T1-PCM-IND
Digital telemetry system for strain gage applications on rotating shafts

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
- Gain: 250-500-1000-2000 or 1000-2000-4000-8000
- 16 bit ADC
- Digital transmission realized inductively
- Distance up to 30mm (Range)
- Powering of transmitter part inductive
- No influence through radio frequency
- Many systems can operated at the same time
- Signal bandwidth 0...1200Hz (-3dB)
- Output +/-10V
- Output 4-20mA (Option)
- System accuracy <0.2%
General description

The T1-PCM-IND single-channel telemetry system offers the easiest handling for the wireless transmission of strain gage signals from rotating shafts. The encoder 35x24x14mm with a weight of 16g. The transmitter (encoder) part is simply mounted on the rotating shaft with a special fiber reinforced tape.

The data transfer between transmitter and receiver is digital. The powering of the transmission part by the T1-PCM-IND is inductive!

Functional description

The T1-PCM-IND transmitter provides a pulse code modulated signal (PCM) to an induction winding around the shaft. The magnetic field of this winding enables the inductive transmission of the signal from coil to pickup. From there the signal is transferred by cable (5 m) to the receiver. The maximum distance between the transmitter coil and the pickup/powerhead is 30mm.

The receiver unit offers a BNC connector at the front panel with analog outputs ± 10 V and optional a current output of 4-20mA. 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 plug-In bridge in 4 steps (250-500-1000-2000 or 1000-2000-4000-8000). 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. The yellow LED flashes as long as the AZ is in progress. 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.

T1-PCM-IND set contains:

- Inductive Pickup/Powerhead with 5m cable
- T1-PCM-DEC (Decoder)
- Mounting tape 2 x 25mm x 50m
- Ferrite tape - 30mm x 3 meter (isolate magnetic field between shaft and coil)
- CU wire, 0.5mm for coil (insulated with lacquer)
- DC-Power cable
- T1-PCM-STG-(IND) (Encoder for strain gages)
- Hexagon key to activate AZ switch
Technical data transmitting part:

### T1-PCM-STG

- **Strain gage:** Full and half bridge >350 Ohm,
- **Excitation:** 4 VDC (fixed)
- **Gain:** 250-500-1000-2000 standard, 1000-2000-4000-8000 \( \text{on request!} \)
- **Gain and Sensitivity**
  - Gain 250 = +/-10mV/V
  - Gain 500 = +/-5mV/V
  - Gain 1000 = +/-2.5mV/V
  - Gain 2000 = +/-1.250mV/V
  - Gain 4000 = +/-0.625mV/V
  - Gain 8000 = +/-0.3125mV/V
- **AZ:** Auto Zero calibration (via AZ button from receiver side)
- **Analog signal bandwidth:** 0 - 1200 Hz (-3 dB)
- **Operating temperature:** -10 to +80 °C
- **Resolution:** 16bit
- **Scanning rate:** 7.5kHz
- **Static acceleration:** up to 3000g
- **Powering:** inductive
- **Dimensions:** 35x24x14mm, weight 16g
- **Housing:** splash-water resistant IP65 (except the connector pins)

### T1-PCM-Pt100

- **Pt100 thermo sensor**
- **Measurement range:** -50 to 250°C or -50 to 500°C (select by jumper)
- **Analog signal bandwidth:** 0 - 10 Hz (-3 dB)
- **Operating temperature:** -10 to +80 °C
- **Resolution:** 16bit
- **Scanning rate:** 7.5kHz
- **Static acceleration:** up to 3000g
- **Powering:** inductive
- **Dimensions:** 35x24x14mm, weight 16g
- **Housing:** splash-water resistant IP65 (except the connector pins)
Dimensions Encoder - T1-PCM-STG

Draw about 1:1

Weight 16 gram
Technical data receiving part

T1-PCM-DEC
Analogue output: +/-10V via BNC output 1200Hz
Optional switchable add. 100Hz filter for the analog output
Optional add. 4-20mA output to the analog output
Auto Zero setting: via AZ button
Autozero LED:
   Yellow ON= successful AZ
   Yellow OFF= not successful AZ
   if flashing, call support of KMT, error in EPROM
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
Output to Powerhead: via 6-pol. Tuchel
Fuse LED: Flashing if fuse is defect
Powering: 10-30V DC, Input via 7-pol. Tuchel
Switch: ON/OFF
Operating temperature: - 10 to +70 °C
Dimensions: 75 x 105 x 105 (without connectors!)
Weight 750 grams
Static acceleration: up to 200g
System accuracy*: +/- 0.2 %
<measure with gain 1000, 350ohm (0.1%) full bridge - test bridge!!>

T1-PCM-Pickup/Powerhead (standard version)
Function: Receiving inductive PCM modulated data from the coil of the T1-PCM-STG unit
Distance between the transmitter coil and the pickup is 5-30*mm
Output to T1-PCM-Decoder: Via 6-pol. Tuchel plug incl. 5m cable
Operating temperature: - 10 to +80 °C
Dimensions: 53x66x30mm (without cable)
Weight: 200 grams (without cable!)
Housing: splash-water resistant IP65 (except connector).
Cable length standard 5m! Optional 10 or 15m
*(depend of shaft diameter!)
Note: The Pickup/Powerhead must be fixed in the middle of the coil in a distance from 5 to 30mm.

At high RPM we recommend to solder the GAIN jumper!
Receiving part:

### Front

- **LED ON** = Error data transmission
- **LED Flashing** = Distance between Coil and Pickup is too far away
- Data input from Pickup and output to Powerhead
- Power IN DC 10 – 30V
- Analog output +/-10V
- Yellow ON - successful AZ
- Yellow OFF - not successful AZ
- If flashing, call support of KMT, error in EPROM
- AZ button
- Flashing if fuse damage
- Power ON LED
- Power ON/OFF switch

### Rear

- Top-hat rail mounting clip (Option!)
Pin connection cable:

**Pickup / Powerhead**
Standard version for distance of 5-30*mm
*(depend of shaft diameter!)*

- Shield
- PCM- grey
- PCM+ red
- GND green
- +15V yellow
- (is void by Batt-Pwr.)
- AC-Pwr1 brown
- AC-Pwr2 white

DC-Power cable

- DC POWER CABLE
- BLACK
- RED
- +POWER

Version 2010-10
Technical Data are subject to change without notice!
### Shaft Installation

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2 layers (layer by layer) of the special ferrite tape around the shaft</td>
</tr>
<tr>
<td>2</td>
<td>Fix with 2 layers of mounting tape around the shaft</td>
</tr>
<tr>
<td>3</td>
<td>Coil, depends on shaft diameter 5-18 parallel windings of 0.5 CU wires, see table for help.</td>
</tr>
<tr>
<td>4</td>
<td>Fix with 2 layers of mounting tape around the coil</td>
</tr>
</tbody>
</table>
Caution:

Fix T1-PCM-STG 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 with high tensile strength 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.

We recommend add. use a steel hose clamps for final fixing!!

We recommend soldering all pins of the T1-PCM-STG!
Find the correct amount of windings

The number of windings depends on several factors. The most important influential factors are the diameter, the material 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.

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Windings (+/4)</th>
<th>max. distance with (30mm) Powerhead</th>
<th>Ferrite tape no. of layers</th>
<th>recommend capacitor (Type MKT or MKS 250V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>5</td>
<td>10mm</td>
<td>2</td>
<td>without built-in 220nF, only with external 68nF (specify at order)</td>
</tr>
<tr>
<td>500</td>
<td>5</td>
<td>18mm</td>
<td>2</td>
<td>without built-in 220nF, only with external 100nF (specify at order)</td>
</tr>
<tr>
<td>500</td>
<td>3</td>
<td>5mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>300</td>
<td>5</td>
<td>22mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>210</td>
<td>6</td>
<td>23mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>160</td>
<td>7</td>
<td>23mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>130</td>
<td>8</td>
<td>30mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>90</td>
<td>11</td>
<td>30mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>60</td>
<td>13</td>
<td>30mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>30</td>
<td>14</td>
<td>30mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>30mm</td>
<td>2</td>
<td>with built-in 220nF (is standard in housing)</td>
</tr>
</tbody>
</table>

Coil, depends of shaft diameter 5-18 windings of 0.5 CU wire
T1-PCM-IND

Following must be considered at the mounting of the inductive power head

- Shaft with Cu wire Coil
- Magnetic field
- 25-30mm

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

Example of mounting

Wrong!!! Mounting (only if metal) plate cover the active area of
Dimensions Powerhead / Pickup

- Height: 33mm
- Drill diameter: 4.3mm
- Cable length: 5m, optional 10...20m
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!!!
Special housing for end of shaft mounting

Wire connection:

- **EXC**: brown 4V bridge excitation
- **½**: gray ½ bridge competition
- **-IN**: black Signal --
- **+IN**: white Signal +
- **GND**: blue Ground signal
Special housing for end of shaft mounting
Head position

Coil position inside

Distance 2-20 mm

Best result of distance you reach, if the coil is in center of the power head
Special housing for end of shaft mounting

T1-PCM-STG Module
integrated in a special housing for end of shaft mounting, max. 3000 RPM

M6 Allen screw
bolt circle 37mm

Data coil
moulded in epoxy resin
(19 windings)

material:
HGW 2082

Gain jumpers
250-500-1000-2000 (standard)
500-1000-2000-4000 (on request)

Connection wires for STG

Gain 250-2000
standard

GAIN setting

Draw:
Optional special housing consists of two Half-Rings. The T1-PCM-STG is integrated in the housing (embedded with epoxy resin) for shaft diameters 15-150mm. Specify exact diameter at order!