Operating manual

Sensor Signal Amplifier SV_flex_RMC

1-Channel, PCM, RMC

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Disclaimer Documentation

The texts and examples were prepared with care. Mistakes can not be excluded. The enterprise Manner Sensortelemetrie will assume no liability for missing or incorrect information and resulting consequences, neither judicial nor otherwise.

Modifications

The enterprise Manner Sensortelemetrie GmbH may change or upgrade hardware and software – or parts of them - as well as the provided documents (operation instructions, start-up instructions, spare parts lists) – or parts of them – without notification.

We would be pleased for suggestion for improvement and notes about mistakes.

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1 Safety

1.1 Definition of Warnings

DANGER!
Hint for possible dangerous situation. Ignoring the security terms may cause death or serious injury.

WARNING!
Hint for possible dangerous situation.

Ignoring the security terms may cause injury.

CAUTION!
Hint for possible damage of property, if the corresponding protective measure were disregarded.

Further information

1.2 General Warnings

The system startup has to be carried out by trained qualified personnel, who is able to evaluate the potential risks. All chapters of this instruction manual had to be read and fully understood before startup.

On non-observance it’s not possible to assert a claim for the incurred losses from the manufacturer. Any changes to the system, except those described in the instruction manual and customer documentation, will invalidate any warranty.

DANGER!
Risk of Injury by Incorrect Installation
Incorrect installation can cause injury to persons directly while the installation or during the subsequent startup

Note the Mounting Hint (see chapter 4, installation instruction)

The system startup has to be carried out by instructed qualified personnel that’s familiar with

- the professional handling of security relevant components,
- the valid regulations for operational safety und rules for accident prevention.

DANGER!
Risk of Injury by Unintentional Startup
Rotating or moving of parts by inadvertent startup of the machine can cause injury .

During all mounting, demounting or repairing the system has to be powered-off. Note the mounting instructions.

DANGER!

Risk of Injury by Movable Parts

While normal operation, as well as inadvertent loosening of parts of the telemetry system during operation, present persons may be injured if protective equipment is absent.

Check the safety function of the protective equipment particularly

- before each startup
- after each replacement of a component
- after a longer standstill
- after each defect

Independent thereof the safety function of the protective equipment must be checked in suitable time intervals as part of the maintenance work!

WARNING!

Risk of Burn Injury

While operation the sensor signal amplifier and the stator antenna may become warm.

Avoid contact.

CAUTION!

Risk of Property Damage

If the connectors disconnected / connected while the system is powered on the telemetry system as well as the connected devices can be damaged.

Plug connectors must not be disconnected / connected when the system is powered on.

2 Conventional Usage

Sensor telemetry systems are used for contact-free data and power transfer from passive and active sensors (e.g. on rotating shafts).

DANGER!
Risk of Subsequent Damages caused by Malfunctions

If the telemetry system is used for measurement and control tasks for which it was not designed, there is a risk of consequential errors and even personal injury.

The delivered system has to be used exclusively for the purpose for which it was ordered.

The operator must take care of his health and safety.

The operator of the equipment must prevent subsequent errors following faulty measuring results. This is particularly necessary if the telemetry system is used in controlling or regulating functions.

The customer, as the builder of a system with an integrated sensor telemetry system, is responsible for the correct and conform operation and also assumes the responsibility for ensuring that the system at start-up complies with all provisions of Directives 2014/53/EU and 2014/35/EU.

Scope of Delivery

A telemetry system normally contains:

- Evaluation unit
- Stator antenna
- Rotor antenna
- Sensor signal amplifier
- HF cable

For the detailed purchased parts package of the delivered telemetry system mind the corresponding shipping ticket.

3 Technical Data

3.1 Measuring System

Technical Data Telemetry System

Term	Value
HF frequency	13.56 MHz
Number of channels	1
Bandwidth	0 to 1 kHz (-3dB)
Linearity	<0.1%

General Measuring Configuration

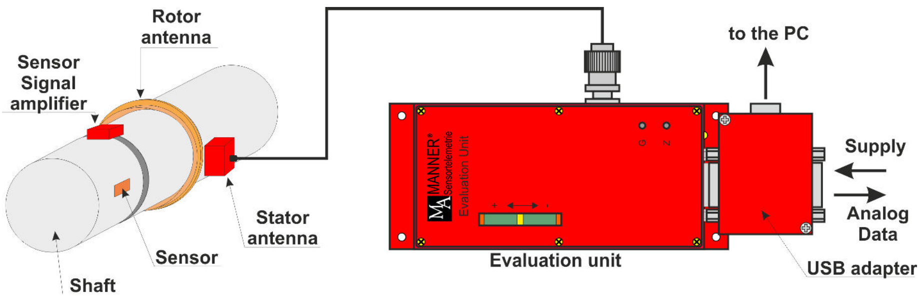


Fig. 1: General measuring configuration

Block Diagram

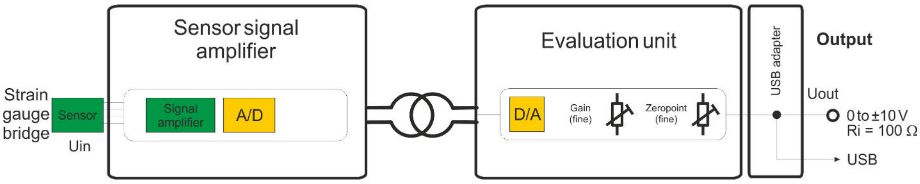


Fig. 2: Block diagram

Energy and Data Flow

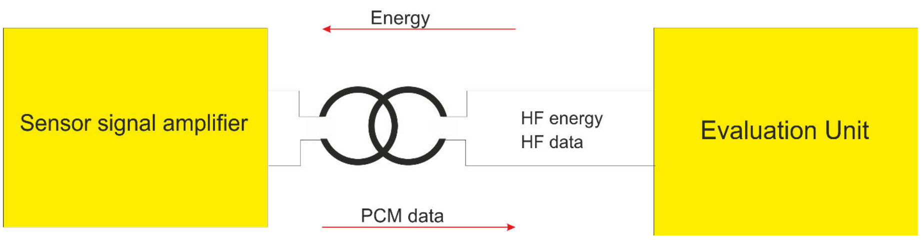


Fig. 3: Energy and data flow

3.2 Sensor Signal Amplifier, Sensors

Technical Data Sensor Signal Amplifier

Term	Value
Sensor signal amplifier type	**SV_flex_PCM16_RMC**
Sensor	Strain gauge (strain gauge resistor ≥350 Ω), PT100
Type of modulation	PCM
HF frequency	13.56 MHz
Channel sample rate	6.62 kS/s
Bridge supply voltage [U_B]	3.3 V
Coarse voltage [U_{coarse_max}]	6.4 to 7,2 V
Zeropoint and gain drift	0.02% / °C
Linearity	0.1% typ.
Amplification (adjustable by software)	0.05 to 10 mV/V
Bandwidth	0 to 1 kHz
Resolution	16 Bit with 16 Bit CRC
Protection class	IP42
Temperature range	-10 to +85°C

Pin Assignment Sensor Signal Amplifier

> **NOTICE!**
> **Possible Damage to the Rotor Electronics while soldering**
> A soldering that is too long or too hot can damage the sensor signal amplifier. Keep soldering as short as possible. If necessary, allow to cool.

> **NOTICE!**
> **Damaging of Electronic**
> *Condensation may cause unwanted contact between the pins*
>
> To prevent any effects of condensation the pin connections must be waterproofed!

> The sensor signal amplifier must be grounded by connecting the GND pin to the rotor.

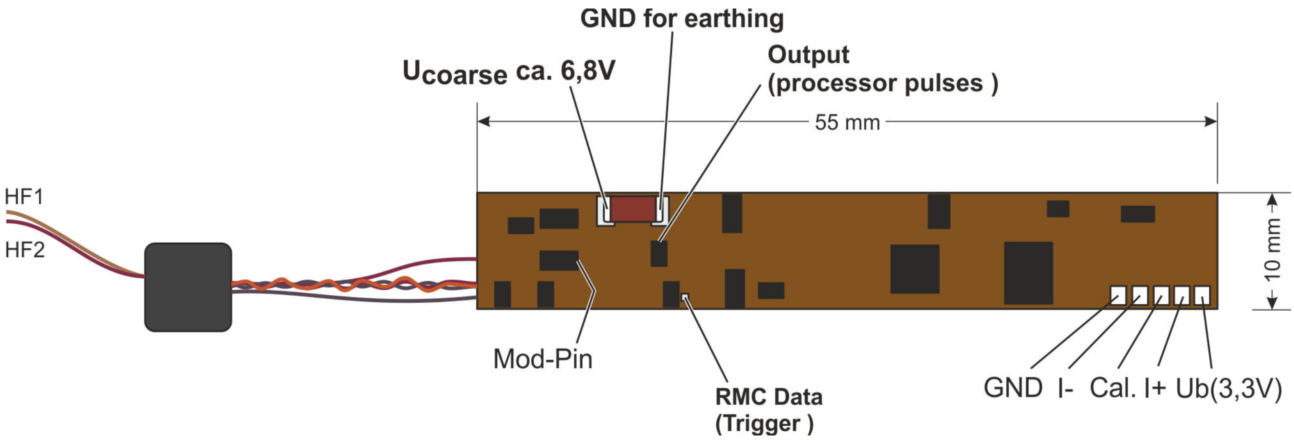


Fig. 4: SV_flex_PCM16_RMC, Pin assignment

3.2.1 Gain Bandwidth Characteristic

Gain Bandwidth Characteristic

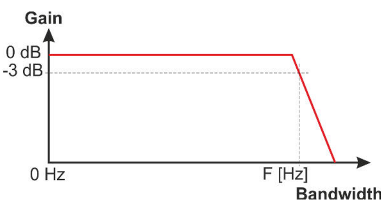


Fig. 5: Gain bandwidth characteristic

> The output signal bandwidth ranges from 0 to 1 kHz.

3.2.2 Operation Mode Strain Gauge

Sensor Operation Mode Full Bridge

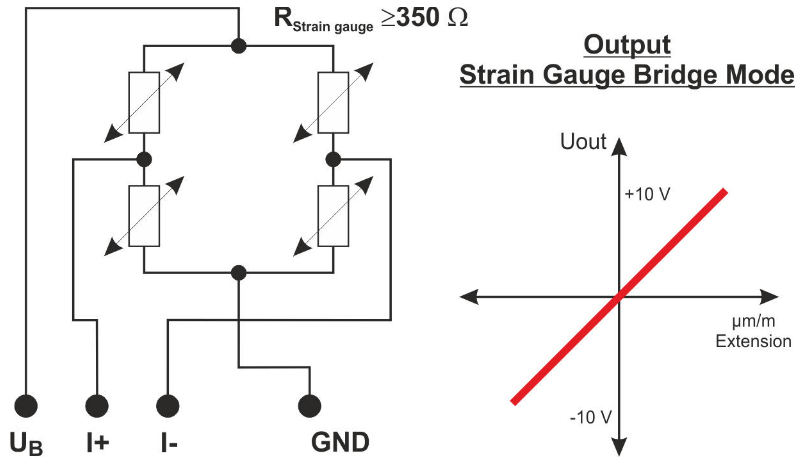


Fig. 6: Operation mode strain gauge (full bridge)

Sensor Operation Mode Half Bridge

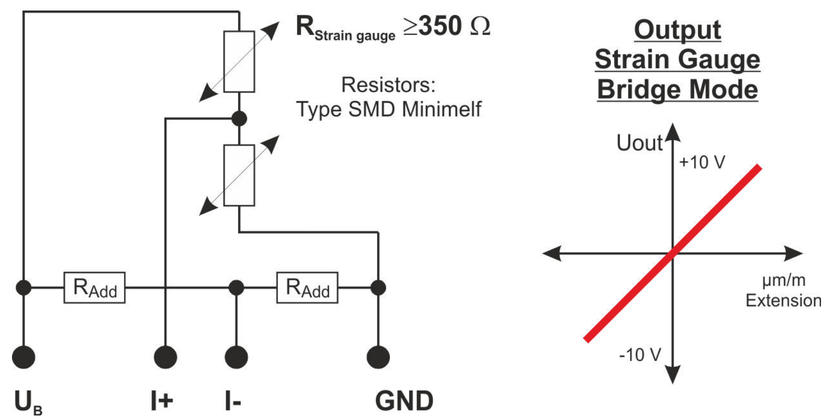


Fig. 7: Operation mode strain gauge (half bridge)

Additional resistors R_{Add} = 1 kΩ, 0.1 %, Tk 15

Sensor Operation Mode
Quarter Bridge

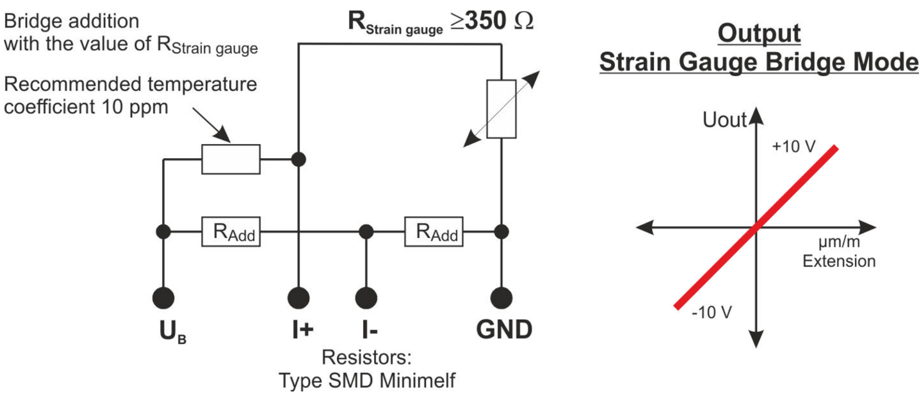


Fig. 8: Operation mode strain gauge (quarter bridge)

Additional resistors R_{Add} = 1 kΩ, 0.1 %, Tk 15

3.2.3 Remote Shunt Calibration Function

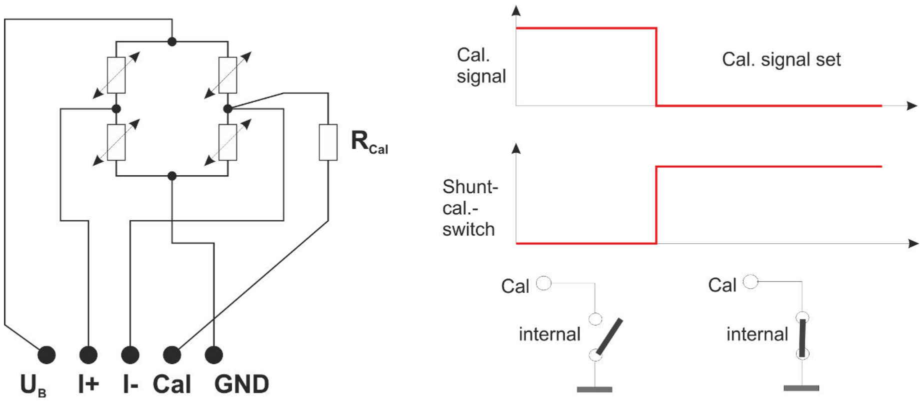


Fig. 9: Remote shunt calibration function

R_{Cal} see "List for Shunt Calibration Resistor"

3.2.4 List for Shunt Calibration Resistor

$E = dL * k_{Factor}$

$R_{shunt} = 1 / (-1+ 1 / (-1+1 / (0.5+E / 1000))) * R_{strain} = (500-E) / (2*E) * R_{strain}$

The system is based on a 350 Ω **full** strain gauge bridge !!!

List for the Shunt Resistor (Strain Gauge Full Bridge)					
k_{Factor}	2.05				
Expansion dL (µm/m)	Electrical signal E (mV/V)	R_{shunt} (kΩ) for a 350Ω $R_{Strain\ gauge}$ (100% adjustment)	R_{shunt} (kΩ) for a 350Ω $R_{Strain\ gauge}$ (80% adjustment)	R_{shunt} (kΩ) for a 1000Ω $R_{Strain\ gauge}$ (100% adjustment)	R_{shunt} (kΩ) for a 120Ω $R_{Strain\ gauge}$ (100% adjustment)
3902.4390	8	10.76	13.45	30.75	3.69
3414.6341	7	12.33	15.41	35.21	4.23
2926.8293	6	14.41	18.01	41.17	4.94
2439.0244	5	17.33	21.66	49.50	5.94
1951.2195	4	21.70	27.13	62.00	7.44
1463.4146	3	28.99	36.24	82.83	9.94
975.6098	2	43.57	54.47	124.50	14.94
487.8049	1	87.32	109.16	249.50	29.94
439.0244	0.9	97.05	121.31	277.28	33.27
390.2439	0.8	109.20	136.50	312.00	37.44
341.4634	0.7	124.82	156.03	356.64	42.80
292.6829	0.6	145.66	182.07	416.17	49.94
243.9024	0.5	174.83	218.53	499.50	59.94
195.1220	0.4	218.58	273.22	624.50	74.94
146.3415	0.3	291.49	364.36	832.83	99.94
121.9512	0.25	349.83	437.28	999.50	119.94
97.5610	0.2	437.32	546.66	1249.50	149.94
60.9756	0.125	699.82	874.78	1999.50	239.94
48.7805	0.1	874.83	1093.53	2499.50	299.94
43.9024	0.09	972.05	1215.06	2777.28	333.27
39.0244	0.08	1093.57	1366.97	3124.50	374.94
34.1463	0.07	1249.82	1562.28	3570.93	428.51
30.4878	0.0625	1399.83	1749.78	3999.50	479.94
29.2683	0.06	1458.16	1822.70	4166.17	499.94
24.3902	0.05	1749.82	2187.28	4999.50	599.94
19.5122	0.04	2187.32	2734.16	6249.50	749.94
14.6341	0.03	2916.49	3645.61	8332.83	999.94
9.7561	0.02	4374,82	5468.53	12499.50	1499.94

Note:

When using a **half** strain gauge bridge the same mechanical expansion [dL] results in a **half** of the electrical signal [E] shown in the table above.

e.g. dL = 487.8049 µm/m → E = 0.5 mV/V → R_{Shunt} = 174.84 kΩ ...

When using a **quarter** strain gauge bridge the same mechanical expansion [dL] results in a **quarter** of the electrical signal [E] shown in the table above.

e.g. dL = 487.8049 µm/m → E = 0.25 mV/V →R_{Shunt} 349.83 kΩ ...

Usage of a strain gauge bridge resistor deviating from the standard resistor

Deviation of sensor signal **gain** [mV/V] when using strain gauge bridge resistor other than 350 Ω.

Applied bridge resistor $R_{strain\ gauge}$ [Ω] fullbridge	Deviation of the sensor signal gain to the reference value $R_{strain\ gauge}$ = 350 Ω fullbridge
120	+1.0%
350	0.0%
700	-1.8%
1,000	-3.1%
1,400	-5.0%
2,000	-7.5%
3,000	-11.5%
4,400	-16.6%
5,000	-18.6%

3.2.5 Operation Mode PT100

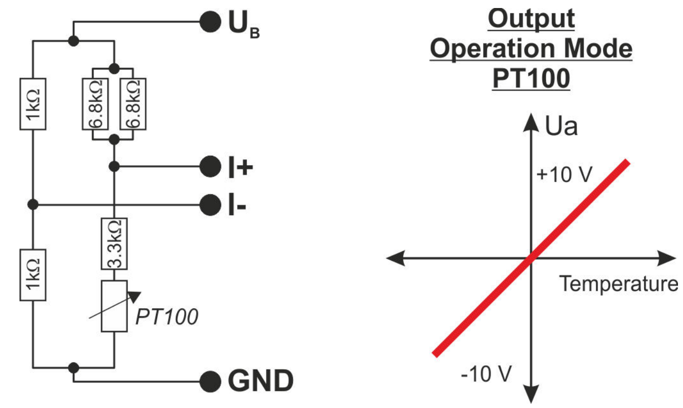


Fig. 10: Operation mode PT100

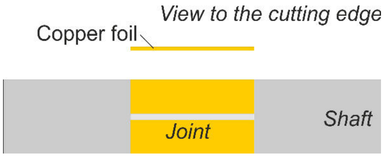
Sensitivity mV/V	Temperature °C
11.6	500
5.8	250
2.9	125
1.45	62.5
1.0	≈45

Not calibrated. Factory setting 1 mV/V

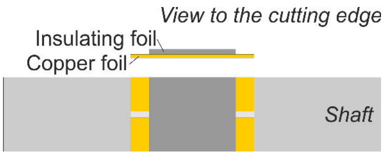
4 Mounting / Starting

4.1 Mounting of Sensor Signal Amplifier

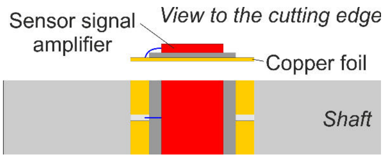
1. Clean the area for the rotor loop with denatured alcohol and acetone and dry with compressed air



2. Glue the strip of copper foil **without bubbles** round the shaft with an overlap of 2 mm
3. Solder the copper foil thin and plane Soldering iron 80W, soldering tip about 3 mm wide Soldering temperature 450°C



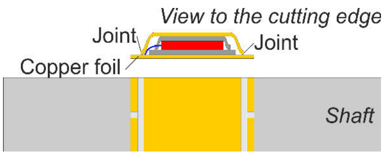
4. Glue an insulating foil over the copper foil There must be no breakthrough from the sensor signal amplifier at any time



5. Fix the sensor signal amplifier at two locations on the insulating foil with superglue

   Fix the transformer on the insulating foil with superglue
6. Solder the wire 'GND for grounding' to the copper foil
7. Connect the sensor signal amplifier and the transformer with the rotor antenna (soldering terminal)
8. HF adjustment- see 'Adjustment rotor antenna'
9. **Optional, if build up location and equipment enables it:**

   Chapter 4.1.1 "Test of Stroke Processing at CAL and RMC Data" on page 15
10. Operate functional check



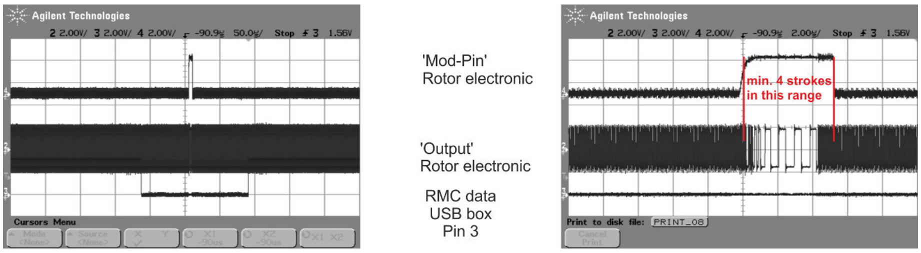
11. If there are too much disturbances from the rotor antenna and the signal has too much noise:

    Glue an insulating foil over the sensor signal amplifier

    There must be no breakthrough from the sensor signal amplifier at any time
12. Glue a piece of copper foil over the sensor signal amplifier (not over the transformer) and solder the copper foils
13. Operate functional check
14. Seal the sensor signal amplifier and the rotor antenna.

4.1.1 Test of Stroke Processing at CAL and RMC Data

1. Start the USB software and activate 'Test Connection'
2. Connect 'RMC data/cal' pin 3 at the connector (between evaluation unit and USB adapter) as trigger signal with the oscilloscope (use pin 5 for ground)
3. Measure with a probe 10:1 at the position 'Mod-Pin' and compare with a second probe at the position 'Output' (at least 4 strokes during the continuous high phase of the 'Mod-Pin' must exist) - use GND of the rotor electronic as ground.
4. Variation of the antenna distances: conditions must be met over the complete transmission range



5. Alternative this function can be tested without oscilloscope by checking the screen display of the function ‘Test Connection’ during the Variation of the antenna distance (the acknowledge display must be shown in black; red signals a failure). With this method however the security stock can not be estimated.
6. If the conditions are not met the antenna system must be re-adjusted

4.2 Adjustment of the Rotor Antenna Loop

Pinning Sensor Signal Amplifier

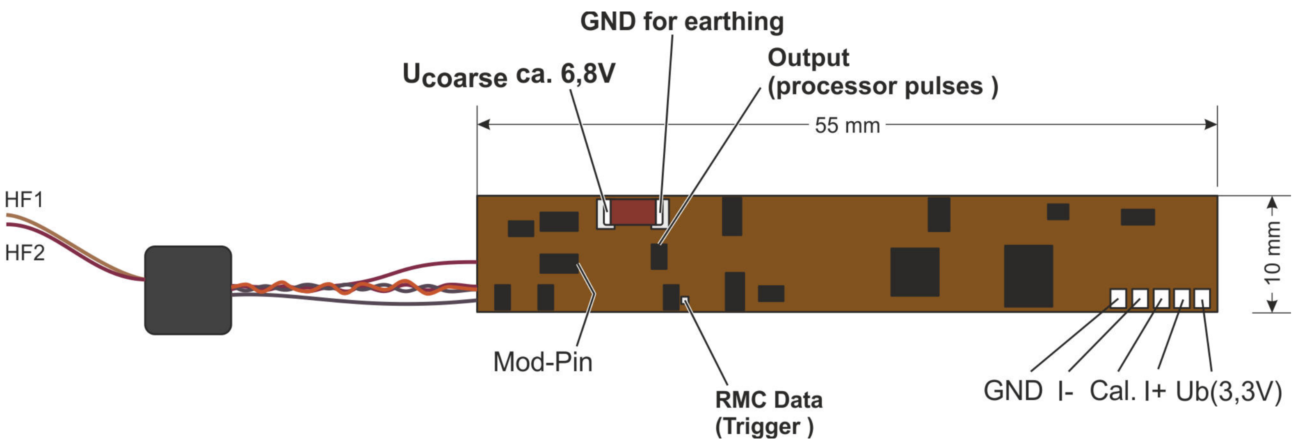


Fig. 11: SV_Flex_PCM_RMC

4.2.1 Adjustment Rotor Antenna

Installation for Adjustment

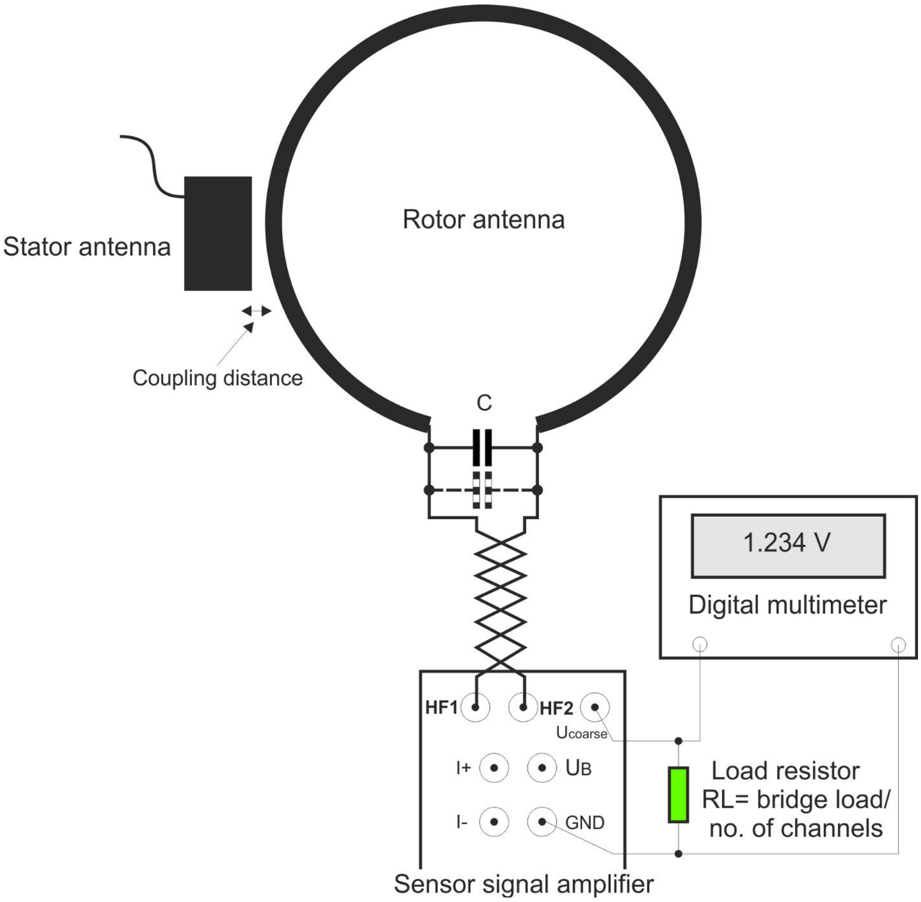
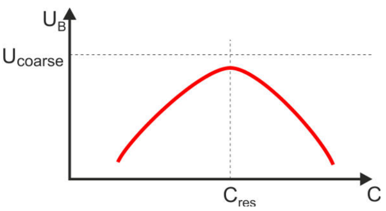


Fig. 12: Adjustment rotor antenna loop

Adjustment with Variable Capacitor



1. Build up the measuring system. Add a load resistor R_L = bridge load/number of channels between U_{coarse} and GND.

   Connect the terminals of the sensor signal amplifier HF1 and HF2 to the rotor antenna.

2. Solder a variable capacitor (0 to 500 pF) parallel to the rotor antenna (pay attention to short connecting leads), set the HF energy adjustment screw (if present) on the stator antenna to the middle position and align the stator antenna correctly to the rotor antenna.

3. Connect the voltage U_{coarse} with a digital multimeter for voltage measurement.

4. Set the HF power control of the evaluation unit (if available) to MINIMUM.

   Switch on the evaluation unit and measure U_{coarse}.

   The voltage U_{coarse} must be less than (U_{coarse_max} - 3,0 V) for the adjustment procedure. If U_{coarse_max} is reached the load resistor can be downsized or the coupling distance between rotor and stator antenna can be enlarged.

   U_{coarse_max} see technical data of the sensor signal amplifier.

5. Change the variable capacitor until the maximum voltage is reached. If the voltage exceeds U_{coarse_max} reduce the HF power.

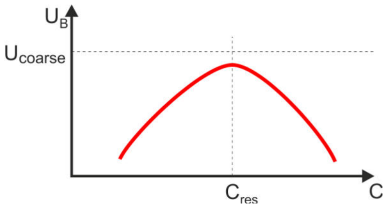
   If the range is not in the variable range of the variable capacitor, connect a static capacitor (470 pF) parallel.

6. Disconnect the variable capacitor and determine the set value with a capacitance meter

7. Solder the next smaller value from the DIN series as a static capacitor (ceramic multilayer, COG).
8. Repeat the procedure to refine the result. Solder the determined difference value as a static capacitor parallel to the first one.
9. Remove the load resistor.
10. Check the strain gauge bridge supply.
11. Remove the digital multimeter.

Adjustment without Variable Capacitor

> **NOTICE!**
> All used capacitors **must be** COG type ≥100 V
>
> For a HF power >3 W **two** capacitors must be connected in series for load spreading.



1. Build up the measuring system. Add a load resistor R_L = bridge load/number of channels between U_{coarse} and GND.

   Connect the terminals of the sensor signal amplifier HF1 and HF2 to the rotor antenna.

   Solder in a 47 pF capacitor parallel to the rotor antenna, turn the HF power adjustment screw of the stator antenna (if existent) to mid-position and position the stator antenna correct to the rotor antenna.
2. Connect the voltage U_{coarse} with a digital multimeter for voltage measurement.
3. Set the HF power control of the evaluation unit (if available) to MINIMUM.

   Switch on the evaluation unit and measure U_{coarse}.

   The voltage U_{coarse} must be less than (U_{coarse_max} - 3,0 V) for the adjustment procedure. If U_{coarse_max} is reached the load resistor can be downsized or the coupling distance between rotor and stator antenna can be enlarged.

   U_{coarse_max} see technical data of the sensor signal amplifier.
4. Increase the value of the capacitor in 47 pF steps and establish the maximum of U_{coarse}
5. Improve the result with 22 pF steps.
6. Remove the load resistor.
7. Check the strain gauge bridge supply.
8. Remove the digital multimeter.

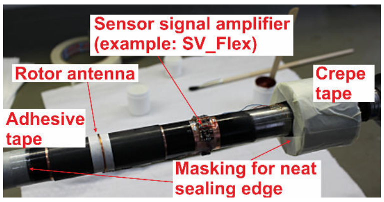
After successful adjustment of the rotor antenna, the data reception by the stator antenna must be correct when switching off and on the evaluation unit without further corrective actions. Yellow and green LED must be on, see 'Control LEDs', description evaluation unit

If data are not available after switching on the evaluation unit (green LED off, see 'Control LEDs', description evaluation unit) the HF1 and HF2 connections of the sensor signal amplifier must be changed at the rotor antenna. Proceed the rotor antenna adjustment again.

> **After successful adjustment of the rotor antenna the connections HF1 / HF2 of the sensor signal amplifier must not be changed!**

4.3 Sealing with Ultifil

Sealing of Sensor Signal Amplifier and Rotor Antenna



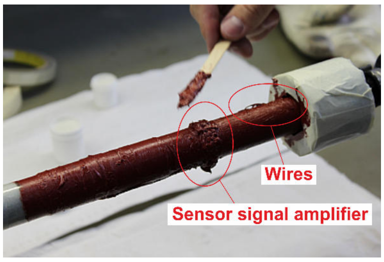
1. Mask the area which will be sealed with a suitable adhesive tape (e.g. Tesa tape, crepe tape)
2. Mix the grouting **Ultifil** according to instruction
(50% component A + 50% component B, depending on proportion of weight)

3. Cover the complete area abundant with sealing compound by dint of a spattle or paint-brush .

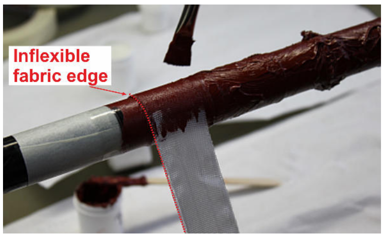
4. Distribute the sealing compound with a paint-brush onto the sealing area.

> **NOTICE!**
> Do not to disconnect or damage the connections and cables at the sensor signal amplifier!

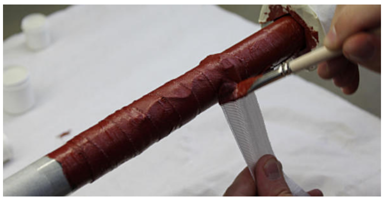
5. Even the sealing compound thoroughly with a paint-brush.



6. Put additional sealing compound with a spattle onto the area of increased parts (sensor signal amplifier, cables).



7. Apply fabric tape. The inflexible fabric edge of the first layer should be positioned outside.

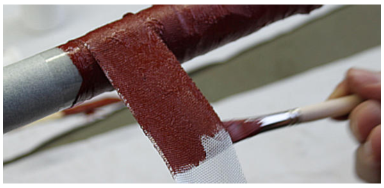


8. Wrap the fabric tape onto the sealing and cover concurrently the surface of the tape with sealing compound. Overlapping range approx. 50%.

   The fabric layers must become a compound. Cover the complete area of measuring position, sensor signal amplifier and rotor antenna thoroughly with sealing compound.
9. After wrapping coat the surface completely with **Ultifil**.

   Mind that the fabric tape is warped close to the masking tapes but <u>not</u> above!

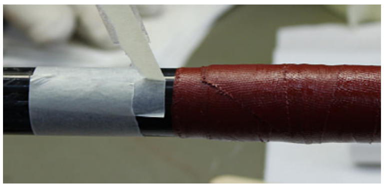
10. Without interruption add a further layer of fabric tape and fix it with sealing compound.



11. At the end of the second layer cover the upper and lower side of the fabric tape with sealing compound.

12. Cut the fabric tape with scissors diagonally.

13. Even the sealing area once again completely with a paint-brush.



14. Remove the masking tape with the sealing is wet.

15. Hardening of sealing compound in horizontal rotating posture.

Requirements:

- 24 h with room ambient temperature
- or alternative 2 h with radiant heater 125 W, distance 100 mm ±20 mm

16. **Final test of shaft for function:**

- torsion,
- energy / maximum distance
- data communication RMC

4.4 Coupling / Installation

Antenna Coupling

DANGER!

Risk of Faulty Measuring Data and Resulting Subsequent Errors, up to Injury to Persons

Damaging, modifications or disturbance of the coaxial cable(s) may falsify the measuring results and optionally cause subsequent errors according to operation purpose.

Do not buckle the coaxial cable!

Do not modify the coaxial cable!

Do not keep data cable and the coaxial cable together with energy- / high-power current cables!

The connectors of the HF energy and / or HF data coaxial cable must not have connection to the grounding of the machine!

Permissible bending radii for coaxial cables:

- RG58 → R_B = 25 mm
- RG400 → R_B = 30 mm static / 50 mm dynamic
- RG178 → R_B = 15 mm
- RG213 → R_B = 50 mm
- RG316 → R_B = 15 mm

The bending radii of the used coaxial cables must not be undercut

CAUTION!

Damaging of Antenna System

Contact between rotor antenna and stator antenna while operating may cause mechanical damages of the antennas

The stator antenna must not touch the rotor antenna.

CAUTION!

Risk of Damaging of Electronic, Faulty Measuring Data

While overheating of the evaluation unit the built-in electronics may be damaged

An overheated evaluation unit may cause faulty measuring values and respectively subsequent errors

The evaluation unit must be mounted onto a heat conductive base.

CAUTION!

Damaging of Evaluation Unit Caused by High Vibrancy

High Vibrancy of the evaluation unit may cause damaging

While mounting in environments with high vibrancy (e.g. in vehicles) the evaluation unit must be mounted vibration damped, e.g. by rubber buffer.

The stator antenna must be mounted directly opposite to the rotor antenna

The stator antenna must be mounted in the middle of the moving range of the rotor antenna

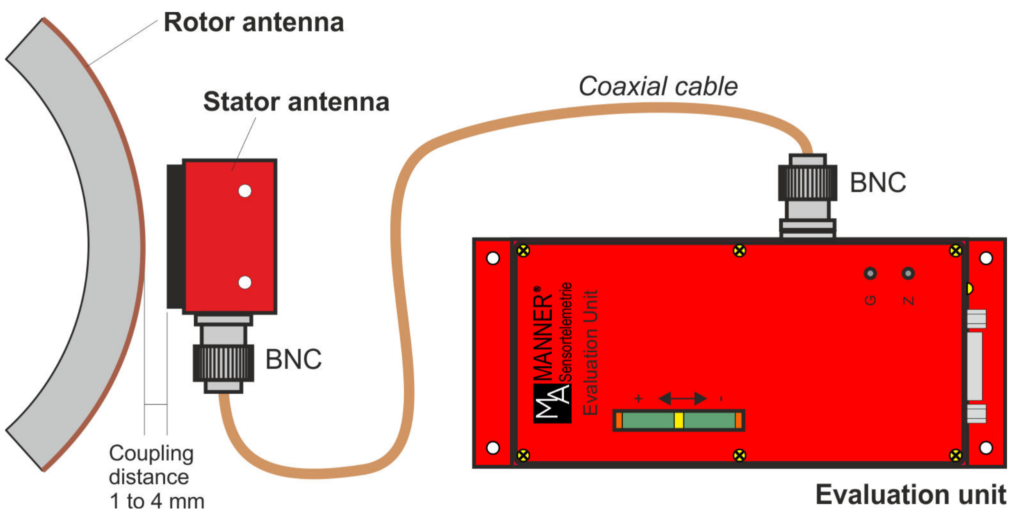


Fig. 13: Coupling

Starting

> **DANGER!**
> **Risk of Injury**
> *Incorrect installation can cause injury to persons directly while the installation or during the subsequent startup*
>
> Follow mandatory the rules for accident prevention!

1. Mount the sensor signal amplifier with the rotor antenna
2. Place the stator antenna correct to the rotor antenna
3. Connect stator antenna with the evaluation unit
4. Switch the system on
5. Connect the evaluation unit via USB interface with the computer

   On initial starting install the software (see chapter Software description)
6. Release measuring point completely
7. Set the output signal to 0.000 V via software and measuring at the 'analog signal output'
8. Load the measuring point with nominal load or set the cal. signal permanently
9. Adjust the output signal by software and measuring of the 'analog signal output' to +10.000 V (loaded) or by adjustment through cal. signal to the specified calibration value (see calibration protocol).
10. Release the measuring point completely or remove the cal. signal.
11. Check the output signal to zero. Repeat step 6 to 11, if necessary.

4.5 Test Circuit

Operation mode strain gauge sensor (full bridge)

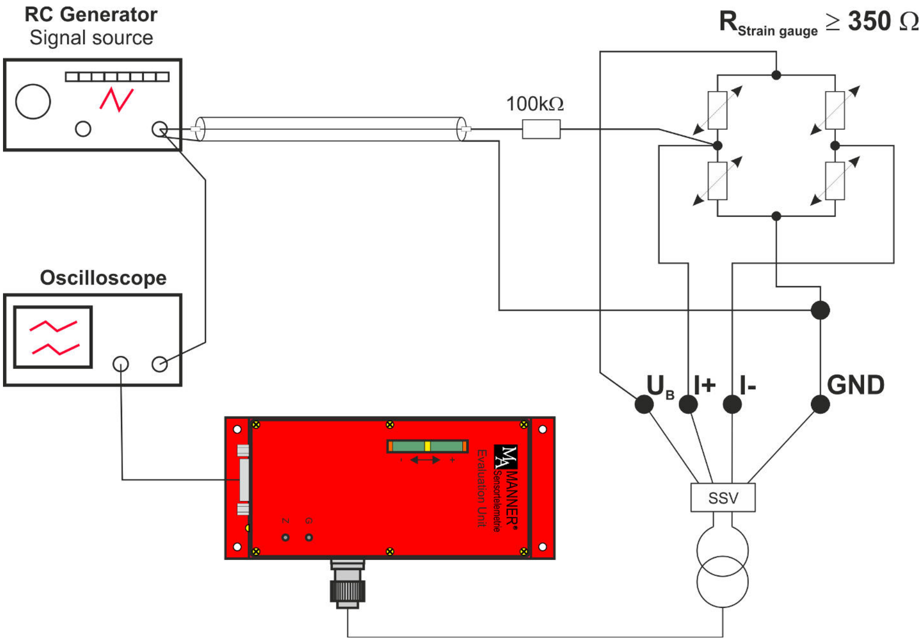


Fig. 14: Test circuit

5 Options

Optionally available

- Temperature measurement (PT100, Thermocouple)
- without Remote Control
- waterproof (sealed)
- ATF oilproof (sealed)

If you have any questions regarding customer-specific solutions, please contact our sales department.

6 Software Interface for 1-4 Channel Systems V2.8.300

The software is not part of the actual shipment. Chapter for information.

Requirements

Windows 7, Windows 10 (German, English Version) - 32 Bit / 64 Bit

1 GHz processor or higher, depending on the data throughput of the system during recording.

1 GByteRAM, 500 MByte free hard disc space

Net Framework 3.5

6.1 Installation of the USB Driver - Installation steps for Windows 7 / 10

For other Windows versions the messages may be different.

1. Connect the USB interface of the telemetry systems to the PC
2. The USB interface is recognized by the PC:

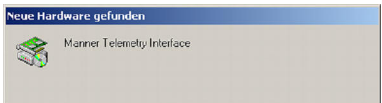


Fig. 15

3. Mark 'NO connection to Windows Update'

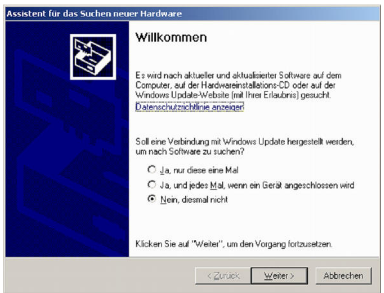


Fig. 16

4. Mark 'Install the software NOT automatically'

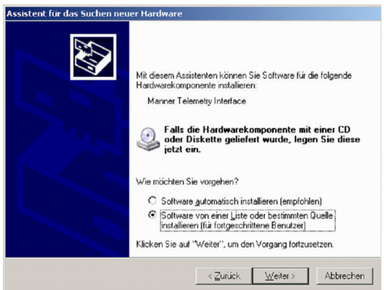


Fig. 17

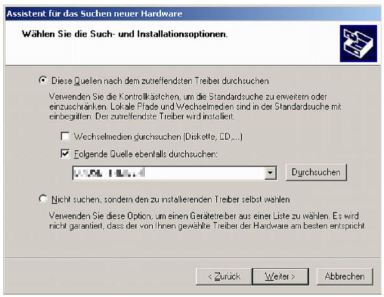


Fig. 18

5. Enter the path and the name of the driver (e.g. included CD / USB stick)

6. Repeat step 3 to 5, thus two instances of the driver were installed

Fig. 19

7. *[Get ready]*

⇨ The installation of the driver is now finished. The device can now be used with the Manner Interface Software. For using more devices repeat the installation steps.

> If there are troubles with the installation of the driver e.g. incompatibility with other devices which also use the USB converter of FTDI Chip, the already installed driver can be removed from the driver path with the program 'FTDIUNIN.EXE'. Then restart the installation.

6.2 Installation of the Software

1. Select path of the installation software with the Windows Explorer and start program **`SETUP.EXE`** (e.g. **`D:\TelemetryinterfaceV2.x.xxx\Telemetryinterface_Vx.x.xxx_32Bit`**, or rather **`...\Telemetryinterface_Vx.x.xxx_64Bit`** on the installation CD in **drive D:**) and follow the instructions.

If required, please install also Net Framework 3.5 you can obtain this from Microsoft over internet (**Netframework 3.5 redistributable x86**)

2. The program can now be started either with a link item at the desktop or with *[Start] -> [Program] -> [TelemetryInterfaceV2.x]*

6.3 Installation of the additional Data Viewer Software for MDF Files

PVIEW (optional with data acquisition)

On the enclosed data storage (USB stick or CD) there is also a free data viewer from Stiegele Datensysteme GmbH (*http://www.stiegele-systems.de*). The software shows the content of the MDF file that is recorded while the measuring period.

1. Select path of the additional software with the Windows Explorer and start program `SETUP.EXE`

(e.g. `D:\PVIEW\setup.exe` on the installation CD in drive D:)

2. Select language and continue the installation.

Fig. 20

3. Set path to `C:\Programme\PVIEW`. In this case the Interface_USB software of Manner and the PVIEW software are directly linked together

4. Perform the further installation steps and complete installation

> At systems with limited user rights, the software will output an error, however, the software will work correct.
>
> Screenshots are from a German Windows System.

6.4 Setting up the Interface-Software

Configuration

> **When using the software for the first time the hardware must be configured select *[menu]* -> *[Setup]* -> *[Hardware configuration]* to configure**
>
> **Not all functions are available in every hardware configuration.**

Please select main-menu

`Setup -> Hardware-Configuration`

Selection of the right configuration for the Device and the Interface - see attached configuration sheet

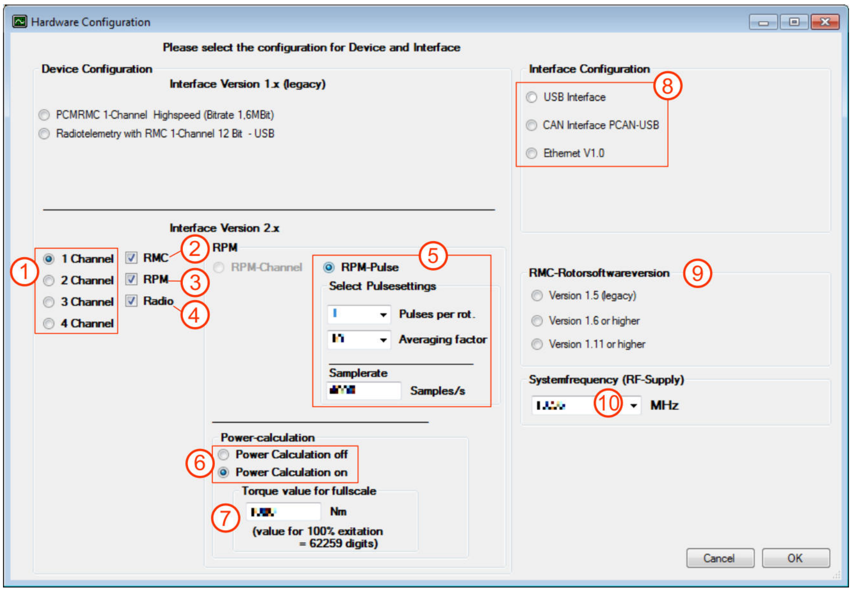


Fig. 21

	Description	Setting for the delivered system
1	Number of channels	1
2	Selection RMC - only for systems with Remote Control	yes
3	Selection RPM - only for systems with RPM acquisition	no
4	Selection Radio - only for systems with radio transmission	no

	Description	Setting for the delivered system
5	RPM-Pulse	--
	Optional: Setting of RPM parameters	
	Pulses per rotation	--
	Averaging factor	--
	Sample rate (samples/s)	--
6	**Optional:** Choice calculation on / off	--
7	**Optional** (if calculation is on): Value for "Torque value for fullscale"	--
8	Choice of the used interface.	USB
9	RMC Rotorsoftwareversion	1.6 or higher
10	Input system frequency	13,56 MHz

Authorization Level

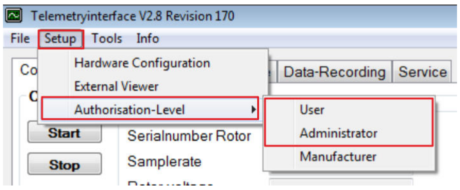


Fig. 22

[Menu] -> [Setup] -> [Authorization Level]

With this settings, it is possible to set different modes for the PC software. The settings are still present at next start of the software.

User (no password required)

Settings for normal operation mode. With this setting, no permanent modifications on the measurement system are possible.

Administrator

In this mode, modifications on the measurement system are possible (e.g. changing amplification over RMC) The password for this mode is "*RMC2000*"

6.5 Using the Interface Software

Configuration

Only for RMC systems.

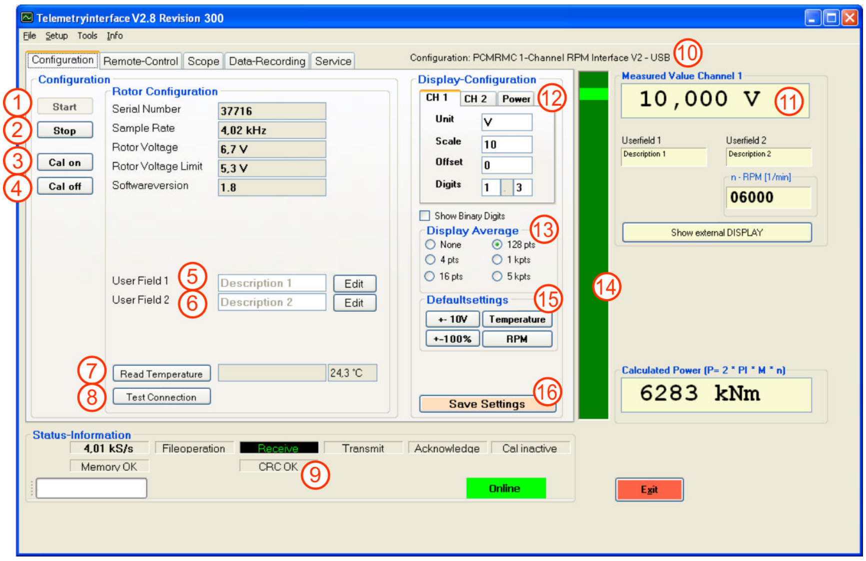


Fig. 23

1	Start display data	
2	Stop display data	
3	Remote calibration on	
4	Remote calibration off	
5	Description field 1	User programmable description field (saved in the rotor-memory)
6	Description field 2	
7	Read the temperature of the rotor electronic via RMC (only for RMC systems)	
8	Start / Stop of the Test-RMC transmission (only for RMC systems)	
9	Communication display: Receive / Transmit / Acknowledge additionally Low-Power (in radio applications) While data transmission to the rotor CRC errors can briefly be shown. This is not relevant to the function. If the transfer fails, a separate dialog box will be displayed.	
10	Display of the selected hardware configuration	
11	Display of the measured value channel 1	
12	Display settings: Unit, Scale, Offset	
13	Average: Number of values used for averaging of the displayed analog value	
14	Bar diagram of the analog output value	
15	Uses predefined settings for the display configuration	
16	Save: Saves the display settings	

RMC - remote control

Only for RMC systems.

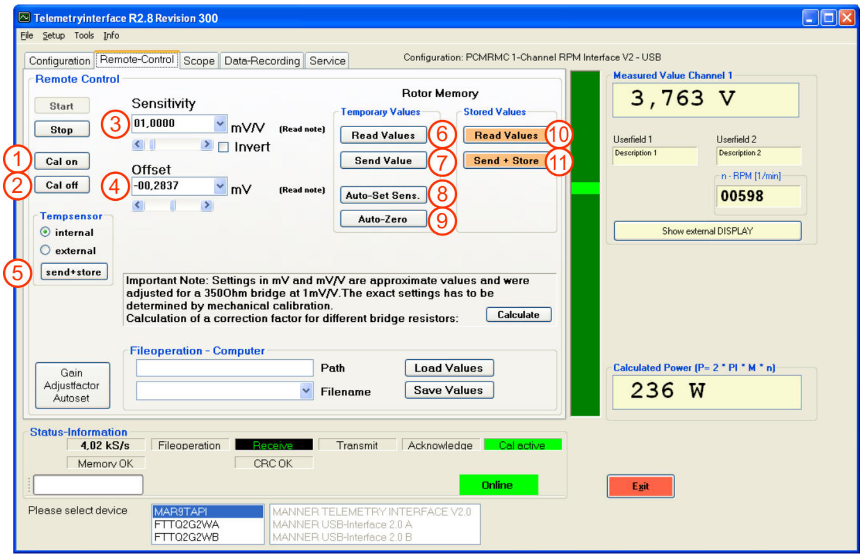


Fig. 24

1	Remote calibration on
2	Remote calibration off
3	Input field for the sensitivity
4	Input for the zero point
5	Selection of the used temperature sensor: internal sensor (standard) or external temperature diode
6	Read actual active values
7	Transmission of the settings - temporary storage: The settings keep actual as long as the measuring amplifier is powered. If the power supply breaks the previous stored settings will get active. This function is useful for tests or alternative settings because it allows a quick update of the measured value. After a successful adjustment the settings can be stored permanently into the EEPROM of the rotor with *[Send and store]*.
8	Automatic gain function: Calculates the gain on a moved system new and sends it to the rotor electronic. The desired output value can be typed into the enquiry field. To keep this value permanently it can be saved with *[Send and store]*.
9	Automatic zero point: Calculates the offset on the basis of the actual measured value and the actual gain to correct the output voltage to Zero. If necessary do this function repetitive. To save this offset permanently store it with *[Send and store]*.
10	This function allows the re-import of the saved (EEPROM on rotor) settings of the rotor measuring amplifier. It is useful to read back these values at start parameters before starting the adjustment.
11	Transmission of the settings - permanent storage: Zero point and gain are sent to the measuring amplifier and stored permanently in the EEPROM of the rotor.

Oscilloscope - optional

Fig. 25

1	Setting time base
2	Setting gain
3	Setting offset

Data recording - optional

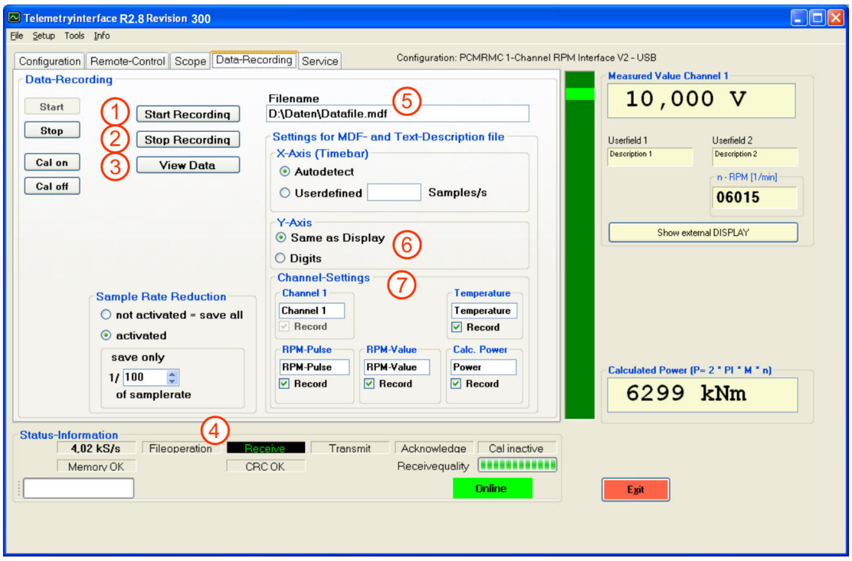


Fig. 26

1	Start recording into a file
2	Stop recording into a file
3	Show data with additional external viewer PVIEW - if installed
4	Display file operation activity
5	Input field for path and file name

6	Additional information, which is saved in the description files
7	Option for RPM-systems save calculated rpm or save rpm-pulses to datafile On menu setup, there is the possibility to activate an averaging for the calculated rpm. For option 'Calculated RPM' take care of the correct setting at configuration (sample rate).

NOTICE!
No other program must be active at the PC while recording data into a file. This can effect a loss of data.

Service

Only for RMC systems.

Enables the possibility for re-calibration of the analog output - available for rmc systems

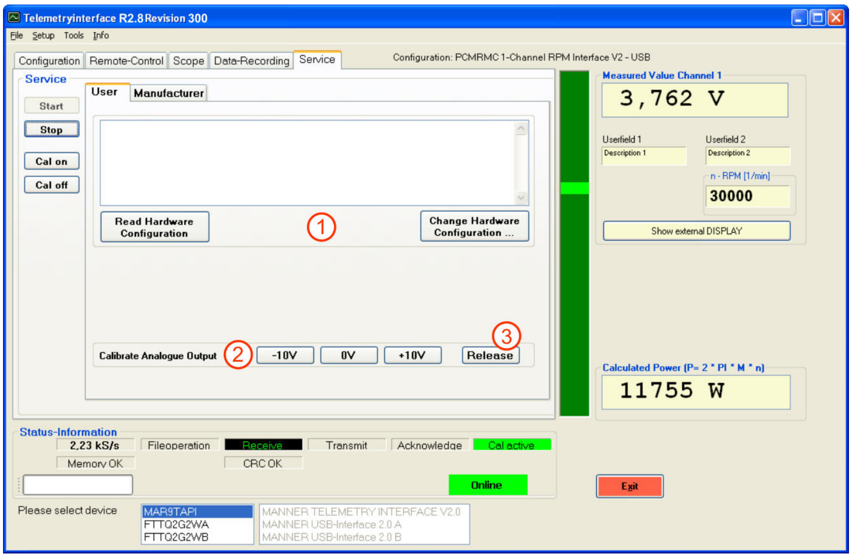


Fig. 27

1	Option to change the hardware configuration of the interface according to instructions of the manufacturer.
2	This mode simulates a constant value from the rotor. This option enables the check and possibility for re-calibration of the analog output voltage
3	Switches back to measurement mode

Tool for strain gauge calculation

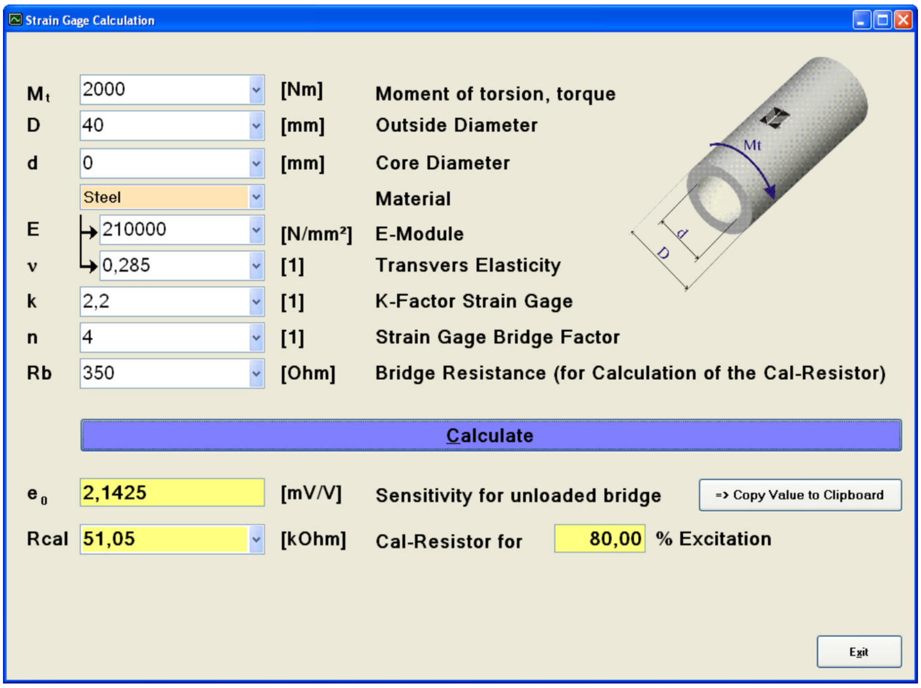


Fig. 28

Select *[Main-Menu] ->[Tools] ->[Strain Gauge Calculation Torsion]*

With this tool it is possible to calculate the sensitivity of a strain gauge for torsion measuring.

Additionally the shunt resistor for the calibration-function is calculated.

Please refer to the technical data of the strain gauge and the used material for the different coefficients.

6.6 Data file format (Option Data Acquisition)

Data Format

The data are recorded in a binary format. The file has the ending '.DAT'. The data can be imported in every analyzing software, which can handle with binary data.

Additionally there are generated two description files:

- MDF-description-file: This file is used to describe the structure of the binary file. The description file is necessary for the data viewing software PVIEW from Stiegele Datensysteme GmbH.
- Text-description-file: Description information in plane text

Format of the Binary File (.DAT)

Definition: LB= Low Byte, HB=High-Byte

First the Low-Byte and then the High-Byte of a channel is recorded.

The range of a 12 and 16 bit system is from 0 to 65535

For 12 bit-systems, the lowest 4 bits are set to 0

Table 1: Assignment to the analog values:

Excitation 100%	correspond to analog output +10 V	digital value 62259 for 16 bit system
Excitation 0%	correspond to analog output 0 V	digital value 32768 for 16 digital value
Excitation -100%	correspond to analog output - 10 V	digital value 3277 for 16 digital value

Excitation [%] = (Digital-Value - 32768) / 294.91 for 16 Bit-Systems

Values, which exceed this range are not within the measuring range.

The time between two measuring values in the .DAT-file corresponds to the reciprocal value of the sample rate of the system (see page technical data)

A optional calculated power-value is saved as 4-Byte float.

6.7 Data File-Structure (Option Data Acquisition)

Structure of the Binary File with extension .DAT: Sample file shown with a Hex Viewer

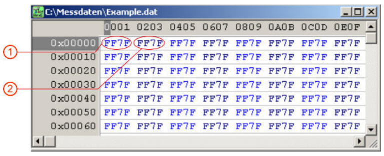


Fig. 29

1	First measuring value FF=Low Byte 7F=High Byte
2	Second measured value

Structure of the Text Description File with extension .txt

Structure shown for a system with two channels

```
[Data-Description file]
Version:            1.0
Binary-Filename:    dataset1.dat
Time of Record:     24.01.2008 17:15:39
Samples per Frame:  2
Bytes per Sample    4
Samplerate  [1/s]   6511,48

[Channeldescription]
Channelnumber:      1
Name:               Ch1
Label:              Channel 1
Unit:               V
Factor:             0,000339086500966397   (1)
Constant:           -11,1111864636669
Dataformat:         4

Channelnumber:      2
Name:               Ch2-RPM
Label:              RPM
Unit:               1/s
Factor:             1
Constant:           0
Dataformat:         4
```

Fig. 30

1	Factor and offset constant to calculate the physical value from the binary value Example: Binary Value 62259 * (0,00033908..)+ (-11,1111..) = 10 V [Unit] Data format: 4 for 2-Byte Integer, 9 for 4-Byte Floating-point

7 Maintenance

The systems of Manner Sensortelemetrie are low-maintenance.

DANGER!
Risk of Injury Caused by Defects on System Built-Up
Particularly loose or damaged parts may endanger present persons

Carry out the maintenance regularly and assiduously.

Within a periodical repeating maintenance following operations have to be done:

- Clean the antenna system, vacuuming of dust deposit
- Check the antenna system for scrub marks or mechanical damages
- Check the fastening of the stator antenna for a fix seat and tighten of the screwed fastenings where necessary.
- Check the plug connections and cables

Document the completed annual maintenance

8 Contact

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