

RTS Specification

Model	RTS-E500	RTS-E1K	RTS-E2K
Torque, rated capacity (RC) [Nm]	500	1000	2000
Safe overload [% RC]		200	
Ultimate overload [% RC]		300	
Maximum revolutions [RPM]		9000	
Overall accuracy [%]		0.03	
Non-linearity [%]		0.02	
Hysteresis [%]		0.02	
Operation temperature range [°C]		-20~+85	
Store temperature range [°C]		-40~+100	
Resistance to vibration [G]		50	
Resistance thrust capacity [kN]	20	30	30
Resistance radial capacity [kN]	20	30	30
Encoder angle resolution [°]		1	
RTS processing			
Screen	5.7 inch TFT-LCD (Thin Film Transistor - Liquid Crystal Display)		
Display contents	Three-component digital display, torque, radial force, thrust force, angular velocity, angle and unit power Torque trend graph (the horizontal axis shows time or rotating angle)		
Processing cycle	200 μ s		
Data Interface	Analog voltage (0 \pm 10V/FS) Digital data output CAN, Ethernet, RS485 File output (data can be displayed) Binary and text		

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Attention to Safety!

● For proper use, read the instruction manuals carefully before use.



AND ...Clearly a Better Value
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● Appearance and/or specifications subject to change for improvement without notice.
● Contents of this catalog last updated October 2005.

*MBS RTS-ADCC-01-BP4-05a03

MBS

[Model Based Sensor]

RTS

(Distributed-Force Measurement Principle)
(Rotating Torque Sensor for Powertrain Testing)

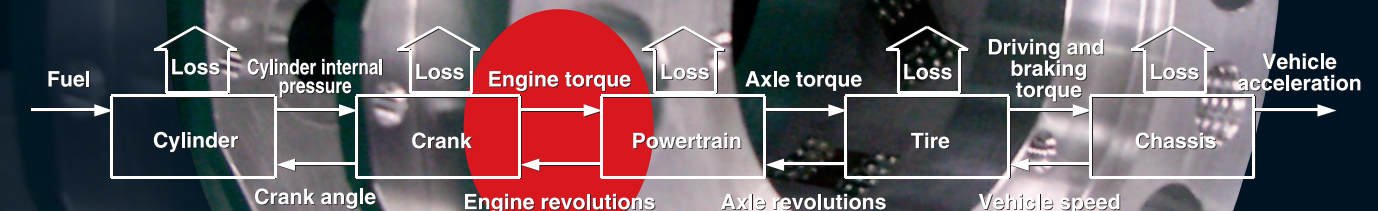
The RTS is a three-component rotating torque meter using wireless technology to measure torque, thrust and radial force.

Enables direct coupling to crankshaft
Synchronization of torque measurement with rotation angle
Simultaneous measurement of thrust and radial force

0.03%

1/10th of resolution and 10 times faster torque measurement than conventional methods

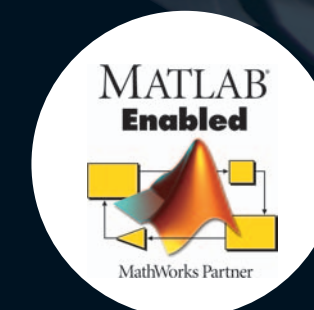
Energy Flow Model based on Torque Demand Concept.



RTS Product Scope

Torque Rating 500N·m
1kN·m
2kN·m
Overall Accuracy 0.03%
Maximum Rotational Speed 9000RPM

Torque Demand Concept
Advanced Performance



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Patent pending

The RTS is an advanced rotating shaft torque meter with wireless communication of digital data, utilizing A&D's advanced weighing techniques in a rotating system. These techniques compensate for radial and thrust forces, giving considerably more accurate torque measurement than has been possible before. Model-Based Real-Time Simulation results in an accuracy 10 times better than would otherwise be possible.

High Accuracy 0.03%

Distributed Force Measurement Technology

A balance is required to accurately indicate the weight of an object, regardless of its position on the weighing pan. Using a single load cell results in forces acting on the strain gauge that distort the force measurement. To eliminate this distortion, A&D uses four to eight advanced load cells, which distribute the forces, and allow an accurate, real-time calculation of the actual weight of the object.

Modeling Technology

Specially developed calibration equipment and procedures result in an accurate model of the torque meter and allow real-time calculation of true torque.

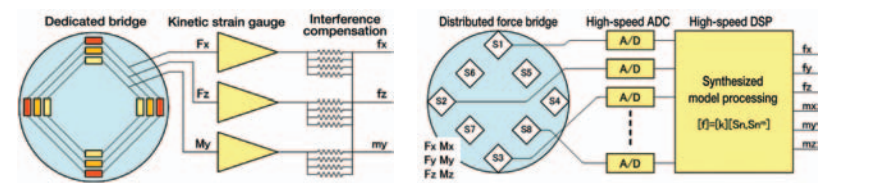
A&D has developed an advanced calibration system for the RTS, where forces can be applied to each axis individually, allowing a true picture of the force measurement to be recorded. Precision weights ($\pm 0.002\%$) are used to apply these forces in a controlled environment. The measurements taken are then used to build a model of the torque meter, which is run in real time to compensate for all non-torque forces being applied.

Comparison of conventional techniques with advanced MBS techniques

Conventional	MBS
<ul style="list-style-type: none"> >A dedicated bridge is required for each component force >Analog compensation and communications —1st order compensation only 	<ul style="list-style-type: none"> >Distributed force detection by multiple bridges >On-board high-speed A/D conversion >Digital communications and digital signal processing >Real-time sensor model on high-speed DSP



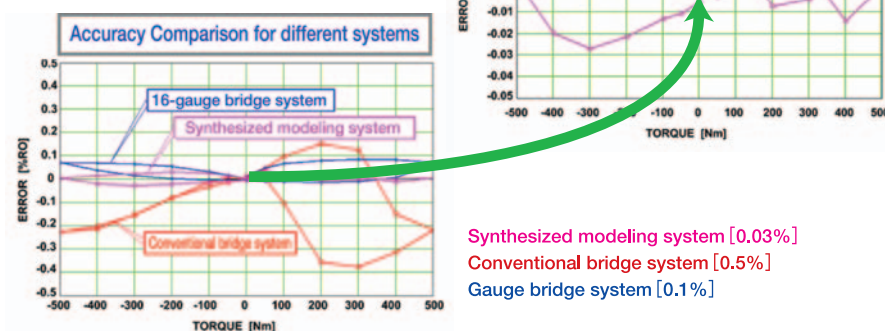
1kNm standard calibration equipment



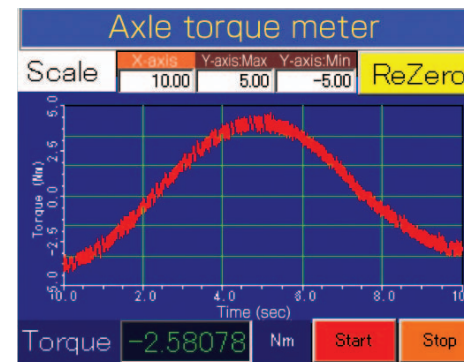
Accuracy Comparison

●Axle torque meter/RTS axle torque meter accuracy

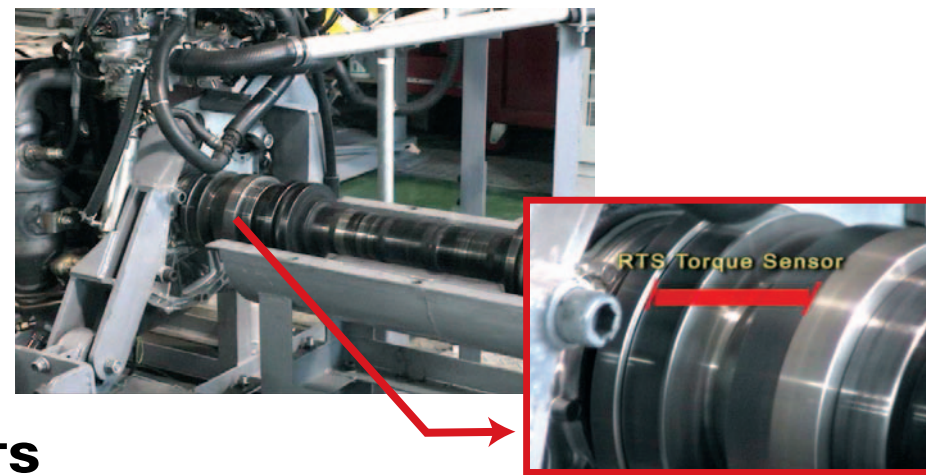
Measurement error 0.03%
10 times better resolution



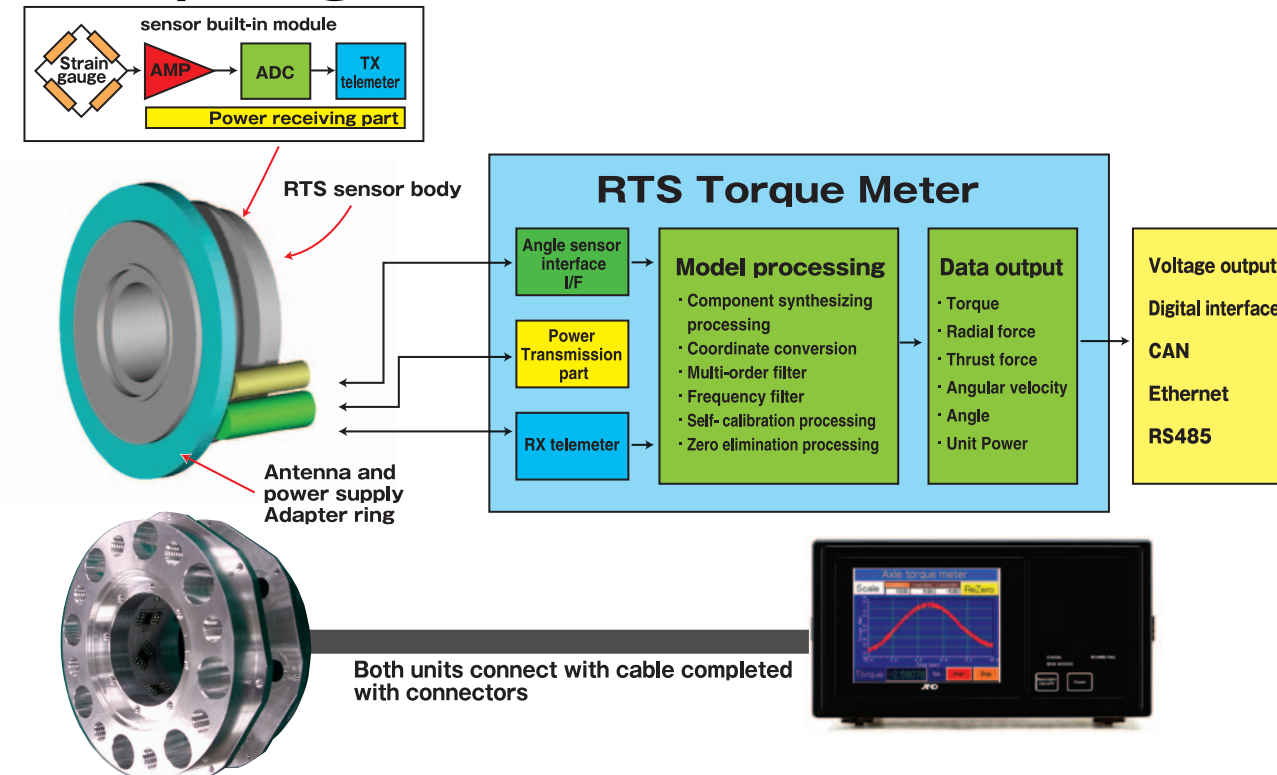
Synthesized modeling system [0.03%]
Conventional bridge system [0.5%]
Gauge bridge system [0.1%]



Direct mounting to the engine crankshaft is possible



RTS Concept Diagram



20 MBPS Telemetry System

The signals from the distributed load cells within the sensor are converted directly to digital information within the sensor using 16-bit A/D converters running at 100kHz. This digital data stream is sent via the telemetry system to the rest of the system at 20 MBPS.

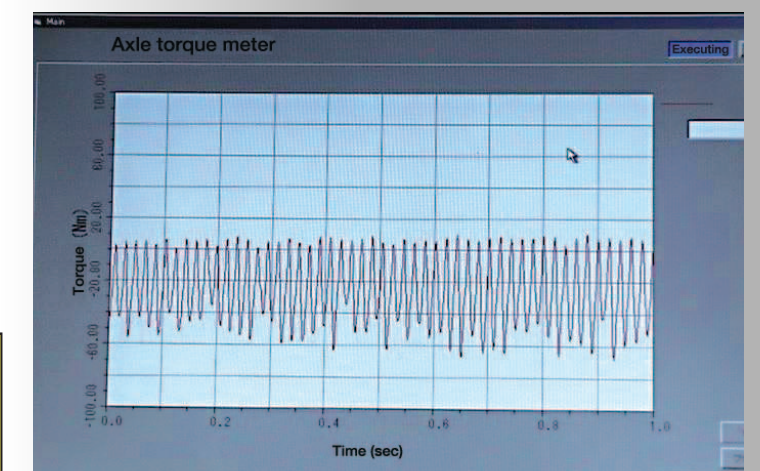
Synchronized Rotation Angle Measurement

An optional optical encoder can be fitted to the sensor, providing both speed and angle measurement. The encoder provides 180 pulses per revolution (ppr), which can be interpolated up to a maximum of 3600 ppr by the DSP. The measurement of sensor forces and angle enables the calculation of torque, thrust force, radial force, angular velocity, angle and power. These calculations are available as outputs from the system.

Next Generation Control Panel and Advanced Data Linkage

Simultaneous Digital (CAN, Ethernet) and Analog (Voltage) Data Transmission

An advanced touch-sensitive LCD panel can be used to modify configurations and view signals. All calculated values can be transmitted via CAN or Ethernet connections to remote instruments, or as analog voltages using high-speed, high-accuracy D/A converters to instruments with no digital capability (chart recorders, oscilloscopes, etc). In addition, the DSP can perform on-board data storage on any calculated value.



Torque Variation Waveform (4-Cylinder Engine)

The picture above shows a torque signal from an engine running at 1500 RPM. Torque pulses are clearly visible for each cylinder, as are the variations due to normal combustion instability.