

## MT1-PCM

### Digital Radio Telemetry System for Strain Gage Applications on Rotating Shafts

*"Gain and Auto Zero setting direct from Receiver Side!"*

## Operating Instructions



- Easy to assemble and operate
- Strain gage sensors (>350 Ohm)
- Full- and half bridge configuration
- Excitation fixed 4 Volt DC
- Auto-Zero adjustment - Setting receiver side
- Gain: 250-8000 - Setting receiver side
- Powering through Lithium battery, >12h work time
- Distance 1-10 meter (rotating application)
- Up to 8 system can work in different radio freq.
- Signal bandwidth 0...500Hz (-3dB)
- Output +/-10V
- System accuracy <0.2%

**INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!**

## General Description

The MT1-PCM single-channel telemetry system offers the easiest handling for the wireless radio transmission of strain gage signals from rotating shafts.

The encoder has dimensions (MT1-PCM-STG) of 62x27x11mm (without connectors) and transmitter (40k-Tx) of 62x27x11mm (without connectors). Each module has a weight of about 30g. The encoder/transmitter parts are simply mounted on the rotating shaft with a special fiber reinforced tape and add steel trip.

Powering of the transmission part is with battery 6-9V, power consumption 90-100mA. The digital data transfer between transmitter and receiver is realized by radio frequency 433MHz or 868MHz, transmitting power 10mW

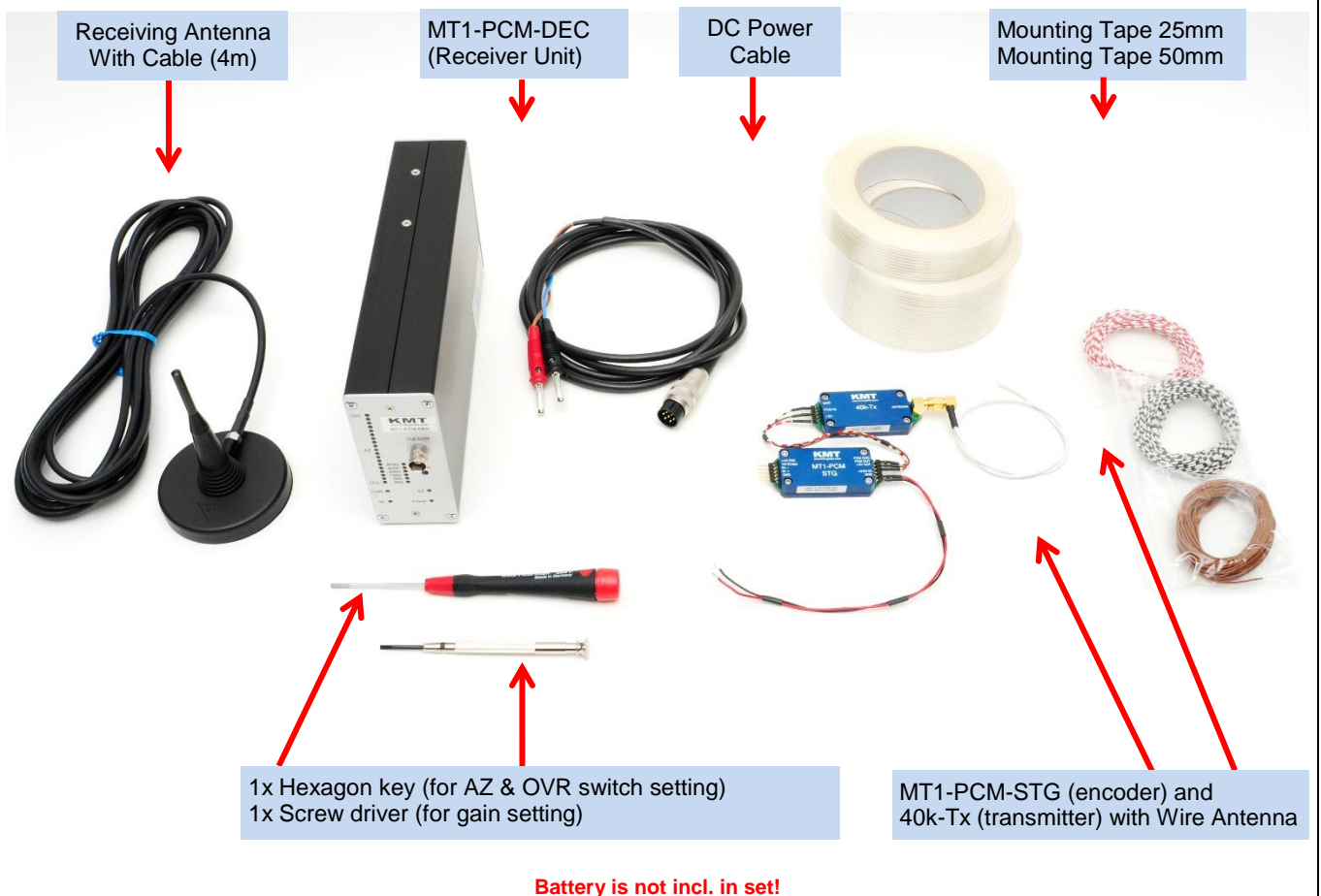
## Functional Description

The MT1-PCM transmitter transmits a digital radio frequency signal to the receiver. The distance between transmitter and receiver ([depends of application](#)) is 1-10 meter. "Not rotating Point to Point application upto 100m at free view"

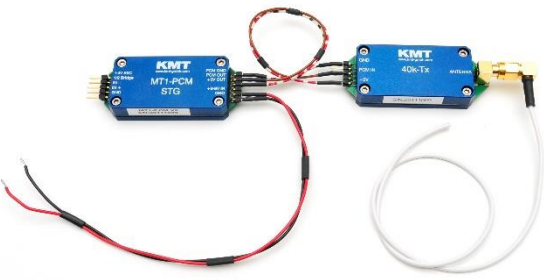
The receiver unit offers a BNC connector at the front panel with analog outputs  $\pm 10$  V. An LED bar indicator shows the actual level and a successful Auto Zero calibration. Overload is indicated by the last LED's in pos. or neg. direction of the bar graph. These OVL-LED's operate in peak-hold mode and are reset by pressing the overload switch.

Strain gage sensors (>350 Ohm) in full- and half- bridge configuration can be directly connected to the transmitter. The excitation is fixed to 4 Volt DC and the gain is set by the gain switch on the receiver side. An auto-zero (AZ) adjustment is executed by pressing the AZ button on the front side of the receiver. The successful AZ operation is indicated by a yellow LED in the middle of the LED bar indicator. When the AZ completes the LED continuously illuminates. A continued flashing of the yellow LED indicates some error in the AZ electronics. In this case please contact the support of KMT. The AZ setting is stored in a Flash-RAM and thus is not lost during power-off. Use only shielded sensor cable.

## MT1-PCM Set Contains:



## Technical Data - Transmitter



### MT1-PCM-STG

Strainage: Full and 1/2 bridge >350 Ohm,  
 Excitation: 4 VDC (fixed)  
 Gain: 250; 500; 1000; 2000; 4000; 8000  
 (select able from receiver side)

#### Gain table

Gain	Autozero range
250	100%
500	200%
1000	400%
2000	400%
4000	400%
8000	400%

Shunt Cal: Via external resistor for positive and negative calibration  
**Analog bandwidth: 0 - 500 Hz (-3 dB)**  
 Operating temperature: - 10 to + 80 °C  
 Sampling rate: 2000 Hz  
 Resolution: 12bit (ADC)

40k-Tx transmitter:  
 Carrier frequency: 433MHz or 868MHz, 10mW transmitting power  
 Dimensions: MT1-PCM-STG = 62x27x11mm (without connectors)  
 40k-Tx = 62x27x11mm (without connectors)  
 Weight: each about 30 gram (without cables)  
 Static acceleration: **up to 3000g (only with inductive power!)  
 with lithium battery about 1000g**  
 Powering: MT1-PCM-STG By battery 6-9V  
 (powering **40k-Tx** trough MT1-PCM-STG, +5V/GND)  
 Power consumption: 90mA  
 Operating time with CR-P2 Lithium 1600mAh battery about >12h

**Optional:** Inductive powering



### MT1-PCM-VOLT

High level inputs: +/- 20, 10V, 5V, 2.5V, 1.25V or 0.625V  
 Range: 250; 500; 1000; 2000; 4000; 8000  
 (select able from receiver side)

#### Gain table

INPUT range	Gain
+/- 20V	250
+/- 10V	500
+/- 5V	1000
+/- 2.500V	2000
+/- 1.250V	4000
+/- 0,625.V	8000

**Analog bandwidth: 0 - 500 Hz (-3 dB)**  
 Operating temperature: - 10 to + 80 °C  
 Sampling rate: 2000 Hz  
 Resolution: 12bit (ADC)

40k-Tx transmitter:  
 Carrier frequency: 433MHz or 868MHz, 10mW transmitting power  
 Dimensions: MT1-PCM-STG = 62x27x13mm (without connectors)  
 40k-Tx = 62x27x11mm (without connectors)  
 Weight: each about 30 gram (without cables)  
 Static acceleration: **up to 3000g (only with inductive power!)  
 with lithium battery about 1000g**  
 Powering: MT1-PCM-STG By battery 6-9V  
 (powering **40k-Tx** trough MT1-PCM-STG, +5V/GND)  
 Power consumption: 90mA  
 Operating time with CR-P2 Lithium 1600mAh battery about >12h

**Optional:** Inductive powering

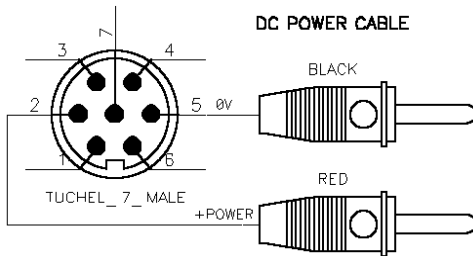


## Technical Data - Receiver



Front side

Rear side



### MT1-PCM-DEC

#### Front side:

Analogue output:	+/-10V via BNC
Resolution:	12bit (DAC)
Gain setting :	via screw switch
Auto Zero setting:	via micro switch
Overload LED's	(Red ON) reset: via micro switch
Autozero LED:	Yellow ON- successful AZ (output signal <+/-30mV) Yellow OFF- not successful AZ (output sign. >+/-30mV) <i>if flashing, call support of KMT, error in EPROM</i>
Green LED's:	Bargraph +/-
SL LED:	Red ON = if error of data transmitting
SL LED:	Red Flashing = if the battery is empty
Power ON LED:	Red ON = if power switch on

#### Rear side:

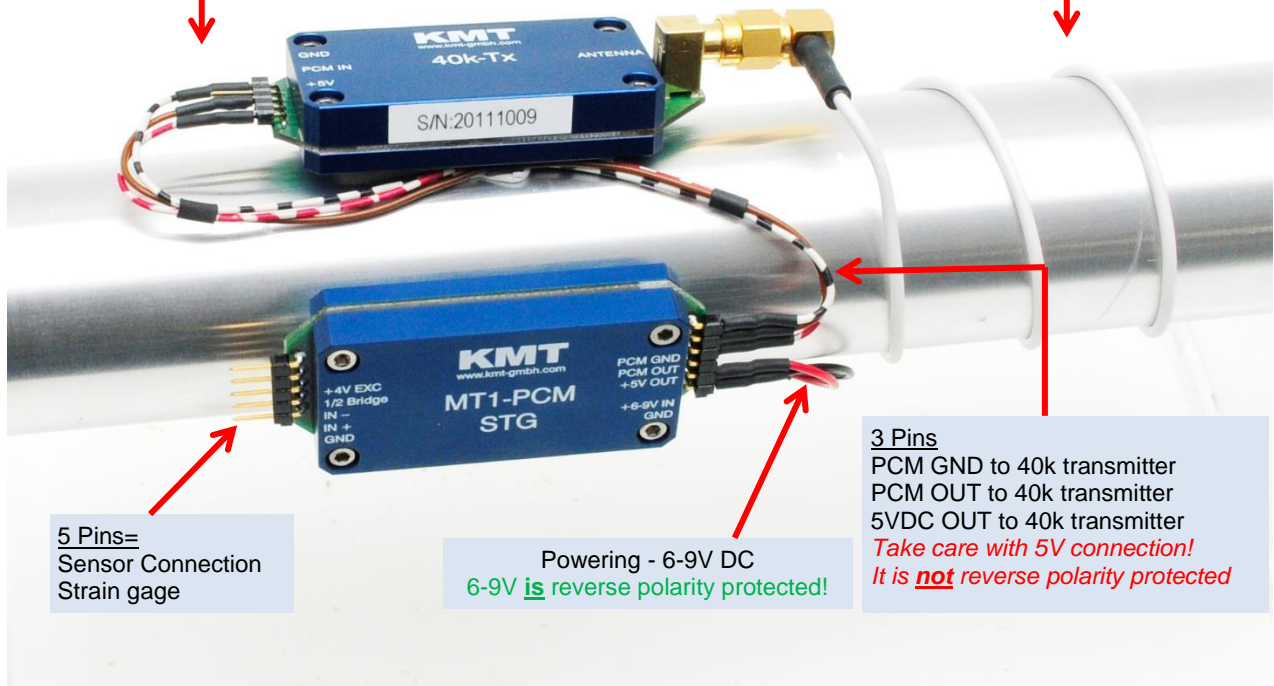
Antenna:	Input for receiving antenna
RF Level:	LED indicator for radio frequency
Fuse LED:	Flashing if fuse is defect
Powering:	10-30V DC, Input via 7pol. Tuchel
Switch:	ON/OFF
Operating temperature:	- 10 to + 70 °C
Dimensions:	200 x 105 x 44 (without connectors!)
Weight	950 grams
Static acceleration:	up to 200g
System accuracy	(without sensor): +/- 0.2 %

## Transmitting Part:

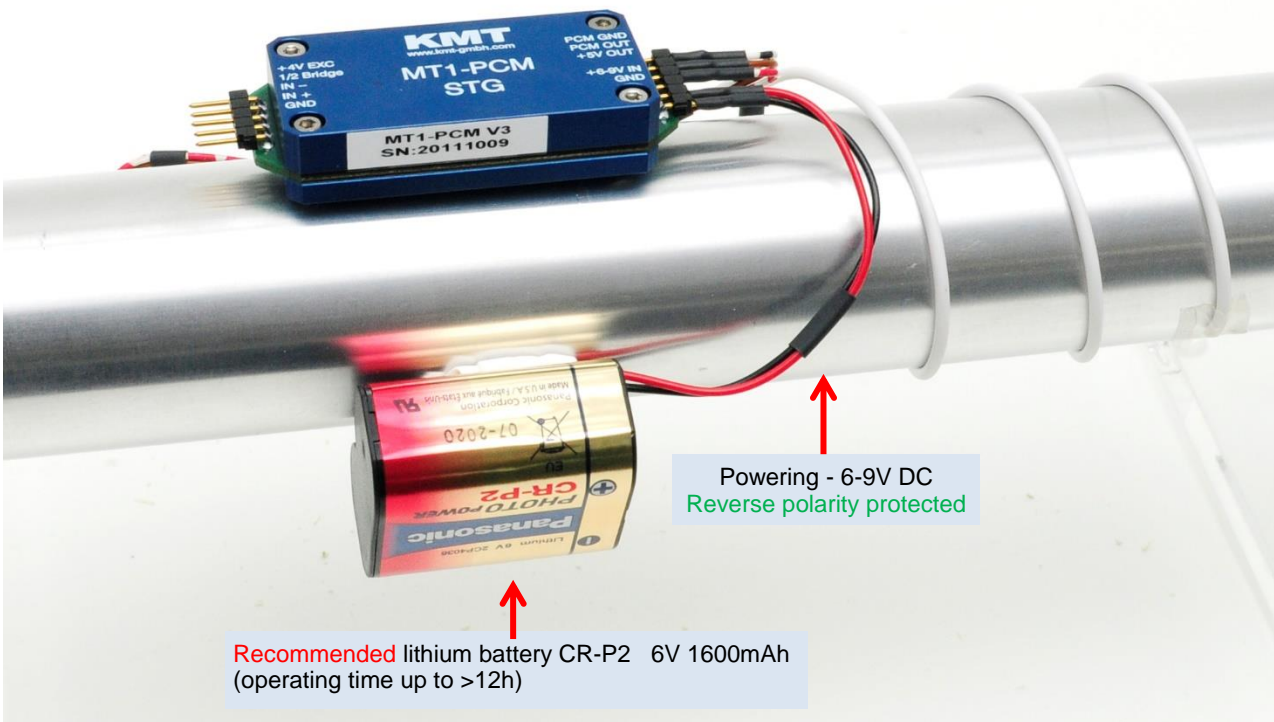
3 Pins=

PCM GND from MT1-PCM-STG  
PCM IN from MT1-PCM-STG  
5VDC IN from MT1-PCM-STG

Wire Antenna

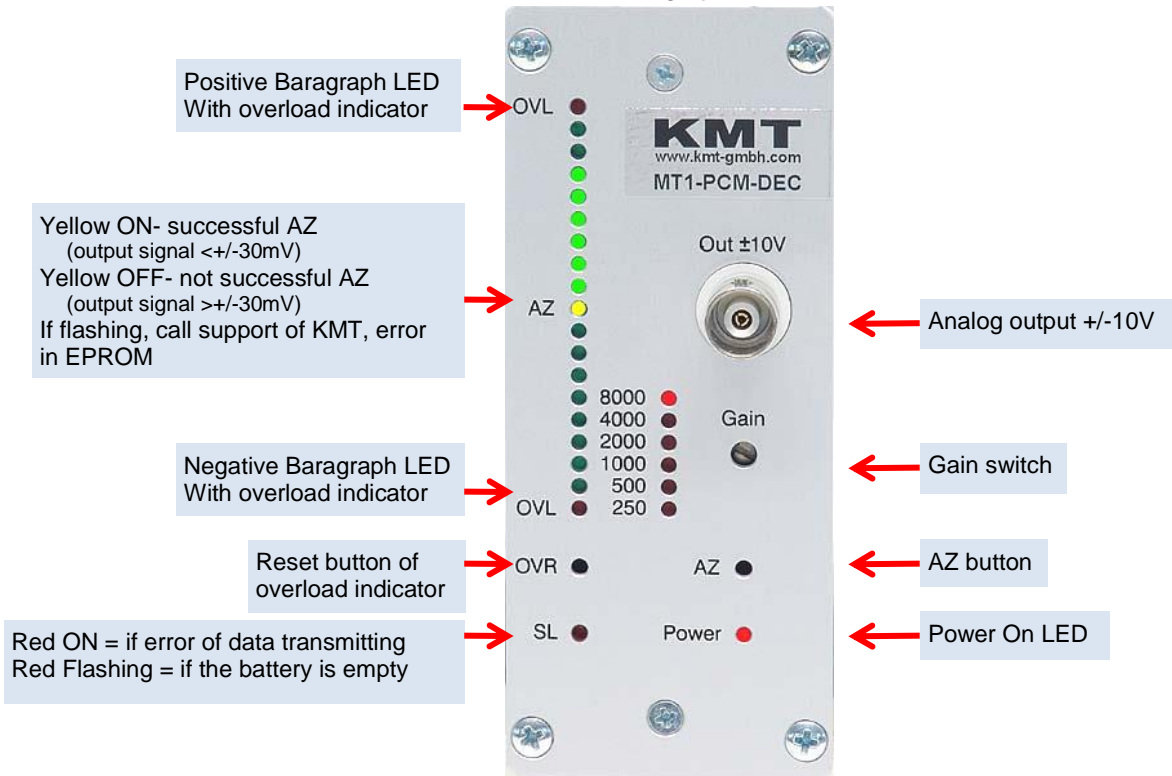


**We recommend to solder all wires!**

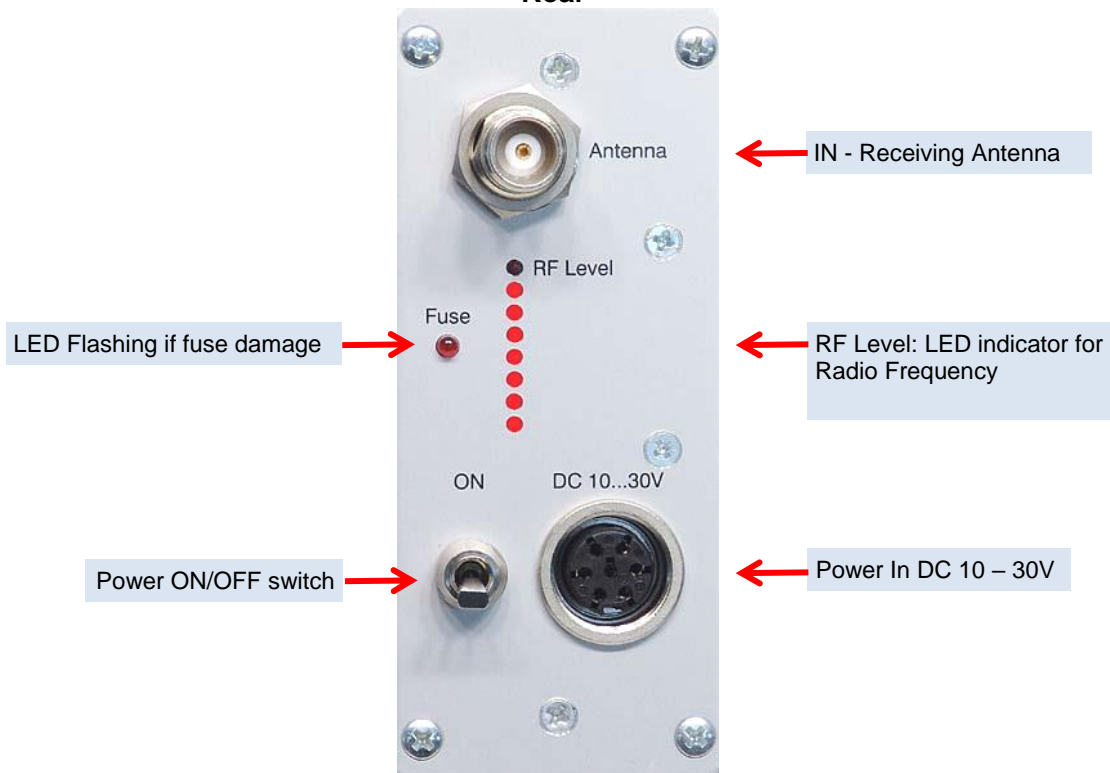


## Receiving Part:

### Front



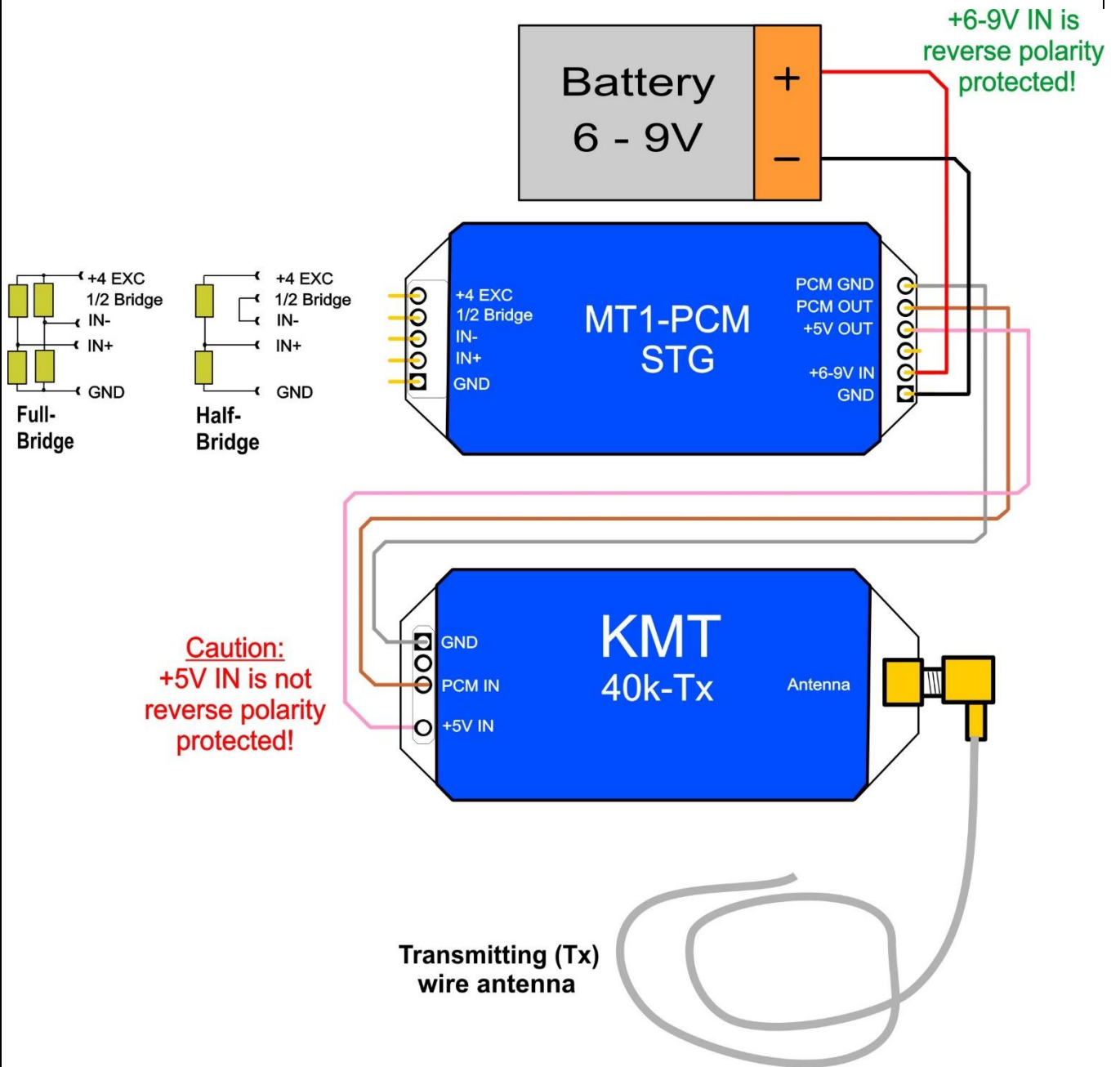
### Rear



## Receiving Part:



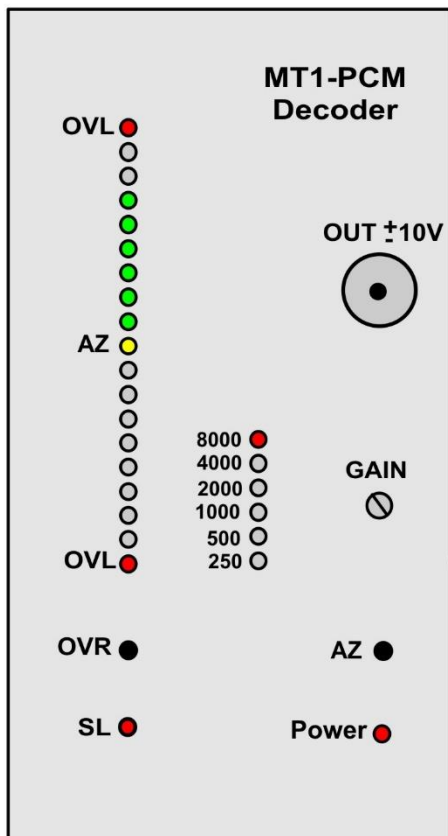
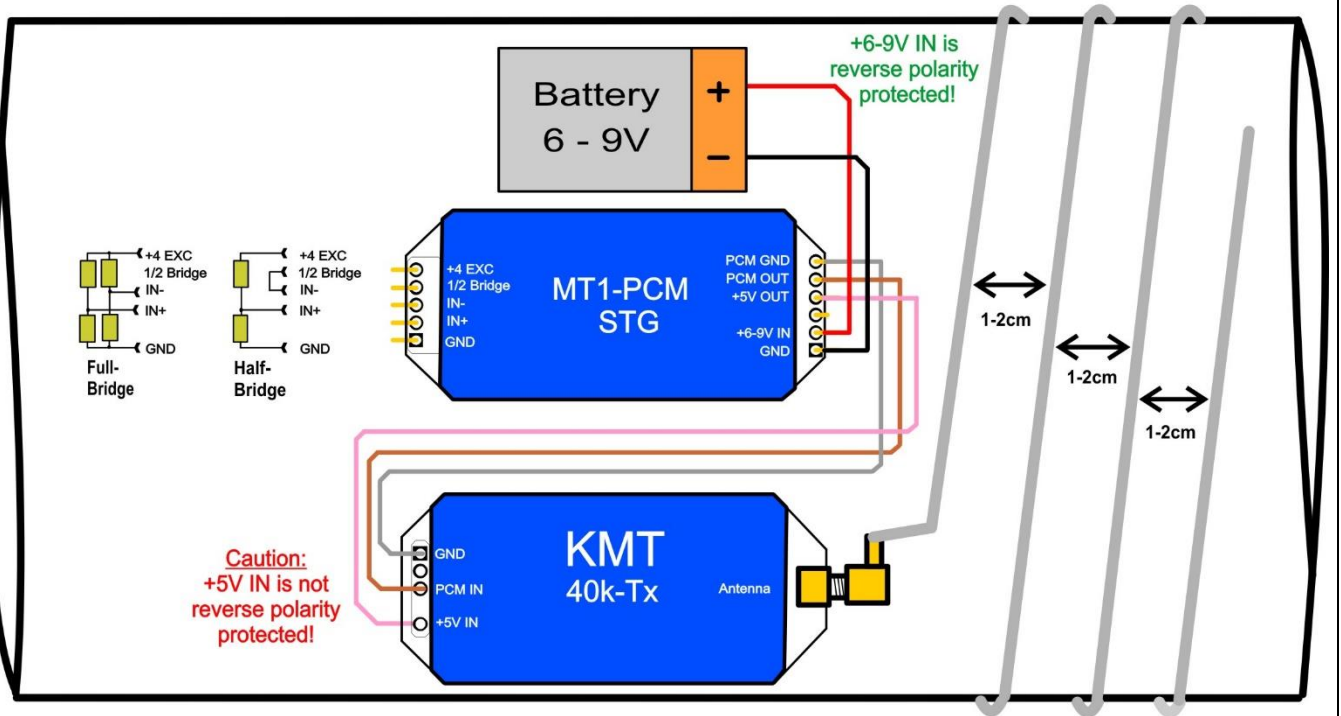
# Pin Connection:



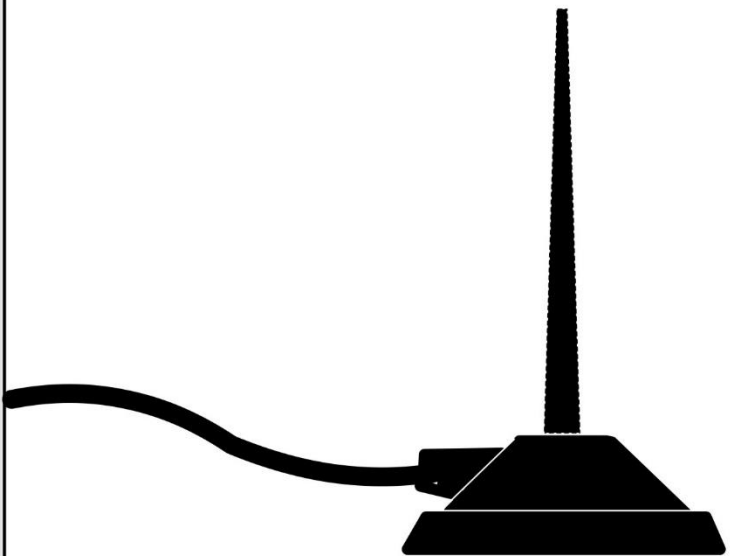


# Block Diagram:

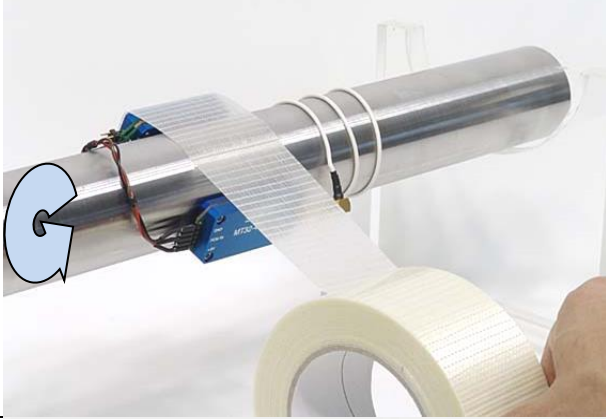
Transmitting (Tx) wire antenna



Distance 1-10m between Tx and Rx antenna (depend of application!)



## Mounting on Shaft:

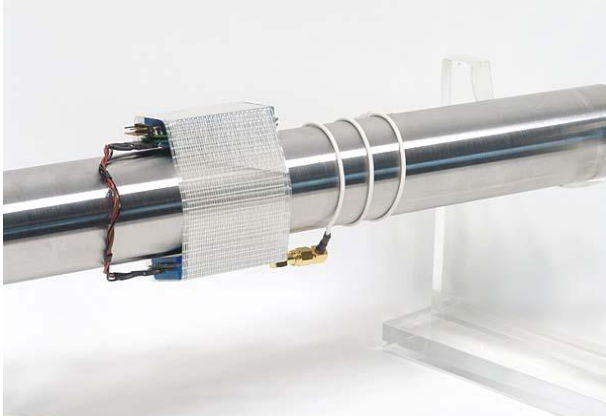


### Caution:

Fix MT1-PCM-STG and Tx-40k module with at least 10 layers of the special mounting tape around the shaft. Depending on the shafts RPM and diameter particular attention needs to be paid to the safe mounting of the components.

**The manufacturer doesn't accept liability for damages, which results from insufficient attachment of the individual components.**

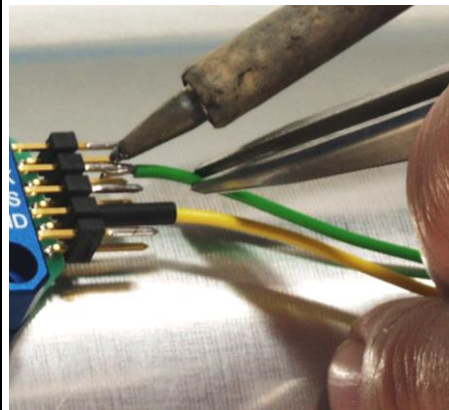
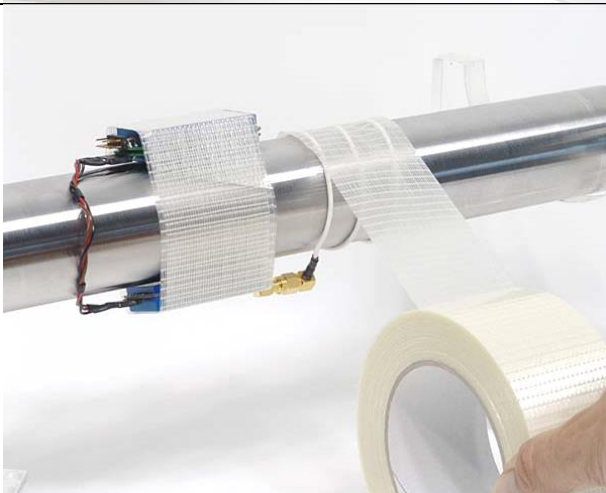
The tape is only for test purposes, in order to test the electrical function of the units in the idle state of the shaft.



During the rotation test appropriate safety precautions should be taken.

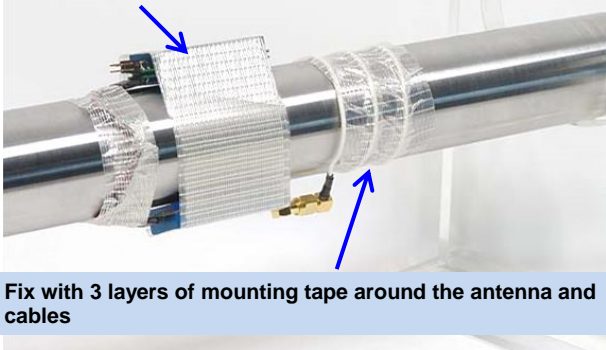
The entire installation may be used only by authorized persons. By using tape for the attachment, it has to be used in the direction of rotation of the shaft and the end has to be secured. Only non-elastic tapes (**Fiberglass Tape**) with high tensile strength should be used for pre-fixing. Additionally, use **steel strip for final fixing!!**

The individual components are to be distributed in such a way on the shaft that imbalances are avoided.



All cable connections should be soldered.

**10 layers of the special mounting tape around the shaft.**  
**We recommend add. use a steel strip for final fixing!!**



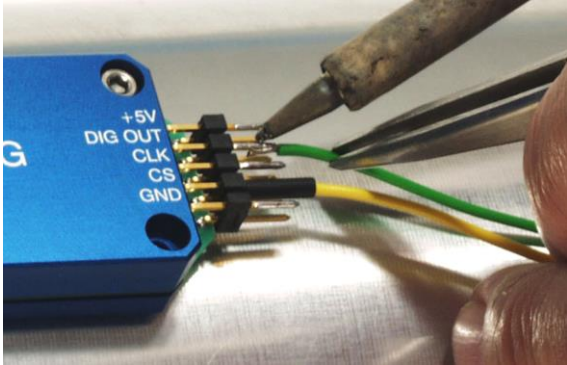
**Fix with 3 layers of mounting tape around the antenna and cables**



Steel strip

## Attention

- Use only special lithium Batterys for rotating applications
- Use only shielded sensor cable
- When used on rotating shafts, all connections must be soldered.



- Mounting of the modules on a shaft must be first fixed with mounting tape (only for prefixing) and then with a steel strip!!!

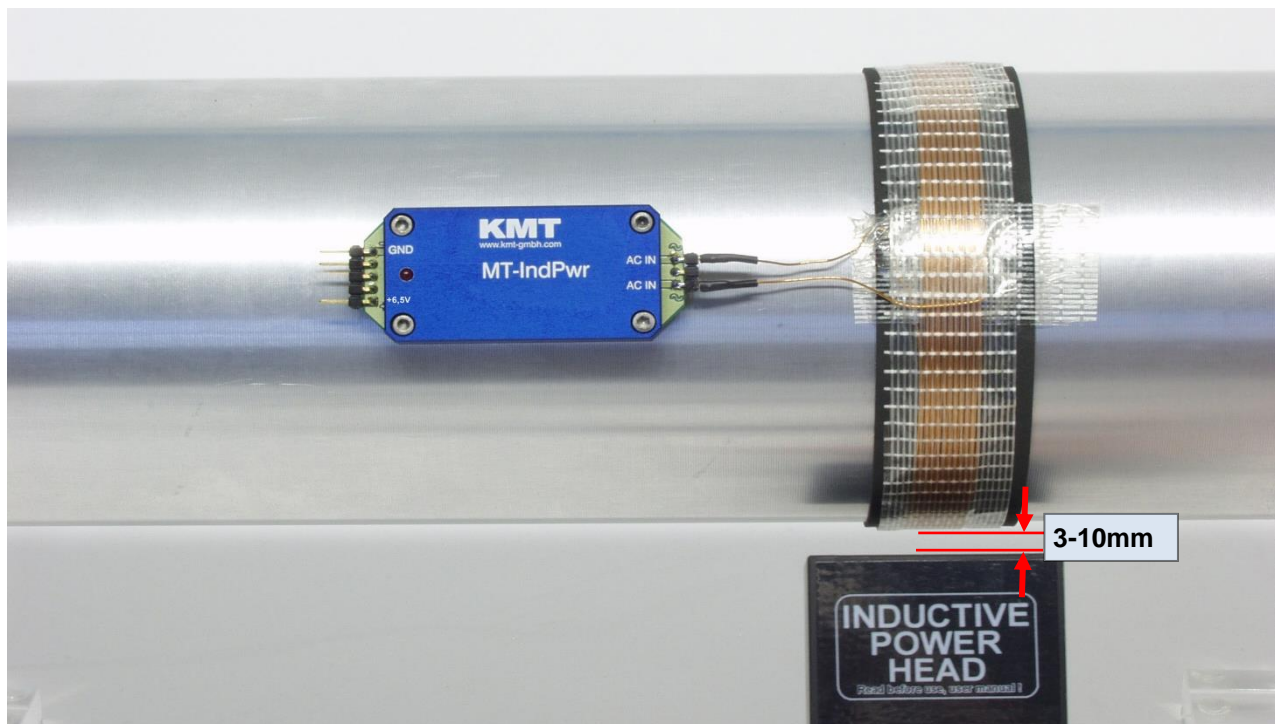


## MT - Inductive power supply set:

(Picture shows standard Inductive power supply for diameter up to 300mm)

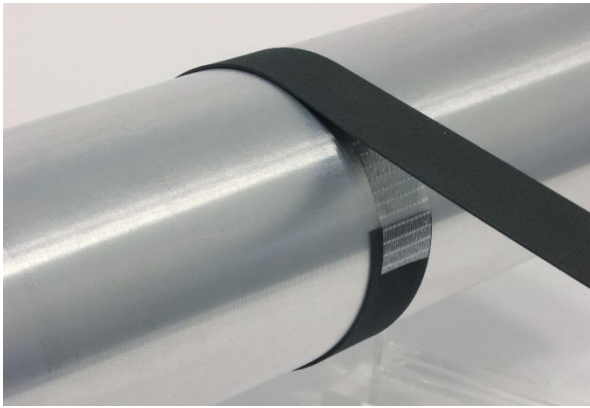


## Mounted on shaft:

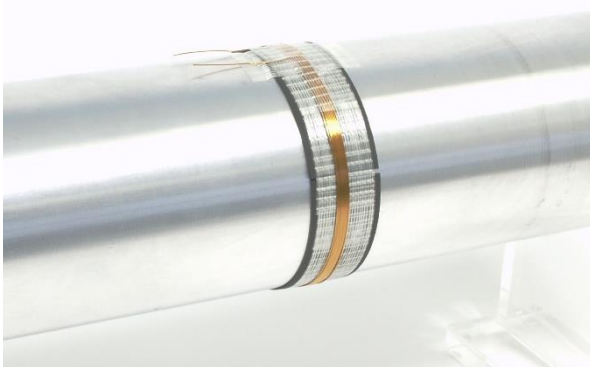
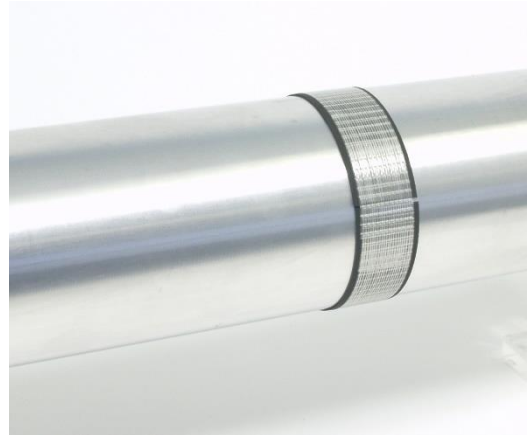




## Installation of coil for inductive powering on shaft



Attach for electromagnetic insulation "Ferrite Tape" **2 x one** layer around the shaft.  
Fixed with 2 layers mounting tape



Wind the 0.50...0.63 mm enameled (CUL) copper wire around the shaft:

10-30 windings for 1000-20mm diameter

Other diameter on request!

*Note: "The inductive load of the MT1- IND-PWR and the capacitor in the Power Head must be in resonance to get the optimal transmission. The inductive load of the shaft depends of diameters, material and number of windings. "*

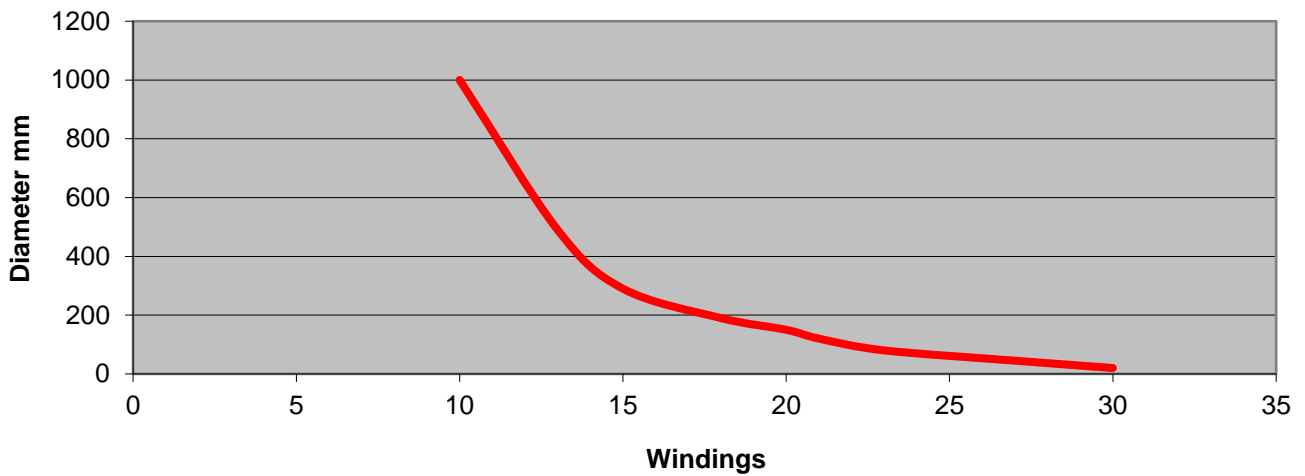
To find the optimal transmission try one winding more or less. The LED on the Inductive Power module will help to find the best configuration. The distance between Powerhad and the coil is 3-10mm.

Control the output voltage and move the powerhead in the max distance to the coil.  
The minimum Output voltage must be 6,5 V!

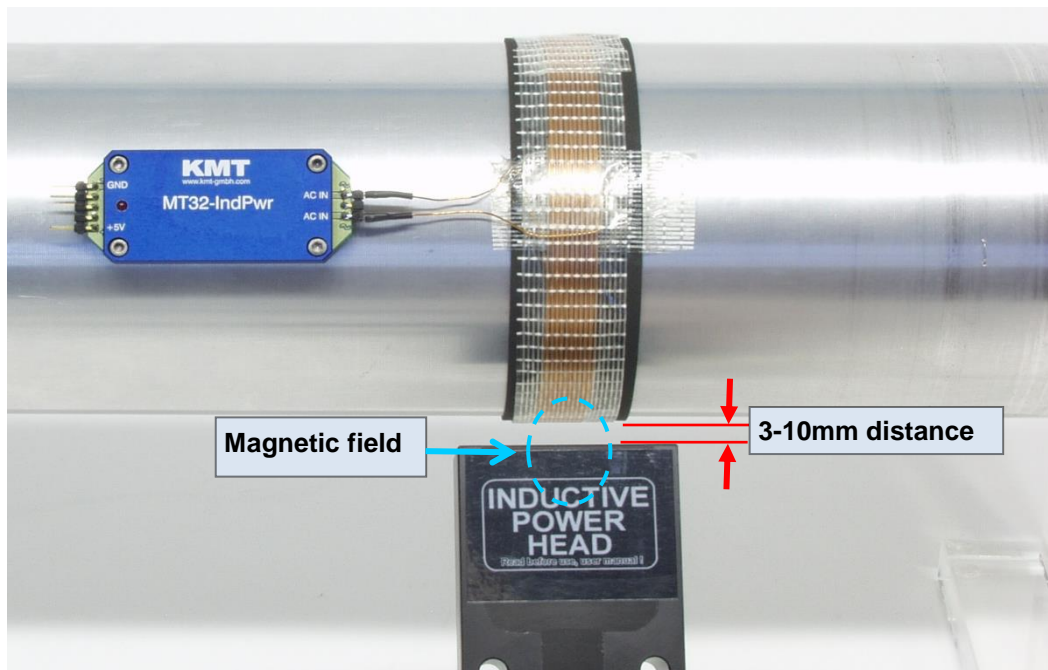
Fix all with 2-3 layers around the coil with mounting tape.

## Find the correct amount of windings of inductive power coil

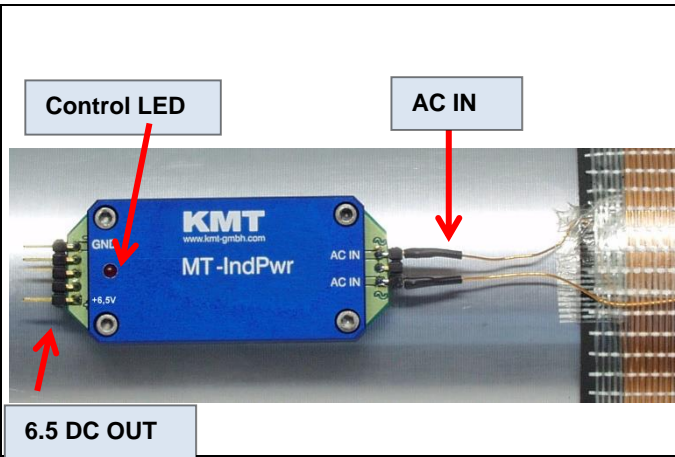
### Optimum windings for steel shafts



Diameter (mm)	Windings
1000	10
490	13
290	15
190	18
150	20
120	21
80	23
45	27
20	30



Distance deepened of current consumption  
e.g. 200mA 3-5mm, 100mA 5-10mm

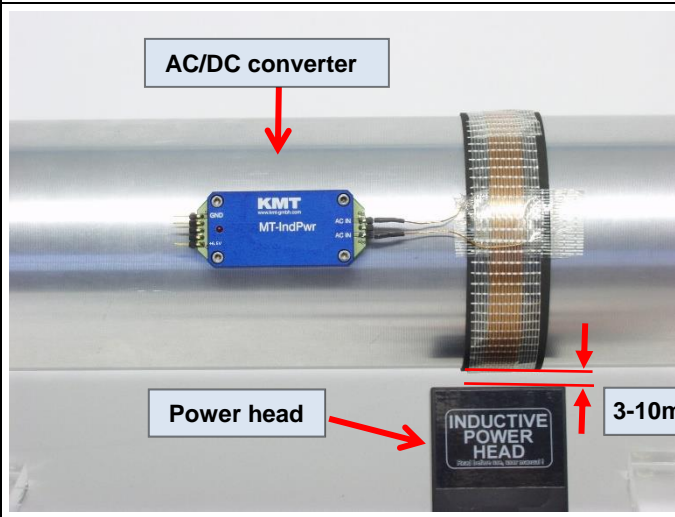
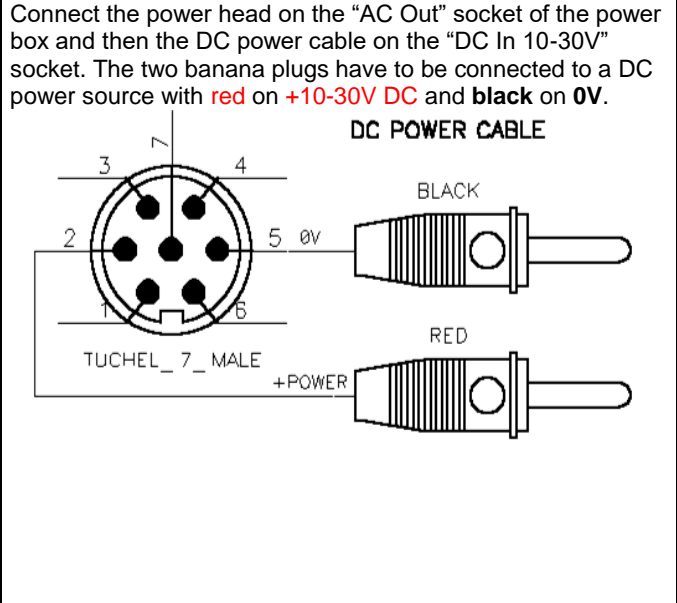
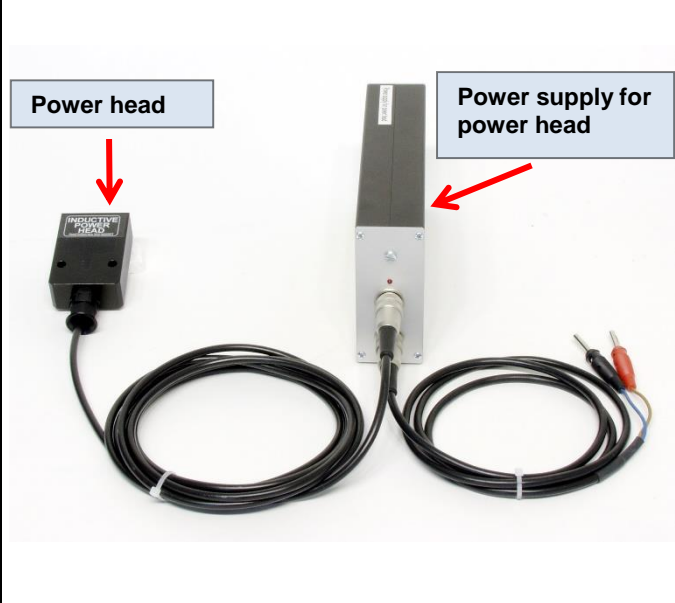


The pins "AC IN" are the AC power input from the coil. On the pins "+6.5" and "GND" you get a stabilized output voltage of 6.5V DC. The control LED will light up, as soon as the power head is switched on and at the right position - close enough to the coil on the shaft.

The max. load current on the DC output is 100mA. The AC/DC converter will use instead battery pack!

**Never use any battery together with the MT-IndPwr!**

### Installation of the power head for inductive powering



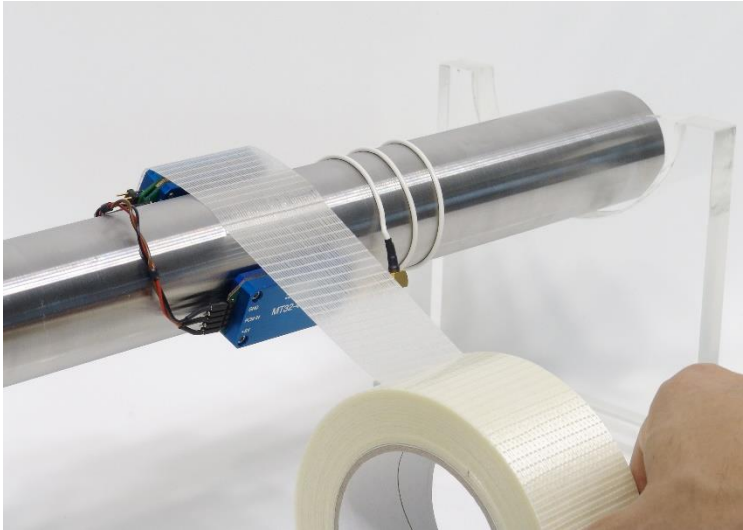
You should mount the power head at a fixed location that it's as free as possible from vibration influences.

The center of the coil should be in the same horizontal position as the center of the power head. The distance is optimal in the range between 3 and 10mm. (depends of shaft and current consumption)

If the red LED of the AC/DC converter lights up, the position of the power head is OK.

## Fixing of MT1 Modules

Fix all MT1 modules with at least 10 layers of the special mounting tape around the shaft. According to the shafts RPM and diameter it's particularly paid attention to safe mounting of the components. The manufacturer doesn't accept liability for damages, which results from not sufficiently attachment of the individual components. The provided cable harness and the tape are only for test purposes, in order to test the electrical function of the units in the idle state of the shaft.



Steel strip

During the rotation test appropriate safety tools are to be attached.

The entire installation may be used **only by authorized persons**. By using tape for the attachment, it has to be used in the direction of rotation of the shaft and the end has to be secured against removing. Only non-elastic tapes with high tensile strength have to be used for pre-fixing. **Add. use steel strip for final fixing!!**

The individual components are to be distributed in such a way on the shaft that imbalances will avoid.

## Safety notes for inductive powering

- The device should only applied by instructed personnel.
- The power head emits strong magnetic radiation at 40-60 kHz to a distance of 20 cm. Therefore persons with cardiac **pacemakers** should **not work** with this device!
- Magnetic data storage media should be kept in a distance of at least 3m from the power head to avoid data loss. The same is valid for electromagnetic sensitive parts, devices and systems.
- Do **not place** the power head in the switched-on state **on metallic objects**, because this results in eddy currents which could overload the device and strong heat up small objects. Also the probe could be destroyed!
- No metallic objects, other than the disc-type coil, should be located in the air gap of the power head. The same applies to metallic parts within a radius of up to 15–20 mm in all directions.
- Do not use damaged or faulty cables!
- Never touch in the area between shaft and inductive head, the rotating shaft itself or rotor electronic contacts during operation!
- This is a "Class A" system suitable for operation in a laboratory or industrial environment. The system can cause electromagnetic interferences when used in residential areas or environments. In this case the operator is responsible for establishing protective procedures.





## Konformitätserklärung

Declaration of Conformity  
Déclaration de Conformité

Wir  
We  
Nous

**KMT - Kraus Messtechnik GmbH**

Anschrift  
Address  
Adress

**Gewerbering 9, D-83624 Otterfing, Germany**

erklären in alleiniger Verantwortung, daß das Produkt
declare under our sole responsibility, that the product
declarons sous notre seule responsabilité, que le produit



Bezeichnung	<b>Messdatenübertragungssystem</b>
Name	
Nom	

Typ,Modell,Artikel-Nr., Größe	<b>MT1-PCM</b>
Type,Model, Article No.,Taille	
Type, Modèle, Mo.d'Article,Taille	

mit den Anforderungen der Normen und Richtlinien
fulfills the requirements of the standard and regulations of the Directive
satisfait aux exigences des normes et directives

<b>108/2004/EG</b>	<b>Elektromagnetische Verträglichkeit EMV / EMC</b>
	DIN EN 61000-6-3 Ausgabe 2002-8 Elektromagnetische Verträglichkeit EMV Teil 6-3 Fachgrundnorm Störaussendung
	DIN EN 61000-6-1 Ausgabe 2002-8 Elektromagnetische Verträglichkeit EMV Teil 6-1 Fachgrundnorm Störfestigkeit

und den angezogenen Prüfberichten übereinstimmt und damit den Bestimmungen entspricht.
and the taken test reports und therefore corresponds to the regulations of the Directive
et les rapports d'essais notifiés et, ainsi, correspond aux règlement de la Directive.

<b>Otterfing, 02.05.2006</b>	<b>Martin Kraus</b>
	  <b>Kraus Messtechnik GmbH</b> Gewerbering 9 D-83624 Otterfing - Germany Tel. 08024-48737 - Fax 08024-5532 <a href="http://www.kmt-gmbh.com">www.kmt-gmbh.com</a>
Ort und Datum der Ausstellung	Name und Unterschrift des Befugten
Place and Date of Issua	Name and Signature of authorized person
Lieu et date d'établissement	Nom et signature de la personne autorisée