

***Digital
RMC-Sensor-Telemetry
with 16 Bit resolution
and direct
PC Interface***

What is RMC-Sensor-Telemetry ?

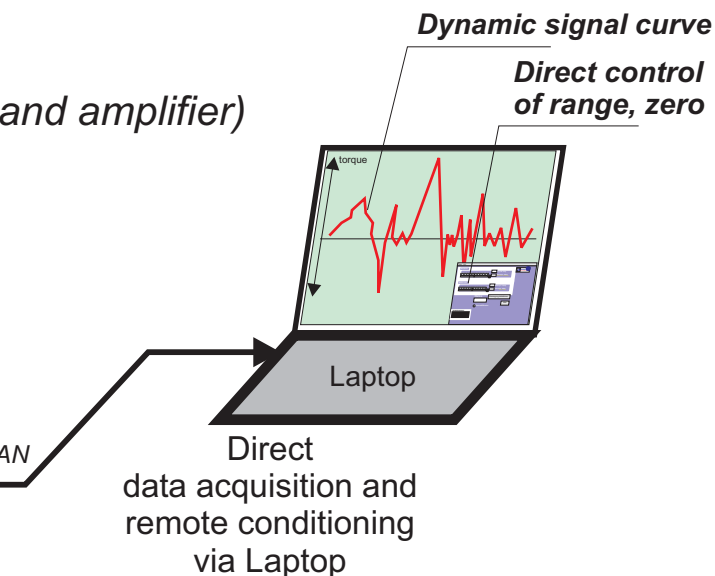
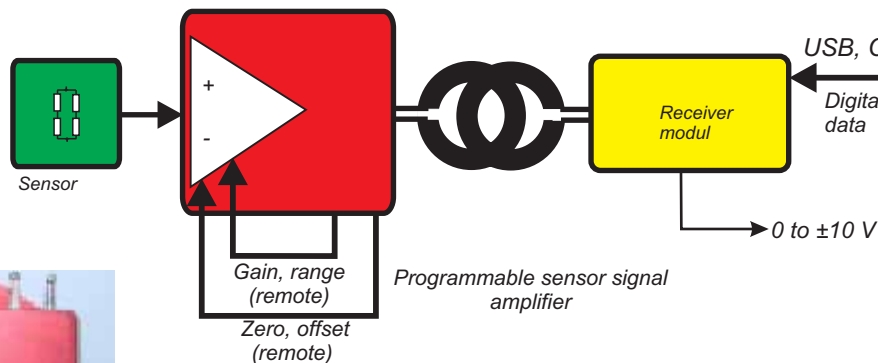
Telemetry system with

- * contactless transmitting of sensor signals from rotating parts
- * integrated inductive power supply for rotating parts (transducer and amplifier)
- * **direct interface to Laptop or PDA**

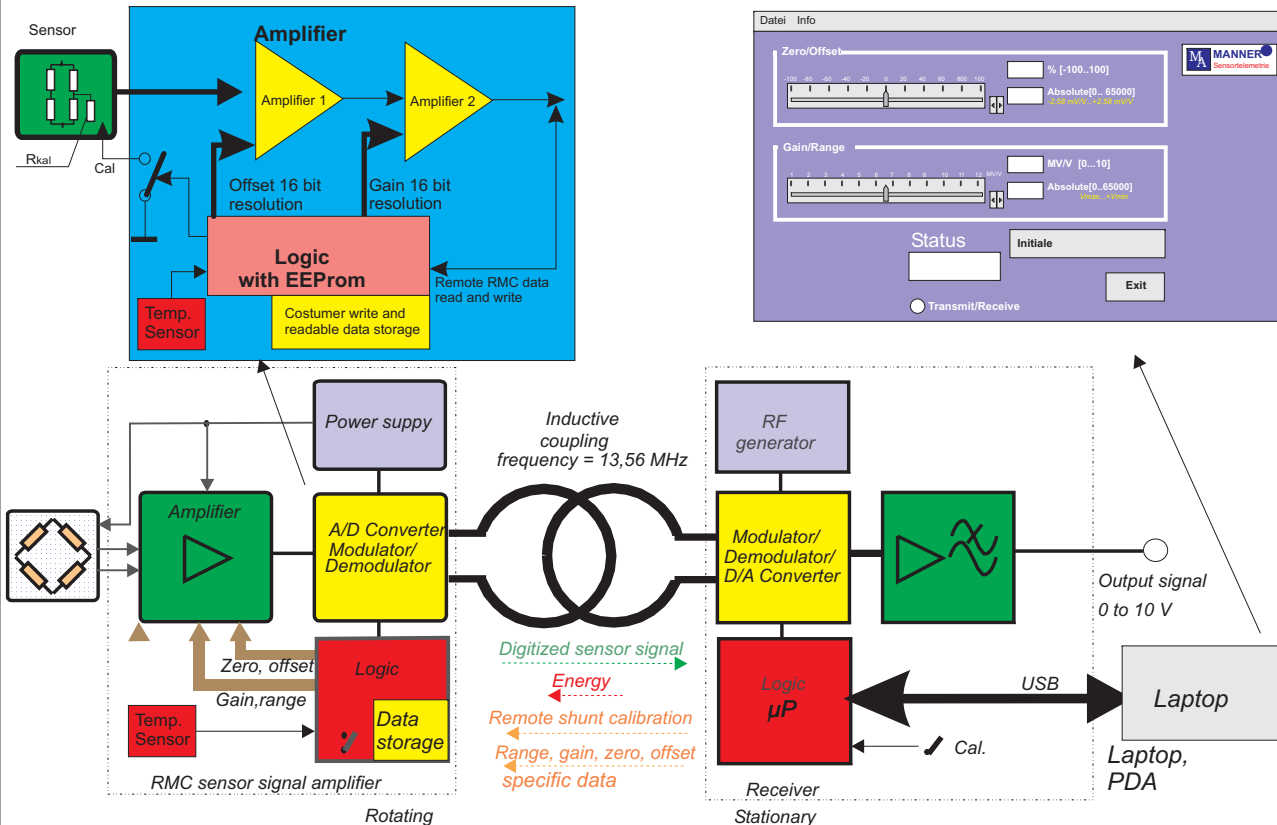
and

integrated remote online controlled sensor signal amplifier

- * **Gain, range control (high resolution adjustment of 16 bits)**
- * **Zeropoint, offset (high resolution adjustment of 16 bits)**
- * **Remote shunt calibration**



How does RMC-Sensor-Telemetry work ?

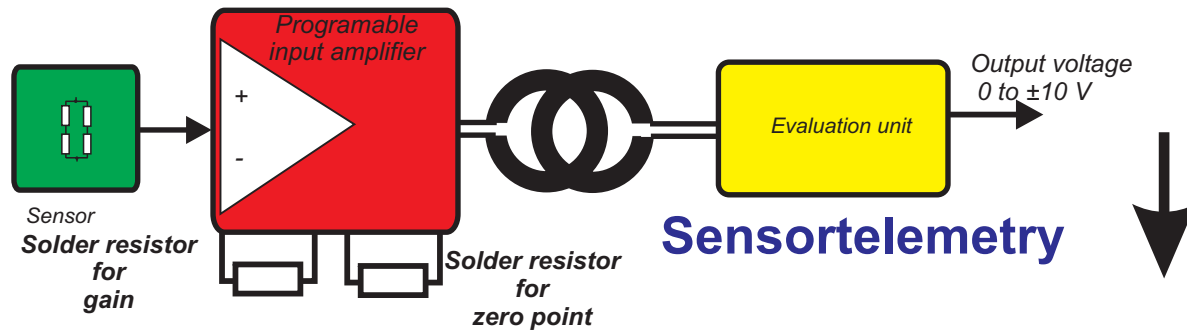


The control data for gain and zero will be online transferred via the telemetry channel

Features:

- * Remote high resolution adjustment (16 bit) of gain, range (0,05 mV/V to 10 mV/V)
- * Auto zero
- * Remote high resolution adjustment (16 bit) zero, offset ($\pm 500\%$ from the adjusted range)
- * Digitalizing of sensor signal with 16 bit resolution inside sensor signal amplifier
- * Integrated sensor signal amplifier for direct interface of strain gage:
standard: strain gage, PT100,
Option: thermocouple, piezoelectric, ICP, LVDT
- * Remote shunt calibration (option)
- * Integrated power supply for transducer and amplifier
- * Very small zero/gain drift: 0,003%/°C
- * Very good linearity : <0,003%
- * environment temperature: -25 to +125°C (-45 to +160°C, Option)
- * Housing: IP67
- * Integrated speed sensor (option)
- * Serial interface USB, direct control of gain and zero by Laptop, PDA
- * Additional int. temperature channel (via digital interface)
- * Read/writeable integrated memory for calibration sheet

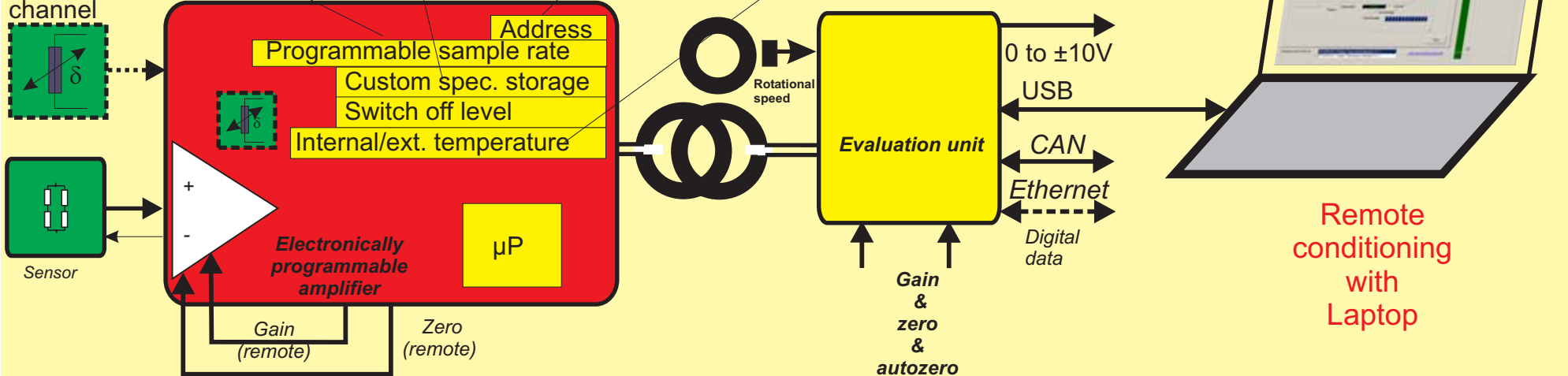
Remote programmable Sensor Telemetry



- Remote programmable samplerate (opt.)
- Storage for calibration data and characteristic curve or custom specific data
- Separate address for each amplifier
- Acquisition of internal temperature or alternative external sensor (opt.)

Optional temperature channel

RMC-Sensortelemetry



Remote controlled range (online via telemetry channel)

Mask 1 Basis

Actual torque value reading

External / internal
temperature

The screenshot displays the MANNER software interface for a torque measurement setup. The main window is titled 'Configuration: PCMRMC 1-Channel' and features several panels:

- Configuration Panel:** Contains 'Rotor Configuration' with fields for Serial Number (15), Sample Rate (6.62 kHz), Rotor Voltage (6.9 V), Rotor Voltage Limit (6.7 V), Softwareversion (1.0), Gain Adjust Factor (9.844999), Offset Adjust Factor (0.000000), Bitratedivider (32), Configuration (255), User Field 1 (Meßstelle 1), and User Field 2 (Configuration 1). It includes 'Start', 'Stop', 'Cal on', and 'Cal off' buttons, along with 'Save to file', 'Read Temperature', and 'Test Connection' buttons.
- Display-Configuration Panel:** Shows 'Unit' (Nm), 'Scale' (100), 'Offset' (0), and 'Digits' (1 and 3). It has a 'Show Binary Digits' checkbox and a 'Display Average' section with radio buttons for 'None', 'Low - 128 pts', 'Medium - 1kpts', and 'High - 5kpts'. The 'Defaultsettings' section has radio buttons for '+- 100 %' and '+- 10 V', and a 'Use as default' button. A 'Save Settings' button is at the bottom.
- Measvalue Panel:** Features a large digital display showing '-0,003 Nm'. Below it are 'Userfield 1' (Meßstelle 1) and 'Userfield 2' (Configuration 1) fields, and a 'Show external DISPLAY' button.
- Export Measvalues - internal function Panel:** Includes a 'Filename' field, a 'Comment' field, and 'Add Value', 'Show Values', and 'Save' buttons.
- Status-Information Panel:** Shows a sample rate of '6,62 kS/s' and a 'Receive' status indicator. It includes 'Transmit' and 'Acknowledge' buttons, and 'Online' and 'Exit' buttons at the bottom.

Mask 2

Remote Control

Actual torque value reading

Storage of conditioning data

Autozero

Fine adjustment of gain
16 bit resolution

File Setup Tools Info

Configuration Remote-Control Scope Data-Aquisition Service Configuration: PCMRMC 1-Channel

Remote Control

Start Stop Cal on Cal off

Sensitivity 01.0000 mV/V (Read note)

Invert

Offset -00.7348 mV (Read note)

Rotor Memory

Temporary Values

Read Values Send Value Auto-Set Sens. Auto-Zero

Stored Values

Read Values Send + Store

Measvalue

-0,017 Nm

Userfield 1 Meßstelle 1 Userfield 2 Configuration 1

Show external DISPLAY

Export Measvalues - internal function

Filename

Comment

Add Value Show Values Save

Important Note: Settings in mV and mV/V are approximate values and were adjusted for a 350Ohm Bridge at 1mV/V. The exact settings has to be determined by calibration. Calculation of a correction factor for different bridge resistors: Calculate

Fileoperation - Computer

Path Load Values Save Values

Filename

Adjustfactor Autoset

Status-Information

6.63 kS/s Fileoperation Receive Transmit Acknowledge

Online Exit

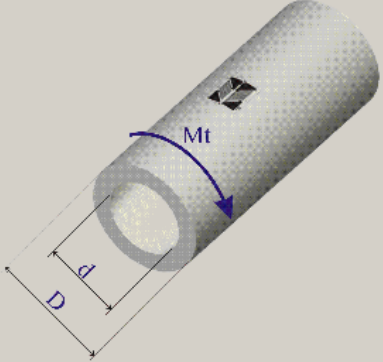
Mask 3

Calculation of Gain

M_t	<input type="text" value="1000"/>	[Nm]	Moment of torsion, torque
D	<input type="text" value="60"/>	[mm]	Outside Diameter
d	<input type="text" value="56"/>	[mm]	Core Diameter
	<input type="text"/>		Material
E	<input type="text" value="210000"/>	[N/mm ²]	E-Module
ν	<input type="text" value="0,32"/>	[1]	Transvers Elasticity
k	<input type="text" value="2,2"/>	[1]	K-Factor Strain Gage
n	<input type="text" value="4"/>	[1]	Strain Gage Bridge Factor
R_b	<input type="text" value="350"/>	[Ohm]	Bridge Resistance (for Calculation of the Cal-Resistor)

Calculate

e_0	<input type="text"/>	[mV/V]	Sensitivity for unloaded bridge	<input type="button" value="=> Copy Value to Clipboard"/>
R_{cal}	<input type="text"/>	[kOhm]	Cal-Resistor for 80% Excitation	



Mask 4

Integrated scope function

Real time signal graph

The screenshot displays a software interface for a PC-Scope. At the top, there is a menu bar with 'File', 'Setup', 'Tools', and 'Info'. Below the menu bar are tabs for 'Configuration', 'Remote-Control', 'Scope', 'Data-Aquisition', and 'Service'. The current configuration is 'PCMRMC 1-Channel'. The main area is divided into several sections:

- PC-Scope:** Contains a central signal graph with a yellow trace on a black background with a green grid. Below the graph are statistics: Min: 0.037 V, Max: -0.031 V, Avg: 0.005 V, and -0.068 Vss. Below the statistics are three control panels for 'Timescale' (10 ksamples/div), 'Gain' (2.0V/div), and 'Offset' (0.000 V).
- Measvalue:** A large yellow box displays '0,054 Nm'. Below it are two userfields: 'Userfield 1' (Meßstelle 1) and 'Userfield 2' (Configuration 1). A 'Show external DISPLAY' button is located below these fields.
- Export Measvalues - internal function:** Includes a 'Filename' input field, a 'Comment' input field, and three buttons: 'Add Value', 'Show Values', and 'Save'.
- Status-Information:** Shows a data rate of '6.62 kS/s' and a 'Receive' status. It also has 'Transmit' and 'Acknowledge' buttons.
- Control Buttons:** 'Start', 'Stop', 'Cal on', and 'Cal off' buttons are on the left. 'Online' (green) and 'Exit' (red) buttons are at the bottom.

Mask 5

Online signal recording (mdf format) (torque, speed, temperature)

File Setup Tools Info

Configuration Remote-Control Scope Data-Aquisition Service Configuration: PCMRMC 1-Channel

Data-Aquisition

Start **Start Aquisition**

Stop **Stop Aquisition**

Cal on **View Data**

Cal off

Settings for MDF- and Text-Description file

X-Axis (Timebar)

Autodetect

Userdefined Samples/s

Y-Axis

Same as Display

Digits

Channel-Name

Measvalue

0,044 Nm

Userfield 1 Userfield 2

Show external DISPLAY

Export Measvalues - internal function

Filename

Comment **Add Value**

Show Values

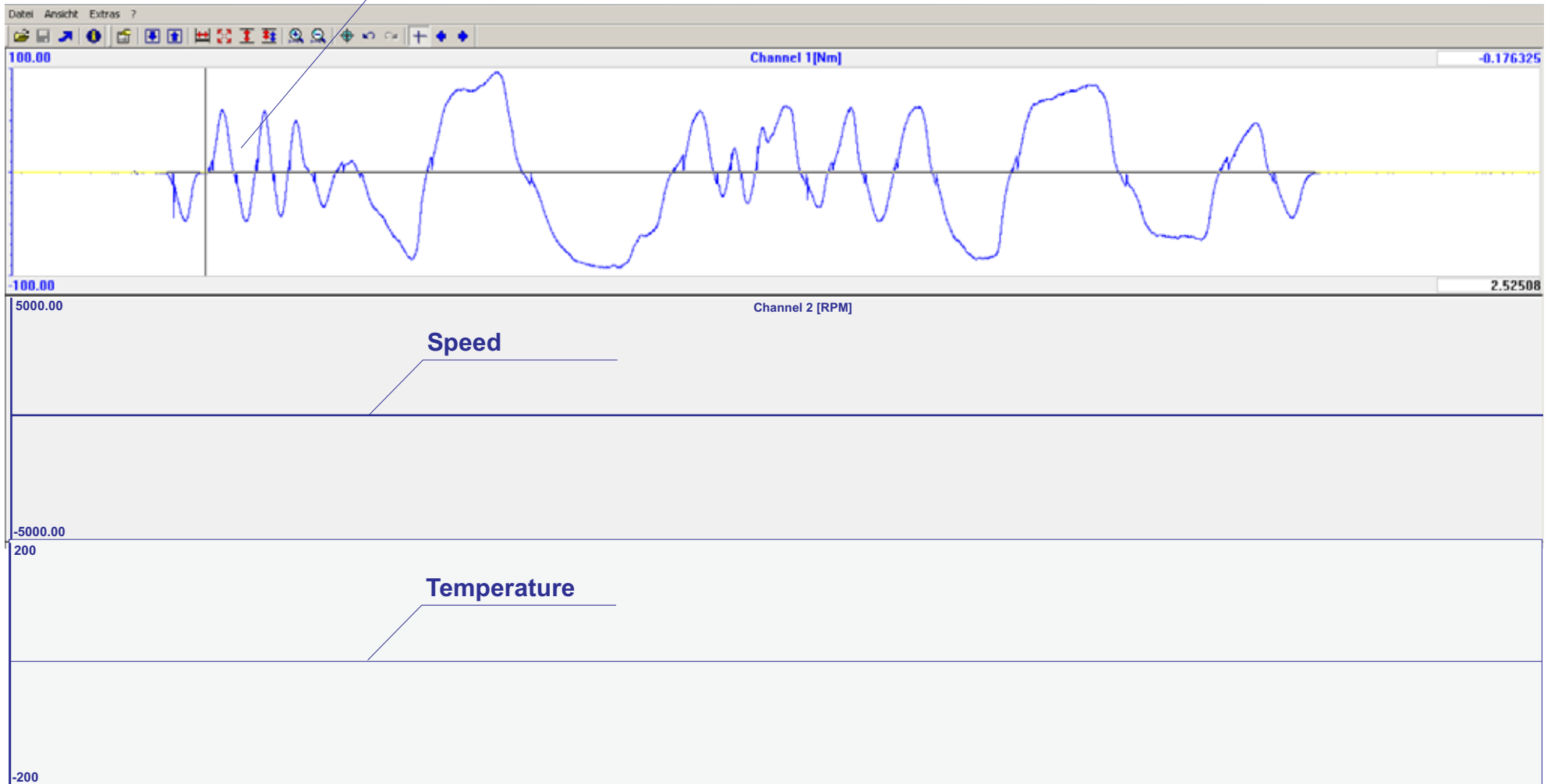
Save

Status-Information

6.62 kS/s Fileoperation **Receive** Transmit Acknowledge

Online **Exit**

Mask 6 Data records

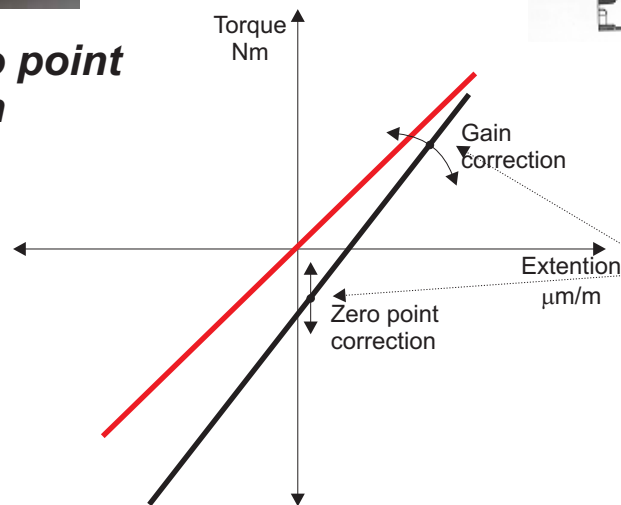


Why RMC-Sensor-Telemetry?

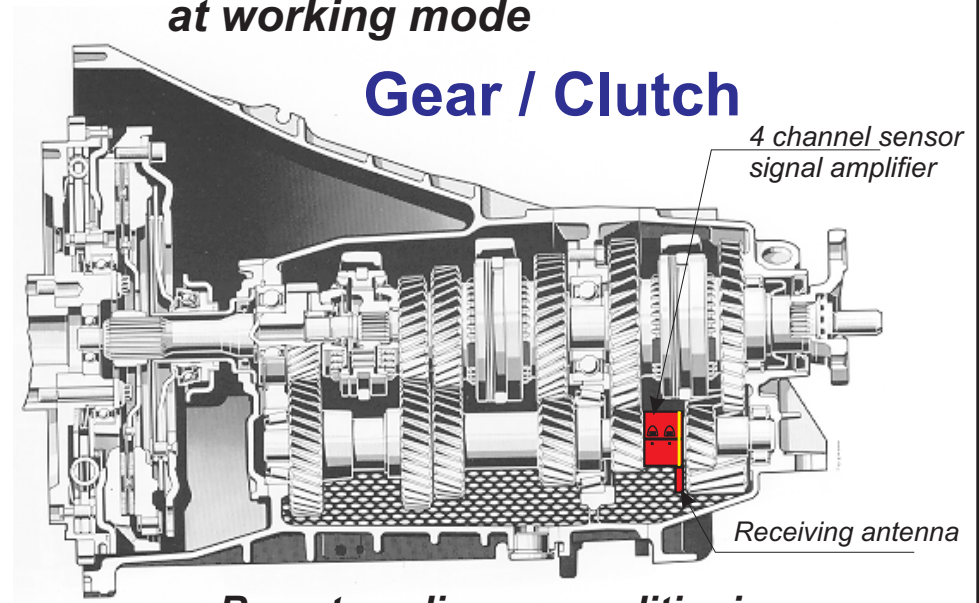
Initial remote setup of the of strain gage application at installation



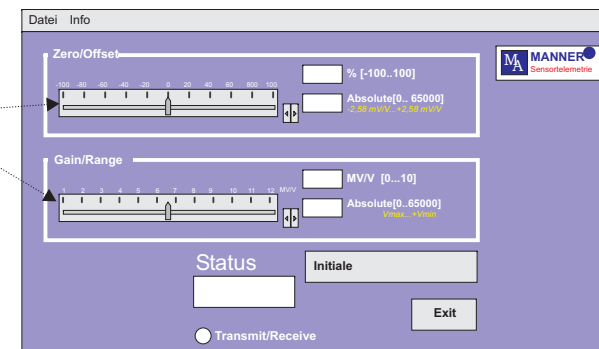
Adjusting tolerances in zero point
Adjusting tolerances in gain



No access to the rotor electronic at working mode



Remote online re-conditioning without opening the gear possible

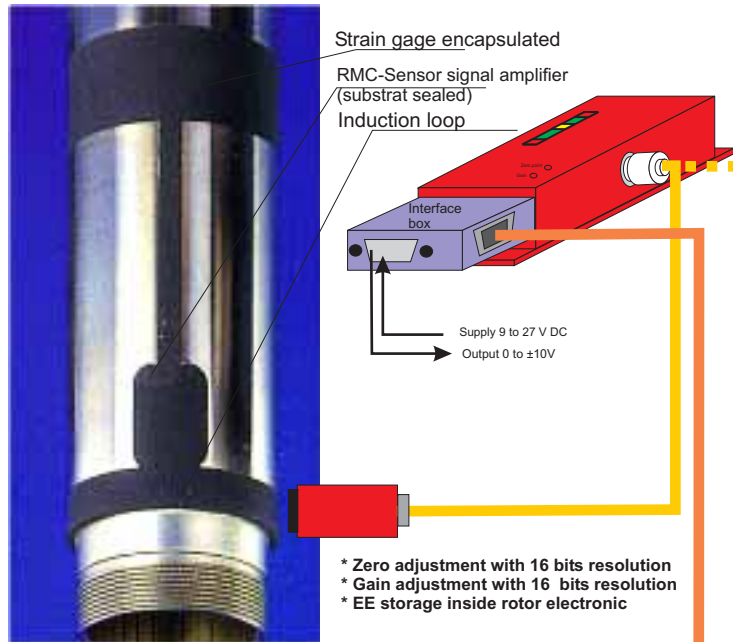


Why RMC-Sensor-Telemetry? fully sealed torque transducer

Initial remote setup of the torque sensor (range, zero) after sealing and re-setup at recalibration

Custom spec. completely sealed torque transducer (water proof)

Axle shaft application

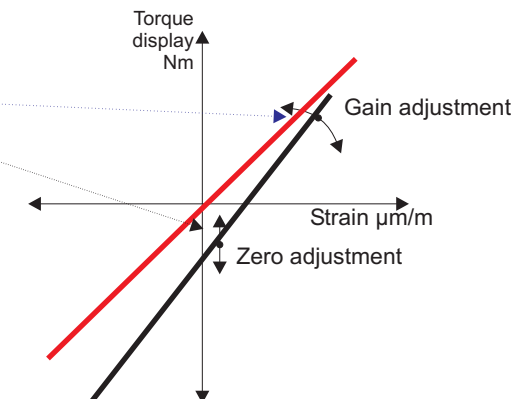
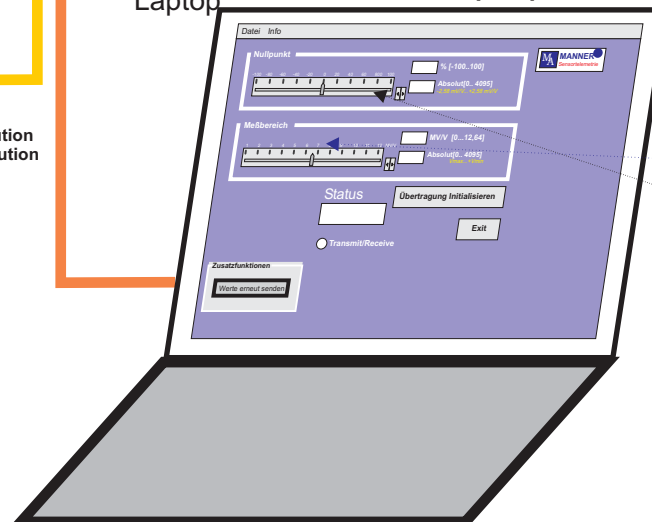


- * Zero adjustment with 16 bits resolution
- * Gain adjustment with 16 bits resolution
- * EE storage inside rotor electronic



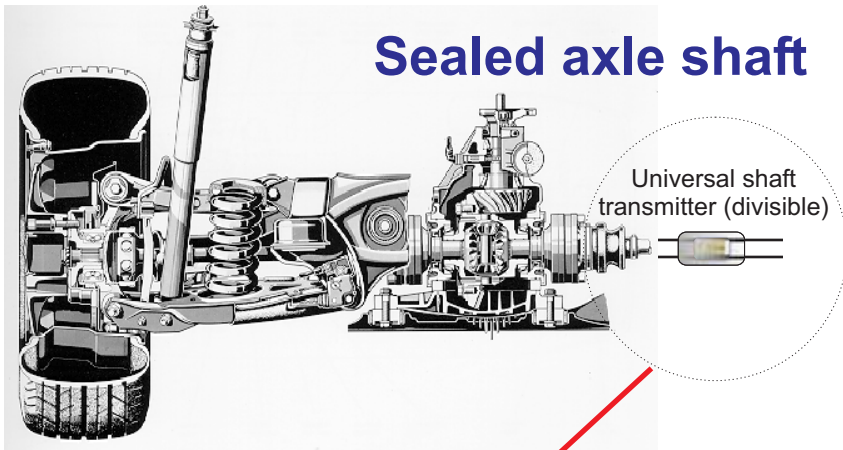
Remote conditioning with Laptop

Laptop



Why RMC-Sensor-Telemetry?

Sealed axle shaft



No access to the rotor electronic

Multi channel sensortelemetry

Many channels (helicopters, turbines) >>
Big work load for conditioning



Why RMC-Sensor-Telemetry?

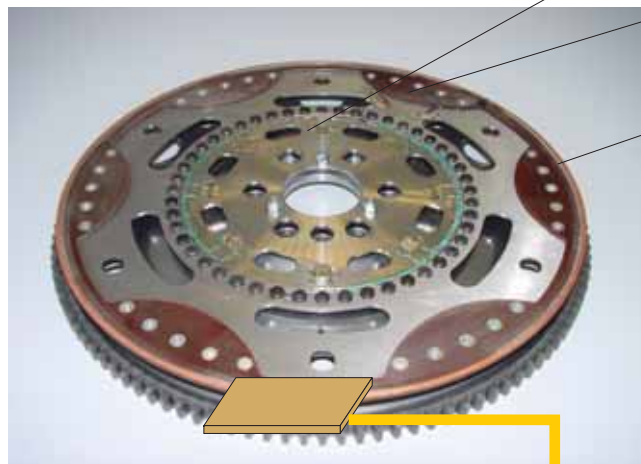
Change of torque range online possible !!!

Custom spec. flex plate torque transducer (car)

Torque transducer

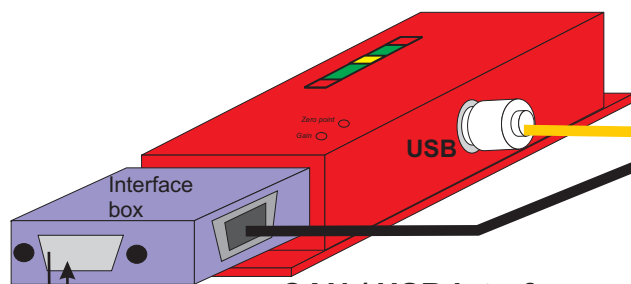
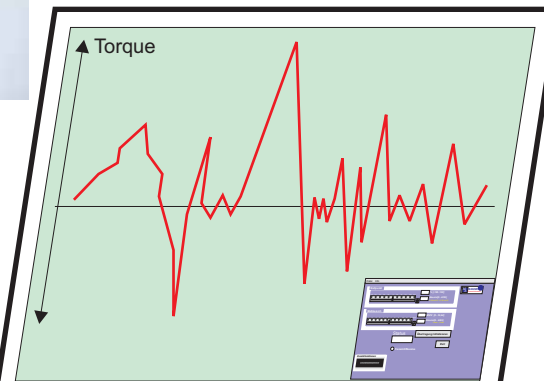
RMC-Sensor signal amplifier

Induction loop



Pick up

Laptop or PDA

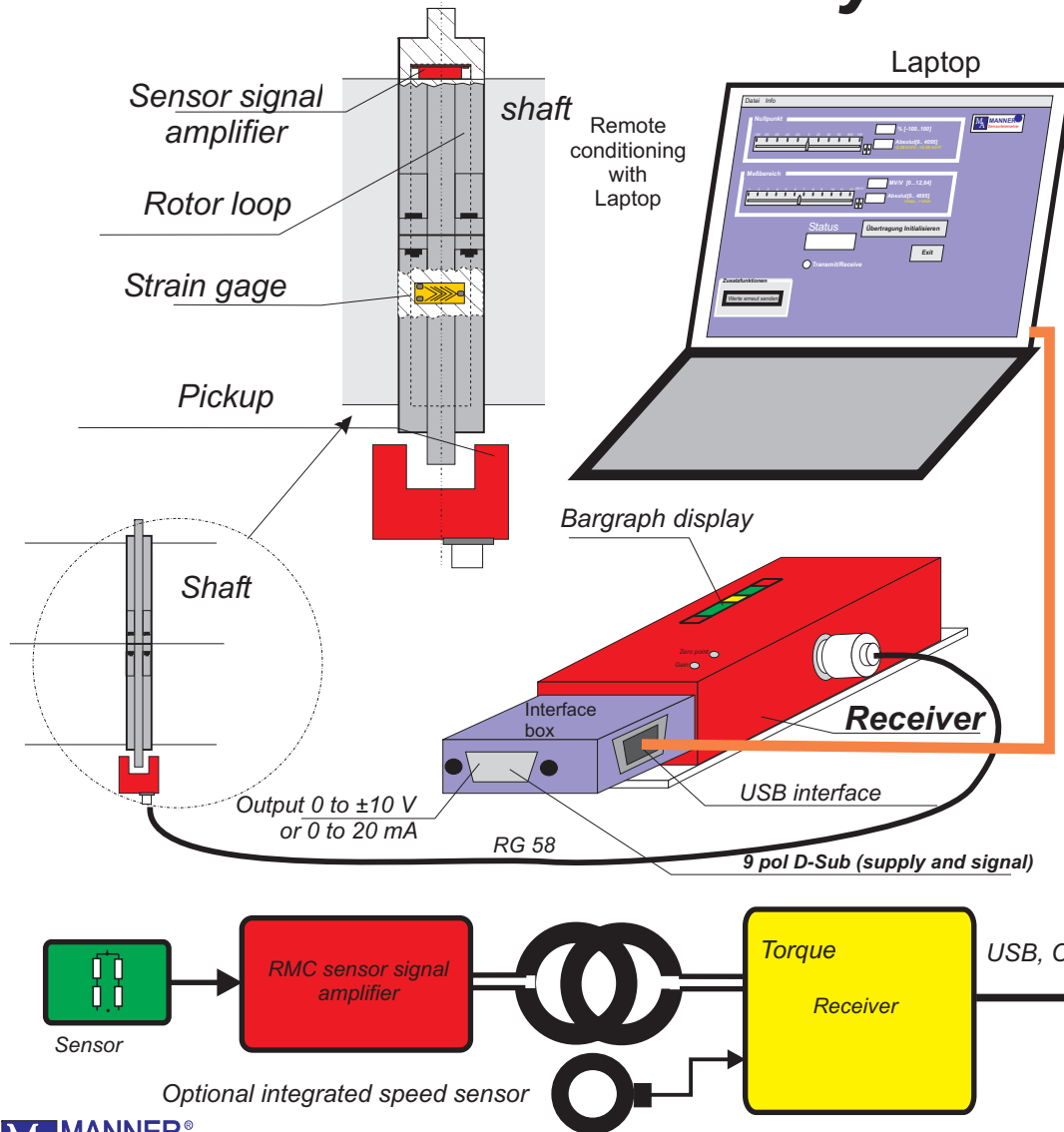


CAN / USB interface

Supply 9 to 27 V DC

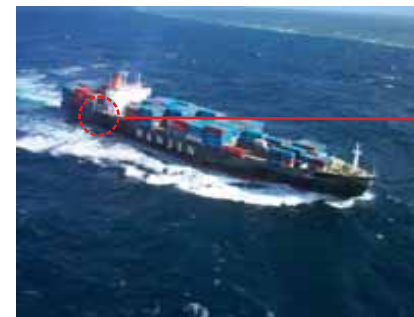
0 to ±10 V

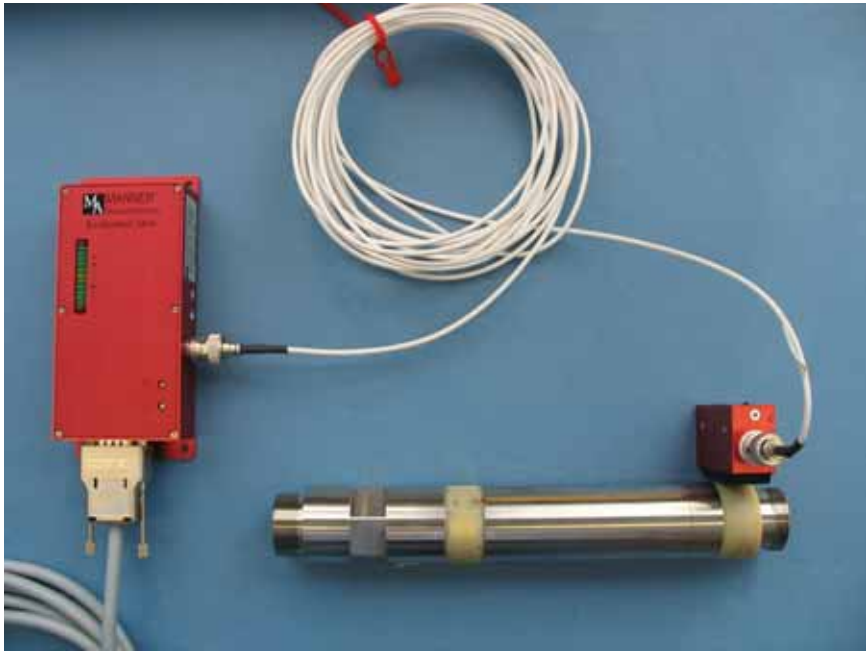
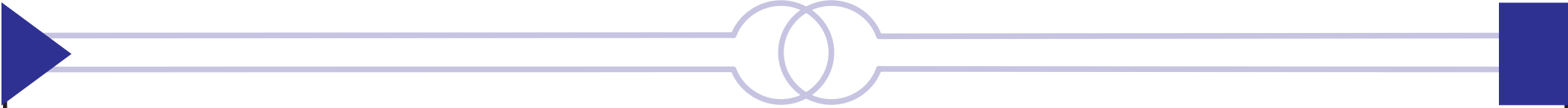
RMC Sensor Telemetry for Power Monitoring on Ships



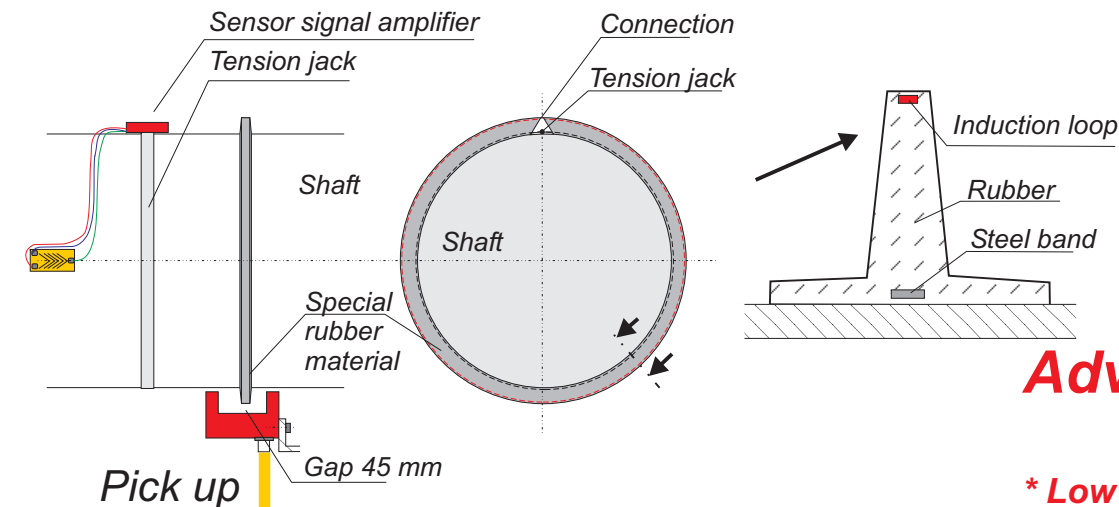
Advantages:

- * Easy mounting
- * Initial remote setup (condition) of the torque sensor at installation
- * Integrated speed pick up (option)
- * Direct display of torque on Laptop or PDA
- * Remote online re-adjustment of torque (power) range possible
- * Serial transmitting of digital data to monitoring system



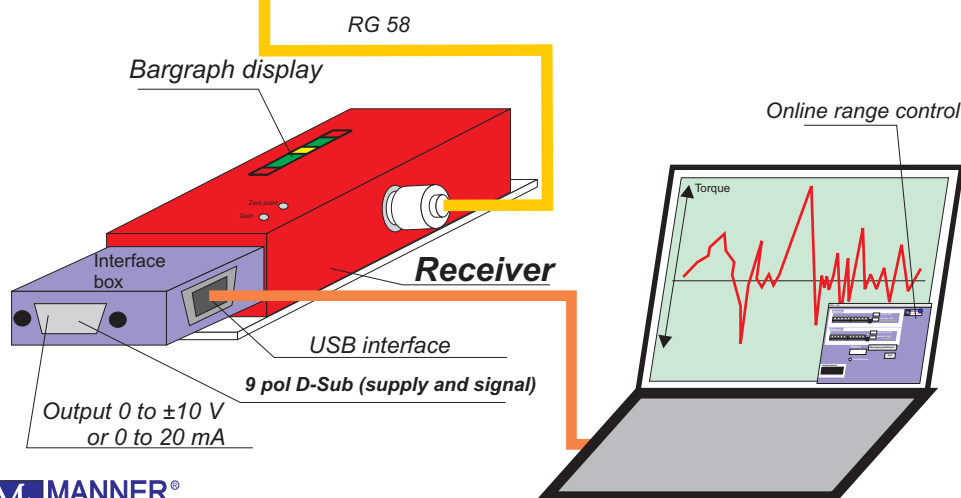


Low Weight Powerful RMC Sensor Telemetry for Mobile Use in Field



Advantages:

- * Low weight (ideal for use in field, travelling by plane)
- * Flexible rotor loop (product sold by meter) for different shaft diameters and easy mounting
- * Easy mounting by special available flexible rotor loop
- * Shaft diameters up 2000 mm
- * Direct strain gage interface (no batteries)
- * High resolution and absolutely noise free digital transmission (16 bits, integrated failure detection)
- * Direct acquisition of dynamic signal by USB interface without any additional data-acquisition system
- * Remote high resolution (16 bits) online range and zero point conditioning by PC
- * Auto zero function inside rotor electronic
- * Integrated RPM option
- * Program for calculation of true values (Nm, N, μ -strain, etc.)



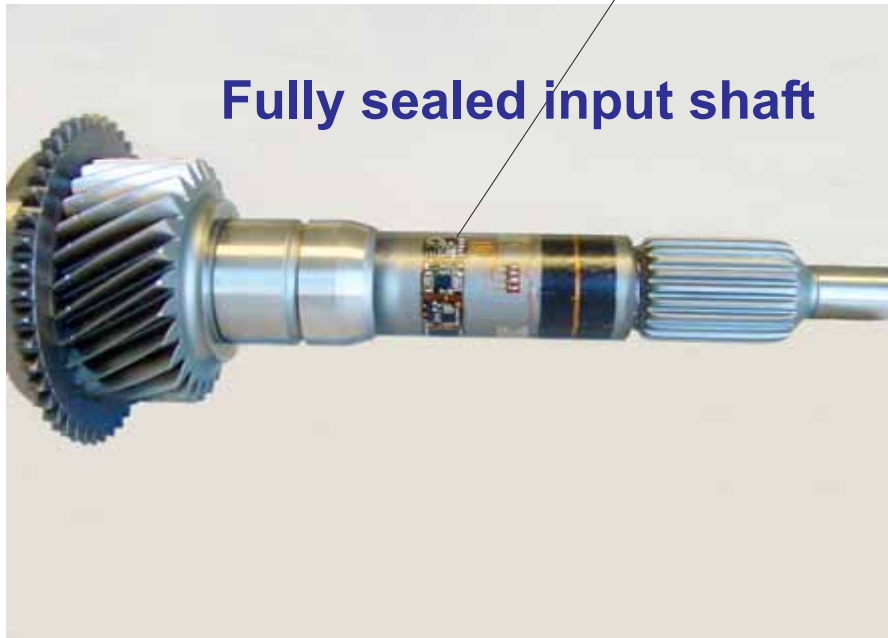
RMC-Telemetry in Flex Substrat Version for Inputshaft in Cars

Range conditioning after sealing !!!

Special use

Sensor signal amplifier
only 2,5 mm width

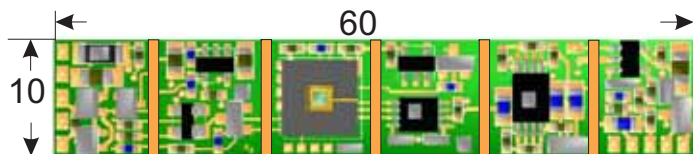
Fully sealed input shaft



Features:

- * Channels: 1
 - * Transmitting sensor telemetry inductive
 - * Digital transmitting: 16 bit resolution
 - * Geometry: flex substrat
 - * Width: 2,5 mm, size: 10 x 60 mm
 - * Smallest circle: diameter 14 mm
 - * High resolution (16 bits) remote range conditioning (gain, zero) by programmable input amplifier
 - * Range: 0,05 to 10 mV/V
 - * Transducer: strain gage (350/1000 Ω), NiCr.-Ni,
 - * Zero drift: 0,003%/°C
 - * Environmental temperature: -40 to 160°C
- Type: SV_Flex_1_0.003_125_PC

Flexible sensor signal amplifier



Data Sheet:

Transmitting frequency: 13,56 MHz (ISM)
Modulations: absorption modulation (Patent of Manner)
Coding: 16 Bit PCM with CRC
Resolution: 16 Bit
Strain gage bridge supply: 3,3 V (5,0 V optional)
Strain gage : $\geq 350 \Omega$
Sensitivity: 0,05 to 10 mV/V
Sample rate: 6,7 kHz
Filter cut off (-3 dB): 1 kHz (2 kHz, 10 kHz optional)
Filter type: 8 pol. Bessel
Additional channel for monitoring sensor amplifier
Output voltage: 0 to ± 10 V
Digital output: USB, CAN, RS232
Software control / monitoring operating system: XP, Windows
Environmental temperature range (SV) : -25 to + 85°C (160°C option)
Zero drift: $< 0,003\%/^{\circ}\text{C}$ at 1 mV/V
Gain drift: $< 0,002\%/^{\circ}\text{C}$ at 1 mV/V
Linearity: $< 0,01\%$ at 1 mV/V
Max. acceleration load: 40 000 g
Weight: depending on housing (min. 3g)
Size: see different types
Supply receiver: 9 to 36 V DC / 90 to 270 V AC
Additional functions:
Integrated temperature sensor with readout
Integrated storage 32 bytes for serial no., calibration value, history

Using the Interface Software

(data acquisition- optional)

The screenshot shows the 'RemoteControl V2' software interface. The 'Data-Aquisition' tab is active. On the left, there are buttons for 'Start Acquisition', 'Stop Acquisition', 'View Data', 'Cal on', and 'Cal off'. The 'Filename' field contains 'D:\Messdaten\Data_File1.mdf'. On the right, a digital display shows '0,765 V' and a vertical green bar graph with markers at +10V, 0V, and -10V. At the bottom, a 'Status' section shows 'Progress 3345' and buttons for 'Acknowledge', 'Transmit', and 'Eject'. The website 'www.sensotelemetrie.de' is visible at the bottom right.

Start recording into a file

Stop recording into a file

Show data with additional data viewer PVIEW - if installed

Input of path and file name

Display file operation active

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

Data File

Data Format

The data are recorded in the MDF-Format.

Two files are generated. One binary file with the ending '.DAT' and one belonging description file with the ending '.MDF'.

The description file is necessary for the data viewing software PVIEW from Stiegele Datensysteme GmbH.

The binary file can be used from other data display or data analysing systems that are able to import digital values.

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 16 bit system is from 0 to 65535, the range of a 12 bit system is from 0 to 4095

Assignment to the analog values:

Excitation 100% (correspond to analog output +10V)	digital value 62259 for 16 Bit-Systems	3891 for 12 Bit-Systems
Excitation 0% (correspond to analog output 0V)	digital value 32768 for 16 Bit-Systems	2048 for 12 Bit-Systems
Excitation -100% (correspond to analog output - 10V)	digital value 3277 for 16 Bit-Systems	205 for 12 Bit-Systems

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

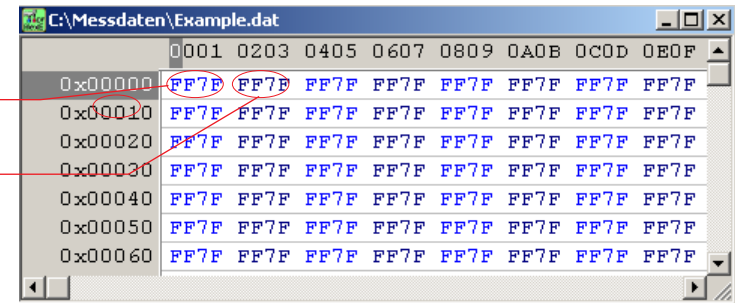
Excitation [%] = (Digital-Value - 2048) / 18,43 for 12 Bit-Systems

Values out of this range are not within the measuring range and cannot be transmitted correctly.

Sample file shown with a Hex Viewer

First measvalue
FF=Low Byte
7F=High Byte channel 16

Second measvalue

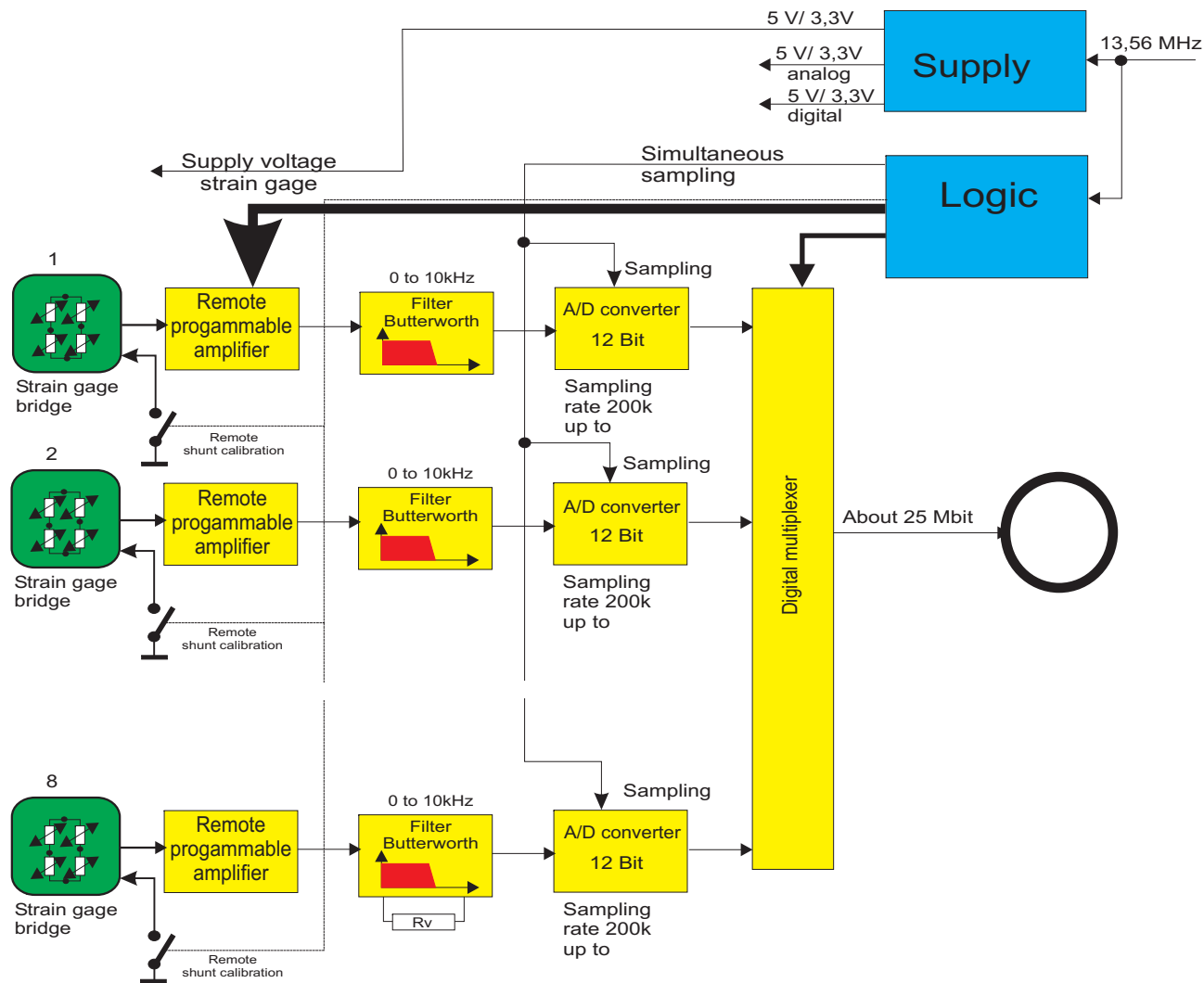




***RMC Multi Channel
Sensor Telemetry
with Time Multiplexing***

Overview

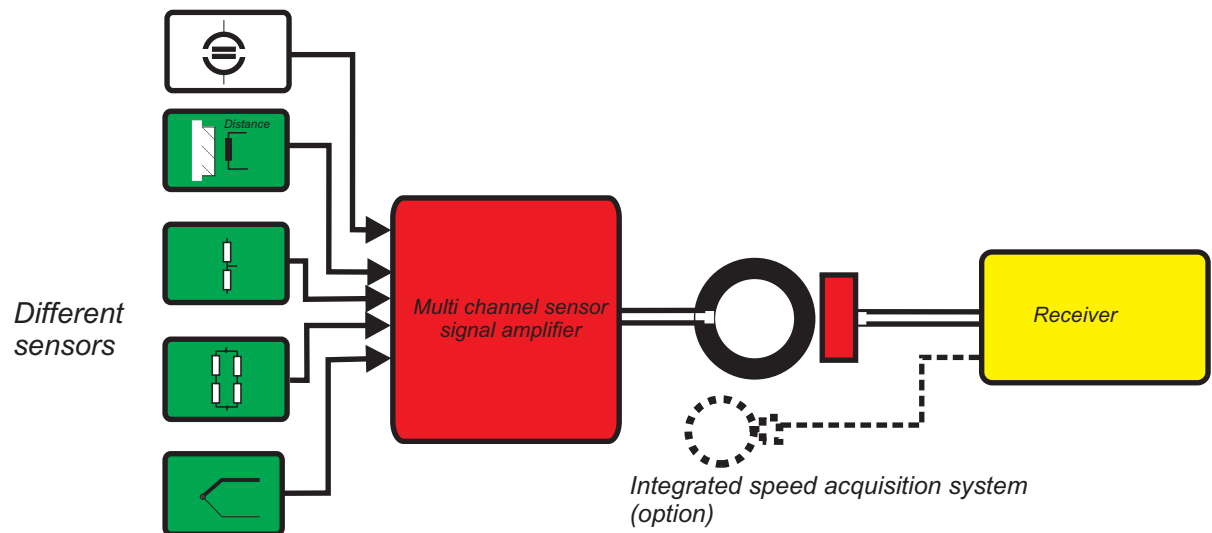
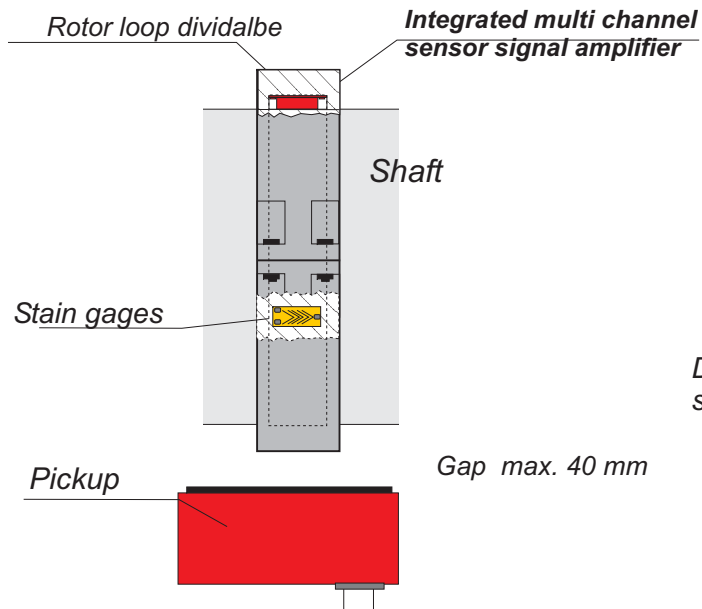
Multi Channel Sensor Telemetry



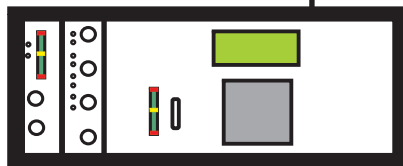
RMC Sensor Telemetry for Universal Use

Multi channel sensor telemetry on Drive Shaft

(without batteries)



To the pickup



Receiver

Features:

Channel count: max. 64 (time multiplex)

Sample rate per channel: 40000 sample/sec (max. 200 000)

Integrated sensor signal amplifier channel
(remote controlled): 0,064 mV/V to 10 mV/V

Auto zero per channel (remote controlled)

Sensor: Strain gage, thermocouple, distance sensor (μ -Epsilon)
zero drift: 0,01 %/° Celsius

Environmental temperature: -25 to 125° C (150°C)