CT2-Wheel - User Manual

2 Channel Wheel Telemetry System

Including signal conditioning for STG, Th-K, Pt100, ICP, POT or high-level inputs

- STG offset via potentiometer or optional Auto Zero calibration
- 12 bit ADC resolution, simultaneous sampling of all channels
- Signal bandwidth: 2 x 0-375Hz (40kbit) up to 2x12000Hz (1280kbit)
- Water protected housing (IP65)
- Output analog (+/- 5V) and digital for PC interface at the receiver side
- Universal mounting adapter for fast and exactly montage on the wheel
- 4x carrier frequencies enable (40kbit) measurements at 4 Wheels for one car
- Accumulator powered (12h)

INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!
General functions CT2-Wheel:

CT2-Wheel is a telemetry system designed for easy mounting onto rotating wheels to provide non-contact transmission of measured parameters such as pressure, force, temperature, acceleration and voltage.

Sensors inputs are connected via screw on, waterproof connectors. Measured values are prepared in analog format, digitized and transmitted via radio frequencies. Four different carrier frequencies are provided, this allows up to four systems (e.g. for four wheels) to operate in parallel. The complete transmitter assembly is waterproofed to IP65 specifications.

The following sensors can be connected to the system: (STG) Strain gages sensors in full-, half- and quarter-bridge configuration (350 ohm or greater), Type K Thermocouples -50 to 1000°C (full galvanic isolated), ICP and capacitive sensors. Voltage inputs of +/-5V and +/-10V are available.

The measured values are processed and output as +/-5V analog signals at the BNC sockets (optional digital output for special PCM interface into a PC) on the stationary receiver located in a vehicle.

Resolution of 12 bits is standard; this enables an amplitude dynamic of 72 dB. The analog signal bandwidth is 0-95 Hz (-3dB) when configured as an eight channel unit, other bandwidth on request! The measurement accuracy is +/-0.25 % (without sensor). The CT2-Wheel is suited for operation at ambient temperatures of -20 to +70°C. The transmission distance between transmitter and receiving antenna is of the order of 10m (30 feet) - depend of application!

<table>
<thead>
<tr>
<th>Bit rate</th>
<th>Cut off frequency per channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 kbit/s</td>
<td>375 Hz (-3dB) (1428 Hz)</td>
</tr>
<tr>
<td>320 kbit/s</td>
<td>3000 Hz (-3dB) (11428 Hz)</td>
</tr>
<tr>
<td>640 kbit/s</td>
<td>6000 Hz (-3dB) (22857 Hz)</td>
</tr>
<tr>
<td>1280 kbit/s</td>
<td>12000 Hz (-3dB) (45714 Hz)</td>
</tr>
</tbody>
</table>

Cut off frequency from anti-aliasing filter - sampling rate (see red)

Application pictures of CT8-Wheel
CT2-Wheel Transmitting Unit Technical Data (Encoder)

CT-STG-V1:
- Sensor: strain gage, > 350 Ohms
- Bridge completion: full and half bridge
- Excitation: 4 VDC (fixed), short-circuit protection up to 20mA
- Gain: 200 or 1000 - selectable by solder jumpers
- Optional Gain: 250-500-1000-2000 with new CT-STG-V2 module
- Offset: Zero adjustment by potentiometer or optional Auto-zero function
- Signal bandwidth: 0...375 Hz -3dB (optional) 3000, 6000 or 12000 Hz

CT-ICP:
- Constant current: 4mA (fixed)
- Gain: 2x, 4x, 8x, 16x or 32x
- Signal bandwidth: 3...375 Hz -3dB (optional) 3000, 6000 or 12000 Hz

CT-POT:
- Sensor: Potentiometer Sensor >350 Ohms to 10kOhms
- Excitation: 4 VDC (fixed)
- Signal bandwidth: 0...375 Hz -3dB (optional) 3000, 6000 or 12000 Hz

CT-TH-K-ISO:
- Sensor: thermo-couple, type K (with cold junction compensation)
- Temperature measuring range: -50°C to +1000°C (other on request) with galvanic isolation, Accuracy 1%
- Signal bandwidth: 0...10 Hz -3dB

CT-PT100:
- Sensor: resistance temperature detectors (RTDs) with resistance of 100 ohm
- Temperature measuring range: -100°C to +500°C

CT-VOLT:
- High-level inputs: +/- 5 Volt or +/- 10 Volt
- Signal bandwidth: 0...375 Hz -3dB (optional) 3000, 6000 or 12000 Hz

System Parameters:
- Channels: 2
- Resolution: 12 bit A/D converter with anti aliasing filter, simultaneous sampling of all channels
- Line-of-sight distance: 20m with 10mW transmitting power, (868MHz Band, FSK modulation)
- Powering: 7.2mA Li-Ion battery 2000mAh 12h operating time
- Power consumption: 100 mA with 2 STG sensors at 350 Ohms full bridge
- Analog signal bandwidth: 2 x 0...375Hz with 40 kbit/s transmitter (-3dB cut-off frequency at receiver side)
- Transmitter carrier frequency: 4 HF-Channels in the 868MHz range
- Transmission: Digital PCM Miller format - FSK
- Transmission Power: 10mW, range of 10m
- Dimensions: Diameter 102mm, bottom plate diameter 122mm, height 94mm
- Weight: 0.900 kg without cables
- Operating temperature: - 20 … +70°C
- Housing: Aluminum anodized, waterproofed (IP65)
- Humidity: 20 ... 80% no condensing
- Vibration: 5g MIL Standard 810C, Curve C
- Static acceleration: 10g in all directions, max. 3000 RPM
- Shock: 200g in all directions
Technical data:
Receiving Unit CT2-Wheel DEC (Decoder)

System Parameters:
- **Channel:** 2 analog outputs via (BNC) +/-5V
- **Resolution:** 12 bit D/A converter, with smoothing filter
- **Dynamic:** 72dB
- **Power supply input:** 10-30 VDC
- **Current consumption:** 300mA at 10V, 100mA at 30V
- **Carrier frequencies:** 4 HF-Channels in the 868MHz range with 40 kbit/s transmitting rate FSK modulation
- **Dimensions:** 105 x 105 x 65mm
- **Weight:** 0.60 kg without cables and antenna
- **Overall system accuracy between encoder input and decoder output:** +/-0.25% without sensor influences

Environmental
- **Operating:** -20 … +70°C
- **Humidity:** 20 … 80% not condensing
- **Vibration:** 5g Mil Standard 810C, Curve C
- **Static acceleration:** 10g in all directions
- **Shock:** 100g in all directions

Technical specifications are subject to change without notice!
Functions:
2 Channel CT2-Wheel ENC (encoder/transmitter)

Option Auto Zero button

Untwist to open the housing

Antenna

ON/OFF

Battery charge

Sensor Inputs
CH1

Sensor inputs
CH2

Sensor Inputs
CH2
Connection, STG bridge configuration:
CT2-Wheel ENC (encoder)

Sensor cable
Black = IN -
White = IN +
Brown = EXC +
Blue = EXC -

Sensor socket

STG module
Type: Strain gage >350 Ohms
Excitation: 4 VDC (fixed)
Gain: 200 or 1000

Sensor plug
CT2-Wheel ENC

1/1 or 1/2 Bridge setting
Zero via Potentiometer
(standard)

Auto Zero Switch
(Option) Only for STG

CT-STG-Version V1  Gain 200 or 1000 by solder bridge

CT-STG-Version V2  Gain 25-500-1000 or 2000 by jumper

Gain 1000
Gain 200

Gain 250 (1000)
Gain 1000 (4000)

Gain 500 (2000)
Gain 2000 (8000)

Gain 1000-2000-4000-8000 on request!

Version 2014-10
**Connection CT-POT:**

<table>
<thead>
<tr>
<th>Sensor cable</th>
<th>Sensor socket</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Sensor cable" /></td>
<td><img src="image2.png" alt="Sensor socket" /></td>
</tr>
</tbody>
</table>

- Black = IN +/-
- White = GND
- Brown = +4V
- Blue = NC*

*NC* = not connected

**CT-POT module for potentiometer sensors**

<table>
<thead>
<tr>
<th>GND (White)</th>
<th>IN +/- (Black)</th>
<th>NC* (Brown)</th>
<th>NC* (Blue)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Sensor plug" /> CT2-Mini ENC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CT-POT (special type off STG)**

- **Type:** Potentiometer >350Ohm to 1kOhm
- **Excitation:** 4 VDC (fixed)
- **Accuracy:** +/- 0.25%

**Attention:**
- The POT modules must be configured as a Half Bridge Unit.
  - *Don't change offset and gain!!*

**Connection CT-Volt module**

<table>
<thead>
<tr>
<th>Sensor cable</th>
<th>Sensor socket</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Sensor cable" /></td>
<td><img src="image5.png" alt="Sensor socket" /></td>
</tr>
</tbody>
</table>

- Black = IN +/-
- White = GND
- Brown = NC*
- Blue = NC*

*NC* = not connected

**CT-Volt**

- **Type:** Volt
- **Range:** +/-5 or +/-10V
- **Accuracy:** +/- 0.25%

**Attention:**
- At Volt modules must plug the plug bridge on Half Bridge Unit.
  - *Don't change offset!!*
### Connection CT-ICP module

**CT-ICP**
- **Type:** ICP
- **Gain:** 2x, 4x, 8x, 16x or 32x
- **Constant current:** 1, 4 or 10mA
- **Accuracy:** +/- 0.25%

**Attentions:**
- At ICP modules must plug the plugbridge on Half Bridge Unit.

### Connection CT-Pt100 module (RTDs)

**CT-Pt100**
- **Type:** RTD 100 ohm
- **Range:** -100 to 500°C
- **Accuracy:** +/- 0.25%

**Attentions:**
- At Pt100 modules must plug the plugbridge on Half Bridge Unit.

### Temperature vs. Output

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>-100</td>
<td>-0.997</td>
<td>150</td>
<td>1,500</td>
<td>400</td>
<td>4,004</td>
</tr>
<tr>
<td>-50</td>
<td>-0.497</td>
<td>200</td>
<td>2,001</td>
<td>450</td>
<td>4,498</td>
</tr>
<tr>
<td>0</td>
<td>0.001</td>
<td>250</td>
<td>2,501</td>
<td>500</td>
<td>4,999</td>
</tr>
<tr>
<td>50</td>
<td>0.499</td>
<td>300</td>
<td>3,001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1.000</td>
<td>350</td>
<td>3,501</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Connection TH-K ISO Thermo couple

Mini thermocouple connector female type K with thermo extension cable

CT-THK-ISO - Galvanic isolated!
Type: K
Range: -50°C – 1000°C
Bandwidth: 0-20Hz (more on request)
Accuracy ±1%

Attention: At Thermo couple must plug the plug bridge on Half Bridge Unit.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>-0.220</td>
<td>250</td>
<td>1.236</td>
<td>550</td>
<td>2.754</td>
<td>850</td>
<td>4.262</td>
</tr>
<tr>
<td>0</td>
<td>0.013</td>
<td>300</td>
<td>1.482</td>
<td>600</td>
<td>3.010</td>
<td>900</td>
<td>4.506</td>
</tr>
<tr>
<td>50</td>
<td>0.254</td>
<td>350</td>
<td>1.734</td>
<td>650</td>
<td>3.266</td>
<td>950</td>
<td>4.746</td>
</tr>
<tr>
<td>100</td>
<td>0.504</td>
<td>400</td>
<td>1.990</td>
<td>700</td>
<td>3.519</td>
<td>1000</td>
<td>4.980</td>
</tr>
<tr>
<td>150</td>
<td>0.752</td>
<td>450</td>
<td>2.242</td>
<td>750</td>
<td>3.700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>0.992</td>
<td>500</td>
<td>2.498</td>
<td>800</td>
<td>4.015</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Li Ion Re-Chargeable Battery with Charger Unit for CT-Wheel

Pin connection

Charge plug at CT2-Wheel ENC

Battery charger CT-Wheel

1. Plug the 3-pole socket (charger) in to the CT2-Wheel encoder.
2. Plug banana plugs on to a battery or AC/DC power supply with a voltage range of 10-30,
3. Press and hold the switch for 1 second to begin charging. The battery will now charge. Charge time 2-3 hours!

Attention:
Li Ion battery has a capacity for about 12 hours. If the red LED indicator, on the Transmitter is ON the battery is 80% discharged and the device will switch off after 1-2 hours!

Mounting hole dimensions:

Base plate side

Do not remove these screws (silicon sealed)

Hole circle diameter 112 mm

Hole diameter 5mm
Dimensions CT2-Wheel-ENC:

- Total weight: 0.8 kg
- Dimensions:
  - Height: 122 mm
  - Height: 102 mm
  - Diameter: 76 mm
  - Diameter: 6 mm
Placing of receiving antennas:

Receiver in the driver’s cab

Recommended placing of receiving antenna for front wheel

Antenna cable between Rx antenna and receiver max. length 25m!

Recommended placing of receiving antenna for rear wheel
Konformitätserklärung

Declaration of Conformity
Declaration de Conformité

Wir
We
Nous

Anschrift
Address
Adresse

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
Name
Nom

Messdatenübertragungssystem

Typ, Modell, Artikel-Nr., Größe
Type, Model, Article No., Taille
Type, Modèle, Mo.d’Article, Taille

CT2-Wheel

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

108/2004/EG
Elektromagnetische Verträglichkeit EMV / EMC

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 and therefore corresponds to the regulations of the Directive
et les rapports d’essais notifiés et, ainsi, correspond aux règlement de la Directive.

Otterfing, 30.05.2006

Martin Kraus

Ort und Datum der Ausstellung
Place and Date of Issue
Lieu et date d'établissement

Name und Unterschrift des Befugten
Name and Signature of authorized person
Nom et signature de la personne autorisée