Scanivalve

DTS4050
Digital Temperature Scanner

DTS4050/16Tx, DTS4050/32Tx

Overview

The DTS4050 Digital Thermocouple Scanner is a high-performance temperature acquisition system designed for accurate measurements in harsh, high-noise environments. It supports 16 or 32 thermocouple inputs and integrates low-pass filtering, 22-bit A/D converters, and DSP-based processing to ensure reliable, high-resolution data even in severe EMI conditions. Its electronics are specifically engineered to provide exceptional common-mode noise rejection while maintaining stable, repeatable measurements.

An integrated isothermal block provides a uniform temperature reference for each 16-channel input group, while NIST thermocouple tables stored in onboard memory enable direct conversion of millivolt inputs to engineering units. The DTS4050 supports multiple thermocouple types simultaneously and outputs temperature in °C, °F, °R, K, millivolts, or counts, with accuracy as low as ±0.25°C depending on thermocouple type and operating range. This onboard processing eliminates the need for external linearization or scaling.

Housed in a corrosion-resistant stainless steel enclosure, the DTS4050 is rugged, splash-resistant, and vibration-isolated for industrial and test-cell use. The unit is designed for mounting close to the test article to minimize thermocouple wire lengths, reducing measurement error and installation cost. Field calibration capabilities allow coefficient adjustments to further improve system accuracy, and the system accepts standard two-wire or three-wire shielded thermocouples.

Features

- 16 and 32 channel options
- Accepted TC type: E, J, K, N, R, S, T and B
- Engineering Unit output: °C, °F, °R, K
- Ethernet Communication: TCP, UDP and FTP; ASCII and Binary data output
- Data rates up to 200Hz (samples/channel/second)
- One 22 bit A/D per channel
- IEEE1588-2008 PTPv2 compatible
- 1000Vdc channel-to-channel isolation
- 600Vdc input isolation
- 160dB 0-60Hz Common Mode Rejection (CMMR)
- 50-60Hz noise rejection
- Integrated isothermal block for accurate cold junction compensation
- Supports mixed thermocouple types within a single module

Applications

- Turbine engine development and production test cells
- Diesel engine and powertrain testing
- Compressor and turbomachinery testing
- Aerospace propulsion and environmental test facilities
- Industrial boiler, furnace, and oven monitoring
- Power generation and energy systems testing
- High-EMI or high-vibration industrial environments

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Temperature Measurement

Thermocouples are widely used for temperature measurement due to their durability, broad temperature coverage, and suitability for harsh environments. Multiple standardized thermocouple types are available, each offering distinct characteristics that make them appropriate for specific temperature ranges, accuracy requirements, and environmental conditions. Proper selection of thermocouple type is critical to achieving optimal measurement performance.

The accuracy of any thermocouple-based measurement is strongly influenced by the reference (cold) junction. Factors such as reference junction material, mechanical installation, thermal stability, and ambient temperature gradients all directly affect overall measurement uncertainty. Maintaining a stable and well-characterized reference junction is therefore essential for high-accuracy temperature acquisition.

The DTS4050 intelligent temperature scanner measures the millivolt signal generated by each thermocouple and automatically compensates for cold junction temperature. An integrated isothermal block provides a stable Uniform Temperature Reference (UTR) for each group of input channels. NIST-standard millivolt-to-temperature tables for each supported thermocouple type are stored in onboard flash memory with 0.1 °C resolution. The DTS4050 microprocessor applies cold junction compensation and converts the corrected EMF values into engineering units internally, eliminating the need for external linearization or post-processing.

Processed temperature data are output digitally over Ethernet using TCP/IP or UDP communication protocols, ensuring accurate, noise-immune data delivery to the host system.

Legacy Compatibility

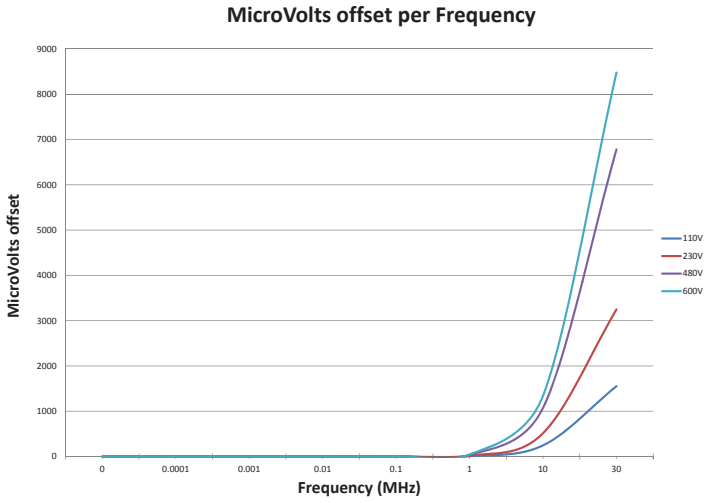
The DTS4050 was designed to provide a seamless upgrade path for existing Scanivalve temperature acquisition systems. The software interface is backward compatible with earlier DTS platforms, allowing DTS3250 and DTS4050 modules to operate concurrently on the same network. Both systems can communicate with the same controlling software without modification, simplifying system expansion or phased upgrades.

This compatibility allows users to integrate new DTS4050 modules into existing installations without disrupting current hardware, software, or test procedures. Mixed-generation systems can be deployed efficiently, protecting prior investments while enabling access to improved performance, noise immunity, and processing capability.

Common Mode Rejection

The DTS4050 product line was specifically engineered for operation in electrically noisy environments with high levels of electromagnetic interference (EMI). The system's architecture allows it to accurately resolve low-level microvolt thermocouple signals even in the presence of hundreds of volts of common mode noise.

Each thermocouple channel incorporates its own dedicated high-resolution A/D conversion circuit with 1000 VDC channel-to-channel isolation. This parallel front-end architecture prevents noise coupling between channels and is the foundation of the DTS4050's exceptional common mode rejection performance. In addition, the input circuitry is designed to withstand a sustained 600 VDC input isolation per channel while maintaining accurate engineering-unit output.



Actual common mode rejection performance will vary depending on installation conditions, including applied voltage, noise frequency, scan rate, and thermocouple type. However, the DTS4050's robust signal conditioning and isolation consistently minimize microvolt-level offsets across the frequency spectrum, including strong rejection of 50–60 Hz power-line interference.

To complement its electrical noise immunity, the DTS4050 is also designed to withstand the physical stresses typically associated with high-noise environments. The insulated enclosure and integrated UTR block provide a stable thermal reference, ensuring accurate and repeatable temperature measurements under vibration, shock, and rapidly changing environmental conditions.

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Specifications

	16Tx	32Tx
Dimensions	See Dimensions drawings	
Weight	13lbs [5.9kg]	15.5lbs [7.03kg]
Channels	16	32
Configuration Options	Panel Jack Inputs, Heater	Panel Jack Inputs, Heater, Rack Mount Kit
Standard Inputs	Screw Terminal (6-32 brass screw)	
Optional Panel Jack Inputs	Omega TPJ (3 prong)	
Thermocouple Types	Screw Terminal Input: E, J, K, S, T, N, B, R Panel Jack Input: E, J, K, S, T	
Accuracy Constant Ambient Temperature*†	E, J, K, N, T: ±0.25°C R and S: ±1.00°C B: ±2.00°C	
Accuracy Dynamic Ambient Temperature†**	E, J, K, N, T: ±0.5°C R and S: ±2.00°C B: ±4.00°C	
UTR Accuracy	±0.1°C	
A/D Resolution	22-bit ADC	
Binary Data Output Rate‡	200Hz	
ASCII Data Output Rate‡	20Hz	
Power Connector	PT06A-8-3S-SR	
Power Supply	18 to 36VDC	
Power Consumption (No Heater)	18W	24W
Power Consumption (w/ Heater)	45W	135W
Config/Trigger Connector	JT02RE8-6P or MS27473T8F6P	
External Trigger	4.5 to 15 VDC, 6.5mA	
Ethernet Connector	Conec 17-101754	
Ethernet Connection	100BaseT, MDIX Auto-crossing	
Communication Protocols	TCP/IP, UDP, FTP, IEEE1588-2008v2 PTP	
Data Synchronization	IEEE1588-2008v2 PTP Timestamping External Hardware Triggering	
Input-Output Isolation	600VDC	
Channel-to-Channel Isolation	1000VDC	
Common Mode Rejection (CMRR):	160dB, 0-60Hz	
Operating Temperature (No Heater)	-5° to 60°C	
Operating Temperature (w/ Heater)	-20° to 60°C	
Storage Temperature	0° to 80°C	
Humidity	5 to 95% RH, Non-condensing	
Environment Pressure	Minimum: 1PSIA (6.8kPa abs) Maximum: 100PSIA (690kPa abs)	
Standards	CE, MIL-STD-810G Cat 24, RoHS v3	

** When used in environments where ambient temperature is steady, ±3°C, anywhere in the operating temperature range*

*** When used in environments where temperature is dynamic, but within the operating temperature range*

† Standard Screw Terminal Inputs. Panel Jack option reduces overall accuracy by factor of two

‡ Maximum data rate may vary based on network limitations

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Ordering Information

DTS4050/16Tx + Heater

- **Model**
- **Channels**: **16** or **32**
- **Input Type**: **Tx** == Screw Terminal (standard); **TxPJ** == TPJ Panel Jack*
  ** Specify TC type: E, J, T, K or S*
- **Optional Heater**: Adds internal heater option

For 32 channel rack mount kit, use PN 21195-04 at time of order

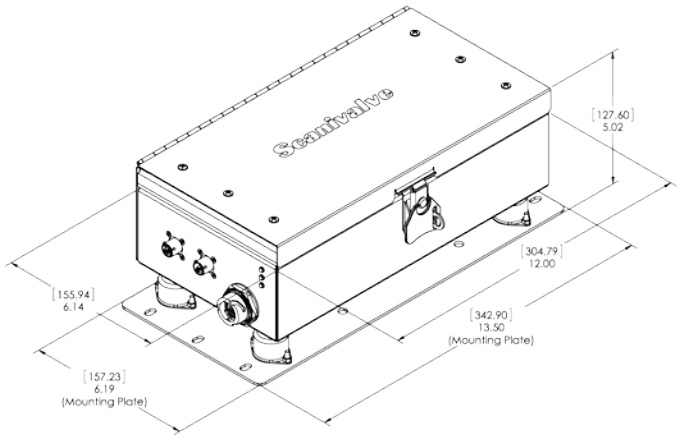
Supporting Accessories

Each DTS4050 is shipped with:

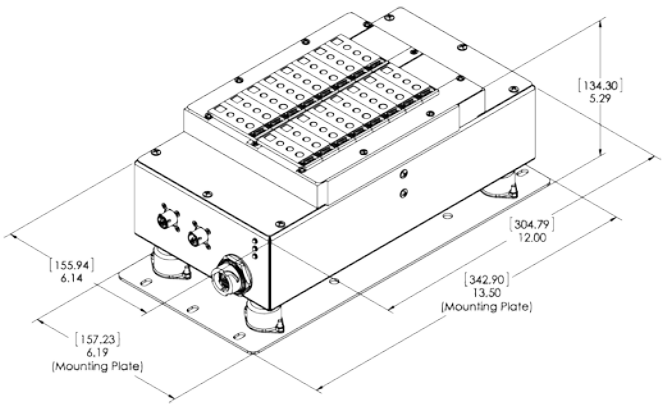
- Mating connectors for power, Ethernet, trigger/config

Additional accessories such as power supplies, calibration harnesses, cabling, and more can be found in the Scanivalve Module Accessory Catalog.

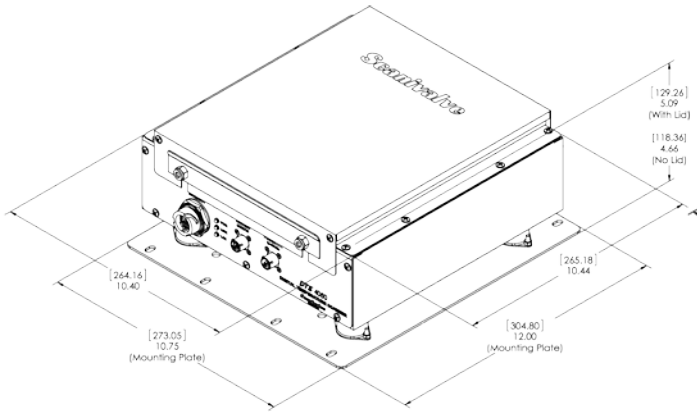
Dimensions Inches [mm]



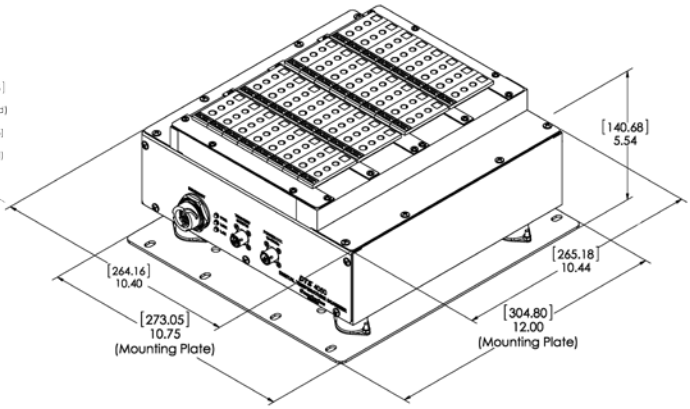
16Tx Screw Terminal Inputs



16Tx Panel Jack Connector Inputs



32Tx Screw Terminal Inputs



32Tx Panel Jack Connector Inputs

**Specifications are subject to change without notice.*

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ISO 9001:2015 CERTIFIED

20260406 - Printed in USA