

MTP-NT

User Manual

**Sophisticated multi-channel telemetry system
for rotating application, fully software
programmable with 18 bit resolution**



INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!

- 2 to 256 channels
- Signal bandwidth up to 24000 Hz
- Inputs: STG, POT, IEPE, VOLT, LVDT/RVDT, TH-K-J-S, RTD
- Auto offset compensation (STG/VOLT)
- 4 Volt Bridge excitation
- STG Input ranges ± 40 to ± 0.3 mV/V
- 18-bit ADC
- Fully software programmable
- BITE (Built-In Test Equipment)
- Inductive or battery powered
- Rugged housing, moisture protected
- Analog output ± 10 V
- Digital Ethernet output for PC

Safety notes

- The device should only be applied by instructed personnel.
- The power head emits strong magnetic radiation at 30-60 kHz to a distance of 300 mm. 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. 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 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 interferences when used in residential areas or environments. In this case the operator is responsible for establishing protective procedures.

Further resources and the latest document versions

MTP-NT Technical Resources Page:	https://www.kmt-telemetry.com/support/mtp-nt/
MTP-NT User Manual:	https://www.kmt-telemetry.com/support/mtp-nt/Files/MTP-NT-UM.pdf
MTP-NT Software & Information Manual:	https://www.kmt-telemetry.com/support/mtp-nt/Files/MTP-NT-SW.pdf
MTP-NT Inductive Powering User Manual:	https://www.kmt-telemetry.com/support/mtp-nt/Files/MTP-IND-PWR.pdf

Short description:

The MTP-NT telemetry is a miniaturized measurement system suitable for sophisticated industrial measurement tasks and rotating applications. Each 2-channel sensor module is equipped with signal conditioning, anti-aliasing filters, analog-to-digital converters (18 bit) and a digital communication bus connection. All these up to 128 modules (=256 channels) will be controlled by the MTP-NT-Controller module via a daisy-chain system bus (extendable to several meters). By this concept it's possible to install the acquisition modules close to the sensor to have short connections for the analog sensor lines. This avoids undesired interferences in noisy environments. The MTP-NT Controller outputs a PCM bit stream signal in NRZ format with data rates up to 10000 kbit/s. The inductive transmitter module transfers the signal over distances of up to 50 mm and the radio transmitter is able to cover ranges of 10m (or more*), depending on application.

MTP-NT acquisition modules (rotor side)

 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-STG2 Acquisition module for 2 strain gauges Full or half bridge ($\geq 120 \Omega$) Quarter bridge (120 Ω or 350 Ω) Fixed excitation voltage: 4.0 Vdc Offset compensation by auto zero Manual offset shifting after auto zero Input ranges ± 40 to ± 0.3 mV/V Shunt-calibration 75(25.5) kΩ 0.1% Signal bandwidth 0 Hz to 24000 Hz* (*see table of max. cut-off frequencies) ADC Resolution: 18 bit Measurement uncertainty < 0.1% Power supply (VBB): 6 to 9 Vdc Current consumption: 100mA (with two full bridges 350 Ω)</p>	 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-IEPE2 Acquisition module for 2x IEPE/ICP[®] sensors Excitation current: 4.0 mA Input ranges: 20 to 0.3 Vpp Signal bandwidth 3 Hz to 24000 Hz* (*see table of max. cut-off frequency) ADC Resolution: 18 bit Measurement uncertainty < 0.1% Power supply (VBB): 6 to 9 Vdc Current consumption: 140 mA</p>
 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-VOLT2 Acquisition module for 2x high level voltage inputs Input ranges ± 10 to ± 0.08 V Signal bandwidth 0 Hz to 24000 Hz* (*see table of max. cut-off frequencies) +4 V sensor excitation (max. 33 mA) ADC Resolution: 18 bit Measurement uncertainty < 0.1% Power supply (VBB): 6 to 9 Vdc Current consumption: 80 mA</p>	 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-XVDT2 Acquisition module for 2x LVDT/RVDT sensors Excitation voltage = 4.096 Vpp, rounded rectangle Excitation frequency = 8 kHz (changeable by software) Sensor impedance $\geq 100 \Omega$ (@ 8 kHz) Signal bandwidth 0 Hz to 200 Hz Programmable lowpass filter Power supply (VBB): 6 to 9 Vdc Current consumption: 130 mA (with 2x MHR500)</p>
 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-POT2 Acquisition module for 2x potentiometer sensors Potentiometer resistance $\geq 120 \Omega$ Fixed excitation voltage: 4.0 Vdc Input resistance: 667 kΩ Signal bandwidth 0 Hz to 24000 Hz* (*see table of max. cut-off frequencies) ADC Resolution: 18 bit Measurement uncertainty < 0.1% Power supply (VBB): 6 to 9 Vdc Current consumption: 90 mA (with two 1 kΩ potentiometers)</p>	 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-THERMO 2 Acquisition module for 2x Temperature Sensor Inputs galvanically isolated (max. potential difference 32 Vdc) Lowpass filter: 1 Hz to 32 Hz (programmable) Sensor types: RTD, Thermocouple, NTC, (& customer-specific types) Measuring range : -273.15 °C to +1635.2 °C Power supply (VBB): 6 to 9 Vdc Current consumption: 85 mA</p>
 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-BLUE Bluetooth module to transfer RS232 wirelessly* Remote On/Off* (concerns battery powered versions) Range 5 to 20 m, depends on application and antenna Power supply (VBB): 6 to 9 Vdc Current consumption: 37 mA (average) * Required is the KMT COMMUNICATOR handheld remote control Bluetooth device with USB connector)</p>	 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-CON-IND-Tx Controller for 1 to 128 acquisition modules Output: PCM <u>built-in inductive transmitter</u> Programmable via RS232/USB adapter and remote software Power supply (VBB): 6 to 9 Vdc Current consumption: 100 mA</p>
<p>Coming soon! 60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-RF-Tx Radio transmitter RF output power: 10 mW / 50 mW Modulation: FM (GMSK) Frequencies: 300 MHz up to S-Band* Data rates: 300 kBit/s to 5 Mbit/s* Modulation input: TTL and RS422 Power supply (VBB): 5 to 9 Vdc Current consumption: 100 mA *depends on version</p>	 <p>60 x 40 x 10 mm Weight 42 grams</p>	<p>MTP-NT-ANALOG NEW Two Channel Acquisition Module for strain gauges*, high level voltage signals*, potentiometer sensors*, IEPE/ICP[®] sensors*, ext. Sensor supply (12 Volt typ.) * * the functionality is programmable by control software ntconfig.exe. Power supply (VBB): 5 to 9 Vdc Current consumption: <140 mA (TBD)</p>

Common characteristics / Environment

Vibration (random)	0.1 g ² /Hz (20 Hz to 2 kHz)	Operating temperature	-40 to +85°C
Vibration (sine)	20 g (20 Hz to 2 kHz)	optional	-40 to +125°C
Shock (½ sine)	10000 g peak (11 ms)	Storage temperature	-40 to +125°C
Static Acceleration	3000 g (depends of mounting!)	Humidity	95 % (not condensing!)

Analog Signal Bandwidth vs. Sampling Rate vs. PCM Bitrate

Cutoff frequency of anti-aliasing filter (-3dB) and sampling rate (red)

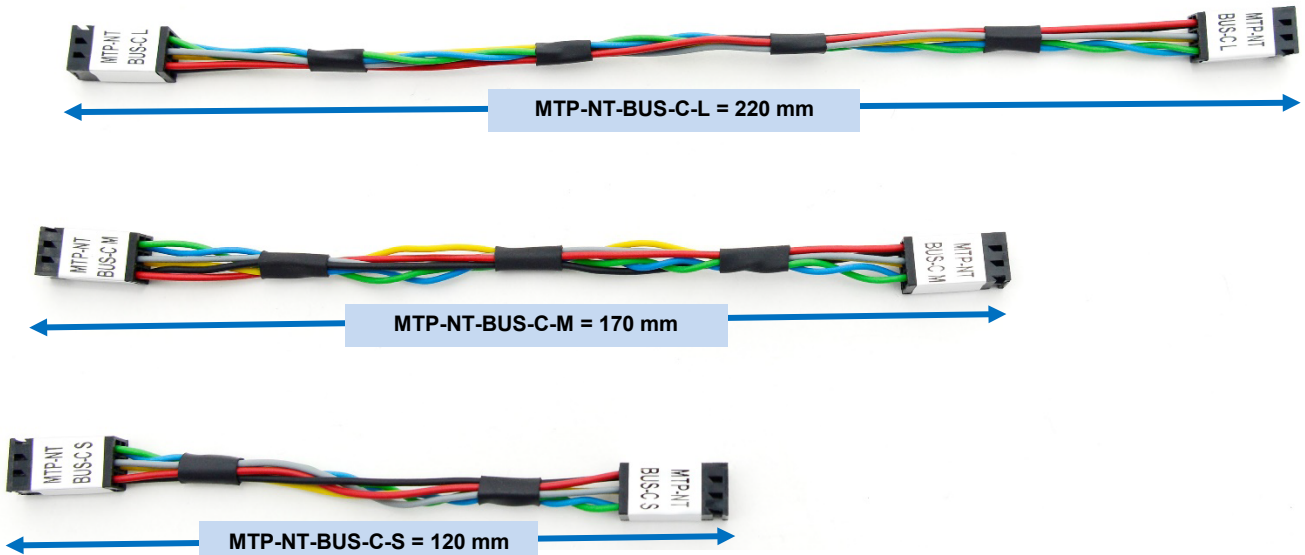
Bit rate	2 CH	4 CH	8 CH	16 CH	32 CH	64 CH	128 CH	256 CH
10000 kbit/s	----	----	24000 Hz (62500 Hz)	12000 Hz (31250 Hz)	6000 Hz (15625 Hz)	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)
5000 kbit/s	----	24000 Hz (62500 Hz)	12000 Hz (31250 Hz)	6000 Hz (15625 Hz)	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)	375 Hz (976.56 Hz)
2500 kbit/s	24000 Hz (62500 Hz)	12000 Hz (31250 Hz)	6000 Hz (15625 Hz)	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)	375 Hz (976.56 Hz)	190Hz (488.28 Hz)
1250 kbit/s	12000 Hz (31250 Hz)	6000 Hz (15625 Hz)	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)	375 Hz (976.56 Hz)	190Hz (488.28 Hz)	95 Hz (244.14 Hz)
625 kbit/s	6000 Hz (15625 Hz)	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)	375 Hz (976.56 Hz)	190Hz (488.28 Hz)	95 Hz (244.14 Hz)	----
312,5 kbit/s	3000 Hz (7812.5 Hz)	1500 Hz (3906.25 Hz)	750 Hz (1953.125 Hz)	375 Hz (976.56 Hz)	190 Hz (488.28 Hz)	95 Hz (244.14 Hz)	----	----

MTP-NT connection overview

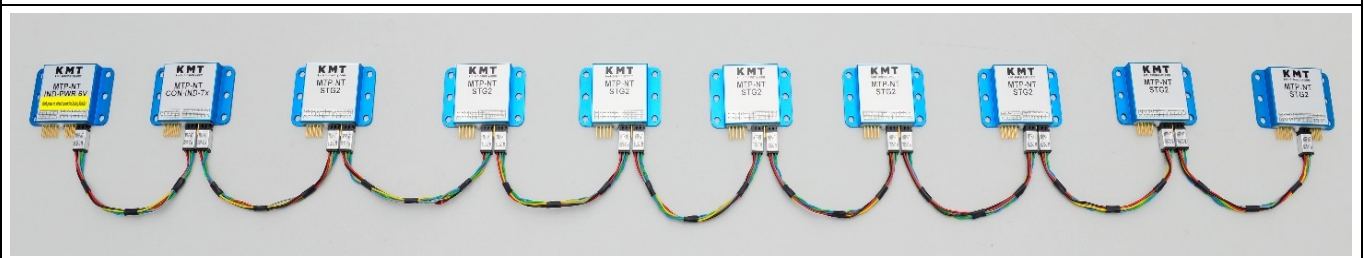


MTP-NT connection cables

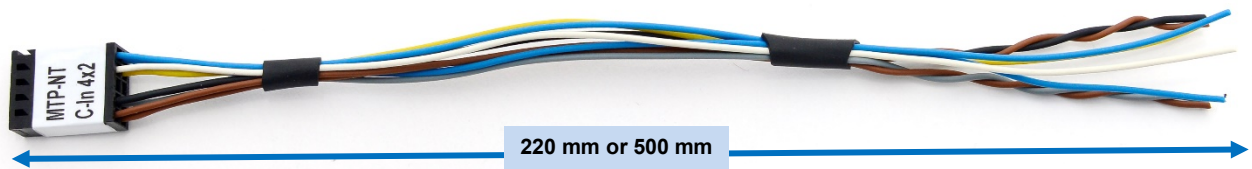
MTP-NT-BUS-C (-L/-M/-S)



Other lengths on request...



Sensor cable with open end (2x 4-pin, STG or POT) – cut it to the required length!



MTP-NT-C-In-2x4

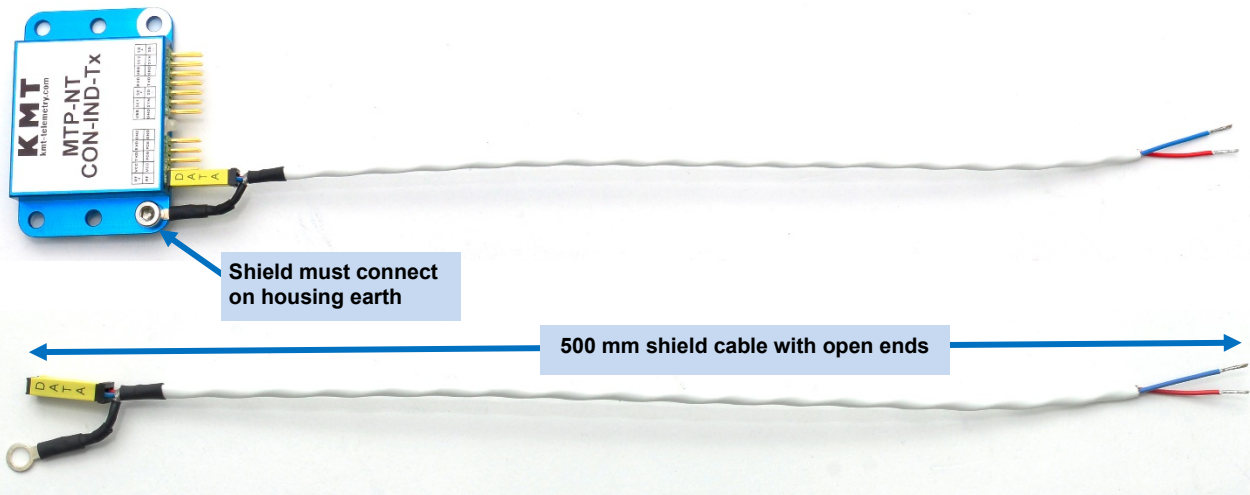
Signal cable 220 mm with open ends (2x 2-pin; VOLT or IEPE) – cut it to the required length!



MTP-NT-C-In-2x2

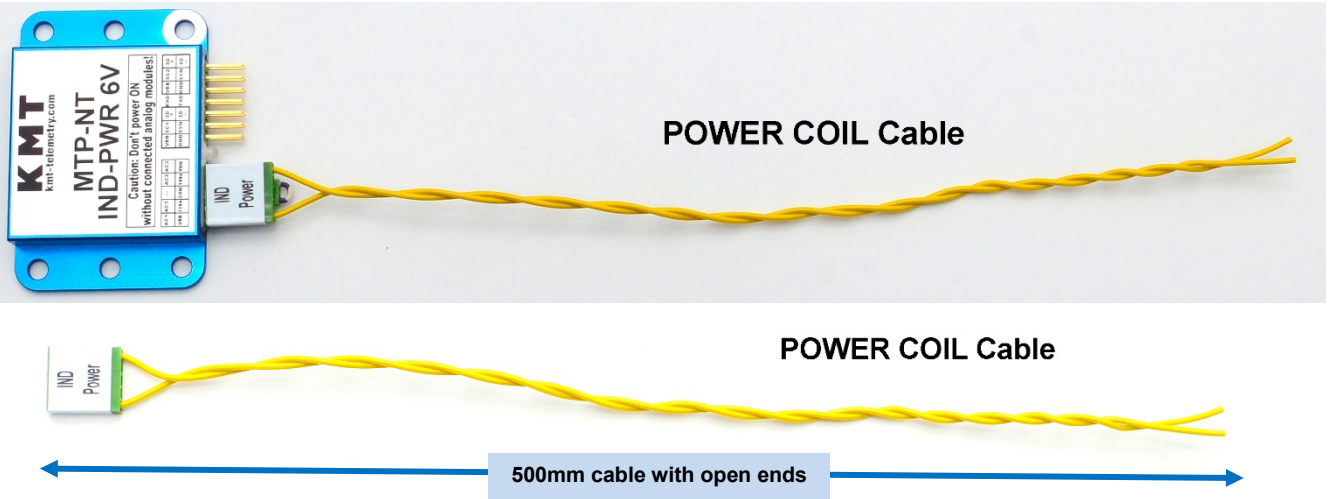
MTP-NT connection cables

Data coil cable 500 mm with open ends, shielded – cut it on the right length!



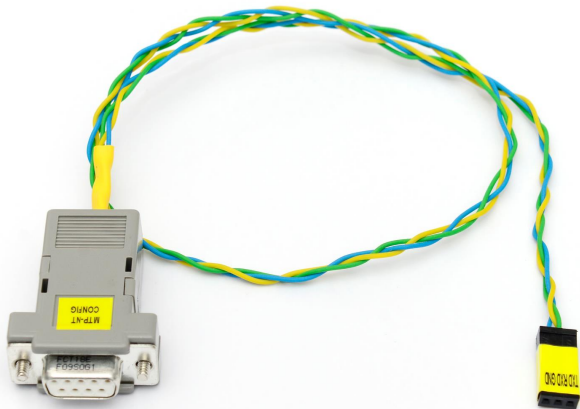
MTP-NT-C-D-COIL-500

Power coil cable 500 mm with open ends – cut it on the right length!



MTP-NT-C-P-COIL-500

RS 232 Connection cable (1 m) to RS232/USB-Adapter



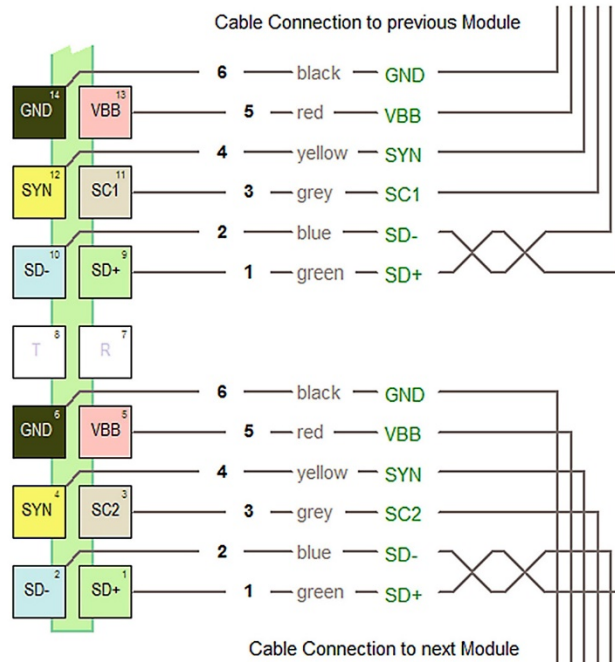
MTP-NT-Config-C

RS232/USB-Adapter



INFO: A Windows COM port is created when the USB port is connected. The Prolific PL2303 is currently used in these adapters; a driver may have to be installed beforehand. A driver is available for download on the NT support page: <https://www.kmt-telemetry.com/support/mtp-nt/>

MTP-NT Bus Connection

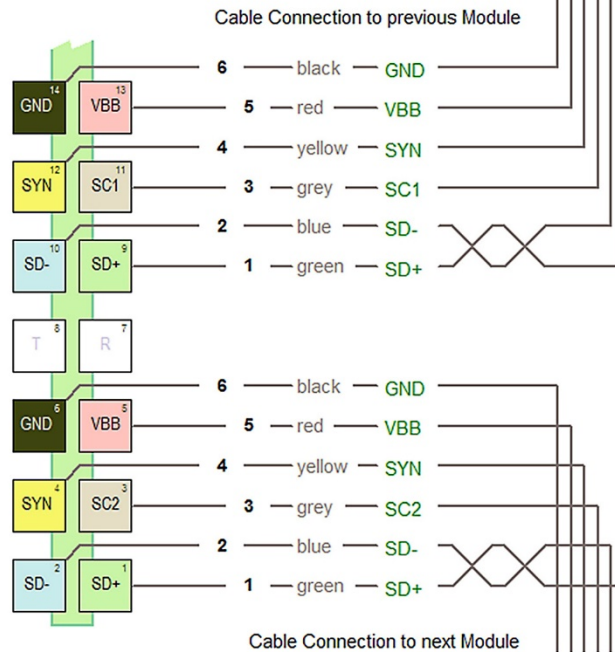


Recommended Wires

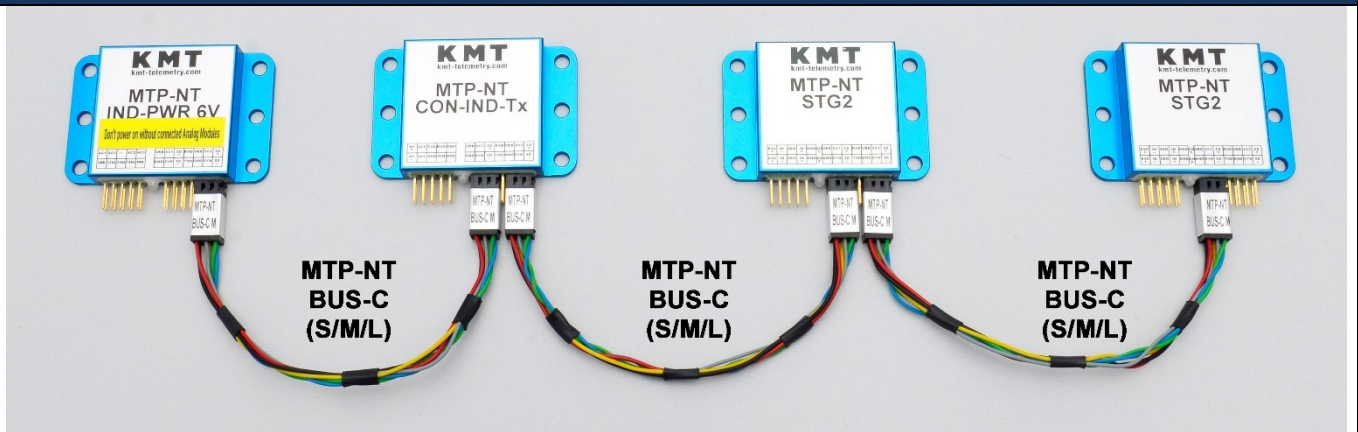
GND + VBB = AWG22 0,34 mm² Ø=1.20mm (7x0.25mm);
 SYN ... SD+ = AWG24 0,22 mm² Ø=1.05mm (7x0.20mm);
 Isolation = mPPE/FRNC UL/cUL Style 11027;
 mPPE (modified polyphenyl ether);
 FRNC (flame retardant non corrosive); -40°C to +105°C;

Signal Description

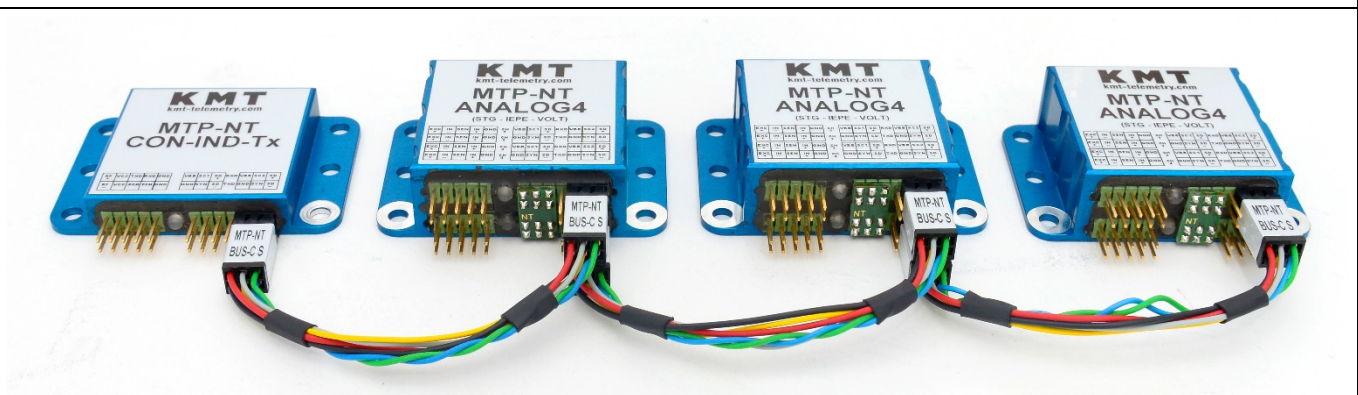
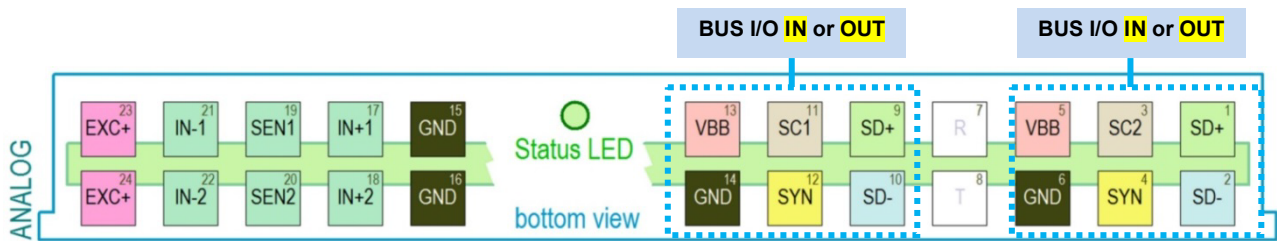
GND	common ground return
VBB	supply voltage +6.0 Vdc
SYN	synchronisation impulse
SC1	serial communication bus
SC2	serial communication bus
SD-	serial data bus (-)
SD+	serial data bus (+)
TXD	RS232 TxD (Output)
RXD	RS232 RxD (Input)
T / R	never connect this pins



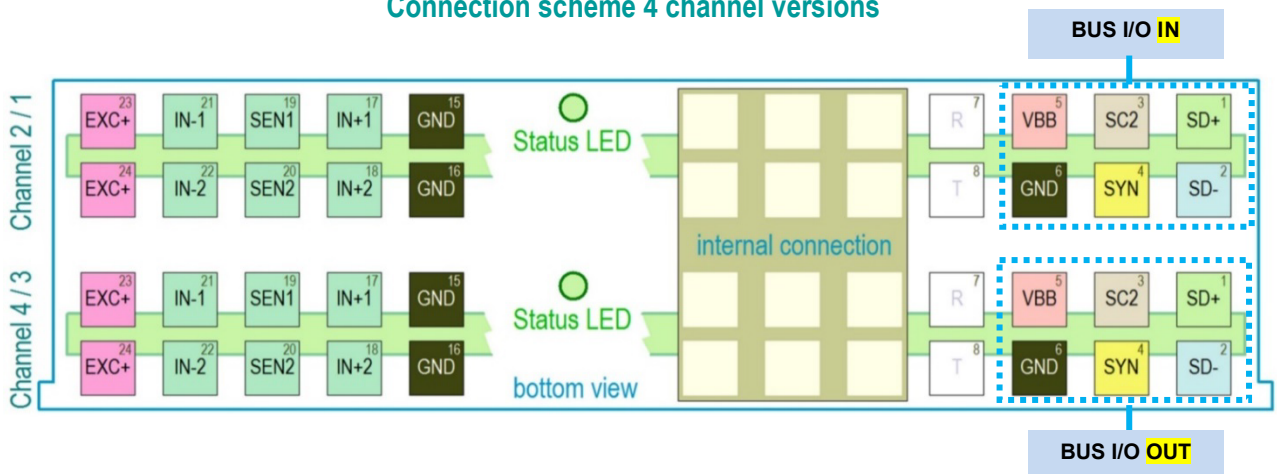
MTP-NT Bus connection 2 or 4 channel modules



Connection scheme 2 channel

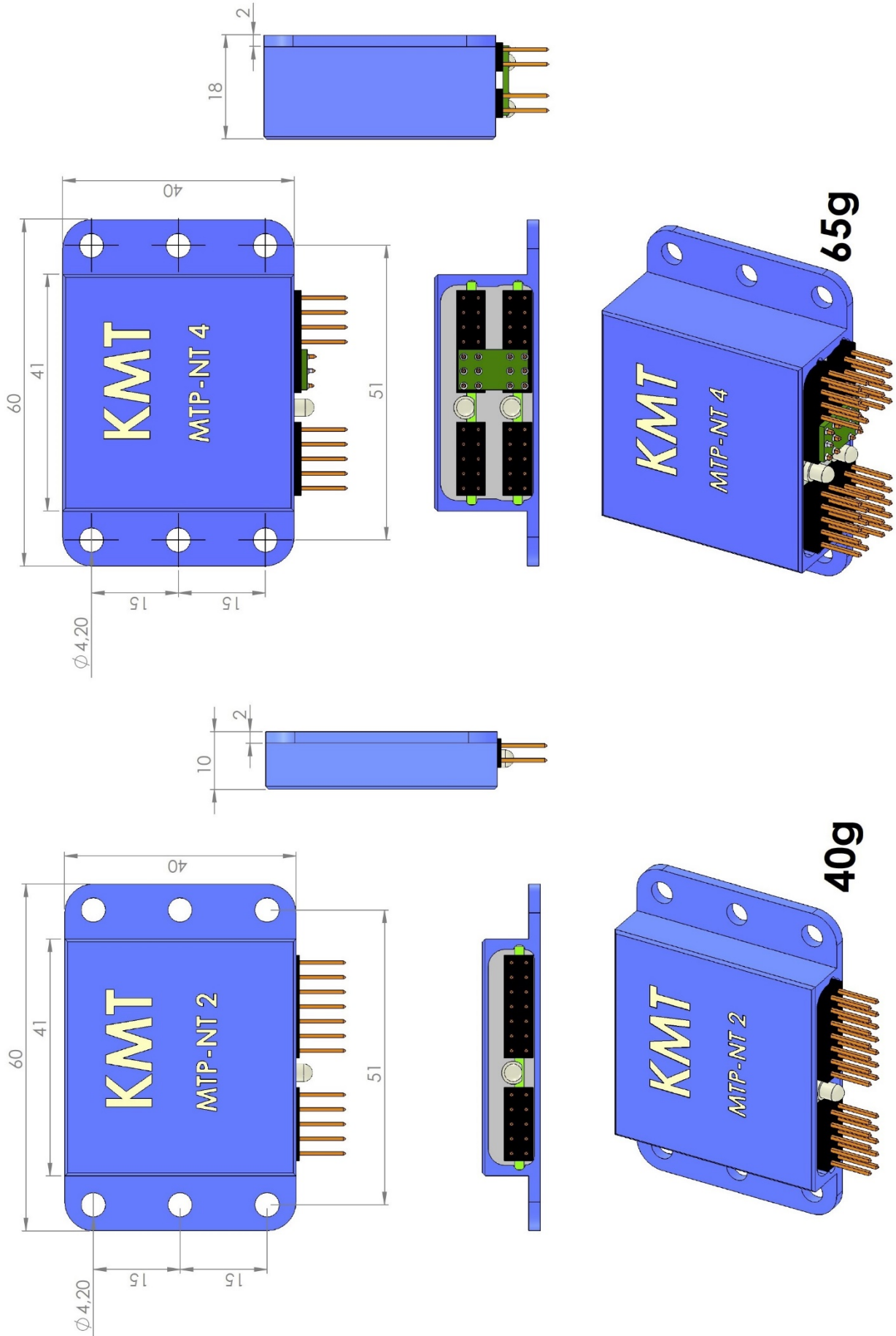


Connection scheme 4 channel versions

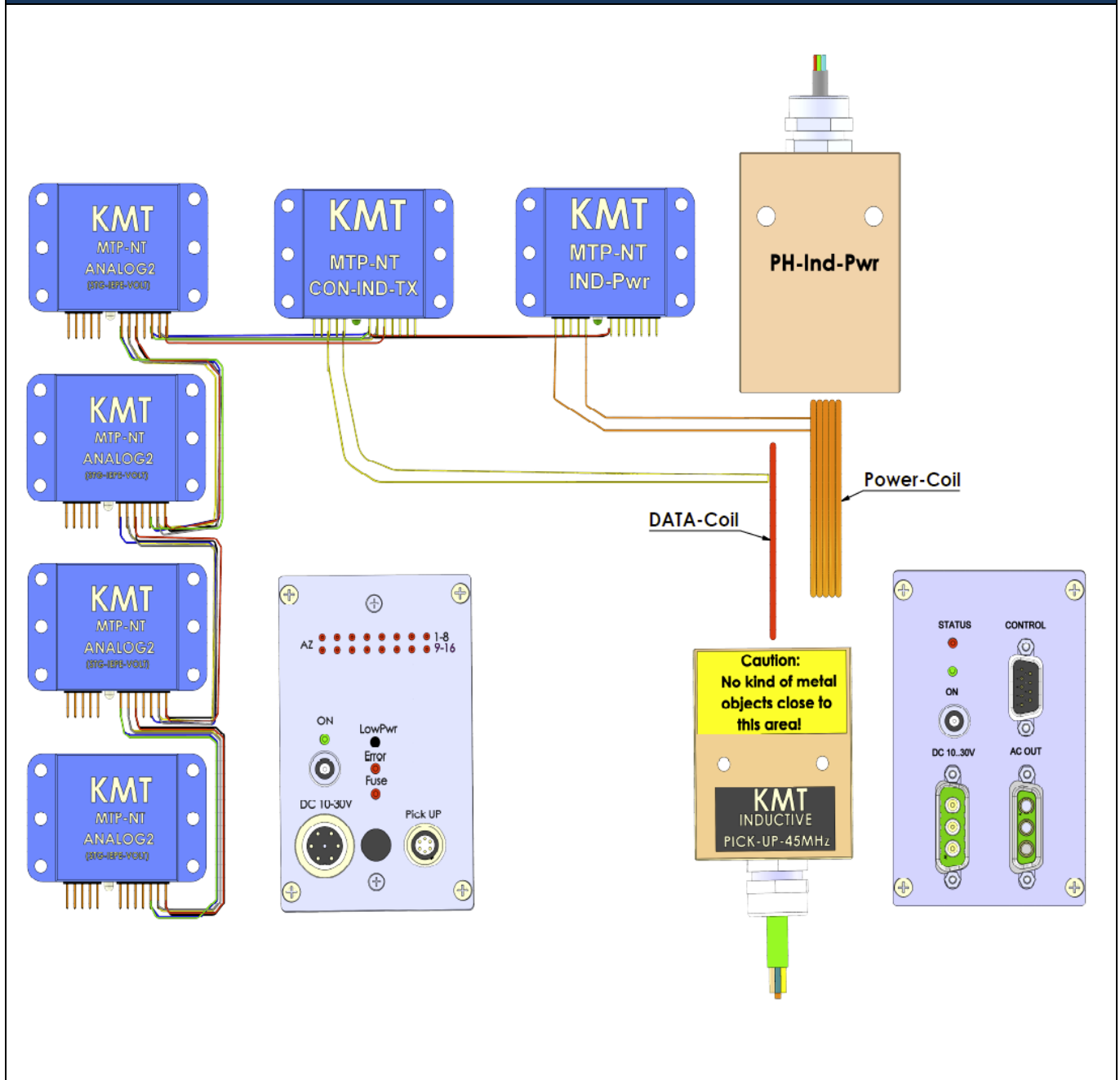


IN means: Bus Cable is coming from the direction of the Controller.
OUT means: Bus Cable goes in the direction of the other modules.

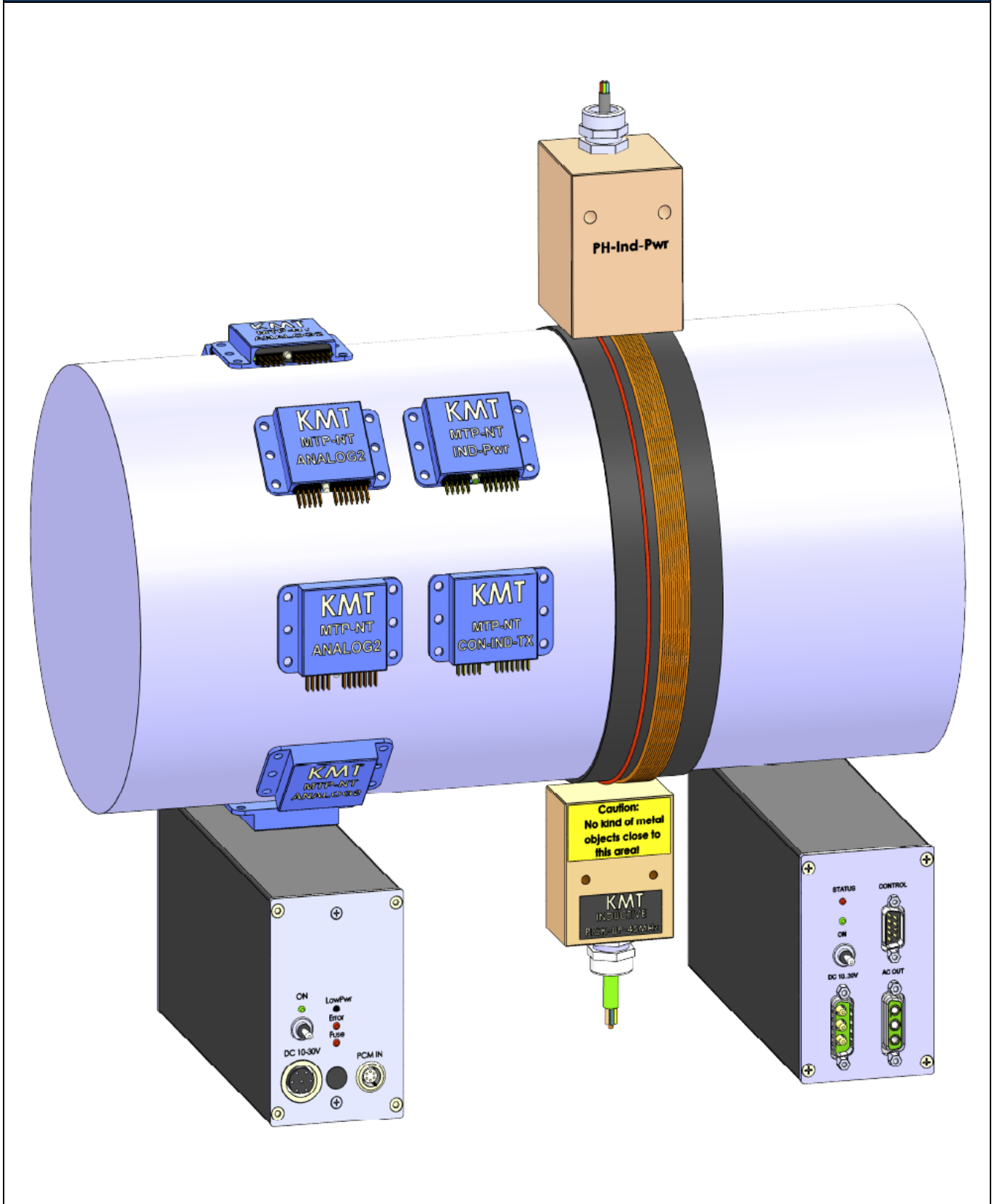
MTP-NT housing dimensions for 2- and 4-channels



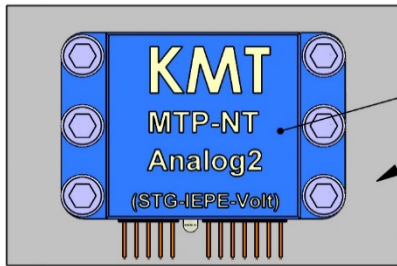
MTP-NT Bock diagram



MTP-NT Bock diagram on shaft



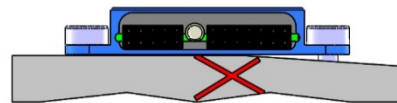
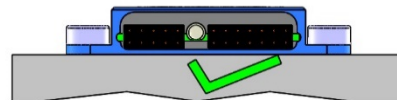
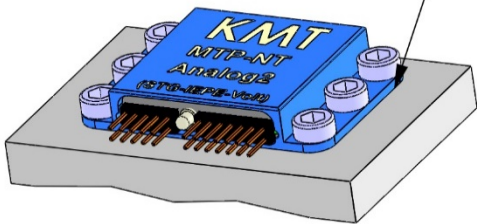
Mounting of the NT module



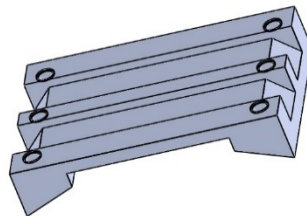
For the module to function correctly, the following instructions must be followed:

Mating surfaces must be smooth and parallel!

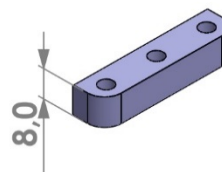
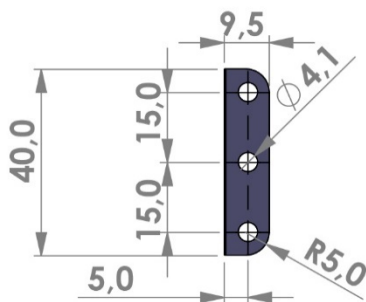
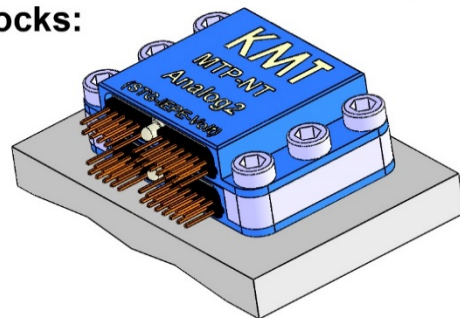
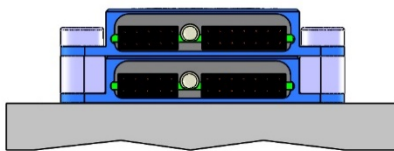
Under no circumstances is the module to be installed onto an uneven surface!



For mounting onto shafts, we recommend using a KMT mounting plate:

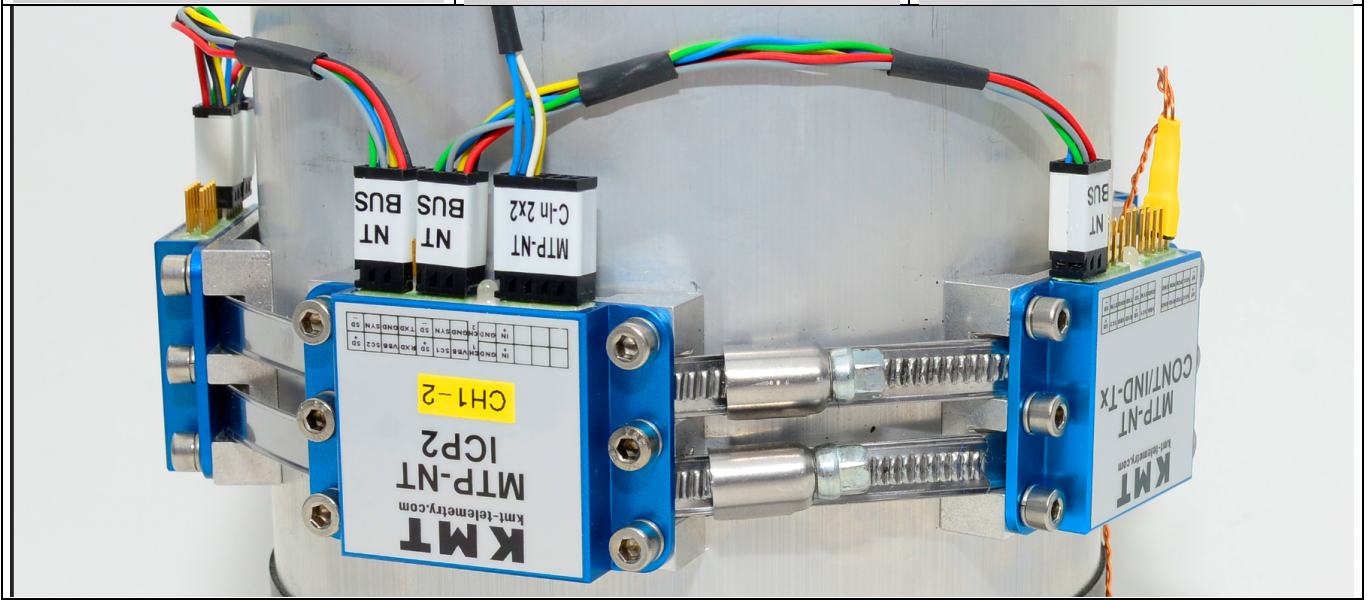
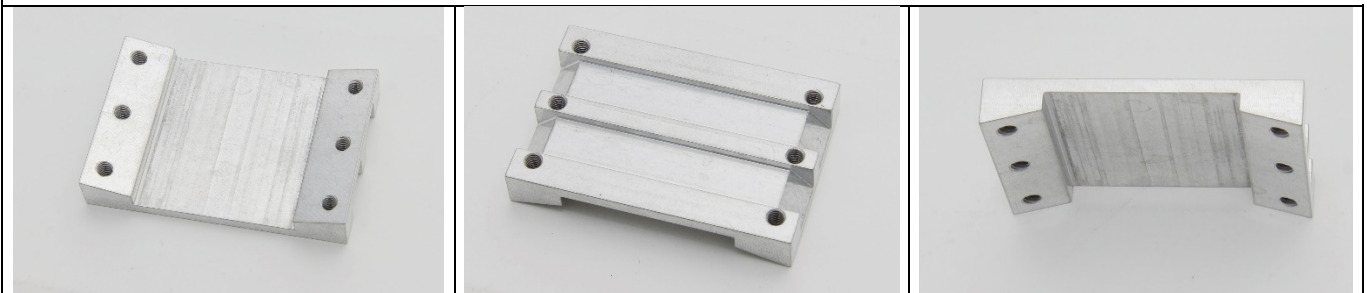
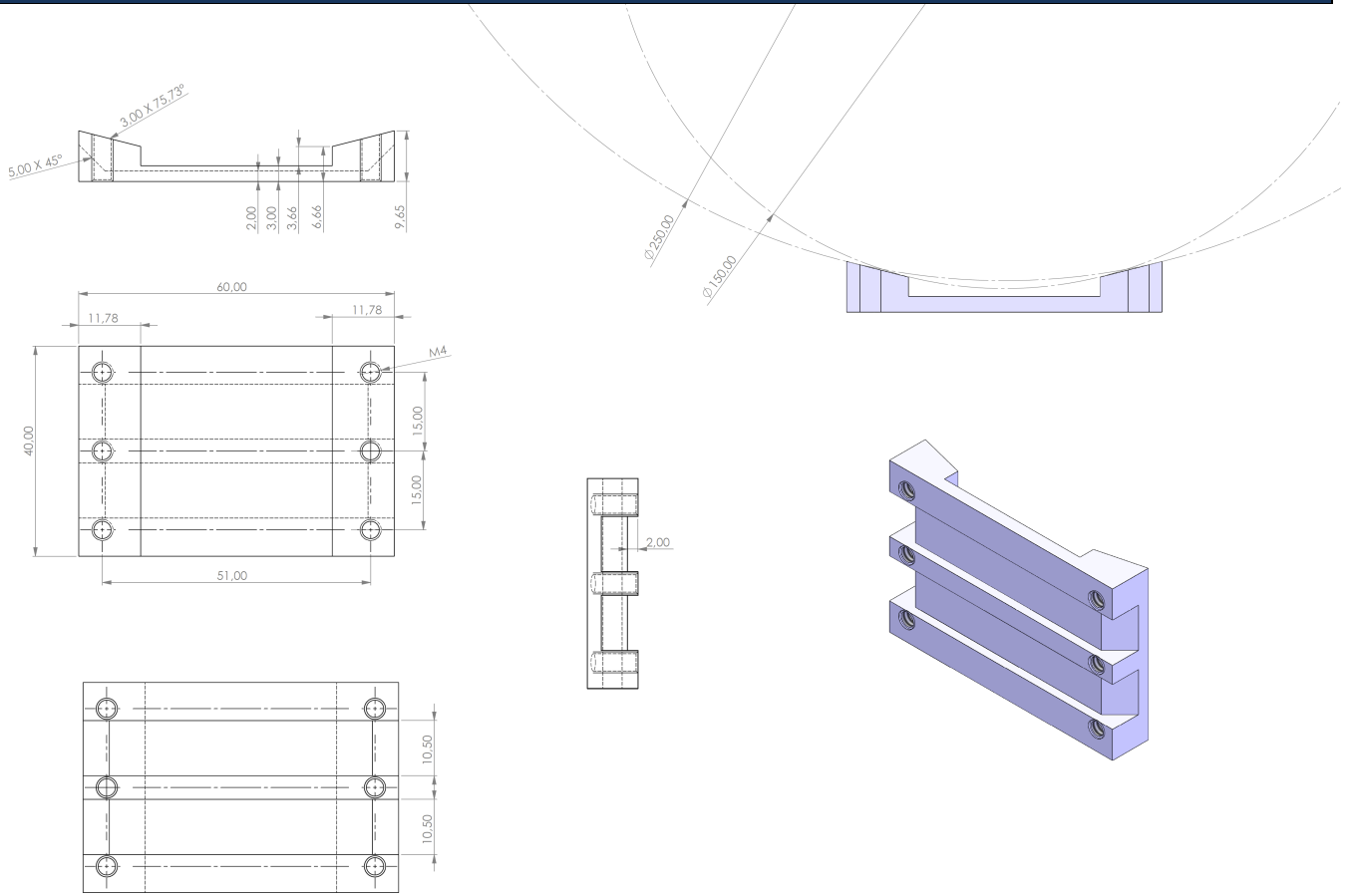


If two modules are to be installed on top of each other, use the specified mounting blocks:



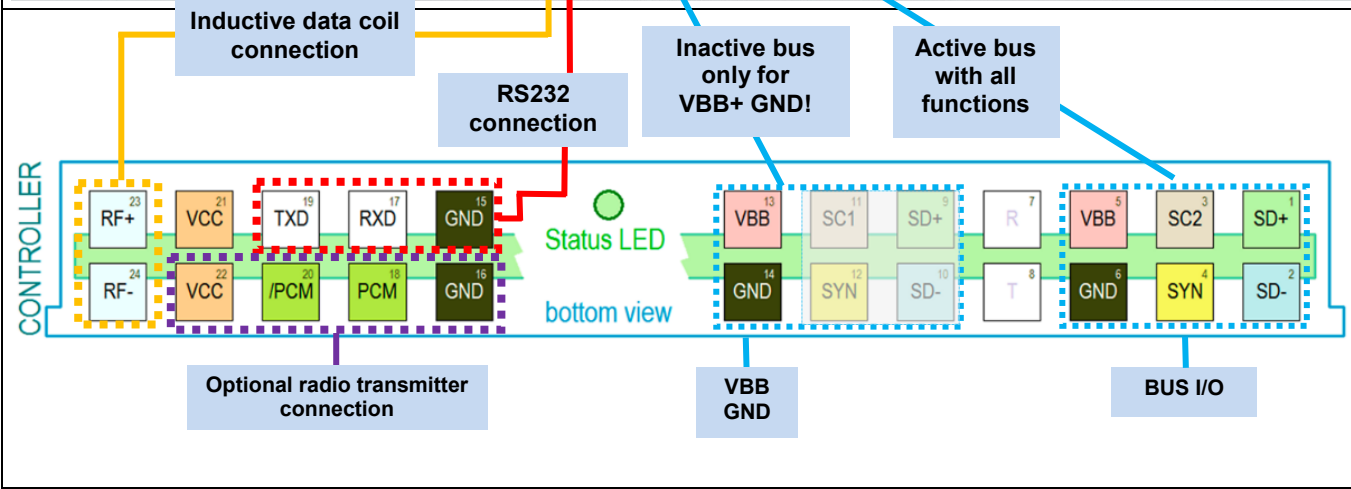
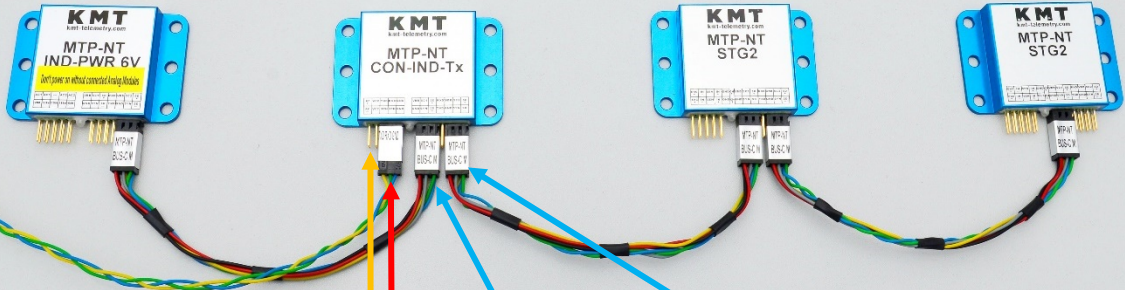
All tolerances: +/- 0.1mm

MTP-NT Modules mounting plate example for shaft diameters 100-200 or 150-250mm



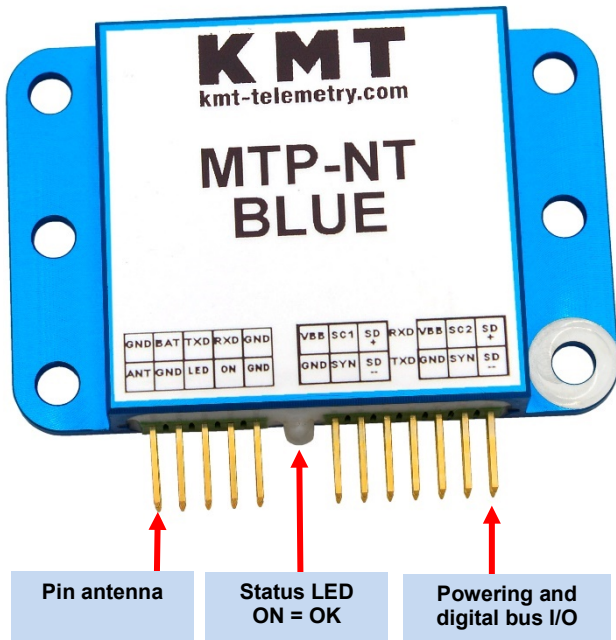
MTP-NT – Setting of parameters or firmware update of all modules via RS232

All parameters are programmable over RS232, RS232/USB-adapter or wirelessly via *BLUE and *COMM (*requires MTP-NT Bluetooth module NT-BLUE & KMT COMMUNICATOR)



See MTP-NT Software & Information Manual for details: <https://www.kmt-telemetry.com/support/mtp-nt/Files/MTP-NT-SW.pdf>

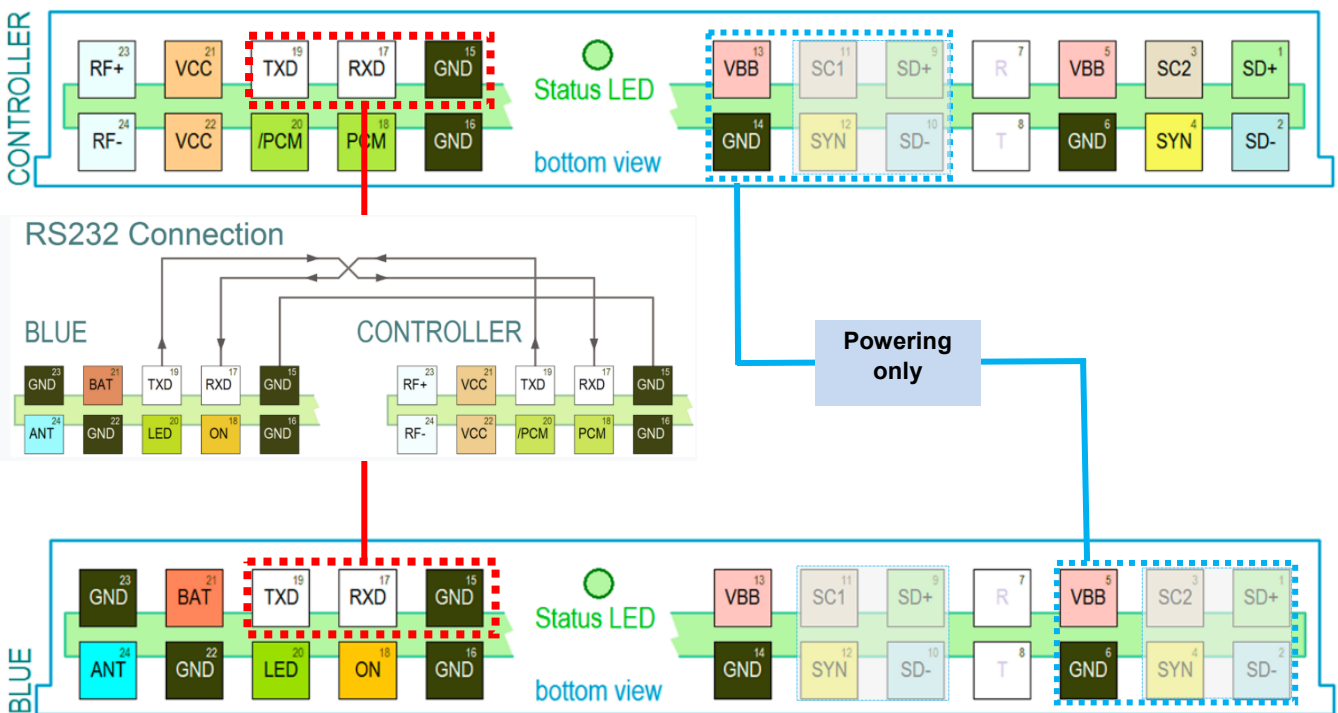
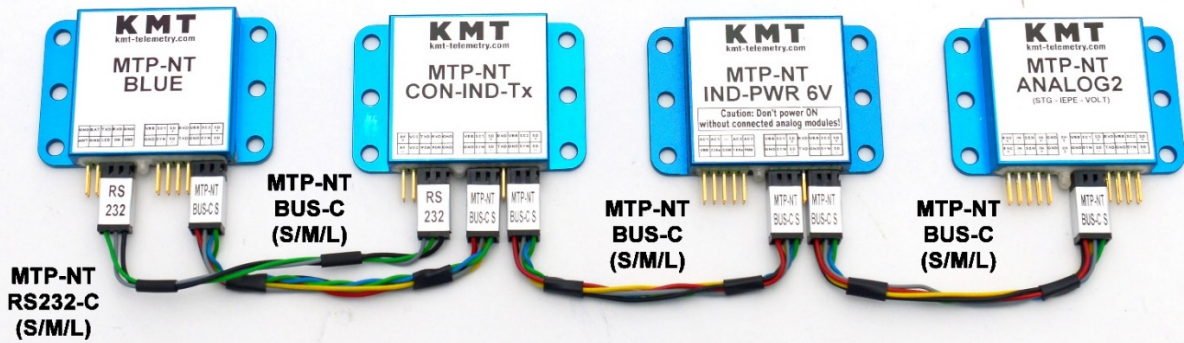
Wireless access to the configuration of MTP-NT acquisition modules via MTP-NT-BLUE



MTP-NT-BLUE

Bluetooth module to transfer RS232 wirelessly*
 Remote On/Off* (concerns battery powered versions)
 Range 5 to 20 m, depends on application and antenna
 Power supply: VBB = 6 to 9 Vdc
 Current consumption: 37 mA (average)
 Standby mode: 15 mA (average)

* Required is the KMT COMMUNICATOR (handheld remote control Bluetooth device with USB connector)



NEW

KMT COMMUNICATOR for wireless configuration of a remote MTP-NT system via USB to the Bluetooth module MTP-NT-BLUE (incl. wireless firmware update)



Blue LED - Bluetooth connection
Blinking (2Hz) = searching
ON = Bluetooth connected (Please wait always until Bluetooth connection is established)

Green LED - Remote system status
Blinking (2Hz) = searching
ON = contact to remote system (means: remote system power ON)

Slow blinking (0.5 Hz) = Low BATT status at battery on rotating parts

Switching ON/OFF of KMT communicator:
Press button long (>4 seconds) = switching the communicator ON/OFF (powering of communicator with internal 9V Lithium battery)

If the communicator is connected via USB, it is always ON and doesn't use the local Lithium battery at all (battery saving). The battery is a primary cell (9 V / 1.2 Ah, >5 years shelf life) so charging of local battery via USB is not possible.

Remote control for switch ON/OFF battery on rotating part

Press button once (1x) = ON (LED on BLUE module rotor side is ON)
Press button twice (2x) = OFF (LED on BLUE module rotor side is blinking)

Test of local 9V Lithium battery of communicator:
If the green LED is 3 sec. fast (10 Hz) blinking at start of communicator, the battery is empty and you must exchange the Lithium battery!



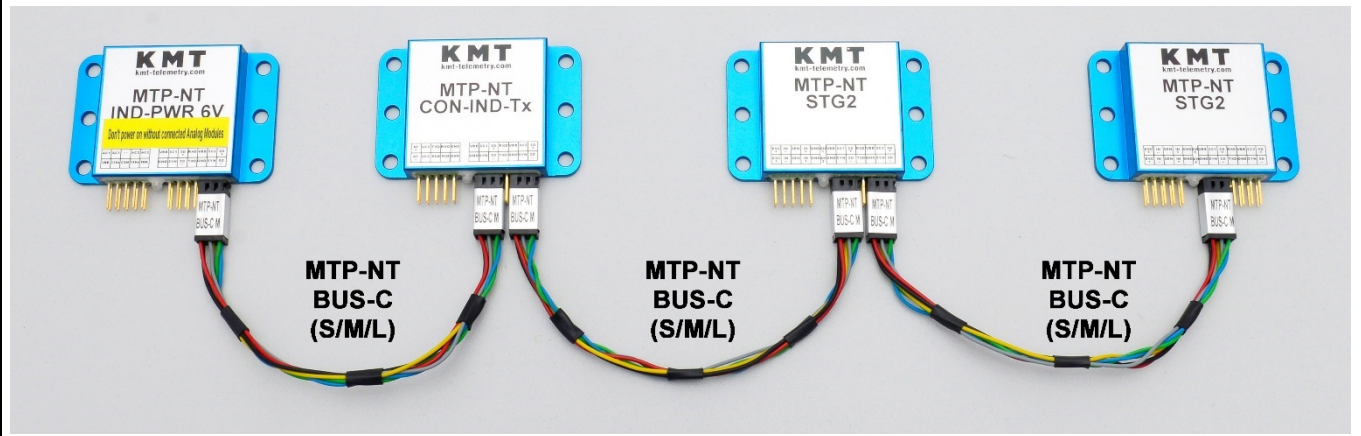
Micro-AB USB Receptacle for powering and communication to PC

Connected to PC or notebook

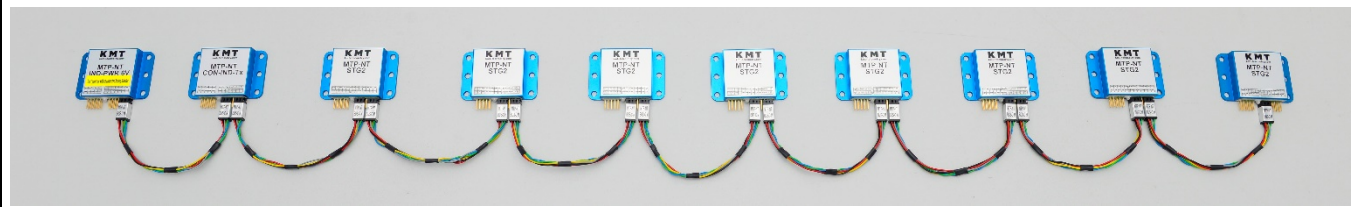


INFO: When connecting the USB port, a Windows COM port is created automatically. A driver doesn't have to be installed; we use the FTDI FT230X chip, which is always automatically recognized by Windows.

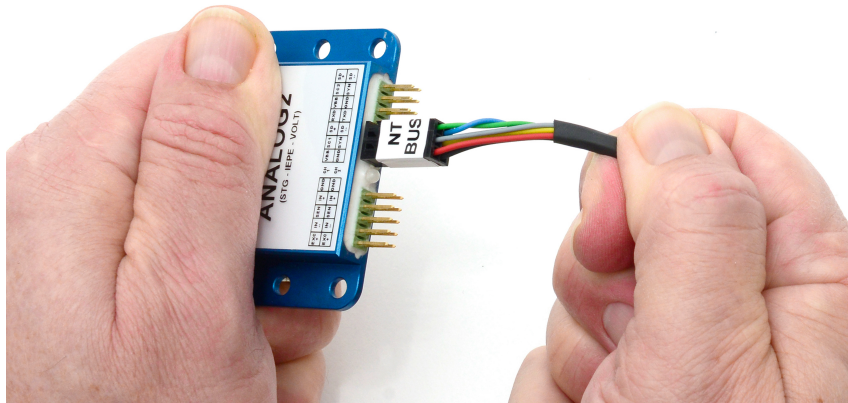
MTP-NT – Easy to connect with daisy-chain connection with the same MTP-NT-BUS-C cable



The bus is extendable to several meters!

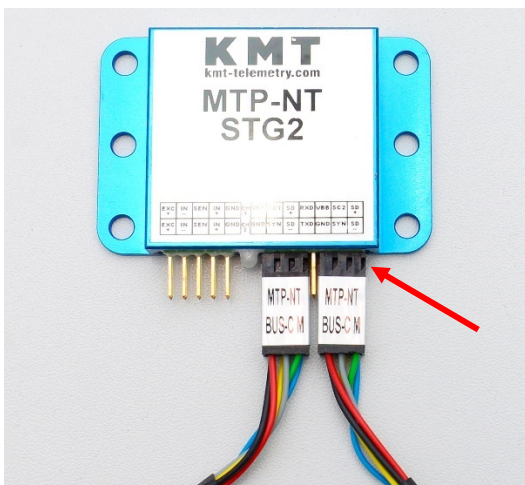


AMP "Locking-Clip" crimp connectors withstand ultra-harsh vibration and shock environment

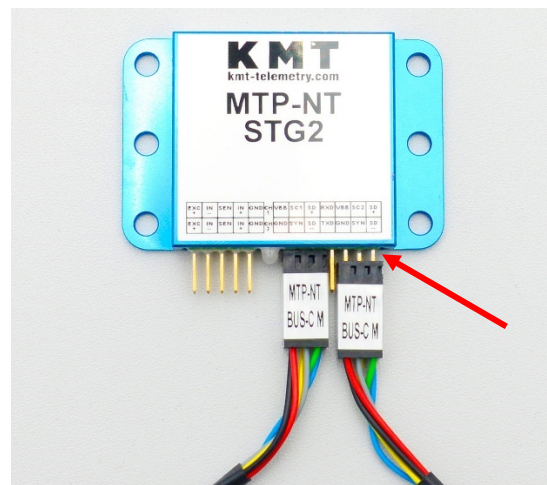


Caution: Locking-Clip must be completely connected!

GOOD 😊

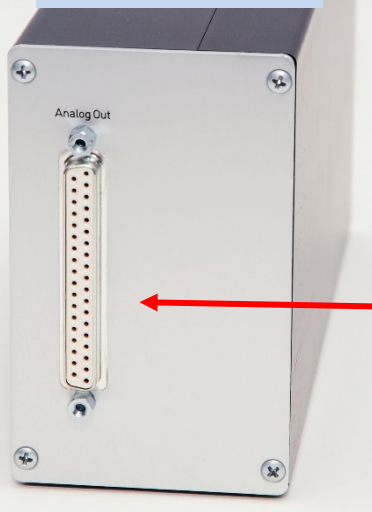


BAD ☹️



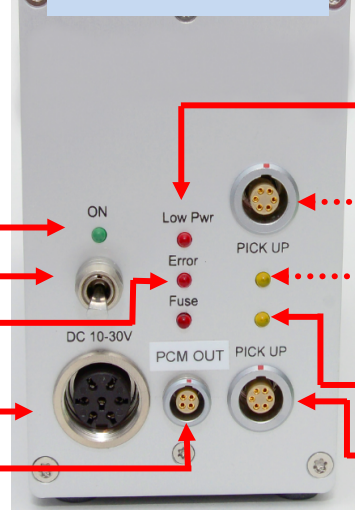
MTP-NT-DEC8/16/24/32 Receiver unit for max 32 Channels output via 37 pol. D-sub Inductive transmission 45 MHz version up to 5000 Mbit (10000Mbit on special request!)

Front side view



Female 37 pole D-sub for analog signal output, CH 1 to 32

Rear side view



Power ON LED

Power Switch

Transmission error LED

7-pole female TUCHEL connector for power supply input (10-30V DC)

Option: PCM out

Inductive power transmission status LED

IND-Pickup head #2 connection for shaft diameter >400mm

Active level LED of Pickup head

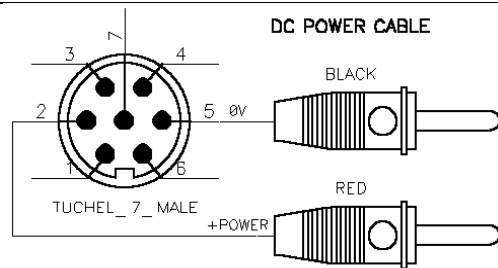
Active level LED of Pickup head

IND-Pickup head connection

1		ANALOG-CH1-OUT
20	ANALOG-CH20-OUT	ANALOG-CH2-OUT
2		ANALOG-CH2-OUT
21	ANALOG-CH21-OUT	ANALOG-CH3-OUT
3		ANALOG-CH3-OUT
22	ANALOG-CH22-OUT	ANALOG-CH4-OUT
4		ANALOG-CH4-OUT
23	ANALOG-CH23-OUT	ANALOG-CH5-OUT
5		ANALOG-CH5-OUT
24	ANALOG-CH24-OUT	ANALOG-CH6-OUT
6		ANALOG-CH6-OUT
25	ANALOG-CH25-OUT	ANALOG-CH7-OUT
7		ANALOG-CH7-OUT
26	ANALOG-CH26-OUT	ANALOG-CH8-OUT
8		ANALOG-CH8-OUT
27	ANALOG-CH27-OUT	ANALOG-CH9-OUT
9		ANALOG-CH9-OUT
28	ANALOG-CH28-OUT	ANALOG-CH10-OUT
10		ANALOG-CH10-OUT
29	ANALOG-CH29-OUT	ANALOG-CH11-OUT
11		ANALOG-CH11-OUT
30	ANALOG-CH30-OUT	ANALOG-CH12-OUT
12		ANALOG-CH12-OUT
31	ANALOG-CH31-OUT	ANALOG-CH13-OUT
13		ANALOG-CH13-OUT
32	ANALOG-CH32-OUT	ANALOG-CH14-OUT
14		ANALOG-CH14-OUT
33		ANALOG-CH15-OUT
15		ANALOG-CH15-OUT
34		ANALOG-CH16OUT
16		ANALOG-CH16OUT
35		ANALOG-CH17-OUT
17		ANALOG-CH17-OUT
36	▷AGND	ANALOG-CH18-OUT
18		ANALOG-CH18-OUT
37	▷AGND	ANALOG-CH19-OUT
19		ANALOG-CH19-OUT

Plug-side

Output single-ended

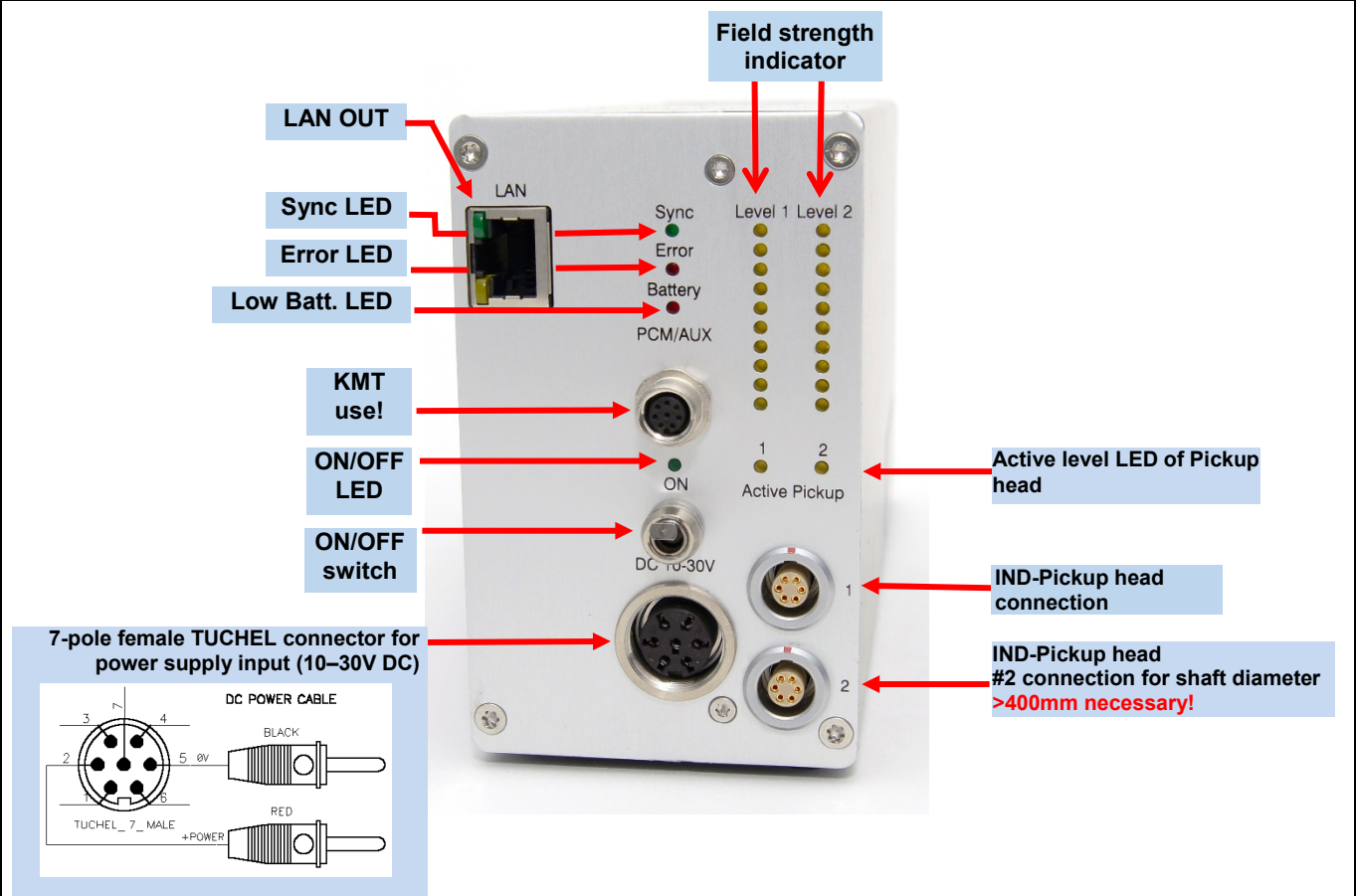


Optional BNC16/32 Box. Connect on 37pol D-Sub

MTP-NT -DEC8/16/24/32 System Parameters:

Channels:	8,16,24 or 32x +/-10 V analog outputs via D-sub female socket
Resolution:	16 bit D/A converter, with smoothing filter
Power supply input:	10-30 Vdc, power consumption < 24 Watt
Dimensions:	205 x 105 x 65mm
Weight:	1.25 kg without cables and data pickup head
Overall measurement uncertainty (sensor input → decoder output):	< 0.1% without sensor influences
Environmental	
Operating:	-20°C to +70°C
Humidity:	+80% not condensing (@ +20°C)
Vibration:	5g
Static acceleration:	10g in all directions
Shock:	100g in all directions

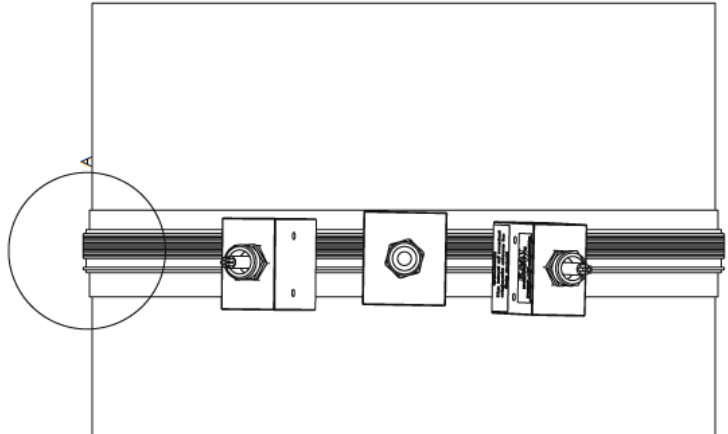
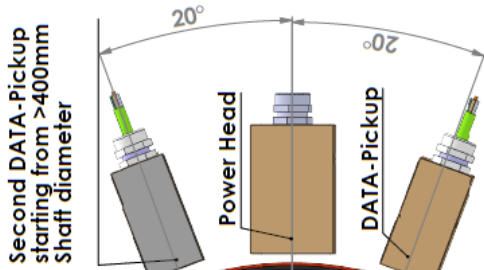
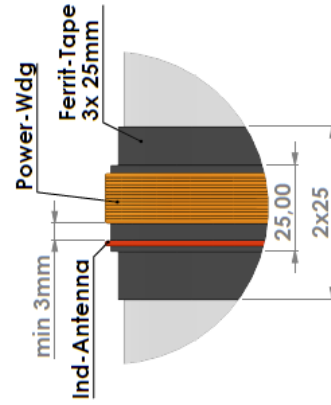
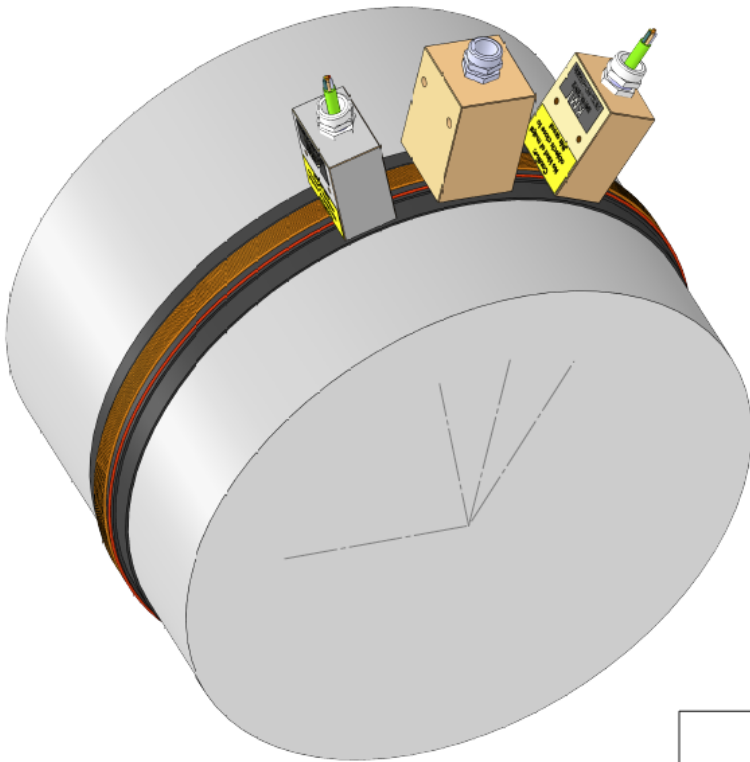
MTP-NT-DIG-DEC-V2 Receiver unit with ethernet (LAN) output
Inductive transmission 45 MHz version up to 5000 Mbit (10000Mbit on special request!)




MTP-NT-DIG-DEC-V2 System Parameters:

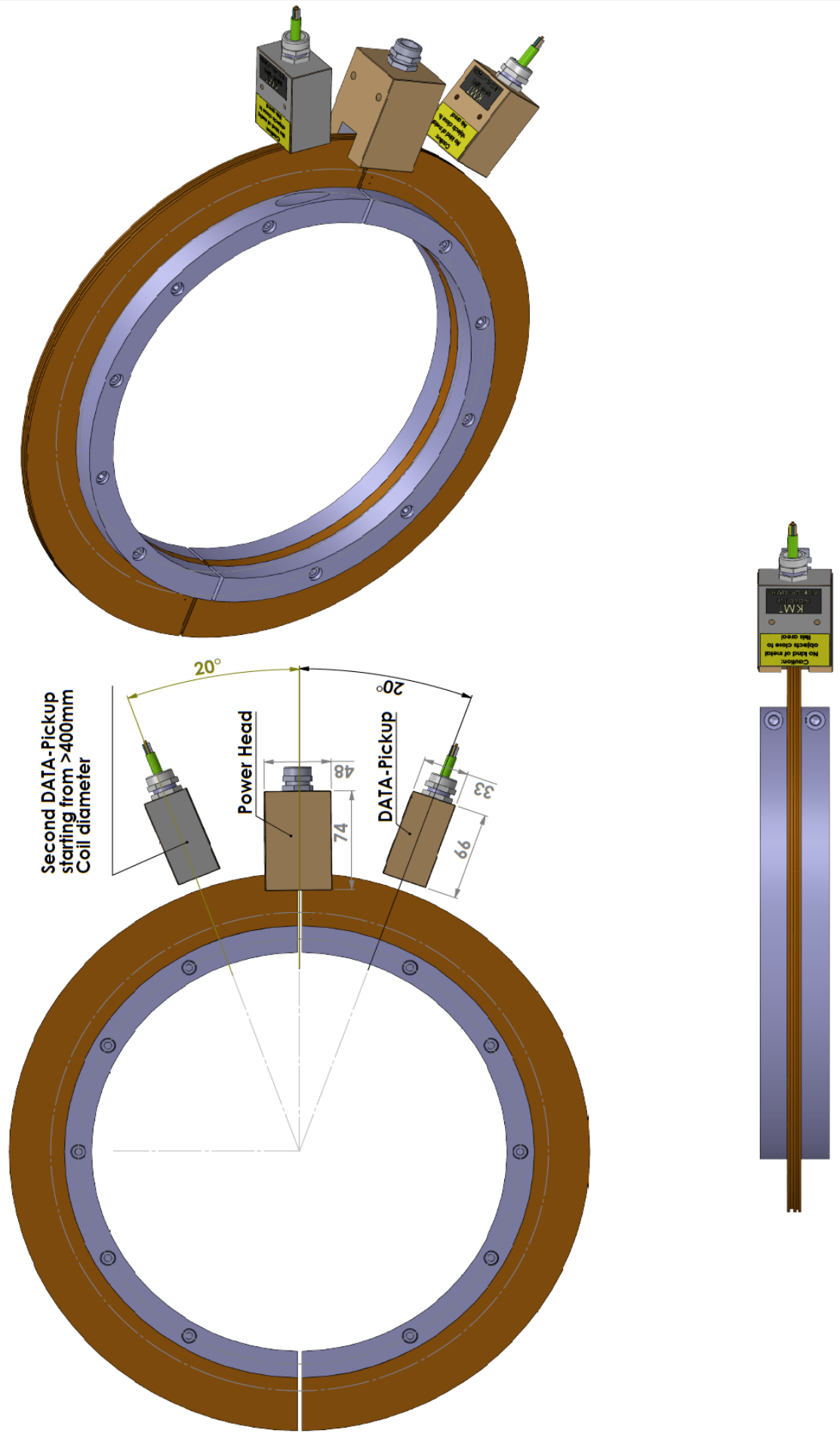
Channels:	2-256 CH ethernet outputs via LAN
Power supply input:	10-30 Vdc, power consumption < 24 Watt
Dimensions:	205 x 105 x 65mm
Weight:	0.990 kg without cables and data pickup head
Overall measurement uncertainty (sensor input → decoder output):	< 0.1% without sensor influences
Environmental	
Operating:	-20°C to +70°C
Humidity:	+80% not condensing (@ +20°C)
Vibration:	5g
Static acceleration:	10g in all directions
Shock:	100g in all directions

MTP-NT – Example mounting of second pick up at flat coil on shaft



Date	Version	Mat:	Remarks:
02.05.2019			Bl.: A2 Weight: 24192,85 gr
			Scale: 1:2
			Part: DEMO-DIV-Welle-Dol
E-Mail: info@kmt.com			

MTP-NT – Example mounting of second pick up at coil ring



Picture of IND-PICKUP-HEAD 45MHz

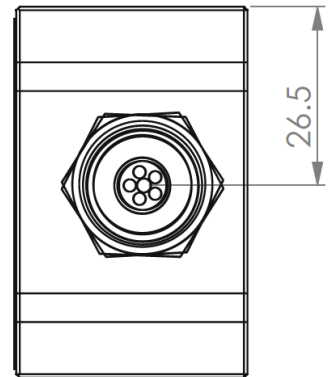
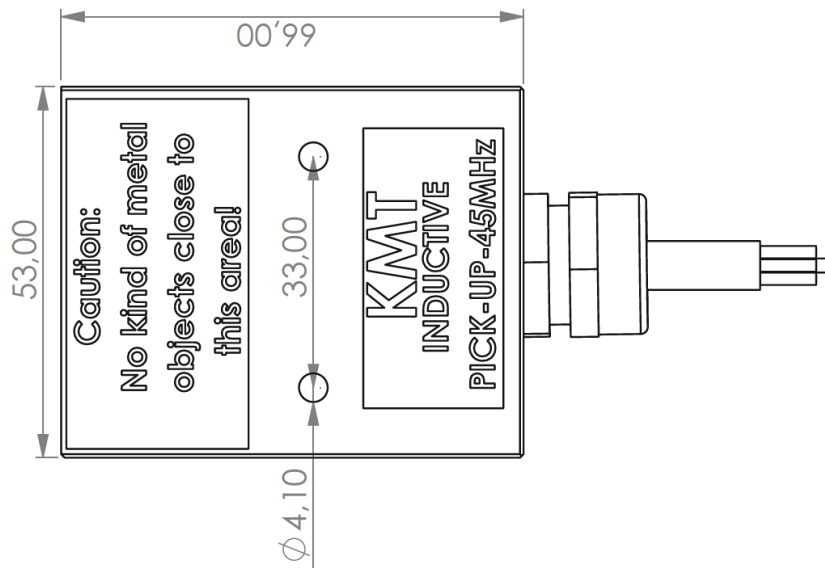
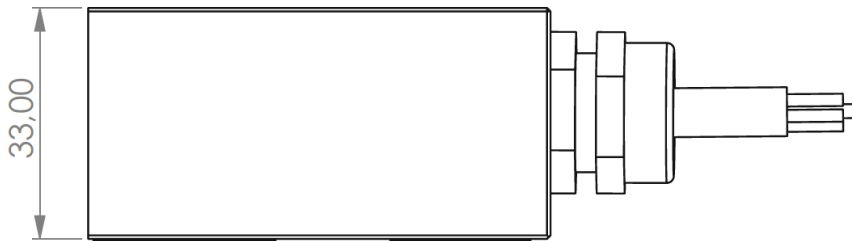
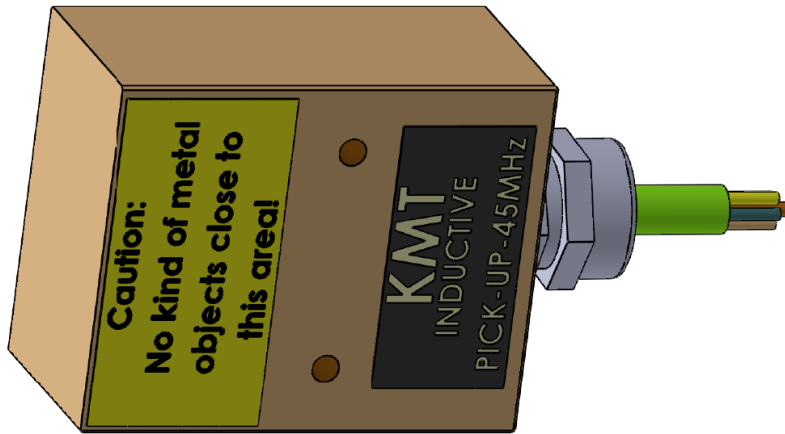


IND-PICKUP-HEAD 45MHz - cable rear side (radial to shaft)



IND-PICKUP-HEAD 45MHz - cable right side (axial to shaft)

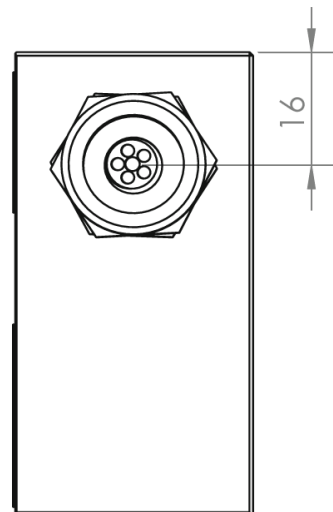
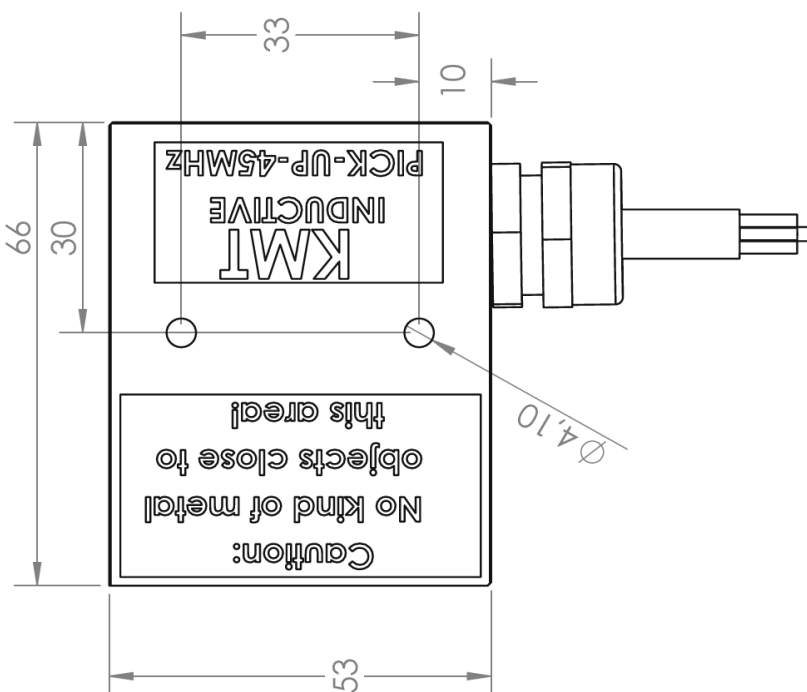
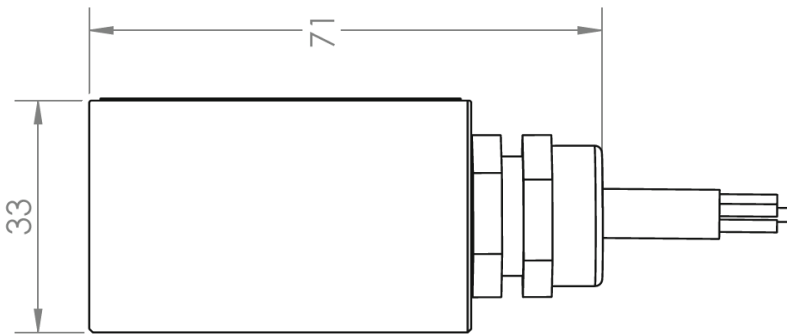
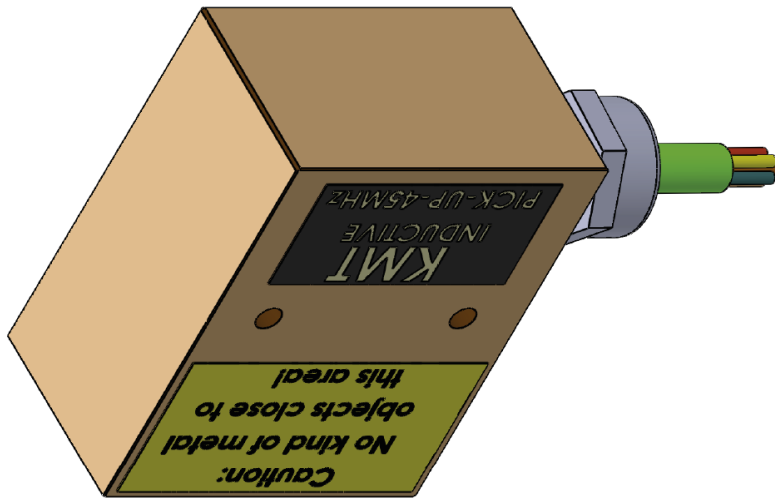
Dimensions of IND-PICKUP-HEAD 45MHz - cable rear side (radial to shaft)




Date	Version	Mat:
09.07.2018	rev1	
Remarks:		
BI : A4	Weight-gr:	152.34
Scale		Part:
1:1		PU-45MHz-rad-bg
www.kmt-telemetry.com		hu
E-mail: info@kmt-telemetry.com		
Tel: +49 8024-48737, Fax: +49 8024-5532		



Dimensions of IND-PICKUP-HEAD 45MHz – cable right side (axial to shaft)



Date	09.07.2018	Version	rev1	Mat:		Remarks:	
				Bl : A4	Weight-gr:	151.37	
				Scale	1:1	Part:	PU-45MHz-cx-bg
				E-mail:	info@kmt-gmbh.com		
				Tel:	08024-48737, Fax: 08024-5532		
					hu		

MTP-NT-DIG-DEC-V2 - Range of digital values in TCP data stream:

This is a table of the whole range of digital values: [nt_digital_range.xlsb](#)

The column "decimal" shows the unsigned short value, coming in the TCP data stream.

This values must be converted into signed short (by subtracting 32768).

The column "bipolar" shows the result that represents the measured value.

Calculation of the bipolar value:

$$[\text{incoming digital value}] - 32768 = [\text{bipolar value}]$$

Examples:

$$65535 - 32768 = 32767$$

$$32768 - 32768 = 0$$

$$0 - 32768 = -32768$$

Analog measurement (strain gauge, voltage etc.):

The range of bipolar values is -32768 to 32767.

The fullscale signal range is -32704 to 32704.

Example 1 (STG module):

* input range setting = ± 5 mV/V

* applied bridge unbalance = +5 mV/V

* digital value (unsigned short) = 65472

* bipolar value = 32704

Example 2 (Volt module):

* input range setting = ± 10 Volt

* applied input voltage = +10 Volt

* digital value (unsigned short) = 65472

* bipolar value = 32704

Temperature measurement:

The digital output resolution is 0.05K/step* (20 steps/Kelvin)

This means that the bipolar value must be divided by 20 to get the temperature.

Example:

* sensor temperature = +100°C

* digital value (unsigned short) = 34768

* bipolar value = 2000

sensor fault message (sensor break): Temperature value = -999.0°C

unreasonable value message (overflow): Temperature value = -998.0°C

* This means the mathematically generated output resolution after linearization; the true ADC resolution depends on sensor type and temperature range and may be significantly lower.

Analog Decoder output:

The bipolar fullscale value (± 32704) generates an analog output Voltage of ± 10.00 Volt.

Analog Decoder output

(Temperature Values):

The 10.00 Volts analog fullscale value corresponds to the full-scale temperature of 1635.20 degrees Celsius. Therefore, the factor for obtaining the temperature value from the analog decoder output is **163.52** (example: 1.00 volts analog output voltage multiplied by 163.52 gives the reading 163.52 degrees Celsius).

Data Stream		Analog Out	Temperature (depending on module setting)			
decimal	bipolar	($\pm 10V$)	-273/+1635	-273/+1000	-273/+500	-250/+250
		Volt	°C	°C	°C	°C
65535	32767	10,019264	1638,35	1001,93	500,96	250,48
65472	32704	10,000000	1635,20	1000,00	500,00	250,00
45850	13082	4,000122	654,10	400,01	200,01	100,00
39309	6541	2,000061	327,05	200,01	100,00	50,00
36039	3271	1,000183	163,55	100,02	50,01	25,00
32768	0	0,000000	0,00	0,00	0,00	0,00
27305	-5463	-1,670438	-273,15	-167,04	-83,52	-41,76
23835	-8933	-2,731470		-273,15	-136,57	-68,29
14902	-17866	-5,462940			-273,15	-136,57
64	-32704	-10,000000				-250,00
0	-32768	-10,019569				-250,49

Version 005

**MTP-NT DEC4/8/16/24/32 with analog output via BNC (4/8) or Sub-D 16/24/32
(Output single-ended)**



4 CH



8 CH



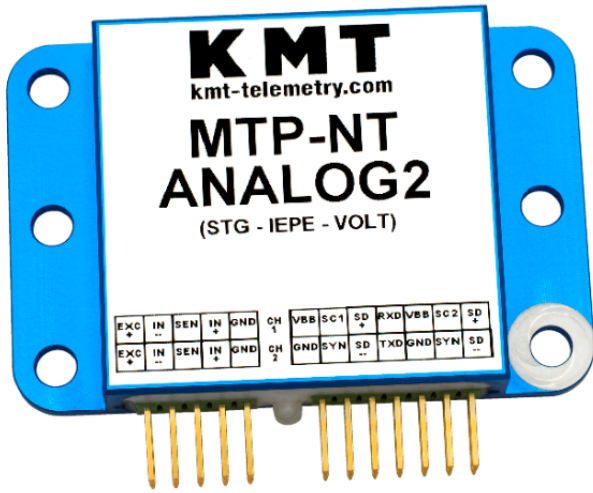
16/24/32 CH

MTP-NT-DIG-DEC-V2 with ethernet output via LAN



2-256 CH

MTP-NT-ANALOG - Two Channel Acquisition Module for STG, VOLT, POT, IEPE



MTP-NT-ANALOG2

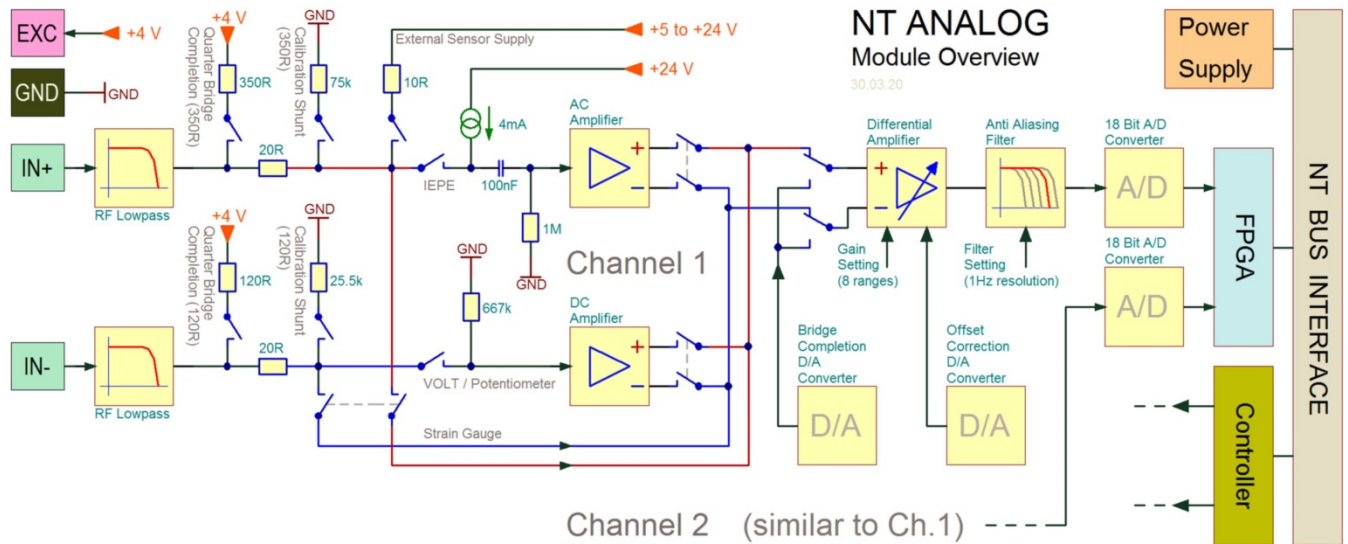
Two Channel Acquisition Module for strain gauges*, high level voltage signals*, potentiometer sensors*, IEPE/ICP® sensors*, external Sensor supply (12 Volt / 30 mA typ.) *

*The functionality is programmable by software [ntconfig.exe](#).

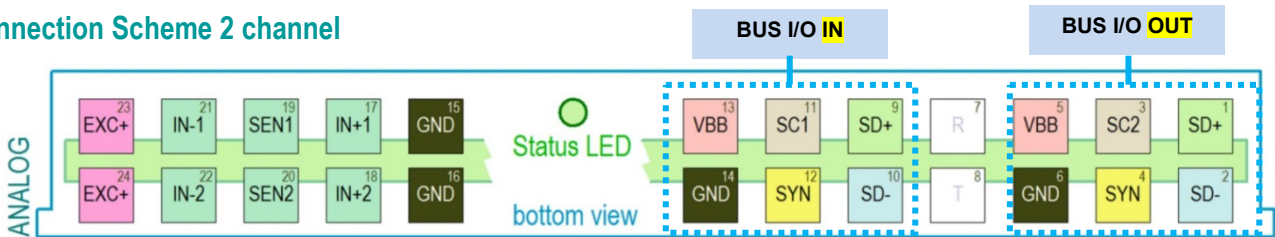
The channel functionality can be set individually for each channel

Power supply (VBB): 5 to 9 Vdc

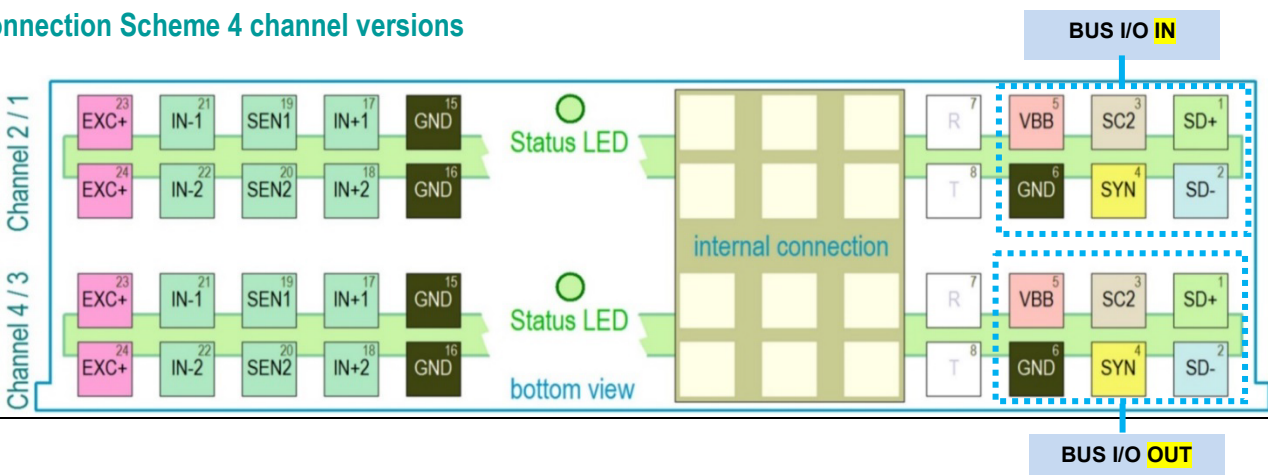
Current consumption: <140 mA (TBD)



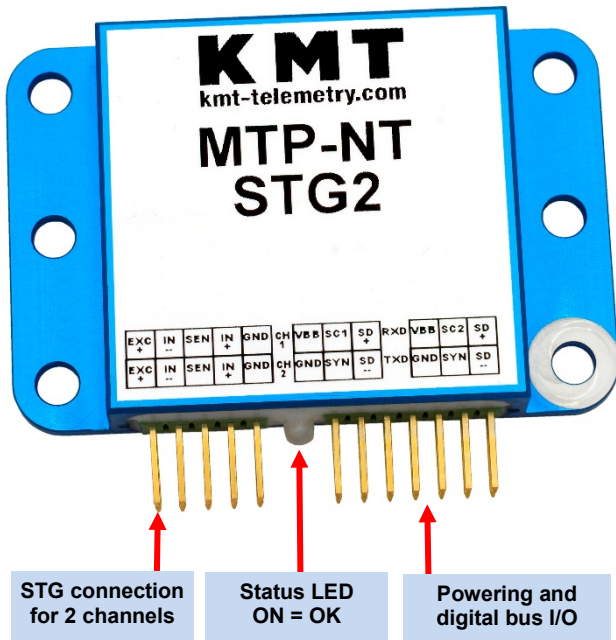
Connection Scheme 2 channel



Connection Scheme 4 channel versions

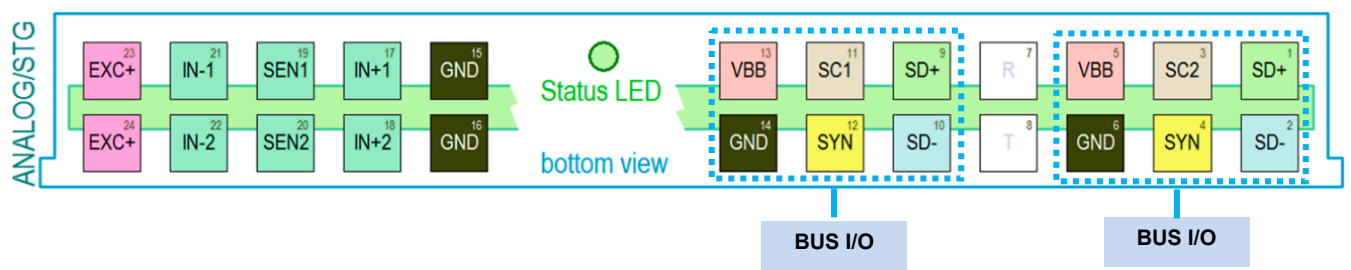


MTP-NT STG - Acquisition module for 2 channels strain gages (STG)

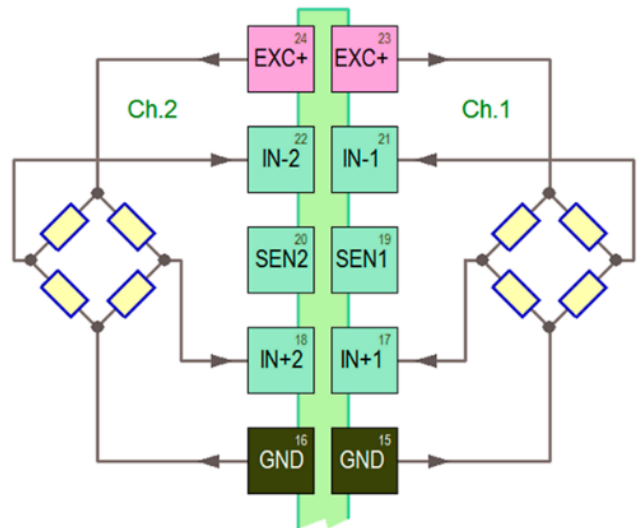


MTP-NT-STG2
 Acquisition module for 2 strain gauges
 Full or half bridge ($\geq 120 \Omega$)
 Quarter bridge (120Ω or 350Ω)
 Fixed excitation voltage: 4.0 Vdc
 Offset compensation by auto zero
 Manual offset shifting after auto zero
 Input ranges ± 40 to ± 0.3 mV/V
 Shunt-calibration $75 \text{ k}\Omega / 25.5 \text{ k}\Omega$ 0.1%
 Signal bandwidth 0 Hz to 24000 Hz*
 (*see table of max. cut-off frequencies)
 ADC Resolution: 18 bit
 Measurement uncertainty $< 0.1\%$
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 100mA
 (with two full bridges 350Ω)

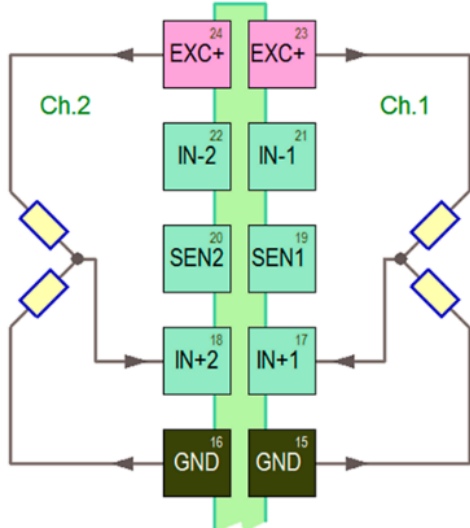
STG connection for 2 channels
 Status LED ON = OK
 Powering and digital bus I/O



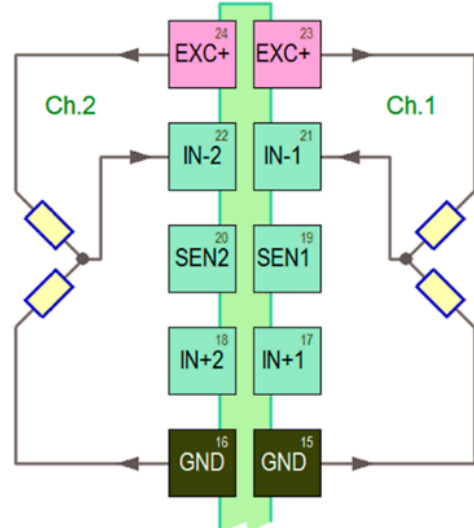
Full Bridge Connection 120 or 350 Ohm



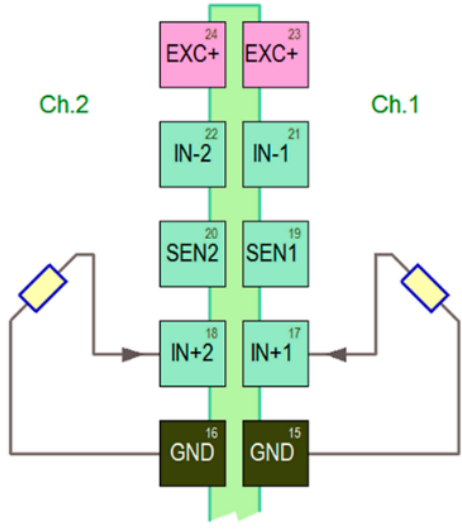
Half Bridge Connection 350 Ohm



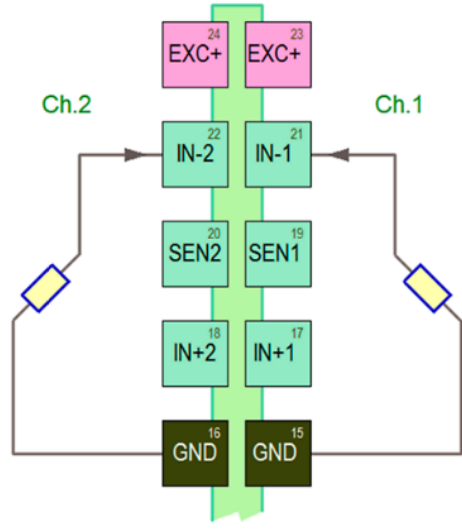
Half Bridge Connection 120 Ohm



Quarter Bridge Connection 350 Ohm

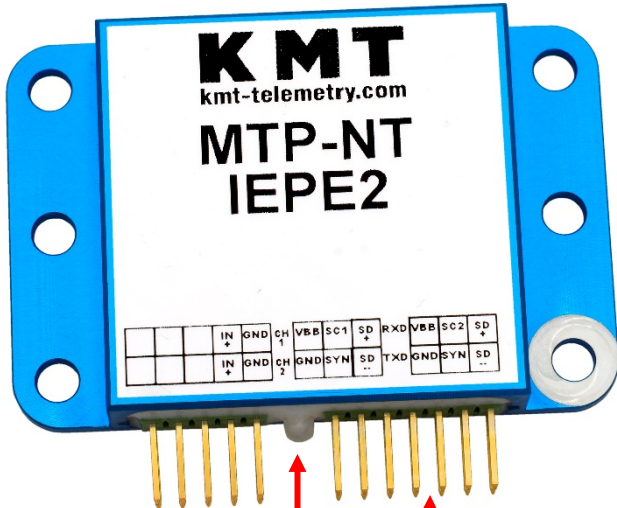


Quarter Bridge Connection 120 Ohm



Of course, all channels can be configured independently (e.g., Channel 1 = Full Bridge, and Channel 2 = Half Bridge).

MTP-NT IEPE - Acquisition module for 2 channels IEPE (ICP) sensor



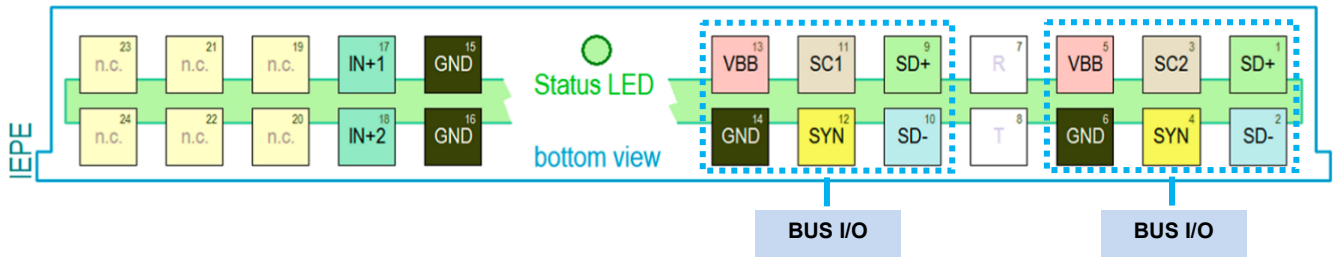
MTP-NT-IEPE2

Acquisition module for 2x IEPE/ICP[®] sensors
 Excitation current: 4.0 mA
 Input ranges: 20 to 0.3 Vpp
 Signal bandwidth 3 Hz to 24000 Hz*
 (*see table of max. cut-off frequency)
 ADC Resolution: 18 bit
 Measurement uncertainty < 0.1%
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 140 mA

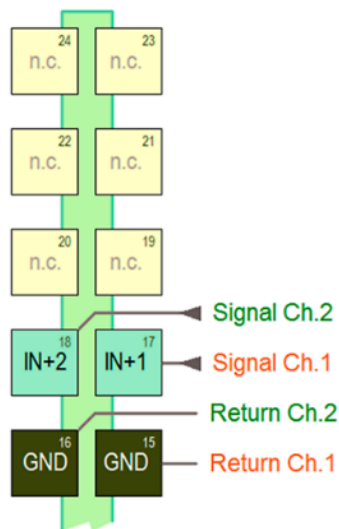
ICP connection for 2 channels

Status LED ON = OK

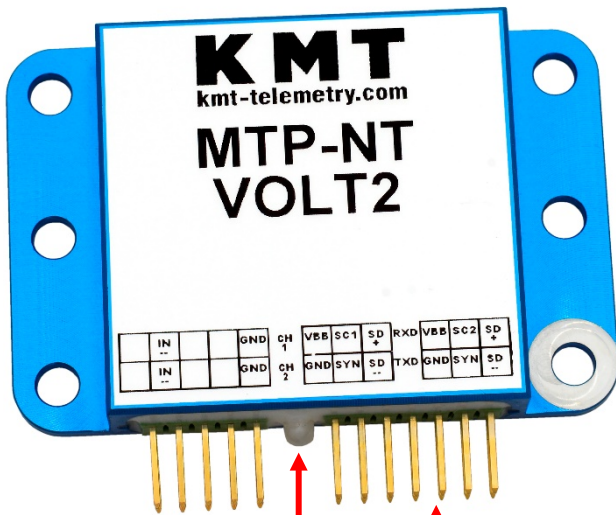
Powering and digital bus I/O



IEPE/ICP Input Connection



MTP-NT VOLT - Acquisition module for 2 channels VOLT inputs



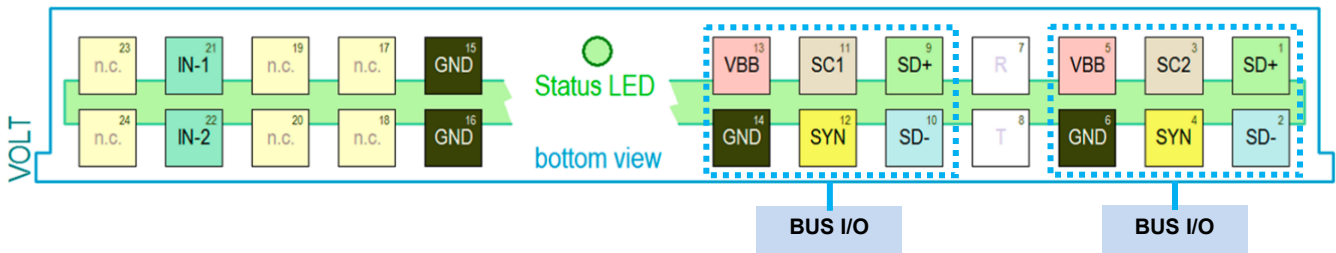
MTP-NT-VOLT2

Acquisition module for 2x high level voltage inputs
 Input ranges ± 10 to ± 0.08 V
 Signal bandwidth 0 Hz to 24000 Hz*
 (*see table of max. cut-off frequencies)
 +4 V sensor excitation (max. 33 mA)
 ADC Resolution: 18 bit
 Measurement uncertainty < 0.1%
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 80 mA

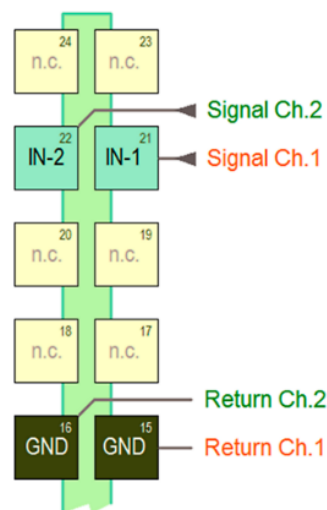
VOLT connection for 2 channels

Status LED ON = OK

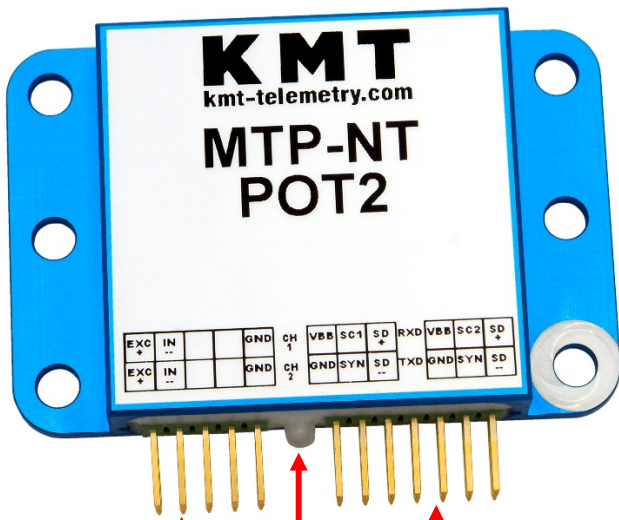
Powering and digital bus I/O



Voltage Input Connection



MTP-NT POT2 - Acquisition module for 2 potentiometer sensors



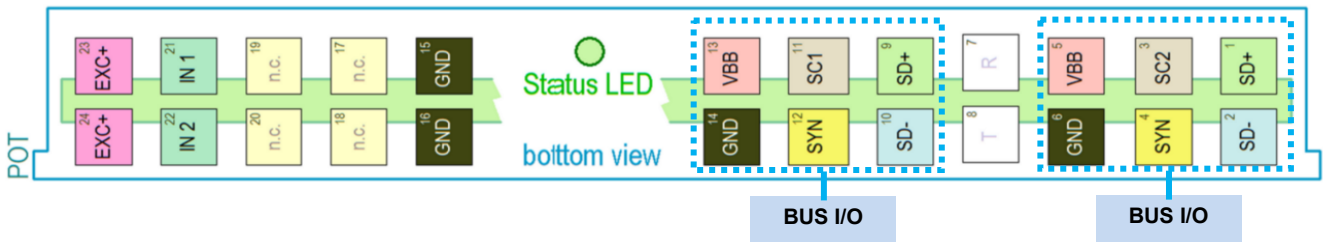
MTP-NT-POT2

Acquisition module for 2x potentiometer sensors
 Potentiometer resistance $\geq 120 \Omega$
 Fixed excitation voltage: 4.0 Vdc
 Input resistance: 667 k Ω
 Signal bandwidth 0 Hz to 24000 Hz*
 (*see table of max. cut-off frequencies)
 ADC Resolution: 18 bit
 Measurement uncertainty < 0.1%
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 90 mA
 (with two 1 k Ω potentiometers)

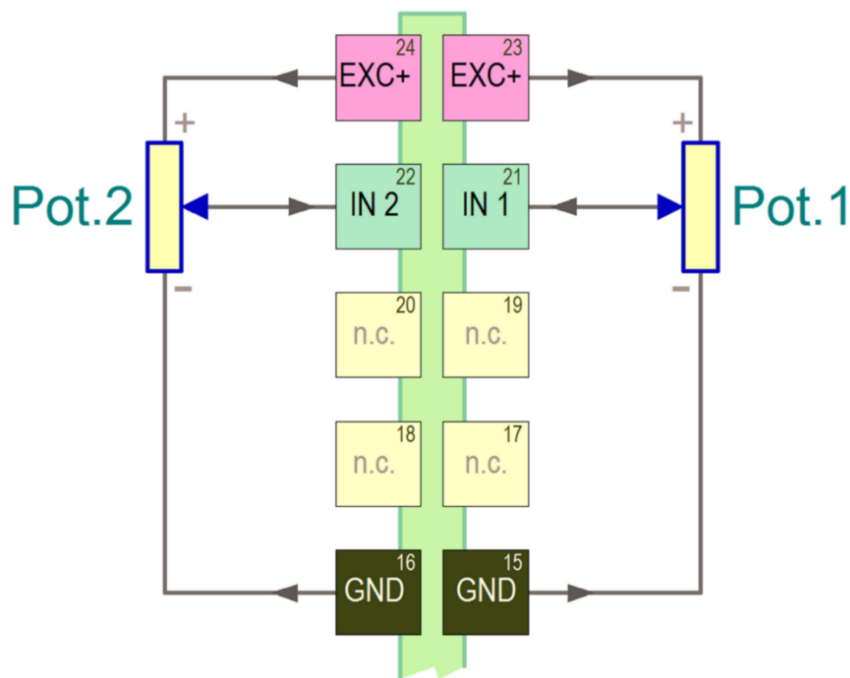
POT connection for 2 channels

Status LED ON = OK

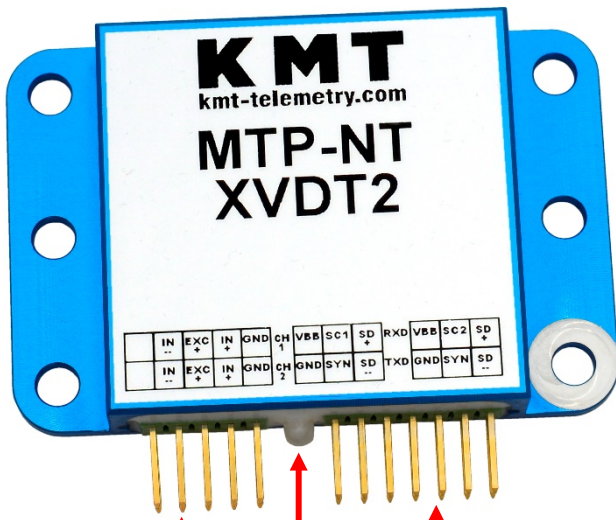
Powering and digital bus I/O



POTENTIOMETER Sensor Connection



MTP-NT XVDT - Acquisition module for 2 channels LVDT/RVDT sensors



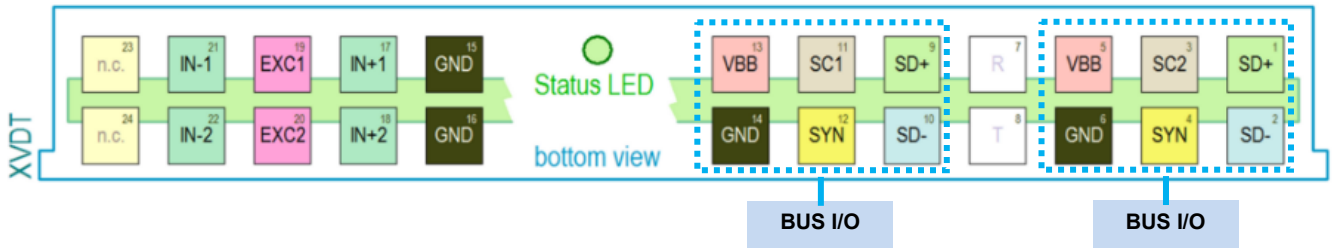
MTP-NT-XVDT2

Acquisition module for 2x LVDT/RVDT sensors
 Excitation voltage = 4.096 Vpp, rounded rectangle
 Excitation frequency = 8 kHz (changeable by software)
 Sensor impedance $\geq 100 \Omega$ (@ 8 kHz)
 Signal bandwidth 0 Hz to 200 Hz
 Programmable lowpass filter
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 130 mA (with 2x MHR500)

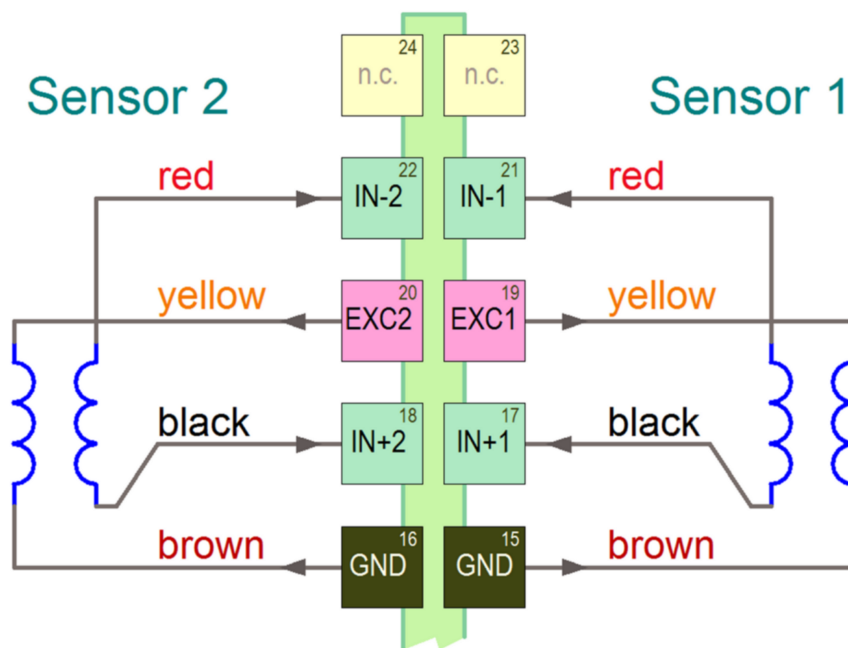
XVDT connection for 2 channels

Status LED ON = OK

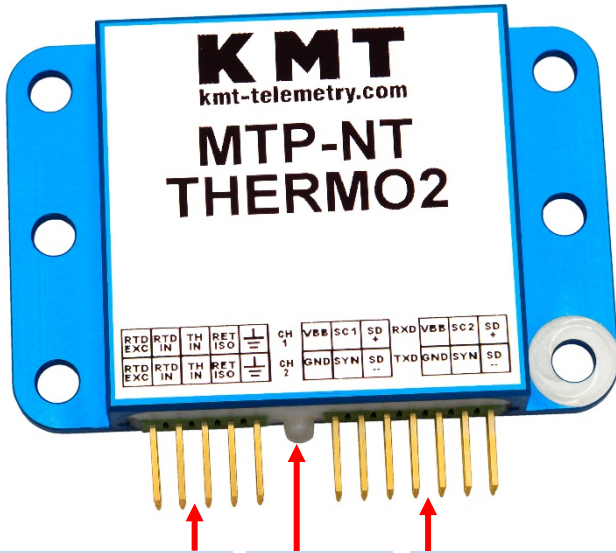
Powering and digital bus I/O



XVDT (LVDT/RVDT) Sensor Connection



MTP-NT THERMO - Acquisition module for 2 channels THERMO inputs



THERMO connection for 2 channels

Status LED ON = OK

Powering and digital bus I/O

MTP-NT-THERMO 2

Acquisition module for 2x Temperature Sensor
Inputs galvanically isolated (max. potential difference 32 Vdc)
Lowpass filter 1 Hz to 32 Hz (programmable)

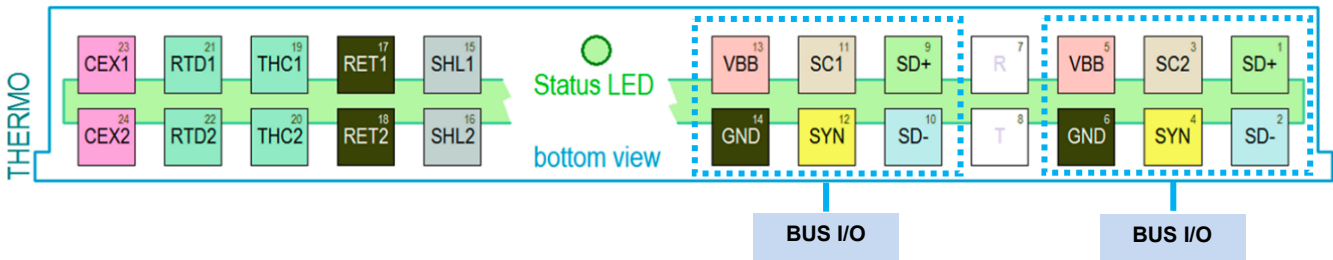
RTD Sensor types: PT100, PT500, PT1000
Connection: 2-Wire and 3-Wire
Excitation current: 1 mA

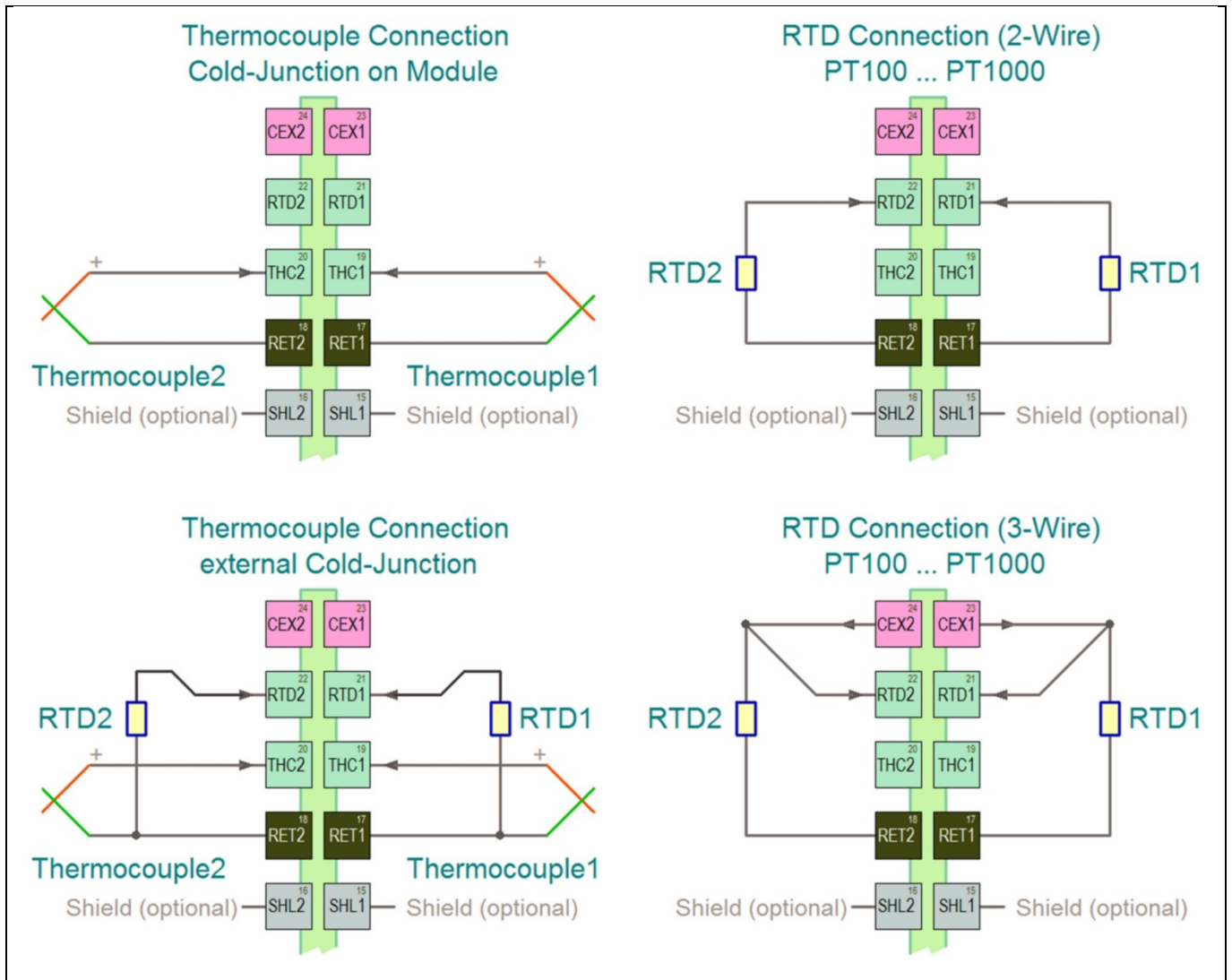
Thermocouple Sensor types: **K**(NiCr-Ni), **J**(Fe-CuNi), **E**(NiCr-CuNi), **T**(Cu-CuNi), **R**(Pt13Rh-Pt), **S**(Pt10Rh-Pt), **B**(Pt30Rh-Pt6Rh)
Reference junction measurement internal & external (RTD sensor)

Other Sensor types: NTC(Thermistor)*, **N**(NiCrSi-NiSi)*, customer-specific*

Measuring range -273.15°C to +1635.2°C
(fullscale value reducible to +1000°C / +500°C / ±250°C)
Output resolution: 0.05K/step (20 steps/Kelvin)
Measurement uncertainty: ≤ 1 K
Sensor break detection message = "-999.0°C "
Unreasonable value message = "-998.0°C "
Power supply: 6 to 9 Vdc
Current consumption: 90 mA

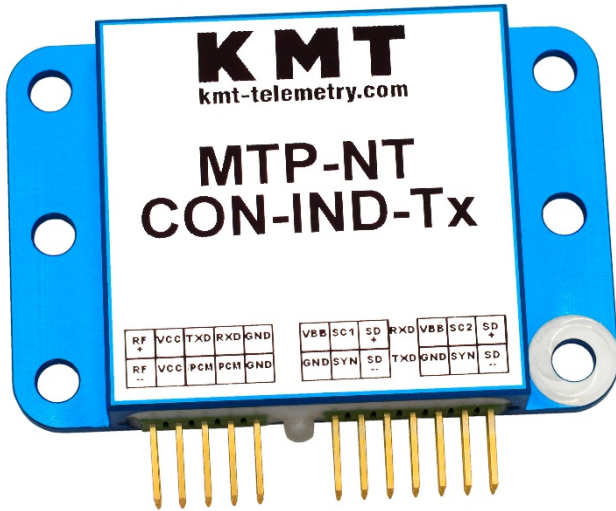
* per Software update





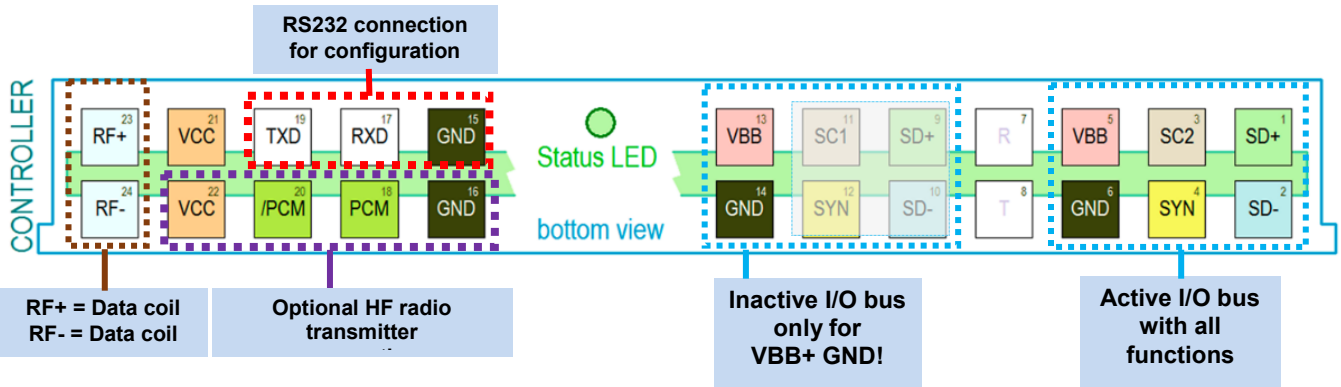
Of course, all channels can be configured independently (e.g., channel 1 = Thermo Couple, and channel 2 = RTD).

MTP-NT CON-IND-Tx - Controller for 256 channels with integrated IND-Tx

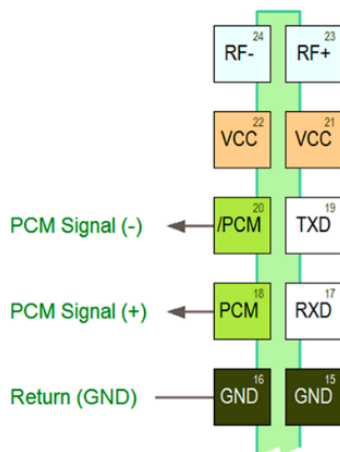


MTP-NT-CON-IND-Tx

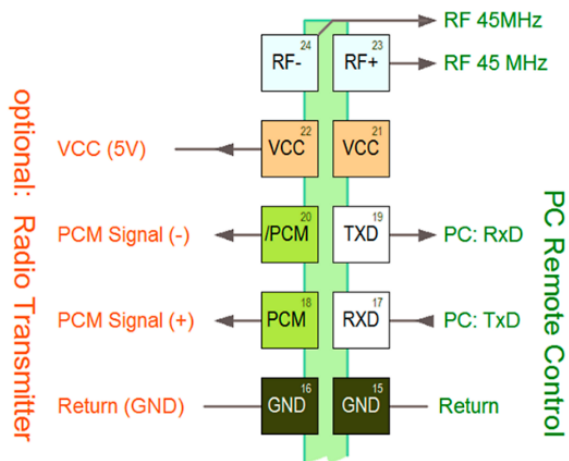
Controller 1-128 acquisition modules = 256 channels
 Output: PCM
 built-in inductive transmitter
 Programmable via RS232/USB adapter and remote software
 Power supply (VBB): 6 to 9 Vdc
 Current consumption: 100 mA



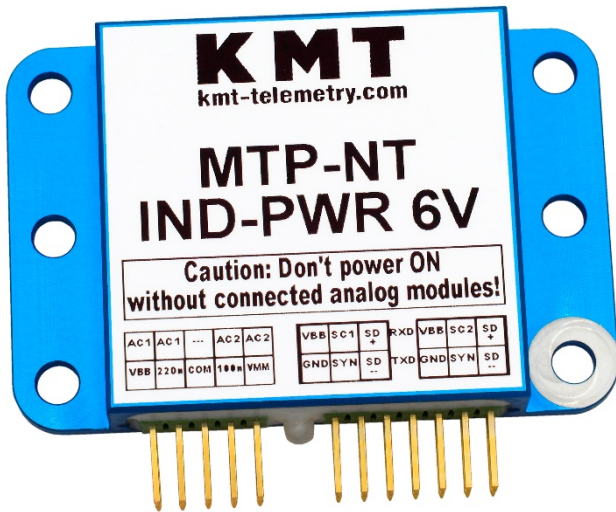
Controller Connection RS422



Controller Connection Remote Control & RF



MTP-NT IND-PWR - AC/DC Module for inductive power transmission

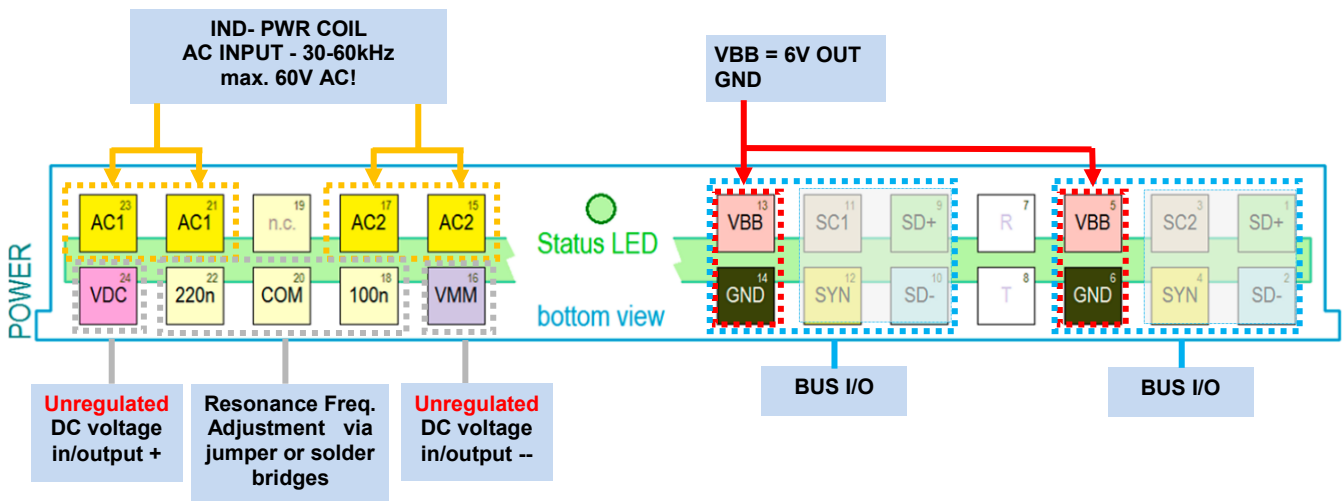


MTP-NT IND-PWR 6V

AC/DC Module for inductive power
 Input: 30-60 kHz, 9-35 Vrms / 24-100 Vpp / 12-50 Vdc
 Output: 6.0 Vdc
 Output Current: up to 2400 mA (more on request)
 Weight: 42 grams

Don't power ON without connecting Analog modules like MTP-NT-STG, IEPE Otherwise you could damage it!!

MTP-NT IND-PWR: Pin assignment



Instructions for adjusting the resonance

The secondary coil for power transmission creates a parallel resonant circuit with a capacitor, which must be tuned to the frequency of the power generator, so that the best possible efficiency is achieved. This (switchable) capacitor is installed in the power module; the capacity is variable between 150 nF and 470 nF.

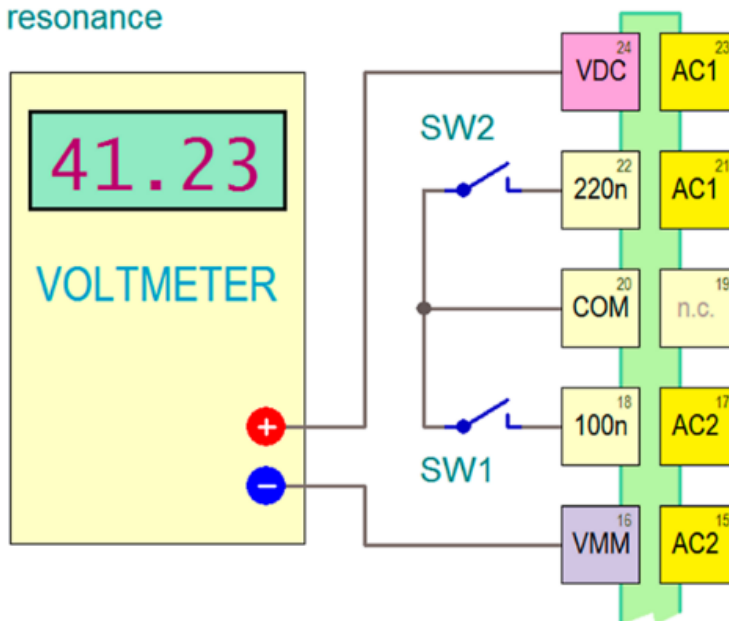
With the "test set-up" (see wiring diagram on the right) you can optimize the resonance.

If the lowest capacitance (both switches open) is still insufficient to provide a good coil-to-powerhead distance, the coil should be experimentally decreased by one turn.

If the largest capacity (both switches closed) is insufficient, the coil should be increased by one turn.

test set-up for optimizing the secondary power coil resonance

Power Module



Allowed voltage range between VMM and VDC

This voltage is the (rectified) internal operating voltage of the power module.

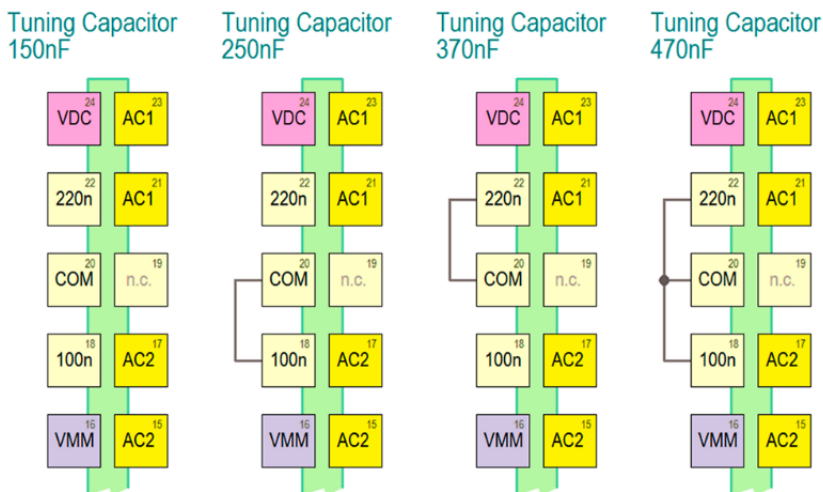
The **absolute maximum value of this voltage is 60 volts DC**, and under no circumstances should it be exceeded. Therefore, during initial start-up, the power head should not be brought too close to the secondary coil, and then slowly approached to the coil while observing the voltmeter.

The minimum value is 18 volts DC [TBD]. Below this value, a function of the power module is no longer guaranteed.

The ideal voltage should be in the range of about 25 volts to 40 volts DC.

Relationship between switch setting and capacity

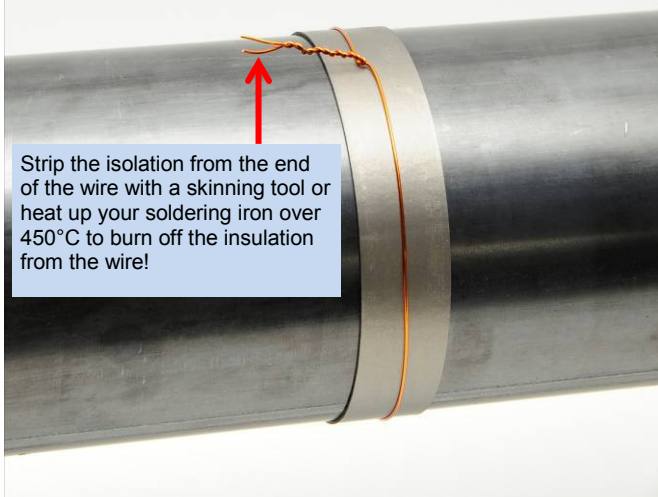
Once the optimal capacity has been found, the required connections can be fixed with a three-pin female connector. This socket connector must have solder bridges as shown in the wiring diagram on the right, and must be plugged on the middle three post pins (on the bottom row of posts). A socket connector with high insertion force must be used, so that it can't get lose in operation.



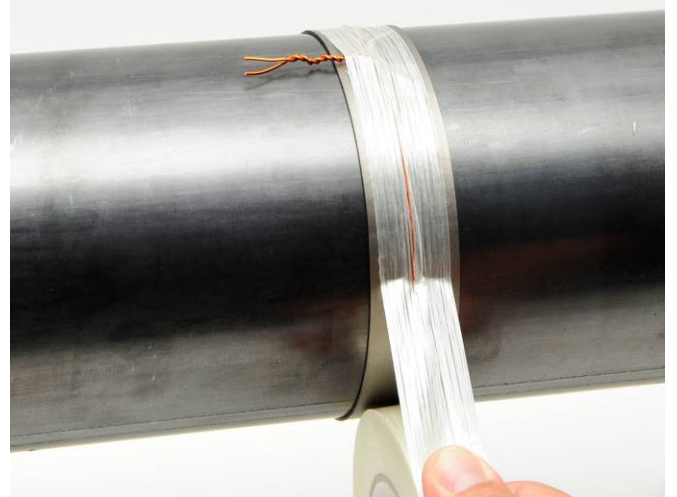
Inductive transmission (2500kbit) with MTP-NT-IND-TX-RX with 45MHz carrier!
With 45MHz carrier is only 1x winding necessary!



Attach for electromagnetic insulation "Ferrite Tape" **2 x one** layer around the shaft.

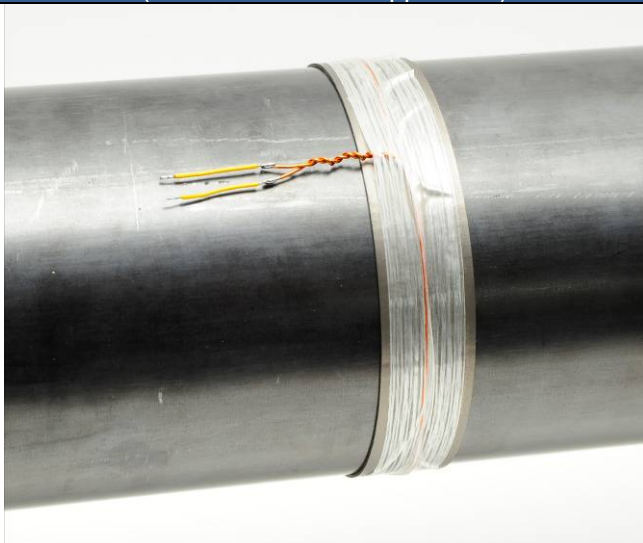


Strip the isolation from the end of the wire with a skinning tool or heat up your soldering iron over 450°C to burn off the insulation from the wire!



Make transmitting coil with **1x winding** and twisted the end of wire. Use CUL 0.63, 0.75 or 1.00mm wire (CUL = Enameled copper wire)

Fix it with 3 layers mounting tape

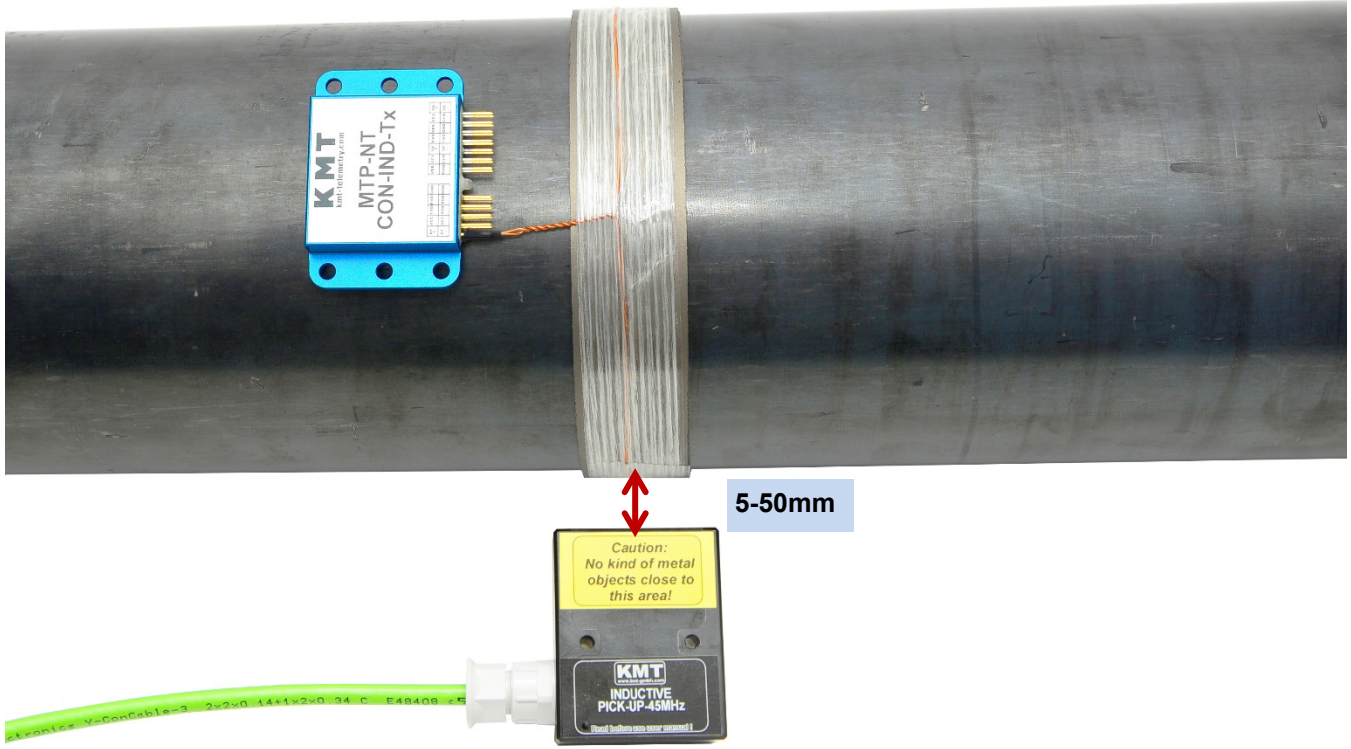


Extend the CUL wire flexible 0.14-0.25mm wire (to decouple the inflexible 1mm wire!, at 0.75 not necessary)

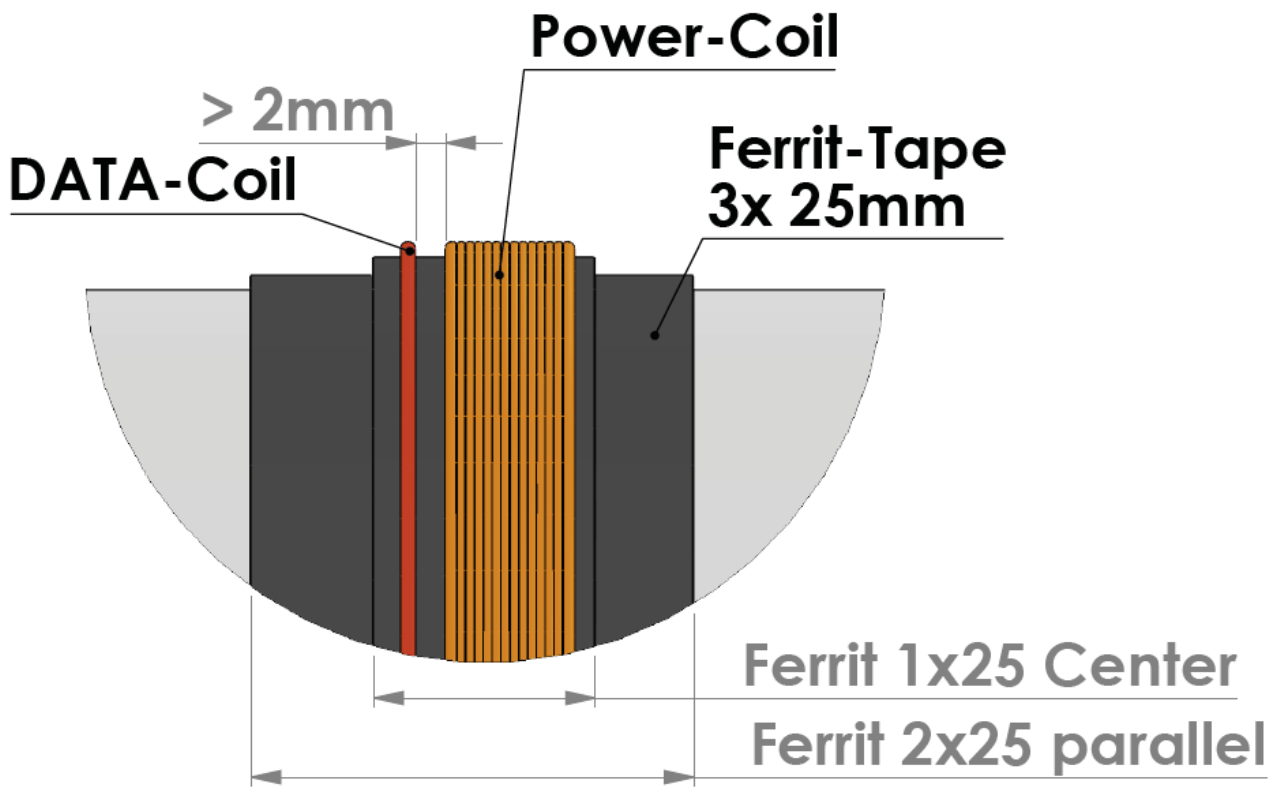


Twist the flexible wire and solder it on the MTP-NT IND-Tx (isolate all solder points with shrink tubing)

MTP-NT CON-IND-TX with 45MHz carrier
Pickup head (2500kbit)

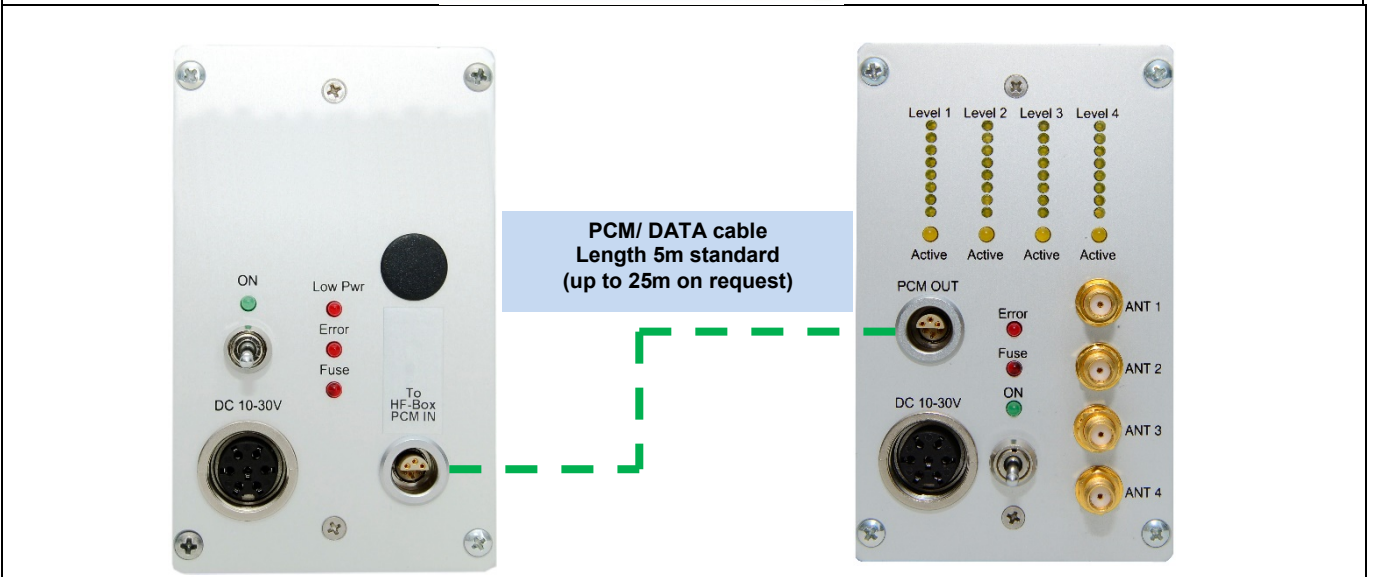
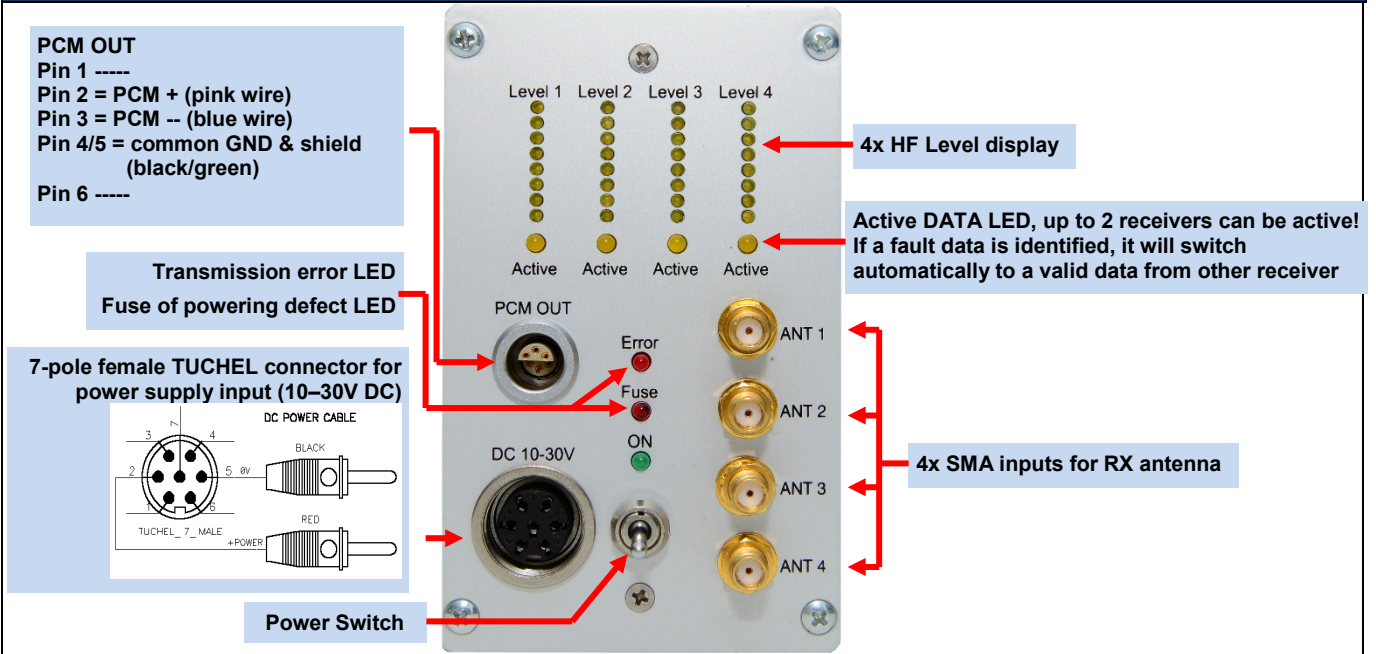


Inductive Pick-Up head mount in this position! Distance between head and Tx coil can be up to 50mm
Distance depends of application!!



CAUTION:
 If you want to install also an inductive power coil close to the data coil, the minimal distance must be >2mm! (distance between IND-DATA coil to IND-POWER coil)

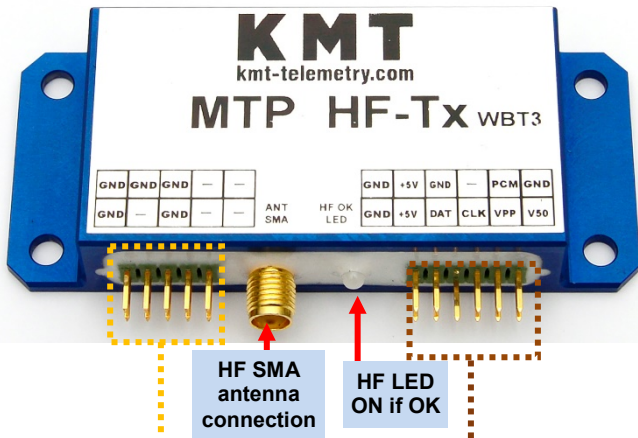
MTP-NT-DEC 8/16/32 Receiver unit for max 32 Channels output via 37 pol. Sub D
(radio transmission version with HF BOX Quad with 4 receiver 1250 ... 5000kbit)



HF BOX Quad System Parameters:

HF receivers	4
Antenna connection	SMA
Output	PCM
Power supply input:	10-30 VDC, power consumption <24 Watt
Dimensions:	205 x 105 x 65mm
Weight:	1.050 kg without cables and antenna
Environmental	
Operating:	-20 ... +70°C
Humidity:	20 ... 80% not condensing
Vibration:	5g
Static acceleration:	10g in all directions
Shock:	100g in all directions

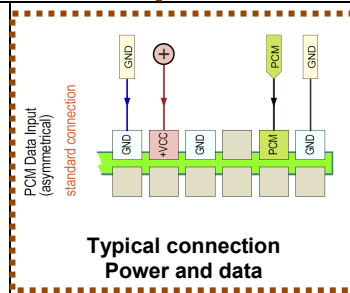
HF-TX - Radio transmitter



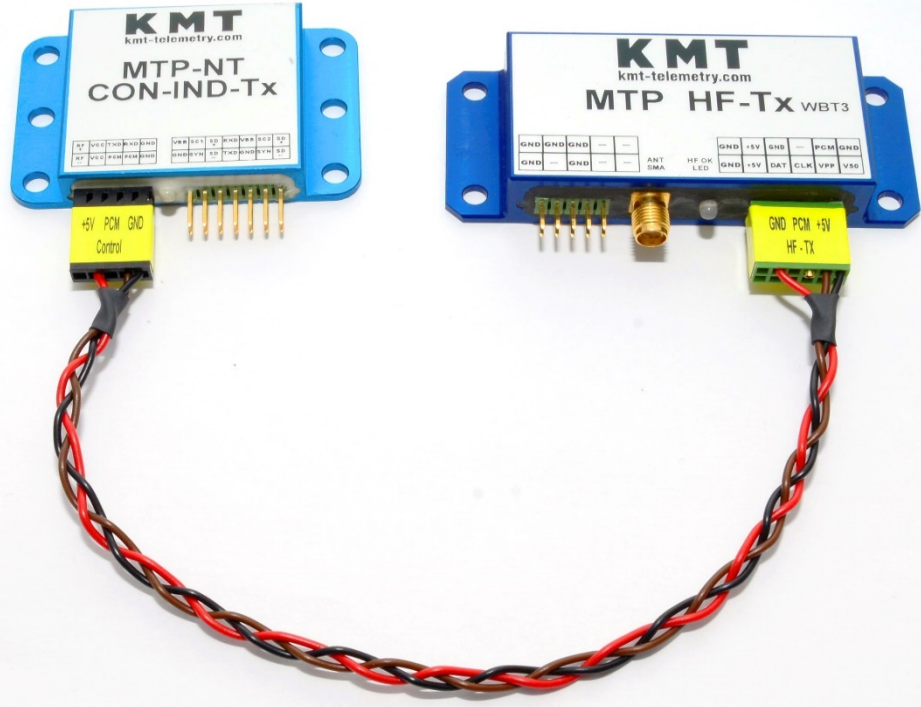
MTP-HF-TX (New version 2016) for MTP and MTP-NT

Radio data transmission transmitter
 Transmission rate 312.5, 625, 1250, 2500 and 5000kbit/s,
 Distance up to 1m (between wire antenna and receiving antenna)
 Consumption of current: 100mA
 Powering: 5V DC (powering comes via MTP-Controller)
 Vibration: 5g
 Static acceleration: 3000g
 Shock: 10000g
 Moisture protected, but not connectors!

Pins are for KMT internal use only!



Wire antenna for shaft application with SMA connector



MTP-NT-Control with MTP HF-Tx



MT32-IND-TX (Version until 2015) for MTP

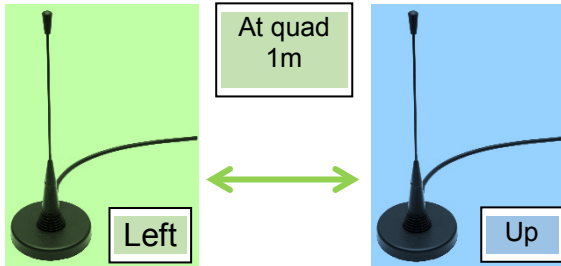
Inductive data transmission transmitter with 45MHz carrier
 Transmission rate 2500kbit/s
 Distance up to 100mm, typical 50mm (between coil and pickup)
 Consumption of current: 70mA
 Powering: 5V DC (powering comes via MTP-Controller)
 Vibration: 5g
 Static acceleration: 3000g
 Shock: 10000g
 Water **non-protected**

MTP 312.5 - 5000k Installation of the radio transmitter on a shaft
For rotating application we usually recommend an inductive transmission instead of radio transmission!



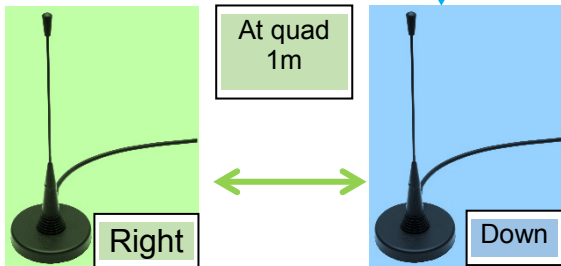
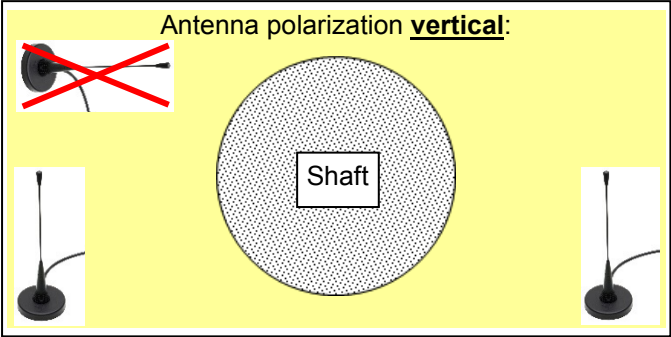
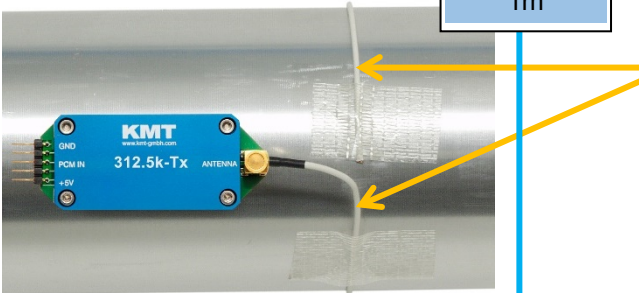
Cable Red = +5V
 Cable Black = GND (Ground)
 Cable Brown = PCM In
 Cable White = Wire antenna

All cable connections should be soldered.

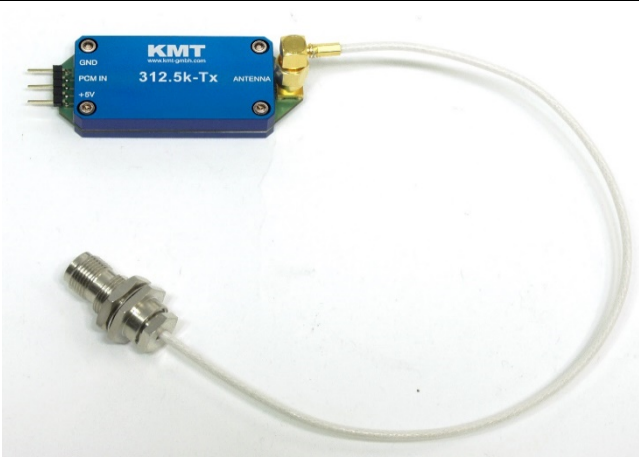


Installation of diversity antennas (2x):
 Install about 1m far from shaft,
 1x up and 1x down side

Mount the cable antenna exactly one winding around the shaft and fix all with 3 windings mounting tape – finish!
 The cable antenna can extend or shorten depending upon requires! (Isolate the solder connection, if you extend the wire antenna cable!)



Installation of quad antennas (4x):
 Install about 1m far from shaft,
 1x up and 1x down side and
 1x left and 1x right side
 About 1m distance to each other antenna



This coaxial adapter (**Tx-TNC-adapter**) makes it possible to connect an antenna with TNC connector for point to point applications. (option)



Transmitting antenna 0dB with magnetic foot (option)

Recommend position of receiving standard magnetic foot antennas if the radio transmitter antenna is mount on top of end of shaft

