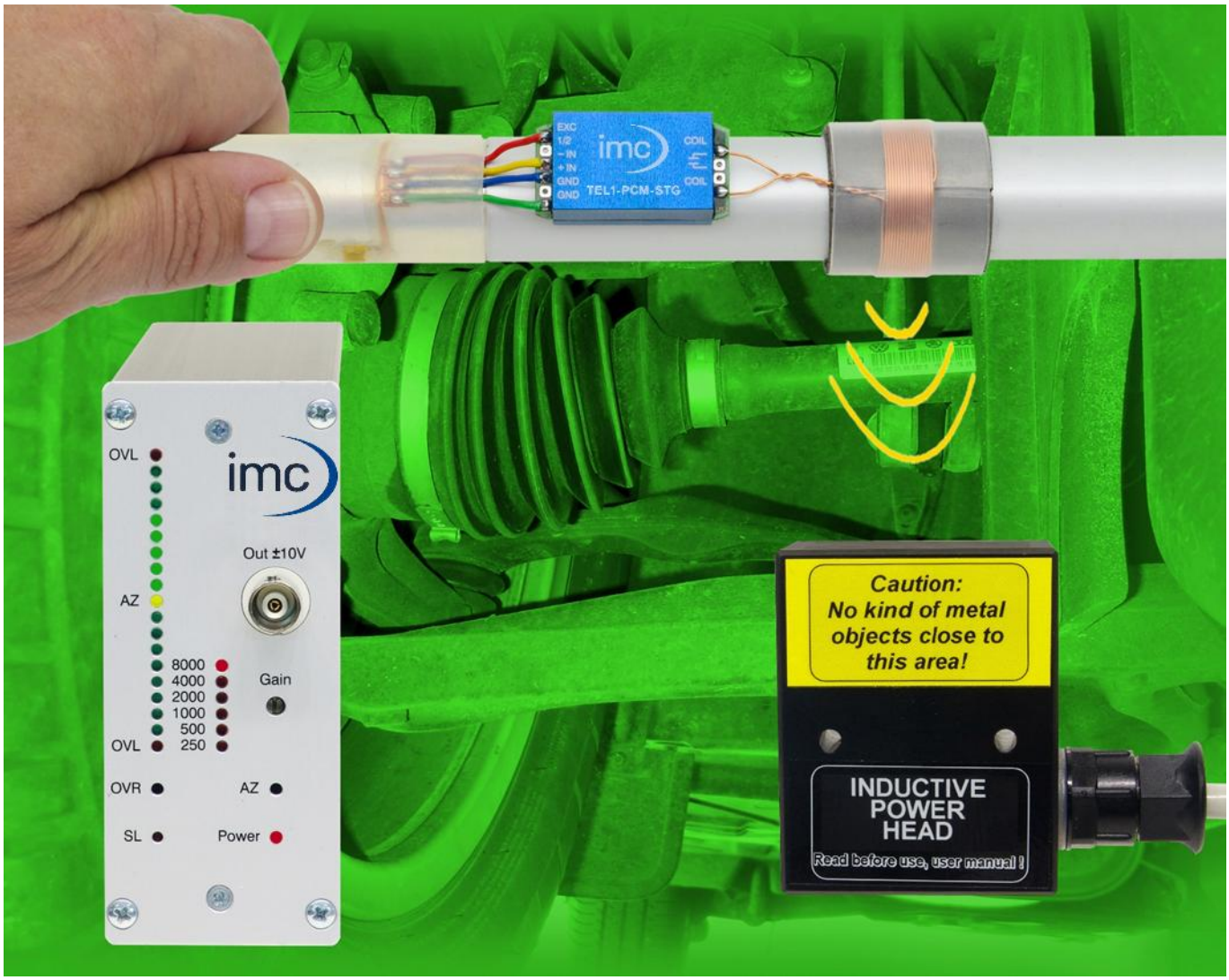
TEL1-PCM

Operating Instructions

Digital Telemetry System for Strain Gage Applications on Rotating Shafts

“Gain and Auto Zero setting direct from Receiver Side!”



INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!

Attention

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

Safety Notes

- The device should only applied by instructed personnel.
- The power head emits strong magnetic radiation at 30-60 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 strongly heat up small objects. In addition, 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 50 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 interference when used in residential areas or environments. In this case the operator is responsible for establishing protective procedures.

General Description

The TEL1-PCM single-channel telemetry system offers the easiest handling for the wireless transmission of strain gage signals from rotating shafts. The very small encoder 35 x 18 x 12 mm with a weight of 13g. The transmitter (encoder) part is simply mounted on the rotating shaft with a special fiber reinforced tape.

Powering of the transmission part and the digital data transfer between transmitter and receiver is realized inductively.

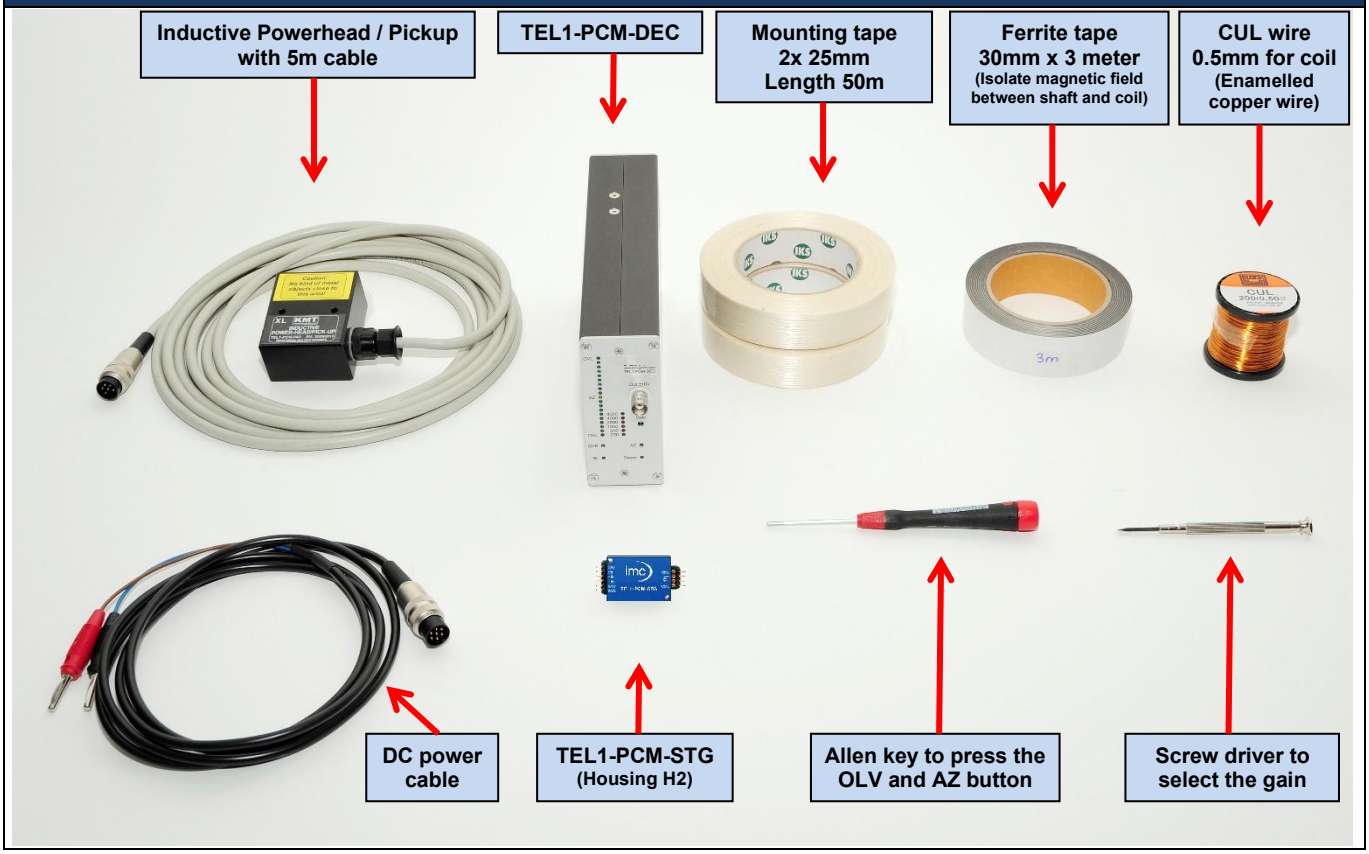
Functional Description

The TEL1-PCM transmitter provides a pulse code modulated signal (PCM) to an induction winding around the *shaft (max. diameter 500mm, other on request!)*. The magnetic field of this winding enables the inductive transmission of the signal to the pickup coil. From there the signal is transferred by cable (5m) to the receiver. The maximum distance between the transmitter coil and the pickup is 25mm with standard head, optional 35mm

The receiver unit offers a BNC connector at the front panel with analog outputs ± 10 V and an optional a digital output for *PCM-LAN IP-Interface* or a output 4-20mA. 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. The AZ setting is stored in a Flash-RAM and thus is not lost during power-off. Use only shielded sensor cable.

TEL1-PCM Set Contains:



Technical Data Transmitting Part:

With built-in 220nF capacitor for shaft up to 400mm recommend! Standard version!

Without built-in capacitor. Only with external capacitor! E. g. 100nF for larger shaft >400mm! Specify at order!

TEL1-PCM-STG

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

Gain	Resolution	Autozero range
250	12 bit	100%
500	12 bit	200%
1000	12 bit	400%
2000	12 bit	400%
4000	12 bit	400%
8000	11 bit	400%

AZ: Auto Zero calibration (selectable from receiver side)
Analog signal bandwidth: 0 - 1200 Hz (-3 dB)
Operating temperature: - 40 to + 85 °C
Sampling rate 6.944kHz
Dimensions: 35 x 18 x 12mm (without connectors)
Weight: each module 13 grams (with epoxy resin)
Powering: Inductive
Housing: splash-water resistant IP65 (except the connector pins)

with female K type thermocouple connector

with solder pins for thermocouple

Analog signal bandwidth: 0 - 10 Hz (-3 dB)
Accuracy: +/-0.5 % (without sensor)
Operating temperature: - 40 to + 85 °C
Dimensions: 35 x 18 x 12mm (without th-connector)
Weight: each module 13 grams (with epoxy resin)
Powering: Inductive
Housing: splash-water resistant IP65
(except the connector pins)

TEL1-PCM-TH-K - Select Gain 250!

At Gain 500 multiply the values x2, Gain 1000 with x4
Max. Voltage output at receiver is +10V!

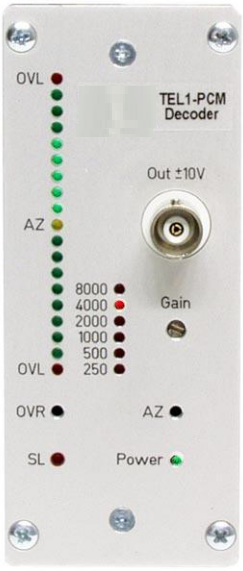
°C	Output at receiver (DEC) Normal (V)	Min. (V)	Max. (V)
-50	-0,508	-0,450	-0,550
0	-0,005	-0,050	0,050
50	0,508	0,450	0,550
100	1,012	0,950	1,050
150	1,505	1,450	1,550
200	2,000	1,950	2,050
250	2,505	2,450	2,550
300	3,010	2,950	3,050
350	3,511	3,450	3,550
400	4,014	3,950	4,050
450	4,511	4,450	4,550
500	5,011	4,950	5,050
550	5,511	5,450	5,550
600	6,010	5,950	6,050
650	6,507	6,450	6,550
700	7,007	6,950	7,050
750	7,507	7,450	7,550
800	8,007	7,950	8,050
850	8,505	8,450	8,550
900	9,003	8,950	9,050
950	9,502	9,450	9,550
1000	9,999	9,950	10,050

If no thermocouple is connected, output is -1000°C = -10V

Common characteristics / Environment (rotating parts)

Vibration (random): 0.05 g²/Hz (20 Hz to 2 kHz)
Vibration (sine): 10 g (20 Hz to 2 kHz)
Shock (½ sine): 500 g peak (11 ms)
Static Acceleration: 3000 g (depends on mounting!)
Operating temperature: -40 to +85°C
Humidity: 95 % (not condensing!)

Technical Data Receiving Part



Front

Rear

TEL1-PCM-DEC

Front side:

Analogue output: +/-10V via BNC
(delay between analog IN/OUT 15mS constant!!)
Digital output for *PCM-LAN-IP-Interface* **OPTION or**
Current output 4-20m output **OPTION**
Gain setting : via screw switch
Auto Zero setting: via micro switch
Overload LED's (Red ON) reset: via micro switch
Green LED's: Bargraph +/-
Autozero LED:
Yellow ON- successful AZ
Yellow OFF- not successful AZ
if flashing, call support of KMT, error in EPROM
Green LED's: Bargraph +/-
SL LED: Red ON = if error of data transmitting
SL LED: Red Flashing = distance to far
Power ON LED: Red ON = if power switch on

Rear side:

Output to Powerhead: via 6pol. Tuchel
Fuse LED: Flashing if fuse is defect
Powering: 10-30V DC (min. 24Watt), Input via 7pol. Tuchel
Switch: ON/OFF

Operating temperature: - 40 to +70 °C
Dimensions: 200 x 105 x 44 (without connectors!)
Weight 950 grams
Static acceleration: up to 200g
System accuracy*: +/- 0.2 %
<*measure with gain 1000, 350ohm (0.1%) full bridge - test bridge!!>

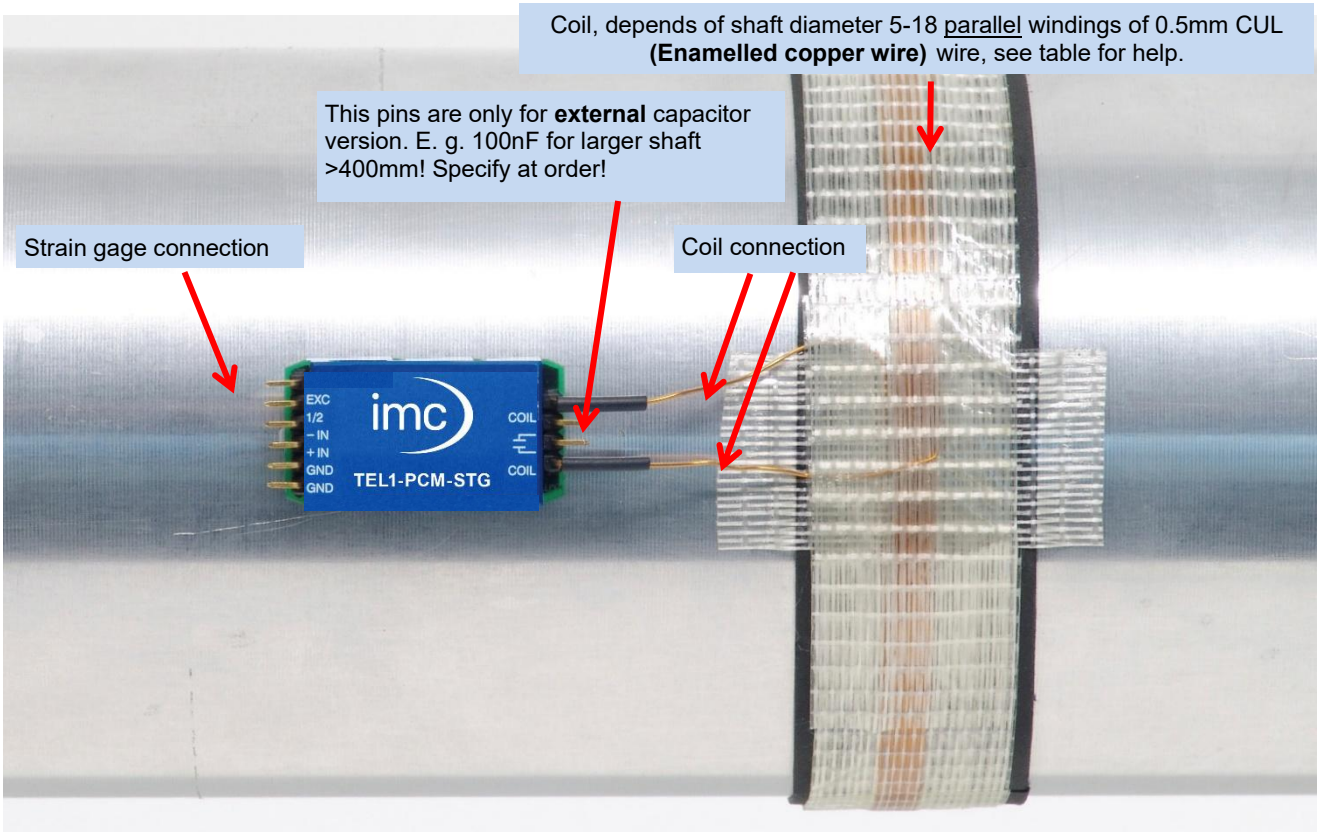
PH-PU Standard with ride side cable out

PH-PU-CRS with cable rear side out

TEL1-PCM-Powerhead/Pickup (standard version)

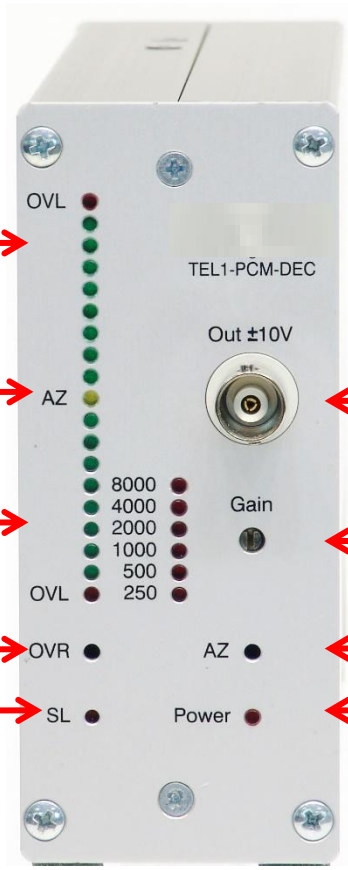
Function: Inductive powering of the TEL1-PCM-STG unit and receiving PCM magnetic field in PCM modulated code
Inductive frequency is 60kHz
Distance between the transmitter coil and the pickup is 25mm
(25mm at diameter <300mm with 5m cable, 15mm with 10m cable)
(Optional 35mm at diameter <300mm - see table)
Output to TEL1-PCM-Decoder: Via 6pol. Tuchel Plug incl. 5m cable
Operating temperature: - 40 to +85 °C
Dimensions: 53x66x30mm (without cable)
Weight: 200 grams (without cable!)
Housing: splash-water resistant IP65 (except connector).
Cable length standard 5m! 10m optional!

Transmitting Part:



Receiving Part:

Front



Positive Baragraph LED
With overload indicator

Yellow ON- successful AZ
Yellow OFF- not successful AZ
If flashing, call support of KMT, error in EPROM

Negative Bar-graph LED
With overload indicator

Reset button of overload indicator

LED ON = Error data transmission
LED Flashing = Distance between Coil and Pickup is too far away

Analog output +/-10V

Gain switch

AZ button

Power ON LED

Rear

Flashing if fuse damage

Optional
PCM OUT for Interface
or
4-20mA output
Pin 1= wire grey = 4-20mA
Pin 4 = wire black = GND

+10V = 20mA
0V = 12mA
-10V = 4mA

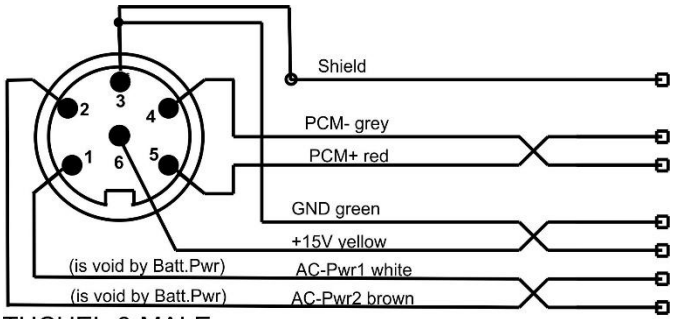
Power ON/OFF switch

Data input from Pickup and output to Powerhead

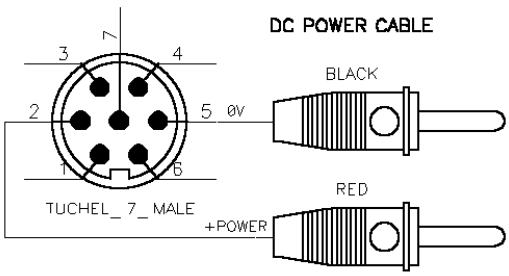
Power IN DC 10 – 30V

Powerhead / Pickup

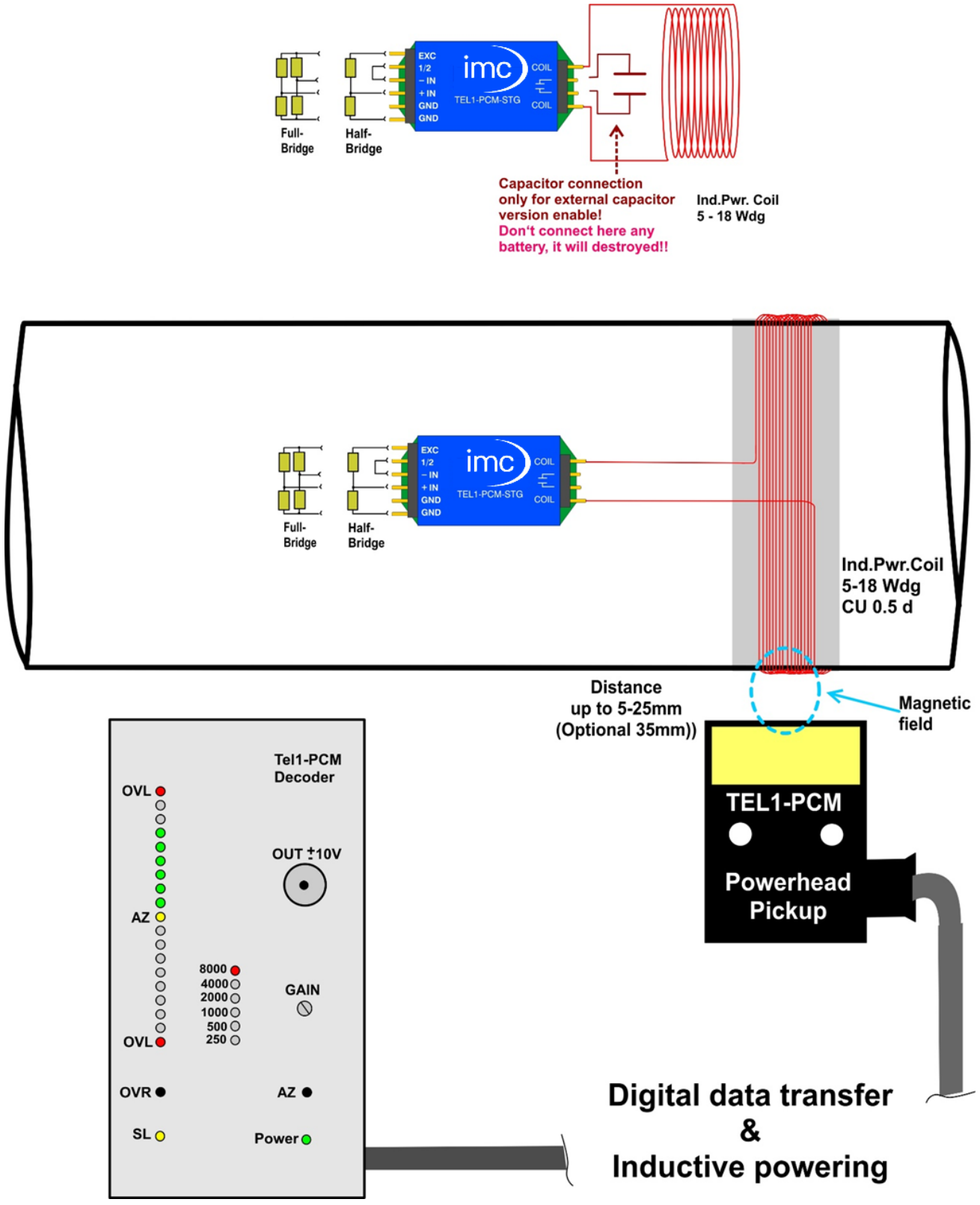
Standard version for distance of 5-25mm
(Optional 5-35mm)



DC-Power cable



Pin Connection & Block Diagram



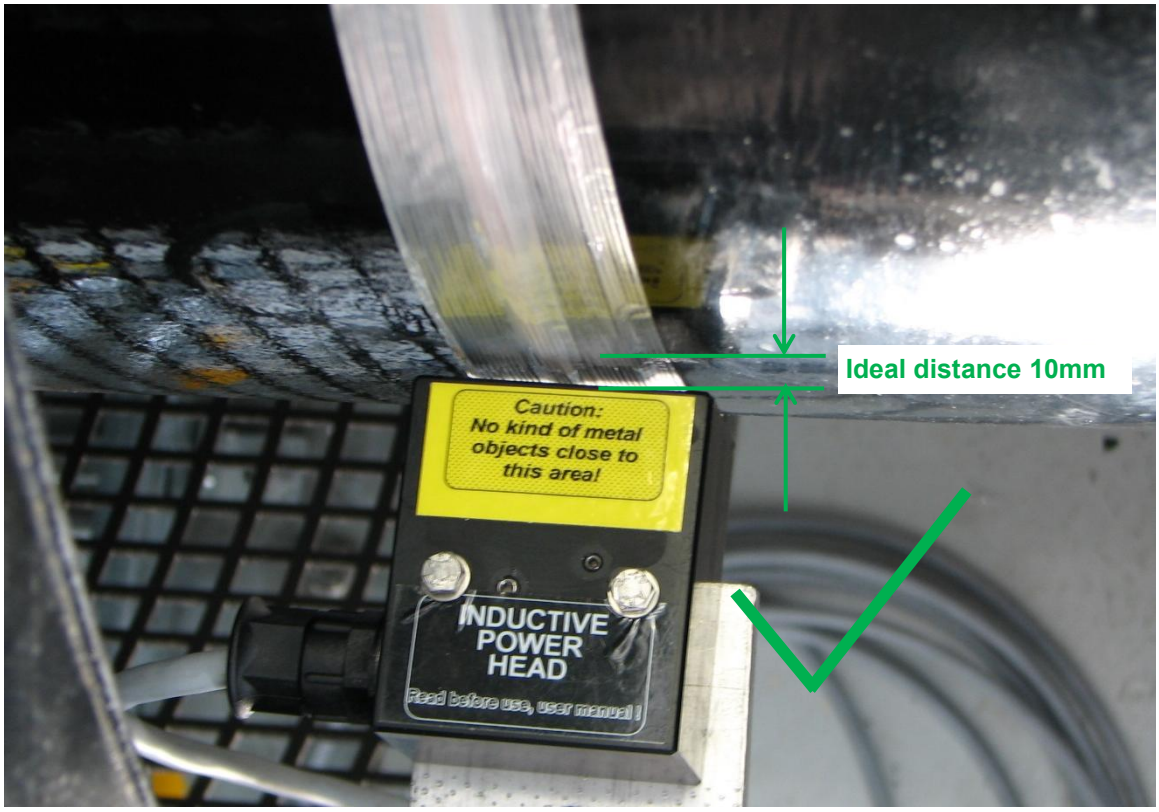
Caution:

The Powerhead must be fixed in the middle of the coil in a distance from 5 to 25 (35)mm.

Don’t introduce any metal parts between or near the Powerhead and the shaft.

Don’t mix T1-PCM and Tel1-PCM parts together!
There are not compatible!

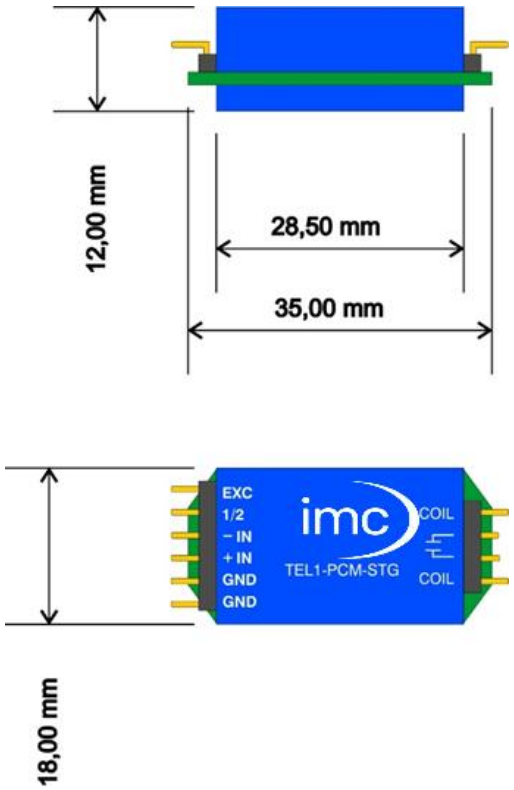
Mounting example of power head / pickup:



Right installation

Wrong installation, head position is 90° wrong to the coil and will not work!

Dimensions Encoder - TEL1-PCM-STG



Version 4.0

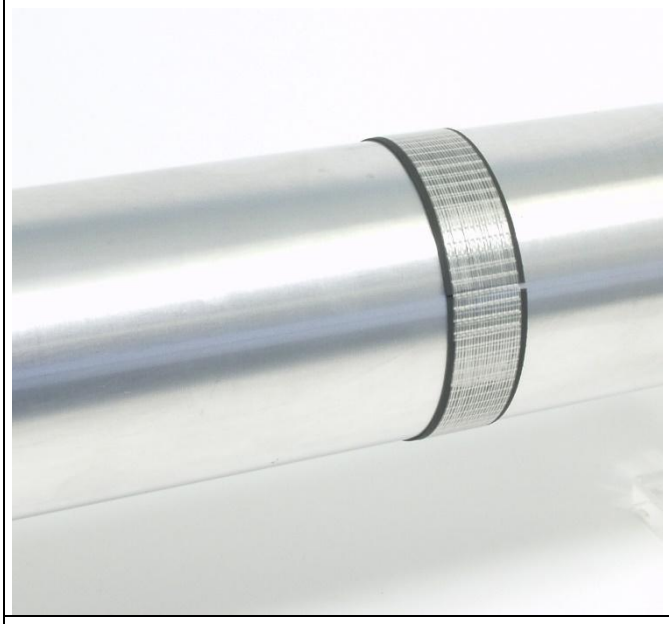
Draw about 1:1

Weight 13gram

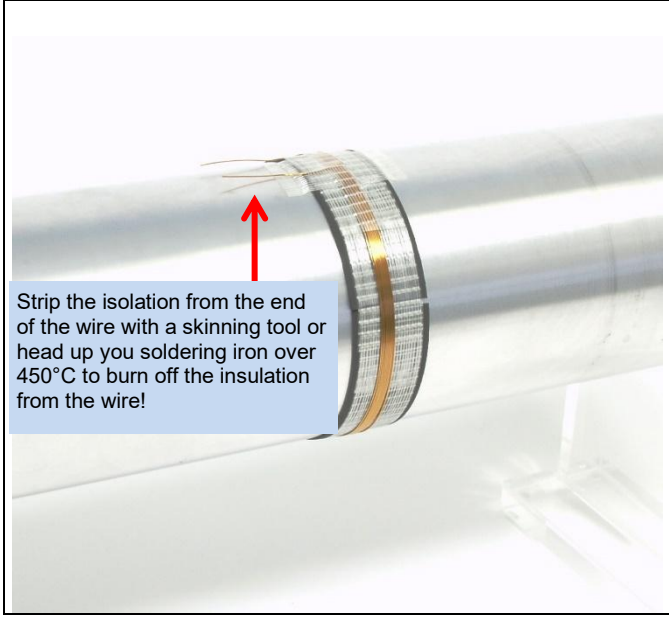
Shaft Installation

2 layers (each separately) of the special ferrite tape around the shaft

Fix with 2 layers of mounting tape around the shaft

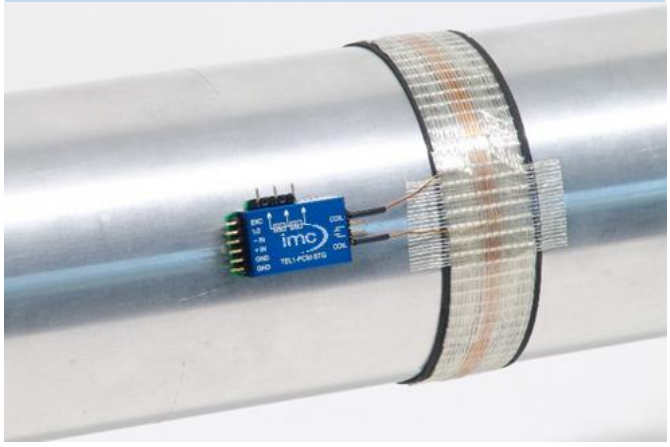


Coil, depends of shaft diameter 5-18 parallel windings of 0.5mm CUL **(Enamelled copper wire)** wire, see table for help.

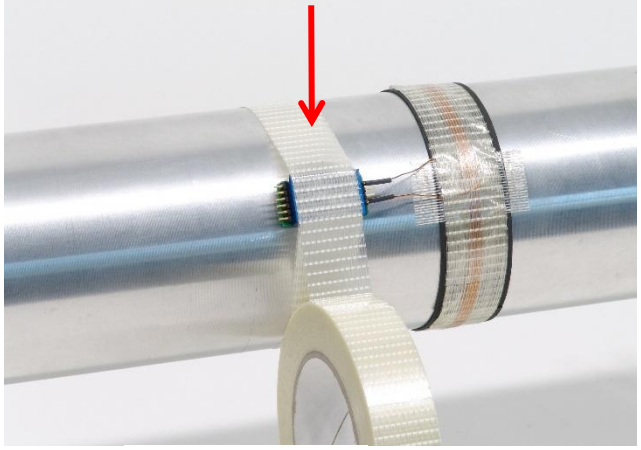


Strip the isolation from the end of the wire with a skinning tool or head up you soldering iron over 450°C to burn off the insulation from the wire!

Solder the wires of the coil on the input pins of TEL1-PCM-STG “COIL” .The pins for capacitor are used only for larger diameter >400mm!

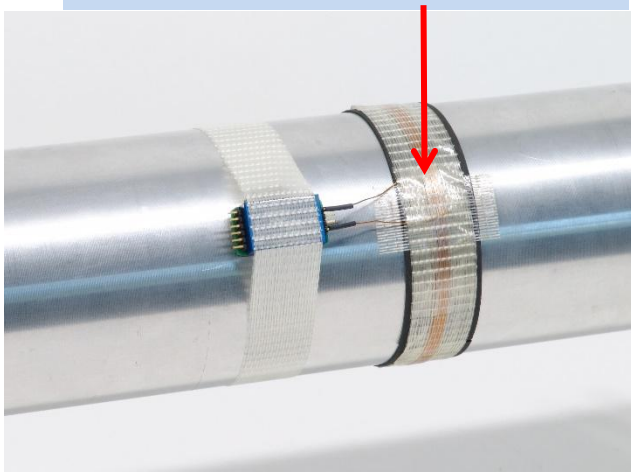


10 layers of the special mounting tape around the shaft. We recommend aadditionally use of a **hose clamps** for final fixing of the transmitter unit!!



hose clamps

Fix with 3 layers of mounting tape around the coil and cables



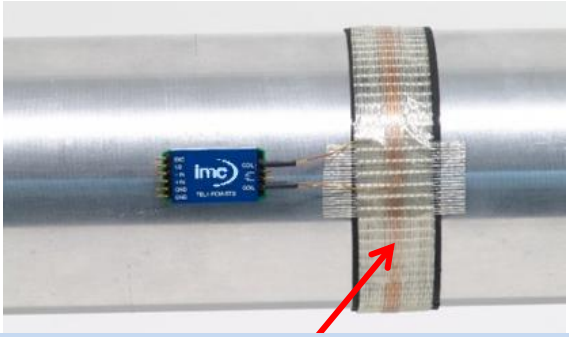
Caution:

Fix TEL1-PCM module with at least 10 layers of the special mounting tape **(only for up to 1000g!)** 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.

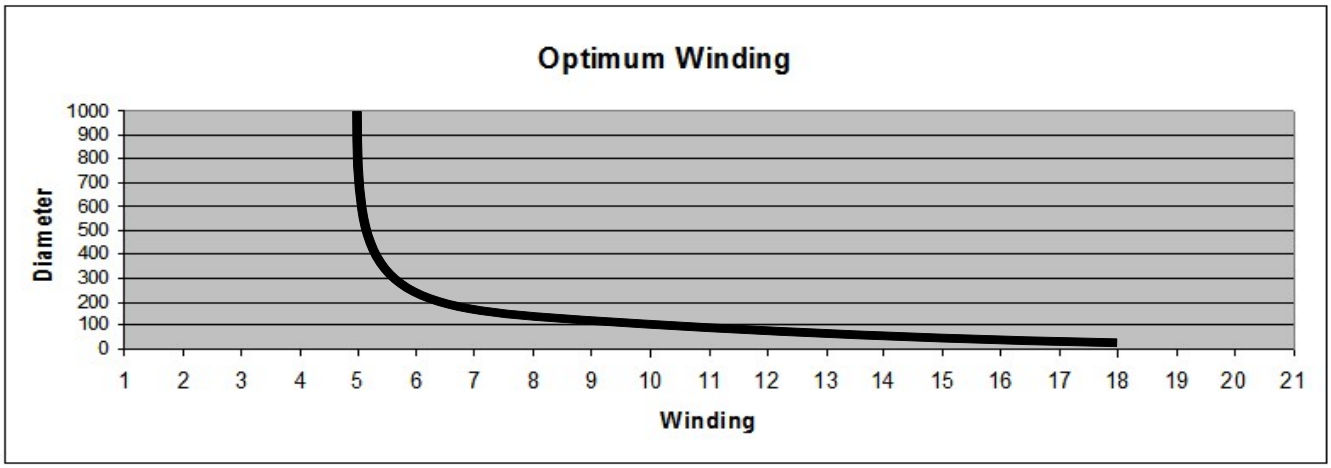
During the rotation test appropriate safety precautions should be taken.
The entire installation may be used only by authorized persons. By using tape for the attachment, it has to be used in the direction of rotation of the shaft and the end has to be secured. Only non-elastic tapes (**Fiberglas Tape)** with high tensile strength (100kg/25mm) should be used for pre-fixing. Additionally, use hose clamps for final fixing!! The individual components are to be distributed in such a way on the shaft that imbalances are avoided.

Finding the Correct Number of Windings

The number of windings depends on several factors. The most important influential factors are the diameter, the materiel of the shaft and the environment around the shaft. The table standing below will help you to find the right number windings for steel shafts. The table below is a help to estimate the number of windings fast. To optimize your results you can try one winding more or less.



Coil, depends of shaft diameter, 5-18 parallel windings of 0.5 or 0.63mm

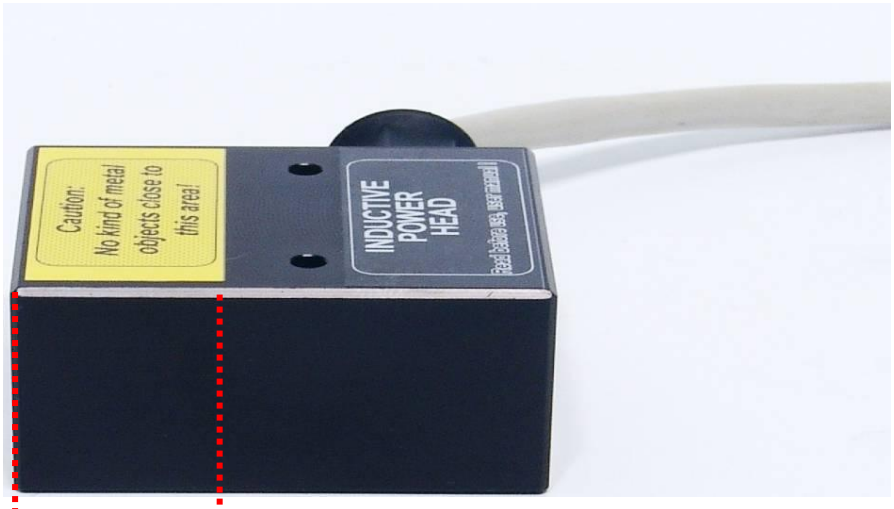


Diameter (mm)	Windings +/-1	max. distance with XL (35mm) Powerhead	Ferrite tape no. of layers	recommend capacitor (Type MKT or MKS 250V)
1000	4-5	12mm	2	**without** built-in 220nF, only with external 68nF (specify at order
500	5-6	20mm	2	**without** built-in 220nF, only with external 100nF (specify at order)
500	3	8mm	2	with built-in 220nF (is standard in housing) Not recommend for large diameters!!!!
300	5	27mm	2	with built-in 220nF (is standard in housing)
210	6	28mm	2	with built-in 220nF (is standard in housing)
160	7	28mm	2	with built-in 220nF (is standard in housing)
130	8	35mm	2	with built-in 220nF (is standard in housing)
90	11	35mm	2	with built-in 220nF (is standard in housing)
60	13	35mm	2	with built-in 220nF (is standard in housing)
30	14	35mm	2	with built-in 220nF (is standard in housing)
20	18	35mm	2	with built-in 220nF (is standard in housing)

With built-in 220nF capacitor for shaft up to 400mm recommend!
Standard version!

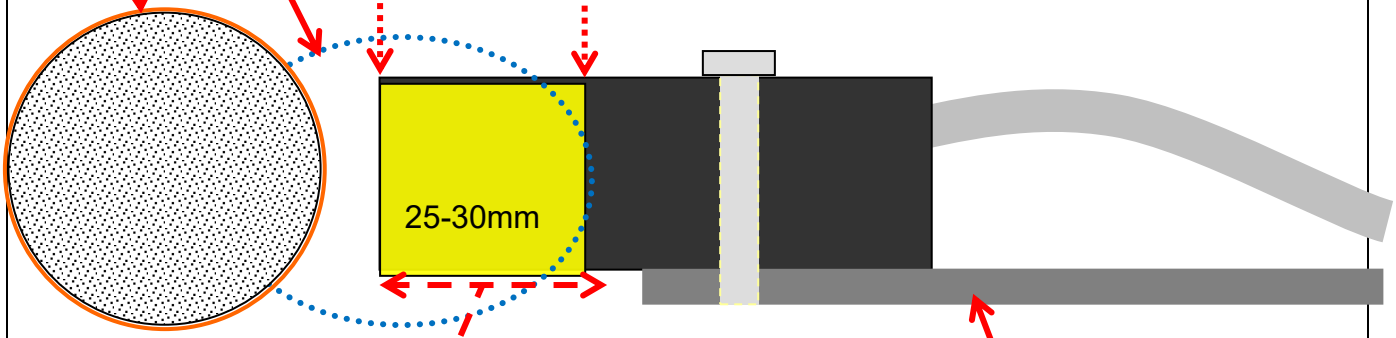
With external capacitor for varies diameters!
220nF for shaft diameter 10-400mm
100nF for shaft diameter 400-800mm
68nF for shaft diameter 800-1200mm
Specify at order!

Following must be considered at the mounting of the inductive power head at TEL1-PCM



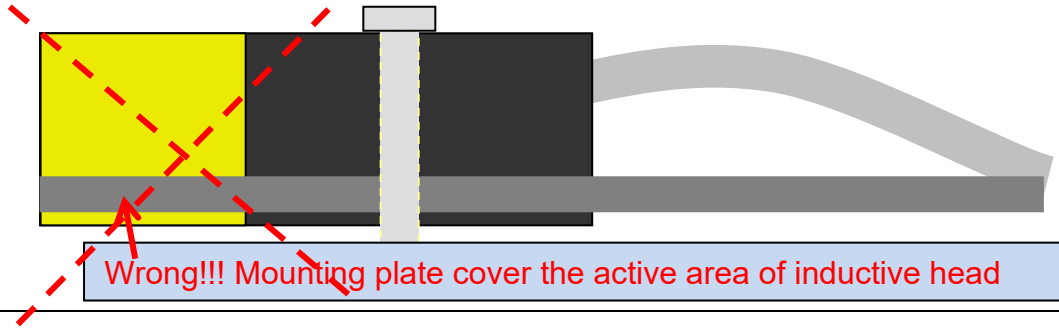
Shaft with Cu wire Coil

Magnetic field



Don’t use for mounting any kind metal in this area (25-30mm)! Otherwise flow magnetic energy in the metal also and decrease the distance between power head and coil (on shaft)!

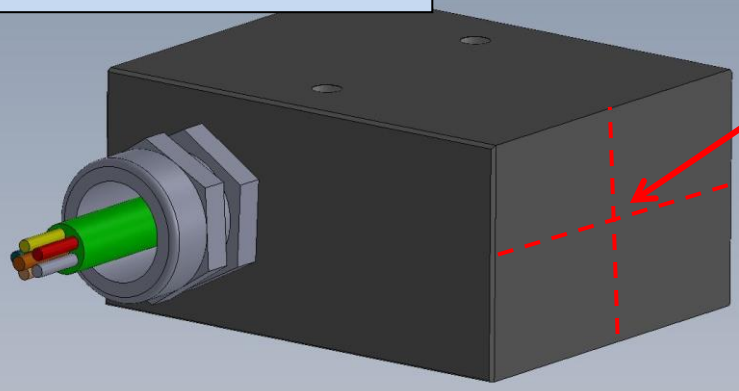
Example of mounting plate,



Wrong!!! Mounting plate cover the active area of inductive head

Powerhead / Pickup - distances (coil / head)

PH-PU-Standard & XL



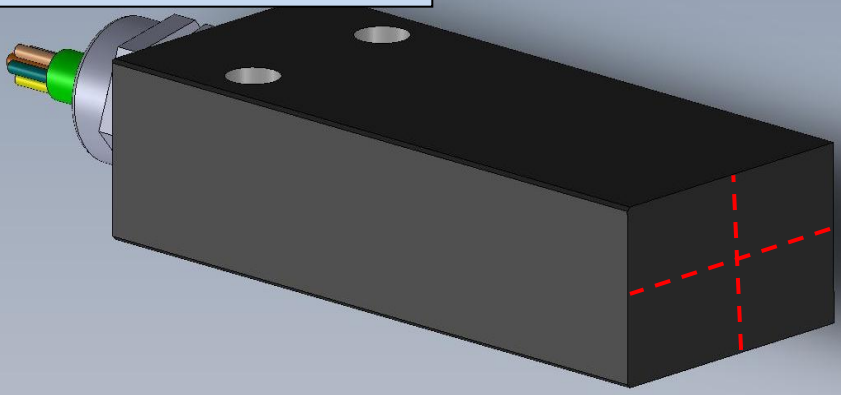
From center cross out

+/-10mm Z

+/-10mm Y

10-25mm standard,
at XL 10-35mm X

PH-PU-N25

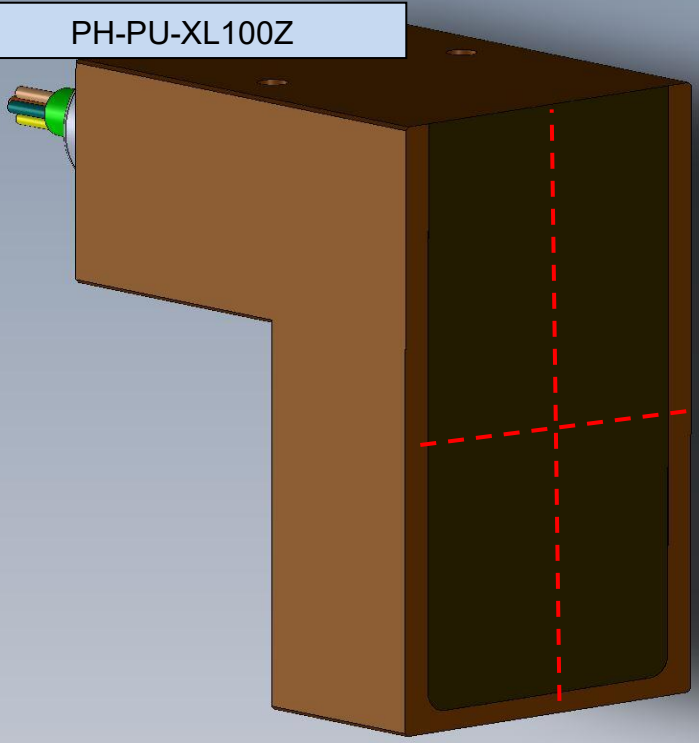


+/-10mm Z

+/-10mm Y

10-25mm X

PH-PU-XL100Z



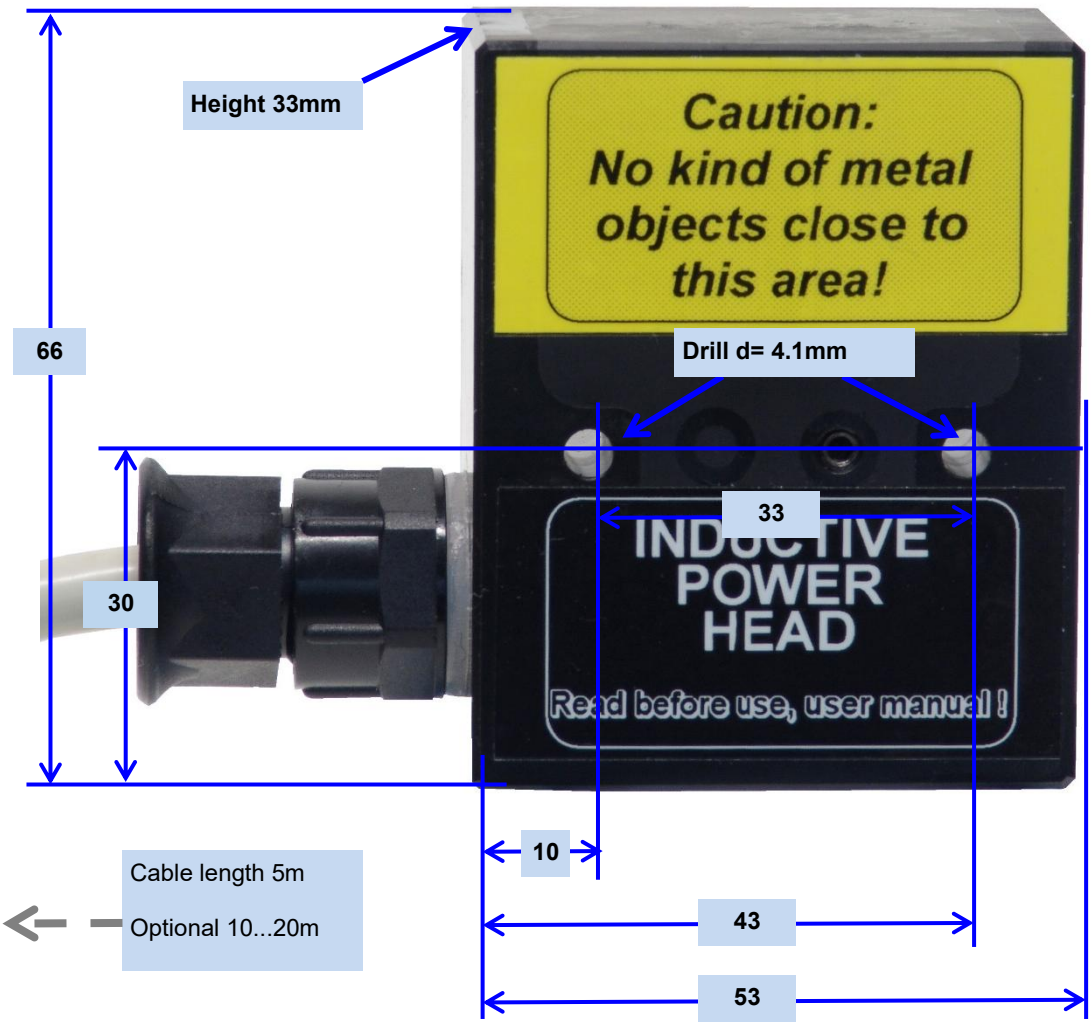
+/-50mm Z

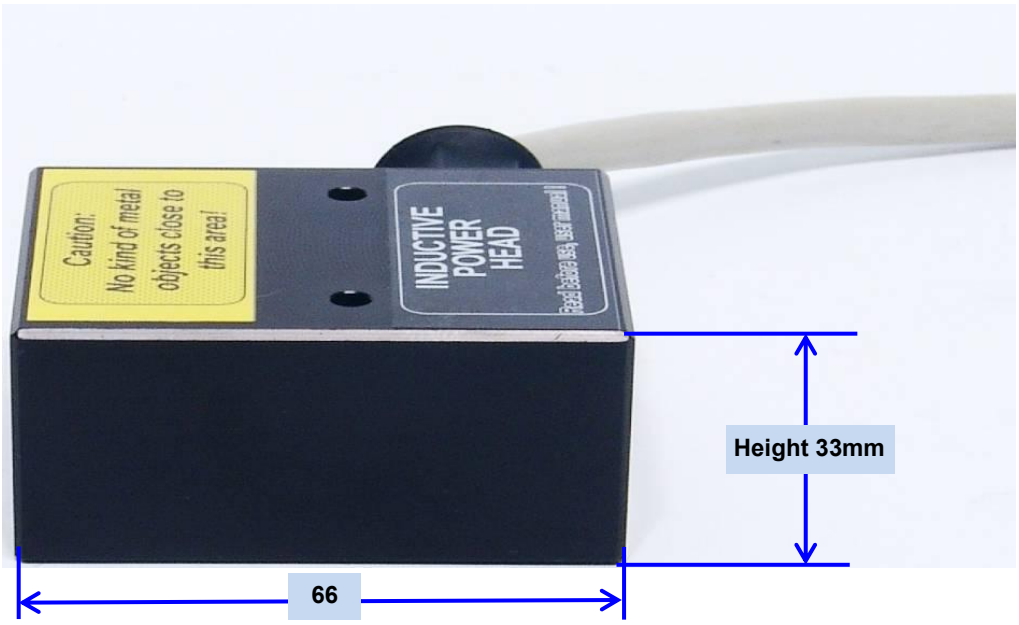
+/-10mm Y

10-30mm X

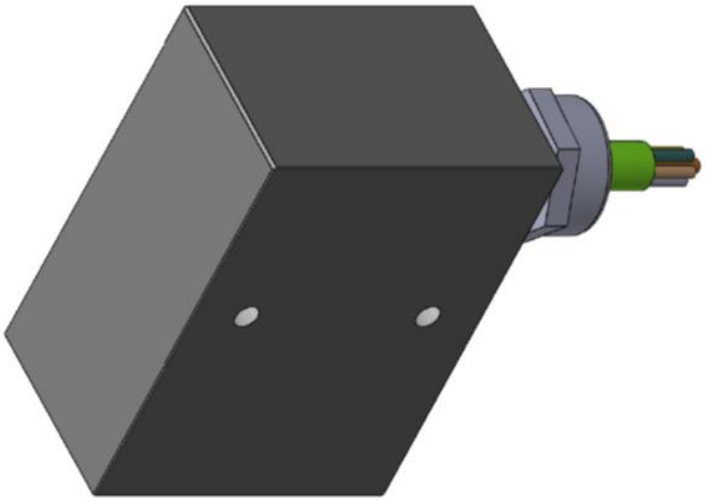
All distance are only **„up to“** and can change a little, depens of diameters!
(typical shaft diameter 20-50mm)

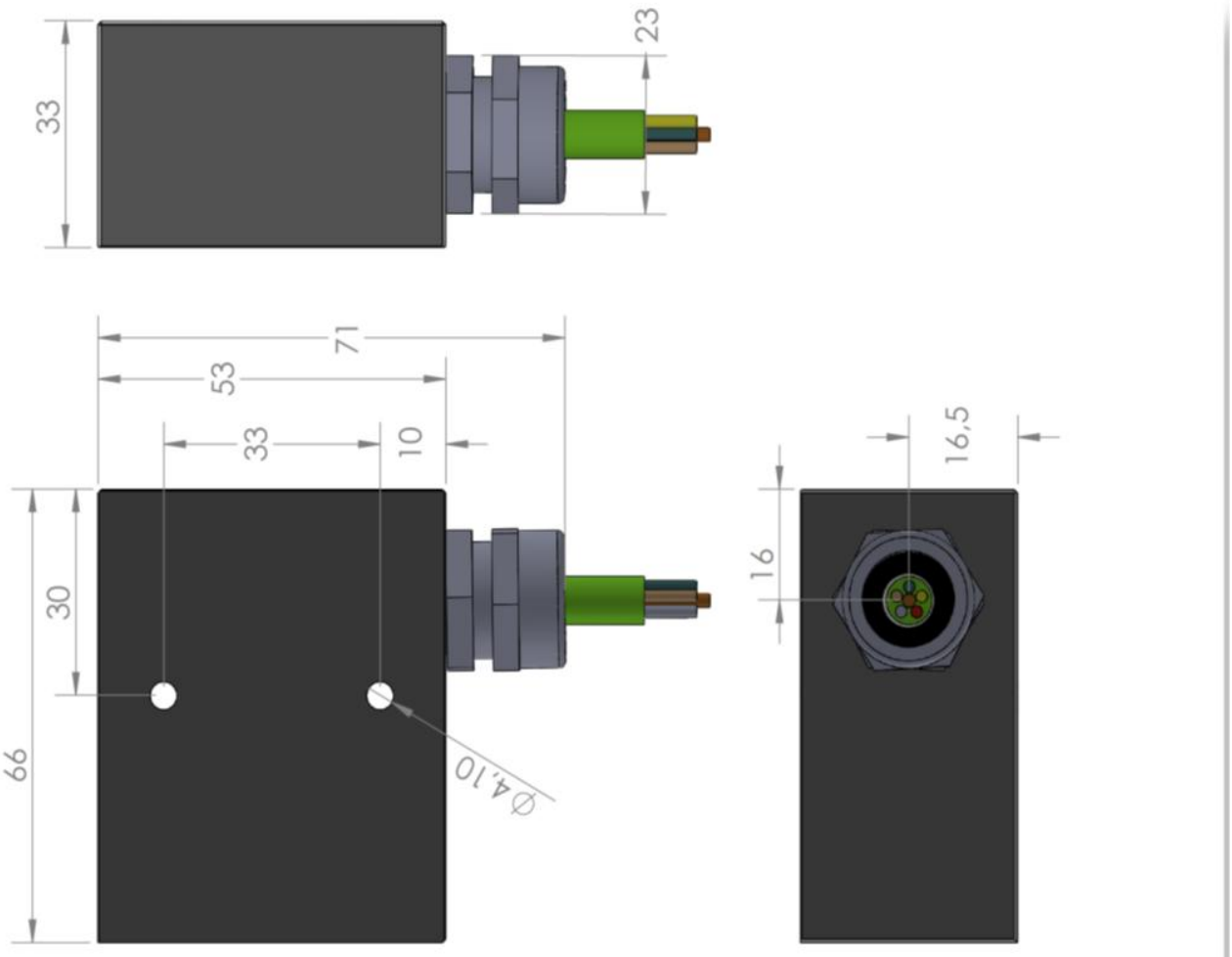
Dimensions Powerhead / Pickup (Standard and XL)



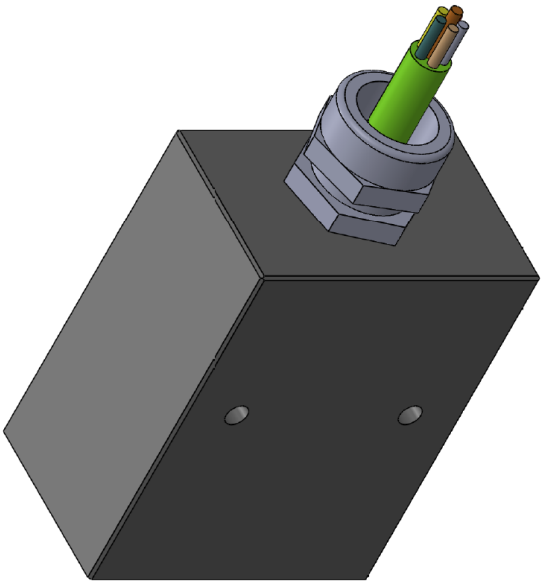


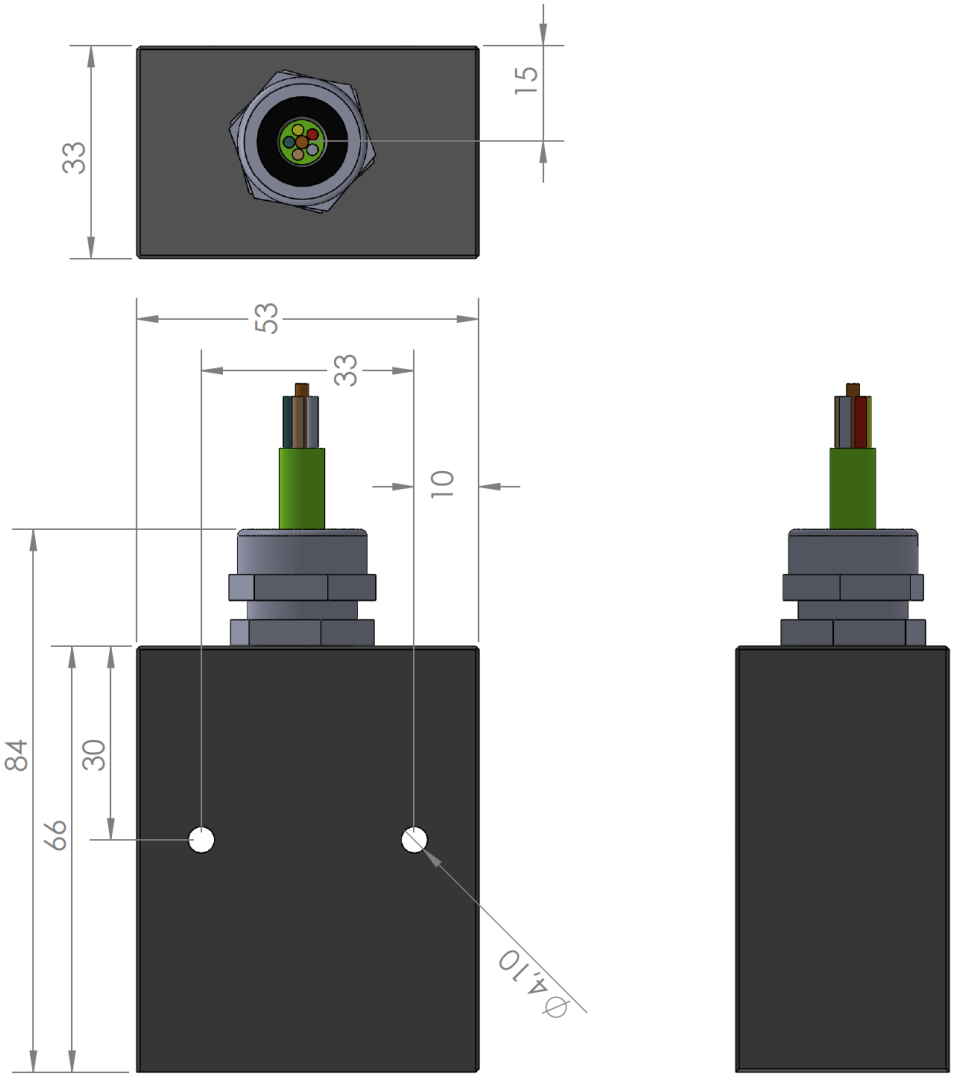
Dimensions Powerhead / Pickup (Standard and XL) draw





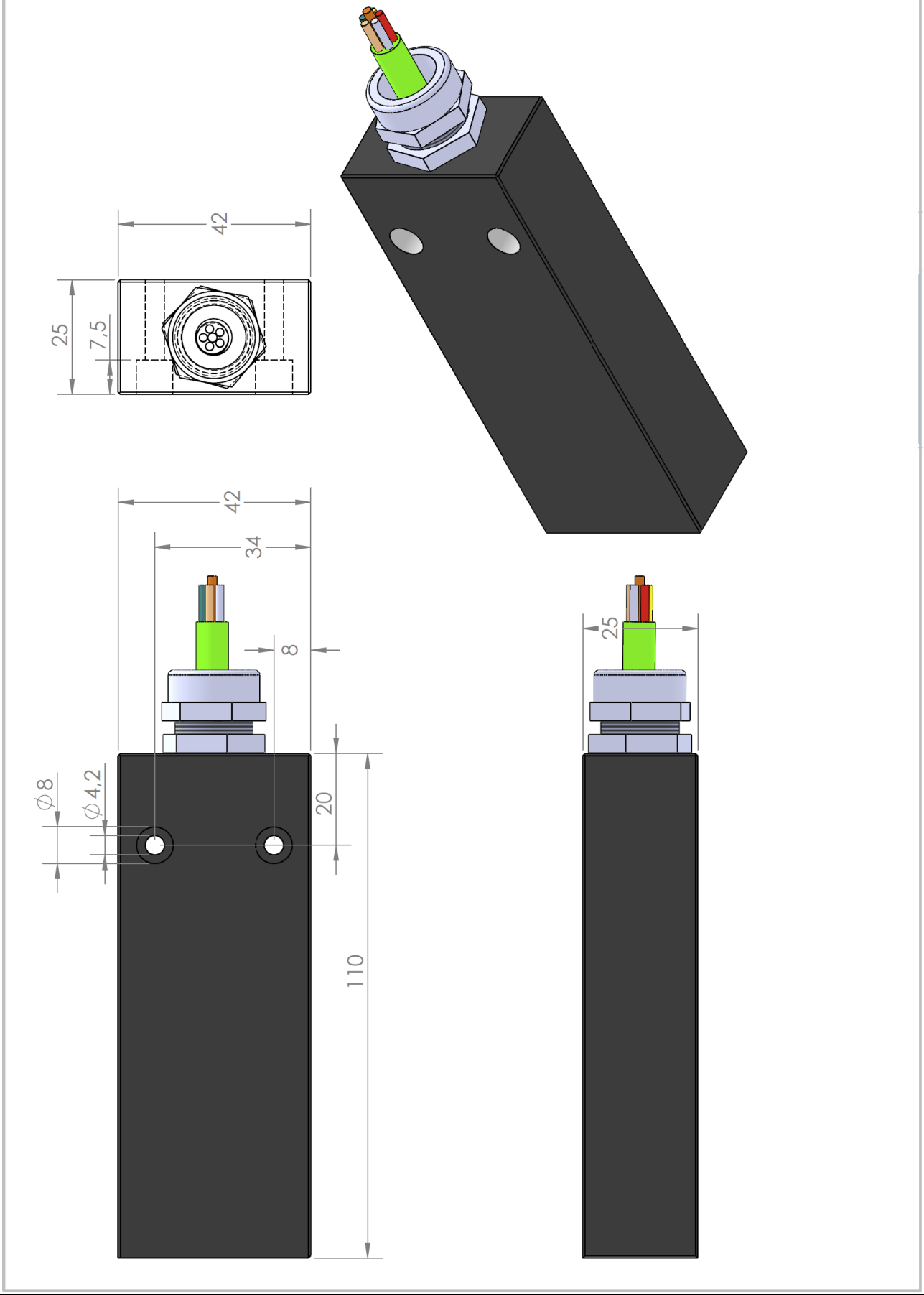
Dimensions Powerhead / Pickup (CRS at standard and XL) draw



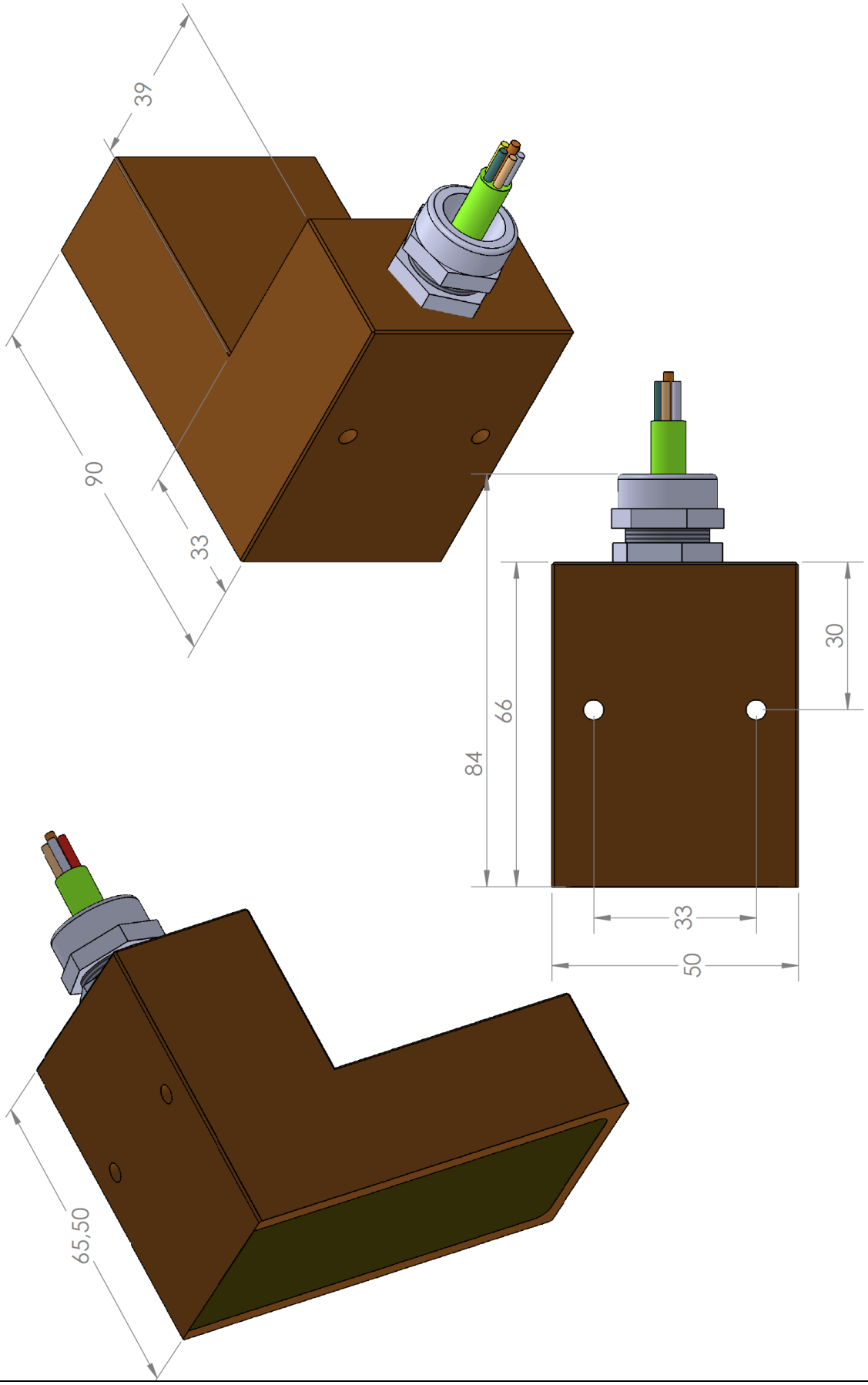


CRS = cable rear side out!

Dimensions Powerhead / Pickup (N25) draw



Dimensions Powerhead / Pickup (XL100-Z) draw



Dimensions Powerhead / Pickup XXL draw