TF 300 SERIES
TORQUE FLANGE SENSORS

FEATURES

- Complete torque measuring system including: measuring flange with signal amplifier, HF transmitter, conditioner and 4 m coaxial cable
- Contactless signal transmission: via telemetry
- Torque Range: 20 N·m ... 150 kN·m (higher torque on request)
- High Accuracy: 0.1 ... 0.2 % (0.05 % on request)
- Overload Capacity: up to 200 % (limit of adhesion)
- Measuring Range: 200 %
- Breaking Limit: >400%
- Compact, easy-to-mount design
- High torsional stiffness
- Bearingless: maintenance and wear-free
- Excellent noise immunity and shock resistance
- Protection class: IP 42 (IP 54 & IP65 option)
- Integrated speed sensor and conditioner for rotational speed measurement (option)
- High temperature capability: up to 125 °C (option)

Fig. 1: Torque Flange Sensors TF 313 & TF 318 with HF Transmitter and Torque Signal Conditioner

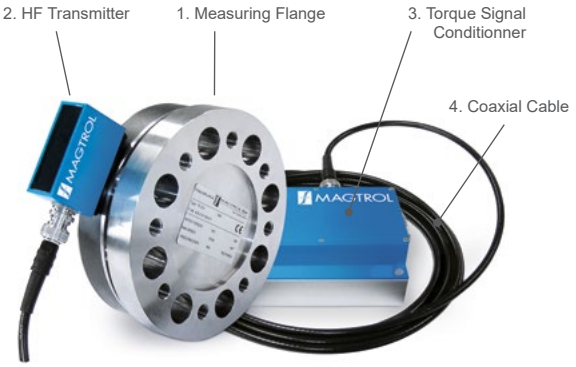
DESCRIPTION

With its compact, bearingless, maintenance-free design, the TF 300 Series Torque Flange Sensor from Magtrol brings many appealing advantages to torque measurement applications. The TF's high torsional rigidity supports direct mounting on the machine shaft or flange, avoiding the use of couplings on one side. This allows easy integration into a test system, shortens the overall length of the test bench and reduces costs.

Based on strain-gauge technology, the TF 300 Series Sensor's precise telemetry system enables highly accurate signal transmission. A signal amplifier mounted in the measuring flange amplifies the measuring signal, modulates it to high frequency and transmits it inductively (via the HF transmitter) to the conditioner. In the signal conditioner, the digitized torque signal is transformed into an analog output signal of ±5 VDC. Rotational speed can be measured and converted to a TTL output signal with the optional speed sensor.

The contactless design of the Torque Flange Sensor permits a gap of up to 5 mm (typically 2 or 3 mm) between the rotor antenna and HF transmitter, which makes the signal acquisition insensitive to any axial or radial misalignment. Another advantage of this torque measurement system is its insusceptibility to signal interference due to the fact that, unlike other designs, the antenna does not need to be looped around the measuring flange. Additionally, a protective cover can be mounted close to the TF Series Torque Flange Sensor with no effect on the signal.

ASSEMBLY

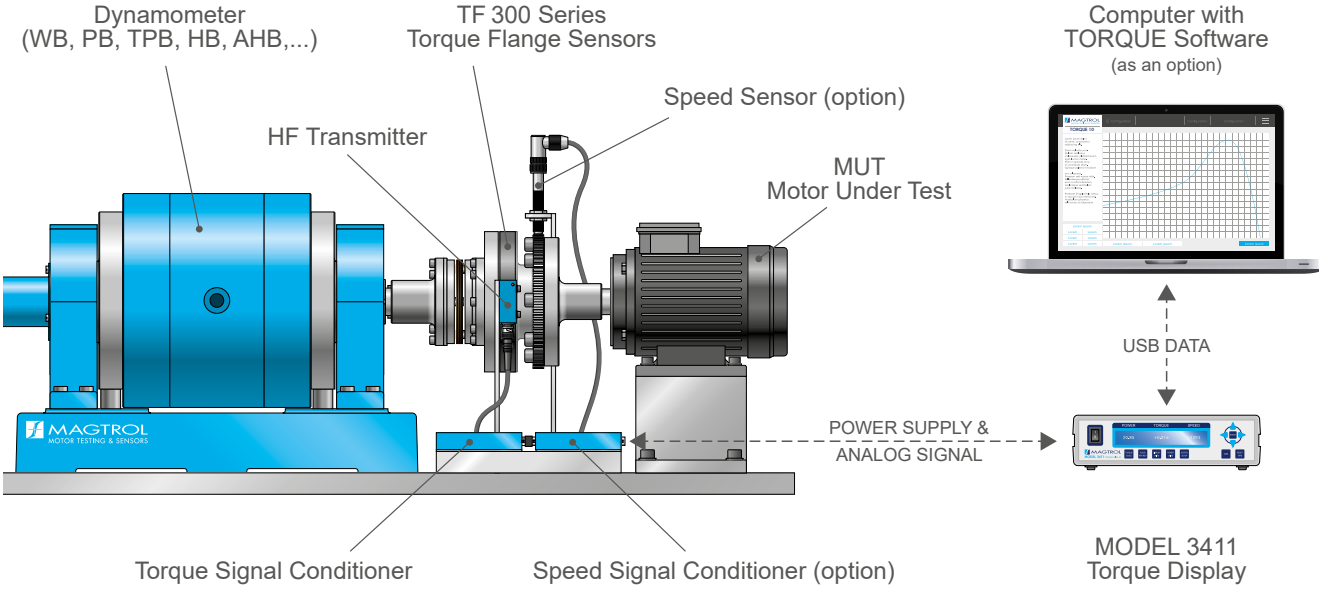


APPLICATIONS

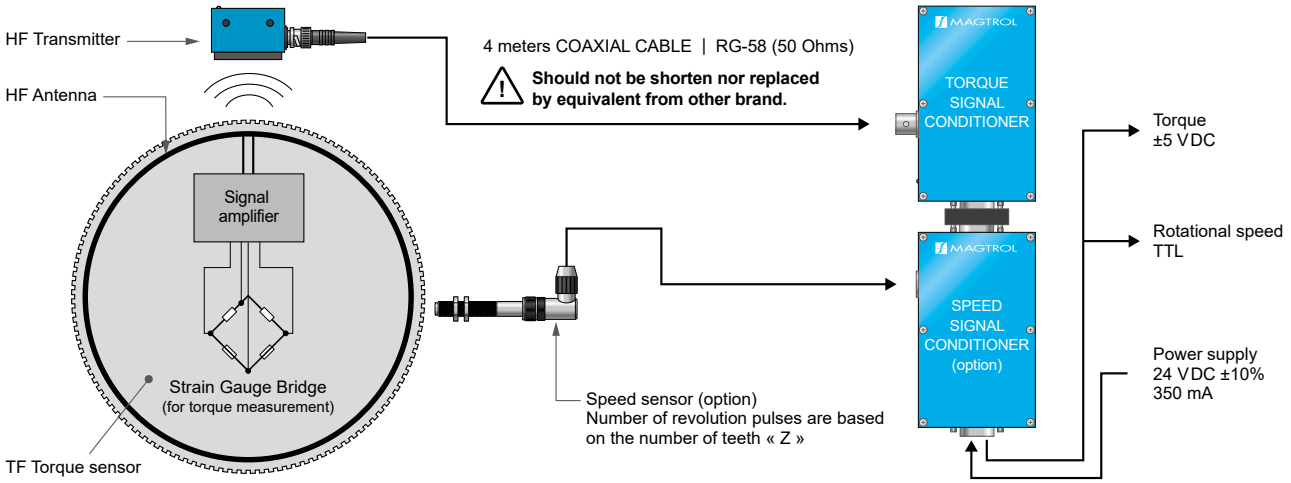
TF 300 Series Torque Flange Sensors measure both static and dynamic torque on stationary and rotating shafts.

They are used in general combustion engine, electric motor and gearbox test benches; and can also be mounted inline for active torque monitoring of transmissions, powertrains, wind generators, gas turbines, boat engines, etc.

SYSTEM CONFIGURATION



ELECTRICAL CONFIGURATION



TECHNICAL DATA

MECHANICAL CHARACTERISTICS

MODEL [a]	RATED TORQUE	OVERLOAD CAPACITY	ACCURACY CLASS	MAXIMUM SPEED	NUMBER OF THEETH [c]	TORSIONAL STIFFNESS	DEFORMATION ANGLE	SENSORS WEIGHT [d]	MOMENT OF INERTIA (X Axis) [f]	
	N·m	% of RT		rpm	Z	kN·m / rad	°	kg	kg·m²	lb·ft·s²
TF 309 TFHS 309	20	200 %	0.1 %	17 000 20 000	52	50	0.023	1.4	0.0022	0.0016
TF 310 TFHS 310	50	200 %	0.1 %	17 000 20 000	52	72	0.040	1.5	0.0022	0.0017
TF 311 TFHS 311	100	200 %	0.1 % [b]	17 000 20 000	52	86	0.067	1.5	0.0022	0.0017
TF 312 TFHS 312	200	200 %	0.1 % [b]	17 000 20 000	52	106	0.108	1.5	0.0023	0.0017
TF 313 TFHS 313	500	200 %	0.1 % [b]	15 000 20 000	59	850	0.034	1.9	0.0046	0.0034
TF 314 TFHS 314	1 000	200 %	0.1 % [b]	15 000 20 000	59	1 285	0.045	2.0	0.0047	0.0035
TF 315 TFHS 315	2 000	200 %	0.1 % [b]	12 000 15 000	79	2 476	0.046	3.2	0.0111	0.0082
TF 316 TFHS 316	5 000	200 %	0.1 % [b]	10 000 12 000	95	5 573	0.051	5.0	0.0252	0.0186
TF 317 TFHS 317	10 000	150 % [e]	0.1 % [b]	10 000 12 000	95	6 141	0.093	6.0	0.0276	0.0204
TF 318	20 000	200 %	0.1 - 0.2 %	3 500	200	44 000	0.026	56.0	1.3430	0.9911
TF 319	50 000	180 % [e]	0.1 - 0.2 %	3 500	200	74 700	0.038	59.0	1.3790	1.0177
TF 320	100 000	180 % [e]	0.1 - 0.2 %	3 500	200	1 047 000	0.055	63.5	1.3970	1.0310

Maximum Dynamique Torque without Damage (Overload Limit)	400 % of Rated Torque

ENVIRONMENT

Rated Temperature Range	+10 °C ... +85 °C
Storage Temperature Range	-25 °C ... +85 °C
Extended Temperature Range (option)	-30 °C ... +125 °C
Temperature influence on zero	0.01 % / °C
Protection class	IP 42 (option IP 54 & IP65) [g]

ELECTRICAL CHARACTERISTICS

Power Supply	24 V DC ±10 %, max 350 mA TF 318, TF 319 & TF 320: 100 - 240 VAC
Torque Output Signal (rated / max.)	±5 V DC / ±10 V DC
Filter Bandwith	0 ... 1 kHz (-3 dB) / (option 5 kHz)

SPEED MEASUREMENT (OPTION)

Number of Theeth	Dependending on TF size; refer to number of teeth
Speed Pick-Up Transducer	Magnetoresistive
Minimum Speed Detection	< 1 rpm
Speed Output	TTL (Pulse Per Revolution correspond with number of teeth)

a) Torque up to 150 kN·m or higher, and high speed versions are available on request.

b) Linearity- hysterese error 0.05 % is available on request.

c) Inductive speed detection is available on request.

d) Add 0.8 ... 2.8 kg to weight (dependending on configuration), for electronic devices attached to the sensor (HF transmitter, receiver, speed conditioner,...)

e) Dynamique torque peak values are due to force transmission limit of mounting screws.

f) The X axis of the moment of inertia represents the rotation axis of the torque transducer (see Fig. 2).

g) With IP 54 & IP65, the combined error for models TF 309 - TF 312 is degraded; it will be 0.15 % instead of 0.1 %.

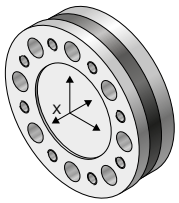
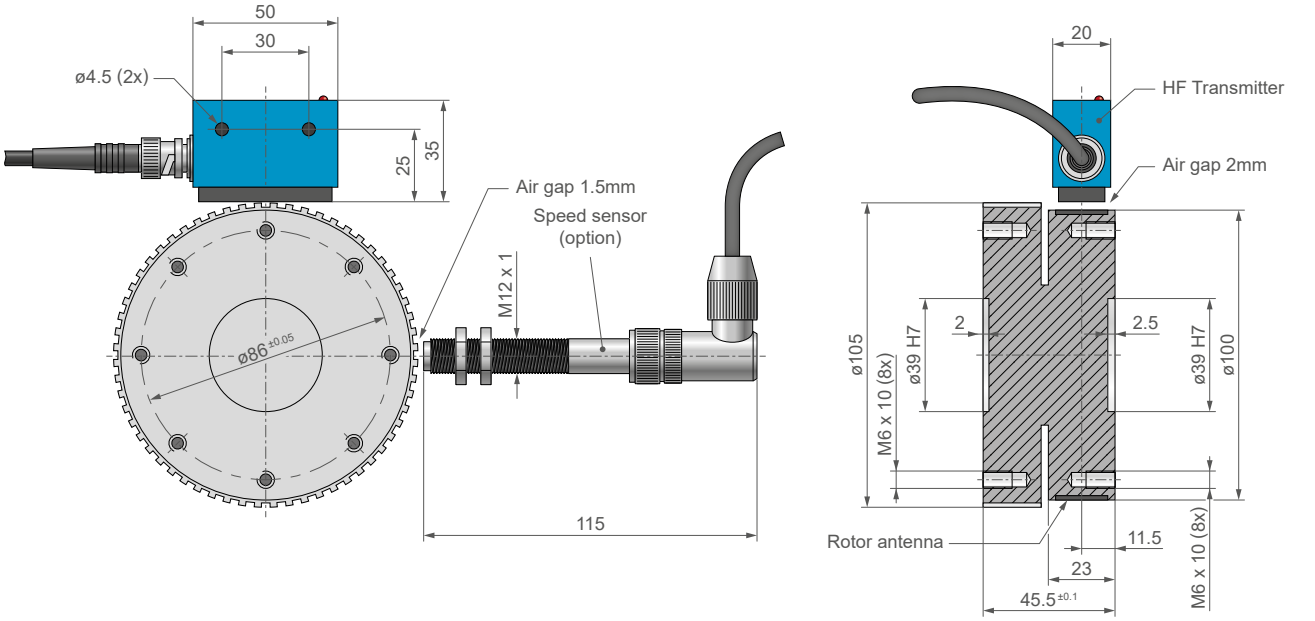
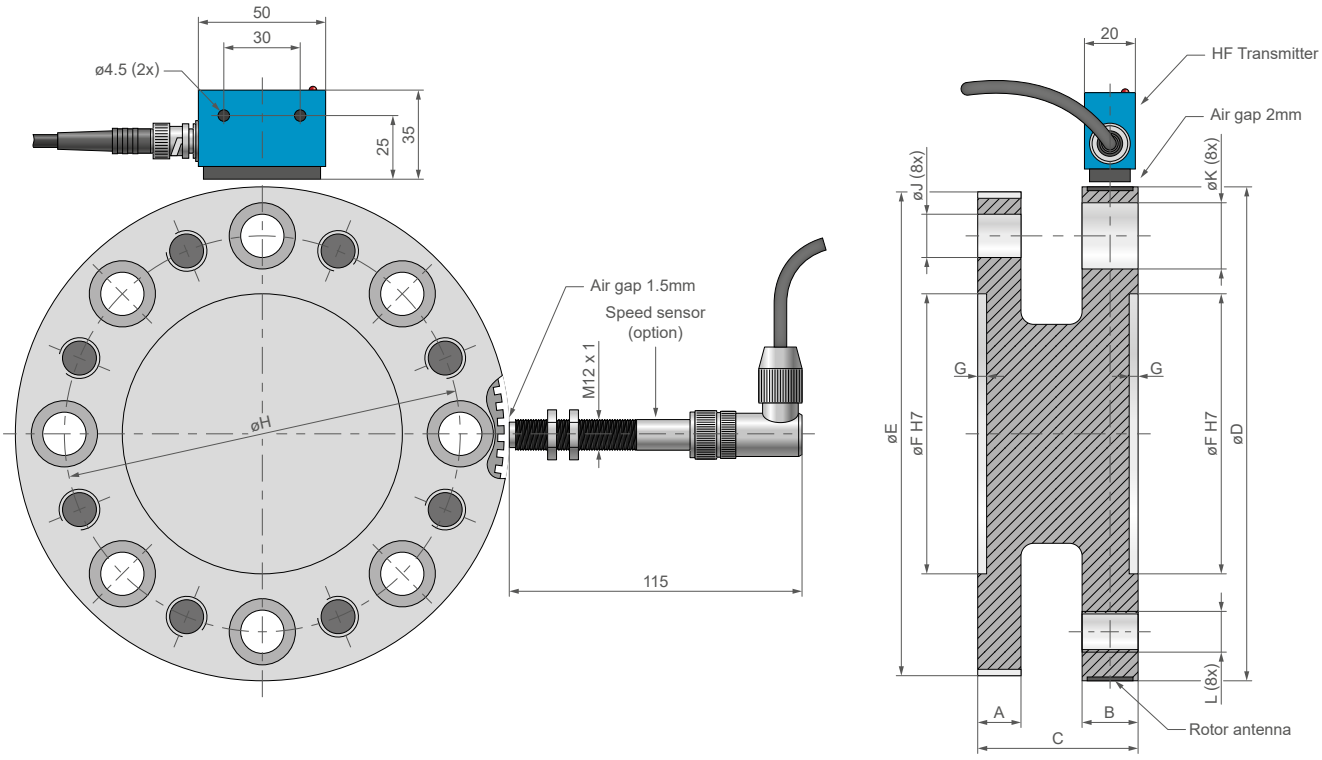


Fig. 2: Moment of Inertia (X Axis)

DIMENSIONS TF & TFHS 309 - 312



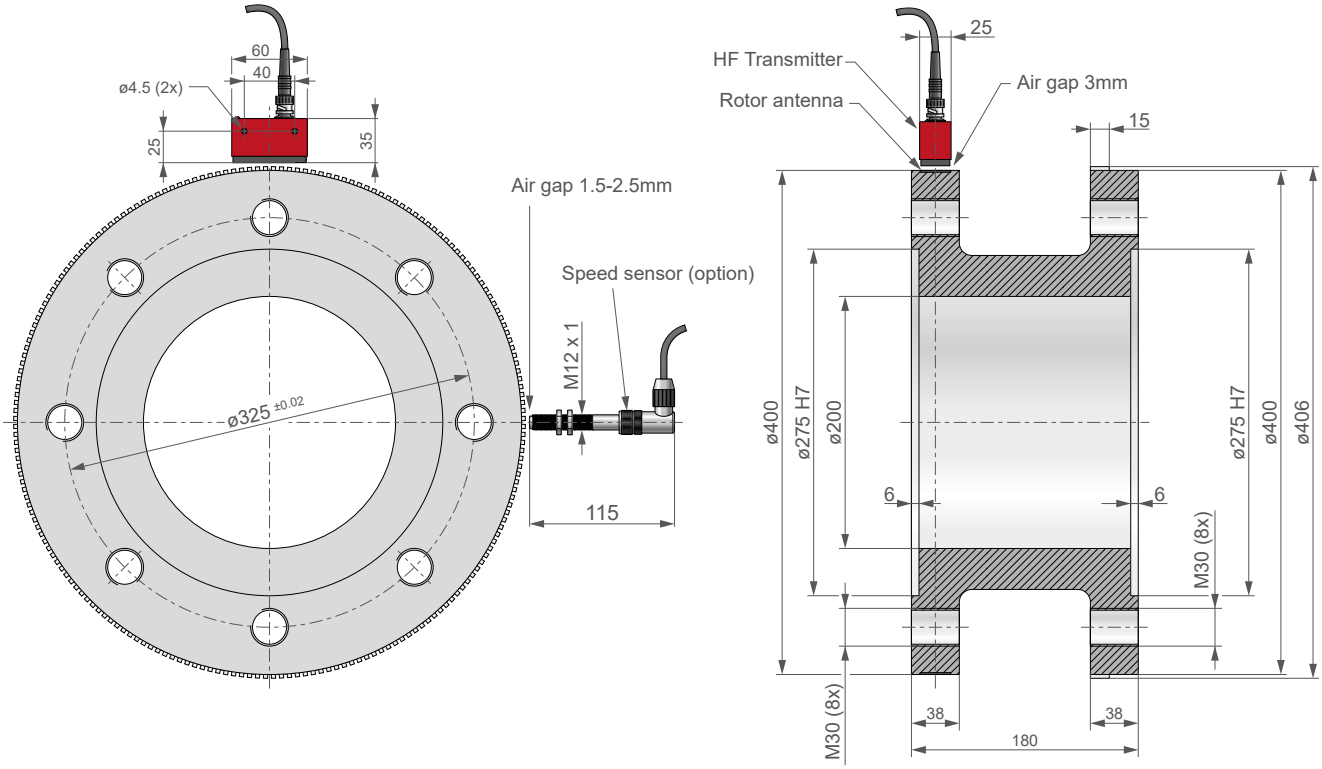
DIMENSIONS TF & TFHS 313 - 317



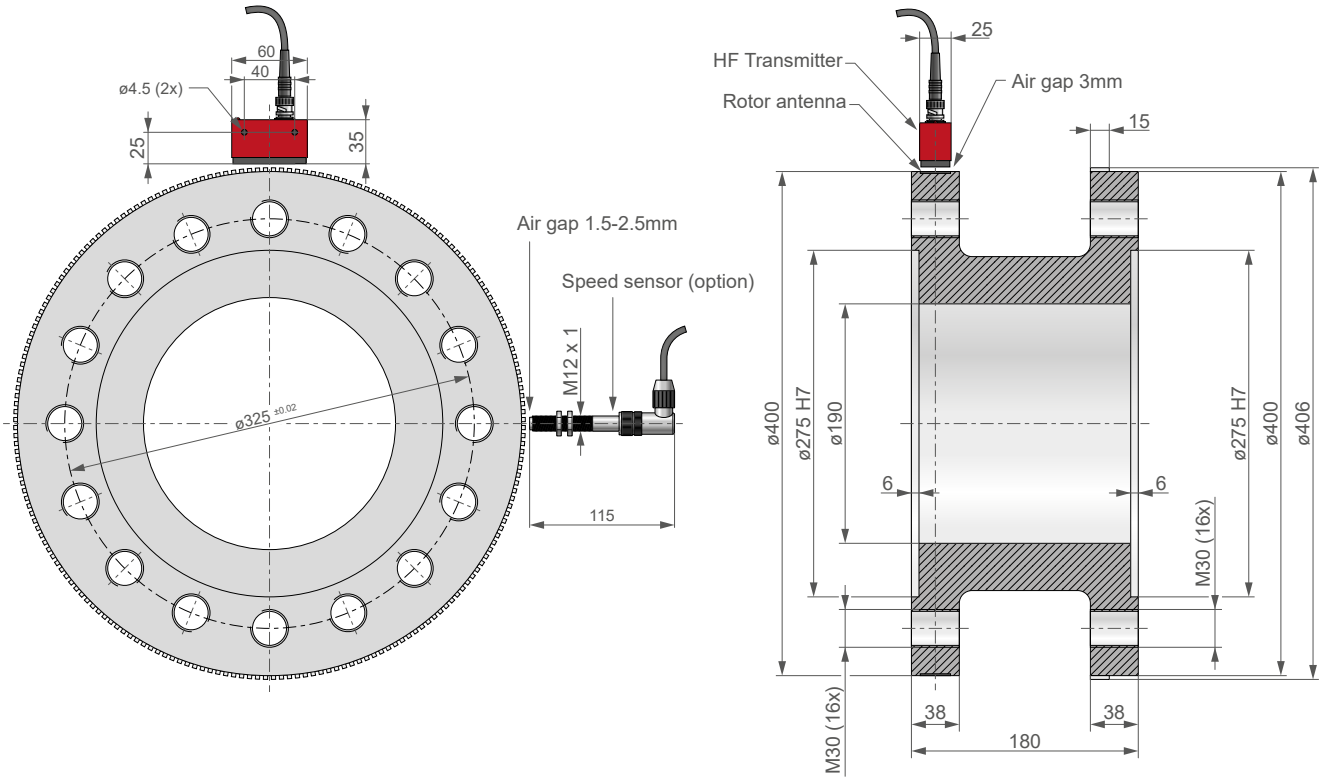
MODEL	A	B	C	øD	øE	øF H7	G	øH	øJ (8x)	øK (8x)	L (8x)
TF/TFHS 313	12	22	49	130	126	75	3.0	101.5 ±0.05	10.5	18	M10
TF/TFHS 314											
TF/TFHS 315			53	164	156	90	3.5	130.0 ±0.05	12.5	20	M12
TF/TFHS 316	14			194	190	110	3.5	155.5 ±0.1	15.0	23	M14
TF/TFHS 317	17		63						17.0	26	M16

NOTE: All dimensions are in metric units.
NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

DIMENSIONS TF 318 - 319



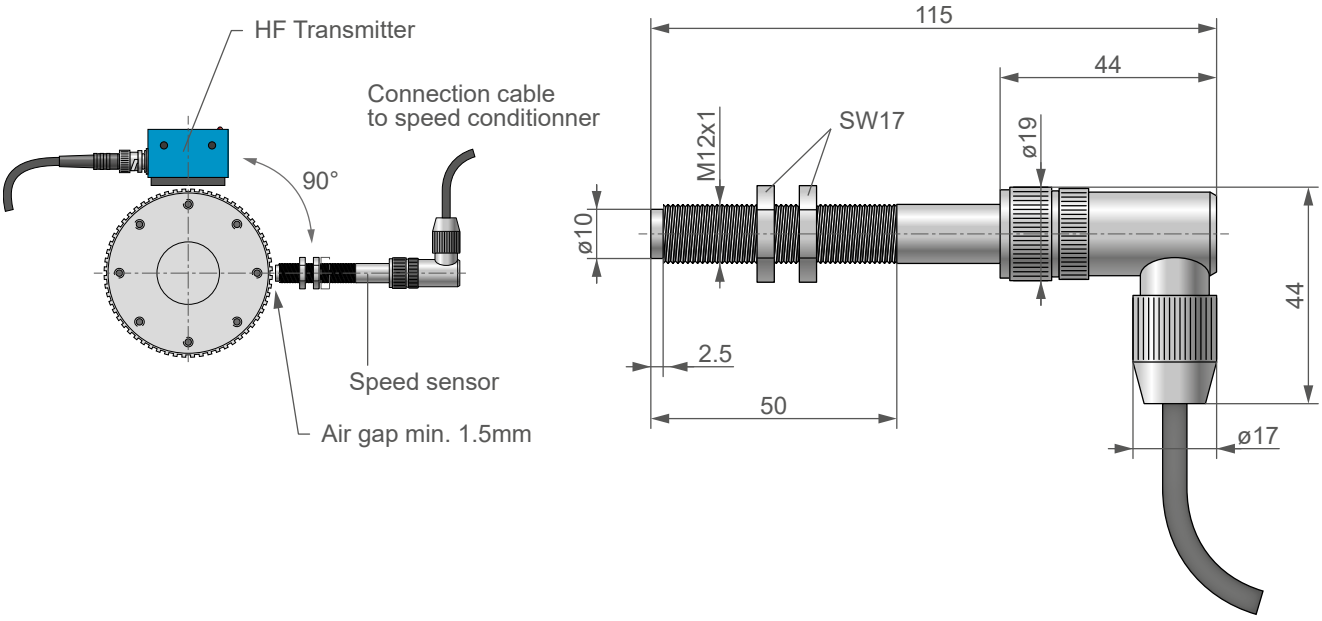
DIMENSIONS TF 320



NOTE: All dimensions are in metric units.
NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

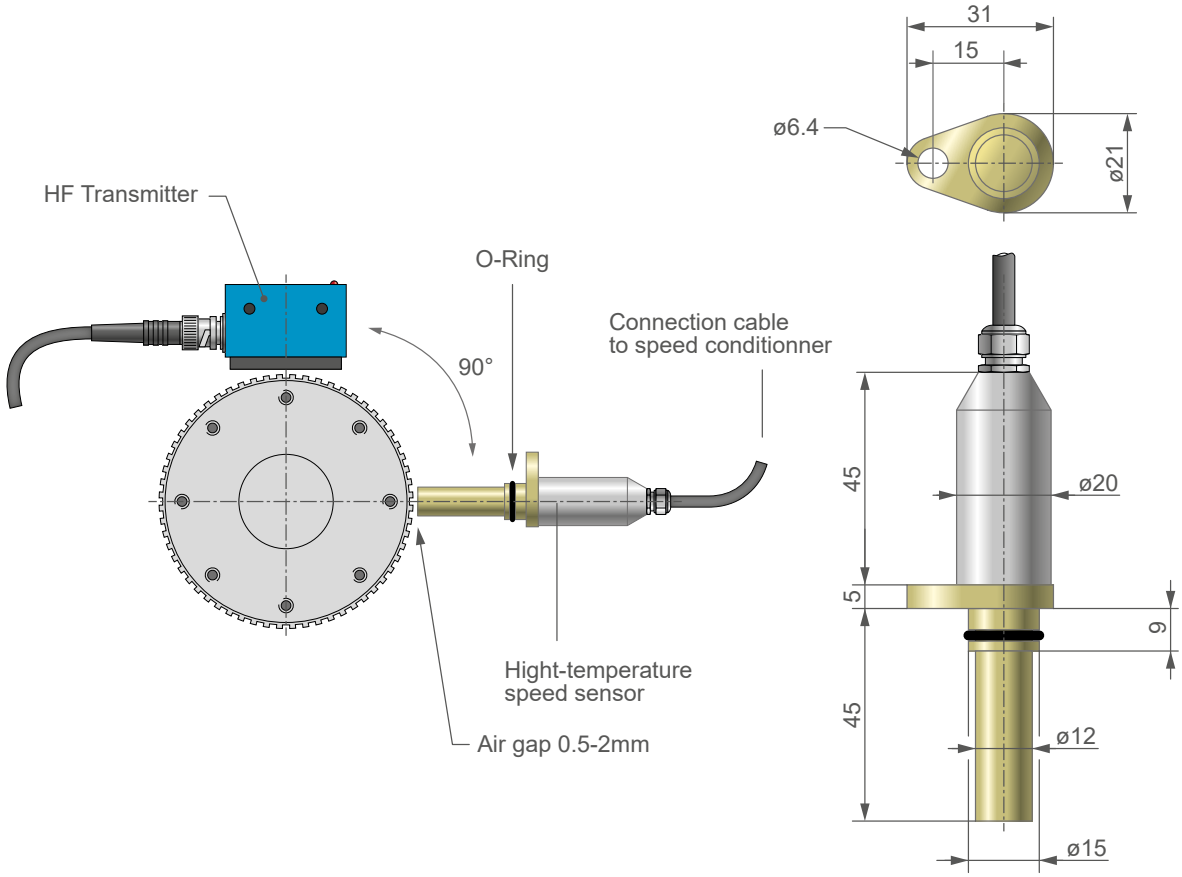
STANDARD SPEED SENSOR

The standard speed sensor is delivered with TF 300 Torque Flange Sensors ordered with the speed measurement option.



HIGH TEMPERATURE SPEED SENSOR

The high-temperature speed sensor is delivered with TF 300 Torque Flange Sensors ordered with both the speed measurement and extended temperature range options (125 °C).



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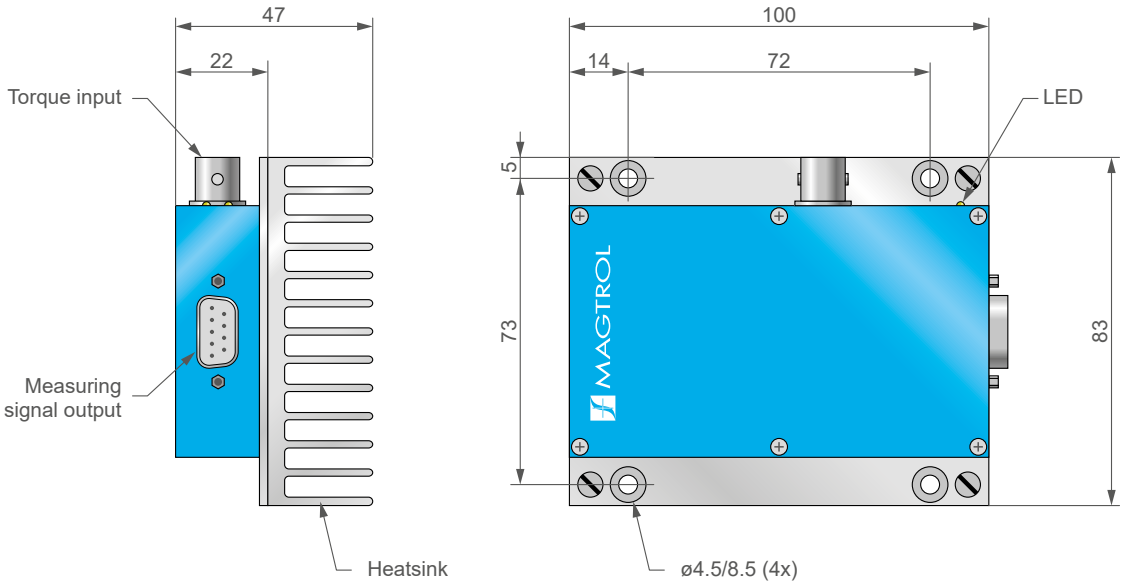
NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

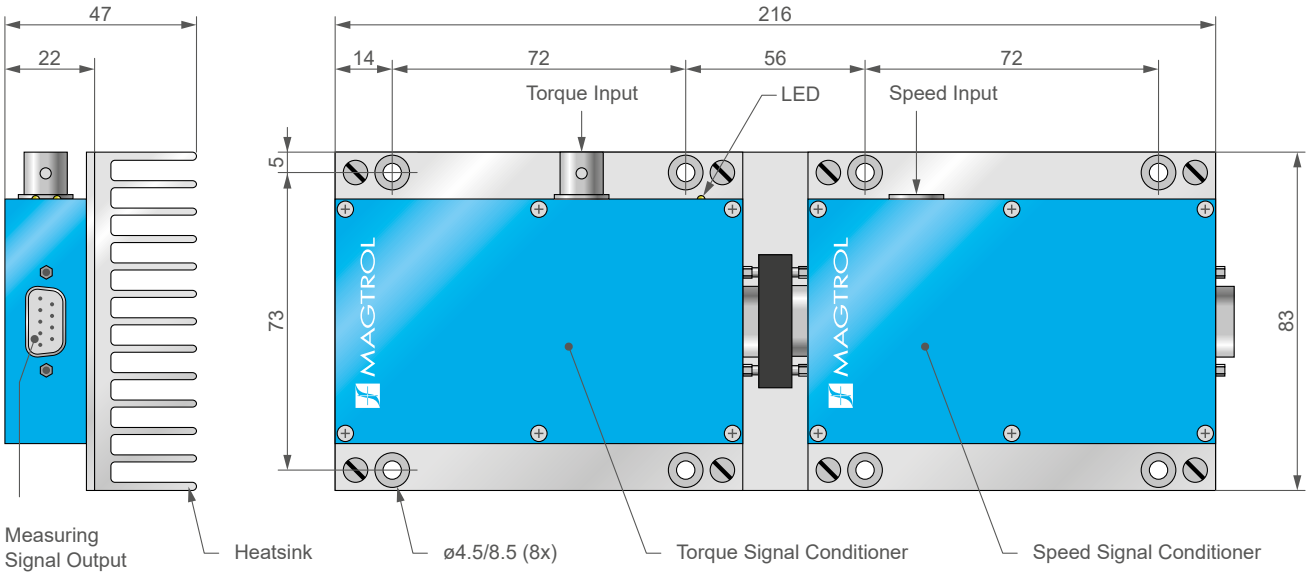
TORQUE SIGNAL CONDITIONER

Conditioner (1.5 W) for TF 309 ... TF 317



TORQUE SIGNAL CONDITIONER WITH SPEED OPTION

Conditioner (1.5 W) with speed option for TF 309 ... TF 317



NOTE: All dimensions are in metric units.
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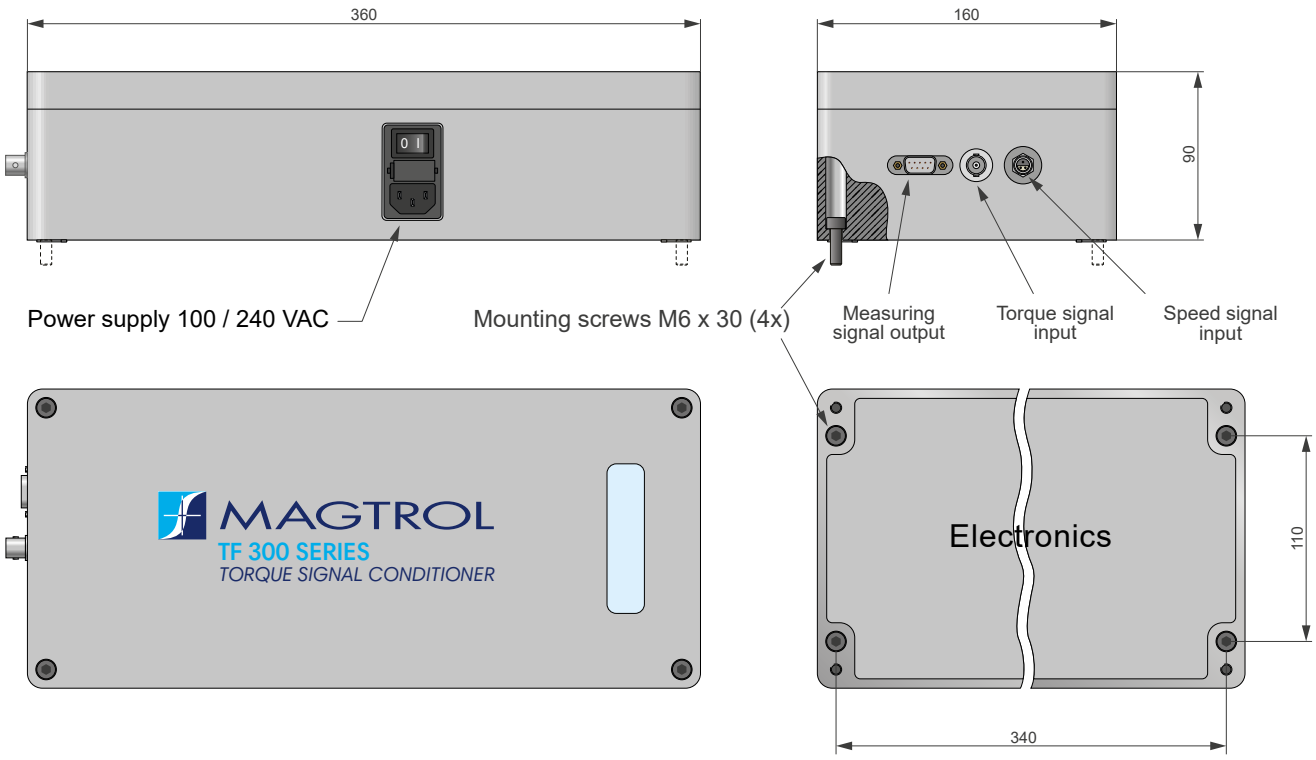
TORQUE SIGNAL CONDITIONER FOR TF 318-320

Conditioner with speed (5 W), for TF 318 ... TF 320



NOTE: All dimensions are in metric units.
NOTE: 3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

SYSTEM OPTIONS

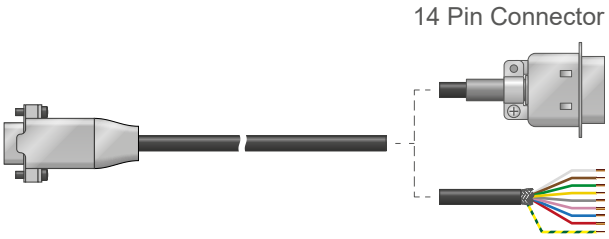
MODEL 3411 - TORQUE DISPLAY

Fig. 3: MODEL 3411 | Torque Display

Magtrol offers the MODEL 3411 Torque Display which supplies power to any TF Sensor and displays torque, speed and mechanical power. Features include:

- Adjustable English, metric and SI torque units
- Large, easy-to-read vacuum fluorescent display
- Built-in self-diagnostic tests (B.I.T.E.)
- Overload indication
- Tare function
- USB & Ethernet interface
- Torque and speed outputs
- Closed-box calibration
- Includes Magtrol's TORQUE Software

CABLE ASSEMBLY



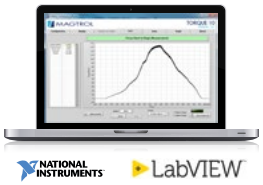
ORDERING NUMBER	ER 1	_ _	- 0	_

16 : 14 Pin connector [a]
17 : Pigtail wires

1 : Cable lenght 5 m
2 : Cable lenght 10 m
3 : Cable lenght 20 m

a) For use with MODEL 3411 Torque Display or DSP Controller

«TORQUE» SOFTWARE



Magtrol's TORQUE Software is an easy-to-use Windows® executable program, used to automatically collect torque, speed and mechanical power data. The data can be printed, displayed graphically or quickly saved as a Microsoft® Excel spreadsheet. Standard features of Magtrol's TORQUE Software include: peak torque capture, multi-axes graphing, measured parameter vs. time, adjustable sampling rates and polynomial curve fitting.

COUPLINGS

For our TF Torque Flange Sensors, Magtrol offers specific couplings KTF Series (flexible disc) or BKC TF Series (below type). For more details, please contact your regional sales office.

Fig. 4: KTF Series | Flexible Disc Coupling

ORDERING INFORMATIONS

ORDERING NUMBER	TF	_ _	_ _ _	/ X	_	X

HS : for High Speed version

309, 310, ..., 320 : Model TF or TFHS

1 : Basic
2 : With Speed Measurement
5 : High Temperature version (up to 125 °C)
6 : Speed Measurement & Hight Temperature (up to 125 °C)

Example: TF 312 Torque Flange Sensor, high speed version, with speed measurement, would be ordered as: **TFHS 312 / X2X.**

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