RTS100 CANopen

ROTARY ENCODER

Absolute single-turn magnetic encoder with integrated inclinometer

L.4 - DS0043 R11 RTS100 CANopen - 10/04/2026

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

IP67 — High protection level

Shock/vibration resistant

SIL2 PLd — Functional safety

Reverse polarity protection

-40...+85 °C — Wide temp. range

CANopen output

CANopen Safety

CPU — Firmware Upgradable

High accuracy

RoHS compliant

E24 — UNECE R10 conformity

CE — EU conformity

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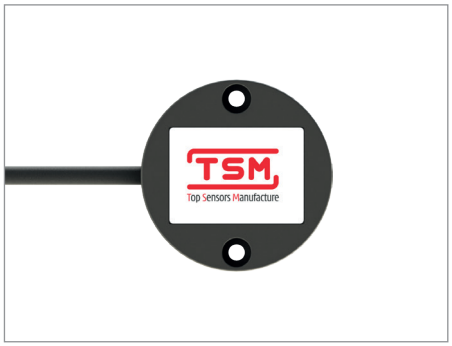
PRODUCT DESCRIPTION

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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Top Sensors Manufacture

PRODUCT CODE

ORDER CODE(1) ▶ RTS100.[a].[b].[c].[d].[e].[f].[g].[h].[i].[l].[m]

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)
- **42** = PUR cable 100cm with DT04-6P connector to be assembly(3)
- **61** = Overmolded Deutsch DT04-4P, PUR cable 30cm type B

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)
- **U** = Dual axis (ceiling 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

(1) Not all combinations can be ordered. Please contact TSM for confirmation before placing an order.
(2) Redundanted primary measures, acquired by a single logical unit and published on the CANOpen output by one or more PDOs, according to the selected mapping.
(3) The cable is supplied with all the connector pins crimped on the wires but with the housing to be mounted separately after installation
(4) Standard component. It does not constitute a safety component as defined in the Machinery Directive 2006/42/CE.

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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)	±0.5°
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 11 ms, 50 G, 100 shocks per axis Axis : X, Y, Z
Vibration resistance	acc. to EN 60068-2-6 10 ... 500 Hz, 10 G, 2h per axis Axis : X, Y, Z

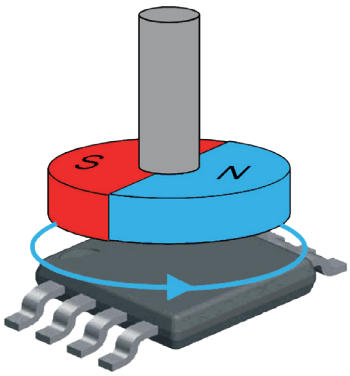
ELECTRICAL CHARACTERISTICS

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

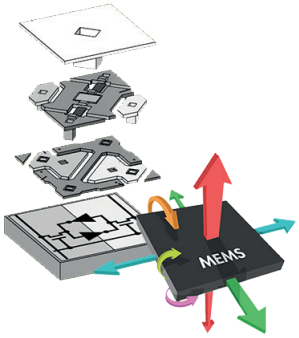
Hall effect

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

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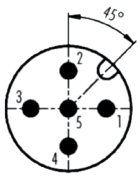
1] ELECTRICAL CONNECTION M12 X 5 PINS

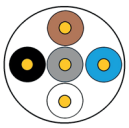


Pinout

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 & 42] ELECTRICAL CONNECTION DEUTSCH DT04-6P

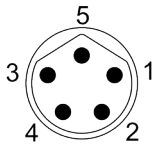
	Pinout	Colors
1	GND	Blue
2	+Vin	White
3	n.c.	n.c.
4	n.c.	n.c.
5	CAN-L	Brown
6	CAN-H	Black

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	Accessory
1	CAN-GND*	Brown
2	+Vin	White
3	GND*	Blue
4	CAN H	Black
5	CAN-L	Gray

* GND and CAN_GND terminals are internally connected to each other and identical in their function

30] ELECTRICAL CONNECTION MICROFIT 6 PINS

CONNECTOR SIDE

	Pinout	Colors
1	GND	White
2	+Vin	Blue
3	CAN H	Grey
4	CAN-L	Brown
5	n.c	Black
6	n.c.	n.c

61] ELECTRICAL CONNECTION DEUTSCH DT04-4P type b

Pinout

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

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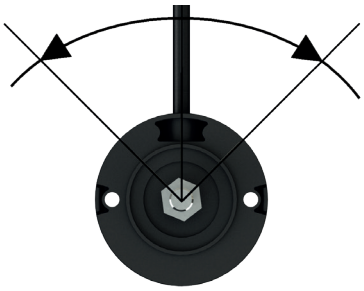
ANGLE COUNTING DIRECTION (BOTTOM VIEW)

1] CH1 & CH2 = CW

CH1: 315°
CH2: 315°

0°

CH1: 45°
CH2: 45°

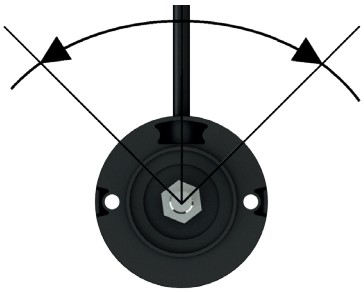


2] CH1 & CH2 = CCW

CH1: 45°
CH2: 45°

0°

CH1: 315°
CH2: 315°

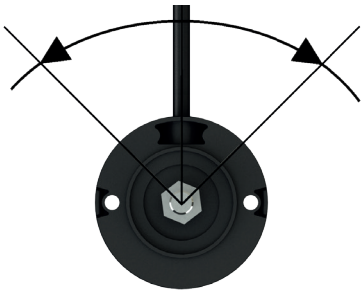


3] CH1 = CW, CH2 = CCW

CH1: 315°
CH2: 45°

0°

CH1: 45°
CH2: 315°

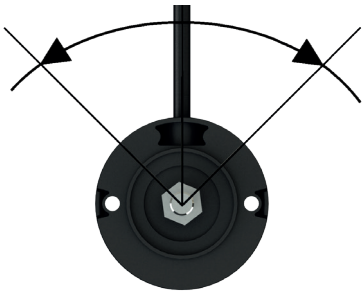


4] CH1 = CCW, CH2 = CW

CH1: 45°
CH2: 315°

0°

CH1: 315°
CH2: 45°

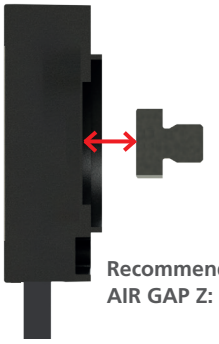


"Zero point is not marked and differs for each unit.
It is recommended to set the zero point by sending the related command once the sensor has been installed on the final application"

MAGNET POSITIONING TOLERANCES

Max radial X - Y misalignment: ±1 mm

AIR GAP Z: 1 – 4 mm



Recommended: 2mm
AIR GAP Z: 1 – 4 mm

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

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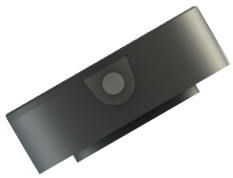
INCLINATION COUNTING DIRECTION

Dual axes (floor mounting)

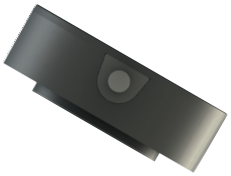
RTS100 dual axes inclinometer

The 2-dimensional tilt sensor must be mounted 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

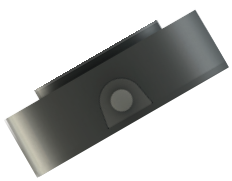
-Y

Dual axes (ceiling mounting)

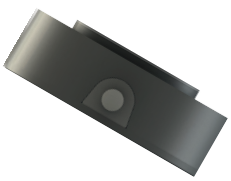
RTS100 dual axes inclinometer

The 2-dimensional tilt sensor must be mounted 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

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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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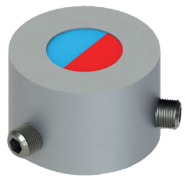
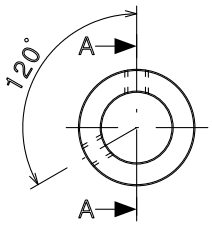
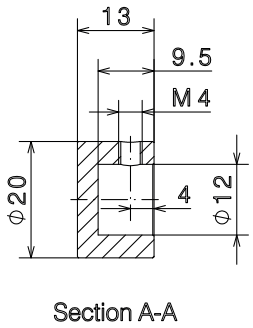
MAGNETS DIMENSIONS [mm]

1] Rotor STD



Anodized aluminum

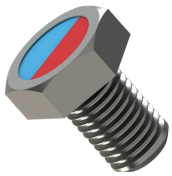




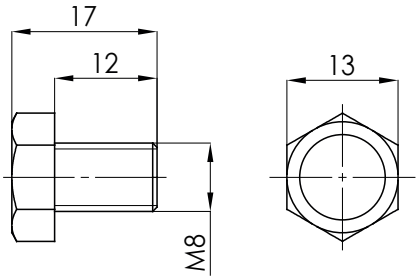
Section A-A

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

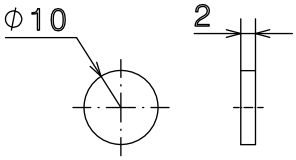
2] Screw magnet "M8, SW13"



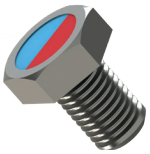
AISI316L



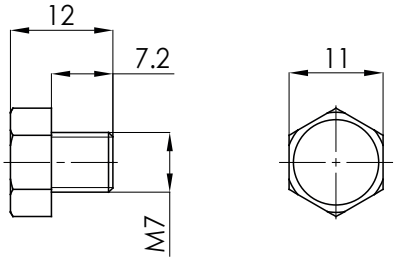
3] Magnet 10 x 2 mm



4] Screw magnet "M7, SW11"



AISI316L



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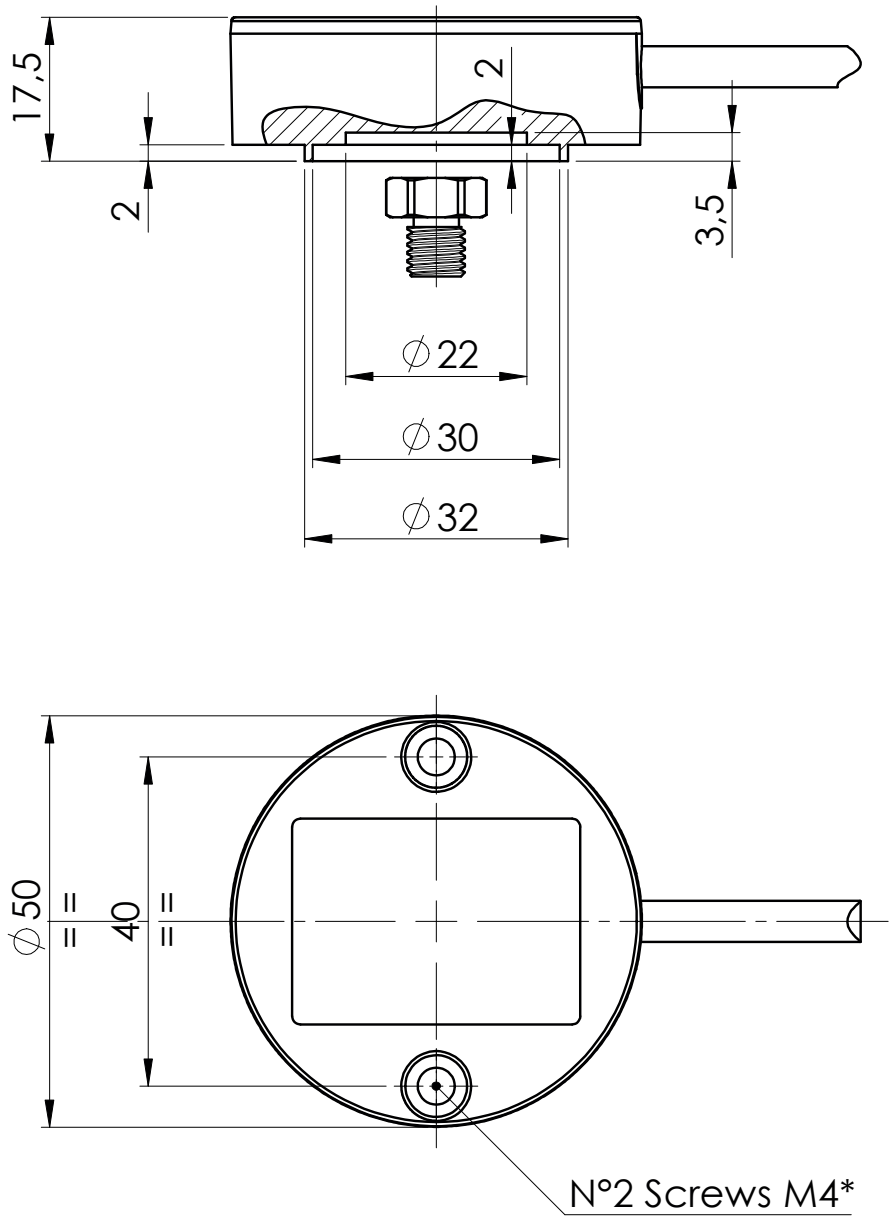
DIMENSIONS [mm]



* MAX tightening torque 2.5Nm

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