



# KRT2-F/KRT2-S2

## VHF Air Band Transceiver



Article number 295154 = KRT2-F (flat 160mm format)



Article number 285942 = KRT2-S2 (Standard 57mm format)

# User and Installation Manual







## Change history

Product re- vision	Date	Description of the change



## Table of contents

1.	Preface.....	7
1.1	Purpose.....	7
1.2	Scope.....	7
1.3	Terminology.....	7
1.4	Symbols.....	7
1.5	List of acronyms.....	8
1.6	Customer support.....	10
1.7	Transceiver characteristics.....	11
1.8	Safety instructions.....	12
1.9	Safety classification.....	12
1.10	Quantitative System Security Identification.....	12
1.11	Restrictions on approval.....	12
2.	Operation.....	13
2.1	Operating elements.....	13
2.1.1	KRT2-F.....	13
2.1.2	KRT2-S2.....	14
2.1.3	Operating elements.....	15
2.1.4	Display.....	16
2.2	Operating steps.....	18
2.2.1	Power On/Off.....	18
2.2.2	Frequency setting.....	20
2.2.3	Audio Menus.....	25
2.2.4	DUAL Watch Mode.....	33
2.3	Transmitting.....	35
2.3.1	Blocked PTT.....	36
2.3.2	Operation with two headsets and only one PTT.....	36
2.4	Self-Test System.....	37
2.4.1	Warning messages.....	37
2.4.2	Error messages.....	37
3.	Reset to factory settings.....	39
4.	Configuration menu (Set-Up).....	40
4.1	Deleting the “Favorite Stations” List.....	40
4.2	Setting the channel spacing.....	41
5.	Remote control.....	42
6.	Installation.....	43
6.1	Notice.....	43
6.2	Telecommunications data.....	43
6.3	FCC approval.....	44
6.3.1	Radiofrequency radiation exposure Information.....	44
6.3.2	Note.....	44
6.3.3	Compliance.....	44
6.3.4	Modifications.....	44
6.4	Scope of delivery.....	45
6.4.1	KRT2-F.....	45
6.4.2	KRT2-S2.....	45
6.5	Unpacking and checking the device.....	45
6.6	Installation.....	45
6.7	Device connection.....	47
6.7.1	Microphone connector.....	47
6.7.2	Loudspeaker and open microphone.....	49
6.7.3	Headphone jack.....	49
6.7.4	External audio input.....	49



6.7.5	Speaker connection .....	49
6.8	Final Audio Setup .....	51
6.8.1	Glider operation .....	51
6.8.2	Motor glider - Two-seater .....	51
6.8.3	Powered Aircraft .....	51
6.9	Wiring .....	52
6.9.1	Hook-up wire .....	52
6.9.2	Interface Pinout .....	52
6.9.3	General information .....	53
6.9.4	Wiring plans .....	54
6.9.5	Connection of dynamic microphones .....	60
6.9.6	Connection aid: ST1 Mating connector .....	60
6.10	Antenna .....	62
6.10.1	Antenna selection .....	62
6.10.2	Installation recommendations .....	62
6.11	Microphone – General notes .....	62
6.12	Inspection after installation .....	64
6.13	Accessories .....	64
6.14	Drawings .....	65
6.14.1	Dimensions KRT2-F .....	65
6.14.2	Dimensions KRT2-S2 .....	67
6.14.3	Rear connections .....	68
7.	Maintenance .....	69
7.1	Periodic maintenance .....	69
7.2	Repairs .....	69
7.3	Cleaning .....	69
8.	Technical data .....	70
8.1	General information .....	70
8.2	Transmitter .....	72
8.3	Receiver .....	72
9.	EXCLUSIVE LIMITED WARRANTY and LIMITATIONS ON LIABILITY .....	73
10.	Software License Conformity .....	74
Appendix A.	Frequency/channel plan for the 8.33 kHz grid .....	75



## List of tables

Table 1: Operating elements .....	15
Table 2: Display .....	17
Table 3: Audio Menus .....	25
Table 4: Audio Menu Lock Status .....	32
Table 5: Warnings.....	37
Table 6: Error Messages.....	38
Table 7: Telecommunications data .....	43
Table 8: Scope of delivery KRT2-F .....	45
Table 9: Scope of delivery KRT2-S .....	45
Table 10: General technical data .....	71
Table 11: Technical data transmitter .....	72
Table 12: Technical data receiver .....	72
Table 13: Frequency/channel plan 8.33 / 25 kHz .....	75

## List of figures

Figure 1: KRT2-F Front view (display and controls) .....	13
Figure 2: KRT2-S2 Front view (display and controls) .....	14
Figure 3: General display .....	16
Figure 4: Switch-on message (example) .....	18
Figure 5: Normal operation display (example).....	18
Figure 6: Microphone settings menu (AUTO mode) .....	31
Figure 7: "DUAL Watch" mode active (example shows reception on standby frequency) .....	33
Figure 8: Transmission mode.....	35
Figure 9: Factory settings menu.....	39
Figure 10: Configuration menu.....	40
Figure 11: Delete "Favorite Stations" list .....	40
Figure 12: Setting the channel grid .....	41
Figure 13: Connection headsets with changeover switch .....	48
Figure 14: Message for incorrectly connected loudspeakers .....	49
Figure 15: Connector Pin assignment .....	52
Figure 16: KRT2-RC connector Pin assignment.....	52
Figure 17: Wiring powered aircrafts.....	54
Figure 18: Wiring glider two-seater .....	55
Figure 19: Wiring glider single-seater.....	56
Figure 20: Wiring motor glider single-seater.....	57
Figure 21: Wiring motor glider two-seater, dynamic microphones .....	58
Figure 22: Wiring motor glider two-seater, electret microphones.....	59
Figure 23: ST1 Interface adapter board .....	60
Figure 24: ST1 Interface adapter board (view of the wiring) .....	61
Figure 25: Dimensions KRT2-F.....	66
Figure 26: Dimensions KRT2-S2.....	67
Figure 27: Panel cutout KRT2-S2 .....	67
Figure 28: Required space for connections .....	68



## 1. Preface

### 1.1 Purpose

This manual contains information about the physical, mechanical and electrical properties, as well as the description of operation and installation of the VHF Airborne Radio KRT2-F/KRT2-S2.

### 1.2 Scope

This manual applies to the operation and installation of the VHF Airborne Radio KRT2-F/KRT2-S2. All descriptions refer to the software version 0016 valid at the time of creation. The software and the contents of the manual can be changed due to technical improvements of the product, without separate reference being made to it.

### 1.3 Terminology




If explicitly indicated, all references to "device" or "installation" refer to the radio set described in Chapter 1.2

All referenced documents are identified by their document number, document name, and version number.

- In the document, the word **MUST** designates a mandatory instruction. A deviation from this is not permitted.
- In the document, the word **SHOULD** denotes a recommendation and an advice. These recommendations or advice must be followed unless there are good reasons to deviate from them.
- In the document, the word **CAN** denotes a permitted method or action.

*Note: Additional information in this document is presented in italics.*

### 1.4 Symbols

	<p><b>DANGER:</b>          Information, the non-observance of which may cause personal injury through electrical radiation and ignition of combustible material.</p>
	<p><b>ATTENTION, PLEASE:</b>          Failure to follow these instructions may result in damage to the unit or other parts of the equipment or may affect the correct functioning of the unit.</p>
	<p><b>INFORMATION:</b>          Supporting information for the operation of the device.</p>



## 1.5 List of acronyms

Abbreviation	Explanation
AC	Alternating Current
ADC	Analog to Digital Converter
AF	Audio Frequency
ANT	Antenna
AUD	Audio
AUTO	Automatic
BAT	Battery (Electrical)
COM	Communication
CS	Certification Specification
DAL	Design Assurance Level
DC	Direct Current
DIM	Dimming
DO	Document
EASA	European Aviation Safety Agency
ECR	Engineering Change Request
ED	European Directive
ENV	Environmental
ETSO	European Technical Standard Order
EUROCAE	European Organization for Civil Aviation Equipment
EXT	External
FAA	Federal Aviation Administration
FAX	Facsimile
FCC	Federal Communications Commission
FREQ	Frequency
GmbH	German limited liability company
GND	Ground
HF	High Frequency
HGB	German commercial code
I2C	Inter-Integrated Circuit
ID	Identity
INFO	Information
INT	Internal
LED	Light Emitting Diode
MAN	Manual



<b>Abbreviation</b>	<b>Explanation</b>
MEM	Memory
MHz	Megahertz
MIC	Microphones
MoC	Means of Compliance
NAV	Navigation
PLL	Phase-Locked Loop
PTT	Push To Talk
RC	Remote Control
RS232	Recommended Standard 232
RSS	Radio Standards Specifications
RTCA	Radio Technical Commission for Aeronautics
RX	Receipt
SAE	Society of Automotive Engineers
SB	Service Bulletin
SIT	Side Tone
SQ	Squelch
TBD	To Be Defined
TQ	Technology in quality (Company name)
TSO	Technical Standards Order
TV	Television
TX	Transmission
VHF	Very High Frequency
VOL	Volume
VOX	Voice Operated Exchange




## 1.6 Customer support

For the fastest possible processing of returns, please use the following e-mail:

[support@tq-general-aviation.com](mailto:support@tq-general-aviation.com)

Additional information and FAX numbers can be found on the TQ Group web portal.

 A blue circular icon with a white lowercase letter 'i' inside, representing information.	<p>Suggestions for the improvement of our manuals are welcome. Contact: <a href="mailto:info@tq-general-aviation.com">info@tq-general-aviation.com</a></p>
--	--

 A blue circular icon with a white lowercase letter 'i' inside, representing information.	<p>Information on software updates is available at: <a href="https://www.tq-group.com/">https://www.tq-group.com/</a></p>
--	---





## 1.7 Transceiver characteristics

The transceiver has the following features:

- VHF radio for installation in aircraft
- Frequency range 117.975 to 137.000 MHz
- Channel spacing 8.33/25 kHz (2278 channels)
- Fast channel adjustment
- 2 microphone inputs (standard or dynamic)
- Audio input for connecting audio signal sources
- Installation: 160 mm (6¼") Format (KRT2-F) or Standard panel cut-out 57 mm (KRT2-S2)
- Integrated Intercom
- 100 freely assignable frequency memory locations to which a name with up to 8 letters/spaces can be assigned.



To prevent unintentional transmission, the transmitter automatically switches off after 2 minutes of continuous transmission.



## 1.8 Safety instructions

To ensure safe operation of the unit, the following instructions **MUST** be observed:

- The installation of the device should only be carried out by authorized aviation companies. The regulations customary in the country must be observed.
- The device may only be operated in compliance with the conditions specified in the technical data (see chapter 8).
- Power supply:
  - The unit must **NOT** be connected to AC power sources.
  - The device **MUST** be connected to the specified DC voltage source (DC), see chapter 8.
  - When connecting the device, the correct polarity **MUST** be observed.
  - Strong interference pulses on the power supply can damage the device. In this case an appropriate filter **MUST** be installed in the power supply line.
- Protection:
  - The device **MUST** be connected to the power supply via its own fuse (circuit breaker or fuse).
- Do not turn the unit on or off while starting or stopping the engine.

## 1.9 Safety classification

The device has been designed as a complete unit for installation in a cockpit environment in General Aviation aircraft subject to the following limitations:

- Installations shall be carried out in accordance with appropriate EASA or FAA approved guidelines.
- The software certification classification is suitable for aircraft.

The error classification according to AC23.1309-1D is:

**MINOR**

The software "Design Assurance Level" (DAL) is:

**Level D**

## 1.10 Quantitative System Security Identification

According to EASA regulations, a system safety reliability of at least  $1 \times 10^{-4}$  per flight hour for Class I aircraft and  $1 \times 10^{-5}$  per flight hour for Class II aircraft should be achieved.

## 1.11 Restrictions on approval

The requirements and tests for the ETSO/TSO approval of this device comply with minimum performance standards. It is the installer's responsibility to ensure that this equipment is within the defined specifications for the aircraft type or class to ensure that installation conditions are within the ETSO/TSO standards.

ETSO/TSO articles require their own approval for installation in the aircraft.



## 2. Operation

### 2.1 Operating elements

#### 2.1.1 KRT2-F

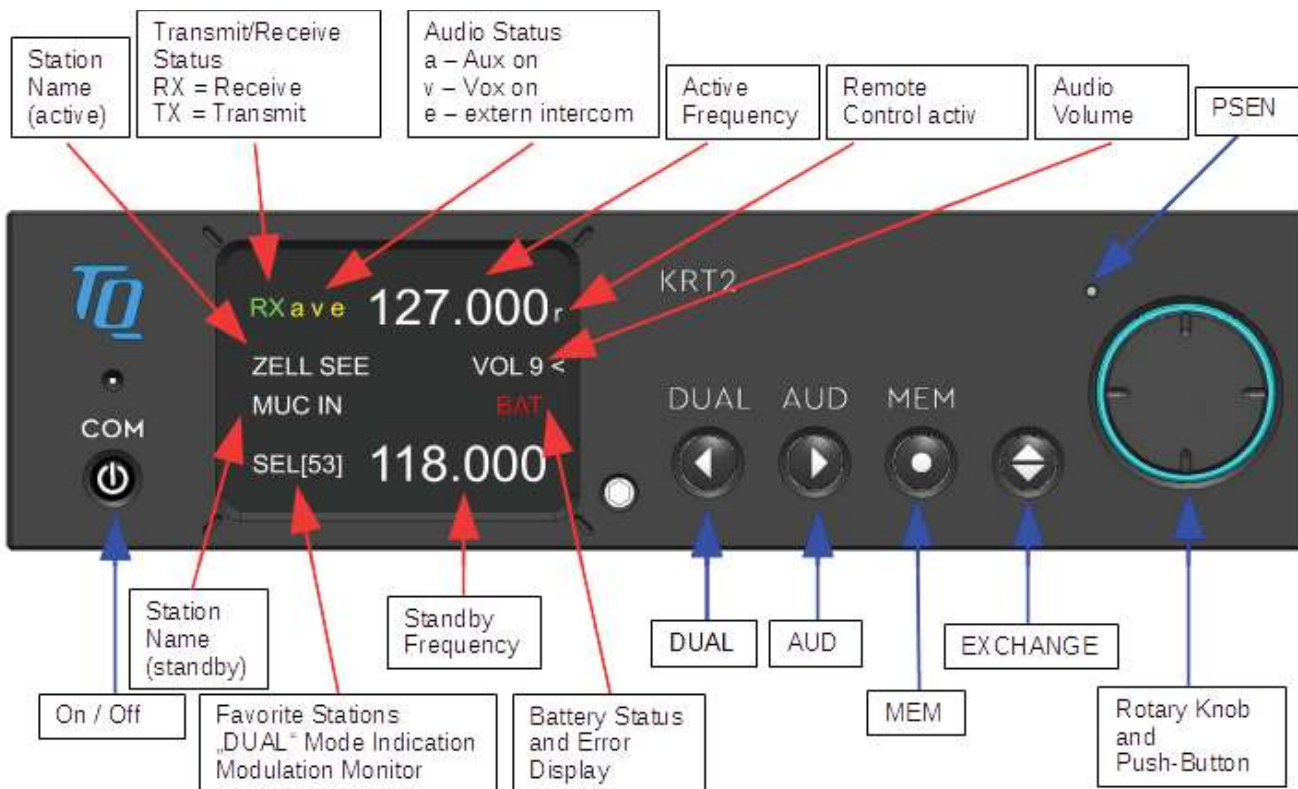


Figure 1: KRT2-F Front view (display and controls)

## 2.1.2 KRT2-S2

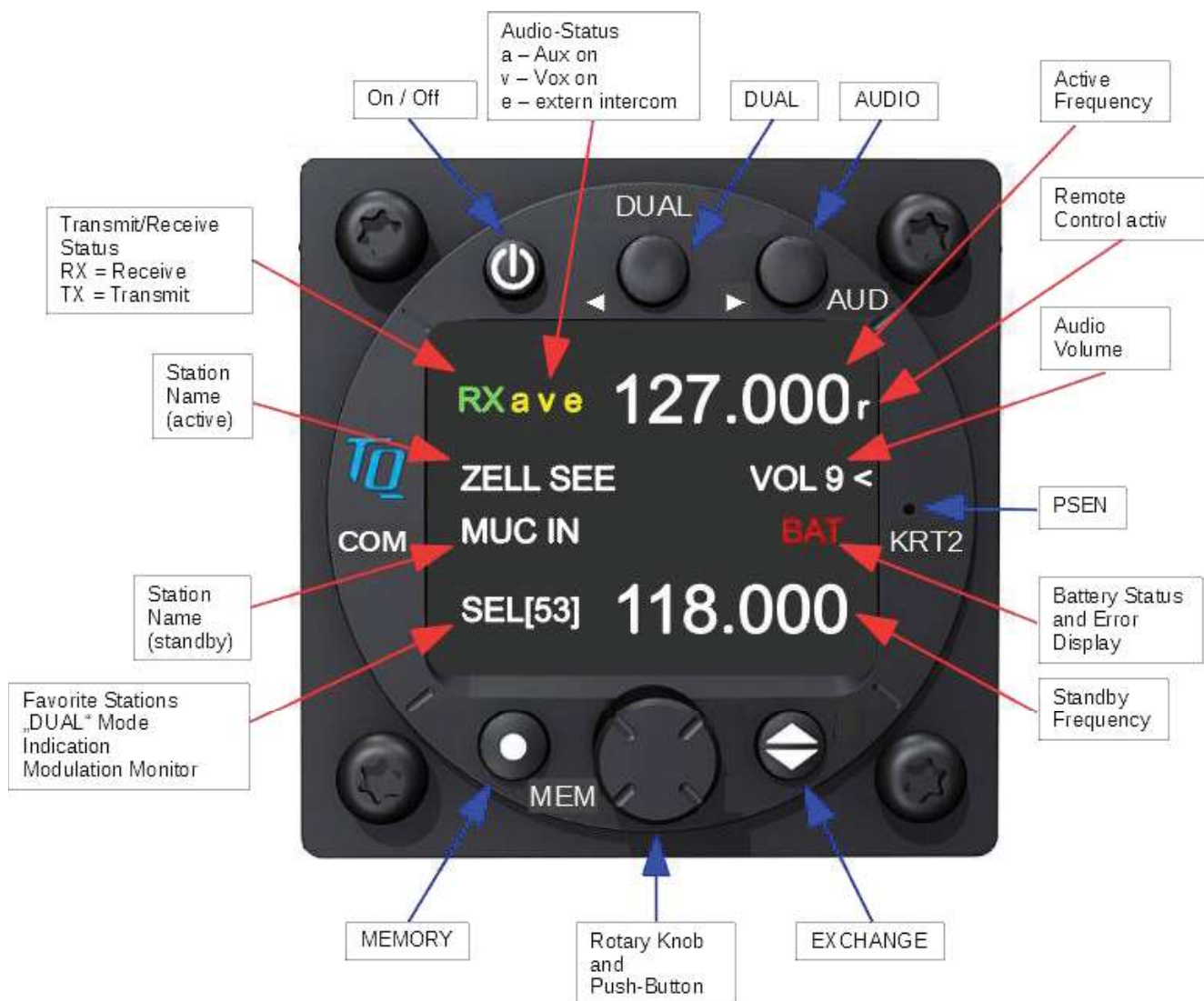


Figure 2: KRT2-S2 Front view (display and controls)

### 2.1.3 Operating elements

This chapter describes how to operate the knobs and the combined rotary switch and push-button during operation.







Buttons / Keys	Designation	Function
	On/Off	<b>Switch:</b>  Switch on/off the device.
	DUAL	<b>Push-button with multiple function:</b>  <ol style="list-style-type: none"> <li>1. Activates "DUAL Watch" mode for monitoring two frequencies alternately</li> <li>2. While programming the station name: Cursor left</li> </ol>
	AUD	<b>Push-button with multiple function:</b>  <ol style="list-style-type: none"> <li>1. Press briefly to navigate through the various audio menus for VOL, SQ, VOX, DIM, etc.</li> <li>2. While programming the station name: Cursor right</li> </ol>
	MEM	<b>Push-button with multiple function:</b>  <ol style="list-style-type: none"> <li>1. Selecting a frequency from the "Favorite Stations" list</li> <li>2. Adding a frequency to the "Favorite Stations" list</li> </ol>
	EXCHANGE	<b>Push button:</b>  Swap active and standby frequency
	FREQ	<b>Rotary switch and push-button with multiple function:</b>  Press for: <ol style="list-style-type: none"> <li>1. frequency setting</li> <li>2. Switching of the ranges MHz, 100kHz, 10kHz</li> </ol> Rotary switch for setting all variable values: <ol style="list-style-type: none"> <li>1. Volume adjustment (headphones, speakers)</li> <li>2. Change MHz / kHz of standby frequency</li> <li>3. Enter letters in MEM mode</li> <li>4. Change the basic microphone settings</li> </ol>

Table 1: Operating elements

## 2.1.4 Display

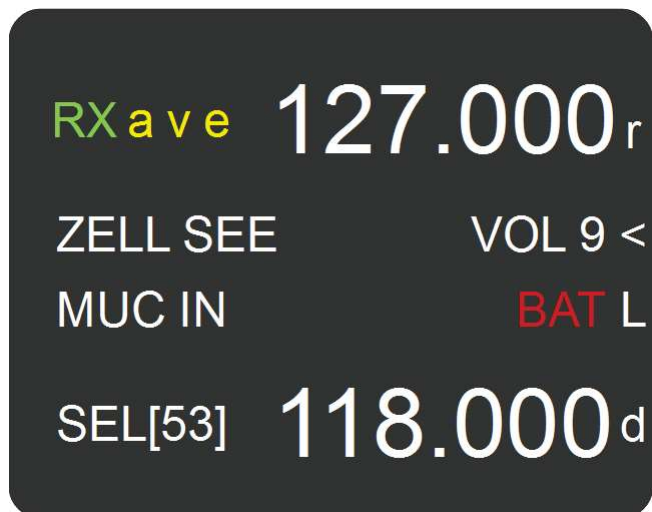




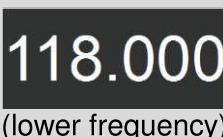



Figure 3: General display

This chapter describes the display of the device during normal operation. Additional displays and error messages are described in the corresponding chapters.

Display	Designation	Remark
	Operating status - Reception	Displayed while receiving (squelch is opened)
	Operating status - Send	Displayed while transmitting
	Operating status - transmission switched off	The transmitter was automatically switched off after 2 min continuous operation.
	Active frequency	Transmit/receive frequency Displayed in large font
	Standby/Dual Frequency	Input field for a new frequency or receive frequency in DUAL Watch mode. Displayed in large font
	Station name of the active frequency	Displayed when the frequency is selected from the Favorites list.



Display	Designation	Remark
MUC IN (lower name)	Station name of the standby frequency	Displayed when the frequency is selected from the Favorites list.
VOL 9	Adjustable volume level	VOL is always displayed by default. This field displays various settings if the "AUD" button is pressed repeatedly.
DUAL ↓	DUAL Watch is active	Can be deactivated by pressing the buttons "DUAL", "FREQ" or "MEM"
SEL[53]	Index of the selected location in the "Favorite Stations" list (0-99)	Index can be selected using the rotary switch
<	Displays the assignment of the rotary knob either to frequency setting, or VOL / SQ / VOX / ...	Jumps either to "Standby" frequency or "VOL / SQ / VOX / ..." settings if the button "FREQ" respectively "AUD" is pressed.
BAT	Operating voltage is less than 10.5 Volt	Battery low Possibly battery/generator defective
a v e	Status indicators for the audio actions	a = external audio input active v = VOX active e = Intercom switched off, switch open
r	Remote control active	The device can also be operated via the connected remote control.
d	Dynamic microphone	The "AUTO" mode for microphone detection is on and a dynamic microphone has been detected.
L	Audio Menu Lock	The audio menu is restricted (see 2.2.3.12)

Table 2: Display





## 2.2 Operating steps

In the basic state, the rotary knob is always assigned to the volume setting (VOL).

Press AUD, FREQ or MEM to exit this state.

If there is no operation for a longer period of time (> 10 sec.) in the respective higher states, the unit returns to the basic state.

### 2.2.1 Power On/Off

To switch on, press the "On/Off" switch. The switch engages in the "On" position. To turn it off, press the "On/Off" switch again.

Shortly after switching on, the display shows the device name, the software version and a checksum (see figure below).



Figure 4: Switch-on message (example)

The instrument performs a self-test and then starts in normal operating mode using the last settings (see figure below).

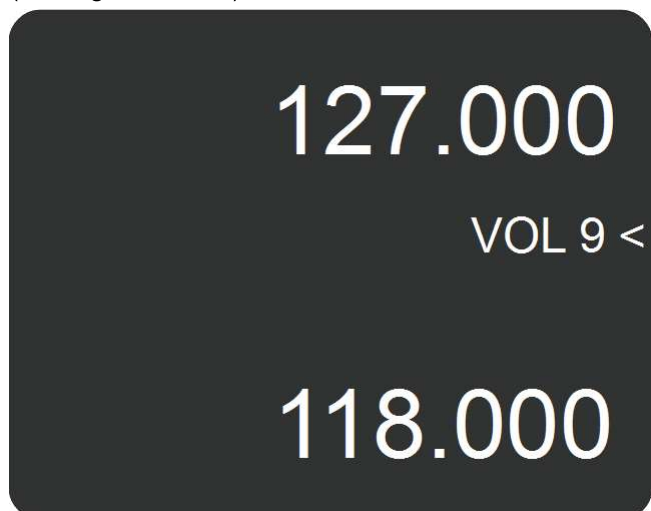


Figure 5: Normal operation display (example)





If an error is detected during the self-test, an error message is displayed. The possible causes and measures are described in chapter 2.4

## 2.2.2 Frequency setting

There are two ways to enter a frequency:

- Direct input
- Selection from "Favorites Stations" list (memory location 0-99)



When setting the frequencies, the respective local and country-specific regulations must be observed.

### 2.2.2.1 Direct input of a frequency

A new frequency can only be set as standby frequency (lower line) using the rotary switch. The MHz, the hundreds kHz and the lower kHz digits can be set individually.

To set a frequency, proceed as follows:

1. If the marker "<" is on the line with volume setting ("VOL"), press the rotary switch once to switch to frequency input.  
The marker "<" changes to standby frequency and the kHz digits are darkened.



123.000

2. With the rotary switch the MHz can be changed.
  - A clockwise rotation increases the frequency in 1 MHz increments.
  - When turning counterclockwise, it reduces in 1 MHz increments.  
*Note: At the band borders, the frequency range is changed to the beginning (136 -> 118) or to the end (118 -> 136).*
  - Press the rotary switch to change to entering the hundred kHz digit.  
The MHz places are darkened and the hundred kHz place becomes bright.



123.700

3. With the rotary switch the hundred kHz digit can be changed.
  - A clockwise rotation increases the frequency in 100 kHz steps.
  - Reduced in 100 kHz steps when turning counterclockwise.  
*Note: When 9 is reached, the value changes to 0 or from 0 to 9. The MHz position is not changed!*
  - Press the rotary switch to change to entering the lower kHz digits.  
The hundreds kHz digit is darkened and the lower kHz digits become bright.



123.725



4. With the rotary switch the lower kHz digits can be changed.

Depending on the set channel grid, the lower kHz digits are changed as follows:

For 25 kHz:

- A clockwise rotation increases the frequency in 25 kHz increments.
- Reduced in 25 kHz increments when turned counterclockwise.

*Note: If the 75 is reached, the value is changed to 00 or from 00 to 75 when turning is continued. The previous digits are not changed!*

- Press the rotary switch to change to entering the MHz digits.  
The kHz digits are darkened and the MHz digits become bright.

For 8.33kHz:

*Note: The display no longer shows the frequency but the channels in 8.33 kHz grid (see appendix).*

- A clockwise rotation increases the channel by one step.
- Turning it counterclockwise reduces the channel by one step.

*Note: If the 90 is reached, the display changes to 00 or from 00 to 90 when you continue turning. The previous digits are not changed!*

- Press the rotary switch to change to entering the MHz digits.  
The kHz digits are darkened and the MHz digits become bright.

5. Press the "EXCHANGE" button to swap the newly set standby frequency with the active frequency.



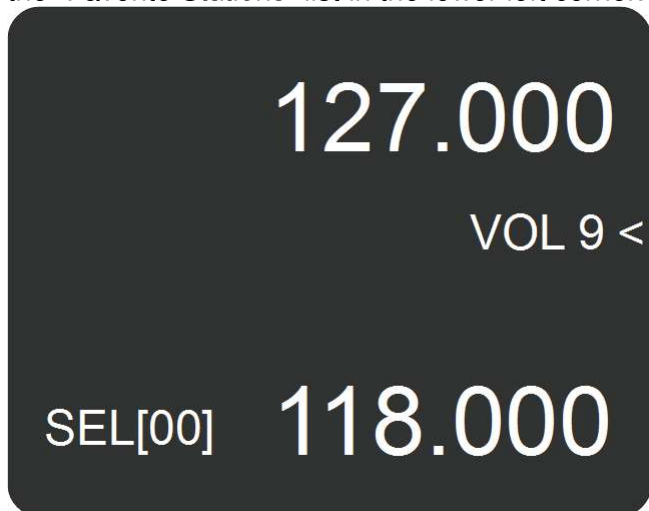
After a few seconds without operation, the unit returns to normal operating mode.



### 2.2.2.2 Selection from “Favorite Stations” List

To set a frequency, proceed as follows:

1. Press the "MEM" button. The display shows the currently selected memory location index of the “Favorite Stations” list in the lower left corner.



2. Use the rotary switch to select the desired memory location (00 to 99). The frequency of the selected memory location is displayed as the standby frequency. If a station name has been assigned to the memory location, it is displayed above the selection for the memory location.
3. Press the "EXCHANGE" button to swap the selected standby frequency with the active frequency.



After a few seconds without operation, the unit returns to normal operating mode.

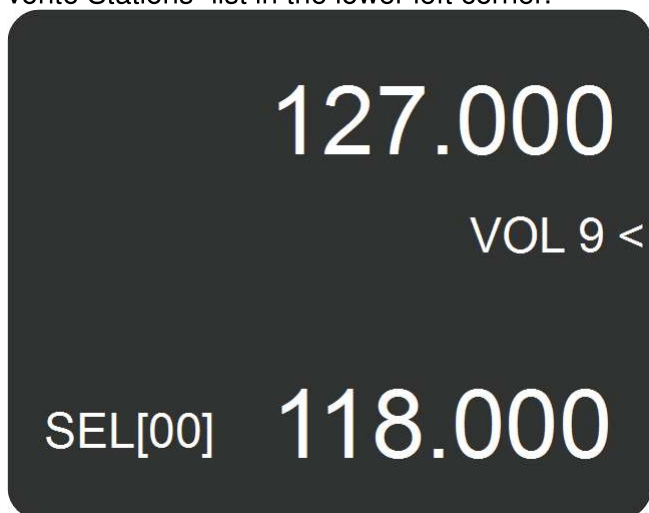


### 2.2.2.3 Storage of a frequency in the “Favorite Stations” list

A maximum of 100 stations can be stored in the “Favorite Stations” list. Each memory location contains a frequency and an optional station name. The station name can contain a maximum of 8 characters (letters or spaces).

To save a frequency, proceed as follows:

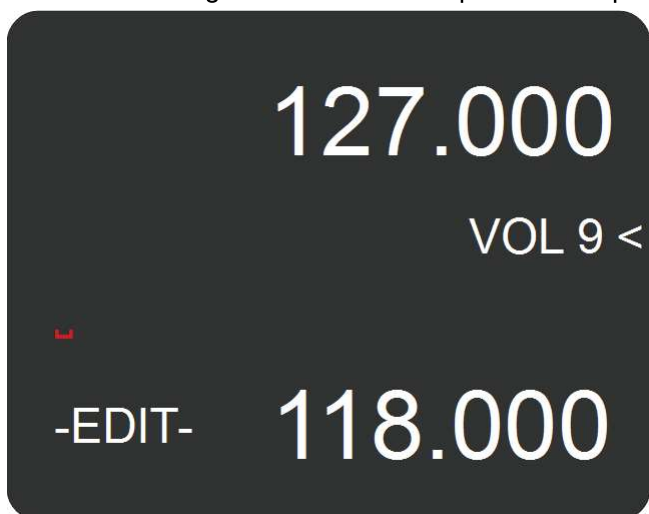
1. Press the "MEM" button. The display shows the selection of the memory location for the “Favorite Stations” list in the lower left corner.



2. Use the rotary switch to select a free memory location or a memory location to be changed (00 to 99).  
The frequency of the selected memory location is displayed as the standby frequency. If a station name has already been assigned to the memory location, it is displayed above the selection for the memory location.
3. Press the "MEM" button. The selection for the memory location is replaced by "-EDIT-".

*Note: Before "-EDIT-" is displayed, "Save=↑" is displayed for a few seconds. This is an indication of which key can be used to save the new frequency.*

The cursor is placed on the first character in the station name field. This is indicated by a periodic color change. The cursor for spaces is displayed as "␣".



4. The rotary switch can be used to select the letters "A" to "Z" and the space character.



5. By pressing the "AUD" key, the cursor can be moved to the next position to the right.  
By pressing the "DUAL" key, the cursor can be moved to the left of the previous position.
6. By pressing the rotary switch the frequency can be set as described under 2.2.2.1  
By pressing the "MEM" key, you can switch back to entering the station name.
7. Press the "EXCHANGE" button to save the displayed frequency and station name.  
After saving, the selection from the favorites list is displayed again (see 2.2.2.2).
8. Optionally, the Favorites list can be sorted alphabetically in ascending order by station name.
  - a. Before performing step 7, press the "MEM" key again.
  - b. The display shows "SORT? "↑".
  - c. Press the "EXCHANGE" key to start the sorting process.
  - d. By pressing the "MEM" key, the sorting process is not started, the "Edit" mode is exited and the device is in normal operating mode.
  - e. During sorting, "SORTING" is displayed.
  - f. After completion of the sorting process, the "Edit" mode is exited and the device is in normal operating mode.
  - g. After sorting, the standby frequency is automatically set to the frequency of the first memory location (00).

*Note: The sorting process may take several minutes.*




After a few seconds without operation, the unit returns to normal operating mode.



### 2.2.3 Audio Menus


By pressing the "AUD" button repeatedly, different audio menus can be selected.

	<p>If the marker "&lt;" is still on the line with the standby frequency, the "AUD" button <b>MUST</b> be pressed once to switch to the audio menu. The marker "&lt;" changes to the field "VOL".</p>
---	--

The following table shows the menu items in the order of their selection by the "AUD" key.

Display	Designation	Remarks
VOL	Volume	Basic state of the audio menu.
SQ	Squelch	
VOX	Voice activation	Voice controlled intercom
TXm**	PTT key selection	TXm*- = left PTT active TXm-* = right PTT active TXm** = both PTTs active
INT	Volume of the Intercom	
ext	Volume of the external audio input	
DIM	Brightness of the backlight for the display	
KEY	Illumination level for the buttons	Only KRT2-F
BATtst	Power supply test display	
SIT	Volume for the monitoring tone	For transmission mode
MIC	Setup menu for the micro-phones	Service menu without radio operation


Table 3: Audio Menus


	<p>After a few seconds without operation, the system returns to the basic status of the audio menu ("VOL").</p>
---	---



### 2.2.3.1 VOL - Volume


This menu item enables you to adjust the volume of the received signal.  
The rotary switch can be used to select values from 1 (lowest volume) to 20 (highest volume).


	The volume of the received signal cannot be set to zero.
---	--


	The VOL setting only affects the volume of the received signal, not the intercom volume. This is set separately via the menu item "INT".
---	--

### 2.2.3.2 SQ - Squelch

This menu item enables you to adjust the sensitivity of the squelch.  
The rotary switch can be used to select values from 1 (no squelch), 2 (high sensitivity) to 10 (low sensitivity).  
The optimum squelch setting depends on several factors. The lower the value, the greater the sensitivity (range). However, this also increases the interference caused by various sources (engine, flashlights, etc.).

	For powered aircraft (with own sources of interference) a value of 3-5 is recommended as output value. For glider pilots a value of 2 is recommended for maximum sensitivity and thus a large reception range.
---	--

	If you also want to hide far-off stations, increase the value.
---	--

	The squelch setting has no effect on intercom operation.
---	--




### 2.2.3.3 VOX - Voice threshold for intercom operation

This menu item enables you to set the sensitivity for speech recognition (VOX) in intercom mode.

The rotary switch can be used to select values from 1 (VOX always activated) via 2 (highest sensitivity) to 9 (lowest sensitivity) and 10 (VOX switched off).

The higher the set value, the louder you have to speak to activate the intercom connection. The activation is indicated by the symbol "v".

	The sensitivity should be set so that normal flight noises are not transmitted to the headphones, but the intercom connection is only activated when the microphone is spoken to.
---	---


#### 2.2.3.3.1 VOX - Manual Intercom


In case of strong background noise or uncompensated microphones, the intercom connection can be activated manually via a separate talk button.

For this purpose the speech recognition must be permanently activated by the VOX value 1.

The Intercom connection is activated by closing the Intercom talk button (see 6.11).

An open intercom talk button is indicated by an "e".

	The manual intercom mode only works when the external audio input is deactivated (see 2.2.3.5).
---	---

	In speaker mode (e.g. for gliders) the VOX value MUST be set to 10 to avoid acoustic feedback.
---	--

#### 2.2.3.4 TXm - PTT key activation

This menu item enables you to configure the activation of the two PTT keys.

The following values can be selected with the rotary switch:

- TXm\*- Only left PTT enabled for transmission
- TXm-\* Only right PTT enabled for sending
- TXm\*\* Both PTTs enabled for transmission



When transmitting, only the microphone assigned to the respective PTT is enabled. This is indicated by TX or TX1/TX2.

### 2.2.3.5 INT - Intercom Volume

This menu item enables you to adjust the volume of the intercom.

The rotary switch can be used to select values from 1 (lowest volume) to 9 (highest volume).

### 2.2.3.6 EXT - Volume of external audio input

This menu item enables you to adjust the volume of a connected external audio signal, e.g. warning tone, vario, etc. (see also 6.7.4).

The rotary switch can be used to select values from 0 (off), 1 (lowest gain without threshold) to 9 (highest gain with threshold for interference suppression).



The input level should be at least 200 mVpp. The maximum level is 6 Vpp.

### 2.2.3.7 DIM - Brightness of the display

This menu item enables you to adjust the brightness of the backlight of the display.

The rotary switch can be used to select values from 1 (low brightness) to 5 (high brightness).

### 2.2.3.8 KEY - Key Brightness (only KRT2-F)

This menu item enables you to adjust the illumination of the keys and the rotary switch.

The rotary switch can be used to select values from 0 (illumination switched off), 1 (low brightness) to 5 (high brightness).

### 2.2.3.9 BAT - Battery Test

This menu item enables you to check the supply voltage of the device. The current voltage is displayed until the next menu item is selected by pressing the "AUD" key. Alternatively the device automatically switches to the basic state ("VOL") after a few seconds.

### 2.2.3.10 SIT - Listening tone (Side tone)

This menu item enables you to adjust the volume of the monitoring tone.

The rotary switch can be used to select values from 1 (lowest volume) to 9 (highest volume).




In loudspeaker mode (e.g. for gliders) the value **MUST** be set to 1 to prevent acoustic feedback. The modulation control can then only be checked via the display (see 2.3).




### 2.2.3.11 MIC - Microphone Settings

This menu item enables you to configure and test different microphones without using the PTT. Each microphone input can be set individually. This allows different microphones to be used.

	A maximum of two microphones may be connected in parallel per input (see 6.7.1).
---	--

Use the "DUAL" button to select between "L" (Left = microphone left), "R" (Right = microphone right) and "AUTO" (Auto mode, see 2.2.3.11.2).

All settings are not saved until you exit the menu.  
If the AUTO mode is to be activated, you **MUST** leave the menu in "AUTO" selection.  
If normal operation is desired, you **MUST** leave the menu in "L" or "R" selection.

	If selected, this menu item remains permanently active and you can only leave it by pressing the "AUD" key.
--	---


#### 2.2.3.11.1 Microphone Sensitivity (select L or R)


Use the rotary switch to select the input sensitivity of the selected channel from 1 (low sensitivity) to 9 (maximum sensitivity). This setting applies to standard microphones.





In addition, there are selection options 10 and 11. These values each represent a special function and are intended for very small microphone signals (e.g. use of dynamic microphones for gliders).

These special functions are assigned as follows:

- 10      for unamplified electret microphones (with 8V supply)
- 11      for Dynamic Microphones (only for left microphone)

	Simultaneous operation of Electret and Dynamic microphones is not possible, as there is only one power supply for both microphone inputs. If the setting for dynamic microphones is selected, the power supply is automatically switched off.
---	---

	A dynamic microphone can be connected only to the left microphone input.
---	--

	<p>The microphone level is displayed on the second line of the display with a bar and numeric.</p>
	<p>For best adjustment, use headphones (with the engine running) to speak at normal volume, optimizing the microphone level to approximately 0.5 (the bar graph corresponds to the middle of the scale).</p>
	<p>A high microphone gain (&gt;9) can possibly lead to feedback via the monitoring tone. In this case the SIT value should be set to 1.</p>
	<p>In loudspeaker mode, feedback may occur as the loudspeaker switching state is adopted at this time when the MIC setting is activated (squelch on or off). The squelch should therefore be closed beforehand.</p>

### 2.2.3.11.2 Microphone Sensitivity (AUTO selection)

When set to "AUTO", the left microphone input will automatically detect the microphone type during operation when PTT is pressed.

If a dynamic microphone is detected, the setting for the left microphone is switched to 11. The setting for the right microphone remains unchanged.


When a standard microphone is detected, the left and right microphone settings are used (see 2.2.3.11.1).


The display shows the detected microphone type at the bottom right ("MIC:") as follows:

- std Standard microphone
- dyn Dynamic microphone



Figure 6: Microphone settings menu (AUTO mode)

	The display for the microphone type (bottom right) is only refreshed once when the MIC menu is called up.
---	---

	To reactivate the intercom connection after a microphone change, the PTT MUST be pressed briefly.
---	---

### 2.2.3.11.3 Additional information

As help for tests, the following additional information is displayed in this menu:

- RxS: RF input signal strength of the receiver
- Ext: Input level of the external audio signal (see 2.2.3.6).



### 2.2.3.12 Menu locking


The menu items from "TXm" to "MIC" can be locked for school operation.

To lock or unlock, press the "AUD" button and the rotary switch simultaneously for at least 2 seconds.

The locking status is indicated by an "L" in the 3rd line on the right of the display.

VOL	SQ	VOX	TXm	INT	EXT	DIM	KEY	BAT	SIT	MIC
Available			Locked					Availa- ble	Locked	

Table 4: Audio Menu Lock Status

	<p>To save the lock state, the squelch setting (menu item SQ in the Audio menu) must be changed before the unit is switched off, e.g. change the value from 2 to 3 and back again to 2.</p>
---	---



## 2.2.4 DUAL Watch Mode

The device offers a so-called "DUAL Watch" mode in which two frequencies can be monitored. Since the device has only one receiver, the monitoring takes place by a periodic change between the active and the standby frequency.

By pressing the "DUAL" button the "DUAL Watch" mode is activated or deactivated. Deactivation also occurs when the "MEM" button or the rotary knob is pressed.

	The frequencies to be monitored <b>MUST</b> be set before activating the "DUAL Watch" mode (see 2.2.2).
--	---

	For the "DUAL Watch" mode, the squelch must not be permanently open, i.e. the SQ value must be at least 2. Otherwise it cannot be recognized on which frequency a signal is received.
--	---

If the "DUAL Watch" mode is activated, "DUAL" is displayed in the bottom left line of the display.



Figure 7: "DUAL Watch" mode active (example shows reception on standby frequency)

In the display, the current frequency of the receiver is indicated by an arrow to the right of the "DUAL" lettering as follows:

- ↑ Reception on the active frequency
- ↓ Reception on Standby Frequency

### Functionality:

In the "DUAL Watch" mode the active frequency has priority and the receiver is mainly on this frequency. As long as no signal is received on both frequencies, the receiver switches to standby frequency several times per second and checks the input signal.



If a signal is received on the active frequency, the monitoring of the standby frequency is interrupted until the end of the reception.

When receiving on the standby frequency, it is interrupted every 2 seconds for a period of several hundred milliseconds to check the active frequency. If a signal additionally appears on the active frequency, it is switched over to this frequency.



In DUAL Watch mode, standby frequency and active frequency can be exchanged by pressing the "EXCHANGE" key.  
Transmission always takes place on the active frequency.





### 2.3 Transmitting

By pressing the PTT key, the corresponding microphone input is enabled and the device goes on transmission on the active frequency (upper line).



Figure 8: Transmission mode

An optical modulation control is displayed at the bottom left of the display. This is especially helpful if no headphones are used for monitoring (e.g. for gliders). In this case, the function and correct setting of the microphone can be monitored via the optical modulation control.

Without a speech signal, the bar appears as a narrow line approximately in the middle between the boundaries. The length of the bar corresponds to the volume of the monitoring tone, i.e. the louder the monitoring tone, the longer the bar is.

	<p>If the center of the modulation display shifts from the center, this indicates a bad adjustment of the antenna.</p>
	<p>The loudspeaker is switched off during transmission. The monitoring tone can only be heard in the headphones.</p>
	<p>When sending, the External Audio input is switched off.</p>



### **2.3.1 Blocked PTT**

To prevent unintentional long transmission, the transmitter switches off after approx. two minutes and the display changes from "TX" to "Te". To transmit again, release the PTT and press it again.

### **2.3.2 Operation with two headsets and only one PTT**

Due to the two separate PTT inputs, only the left or right microphone input is enabled during transmission. This ensures that no noise or unwanted speech is emitted from the other microphone.

If two headsets are connected but only one PTT input is available, both inputs for the PTT inputs must be connected in parallel (see also 2.2.3.4).



## 2.4 Self-Test System

While the device is in operation, a constant hardware check takes place in the background. The field for the battery status and error display is used to display warnings and, in the event of errors, also to display the errors that have occurred.

### 2.4.1 Warning messages

Warning	Significance	Remarks
<b>BAT</b>	Supply voltage too low (less than 10.5V)	Check power supply.
<b>TE</b>	Transmission time exceeded (greater than 2 minutes)	
<b>WARNING Speaker grounded</b>	Speaker connection has short circuit to ground.	Check speaker connection (see 6.7.5)

Table 5: Warnings

### 2.4.2 Error messages

Warning	Significance	Remarks
<b>Er-FPA</b>	Error in speech processor	Send in device for service.
<b>Er-ADC</b>	Error in the internal monitoring	Send in device for service.
<b>Er-ANT</b>	Error in antenna monitoring	Send in device for service.
<b>Er-LED</b>	Error in button illumination	Send in device for service. (only KRT2-F)



Warning	Significance	Remarks
<b>Er-3V3</b>	Error in internal power supply	Send in device for service.
<b>Er-PLL</b>	Error in frequency generation	Send in device for service.
<b>Er-I2C</b>	Error in internal data communication	Send in device for service.
<b>Er-D10</b>	Error in the RX/TX switchover	Send in device for service.
<b>Key-Blk</b>	Error of the operating keys	Send in device for service.
<b>Firmware Corrupted</b>	Failure in firmware.	Send in device for service.
<b>EEPROM Failure</b>	Configuration memory corrupted.	Send in device for service.

Table 6: Error Messages

### 3. Reset to factory settings

The device can be reset to the factory setting. To do this, press the "DUAL" key during power-up.

The display shows the menu for selecting the factory settings.

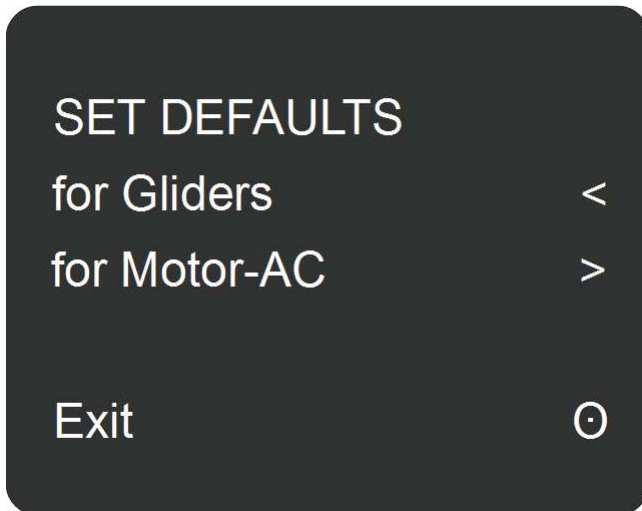


Figure 9: Factory settings menu

By pressing the "DUAL" button (<) the unit can be reset to the factory settings for gliders.

By pressing the "AUD" (>) key, the unit can be reset to the factory settings for engine-powered aircraft.

Pressing the rotary knob does not reset the device, but exits the menu and starts the device in its normal operating state.

During the reset, the selection made and a "done" are displayed. The device is then started in normal operating mode.

#### 4. Configuration menu (Set-Up)

The configuration menu can be called up by pressing the "MEM" button during power-up.

First the message "ENTER SETUP" is displayed. After a few seconds, the configuration menu is displayed.

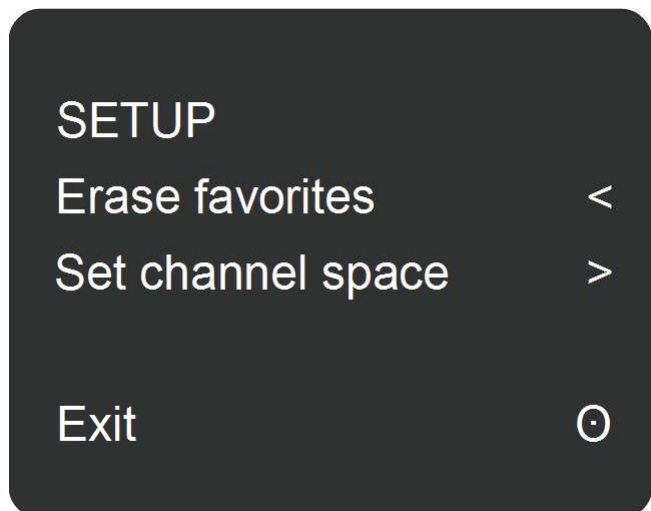


Figure 10: Configuration menu

Press the "DUAL" key (<) to display a menu for deleting the "Favorite Stations" list. By pressing the "AUD" (>) key, a menu for setting the channel spacing can be called up.

The menu is closed by pressing the rotary knob and the device is started in normal operating mode.

##### 4.1 Deleting the "Favorite Stations" List

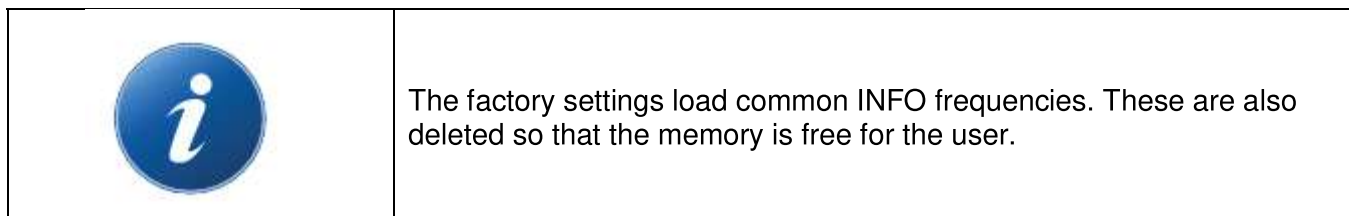


Figure 11: Delete "Favorite Stations" list

By pressing the "DUAL" key (<), all entries in the "Favorite Stations" list can be deleted.

Press the rotary knob to exit the menu and return to the previous menu.

During the deletion process, "Erasing favorites..." is displayed, followed by a "done". The configuration menu is then called up again.



#### 4.2 Setting the channel spacing

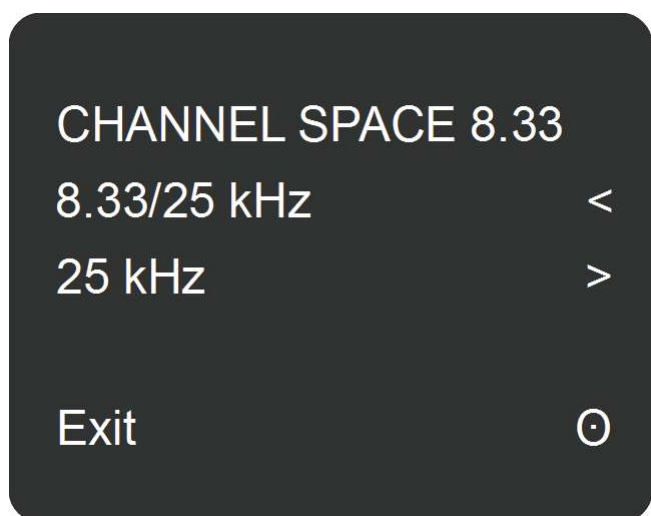


Figure 12: Setting the channel grid

The currently set channel spacing is displayed in the upper right corner.

By pressing the "DUAL" key (<) the 8.33 kHz channel spacing can be set.

By pressing the key "AUD" (>) the 25 kHz channel spacing can be set.

Press the rotary knob to exit the menu and return to the previous menu.

When "DUAL" or "AUD" is pressed, the selected channel spacing is briefly displayed and then the channel spacing menu is displayed again.




## 5. Remote control

In tandem aircraft, an additional control head (KRT2-RC, Remote Control Unit), which is connected to the RS232 interface, can be used to control frequency, volume, squelch, VOX and local variables (e.g. display settings) from the second panel. This allows remote control of the device.

In case of possible transmission errors, corresponding messages are displayed in the error field:

- R\_Time = Time-out transmission error
- R\_ChkS = faulty transmission (checksum error)
- R\_Cmd = unknown command
- R\_Char = data error
- R\_Freq = Wrong frequency

As soon as a correct command or a new frequency is entered, or after 5 seconds at the latest, the error message in the display is deleted.

 A blue circular icon with a white lowercase letter 'i' inside, representing an information or note.	The operation of the KRT2-F/KRT2-S2 is not disturbed by a malfunction of the remote control.
--	--

The connection between the device and the remote control (KRT2-RC) is checked at least once per minute and the establishment of the connection is confirmed with an "r" in the upper right corner of the display.

With the remote control, the device can be operated completely independently, whereby the device can be installed anywhere in the aircraft. This is particularly important in tandem aircraft or when space is a problem.





## 6. Installation

### 6.1 Notice

The following information must be taken into account during installation.

A commissioned aviation company can carry out the installation and wiring. Wiring diagrams see 6.9.4.

The device was developed as a self-contained unit for assembly in a cockpit environment in General Aviation aircraft under the following restrictions:

- Installations shall be carried out in accordance with appropriate EASA or FAA approved guidelines.
- The device must be connected to an aeronautically approved antenna.
- The requirements for characteristics and tests of the (E)TSO approval of this device meet minimum performance standards. It is the installer's responsibility to ensure that this equipment is either within or within the defined specifications for aircraft type or class to ensure that installation conditions are within (E)TSO standards. (E)TSO articles require their own approval for installation in aircraft. This equipment may only be installed in accordance with the applicable airworthiness requirements.
- The "Design Assurance Level" (DAL, see "Quantitative System Safety Identification") is limited to the following aircraft types: CS-23 (Part 23) Class 1 and Class 2 aircraft according to AC23.1309-1D.
- The environmental conditions at the installation site must be within the limits of the environmental qualification (see chapter "Technical data").
- The device classes (see chapter "Technical data") must be suitable for the aircraft type.
- The device must not be used in areas where liquids are present.

### 6.2 Telecommunications data

Information required for the application for frequency allocation by the Federal Network Agency:

Manufacturer:	TQ-Systems GmbH
Type designation:	KRT2-F KRT2-S2
EASA approval number:	KRT2-F:      EASA.21O.10074039 KRT2-S2:    EASA.21O.10063547
Part number:	KRT2-F:      P/N 295154 – XX(XX) – XX(XX) KRT2-S2:    P/N 285942 – 01(XX) – 01(XX)
Transmission power:	5 Watt
Frequency range:	117,975 - 137,000 MHz
Emission designator:	6k00A3E for 25kHz channel spacing 5k60A3E for 8.33kHz channel spacing

Table 7: Telecommunications data



## 6.3 FCC approval

### 6.3.1 Radiofrequency radiation exposure Information

This transceiver complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transceiver should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### 6.3.2 Note

This transceiver has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This transceiver generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### 6.3.3 Compliance

**Notice:** This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

Operation is subject to the following two conditions:

- (1) this transceiver may not cause harmful interference, and
- (2) this transceiver must accept any interference received, including interference that may cause undesired operation.

### 6.3.4 Modifications

**Notice:** Changes or modifications made to this transceiver not expressly approved by TQ-Systems GmbH may void the FCC authorization to operate this equipment.

## 6.4 Scope of delivery

### 6.4.1 KRT2-F

item number	Description of the
KRT2-F	KRT2-F - VHF aeronautical radio transceiver
ZUB	Mounting frame
KRT2-F.A-MAN	Operation Manual KRT2-F/KRT2-S2 ( <a href="https://www.tq-group.com/en/support/downloads/tq-general-aviation/">https://www.tq-group.com/en/support/downloads/tq-general-aviation/</a> )
	EASA Form 1

Table 8: Scope of delivery KRT2-F


### 6.4.2 KRT2-S2

item number	Description of the
KRT2-S2	KRT2-S2 - VHF aeronautical radio transceiver
ZUB2 (4 pieces)	Mounting screw head KRT2-S2 - for panels up to 3mm
KRT2-F.A-MAN	Operation Manual KRT2-F/KRT2-S2 ( <a href="https://www.tq-group.com/en/support/downloads/tq-general-aviation/">https://www.tq-group.com/en/support/downloads/tq-general-aviation/</a> )
	EASA Form 1

Table 9: Scope of delivery KRT2-S

## 6.5 Unpacking and checking the device

Carefully unpack the unit. Transport damage must be reported immediately to the shipping company. The original shipping container and all package materials must be held available for evidence purposes.

	The original packaging material should be used for storage or return.
---	---

## 6.6 Installation


- In consultation with an aviation company, the installation location and type of installation are determined. An aviation company can install all cables. Cable harnesses are available from TQ-Systems GmbH.
- Avoid installation near heat sources.
- Sufficient air circulation is required.
- Sufficient space must be available for the installation of cables and connectors.
- Avoid kinks and the routing of cables in the vicinity of control cables.
- The cables must be long enough for plugs to be accessible during repairs.



- The wiring harness leading to the appliance plug must be laid in such a way that condensation water cannot run into the plug.
- Remove the rotary knobs for installing the device:
  - Lift off the caps of the rotary knobs with a suitable tool.
  - Loosen the fastening screw and pull off the rotary knob.
  - Observe the alignment when inserting the cover!
- Installation instructions and drawing, see 6.9.4.

## 6.7 Device connection

The 15-pin device plug (D-SUB) contains all electrical connections with the exception of the antenna connection.

	<b>The positive wire must be protected with an overload protection (3 Amp. slow-blow)!</b>
---	--


### 6.7.1 Microphone connector


The two microphone inputs can be operated either for standard microphones (standardized signal level 1Vpp) or conditionally for dynamic microphones (level approx. 5 mV to 10 mV).


A supply voltage of 8V at 330 Ohm is provided for the standard microphones.

In addition, elementary electret microphones can also be operated, which also require the 8V supply voltage, but deliver a considerably lower signal level.


The gain for the inputs can be adjusted accordingly in the set-up, see 2.2.3.11.


	The two microphone inputs (left/right) should not be combined.
---	--

	The main input is the left microphone input. The right input is for additional microphones or headsets only.
---	--

	Under certain conditions, a maximum of two microphones of the same type can be connected in parallel per input. However, there are considerable differences in the power consumption of standard microphones, so that a parallel connection is not possible when connecting microphones from different manufacturers.
---	---

For the operation of dynamic microphones, as usual in gliders, the 8V supply voltage is switched off.


	<p>Standard (headset) and dynamic microphones cannot be used simultaneously but only alternatively. The 8V supply voltage cannot be switched off individually for each microphone input.</p>
---	--

	<p>If the right input is not required for dynamic microphones, this input should not remain open and should not be connected to open lines as this can cause interference.</p>
---	--

### 6.7.1.1 Switching between standard (headset) and dynamic microphone

For installations that require switching between a headset and a dynamic microphone, an external switch MUST be used. This is useful e.g. for motor gliders to switch between the standard microphone for motor flight and the dynamic microphone for gliding.

To avoid always having to change the microphone setting, there is the "AUTO" mode in the microphone settings. This automatically switches to the appropriate microphone settings depending on the detected microphone (see 2.2.3.11.2).

	<p>The "AUTO" mode for microphone detection only works for the left microphone input.</p>
---	---

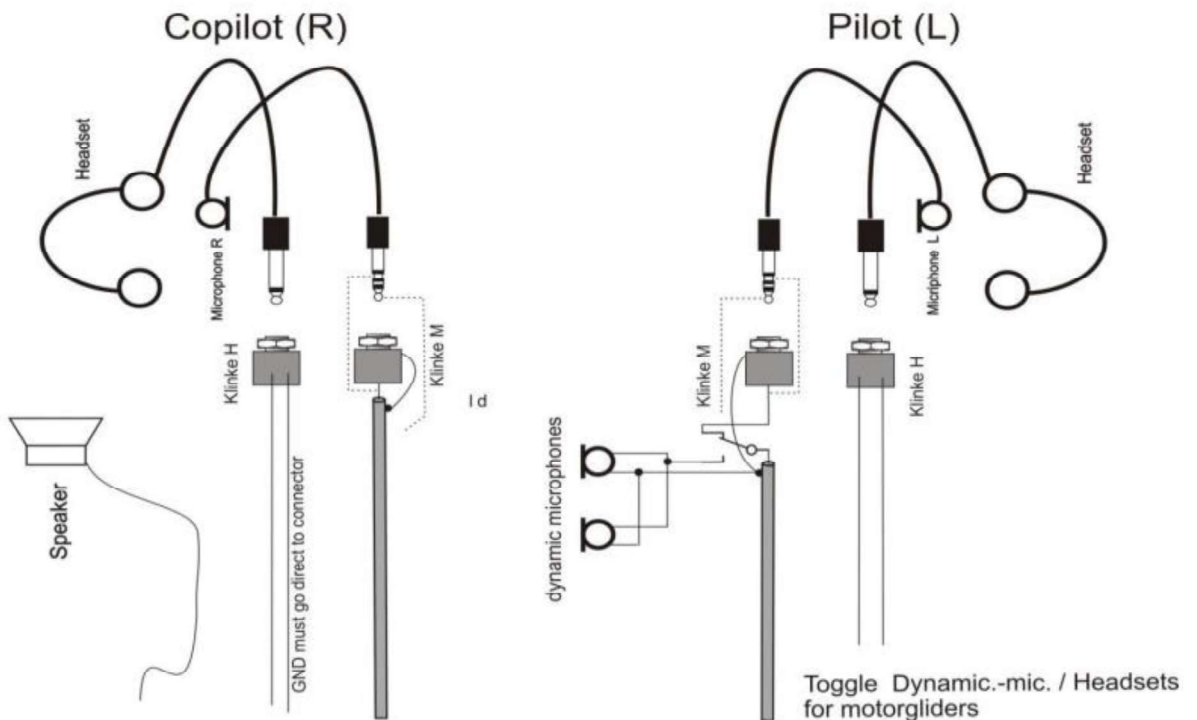


Figure 13: Connection headsets with changeover switch

*Note: Due to the automatic disconnection of the supply voltage during gliding operation (dynamic), the second headset microphone is out of operation.*

### 6.7.2 Loudspeaker and open microphone

It is not possible to operate the loudspeaker, open microphone and intercom together. When using loudspeaker and open microphone (e.g. gooseneck microphone) the intercom mode must be switched off by setting VOX=10, or the intercom talk button must be open (display "e"), otherwise feedback from the loudspeaker will occur.

### 6.7.3 Headphone jack


Multiple headphones of the same type can be connected in parallel. The total impedance should not fall below 60 Ohms.

### 6.7.4 External audio input

The external audio input is used for warning signals from other audio sources. If this input is not used, the corresponding line (pin 5) should be short-circuited to GND to avoid interference.

### 6.7.5 Speaker connection

The device has a differential loudspeaker connection to which a 4 - 8 Ohm loudspeaker can be connected.

	Due to the differential connection, the loudspeaker must not be earthed on one side. Both lines to the loudspeaker must be laid insulated.
---	--

If one of the speaker lines is connected to ground, the following message will appear in the display after switching on.

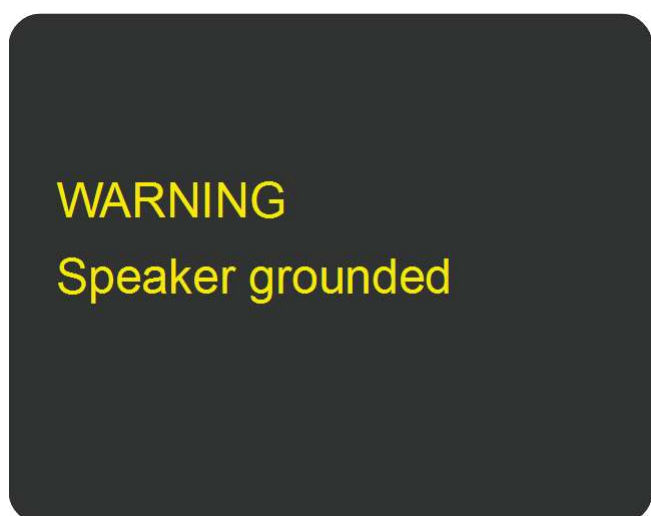


Figure 14: Message for incorrectly connected loudspeakers



A prolonged operation under these conditions can lead to a defect of the device.





## 6.8 Final Audio Setup

The following is an overview of the appropriate audio settings for each application. These settings are only examples and the concrete settings may differ depending on the installation situation.

### 6.8.1 Glider operation

- Set VOX value to 10 (switch off) or leave intercom talk button open (display shows "e").
- In tandem mode set TXm value to TXm\*\* to activate 2nd PTT.
- If necessary, set EXT value to 0 (external audio input switched off).

#### 6.8.1.1 For dynamic microphone

- In the MIC menu, set the MIC setting for MIC-L to 11.
- Set SIT value to 1.

#### 6.8.1.2 For standard or electret microphone

- In the MIC menu, set the MIC setting to a value between 3 and 10, so that with normal language, the level is just over half (optical level indicator).
- Exit the MIC menu in position "L" (not AUTO).

### 6.8.2 Motor glider - Two-seater

For alternating operation, i.e. powered flight with headset or gliding flight with dynamic microphone:

- Set VOX value to 3.
- In tandem mode set TXm value to TXm\*\* to activate 2nd PTT.
- If necessary, set EXT value to 0 (external audio input switched off).
- MIC menu:
  - Set MIC-L setting to 5 (depending on headset).
  - Set setting for MIC-R accordingly or to 1 if unused.
  - Exit MIC menu with "AUTO" selection!

### 6.8.3 Powered Aircraft

- Set VOX value to 3.
- In tandem mode set TXm value to TXm\*\* to activate 2nd PTT.
- If necessary, set EXT value to 0 (external audio input switched off).
- MIC menu:
  - Set the MIC-L setting to 3 (depending on the headset).
  - Set setting for MIC-R accordingly or to 1 if unused.
  - Exit MIC menu with selection "L"!

## 6.9 Wiring

### 6.9.1 Hook-up wire

Supply lines (Power, GND):      AWG20 (0.61 mm<sup>2</sup>)

Signal lines:      AWG22 (0.38 mm<sup>2</sup>)

The cables used must be approved for installation in aircrafts.

### 6.9.2 Interface Pinout

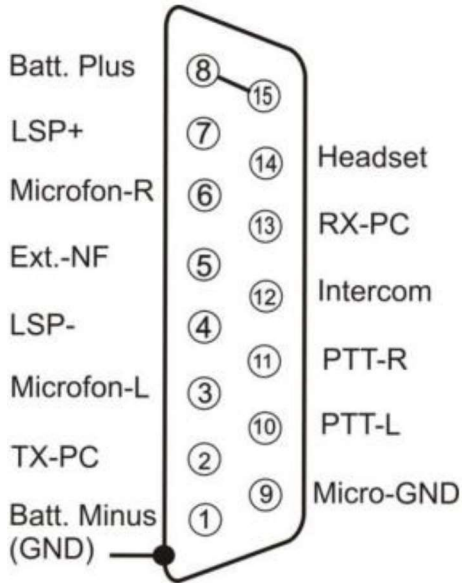



Figure 15: Connector Pin assignment

	<p>If the manual intercom mode is not used, pin 12 must be connected to GND (Batt. Minus).</p>
---	--

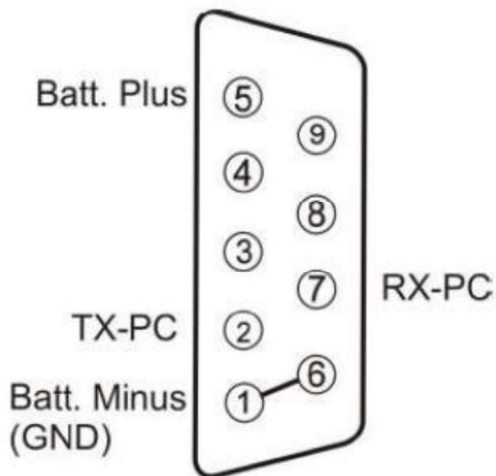


Figure 16: KRT2-RC connector Pin assignment



With the KRT2-RC plug a connection to the KRT2-F/KRT2-S2 is possible.

### 6.9.3 General information

The following drawings show possible configurations.

Many different headsets with different performance features are available on the market. Therefore the use of electret microphones with standard output levels is recommended.

## 6.9.4 Wiring plans

### 6.9.4.1 Wiring for Powered Aircrafts

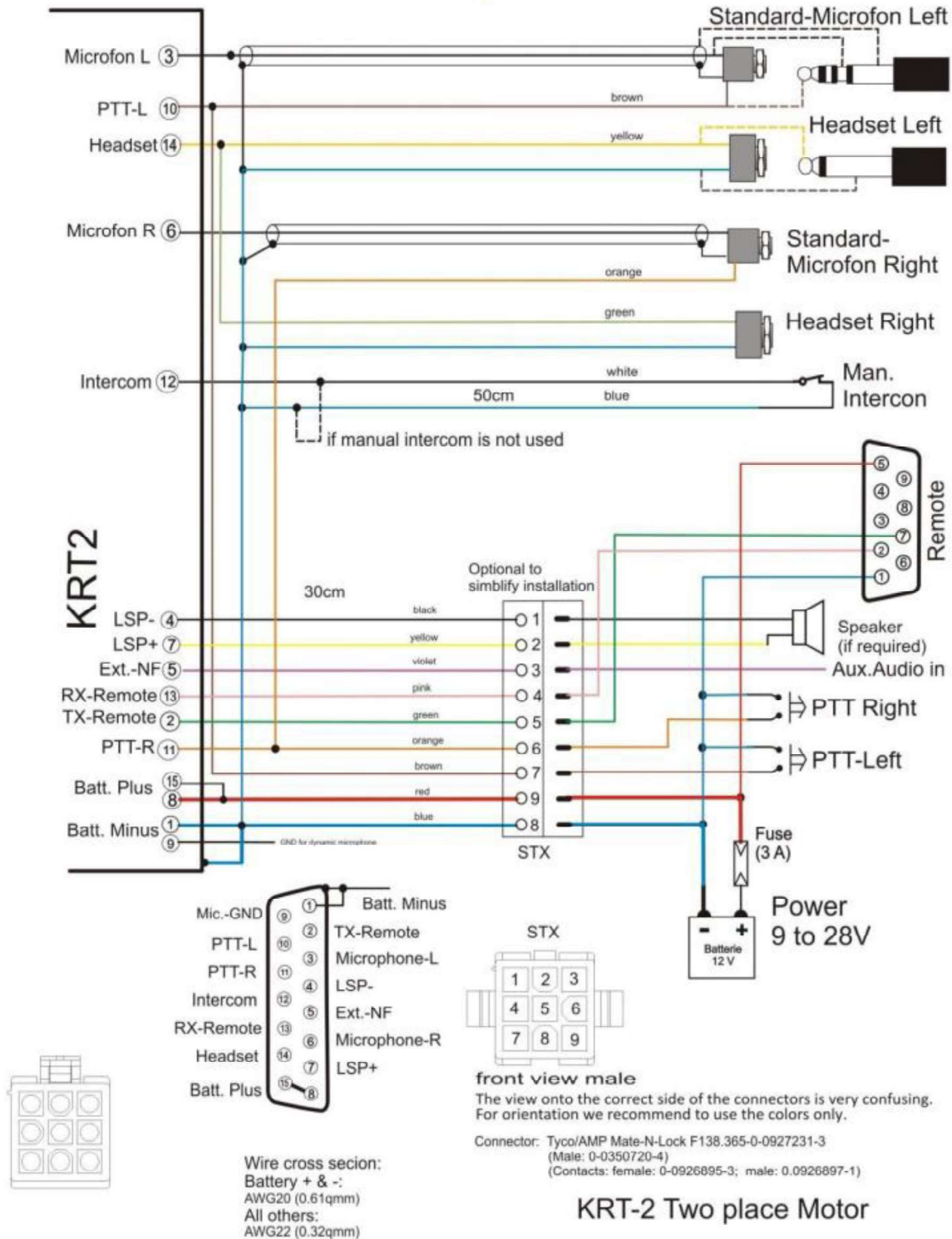


Figure 17: Wiring powered aircrafts

### 6.9.4.2 Wiring for Gliders – Two-seater, dynamic microphones

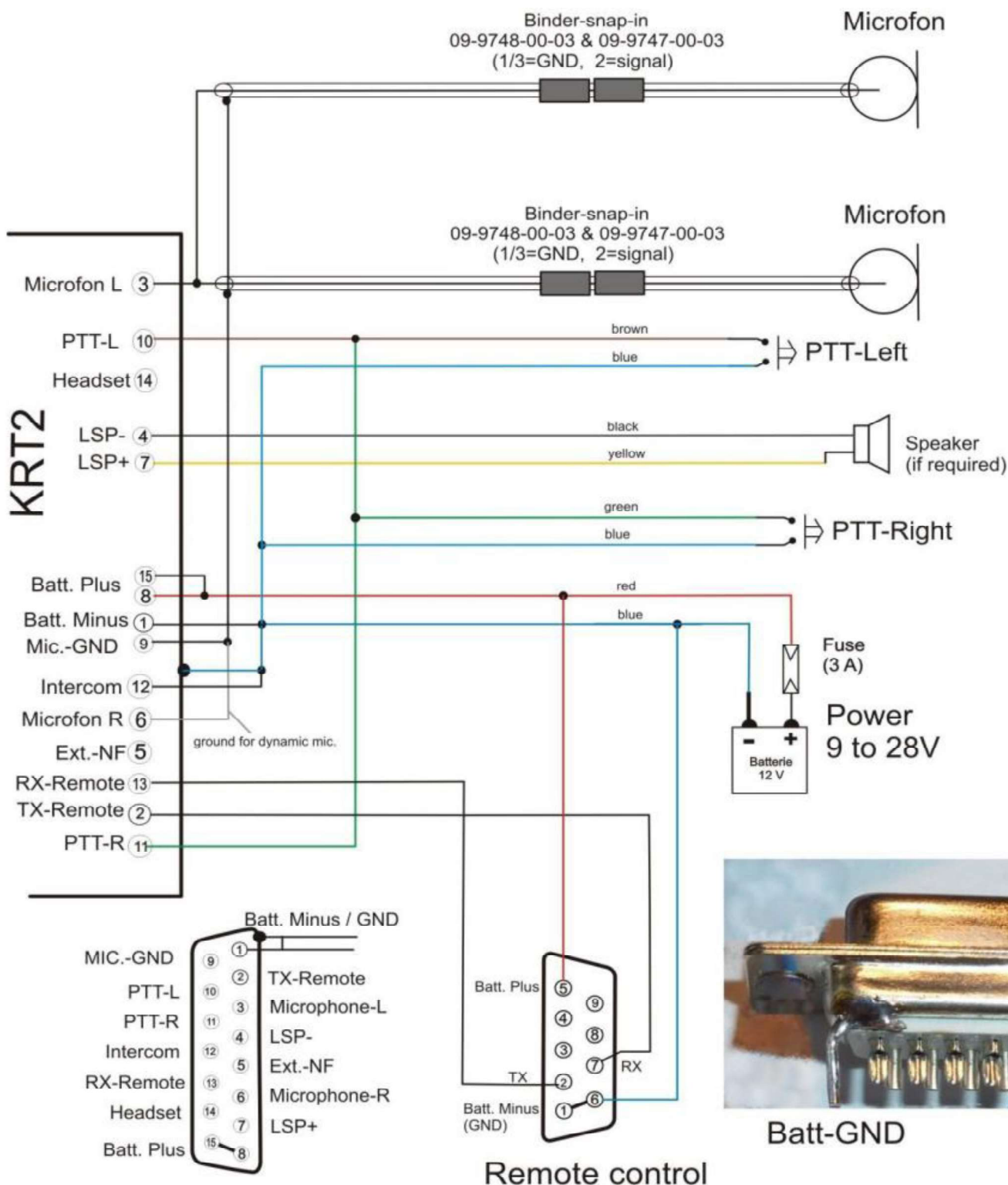


Figure 18: Wiring glider two-seater

### 6.9.4.3 Cabling for Gliders – Single-seater, dynamic microphone

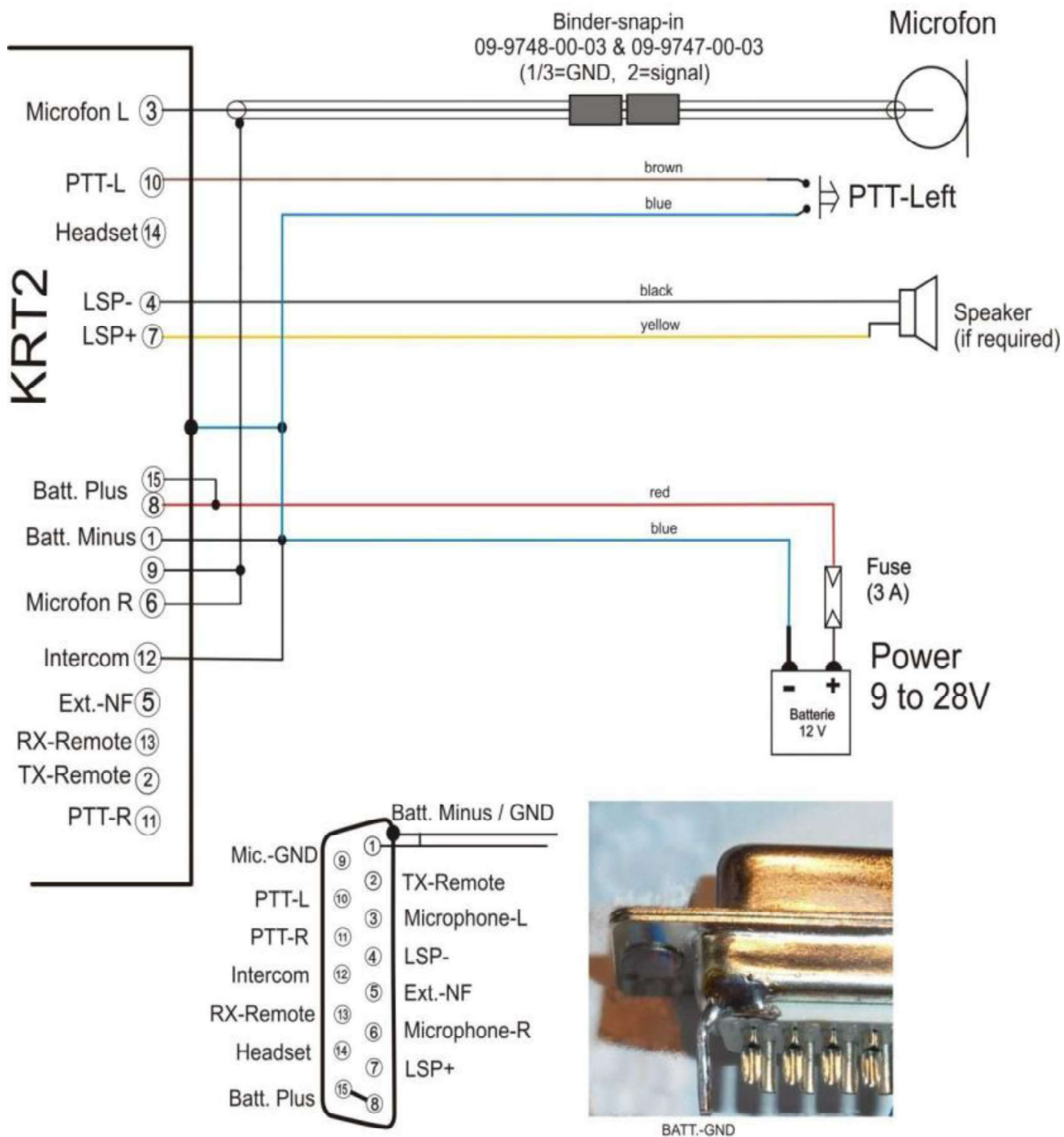


Figure 19: Wiring glider single-seater



### 6.9.4.4 Wiring for Motor glider – Single-seater

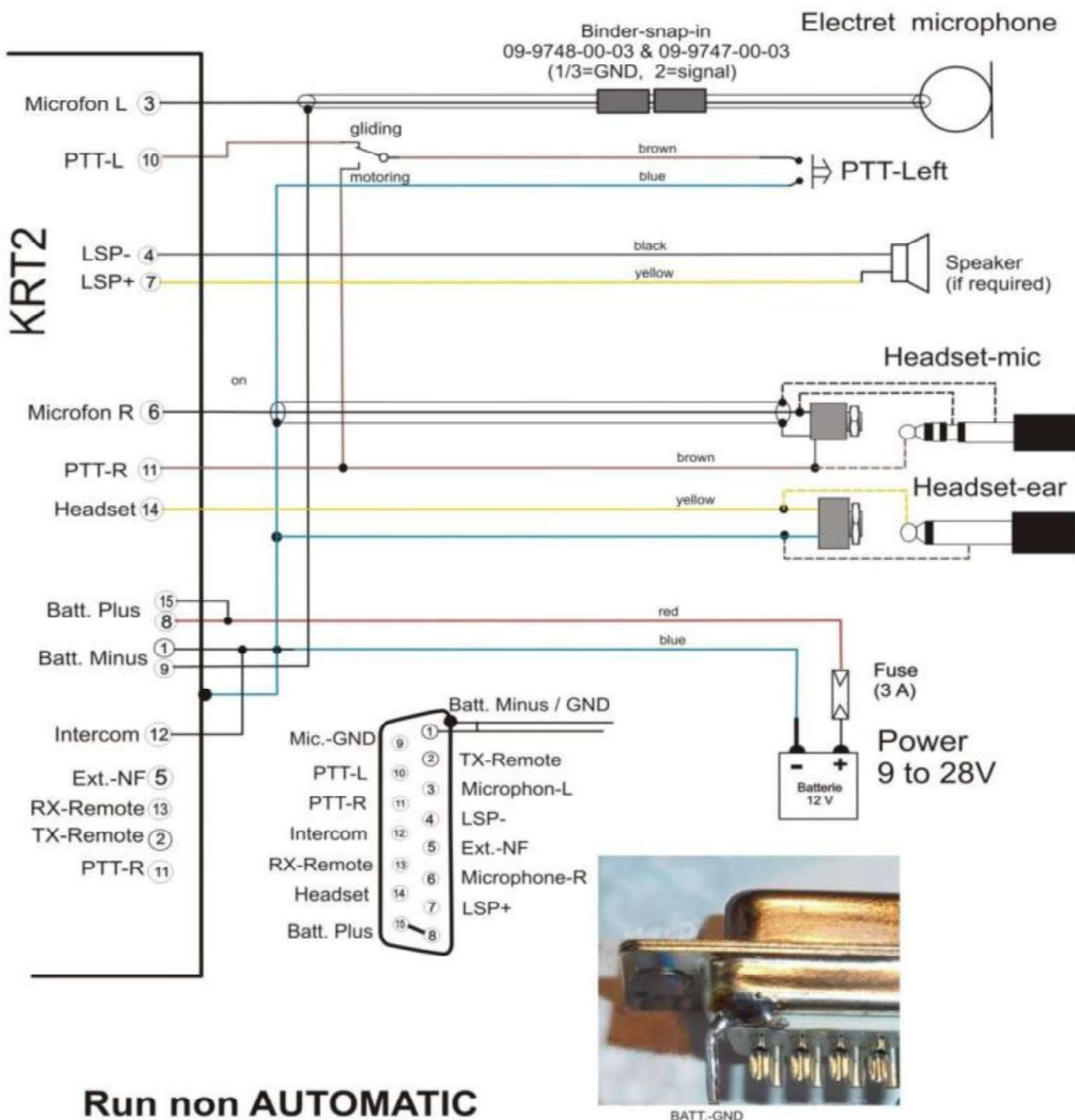


Figure 20: Wiring motor glider single-seater



### 6.9.4.5 Wiring for Motor glider – Two-seater, dynamic microphones

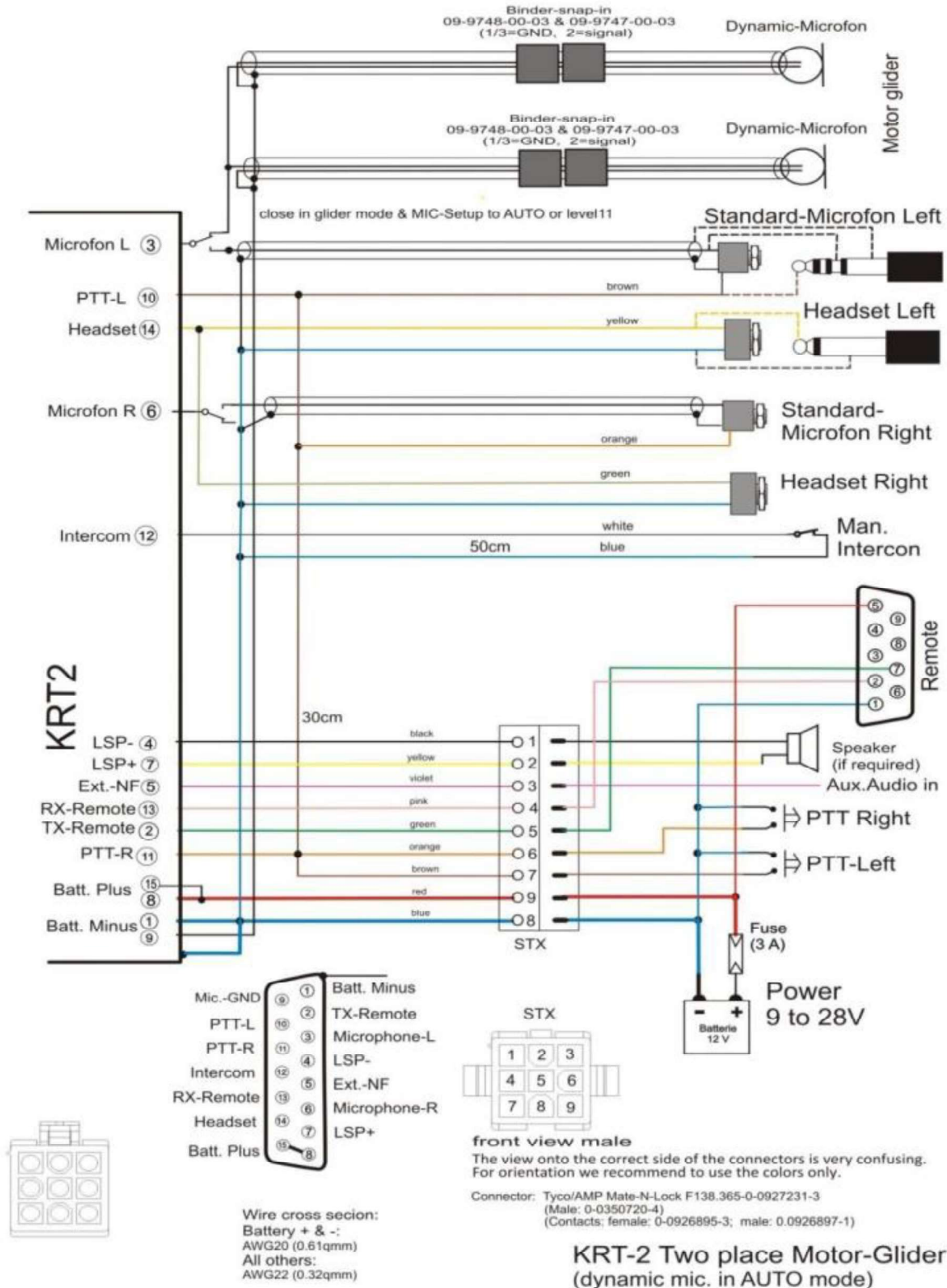


Figure 21: Wiring motor glider two-seater, dynamic microphones



### 6.9.4.6 Wiring for Motor glider – Two-seater, electret microphones

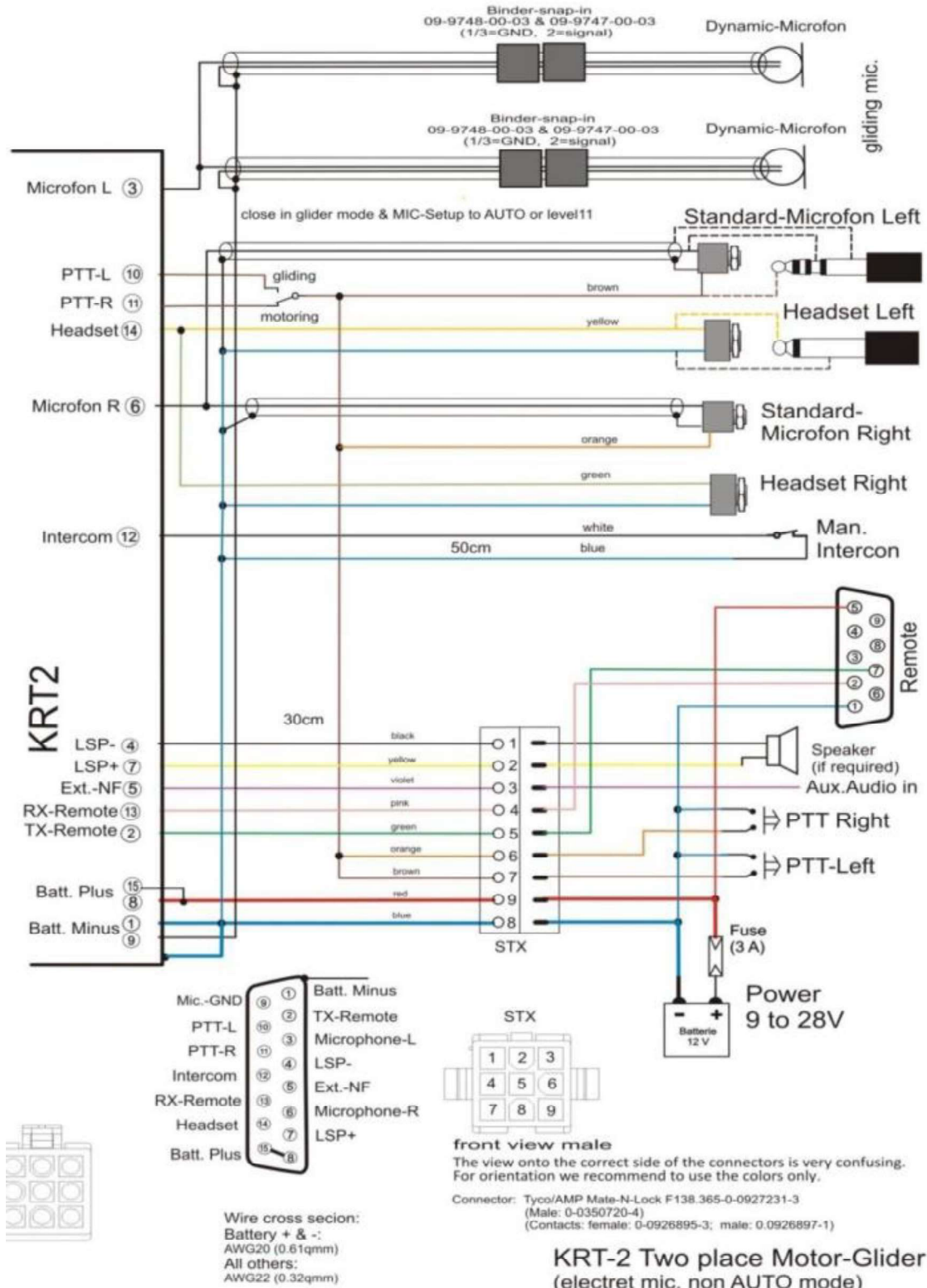



Figure 22: Wiring motor glider two-seater, electret microphones

### 6.9.5 Connection of dynamic microphones

Special attention must be paid to the cabling for dynamic microphones, as the necessary high amplification can cause even the smallest ground faults to cause interference and feedback.

	Never connect the microphone ground to live ground.
---	---

The best ground connection is via the device housing. Therefore the negative battery connector should be placed together with pin 1 on the housing and the microphone ground should be placed only on pin 9, as shown in the examples above.

### 6.9.6 Connection aid: ST1 Mating connector

A small adapter board is inserted into the D-plug in order to be able to connect the shields of the shielded cables cleanly and to prevent unwanted ground loops:

The board is placed between the contact rows and soldered so that the general GND is on pin 1 together with the housing shield.

The microphone ground (pin 9) has its own soldering surfaces for shielding.

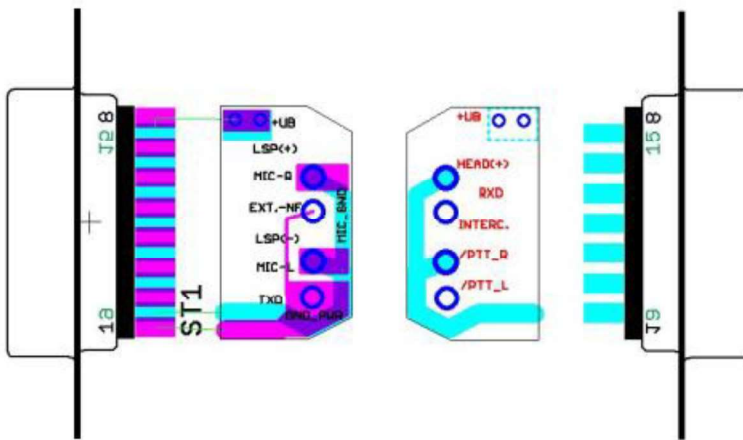
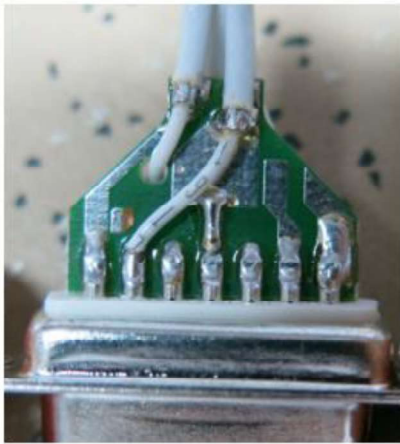
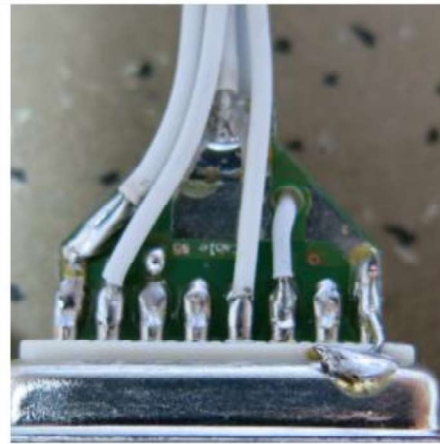


Figure 23: ST1 Interface adapter board



From left to right:  
Pin 9: GND Mikrofon  
Pin 10: PTT-L  
Pin 11: PTT-R  
Pin 12: Intercom with Bridge to Gnd  
Pin 13: RX  
Pin 14: Headset  
Pin 15: connected with Pin 8 Batterie+



From left to right:  
Pin 8: Batterie plus  
Pin 7: Speaker +  
Pin 6: Mikrofon R  
Pin 5: Ext. NF  
Pin 4: Speaker minus (not GND)  
Pin 3: Mikrofon L  
Pin 2: TX Remote  
Pin 1: Batterie – GND

Figure 24: ST1 Interface adapter board (view of the wiring)



## 6.10 Antenna

### 6.10.1 Antenna selection

- A VHF-COM antenna with an impedance of 50 Ohm is required.
- The antenna must be suitable and approved for the aircraft and the intended installation location.
- The specified performance of the device depends on proper installation.

### 6.10.2 Installation recommendations

- The manufacturer's instructions must be observed.
- The metallic contact between aircraft surface and antenna must be very good. For airplanes with non-metallic surfaces, a metal grid/sheet must be glued to the inside of the fuselage as an electrical counterweight (min. 80 cm x 80 cm).
- In order to avoid mutual interference between the devices, the antenna distance between a voice radio and a navigation antenna or between two COM antennas should be as large as possible. A distance of 2 meters is usually sufficient.
- The antenna must be mounted vertically on or under the fuselage so that it is as far away as possible from all shielding parts (propeller, landing gear, vertical tail).
- For installation in gliders, the internal antenna installed by the manufacturer should be used.



The HF antenna cable must not be integrated into other wiring harnesses, e.g. power supply and microphone. It must also not be laid together with other antenna cables, e.g. NAV or transponders.

## 6.11 Microphone – General notes

The setting of the MIC and VOX values is important for on-board intercom, see 2.2.3.11 and 2.2.3.3. With the VOX value the volume threshold shall be set so that normal flight noises are not transmitted to the headphones, but the connection is only established when the microphone is directly spoken to. For strong background noise, such as open planes or uncompensated microphones, a manual intercom mode should be selected.

The following settings must be made for this:

- The VOX value must be set to 1 to permanently activate the intercom connection.
- The switching on/off of the Intercom mode must then be activated with the help of a separate (or two parallel) Intercom talk button(s). This switch must be wired between pin 12 (intercom) of the device plug and GND.



The intercom talk button must not be confused with the PTT button.



The intercom muting is indicated by an "e" when the input is not connected to GND.



For normal operation of the VOX, pin 12 must be permanently connected to GND.



In principle, the suppression of background noise is only possible with differential microphones, as is common with modern headsets. Normal electret microphones are not suitable for this.

## 6.12 Inspection after installation



The inspection of the installed system **MUST** be carried out by an approved aviation company.

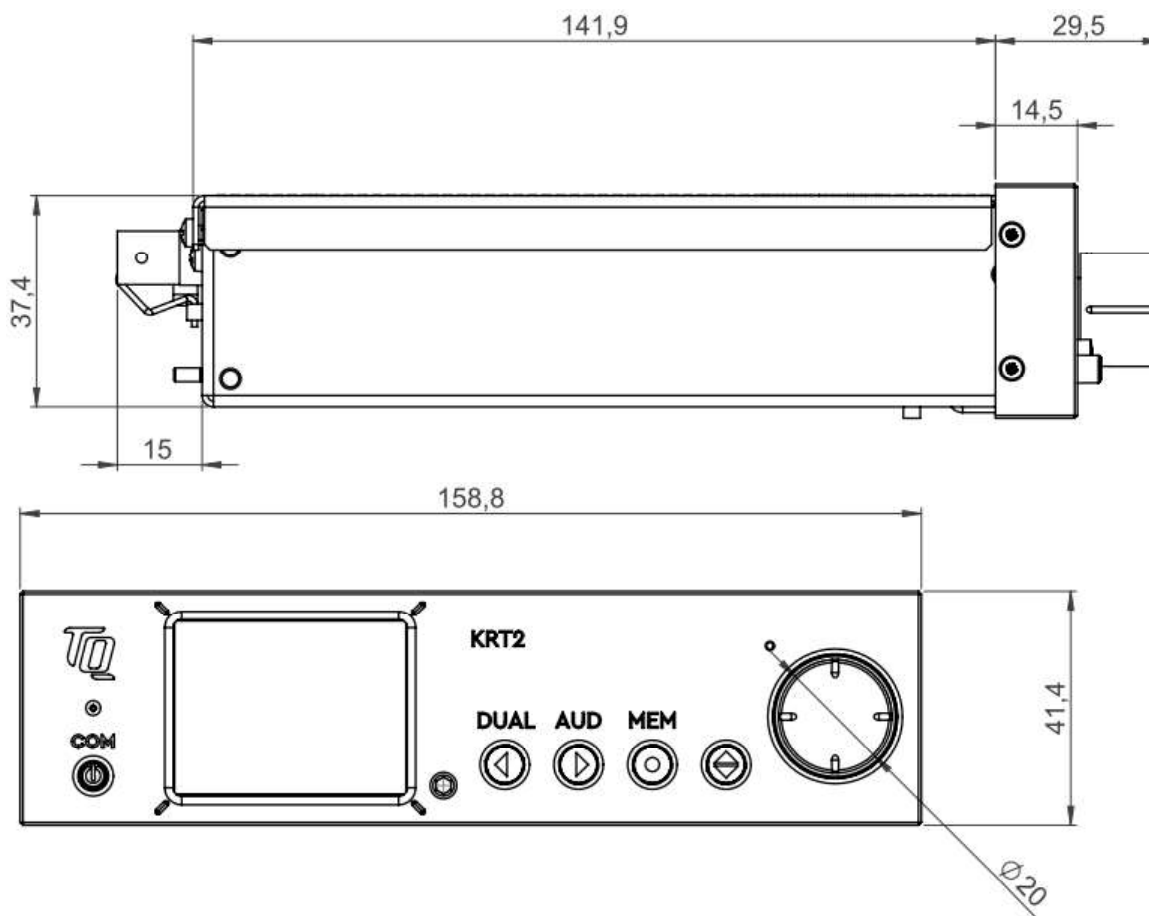
- All control and monitoring functions of the airplane must be tested to prevent interference from wiring.
- The standing wave ratio must be less than 3:1.
- A test flight is also recommended to ensure satisfactory operation of the radio in flight:
  - At an altitude of at least 2000 feet above ground contact a ground station at least 50 km away.
  - Pay attention to unusual electrical noise.
  - If possible, determine the ability to communicate on frequencies in the upper and lower VHF radio frequency ranges.

## 6.13 Accessories

Suitable accessories such as antennas, cable harnesses, plugs and switches can be found in the current price list or in the online shop at <https://www.tq-avionics.com/>.

## 6.14 Drawings

### 6.14.1 Dimensions KRT2-F





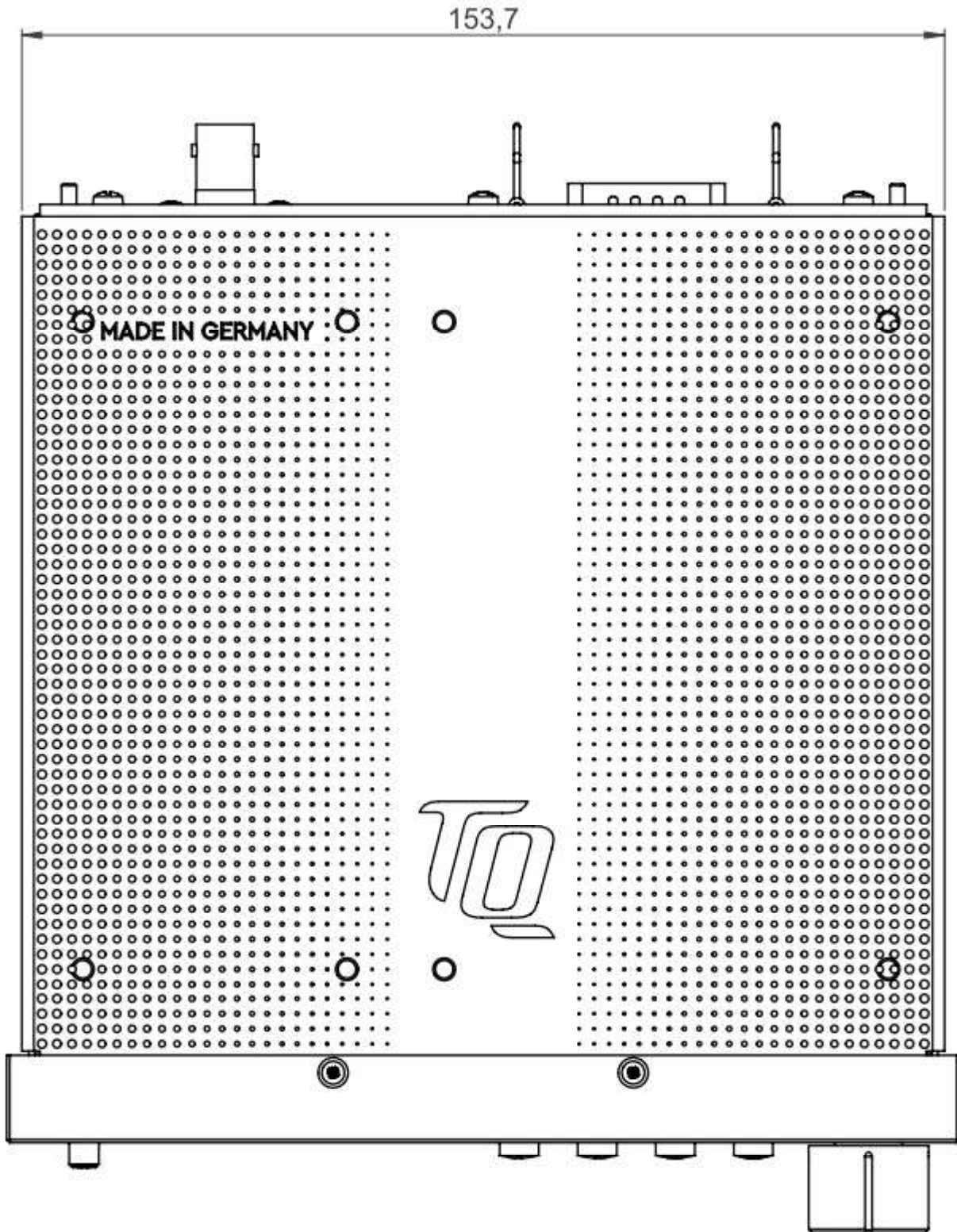


Figure 25: Dimensions KRT2-F



## 6.14.2 Dimensions KRT2-S2

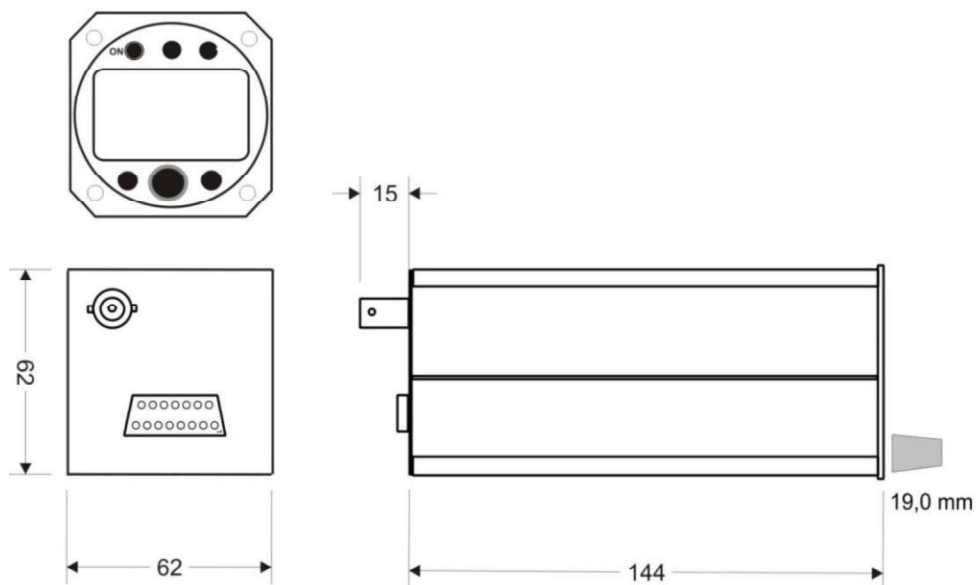


Figure 26: Dimensions KRT2-S2

### 6.14.2.1 Installation details KRT2-S2

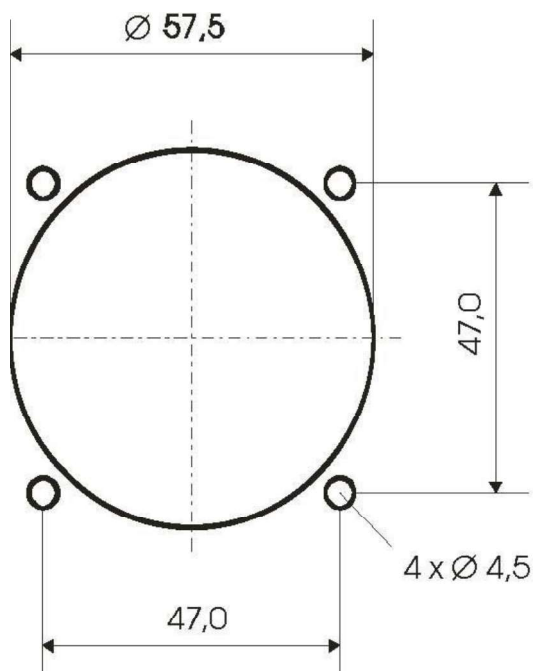


Figure 27: Panel cutout KRT2-S2

### 6.14.3 Rear connections

The following picture shows the necessary space required for connections at the rear side of the transceiver.

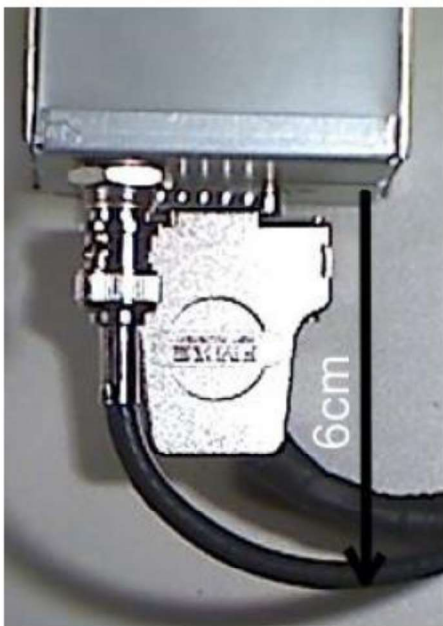


Figure 28: Required space for connections



## **7. Maintenance**

### **7.1 Periodic maintenance**

No periodic maintenance work is required for the device, such work is carried out "on condition". This means that no specific maintenance intervals are required to maintain airworthiness and no other maintenance is required as long as the unit is functioning properly. If a service or maintenance has to be carried out, a complete performance test according to the TQ Systems GmbH service procedures has to be carried out afterwards.

### **7.2 Repairs**

Only an exchange of modules is permitted.

In the event of a device defect, the device must be returned to the manufacturer, see 1.6.

### **7.3 Cleaning**

The display may only be cleaned with a dust-free cloth, e.g. spectacle cloth.



## 8. Technical data

### 8.1 General information

designation	
<b>Approval Number</b>	KRT2-F: EASA.21O.10074039 KRT2-S2: EASA.21O.10063547
<b>Approval Standards</b>	ETSO-2C169a / TSO-C169a Emitter: ED-23C Class 4,6 / DO-186B, Class 4,6 Receiver: ED-23C Class C-D-E-H1/2 / DO-186B, Class C-D-E
<b>Applied standards</b>	RTCA DO-186B / EUROCAE ED-23C RTCA DO-160F / EUROCAE ED14F RTCA DO-178C / EUROCAE ED-12C, Level D RTCA DO-254 / ED80 Level C SAE AS8003 FCC ID: 2ANFF-KRT2F (KRT2-F) FCC ID: 2ANFF-KRTS2 (KRT2-S2)
<b>Dimensions</b>	KRT2-F: 158.75 x 41.4 x 190.35 +/- 1 mm (6.25" x 1.63" x 7.5")  KRT2-S2: 62 x 62 x 144 +/- 1 mm (2.44" x 2.44" x 5.67")
<b>Weight</b>	KRT2-F: 0.600 kg (1.3 lbs) KRT2-S2: 0.400 kg (0.8 lbs)
<b>Assembly</b>	KRT2-F: Panel cut-out 155 x 38 +/- 0.2 mm (6.1" x 1.5") Installation depth Frame, short: 140 +/- 0.2 mm (5.5") Frame, long: 236.4 +/- 0.2 mm (9.3")  KRT2-S2: Panel cut-out Ø 57 mm (2.24")
<b>Temperature Ranges: Operation Storage</b>	-20 °C to +55 °C -55 °C to +85 °C
<b>Altitude</b>	35000 feet



designation	
<b>Vibration</b>	DO-160F, Cat. S, Vibration Curve M
<b>Humidity</b>	RTCA DO-160F, Cat. A
<b>Shock</b>	6G operation 20G crash safety
<b>RTCA DO-160F ENV. Cat.</b>	[C4Z]CAB[SM]XXXXXXXXZBBB[AC]TMXXXAX
<b>Software Cat.</b>	ED-12C (RTCA DO-178C) Level D
<b>Hardware Cat.</b>	DO-254 Level C
<b>Power supply</b>	9 VDC to 30 VDC, emergency operation at 9 VDC Typical current consumption at 13.8 VDC: <ul style="list-style-type: none"> <li>• Transmitter: 2.0 A</li> <li>• Receiver: 0.13 A</li> <li>• Lighting: Up to 0.017A</li> <li>• AF Amplifier: Up to 1A</li> </ul>
<b>Power consumption</b>	Standby 2.4W, transmit mode 30 W
<b>Frequency range</b>	117,975 - 137,000 MHz
<b>Frequency accuracy</b>	±5 ppm
<b>Protection</b>	Required external fuse: 3 A, slow blow
<b>Compass Safety distance</b>	300 mm (12")

Table 10: General technical data



## 8.2 Transmitter

transmitters	
<b>Transmitter Power</b>	6 W (nominal) at >13.5V 4 W (minimum)
<b>Harmonic Distortion</b>	<10 % with 70 % modulation
<b>Sidetone Output</b>	>0.5W to 300Ω (headphone output)
<b>Microphone Inputs</b>	2x standard (50mV...2V) to 100Ω or dynamic
<b>Spurious Attenuation</b>	> 60dBc
<b>Modulation Audio Response</b>	Deviation <6 dB between 350...2500Hz
<b>Modulation-to-noise Ratio</b>	>35dB at 70% modulation degree
<b>Interference Frequency Modulation</b>	<1kHz at m=70% / 1kHz
<b>Transmission Cycle</b>	2 minutes on, 4 minutes off; automatic switch-off of the transmitter after 2 minutes continuous transmission operation

Table 11: Technical data transmitter

## 8.3 Receiver

receivers	
<b>Sensitivity</b>	-105 dBm (>6 dB S+N/N, m = 30% / 1kHz)
<b>Selectivity 25 kHz</b>	-6 dB bandwidth > ±8.0 kHz -40 dB bandwidth < ±17.0 kHz -60 dB bandwidth < ±22.0 kHz
<b>Selectivity 8.33 kHz</b>	-6 dB bandwidth > ±2.78 kHz -60 dB bandwidth < ±7.37 kHz
<b>Audio Output</b>	≥10 W to 4 Ω (speaker output)
<b>AGC Characteristics</b>	Deviation of the AF output < 6 dB from 10 μV to 10 mV
<b>Squelch</b>	automatic squelch (adjustable)
<b>Spurious Response</b>	> 80 dB
<b>Demodulated Audio Distortion</b>	<25% at rated power (85% / -33dBm) <10% at 10dB below rated power (70% / -33dBm)

Table 12: Technical data receiver



## 9. EXCLUSIVE LIMITED WARRANTY and LIMITATIONS ON LIABILITY

1. Our warranty and liability is based on legal provisions, provided nothing else has been agreed.
2. Delivery items may differ from product illustrations, especially in regard with color and weight. Such differences do not constitute a defect of quality which is relevant for warranty claims.
3. The Customer's warranty rights are subject to the fact that the Customer has properly fulfilled its obligations of examination and notification of defects under § 377 HGB (Commercial Code).

Inasmuch as the Customer is a consumer, the delivery will be considered as approved if written notice of defects is not received within a period of ten (10) working days after arrival of the goods. If the defect was not noticeable in an ordinary inspection the period is extended to four (4) weeks.

If the claim for defects is not filed in good time, warranty shall be excluded.

4. Our warranty obligation to the Customer ends 36 months after delivery to the Customer or 24 months after delivery to the end customer, whichever period expires first. The warranty obligation for claims for subsequent performance, replacement deliveries or replacement performance after a substitute performance, replacement delivery or replacement performance exist within the scope of the remaining period of the warranty term as stated above.
5. The warranty period expires prematurely, however, if repair attempts or other modifications are made to the contractual objects by the Customer or agents it has commissioned without the prior agreement.
6. Our liability for damages attributable to it or its agents is, in cases of gross negligence or damage with negligence, an obligation that is significant for achieving the purpose of the contract and is financially and materially limited to the business and product liability insurance cover concluded. Any further liability is excluded.



## 10. Software License Conformity

The copyright holders, disclaimers and license texts can be downloaded from the following website:

<https://www.tq-group.com/en/support/downloads/tq-software-license-conditions/>

or contact the product management by e-mail:

<mailto:support@tq-general-aviation.com>





**Appendix A. Frequency/channel plan for the 8.33 kHz grid**

Operating frequency (MHz)	Channel spacing (kHz)	Displayed channel 8.33 kHz spacing	Displayed channel 25 kHz spacing
<b>118.0000</b>	<b>25</b>	<b>118.000</b>	<b>118.000</b>
118.0000	8.33	118.005	
118.0083	8.33	118.010	
118.0166	8.33	118.015	
<b>118.0250</b>	<b>25</b>	<b>118.025</b>	<b>118.025</b>
118.0250	8.33	118.030	
118.0333	8.33	118.035	
118.0416	8.33	118.040	
<b>118.0500</b>	<b>25</b>	<b>118.050</b>	<b>118.050</b>
118.0500	8.33	118.055	
118.0583	8.33	118.060	
118.0666	8.33	118.065	
<b>118.0750</b>	<b>25</b>	<b>118.075</b>	<b>118.075</b>
118.0750	8.33	118.080	
118.0833	8.33	118.085	
118.0916	8.33	118.090	
<b>118.1000</b>	<b>25</b>	<b>118.100</b>	<b>118.100</b>
118.1000	8.33	118.105	
etc.	etc.	etc.	etc.

Table 13: Frequency/channel plan 8.33 / 25 kHz



## **TQ-Systems GmbH**

Support E-mail: [support@tq-general-aviation.com](mailto:support@tq-general-aviation.com)

Internet: [www.tq-avionics.com](http://www.tq-avionics.com)