

m&h RADIO-WAVE RECEIVER

RWR95.50



Manual Version V01.00-REV01.00
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1 Description



1.1 General

1.1.1 Preface

The instructions and safety instructions in this manual have to be strictly observed to guarantee a safe and reliable function of the receiver and to avoid personal and material damage. The meaning of the symbols related to the safety instructions is described in the table below:

 CAUTION	CAUTION indicates a hazard which can lead to injuries if not avoided.
NOTICE	NOTICE indicates information considered important, but not hazard-related (e.g. messages relating to property damage).
INFORMATION	INFORMATION indicates important information or helpful advice for working with the described device.

1.1.2 Safety Instructions

 CAUTION	
Risk of injuries due to electric shock!	
When connecting the radio-wave receiver to the control, there is a danger of electric shock. Incorrect connection may result in unsafe usage of the radio-wave receiver.	
<ul style="list-style-type: none"> • Connection must only be carried out if the machine is switched to a completely de-energized state and only by especially trained and qualified personnel. 	
 CAUTION	
Risk of injuries due to moving machine parts or defect compressed air lines!	
When connecting compressed air lines there is a risk of injuries/eye injuries due to defect compressed air lines and uncontrolled moving machine parts.	
<ul style="list-style-type: none"> • Installation of the radio-wave receiver must only be carried out if the machine is switched to a completely de-energized and de-pressurized state. • Installation must only be carried out by appropriately trained and qualified personnel. • The radio-wave receiver may only be operated with the protective equipment (protective door) closed. Disabling the guards is strictly forbidden. 	
NOTICE	
Risk of material damage caused by third-party parts!	
<ul style="list-style-type: none"> • Only use the original spare parts listed in these operating instructions to perform maintenance and repairs. 	
INFORMATION	
The information given in this manual can be changed by the manufacturer at any time. Thus the user is responsible to regularly inquire about updated information.	

1.1.3 Declaration of Conformity

Declarations of Conformity can be requested as required. The contact information for this purpose is listed at the end of these operating instructions.

1.1.4 FCC- / RSS-Declaration

- This device complies with Part 15 of the FCC Rules [and with Industry Canada licence-exempt RSS standard(s)]. Operation is subject to the following two conditions:
 - (1) This device may not cause harmful interference, and
 - (2) This device must accept any interference received, including interference that may cause undesired operation.
- This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the device is operated in a commercial environment. This device generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- The radiated output power of the device is far below the FCC radio frequency exposure limits. Nevertheless, the device shall be used in such a manner that the potential for human contact during normal operation is minimized.

1.1.5 Validity

This document is valid for the hardware available at the time of creation of these operating instructions. The manufacturer reserves the right to make technical modifications. The latest version of these operating instructions can be downloaded at www.mh-inprocess.com under Downloads.

1.2 Purpose

The radio-wave receiver RWR95.50 is used for reception of measuring signals from m&h touch probe system RWP25.50.

1.3 System components

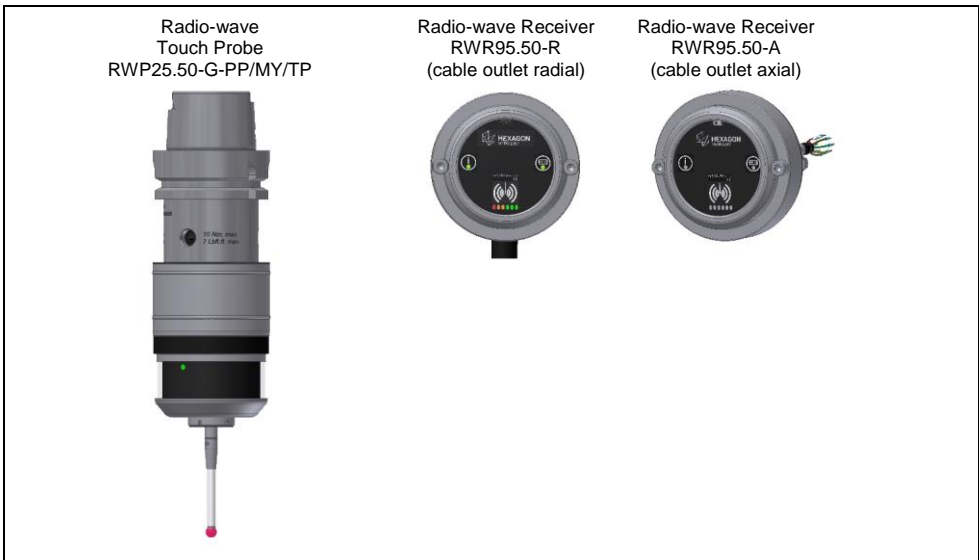


Fig. 1 System components

1.4 Technical Data

Reception Area	2400-2483.5 MHz (2.4 GHz)
Modulation Process	DSSS
EMC-tested	CE conforms
Power supply	12 - 32 VDC, max. 100 mA
Weight	RWR95.50-A = 1450 g (with cable) RWR95.50-R = 1550 g (with cable and protection tube)
Temperature range	Operation: 10° - 50°C Storage: 5° - 70°C
Material	Stainless steel
Sealing	IP68: EN60529 IEC529/DIN40050
Mounting	2x Cap head screws M5
Connecting Cable	15 m with strands
Protection Tube	1 m (PUR)

1.5 Dimensions

1.5.1 Dimensions RWR95.50-R

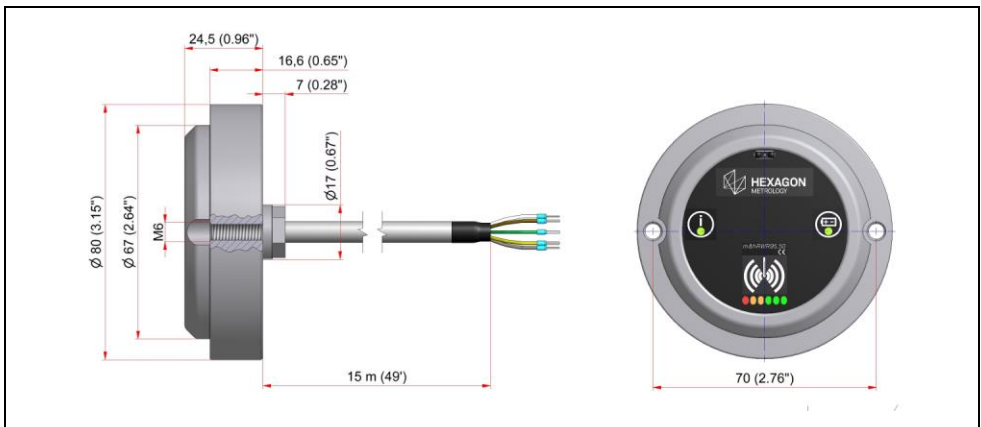


Fig. 2 Dimensions RWR95.50-A (cable outlet axial)

1.5.2 Dimensions RWR95.50-A

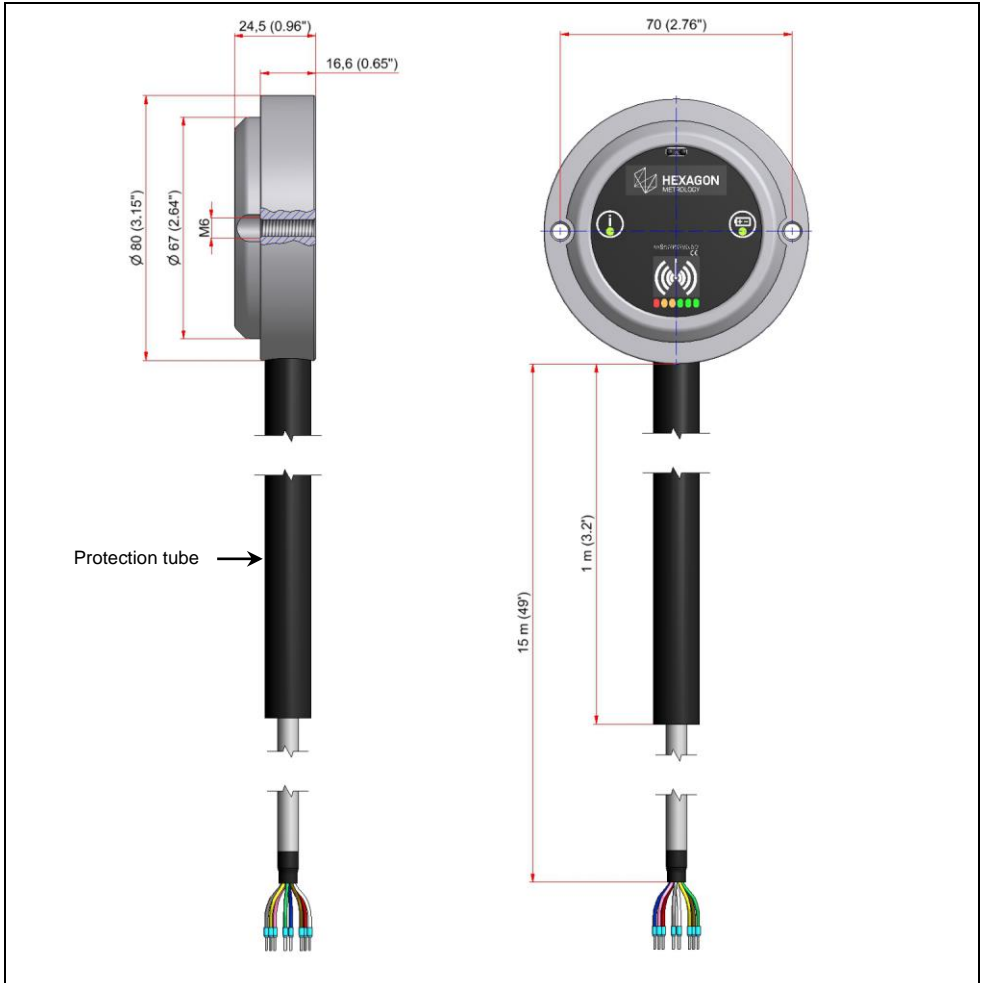


Fig. 3 Dimensions RWR95.50-A (cable outlet radial)

1.6 Transmission and Reception Area

INFORMATION

The transmission/reception ranges shown below only apply under optimum operating conditions.

It is recommended that the receiver is arranged so that the measuring system is within an angle of -30° to 30° relative to the receiver (see Fig. 4).

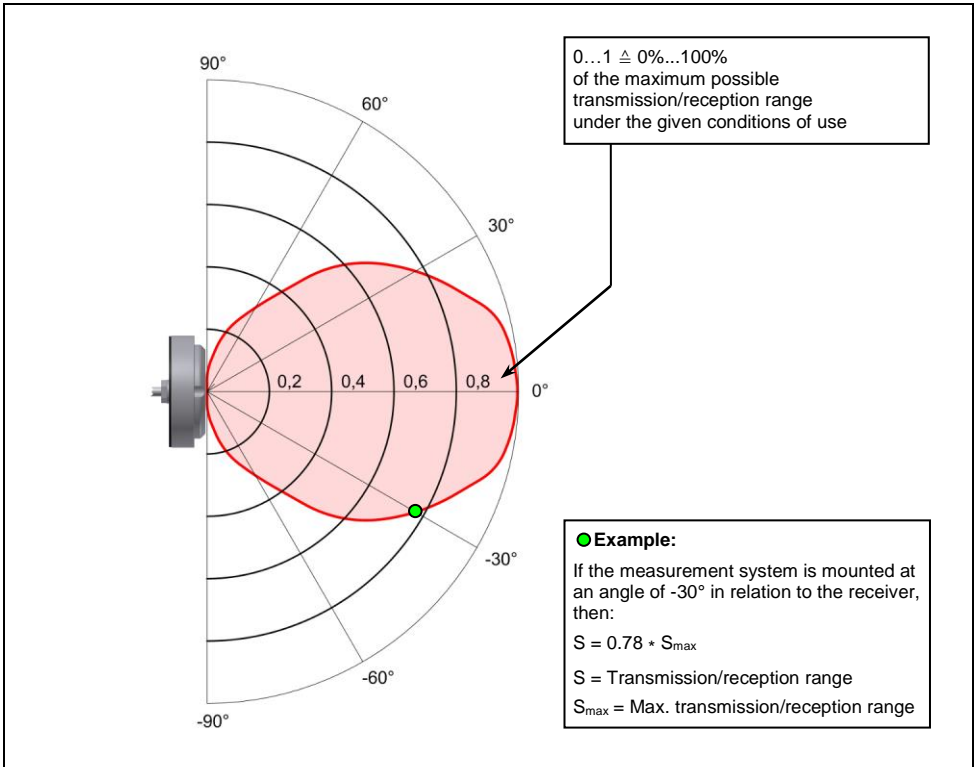









Fig. 4 Transmission and reception area (emission behaviour of antenna)

1.7 Delivery Contents, Accessories and Spares












1.7.1 Delivery Contents

Order number	Description	
95.50-RWR-A 95.50-RWR-R	Radio-wave Receiver RWR95.50-R (radial) with connecting cable (15 m)	Radio-wave receiver RWR95.50-A (axial) with connecting cable (15 m)
	Mounting parts: 2x Cap head screw DIN912 M5x30 (5297) 1x Gasket (Viton) (5286) 2x Spring washer DIN128 (3478) 2x Nut DIN934 M5 (0852) 1x Tube clip (0201) 1x Tube fitting M16x1.5 (2543) 1x Sealing ring for M16 (2541) 1x Nut M16x1.5 (2542)	Mounting parts: 2x Cap head screw DIN912 M5x30 (5297) 1x Gasket (Viton) (5286) 2x Spring washer DIN128 (3478) 2x Nut DIN934 M5 (0852)

1.7.2 Accessories

Order number	Description	Illustration
91.40-ST2-X12	Connecting cable (2 m) with plug and strands for Heidenhain (X12)	
35.40-ST2-X13	Connecting cable (2 m) with plug and strands for Heidenhain (X13)	
91.40-ST2-X112	Connecting cable (2 m) with plug and strands for Heidenhain iTNC 530 HSCI/TNC620, (X112)	
35.40-ST2-X113	Connecting cable (2 m) with plug and strands for Heidenhain iTNC 530 HSCI/TNC620, (X113)	
91.10-SI-UN	Connecting cable (2 m) with plug and strands for Siemens control	
91.10-FA-UN	Connecting cable (6 m) with plug and strands for Fanuc High Speed Skip	
91.10-SE-UN	Connecting cable (2 m) with plug and strands for Selca control	
4069	Signal converter	

1.7.3 Spare Parts

Order number	Description	Illustration
5297	Cap head screw DIN912 M5x30	
5298	Cap head screw DIN912 M5x25	
3826	Cap head screw DIN912 M5x12	
3478	Spring washer	
0852	Nut DIN934 M5	
5286	Gasket (Viton)	
2542	Nut M16x1.5	
2543	Tube fitting M16x1.5	
2541	Sealing ring for M16	
0201	Tube clip	
95.50-M	Mounting bracket with mounting parts: 2x Cap head screw DIN912 M5x25 (5298) 2x Cap head screw DIN912 M5x12 (3826) 4x Nut DIN934 M5 (0852) 2x Spring washer (3478)	

2 Operation

2.1 Mounting

2.1.1 General Instructions for Mounting

NOTICE

Risk of transmission faults!

- Never mount the receiver in the vicinity of electrical components.
- Mount the receiver as close as possible to the touch probe.
- Preferably mount the receiver isolated from the machine for optimum reception.



Fig. 5 Mounting Instructions

2.1.2 Mounting RWR95.50-R

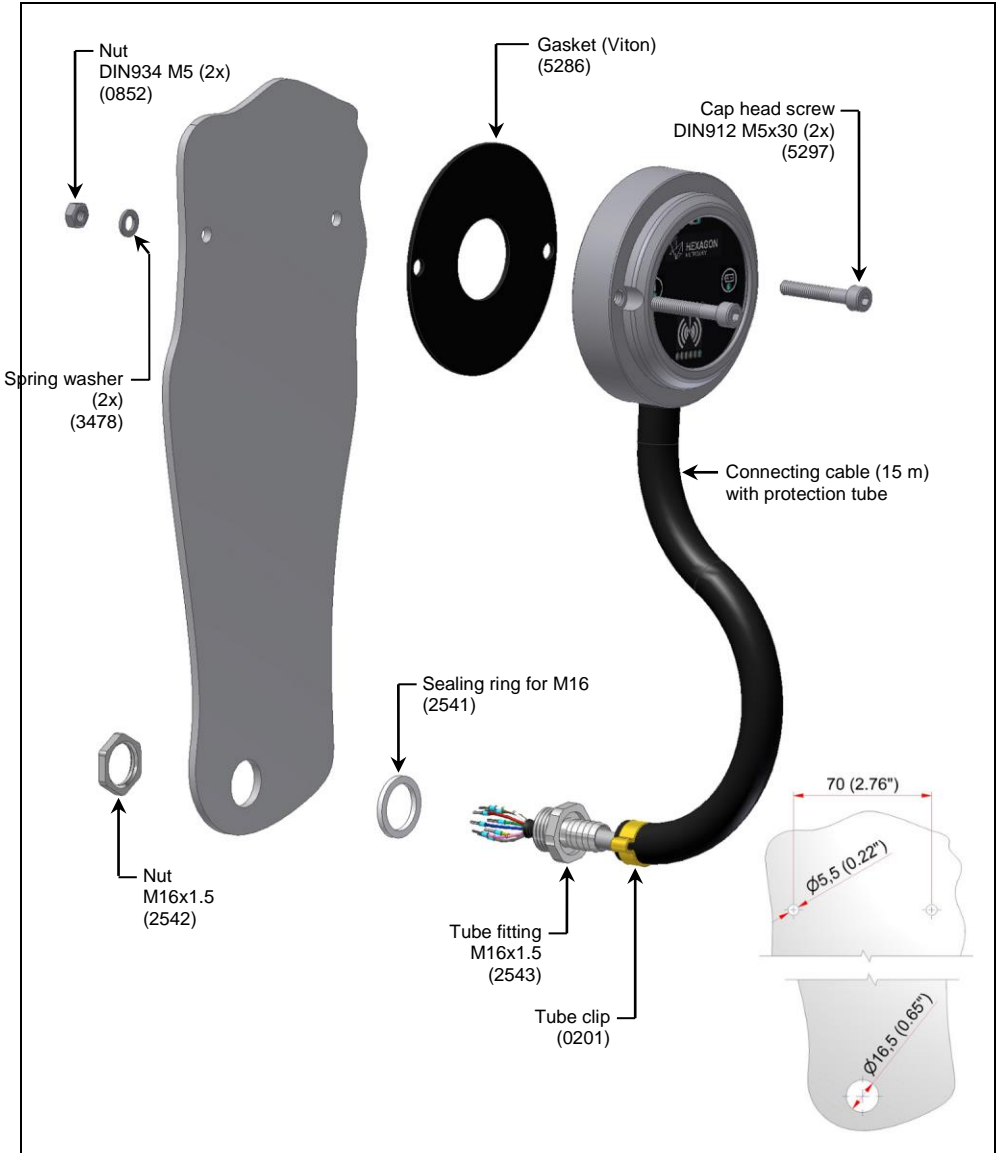


Fig. 6 Mounting RWR95.50-R

2.1.3 Mounting RWR95.50-R with Mounting Bracket

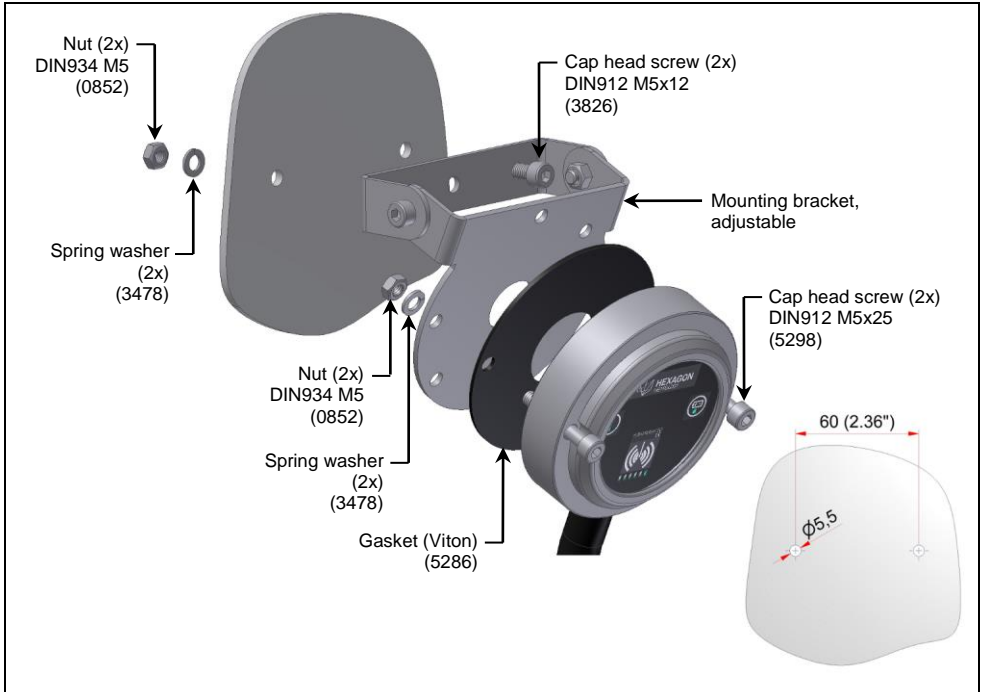


Fig. 7 Mounting RWR95.50-R with Mounting Bracket

2.1.4 Mounting RWR95.50-A

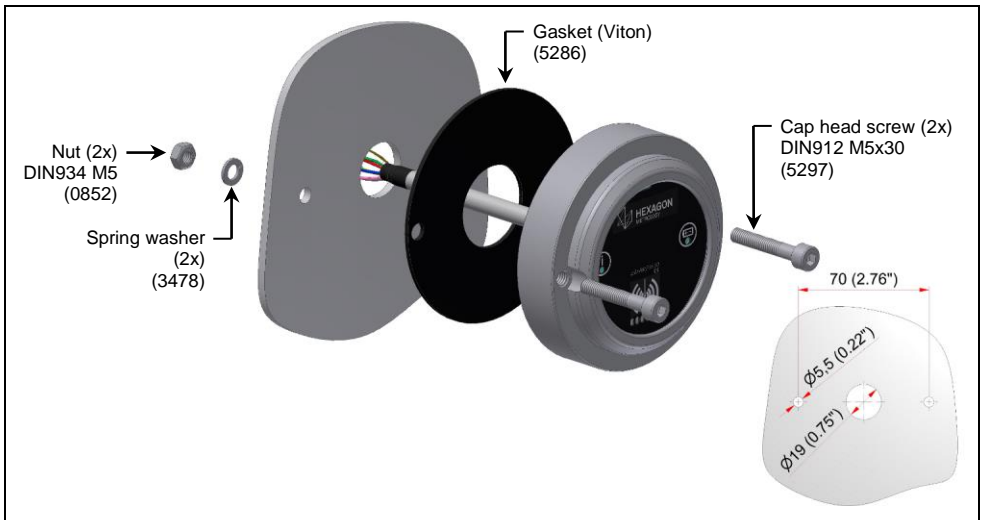



Fig. 8 Mounting RWR95.50-A

2.2 Connection

2.2.1 Electrical Connection

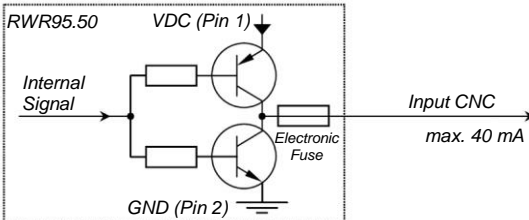
INFORMATION	
Wiring diagrams for specific controls and measurement-system combinations are available upon request.	
NOTICE	
Risk of material damage!	
<ul style="list-style-type: none"> First set the output signals (refer to chapter 2.3.1), then connect pins 3, 4 and 5. 	



Pin 1 VDC 12-32 V (<100 mA)	white
Pin 2 GND 0 V	brown
Pin 3 READY (max. 40 mA)	green
Pin 4 PROBE (max. 40 mA)	yellow
Pin 5 LOW BATTERY (max. 40 mA)	grey
Pin 6 M-Code "A" ON/OFF (Bidi) / GND 0 V (Mono)	pink
Pin 7 M-Code "B" ON/OFF (Bidi) / GND 0 V (Mono)	blue
Pin 8 Temperature measurement analog output	red
Shield - transparent	

Fig. 9 Electrical Connection

2.2.2 Output Circuit Pin 3, 4 and 5



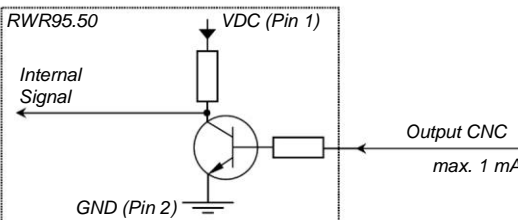
Circuit for outputs

- Pin 3 = READY
- Pin 4 = PROBE
- Pin 5 = LOW BATTERY

Low \leq GND + 1.2 V
High \geq VDC - 2 V

Fig. 10 Output Circuit Pin 3, 4 and 5

2.2.3 Input Circuit Pin 6 and 7



Circuit for inputs

- Pin 6 = Touch probe "A" ON/OFF
- Pin 7 = Tool Setter "B" ON/OFF
- Pin 6 + Pin 7 = Touch probe "C" ON/OFF

Low < 3 V - min. GND 0 V
High > 10 V - max. 12-32 VDC

Fig. 11 Input Circuit Pin 6 and 7

2.2.4 Output Circuit, Temperature Measuring Pin 8

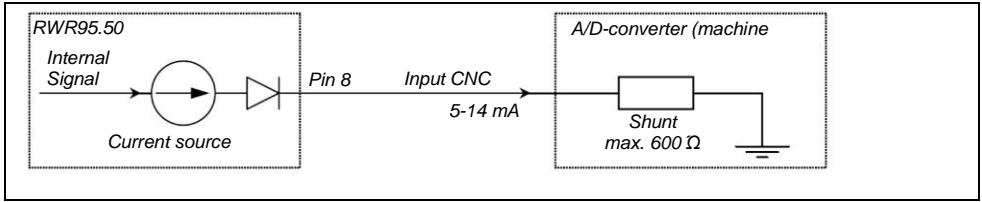


Fig. 12 Output Circuit, Temperature Measuring Pin 8

2.2.5 Signal Connection

INFORMATION

Temperature measurement is not possible with signal connection!

INFORMATION

Signal connection is recommended, if the machine control cannot check "READY".
The signal connection can be dynamically activated and deactivated by M-Code.

Signal connection is active, if voltage >10 VDC (HIGH) is applied to Pin 8:

- "ERROR" causes "PROBE"

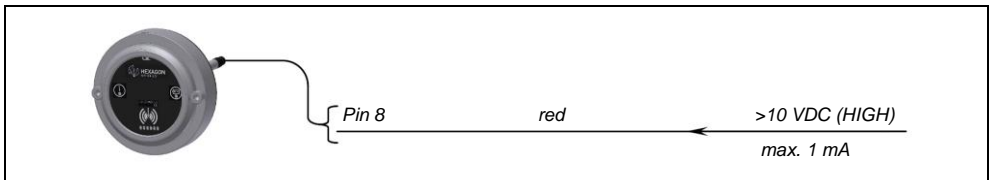


Fig. 13 Signal Connection

2.3 Output Signals

2.3.1 Setting the Behaviour of the Output Signals

The behaviour of the output signals is set using a rotary coding switch on the rear of the device. The setting only takes effect after a restart of the receiver.

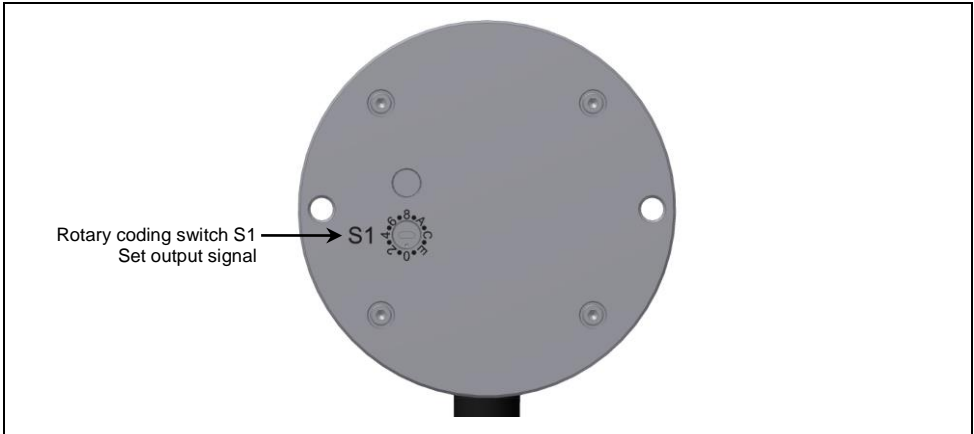















Fig. 14 Setting of output signal with the rotary coding switch

2.3.2 Overview of Output Signal Settings

Configuration	PROBE	ERROR	LOW BATTERY	Control
All output signals Push-Pull: LOW ≤ GND+1,2 V; HIGH ≥ VDC-2 V				
0*)	HIGH→LOW	HIGH→LOW	HIGH→LOW	Heidenhain/Siemens
1	HIGH→LOW	HIGH→LOW	LOW→HIGH	Fanuc Ordinary Skip / Siemens
2	HIGH→LOW	LOW→HIGH	LOW→HIGH	Fanuc Ordinary Skip / Siemens
3	LOW→HIGH	LOW→HIGH	LOW→HIGH	Fanuc Ordinary Skip / Siemens
4	LOW→HIGH	LOW→HIGH	HIGH→LOW	Fanuc Ordinary Skip / Siemens
5	LOW→HIGH	HIGH→LOW	HIGH→LOW	Fanuc Ordinary Skip / Siemens
6	LOW→HIGH	HIGH→LOW	LOW→HIGH	Fanuc Ordinary Skip / Siemens
7	HIGH→LOW	LOW→HIGH	HIGH→LOW	Fanuc Ordinary Skip / Siemens
	HIGH = 3.9 V – 5.4 V			
8	LOW→HIGH	HIGH→LOW	HIGH→LOW	Fanuc High Speed Skip
9	HIGH→LOW	HIGH→LOW	LOW→HIGH	Fanuc High Speed Skip
A	HIGH→LOW	LOW→HIGH	LOW→HIGH	Fanuc High Speed Skip
B	LOW→HIGH	LOW→HIGH	LOW→HIGH	Fanuc High Speed Skip
C	LOW→HIGH	LOW→HIGH	HIGH→LOW	Fanuc High Speed Skip
D	HIGH→LOW	HIGH→LOW	HIGH→LOW	Fanuc High Speed Skip
E	LOW→HIGH	HIGH→LOW	LOW→HIGH	Fanuc High Speed Skip
F	HIGH→LOW	LOW→HIGH	HIGH→LOW	Fanuc High Speed Skip
*) Setting for standard delivery				



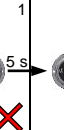








2.3.3 Signal Diagram (Bi-directional Mode)

Example of output signal "0" (Heidenhain/Siemens)

										
Received Signal	RWR95.50 OFF	RWR95.50 ON	Switching ON procedure	Probe ON	Probe deflected	ERROR during PROBE	LOW BATTERY	ERROR	Switching OFF procedure	Probe OFF
PROBE	---	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH	HIGH
READY	---	LOW	LOW	HIGH	HIGH	LOW	HIGH	LOW	LOW	LOW
LOW BATTERY	---	HIGH	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	HIGH	HIGH
Pin 6 Measurement system A ON or Pin 7 Measurement system B ON or Pin 6 + 7 Measurement system C ON	HIGH	LOW							2 s	
		red	green flashing	green	orange	red	green	red	red	red
							red			

2.3.4 Signal Diagram (Mono-directional Mode)

Example of output signal "0" (Heidenhain/Siemens)

								
Received Signal	RWR95.50 OFF	RWR95.50 ON	Probe in Spindle (ON)	Probe deflected	ERROR during PROBE	LOW BATTERY	ERROR	Probe from Spindle (OFF)
PROBE	---	HIGH	HIGH	LOW	HIGH	HIGH	HIGH	HIGH
READY	---	LOW	HIGH	HIGH	LOW	HIGH	LOW	LOW
LOW BATTERY	---	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	HIGH
		red	green	orange	red	green	red	red
						red		

2.4 Assigning the Touch Probe ("Synchronisation Mode")

Every receiver RWR95.50 is capable of managing the addresses of **three bidirectional** probes (probe configuration A/B/C). These probes are assigned in "Synchronisation mode" via the integrated IRDA interface. The address of the receiver is uniquely assigned to the probe and the address of the probe to the receiver. Should another probe be assigned the same probe configuration (A/B/C) as a probe already assigned at a later time, then the address of the probe first assigned is deleted in the receiver and the address of the new probe is saved. Synchronisation mode is started by the probe and the precise procedure for assignment is described in the operating instructions for the probe.

With mono-directional activation, the address of the probe is also assigned to the receiver in "Synchronisation mode". Any number of mono-directional probes can be operated by only one receiver. They only have to be synchronised once with their first use and are automatically detected by the receiver with subsequent use.

2.5 Automatic Frequency Assignment for Data Transmission

Blocking of Faulty Frequencies:

Providing the receiver is in "ERROR" status (no active connection between the touch probe/receiver), the receiver checks the environment for radio interference and evaluates the available frequencies in terms of their suitability for communication with the touch probe (signal quality). This enables all radio interference to be detected within a short time. Should a touch probe now be activated bidirectionally or should a mono-directionally activated touch probe issue a communication request, then the receiver assigns it to a transmission frequency with as small an interference range as possible.

Release of Frequencies:

If it is in "ERROR" status (no active connection between the touch probe/receiver), the receiver continues to always check the environment and constantly evaluates the frequencies. Therefore with new or additional communication requests, frequencies previously classified as poor can also be assigned, as the environmental situation (interference) has now been able to be improved.

2.6 Activation/Deactivation of the Measuring System

2.6.1 Bi-directional Mode

INFORMATION

In "ERROR" mode, the receiver scans the entire frequency range available to it for interference and internally evaluates the available frequency bands for their quality.
 If a touch probe is activated with a radio-wave signal, then the information is simultaneously transmitted with the activation signal about which frequency band communication is to be made (best quality).
 The transmission is a semi-duplex transmission, i.e. the signal transmission takes place alternately in both directions.

1. Switching ON the probe:
 - 1.1. Load probe.
 - 1.2. Switch ON signal from machine control to receiver.
 - 1.3. Receiver switches touch probe on by radio-wave signal and transmits the optimum frequency band for further communication.
 - 1.4. Probe transmits "READY" signals to receiver.
 - 1.5. Receiver transmits "READY" signal to machine control.
 - 1.6. Probe ready to work.
2. Switching OFF the touch probe:
 - 2.1. Machine control sends switch-off signal to receiver.
 - 2.2. The touch probe automatically switches to Standby mode as soon as no transmission confirmation from the receiver is registered.

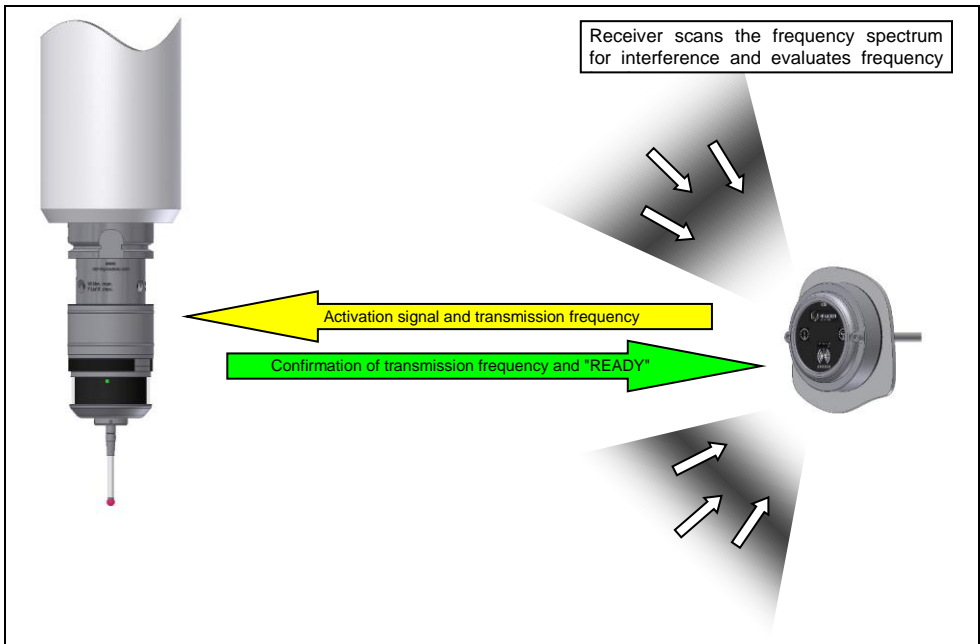


Fig. 15 Measurement system activation in bi-directional mode

The touch probe RWP20.50 can be activated and deactivated by the radio-wave receiver RWR95.50. Once the M code has been set, the touch probe will be activated in < 1 s and deactivated again < 1 s after reset.

The subsequent table shows the signal curves during probe activation in bi-directional mode:

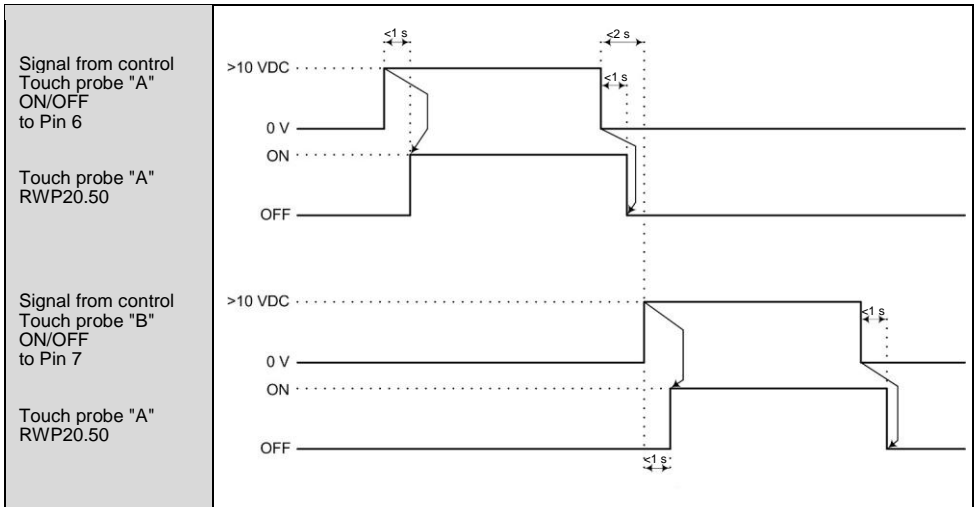


Fig. 16 Signal curves during touch probe/tool setter activation in bi-directional mode

2.6.2 Mono-directional Mode

INFORMATION

Mechanical self activation of the probe.

1. Switching ON the probe:
 - 1.1. Load probe into spindle.
 - 1.2. Probe switches ON by mechanical ON-OFF method:
 - AZ → Pullforce at SK-pullstud
 - ME → Switch ON mechanic into HSK
 - WS → Cooling water supply or spindle air blast
(Description of mechanical switch ON methods in the respective operating instructions)
 - 1.3. Probe transmits Wake-Up signal to receiver.
 - 1.4. Receiver transmits transmission frequency to be used to probe.
 - 1.5. Probe sends confirmation of transmission frequency and "READY" signal to receiver.
 - 1.6. Receiver passes electrical READY signal to machine control.
 - 1.7. Probe ready to work.
2. Switching OFF the touch probe:
 - 2.1. Remove the probe from the spindle to switch off the probe.

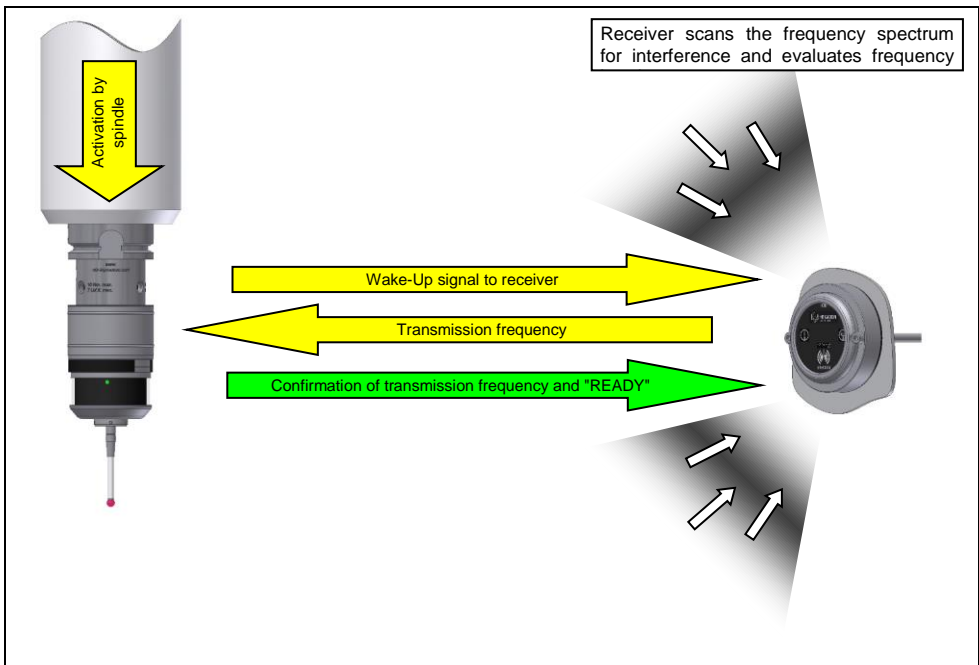


Fig. 17 Activation of the measurement system in mono-directional mode

2.7 Temperature Measurement

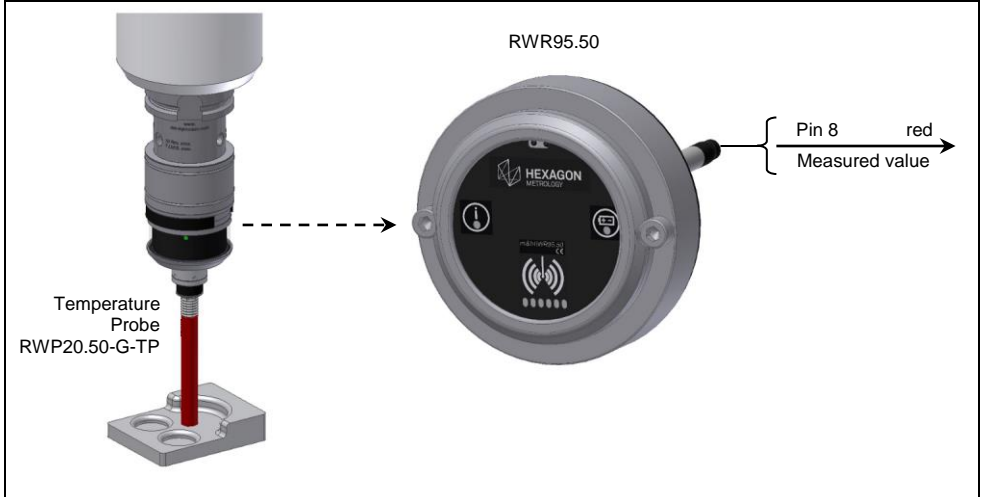


Fig. 18 Temperature Measurement

Measuring Range	5 - 50°C (5-14 mA)
	41 - 122°F (5-14 mA)
Resolution	$\Delta 0.1^\circ\text{C} = 20 \mu\text{A}$
	$\Delta 0.182^\circ\text{F} = 20 \mu\text{A}$

Temperature Calculation:

$$(x \text{ mA} * 5^\circ\text{C}/\text{mA}) - 20^\circ\text{C} = \text{Temperature in } ^\circ\text{C}$$

$$(x \text{ mA} * 9^\circ\text{F}/\text{mA}) - 4^\circ\text{F} = \text{Temperature in } ^\circ\text{F}$$

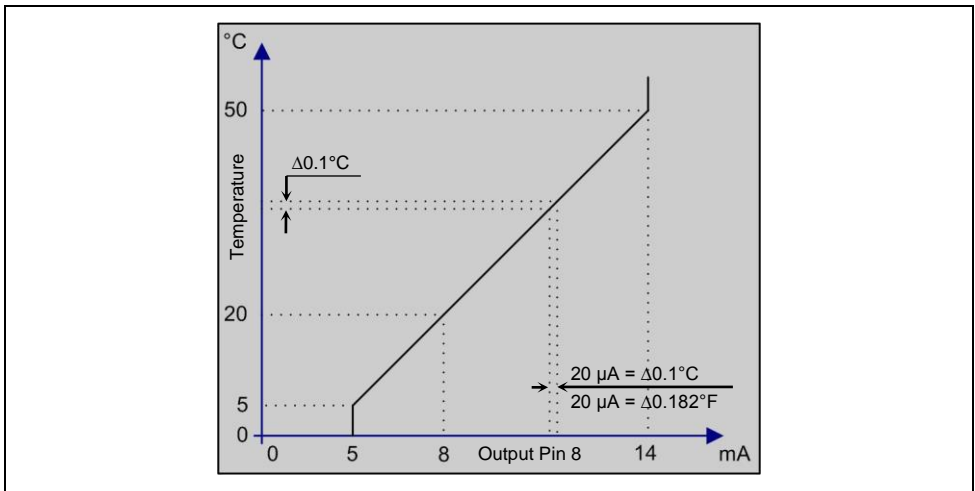




Fig. 19 Temperature Characteristic of RWR95.50

2.8 Optical Indicators

2.8.1 Indicators in Bi-directional Mode

Indicator	Blinking pattern	Meaning
Status LED (1/Fig. 20) 	Green	<ul style="list-style-type: none"> Status: "READY" Receives signals from measurement system
	Green flashing	<ul style="list-style-type: none"> Activation of measurement system A/B/C
	Orange	<ul style="list-style-type: none"> Status: "PROBE" Measurement system deflected
	Red	<ul style="list-style-type: none"> Inactive status of measurement system
	Red flashing	<ul style="list-style-type: none"> Error function, refer to chapter 2.8.3
Battery LED (2/Fig. 20) 	Red	<ul style="list-style-type: none"> Status: "LOW BATTERY" Measurement system transmits low battery warning Change measurement system batteries!
	Red flashing	<ul style="list-style-type: none"> Error function, refer to chapter 2.8.3

2.8.2 Indicators in Mono-directional Mode



Indicator	Blinking pattern	Meaning
Status LED (1/Fig. 20) 	Green	<ul style="list-style-type: none"> Status: "READY" Receives signals from probe
	Orange	<ul style="list-style-type: none"> Status: "PROBE" Measurement system deflected
	Red	<ul style="list-style-type: none"> Inactive status of measurement system
	Red flashing	<ul style="list-style-type: none"> Error function, refer to chapter 2.8.3
Battery LED (2/Fig. 20) 	Red	<ul style="list-style-type: none"> Status: "LOW BATTERY" Measurement system transmits low battery warning Change measurement system batteries!
	Red flashing	<ul style="list-style-type: none"> Error function, refer to chapter 2.8.3



Fig. 20 LED Indicators of RWR95.50

2.8.3 Transmission Power Indicator

Transmission/Reception Power	Indicator

2.8.4 Status-LED Error Outputs

Error Description	LED blinking pattern			
Short circuit/overcurrent of pin 3, 4 or 5 → Check circuit of pins 3, 4 and 5				
Error during first probing → Repeat measurement				
Temperature value cannot be output → Check circuit of pin 8				
= LED OFF = LED illuminated in ORANGE = LED flashes RED = LED illuminated				



HEXAGON
MANUFACTURING INTELLIGENCE

Hexagon Manufacturing Intelligence helps industrial manufacturers develop the disruptive technologies of today and the life-changing products of tomorrow. As a leading metrology and manufacturing solution specialist, our expertise in sensing, thinking and acting – the collection, analysis and active use of measurement data – gives our customers the confidence to increase production speed and accelerate productivity while enhancing product quality.

Through a network of local service centres, production facilities and commercial operations across five continents, we are shaping smart change in manufacturing to build a world where quality drives productivity. For more information, visit HexagonMI.com.














Hexagon Manufacturing Intelligence is part of Hexagon (Nasdaq Stockholm: HEXA B; hexagon.com), a leading global provider of information technologies that drive quality and productivity across geospatial and industrial enterprise applications.

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