

User Manual INPUD-TC



**Contact less transmission system
with front end for thermocouple transducer type J, type K**

for shaft diameter up to 32mm

with voltage output interface 0..10V
or
with current output interface 4..20mA



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Congratulations on your INPUD-TC! You have made an excellent choice in buying this innovative technology which offers a variety of advantages in its use. In order to avoid handling errors you should take a few minutes and read these operating instructions carefully.

When you have read these instructions you should keep them safely at a place where they can be easily accessed so that you can refer to them again at any time.

The information and data contained in these Operating Instructions may be modified without prior notice. No part of this documentation may be reproduced or transmitted for any purpose whatsoever, regardless of the mode or the means, electronically or mechanically, without the prior permission in writing of MESA Systemtechnik GmbH.

In order to protect the unit against fire, electric shock or potential destruction of the electronic components contained in it, it must never be exposed to rain or extreme humidity. Direct sun or heat should be avoided as well.

Please do not try to open the Stationary or Rotating Module. There are no parts inside which you could maintain.

All data in this publication have been compiled and checked with utmost diligence, nevertheless errors and mistakes cannot be totally excluded.

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1. Safety notes



INPUD (Inductive power and Data transmission) systems are not permitted for use in applications in which the safety of persons depends on the unit function (not safety components according to EU Directives). Knowledge of the safety information and safety regulations is a basic requirement for safe handling and fault-free device operation.

Work on the electrical connection and the power supply should only be done by an electrician.



No changes, alterations or additions may be made to the system or any of its parts without the permission of the manufacturer. Alterations, additions or modifications to the device without the manufacturer's express approval are prohibited. Parts, which are not in an impeccable state have to be changed immediately but only with original spare parts.

2. Introduction

INPUD-TC systems are used in places where fixed wiring is not possible, e.g. on rotary tables, mills, calendars and godets; they are generally used on rotating axles where reliable supply for sensors and actors on moving parts must be ensured. It is the wear and tear of slip ring systems which makes processes unreliable and causes even down times due to maintenance work, which in turn may result in considerable losses of production.

2.1 Functional principle

The sensor signal of the unlinearized temperature sensor is applied to the INPUD-TC Rotor where it is then processed electronically. After signal processing and digitalization, the data are transferred in serial form to the INPUD-TC Stationary Module and they are converted into an output signal in proportion to temperature. This signal is available as a current or as a voltage output signal for further processing. The INPUD-TC Stationary Module is also used to supply the necessary electric energy to the rotating electronics by means of induction.

2.2 Packing list

When unpacking the unit, please make sure that all parts and components are included in your INPUD-TC delivery package:

- Stationary Module
- Rotating Module
- User Manual

optionally available:

- Flange connectors and flange socket for power supply and signal out for the Stationary Module
- Mounting ring for the rotor plus hexagon socket set screw M4x6 or 8, DIN 914 (4 are pre-assembled) 2 ea. socket head screw M4x18, DIN 912
- Cable assembly for individual lengths with straight or right angle plug, preferred types refer to chapter 5.1

3. Technical data

	INPUD-TC Stator	INPUD-TC Rotor
Dimensions	75x 50x 25 mm (without mating connector)	$d_i=32$ mm; $d_a = 75$ mm (without Mounting Ring)
Installation type	fest	Rotating on a shaft, $d = 32^{+0.1}$ mm with Mounting Ring $d = xx$ mm
Fastening	2 screws M5	fixed onto the shaft with hex-socket set screws M4
Supply voltage U_b incl. residual ripple	24V DC, $\pm 10\%$	internal
Current consumption	70..90 mA (nom.) max. 120 mA inrush	
Temperature range T_a	0°...70° C	0°...70° C
Sensor inputs		2 x thermocouple typ J or K **
Transmission path failure		$F=\pm(0,15+0,002*T)$ (at 15...40 ° C ambient temperature)
Lead failure transducer		na
Measurement range		0..300° C (standard) 0..100° C bis 0..700° C **
Resolution	0,2° K	
Output signal **)	2x 0..10 V (load $\geq 1k\Omega$) or 2 x 4...20 mA load $\leq 400 \Omega$	
Sampling rate		10Hz
Connections for power supply 3 pin for signal out 5 pin	flange connector M8 flange socket M8	M3 solderless plug
Protection class	IP67	IP54
Material (housing)	PETP	PETP
Coverage	Aluminum anodized	PETP
Rotational speed		<5.000 1/min**
Weight	115 g	130 g
Air gap (transmission distance)	2 mm (between Stationary and Rotating Module) (tolerance +/-1 mm)	
Axial shift	+/-1 mm	

*) This value indicates just an orientation. It is highly recommended to care for appropriate safety precautions to prevent persons from injury.

***) Refer to type label



The speed strength of the Rotating Module has been verified by several life tests. It is to be considered that not all operating conditions, e.g. thermal cycles and dynamic stress, also production lots of basic material (PEEK) could be tested. Those parameters could have an impact to the enduring speed strength.

4. Installation notes

The following installation notes must be strictly observed:

- Installation, removal and wiring only when no external power is applied
- INPUD-TC Rotating Module must not be supplied with external voltage
- INPUD-TC Stationary Module shouldn't be supplied with energy if INPUD-TC Rotating Module is not in opposite position
- Modules could grow hot depending on their individual operating state
- Mounting the INPUD-TC Stationary Module please note that plastic case would not be damaged when tightening mounting screws. For a long term and save fixation we recommend using thread locking compound.

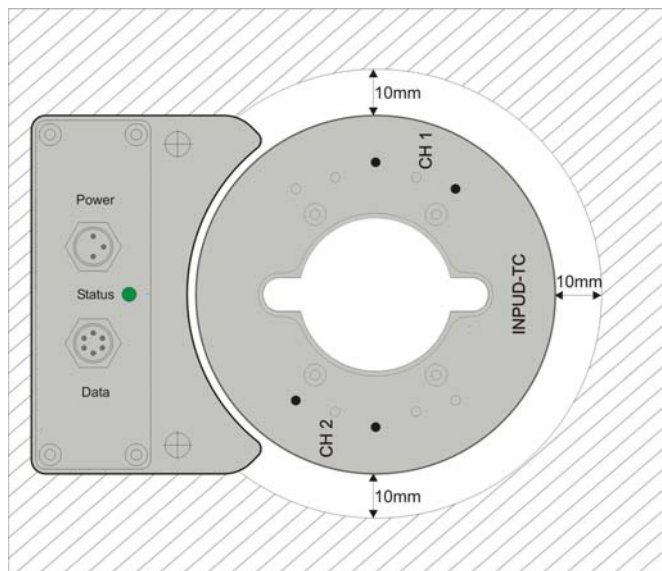
When attaching the INPUD-TC to power supply, note the following:

- Check connecting cables and connectors for damage
- Laying of wires in the vicinity of other cables carrying high voltages or frequencies should be avoided to minimize interference injections
- The bending radius of the connecting cable should be considered
- Cables must not be pinched or crimped

4.1 Power supply

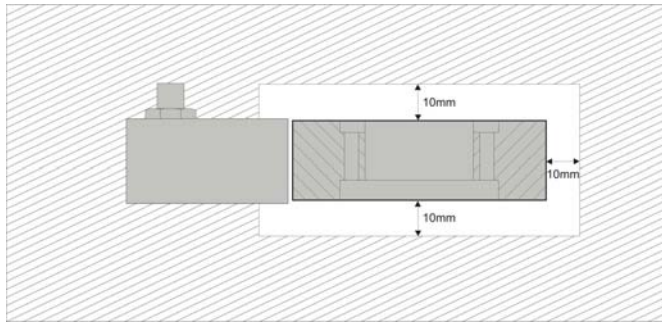
The INPUD-TC system is supplied with 24 VDC. The power consumption is at standard distance between stationary and secondary part ≤ 90 mA. This number is dependent on the air gap and the supply voltage.

4.2 Installation in metal surroundings



Front view INPUD-TC

For an installation in metal, the minimum distances to the environment **must** be observed. As a result, the transmission distance between Stationary Module and rotor might be reduced. The kind of the surrounding metal may also influence the transmission distance.



The system must have a 10mm clearance to metallic surface.

Side view INPUD-TC

4.3 Installation instructions

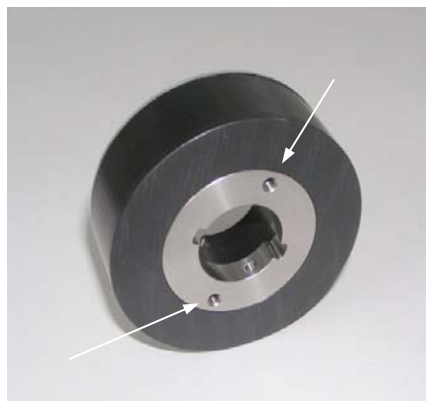


Procedure for the Rotating Module:

- Fasten the Mounting Ring with hexagon socket set screws M4x6 or x8 onto the shaft.
- Be sure that Mounting Ring is properly matched to the shaft.

Remarks:

- The Mounting Ring up can be supplied with an inner diameter of 10 to 32 mm. For a shaft diameter of 25 mm a standard steel Mounting Ring is available (Id. 00010021).



- Shift the Rotor onto the Mounting Ring so that the axial holes of the steel pick up are in line with those on the Rotating Module.



- Fasten the Rotating Module onto the Mounting Ring with 2 ea. screws M4x18.
- The screws are modestly tightened and to be locked with thread locking compound.



- Thermocouple to be connected to channel 1 (CH1) and/or 2 (CH2)
- The screws of the Rotating Module terminators has to be tightened properly



Thermocouple input not in use should be short circuit. If not, this input will generate unnecessary flash mode indication.



Please be assured, that the Rotating Module is mounted properly on the shaft prior to switch on the machine. Corresponding safety protection has to be considered due to prevent any personal injury.

Procedure for the Stationary Module:

- Install the Stationary Module and adjust it so that the air gap between Stationary Module and Rotating Module is 2 mm; choose the distance in such a way that the two systems do not touch each other mechanically in case of unbalances or vibrations of the rotating shaft
- Switch the system on; the current consumption should be 90mA maximum.

4.4 Maintenance

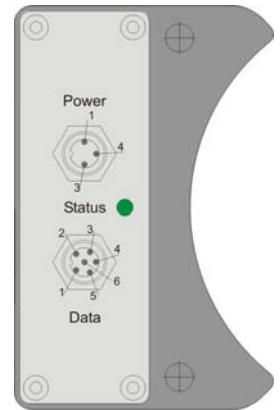
Since this technology does not include any parts subject to mechanical contact, no service or maintenance works are required. It is, however, recommended that the mechanical fastening and the width of the air gap should be checked at regular intervals.

5. Connector assignment

Power supply should be connected to the 3 pin connectors onto the Stationary Module. Signal out is connected to the 5 pin flange connector.

Connector assignment flange connector 3 pin:

	Pin	Description	Remark
Power	1	Power supply IN	24 VDC ($\pm 10\%$)
Power	3	Ground IN	GND
Power	4	Nc	



Connector assignment flange socket 5 pin:

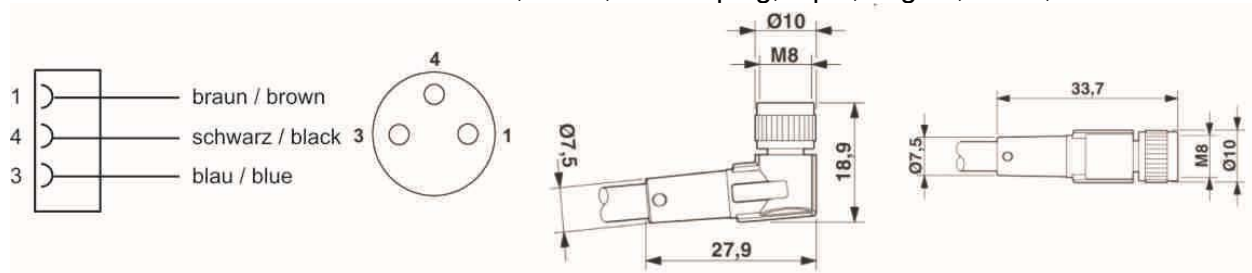
	Pin	Description
Data	1	CH 1 Analog out
Data	2	CH 2 Analog out
Data	3	Analog Ground
Data	4	Analog Ground
Data	5	Status-output (open drain, max 24 V, 0,1 A)

5.1 Accessories (optionally available)

Power supply and signal cables are connected to the M8, 3 and 5 pin connectors onto the Sstationary Modules. Tailored cables with cable tail could be purchased as follows:

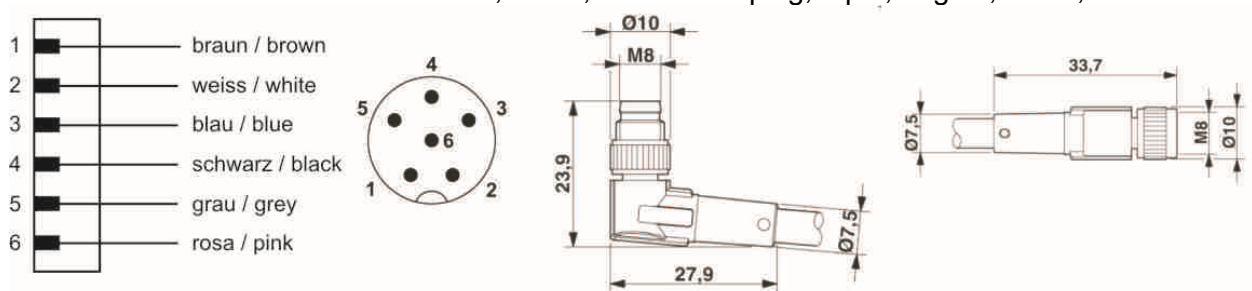
Power supply:

- 31235001 Power cable INPUD-T/TC, axial, female plug, 3 pin, straight, M8x1, 3 m* PUR
- 31235011 Power cable INPUD-T/TC, radial, female plug, 3 pin, angled, M8x1, 3 m* PUR



Signal out:

- 31235071 Data cable INPUD-T/TC, axial, male cable plug, 5 pin, straight, M8x1, 3 m* PUR
- 31235081 Data cable INPUD-T/TC, radial, male cable plug, 5 pin, angled, M8x1, 3 m* PUR



*) Other cable lengths on request

Remark: Lead colors could change.

6. Measuring range

6.1 Thermocouple interface

INPUD-TC is available for type J and K thermocouples. Type J and K are defined as follows:

type J iron/copper-nickel, temperature range -270° C...1200° C

type K nickel-chrome/nickel-aluminum, temperature range -270° C...1370° C

The conversion of the thermoelectric voltage into a normalized voltage or current signal refers to EN 6060584-1 (IEC 584-1) in the Rotating Module of INPUD transmission system.

Temperature range is mentioned on INPUD Rotating Module. Standard version covers a temperature range from 0...300° C.

Further measurement ranges are available on request: 0..100° C, ..150, ..200, etc. up to 700° C (in 50° C steps).

The output reading for a standard measurement range from 0..300° C on the Stationary Module is set to

0V or 4mA corresponds to 0° C
10V or 20mA corresponds to 300° C.

Sample:

Temperature [°C]	0	25	50	75	100	125	150	175	200	225	250	275	300
Output reading volt [V]	0	0,83	1,67	2,5	3,33	4,17	5,00	5,83	6,67	7,50	8,33	9,17	10,0
Output current [mA]	4,00	5,33	6,66	8,00	9,33	10,66	12,00	13,33	14,66	16,00	17,33	18,66	20,00

The temperature values could be calculated as follows (base 0..300° C):

whereas $K = \text{temperature [°C]}$ $U = \text{voltage [V]}$ $I = \text{current [mA]}$

a.) for output voltage:

$$K = \frac{300^\circ \times U[V]}{10V} \qquad U = \frac{10V \times K[^\circ]}{300^\circ}$$

b.) for output current:

$$Y = \frac{\Delta K}{\Delta I} = \frac{300^\circ\text{C}}{16\text{mA}} = 18,75 \frac{^\circ\text{C}}{\text{mA}} \qquad K = (I - 4\text{mA}) \times 18,75 \frac{^\circ\text{C}}{\text{mA}}$$

$$I = 4\text{mA} + \frac{K}{18,75 \frac{^\circ\text{C}}{\text{mA}}} = 4\text{mA} + K \times 0,0266 \bar{6} \frac{\text{mA}}{^\circ\text{C}}$$



Connecting thermocouples keep attention to the right polarity.

7. System status

7.1 Status-LED

The multicolor LED integrated in the Stationary Module is used to visualize the different operating conditions:

● green LED steady on	:	normal operation
● red LED steady on	:	Error 1 (see section 7.2)
● red LED flashing slowly (1,2 s cycle)	:	Error 2 (see section 7.2)
● red LED flashing fast (0,4 s cycle)	:	Error 3 (see section 7.2)
● fast change orange to red	:	Error 4 (see section 7.2)
● orange LED flashing fast:	:	Error 5 (see section 7.2)
● orange LED flashing slow	:	Error 6 (see section 7.2)
● orange LED steady on	:	Error 7 (see section 7.2)
● slow change orange to red	:	Error 9 (see section 7.2)

7.2 Flashmode Summary

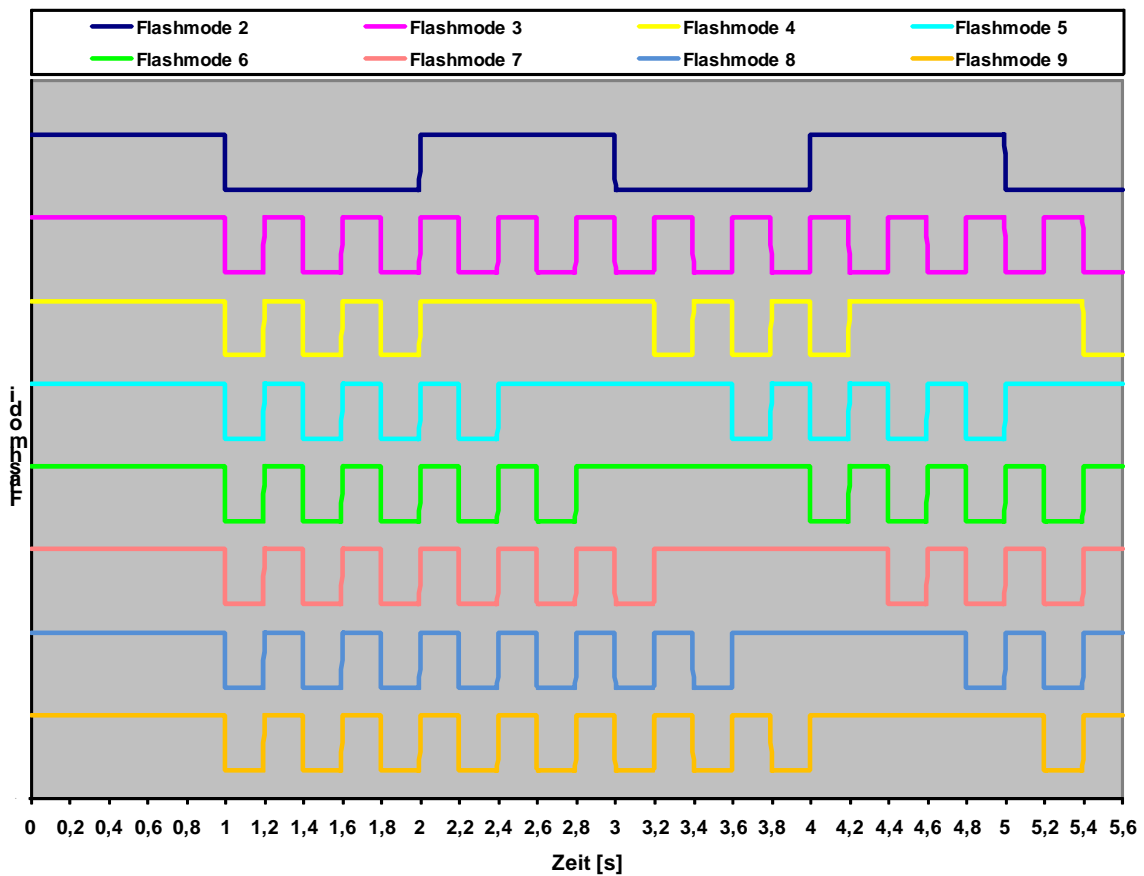
System state	prio	meaning	status read ❶
Okay		normal operation	high
Error 1	1	24 V _{DC} power supply "out of range" ❷	low
Error 2	2	Internal power supply of Stationary Module "out of range" ❷	Flashmode 2
Error 3	3	Internal temperature or current consumption "out of range" ❷	Flashmode 3
Error 4	9	Inverter frequency at/above the limit	Flashmode 4
Error 5	6	Voltage at INPUD-TC Rotor "out of range"	Flashmode 5
Error 6	7	Transducer values "out of range" or wire break or short circuit on INPUD-TC Rotor	Flashmode 6
Error 7	4	Data communication Rotor → Stator "time out" ❸	Flashmode 7
Error 8	5	Reserved, not in use	Flashmode 8
Error 9	8	Error at INPUD-TC Stationary Module analog out (0 ...10 V or 0/4 ...20 mA)	Flashmode 9

❶ Status out open drain (low side)

❷ INPUD-T Rotor to be deactivated completely when error occurs

❸ INPUD-T Rotor to be deactivated/activated cyclically when error occurs

7.3 Flashmode – at a glance



Flashmodi of status out

Description:

- from the beginning of an error, about 1 second waiting time (that long must an error be present at least to be displayed)
- flashmode 4 to 9 are repeated every 1.2 seconds as long as the error is pending
- after an errors end the respective sequence is fully completed
- if several faults occur simultaneously, only the fault with the highest priority will be displayed (see section 7.2)

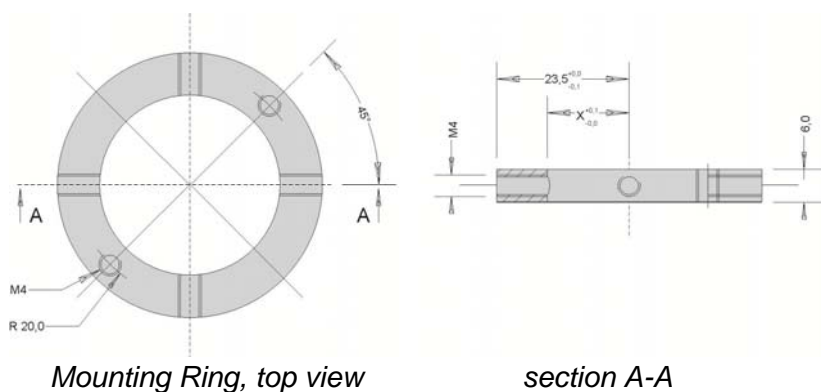
8. Mechanical dimensions

8.1 Mounting Ring

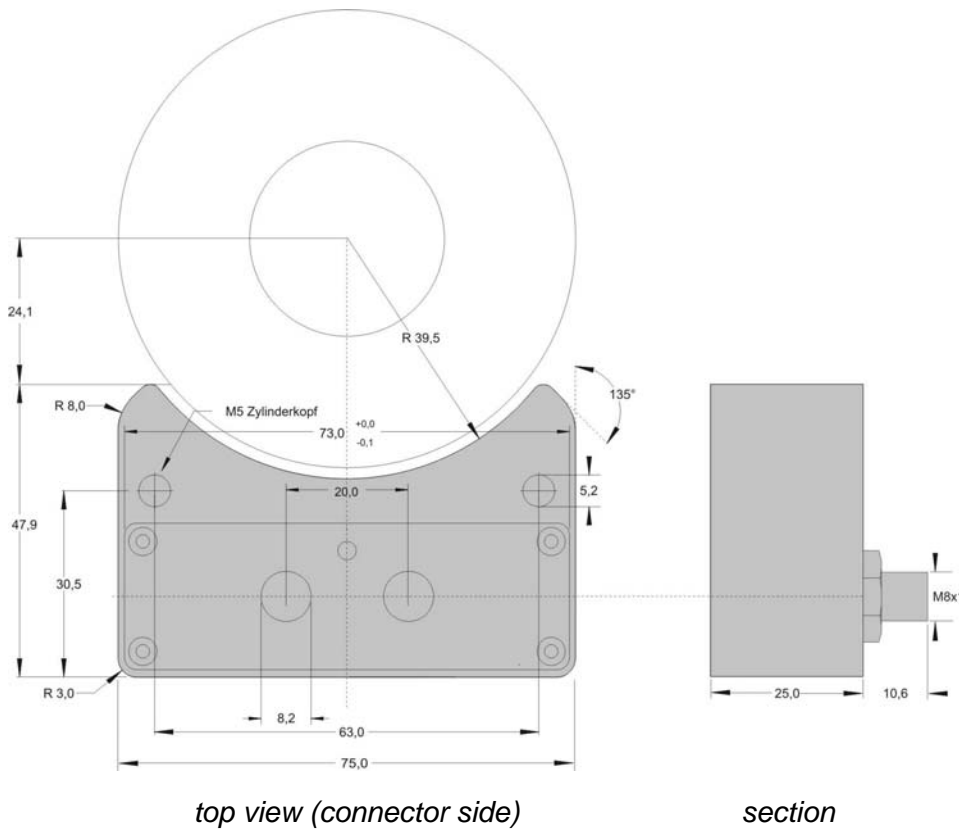
Mounting Rings are available for following shaft diameter:

- 25mm Id. 00010021
- 32mm Id. 00010022

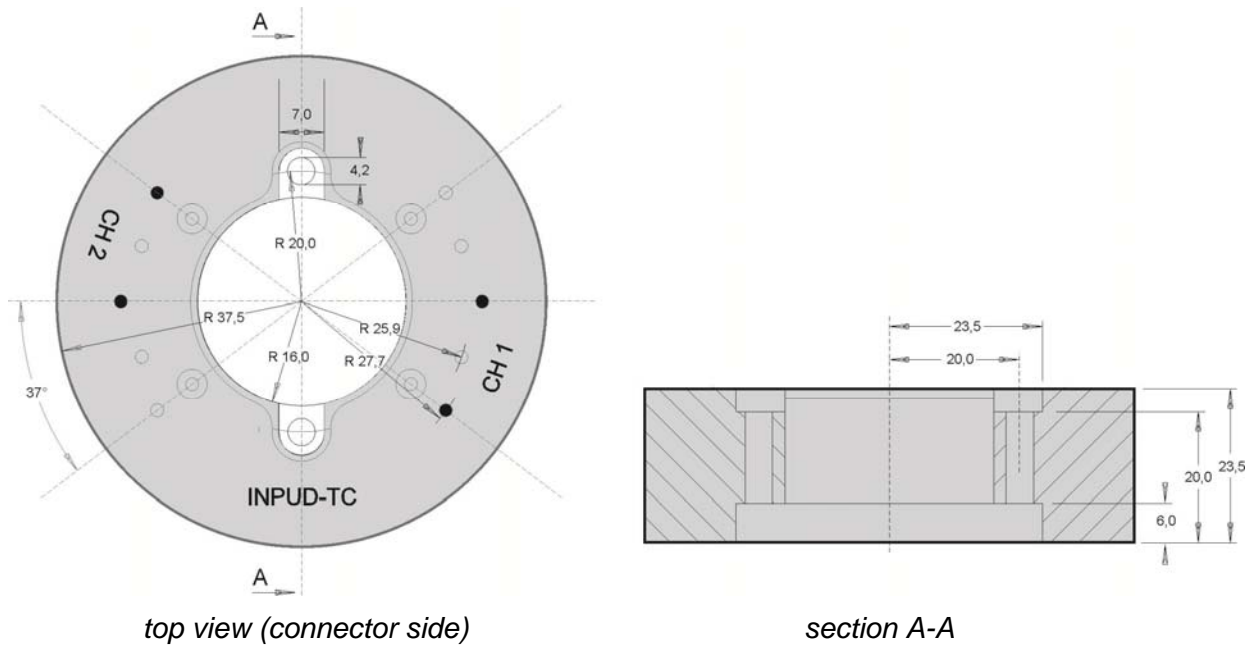
From 15...32 mm
On request Id. 00010020



8.2 INPUD-TC Stationary Module



8.3 INPUD-TC Rotating Module



Threads or connecting terminals of the electric connections are to be tightened carefully.