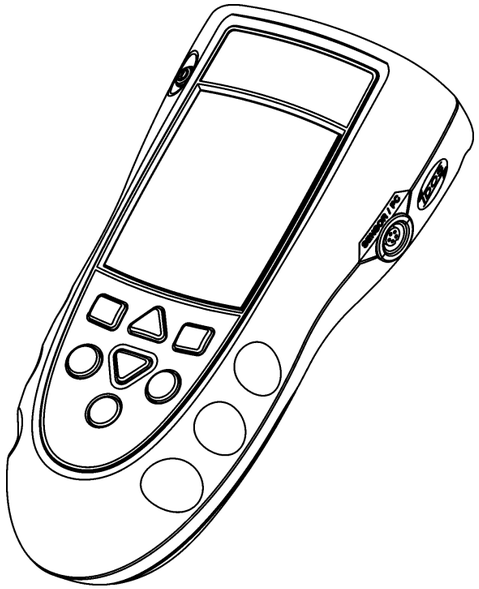
GE
Sensing

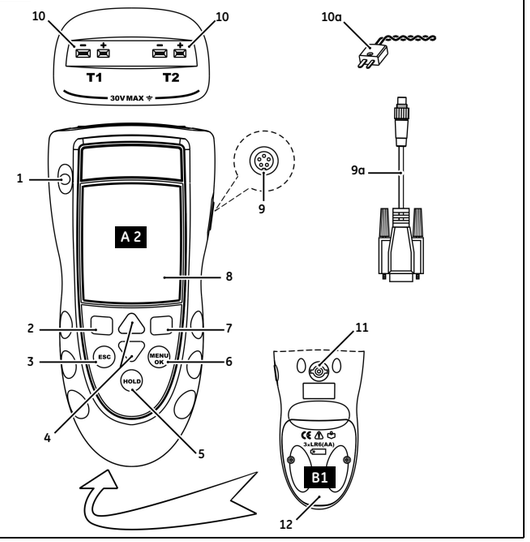
Druck DPI 820

Dual input thermometer

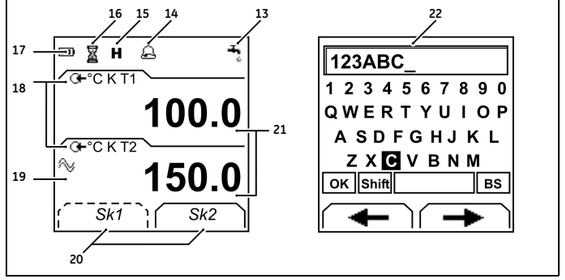
User manual - K0386



A1



A2



B1

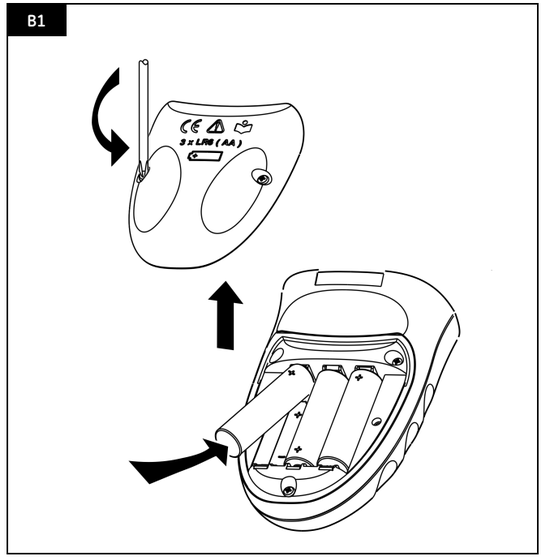


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Table of Contents

Introduction

The DPI 820 Dual Input Thermometer is part of the Druck DPI 800 series of hand held instruments.

The DPI 800 series uses Intelligent Digital Output Sensor (IDOS) technology to give instant plug and play functionality with a range of Universal Measurement Modules (UMM). Example: the Universal Pressure Module (UPM).

The DPI 820 includes these functions:

Function
* Measure temperature: T1 and/or T2
* Measure temperature difference: T1 - T2
* Cold Junction (CJ) compensation: Automatic/Manual
Snapshot: Up to 1000 displays with a date/time stamp
Communications port: IDOS or RS232
Language selection
** Measure pressure/Leak test: External IDOS UPM
Other functions: Hold, Maximum/Minimum/Average, Filter, Tare, Scaled values, Backlight, Alarm

* *Refer to "Specification data".*
** *Optional item*

Safety

Before you use the instrument, make sure that you read and understand all the related data. This includes: all local safety procedures, the instructions for the UMM (if applicable), and this publication.

WARNING

- **It is dangerous to ignore the specified limits for the instrument or to use the instrument when it is not in its normal condition. Use the applicable protection and obey all safety precautions.**
- **Do not use the instrument in locations with explosive gas, vapor or dust. There is a risk of an explosion.**
- **To prevent electrical shocks or damage to the instrument, do not connect more than 30V between the terminals, or between the terminals and the ground (earth).**
- **UPM only. To prevent a dangerous release of pressure, isolate and bleed the system before you disconnect a pressure connection.**

Continued

Safety (Continued)

Before you start an operation or procedure in this publication, make sure that you have the necessary skills (if necessary, with qualifications from an approved training establishment). Follow good engineering practice at all times.

Safety - Marks and symbols on the instrument

CE	Complies with European Union directives	⚠	Warning - refer to the manual
📖	Read the manual	▭	Battery
⏚	Ground (Earth)	⏻	ON/OFF
🗑	Do not dispose of this product as household waste. Refer to "Maintenance".		
T1/T2	Identifies the thermocouple connector		

To start

To start - Location of items **A1**

Item		Description
1.	❍	On or off button.
2.	■■	Left-hand soft-key. Selects the function above it on the display (Item 20). Example: Edit
3.	**ESC**	Moves back one menu level. Leaves a menu option. Cancels the changes to a value.
4.	▲ ▼	Increases or decreases a value. Highlights a different item.
5.	**HOLD**	Holds the data on the display. To continue, press the **HOLD** button again. If *Snapshot* is on (Item 16): HOLD records the data on the display.
6.	**MENU OK**	Shows the *Select Task* menu. Selects or accepts an item or value. Selects [✓] or cancels [ ] a selection.
7.	■■	Right-hand soft-key. Selects the function above it on the display (Item 20). Example: Settings
8.		Display. Refer to A2
9.	**SENSOR / PC**	Communications port. Use to connect a Universal Measurement Module (UMM) or a RS232 cable.
9a.		Optional item - Part No. IO800D: RS232 cable (5-pin to 9-pin D type connector). Use to copy the snapshot records to a PC or to a printer. Refer to "Operation".
10.		Thermocouple connector: Refer to "Operation".
10a.		Type K thermocouple (two included).
11.		Connection point for some of the optional accessories. Refer to the datasheet.
12.		Battery compartment. Refer to B1.

To start - Items on the display **A2**

Item		Description
13.		UPM only. Task indication for the leak test. *Refer to: Select Task (Table 2)*
14.		The measured value satisfies one of the alarm conditions. *Refer to: Settings (*Table 3*)*
15.	**H**	The data on the display is on hold. To continue, press the **HOLD** button again.
16.		*The Snapshot* function is set up to record the data on the display (*Keypress* or *Periodic*). Refer to "Operation" (Table 4)
17.		Shows the battery level: 0 ... 100%.
18.		Identifies the type of data: measurement range, units, thermocouple type (K, J, T ...), T1/T2 - If applicable. = Input = IDOS Input *Refer to: Select Task (Table 2)*
19.		Shows the settings applied to the input (If applicable). 123ABC = x:y scaled value = Filter = Maximum = Average = Tare = Minimum *Refer to: Settings (Table 3)*
20.		A soft-key function. To select an available function, press the soft-key below it. Example: = Move left = Move right
21.		The measured value or values applicable to the task selection.
22.		The *Edit* display to set up text labels (≤ 6 characters): *Snapshot (*Table 1*), x:y Scaling (*Table 3*).* **OK** = Accept the new text label **Shift** = Change the keys: 123ABC or -_+abc = Add a space **BS** = Back space (Delete character)

To start - Prepare the instrument

Before you use the instrument for the first time:

- Make sure that there is no damage to the instrument, and that there are no missing items.
- Remove the plastic film that protects the display. Use the tag (◗) in the top right-hand corner.
- Install the batteries (refer to B1). Then re-attach the cover.

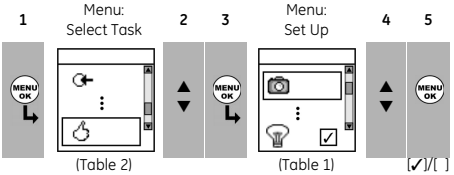
To start - Power on or off

To turn the instrument on or off, press ❍ (A1 - item [1]). The instrument does a self test and then shows the applicable data.

When the power is off, the last set of configuration options stays in memory. Refer to "Maintenance".

To start - Set up the basic operation

Use the *Set Up* menu to set up the basic operation of the instrument.



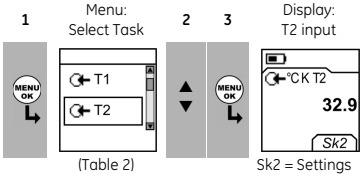
If there is additional data for a menu option, select *Settings* (■ ■) to see the values that are set up. If necessary, adjust the values.

Table 1: *Menu options - Set Up*

Options (If applicable)	**Description**
	To set up and use *the Snapshot* functions. *Additional data:* Refer to "Operation" (Table 4)
... Scale	To select the applicable international temperature scale: IPTS 68 or ITS 90.
CJ ...	To select the type of cold junction (CJ) compensation. *Automatic*: The instrument monitors the CJ temperature and applies the necessary CJ compensation. *Manual*: Measure the CJ temperature and set the applicable value. The instrument uses this value to apply the necessary CJ compensation. *Additional data (Manual): Select Settings* (■ ■)
	To select and set up the backlight facility + timer. *Additional data: Select Settings* (■ ■)
	To select and set up the power off facility + timer. *Additional data: Select Settings* (■ ■)
	To show the battery level (%).
	To set the display contrast (%). ▲ Increases %, ▼ decreases %
	To set the time + date. The calibration facility uses the date to give service and calibration messages. *Snapshot* adds a date/time stamp to each display.
	To set the language option.
	To calibrate the instrument. *Additional data: Refer to "Calibration".*
	To select and show the applicable status data. (Software Build, Calibration Due date, Serial Number, IDOS Information).

To start - Select a task (Measure)

When the instrument is set up (Table 1), use the *Select Task* menu to select the applicable task.



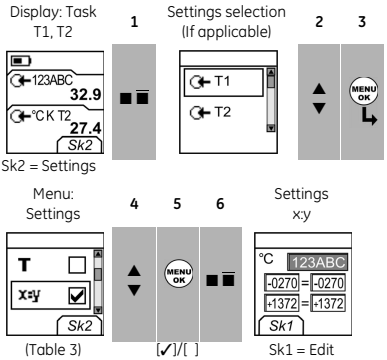
In Table 2, IDOS is a Universal Measurement Module (UMM). If you attach a UMM to the communications port (A1 - item [9]), the *Select Task* menu shows the applicable IDOS options.

Table 2: *Menu options - Select Task*

Options (If applicable)	**Description**
T1	Selects one temperature measurement task (T1, T2, T1-T2). T1-T2 gives the temperature difference.
	Selects two temperature measurement tasks (T1 and T2).
IDOS	*UMM only.* An IDOS measurement task.
	UMM only. Selects one temperature measurement task (T1, T2, T1-T2) + an IDOS measurement task.
IDOS	*UPM only.* Selects the IDOS pressure measurement task + leak test.
	To set up the way the instrument works. *Additional data: Refer to: Set Up* (Table 1).

To start - Set up the settings

When the task is set up (Table 2), use the *Settings* menu to adjust the measurement operation.



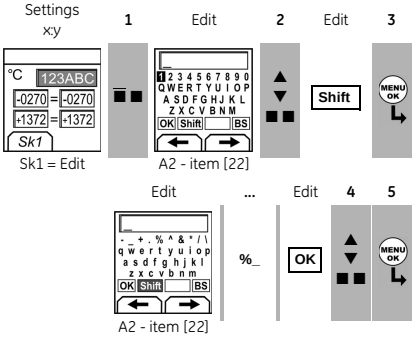
If there is additional data for a menu option, select *Settings* (■ ■) to see the values that are set up. If necessary, adjust the values. Refer to "Edit functions".

Table 3: *Menu options - Settings*

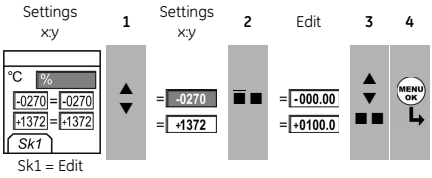
Options (If applicable)	**Description**
... Units	To select the temperature units (°C or °F).
	UPM only = "Pressure Units" if you select an IDOS task (Table 2). Select one of the fixed units of measurement (psi, mbar ...).
... type	To select an applicable thermocouple type (K, J, T ...)
▲▼	To include maximum, minimum and average values for the measurement task. Only available when there is one input measurement task.
T	To select and set up a tare value for the measurement task (a specified value or the reading on the display). The instrument subtracts a positive tare value, and adds a negative tare value. *Additional data: Select Settings* (■■)
x:y	To select and set up a scale of values: One local scale for each measurement task (Maximum: 5). *Additional data (Example 1/2): Select Settings* (■■)
	To select and set up the filter values to give a smoother output for the measurement task: Band as a % of full scale (FS). The filter compares each new value with the previous value. If the new value is outside the band, it is not filtered. Low pass filter time constant in seconds. Increase the value to increase damping factor. *Additional data: Select Settings* (■■)
	To select and set up the alarm values for the measurement task (maximum and minimum). *Additional data: Select Settings* (■■)
0.0	*UPM only.* Gage sensors or sensors with differential operation. A zero correction that makes the instrument read zero at local pressure.
	Leak Test only. To set an applicable period for the leak test (Hours:Minutes:Seconds).

To start - Edit functions

Example 1) Set up a label for *x:y Scaling* = %.



Example 2) Set up values for *x:y Scaling* = 0 to 100%.



Operation

This section gives examples of how to connect and use the instrument. Before you start:

- Read and understand the "Safety" section.
- Do not use a damaged instrument.

Operation - Thermocouple connections

Attach the thermocouple wires to the applicable thermocouple mini-connector (Figure 1). The wider blade is the negative.

Then attach the connector to the instrument.

Operation - Communications port connections

Use the communications port (A1 - item [9]) to attach an IDOS Universal Measurement Module (UMM) or an RS232 device.

IDOS Communications

When you attach the cable from a UMM (Figure 3/4), the instrument automatically changes the menus to give you all the applicable options (Table 2).

RS232 Communications

Use an RS232 cable (A1 - item [9a]) to transmit all the Snapshot data to a PC or a printer (Table 4).

Operation - Measure temperature

To measure temperature:

1. Connect the applicable thermocouples (Figure 1/2) and, if necessary, adjust the *Set Up* (Table 1).
2. Select a *Temperature* input task from *Select Task* (Table 2) and, if necessary, adjust the *Settings* (Table 3).

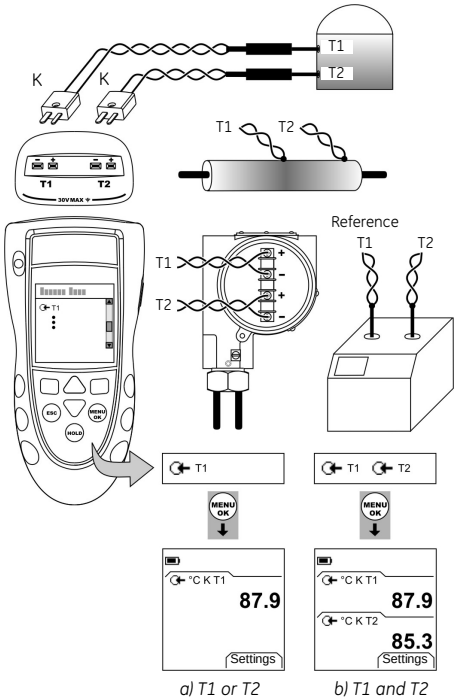


Figure 1: *Example configurations - To measure the temperature with one or two thermocouples*

The examples in Figure 1 show how to compare temperatures or measure different temperatures in a system.

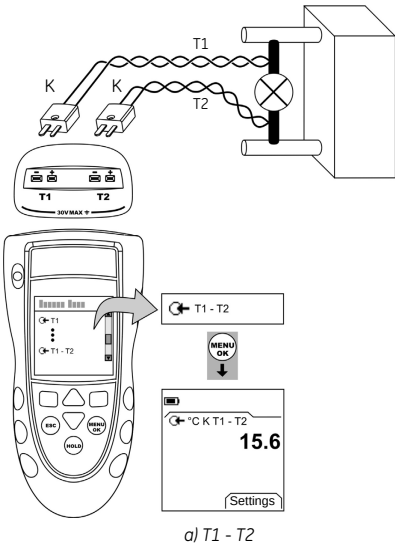


Figure 2: *Example configuration - To measure the temperature difference*

Operation - UPM Pressure measurements

Read all the instructions supplied with the UPM and then use the specified procedures to connect it (Figure 3/4).

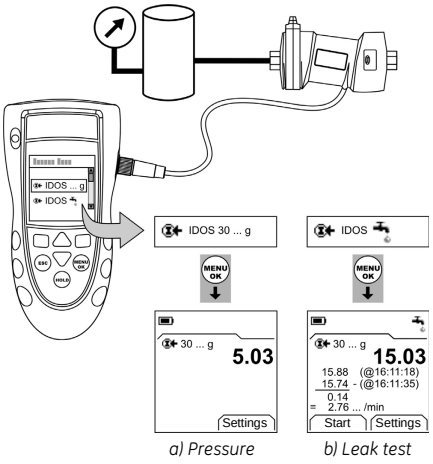


Figure 3: *Example configuration - Pressure measurement with a UPM*

When the connections are complete, make the necessary IDOS selections (Table 2).

If you re-attach a UPM, the instrument uses the same measurement units that you used before. The instrument keeps a record for the last 10 modules.

UPM - Measure the pressure

To measure the pressure (Figure 3):

1. Select the applicable pressure task from *Select Task* (Table 2) and, if necessary, adjust the *Set Up* (Table 1), and the *Settings* (Table 3).
2. If necessary, do a zero correction (Table 3).

To measure pressure with another operation (Figure 4), use the same procedure.

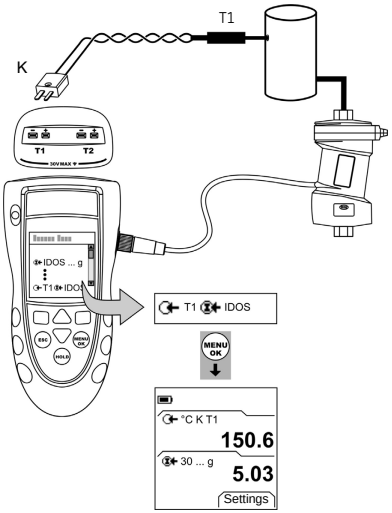


Figure 4: *Example configuration - To measure pressure and temperature*

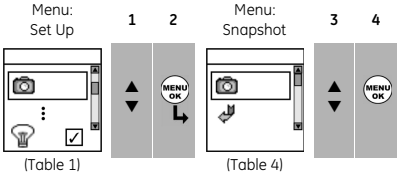
UPM - Leak test

To do a leak test on a pressure system (Figure 3):

1. Select an applicable leak test from *Select Task* (Table 2) and, if necessary, adjust the *Set Up* (Table 1), and the *Settings* (Table 3).
2. Set the period for the leak test (Table 3).
3. If necessary, do a zero correction (Table 3).
4. To start the leak test, select Start (■ ■). When the test is finished, the instrument calculates the leak rate in the applicable units/minute.

Operation - Use the Snapshot functions

Use *Snapshot* to record up to 1000 displays then examine the results on the display, or transmit all the data to a PC or printer (Figure 5).



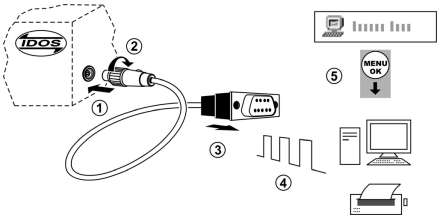
If there is additional data for a menu option, select *Settings* (■ ■) to see the values that are set up. If necessary, adjust the values.

Table 4: *Snapshot functions*

Options	Description
	Use *Snapshot Setup* to set up a *tag name* for the *Snapshot* file (refer to "To start - Edit functions") and to select the *Snapshot* method.
	Keypress: Use this option to record an individual display each time you press HOLD.
	Periodic: Use this option to record the displays at specified intervals of time. Press HOLD to start.
	Additional data: Select *Settings* (■ ■)
	Off - Snapshot is off
	To show the available *Snapshot* data on the display. Use these keys: ▲, ▼, MENU/OK
	To transmit all the *Snapshot* data to a PC or a printer (Figure 5).
	To erase all the *Snapshot* data.
	To show the amount of memory used (%). Total memory = 12 288 bytes Capacity ≈ 1000 displays (one measurement) Capacity ≈ 750 displays (two measurements)
	Example: One file ≈ 96 bytes (no *Settings*) For each display in the file: Date/Time = 8 bytes; Each value = 4 bytes One display (One measurement) = 12 bytes

Snapshot - Use the Snapshot data

Use HOLD to record the data (Table 4). When you have sufficient records, select *Stop Log* (■ ■). You can then read the data back on the display or transmit it to a PC or printer.



Step	Procedure
①, ②	A1 - Item 1b (Optional): Connect the 5-pin connector to the IDOS instrument.
③	A1 - Item 1b (Optional): Connect the 9-pin connector to the serial port on the PC or to a serial printer (refer to the PC or printer instructions).
④	*PC*: Make sure that Windows® HyperTerminal or similar program is set up to use the specified data format (refer to your PC on-line Help).
	Serial printer: Make sure that the printer can use the specified data format.
	Data format Baud rate: 19200 Data bits: 8 Parity: None Stop bits: 1 Software handshake: Xon/Xoff Flow Control. ASCII format text; Comma delimited
	ASCII Setup: Make sure that the *ASCII Receiving* option is set to "Append line feeds to incoming line ends"
⑤	Transmit the data to the PC or printer (Table 4).
	PC: Use Windows® HyperTerminal or a similar program to make a text file. You can then import the text file into a spreadsheet.

Figure 5: *Procedure to transmit the Snapshot data*

Snapshot - Contents of the Snapshot data

Model	820		**(English text only)**
Serial No	8200000001		
Calibration due	01/01/2004		
Tag	H2O-1		
Task Id	110		
T1 in			
Date	Time	°C K T1	
08/07/2004	12:06:44	27.6	
08/07/2004	12:06:46	27.2	
Tag	B145		
Task Id	164		
T1 In	Tare On		
T2 In	Filter On	Tare On	
Date	Time	°C K T1	°C K T2
08/07/2004	14:41:36	32.5	32.4
08/07/2004	14:41:38	32.5	32.4
08/07/2004	14:41:41	32.4	32.5

Figure 6: *Example Snapshot data*

Operation - Error indications

If the display shows <<<< or >>>> :

- Make sure that the range is correct.
- Make sure that all the related equipment and connections are serviceable.

Maintenance

This section gives procedures to maintain the unit in a good condition. Return the instrument to the manufacturer or an approved service agent for all repairs.

Do not dispose of this product as household waste. Use an approved organisation that collects and/or recycles waste electrical and electronic equipment.

For more information, contact one of these:

- our customer service department: (Contact us at www.gesensing.com)
- your local government office.

Maintenance - Clean the unit

Clean the case with a moist, lint-free cloth and a weak detergent. Do not use solvents or abrasive materials.

Maintenance - Replace the batteries **B1**

To replace the batteries, refer to B1. Then re-attach the cover.

Make sure that the time and date are correct. The calibration facility uses the date to give service and calibration messages.

All the other configuration options stay in memory.

Calibration

Note: GE can provide a calibration service that is traceable to international standards.

We recommend that you return the instrument to the manufacturer or an approved service agent for calibration.

If you use an alternative calibration facility, make sure that it uses these standards.

Calibration - Before you start

To do an accurate calibration, you must have:

- the calibration equipment specified in Table 5.
- a stable temperature environment: 70 ± 2°F (21 ± 1°C)

Table 5: *Calibration equipment*

Function	Calibration equipment
mV	mV calibrator. Accuracy: Refer to Table 7.
CJ	- Standard RTD probe Accuracy: 50 mK for 23 ... 82.4°F (-5 ... 28°C) - Digital thermometer Accuracy: 10 mK
Pressure	UPM only. Refer to the user manual for the IDOS UPM.

Before you start the calibration, make sure that the time and date on the instrument are correct (Table 1).

Selection sequence:

➤ *Select Task* (Table 2) ➤ *Set Up* (Table 1) ➤ *Calibration* ➤

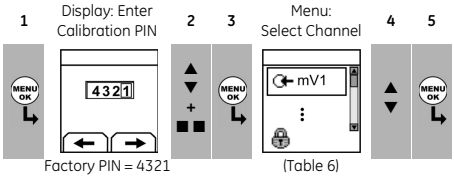


Table 6: *Calibration options*

Options	Description
mV ...	To calibrate the specified thermocouple channel.
CJ ...	To calibrate the specified cold junction channel.
IDOS ...	UMM only. To calibrate the specified IDOS UMM. Refer to the user manual for the IDOS UMM.
	Calibration Due: To set the date of the next calibration for the instrument. After the specified calibration date, there is a warning message. There is a selection box to stop the warning.
	To change the calibration PIN (Personal Identification Number).

When you select a channel, the display shows the applicable instructions to complete the calibration.

When the calibration is complete, select *Calibration Due* and set the new calibration date for the instrument.

Calibration - Procedures (mV input)

1. Connect the instrument to the calibration equipment: mV input = Figure 1
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Table 6) to do the calibration: mV input = three-point calibration (-FS, Zero and +FS).

Note: mV range = -10 ... 100 mV

4. To make sure that the calibration is correct, set up an applicable T1/T2 input task (Figure 1).
5. Apply a range of mV values that are applicable to the specified thermocouple (Table 7).
6. Make sure that the error is in the specified limits: use the applicable values from Table 7 and the reference table for the thermocouple.

Table 7: *mV input error limits*

Input (mV)	**Calibrator error (mV)** mV	**Permitted DPI 820 error (mV)** mV
±5	0.0004	0.009
0	-	0.008
10	0.0005	0.010
20	0.0006	0.011
50	0.0008	0.016
75	0.0010	0.018

Calibration - Procedures (CJ input)

1. Connect the instrument to the calibration equipment (Figure 1).
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Table 6) to do a one-point calibration (+FS). The display shows the applicable instructions to complete the calibration.
4. To make sure that the calibration is correct, select the applicable T1/T2 input task (Table 2).
5. Make sure that the DPI 820 gives a probe temperature that agrees with the temperature on the digital thermometer ±0.2°F (0.1°C).

Calibration - Procedures (IDOS UMM)

Refer to the user manual for the IDOS UMM.

When the calibration is complete, the instrument automatically sets a new calibration date in the UMM.

Specification data

All accuracy statements are for one year.

Specification - General

Languages	English [Default]
Operating temperature	14 ... 122°F (-10 ... 50°C)
Storage temperature	-4 ... 158°F (-20 ... 70°C)
Humidity	0 to 90% without condensation (Def Stan 66-31, 8.6 cat III)
Shock/Vibration	BS EN 61010:2001; Def Stan 66-31, 8.4 cat III
EMC	BS EN 61326-1:1998 + A2:2001
Safety	Electrical - BS EN 61010:2001; CE Marked
Size (L: W: H)	7.1 x 3.3 x 2.0 in (180 x 85 x 50 mm)
Weight	14 oz (400 g)
Power supply	3 x AA alkaline batteries
Duration (Measure)	T1, T2: ≈ 70 hours

Specification - Temperature ranges

Thermocouple type	Standard	Range °F	Range °C	Accuracy °F *	Accuracy °C *
K	IEC 584	-454 .... -328	-270 .... -200	3.6	2.0
K	IEC 584	-328 ... 2502	-200 ... 1372	1.1	0.6
J	IEC 584	-346 ... 2192	-210 ... 1200	0.9	0.5
T	IEC 584	-454 .... -292	-270 .... -180	2.5	1.4
T	IEC 584	-292 ..... -94	-180 ..... -70	0.9	0.5
T	IEC 584	-94 752	-70 400	0.6	0.3
B	IEC 584	122 932	50 500	9.4	5.2
B	IEC 584	932 ... 2192	500 ... 1200	3.6	2.0
B	IEC 584	2192 ... 3308	1200 ... 1820	2.2	1.2
R	IEC 584	-58 32	-50 0	5.4	3.0
R	IEC 584	32 572	0 300	3.6	2.0
R	IEC 584	572 ... 3214	300 ... 1768	1.8	1.0
S	IEC 584	-58 32	-50 0	4.5	2.5
S	IEC 584	32 212	0 100	3.4	1.9
S	IEC 584	212 ... 3214	100 ... 1768	2.5	1.4
E	IEC 584	-454 .... -238	-270 .... -150	1.6	0.9
E	IEC 584	-238 ... 1832	-150 ... 1000	0.7	0.4
N	IEC 584	-454 ..... -4	-270 ..... -20	1.8	1.0
N	IEC 584	-4 ... 2372	-20 ... 1300	1.1	0.6
L	DIN 43710	-328 ... 1652	-200 900	0.6	0.3
U	DIN 43710	-328 212	-200 100	0.9	0.5
U	DIN 43710	212 ... 1112	100 600	0.6	0.3
C		32 ... 2732	0 ... 1500	1.8	1.0
C		2732 ... 3632	1500 ... 2000	2.5	1.4
C		3632 ... 4208	2000 ... 2320	3.4	1.9
D		32 ... 3092	0 ... 1700	1.8	1.0
D		3092 ... 3992	1700 ... 2200	2.9	1.6
D		3992 ... 4514	2200 ... 2490	6.5	3.6
ХА (K) **		-454 ... 2502	-270 ... 1372	-	0.6 ***
ЖК (J) **		-346 ... 2192	-210 ... 1200	-	0.5 ***
МК (T) **		-454 752	-270 400	-	0.3 ***
ПР (B) **		122 ... 3308	50 ... 1820	-	1.2 ***
ПП (S) **		-58 ... 3214	-50 ... 1768	-	1.4 ***
ХК (E) **		-454 ... 1832	-270 ... 1000	-	0.4 ***
ВР-1 **	ГОСТ 50431-92	32 ... 4532	0 ... 2500	-	2.5 ***
ХК(r) / ХК(рус) **	ГОСТ 50431	-328 ... 1472	-200 800	-	0.25 ***

* Mid-point value for the specified range. To calculate the actual error at a specified temperature, use the mV specification and the reference table for the applicable thermocouple.

** Only available with Russian versions of the DPI 820. *** Best accuracy for the range.

Cold Junction (CJ) error (Maximum):

Range 50° ... 86°F (10 ... 30°C) = 0.4°F (0.2°C)

Add 0.01° CJ error / ° ambient temperature change for ranges: 14 ... 50°F, 86 ... 122°F (-10 ... 10°C, 30 ... 50°C)

Specification - mV range

Range (mV)	Impedance	Accuracy
-10 ... 100	< 0.2 Ω	0.02% of reading + 0.01% FS