



ABSOLUTE TTSa46648L400 Serie

Magnetic absolute angle sensor

TECHNICAL DATASHEET

The TTSa46648 series is part of the SNR range of tube sensors.

These are known as "True Power On" angle sensors.

Combined with the Nonius/Vernier RMMnL400 range of two-track magnetic rings, they form **ABSOLUTE**, SNR's absolute angle measurement system.

They measure the angular position of a rotating shaft as soon as it is powered up.

These sensors are available with an SSI or BiSS-C interface.



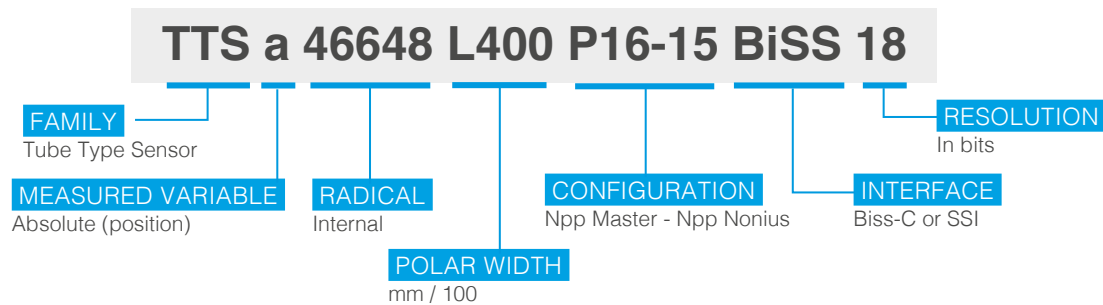
BENEFITS

- Robustness
- Performance
- Easy to install and operate

APPLICATIONS

- Autonomous vehicles
- Multi-axis robots
- Polluted industrial environments
- Electric motors, etc.

DESIGNATIONS



The TTSa46648 sensor range includes the following part numbers:

For shaft Ø 36.6 mm

Associated magnetic ring: RMRn46651L400P16-15

Reference	Interface	Resolution (bit)	Accuracy (°)	Pole width (mm)	Magnetic ring (pp)
TTSa46648L400P16-15BiSS18	BiSS-C	18	0.1	4	16/15
TTSa46648L400P16-15SSI18	SSI	18	0.1	4	16/15

For shaft Ø 77.4 mm

Associated magnetic ring: RMRn46652L400P32-31

Reference	Interface	Resolution (bit)	Accuracy (°)	Pole width (mm)	Magnetic ring (pp)
TTSa46648L400P32-31BiSS19	BiSS-C	19	0.1	4	32/31
TTSa46648L400P32-31SSI19	SSI	19	0.1	4	32/31

For high volumes, the interface can be adapted to customer specifications (BiSS-C / SSI: lower resolution, and/or addition of zero bits; SSI: odd parity or no parity, error bit, etc.). Please contact NTN Europe.

SPECIFICATIONS


Maximum voltage (sensor non-functional)

Symbol	Parameter	Minimum (V)	Maximum (V)
VCC	Supply voltage	-6	6
VPRES	Voltage on PRES input	0	6

Operating temperatures

Symbol	Parameter	Minimum (°C)	Maximum (°C)
T _{ope}	Operating temperature	-40	105
T _{sto}	Storage temperature	-40	125

Environmental characteristics

Symbol	Parameter	Value
Vib	Vibrations	IEC60068-2-6: 10 – 2000 Hz: 30 g
Cho	Shocks	IEC60068-2-27: 50 g / 11 ms
IP	Protection level	ISO20653: IP65 / IP67 ⁽¹⁾
Sel	Resistance to salt spray	IEC 60068-2-52
	CE certification	Directive: • 2002/95/CE CEM: • EN61000-6-2* • EN61000-6-3

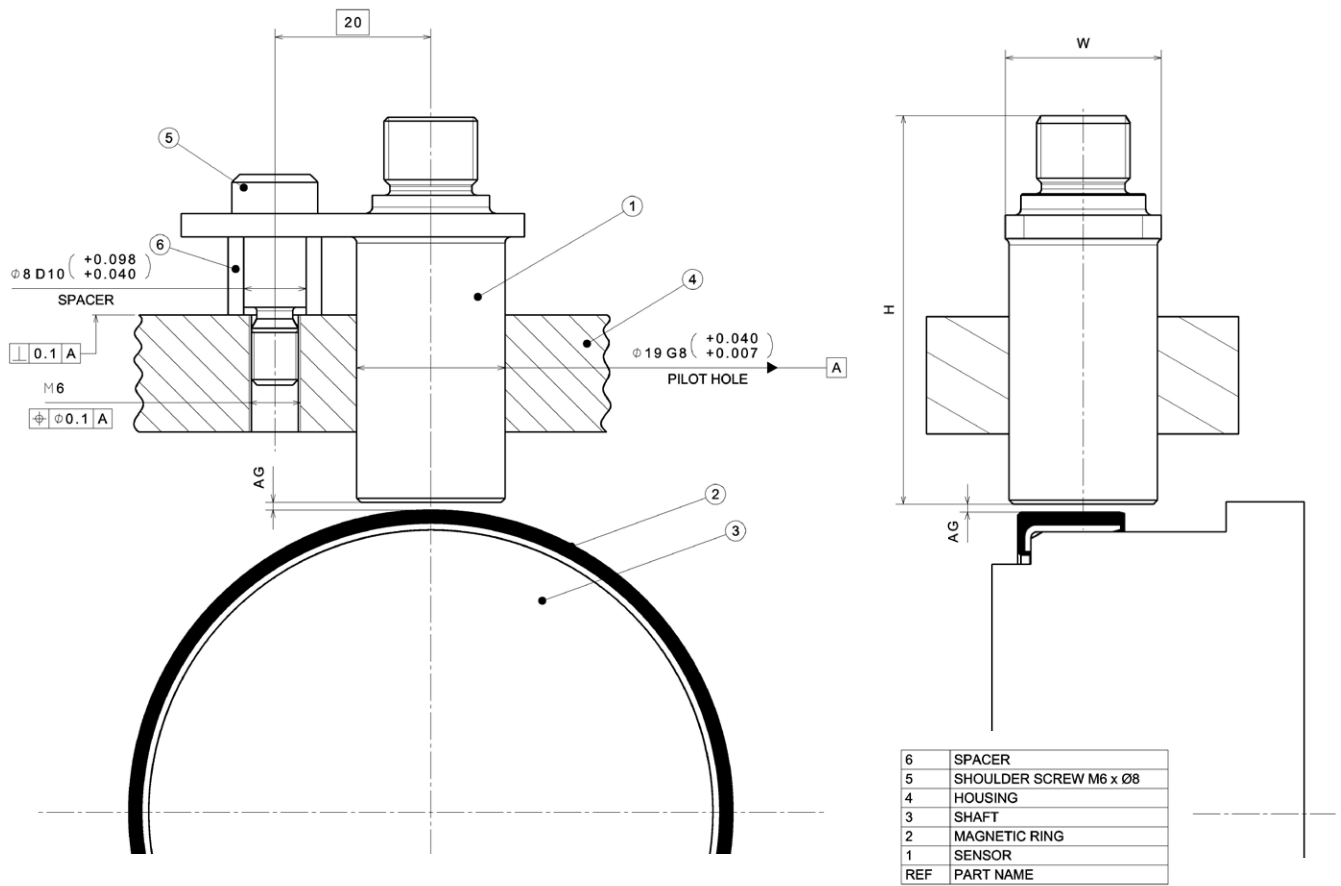
*61000-4-5 1000V criterion C

Electrical characteristics

Symbol	Parameter	Conditions	Minimum	Typ.	Maximum	Unit
Power supply						
VCC	⁽²⁾		4.5	5	5.5	V
I _{CC}	Supply current	Vcc = 5V outputs no loaded		65		mA
Differential inputs MA+ / MA-: Additional TTL 5V logic signals						
V _{IN}	Input		-7		12	V
V _{IHdiff}	High logic level	Differential	50		200	mV
V _{ILdiff}	Low logic level	Differential	-200		-50	mV
R _{IN}	Input resistance		145	150	155	Ω
SLO+ / SLO- differential outputs: Additional TTL 5V logic signals ⁽³⁾						
DV _{oH}	Voltage drop for high logic level	Load: 4mA			500	mV
		Load: 20 mA			1100	mV
DV _{oL}	Voltage drop for low logic level	Load: 4mA			500	mV
		Load: 20 mA			900	mV
I _{ECC}	Short circuit output current	Low logic level	4		70	mA
Interface time parameters						
F _{SSI}	Frequency	SSI interface	32		4000	kHz
F _{BiSS}	Frequency	BiSS interface	50		10000	kHz
T _{OUT}	Waiting time				24	μs
PRES input						
V _{IH}	High logic level input		2			V
V _{IL}	Low logic level input				0.8	V
I _{IN}	Input current				100	μA
T _{ACTPRES}	Activation		20			μs
Error output						
V _{oL}	Low logic level output	Open collector Load: 4mA			450	mV
I _{ECC}	Short circuit output current	Low logic level	4		70	mA
T _{ACTERR}	Activation		20			μs

⁽¹⁾ IP67: when the opposite connector is fitted • ⁽²⁾ Protected against polarity reversal • ⁽³⁾ Protected against overvoltage of -6 and +6 V

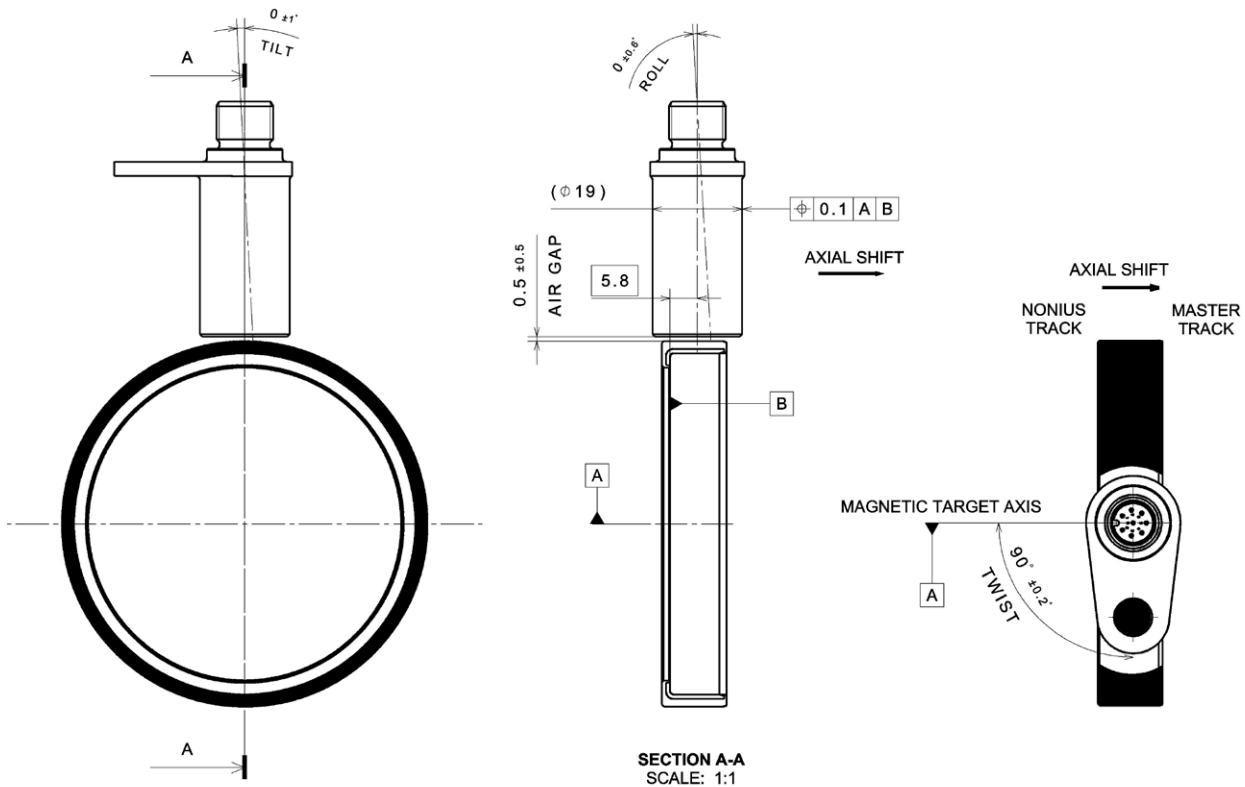
MECHANICAL CHARACTERISTICS AND ASSEMBLY TOLERANCES



Sensor dimensions

Symbol	Parameter	Conditions	Minimum	Typ.	Maximum	Unit
H	Height	Without mating connector	49.62	49.77	49.92	mm
W	Width		20	20.5	21	mm
D	Depth		37.55	37.9	38.25	mm
We	Weight	Without mating connector		56		g
T	Tightening torque	With M6 shoulder screw, Shoulder Ø 8 mm	-	16.4	-	Nm

Sensor positioning tolerances



TTSa46648L400P16-15

Symbol	Parameter	Conditions	Minimum	Typ.	Maximum	Unit
AS	Axial shift	To master track	5.3	5.8	6.3	mm
AG	Air gap	Mechanical air gap	0.0 ⁽¹⁾	0.5	1.0	mm
TWIST	Twist angle	Refer to the diagrams above ⁽²⁾	89.8	90	90.2	°
TILT	Tilt angle	Refer to the diagrams above ⁽²⁾	-1	0	1	°
ROLL	Roll angle	Refer to the diagrams above ⁽²⁾	-0.6	0	0.6	°
Acc	Angular accuracy ⁽³⁾			0.1		°

TTSa46648L400P32-31

Symbol	Parameter	Conditions	Minimum	Typ.	Maximum	Unit
AS	Axial shift	To master track	5	5,5	6	mm
AG	Air gap	Mechanical air gap	0 ⁽¹⁾	0,5	1	mm
TWIST	Twist angle	Refer to the diagrams above ⁽²⁾	89,8	90	90,2	°
TILT	Tilt angle	Refer to the diagrams above ⁽²⁾	-1	0	1	°
ROLL	Roll angle	Refer to the diagrams above ⁽²⁾	-1	0	1	°
Acc	Angular accuracy ⁽³⁾			0.1		°

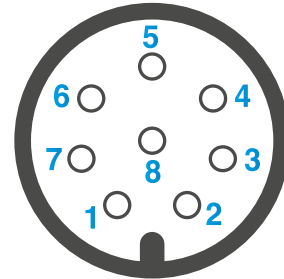
⁽¹⁾ Avoid sensor / magnetic ring contact • ⁽²⁾ Do not combine these values • ⁽³⁾ Magnetic ring mounted on the shaft without eccentricity and shaft rotating precisely around its axis

ELECTRICAL CONNECTIONS

M12 IEC 61076-2-101 8-contact male connector (shielded connector and cable).

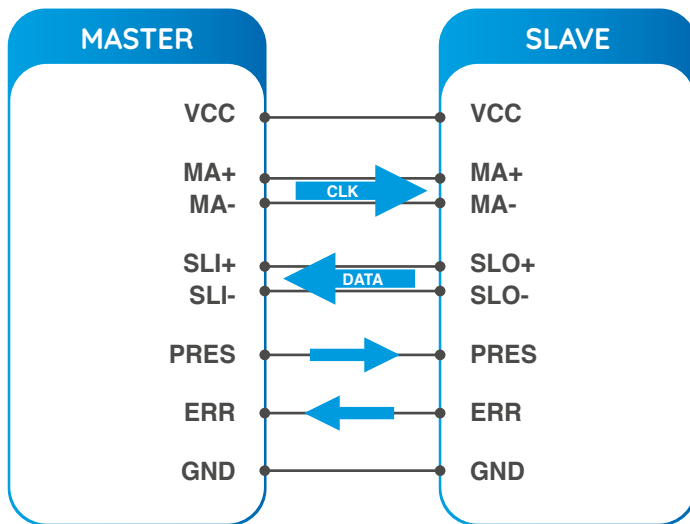
Broaching

Connector	Signal	Description
1	PRES	Preset zero position (0°)
2	VCC	5V power supply
3	GND	Electrical ground
4	MA+	BiSS or SSI: "+" clock
5	MA-	BiSS or SSI: "-" clock
6	SLO-	BiSS or SSI: "-" data
7	SLO+	BiSS or SSI: "+" data
8	ERR	Error output
-	Shielding	Connected to the metal tube



Pins position, sensor side view

Typical implementation

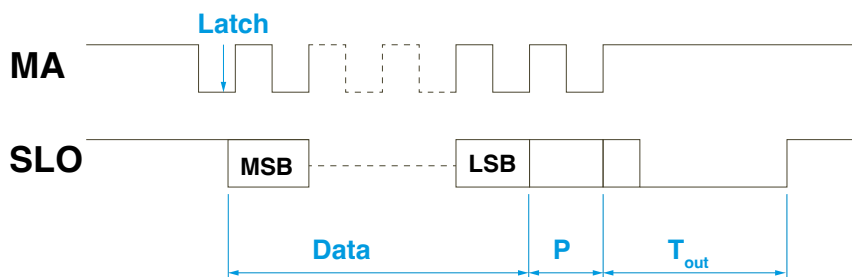


Note: the sensor is connected in a point-to-point network, one master - one slave, and cannot be used in a multi-slave network.

SSI SERIAL INTERFACE

The data rate is defined by the frequency of clock signals.

SSI frame



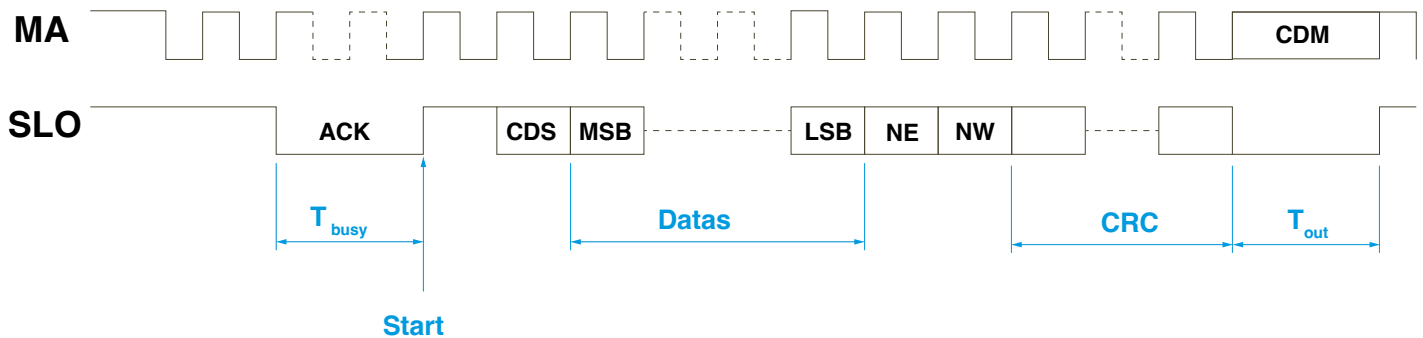
Data: angular value

P: even parity bit

BISS-C SERIAL INTERFACE

The data rate is defined by the frequency of clock signals.

BiSS-C frame



T_{busy} : data acquisition, $N \times MA$ periods, depends on sensor and frequency

Start: high level, start of frame

CDM: Control Data Master, see BiSS protocol description

CDS: Control Data Slave, see BiSS protocol description

Data: angular value

NE: error, active at low level, information identical to the Error output

NW: alert, active at low level, not valid on this sensor (permanent high level)

CRC: 6 bits, most significant bit 1st, hexadecimal value 0x43, polynomial x^6+x^1+1

For more details, please refer to BiSS-C interface specification: <https://biss-interface.com>.

ANGULAR VALUE

TTSa46648L400P32-31

19-bit measurement, values from 0h to 7 FFFFh (hexadecimal) corresponding to an angle from 0 to 360°.

TTSa46648L400P16-15

18-bit measurement, values from 0h to 3 FFFFh (hexadecimal) corresponding to an angle from 0 to 360°.

PRES INPUT

PRES is an input active in the high logic level.

When PRES is activated, the current position of the magnetic ring becomes the 0° reference value. This value is stored when the sensor is no longer powered.

Caution: the active signal must be maintained for at least 20 ms, otherwise the value may not be stored and an error may be generated when the power is switched on again.

ERROR OUTPUT

ERR is an output active in the low level.

The error signal indicates an incorrect angle value which may be due, for example, to an incorrect position of the sensor in front of the magnetic ring.

HANDLING

Avoid shocks or impacts during transport, handling and assembly.

TTSa46648 sensors and RMMnL400 magnetic rings are very sensitive to magnetic fields. They must be kept away from all sources of magnetic disturbances such as magnets, relays and mobile phones.



MAINTENANCE

The TTSa46648 sensors should be cleaned with a soft cloth.

STORAGE

Before and after use, TTSa46648 sensors and RMMnL400 magnetic rings should be stored in their original packaging in a cool, dry place.

RECYCLING

Sensors are electrical and electronic equipment. When they are discarded, they must be collected by the waste electrical and electronic equipment (WEEE) management system, in accordance with the local regulations in force.