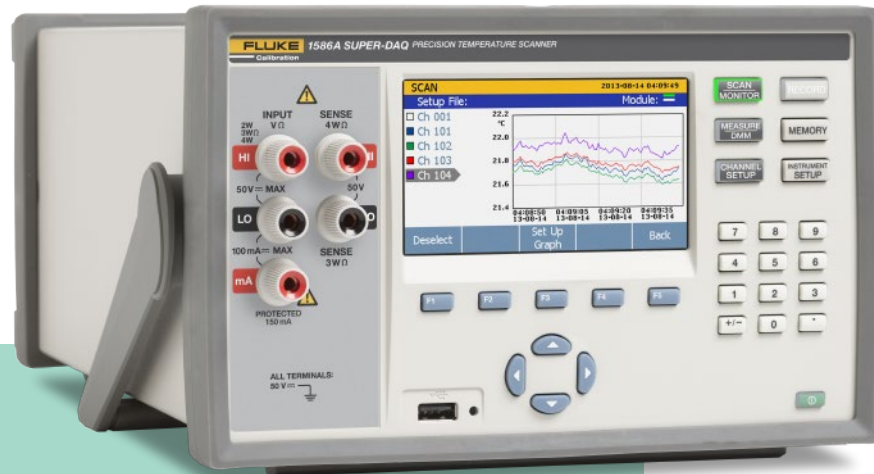


# 1586A Super-DAQ Precision Temperature Scanner

## Extended Specifications



The 1586A Super-DAQ is the most accurate and flexible temperature data acquisition system on the market. It scans and records temperature, dc voltage, dc current, and resistance for up to 40 input channels and scan speeds as fast as 10 channels per second. The Super-DAQ can be configured for use as a multi-channel data logger in the factory or as a precision reference thermometer for benchtop sensor calibration in the lab.

- Measure thermocouples, PRTs, thermistors, dc voltage, dc current, and resistance
- Best-in-class temperature measurement accuracy:
  - PRTs:  $\pm 0.005$  °C (using external DAQ-STAQ Multiplexer)
  - Thermocouples:  $\pm 0.5$  °C (using High-Capacity Module and internal CJC)
  - Thermistors:  $\pm 0.002$  °C
- Input Channels: Up to 40 isolated universal inputs
- Flexible configuration: Internal High-Capacity Module and/or DAQ-STAQ Multiplexer
- Selectable scan speed: Up to 10 channels per second
- Four modes of operation: Scan, Monitor, Measure, Digital Multimeter (DMM)
- Real-time color trending: Chart up to four channels simultaneously
- Automated sensor calibration: Control Fluke Calibration temperature sources such as dry-wells or micro-baths for automated calibration routines
- Data storage: Records up to 20 MB of data and setup files to internal non-volatile memory or to an external USB drive. Transfer data to a PC using the USB drive or LAN connection and view data in Microsoft® Excel
- Data security: Administrator and user profiles for protecting settings and ensuring test traceability
- Mx + B scaling and channel offset zero function
- Alarms: Two independent, user-defined alarms for each channel indicate when an upper or lower range has been exceeded

# 1586A Super-DAQ at a glance

Color display with channel status indicators. Chart up to 4 channels simultaneously.

Back lit main function keys—always know the mode of operation and recording status.

Front panel

Five-way binding post for reference thermometers. Also measures dc voltage, dc current, and resistance.

Memory management—for downloading and moving data and setup files.

USB support for easy transfer of data and setup files.

Measure/DMM function for quick measurements and recording with minimal setup.

Navigation keys for fast selection of information.

Function soft keys support fast setup and operation.

Standby key turns the display and keypad off—eliminates warm-up time.



Back panel

Line voltage and fuse selector.

Two rear panel slots can be configured for the internal High-Capacity Module or the external DAQ-STAQ Multiplexer—or one of each.

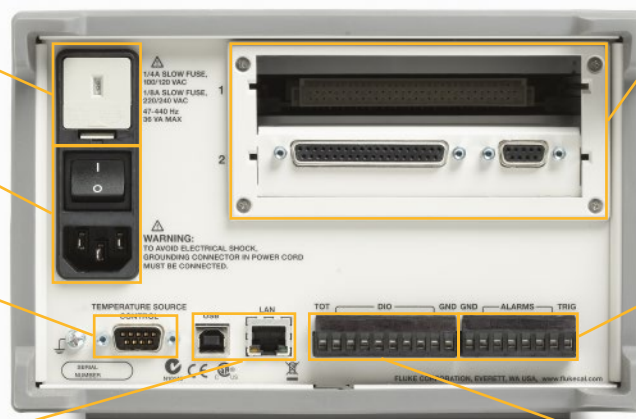
Power switch and line cord connector.

Dedicated connector for control of Fluke Calibration dry-wells or temperature baths for automated tests.

Digital external alarm trigger outputs.

USB and Ethernet ports used for remote operation.

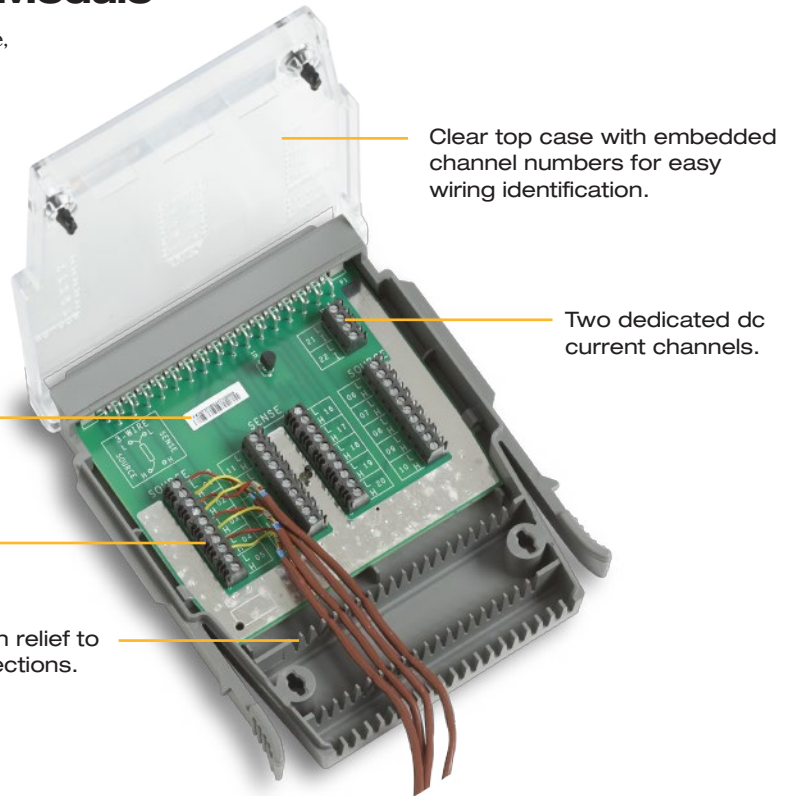
Totalizer and Digital I/O input ports.



## 1586A modules at a glance

### 1586-2586 High-Capacity Module

Universal input channels designed to measure temperature, resistance, dc voltage, and dc current for data acquisition applications on the factory floor where channel count and scan speed are important.



Clear top case with embedded channel numbers for easy wiring identification.

Two dedicated dc current channels.

Electronic ID with serial number and calibration date reports to the 1586A Super-DAQ.

Twenty 2-wire or ten 3-, or 4-wire connections.

Built-in cable strain relief to help secure connections.

### 1586-2588 DAQ-STAQ Multiplexer

Designed for high-accuracy measurements in secondary temperature calibration labs. Easily connect/disconnect thermocouples, PRTs, and thermistors.

Twenty mini-jack thermocouple inputs and up to ten four-wire, gold-plated PRT/thermistor connectors.



# 1586A Super-DAQ general specifications

General	
Maximum input	50 V
Offset voltage	<2 $\mu$ V
3-wire internal resistance mismatch	<50 m
Basic CJC accuracy	0.25 °C

<b>Mains Voltage</b>	100 V Setting	90 V to 110 V
	120 V Setting	108 V to 132 V
	220 V Setting	198 V to 242 V
	240 V Setting	216 V to 264 V
<b>Frequency</b>	47 Hz to 440 Hz	
<b>Power Consumption</b>	36 VA peak (24 W average)	
<b>Environment Temperature</b>	Operating	0 °C to 50 °C
	Full accuracy	18 °C to 28 °C
	Storage	-20 °C to 70 °C
<b>Warm-up</b>	1 hour to full accuracy specifications	
<b>Relative Humidity (non-condensing)</b>	Operating	0 °C to 30 °C <80 % 30 °C to 50 °C <50 %
	Storage	-20 °C to 70 °C <95 %
<b>Altitude</b>	Operating	2,000 m
	Storage	12,000 m
<b>Vibration and Shock</b>	Complies with MIL-PRF-28800F Class 3	
<b>Channel Capacity</b>	Total analog channels	45
	Voltage/resistance channels	41
	Current channels	5
	Digital I/O	8 bits
	Totalizer	1
	Alarm outputs	6
	Trigger input	1
<b>Input Protection</b>	50 V all functions, terminals and ranges	
<b>Math Channels</b>	Number of channels	20
	Operations	sum, difference, multiply, divide, polynomial, power, square root, reciprocal, exponential, logarithm, absolute value, average, maximum, minimum
<b>Triggers</b>	Interval, external (trigger input), alarm, remote (bus), manual, automated test	
<b>Memory</b>	Scan data RAM	75,000 readings with timestamp
	Data/Setup flash memory	20 MB
<b>USB Host Port</b>	Connector type	Type A
	Function	Memory
	File system	FAT32
	Memory capacity	32 GB
<b>USB Device Port</b>	Connector type	Type B
	Class	Instrument
	Function	Control and data transfer
	Command protocol	SCPI

<b>LAN</b>	Function	Control and data transfer
	Network protocols	Ethernet 10/100, TCP/IP
	Command protocol	SCPI
<b>RS-232</b>	Connector	D-sub 9 pin (DE-9)
	Baud rates	1200, 2400, 4800, 9600, 19200, 38400
	Function	Temperature source control output
<b>Dimensions</b>	Height	150 mm
	Width	245 mm
	Depth	385 mm
	Weight	6 kg (typical configuration)
	Shipping weight	9.5 kg (typical configuration)
<b>Conformity</b>	CE, CSA, IEC 61010 3rd edition	

## 1586-2586 High-Capacity Module specifications

<b>General</b>	
Maximum input	50 V
Offset voltage	<2 $\mu$ V
3-wire internal resistance mismatch	<50 m
Basic CJC accuracy	0.6 °C

## 1586-2588 DAQ-STAQ Multiplexer specifications

<b>General</b>	
Maximum input	50 V
Offset voltage	<2 $\mu$ V
3-wire internal resistance mismatch	<50 m
Basic CJC accuracy	0.25 °C

## Measurement specifications

Accuracy specifications generally apply with medium and slow sample rates (unless otherwise noted), after a warm-up time of 1 hour, and within an environment temperature range of 18 °C to 28 °C, and may depend on the channel. The confidence level for accuracy specifications is 95% within one year of calibration.

<b>Scan rate</b>	Fast	10 channels per second max (0.1 seconds per channel)
	Medium	1 channel per second (1 second per channel)
	Slow	4 seconds per channel
<b>Display resolution</b>	4 ½ to 6 ½ digits, depending on function and Sample Rate (see Measurement Characteristics tables below to find the display resolution of temperature readings)	
<b>PRT/RTD</b>		
<b>Temperature range</b>	-200 °C to 1200 °C (depending on the sensor)	
<b>Resistance range</b>	0 to 4 k	
<b>Offset compensation</b>	0 to 400 $\Omega$ , 4-wire	automatic current reversal
	400 to 4000 $\Omega$ or 3-wire	none
<b>Source current reversal interval (0 <math>\Omega</math> to 400 <math>\Omega</math> range)</b>	Fast sample rate	2 ms
	Medium sample rate	250 ms
	Slow sample rate	250 ms
<b>Maximum lead resistance (4-wire <math>\Omega</math>)</b>	2.5% of range per lead for 400 $\Omega$ and 4 k $\Omega$ ranges.	

### PRT/RTD resistance accuracy

Accuracy is given as % of measurement or ohms, whichever is greater. Basic accuracy is for 4-wire PRT/RTD. When using 3-wire PRT/RTD add 0.013 to the accuracy specification for internal resistance mismatch and voltage offset if using Channel 1, or add 0.05 if using channels x01 through x20. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification.

Range	Sample Rate	DAQ-STAQ Multiplexer and Channel 1	High-Capacity Module	T.C./ °C Outside 18 °C to 28 °C
0 to 400	Slow	0.002 % or 0.0008	0.003 % or 0.003	0.0001 % or 0.0008
	Medium	0.002 % or 0.002	0.003 % or 0.003	0.0001 % or 0.0008
	Fast	0.002 % or 0.005	0.003 % or 0.006	0.0001 % or 0.0008
400 to 4 k	Slow	0.004 % or 0.06	0.006 % or 0.06	0.0001 % or 0.008
	Medium	0.004 % or 0.1	0.006 % or 0.1	0.0001 % or 0.008
	Fast	0.004 % or 0.18	0.006 % or 0.18	0.0001 % or 0.008

### PRT/RTD temperature accuracy

Accuracy is for 4-wire 100 nominal PRT/RTD. When using 3-wire PRT/RTD add 0.039 °C to the accuracy specification for internal resistance mismatch and voltage offset if using Channel 1, or add 0.15 °C if using channels x01 through x20. If the environment temperature is outside the specified range, multiply the temperature coefficient number by the temperature deviation and add to the accuracy specification. Linear interpolation may be used between points in the table. Specifications do not include sensor accuracy. The practical range of temperature measurement depends on the sensor and characterization.

Sample Rate	Temperature	DAQ-STAQ Multiplexer and Channel 1	High-Capacity Module	T.C./ °C Outside 18 °C to 28 °C
Slow	-200 °C	0.002 °C	0.008 °C	0.002 °C
	0 °C	0.005 °C	0.008 °C	0.003 °C
	300 °C	0.012 °C	0.018 °C	0.006 °C
	600 °C	0.02 °C	0.03 °C	0.01 °C
Medium	-200 °C	0.005 °C	0.008 °C	0.002 °C
	0 °C	0.005 °C	0.008 °C	0.003 °C
	300 °C	0.012 °C	0.018 °C	0.006 °C
	600 °C	0.02 °C	0.03 °C	0.01 °C
Fast	-200 °C	0.013 °C	0.015 °C	0.002 °C
	0 °C	0.013 °C	0.015 °C	0.003 °C
	300 °C	0.014 °C	0.018 °C	0.006 °C
	600 °C	0.02 °C	0.03 °C	0.01 °C

### PRT/RTD measurement characteristics

Range	Temperature Display Resolution		Source Current
	Slow / Medium Sample Rate	Fast Sample Rate	
0 to 400	0.001 °C	0.01 °C	±1 mA
400 to 4 k	0.001 °C	0.01 °C	0.1 mA

Thermistor	
Temperature range	-200 °C to 400 °C (depending on the sensor)
Resistance range	0 to 1 M

### Thermistor resistance accuracy

Accuracy is given as  $\pm$  (% of measurement + ). The basic accuracy specification is for 4-wire thermistor, slow sample rate. When using medium or fast sample rate, add the number given in the table to the accuracy specification. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification. For 2-wire thermistor add 0.02 internal resistance if using Channel 1 or 1.5 if using channels x01 through x20, and add external lead wire resistance.

Range	Slow Sample Rate	Medium Sample Rate	Fast Sample Rate	T.C./ °C Outside 18 °C to 28 °C
0 to 2.2 k	0.004 % + 0.2	add 0.3	add 1	0.0005 % + 0.05
2.1 k to 98 k	0.004 % + 0.5	add 0.5	add 1.3	0.0005 % + 0.1
95 k to 1 M	0.015 % + 5	add 5	add 13	0.001 % + 2

### Thermistor temperature accuracy

Accuracy specifications are for 4-wire thermistor. When using 2-wire thermistor, add the number given in the table to the specification for internal resistance. If the environment temperature is outside the specified range, increase the accuracy specification by 25% for every 1 °C outside the specified environment temperature range. Specifications do not include sensor accuracy. The practical range of temperature measurement depends on the sensor.

Range	Accuracy 2.2 kΩ Thermistor			
	Slow Sample Rate	Medium Sample Rate	Fast Sample Rate	2-wire
-40 °C	0.001 °C	0.001 °C	0.01 °C	add 0.001 °C
0 °C	0.003 °C	0.004 °C	0.01 °C	add 0.004 °C
25 °C	0.006 °C	0.011 °C	0.02 °C	add 0.016 °C
50 °C	0.008 °C	0.018 °C	0.04 °C	add 0.05 °C
100 °C	0.047 °C	0.114 °C	0.28 °C	add 0.34 °C
150 °C	0.23 °C	0.56 °C	1.34 °C	add 1.7 °C

Range	Accuracy 5 kΩ Thermistor			
	Slow Sample Rate	Medium Sample Rate	Fast Sample Rate	2-wire
-40 °C	0.003 °C	0.004 °C	0.01 °C	add 0.001 °C
0 °C	0.002 °C	0.002 °C	0.01 °C	add 0.002 °C
25 °C	0.004 °C	0.006 °C	0.01 °C	add 0.007 °C
50 °C	0.005 °C	0.009 °C	0.02 °C	add 0.022 °C
100 °C	0.022 °C	0.052 °C	0.13 °C	add 0.16 °C
150 °C	0.096 °C	0.24 °C	0.57 °C	add 0.7 °C

Range	Accuracy 10 kΩ Thermistor			
	Slow Sample Rate	Medium Sample Rate	Fast Sample Rate	2-wire
-40 °C	0.003 °C	0.004 °C	0.01 °C	add 0.001 °C
0 °C	0.002 °C	0.002 °C	0.01 °C	add 0.002 °C
25 °C	0.003 °C	0.004 °C	0.01 °C	add 0.004 °C
50 °C	0.005 °C	0.009 °C	0.02 °C	add 0.011 °C
100 °C	0.011 °C	0.024 °C	0.06 °C	add 0.067 °C
150 °C	0.04 °C	0.098 °C	0.24 °C	add 0.29 °C

### Thermistor measurement characteristics

Range	Temperature Display Resolution		Source Current
	Slow / Medium Sample Rate	Fast Sample Rate	
0 to 2.2 k	0.0001 °C	0.001 °C	10 µA
2.1 k to 98 k	0.0001 °C	0.001 °C	10 µA
95 k to 1 M	0.0001 °C	0.001 °C	1 µA

### Thermocouple

Temperature range	-200 °C to 2315 °C (depending on the sensor)
Voltage range	-15 mV to 100 mV

### Thermocouple voltage accuracy

Accuracy is given as  $\pm$  (|% of measurement| +  $\mu$ V). Basic accuracy specification is for medium or slow sample rate. When using a fast sample rate add the number given in the table to the accuracy specification. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification.

Range	Accuracy Channel 1	Ch. $\times 01 - \times 20$	Fast Sample Rate	T.C./ °C Outside 18 °C to 28 °C
-15 mV to 100 mV	0.004 % + 4 $\mu$ V	add 2 $\mu$ V	add 1 $\mu$ V	0.0005 % + 0.0005 mV

### Thermocouple reference junction accuracy

Module	CJC Accuracy	T.C./ °C Outside 18 °C to 28 °C
DAQ-STAQ Multiplexer	0.25 °C	0.02 °C
High-Capacity Module	0.6 °C	0.05 °C



**Thermocouple temperature accuracy**

Accuracy specifications apply using medium or slow sample rate. When using fast sample rate, increase the accuracy specification by 25%. If the environment temperature is outside the specified range, increase the accuracy specification by 12% for every 1 °C outside the specified environment temperature range. Accuracy with fixed/external CJC does not include the accuracy of the reference junction temperature. Linear interpolation may be used between points in the table. Specifications do not include sensor accuracy. The practical range of temperature measurement depends on the sensor.

Type (Range)					

## Thermocouple measurement characteristics

Range	Temperature Display Resolution	
	Slow / Medium Sample Rate	Fast Sample Rate
-270 °C to 2315 °C	0.01 °C	0.1 °C

DC voltage	
Maximum input	50 V on any range
Common mode rejection	140 dB at 50 Hz or 60 Hz (1 k $\Omega$ unbalance in LOW lead) $\pm$ 50 V peak maximum
Normal mode rejection	55 dB for power line frequency $\pm$ 0.1%, $\pm$ 120% of range peak maximum
A/D linearity	2 ppm of measurement + 1 ppm of range
Input bias current	30 pA at 25 °C

## DC voltage accuracy

Accuracy is given as  $\pm$  (% measurement + % of range). Basic accuracy specification is for Channel 1, medium or slow sample rate. For channels x01 through x20 or when using Fast sample rate, add the numbers given in the table to the accuracy specification. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification.

Range	Accuracy Channel 1	Ch. x01 – x20	Fast Sample Rate	T.C./ °C Outside 18 °C to 28 °C
$\pm$ 100 mV	0.0037 % + 0.0035 %	add 2 $\mu$ V	add 0.0008 % of range	0.0005 % + 0.0005 %
$\pm$ 1 V	0.0025 % + 0.0007 %	add 2 $\mu$ V	add 0.0008 % of range	0.0005 % + 0.0001 %
$\pm$ 10 V	0.0024 % + 0.0005 %	–	add 0.0008 % of range	0.0005 % + 0.0001 %
$\pm$ 50 V	0.0038 % + 0.0012 %	–	add 0.0008 % of range	0.0005 % + 0.0001 %

## DC voltage input characteristics

Range	Resolution		Input Impedance
	Slow / Medium	Fast	
$\pm$ 100 mV	0.1 $\mu$ V	1 $\mu$ V	10 G <sup>1</sup>
$\pm$ 1 V	1 $\mu$ V	10 $\mu$ V	10 G <sup>1</sup>
$\pm$ 10 V	10 $\mu$ V	100 $\mu$ V	10 G <sup>1</sup>
$\pm$ 50 V	100 $\mu$ V	1 mV	10 M $\pm$ 1 %

<sup>1</sup> Input beyond  $\pm$ 12 V is clamped. The clamp current is up to 3 mA.

DC current	
Input protection	0.15 A resettable PTC

## DC current accuracy

Accuracy is given as  $\pm$  (% measurement + % of range). Basic accuracy specification is for medium or slow sample rate. When using a fast sample rate, add the number given in the table to the accuracy specification. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification.

Range	Accuracy	Fast Sample Rate	T.C./ °C Outside 18 °C to 28 °C
±100 µA	0.015 % + 0.0035 %	add 0.0008 % of range	0.002 % + 0.001 %
±1 mA	0.015 % + 0.0011 %	add 0.0008 % of range	0.002 % + 0.001 %
±10 mA	0.015 % + 0.0035 %	add 0.0008 % of range	0.002 % + 0.001 %
±100 mA	0.015 % + 0.0035 %	add 0.0008 % of range	0.002 % + 0.001 %

### DC current input characteristics

Range	Resolution		Burden Voltage
	Slow / Medium	Fast	
±100 µA	0.1 nA	1 nA	< 1 mV
±1 mA	1 nA	10 nA	< 1 mV
±10 mA	10 nA	100 nA	< 1 mV
±100 mA	100 nA	1 µA	< 1 mV

Resistance	
Max. lead resistance (4-wire ohms)	10 per lead for 100 and 1 k ranges. 1 k per lead on all other ranges

### Resistance accuracy

Accuracy is given as ± (% measurement + % of range). Basic accuracy specification is for 4-wire resistance, medium or slow sample rate. For 2-wire resistance add 0.02 internal resistance if using Channel 1, or 1.5 if using channels x01 through x20, and add external lead wire resistance. When using fast sample rate, add the numbers given in the table to the accuracy specification. If the environment temperature is outside the specified range, multiply the temperature coefficient numbers by the temperature deviation and add to the accuracy specification.

Range	Accuracy	Fast Sample Rate	T.C./ °C Outside 18 °C to 28 °C
100	0.004 % + 0.0035 %	add 0.001 % of range	0.0001 % + 0.0005 %
1 k	0.003 % + 0.001 %	add 0.001 % of range	0.0001 % + 0.0001 %
10 k	0.004 % + 0.001 %	add 0.001 % of range	0.0001 % + 0.0001 %
100 k	0.004 % + 0.001 %	add 0.001 % of range	0.0001 % + 0.0001 %
1 M	0.006 % + 0.001 %	add 0.002 % of reading plus 0.0008 % of range	0.0005 % + 0.0002 %
10 M	0.015 % + 0.001 %	add 0.002 % of reading plus 0.0008 % of range	0.001 % + 0.0004 %
100 M	0.8 % + 0.01 %	add 0.001 % of range	0.05 % + 0.002 %

### Resistance input characteristics

Range	Resolution		Source Current (open-circuit voltage)
	Slow / Medium	Fast	
100	0.1 m	1 m	1 mA (4 V)
1 k	1 m	10 m	1 mA (4 V)
10 k	10 m	100 m	100 µA (6 V)
100 k	100 m	1	100 µA (12 V)
1 M	1	10	10 µA (12 V)
10 M	10	100	1 µA (12 V)
100 M	100	1 k	0.1 µA (12 V)

## Ordering information

### 1586A Super-DAQ Precision Temperature Scanner

#### Super-DAQ and DAQ-STAQ Multiplexer

- 1586A/1DS** Super-DAQ, 1 DAQ-STAQ Multiplexer
- 1586A/1DS/C** Super-DAQ, 1 DAQ-STAQ Multiplexer, Accredited Calibration
- 1586A/2DS** Super-DAQ, 2 DAQ-STAQ Multiplexers
- 1586A/2DS/C** Super-DAQ, 2 DAQ-STAQ Multiplexers, Accredited Calibration

#### Super-DAQ and High-Capacity Module

- 1586A/1HC** Super-DAQ, 1 High-Capacity Module
- 1586A/1HC/C** Super-DAQ, 1 High-Capacity Module, Accredited Calibration
- 1586A/2HC** Super-DAQ, 2 High-Capacity Modules
- 1586A/2HC/C** Super-DAQ, 2 High-Capacity Modules, Accredited Calibration

#### Super-DAQ, High-Capacity Module, and DAQ-STAQ Multiplexer

- 1586A/DS-HC** Super-DAQ, 1 High-Capacity Module, 1 DAQ-STAQ Multiplexer
- 1586A/DSHC/C** Super-DAQ, 1 High-Capacity Module, 1 DAQ-STAQ Multiplexer, Accredited Calibration

#### Accessories

- 1586-2586** High-Capacity Module without Relay Card
- 1586-2586-KIT** High-Capacity Module with Relay Card
- 1586-2588** DAQ-STAQ Multiplexer without Adapter Card
- 1586-2588-KIT** DAQ-STAQ Multiplexer, Adapter Card, Interface Cable
- 1586-2588-CBL** DAQ-STAQ Multiplexer Interface Cable
- Y1586S** Rack Mount Kit, Single (half rack)
- Y1586D** Rack Mount Kit, Dual (full rack)
- 1586-CASE** Super-DAQ Carrying Case (mainframe and internal modules)
- 1586/DS-CASE** Super-DAQ/DAQ-STAQ Carrying Case (mainframe and external module)



**Fluke Calibration.** Precision, performance, confidence.™

Electrical	RF	Temperature	Pressure	Flow	Software
------------	----	-------------	----------	------	----------

**Fluke Calibration**  
PO Box 9090, Everett, WA 98206 U.S.A.  
**Fluke Europe B.V.**  
PO Box 1186, 5602 BD  
Eindhoven, The Netherlands

**For more information call:**  
In the U.S.A. (877) 355-3225 or  
Fax (425) 446-5116  
In Europe/M-East/Africa +31 (0) 40  
2675 200 or Fax +31 (0) 40 2675 222  
In Canada (800)-36-FLUKE or  
Fax (905) 890-6866

From other countries +1 (425) 446-5500 or  
Fax +1 (425) 446-5116  
Web access: <http://www.flukecal.com>

©2013 Fluke Calibration.  
Specifications subject to change without notice.  
Printed in U.S.A. 9/2013 6000790B\_EN  
Pub-ID 12118-eng

**Modification of this document is not permitted  
without written permission from Fluke Calibration.**