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DPI 620-IS

Advanced Modular Calibrator

User Manual

K0460

Amendment Record

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GE
Measurement & Control Systems

Druck DPI 620-IS

advanced modular calibrator

user manual - K0460

Quick reference data

A1.1 DPI 620-IS: Channel 1 (CH1)

Measure (M) / Source (S) / Power (P)	
±30 V (M)	±55 mA (M)
0 to 12 V (S)	0 to 24 mA (S)
±2000 mV (M) 0 to 2000 mV (S)	8 RTDs (M/S): Pt1000, Pt500, Pt200, Pt100(385), Pt50, D 100, Ni 100, Ni 120
0 to 4000 Ω (M/S)	12 Thermocouples (M/S): K, J, T, B, R, S, E, N, L, U, C, D
0 to 5 kHz (M/S)	
Switch (M)	
Pulse counting and sourcing up to 5k.	

A1.2 DPI 620-IS: Channel 2 (CH2)

±30 V (M)	0 to 20 mA (S)
±2000 mV (M)	24 V nominal; maximum: 20 mA
±55 mA (M)	Switch (M)

A1.3 DPI 620-IS + MC 620-IS + PM 620-IS

Pressure* (M)	
Gauge: 25 mbar to 200 bar (0.36 to 3000 psi). Absolute: 350 mbar to 1000 bar (5 to 15000 psi). ***Note:*** *Maximum pneumatic pressure: 500 bar (7250 psi).*	

Caution: To prevent damage to the PM 620-IS module, only use it within the specified pressure limit on the label.

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HART® is a registered trademark of the HART Communications Foundation.

All product names are trademarks of their respect ive companies.

Safety

Before using the instrument, read and understand all the related data. This includes: the applicable local safety procedures, this publication, and the instructions for any accessories/options/equipment.

General warnings

⚠ WARNING ⚠

- **It is dangerous to ignore the specified limits for the instrument or its related accessories. Do not use the instrument or accessory if it is not in its normal condition. Use the applicable protection and obey all safety precautions.**

Electrical warnings

- **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).**
- **This instrument uses a Ni-MH battery pack. To prevent an explosion or fire, do not short circuit, do not disassemble, keep it safe from damage. For operating conditions, see Table 11-1.**
- **To prevent battery leakage or heat generation, only use the battery charger and power supply in the temperature range 0 to 40°C (32 to 104°F). For operating conditions, see Table 11-1.**
- **To make sure the display shows the correct data, disconnect the test leads before setting the power to on or change to another measure or source function.**

Pressure warnings

When using a pressure option with the DPI 620-IS calibrator, these warnings are also applicable:

- **Some liquid and gas mixtures are dangerous. This includes mixtures that occur because of contamination. Make sure that the equipment is safe to use with the necessary media.**
- **Pressurized gases and fluids are dangerous. Before connecting or disconnecting pressure equipment, safely release all the pressure.**
- **To prevent a dangerous release of pressure, make sure that all the related pipes, hoses and equipment have the correct pressure rating, are safe to use and are correctly attached.**

- **It is dangerous to attach an external source of pressure to a PM 620-IS series pressure station. Use only the specified mechanisms to set and control the pressure in the pressure station.**

Cautions

To prevent damage to the display, do not use sharp objects on the touch-screen.

To prevent damage to the PM 620-IS module, only use it within the specified pressure limit on the label.

Before starting an operation or procedure in this publication, the user must have the necessary skills (if necessary, with qualifications from an approved training establishment). Follow good engineering practice at all times.

Marks and symbols on the instrument

CE	Complies with European Union directives		Warning - refer to the manual
	Read the manual		USB port: Mini type B connector
	Ground (Earth)		ON/OFF
	Do not dispose of this product as household waste. Refer to Chapter 9 (Maintenance procedures).		
More marks and symbols are specified in this manual: electrical marks, display symbols (Chapter 1); pressure related marks and symbols (Chapter 4).			

Overview

DPI 620-IS

MC 620-IS

PM 620-IS

Pressure calibrator

The intrinsically safe, advanced modular calibrator (AMC) is part of a set of hand-held modules that can be quickly put together to include a wide range of calibrator functions.

Advanced modular calibrator, DPI 620-IS (this user manual): This is a battery-powered instrument for electrical measure and source operations and HART® communications; see Table A1 (front cover). It also supplies the power and user interface functions for all the add-on modules. Use the touch-screen to display up to six different parameters.

Pressure module carrier, MC 620-IS (this user manual): This attaches to the DPI 620-IS calibrator to make a fully integrated pressure indicator instrument. To measure and display pneumatic or hydraulic pressures, up to two interchangeable pressure modules can be used at a time. *When not in use fit blanking device (part number 191-369).*

Pressure modules, PM 620-IS (this user manual): *Optional item.* These modules attach to the pressure module carrier (MC 620-IS) or to a pressure station (PV 62x-IS) to give the DPI 620-IS calibrator the necessary pressure measurement functionality. They are fully interchangeable “plug and play” modules with no initial set-up or user calibration.

Pressure stations, PV 62x-IS (user manual - K0462: *Optional item.* To make a fully integrated pressure calibrator, attach the DPI 620-IS calibrator to one of the three pressure stations:

- two pneumatic pressure stations gives an accurate and controlled pressure and vacuum conditions:

  PV 621-IS: -950 mbar to 20 bar (-13.5 to 300 psi) version
  PV 622-IS: -950 mbar to 100 bar (-13.5 to 1500 psi) version

- one hydraulic pressure station gives an accurate and controlled hydraulic pressure conditions:

  PV 623-IS: 0 to 1000 bar (15000 psi)

The advanced modular calibrator (AMC-IS) and the pressure module (PM 620-IS) are part of a set of hand-held modules that can be quickly put together to include a wide range of calibrator functions.

To give the attached equipment overpressure protection, there are pressure relief valves (PRV) available for all the pressure stations.

Software (this user manual): The DPI 620-IS calibrator includes the following software:

- documenting software • HART® communications software

Other accessories and options: For part numbers (P/N), refer to Section 1.4 (Accessories).

Summary of functions

This table gives a summary of the available functions with the DPI 620-IS calibrator.

DPI 620-IS - Calibrator functions

Function
Easy to read, Active Matrix Organic Light Emitting Diode Display in colour.
No keys: the touch-screen has large buttons for finger operation.
Rechargeable NiMH battery with enhanced power control for prolonged battery life.
* Measure current (mA), voltage (Volts/mV), frequency (Hz/pulse count).
* Supply current (mA), voltage (Volts/mV), frequency (Hz/pulse count).
* Measure/simulate: - a Resistance Temperature Detector (RTD): Ω or °C/°F - a thermocouple (TC): mV or °C/°F - a resistor (Ω)
Cold Junction (CJ) compensation: Automatic/Manual.
Step/Ramp functions: Automatic/Manual.
Switch test and condition indicator (open/closed).
Language selection (see Section 2.8 (Menu sequence)).
Universal Serial Bus (USB) communications ports: For computer communications, external modules.
† Windows® CE operating system.
** Measure pressure/Leak test: See pressure accessories.
Documenting software to give an analysis of a device calibration.
Set-up function to save and recall personal settings, instrument calibration settings and other standard instrument operations.

DPI 620-IS - Calibrator functions (Continued)

Function
HART® (Highway Addressable Remote Transducer) communications software to set up and calibrate devices that use the HART field communications protocol.
Other functions: Hold, maximum/minimum/average, filter, tare, adjustable backlight, alarm indication (on the display), automatic power off.

** Refer to the datasheet*
*** Optional item*
† Factory configured

About this manual

This user manual is set up for use on a computer or similar device that has the necessary software to read a Portable Document Format (PDF) file.

It is supplied as a PDF on a compact disc (CD) but can be copied or saved onto a computer or similar device that has the necessary PDF software.

To navigate between related items of information, the user manual includes cross references and links (shown in blue); for example:

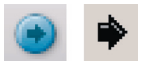
- text cross references: ... Figure 1-1; Table 11-1; Chapter 1; Section 1.4 (Accessories)

Note: *Moving the PDF software cursor over an item that has a link, the cursor symbol normally changes.*

Click on a link, and the PDF software shows the applicable page. To help navigate through the links use, the PDF software which usually includes these buttons:

Example buttons:

Previous view: To go back to a previous page selection.



Next view: In a sequence of page selections, this moves forward to the next page.

Note: *Different software versions have different buttons. In some versions, it is also necessary to set up the "View" to include these "Tools" in the "Page Navigation Toolbar"; refer to the PDF software documentation.*

Table of Contents

Chapter 6: Datalog operation

Chapter 7: Documenting functions

Chapter 8: HART® device operations

Chapter 9: Maintenance procedures

Chapter 10: Calibration procedures

Chapter 1: Instrument parts, accessories and options

1.1 Introduction

This chapter gives a description of the different parts of the instrument and the accessories/options available.

1.2 The instrument

Figure 1-1: *General view of the instrument*

1.	⏻	On or off button. Refer to “Quick Reference”.
2.	CH1	Connectors for Channel 1
	CH2	Connectors channel 2
3.	USB	Connector.
4.		Display screen.

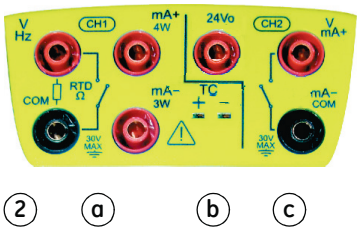


Figure 1-2: *CH1/CH2 connections*

2a	Channel 1 (CH1) connectors for: **V:** volts/mV DC; **Hz:** frequency and counts/min, counts/hour (cpm/cph); **Ω:** resistance; **RTD:** 2-wire, 3-wire (3W), 4-wire (4W) resistance temperature detectors; **:** switch operation; **mA+, mA-:** current. Refer to Chapter 3 (Electrical operations).
2b	Channel 1 (CH1) connectors for thermocouples (**TC**). Refer to Chapter 3.
2c	Isolated channel 2 (CH2) connectors for: **V:** volts/mV DC; **mA+, mA-:** current; **24Vo:** 24V loop power supply; **:** switch operation; refer to Chapter 3. For HART connections, refer to Chapter 8.

Figure 1-3: *The USB connector*

3.	: USB mini Type B connector for communication with a computer.

Figure 1-4: *Bottom view (cover attached)*

5.	Cover for the USB connector (Figure 1-3). For IP65, press it fully into the recess over the connectors.
6.	Two connection points to attach the pressure module carrier (MC 620-IS); refer to Chapter 4 (Pressure indicator operation (MC 620-IS)).
7.	Electrical connections for the pressure module carrier (MC 620-IS) or a pressure station (PV 62x-IS).
8.	Label: *model*, *date of manufacture* (DoM: month/year), *serial number* (S/N); *manufacturer*: name, address, website
9.	Compartment cover for the battery.

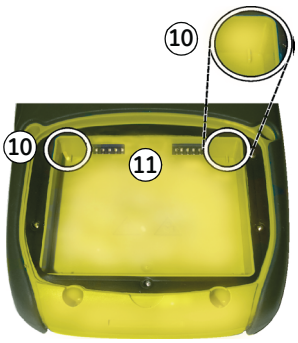


Figure 1-5: *Bottom view (cover/battery removed)*

10.	Two position guides for the battery. Refer to Section 2.5.2 (Install the battery).
11.	Electrical connections for the battery.

1.3 The display

This is a OLED with a colour display with a touch-screen. To make a selection, lightly tap on the applicable display area with a finger; see Section 2.7 (Display operation).

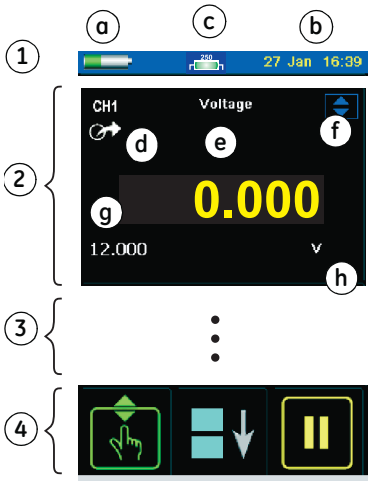


Figure 1-6: *Example display*

1.	Status bar: This includes: **a.** Battery indicator **b.** Date and time c. Indicators for a *Pressure* connection, a *HART* protocol resistor, *Datalog* and wireless operation; for example: P : Pressure; 250 : HART
2.	CH1: Window for the channel 1 settings and values; see Section 2.8.1. **d.** Measure or source indication: : Measure; : Source **e.** Function (voltage, current, pressure ...) **f.** Source process indicator; for example: : Nudge; : Span check; : Ramp **g.** Full scale (FS) range **h.** Function units
3.	Other windows: The number of windows seen on the display is set by the number of task selections and external modules you are working with (maximum: 6); see Section 2.7.
4.	Tap this button to set up the *Task*, set up the instrument (*Configure*) and to access Help (?). see Section 2.8 (Menu sequence). 
5.	Tap this button to maximise each of the available windows in sequence; see Section 2.7.4 
6.	*Pause* (**II**) or *Play* (▶): Tap (**II**) to hold (freeze) all the data on the display. To release the display and continue, tap (▶).

1.4 Accessories

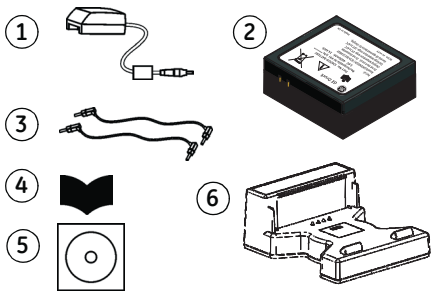


Figure 1-7: *Accessories included*

1.	IO620IS-CHARGER
2.	IO620-IS BATTERY. Ni-MH battery
3.	209-539. Set of six electrical test leads
4.	K0461. Safety and quick reference guide
5.	UD-0004. CD with the user manual
6.	IO620IS CRADLE

7.	IO620-CASE-1. Fabric carry case with a belt loop, shoulder strap and a large pocket for accessories. It can hold one DPI 620-IS calibrator.
8.	IO620-CASE-2. Fabric carry case. It can hold a set of units: one DPI 620-IS calibrator; one MC 620-IS module carrier; PM 620-IS modules and related accessories.
9.	IO620-USB-PC. USB mini Type B cable to connect the DPI 620-IS calibrator to a computer.
10.	IO620-FIELD-CAL. Intecal field calibration manager. Use the documenting functions in the calibrator with elements of the Intecal database; set-up new device records and procedures; upload Intecal data to your computer database.
11.	Pressure modules (PM 620-IS); refer to the datasheet.
12.	Pneumatic hose kit rated to 400 bar (5800 psi) with “Quick fit” connectors for the test port. IO620-HOSE-P1-IS: 1 metre (≈ 39”) IO620-HOSE-P2-IS: 2 metre (≈ 78”)
13.	Hydraulic hose kit rated to 1000 bar (15000 psi) with “Quick fit” connectors for the test port. IO620-HOSE-H1-IS: 1 metre (≈ 39”) IO620-HOSE-H2-IS: 2 metre (≈ 78”)
14.	Pressure adaptor sets designed for the MC 620-IS, PV 62x-IS and the hose kits: IO620-BSP: G1/8, G1/4 male; G1/4, G3/8 and G½ female IO620-NPT: 1/8NPT, ¼NPT male, ¼NPT, 3/8NPT, and ½NPT female IO620-MET: M14 x 1.5 and M20 x 1.5 female

Chapter 2: Prepare the instrument

2.1 Introduction

This chapter gives a description of these items:

- the initial checks and procedures
- the available power options
- the battery and related procedures (install and charge)
- the start-up procedures
- the menu structure and options
- the *Process* and *Automation* options available for the measure and source ()functions

2.2 Initial checks

Before using the instrument for the first time:

- Make sure that there is no damage to the instrument, and that there are no parts missing; see Figure 1-7.
- Remove the plastic film that protects the display. Use the tag (◗) in the top right-hand corner.

2.3 Initial procedures

Before using the instrument for the first time, complete these procedures:

- Charge the battery (Section 2.5.3).
- Install the fully-charged battery (Section 2.5.2). Then refit the cover.
- To make sure that the calibration schedule works correctly, set the date and time; see Section 2.8 (Menu sequence).

2.4 Power supply

This instrument is battery powered:

Ni-MH battery (Section 2.5): All the instrument functions are available with a fully-charged battery.

2.5 The battery

⚠ WARNING ⚠

- **This instrument uses the GE specified, Ni-MH battery pack. To prevent an explosion or fire, do not short circuit, do not disassemble, keep it safe from damage. For operating conditions, see Table 11-1.**
- **Charge the GE specified battery in a safe area, using the GE supplied charger and cradle.**
- **To prevent battery leakage or heat generation, only use the battery charger and cradle in the temperature range 0 to 40°C (32 to 104°F). For operating conditions, see Table 11-1.**

For a full battery specification, refer to Table 11-1.

2.5.1 Battery condition

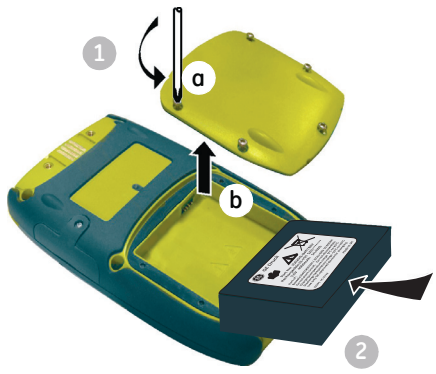
On receipt of a new DPI 620-IS calibrator, the battery will be partly-charged. We recommend that it is fully-charged (Section 2.5.3).

Charge indications

After switching on, the battery symbol at the top of the display shows the charge condition in 10% increments.

To get an accurate indication (1% increments), use the *Configuration* menu; see Section 2.8.2 (Procedure to see the instrument status).

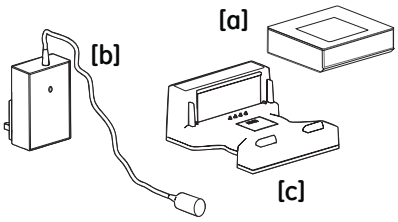
2.5.2 Install the battery



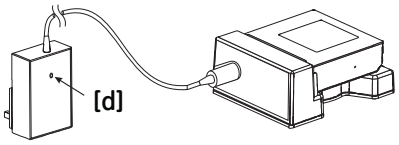
Step	Procedure
1.	When the power is off, loosen the five screws (a) and remove the cover (b).
	If necessary, turn the instrument over and collect the discharged battery. If the battery does not hold a charge, discard it safely. Obey all the local health and safety procedures.
2.	Install the new fully-charged battery in the compartment.
3.	Refit the cover.

2.5.3 Charge the battery

Fully-charge the battery, using the charger and cradle, in a safe area.



- The battery pack **[a]** (part number: IO620IS – Battery) will be partly-charged, it is recommended to fully charge the battery pack before using the instrument:



- Connect the charger **[b]** (part number: IO620IS-Charger) to a power supply.
- Connect the charger to the cradle **[c]** (part number: IO620IS-Cradle).
- Correctly insert the battery into the cradle (making sure the battery pack label faces upwards).
- The battery charger LED **[d]** indicates the different charge states. When the LED shows green the battery pack is fully-charged and ready to use. The battery pack takes approximately 8 hours to fully charge.

2.5.4 Charge times

Charge method	Charge time (to full capacity)
External battery charger	≈ 6.5 hours

During the charge cycle the charger LED indicator changes colour:

LED Indicator	Mode
Yellow	Battery not connected
Yellow	Battery initialisation and analysis
Orange	Fast charge
Green with intermittent yellow flash	Top-off charge
Green	Trickle charge
Alternating orange - green	Error

2.5.5 Operating time

Operation	Battery duration
Continuous operation (measure)	> 10 hours
Continuous operation (measure and source with loop power on)	> 6 hours

These are typical operating times for a new, fully-charged Ni-MH battery pack with these settings:

- *Backlight Intensity* set to 80% (Default: 80%).
- *Backlight Timeout* set to 2 hours (Default: 2 minutes).

Power save options

To get the best battery duration, set a low value for the *Backlight Intensity* (40%) and a short *Timeout*; see Section 2.8.1 (Procedure to set the basic operations:).

2.6 Power on or off

To set the instrument power on, press and hold this button down until the display comes on (≈ 2 seconds). During the power on sequence, the instrument shows a timer and then shows the applicable data.

To set the instrument power off, press and hold this button. When the power is off, the last set of configuration options stays in memory.

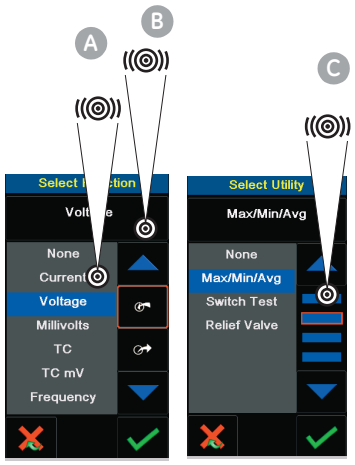
2.7 Display operation

This instrument has a touch-screen. To make a selection, lightly tap on the applicable display area (window, button, option) with a finger.

Caution: To prevent damage to the display, do not use sharp objects on the touch-screen.

The number of windows shown on the display is set by the number of task selections and external modules enabled (maximum: 6); see Section 2.8.3 (Procedures to make Task selections).

2.7.1 Change items in a list



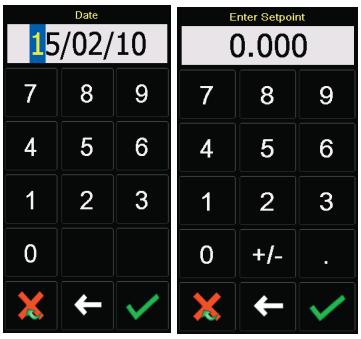
To change an item in a list, you have these options:

- tap on the item you want to use (A).
- tap on the ▲ or ▼ button (B).
- tap on one of the horizontal bars beside the list (C) (if applicable).

Accept: To accept the selection and go back to the previous display, tap this button. If necessary, tap this button on all subsequent displays until you get back to the start.

Cancel: To cancel the selection and go back to the previous display, tap this button

2.7.2 Change numeric values



There are numeric key-pad displays for these items:

- dates and times
- set-point values
- source *Automation* processes (*Nudge*, *Span Check*, ...)
- calibration and other processes

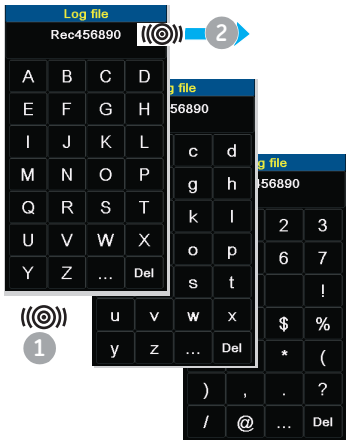
Tap in the necessary value on the key-pad. If applicable, the key-pad includes the buttons for +/- and decimal point.

Backspace: To go back one character, tap this button. If it is not a date or time, it deletes the character.

Accept: To accept the specified value and go back to the previous display, tap this button.

Cancel: To cancel the specified value and go back to the previous display, tap this button.

2.7.3 Enter text



There are alphanumeric key-pad displays for these items:

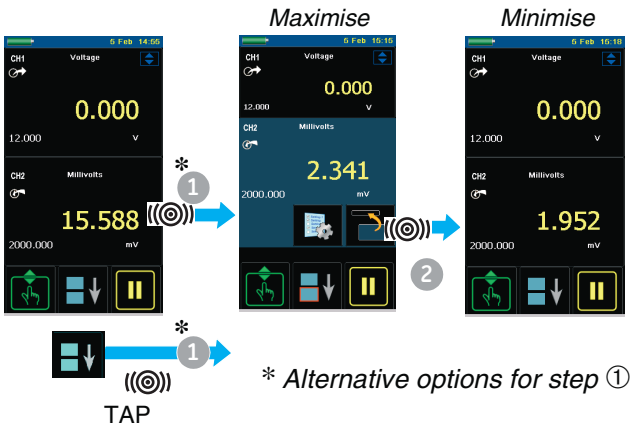
- Captions; see Section 2.8.4 (maximum: 15 characters; all characters permitted)
- Filenames (maximum: 10 characters; no special characters)

1. Tap in the applicable characters.
2. To accept the data and go back to the previous display, tap on the completed text in the data entry box.

…	*Next key-pad*: To use characters on the next key-pad (upper case > lower case > numeric), tap this button.
Del	*Delete*: To delete the last character in the data entry box, tap this button.
Esc	*Escape*: If there are no characters in the data entry box, the *Esc* button replaces the *Del* button. To leave the key-pad and go back to the previous display, tap on the *Esc* button.

2.7.4 Maximise/minimise a window

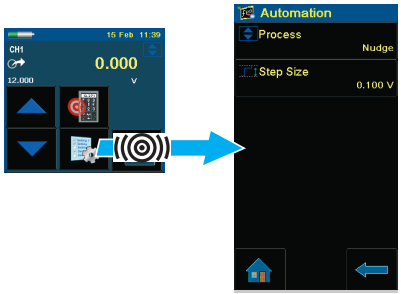
There can be up to 6 functions on the display. To set a *Process* (measure operations), an *Automation* option (source operations), or other *Settings* maximise the applicable function:



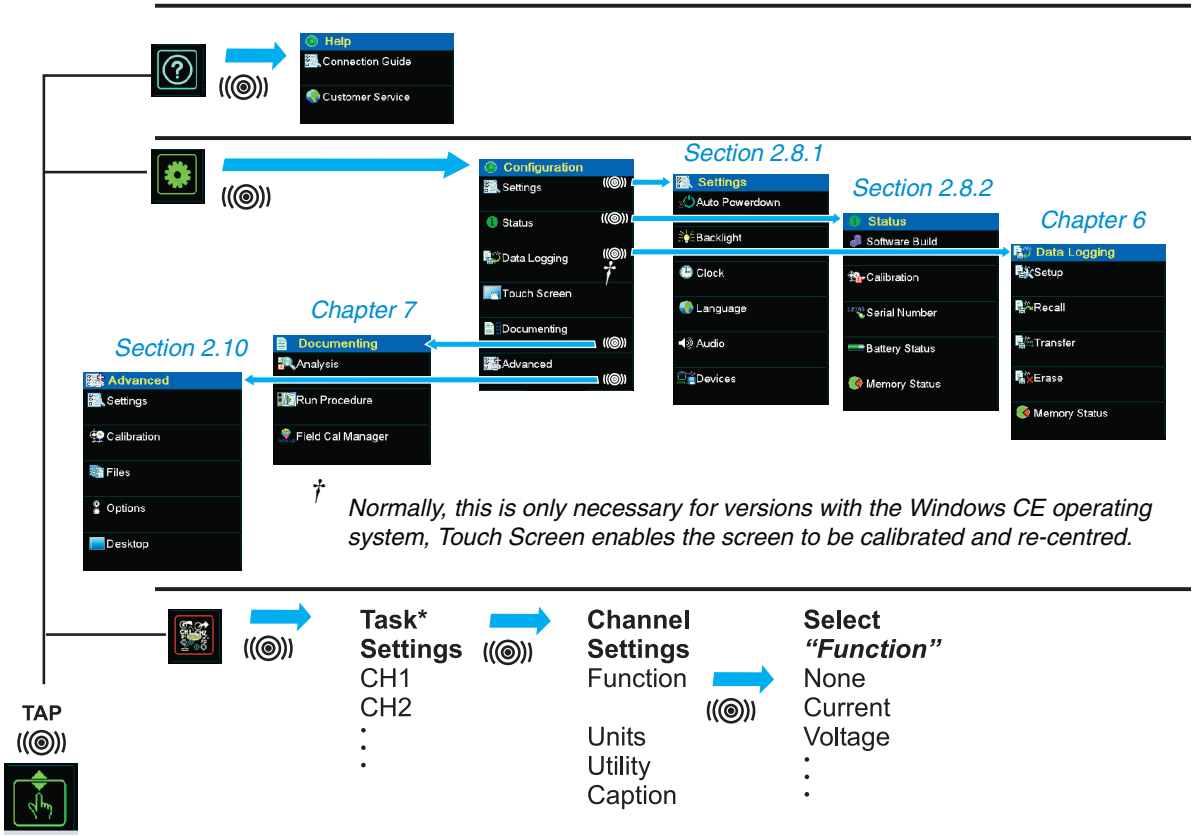
* *Alternative options for step ①*

Processes (measure operations)

Automation (source operations)

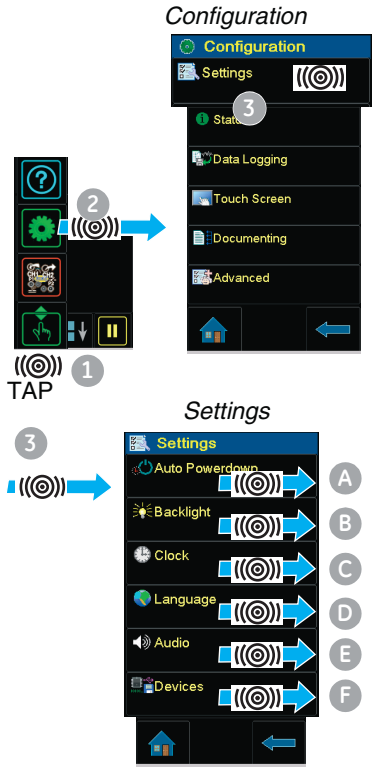


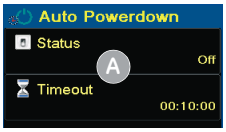
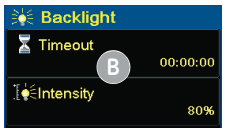
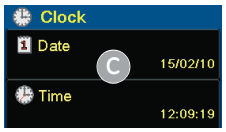
2.8 Menu sequence



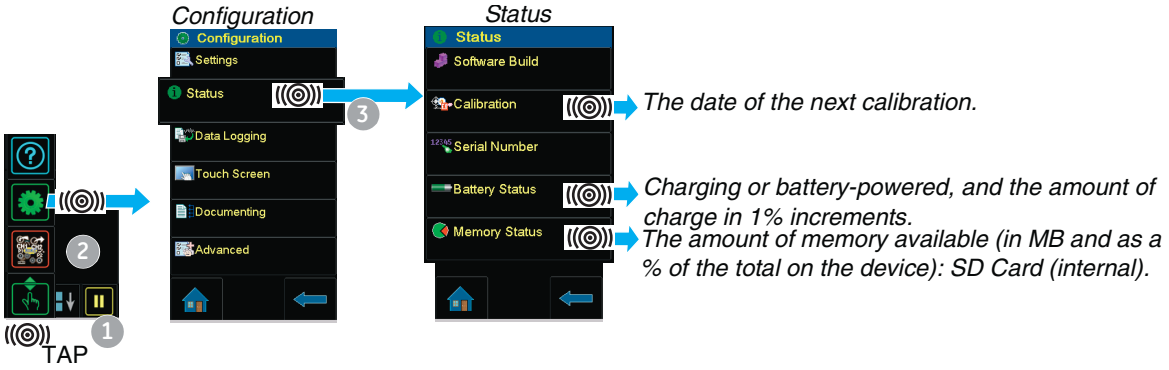
* A channel can only have one function at a time.

2.8.1 Procedure to set the basic operations:

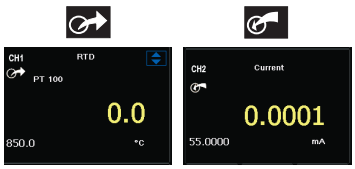


Description
 Sets the power off automatically after the specified *Timeout* period. To save the battery power, set this to *On*. *Status*: On or Off *Timeout*: 00:02:00 to 01:00:00 hours:minutes:seconds (hh:mm:ss)
 Sets the backlight. Low values save battery power; see Section 2.5.5 (Operating time). *Timeout*: 00:02:00 to 02:00:00 hours:minutes:seconds (hh:mm:ss) *Intensity*: 20, 40, 60, 80, 100%
 Sets the date and time. The calibration function uses this to give calibration messages. *D*ate: day/month/year (dd/mm/yy) OR month/day/year (mm/dd/yy). The format is factory configured. *Time*: 24 hour; hours:minutes:seconds (hh:mm:ss)
 Sets the language. *Selected*: English (Other languages to be released).
 Sets the communications using the USB port. *Communications*: *Storage device, communications, active sync.*

2.8.2 Procedure to see the instrument status



2.8.3 Procedures to make Task selections



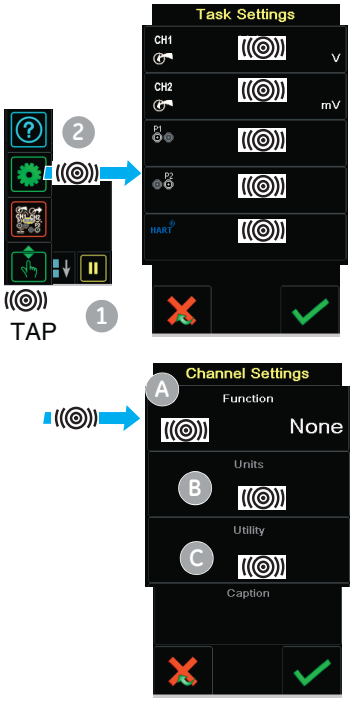
CH1: source *CH2: measure*

When first using the calibrator, there are default measure and source functions on the display:

- CH1 settings: RTD source, RTD type is PT100, scale is °C; Automation is *Nudge*; see Chapter 3.
- CH2 settings: Current measure, see Chapter 3.

Procedure Overview

Use the *Task* menu to complete these procedures:



- Set the calibrator functions on the display: item A ; see Section 2.8.4.

  a. CH1: Channel 1 electrical function: Choose one option:

None		Resistance	
Current		RTD	
Voltage		CJ	
Millivolts		Observed*	
TC (°C/°F)			
TC (mV)			
Frequency			

  b. CH2: Channel 2 electrical function: Choose one option:

None		Voltage	
Current		Millivolts	
Current (24V)		Observed*	

Note: ** Observed (Only available as a source option). Use this option to make a manual record of the readings on another instrument; see Section 2.9.3.*

c. * Pressure function (P1): for the PV 62x-IS pressure stations, refer to user manual - K0462; for the MC 620-IS module carrier, see Chapter 4.

d. * Pressure function (P2): the MC 620-IS module carrier can use P1 and/or P2; see Chapter 4.

e. HART function: HART device communications; see Chapter 8.

- If applicable, change the *Units* for the function: item B ; see Section 2.8.5.
- If applicable, set a *Utility* for the function: item C

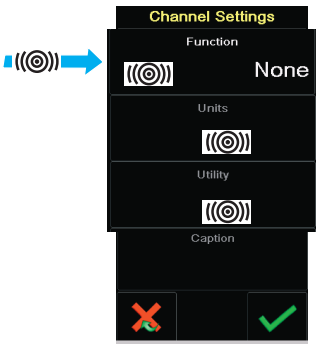
a. *Max/Min/Avg*; see Section 2.8.6.

b. *Switch Test*: CH1, P1, P2 and IDOS functions use the CH2 switch connections; CH2 functions use the CH1 switch connections. See Chapter 3.

c. *Leak Test (Pressure options only);* see Chapter 4.

Note: *Making the connections for a switch on CH1 or CH2 means another function cannot be set on that channel.*

Continued

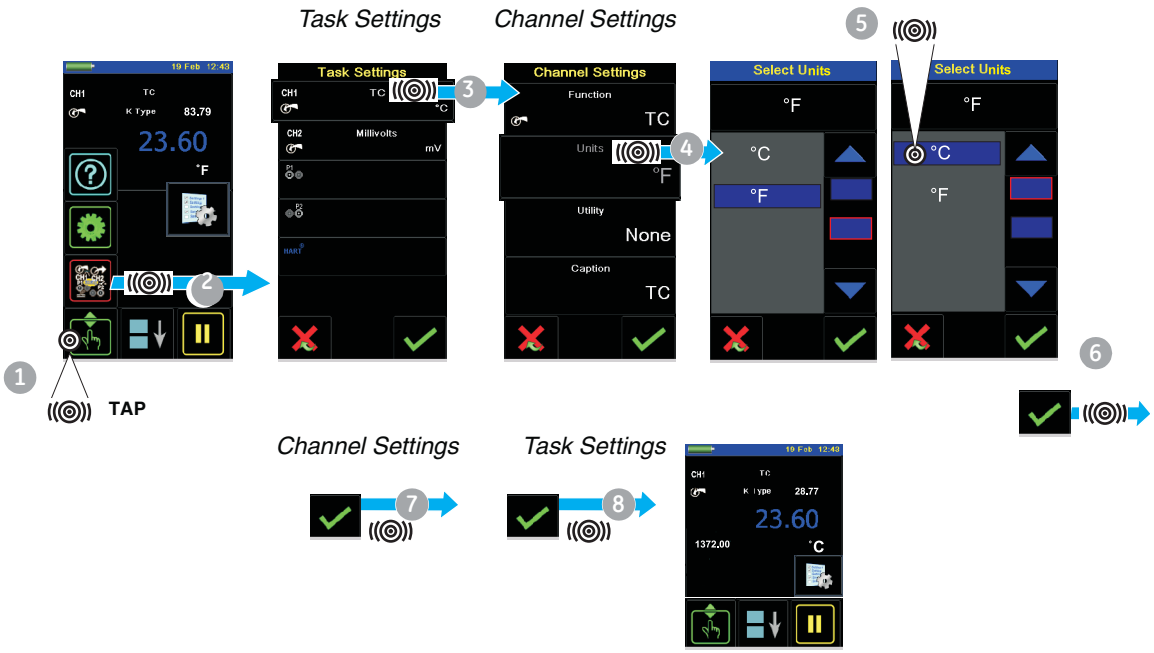


2.8.4 Set a function

This example shows the sequence to set the Channel 1 (CH1) function. It is a similar procedure for other functions.

2.8.5 Set the units

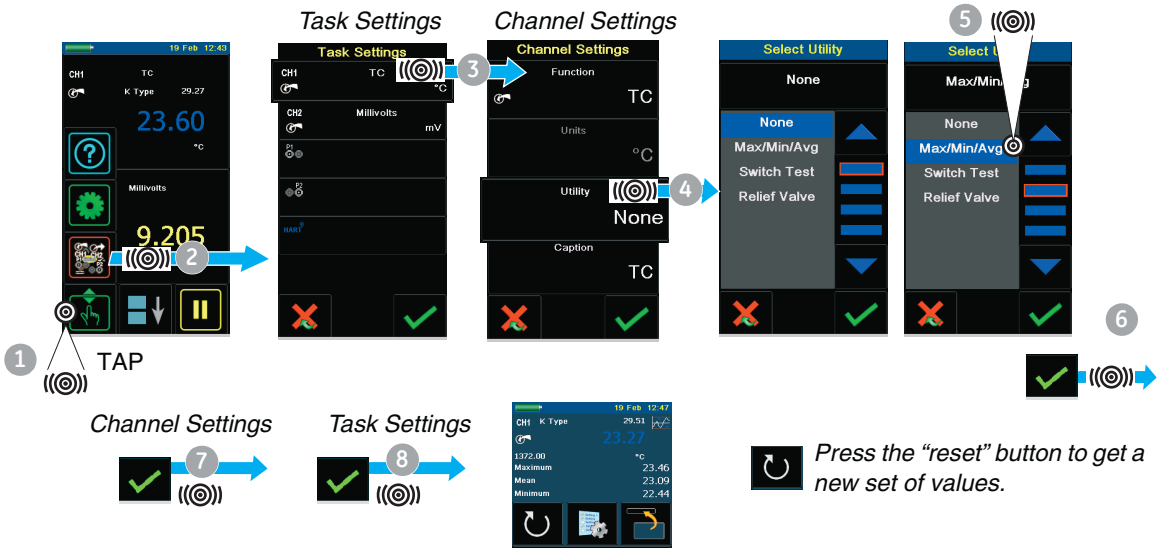
If a function has alternative units, another unit can be set. If there are no alternatives, the area is shown grey.



2.8.6 Set up a utility: Maximum/Minimum/Average example

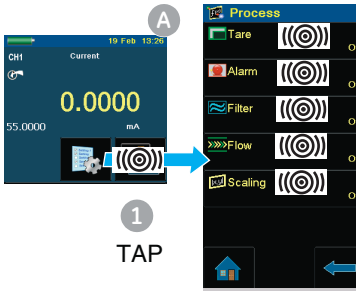
This example shows the sequence to set the *Max/Min/Avg* utility. Use the same procedure for these options:

- *Switch Test*; see Chapter 3.
- *Leak Test (pressure options only)*; see Chapter 4.



2.9 Measure and source operations

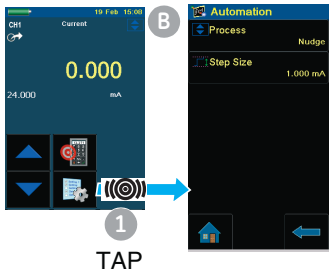
After setting the measure and source functions required on the display (see Section 2.8.3), these procedures can be set:



- If necessary, change the *Process* for the CH1 and/or CH2 measure functions (item A) including:

  Tare, *Alarm*, *Filter*, *Flow*, *Scaling*; see Section 2.9.1.

  For more optional *Settings* for the *TC*, *Frequency*, and *RTD* functions; see Chapter 3.

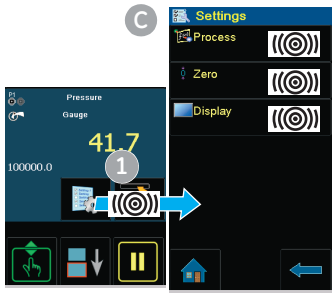


- If necessary, change the *Automation* options for the CH1 and/or CH2 source functions (item B) including:

  Nudge, *Span Check*, *Percent Step*, *Defined Step*, *Ramp*; see Section 2.9.2.

  For more optional *Source Settings* for the *TC*, *Frequency*, *and RTD* functions; see Chapter 3.

  For other *Settings* for *Observed* functions; see Section 2.9.3.

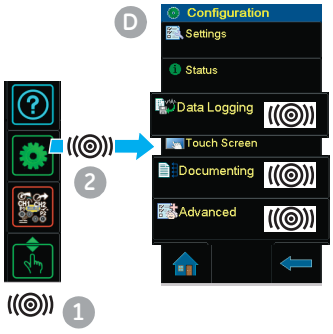


- If necessary, change the *Settings* for the pressure function (item C):

  a. *Process* (*Tare*, *Alarm*, *Filter*, *Flow*, *Scaling*); see Section 2.9.1.

  b. *Leak Test* (Only when the function is set-up with this *Utility* - Section 2.8.6); for operation, see Chapter 4.

  c. *Zero;* see Chapter 4.



- If necessary, change the *Configuration (*item D) including:

  Data Logging (Chapter 6), *Documenting* (Chapter 7), and *Advanced* options (Section 2.10).

- When all the software selections are complete, make the applicable connections (electrical and/or pressure).

  Examples:

  a. Electrical operations (Chapter 3).

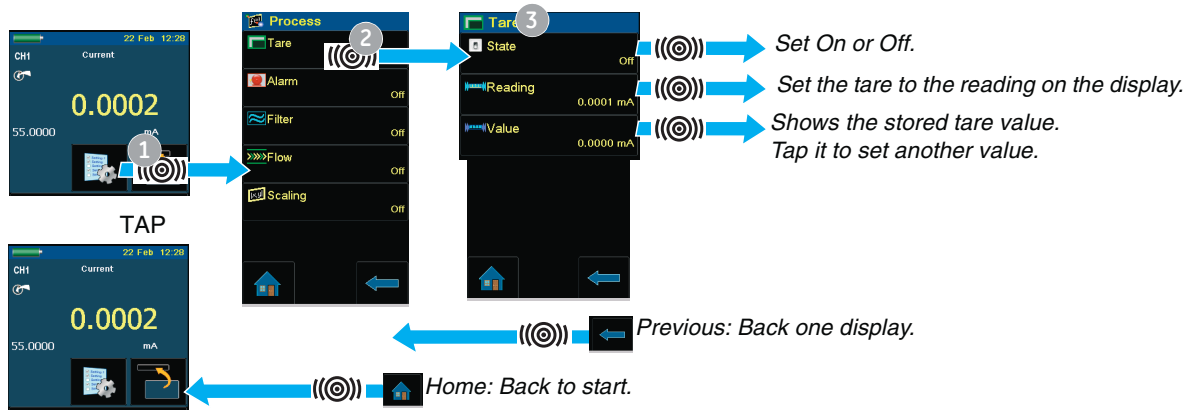
  b. Pressure operations with the MC 620-IS module carrier (Chapter 4).

  c. Pressure operations with a PV 62x-IS pressure station (refer to the user manual - K0462).

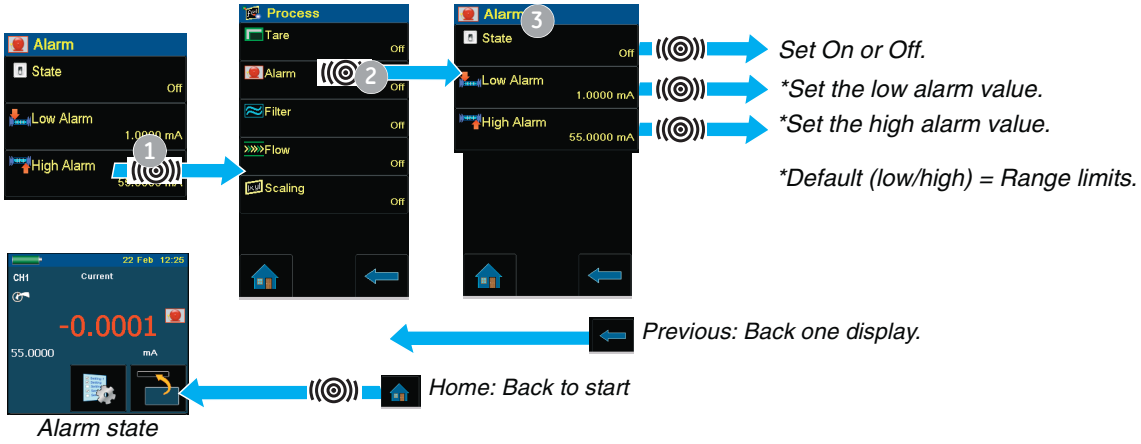
2.9.1 Set the Process options (measure)

Note: *Section 2.7 (Display operation) shows how to set and change the values on the display.*

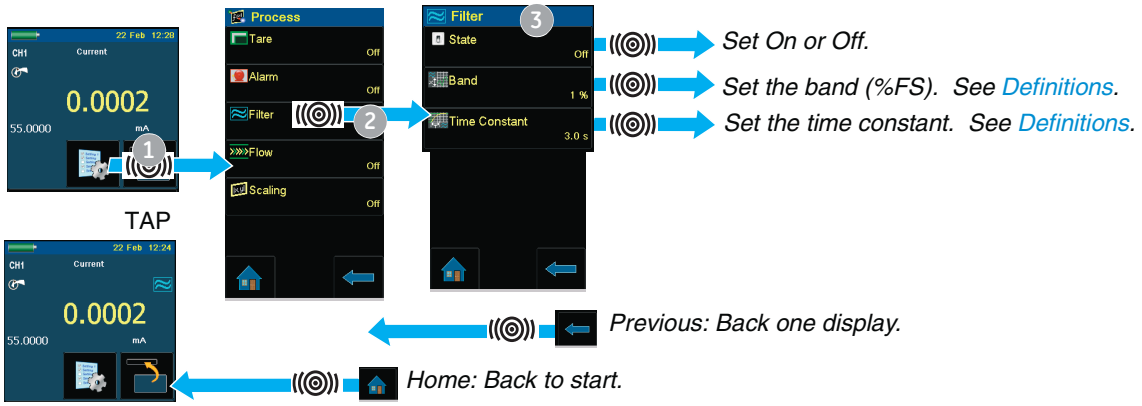
Tare Use *Tare* to set a temporary value for zero. This makes an adjustment to all subsequent readings on the display.



Alarm: When the alarm activates and displays the reading in red.



Filter: Set the *Band* and the *Time Constant* for the low pass filter:

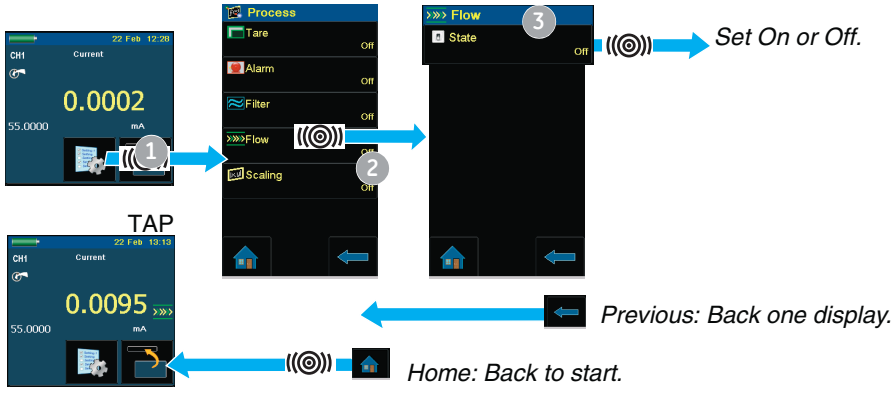


Definitions

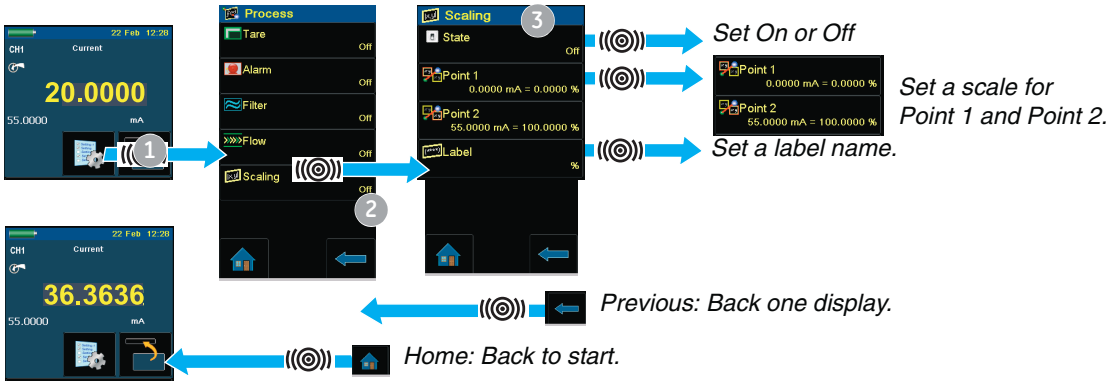
Band: The filter compares each new value with the previous value. If the new value is outside the band, it is not filtered.

Time Constant: This sets the cut-off frequency for the filter. Higher value (in seconds) = more filtering.

Flow: (Square root function)



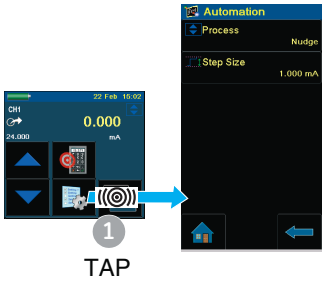
Scaling:



2.9.2 Set the Automation options (source)

Note: *Section 2.7 (Display operation) shows how to set and change the values on the display.*

Nudge

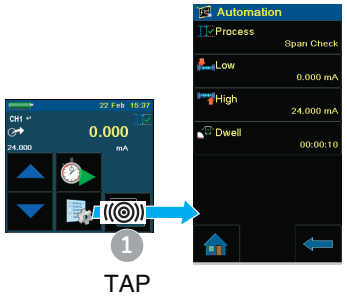


Description
Process: Nudge; *Values to set:* Step Size.

Use these buttons to increase or decrease the output value. Increments = Step size.

Use this button (set-point) to set the output value.

Span Check



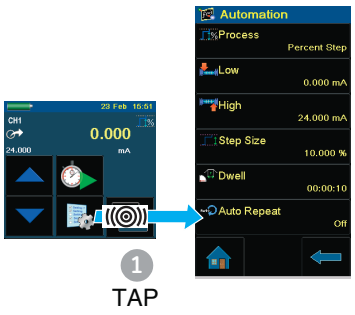
Description
Process: Span Check; *Values to set:* Low, High, Dwell

Use these buttons to change the value manually from *High* to *Low*.

Use the start and stop buttons to change the value automatically from *High* to *Low*.

Dwell sets the period between each change. The cycle repeats automatically.

Percent Step



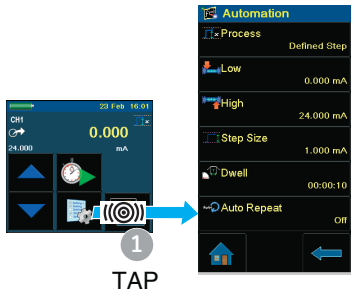
Description
Process: Percent Step; *Values to set:* Low, High, Step Size (%FS), Dwell, Auto Repeat (On/Off).

Use these buttons to change the value manually by the specified *Step Size*.

Use the start and stop buttons to change the value automatically by the specified *Step Size*.

Dwell sets the period between each change.

Defined Step



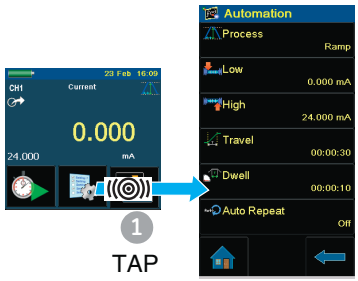
Description
Process: Defined Step; *Values to set:* Low, High, Step Size, Dwell, Auto Repeat (On/Off).

Use these buttons to change the value manually by the specified *Step Size*.

Use the start and stop buttons to change the value automatically by the specified *Step Size*.

Dwell sets the period between each change.

Ramp



Description
Process: Ramp; *Values to set:* Low, High, Travel, Dwell, Auto Repeat (On/Off).

Use the start and stop buttons for this process. *Travel* sets the duration of the *Ramp*.

Dwell sets the period between each change in direction.

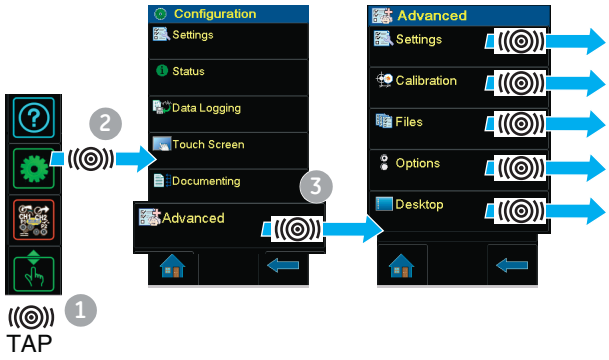
2.9.3 Set the Observed settings (source)

The *Observed* function is available as a *Source* on the task selections: CH1, CH2, P1, P2. To set the *Observed* function, see Section 2.8.4.

2.10 The Advanced menu options

The Advanced menu provides settings and use of options:

- Settings
- Calibration
- Files
- Options



***Hart** On or Off; see Chapter 8. **Standards** sets IPTS 68 or ITS 90; see Chapter 3*

See Section 2.10.1.

See Section 2.10.2.

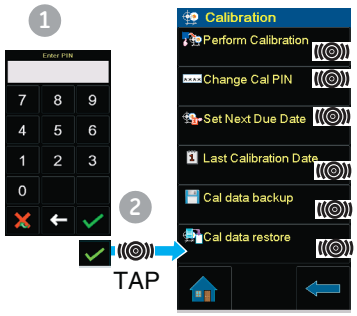
Lists options installed.

Goes back to Windows desktop.

2.10.1 Advanced: Calibration options

There are two calibration menus that can be used:

Menu to calibrate the DPI 620-IS



1. Enter the calibration PIN: 4321.
2. Tap the “Accept” button and continue with these operations:

- Calibrate the different measure and source channels on the DPI 620-IS calibrator.

  Contact us at: www.gesensinginspection.com

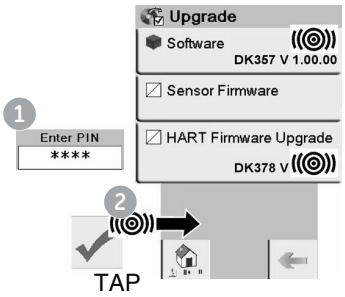
- Change the calibration PIN and then enable it, confirm the new PIN.
- Set the next calibration date and/or set the *Notification* option. If *Notification* is *On* and calibration is overdue, the display shows “Calibration due ... ” message at the end of the power on sequence.

Menu to upgrade the DPI 620-IS software and firmware

To use the most up-to-date software and firmware on the DPI 620-IS calibrator, visit the GE website:

www.gesensinginspection.com

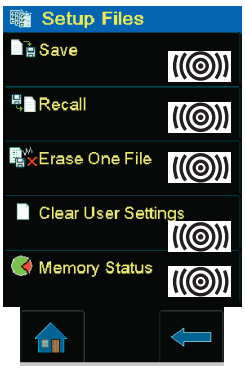
Follow the website instructions, use this menu to upgrade:



- Connect the instrument to be upgraded to a PC. Copy the files to the instrument's storage memory (make sure the instrument is in storage mode).

Note: *Make sure the battery is fully-charged before starting the upgrade process.*

2.10.2 Advanced Setup options



FILES

Use this menu to save and recall personal settings, instrument calibration settings and other standard instrument operations.

Save: After setting up the functions needed on the display (Section 2.8.3) and all the measure and source operations (Section 2.9), save the settings to a file.

Recall: To use the specified settings again, select the applicable filename from the list.

Erase One File: This deletes one file from the list. Confirm the file to delete.

Clear User Settings: This clears user settings, they are replaced by default (factory) settings.

Memory Status: The amount of memory available (in MB and as a % of the total on the device): internal memory; SD card.

2.11 The Help menu

The Help menu includes electrical connection diagrams to help set-up and use the electrical functions on channel 1 (CH1), channel 2 (CH2).

Chapter 3: Electrical operations

3.1 Introduction

This section gives examples of how to connect and use the instrument for these operations:

- To measure and source electrical values.

Before starting:

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

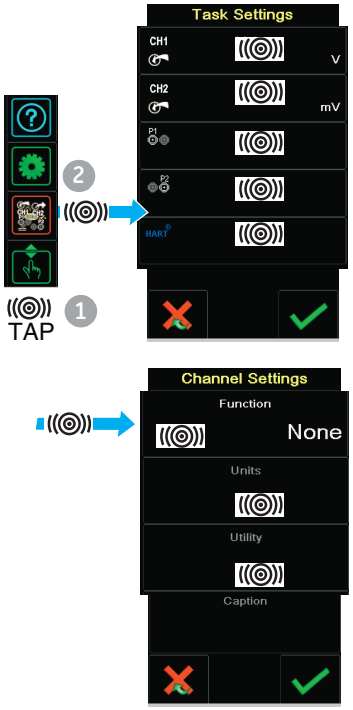
Note: *Use only original parts supplied by the manufacturer.*

3.2 Measure and source operations

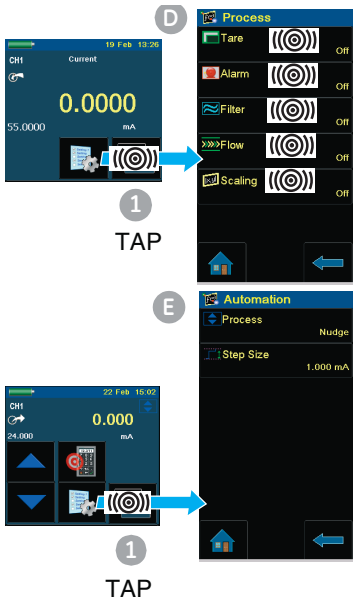
When using the calibrator for the first time, there are default measure and source functions on the display; see Section 2.8.3.

3.2.1 Procedure overview

To use the calibrator, complete these procedures:



- Set the required calibrator functions on the display: item A ; see Section 2.8.3. This includes:
  a. CH1: Channel 1 electrical function (measure or source).
  b. CH2: Channel 2 electrical function (measure or source).
  c. Pressure function (P1 and/or P2): for the MC 620-IS module carrier, see Chapter 4; for the PV 62x-IS pressure stations (P1 only), refer to user manual - K0462.
  d. Other functions (maximum: 6 functions).
- If necessary, change the *Units* for the function: item B ; see Section 2.8.5
- If necessary, set a *Utility* for the function: item C ; see Section 2.8.6
  a. Max/Min/Avg
  b. Switch Test
  c. *Leak Test* (pressure options only)



- If necessary, change the *Process* for the CH1 and/or CH2 measure functions: item D

  This includes: *Tare*, *Alarm*, *Filter*, *Flow*, *Scaling*; see Section 2.9.1.

  There are more optional *Settings* for the *TC*, *Frequency*, and *RTD* functions.

- If necessary, change the *Automation* options for the CH1 and/or CH2 source functions: item E

  This includes: *Nudge*, *Span Check*, *Percent Step*, *Defined Step*, *Ramp*; see Section 2.9.2.

  There are more optional *Source Settings* for the *TC*, *Frequency*, *and RTD* functions.

  There are other *Settings* for *Observed* functions; see Section 2.9.3.

- When all the software selections are complete, make the applicable electrical connections.

3.2.2 Example procedure: Measure or source current

These examples (A and B) show Channel 1 (CH1) set-up to measure or source a current with external loop power.

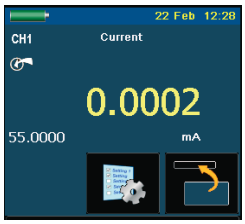
Note: *Using Channel 2 (CH2) connectors, use Channel 2 to measure or source these ranges with internal or external loop power (internal loop power = 24 V).*

A

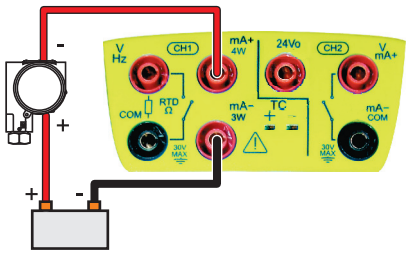
Measure current on channel 1 (CH1)

Range: ±55 mA

1



2



Maximum: 30V

B

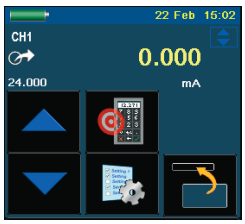
Source current on channel 1 (CH1)

Range: 0 to 24 mA

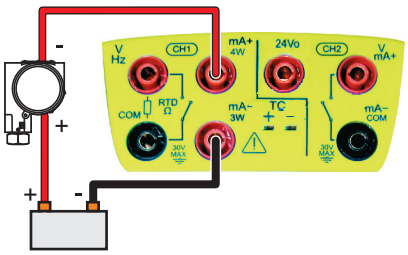
Automation: *Nudge* (Section 2.9.2)

1

3



2



Maximum: 30V

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections and continue with the measure or source operation.
3. Source only (*Automation*): Set the applicable output value; see Section 2.9.2.

3.2.3 Example procedure: Measure DC voltage

These examples (A and B) show Channel 1 (CH1) set-up to measure a DC voltage.

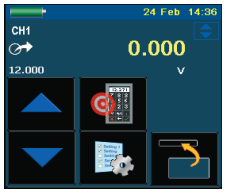
Note: *Using Channel 2 (CH2) connectors, use Channel 2 to measure these ranges.*

A

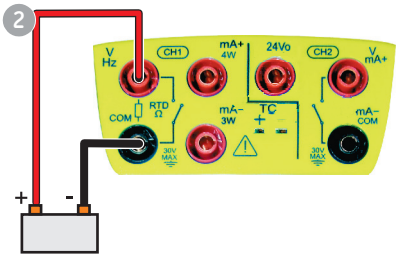
Measure DC volts on channel 1 (CH1)

Range: ±30 V (DC)

1



2

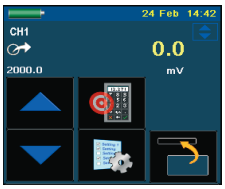


B

Measure DC millivolts on channel 1 (CH1)

Range: ±2000 mV (DC)

1



1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections and continue with the measure operation.

3.2.4 Example procedure: Source DC voltage (CH1)

These examples (A and B) show Channel 1 (CH1) set-up to source a DC voltage.

A

Source DC volts on channel 1 (CH1)

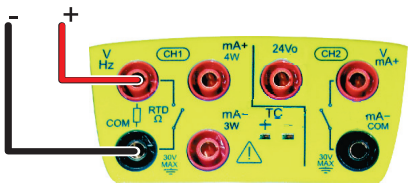
Range: 0 to 12 V (DC)

Automation: *Nudge* (Section 2.9.2)

1

3

2



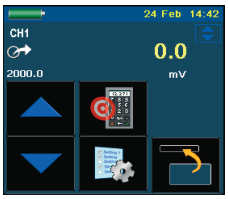
B

Source DC millivolts on channel 1 (CH1)

Range: 0 to 2000 mV (DC)

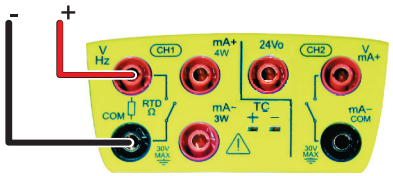
Automation: *Nudge* (Section 2.9.2)

1



3

2



1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.
3. To continue, set the applicable output value; see Section 2.9.2.

3.2.5 Example procedure: Measure or source frequency signals

These examples (A and B) show Channel 1 (CH1) set up to measure or source a frequency. This includes Hz, kHz and counts (cpm or cph).

The selection of units sets the available range, for example:

Hz = 0 to 1000 Hz kHz = 0 to 5 kHz

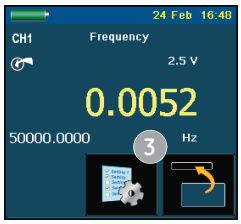
A

Measure frequency on channel 1 (CH1)

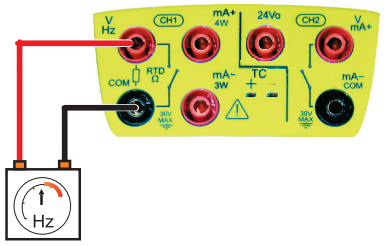
Range: 0 to 5 kHz

Trigger level: 2.5 V

1



2



B

Source frequency on channel 1 (CH1)

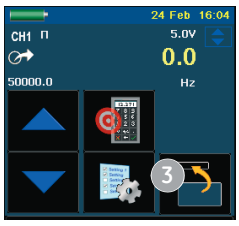
Range: 0 to 5 kHz

Waveform: Triangle

Amplitude: 5.0 V

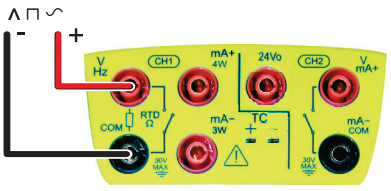
Automation: *Nudge* (Section 2.9.2)

1



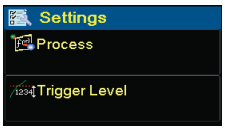
4

2



Example A

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.



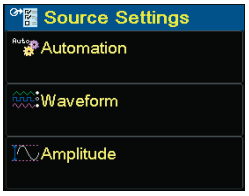
3. If necessary, change the *Trigger Level* (*Settings*) 3 and continue with the measure operation.

   Values to set:

   Mode (Automatic/Manual);
   Manual Level (trigger level value)

Example B

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.



3. If necessary change the *Source Settings* and continue with source operation.

   Values to set:

   Waveform (Square, Triangle, Sine);
   Amplitude (Amplitude value)

4. *Automation*: Set the applicable output value; see Section 2.9.2.

3.2.6 Example procedure: Measure or source current (24V loop power)

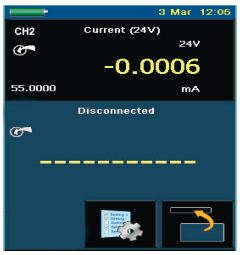
These examples (A and B) show Channel 2 (CH2) set up to measure or source a current with 24V loop power.

A

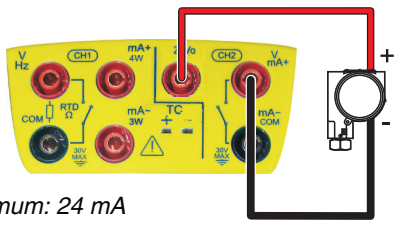
Measure current on channel 2 (CH2) with 24V loop power

Range: ±55 mA

1



2



Maximum: 24 mA

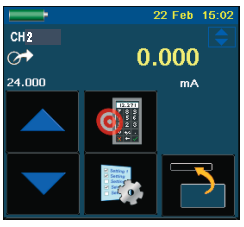
B

Source current on channel 2 (CH2) with 24V loop power

Range: 0 to 24 mA

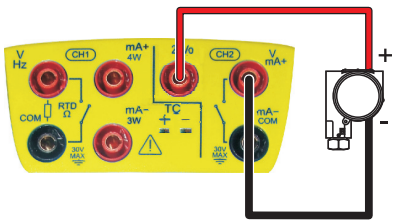
Automation: *Nudge* (Section 2.11.2)

1



3

2



1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections and continue with the measure or source operation.
3. Source only (*Automation*): Set the applicable output value; see Section 2.11.2.

3.2.7 Example procedure: Measure or simulate an RTD (or Resistance)

These examples (A and B) show Channel 1 (CH1) set-up to measure or simulate an RTD. A 4-Wire configuration gives the best accuracy; a 2-Wire configuration has the lowest accuracy (4-Wire RTD shown).

Note: *To measure or simulate resistance (Ω), set the Resistance function.*

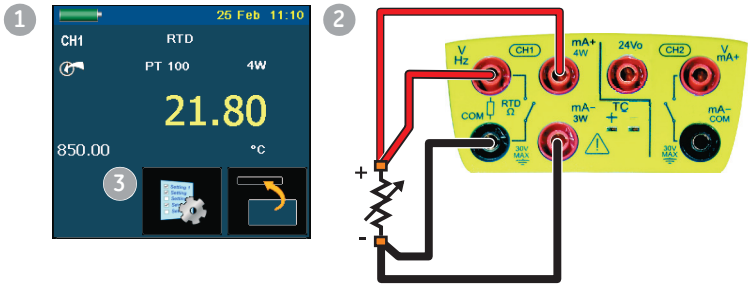
A

Measure an RTD on channel 1 (CH1)

Range: 850 °C

RTD Type: PT100

Connection: 4 wire



B

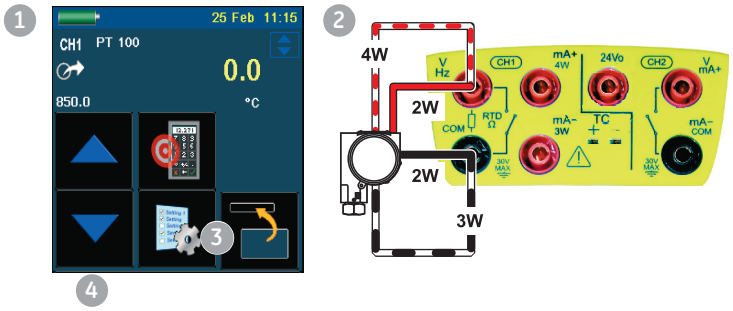
Simulate an RTD on channel 1 (CH1)

Range: 850 °C

RTD Type: PT100

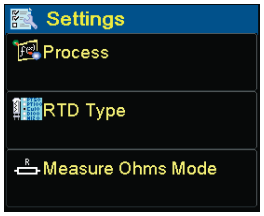
Connection: 4 wire

Automation: *Nudge* (Section 2.9.2)



Example A

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.
3. If necessary change the *Settings* and continue with the measure operation.

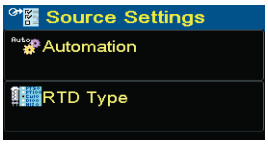


Values to set:

RTD Type (Set the applicable RTD); see Table A1 (front cover) for the available options.

Example B

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.



3. If necessary change the *Source Settings* and continue with source operation.

   Automation: Set the applicable output value; see Section 2.9.2.

   Values to set:

   RTD Type (Set the applicable RTD); see Table A1 (front cover) for the available options.

3.2.8 Example procedure: Measure or simulate a thermocouple (or TC mV)

These examples (A and B) show Channel 1 (CH1) set-up to measure or simulate a thermocouple temperature.

To measure or simulate TC millivolts, set the TC mV function.

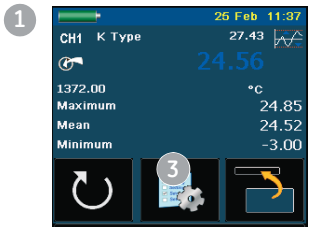
A

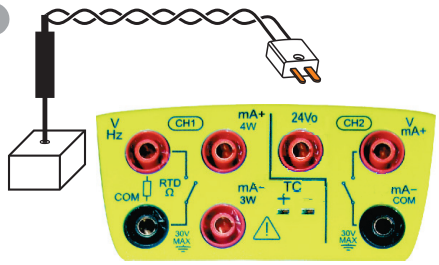
Measure a TC temperature on channel 1 (CH1)

Range: 1372 °C

TC Type: K Type

Cold Junction: 27.43





B

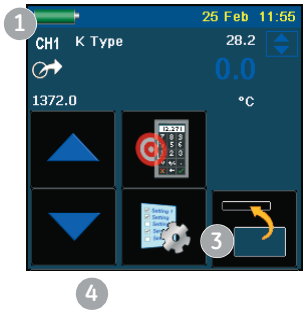
Simulate a TC temperature on channel 1 (CH1)

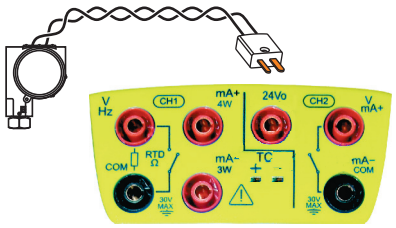
Range: 1372 °C

TC Type: K Type

Cold Junction: 38.2

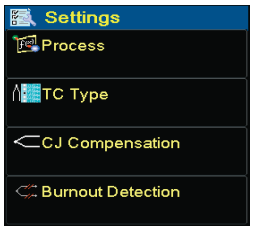
Automation: *Nudge* (Section 2.9.2)





Example A

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.



3. If necessary change the *Settings* and continue with the measure operation.

   Values to set:

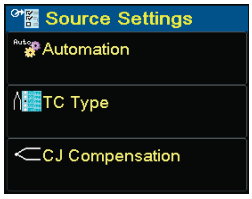
   TC Type (Set the applicable TC).

   CJ compensation (Mode: Automatic/Manual). *Automatic* uses the internal cold junction. Use *Manual* mode for an external cold junction.

   CJ Value. For *Manual* mode, set an applicable value. The value is not used in *Automatic* mode.

Example B

1. Set the applicable software options; see Section 3.2.1 (Procedure overview).
2. Complete the electrical connections.



3. If necessary, change the *Source Settings* and continue with source operation.

   Values to set:

   TC Type (Set the applicable TC).

   CJ compensation (Mode: Automatic/Manual). *Automatic mode* uses the internal cold junction. *Manual* mode uses an external cold junction.

   CJ Value. For *Manual* mode, set an applicable value. The value is not used in *Automatic* mode.

4. *Automation*: Set the applicable output value; see Section 2.9.2.

3.2.9 Example procedure: Switch test

CH1, P1, P2 functions use the CH2 switch connections; CH2 functions use the CH1 switch connections.

Switch operation

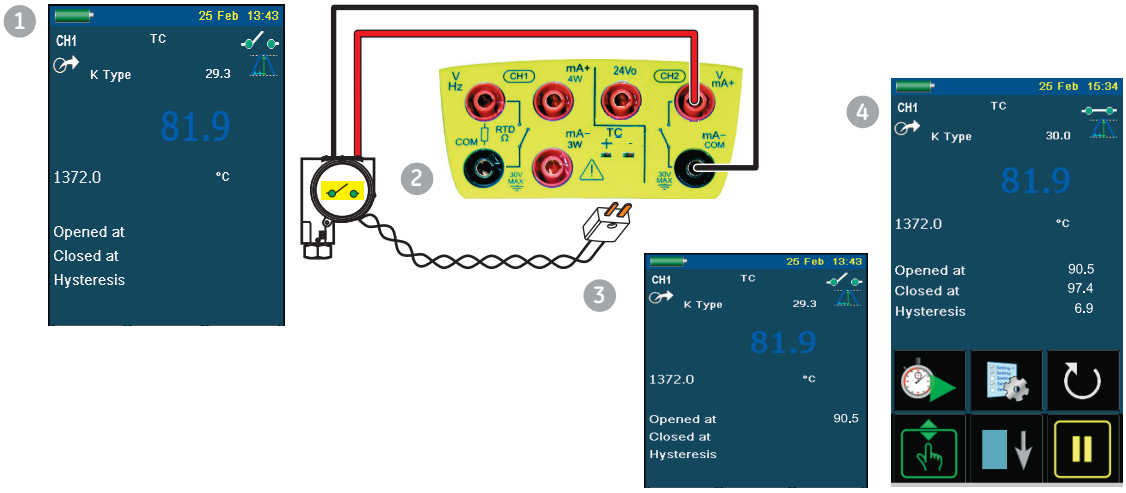
When setting the *Switch Test* utility on one channel, the software automatically sets-up the other channel for the switch connections.

Note: *If there is a measure or source function on the switch connection channel, it is automatically disabled with the screen message "... Function Disabled".*

An attempt to set a measure or source function on the switch connection channel, causes a screen message "... Function not set".

Example

This example shows a thermocouple switch:



1. Set the applicable software options; see Section 3.2.1 (Procedure overview). This example shows one function:

- Thermocouple (TC) is set to source a temperature. The *Utility* is set to *Switch Test*. The *Automation* is set to *Ramp; see Section 2.9.2*.

2. Complete the electrical connections. Because it is a Channel 1 function (TC), Channel 2 (CH2) must have the switch connections.

Start/Stop

3. For the *Ramp* process, set “High” and “Low” values that are applicable to the switch value. Then, to get an accurate switch value, set a long “Travel” period.

   Use Start/Stop to start and stop the “Ramp” cycle. If necessary, supply the output values in the opposite direction until the switch changes condition again.

Open

Closed

4. The display shows:

- the values to open and close the switch
- the hysteresis value

Reset

5. To do the test again, use the reset button.

3.3 Error indications

If the display shows <<<< (under range) or >>>> (over range):

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

<<<<< Under range: The display shows this symbol for this condition:

Reading < Negative FS - (10% of negative FS).

>>>>> Over range: The display shows this symbol for this condition:

Reading > Positive FS + (10% of positive FS).

Chapter 4: Pressure indicator operation (MC 620-IS)

4.1 Introduction

This section gives examples of how to connect and use the instrument to measure pressure with the module carrier (MC 620-IS) and the applicable pressure modules (PM 620-IS).

To measure pressure with the IDOS UPM, refer to Chapter 3.

To make a fully integrated pressure calibrator instrument with one of the three pressure stations, refer to the user manual for the PV 62x-IS series of pressure stations - K0462

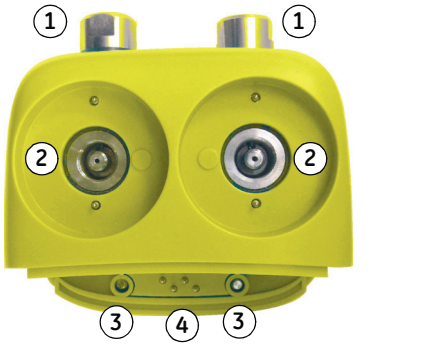
Before starting:

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

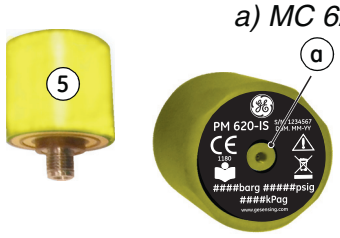
Note: *Use only original parts supplied by the manufacturer.*

4.2 Parts and assembly

This figure shows the parts of the module carrier (MC 620-IS) and pressure module (PM 620-IS).



a) MC 620-IS



b)

1.	Pressure connection (G1/8 or 1/8NPT) to attach external pressure equipment.
2.	Pressure and electrical connections for a pressure module (PM 620-IS). These are self-sealing pressure connections.
3.	Two screws to attach the calibrator (DPI 620-IS).
4.	Electrical connections for the calibrator (DPI 620-IS).
5.	Pressure module (PM 620-IS) with a pressure connection, reference port (a) and a label. The label includes: *Pressure range*. Example: 20 bar g (g: gauge; a: absolute); *serial number* (S/N); *manufacturer*: name, address, website.

Caution: To prevent damage to the PM 620-IS, use within the specified pressure limit on the label.

After attaching these items to the DPI 620-IS calibrator, a fully integrated pressure indicator is formed that can measure pneumatic or hydraulic pressure.

4.2.1 Assembly instructions

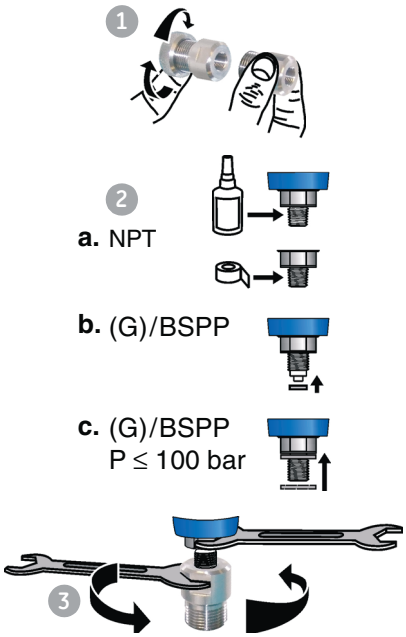
Step	Procedure
1.	Align the two slots (a) on the calibrator with the two posts (b) on the module carrier.
2.	When the posts are fully engaged in the slots, tighten the two screws until they are hand-tight.
3.	Attach one or two PM 620-IS modules with the correct range and type.
4.	Tighten each one until it is hand tight only.
P	When this symbol flashes at the top of the display, it shows there is communication between the module and the calibrator.

4.3 Pressure connections

WARNING: Pressurized gases and fluids are dangerous. Before attaching or disconnecting pressure equipment, safely release all the pressure.

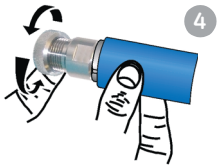
The pressure ports for external equipment use “Quick fit” pressure adaptors; see Section 1.4 (Accessories). These are easy to remove, change and install.

4.3.1 Procedure (to attach external equipment)



Step	Procedure
1.	Remove the adaptor from the pressure port.
2.	Use an applicable seal for the pressure connection: **a.** NPT type: Use an applicable sealant on the thread. **b.** BSP (parallel) type: A bonded seal at the bottom is recommended. **c.** BSP (parallel) type, 100 bar (1500 psi) or less: a bonded seal at the top is permitted.
3.	Attach the adaptor to the external equipment; if necessary use one of the alternative adaptors in Section 1.4 (Accessories), then tighten to the applicable torque.

Continued



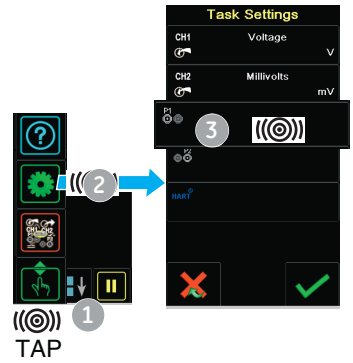
Step	Procedure
4.	Re-attach the adaptor to the MC 620-IS carrier and tighten it until it is hand tight only.

4.4 Measure pressure

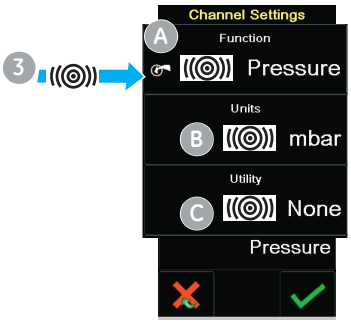
When the pressure indicator assembly is complete (Section 4.2.1), use the menus to set-up the necessary operations.

4.4.1 Procedure overview

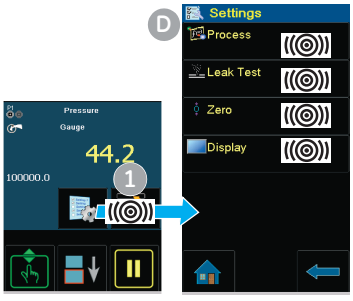
To use the pressure indicator, complete these procedures:



- Set the calibrator functions to use on the display; see Section 2.8.3. This includes:
  a. Pressure function (P1 and/or P2): item A .
  b. CH1: Channel 1 electrical function (measure or source).
  c. CH2: Channel 2 electrical function (measure or source).
  d. Other functions (maximum: 6 functions).



- If necessary, change the *Units* for the function: item B ; see Section 2.8.5.
- If necessary, set a *Utility* for the function: item C ; see Section 2.8.6.
  a. Max/Min/Avg
  b. Switch Test
  c. *Leak Test;* see Section 4.4.2.



- If necessary, change the *Settings* for the pressure function: item D .
  a. *Process* (*Tare*, *Alarm*, *Filter*, *Flow*, *Scaling*); see Section 2.9.1.
  b. *Leak Test (Only when the Utility is set);* see Section 4.4.2.
  c. *Zero* Recommend - zero a gauge sensor before use; see Section 4.4.3.
  d. *Display* If necessary, change the number of digits in the display reading.

- When all the software selections are complete, make the applicable pressure and electrical connections. Examples:

  Measure pressure (Section 4.4.4).

4.4.2 Set-up a Leak Test

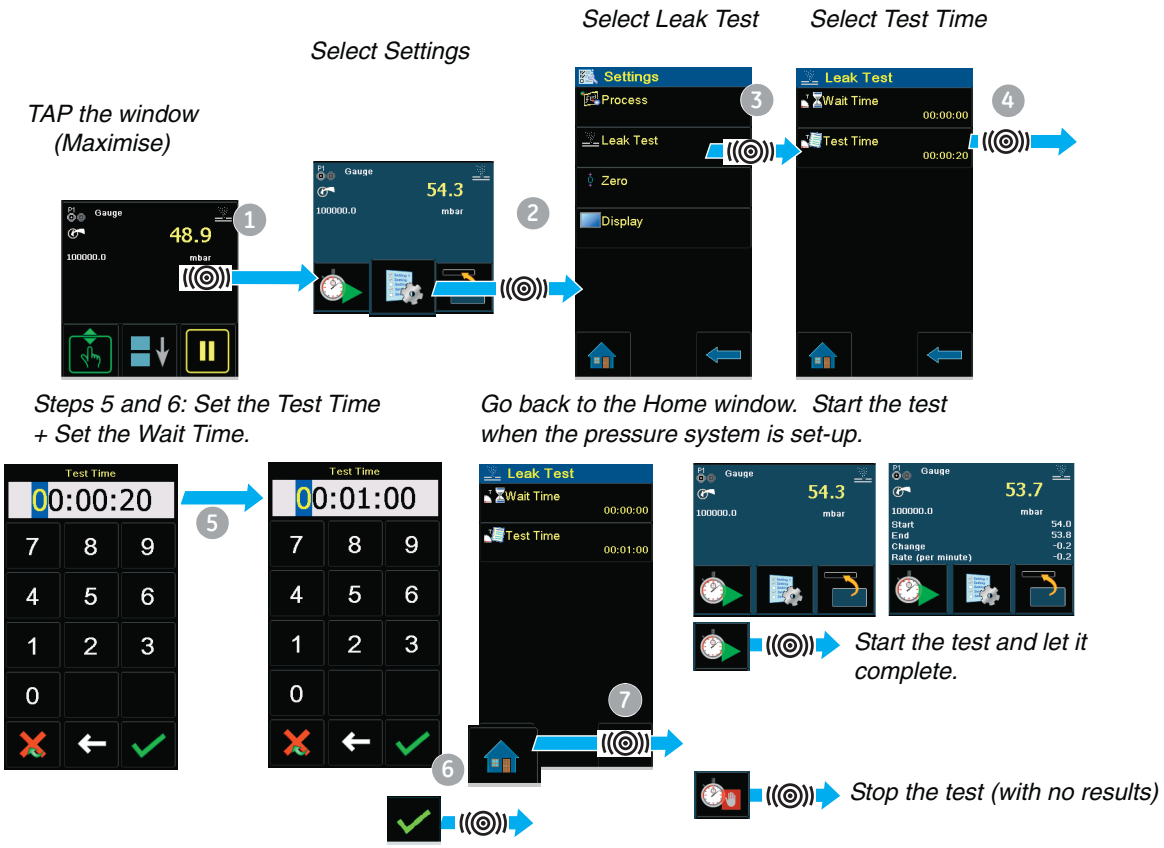
1) Set the Utility Set the *Utility* to *Leak Test* (Section 2.8.6).

2) Set the Leak Test options When setting the *Utility* to *Leak Test*, set these options:

Wait Time: The time before the test starts in hours:minutes:seconds (hh:mm:ss).

Test Time: The period of the leak test in hours:minutes:seconds (hh:mm:ss).

Note: *To set the Leak Test options, have a pressure module correctly installed (Section 4.2.1).*



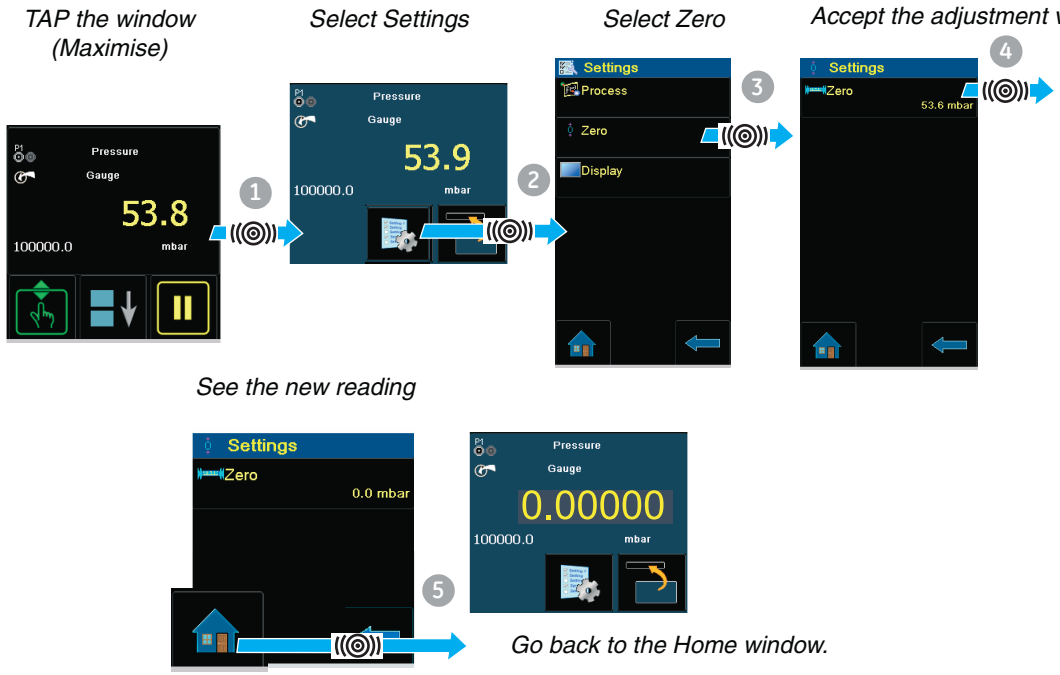
4.4.3 Set the pressure module to zero

Use this option to write a new zero pressure value to the pressure module.

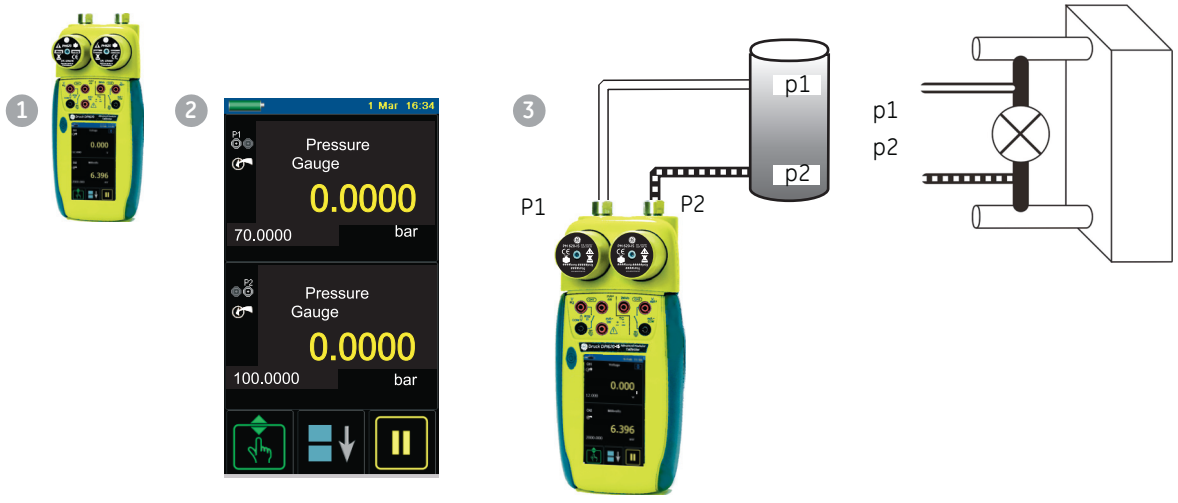
The sensor adjustment is permitted if it obeys this condition:

Adjustment ≤ 10% FS positive pressure value
(for the Sensor)

Note: *To make a temporary adjustment for zero, use the Tare function; see Section 2.9.1.*



4.4.4 Example procedure: Measure pressure



1. Assemble the pressure indicator with the correct PM 620-IS modules; see Section 4.2.1.
2. Set the applicable software options; see Section 4.4.1 (Procedure overview). This example shows two pressure functions:

- Pressure functions P1 and P2 are set-up.

3. To attach the external equipment, see Section 4.3.1.

4.5 Error indications

If the display shows <<<< (under range) or >>>> (over range):

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

<<<<< Under range: The display shows this symbol for this condition:

Reading < Negative FS - (10% of negative full-scale).

>>>>> Over range: The display shows this symbol for this condition:

Reading > Positive FS + (10% of positive full-scale).

Chapter 5: Instrument communications

5.1 Introduction

This chapter gives a description of these items:

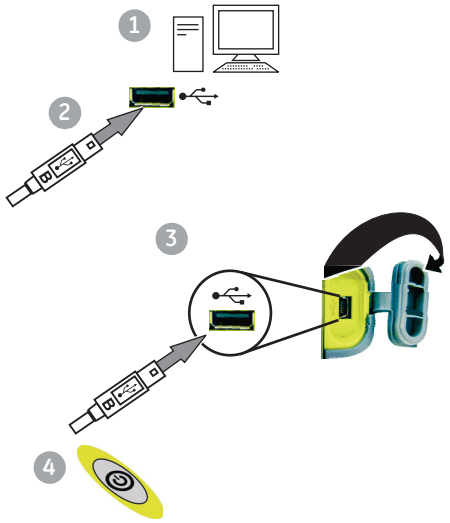
- the procedures to connect the instrument to a computer with the optional USB mini Type B cable.

For a full list of optional accessories, refer to Section 1.4.

5.2 Connect to a computer (USB)

A USB mini Type B connector connected between the instrument and a computer can be used to download or upload data to the SD card, see Chapter 6 (Datalog operation).

Note: *If the power supply fails, the data will not transmit correctly.*



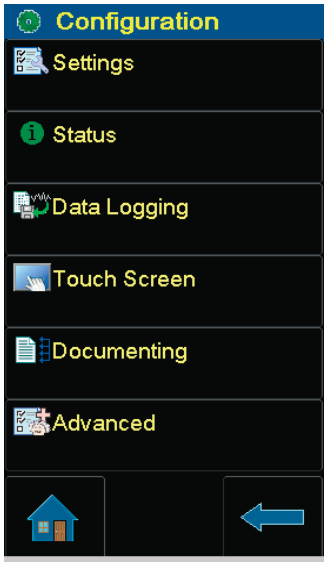
Step	Procedure
1.	Start the computer.
2.	On the right-hand side of the instrument (Figure 1-3), use the rubber recess to pull down the cover for the connections.
3.	Push the mini Type B end of the USB cable into the USB socket on the instrument.
4.	Set the instrument power on.

When the connections are complete, files can be moved between the computer and the DPI 620-IS calibrator using normal file manager software (for example, Windows Explorer).

Note: *The computer can get access to the internal memory of the DPI 620-IS calibrator by using Active Sync.*

Chapter 6: Datalog operation

6.1 Introduction

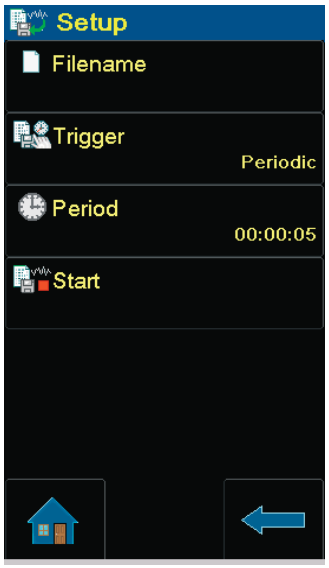


This section gives examples of how to log measurements with time and date over a set time period or on a key press. Logged data is stored in a user defined file. The instrument logs all the tasks currently enabled.

Stores this data internally but can be downloaded (transferred) through the mini Type B USB serial port. The data transfer to the PC uses Active Sync.

To enter data logging select configuration menu and press data logging.

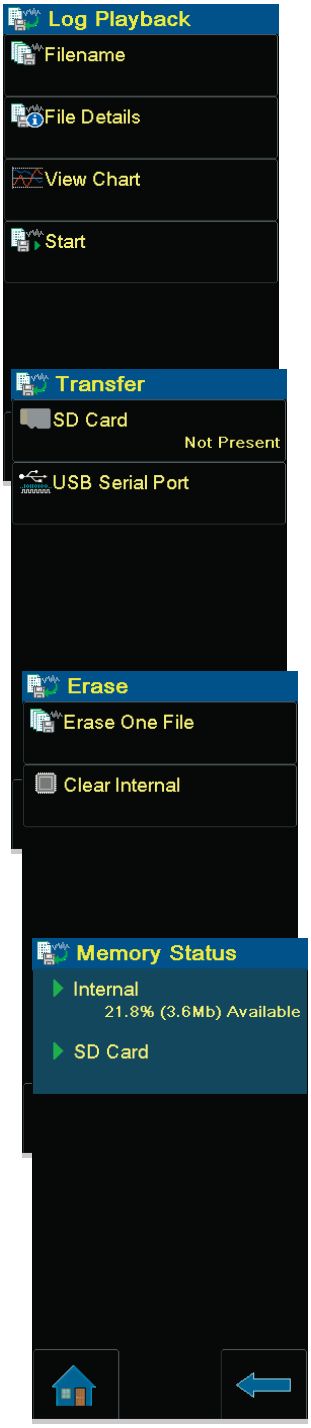
6.2 Set-up



To set the data logging process:

Selection	Action
Filename	Enter name using three-page screen alpha/numeric key-pad.
Trigger	Set to **Key Press** to activate on pressing of bottom right key or **Periodic** set to activate on time set in period.
Period	Sets the time period of data recording using numeric keys and HH:MM:SS format.
Start	Starts data logging.

After data logging the data file can be used in the data logging menu as follows:



Recall

Log Playback

Filename recalls data by filename from the list.

File details shows file name, start time and number of points.

Start begins playback of the selected file by pressing the Pause/Play key.

Press and hold the Pause/Play key for at least two seconds to reverse sequence.

Transfer

The stored data held in the internal memory can be transferred to an external memory device:

USB serial port.

Erase

Erase one file Select file to erase.

Clear internal erases all files held in the instrument's memory.

Clear SD card erases all data on the internal SD card.

Memory status

The amount of memory available (in MB and as a % of the total on the device):

Internal SD card.

6.3 Data Logging

To data log:

To log measurements made by the instrument, set the required tasks in Task Settings.

Select Configuration and select Data Logging.

Select Filename and enter a name using the three-page screen alpha/numeric key-pad.

Select Trigger and either a time (Periodic) or key press (play/pause).

Select start to set the data logging.

The display changes to the task screen with data logging flashing at the top.

If necessary, press play/pause to increment the data logging.

At the end of data logging press the cancel key.

The instrument stores the recorded data.

6.4 Data handling

Using the data logging menu, a data file can be replayed, stored in a memory device or transferred to an external device; see Section 6.2.

The data file can be imported into a number of spreadsheet programs for analysis and graphic presentation.

Comma separation applies to this data.

Comma separated file

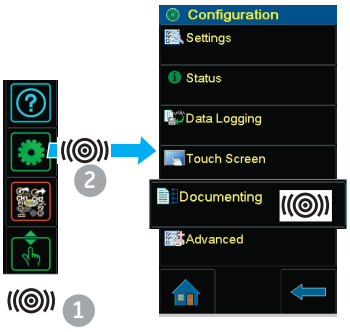
```
FILENAME,P080821A
COLUMNS,3,9
START,21 Aug 2008, 21:38:59
CHANNEL 001, Current (24V),In,mA,55
CHANNEL 005, HART,In,,0
DATA,START
ID,Date,Time,Main Reading,Secondary Reading,
0,21 Aug 2008, 21:39:14,8.7525,24V,4,0,False
1,21 Aug 2008, 21:39:29,8.5711,24V,4,0,False
2,21 Aug 2008, 21:39:44,8.4080,24V,4,0,False
3,21 Aug 2008, 21:39:59,8.2475,24V,4,0,False
4,21 Aug 2008, 21:40:14,8.0733,24V,4,0,False
5,21 Aug 2008, 21:40:29,7.9288,24V,4,0,False
```

Data imported into a spreadsheet

	A	B	C	D	E	F	G	H
1	FILENAME	P080821A						
2	COLUMNS	3	9					
3	START	21-Aug-08	21:38:59					
4	CHANNEL 001	Current (24V)	In	mA	55			
5	CHANNEL 005	HART	In		0			
6	DATA	START						
7	ID	Date	Time	Main Reading	Secondary Reading	Decimal Places	In Range	Alarm
8	0	21-Aug-08	21:39:14	8.7525	24V	4	0	FALSE
9	1	21-Aug-08	21:39:29	8.5711	24V	4	0	FALSE
10	2	21-Aug-08	21:39:44	8.408	24V	4	0	FALSE
11	3	21-Aug-08	21:39:59	8.2475	24V	4	0	FALSE
12	4	21-Aug-08	21:40:14	8.0733	24V	4	0	FALSE
13	5	21-Aug-08	21:40:29	7.9288	24V	4	0	FALSE

Chapter 7: Documenting functions

7.1 Introduction



This section gives examples of the documenting functions available with the DPI 620-IS calibrator. There are two options:

Analysis (Section 7.2): This function compares the data from two Channels on the DPI 620-IS calibrator: the device under test (DUT) and a reference instrument.

It calculates the % span or % reading error for the device and then gives a pass or fail indication.

Run Procedure (Section 7.3): This uses the Intecal Calibration software (Optional item) to download a calibration procedure.

Before starting:

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

Note: *Use only original parts supplied by the manufacturer.*

7.2 Analysis

To use the *Analysis* function, set the functions in the two channels for comparison (Section 2.8.4). Then use these procedures:

Input and Reference options

Channel type (A) **:** *Input* or *Reference*

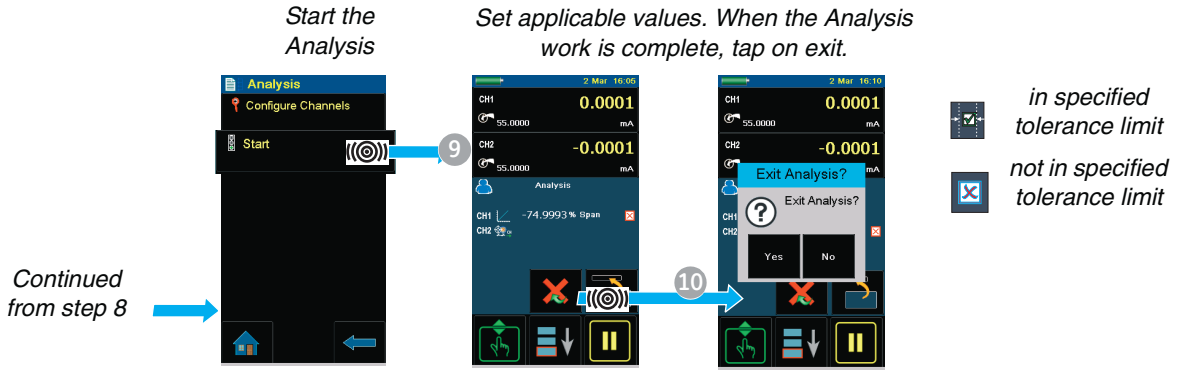
Scaling (B) **(Input only):** *Values for Reference High* and *Low* and *Input High* and *Low*. This sets the scale for the *Analysis* function.

Error Type (C) **(Input only):** *% Span* or *% Rdg* (Reading)

Linearity (D) **(Input only):** *Linear* or *Square Root*

Tolerance (E) **(Input only):** an applicable value for the pass/fail calculation

When the *Input* and *Reference* options are set, start the analysis.



7.3 Run a procedure

The Intecal calibration *Procedure* contains all the values to calibrate a device under test (test points, ramp time). Use the same calibration procedure for all the applicable devices under test.

To use the *Run Procedure* function, the following items are required:

- a copy of the Intecal Calibration Software. This is available on the website at: www.gesensinginspection.com

  There is a 30 day free trial.

- IO620-USB-RS232 (Intecal version 5 only). An adaptor to connect the DPI 620-IS calibrator to the RS232 interface of a computer.

- a DPI 620-IS calibrator device driver: available as a download from our website.

Chapter 8: HART® device operations

8.1 Introduction

The DPI 620-IS calibrator can be used to communicate with devices that use the HART® protocol:

- The Universal and Common Practice commands specified in HART® revision 5 to 7.

This section includes procedures to use the HART® functions available in the calibrator.

Before starting:

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

Note: *Use only original parts supplied by the manufacturer.*

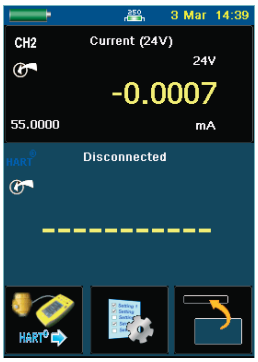
8.2 About HART

- The HART® (Highway Addressable Remote Transducer) protocol uses a digital signal on top of a standard 4 - 20 mA current loop to get data to and from a HART® enabled field device. The following are typical operations:
- read the primary variable and the analogue output.
- read the device serial number, type and supplier.
- get calibration data (upper and lower range values, sensor limits, calibration date).
- do status and fault finding checks.
- change the device configuration (range, units, damping).

One HART device (a master device) starts and controls the communications with commands. The field device (a slave device) uses each command to make a change and/or send data back.

Two master devices are permitted: a primary master (usually the main control and monitor system), and a secondary master (usually a hand-held communicator). The DPI 620-IS calibrator operates as a secondary master.

First steps

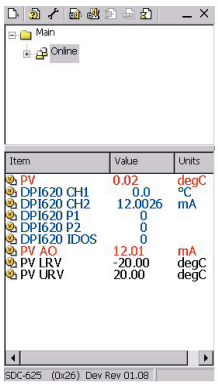


- Set-up the HART® device, if loop power required, use CH2 for current (24V), see section 14.
- If the loop is already powered and there is an external HART resistor turn off channel 2. Connect the channel 2 mA+ and mA- connections across the external HART resistor. See section 14.3.
- If required, turn on the internal HART® resistor. This can be selected by pressing  *icon.*
- Press the HART® button.
- The HART® application starts-up.

Getting Device Identity

- The HART® applications operates and displays status information on the bottom left hand side of the screen as the program executes.
- As the HART® application operates the DPI 620-IS finds the DD associated with the device and all the parameters of the HART® transmitter are collected and loaded into memory.
- A message box shows "Cannot find a device" if the device is not connected. Refer to section 15.

First screen



- This is the first screen displayed by the instrument showing concise information like Windows® menu tree structure.

Note:

The following screens are from the DPI 620, the screens for the DPI 620-IS will be issued later. Items in black (below) will be changed to white for the DPI 620-IS.

- Online = summary view displaying the parameters and variables of interest.

  Items in red - read only

  Items in blue - DPI 620-IS channel data

  Items in black - can be edited.

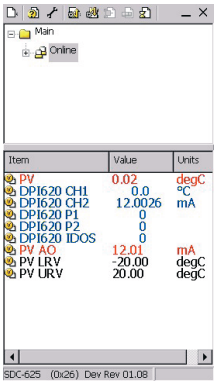
Variables

Launches a data entry screen

Methods

Only a single tap on the screen is required to open any item in black or open any folder.

Terminology



PV = Digital Value of Primary Variable (i.e. this is the parameter that the transmitter measures - pressure, current, voltage).

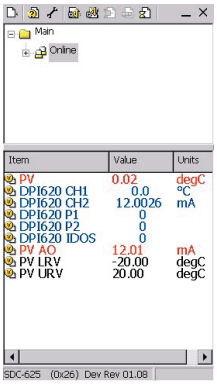
PV AO = Digital Value of Primary Variable mA current.

DPI 620-IS CH1 = Analogue Value of Primary Variable (actual calibrated value).

DPI 620-IS CH2 = Analogue value of Primary Variable mA current (actual calibrated value).

DPI620 P1, P2 and IDOS reflect the analogue pressure values measured by the relevant pressure ports on the DPI620-IS.

Range Values



PV LRV = Lower range value of Primary Variable.

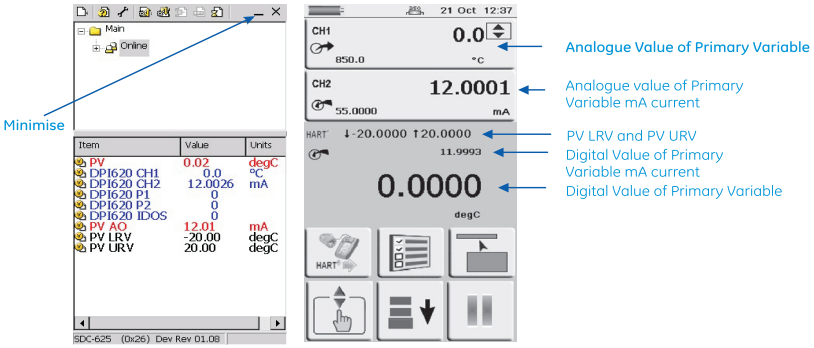
PV URV = Upper range value of Primary Variable.

Example: Transmitter under test has a range of -200°C to +800°C.

Setting the LRV to -20°C (zero value) and URV to +20°C (span value) allows re-ranging the transmitter (zero & span) to specified limits.

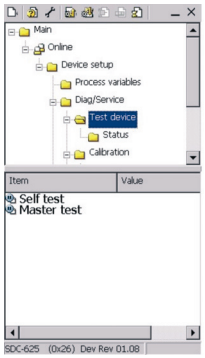
The PV % of range in this example for a PV = 0°C is equal to 50%.

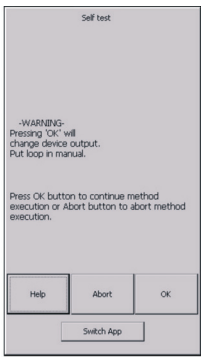
Minimise button.



- Switch between screens by selecting minimise button.
- This allows switching between Windows to review and adjust the PV during calibrations.

Method





- Any item that has got a method icon executes a method window to prompt with on-screen instructions for performing a test or calibration.

Menu Bar

- device connection - pressing this allows the user to connect to a transmitter.

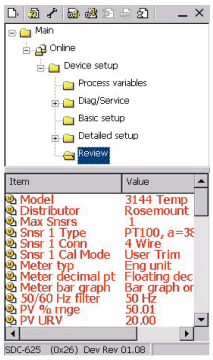
- software version - pressing this allows the user to identify the DK0397 software version.

- preferences - pressing this allows the user to change the search by poll address short tag or long tag.

- commit - pressing this allows the user to commit (write data) to the transmitter anything highlighted in yellow will change.

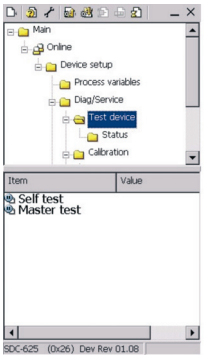
- undo - pressing this allows the user to undo any changes that are highlighted in yellow that were made to the local variables in SDC625.

Review menus

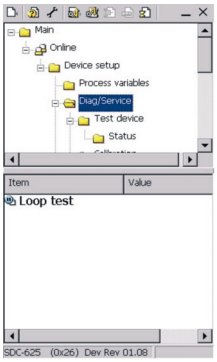


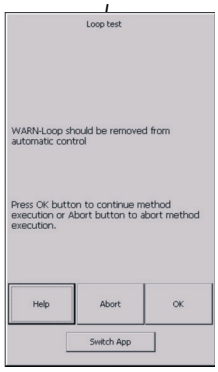
This is the ideal starting point for finding out information on the configuration of the HART® transmitter. It provides details of the model, distributor, tag, serial number, sensor & trim limits, alarm parameters, saturation limits, damping and span limits etc.

Self-test



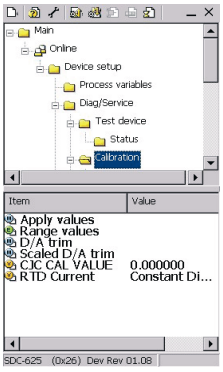
- To confirm that the transmitter is functioning correctly, navigate through the menus to the self-test method button:
- Press the self-test button.
- Press OK and the self-test executes.





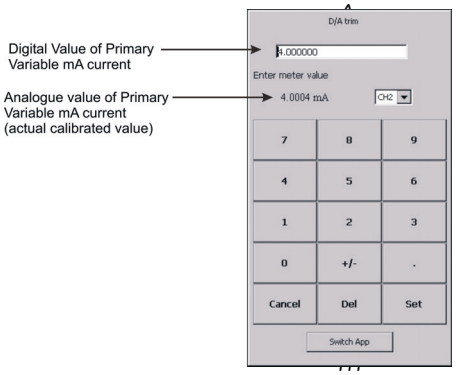
- To confirm that the transmitter is functioning correctly navigate through the menus to the loop test button:
- Press the loop test button.
- Press OK and the loop test executes.
- The loop test can be put into various modes, typically 4 mA and 20 mA should be selected. The Analogue value of Primary Variable mA current (actual calibrated value) of the transmitter can be seen by selecting the CH2 drop-down box. If this value needs adjusting then use the analogue trim (sometimes referred to as D/A trim) in the calibration menu.

Analog trim (D/A trim)



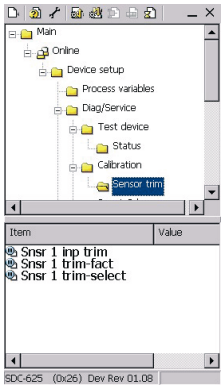
- Using the DPI 620-IS, an analogue trim can be performed on the 4 to 20 mA loop without having to connect any external reference meters.
- Navigate to the calibration folder and select the D/A trim method. Follow the on-screen instructions.

mA

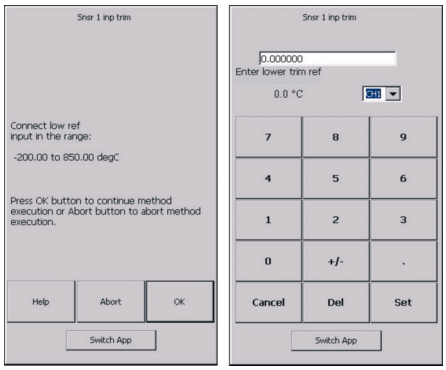


- Type the Analogue value of Primary Variable mA current (actual calibrated value) into the box using the key-pad and then press Set. Repeat this process with 20 mA selected. This will accurately calibrate the transmitter's output 4 to 20 mA loop current.

Sensor Trim

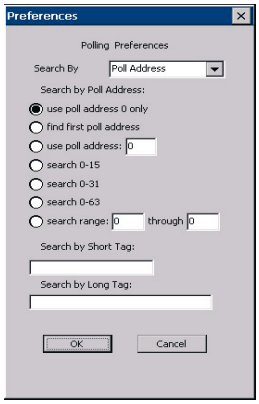


- Using the DPI 620-IS, a sensor trim on most Primary Variables can be performed without having to connect any external reference meters. If the Primary Variable is a pressure device use the DPI 620-IS and PV 62x-IS pressure generation stations to provide the pressure source. Alternatively, use DPI 620-IS and MC 620-IS to accurately measure pressure.
- Navigate to the calibration folder and select the sensor trim method. Follow the on-screen instructions.



- In this example a lower trim has been selected. The DPI 620-IS is set-up to source a Primary Variable to the transmitter. CH1 has been configured to output 0°C. This can be done by selecting the Switch App button at the bottom of the method window and configuring the DPI 620-IS to simulate an RTD at 0°C. The Analogue Value of the Primary Variable can be seen by selecting CH1 on the drop-down menu.
- Type the Analogue Value of the Primary Variable (actual calibrated value) into the box using the key-pad and then press Set. Repeat this process with an upper trim value. This will accurately calibrate the transmitter's sensor output.

Preferences



- Selecting the icon allows the changing of the poll address, short tag or long tag of the transmitter. The DPI 620-IS is set by default to use Poll Address 0 (zero) only. This can be changed by selecting the appropriate search radio button or by entering the tag name in the search field.

8.3 HART® Connections

Examine the power supply connections for the transmitter before connecting the HART® transmitter to the DPI 620-IS calibrator.

8.3.1 Power supply from the calibrator

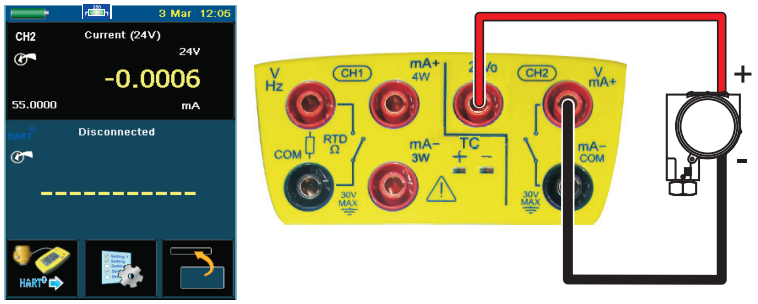
In this example, the DPI 620-IS calibrator supplies the loop power and a 250Ω HART® resistor.

Measure current on channel 2 (CH2) with 24V loop power

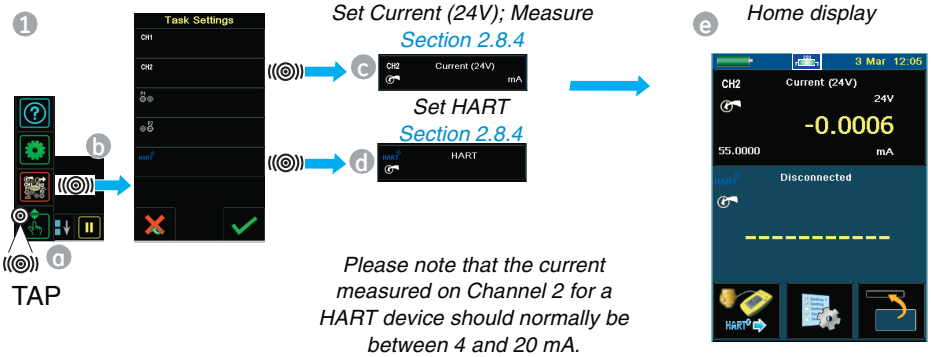
Range: ±55 mA

HART® Function is set

250Ω resistor is set



1. Set the functions for channel 2 and HART®:



Please note that the current measured on Channel 2 for a HART device should normally be between 4 and 20 mA.

2. Set-up the *HART® device, if loop power required, use CH2 for current (24V).*

   If the loop is already powered and there is an external HART® resistor, turn off CH2. Connect CH2 mA+ and mA- connections to the HART® resistor, see Section 1.3.

   If required, turn on the internal HART® resistor. This can be selected by pressing icon.

   Press the HART® button and the application starts.

3. Complete the electrical connections and continue with the HART® menu operation; see Section 8.4.

4. Complete the electrical connections and continue with the HART® menu operation; see Section 8.4.

8.3.2 External loop power

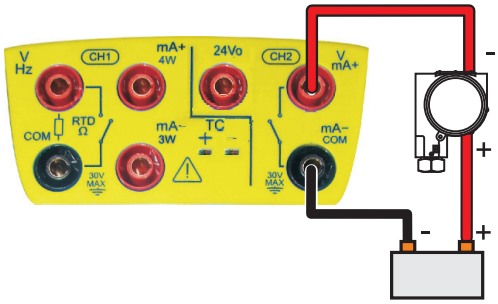
In this example, there is an external power supply.

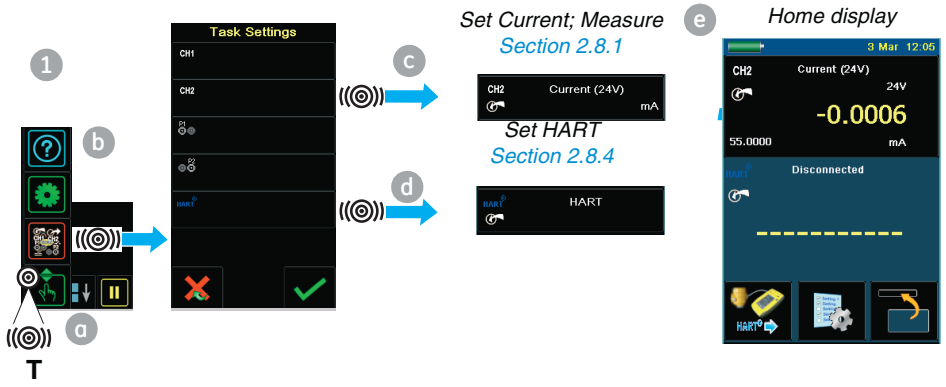
Measure current on channel 2 (CH2)

Range: ±55 mA

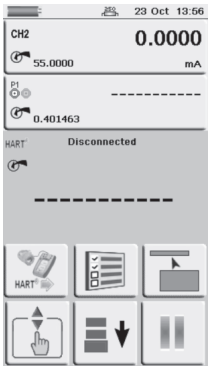
HART Function is set

250Ω resistor is set





5. Set the *HART® Resistor.*



Turn on the internal HART® resistor. This can be selected by pressing icon.

6. Complete the electrical connections and continue with the HART® menu operation.

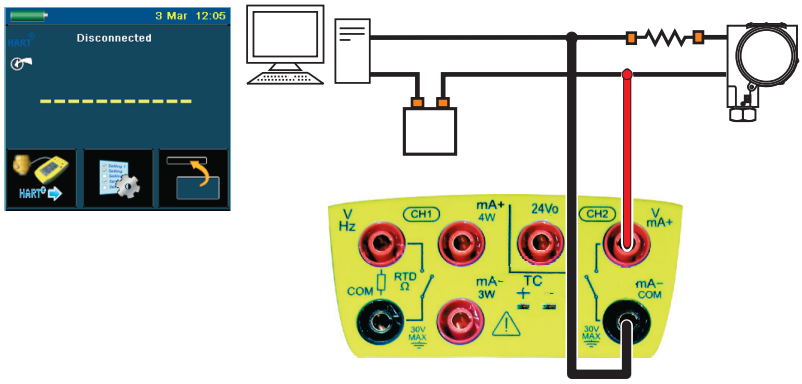
8.3.3 *Communicator attached to a network*

In this example, the calibrator connects directly to a network. There must be a 250Ω resistor in series with the loop power supply and the HART® device.

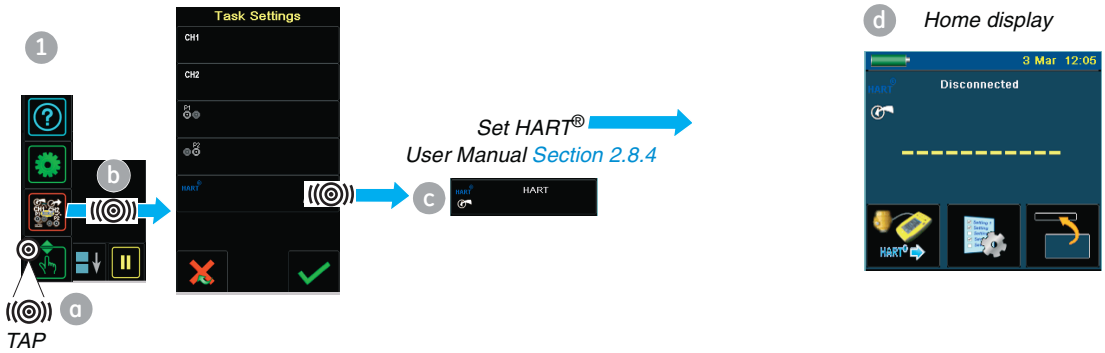
No functions on channel 2 (CH2)

HART® Function is set

250Ω resistor is set to *Off*



1. Set the function for HART®:



8.4 Failed to find a device

The following is a checklist of what to do.

- When using the DPI620-IS to supply power, make sure that the internal HART® resistor is turned on.
- Check the preferences option and set this to find first, then re-start the application. This will ensure that SDC625 finds a device that is not at poll address 0.
- When supplying power to the transmitter, check that the loop current measured on channel 2 is between 4 and 20 mA. In alarm conditions it is possible for it to be parked at 21.5 mA or 3.9 mA. However, if the current measured by channel 2 is far from these values, there must be a configuration fault.
- If the transmitter is powered externally with an external HART® resistor, ensure that channel 2 has been turned off.

Chapter 9: Maintenance procedures

9.1 Introduction

This section gives procedures to maintain the instrument 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.gesensinginspection.com)
- local government office.

9.2 Clean the unit

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

9.3 Replace the batteries

To replace the batteries, refer to Section 2.5.

All the configuration options stay in memory.

Chapter 10: Calibration procedures

10.1 Introduction

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

Return of the instrument to the manufacturer (recommended) or an approved service agent for calibration.

When using an alternative calibration facility, make sure that it uses these standards.

10.2 Before starting

To do an accurate calibration:

- use the calibration equipment specified in Table 10-1.
- calibrate in a stable temperature environment: 21 ± 1°C (70 ± 2°F).

Note: *Before starting a calibration procedure, leave the instrument in the calibration environment for a minimum period of two hours.*

Table 10-1: *Calibration equipment*

Function	Calibration equipment (ppm = parts per million)	
Current (CH1 or CH2)	Current (mA) calibrator. Accuracy - Current measure/source; see Table 10-2/10-3.	
Voltage (CH1 or CH2)	Volts calibrator. Accuracy - Voltage measure/source; see Table 10-5/10-7.	
Millivolts (CH1 or CH2) OR TC mV (CH1)	mV calibrator. Accuracy - Millivolts measure/source; see Table 10-4/10-6. Accuracy - TC mV; see Table 10-12.	
Frequency (CH1)	**(measure)** Signal generator Total error: 0.3 ppm or better	**(source)** Frequency meter Total error: 0.3 ppm or better Resolution: 8 digits (minimum)
Amplitude (source)	Digital voltmeter (DVM)	

Table 10-1: *Calibration equipment (Continued)*

Function	Calibration equipment (ppm = parts per million)	
Resistance (CH1)	**(measure)** Standard 0Ω resistor	**(source)** An ohmmeter or an RTD measurement system with the specified excitation currents; see Table 10-11.
	*Standard resistor (Ω): 100, 200, 300, 400, 1k, 2k, 4k Total uncertainty: 20 ppm	
CJ (CH1)	- Calibrated K type thermocouple Accuracy: 50 mK for -5 to 28°C (23 to 82.4°F) - Thermocouple temperature reference unit (0°C) Accuracy: 30 mK	
Pressure (P1 or P2)	An applicable pressure standard (primary or secondary): **Range 25 mbar/0.36 psi**: total uncertainty of 0.015% reading or better **Ranges > 25 mbar/0.36 psi**: total uncertainty of 0.01% reading or better	

* *Or an equivalent resistance simulator*

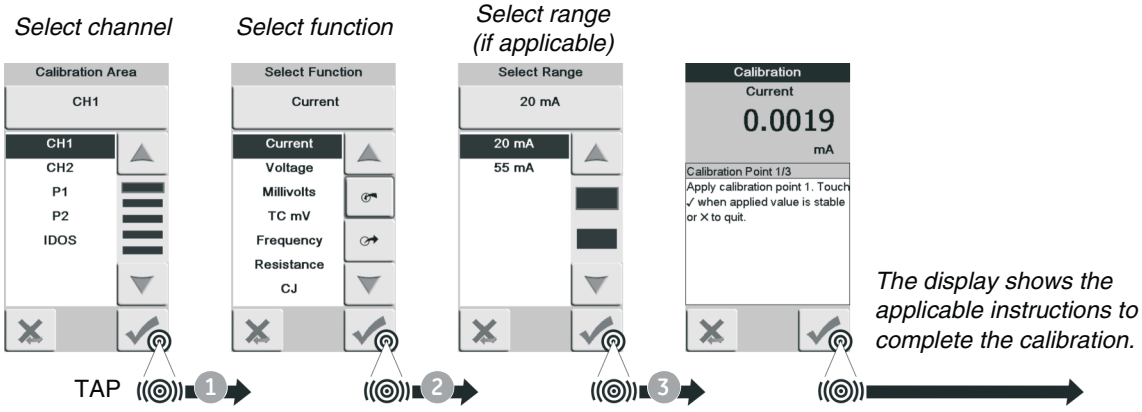
Before starting the calibration, make sure that the time and date on the instrument are correct; see Section 2.8.1 (Procedure to set the basic operations:).

10.3 Selection sequence

To do a calibration on a measure or source function, use the Advanced menu option; see Section 2.10 (The Advanced menu options):

➤ *Configuration* ➤ *Advanced* ➤ *Calibration* ➤ [Enter PIN: 4321] ➤ *Perform Calibration* ➤

Then select a function and start the calibration. This example shows the Current (measure) function:



When the calibration is complete, set the next calibration date; see Section 2.10.1 (Advanced: Calibration options).

10.4 Procedures (CH1/CH2): Current (measure)

(FS = full-scale)

1. Connect the applicable calibration equipment specified in Table 10-1; for example: see Section 3.2.2 (Example procedure: Measure or source current).
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a three-point calibration (-FS, Zero and +FS) for each range: 20 mA and 55 mA.
4. To make sure the calibration is correct, select the applicable Current (measure) function; see Section 3.2.2 and apply these values:

- mA: -55, -25, -10, -5, 0 (open circuit)

  Then mA: 0, 5, 10, 20, 25, 55.

5. Make sure the error is in the specified limits (Table 10-2).

Table 10-2: *Current (measure) error limits*

Applied mA	Calibrator uncertainty (mA)	Permitted DPI 620-IS error (mA)
±55	0.003	0.0055
±25	0.0025	0.0040
±20	0.00063	0.0022
±10	0.00036	0.0016
±5	0.00025	0.0013
0 (open circuit)	0.0002	0.0010

10.5 Procedures (CH1/CH2): Current (source)

1. Connect the applicable calibration equipment in Table 10-1; for example:

- CH1/CH2 (24 mA range): see Section 3.2.2 (Example procedure: Measure or source current), example **B**.
- CH2 (-24 mA range only): see Section 3.2.6 (Example procedure: Measure or source current (24V loop power)), example **B**.

2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).

3. Use the calibration menu (Section 10.3) to do a two-point calibration (Zero and FS):

- CH1 (one range): 24 mA.
- CH2 (two ranges): -24 mA and 24 mA.

4. To make sure the calibration is correct, select the applicable Current (source) function; see Section 3.2.2 or Section 3.2.6 and apply these values:

- CH1/CH2 (24 mA range): 0.2, 6, 12, 18, 24.
- CH2 (-24 mA range): -0.2, -6, -12, -18, -24.

5. Make sure the error is in the specified limits (Table 10-3).

Table 10-3: *Current (source) error limits*

Source mA	Calibrator uncertainty (mA)	Permitted DPI 620-IS error (mA)
±0.2	0.00008	0.0010
±6	0.00023	0.0016
±12	0.00044	0.0022
±18	0.0065	0.0028
±24	0.0012	0.0034

10.6 Procedures (CH1/CH2): DC mV/Volts (measure)

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.3 (Example procedure: Measure DC voltage).
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a three-point calibration (-FS, Zero and +FS) for the applicable set of ranges:

mV (measure) ranges	Volts (measure) ranges
• 200 mV	• 20 V
• 2000 mV	• 30 V

4. To make sure the calibration is correct, select the applicable Millivolts or Voltage (measure) function; see Section 3.2.3.
5. Then apply the input values that are applicable to the calibration:

- mV: -2000, -1000, -200, -100, 0 (short circuit).

  Then mV: 0, 100, 200, 1000, 2000.

OR

- Volts (V): -30, -21, -20, -10, -5, 0 (short circuit).

  Then volts (V): 0, 5, 10, 20, 21, 30.

6. Make sure the error is in the specified limits (Table 10-4 or Table 10-5).

Table 10-4: *Millivolts (measure) error limits*

Applied mV	Calibrator uncertainty (mV)	Permitted DPI 620-IS error (mV)
±2000	0.051	0.14
±1000	0.040	0.1
±200	0.0051	0.017
±100	0.0040	0.0125
0 (Short circuit)	0.0036	0.008

10.7 Procedures (CH1 mV (measure)/Volts Source

1. Connect the applicable calibration equipment in Table 10-1;

Table 10-5: *Voltage (measure) error limits*

Applied V	Calibrator uncertainty (V)	Permitted DPI 620-IS error (V)
±30	0.00052	0.0021
±21	0.0004	0.0018
±20	0.00031	0.0009
±10	0.00016	0.00065
±5	0.00008	0.00053
0 (Short circuit)	0.000024	0.0004

for example: see Section 3.2.6 (Example procedure: Source DC voltage (CH1)).

2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a two-point calibration (Zero and +FS) for the applicable range:

mV (source) ranges

- 2000 mV

Volts (source) ranges

- 12 V

4. To make sure the calibration is correct, select the applicable Millivolts or Voltage (measure) function; see Section 3.2.6.
5. Then set the output values applicable to the calibration:

- mV: 0, 100, 200, 1000, 2000 OR.
- Volts (V): 0, 3, 6, 9, 12.

6. Make sure the error is in the specified limits (Table 10-6 or Table 10-7).

Table 10-6: *Millivolts (source) error limits*

Source mV	Calibrator uncertainty (mV)	Permitted DPI 620-IS error (mV)
0	0.0001	0.008
100	0.00046	0.0125
200	0.0009	0.017
1000	0.003	0.1
2000	0.006	0.14

Table 10-7: *Voltage (source) error limits*

Source V	Calibrator uncertainty (V)	Permitted DPI 620-IS error (V)
0	0.000004	0.00042
3	0.000010	0.0006
6	0.000018	0.00078
9	0.000027	0.00096
12	0.000036	0.0011

10.8 Procedures (CH1): Frequency (measure/source)

It is only necessary to do one frequency calibration; use the measure function or the source function.

Frequency calibration (measure function): With the necessary calibration equipment, use this procedure:

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.8 (Example procedure: Measure or source frequency signals), example **A**.
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Set-up the equipment with these conditions:

Signal generator:	Output = 10V, unipolar, square wave
	Frequency = 990 Hz
DPI 620-IS:	Input units = Hz
	Input trigger level = 5 V

4. Use the calibration menu (Section 10.3) to do a one-point calibration then do the calibration checks (step 5).

Frequency calibration (source function): With the necessary calibration equipment, use this procedure:

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.8 (Example procedure: Measure or source frequency signals), example **B**.
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).

3. Set-up the equipment with these conditions:

Frequency meter: Gate time = one second

DPI 620-IS: *Waveform = Square;*
Amplitude = 10 V;
Frequency = 990 Hz

4. Use the calibration menu (Section 10.3) to do a one-point calibration then do the calibration checks (step 5).

Calibration check

5. To make sure the frequency calibration is correct, set-up the equipment to do one of these calibration checks:

- Frequency (measure) calibration check (Section 3.2.8):

  Signal generator: Output = 10 V, unipolar, square wave

  DPI 620-IS: Input trigger level = 5 V

  Units: Hz or kHz as specified in Table 10-8 or Table 10-9.

- Frequency (source) calibration check (Section 3.2.8):

  Frequency meter: Gate time = one second

  DPI 620-IS: Units: Hz or kHz as specified in Table 10-8 or Table 10-9.

6. Measure or source the specified values (Table 10-8 or Table 10-9): Hz then kHz. Make sure the error is in the specified limits.

Table 10-8: *Hz error limits (measure/source)*

Measure/ source Hz	Calibrator uncertainty (Hz)	Permitted DPI 620-IS error (Hz)	
		(measure)	(source)
100	0.0002	0.0023	0.0026
990	0.0005	0.0050	0.0053
5000	0.0002	0.00035	0.000185

10.9 Procedures (CH1): Frequency amplitude (source)

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.8 (Example procedure: Measure or source frequency signals), example **B**.
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Set-up the DPI 620-IS with these conditions:

   Source frequency = 0 (For direct current output);
   Waveform = Square
4. Use the calibration menu (Section 10.3) to do a two-point calibration:

   point 1 = 0.2 V, point 2 = 12 V
5. To make sure the calibration is correct, set-up the DPI 620-IS with these conditions:

   Source frequency = 0 (For direct current output);
   Waveform = Square
6. Set the specified values (Table 10-9). Make sure the error is in the specified limits.

Table 10-9: *Amplitude (source) error limits*

Amplitude Volts (V)	Calibrator uncertainty (V)	Permitted DPI 620-IS error (V)
0.2	0.01	0.1
4.0	0.01	0.1
8.0	0.01	0.1
12.0	0.01	0.1

Note: *The calibrated amplitude is the positive (mark) voltage level. The negative (space) voltage level is approximately -120 mV.*

10.10 Procedures (CH1): Resistance (measure)

1. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
2. Use the calibration menu (Section 10.3) to do a two-point calibration for each range.

- Range: 0-400Ω
  a. Nominal zero ohms: Make a 4-wire connection to the 0Ω resistor; see Section 3.2.9 (Example procedure: Measure or simulate an RTD (or Resistance)), example **A**.
  b. Nominal positive full-scale ohms: Make a 4-wire connection to the 400Ω resistor; see Section 3.2.9 (**A**).
- Range: 400Ω-4kΩ.
  a. Nominal 400 ohms: Make a 4-wire connection to the 400Ω resistor; see Section 3.2.9 **(A)**.
  b. Nominal positive full-scale ohms: Make a 4-wire connection to the 4kΩ resistor; see Section 3.2.9 (**A**).

Note: *Details of the true ohms option to be issued later.*

3. To make sure the calibration is correct, select the applicable Resistance (measure) function; see Section 3.2.9, (**A**).
4. Make a 4-wire connection to the applicable standard resistor (Table 10-10) and measure the value; see Section 3.2.9, (**A**).
5. Make sure the error is in the specified limits (Table 10-10).

Table 10-10: *Resistance (measure) error limits*

Standard Resistor* (Ω)	Resistor uncertainty (Ω)	Permitted DPI 620-IS error (Ω)
0 (Short circuit)	-	0.02
100	0.002	0.032
200	0.004	0.044
300	0.006	0.056
400	0.008	0.068
1k	0.02	0.30
2k	0.04	0.41
4k	0.08	0.64

* *Or an equivalent resistance simulator*

10.11 Procedures (CH1): Resistance (source)

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.9 (Example procedure: Measure or simulate an RTD (or Resistance)), example **B**.
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a two-point calibration for each range.

- Range: 0-400Ω
- Range: 400Ω-2000Ω
- Range: 2kΩ-4kΩ

4. To make sure the calibration is correct, select the applicable Resistance (source) function; see Section 3.2.9, (**B**).
5. Set the specified values (Table 10-11). Make sure the error is in the specified limits.

Table 10-11: *Resistance (source) error limits*

Ohms (Ω)	Excitation (mA)	Calibrator uncertainty (Ω)	Permitted DPI 620-IS error (Ω)
0	0.1	0.0014	0.014
100	0.1	0.0016	0.038
200	0.1	0.0021	0.062
300	0.1	0.0028	0.11
400	0.1	0.0035	0.31
1000	0.1	0.008	0.55
2000	0.1	0.016	0.86
4000	0.1	0.032	1.1

10.12 Procedures (CH1): TC mV (measure or source)

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.10 (Example procedure: Measure or simulate a thermocouple (or TC mV)).
2. Let the equipment get to a stable temperature (minimum: 5 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a three-point calibration (-10 mV, Zero and 100 mV) for the measure or source function:
4. To make sure the calibration is correct, select the applicable TC mV (measure) or (source) function; see Section 3.2.10, and apply the necessary values:

- TC mV (measure): -10, 0 (short circuit).

  Then TC (mV): 10, 25, 50, 100.

OR

- TC mV (source): -10, 0, 10, 25, 50, 100.

5. Make sure the error is in the specified limits (Table 10-12).

Table 10-12: *TC mV (measure or source) error limits*

Input or output	Calibrator uncertainty TC (mV)		Permitted DPI 620-IS error (mV)	
TC (mV)	(measure)	(source)	(measure)	(source)
-10	0.0036	0.00011	0.0085	0.0085
0	0.0036	0.0001	0.008	0.008
10	0.0036	0.00011	0.0085	0.0085
25	0.0036	0.00015	0.0091	0.0091
50	0.0037	0.00025	0.010	0.010
100	0.004	0.00046	0.0125	0.0125

10.13 Procedures (CH1): CJ (measure)

Note: *Do the TC mV (measure) calibration (Section 10.12) before the cold junction calibration.*

1. Connect the applicable calibration equipment in Table 10-1; for example: see Section 3.2.10 (Example procedure: Measure or simulate a thermocouple (or TC mV)), example **A**.
2. Set-up the DPI 620-IS calibrator:

   Function = TC (measure);
   TC Type = K Type
   CJ Compensation; Mode = Automatic
3. Set the reference unit temperature: 0°C
4. Let the equipment get to a stable temperature (minimum: 2 hours since the last power on).
5. Record these values:

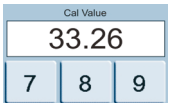
- the thermocouple temperature given on the reference unit, T (actual).
- the thermocouple temperature given on the calibrator, T (measured).
- the CJ temperature given on the calibrator, CJ (measured); for example: in Section 3.2.10 example (**A**), CJ (measured) = 32.66.

6. Calculate the CJ (Cal Value) as follows:

   CJ (Cal Value) = CJ (measured) - T (actual) + T (measured)
7. Use the calibration menu (Section 10.3) to do a one-point calibration for the CJ (measure) function.

   When the screen shows “Sampling complete. ... ”, set the correct *Cal Value* = CJ (Cal Value) in step 6.

Set the *Cal Value*:



8. To make sure the calibration is correct, select the TC (measure) function; see Section 3.2.10, (**A**).
9. Make sure the DPI 620-IS calibrator gives a thermocouple temperature that agrees with the temperature on the reference unit ±0.1°C (0.2°F).

10.14 Procedures: Pressure indicator modules (PM 620-IS)

1. Assemble the pressure indicator with the necessary PM 620-IS modules and connect the instrument to the pressure standard; see Section 4.4.4 (Example procedure: Measure pressure).
2. Let the equipment get to a stable temperature (minimum: 60 minutes since the last power on).
3. Use the calibration menu (Section 10.3) to do a two-point calibration (Zero and +FS) or a three-point calibration (-FS, Zero and +FS). Refer to Table 10-13.

Table 10-13: *Calibration pressures*

Ranges: g	Nominal applied pressure mbar (psi)		
	-FS †	Zero	+FS
≤ 700 mbar (10.0 psi)	-FS	0	+FS
> 700 mbar (10.0 psi)	-900 (-13.1)	0	+FS
† *For a three-point calibration, do not apply more than -90% of the specified FS for the unit.*			
Ranges: a	**Nominal applied pressure mbar (psi)**		
	Zero		**+FS**
350 mbar (5.00 psi)	< 1.0 (0.02)		+FS
2 bar (30.0 psi)	< 5.0 (0.07)		+FS
7 bar (100.0 psi)	< 20.0 (0.29)		+FS
20 bar (300.0 psi)	< 50.0 (0.73)		+FS
≥ 350 bar (5000 psi)	Use atmospheric pressure as zero.		+FS

4. To make sure the calibration is correct, select the applicable pressure function; see Section 4.4.4, and apply these pressure values:

- Ranges g: 0, 20, 40, 60, 80, 100 (%FS)

  Then: Go back to 0 in the same steps.

  Then (three-point calibration only):
  -20, -40, -60, -80, -100 (%FS)

  Then: Go back to 0 in the same steps.
- Ranges a: 0, 20, 40, 60, 80, 100 (%FS)

  Then: Go back to 0 in the same steps.

5. Make sure the error is in the specified limits; see the tables for *Gauge Ranges* or *Absolute Ranges* given in the datasheet (supplied on the CD: P/N UD-0002); use the values in column “Total uncertainty ... “.

The specified values include an allowance for temperature changes, reading stability for one year, and the uncertainty of the standard used for calibration.

Chapter 11: General specification

11.1 Introduction

For a full specification of the DPI 620-IS calibrator and its related accessories (MC 620-IS carrier, PM 620-IS module, and PV 62x-IS pressure stations) refer to the datasheet supplied on the CD (CD: P/N UD-0003).

Table 11-1: *General specification*

Display	OLED: Colour display with touch-screen
Operating temperature	-10 to 40°C (14 to 104°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Ingress Protection	IP65 (DPI 620-IS calibrator only)
Humidity	0 to 90% relative humidity (RH) non-condensing
Shock/Vibration	Def Stan 66-31, 8.4 cat III
EMC	Electromagnetic compatibility: BS EN 61326-1:2006
Electrical safety	Electrical - BS EN 61010:2001
Pressure safety	Pressure Equipment Directive - Class: Sound Engineering Practice (SEP)
Approved	CE Marked
Battery power	NiMH battery (GE Part number: IO620IS-Battery) Capacity: 4000 mAh; Nominal voltage: 3.6 V Charge temperature: 0 to 40°C (32 to 104°F) If the charger senses the temperature is outside this range, it stops charging. Discharge temperature: -10 to 50°C (14 to 122°F) Charge/discharge cycles: > 500 > 70% capacity

Customer service

Visit our web site: www.gesensinginspection.com