

# Manual

## mz-24 Pro

12 channel HoTT 2,4 GHz transmitter

No. S1006.PRO



CE Part 2  
Programming manual

**Graupner**

# Index

## General operating instructions



Before use .....	3
Warning and advisory symbols and their meaning .....	3
Starting up the transmitter .....	4
Operating the display .....	6
Warnings .....	8
DSC socket .....	10
Data socket .....	10
Ear phones port .....	11
Card slot .....	11
Mini-USB connection .....	12
Starting up the receiver .....	14
Installation notices .....	16
Safety and handling instructions for Lith. Batteries .....	22
Definition of terms .....	24
Control and switch assignment.....	26
Receiver configuration	
Vehicles, boats and copters.....	30
Helicopter models .....	31
Fixed-wing models.....	32

## Program description

Program description .....	34
---------------------------	----

## Base menu



Model selection .....	38
HoTT synchronization methods setting .....	39
Model name.....	42
Manually programming the basic settings of a new model.....	42
Entering the basic settings of a new model with an assistant .....	44

Model type .....	60
E.P.A .....	62
REV/SUB .....	64
Throttle Cut .....	66
Transmitter setting .....	68
Timers .....	74
Fail Safe .....	80
Trim settings.....	82
Servo monitor .....	86
Base menu - Control/switch setting .....	90
Throttle limit function .....	94
Transmitter output .....	96
Telemetry .....	98
Announces .....	118

## Function menu



Phase .....	120
D/R,EXP .....	124
THR.CRV .....	128
What is a mixer? .....	132
General information on programmable mixers .....	133
Free mixer.....	134
Trainer .....	141
Connecting scheme .....	144
Wireless HoTT system .....	145
Logical switch.....	148
Sequencer .....	150



Phase .....	120
D/R,EXP .....	124
Pitch curve .....	154
Throttle curve .....	160
Gyro/governor .....	166
THR.HOLD .....	170

Swashplate mixer .....	172
Swashplate limiter .....	173
Heli mixer .....	174
Throttle mixer .....	176
What is a mixer? .....	132
General information on programmable mixers .....	133
Free mixer.....	134
Trainer .....	141
Connecting scheme .....	144
Wireless HoTT system .....	145
PIT>>TAIL .....	178
Logical switch.....	148
Sequencer .....	150



Phase .....	120
D/R,EXP .....	124
THR.CRV .....	128
Idle LOW .....	180
What is a mixer? .....	132
General information on programmable mixers .....	133
Free mixer.....	134
Snap roll .....	181
AILE differentiation (motor airplane).....	182
AILE differentiation (glider) .....	184
Wing Mix .....	188
Flap mixer .....	192
Flap Sett .....	196
Airbrake .....	200
Butterfly .....	202
Trainer .....	141
Connecting scheme .....	144
Wireless HoTT system .....	145
Logical switch.....	148
Sequencer .....	150
V-Tail .....	206

## System menu

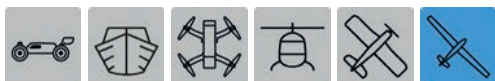


Control mode .....	208
Warning .....	210
Etc. Set .....	212
Display .....	216
Stick calibration .....	220
MP3 Player .....	222

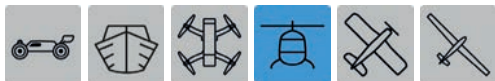
## Telemetry

Telemetry data display .....	225
------------------------------	-----

## Programming examples



Phase specific flaps trimming .....	230
-------------------------------------	-----



Phase specific pitch trimming .....	232
-------------------------------------	-----

Phase specific trimming .....	232
"RPM setting" .....	233

## Appendix

Appendix .....	234
----------------	-----

## Before use

Thank you very much for purchasing the *Graupner mz-24* HoTT Pro transmitter.

The manual of this transmitter is made of two parts: The one named Part 1 quick guide is included in the package of the transmitter and this Part 2 in form of programming manual is always updated and is available as download in the web page of the related item on [www.graupner.de](http://www.graupner.de).

Read both manuals carefully to use the transmitter optimally and first of all to safely control your models. If you experience any trouble during operation, take the instructions to help or ask your dealer or *Graupner* Service Centre.

To make the research of important information easier, the single paragraphs in this manual are marked with model type symbols. They are the same as the ones used in the transmitter and they show you which paragraph is related to your model type.



Furthermore you can find in many places in the manual numbers (page number) or strings in blue characters, for example [www.graupner.de](http://www.graupner.de). Clicking or tapping on brings you directly to the related target.

## Warning and advisory symbols and their meaning



Always observe the information indicated by this warning sign. Particularly those which are additionally marked with the **CAUTION** or **WARNING**.

The signal word **WARNING** indicates the potential for serious injury, the signal word **CAUTION** indicates possibility of lighter injuries.



The signal word **Note** indicates potential malfunctions.

**Attention** warns you against potential damages to objects.



This symbol indicates instructions on the care of the device that the user must follow to ensure that the device remains useful over a long period.

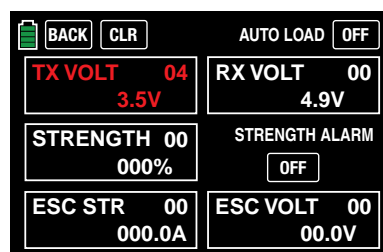
# Starting up the transmitter

## Preliminary remarks

Theoretically, the *Graupner*-HoTT system allows more than 200 models or remote-control systems to be operated at the same time. This number will be significantly less in practice since permits are required for combined remote operation within the 2.4 GHz ISM band. The ultimate limiting factor should be overall the dimension of the available field.

## Battery charged?

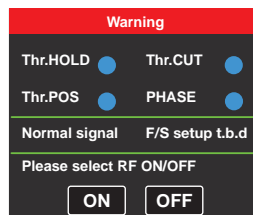
Since the transmitter is delivered with a partially charged battery, you will need to charge it observing the charge instructions included in the Part 1 of the manual. Otherwise, a warning signal will sound after a short time, and a related message will appear in the basic display after the voltage drops below a certain threshold which can be changed in the line "Batt warning" in the sub-menu "ETC. SET", within the system menu.



## Transmitter startup

After the transmitter is switched on by a motor powered fixed wing model the actual control impulse of the output 1 or by helicopter model the throttle servo or rpm controller connected to the output 6 are checked. If this impulse is outside a specifically selected band width for idle and then there is the danger that the motor can start, the RF module remains off for safety reasons.

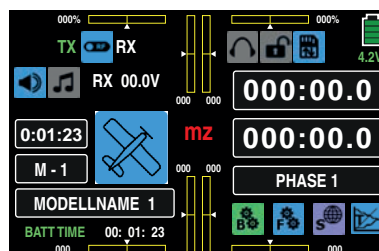
In all other cases by switching on the transmitter the RF module will be switched on too and in the center of the display it will appear the message:



At the same time, audible warning signals sound for a few seconds.

You now have the option of waiting a few seconds until the display disappears automatically or maintaining the HF transmissions by manually tapping the **ON** button, or switching them off by tapping the **OFF** button.

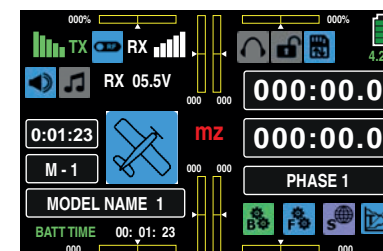
You can turn off a receiver that is on and then first touch **ON** for demonstration purposes. You are then in the basic display of the **mz-24** HoTT Pro transmitter:



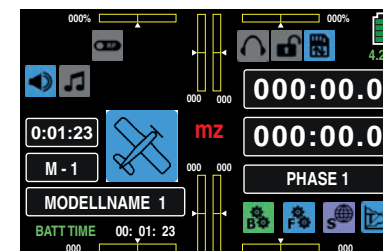
The blue switch symbol at the top left between the green "TX" and the white "RX" means that the RF transmission of the transmitter is on. (Otherwise the symbol would be gray.)

The green "TX" and white "RX" on the left and right of this switch symbol mean that the currently active model memory has once been linked to a *Graupner*-HoTT receiver but is presently not linked.

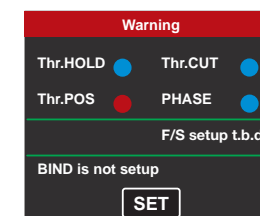
Once this link exists, the field strength display appears to the left of the green "TX" and to the right of the white "RX", and the numeric display underneath shows the current voltage of the receiver power supply, for example:



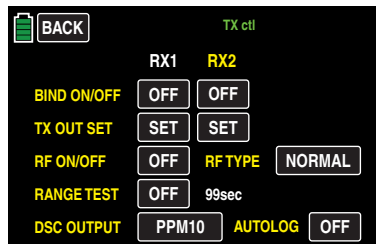
If the transmitter is turned on while the RF transmission is off, all of this information is not displayed, and the RF switch symbol is gray.



If the following warning appears in the display after the transmitter is turned on, ...



... the currently active model memory is not linked to any receiver. Tapping on the **SET** button you accede immediately the under-menu »**Transmitter setting**«, ...



... where you can bind your receiver or, tapping on the **BACK** button at the top left of the display to terminate the procedure.

### Tip

The basic procedure for initially programming a new model memory starts on page 42.

### Notices



- With this **mz-24** HoTT Pro transmitter it is possible to control up to 12 functions. Any servos which are connected to connections 13 and higher remain in their middle position by default and cannot be actuated by the transmitter as standard.
- For the sake of maximum flexibility and to prevent unintentional misuse, control channels 5-12 are initially not assigned to any control elements, and the servos linked to these channels first remain in their middle position until an operating element has been assigned. For the same reason, nearly all mixers are inactive. Similarly you will find at the begin of the paragraph's description "**CTL Set**".

- When training, linking or adjusting the remote control, make sure that the transmitter antenna is always far enough from the receiver antennas. If the transmitter antenna is too close to the receiver antennas, the receiver will overdrive, and the red LED on the receiver will shine to indicate that no signal is received. At the same time, the feedback channel will stop working, the field strength bar in the transmitter display will disappear, and the current receiver battery voltage will be displayed as 0.0 V. In this moment the transmitter is in the so called **Fail safe mode**. That is, due to the loss of reception, the servos remain in the last correctly received positions or after a short time in the preset Fail-Safe positions, until a new valid signal is received. In this case, move the two antennas away until the displays return to normal.

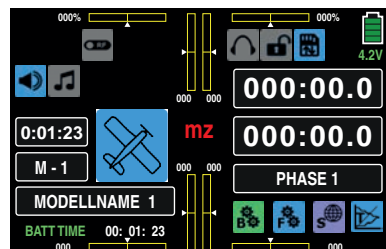
### CAUTION



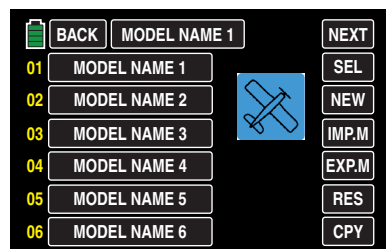
**Never turn off the transmitter while operating the model! If this nonetheless accidentally happens, do not panic, and wait until the transmitter display goes dark which indicates that the transmitter is completely off. This will take at least four seconds. After this time, turn the transmitter on again. Otherwise, the transmitter may freeze directly after being turned on, and you will be unable to control the model any more. The transmitter may only be turned on again after it has been turned off and the described procedure has been correctly repeated.**

# Operating the display

The display is basically operated by touching the desired field with a finger or the provided stylus:



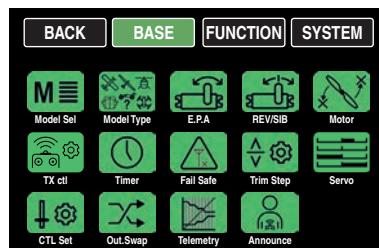
By touching the model memory field labeled "M 1" in the above display with a finger or the provided stylus, the "Model memory" selection menu opens.



In this sub-menu, you have the possibility for example to change the model memory by touching the desired model memory and then the **SEL** button.

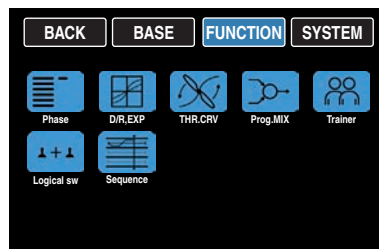
Just as described on page , touch **NEW** to start programming a [Programming a new model](#) , or touch the field **MODEL NAME 1** at the upper edge of the display to switch to the "Model name" entry menu, or touch **BACK** at the top left to return to the previous menu item. In contrast, touch the button **SW** [**Change page**] (generally using the rotation method) which is also available in several menus to go to the next page. In the above display of the model memory, this would be to the display of model memories 07 ... 12, etc.

Touching one of the three gear icons identified with "B", "F", and "S", special selection menus open on the bottom right from which you can switch to other sub-menus. Starting with the green **BASE** menu, the selection displays appear as follows, ...

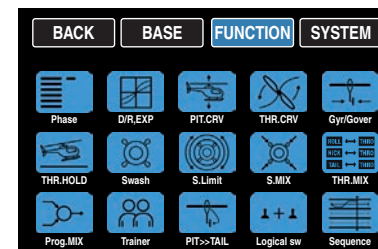


... it should be noted that the blue function menu described from page 120, **Function** menu contains model-type-specific sub-menus and for this reason in divided into a total of three paragraphs.

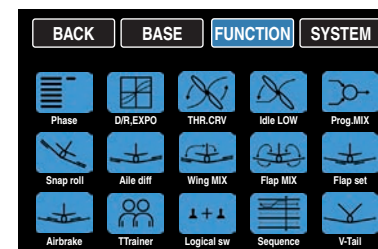
In the first paragraph starting on page 120 only the sub-menus for "Vehicles", "Copters" and "Boats" model types will be described. Because the same sub-menus are also included in the "blue" menu of the model type "Helicopter" and "Fixed-wing" models, their description is valid for all the model types and for space reasons they will not be repeated in both other paragraphs:



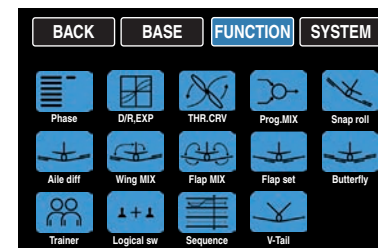
In the second paragraph, beginning on page 154, exclusively the sub-menus related to the model type "Helicopter" will be described excluding the above mentioned "general menus":



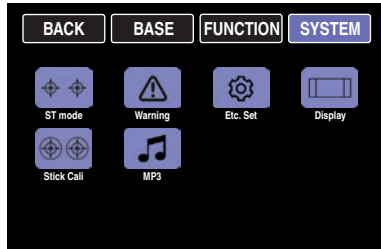
And in the third paragraph, beginning on page 182 also excluding the previously described "general menus", exclusively the sub-menus related to the "fixed-wing" model type, in which the menus of a "motor powered model" ...



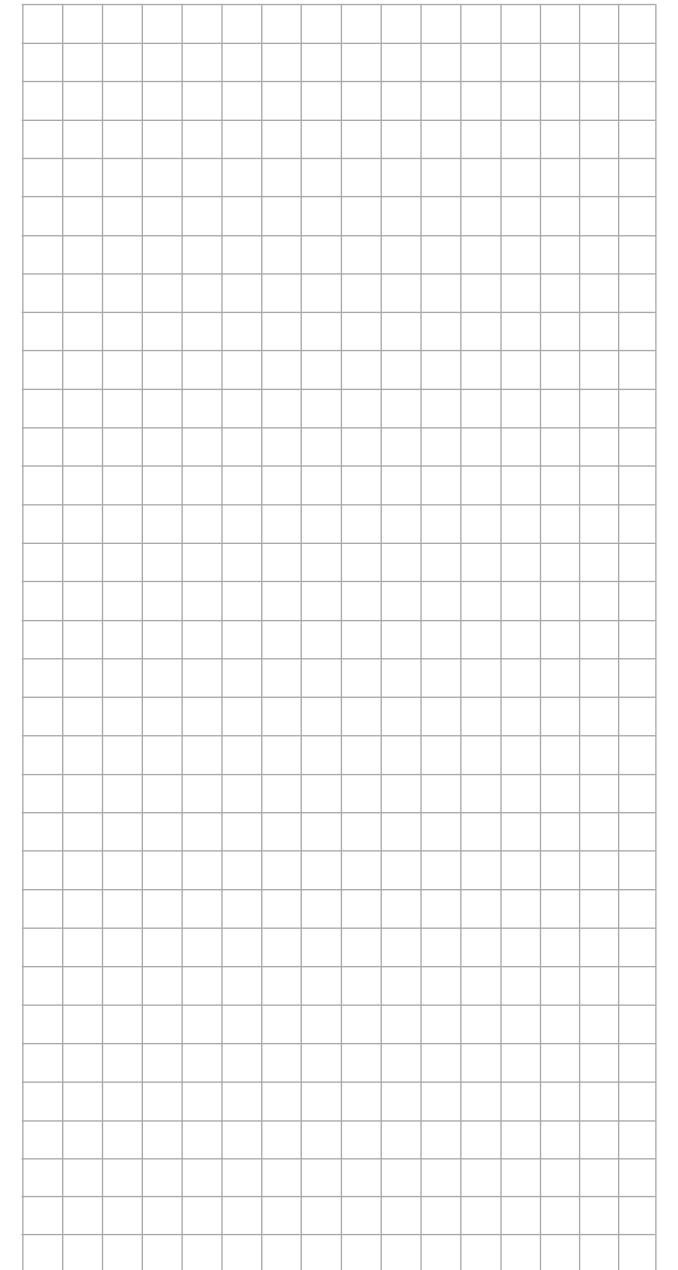
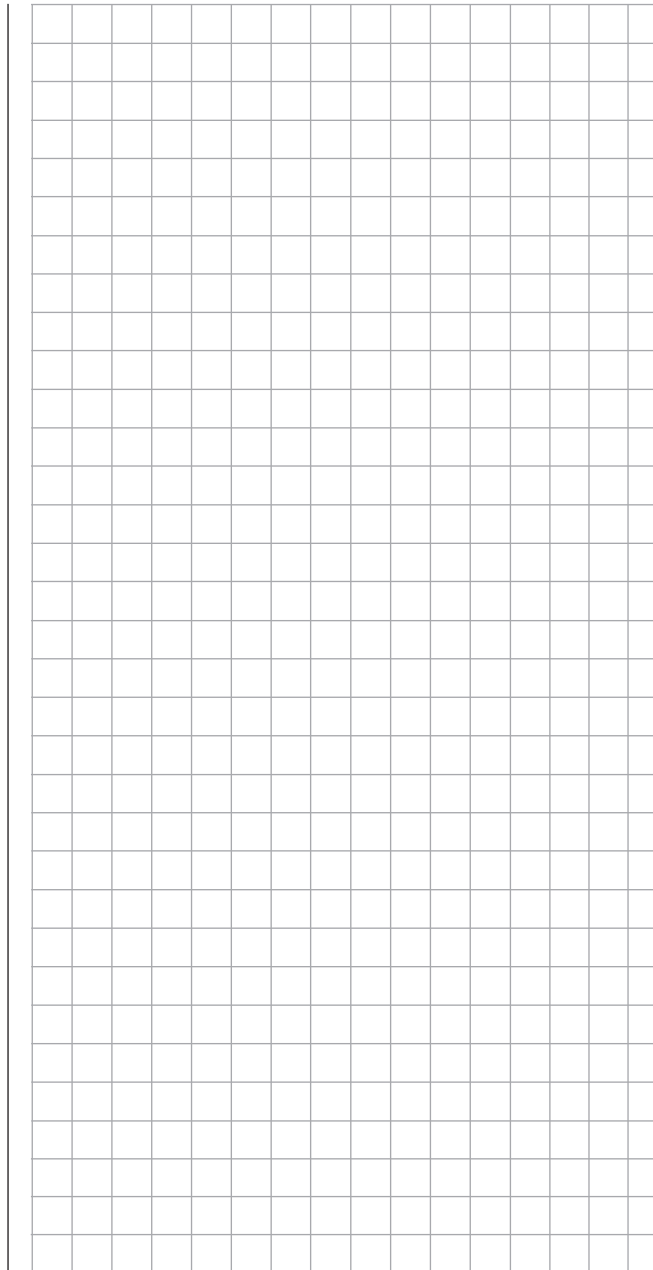
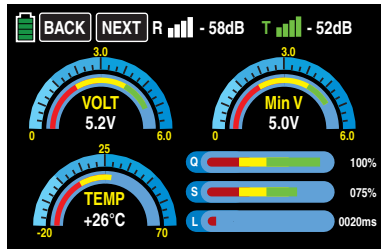
... distinguishes from the menus of a "Glider" model:



The purple **System** menu which can be accessed tapping on "S" and whose description begins on page 220, is displayed as follows ...



... and the display which can be accessed by tapping on "T" and detailed described from page 225 is displayed for graphic representation of the telemetry data e.g. so:

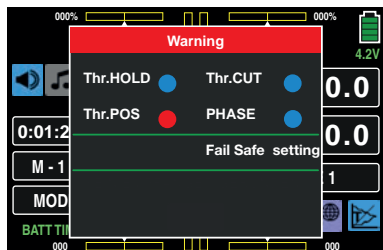


# Warnings

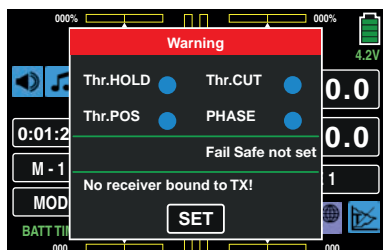
In the display of the **mz-24** HoTT Pro transmitter appear different warning windows. These can be divided into two groups:

## "Warning" display

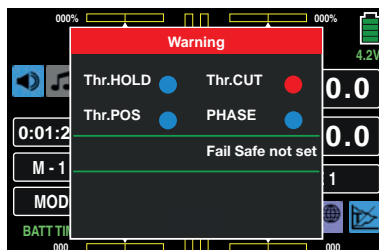
These warning windows primarily appear after the transmitter is turned on and indicate certain operating states. In the following illustration, for instance, the red dot after "CH1-POS" indicates that the throttle servo connected to the output 1 in fixed-wing models, or the throttle servo and to output 6 on an helicopter model, is not in the idle position and there is the risk of a runaway engine. Until this state persists, the content of the underneath field are obscured for safety reasons ...



... until the Throttle/Pitch control stick is not in the idle area:



Basically the it is the same for the warning option "Thr. HOLD", with the difference that the sub-men "WARNING" of the system menu it can be selected, depending on the model, if the motor stop function on/off must be worn:

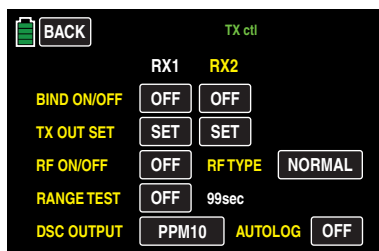


## Notice



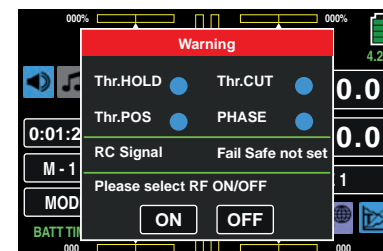
In no case you should use the possibility of the servo reverse of the channel 6 for helicopters and channel 1 for other model types to reverse the direction in which the related control stick works. Because the switch-on warning "CH1-Pos" as the "Thr. HOLD" function do not follow this kind of reverse control direction. To reverse the control direction use exclusively the possibility offered by the "Pitch curve" menu for helicopters models and "Throttle curve" for all the other model types.

Touch **SET** with a finger or the provided stylus to go directly to the »TX ctl« display (Transmitter setting) in which you can link the receiver to the model memory as described in the related paragraph ...



Or touch the **BACK** button at the top left to terminate the procedure.

If instead by switching the transmitter, there is already a receiver bound to the model memory and *inactive* Thr.POS warning, the transmitter will switch on and the RF module will also be active. Otherwise in the middle of the display it will standardly appear the following page and at the same time an acoustic warning will be emitted.



You now have the option of waiting a few seconds until the display disappears automatically or maintaining the HF transmissions by manually tapping the **ON** button, or switching them off by tapping the **OFF** button.

In the field between the two green lines, the message "RC signal" indicates that the transmitter is set to normal remote control. Alternately, messages such as "TEACH signal" or "PUPIL signal" can appear here. Another – possible – variant is to display "SET F/S" as an indication that no fail-safe settings have yet been made.

## Notices

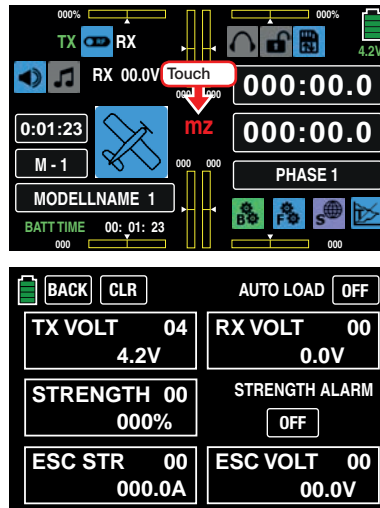


- By default, only the monitoring of the "Warning" sub-menu is activated in the display of the sub-menu "Warning" of the system menu.
- By selecting **REV** in the "Thr.HOLD" line of the "Warning" sub-menu the transmitter can remind you to switch this function safely on.



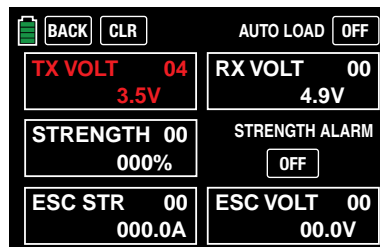
## "Acute warning" display

You can open this display by touching **mz** in the middle of the transmitter's basic display ...



... and touch the **BACK** button at the top left to close the display.

If acoustic warnings sound and the normal transmitter display is covered by this display, take note of the message in red. An example would be because the transmitter's supply voltage has reached the warning threshold set in the sub-menu "»ETC. SET" of the SYSTEM menu:



At the same time, the display contrast is reduced to 05 to save power.

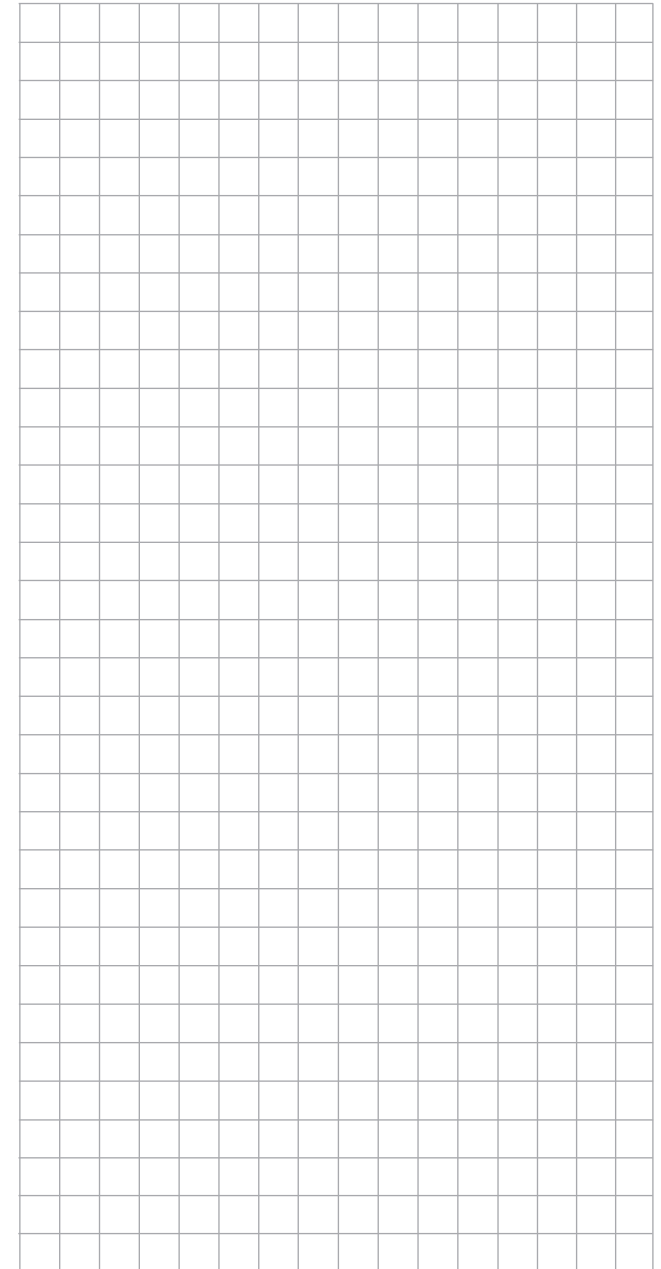
This warning can be kept from reappearing by touching the **ON** button at the top right then deleted by touching the **BACK** button at the top left in the display. (In specific cases, stop operating the model as soon as possible and charge the transmitter).

The red number at the top right of each warning field shows the number of current warnings; in the above example, the warning is the fourth one. This count can be deleted by touching the **CLR** button at the top left. All other warnings in this display can be handled in the same way. However, in the case of a field strength alarm, you can also suppress other alarms triggered by the low field strength by touching the **ON** button under "STRENGTH ALARM" and switch it to **OFF**.

## CAUTION



A switched **OFF** "Strength alarm" will not automatically be set to the "ON" position when the transmitter will be switched on the next time.



## DSC socket

The abbreviation "DSC" is from the initial letters of the original function, "direct servo control". With the HoTT system, "direct servo control" using a diagnostic cable is not possible for technical reasons.

The standard two-pin DSC socket on the back of the **mz-24** HoTT Pro transmitters functions as a TRAINER or PUPIL socket as well as an interface for flight simulators or other external devices.



**To ensure a correct DSC connection, observe the following:**

1. Perform any necessary adaptations in the menu.  
To adapt to the transmitter to a trainer system, see the description of the "**Trainer**" menu.
2. Connect the other end of the connecting cable to the desired device while observing the relevant operating instructions.

### Tip

Make sure that all the plugs are securely inserted in the respective sockets, and only use the provided plug-in connections with a 2-pin jack plug on the DSC side.

3. In the sub-menu **»TX ctl«**, depending on the number of channels used for the connected flight simulator or for the Training mode, you can select in the line "DSC output" one of the following modes: PPM10, PPM16, PPM18 und PPM24. Default setting: PPM10.

### Notice

Given the numerous flight simulators on the market, it is possible that the contacts on the jack plug or DSC module may have to be adapted by *Graupner Service*.

### Attention

When your transmitter is directly connected to a desktop computer or laptop by a connecting cable (DSC cable) and/or a computer interface is connected to your simulator, the transmitter may be destroyed by electrostatic discharge. This type of connection should therefore only be used if you protect yourself from electrostatic discharge while operating the simulator by wearing a commercially available grounding armband. *Graupner* therefore strongly recommends only using wireless simulators.

## Data socket

The so-called DATA socket is found under the back cover of the **mz-24** HoTT Pro transmitters:



This is for connecting the optional Smart Box ( order No. **33700**) or alternatively for an external Bluetooth module (No. **S8351**).

Further information on the Smart Box and the Bluetooth module can be found in the main *Graupner* FS catalogue and on the Internet at [www.graupner.de](http://www.graupner.de) for the respective product.

## Ear phones port

The headphone connection is found left of center under the back cover of the **mz-24** HoTT Pro transmitter:



The socket is for connecting commercially available ear buds or headphones with a 3.5 mm stereo jack. (Not included in the set.)

When headphones are plugged in, the transmitter's speaker is turned off and the stylized icon of a headphone is depicted in color and not gray in the basic display.

In addition to acoustic signals from the transmitter, signals and messages associated with the "**Telemetry**" menu are output via this connection. These messages are in German by default. Further information can be found under "Announces" in the "**Telemetry**" section.

## Card slot

Micro-SD and micro-SDHC

The card slot for micro-SD und micro-SDHC memory cards is found on the right of center under the back cover of the **mz-24** HoTT Pro transmitters:



In addition to the micro-SD memory cards that come standard with the **mz-24** HoTT Pro, all conventional micro-SD memory cards with up to 2 GB and micro-SDHC cards with up to 32 GB memory can be used. The manufacturer recommends using memory cards with a maximum of 4 GB since this capacity is normally sufficient.

The memory card that is provided for the transmitter is inserted into the slot behind the cover with the contacts facing up and then locked in place. After the memory card is inserted, the transmitter cover can be closed.

After the provided memory card included in the **mz-24** HoTT Pro set or another memory card has been inserted in the transmitter at least once, the card is ready for use directly after the transmitter is turned on. If the transmitter is turned on after the memory card is inserted, the stylized memory card icon is displayed in color and not gray in the basic display. Otherwise, a few folders are first created on the memory card.

### Removing the memory card

Open the cover on the back. Press the SD card slightly toward the card slot to unlock it and then remove it.

### Capturing / saving data

The data memory on the SD card is linked to timer 1: Once this starts, data storage also starts assuming that an appropriate memory card is in the card slot and there is a telemetry link with the receiver. Data storage stops when the timer 1 is stopped. Timer 1 starts and stops as described in the section "**Timer**". The data writing on the memory card is remarked by an animation of the memory card symbol.

After data storage is finished, an (empty) "Models" folder and "LogData" folder appear on the memory card. Finally, the log files are saved in subfolders called "Modelname" named according to the structure 0001\_year-month-day.bin, 0002\_year-month-day.bin. If in contrast a model memory is still nameless, the corresponding log files are saved in a subfolder entitled "NoName" after the memory card is removed from the transmitter and inserted in the card slot of a desktop or laptop computer. The data can be evaluated on a compatible computer using the programs found on the downloads page for the transmitter under [www.graupner.de](http://www.graupner.de).

### Notice



Please note that for technical reasons NO data representation is possible during the reproduction of MP3 data.

## Mini-USB connection

### Tip

In order to be aware of important software updates, you should therefore register at <https://www.graupner.de/de/service/produktregistrierung.aspx>. This will allow you to automatically receive updates by e-mail.

### Importing and exporting model memories

To exchange data between transmitters of the same make or to backup data, model memories can be copied to the inserted memory card, or from the memory card to the transmitter. More information can be found in the section "[Import from SD card](#)" or "[Export to SD card](#)".

### Notices



- Some of the special characters used in model names cannot be transferred to FAT and FAT32 file systems due to the specific restrictions of these file systems used by the memory card and are therefore replaced by a tilde (~) during the copying process.
- The model memories of the **mz-24** and **mz-24 Pro** transmitters are in principle compatible, BUT:

In order to import from an SD card in another transmitter type, the desired model memory must be copied or moved to a corresponding directory on a desktop or laptop. For example from \\Models\mz-24 to \\Models\mz-24pro or vice versa.

More information on "[import from SD card](#)"

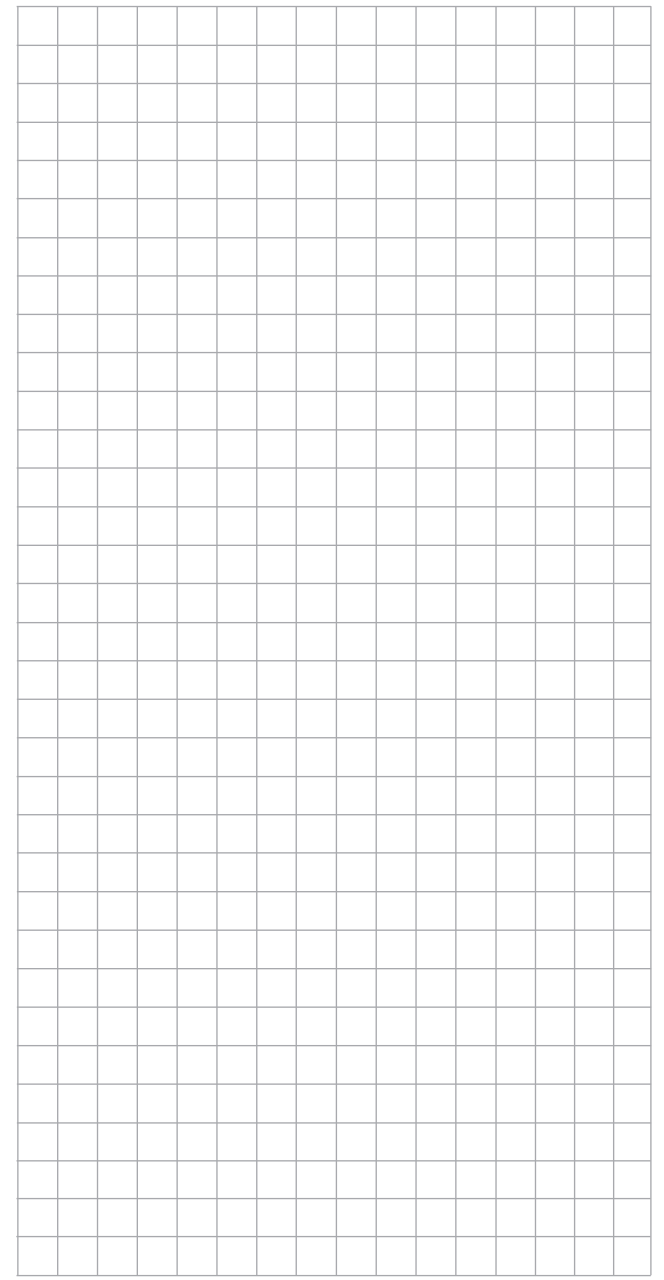
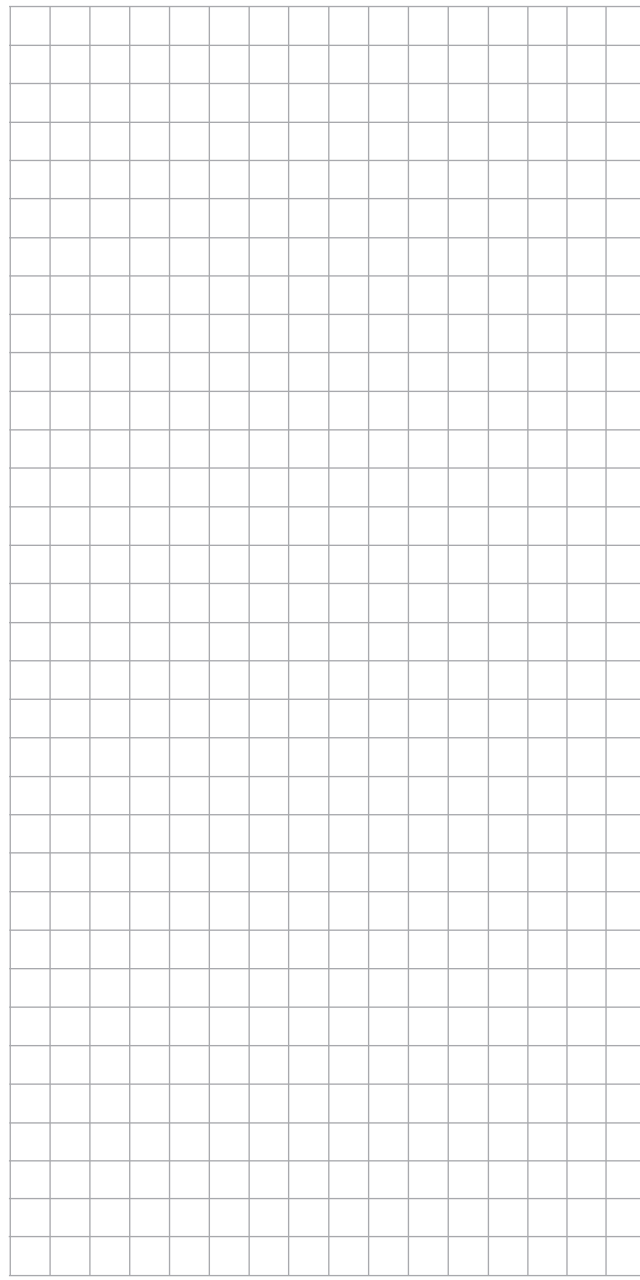
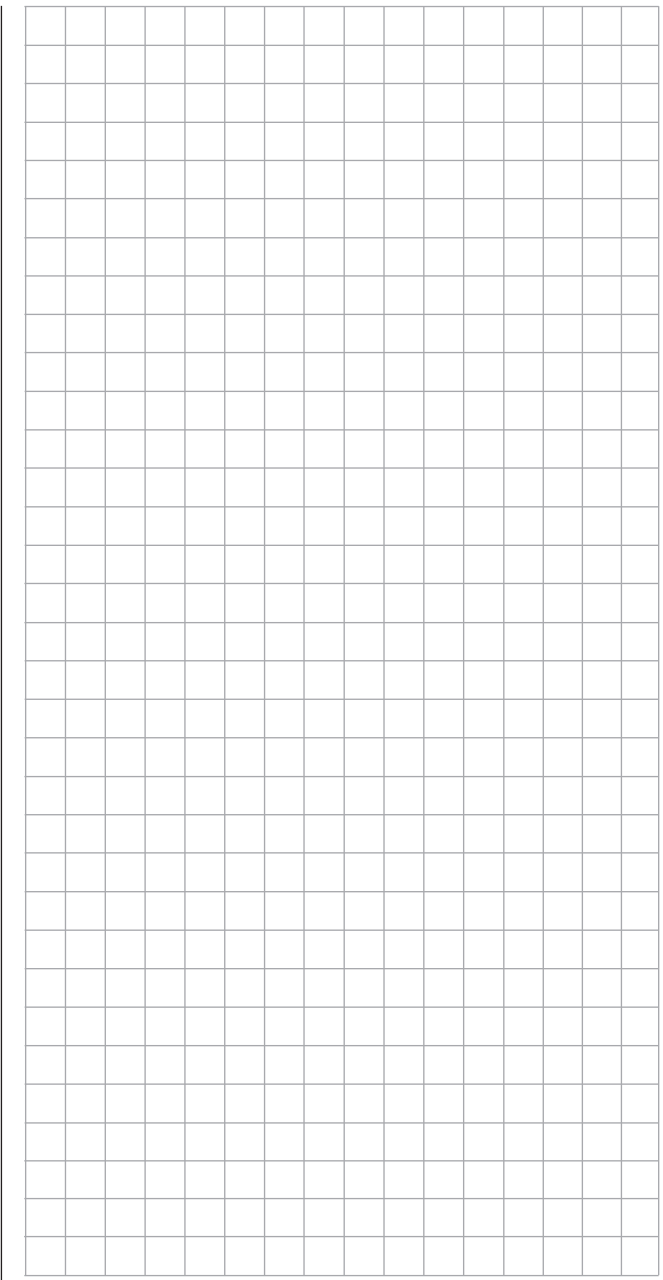
After importing from an SD card, you always need to check each and every model function and in particular adapt the control and switch functions to the respective transmitter.

Located under the rear cover of the **mz-24** HoTT Pro transmitter, there is a connection socket for software updates as well as the date and time setting from a desktop or laptop with one of the Windows operating systems (XP, Vista, 7 ... 10):



The USB cable that comes with the set is plugged into this socket. The procedure for obtaining software updates through a computer is described in the software package instructions.

The software that the computer needs as well as the appropriate USB driver can be found on the download page at [www.graupner.de](http://www.graupner.de) for the respective product. After the required driver and software are installed, the transmitter can be updated as needed using this connection, or the date and time can be set.



# Starting up the receiver

## Preliminary remarks

### Notice

With this **mz-24** HoTT Pro transmitter it is possible to control up to 12 functions. Any servos which are connected to the receiver outputs 13 and higher remain in their middle position by default and cannot be actuated by the transmitter.

As described in the manual of the related receiver, after switching it on a LED indicates the missing reception, so long as "its" transmitter is out of range or switched off or simply the wrong model memory has been selected in the transmitter. This means that a link has not (yet) been established with a *Graupner*-HoTT transmitter.

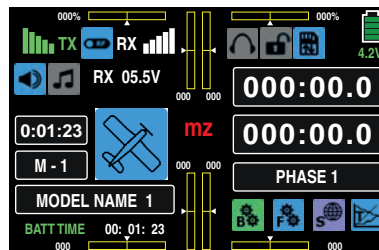
To establish a connection with the transmitter, first the *Graupner* HoTT receiver must be "bound" to its model memory in its *Graupner* HoTT transmitter. This process is known as "Binding". This "binding" is however required only once for each receiver-model memory combination or, after changes have been made to one or more model memories (see page 39), only once for each transmitter-receiver combination. Therefore you need to perform a "binding" only after buying a new transmitter or other receivers or for example if you have changed model memory (and you can repeat it at any time).

### Notice

If the LED of your receiver indicates that it is ready for use and the receiver does not react to the SET button and to the control movements, then you would be better to check the polarity of your receiver power supply.

### On-board voltage display

When a telemetry link exists, the current voltage of the receiver power supply appears in the transmitter display in white.



### Temperature warning

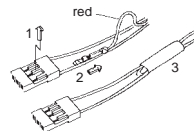
If the receiver temperature falls below a threshold which can be set in the receiver (-10°C by default) or exceeds a top warning threshold (+55°C by default) which can also be set in the receiver, the receiver emits a warning in the form of a beep that repeats approximately once per second.

Note the installation instructions for the receiver, receiver antennas and servos on page 16.

### Notice

If you are using a speed controller with an integrated BEC\* in addition to the receiver battery, the plus pole (red cable) may have to be removed from the 3-pin plug depending on the speed controller. In this regard, take note of the related information in the speed controller instructions.

Use a short screwdriver to carefully lift the middle tab of the plug (1), remove the red cable (2), and use electrician's tape to protect against shorts (3).



### Reset

To reset the receiver, hold down the SET button on the top of the receiver while turning on the power.

If the reset is performed while the transmitter is switched off or with a not bound receiver, the LED on the receiver indicates the actual status according to the description included in the package. If there is no different description, release the button after about 3 seconds.

If the reset is performed with a not bound receiver, you can then start a binding process at any time.

If a linked receiver is reset and the associated model memory is active in the turned-on transmitter, the LED indicates for about 2-3 seconds, accordingly to the description included in the package of the receiver, to indicate that your transmitter/receiver system is ready to use.

### Note

Through a RESET ALL of the settings in the receiver are brought to the factory settings with the exception of the HoTT synchronization information!

If a reset is performed accidentally, all of these settings that were made using the "Telemetry" menu in the receiver should be restored.

Resetting is particularly recommendable when you want to switch a receiver to a different model. This makes it easy to keep settings which do not match from being transferred.

\* BEC = Battery Elimination Circuit

# Installing the receiver

## Installing the receiver

Whatever *Graupner* receiver system you use, the procedure is the same.

For aircraft models, the receiver is installed behind a strong bulkhead or it is protected against dust and splash water in car and ship models. When you install the receiver, make sure that it is not excessively airtight to prevent it from overheating during operation.

The receiver may not directly touch the fuselage or chassis since they can directly transmit motor vibration or impact from landing. When installing the receiver in a model with a gas motor, all of the parts must be protected to prevent exhaust or oil from penetrating. This holds true in particular for the ON/OFF switch that is installed in the shell of the model in most cases.

Install the receiver so that the connecting cables for the servos and power supply remain loose, and so that the receiving antennas are at least 5 cm from all large metal parts or wires that do not directly originate from the receiver. This includes carbon fiber parts, servos, electric motors, fuel pumps, all types of cables, etc. in addition to steel parts.

It is preferable to install the receiver away from all other installed parts at an easily accessible location in the model. Servo cables may not be wound around antennas or run next to them.

Note that the cables can shift under the influence of acceleration during flight. You therefore need to make sure that the cables cannot move to be directly adjacent to antennas. Moving cables can interfere with reception.

## Installing the receiver antennas

In case of single antenna, the orientation is not crucial. In the case of diversity antennas (two antennas), the active end of the second antenna should be at a 90° angle from the end of the first antenna, and the distance between the active ends should ideally be more than 125 mm.

If the fuselages are made of carbon fiber, the ends of the antennas should extend from the fuselage by at least 35 mm. If necessary, exchange the approx. 145 mm standard antennas for HoTT receivers with the 300 mm or 450 mm long antennas No. **33500.2** or **33500.3**.

## Servo connections and polarity

The servo connections of the *Graupner*-HoTT receiver are numbered. The supply voltage runs through all the numbered connections. The polarity of the plug-in system cannot be reversed. When inserting the plug, note the small bevels on the side. Do not apply force.

### Attention



Do not reverse the polarity of these connections! This can destroy the receiver and connected devices.

### Notice



In compact receivers like the GR-12L HoTT the outputs 1 ... 6 are reverse of 180° if compared to bigger receivers, for this reason we recommend to pay a very lot of attention while you connect any plug to the receiver. If applicable, use a V or Y cable (No. **3936.11**).

## Channel mapping

The function of each channel is determined by the transmitter and not the receiver. The channel mapping can be changed directly in the receiver programming the "**Telemetry**" menu and indirectly through the menu point "**Transmitter output**" of the base menu.

# Installation notices

## Components and accessories

### Attention

As the manufacturer, *Graupner|SJ* GmbH recommends only using components and accessories that have been tested and accepted by *Graupner|SJ* GmbH for suitability, functioning and safety. If this is done, *Graupner|SJ* GmbH will assume responsibility for the product.

However, *Graupner|SJ* GmbH assumes no liability for products or accessories by other manufacturers that have not been approved, and is incapable of evaluating every single third-party product to determine if it can be used safely.

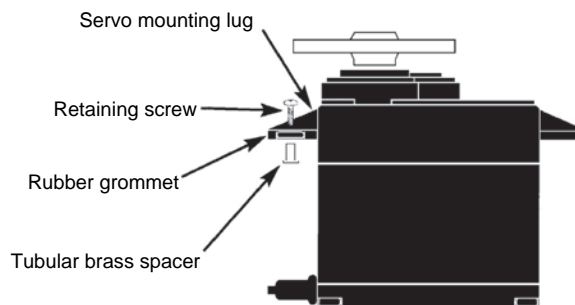
### Installing the switch

All of the switches must be installed so that they are not influenced by exhaust or vibration. The switch knob must be freely accessible over its entire operating range.

### Installing the servos

Always install the servos with the provided rubber vibration damper, see the following installing notices. This is the only way to protect them somewhat from excessive vibration.

- Install the servos on rubber grommets with tubular brass spacers to protect them from vibration. Do not overtighten the fixing screws; this could counteract the vibration protection provided by the rubber grommets. The system offers both safety and vibration protection for your servos when the servo fixing screws are properly tightened. The following figure shows how to correctly mount a servo. The brass spacers are inserted from below into the rubber grommets:



- The servo arms must be freely movable throughout their operating range. Make sure that no linkage parts block the free movement of the servo.
- Connect the receiver's power supply cable(s) or the servo connecting cable to the receiver as follows ...



... they should never be connected as follows:



- In contrast, the sequence for connecting the servos depends on the model type. Refer to the connection assignments for [Helicopter models](#) and [Fixed-wing models](#).

## WARNINGS



- Technical defects of an electrical or mechanical nature may cause motors to start without warning, or may generate flying parts which can cause significant injury to you and others!
- Avoid every kind of short-circuit! Short-circuits can destroy parts of the remote control system and cause serious burns or explosions depending on the circumstances and the battery charge.
- All parts driven by the motor such as air and water propellers as well as helicopter rotors, exposed gears, etc. always pose an injury hazard. Never touch these parts! A fast-rotating propeller can cut off a finger! Make sure that no other objects come into contact with driven parts.



- **Once the battery is connected or the motor is running, always maintain a safe distance from the hazard area posed by the propulsion system!**
- **During the programming process, make sure that a connected gas engine or electric motor cannot accidentally start. Disconnect the fuel supply or drive battery beforehand.**

#### Notices



- Protect all equipment from dust, dirt, moisture and other foreign parts. All equipment must be protected from vibration as well as excessive heat or cold. The models may only be operated remotely in normal outside temperatures such as from -10°C to +55°C.
- Avoid shock and pressure. Check for damage to the housing and cables. Devices that become wet or damaged may not be used anymore even if they dry out.
- Only use the components and spare parts that we recommend. Always use matching, original *Graupner* plug-in connections of the same design and material.
- When running the cables, make sure that they are not excessively tight, kinked, or severed. A sharp edge can also damage insulation.
- Make sure that all of the plug-in connections are tight. When disconnecting the plug-in connections, do not pull the cables.
- No changes may be made to the devices. This will void permission to use the device along with the warranty. If appropriate, send the relevant device to the responsible *Graupner* Service Center

#### Range and function test

Before every use, check the range and functioning. Firmly secure the model, and make sure that no one is nearby.

Perform at least one complete function test on the ground, and run through an entire flight simulation to determine if there are any problems with the system or the programming of the model. Always follow the instructions under [Range test](#).

#### WARNING



**If the range and function test as well as the flight simulation are not performed completely and conscientiously, malfunctions may go unrecognized and reception may be lost which could cause a loss of control or even cause the model to crash. This can result in major property damage and/or personal injury.**

#### Servo noise filters for extension cables

##### No. 1040

The servo noise filter is required when using longer-than-usual servo cables. The filter is connected directly to the receiver output. In critical cases, a second filter can be placed on the servo.

#### Electrical ignitions

Ignition systems of gas engines also generate interference that can impair the functioning of remote controls.

The power for electrical ignitions should always be from a separate source.

Only use interference-suppressed spark plugs and spark plug connectors and shielded ignition cables.

The receiver should be at a sufficient distance from the ignition system.

#### Model function

#### WARNING



- **Never fly the model over observers or other pilots. Never endanger people or animals. Never fly close to power lines. In addition, never operate your model close to locks and open nautical traffic. Do not operate your model on open roads, highways, paths, public walkways, etc.**
- **Never turn off the transmitter while operating the model! If this nonetheless accidentally happens, do not panic, and wait until the transmitter display goes dark which indicates that the transmitter is completely off. This will take at least three seconds. After this time, turn the transmitter on again.**

- **Otherwise, the transmitter may freeze directly after being turned on, and you will be unable to control the model. The transmitter may only be turned on again after it has been turned off and the described procedure has been correctly repeated.**
- **When operating towed models, maintain a minimum distance of approximately 50 cm between the participating receivers or their antennas. Using the satellite receiver is an option. Otherwise, malfunctions from the feedback channel are possible.**

#### Checking the transmitter and receiver batteries

Stop operation and recharge the transmitter battery at the latest when the transmitter battery is running low, the message "**Charge the battery!**" appears in the display, and an acoustic warning sounds.

Regularly check the battery charge, especially of the receiver battery. Do not wait until the movements of the rudder are noticeably slower. Replace dead batteries in a timely manner.

Always follow the manufacturer's charging instructions, and charge the battery for the indicated time. Do not charge the batteries without monitoring them. Never attempt to charge dry batteries. An acute explosion hazard exists.

All batteries must be charged before each use. To prevent short-circuits, first plug the banana plugs of the charging cable into the charger (make sure the poles are correct). Then plug in the charging cable plugs into the sockets of the transmitter and receiver battery.

If you are not going to use your model for a while, disconnect all power sources.

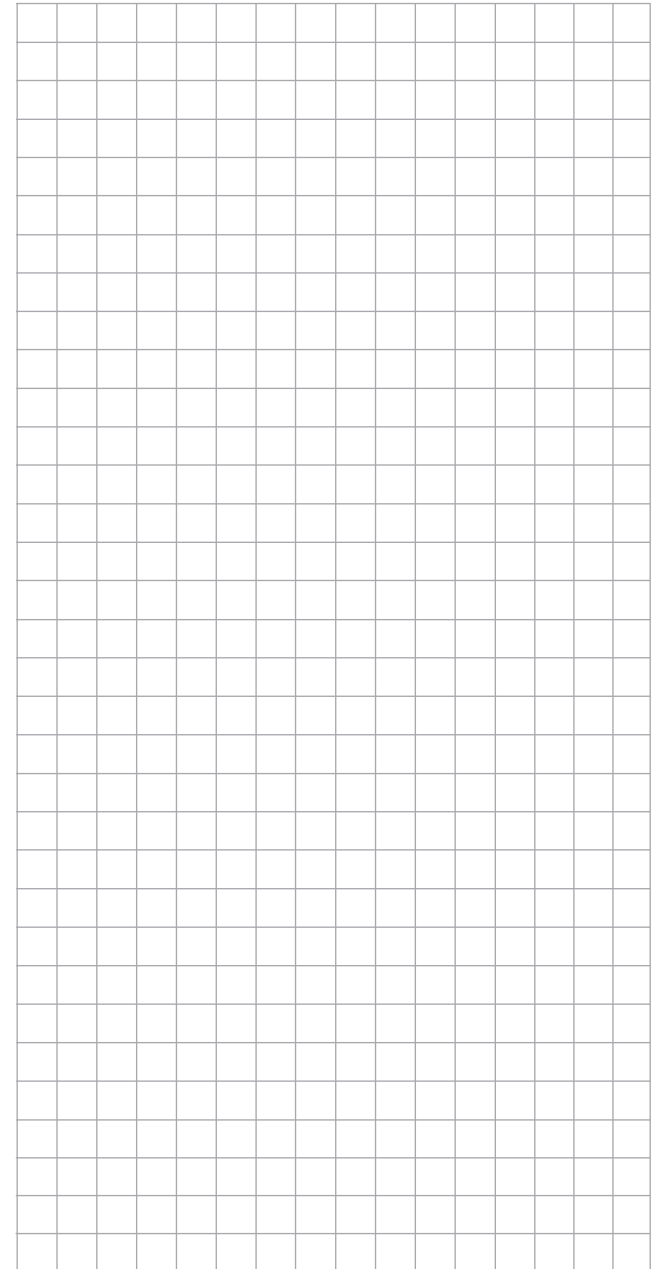
**Never** use rechargeable or replaceable batteries with damaged, defective or different cell types; that is, a mixture of old and new cells, or cells by a different manufacturer. Combinations of old and new cells or cells from different manufacturers.

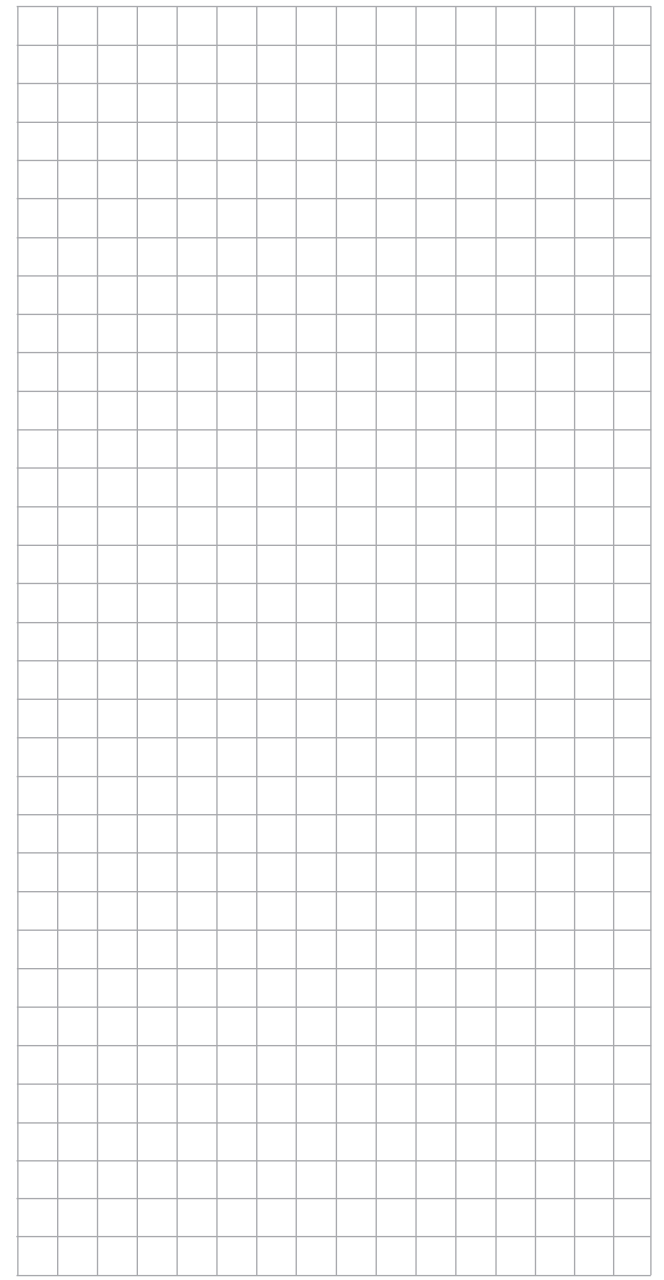
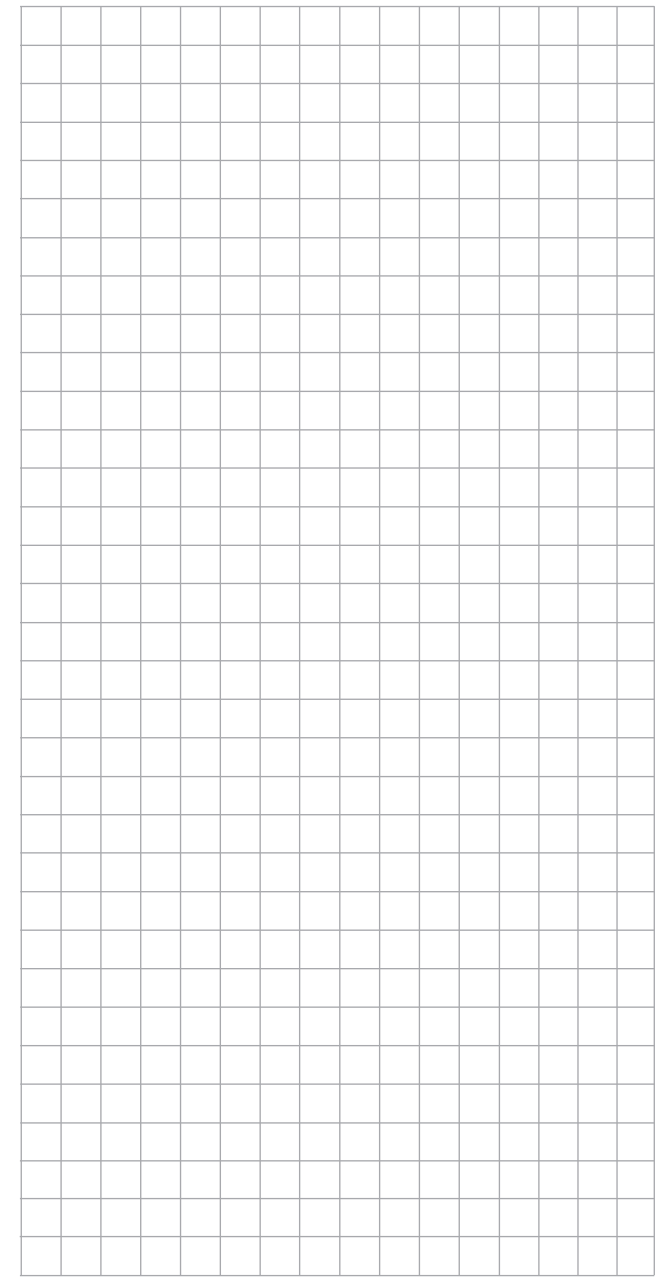
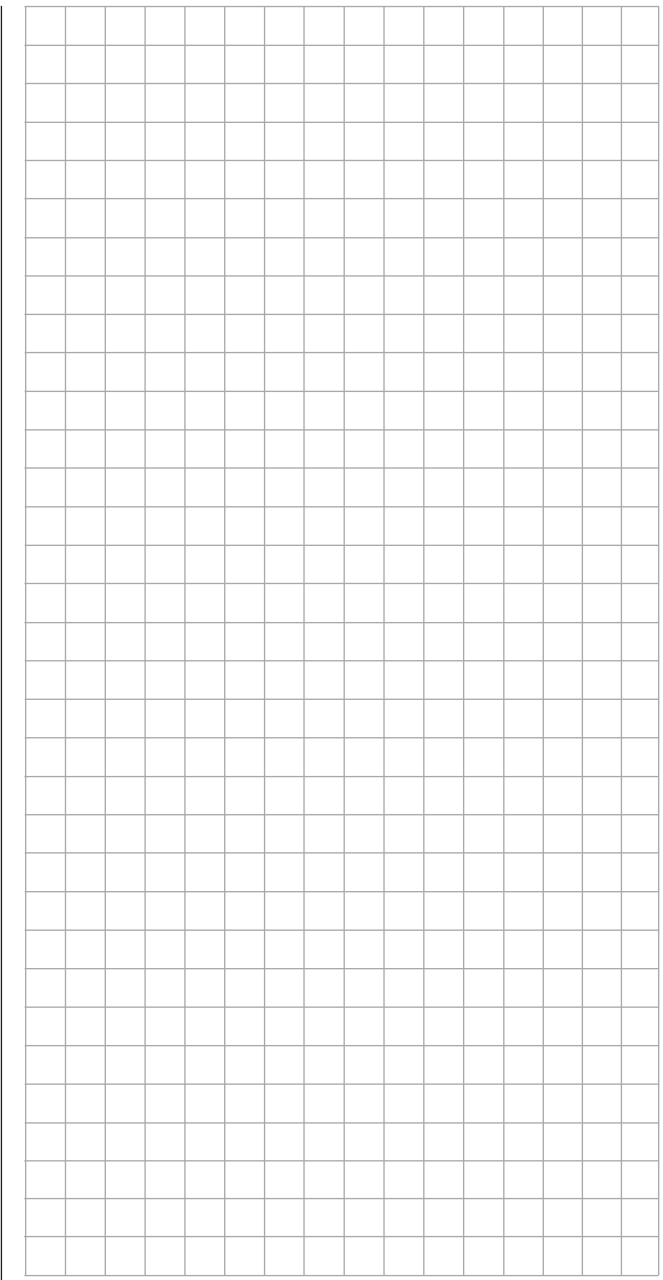
#### Capacity and operating time

The following applies to all power sources: The capacity decreases with each charge. At low temperatures, the internal resistance increases while the capacity decreases further. As a result, the battery's ability to discharge and retain power is reduced.

Frequently charging and/or using battery care programs can also gradually reduce the capacity. Nevertheless, check the capacity of power sources at least every 6 months, and replace them if their performance is significantly low.

Only use original *Graupner* rechargeable batteries!





## Receiver system power supply

To safely operate the model, a reliable power supply is required. If the receiver voltage shown on the transmitter display always drops or is generally (too) low even though the linkage moves freely, the battery is full, the cross-section of the battery connecting cable is sufficient, and the transition resistance at the plug-in connections is minimal, etc., observe following:

First make sure that the battery remains fully charged when initially operating the model. Make sure that the resistance of the contacts and switches is low. Measure the voltage drop over the installed switch cables under a load since even robust, new switches cause a voltage drop of up to 0.2 V. This value can be several times higher due to aging and oxidation of the contacts. In addition, constant vibration and shaking of the contacts also gradually increase the transition resistance.

Furthermore, even small servos such as a *Graupner/JR DS-281* draw stall current to 0.75A when you stop under a load. Four of these servos in a foam airplane can hence draw up to 3A from the on-board power supply.

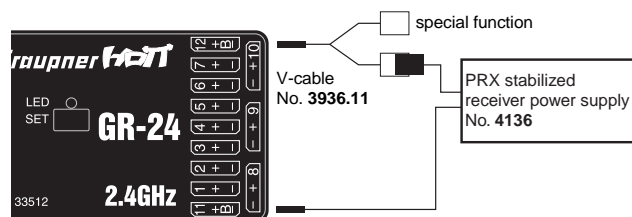
Furthermore, servos connected to a 2.4 GHz receiver receive control pulses more frequently than comparable receivers in the classic frequency range. This affects the power consumption of the receiver system as well as the characteristic of many modern digital servos of maintaining the last position specified by the last control pulse until the next pulse arrives.

You should not only therefore choose a power supply that does not fail under a permanent high load and always provides sufficient voltage. To calculate the required battery capacity, add at least 350mAh for each analog servo, and at least 500mAh for each digital servo.

Using this method, a battery with 1400mAh represents the absolute minimum for supplying power to a receiver with four analogue servos. In your calculation, also include the receiver which requires about 70mA due to its bidirectional function.

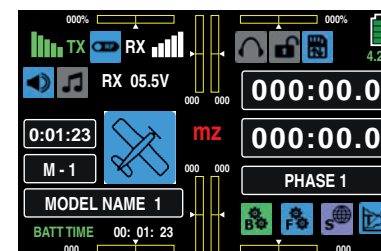
Apart from the above considerations, it is generally recommendable to connect the receiver to the power supply using two cables. As usual, connect cable "1" to the "6+B" or "12+B-" output of a GR-16 or GR-24 receiver, and cable "2" to the opposite end of the connector strip labeled "1+B-" or "11+B-" of the receiver. When, for example, using a switch or voltage regulator with two power supply cables leading to the receiver. Between the cable and receiver, you can use a V or Y cable (No. **3936.11**, see figure) if one or both receiver connections also need to be connected to a servo, speed controller, etc. With the double connection to the switch or voltage controller, you not only reduce the risk of a cable rupture but also ensure an even power supply to the connected servos.

If you connect a separate battery to each battery connection, be sure that each of the batteries have the same rated voltage and capacity. Never connect different battery types or batteries with strongly different charges since this can cause an effect similar to a short circuit. In such cases for safety reasons, insert voltage stabilizing elements such as the PRX-5A receiver power supplies between the batteries and receiver:



For safety reasons, never used battery boxes or dry batteries.

The voltage of the on-board power supply is graphically represented, when the model is in use, in the upper right side of the display so as underneath in green numerically:



If the voltage falls below the warning threshold (normally 3.8 V) which can be adjusted in the "RX SERVO TEST" display of the "SETTING & DATA VIEW" of the "Telemetry" menu, a visual and acoustic low-voltage warnings are generated.

### Attention

**>>** The battery level should be checked regularly. Do not wait to charge the battery until the voltage decreases enough for a warning signal to be generated.

### Tip

A summary of the batteries, chargers and measuring devices for checking the power sources can be found in the main *Graupner* FS catalogue as well as on the Internet at [www.graupner.de](http://www.graupner.de).

## Receiver system power supply

### NiMH battery packs with 4 cells

With a traditional 4-cell pack, you can reliably operate your *Graupner* HoTT system providing that the above conditions are observed, and assuming that the packs have a sufficient capacity and charge.

### NiMH battery packs with 5 cells

Battery packs with five cells offer greater leeway in comparison to 4-cell packs.

You should note, however, that not every servo available on the market can handle the voltage from a 5-cell pack over the long term, especially when the pack is freshly charged. Some of these servos audibly "growl" when operated with a 5-pack.

### Notice

**>>** You should therefore note the specifications for your servo before you choose to use a 5-cell pack.

### LiFe packs with 2 cells

Given the above considerations, these cells are the best choice.

LiFe cells are also available in a hard plastic housing to protect against mechanical damage. Like lithium polymer cells, LiFe cells can be charged quickly with suitable chargers and are comparably robust.

In addition, this type of cell can undergo significantly more charging/discharging cycles than conventional LiPo batteries. The comparatively high rated voltage of 6.6 V of two cell LiFe battery packs does not pose any problems to *Graupner* HoTT receivers or the servos, speed controllers, gyros, etc. which are approved for operation with this higher voltage.

### Attention

**>>** However, practically all of the previously marketed servos, speed controllers, gyros, etc. as well as many which are offered today have a permissible operating voltage range of 4.8 to 6 V. Stabilized voltage control such as the PRX (No. **4136**) is therefore needed to connect them to the receiver. Otherwise, the connected devices may quickly become damaged.

### LiPo packs with 2 cells

LiPo batteries are lighter yet they offer the same capacity of NiMH batteries. LiPo batteries also come in a hard plastic housing to protect against mechanical damage.

The comparatively high rated voltage of 7.4 V of two cell LiPo battery packs does not pose any problems to *Graupner* HoTT receivers or the servos, speed controllers, gyros, etc. which are approved for operation with this higher voltage.

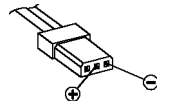
### Attention

**>>** However, practically all of the previously marketed servos, speed controllers, gyros, etc. as well as many which are offered today have a permissible operating voltage range of 4.8 to 6 V. Stabilized voltage control such as the PRX (No. **4136**) is therefore needed to connect them to the receiver. Otherwise, the connected devices may quickly become damaged.

## Charging the receiver battery

The charging cable (No. **3021**) can be connected directly to the receiver battery to charge it. If the battery in the model is connected by a power supply cable (No. **3046**, **3934**, **3934.1** or **3934.3**), the battery is charged via the charging socket integrated in the switch, or a separate charging connection. The switch for the power supply cable must be set to "OFF" for charging.

Polarity of the receiver battery plug



# Safety and handling instructions

## for lithium-ion (Lilo) and lithium polymer (LiPo) rechargeable batteries

Lithium-ion (Lilo) and lithium polymer (LiPo) batteries require special treatment. This is true when charging, discharging, storing and all other types of handling. Observe the following specifications:

### Charging *Graupner* LiPo/Lilo batteries

- Since *Graupner*|SJ GmbH is unable to monitor whether the batteries are correctly charged and discharged, all warranties are voided upon incorrect charging or discharging.
- Only use the approved chargers with the associated charging cables to charge lithium ion/lithium polymer batteries. Any alterations to the charger and/or charging cables can cause serious damage.
- The maximum charging capacity must be limited to a factor of 1.05 of the battery capacity.  
Example: 700mAh battery = 735mAh max. charging capacity
- To charge and discharge lithium-ion/lithium polymer batteries, only use the plug-in charger in the set, or the specially designed charger/dischargers by *Graupner*, see under [www.graupner.de](http://www.graupner.de).
- Make sure that the number of cells, charging cut-off and discharging cutoff voltage are set correctly. Refer to the operating instructions of your charger/discharger.
- Under these prerequisites, *Graupner* lithium-ion/lithium polymer batteries can be charged with a maximum 2C (1C corresponds to the cell capacity) charging current. Starting at a maximum 4.2 V per cell, continue charging at a constant 4.2 V per cell until the charging current falls below 0.1... 0.2 A.
- Do not charge with more than 4.20 V per cell. This would permanently damage the cell and may cause a fire.

To keep from overcharging individual cells within the pack, set the cutoff voltage to between 4.10... 4.15 V per cell in order to extend the battery life.

- The permissible temperature range for charging and discharging lithium ion/lithium polymer batteries is 0... +50°C.
- Batteries as well as individual cells are not toys and must be kept from children. They must therefore be stored out of the reach of children.
- Keep batteries away from infants and small children. If a battery is swallowed, immediately consult a physician or go to an emergency room.
- Never place a battery in a microwave or under pressure. This may cause smoke, fire or an explosion.
- Do not disassemble lithium ion/lithium polymer batteries. Disassembling a battery can cause internal short-circuits. This can result in the release of gas, fire and explosion, or other problems.
- The electrolyte and electrolyte vapors within lithium-ion/lithium polymer batteries are hazardous to health. Avoid direct contact with electrolytes. If the electrolyte comes into contact with your skin, eyes or other body parts, use a large amount of fresh water for rinsing and then consult a doctor.
- Before each use, make sure that the batteries are in a satisfactory condition. Defective or damaged cells or batteries may not be used.
- Cells and batteries may only be used in accordance with the technical specifications for the specific cell type.
- Batteries and cells may not be heated, burned, short-circuited or charged with excessive current or with reversed polarity.

- If handled improperly, there is a danger of fire, explosion, irritation and burns. To extinguish a fire, use a fire extinguishing blanket, CO2 extinguisher or sand.
- If the batteries overheat, proceed as follows:  
Disconnect the battery, and place it on a non-flammable surface (such as concrete) until it cools down. Never hold the battery in your hand due to the risk of explosion.
- Batteries from parallel-connected cells, and combinations of old and new cells, cells of different makes, sizes, capacities, manufacturers, brands or type may not be used.
- Batteries which have been installed in a device should always be removed when the device is not being used. Always turn devices off after you have finished using them to prevent battery drainage. Dead lithium-ion/lithium polymer batteries are considered defective and may not be reused.
- Be sure to charge the batteries in a timely manner. While they are being charged, the batteries must be placed on a non-flammable, heat-resistant and non-conductive surface. Combustible or highly flammable objects are to be kept away from the charging area.
- Batteries must be monitored while they are being charged. The maximum charging current specified for the respective cell type may not be exceeded.
- You may only charge a pack of series-connected lithium-ion/lithium polymer batteries all at once as long as the voltage of the individual cells does not deviate by more than 0.05 V, or if the differences in voltage are monitored and equalized by a balancer connection using a balancer or equalizer during charging.

The 1s lithium-ion battery in the set comes with a special safety shut off. The voltage differences between individual cells are therefore not balanced by means of the usual balancer plug-in connection.

- If the battery heats up above 60°C while it is being charged, stop charging and let the battery cool down to approximately 30°C.
- The batteries may not be modified. Do not directly solder or weld the cells.
- To avoid deformation, avoid excessive mechanical pressure.
- Make sure to observe the charging and discharging instructions.

### Storage

Lilo/LiPo cells should be stocked with about 50% of their nominal capacity. If the cell voltage falls below 3 V during the stocking, the lithium ion/lithium polymer cells must be recharged to 50% of the full capacity. Otherwise, the battery will die during storage and become useless.

### Special instructions on discharging *Graupner* Lilo/LiPo polymer batteries:

- A continuous current of approximately 1 C does not pose a problem for *Graupner* lithium-ion/lithium polymer batteries. If the current is higher, refer to the instructions in the catalogue. Bear in mind the maximum load for the plug-in system (see the maximum discharge current indicated on the battery label).
- Discharging below 2.5 V per cell will damage the cells and should therefore be avoided at all costs.

- The batteries should never be short-circuited. Short-circuits generate a very high current which heats up the cells. This causes a loss of electrolyte, gas formation or even explosions. *Graupner* Lilo/LiPo batteries should therefore be kept away from and not touch conductive surfaces due to the short-circuit hazard.
- The battery's temperature during discharging should never exceed +70°C. If this occurs, make sure that the battery is sufficiently cooled, or reduce the discharge current. The temperature can be easily checked using the infrared thermometer (No. 1963). However, the battery may not be discharged using the transmitter's charging socket. This socket is not designed for this purpose.

### Additional instructions on handling

- The battery capacity decreases each time it is charged and discharged. Charging when the temperature is too high or too low can also gradually reduce the battery's capacity. After 50 cycles, the battery capacity of models is only 50-80% of that of a new battery due to the occasionally high discharge current and induction current of the motor, even when all charging and discharging instructions have been followed.
- Batteries may only be series-connected or parallel-connected in exceptions since the cell capacity and charge can differ. The battery packs that we supply are therefore preferable.
- The connections of lithium ion/lithium polymer batteries are not as robust as other batteries. This holds true particularly for the plus pole connection. The connections can easily break.

### Cells connection

#### Attention



Direct soldering on the battery cells is impermissible. The heat from direct soldering can damage battery components such as the separator or isolator.

Battery connections should only be created by spot welding in the factory. If the cable is missing or severed, have it repaired professionally by the manufacturer or dealer.

### Replacing individual battery cells

#### Attention



Individually battery cells may only be exchanged by the manufacturer or dealer and not by the user.

### Do not use damaged cells

Damaged cells may not be used.

Indications of damaged cells include damaged housing packaging, deformed cells, the smell of electrolyte or leaking electrolyte. The battery may not be used in these cases.

Damaged or useless cells are considered hazardous waste and must be disposed of properly.

### Contact with liquids

Batteries may not be immersed in liquid such as tap water, sea water or beverages. Avoid all contact with liquids of any kind.

# Definition of terms

## Control function, control, function input, control channel, mixer, switch, control and logical switch

To make it easier to use the Part 2 of the manual, we offer a few definitions of terms that appear repeatedly in the manual.

### Control function

A control function is understood as the signal for a specific control function independent of the signal within the transmitter. In fixed-wing models set e.g. the control signals would be throttle, rudder or aileron; in helicopter models, these would be e.g. pitch, roll or nick.

The signal of a control function can be transmitted directly into one control channel or through a mixer to several control channels. A typical example of the latter are separate aileron servos, or the use of two roll or elevation servos in helicopters. The control function includes the influence of the mechanical control path on the corresponding servo. This can be spread or concentrated and modified from linear to highly exponential.

### Controls

Controls are the control elements on the transmitter that are activated directly by the pilot that control the connected servos, speed controllers, etc. on the receiver. These include:

- The two control sticks for control functions 1 to 4, including the related trims. These four functions in all the six model types (vehicle, boat, copter, helicopter, motor airplane and glider) can be exchanged using the mode setting in the software, such as throttle left or right. Throttle/brake or throttle/pitch left or right. The control stick function for Throttle/brake flap control for fixed-wing models or throttle/pitch control in helicopters is frequently identified as the THR control (channel 1).
- the four proportional dials (DV1 ... DV4)

- The two side proportional rotary controls SL1 and SL2 mounted on the bottom.
- Switches S1 ... S8
- the INC/DEC buttons DT1 and DT2

With the type DV and SL proportional controls as well as the INC/DEC buttons, the servos directly follow the control position, whereas only a two or three-stage adjustment is possible with a switch.

The assignment of the controls and switches to the servos 5 ... 12 is freely programmable.

### Function input

This is an imaginary point in the signal flow and should not be confused with the control connection on the printed circuit board. The selected control mode and the settings "TX OUT SET" line of the "**CTL Set**" sub-menu (transmitter setting) of the base menu influence the sequence beyond the physical connecting points and this can generate differences between the number of function inputs and the number of subsequent control channels.

### Control channel

From the point at which a signal contains all control information necessary for a particular servo, whether directly from the control or indirectly via a mixer, the term control channel is used.

For example, the "aileron" control function of a fixed-wing model for the model type "2AILE" is divided into control channels for the left and right aileron. Analogously, the "Roll" control function for the helicopter model "3Sv(2Roll)" governs the control channels for both the left and right roll servo.

This signal is only influenced by the settings made in the sub-menus "**E.P.A**" (servo path/servo limit), "**REV/SUB**" (servo direction reverse/delay) and "Sub-Trim" (servo middle and neutral position) to adjust the servo, and possibly the settings in the sub-menu "**Out.Swap**" (transmitter output) and is then transmitted by the transmitter through the RF module. Once it arrives in the receiver, this signal may be modified by settings saved in the "**Telemetry**" menu, after which it controls the associated servo.

### Mixer

The transmitter program contains a variety of mixing functions. These allow a control function to influence several control channels and as final result several servos or even many control functions to influence the same one servo.

In this context, you can refer to the numerous mixing functions.

### Switch

The series of toggle switches S1 ... S8 can also be included in the control programming. The switches are however generally also intended to switch program options such as to start and stop the timers, turn mixers on and off, as trainer switches etc. Each of the switches can be assigned any number of functions.

Related examples are listed in the manual.

### Control switch

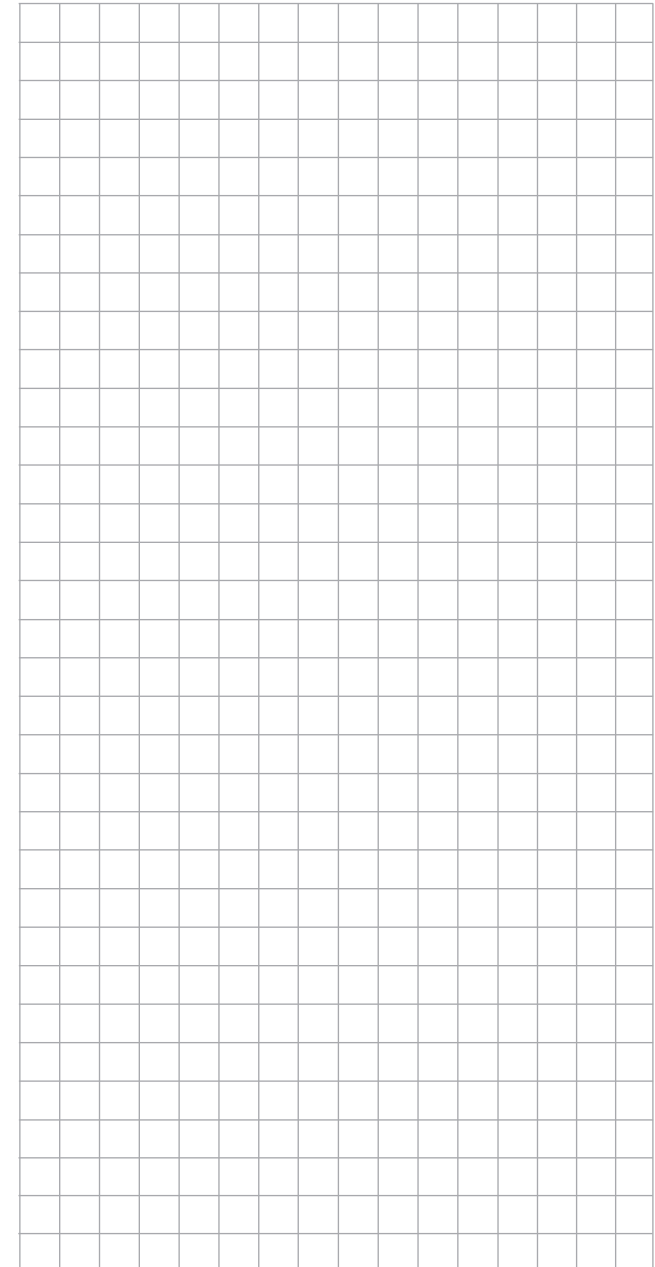
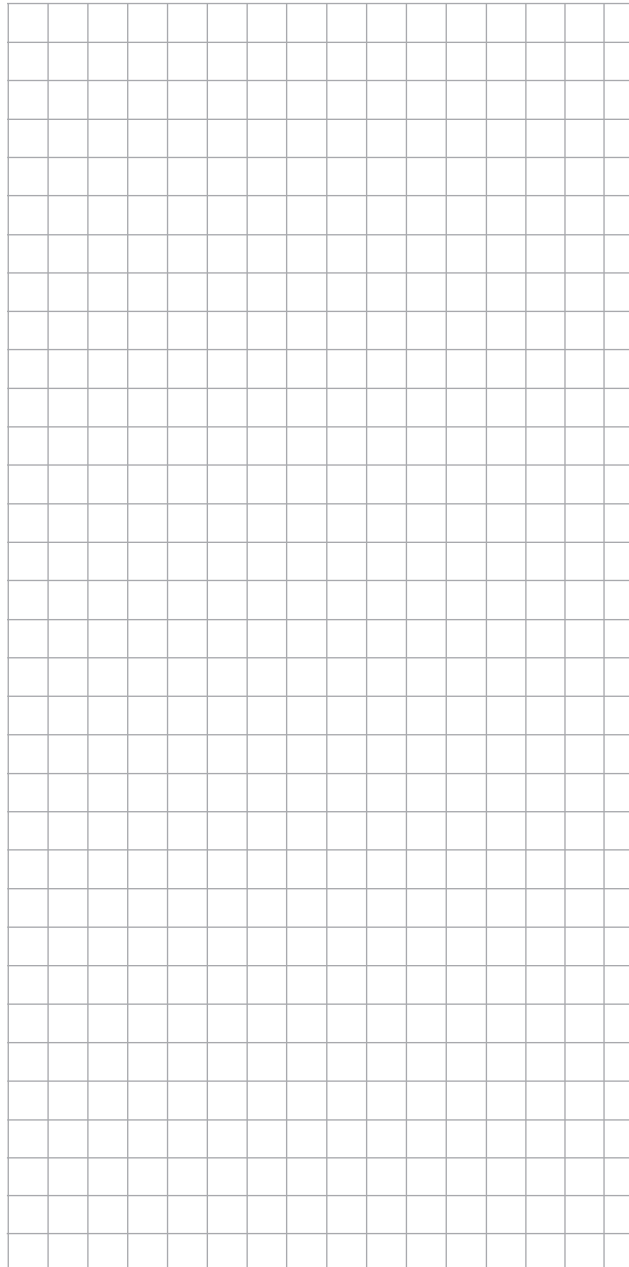
Since it is occasionally practical to automatically switch a timer or a function on or off when a control is in a specific position (a stopwatch turns on/off to measure engine operating times), the program for the **mz-24** HoTT Pro transmitter also allows you to program control switches.



With these program switches, all you have to do is specify the switching point along the control path in the direction of switching. More detailed information are easily available in the paragraph "Controls and switches assignment".

### **Logical switch**

Through this option two switches, controls and/or logical switches or the favorite combination of them, can be interconnected in an "AND" or "OR" switch. A total amount of 8 logical switches "L1 ... L8" can be programmed, see description in the "**Logical switch**" menu.



# Control and switch assignment

## Basic procedure

In many places in the program, you can actuate a control function with a freely selectable control (ST 1 ... 4, DV1 ... D4, DT1 and DT2, SL1 and SL2), switch (S1 ... 8), or switch between settings with a switch (S1 ... 8), control or logical switch (see below). In both cases, multiple assignments are always possible. (The distinction between a control and switch is explained in the section "Definition of terms").

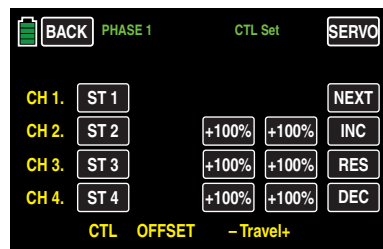
### Notice

It should be noted however that incorrect responses may arise from functional overlaps such as using the same physical switch as a switch to switch between Phase switch and as a control for Phase trimming. Change also your switch assignment.

Since the same method is used to assign the controls, switches control and logical switches in all relevant menus, the basic procedure will be explained at this point which will allow you to focus on the specifics in the detailed menu descriptions.

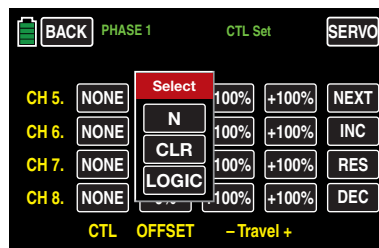
### Control and switch assignment

In the sub-menu "CTL Set" (control and switch assignment) you can ...

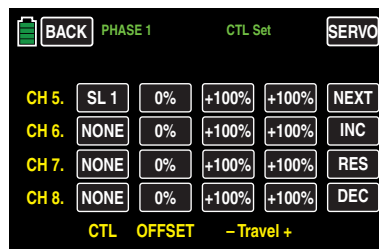


... assign transmitter inputs 1 ... 12 to operate servos of the **mz-24** HoTT Pro transmitter as well as any control stick (ST1 ... ST4) and controls identified as "DVx", "SLx" or "DTx", or any switch identified as "S1 ... S8".

The following window appears in the display after touching the corresponding button, such as the **NONE** button to the right of "CH 5" in the second page of the display of this menu, with a finger or the provide stylus, and the following window will appear:



Actuate the desired control (control stick 1 ... 4, DV1 ... DV4, SL1 ... SL2, or DT1 ... DT2) or switch (S1 ... S8), such as the right proportional rotary control SL1:



### Note

The controls are only recognized after a specific path. Therefore move the control to the left or right, forward or backward until the assignment appears on the display. If the length of travel is insufficient, move the control in the opposite direction.

### Deleting controls or switches

After the switching or control assignment has been activated as described, touch the **CLR** button.



### Control or switch assignment interruption

After the switching or control assignment has been activated as described, touch the **N** button.

### Notice

In few menu positions you can assign only physical controls or switches, that is the reason why in the pop-up windows that appear in those positions the **LOGIC** button is not available, for example:

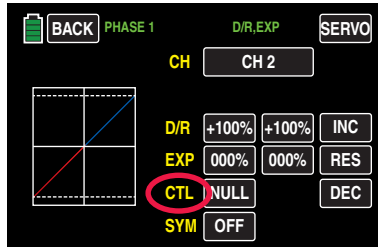


This is not an error.

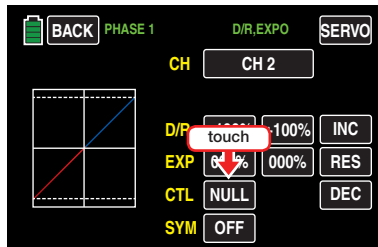
## Assigning logical switch or control

### • Switch assignment

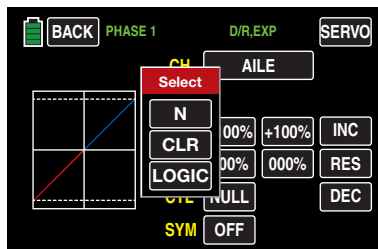
The places in the program where a switch, a logical control or switch can be assigned are marked with "CTL". So as for example as marked with a red circle in the penultimate line of the following picture of the Dual Rate / Expo displays:



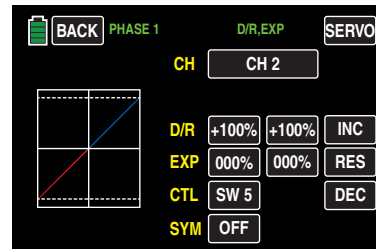
As soon as you tap on **NONE**, on the right near CTL ...



... the window in the display will ...



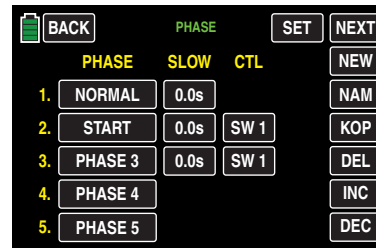
... appear. Actuate the desired switch, for example the front left 3-way switch S5:



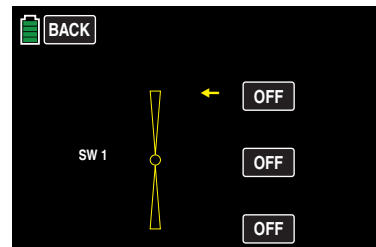
Thus completes the assignment of the switch for this menu.

### • Switch setup

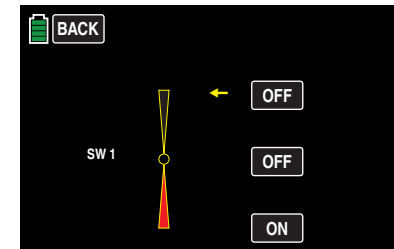
In other menus, in which the switches can be assigned, for example the "PHASE" menu, ...



... an accessory display will appear immediately after the switch assignment.



Completely independently from the yellow arrow, which only indicates the actual position, you can confirm in this display by touching the related button, in which position di selected phase should be "ON", for example:



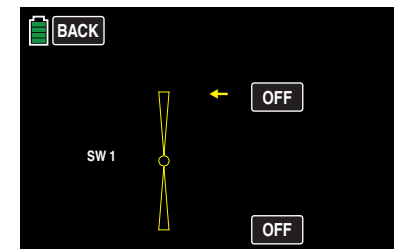
It has to be logically matched with the other switch positions.

### Notice



The phase 1, the "normal phase", is then always active when none of the assigned phase switch is on the "ON" position.

If you choose the 2-stage switch SW 6 instead of the 3-stage switch SW 1, the display appears as follows:



Select the desired switching direction as above.

### • Deleting switches

After the switching or control assignment has been activated as described at the beginning of this section, touch the **CLR** button.



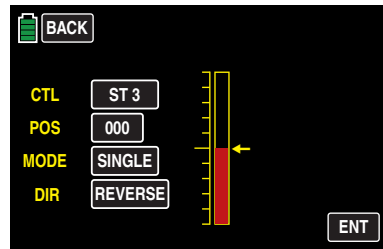
### Canceling the switch assignment

After the switching assignment has been activated as described at the beginning of this section, touch the **N** button.



### Control switch assignment

Move the control that you want to use to activate the switching function, for example the control function 3, indicated with "SL2":



The yellow arrow to the right of the bar diagram illustrates the current control position which can be accepted by touching the **ENT** button as the switching point in the value field to the right of "POS". Reverse the switching direction by touching **REV** in the line "DIR(ection)".

In the "MODE" line, the switching function of the control switch can be changed from on/off like a 2-stage switch to the switching behavior of a 3-stage switch.

### Notice

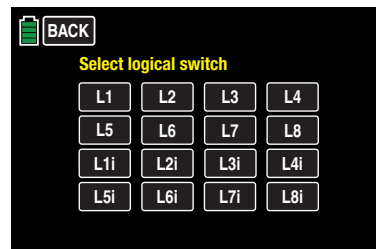
» In this case, be sure to specify a switching position that is not "000". Otherwise, you risk switching continuously back-and-forth between the two switching states while the relevant control is in the middle control position.

### Assigning logical switch

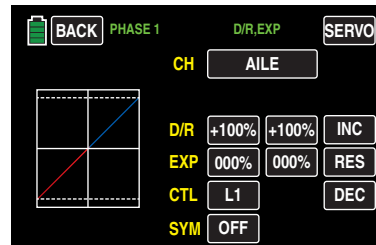
After the switching or control assignment has been activated as described at the beginning of this section, touch the **LOGIC** button:



In the new window appears a list with the eight logical switches "L1 ... L8" so as 8 inverted logical switches.



As soon as you tap on the desired switch, it will be assumed in the output menu, for example:



### Notice

» Therefore do not forget to program the related selected logical switch in the "Logical sw" sub-menu!

### Tips

Through the logical switches, see sub-menu "Logical sw", you can logically interconnect two switches and/or also control switch in a "AND" or "OR" switch.. A total amount of 8 logical switches "L1 ... L8" (so as 8 accessory logical switches with reversed switch direction) are available.

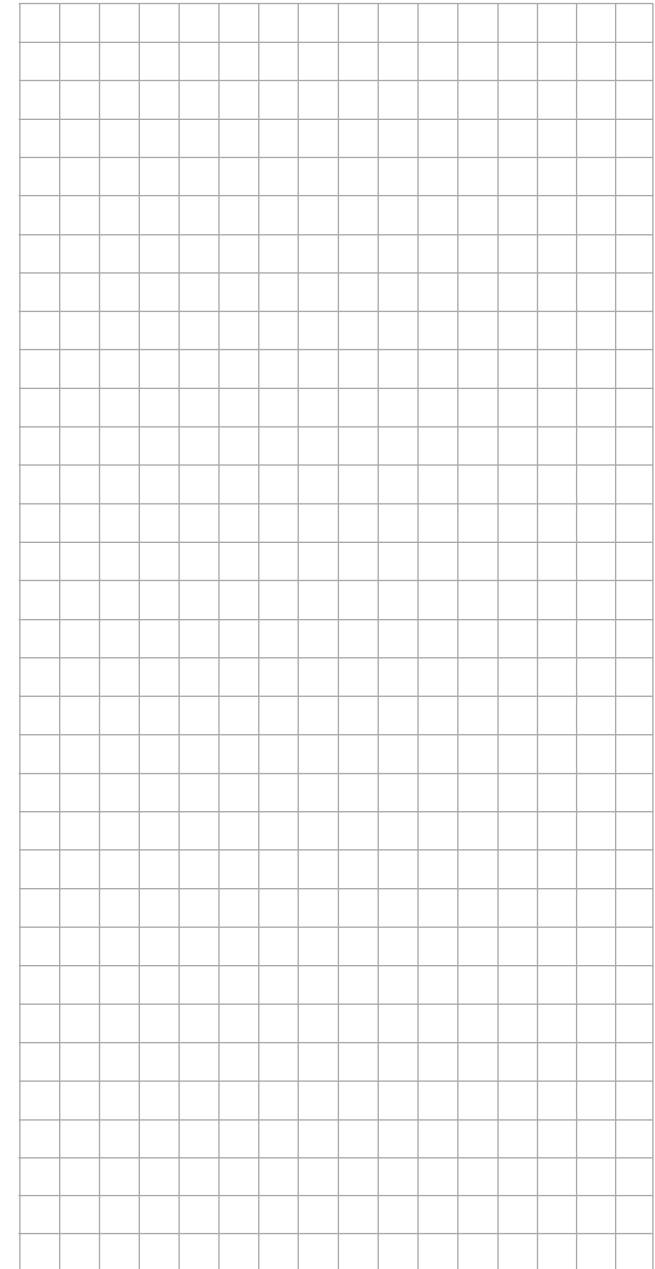
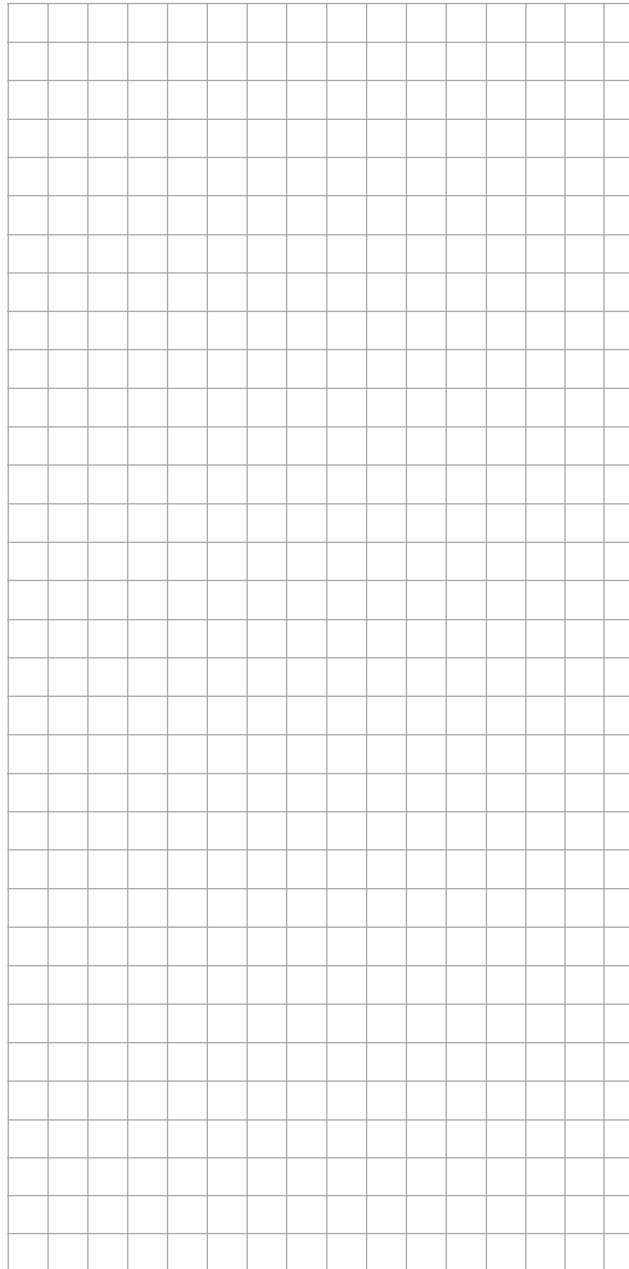
The result of one of these logical switch functions can also be used as switch function in another logical switch. For more specific details, see the related menu.

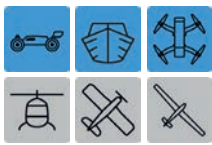
- All of these switches can be given multiple assignments. Make sure that you do not accidentally assign competing functions to a switch. It is recommendable to write down the switching functions.

### Practical examples:

- Turning an on-board glow plug heater on and off when a idling switching point for the THR control stick is exceeded or undershot. The switch for the glow plug heater is controlled at the transmitter by a mixer.
- Automatically turning the stopwatch on and off to measure the actual flight time of a helicopter by means of a control switch on the throttle limiter.
- Automatically turning off the mixer "AILE → RUDD" when the brake flap extends to adapt the landing position of the model to the ground contour when landing on a slope without affecting the direction of flight by rudders which are otherwise involved.

- Extend the landing flaps and retrim the elevator while approaching a landing once the throttle control stick is moved beyond the switching point.
- Turn the stop watch on and off to measure the operating time of electric motors.
- ...

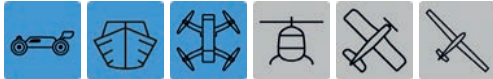




# Receiver configuration

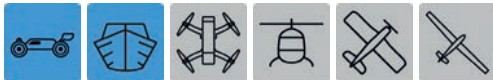
Vehicles, boats and copters

All of the relevant menus for the previously mentioned model types are identified in the next section with at least one of these three model characterizing "colored" symbols, ...

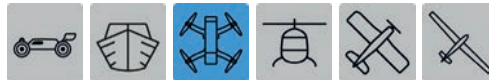
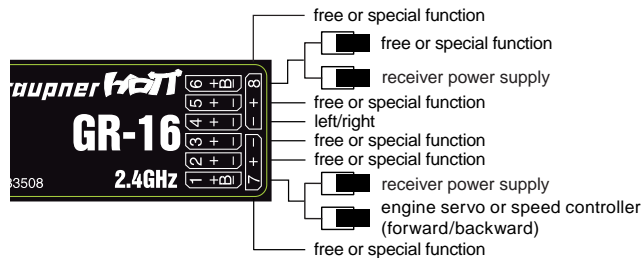


So that when you are programming you will only have to concern yourself with the related menus.

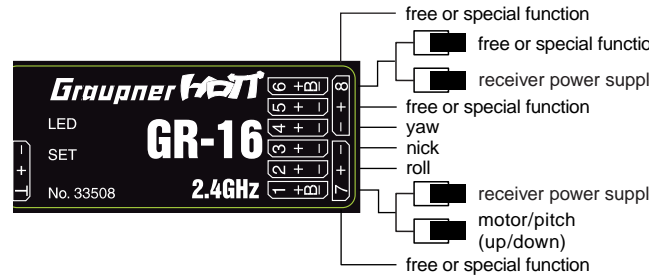
## Connection notices



For vehicle and boat models there are basically four different ways of assigning the control functions forward/backward and left/right of both control sticks. The options that are chosen depend on the individual preferences of the model pilot. The compatibility with the **Control modes 1 ... 4** ways is however recommended, connect the control function 1 with the forward/backward function and the control function 4 with the direction function:



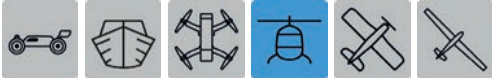
Also for copters there are basically four different ways of assigning the four control functions of roll, nick, yaw and throttle/pitch of both sticks. The options that are chosen depend on the individual preferences of the model pilot. The compatibility with the **Control modes 1 ... 4** ways is however recommended to take the following occupation as example:





## Helicopter models

All of the relevant menus for helicopter models are identified in the following "Program description" section with the symbol that characterizes this model type...



... so that you only have to deal with these menus when programming helicopter models.

### Installation notices

#### Notice



The servos must be connected to the receiver in the indicated sequence. Outputs that are not required are simply not assigned.

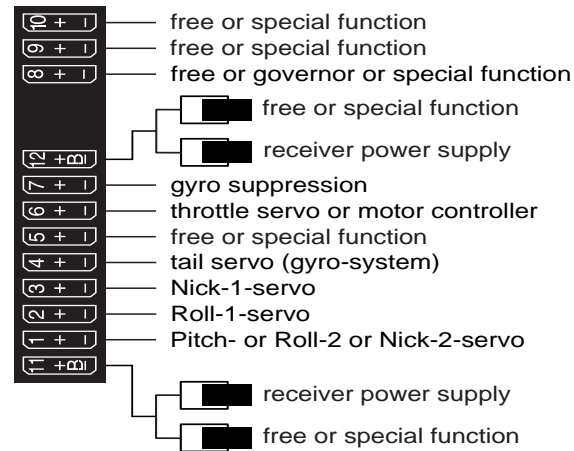
Follow the instructions on the subsequent pages.

#### Tip

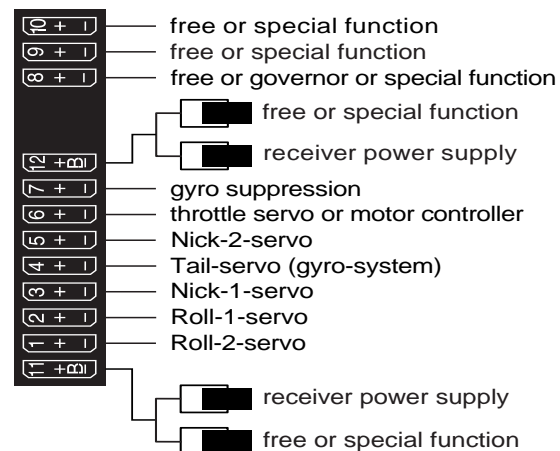
In order to take advantage of the comfort and safety features of the "Thr.Limit", a governor should be connected to receiver output "6" instead of receiver output "8" in the adjacent receiver configuration. More information on this subject can be found on page 161.

### Receiver assignment for helicopter models ...

#### ... with 1 to 3 swashplate servos



#### ... with 4 swashplate servos

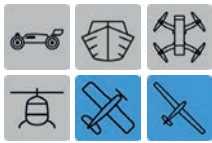


#### Notice



In comparison to the receiver configuration of some older *Graupner/JR* transmitters, servo connection 1 (pitch servo) and servo connection 6 (throttle servo) have been switched. The servos **must** be connected to the receiver outputs as depicted on the right. Outputs that are not required are simply not assigned.

More details on the swashplate type can be found in the menu "**Model selection**".



## Motor-powered airplanes and glider models

All of the relevant menus for motor-powered airplanes or glider models are identified in the next section with at least one of these two model types characterizing "colored" symbols, ...



... so that you only have to deal with the relevant menus when programming fixed-wing models.

### Installation notices

#### Notice

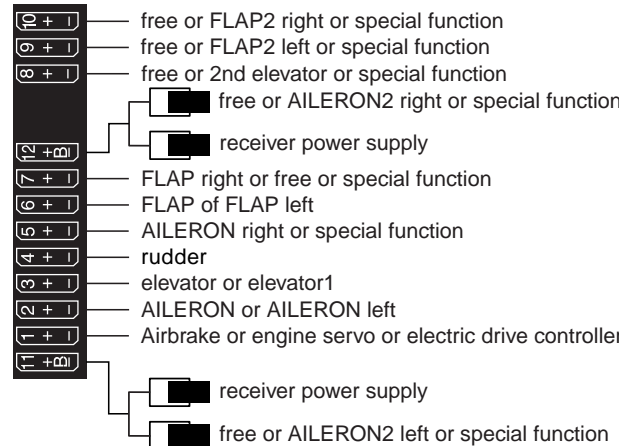


The servos must be connected to the receiver in the indicated sequence. Outputs that are not required are simply not assigned.

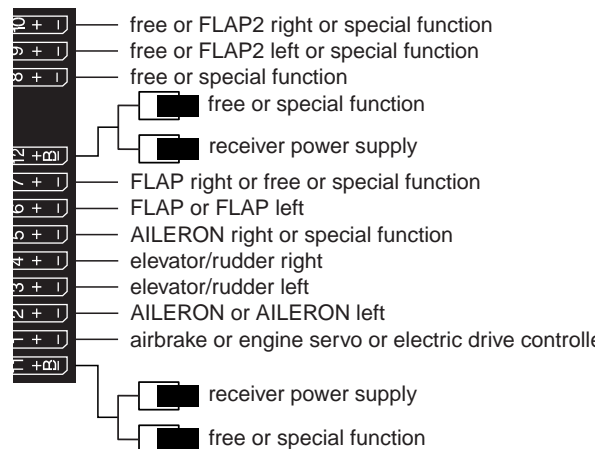
Follow the instructions on the following pages.

### Fixed-wing models with and without a motor with up to 4 ailerons and up to 4 flaps ...

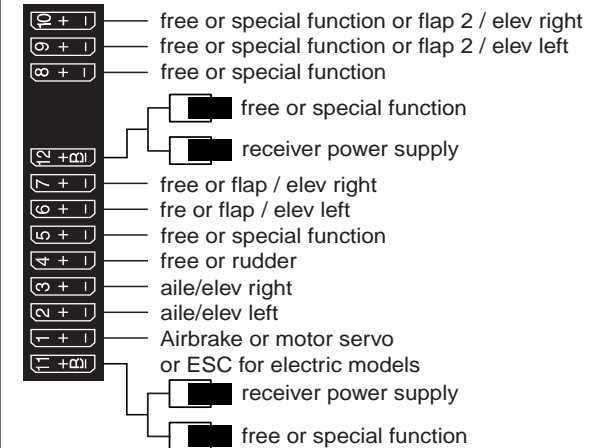
#### ... and a normal tail unit or "2 elevator servos"



#### ... and "V-tail"



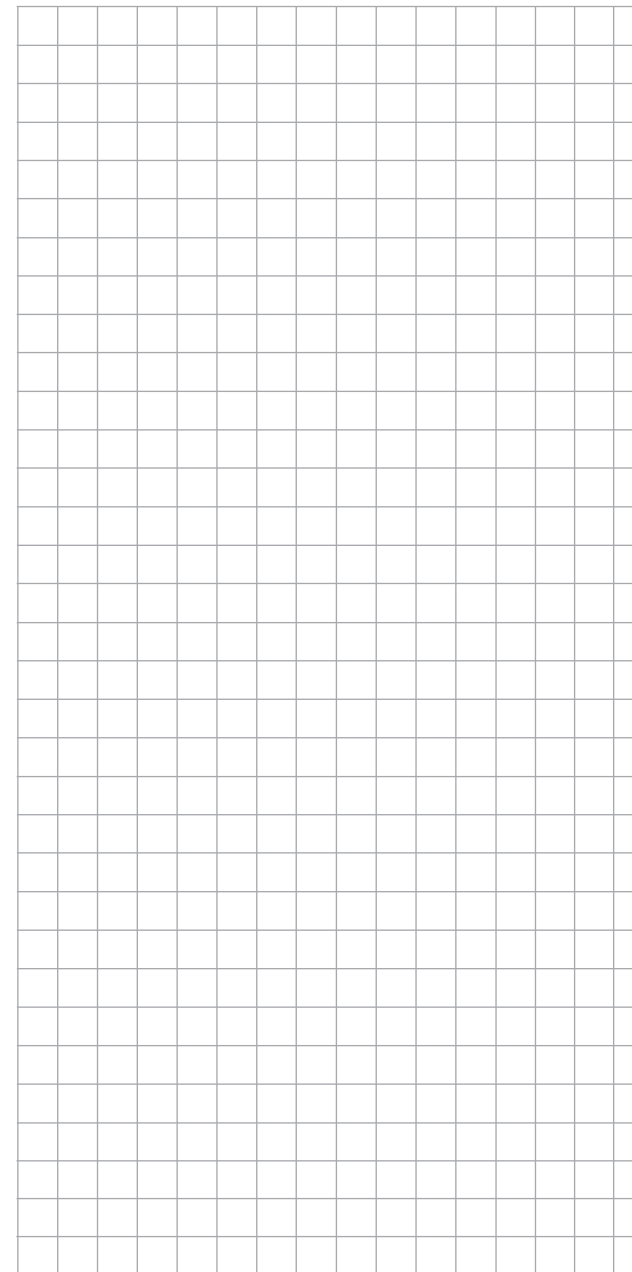
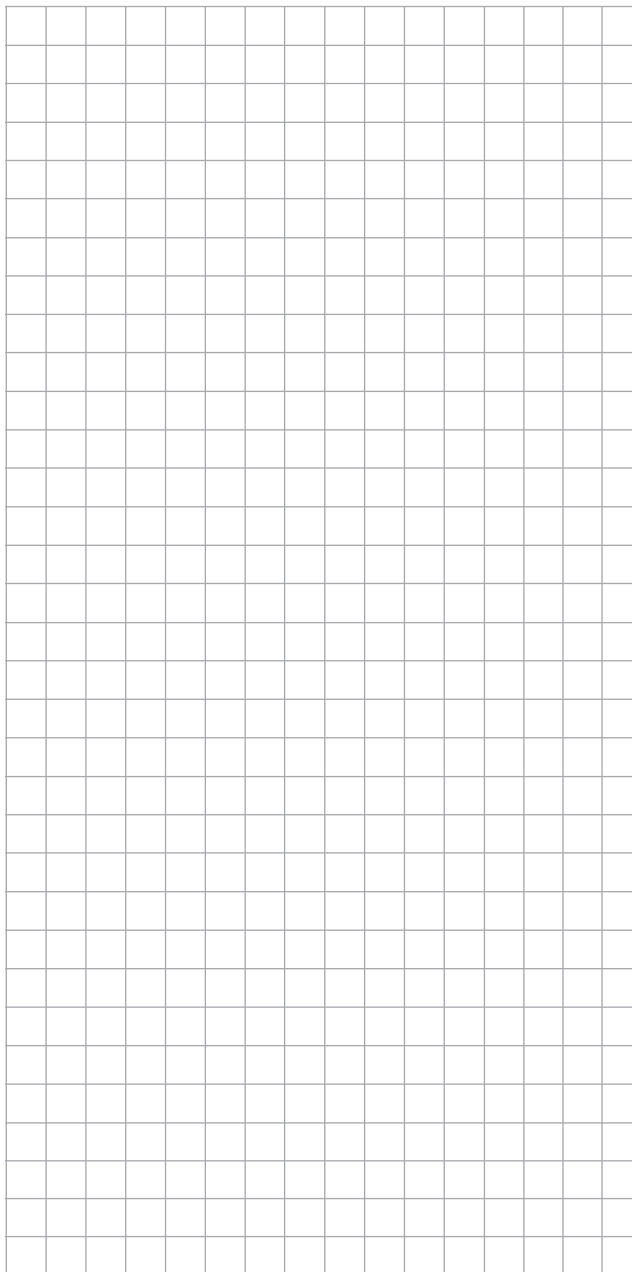
### Delta/flying wing models with and without a motor with up to 4 ailerons/elevators and 4 flap/elevator servos





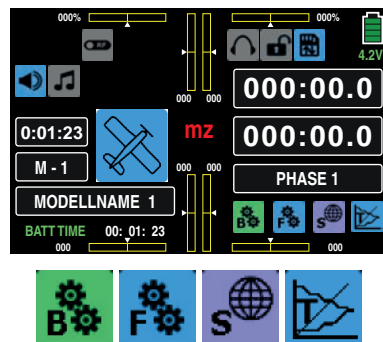
Due to the different installation of the servos and rudder linkages, the operating direction for certain servos can be reversed. The following table offers assistance in this regard.

Model type	Servo with wrong direction of rotation	Solution
V-Tail	Reverse rudder and elevator	Invert the servos 3 + 4 in the sub-menu " <b>REV/SUB</b> "
	Rudder correct, elevator reversed	Switch servos 3 + 4 on the receiver
	The elevator is correct, rudder is reversed	Invert the servo 3 + 4 in the sub-menu " <b>REV/SUB</b> " AND switch them in the receiver
Delta, Flying wing	Elevator and aileron reversed	Invert the servos 2 + 3 in the sub-menu " <b>REV/SUB</b> "
	Elevator correct, aileron reversed	Invert the servo 2 + 3 in the sub-menu " <b>REV/SUB</b> " AND switch them in the receiver
	Aileron correct, elevator reversed	Switch servos 2 + 3 on the receiver



# Program description

As already mentioned in section [Operating the displays](#), you can touch one of the four gear icons at the bottom right of the basic display identified with "B", "F", "S" and T...




... to open the respective selection menu.

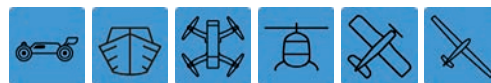
These sub menus contain all of the setting and display menus required to program a model as well as the transmitter.

The description of the individual menu items starting on page 38 is offered in the sequence provided by the transmitter.

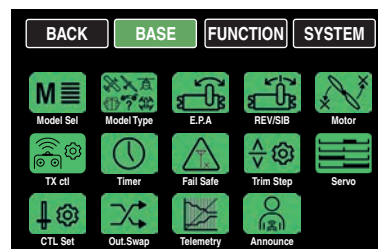
## Notice

 The display screen-shots of this manual are intended for illustration purpose only. Therefore please note that the represented settings and setting values cannot be used for 1:1 reference.

## "B" ("green" basis menu)



Touch the gear icon labeled "S" with a finger or with the provided stylus:



This menu contains all of the base setting and display menus that are needed to set up the model:

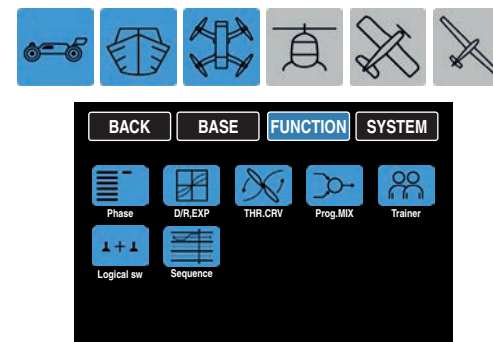
Name	Menu	Page
MOD.SEL.	"Model Sel"	38
Model Type	"Model type"	60
E.P.A	"Servo path/servo limit"	62
REV/SUB	"Servo reverse/servo sub-trim"	64
THT.CUT	"Throttle Cut"*	66
TX ctl	"Transmitter controls"	68
Timer	"Timer"	74
Fail Safe	"Fail Safe"	80
Trim Step	"Trim step"	82
Servo	"Servo monitor"	86
CTL Set	"Control setting"	90
Out.Swap	"Transmitter output"	96
Telemetry	"Telemetry setting"	98
Announce	"Announce"	118

\* hidden for models without a motor

## "F" ("blue" function menu)

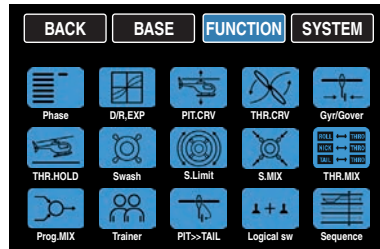
Touch the gear icon labeled "F" with a finger or with the provided stylus:

Depending on the model type of the currently active model memory, different menu structures are displayed. These can also vary depending on the basic settings of the model. The following menu representations therefore only offer a selection as an example:

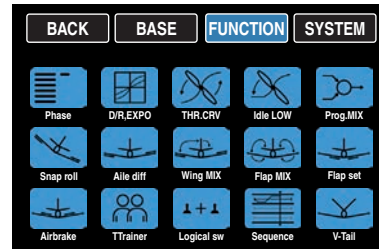


Name	Menu	Page
Phase	"Phase setting"	120
D/R,EXP	"Dual rate, Expo"	124
THR,CRV	"Throttle curve"	128
Prog,MIX	"Free mixers"	134
Trainer	"Trainer system"	141
Logical sw	"Logical switch"	148
Sequence	"Sequencer"	150

For reasons of space the description of these "general menus" in the next paragraphs will not be repeated because the sub-menus are contained also in the "blue" menus of the model type "helicopter" and "airplane". However, for major clarity, these "general menus" have been integrated both in the [Index](#) and in the following charts according to the sequence.

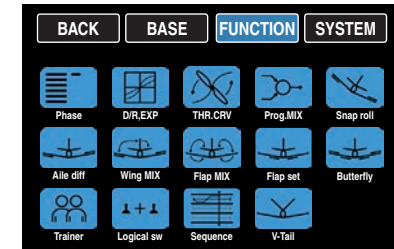
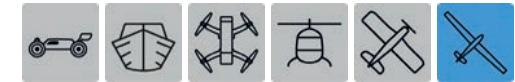


Name	Menu	Page
Phase	"Phase setting"	120
D/R,EXP	"Dual rate, Expo"	124
PIT,CRV	"Pitch curve"	154
THR,CRV	"Throttle curve"	160
Gyr/Gover	"Gyro/governor"	166
THR,HOLD	"Throttle autorotation"	170
Swash	"Swashplate mixer"	172
S.Limit	"Swashplate limiter"	173
S.MIX	"Heli mixer"	174
THR,MIX	"Throttle mixer"	176
Prog,MIX	"Free mixers"	134
Trainer	"Trainer system"	141
PIT->TAIL	"Pitch >> tail mixer"	178
Logical sw	"Logical switch"	148
Sequence	"Sequencer"	150



Name	Menu	Page
Phase	"Phase setting"	120
D/R,EXP	"Dual rate, Expo"	124
THR,CRV	"Throttle curve"	128
Idle LOW	"Idle setting"*	180
Prog,MIX	"Free mixers"	134
Snap roll	"Snap roll setting"	181
Aile diff	"Aileron setting"	182
Wing MIX	"Wing mixer"	188
Flap MIX	"AILE and FLAP mix"***	192
Flap set	"Flap setting"***	196
Airbrake	"Airbrake settings"***	200
Trainer	"Trainer system"	141
Logical sw	"Logical switch"	148
Sequence	"Sequencer"	150
V-Tail	"V-Tail"***	206

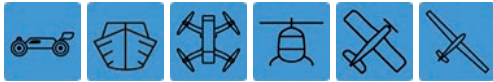
\* hidden for models with an electric motor  
 \*\* Depending on the selected model type or hidden.



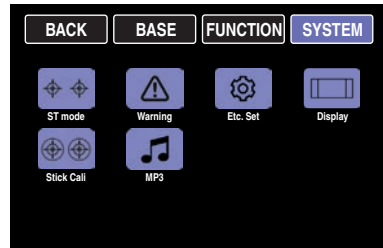
Name	Menu	Page
Phase	"Phase setting"	120
D/R,EXP	"Dual rate, Expo"	124
THR,CRV	"Throttle curve"*	128
Prog,MIX	"Free mixers"	134
Snap roll	"Snap roll setting"	181
Aile diff	"Aileron setting"	184
Wing MIX	"Wing mixer"	188
Flap MIX	"AILE and FLAP mix"***	192
Flap set	"Flap setting"***	196
Butterfly	"Butterfly"***	202
Trainer	"Trainer system"	141
Logical sw	"Logical switch"	148
Sequence	"Sequencer"	150
V-Tail	"V-Tail"***	206

\* hidden for models without a motor  
 \*\* Depending on the selected model type or hidden.

**"S"** ("purple" system menu)



Touch the gear icon labeled "S" with a finger or with the provided stylus:



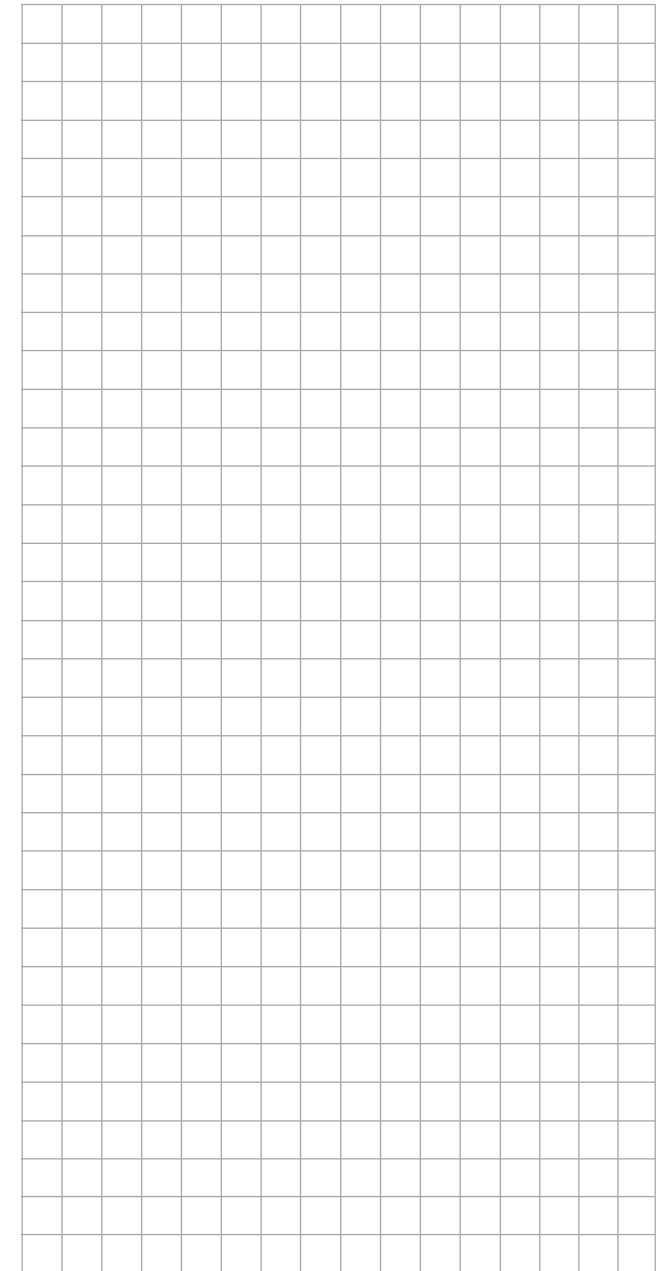
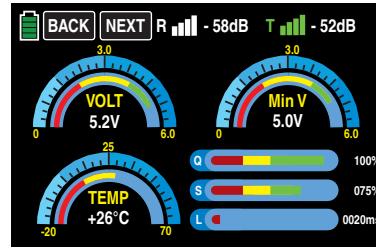
In this menu exclusively transmitter specific setting and display menus reassumed, excluding the "WARNING" menus:

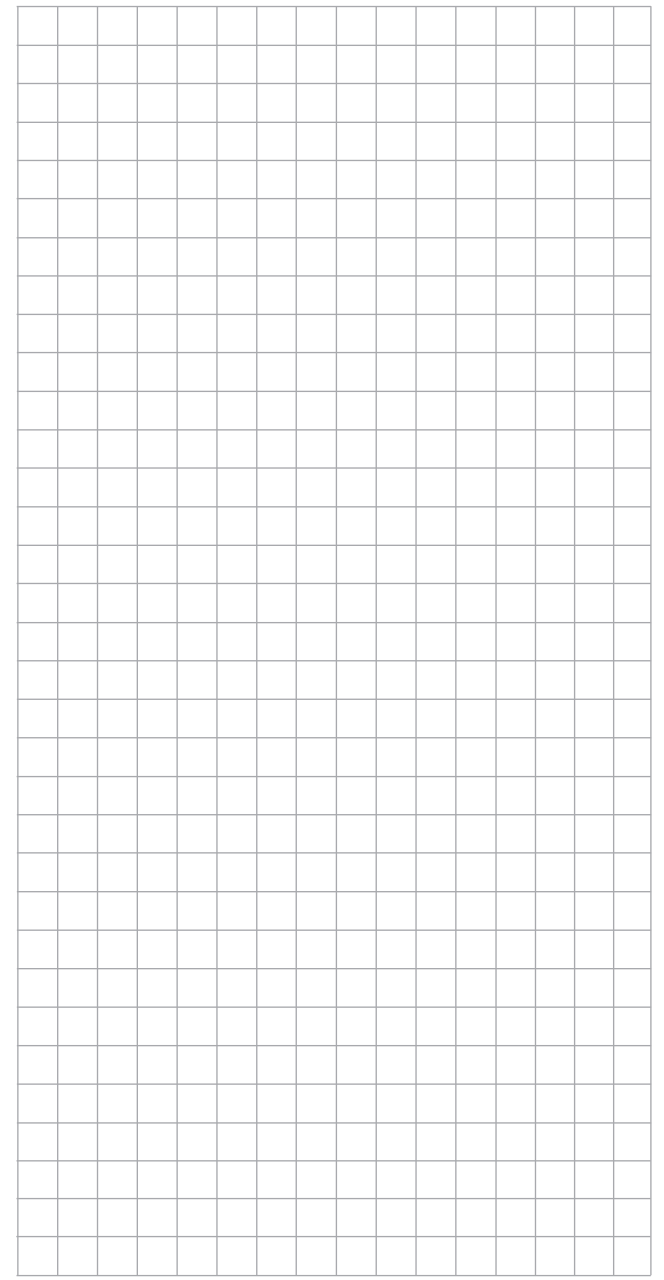
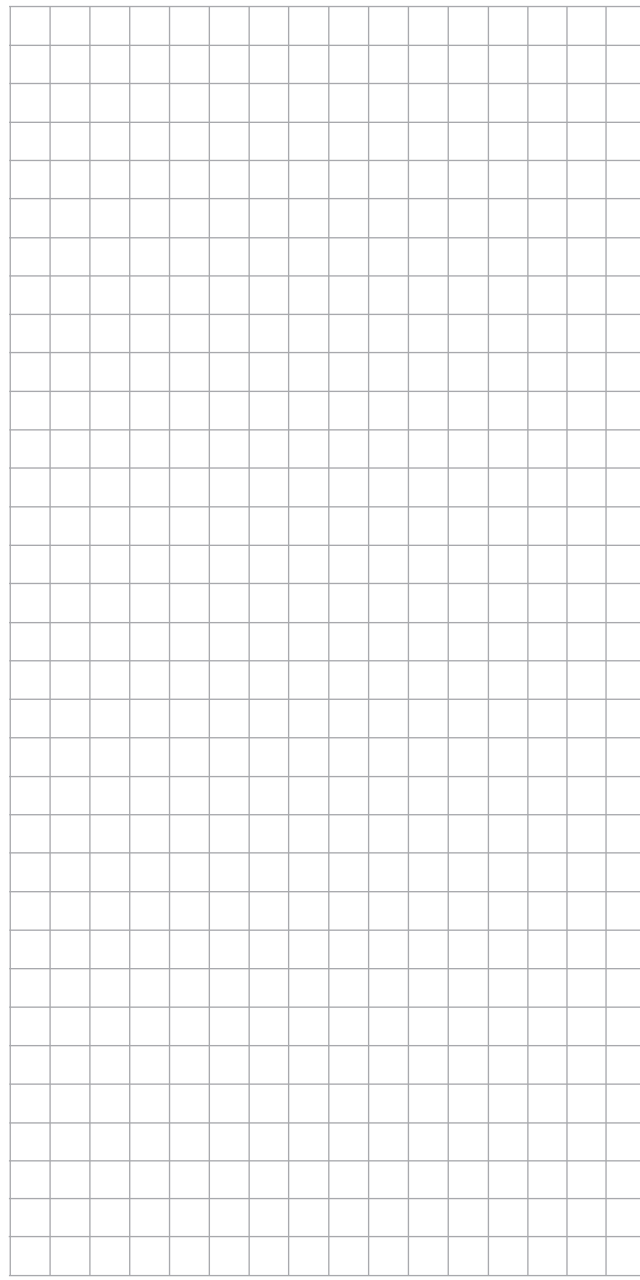
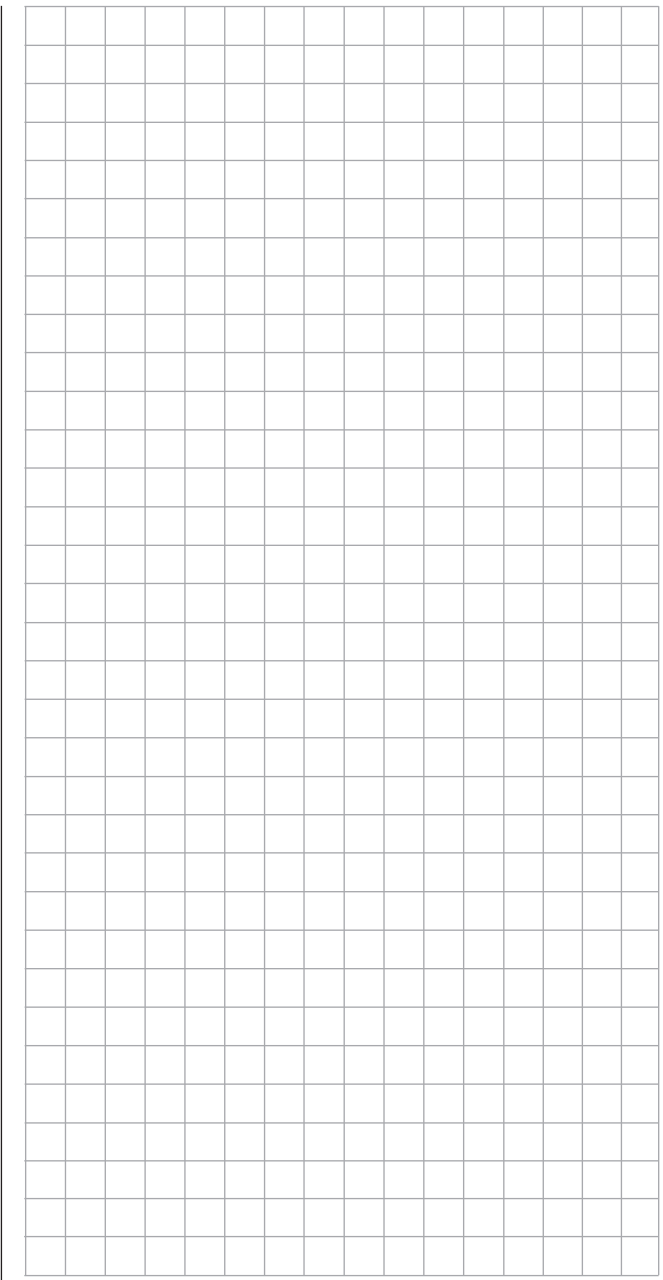
Name	Menu	Page
ST mode	"Stick mode"	<a href="#">208</a>
Warning	"Warning instructions"	<a href="#">210</a>
Etc. Set	"Various settings"	<a href="#">212</a>
Display	"Display settings"	<a href="#">216</a>
Stick Cali	"Stick calibration"	<a href="#">220</a>
MP3	"MP3 Player"	<a href="#">222</a>

**"T"** ("Telemetry display")

Touch the gear icon labeled with "T" at the bottom right with a finger or with the provided stylus:

The display switches from the basic display to a display of the telemetry data such as:



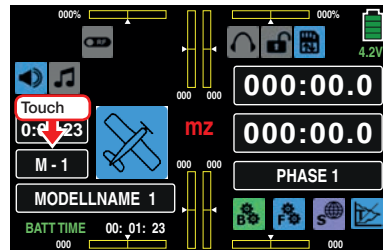




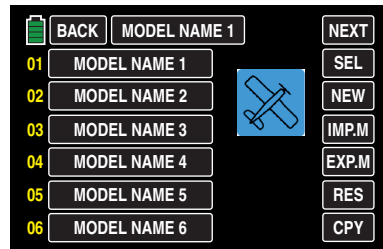
# Model selection

Edit model memories 1 ... 30

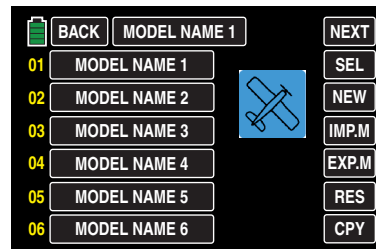
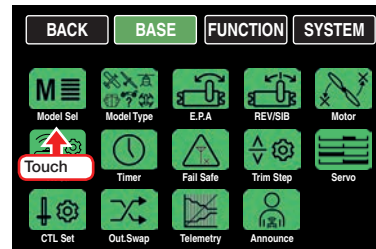
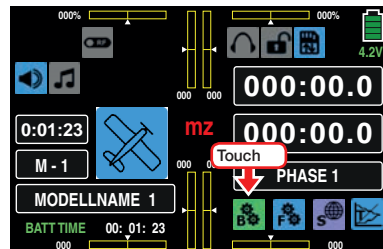
Switch your receiver system and the RF module of your transmitter *off*. Then touch the "M x" value field in the left side of the display with a finger or the provided stylus in the basic transmitter display of the transmitter:



... to change directly to the "Model select" sub-menu:



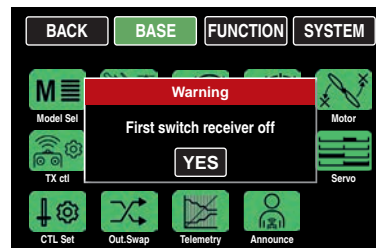
Or alternately touch the gear icon labeled "B" to open the same sub-menu from the base menu:



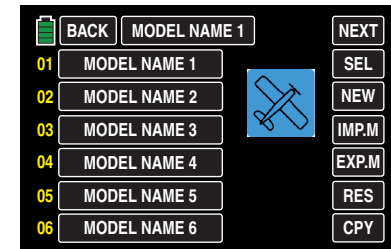
## Notices



- If there is no reaction by tapping on the value field **M x** in the base menu of the transmitter or if after tapping on the "green" "**Model select**" icon, visible in the base menu, it appears the warning message ...



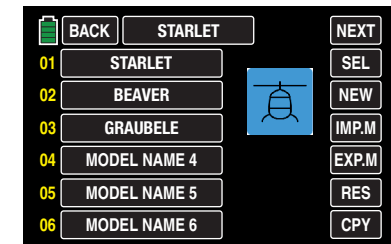
- ... then there is still a connection between transmitter and receiver. Switch the power supply of the receiver off and try again:



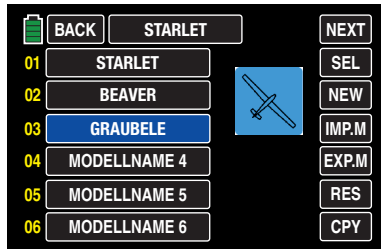
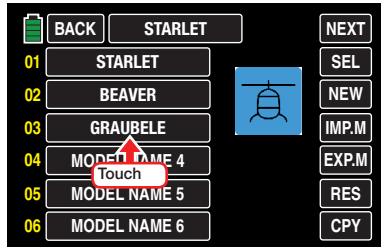
- Until the transmitter is in [Wireless trainer mode](#), the access to the "**Model select**" sub-menu is generally blocked.

## Model type display

The name of the actually active model memory is shown in the upper part of the display and the model type of the active model memory is indicated by the icon right underneath. For example the model type "Heli" of the active model memory 01 which is named "STARLET":



Without starting a model change, that actual model type can also be recalled by simply tapping on the desired model memory, for example:



**Tip**

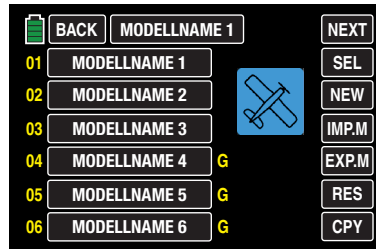
In the same way you can proceed for the display of the model type in the "Import from SD card" option.

**HoTT synchronization methods setting**

As already mentioned in the paragraph "[Starting up the receiver](#)", if both receiver and RF module are switched off each preferred of the total 30 model memories of the **mz-24** HoTT Pro transmitter can be switched from the standard memory specific HoTT-Synchronization to transmitter specific and vice-versa. It is possible to recognize the model memory with active HoTT-synchronization method from the yellow "G" which is displayed on the right near the selection button which is near the model name.

	WITHOUT "G" on the right near the button = memory specific bound
	WITH "G" on the right near the button = transmitter specific (global) bound

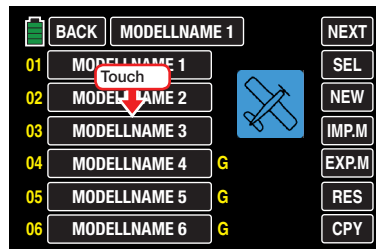
In the following representation the model memories 1, 2 and 3 are left as example on memory specific HoTT-Synchronization and the memories 4, 5 and 6 have been switched to transmitter specific HoTT-Synchronisation.



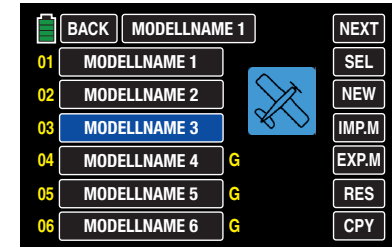
**Switching the HoTT-Synchronization**

Switch the RF module of your transmitter off.

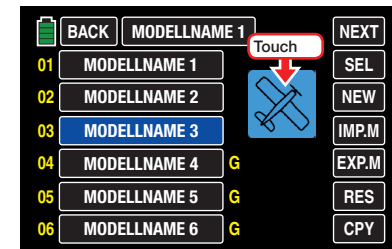
Tap on the actually in use model memory, for example model memory 3:



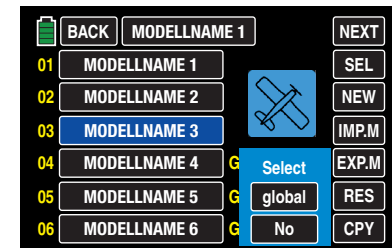
The color of the field switches from black to blue:



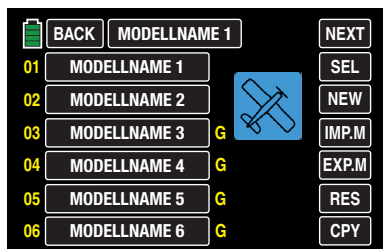
Now tap on the model type icon, ...



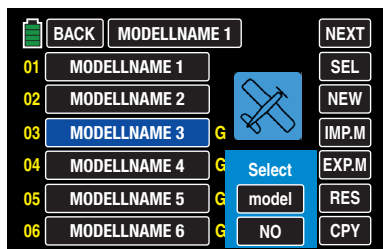
... here it will appear a selection window, where the selection buttons are always indicated with the description of the method, *through which you can switch*. In this example from memory specific to transmitter specific. Subsequently the button is actually described with the synonym "GLOBAL" for transmitter specific:



Touch **NO** to terminate the procedure. Touching **GLOBAL** switches the selected model memory to "global", that means transmitter specific HoTT-Synchronization:



If you want to switch a model memory, which is actually set to **GLOBAL**, to model specific HoTT-Synchronization, then the selection button will appear with the description **MODEL**:



Touch **NO** to terminate the procedure. Touching **MODEL** switches the selected model memory back to model memory specific HoTT-Synchronization:

- As conclusion of the switching process for one or more model memories all the involved receivers must be bound again.
- "GLOBAL", then transmitter specific, bound receivers react to the signals of all of the global bound model memories of "their" transmitter, this explains why for safety reasons a model memory change is only possible after switching off the receiver system!

### CAUTION



A receiver system, switched on accidentally after a model memory change, reacts to every control movements of the model memory bound in global mode as soon as a valid signal is emitted from "its" transmitter.

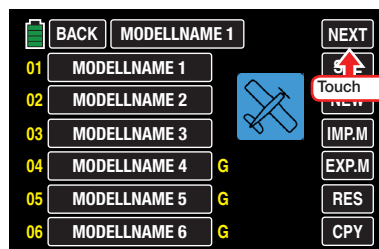
- "MODEL" specific bound receivers react exclusively to the signal coming from the specifically assigned model memory. An accidental use through a non specifically assigned model memory is NOT possible. A receiver which has eventually been switched on after a model memory change will pass to the Fail-safe mode during all the time in which the aforementioned situation lasts.

### Tip

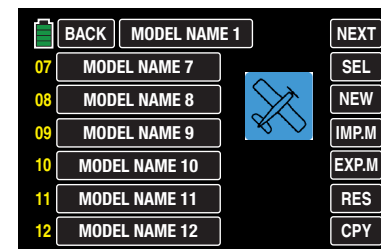
Information about HoTT-Synchronisation after copying or exporting/importing a model memory can be found in the related following section.

### SW (page change)

Touch the **SW** button in the display at the top right to switch, according to the rotation principle, from the first six model memories...



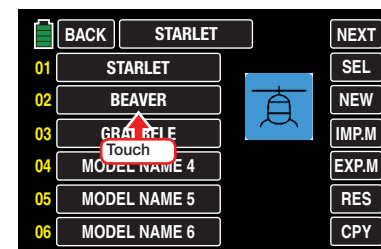
... to a display of the next six...



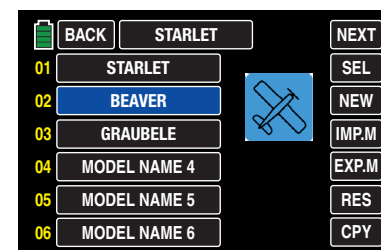
... etc. After model memories 25 ... 30 are displayed, model memories 01 ... 06 reappear for selection, etc.

### SEL (change model)

Touch the selection field for the desired model memory, for example:

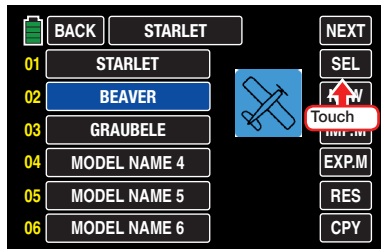


The color of the field switches from black to blue:

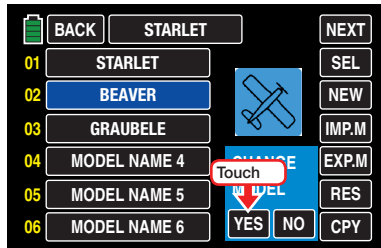


Tap on the **SEL** button on the right side of the display ...

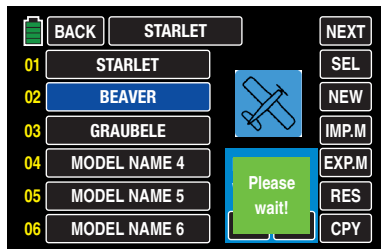




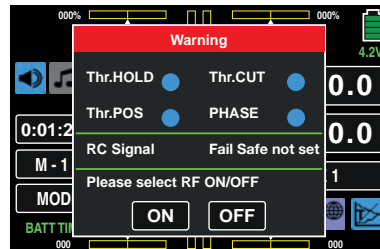
... and then touch **NO** to terminate the process or **YES** to switch the model ...



... "Please wait!!" appears for about 1 second:

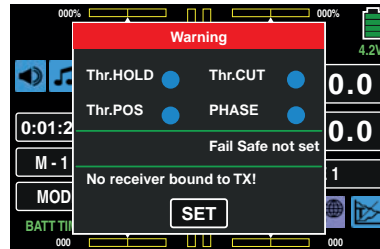


- If a receiver is already bound to the selected model memory, in case of *inactive* Thr.POS warning the RF module of the transmitter will be switched on and the display changes to the base display with a warning window:

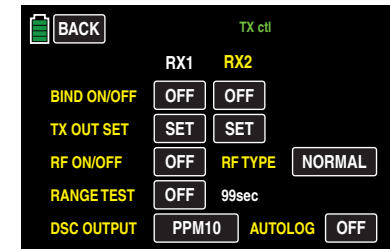


So as it happens when you switch the transmitter on, you now have the option of waiting a few seconds until the display disappears automatically or maintaining the RF transmissions by manually tapping the **ON** button, or switching them off by tapping the **OFF** button.

- If *no* receiver is bound to the selected model memory, the display also changes to the base display with the visible window. The RF module remains then switched off and in place of the "RF ON/OFF" warning it will appear "No receiver bound to TX!":



Tapping on the **SET** button directly opens the sub-menu »TX ctl« of the basis menu, where you can bind your receiver in the line "Bind ON/OFF" ...



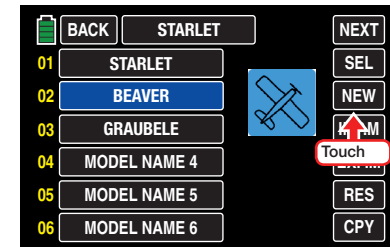
... or by touching the related **BACK** button until you will be brought directly to the base display of the transmitter.

**NEU** (create new model)

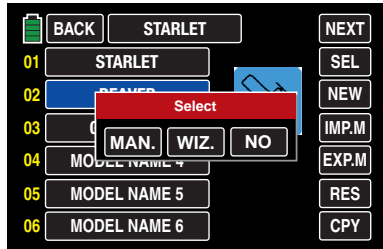
### Tips

- To reach up for model memories with number higher than 06, tap on the **NEXT** button on the right upper side of the display (next page).
- You can change between already occupied model memories through **SEL**.

As described above under **SEL**, to set up a new model, select a free model memory or model memory that has already been assigned but is no longer required. Tap on the **NEW** button on the right side of the display:



After tapping on **NEW** a selection window will appear in which you can select one option between manual or assisted programming of the new model so as **NO** to interrupt the procedure:



In the following sub-menus, the options to configure the required options will be proposed according to the model type previously selected.

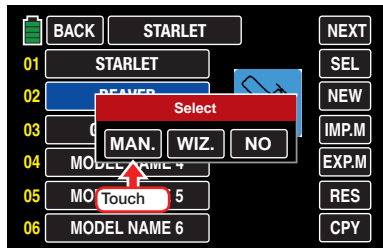
The sequence of the buttons for the manual programming referred to a fixed wing model will be explained in the following sections.

### Tip

Assistant-controlled model programming will be subsequently addressed with reference to programming a helicopter.

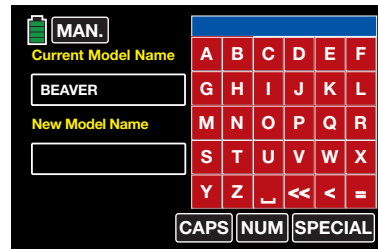
### Manually programming the basic settings of a new model

Tap then on the **MAN.** button:



The manual, so as the [assistant controlled](#), programming of a model follows always a program predefined procedure which begins with the input of the model name:

### "Model name"



Switch between uppercase and lowercase and vice versa with the **CAPS** button at the bottom edge of the screen, and similarly, press the **NUM** button to go to the numbers 0 ... 9 and special characters.

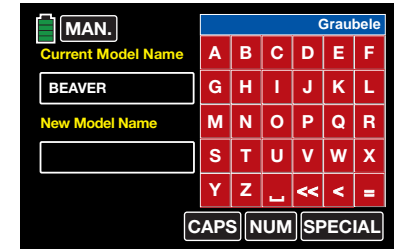
Switch to the desired symbols chart and tap on the first character of the model name.

To enter an empty space tap on the **[Space]** button. You can select other special characters by touching the **SPECIAL** button.

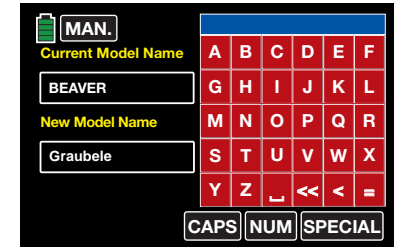
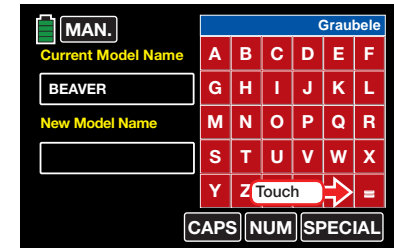
All other characters can be entered in the same manner. A maximum of 15 characters can be entered for a model name.

By touching **< [DELETE]** in the bottom row of red buttons, the last character is deleted. To delete all of the entered characters at once, touch **<< [CLEAR]**.

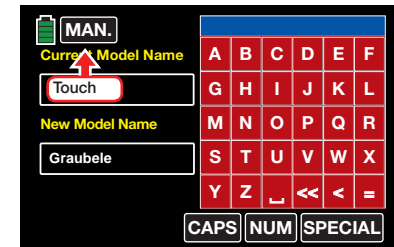
The characters which are entered in this manner appear in the blue field above the keypad in the sequence in which they are entered, for example:



To transfer the model name into the model memory, touch the red button **= [ENTER]** at the bottom right:

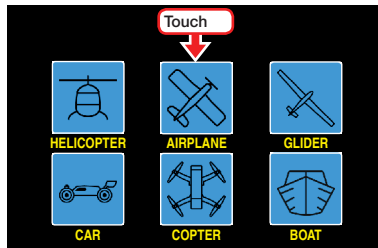


Touch the **MAN.** button at the top left to go to the next option:



## "Model type"

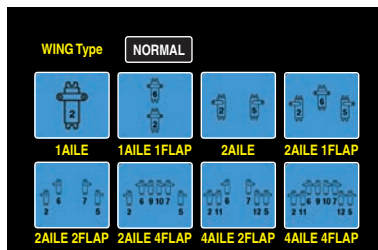
Since at this juncture we want to program an "airplane with electric drive", touch the selection field "MOT(motor model)":



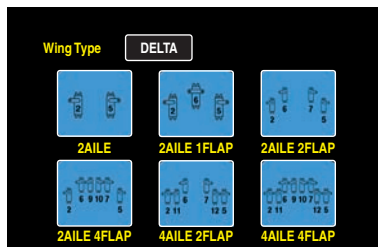
After selecting the basic model type, the following appears in the display...

## "Wing type"

... in which you can specify the number of aileron and flap servos by touching the corresponding selection field:



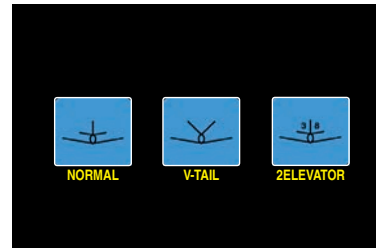
You can switch beforehand to the selection list for delta/flying fixed-wing models by touching the top button labeled **Normal**:



After you select a wing type, the following display appears...

## "Tail type"

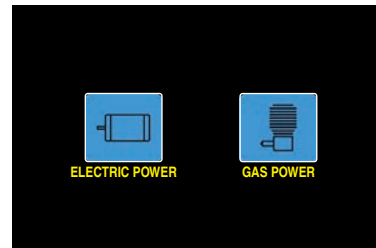
..., in which you can specify the type of your tail:



Finish your entry by selecting...

## "Propulsion type"

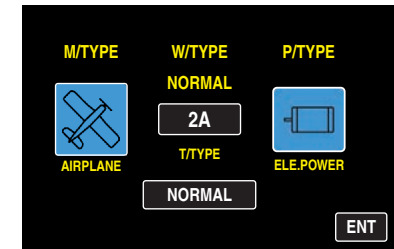
... For your model:



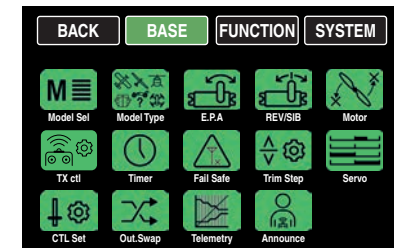
### Tip

The default for "Motor off" or "Idle" = "Rear thro position" can be switched to "Front thro position" for fixed-wing models in the **"Throttle curve"** menu, by inverting the control curve.

After the propulsion type has been selected, a display appears with an overview of the previous entries such as...



..., which you can leave to go to the base menu by touching the **ENT** button at the right bottom:

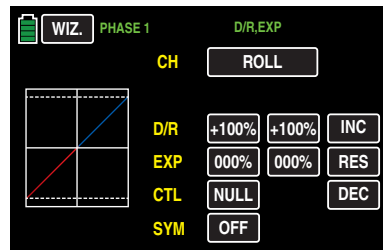


### Entering the basic settings of a new model with an assistant

The previous section described the basic *manual* programming of a fixed-wing model. In the following, the *assistant-controlled* programming of a helicopter model will be described. As the manual programming, also the assisted programming follows always a pre-defined program procedure.

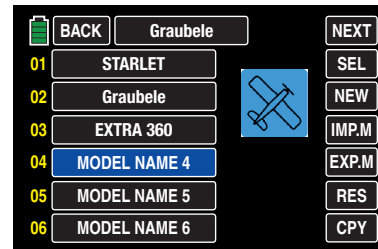
#### Tip

Some of the following described sub-menus offer theoretically the possibility of phase-specific settings. Each one indicated on the upper left side by the green colored phase name "PHASE 1", for example:



Because within the assisted programming only settings in the "Phase 1" (the normal phase) are possible, in this context it will not be told much more about "phase specific settings". More about this point is explained in the description of the single menu point.

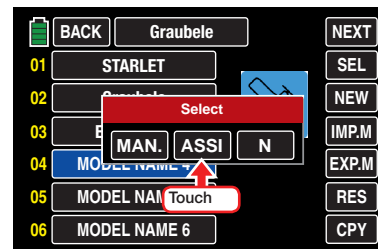
As described under **NEW** in the section "[Model selection](#)", to set up a new model, select a free model memory or model memory that has already been assigned but is no longer required.



After tapping on **NEW** a selection window will appear in which you can select one option between manual or assisted programming of the new model so as **NO** to interrupt the procedure:

In the following sub-menus, the options to configure the required options will be proposed according to the model type previously selected.

Since the programming of a helicopter with the help of an assistant will be soon described in this section, touch the **WIZ.** button:

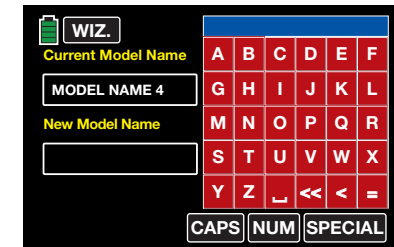


#### Tip

An example of manual model programming is described in the previous section in the context of programming a fixed wing model.

As previously described with reference to manual model programming, basic programming is started by entering a model name when programming a model with an assistant.

### "Model name"



Switch between uppercase and lowercase and vice versa with the **CAPS** button at the bottom edge of the screen, and similarly, press the **NUM** button to go to the numbers 0 ... 9 and special characters.

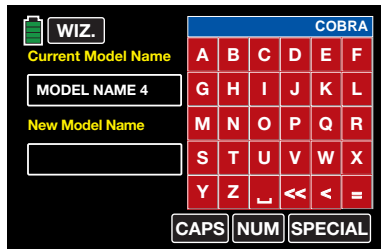
Switch to the desired symbols chart and tap on the first character of the model name.

To enter an empty space tap on the **[Space]** button. You can select other special characters by touching the **SPECIAL** button.

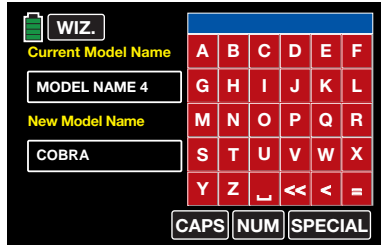
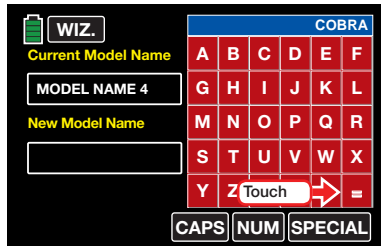
All other characters can be entered in the same manner. A maximum of 15 characters can be entered for a model name.

By touching **< [DELETE]** in the bottom row of red buttons, the last character is deleted. To delete all of the entered characters at once, touch **<< [CLEAR]**.

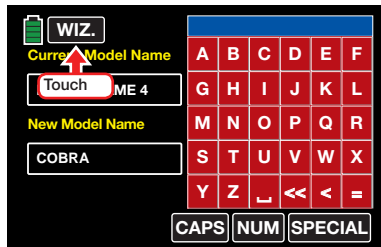
The characters which are entered in this manner appear in the blue field above the keypad in the sequence in which they are entered, for example:



To transfer the model name into the model memory, touch the red button **[ENTER]** at the bottom right:

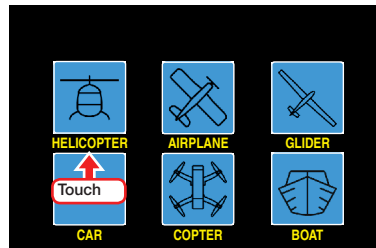


Touch the **WIZ.** button at the top left to go to the next option:



## "Model type"

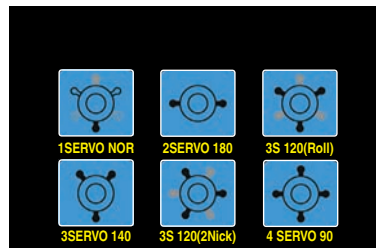
Since at this juncture we want to program a "helicopter model", touch the **Heli** button:



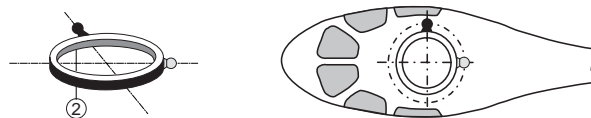
After selecting the basic model type, the following appears in the display...

## "Swashplate type"

... in which you can specify the number of swashplate servos by touching the corresponding selection field:



## "1 Servo"

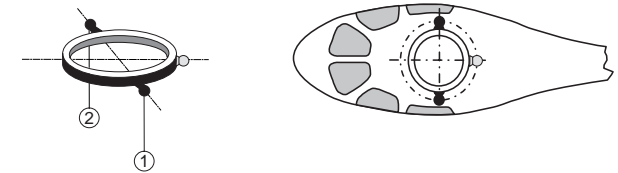


You are using a flybar system, or the swashplate is tilted by a roll and nick servo. *One* separate servo is used for the *pitch control*.

(Since helicopter models with only one pitch servo that have three swashplate servos for pitch, nick and roll also operate without a mix of functions in the transmitter as is usually the case with flybar

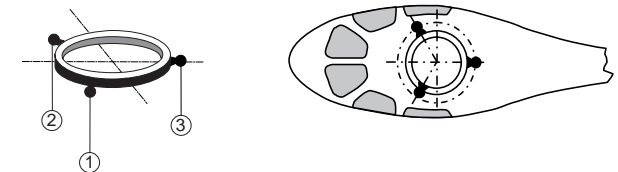
systems, the menu item "**Swash**", page , normally does not appear on the multifunction menu.)

## • "2 Servo"



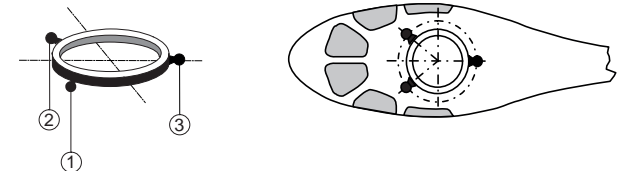
The swashplate is shifted axially for the pitch control by means of two roll servos; the nick control is decoupled by means of a mechanical compensation rocker.

## • "3Sv (2Roll)"



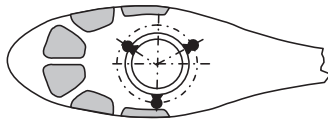
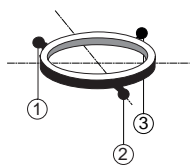
Symmetrical three-point control of the swashplate by means of three articulations points offset by 120°, by means of which one nick servo (front or rear) and two roll servos (to the left and right side) are connected. All of the three servos of the swashplate shift axially for pitch control.

## • "3Sv (140)"



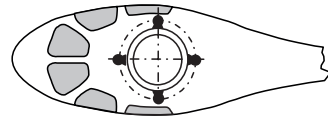
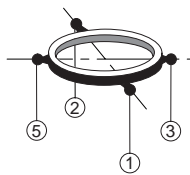
Asymmetrical three-point control of the swashplate by means of three articulations points offset, by means of which one nick servo (rear) and two roll servos (to the left side and right front) are connected. All of the three servos of the swashplate shift axially for pitch control.

• "3Sv (2Nick)"



Symmetrical three-point axis as before, but rotated 90°; one roll servo on the side, and two nick servos, front and rear.

• "4Sv (90)"

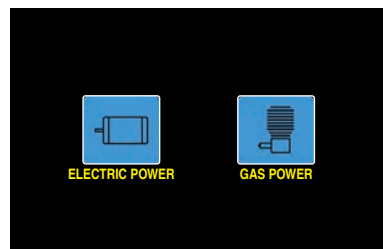


Four-point control of the swashplate by means of two roll servos and two nick servos.

Directly after you make your swash plate selection, the following display appears ...

"Propulsion type"

... where you specify whether your helicopter is driven by an electric motor or ICE engine:



After you select the propulsion mode, the assistant takes you to the first model-dependent settings in the following display...

"REV/SUB" (Servo reverse/Servo sub trim)

WIZ.	REV	SUB.TR	SERVO
CH 1.	NOR	000%	
CH 2.	NOR	000%	NEXT
CH 3.	NOR	000%	INC
CH 4.	NOR	000%	RES
CH 5.	NOR	000%	DEC
CH 6.	NOR	000%	

Tip

In order to set control channels with numbers higher than CH6, touch **NEXT** [change page].

In this display you can set on the left column the directions and on the right column the neutral positions of each servo *phase specific* by tapping on the related button, for example in the second display page to find the servo 8:

WIZ.	REV	SUB.TR	SERVO
CH 7.	NOR	000%	
CH 8.	NOR	000%	NEXT
CH 9.	NOR	000%	INC
CH 10.	Touch	000%	RES
CH 11.	NOR	000%	DEC
CH 12.	NOR	000%	

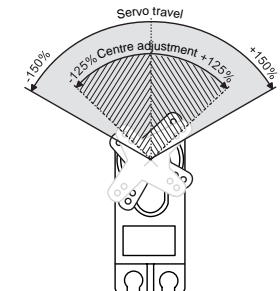
WIZ.	REV	SUB.TR	SERVO
K 7.	NOR	000%	
K 8.	REV	000%	NEXT
K 9.	NOR	000%	INC
K 10.	NOR	000%	RES
K 11.	NOR	000%	DEC
K 12.	NOR	000%	

Notices



- The possibility to reverse the direction of the servos connected to the output 6 (C6) in a helicopter model and the output 1 (C1) in the other types is only offered to match with the different building cases. Otherwise the switch-on warning will react not properly. For this reason a change in the value field is only possible after confirming the "SURE?" warning.
- Independent of trim controls and any mix settings, the neutral position can be shifted around  $\pm 125\%$  within the maximum servo travel of  $\pm 150\%$ . The servo is always adjusted directly independent of all other trim and mix settings.

Note that if the neutral position is adjusted strongly, servo travel on one side may be restricted since the total travel is limited to  $\pm 150\%$  for electronic and mechanical reasons.



Tap on the **WIZ.** button at the top left to go to the next option ...

## "E.P.A."

(Servo travel/limit)



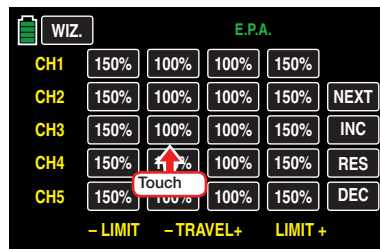
### Tip

In order to set control channels with numbers higher than CH6, touch **NEXT** [change page].

The travel and limitation are shown separately for each side in this display. The setting range in both cases is 0 ... 150% of the normal travel.

The set values always refer to the settings in the sub-menu "REV/SUB".

To change a current value, touch the desired option field, for example:



The selected option field will be marked in blue:



Touch the **+** button at the right edge of the display to gradually increase the value of the active option field. Touch the **-** button underneath to reduce the current value of the active option field, and touch the **RES** button to reset the changed value back to the default. Once all you have adjusted all of your servos, touch the **WIZ.** button at the top left to switch to the next adjustment phase:

## "D/R,EXP"

The dual rate/expo function allows you to switch or influence the control deflections and characteristics for the control functions of roll, nick and tail rotor, i.e. control functions 2 ... 4 through switch.

**Dual Rate** acts, as the control setting in the sub-menu "**Ctrl.SET**", directly on the related *Control function*, independently from the fact that the function is associated to a single servo or is actuated through a complex mixer or coupling function by many different servos.

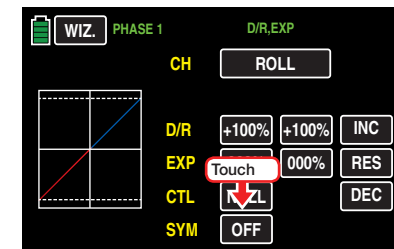
The control deflections can be set for each switch position between 0 and 125% of the normal control travel.

**EXP** allows a more sensitive control of the model in the central position of the respective control function (roll, nick and tail rotor) for values greater than 0% without having to do without the complete deflection in the end position of the control stick.

Conversely, the effect of the control around neutral position increases for values less than 0% and decreases in the direction of the full deflection. The progression can be set from -100% to +100%; 0% corresponds to the normal linear control characteristic.

The EXP setting always acts directly on the corresponding control function independent of whether it affects the individual servo or several servos by means of complex mixing and coupling functions.

By default, the dual rate and/or expo values are set for each control side. After switching the option "**SYM**" from **OFF** to ...



... to **ON**, a symmetrical, that is joint, setting of both control sides is possible.

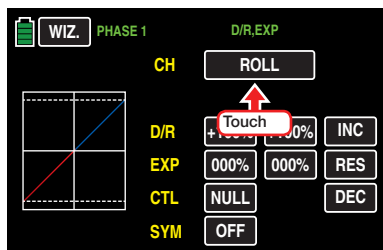
In the graphic of the display, the curve characteristics are shown directly.

### Tip

After having completed the program assisted model programming and the setting of the phases in the "**PHASE**" sub-menu of the functions menu all the options contained in the Dual rate/Expo phase specific menus can be programmed.

## Programming

Between the setting displays of individual control functions, alternatively touch the button on the right near the yellow "C" (channel) with a finger or the provided stylus:



Analogous to the previously described displays, touch the corresponding option field to change a current value, and raise or lower the value by touching the **+** and **-** buttons at the right side of the display the appropriate number of times.

The adjustment range is  $\pm 125\%$  in the "D/R" line and  $\pm 100\%$  in the "EXP" line.

Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

If you desire a switch between two variants, you can assign a switch or a control in the CTL line, as described in the "Control and switch assignment" paragraph.

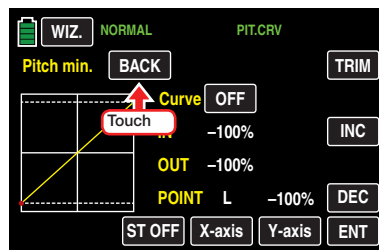
Once all you have adjusted all the DR/EXPO functions, touch again the **WIZ.** button at the top left to switch to the next adjustment phase:

### "Pitch curve"

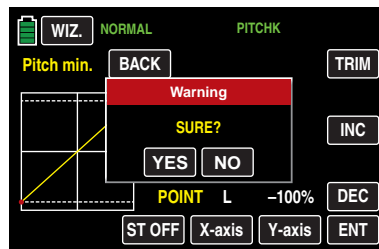
In the "PITCH MIN." line of this display you can adjust to your preferences the movement direction of the pitch stick so as, through the remaining options, the pitch curve.

#### 1. Line "PITCH MIN."

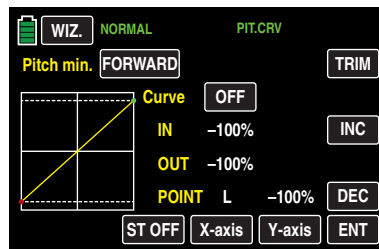
Through this option you can easily reverse the control direction of the pitch control stick from the standard pre-set position "pitch min back" to "pitch min forward", and vice versa, by tapping on the **BACK** or **FORWARD** button in the "Pitch min" line:



After tapping on this button it will appear a safety query:



Touch **NO** to terminate the procedure. Tapping on **YES** confirms the procedure and reverses the movement direction of the pitch stick WITHOUT any visual changes in the display:



#### 2. Setting the pitch curve

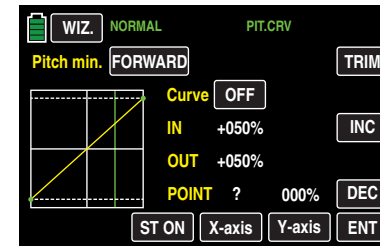
##### Tip

After having completed the program assisted model programming and the setting of the phases in the "PHASE" sub-menu of the functions phase specific menus can be programmed.

### Basic operating steps

- **Button ST OFF / ST ON**

Touch this button to turn the graphic and numeric display of the control stick position on and off, for example:



With the control element (gas/pitch control stick), a vertical green line is moved synchronously in the graph between the two endpoints "L" and "H". The momentary control stick position is also displayed numerically in the line "IN"(put) (-100 % to +100 %). The intersection of this line with the curve is identified as "OUT"(put) and can be varied at the support points between -125% and +125%. The control signal which is changed in this way then affects all of the following mixing and coupling functions.

- **ENT button**

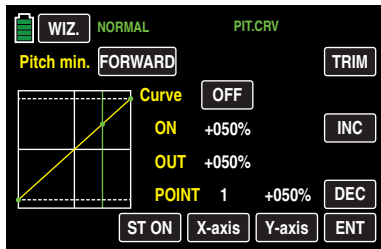
Touch the button at the bottom right of the display to set up to 5 additional points between the two endpoints "L" and "H".

In the following example, the control stick is exactly between the middle and end of its path, at +50% of the control path, and generates an output signal that is also +50% due to the linear characteristic.

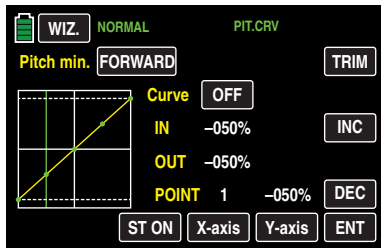


Between the two endpoints "L" and "H", up to 5 additional support points can be set, and the distance between neighboring support points may not be less than approximately 25%.

Move the control stick. As long as a ? is next to the "POINT", you can set the next support point by touching the **ENT** button. At the same time, the "?" is replaced with a number:



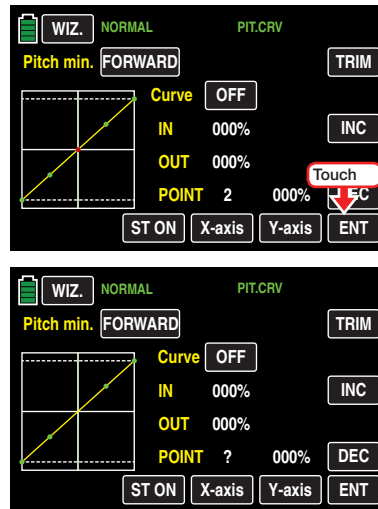
The sequence in which the up to 5 points between the end points "L" and "H" are generated does not matter since the support points are automatically renumbered sequentially from left to right after one support point is set or deleted, for example:



### Deleting a support point

In order to delete the set support points 1 to 5, move the vertical line with the control stick next to the relevant support point.

Once the support point number appears along with the associated value in the line "POINT" and the point is red (see the screen-shot below), you can delete it by touching the **ENT** button, for example:

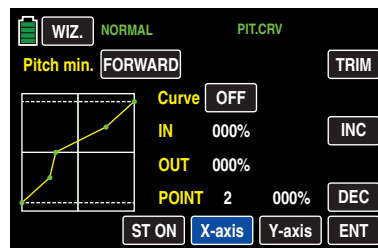


### Changing the support point value

- **X-axis button** (X-axis)

Activate this function by touching the button at the bottom edge of the display.

You can then move an active (red) point to the right with the **+** button, and to the left with the **-** button, for example:



Touch the **X-axis** button again to deactivate the function.

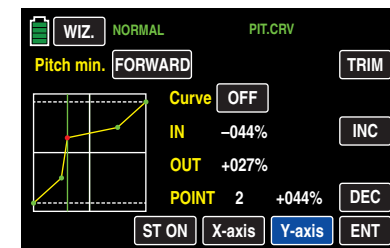
### Tips

- If you move the red point horizontally away from the current control position, the point becomes green after a short while, and a "?" appears in the Point line. This question mark does not relate to the point which has been moved but rather indicates that another point can be set at the current control position.
- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

- **Y-axis button** (Y-axis)

Activate this function by touching the button at the bottom edge of the display.

You can then move an active (red) point to the top with the **+** button, and to the bottom with the **-** button, for example:



Touch the **Y-axis** button again to deactivate the function.

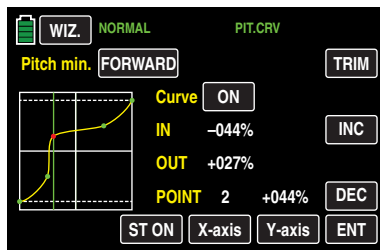
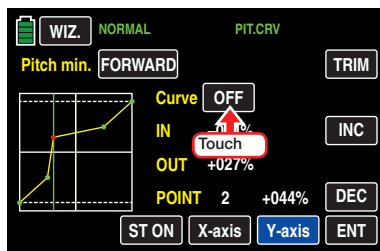
**Tip**

Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

**Rounding off the throttle curve**

- **ON/OFF button in the "Curve" line**

The default angled curve profile can be automatically rounded off by turning on the rounding function by pressing this button, for example:



**Notice**

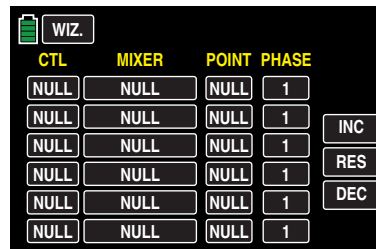


The curves portrayed here are for demonstration purposes only and do not represent real pitch curves.

- **TRIM button**

The **mz-24** HoTT Pro transmitters has a function that is integrated in the helicopter program for trimming up to six support points of the two options "throttle curve" and "pitch curve" during flight though the transmitter software.

Open the following window by touching the **TRIM** button at the top right edge of the display:

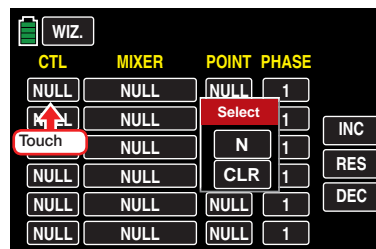


**Basic operating steps**

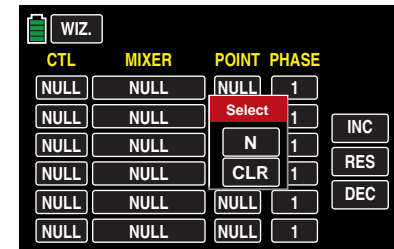
- **"CTL" column**

In the first column of the menu with the heading "Control", select a control that appears suitable for this purpose from the controls offered by your **mz-24** HoTT Pro transmitter.

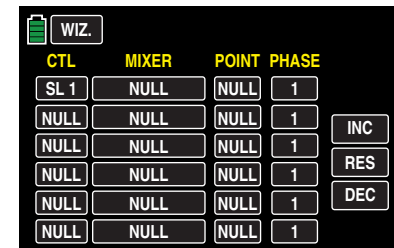
In order to assign a control, touch the button in the "CTL" column and the desired line with a finger or a provided stylus, for example:



The following appears in the display:



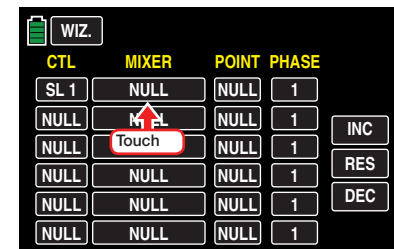
Then press the desired control such as the right proportional rotary control SL1:



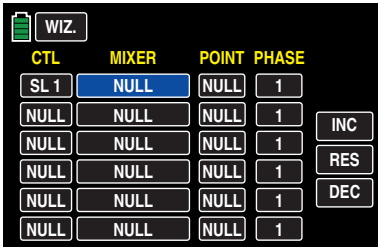
- **"MIXER" column**

In the six value fields of the second column with the header "MIXER", you can select individual helicopter mixers, or one of the two available mixers in any combination.

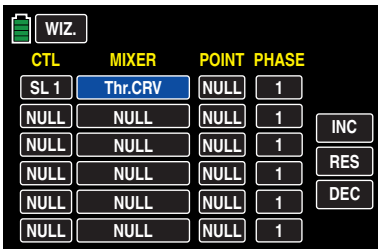
To select a mixer, touch the button in the "MIXER" column in the desired line with a finger or the provided stylus, for example:



The button color changes from black to blue:



Select the desired mixer in the actually blue, then active, value field by tapping on the **+** or **-** button which are located on the right side of the display, for example:

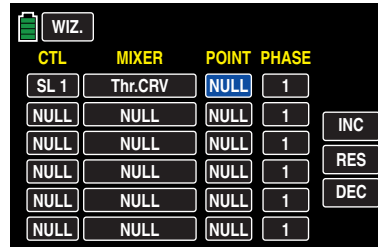


Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

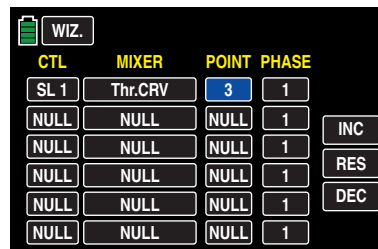
- **"POINT" column**

You have selected one or more mixers in the lines of the "Mixer" column. In the "POINT" column, specify the support point(s) to be trimmed.

To select a point, touch the button in the "POINT" column in the desired line with a finger or the provided stylus, for example:



Select the desired point L, 1 ... 5 or H in the actually blue, then active, value field by tapping on the **+** or **-** button which are located on the right side of the display, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

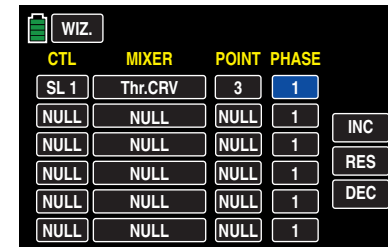
**Notice**

» The associated controller does not have any effect if an undefined point is selected (in the basic version of the relevant curve mixers, only the points "L" and "H" are set).

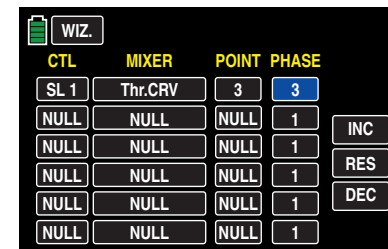
- **"PHASE" column**

If you want to, specify in the right "PHASE" column the programmed phases in which the governor should be active. In the value field, in the example, "1 (normal)", the number refers to the phase number that can be found in the sub-menu **"PHASE"**.

To select another phase than default Phase1, touch the button in the "Phase" column in the desired line with a finger or the provided stylus, for example:



You can change the current Phase number in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display the desired number of times, for example:

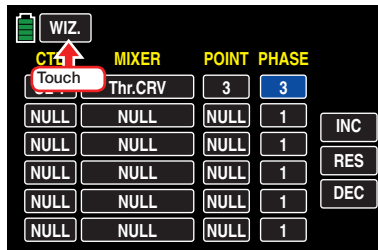


Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

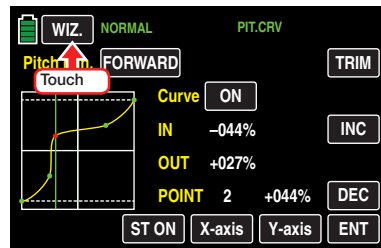
### Notice

» The settings that appear in this display affect the same records as those at a comparable location in the "TRIM" display of the **"THR.CRIV"** sub-menu (see next column) which is why changes always affect each other.

After you finish making your settings, touch the **WIZ.** button at the top left of the display to leave this menu and go to "Pitch curve":



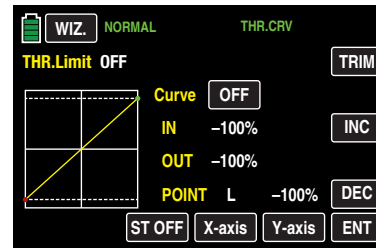
Touch the **WIZ.** button again in the "Pitch curve" display ...



... To leave the assistant and to open the next sub-menu ...

### "Throttle curve"

The throttle curve can be specified by up to 7 points, the so-called support points, along the entire control stick travel:

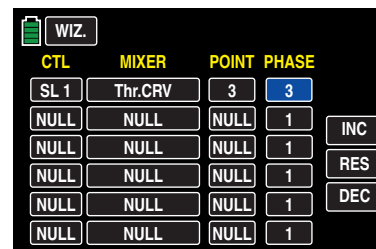


Support points can be set, changed and deleted in the same manner as described in the previous section, "Pitch curve". First specify the throttle curve using three points, that is, the two end points "L" and "H", as well as the other set point "1" in the control center in order to harmonize the motor performance curve with the pitch curve.

### Tip

The value shown in the top left "throttle limit" line indicates basically the status or the position of the throttle limit.

Further information about setting throttle curves can be found in the description of the **THROTTLE CURVE** menu.



### Notice

» The associated controller does not have any effect if an undefined point is selected (in the basic version of the relevant curve mixers, only the points "L" and "H" are set).

### Tips

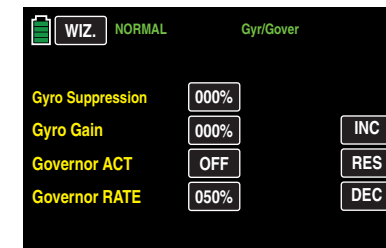
The settings that appear in this display affect the same records as those at a comparable location in the "TRIM" display of the **"Pitch curve"** sub-menu which is why changes always affect each other.

- After having completed the program assisted model programming and the setting of the phases in the **"PHASE"** sub-menu of the functions phase specific throttle curves can be programmed.

Touch the **WIZ.** button in the "Throttle curve" display to leave the assistant and open the next sub-menu: ...

### "Gyr/Gover" (Gyro/Governor)

Within this display, you can make initial basic settings as needed for your gyro and/or for any governor that is used in your model.



### Tip

After having completed the program assisted model programming and the setting of the phases in the **"PHASE"** sub-menu of the functions menu all the options contained in this menu all the phase specific values can be programmed.

- **"Gyro Suppression" line**

**Notice**

» This option may normally not be used for current standard gyro systems. You therefore need to consult your gyro setting instructions since otherwise you may make it impossible to fly your helicopter. Nonetheless, this sub-menu was retained to satisfy all requirements and conventions.

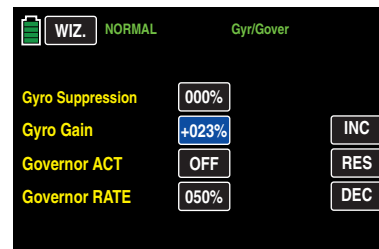
This option can influence the effect of the gyro sensor (gyroscope) as the tail rotor control stick is moved, assuming that a gyro system is used in which the gyro's effect can be set by the transmitter using an additional channel, channel 7 in the *Graupner* remote-control system. The gyro suppression reduces the gyro's effect in a linear manner in proportion to the deflection of the tail rotor control stick corresponding to the set value. If the gyro has not been suppressed (at a value of 0%), the gyro's effect remains independent of the control stick deflection.

The gyro's effect can however be additionally varied smoothly between a minimum and maximum using a control assigned in the "Gyro" line in the **"CTL Set"** menu, for example with one of the proportional dials DVx. More on this subject can be found in the section **"Gyro/governor"**.

- **"Gyro Gain" line**

Most of the current gyro systems can be adjusted for a smooth, proportional effect; you can also choose between two different modes of action by the transmitter.

If the gyro that you are using also has one of these options, the alternative offset setting enables both the normal gyro gain and "heading lock mode" as well as flying with maximum stabilization in normal, slow fights within this selected mode, and reducing the gyro gain in fast roundtrips and aerobatics. Values up to  $\pm 125\%$  are possible, for example:



Based on these phase specific settings (offset) the gyro gain can also be proportionally varied with a control assigned in the line "C7" in the sub-menu **"CTL Set"**, as for example the proportional dial DVx.

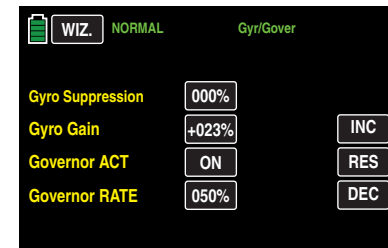
**Attention**

- »
- You therefore need to consult your gyro setting instructions since otherwise you may make it impossible to fly your helicopter.
  - Note that the offset values entered in this option as well as in the line "CH 7" of the sub-menu **"CTL Set"** add up! For the sake of clarity, make sure to only enter or change an offset value in one of the two options.

- **"Governor ACT" line**

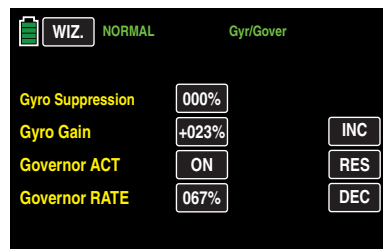
In contrast to speed *controllers* that only regulate performance like a carburetor, *governors* maintain a constant speed in the system that they are monitoring by independently regulating the provided output. Like the cruise control in cars, a governor controls in case of ice engine helicopter the throttle servo in the same way as the speed controller of an electric motor helicopter. *Governors therefore only require a speed setting and not a classic throttle curve.* A deviation from the set speed occurs when the required output exceeds the maximum available output.

To change the current value, touch the desired button in the "Governor ACT" line. The display switches from **"OFF"** to **"ON"** and vice versa, for example:



- **"Governor RATE" line**

In the "GOVERNOR" line, in case you have switched on the function "Governor at CH8". In the "Governor RATE" line, enter the appropriate offset value for the desired rotor speed. The value to be set depends on the governor that is used as well as the desired target speed, and can of course be varied for specific phases, for example:

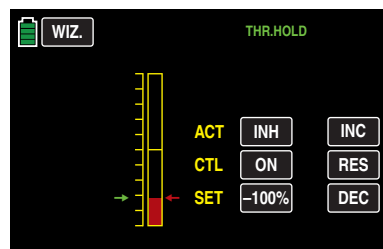


With a control assigned in the "C8" line of the sub-menu "CTL Set", for example the proportional dial DVx, this value can also be proportionally varied. Touch the **WIZ.** button in the "Gyr/Gover" display to leave the assistant and open the next sub-menu ...

### THR.HOLD

During competition, is expected that gas engines should be completely turned off. In the training phase, this is a bit inconvenient since you would have to restart the engine after each autorotation training landing.

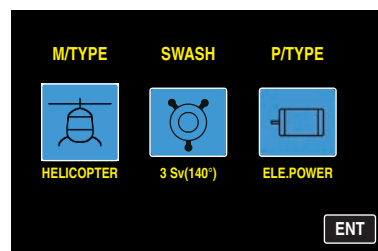
Therefore make the appropriate settings during the training phase, as fully described in the [THR.HOLD](#) paragraph, in this display so that the gas engine can be kept idling during the autorotation phase without the clutch engaging, or so that any electric drive is definitely off, for example:



### Tip

With the **"Throttle Cut"** option in the Base menu, there is an alternative emergency off function.

Touch the **WIZ.** button in the "THR.HOLD" display to leave the assistant and open the next menu, for example ...

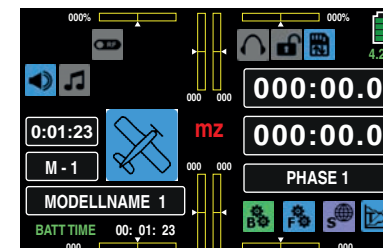


..., which you can leave to go to the base menu by touching the **ENT** button at the right bottom:

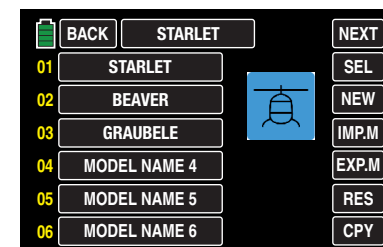
### IMP.M

(import from SD card)

Once a memory card is in an operational transmitter, a blue memory card icon appears at the top right of the basic display:

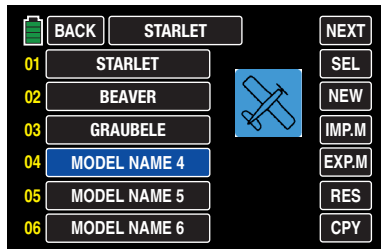


In the "Model Sel" sub-menu described here...

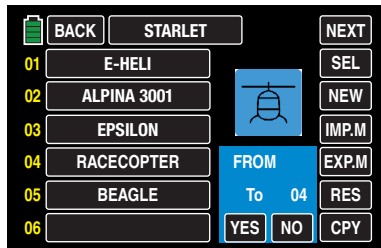
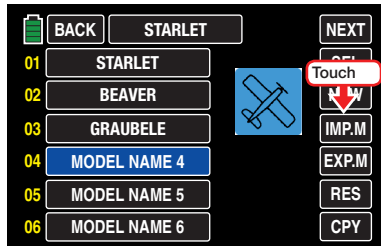


... you can import compatible models into the transmitter memory from the memory card inserted in the transmitter's card slot.

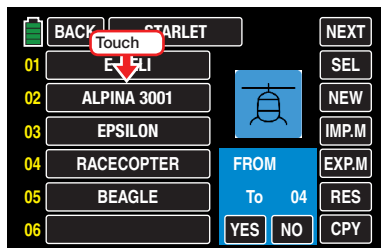
For this reason, from the list of empty model memories offered in the "Model Sel" display, first select one that appears appropriate, such as model memory 4 which is still available in this example. Touch the field on the right adjacent to the yellow 04 with a finger or the provided stylus. The color of the field switches from black to blue:



Then switch to the display of the data model saved on the SD card by touching the **IMP.M** button in the middle of the right column:

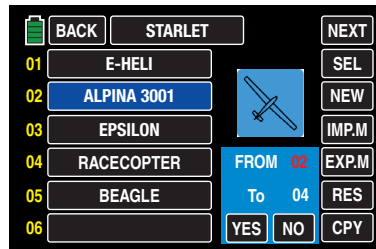


Touch the model to be imported from the SD memory card, for example:



The color of the field switches from black to blue. At the same time the display of the model type icon

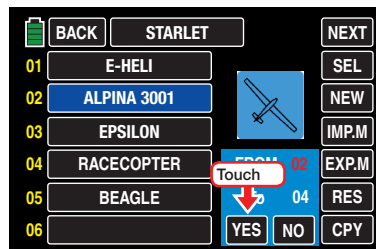
changes accordingly and on the right near "ORIGIN" appears the number of the memory to import in red characters:



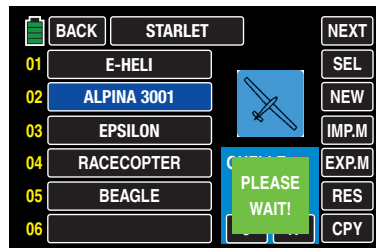
### Tip

The recall of each model type of the models saved on the memory card is performed as described under "[Model type display](#)".

Touch **NO** to terminate the action and return to the start page. After tapping on **YES** ...

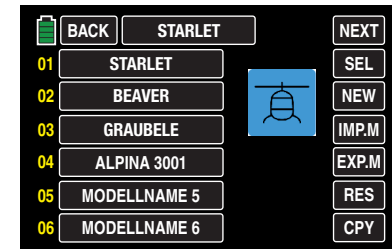


... after a short while the message "Please Wait!" appears ...



... while the selected model is imported into the selected mode memory.

Once the process is completed, all the warning messages will disappear, and the display returns to the list of models and the transmitter:



### Tips

If a memory specific bound (and at the same time assigned to the SD card, eventually for safety reasons) model is loaded again on the originally model memory of the same transmitter, the receiver binding will always be functional.

If, in contrast, the same model is copied in another model memory or in a completely different transmitter, the receiver MUST be bound again to the transmitter.

- If a transmitter specific bound (and at the same time assigned to the SD card, eventually for safety reasons) model is loaded again on another model memory of the same transmitter, the receiver binding will always be functional.

If, in contrast, the same model is copied in another transmitter, the receiver MUST be bound again to the transmitter.

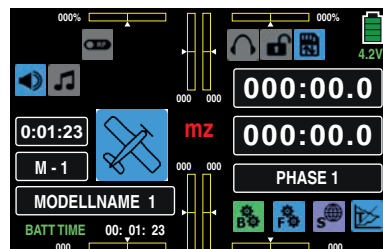
## **EXP.M** (Export to SD card)

Use this option to export models saved in the transmitter to a memory card inserted into the transmitter's card slot. The binding information of the exported model memories remain included.

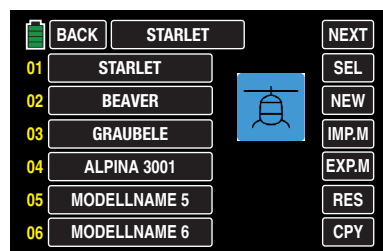
### Tip

Information about HoTT-Synchronisation of a model memory after importing from an SD card can be found in the precedent pages, in the notices under **IMP.M**.

Once a memory card is in an operational transmitter, a blue memory card icon appears at the top right of the basic display:

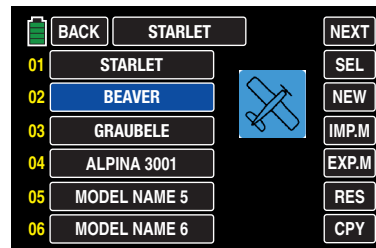


In the "Model Sel" sub-menu described here...

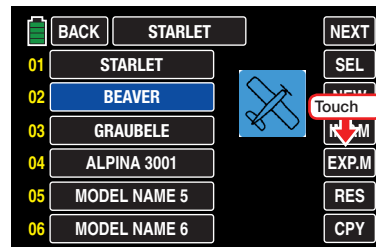


... you can export assigned model memories as desired to the memory card inserted in the card slot of the transmitter.

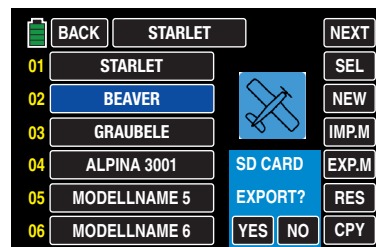
Select the desired model memory, as for example the model memory 02, from the list offered in the "model sel." display. Tap on the field with the selected model name. The color of the field switches from black to blue:



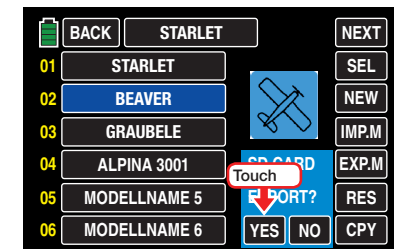
As next, tap on the **EXP.M** button on the right side of the display ...



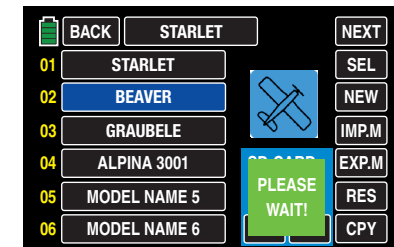
Additional information and buttons appear at the bottom right.



Touch **NO** to terminate the action and return to the start page. After tapping on **YES** ...

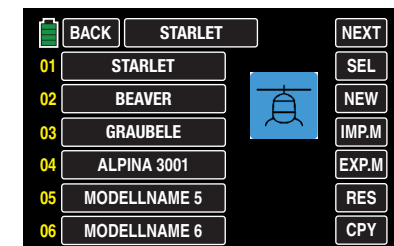


... after a short while the message "Please Wait!" appears ...



... while the selected model is being exported to the SD card.

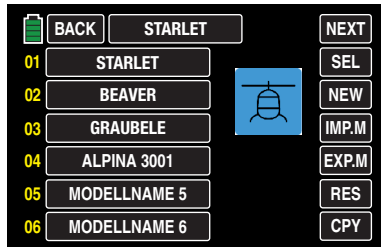
Once the process is completed, all the warning messages will disappear, and the display returns to the list of models and the transmitter:



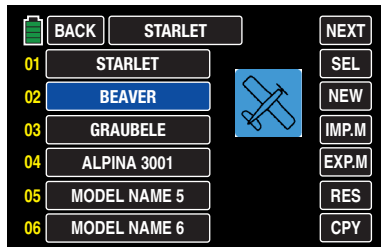


**RES** (delete model)

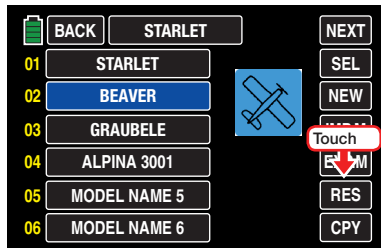
In the "Model Sel" sub-menu described here...



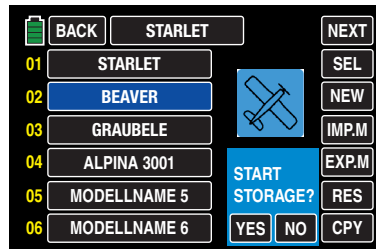
... you can reset an assigned model memory using the **RES** button at the right edge of the display. Select then the desired model memory in the list offered in the "Model Sel" display, as for example the model memory 02, by tapping on it. The color of the field switches from black to blue:



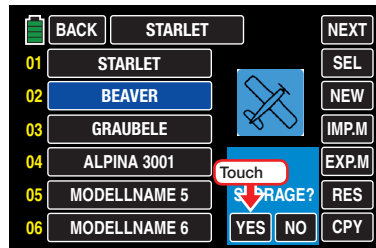
Tap on the **RES** button on the right side of the display:



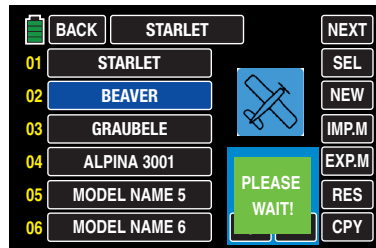
Additional information and buttons appear at the bottom right.



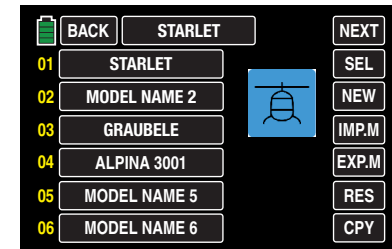
Touch **NO** to terminate the action and return to the start page. After tapping on **YES** ...



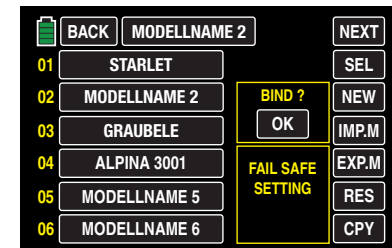
... after a short while the message "Please Wait!" appears ...



... while the selected model is being initialized. Once the process is completed, all the warning messages will disappear, and the display returns to the list of models and the transmitter:



If you have initialized not a "different" but the actually in use model memory, after the end of the initialization two note windows will appear:



Tapping on **OK** opens directly the "TX ctl" menu, where you can bind again your receiver. The note "Fail Safe not set" should remind you that no fail safe has been set yet.

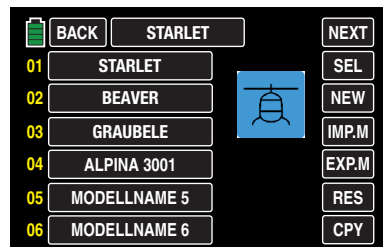
Tapping on **NO** terminates the process and brings you back to the base menu.

**Notice**

» This deletion cannot be restored. All of the data in the selected model memory are completely deleted.

## CPY (copy model → model)

In the "Model Sel" sub-menu described here...

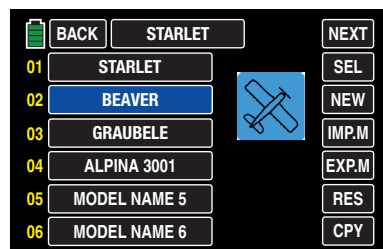


... using the **CPY** button at the right edge of the display, you can copy an assigned model memory to any other model memory.

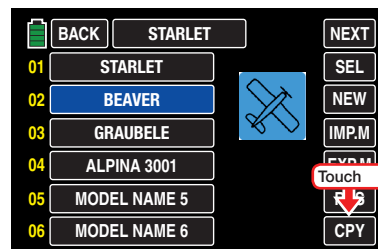
### Tips

- If a memory specific bound model is copied in another model memory of the same transmitter, the receiver must be bound again in the target model memory.
- If a transmitter specific bound model is loaded on another model memory of the same transmitter, the receiver binding will always be functional.

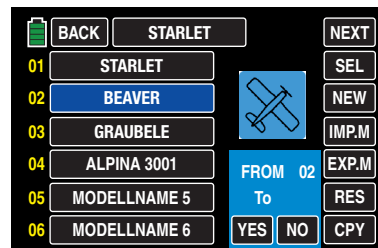
Select then the desired model memory in the list offered in the "Model Sel" display, as for example the model memory 02, by tapping on it. The color of the field switches from black to blue:



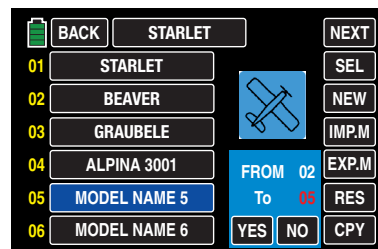
Tap on the **CPY** button right on the bottom:



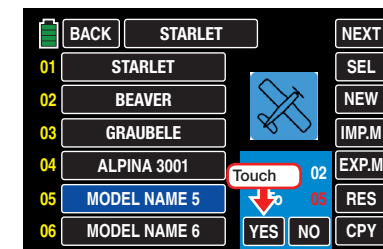
Additional information and buttons appear at the bottom right.



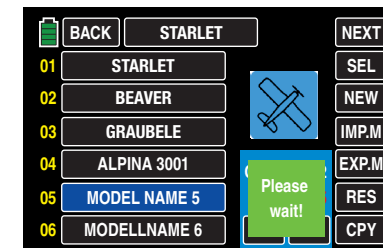
Touch the desired target memory. The color of the selected field switches from black to blue, and the number of the selected target memory appears in red next to "Target" in the blue field, for example: 05:



Touch **NO** to terminate the action and return to the start page. After tapping on **YES** ...

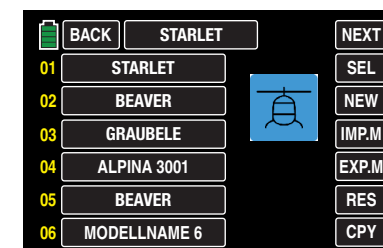


... after a short while the message "Please Wait!" appears ...

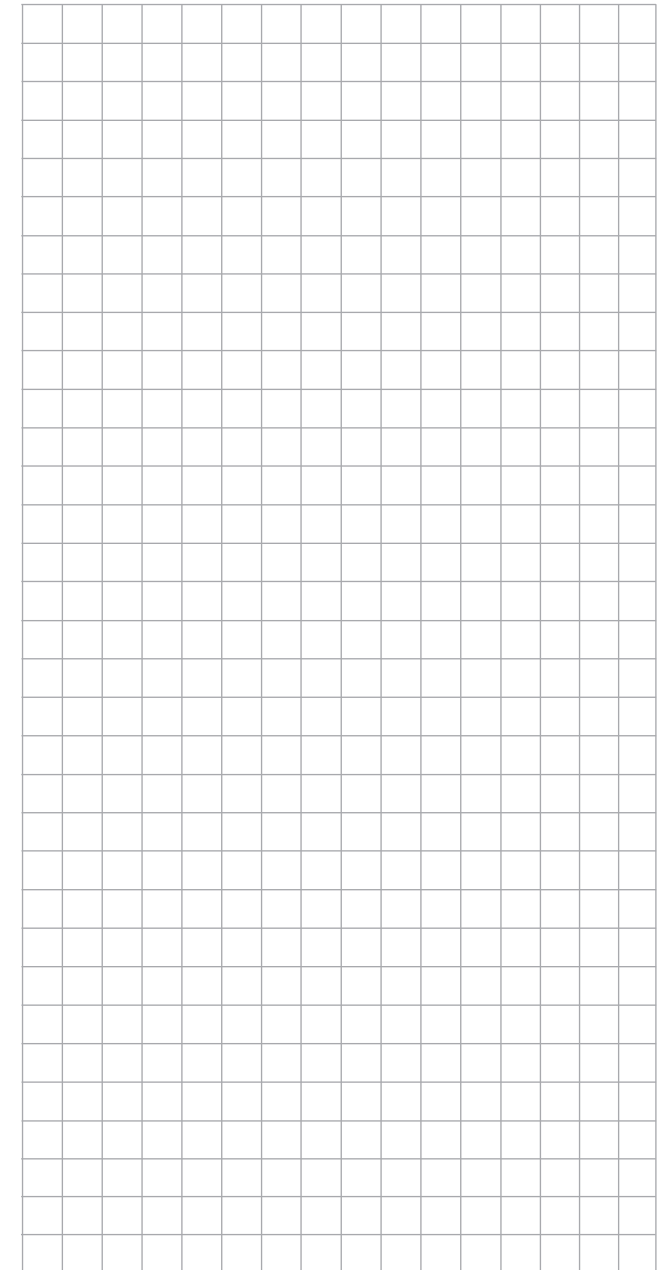
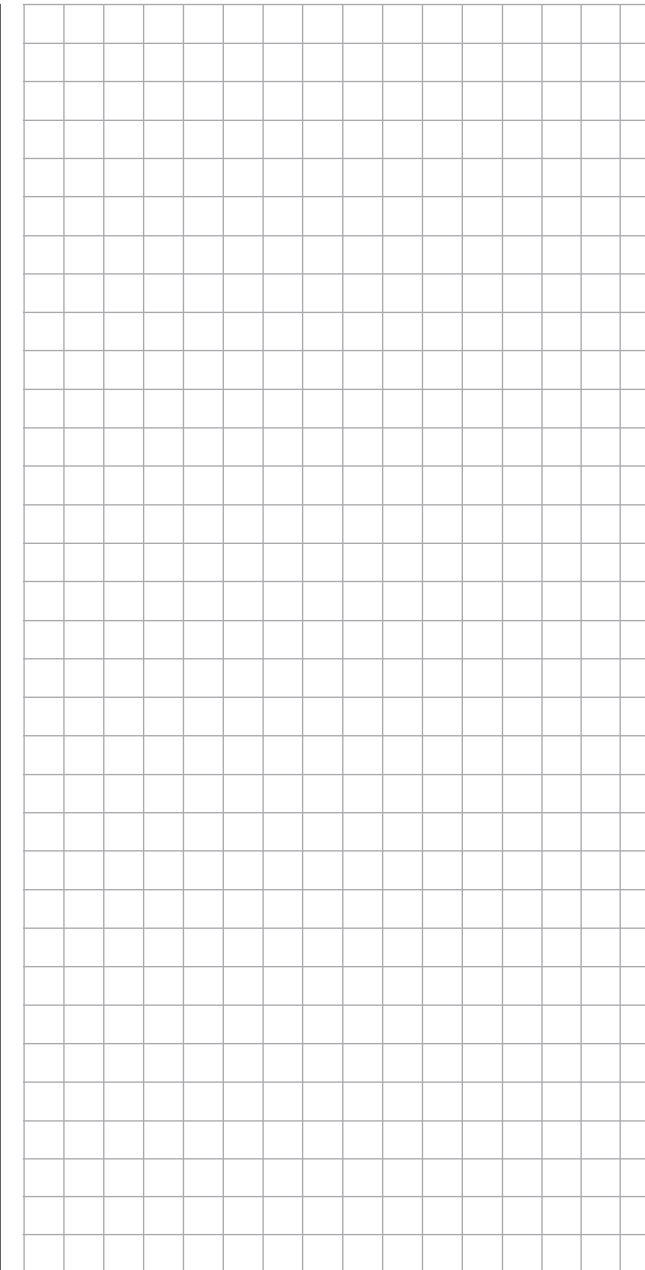
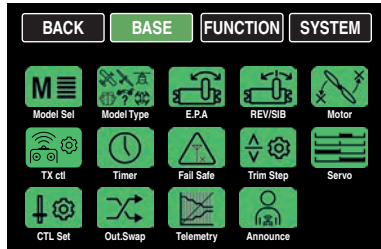
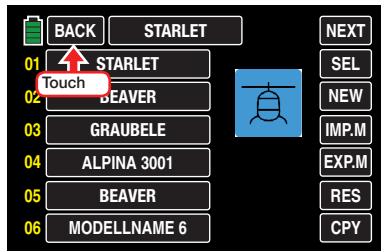


... while the selected model is being copied to the target memory.

Once the process is completed, all the warning messages will disappear, and the display returns to the list of models and the transmitter:



To go to the "Home menu", leave the "Model select" display by touching the **BACK** button at the top left:

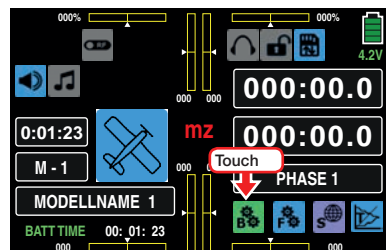


# Model type

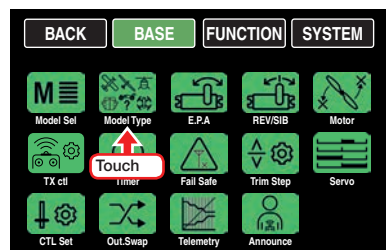


Change the model type

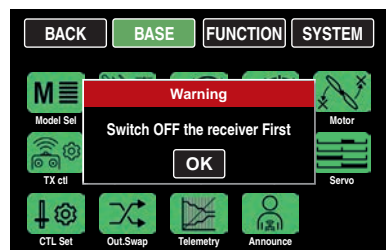
Switch your receiver system and the RF module of your transmitter *off*. In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B" to accede into the base menu:



The display switches to the "green" base menu. Touch the menu item "Model Type".

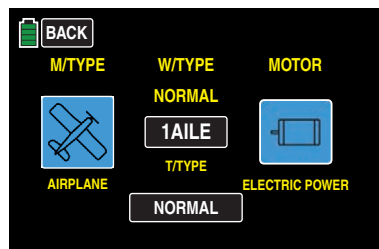


If after touching the "MODEL TYPE" icon in stead of the awaited menu it appears the warning message ...



... then there is still a connection between transmitter and receiver. Switch your receiver off and try again.

In the delivered form the transmitter the model selection display looks for example like this:



Normally, the basic type of model is specified when creating the model memory in the sub-menu "Model selection" of the base menu. In the "Model Type" sub-menu, you can directly change the type of the current model. When such a change is made, all of the mixers, coupling functions, etc. for the previous model type are also deleted or at least need to be adapted to the changed type.

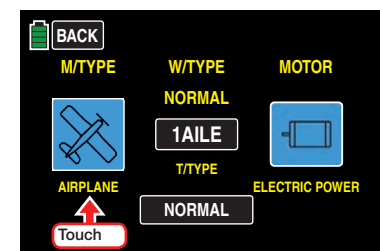
## Notice



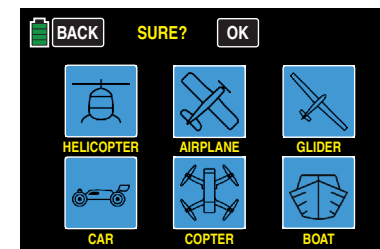
Once you change any of the existing settings, all of the relevant parameters are reset.

## Programming

For example, the model memory 01 already used for an helicopter has to be reprogrammed in the model type "motor model". So Tap the first of the fields to be changed, in this example, the key of the model underlying programming model type:

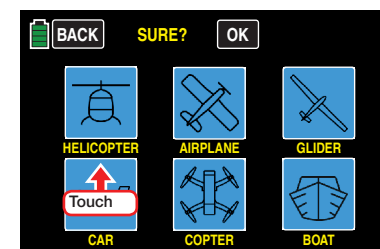


As described in detail in the section "Manually programming the basic settings of a new model", the manual configuration of a model memory starts with a safety query:

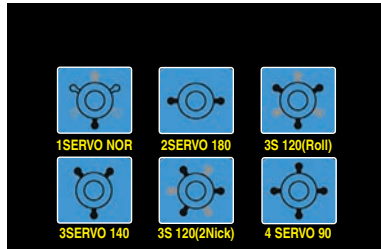


Touch **NO** to terminate the procedure. Touching **OK** will cause a change of the color of the OK button for about 1s. Afterwards the model type selection is available.

Following the example, touch the central button labeled "HELI" in this display...

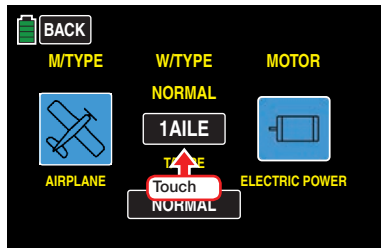


... the display then switches to the selection of the next option...

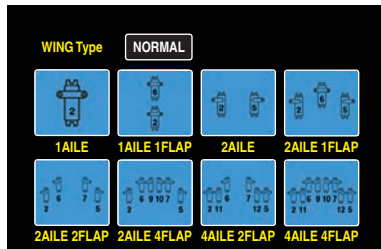


... etc. For the remainder of the process, you only need to use the assistant as described in the mentioned section until all the basic settings of the newly selected model type are entered.

Basically, use the same procedure as you would, for example, to change the wing type of the current model from "1AILE" to "2AILE 2FLAP". In this case tap on the button under "Wing Type" ...

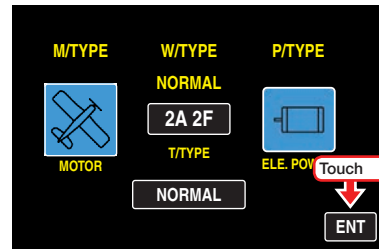


... and change the wing type in the display "Wing Type" that appears...

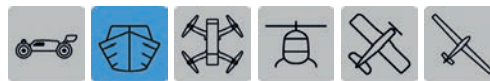


... by touching the desired "new" wing type. Use the same procedure for all of the selectable fields.

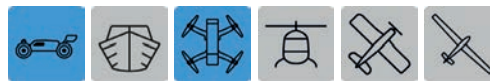
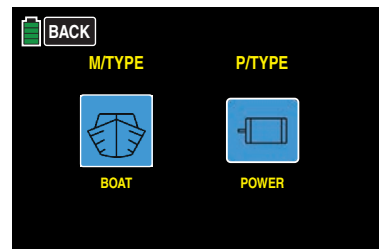
The entire process is concluded by touching the **ENT** button at the lower right side of the display which resumes all the selected options, for example:



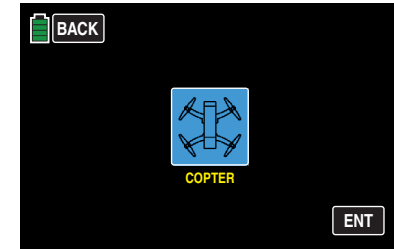
### Notices



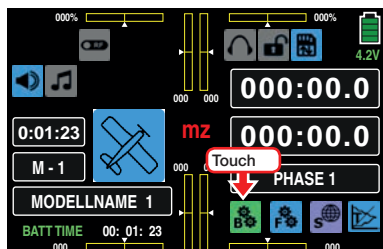
- In the model type "BOAT", the only possible selection is basically between motor powered or non motor powered model type:



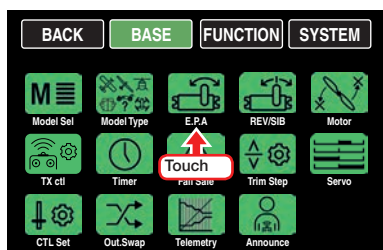
- In the model type "CAR" and "COPTER", the only possible selection is basically the model type:



In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":

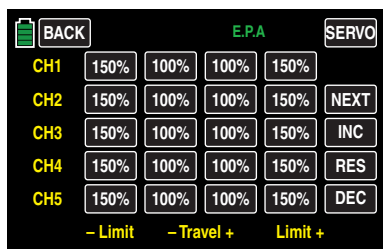


The display switches to the "green" base menu. Touch the menu item "E.P.A".



### E.P.A. Setting

In this display, the parameters are set that exclusively relate to the servo, that is the servo path and angle of rotation or its limit.

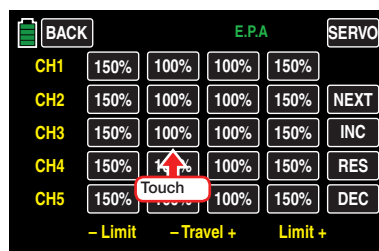


The set values always refer to the settings in the sub-menu "REV/SUB".

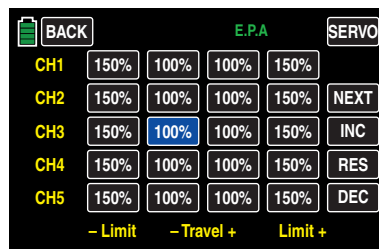
### Tip

In order to reach control channels with numbers higher than CH5, touch **NEXT** [change page] at the top right of the display.

To change a current value, touch the desired button, for example:



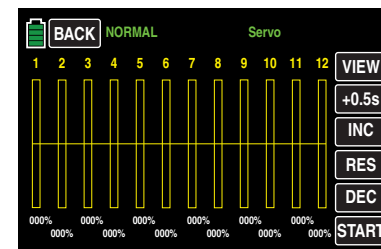
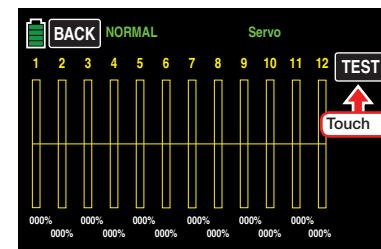
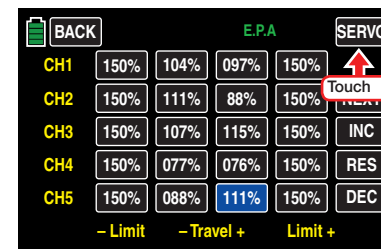
The button color changes from black to blue:



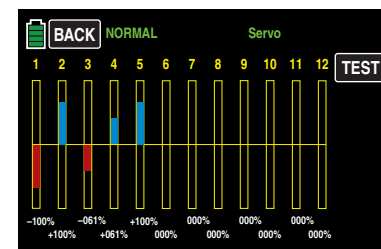
Repeatedly touch the **+** button at the right edge of the display to gradually increase the current value, and touch the **-** button to lower the value in the active value field. Touch the **RES** button to reset a changed value back to the default value.

Use the same procedure for all the other settings.

To recall the graphic display of the servo travels of the "Servo" menu (servo monitor) and to activate the "Servo test" function integrated in this display by touching the **TEST** field, tap on the **SERVO** button on the top right side of the display or push the **▲▼** buttons on the left of the display, at the same time, *while no value field is active*:



Once you activate one or more control elements of your transmitter, the resulting servo travel is graphically displayed, for example:



To go to the "BASE menu", leave the "Servo display" by touching the **BACK** button at the top left:

**Notice**



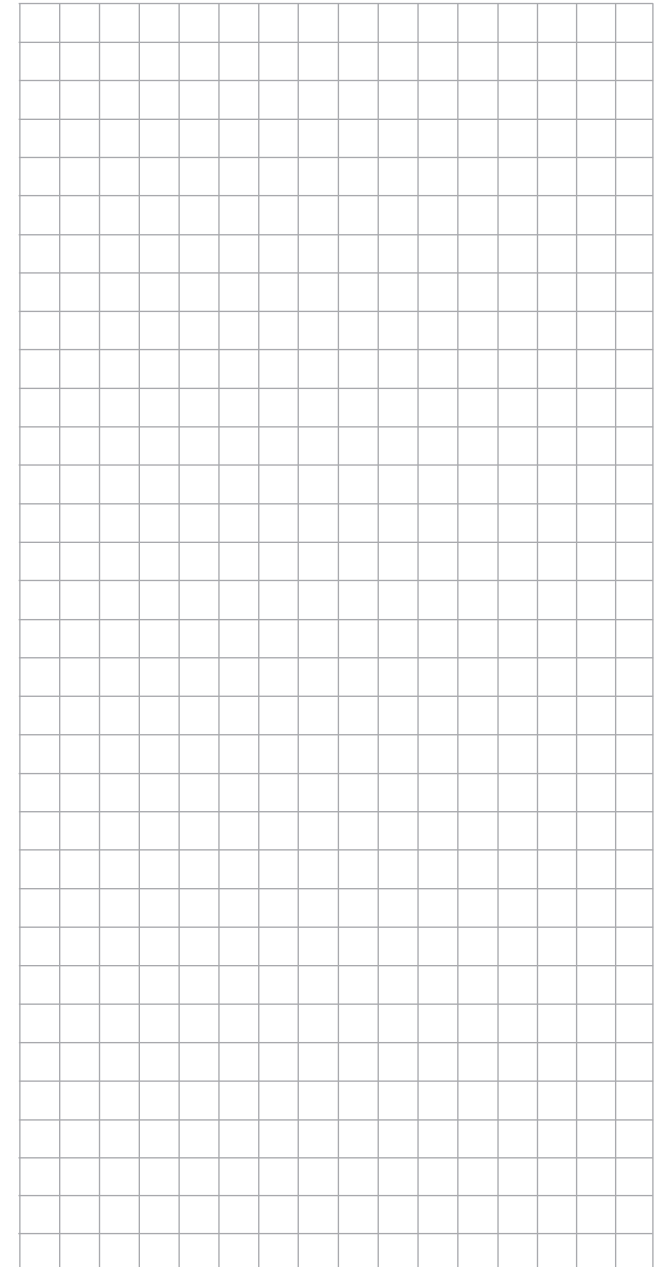
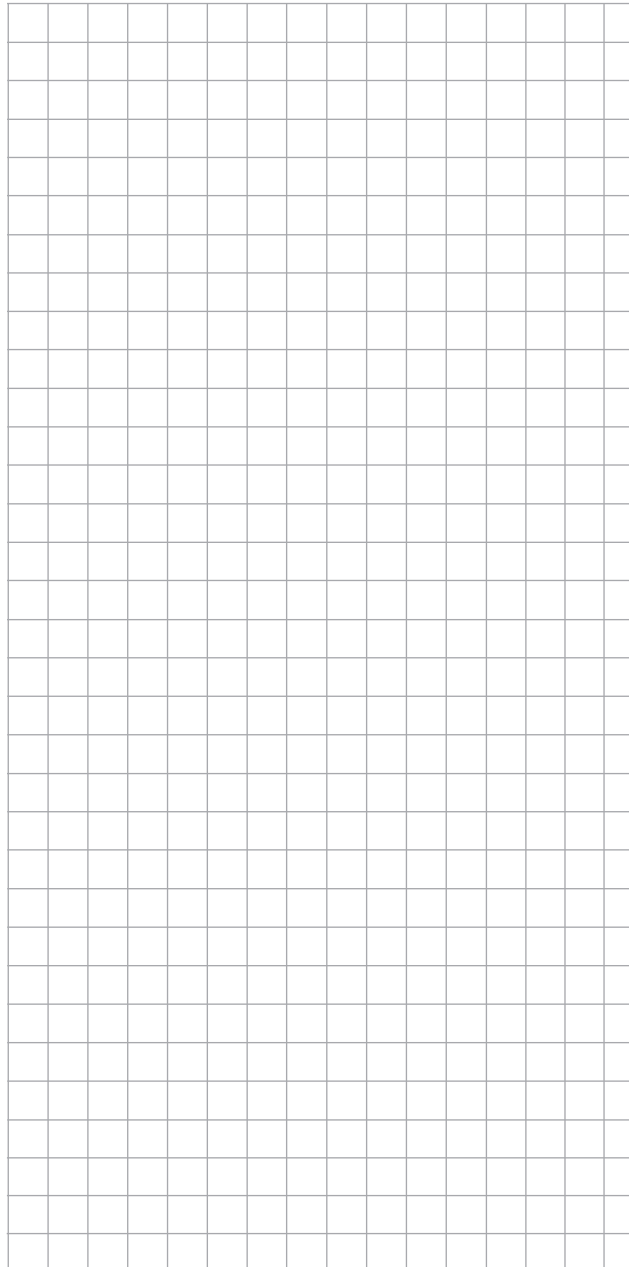
In contrast to the "CTL Set" sub-menu, all the settings of this sub-menu refer to the relevant servo independent of where the control signal for the servo comes from, i.e., either directly from the control element or from mix functions.

**Example**

The rudder servo of a model is directly controlled by the rudder control stick and also through an accessory "Aileron → Rudder" mixer. For model-specific reasons, this servo can only follow a maximum servo travel of 100% since for example the rudder would contact the elevator if the allowed mechanical travel was more than 100%.

As long as only the rudder is used, this is not a problem. It becomes a problem, however, if the signals add up to a total travel of more than 100% when simultaneously using the rudder and the aileron. The linkages and servos can be subject to an extreme load...

To prevent this, the path of the relevant servo has to be limited individually. In the case of the rudder servos used here as an example, this would be slightly less than 100% since we are assuming that the rudder is already traveling 100%.

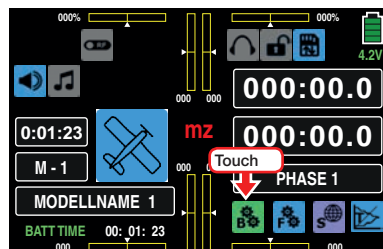


# REV/SUB

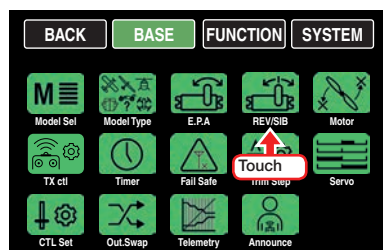


Setting of the servo direction and neutral position

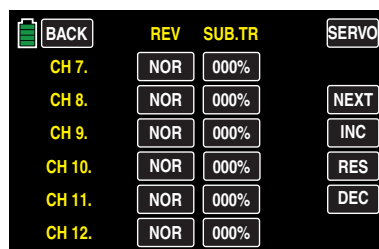
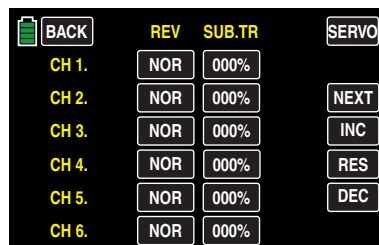
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "REV/SUB".



## Servo direction and neutral position



In both these displays in the left column can be set the direction of each servo and in the right column the related neutral position.

### Notices

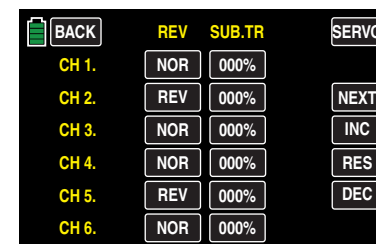


- First of all start by setting basically the direction in which the servos have to move before you start setting other parameters!
- The numbers for the servos refer to the servos connected to the corresponding receiver outputs providing that the transmitter and receiver outputs have not been switched. A change in the control mode therefore does not influence the numbering of the servos.

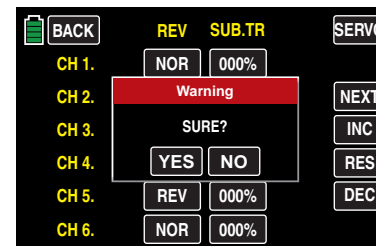
## 1. Setting the servo direction

With this option, the direction of servo rotation is adapted to the specifics in the particular model so that, when the control linkages and articulations are installed, the servo's rotational direction does not have to be considered.

The direction of travel is reversed by touching the corresponding value fields labeled **NOR** and **REV**, such as:



As soon as the travel direction of CH6 in a helicopter model type or CH1 in the other model types is going to be changed, a warning will be displayed:



Touch **NO** to terminate the procedure. Touch **YES** to confirm the procedure which changes the direction of travel of the servo connected to CH1 or CH 6.



## Notice

» In no case you should use the possibility of the servo reverse of the channel 6 for helicopters and channel 1 for other model types to reverse the direction in which the related control stick works, only use this possibility for situation adaptation. Because the switch-on warning "CH1-Pos" as the "Thr.HOLD" function do not follow this kind of reverse control direction. To reverse the control direction use exclusively the possibility offered by the "Pitch curve" menu for helicopters models and "Throttle curve" for all the other model types.

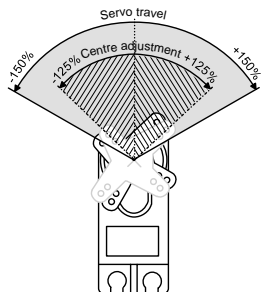
## 2. Setting of the neutral position

The servo middle position is for adapting servos that are not standard (servo middle position with a pulse length of 1.5 ms or 1500  $\mu$ s ) as well as for minor adaptations, for example fine adjustment to the neutral position of control surfaces on the model.

Independent of trim controls and any mix settings, the neutral position can be shifted around  $\pm 125\%$  within the maximum servo travel of  $\pm 150\%$ . The servo is always adjusted directly independent of all other trim and mix settings.

## Notice

» Note that if the neutral position is adjusted strongly, servo travel on one side may be restricted since the total travel is limited to  $\pm 150\%$  for electronic and mechanical reasons.

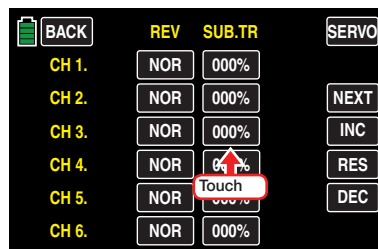


## Notice

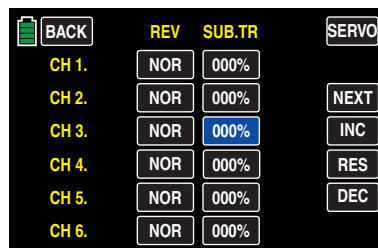
» Move the trim control into the middle position before changing the middle values.

## Programming

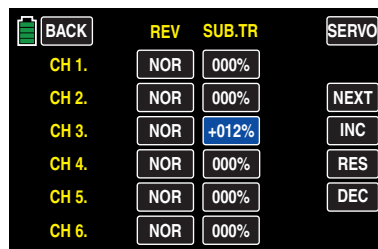
To change the neutral position of a specific servo, touch the corresponding button, for example:



The button color changes from black to blue:



Change the desired value by touching accordingly the  $\uparrow$  or  $\downarrow$  buttons on the right to the outside, for example:



Touch the **RES** button to reset a changed value in the blue field back to the default.

To recall the graphic display of the servo travels of the "Servo" menu (servo monitor) and to activate the "Servo test" function integrated in this display by touching the **SERVO** field, tap on the **SERVO** button on the top right side of the display or push the  $\uparrow$   $\downarrow$  buttons on the left of the display, at the same time, *while no value field is active*.

To go to the "Home menu", leave the "Sub-Trim" display by touching the **BACK** button at the top left:

# Throttle Cut



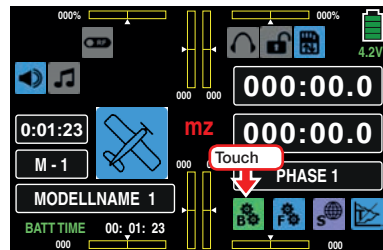
Switchable throttle cut or motor limiter



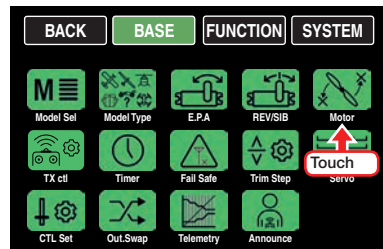
This sub-menu is not shown in model type "glider without motor".



In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "THR.CUT".



## Throttle Cut

In this "Throttle Cut" option, you can turn off a speed controller with a switch, or move a servo for the throttle control in the pre-defined motor OFF position (or to idle position).

This option can also be used as an emergency OFF function as well. The motor OFF position, or also an idle position, is designated in the value field of the

"SET" line and needs to be determined through experimentation.

The speed controller or the throttle servo only assumes the set position if a freely selectable switch has been activated ...



- By moving the selected switch to the ON position the speed controller or the governor will be reduced to the value which has been input in the "SET" line, independently from the actual position of the throttle/brake or throttle/pitch control stick.



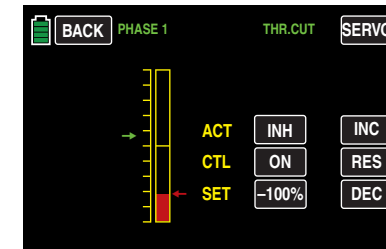
... and in models with ICE engine also this passage must be performed:

- If the set percentage in the "SET" line is *less* than the current servo position, that is, the current servo position represented by the green arrow to the left of the bar graphic is *above* the switching threshold represented by the red arrow in the bar graphic, the speed controller reduces the motor speed, or the throttle servo closes the carburetor as specified in the "SET" line once the servo position *falls below* the switching threshold of -66% when the switch is in the ON position.
- If the control stick position, represented by the green arrow on the left of the bar graphic, is actually *under* the red arrow on the right of the graphic, the speed controller or governor increases the motor speed or the throttle servo opens the carburetor as specified in the "SET" line, after moving the switch to the ON position as soon as the control stick moves *over* +66% or *under* -66% of the switch threshold if the motor OFF position is set in the plus side.



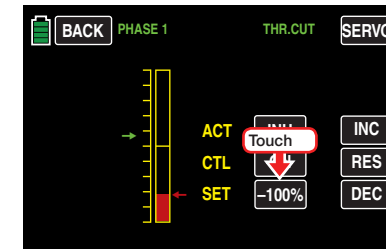
- In this motor OFF position, the speed controller or the governor are disabled until the selected switch is not moved again.

The preset value of the field in the "SET" line of the idle or "motor off" position is -100% of the throttle/brake or throttle/pitch control stick travel:

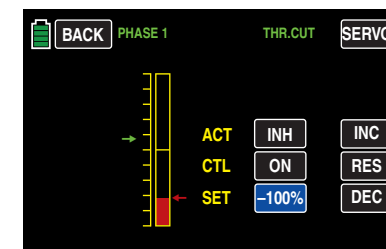


## Programming

To change the default for the "Motor OFF" position, touch the value field in the "SET" line:

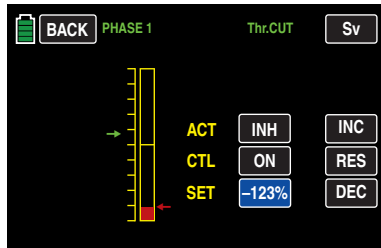


The color of the field switches from black to blue:



Set a value with **+** or **-** on the right to the outside which allows the motor or engine to run affordable at the desired idle speed or which for example switches definitely the engine or motor "off":

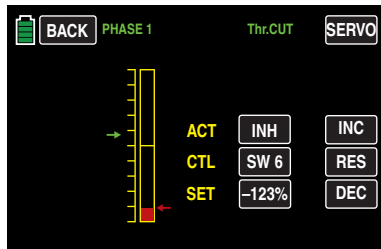
The adjustment range is  $\pm 150\%$ .



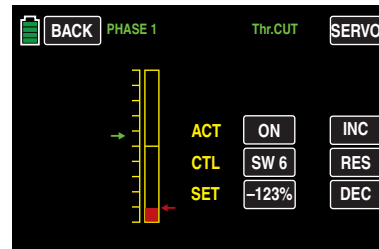
**Notice**

**>>** With a ICE engine, make sure that the throttle servo does not mechanically over-travel.

Assign the required ON/OFF switches (such as S6) in the "CTL Set" line as described in detail in the [Control and switch assignment](#) paragraph:



In conclusion, touch the value field in the "ACT" line to release the option which is blocked by default (**BLK**). Depending on the switch position, the display of this field switches to **ON** or **OFF**.

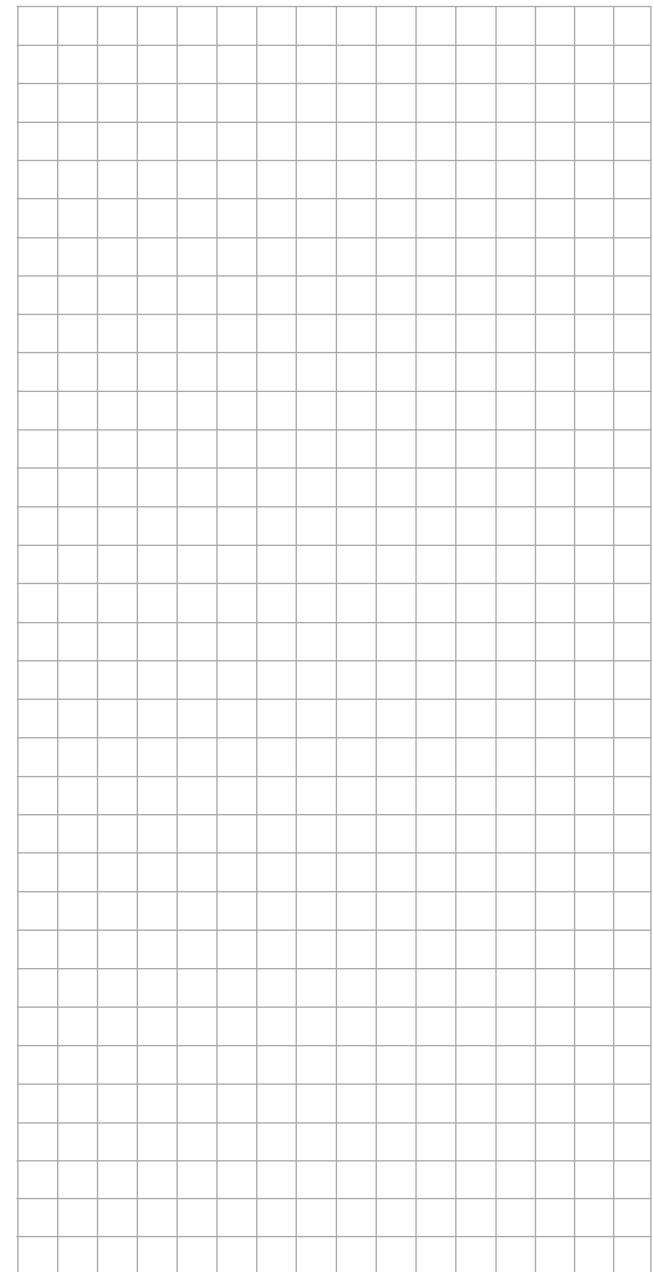
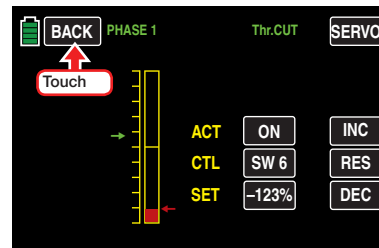


To recall the graphic display of the servo travels of the "Servo" menu (servo monitor) and to activate the "Servo test" function integrated in this display by touching the **SERVO** field, tap on the **SERVO** button on the top right side of the display or push the **▲▼** buttons on the left of the display, at the same time, while no value field is active.

**Tip**

After setting the value field in the "THR.Cut" line in the "WARNING" sub-men of the system menu the transmitter warns by switching on (**ON**) or off (**REV**) throttle cut function.

To go to the "Home menu", leave the "THR.CUT" display by touching the **BACK** button at the top left:

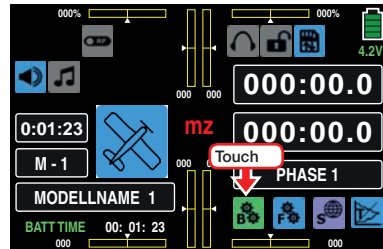




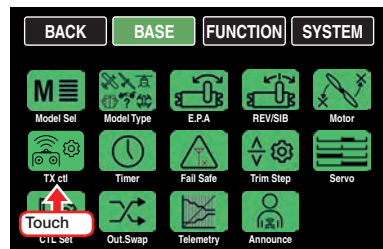
# Transmitter setting

Transmitter settings

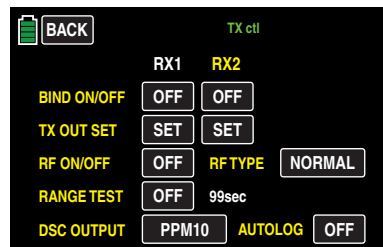
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "TX Ctl".

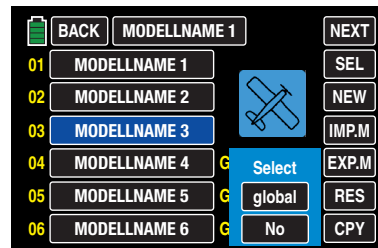


In this sub-menu transmitter specific functions like, e.g. "Bind", "TX OUT SET", "RF ON/OFF", "RF TYPE", "RANGE TEST", "DSC OUTPUT" and "AUTOLOG" can be configured:



## BIND ON/OFF

To establish a connection with the transmitter, the *Graupner* HoTT receiver must first be "bound" to at least one model memory in "its" *Graupner* HoTT transmitter. This process is generally called "binding" and it can be repeated all the times it is needed. This binding of a receiver is normally performed always model memory specifically, but it can be changed in every moment to transmitter specific, for every model memory of the same transmitter in the sub-menu "Model selection". A detailed description of this process is available in the "HoTT synchronization methods setting" section:



- **MODEL** memory specific synchronized receivers react exclusively to the signal coming from the specifically assigned model memory. An accidental use through another non specifically assigned model memory is then basically NOT possible. A receiver which has eventually been switched on will pass to the Fail-safe mode during all the time in which the aforementioned situation lasts.
- **GLOBAL**, transmitter specific, synchronized receivers react to the signals of all of the *global* bound model memories of "their" transmitter, this explains why for safety reasons a model memory change is only possible after switching off the receiver system!

## WARNING



**A receiver system, switched on accidentally after a model memory change, reacts to every control movements of the model memory bound in global mode as soon as a valid signal is emitted from "its" transmitter.**

- The HoTT synchronization process of a copied or imported model memory depends on many different factors. More about this point can be found on page 54 and 58.

## Notices

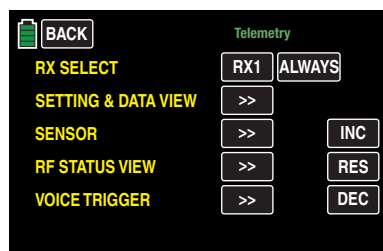


- As conclusion of the switching process for one or more model memories all the involved receivers must be bound again.
- When binding, make sure that the transmitter antenna is always far enough away from the receiver antenna. Maintain a distance of 1 meter to be on the safe side. Otherwise, you risk endangering the connection with the feedback channel and causing malfunctions.
- Make sure that the receiver power supply is correct. If the power supply is too low, the receiver LEDs will react, as described in the included receiver manual, in response to your binding attempt, but the HoTT synchronization will not be performed.
- When binding to other receivers, note that other switched-on receivers already bound to the transmitter (and hence not directly affected by the binding process) enter fail safe mode while the transmitter is binding.

## Binding several receivers per model

If desired, several receivers per model can be bound. In the related programs of the **mz-24** HoTT Pro receivers, you can directly manage *up to two receivers bound to each active model memory* and use a menu to distribute the 12 transmitter control channels between the two receivers (see below in this section). First bind the two receivers one by one as described below.

During subsequent operation, only the receiver establishes a telemetry link to the transmitter that was either last bound to the active model memory, or was selected in the "RECEIVER SELECT" line in the "Telemetry", for example:



Telemetry sensors eventually installed in the model have to be connected to this receiver, because the transmitter will indicate only the values coming from the back channel of the receiver *selected in this line*. The second receiver (and all other receivers) run independently at the same time in slave mode.

## Tip

- To **RX2** can only be bound a receiver if there is already a bound receiver on **RX1**.
- If for any reason the binding of the **RX2** should fall, also the **RX1** will be set to **OFF**. The binding of a receiver to **RX1** has to be renewed firstly and of course before a new binding can be attempted to **RX2**.

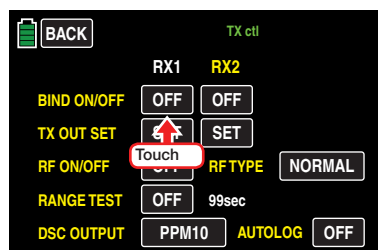
## "Binding" transmitter and receiver

Turn off the power supply to your receiver at this time (at the latest).

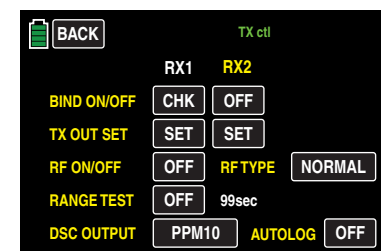
- **GR-16 and GR-24 and similar receivers**

The red LED flashes on the receiver.

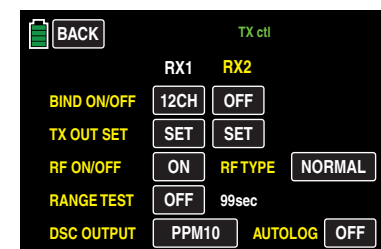
Hold down the SET button on the receiver until, after about 3 seconds, the flashing red LED flashes red/green for around 3 seconds. Then release the SET button on the receiver. As long as the LED is flashing red/green, the receiver is in binding mode. Within this 3 second window, start binding the receiver to the current model memory by touching the **RX1** button in the "BIND ON/OFF" line with a finger or the provided stylus, for example.



The writing in the button will change from "OFF" to "CHK":



Binding is complete once (within a period of approximately 10 seconds) the flashing red receiver LED shines green continuously. Your model memory/receiver combination is now operable. At the same time, instead of **CHK**, an abbreviation of the receiver type such as **12CH** appears for the receiver GR-24 HoTT receiver which comes standard:



At the same time, RF transmission is turned on (see the line "RF ON/OFF" in the following display). If the red receiver LED continues to flash for more than 10 seconds, the binding process was unsuccessful. At the same time, **OFF** appears again in the line "BIND ON/OFF". Change the positions of the associated antennas and try the entire procedure again.

- **GR-12L and similar receivers**

The red LED on the receiver shines.

Hold down the SET button on the receiver until, after about 3 seconds, the red LED goes dark for around 3 seconds. Then release the SET button on

the receiver. As long as the LED is dark, the receiver is in binding mode.

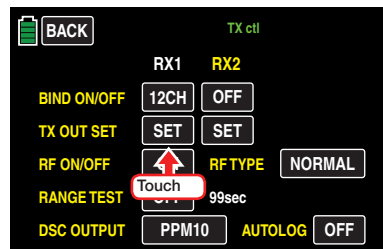
As described above, within this 3 second window, start binding the receiver to the current model memory by touching one of the two buttons in the "BIND ON/OFF" line with a finger or the provided stylus, for example.

Binding has been successful if the receiver LED remains dark and the receiver display switches to **6CH**.

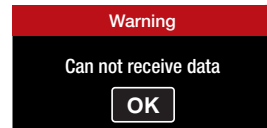
If the red receiver LED shines red again, the binding process was unsuccessful. At the same time, **OFF** appears again in the line "BIND ON/OFF". Change the positions of the associated antennas and try the entire procedure again.

### Out.Swap (receiver output)

As mentioned in the introduction to the section "Binding receivers", the **mz-24** HoTT Pro transmitter allow you use this menu item to distribute the transmitter control channels *within a receiver* as desired, and you can also distribute the 12 receiver control channels to the *two receivers* as preferred. This distribution will be termed mapping or channel mapping in the following. Touch the receiver (such as "RX1") to be mapped in the line **Out.Swap**:



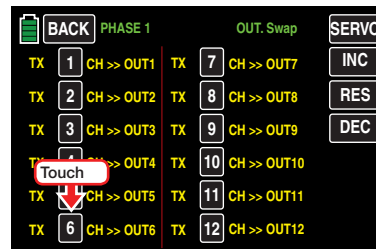
- If there is no other reaction than a "beep", the RF module is switched off. Switch the RF module on and repeat the process.
- If a pop-up display appears with the warning text ...



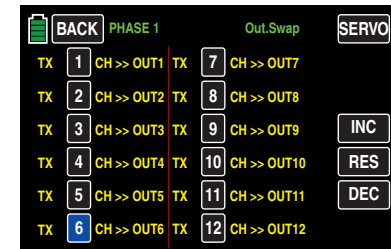
... the RF module of your transmitter is switched on but there is no connection with the receiver. Then switch the receiver system on and/or bind correctly the receiver and repeat the process.

### Channel assignment within a receiver

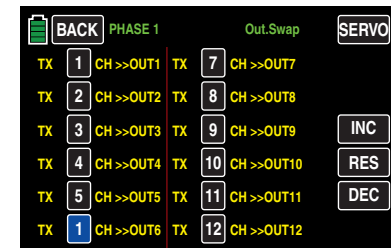
Like the channel mapping described in "Channel Mapping" (also termed "channel mapping" in the "Telemetry" menu), you can easily distribute transmitter control channels at the receiver inputs to the outputs, or servo connections, of the selected receiver, for example:



After selecting the desired *output* the respective servo output of the receiver to map by tapping on the related channel button, the color of the selected button changes from black to blue:



Repeatedly touch **+** or **-** to select the desired input channel related **Transmitter output** (see page ), for example:



Touch the **RES** button to reset a changed output to the default mapping.

The value modified by touching one of the three lateral **+**, **RES** or **-** buttons will be automatically transmitted to the related receiver.

Use the same procedure to switch other control channel/receiver output combinations.

### Notice

➤ If for example you entered "2AILE" in the basic settings for a model, the transmitter assigns control function 2 (aileron) to control channels 2+5 for the left and right aileron. The corresponding transmitter outputs (= receiver inputs) to be mapped would in this case be channels 2+5 (see the examples below).

Touch the **BACK** button at the top left of the display to return to the "Transmitter setting" sub-menu.

### Examples

- On a large model, you want to control each aileron flap using two or more servos:  
Assign the same **input** (control channel) to the relevant **outputs** (servo connections). In this case, assign one of the two default aileron control channels 2 + 5 as an **input** depending on the left or right wing.
- On a large model, you want to control the rudder using two or more servos:  
Assign the same **input** (control channel) to the relevant **outputs** (servo connections). In this case, default rudder channel 4.

### Notices

- The maximum number of available lines (outputs) corresponds to the maximum number of servos that can be connected to each receiver.
- You can use the "**Transmitter output**" option, of the **mz-24** HoTT Pro transmitter to switch the transmitter control function as desired, or assign the same control function to several outputs. For the sake of clarity, it is strongly recommended to only use one of the two options.

### Assigning one channel to two receivers

As mentioned above, you can use the "receiver output" option to distribute the 12 control channels of the **mz-24** HoTT Pro transmitter to *two receivers* as desired.

The numbering of the outputs (servo connections) and the maximum number of available lines (outputs) corresponds to the maximum number of servos that can be connected to the respective receivers. Follow the same procedure as above.

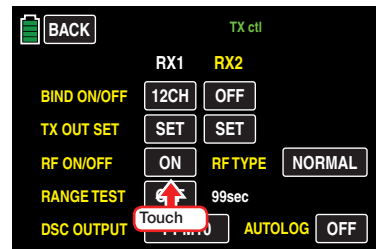
### RF ON/OFF

In this line, you can manually turn the transmitter's RF transmission off and back while the transmitter is currently turned on, For example to be able to change model memory or to change model type .

### Notice

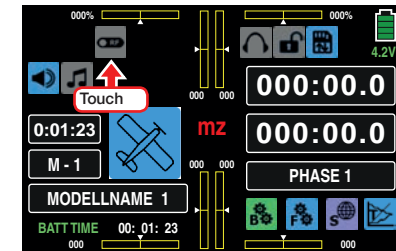
» The next time the transmitter is turned on or a model is switched, the OFF setting is reversed.

To manually turn the high-frequency transmission of your transmitter on or off, touch the corresponding button in the "RF ON/OFF" line:



### Tip

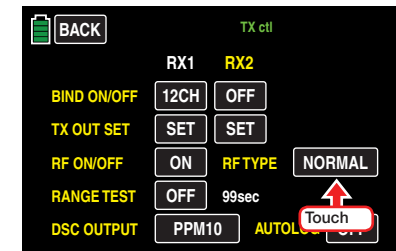
Alternatively it is also possible to tap on the RF switch symbol in the basic menu of the transmitter to recall a function similar to the RF emission.



RF type \_\_\_\_\_ (country setting)

The specific RF type needs to be set to satisfy the relevant guidelines (FCC, ETSI, IC, etc.).

To switch your transmitter's country setting between "NORMAL" or "USA", touch the button to the right of "RF type":



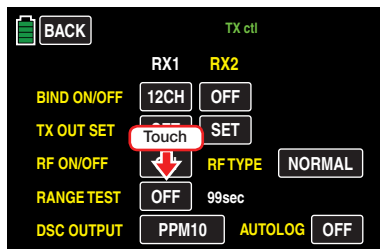
### RANGE TEST

The integrated range test reduces the transmitter output so that you can perform a function test at a distance of less the 100 m.

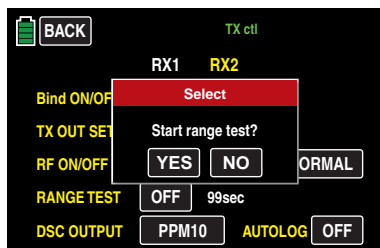
Perform the range test for the *Graupner*-HoTT system according to the following instructions. It is useful to have an assistant to help you with the range test.

1. Install the receiver(s) already bound to the transmitter into the model as described.
2. Switch the transmitter on and wait until the receiver/s indicate/s a correct function connection. You are now able to monitor servo movements.

- Place the model on a flat surface (concrete, mowed lawn or ground) so that the receiver antennas are at least 15 cm above the ground. It may therefore be necessary to place a support underneath the model during the test.
- Hold the transmitter at hip level at a slight distance from your body. Do not point the antenna directly at the model; rotate and/or bend the transmitter antenna so that it is approximately at a right angle to the model.
- Activate the range test mode by touching the button to the right of "RANGE TEST" with a finger or the provided stylus, ...



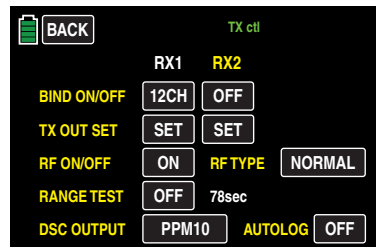
... whereupon a safety query appears:



Touch **NO** to terminate the procedure. Touch **YES** to start the range test.

When the range test starts, the output of the transmitter decreases significantly. At the same time, the illuminated company name *Graupner* below the two middle proportional dials starts to flash.

Simultaneously, the time display in the transmitter display starts to count backwards and emits 2 beeps every 2 seconds.



5 seconds before the range test ends, 3 beeps every second. After the 99-second range test, the transmitter switches back to full output, and the *Graupner* logo shines continuously.

- During this time, move away from the model, and also move the transmitter's control elements. If you detect an interruption in the link within a range of about 50 m at any time, attempt to reproduce it.
- If the model has a motor, turn it on to also check interference resistance.
- Move further away from the model until it does not respond perfectly.
- At this location, wait for the remainder of the test period with the still operable model. The model should still react properly to control commands once the range test is finished. If this is not 100 % the case, do not use the system and contact your Service at *Graupner/SJ GmbH*.
- Perform a range test before each flight, and simulate all servo movements that could occur during the flight. In order to guarantee a safe model operation, the range must always be at least 50 m on the ground.

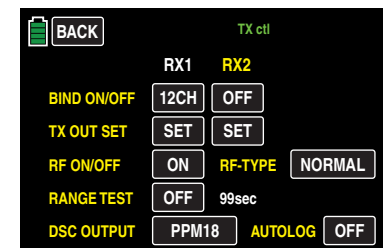
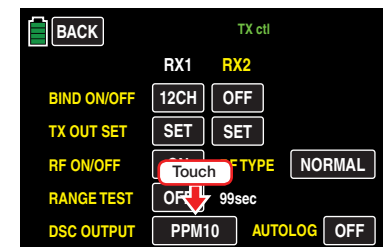
## WARNING



**Never start a range test on the transmitter during normal model operation!**

### DSC OUTPUT

To set the modulation of your transmitter at the DNC output, touch the button with the current setting in the "DSC Output" line (repeatedly if necessary) until the desired modulation appears. Four types of modulation are available in this sequence: "PPM10", "PPM16", "PPM18" and "PPM24":

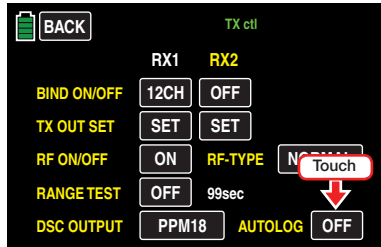


The selected modulation primarily influences the band width and the number of available control channels at this DSC socket and hence a flight simulator or trainer system connected to this socket. If "PPM10" is selected, the channels are 1 ... 5; with "PPM16", the channels are 1 ... 8, with "PPM18", the channels are 1 ... 9, and with "PPM24", the control channels are 1 ... 12.

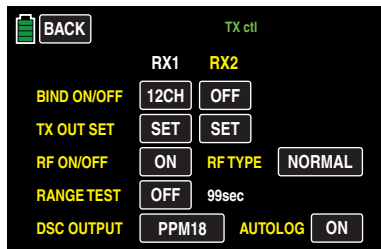


## AUTOLOG

Touch the **OFF** button at the bottom right of the display while RF module is switched off ...



... to switch the automatic saving of the logging data **ON** or vice versa:

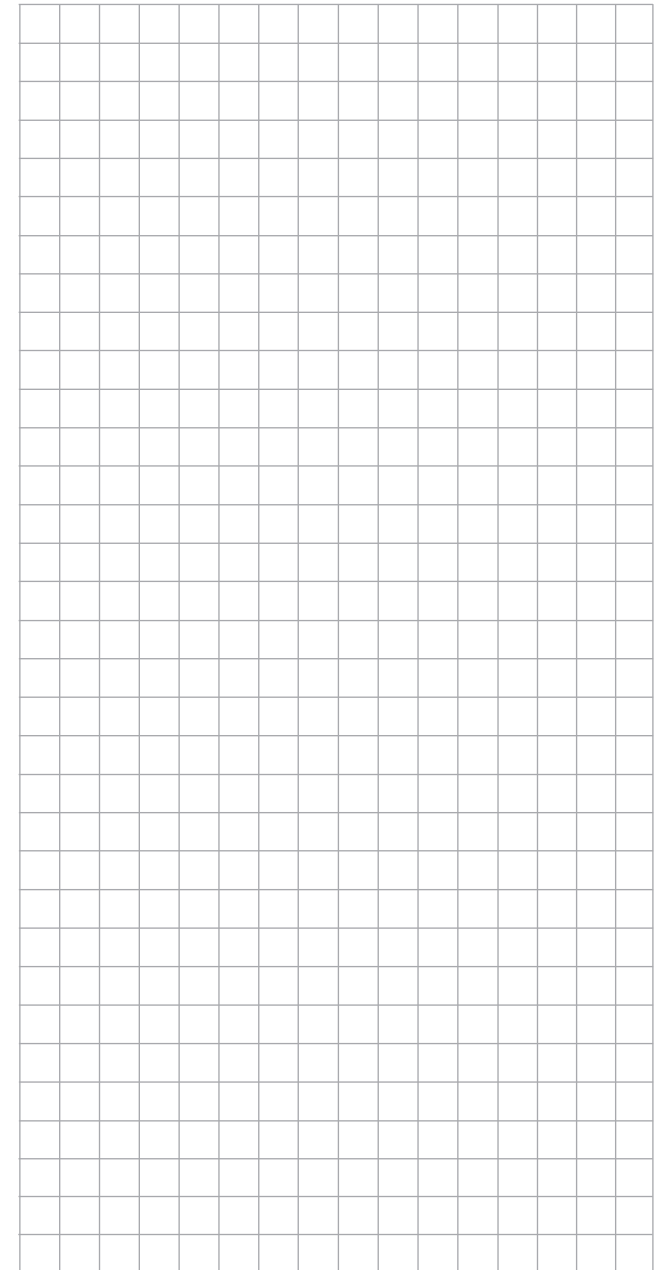
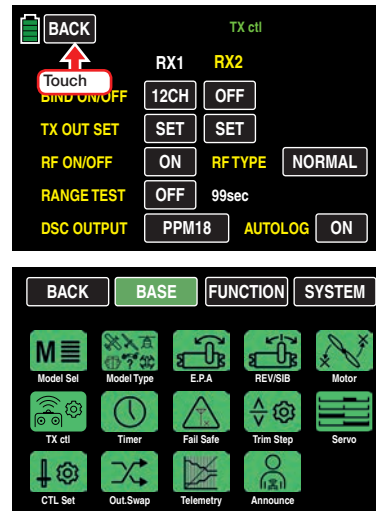


As soon as you switch the RF transmission on, the log data start to be saved in the memory card inserted in the memory card slot and it will stop as soon as the transmitter or the RF module are switched off.

### Notice

» The "AUTOLOG" option remains switched ON or OFF as long as the actual setting is not changed while the RF module is switched off.

Touch the **BACK** button at the top left of the display to leave this sub-menu and return to the basic menu.





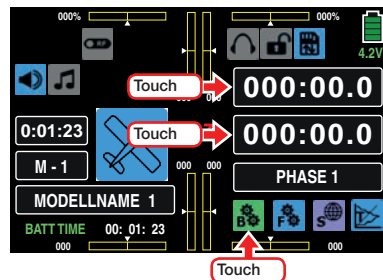
# Timers

Setting TIMER 1 and TIMER 2 as well as the date and time

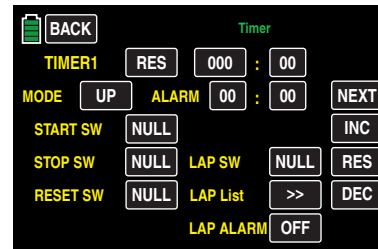
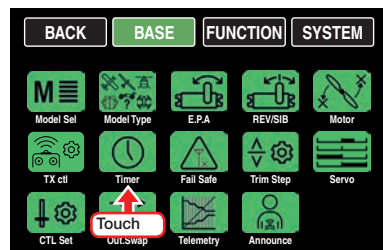
The basic transmitter display comes with four timers (see the display below). Next to the transmitter operating time and the model time on the left side of the display, there is an "upper" and "lower" timer on the right side of the display.

Short tapping on the "upper" timer 1 and/or the "lower" timer 2 resets the related timer. Longer tapping opens the setting page of the tapped timer and tapping on the model timer on the left of the display opens the date and time setting page.

Alternately, you can also access the "Timer" menu item also from the green "BASE menu": Touch the gear icon labeled "B" in the basic display of the transmitter...



The display switches to the green base menu. Touch the menu item "TIMER".



## Tip

Touch the **NEXT** button at the top right edge of the display to switch the rotation procedure from "TIMER1" to "TIMER2", and from "DATE" back to "TIMER1":

## TIMER1 and TIMER2

To program the "timer 1" or "timer 2", it is preferable to start in the "MODE" line by checking the value field directly to the right. By default, **UP** is provided as a synonym for counting forward (see the figure above). If this is what you want and you do not need an alarm for a forward-counting timer, then jump to the alarm function description section and start reading at "START SW" on the next page.

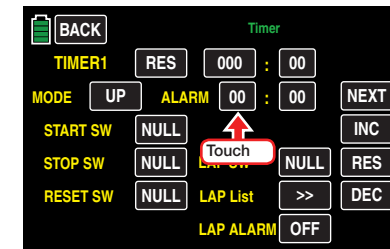
## Alarm function

An alarm function can be activated for a forward-counting and backward-counting timer by setting the desired time frame in the minute and/or second field to the right next to "ALARM". Within the last 20 seconds of this period, beeps sound so that you do not have to continuously monitor that display during the flight.

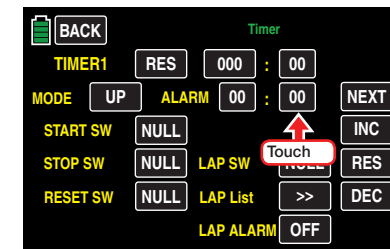
## Acoustic signal sequence

- 20s before zero: 2 beeps
  - Single beep every 2 seconds
- 10s before zero: single beep
  - Single beep every second with a changed pitch
- 5s before zero: single beep every second with reduced frequency
- Zero: voice trigger

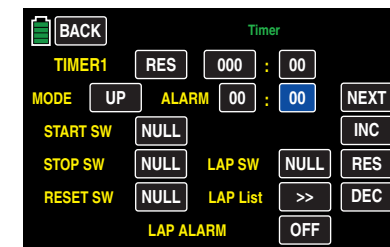
To specify the desired time period, touch the left minute field...



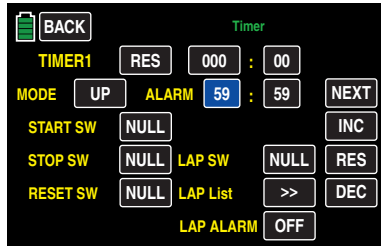
... and/or the right second field:



The color of the field switches from black to blue:



Repeatedly touched the **+** or **-** button on the right edge of the display, or hold down the relevant button until your desired time is displayed between 00:00 and a maximum of 59:59, for example:



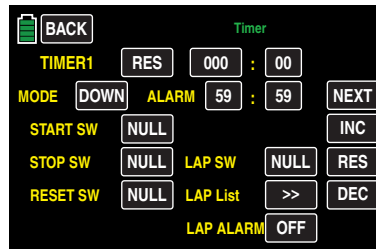
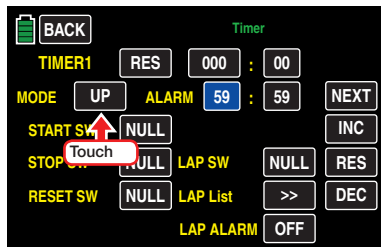
Touch the **RES** button to reset a changed value in the active field to the default.

### Forward-counting timer **(UP)**

Since a forward-counting timer starts at 000:00, such a timer is only assigned a start switch and timer reset switch if desired as described below.

### Backward-counting timer **(DOWN)**

To transfer the time period selected as described above to the minutes : seconds fields of the respective "Timer" line, and to switch "Timer X" from counting forward to counting backward, touch the **DOWN** button to the right of "MODE":



### Tip

Alternately, a timer can be switched beforehand from forward counting to backward counting, and a time-frame entered or changed afterward can be transferred by touching the **RES** button.

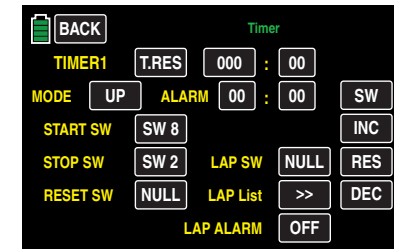
### Notice

If a started and then stopped timer is switched from forward to backward counting or vice versa by touching a relevant button, only the remaining time on the relevant timer is updated, and the time is not reset.

### Start and stop timer 1 and timer 2

#### • "Timer 1"

This timer can only be started through a switch assigned in the line "START SW", for example through the button function of the S8 switch, and tapping on the minutes or seconds field or through a switch assigned in the "STOP SW" line, for example the button function of S2 switch the timer can be stopped.



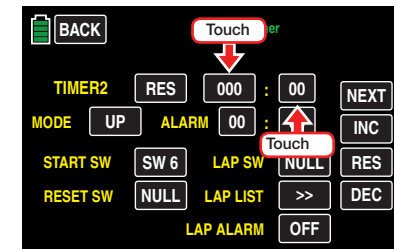
### Notice



In both cases by stopping the "Timer 1" also the data log on the SD memory card will be stopped.

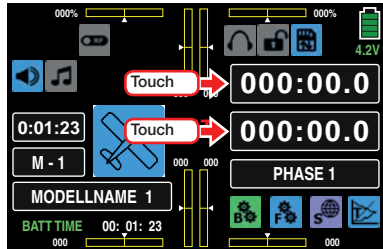
#### • "Timer 2"

This timer can be started and stopped by tapping on the minutes or seconds field or alternatively through a switch assigned in the "START SW" line.

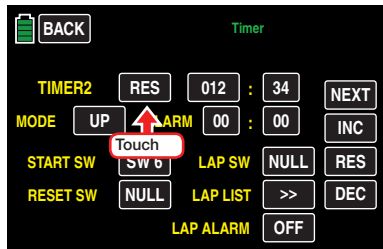


### Resetting started timers

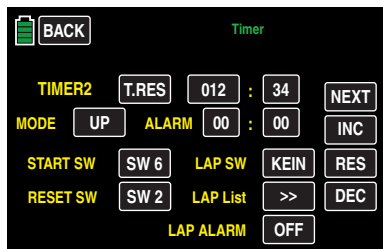
- Both "Timer 1" and "Timer 2" can be reset to the original value in every moment by short tapping on the related timer field in the basic display.



- Both "Timer 1" and "Timer 2" can be reset to the original value in every moment by tapping on the **RES** button in the "Timer 1" and "Timer 2" displays.



- Both "Timer 1" and "Timer 2" can be reset to the original value in every moment by moving the desired switch assigned, as following described, in the line RESET SW in the "Timer 1" and "Timer 2" displays.



A parallel to "Timer 1" data stream saved on the SD memory card will not be influenced by the reset of the Timer 1.

### "START SW" (start switch)

In this line you can assign to "Timer 1" or "Timer 2", as detailed described in the section "[Control and switch assignment](#)", a timer to start the selected timer.

### "STOP SW" (stop switch)

In this line you can assign to "Timer 1", as detailed described in the section "[Control and switch assignment](#)", a timer to stop the selected timer.

### "RESET SW" (reset switch)

In this line you can assign to "Timer 1" or "Timer 2", as detailed described in the section "[Control and switch assignment](#)", a timer to reset the selected timer to the original values.

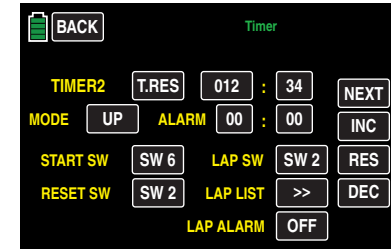
### Tip

A time period that has been changed is automatically transferred to the "TIMER" line when this switch is activated. You can alternately touch the **RES** button.

### "LAP SW" (lap switch)

Ground requirement for the use of the laps counter is:

- The programming of a forward or backward "Timer 1" or "Timer 2".
- The setting of switches in the value fields of the options "START SW", "RESET SW" and "LAP SW", for example:

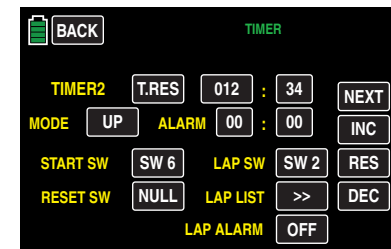


In this example by pushing the SW6, assigned in the value field "START SW", "Timer 2" will start and, as soon as SW6 is pushed again, the timer will be stopped.

By the first push for example of the intermittent switch function of the 3-position switch SW2 through the pilot, e.g. when a marking happens, "Timer 2" will be reset to the "0" value and at the same time the chronometer for lap 1 will start.

Every other push on the intermittent switch will increase the lap counter of one unit and will stop the lap time (which will be saved) which has been running during this lap. At the same time, the intermittent switch starts the timer for the next round, etc.

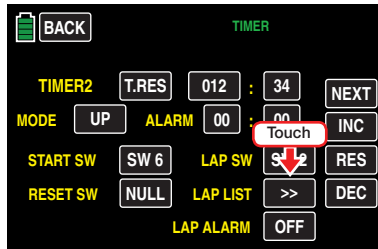
- If the assignment of a switch in the value field "RESET SW" is omitted, ...



... with each push of the intermittent switch SW2 will be saved since the start of the timer in each elapsed time in the form of cumulative lap times.

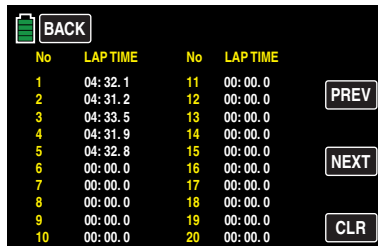
## "LAP List"

Tapping on the **>>** button ...

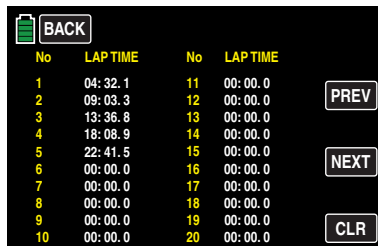


... switch to the list of lap times, i.e., in the page the first 20 of a total of 100 possible lap times. Scroll between individual pages using the forward button **NEXT** and the back button **PREV**:

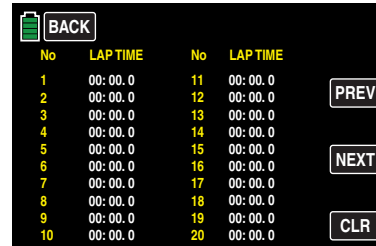
- If the lap counter, as described in the following point 2, starts at the same time as the timer has been reset, the lap list will look like follows:



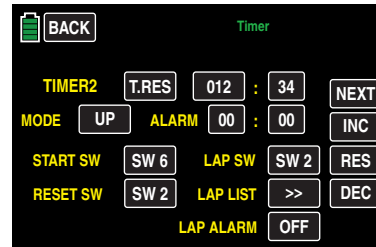
- If on the other hand the lap counter, as described in the following point 3, starts WITHOUT the timer has been reset, the lap list will look, according to the times of the list above, like follows:



Touch the **CLR** button to clear in both cases the lap times:

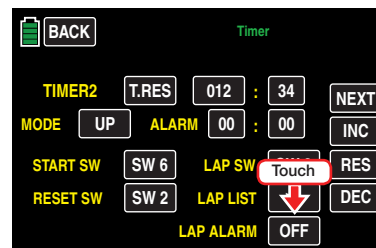


Touch the **BACK** button at the top left to go back to the "Timer" setting display:



## "Lap timer alarm"

As soon as the lap times have been recorded, as described before, you cannot only save and in a second time read them but you can also let them be repeated after the end of every lap. Switch the **OFF** button of this option to **ON** by tapping on it, or vice versa, to shut the voice trigger down.



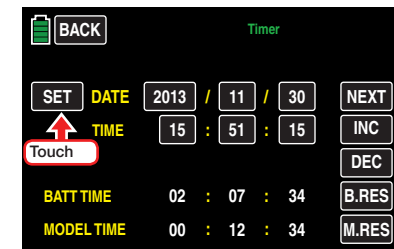
## Date and time

On the third display page of the "Timer" menu, you can enter or change the date and time.

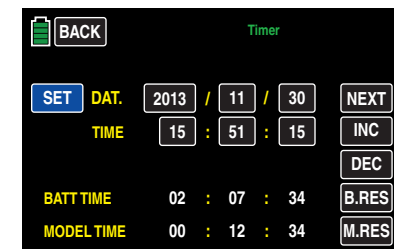
### Tip

By tapping on the model timer display in the basic display of the transmitter you can also directly recall this display.

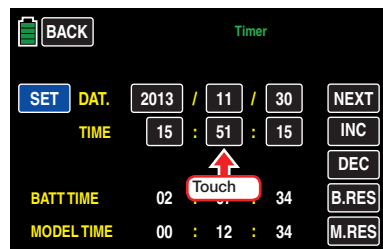
You can only set or change the date and/or time after this option has been released by touching the **SET** button:



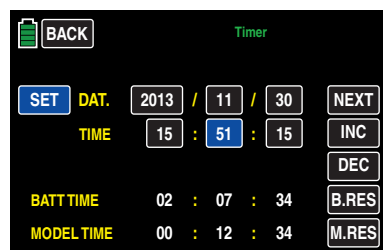
The color of the **SET** field switches to blue:



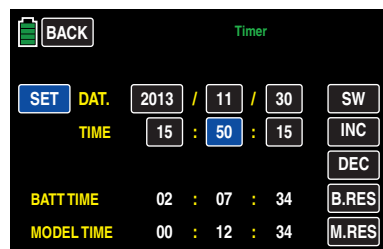
Then touch the value field to be set or changed, for example:



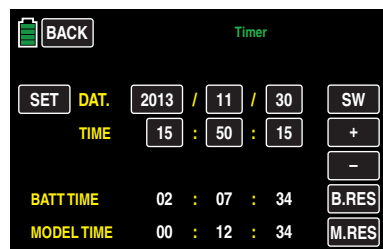
The color of this field also switches to blue:



Set the desired value with the **+** or **-** button at the right edge of the display, for example:



Use the same procedure with the other values. Finally, to transfer your changes to the transmitter memory, touch **SET** again:



All value fields are black, and the current date and time have been transferred to the memory.

### Tip

As soon as the transmitter is connected to the PC, the date and time can also be updated with the aid of "Firmware\_Upgrade\_grStudio V4.x".

### "BATT TIME" and "MODEL TIME"

- **"Batt time"**

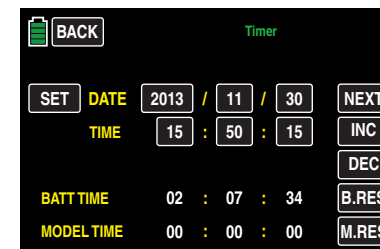
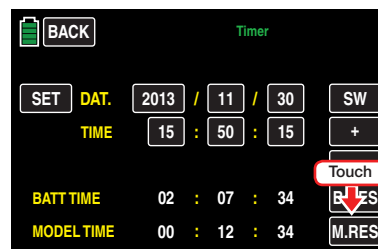
To monitor the battery time use the operating time meter "Batt time" which measures the total operating time of the transmitter. A switch cannot be assigned.

The timer is automatically reset to "0.00h" when the voltage of the transmitter battery is noticeably higher than before after restarting the transmitter, for example from charging or exchanging the battery with a charged battery.

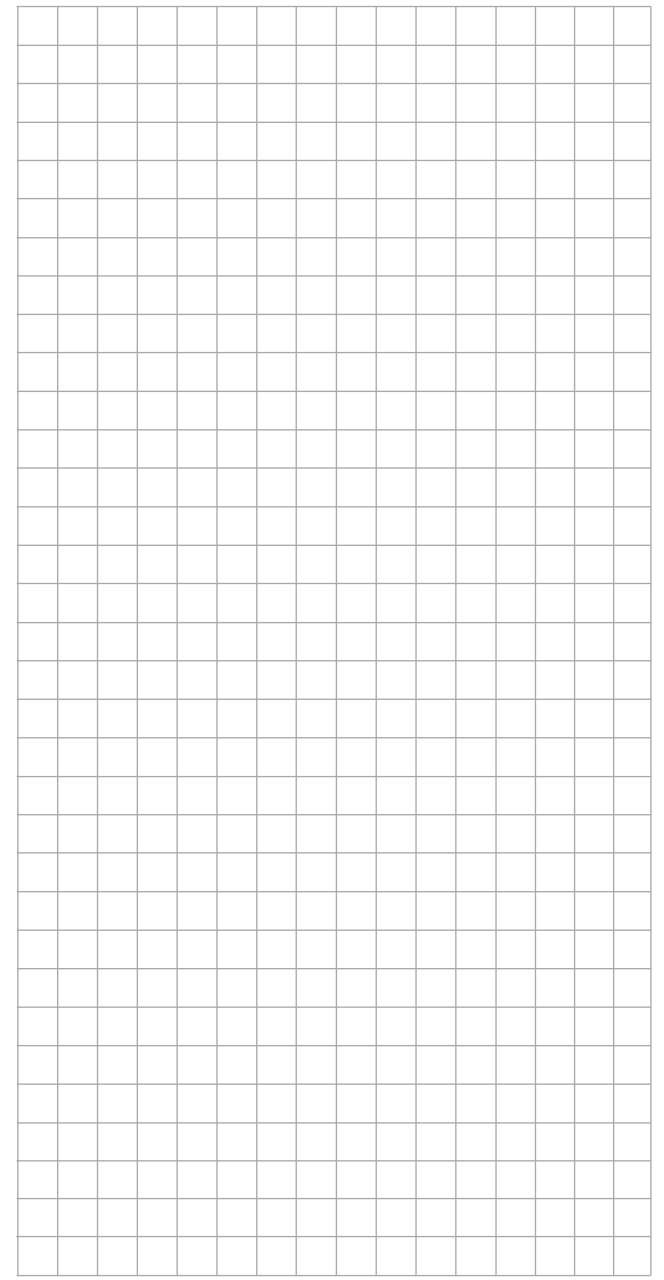
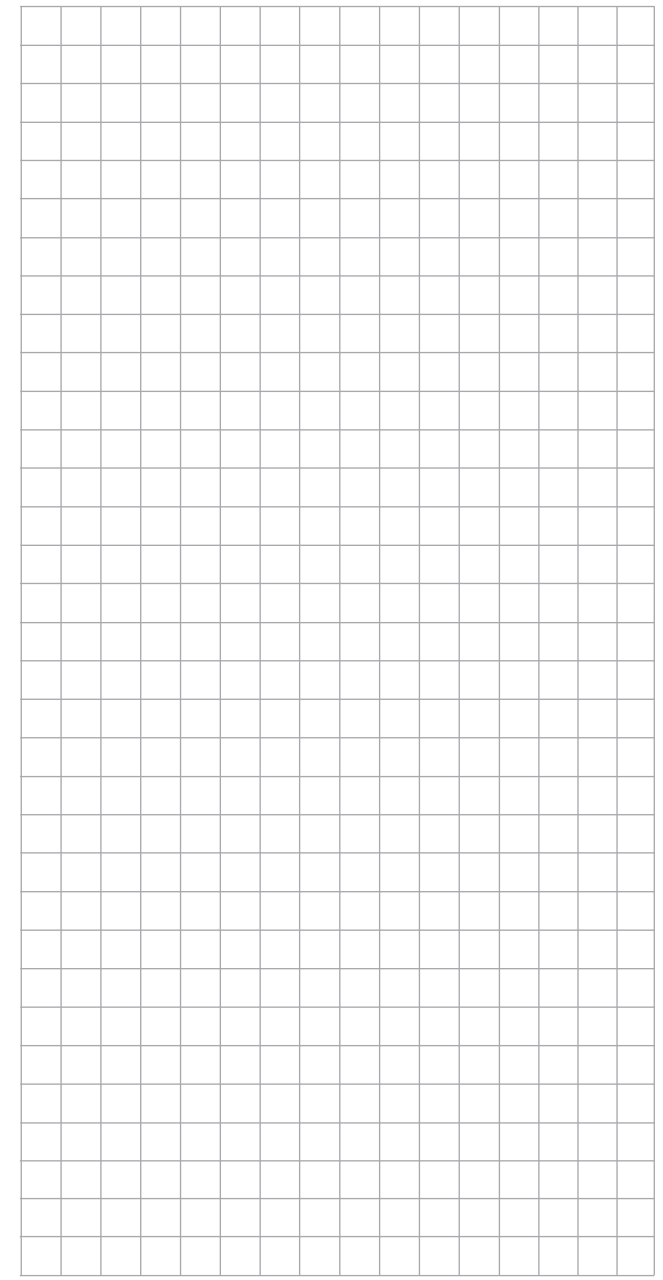
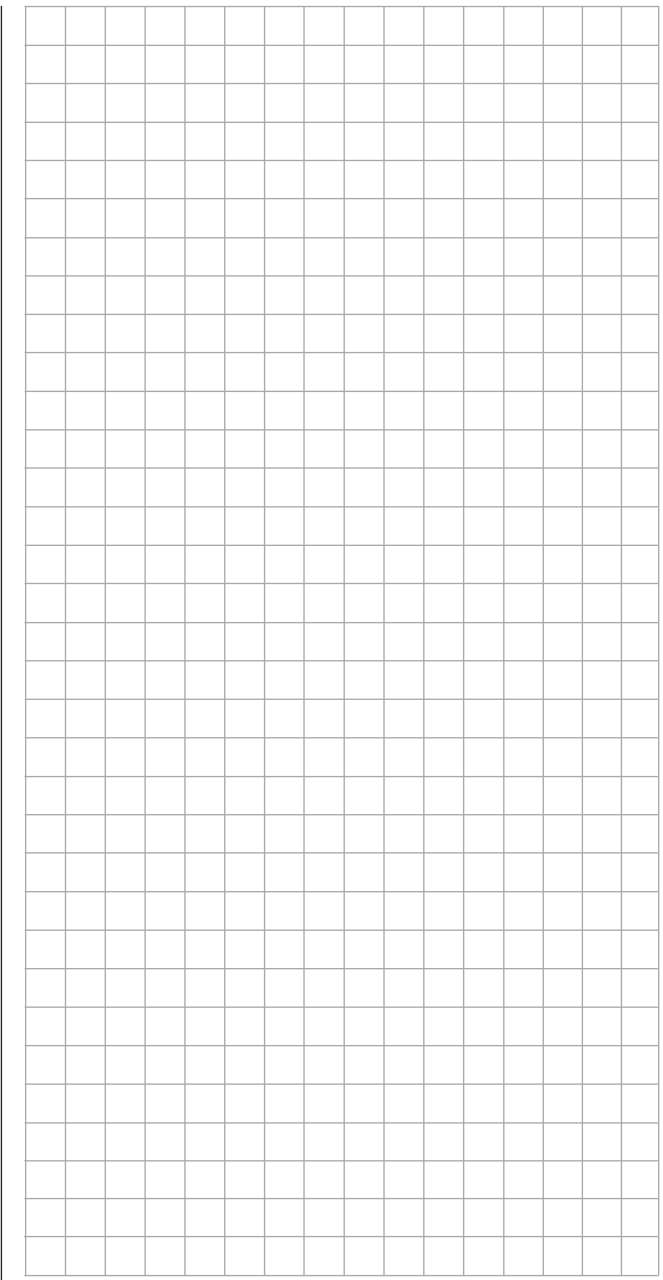
- **"Model time"**

The "model time" timer shows the currently recorded overall access time to the active model memory.

Both timers cannot be switched, but they can be manually reset to zero if desired by touching the **RES** button:



After you have finished making your settings, touch the **BACK** button at the top left of the display to leave the "Timer" menu and return to the base menu.

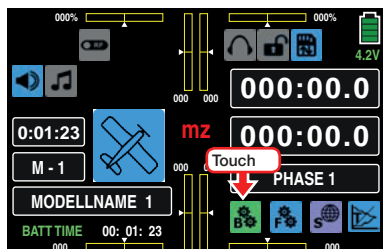




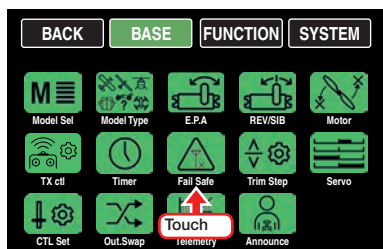
# Fail Safe

What to do in case of a malfunction

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "FAIL-SAFE".



## Fail Safe

In comparison to classic PPM technology, the system-related greater reliability of the HoTT system is because the microprocessor in the HoTT receiver can process both undistorted signals from its transmitter as well as distorted control signals. Only when the signals are excessively distorted or garbled, for example from noise, the processor replaces them with control signals that are saved in the receiver depending on the settings described below (hold or fail safe mode). This allows intermittent disturbances such as drops in field strength, etc. to be overlooked which would otherwise lead to familiar "wobbles".

Therefore the "Switch-on fail safe" function ensures that as far, after switching the receiver system on, no valid signal from the transmitter is received, all the servo outputs are provided with pre-definable signals so that e.g. a retractable landing gear will not close unexpectedly or other unwanted things happen.

## Function description

The "Fail Safe" function determines the response of the receiver both by directly switching on the receiver system and when there is an interruption in transmission from the transmitter to receiver.

The servos connected to the receiver outputs 1 to max. 12 can then ...

- ... after the receiver is powered on and until there is no signal from the transmitter, take the positions saved in the receiver. Completely independently from receiver settings "hold" or "pos".

## Notice



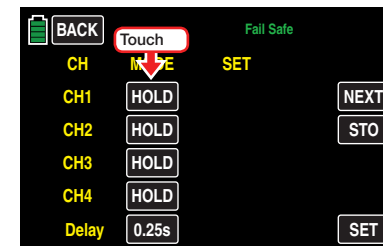
The standard setting, until a change occurs, is the central position.

- ... in case of interference ...

1. ... maintain the current position ("hold").  
In case of transmission interruptions, all servos programmed to "hold" remain at their position which was last identified to be correct until a new, correct control signal is received by the receiver.
2. ... after the preselected "failsafe delay" move to a selectable position ("pos").

## Programming

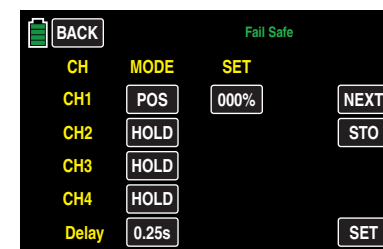
To switch between "HOLD" and "F/S" or vice versa, touch the button in the "Mode" column in the line of the channel to be switched to with a finger or the provided stylus, for example:



## Tip

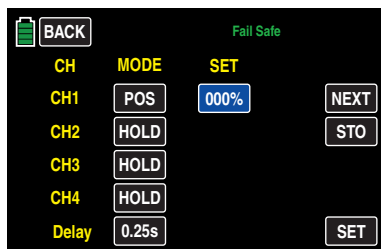
In order to set the control channels CH5 ... 8 and CH 9 ... 12, tap in the right side of the display on **NEXT** [change page].

By switching to "F/S" in the "SET" column appears a value field with the standard value "000%".

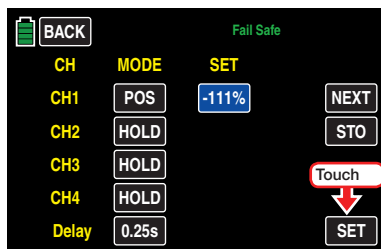


To set the fail safe position tap on the "F/S" value field, for example on the one displayed in the line "CH1" The color of the field switches from black to blue:



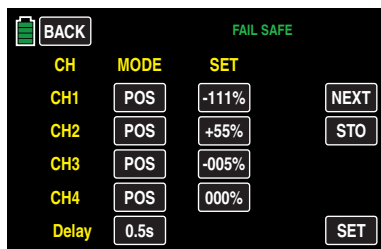


Move the control element for this control channel into the desired position and touch the **SET** button at the bottom right of the display to transfer the position into the value field, for example:



Use same procedure to save additional fail safe positions.

Finally, in the bottom line "Delay", repeatedly touch the value field to choose the desired delay from among the four delays (0.25s, 0.5s, 0.75s and 1s), for example:

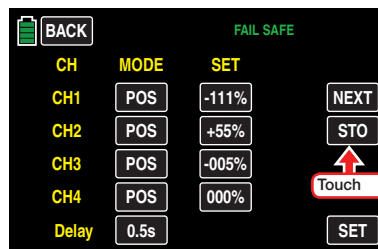


### Notice

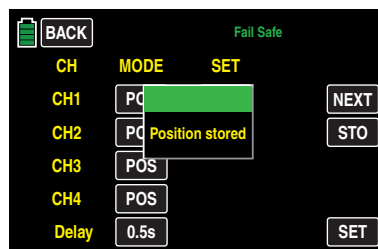


After having set the fail-safe positions so as the proper delays, the settings saved on the transmitter must be transmitted to the receiver. Otherwise the settings could not be used in case of fail safe.

Switch at least now the receiver on and transmit the selected **F/S** values to the receiver by tapping on the **STO** button, so that the setting can be recall in case they will be needed.



The successful storage of the data is shortly confirmed in the display an at the same time the **F/S** value fields will be unmarked again.



Otherwise check the correct radio transmission between your transmitter and receiver systems and repeat the process.

### Tip

By tapping on the needed **F/S** button in the "MODE" column the stored fail safe position can be recalled and changed as described. Unchanged **F/S** values will be unmarked as soon as the sub-menu has been left.



### WARNING

- The fail safe settings stored in the transmitter will not be automatically transmitted to the receiver during the operation! Their transmission must be manually performed within a radio connection by tapping on the **STO** button!
- The fail safe settings stored in the transmitter should be restored after changing a receiver and should be deleted in the previous receiver by **Reset**.
- Use this safety option to program a Fail Safe for at least the motor throttle position in gas models while idling, or to program the motor function to stop with electric models, or to hold with helicopter models. This makes it more difficult for the model to operate independently after switching on the receiver system or in case of malfunctions and cause property damage and injury. If necessary, ask for assistance from an experienced pilot.

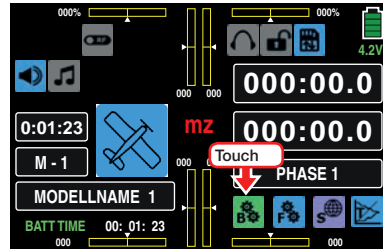
Touch the **BACK** button at the top left of the display to leave this sub-menu and return to the basic menu.



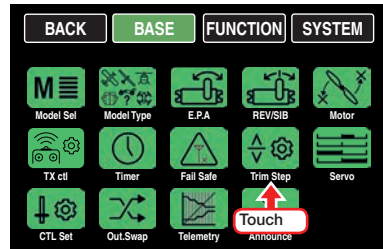
# Trim settings

Trimming settings

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "Trim Step".



The two control sticks come with digital trimming. With each click, briefly touching the trimming control moves the initial position of the control stick by a certain value. If it is held, the trimming moves in the corresponding direction with increasing speed.

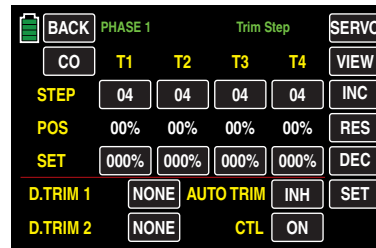
The current trimming positions are displayed in the main display, and adjustments are audible. It is therefore easy to find the middle position during model use without looking at the display: When you pass over the middle position, a brief pause is inserted.

The current trimming values are automatically saved when the model memory is switched.

For factory setting the **mz-24** HoTT Pro transmitter original trim is saved in relation to the model memory but you can change this setting by assigning to each flight phase a different trim setting.

## Phase depending settings

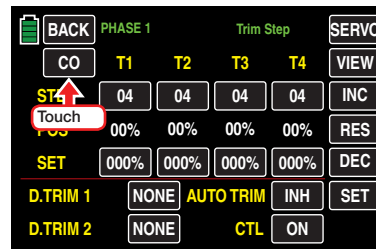
The here mentioned sub-menu offers the possibility to store phase specific values. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.



## CO / SE option buttons (global/phase)

The setting of **CO** (global) or **SE** (phase) is performed in the top left side of the display, where the trim of the throttle/brake or throttle/pitch control stick, generally also called control function CH1 (channel 1), is set as "global", which means phase dependent.

Touch this button at the top left of the display ...



... sets the trim of the control function 2 ... 4 from phase influencing (**CO** (global)) to phase specific (**SE** (phase)) and vice versa.

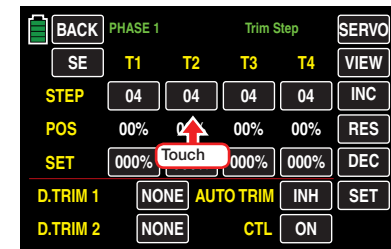
## "STEP" line (trimming step)

With each click, the four digital trimming controls shift the neutral position of the respective control stick by an increment adjustable between "01" and a max. of "10" in each direction. The maximum trimming path is always approximately  $\pm 30\%$  of the control path independent of the selected number of trimming steps.

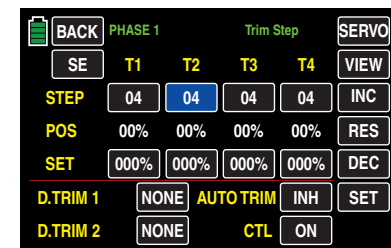
## Notice

This setting is always "global" independent of the setting **CO** (global) or **SE** (phase).

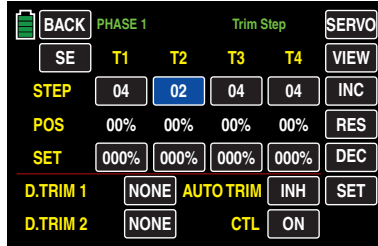
To change the current step of a trim control, touch the corresponding value field in the "STEP" line, for example:



The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge, for example:



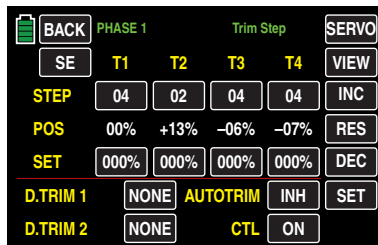
Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value. Use the same procedure with the other trim controls.

### Tip

The numbering of the trim controls T1 ... T4 refers exclusively to the assignment of control channels 1 ... 4. Whether a specific name relates to a trim control of the left and right control stick depends on the control mode selected in the **"ST mode"** sub-menu of the system menu.

### "POS" line (trimming position)

The current trimming positions are shown in the "POS" column. (The trimming range is about  $\pm 30\%$  of the entire control path.) They can appear as follows for example:

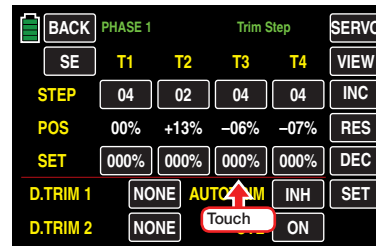


### "SET" line (saving trimming positions)

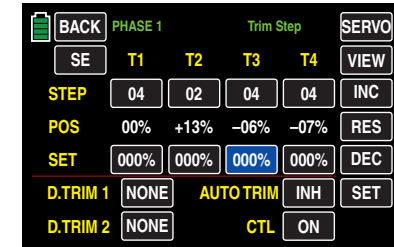
This option allows you to optionally save the current position of the four digital trimmings so that they can be returned to the visual middle position. After a model memory is changed or after long periods between flights, the last safe trimming positions are available in the middle positions of the respective trimming display of the control functions 1 ... 4.

Say for example you have landed your model and trimmed it. The current trimming positions are displayed white in the "POS" line approximately in the middle of the display. (The trimming range is approximately  $\pm 30\%$  of the overall control path.) The value fields in the "SET" line underneath display the saved trimming and, since no values have yet been saved, the value fields all contain 000%. The display therefore appears e.g. as above in the section "POS" line.

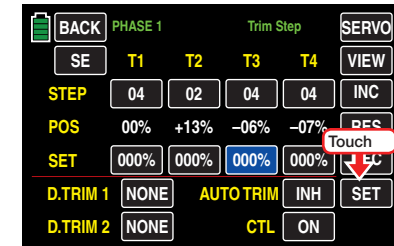
To save a trimming value, touch the value field below the trimming value to be transferred, such as the value field in column "T3" (elevator in case of fixed wing model):



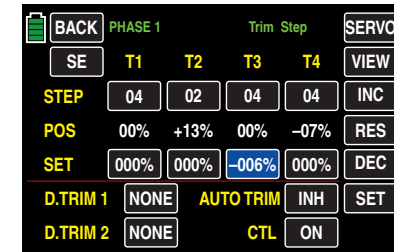
The color of the field switches from black to blue:



Touch the **SET** button at the bottom right of the display ...



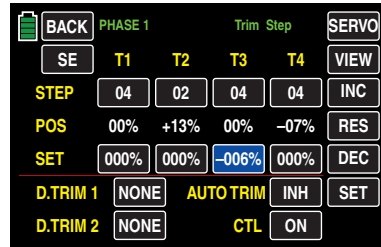
... to transfer the trimming value from the "POS" line into the separate trimming memory:



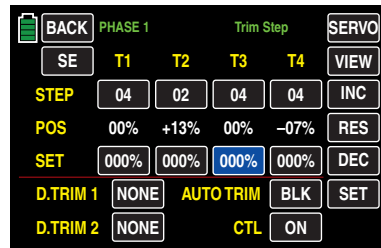
Use the same procedure for other trimming values.

## Deleting saved trimming positions

Touch the value field with the trimming value you want to delete, for example:



Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default.



Use the same procedure for other trimming values.

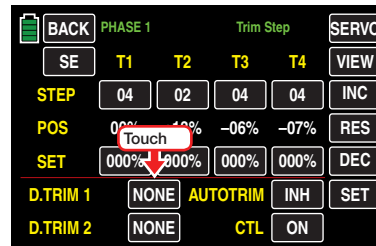
## Digital Trim 1 and 2

Independent from the above described settings of the trim control 1 ... 4, you can assign the INC/DEC buttons "DT1" and "DT2" installed in the **mz-24** HoTT transmitter in the lines "Digital Trim 1" and "Digital Trim 2" to any desired control channel 5 ... 12 (see [Definition of terms](#)) as the control. Depending on your setting on **CO** (global) or **SE** (phase) on the top left side of the display, follows the storage of their trim options accordingly **CO** (global) or **SE** (phase)

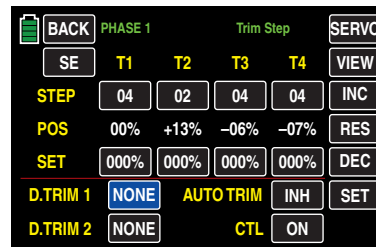
The possible trim amount is  $\pm 30\%$ .

### Programming

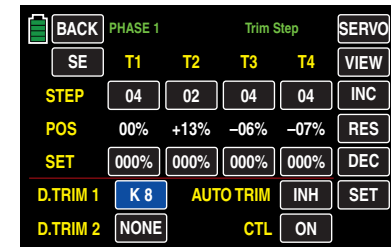
Touch the button in the line of the desired control, such as "Digital Trim 1":



The button color changes from black to blue:



Set the desired channel "CH5 ... CH12" with the **+** or **-** button at the right edge, for example:

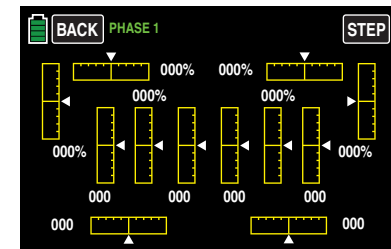


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default **NONE**. Use the same procedure for "Digital Trim 2".

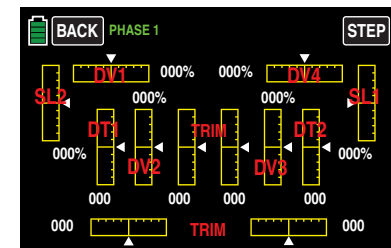
### Tip

Real use examples are available in the section "[Programming examples](#)".

To optically verify your settings change, by tapping on the **VIEW** button at the top right of the display, to graphically display the options of all trim controls ...

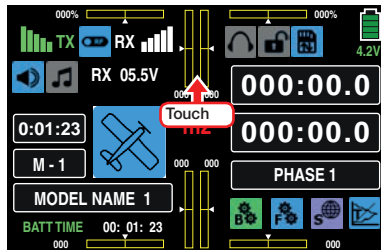


... and the graphic display is assigned to the individual trim controllers according to the following scheme:



## Tip

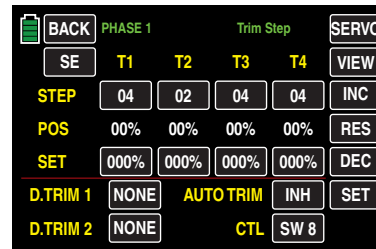
The same display can be reached at any time from the basic display of the **mz-24** HoTT Pro, by tapping on one of both middle bar graphics:



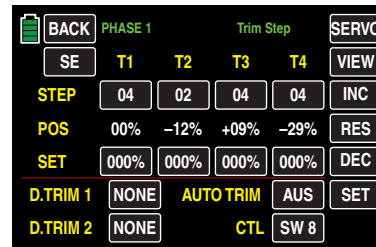
### AUTO TRIM

The "AUTO TRIM" function offers you the possibility to trim a model easily and quickly, for example during the first flight or after (bigger) reparations or similar. During such kind of "first flights" the previous settings of the model performed on the ground may not fit 100% with the flight requirements, in those cases you usually need to move the control sticks in order to correct the model attitude until it flies straight and at the same time you have to move the trim controls to obtain the same effect.

Exactly here is the "AUTO TRIM" function useful: after having reached the required flight attitude through the control functions 2 ... 4 this function is activated moving ONCE an intermittent switch previously assigned, normally a self neutralizing switch. For example the 3-position switch S8, which push function after the assignation is declared as ON position. (For safety reasons - see what follows in the "Notice" - is strictly recommended not to use a switch with a permanent "ON" position):



As consequence of pushing the switch, the deviation of the control sticks positions 2 ... 4 from the related neutral positions are stored as trim value, within maximum  $\pm 30\%$ , in about 1 second. At the same time the control sticks can be released to the normal position, for example:



## Notices



- For safety reasons never use the "AUTO TRIM" option if you have set "0" as trim step.
- Be sure that the control sticks 2 ... 4 are in their neutral position while the switch is assigned. Otherwise the deviations from the neutral position will already be stored in the trim memory as trim values.

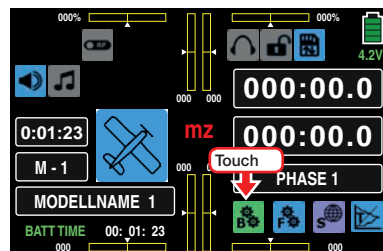
- EACH activation of the AUTO TRIM switch acts cumulatively, that is why for safety reasons is strictly recommended to use the switch only once and to deactivate it after the "AUTO TRIM flight" has finished. Otherwise there is the risk that the "AUTO TRIM" function might be inadvertently activated.
- Never assign a "normal" position holding switch to the "AUTO TRIM" function or always affordable bring the switch to the "OFF" position after each AUTO TRIM process. OTHERWISE EVERY ACTIVATION OF EVERY OTHER SWITCH WILL INHIBIT THE FUNCTION OF THE AUTO TRIM PROCESS.
- The storage of the trim values from the "POS" line in the "SET" line so as the reset of the values is performed as described at the beginning of this paragraph.



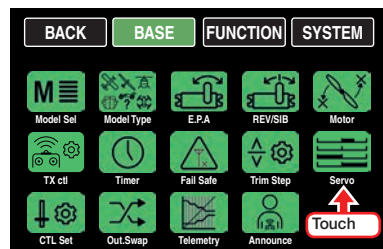
# Servo monitor

Display of servo positions and servo test function

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "Servo".



The optical display of the actual servo positions can be recalled at any time not only through the previously described selection of this menu item but alternatively *by inactive value fields* also from the basic display and from almost all the menu positions by pushing at the same time the ▲▼ buttons on the left of the display. Pushing the **ESC** button, which is directly underneath, brings you back to the originally menu point.

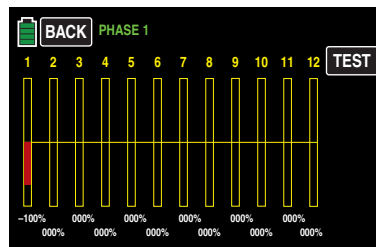
## Phase depending displays

The here mentioned sub-menu offers the possibility to display phase specific values. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1".

As soon as you will have defined one or many other phases in the "**PHASE**" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Servo monitor

The current setting of each servo is displayed precisely between -150% and +150% of the normal path taking into account the control and servo settings, dual rate/expo functions, the interaction between the linear and curve mixes, etc. 0% equals the middle position of the servo. You can therefore quickly check your settings without having to turn on the receiver. This does not relieve you of the responsibility, however, of carefully testing all the program steps on the model before first use to make sure there are no errors.



The display follows the assignment below for:

## Land and water models

Please refer to your channel assignment.

## Copter

- Bar 1 Pitch (climb/sink)
- Bar 2 Roll
- Bar 3 Nick
- Bar 4 Yaw
- Bar 5 ... 12 related to your assignation

## Helicopter models

- Bar 1 Pitch or roll (2) or nick (2) servo
- Bar 2 Roll (1) servo
- Bar 3 Nick (1) servo
- Bar 4 Yaw servo (gyro)
- Bar 5 Nick (2)-Servo / free channel
- Bar 6 Throttle servo or governor
- Bar 7 Gyro sensitivity / free channel
- Bar 8 Speed controller / free channel
- Bar 9 Free channel
- Bar 10 Free channel
- Bar 11 Free channel
- Bar 12 Free channel

## Fixed-wing models

- Bar 1 Throttle/brake servo
- Bar 2 Aileron or left aileron
- Bar 3 Elevator
- Bar 4 Rudder
- Bar 5 Aileron right
- Bar 6 Flap (left) / free channel
- Bar 7 Flap (right) / free channel
- Bar 8 Free channel / second elevator servo
- Bar 9 Free channel / AILE2 left
- Bar 10 Free channel / flap2 right
- Bar 11 Free channel / AILE2 left
- Bar 12 Free channel / AILE2 right

## Notices



- Because for the model types "Car", "Copter" and "Boat" there is no established pre-assignation, for those model types it is not possible to offer a reference list of assignation.
- Note that the servo display refers exclusively to the original sequence of the servos, that is, it does not refer to any changes to the out-

puts made in the "Transmitter output" sub-menu, or in the "Receiver output" sub-menu of the "Transmitter setting" sub-menu.

- The count of the channels displayed in this menu refers to the maximum control channels available in the transmitter. The number of usable channels depends on the type of receiver as well as the number of connected servos and may therefore be significantly less.
- Use this display while programming the model since you can immediately check all your settings on the transmitter. This does not relieve you of the responsibility, however, of carefully testing all the program steps on the model before first use to make sure there are no errors.

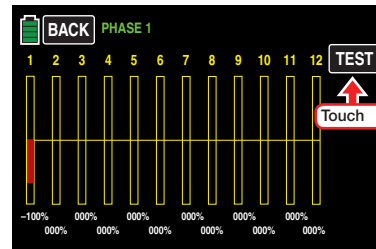
## Servo test

### Notice

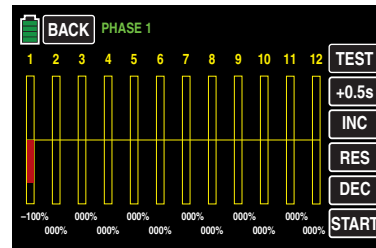


Only start a servo test in a model memory created for this purpose without any mixer. Otherwise, unforeseeable servo deflections will occur.

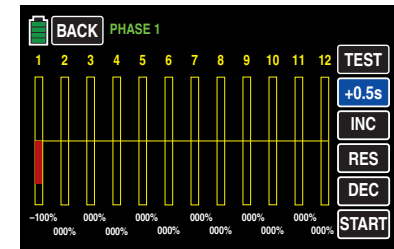
To activate the servo test function, use a finger or the provided stylus to touch the **TEST** field at the top right:



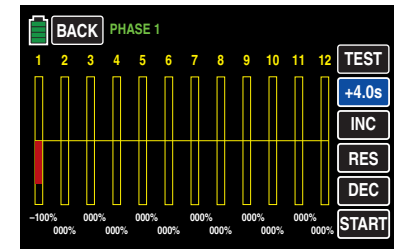
Additional buttons appear at the right edge of the display:



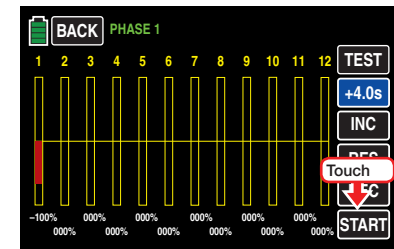
To change the default cycle time of 0.5 seconds, touch the corresponding value field. The color of the field switches from black to blue:



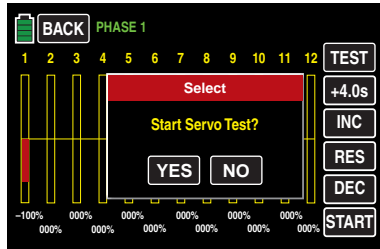
In the blue value field, the time for a movement cycle can be changed at 0.5 s steps between 0.5 and a maximum of 5.0 seconds with the **+** or **-** button at the right edge:



Touch the **RES** button to reset a changed value in the active field to the default of 0.5 seconds. Start the servo test by touching the **START** button at the bottom right:

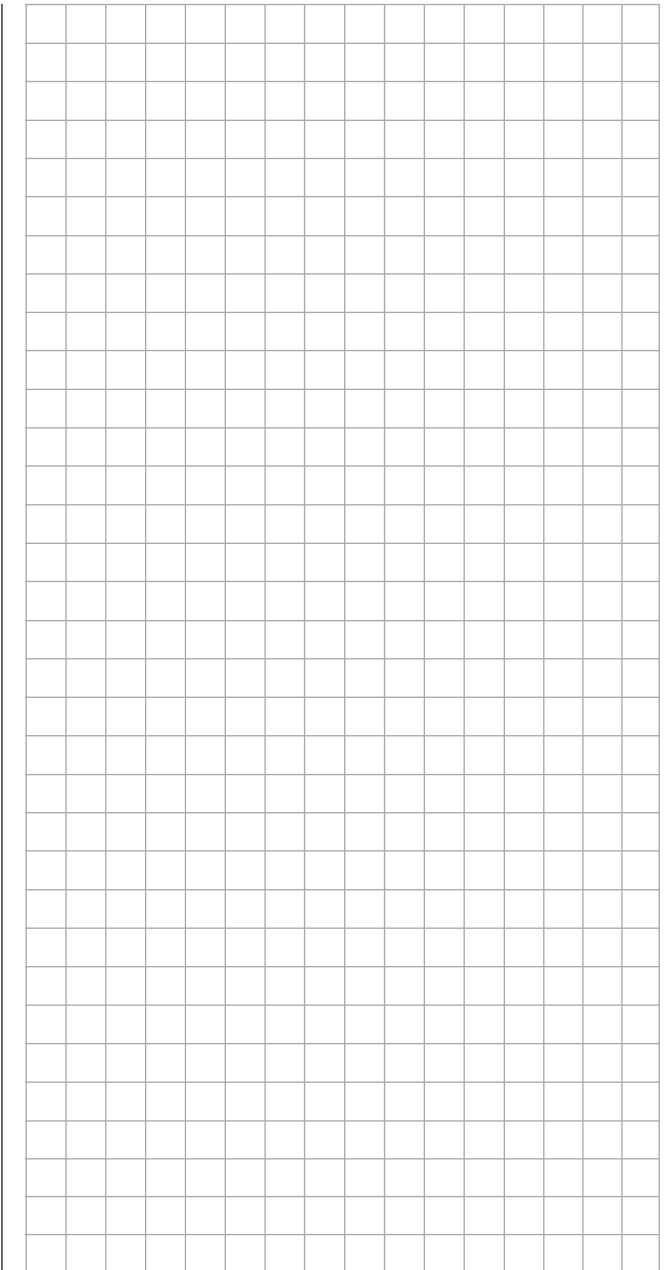
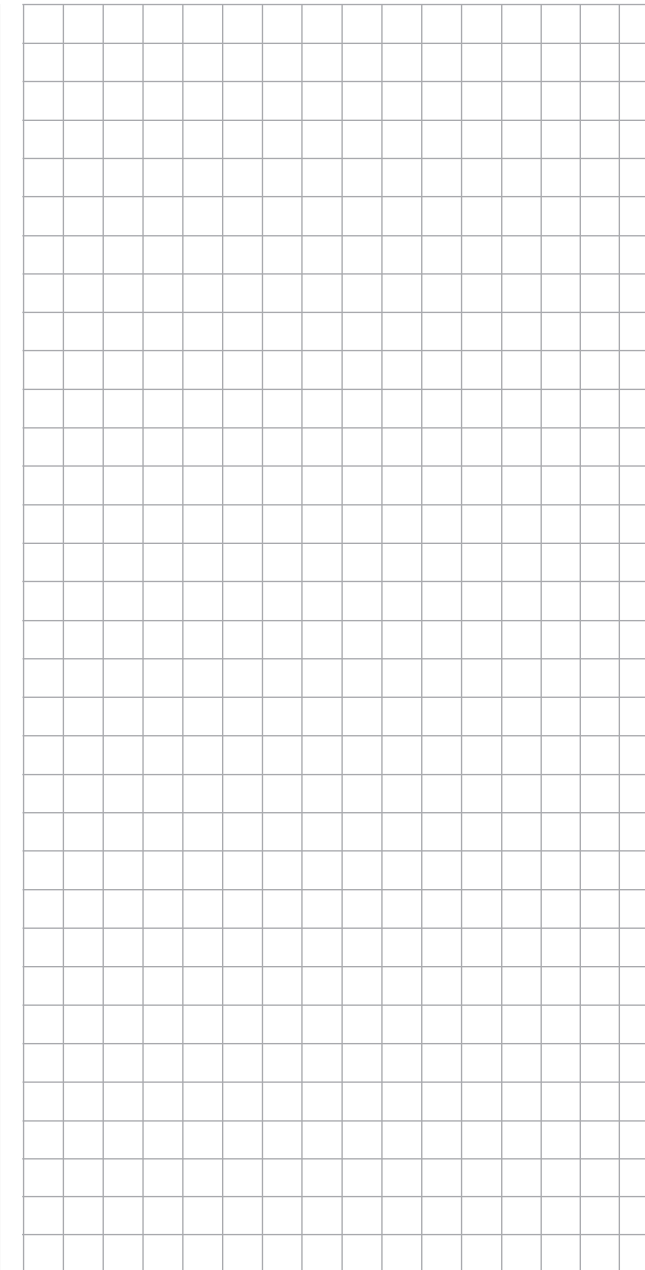
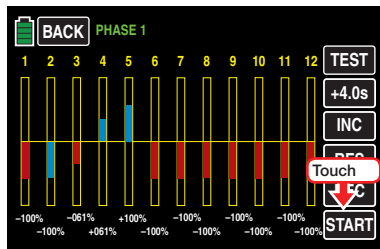


... whereupon a safety query appears in the display:

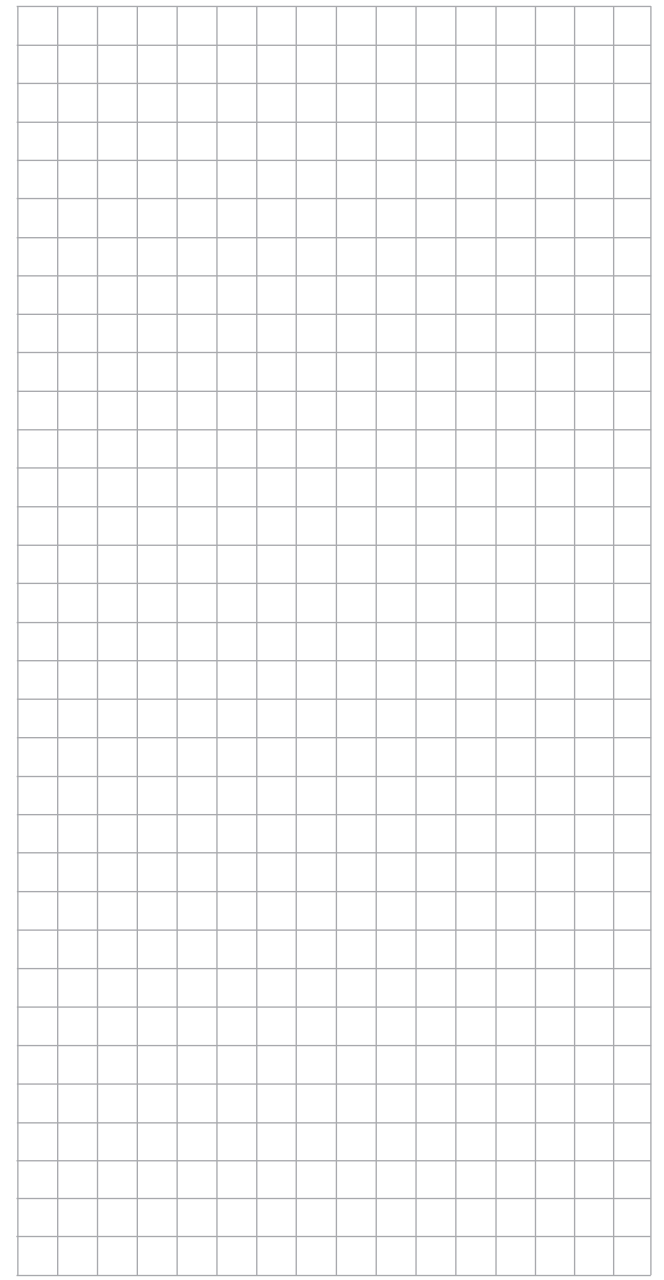
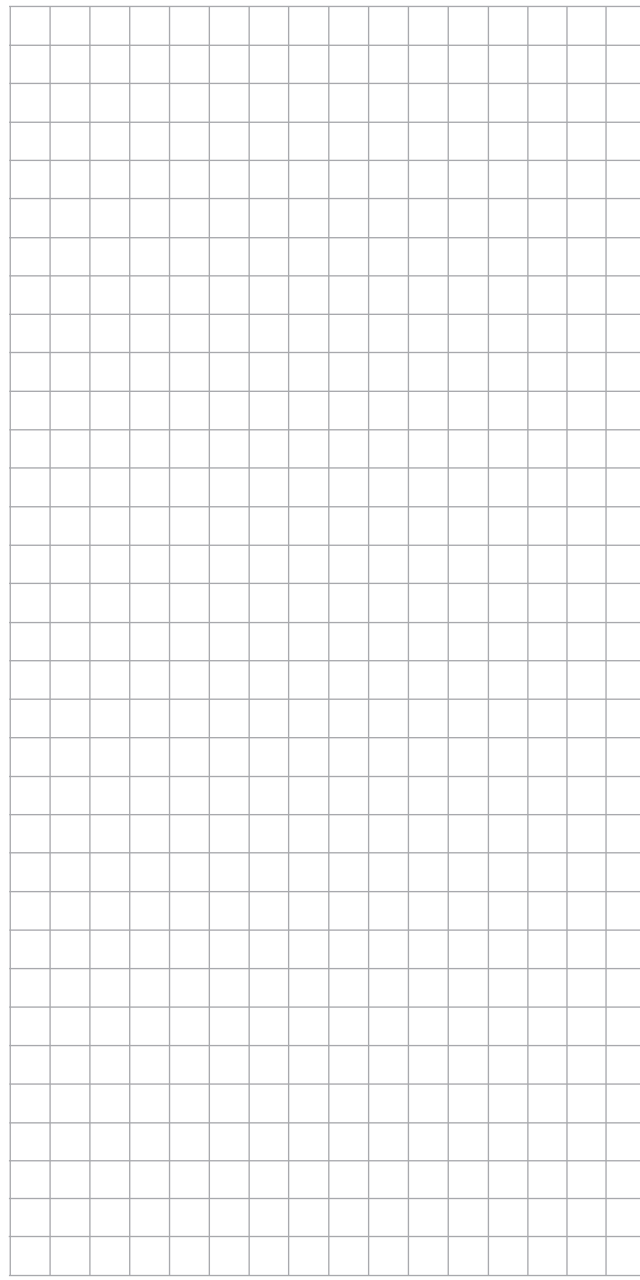
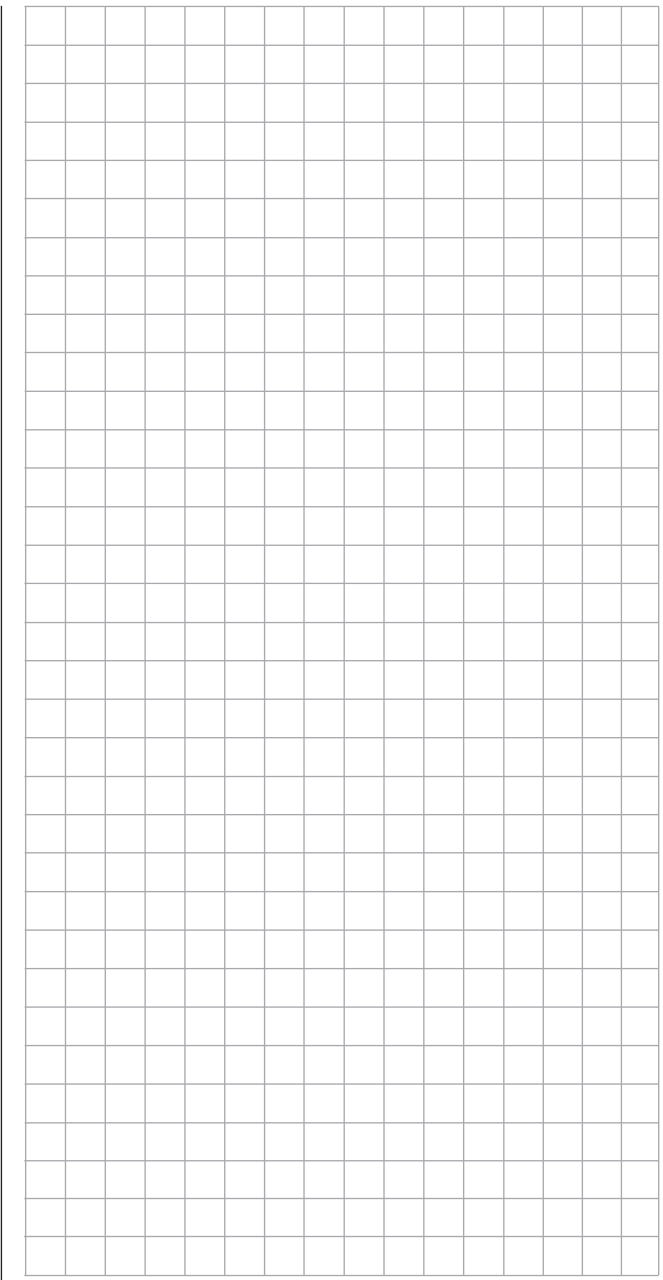


Touch **NO** to terminate the procedure.

Touch **YES** to start the servo test function. This function automatically controls the servos operating under the assumption that the associated controls (starting from the neutral position) will be simultaneously and continuously moved back and forth between -100% and +100% during the set period. All of the servos that are active in the model memory move within the set servo paths and servo path limits until the servo test is stopped by touching the **STOP** button at the bottom right:





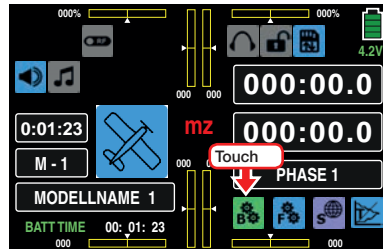




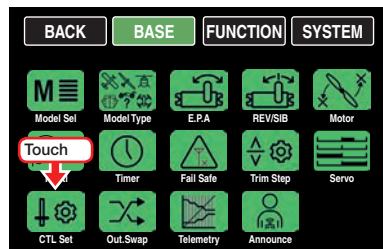
# Base menu - Control/switch setting

Control and switch assignment

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "TX Ctl".



Near the gimbal sticks for the control functions 1 ... 4 and their trim controls the **mz-24** HoTT Pro transmitter is provided as standard with other control elements:

- 1 two-position switch with long handle (S6)
- 1 three-position switch with long handle (S3)
- 4 three-position switches with a short handle (S1, S4, S5 and S7)
- 2 one-side, self-neutralizing three-position switches with long handle (S2 and S8)
- 2 INC/DEC buttons (DT1 and DT2)
- 2 rear proportional sliders (SL1 and SL2)
- 4 proportional dials (DV1 ... DV4)

In contrast to the two control sticks that immediately act on the servos connected to receiver outputs 1 ... 4 with a newly initialized model memory and for an helicopter model also for the servo 6, the aforementioned control elements are initially inactive.

Consequently, only the servos controlled by the two control sticks can be moved when these systems are initially delivered and a new model memory is initialized and bound to the receiver to be installed. In contrast, the servos connected to different slots remain in their middle position.


Even though this may initially appear to be inconvenient ..., it is the only way to freely select from the "other" control elements of your transmitter and avoid the deactivation of unnecessary control elements. A not needed control element, erroneously actioned, also has then no influence on your model if it is not active, it means when it is not assigned to any function. As needed, you can therefore assign all of the aforementioned control elements within the "CTL Set" sub-menu addressed here to any function input without restriction, . This also means that each of these control elements can also be simultaneously assigned several functions as needed. For example, the same toggle switch that is assigned to an input in this menu can also be assigned as a timer on/off switch in the "Timer" menu, etc.


## Notices







- It should be noted that incorrect responses may arise from functional overlaps such as using the same physical switch as a switch to switch between Phase switch and as a control for Phase trimming. Change also your switch assignment.

- In contrast to setting servo travel, setting the control travel affects **all outgoing** mixing and coupling functions and hence all servos that are activated by the relevant control element.

-  The control direction of the brake control of a "glider model", generally the "front" position of the CH1 control stick, is defines through the off-set value in the line "CTL OFFSET" of the "BUTTERFLY" sub-menu.

-  The conversion of the control direction of the throttle control stick (CH1) of a motor powered model is described in the sub-menu "Throttle CURVE" context.

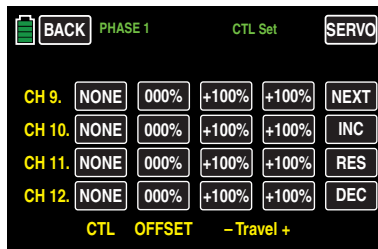
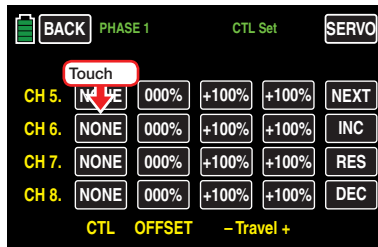
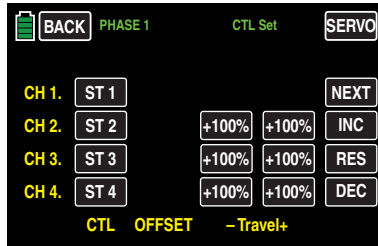
-  The conversion of the control direction of the throttle/pitch control stick (CH1) of a helicopter model is described in the sub-menu "Pitch curve" context.

-    The conversion of the control direction of the throttle control stick (CH1) of these three model types is described in the sub-menu "Throttle CURVE" context.

**"CTL/Set" column** (control/switch)

**Assigning switch or control**

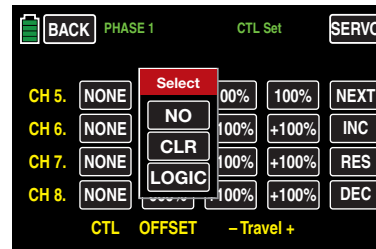
To assign a control element tap on the value field in the line of the desired control channel, for example input 6 in the second display page of this sub-menu:



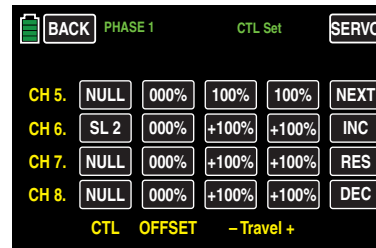
**Tip**

In order to set the control channels CH5 ... 8 and CH 9 ... 12 so as to be able to set a delay in the fourth page of this sub-menu, tap in the right side of the display on **NEXT** [change page].

The "SELECT" pop-up display appears:

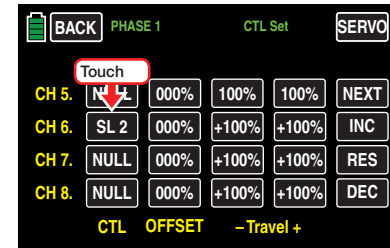


Touch **NO** to terminate the procedure. To assign the control or switch, activate the desired control element; remember that the proportional dials and rotary controls are only recognized after a pause and therefore need to be activated for slightly longer. If the travel is no longer sufficient, activate the control in the opposite direction if necessary. With an assigned 2-position switch, you can only switch back-and-forth between the end values as for example motor ON / OFF The 3-position switch offers a middle position. The display shows either the control name or the switch number, such as:

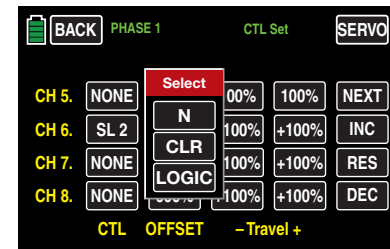


**Deleting controls or switches**

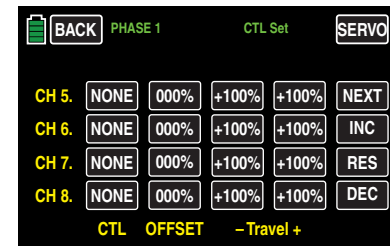
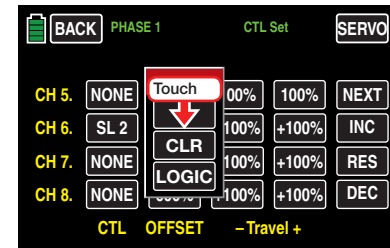
Touch the value field of the assignment to be deleted, for example:



The "SELECT" display reappears again:



To delete the assigned control or switch, touch **CLR**:



Use the same procedure for the other settings.

## Notices



- The controllers assigned in this sub-menu globally affect all the phases. Only the offset in the second line and the "travel setting" in the third and fourth column affect specific phases.
- If, with a model that has flaps, you assign to input 6 a control or switch identified as "FLAP(1L)", its function is dependent on the current setting in the line "ACT" of the sub-menu "Flap Sett" of the function menu (page ). If the value field to the right of "ACT" is **INH** or **OFF**, then this control or switch acts exclusively on servo 6 and possibly 7 with the values set in the sub-menu "D/R,Exp". Otherwise, this control or switch assumes the function of Q.Link trimming with the value set in the sub-menu "Flap Sett".

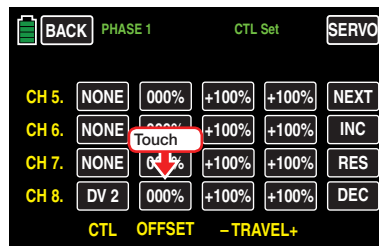
## Phase depending settings

In contrast to the previously described - phase influencing - control and switch assignment in the "CTL Set" column the values act in the following described columns "OFFSET" and "-Travel+" so as the phase specific "symmetrical delay" which are available in a specific page. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

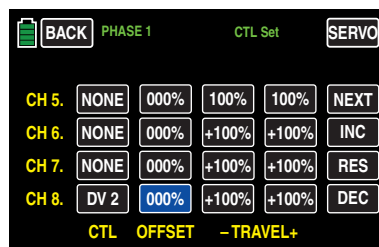
## "OFFSET" column

Change the center of each control element, i.e., its zero point (if desired with reference to a specific phase), in this column.

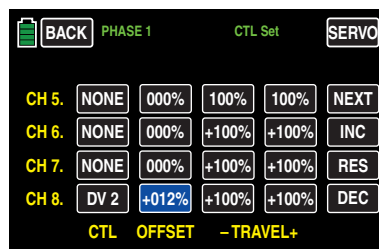
Touch the offset value to be changed, for example:



The color of the value field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge, for example:



The adjustment range is  $\pm 125\%$ .

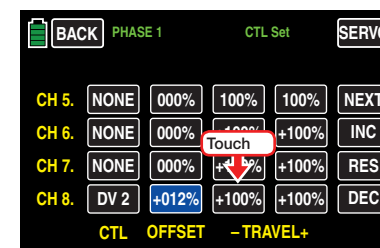
Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

Use the same procedure for the other settings.

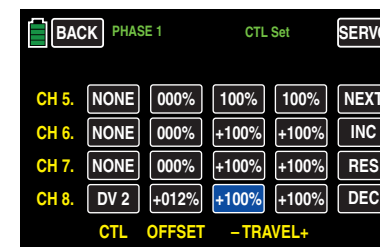
## "- Travel+" column

In this column is set the travel of each control element, specifically for each page.

Touch the left value field in the corresponding line to set a value to the minus side of the control travel, and/or on the right to set a value on the plus side of the control travel, for example:



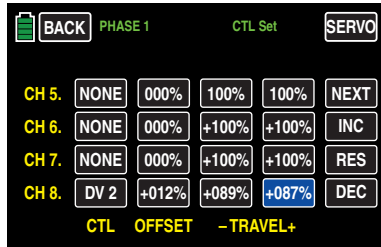
The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

The adjustment range is  $\pm 125\%$ .

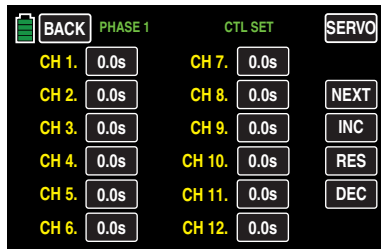
Use the same procedure for a value on the plus side of the control travel, for example:



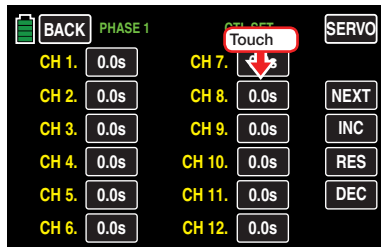
Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value. Use the same procedure for the other settings.

### Symmetrical delay

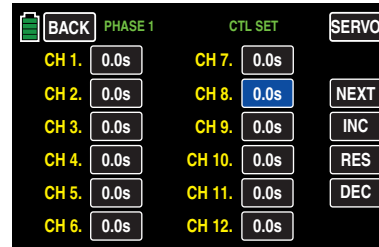
Tap on the **SEL** button on the right side of the display to move to this display page:



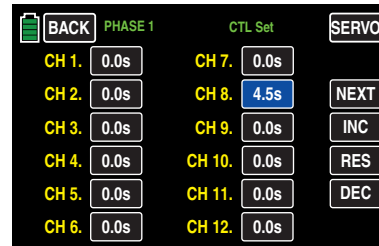
To set a time delay of the selected control signal tap on the button standardly labeled with **0.0s**, for example CH 8:



The button color changes from black to blue:



Touch the **+** button at the right edge of the display to gradually increase the value to a maximum of 9.9 seconds:



Touch the **-** button underneath to reduce the value to a minimum of 0.0 s, and touch the **RES** button to reset the changed value back to the default.

To recall the graphic display of the servo travels of the "Servo" menu (servo monitor) and to activate the "Servo test" function integrated in this display by tapping on the **SERVO** button on the top right side of the display or push the **▲▼** buttons on the left of the display, at the same time, *while no value field is active*. Use the same procedure for the other settings.

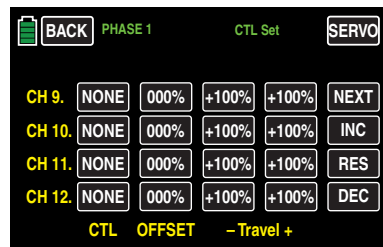
### Notice

Set a symmetrical delay for the transmitter-side control signal with buttons with the standard labeling **0.0s**. A delay which is set here affects the servo that has the number of the delayed receiver connection as well as all servos controlled by the control element assigned to control function X.



## Throttle limit function

After the initialization of a new model memory with the model type "helicopter" in the transmitter **mz-24** HoTT Pro the input "12" is provided with the "throttle limit" function. This function is standardly deactivated and remains so until **NO** control is assigned to the input 12:

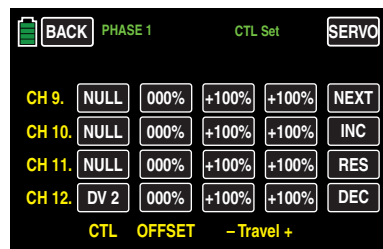


### Notice



The throttle limit is deactivated until the input "12" is free! This input cannot be used for any other use!

By assigning a control, for example the momentary proportional dial DV2 on the top left side of the transmitter, the following described "throttle limit" function will be activated again and it can be set according to the following description.



With this setting and the assignation of a control to the input 12, it is unnecessary to program two phases (THR.HOLD and no THR.HOLD) that is frequently the usual approach with other remote control systems.

As opposed to THR.HOLD, increasing the system speed below hovering is much more flexible and can be adjusted more precisely with the options offered by the they **mz-24** HoTT Pro transmitter.

### Meaning and use of throttle limit

In contrast to fixed-wing models, the performance of the power unit for helicopters cannot be directly controlled with the CH1 control stick; it can only be indirectly controlled by the gas curve settings made in certain helicopter menus of the function menu, or by a *governor* if the model has one.

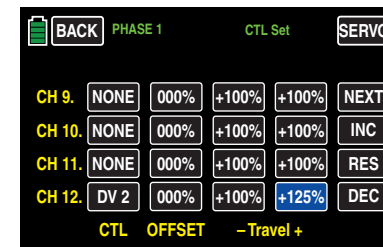
### Tip

For different phases, you can of course also adjust individual gas curves when programming the phases.

Both methods of controlling the output prevent carburetor motors of a helicopter from approaching idling during normal flight which allows them to be reliably started and stopped without additional intervention.

The gas limit function elegantly solves this problem by *limiting* the position of the throttle servo or the performance of a motor control unit: This makes it possible to optionally turn down the throttle to idle with the throttle limit control, upon which the trim control of the throttle/pitch control stick assumes control, or to directly turn off an electric drive. Conversely, the throttle servo or motor control unit can only reach its full throttle position when the throttle limit control also releases the entire travel.

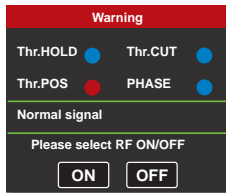
The set value on the (right) plus side of the "Travel" column of the function menu, therefore has to be large enough so that, when the throttle limit control is at its maximum position, the full throttle setting achievable by the throttle curve settings is not limited. Normally, a value between +100 % and +125 % is set.



The value on the (left) minus side of the "Travel" column should be set to allow an electric drive to be reliably turned off with the throttle limit control, or to allow a carburetor to be closed enough so that the ICE engine can also be turned off in conjunction with digital CH1 trimming. This value should therefore be left at +100%.

This variable limitation of the throttle travel allows the drive to be comfortably started and stopped, and generally this approach is significantly safer. Imagine what could happen if for example you carried a helicopter to the takeoff site while the motor is running and accidentally activated the CH1 control stick.

If the carburetor or motor control unit is open to much, a beep sounds when you turn on the transmitter or after a model change, and the following message appears in the main display:



At the same time as long as the automatic switch on of the RF module is inhibited, until the throttle limit or the throttle/pitch control stick let the output signal of the channel 6 be out of the idle range.

### Tip

View the "Servo monitor" to monitor the influence of the throttle limit control. Be sure to remember that servo output 6 controls the throttle servo in the **mz-24** HoTT Pro transmitter.

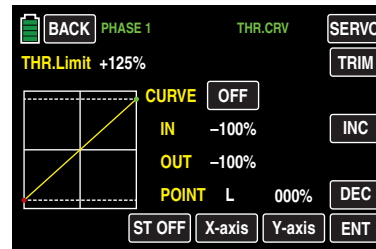
### Idle basic settings

Open the throttle limit until the end point. Move the throttle/pitch control stick to the maximum pitch position and, in the sub-menu...

#### »Throttle curve«

... of the function menu, make sure that the standard gas curve is active.

If the standard gas curve has already been changed after a model memory has been initialized, reset it (at least temporarily) to "POINT L = 0%", "POINT 3 = +50%" and "POINT H = +100%":



### Notice



Since the throttle trimming lever does not work when the throttle limiter is open, its position is irrelevant in this case.

Without starting the gas engine, adjust the throttle servo (preferably mechanically), and if desired additionally by adjusting the travel of servo 6 in the sub-menu "E.P.A." of the base menu to completely open the carburetor.

Then completely close the throttle limiter, for example by turning the proportional dial "DV 2" all the way clockwise. Use the trimming control of the throttle/pitch control stick to move the marking of the trimming position into the motor OFF position.

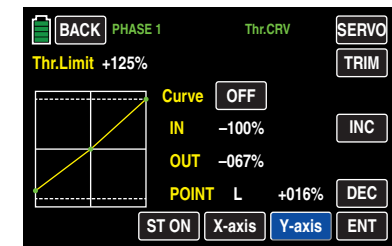
### Notice



The position of the throttle/pitch control stick is irrelevant when the gas limiter is closed. It can therefore remain in the maximum pitch position as long as you can switch between full throttle (throttle limiter open) and "Motor OFF" (throttle limiter closed) using just the throttle limiter when adjusting the carburetor linkage.

While the gas limiter is closed, adjust the carburetor linkage so that the carburetor is completely closed. Make sure that the throttle servo does not mechanically over-travel in the two extreme positions (full throttle/motor OFF).

To conclude this basic setting, match the setting range of idle trimming with point "L" of the gas curve. Adjust point "L" of the "throttle curve" display to approximately +15 to +18%, for example:



To *precisely* adjust a seamless transition from idle trimming to the throttle curve, move the pitch control stick back and forth slightly at the minimum stop while the throttle limiter is closed and idle trimming is completely open. The throttle servo should not move. Any subsequent adaptation of the gas curve must be done later during flight.

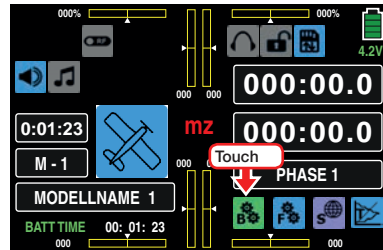
The motor should always be started with the throttle limiter completely closed. Adjusted the idle only with the trimming control of the throttle/pitch control stick, and turn off the motor with digital trimming.



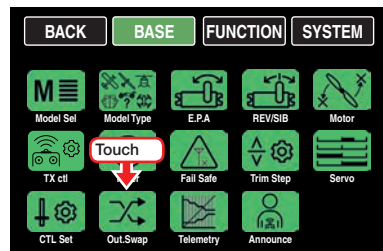
# Transmitter output

Changing the outputs in the transmitter

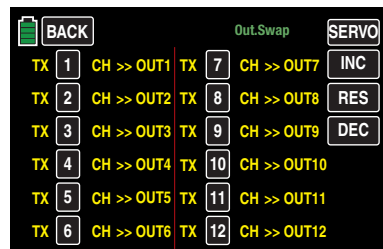
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Touch the menu item "Out.Swap".



To ensure maximum flexibility in regard to receiver assignment, you can freely switch transmitter outputs 1 to 12 in the program of the **mz-24** HoTT pro transmitter according to your preference:

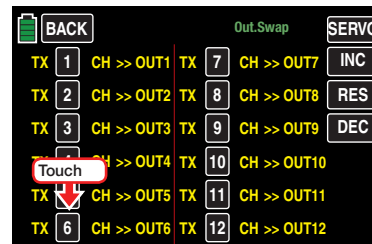


With this option, you can distribute the 12 *control channels* of the **mz-24** HoTT Pro transmitter to *transmitter outputs* 1 ... 12 as desired.

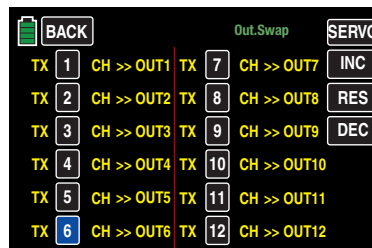
Remember that the display in the "**Servo monitor**", exclusively refers to the *control channels* that are set according to the receiver assignment, and that the outputs are NOT changed.

## Programming

Touch the value field in the line of the channel/output combination to be changed, for example:

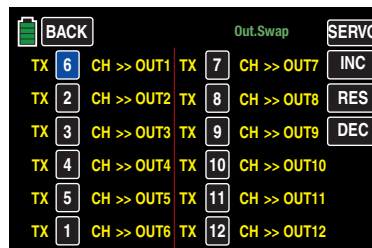


The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

Use the same procedure for the other transmitter outputs, for example:

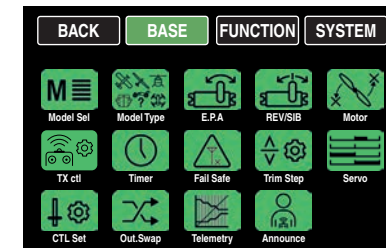


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

## Notice

Any subsequent changes to the settings such as servo travel settings, dual rate/expo, mixer, etc., always have to correspond with the original receiver assignment.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



## Example

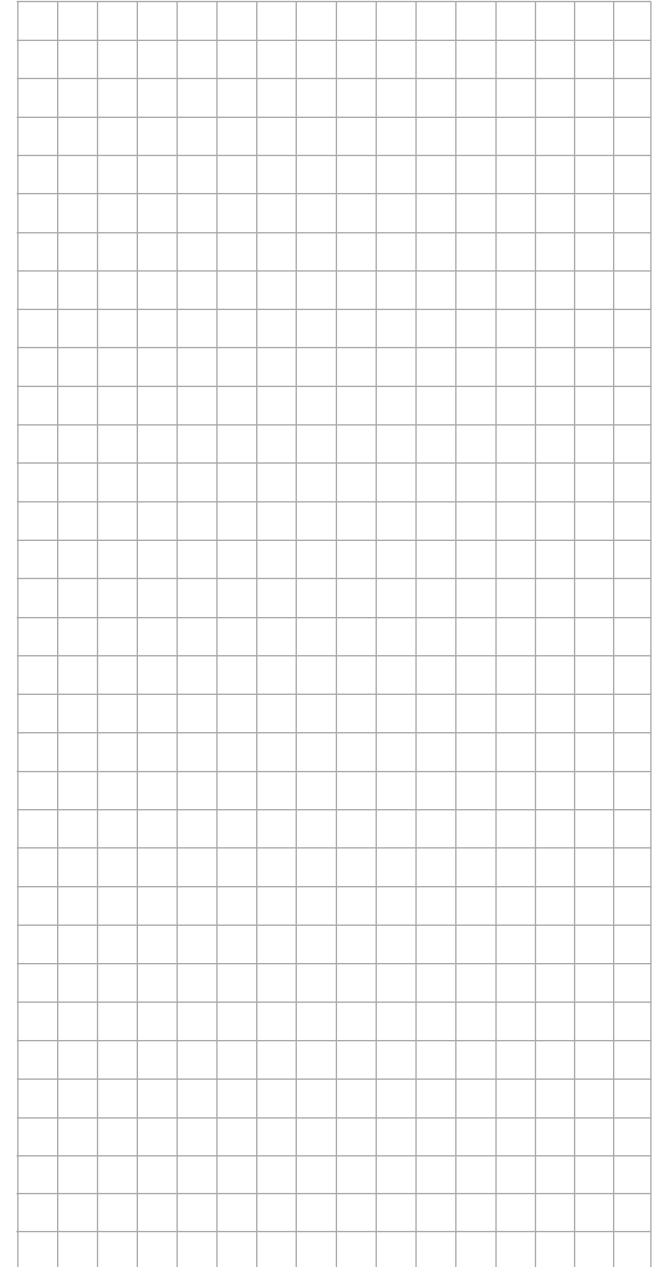
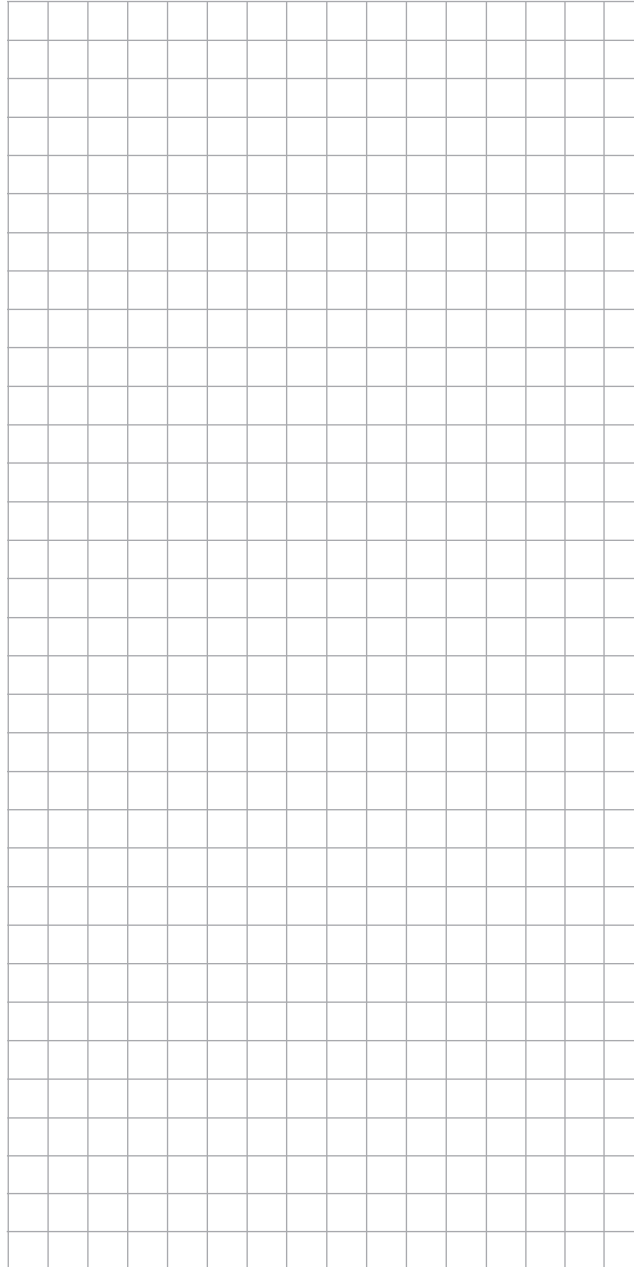
In the helicopter program for the **mz-24** HoTT Pro transmitter, the outputs for a pitch servo and the throttle servo have been changed in comparison to previous *Graupner/JR* transmitters. The throttle servo is assigned to transmitter output "6", and the pitch servo is assigned to output "1". You may wish to keep the previous configuration. In this case, switch channels 1 and 6 so that (as described above) (control) channel 6 is at output 1 and vice versa.

## Notice

By using the receiver-side channel assignment function called "**Channel Mapping**" which is integrated in the "**Telemetry**" menu of the **mz-24** HoTT Pro transmitter, the 12 control channels of these transmitters can be distributed as desired within one receiver as well as to several receivers.



In addition, several receiver outputs can be assigned the same control function. For the sake of clarity, it is strongly recommended to only use one of the two options.





# Telemetry

Settings and displays

Receiver settings and the displays and settings of the connected telemetry sensors can be retrieved and programmed in real time in the **"Telemetry"** menu. The connection to the receiver is maintained by the feedback channel integrated in the HoTT receivers.

Up to four sensors can be connected through a V or Y cable at the telemetry connection of the HoTT receivers provided with actual firmware.

The ability of these and future receivers to be updated by the user keeps the associated **"Telemetry"** menus current and allows additional functions or languages to be added.

## Tip

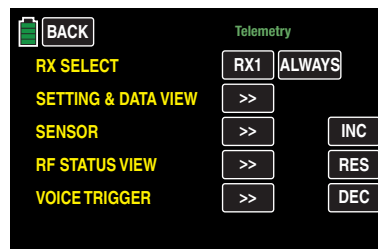
After the product has been registered at <https://www.graupner.de/de/service/produktregistrierung.aspx>, you will automatically be notified of updates by e-mail.

## Notes



- These instructions are based on the functions available at the time at which this manual was drafted.
- As already noted in the section **"Binding several receivers"** on page , if desired several receivers per model can be bound. In the related programs of the **mz-24** HoTT transmitter, you can directly manage one or two receivers and use a menu to distribute the 12 transmitter control channels between the two receivers.

During subsequent operation, only the receiver selected in the line "RECEIVER SELECT" of the **"Telemetry"** menu can establish a telemetry connection with the transmitter. As standard it is the last bound one.



Conversely, this also means that only these receivers can be addressed by the **"Telemetry"** menu. The selection therefore may have to change before settings can be made to a specific receiver, because the second and all the other receivers work in parallel in the so called "slave mode"!

- The exchange of telemetry data between transmitter and receiver takes normally place only after each four RC data-packs or even after even bigger distance, see next page. Therefore also the reaction to control buttons or setting changes has normally within a telemetry connection a delay. This does not constitute an error.
- When adjusting the remote control, make sure that the transmitter antenna is always far enough from the receiver antennas. Maintain a distance of 1 meter to be on the safe side. Otherwise, you risk endangering the connection with the feedback channel and causing malfunctions.
- All settings that have been made using the **"Telemetry"** menu (such as fail safe, reversal of the direction of servo rotation, servo travel, mixer and curve settings, etc.) are only saved in the receiver and are therefore transferred to other models when the receiver is switched.

You therefore need to reinitialize your HoTT receiver if you want to use your receiver in another model (see "Reset" on page [Reset](#)).

You should therefore only program the rotational direction of servos, servo travel, mixer and curve settings, etc. in a model specified standard menu of the respective transmitter. Otherwise, the settings will overlap each other which at least will cause a lack of clarity and, at worst, will cause problems in subsequent operation.

- By using the receiver-side channel assignment function called "Channel Mapping" which is integrated in the "Telemetry" menu of the **mz-24** HoTT Pro transmitter, the control channels of these transmitters can be distributed as desired within one receiver as well as to several receivers. In addition, several receiver outputs can be assigned the same control function. For example, this is useful if you wish to actuate each aileron with two servos instead of just one, etc. Also here it is strictly recommended to pay maximum attention during programming.

## WARNING

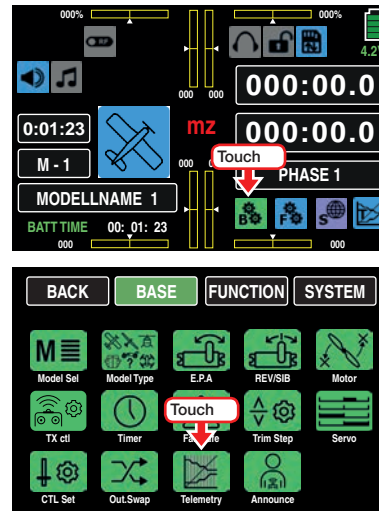


- **When operating towed models, maintain a minimum distance of approximately 50 cm between the participating receivers or their antennas. Using the satellite receiver is an option. Otherwise, malfunctions from the feedback channel are possible.**

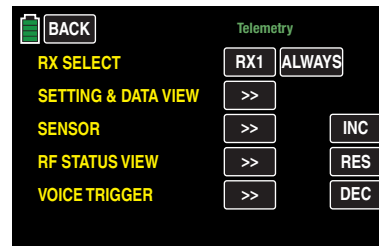
- The model or sensors may only be programmed when the model is on the ground. Only perform settings when the motor is turned off or the drive battery is disconnected. Otherwise, unanticipated reactions may occur. A servo test that is accidentally activated in the receiver, for example, could cause the model to crash and cause injury or property damage.
- In addition, consult the safety instructions contained in the Part 1 of the manual included in the transmitter package.

## Telemetry

The menus that fall under the generic term of "Telemetry" can be accessed from the "free" function menu of the **mz-24** HoTT transmitter. You can open this function menu by touching the gear icon labeled "B":



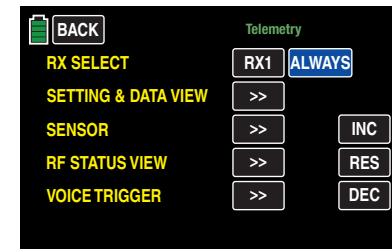
Tap on the "Telemetry" icon to open the first page of the telemetry display:



### Basic operation

Basically the "Telemetry" menu corresponds to the other menus of the **mz-24** HoTT Pro transmitter: The few deviations are described below:

If you have bound a receiver as RX1 or also as RX2 in the sub-menu "TX ctl", then you can declare one of the two receivers as "Telemetry-receiver" by tapping on the standardly **RX1** labeled value field. As standard it is the last bound one. To change the standard setting **ALWAYS** on the right according to your preference, tap on the value field. The color of the value field changes from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

Value	Explanation
<b>ALWAYS</b>	The transmitter reacts standardly to the back-channel of the selected receiver.
<b>4x / 8x</b>	The transmitter reacts to the back-channel of the selected receiver with the related delay.
<b>OFF</b>	The transmitter telemetry functions are switched off.

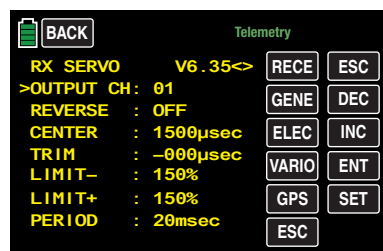
### Notice

» Actually the use of settings different from the standard value **ALWAYS** is only suggested if two receiver, which are not connected to each other and which are bound to two different transmitters, are intended to use in close distance and therefore there are oft disturbs in the back-channel of one of both receivers.

Specifically if there is the possibility of reciprocal interference of the back-channels, as for example in a camera drone with separate camera and copter control or a towing model for model-parachute.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

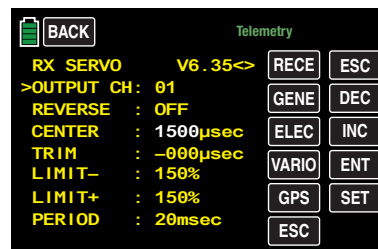
Switch between the individual pages of the "Telemetry" menu by touching the **ENT** button (forward) and **ESC** (reverse or) with a finger at a provided stylus. Corresponding pointers indicating direction can be found on each page of the display at the top right in the form of angled brackets ">" or "<", such as:



If there is only one angled bracket, you are on the first or last page. You can then only change pages in the displayed direction.

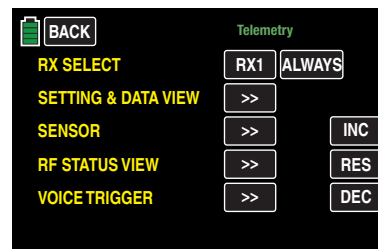
Menu lines in which parameters can be changed are indicated by a preceding angle bracket (see screenshot above). Touch the **INC** or **DEC** button to move the ">" pointer one line up or down. Lines which cannot be jumped cannot be changed.

To change a parameter, touch the **SET** button at the right edge of the screen. The selected parameter is represented in white.



Then use the **INC** or **DEC** buttons to change the selected value within the possible range; the changed value is confirmed and stored in the receiver memory by touching one more time the **SET** button.

Touch the **ESC** button at the top right of the display to return to the previous page and touch the **BACK** button at the top left of the display to return to the initial position:



### Notices



- If however the following message appears instead of the desired sub-menu, then there is no connection with the receiver. Switch on your receiver system or [bind](#) the corresponding receiver or activate it in the "RX SELECT" line as described before.

- If, however, you have opened one of the sub-menus described below and this is unexpectedly replaced by, as the selection menu shown below, then the connection to your receiving system is lost. Then switch on the receiver system again or solve find the origin of the connection failure.

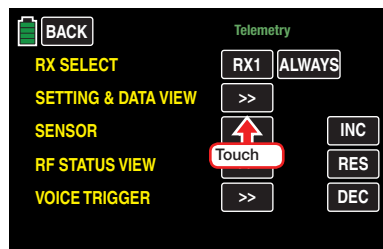
Touch the button of the desired sub-menu.

# SETTING & DATA VIEW

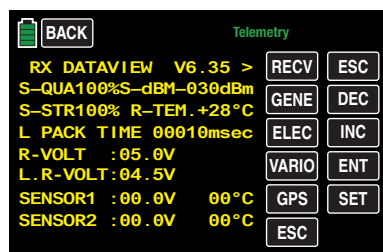
On the first page of the display with the header ...

## RX DATAVIEW

... of the sub-menu SETTINGS DISPLAYS " of the "Telemetry" menu...



... you will not be able to make any settings. This page is for information only:



Value	Explanation
Vx.xx	Firmware version of the receiver
S-QUA	Quality expressed as a percentage of the signal packages from the transmitter arriving at the receiver
S-dBm	Level in dBm expressed as the percentage of the transmitter signal arriving at the receiver
S-STR	Signal strength expressed in percentage of the signal from the transmitter arriving at the receiver
R-TEM.	Receiver temperature in °C

L.PACK TIME	Shows the longest time in milliseconds in which data packages were lost when transmitting from the transmitter to receiver
R-VOLT	Current operating voltage of the receiver
L.R-VOLT	Current operating voltage of the receiver since the last time the receiver was turned on
SENSOR1	Indicates the voltage and °C of the optional telemetry sensor 1
SENSOR2	Indicates the voltage and °C of the optional telemetry sensor 2

## S-QUA (signal quality)

This value is a type of evaluation of usefulness, expressed as a percentage, of the signal packages from the transmitter arriving at the receiver.

This evaluation in percentage of the quality of the signal packages from the transmitter received by the receiver's microprocessor is shown live on the transmitter's display via the receiver's feedback channel.

## S-dBm (reception level)

dBm is a logarithmic value that provides a comparative overview of extreme differences in level. A level of 0dBm corresponds to 1mW. The dBm is positive for an output > 1mW, and the dBm is correspondingly negative for an output < 1mW.

In practice, this means that when a remote control system is used, generally (significantly) less than 1mW and hence a level < 0dBm is received by the receiver from a 100mW output of a standard transmitter (= 20dBm) because of the fanning out of the radio waves and associated weakening of the signal on the way to the receiver.

Consequently, the reception shown in dBm in the display is generally negative. The higher the number after the minus sign, the worse the reception. This is important to remember during [Range test](#) before using the model.

Perform a [Range test](#) before each flight, and simulate all servo movements that could occur during the flight. The range must be at least 50m on the ground in an activated range test. At this distance, a value not worse than -80dBm may be displayed in the "RX DATAVIEW" display under "S-dBm" to ensure safe operation. If the value is lower, such as -85dBm, you should not operate your model. Check the installation of the receiver and antenna position.

During operation, the reception should not fall below -90dBm; if this is the case, you should reduce your distance to the model. Normally before this level is reached, the acoustic range warning is triggered (1 beep every second) *which reflects the signal strength* of the feedback channel to ensure safe operation.

## S-STR (signal strength)

The signal strength (S-STR) is displayed in percentage. In general, an acoustic range warning (1 beep every second) is emitted once the receiver signal in the feedback channel becomes too weak. Since the transmitter's output is significantly higher than the receiver, the model can always be operated safely. The model distance should nevertheless be reduced for reasons of safety until the warning tone stops.

### R-TEM. (receiver temperature)

Make sure that the temperature of your receiver remains within the permissible range under all flight conditions (ideally between -10 and +55 °C).

The receiver temperature threshold which triggers a warning can be set in the sub-menu "RX SERVO TEST" under "ALARM TEMP+" (50 ... 80°C) and "ALARM TEMP-" (-20 ... +10°C). When the temperature is too high or too low, a continuous warning tone sounds, and "**TEMPE**" appears in red at the top right in the receiver menu "RX". In the "RX DATAVIEW" display, the parameter "**R-VOLT**" is displayed in white.

### L PACK TIME (data packages)

This indicates the longest period in milliseconds in which data packages are lost when transmitted from the transmitter to receiver. In practice, this is the longest period in which the remote control system enters fail safe mode.

### R-VOLT (receiver operating voltage)

The receiver low-voltage warning can be set in the sub-menu "RX SERVO TEST" under "ALARM VOLT" between 3.0 and 7.5 V. When it is too low, a continuous warning tone sounds, and "**VOLTE**" appears in red or white at the top right in the receiver menu "RX ...". In the sub-menu "RX DATAVIEW", the parameter "**R-VOLT**" is displayed in white.

The current receiver battery voltage is displayed in the basic display.

## CAUTION



**Always keep an eye on the receiver's operating voltage. If it is too low, do not operate or start your model.**

### L.R-VOLT (lowest receiver operating voltage)

"L.R-VOLT" shows the lowest operating voltage of the receiver since the last time the receiver was turned on.

### Attention

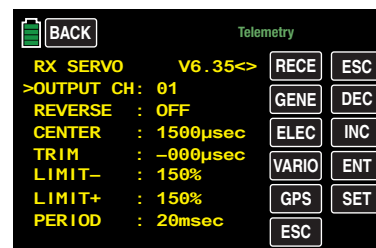


If this voltage differs significantly from the current operating voltage "R-VOLT", the drain on the receiver battery from the servos may be too much and/or the resistance of the wiring is too high. In this case, check and correct your power supply to maximize operating safety.

### Sensors 1 + 2

Indicates the voltage and temperature in °C of the optional telemetry sensors 1 and 2.

### RX SERVO

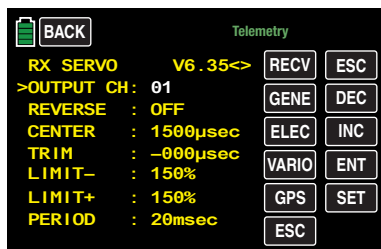


Before programming on this display page, consult the [Notices](#) at the begin of the "[Telemetry](#)" menu.

Value	Explanation	Possible settings
Vx.xx	Firmware version of the receiver	None
OUTPUT CH	Selected channel	1 ... depending on the receiver
REVERSE	Servo reversal	OFF / ON
CENTER	Servo center in µs	Currently set "servo neutral position"
TRIM	Trim position in µs deviation from the CENTER position	-120 ... +120µs
LIMIT-	Limit on the "-" side of the servo travel in percentage servo travel	30 ... 150 %
LIMIT+	Limit on the "+" side of the servo travel in percentage servo travel	30 ... 150 %
PERIOD	Cycle time in ms	10 or 20 ms

### OUTPUT CH (selected channel)

Select the line "OUTPUT CH" through the **INC** or **DEC** buttons and tap on the **SET** button in the lower right side of the display. The parameter is displayed in white.



Select the desired receiver servo connection (such as 01) using the **INC** or **DEC** buttons.

#### Notice



The following parameters always refer to the connection which is set here.

#### Reverse

(servo reverse)

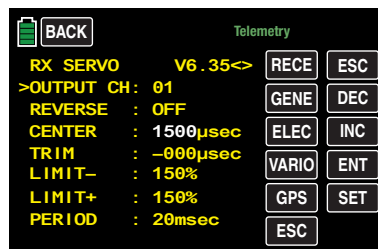
When the value field is *active*, this sets the direction of rotation of the servo connected to the selected control channel: Servo Reverse ON / OFF

#### CENTER

(servo center)

In the "CENTER" line, the currently saved pulse time for the servo center of the control channel selected in the "OUTPUT CH" line is displayed in  $\mu\text{s}$ . The set channel pulse time of 1500  $\mu\text{s}$  is the standard center position and hence the normal servo center.

To change this value, select the "CENTER" line, and use a finger or the provided stylus to touch the **SET** button at the bottom right of the display. The value field is displayed in white:



Now move the corresponding control, control stick and/or trimming control into the desired position and save the current control position by touching the **SET** button. This position is saved as the new neutral position.

The displayed new value depends on the current position of the control influencing this control channel, and if applicable the position of the trim when you touched to the **SET** button.

#### TRIM

(trimming position)

In the "TRIM" line, you can sensitively adjust the neutral position in 1- $\mu\text{s}$  increments of a servo connected to the control channel selected in the line "OUTPUT CH". Activate the value field by touching the **SET** button at the bottom right of the display with a finger or the provided stylus. The "TRIM" parameter is displayed in white. The TRIM value set here can be adjusted  $\pm 120\mu\text{s}$  in the "CENTER" line with the **INC** or **DEC** buttons.

Factory setting: 0 $\mu\text{s}$ .

#### LIMIT-/+

(side-dependent limit -/+)

This option is for adjusting a side-dependent limit of the servo travel (rudder deflection) of the servo connected to the receiver output selected in the "OUTPUT CH" line.

An adjustment within 30 ... 150% is performed separately for both directions.

Factory setting: 150%.

#### PERIOD

(cycle time)

In this line, specify the periods for the individual channel pulses. This setting is transferred for all control channels.

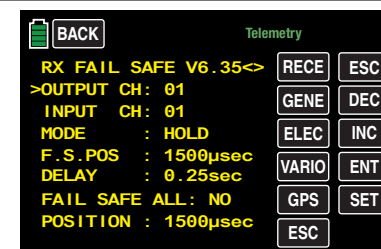
When using digital servos, you can set a cycle time of 10 ms.

#### Attention



If your system includes some or uses exclusively analogue servos, always select 20 ms since the analogue servos may be overloaded and respond by "jittering" or "growling".

#### RX FAIL SAFE



Before describing this menu, a few precautionary words:

Doing nothing is the worst thing you can do here. "HOLD" is the default in the base menu of all the HoTT receivers.

If a malfunction occurs, in a best-case scenario the flying model will fly straight for a certain amount of time and then land somewhere without causing too much damage. If this happens at the wrong time and place, the airplane may become uncontrollable and buzz the flight field and endanger pilots and spectators.

It is therefore recommendable to at least program "motor off" to prevent such risks. If necessary, consult a competent pilot to find a recommendable setting for your model.

In this context the "Switch-on fail safe" function should not be undervalued because it ensures that as far, after switching the receiver system on, no valid signal from the transmitter is received, all the servo outputs are provided with pre-definable signals so that e.g. a retractable landing gear will not close unexpectedly or other unwanted things happen.

An additional recommendation regarding the fail safe setting for the three possible versions of the **mz-24** HoTT Pro transmitter:

The easiest and most recommendable way to make fail safe settings is to use the "**Fail Safe**" sub-menu that can be reached from the base menu.

Furthermore, although a bit more involved, the "FAIL SAFE ALL" option described on the next two pages also works.

Beyond this is the relatively complex method of individual adjustments within the "RX FAIL SAFE" menu of the "**Telemetry**" menu using the options "MODE", "F.S.Pos." and "DELAY". The description of these versions starts with the "MODE" option below.

Value	Explanation	Possible settings
Vx.xx	Firmware version of the receiver	None
OUTPUT CH	Output channel (servo connection of the receiver)	1 ... depending on the receiver

INPUT CH	Input channel (control channel coming from the transmitter)	1 ... max. 12
MODE	Fail safe mode	HOLD FAIL SAFE OFF
F.S.POS.	Fail-Safe position	1000 ... 2000 µs
DELAY	Reaction time	0,25, 0,50, 0,75 and 1,00 s
FAIL SAFE ALL	Save the fail safe positions of all control channels	NO / SAVE
POSITION	Display the saved fail safe position	between approximately 1000 and 2000 µs

**OUTPUT CH** (servo connection)

In this line, select the OUTPUT CH to be set (receiver servo connection).

**INPUT CH** (selected input channel)


As mentioned in the [Notices](#) at the begin of the "**Telemetry**" section, the 12 control channels of the 12-channel **mz-24** HoTT Pro transmitter, can be distributed as desire within a receiver, or to several receivers, or several receiver inputs can be assigned the same control function. This can for example be done to control each aileron with two servos instead of just one, or to control a large rudder with coupled servos instead of a single servo.

Distributing the control functions to several HoTT receivers is recommendable for large models, for example to avoid long servo cables.

In this case, remember that only the receivers selected in the "RECEIVER SELECT" line can be addressed by the "**Telemetry**" menu.

The 12 control channels (INPUT CH) of the **mz-24** HoTT Pro transmitter can be correspondingly administered by assigning the servo connection of the receiver selected in the OUTPUT CH line to the INPUT CH of another control channel by "channel mapping".

#### Notice

 If for example you entered "2AILE" in the basic settings for a model memory, the transmitter assigns control function 2 (*aileron*) to control channels 2+5 for the left and right aileron. The corresponding *INPUT CH* of the receiver to be mapped would in this case be channels 02 + 05 (see the example below).

#### Examples

- On a large model, you want to control each aileron flap using two or more servos:  
Assign the relevant OUTPUT CH (servo connections of the receiver) as the INPUT CH to one of the two default aileron control channels 2 or 5 depending on the left or right wing.
- On a large model, you want to control the rudder using two or more servos:  
Assign the same INPUT CH (control channel) to the relevant OUTPUT CH (servo connections of the receiver). In this case, default rudder channel 4.

**MODE** (methods)

The settings of the options "MODE", "F.S." and "DELAY" determine the response of the receiver when there is an interruption in transmission from the transmitter to receiver.



The setting programmed under "MODE" *always* refers to the channel set in the line OUTPUT CH.

The factory setting for all servos is "HOLD".

For each selected OUTPUT CH (receiver servo channel), you can select between the following:

- **FAI(L) SAFE**

With this selection, the corresponding servo moves into the position displayed in  $\mu\text{s}$  in the line "POSITION" in case of a malfunction after expiration of the delay set in the "DELAY" line for the remainder of the malfunction.

- **HOLD**

With the "HOLD" setting, over the course of a malfunction, the servo remains in the last correctly received servo position.

- **OFF**

With the "OFF" setting, over the course of a malfunction, the receiver stops transmitting (buffered) control pulses for the relevant servo output. The receiver switches the pulse line "off".

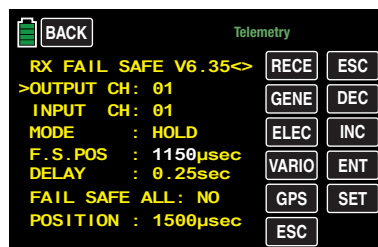
### Notice

» Analogue servos and many digital servos no longer experience resistance to the ongoing control pressure after control pulses stop and are moved out of their position at greater or lesser speed.

### F.S.POS. (Fail-Safe position)

For each OUTPUT CH (receiver servo connection), after activating the value field (red parameter) by touching the **SET** button at the bottom right of this display, set the servo position for the servo to assume in a malfunction in "FAI(L) SAFE" in the line "F.S.POS." by using the **INC** or **DEC** buttons.

The setting is made in 10- $\mu\text{s}$  increments, for example:



Factory setting: 1500  $\mu\text{s}$  (servo center).

### Attention

» In all three modes "OFF", "HOLD" and "FAI(L) SAFE", the function "F.S.POS." is particularly important when waiting for a valid signal after turning on the receiver:

The servo immediately moves into the fail safe positions set in the "POSITION" line. This prevents landing gear from retracting when the receiver is accidentally turned on while the transmitter is off. In normal model operation, the corresponding servo contrastingly acts according to the set "MODE" in a malfunction.

### DELAY (fail safe reaction time or delay)

Set the delay after which the servos are to move to their set positions when the signal is interrupted. This setting is adopted by all the channels and only affects the servos programmed for "FAIL SAFE" mode.

Factory setting: 0.75 s.

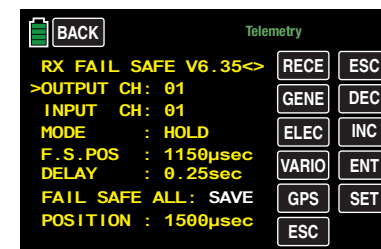
### FAIL SAFE ALL (global fail safe setting)

This sub-menu allows you to easily determine the fail safe positions of servos by pressing a button similar to the "Fail Safe" sub-menu of the basic menu:

Touch the **SET** button at the bottom right of the display with a finger or the provided stylus to switch to the "FAIL SAFE ALL" line and activate the value field. "NO" is displayed in white: Set the parameter with the **INC** or **DEC** button to "SAVE".

Use the transmitter control elements to AT THE SAME TIME move all the servos, those that you have assigned in the "MODE" "FAIL SAFE" line and/or the others which have to take a specific position during the switch-on phase of the receiver system, to the desired fail-safe position and keep them still.

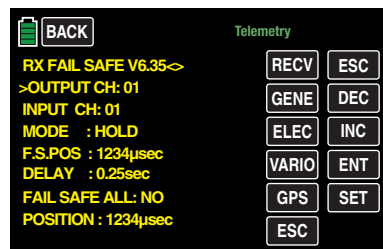
In the bottom "POSITION" line, the current servo position is displayed for the selected OUTPUT CH, for example:



Touch the **SET** button at the bottom right of the display to switch the display from "SAVE" to "NO".

This saves the positions of all of the servos affected by these measures and simultaneously transfers them to the "F.S.Pos." line so that the receiver can access them in a malfunction.

You can now release the control elements of the transmitter.

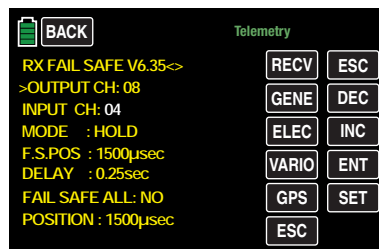
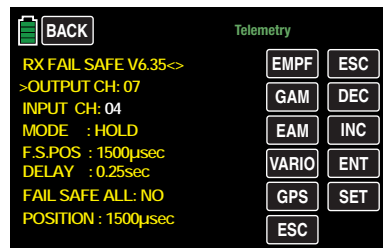
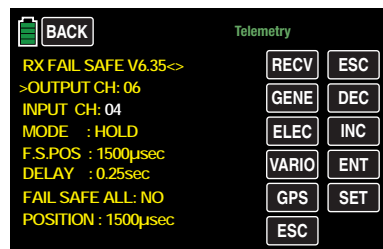


Turn off the transmitter and check the fail safe positions by checking the servo travel.

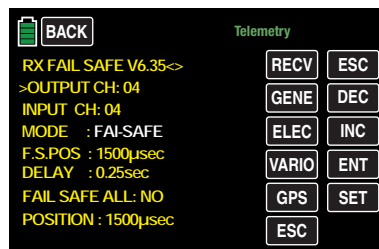
### "Fail safe" in combination with "Channel mapping"

To make sure that mapped servos react in the same way even in a malfunction, that is, servos that are controlled by common control channel (INPUT CH), the corresponding settings of the *INPUT CH* determine the behavior of mapped servos.

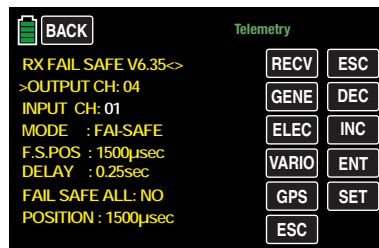
If for example servo connections 6, 7 and 8 of a receiver are mapped by assigning the same control channel "04" as the INPUT CH to OUTPUT CH (servo connections of the receiver) 06, 07 and 08...



... then INPUT CH 04 determines the fail safe behavior of these three servos connected to control channel 4 fully independent of the settings of the respective OUTPUT CH:



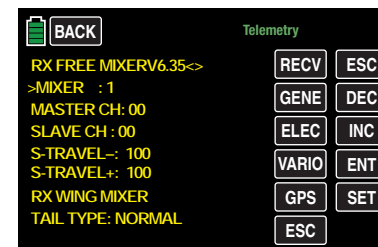
This is also true when INPUT CH 01 is used for mapping:



In this case, servo connection 04 reacts according to the fail safe settings of CH 01.

The reaction time or delay set in the "DELAY" line contrastingly applies uniformly to all channels set to "FAI(L) SAFE".

## RX FREE MIXER



Value	Explanation	Possible settings
Vx.xx	Firmware version of the receiver	None
MIXER	Mixer selection	1 ... 5
MASTER CH	Signal source or source channel	0, 1 ... depending on the receiver
SLAVE CH	Target channel	0, 1 ... depending on the receiver
S-TRAVEL-	Mixing on the "-" side of the servo travel in percentage servo travel	0 ... 100 %
S-TRAVEL+	Mixing on the "+" side of the servo travel in percentage servo travel	0 ... 100 %
RX WING MIXER TAIL TYPE	Tail type	NORMAL, V-TAIL (V-LW) ELEVON (elevator/aileron mixer for delta and flying wing)

## MIXER

Up to five mixers can be programmed. In the "MIXER" line, select one of mixers 1 ... 5.

The following settings in this display *only* relate to the mixers selected in the "MIXER" line.

### Notice

» If you have already programmed mixer functions in the "Wing Mix" or "Free mixers" menus of the transmitter, pay special attention to ensure that these mixers do not overlap with those in the "RX FREE MIXER" menu!

## MASTER CH ("from")

According to the same principles described in the section "[General information on programmable mixers](#)", the signal at MASTER CH (signal source or source channel) can be mixed with the SLAVE CH (target channel) to the adjustable amount. Select "00" if you do not require the mixer.

## SLAVE CH ("to")

The signal of the MASTER CH (signal source or source channel) is proportionately mixed with the SLAVE CH (target channel). The level of mixing is determined by the percentages entered in the "TRAVEL-" and "TRAVEL+" lines.

Select "00" if you do not require the mixer.

TRAVEL-/+ (level of mixing in %)

With the settings of these two lines, the percentage of mixing is specified in relation to the MASTER signal separately for both directions.

## RX WING MIXER TAIL TYPE (tail type)

### Notice

» The following model types are also available in the base menu of a model and should preferably be preset there. In this case, *always* leave the TAIL TYPE at NORMAL.

If you still want to use the mixers integrated in the receiver, you can then select the preset mixer functions for the corresponding model type:

- **NORMAL**

This setting corresponds to the classic airplane type with a rear tail and separate rudder and elevator. No mixing function is required for this model type.

- **V-TAIL**

With this model type, the control functions of the elevator and rudder are linked to each other so that each of the two tail flaps assumes the elevator and rudder function controlled by a separate servo.

The servos are normally connected to the receiver as follows:

OUTPUT CH 3: V-tail servo, left  
OUTPUT CH 4: V-tail servo, right

If the rudder travel is not as desired, observe the instructions on page 33.

- **ELEVON (delta/flying wing models)**

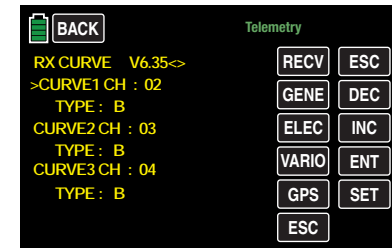
The servos connected to outputs 2 and 3 assume an aileron and elevator function. The servos are normally connected to the receiver as follows:

OUTPUT CH 2: Aileron/elevator, left  
OUTPUT CH 3: Aileron/elevator, right

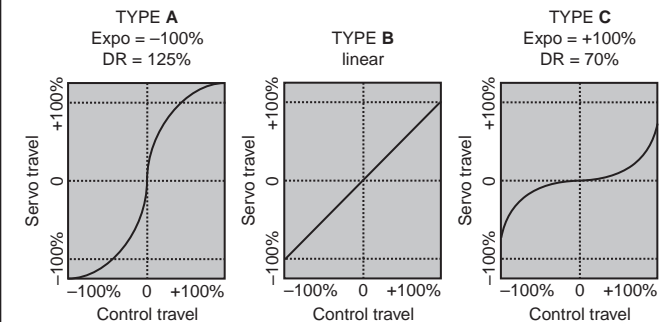
If the rudder travel is not as desired, observe these [Notices](#).

## RX CURVE

With the RX CURVE function, you can administer control characteristics for up to three servos:



Value	Explanation	Possible settings
Vx.xx	Firmware version of the receiver	None
CURVE 1, 2 or 3 CH	Channel assignment of the respective curve setting	1 ... depending on the receiver
TYPE	Curve type	A, B, C see figure



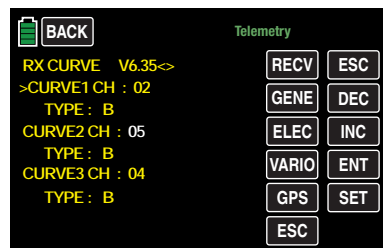
Generally, a nonlinear control function is used for the aileron (channel 2), elevator (channel 3) and rudder (channel 4). These channel settings also correspond to the factory setting.

### Note



This assignment is only relevant when you have not specified "V-wing" or "2ElevSv 3+8" for your tail type, or "2AILE" or "2/4AILE 2/4FLAP" for your flaps in the transmitter. Otherwise, the control function 3 (elevator) is split to control channels 3 + 8 in the transmitter, and control functions 2 (aileron) is split to control channels 2 + 5 for the left and right aileron. In these two cases, the corresponding control channels (INPUT CH) of the receiver would be channels 03 + 08 and 02 + 05.

If you have for example specified "2AILE" in the transmitter and wish to use the RX CURVE option instead of the individually settable menu "Dual rate, Expo", page or , of mz-24 HoTT Pro transmitter, then set 2 curves. Otherwise, the left and right aileron have different control characteristics:



### CURVE 1, 2 or 3 CH

Select the desired control channel (INPUT CH).

The following setting in TYPE only affects the selected control channel.

### TYPE

Select the servo curve:

**A** EXP = -100 % and D/R = 125%

The servo reacts strongly to control stick movement around the neutral position. The curve becomes flatter as the rudder deflection increases to about 125% of the servo travel.

### B Linear setting.

The Servo follows the control stick travel in a linear manner in case of not changed servo travel.

### C EXP = +100 % and D/R = 70%

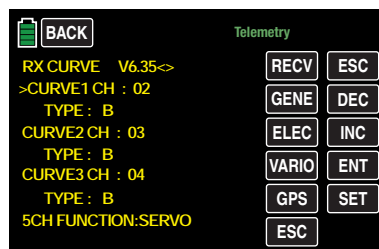
The servo reacts weakly to control stick movement around the neutral position. The curve becomes steeper as the rudder deflection reduces to about 70% of the servo travel.

### Notice



The control characteristics that are programmed here affect the mapped receiver outputs.

### 5CH FUNCTION: "SERVO" or "SENSOR"

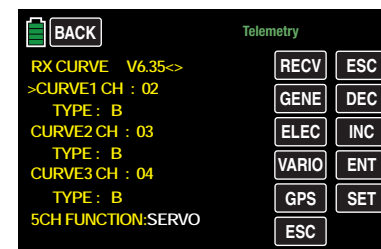


With certain receivers, a certain servo connection is designed to be switchable instead of an independent telemetry connection. For example, with the GR-12 receiver a telemetry sensor can also be connected to servo connection 5 identified with an additional "T" ...

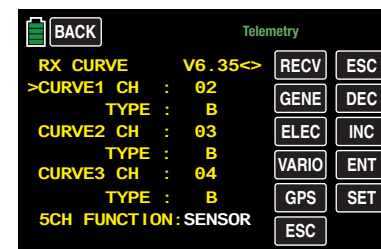


... alternatively not only the adapter cable (No. 7168.6S) for updating the receiver but also a telemetry can be used.

In order for the connected device to be correctly identified by the receiver, servo connection 5 MUST be switched from "SERVO" to "SENSOR" and vice versa. Use the **INC** button to move the ">" icon at the left edge in front of the last line, and touch the **SET** button at the bottom right of the display:



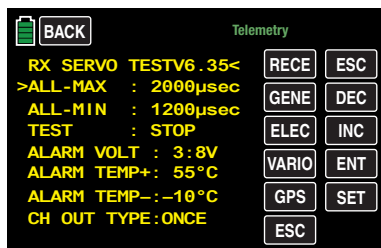
Use the **INC** or **DEC** button to select the alternative setting "SENSOR":



Touch the **SET** button again at the bottom right of the display to finalize your selection and, if desired, return to the main display of the transmitter by repeatedly pressing the **BACK** button at the top left of the display.

## RX SERVO TEST

With the RX SERVO TEST function, you can test the servos connected to the currently active receiver:



Value	Explanation	Possible settings
Vx.xx	Firmware version of the receiver	None
ALL-MAX	Servo travel on the "+" side for all servo outputs for the servo test	1500 ... 2000 µs
ALL-MIN	Servo travel on the "-" side for all servo outputs for the servo test	1500 ... 1000 µs
TEST	Test procedure	START / STOP
ALARM VOLT	Alarm threshold for the receiver's low voltage warning	3.0 ... 7.5V factory setting: 3.8 V
ALARM TEMP+	Alarm threshold when the receiver temperature is too high	50 ... 80°C factory setting: 55°C

ALARM TEMP-	Alarm threshold when the receiver temperature is too low	-20 ... +10°C factory setting: -10°C
CH OUTPUT TYPE	Channel sequence or type of aggregate symbol	ONCE, SAME, SUMI, SUMO and SUMD

**ALL-MAX** (servo travel on the "+" side)

In this line, set the maximum servo travel on the plus side of the control travel for the servo test.

2000 µs corresponds to a full deflection on the "+" side of the servo travel, and 1500 µs corresponds to the neutral position.

Make sure that the servos do not strike anything during the test routine.

**ALL-MIN** (servo travel on the "-" side)

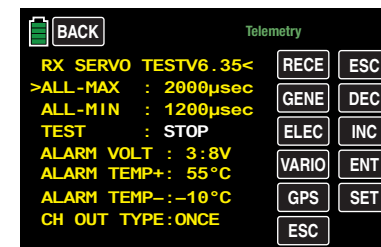
In this line, set the maximum servo travel on the minus side of the control travel for the servo test.

1000 µs corresponds to a full deflection on the "-" side of the servo travel, and 1500 µs corresponds to the neutral position.

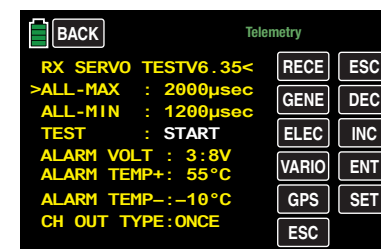
Make sure that the servos do not strike anything during the test routine.

**TEST** (start/stop)

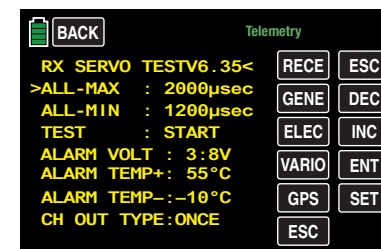
In this line, briefly touch the **SET** button at the bottom right of the display to start and stop the servo test integrated in the receiver.



Use the **INC** or **DEC** button to select "START"...



... and touch the **SET** button again at the bottom right of the display to start the test. The entry field returns to normal:

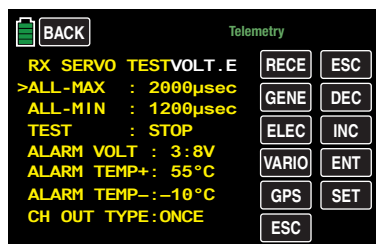


To stop the servo test, reactivate the entry field as described above, select "STOP", and confirm by touching the **SET** button at the bottom right.

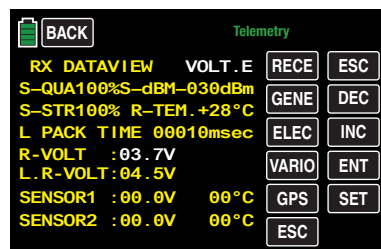
**ALARM VOLT** (receiver low voltage warning)

Through the "ALARM VOLT" the operating voltage of the receiver is monitored. The alarm threshold can be set between 3,0 and 7,5 Volt in 0,1 Volt steps.

When the voltage falls below the set alarm threshold, a warning tone sounds, and "VOLTE" appears in white at the top right in all "RX..." displays.



In the "RX DATAVIEW" display, the parameter "R-VOLT" is displayed in white.



### ALARM TEMP +/- (receiver temperature monitoring)

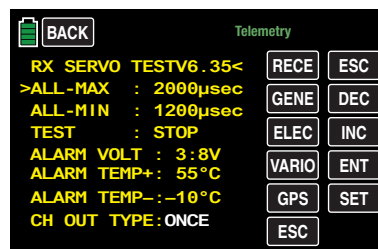
These two options monitor the receiver temperature. You can program a bottom threshold "ALARM TEMP-" (-20 ... +10°C) and an upper threshold "ALARM TEMP+" (+50 ... +80°C). If the upper or lower thresholds are exceeded, a continuous warning tone sounds, and "TEMPE" appears in white at the top right in all receiver displays. On the display page "RX DATAVIEW", the parameter "R-TEM" is also displayed in red or white.

Make sure that the temperature of your receiver remains within the permissible range under all operating conditions (ideally between -10 and +55°C).

### CH OUTPUT TYPE (connection type)

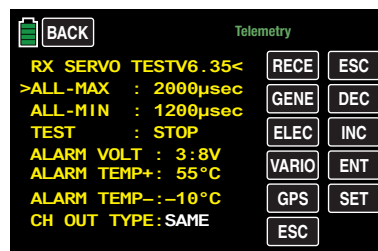
In this line, select the type of servo control or alternately the signal type of the aggregate signal output:

- ONCE



The servo connections of the receiver are actuated sequentially. Recommended for analog servos. With this setting, the servos are automatically operated at a cycle of 20 ms (30 ms for a 12 channel GR-24 receiver (No. **33512**)) no matter what is set or displayed in the "RX SERVO" display in the line "PERIOD".

- SAME



The servo connections of the receiver are actuated simultaneously in blocks. That is, the servos connected to connections 1 to 4 as well as 5 to 8 can be simultaneously supplied with their control signals with a GR-16 receiver (No. **33508**), and the servos connected to connections 1 to 4, 5 to 8 as well as 9 to 12 can be simultaneously supplied with their control signals with a GR-24 receiver (No. **33512**).

This is recommended for digital servos when several servos are used for a single function (such as an aileron) so that the servos are fully synchronized.

When exclusively digital servos are used, it is recommendable to set "10 ms" in the line "PERIOD" of the display "RX SERVO" to exploit the fast reaction of digital servos. When analogue servos or mixed operation is used, be sure to select "20 ms".

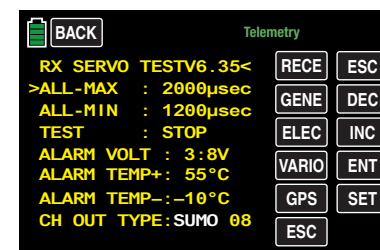
### Attention

When this setting is used, make sure that the receiver power supply is sufficiently large. Since four servos are always triggered simultaneously when "SAME" is selected, the power supply is subjected to a related load.

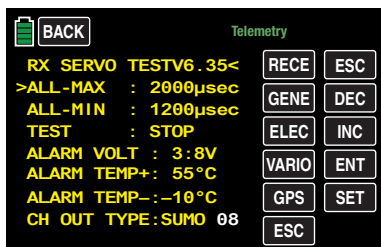
- SUMO (aggregate signal OUT)

A HoTT receiver configured as SUMO always generates an aggregate signal from the control signals of all its controls channels, and forwards this to servo connection 8 of the GR-16 (No. **33508**) and GR-24 receiver (No. **33512**).

With receivers that have a two-digit number to the right of "SUMO" in their display,...



... the active field switches to the right to channel selection by touching the **SET** button at the bottom right after "SUMO" is confirmed. With the selection, you determine the *highest* control channels within the SUMO signal.



You can confirm this setting by again touching the **SET** button at the bottom right, or use the **INC** or **DEC** buttons to select one of the other channels between 04 and 09 or 12 and confirm it with **SET**.

The sum signals of the channel 1 ... X will be generated in a 20ms cycle (in the GR-32 DUAL receiver, No. **33516**, 30ms) to the related output, also if on the "RX SERVO" display page in the "PERIOD" line 10ms has been set.

Primarily conceived for the satellite operation (described below) of two HoTT receivers, the aggregate signal that is generated by the receiver and defined as a SUMO can also be used to control a flybar system, providing that it has an appropriate input, or it can be used to control flight simulators by means of the adapter cable (No. **33310**).  
In ...

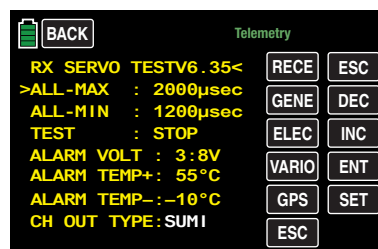
### Satellite mode

... two HoTT receivers are connected to each other by means of a 3 wire connecting cable (No. **33700.1** (300mm) or **33700.2** (100mm)) to servo connections for specific receiver types. Type GR-16 receivers (No. **33508**) and GR-24 (No. **33512**) are for example connected to each other at servo output 8.

Type GR-32 DUAL receivers (No. **33516**) contrastingly have their own aggregate signal connection at the bottom left identified with "- + S". Further information can be found on the Internet at [www.graupner.de](http://www.graupner.de).

By means of this connection, all of the channels selected in the "CH OUT TYPE" line of the HoTT receiver configured as a SUMO and identified as the satellite receiver are continuously transferred to the second HoTT receiver (the main receiver) that needs to be programmed as the ...

- SUMI (aggregate signal IN)  
The signal therefore always runs in the direction of the SUMI:



When reception fails, the receiver defined as SUMI only uses the aggregate signal coming from SUMO if at least one channel is programmed as fail safe in the SUMI.

If the reception fails of the receiver programmed as the SUMO satellite receiver, the servo(s) connected to this receiver assume the fail safe positions that are programmed in the satellite receiver independent of the main receiver.

If the reception fails for both receivers *at the same time*, then the fail safe settings of the SUMO are assumed in the receiver software current when these instructions were revised.

### Notice



In individual cases, interactions may occur. It is therefore strongly recommended that relevant tests be performed before starting the model.

This receiver configuration is recommendable when for example one of the two receivers is installed in the model at a location with poor reception, or nozzles, carbon fiber material, etc. may weaken the reception depending on the flight direction is which can restrict the range.

The most important control function should therefore be associated with the main receiver programmed as SUMI so that, in case of a malfunction, the model can still be controlled if the SUMO satellite receiver no longer receives a good signal. Connect telemetry sensors with the SUMO satellite receiver and then select this receiver in the line "RECEIVER SELECT" of the "Telemetry" menu (RX 1 ... 2), see "Notices" at the begin of the "Telemetry" section.

Each receiver should be connected to the common power supply with its own cable. With receivers subject to high current load, it may even be useful to connect them to the common power supply with two cables.

If in contrast each of the two receivers are connected to their own power supply, the middle cable should be removed from one of the two plugs of the satellite cable (see figure bottom left).

If you wish to do additional programming such as fail safe settings, disconnect the 3-pin satellite connection between the two receivers, and only turn on the relevant receiver. You may also have to change the binding sequence.

- **SUMD** (digital sum signal)

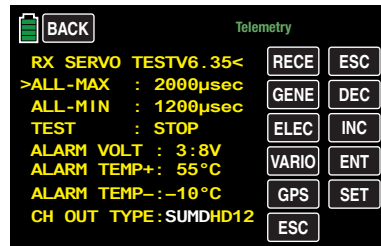
A HoTT receiver configured as SUMD as described earlier always generates a digital aggregate signal from the control signals of a selectable number of its controls channels, see more about on in the SUMO section, and forwards this to servo connection 8 in the GR-16 and GR-24 receivers.

At the time this manual was revised, this type of signal was being used by several of the latest electronic applications of flybarless systems, power supplies, etc.

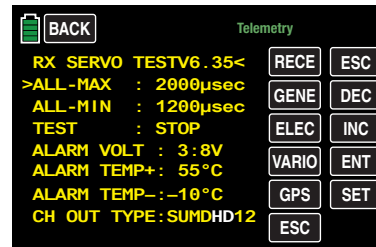
**Notice**



You therefore need to consult your setting instructions for the attached device since otherwise you may make it impossible to fly the model.



After confirming "SUMD" by touching the **SET** button at the bottom right in the display, the active value field switches to the right for selecting one of the three possible receiver reactions in case of a loss of reception (fail safe):



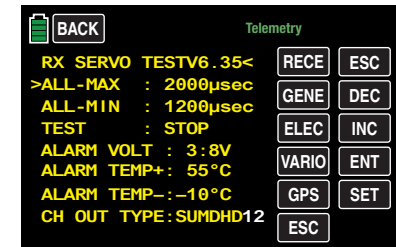
- **HD** ("hold")  
The last signals recognized as being correct are retained at the output (hold).
- **FS** (fail safe)  
The signals of previously-saved fail safe positions are provided at the output (see the section "**Fail Safe**").
- **OF** (OFF)  
No signals are supplied for the duration of the loss of reception.

**Attention**



Analogue servos and many digital servos no longer experience resistance to the ongoing control pressure after control pulses stop and are moved out of their position at greater or lesser speed.

Finally, switch the active field to channel selection by touching the **SET** button at the bottom right. With the selection, you determine the *highest* transmitter channels within the SUMD signal.



**Tip**

Normally, a value greater than "12" is not required by potentially connectible devices.



## SETTINGS, DISPLAYS for sensor(s)

If one or more sensors are connected to a receiver and a telemetry link exists with this receiver, you can retrieve the display of any sensor and change its settings after the display "RX SERVO TEST" described above.

### Tip

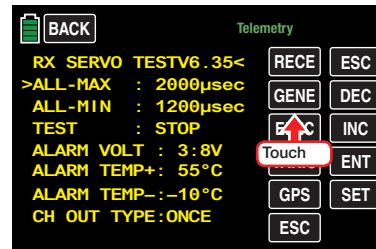
Transmitters of the **mz-24** HoTT Pro type automatically recognize any sensor or sensors connected to a switched on receiver or sensors that have been connected after the power supply connection.

If you have connected at least one sensor to your telemetry receiver and it has firmware from the same Vx firmware package as your receiver, you can switch directly between the individual devices.

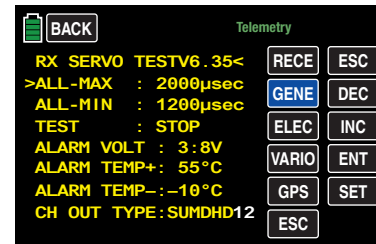
- The abbreviations on the selection buttons stand for the following:

<b>RECV</b>	= Receiver
<b>GAM</b>	= General air module
<b>EAM</b>	= Electric air module
<b>VARIO</b>	= Vario module
<b>GPS</b>	= GPS module
<b>ESC</b>	= Electronic speed controller

You can switch between the displays of the automatically activated sensors by touching a red selection button, for example:



The color of the field switches to blue, and briefly afterward, an angle bracket (>) appears, providing that the sensor was actually recognized by the receiver after this last one has been switched on, for example:

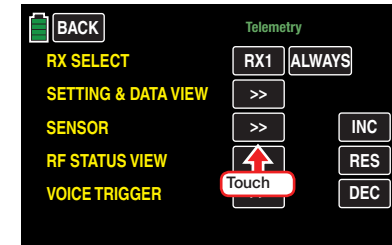


Press the **ENT** button at the bottom right of the display of the selected sensor, and check or change its settings as described in the instructions that came with the sensor.

## SENSOR

Display of active/inactive sensors

Touch the corresponding button ...

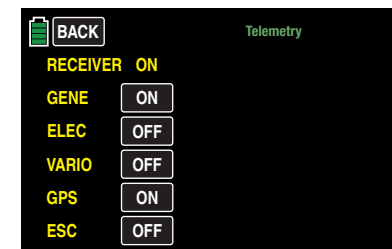


... to open the selected sub-menu.

### Notice

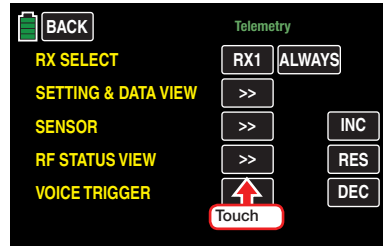
With transmitters of the type **mz-24** HoTT Pro, any sensors that are connected to the receiver are automatically recognized and activated when the power supply is turned on.

Active or inactive sensors are automatically labeled with **ON** or **OFF** in this sub-menu provided that a telemetry link exists. Manual sensor selection is then unnecessary and impossible, for example:

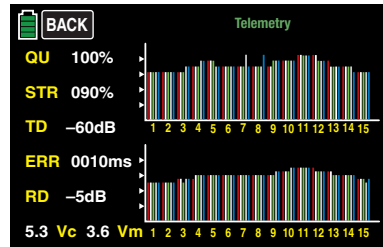


# Display of RF status

Touch the corresponding button ...



... to open the selected sub-menu. This visualizes the quality of the connection between transmitter and receiver:



Top row: Level of channels 1 ... 75 coming from the receiver of the 2.4 GHz band in dBm at the transmitter.

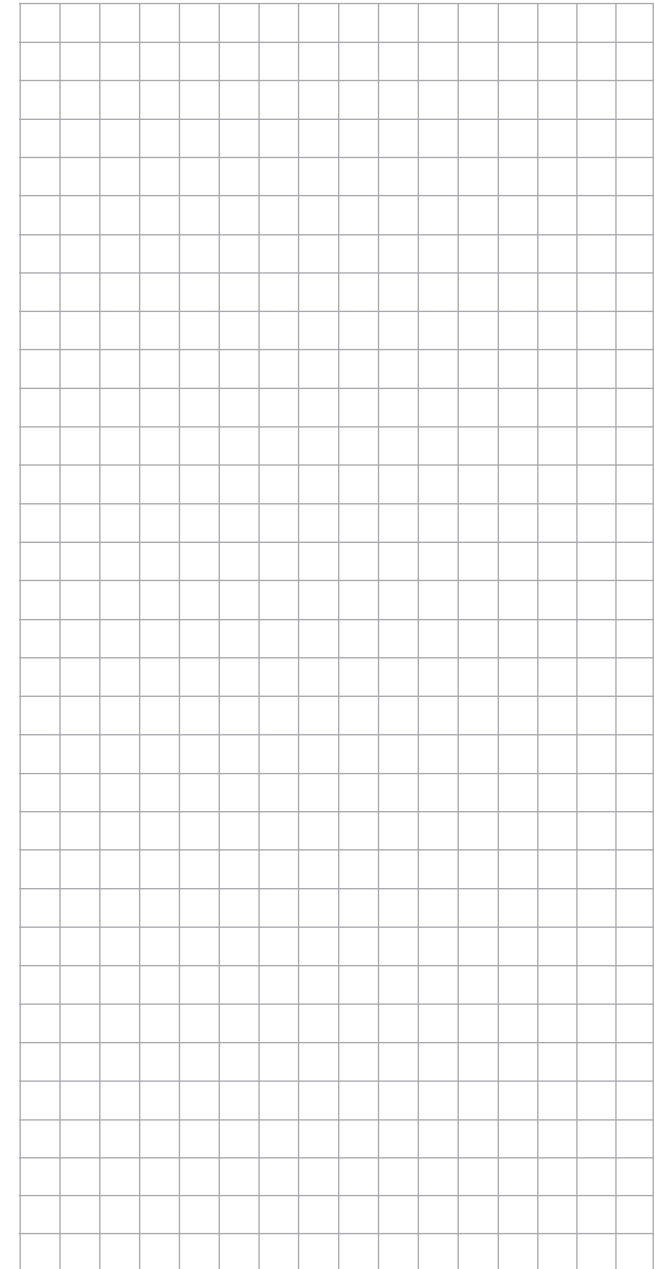
Bottom row: Level of channels 1 ... 75 coming from the transmitter of the 2.4 GHz band in dBm at the receiver.

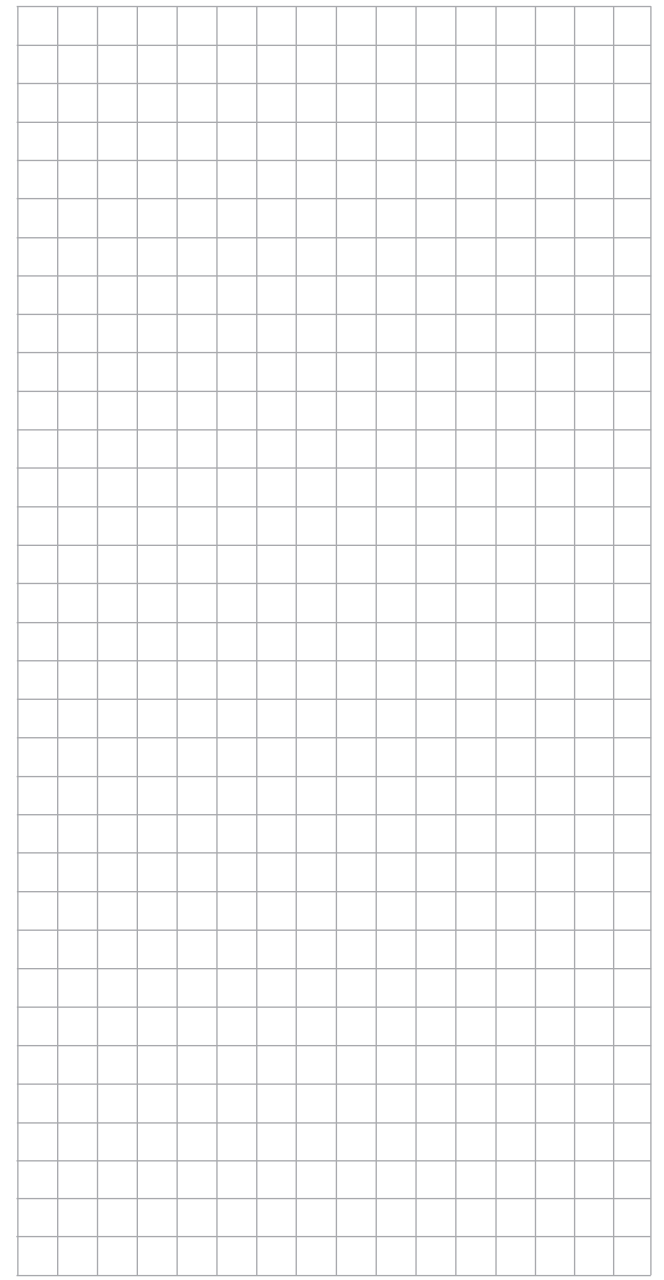
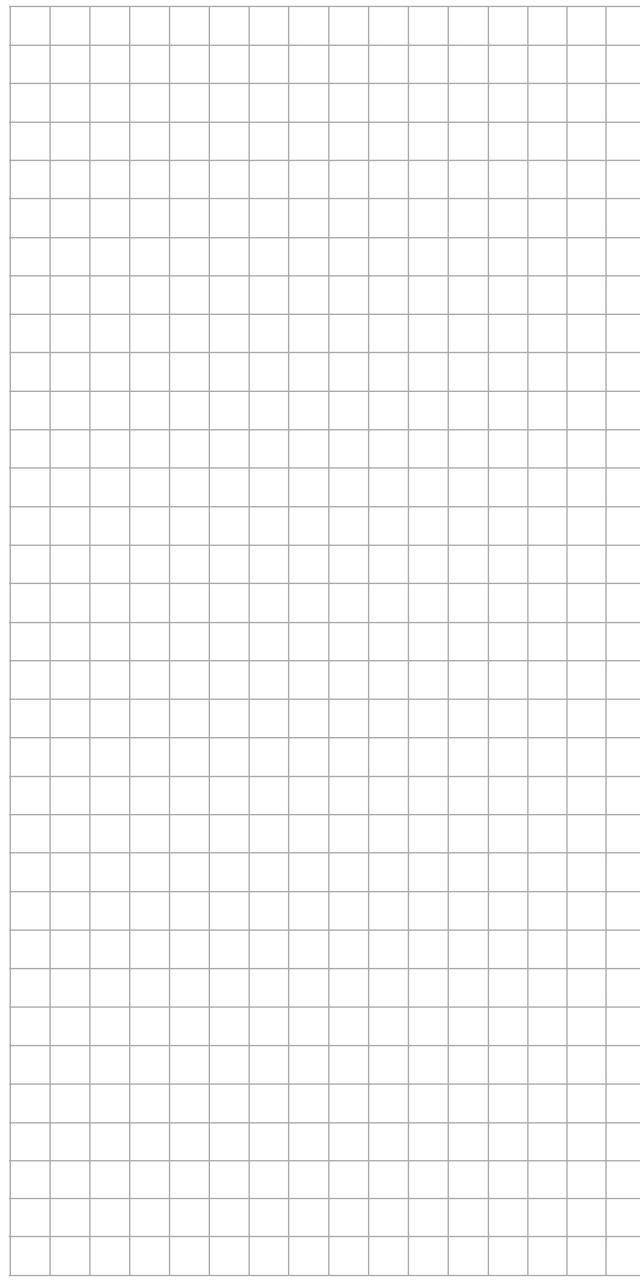
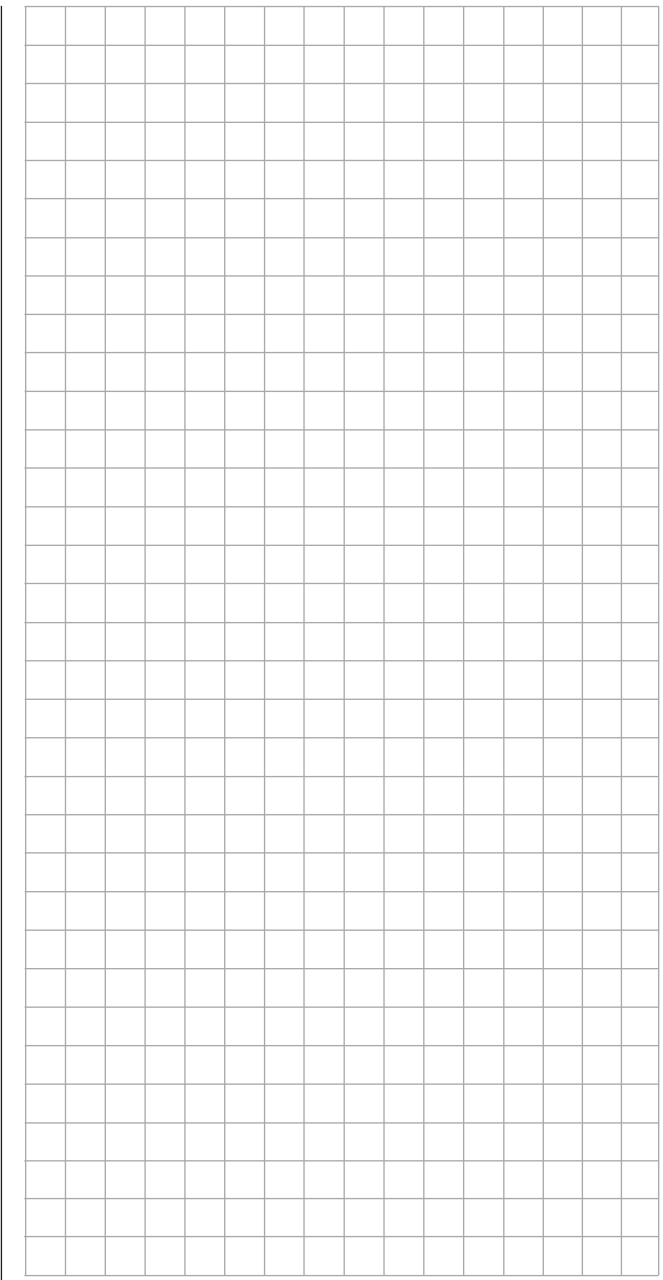
### Tips

- The height of the bar is a measure of the reception level expressed as logarithmic values with the unit dBm (1 mW = 0 dBm).
- 0 dBm corresponds to the two baselines in the above graph. Consequently, the level is poorer the higher the bar and vice versa (see also "S-dBm (reception level)").

In addition to the graphic display of the reception level, additional numeric information is provided to the left. The abbreviations have the following meaning:

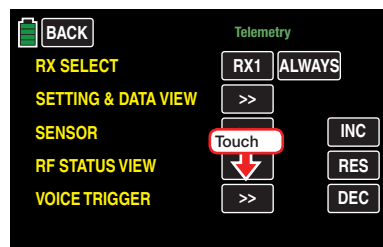
Value	Explanation
QU	Quality expressed as a percentage of the signal packages from the receiver arriving at the transmitter
STR	Quality expressed as a percentage of the signal packages from the transmitter arriving at the receiver
TD	Level in dBm expressed as the percentage of the receiver signal arriving at the transmitter
ERR	Shows the longest time in increments of 10 ms in which data packages were lost when transmitting from the transmitter to receiver
RD	Level in dBm expressed as the percentage of the transmitter signal arriving at the receiver
Vc	Current operating voltage of the receiver
Vm	"L.R-VOLT" shows the lowest operating voltage of the receiver since the last time the receiver was turned on



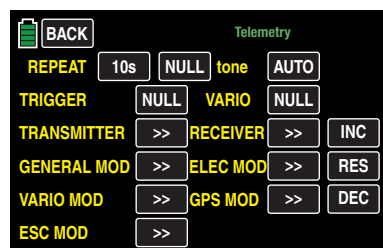


# VOICE TRIGGER

Touch the corresponding button ...

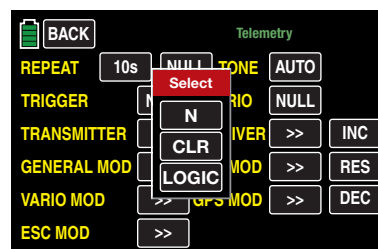
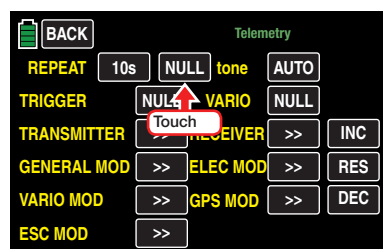


... to open the selected sub-menu:



## REPEAT

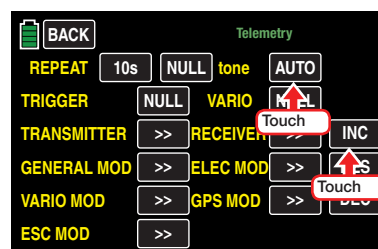
To be able to start the audio reproduction, at least in the "REPEAT" line a switch must be assigned. Follow the procedure described in section [Control and switch assignment](#):



As long as the selected switch is active, the last reproduced message will be repeated in the period which has been set on the left side of the switch

## TONE (module select)

If the transmitter recognizes many Vario sensors, for example because both a General Electric and a GPS module are installed in the model and connected to the receiver, after tapping on the value field it is possible to select, through the **+** or **-** buttons, the desired vario announce.

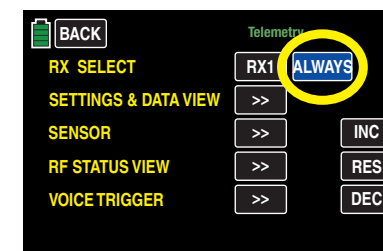


The following selections are available: VARIO, GAM, EAM, GPS so as AUTO. (In the AUTO position the sensors order will be selected as in the aforementioned list.)

## Tips

- To be able to recall also the vario tones, you need to assign a switch in the following "VARIO" value field.

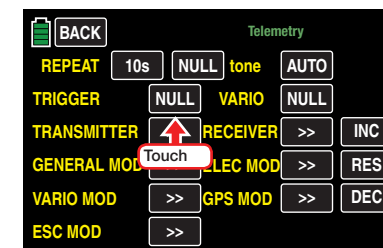
- As soon as the transmitter and/or the receiver have been switched on, the system starts the research of the connected sensors. A conversion in the value field **V-TON** is only possible after the 30 seconds which are normally required to complete the research. If instead of **ALWAYS** you have selected another value in the higher part of the "RX SELECT" line ...



... as for example **4x** or **8x**, then the process will take longer.

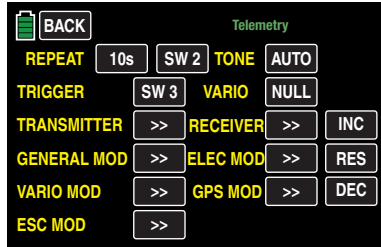
## TRIGGER (NEXT ANNOUNCE)

- manual**  
With a switch assigned to this line, preferably one function of the two pushbuttons S2 or S8, you incrementally switch in a loop between the options (described below) "TRANSMITTER", "RECEIVER", and voice triggers selected under "Sensors". The switch assignment is performed as described in the ["Control and switch assignment"](#) section:



- **automatic sequential**

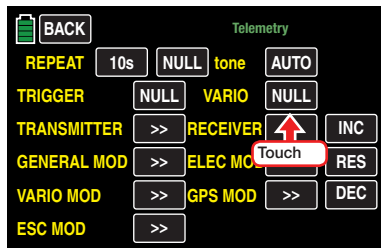
As long as the switches assigned to the line "REPEAT" and "TRIGGER" are switched on, ...



... all the announces included in this menu and in all of its sub-menus, which have been activated, will be repeated within the interval selected in the line "REPEAT".

### VARIO

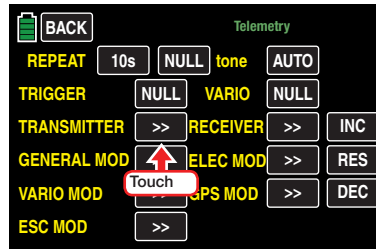
When the line "VARIO" is active in the sub-menu "SENSOR" (**ON**), you can use one of the switches assigned to this line to retrieve vario-specific voice triggers such as "slowly ascending/descending" through the transmitter's headphones independent of the other voice triggers, i.e., voice triggers triggered by a change in height.



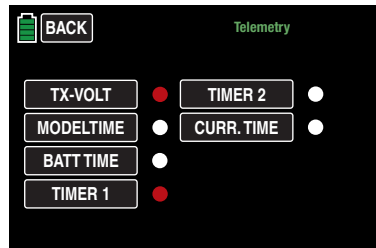
The switch assignment, follows the procedure described in section [Control and switch assignment](#).

### TRANSMITTER

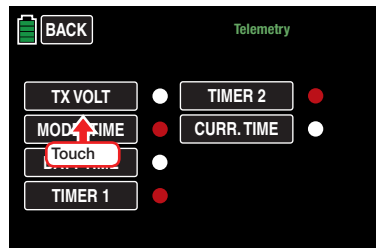
After tapping on the desired button ...



... to open the selected sub-menu:

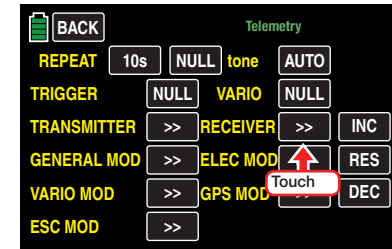


In this sub-menu you can activate and deactivate the voice triggers available for selection in the related value fields, for example:

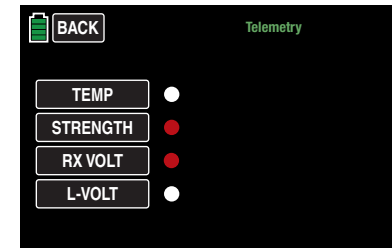


### RECEIVER

After tapping on the desired button ...



... to open the selected sub-menu:



In this sub-menu you can activate and deactivate the voice triggers available for selection in the related value fields.

### "Sensors"

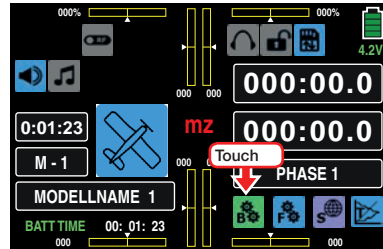
As soon as, after switch on, you receiver system and the sensors connected to the receiver have been recognized, specific displays related to the sensors can be selected and opened by tapping on the >> button. The voice triggers are selected as described above.



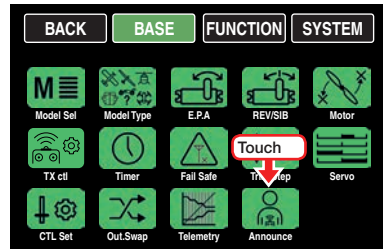
# Announce

Setting individual announces

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "B":



The display switches to the "green" base menu. Tap now on the menu point "ANNOUNCE":



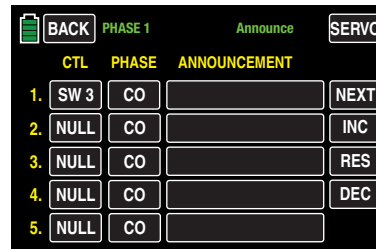
As standard in the memory of the **mz-24** HoTT Pro transmitter are saved, near the data for the different other announces of the transmitter, also the so called User-Voice-Files. These special announces, normally numbered from 285 to 294, can be replaced if required by individually created .wav files through the dedicated program point of the Firmware\_Upgrade\_grStudio. These, and if required also the lower numbered ones, voice files can be assigned in the menu point »**Announces**« as phase specific or phase crossing.

## Phase depending settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## "CTL" column

In this column you can assign a switch, as detailed described in the section "Control and switch assignment", for example:



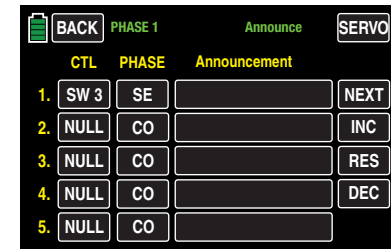
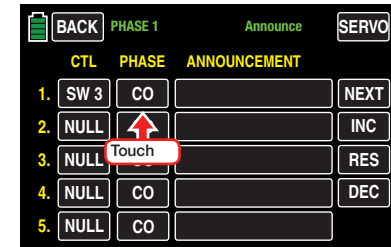
## Notices



Free switch choice is only possible until in the value field of the "PHASE" column is selected "CO". As soon as this value is changed to "SE", it will be possible to assign only the switches which have been assigned to NO phase to this model memory in the "PHASE" menu. Otherwise there will be an error function.

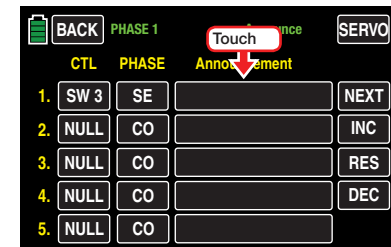
## "PHASE" column

In this column you can change between "CO" (global), which means model memory specific, and "SE" (phase), then phase specific announce. Tap on the value field of the value that you want to change, for example:

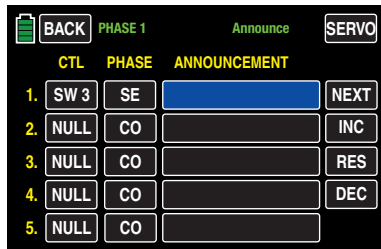


## "ANNOUNCEMENT" column

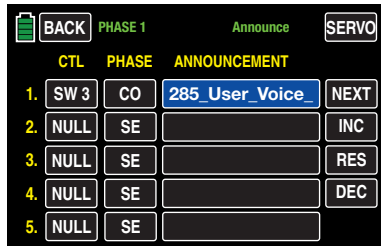
In this column you can activate, according to the switch position and to a phase, one of the "User-Voice" announces. Tap on the desired value field in the "ANNOUNCEMENT" line:



The color of the field switches from black to blue:



Select through the **+** or **-** buttons out on the right the desired voice file, for example:

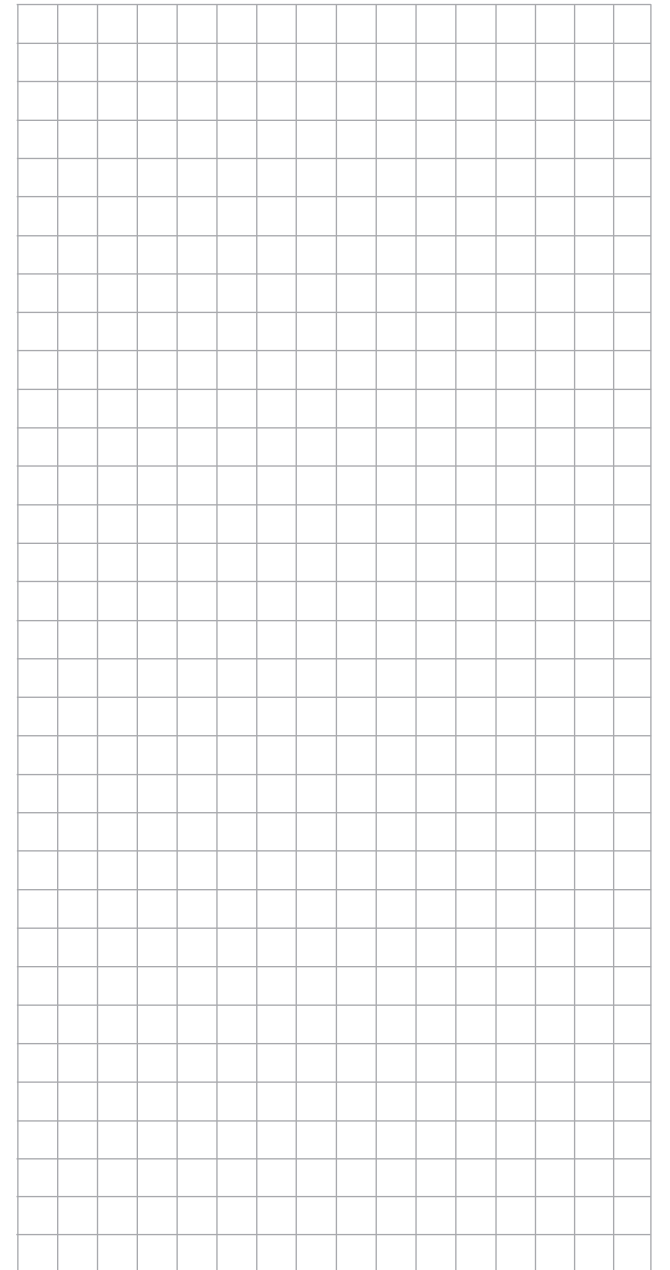
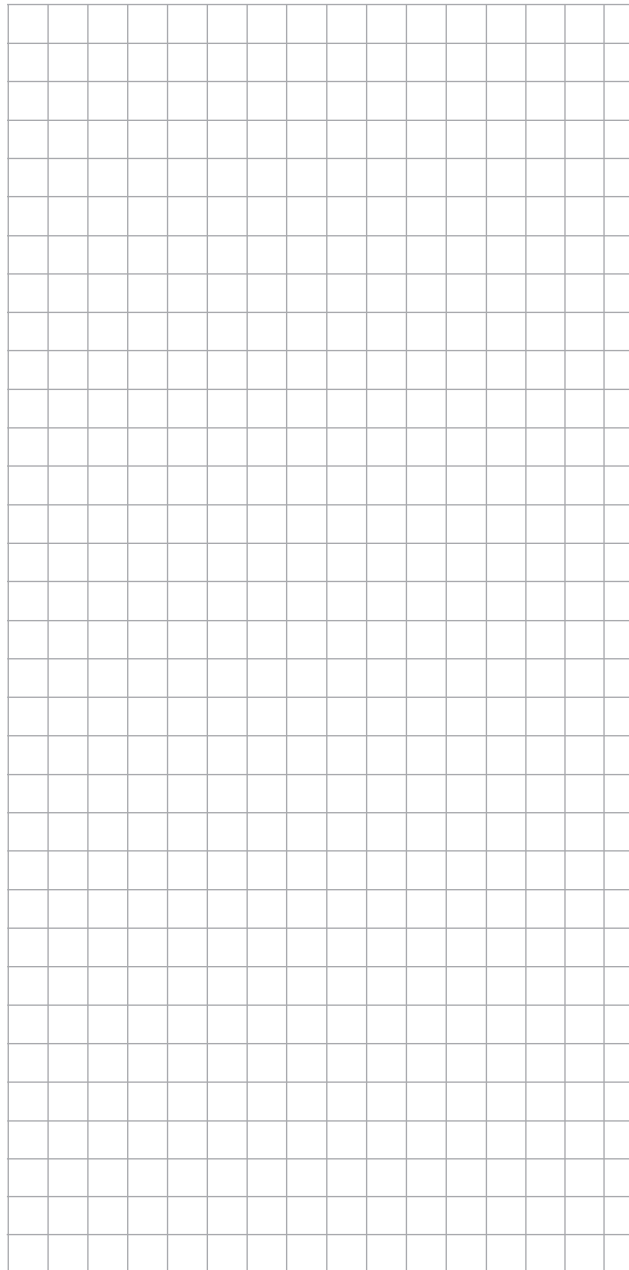


With each switch position and with other lines you can proceed in the same way.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

**Tip**

In order to be able to set the announces 6 ... 10, tap on **NEXT** [change page] in the upper right part of the display.

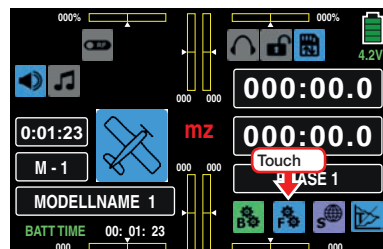


# Phase

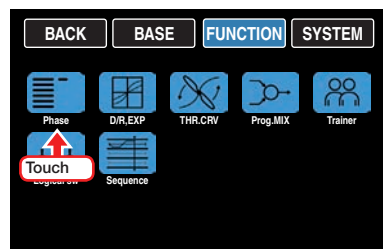


Setting up phases

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

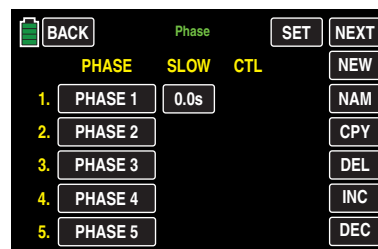
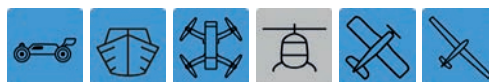


The display switches to the blue function menu. Touch the menu item "Phase".

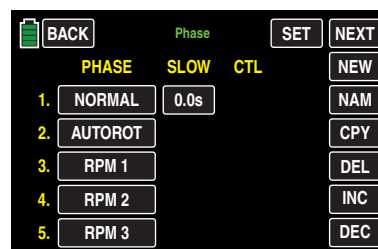


Within a model memory, the **mz-24** HoTT Pro transmitter make's it possible to program up to 6 different settings for different flight states, normally termed Phases, in the corresponding menus. Recognizable on the top left side of the display in green color is displayed the phase name in these sub-menus. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". Setting up other phases for the actually active model starts in this menu item by assigning the individual phases a name and a time for smoothly switching to the respective phase.

The assignment sequence of links 1 to a maximum of 6 is irrelevant and can have gaps.



Basically the same is for the similarly named sub-menu of the model type "helicopter", in which are included the same single phases with other phase names:

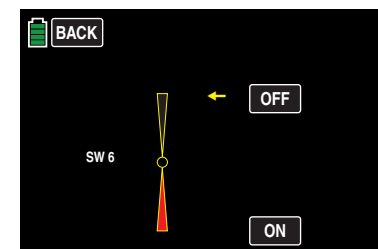


Nevertheless, always start with "PHASE 1" of the "NORMAL" link which is always active when no Phase switch is set, or no Phase has been assigned to a specific switch combinations.

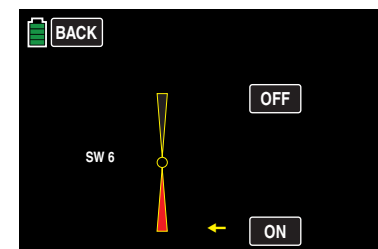
Assigning or leaving the Phase name "NORMAL" for "Phase 1" could therefore be recommendable. The names themselves do not have any technical relevance to the program and only serve to visually identify the phase that has been turned on and are therefore displayed in all phase-dependent menus as well as the transmitter's main display.

Furthermore, it should be noted that the flight phases have priority, which should be taken into account, in particular, in the allocation of individual switches. The underlying scheme can be described as follows:

- If all flight phase switches, if any, are open, that is, in a position defined as "OFF", the flight phase "Normal" is active:



- If only one switch is closed, that is, in a position defined as "ON", then the flight phase that has been assigned to the currently closed switch is active:



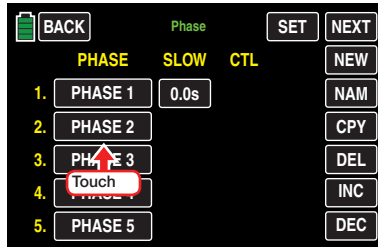
If two or more switches are closed, the flight phase with the lower phase number is active.



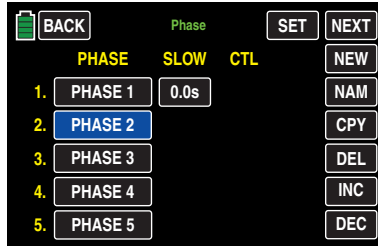
## Setting up phases

- **"PHASE" column**

As long as the actual settings belong to Phases, they are referred to "Phase 1". To set up the first real phase, touch the desired value field in the "PHASE" column such as "PHASE 2" (or higher):



The color of the field switches from black to blue:

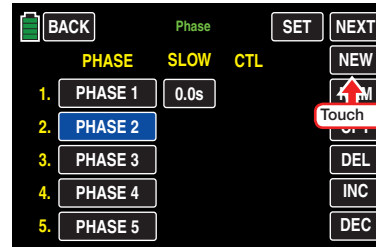


### Tip

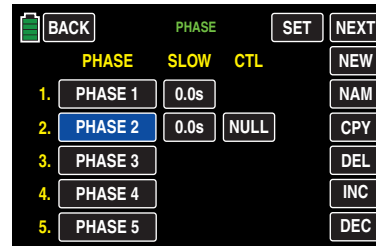
In order to set Phase 6, touch **NEXT** [change page] at the top right of the display.

- **NEW button**

The selected Phase is activated by tapping on the **NEW** button:



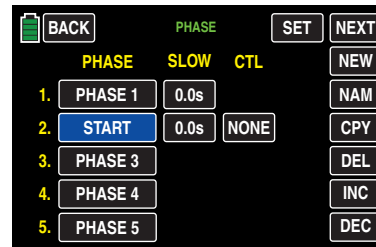
In the "SLOW" (delay) and "CTL" (control) column will appear other value fields:



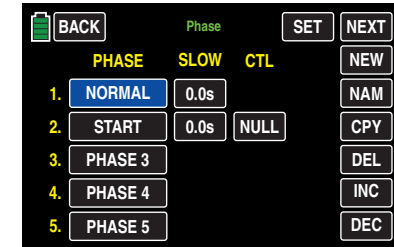
- **NAM button**

(Name)

You can describe or change to the existing Q.Link name by touching the **NAM** [Name] button at the right of the display with your finger or provided stylus as described in detail in the section "[Model name](#)", such as to the name "START":



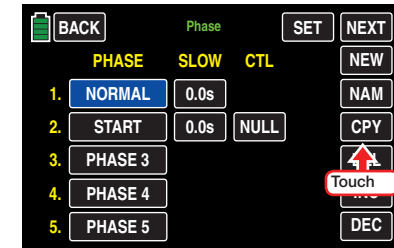
And at this moment you can assign the Phase 1 a name so that it will be possible to assign announcements, e.x. "NORMAL":



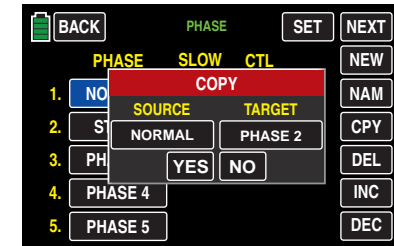
- **CPY button**

(Copy)

A blue, set-up phase that is therefore active can be copied to any another phase by touching the **CPY** [copy] button at the right of the display with your finger or the provided stylus, for example:

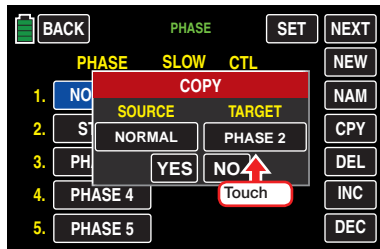


After you touch the **CPY** button, a window appears and asks you the reason for copying:

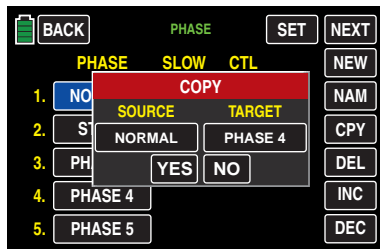


Touch **NO** to terminate the procedure.

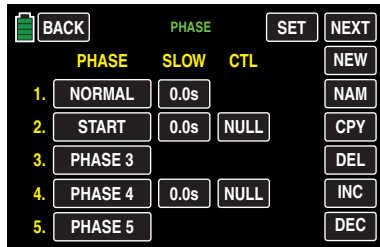
To change this setting, repeatedly touch the button below "TARGET",...



... until the desired phase appears, for example:



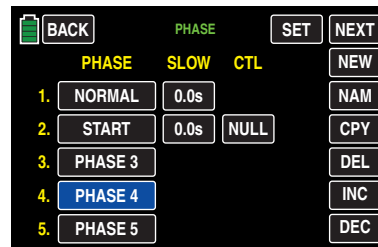
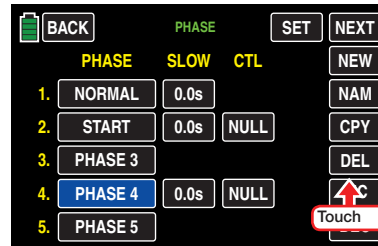
Touch **NO** to terminate the procedure. Touch **YES** to confirm the procedure: The source phase is copied to the selected target phase.



You can change the existing phase name as described in detail in the section "Model name" and/or adapt the transferred delay or transferred switch to your needs.

- **DEL** button (delete)

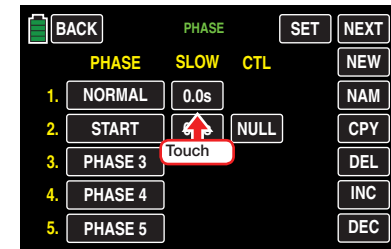
A blue, set-up phase that is therefore active can be deleted or deactivated by touching the **DEL** [delete] button at the right of the display with your finger or the provided stylus, for example:



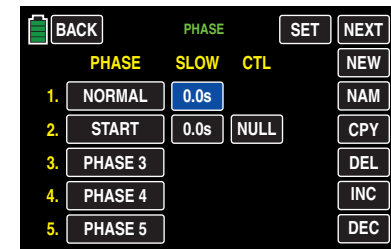
- **"SLOW"** column (delay)

To avoid abrupt changing of the control surfaces positions while switching between phases, it is advisable to program in this column a time for smooth transition to the respective phase. It is therefore also possible to set a different time for switching from a phase to (for example) phase 3 then for switching to phase 1.

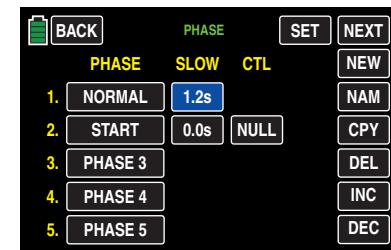
To change a switchover time, activate the value field "SLOW" for the desired phase by touching it, for example:



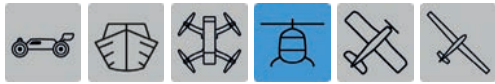
The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge. In the blue and hence active value field, you can select switchover times from 0 to 9.9 seconds, for example:



Use the same procedure with the other phase.



### Attention

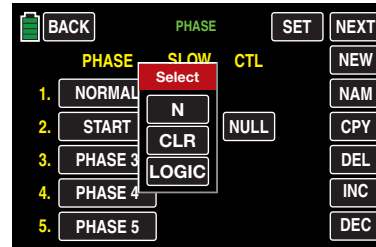
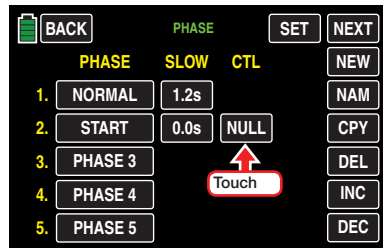
In the "AUTOROT" phase you should always leave the standard 0.0s switch time, so that in case of necessity you can switch to this phase without delay.



### Notice

The switchover time that is set here acts uniformly on all phase-specific settings as well as all mixers that are activated in the Mixer menu. The switchover between phase-dependent mixers then also proceeds smoothly.

- **"CTL" column** (Control/switch)  
In the previously described columns "phase" and "DELAY", you assigned names to Phase1 ... Phase6 and may have programmed switchover times; however switching between the phase is not yet possible. To enable this, touch the desired value field in the "CTL" column, for example...

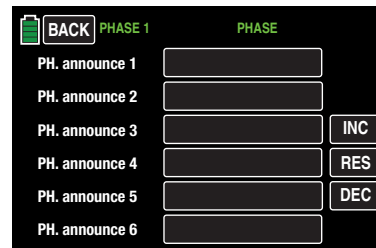


... and assign a switch or control switch as described in section [Control and switch assignment](#).

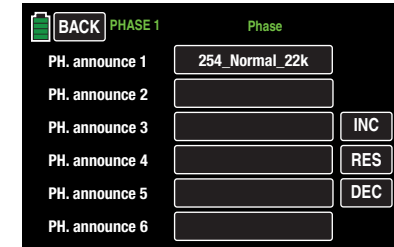
### Notices

- The phase 1, the "normal phase", is then always active when none of the assigned phase switch is on the "ON" position.
- To avoid function errors in no case a switch which has been used or is going to be used in the "Announce" menu has to be assigned as a phase switch.

- **SET button**  
Touch the **SET** button at the upper right of the display opens a sub-menu ...



... in which you can assign individual announcements related to the phases, as meanwhile usual, by tapping on the respective value field and select through the **+** or **-** buttons, for example:



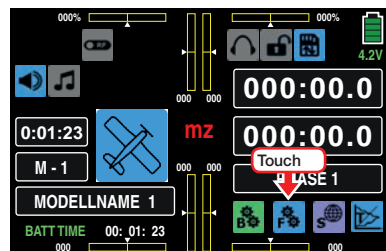
After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:

# D/R, EXP



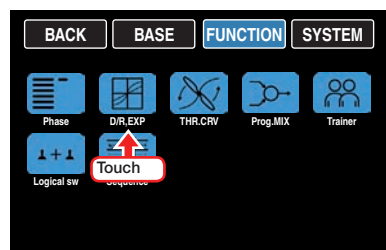
Influence of the control attitude of the control functions 2, 3 and 4

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

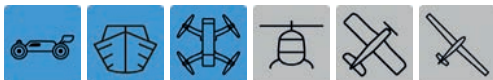


The display switches to the blue function menu. Touch the menu item

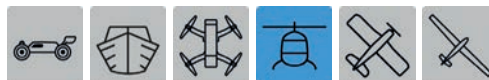
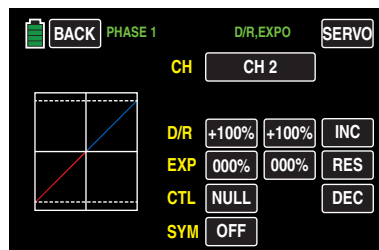
"D/R,EXP".



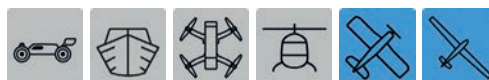
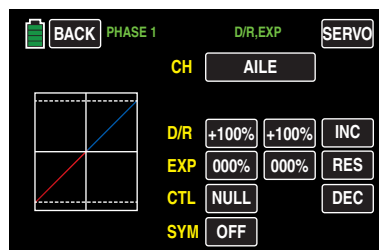
The dual rate/expo function allows you to switch or influence the control deflections and characteristics for the control functions of the control functions 2 ... 4 through switch according to the phases. By otherwise identical procedure the model specific differences are related to the labeling of the respective value field right near the yellow "CH":



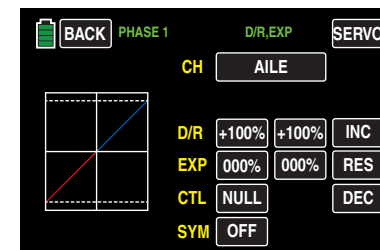
If the actually active model memory is configured as "car", "boat" or "copter", then the setting pages of this sub-menu are identified as "CH2", "CH3" and "CH4", for example:



If the actually active model memory is configured as "helicopter", then the setting pages of this sub-menu are identified as "ROLL", "NICK" and "TAIL" instead of "CH2", "CH3" and "CH4", for example:



If the actually active model memory is configured as "airplane" or "glider", then the setting pages of this sub-menu are identified as "AILE" (aileron), "ELEV" (elevator) and "RUDD" (rudder) instead of "CH2", "CH3" and "CH4", for example:



## Tip

An individual characteristic curve for control function 1 (Throttle/brake) can be set according to the model type in the "THR.CRV" or "C 1 curve" menu, by means of which 7 separately programmable points can be set.

**Dual Rate** acts, as the control setting in the sub-menu "CTL Set", directly on the related **Control function**, independently from the fact that the function is associated to a single servo or is actuated through a complex mixer or coupling function by many different servos.

The control deflections can be set for each switch position between 0 and 125% of the normal control travel.

**EXP** allows a more sensitive control of the model in the central position of the respective control function for values greater than 0% without having to do without the complete deflection in the end position of the control stick.

Conversely, the effect of the control around neutral position increases for values less than 0% and decreases in the direction of the full deflection. The progression can be set from -100% to +100%; 0% corresponds to the normal linear control characteristic.

There is another use for the most common rotary servos:

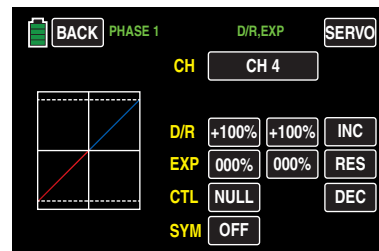
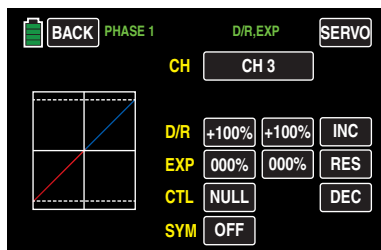
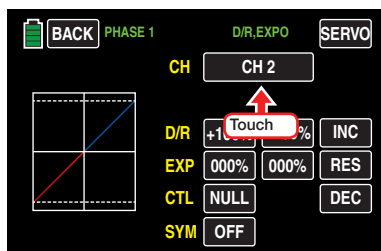
The actual rudder control is nonlinear since the rudder deflection from the servo linkage becomes increasingly smaller as the angle of rotation of the connecting pulley or cantilever increases. When EXP values are greater than 0%, this effect can be counteracted so that the angle of rotation increases disproportionately as the control stick deflection increases.

The EXP setting always acts directly on the corresponding control function independent of whether it affects the individual servo or several servos by means of complex mixing and coupling functions.

The D/R and EXP functions can be switched together by a single control if the control has been correspondingly assigned. It is therefore possible to link the dual rate and EXP functions which can be advantageous, especially with fast models.

In the display graphic the green vertical line moves together with the related control stick to allow a clearer evaluation of the curve characteristics related to the control travel.

Between the displays of individual setting options, alternatively touch the value field of the line "Ch" with a finger or the provided stylus:

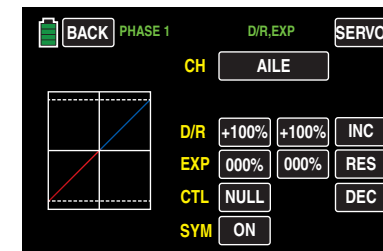
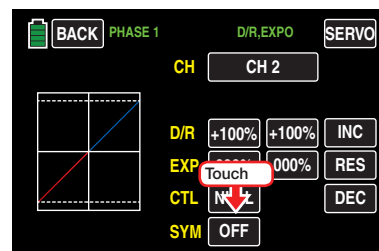


### Phase depending Dual-Rate/Expo settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

### SYM button

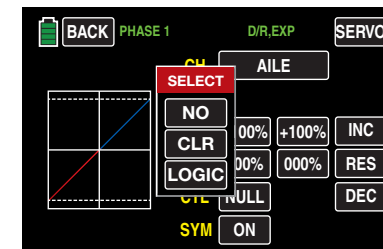
After switching the option "SYM" added to the bottom line from **OFF** to **ON**, a symmetrical, that is joint, setting of both control sides is possible.



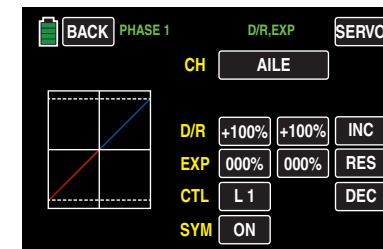
### D/R function

#### Setting symmetrical Dual Rate values

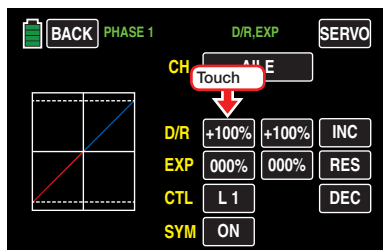
If you want to switch between two or three versions, assign a control in the line "Ctrl/sw" as described in the section "Control and switch assignment" ...



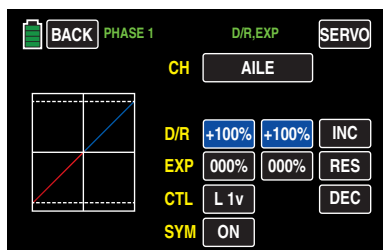
... a 2 or 3 way switch. If necessary also a control or logical switch, e.g.:



Tap in the line labeled with "D/R" on one of both value fields to set in conjunction a dual rate value, for example:



The button color of both value fields changes from black to blue:



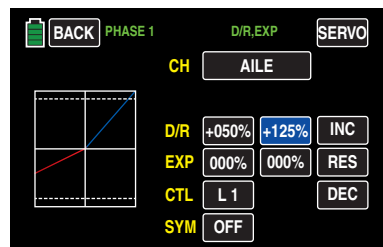
Set the desired value with the **+** or **-** button at the right edge.

The adjustment range is  $\pm 125\%$ .

### Setting asymmetrical Dual Rate values

Leave or set the value button right near "SYM" in the lowest line on **AUS**.

Touch the left value field in the "D/R" line to set a dual rate value to the minus side of the control travel, and/or on the right to set a dual rate value on the plus side of the control travel, for example:



The dual rate curve is simultaneously displayed in the graph.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### Attention

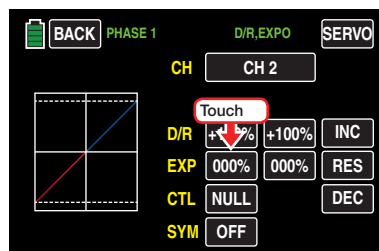


For safety reasons, the dual rate value should not fall below 20%.

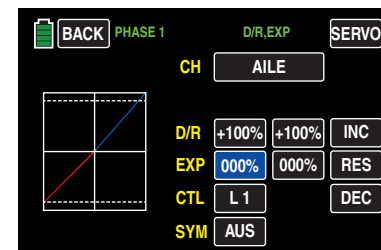
### Exponential function

Switch, as previously described in the Dual-Rate function, in the symmetrical setting of the Expo values the value field in the "SYM" line to **ON** and, once back to the setting symmetrical Expo values, tap on the "EXP" line in one of both value fields.

To set asymmetrical values set or leave the value field in the "SYM" line to **OFF** and tap on the left value field to set an Expo value to minus and/or on the right side to set an Expo value on the positive side of the control travels, for example:



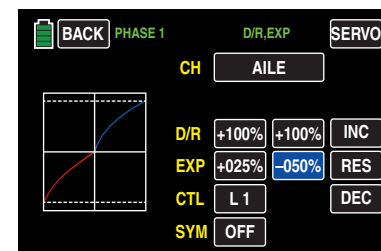
The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

The adjustment range is  $\pm 100\%$ .

Use the same procedure for a value on the plus side of the control travel, for example:



The exponential curve is simultaneously displayed in the graph.

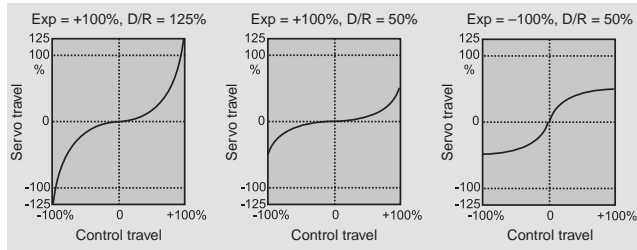
### Notice



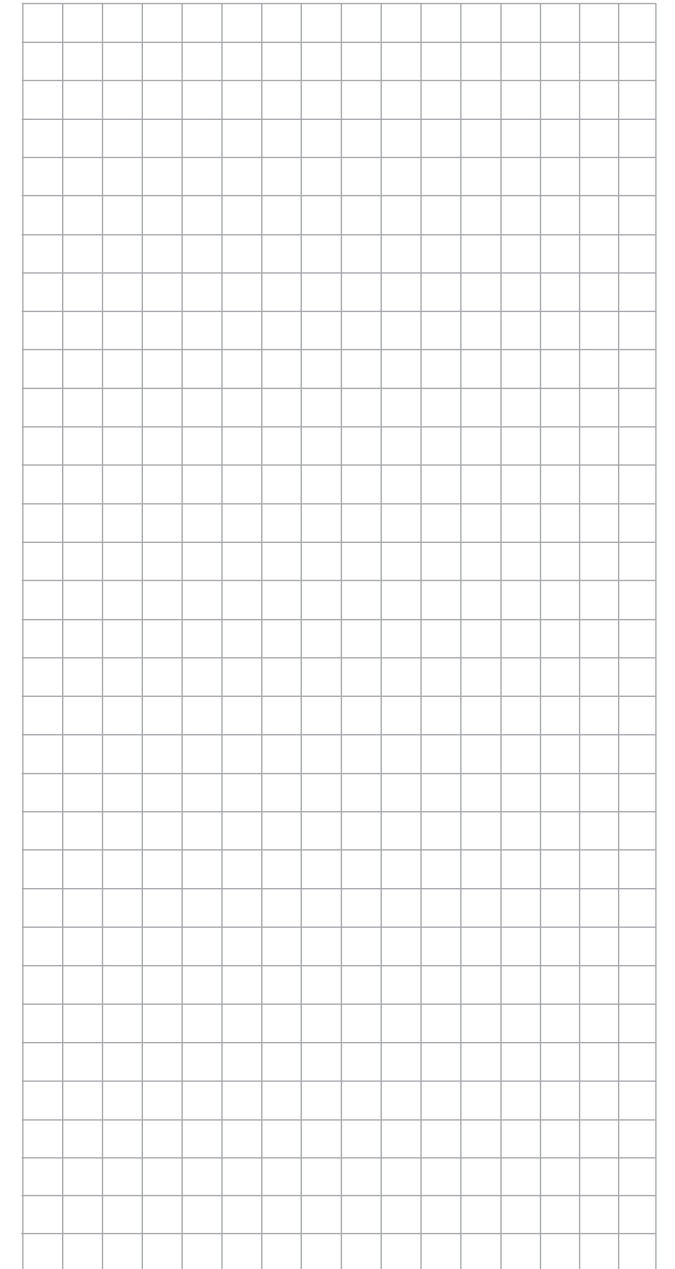
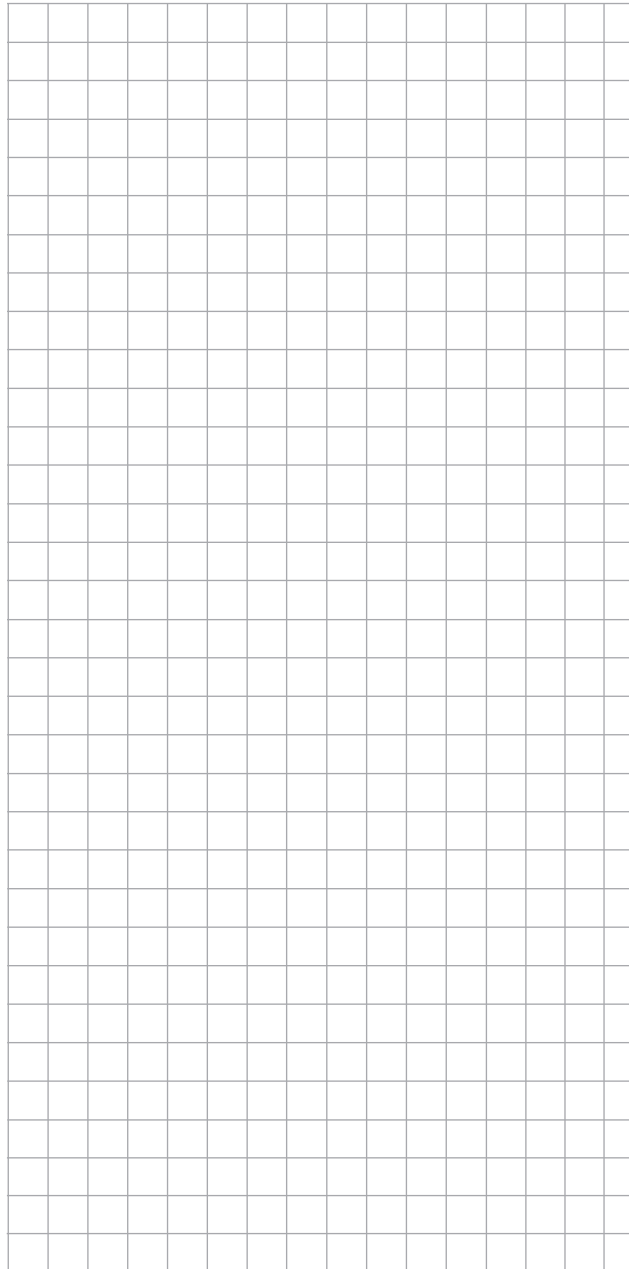
The curve shown here is only for demonstration purposes and does not represent an actual exponential curve.

### Combining dual rate and exponential values

If you enter a value for both the dual rate and exponential function, the effects of the two functions overlap as follows:



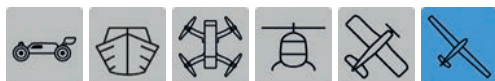
After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.



# THR.CR.V

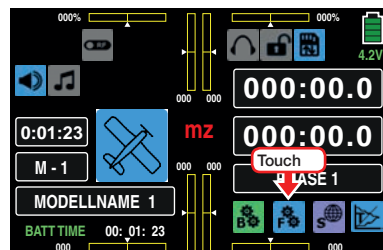


Setting the control characteristic of the Throttle control stick

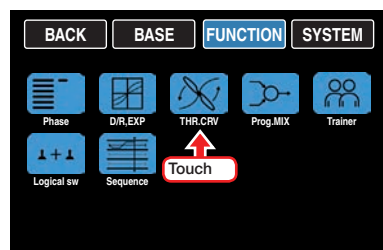


This sub-menu is not displayed, depending on the configuration of a glider "with or without motor".

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "THR.CR.V".



In this sub-menu, you can adapt the control characteristic as well as the idle LOW or "motor off" position of the throttle.

This menu allows you to change the *control characteristic of the throttle and control stick* independent of whether the control function acts directly on a servo connected to control channel 1, or via a number of mixers on several servos.

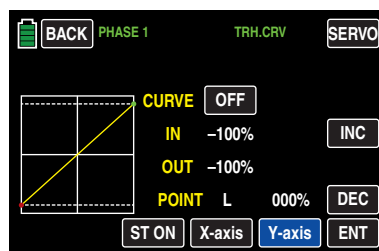
## Phase depending settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Changing the control direction

In the wing program of the **mz-24** HoTT Pro transmitter, the rear throttle position is the default for the "motor off" position with electric drives. Not only in this special case the control direction of throttle control stick can be inverted through the throttle curve from "accelerate from back to front" to "accelerate from front to back".

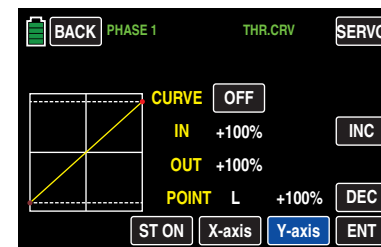
Turn on the graphic and numerical display of the control stick position by touching the **ST OFF** button at the bottom left of the display and then activate the Y-coordinate adjustment option by touching the **Y-axis** button:



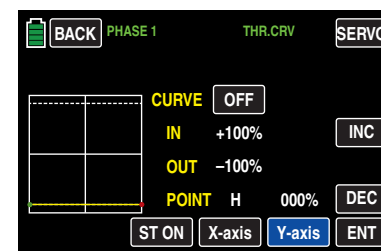
Use the throttle to move a vertical green line between the two endpoints "L" and "H" in the graphic.

The momentary control stick position is also displayed numerically in the line "IN"(put) (-100 % to +100 %).

Then move the throttle to one of the two end positions such as the front. The green line moves the right and disappears under the white frame. At the same time, the color of the point at the top right changes from green to red:

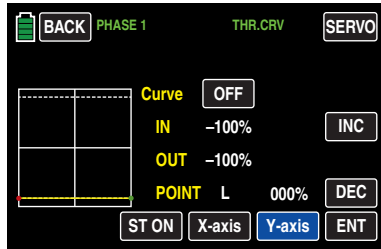


Hold down the "ST OFF" button at the right edge of the display to move the red point down to a value of 000% in the line "POINT":

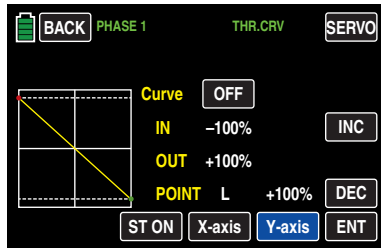


Then move the throttle to the opposite end position, such as the rear. The green line moves to the left, and the points at the ends of the yellow horizontal line change color:





Hold down the "+" button at the right side of the display until a value of +100% is reached in the "POINT" line.



Such an inverted control signal acts on all following mixed and coupling functions and the active Power OFF time of the Thro Position. Repeat if required this changing for every phase.

**Notice**

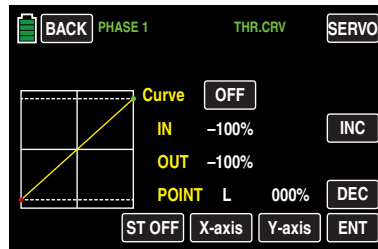
In no case you should use the possibility to reverse the rotation direction of the control channel CH1 of the "REV/SUB" sub-menu of the basic menu to reverse the control direction of the related control sticks. Because the switch-on warning "CH1-Pos" as the "Thr.HOLD" function do not follow this kind of reverse control direction.

**Setting support points**

The control curve can be specified by up to 7 points, termed support points in the following, along the entire control stick travel:

The graphic display makes it much easier to specify the support points and their adjustment. It is, however, recommendable to start with just a few support points.

In the basic setting in the program, 2 support points describe a linear characteristic, that is, the two endpoints at the bottom control stick stop "L" (low = -100% control travel) and at the top control stick stop "H" (high = +100% control travel).

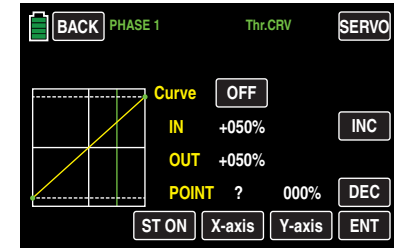


• **Button ST OFF or ST ON**

Touch this button to turn the graphic and numeric display of the control stick position on and off. In switch on stand through the control elements (throttle control stick) a vertical green line is moved synchronously in the graph between the two endpoints "L" and "H". The momentary control stick position is also displayed numerically in the line "IN"(put) (-100 % to +100 %). The intersection of this line with the curve is identified as "OUT"(put) and can be varied at the support points between -125% and +125%. The control signal which is changed in this way then affects all of the following mixing and coupling functions.

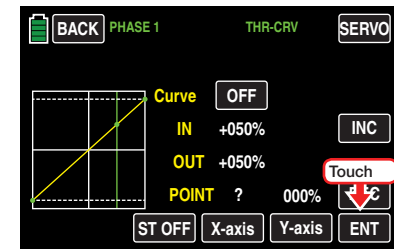
In the following example, the control stick is exactly halfway between the middle and end of its path, at +50% of the control path, and generates an output signal that is also +50% due to the linear characteristic.

Between the two endpoints "L" and "H", up to 5 additional support points can be set, and the distance between neighboring support points may not be less than approximately 25%.

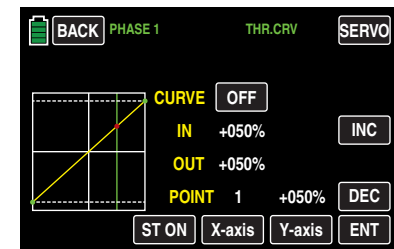


• **ENT button**

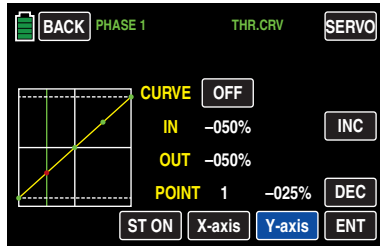
Move the control stick. As long as a "?" is next to the "POINT", you can set the next support point by touching the ENT button. At the same time, a green point appears at the intersection between the yellow and green lines:



Once the green line is moved with the control stick around the point, it becomes red, the "?" is replaced with a number, and the point value appears in the value field to the right of the support point number:

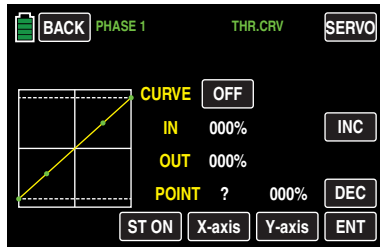
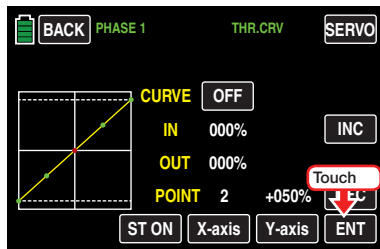


The sequence in which the up to 5 points between the end points "L" and "H" are generated does not matter since the support points are automatically renumbered sequentially from left to right after one support point is set or deleted, for example:



### Deleting a support point

In order to delete the set support points 1 to 5, move the vertical green line with the control stick next to the relevant support point. Once the support point number appears along with the associated value in the line "POINT" and the point is red (see the screen-shot below), you can delete it by touching the **ENT** button, for example:

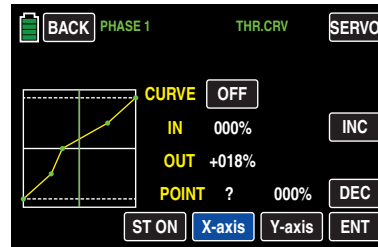


### Changing the support point value

- **X-axis button** (X-axis)

Activate this function by touching the button at the bottom edge of the display.

You can then move an active (red) point to the right with the **+** button, and to the left with the **-** button, for example:



Touch the **X-axis** button again to deactivate the function.

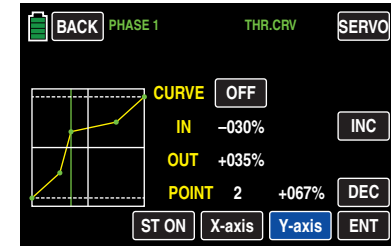
### Notices

- If you move the red point horizontally away from the current control position, the point becomes green after a short while, and a "?" appears in the Point line. This question mark does not relate to the point which has been moved but rather indicates that another point can be set at the current control position.
- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

- **Y-axis button** (Y-axis)

Activate this function by touching the button at the bottom edge of the display.

You can then move an active (red) point to the top with the **+** button, and to the bottom with the **-** button, for example:



Touch the **Y-axis** button again to deactivate the function.

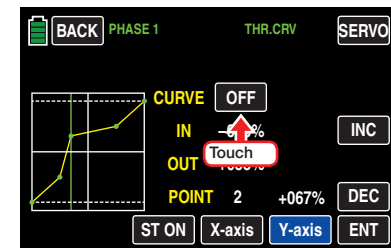
### Notice

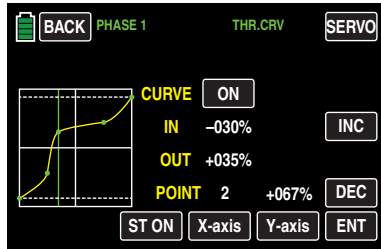
Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

### Rounding off the throttle curve

- **ON/OFF button in the "Curve" line**

The default angled curve profile can be automatically rounded off by turning on the rounding function by pressing this button, for example:



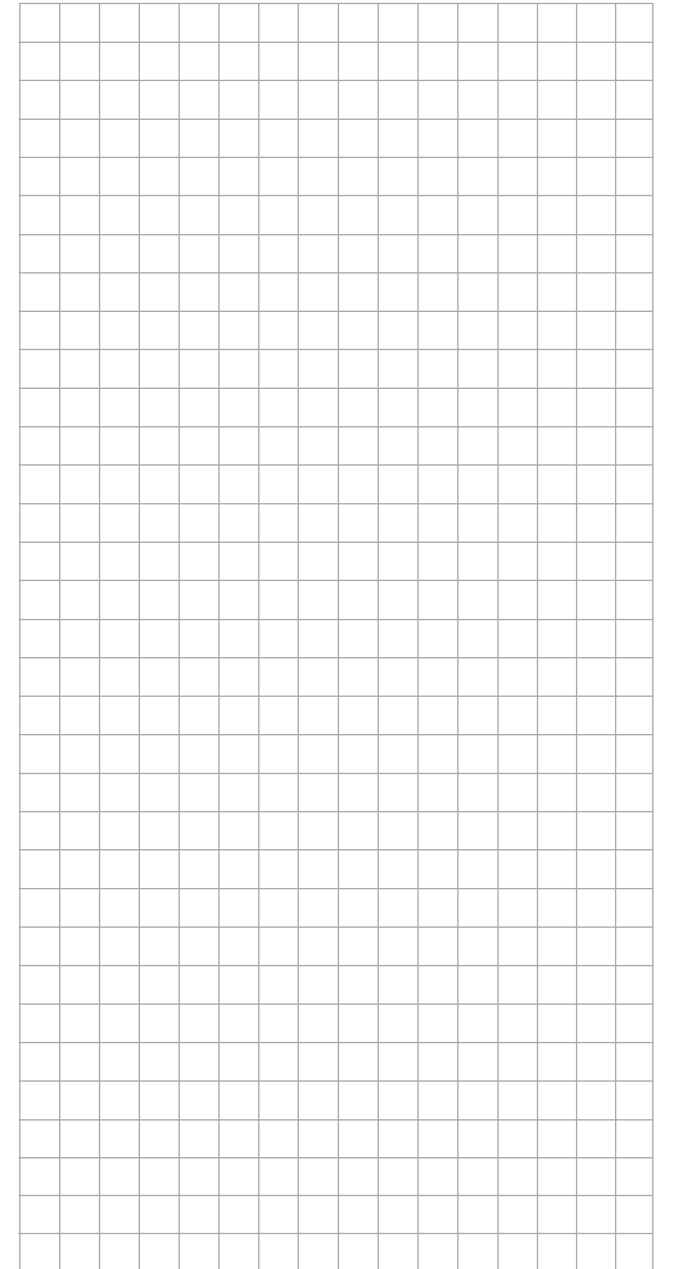
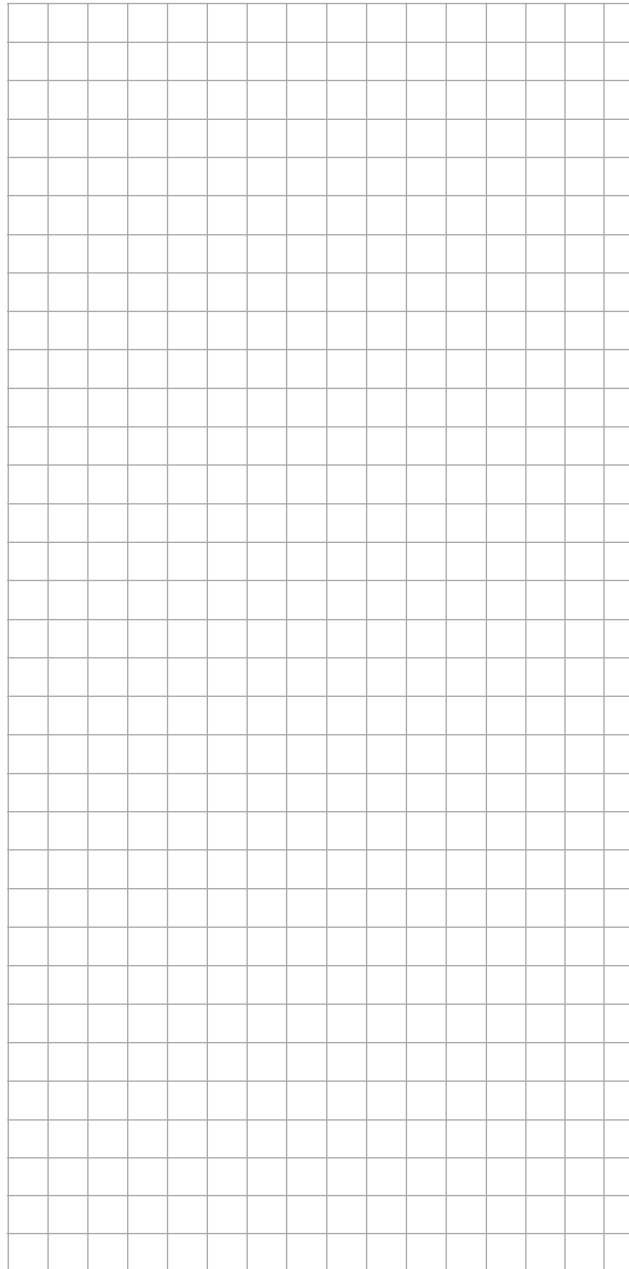


**Attention**



The curves shown here are only for demonstration purposes and do not represent actual throttle curves.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.

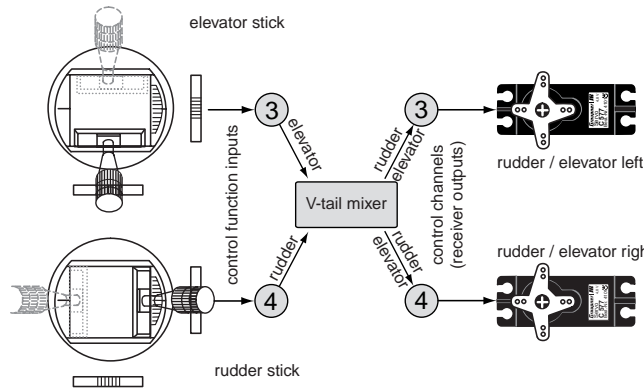


# What is a mixer?

## Basic functions

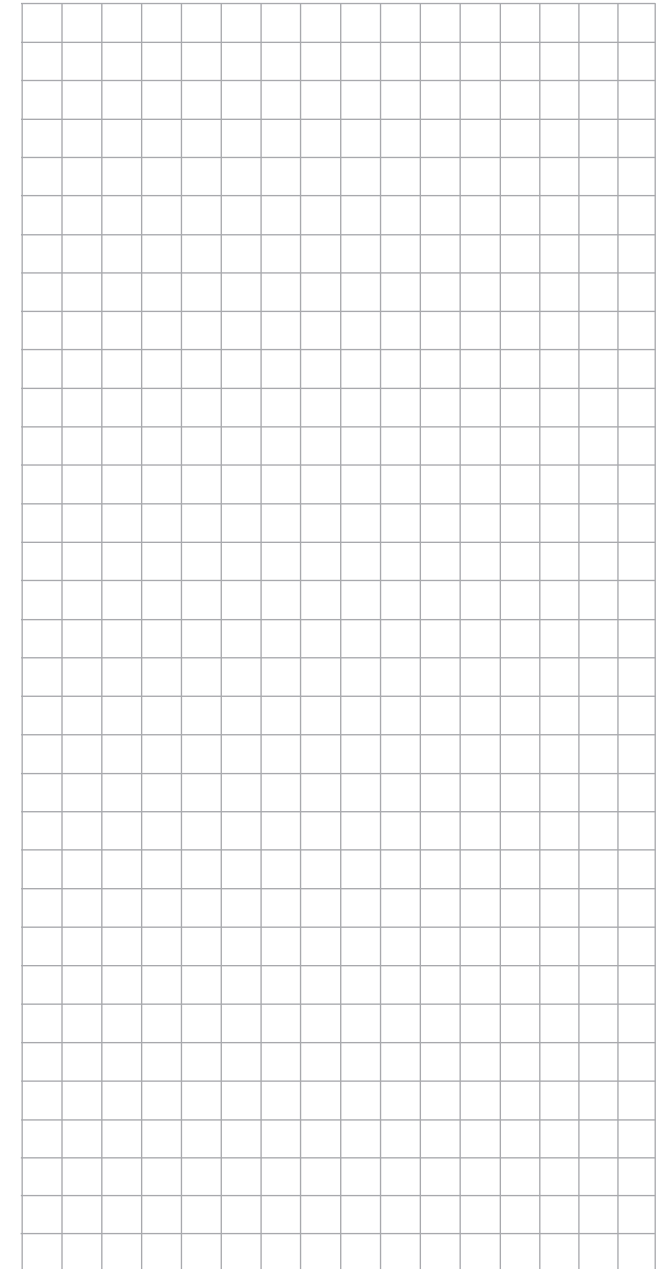
In many models, it is frequently desirable to mix functions within the model, for example to couple ailerons and rudders, or to couple two servos when you want two rudders with the same function to be controlled by a single servo. In all these cases, the signal flow at the output of the transmitter-side control function branches at a point at which the influences of all transmitter options such as "**D/R,EXP**", "**CTL Set**", "**THR.CRV**", etc. are contained within the signal so that the signal can act specifically on the input of another control channel and hence on another receiver output.

### Example: V-tail mixer



The program of the **mz-24** HoTT Pro transmitter already contains numerous preprogrammed coupling functions in which two (or more) control channels are mixed with each other. The mixer cited as an example can therefore be activated in the form of a V-tail in the program while making the [basic settings for a model](#). In addition, the program in each model memory of the fixed-wing and helicopter program has five freely programmable linear mixers and 3 curve mixers per activated Phase.

More information about this subject can be found on the relevant page on "free mixers".



# General information on programmable mixers

This manual has described numerous preprogrammed coupling functions. The basic meaning of mixers and their functions are explained on the page to the left. The following offers information on "free mixers".

In addition to the aforementioned preprogrammed mixers, the **mz-24** HoTT Pro transmitter offers five freely programmable linear mixers and three curve mixers in each of the 30 model memories per programmed phase in which you can define inputs and outputs as well as the degree of desired mixing.

This maximum of 48 mixers per model memory should be sufficient, in particular for taking advantage of the options of pre-programmed coupling functions.

The input signal for a control function (1 ... 12) is used as the *input signal* for free mixers. The signal that is on the control channel and supplied to the mixer input is always influenced by its control element and its set characteristic that for example is specified by settings in the "**D/R,EXP**", "**THR.CRV**" and "**CTL Set**" menus.

The mixer output acts on a freely-selectable control channel (1 to a maximum of 12 depending on the transmitter and receiver) which, before it sends the signal to the servo, can only be influenced by the functions Reverse, Sub-Trim, Travel and E.P.A, and possibly the option "**Transmitter output**".

One **Control function**, may be used simultaneously for any number of mixer inputs when for example you want mixers to be parallel-connected.

Conversely, any number of mixer outputs can affect one and the same **Control channel**. Particularly in the latter case, however, you should make sure that the affected servo does not reach its mechanical limit when several mixing signals combine into one which is too large.

To be safe, a corresponding travel limit should therefore be set in the "**E.P.A**" sub-menu.

In the program, a free mixer is initially always **blocked** and therefore needs to be explicitly turned on while programming it. Optionally, the mixer can also be assigned an ON/OFF switch. Given the numerous switchable functions, make sure that you do not unintentionally assign a switch two functions.

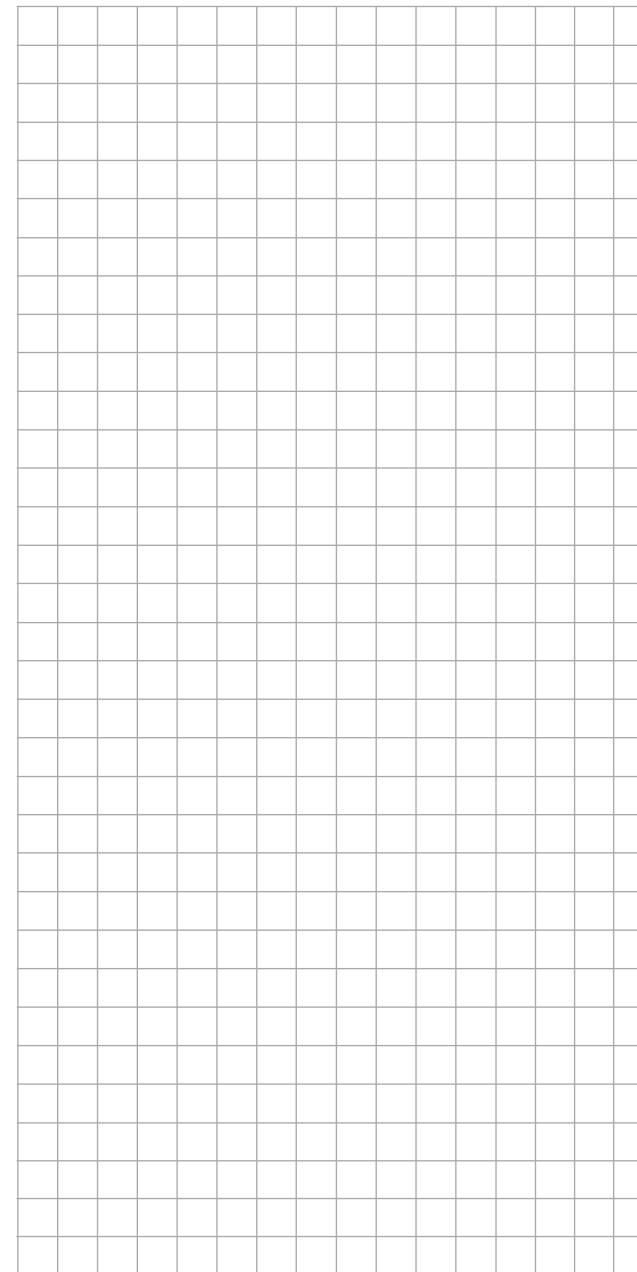
## The two essential parameters of the mixers are ...

- ... **the degree of mixing** that determines the level of influence of the input signal on the control channel connected to the mixer output.

With linear mixers, the mixing level can be adjusted symmetrically or asymmetrically. With curve mixers, the mixing level can also be configured according to your own specifications by up to 7 points to produce extremely nonlinear mixer guide lines.

- ...the **neutral point** of a linear mixer, also termed the offset.

The offset is the point along the travel of a control element (control stick, proportional control or switch) at which the mixer no longer influences the control channel connected to its output. Normally, this is the middle position of the control. The offset can also be located at any other position along the servo travel. Since curve mixers can be configured as desired, it is only recommendable and possible to specify a mixer neutral point for the 5 linear mixers.

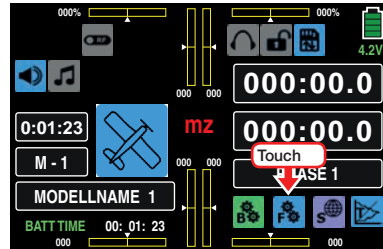




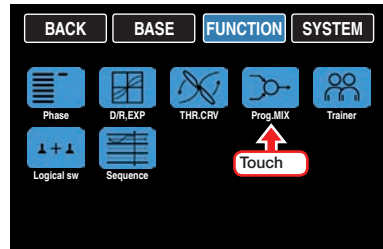
# Free mixers

free programmable linear and curve mixers

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Prog.MIX":



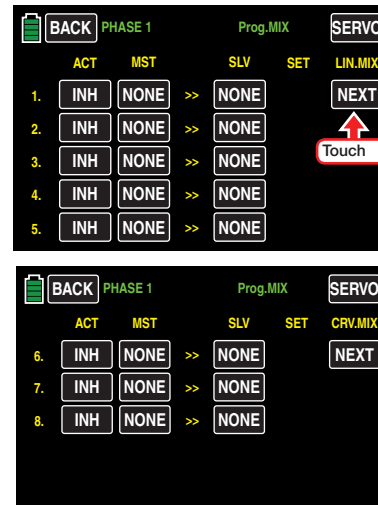
Independent of the selected model type, there are five linear mixers and three 7-point curve mixers in each of the 30 model memories per set-up phase.

## Phase-dependent settings of free mixers

The here mentioned sub-menu offers the possibility to program phase specific free mixers. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Page change

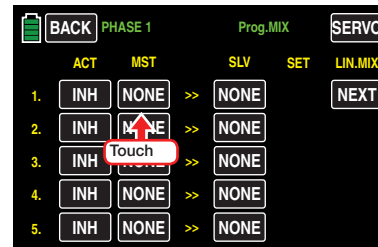
Press the **NEXT** button at the top right edge of the display to switch the rotation procedure in the selection page between linear mixer 1 ... 5 to the selection page of the curve mixer 6 ... 8 etc... :



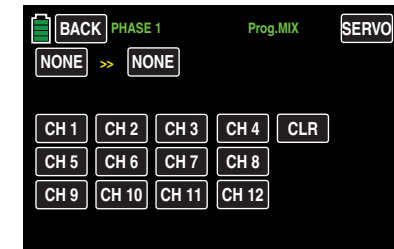
## Setting up mixers

Switch to the desired phase.

In the line of the mixer to set up tap on one of the two buttons labeled with **NONE**, for example:

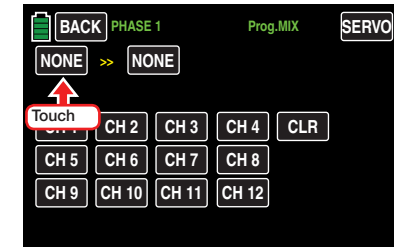


The selection page "MST >> SLV" of the selected mixer appears in the display:

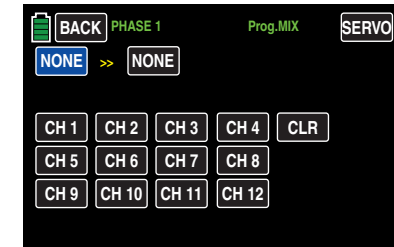


- "MST"

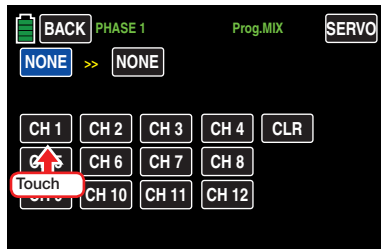
In this display, touch the left of the two top red buttons:



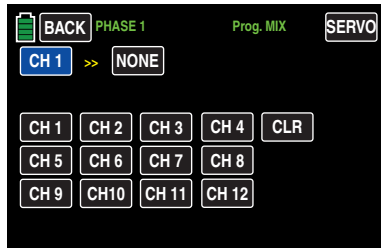
The button color changes from black to blue:



Select one of the **Control functions** 1 ... 12 by tapping on it, for example:



Touch the desired channel to transfer it to the blue (active) value field:



Touch the **CLR** button to reset a changed value in the blue (and hence active) field to **NONE**.

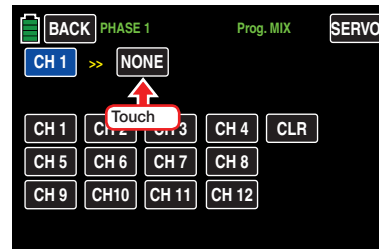
#### Notice



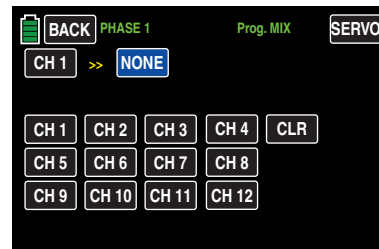
Do not forget to assign a switch to the selected **Control functions** 5 ... 12 in the "**CTL Set**" sub menu!

#### • "SLV"

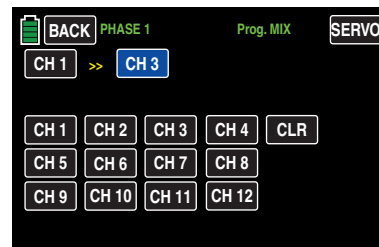
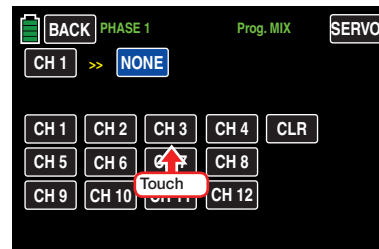
In the right input field of this line you can input the target of the mixer, which means the mixer output, to one of the **control channels**. Activate then the right of the two upper buttons by tapping on it:



The button color changes from black to blue:



Select one of the **control channels** 1 ... 12 as target by tapping on it, for example:



The touched control function is transferred immediately to the blue field.

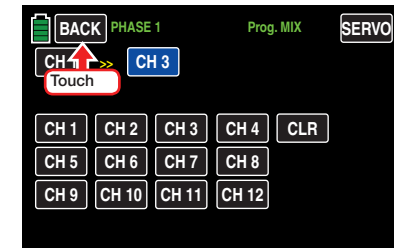
#### Tip

Mixers in which the mixer input is set to be the same as the mixer output (such as CH1 >> CH1) allow you to achieve special effects in connection with the option of turning free mixers on and off as desired.

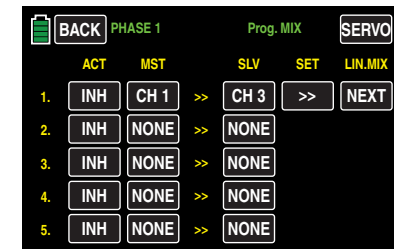
Touch the **CLR** button to reset a changed value in the blue (and hence active) field to **NONE**.

Touch the **BACK** button at the top left of the display

...

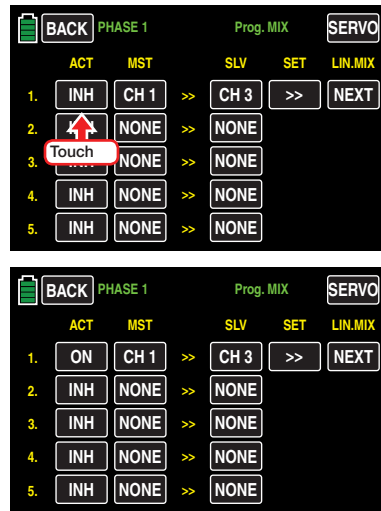


... to leave the sub-menu for "Mixer selection":



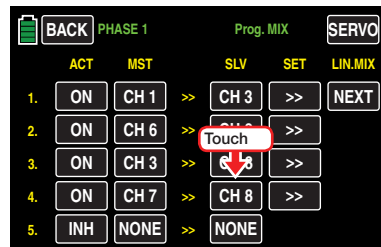
## Activating and deactivating mixers

To activate or deactivate a mixer set up as described above, touch the value field of the mixer to be activated or deactivated in the "ACT" column, for example:

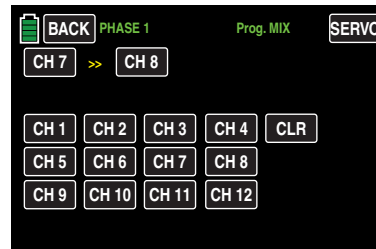


## Deleting mixers

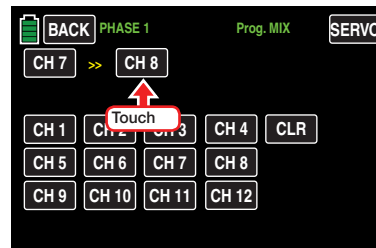
To delete a mixer which has been defined, touch the "MST" or "SLV" button of the mixer to be deleted, for example:



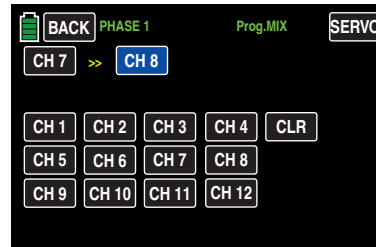
The channel selection display opens:



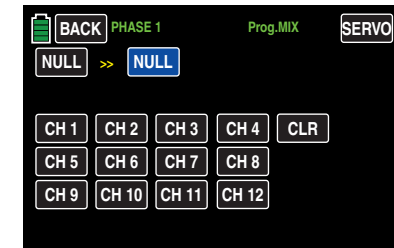
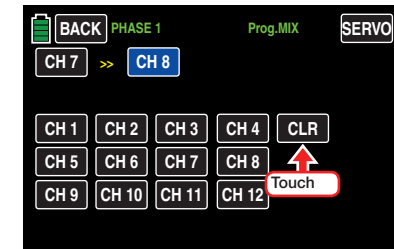
In this case as well, touch the "MST" or "SLV" button of the mixer to be deleted. In this example, **CH 8** to the right of the two angle brackets:



The button color changes from black to blue:



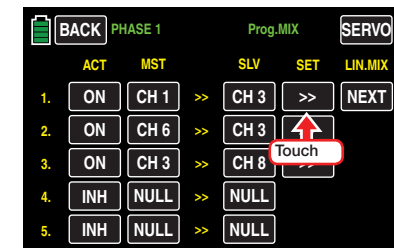
Touch the **CLR** button to reset the blue (active) and black field on the same line to **NONE**.



Touch the **BACK** button at the top left of the display to leave this menu and return to mixer selection.

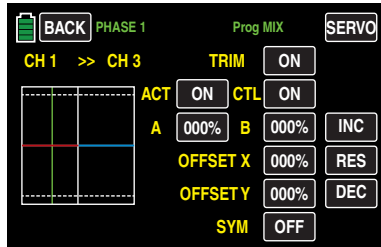
## Setting linear mixers 1 ... 5

To set one of linear mixers 1-5, touch the button in the "SET" column in the line of the mixer to be set, for example,



The settings page for the selected mixer appears in the display:





The vertical green line represents the present position of the control at input 1.

The horizontal line (left half red and right half blue) indicates the mixing level that is consistently zero at present over the entire control travel. The elevator will accordingly not respond to the actuation of the CH1 transmitter.

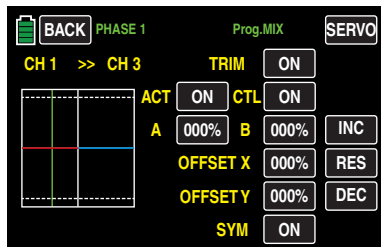
First, define the ...

### Mixing levels

... above and below the mixer neutral point proceeding from its momentary position.

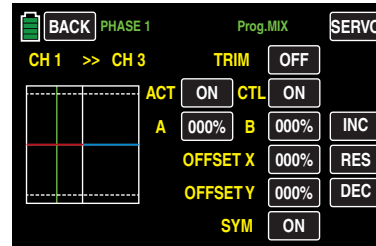
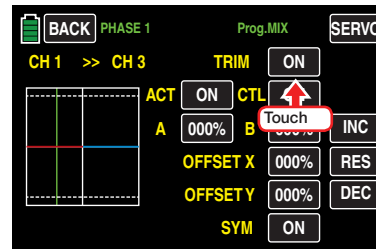
### Setting symmetrical or asymmetrical values

By default, the values are set for each control side. After switching the option "SYM" added to the bottom line from **OFF** to **ON**, a symmetrical, that is joint, setting of both control sides is possible.



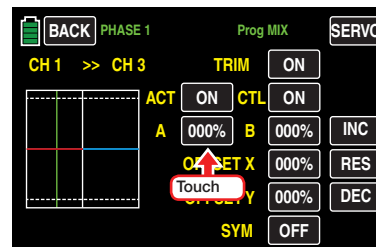
### "TRIM" line

As standard also the digital trim of each one of the control functions 1 ... 4 act on the mixer input. The same is for the control functions 5 ... 12, in case you have assigned one of those functions to one of the two **INC/DEC** buttons. The influence of the trim can however be switched off if required in the value field of the "TRIM" line:

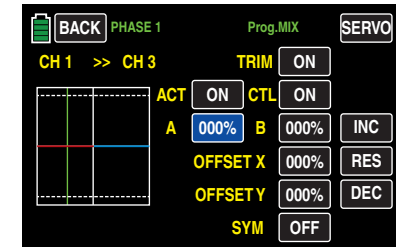


### Programming

To set the mixing value on the left of the actually 0% control travel and to set the neutral position in the middle of the graph, touch the value field on the right next to "A":



The color of the field switches from black to blue:

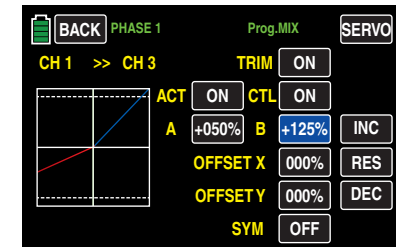


Set the desired value with the **+** or **-** button at the right edge.

The adjustment range is  $\pm 125\%$ .

Use the same procedure for a value on the right of the neutral point.

Symmetrical and asymmetrical values can be set, for example:



Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

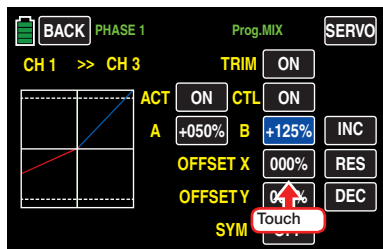
### Offset (mixer neutral point)

By default, the mixer neutral point (offset) (the point along the control travel at which the mixer does NOT influence the control channel connected to an output) is precisely in the middle of the control range. With both the following described options this point can however be moved:

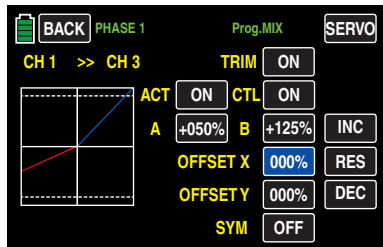
- **Offset X**

A value unequal to "000%" entered in the "Offset X" line causes the offset to shift *horizontally* by a maximum of  $\pm 100\%$ .

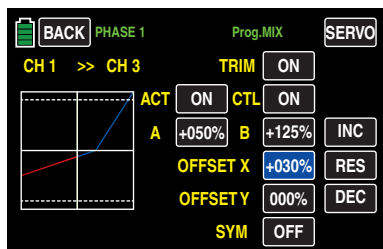
To move the offset point 30% to the right (for example), touch the value field to the right of "OFFSET X":



The color of the field switches from black to blue:



Use the **+** button to move the offset point, within the actually set mixer end point, the aforementioned 30% to the right:

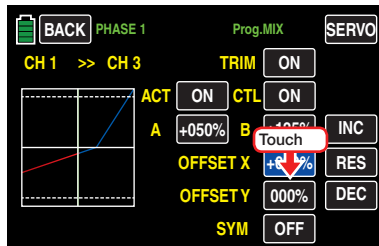


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

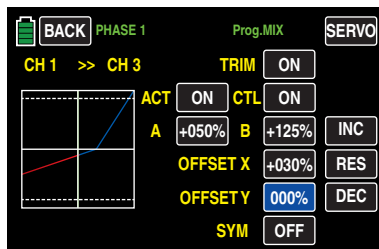
- **Offset Y**

A value unequal to "000%" entered in the "Offset Y" line in contrast causes the characteristic of the mixer to shift *vertically* by a maximum of  $\pm 100\%$ .

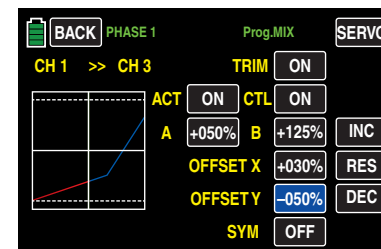
To move the previously mentioned as example offset point 30% to the right, always for example also 50% to the bottom, tap on the value field on the right, near the "OFFSET Y":



The color of the field switches from black to blue:



Use the **-** button to move the offset the aforementioned 50% down:



Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### Attention

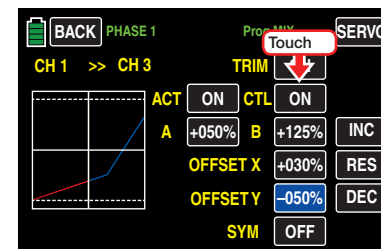


The curve shown here is only for demonstration purposes and does not represent an actual mixer guide line.

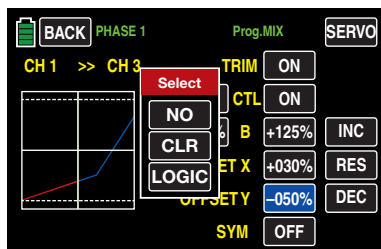
### Mixer switch

Once a mixer is activated, as described in the "[Activating and deactivating mixers](#)" section, the value fields to the right of "ACT" and "Ctrl/sw" are also **ON**. This activates the relevant mixer and turns it permanently on in the current phase.

Independent of other factors, each mixer can, however, be turned on and off by assigning it its own switch. On the right next to "Ctrl/sw", touch the value field ...



... and assign a switch or control switch as described in section [Control and switch assignment](#):



After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the mixer selection:

### Setting curve mixers 6 ... 8

These three curve mixers make it possible to define extremely nonlinear mixer guide lines with up to five freely positionable points between the two endpoints "L" (low = -100% control travel) and "H" (high = +100% control travel) along the control travel.

### Programming details

The control curve is defined by up to 7 points, so-called support points. In the default settings of the program, 2 support points are already defined, the endpoints "L" and "H".

### Notice

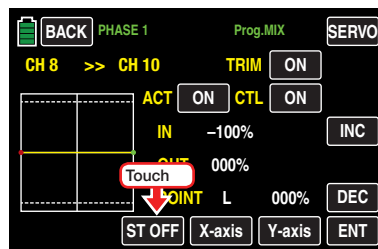


The following examples are only for demonstration purposes and do not represent a realistic mixer guide line.

### Setting support points

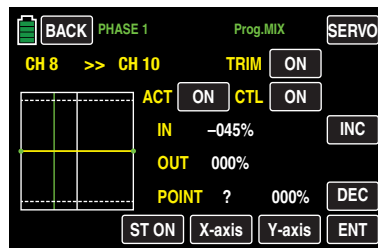
A green vertical line (normally hidden) is moved synchronously in the graphic between the two endpoints with the mixer input control, here the control function 8 of the side proportional rotary control SL1.

To show this line, touch the **ST OFF** button at the bottom left:



After this value field is switched to **ST ON**, the green vertical line representing the momentary control position appears, and the control position is also numerically displayed in the "IN(put)" line.

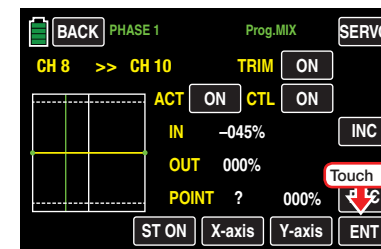
In the following example, the control at input 8 is at -45% of the control travel. The output signal remains 0% since a value has not been entered:



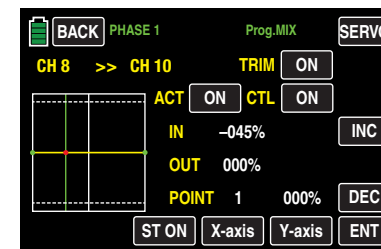
The intersection of this line with the mixer curve is identified as "OUT(put)" and can be varied at the support points within a range of  $\pm 125\%$  (see below). This resulting control signal affects the mixer output.

Between the two endpoints "L" and "H", up to five additional support points can be set, and the distance between neighboring support points may not be less than approximately 25%.

Move the green line through the related control. As soon as you tap on **ENT**, right on the bottom ...



... a red dot appears at the interface between the two lines. At the same time, the "?" is replaced with a point number, and the value field to the right shows the current output value:



As described below, the set point can be moved horizontally with the **X-axis** function within a range of approximately  $\pm 90\%$ , and vertically with the **Y-axis** function within a range of  $\pm 125\%$ .

### Notice

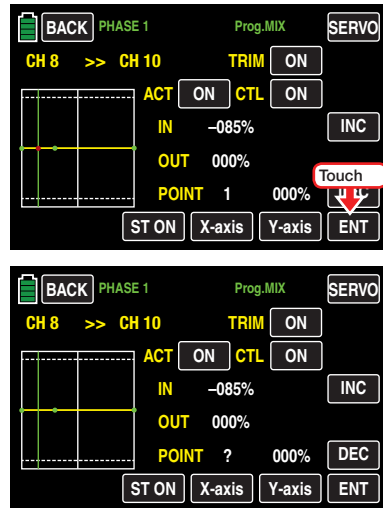


If the relevant control is not set precisely at the support point, it should be remembered that the percentages of the "input" and "output" lines always refer to the momentary control position.

Use the same procedure for the other support points. The sequence in which the up to five points between the end points "L" and "H" are generated does not matter since the support points are automatically re-numbered sequentially from left to right after one support point is set or deleted.

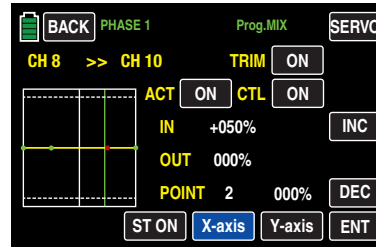
## Deleting a support point

In order to delete the set support points 1 to 5, move the green line with the associated control element next to the relevant support point. Once the support point number appears along with the associated value in the line "POINT" and the point is red (see the screen-shot below), you can delete it by touching the **ENT** button, for example:



## Changing the support point value

- X-axis button** (X-axis)  
 Activate this function by touching the button at the bottom edge of the display.  
 You can then move an active (red) point to the right by pressing the **+** button, or to the left by pressing the **-** button: For example, to move point 1 set at -45% and point 2 set at +45% precisely between the end position and middle position:

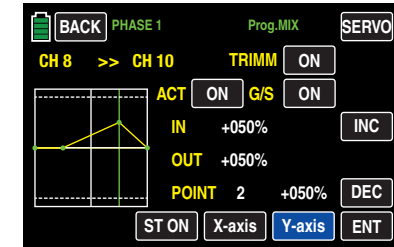


Touch the **X AXIS** button to deactivate the function.

### Notices

- If you move the red point horizontally away from the current control position, the point becomes green after a short while, and a "?" appears in the Point line. This question mark does not relate to the point which has been moved but rather indicates that another point can be set at the current control position.
- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the related control stick and not to the position of the point.

- Y-axis button** (Y-axis)  
 Activate this function by touching the button at the bottom edge of the display.  
 You can then move an active (red) point to the top by pressing the **+** button, or to the bottom by pressing the **-** button:

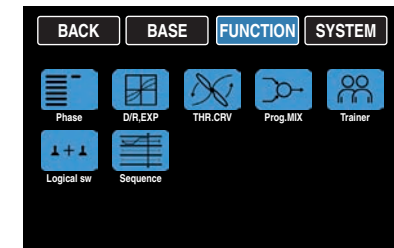


Touch the **Y AXIS** button to deactivate the function.

### Notice

- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the mixer selection and, if desired, further to the menu selection:



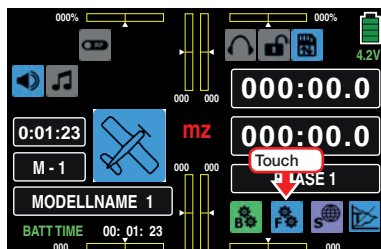
# Trainer



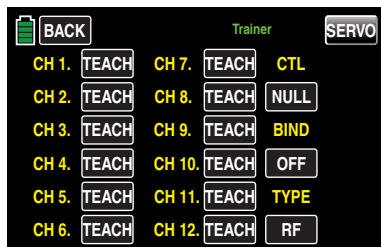
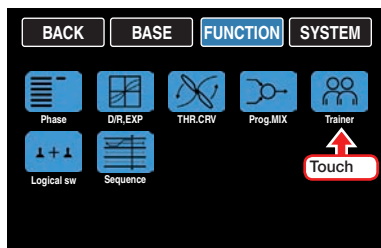
Connection between two transmitters with a DSC cable

The **mz-24** HoTT Pro transmitter comes standard with a **DSC socket** in the rear of the transmitter. This can be used to connect flight simulators but also to integrate the transmitter into a cable-linked trainer system.

In the basic transmitter display, touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Trainer".



## Notice



The above figure shows the initial status of this sub-menu: The PUPIL control has not been released; neither has a switch been assigned.

## TEACH transmitter settings

An **mz-24** HoTT Pro TEACH transmitter can be connected to any suitable PUPIL transmitter, including transmitters with a classic 35/40 MHz range.

The model to be controlled by the PUPIL *must be programmed with all its functions* including trimming and any mixed functions in a model memory of the **mz-24** HoTT Pro TEACH transmitter. The HoTT receiver of the relevant model must also be bound to the TEACH transmitter since it is responsible for controlling the model even in PUPIL mode.

You can transfer up to 12 *function inputs*, see "[Definition of terms](#)", of a **mz-24** HoTT TEACH transmitter, to the PUPIL transmitter, either individually or in any desired combination.

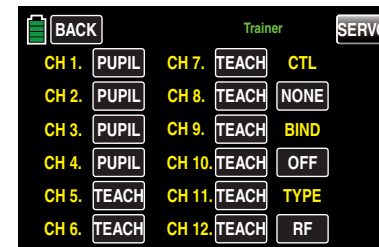
The standard with **TEACH.** labeling value field or button indicate the **Function inputs** 1 ... 4, which are normally in all the model types assigned to the control sticks functions so as the standardly "free" **Function inputs** 5 ... 12 in the "**CTL Set**" sub-menu.

## Notice



It does not matter which specific controls are assigned to the control function inputs to be transferred to the PUPIL. They can only be assigned in the "**CTL Set**" sub-menu when the trainer connection is turned off.

Select by touching the control function inputs 1 to 12 to be transferred to the PUPIL, for example:



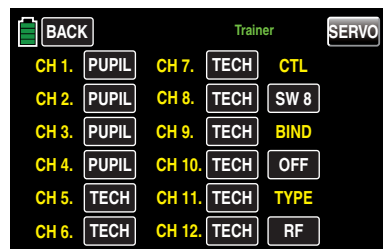
Observe the standard conventions in the model types "motor airplane" and "glider" so as in the model type "helicopter" when assigning control functions:

Channel	Function
1	Motor/airbrake or pitch
2	Aileron or Roll
3	Elevator or Nick
4	Rudder or Yaw



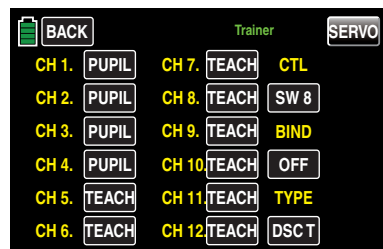
TO be able to switch between teacher and pupil a trainer-switch must be assigned in the "CTL" value field right in the top of the display, as described in the "[Control and switch assignment](#)" section.

It is preferable to use an intermittent switch so that you can withdraw the control from the trainer at any time, such as S8:



Since at this early point in the trainer system programming an operable PUPIL transmitter will not be connected to a TEACH transmitter, the transmitter immediately reacts with acoustical alarms to switches connected during the switch assignment. At the same time, a warning message flashes every second at the top left in the transmitter's main display (see the figure at the end of the section, "Wireless HoTT system"). Open the switch that has just been assigned.

First, in the value field under "TYPE", change the default **RF** to **DSC L** in the bottom line to the right in order to switch the DSC connection to "signal output":



If the connection to the PUPIL is NOT made with a two-pin DSC socket but rather a three-pin T/P jack by *Graupner*, for a correct connection to a PUPIL transmitter, the modulation type PPM(10, 16, 18 or 24) must be set in the PUPIL transmitter independent of the type of modulation used in the TEACH transmitter.

## PUPIL transmitter settings

The model to be controlled by the PUPIL *must be programmed with all its functions* including trimming and any mixed functions in a model memory of TEACH transmitter. If applicable, the HoTT receiver of the relevant model must also be bound to the TEACH transmitter. In principle, a HoTT PUPIL transmitter can be connected to a TEACH transmitter with the classic 35/40 MHz range since the required PPM signal required by the TEACH transmitter is normally always applied to the DSC socket of a HoTT transmitter.

Almost any transmitter from the past and current *Graupner* product line with at least 4 control functions can be used as the PUPIL transmitter. The PUPIL transmitter should however be equipped with the current connection module for PUPIL transmitters. The module should be connected to the transmitter board in accordance with the provided installation instructions.

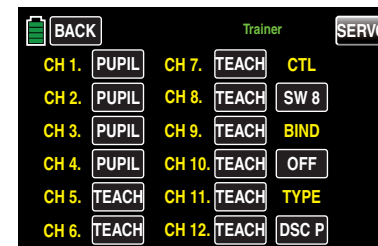
The specified cable is used to connect to the TEACH transmitter (see the next two pages).

More information can be found in the main *Graupner* FS catalogue and on the Internet at [www.graupner.de](http://www.graupner.de).

The control functions of the PUPIL transmitter must act directly on the control channels without any intermediate mixers, i.e. the receiver outputs

With transmitters of the series "mc", "mx" or "mz", it is best to assign the model name "PUPIL" to a free model memory activated with the required model type ("wing" or "heli"), and adapt the control arrangement (mode 1 ... 4) and "THR min or PITC min front/rear" to the PUPIL's preferences. All other settings as well as mixing and coupling functions are made in the TEACH transmitter and are transmitted by the TEACH transmitter to the receiver.

With transmitters of the "mz- 18/24" series, also touch the value field under "TYPE" in the bottom line of the "T/P" sub-menu at the bottom right of the display to switch it to **DSC S** and hence switch the rear DSC transmitter connection to "signal output":



With a **mx-20** HoTT, **mc-16** HoTT, **mc-20** HoTT or **mc-32** HoTT PUPIL transmitter, adapt the modulation types to the *number of control channels* to be transferred in the line "DSC OUTPUT" of the "BASE" menu. For example, the signal package with modulation type "PPM10" only contains control channels 1 ... 5, and channels 6 and higher are not included. In order for the PUPIL to use one or more of channels 5 and above, select one of the modulation types that includes the required channels. If in addition PUPIL mode is to be used with an existing model memory instead of a newly initialized one in one of the aforementioned transmitters, make sure to enter "HoTT" in the "Module" line of the "BASE" menu. Otherwise, the PPM signal at the DSC socket may be inverted.

If you wish to assign other control functions to the TEACH transmitter in addition to the functions of the two control sticks (1 ... 4), assign control elements to the *inputs* in the "Control assignment" menu of the PUPIL transmitter that correspond to the released *function inputs 5... 12* in the "Trainer" menu of the TEACH transmitter.

In the case of older transmitters of the "D" and "FM" type, check the servo direction and control mode and change them if necessary by switching the corresponding cables. If necessary, turn off all the mixers or set them to zero.

### Notices



- If you forget to assign a control in the PUPIL transmitter, the relevant servo(s) remain in middle position after transferring control functions to the PUPIL transmitter.
- Independent of the type of RF link of the TEACH transmitter to the model, the PUPIL transmitter should always be operated in normal PPM mode.

### Teacher/Pupil function

Both transmitters are connected to each other using an appropriate cable (see the overview on the next page): Insert the plug identified as "M" (master) in the socket of the TEACH transmitter, and insert the plug with "S" (student) (depending on the available cable) in the socket of the PUPIL transmitter.

### Attention



BEFORE starting trainer mode for the operational model, be sure to check whether all the functions have been correctly transferred.

### Notice



Do not insert an end of your trainer cable identified with "S" or "M" with a 3-pin jack plug into a socket of the DSC system. It is not designed for this purpose. The DSC socket can only be used for cables with a 2-pin jack plug.

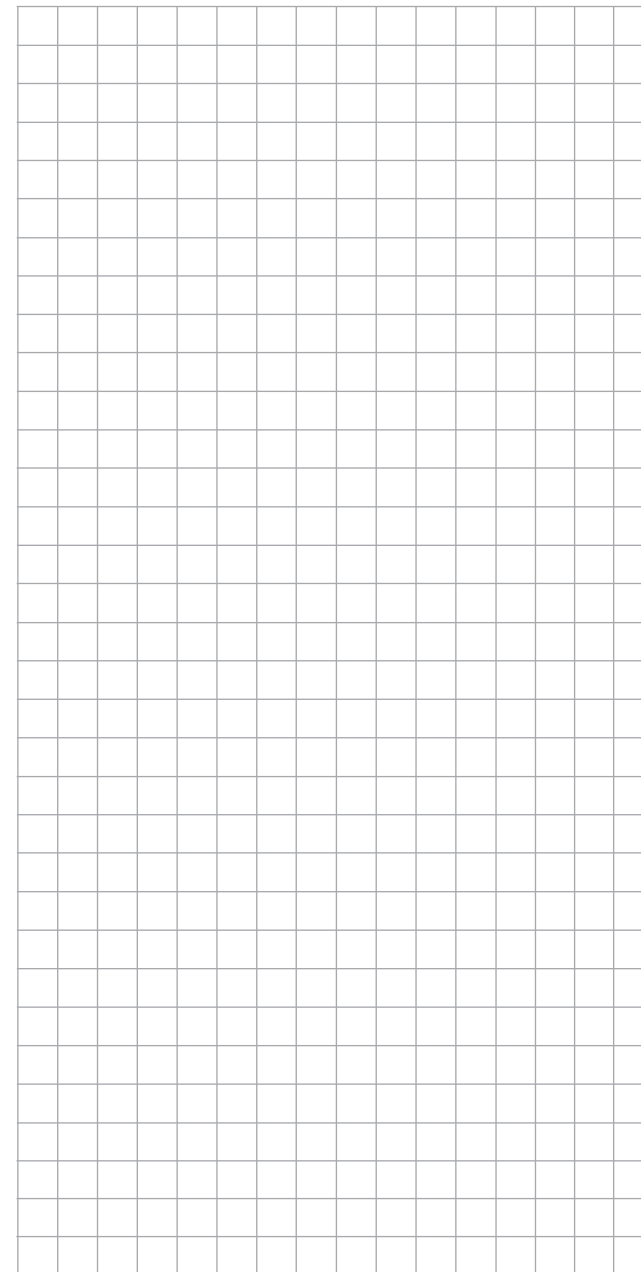
### Trainer cable

**4179.1** for trainer mode between any two *Graupner* transmitters with a DSC socket which can be identified by a 2-pin jack plug on both ends.

**3290.7** Trainer cable to connect a TEACH transmitter having a DSC socket (such as an **MLC-16** to an **mz-24** HoTT Pro transmitter, or a transmitter retrofitted with the optional DSC module - order No. **3290.24**) to a *Graupner* PUPIL transmitter with a PUPIL socket for the optoelectronic system - identifiable by the "S" on the side of the three-pin jack plug.

**3290.7** Trainer cable to connect a TEACH transmitter having a DSC socket (such as an **MLC-16** to an **mz-24** HoTT Pro transmitter, or a transmitter retrofitted with the optional DSC module - order No. **3290.24**) to a *Graupner* PUPIL transmitter with a PUPIL socket for the optoelectronic system - identifiable by the "M" on the side of the three-pin jack plug.

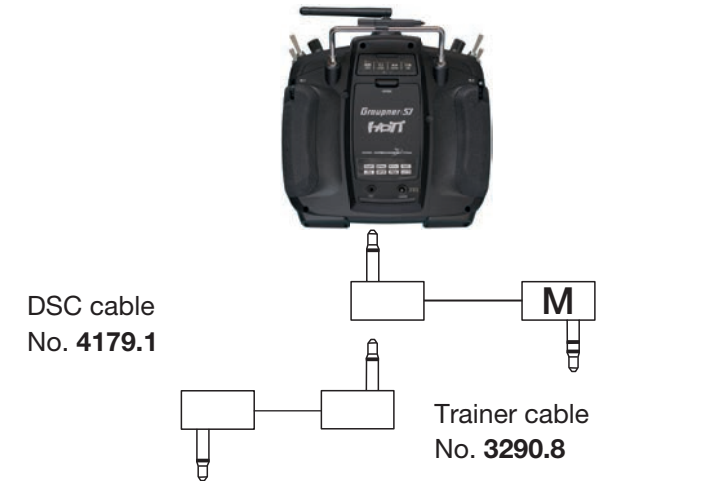
Additional information on the cables and modules mentioned in this section for the TEACH and PUPIL transmitters can be found in the relevant transmitter instructions in the main *Graupner* FS catalogue, and on the Internet at [www.graupner.de](http://www.graupner.de).



# Connecting scheme

The connecting schemes on this page constitute the transmitter combinations possible at the time at which this manual was created.

## Pupil transmitter mz-24 HoTT Pro



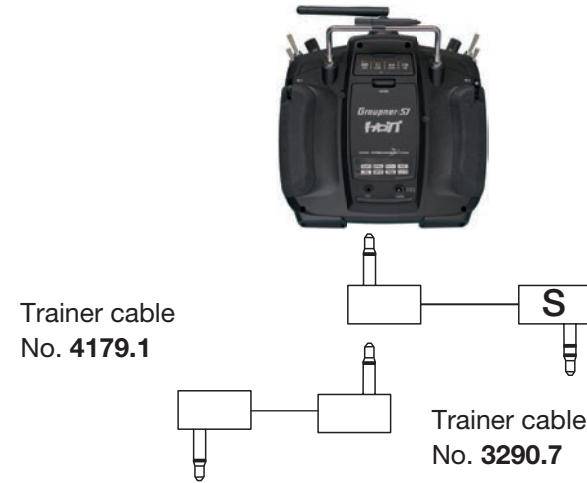
TEACH transmitter  
with DSC socket

- MC-16** HoTT
- MC-20** HoTT
- MC-32** HoTT
- mx-12** HoTT
- mx-16** HoTT
- mx-20** HoTT
- mz-10** HoTT
- mz-12** HoTT
- mz-18** HoTT
- mz-24** HoTT (Pro)

Trainer transmitter  
with TEACH module No.  
**3290.2, 3290.19, 3290.22**

- mc-19** to **mc-24**,
- mx-22(iFS)**, **mx-24s**

## Teacher transmitter mz-24 HoTT Pro



PUPIL transmitter  
with DSC socket

- MC-16** HoTT
- MC-20** HoTT
- MC-32** HoTT
- mx-12** HoTT
- mx-16** HoTT
- mx-20** HoTT
- mz-10** HoTT
- mz-12** HoTT
- mz-18** HoTT
- mz-24** HoTT (Pro)

PUPIL transmitter with PU-  
PIL module, No. **3290.3**,  
**3290.10, 3290.33**

- D 14, FM 414, FM 4014,
- FM 6014, **mc-10** ... **mc-24**,
- mx-22(iFS)**, **mx-24s**



# Wireless HoTT system

The trainer system of the **mz-24** HoTT Pro transmitter can also be operated remotely. As described below, the TEACH transmitter is bound to a PUPIL transmitter. This configuration is possible between two transmitters that are available in the **"Trainer"** menu using the "BIND" option (see the figures in this section).

## Preparing for training mode

### TEACH transmitter

The training model *must be programmed with all its functions* including trimming and any mixed functions in a model memory of the HoTT *TEACH* transmitter.

### Attention

» The model provided for training must therefore be completely controllable by the TEACH transmitter and remains also during the training phase connected to the teacher transmitter.

### Notice

» Regardless of the firmware version of the teacher transmitter, the training model **MUST ALWAYS** be linked to the pupil transmitter in the case of a type **mx-10** HoTT pupil transmitter with firmware version V 1a20. In addition, it is absolutely essential for correct schooling that both option buttons in the "BIND ON/OFF" line of the **"TX cti"** menu be set to **OFF** in the model memory of the teacher transmitter used for the training. In other words, there is no link to a receiver in this model memory under either RX1 or RX2.

### PUPIL transmitter

With *Graupner* HoTT transmitters of the series "mC", "mx" or "mz", it is best to assign the model name "PUPIL" to a free model memory activated with the

required model type and adapt the control arrangement (mode 1 ... 4) and "THR min or PITC min front/rear" to the PUPIL's preferences.

All other settings as well as all mixing and coupling functions are made in the TEACH transmitter and are transmitted by the TEACH transmitter to the receiver.



Observe the standard conventions in the model types "motor airplane" and "glider" so as in the model type "helicopter" when assigning control functions:

Channel	Function
1	Motor/airbrake or pitch
2	Aileron or Roll
3	Elevator or Nick
4	Rudder or Yaw



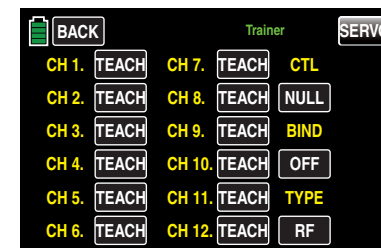
If you wish to assign other **Control functions** to the TEACH transmitter in addition to the functions of the two control sticks (1 ... 4), assign control elements to the *inputs* in the **"Control assignment"** menu of the PUPIL transmitter that correspond to the released **Functions or control inputs 5... 12** in the **"Trainer"** menu of the TEACH transmitter.

### Notice

» If you forget to assign a control in the PUPIL transmitter, the relevant servo(s) remain in middle position after transferring control functions to the PUPIL transmitter.

## Preparing TEACH and PUPIL transmitters

After binding the training model to the PUPIL transmitter, also turn on the TEACH transmitter and open the **"Trainer"** display on the two transmitters:



The above figure shows the original layout of the sub-menu.

### Notice

» Note that the value field under "TYPE" at the bottom right of the display is set to **RF** in both the PUPIL and TEACH transmitter.

### PUPIL transmitter

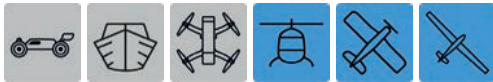
Check the display and modify it so that it corresponds with the above screen-shot.

### TEACH transmitter

You can transfer up to twelve **Function inputs**, of an **mz-24** HoTT Pro TEACH transmitter, to the PUPIL transmitter, either individually or in any desired combination.

### Notice

» It does not matter which specific **Controls** are assigned to the inputs to be transferred to the PUPIL. They can only be assigned in the **"CTL Set"** sub-menu when the trainer connection is turned off.

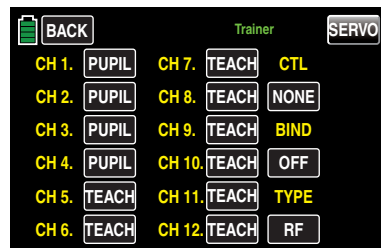


Observe the standard conventions in the model types "motor airplane" and "glider" so as in the model type "helicopter" when assigning control functions:

Channel	Function
1	Motor/airbrake or pitch
2	Aileron or Roll
3	Elevator or Nick
4	Rudder or Yaw

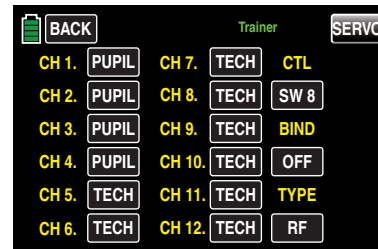


Select by touching the control **control functions inputs 1 to 12** to be transferred to the PUPIL, for example:



TO be able to switch between teacher and pupil a trainer-switch must be assigned in the "CTL" value field right in the top of the display, as described in the "**Control and switch assignment**" section.

It is preferable to use an intermittent switch so that you can withdraw the control from the trainer at any time, such as S8:



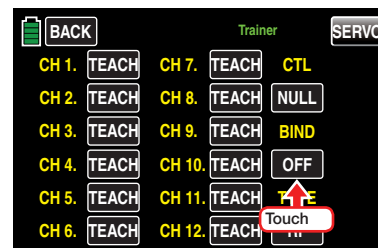
Since at this early point in the trainer system programming an operable PUPIL transmitter will not be connected to a TEACH transmitter, the transmitter immediately reacts with acoustical alarms to switches connected during the switch assignment. At the same time, a warning message flashes every second at the top left in the transmitter's main display (see the figure at the end of this section). Open the switch that has just been assigned.

### Binding the PUPIL transmitter to the TEACH transmitter

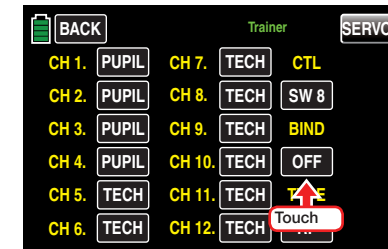
#### Notice

During the binding process, the distance between the two transmitters should not be too great. If necessary, change to the position of the two transmitters and restart the binding process.

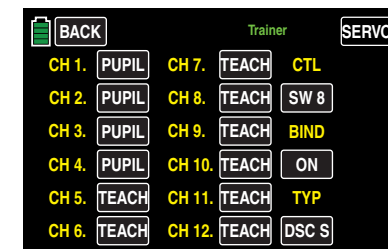
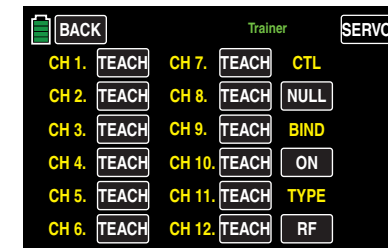
Initially, start the "BINDING" process in the PUPIL transmitter by touching the middle button in the right column ...



... and then directly afterward in the TEACH transmitter:



Once this process has concluded, "ON" appears in both displays instead of "CHK":



Both transmitters can then return to the basic display and commence training after a thorough check of all functions.

If only one or neither transmitter displays "ON" indicating that the binding process failed, change the positions of the two transmitters and repeat the entire procedure.

#### Attention

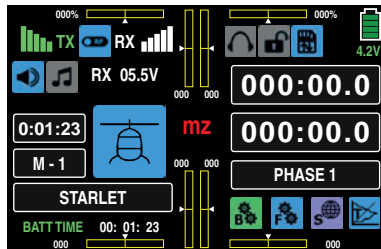
BEFORE starting trainer mode for the operational model, be sure to check whether all the functions have been correctly transferred.

During ...

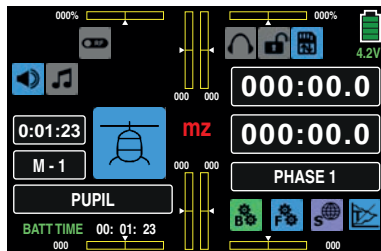
### training

... the teacher and pupil can maintain a comfortable distance. The "earshot" distance (a maximum of 50 m) should not be exceeded, and no one should be between the teacher and pupil since this would reduce the range of the feedback channel used to connect the two transmitters.

During this mode, the basic display of the TEACH transmitter can have the following appearance...

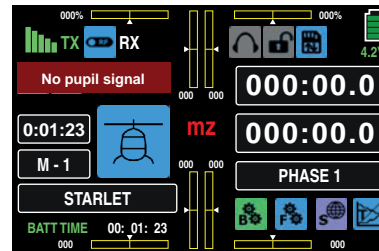


... and the PUPIL transmitter has the following appearance:



If the connection becomes lost between the TEACH and PUPIL transmitters during training, the TEACH transmitter automatically assumes control of the model.

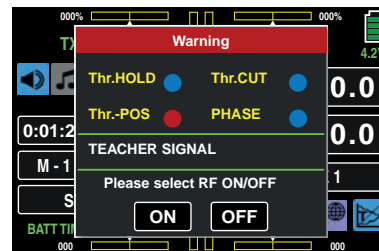
If the T switch is in the "pupil" position in this situation, acoustic warnings sound while the signal is lost, and a warning message flashes every second at the top left of the display:



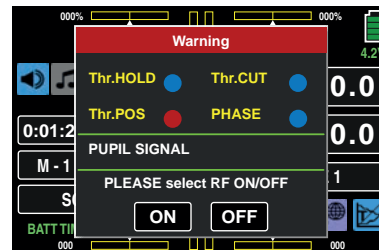
In both cases you should provide a smaller distance between both transmitters. If it does not help, you should immediately stop the use of the model and search for the reason.

### Restarting the trainer mode

If, for any reason, you have switched one or both transmitters off, then after switching it/them on again it will appear in the teacher transmitter display the warning message "TEACHER SIGNAL" ...



... and in the same way in the pupil transmitter display "PUPIL SIGNAL":



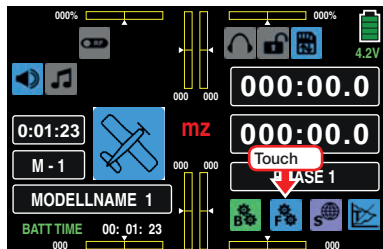
Tapping on the **ON** button you confirm that the trainer mode is active. Tapping on **OFF** stops the training mode.



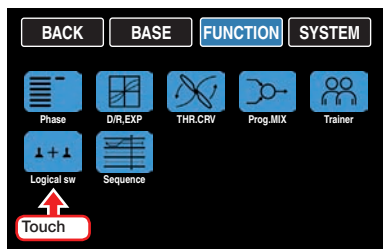
# Logical switch

Programming the logical switch

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

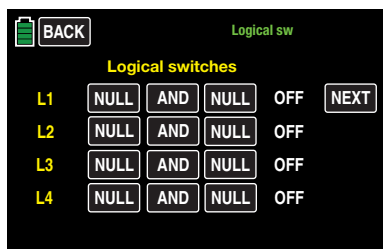


The display switches to the blue function menu. Touch the menu item "Logical sw".



Through this function two switches, controls and/or logical switches or the favorite combination of them, can be interconnected in an "AND" or "OR" switch.

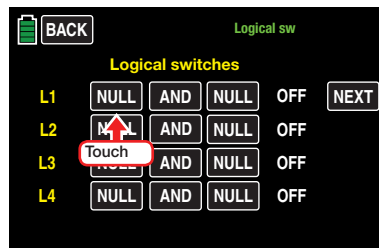
A total amount of 8 logical switches "L1 ... L8" can be programmed:



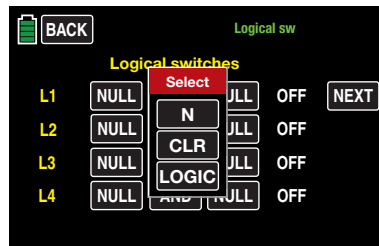
The result of such a logical switch function, indicated on the right in the display, can be used as alternative switch function.

## Programming

The assignment of a required switch for a logical connection is performed as usually in both value fields of one line as described in the "Control and switch assignment" section. Tap on the left value field of the logical switch to program, for example:

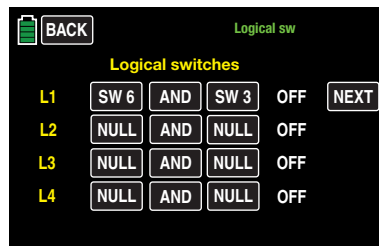


Whether the corresponding selection window appears:



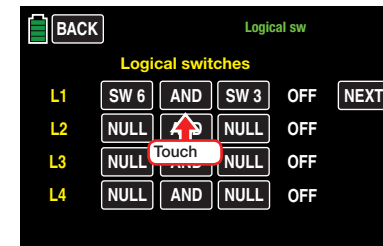
Touch **NO** to terminate the procedure.

The assignment of a switch, control switch or logical switch to both fields in one line follows as detailed described in the "Control and switch assignment" section, for example:



## "AND" / "OR"

The standard switch connection "AND", and vice versa, is set by tapping the related value field, for example:



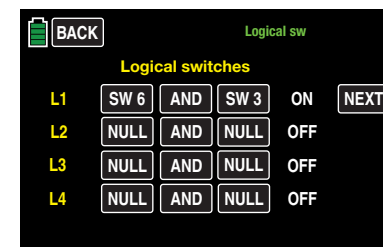
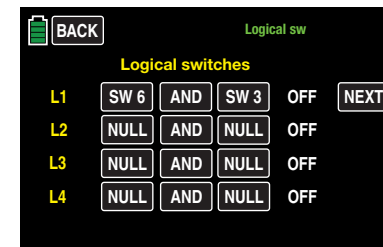
- "AND"

A logical switch is only then "closed", when both switches are "closed".

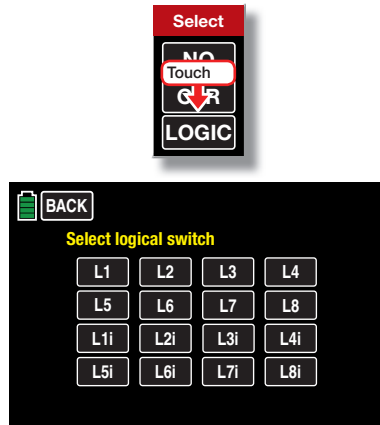
- "OR"

A logical switch is already "closed" when one of both assigned switches is closed.

The related actual switch position of the logical switches is displayed in the right column:



To let the logical switches be assigned and used, in every sub-menu where it can be assigned a switch, the selection menu of the "logical switches" can be recalled. Tap then on the selection field **LOGIC**:

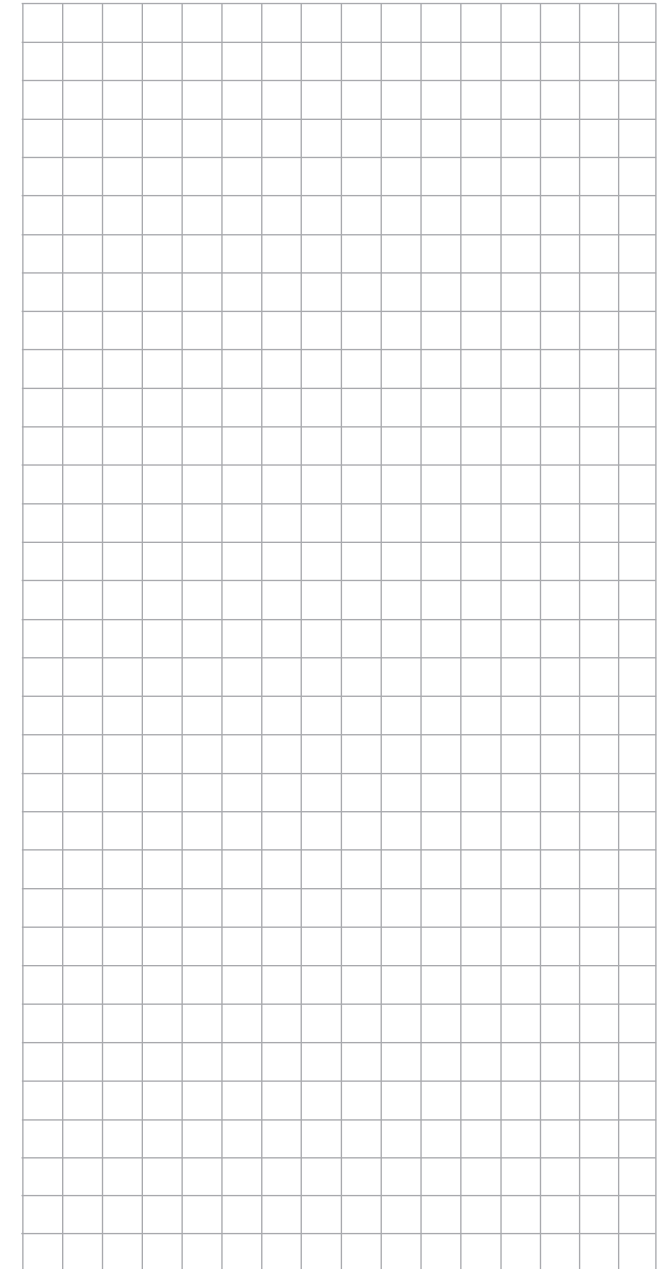
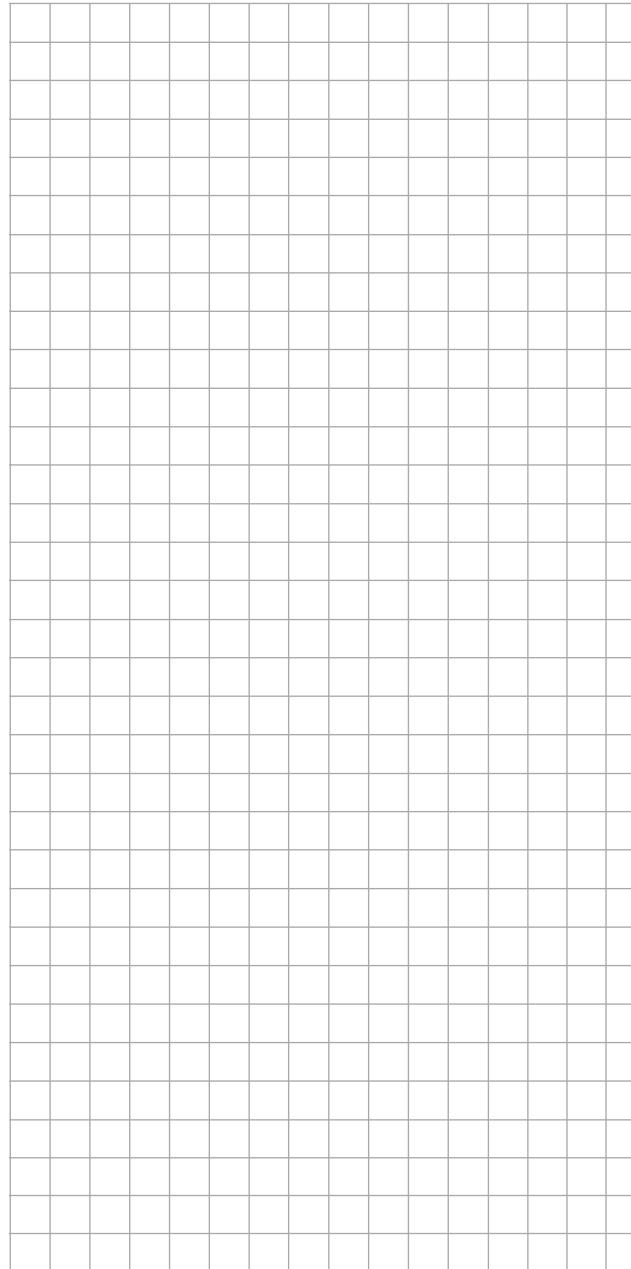


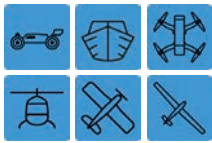
By tapping on the desired logical switch you assign it to the related value field.

### Tip

With the selection of an inverted switch in the switch assignation, e.g. "L3i" instead of "L3", only the switch direction of this specific switch will be reversed and not the logical switch in general!

By the way, if a specific "L" switch activates a function (such as a timer) when it is switched on (**ON** position), then it will activate this function when it will be switched off (**OFF** position) if the setting is "i" (inverted). A specific use possibility is, e.g. if the same switch is used to activate one function while deactivating another function and vice versa.

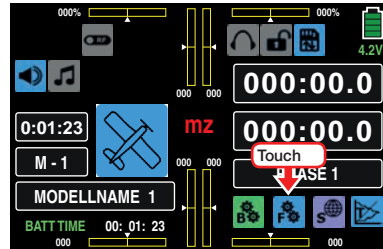




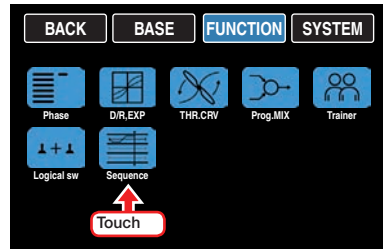
# Sequencer

Programming the logical switch

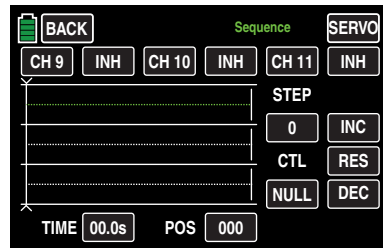
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Sequencer".



Through the following described menu item "Sequencer" ...



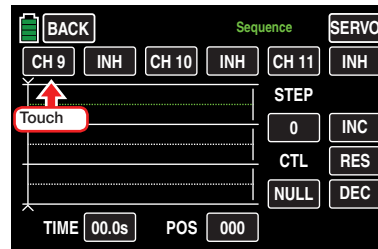
... you can activate, through one common switch and starting from a specifically settable output position, up to 9 precisely determined one another steps from up to three servos within 30 seconds.

In this way it is possible to open the cover while a folding landing gear is coming out from the fuselage, so as it is easy to program the opening of the landing gear case with subsequent closing of one cover after the landing gear leg has extended, or it is even possible to let the capote open and the pilot turn his head and great with his hand. Pre-requirement for all of these actions is that the desired movements have to be divided in a logical sequence of single movements.

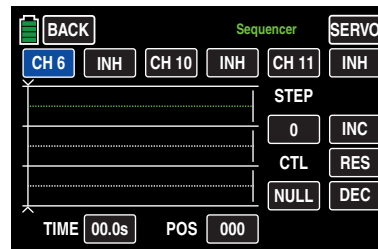
## Selection and activation of the control channels

### Channel selection

You can leave the three pre-set channels "CH9", "CH10" and "CH11" or you can change, by tapping with a finger or with the provided stylus, ...



... in the active value field, which is actually marked in blue, the actual setting through the **+** or **-** buttons on the right of the display. The available channels are 5 ... 12, e.g.:

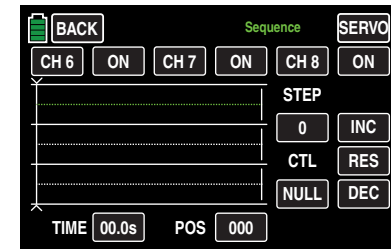


Use the same procedure with the other channel value fields.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### Activation / deactivation

The control channels specifically required for the channel sequencing are activated and deactivated by tapping on the **INH** so that **ON** appears and vice versa, for example:



### Notice

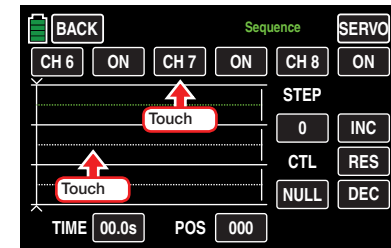


In the sub-menu "Sequencer" activated control channels are consequentially not available for other uses.

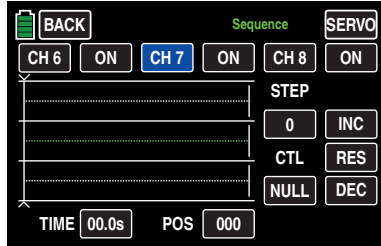
## Sequencing

### STEP 0: Setting the output position

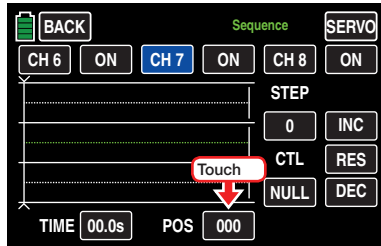
Concentrate the focus on the actually green line or change to another favorite control channel of the three available by tapping on the desired channel value field or the desired line, for example:



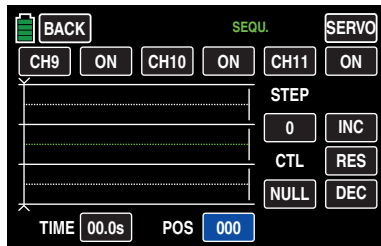
The color of the value field switches from black to blue and the related line from white to green:



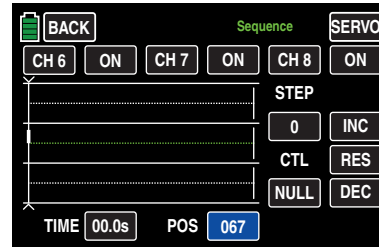
Touch the **POS** button at the bottom right of the display with a finger or the provided stylus:



The color of the value field switches from black to blue:



After tapping on the **+** or **-** buttons in the right lower part of the display, move the selected servo to the desired output position, for example:



The setting range is  $\pm 100$ .

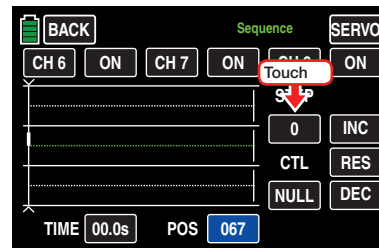
Repeat the process for the other two channels.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

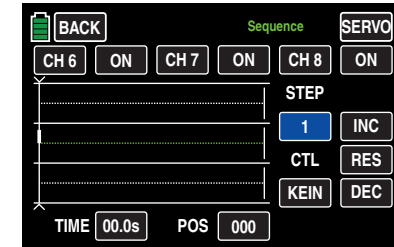
• **STEP 1: first result**

After setting the output positions only the first step has been set. Then what has to happen or has not to happen after a determined time lapse.

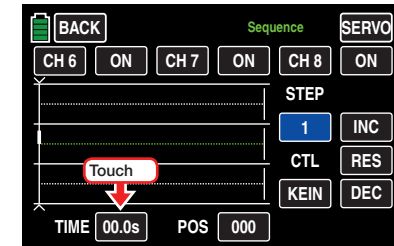
Activate then the **STEP** value field, in which you tap on ...



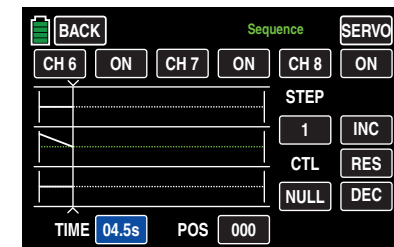
... and set it by tapping on the **+** button on the right lower part of the display to "1":



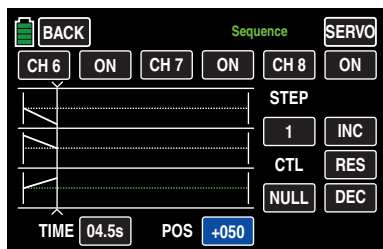
In the value field of the column "TIME" set, after tapping on the related value field for activation, ...



... the desired time lapse of the first step by tapping on the **+** or **-** buttons on the right lower part of the display, e.g. 4,5s. The vertical line which represents the time flow moves to the right and, at the same time, the flow of the servo positions is displayed in form of lines between the time points "0" and "1":

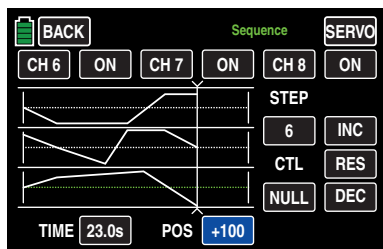


Set now, as described in the "STEP 0", the desired servo positions after the first time lapse or leave one or the other servo the position assumed by the previous sequence:



• **STEP 2 ... maximum 9:**

Repeat the previously described steps for the further sequence, until you have reached the target position of your servos, for example:



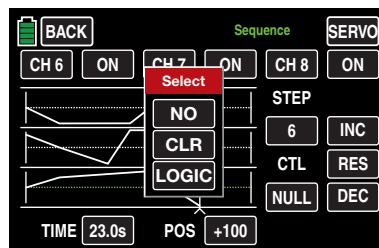
**Notice**



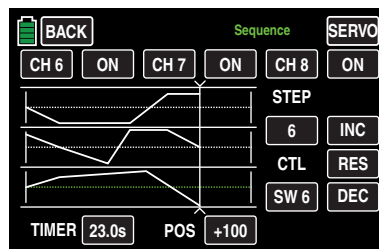
The following shown sequencing is only for demonstration purpose and does not represent a real sequence of servo movements.

**Switch assignment**

Finally assign to the just completed sequence an activation switch, as described in the "Control and switch assignment" section, ...



... through which you can switch between the output and the target positions of the servos, e.g. S6:



As soon as the switch is "closed" the movement sequence of the selected servos can be followed in the servo monitor, which can be recalled by tapping on the **Sv** button on the right up in the display or alternatively by pushing at the same time both arrow keys on the left of the display. All the movements will move reversed when the switch is "opened" again.

**Notices**

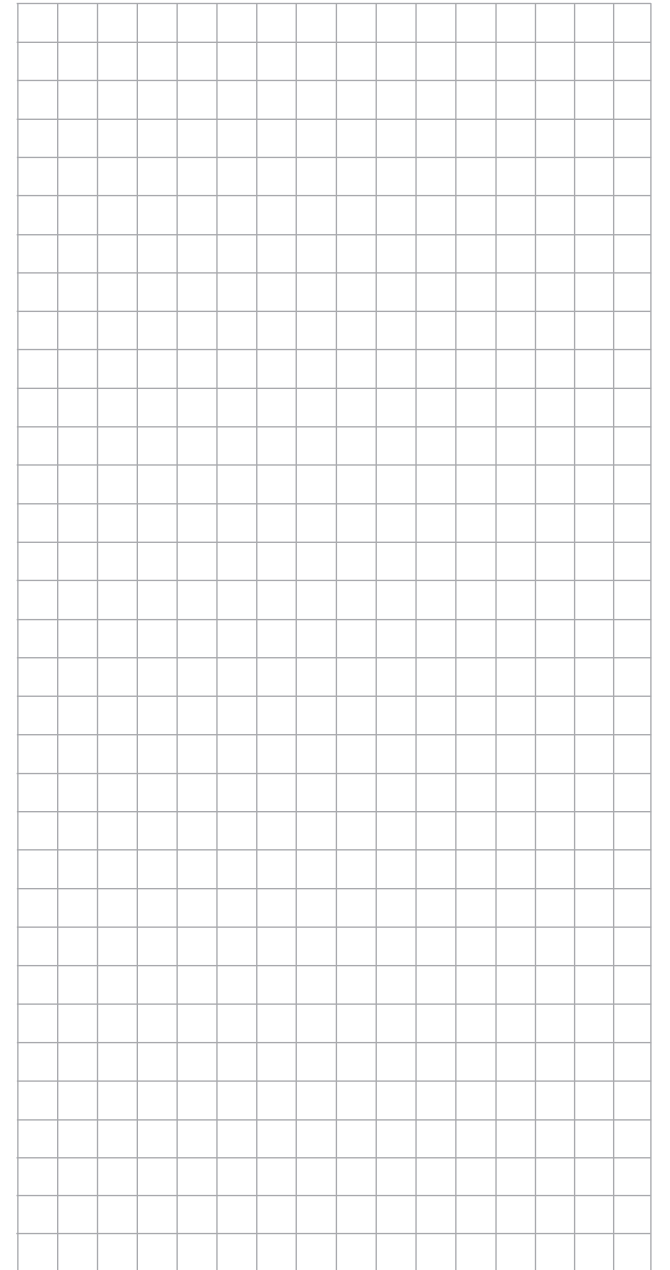
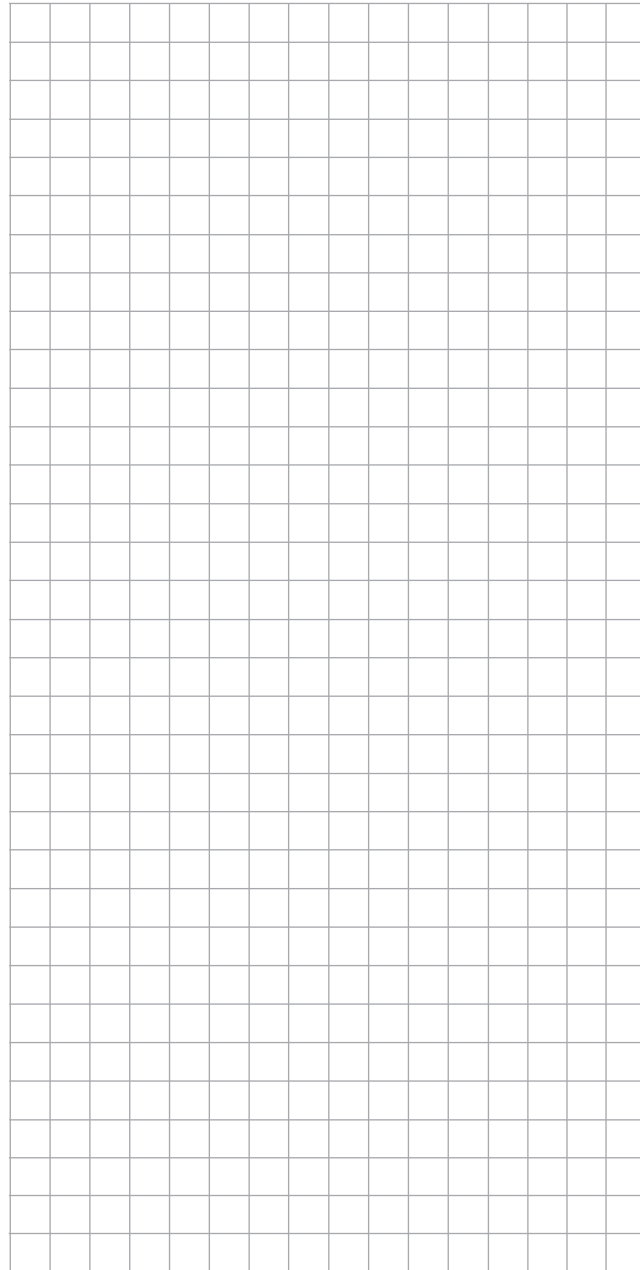
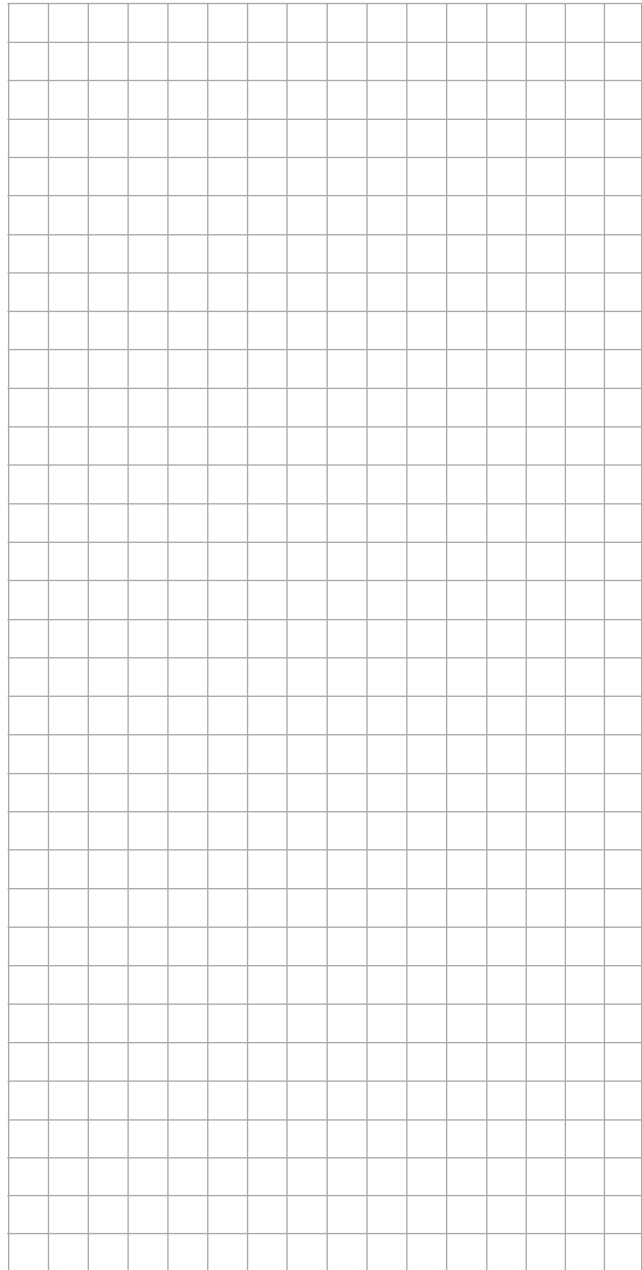


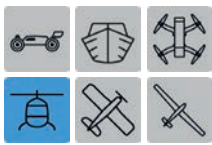
- In the value field "POS" the input settings are in the place where otherwise would be the "common" control signal.

That is why you should check, before programming a sequencer in the "Servo monitor" sub-menu, that none of the channels involved in the planned sequencer is assigned to any control element of the transmitter. Otherwise the action on those controls may lead to unwanted malfunction of the process.

- Make sure that the servos do not strike anything when preparing and setting a sequencer. Use the "E.P.A" option of the sub-menu "E.P.A".



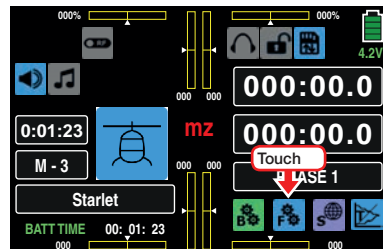




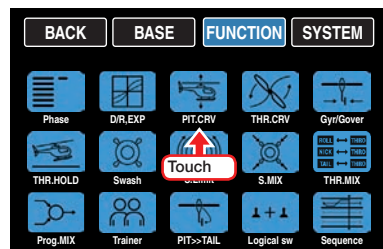
# Pitch curve

Phase-specific setting of the pitch control curve

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "PIT.CRV".

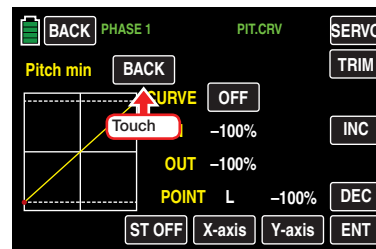


For the setting of the pitch curve there is a curve mixer available in every flight phase. In this mixer can however only be programmed if required also not linear mixer actions analog to the control stick travels.

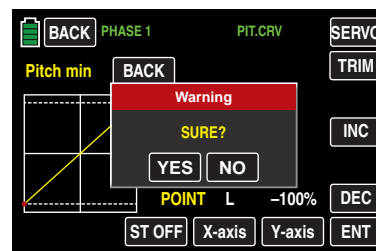
## "Pitch min" line

In the helicopter program for the **mz-24** HoTT Pro transmitter, the "rear" throttle position is the "Pitch min." position by default.

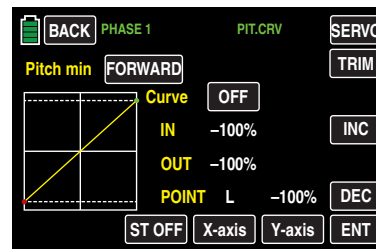
Through this option you can easily reverse the control direction of the pitch control stick from the standard pre-set position "pitch min back" to "pitch min forward", and vice versa, by tapping on the **BACK** or **FORWARD** button in the "Pitch min" line:



The warning note appears:



Touch **NO** to terminate the procedure. Touch **YES** to confirm the procedure which changes the direction of travel of the pitch control stick:



Such an inverted control signal acts on all following mixed and coupling functions and the active Power OFF time of the Thro Position.

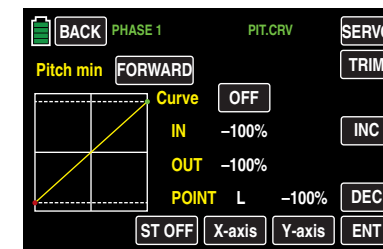
## Phase-dependent settings of the pitch curves

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name.

As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Setting the pitch curve

In this display, you can adapt the pitch curve as needed, depending on the phase if desired:



## Notice

➤ In the display graph will be represented the curve characteristics directly and completely independently from the actually selected direction of the pitch control stick.

The pitch control curve can be specified by up to 7 points, the so-called support points, along the entire control stick travel.

At the beginning, fewer support points are required to set the pitch curve. It is, however, highly recommendable to start with three support points.

These three endpoints, the two endpoints "Pitch low (L)" = -100% control travel and "Pitch high (H)" = +100% control travel, as well as a point to be placed in the control, center describe a linear characteristic for the pitch control curve.

## Basic operating steps

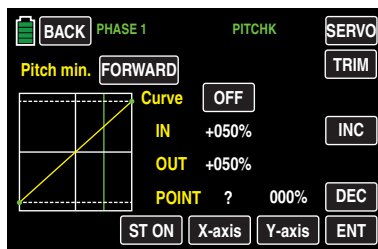
- **ST OFF / ST ON buttons**

Touch this button to turn the graphic and numeric display of the control stick position on or off.

In switch on stand through the control elements (throttle/pitch control stick) a vertical green line is moved synchronously in the graph between the two endpoints "L" and "H". The momentary control stick position is also displayed numerically in the line "IN"(put) (-100 % to +100 %). The intersection of this line with the curve is identified as "OUT"(put) and can be varied at the support points between -125% and +125%. The control signal which is changed in this way then affects all of the following mixing and coupling functions.

In the following example, the control stick is exactly halfway between the middle and end of its path, at +50% of the control path, and generates an output signal that is also +50% due to the linear characteristic.

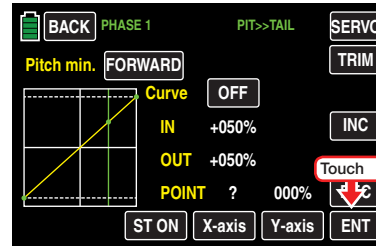
Between the two endpoints "L" and "H", up to 5 additional support points can be set, and the distance between neighboring support points may not be less than approximately 25%.



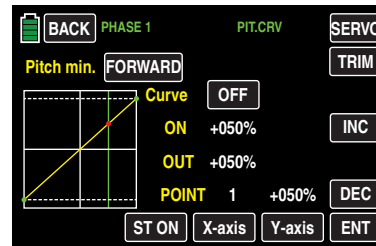
- **ENT button**

Move the control stick. As long as a "?" is next to the "POINT", you can set the next support point by touching the **ENT** button.

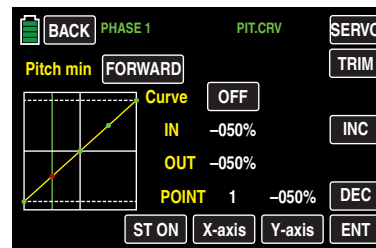
At the same time, a green point appears at the intersection between the yellow and green lines:



Once the green line is moved with the control stick around the point, it becomes red, the "?" is replaced with a number, and the point value appears in the value field to the right of the support point number:

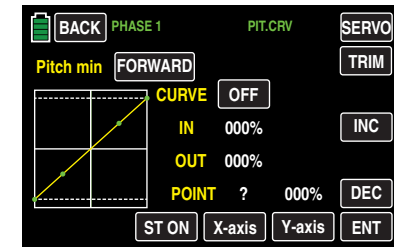
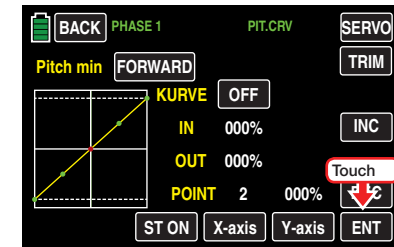


The sequence in which the up to 5 points between the end points "L" and "H" are generated does not matter since the support points are automatically renumbered sequentially from left to right after one support point is set or deleted, for example:



## Deleting a support point

In order to delete the set support points 1 to 5, move the vertical green line with the control stick next to the relevant support point. Once the support point number appears along with the associated value in the line "POINT" and the point is red (see the screen-shot below), you can delete it by touching the **ENT** button, for example:

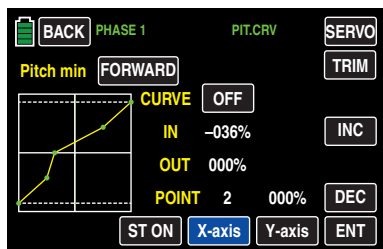


## Changing the support point value

- **X-axis button** (X-axis)

Activate this function by touching the button at the bottom edge of the display. The button color changes from black to blue:

You can then move an active (red) point to the right with the **+** button, and to the left with the **-** button, for example:



Touch the **X-axis** blue button again to deactivate the function. The button color changes again to red.

### Notices

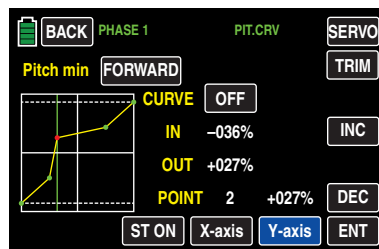


- If you move the red point horizontally away from the current control position, the point becomes green after a short while, and a "?" appears in the Point line. This question mark does not relate to the point which has been moved but rather indicates that another point can be set at the current control position.
- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

### • **Y-axis** button (Y-axis)

Activate this function by touching the button at the bottom edge of the display. The button color changes from red to blue:

You can then move an active (red) point to the right with the **+** button, and to the left with the **-** button, for example:



Touch the **Y-axis** blue button again to deactivate the function. The button color changes again to red.

### Notice

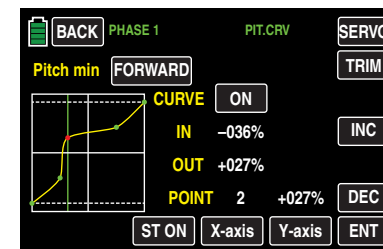
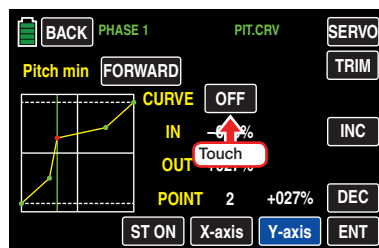


- Remember that the percentages in the "IN"(put) and "OUT"(put) line always refer to the momentary position of the control stick and not to the position of the point.

### Rounding off the throttle curve

#### • **ON / OFF** buttons in the "Curve" line

The default angled curve profile can be automatically rounded off by turning on the rounding function by pressing this button, for example:



### Notice



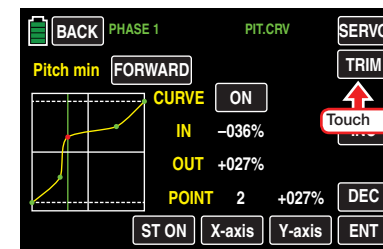
The curves portrayed here are for demonstration purposes only and do not represent real pitch curves.

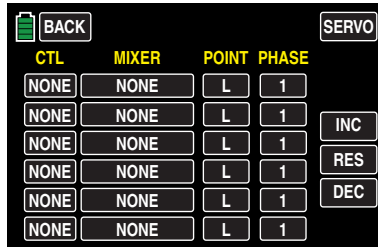
### Additional functions

#### • **TRIM** buttons

The **mz-24** HoTT Pro transmitters has a function that is integrated in the helicopter program for trimming up to six support points of the two options "throttle curve" and "pitch curve" during flight through the transmitter software.

Touch the **TRIM** button at the top right edge of the display with a finger or the provided stylus to open the corresponding display:



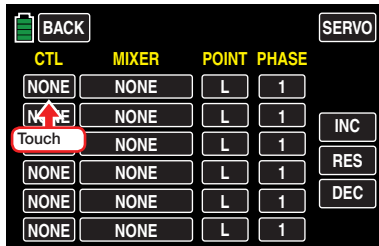


### Basic operating steps

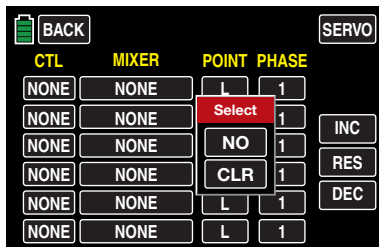
- **"CTL" column**

In the first column of the menu with the heading "Control", select a control that appears suitable for this purpose from the controls offered by your **mz-24** HoTT Pro transmitter.

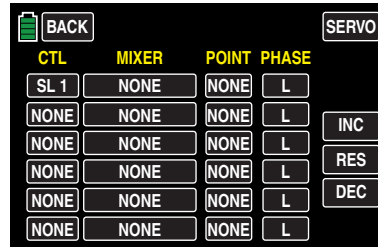
In order to assign a control, touch the button in this column and the desired line, for example:



The following appears in the display:



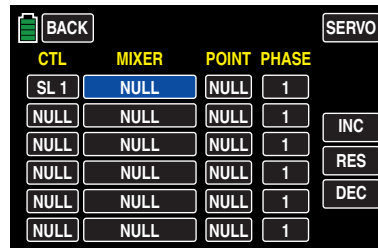
Then press the desired control such as the right proportional rotary control SL1:



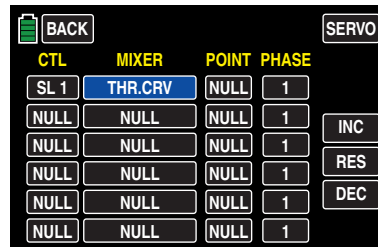
- **"MIXER" column**

In the six value fields of the second column with the header "MIXER", you can select individual helicopter mixers, or one of the two available mixers in any combination.

To select a mixer, touch the button in the "MIXER" column in the desired line, for example:



You can change the current value in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display, for example:

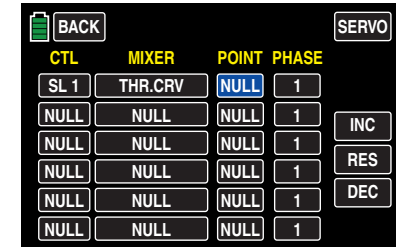


Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

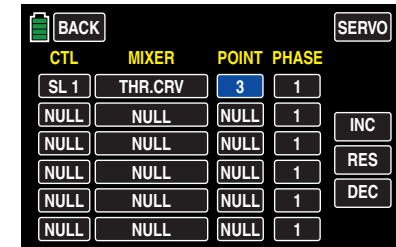
- **"POINT" column**

In the lines in the "MIXER" column, you have selected one or more mixers. In the "POINT" column, specify the support point(s) of the related mixer to be trimmed.

To select a point, touch the button in the "POINT" column in the desired line, for example:



You can change the current value in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display the desired number of times, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

## Autorotation setting

### Notice

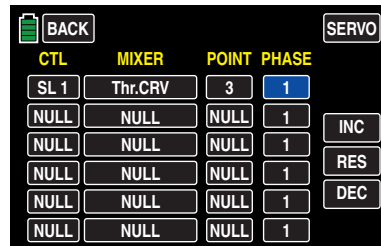


The associated controller does not have any effect if an undefined point is selected (in the basic version of the relevant curve mixers, only the points "L" and "H" are set).

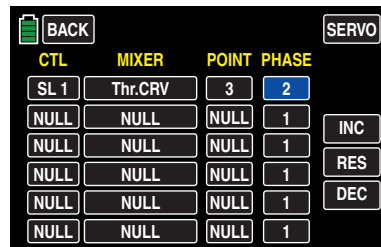
### • "PHASE" column

If you want to, specify in the right "PHASE" column the phase in which the governor should be active. In the value field, in the example, "1 (normal)", the number refers to the phase number that can be found in the sub-menu "PHASE".

To select another phase than default Phase1, touch the button in the "Phase" column in the desired line, for example:



You can change the current Phase number in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display the desired number of times, for example:



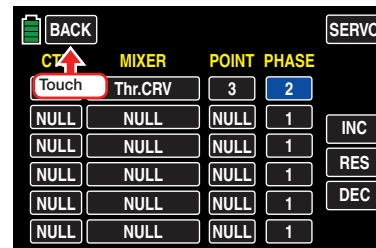
Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

### Notice



When selecting a not defined phase, as standard only the Phase 1 is active, the associated controller does not have any effect.

After you finish making your settings, touch the **BACK** button at the top left of the display to leave this menu and go to "Pitch curve":



### Notice



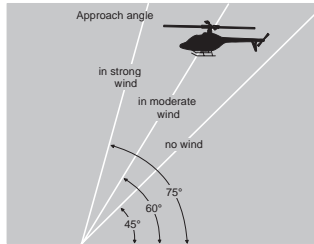
The settings that appear in this display affect the same records as those at a comparable location in the "TRIM" display of the **THR.CRV** sub-menu, see next section, which is why changes always affect each other.

In a powered flight, the maximum wing angle is limited by the available motor output; in autorotation flight, however, it is limited by the stall at the main rotor blades. To provide sufficient lift even while the speed is decreasing when flaring the helicopter, the maximum pitch needs to be set.

Switch to the autorotation phase, and move the green vertical line to the "H" point with the control stick. First set a value that is about 10 to 20% *higher* than the normal maximum pitch. Do not set a value at the very beginning that is significantly higher than normal flight since of the behaviour of the pitch control will be significantly different after switching in comparison to the usual reaction. The danger exists of over-controlling after flaring with the model continuing to rise; then the motor speed will decrease suddenly high above the ground, and the model will drop. Later, after a few test autorotations, the value can always be readjusted.

The minimum pitch *can* be different from that for normal flight. It depends on conventional control practice during normal flight. In any case, you need to set a minimum pitch for the "L" point for autorotation that will allow your model to be brought into a descent of approximately 60-70° out of a forward flight path at an average speed when the pitch is reduced to a minimum. If you use such a setting in normal flight like most of helicopter pilots, the value can be easily transferred.

If you normally let your model descend at a flatter angle, increase the value at the "L" point and vice versa.

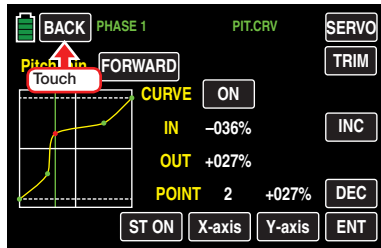


Approach angle under different wind conditions.

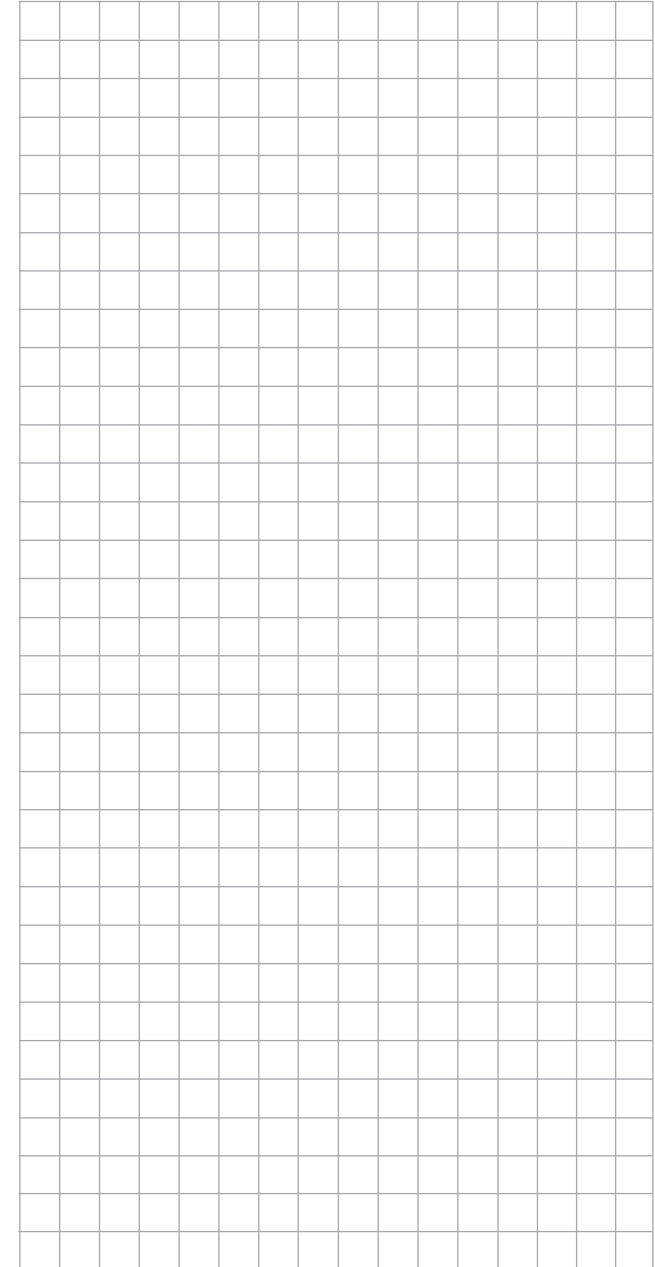
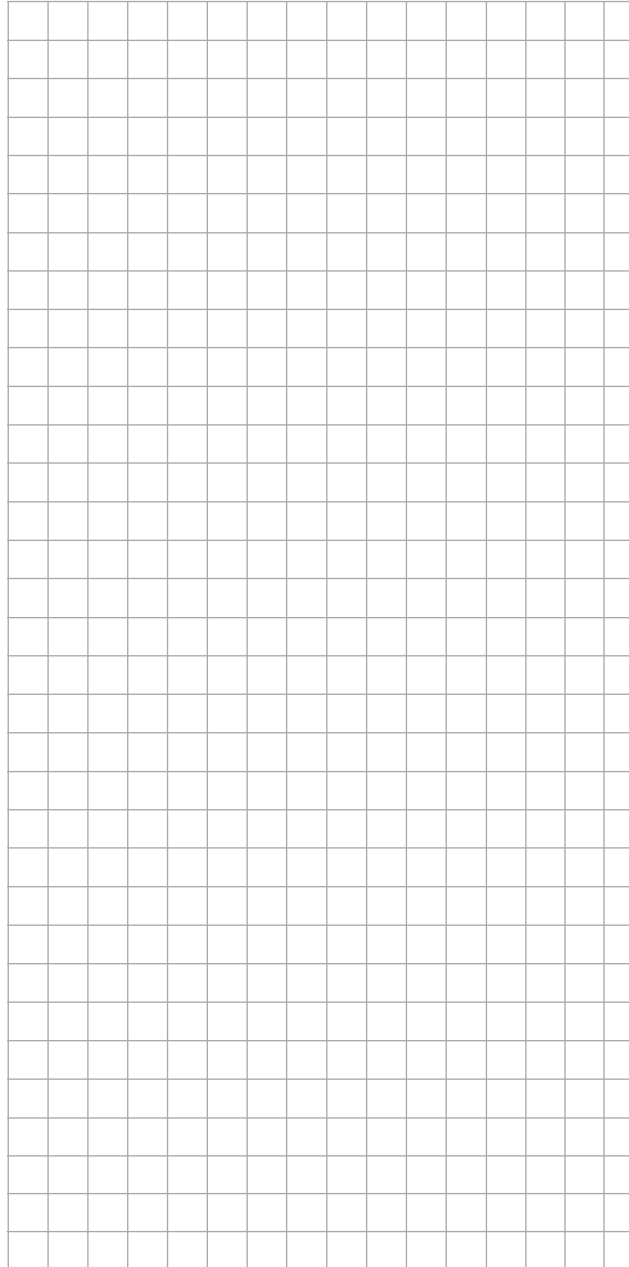
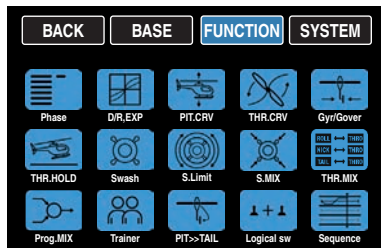
The pitch control stick is not necessarily in the bottom position during autorotation. Typically, it is between hovering position and the bottom stop so that the longitudinal inclination can be corrected using the elevation control.

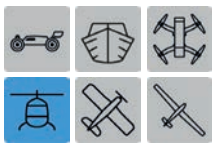
You can shorten the approach by carefully pulling back on the elevation control and sensitively reducing the pitch, or extending the approach by pushing the elevation control forward and carefully increasing the pitch.

After making your settings, leave this menu and go to "PIT.CRV" menu by touching the **BACK** button at the top right of the display:



... and go to the menu selection of the function menu:

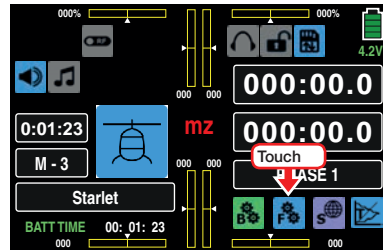




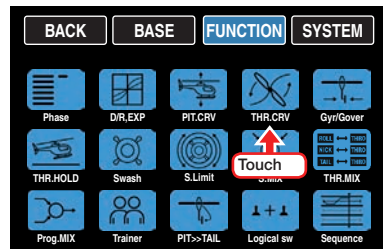
# Throttle curve

Phase-specific setting of the throttle control curve

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "THR.CRV":



As for the setting of the pitch curve also for the throttle curve there is a curve mixer available in every flight phase. Also in this mixer can however only be programmed if required not linear mixer actions analog to the control stick travels.

## Phase-dependent settings of the throttle curve

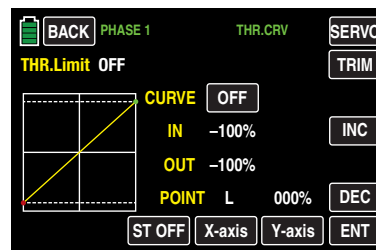
The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Tips

- The "Throttle" setting for the autorotation phase is described in the sub-menu "THR.HOLD", .
- If the "THR.Limit" has been activated in the menu »CTL Set« through the assignation of a control, its actual position in the line "THR:Limit" in the upper left side of the display is displayed in numerical value.

## Throttle curve

The throttle curve can be specified by up to 7 points, the so-called support points, along the entire control stick phase specific travel:



At the beginning, fewer support points are required to set the throttle curve. It is, however, highly recommendable to start with three support points.

These three endpoints, the two endpoints "Pitch low (L)" = -100% control travel and "Pitch high (H)" = +100% control travel, as well as a point to be placed in the control, center describe a linear characteristic for the pitch control curve.

Support points can be set, changed and deleted in the same manner as described in the previous section, "PIT.CRV". First specify the throttle curve using three points, that is, the two end points "L" and "H", as well as the other set point "1" in the control center in order to harmonize the motor performance curve with the pitch curve.

## Helicopter with gas motor or electric drive with a governor

### Notice

The appropriate adjustment of the throttle curve to a helicopter equipped with a **governor** will be addressed below.

This setting only refers to the control curve for the throttle servo or the **governor**.

- The control curve should be set so that the carburettor is completely open when the throttle/pitch control stick is in end position, or the actuator of an electric helicopter is fully enabled (with the exception of autorotation flight).
- For the hovering point which is normally in the center of the control, the carburettor setting or performance control of the motor control unit needs to be coordinated with the pitch curve to produce the desired system speed.
- At the minimum position of the throttle/pitch control stick, initially set the throttle curve so that a gas motor runs significantly faster in comparison to idling, and the clutch engages reliably.

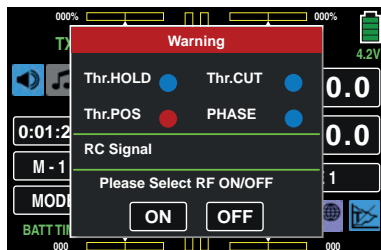
### Notice

Both a gas engine and electric motor are stopped using the **THR.Limit** within the phase.

It is unnecessary to program two quick links ("with throttle preset" and "without throttle preset" to thereby "gift" a quick link to the gas preset) which is sometimes used in other remote control systems to accomplish the same purpose since the system speed can be increased below the hovering point much more flexibly and sensitively with the **THR.Limit** included in the **mz-24** HoTT Pro transmitter than by using a gas preset.

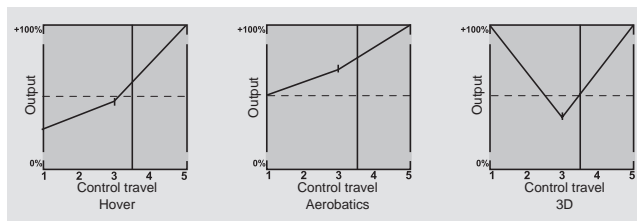


To start the gas motor, make sure that the **THR.Limit** is closed; that is, the carburetor can only be adjusted by trimming its idle position. For this, observe punctually the **Safety notes** at the end of this section. If the throttle is set too high when the transmitter is turned on, the RF module remains off and a visual and acoustic warning are generated.



The following three diagrams show typical 3-point throttle curves for different phases such as hovering, aerobatics and 3-D flight.

### Example throttle curves for different phases:

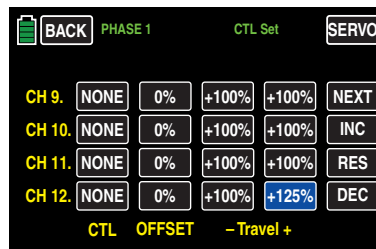


### Notices



- In any case, you should use the **Throttle limit function** (see the section "**CTL Set**"). The throttle servo is normally completely separate from the throttle curve at the left stop of the (throttle limit) proportional dial DV1, the motor is idling and only reacts to CH1 trimming. This option allows you to start the motor from any phase and turn it off using digital trimming.

After starting the motor, slowly turn the throttle limiter to the opposite stop in order to completely actuate the throttle servo using the throttle/pitch control stick. To keep the throttle servo from being limited by the throttle limiter in the full throttle direction, in line "CH12" of the sub-menu "D/R,Exp", set the control travel on the plus side of the "Travel" column the value according to each phase to +125%:



- Since electric drives do not require an idle setting, when making the basic settings for an electric helicopter, ensure that the control range of the throttle limiter reliably exceeds or falls below the setting range of the motor control unit which normally extends from -100% to +100%.

The "Travel" setting of the throttle limiter may have to be correspondingly adapted in all phases in the line "CH 12" of the sub-menu "D/R,Exp".

The throttle curve should be adapted in the same manner as with a gas helicopter in flight.

### Tip

In order to measure the flight time of a (gas) helicopter, you can assign a control switch to the throttle limit servo and use it to turn a **Timer** on and off.

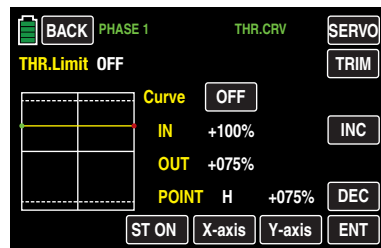
### Helicopters with governor

In contrast to speed **controllers** that only regulate performance like a carburetor, **governors** maintain a constant speed in the system that they are monitoring by independently regulating the provided output. In the case of a gas helicopter, the control independently controls the throttle servo like the motor control unit of an electric helicopter. *Governors therefore only require a speed setting and not a classic throttle curve.* A deviation from the set speed occurs when the required output exceeds the maximum available output. Normally, receiver output 8 is used for connecting a **governor** (see **Receiver assignation**). If this connection is used, the gas throttle limiter is not used since it exclusively acts via the "Throttle curve" mixer on output 6 which is not assigned.

In order to take advantage of the comfort and safety features of the throttle limiter, connect the governor to receiver output 6 in deviation from the general connecting strategy, and only adapt the throttle curve so that it can assume the task of the normal servo.

Since the throttle curve in this case only determines the target speed of the motor control unit and this target speed normally remains constant over the entire pitch adjustment range, set a horizontal line in the "Throttle curve" sub-menu (each (pitch) input value results in the same (throttle) output value) whose level determines the target speed.

First, delete support points 1 to 5 that may be set, and then set the support points "L" (input = 0%) and "H" (input = +100%) to the *same* value, for example:



The value to be set depends on the governor that is used as well as the desired target speed, and can of course be varied for specific phases.

### Tip

If required the implemented governor function can be phase specifically trimmed after the required programming of a free mixer by tapping on one of the two digi-trim buttons of the **mz-24** HoTT Pro transmitter within a maximum of  $\pm 37,5\%$ , see [Programming example](#). This options offers you the possibility to correct the trimming of the phase specific (and at any time recallable) governor through only one control element.

### Notice



If, as previously described, the throttle curve is used to control a **governor**, all the mixers of the "**THR.MIX**" menu have to be left on **INH**.

### Adjusting the throttle and pitch curve

The throttle and pitch control are always activated by separate servos which, however, are always activated together by the throttle/pitch control stick (except in the autorotation phase). The helicopter program automatically couples the servos. The trim lever for control function 1 in principle only acts on the throttle servo of the **mz-24** HoTT Pro transmitter programs.

The coordination of throttle and pitch, i.e., the performance curve of the motor with collective blade adjustment, is the most important setting for helicopters. The **mz-24** HoTT Pro transmitter programs allow the throttle, pitch and torque compensating curves to be independently adjusted.

These curves can be characterized with up to seven points, but generally fewer points are sufficient. It is strongly recommended to first start with 3-point curves. Individual values can be entered for the center position and any other support points, as well as for the two end positions ("L" ("low") and "H" ("high")) of the throttle/pitch control stick which establish the control curves.

Before adjusting the throttle and pitch function, the linkage of all servos must be first correctly pre-adjusted mechanically according to the helicopter's adjusting instructions.

### Notice



The hovering point should always be in the center position of the throttle/pitch control stick. In special cases, for example for 3-D flight, deviating hovering points can also be programmed, for example a point for the normal flight position above the center, and a point for inverted flight below the center.

### Idle setting and throttle curve

### Notice

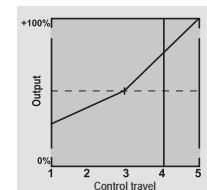


Since electric drives do not require an idle setting, an idle adjustment is unnecessary with this type of drive. The coordination of the throttle and pitch curve(s) described here is similar to gas helicopters, however.

The **Idle setting**, is done exclusively when the throttle limiter is closed, normally with the trim control of the CH1 function, and only in special cases with the throttle limiter as well.

Programming a corresponding value at the "L" point of the throttle curve adjusts the descent speed of the motor without influencing the hovering setting.

You can use the phase programming, for example, to set different throttle curves. This higher system speed below the hovering point is useful for example in fast, steep landing approaches when the pitch is very low, and in aerobatics.



The figure shows a curve with a throttle position that changes slightly below the hovering point in the control center.

Different throttle curves depending on the phase are programmed for optimum adjustment for hovering and aerobatics:

- A lower system speed with smooth, soft control reactions and less noise while hovering.
- A higher rotor speed for aerobatics at the maximum motor output. In this case, the throttle curve needs to be adapted within the hovering range as well.

### Basic settings

Although the pitch and throttle curves in the **mz-24** HoTT Pro transmitter can be electronically adjusted over a wide range, all the linkages in the model must be correctly adjusted mechanically according to the helicopter instructions. Experienced helicopter pilots will in all likelihood be glad to help you with the basic settings.

The carburettor control must be adjusted so that the throttle is completely open at the maximum pitch position, or the motor control unit of an electric helicopter is at full power. When the throttle limiter is closed, the carburetor must also be able to be completely closed with the CH1 trim control, and the servo may not mechanically overtravel. The motor control unit must reliably turn off the electric power when the throttle limiter of an electric helicopter is closed.

Perform these settings very carefully by correspondingly adapting the control linkage and/or changing the articulation point on the servo or carburettor arm. Only after this is done should the throttle servo be finely adjusted electronically.

### CAUTION



**Before you start the motor the first time, become familiar with the dangers and precautions involved in handling motors and helicopters.**

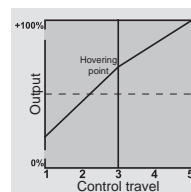
After these basic settings are made, the motor should be started according to the motor operating instructions, and the idling can be adjusted using the trim control of the throttle/pitch control stick. The idling position that you set is displayed in the transmitter's basic display by a horizontal bar in the position display of the CH1 trim control.

### Hover settings

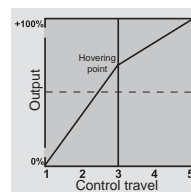
The model should lift off the ground when the pitch control stick is approximately in center position and hover at the set speed. If this does not occur, proceed as follows:

#### 1. The model lifts off when the pitch control stick is past center position:

- a) The speed is too low  
Solution: Increase the value of point "1" in the THR.CRV display.

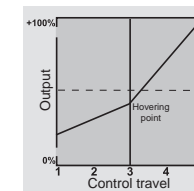


- a) The speed is too high  
Solution: Increase the pitch angle of the rotor blades by increasing the value of point "1" in the PIT.CRV display.

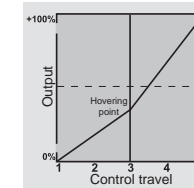


#### 2. The model lifts off before the pitch control stick reaches center position:

- a) The speed is too high  
Solution: Reduce the carburettor opening by reducing the value of point "1" in the THR.CRV display.



- b) The speed is too low  
Solution: Reduce the pitch angle of the rotor blades by reducing the value of point "1" in the PIT.CRV display.



### Notice

Perform these adjustments until the model hovers at the right speed when the throttle/pitch control stick is in center position. All the other adjustments of the model parameters depend on this being performed correctly.

### Standard adjustments

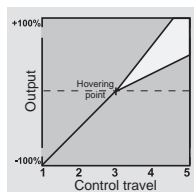
Standard adjustments are performed after the above-described basic settings where the model hovers at the provided speed in normal flight when the throttle/pitch control stick is in center position. The standard adjustments are made to allow the model to hover and perform roundtrips in all phases at a *constant speed*.

### Adjustments for climbing

A combination of the throttle/hovering setting, the pitch setting for the hovering point and the maximum pitch position (point "H") allows you to easily achieve a constant speed from hovering to maximum climbing.

First, perform a slow vertical climbing flight by moving the pitch control stick to the end position. The motor speed should not change in comparison to the hover setting.

If the speed decreases while climbing even though the drive is at maximum output and no additional power can be provided, reduce the maximum blade angle while the pitch control stick is fully deflected, that is, the value of point "H". Conversely, increase the pitch angle if the motor speed increases while climbing. In the graph of the PIT.CRV display, move the vertical line to point "H" with the pitch control stick, and correspondingly change its value.

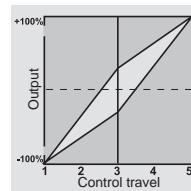


*This picture only shows changes of the maximum pitch setting.*

Then make the model hover which should occur when the throttle is in the center position. If the pitch control stick needs to be moved out of the center position toward higher values for the hovering point, compensate this deviation by slightly increasing the pitch value during hovering (i.e., from point "1") until the model hovers when the control stick is in the center position. If the model hovers below the center position, correspondingly reduce the pitch angle.

In certain circumstances, it can also be necessary to adjust the carburettor opening at the hovering point (point "1") of the THR.CRV display.

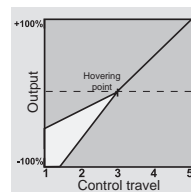
*This picture illustrates the change of the hovering point, that is the minimum and maximum pitch were left at -100% and +100%.*



Modify these settings until the speed remains constant over the entire control travel between hovering and climbing.

### Adjustments for descending

Descent is adjusted so that the model descends from forward flight at a great height while the pitch is completely pulled back. Set the minimum pitch (point "L") so that the model descends at an angle of 60-70°. In the graph of the "Pitch" display, move the vertical line to point "L" with the pitch control stick, and correspondingly change its value.



*This picture only shows an example of changes of the minimum pitch setting.*

Once this flight response is achieved, adjust the value for "Throttle min" (the value of point "L" in the graph of the THR.CRV display) so that the speed neither increases nor decreases. The coordination of throttle and pitch is now complete.

### Final important instructions:

Before starting the motor, make sure that the throttle limiter is completely closed so that the carburettor only reacts to the throttle trim lever.

Before starting the motor, make sure that the throttle limiter is completely closed so that the carburetor only reacts to the throttle trim control. If the carburetor is opened too wide when the transmitter is turned on, not only a visual and acoustic warning are generated but also the automatic switch on of the RF module is blocked. If the carburettor is open too wide or if the speed controller is set too high, there is a danger that the motor will start at a high speed once it is turned on, and the centrifugal clutch will engage immediately.

You should therefore always

**hold the rotor head tightly when starting.**

If the motor accidentally starts when the carburettor is open too wide, always remember

**do not panic!**

**Keep a firm grip on the rotor head!**

**Do not let go,**

immediately turn down the throttle limiter even if there is a danger of the drive becoming damaged since

**you are responsible for ensuring that the helicopter does not move in an uncontrollable manner.**

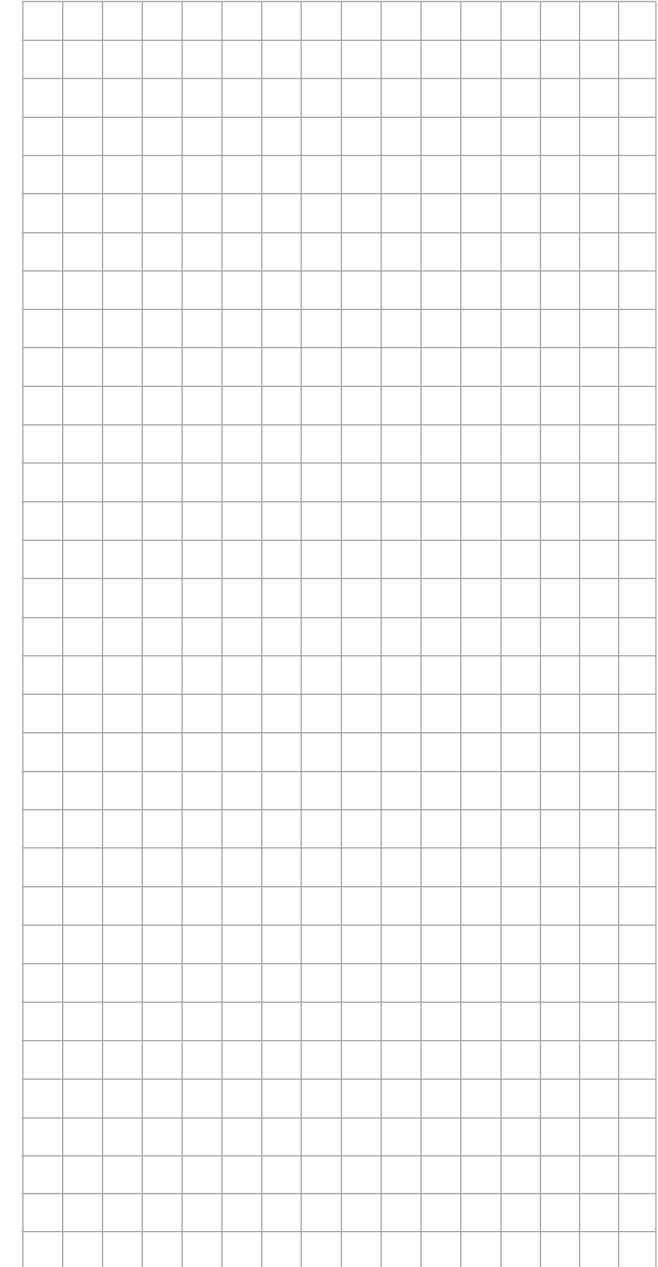
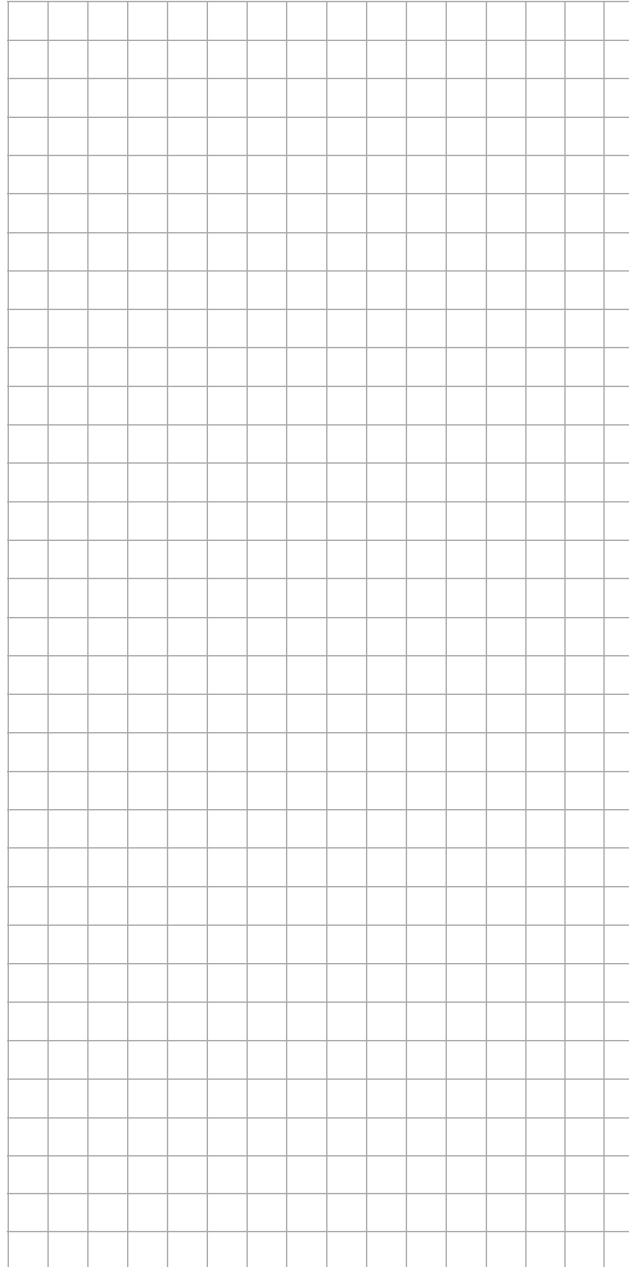
The cost of repairing a clutch, transmission or at the motor are negligible in comparison to the injury and damage that can arise from the rotor blades of a model helicopter flying around uncontrollably.

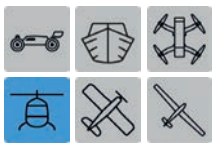
**Make sure that no one else is within the hazard zone of the helicopter.**

In addition, you should not switch from idling to the flight setting while the motor is operating at a high speed.

This would suddenly speed up the rotor which prematurely wears out the clutch and gearing. In addition, the main rotor blades which are generally loosely hinged would not smoothly follow such a sudden acceleration and would swing out of their normal position, perhaps even striking the tail boom.

After starting the motor, you should therefore **s l o w - l y** accelerate the system speed with the throttle limiter.

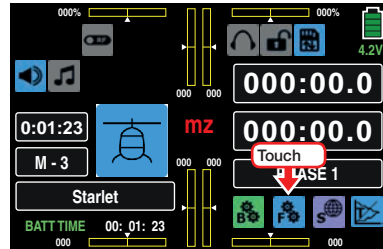




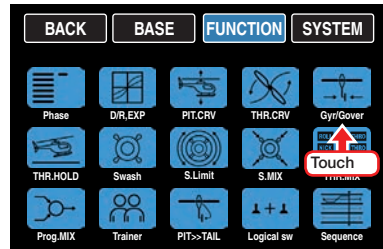
# Gyro/governor

Settings for the gyro and governor

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



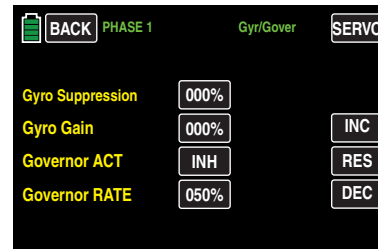
The display switches to the blue function menu. Touch the menu item "Gyr/Gover".



## Phase-dependent settings for the gyro and governor

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## "Gyro suppression" line



### Notice



This option may normally not be used for current standard gyro systems. You therefore need to consult your gyro setting instructions since otherwise you may make it impossible to fly your helicopter. Nonetheless, this option was retained to satisfy all requirements and conventions.

This option can influence the effect of the gyro sensor (gyroscope) as the tail rotor control stick is moved, assuming that a gyro system is used in which the gyro's effect can be set by the transmitter using an additional channel, channel 7 in the *Graupner/JR* and *Graupner* remote-control system. The gyro suppression reduces the gyro's effect in a linear manner in proportion to the deflection of the tail rotor control stick corresponding to the set value. If the gyro has not been suppressed (at a value of 0%), the gyro's effect remains independent of the control stick deflection.

The gyro's effect can however be additionally varied smoothly (depending on the phase if desired) between a minimum and maximum using a control assigned in the "Gyro" line in the "CTL Set" sub-menu, for example with one of the side proportional dials SL1 or SL2. The maximum gyro gain occurs at the full deflection of the control and is zero at the opposite limit.

In the program, you are of course free to restrict the effective range to both sides by setting the control travel.

Depending on the position of the control, the gyro gain is as follows in response to the full deflection of the tail rotor control control stick:

**"Momentary control position  
minus  
the value of the gyro suppression".**

If the gyro is in the neutral position and gyro suppression is set, the gyro's effect is accordingly reduced from 100% to zero with increasing tail rotor excursion. For values between 100% and a maximum of 199%, full gyro suppression is achievable before full tail rotor excursion (depending on the control position) (see the figure after the next).

With the *Graupner/JR*-Gyro NEJ-120 BB, No. **3277**, both the bottom and top value are set: control 1 sets the *minimum* gyro gain in the *bottom* position of the servo, control 2 sets the *maximum* effect in the *top* end position of the servo. The switch between these two values occurs approximately in the center of the servo travel.

The gyro systems PIEZO 900, PIEZO 2000 and PIEZO 3000 contrastingly feature proportional, infinitely variable adjustment of gyro gain (see the following example graphs).

As an example, the option to configure phase-specific – and static – gyro gain gives you the opportunity to exploit maximum stabilization for normal, slow flying, but to reduce gyro gain for fast circuits and aerobatics.

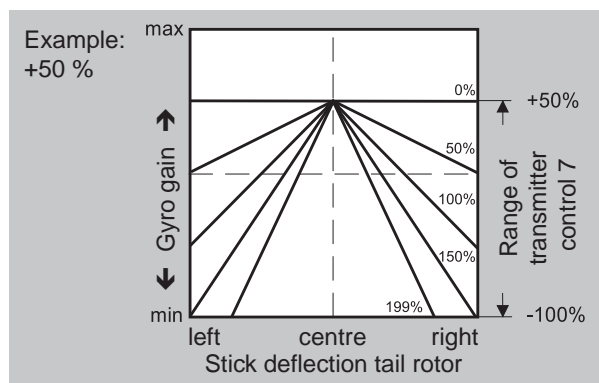
## Samples of various gyro settings

- Linear gyro suppression: 0% to 199%.

With the tail rotor control stick in the center position, the resulting gyro gain is set using the selected control. Using a proportional rotary control, the effect is infinitely variable between zero ("min") and maximum ("max"), provided that control travel is not restricted. With full tail rotor deflection, the effective gyro gain is as follows:

"current control position  
minus  
gyro suppression value".

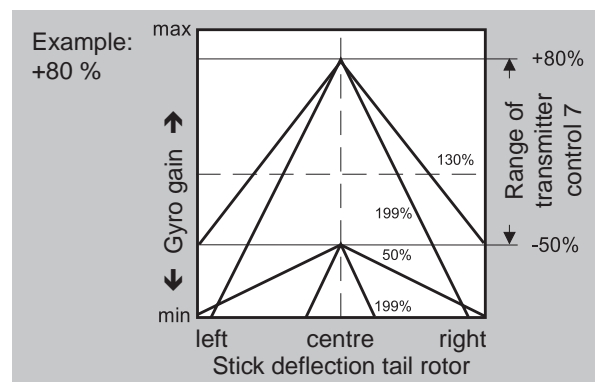
Accordingly: at 0% gyro suppression, gyro gain is constant for tail rotor control stick movement; at 50% suppression, gyro gain is reduced to half if the assigned control is moved to the +50% position (as shown here); and only at >150% suppression is gain reduced to zero with the control at this position, well before full tail rotor deflection.



- Linear gyro suppression with reduced control travel, e.g. -50% to +80% of full travel.

Gyro gain is smoothly variable within these control limits.

Here too, for purposes of illustration, we plot gyro gain values in relation to tail rotor deflection for various parameter values of gyro suppression.



## Adjusting the gyro sensor

To achieve the maximum possible level of stabilization for the helicopter with the gyro along the vertical axis, observe the following:

- The controls should have as little friction and "play" as possible.
- There should be no "spring" in the control linkage.
- Use a strong and – in particular – a fast servo.

When the gyro sensor detects a model rotation, or a corresponding corrective change to tail rotor thrust takes effect, the further the gyro gain adjuster can be moved without causing the tail of the model to start oscillating, and the better the model's stability about its vertical axis. If the response is slower, there is a risk that the model's tail will start to oscillate even at low gyro gain settings. Here, further reductions to gyro gain will need to be made to eliminate the oscillation.

If the model is flying forward at high speed or hovering in a powerful headwind, the net result of the stabilizing effect of the vertical fin combined with the gyro may also lead to an overreaction that once again manifests itself through tail oscillation. To achieve optimum gyro stabilization under all conditions, you can make use of the option to adjust gyro gain from the transmitter using a transmitter control assigned to input "7", in connection with gyro suppression and/or the two settings on the Gyro NEJ-120 BB.

## Further tips on gyros with configurable multilevel gyro gain (e. g. NEJ-120 BB)

Since you cannot specify the gyro gain from the transmitter proportionally via the transmitter control, the gyro's own control 1 must be used to set the (weaker) gyro gain (e. g. for aerobatics) and control 2 must be used to set the stronger gyro gain (e. g. for hovering). Even though a proportional control is used for control function 7, only a switch-over between these two values takes place and the setting is therefore not proportional.

You should therefore advance control 2 to the point where the model is on the brink of oscillating when hovering in calm conditions, and advance control 1 to the point where the model does not oscillate with its tail even when flying at maximum speed into a strong headwind. Depending on the state of the weather and the flight program planned, you can also switch the gyro gain from the transmitter, possibly with gyro suppression dependent on tail rotor deflection if required.

## "Gyro Gain" line

### Notice

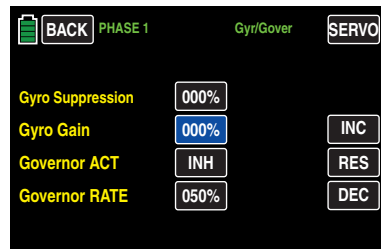
» An offset value input in this option and / or in the line "CH7" of the sub-menu "CTL Set" of the basis menu adds itself!

For the sake of clarity, make sure to only enter and / or change an offset value in one of the two options.

Most of the current gyro systems can be adjusted for a smooth, proportional effect; you can also choose between two different modes of action by the transmitter.

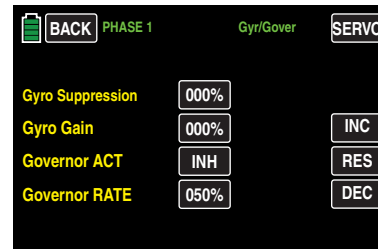
If the gyro that you are using also has one of these options, the alternative offset setting enables both the normal gyro gain and "heading lock mode" as well as flying with maximum stabilization in normal, slow flights within this selected mode, and reducing the gyro gain in fast roundtrips and aerobatics.

You should accordingly take advantage of switching phases to enter different settings in the "GYRO OFF-SET" line. Values between -125% and +125% are possible, for example:



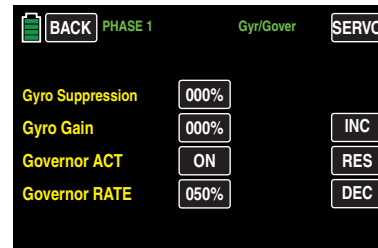
Based on these phase-specific (offset) settings, the gyro gain can also be smoothly varied with a control in the "Gyro" line in the "CTL Set" sub-menu, .

### "Governor ACT" line



In the above figure, this option is normally **OFF**, which means that the control channel 8 can be normally used without restriction.

If you have or wish to connect a **governor** to output 8 to automatically maintain the rotor speed, touch the value field of this line with a finger or the provided stylus to turn it **ON** ...



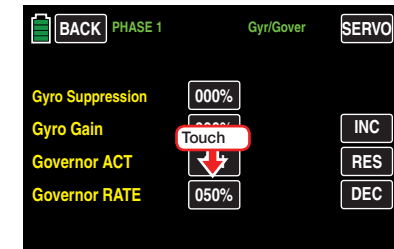
... and vice versa.

### "Governor RATE" line

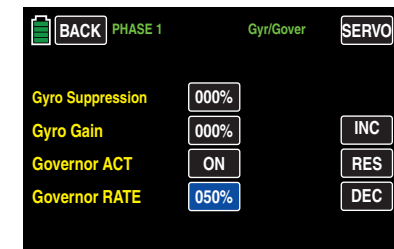
After you have activated the option "Governor at CH8" by switching to **ON** in the previous line, you can set the rotor speed to be maintained by your governor in this line by changing the percentage.

The adjustment range is 0 to 100%.

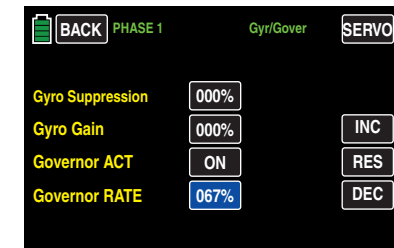
Touch the value field of this line:



The color of the field switches from black to blue:



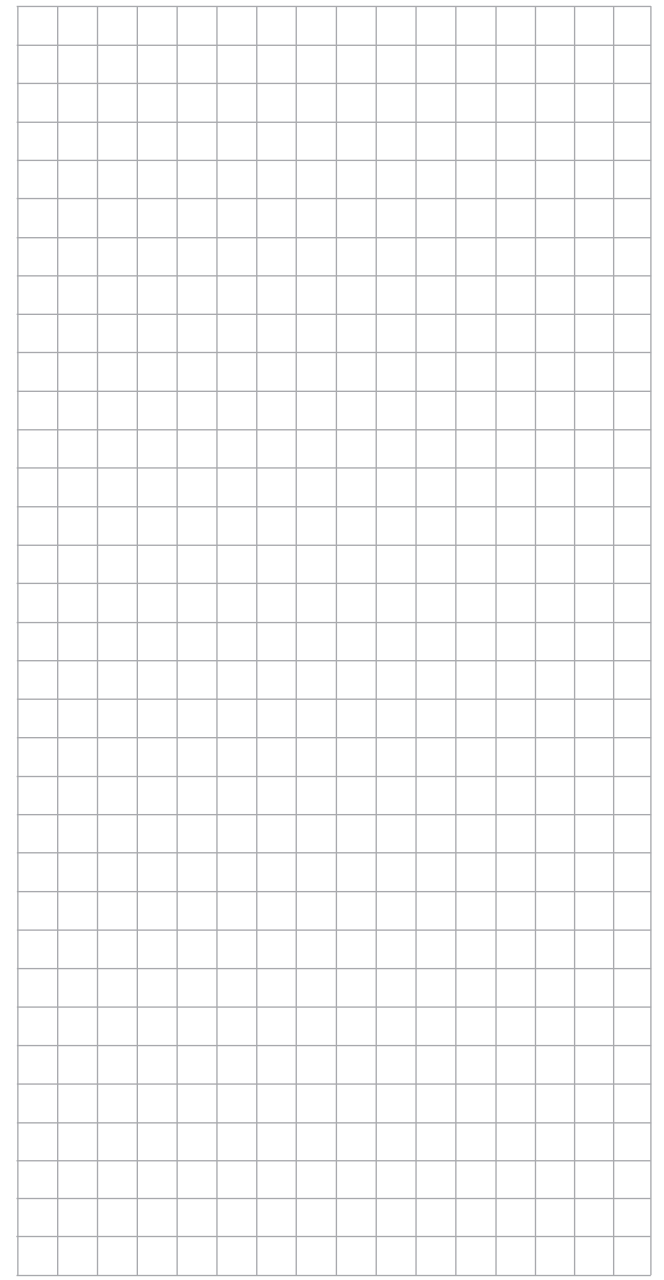
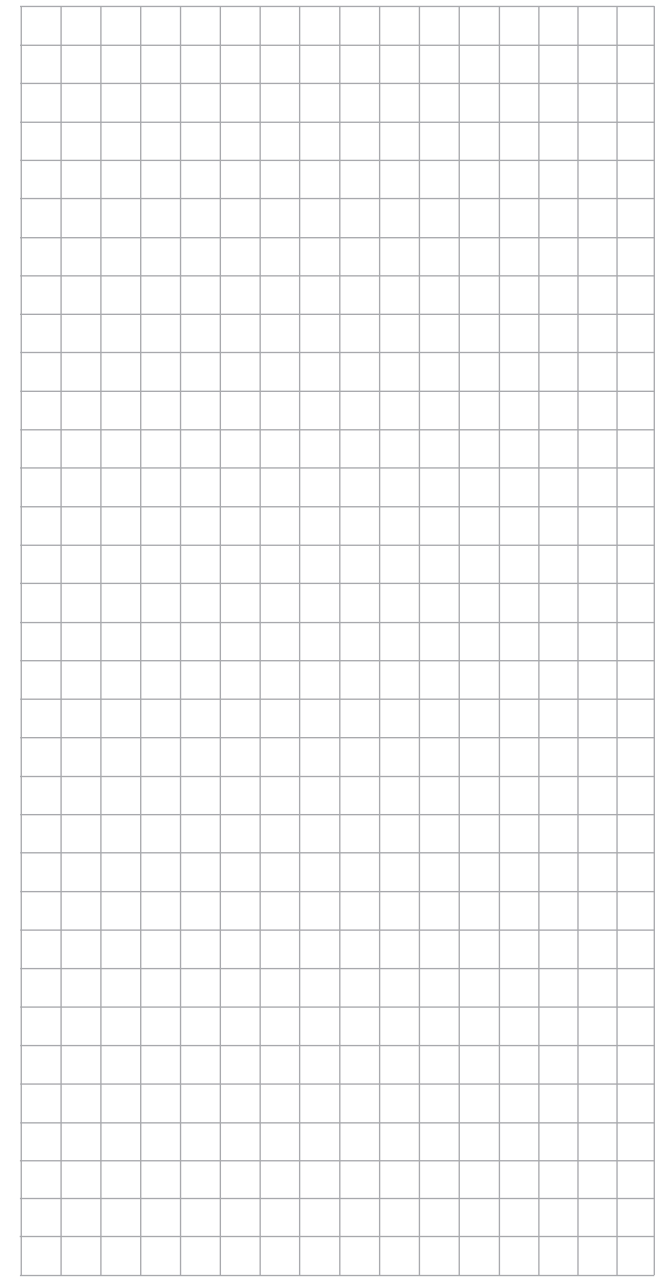
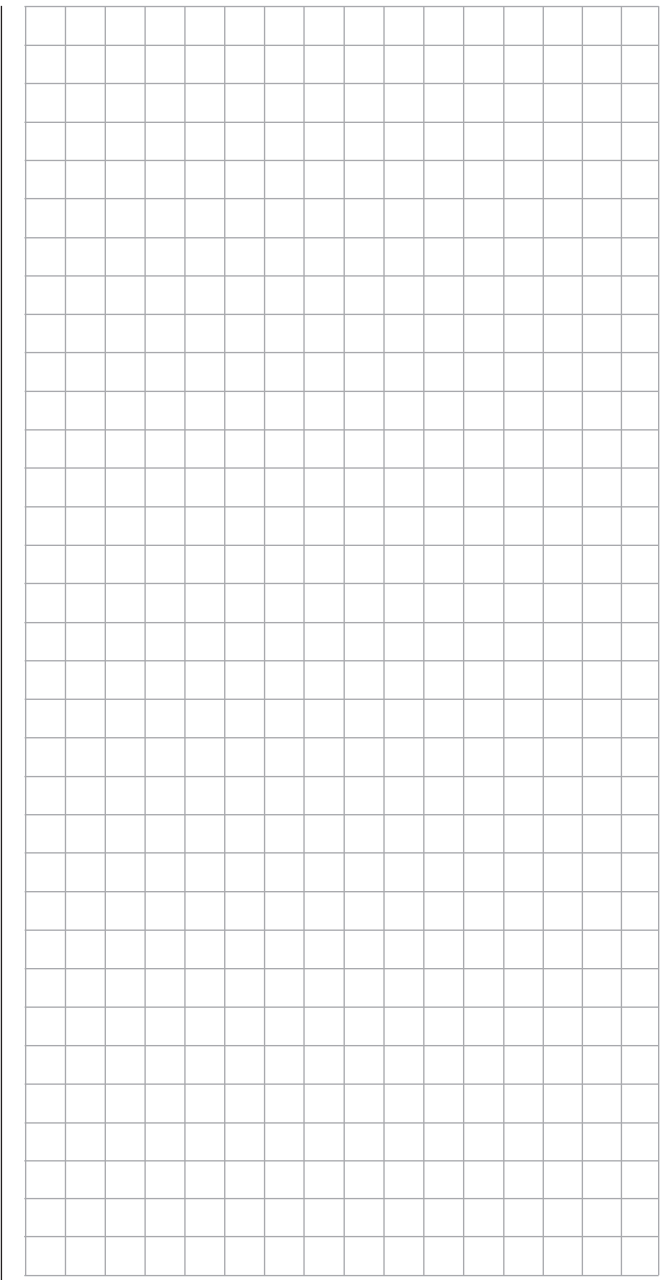
You can change the current value in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.

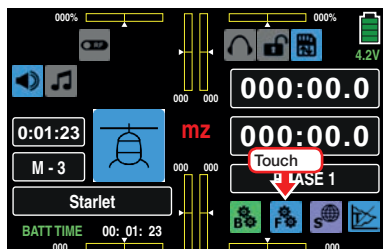




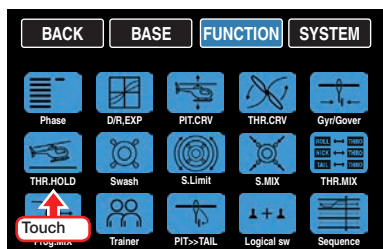
# THR.HOLD

AR throttle position

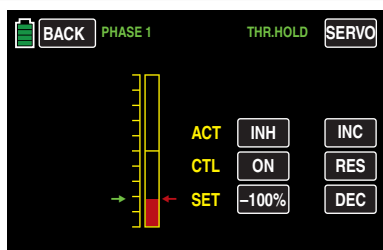
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "THR.HOLD":



## AR throttle position



During competition, is expected that gas engines should be completely turned off. In the training phase, this is a bit inconvenient since you would have to restart the motor after each autorotation landing.

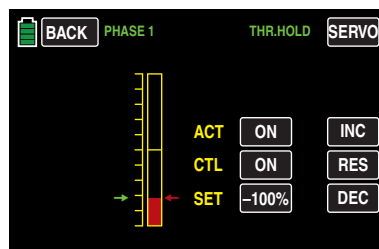
Therefore, set the value during the training phase in this display so that the gas motor can be kept idling during the autorotation phase without the clutch engaging, and so that any electric drive is definitely off.

### Tip

With the "Thr.CUT" option in the Base menu, there is an alternative emergency off function.

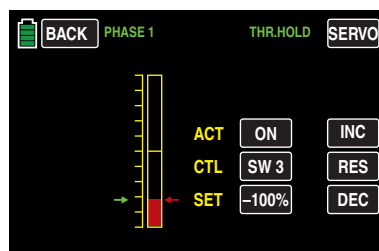
- **ACT line**

To turn this option on and off, touch the value field of the "ACT" line, for example:



- **Ctrl/sw line**

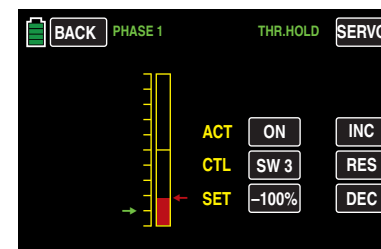
In this line, as described in the [Control and switch assignment](#) section, assign **the same** switch with which you switch to the autorotation phase, for example:



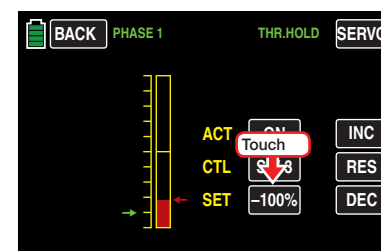
- **SET line**

The green arrow to the left of the bar graph indicates the current, influenced by the actual position of the Throttle/pitch control stick as well as by the throttle limit, position of the throttle servo. The red arrow to the right indicates the currently set autorotation throttle position, as standard -100%.

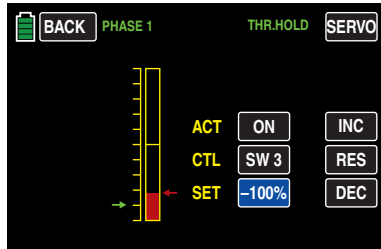
To change the current autorotation throttle position, use the throttle/pitch control stick to move the green arrow, and possibly the throttle trim, to the position that the throttle servo is to assume during autorotation, for example:



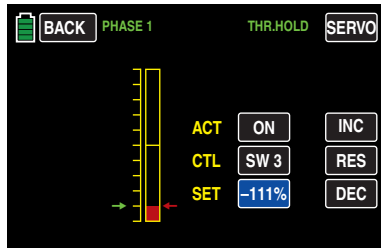
Touch the value field of this "SET" line:



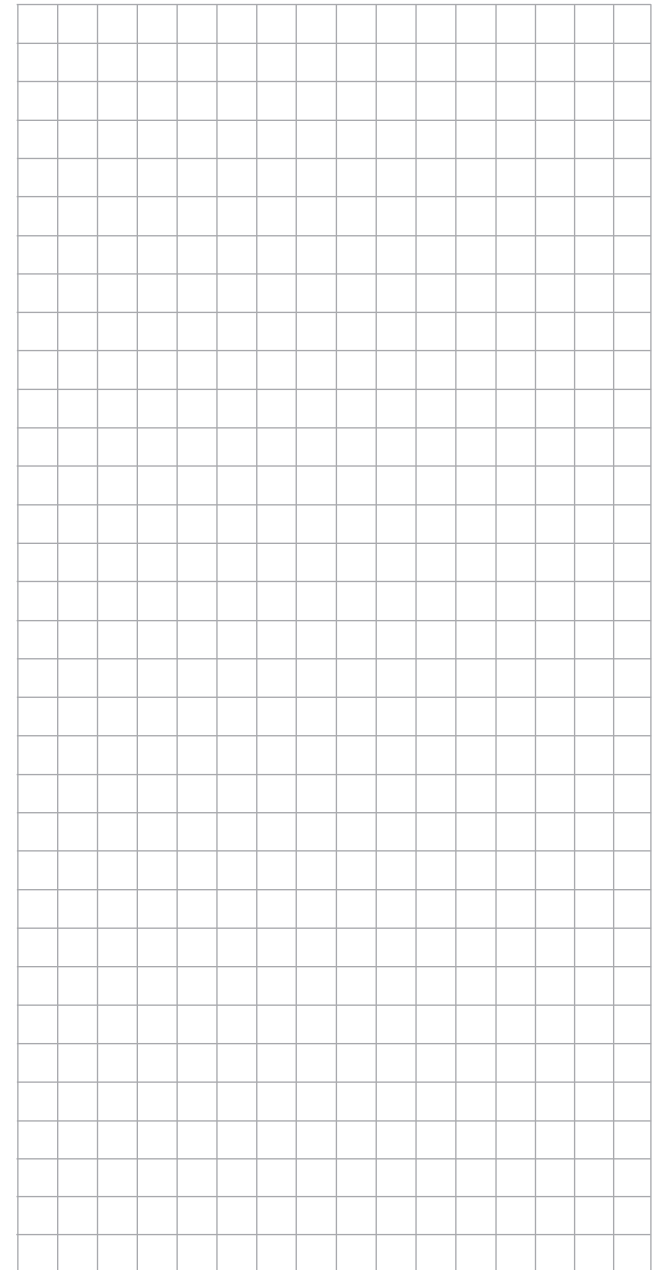
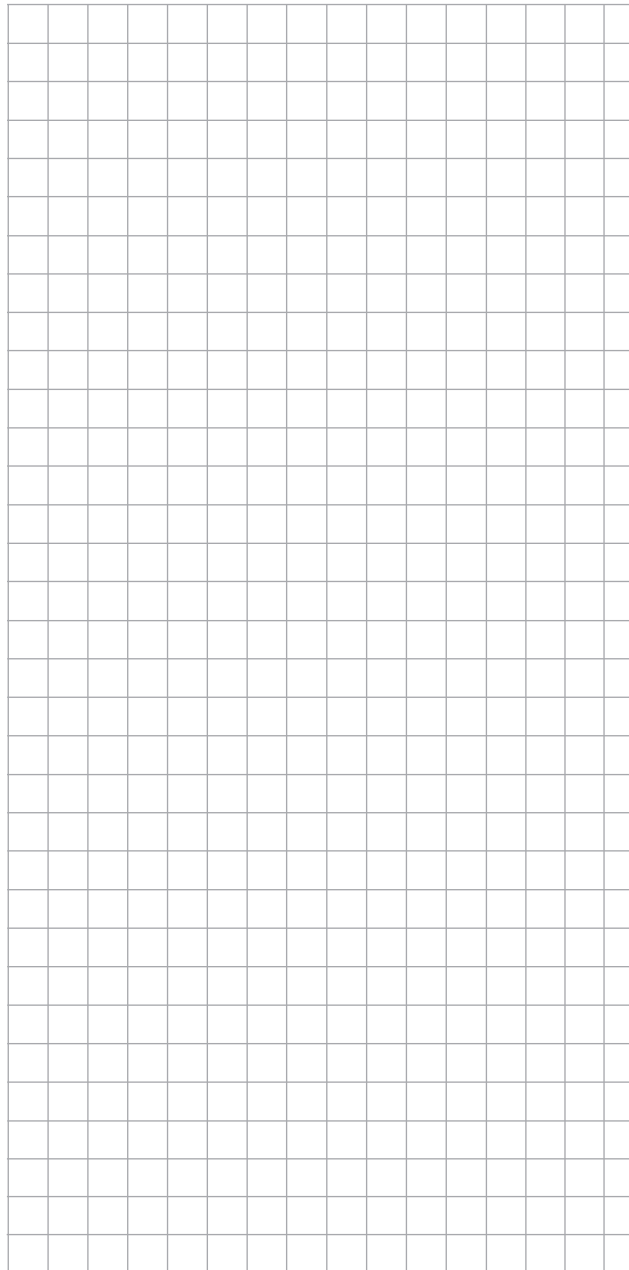
The color of the field switches from black to blue:

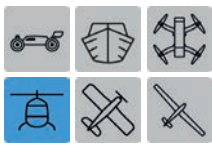


In the blue (active) value field, touch the **+** or **-** buttons, move the red arrow relative to the green arrow, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value. After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.



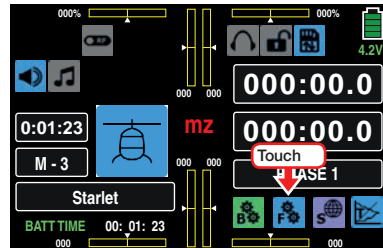


# Swashplate mixer

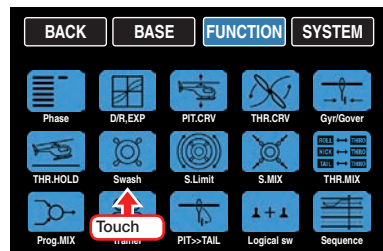
Pitch, roll and nick mixer

This sub-menu is hidden when selecting "1 (swashplate) servo" in the basic settings of the model.

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

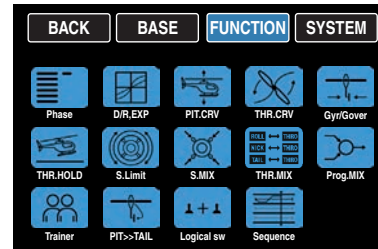


The display switches to the blue function menu. Touch the menu item "Swash":

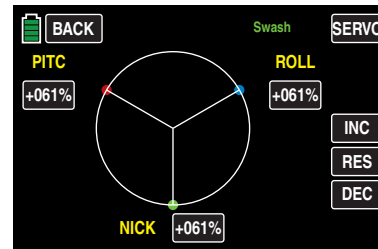


In the basic settings, you have specified how many servos are installed for pitch control in your helicopter in the "Swash" display. Once this entry is made, the required mixers for the swashplate functions of roll, elevation and pitch axis are activated so that you do not have to define any additional mixers.

With helicopters that are controlled only using a *separate pitch servo*, the menu item "Swash" is unnecessary since three swashplate servos are operated separately for pitch, elevation and roll by the software program; that is, without any mixer. Consequently the menu item "Swash" will also be obscured by selecting "1 SERVO":

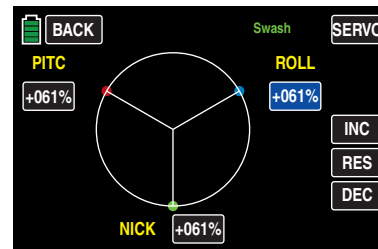


With all other swashplate linkages employing 2 ... 4 collective pitch servos, the mixer ratios and directions are set up by default, as represented in the following display for "3Sv 120° (roll)" swashplate of an helicopter. The preset is +61%...

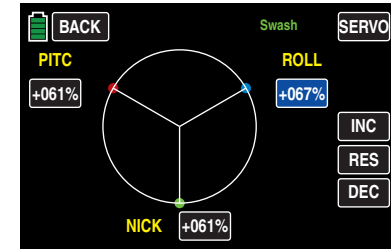


... but the value can be varied from -100% to +100% if required.

As usual, touch the value field of the mixer to be changed, for example:



You can change the current value in the value field as needed by touching the + or - buttons at the right edge of the display, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

If the swashplate control (pitch, roll and elevation) does not respond to the control sticks properly, you should alter the mixer directions ("+" or "-") before trying to correct the directions of servo rotation.

### Notice

➤ Ensure that changed mixer values do not result in the servos mechanically striking their end-stops.

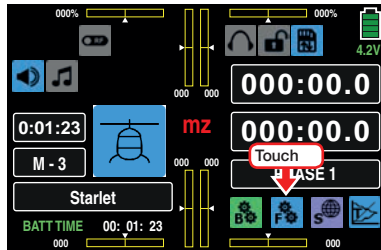
After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.



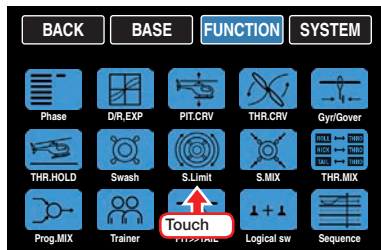
# Swashplate limiter

Adjustable limitation and rotation of deflection

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

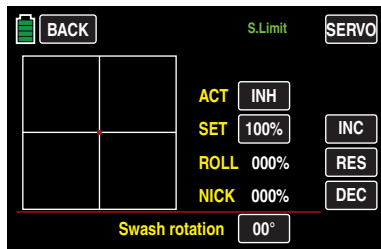


The display switches to the blue function menu. Touch the menu item "S.Limit":

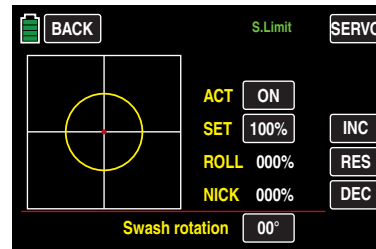


## Swashplate limiter

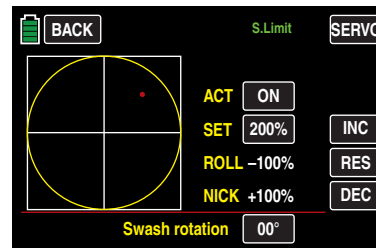
This function acts like a circular mechanical fence that limits the normally square path ...



... of a control stick (marked with a red circle) to a maximum of one circular area provided that the limiter is turned **ON** in the "ACT" line:



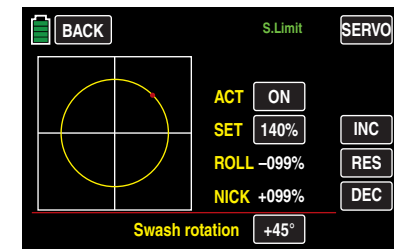
If the helicopter is adjusted so that the deflections for roll and/or elevation exploit the maximum travel mechanically possible, e. g. for 3D helicopters, then the total tilt applied to the swashplate if full roll and elevation commands are applied simultaneously will be considerably greater (141% in numerical terms). The swashplate mechanism may then strike its endstops and, in the worst case, the ball-heads could even be disengaged.



In the **mz-24** HoTT transmitter, the relevant software function offers a limitation of the swashplate deflection that can be adjusted between any combination of circular and square. That is, the limitation of the overall swashplate deflection or the swashplate tilt angle can be limited between 100% (the deflection has a circular limit to the value achievable with roll or elevation) and 200% (no effective limit) in the "SET" line with the **+** or **-** buttons at the right edge of the display. In addition, the function can be completely deactivated by selecting **BLK** in the line "ACT". Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

## Swash rotation

With some rotor head controls, it is necessary to tilt the swashplate in another direction than the intended rotor plane angle during cyclical control. For example if a four-blade rotor is used, it may be necessary to turn the actuation 45° to the right or left with this menu item so that the control linkage from the swashplate to the rotor head can be precisely vertical. This allows the blades to be controlled correctly without undesirable differentiation. The controlling linkage then does not have to be mechanically changed. Negative angles equate to a virtual rotation of the rotor head to the left; positive angles a virtual rotation to the right.



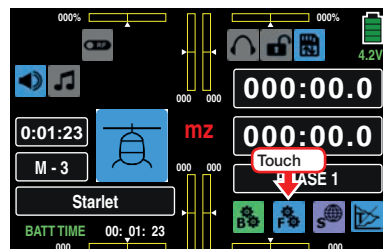
After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.



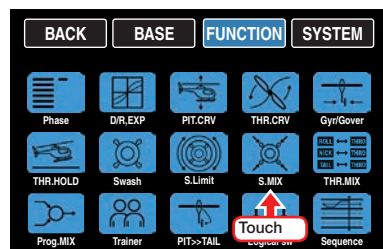
# Heli mixer

Phase-dependent settings of pitch, roll and nick

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "S.MIX":

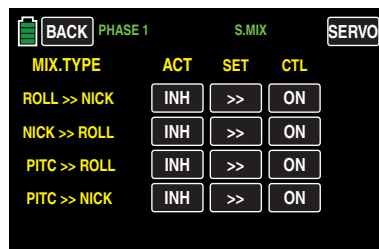


In the following menu "HELI-MIX" addressed below, the flight-phase dependent mixers "ROLL >> NICK", "NICK >> ROLL", "PITC >> ROLL", and "PITC >> NICK" are described. These menus are used especially for compensating asymmetrical helicopter reactions to control commands and to adjust helicopters with multi-blade rotors.

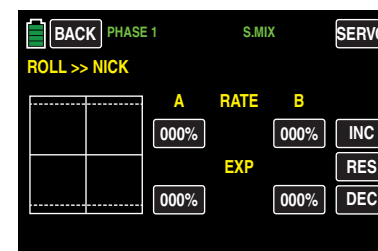
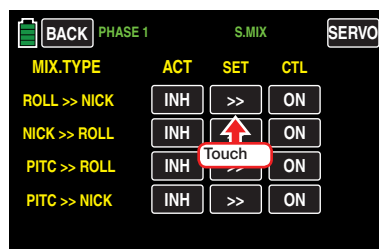
## Phase-dependent settings

This sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases.

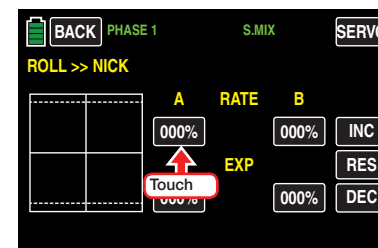
Activate the corresponding switch or switches if desired to switch between the phases.



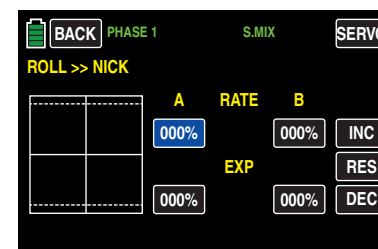
- ACT column** (active)  
 In the value fields of this column, indicate whether the function of the line is generally blocked (**BLK**) or **ON**.  
 Once you set this value field to **ON**, you can turn the effect of the respective control element on the selected mixer for specific quick links individually on and off with a control assigned in the option field "Ctrl/sw" (see below in the section).
- SET column** (setting)  
 Touch one of the four buttons in this column to open the setting page for the selected mixer, for example:



Based on the defaults shown here, you can adapt the current settings as needed by touching the value field to be changed to activate it, for example:



The color of the value field switches from black to blue:



You can change the current value in the blue (active) value field by touching the **+** or **-** buttons at the right edge of the display, for example:



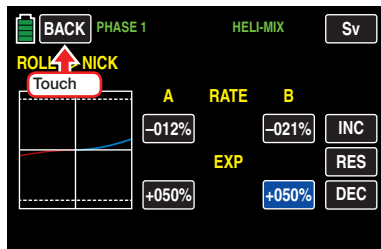
Use the same procedure for the value on the opposite side of the control travel, for example:



Touch the **RES** button to reset a changed value in a blue (active) value field to the default value.

You can make any necessary settings in the two bottom EXP value fields as in the related description in the section **"Dual rate, Expo"**.

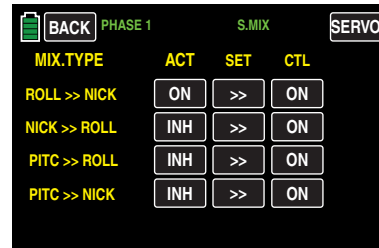
After making your settings, leave this display and go to "Heli-Mix" selection by touching the **BACK** button at the top left of the display.



### Notice

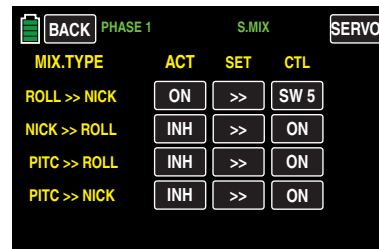


The mixed values portrayed here are for demonstration purposes only and do not represent real values.

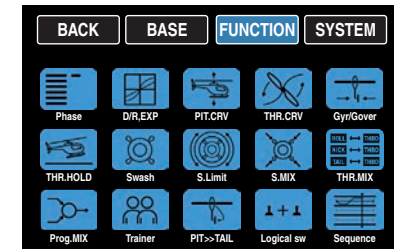


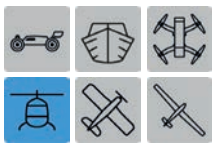
Select another mixer here if desired and adjust it as described.

- **"CTL" column** (Control/switch)  
In this column, as described in the section **Control and switch assignment**, assign a control to the respective mixer that you can use to turn the mixer on and off, for example:



After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.

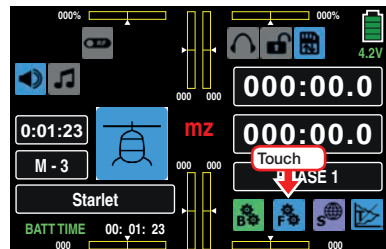




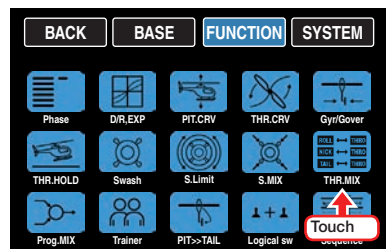
# Throttle mixer

Phase-dependent settings of throttle tracking with roll, elevation and tail

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "THR.MIX":



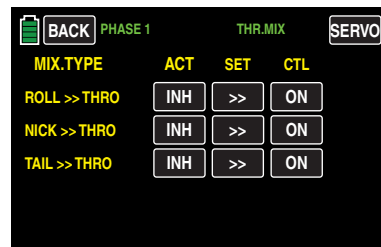
The throttle needs to follow an increase in pitch; likewise, the throttle should track with large cyclical control movements, that is, tilting a swashplate in a desired direction. The motor output should also be adapted when the thrust of the tail rotor is increased so as to maintain a constant system speed. In the **mz-24** HoTT transmitter programs, throttle tracking with roll, pitch and tail control can be attempted separately.

This is advantageous especially with aerobatics (for example when performing rolls) since cyclical control deflections are used with middle collective pitch values where the carburetor is about halfway open that require significantly higher motor output.

If you are using a *governor* to automatically maintain the rotor speed, the governor adapts the output as necessary. Otherwise, you can adjust throttle tracking in these three mixers.

## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.



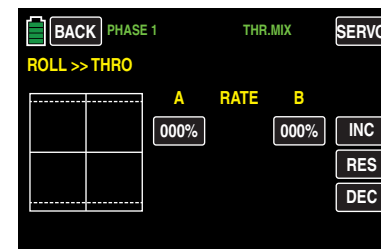
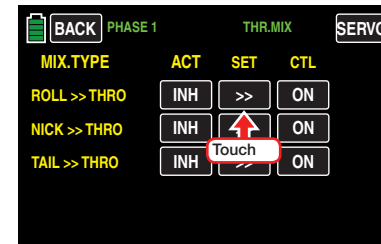
## • ACT column (active)

In the value fields of this column, indicate whether the function of the line is generally blocked (**BLK**) or **ON**.

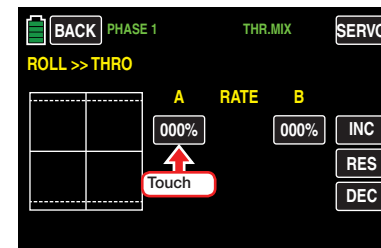
Once you set this value field to **ON**, you can turn the effect of the respective control element on the selected mixer for specific quick links individually on and off with a control assigned in the option field "Ctrl/sw" (see below in the section).

## • SET column (setting)

By touching one of the three buttons in this column changes to the setting page of the selected mixer, e.g.:

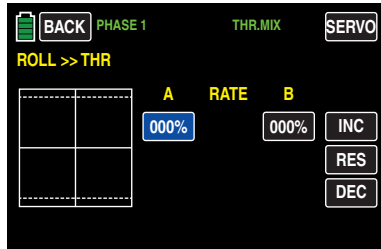


Based on the defaults shown here, you can adapt the current settings as needed by touching the value field to be changed to activate it, for example:

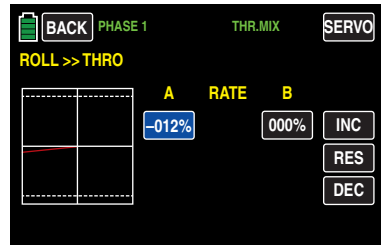


The color of the value field switches from black to blue:

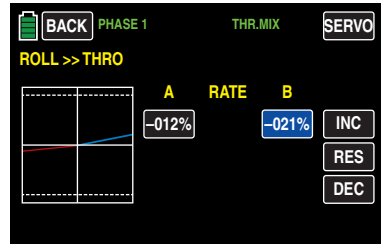




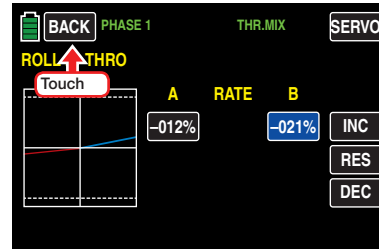
You can change the current value in the blue (active) value field as needed by touching the **+** or **-** buttons at the right edge of the display, for example:



If desired, use the same procedure for the value on the opposite side of the control travel, for example:



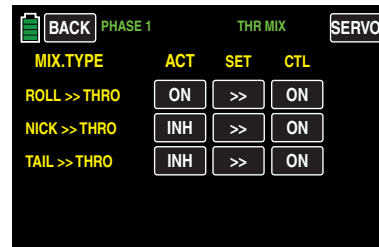
Touch the **RES** button to reset a changed value in a blue (active) value field to the default value. After making your settings, leave this display and go to the "Throttle mixer" selection by touching the **BACK** button at the top left of the display.



### Notice

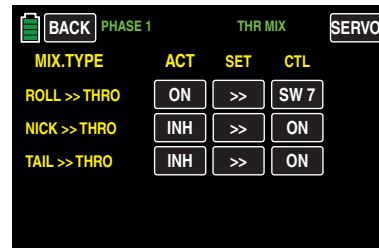


The mixed values portrayed here are for demonstration purposes only and do not represent real values.

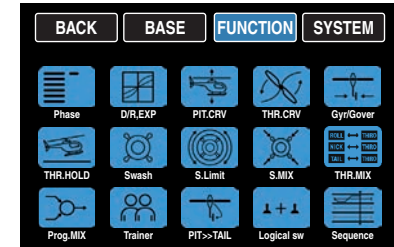


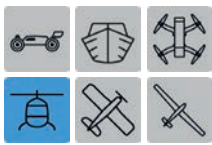
Select another mixer here if desired and adjust it as described.

- **"CTL" column** (Control/switch)  
In this column, as described in the section [Control and switch assignment](#), assign a control to the respective mixer that you can use to turn the mixer on and off, for example:



After making your settings, leave this menu and go to "Menu selection" by touching the **BACK** button at the top left of the display.

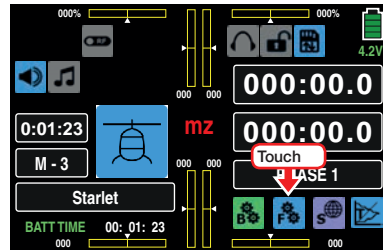




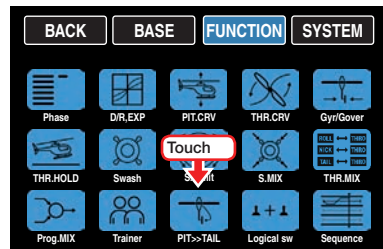
# PIT>>TAIL

Phase-dependent static torque compensation

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "PIT >> TAIL":

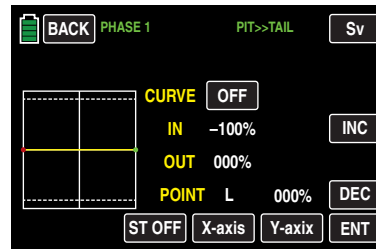


## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

### Introduction

A torque compensation curve with a linear mixer ratio of 0% is uniformly set by default which is necessary for gyro sensors that operate in heading-lock mode:



If you are using your gyro sensor in normal mode or the sensor can only handle normal mode, adjust the mixer as follows:

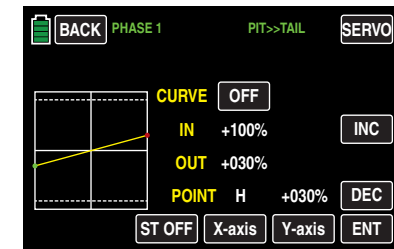
### Notice



You therefore need to consult your gyro setting instructions since otherwise you may make it impossible to fly your helicopter.

### Programming

Similar to adjusting the [Pitch curve](#), the control curve for the tail rotor can also be defined with up to 7 points. As needed, you can therefore modify the mixer at any time and specify symmetrical and asymmetrical mixer ratios above and below the hovering point. Starting with -30% at point "L" and +30% at point "H", adjust the mixer so that the helicopter does not rotate about the vertical axis, even during long vertical ascents and descents, as a result of differing main rotor torque in comparison to hovering. While hovering, only change the trim using the digital tail rotor trim control:



In order to reliably adjust the torque compensation, the pitch and throttle curves must be correctly adjusted; in other words, the speed must remain constant over the entire collective pitch adjustment range.

### Autorotation setting

In normal flight, the tail rotor is adjusted so that it compensates for the torque of the main rotor during hovering. It therefore generates a certain amount of thrust in home position. This thrust is then varied by the tail rotor control and different mixers for all types of torque compensation and is adjusted by trimming the tail rotor to accommodate the weather, system speed and other influences.

During autorotation however, the main rotor is not driven by the motor but according to the windmill principle. In this context, there is no torque that the tail rotor must compensate. All of the corresponding mixers are therefore automatically turned off.

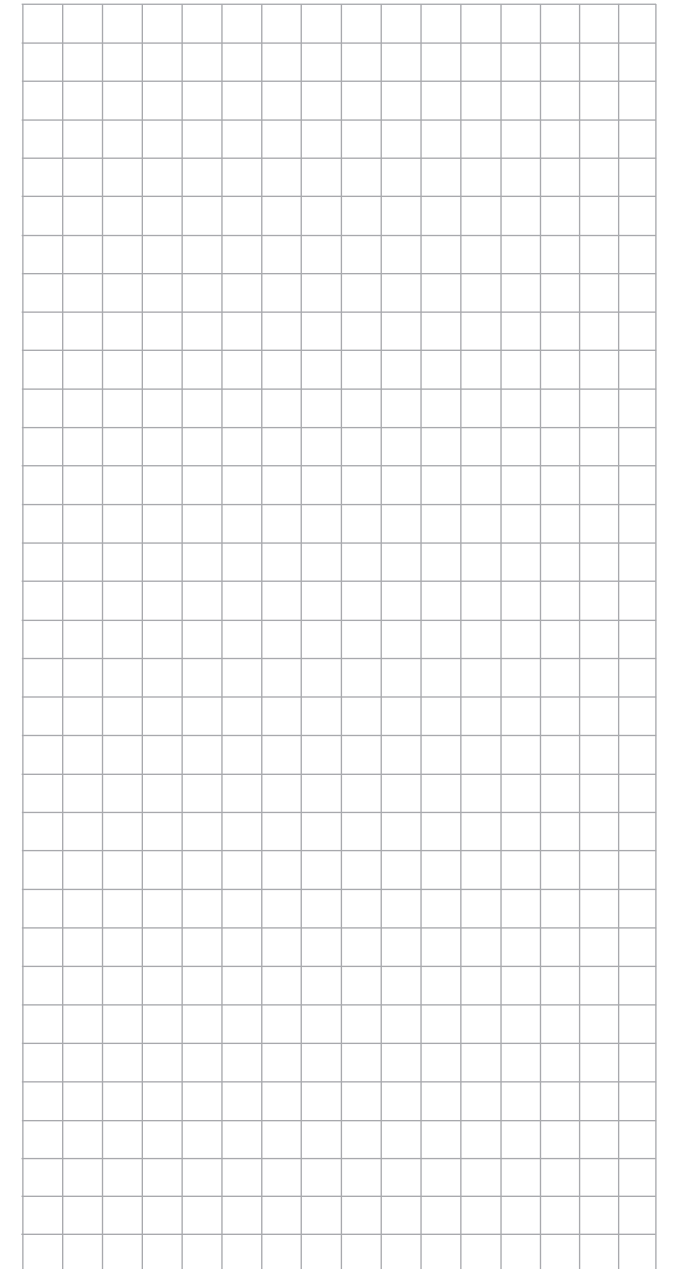
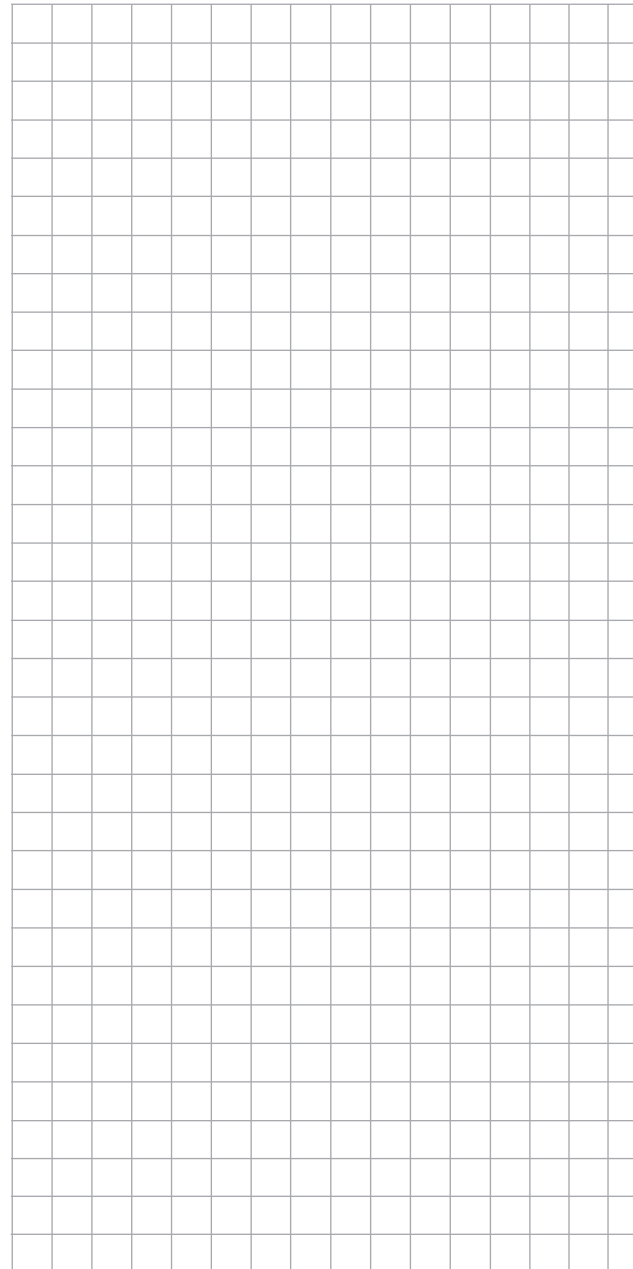
Since the aforementioned thrust is no longer necessary during autorotation because of the lack of torque, the basic position of the tail rotor must also be different:

While the motor is turned off, place the helicopter in a horizontal position. Turn on the transmitter and receiver, select the phase "autorotation", fold down the tail rotor blades, and change the mixer settings until the pitch angle of the tail rotor blades equals 0°. The tail rotor blades are then parallel with each other when viewed from the rear.

## ◀ Helicopter model function menus

## Fixed-wing model function menus ▶

Depending on the friction and operating resistance of the gearing, the fuselage may still rotate slightly. This relatively slight torque should then be corrected using the tail rotor blade pitch angle. In any case, this value is between  $0^\circ$  and a pitch angle that is opposite the direction of the pitch angle during flight.



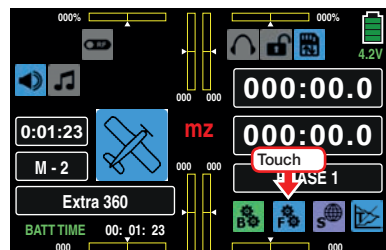
# Idle LOW



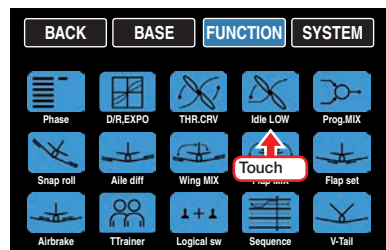
Setting a stable idle

This sub-menu is hidden when selecting electric motor in the basic settings of the model memory.

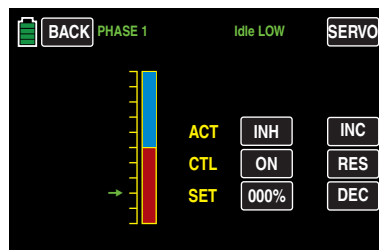
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Idle LOW".

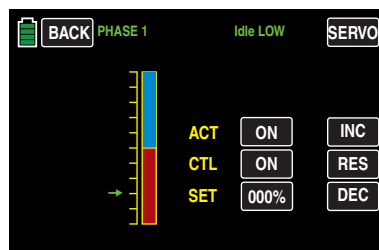


Normally, the idle of a gas motor is set using the digital trim control for the throttle. This idle position of the throttle servo (which depends on the position of the trim control) can be adjusted as necessary to a higher or lower idle with a switch to a value that can be set in this sub-menu within a range of  $\pm 20\%$ .

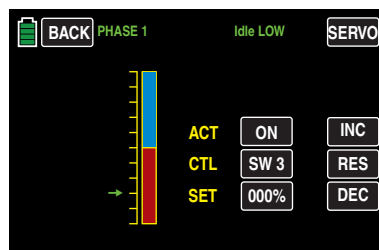


## Programming

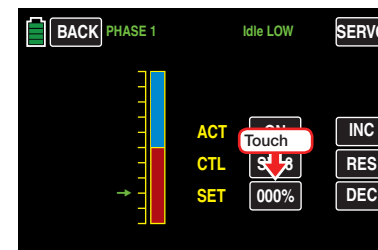
In the "ACT" line, activate or deactivate the "Idle LOW" option by touching the associated button with a finger or the provided stylus, for example:



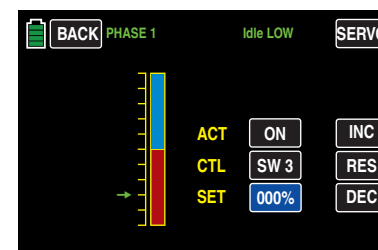
In the "Ctrl/sw" line, assign a control for adding or removing the corrective value to be set in the line "SET" as described in the section [Control and switch assignment](#), such as:



In the "SET" line, set the desired corrective value by touching the associated value field:



The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

The adjustment range is  $\pm 100\%$ . A value of  $+100\%$  moves the idle position of the throttle servo set with the throttle trim 20% toward Idle LOW, and vice versa. Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

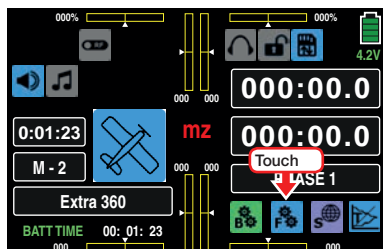
After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.

# Snap roll

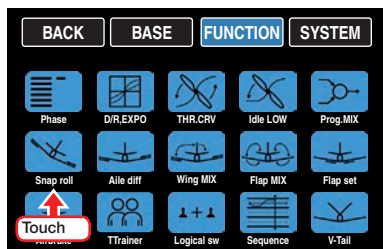


Automated programming

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



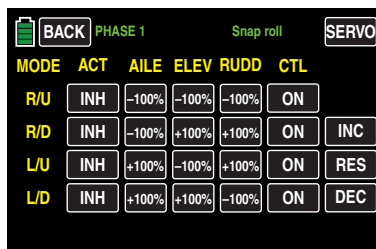
The display switches to the blue function menu. Touch the menu item "Snap roll".



Some pilots like to automatically program snap rolls when flying.

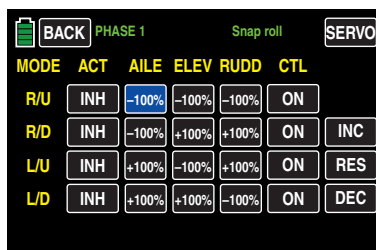
## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

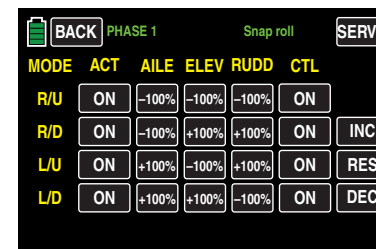


The automated programming described here for the **mz-24** HoTT Pro transmitter enables up to four pre-programmed snap settings (positive right/negative right and positive left/negative left) per Phase. The position of the switch assigned to the individual presets determines the respective figure program in which the control stick signals are set at a fixed value independent of the momentary control stick positions. That is, all aileron, elevator and rudder servos move as if the relevant control stick had been shifted to the preset position.

As usual, you can activate settings within a range of  $\pm 150\%$  in the blue value field activated by a finger or the provided stylus with the three buttons at the right edge of the display, for example:



In general, the individual figure programs are activated and deactivated by switching the corresponding value field in the "ACT" column from **BLK** to **ON** or vice versa, by touching them, for example:



Finally, you should assign each activated figure program, as described in the section [Control and switch assignment](#), a control with which you can turn the figure programs on and off during flight.

## WARNING



**Never turn on one of these figure programs accidentally, especially during flight! If the programs are turned on at in the wrong location or time, it can cause significant property damage and/or injury.**

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.

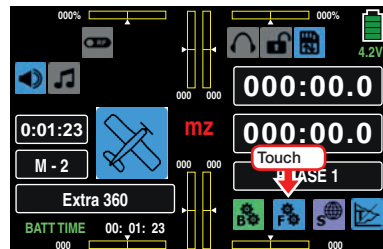


# AILE differentiation

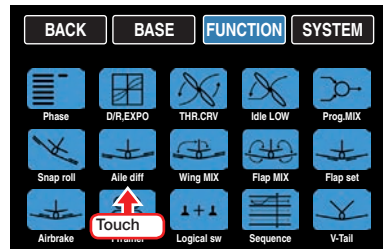
Setting the aileron travel and differentiation

This sub-menu is hidden when selecting "1AILE" or "1AILE1FLAP" in the basic settings of the model memory.

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



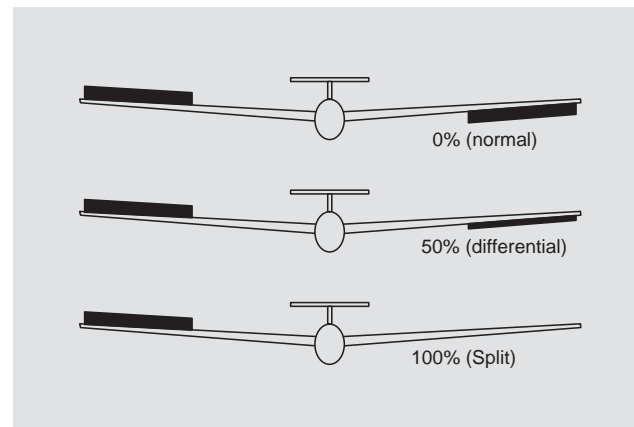
The display switches to the blue function menu. Touch the menu item "Aile diff".



An aileron deflected downward generates greater resistance for aerodynamic reasons than one deflected upward. Given this asymmetrical resistance, torque is generated about the vertical axis which causes a turning out of the intended flight direction. This undesirable side-effect is also determined "adverse yaw". This effect naturally occurs more strongly on the comparatively long wings of gliders than with motorized airplanes with their generally much shorter lever arms, and normally must be compensated by a simultaneous, counteracting rudder deflection.

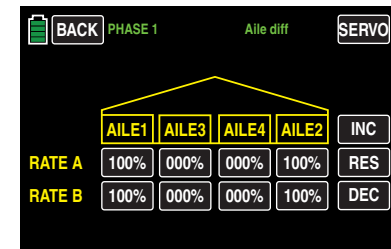
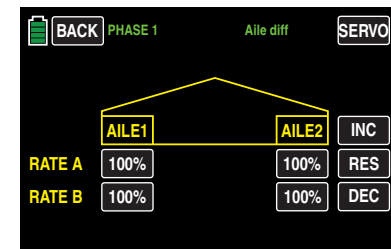
This rudder deflection also generates additional resistance and impairs flight.

If the rudder deflection is differentiated so that the downward deflection of the aileron is less than the upward deflection, the adverse yaw can be reduced or eliminated without having to compensate manually the rudder each time you act on the aileron control.



## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.



## Notice



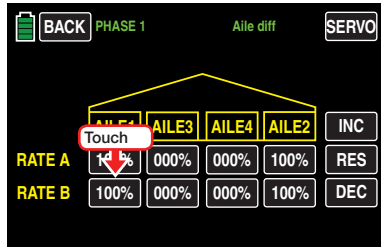
The available setting options depend on the number of ailerons selected in the basic settings of the model.

## Programming

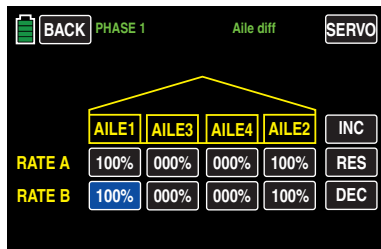
The adjustment range of 100% to both sides allows you to adjust different deflection on the right side independent of the direction of rotation of the aileron servos. 100% (travel) corresponds to normal deflection (no differentiation), and 0% (travel) corresponds to the split function.

High absolute values are required during stunt flying in order for the model to rotate precisely about the longitudinal axis when the aileron is deflected. Average values of about 50% are typical for supporting curved flight in a thermal.

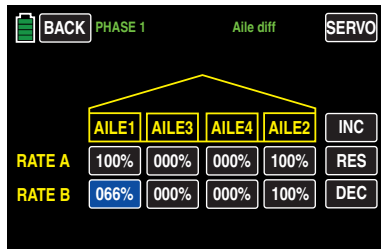
To change a value, touch the corresponding value field, for example:



The color of the field switches from black to blue:



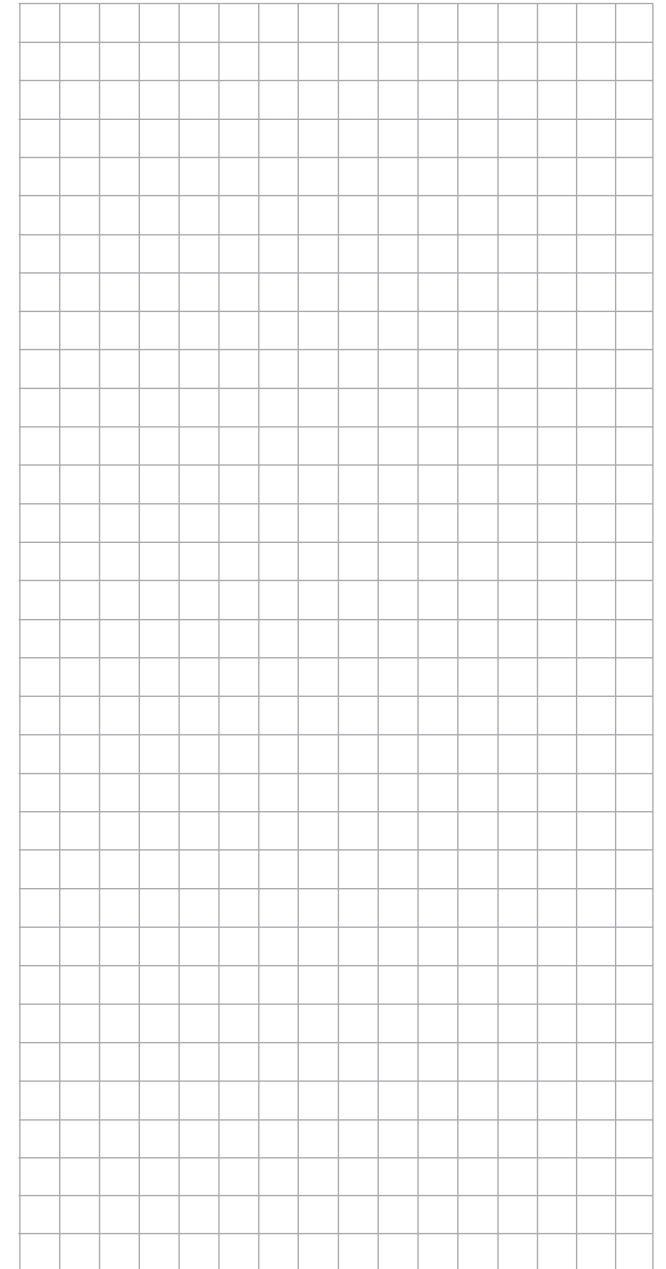
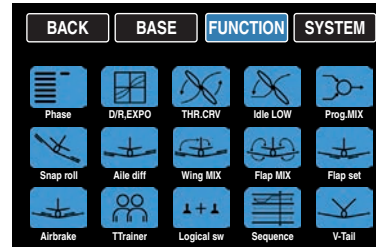
Then, in the active (blue) value field, press **+** to increase the current value and **-** to reduce it, for example:



Use the same procedure with the differentiation value for the right aileron and any inboard aileron "Aileron 2L" and "Aileron 2R".

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



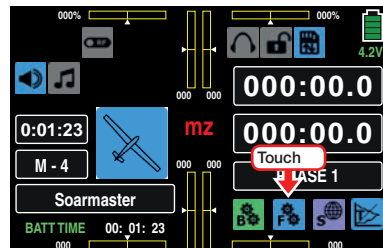


# AILE differentiation

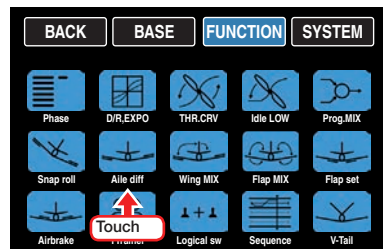
Setting the aileron travel, differentiation and differentiation reduction

This sub-menu is hidden when selecting "1AILE" or "1AILE1FLAP" in the basic settings of the model memory.

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



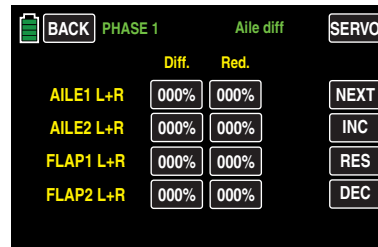
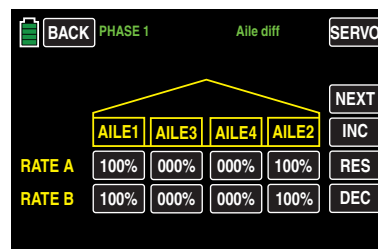
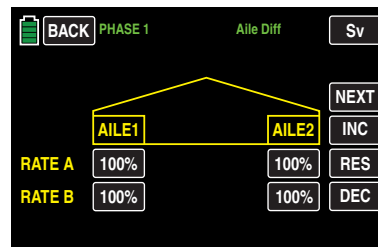
The display switches to the blue function menu. Touch the menu item "Aile diff".



## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

The top of the two following figures shows an example of the display when setting the minimum "2AILE", the central figure in case of selecting up to "4AILE" and the bottom figure shows the display of differentiation and differentiation reduction while selecting "4AILE 4FLAPS".



## Notice



The available setting options depend on the number of ailerons selected in the basic settings of the model.

## Display page "Travel setting"

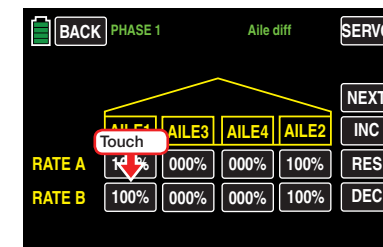
The adjustment range of 100% to both sides allows you to adjust different deflection on the right side independent of the direction of rotation of the aileron servos in this display page. 100% (travel) corresponds to normal deflection, and 0% (travel) corresponds to the split function.

## Notice

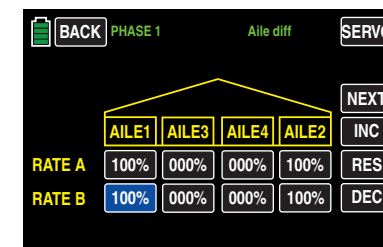


At least then, in case of use of the butterfly system of the differentiation reduction function, see following, a differentiation should not be performed in this display page but, after tapping on the **NEXT** button, in the next display page.

To change a value, touch the corresponding value field, for example:

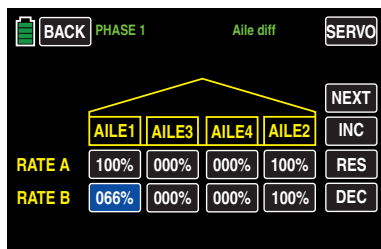


The color of the field switches from black to blue:





Then, in the active (blue) value field, press **+** to increase the current value and **-** to reduce it, for example:



Use the same procedure with the differentiation value for the right aileron and any inboard aileron "Aileron 2L" and "Aileron 2R".

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### Display page differentiation



### Notice

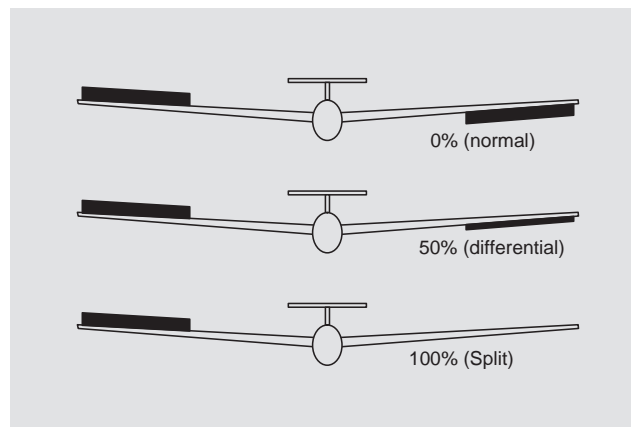
The available setting options depend on the number of ailerons and flaps selected in the basic settings of the model.

An aileron deflected downward generates greater resistance for aerodynamic reasons than one deflected upward.

Given this asymmetrical resistance, torque is generated about the vertical axis which causes a turning out of the intended flight direction.

This undesirable side-effect is also determined "adverse yaw". This effect naturally occurs more strongly on the comparatively long wings of gliders than with motorized airplanes with their generally much shorter lever arms, and normally must be compensated by a simultaneous, counteracting rudder deflection. This rudder deflection also generates additional resistance and impairs flight.

If the rudder deflection is differentiated so that the downward deflection of the aileron is less than the upward deflection, the adverse yaw can be reduced or eliminated without having to compensate manually the rudder each time you act on the aileron control.



When the ailerons are raised as part of a butterfly configuration, however, the adjusted aileron differentiation has a disadvantageous effect, since the aileron effect is thereby more or less strongly impaired:

On the one hand, another excursion of the one aileron is almost impossible (on the other hand). Depending on the position and degree of differentiation - often it does not even have the neutral position.

In order to restore the reduction of the aileron effect as much as possible, you should use the automatic "reduction of the differentiation" in the right-hand column of this display page: This option reduces the degree of aileron differentiation continuously and in an adjustable manner when the brake system is extended or even set them up, depending on the setting.

### Programming the differentiation

The adjustment range of 100% to allows you to adjust different deflection on the right side independent of the direction of rotation of the servos. 0% (differentiation) corresponds to normal deflection and 100% (differentiation) of the split function. To set up the differentiation tap in the left one of the two columns on the desired value field with a finger or the provided stylus, for example:



The color of the field switches from black to blue:



Set the desired grade of differentiation with the **+** or **-** button at the right edge of the display, for example:



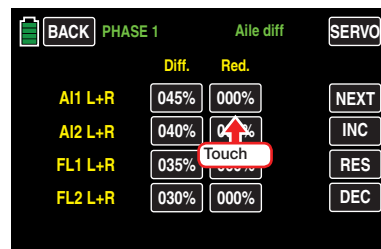
With the provided other flap pairs proceed similarly.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

- **Programming the reduction**

A 0% value in the right column means that the "aileron differentiation" programmed in the transmitter is held. A value equal to the set percentage of the aileron differentiation means that this, in maximum butterfly function (with flaps completely out) is completely removed. In case of a reduction value bigger than the set aileron differentiation this will be removed completely before the full deflection of the flap control stick.

To set up the reduction of the differentiation tap in the left one of the two columns on the desired value field with a finger or the provided stylus, for example:

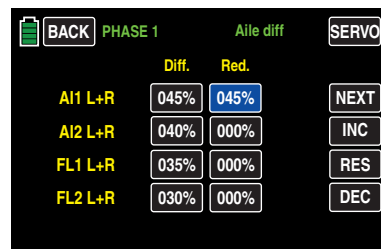


The adjustment range of  $\pm 150\%$  allows you to set the reduction of the set differentiation completely independently from the direction of rotation of the servos installed in the wings.

The color of the field switches from black to blue:



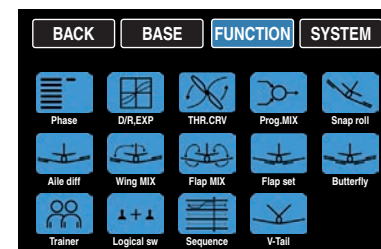
Set the desired grade of differentiation with the **+** or **-** button at the right edge of the display, for example:

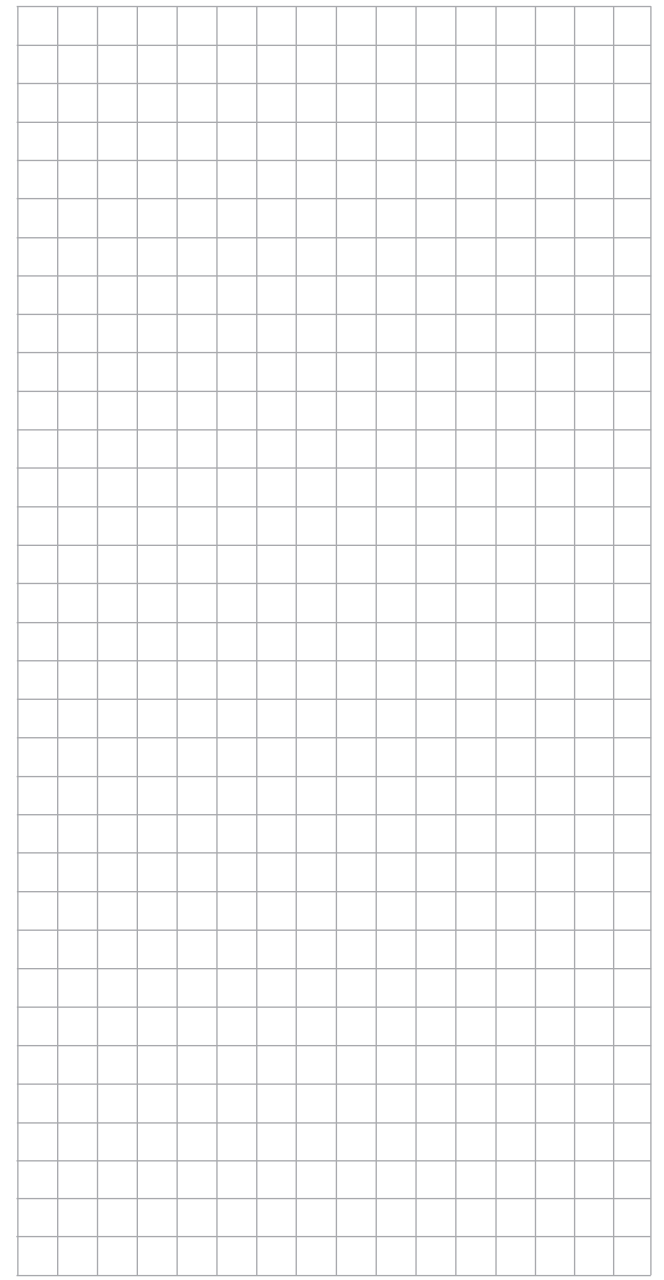
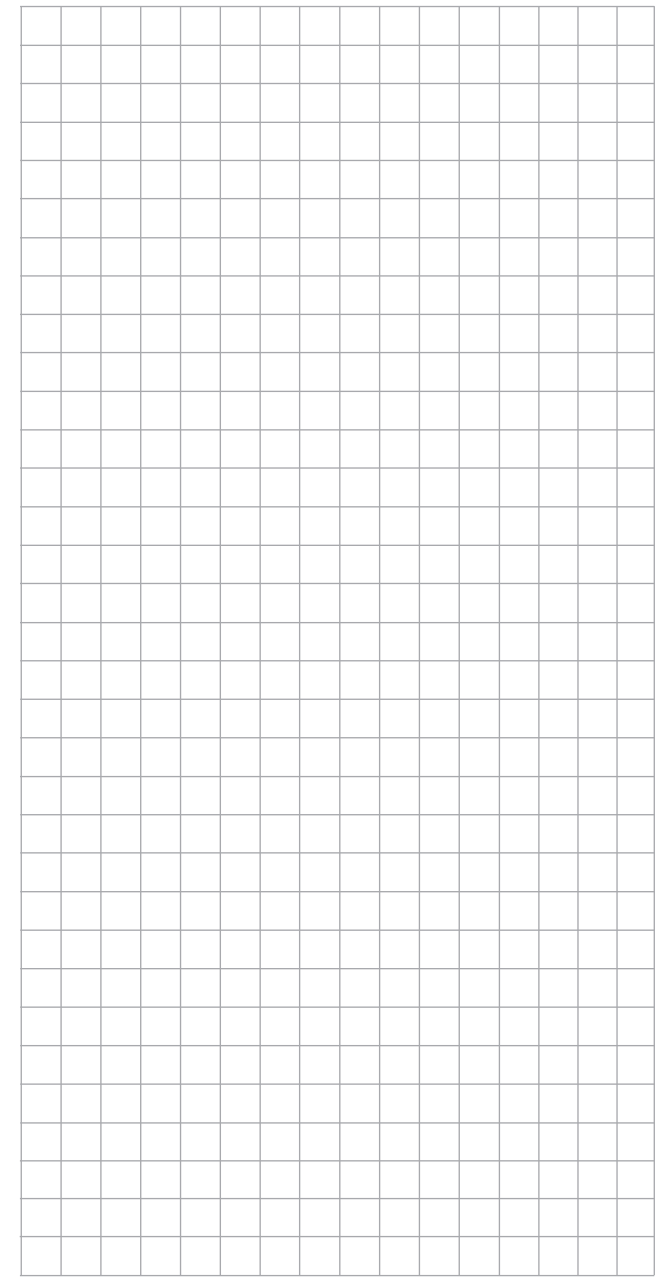
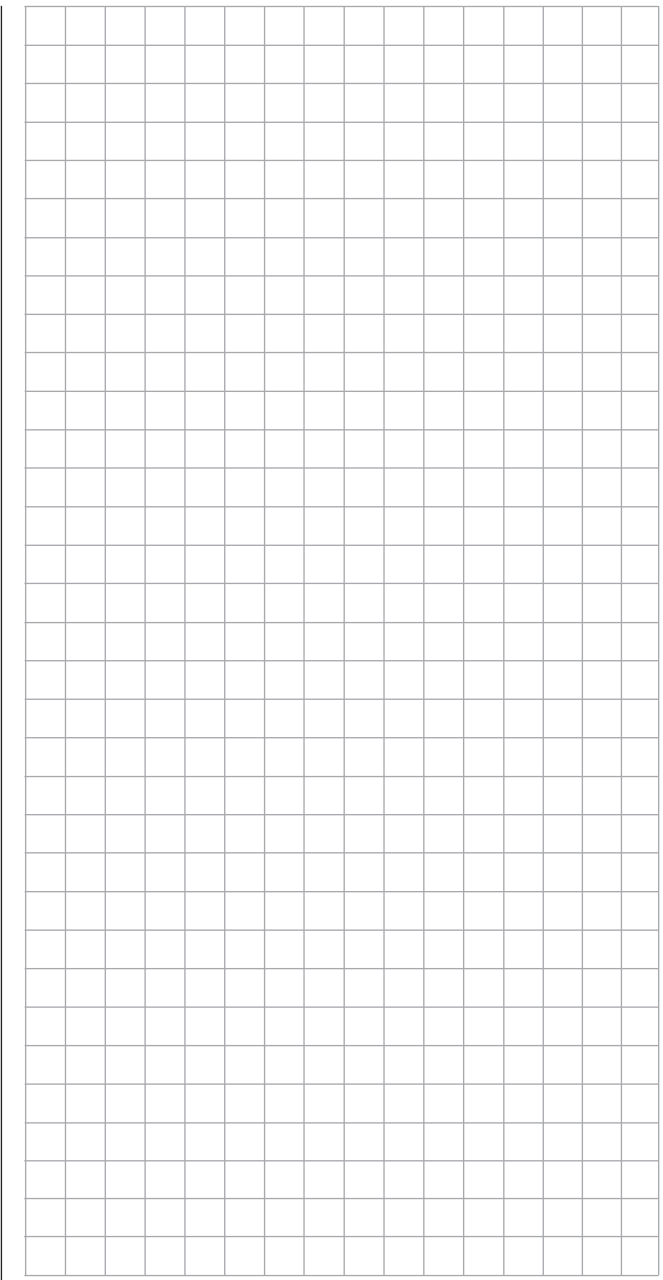


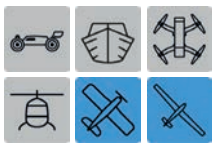
With the provided other flap pairs proceed similarly.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



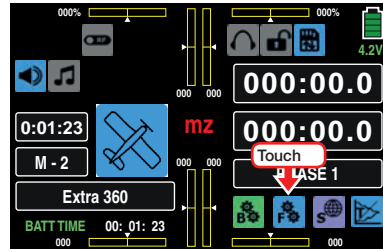




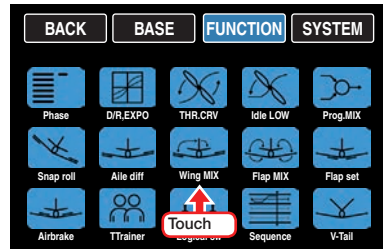
# Wing Mix

Adjusting mixers

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Wing MIX":



## Phase depending settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Programming

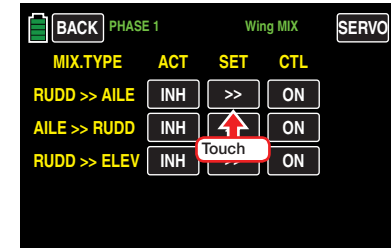
- ACT column** (active)  
 Within the value field for this column, specify whether the mixer is generally blocked **INH** or **ON**.  
 Once you set this value field to **ON**, you can turn the mixer on and off through a control assigned in the right column "Ctrl/sw".
- SET column** (setting)  
 To switch to the related setting menu, touch the corresponding **>>** button in the "SET" column:
- "CTL" column** (Control/switch)  
 In the value field in the Ctrl/sw column, assign a control or control switch to the mixer as described in section "Control and switch assignment".

RUDD >> AILE line (rudder >> aileron)

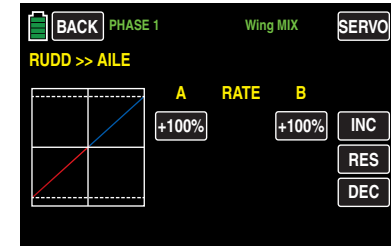
Frequently in aerobatic flight, the behavior of the longitudinal axis is influenced when the rudder is actuated. This is particularly problematic in "knife edge flying" in which the only lift is from the fuselage when the rudder is deflected since the wings are vertical in this flight position. This can cause a model to rotate on the longitude axis as if the aileron were actuated. A correction is necessary along the longitudinal axis (aileron) within an adjustable range when the rudders are controlled.

The setting range of  $\pm 150\%$  makes it possible to appropriately adapt the direction of deflection. This mixer can optionally be turned on and off by one of the controls which cannot be independently reset, or a control switch or even a logical switch, so that the model can be controlled exclusively using the rudder.

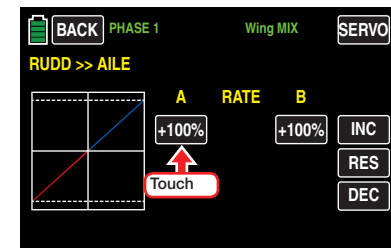
To set the mixer, use a finger or the provided stylus to touch the middle button in the line "RUDD >> AILE":



The corresponding setting menu opens:



To enable this, touch the desired value field, such as the left one:

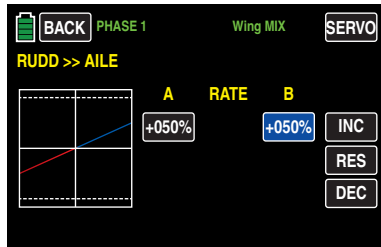


The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

Use the same procedure for a value on the plus side of the control travel, for example:

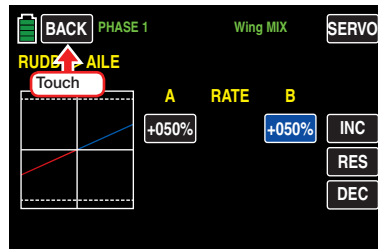


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### Tip

To graphically display the current servo positions, you can access them from nearly every menu with the button labeled **SERVO** in the top right of the display or alternatively pushing with inactivated value field at the same time the **▲▼** keys on the left of the display. Touch the **BACK** button or push the **ESC** key to return to your starting point.

Touch the **BACK** button at the top left of the display or push the **ESC** key on the left of the display ...



... to return to the mixer selection.



AILE >> RUDD line

(aileron >> rudder)

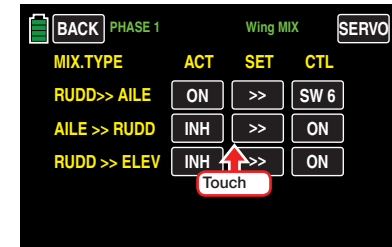
The rudder also moves to an adjustable degree when the aileron is actuated. This can compensate for the negative torque in conjunction with **Aileron differentiation** which smooths flight in curves. Of course, the rudder remain separately controllable.

The setting range of  $\pm 150\%$  makes it possible to appropriately adapt the direction of deflection. This mixer can optionally be turned on and off by one of the controls which cannot be independently reset, or a control switch or even a logical switch, so that the model can be controlled exclusively using the ailerons.

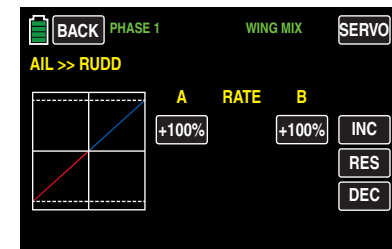
### Tip

Normally, this mixer is adjusted so that the rudder extends on the side of aileron moving upward; an adjustment of 50% is generally appropriate.

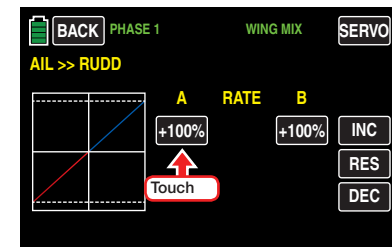
The adjustment should normally be only be symmetrical with the neutral point of the aileron control stick. To set the mixer, use a finger or the provided stylus to touch the middle button in the line "AILE >> RUDD":



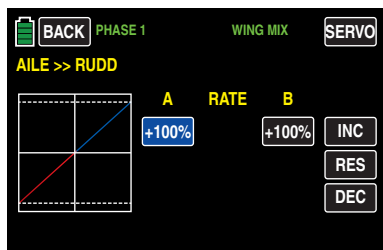
The corresponding setting menu opens:



To enable this, touch the desired value field, such as the left one:

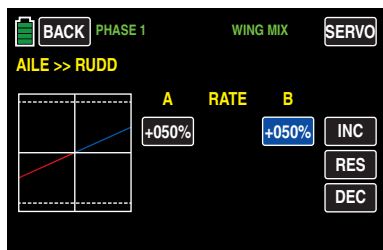


The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

Use the same procedure for a value on the plus side of the control travel, for example:

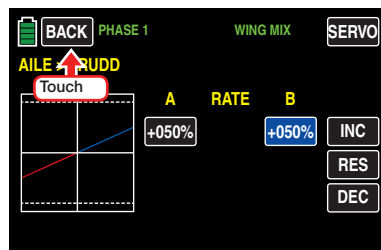


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

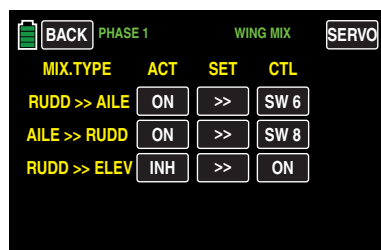
### Tip

To graphically display the current servo positions, you can access them from nearly every menu with the button labeled **SERVO** in the top right of the display or alternatively pushing with inactivated value field at the same time the **▲▼** keys on the left of the display. Touch the **BACK** button or push the **ESC** key to return to your starting point.

Touch the **BACK** button at the top left of the display or push the ESC key on the left of the display ...



... to return to the mixer selection.



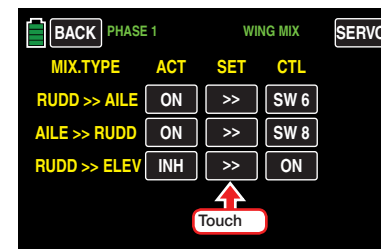
RUDD >> ELEV line (rudder >> elevator)

Frequently in aerobatic flight, the behavior of the latitude axis is influenced when the rudder is actuated. This is particularly problematic in "knife edge flying" in which the only lift is from the fuselage when the rudder is deflected since the wings are vertical in this flight position. Changes in direction can occur as if the elevator were actuated. A correction is necessary along the transverse axis (elevator) within an adjustable range when the rudders are controlled.

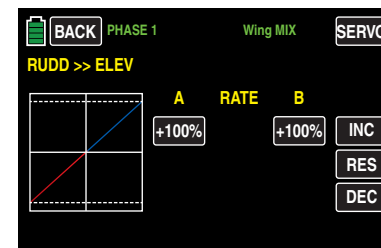
Of course, the rudder and elevator remain separately controllable.

The setting range of  $\pm 150\%$  makes it possible to appropriately adapt the direction of deflection. This mixer can optionally be turned on and off by one of the controls which cannot be independently reset, or a control switch, so that the model can be controlled exclusively using the rudder.

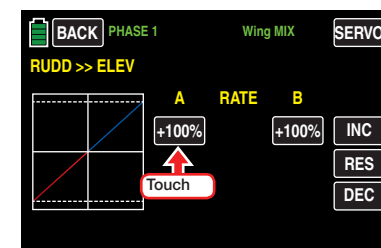
To set the mixer, use a finger or the provided stylus to touch the middle button in the line "RUDD >> ELE":



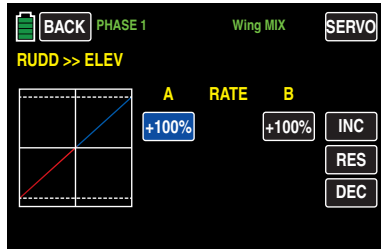
The corresponding setting menu opens:



To enable this, touch the desired value field, such as the left one:

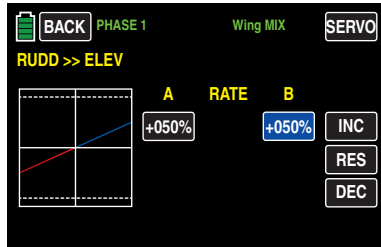


The color of the field switches from black to blue:



Set the desired value with the **+** or **-** button at the right edge.

Use the same procedure for a value on the plus side of the control travel, for example:

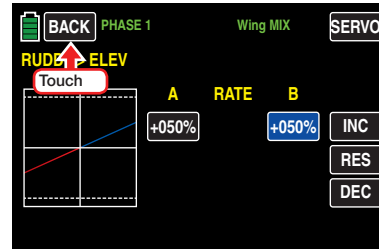


Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

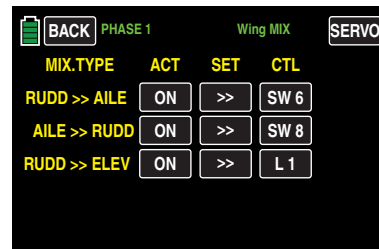
### Tip

To graphically display the current servo positions, you can access them from nearly every menu with the button labeled **SERVO** in the top right of the display or alternatively pushing with inactivated value field at the same time the **▲▼** keys on the left of the display. Touch the **BACK** button or push the **ESC** key to return to your starting point.

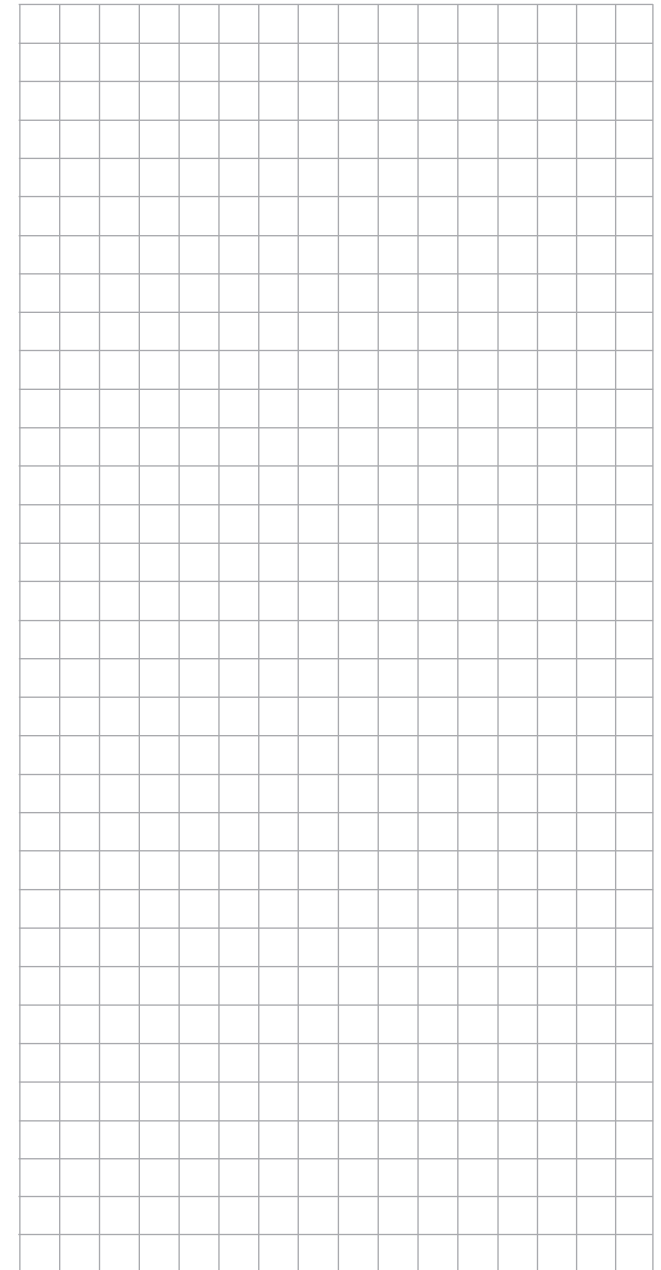
Touch the **BACK** button at the top left of the display or push the **ESC** key on the left of the display ...



... to return to the mixer selection.



After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.



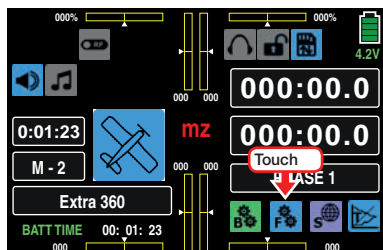


# Flap mixer

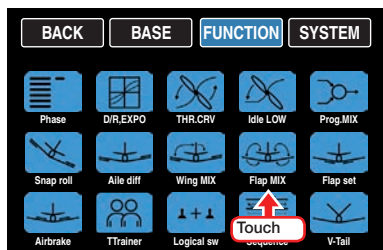
Adjustment of the flap mixer

This sub-menu is hidden only when selecting "1AILE" or "2AILE" in the basic settings of the model memory.

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":

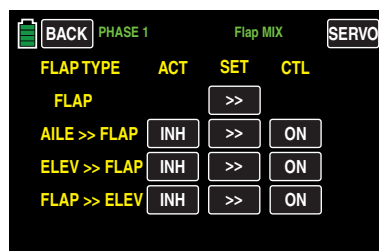


The display switches to the blue function menu. Touch the menu item "Flap MIX":



## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.



## Programming

- ACT column** (active)
 

Within the value field for this column, specify whether the mixer is generally blocked **INH** or **ON**.

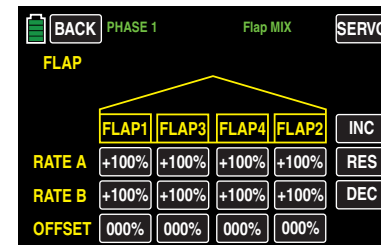
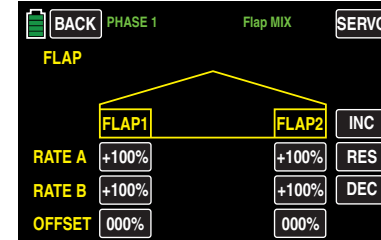
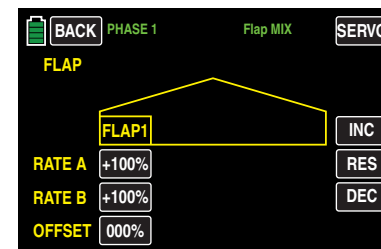
Once you set this value field to **ON**, you can turn the mixer on and off through a control assigned in the right column "Ctrl/sw".
- SET column** (setting)
 

To switch to the related setting menu, touch the corresponding **>>** button in the "SET" column:
- "CTL" column** (Control/switch)
 

In the value field in the Ctrl/sw column, assign a control or control switch to the mixer as described in section [Control and switch assignment](#).

## FLAP line

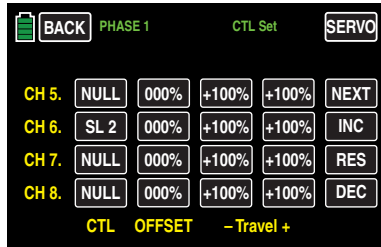
Depending on the selected number of flaps, the display shows one of three views:



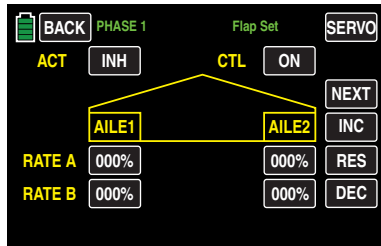
- Lines RATE A / B**

If in the sub-menu "CTL Set" of the basic menu assign a switch to the output 6, for example the left proportional control lever "SL2" ...

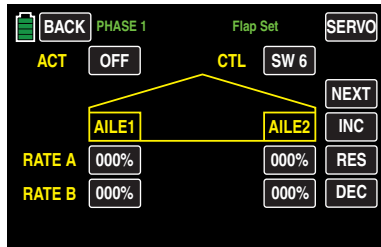




... AND set "ACT" in the sub-menu "Flap set" of the function menu to **INH** ...

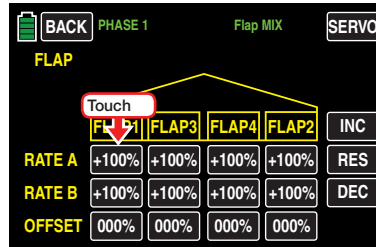


... or a switch assigned in the same line is switched **OFF** and in this way in the value field on the right near "ACT" indicates **OFF**, ...

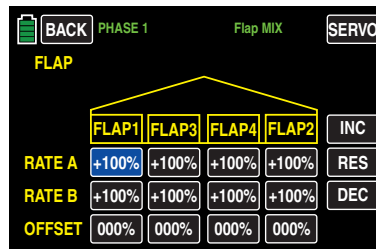


... THEN determine the value input in the RATE A / B line the grade of deflection of the flap through the selected control.

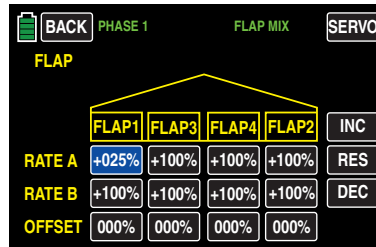
To change a previously input value, touch the corresponding value field, for example:



The color of the field switches from black to blue:



Then, in the active (blue) value field, press **+** to increase the current value within a range of  $\pm 125\%$  and **-** to reduce it, for example:



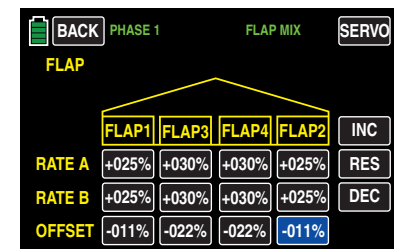
Use the same procedure with the value for the downward deflection of the left flap (RATE B) and for the values of the right flap and for any second flap pair. Symmetrical and asymmetrical values are possible.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

### • "OFFSET" line

In this line, set the phase-specific positions for all of the flaps in the respective model. This allows you to set the positions that the individual flaps are to assume for each phase.

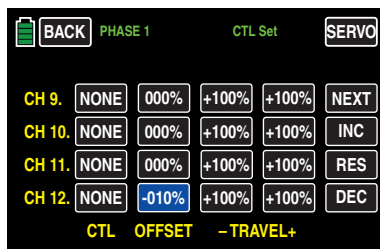
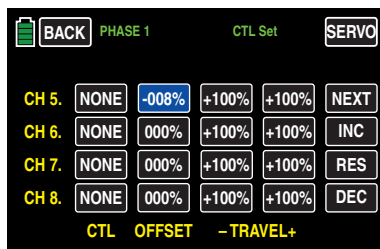
The adjustment range of  $\pm 100\%$  allows the flaps to be moved to the desired position independent of the rotational direction of the flap servos, for example:



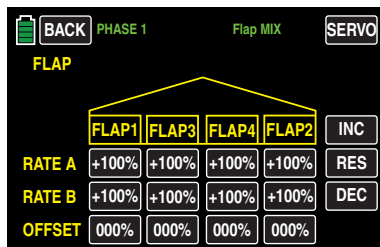
### Notices



- The available setting options depend on the number of flaps selected in the basic settings of the model memory.
- The flap offset of the flaps is set, completely independently from the used described in connection with the left "ACT", in the phase trimming described in the following "Flap Set" section.
- The corresponding offset-positions of the first aileron pair have to be set, according to the phase, in the "CH5" line and the eventually required second flap pair has to be set in the "CH12" line of the "CTL Set" sub-menu:



- Alternatively the offset value of the "OFFSET" line of the option "AILE" so as the previously mentioned "corresponding offset positions of the aileron pairs" can be left to the standard value "000%" ...



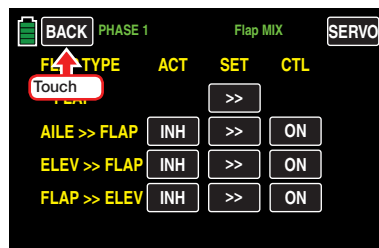
... and instead of that input a proper offset value in the "CH6" line of the sub-menu "CTL Set", for example:



- In case of **ACT** = **INH** or **OFF** of the "Flap set" sub-menu described in the following section, all the provided flaps move in the position corresponding to the control position ("CTL Set"), offset value and travel setting so as ("Flap MIX") RATE and offset values of the respective flaps positions.
- In case of **ACT** = **ON** of the "Flap set" sub-menu described in the following section, all the provided flaps move in the position corresponding to the control position ("CTL Set"), offset value and travel setting so as ("Flap MIX") offset and ("Flap set") RATE values of the respective flaps positions.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

After you have finished making your settings, touch the **BACK** button at the top left to return to the mixer selection:



## AILE >> FLAP line

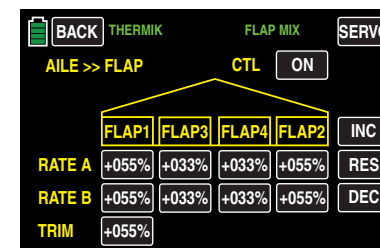
In this line, you can set for each phase the amount of movement of the flap pair "FLAP" (and possibly "FLAP2") as an aileron when the aileron is actuated. Normally, the flaps follow the ailerons with less deflection, that is, the mixed amount is less than 100%. The setting range of  $\pm 125\%$  makes it possible to appropriately adapt the direction of deflection to the ailerons depending on the direction of rotation of the flap servos.

### Notice

Since all values are set separately, the aileron deflections of the flaps can also be different. In case of "glider" is instead suggested to use the options "Diff." and "Red." which are available in the second display page of the "Aile diff" sub-menu.

In the lowest "TRIM" line you can also set the grade of action of the aileron trim on the aileron function of the flaps between 0 and 150%.

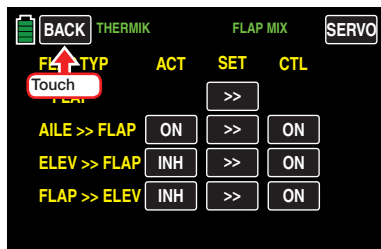
Adapt the individual values as described above, for example:



**Notice**

» The available setting options depend on the number of flaps selected in the basic settings of the actual model.

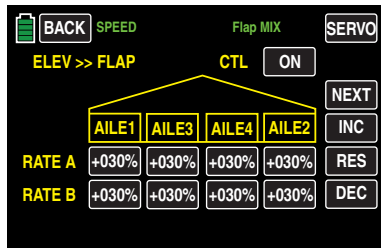
After you have finished making your settings, touch the **BACK** button at the top left to return to the mixer selection:



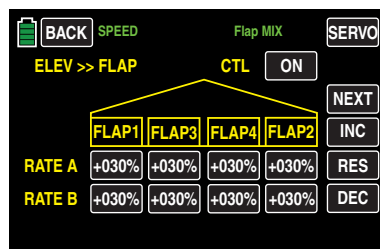
**ELEV >> FLAP line**

To support the elevator in tight curves and aerobatics, the flap function can be included by controlling the elevator with this mixer. Select the mixing direction so that the flaps move downward when the elevator is pulled ("up"), and conversely upward when the elevator is pushed ("down"), that is, in an opposite direction.

A symmetrical or an asymmetrical effect can be defined for each flap pair. Values of ±125% are possible. By default, uniform values of +30% are set for the aileron...



... and the flaps:

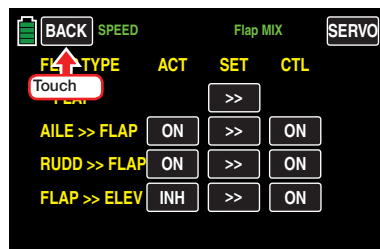


Adapt the individual values as described under "FLAP line".

**Notice**

» The available setting options depend on the number of ailerons and flaps selected in the basic settings of the actual model.

After you have finished making your settings, touch the **BACK** button at the top left to return to the mixer selection:



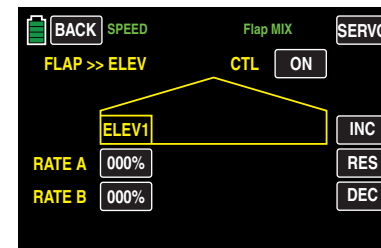
**FLAP >> ELEV line**

When setting flaps, upward or downward torque can arise about the transverse axis. It may also be desirable for the model to pick up the pace somewhat when slightly elevating the flaps. Both of these reactions can be achieved with the mixer.

When setting the flaps, you can use this mixer to have the position of the aileron automatically track the flaps depending on the set value.

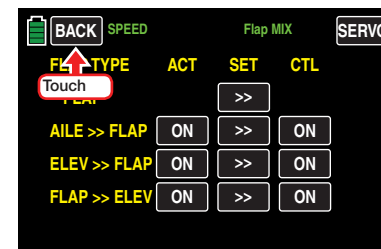
The setting can be symmetrical or asymmetrical to the neutral point of the flap control.

The adjustment range is ±125%. With this mixer, normal settings lie within the single-digit to low double-digit range. By default, 0% is uniformly set:

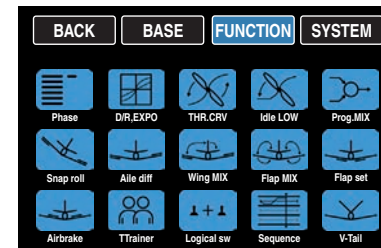


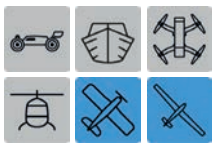
Adapt the individual values as described at the beginning of this section under "FLAP line".

After you have finished making your settings, touch the **BACK** button at the top left to return to the mixer selection:



... and by tapping again on the **BACK** button you will return to the menu selection:



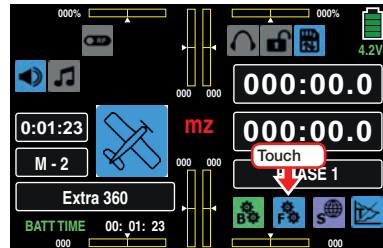


# Flap Set

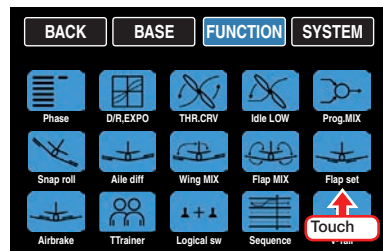
Adjusting the effect of the flap servo

This sub-menu is hidden when selecting "1 AILE" in the basic settings of the actual model.

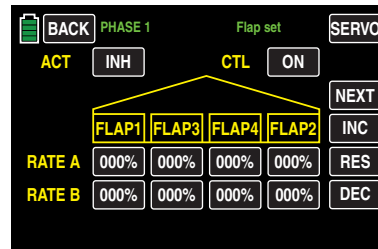
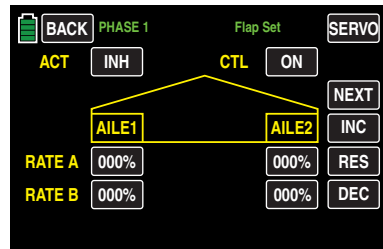
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Flap set":



Depending on the selected number of ailerons and flaps, the display shows different views: The top of the two following figures shows the display when setting the minimum "2AILE", and the bottom figure shows the display when selecting the maximum "... 4FLAP".



## Phase-dependent settings

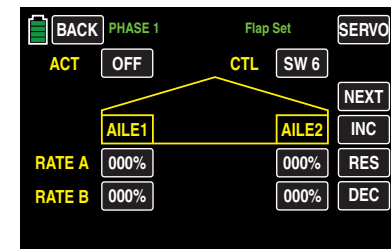
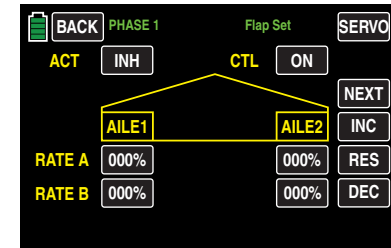
The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Programming

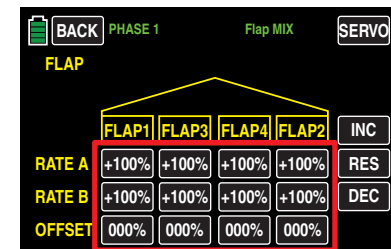
- **ACT** column (active)

- "ACT" = **INH** or **OFF**

As long as "ACT" is deactivated ...

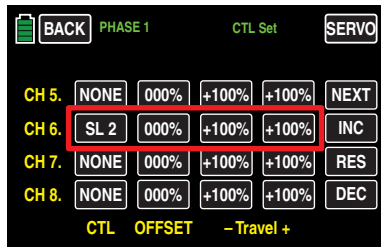


... the standard or previously customized values of the "aileron" option of the "Flap MIX" sub-menu are valid ...



... on the standard flap servos 6 and 7 so as 9 and 10, or in case of a model with only one flap servo only to the servo 6.

If in the sub-menu "**CTL Set**" a switch or a control has been assigned to the output "CH6", for example the left proportional control lever "SL2" ...



... then all the provided flaps move in the position corresponding to the control position ("**CTL Set**"), offset value and travel setting so as ("**Flap MIX**") RATE and offset values of the respective flaps positions.

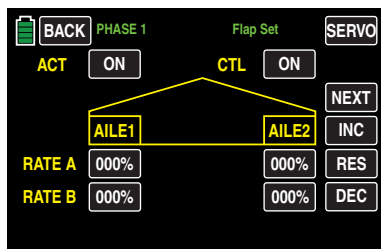
**Notice**



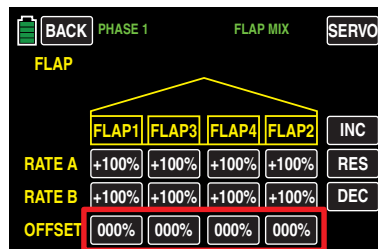
Set therefore the clarity as far as possible only in one of the involved sub-menus value.

- "**ACT**" = **ON**

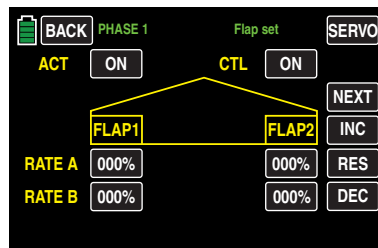
As long as "**ACT**" is activated ...



... only the standard or previously customized offset values of the "aileron" option of the "**Flap MIX**" sub-menu are valid ...

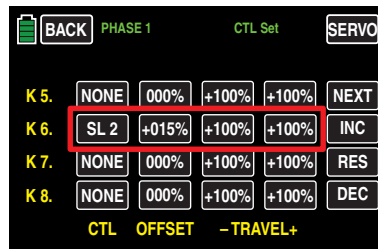


... so as the following described RATE setting of the "AILERON" display page of the "**Flap set**" sub-menu ...



... on the standard flap servos 6 and 7 so as 9 and 10, or in case of a model with only one flap servo only to the servo 6.

If in the sub-menu "**CTL Set**" a switch or a control has been assigned to the output "CH6", for example the left proportional control lever "SL2" so as an offset value, e.g. ...



... then all the provided flaps move to the control position ("**CTL Set**"),

Offset and travel settings so as to the RATE values of the following described aileron displays of the "**Flap set**" sub menu. And all the flaps accordingly to the addition of ("**CTL Set**") control position, offset value and travel settings so as ("**Flap MIX**") offset and the RATE values of the following described aileron display of the "**Flap set**" sub-menu.

**Notice**

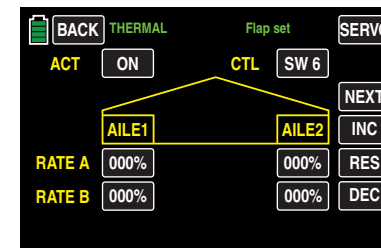


Set the clarity as far as possible only in one of the involved sub-menus value.

In the displays described below, you specify the effect of the control elements assigned to channel 6 in the "**CTL Set**" sub-menu, in the form of a phase trim on the positions of the ailerons, flaps, and possibly the elevators.

- **Ctrl/sw option** (control/switch)

In the value field in the Ctrl/sw column, you assign a control or control switch for a specific phase to the mixer as described in the section **Control and switch assignment**, for example in the phase "THERMAL":



## Notice

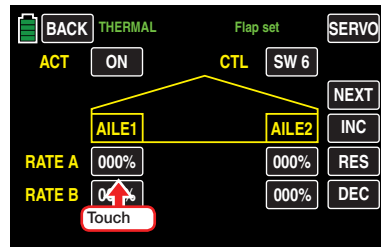


If you switch, through the switch assigned here, **OFF**, you turn off not only the phase trim described here, but at the same time the functions described at the begin of this section under "ACT" = **INH** or **OFF**.

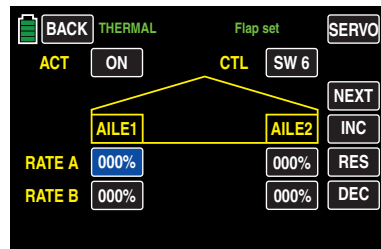
## Lines RATE A / B

A symmetrical or an asymmetrical effect can be defined for each flap pair. If in the **CTL Set** sub-menu you leave (have left) the travel settings of the switch assigned to the flap trimming to +100%, then here you can input values within 5 and 20% which should be enough.

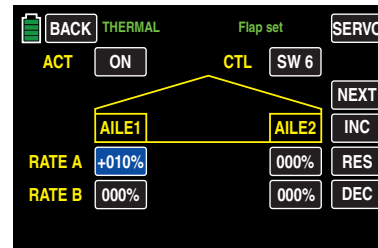
Switch to the desired phase, and touch the value field to be set with a finger or the provided stylus:



The color of the value field switches from black to blue:

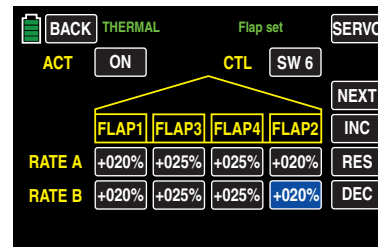


In the active (blue) value field, press **+** to increase the current value within a range of  $\pm 100\%$  and **-** to reduce it, for example:

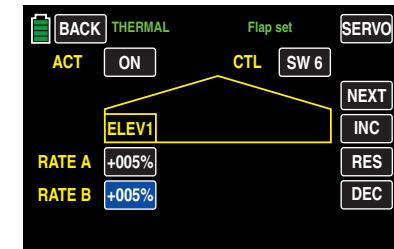


Use same procedure with the other values to be set, as well as any inboard aileron "AILE2L" and "AILE2R". Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

After completing the settings for the ailerons, you can switch to the page for setting the flaps by touching **NEXT** at the right edge of the display to set the flaps and enter the desired settings using the procedure described above, for example:



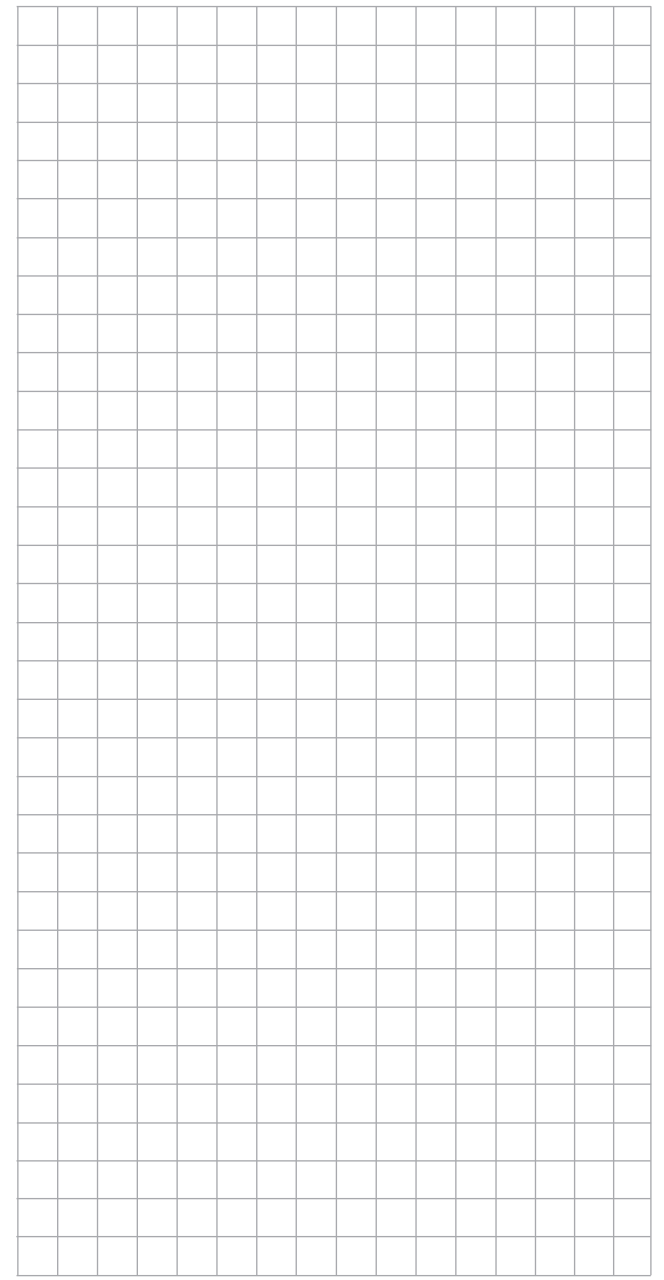
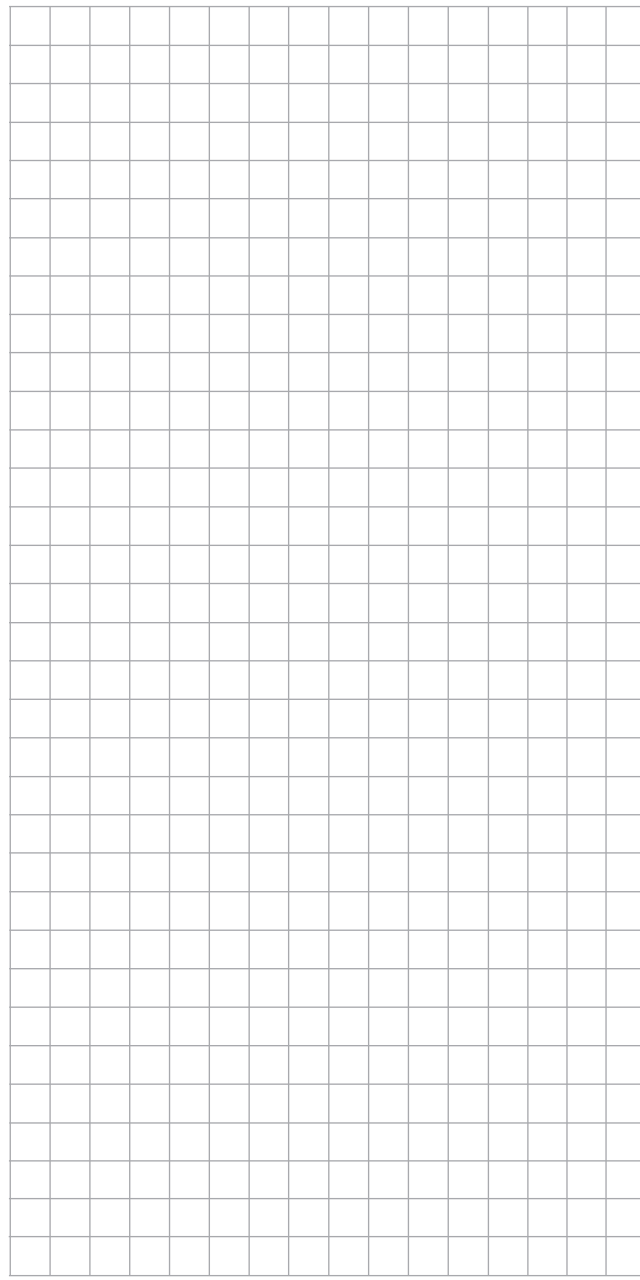
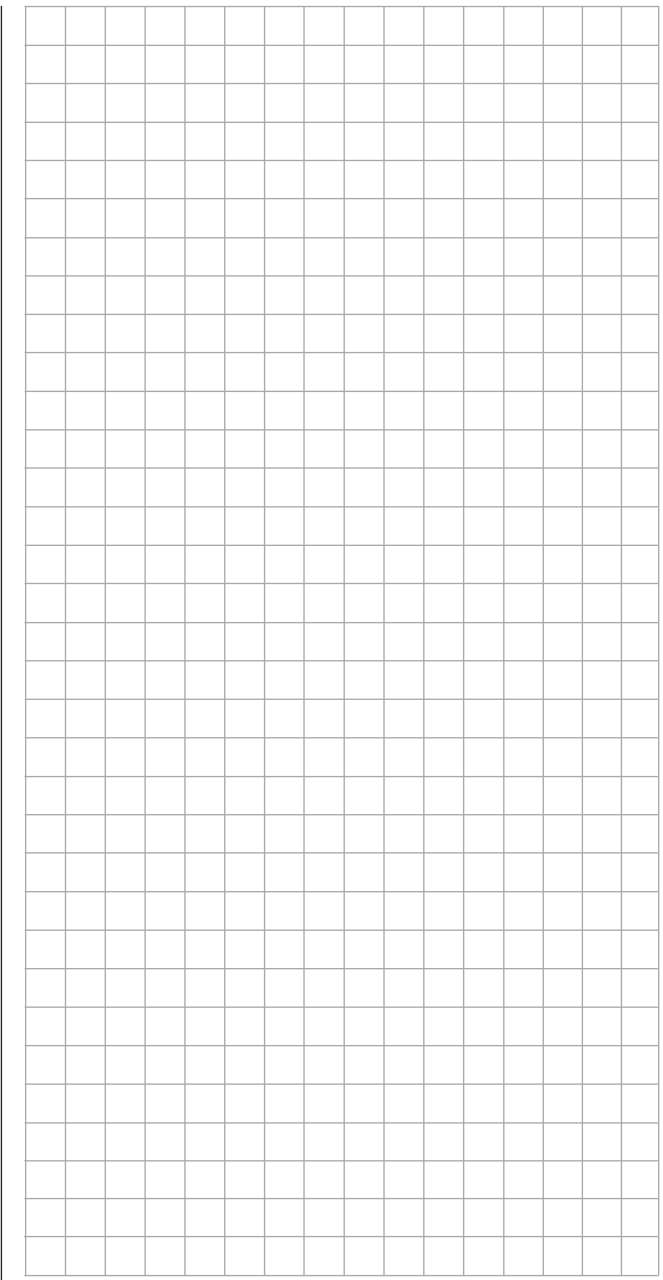
Finally, you can switch to the page for setting the elevator by touching **NEXT** at the right edge of the display to set the elevator and enter the desired settings using the procedure described above, for example:



## Tip

Standardly in the "**CTL Set**" sub-menu to the inputs "CH5 ... CH12" NO control is assigned. However, you can assign a control or switch at any time and hence set different flap positions within a phase as described in this section. In contrast the [Variant of a flaps trimming](#) described in the "program examples" allows to trim the flaps specifically for the phases through only one control element within all the phases.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection.



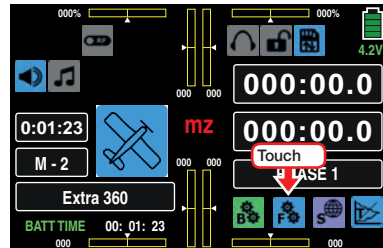


# Airbrake

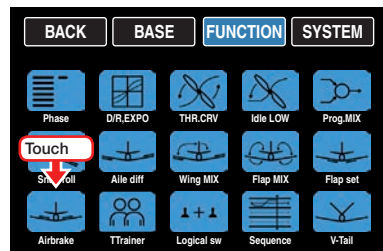
Adjusting the braking system of airplanes

This sub-menu is displayed, according to the selected model type and its configuration.

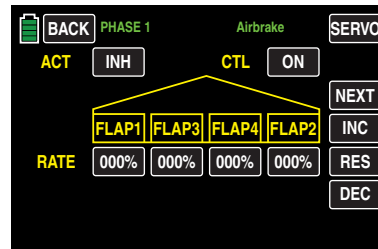
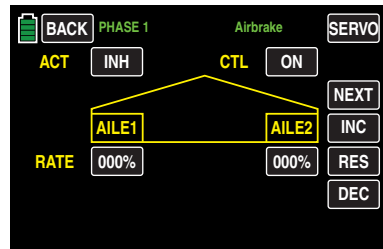
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "Airbrake".



Depending on the selected number of ailerons and flaps, the display shows different views: The top of the two following figures shows the display when setting the minimum "2AILE", and the bottom figure shows the display when selecting the maximum "... 4FLAP".



## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Programming

In the display described below, enter the amount and direction of the deflection of your flaps, and possibly also the elevator, for braking. In order for these settings to be effective and retrievable with a switch, for example, start programming the option fields "ACT" and "Ctrl/sw" described below:

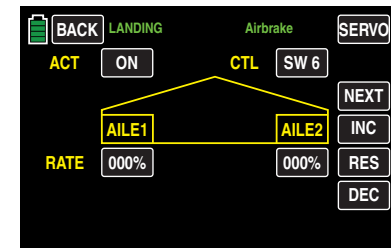
### • ACT column (active)

Within the value field for this column, specify phase specifically whether this function is generally blocked (**INH**) or **ON**.

Once you set this value field to **ON**, you can turn the effect of the selected control element on the flap position for specific phases individually on and off with a control assigned in the option field "Ctrl/sw".

### • Ctrl/sw option (control/switch)

In the value field in the Ctrl/sw column, you assign a control or control switch for a specific phase to the mixer as described in the section [Control and switch assignment](#), for example in the phase "LANDING":

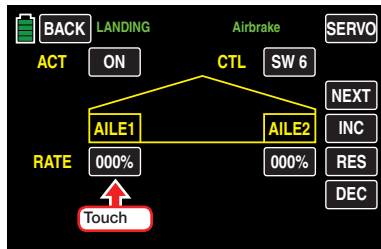


### RATE line

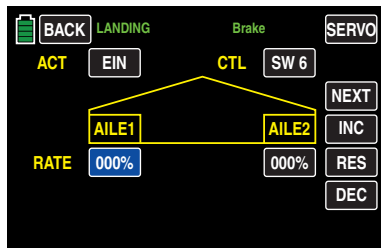
A symmetrical or an asymmetrical effect can be defined for each flap pair. In order to be able to define upward and downward deflections, the setting range is  $\pm 150\%$ .

Switch to the desired phase, such as "LANDING", and touch the value field to be set.

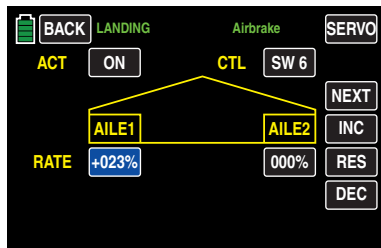




The color of the value field switches from black to blue:

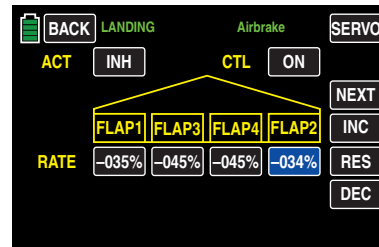


In the active (blue) value field, press **+** to increase the current value within a range of  $\pm 150\%$  and **-** to reduce it, for example:

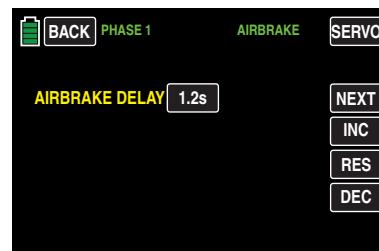


Use the same procedure for the value of the aileron on the opposite side as well as any inboard ailerons. Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

After completing the settings for the ailerons, you can switch to the page for setting the flaps by touching **NEXT** at the right edge of the display to set the flaps and enter the desired settings using the procedure described above, for example:



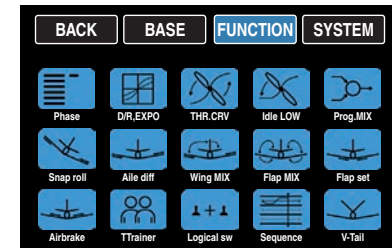
To prevent the sudden deflection of (brake) flaps adjusted in this manner when activating the selected control, touch the **NEXT** button at the right of the display to go to the last display of this option. Incorporate a delay for the *deflection* of the flaps as described above, for example:



### Tip

Smoothly retract the flaps by setting up a "LANDING" phase in addition to the "NORMAL" phase in the "PHASE" sub-menu, and incorporate a switching delay. For the switch, use the same control that (is to be) used to trigger the braking function.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



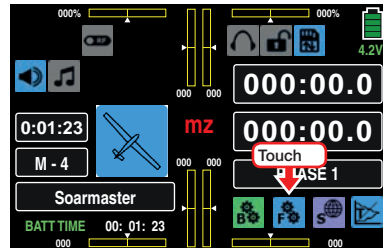


# Butterfly

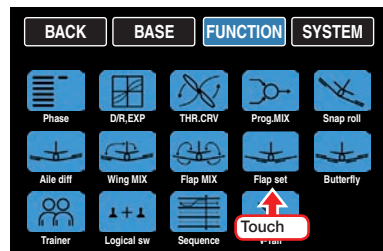
Adjusting the braking system of gliders

This sub-menu is displayed, according to the selected model type and its configuration.

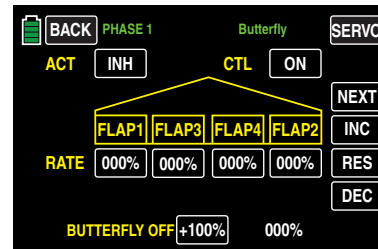
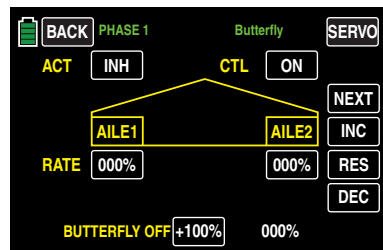
In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



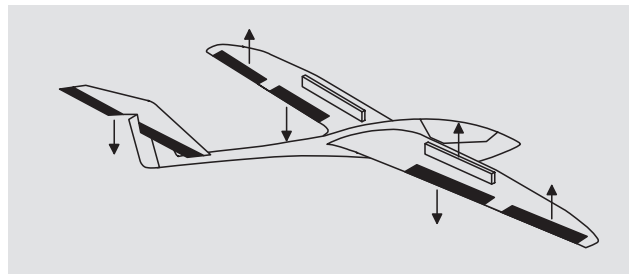
The display switches to the blue function menu. Touch the menu item "**Butterfly**".



Depending on the selected number of ailerons and flaps, the display shows different views: The top of the two following figures shows an example of the display when setting the minimum "2AILE", and the bottom figure shows the display when selecting the maximum "... 4FLAP".



In this menu, you can set a special flap arrangement, the *crow* position or *butterfly*. In this braking position, both *ailerons are moved slightly upward*, and the *flaps move downward as far as possible*. By means of an additional mixer (the "elevator curve" mixer described below), the elevator is trimmed so that the flight speed does not change significantly in comparison to the normal flight position. Otherwise, there is a danger that the model will slow down too much and, after the brake system is retracted (for example to lengthen a landing approach that is too short), will crash or fall.



This interaction of the flaps, aileron and elevator control the gliding angle when approaching a landing. (The butterfly flap position is frequently used in sports models instead of brake flaps or spoilers).

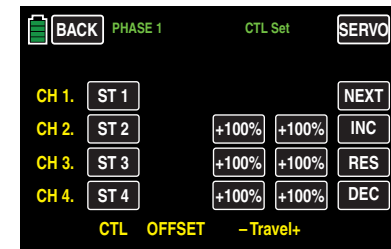
## Phase-dependent settings

The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "**PHASE**" menu, you will be able to switch among those phases. Activate the corresponding switch or switches if desired to switch between the phases.

## Programming

The butterfly mixers described below are actuated by the throttle/brake control stick assigned by default to the "CH1" input, or alternately by any other transmitter control element that is assigned to the "CH1" input of the "**CTL Set**".

In most cases, however, the selection is limited to preset control, and the airbrake is operated using the non-neutralizing CH1 control stick:



The use of other control elements offers also the possibility to be able to control the airbrakes alternatively also through another accessory function control, in case the CH1 control stick is going to be used for other scope.

## "BUTT.OFFSET" line

The selected offset or BUTTERFLY OFF point determines the control position at which the brake system is retracted or closed, and it also determines the direction of actuation of the assigned control element, by default the throttle control stick, when extending in the brake system:

- The actuating direction of the CH1 control stick for actuating an electric drive, if present, is fixed against the actuating direction for the extension of an airbrake system.

### Notice

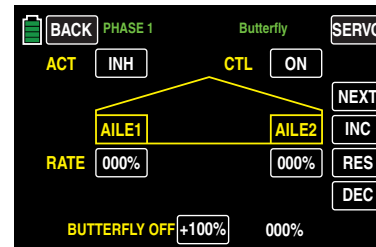


An inverted CH1 curve acts on the actuating direction of the butterfly (so as on the motor) control as "reversed". Then only the output positions are changed, but not the "correlated" fixed actuating directions.

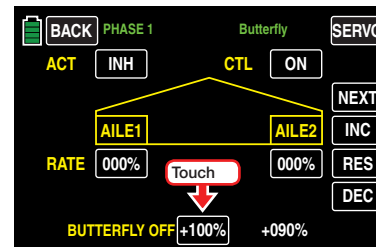
- The flaps are extended for brake offset values with a "+" when the corresponding control element such as the throttle control stick is moved *from front to rear* toward the pilot.
- The flaps are extended for brake offset values with a "-" when the corresponding control element such as the throttle control stick is moved *from back to front* away from the pilot.
- If the offset point is not placed at the end of the control travel, the remainder of the travel up to this stop is "free travel", i.e., the "free travel" does not influence the flap mixer described below.

This free travel ensures that all brake settings are at neutral even when there are slight deviations in the end stop of the brake flap control. At same time, the effective control travel is automatically extended to 100%.

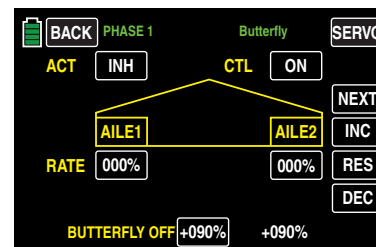
Then move the control element assigned to the input "CH1", by default the throttle/brake control stick, to the position at which the flaps are to be retracted or closed. The current control position is numerically displayed in white to the right of the value field:



Once the desired position is reached, transfer it to the value field by touching it, for example:

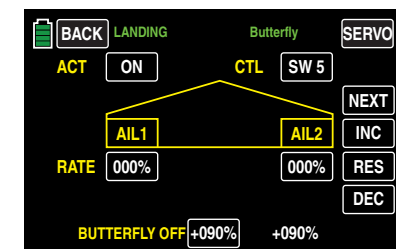


The current white control position is transferred to the value field:



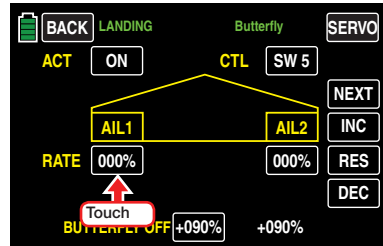
After the brake offset, which is not quite unimportant for the correct operation of the flaps, is set in the "RATE" line of this display and, if necessary, also in the following, with which percentage and in which direction your wing flaps and, if appropriate, also the elevator, should deflect to "brake". In order for these settings to be effective and if necessary retrievable with a switch, it is also recommendable to program the two option fields "ACT" and "Ctrl/sw" described below after setting the preferable offset point: Switch first to the desired phase, such as «LANDING»:

- **ACT column** (active)  
Within the value field for this column, specify phase specifically whether this function is generally blocked (**INH**) or **ON**.  
Once you set this value field to **ON**, you can turn the effect of the selected control element on the flap position for specific phases individually on and off with a control assigned in the option field "Ctrl/sw".
- **Ctrl/sw option** (control/switch)  
In the value field in the Ctrl/sw column, assign a control or control switch for a specific phase to the mixer as described in the section [Control and switch assignment](#). This can be for example the same control that you used to switch to the "LANDING" phase:

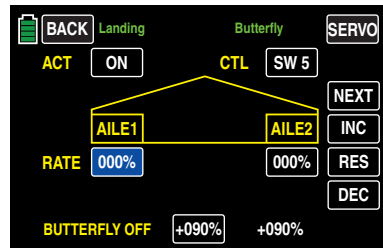


## RATE line

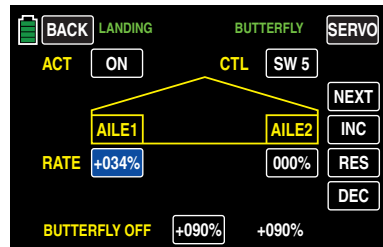
Switch to the desired phase, such as "LANDING", and touch the value field to be set with a finger or the provided stylus: In order to be able to define upward and downward deflections, the setting range is  $\pm 150\%$ :



The color of the value field switches from black to blue:



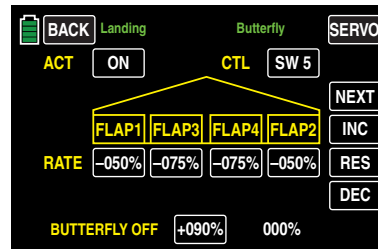
In the active (blue) value field, press **+** to increase the current value **-** to reduce it, for example:



Use the same procedure for the value of the aileron (AILE2) on the opposite side as well as any inboard ailerons.

Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

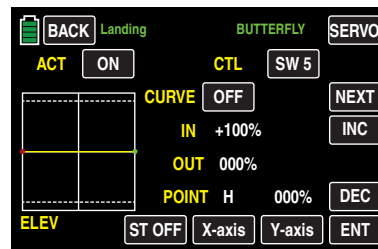
After completing the settings for the ailerons, you can switch to the page for setting the flaps by touching **NEXT [page change]** at the right edge of the display to set the flaps and enter the desired settings using the procedure described above, for example:



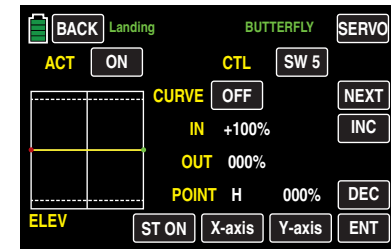
## Tips for visualizing the braking effect:

Spread the flaps and, from the front, look at the surface from above and below. The greater the projected surface of the protruding rudder, the greater the braking effect.

## Elevator curve display

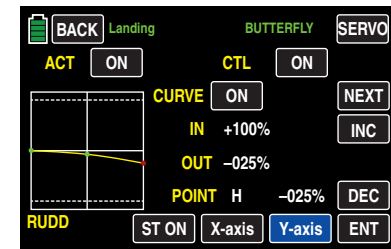


Switch to the display for the control position by touching the **ST OFF** button at the bottom left of the display in order to make the necessary settings:



The green, vertical bar in the graphic display which indicates the position of the brake control moves away from the edge of the graph as soon as the throttle/brake control stick is moved from its higher or lower end point.

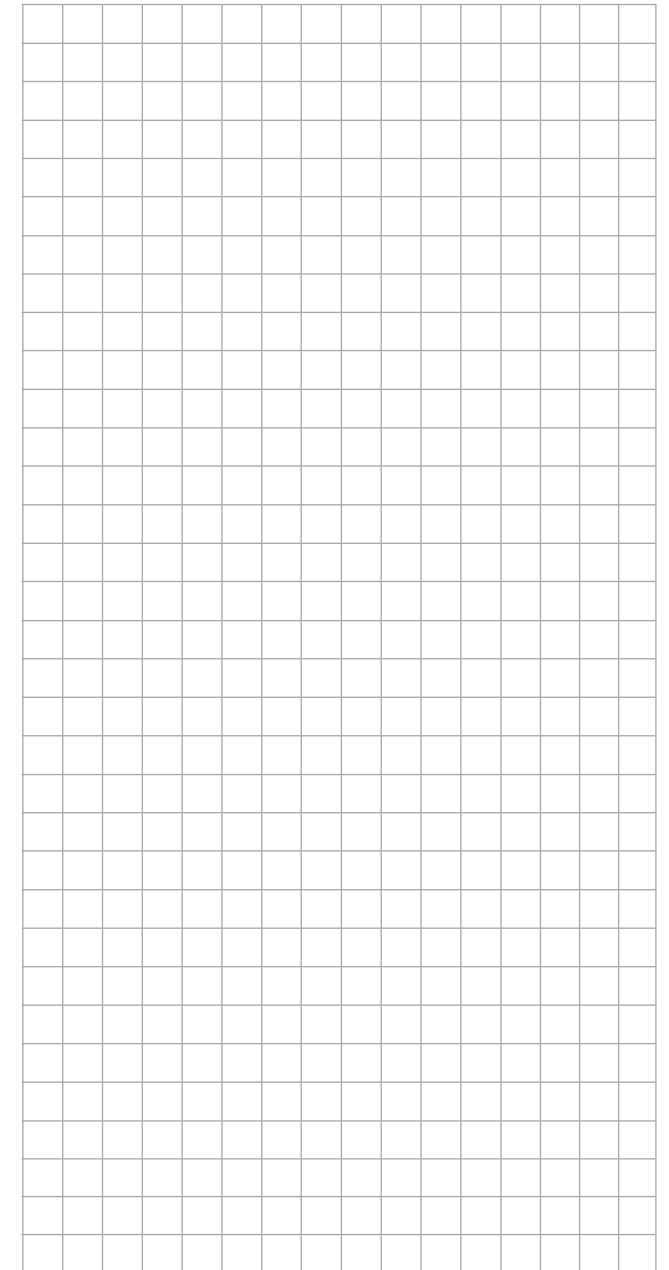
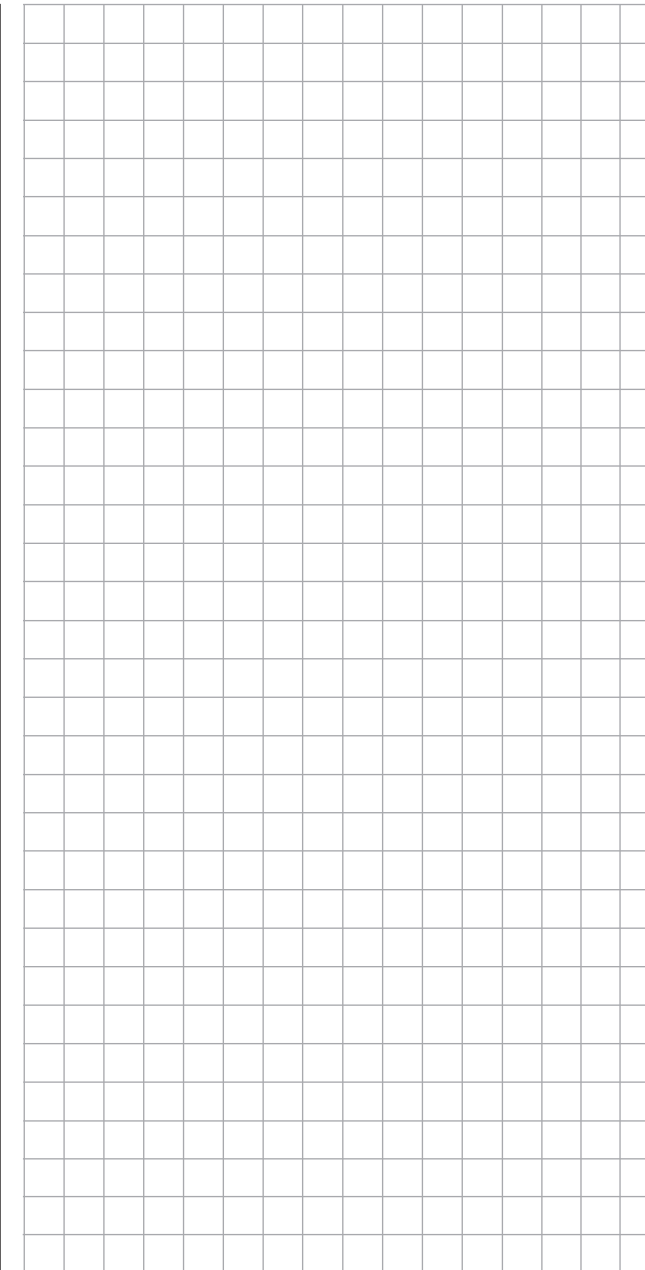
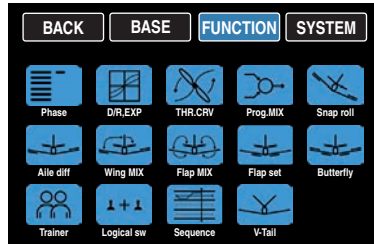
Move the elevator curve toward the opposite stop as needed, in direction of "brake active". The method for adjusting the curve of this 7-point curve mixer follows the same principles, for example, as those used for the curve mixer described in the **"THR.CRV"** sub-menu, such as:



## Attention

**>>>** The chosen setting should be tried out and adjusted if necessary at a sufficient height. Make sure that the model does not become too slow when the brake system is extended! Otherwise, there is a risk that, after the brake system is retracted (for example to lengthen a landing approach that is too short), the model will crash or fall.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



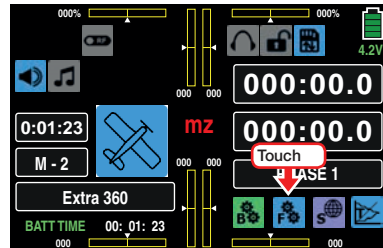
# V-Tail



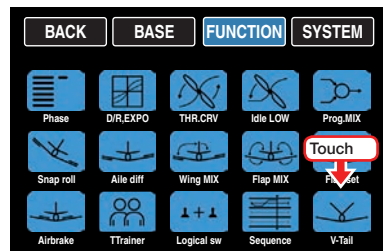
Adjusting the actuation of a V-tail

This sub-menu only appears when a V-Tail has been selected in the basic settings of the model.

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "F":



The display switches to the blue function menu. Touch the menu item "V-Tail".

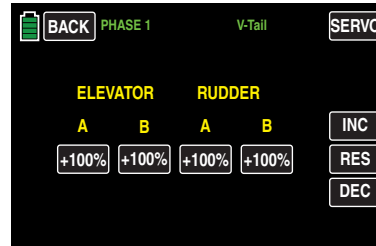


The elevator and rudder are controlled by two separately-articulated rudders arranged in a V-shape. The coupling function for the rudder and elevator control is automatically transferred from the program.

## Phase-dependent settings

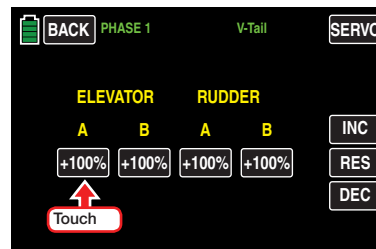
The here mentioned sub-menu offers the possibility of phase specific settings. Recognizable on the top left side of the display in green color is displayed the phase name. As standard is displayed the name of the phase 1, which is indicated by the name "NORMAL" or "PHASE 1". As soon as you will have defined one or many other phases in the "PHASE" menu, you will be able to switch among those phases.

Activate the corresponding switch or switches if desired to switch between the phases.

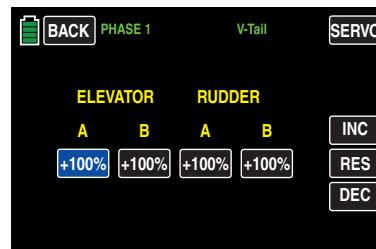


## Programming

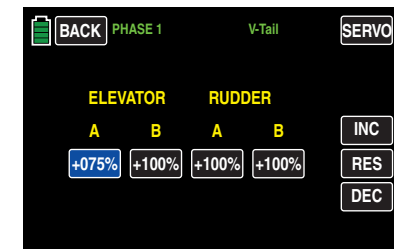
Touch the corresponding value field with the value to be changed, for example:



The color of the value field switches from black to blue:



In the active (blue) value field, press **+** to increase the current value **-** to reduce it, for example:



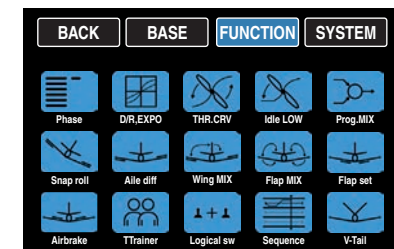
Use the same procedure with the values in the other value fields.

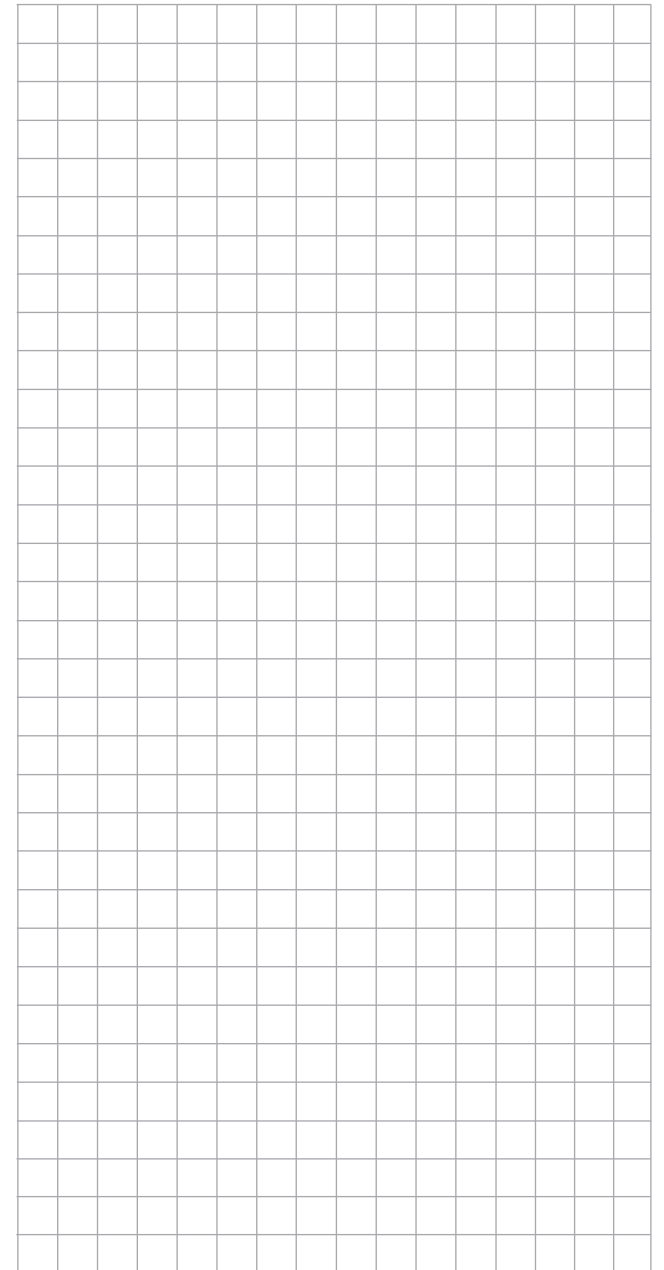
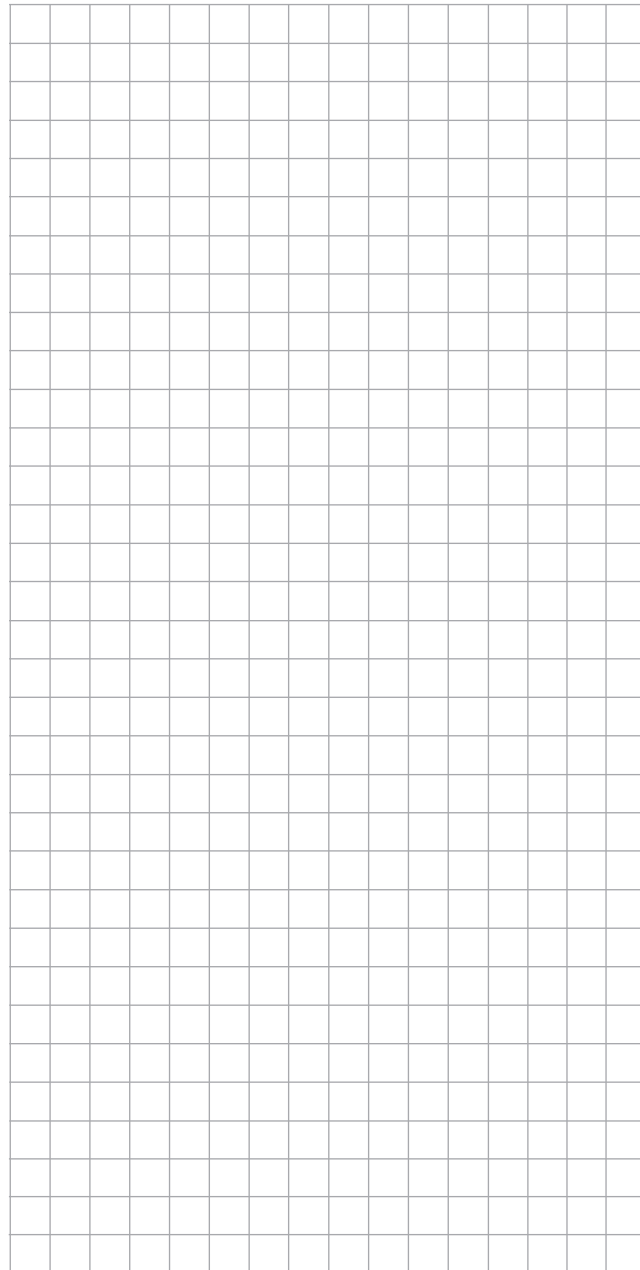
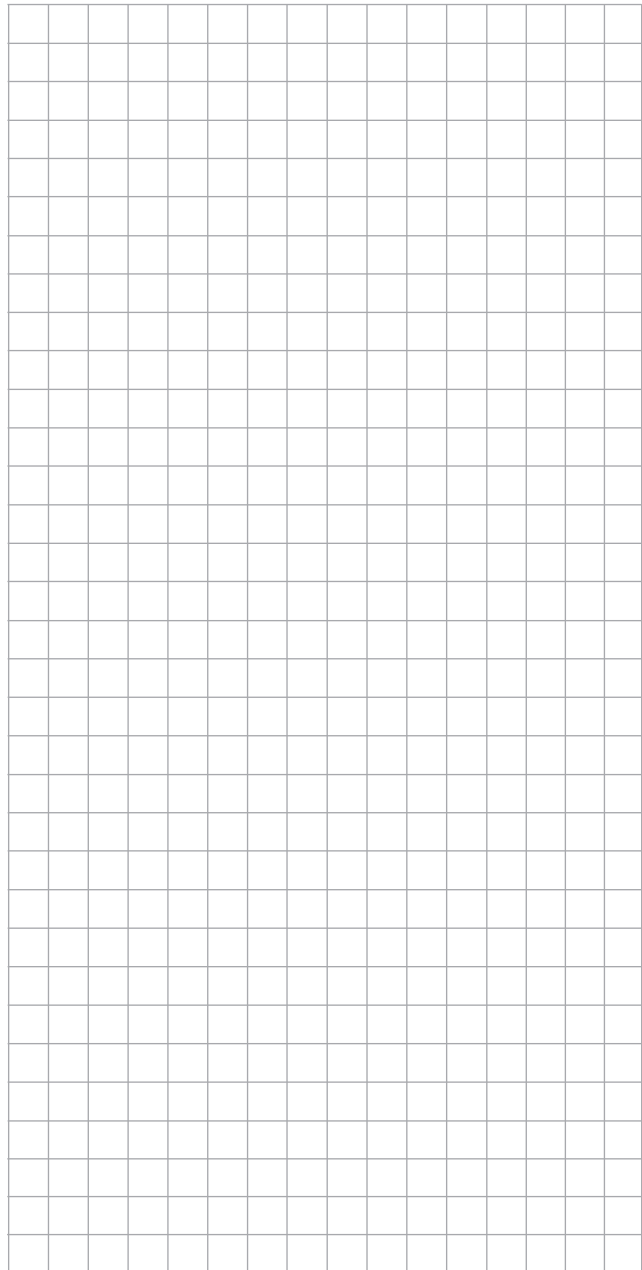
Touch the **RES** button to reset a changed value in the blue (and hence active) field to the default value.

## Notice

Remember that the mixing travel of the mixers is cumulative with simultaneous control stick movement, and one servo or both servos may mechanically collide. To prevent this, reduce the related set mixing values if necessary.

After you have finished making your settings, touch the **BACK** button at the top left of the display to return to the menu selection:



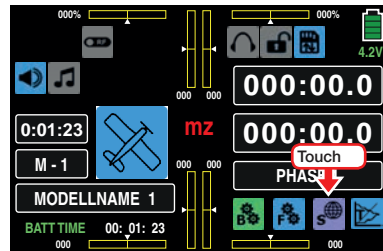




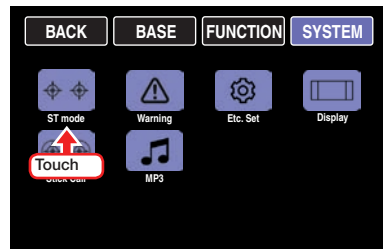
# Control mode

Model-specific basic settings

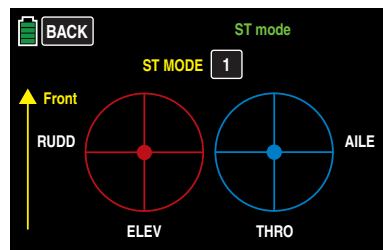
To open the sub-menus of the SYSTEM menu, touch to the gear symbol labeled "S" in the transmitter's basic display at the bottom right.



The display switches to the purple main menu. Touch the menu item "ST mode".



Basically by all the six model types which are selectable in the **mz-24** HoTT Pro there are four different possibilities to assign the control functions to both control sticks. The options that are chosen according to both the individual preferences of the model pilot and to the model type. "Mode 1" is the default.



## Notice



The setting selected in this menu does not depend on the model memory and is at the same time valid for all of the model memories and as comprehensible for all the model types stored in the transmitter. Therefore, you should be particularly careful with the control assignment of "cars" and "boats" on the control codes of the "aircraft" fractions in order to avoid conflicts after a possible model (type) change,

## Land and water models

The compatibility with the following described control mode 1 ... 4 of the aircraft model type ways is however recommended, connect the control function 1 with the forward/backward function and the control function 4 with the direction function:

MODE 1 (throttle at right stick)	MODE 2 (throttle at left stick)
MODE 3 (throttle at right stick)	MODE 4 (throttle at left stick)

## Copter

MODE 1 (throttle/pitch right)	MODE 2 (throttle/pitch left)
MODE 3 (throttle/pitch right)	MODE 4 (throttle/pitch left)

## Helicopter model

MODE 1 (throttle right)	MODE 2 (throttle left)
MODE 3 (throttle right)	MODE 4 (throttle left)

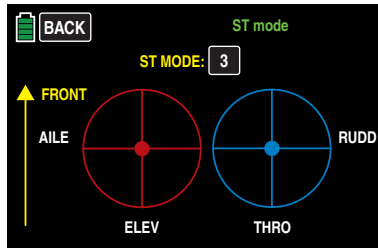


## Fixed-wing model

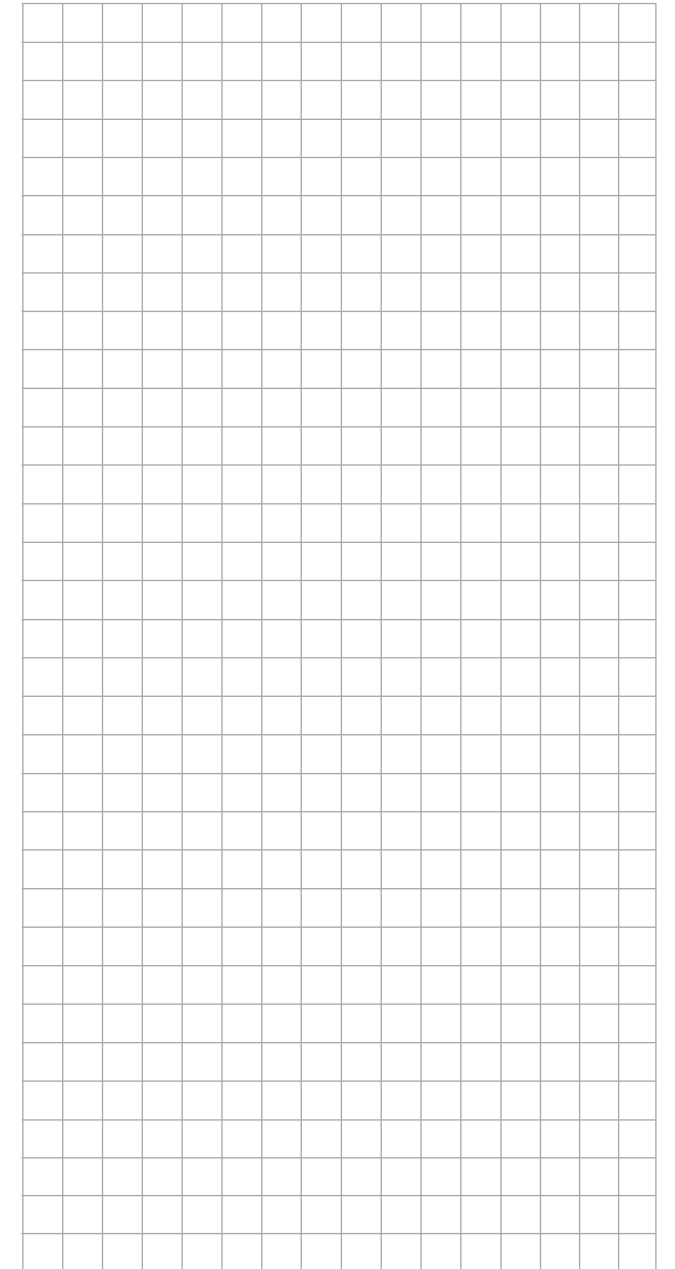
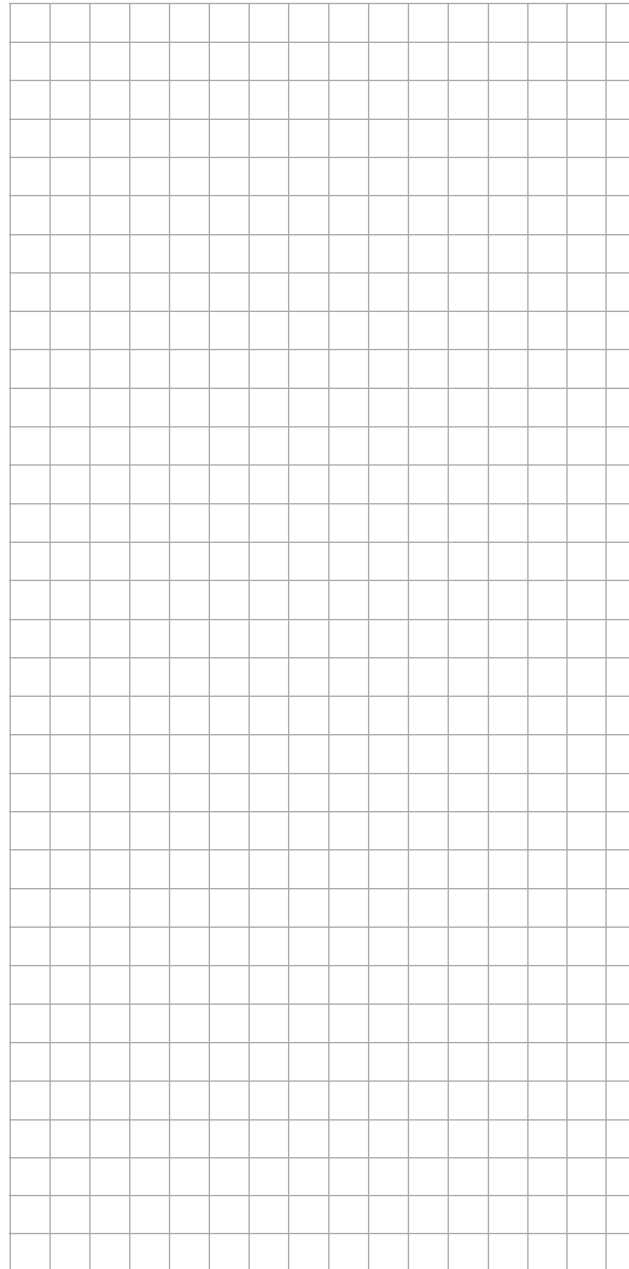
MODE 1 (throttle right)	MODE 2 (throttle left)
MODE 3 (throttle right)	MODE 4 (throttle left)

## Programming

In order to switch to a control mode different from the default, touch the yellow button on the right of the "ST MODE" button until the number appears of the control mode that you want, for example:



Touch the **BACK** button at the top left to return to the system menu.

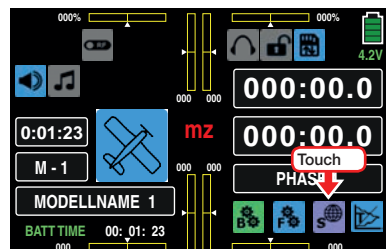




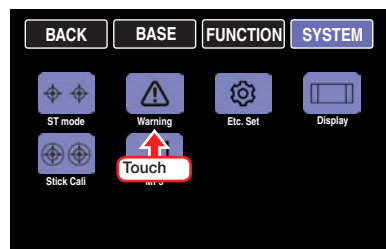
# Warning

Model memory specific warning settings

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "S":



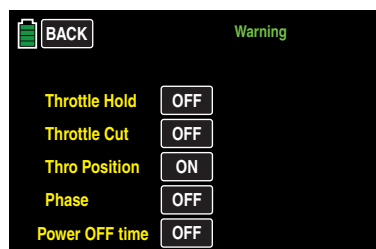
The display switches to the purple main menu. Touch the menu item "Warning".



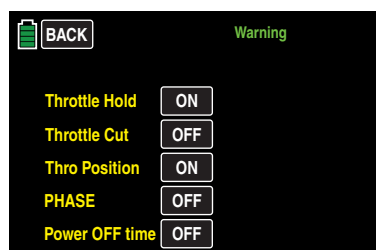
In this sub-menu, you can turn five triggers of a visual and acoustical alarm on or off. Normally, only the "CH1-POS", normally the throttle servo, is actively monitored. Other switchable options are "Throttle Hold", "Throttle Cut", "Phase" so as "Power OFF time".

## Notice

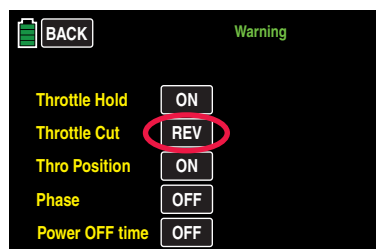
» These settings are model memory specific and for this reason they are settable individually for each model memory.



In order to switch back and forth between **ON** and **OFF**, touch the field for the other options, for example:



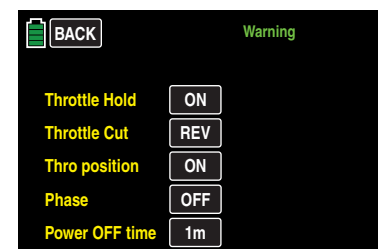
Moreover in the "Throttle Cut" line it is also available the option **REV**:



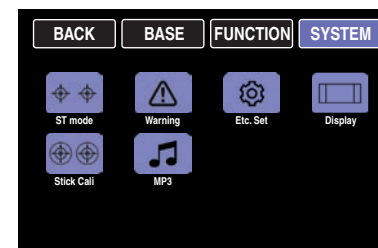
While with **ON** the switch on warning with switched on Throttle Cut is active, **REV** activates it exactly reversed, with switched off Throttle Cut.

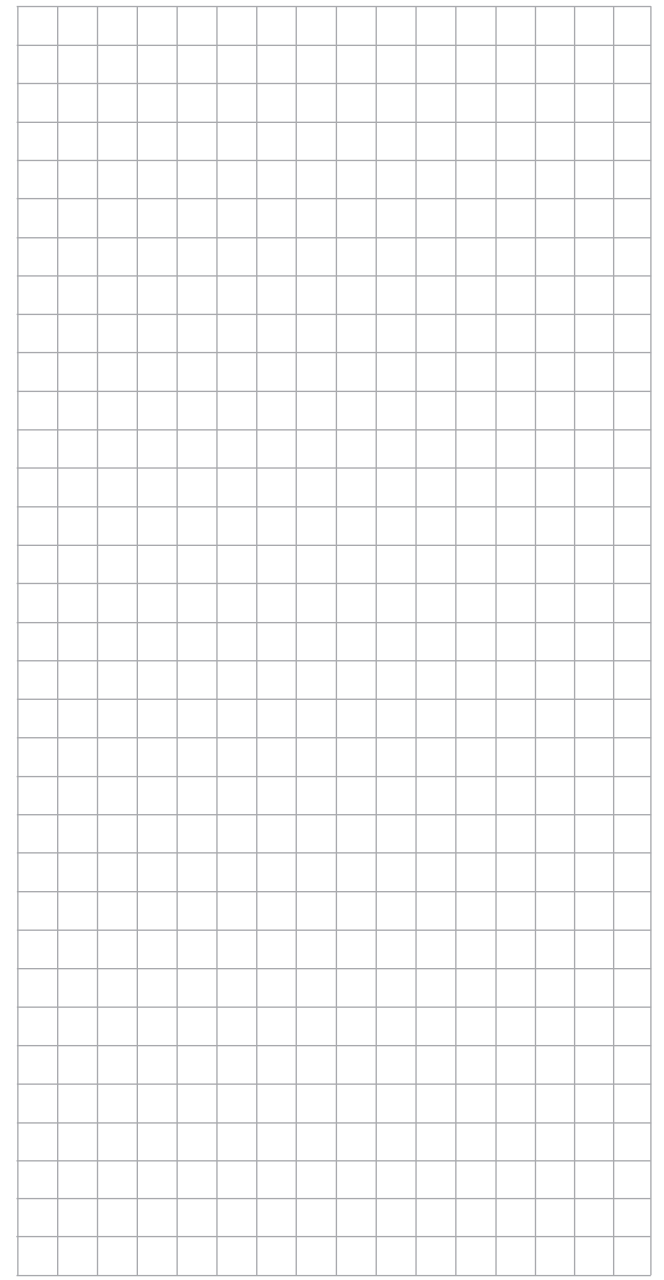
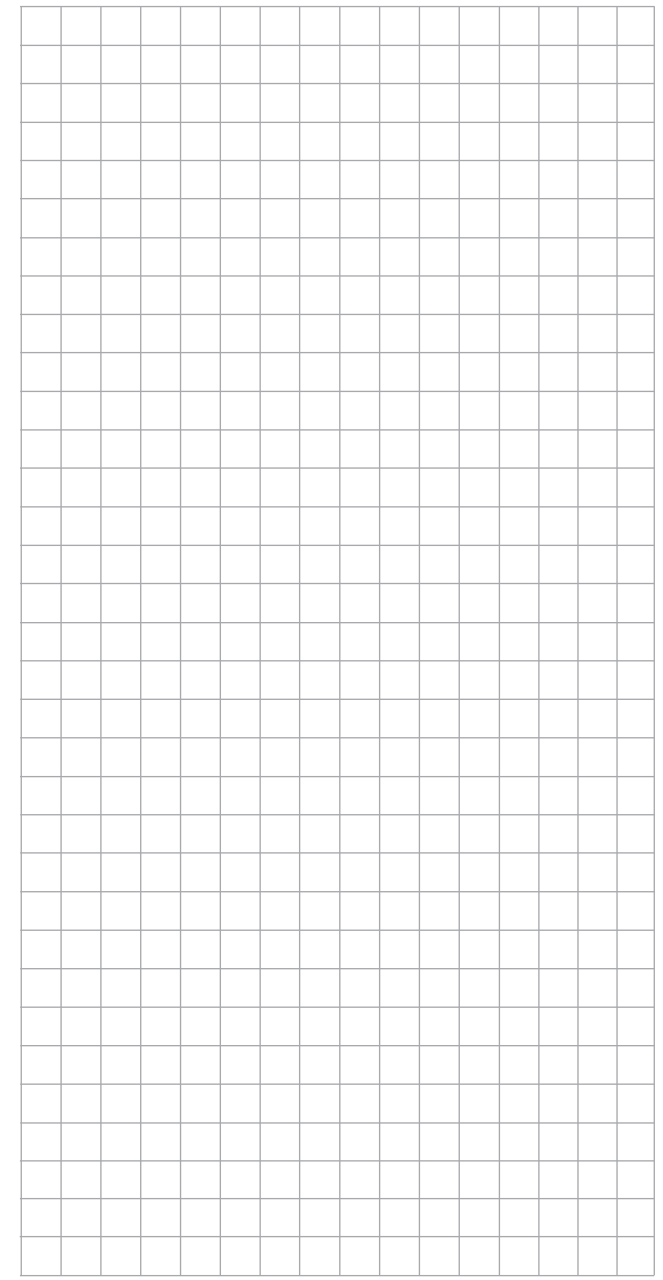
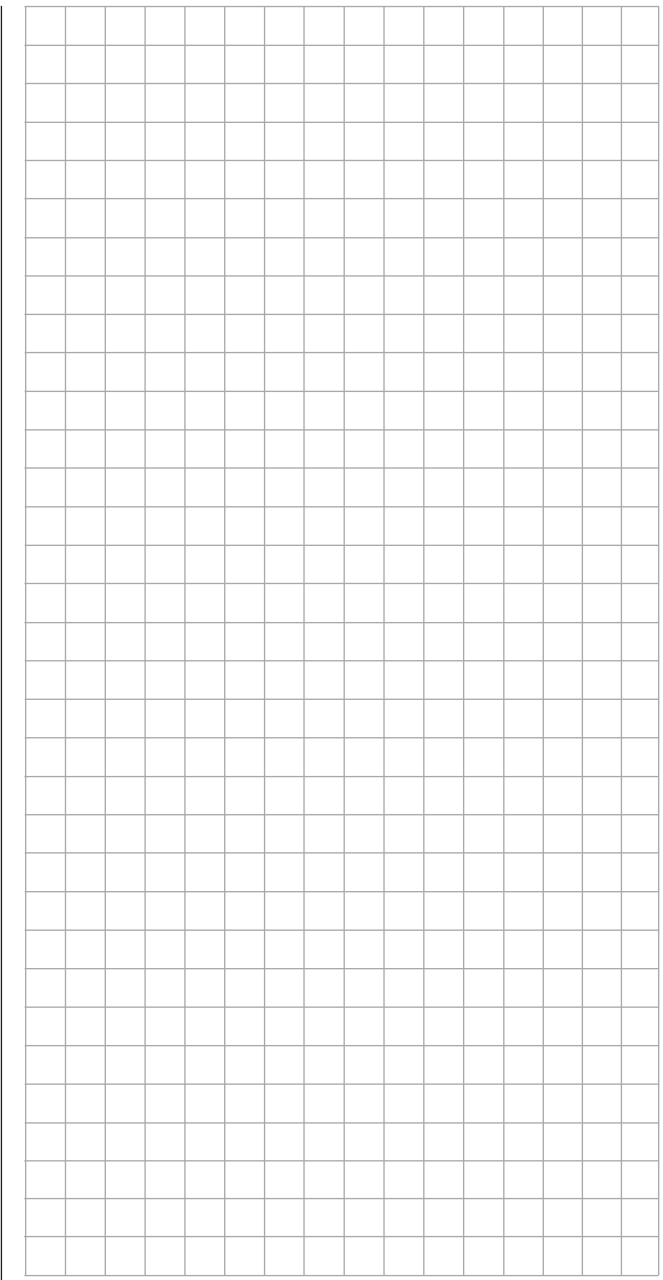
In the last line (Power OFF time), you can not only switch this option **ON** but also specify how long the transmitter should wait following the last actuation of a control element until triggering a visual and acoustic warning before the transmitter turns off after an additional three minutes of inactivity.

The following selections are available: "OFF", "30s" so as 1, 5, 10, 20, 30 and 60 minutes. Repeatedly touch the field of this line, such as:



Touch the **BACK** button at the top left to return to the system menu:



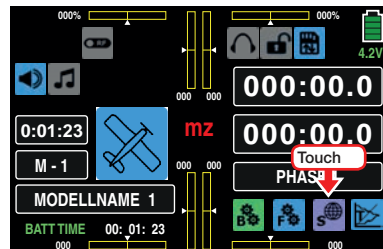




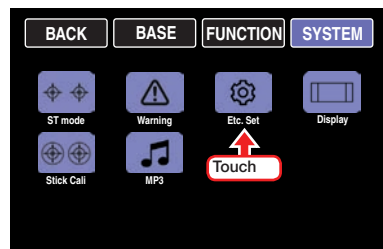
## Etc. Set

Various transmitter-wide settings

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "S":

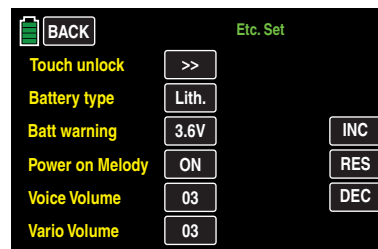


The display switches to the purple main menu. Touch the menu item "Etc. Set":

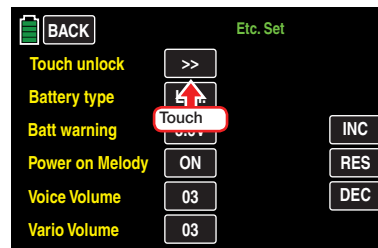


In the first line of the "Etc. Set" sub-menu it is possible to change the key lock deactivation from the standard push of both **ESC** and **ENT** buttons located on the sides of the display, through a lock code. In the next lines it is possible to pre-set some settings according to the customer preference.

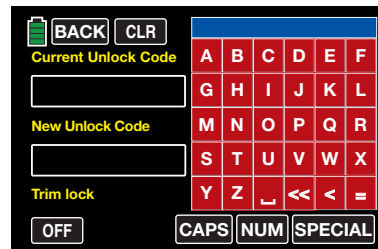
### "Touch unlock" line



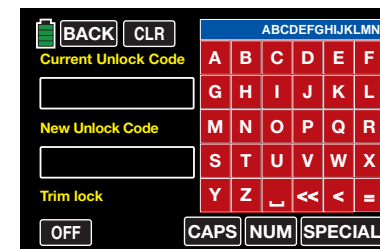
To set an individual PIN tap on the **>>** button in the "Touch unlock" line:



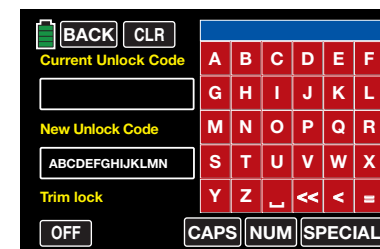
The corresponding input menu opens:



In this sub-menu you can input a PIN with a maximum of 14 characters, as detailed described in the section "[Model name](#)", for example:



Tapping on the **<** button deletes the last character, tapping on **<<** deletes all the characters in the blue input field. Tapping on the **=** button, in the lower right part of the display, confirms the input characters in the "New Unlock Code" field:



### • Locking the displays

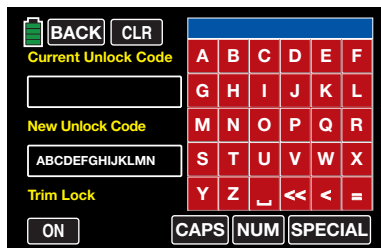
As soon as you have left this display push at the same time and keep pushed both **ESC** and **ENT** buttons on the sides of the display for about one second until a short beep will be emitted, now the touch-function of the display is locked. Both buttons can be released. The transmitter reacts only to the lateral buttons so as to the control elements used to control a model.

### Notice

**>>** Remark well the CODE and keep it in safe for the feature. Otherwise you will have to tap all the possible character combination until you will have found the right one ... or alternatively you can send the transmitter to the *Graupner* Service to unlock it.

- **Locking the displays and the trimming**

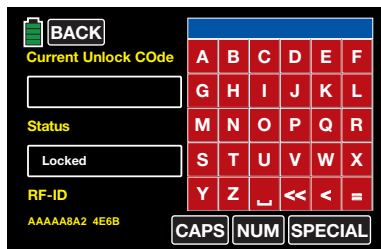
Before or after setting a lock code, as previously described, you can tap on the **OFF** button in the left lower part of the display, to switch at the same time **ON** ...



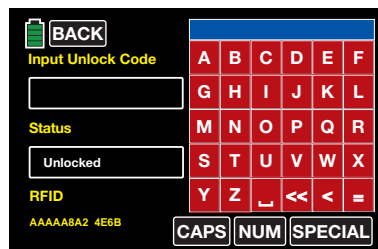
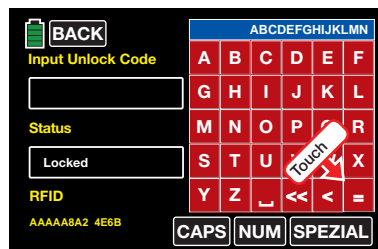
... and also again **OFF** the trim lock.

- **Unlocking the display and the trimming**

Push and hold the **ESC** and **ENT** buttons on the sides of the display for about one minute until a short beep is emitted and the unlock display appears:



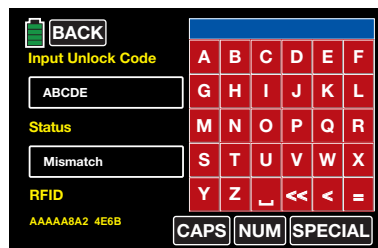
Insert the PIN and then tap on the **EN** button in the right lower part of the display, such as:



As soon as in the status line the "Locked" message disappears, the transmitter can be used without limitations.

Touch the **BACK** button at the top left of the display to leave the locking menu.

If in the status line appears in place of "unlocked" the message "error" ...

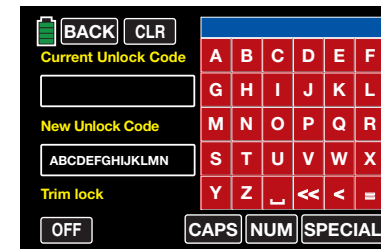


... a wrong PIN has just been input or another error has happened.

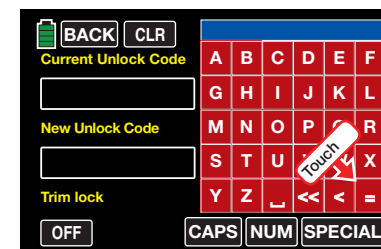
- **Exiting the menus without setting a PIN**

It has already been input a PIN in the "New Unlock Code" line, see previous image.

This process can always be reversible, for example:



By touching again the **=** button in the lower right part of the display the "content" of the empty PIN input field is recognized as "new" PIN:



- **Deleting the PIN**

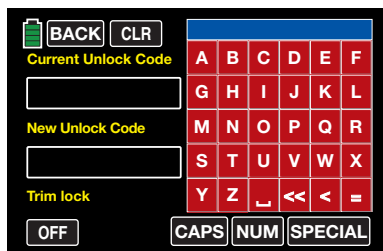
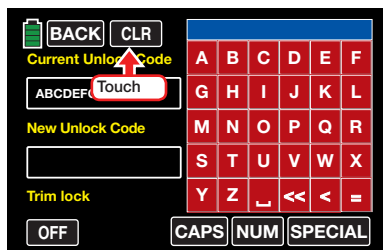
There are two possibilities to delete or remove a PIN:

- **Variant 1**

As previously described, assume the "content" of the empty PIN input field as "new" PIN by tapping the **=** button.

- **Variant 2**

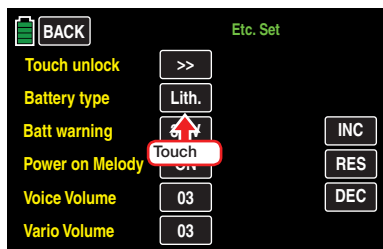
After opening the menu tap on the **CLEAR** button in the upper side of the display, for example:



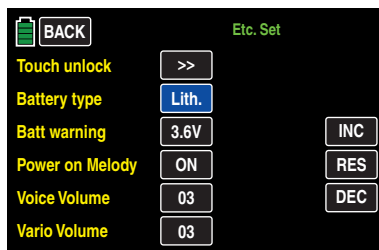
### "Battery type" line

In this line, inform the transmitter whether the power supply is a four-cell NiMH battery or a 1s lithium battery. Depending on the setting, an adapted voltage range is offered in the next line, BATT warning.

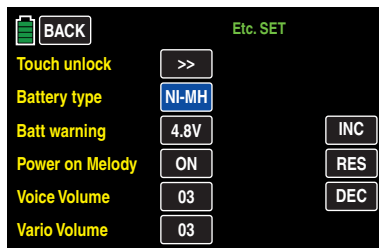
To make any necessary changes to the setting, touch the field of the line "Battery type":



The color of the field switches from black to blue:



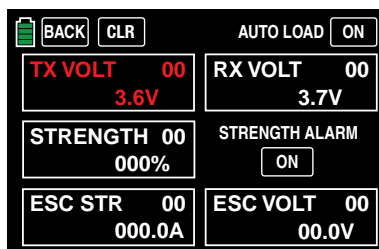
Touch **+** or **-** at the right edge of the display to select the appropriate battery type, for example:



Touch the **RES** button to reset a changed value back to the default.

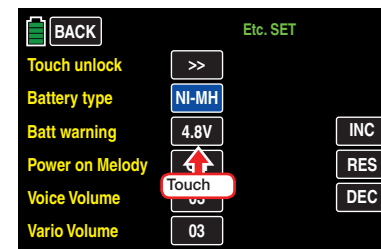
### "Batt warning" line

In the "BATT warning" line, you can set the warning threshold of the display...

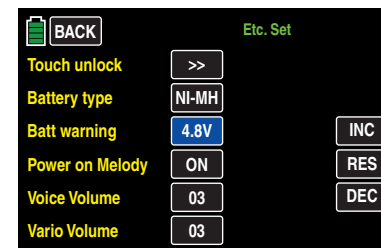


... depending on the selected battery type in the line above, in increments of 0.1 V between 4.5 and 5.5 V (NiMH battery) or 3.4 and 4.2 V (lithium-ion/lithium polymer battery). Make sure that the set value is not too low to give you sufficient time to land your model after a battery warning.

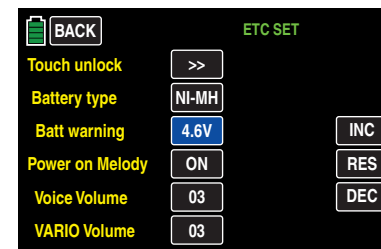
To make any necessary changes to the setting, touch the field of the line "Batt warning":



The color of the field switches from black to blue:



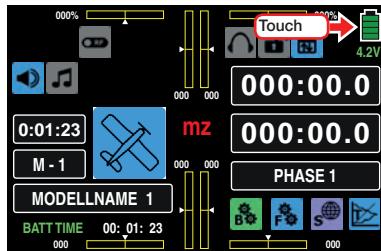
Touch **+** or **-** at the right edge of the display to select the appropriate warning threshold, for example:



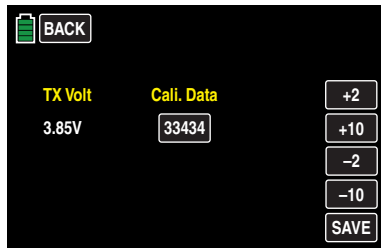
Touch the **RES** button to reset a changed value back to the default.

### Tip

In a special calibration menu that can be opened by touching the voltage display in the basic display of the transmitter ...



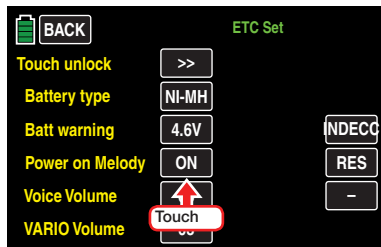
... the voltage display and hence the threshold of the battery warning can be fine-tuned using a precision volt-meter.



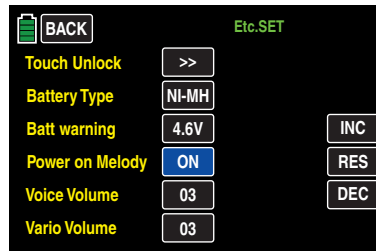
### "Power on Melody" line

You can turn the power on and power off melody of the transmitter **ON** and **OFF** in this line.

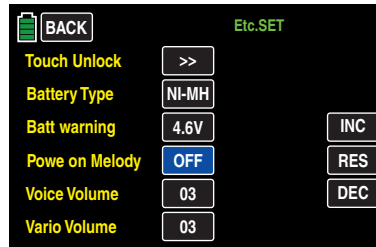
Repeatedly touch the field in the line "Power on Melody":



The color of the field switches from black to blue:



Touch the **-** button at the right edge of the display to turn **OFF** the power on melody...

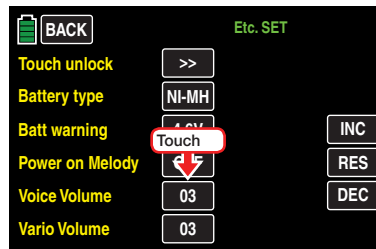


..... and touch the **+** button or **RES** to turn it on again.

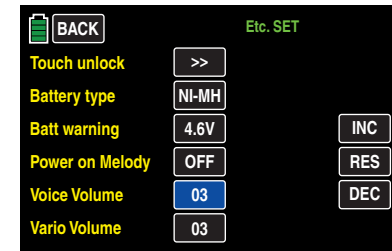
### "Voice Volume" line

In this line, you can individually adjust the volume of the acoustic signals and voice triggers of the transmitter.

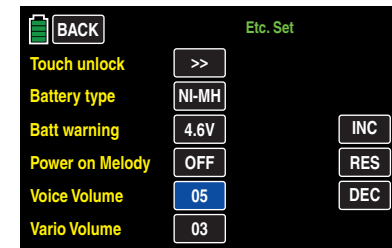
Repeatedly touch the field in the line "Voice Volume":



The color of the field switches from black to blue:

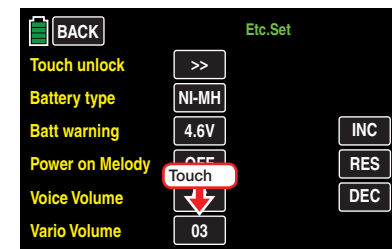


Touch **+** or **-** at the right edge of the display to select the appropriate volume. The following selections are available: "OFF", "1 ... 5", for example:



### "Vario Volume" line

In this line, you can individually adjust the volume of the Vario announcements of the transmitter as described at the left under "Voice Volume":



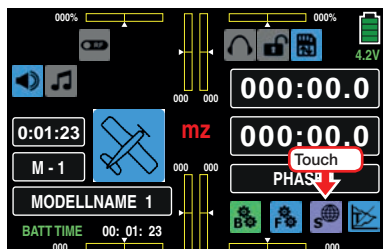
Touch **RES** to reset a changed value to the default, and touch **BACK** at the top left of the display to return to the system menu:

# Display

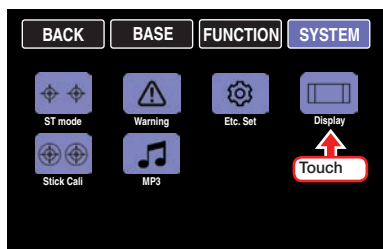


Transmitter-wide display settings

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "S":



The display switches to the purple main menu. Touch the menu item "Display".



In the "Display" sub-menu, you can enter display settings such as changing the contrast, turning the back-lighting on or off, and adjusting the touch sensitivity to your preferences. Furthermore, you can change the color of the transmitter logo, and turn a function on and off that makes it easier to read the display in a sunny environment.

## "Brightness" line

You can adjust the display contrast in this line to make the **mz-24** HoTT Pro transmitter displays easy to read in all weather conditions and temperatures.

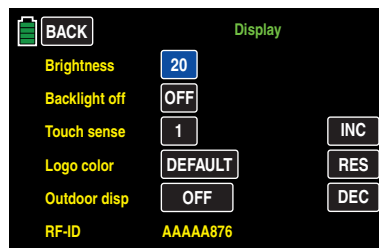
To make any necessary changes to the setting, touch the field of the line "Brightness":



The color of the field switches from black to blue:



Touch **+** or **-** at the right edge of the display to select the appropriate brightness from a range of 1 ... 20, for example:



Touch the **RES** button to reset a changed value back to the default "15" standard value.

## Notice

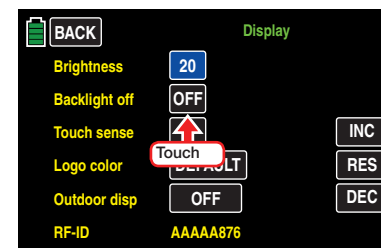
**>>>** If the transmitter's supply voltage has reached the warning threshold set in the sub-menu "ETC. SET" the display brightness will be reduced to 05 value to save energy. That is why after charging the battery you should set the desired value in the brightness line again.

## "Back-light off" line

In this line, specify how long the background lighting of the display remains on after turning on the transmitter without actuating a control element, or since a control element has been actuated.

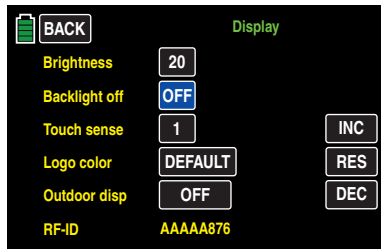
The following options are available: "OFF" (unlimited) "10s", "30s", "1m" and "3m".

Repeatedly touch the field in the line "Back-light off":

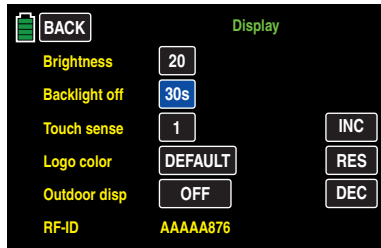


The color of the field switches from black to blue:





Touch **+** or **-** at the right edge of the display to select the appropriate appearing value, for example:



Touch the **RES** button to reset a changed value back to the default **OFF**.

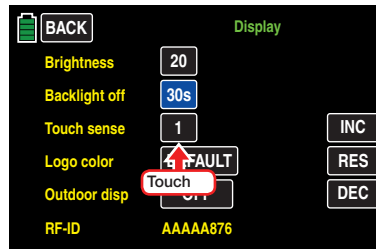
**Notice**

**>>** A display that has gone dark after a set time and has elapsed can be illuminated again by pressing one of the two **<>** buttons to the right of the display.

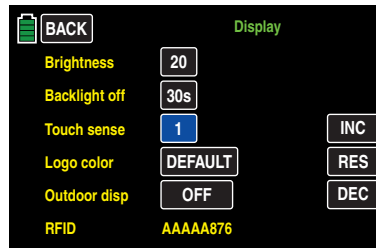
**"Touch sense" line**

In this line, you can select, within the range of 1 to 5, the reactivity of the transmitter to touching the touch-sensitive display fields. The lower the number, the more sensitive the response to touching the touch-sensitive fields and vice versa.

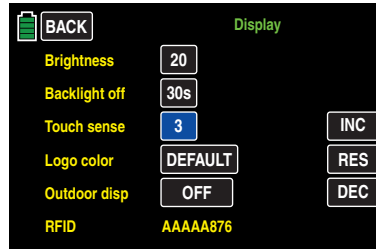
Repeatedly touch the field in the line "Touch sense":



The color of the field switches from black to blue:



Touch **+** or **-** at the right edge of the display to select the appropriate appearing value, for example:

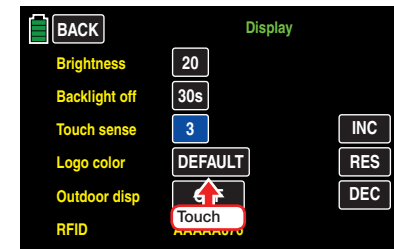


Touch the **RES** button to reset a changed value back to the default "1" standard value.

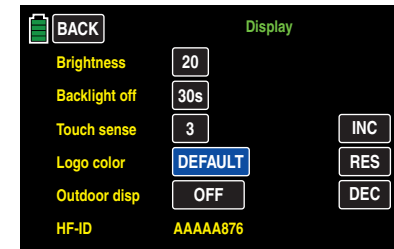
**"Logo color" line**

In this line, you can adapt the color of the transmitter logo to your preference.

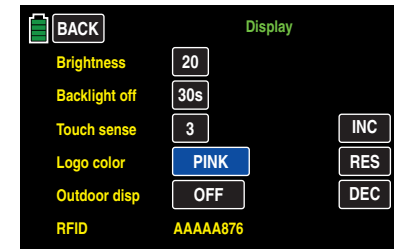
Repeatedly touch the field in the line "Logo color":



The color of the field switches from black to blue:



Touch **+** or **-** at the right edge of the display to select your preference. The following are available for selection: "default", "red", "green", "blue", "pink", "yellow" and "turquoise", for example:

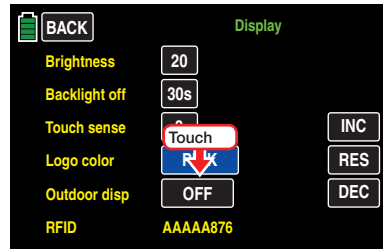


Touch the **RES** button to reset a changed value back to the "DEFAULT".

### "Outdoor disp" line

To maintain the legibility of the **mz-24** HoTT Pro transmitter displays even in bright surroundings or sunlight, you can set the default to "high contrast".

In order to switch back and forth between **ON** and **OFF**, touch the field for the other options, for example:



The display immediately switches to **ON** (or vice versa) ...



### Notice

With the switch from **OFF** to **ON** in the "Outdoor disp" line it changes also the representation of the display "[Telemetry data display](#)".

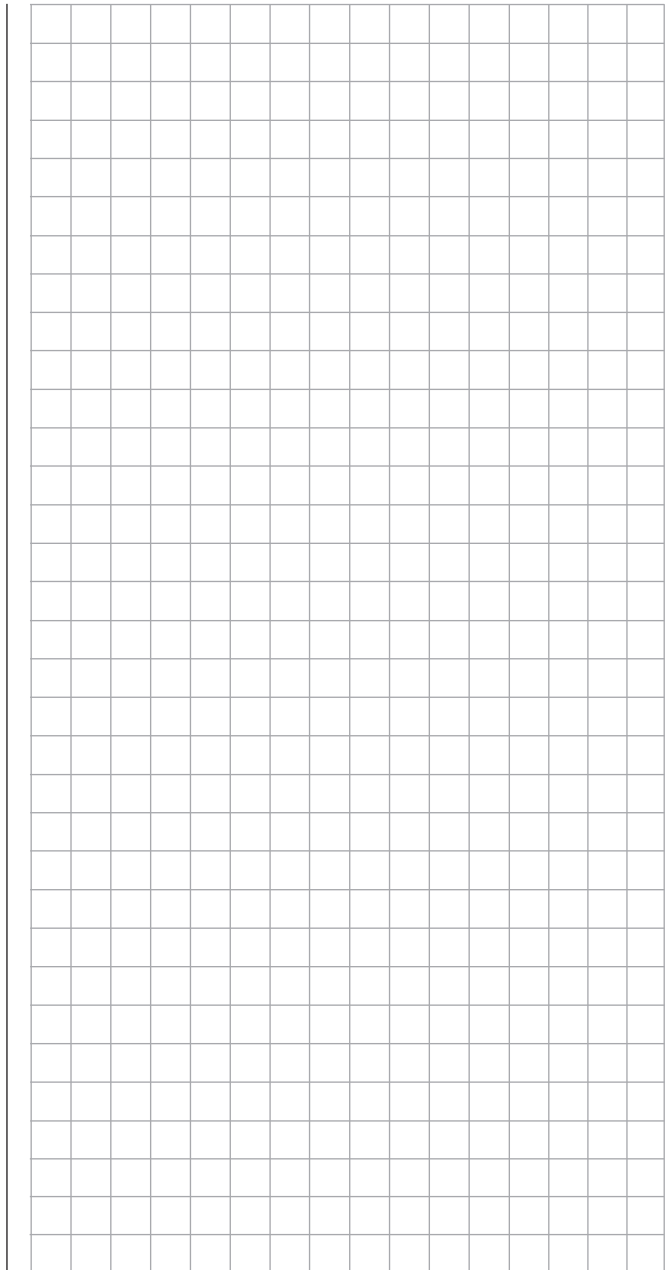
### "RFID" line

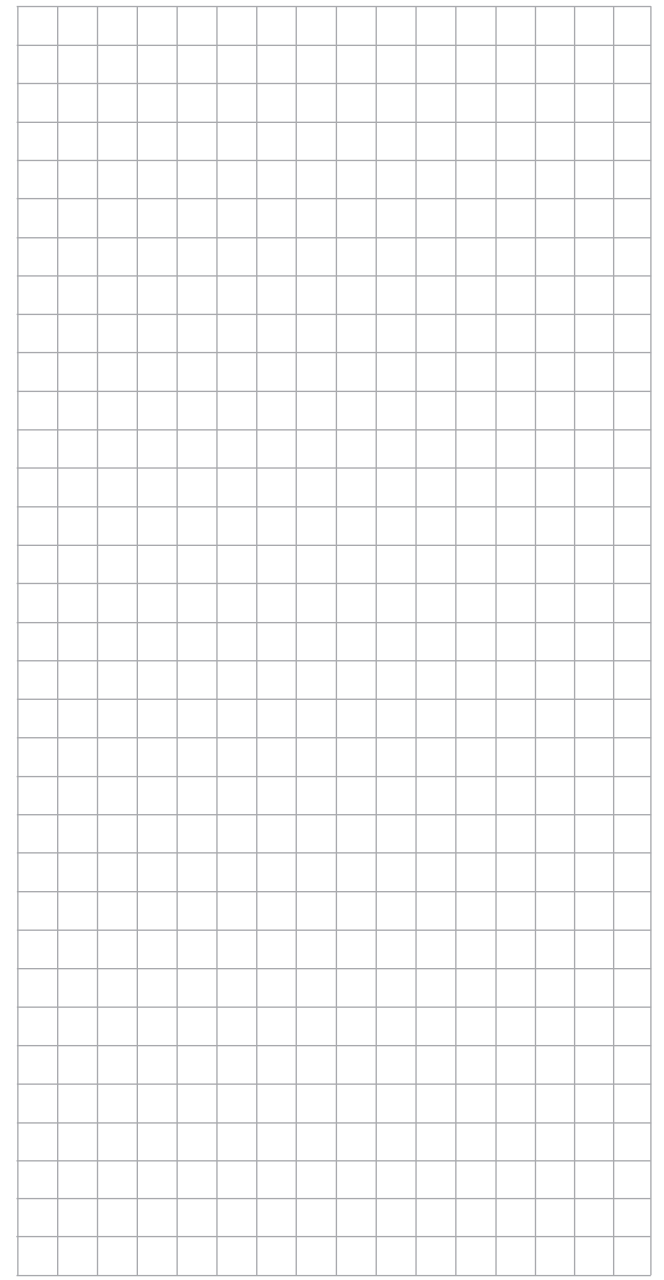
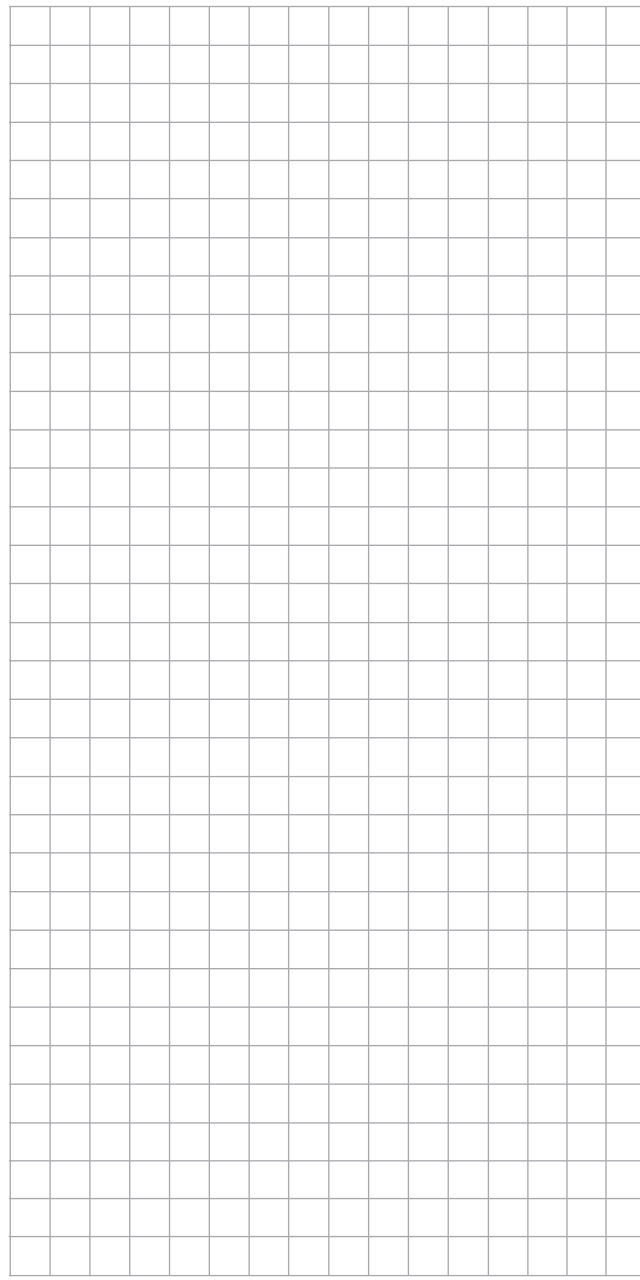
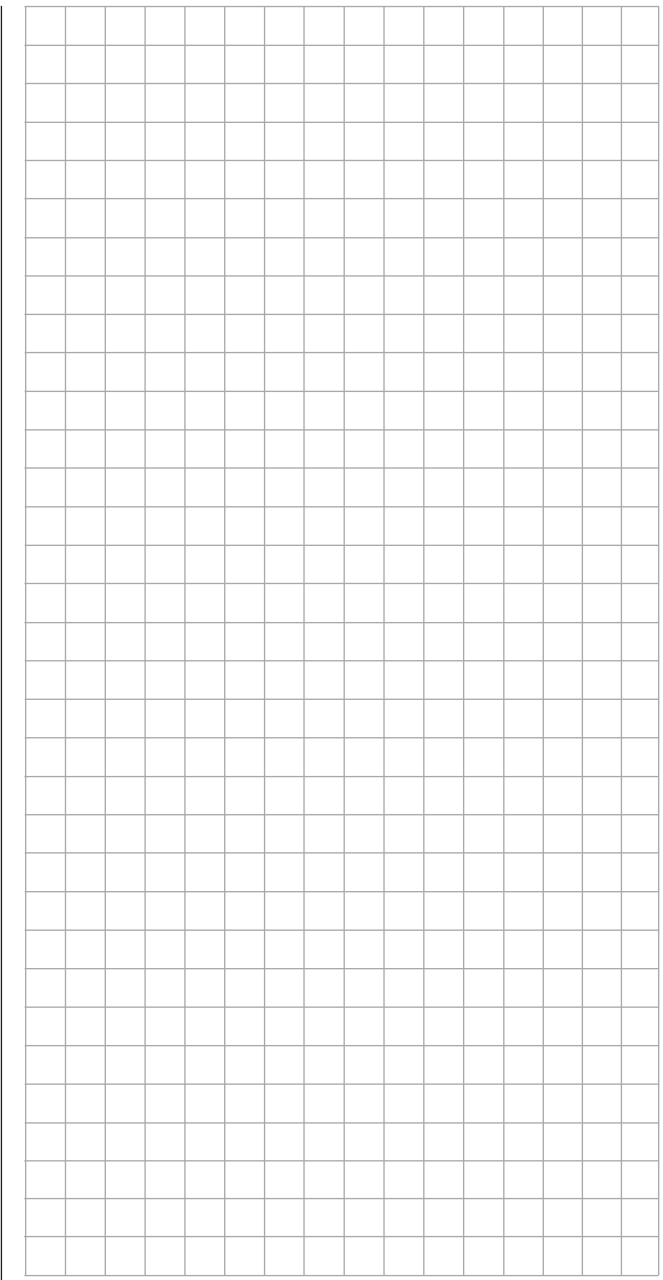
The RFID of the transmitter is displayed in this last line, for example:



This ID is specific for each transmitter, is only issued once per transmitter, and cannot be changed. During the HoTT-synchronization process, this ID is transmitted to the receiver which allows it to always identify the radio signals of its transmitter.

Touch the **BACK** button at the top left to return to the system menu:



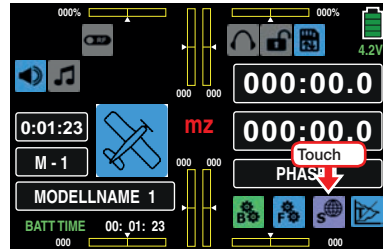




# Stick calibration

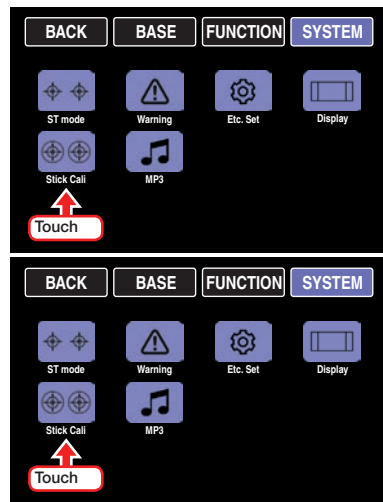
Calibration of the neutral position of the two control sticks

In the basic transmitter display, use your finger or the provided stylus to touch the gear icon labeled "S":



The display switches to the purple main menu. Touch the menu item

"Stick Cali".

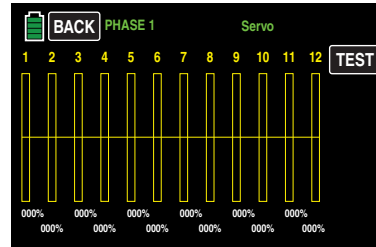


If you feel that the center position of your self-neutralizing control stick (controls 1 ... 4) does not precisely correspond to 0% control travel, you can check and correct it as follows:

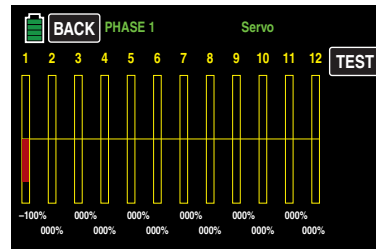
Initialize a [free model memory](#). For which model type you decide is completely irrelevant. It is only important that no trimming or programming has been performed.

Change from that to the "**Servo**" sub-menu by tapping at the same time the ▲▼ on the left of the display.

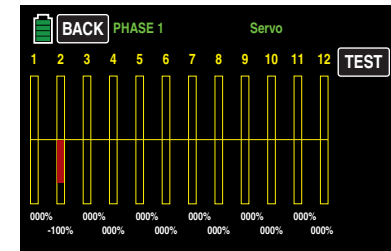
If all four of your transmitter's control stick functions are still self-neutralizing, this display should ideally look like the one shown below.



Otherwise the graph bars show current setting percentages for control stick control functions which are not self-neutralizing, normally CH1. For example, if the CH1 control stick is in its "idle LOW" position, the display would appear as shown below.

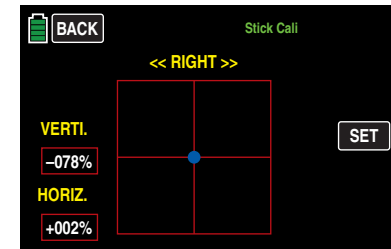


One after the other, put both control sticks into each of their four possible limit positions *without* exerting force at the limit position. In each of these eight possible limit positions, the – side dependent – indication for exactly -100% or +100% should be displayed. For example, if control 2 is at its right limit and the other three other control stick functions are in their respective middle positions, then your transmitter's display should look like the one shown below.



Regardless of the number of self-neutralizing control stick functions available on your transmitter, if these checks produce four 0% results and eight 100% results, then your transmitter's control sticks are optimally calibrated. You can terminate this process and then, if appropriate, delete the model memory just created.

Otherwise, switch to the sub-menu "**Stick Cali**" of the system menu in which you can cyclically selected the positions of the four stick levers that can be calibrated, starting with the neutral position of the right control stick system:



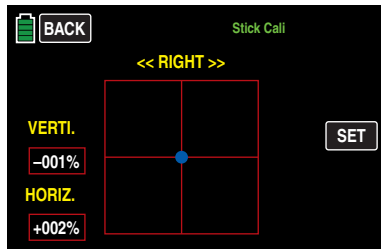
The blue point (in the midpoint of the square in the display above) indicates the stick position to be adjusted.

The percentages in white in the red rectangles on the left of the display under VERTI(cal) and HORIZ(ontal) indicate the current stick position.

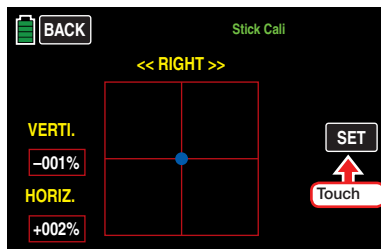
Although the right-hand stick is located exactly in the middle of its path due to its horizontal self-neutralization, an example adjustment of +2% is shown in the figure above.

Vertically, on the other hand, the right stick is also exemplarily located on a rather randomly inclined position in the direction of the pilot due to its non-self-neutralizing characteristic as a CH1 control stick.

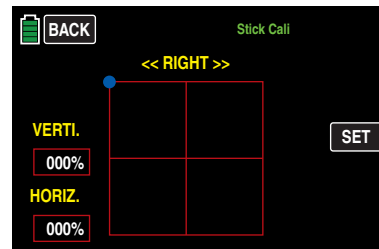
Before tapping the **SET** button on the right, the right control stick, which is not self-neutralizing in this example, should therefore be moved to the mechanical center:



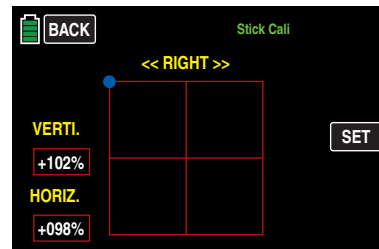
As soon as this state is reached, the **SET** button can be tapped at the right edge of the display:



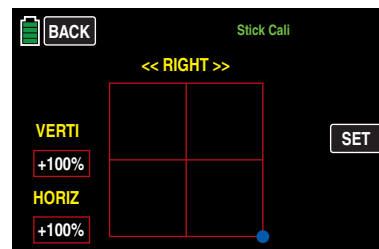
The neutral position of the right control stick is then calibrated in this example, and the blue point is in the left, top corner of the red square:



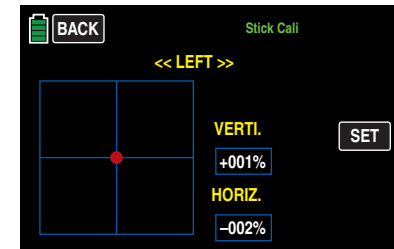
Move the right control stick to the left, front corner *without* exerting pressure at the limit. If the transmitter is incorrectly adjusted, the results can have the following appearance:



Touching the **SET** button at the right edge of the display with a finger or the provided stylus to transfer the 100% position to the memory; the selected point then switches to the opposite corner:



Use the same procedure for the opposite corner; the display will then switch to calibrate the left control stick:



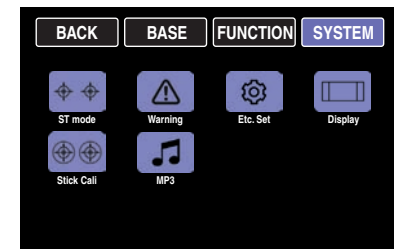
Use the same procedure for calibrating the left control stick.

### Notice



The entire process will have to be repeated if the calibration is incorrect.

Touch the **BACK** button at the top left to return to the system menu:

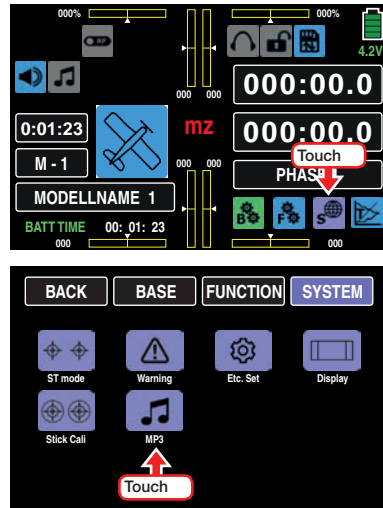




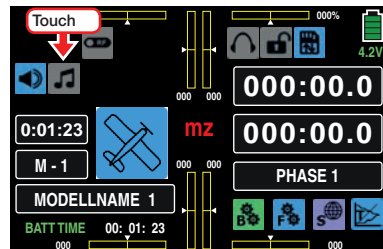
# MP3 Player

Program for playing MP3 files such as music files

The MP3 menu can now be accessed not only from the system menu ...



... but also directly by tapping the MP3 icon in the basic display:



Furthermore, it is now also possible to operate the MP3 menu by means of the buttons on either side of the display:

- Start and stop the currently selected MP3 file by pressing the **ENT** button to the right of the display.
- Change the volume by pressing one of the two ▲ ▼ buttons to the left of the display.

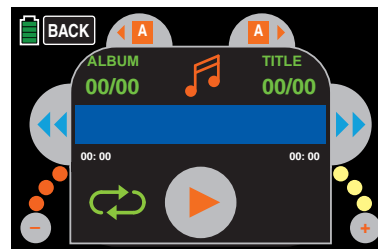
- Scroll forwards/backwards in the current album by pressing one of the two ◀ ▶ buttons to the right of the display.
- Exit the MP3 menu by pressing the **ESC** button to the left of the display.

## Notice

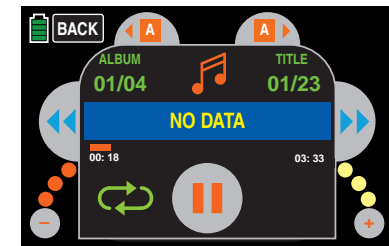
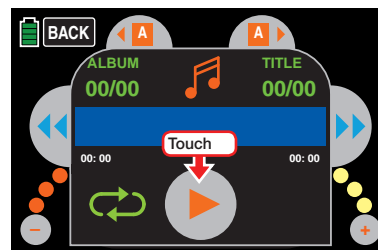


Please note that for technical reasons NO data representation is possible during the reproduction of MP3 data.

Whether or not an SD card with MP3 files is inserted, the display has the following appearance directly after this menu item is opened:



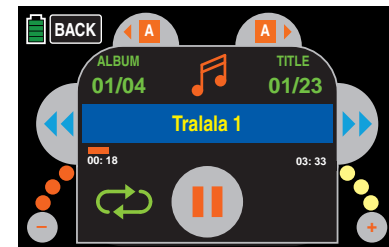
Touch the large red triangle or push the **ENT** button on the right side of the display to start playing the first MP3 file of album 1. The file starts playing immediately, but the information on the number of albums and titles as well as the name of the current MP3 file may appear after a slight delay depending on the size of the MP3 file.



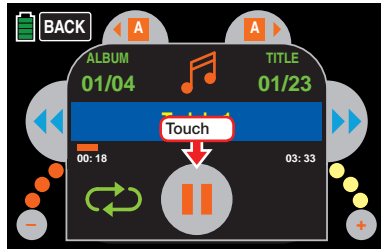
If no title is started and the text "NO FILE" is shown instead, the transmitter does not find a suitable MP3 file on the inserted SD card or there is no SD card in the card slot.

Insert a suitable memory card, or check on a computer the content of the MP3 directory on the SD card removed from the transmitter. The MP3 files may only be saved within the MP3 directory or one folder below. If this directory is empty, copy suitable MP3 files into the directory.

Use an SD card with MP3 files in the MP3 directory, and try again after turning on the transmitter:



Album 1 will automatically play back until you stop it by touching the stop button or by pushing again the **ENT** button on the right side of the display...



... pause ...



... or turn off the transmitter.

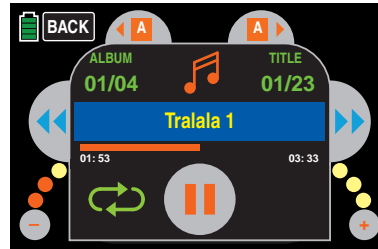
During playback, you can exit the sub-menu at any time by tapping the **BACK** button or pressing the **ESC** button to the left of the display, and use the transmitter without restriction. Only a data recording (data-log) parallel to the playback of MP3 files is unfortunately not possible for technical reasons.

### Tip

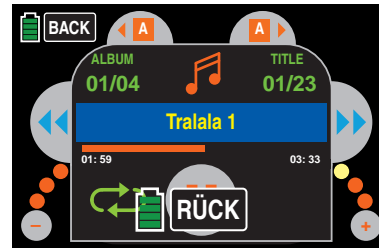
Any activated voice triggers are displayed in the MP3 file that is playing.

### Volume

To reduce the volume, press the **▼** key on the left of the display or tap the gray dot with the "-" sign in the lower left corner of the display. Each time the button is pressed or the point is touched, the color of one of the three small dots on the left and right down changes gradually from red to yellow, for example:

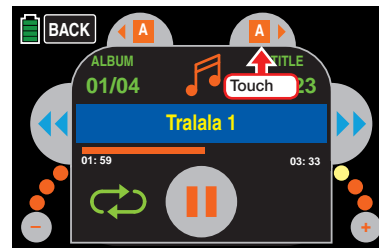


Pressing the **▲** key on the left of the display or tapping the point with the "+" sign on the lower right increases the volume by analogy:



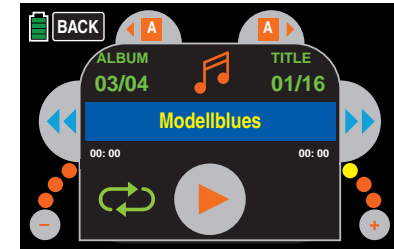
### Album

To change to the next album, tap the right selection field at the top of the display.



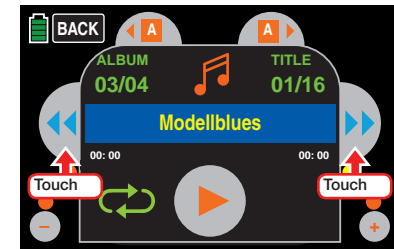
... and in the direction of the previous album on the left.

The information on the number of the album and the number of titles contained therein are updated accordingly:

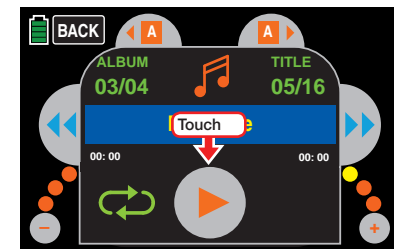


### Title

To change or select a track, tap one of the two fields on either side of the track display, or press one of the **◀ ▶** buttons to the right of the display:



To start playback of the selected track, either press the "Start" button in the middle of the screen as described above, or press the **ENT** button to the left of the display:



### Notices



- The title is not the file name, if any, of the MP3 file, but the title in the corresponding metadata field of the MP3 file.


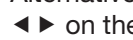
## ◀ System menu

- However, this may only contain characters from the Anglican character table! If the title contains only one character from another character table, the title field remains empty.


Within an album, the tracks are played in alphabetical order, or numeric if the related information is contained in the file name.


- The number of titles of the selected album displayed on the right is calculated from the number of MP3 files per directory.


### Control panel

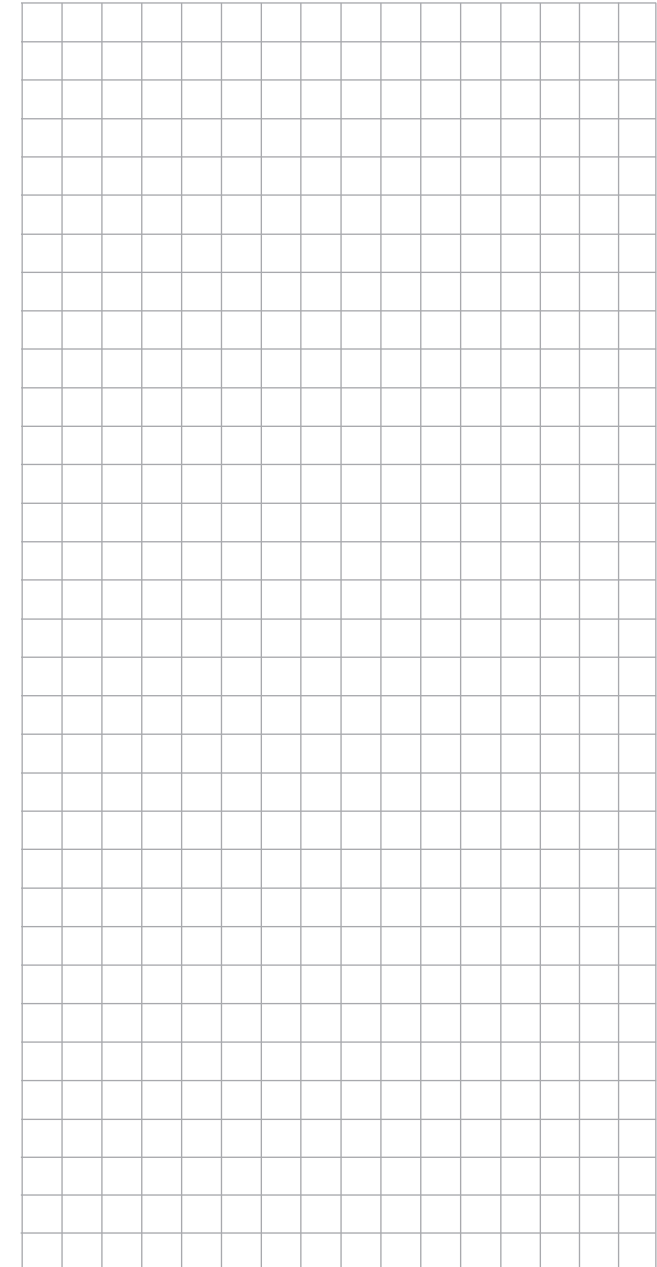
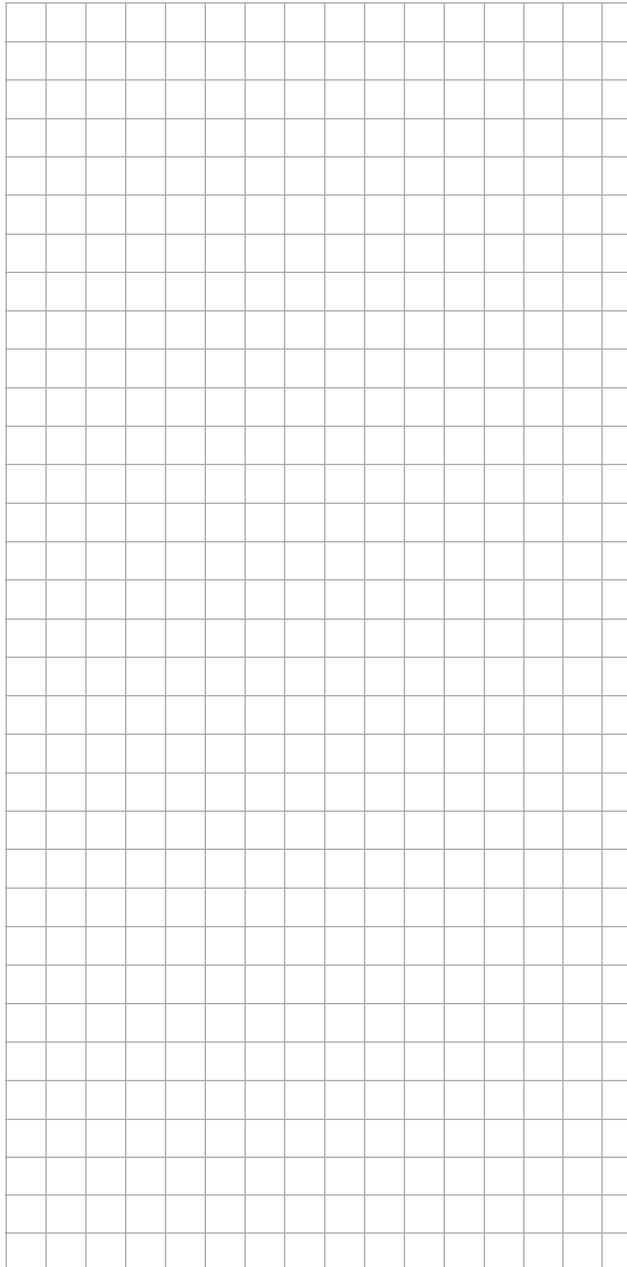
 You can jump forward to a title by touching the right selection button and jump back a title by touching the left button similar to corresponding buttons on MP3 players or other players. Alternatively you can also use both selection buttons  on the right of the display

Touch the field to cycle through the following three options:

 The selected album is played in a continuous loop until you either stop it or turn off the transmitter.

 The current title is played in a continuous loop until you either stop it or turn off the transmitter.

 Playback automatically stops at the end of the current title.

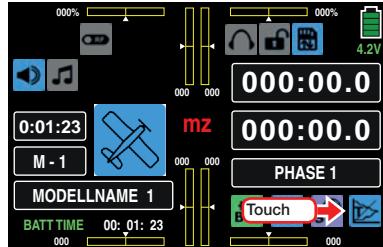




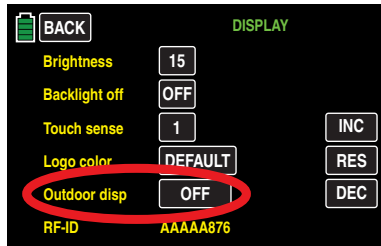


# Telemetry data display

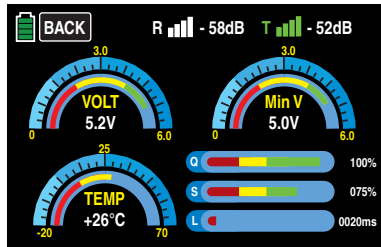
The display of the **mz-24** HoTT Pro transmitter is used for operating the transmitter and to graphically display telemetry data. You can switch between modes by touching the "T" icon at the bottom right of the basic display with a finger or the provided stylus:



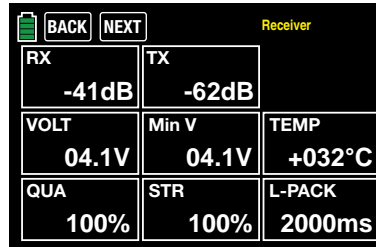
By default, the receiver display appears after you select the telemetry display. If *no* sensors are connected to the receiver and the standard entry **OFF** is left in the line "SUN" of the sub-menu "Display", ...



... the display will look as follows:

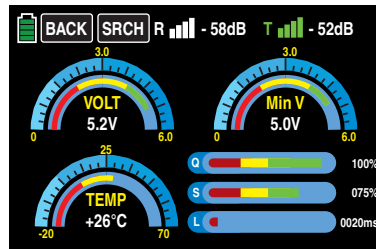


However, if this value field is switched to **ON**, the same display appears as follows ...

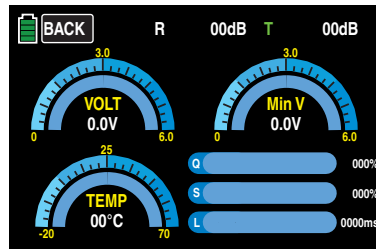


... And correspondingly also all other of the described displays.

If at least one sensor has been connected to the receiver before the receiver is switched on, the transmitter "scans" sensors for approx. 30 seconds and also displays this in the upper left corner of the display:

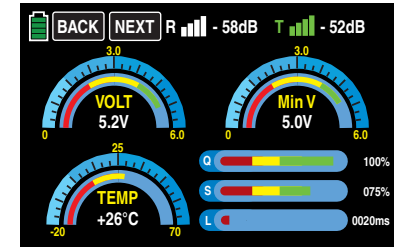


If, however, neither the "SEARCH" button nor the field strength indicators "...ll" are visible on the upper display edge, and no data are displayed in any case ...



..., no receiver is within range which can respond to the telemetry link. Turn on your receiver, or bind a receiver to the active model memory as described in detail on page68.

As soon as the search for sensors has been terminated, the label of the button on the upper edge of the display changes from **SEARCH** to **NEXT**:

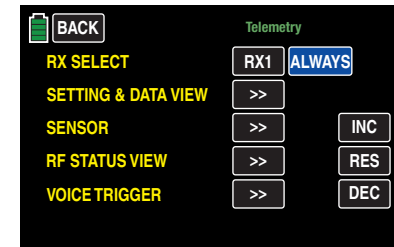


## Tip

A more detailed description of this display can be found below in the "receiver" section.

## Notice

The duration of the "research" is however completely independent from your setting in the "RECEIVER SELECT" line of the "Telemetry" menu:



## Sensor(s)

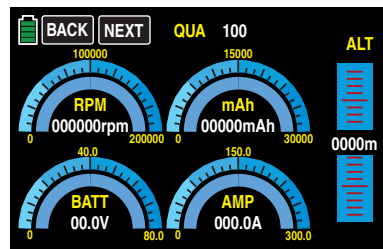
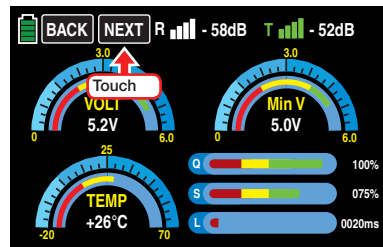
Any combination of to four sensors can be connected to a receiver that operates by telemetry.

The data from the sensors are transmitted to the graphs described below only if they are properly connected to the receiver before the receiver is turned on and after all the involved components have been switched on and all the back channels are recognized by the transmitter too.

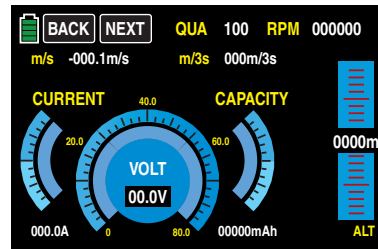
In addition, make sure that the relevant receiver is bound (as described above) in the line "BIND ON/OFF" of the sub-menu "Tx SET" of the base menu "TX ctl" and that the receiver is selected in the "RECEIVER SELECT" line of the "Telemetry" menu (RX1 ... RX2), and that the receiver is turned on. If another receiver has been selected, only the data from this receiver is displayed in the "Receiver" display.

In addition, sensors in the sub-menu "SETTING & DATA VIEW" of the "Telemetry" menu will only respond under the above prerequisite corresponding to the instructions for the respective sensor.

You can switch between the displays of the automatically activated sensors by touching the **NEXT** button at the top edge of the display...



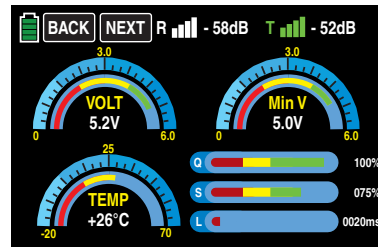
... and switch to the next sensor by touching the button again.



**Tip**

Further information on the modules cited below can be found in the Annex and on the Internet at [www.graupner.de](http://www.graupner.de) for the respective product.

**RECEIVER**



This display offers a graph of the data from the display "RX DATAVIEW" of the "Telemetry" menu "SETTINGS & DATAVIEW".

It has the following meaning:

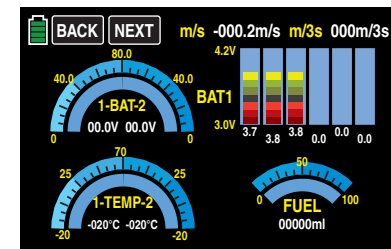
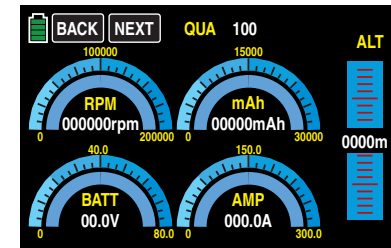
Value	Explanation
R ... dB	Level in dBm expressed as the percentage of the transmitter signal arriving at the receiver
T ... dB	Level in dBm expressed as the percentage of the receiver signal arriving at the transmitter
VOLT	Current operating voltage of the receiver power supply in Volts

Min V	Lowest operating voltage of the receiver power supply since the last startup in Volts
TEMP	The thermometer visualizes the current operating temperature of the receiver
Q	Quality expressed as a percentage of the signal packages from the transmitter arriving at the receiver
S	Signal strength expressed in percentage of the signal from the transmitter arriving at the receiver
L	Shows the longest time in ms in which the data packets are lost during a transmission from the transmitter to receiver

**Tip**

Detailed explanations of the terms in the "Value" column can be found in the section "RX DATA VIEW".

**GENERAL MODULE**



To change between both displays tap on one of the graphs in the display.

These two displays visualize the data of a general engine module (order No. **33610**) or a general air module (order No. **33611**) that may be connected to the receiver. Further information on these modules can be found in the Annex or on the Internet at [www.graupner.de](http://www.graupner.de) for the respective product.

Depending on the configuration of the modules with additional sensors, the following data can be permanently shown on the display:

### 1. Display

At the top edge of the display, "QUA" identifies the quality, expressed as a percentage, of the signal coming from the transmitter.

The graphic at the top left shows the speed detected by a speed sensor connected to the module, and the graphic adjacent to the right shows the remaining charge of the connected battery.

#### Notice



To correctly display the data, the relevant number of blades and the charge must be entered beforehand in the "Telemetry" menu.

The graphic at the bottom left shows the current voltage of the battery connected to the module, and the adjacent graph to the right shows the momentary flow of current. The graph at the right edge of the display shows the present height relative to the location.

### 2. Display

The current ascent/descent is displayed at the top edge in m/s and m/3 s.

The two graphics to the left show the current voltage measured by the temperature and voltage sensors (No. **33612** and **33613**) connected to the model from up to two batteries (BAT-1 and BAT-2). They also show the corresponding temperature: On the left side,

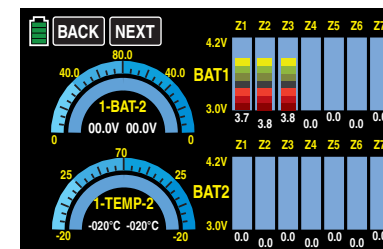
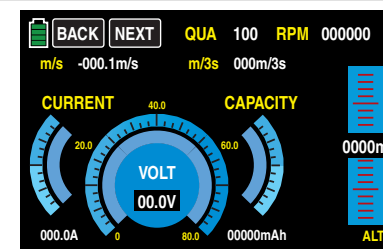
you can see the data of sensor 1 and on the right side, you can see the data of sensor 2.

In the right top half of the display, the current cell voltages are displayed graphically and numerically of a lithium polymer battery with up to six cells, as well as the level of a fuel tank so as the cumulative consumption in ml measured by a sensor connected to the module.

It has the following meaning:

Value	Explanation
1-BAT-2	BATT 1 to the left and BATT 2 to the right
QUA	Signal quality expressed as percentage
FUEL	Fuel level/tank display
ml	cumulative consumption in ml
1-TEMP-2	Temperature of sensors 1 and 2
BAT1	Cell voltage of cells 1... max. 6
ALT	Current altitude (only with module <b>33611</b> )
m/s	Ascent/descent in m/1 s (only with model <b>33611</b> )
m/3s	Ascent/descent in m/3 s (only with model <b>33611</b> )
VOLT	Current voltage of the battery connected to the module
AMP	Momentary current in amps

## ELECTRIC AIR MODULE



To change between both displays tap on one of the graphs in the display.

These two displays visualize the data of an electric air module connected to the receiver (No. **33620**). Further information on this module can be found in the Annex or on the Internet at [www.graupner.de](http://www.graupner.de) for the respective product.

Depending on the configuration of the module with additional sensors, the following data can be permanently shown on the display:

### 1. Display

At the top edge of the display, "QUA" identifies the quality, expressed as a percentage, of the signal coming from the transmitter. The line above shows the current ascent/descent in m/s and m/3 s. The graphic at the right edge of the display visualizes the current height relative to the location.

The central graphic is a graphic and numeric display of the current voltage of the connected battery. The scale to the left shows the momentary current in amps, and the scale to the right shows the momentary

charge of the power source connected to the module at the battery connection.

### Notice



To correctly display the data, the charge must be entered beforehand in the "Telemetry" menu.

## 2. Display

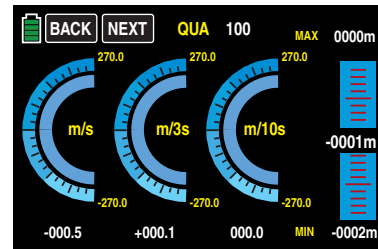
The two graphics to the left show the current voltage measured by the temperature and voltage sensors (No. **33612** and **33613**) connected to the model from up to two batteries (BAT-1 and BAT-2). They also show the corresponding temperature: On the left side, you can see the data of sensor 1 and on the right side, you can see the data of sensor 2.

The right half of the display shows graphically and numerically the current cell voltages of the (max.) 7 cell battery pack connected to balancer connection 1 (L) and possibly 2 (H).

It has the following meaning:

Value	Explanation
QUA	Signal quality expressed as percentage
m/s	m/s - Climb/Sink
m/3s	m/3s Climb/Sink
A	Actual current
V	Actual voltage
mAh	Battery capacity in mAh
ALT	Current altitude
1-BAT-2	BATT 1 and BATT 2
1-TEMP-2	Temperature of sensors 1 and 2
BAT-1/ BAT-2	Cell voltage of cells 1... max. 14 L = Balance port 1 H = Balance port 2

## VARIO

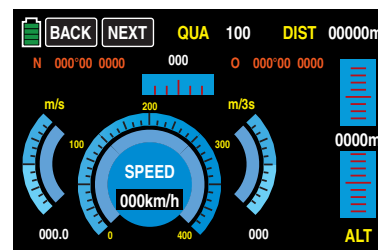


This display visualizes the data of a Vario module connected to the receiver (No. **33601**).

It has the following meaning:

Value	Explanation
QUA	Transmitter signal quality received by the receiver expressed as percentage, see page 101.
MAX	Maximum level in meters relative to the starting location
MIN	Maximum altitude below the starting location in meters
m/s	m/s - Climb/Sink
m/3s	m/3s Climb/Sink
m/10s	m/10s Climb/Sink

## GPS



This display shows the data of a GPS module with an integrated Vario module connected to the receiver (No. **33600**).

In addition to the current position data and model speed in the center of the display, the current height is displayed in relation to the starting location along with the ascent and descent of the module in m/s and m/3s; the current reception as well as the distance from the starting location are also shown.

It has the following meaning:

Value	Explanation
QUA	Transmitter signal quality received by the receiver expressed as percentage, see page 101.
DIST.	Distance
N / W	North/west
m/s	m/s - Climb/Sink
m/3s	m/3s Climb/Sink
kmh	Speed above ground calculated by the GPS system
ALT	Current altitude relative to the starting location

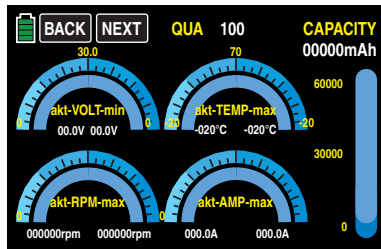
### Notice



If the telemetry connection is interrupted, for any possible reason, for longer than three seconds and if the transmitter is not switched off, the last correctly transmitted GPS coordinates are saved in the flash memory of the transmitter. Those data can be read on the GPS display if necessary using the control buttons of the transmitter accordingly to go back to the main menu or to recall the GPS display.

## ESC

(Electronic Speed Controller)

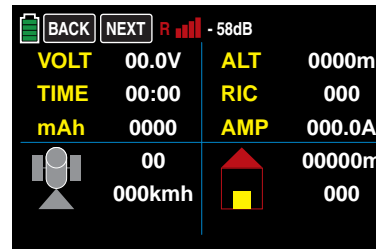


This display shows the data from a HoTT compatible brushless controller connected to the receiver with integrated telemetry.

The display shows the current and maximum electrical values of the drive, the current and maximum temperature of the controller, and the current and maximum speed of the motor connected to the controller. It has the following meaning:

Value	Explanation
QUA	Transmitter signal quality received by the receiver expressed as percentage, see page 101.
Cur-VOLT-Min	left value: actual input voltage Right value: lowest input voltage since the device has been switched on
Cur-TEMP-Max	Left value: current controller temperature Right value: maximum controller temperature since the device has been switched on
Cur-RPM-Max	Left value: current motor speed Right value: maximum motor speed since the device has been switched on
Cur-AMP-Max	Left value: Momentary current Right value: maximum current since the device has been switched on

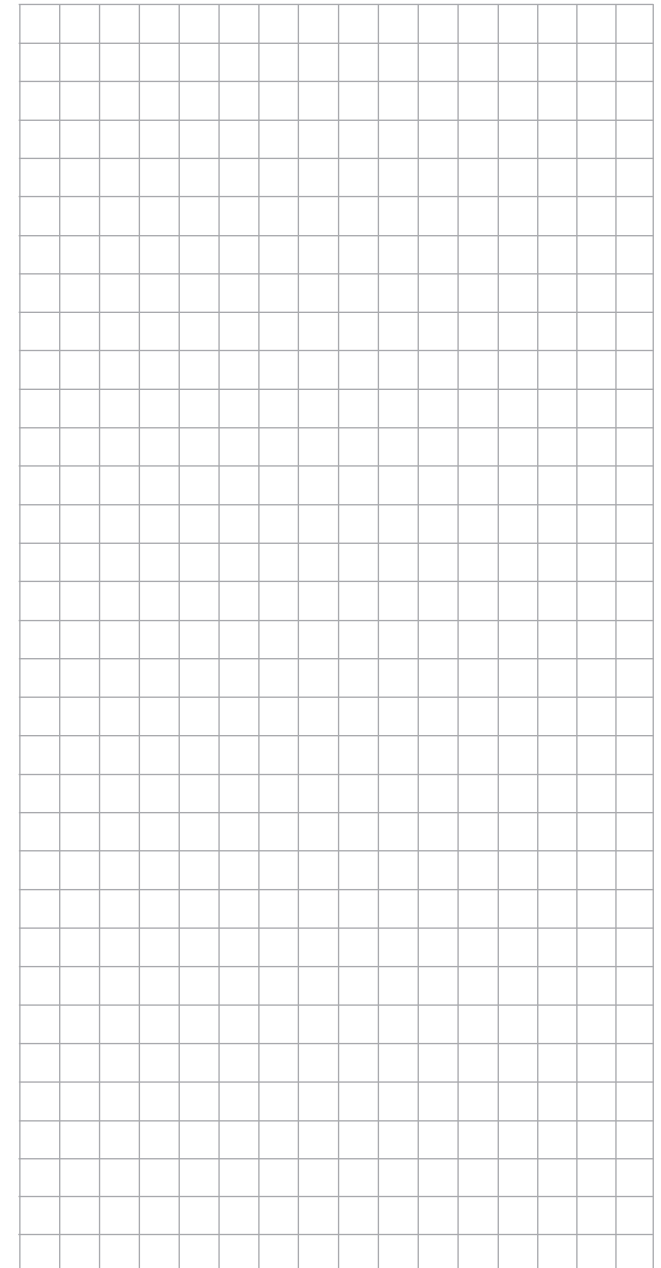
## Microcopter display



This display shows the data of a HoTT-compatible microcopter and appears after the display of the electric air, Vario and GPS module. It has the following meaning (from top to bottom starting on the left):

Value	Explanation
VOLT	Actual voltage
Time	Time turned on
mAh	Used battery charge since the device has been turned on
00	Position number of the satellite
kmh	Speed above ground calculated by the GPS system
ALT	Current altitude relative to the starting location
RIC	Direction of movement
AMP	Momentary current
m	Distance from the starting location calculated by the GPS system
000	Position in angular degrees relative to the starting location calculated by the GPS system

Messages from the microcopter sensor are displayed in the bottom line in the above display.





# Programming example

## Phase specific flaps trimming

The following described options offers you the possibility to correct the trimming of the phase specific (and at any time recallable) trimming of the flaps through only *one* control element in all the phases.

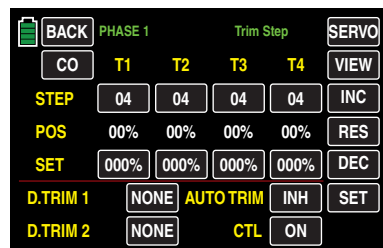
With this programming example, you must have already covered the description of the individual menus, and you must be familiar with the use of the transmitter. It is also assumed that the [Receiver connection assignment](#) has been performed according to what written on page 32 and also that the model has been completely programmed in the **mz-24** HoTT Pro transmitter and mechanically adjusted. In addition, you should have been convinced by the correct lateral deflection of all rudders. Also, it is by no means a disadvantage, if the model has already the first flights, as well as the resulting adjustments, behind it.

### Programming

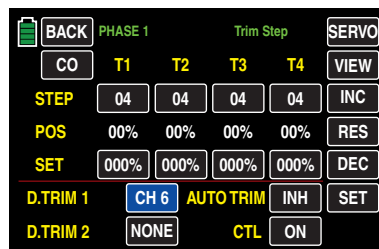
Switch your transmitter on and start programming the flaps positions in the sub-menu ...

#### »Trim Step«

... of the basis menu:



In one of the two "DIGITRIM" lines tap on the normally labeled as **NONE** button and change its labeling by tapping on the **+** and alternatively **-** button in "CH6":



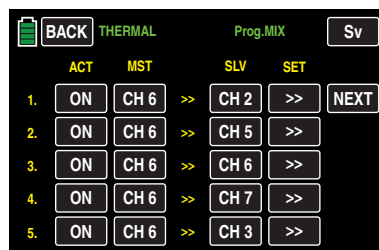
Then change to the sub-menu ...

#### »P/MIX«

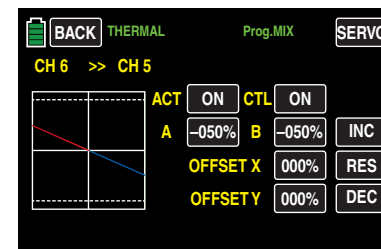
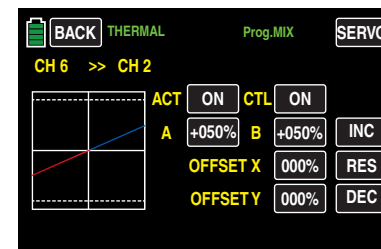
... of the functions menu and switch to the desired phase.

Set in the desired phase the related number of mixers according to the scheme "CH6 >> CH2" and "CH6 >> CH5" for left and right ailerons; "CH6 >> CH6" and "CH6 >> CH7" for the flaps or for left and right flaps so as-if included-"CH6 >> CH9" and "CH6 >> CH10" for the second flaps pair.

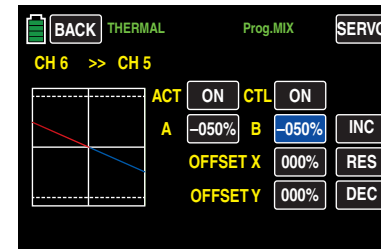
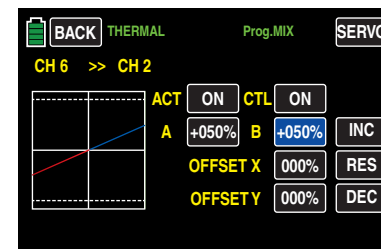
For a model of the "2AILE 2FLAPS" type see as reference the display "Thermal" for example as follows:



Depending on the installation situation of your wing servos as well as the desired operating direction of the selected Digitrim button, the mixing direction of the individual mixer pairs must be set individually. This allows both contrasting ...

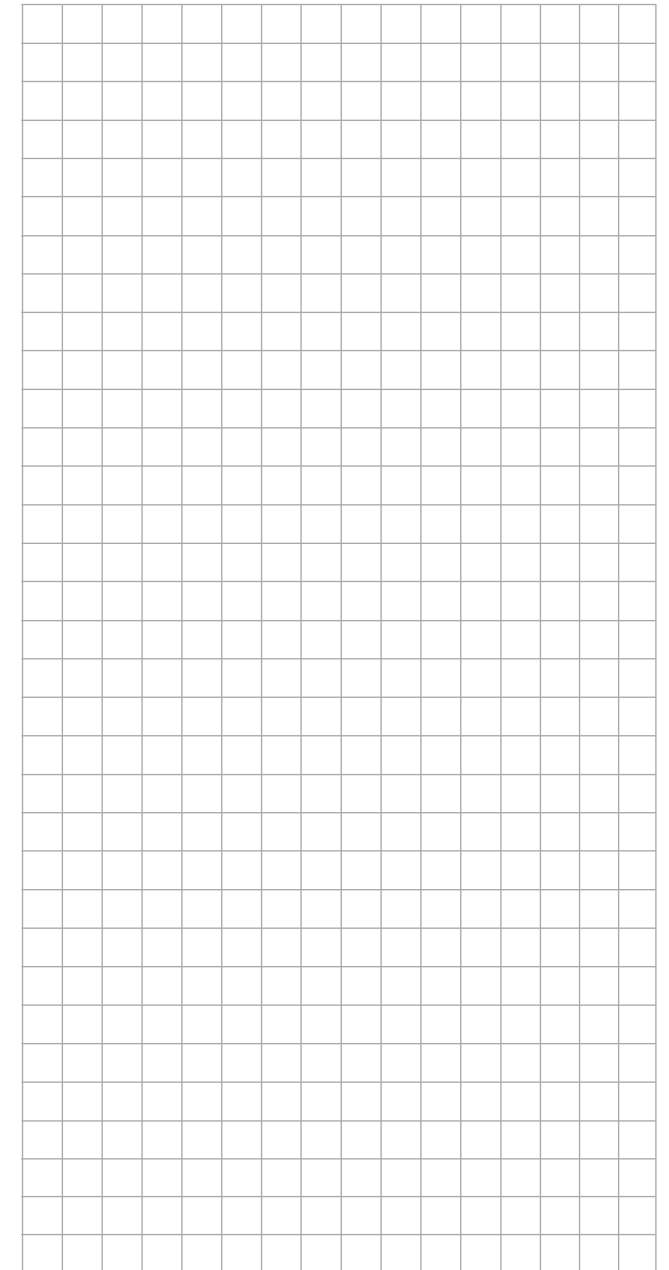
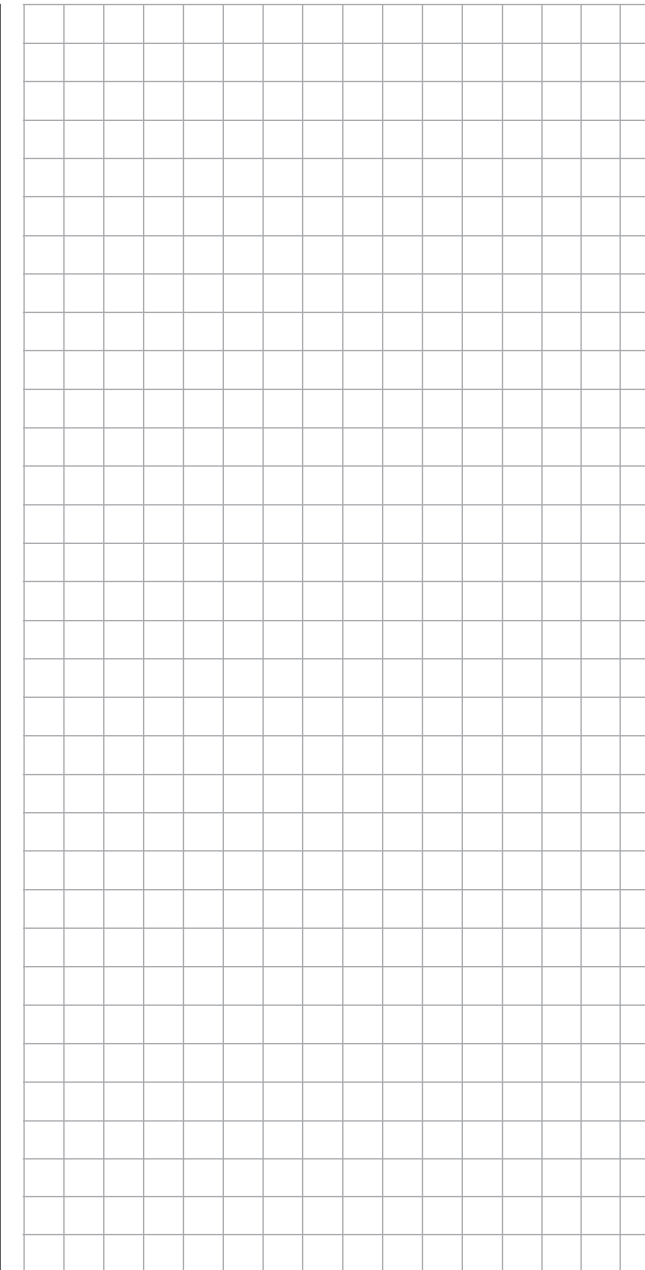
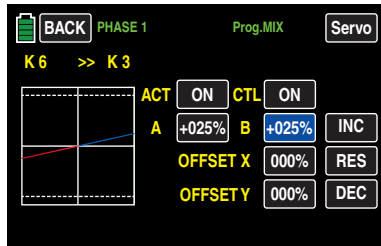


... as well as parallel mixing directions for each pair of flaps, in both cases, the trimming distance (max. 37,5% at 125% admixture) is determined according to the mixing proportion:



Proceed in the same way for the other pairs of flaps as well as in the desired phases.

Lastly, determine the proportional entrainment of the elevator via the mixing value and the mixing direction of the mixer "CH6 >> CH3", for example:





# Programming example

## Phase specific pitch trimming

The following described options offers you the possibility to correct the trimming of the phase specific (and at any time recallable) trimming of the pitch through only *one* control element in all the phases.

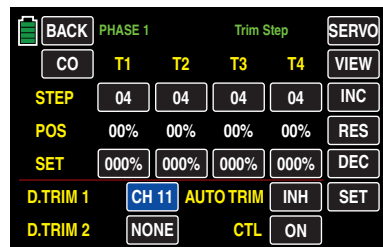
With this programming example, you must have already covered the description of the individual menus, and you must be familiar with the use of the transmitter. It is also assumed that the [Receiver connection assignment](#) has been performed according to what written on page 31 and also that the model has been completely programmed in the **mz-24** HoTT Pro transmitter and mechanically adjusted. In addition, you should have been convinced by the correct lateral deflection of all rudders. Also, it is by no means a disadvantage, if the model has already the first flights, as well as the resulting adjustments, behind it.

### Programming

If you want to adjust the pitch trimming in the Heli program using one of the two Digitrim buttons, assign this button in the sub-menu ...

#### »TR. ST.«

... of the basic menu, for example, the control channel "CH11" usually unoccupied in a helicopter model to:

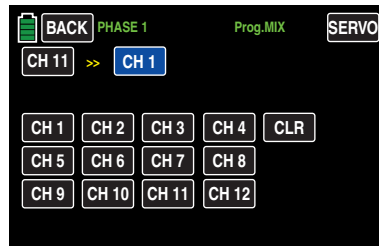


Then change to the sub-menu ...

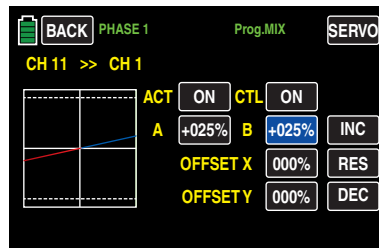
#### »Prog.MIX«

... of the functions menu and switch to the desired phase.

Now create a mixer "CH11 >> CH1", possibly in any desired phase ...



Then, on the setting side of this mixer / these mixers, define a symmetrical mixing proportion of, for example, 25%:



Please note that the operating direction of the digitrim pushbutton from the mixing direction and the trimming distance (max. 37.5% at 125% admixture) are determined proportionally from the adjusted mixing ratio.

The DT1 button used in this example then acts equally on all available pitch servos due to the internal coupling without influencing the throttle servo.





# Programming example

## Phase specific trimming

### "RPM setting" of a governor connected to CH6

If you have programmed the speed setting of your [governor](#) in the Heli program, you can use this option with additional programming via one of the two digitrim keys, eg DT2, to trim even during the flight.

With this programming example, you must have already covered the description of the individual menus, and you must be familiar with the use of the transmitter. It is also assumed that the [Receiver connection assignation](#) has been performed according to what written on page 31 and also that the model has been completely programmed in the **mz-24** HoTT Pro transmitter and mechanically adjusted. In addition, you should have been convinced by the correct lateral deflection of all rudders. Also, it is by no means a disadvantage, if the model has already the first flights, as well as the resulting adjustments, behind it.

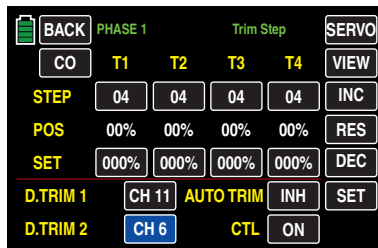
### Programming

Start programming this complement in the sub-menu

...

#### »TR. ST.«

... of the basic menu and assign to the line "DIG-ITRIM2" in this particular case the throttle control channel "CH6" to:

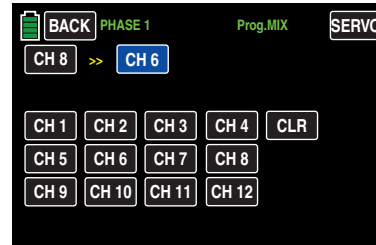


Then change to the sub-menu ...

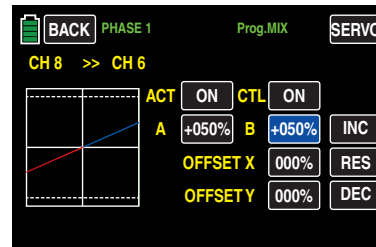
#### »P/MIX«

... of the functions menu and switch to the desired phase.

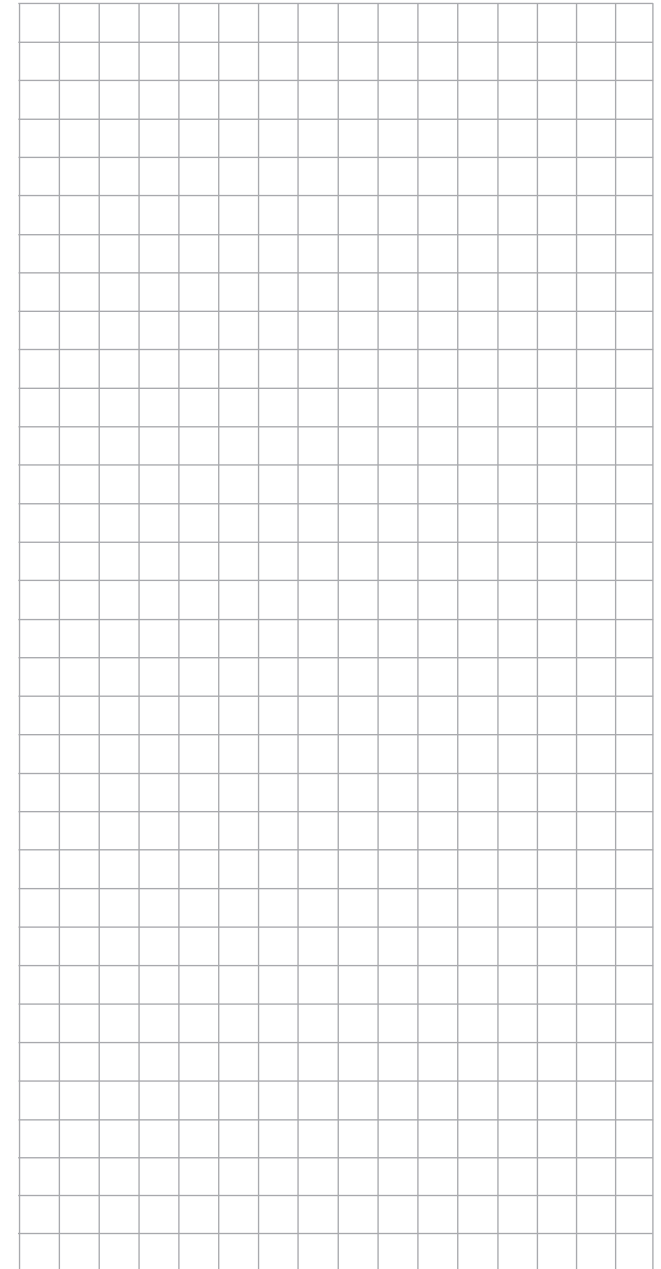
Now create a *same-channel* mixer "CH6 >> CH6", possibly in any desired phase ...



Then, on the setting side of this mixer / these mixers, define a symmetrical mixing proportion of, for example, 50%:



Please note that the operating direction of the digitrim pushbutton from the mixing direction and the trimming distance (max. 37.5% at 125% admixture) are determined proportionally from the adjusted mixing ratio.



# Appendix



## PRX (power for receiver)

No. 4136

Highly developed, stabilized receiver power supply with intelligent power management.

The unit offers a stabilized and adjustable receiver power supply to further enhance the reliability of the power supply. Appropriate for different receiver batteries for uncomplicated and wide-ranging use. If the battery voltage fails during operation, this event is saved and displayed to help prevent the use of a receiver battery which is too small, or to prevent the failure of the battery.

- For operation with one or two receiver batteries. (simultaneous discharge when two batteries are used)
- Appropriate for a 5- or 6-cell NiMH battery, or 2-cell LiPo or LiFe battery *Graupner*/JR, G3,5, G2 and BEC plug-in systems.
- Three adjustable levels for the output voltage to supply the receiver (5.1V / 5.5V / 5.9V).
- Two ultrabright LEDs separately display the charge of battery 1 and battery 2.
- Integrated high-quality On/Off switch
- High-current resistant design
- Flatter switch and LED construction not to influence the characteristics and the optic of the model
- Flatter design of the fastening brackets, LEDs and switches for easy installation with an accompanying drilling template.



## Graupner HoTT GPS/Vario module

No. 33600

Vario with altitude signals and five tones for ascending and descending, an integrated GPS with distance measurement, travel measurement, speed display, and display of the direction of flight and coordinates

- Additional warning thresholds for min. altitude, max. altitude, speed of ascent and descent in two levels
- Altitude display and storage of min. and max. altitude.
- Settable warning time: OFF, 5, 10, 15, 20, 25, 30 seconds, constant
- Settable repeated warning time: constant, 1, 2, 3, 4, 5 min., once
- The Vario sensor can be connected directly to the telemetry input of the receiver.

Technical data for the Vario:

- Altitude measurement: -500m ... +3000m
- Resolution: 0.1 m
- Vario sensitivity: programmable 0.5 m/3s, 1 m/3s, 0.5 m/s, 1 m/s, 3 m/s pro tone
- Average calculation: programmable 4 - 20 measurements per measured value



## Vario Module Graupner HoTT

No. 33601

Vario with altitude signals and 5 tones for ascending and descending, altitude display and storage of min. and max. altitude.

- Additional warning thresholds for min. altitude, max. altitude, speed of ascent and descent in two levels
- Settable warning time: OFF, 5, 10, 15, 20, 25, 30 seconds, constant
- Settable repeated warning time: constant, 1, 2, 3, 4, 5 min., once
- The Vario sensor can be connected directly to the telemetry input of the receiver.

Technical Data

- Altitude measurement: -500 m ... +3000 m
- Resolution: 0.1 m
- Vario sensitivity: programmable 0.5 m/3s, 1 m/3s, 0.5 m/s, 1 m/s, 3 m/s pro tone
- Average calculation: programmable 4 - 20 measurements per measured value



**Graupner HoTT General Engine Module**  
No. 33610

General sensor for *Graupner* HoTT receivers and models with gas engine or electric motor

- 2x temperature and voltage measurements with warning thresholds for min. and max. voltage and min. and max. temperature
- Single cell measurement with warning thresholds for min. voltage
- Voltage, current and capacity measurement with warning thresholds for min. and max. voltage, max. capacity and max. current
- Programmable current limiting
- Current limiting with shunt resistors 2 x 1 mOhm parallel = 0.5 mOhm
- Rotational speed measurement and warning thresholds for min. and max. rotational speed
- Fuel measurement with warning thresholds in 25 % increments (after software update).
- Settable warning time: OFF, 5, 10, 15, 20, 25, 30 seconds, constant
- Settable repeated warning time: constant, 1, 2, 3, 4, 5 min., once
- 2x temperature selectively 0 to 120°C or 200°C and voltage measurement up to 80 V DC
- 1x rotational speed measurement up to 100,000 rpm with a two-blade propeller
- 1x speed controller/servo input, 1x rotational speed regulation input, 1x speed controller/servo output for rotational speed regulation
- 1x current and voltage and capacity measurement up to 40 A (short-term 1 sec 60 A) and up to 30 V
- 1x single cell monitoring for 2 - 6S lithium batteries (LiPo, lithium ion, LiFe), see [www.graupner.de](http://www.graupner.de) for the related items



**Graupner HoTT General Air Module**  
No. 33611

General sensor for *Graupner* HoTT receivers and models with gas engine or electric motor

- Vario with altitude signals and ascent and descent signals, and additional warning thresholds for min. altitude, max. altitude, rate of ascent and descent in two stages
- Altitude display (-500 ... +3000 m) and storage of the min. and max. altitude.
- 2x temperature and voltage measurements with warning thresholds for min. and max. voltage and min. and max. temperature
- Single cell measurement with warning thresholds for min. voltage
- Voltage, current and capacity measurement with warning thresholds for min. and max. voltage, max. capacity and max. current
- Rotational speed measurement with rotational speed regulation (programmable) and warning thresholds for min. and max. rotational speed
- Fuel measurement with warning thresholds in 25% increments
- Settable warning time: OFF, 5, 10, 15, 20, 25, 30 seconds, constant
- Settable repeated warning time: constant, 1, 2, 3, 4, 5 min., once
- 2x temperature selectively 0 to 120°C or 200°C and voltage measurement up to 80 V DC
- 1x rotational speed measurement up to 100,000 rpm with a two-blade propeller
- 1x speed controller/servo input, 1x rotational speed regulation input, 1x speed controller/servo output for rotational speed regulation
- 1x current and voltage and capacity measurement up to 40 A (short-term 1 sec 60 A) and up to 30 V
- etc., see [www.graupner.de](http://www.graupner.de) for the related items



**Graupner HoTT Electric Air Module**  
No. 33620

General sensor for *Graupner* HoTT receivers and models with electric motor

- Vario with altitude signals and ascent and descent signals, and additional warning thresholds for min. altitude, max. altitude, rate of ascent and descent in two stages
- Altitude display (-500 ... +3000 m) and storage of the min. and max. altitude.
- 2x temperature and voltage measurements with warning thresholds for min. and max. voltage and min. and max. temperature
- Single cell measurement 2 ... 14 s with warning thresholds for min. voltage
- Voltage, current and capacity measurement with warning thresholds for min. and max. voltage, max. capacity and max. current
- Settable warning time: OFF, 5, 10, 15, 20, 25, 30 seconds, constant
- Settable repeated warning time: constant, 1, 2, 3, 4, 5 min., once
- 2x temperature selectively 0 to 120°C or 200°C and voltage measurement up to 80 V DC
- 1x speed controller input, 1x speed controller output for single cell undervoltage correction
- 1x current and voltage and capacity measurement up to 150 A (short-term 1 sec 320 A) and up to 60 V
- 1x single cell monitoring for 2 - 14S lithium batteries (LiPo, lithium ion, LiFe)
- 1x Telemetry connection for receiver



**Graupner HoTT RPM magnetic sensor**  
No. 33616

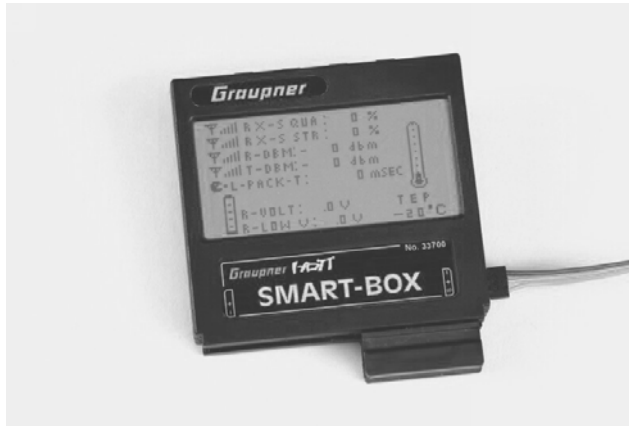
For connecting to the General Engine (No. 33610) or General Air Module (No. 33611).

Select the number of blades in the module's **Telemetry** menu.

**Graupner HoTT RPM optical sensor**  
No. 33615

For connecting to the General Engine (No. 33610) or General Air Module (No. 33611).

Select the number of blades in the module's **Telemetry** menu.



**Graupner HoTT Smart-Box**  
No. 33700

Wide-ranging functions combined into one device make the SMART BOX your future smart companion. Whether it comes to displaying real-time telemetry data or making settings on your HoTT system, 8 x 21 characters on a large display enable easy use. An integrated buzzer that emits an acoustic signal and warning tone enhances the flexible use of the BOX even further.

Using the accompanying installation set, the device can be mounted on brackets of the transmitter and is thus optimally positioned to enable the reading of real-time telemetry data even while controlling your model.

The user-installed updates ensures that the SMART BOX always has the latest software and can be safely expanded with future functions.

- Transmitter voltage display with adjustable warning threshold
- Range test
- Receiver temperature
- Servo reversal
- Servo travel
- Channel switching
- Mixer settings
- Country setting
- Signal quality
- Receiver voltage
- Servo neutral position
- Cycle time
- Fail-Safe settings
- Servo test

Dimensions: approx. 76 mm x 72 mm x 17 mm (L x W x H)  
Weight: approx. 55g



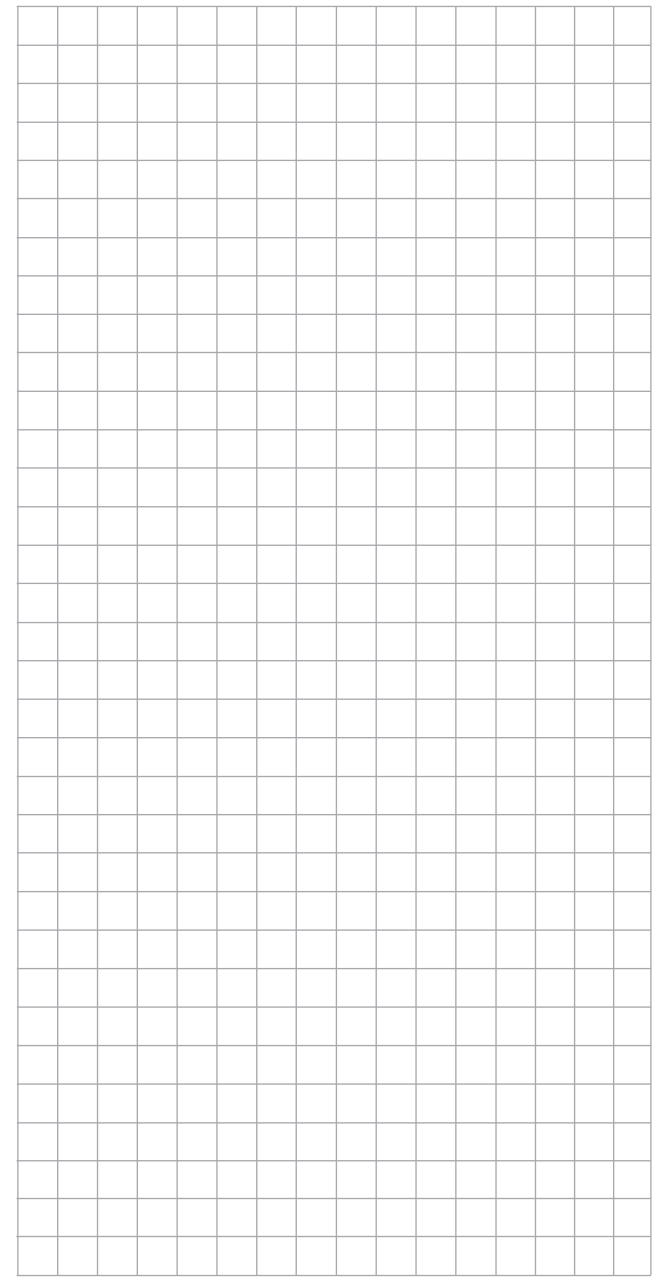
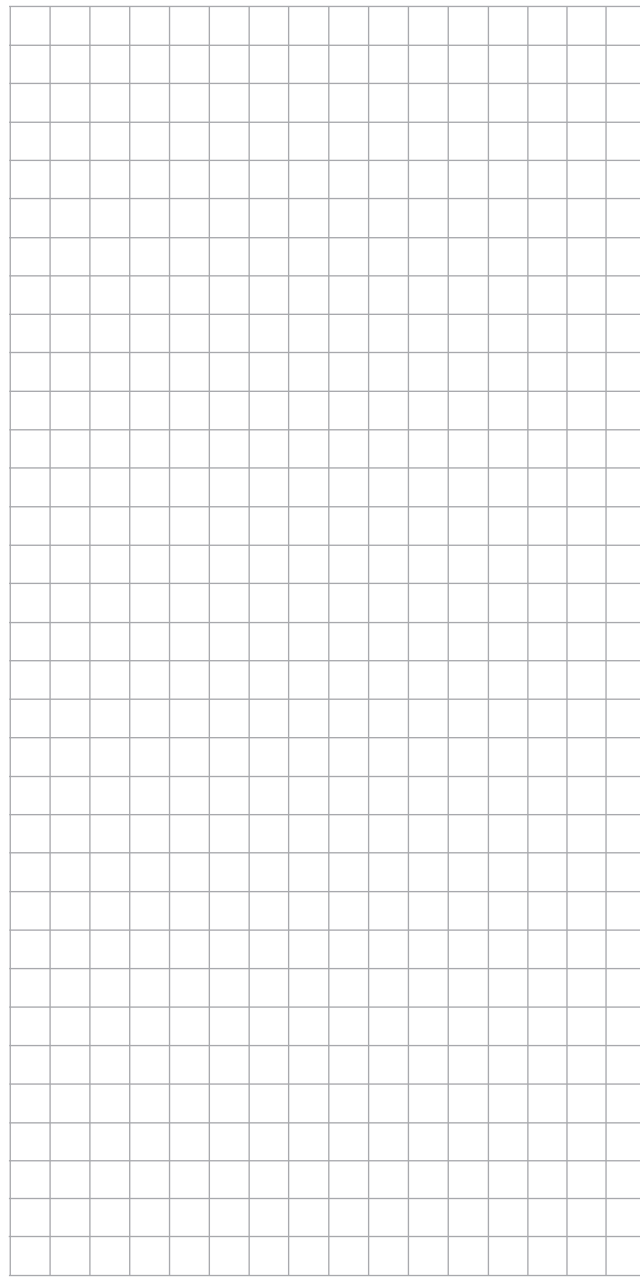
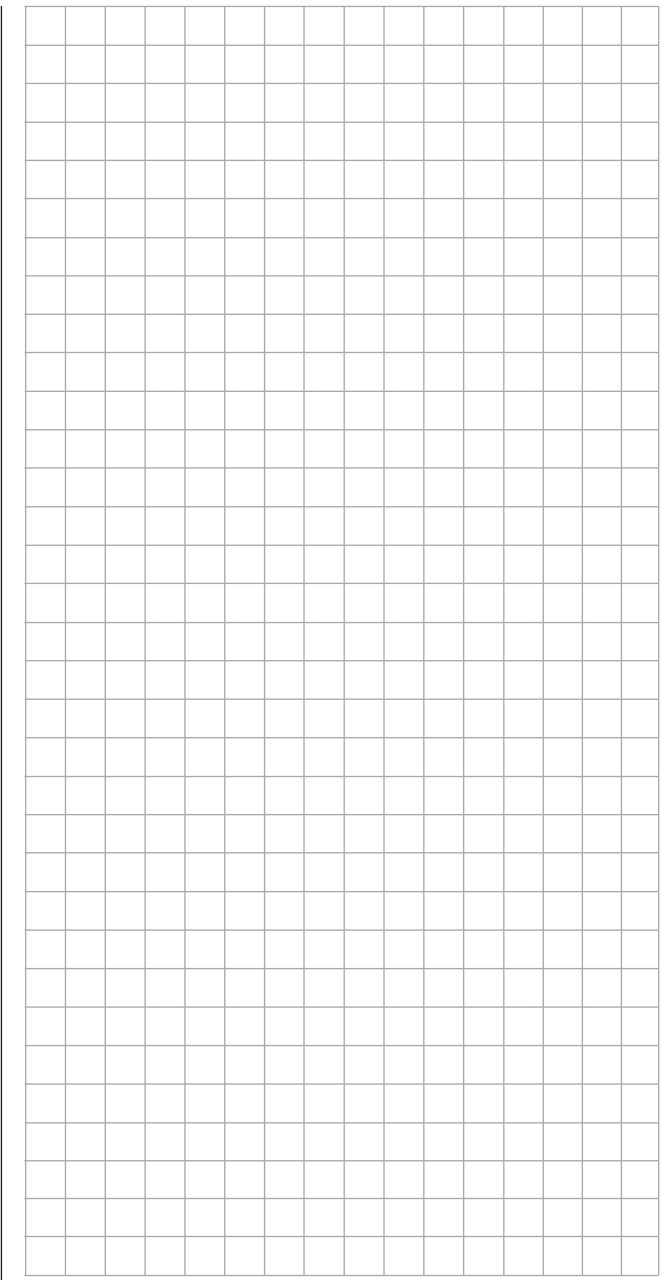
**Graupner HoTT USB interface**  
No. 7168.6

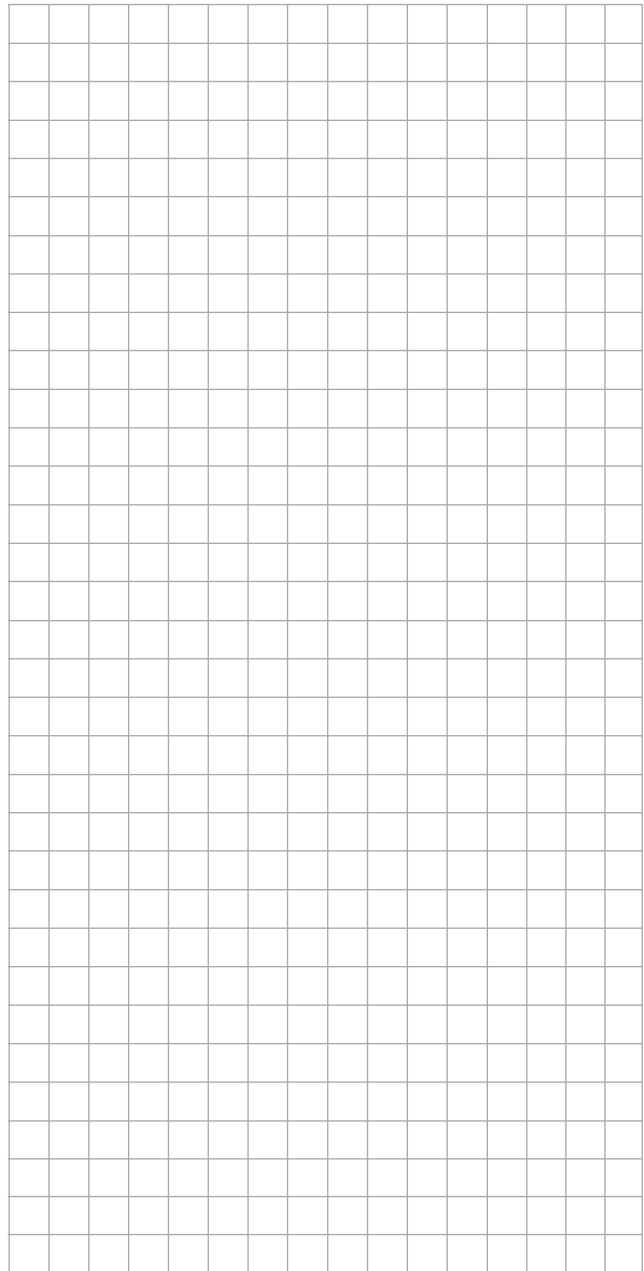
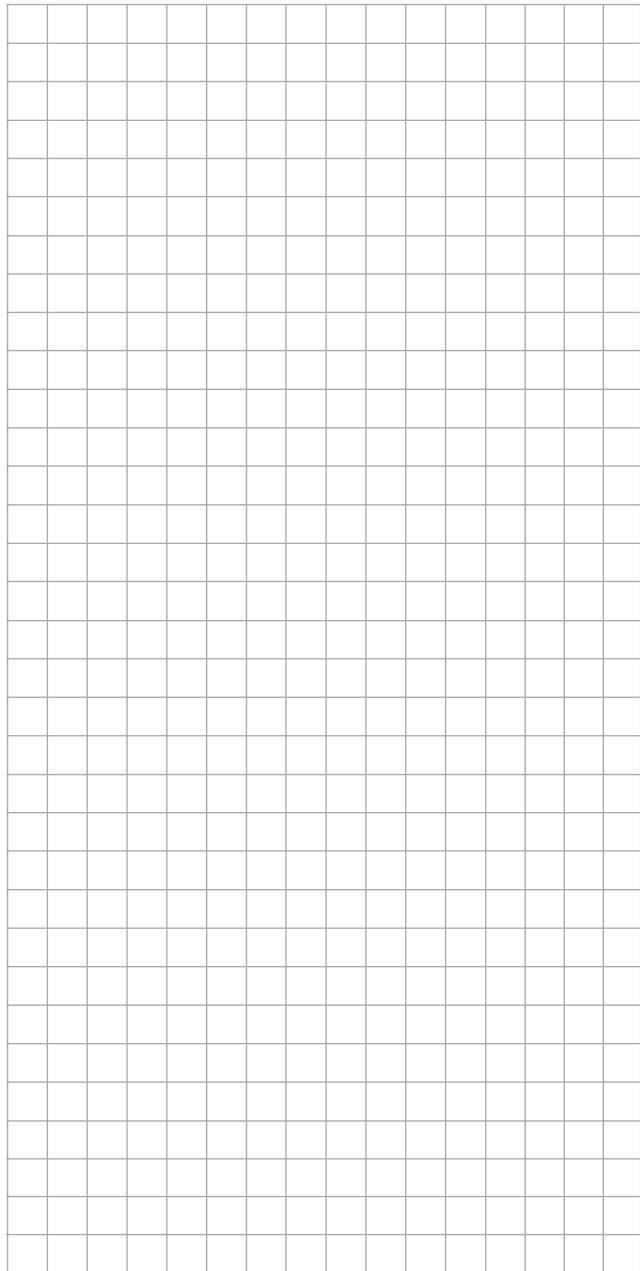
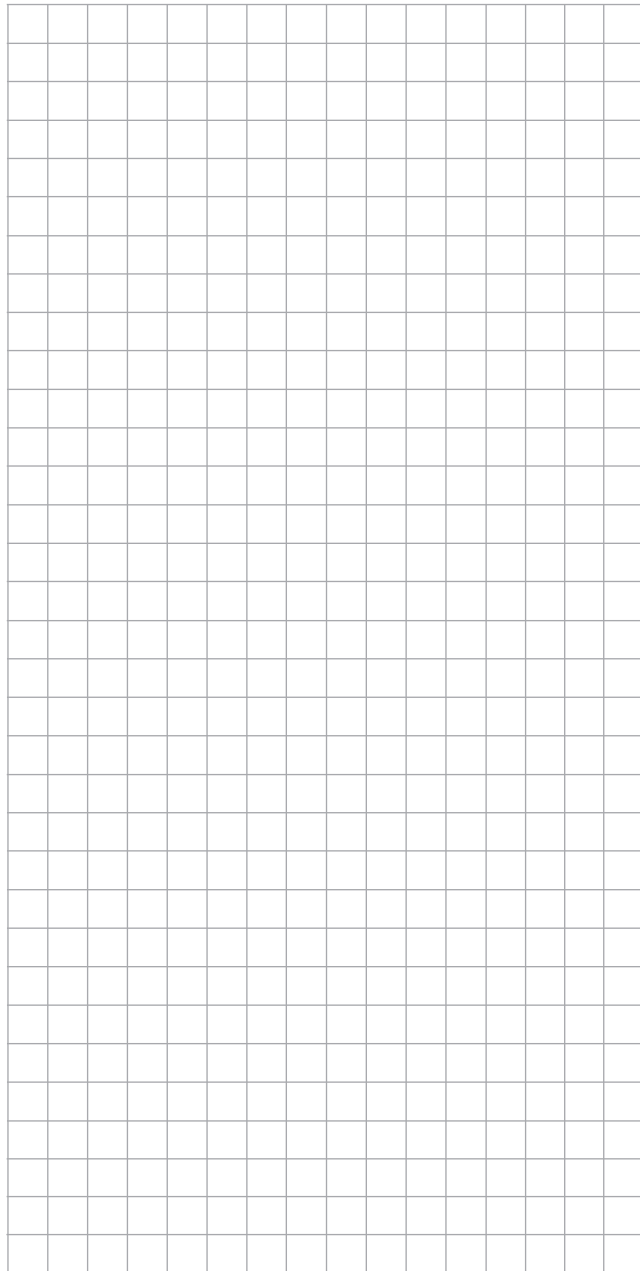
This adapter cable is required together with the separately available USB interface (order No. 7168.6), for updating receivers and sensors.

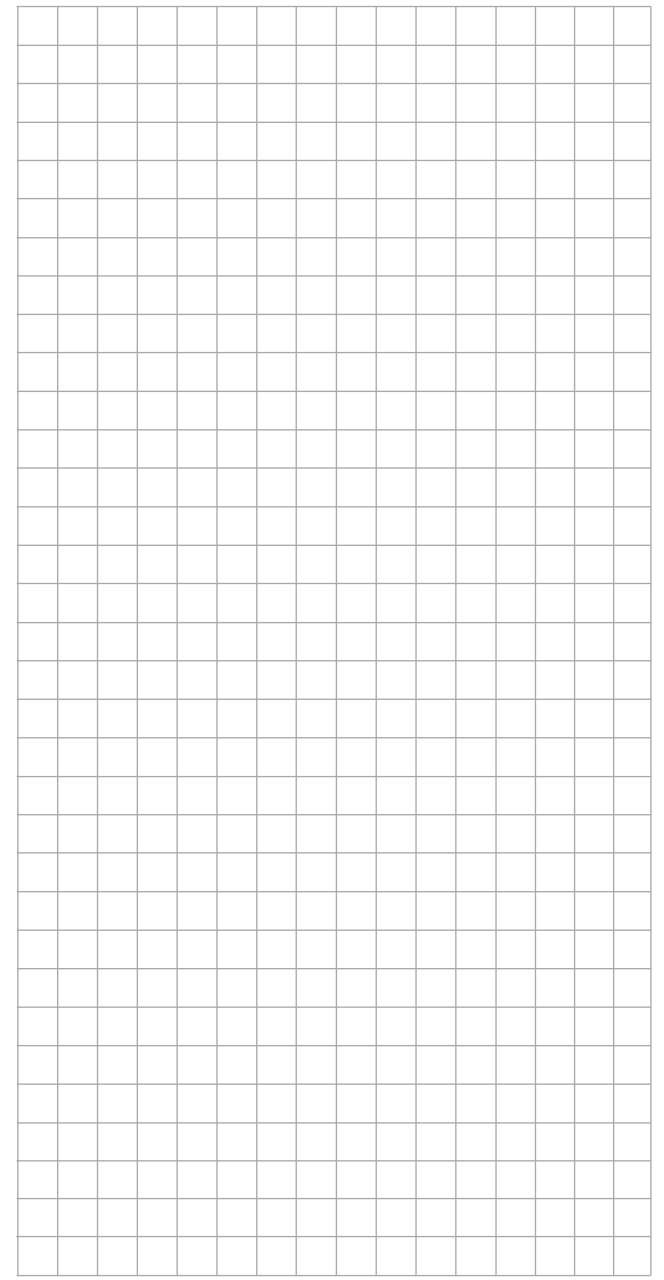
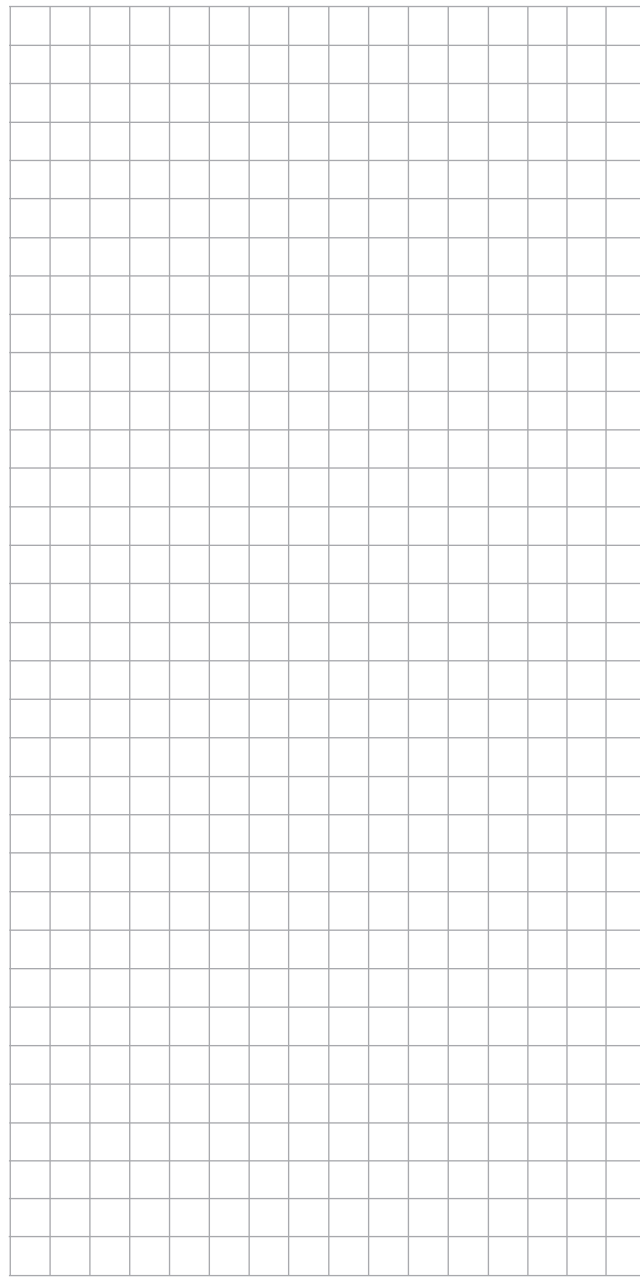
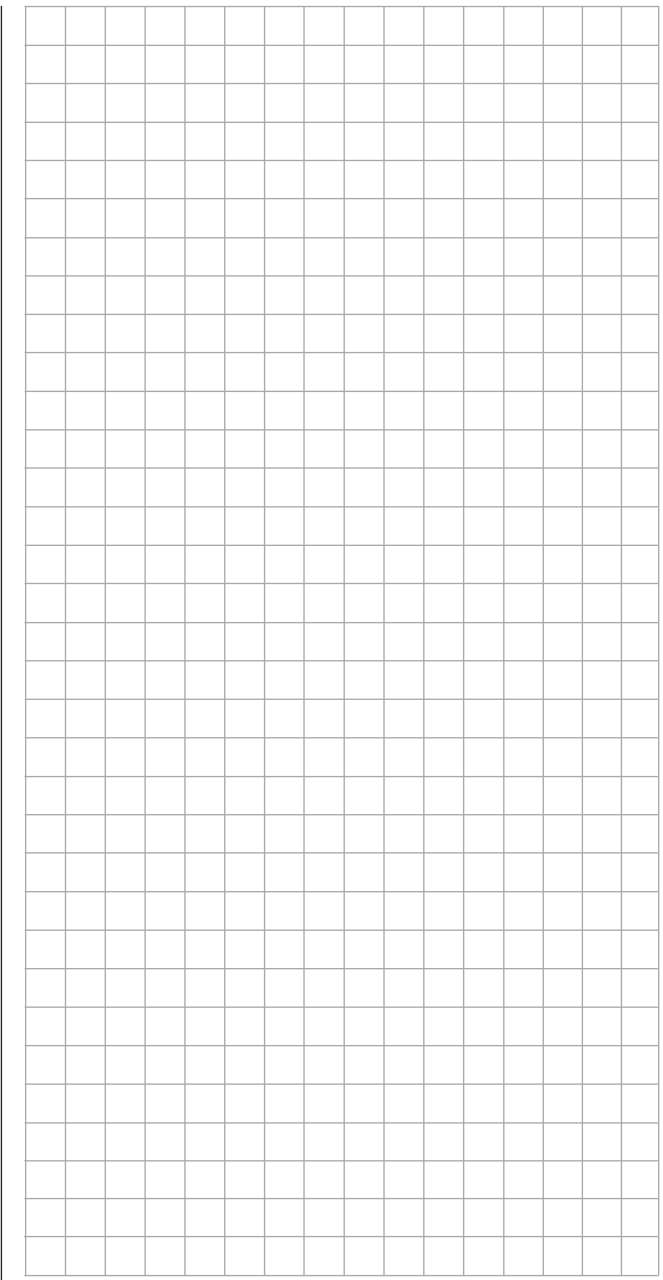


**Graupner HoTT adapter cable**  
No. 7168.6S

This adapter cable is required together with the separately available USB interface (No. 7168.6), for updating receivers and sensors. The **mz-24** HoTT Pro transmitter can be updated directly with the USB cable included in the delivery of the interface.







# ***Graupner***



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<http://www.graupner.de>

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PN.UG-01 (V2016/sh)

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