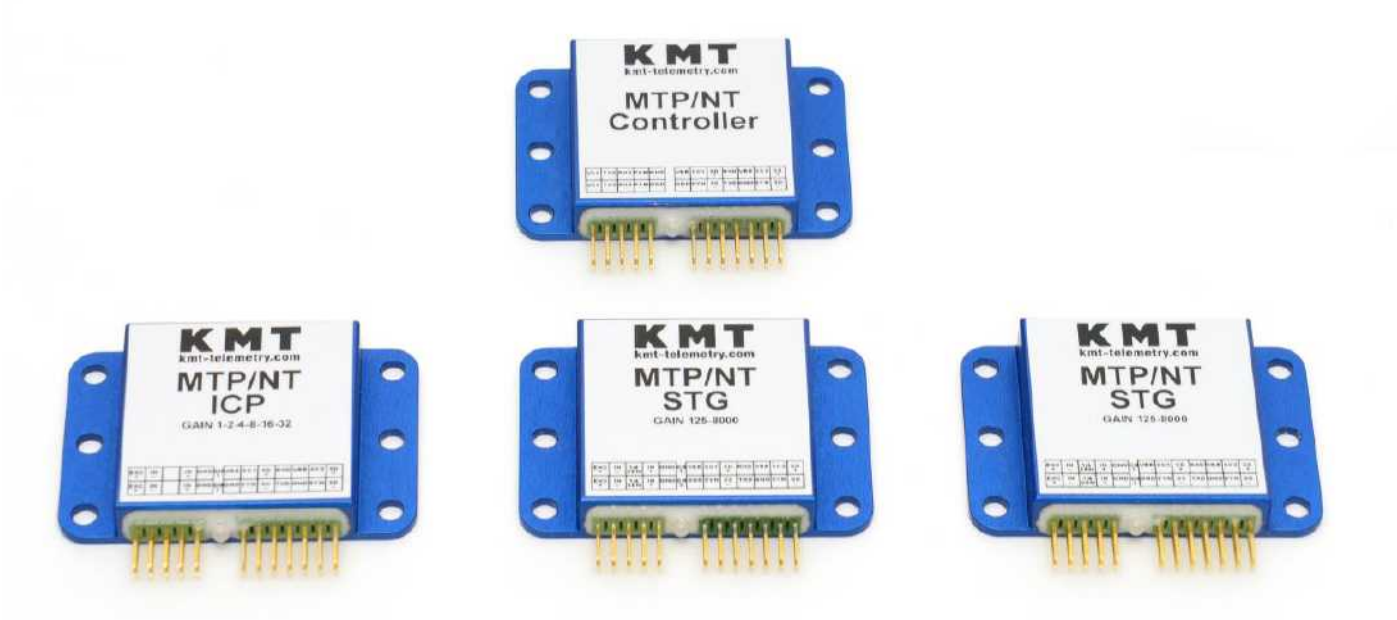
An Axiometrix Solutions Brand

imc MTP-NT

Manual

Edition 2 - 2023-11-09



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Disclaimer of liability

The contents of this documentation have been carefully checked for consistency with the hardware and software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity.

We reserve the right to make technical modifications of the systems.

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The software described in this document may only be used in accordance with the provisions of the "imc Software License Agreement".

Open Source Software Licenses

Some components of imc products use software which is licensed under the GNU General Public License (GPL). Details are available in the About dialog.

A list of the open source software licenses for the imc measurement devices is located on the imc STUDIO/imc WAVE/imc STUDIO Monitor installation medium in the folder "*Products**imc DEVICES**OSS*" or "*Products**imc DEVICEcore**OSS*" or "*Products**imc STUDIO**OSS*". If you wish to receive a copy of the GPL sources used, please contact our Hotline.

Notes regarding this document

This document provides important notes on using the device / the module. Safe working is conditional on compliance with all safety measures and instructions provided. The manual is to be used as a kind of reference book. You can skip the description of the modules you do not have.

Additionally, all accident prevention and general safety regulations pertinent to the location at which the device is used must be adhered to.

These instructions exclusively describe the device, **not how to operate** it by means of **the software**!

If you have any questions as to whether you can set up the device / module in the intended environment, please contact the imc hotline. The measurement system has been designed, manufactured and unit-tested with all due care and in accordance with the safety regulations before delivery and has left the factory in perfect condition. In order to maintain this condition and to ensure safe operation, the user must observe the notes and warnings contained in this chapter and in the specific sections applicable to the concrete device. Never use the device outside the specification.

This will protect you and prevent damage to the device.

Special notes

Warning

Warnings contain information that must be observed to protect the user from harm or to prevent damage to property.

Note

Notes denote useful additional information on a particular topic.

Reference

A reference in this document is a reference in the text to another text passage.

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1 General Notes

1.1 imc Customer Support / Hotline

If you have problems or questions, please contact our Customer Support/Hotline:

imc Test & Measurement GmbH

Hotline (Germany): **+49 30 467090-26**

E-Mail: hotline@imc-tm.de

Internet: https://www.imc-tm.com

International partners

For our international partners see https://www.imc-tm.com/imc-worldwide/.

Tip for ensuring quick processing of your questions:

If you contact us **you would help us**, if you know the **serial number of your devices** and the **version info of the software**. This documentation should also be on hand.

- The device's serial number appears on the nameplate.
- The program version designation is available in the About-Dialog.

1.2 Legal notices

Quality Management

imc Test & Measurement GmbH holds DIN EN ISO 9001 certification since May 1995 and DIN EN ISO 14001 certification since November 2023. You can download the CE Certification, current certificates and information about the imc quality system on our website: https://www.imc-tm.com/quality-assurance/.

imc Warranty

Subject to the general terms and conditions of imc Test & Measurement GmbH.

Liability restrictions

All specifications and notes in this document are subject to applicable standards and regulations, and reflect the state of the art well as accumulated years of knowledge and experience. The contents of this document have been carefully checked for consistency with the hardware and the software systems described. Nevertheless, it is impossible to completely rule out inconsistencies, so that we decline to offer any guarantee of total conformity. We reserve the right to make technical modifications of the systems.

The manufacturer declines any liability for damage arising from:

- failure to comply with the provided documentation,
- inappropriate use of the equipment.

Please note that all properties described refer to a closed measurement system and not to its individual slices.

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Guarantee

Each device is subjected to a 24-hour "burn-in" before leaving imc. This procedure is capable of detecting almost all cases of early failure. This does not, however, guarantee that a component will not fail after longer operation. Therefore, all imc devices are granted liability for a period of two years. The condition for this guarantee is that no alterations or modifications have been made to the device by the customer.

Unauthorized intervention in the device renders the guarantee null and void.

Notes on radio interference suppression

The imc MTP-NT telemetry system satisfy the EMC requirements for an use in industrial settings.

Any additional products connected to the product must satisfy the EMC requirements as specified by the responsible authority (within Europe[1]) in Germany the BNetzA - "Bundesnetzagentur" (formerly BMPT-Vfg. No. 1046/84 or No. 243/91) or EC Guidelines 2014/30/EU. All products which satisfy these requirements must be appropriately marked by the manufacturer or display the CE certification marking.

Products not satisfying these requirements may only be used with special approval of the regulating body in the country where operated.

All lines connected to the MTP-NT telemetry system should not be longer than 30 m and they should be shielded and the shielding must be grounded.

Note

The EMC tests were carried out using shielded and grounded input and output cables with the exception of the power cord. Observe this condition when designing your setup to ensure high interference immunity and low jamming.

[1] If you are located outside Europe, please refer the appropriate EMC standards used in the country of operation.

Cables and leads

In order to comply with the value limits applicable to Class B devices according to part 15 of the FCC regulations, all signal leads connected to the MTP-NT telemetry system must be shielded.

Unless otherwise indicated, no connection leads may be long leads (< 30 m) as defined by the standard IEC 61326-1. LAN-cables (RJ 45) and CAN-Bus cables (DSUB-9) are excepted from this rule.

Only cables with suitable properties for the task (e.g. isolation for protection against electric shock) may be used.

ElektroG, RoHS, WEEE, CE

The imc Test & Measurement GmbH is registered with the authority as follows:
WEEE Reg. No. DE 43368136
valid from 24.11.2005

Reference

https://www.imc-tm.com/elekrog-rohs-weee/ and https://www.imc-tm.com/ce-conformity/

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FCC-Notice

This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult our imc Hotline or an experienced technician for help.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this product that are not expressly approved by imc may void the user's authority to operate this equipment.

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1.3 Explanation of symbols

CE Conformity

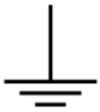
see CE chapter 1.2 6

No household waste

Please do not dispose of the electrical/electronic device with household waste, but at the appropriate collection points for electrical waste, see also chapter 1.2 6.

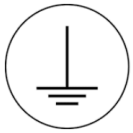
Potential compensation

Connection for potential compensation



Grounding

Connection for grounding (general, without protective function)



Protective connection

Connection for the protective conductor or grounding with protective function

Attention! General danger zone!

This symbol indicates a dangerous situation;
Since there is insufficient space for indicating the rated quantity at the measuring inputs, refer to this manual for the rated quantities of the measuring inputs before operation.

Attention! Injuries from hot surfaces!

Surfaces whose temperatures can exceed the limits under certain circumstances are denoted by the symbol shown at left.

ESD-sensitive components (device/connector)

When handling unprotected circuit boards, take suitable measures to protect against ESD (e.g. insert/remove ACC/CANFT-RESET).

Possibility of electric shock

The warning generally refers to high measurement voltages or signals at high potentials and is located on devices suitable for such measurements. The device itself does not generate dangerous voltages.

DC, Direct Current

Supply of the device via a DC voltage source (in the specified voltage range)

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RoHS of the PR China

The limits for hazardous substances in electrical/electronic equipment applicable in the PRC are identical to those in the EU. The restrictions are complied with (see chapter 1.2 6). A corresponding "China-RoHS" label is omitted for formal/economic reasons. Instead, the number in the symbol indicates the number of years in which no hazardous substances are released. (This is guaranteed by the absence of named substances).

Labeling integrated energy sources

UxxRxx are integrated in the symbolism. "U" stands for the installed UPS energy sources, if 0 = not installed. "R" stands for the installed RTC energy sources, if 0 = not installed. You can download the corresponding data sheets from the imc website: https://www.imc-tm.com/about-imc/quality-assurance/transport-instructions/

Observe the documentation

Read the documentation before starting work and/or operating.

On/Off

On/Off button (no complete disconnection from the power supply)

1.4 Document history

Additions and bug-fixes in Edition 2

Chapter	
Inductive powering	Updated description and pin configuration, currently available in a separate document. The content of this separate document "Initial operation for inductive powering" will be included in the next Edition of this manual.

1.5 After unpacking

Check the delivered system immediately upon receiving it for completeness and for possible transport damage. In case of damage visible from outside, proceed as follows:

- Do not accept the delivery or only accept it with reservations
- Note the extent of the damage on the packing documents or on the delivery service's packing list.
- Begin the claims process.

Please check the device for mechanical damage and/ or loose parts after unpacking it. The supplier must be notified immediately of any transportation damage. Do not operate a damaged device.

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2 Safety

This section provides an overview of all important aspects of protection of the users for reliable and trouble-free operation. Failure to comply with the instructions and protection notes provided here can result in serious danger.

Responsibility of the operator

The MTP-NT telemetry system is for use in commercial applications. The user is therefore obligated to comply with legal regulations for work safety.

Along with the work safety procedures described in this document, the user must also conform to regulations for safety, accident prevention and environmental protection which apply to the work site. If the product is not used in a manner specified by the manufacturer, the protection supported by the product may be impaired.

The user must also ensure that any personnel assisting in the use of the MTP-NT telemetry system have also read and understood the content of this document.

Operating personnel

This document identifies the following qualifications for various fields of activity:

- *Users of measurement engineering*: Fundamentals of measurement engineering. Basic knowledge of electrical engineering is recommended. Familiarity with computers and the Microsoft Windows operating system. Users must not open or structurally modify the measurement device.
- *Qualified personnel* are able, due to training in the field and to possession of skills, experience and familiarity with the relevant regulations, to perform work assigned while independently recognizing any hazards.

Warning

- **Danger of injury due to inadequate qualifications!**
- Improper handling may lead to serious damage to personnel and property. When in doubt, consult qualified personnel.
- Work which may only be performed by trained imc personnel may not be performed by the user. Any exceptions are subject to prior consultation with the manufacturer and are conditional on having obtained corresponding training.

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Special hazards

This segment states what residual dangers have been identified by the hazard analysis. Observe the safety notes listed here and the warnings appearing in subsequent chapters of this manual in order to reduce health risks and to avoid dangerous situations. Existing ventilation slits on the sides of the device must be kept free to prevent heat accumulation inside the device. Please operate the device only in the intended position of use if so specified.

Danger

Lethal danger from electric current!

- Contact with conducting parts is associated with immediate lethal danger.
- Damage to the insulation or to individual components can be lethally dangerous.

Therefore:

- In case of damage to the insulation, immediately cut off the power supply and have repair performed.
- Work on the electrical equipment must be performed exclusively by expert electricians.
- During all work performed on the electrical equipment, it must be deactivated and tested for static potential.

Injuries from hot surfaces!

- Devices from imc are designed so that their surface temperatures do not exceed limits stipulated in EN 61010-1 under normal conditions.

Therefore:

- Surfaces whose temperature can exceed the limits under circumstances are denoted by the symbol shown at left.

Industrial safety

We certify that the MTP-NT telemetry system in all product configuration options corresponding to this documentation conforms to the directives in the accident prevention regulations in "Electric Installations and Industrial Equipment" (DGUV Regulation 3)*. This confirmation applies exclusively to the MTP-NT telemetry system, but not to all other components included in the scope of delivery.

This certification has the sole purpose of releasing imc from the obligation to have the electrical equipment tested prior to first use (§ 5 Sec. 1, 4 of DGUV Regulation 3). This does not affect guarantee and liability regulations of the civil code.

* previously BGV A3.

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Magnetic radiation

- The MTP-NT telemetry system should only be applied by qualified personnel.
- The telemetry system (see chap. "Inductive transmission" 61) emits strong magnetic radiation at 30-60 kHz to a distance of 20 cm. Therefore, persons with cardiac **pacemakers** should not work with this telemetry system.
- Magnetic data storage media should be kept in a distance of at least 3 m from the power head to avoid data loss. The same is valid for electromagnetic sensitive parts, devices and systems.
- Do not place the telemetry system in the switched-on state near 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 should be located in the air gap of the telemetry system. The same applies to metallic parts within a radius of up to 15 to 20 mm in all directions.
- Never touch the rotating shaft itself or rotor electronic contacts during operation.

Observe notes and warnings

Devices from imc have been carefully designed, assembled and routinely tested in accordance with the safety regulations specified in the included certificate of conformity and has left imc in perfect operating condition. To maintain this condition and to ensure continued danger-free operation, the user should pay particular attention to the remarks and warnings made in this chapter. In this way, you protect yourself and prevent the device from being damaged.

Read this document before turning on the device for the first time carefully.

Warning

Before touching the device sockets and the lines connected to them, make sure static electricity is diverted to ground. Damage arising from electrostatic discharge is not covered by the warranty.

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3 Start of operation

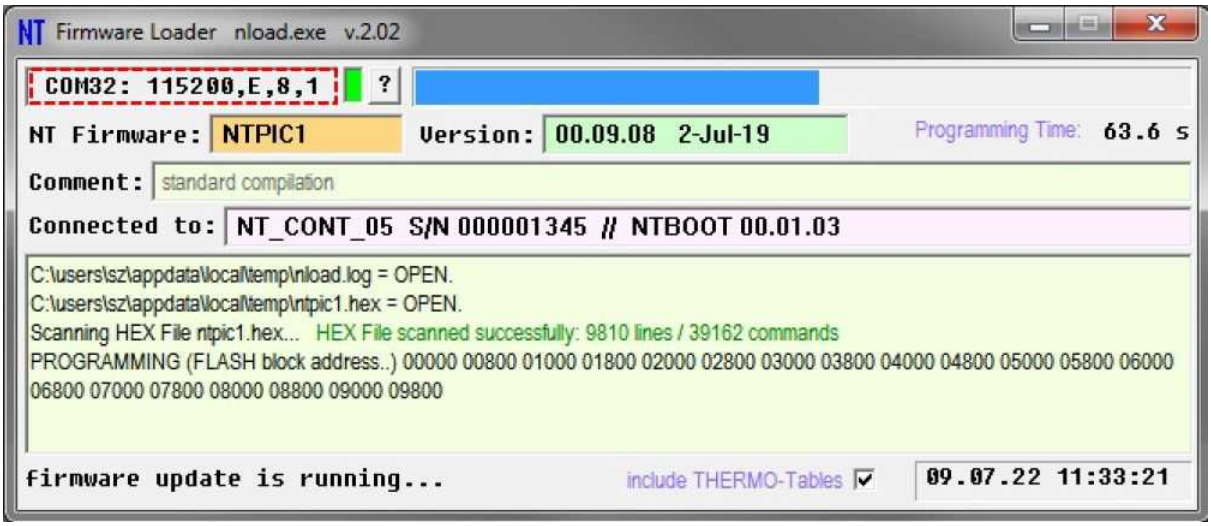
3.1 NT module firmware

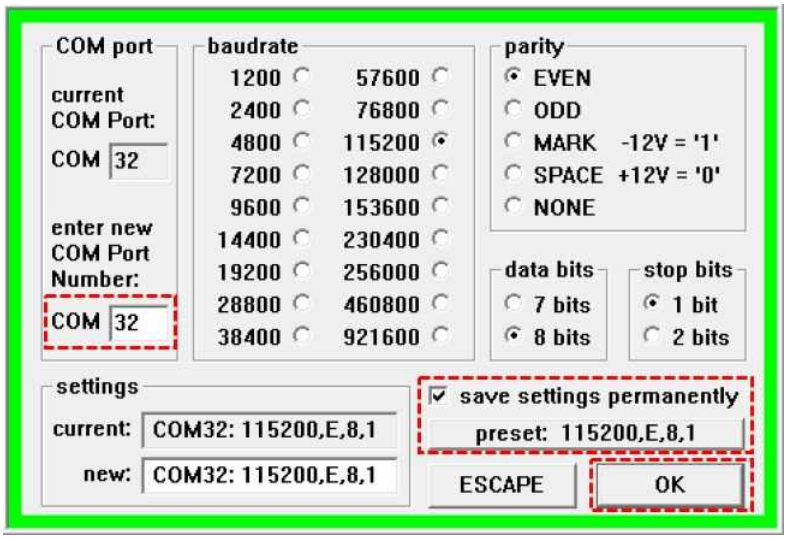
Please download the firmware setup file **nt_update.exe** from the imc web page:

https://www.imc-tm.com/download-center/product-downloads/mtp-nt/software/

MTP-NT firmware for all MTP-NT systems

All MTP-NT modules 16 are supported by the same firmware. Therefore, with one single operation a complete MTP-NT system can be updated to the latest firmware version.





To change the COM port click on the *COM port settings* box that is located on the top left corner (marked in red).

In the COM port settings window you can change the COM port number. The default communication setting for all MTP-NT systems is displayed in the Screenshot: 115200,E,8,1.

Note

This setting never has to be changed, but you must be sure that this setting is correct. In case of connection problems, you should check the Device Manager to see if the COM port used is available.

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3.2 NT configuration software

Please download the configuration software file **ntconfiginstaller.exe** from the imc web page:
https://www.imc-tm.com/download-center/product-downloads/mtp-nt/software/

Reference

Please find a detailed description of the configuration software in the chapter: "TBD".

4 MTP-NT 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 (16 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 5000 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 10 m, depends of application.

4.1 MTP-NT modules

MTP-NT-STG2

Acquisition module for 2 strain gauges

- Full or half bridge (≥120 Ω)
- Quarter bridge (120 Ω or 350 Ω)
- Fixed excitation 4 V DC
- Offset compensation by auto zero
- Manual offset shifting after auto zero
- Signal bandwidth, see chap. signal bandwidth 24
- ADC Resolution 18 bit

imc article no.: 13220263, order code: MTP-NT-STG2-SET
Set includes: acquisition module (standard housing: standard temperature range: -40 °C to +85 °C), sensor cable 500 mm with open end (2x 4-pin), bus cable for MTP-NT modules length 120 mm

MTP-NT-XVDT2

Acquisition module for 2x LVDT/RVDT sensors

- Excitation voltage 4.096 Vpp (rounded rectangle)
- Excitation frequency 8 kHz (adjustable via software)
- Sensor impedance ≥ 100 Ω (@ 8 kHz)
- Signal bandwidth, see chap. signal bandwidth 24

imc article no.: 13220170, order code: MTP-NT-XVDT2-SET
Set includes: acquisition module (standard housing: standard temperature range: -40 °C to +85 °C), sensor cable 500 mm with open end (2x 4-pin), bus cable for MTP-NT modules length 120 mm

MTP-NT-VOLT2

Acquisition module for 2x high level voltage inputs

- Input ranges ±10 to ±0.08 V
- 4 V sensor excitation max. 20 mA
- Signal bandwidth, see chap. signal bandwidth 24
- ADC Resolution 18 bit

MTP-NT-IEPE2

Acquisition module for 2 IEPE/ICP® sensors

- Excitation current EXC. 4 mA
- Input ranges 20 to ±0.3 Vpp
- Signal bandwidth, see chap. signal bandwidth 24
- ADC Resolution 18 bit

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MTP-NT-POT2

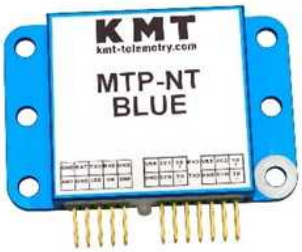
Acquisition module for 2 potentiometer sensors

- Potentiometer resistance ≥ 120 Ω
- Fixed excitation voltage: 4.0 V DC
- Input resistance: 667 kΩ
- Signal bandwidth, see chap. signal bandwidth 24
- ADC Resolution: 18 bit

MTP-NT-THERMO2

Acquisition module for 2 temperature sensors

- Sensor types:
  RTD, Thermocouple, NTC,
  (& customer-specific types)
- Inputs galvanically isolated
  (max. potential difference 32 V DC)
- Measuring range:
  -273.15 °C to +1635.2 °C
- Lowpass filter: 1 Hz to 32 Hz
  (programmable)



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: 6 to 9 V DC
- Current consumption: 37 mA (average)

* Required is the
KMT COMMUNICATOR
handheld remote control Blue-
tooth device with USB connector)

MTP-NT-CONTROLLER

Controller for 1 to 128 acquisition modules

- Output: PCM
  built-in inductive transmitter
- Programmable via RS232/USB adapter and remote software
- Power supply: 6 to 9 V DC
- Current consumption: 100 mA

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MTP-NT-RF-Tx Radio transmitter coming soon ➢ RF output power: 10 mW / 50 mW ➢ Modulation: FM (GMSK) ➢ Frequencies: 300 MHz up to S-Band* ➢ Data rates: 300 kBit/s to 10 Mbit/s* ➢ Modulation input: TTL and RS422 ➢ Power supply: 5 to 9 V DC ➢ Current consumption: 100 mA *depends on version	 **MTP-NT-ANALOG2** Two Channel Acquisition Module for: strain gauges*, high level voltage signals*, potentiometer sensors*, IEPE/ICP® sensors*, Sensor supply (12 V typ.) *The functionality is programmable by the NT control software: *ntconfig.exe*. imc article no.: 13220141, order code: MTP-NT-ANALOG2-SET Set includes: acquisition module with sensor supply for 2 channels for VOLT, IEPE, STG, POT (standard housing: standard temperature range: -40 °C to +85 °C), sensor cable 500 mm with open end (2x 4-pin), bus cable for MTP-NT modules length 120 mm

Common characteristics / Environment			
Dimension	60 x 40 x 10 mm		
Weight	42 g		
Vibration (random)	0.1 g²/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	100 %

Table 1: Common specifications of MTP-NT modules

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4.1.1 Pin configuration

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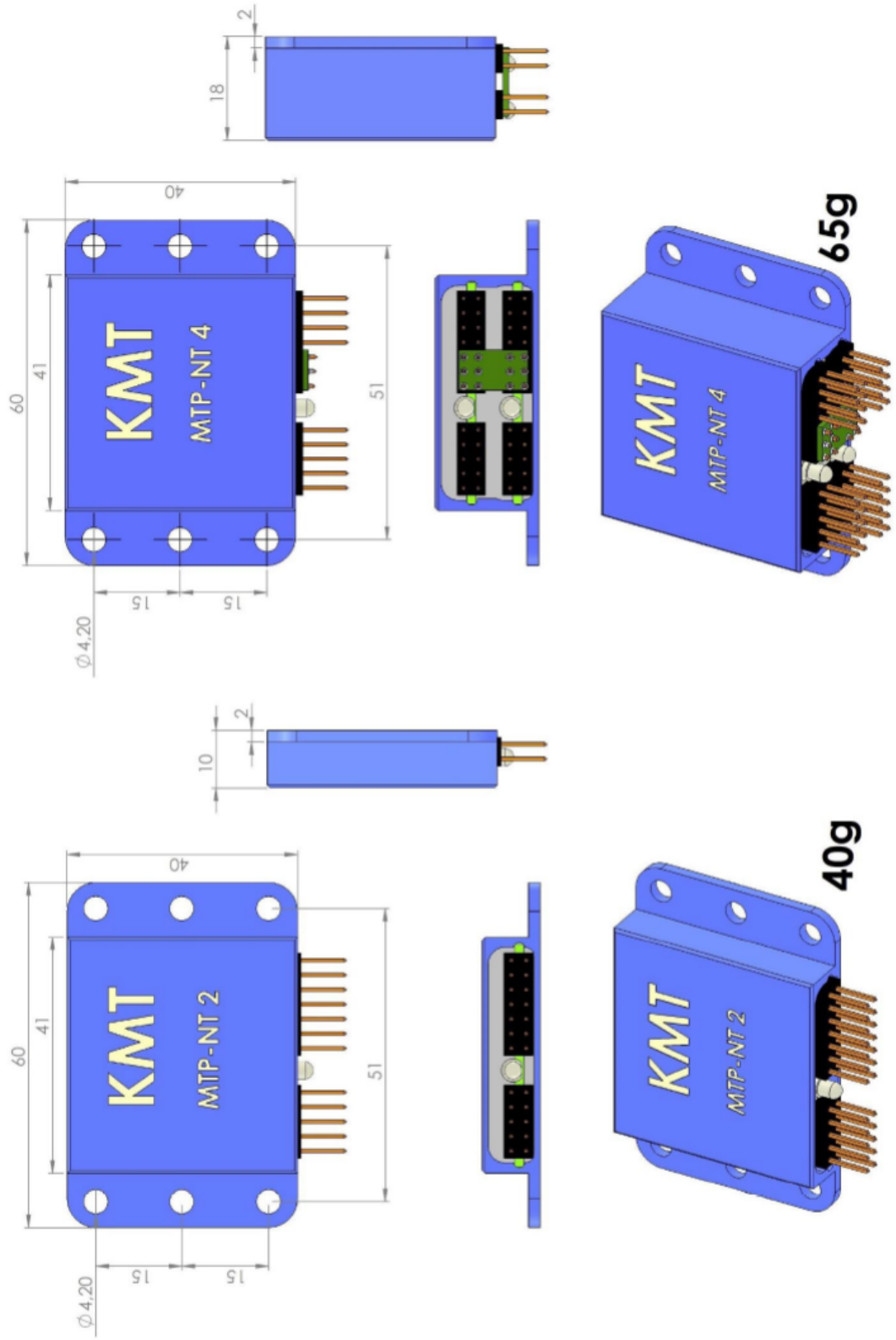
4.1.2 Housing dimensions and weight of the modules



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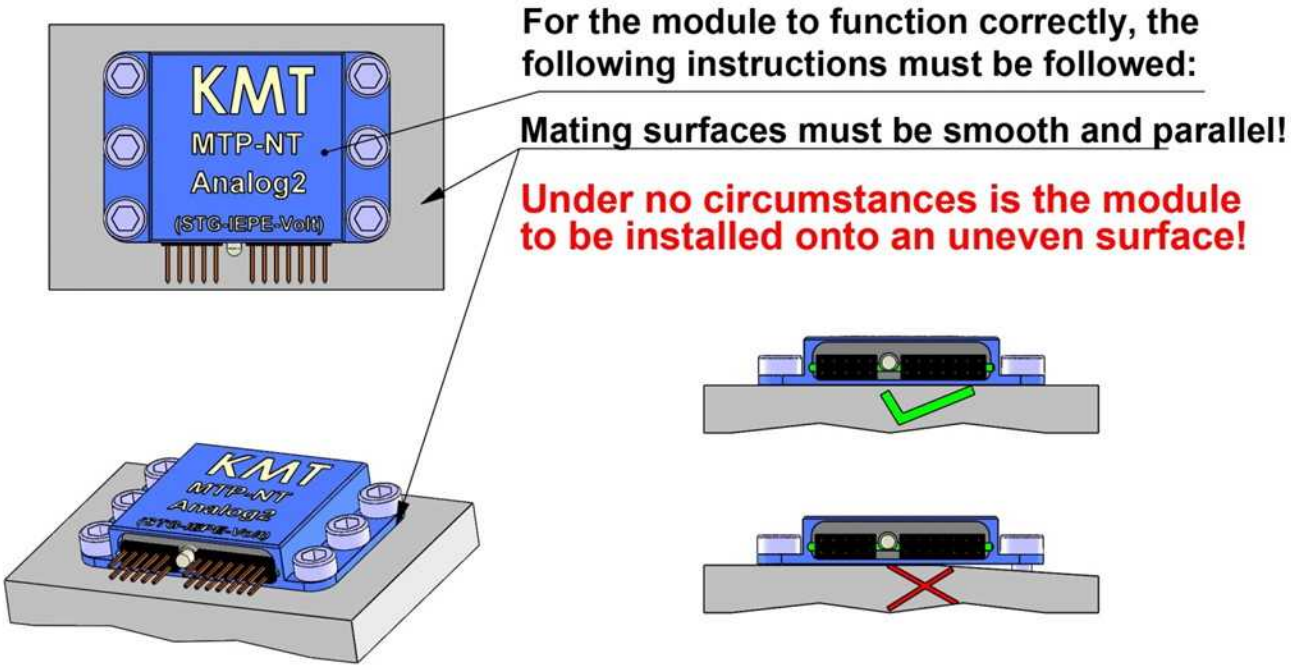
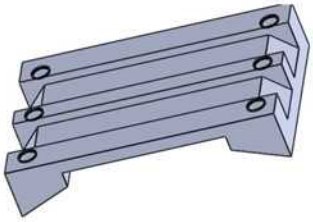
4.1.3 Mounting plates for MTP-NT modules

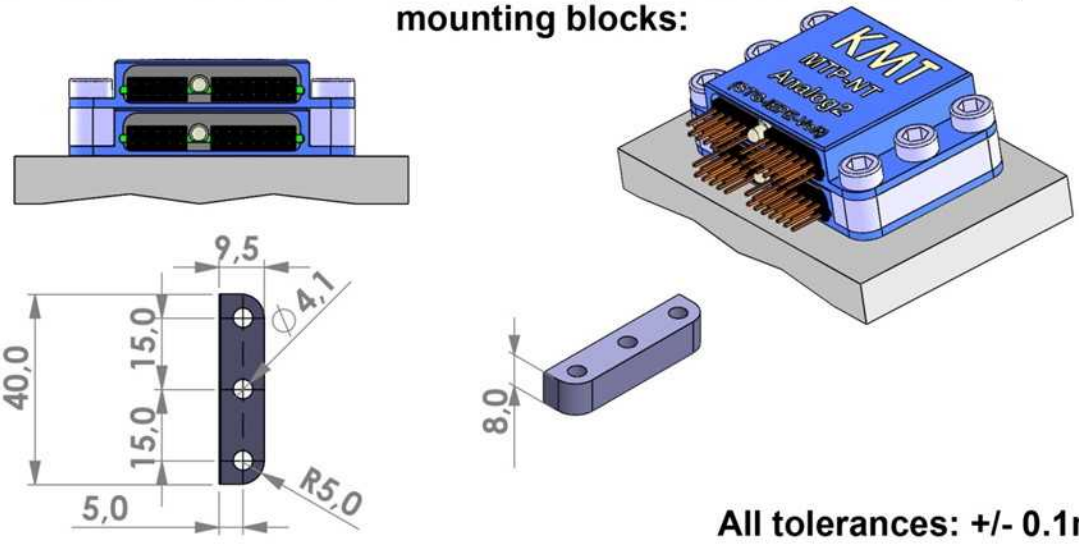


We recommend M4 stainless steel screws with Nord-Lock® locking washers. Tightening torque should be (min.) 2.5 Nm to (max.) 3.0 Nm.

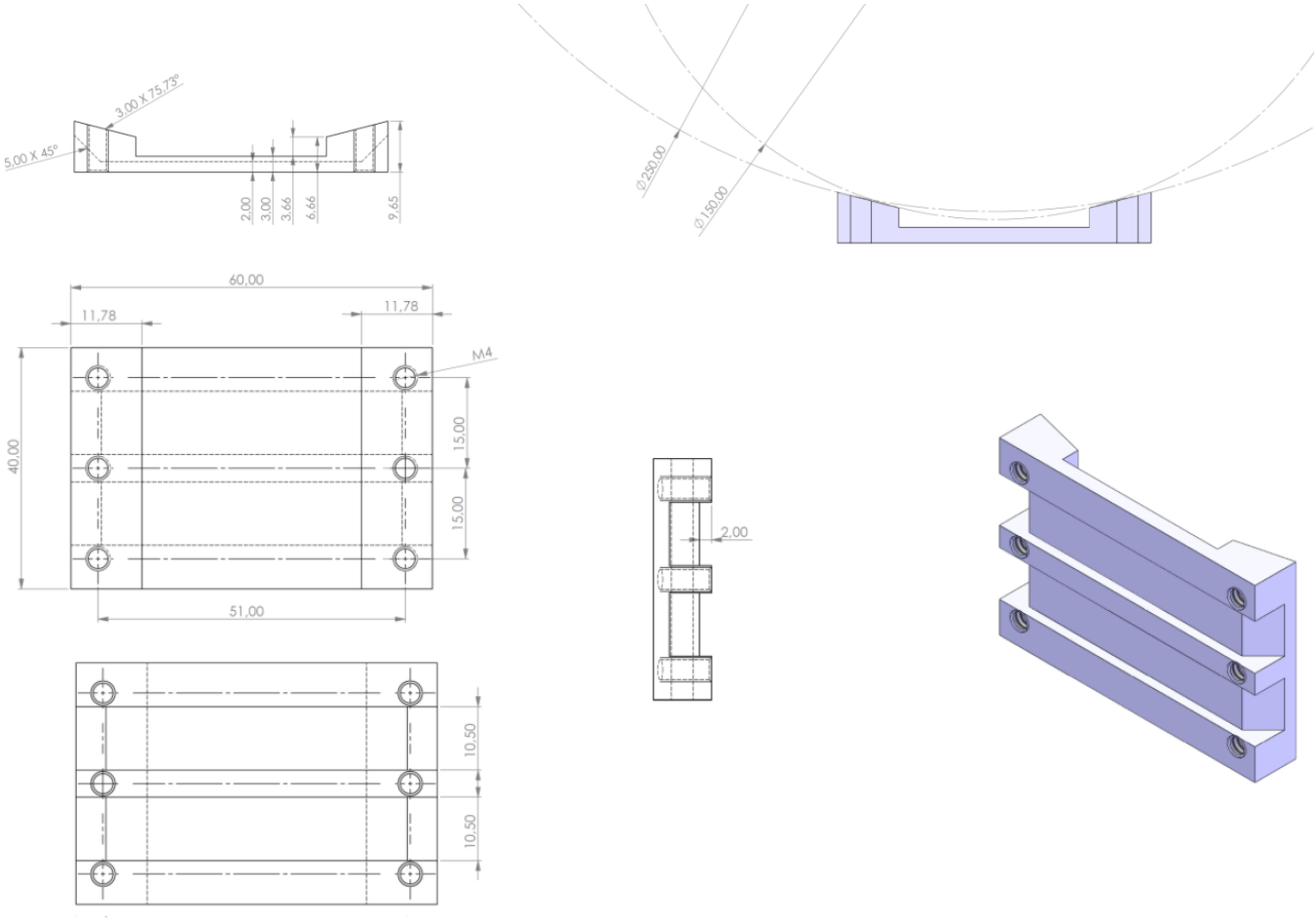
For mounting onto shafts, we recommend using a KMT mounting plate:



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



Mounting plates example for shaft diameters 100-200 or 150-250 mm



4.2 Signal bandwidth and sampling rates

Bandwidth (-3 dB) and sampling rate (red)								
Bit rate	2 CH	4 CH	8 CH	16 CH	32 CH	64 CH	128 CH	256 CH
5 Mbit/s	--	24 kHz (62.5 kHz)	12 kHz (31.25 kHz)	6 kHz (15.63 kHz)	3 kHz (7.8 kHz)	1.5 kHz (3.9 kHz)	750 Hz (1.95 kHz)	375 Hz (976.56 Hz)
2.5 Mbit/s	24 kHz (62.5 kHz)	12 kHz (31.25 kHz)	6 kHz (15.63 kHz)	3 kHz (7.8 kHz)	1.5 kHz (3.9 kHz)	750 Hz (1.95 kHz)	375 Hz (976.56 Hz)	190 Hz (488.28 Hz)
1.25 Mbit/s	12 kHz (31.25 kHz)	6 kHz (15.63 kHz)	3 kHz (7.8 kHz)	1.5 kHz (3.9 kHz)	750 Hz (1.95 kHz)	375 Hz (976.56 Hz)	190 Hz (488.28 Hz)	95 Hz (244.14 Hz)
625 kbit/s	6 kHz (15.63 kHz)	3 kHz (7.8 kHz)	1.5 kHz (3.9 kHz)	750 Hz (1.95 kHz)	375 Hz (976.56 Hz)	190 Hz (488.28 Hz)	95 Hz (244.14 Hz)	--
312.5 kbit/s	3 kHz (7.8 kHz)	1.5 kHz (3.9 kHz)	750 Hz (1.95 kHz)	375 Hz (976.56 Hz)	190 Hz (488.28 Hz)	95 Hz (244.14 Hz)	--	--

Table 2: Signal bandwidth and sampling rates

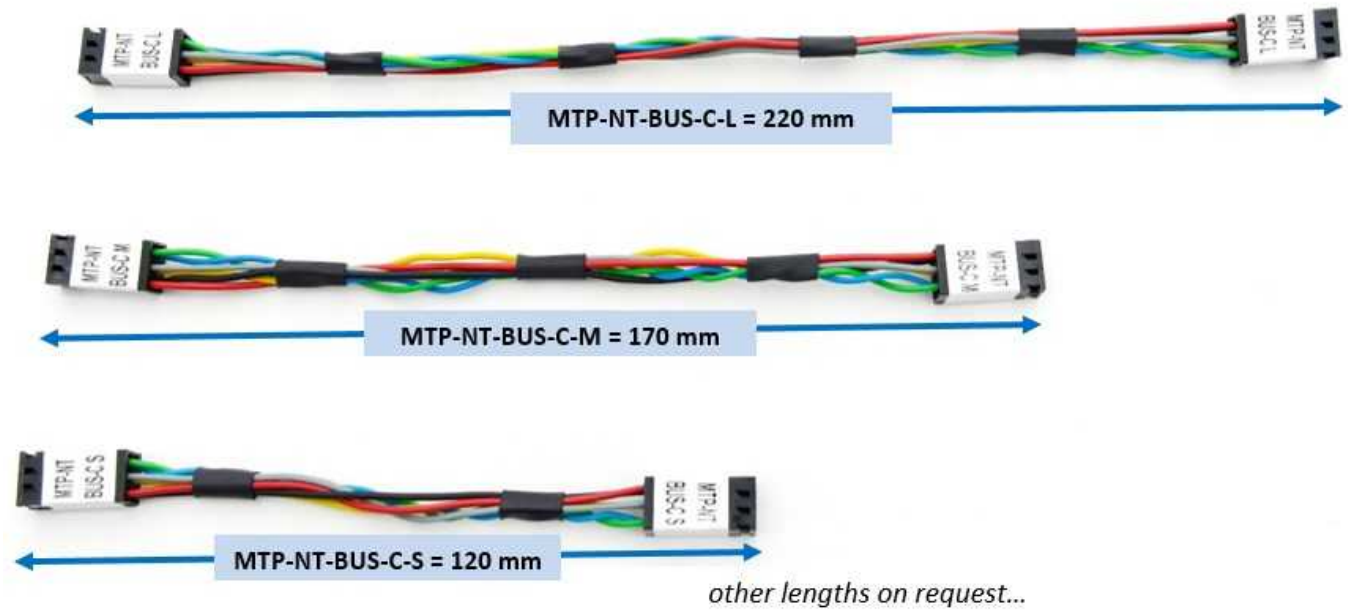
Information about the data resolution

Note Encoder

- The resolution of the A/D converter and the data handling within the NT module system is 18 bits.
- The PCM data stream is currently 16 bit wide.

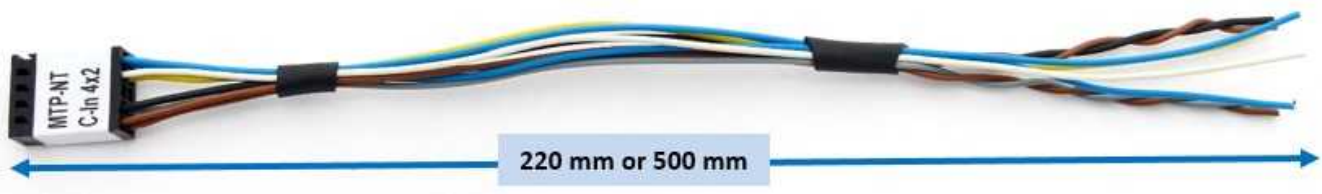
4.3 Connection cables

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



4.3.2 Sensor cable with open end

Sensor cable with open end (2x 4-pin, STG or POT)



MTP-NT-C-In-4x2

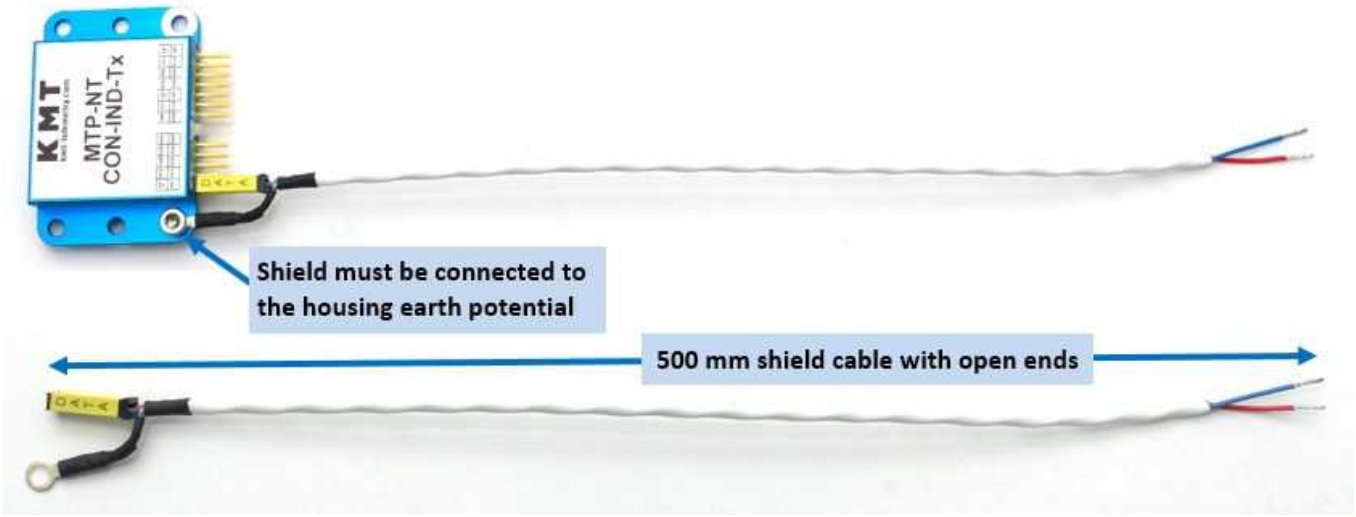
Signal cable 220 mm with open ends (2x 2-pin, VOLT or IEPE)

MTP-NT-C-In-2x2

Cut the cables to your required length.

4.3.3 Data cable

Data coil cable 500 mm with open ends, shielded



MTP-NT-C-D-COIL-500

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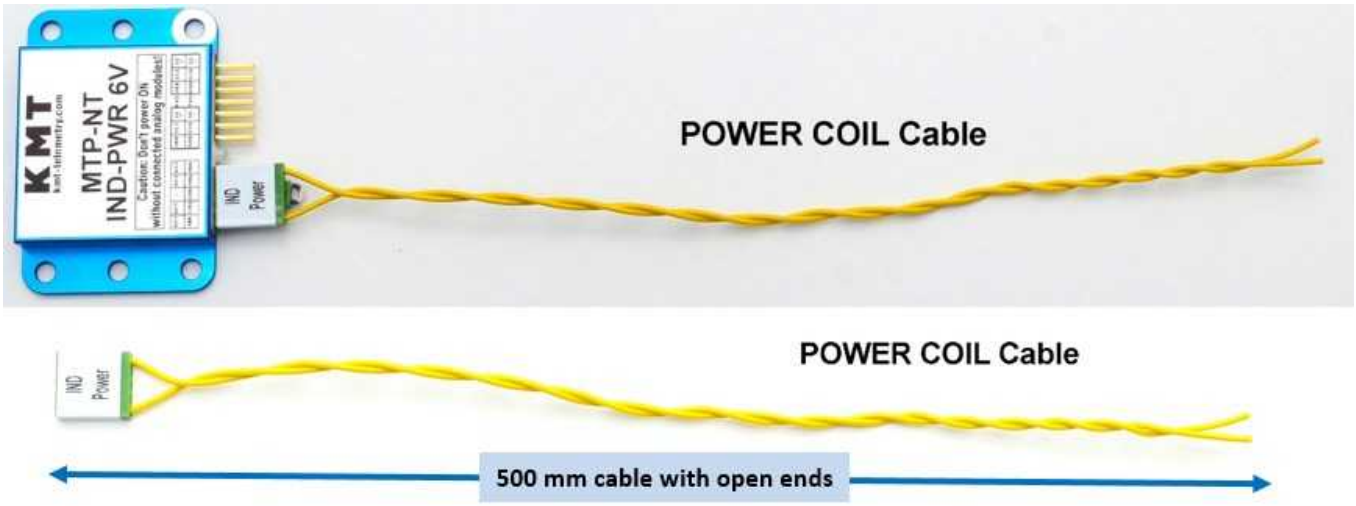
4.3.4 Power cable

Power coil cable 500 mm with open ends



MTP-NT-C-P-COIL-500

Note

Cut the cables to your required length.

4.3.5 RS 232

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

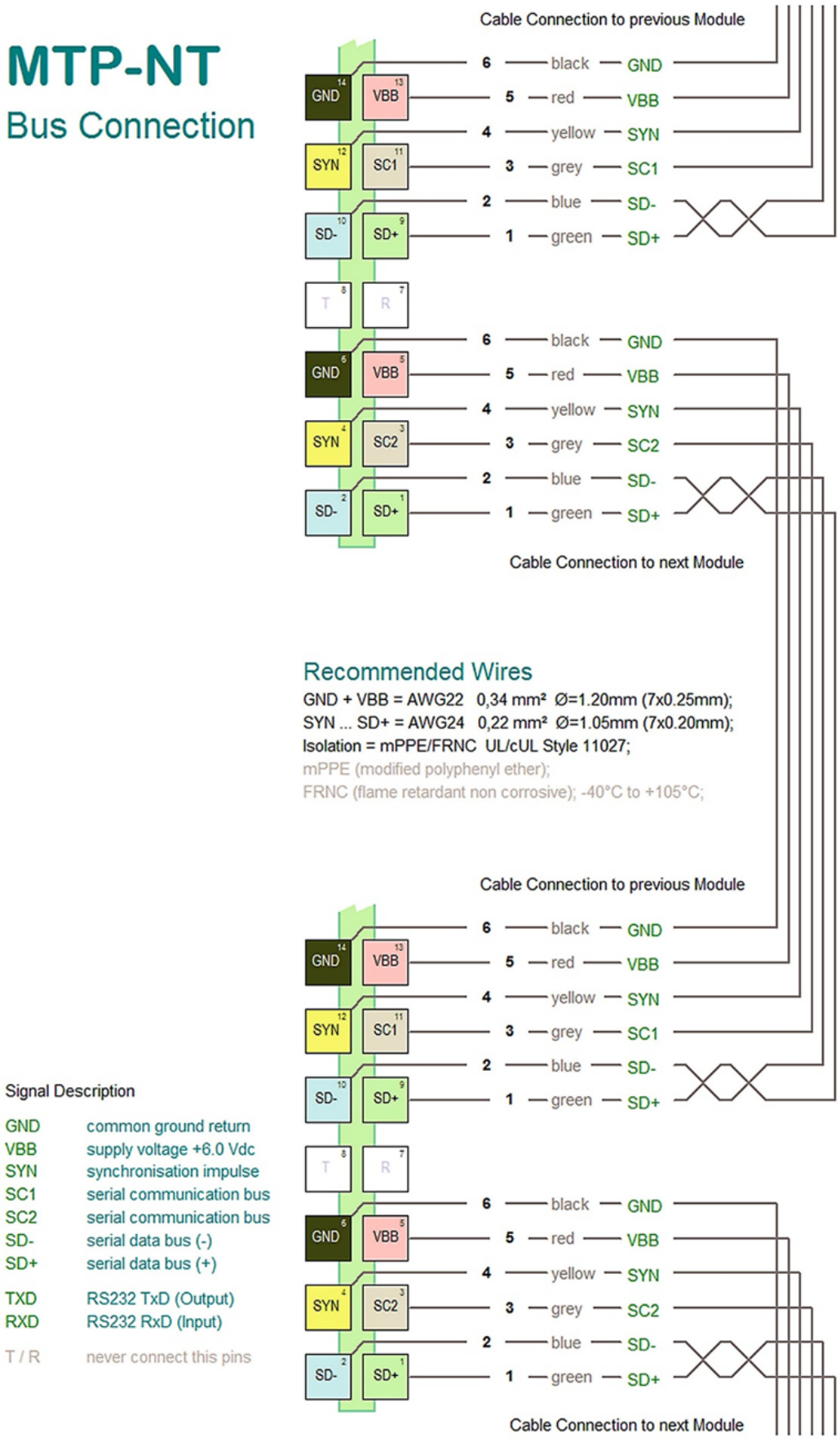
RS232/USB adaptor

MTP-NT-Config-C

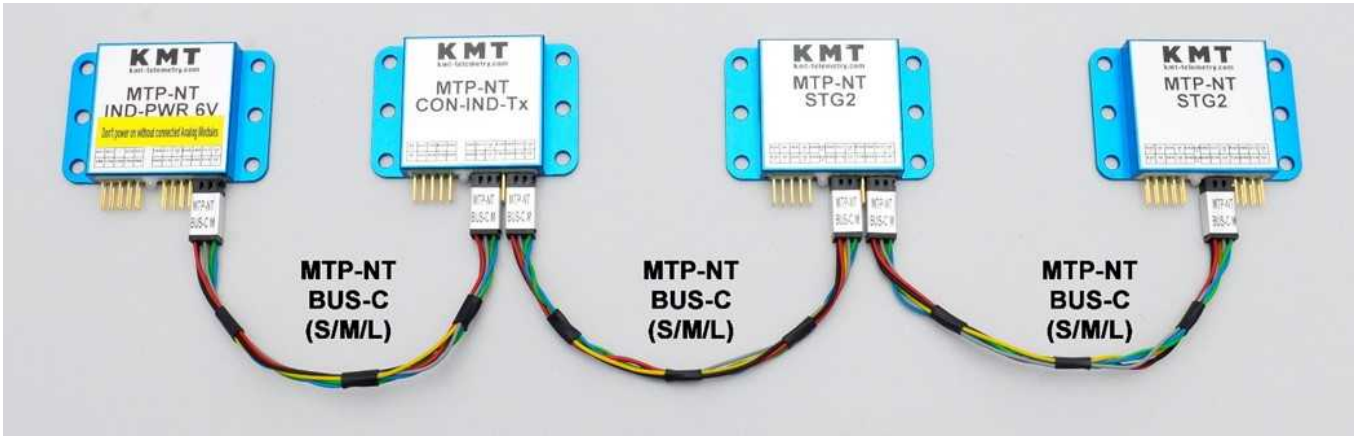
Hinweis

The USB adaptor ist not compatible with Windows 11.

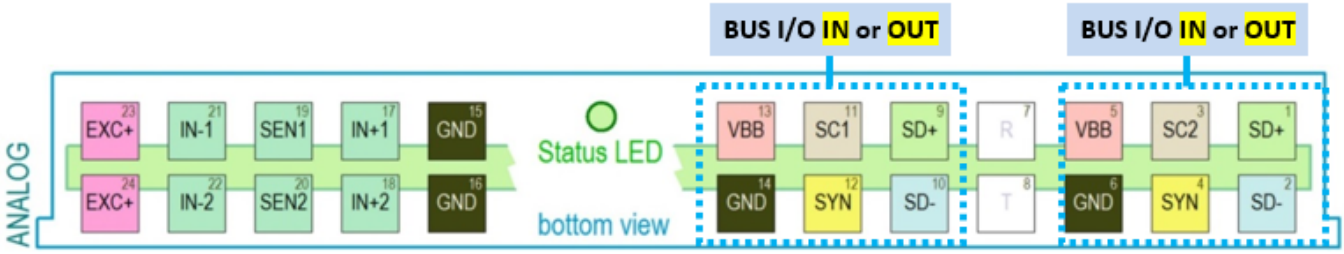
4.4 MTP-NT Bus connection



4.4.1 2 or 4 channel modules



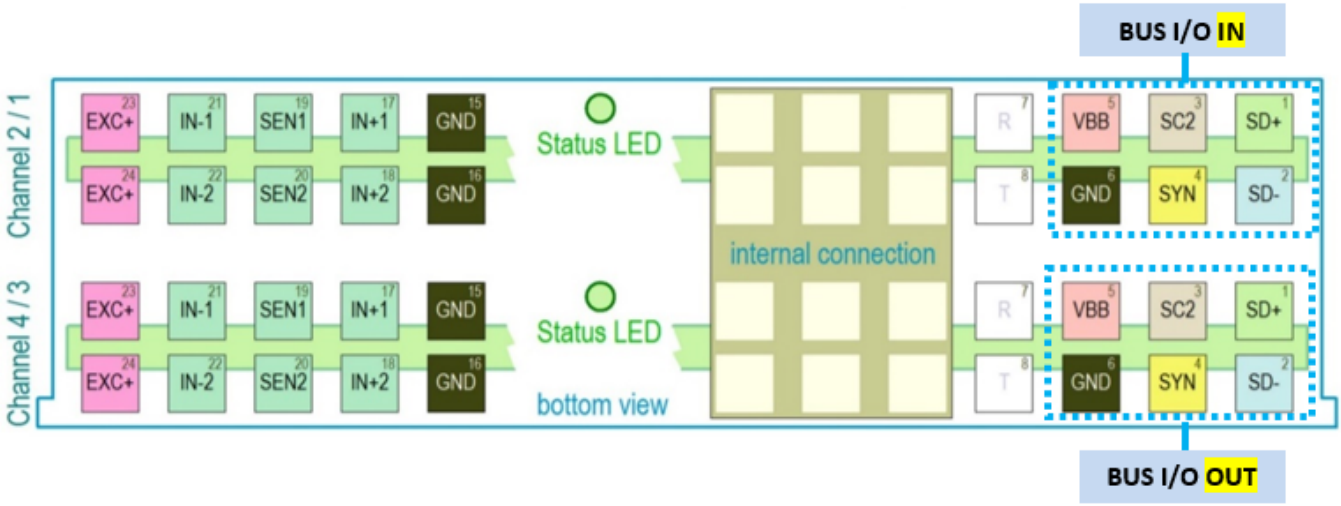
connection scheme 2 channel



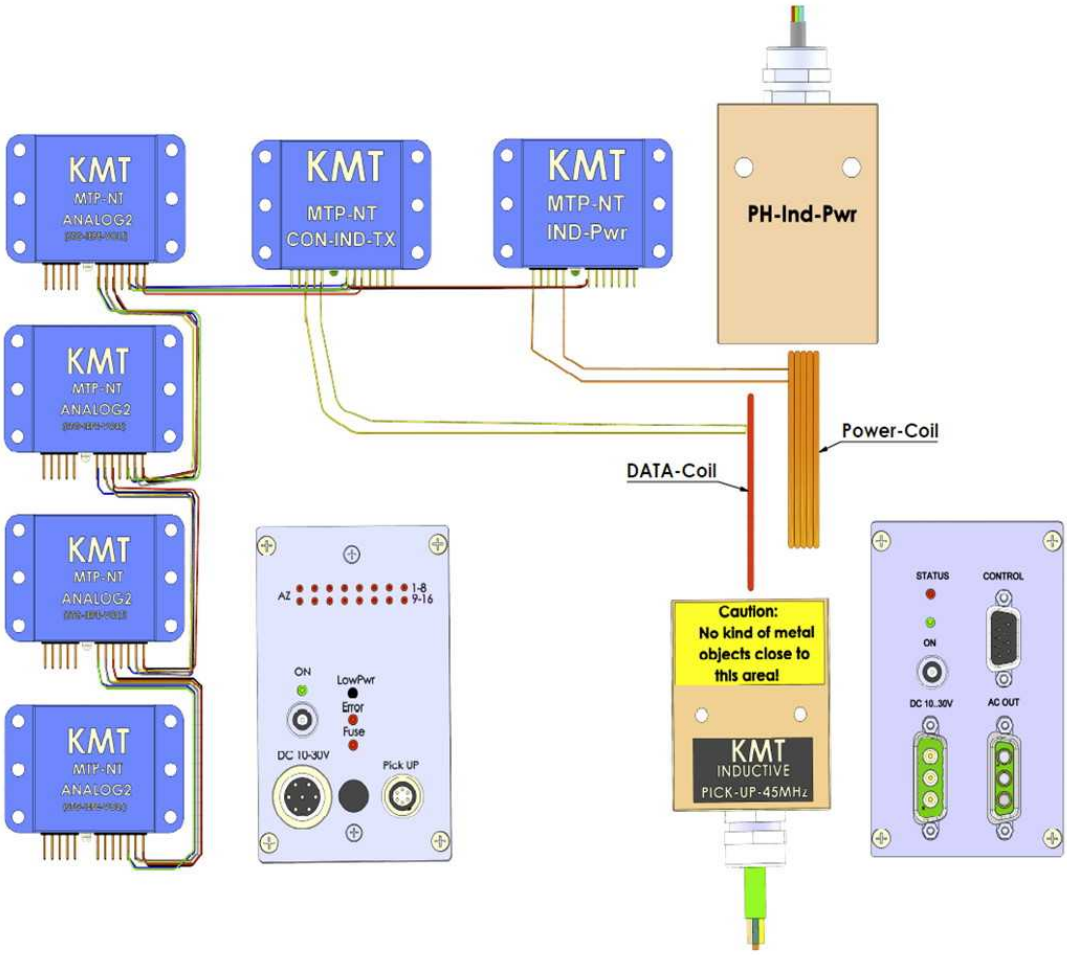
Note

IN means: bus cable is coming from the direction of the controller.
OUT means: bus cable goes in the direction of the other modules.

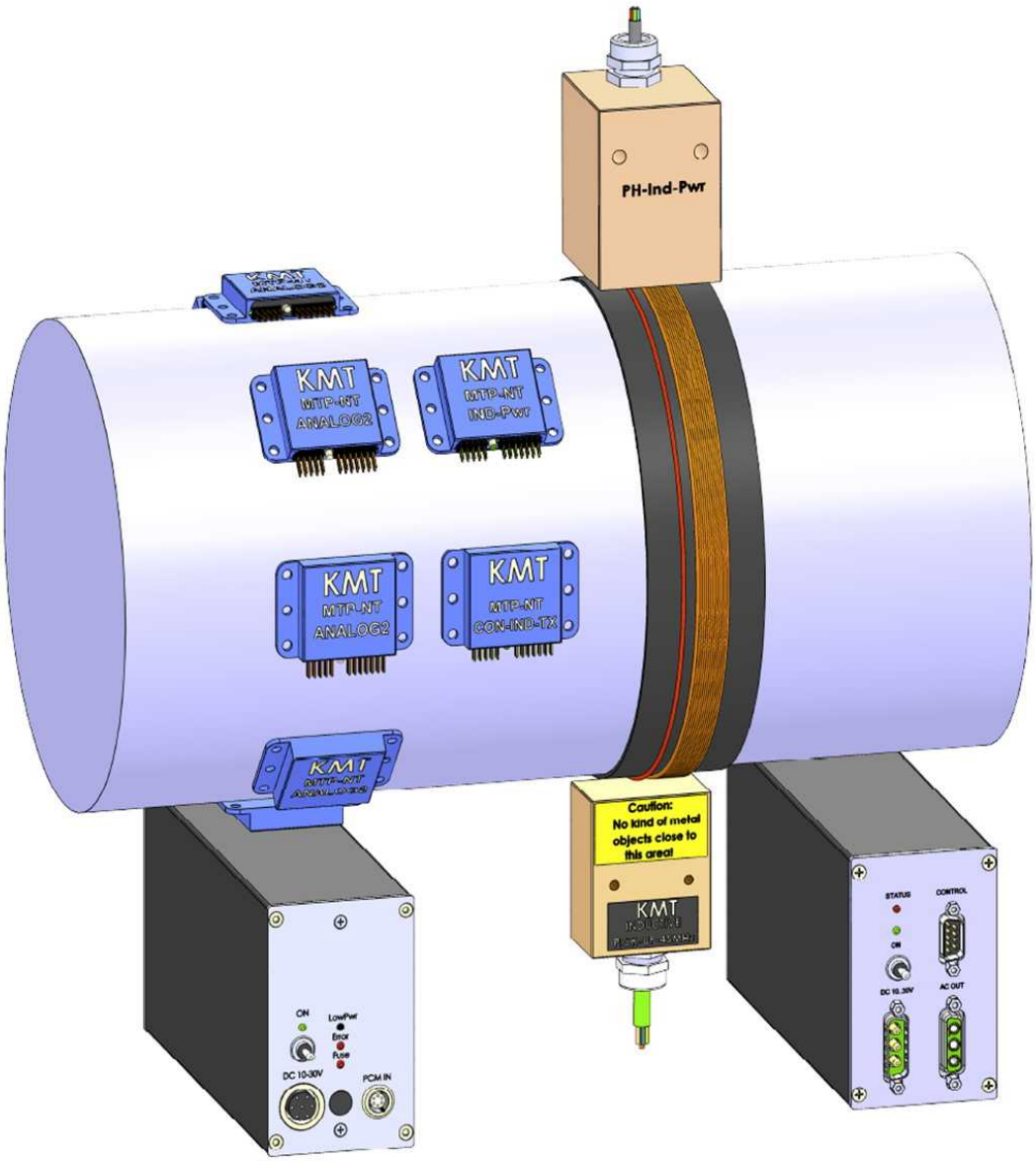
connection scheme 4 channel version



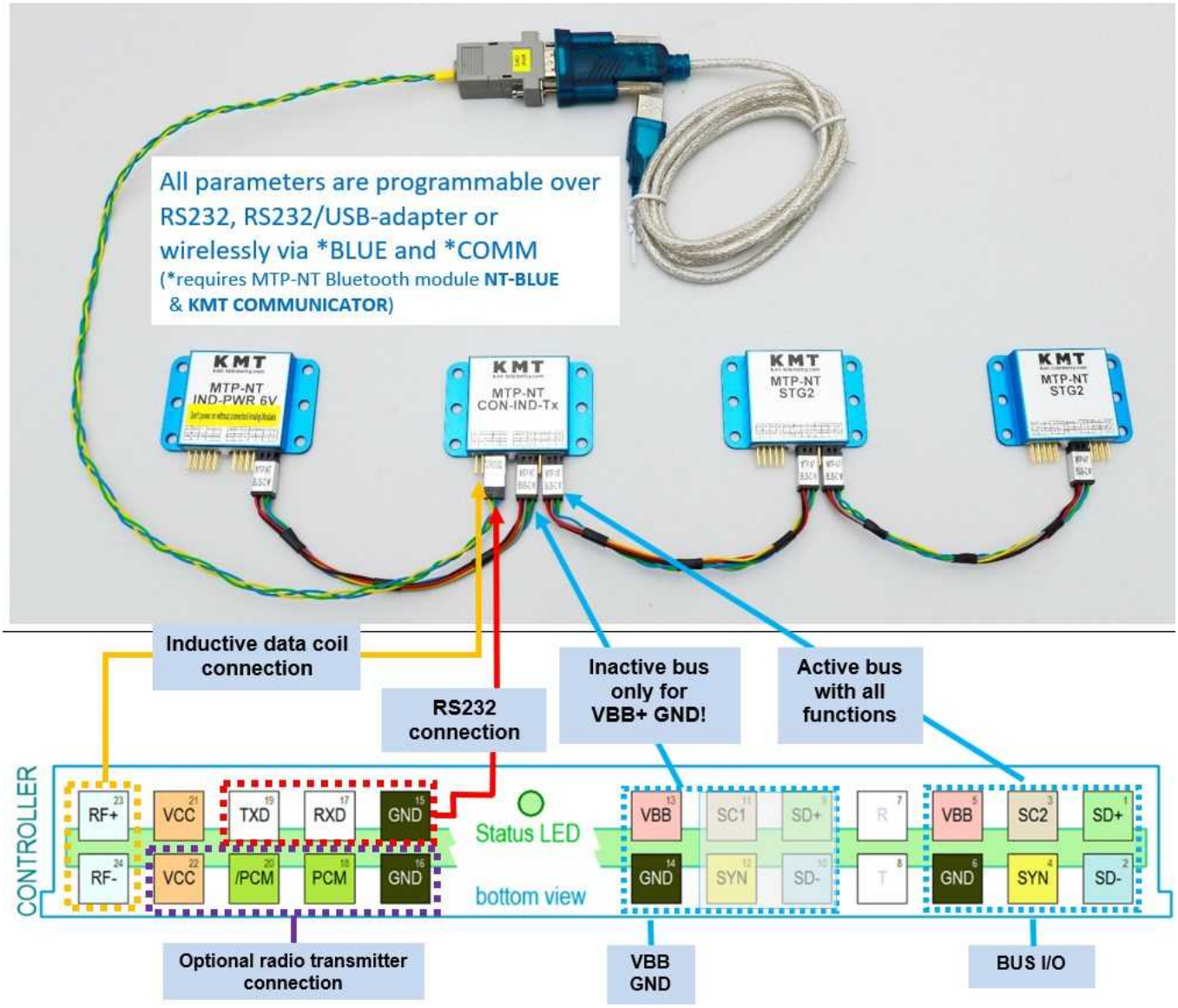
4.5 Block diagram



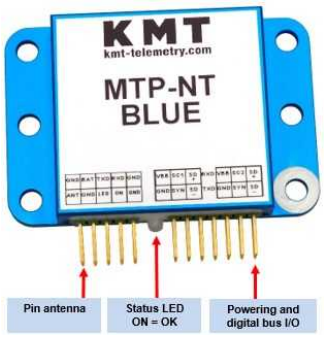
Installation on a shaft



4.6 Settings of parameters of MTP-NT-Controller



4.7 Wireless solutions



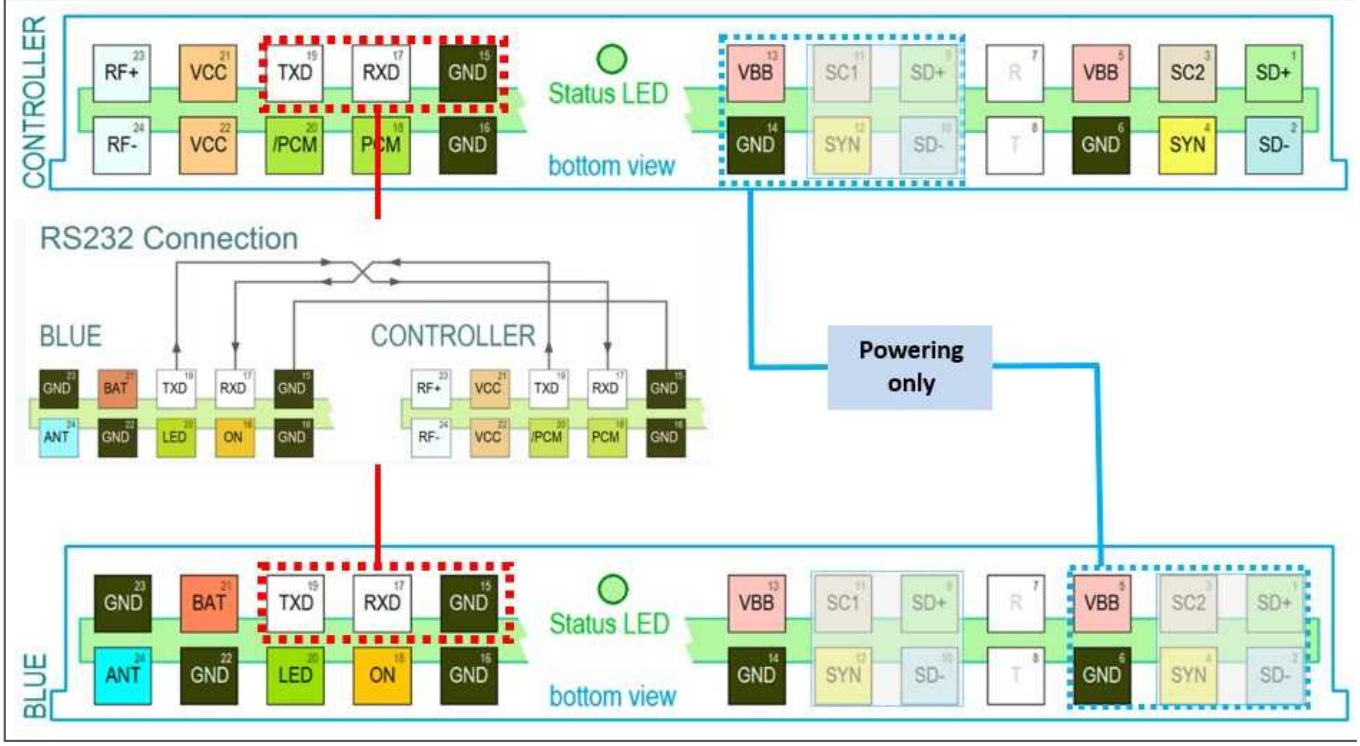
MTP-NT-BLUE

Bluetooth module to transfer RS232 wirelessly*

*requires the KMT communicator (handheld remote control Bluetooth device with USB connector)

- Remote On/Off*
- Range 5 to 20 m
- Power supply: 6 to 9 V DC
- Current consumption: 37 mA (average)
  standby mode: 15 mA (average)

*concerns battery powered versions



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4.7.1 KMT Communicator

Device for a 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 (2 Hz) = 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!

length x width x height: 144 mm x 78 mm x 35 mm
weight: 210 g

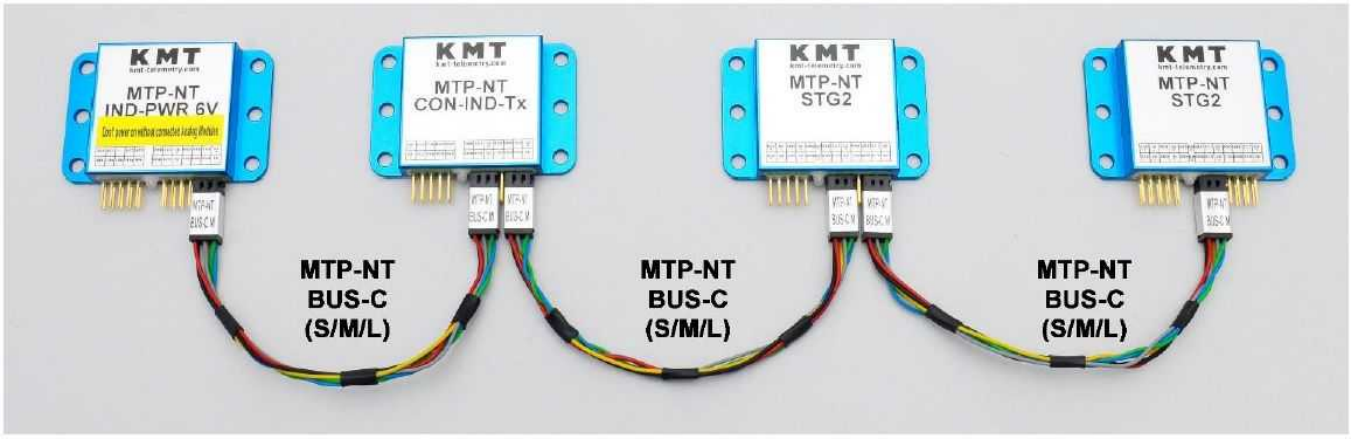
Micro-AB USB Receptacle for powering and communication to PC

Connected to PC or notebook

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.

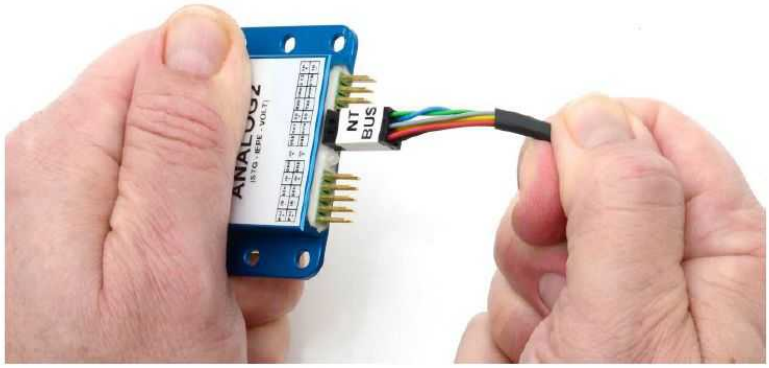
4.8 Daisy-chain connection (bus cable)

Easy to connect - with the same MTP-NT-BUS-C cable

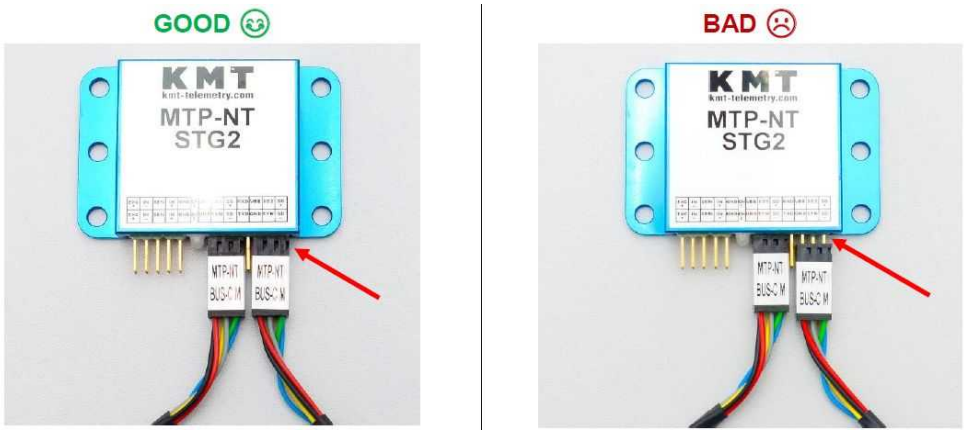


The bus is expandable to several meters.

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



Caution: Locking-Clip must be completely connected!

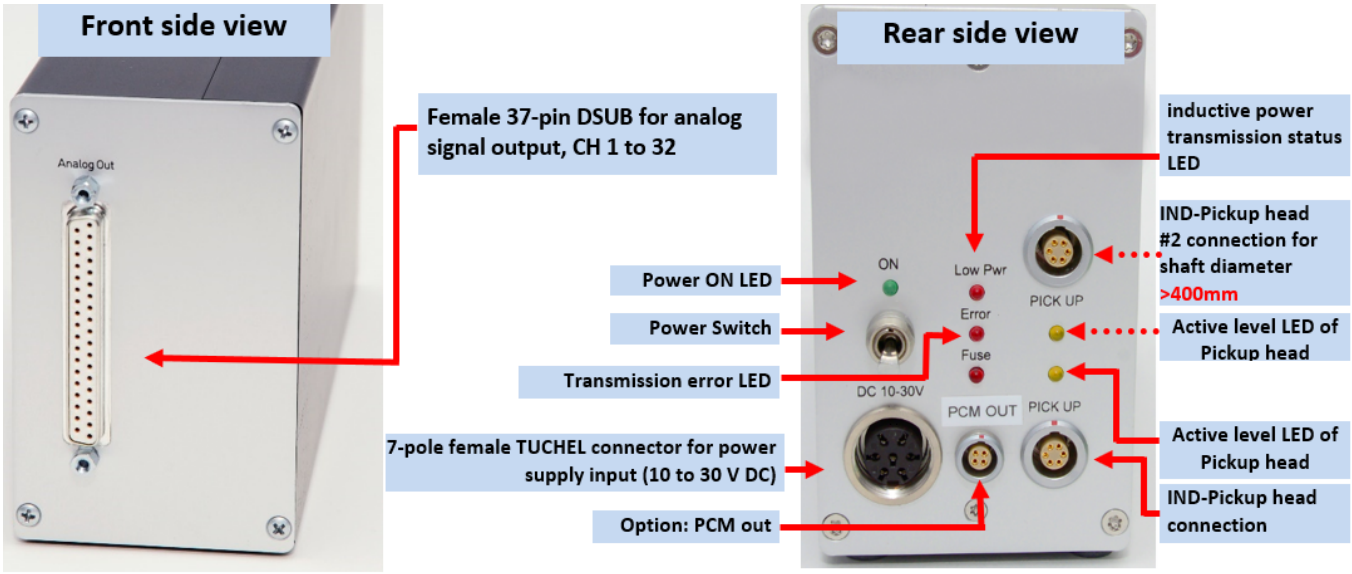


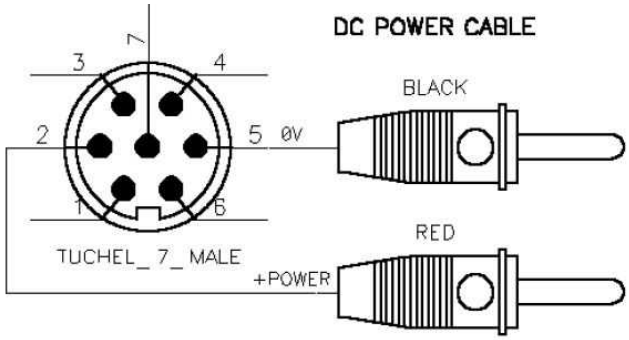
5 Decoder

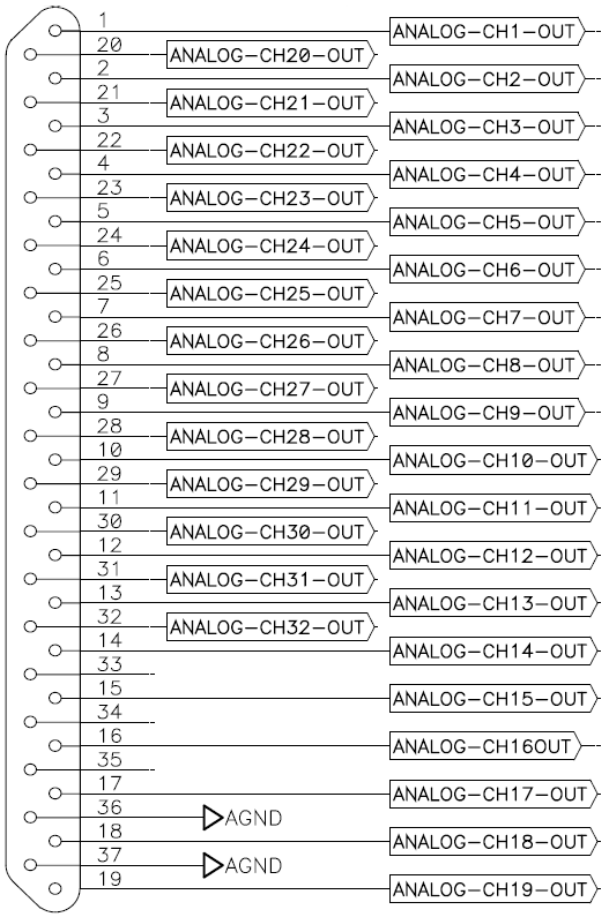
5.1 Analog Decoder: MTP-NT-DEC8CH/16CH, 24CH, 32CH

Receiver unit for max. 32 channels; output via DSUB-37

Inductive transmission 45 MHz version up to 5000 Mbit (10000 Mbit on special request)







Technical Specs: MTP-NT-DEC8CH/16CH, 24CH, 32CH

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

Table 3: Technical Specs: MTP-NT-DEC8CH/16CH, 24CH, 32CH

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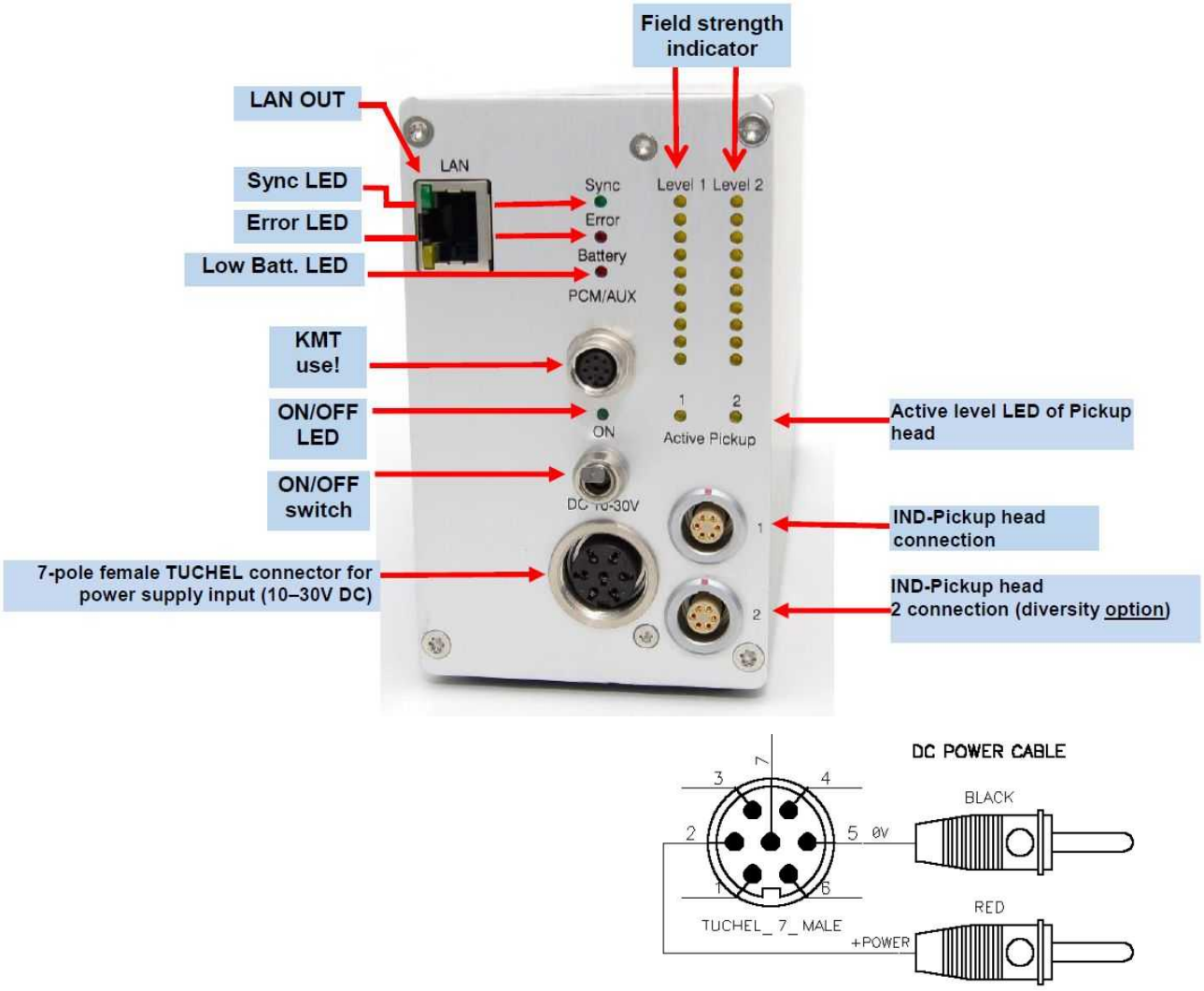
5.2 Digital Decoder: MTP-NT-DIG-DEC-V2



Technical Specs: MTP-NT-DIG-DEC-V2

Parameter	Value	Remarks
Channels	2-256	Ethernet outputs via LAN
Power supply input	10 to 30 V DC	
Power consumption	<24 W	
Dimensions	205 x 105 x 65 mm	
Weight	0.99 kg	without cables and data pickup head
Overall measurement error (sensor input → decoder output)	<0.1%	without sensor influences
Environmental		
Operating	-20°C to +70°C	
Humidity	+80% not condensing	at +20°C
Vibration	5 g	
Static acceleration	10 g	in all directions
Shock	100 g	in all directions

Table 4: Technical Specs: MTP-NT-DIG-DEC-V2

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5.2.1 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.
- Those 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: [incoming digital value] - 32768 = [bipolar value]

Example

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 V
- applied input voltage = +10 V
- digital value (unsigned short) = 65472
- bipolar value = 32704

Temperature measurement:

The digital output resolution is 0.05 K/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

Note

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.

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Analog Decoder output

The bipolar full scale value (±32704) generates an analog output voltage of ±10 V.

Analog Decoder output (Temperature Values):

The 10 V analog full scale 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 V 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**	(±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

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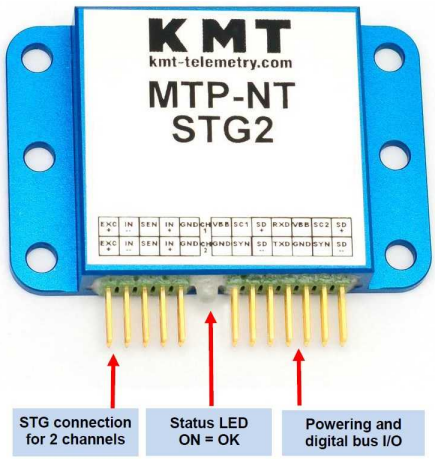
6 Measurement types

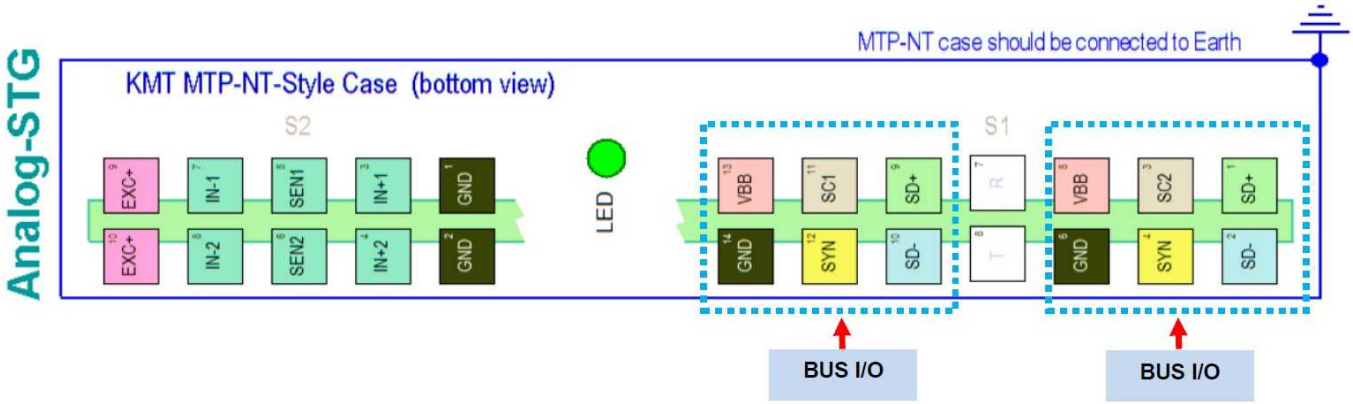
6.1 MTP-NT-STG2 - measuring bridges



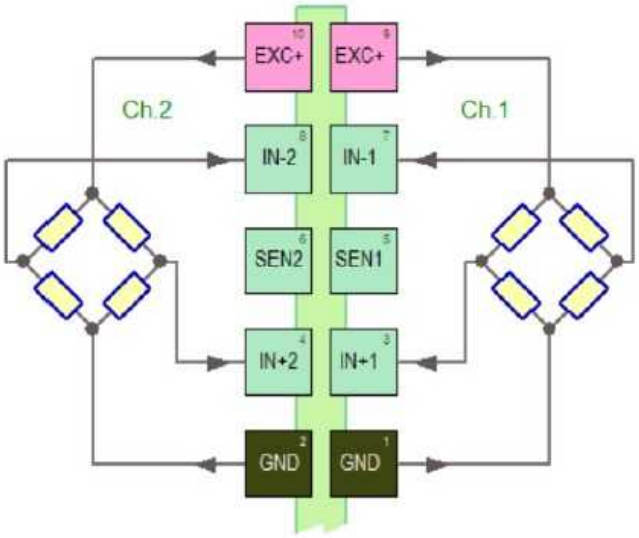
Acquisition module for 2 strain gauges

- Full or half (≥120 Ω)
- Quarter bridge (120 Ω or 350 Ω)
- Fixed excitation 4 V DC
- Offset compensation by auto zero
- Manual offset shifting after auto zero
- Gain 62.5-8000 (40 to 0.3 mV/V)
- Input ranges ±40 to ±0.3 mV/V
- Shunt-calibration 75 (25.5) kΩ, 0.1%
- Signal bandwidth 0 Hz to 24000 Hz
- ADC Resolution 18 bit
- Measurement uncertainty <0.1%
- Gain uncertainty <0.1%

- Power supply: 6 to 9 V DC
- Current consumption (with full bridge 350 Ω) 90 mA

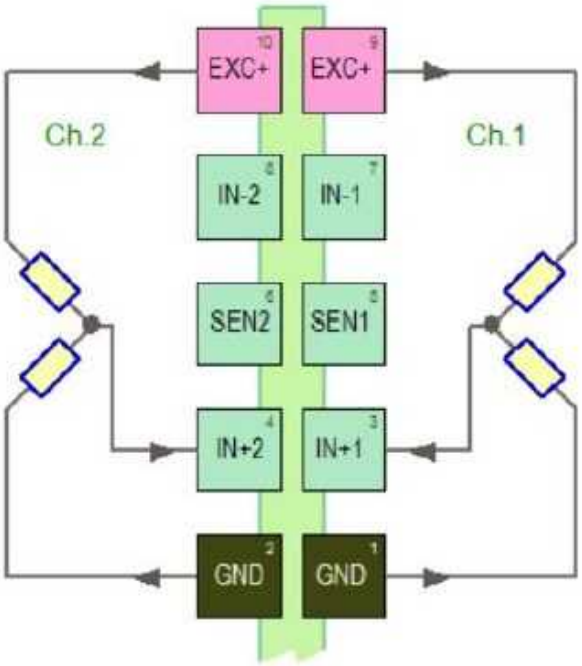


Full bridge (120 Ω or 350 Ω)

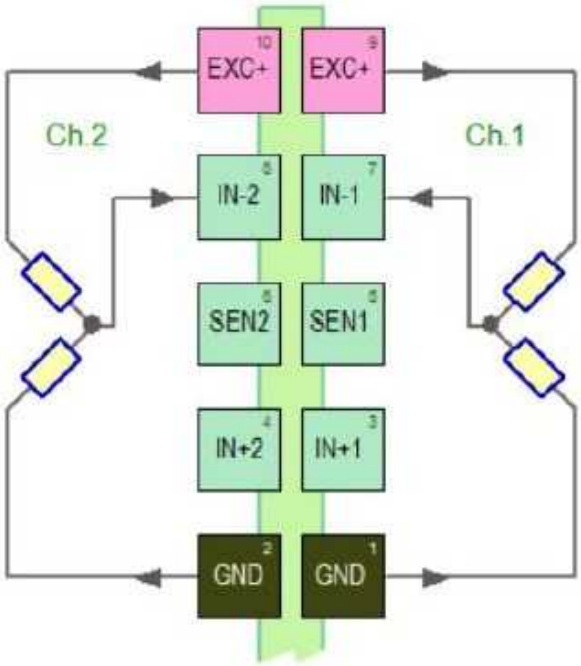


Half bridge

350 Ω



120 Ω



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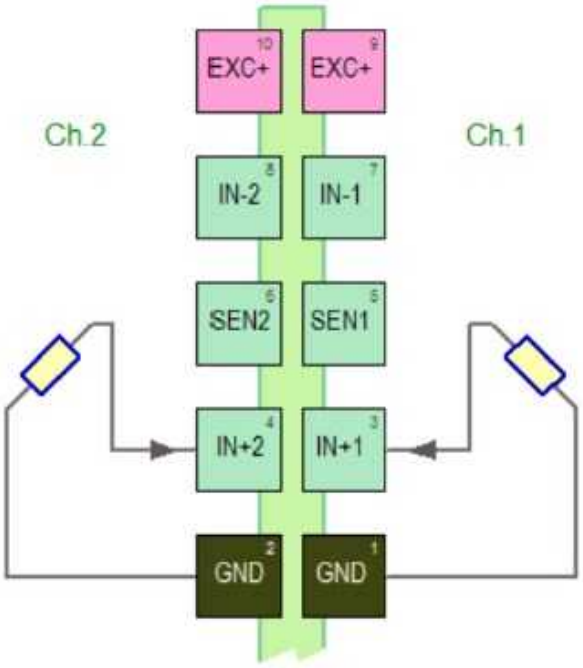
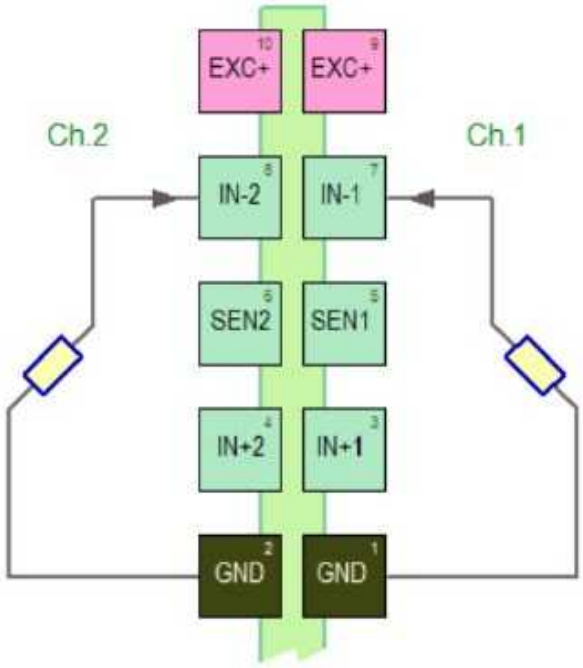
Quarter bridge

350 Ω



120 Ω



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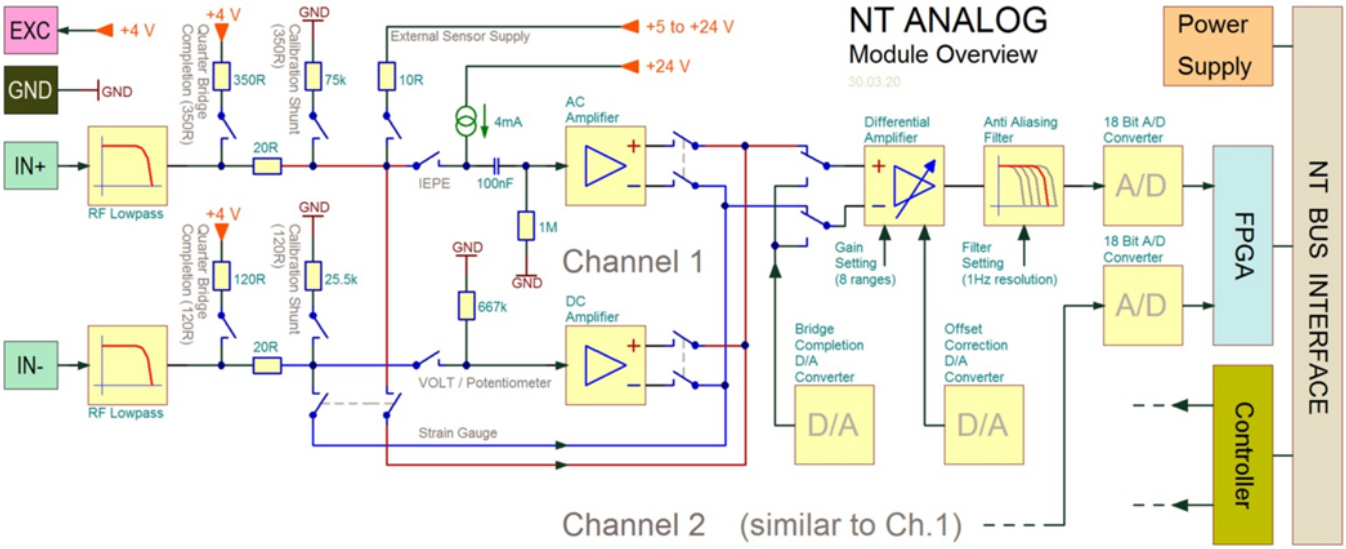
6.2 MTP-NT-ANALOG2

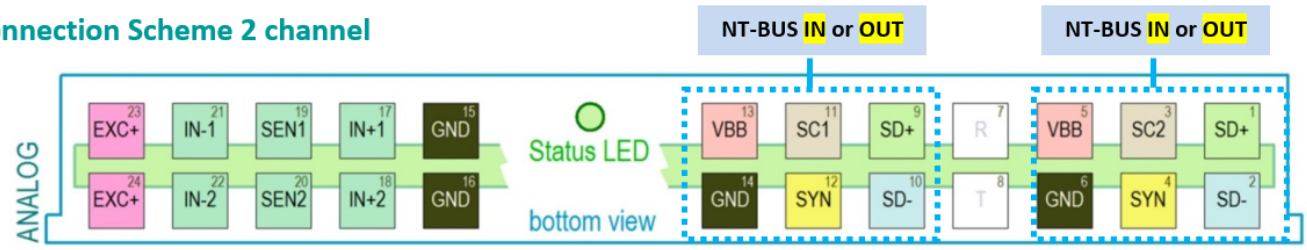
Two Channel Acquisition Module;
The functionality can be set individually for each channel for:

- strain gauges,
- high level voltage signals,
- potentiometer sensors,
- IEPE/ICP® sensors,
- sensor supply (12 V / 30 mA typ.)

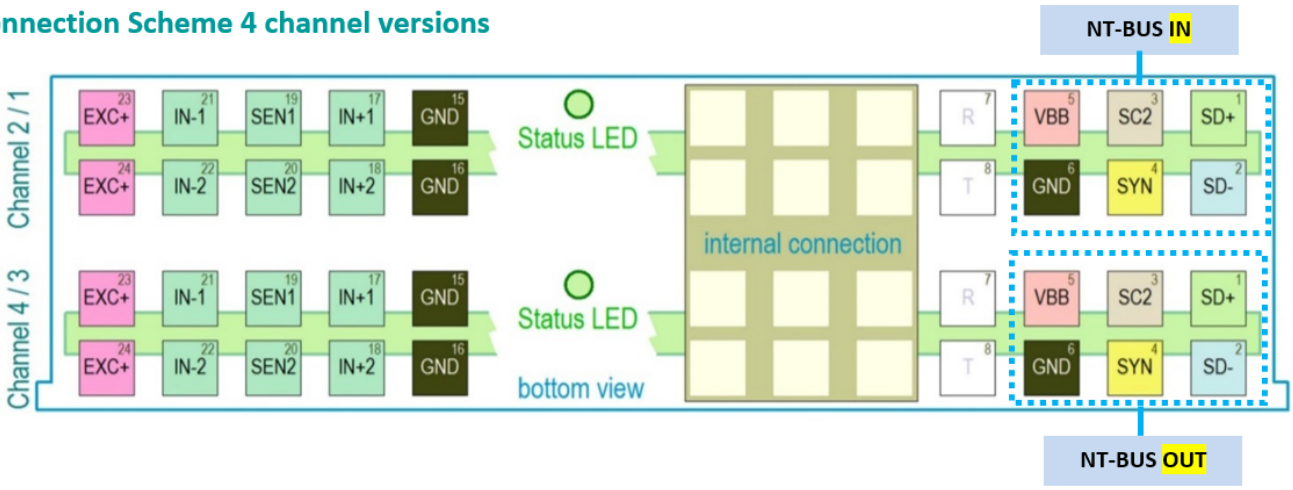
- Power supply: 6 to 9 V DC
- Current consumption: 120 to 160 mA



Connection Scheme 2 channel



Connection Scheme 4 channel versions



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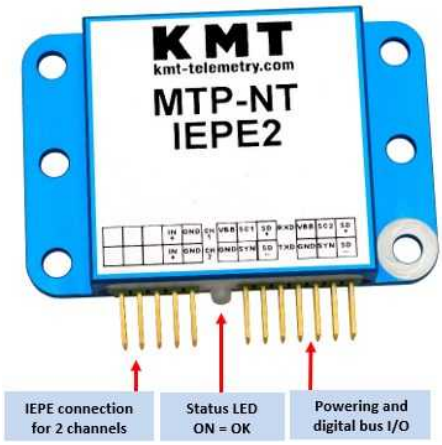
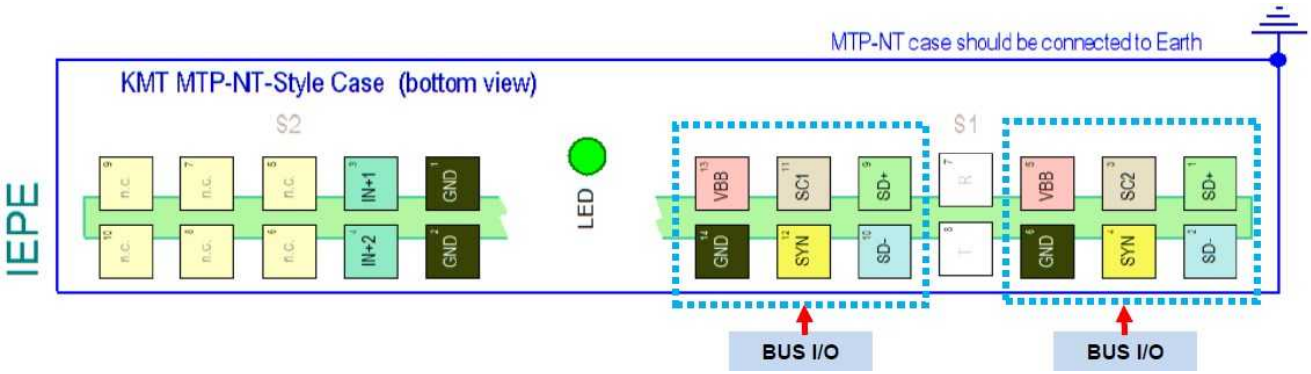
6.3 MTP-NT-IEPE2 connection options for sensors



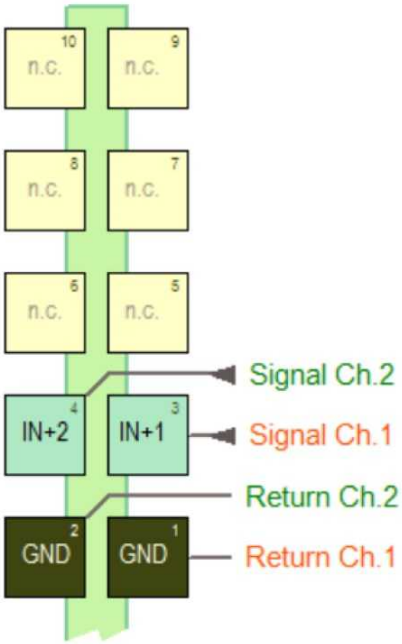
Acquisition module for 2 IEPE/ICP® sensors

- Excitation current EXC. 4 mA
- Input ranges 20 to ±0.3 Vpp
- Gain: 1-2-4-8-16-32
- Signal bandwidth 3 Hz to 24000 Hz
- ADC Resolution 18 bit
- Measurement uncertainty <0.1%
- Gain uncertainty <0.1%

- Power supply: 6 to 9 V DC
- Current consumption 140 mA



IEPE/ICP input



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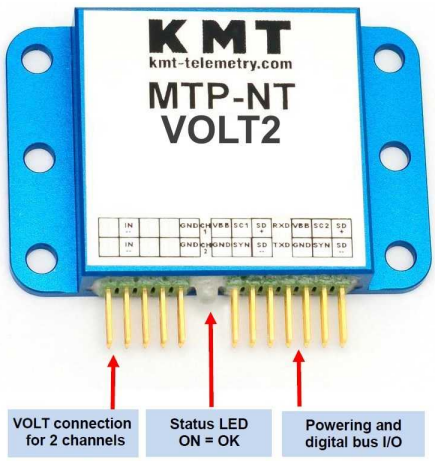
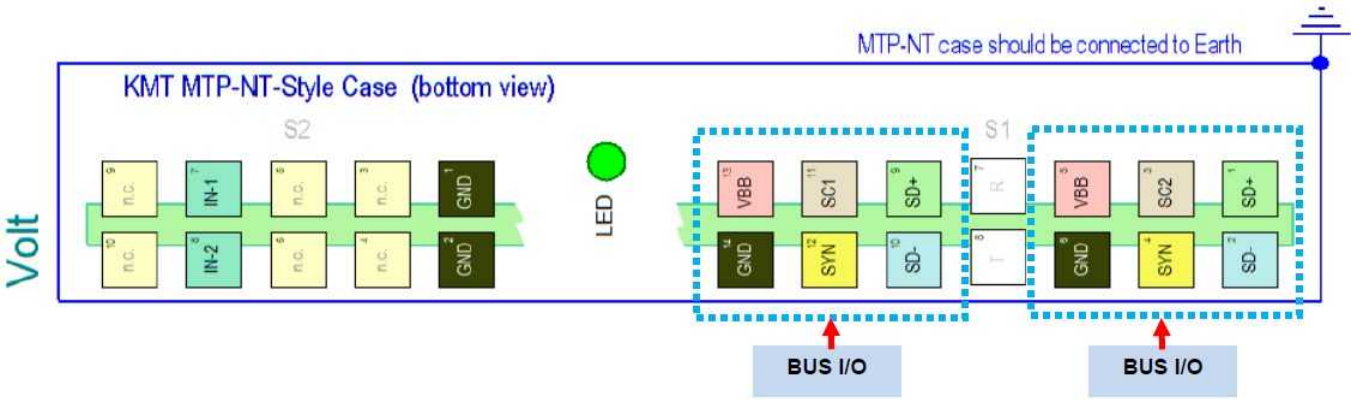
6.4 MTP-NT-VOLT2 - mesauring voltages



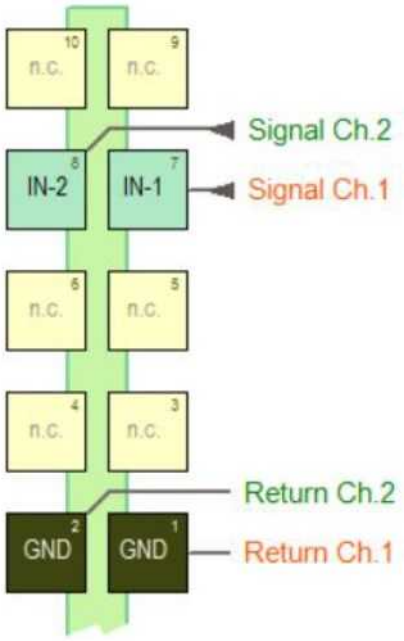
Acquisition module for 2x high level inputs

- Input ranges ±10 to ±0.08 V
- Signal bandwidth 0 Hz to 24000 Hz
- +4 V sensor excitation max. 20 mA
- ADC Resolution 18 bit
- Measurement uncertainty <0.1%

- Power supply: 6 to 9 V DC
- Current consumption 80 mA



Voltage input



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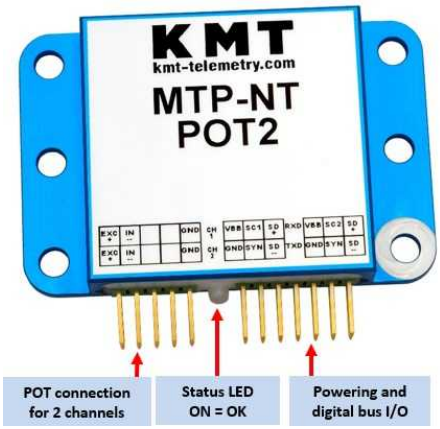
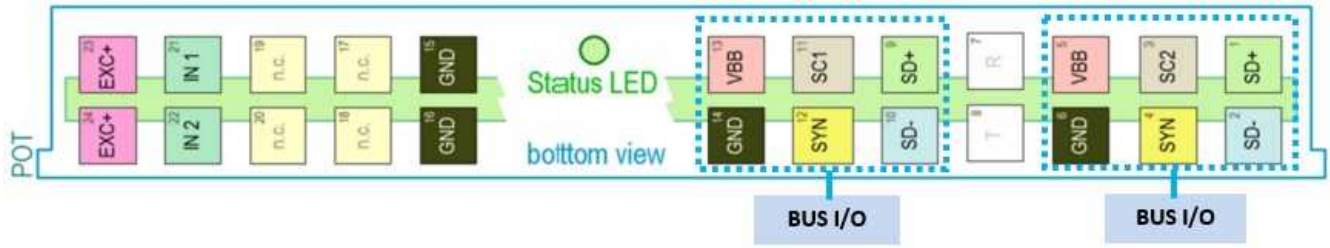
6.5 MTP-NT-POT2

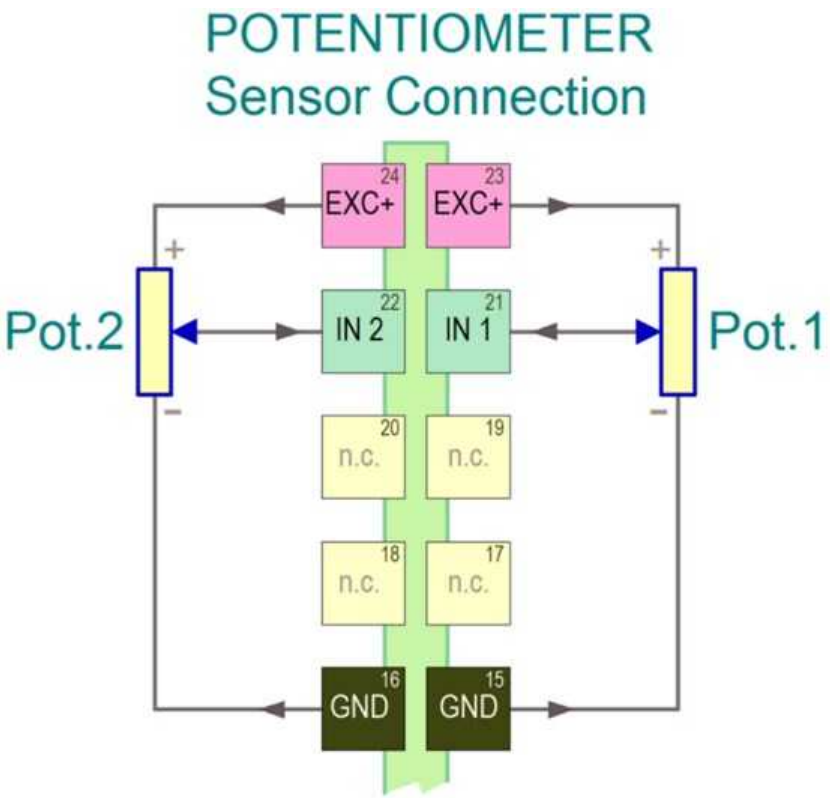


Acquisition module for 2x potentiometer sensors

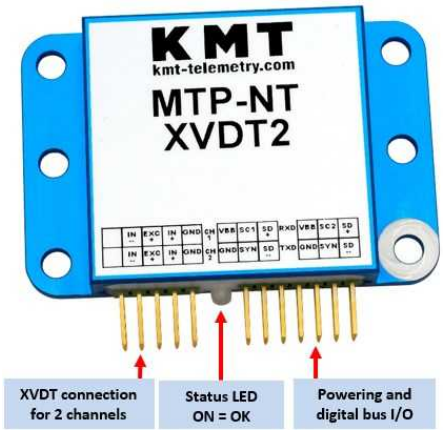
- Potentiometer resistance ≥120 Ω
- Fixed excitation voltage: 4 V DC
- Input resistance: 667 kΩ
- Signal bandwidth 0 Hz to 24000 Hz
- ADC Resolution: 18 bit
- Measurement uncertainty < 0.1%

- Power supply: 6 to 9 V DC
- Current consumption: 90 mA
  (with two 1 kΩ potentiometers)





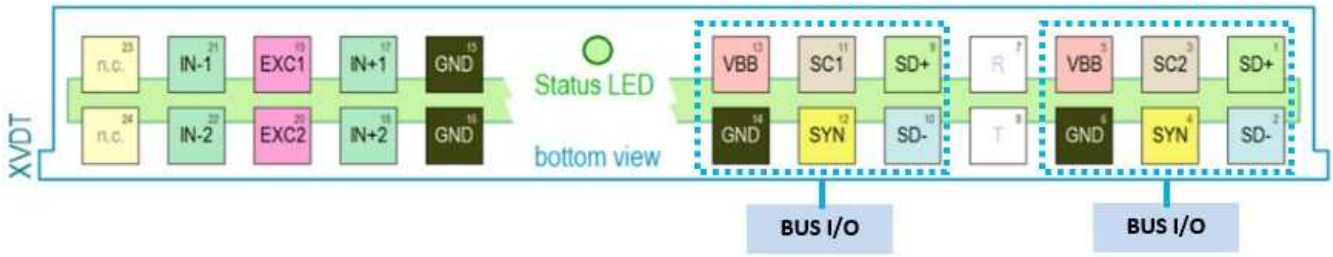
6.6 MTP-NT-XVDT2

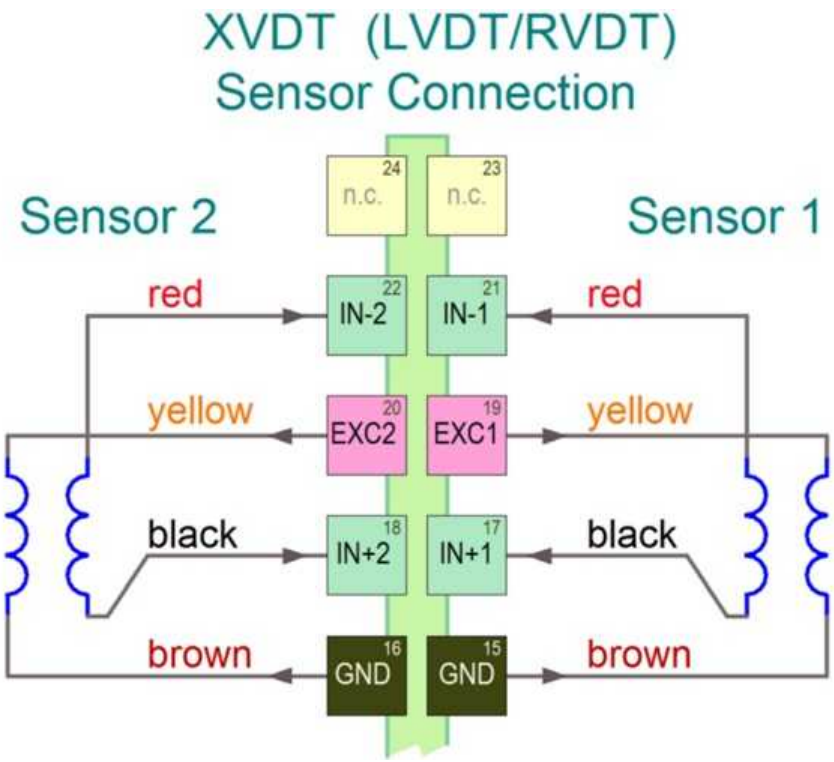


Acquisition module for 2x LVDT/RVDT sensors

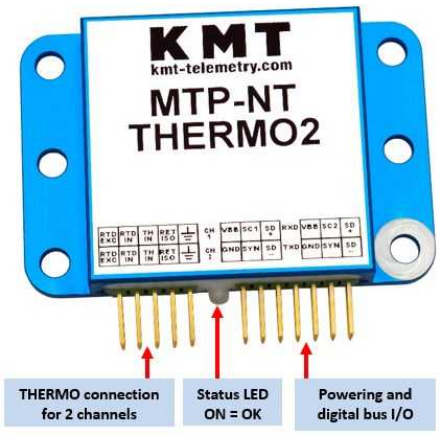
- Excitation voltage = 4.096 Vpp, rounded rectangle
- Excitation frequency = 8 kHz (changeable by software)
- Sensor impedance ≥ 100 Ω (@ 8 kHz)
- Signal bandwidth 0 Hz to 200 Hz
- Programmable lowpass filter

- Power supply: 6 to 9 V DC
- Current consumption: 130 mA (with 2x MHR500)





6.7 MTP-NT-THERMO2



Acquisition module for 2x Temperature Sensor

- Inputs galvanically isolated (max. potential difference 32 V DC)
- Lowpass filter 1 Hz to 32 Hz (programmable)
- RTD Sensor types: PT100, PT500, PT1000
- Connection: 2-Wire and 3-Wire
- Excitation current: 1 mA

- Power supply: 6 to 9 V DC
- Current consumption: 90 mA

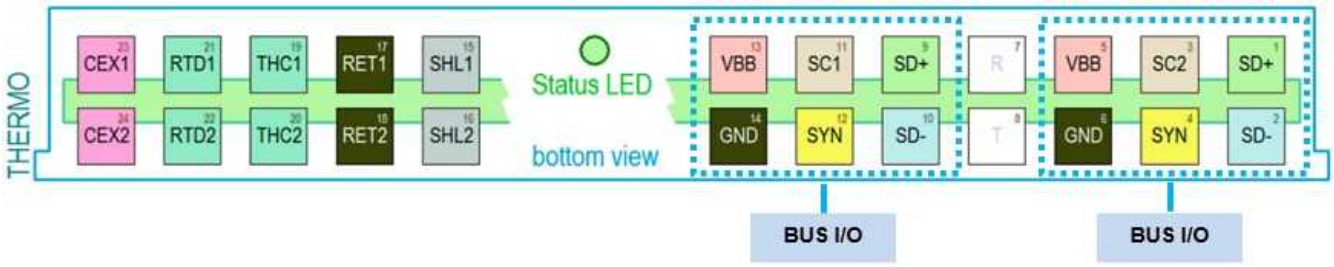
Supported thermocouple sensor types: K (NiCr-Ni), J (Fe-CuNi), E (NiCr-CuNi), T (Cu-CuNi), R (Pt13Rh-Pt), S (Pt10Rh-Pt), B (Pt30Rh-Pt6Rh)

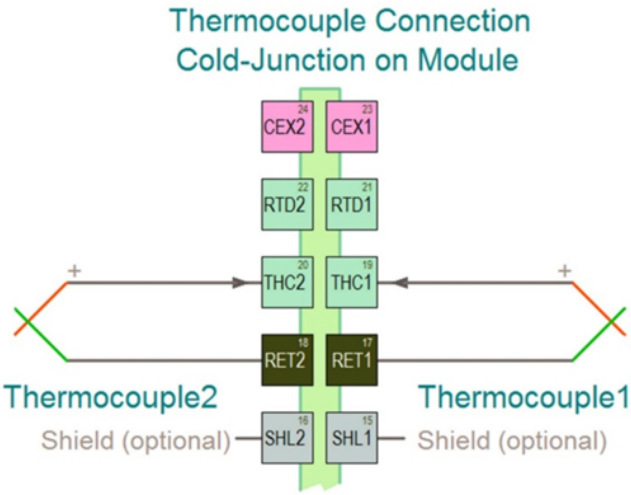
Reference junction measurement internal & external (RTD sensor)

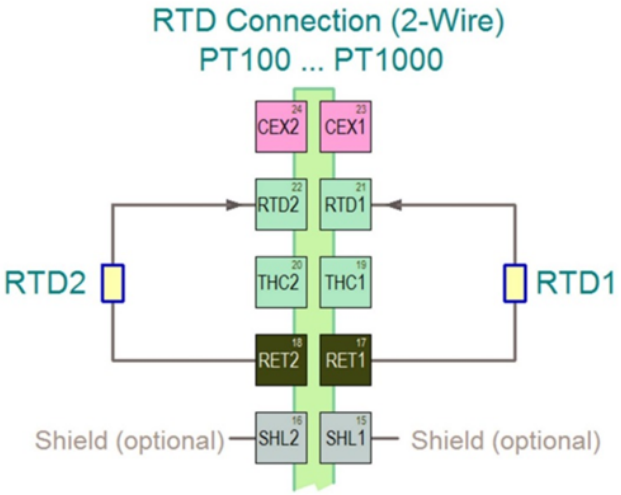
Other Sensor types: NTC(Thermistor)*, N(NiCrSi-NiSi)*, customer-specific (per Software update available)

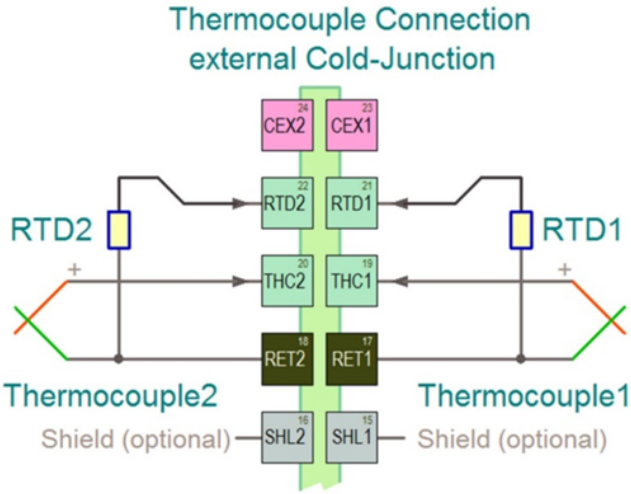
Parameter	Value	Remarks
Measuring range	-273.15°C to +1635.2°C	fullscale value reducible to +1000°C / +500°C / ±250°C
Output resolution	0.05K/step (20 steps/Kelvin)	
Measurement uncertainty	≤ 1 K	
Sensor break detection message	= "-999.0°C"	
Unreasonable value message	= "-998.0°C"	

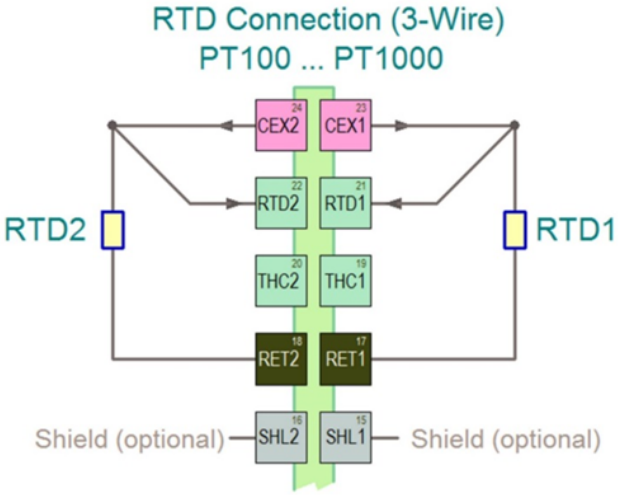
Table 5: MTP-NT-THERMO2 Specifications











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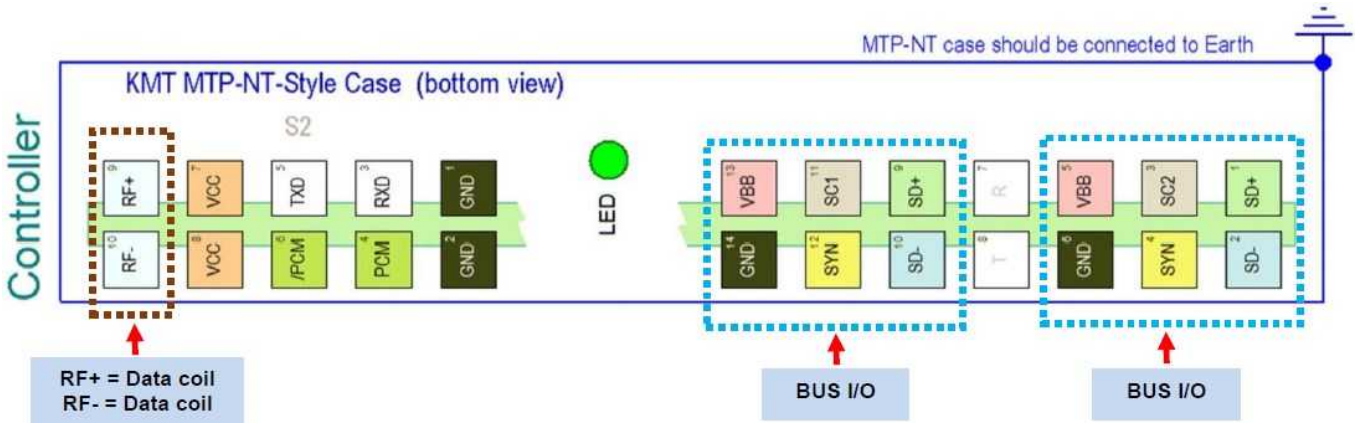
6.8 MTP-NT-CON-IND-Tx (controller connection)

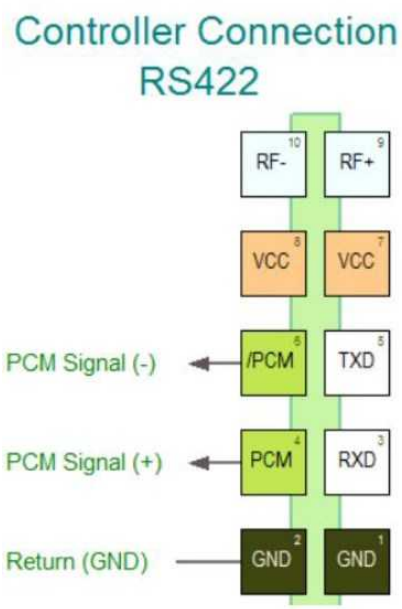
Controller 1- 128 acquisition modules = 256 channels

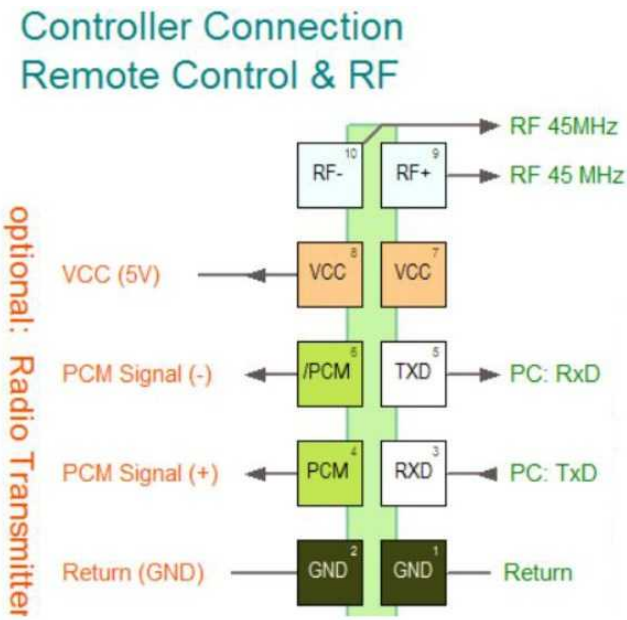
- Output: PCM

IND-Transmitter included

- Programmable via RS232/USB adapter and remote software
- Power supply: 6 to 9 V DC
- Current consumption 150 mA







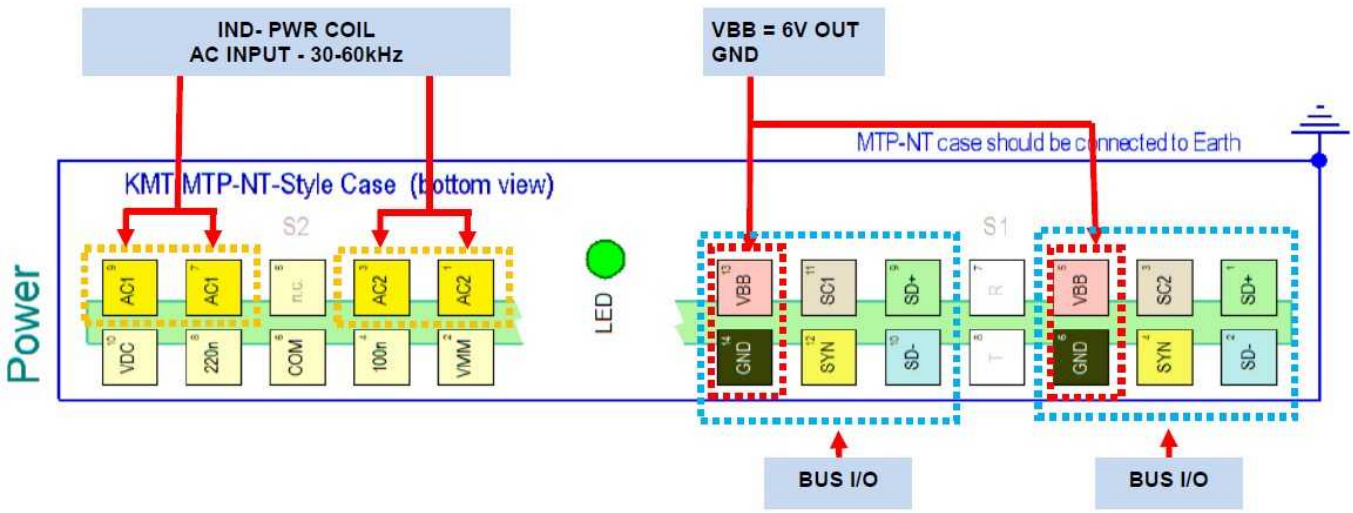
6.9 MTP-NT IND PWR 6V (power module connection)

AC/DC Module for inductive power

- Input: 30-60 kHz 10-40V AC
- Output: 6.1 V DC
- Current: up to 2400 mA (more on request)
- Weight: 40 g
- Vibration: 5 g
- Shock: 3000 g

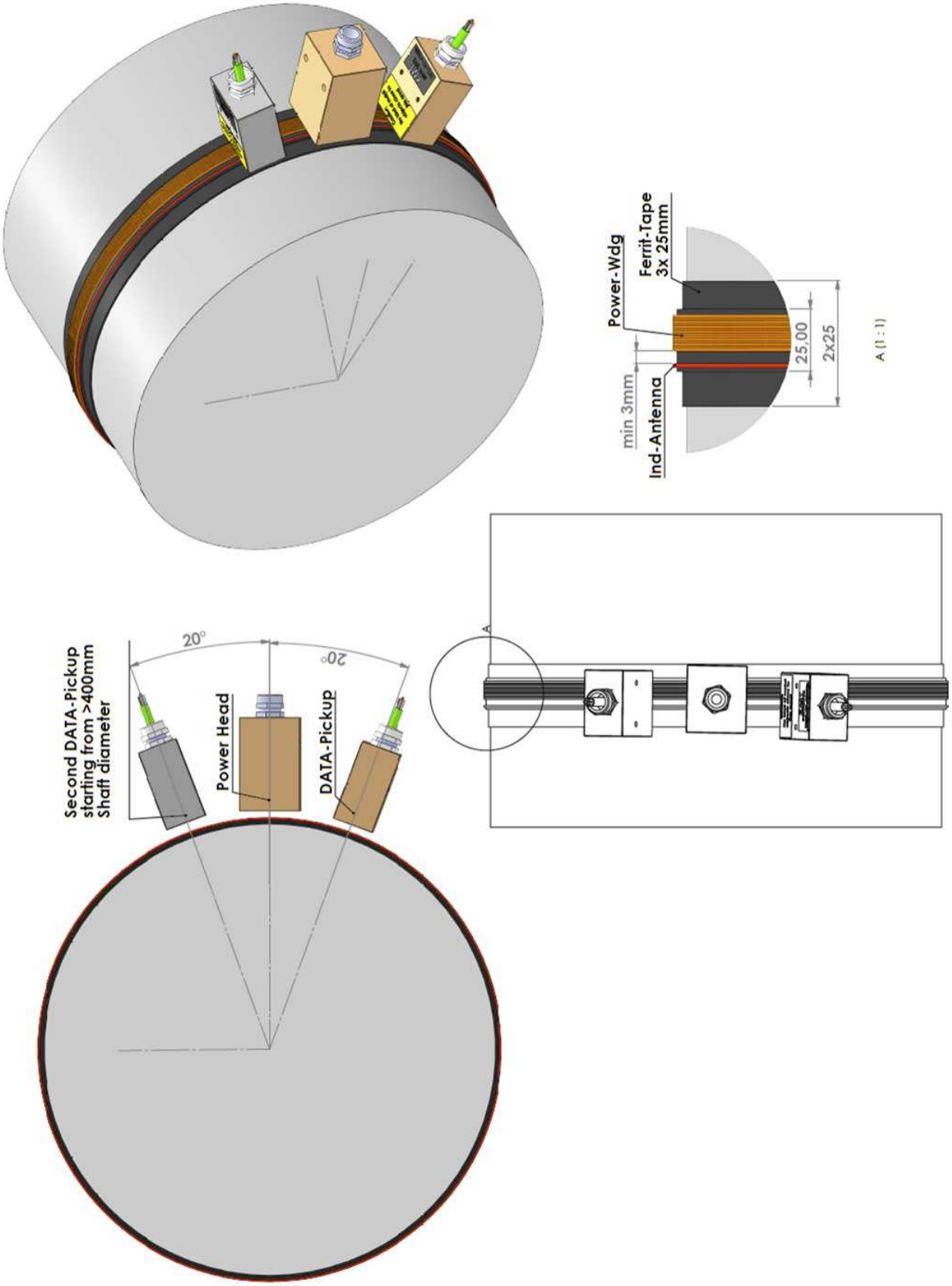
Warning

Don't power ON without connected Analog modules like MTP-NT-STG, ICP. Otherwise you can damage it!!

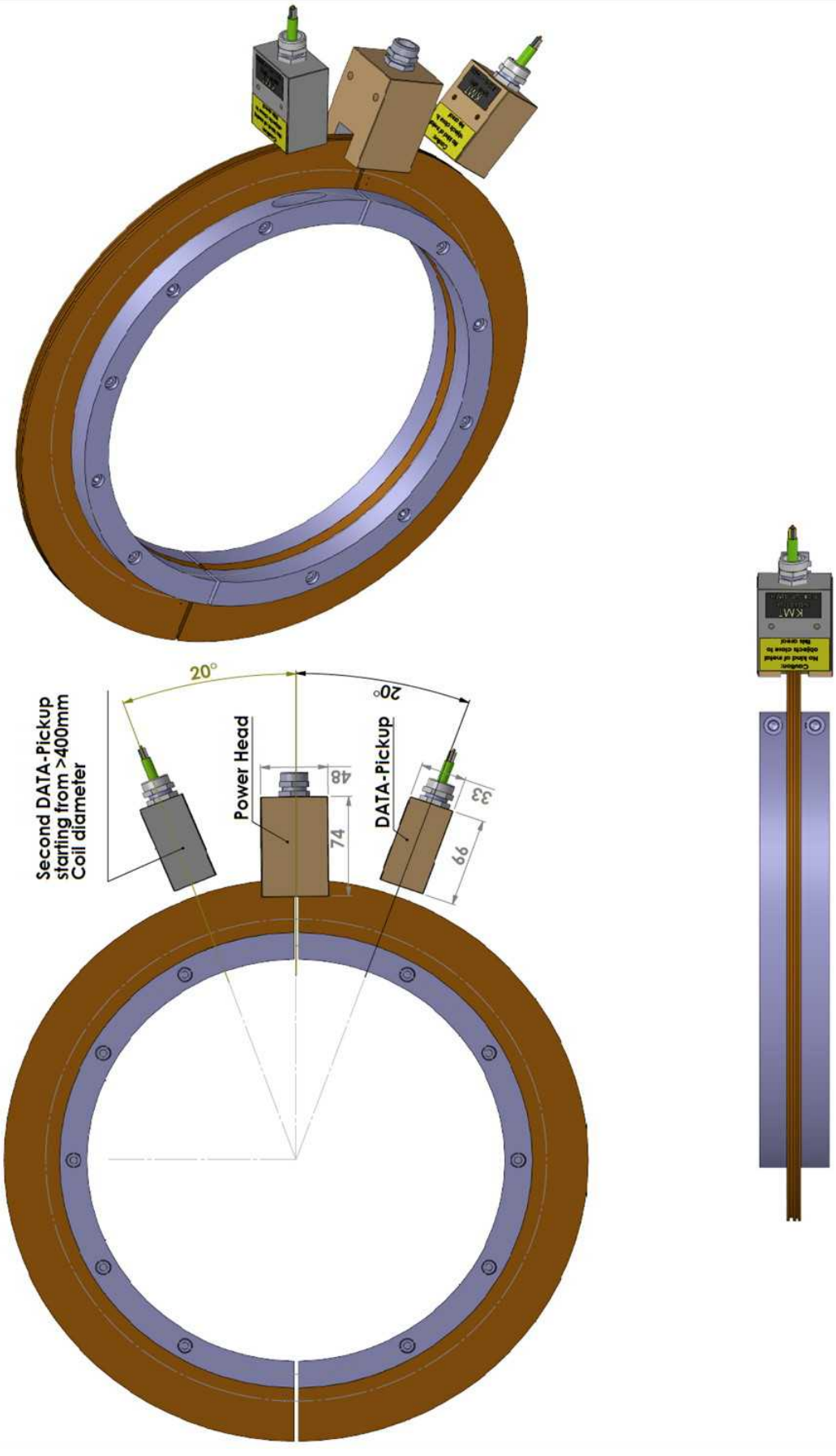


7 MTP-NT mounting

7.1 Mounting of second pick up at flat coil on shaft

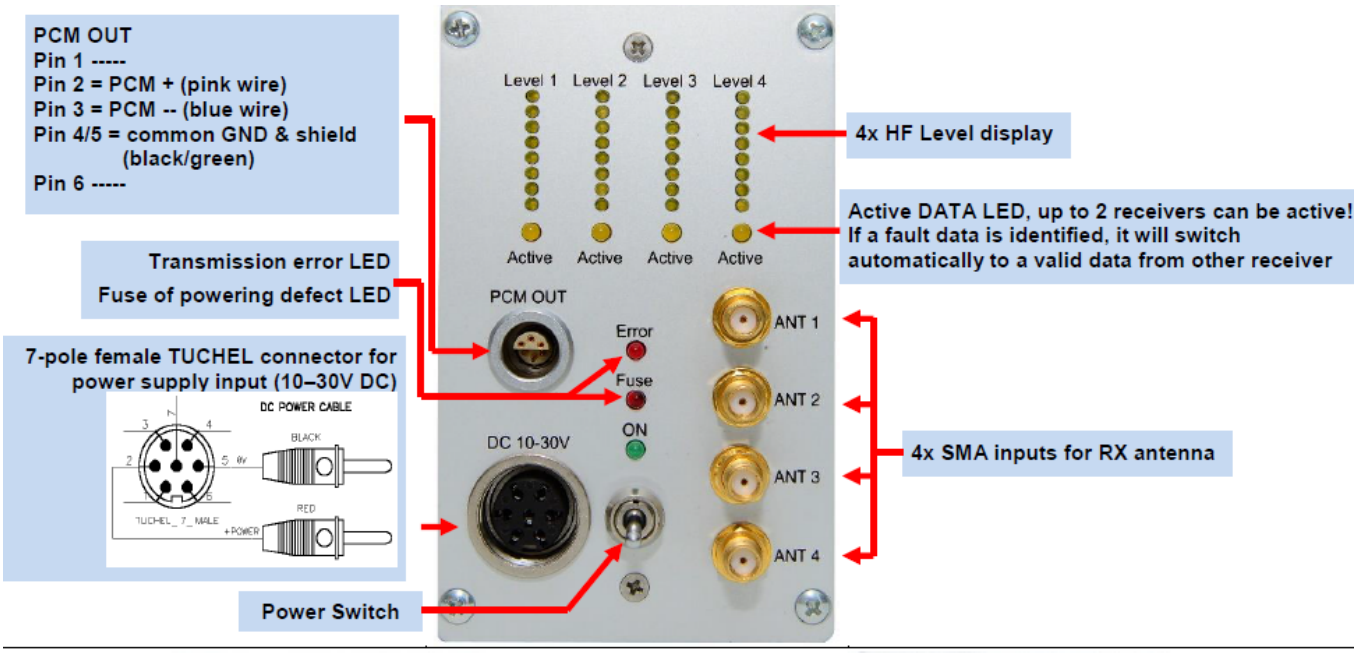


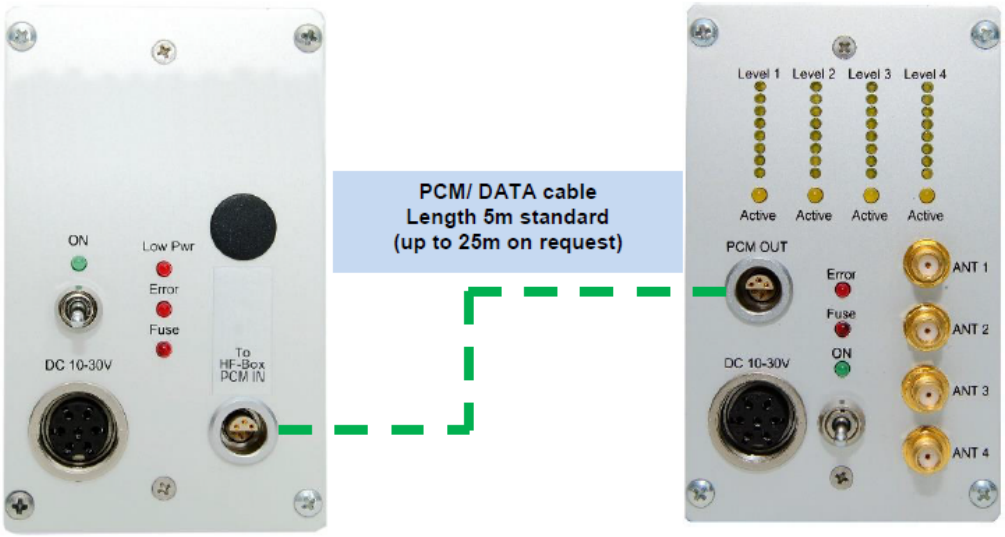
7.2 Mounting of second pick up at coil ring



8 Radio transmission

8.1 Decoder/Receiver box (radio transmission version)





Parameters - HF Quad	Value	Remarks
HF receivers	4	
Antenna connection	SMA	
Output	PCM	
Power supply input	10 to 30 V DC	
Dimensions	205 x 105 x 65 mm	
Weight	1.05 kg	without cables and antenna
Environmental Operating Humidity Vibration Static acceleration Shock	 -20°C to 70°C 20 to 80% 5 g 10 g in all directions 100 g in all directions	not condensing

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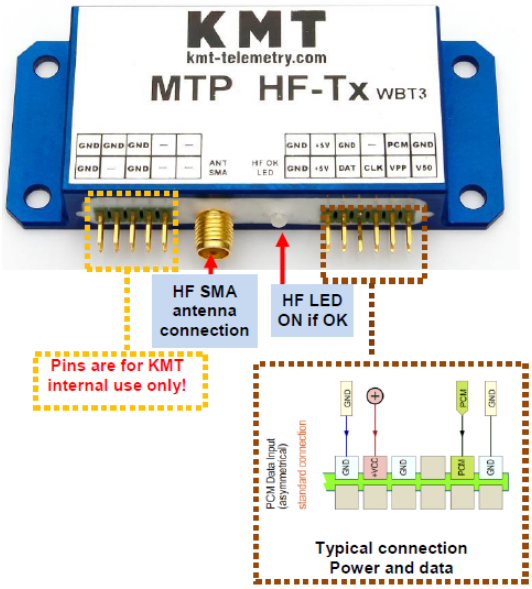
8.2 HF-Tx - Radio transmitter incl. antenna (rotor side)



MTP-NT-Control with MTP HF-Tx

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

Wire antenna for shaft application with SMA connector

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

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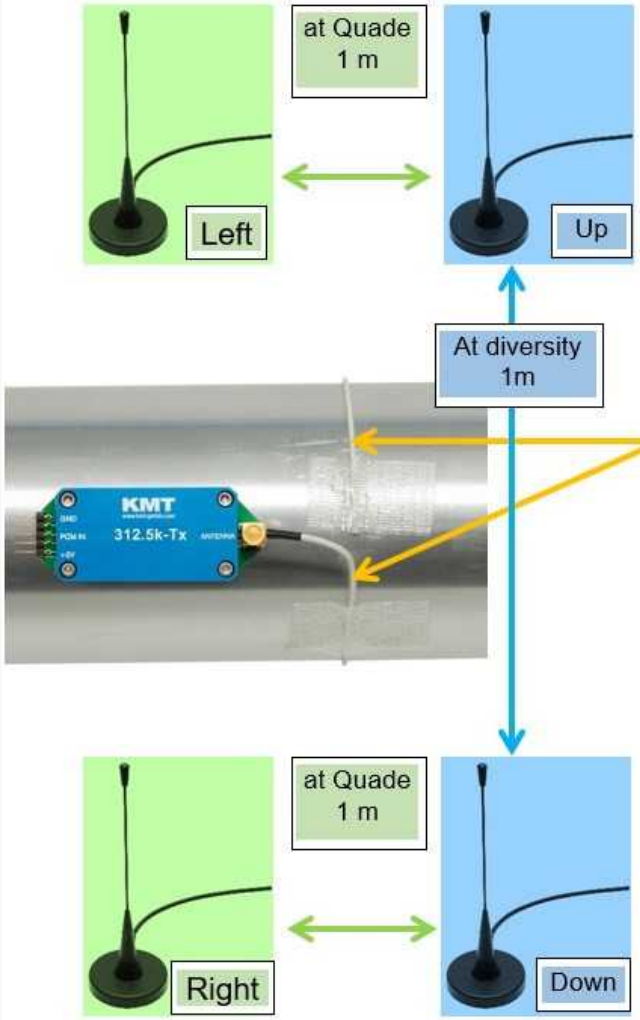
8.3 Installation of the radio transmitter on a shaft

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

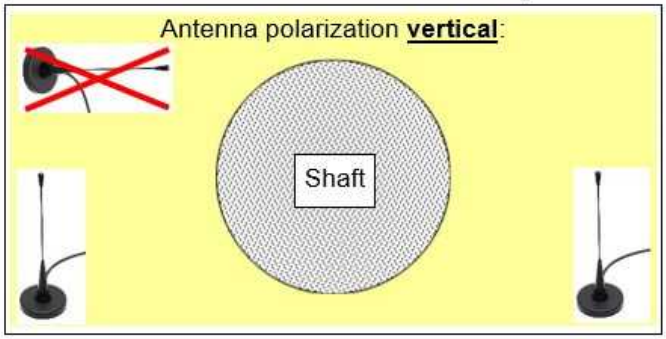
All cable connections should be soldered.



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

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 downside 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)

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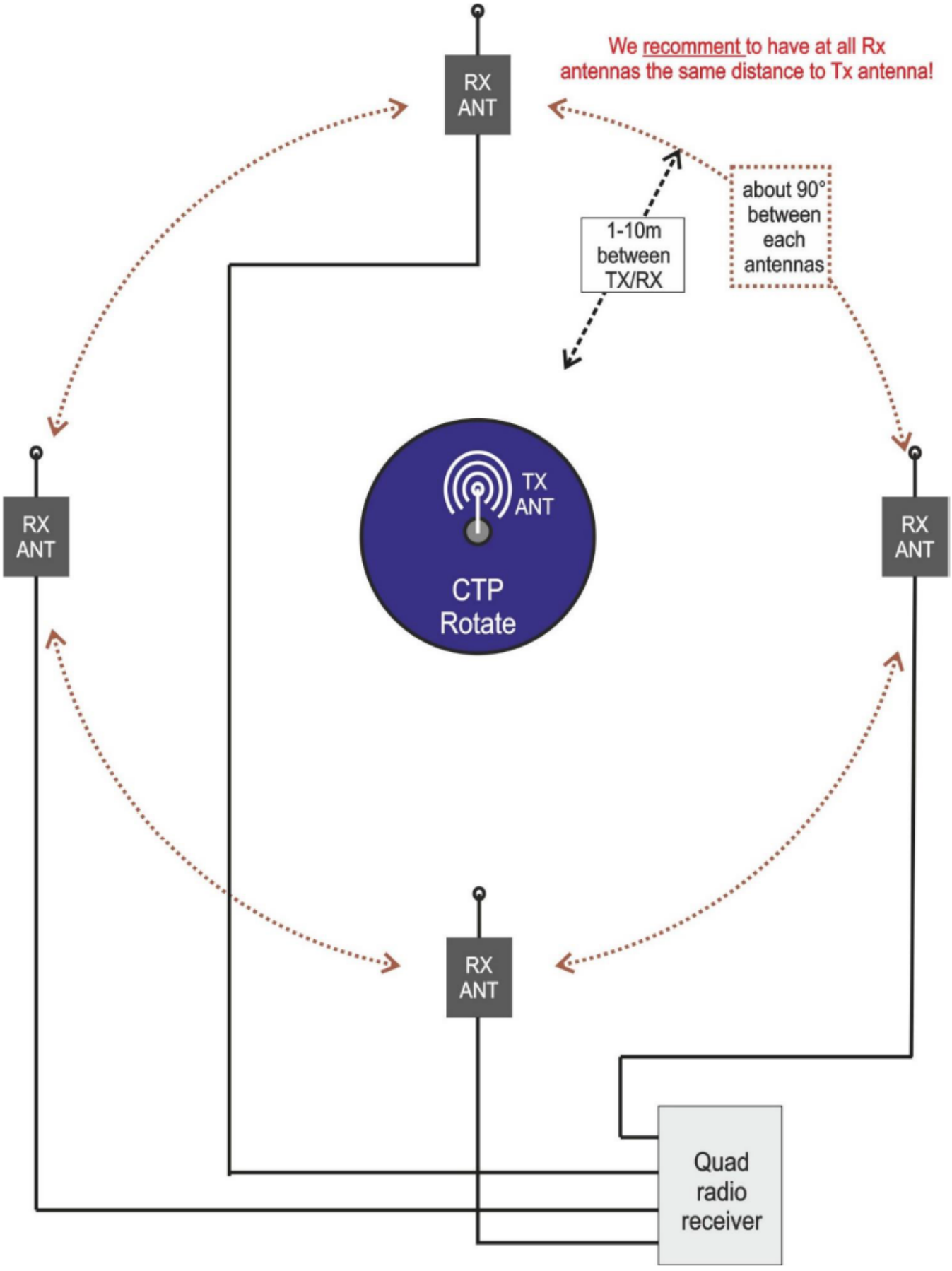
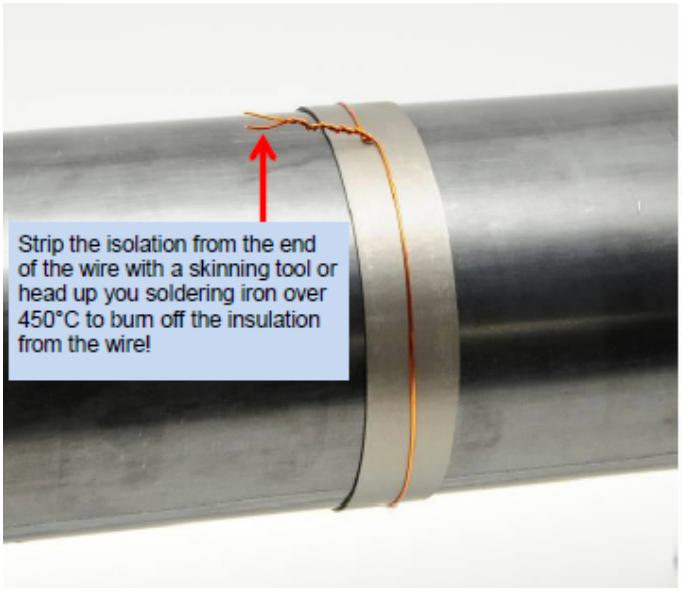
8.4 Position of receiving standard magnetic foot antennas



9 Inductive transmission

Inductive transmission (2500 kbit) with MTP-NT-IND-TX-RX with 45 MHz carrier (coil mounting on a shaft). With 45 MHz carrier is only 1x winding necessary.

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



Make transmitting coil with 1x winding and twist the end of wire. Use CUL 0.63-1.00 mm wire

Fix it with 3 layers mounting tape

Extend the CUL wire flexible 0.14-0.25 mm (to decouple the inflexible 1 mm wire, at 0.63 not necessary)

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

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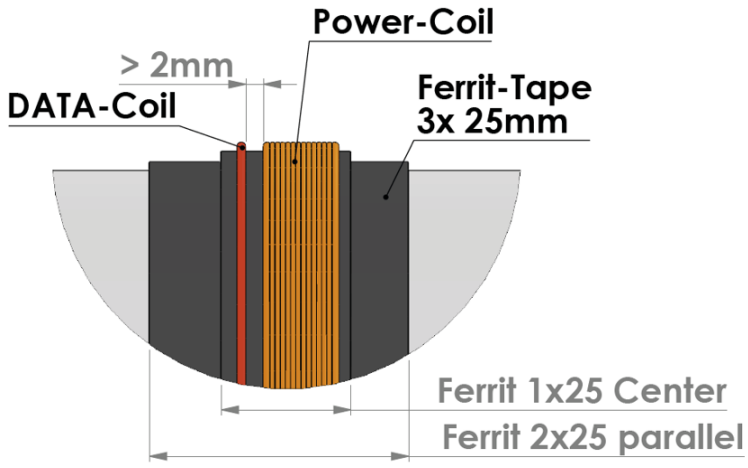
9.1 Inductive Pick-up head

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

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

Warning Installation

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



9.2 IND-PICKUP-HEAD 45 MHz

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

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

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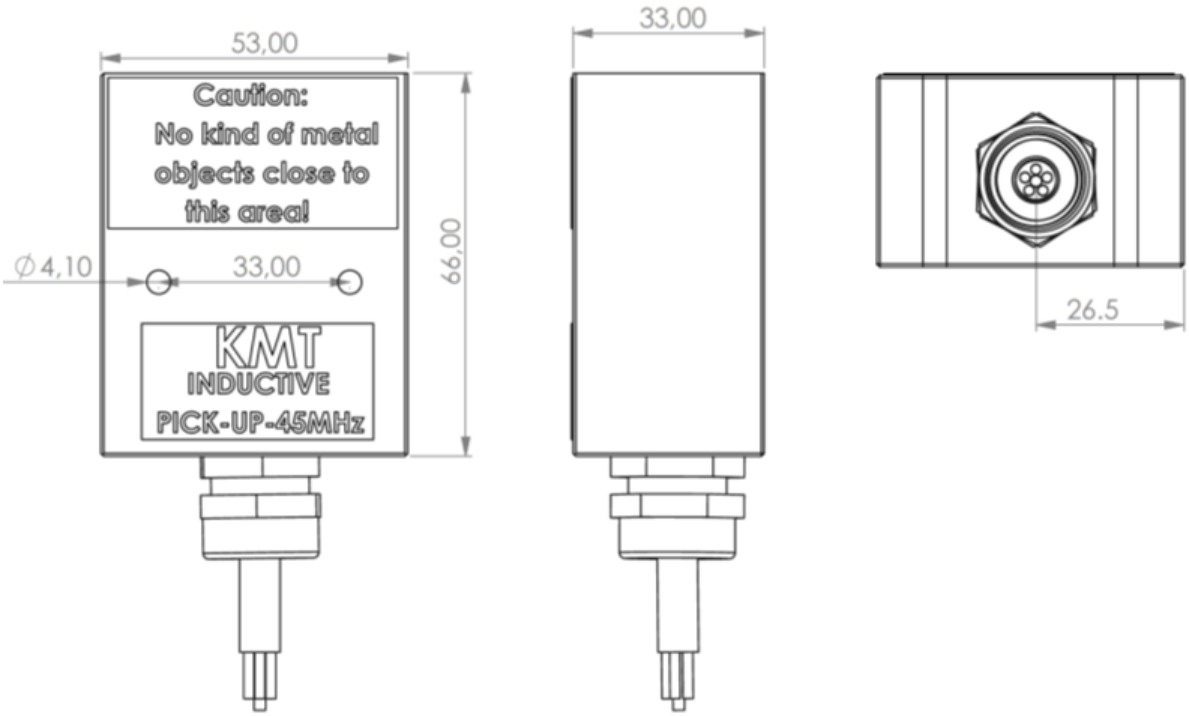
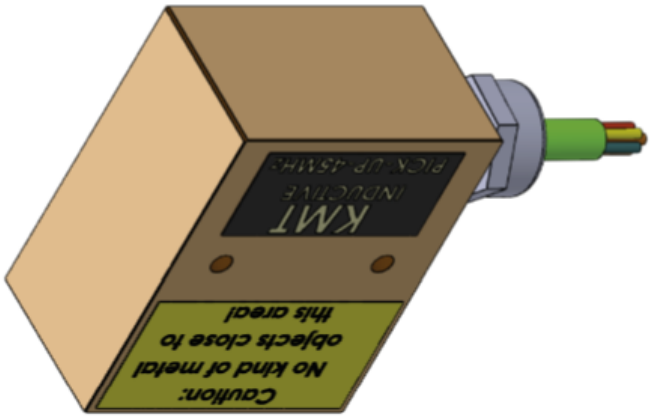
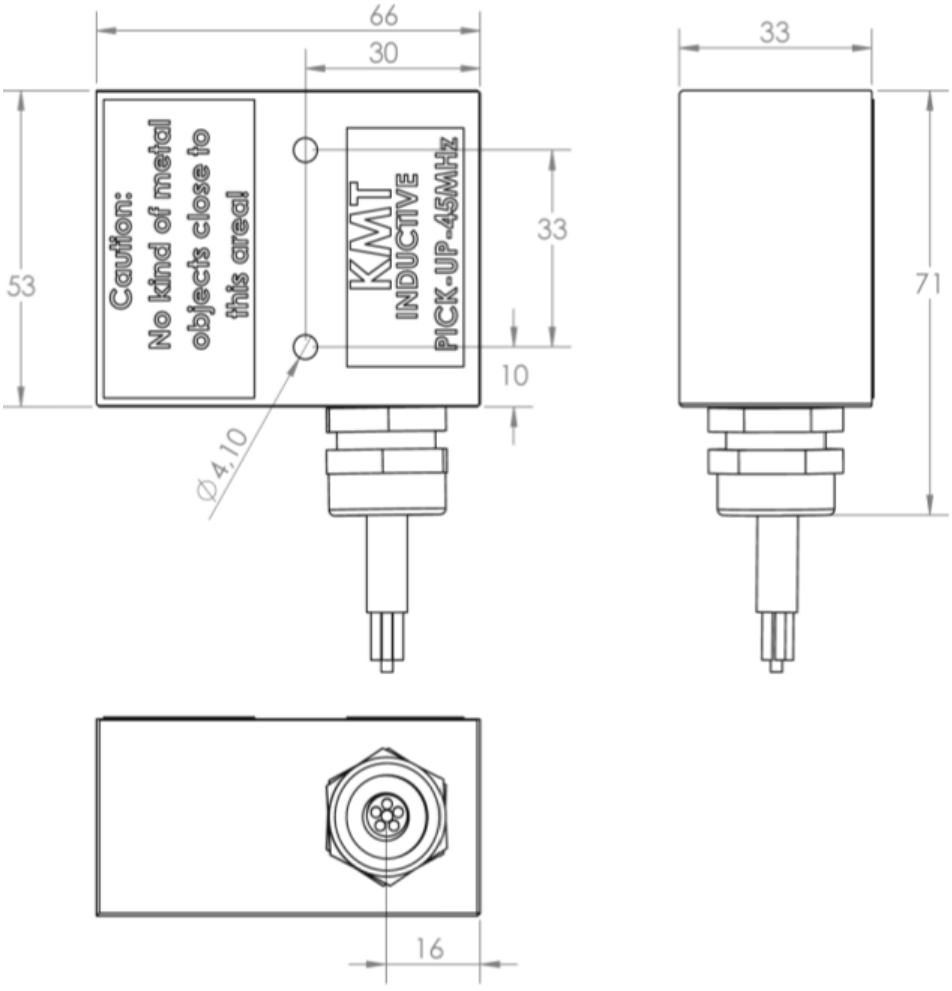
9.2.1 Dimensions

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



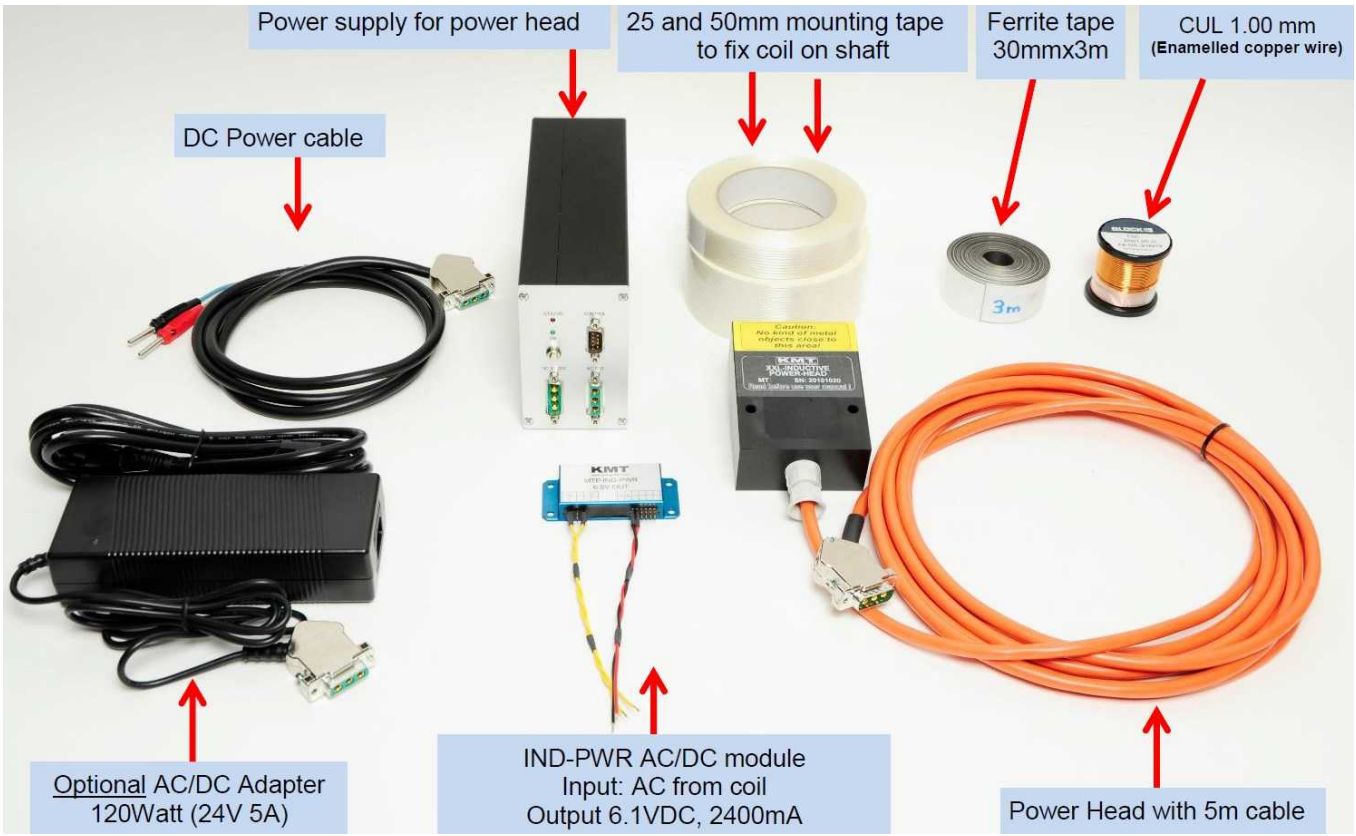
IND-PICKUP-HEAD 45MHz – cable right side (axial to shaft)





9.3 Inductive powering

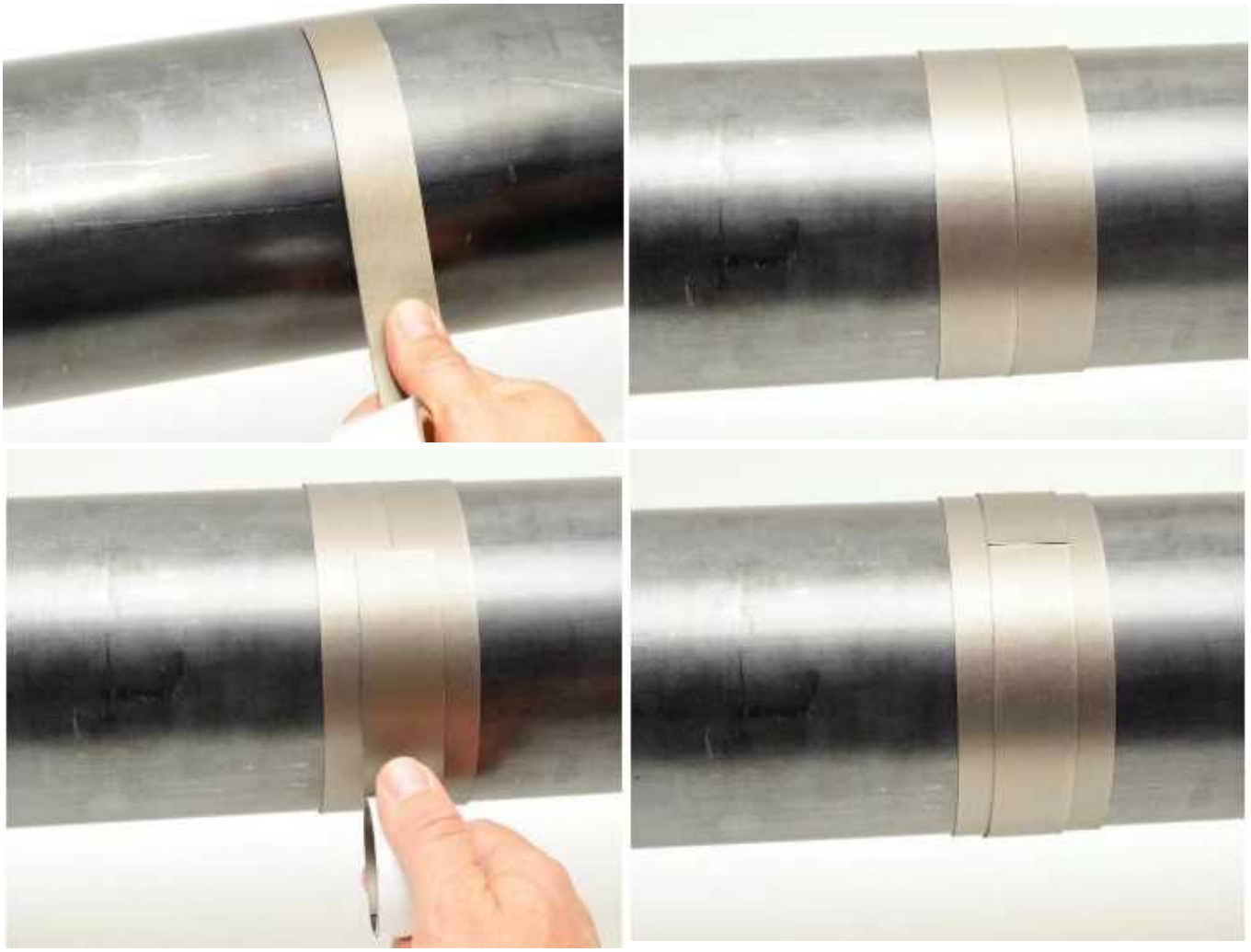
Inductive power supply set



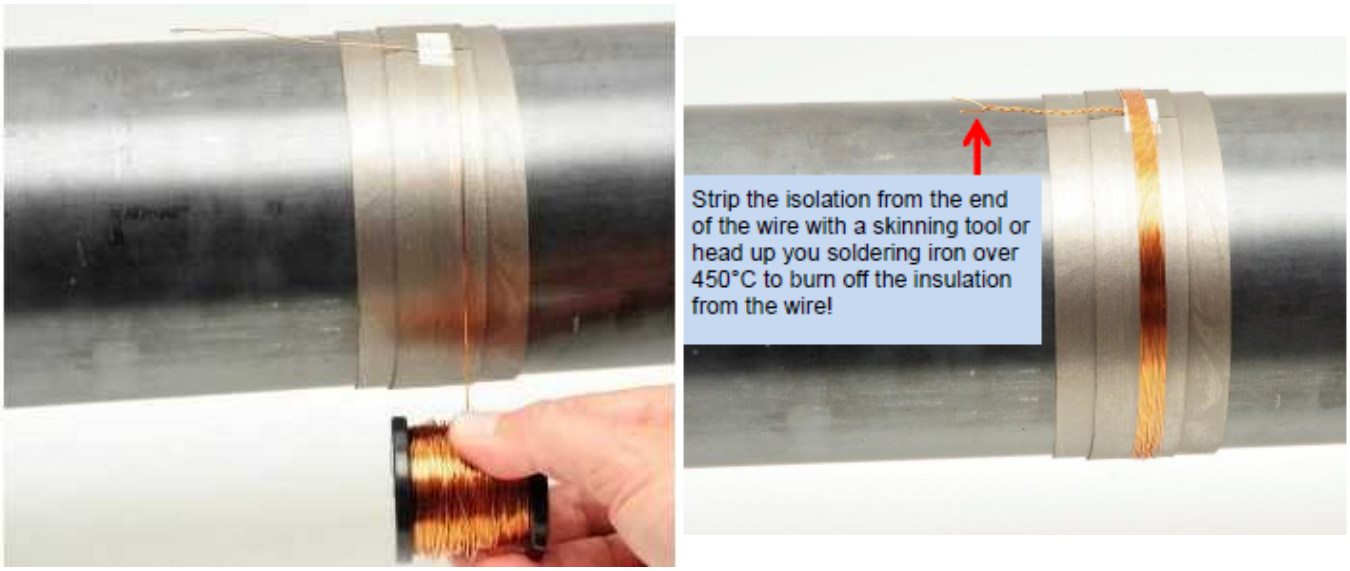
Picture shows standard inductive power supply for diameter up to 300 mm

9.3.1 Installation of coil for inductive powering on shaft

MTP-NT inductive power supply



Attach for electromagnetic isolation "Ferrite Tape" 2x parallel and
1x in the middle over two layer around the shaft



Make power coil with 3-18 windings for 1000-20 mm diameter (see diagram) and twisted the end of wire. Use 0.63…1.00 mm (1.00 mm for diameter of 100-1000 mm) CUL wire (Enameled copper wire)

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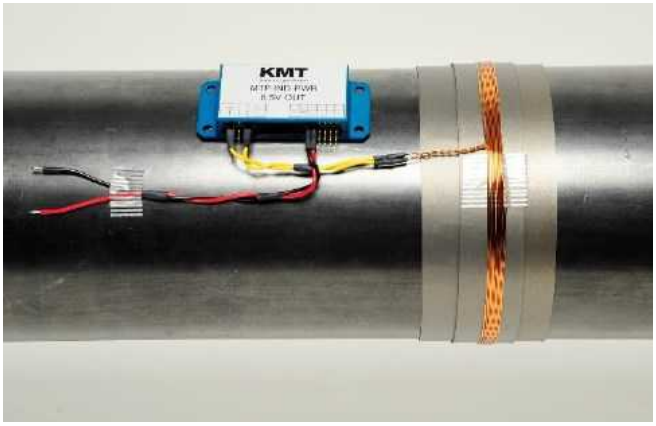
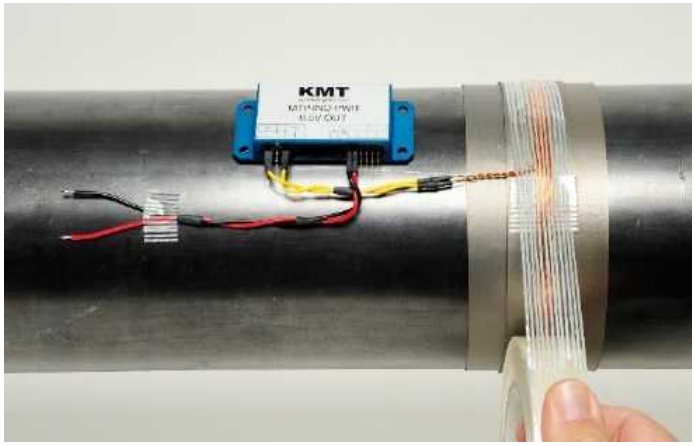
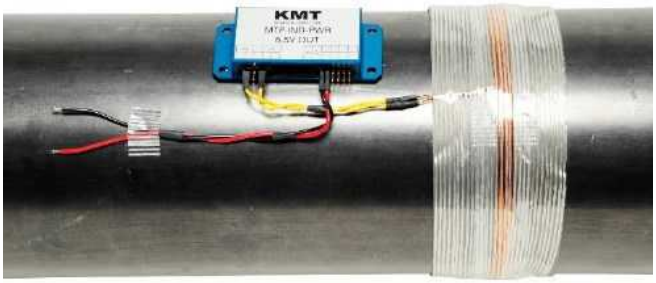


Solder the end of the wire on the AC IN of the IND-PWR module and isolate all solder points with shrink tubing.



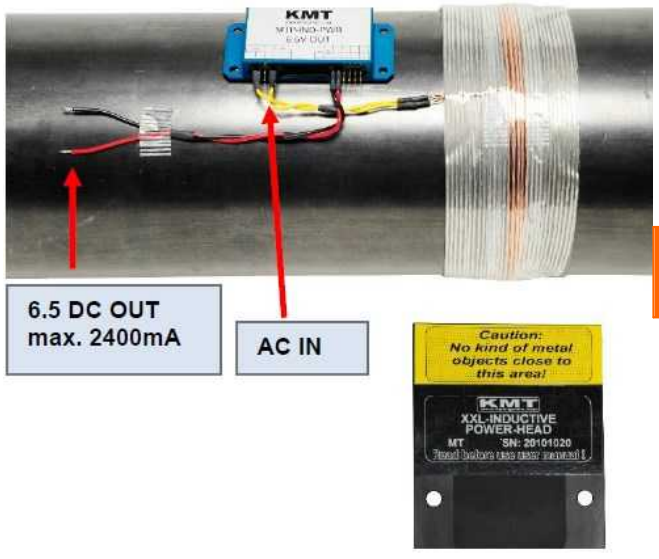
Fixed with 3 layers mounting tape



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

Control the output voltage and move the power-head in the max distance to the coil.

The output voltage must be 6.5 V!



The pins "Coil" are the AC power input from the coil. On the pins "+6.5" and "GND" you get a stabilized output voltage of 6.5 V DC.

The max. load current on the DC output is 2400 mA.

The IND-PWR converter will use instead battery pack!

Never use any battery together with the MTP-NT IndPwr!

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

The center of the coil should be in the same horizontal position as the center of the power head. The distance is optimal in the range between 5 and 10mm. (depends of shaft and current consumption)

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9.3.2 Optimum windings for steel shafts

Find the correct number of windings for the inductive power coil.

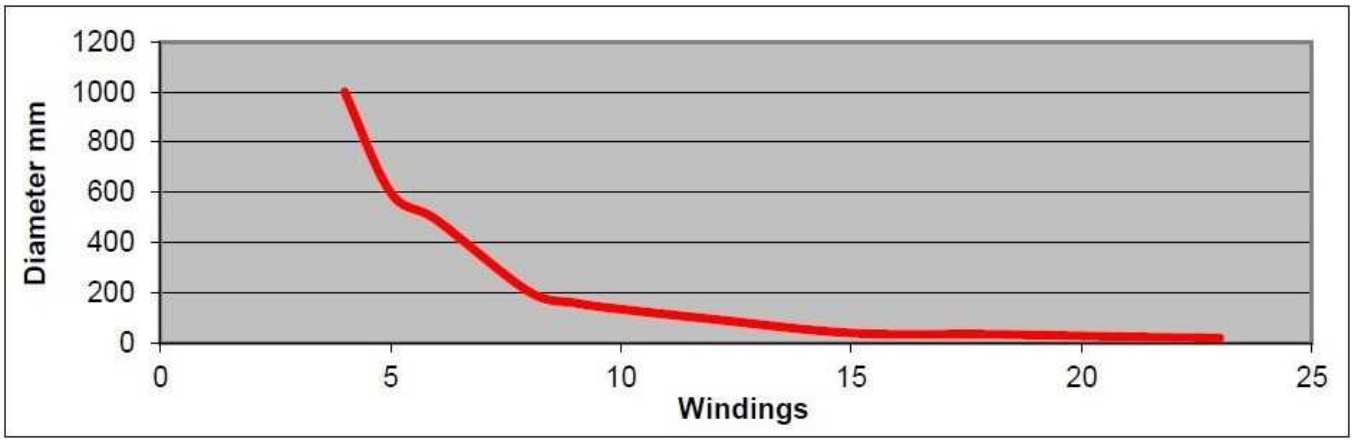
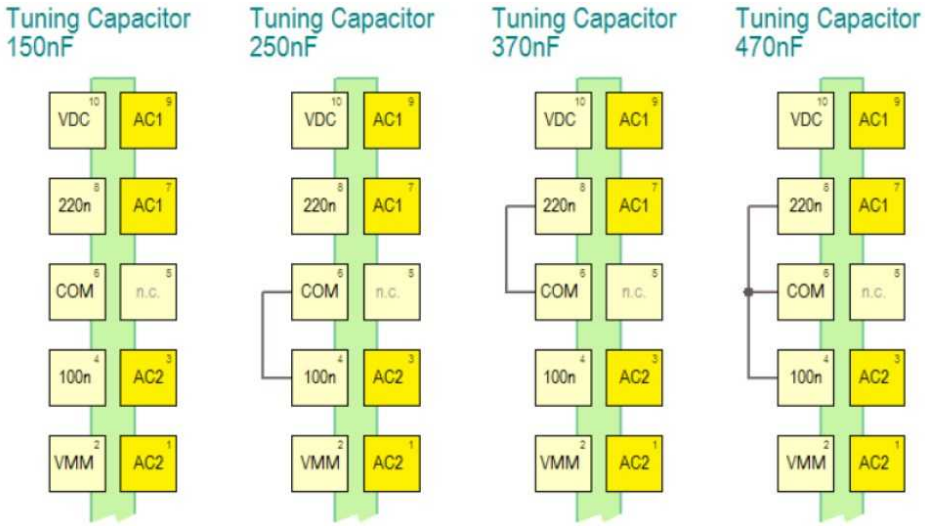
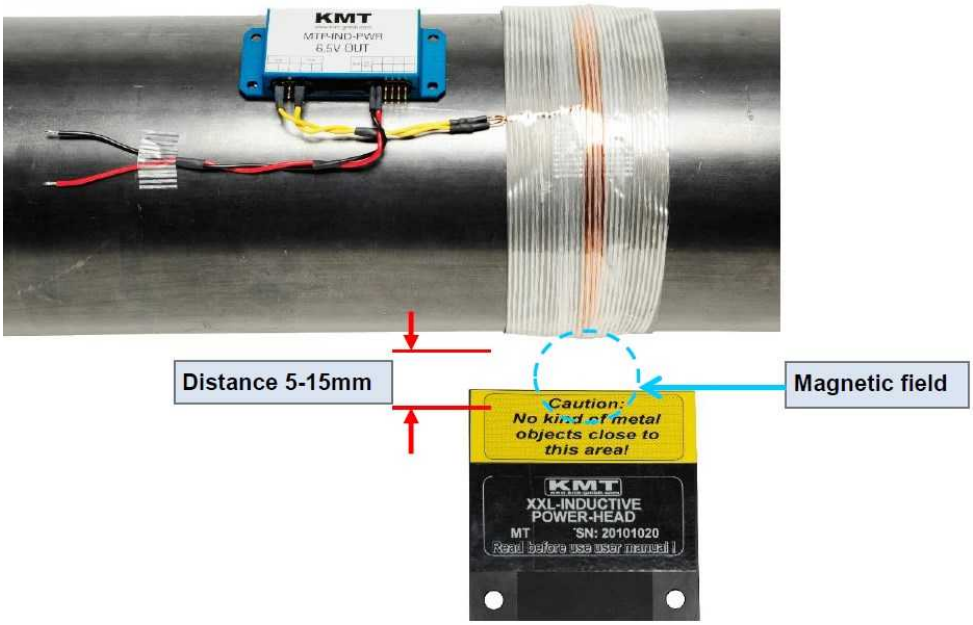


Table 6: Optimum windings for steel shafts

Missing turns occasionally can be compensated by increasing the tuning capacity from 150 nF up to 470 nF.

Windings (±1)	nF	Diameter (mm)
4	250 nF	1000
5	150 nF	600
6	150 nF	490
8	150 nF	205
9	150 nF	160
10	150 nF	135
12	150 nF	95
15	150 nF	40
18	150 nF	35
21	150 nF	25
23	150 nF	20





Distance dependent of current consumption e.g. 2000 mA at 5-10 mm, 500 mA at 10-15 mm

9.3.3 Power head selection – depends on diameter (table)

Recommended power heads:

Diameter	150 mm	300 mm	500 mm	1000 mm
4-Channel	XL	XL	XL	2XL
8-Channel	XL	XL	2XL	3XL
16-Channel	XL	2XL	3XL	3XL
32-Channel	2XL	3XL	3XL	4XL

IND-PWR-HEAD-XL and XXL

IND-PWR-HEAD-XXXL(old version)

Warning

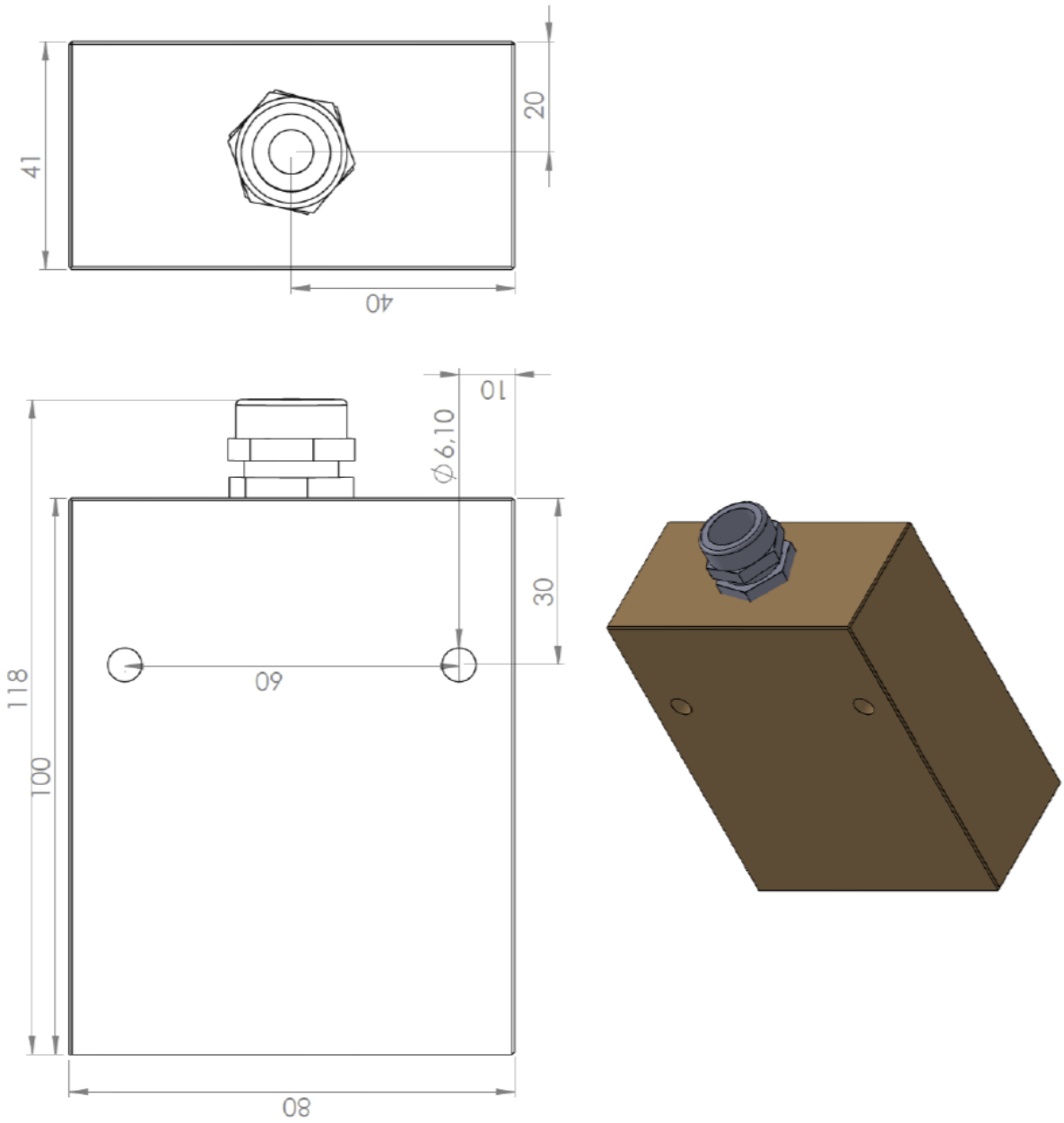
Caution for use of XXL and XXXL power heads!

Cable must be unrolled for use, otherwise it will warm up!

9.3.4 Dimensions of inductive Power head

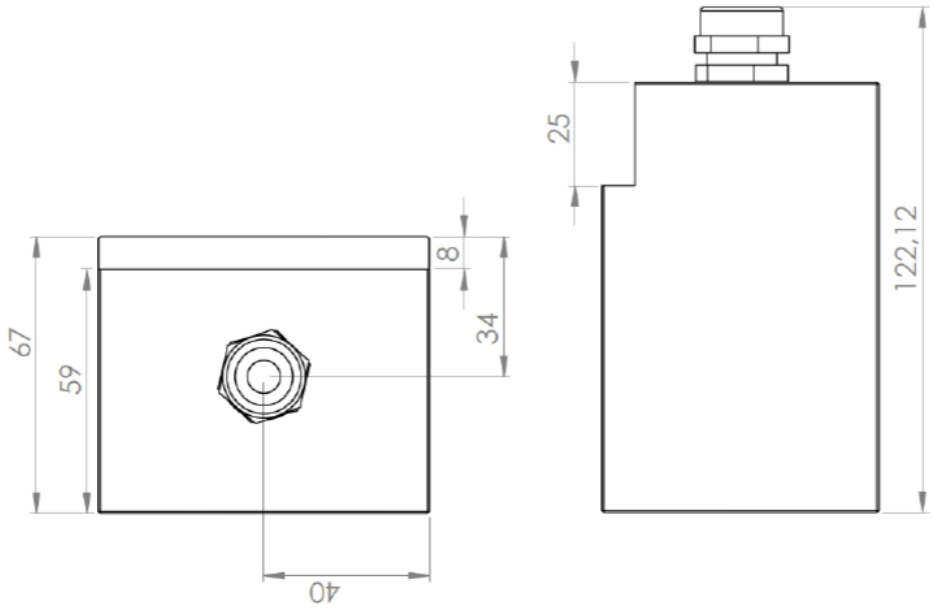
9.3.4.1 Power head XL and XXL

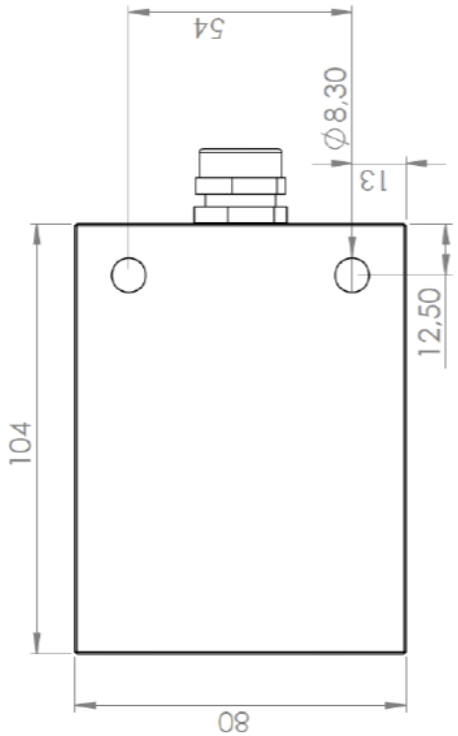
Dimensions of IND-PWR-HEAD-XL and XXL

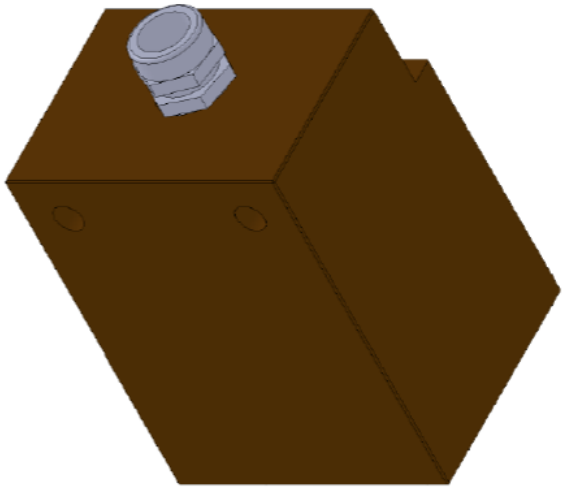


9.3.4.2 Power head XXXL (old version)

IND-PWR-HEAD-XXXL

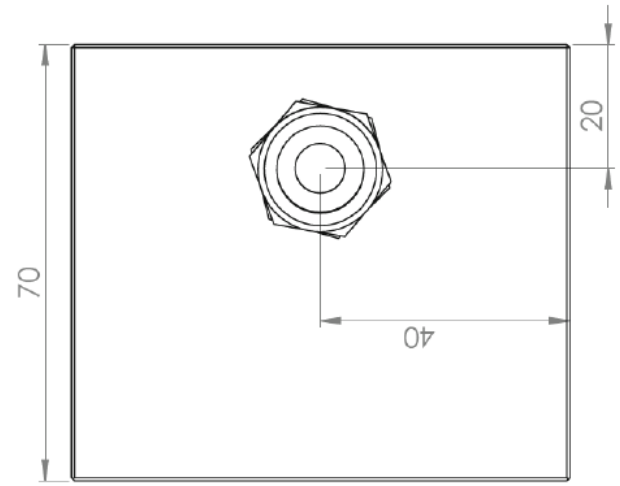


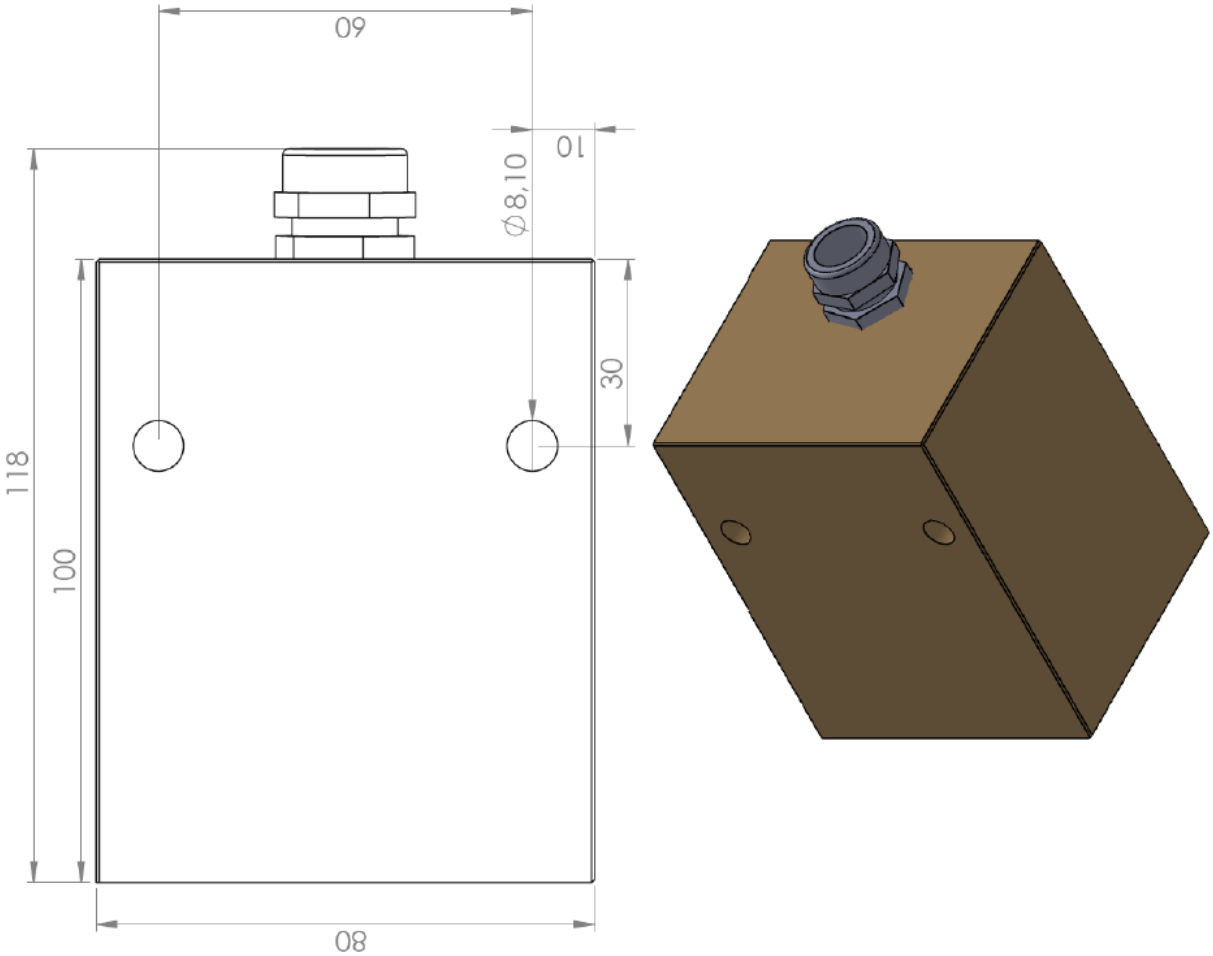




9.3.4.3 Power head 3XL (new version)

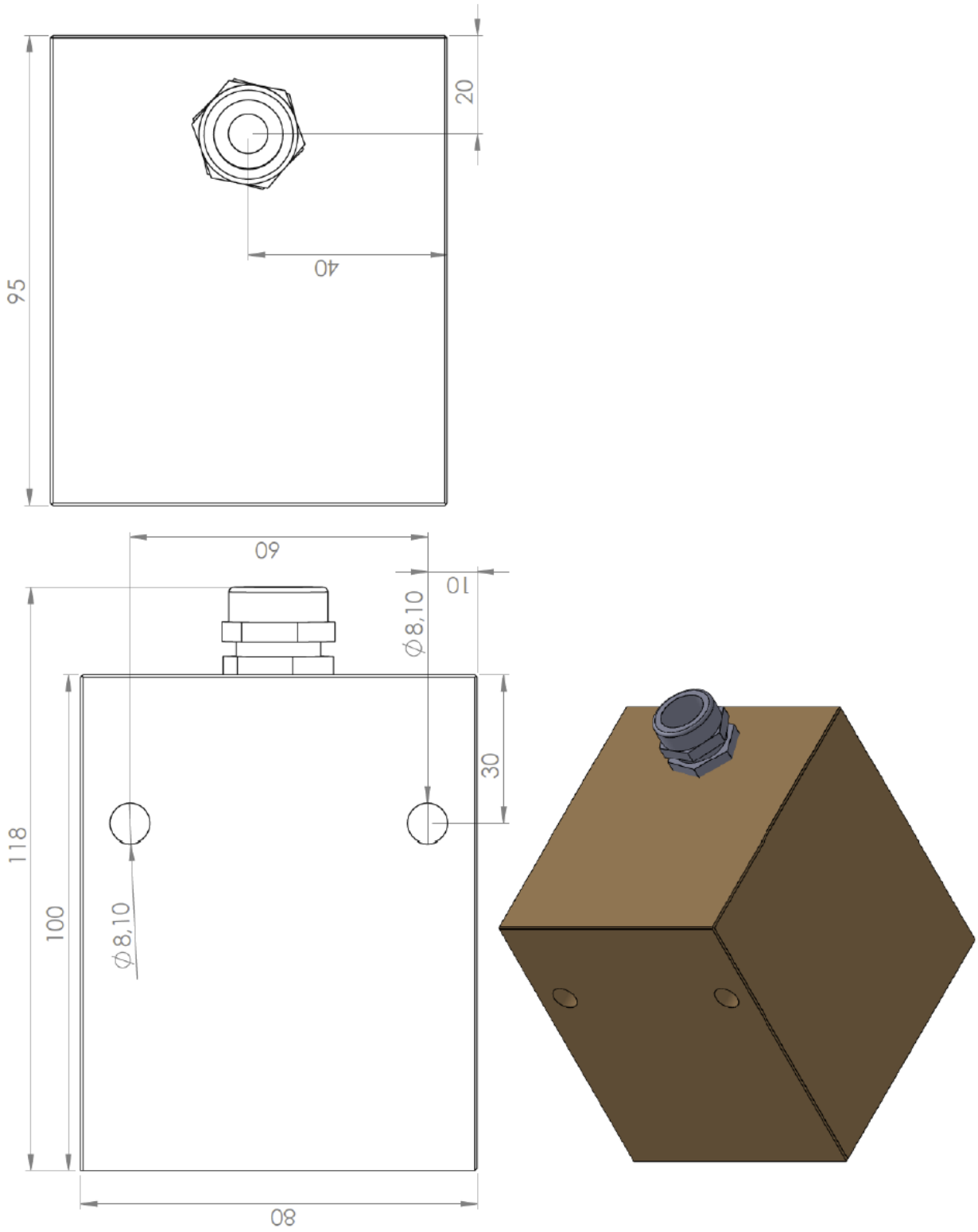
IND-PWR-HEAD-3XL



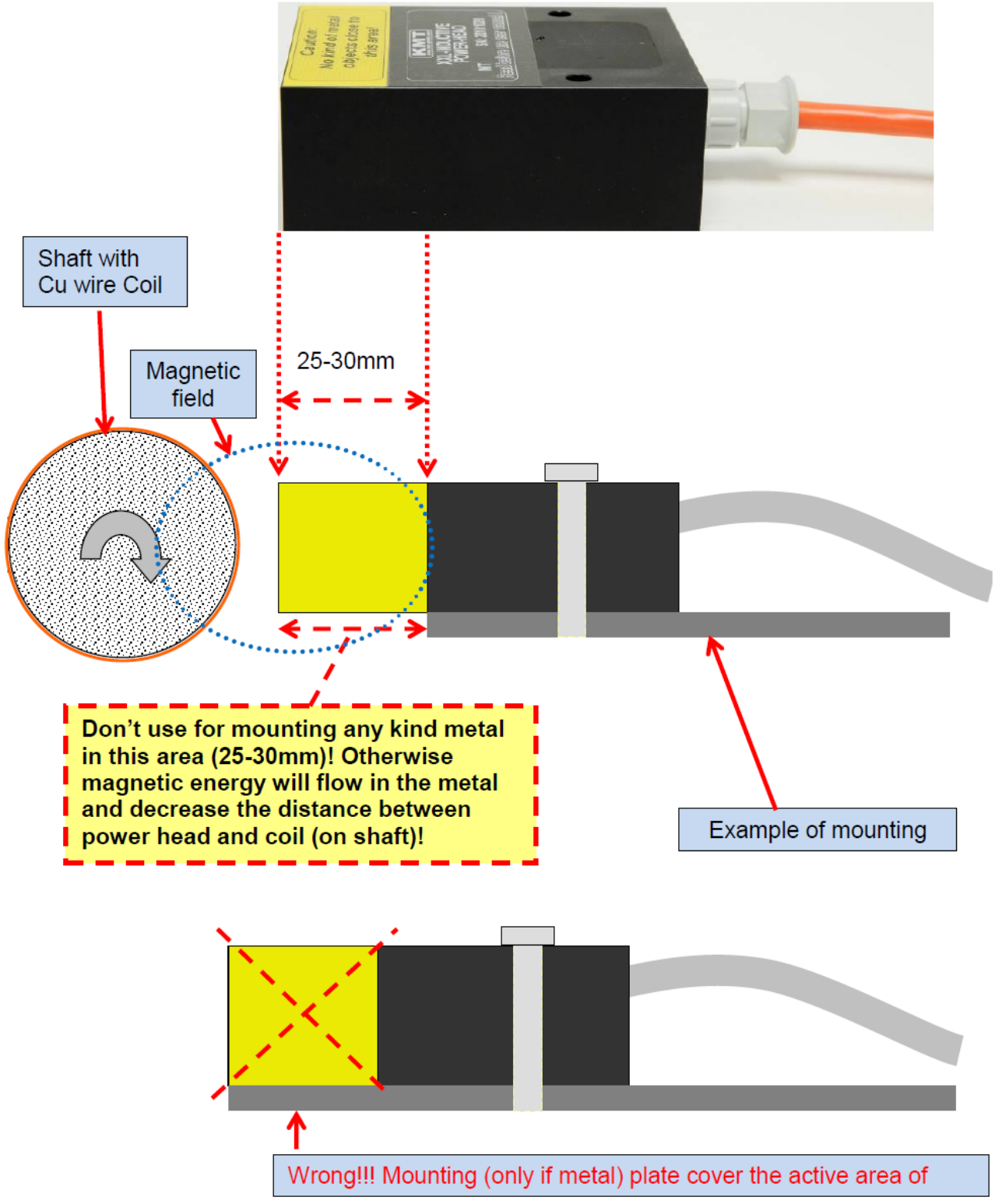


9.3.4.4 Power head 4XL (new version)

IND-PWR-HEAD-4XL

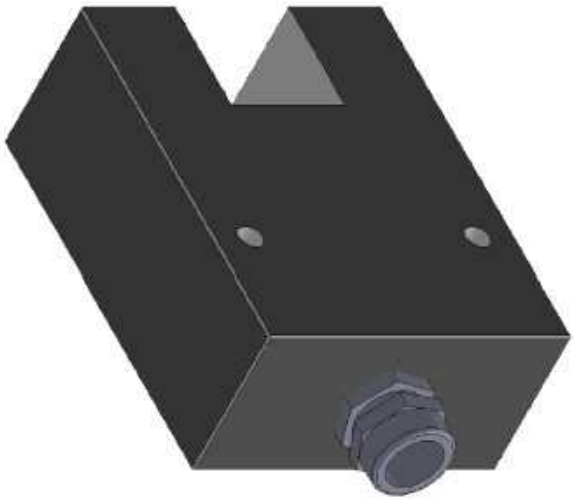


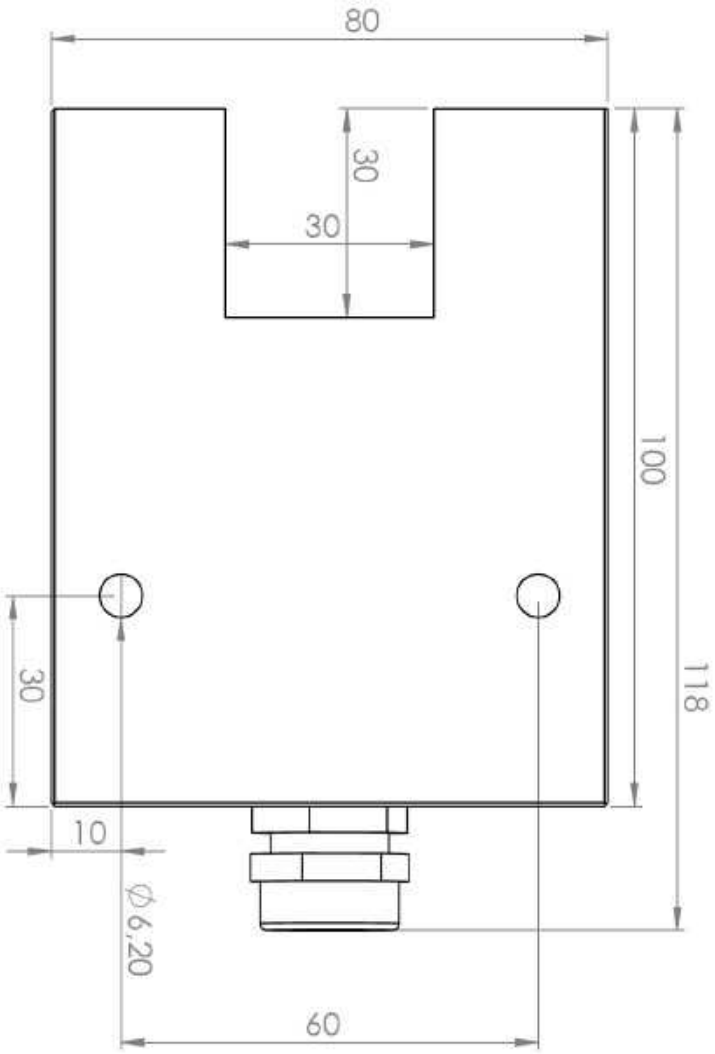
9.3.4.5 Mounting Power head

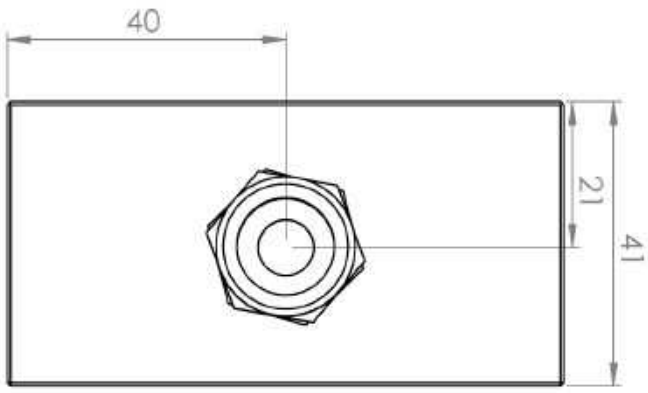


9.3.5 Power head with slot

9.3.5.1 Dimensions of power head XXL with slot







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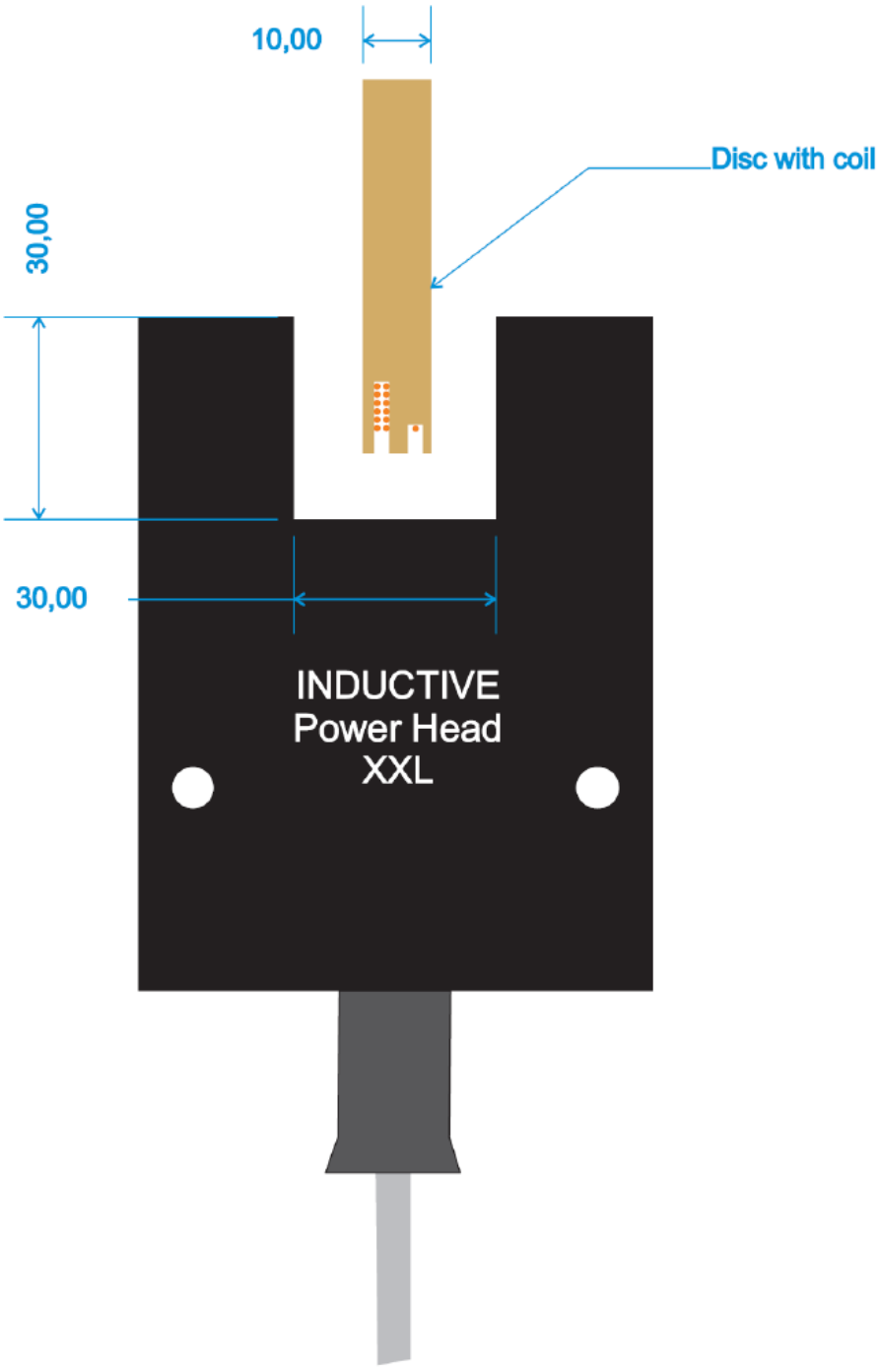
Inductive Power head XXL

Coil distances



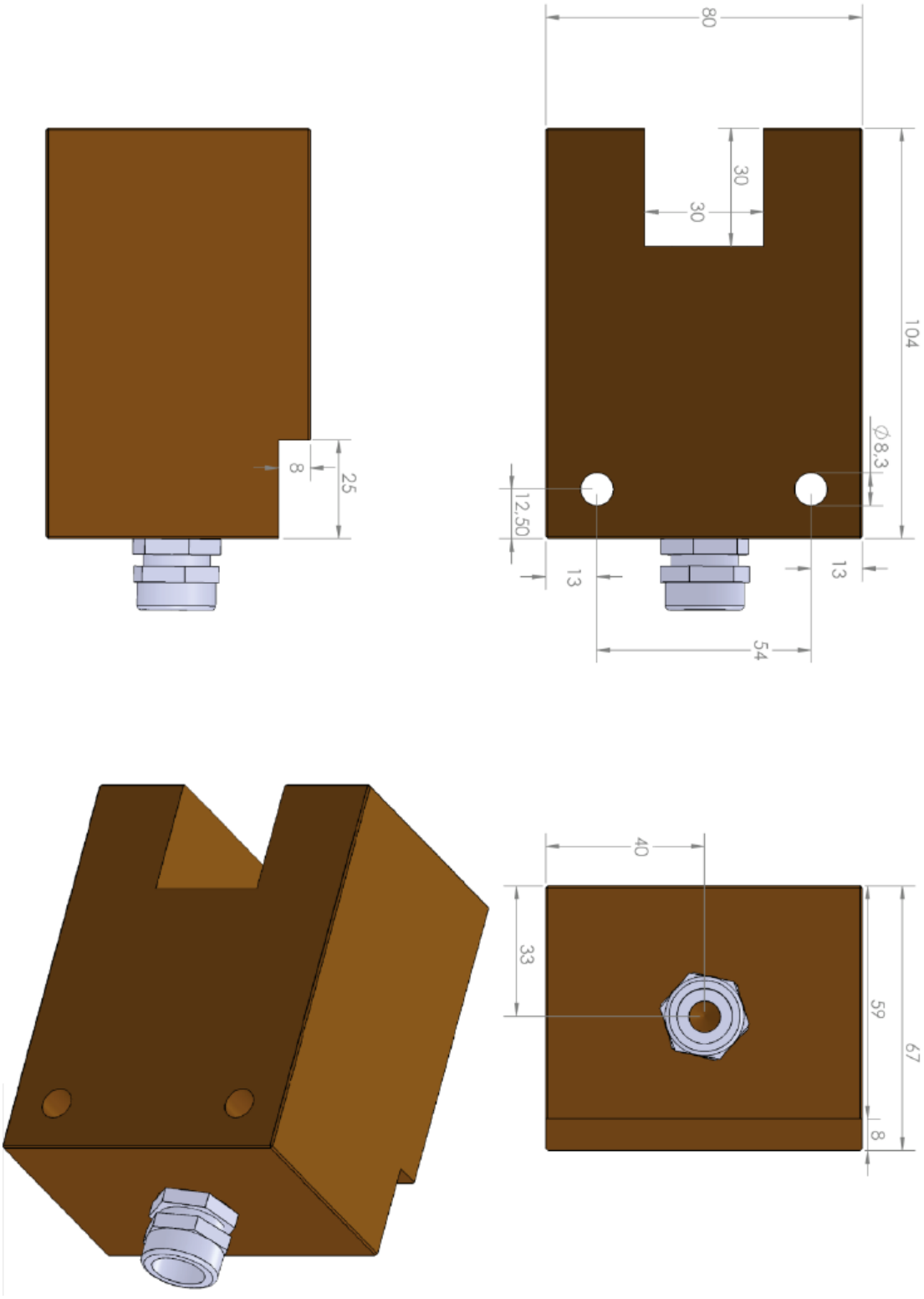
9.3.5.2 Caution for use of XXL power heads with slot

Warning

Caution for use of power heads!

Cable must be unrolled before use, otherwise they will warm up!

9.3.5.3 Dimensions of inductive power head XXXL with slot



9.3.5.4 Caution for use of XXXL power heads with slot

Warning

Caution for use of power heads!

Cable must be unrolled before use, otherwise they will warm up!

9.3.6 Inductive power generator

9.3.6.1 Inductive power generator L, XL , 2XL, 3XL and 4XL

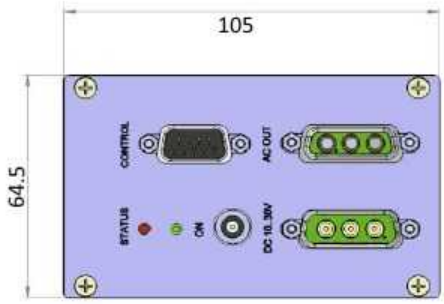
IND-Power generator for L, XL, 2XL, without cooling rip

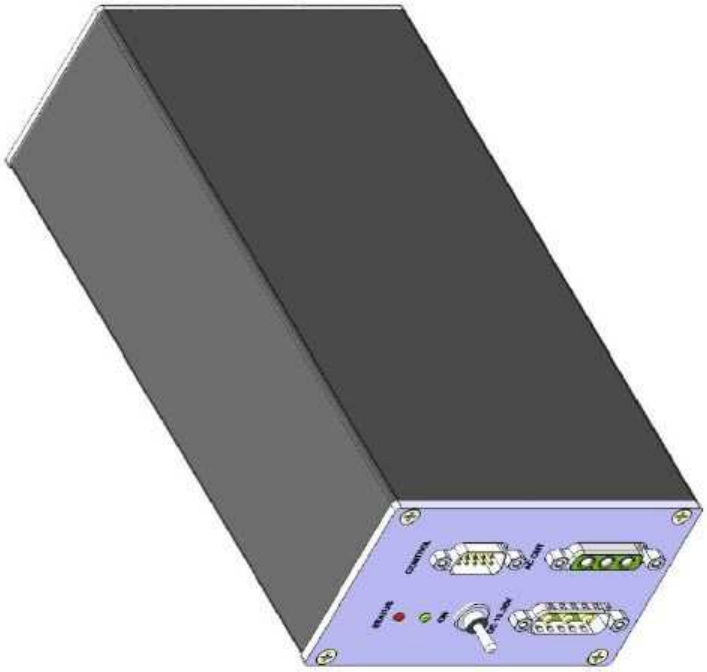
IND-Power generator for 3XL and 4XL, with cooling rip

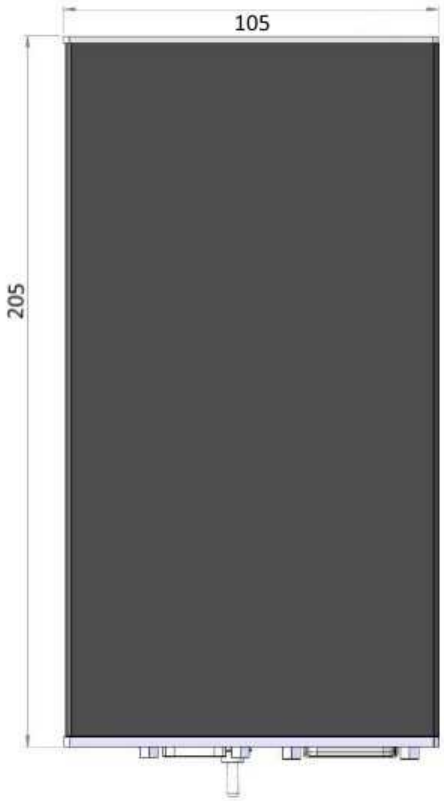
Parameter	Value	Remarks
Power output	AC 25-35kHz for power head L, XL, XXL, 3XL and 4XL	
Power input	10-30 V DC, typical 24V	
Power consumption	<100 W	depends on power head
Dimensions	205 x 105 x 65 mm	
Weight	1.28 kg 3.35 kg	2XL 4XL
Environmental		
Operating	-20°C to 70°C	
Humidity	20 to 80%	not condensing
Vibration	5 g	
Static acceleration	10 g in all directions	
Shock	100 g in all directions	

Table 7: Inductive power generator specifications

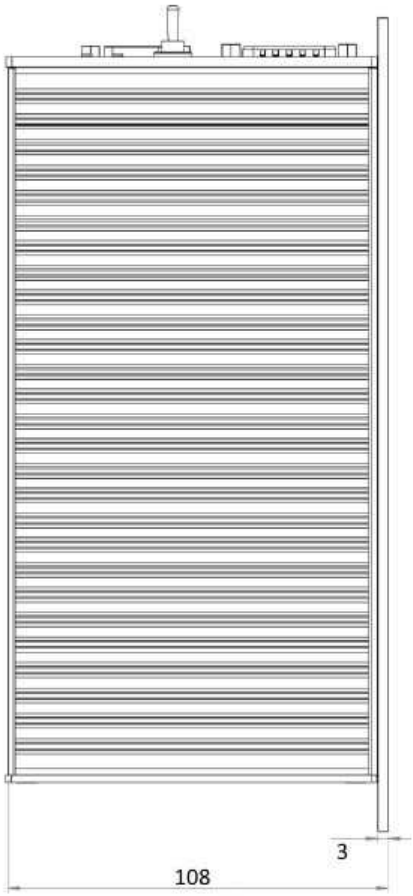
9.3.6.2 Dimensions of IND-Power generator for L, XL and 2XL

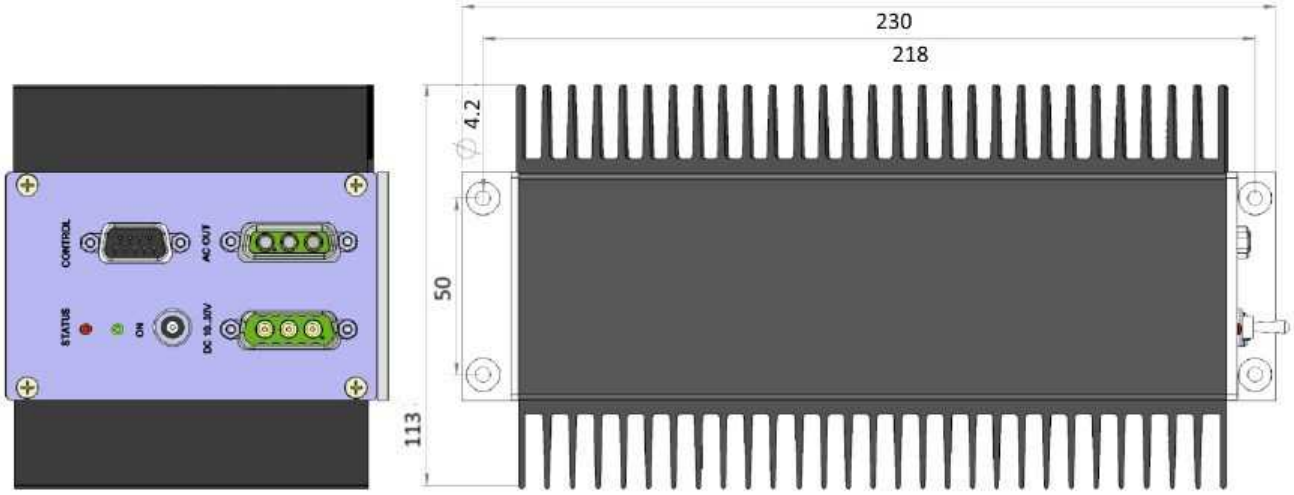




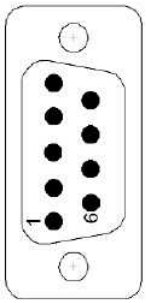


9.3.6.3 Dimensions of IND-Power generator for 3XL and 4XL

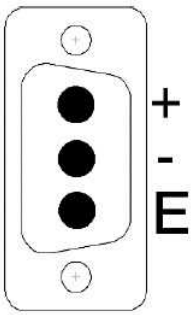




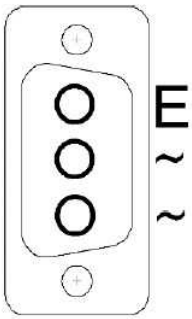
9.3.6.4 Pin connection of IND-Power generator



CONTROL - not used

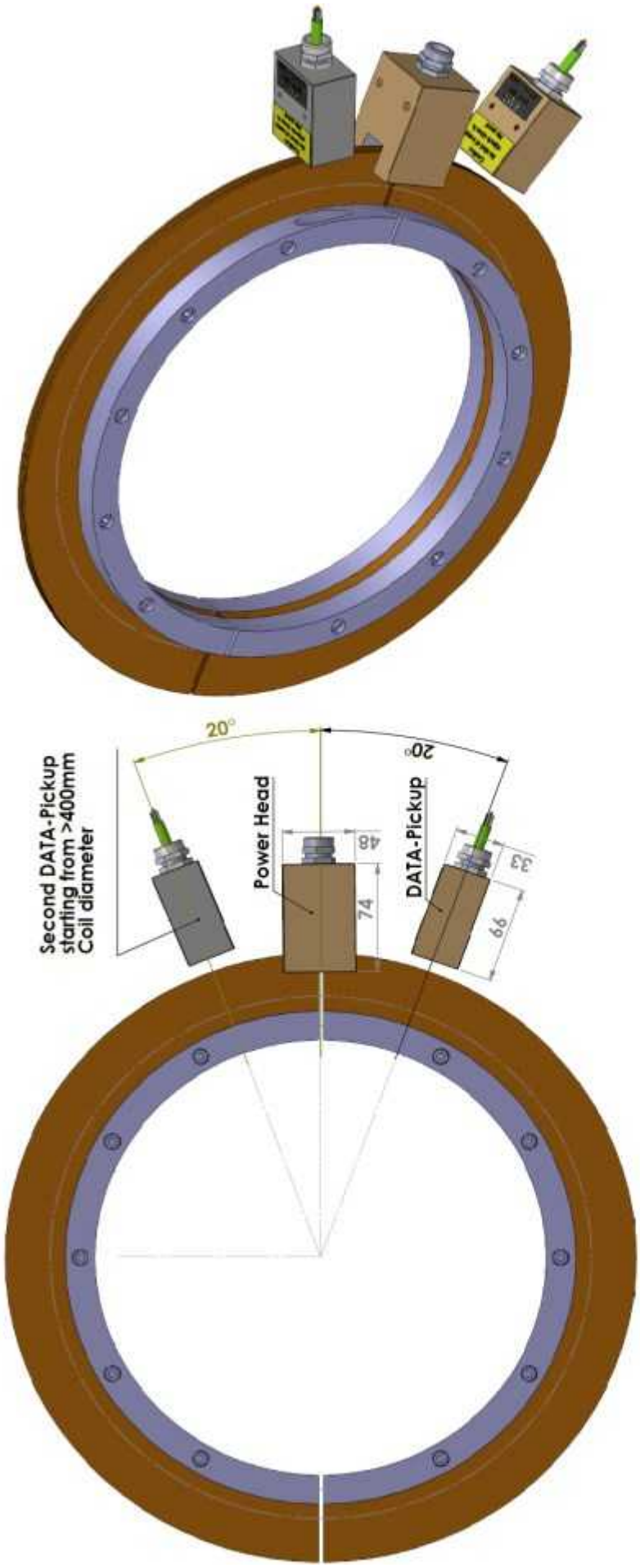


DC 10 to 30 V
typ. 24 V, 5 A

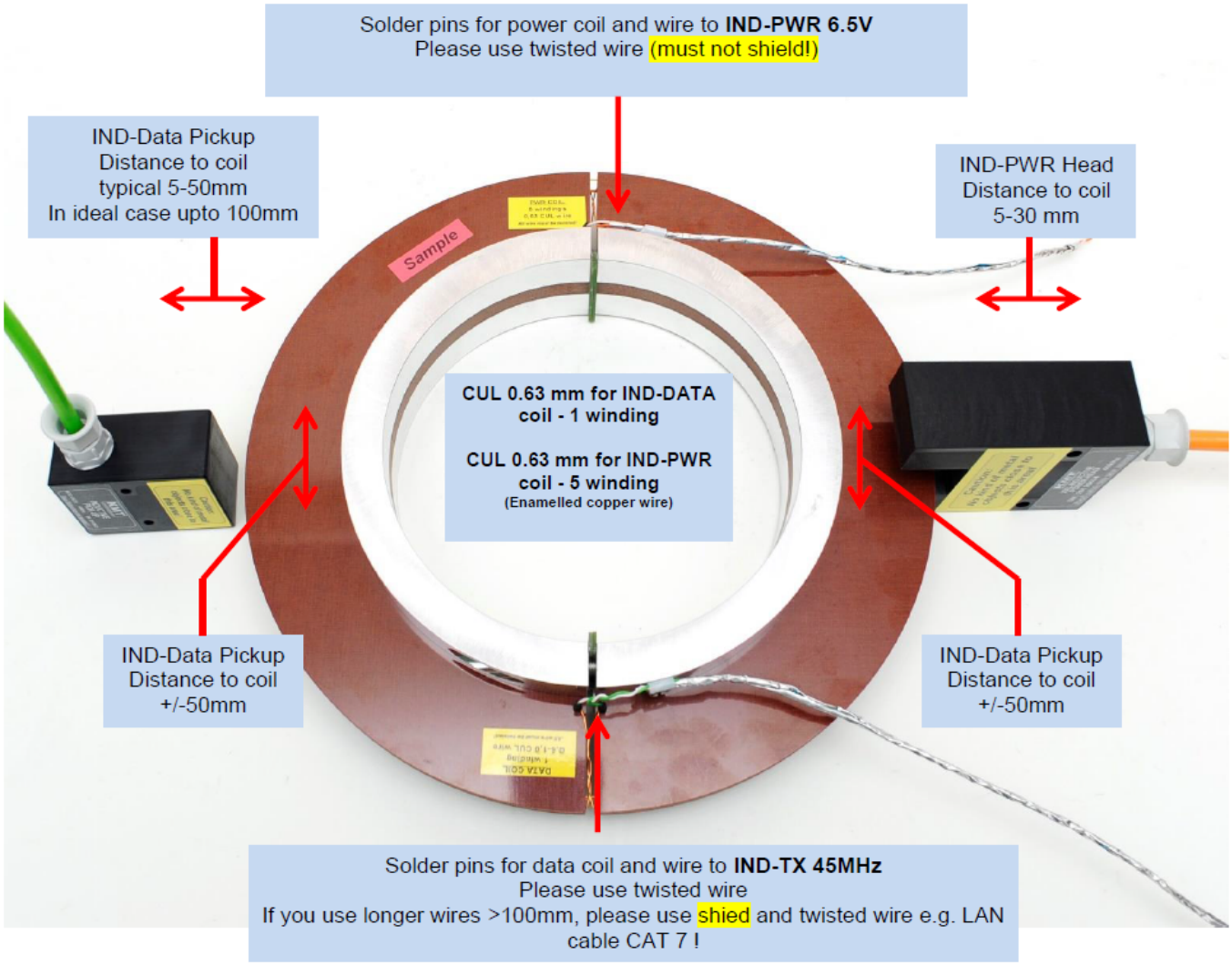


AC 25 to 35 kHz output
power head

9.3.7 Inductive power with RING COIL



9.3.7.1 Distance of power head and pick-up head to coil



Data cable CAT. 7A S/FTP 4P AWG22 (= solid bare copper wire 0.64 mm-diameter) recommend
or
Data cable CAT. 7 S/FTP 4P AWG23 (= solid bare copper wire 0.55 mm-diameter)

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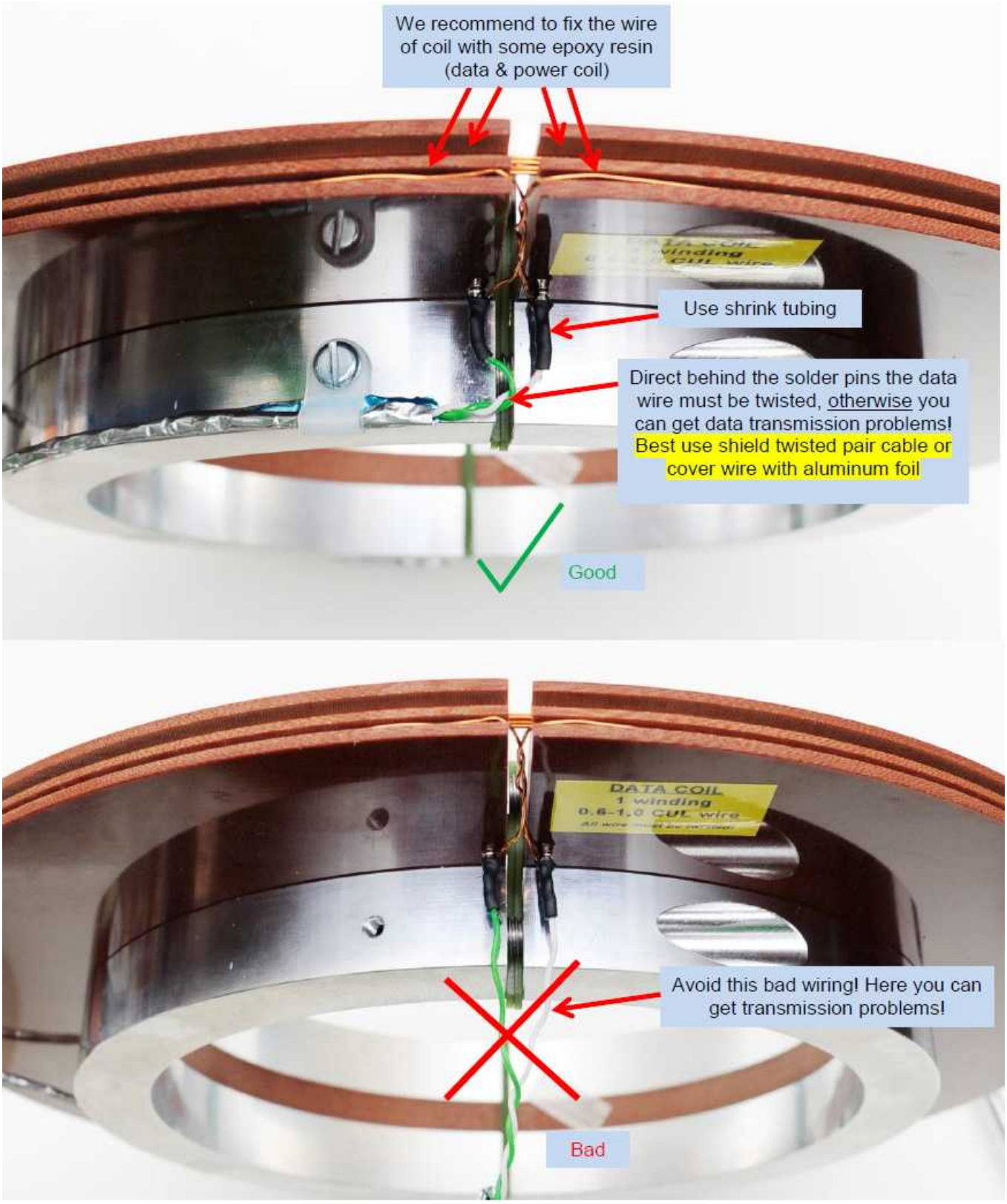
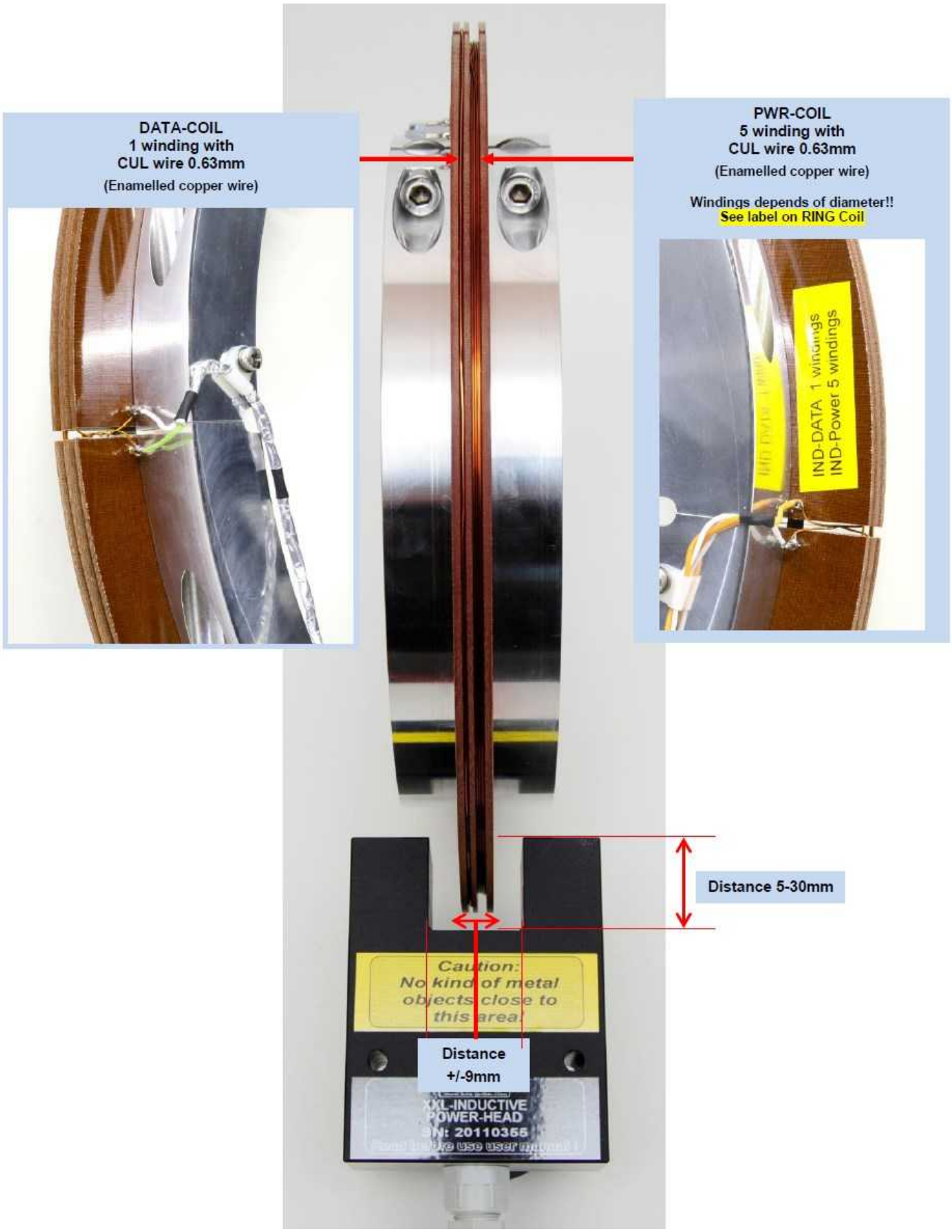
9.3.7.2 Uncouple the 45MHz frequency to reach better transmitting range

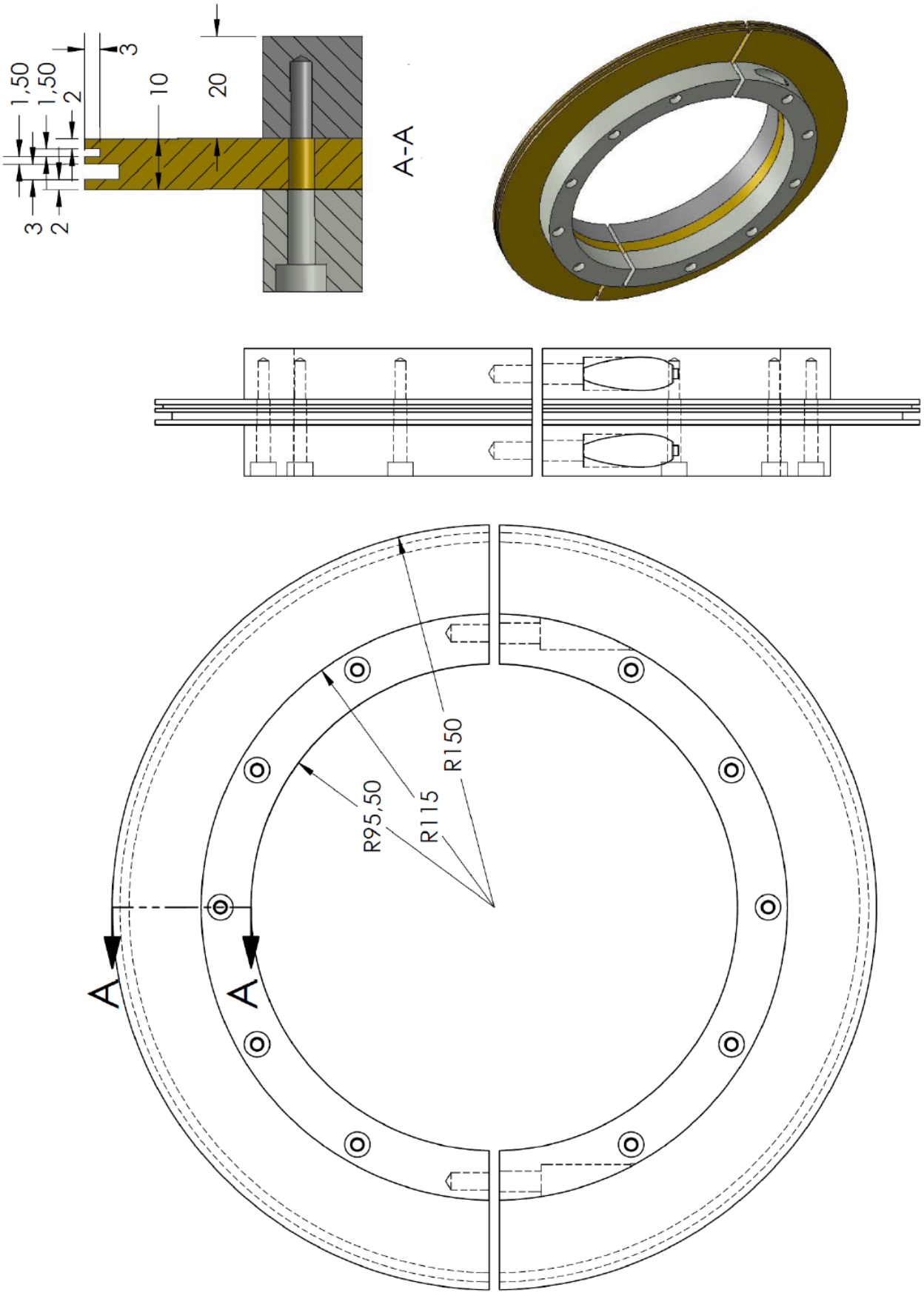
9.3.7.3 Wire connection



9.3.7.4 Distance from coil to power head



9.3.7.5 Example of a Ring Coil diameter



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