

TF SERIES

TORQUE FLANGE SENSORS

FEATURES

- Complete torque measuring system including: measuring flange with signal amplifier, HF transmitter, conditioner and 4m coaxial cable
- Contactless signal transmission: via telemetry
- Torque range: 20 N·m to 150 kN·m (higher on demand)
- High accuracy: 0.1 % to 0.2 % (0.05 % option)
- Overload capacity: up to 200 % (limit of adhesion)
- Measuring range: 200 %
- Braking torque: 400 %
- Compact, easy-to-mount design
- High torsional stiffness
- Bearingless: maintenance and wear-free
- Excellent noise immunity and shock resistance
- Protection class: IP42 (IP54 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 signal amplifier

DESCRIPTION

With its compact, bearingless, maintenance-free design, the TF 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 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 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 Sensor with no effect on the signal.

ASSEMBLY

APPLICATIONS



Fig.2: 1) HF Transmitter 2) Measuring flange with signal amplifier
3) 4 meter coaxial cable 4) Torque conditioner

TF 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

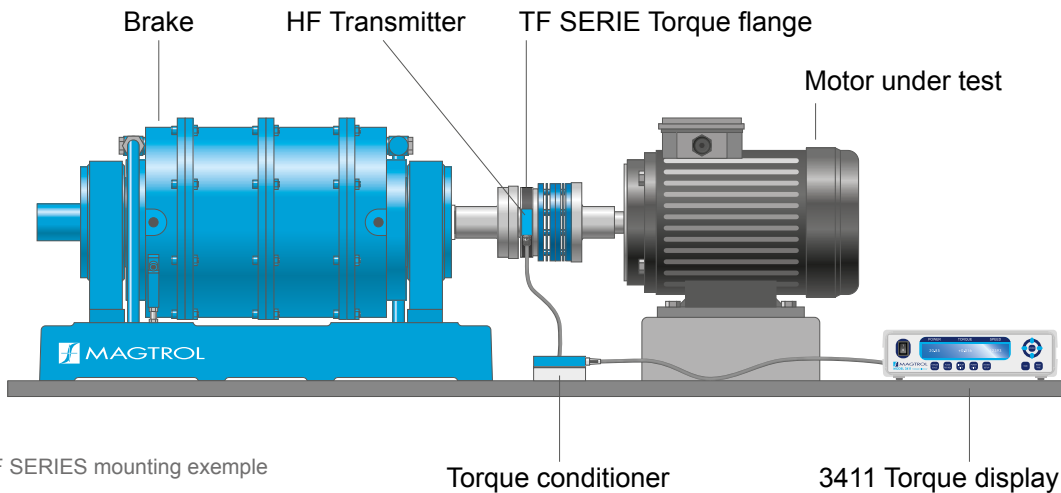


Fig.3: TF SERIES mounting exemple

ELECTRICAL CONFIGURATION

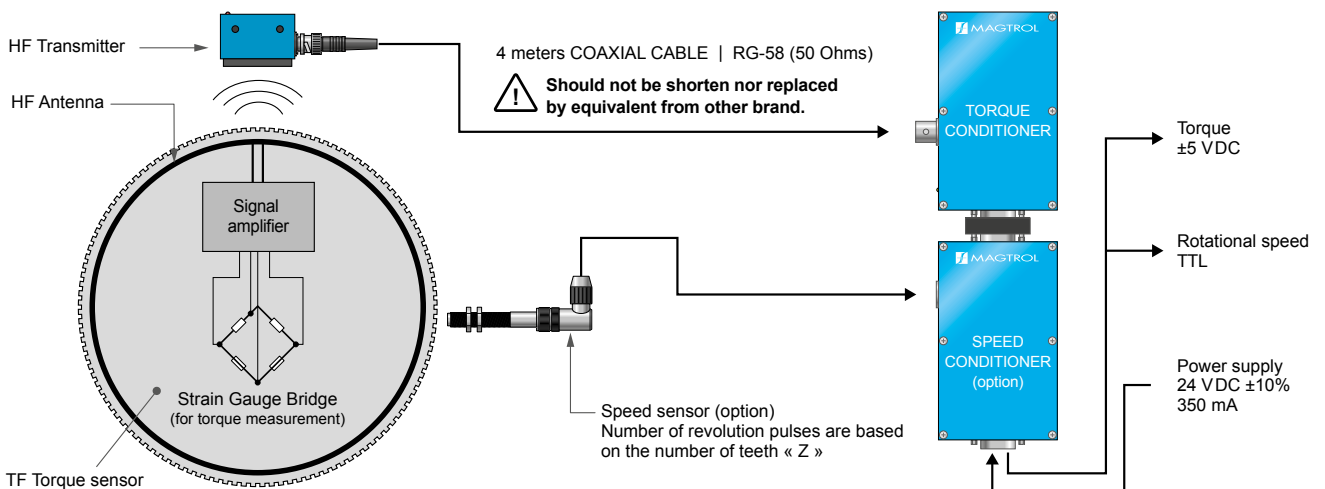


Fig.4: TF SERIES electrical configuration schemas

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	
	N·m	% of RT		rpm	Z	N·m / rad	°	kg	kg·m ²	lb·ft·s ²
TF309 TFHS309	20	200%	0.1%	17000 20000	52	5.04 x 10 ⁴	0.023	1.4	2.213 x 10 ⁻³	1.633 x 10 ⁻³
TF310 TFHS310	50	200%	0.1%	17000 20000	52	7.20 x 10 ⁴	0.04	1.5	2.236 x 10 ⁻³	1.650 x 10 ⁻³
TF311 TFHS311	100	200%	0.1% ^{b)}	17000 20000	52	8.57 x 10 ⁴	0.067	1.5	2.238 x 10 ⁻³	1.651 x 10 ⁻³
TF312 TFHS312	200	200%	0.1% ^{b)}	17000 20000	52	1.06 x 10 ⁵	0.108	1.5	2.254 x 10 ⁻³	1.663 x 10 ⁻³
TF313 TFHS313	500	200%	0.1% ^{b)}	15000 20000	59	8.5 x 10 ⁵	0.034	1.9	4.6 x 10 ⁻³	5.758 x 10 ⁻³
TF314 TFHS314	1000	200%	0.1% ^{b)}	15000 20000	59	1.285 x 10 ⁶	0.045	2.0	4.7 x 10 ⁻³	4.769 x 10 ⁻³
TF215	2000	200%	0.1% ^{b)}	10000	113	2.86 x 10 ⁶	0.04	5.2	1.868 x 10 ⁻²	1.378 x 10 ⁻²
TF216	5000	200%	0.1% ^{b)}	8000	133	7.16 x 10 ⁶	0.04	9.3	4.747 x 10 ⁻²	3.505 x 10 ⁻²
TF317 TFHS317	10000	150% ^{e)}	0.1% ^{b)}	10000 12000	95	6.141 x 10 ⁶	0.093	6.0	2.76 x 10 ⁻²	3.472 x 10 ⁻²
TF318	20000	200%	0.1-0.2%	3500	200	4.40 x 10 ⁷	0.026	56.0	1.343	9.905 x 10 ⁻¹
TF319	50000	180% ^{e)}	0.1-0.2%	3500	200	7.47 x 10 ⁷	0.038	59.0	1.379	1.017
TF320	100000	180% ^{e)}	0.1-0.2%	3500	200	10.47 x 10 ⁷	0.055	63.5	1.397	1.03

Maximum Dynamique Torque without Damage (Overload Limit)

400% of Rated Torque

ENVIRONEMENT

Rated Temperature Range	+10 °C to +85 °C
Storage Temperature Range	-25 °C to +85 °C
Extended Temperature Range (option)	-30 °C to +125 °C
Temperature influence on zero	0.01% / °C
Protection class	IP42 (option IP54)

ELECTRICAL CHARACTERISTICS

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

SPEED MEASUREMENT (OPTION)

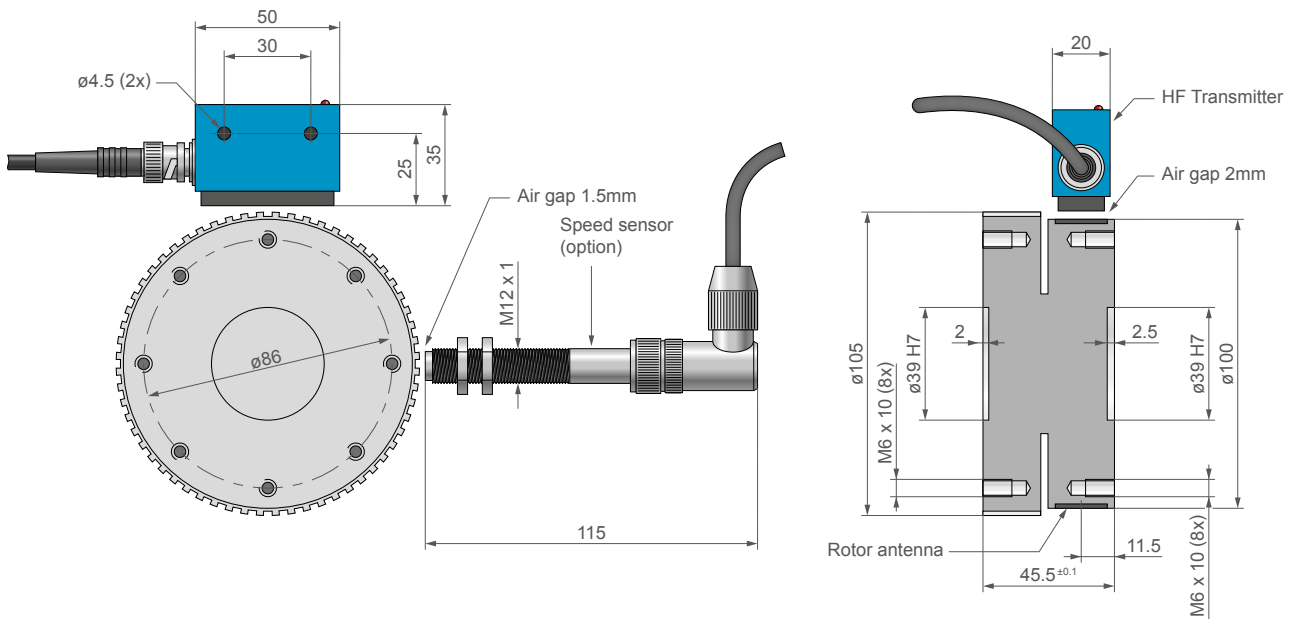
Number of Theeth	Depending on TF size; refer to number of teeth
Speed Pick-Up Transducer	Magneto-resistive
Minimum Speed Detection	< 1 rpm
Speed Output	TTL (pulse per revolution correspond with number of teeth)

- a) Torque up to 150kN·m or higher, and high speed versions are available on request
- b) Linearity- hysteresis error 0.05% is available on request
- c) Inductive speed detection is available on request
- d) Add 0.8-2.8kg to weight (depending 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.

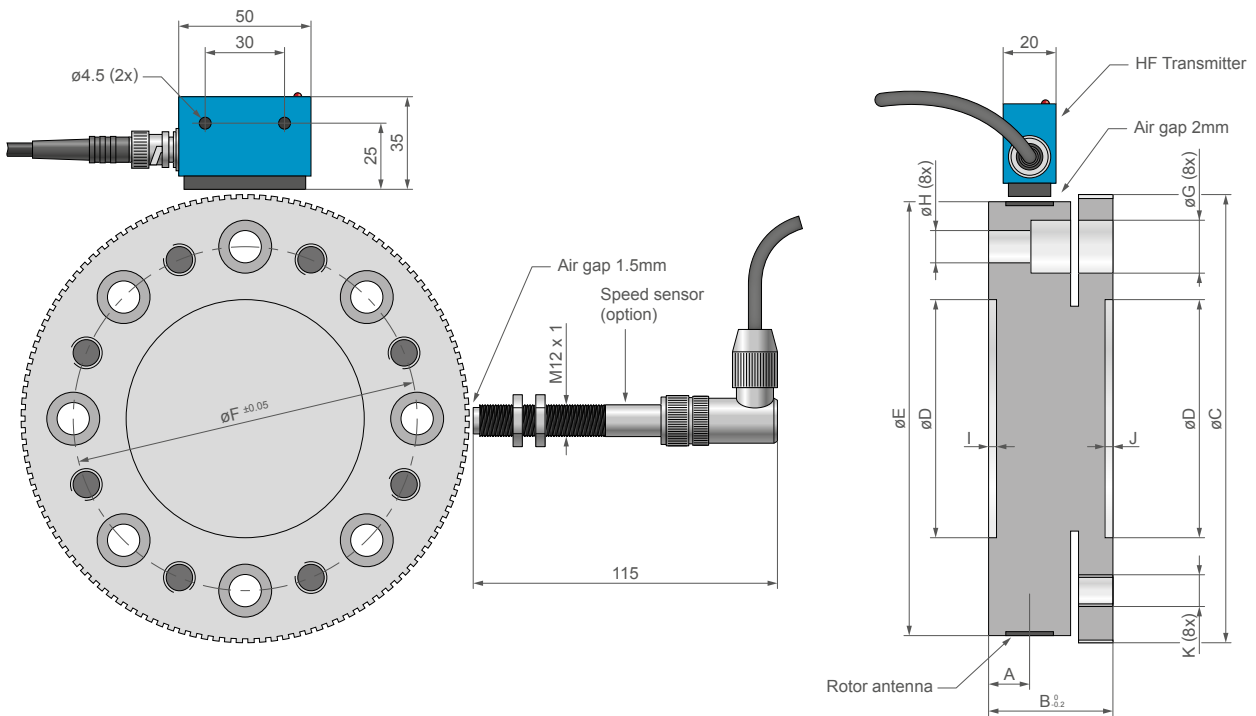


Fig. 5: Moment of inertia (X axis)

DIMENSIONS TF & TFHS 309 - 312



DIMENSIONS TF 215 - 216

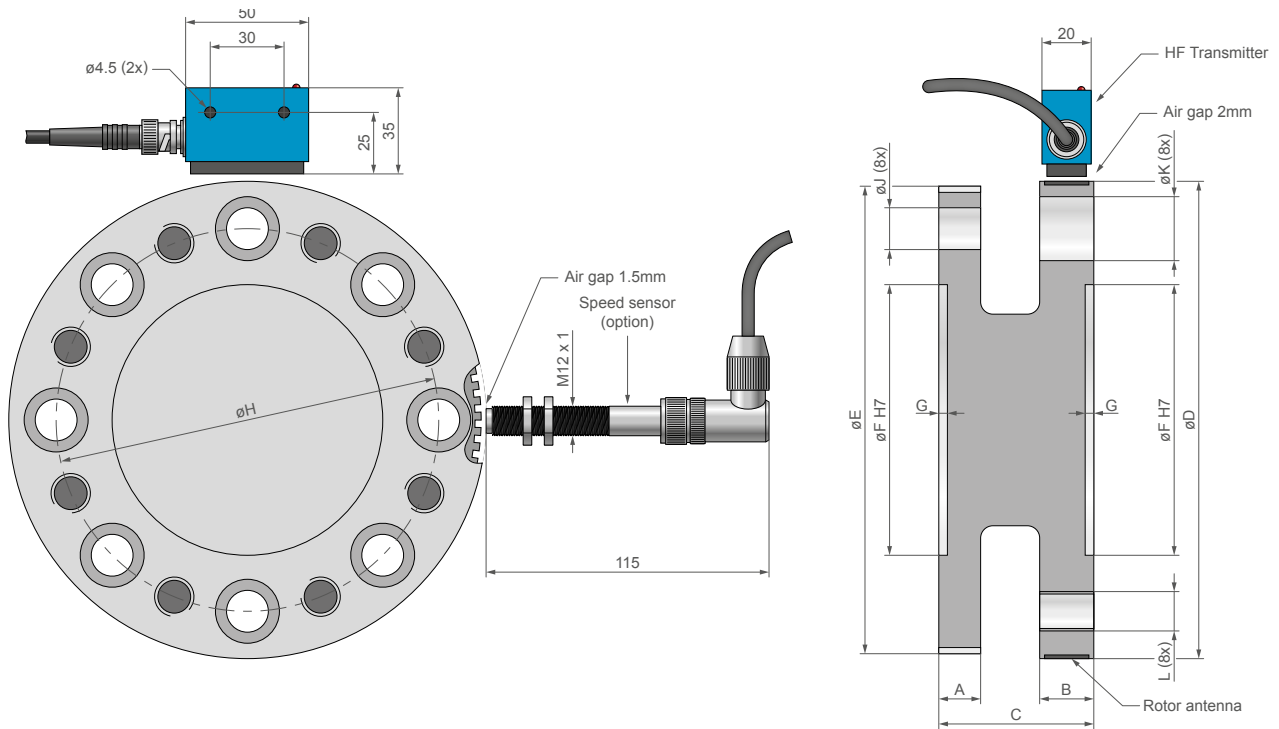


NOTE: All dimensions are in metric units.

MODEL	A	B _{±0.2}	øC	øD H7	øE	øF ±0.05	øG (8x)	øH (8x)	I	J	K (8x)
TF215	15.5	47	169.5	90	164	130.0	20	12.2	3	3	M12
TF216	27.0	55	199.5	110	194	155.5	23	15.0	11		M14

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 & TFHS 313 - 314 & 317

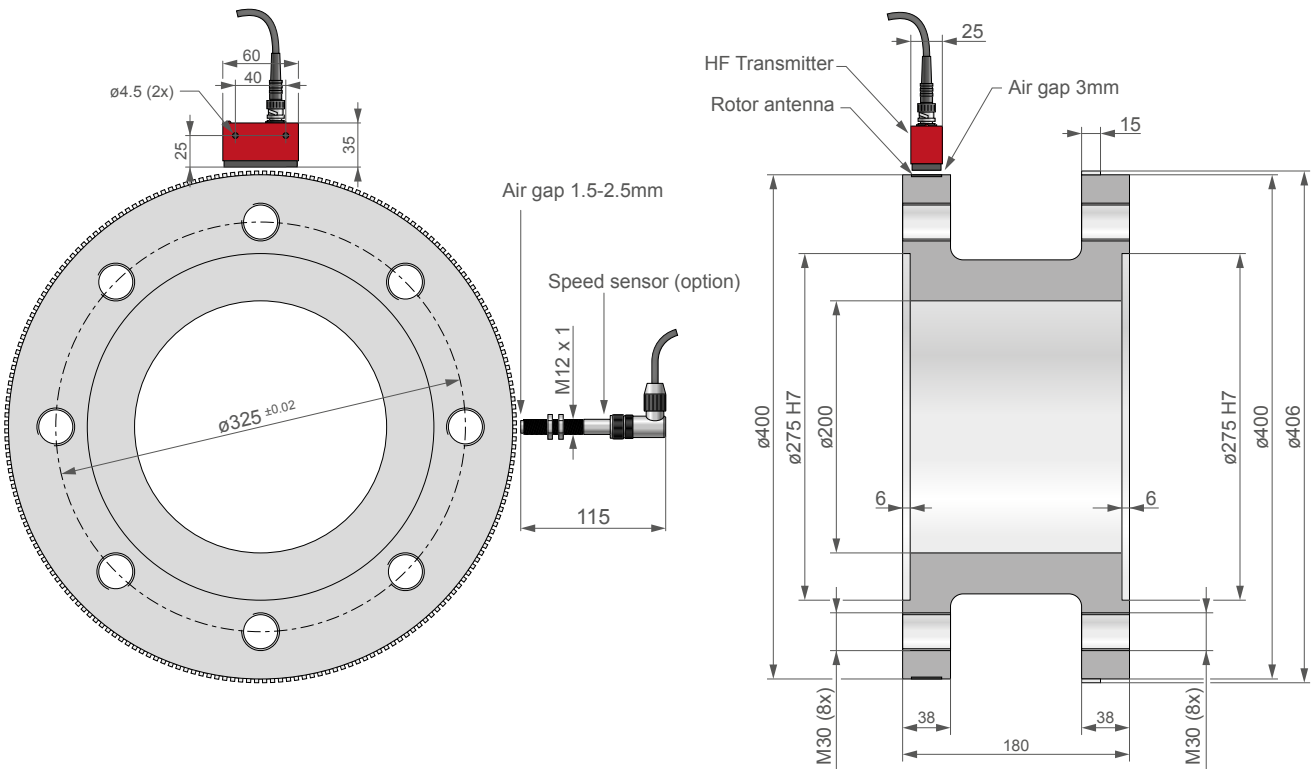


NOTE: All dimensions are in metric units.

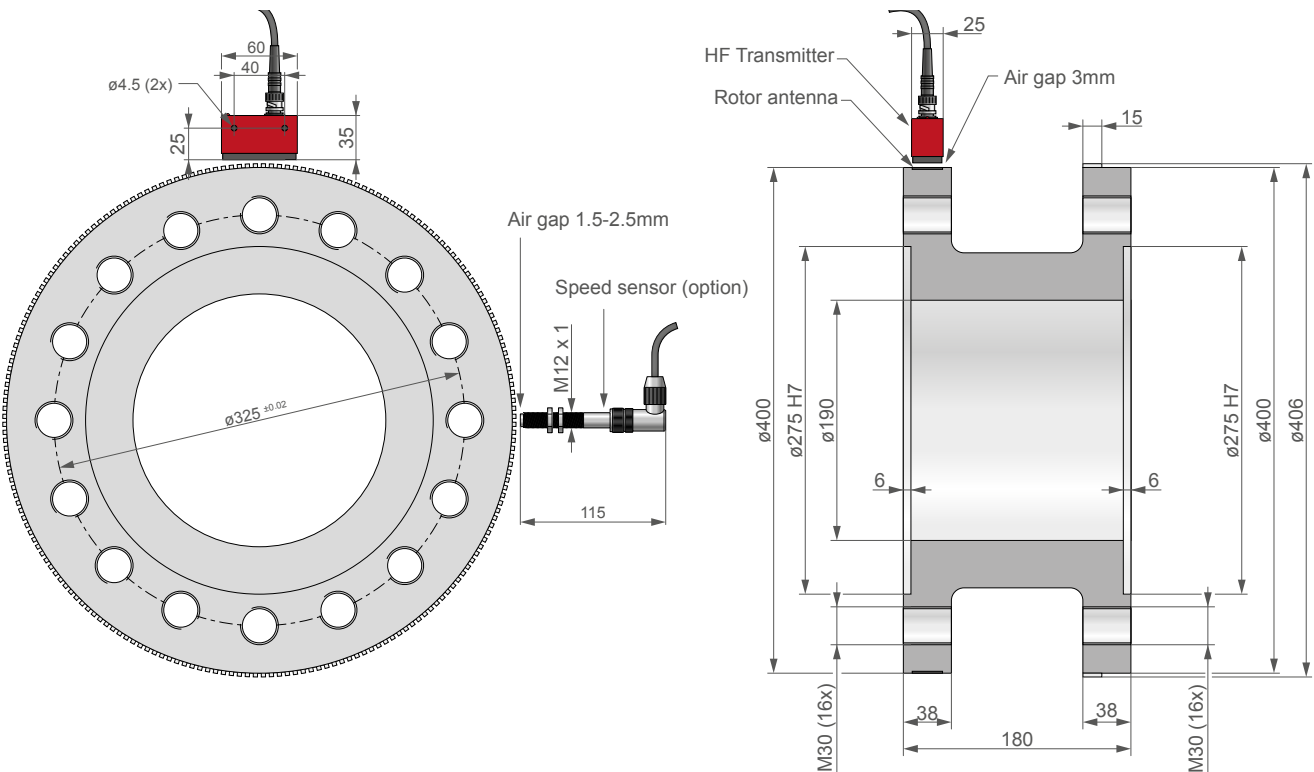
MODEL	A	B	C	ϕD	ϕE	$\phi F H7$	G	ϕH	$\phi J (8x)$	$\phi K (8x)$	L (8x)
TF/TFHS313 TF/TFHS314	12	22	49	130	126	75	3.0	101.5 \pm 0.05	10.5	18	M10
TF/TFHS317	17	22	63	194	190	110	3.5	155.5 \pm 0.1	17.0	26	M16

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DIMENSIONS TF 318 - 319



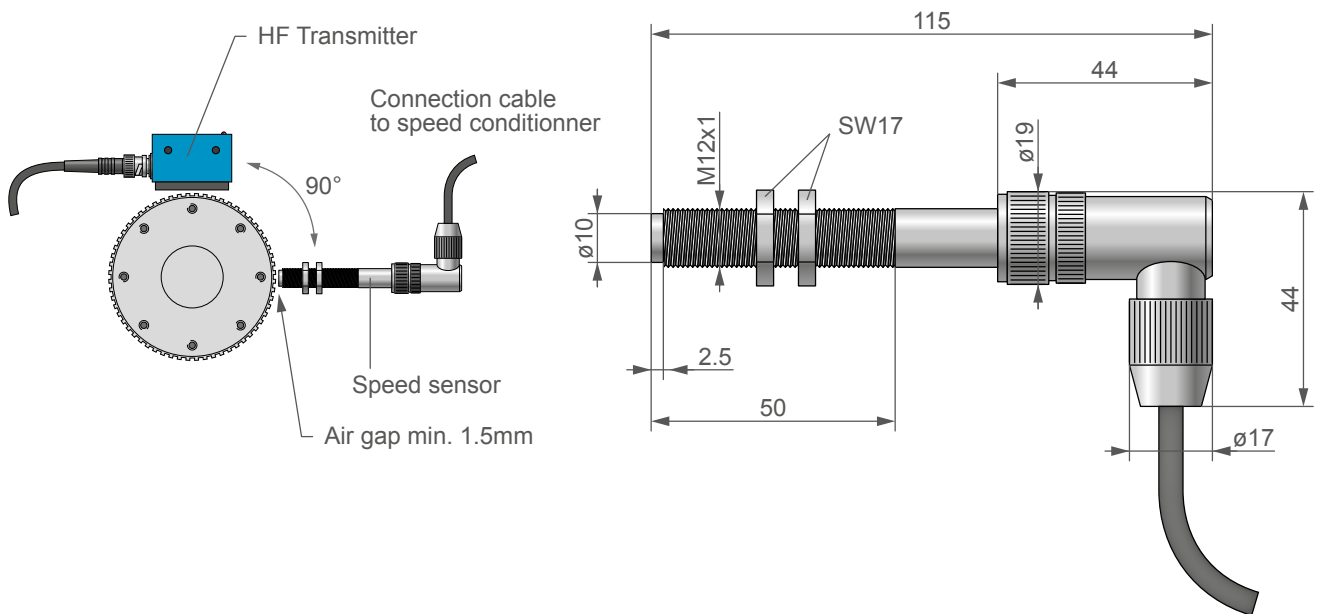
DIMENSIONS TF 320



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

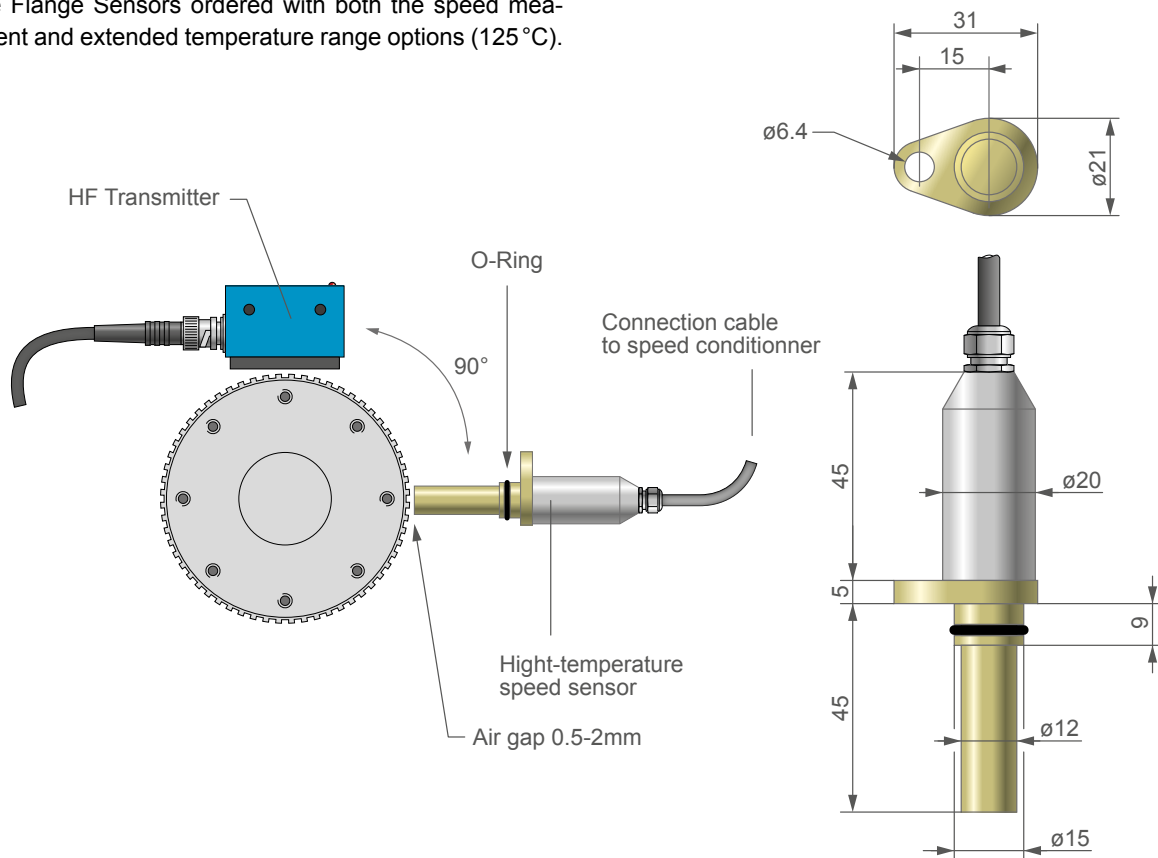
STANDARD SPEED SENSOR

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



HIGH TEMPERATURE SPEED SENSOR

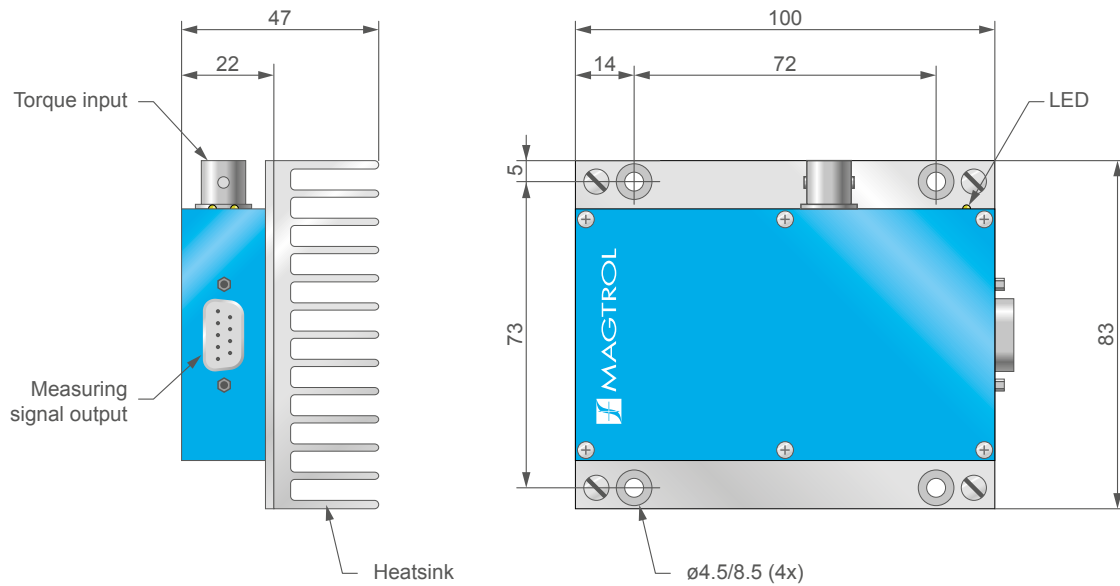
The high-temperature speed sensor is delivered with TF Torque Flange Sensors ordered with both the speed measurement and extended temperature range options (125°C).



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

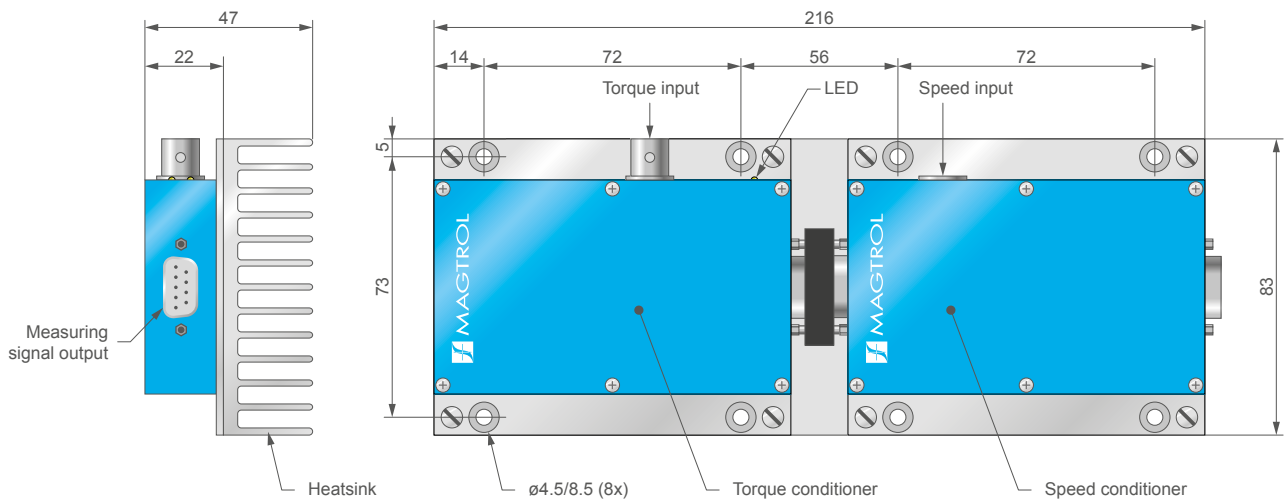
STANDARD CONDITIONER

Conditioner (1.5W),
for TF 309 to TF 314, TF 317 and TF 215 & TF 216



CONDITIONER WITH SPEED OPTION

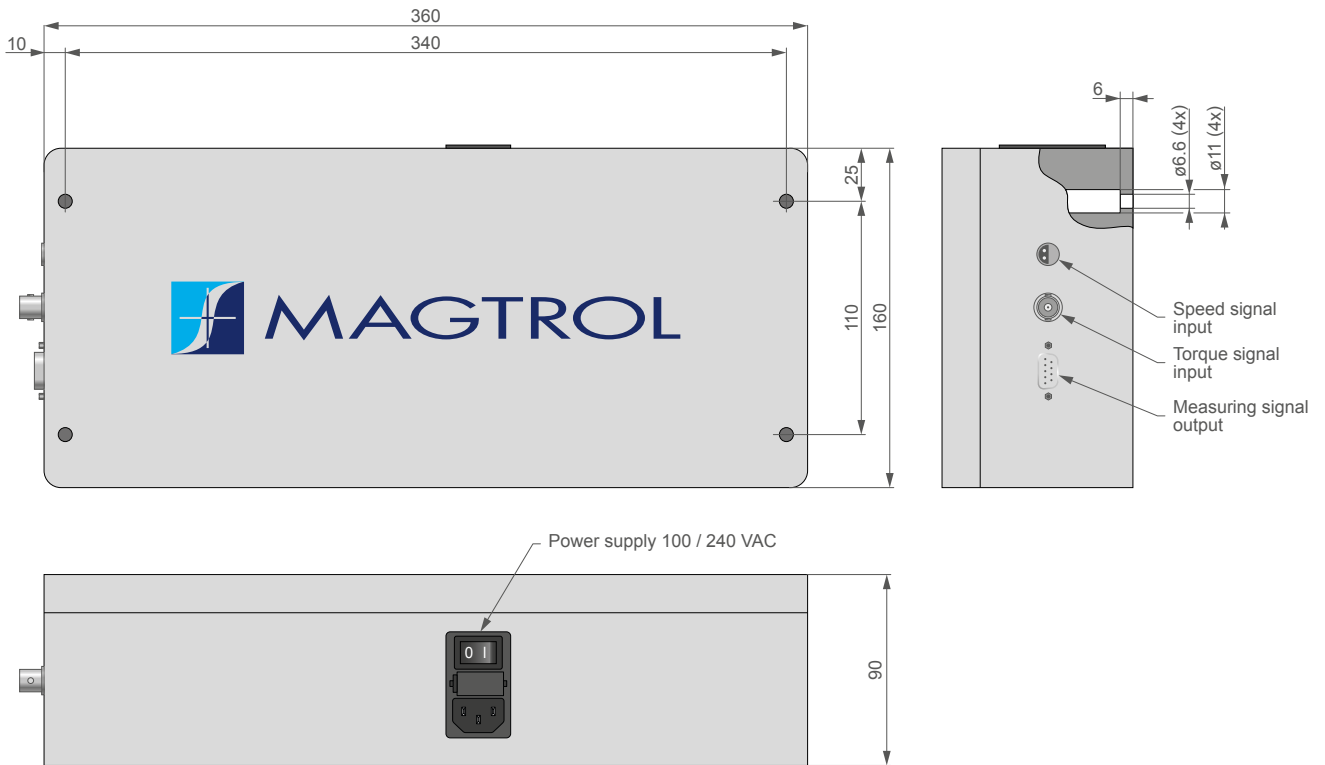
Conditioner (1.5W) with speed option,
for TF 309 to TF 314, TF 317 and TF 215 & TF 216



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

CONDITIONER FOR TF 318-320

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



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

ORDERING INFORMATION

ORDERING NUMBER	TF	-	---	/ 0	-	X
HS : for high speed serie						
309, 310, ..., 215, 216, ..., 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: TF312 Torque Flange Sensor, high speed version, with speed measurement, would be ordered as: TFHS312/02X.

SYSTEM OPTIONS

MODEL 3411 TORQUE TRANSDUCER DISPLAY

Magtrol offers the Model 3411 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
- Overload indication
- Tare function
- Ethernet connectivity
- Torque and speed outputs
- Closed-box calibration
- Includes Magtrol TORQUE 10 Software

TORQUE 10 SOFTWARE

Magtrol's TORQUE 10 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 10 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 couplings (flexible disc or below type). For more details, please contact your regional sales office.

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 Model3411 Torque Display or DSP Controller



Fig. 6: Model 3411 | Torque Display



Fig. 7: Example of flexible disc coupling