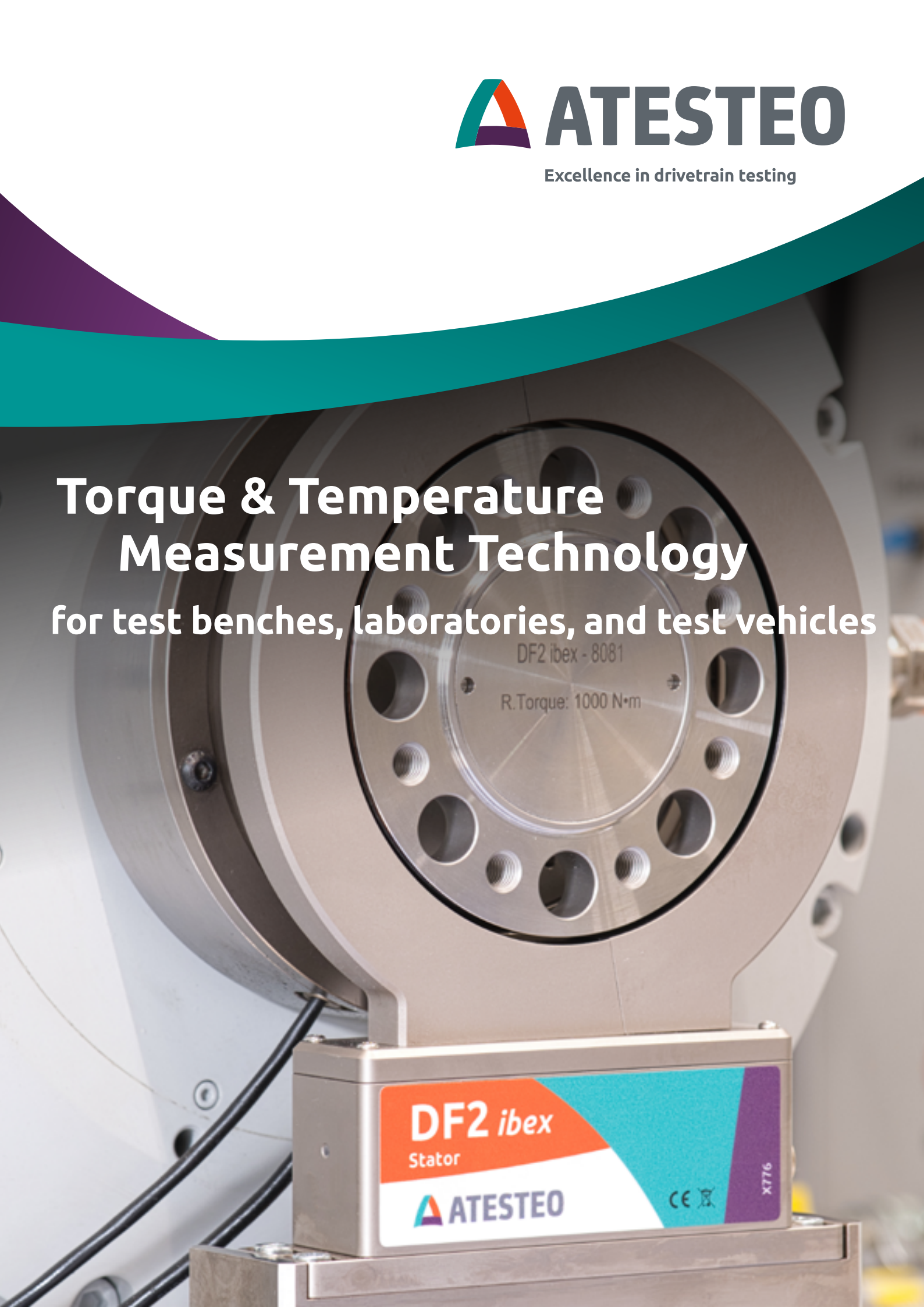
ATESTEO

Excellence in drivetrain testing

Torque & Temperature Measurement Technology

for test benches, laboratories, and test vehicles



Precise measurement data forms the basis of every drive system development. ATESTEO develops and manufactures the necessary measurement technology inhouse, from the mechanical components to the electronics. This results in systems for measuring torque and temperature that stand up to daily testing operations: highly accurate and durable. Whether on a test bench, in a laboratory, or in a test vehicle: At ATESTEO, you'll find the right solution for every measurement task—customized to your specifications upon request.

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ATESTEO Product Overview

As a leading, globally active test service provider, ATESTEO offers a product line of measurement technology for test benches, laboratories, and test vehicles. The product division's specialty—telemetric measurement of torque or temperatures on rotating parts—is complemented by products for measuring temperatures in highvoltage applications and measurement technology for non-rotating reference measurements. ATESTEO is the only manufacturer that uses the products it develops on over 200 of its own test benches worldwide.

Torque Measurement Systems

Most of ATESTEO's rotating torque measurement systems operate bearing-free and contact-free and are ideally suited for measuring torque on rotating parts. They are maintenance-free and provide highly accurate measurements.

For non-rotating test specimens, the measuring flanges can be configured as static torque sensors without telemetry. Due to their high accuracy, they are suitable as reference sensors for test systems.

Temperature Measurement Systems

ATESTEO's temperature measurement systems are designed for use with Type K thermocouples. Variants are available for measuring temperature on rotating parts, for combined torque and temperature measurement on rotating parts, and as temperature measurement systems for non-rotating parts that may be subject to high voltage.

Product Overview

Torque Meters

Key Facts

- 5 to 250,000 Nm rated torque
- Accuracy class up to 0.02% of rated torque
- Maximum speed up to 40,000 min^{-1}
- Integrated or optional speed detection system
- Various rotors available (standard, custom, with central bore, steel/titanium)
- Contactless data transmission and power supply for rotating flanges
- With temperature and speed compensation
- CAN interface already integrated in many products
- Generation of simulation values (test signals) for measurement chain calibration

Developed and manufactured in Germany. Calibrated in our in-house calibration laboratory. Optional in accordance with DIN 51309.

Where are torque measurement flanges used?

Torque measurement flanges were developed for applications that require high accuracy and long service life. These include, for example:

- Research and development test benches for:
  - All types of passenger car powertrains and transmissions
  - All types of truck powertrains and transmissions
  - Wind turbines
  - Railway railcars
  - Small components (such as pumps)
  - Brake test stands
  - Other industrial machinery (mining, agriculture, marine)
- Machine monitoring during operation
- Process monitoring in production, EOL testing

Efficiency measurements

Endurance testing

Functional tests

Standard tests

Rotational speed measurement systems

It is often necessary to measure rotational speed in close proximity to the torque measurement point. ATESTEO torque measurement flanges offer a variety of rotational speed measurement systems.

These can be an integral part of the system or purchased as an option and installed at the factory.

CAN interface already integrated.

What if no system fits?

ATESTEO offers custom systems upon request. Thanks to our high level of vertical integration, our development engineers can adapt the mechanical and electronic components to meet the customer's specific requirements. After the production phase, the measurement accuracy of the custom system is verified and documented in our in-house calibration laboratory.

Rotating torque transducers

Rotating torque transducers

Components

Rotating torque measurement flanges consist of three parts:

1. a rotor, which measures the torque via a sensor system,
2. a stator, which supplies power to the rotor and receives the measurement data contactlessly, and
3. an evaluation unit, called the TCU (Torque Control Unit), which processes the received data and forwards it to the customer's measurement system, as well as enabling user configuration.

The rotors are temperature-compensated during the manufacturing process and are balanced and speed-compensated after manufacturing. This ensures the highest accuracy and reliable operation. During operation, the evaluation unit monitors the system status. Errors in the power supply or data transmission are detected and reported.

In the world of torque measurement, the CAN bus and an RS422 frequency output have established themselves as highly accurate signal formats. In addition, ATESTEO sensors feature classic analog voltage outputs for monitoring.

Series designation	Nominal Torque Range	Accuracy Class[1]	Additional Features	Page
DF Series	100 to 10,000 Nm	0.02%	Rotors with DIN hole patterns	10
F Series	5 to 250,000 Nm	0.03%	Infrared data transmission	14
TxS/SxS Series	50 to 1,000 Nm	0.05%	Center bore with 50 mm Ø	16
HSTT Series	50 to 200 Nm	0.05%	Up to 40,000 rpm	17
RT11 Series	5 to 50 Nm	0.03%	Up to 32,000 rpm	17
QKS6 Series	4,000 to 10,000 Nm	0.1%	With up to 16 temperature measurement points	18
PTO Series	2,500 to 3,500 Nm	0.05%	For use in agricultural machinery	20
Measuring steering wheel	50 to 400 Nm	0.1%	For measuring steering torques in vehicles	21

[1]The table shows the best accuracy class of the series. For exact specifications, please refer to the data sheets.

DF Family

Our DF Family!

The DF product family consists of the DF ibex, DF dual, and DF plus series. The rotors in the DF family feature a standardized bolt pattern. The signals are digitized directly in the rotor. As a result, the cable running from the stator to the evaluation unit can be long enough to allow the evaluation unit to be installed in a control cabinet outside the test bench. The system features an overload channel capable of handling up to 300% of the rated torque, which allows for the subsequent analysis and correction of an unexpected, faulty test sequence.

DF ibex is the high-precision variant of the family. With an accuracy class of 0.02%, it is ideally suited for efficiency measurements, drag torque measurements, and other tests with increased accuracy requirements. The ring stator of the ibex series is separable, making installation easier.

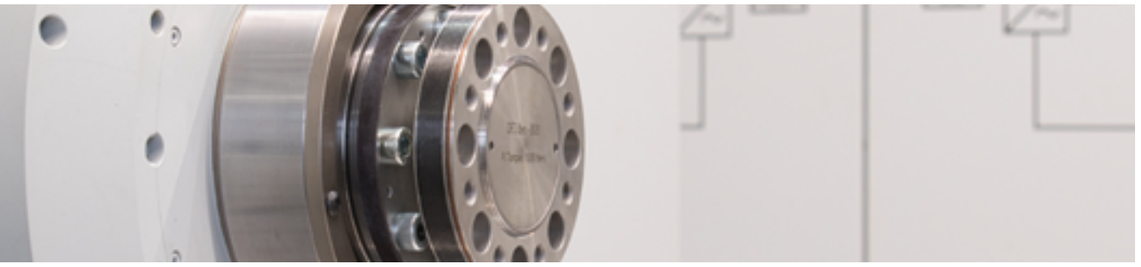
Rated torques:	500 to 10,000 Nm
Accuracy class:	0.02%
Max. speed:	Up to 25,000 rpm
Additional features:	Highest accuracy class

More on DF ibex

The **DF dual** is a torque measurement flange with two measurement ranges. With an accuracy of 0.04%, the DF dual is suitable for measurements where changing the measurement technology is not possible, yet small torques still need to be measured accurately. Externally, it is identical in design to the ibex and also features the split ring stator.

More about the DF dual

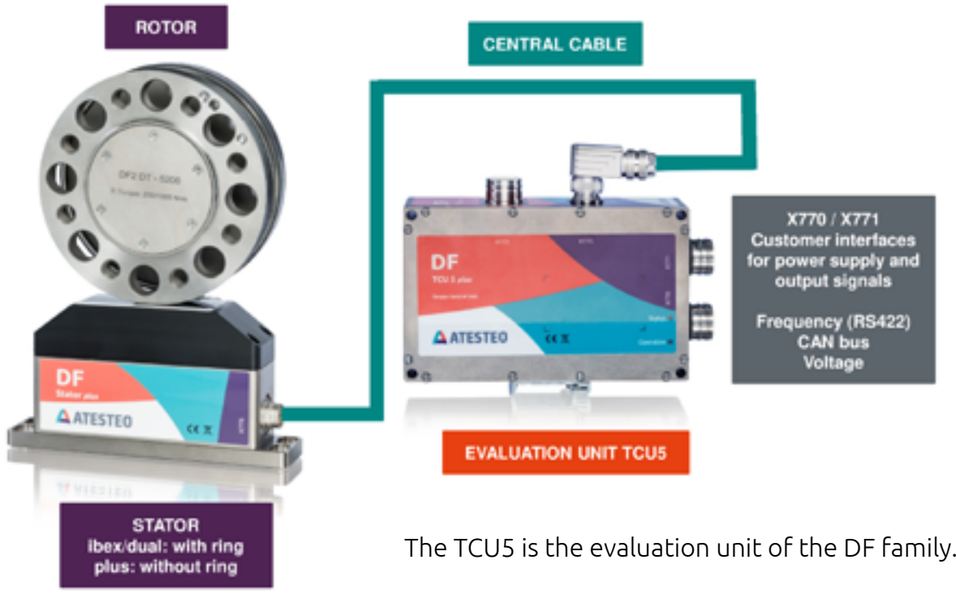
Rated torques:	250 to 10,000 Nm
Accuracy class:	0.04%
Max. speed:	Up to 25,000 rpm.
Additional features:	Second measurement range



Use of a DF2 ibex on a high-speed electric motor.

The **DF plus Series** was the first member of the DF family. With this series, ATESTEO introduced rotors with DIN bolt circles for the first time. The ringless stator is particularly space-saving. A single stator can be used for all rotor sizes.

Rated torques:	100 to 10,000 Nm
Accuracy class:	0.04%
Max. speed:	Up to 25,000 rpm
Additional features:	Ringless stator

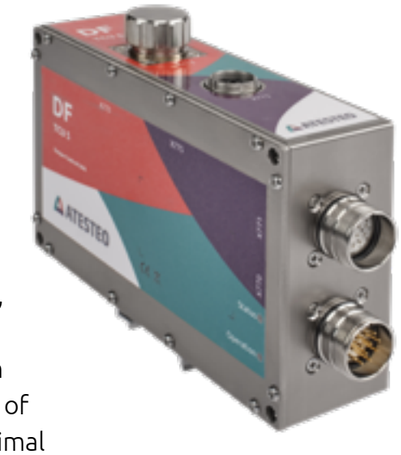


The TCU5 is the evaluation unit of the DF family.

TCU5

The TCU5 evaluation unit from the DF family has the following integrated data interfaces:

- Frequency outputs (RS422) for torque and optional speed measurement CAN bus (2B)
- Analog voltage
- Digital interfaces for status or triggers



The system can be easily and intuitively configured, maintained, and operated via the integrated web interface. Debug signals on the CAN bus assist with fault diagnosis and ensure safe and precise control of the test stand. Various filtering options ensure optimal signal processing.

Screenshot of the TCU5 web interface

F Series

The F Series covers an extremely wide range of rated torques. With nine different rotor sizes, torques of up to 250,000 Nm can be achieved. The series is cost-effective and extremely durable (often lasting 20 years or more).

It uses infrared signals for data transmission and is therefore completely immune to electromagnetic interference. The infrared light emitted by the rotor is detected by receiver diodes on the stator and transmitted to the evaluation unit.

System Variants

The F Series is available in two variants.
eS: Remote evaluation unit (TCU2), which is connected to the stator ring via 1.5 m long cables. Due to the distance between the stator and the evaluation unit, the operating temperature of the rotor-stator combination is up to 85 °C. Another advantage of the eS variant is the reduced installation space required around the rotor.

iS: The electronics of the evaluation unit are permanently integrated into a housing beneath the stator ring. The stator and evaluation unit form a single unit. In addition to ring mounting on a lathe, this variant can be installed using a base mount. The maximum operating temperature is 70°C.

eS

Rotor, ring stator & external evaluation unit (TCU)
Rotor, Ringstator & abgesetzte Auswerteeinheit (TCU)

iS

Rotor & stator with integrated evaluation unit (TCU)
Rotor & Stator mit integrierter Auswerteeinheit (TCU)

More Info!

Series designation	Rated torque range	Accuracy Class [2]	Max. speed [3]	Speed measurement system
F0xS	50 to 200	0.03%	25,000 rpm	inductive / optical
F0xS-HS	500 to 1,000	0.03%	30,000 rpm	inductive / optical
F0xS-SV	200 to 500	0.05%	30,000 rpm	optical
F1xS	200 to 3,000	0.03%	25,000 rpm	inductive / magnetic
F2xS	2,500 to 20,000	0.03%	17,000 rpm	inductive / magnetic
F23xS	20,000 to 30,000	0.05%	13,000 rpm	inductive
F3xS	30,000 to 50,000	0.1%	10,000 rpm	inductive / optical
F34xS	60,000 to 80,000	0.1%	10,000 rpm	inductive
F4xS	60,000 to 120,000	0.1%	8,000 rpm	inductive
F5xS	110,000 to 150,000	0.1%	7,000 rpm	inductive
F6xS	up to 250,000	0.2%	5,000 rpm	inductive

[2]The table shows the best accuracy class for the products. It depends on the rated torque and, if applicable, on optional features that incur additional costs. Refer to the data sheets for exact specifications.

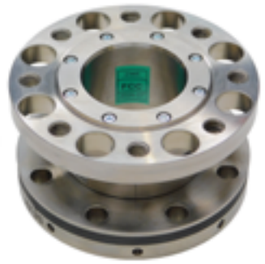
[3]The table shows the best maximum speeds. These depend on the system and, if applicable, on optional features subject to additional charges. Please refer to the data sheets for exact specifications.

Additional Torque Meters

Additional torque measurement systems are based on the electronics and design of the F Series. They therefore use infrared data transmission and the eS or iS designs.

The **TxS and SxS Z50 series** feature rotors with a central bore of 50 mm in diameter. Cables or hoses can be routed through the central bore. Ideal for use in coaxial gearbox test stands or any systems with a secondary shaft or oil/hydraulic lines. Rotors up to 500 Nm are made of titanium, making them lightweight with low inertia.

Rated torques:	50 to 1,000 Nm
Accuracy class:	0.05%
Max. speed:	Up to 25,000 rpm
Additional features:	50 mm center bore



Mehr Info!

With the **HSTT series,** ATESTEO offers high-speed measurement flanges up to 200 Nm. The rotors are made of titanium. They are manufactured as the eS variant.

Rated torques:	50 to 200 Nm
Accuracy class:	0.05%
Max. speed:	Up to 40,000 rpm
Additional features:	Titanium rotors, low rotor weights

The **RT11 series** was developed for drag torque measurements. The rotor is very lightweight and compact. It can optionally be equipped with a shaft stub for connecting a coupling or a clamping sleeve.

Rated torques:	5 to 50 Nm
Accuracy class:	0.03%
Max. speed:	Up to 32,000 rpm
Additional features:	Titanium rotors, low rotor weights

QKS Series

The QKS Series combines torque and temperature measurement technology in a single rotor. The system was developed specifically for brake test stands and features increased resistance to lateral forces. The lateral forces generated during braking have only a minimal effect on the torque signal. In addition to the proven torque measurement technology, the rotor incorporates temperature measurement technology capable of connecting up to 16 Type K thermocouples. This allows temperatures to be measured on rotating parts. The thermocouples are installed by the customer and connected to the QKS6 rotor using standard thermocouple connectors. The temperature measurement points are cold-junction compensated. Cable break detection is included.

Torque	
Rated torques:	4,000 to 10,000 Nm
Accuracy class:	0.1%
Max. speed:	3,000 rpm
Additional features:	Measuring element insensitive to shear forces

Temperature	
Thermocouples:	Type K, -100 to 1,200 °C, up to 16 channels
Accuracy of the electronics:	±1 K
Conversion rate per channel:	25 Hz

QKS Series

Optionally, the system can be configured as a dual-range measuring flange for measuring residual grinding torques.

The system is configured via the intuitive, integrated web interface. Test signals for the measured variables “torque” and “temperature” can be generated in the rotor to verify the measurement chain.

Discover our new QKS6 series

Vehicle Torque Sensors

Vehicle Torque Sensors

The **PTO series** is used in agricultural machinery to measure torque at the power take-off (PTO). This allows the torque generated at the PTO during harvesting to be measured while the machine is in operation. Thanks to its housing and a bearing arrangement between the rotor and stator, the system is ideally suited for outdoor use. The compact design allows for installation between the PTO shaft and the attached implement, such as a mower, mulcher, or pump.

Rated torques:	2,500 to 3,500 Nm
Accuracy class:	0.05%
Max. speed:	2,000 rpm
Additional features:	For connection to the power take-off of an agricultural machine, 75 mm axial length

The **steering wheel torque transducer** can be used to measure steering torques in passenger cars and trucks. The torque transducer body is clamped onto the original steering wheel using a clamping system. The mounting kit allows it to be clamped onto steering wheels with different diameters and offsets. A motorsport steering wheel is screwed onto the top of the transducer body for operation purposes.

The internal rotation angle sensor can measure up to 4.2 revolutions. If necessary, the customer must install a support for the mounted housing on the vehicle.

Rated torques:	50 to 400 Nm
Accuracy class:	0.1%
Max. speed:	7,680 pulses per revolution, 0.05° resolution
Additional features:	For measuring steering torques in vehicles

Static Torque Flanges

Static torque measurement flanges do not have telemetry; instead, they feature an integrated connector for connecting the data and power cables. The design is comparatively compact since it does not include a stator. The output signal is in mV/V and must be connected to a bridge amplifier. ATESTEO offers the SAFO 2.3D for this purpose, which converts the torque signal to a frequency (RS422), CAN signals, or voltage. The measuring bodies feature the hole patterns of the F or DF series.

Non-rotating solutions from the DF series (DF RTS)

More about static torque measurement flanges of the F Series (F RTS)

Static Torque Flanges

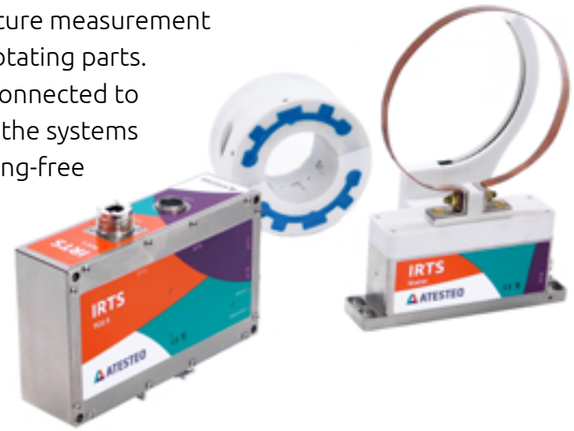
The stationary torque sensors are ideal for use as test equipment (reference sensors) or in torsion test stands.

Rated torques:	200 to 150,000 Nm
Accuracy class:	0.03%
Additional features:	Optional with center bore

SAFO 2.3D Strain Gauge

IRTS System

The IRTS system is a telemetric temperature measurement system for recording temperatures on rotating parts. Up to 16 Type K thermocouples can be connected to the rotor. As with torque measurement, the systems are designed to be contactless and bearing-free within a rotor-stator combination.
The measurement signals are provided by the evaluation unit as CAN signals.
The temperature measurement points are cold-junction compensated.
Cable break detection is included.



The system can be manufactured in various designs:

- As a half-shell variant for easy clamp mounting on rotating shafts,
- For installation in a test bench with a specially designed rotor, optionally in combination with a torque measurement flange, or
- As a custom solution for direct integration into the test specimen.

The system is configured via the intuitive, integrated web interface. Test signals for the “temperature” measurement parameter can be generated to verify the measurement chain within the rotor.

IRTS is suitable for use with all rotating parts whose temperatures need to be monitored or studied. These include electric motors for vehicles, electric machines for industrial plants, generators, or transformers. Whether the focus is on researching durability or efficiency, or verifying compliance with standards.

Thermocouples:	Type K, -100 to 1,200 °C, up to 16 channels
Accuracy of the temperature electronics:	±1 K
Conversion rate per channel:	25 Hz
Mechanical specifications:	Half-shells, rotor discs, or custom designs

Learn more about the IRTS system and request information

CapSync HVT

CapSync HVT

CapSync HVT is a modular temperature measurement system that enables safe measurement in high-voltage environments. Whether on a test bench or in a test lab—the temperature of electric motors and high-voltage components such as batteries, fuel cells, or power supply circuits can be measured with complete personnel safety in all environments.

The modular temperature measurement system has two slots on the input side, each of which can accommodate four thermocouples. Internal galvanic isolation ensures that voltages cannot reach the output side or the power supply side. CapSync HVT can be easily and cost-effectively deployed on a test bench. Multiple modules of the high-voltage temperature measurement system can be mounted in series, automatically connecting the CAN bus and the power supply.

Thermocouples:	Type K, -200 to 1,200 °C, up to 8 channels
Accuracy of the temperature electronics:	±1 K
Conversion rate per channel:	50 Hz
Insulation:	1,000 Vrms and 1,500 Vpeak
Standards:	IEC 61326-1, DIN EN 61010-1, DIN EN 61010-2-030

ATESTEO

Excellence in drivetrain testing

Discover precision measurement technology at the highest level—tailored to your testing requirements. Boost the efficiency and accuracy of your test benches with innovative solutions from ATESTEO.

Benefit from our many years of expertise and globally proven technology.
Contact us now and take your measurement technology to the next level!

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