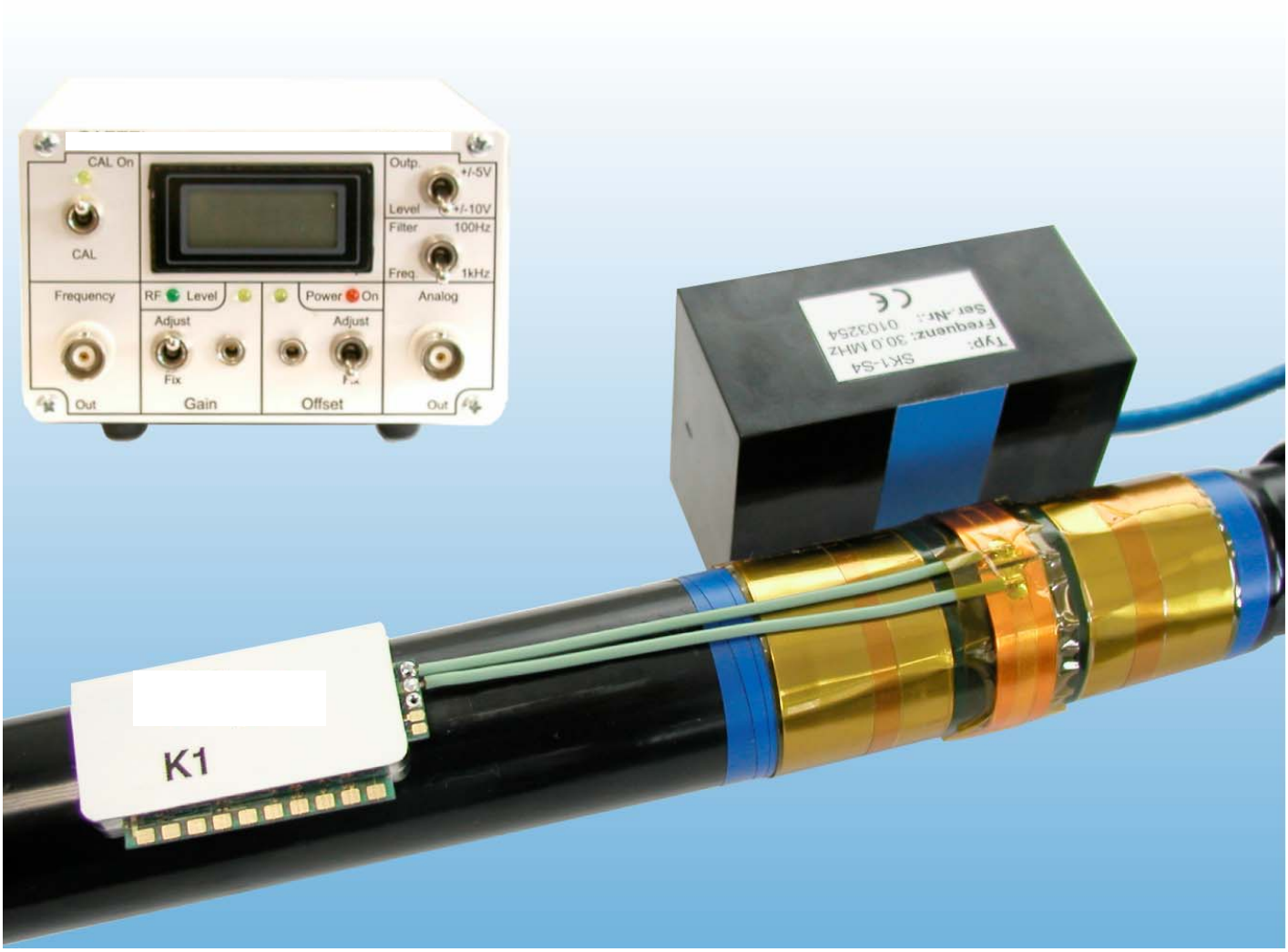
1-Channel FM-Telemetry

RTM
Rainer Thomas Messtechnik

K1



Acquire physical values with Strain gage fullbridge
NiCr-Ni Thermocouple
Pt100 Thermoresistor
Potentiometer

Wireless data transmit with FM-RF transmitter

Wireless supply with inductive transformer

Contents 1- Channel Telemetry System K1

K1

E Introduction

E-1.0 General

The 1-Channel Telemetry System K1 allows the acquisition of physical data from moving parts of machines, vehicles, ships, aircraft in the sectors of industry, agriculture, automotive, medicine, pharmacy and much more.
The system can be configured to accept a variety of sensors, making different measurement tasks possible.
For supplying sensors and electronics on the rotating side, battery-power or inductive power can be used. Using the inductive power configuration, the system can run with continuous operation.
The K1 also has the ability to work with inductive power on large diameter shafts, with diameters of more than 1m.
Multi-channel data acquisition with the K1-System is possible too. This is achieved by using a special carrier frequency channel per channel.

E-1.1 Abbreviations and terms

Symbol	Unit	Name	Note
Rb	**kOhm**	Bridge resistor	Resistor of installed strain gauge bridge
S	**mV/V**	Sensitivity	Parameter of strain gauge application
D	**%**	Shunt calibration	Unbalancing of strain gauge bridge by n% of full scale range
RGain	**kOhm**	Gain determining resistor	Determines factor of amplification
RCal	**kOhm**	Shunt resistor	Calibration shunt value

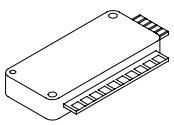
D Specification 1-Channel Telemetry system K1

Basic version

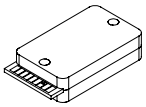
K1

System	
Accuracy	0.1% (60dB)
Signal bandwidth	0....1 kHz
Rotor	
RK1-R2	
Dimensions	44 (48) x 20 (24) x 8 mm
Sensors	strain gauge, ≥ 350Ω, full bridge thermocouple type K (NiCr-Ni), Pt100, voltage
Ranges	... 0.5mV/V....50mV/V by soldering resistor -200°C...1000°C (TC), -40°C... 200°C (Pt), ±5V
Weight	15g
RK1-M1/-M2	
Dimensions	28 (31) x 17 x 7 mm
Sensors	**-M1** strain gauge, ≥ 350Ω, full/half bridge **-M2** thermocouple type K (NiCr-Ni),
Weight	7g
RK1-PM1/-PM2	
Dimensions	29,5 (32,5) x 18 (28) mm
Sensors	**-PM1** strain gauge, ≥ 350Ω, full/half bridge **-PM2** thermocouple type K (NiCr-Ni),
Weight	14g
RK1-IP	Inductive Power module to use with **–M1,-M2,-PM1,-PM2**
Dimensions	about 15 x 12 x 6 mm
Excitation	5V/15mA or 0.5mA (Pt)
Shunt-calibration	soldering resistor
RF-frequency	10.7 MHz (standard), 5 others up to 30 MHz
Supply	8...12VDC
Connections	soldering pads
Operating temperature	0....80°C (optional -40°C...120°C)
Stator	
SK1-E1	receiving head
Dimensions	25 x 25 x 15 mm
SK1-S2, SK1-S4	inductive and receiving head
Dimensions	-S2 25 x 30 x 45 mm / -S4 35 x 50 x 70 mm
Distance to shaft	in relation to installation, ... about 100 mm (-E1), 10 mm (-S2), 40 mm (-S4)
Cable length	3 m
Operating temperature	0....80°C (optional –40°C...120°C)
Repro-unit	
WK1-T	desktop-unit
Dimensions	105 x 64.5 x 184 mm
WK1-E	rack mount-unit, 19"
Dimensions	70.8 x 128 x 171 mm
Analog-output	± 5 V, ± 10 V switchable
Frequency-output	10 kHz ± 5 kHz
Output-filter	100 Hz/ 1 kHz switchable
Offset adjustment	± 1.8V analog output, potentiometer
Gain correction	± 20%, potentiometer
Shunt-calibration	switch (RK1-R2), poweron (RK1-F1)
Monitor	LCD-display, 3½ digit
Power-supply	9...32 V DC
Operating temperature	0...60°C (optional –20°C...80°C)
Options	
K1-T	extended temperature range RK1- -40°C...120°C SK1 -20°C...100°C WK1- -20°C... 80°C
K1-F-x	from 10.7MHz different carrier frequencies (30/ 19,5/ 23/ 17/ 12,5 MHz)
Accessories	
K1-N1	AC-Adapter 90...240 V / 50...60 Hz
K1-EC-10, -20	cable extension stator- repro unit 10 m or 20 m
K1-I1	installation set for about 1m perimeter of shaft
Specials	
K1-A1	strain gage application
K1-K1	calibration
K1-G1	system-installation
Post calibration cycle	for the components of the system, a period of post calibration time exists from 2 years

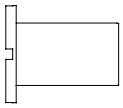
RK1-R2



RK1-M1/-M2



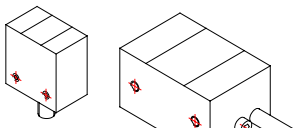
RK1-PM1/-PM2



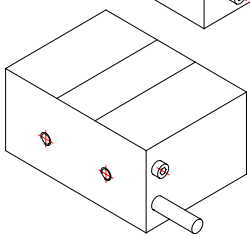
RK1-IP

SK1-E1

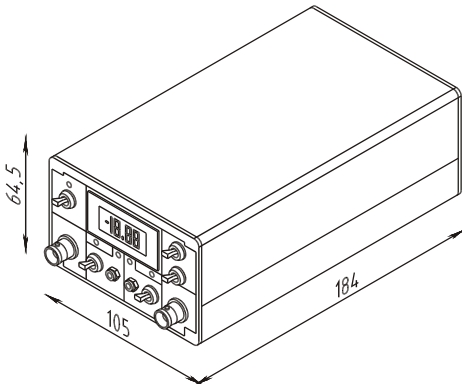
SK1-S2



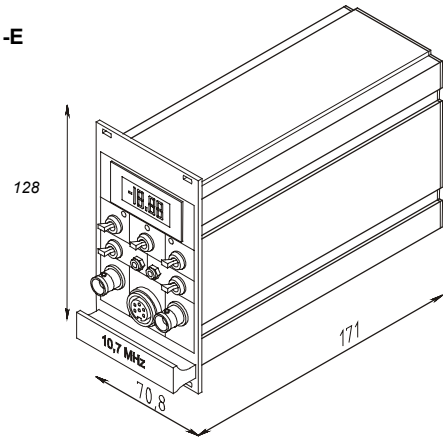
SK1-S4



WK1-T



WK1-E



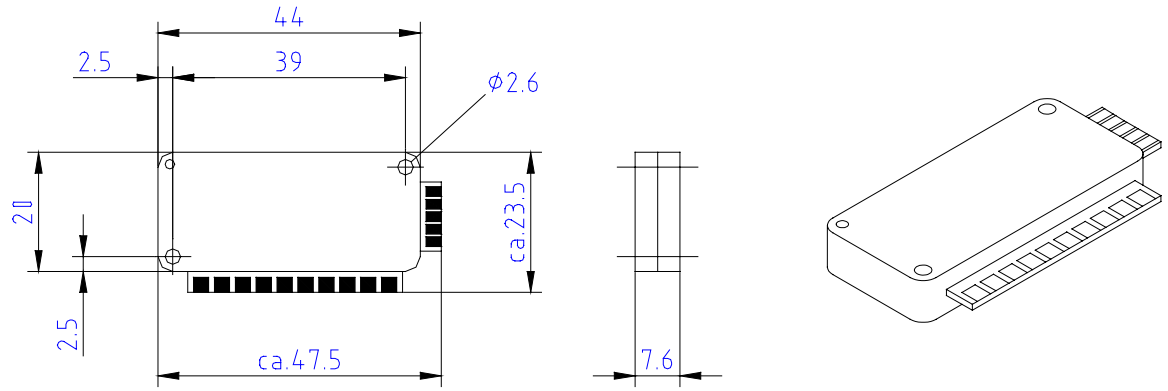
R Rotor units of the 1-Channel Telemetry System K1

K1

R-1.0 Standard

The miniature Rotor unit **RK1-R2** (20mm x 44mm x 8mm, weight 15g) combines the following functional units: Signal conditioning for different sensors, Voltage-/Frequency-converter, RF-transmitter, Supply module for inductive and battery supply as well as the availability of excitation for sensors. The Rotor unit **RK1-M1** (17mm x 28mm x 7mm, weight 7g) is a smaller one especially for strain gauges.

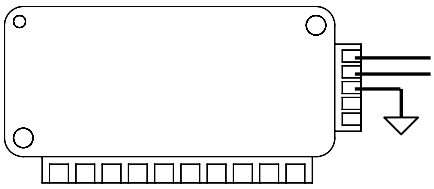
R-1.1 Rotor electronics RK1-R2



Power supply

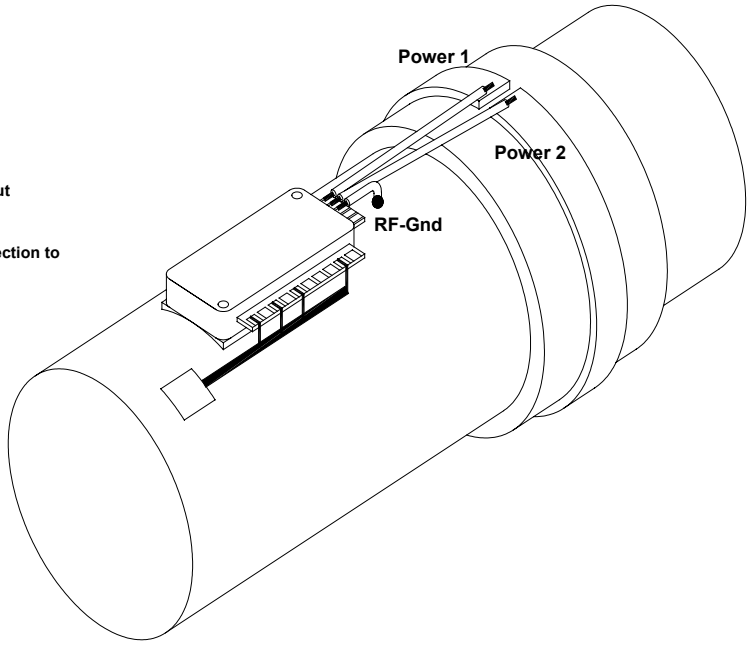
Powering of Rotor electronics **RK1-R2** is possible by DC voltage **DC-Supply** or by inductive transmission **AC-Supply**. If inductive supply is needed, the **Inductive and Receiving heads SK1-S2, SK1-S4** are necessary. The **Receiving head SK1-E1** is designed to receive data only and so a separate Power supply (battery, accumulator, ...) for the Rotor electronics is necessary .

AC-supply / inductive

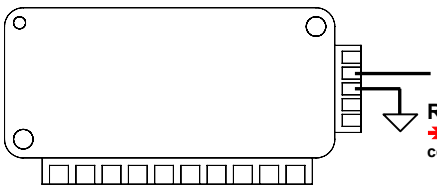


Power winding
Power 1
Power 2 / RF-output

RF-Gnd
➔Conductive connection to the shaft



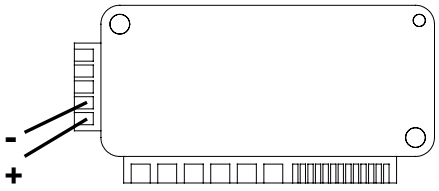
DC-supply / battery



Power winding
Power 2 / RF-output

RF-Gnd
➔ Conductive connection to the shaft

DC-supply
7,5 ... 15V



K1

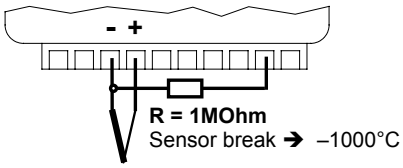
R-1.1 Rotor electronics RK1-R2

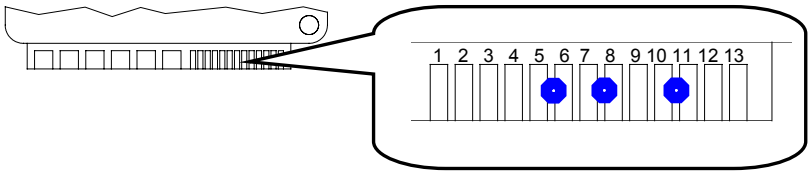
Sensor connection and configuration

The Rotor electronics **RK1-R2** allows the connection of different sensors. If sensor excitation is needed, it is also generated by the Rotor Electronics.
On the configuration-pads solder bridges are installed, corresponding to the sensor used. ➔ 
Solder bridges can also be used to select different fixed amplifier gain ranges. ➔

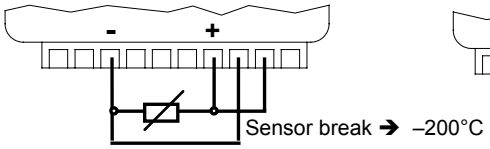
➔ When soldering on the pads of the Rotor electronics use a soldering iron rated at less than 30W.
➔ To solder use a tin-lead solder with an acid free flux.

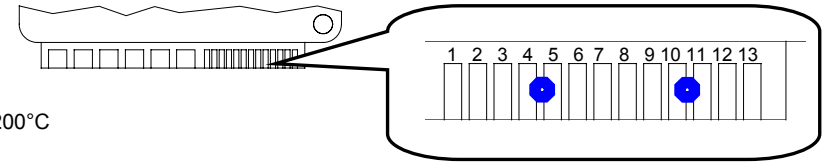
Thermocouple NiCr-Ni, type K Range -200°C ... 1000°C



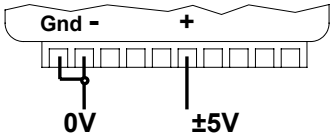


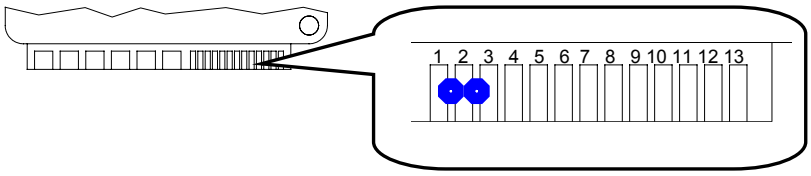
Thermo-resistor Pt100 Range -40°C ... 200°C



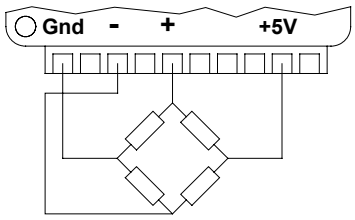


Voltage Range ± 5V



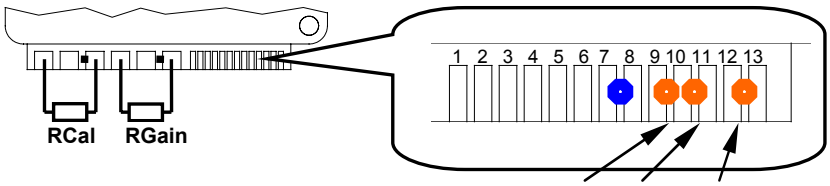


Strain gauge – full bridge, 350 Ohm Range ...0.5mV/V... 50mV/V



S [mV/V]	RGain [kOhm]	RCal [kOhm]
0.5	0.5051	217.575
1.0	1.0204	108.200
1.5	1.5464	71.7417
2.0	2.0833	53.5125
2.5	2.6316	42.5750
3.0	3.1915	35.2833
5.0	5.5556	20.7000

Bridge with Rb=350 Ohm,
Shunt cal D= 80% of full-scale
Analog output range ±10V



The resistor **RCal** is switched parallel to an arm of the bridge by an internal contact. Therefore is a defined **Shunt cal D** of the bridge.

➔ The function "Shunt-Calibration" is switched on with the key **CAL** at the front of the Reproducer WK1 and only available using inductive power supply.

The resistor **RGain** allows stepless adjustment of **Sensitivity S**.

Solder bridges **9-10**, **10-11** and **12-13** allow the activation of adjusted ranges:

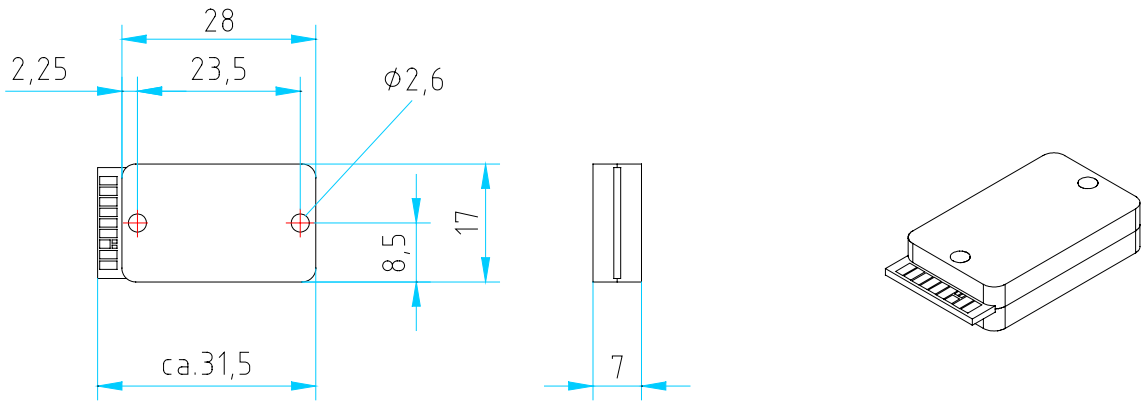
Solder bridge	**9-10**	**4 mV/V**
Solder bridge	**10-11**	**8,25 mV/V**
Solder bridge	**12-13**	**1 mV/V**

➔ Only one of the solder bridges 9-10, 10-11 or 12-13 is allowable.
➔ If there is no solder bridge installed, the sensitivity is **50mV/V** or is determined by the resistor **RGain**.

K1

R-1.2 Rotor electronics RK1-M1/-M2 with K1-IP

!! spare part only

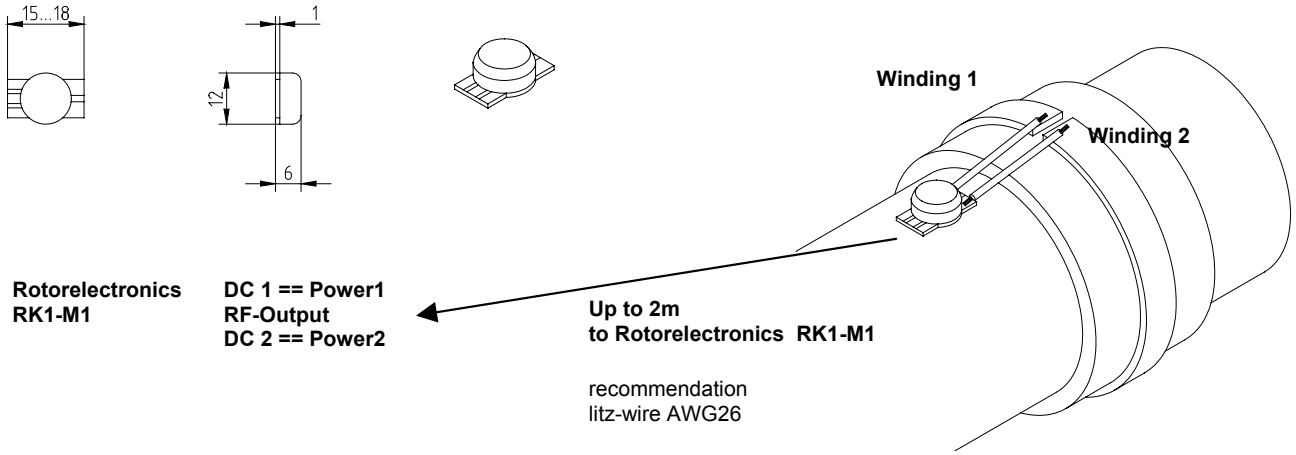


Power supply

Powering of Rotor electronics **RK1-M1/-M2** is possible by DC voltage **DC-Supply** or by inductive transmission **AC-Supply**. If inductive supply is needed, the **Inductive and Receiving heads SK1-S2** or **–S4** are necessary. The **Receiving head SK1-E1** is designed to receive data only and so a separate Power supply (battery, accumulator, ...) for the Rotor electronics is necessary.
The **K1-IP** module allows to increase the distance between the inductive antenna and the electronics up to about 2m..

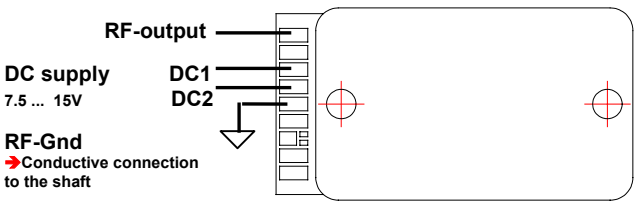
AC-supply / inductive

K1-IP module



DC-supply / battery

antenna winding



Polarity of DC supply is random, because a rectification is integrated

So it is possible to power by an AC supply, too

K1

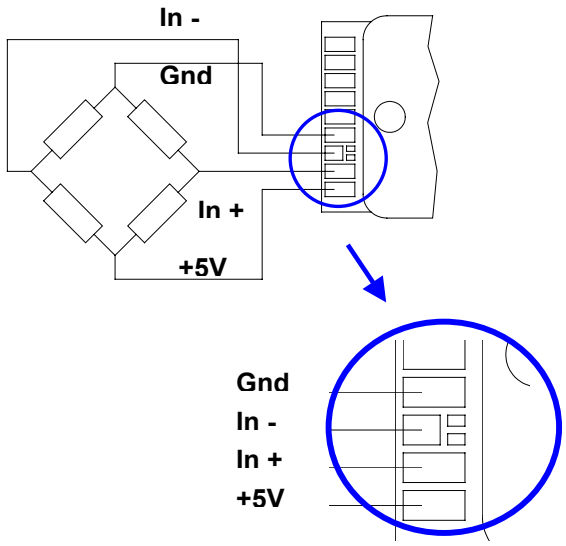
R-1.2 Rotor electronics RK1-M1/-M2 with K1-IP

Sensor connection and configuration

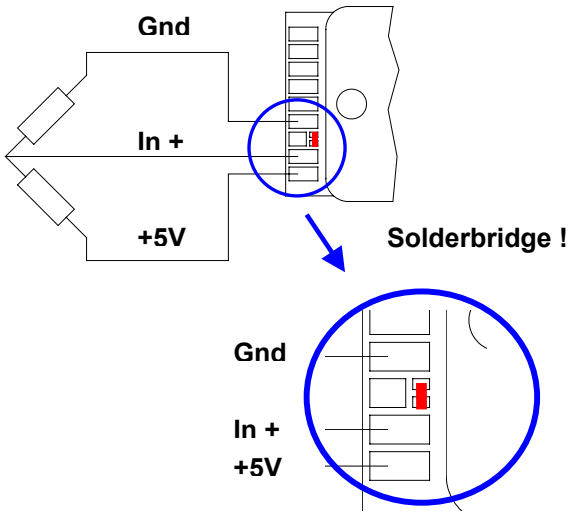
The Rotor electronics **RK1-M1** allows the connection of strain gauge sensors in full- or half-bridge wiring. Sensor excitation is generated by the Rotor Electronics.
Solder-pads are used for configuration and adjustment of amplifier gain ranges.
The Rotor electronics **RK1-M2** allows the connection of thermo couple type K.

➔ When soldering on the pads of the Rotor electronics use a soldering iron rated at less than 30W.
➔ To solder use a tin-lead solder with an acid free flux.

Strain gauge – full bridge



Strain gauge – half bridge

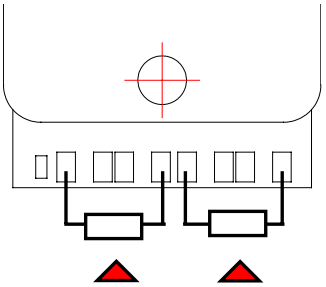


Using the **K1–M2** electronics the thermo couple is to connect to the pads In+ and In-.

The resistor **RCal** is switched parallel to an arm of the bridge by an internal contact. Therefore is a defined **Shunt cal D** of the bridge.

Using the RK1-M1 electronics
➔ The function "Shunt-Calibration" is switched on after "power on" the system, hold for some seconds.
➔ The key **CAL** at the front of the Reproducer WK1- is not in use.

The resistor **RGain** allows stepless adjustment of **Sensitivity S**.



S [mV/V]	RGain [kOhm]	RCal [kOhm]
0.5	0.100	217.575
1.0	0.201	108.200
1.5	0.302	71.7417
2.0	0.403	53.5125
2.5	0.505	42.5750
3.0	0.607	35.2833
5.0	1.020	20.7000

Bridge with Rb=350 Ohm,
Shunt cal D= 80% of full-scale
Analog output range ±10V

S/E Stator units of 1-Channel Telemetry System K1

K1

S/E-1.0 Standard

The stator units **- Receiving head SK1-E1** and **Inductive-and receiving head SK1-S2 / SK1-S4** are used to receive data from the rotary electronics e.g. RK1-R2. The data RF-modulated and emitted by transmission winding.
The integrated active antenna is adjusted to each special carrier frequency of the system. So it becomes possible to work with some systems in parallel without mutual influence.
Caused in the very low transmitting power and the different installation conditions, is it very difficult to give a RF-range.
Typical value: some decimeter.

Systems, working with the **Receiving head SK1-E1** need a separate power supply for the rotary electronics (battery, accumulator,...).

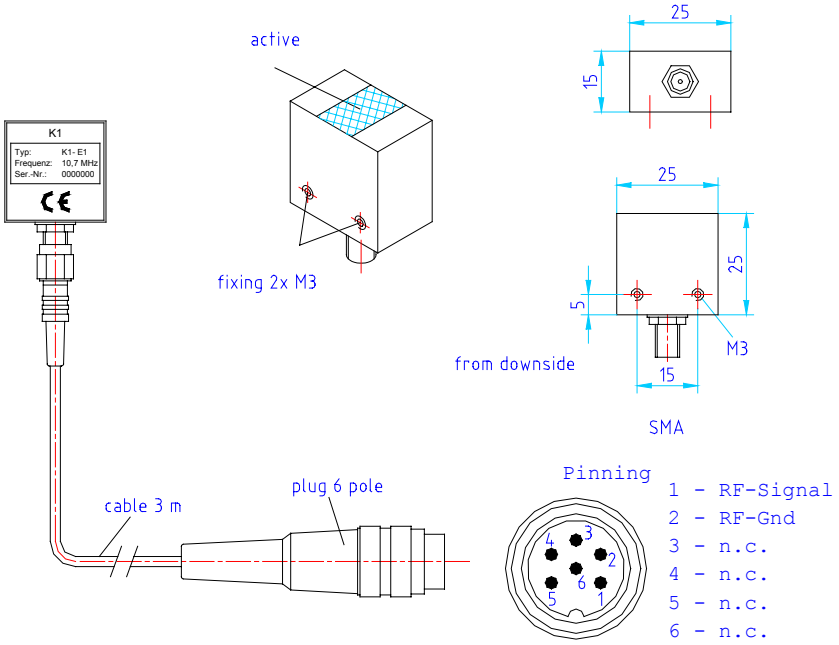
The stator units **Inductive-and receiving head SK1-S2 / SK1-S4** are extended by the function of the inductive power supply for the rotary electronics. The coil integrated in the stator unit is powered by an oscillator and couples the energy to the power winding. The oscillator is part of the **repro units WK1-T** and **WK1-E**. The power winding has 2 functions: transmitting the data to the static part and supply the rotary electronics from the static part.
The possible distances are in relation to the specific application and the used hardware.
Typical values: SK1-S2 about 15mm, SK1-S4 about 40mm.

➔ In the plug of the **Inductive- and receiving heads SK1-S2 / -S4** is an electrical bridge integrated. This bridge switches on the power oscillator when the plug is connected. This function is important, because it is not allowed to operate the oscillator without a load.
➔ risk of overheating

➔ Operating inductive heads are not allowed to put with the face on a metallic plate or e.g. to touch an applicated shaft.
➔ risk of overheating

➔ Fixation of Stator units occurs by 2 screws on a non-metallic holder or with a 10mm non-metallic spacer. ➔ risk of power loss using a metallic holder.

S/E-1.1 Receiving head SK1-E1



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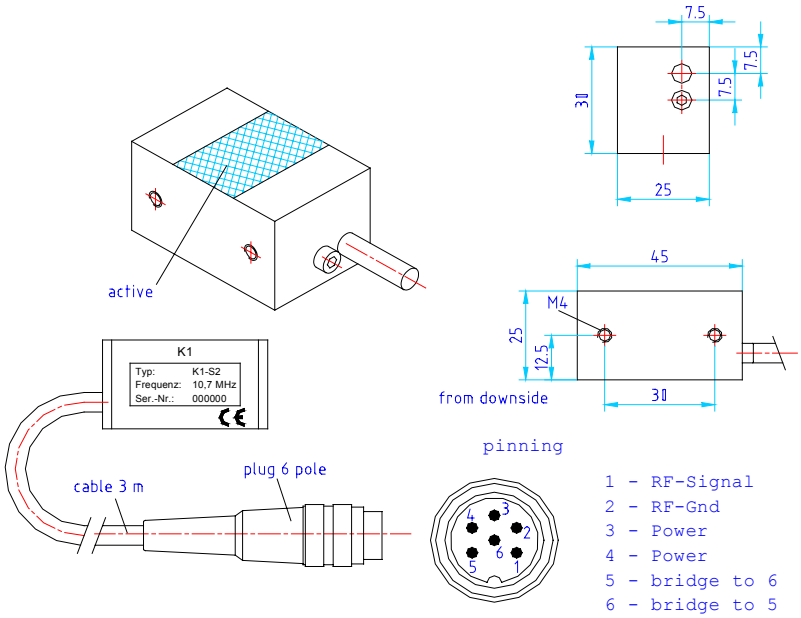
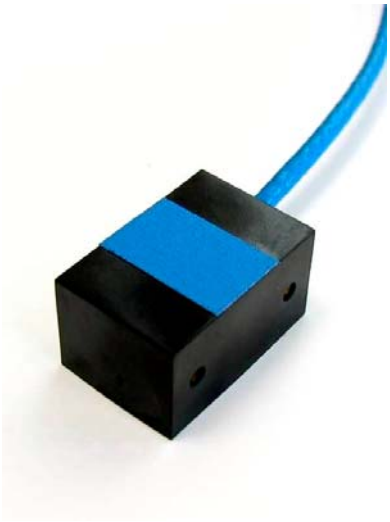
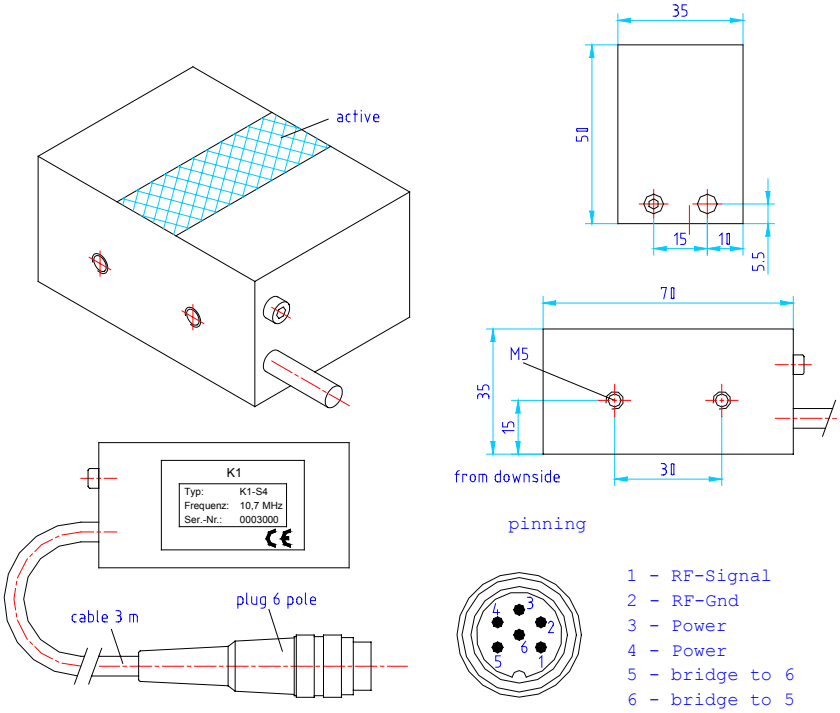
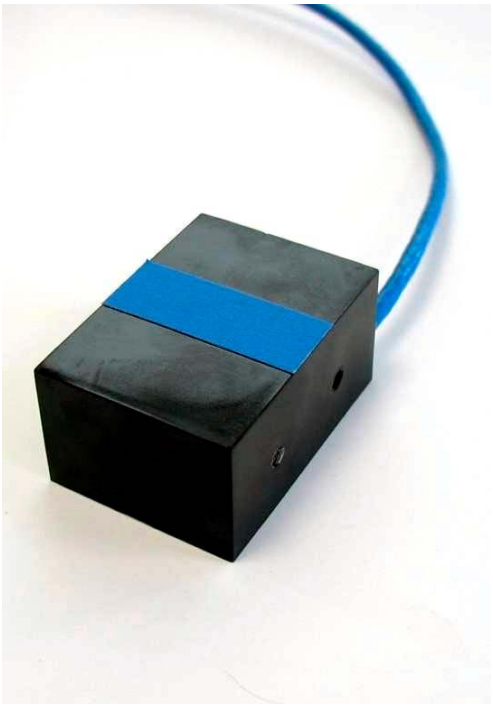
S/E-1.2 Inductive and Receiving Head SK1-S2





S/E-1.3 Inductive and Receiving Head SK1-S4





W Repro unit of 1-Channel Telemetry System K1

W-1.0 Standard

K1

The Repro units **WK1-T** and **WK1-E** are the standard systems.
They are used to demodulate the RF-data stream and to convert the demodulated frequency signal into a voltage signal. The analog signal bandwidth is 1kHz.
A power oscillator is integrated and allows together with an inductive and receiving head SK1-S2 or SK1-S4 the contactless power supply of the rotor electronics.

W-1.1 Desktop Version WK1-T

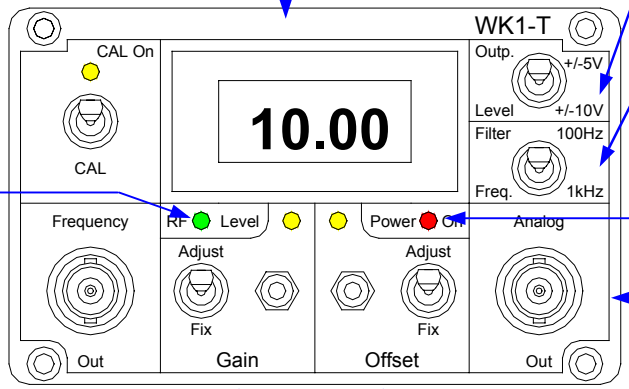
The repro-unit **WK1-T** is integrated in a compact aluminium housing with the dimensions 105mm x 64.5mm x 184mm, weighs 850g and meets protection level IP40.

Display
Displays the Output-voltage
➔ Monitor function only

Shunt-Calibration
Switch activates Shunt Calibration
LED lights yellow.
➔ Only strain gauge measurement with inductive power supply and RK1-R2

RF-Level
LED lights green, if RF-Level for data transmission is in range

Frequency Output
Output signal: Frequency
10kHz +/- 5kHz; TTL-Level
BNC-Socket



Voltage Range
Output voltage selectable by switch:
+/- 5V or +/- 10V

Output Filter
Output filter frequency selectable by switch 100Hz or 1kHz

Power Status
LED signals the On- status of the unit, When the voltage is in the range of 9...32VDC.

Voltage Output
Output signal: Voltage
+/-5V or +/-10V
BNC-Socket

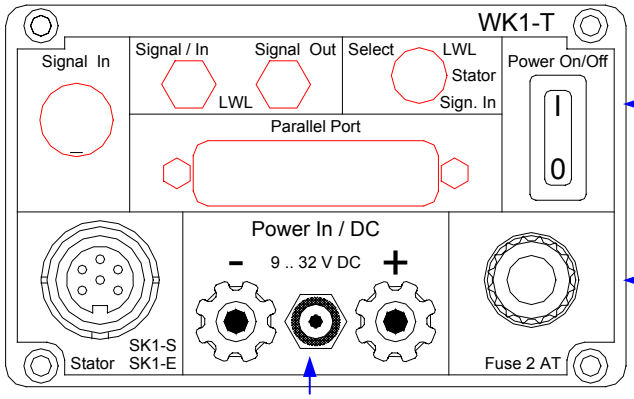
Gain adjustment
The factory setting of Gain is activated in position **FIX** and the LED is off.
In position **ADJUST** the LED lights yellow and the output voltage of nominal +/- 10V can be affected by about +/- 20% with the potentiometer.

Offset adjustment
The factory setting of **OFFSET** is activated in position **FIX** and the LED is off.
In position **ADJUST** the LED lights yellow and the zero-point of the output voltage can be affected by about +/- 1.8V with the potentiometer.

➔ Red-marked elements are reserved for optional extensions and without any relevance for Standard-Systems

Stator-Connection
Socket is used to connect:
Inductive and receiving head
SK1-S2 /-S4
or Receiving head
SK1-E1

Assignment:
Pin 1 RF-Data-Signal
Pin 2 RF-Ground
Pin 3 Power
Pin 4 Power
Pin 5 Bridge to Pin 6
Pin 6 Bridge to Pin 5
➔ Bridge is necessary inside the plug of the Inductive heads to switch-on the power oscillator.



On/Off
With the on/off switch the system can powered-on

Fuse
TR5 miniature fuse
2A slow

Power Supply Connection
Supply voltage has to be in the range of 9...32Vdc with a load of 15 Watt.
The connection is made by spade terminals or 2.1mm jack plug.
An adaptor for AC-power 90V...240V/ 50...60Hz is available.
➔ The red is "Plus" and the black "Minus" dc supply.
➔ The inner wire of the jack is the "Plus".

W-1.2 Vertical mounting version WK1-E

K1

The Repro unit **WK1-E** is integrated in a standard 19“ plug-in module housing with 3HE, 14TE and 171mm depth, weighs 850g and meets, when used as a free standing unit not in a rack, IP20 standards.
The **WK1-E** is designed for use in control racks and allows all wiring to be made to the rear if required.
For multi-channel applications it is allowed, to install several of these with different carrier frequencies directly side by side in one rack.
Up to 6 units can be accommodated in a standard 19 inch rack.

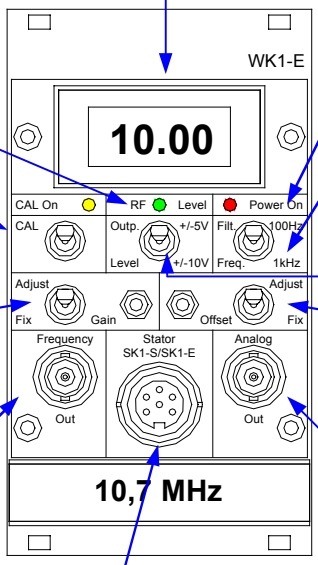
Display
Displays the Output-voltage
➔ Monitor function only

RF-Level
LED lights green, if RF-Level
for data transmission is in range

Shunt-Calibration
CAL switch activates Shunt-calibration
LED lights yellow.
➔ Only strain gauge measurement with inductive power supply and RK1-R2

Gain adjustment
The factory setting for **GAIN** is activated in position **FIX** and the LED is off.
In position **ADJUST** the LED lights yellow and the output voltage of nominal +/- 10V can be affected by about +/- 20% with the potentiometer.

Frequency Output
Output signal: Frequency
10kHz +/- 5kHz; TTL-Level
BNC-Socket



Power Status
LED signals the ON status of the unit,
With the input voltage in the range of 9...32Vdc.

Output Filter
Output filter frequency selectable by switch
100Hz or 1kHz

Voltage Range
Output voltage selectable by switch:
+/- 5V or +/- 10V

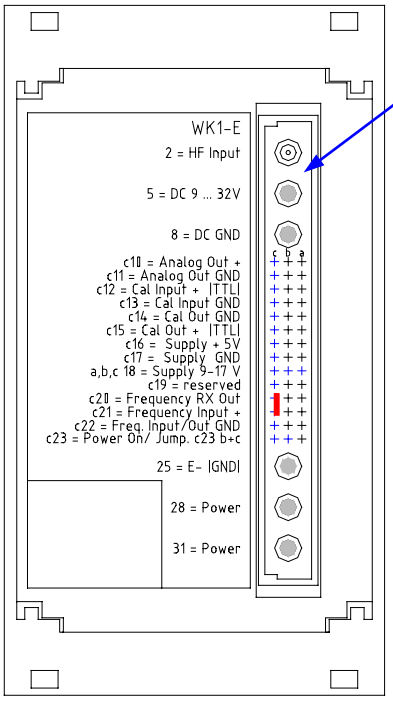
Offset adjustment
The factory Offset setting is activated in position **FIX** and the LED is off.
In position **ADJUST** the LED lights yellow and the zero-point of the output voltage can be affected by about +/- 1.8V with the potentiometer.

Voltage Output
Output signal: Voltage
+/-5V or +/-10V
BNC-Socket

Stator-Connection for SK1-S2/-S4/-E1

Pin 1 RF-Data-Signal
Pin 3 Power Pin 2 RF-Ground
Pin 4 Power Pin 5 Link inside the
plug to
Pin 6 ➔ Power oscillator switch-on

Connection at rear combi-connector DIN 41612, type M 42+6 (Free connector supplied)



➔ **Always necessary:**
Pin 5 Positive pole supply voltage 9...32VDC with 15 Watt load (solder bucket)
Pin 8 Ground supply voltage (solder bucket)
Pin c20 and c21 are connected together (factory fitted jumper plug)

Stator-Connection at rear

When not using the front socket to connect Stator unit, there is a possibility to connect it to the rear combi-connector:

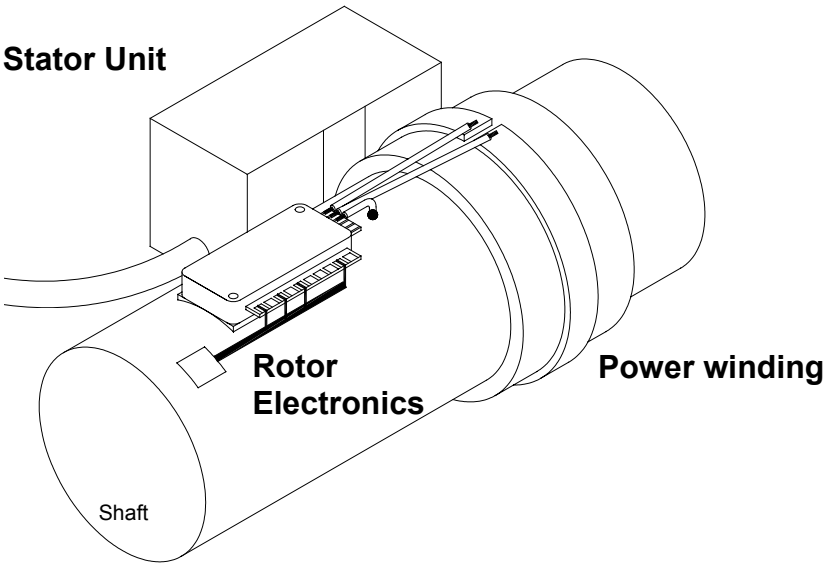
Pin 2	Coax-Connector for Data	➔ Stator-plug Pin 1 and Pin 2 (Gnd)
Pin 28	Inductive Power	➔ Stator-plug Pin 3
Pin 31	Inductive Power	➔ Stator-plug Pin 4
Pin b23	Activation Power oscillator	➔ Stator-plug Pin 5
Pin c23	Activation Power oscillator	➔ Stator-plug Pin 6

➔ The bridge in the plug of Stator units SK1-S2/ -S4 switches-on the power oscillator only if an inductive head is connected and in case of using the receiving head SK1-E1 the oscillator is not used and is switched-off.
➔ This link is allowed in the plug only, not at the combi-connector.
➔ At the same time it is not allowed to connect at front and rear a Stator unit.
➔ Disregarding these instructions may destroy oscillator and Stator unit.

➔ Not explained contacts of the combi-connector are used for optional extensions or aimed as test-points and without any relevance for the standard system.
These contacts are not allowed to connect anyhow.

I Installation of the 1-Channel Telemetry System K1

K1



I-1.1 Installation of the Power Winding

The power winding consists of a **Copper Band**, fixed around the shaft.
To isolate the shaft **insulating tape** is used for electrical insulation and for magnetic shielding, **Mu-metal.**
If operating the system with battery power, the same construction of the power winding is also recommended.

The necessary width of Mu-metal layer is dependent on the Stator unit used:

SK1-S4 ➔ 75 mm
SK1-S2 ➔ 50 mm

The insulating tape layers should be 5 mm wider than the Mu-metal on both sides.

➔ The ends of the Mu-metal tape are not allowed to touch each other. A gap of 2 to 3 mm is recommended.
➔ Also after covering the Mu-metal layer with insulation tape, the gap must still be present.
➔ The second layer of Mu-metal should be installed with a displacement of the gap by about 90°.

➔ The ends of the copper band must not touch each other. A gap of 2 to 3 mm is recommended.

Steps to install the power winding on a shaft

Rewind shaft with one layer insulation tape. **ISO1**

Centred one layer self-adhesive Mu-metal tape **MU1**

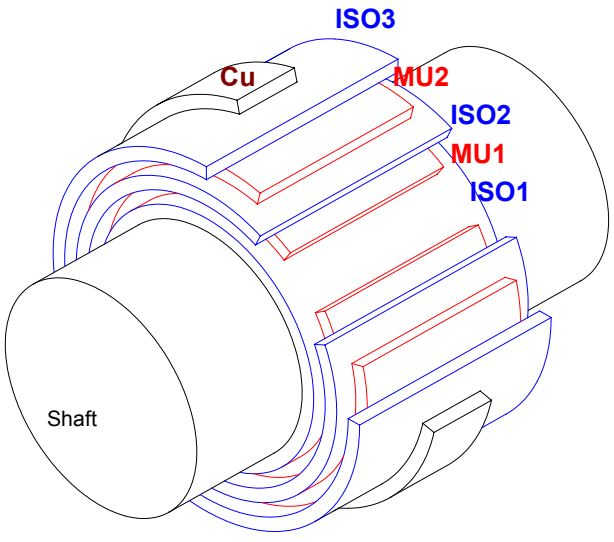
Covering with one layer insulation tape **ISO2**

Second layer Mu-metal tape with a displacement to the first layer by about 90°. **MU2**

Covering with one layer insulation tape **ISO3**

Self-adhesive copper band rewind in the centre of ISO3 **Cu**

Solder the ends of the litz wires to the ends of the copper band.



The final insulation will depend on the environment. Any covering or waterproofing should be non-conductive.
For extended temperature range the covering should be Kapton high temperature tape (supplied) and if there are very high acceleration loads a covering with epoxy-glass cloth is recommended.

I-1.2 Installation of Rotor unit

After connecting and configuring the Rotor unit in accordance with chapter K1-R of this manual, it is ready to mount on the shaft, for example.

➔ The distance between the electronics and the power winding should not be larger than 100 mm.

➔ The 2-Component Epoxy-Kit is very useful to fix the RK1-R2 to the shaft and accommodates the curvature of the shaft.
➔ If shaft forces are high or the shaft will be subject to contamination from oils, water etc. then consider appropriate methods of securing and protecting the shaft electronics installation. (waterproof tape, clamping bands, glass cloth tape...)
➔ **CAUTION:** work carefully with the Epoxy-Kit. Consider the Manufacturer's specifications and safety instructions.
➔ **CAUTION:** do not contaminate the solder pads of the Rotor unit with careless application of Epoxy resin.

I-1.3 Installation of Stator unit

The inductive supply and receiving heads SK1-S2 and SK1-S4 as well as the receiving head type SK1-E1, should be fastened with the appropriate size metric screws to a mounting plate. The plate should be non-metallic and provide a separation distance of at least 10 mm from any surrounding metal.

The stator head should have the correct orientation and the indicated active surface of the head should be in line with the antenna.

The transmission distance achieved will depend on the type of stator head and the specific installation conditions. With the rotor stationary, measure the bridge supply at the rotor electronics. This should be +5V. The RF indicator LED on the receiving unit should also be on indicating that the high frequency transmitter is within range.

I-1.4 Installation material IK1

The installation materials are available as a kit part number K1-I1. There is sufficient material for an installation length of 1 m or approximately 300 mm diameter shaft. The kit consists of:

1m Mu-Metal Shielding Foil with adhesive coating. 0.1mm x 155mm
1m Copper Band with adhesive backing. 0.3mm x 10mm
1 Roll Fabric-Tape.
1 Pack 2-Component Epoxy Resin
1 Roll High-Temperature Tape.

I-1.5 Troubleshooting, Hints

Most problems with the telemetry system are usually caused by incorrect installation of the shaft rotor or the stator head.
To isolate any potential problems, check the installation for the following points:

- Is the rotor electronics programmed for the correct type of sensor using the solder pads?
- Is the rotor K1-R2 fitted with the correct resistor or solder bridges to programme the amplifier gain?
- Unless using the IP1, are the connections between rotor and antenna no more than 10 cm?
- Has the antenna a clear gap of 2 to 3 mm?
- Are the layers of Mu-Metal correctly isolated from each other?
- Do the ends of each layer of Mu-Metal have a gap between them?
- Is the lower layer of Mu-Metal correctly insulated from the shaft?
- Is the stator mounted at the correct orientation and distance?
- Is the stator head is mounted on a non-metallic surface providing adequate separation from any surrounding metal?

Correct functioning of the inductive power supply (or the on-shaft battery supply) can be checked by measuring the presence the +5V bridge excitation if the rotor is programmed for strain input.

The illumination of the RF indicator LED will indicate the presence of a data signal received from the shaft antenna.

The distance of the stator head from the antenna can be reduced as necessary to ensure the signal is within range.
CAUTION: Ensure that there is adequate clearance between shaft and stator under all operating conditions.

If the transmission range is limited, recheck the installation. For large diameter shafts, it may be necessary to tune the inductive supply to the antenna. See Chapter B-1.2.

B-1.1 Calculations for configuration of the rotor electronics

Dimensional equations for the determination of the values RGain and RCal of the RK1-R2

Ensure the values entered are in the correct units.

➔ $$RGain = \frac{50 \bullet S}{50 - S}$$ with: RGain [kOhm], S [mV/V],

➔ $$RCal = Rb\left(\frac{25000}{D \bullet S} - 0.5\right) - 1$$ RCal [kOhm], Rb [kOhm], D [%]

Example: Sensitivity S = 2mV/V , Bridge resistor Rb = 0.350 kOhm, Shunt Cal D = 80%

$$RGain = \frac{50 \bullet 2}{50 - 2} = \frac{100}{48} = \underline{\underline{2.0833 kOhm}}$$

$$RCal = 0.35\left(\frac{25000}{D \bullet S} - 0.5\right) - 1 = 0.35(156.25 - 0.5) - 1 = 54.5125 - 1 = \underline{\underline{53.5125 kOhm}}$$

➔ For calculation of the configuration of the RK1-R2 and for calculation of Sensitivity for a torque application, calculation programs are available.

Dimensional equations for the determination of the values RGain and RCal of the RK1-M1/PM1

➔ $$RGain = \frac{50 \bullet S}{250 - S}$$ with: RGain [kOhm], S [mV/V],

➔ $$RCal = Rb\left(\frac{25000}{D \bullet S} - 0.5\right) - 1$$ RCal [kOhm], Rb [kOhm], D [%]

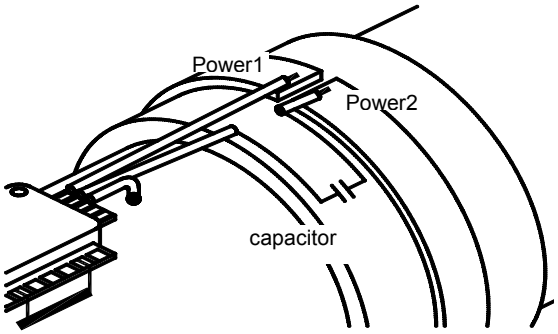
Example: Sensitivity S = 2mV/V , Bridge resistor Rb = 0.350 kOhm, Shunt Cal D = 80%

$$RGain = \frac{50 \bullet 2}{250 - 2} = \frac{100}{280} = \underline{\underline{0.403 \ kOhm}}$$

$$RCal = 0.35\left(\frac{25000}{D \bullet S} - 0.5\right) - 1 = 0.35(156.25 - 0.5) - 1 = 54.5125 - 1 = \underline{\underline{53.5125 kOhm}}$$

B-1.2 Installation on large diameter shafts

Inductive power supply with the 1-channel Telemetry system installed on large diameter shafts is also possible.
In this case is an adaptation of the inductive current supply transfer to the antenna is necessary.
The resonance frequency of the transmission system is adjusted accordingly.
With a series capacitor, the voltage at pads Power1 and Power2 of the rotor unit RK1-R2, is tuned for a maximum.
Only high-quality, high-voltage capacitors without polarisation should be fitted.
The shaft diameter that this adjustment is required, is dependent on many factors, usually 200 to 300 mm.



➔ It is recommended that the installation required for large shafts is discussed with the supplier before commencing.

➔ equals is valid for the RK1-M1/-PM1

B-1.3 Multi-channel systems

The standard version of the telemetry system K1 works for data transmission with a carrier frequency of 10.7MHz.
Units can be supplied with other carrier frequencies. It is permitted to run several systems in direct proximity.

Without mutual interference or influence, some systems can work at the same time in the frequency range of 10.7MHz
2 systems can run with one power head SK1-S4, but the distance between the static head and transmission winding is reduced.
If more than 2 systems with permanent power are planned, check that there is no interference between the systems.
If necessary it is possible to arrange for the power oscillators to be synchronised..

➔ For project planning and installation of multi-channel applications, co-operation with the manufacturer is necessary.

X Part numbers for 1-Channel Telemetry System Type K1

K1

X-1.1 Complete systems

K1-KT packed in a case with Installation-material K1-I1 and documentation
complete set table-version consisting of:
Rotor electronics RK1-R2, Stator SK1-Sx and Repro system WK1-T

X-1.2 Options

➔ Factory fitted options only.

K1-T Extended temperature range - 40° ... 120°C for the Rotor electronics RK1-R2 and for the other components corresponding to datasheet

K1-F-x from standard frequency 10.7MHz different carrier frequency

X-1.3 Accessories

K1-EC-x cable extension from Stator unit to Repro unit with x=10 for 10m and x=20 for 20m length.

K1-N1 AC-adapter to supply the system with 90 ... 240VAC / 50 ... 60Hz

K1-I1 Installation-material, complete set for about 1m perimeter of shaft

X-1.4 Spare parts

All component parts of the Telemetry system K1 are available as spares.

X-1.5 Specials

➔This sector requires the agreement with the manufacturer.

K1-A1 Application of a strain gauges

K1-K1 Calibration of complete measuring set-up

K1-G1 Installation of overall system

X-1.6 Maintenance, storage

There are no special preventive maintenance instructions for the Telemetry system K1.

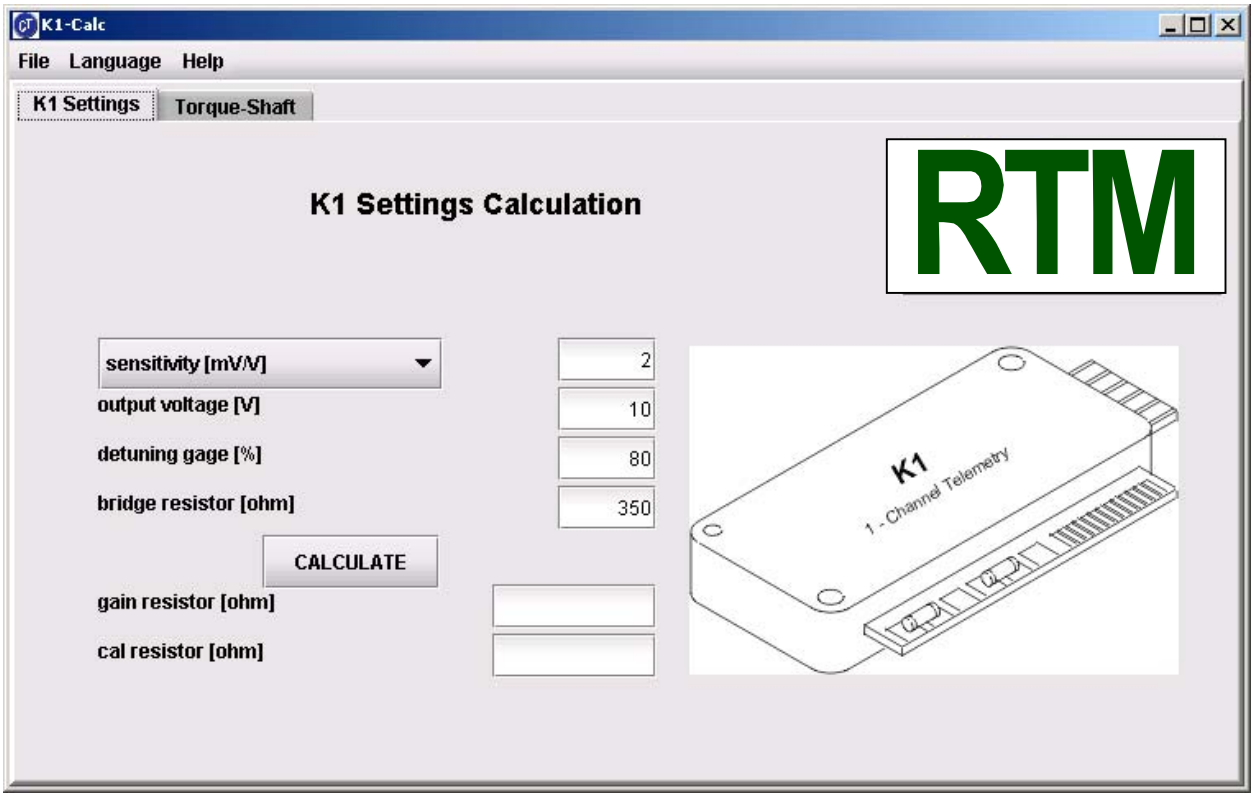
The storage of the system has to be dry and the temperature in a range of 10°C ... 50°C.

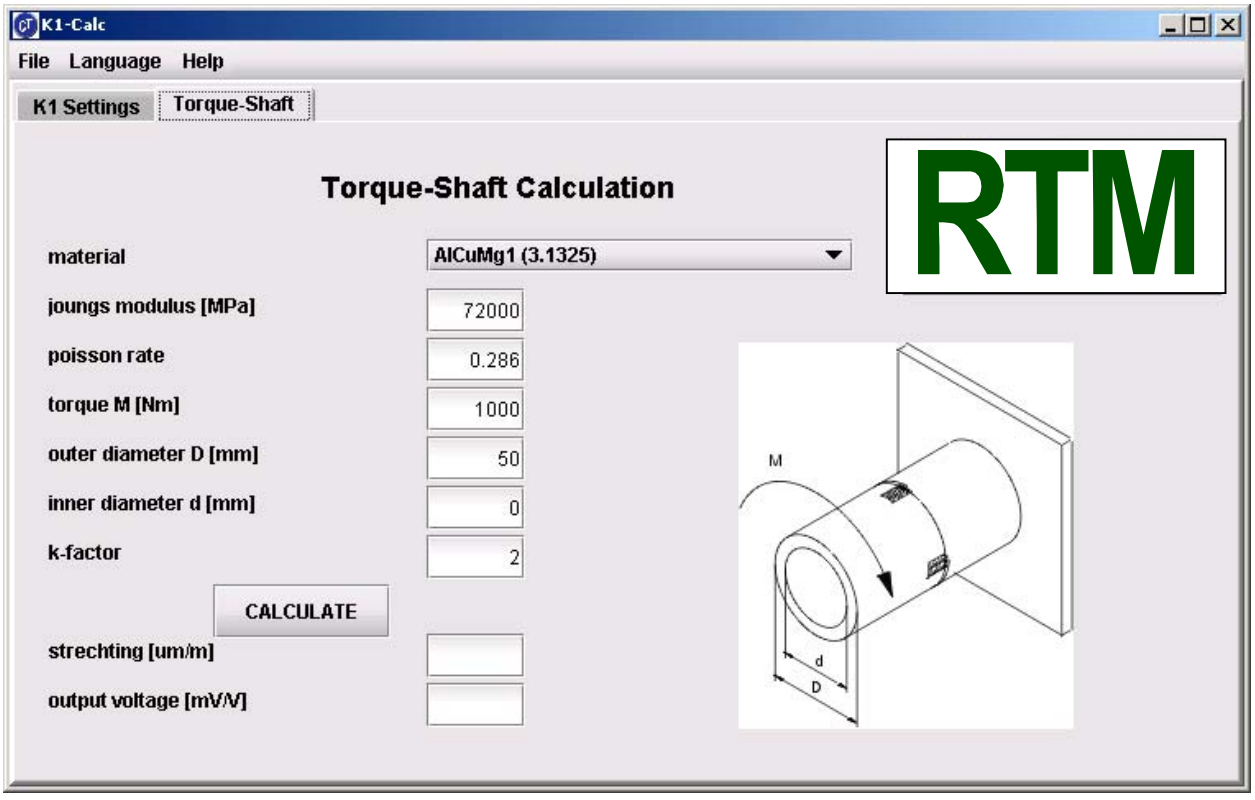
X-1.7 Calibration

The calibration cycle is 2 years.

K1

To evaluate torque values and the resistors RGain / RCal for setting the amplifier gain and shunt calibration of 1-Channel Telemetry System K1, there are software utilities available to assist the calculations.
Versions for the –R2 and –M1/-PM1 Rotary units are available
Contact your supplier for details.





K1

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D-83703 Gmund am Tegernsee
Germany

EC – Certificate of Conformity

We hereby certify, that the model of the subsequently designated device corresponds to the essential relevant EC-guidelines mentioned below during compatibility evaluation of the product.

Any changes not agreed with us, will void this declaration.

Description:	**1-channel-Telemetry**
Type:	**K1**
Serial numbers:	**0101001 ... 0999999**

Relevant EC-guidelines:

Radio and Spectrum engineering parameters: EN 300 220-3
Electromagnetic Compatibility: EN 301 489-01 and 301 489-03
Electric safty: EN 60 950

The device was tested in a typical situation.

Gmund, Jan. 02th 2007