

RTS100 CANopen

ROTARY ENCODER

Absolute single-turn magnetic encoder with integrated inclinometer



L4 - DS0043 R05 RTS100 CANopen - 04/11/24



CHARACTERISTICS

Measuring range up to 360°
High resistance to shock and vibrations
Compact size
High accuracy of measurement
High protection level and wide temperature range
Multi-variable position sensor (angle & inclination)
Detection of magnetic loss



ADVANTAGES

Contactless Hall effect technology
Reliability and long service life in outdoor use
Optimized for integration in mobile machines
Several connection types available
Highly configurable via CANopen
Firmware upgradable via proprietary bootloader
Recommended for safety relevant applications



High protection level



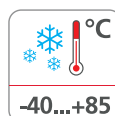
Shock/vibration resistant



Functional safety



Reverse polarity protection



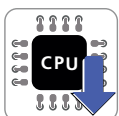
Wide temp. range



CANopen output



CANopen Safety



Firmware Upgradable



High accuracy



RoHS compliant



UNECE R10 conformity



EU conformity

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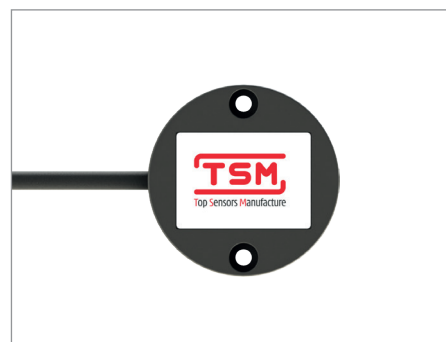


PRODUCT DESCRIPTION

RTS100 is a new generation of multi-variable position sensor by TSM.

It has a particularly compact and robust plastic housing that, in a diameter of just 50 mm, encloses the technological heart of the sensor, a system for simultaneous measurement of angle position and inclination based on Hall effect and MEMS components, respectively. The contactless technology makes this sensor a very robust device with expected life practically infinite thanks to the absence of wear on the sensing element.

Excellent accuracy, high IP rating, shock and vibration resistance and electromagnetic immunity make this transducer suitable for outdoor mobile hydraulic applications such as: agricultural vehicles, construction equipment, loader cranes, telehandlers and aerial work platforms. Thanks to CANopen safety protocol and SIL2-PLd certification it is recommended for safety relevant applications.



Agricultural machinery



Construction



Earth moving



Handling and lifting

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ORDER CODE⁽¹⁾ ▶ **RTS 100.**

Position	Option	Description
a	Counting direction	
1	◀	= CH1 & CH2 = CW
2	◀	= CH1 & CH2 = CCW
3	◀	= CH1 = CW, CH2 = CCW
4	◀	= CH1 = CCW, CH2 = CW
b	Power supply range	
2	◀	= 9 ... 30 V DC
6	◀	= 8 ... 36 V DC
c	Measurement range	
360	◀	= 360°
d	Output type ⁽²⁾	
6	◀	= CANopen
28	◀	= CANopen with diagnostics
40	◀	= SAE J1939
43	◀	= CANopen safety
e	Connections	
1	◀	= Male connector M12x5, PUR cable 30cm
4	◀	= Wire connector 5x0.25mm² PUR cable 30cm
13	◀	= Overmolded Deutsch DT04-6P, PUR cable 30cm
20	◀	= Overmolded Deutsch DT04-4P, PUR cable 30cm
30	◀	= Molex Micro-Fit 6 poles (cod. 43025-0600) with PUR cable 30cm
31	◀	= Male connector M8x5 molded 90°, PUR cable 15cm code B
39	◀	= PUR cable 60cm with DT04-6P connector to be assembly ⁽³⁾
f	Type of magnet	
1	◀	= Rotor STD
2	◀	= Screw Magnet "M8, SW13"
3	◀	= Magnet 10 x 2 mm
4	◀	= Screw Magnet "M7, SW11"
g	Inclinometer type	
X	◀	= None
H	◀	= Dual axis (floor mounting)
V	◀	= Single axis (wall mounting)
h	Inclinometer measurement range	
XXX	◀	= None
360	◀	= 0 ... 360 deg
NNN	◀	= ± NNN deg
i	Inclinometer options	
X	◀	= None
0	◀	= Static
1	◀	= Dynamic
l	Customization	
X	◀	= None
?	◀	= Customization code
m	Approvals	
1	◀	= Standard components ⁽⁴⁾
2	◀	= SIL2/PLd

4 - DS0043 R05 RTS100 CANopen - 04/11/24

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TECHNICAL SPECIFICATION

Rotary measuring range	0 ... 360°
Rotary resolution	Default: 0.01° Selectable: 0.01° - 0.1° - 1°
Rotary linearity (Ta = 25°C)	±0.3°
Rotary temperature drift	±0.01 °/°C typ.
Inclinometer measuring range	Up to ±85° for dual axis type ±180° and 0 ... 360° for single axis type
Inclinometer static accuracy (Ta = 25 °C)	±0.3°
Inclinometer temp. drift (at 0° inclination)	±0.01 °/°C typ.
Working distance*	Axial: 2mm (recommended); air gap 1-4mm Radial: 0mm (recommended); air gap ± 1mm
Material	Housing: PBT + 30%GF Cable sheat: PUR Magnet rotor: see page 8
Protection class	IP67 (acc. to EN 60529)
Temperature range	-40°C ... +85°C
Size (flange)	Ø 50 mm
Weight approx.	60 g
Shock resistance	acc. to EN 60068-2-27 500 m/s ² , 11 ms, 100 shocks per axis Axis : X, Y, Z
Vibration resistance	acc. to EN 60068-2-6 10 ... 500 Hz, 100 m/s ² , 2h per axis Axis : X, Y, Z



ELECTRICAL CHARACTERISTICS

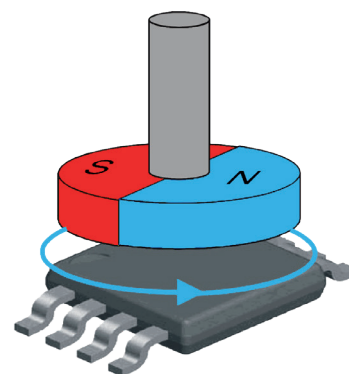
Power supply range	See order code
Consumption typ.	35 mA (12 VDC, w/o load) 18 mA (24 VDC, w/o load)
Startup time	< 1 s
Interface	See order code
CANopen profile conformity	CiA DS301
EMC compatibility	acc. to EN 61326-1, EN 61326-3-1 (Industrial electromagnetic environment) acc. to EN ISO13766-1, EN ISO13766-2
EU Conformity	EMC directive 2014/30/EU UNECE Reg. 10 R06 RoHS directive 2011/65/EU + 2015/863/EU



ROTARY OPERATING PRINCIPLE

Hall effect

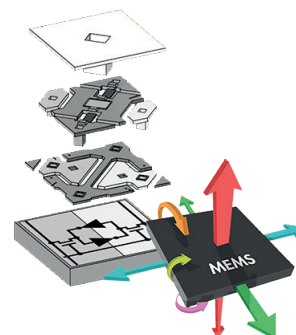
Bases its operation principle on the generation of a voltage across an electrical conductor when a magnetic field is applied in a direction perpendicular to the current flow. An hall-effect rotary sensor gives the absolute angular position of a small rotating dipole magnet above the device surface (end of shaft magnet).



INCLINOMETER OPERATING PRINCIPLE

MEMS, or Micro Electro-Mechanical System, is a chip-based technology where sensors are composed of proof masses sprung between capacitive plates. Each mass act like a moving plate of a variable capacitor formed by an array of interlaced 'fingers'.

When the sensor is tilted, the mass moves changing the distance between the plates and therefore the capacitance. By measuring the capacitance variation the angle value can be detected.



* see magnet position tolerances section

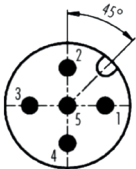
RTS100 CANopen

ROTARY ENCODER

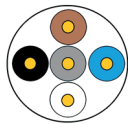
Absolute single-turn magnetic encoder with integrated inclinometer



1] ELECTRICAL CONNECTION M12 X 5 PINS

	
Pinout	
1	GND*
2	+Vin
3	CAN-GND*
4	CAN-H
5	CAN-L
* GND and CAN_GND terminals are internally connected to each other and identical in their function	


4] ELECTRICAL CONNECTION WIRE CONECTOR

	
Pinout	
Brown	GND*
White	+Vin
Blue	CAN-GND*
Black	CAN-H
Grey	CAN-L
* GND and CAN_GND terminals are internally connected to each other and identical in their function	

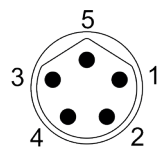
13 & 39] ELECTRICAL CONNECTION DEUTSCH DT04-6P

	
Pinout	
1	GND
2	+Vin
3	n.c.
4	n.c.
5	CAN-L
6	CAN-H


20] ELECTRICAL CONNECTION DEUTSCH DT04-4P

	
Pinout	
1	CAN-L
2	CAN-H
3	+Vin
4	GND

31] ELECTRICAL CONNECTION M8 X 5 PINS

	
Pinout	
	Connector
1	CAN-GND*
2	+Vin
3	GND*
4	CAN H
5	CAN-L
* GND and CAN_GND terminals are internally connected to each other and identical in their function	

30] ELECTRICAL CONNECTION MICROFIT 6 PINS

	
Pinout	
1	GND
2	+Vin
3	CAN H
4	CAN-L
5	n.c.
6	n.c.

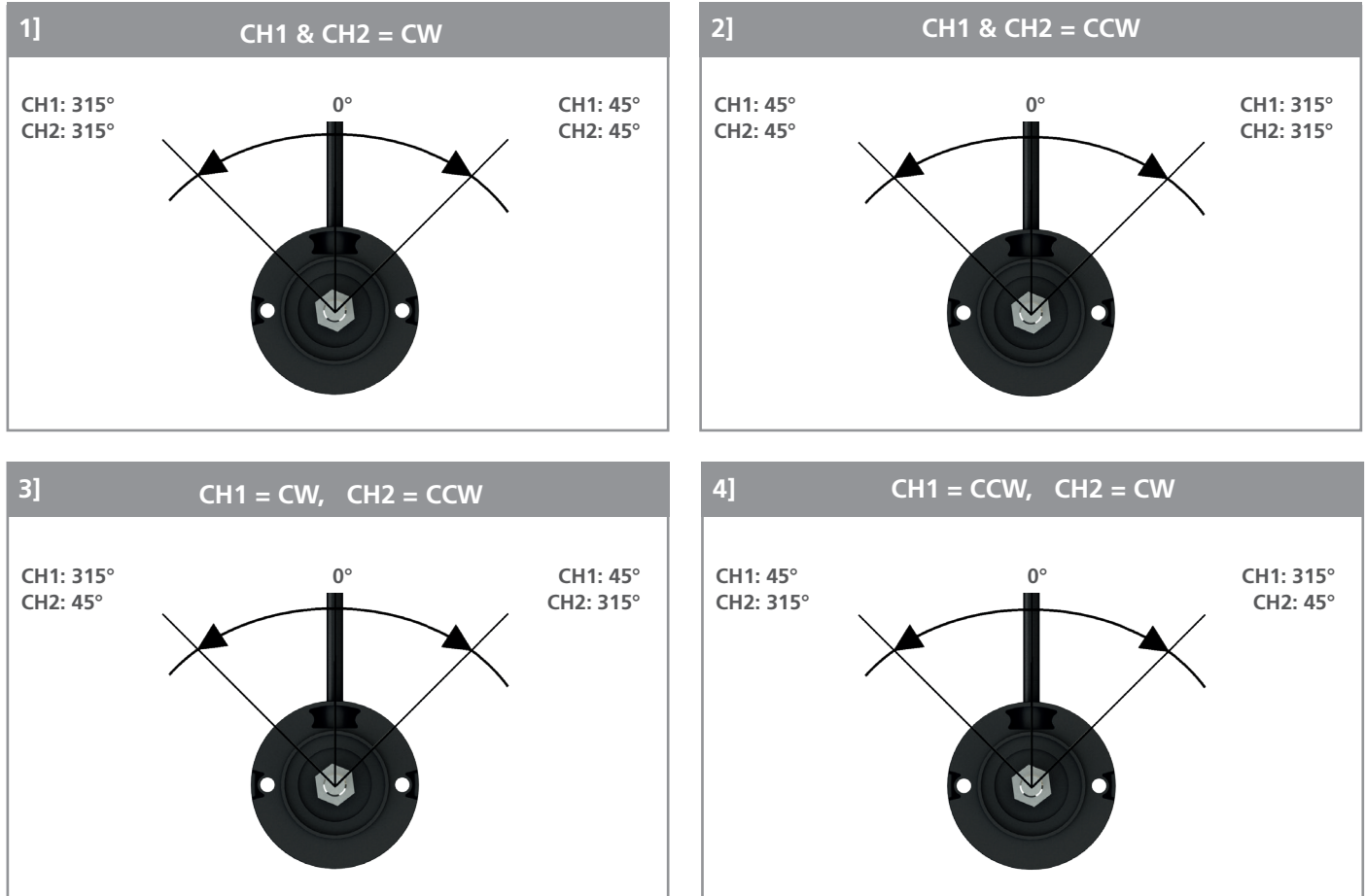
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ROTARY ENCODER

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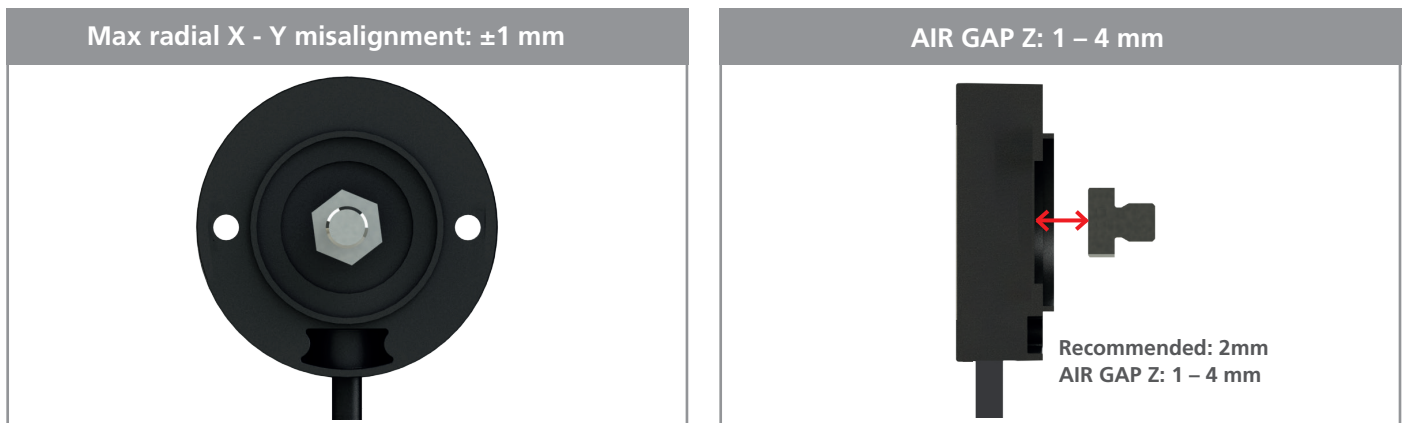
ANGLE COUNTING DIRECTION (BOTTOM VIEW)



"Zero point is not marked and differs for each unit.
It is recommended to set the zero point by sending the related command once the sensor has been installed on the final application"



MAGNET POSITIONING TOLERANCES



NOTE:

- Any extra offset or misalignment increases the non-linearity.
- Each sensor **MUST** be mounted with its own rotor / screw / magnet included in the package.
- Magnet should **NOT** be incorporated in a ferromagnetic housing (holder)
- Magnet must **NOT** be installed in close contact with a surface of ferromagnetic material
- The sensor must be mounted using M4 screws in non-magnetic stainless steel e.g. AISI 316

The company reserves the right to make any kind of design or functional modification at any moment without prior notice.

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INCLINATION COUNTING DIRECTION

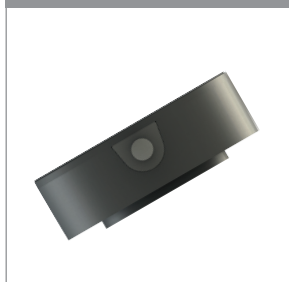
Dual axes



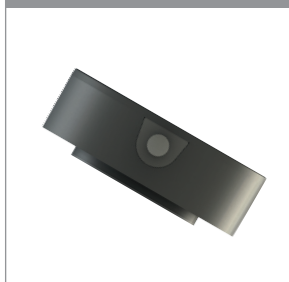
RTS100 dual axes inclinometer

The 2-dimensional tilt sensor must be mounted with the base plate in horizontal position, i.e. parallel to the horizontal line. The sensor can be tilted to both the X and Y axes at the same time. A separate measure is provided for each axis.

+X



-X



+Y



-Y



Single axis



RTS100 single axis inclinometer

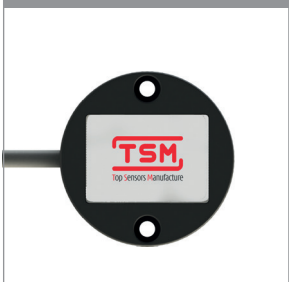
The 1-dimensional tilt sensor must be installed with the base plate in vertical position, i.e. Z-axis perpendicular to the force of gravity.

The default "zero point" position is the one shown in the following images.

Z = 0°



Z = 90°



Z = 180°



Z = 270°



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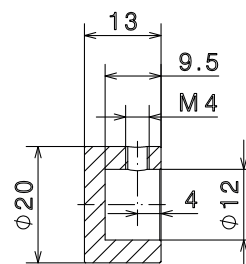
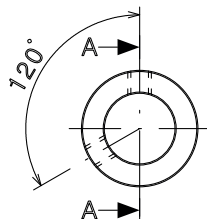


MAGNETS DIMENSIONS [mm]

1] Rotor STD



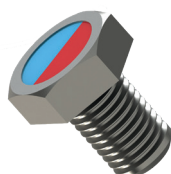
Anodized aluminum



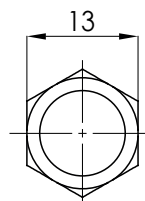
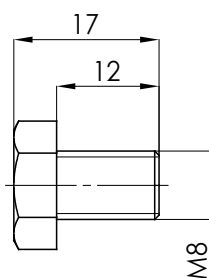
Section A-A

Recommended shaft \varnothing 12 fix threaded x2 pin M4 (included in delivery)

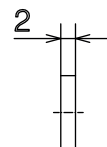
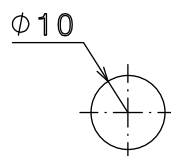
2] Screw magnet "M8, SW13"



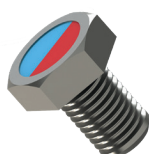
AISI316L



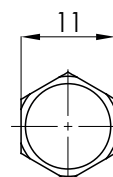
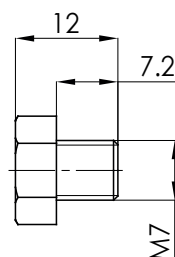
3] Magnet 10 x 2 mm



4] Screw magnet "M7, SW11"



AISI316L



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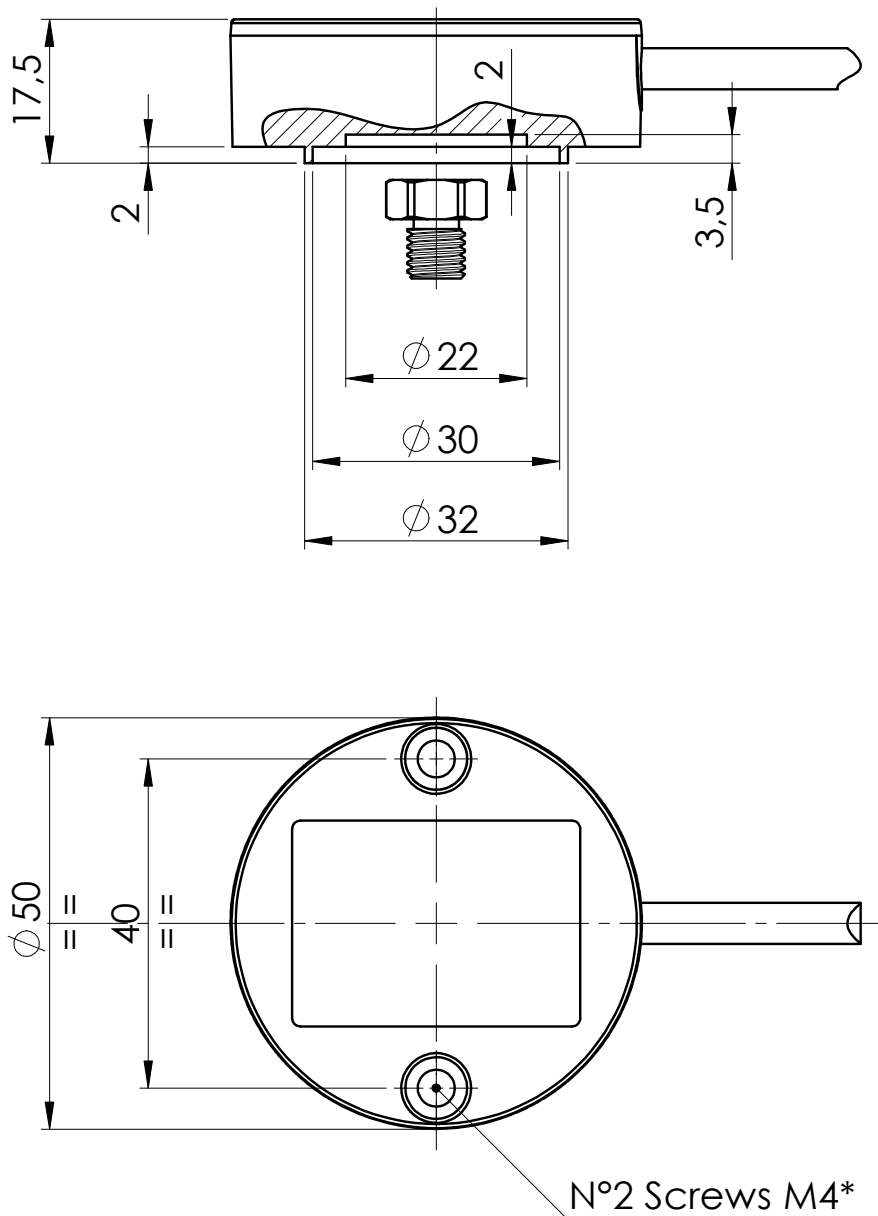
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DIMENSIONS [mm]



* MAX tightening torque 2.5Nm