
TF Series

Torque Flange Sensor

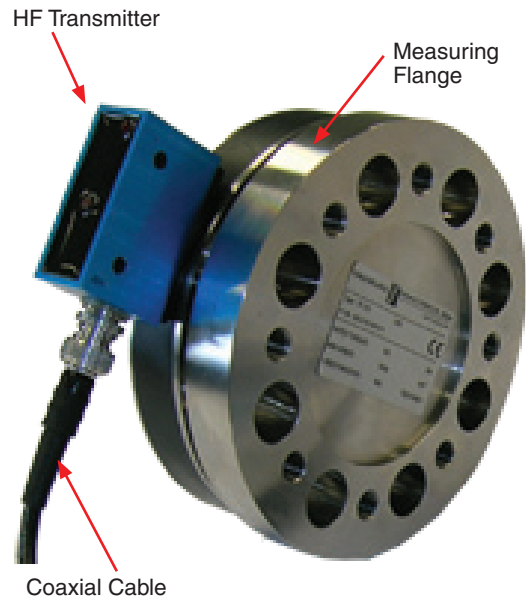
FEATURES

- Complete torque measuring system consisting of:
 - Measuring flange with signal amplifier
 - HF transmitter
 - Conditioner
 - 4 m coaxial cable
- Contactless signal transmission: via telemetry
- Torque range: 50 N·m to 150,000 N·m
- High accuracy: 0.1% to 0.25%
- 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: IP 42 (IP 54 optional)
- 24 VDC standard power supply
- Integrated speed sensor and conditioner (option): for rotational speed measurement
- High temperature capability: up to 125 °C (optional)

DESCRIPTION

With its compact, bearingless, maintenance-free design, the new 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.



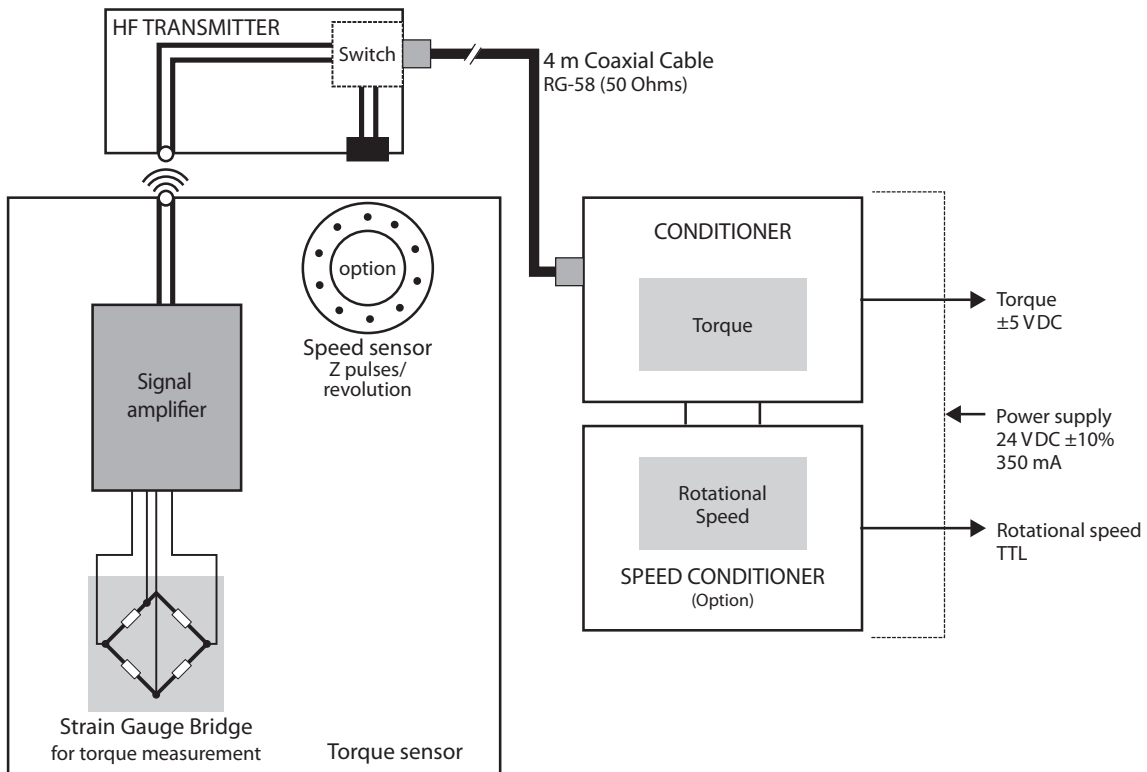
Model TF Torque Flange Sensor

The contactless design of the Torque Flange Sensor permits a gap of up to 5 mm (typically 1 to 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.

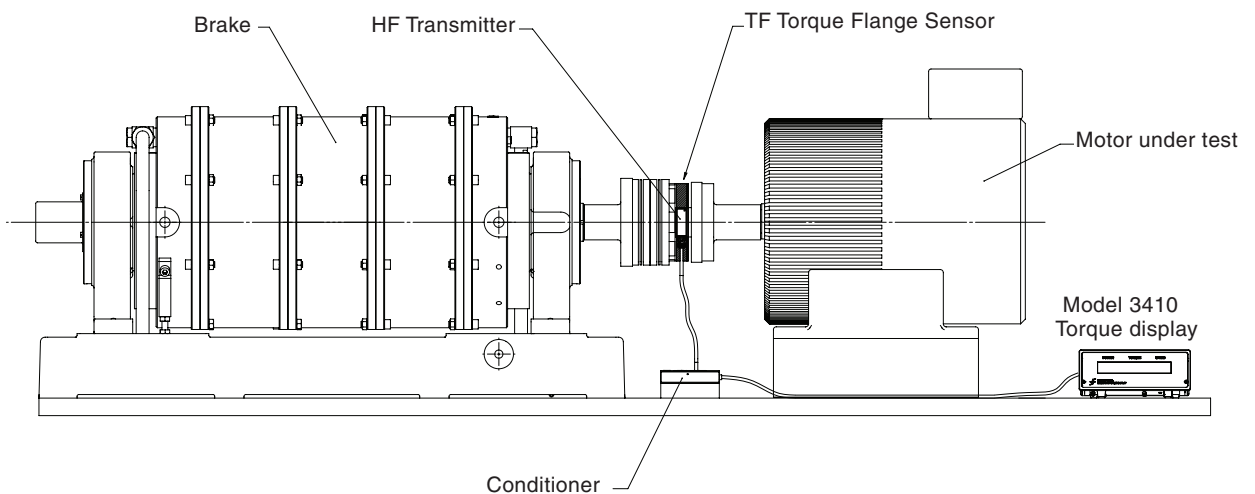
APPLICATIONS

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.

BLOCK DIAGRAM



SYSTEM CONFIGURATION



MODEL RATINGS

Model	Rated Torque	Overload Capacity	Accuracy Class	Maximum Speed	Number of Teeth **	Torsional Stiffness	Deformation Angle
	N·m	% of R.T.		rpm		Z	N·m/rad
TF 210	50	200%	0.1%	17,000	70	7.16×10^4	0.040
TF 211	100	200%	0.1%	17,000	70	1.25×10^5	0.046
TF 212	200	200%	0.1%	17,000	70	2.05×10^5	0.056
TF 213	500	200%	0.1% *	13,000	91	7.16×10^5	0.040
TF 214	1,000	200%	0.1% *	13,000	91	9.55×10^5	0.060
TF 215	2,000	200%	0.1% *	10,000	113	2.86×10^6	0.040
TF 216	5,000	200%	0.1%	8,000	133	7.16×10^6	0.040
TF 217	10,000	‡ 150%	0.1%	8,000	133	1.25×10^7	0.046
TF 218	20,000	200%	0.20% – 0.25%	3,000	283	2.86×10^7	0.040
TF 219	50,000	‡ 180%	0.20% – 0.25%	3,000	283	6.82×10^7	0.042
TF 220	100,000	‡ 180%	0.25% – 0.30%	3,000	270	3.37×10^8	0.017

Model	Sensor Weight ***	Moment of Inertia	
	kg	kg·m ²	lb·ft·s ²
TF 210	2.1	2.996×10^{-3}	2.211×10^{-3}
TF 211	2.2	3.172×10^{-3}	2.341×10^{-3}
TF 212	2.2	3.138×10^{-3}	2.316×10^{-3}
TF 213	3.3	7.803×10^{-3}	5.758×10^{-3}
TF 214	3.3	7.818×10^{-3}	5.769×10^{-3}
TF 215	5.2	1.868×10^{-2}	1.378×10^{-2}
TF 216	9.3	4.747×10^{-2}	3.503×10^{-2}
TF 217	9.3	4.706×10^{-2}	3.472×10^{-2}
TF 218	42.7	9.635×10^{-1}	7.109×10^{-1}
TF 219	43.3	9.724×10^{-1}	7.175×10^{-1}
TF 220	36.0	1.070×10^0	7.895×10^{-1}

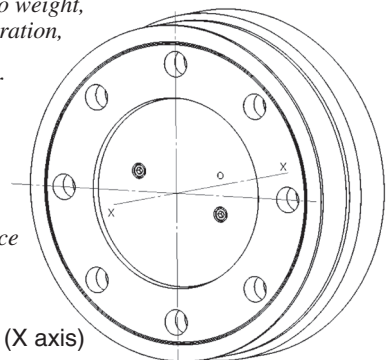
Available upon request:

- Torque up to 150,000 N·m
- High speed versions

- * Linearity-hysteresis error 0.05% on request
- ** Inductive speed detection available on request.

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

‡ Dynamic torque peak values for Models TF 217, TF 219 and TF 220 are due to force transmission limit of mounting screws.

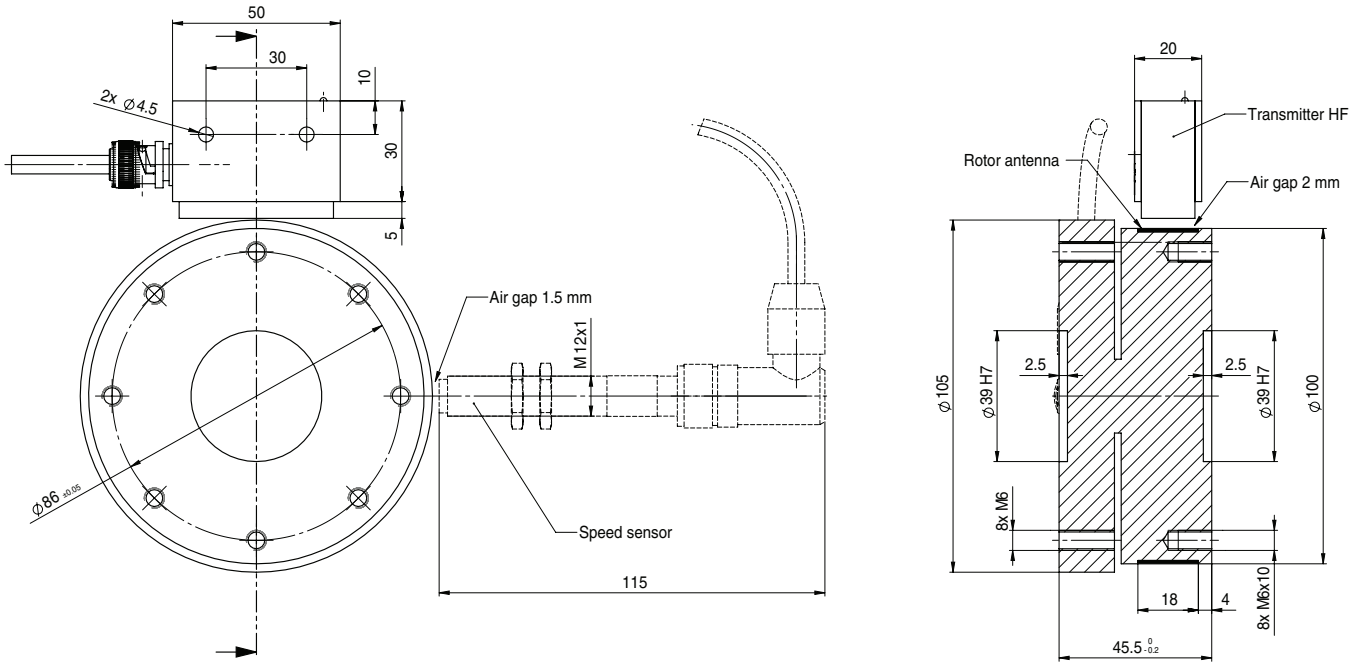


Moment of Inertia (X axis)

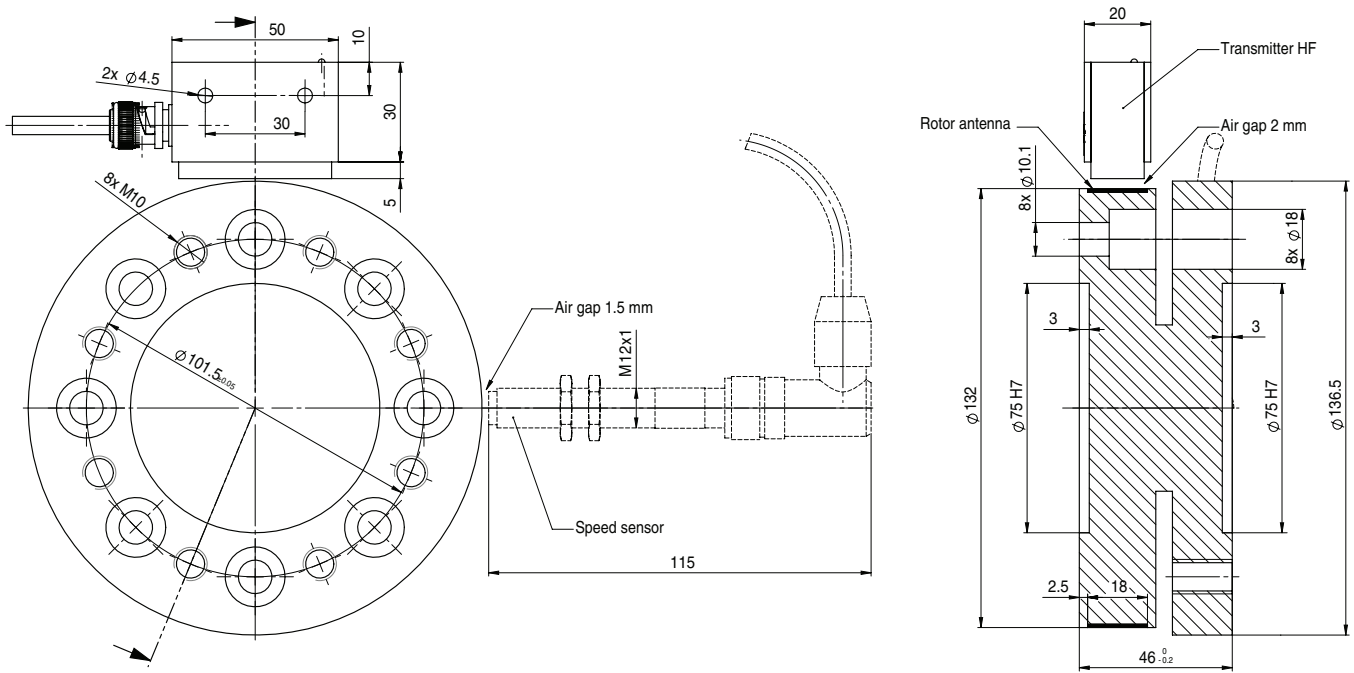
RATINGS COMMON TO ALL TF SENSORS

TORQUE MEASUREMENT	
Maximum Dynamic Torque Without Damage (Overload Limit)	400% of Rated Torque
SPEED MEASUREMENT (option)	
Number of Teeth	Depending on the size; Refer to Z under Model Ratings
Speed Pick-up Transducer	Magneto-resistive
Minimum Speed Detection	0.5 rpm
ENVIRONMENT	
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	IP 42 (optional IP 54)
INPUT AND OUTPUT SIGNALS	
Power Supply	TF 209 – TF 217: 24 VDC ±10%, max 350 mA TF 218 – TF 220: 100–240 VAC
Torque Output Signal (rated / max)	±5 VDC / ±10 VDC
Passband Frequency	0 to 1 kHz (-3 dB)
Speed Output (option)	TTL (pulses per revolution corresponds with number of teeth)

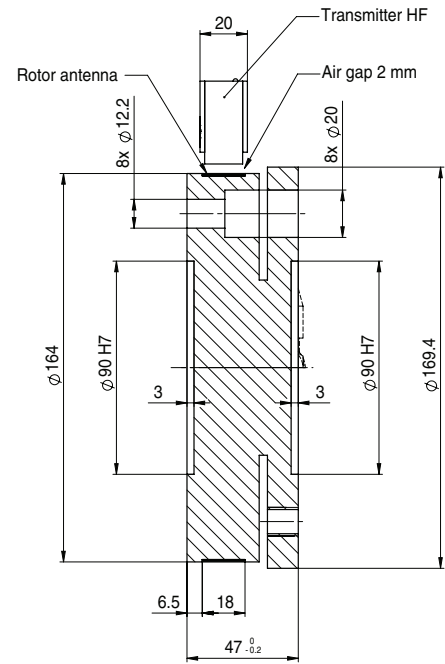
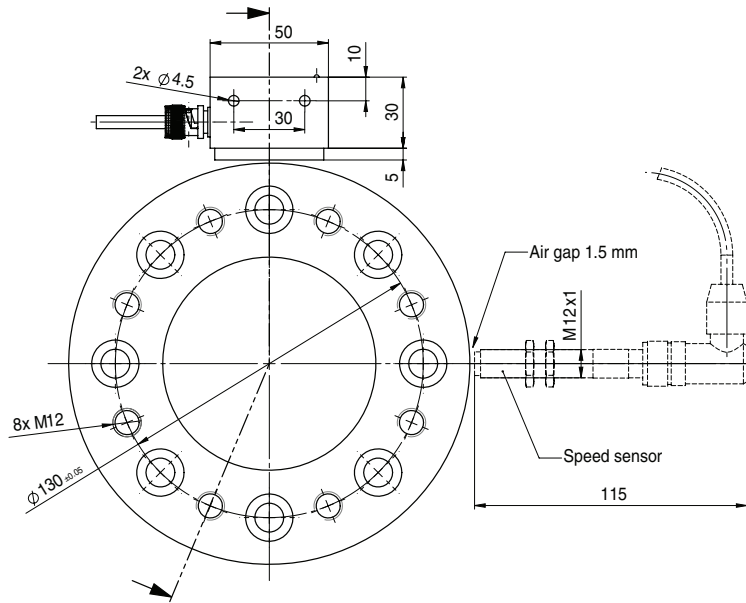
TF 210 TO TF 212



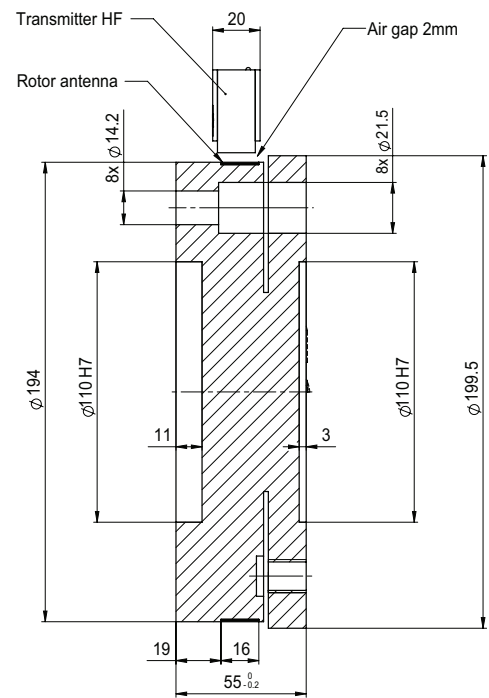
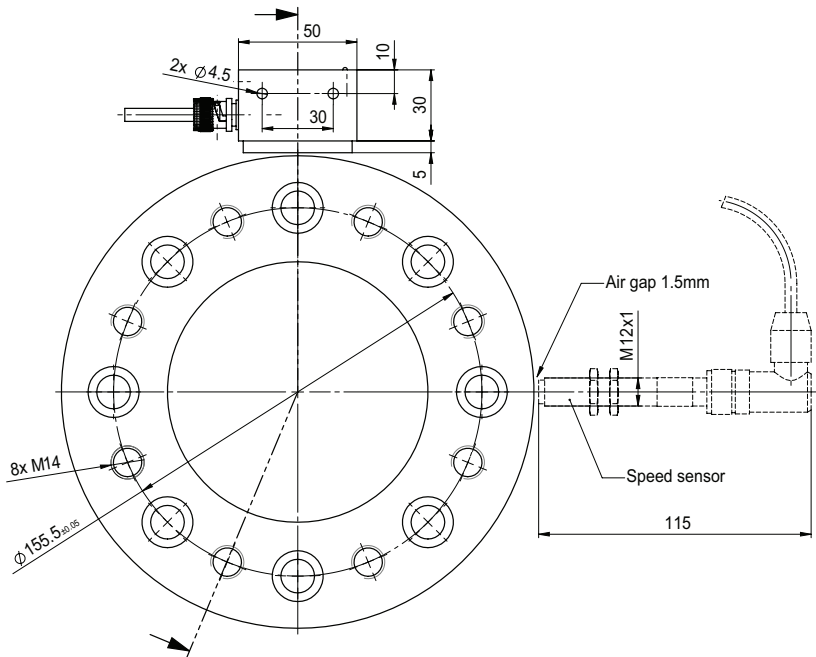
TF 213 AND TF 214



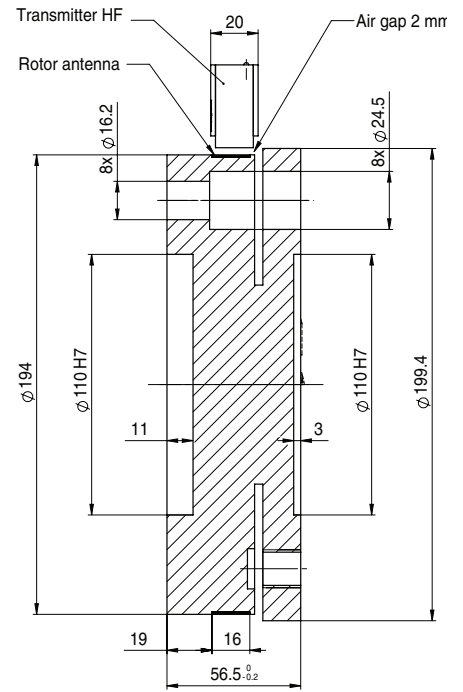
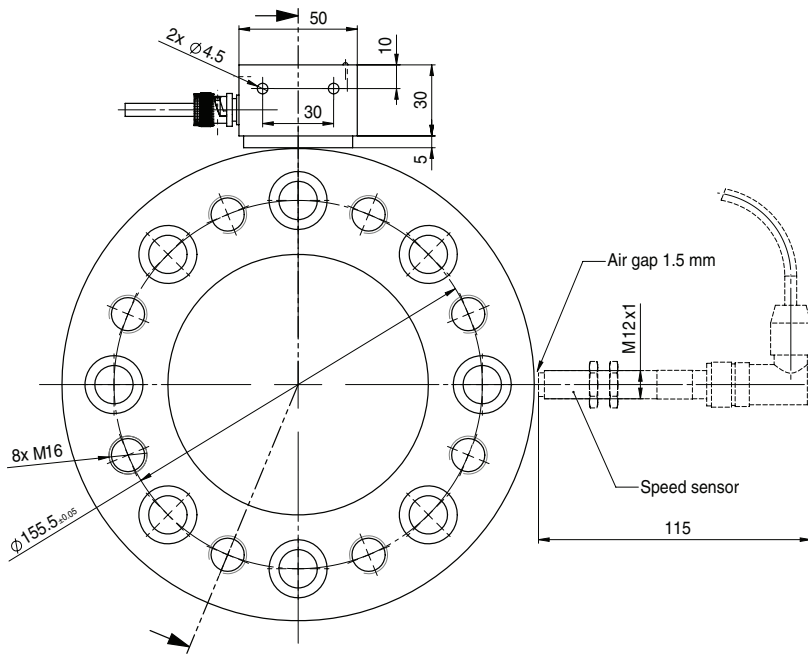
TF 215



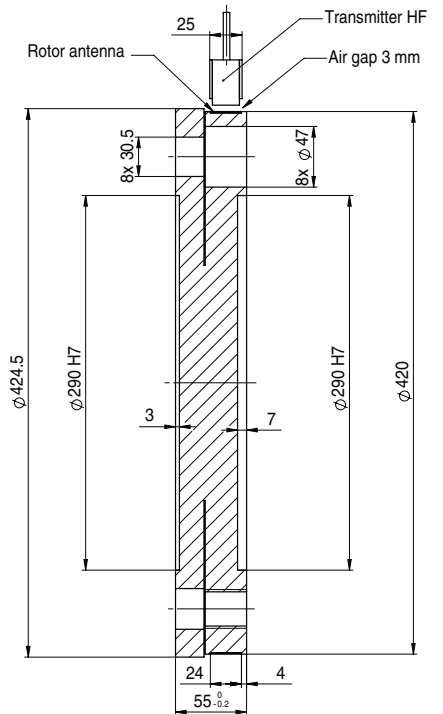
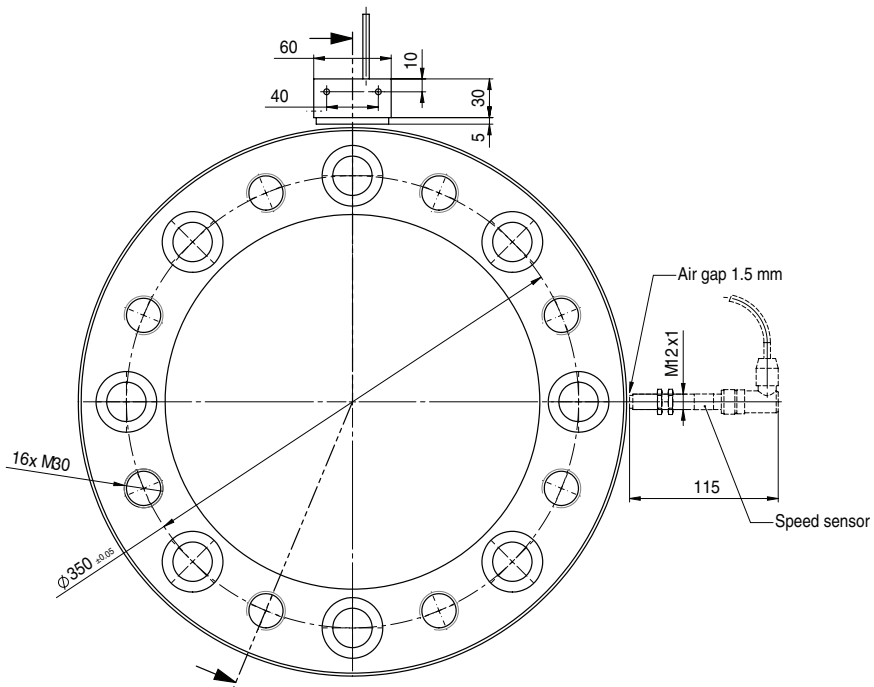
TF 216



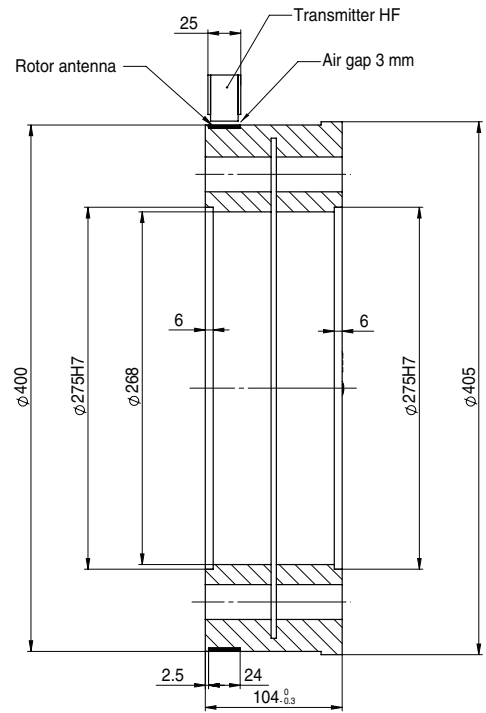
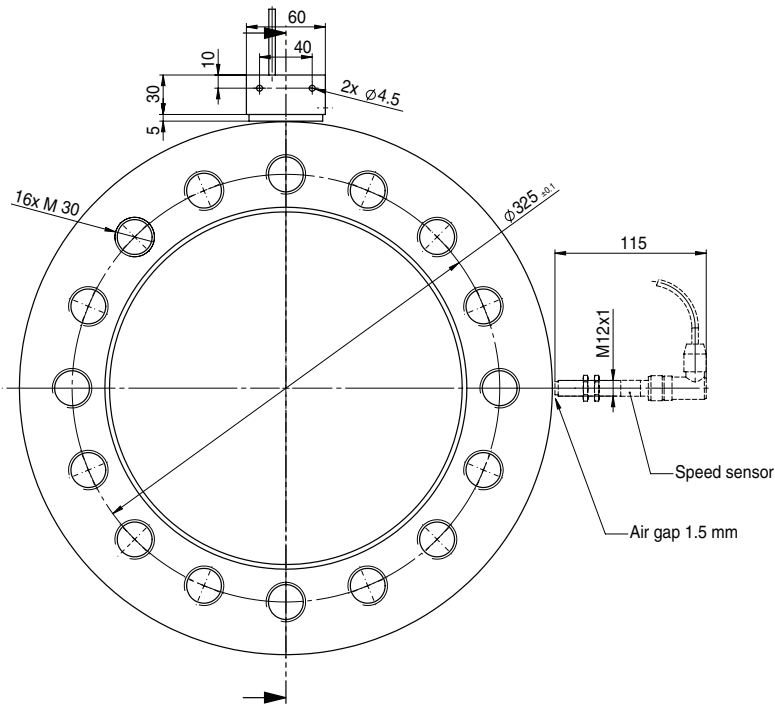
TF 217



TF 218 AND TF 219

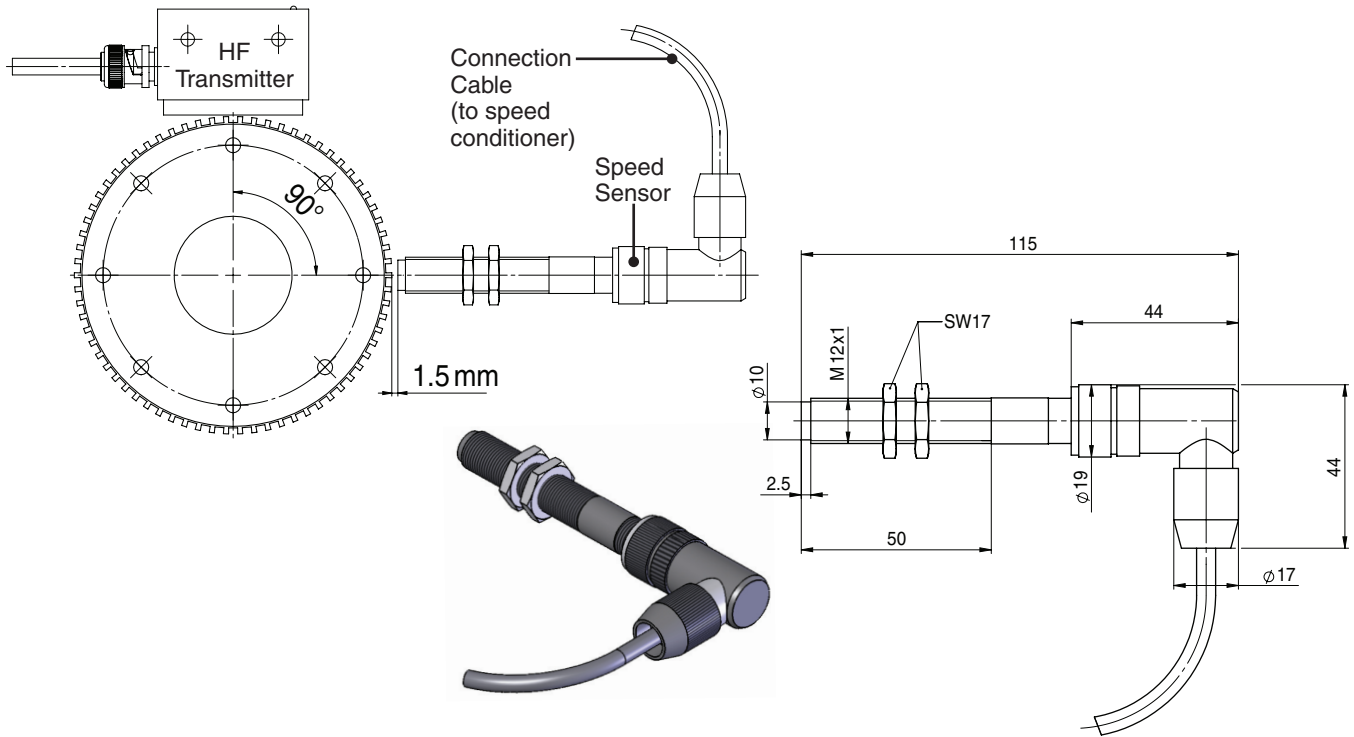


TF 220



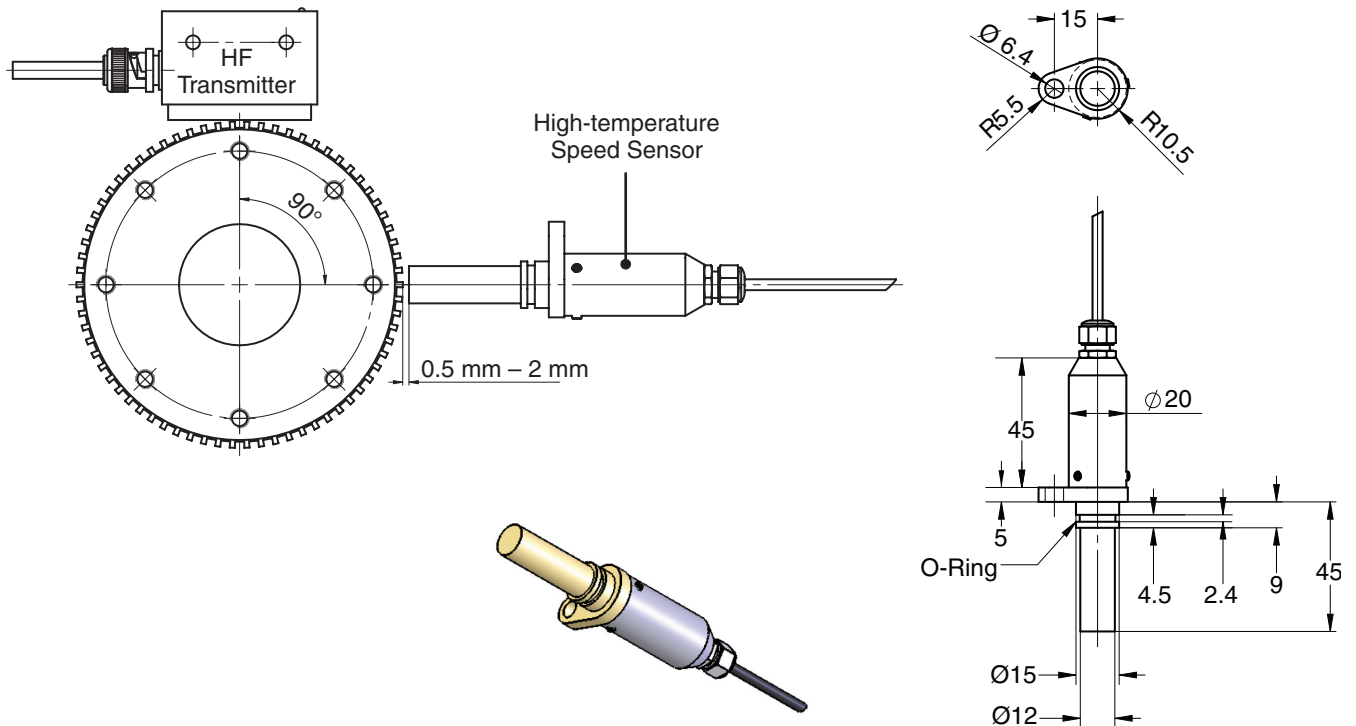
STANDARD SPEED SENSOR

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

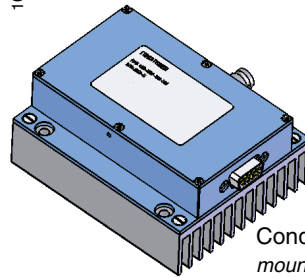
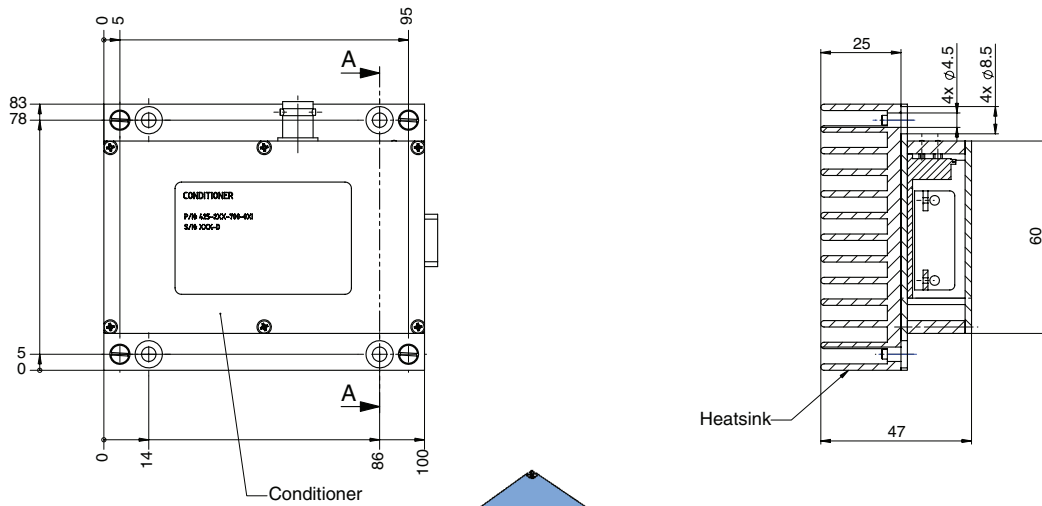


HIGH-TEMPERATURE SPEED SENSOR

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

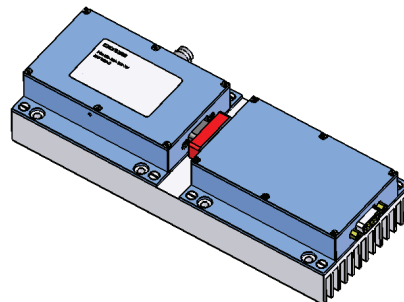
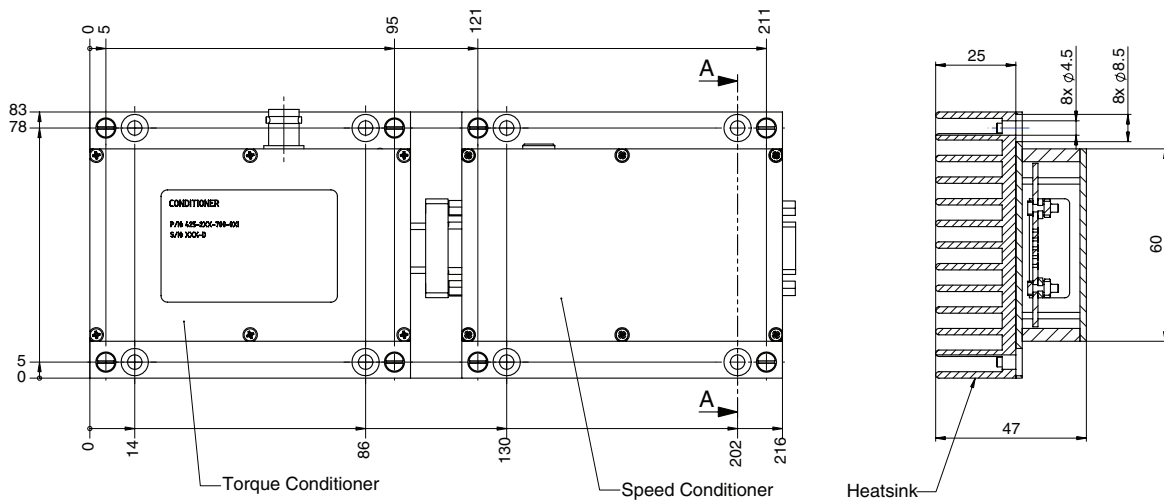


TF 210 TO TF 217 - STANDARD



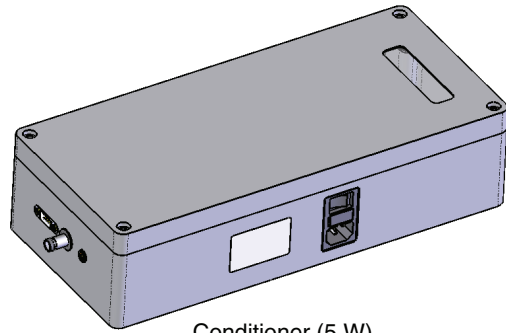
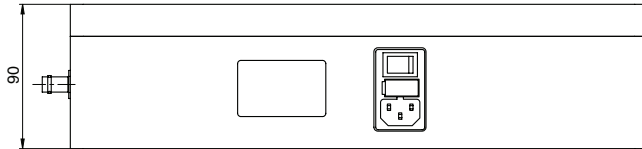
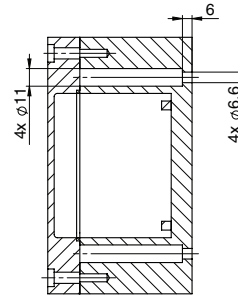
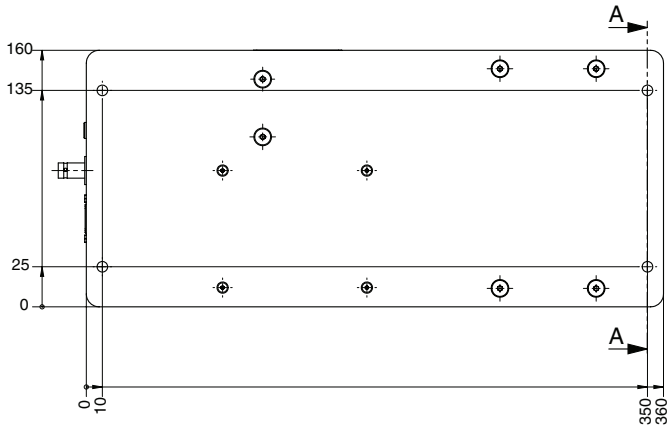
Conditioner - standard version (1.5 W)
mounted on heatsink for heat dissipation

TF 210 TO TF 217 - WITH SPEED OPTION



Conditioner - speed version (1.5 W)
mounted on heatsink for heat dissipation

TF 218, TF 219 AND TF 220



Conditioner (5 W)
mounted inside electronics module

OPTIONS AND ORDERING INFORMATION

MODEL NUMBER:	TF 2 <input type="checkbox"/> <input type="checkbox"/> / 0 <input type="checkbox"/> 1
MODEL TF 2 <input type="checkbox"/> 10 – 2 <input type="checkbox"/> 20	
SPEED MEASUREMENT	
• without (standard)	1
• with (option)	2

SYSTEM OPTIONS

Model 3410 Torque Transducer Display

Magtrol offers the new Model 3410 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
- RS-232 interface
- Torque and speed outputs
- Closed-box calibration
- Includes Magtrol Torque 1.0 Software

Torque 1.0 Software

Magtrol's Torque 1.0 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 1.0 Software include: peak torque capture, multi-axes graphing, measured parameter vs. time, adjustable sampling rates and polynomial curve fitting.

Connection Cables

MODEL NUMBER:	ER 1 <input type="checkbox"/> <input type="checkbox"/> - 0 <input type="checkbox"/>
CABLE END	
• 14-Pin Connector <i>(For use with 3410 Display or DSP6001 Controller)</i>	16
• Pigtail Wires	17
CABLE LENGTH	
• 5 m	1
• 10 m	2
• 20 m	3

Couplings

For the TF 210 – TF 219 Torque Flange Sensors, Magtrol offers double-element high-speed couplings to provide compensation for axial, angular and radial misalignments. Engaged by friction, they are torsionally-stiff and minimize reaction forces. BSD 9200 Series couplings are wear and maintenance-free and feature a compact design.

TF Torque Sensor	BSD Moduflex® 9200 Coupling
TF 210 to TF 211	BSD 9200-2.8-200
TF 212	BSD 9200-4.5-200
TF 213 and TF 214	BSD 9200-17-200
TF 215	BSD 9200-28-200
TF 216	BSD 9200-64-200
TF 217	BSD 9200-110-200
TF 218 and TF 219	BSD 9200-640-200

Due to the continual development of our products, we reserve the right to modify specifications without forewarning.



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