JOFRA calibration

DTI-1000 & STS-050, -100, -102

Digital Temperature Indicator and STS Reference Sensors

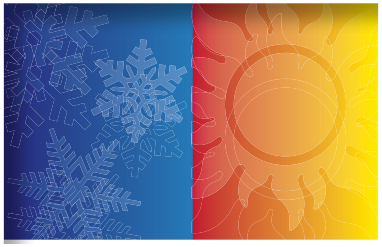
CALRIGHT INSTRUMENTS
The Right Source For Your Test & Measurement Needs

8715 Mesa Point Terrace San Diego, CA 92154
Toll Free: 1.866.363.6634 Tel: 1.619.429.4545 Fax: 1.619.374.7012
Email: sales@calright.com http://www.calright.com

What to expect

JOFRA calibration

Wide Temperature Range



The DTI-1000 with a STS-probe is a fully traceable thermometer recommended as the reference instrument to verify the true temperature in any type of temperature calibrator, liquid bath, or dry-block calibrator.

DTI-1000: -200 to 750°C
STS-050: -50 to 400°C
STS-100: -150 to 650°C
STS-102: -50 to 155°C

Improve your Accuracy

Use the DTI-1000 and the STS probes as your working temperature reference in any calibration application or use the set-up directly in custody transfer applications where high accuracy (low uncertainty) means money.

DTI-1000 accuracy up to ±0.005°C
DTI-1000 & STS sensor ±0.03°C ± LSD

Reliable Temperature Readings

The superior specifications combined with a long history of reliability and low drift have made the DTI-1000 and the STS sensor the working standard in many national laboratories worldwide.
The measuring principle is a 4-wire True Ohm Measurement, which eliminates the EMF in cables, sockets, and sensors.

Dual Channel Inputs

Specify temperature modes on the dual channel inputs: sensor 1 and sensor 2, with differential values 1-2, peak hold etc.

Specified Low Drift

The STS industrial temperature reference probes are built to last. All Superior Temperature Standard probes are economical and offer fast response times, low immersion depths, compact physical sizes, and specified low drift rates; even at high temperatures. Maintains a minimum uncertainty budget throughout the period between re-calibration intervals.

Fast Response Time

This simple to use instrument offers great flexibility, being able to work with both 'smart' and standard temperature sensors. A fast response time ensures precise monitoring of temperature stability and low drift reduces uncertainty of measurement between calibration intervals.

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Intuitive and fast navigation

JOFRA calibration

Menu / Enter

The MENU/ENTER key includes intelligent prompts that guide the user through setup and operation. This key allows the user to specify measuring units, resolution, sensor identification, and coefficients.

On / Off

The ON/OFF key automatically initiates a self-test routine and the display indicates tested parameter results plus the date of the last calibration.

Reset / Select

The RESET/SELECT key allows the user to enter peakholds and to change settings in the MENU mode.

Sensor 1 connections

Sensor 2 connections

Display

Display with 2 * 20 characters, which continuously read out the two inputs.

Mode

The MODE key allows the user to specify temperature modes on the dual channel inputs; sensor 1 and sensor 2, with differential values 1-2, peak hold etc.

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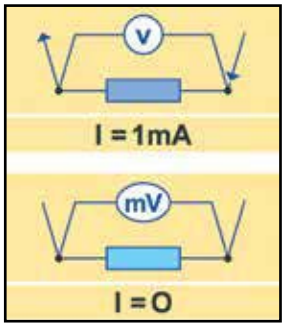
...and even more

True Ohm Measurement

The DTI-1000 has been designed to employ state-of-the-art DC measuring techniques in combination with powerful microprocessor technology. To achieve high accuracy, the measuring principle used by the DTI-1000 is True Ohm Measurement thus eliminating the EMF from cables, sockets, and sensors.

True Ohm Measurement is a proven method to achieve accurate compensation for errors induced by thermal effects.

The resistance is measured through the 4-wire system at 1 mA, after which the instrument takes a reading without any applied current; this second reading is the "error EMF".



Conversion to Temperature

DTI-1000 will accept Callendar van Dusen coefficients R_0, A, B and C or ITS-90 coefficients for converting resistance to temperature. If you do not have these coefficients available from the sensors certificate, but have measurement data (temperature and resistance), JofraCal can help you calculate the coefficients required.

Combining a DTI-1000 and a STS reference sensor with the use of ITS-90 coefficients ensures the best overall accuracy.

Linearity

To obtain high accuracy, it is necessary to know the characteristics of the Pt100 sensor to be used with the DTI-1000 e.g. a STS sensor. The DTI-1000 provides 3 different linearity setups:

- Certified data pairs of ohm and reference temperature. Use JofraCal to calculate and download individual coefficients from a certified sensor e.g. a STS sensor based on "best curve fit"
- Coefficients, according to IEC 751
- Coefficients according to ITS-90

Reference Resistors

To minimize the effect of any drift caused by ambient temperature, humidity and /or aging, the DTI series is designed with built-in high precision and extremely stable reference resistors. This technique minimizes drift.

Calibration software included

JofraCal calibration software ensures easy calibration of RTD´s, thermocouples, transmitters, thermoswithes, pressure gauges and pressure switches.

JofraCal software controls the complete calibration procedure, stores the results and provides a calibration audit trail through hard-copy certificates. All calibration data are stored for each sensor to monitor drift and optimise recalibration intervals. A scheduler feature allows planning of future calibrations.

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Specifications DTI-1000

JOFRA calibration

Functional

Input Interface

DTI-1000 A (Pt100/Pt25) 0-360Ω
DTI-1000 B (Pt25)..... 0-95

Accuracy, 12 months use

DTI-1000 A ..... ±(6 ppm rdg + 1.4 mΩ)
DTI-1000 B ..... ±(6 ppm rdg + 0.7 mΩ)

**for accuracies in °C and °F please see table*

Mains specifications

Temp. range..... -200 to 750°C / -328 to 1382°F
Temp. coefficient ..... .outside 23°C ±3°C / outside 73°F ±5°F
..... .0.8 ppm/°C / 0.45 ppm/°F
Input channels 2
Termination .... Goldplated LEMO/4mm banana test sockets
Resolution ..... 0.1, 0.01 or 0.001°C/F/K/Ω
Update rate (0.1/0.01/0.001°) ..... .2 / 3 / 12 seconds
Measuring units ..... °C, °F, K and Ω
Measuring current..... .1 mA

Miscellaneous

Serial data interface RS232
Display..... VFD, two lines, 20 characters alphanumeric
Operating temp. (ambient) ..... .0 to 50°C / 32 to 122°F
Storage temp. (ambient)..... -20 to 60°C / -4 to 140°F
Humidity..... .0 to 90% RH

Power Supply

Mains Adapter

9 VDC / 200 mA

Battery

8 x 1.5 V (type AA)

Battery Life

Typically 15 hours

Physical Specifications

Dimension L x W x H..... .225x135x195 mm / 8.9x5.3x7.7 in

Weight

DTI-1000 ..... .2.2 kg / 4.9 lb

Shipping Dimension incl. standard accessories and carrying case

DTI-1000 ..... 600x380x310 mm / 23.6x15.0x12.2 in

Shipping Weight incl. standard accessories and carrying case

DTI-1000 ..... 10.4 kg / 22.9 lb

Accuracy - 12 months Temperature range	DTI-1000 A with Pt100 (excl. sensor uncertaintly)	DTI-1000 A with Pt25 (excl. sensor uncertaintly)	DTI-1000 B with Pt25 (excl. sensor uncertaintly)
-200°C / -328°F	±-0.004°C / ±0.006°F	±-0.014°C / ±0.026°F	±-0.007°C / ±0.013°F
0°C / -32°F	±-0.005°C / ±0.009°F	±-0.016°C / ±0.028°F	±-0.008°C / ±0.015°F
-155°C / -311°F	±-0.006°C / ±0.011°F	±-0.017°C / ±0.031°F	±-0.010°C / ±0.018°F
200°C / 392°F	±-0.007°C / ±0.013°F	±-0.018°C / ±0.032°F	±-0.010°C / ±0.019°F
320°C / 608°F	±-0.008°C / ±0.014°F	±-0.019°C / ±0.035°F	±-0.012°C / ±0.021°F
400°C / 752°F	±-0.008°C / ±0.015°F	±-0.020°C / ±0.037°F	±-0.012°C / ±0.022°F
600°C / 1112°F	±-0.010°C / ±0.019°F	±-0.023°C / ±0.041°F	±-0.014°C / ±0.026°F
650°C / 1202°F	±-0.011°C / ±0.020°F	±-0.024°C / ±0.043°F	±-0.015°C / ±0.027°F
750°C / 1382°F	±-0.012°C / ±0.021°F	±-0.026°C / ±0.047°F	±-0.017°C / ±0.030°F

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STS Reference Sensors

JOFRA calibration

System accuracy for DTI-1000 & STS

STS-050 sensor	
-45 to 400 °C / -49 to 752 °F	**±0.060 °C / 0.108 °F** [1,2]
	±0.070°C / 0.126 °F [1,3]
STS-100 sensor	
-50 to 250 °C / -58 to 482 °F	**±0.030 °C / 0.054 °F** [1,2]
	±0.045 °C / 0.081°F [1,3]
-50 to 320 °C / -58 to 608 °F	**±0.040 °C / 0.072 °F** [1,2]
	±0.050 °C / 0.090 °F [1,3]
-50 to 400 °C / -58 to 752 °F	**±0.060 °C / 0.108 °F** [1,2]
	±0.070 °C / 0.126 °F [1,3]
-50 to 650 °C / -58 to 1202 °F	**±0.060 °C / 0.108 °F** [1,2]
	±0.080 °C / 0.144 °F [1,3]
-90 to 650 °C / -130 to 1202 °F	**±0.080 °C / 0.144 °F** [1,2]
	±0.110 °C / 0.198 °F [1,3]
STS-102 cable sensor	
-45 to 155 °C / -49 to 311 °F	**±0.040 °C / 0.072 °F** [1,2]
	±0.070 °C / 0.126 °F [1,3]

All sensors are as standard supplied with an accredited certificate stating the sensor coefficients.

[1] Specified at 95% confidence interval k=2 over full range, including calibration uncertainty, excluding 1 LSD (last significant digit)

[2] Excluding sensor drift

[3] Including sensor drift after 100 hours at max. temperature

STS-050
Delivered in a cardboard box

STS-100
Delivered in aluminium protection case

STS-102
Delivered in a plastic protection case

STS Superior Temperature Reference Sensors

To get an ideal reference system, we offer a range of reference sensors. The STS Superior Temperature reference Sensors are based on more than 50 years of industrial temperature sensor manufacturing experience. The main requirement of a reference sensor is stability: The less the sensor drifts, the lower the measurement uncertainty. All STS sensors are economical and offer fast response times, low immersion depths, compact physical sizes, and specified low drift rates: even at high temperatures. These are all important considerations when selecting a reference sensor.

All sensors are supplied with an accredited certificate stating the sensor coefficients.

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AMETEK®
SENSORS, TEST & CALIBRATION

Specifications STS-050/100/102

JOFRA calibration

Functional

Temperature Range

STS-050 ..... -50 to 400°C
STS-100 ..... -150 to 650°C
STS-102 ..... -50 to 155°C

Accuracy, 12 months use

STS-050
Hysteresis[3] @0°C/32°F ..... 0.01°C / 0.02°F
Long Term Stabilty[4] @0°C/32°F ..... typ. 0.014°C / 0.025°F
Repeatability ..... 0.005°C / 0.009°F
STS-100
Hysteresis[1] @0°C/32°F ..... 0.01°C / 0.02°F
Long Term Stabilty[2] @0°C/32°F ..... typ. 0.014°C / 0.025°F
Repeatability ..... 0.002°C / 0.0036°F
STS-102
Hysteresis[1] @0°C/32°F ..... 0.01°C / 0.018°F
Long Term Stabilty[2] @0°C/32°F ..... typ. 0.025°C / 0.045°F
Repeatability ..... 0.002°C / 0.0036°F

1) When exposed to 155°C /311°F for 200 hours
2) When exposed to 650°C /1202°F for 100 hours stability will depend on actualuse of the sensor.
3) When used in the range –50°C to 400°C / -58°F to 752°F.
4) Stability when exposed to 400°C / 752°F for 100 hours.
Stability will depend on actual use of the probe.

Sensing element

Type Pt100
Nominal resistance @0°C/32°F 100Ω
Temperature coefficient ..... α_{100}= 0.00385 1/°

Minimum immersion depth

STS-050 (4 mm / 0.16 in) ..... 100 mm / 3.9 in
STS-100 A (4 mm / 0.16 in) ..... 100 mm / 3.9 in
STS-100 B (6.35 mm / 0.25 in) ..... 110 mm / 4.3 in
STS-102 A ..... 30 mm / 1.18 in

Self-heating effect

STS-050 ..... 0.06°C/mW / 0.108°F/mW
STS-100, & STS-102 ..... 0.04°C/mW / 0.07°F/mW

Response time

STS-050 & STS-100 A $\tau_{0.5}$ (50%) ..... 8 sec
STS-050 & STS-100 A $\tau_{0.9}$ (90%) ..... 26 sec
STS-100 B $\tau_{0.5}$ (50%) ..... 18 sec
STS-100 B $\tau_{0.9}$ (90%) ..... 44 sec
STS-102 A $\tau_{0.9}$ (90%) ..... 16 sec

Electrical connections

Cable ..... 4 wire + shield
Connection ..... LEMO Goldplated

Outer tube

STS-050 & STS-100 ..... Inconel 600
STS-102 ..... AISI 316TI

Operating conditions

Sensor connection and cable, STS-100 ..... Max 70°C / 158°F
Sensor connection, STS-102 ..... Max 70°C / 158°F
Sensor cable, STS-102 ..... Max 175°C / 347°F
Storage temparature ..... -20 to 70°C / -4 to 158°F
Humidity ..... 0 to 90% RH
Protection class (connectors) ..... DIN 40050 IP-50

Physical Specifications

Shipping dimensions incl. carrying case

STS-050, LxWxH ..... 750x150x140 mm / 29.5x5.9x5.5 in
STS-100, LxWxH ..... 750x150x140 mm / 29.5x5.9x5.5 in
STS-102, LxWxH ..... 360x290x50 mm / 14.2x11.4x1.9 in
STS-050, weight ..... 1.0 kg / 2.2 lb
STS-100, weight ..... 3.0 kg / 6.6 lb
STS-102, weight ..... 1.0 kg / 2.2 lb

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Ordering Information

DTI-1000 indicator

Base Model Number	
DTI-1000A	DTI-1000 A and Pt100 or Pt25
DTI-1000B	DTI-1000 B and Pt25

Calibration Certificate	
F	Traceable Certificate to international standards (Standard)
H	Accredited Certificate - ISO17025

Options	
C	Carrying Case, aluminium

DTI1000A F C

DTI-1000 A temperature indicator with standard traceable certificate and carrying case

JOFRA calibration

Standard Delivery DTI-1000

- DTI-1000 Indicator
- USB containing manual and JOFRACAL software
- AmeTrim to adjust the DTI-1000
- RS232 cable, 9 pin adapter
- 8 batteries
- Calibration certificate, traceable to int. standards
- Mains adapter

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Ordering Information

JOFRA calibration

STS-050 A

Base Model Number	
STS050	Pt100 reference probe w/ handle, -50 to 400°C / -58 to 752°F

Diameter of the sensor	
A	Overall diameter 4 mm / 0.16 in

Shape and length	
250	Straight, 250 mm / 9.8 in, incl. cardboard box
350	Straight, 350 mm / 13.8 in, incl. cardboard box

Cable length and termination	
G	Cable 1 m / 3.3 ft plus LEMO connector

Calibration certificate	
F	Traceable Certificate to Int'l Standards – Standard -45 to 400°C
H	Accredited Certificate – ISO17025 – Opiton -45 to 400°C

STS050 A 250 G H

4mm STS-050 A reference sensor, 250 mm straight sensor, 1m cable plus LEMO connector, and accredited certificate.

STS-102 A

Base Model Number	
STS102	Pt100 reference sensor, cable, -50 to 155°C / -58 to 311°F

Diameter of the sensor	
A	Overall diameter 4 mm / 0.16 in

Shape and length	
030	Short sensor 30 mm / 1.18 in, incl. plastic case

Cable length and termination	
S	Cable 1 m / 3.3 ft + LEMO connector

Calibration certificate	
H	Accredited Certificate – ISO17025 – Standard -45 to 155°C
I	No Certificate – Annealed only (Useless without certificate/coefficients)

STS102 A 030 S H

4mm STS-102 A reference sensor, 30 mm short sensor, 1 m cable plus LEMO connector and accredited certificate.

STS-100 A/B

Base Model Number	
STS100	Pt100 reference sensor, solid, -150 to 650°C / -238 to 1207°F

Diameter of the sensor	
A	Overall diameter 4 mm / 0.16 in
B	Overall diameter 6.35 mm / 0.25 in

Shape and length	
250	Straight, 250 mm / 9.8 in, incl. alu case
350	Straight, 350 mm / 13.8 in, incl. alu case
500	Straight, 500 mm / 19.7 in, incl. alu case

Cable length and termination	
A	Cable 0.5 m / 1.6 ft + LEMO connector
B	Cable 2 m / 6.6 ft + LEMO connector
C	Cable 2 m / 6.6 ft + Banana plug connector

Calibration certificate	
H	Accredited Certificate – ISO17025 – Standard -45 to 650°C
HL	Accredited Certificate – ISO17025 – Standard -90 to 120°C
I	No Certificate – Annealed only (Useless without certificate/coefficients)

STS100 A 350 B H

4mm STS-100 A reference sensor, 350mm straight sensor, 2m cable, plus LEMO connector and accredited certificate.

Accessories STS-100

122801 ..... Cable 0.5 m / 1.6 ft. LEMO to LEMO

65-PT100-LL-Cable ..... Cable 2 m / 6.6 ft. LEMO to LEMO

65-PT100-LB-Cable ..... Cable 2 m / 6.6 ft. LEMO to banana

125522 ..... Cable 2 m / 6.6 ft. with LEMO / Redel

System Calibration - DTI-1000 and STS-050

SYS050/1 . . . DTI/STS050 Cal.: -45, -30, -15, 0, 100, 250, 400°C

System Calibration - DTI-1000 and STS-100

SYS100/1 . . . DTI/STS100 Cal.: -90, -45, -15, 0, 50, 100, 125°C

SYS100/2 . . . DTI/STS100 Cal.: -45, -30, -15, 0, 50, 100, 155°C

SYS100/3 . . . DTI/STS100 Cal.: 0, 50, 100, 150, 200, 250, 320°C

SYS100/4 . . . DTI/STS100 Cal.: 0, 50, 100, 200, 320, 450, 650°C

SYS100/5 . . . DTI/STS100 Cal.: -45, -30, -15, 0, 50, 100, 200, 320, 450, 650°C

System Calibration - DTI-1000 and STS-102

SYS102/1 . . . DTI/STS102 Cal.: -45, -30, -15, 0, 50, 100, 155°C

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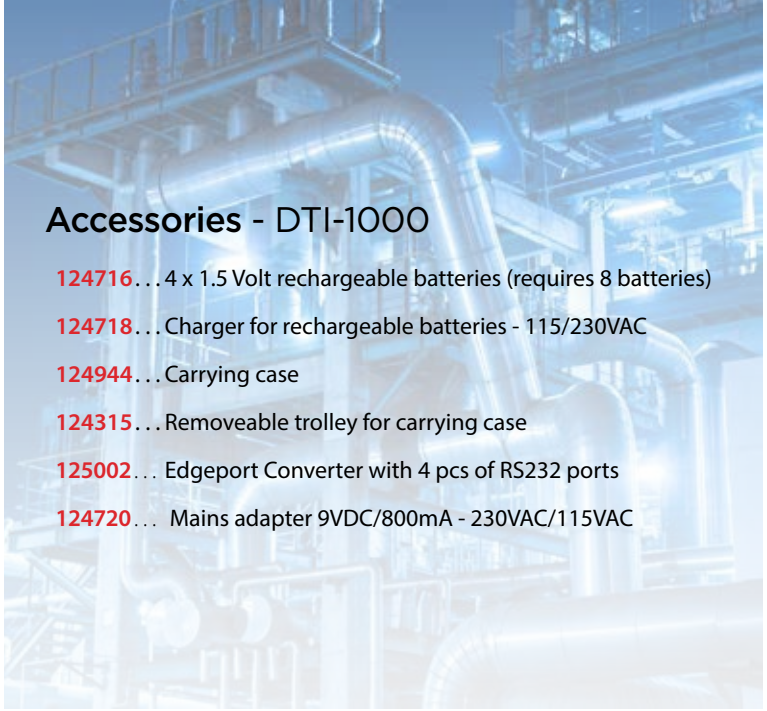

Accessories - DTI-1000

124716 . . . 4 x 1.5 Volt rechargeable batteries (requires 8 batteries)

124718 . . . Charger for rechargeable batteries - 115/230VAC

124944 . . . Carrying case

124315 . . . Removeable trolley for carrying case

125002 . . . Edgeport Converter with 4 pcs of RS232 ports

124720 . . . Mains adapter 9VDC/800mA - 230VAC/115VAC

EN ISO/IEC 17025 Laboratory accreditation

AMETEK Sensors, Test & Calibration has two EN ISO/IEC 17025 accredited laboratories that issues accredited certificates in accordance with international standards. Laboratory accreditation is a reliable indicator of technical competence assuring customers the most accurate documentation. We believe in being clear about our capabilities, our accuracy, and about what you can expect from us.

Because calibration is a matter of confidence!

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