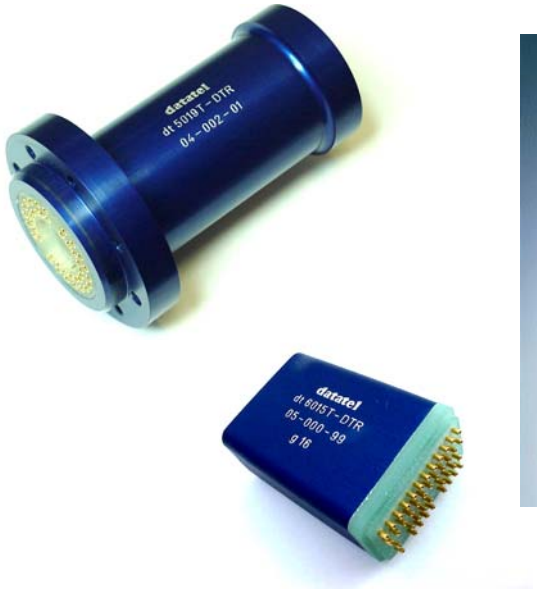
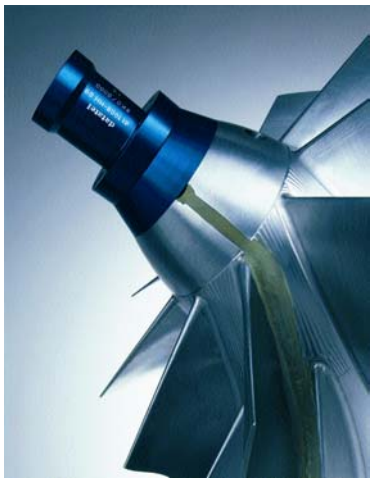
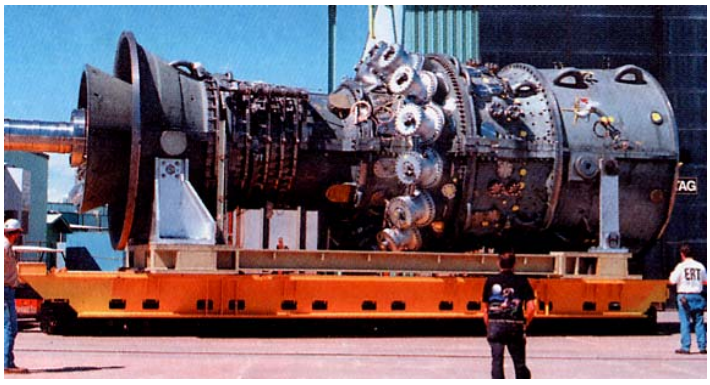
Advanced Digital Multi-Channel Telemetry System for Next Generation Turbomachinery Testing

High performance, modular digital telemetry solution with 900+ channel capability for simultaneous transmission of static & dynamic strain gage, thermocouple and pressure transducer signals from turbomachinery rotors







Applications

- Aero and Industrial Turbomachinery Testing
- Compressor and Turbine Test Rigs
- Heavy-Duty Turbocharger and CF Compressor Testing
- Wireless Telemetry Slipring Assemblies

Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de

Key Features at a Glance

General

- Very high channel capability (up to 600 dyn. S/G plus 300 T/C)
- Very high signal bandwidth (up to 96kHz (-3dB) per channel)
- Combined telemetry modules for dyn. S/G and T/C input
- Modular design based on self-sufficient transmitter and reciever structure (no need for interconnection with other overhead modules)
- Highest level of flexibility due to modular design
- Remotely programmable (eg. measuring range, dyn. shunt calibration, sensor excitation, RF carrier frequency etc.)
- Intelligent monitoring functions (eg. transmitter power supply and transmitter temperature monitoring)
- High accuracy and signal quality
- High g-load capability (up to 100.000g, depending on application)
- Small module shape, high package density

Signal Conditioning & Sensor Interface

- Rotor instrumentation diagnostics features (sensor and telemetry)
- Sensor open and short detection for automatic sensor condition monitoring
- Remotely programmable S/G constant current excitation (2 selectable excitation currents and sensor excitation on/off function)
- Internal and external cold junction compenstation option for high accuracy T/C measurement
- Automatic offset drift compensation for T/C channels
- Integrated sensor connector interface, easy hookup

Data Interface & User Interface

- Analog receiver outputs for measured data
- Optional digital data interface (Ethernet)
- Remote control and feedback channel integrated into the system to avoid command corruption
- Convenient system configuration and programming via graphical user interface (HTML application on standard web browsers)

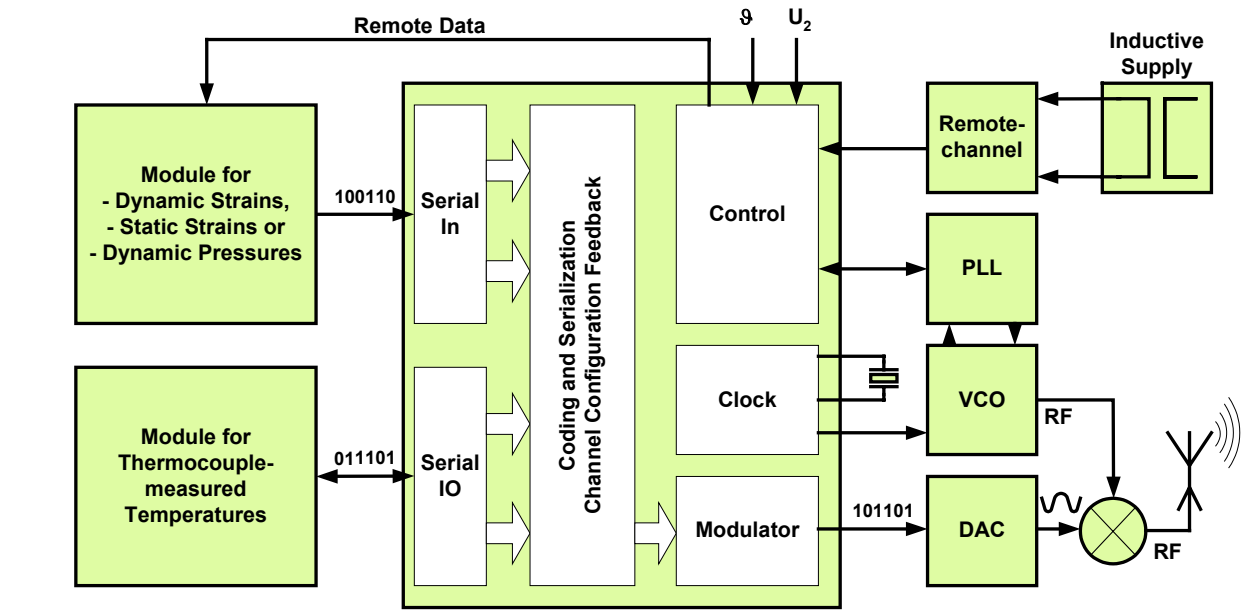
Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

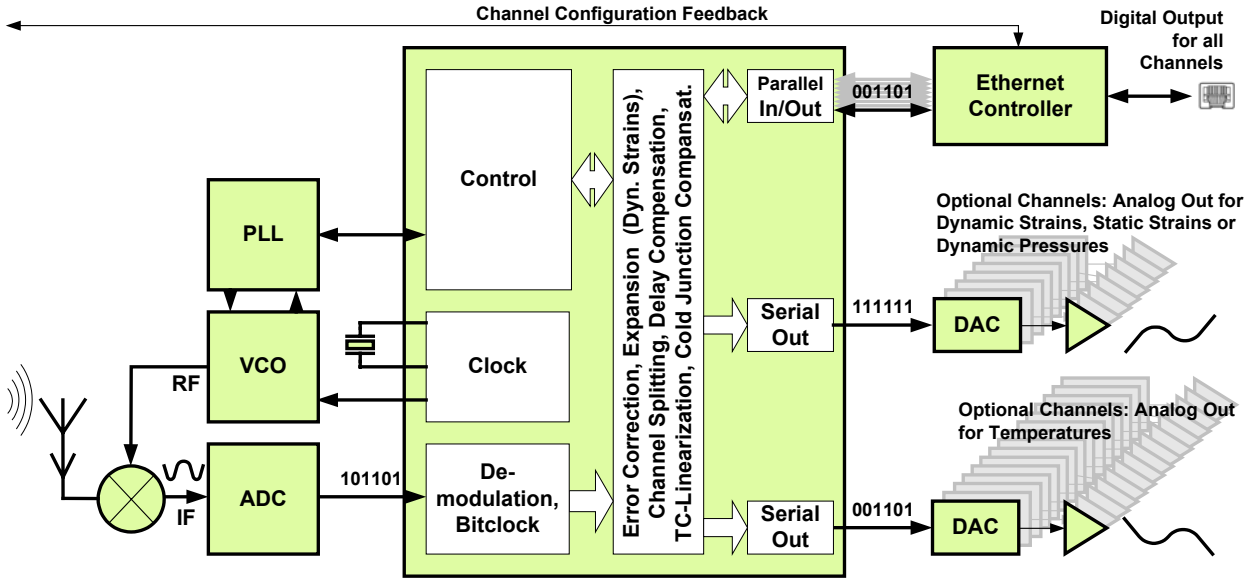
info@datatel-telemetry.de
www.datatel-telemetry.de

Block Scheme

Digital Telemetry Transmitter Module



Digital Telemetry Receiver Unit

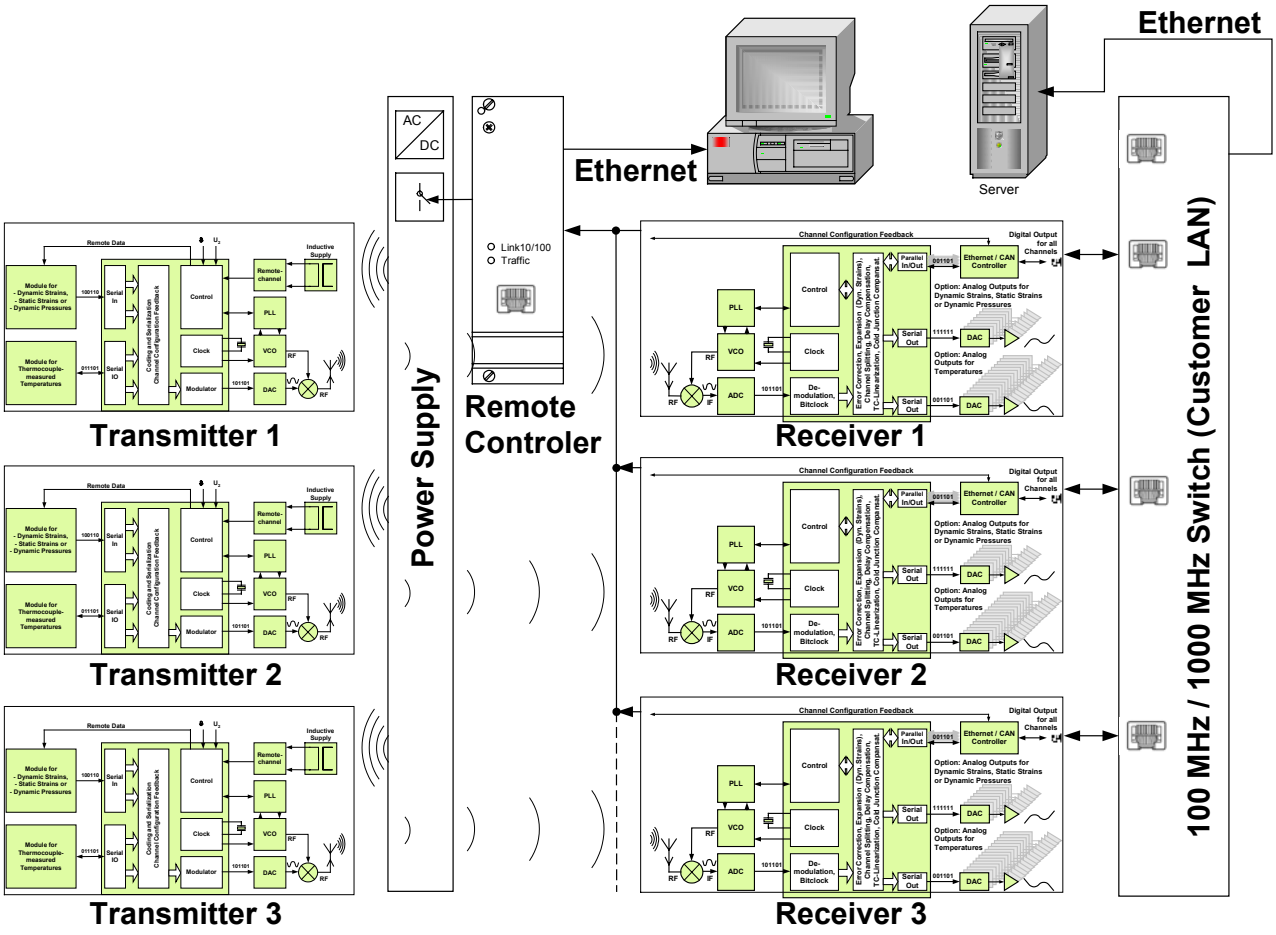


Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de

Block Scheme Digital Telemetry System Setup (Example)



Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de

Overview System Configuration & Channel Capability

Table 1: Dyn. S/G Channels per Module & Analog Signal Bandwidth per Channel		
No. of Dyn. S/G	**Analog Signal Bandwidth with Data Compression (Resolution max. 11 bit)**	**Analog Signal Bandwidth without Data Compression, (Resolution 14 bit)**
4	96 kHz	48 kHz
8	48 kHz	N.A.
10	38 kHz	19 kHz
20	19 kHz	9 kHz
40	9 kHz	N.A.

Table 2: Max. Channel Capability per Telemetry Setup					
Module Type	**Modules Total**	**S/G+T/C+RTD per Module**	**S/G Total**	**T/C Total**	**Application Remarks**
dt5019T-DTR (Uniband)	1	8+10+1	8 (48kHz)	10	Uniband system, limited no. of sensors, for small test rig installations, turbocharger testing etc.
dt6015T-DTR	30	4+10+1	120 (96kHz)	300	Aero and industrial turbomachinery testing, limited space availability Module size 16,5x28x38mm
dt6019T-DTR	30	8+10+1	240 (48kHz)	300	Aero and industrial turbo-machinery testing, high no. of channels required Module size 21x34x38mm
dt6021T-DTR	30	10+10+1	300 (38kHz)	300	Industrial turbomachinery testing, high no. of channels required Module size 21x34x38mm
dt6031T-DTR	30	20+10+1	600 (19kHz)	300	Heavy-Duty industrial turbomachinery testing, very high no. of channels required

Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de

Technical Specification

Dynamic Strain Gage	
Signal Bandwidth per Channel	10Hz..96kHz (-3dB) max. (options see Table 1)
Programmable Sensor Excitation	Constant current, 0/4/8mA selectable
Loop Resistance	1000 Ohm max.
Programmable Gain	8 input ranges selectable (4mVp-p..60mVp-p)
Resolution	11 or 14 bit
Accuracy	< ±1% f.s.
S/G Open & Short Detection	Yes
Dyn. Shunt Calibration	Yes (to S/G)
Telemetry Receiver Analog Output	20Vp-p (1Vp-p..20Vp-p on request)
Static Strain Gage / Static Pressure (Preliminary)	
Signal Bandwidth per Channel	DC..19kHz (-3dB) max.
Sensor Excitation	Constant voltage, 3V DC
Programmable Gain	8 input ranges selectable
Resolution	14 bit
Accuracy	< ±0.2% f.s.
Dyn. Shunt Calibration	Yes (to S/G)
Telemetry Receiver Analog Output	±10V (±1V..±10V on request)
Dynamic Pressure (Preliminary)	
Signal Bandwidth per Channel	10Hz..96kHz (-3dB) max.
Sensor Excitation	Constant voltage, 3V DC
Programmable Gain	8 input ranges selectable
Resolution	11 or 14 bit
Accuracy	< ±1% f.s.
Dyn. Shunt Calibration	Yes (to pressure transducer)
Telemetry Receiver Analog Output	20Vp-p (1Vp-p..20Vp-p on request)
Thermocouple Extension	
Number of Channels per Module	10ch. T/C type K (others, on request)
Additional Reference Channels	2x RTD (internal and external cold junction compensation) 1x Zero Reference (auto offset drift compensation)
Signal Bandwidth per Channel	DC..20Hz (-3dB)
Programmable Gain	8 input ranges selectable (150°C..1300°C)
Resolution	16 bit
Accuracy	< ±0.1% f.s.
T/C Open Detection	Yes
Linearisation	Yes
Telemetry Receiver Analog Output	0..+10V (0..+1V to 0..+10V on request)

Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de

Rotor Instrumentation Diagnostic Features

The Background

- S/G instrumentation for blade vibration measurement (especially turbine blades) has a limited life time
- Vibration modes get more and more complex due to blisk technology and new airfoil shapes etc.
- Desirable to check in-situ the condition of S/G and the associated wiring
- Determination of whether a real blade vibration signal is being measured, or noise induced into the lead wires, is important for data analysis
- Online check-out of the telemetry system itself is an important tool to acquire reliable data

The Solution

- datatel has integrated a variety of remotely controlled diagnostic functions into the next generation telemetry systems to meet these demands:

  - Automatic sensor condition monitoring (Sensor open/short detection)
  - Excitation current off (0mA) & switchable current ranges (4mA/8mA)
  - Dynamic shunt calibration to S/G resistor

- The excitation current off feature eliminates the signal produced by the S/G itself and noise in the wiring can be determined
- In the case of a failed S/G, producing strong noise which may interfere with a correctly functioning S/G, the cross talk can be eliminated by switching off the excitation of the disturbing source
- With the shunt cal. parallel to S/G the gage resistance plus wiring can be determined at any time.
- The automatic sensor condition monitoring feature helps to detect open or shorted S/G or open T/C instrumentation

Telemetrie Elektronik GmbH
Berliner Allee 42
D-30855 Langenhagen

✆ +49 (0) 511/97 83 96-0
🖷 +49 (0) 511/97 83 96-16

info@datatel-telemetry.de
www.datatel-telemetry.de