Druck DPI 104
Digital pressure indicator
User manual - K394
Introduction

The Druck DPI 104 is a digital pressure indicator that measures the pressure of liquid, gas or vapour and shows the pressure value on a liquid crystal display (LCD). It also has the Intelligent Digital Output Sensor (IDOS) technology to use data from a Universal Pressure Module (UPM). The DPI 104 includes these functions:

- * Measure pressure - Accuracy: 0.05% full scale (FS)
- Large 5-digit main display with 11 pressure units
- Adjustable Full Scale Output (FSO)
- 20 segment analogue dial in increments of 5% FSO (large division marks = 10% increments)
- 2.5 digit percentage indicator (0-100% FSO)
- 8-pin connector port: For RS232, **IDOS UPM, external power supply
- Alarm output for high/low pressure conditions
- Switch input to monitor an external pressure switch
- Analogue voltage output (Vout): 0 - 5 Vdc
- Other functions: Maximum/minimum, tare, Vout scale factor, automatic power off

Safety

Before you use the DPI 104, make sure that you read and understand all the related data. This includes: all local safety procedures, and this publication.

**WARNING**
- Some liquid and gas mixtures are dangerous. This includes mixtures that occur because of contamination. Make sure that the DPI 104 is safe to use with the necessary media.
- It is dangerous to ignore the specified limits for the DPI 104 or to use the DPI 104 when it is not in its normal condition. Use the applicable protection and obey all safety precautions.
- To prevent a dangerous release of pressure, isolate and bleed the system before you disconnect a pressure connection.
- Do not use the DPI 104 in locations with explosive gas, vapour or dust. There is a risk of an explosion. Before you start an operation or procedure, make sure that you have the necessary skills (if necessary, with qualifications from an approved training establishment). Follow good engineering practice at all times.

Safety - Marks and symbols on the DPI 104

Complies with European Union directives
To Start

To start - Location of items

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>8-pin connector for external power supplies, RS232/UPM connections and signal input/output.</td>
</tr>
<tr>
<td>2.</td>
<td>• Power on button</td>
</tr>
<tr>
<td></td>
<td>• Menu mode: Press for 2 seconds to show the first menu option. To move down the menu structure, press again and again, or press and hold.</td>
</tr>
<tr>
<td></td>
<td>• Reject or stop the change to a value.</td>
</tr>
<tr>
<td></td>
<td>• In Maximum/minimum mode. Press to show the maximum and minimum values since the last reset. A = maximum j = minimum</td>
</tr>
<tr>
<td>3.</td>
<td>In menu mode:</td>
</tr>
<tr>
<td></td>
<td>- On/OFF selection</td>
</tr>
<tr>
<td></td>
<td>- Increase/decrease a value</td>
</tr>
<tr>
<td></td>
<td>- Move the decimal left/right</td>
</tr>
<tr>
<td>4.</td>
<td>Pressure sensor and connector with 320° of turn: gauge (g), absolute (a) or Sealed gauge (sg). Refer to “Specification data”.</td>
</tr>
<tr>
<td>5.</td>
<td>In menu mode:</td>
</tr>
<tr>
<td></td>
<td>- Accepts a menu selection</td>
</tr>
<tr>
<td></td>
<td>- Shows the next menu level</td>
</tr>
<tr>
<td></td>
<td>- Accepts a value</td>
</tr>
<tr>
<td></td>
<td>• In Tare mode: Tare the pressure value on the display.</td>
</tr>
<tr>
<td></td>
<td>• In Maximum/minimum mode. Reset the maximum/minimum values.</td>
</tr>
<tr>
<td>6.</td>
<td>Display bezel with 348° of turn.</td>
</tr>
<tr>
<td>7.</td>
<td>O-ring.</td>
</tr>
<tr>
<td>8.</td>
<td>Battery connector</td>
</tr>
<tr>
<td>9.</td>
<td>Battery: 9 V Alkaline (supplied but not installed). Refer to “Installation”.</td>
</tr>
<tr>
<td>10.</td>
<td>Battery clamp with two screws.</td>
</tr>
</tbody>
</table>

To start - Items on the display

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>5-digit main display.</td>
</tr>
<tr>
<td>12.</td>
<td>2.5-digit percentage indicator (0-100% FSO).</td>
</tr>
<tr>
<td></td>
<td>%FSO = [Applied Pressure/FSOHigh — FSOLow] * 100</td>
</tr>
<tr>
<td>13.</td>
<td>20 segment analogue dial in increments of 5% FSO (large division marks = 10% increments).</td>
</tr>
<tr>
<td></td>
<td>%FSO = [Applied Pressure/FSOHigh — FSOLow] * 100</td>
</tr>
<tr>
<td>14.</td>
<td>The units of measurement: kPa, MPa, kg/cm², psi, mbar, bar, mmHg, mmH₂O, mH₂O, inH₂O, inHg</td>
</tr>
</tbody>
</table>

15. Mode indication.
- Voltage output (Vout) mode - On.
- RS232 connection. The data transmit/receive function is active.
- Switch mode - On. To monitor an external pressure switch.
  - = switch closed
  - = switch open
- Menu Lock mode - On. To restrict access to the menu functions.
- Alarm mode - On. The symbol flashes when the measured value satisfies one of the alarm conditions.
  - = High alarm
  - = Low alarm
- Maximum/minimum mode - On.
- IDOS UPM mode - On. To monitor pressure from a UPM

16. Low battery power indication: Battery life ≤ 15%.

To start - Prepare the instrument

Before you use the instrument for the first time:
- Make sure that there is no damage to the instrument, and that there are no missing items.
- Install the battery (refer to “Installation”). Then re-attach the display bezel [A1: item 6].

To start - Power on or off

Press the buttons in the sequence shown below.
- Power on sequence:
  - First display = FS limit Then: Normal output
    - Normal output
    - Menu: 2
    - OFF (For 2 seconds)

- Power off sequence:
  - Normal output

When the power is off, the last set of configuration options stays in memory.
Note: The DPI 104 uses a small quantity of power while it is OFF. If you put it into storage for a long period, disconnect the battery (refer to “Installation”).
### To start - Menu operation

<table>
<thead>
<tr>
<th>Menu Description</th>
<th>Steps</th>
<th>Result/Subsequent steps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF</strong> = Power supply: OFF only</td>
<td>1</td>
<td>Power goes off</td>
</tr>
<tr>
<td><strong>unitS</strong> = Set units: [A2: item 14]</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>t OFF</strong> = Set tare: Set to On or OFF.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong> = Monitor maximum/minimum:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong> = Monitor a pressure switch:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>C _ _ _ C</strong> = Calibration: To continue, set</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A OFF</strong> = Set low/high alarm: Set to On or</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong> = Supply voltage output (Vout):</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S 1.00</strong> = Set Vout scale factor: A Vout</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Au On</strong> = Set automatic power OFF:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong> = Set lock code: A menu protection</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sc 02</strong> = Set scan rate: A rate to update</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong> = Monitor external IDOS: Set to On or</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS ↓</strong> = Set FSO low register: To set a</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FS ↑</strong> = Set FSO high register: To set a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Power supply:
- OFF only

#### Units:
- [A2: item 14]

#### Tare:
- Set to On or OFF

#### Monitor maximum/minimum:
- Set to On or OFF

#### Monitor a pressure switch:
- Set to On or OFF

#### Calibration:
- Continue setting
  - C0 (Correct the zero offset value)
  - C2 (Do a two-point pressure calibration)
  - V2 (Do a two-point voltage calibration).

#### Set tare:
- Set to On or OFF
  - 0A 00.000: Set a tare value (Refer to Table 4)

#### Monitor function is set on or off

#### Supply voltage output (Vout):
- Set to OFF, P-V, or US
  - **P-V:** Vout is proportional to the pressure value on the display. Make sure the Vout scale factor is correct.
  - **US:** Set a Vout value (0% to 100%) to control an external pressure regulator. Make sure the Vout scale factor is correct.

#### Set Vout scale factor:
- Set a value for the low and/or high alarm
  - (0 to 105% FSO)

#### Set low/high alarm:
- Set to On or OFF
  - On ➤ 000.0 ➤ 100.0 ➤

#### Set lock code:
- Set to On or OFF
  - On ➤ L 000: Set a new lock code (If necessary)

#### Set scan rate:
- Set an applicable rate (02 to 10 Hz)

#### Set automatic power OFF:
- Set to On or OFF
  - On ➤ Au 15 : Set the period for automatic power OFF (1 to 99 minutes) Factory value = 15 minutes.

#### Set lock code:
- Set to On or OFF
  - On ➤ L 000: Set a new lock code (If necessary)

#### Monitor function is set on or off

#### Set FSO low register:
- To set a different range for these functions
  - analogue display, %, alarm

#### Set FSO high register:
- To set a different range for these functions
  - analogue display, %, alarm

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Normal display
**Installation**

This section shows how to install and connect the DPI 104. Before you start:

- Read and understand the “Safety” section.
- Do not use a damaged DPI 104.

**Installation - Battery**

Use the procedures in Table 1 to install or replace the battery.

**Table 1: Installation procedures - Battery**

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If applicable, set the power to off and isolate the external power supply.</td>
</tr>
<tr>
<td>2</td>
<td>Remove the display bezel (Figure A1.2).</td>
</tr>
<tr>
<td>3</td>
<td>Make sure that the o-ring [A1: item 7] and the related surfaces are serviceable. Use only original parts supplied by the manufacturer.</td>
</tr>
<tr>
<td>4</td>
<td>Remove the battery clamp [A1: item 10].</td>
</tr>
<tr>
<td>5</td>
<td>If applicable, disconnect the battery connector [A1: item 8] and discard the used battery.</td>
</tr>
<tr>
<td>6</td>
<td>Attach the battery connector [A1: item 8] to the new battery.</td>
</tr>
<tr>
<td>7</td>
<td>Install the new battery (Figure A1.3) and re-attach the battery clamp [A1: item 10].</td>
</tr>
<tr>
<td>8</td>
<td>Push the display bezel [A1: item 6] back into position until it is fully engaged.</td>
</tr>
</tbody>
</table>

* Use an applicable recycling facility.

**Installation - Position**

Make sure that you attach the DPI 104 in a safe configuration that prevents unwanted stress (for example, vibration, physical impact, shock, mechanical and thermal stresses).

To get the best installation position, you can turn the pressure connector (A1: item 4) and the display bezel (A1: item 6) to give the best view of the display (Figure B1). End stops set the limits in each axis.

**CAUTION:** To prevent damage when you are setting the best view of the display, do not use force to turn the pressure connector or the bezel farther than the end stops.

**Installation - Pressure connections**

**CAUTION:** To prevent damage, do not use the body of the DPI 104 to tighten the pressure connection. Use the flat faces on the pressure connector.

Use an applicable method to seal the pressure connections, and then tighten to the applicable torque (Figure 1 and Table 2).

**Table 2: Key to figure 1**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Applicable DPI 104 pressure connector. Maximum torque: 1/4 NPT: 68 Nm (50 lbf.ft) G1/4: 20 Nm (15 lbf.ft) 9/16 x 18 UNF cone: 34 Nm (25 lbf.ft)</td>
</tr>
<tr>
<td>2.</td>
<td>(1/4 NPT only) Thread with an applicable sealant</td>
</tr>
<tr>
<td>3.</td>
<td>(G1/4 only) Applicable bonded seal</td>
</tr>
</tbody>
</table>

**Table 3: Connections for the 8-Pin connector**

<table>
<thead>
<tr>
<th>Connector</th>
<th>Pin</th>
<th>Input/Output</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Input</td>
<td>12 - 24V dc power supply</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Input</td>
<td>Signal ground</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Output</td>
<td>RS232 transmit</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Input</td>
<td>RS232 receive</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Output</td>
<td>Voltage output</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Output</td>
<td>Alarm output</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Input</td>
<td>Pressure switch input</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Output</td>
<td>No connection</td>
<td></td>
</tr>
</tbody>
</table>

These optional accessories use the connector:

- RS232 PC connection
- external IDOS UPM connection + power supply adaptor

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

You can also use the RS232 interface to make a serial network of units (maximum: 99). Refer to “Operation - Set up a DPI 104 network”.

**Electrical connections - External power**

We recommend you use an external power supply for these functions and operations:

- Functions: Maximum/minimum, Switch, Low/high alarm, Vout, IDOS
- Operations that use the DPI 104 for long periods
Operation
This section shows how to use the DPI 104. Before you start:
• Read and understand the “Safety” section.
• Make sure that the installation is complete (Refer to the “Installation” section).
• Do not use a damaged DPI 104.

Operation - Menu: Set units
There are 11 different units to measure pressure. Refer to the “Specification data” section.

Units - Set up
Refer to “To start - Menu operation”.

Operation - Menu: Set tare
Use the tare function to adjust the pressure value on the display. For example: To make an adjustment for atmospheric pressure. Refer to Table 4.

Table 4: Permitted tare values

<table>
<thead>
<tr>
<th>Range</th>
<th>Permitted tare values</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ranges: a, sg</td>
<td>0 to 105% FS</td>
</tr>
<tr>
<td>g: 0.7 bar [10 psi]</td>
<td>-0.7 bar [-10 psi] to 105% FS</td>
</tr>
<tr>
<td>g: ≥ 2 bar [30 psi]</td>
<td>-1 bar [-15 psi] to 105% FS</td>
</tr>
</tbody>
</table>

If you set a value that is not in the permitted range, the value is reset to the nearest applicable limit.

Tare - Set up and use
Menu: Set this function to On (Refer to “To start - Menu operation”).
When this function is On, there are two options to set a tare value (tA):

• Menu option: Set the menu “t On”, then set a tA value:

  ```
  tA display
  R |
  \ |
  O|
  0 0 0 0 . mbar

  1 2
  tA display
  R |
  \ |
  O|
  0 7 0 0 . mbar

  0 to 9, or -

  Repeat steps 1 + 2 for each digit and for the decimal point.
  
  • Zero option: Step 1 lets you set a value for tA. Press and hold.

Normal output

  7 0 0 0 . mbar

  tA = 0

  Normal output

  0 0 0 0 . mbar

  tA = 70 mbar
```

When tA is not zero, the last segment on the analogue dial flashes.

To make sure that there is an indication of the correct pressure while tare is On, the analogue dial and % indication show values calculated from the calibrated range without the tare adjustment.

Tare - With Lock
If the menu lock is On with a lock code set < 500, the zero option is rejected - Error code (E0002).

Tare - With Alarm and/or Vout
If you set a tare value (tA) while the alarm and/or Vout functions are On, the display counts down from: tAR09 to tAR00.

To cancel the specified tA value, press this button OR let the count complete.

To continue with the specified tA value, press this button.

Tare - With FSO values
To make sure that there is an indication of the correct pressure while tare is On, the FSO Low and/or FSO High values are not used.

Operation - Menu: Monitor maximum/minimum
When this function is On, it updates its data at five times the specified scan rate (02 to 10 Hz). Refer to “To start - Menu operation”.

To save battery power, we recommend that you use an external power supply with this function.

Maximum/minimum - Set up and use
Menu: Set this function to On (Refer to “To start - Menu operation”).
When this function is On, use steps 1 + 2 to show the maximum/minimum since the last reset.

<table>
<thead>
<tr>
<th>1 maximum</th>
<th>2  minimum</th>
<th>3  donE</th>
</tr>
</thead>
<tbody>
<tr>
<td>78.80 mbar</td>
<td>65.80 mbar</td>
<td>Reset</td>
</tr>
</tbody>
</table>

Step 3 lets you reset the values for maximum/minimum. Press and hold.
**Operation - Menu: Monitor a pressure switch**
Use this function to measure the performance of a pressure switch (mechanical operation and hysteresis). To save battery power, we recommend that you use an external power supply with this function.

**Pressure switch input - Set up and use**
1. Connect the instrument (Figure 2/Table 3).
2. Menu: Set this function to **On** (Refer to “To start - Menu operation”).

![Figure 2: Example configuration - Switch input](image)

Figure 2 shows the display when the switch condition changes (open or closed). The analogue dial and the % indication continue to monitor the normal pressure. The switch symbol and the value on the main display flash to give the switch condition and the switch pressure.

To reset the monitor function, press this button.

**Operation - Menu: Calibration**
Refer to the “Calibration” section.

**Operation - Menu: Set low/high alarm**
Use the alarm function to show when the pressure is not in the specified limits for the system.
Set applicable values in the range 0 to 105% FSO:

\[
\%\text{FSO} = \left(\frac{\text{Applied Pressure}}{\text{FSO High} - \text{FSO Low}}\right) \times 100
\]

Note: If you set a tare value, the alarm function uses the calibrated range (Refer to "Operation - Menu: Set tare").

The alarm indication is available on the display and as a signal output (Table 3).

While there is an alarm condition, the applicable alarm symbol (high or low) flashes on the display (A1: Item 15).

To save battery power, we recommend that you use an external power supply with this function.

**Low/high alarm - Set up and use**
Menu: Set this function to **On** (Refer to “To start - Menu operation”). Then use these steps to set the low and/or high alarm.

![Alarm indicator](image)

5. To finish, repeat steps 3 + 4 for each digit.

If the value you enter is not correct, the value resets to the nearest permitted value. That is:
- a value in the range 0 to 105% FSO
- a low alarm value < high alarm value

To accept or change the new value, repeat steps 1 to 5.

To cancel the new value, press this button.

**Operation - Menu: Supply voltage output (Vout)**
Use the Vout function to supply a voltage output (0 to 5V) to an external system. There are two options:

**P-V:** Vout is proportional to the pressure value on the display.

**US:** User mode. Set a value in the Vout register (0 to 100%) to control an external pressure regulator.

To save battery power, we recommend that you use an external power supply with this function.

**P-V mode voltage calculation**
Example DPI 104: FSO = 20 bar (or 300 psi), Vout scale factor = 1.00.

If you apply 10 bar (or 150 psi) to this DPI 104:

\[
\text{Vout} = \frac{10}{20} \times 5V = 2.5V
\]

**US mode voltage calculation**
This calculation uses the values set up for the Vout register and the Vout scale factor.

If the pressure ranges for the DPI 104 and the regulator are different, set a new Vout scale factor (refer to “Operation - Menu: Set Vout scale factor”).

\[
\text{Vout} = \left(\frac{\text{Vout register} \times 5V}{100}\right) \times \text{Vout scale factor}
\]

Example if the Vout register is set to 25%, and the Vout scale factor is set to 0.5:

\[
\text{Vout} = \frac{25}{100} \times 5V = \frac{2.5V}{0.5} = 2.5V
\]

**Voltage output (Vout) - Set up and use**
1. Connect the instrument (Figure 3).
2. Menu: Set this function to **OFF, P-V, US** (Refer to “To start - Menu operation”).
**Operation - Menu: Set Vout scale factor**

When the Vout function is set to P-V or US mode, the Vout scale factor becomes part of the Vout calculation (refer to “Operation - Menu: Supply voltage output (Vout)”). If the pressure ranges for the DPI 104 and the external pressure regulator are different, you must set an applicable scale factor (0.01 to 9.99).

**Example - To get a 25 bar (or a 375 psi) line pressure with:**

- an External pressure regulator:
  
  FSO = 100 bar (or 1500 psi)

- a DPI 104: FSO = 200 bar (or 3000 psi)

In this example:

\[
\text{Scale factor} = \frac{100}{200} \text{ OR } \frac{1500}{3000} = 0.5
\]

\[
\text{Vout register (\%)} \text{ (DPI 104)} = (25/200) \times 100 \text{ OR } (375/3000) \times 100
\]

\[
= 12.5\%
\]

To get a 25 bar (or a 375 psi) line pressure, the DPI 104 uses these values to supply the Vout value shown below:

\[
\text{Vout} = \left( \frac{12.5}{100} \times 5V \right) / 0.5 = 1.25 \text{ V}
\]

**Operation - Menu: Set automatic power OFF**

Use this function to save battery power. The power goes off a specified period after the last button or external software operation. To get the maximum battery life, we recommend you use this function.

*Note: The DPI 104 uses a small quantity of power while it is OFF. If you put it into storage for a long period, disconnect the battery (refer to “Installation”).*

**Automatic power OFF - Set up and use**

Menu: Set this function to On. Then set an applicable value in the range 1 to 99 minutes. Refer to “To start - Menu operation”.

*Note: If continuous operation is important, set this function to OFF and use an external power supply.*

**Operation - Menu: Set lock code**

Use the lock function to prevent accidental changes to the configuration. There are two options:

- Lock code < 500: This locks the menu and the tare function. Factory code = 000
- Lock code > 499: This locks the menu but you can still use the zero option to set a tare value.

Refer to “Operation - Menu: Set tare”.

**Lock code - Set up and use**

Menu: Set this function to On (Refer to “To start - Menu operation”). Then use these steps to set a new code.

1. Connect the instrument (Figure B2).
2. Menu: Set this function to On (Refer to “To start - Menu operation”).
3. To finish the lock code, repeat steps 1 + 2 for each digit.

The next time you want to change the menu options, the display shows: L - - -

Enter the applicable code. To reset the code to the factory code, you must do a restore operation. Refer to “Maintenance”.

**Operation - Menu: Set scan rate**

Use the scan rate function to set the rate used to update the maximum/minimum values.

*Note: When you increase the scan rate, you increase the power consumption. The maximum/minimum function updates its data at five times the specified scan rate.*

The rate for the normal pressure display is always 2 Hz.

**Scan rate - Set up and use**

Menu: Set an applicable value in the range 2 to 10 Hz. Refer to “To start - Menu operation”.

**Operation - Menu: Monitor external IDOS**

Use this function to read the pressure from an external IDOS UPM. The calibration function is not available but you can use all the other DPI 104 pressure functions. Example: Set tare, Monitor maximum/minimum.

This function does not supply power to the IDOS UPM. To use it, you must have the optional external IDOS UPM connection + power supply. This optional accessory uses the RS232 connections in the 8-pin connector (Table 3).

**Monitor external IDOS - Set up and use**

1. Connect the instrument (Figure B2).
2. Menu: Set this function to On (Refer to “To start - Menu operation”).
3. If necessary, set the applicable additional functions specified in this manual.
**Operation - Menu: Set FSO low/high registers**

Use the FSO low/high registers to set a different range for these functions: analogue display, % indication, low/high alarm.

Initially, these register values are set to the factory calibration values. Example:

Calibrated range: 0.7 bar (10 psi) gauge.
Selected units: mbar

Table 5 gives the permitted alternative values you can use.

**Table 5: Permitted FSO values**

<table>
<thead>
<tr>
<th>Range</th>
<th>Permitted FSO values</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ranges: a, sg</td>
<td>0 to 105% FS</td>
</tr>
<tr>
<td>g: 0.7 bar (10 psi)</td>
<td>-0.7 bar (-10 psi) to 105% FS</td>
</tr>
<tr>
<td>g: ± 2 bar (30 psi)</td>
<td>-1 bar (-15 psi) to 105% FS</td>
</tr>
<tr>
<td>All ranges</td>
<td>FSO low &lt; FSO high</td>
</tr>
</tbody>
</table>

**FSO low/high registers - Set up and use**

Menu: Set the menu option to the FSO low register (Refer to “To start - Menu operation”). Then use these steps to set an applicable value in the permitted range (Table 5).

1. Select the menu option.
2. Use the cursor keys to change the digits.
3. Repeat steps 1 + 2 for each digit and for the decimal point.

If the value you enter is not correct, the value resets to the nearest permitted value (Table 5).

To accept or change the new value, repeat steps 1 to 3.

To cancel the new value, press this button.

4. If necessary, repeat the procedure for the FSO high register.

**Operation - Set up a DPI 104 network**

You can set up a network of up to 99 units in series (‘daisy chain’). Figure 4 shows the electrical connections to do this (Refer to Table 3).

![Connections for a DPI 104 network](image)

**Figure 4: Connections for a DPI 104 network**

**Operation - Error indications**

**Table 6: Error codes/indications**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0001</td>
<td>Incorrect unlock code. Use the correct code.</td>
</tr>
<tr>
<td>E0002</td>
<td>The tare facility is not available because the menu lock is On and the lock code &lt; 500. Change the menu configuration.</td>
</tr>
<tr>
<td>E0004</td>
<td>Start up error. Do a restore operation (Refer to “Maintenance”).</td>
</tr>
<tr>
<td>E0005</td>
<td>External IDOS UPM not found. Make sure that all the related equipment and connections are serviceable.</td>
</tr>
<tr>
<td>E0006</td>
<td>Incorrect calibration access code. Use the correct code.</td>
</tr>
<tr>
<td>E0007</td>
<td>The power supply is too low to do a calibration. Use an external power supply or replace the battery.</td>
</tr>
<tr>
<td>E0009</td>
<td>Unable to supply the specified Vout. Example:</td>
</tr>
<tr>
<td></td>
<td>• Low battery. Use an external power supply or replace the battery.</td>
</tr>
<tr>
<td></td>
<td>• Bad connection. Make sure that all the related equipment and connections are serviceable.</td>
</tr>
<tr>
<td>OLoAd</td>
<td>Applied pressure ≥ 110% FS. Reduce the pressure.</td>
</tr>
<tr>
<td>99999/ -9999</td>
<td>There are not enough digits in the main display to give the correct pressure value. Change the measurement units.</td>
</tr>
</tbody>
</table>
Maintenance
Clean the case with a moist, lint-free cloth and a weak detergent. Do not use solvents or abrasive materials.
Make sure that there is no damage to the threads and O-rings, and that they are free of grit and other obstructions.
You must return the unit to the supplier for all repairs.

Maintenance - Replace the batteries
To replace the batteries, refer to “Installation”. All the configuration options stay in memory.

Maintenance - Restore the original configuration
If it is necessary to restore the unit to the original factory configuration, press and hold all four buttons until the display goes off (≈ five seconds). The unit then restarts.

“To start - Menu operation” shows the factory settings. The lock code is reset to the factory code (000).

Calibration
Note: GE can provide a calibration service that is traceable to international standards.
We recommend that you return the DPI 104 to the manufacturer or an approved service agent for calibration.
If you use an alternative calibration facility, make sure that it uses these standards.

Calibration - Equipment and conditions
To do an accurate calibration, you must have:
• the calibration equipment specified in Table 7.
• a stable temperature environment: 20 ± 1°C (68 ± 2°F)

Table 7: Calibration equipment

<table>
<thead>
<tr>
<th>Function</th>
<th>Calibration equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>An applicable pressure standard (primary or secondary) with a total uncertainty of 0.01% reading or better. Make the pressure connection to A1 - item 4. Refer to “Installation”.</td>
</tr>
<tr>
<td>Volts (V)</td>
<td>Volts calibrator. Accuracy: 0.025% reading or better. Make the Vout connection to A1 - item 1. Refer to “Installation”.</td>
</tr>
</tbody>
</table>

Calibration - Procedures
1. Connect the applicable calibration equipment (Table 7).
2. Menu: Set the menu option to C _ _ _ _. Then set the calibration access code = last four digits of the serial number (Refer to “To start - Menu operation”).
3. Set the necessary offset value for the instrument to give the correct pressure related to zero:
   - All ranges g or sg: Zero (bar/psi);
   - Ranges a: Ambient pressure

There are three calibration options (Table 8):

Table 8: Calibration options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>
| C0:    | Set the necessary offset value for the instrument to give the correct pressure related to zero: All ranges g or sg: Zero (bar/psi);
|        | Ranges a: Ambient pressure |
| C2:    | Do a two-point pressure calibration. All ranges g or sg: P1 = Zero (bar/psi); P2* = FS
|        | Ranges a: P1* = Ambient pressure; P2* = FS |
| V2:    | Do a two-point voltage calibration. All ranges: P1** = 0.1000 V; P2** = 5.0000 V

* adjustable by 5% FS; ** adjustable by 50 mV

To move to the next option without a change to the values, press this button.
To stop and make changes to a value, press this button.
To return to the normal display, wait eight seconds.

Calibration - C0 (Zero offset)
The DPI 104 shows these displays:
1. The calibration point to be used for C0. This value is only adjustable for an absolute type DPI 104 (Table 8).
   - C0 - Absolute
   - C0 - Absolute
2. This sequence of displays will follow:
3. The SP value is followed by the measured pressure - Current Pressure (CP). This sequence continues until you accept or reject the offset value.
4. When the pressure is stable:
   - To accept the new offset value, press this button.
   - The display shows “donE”, and then the next calibration option (C2).
   - To reject the new offset value and move to the next calibration option (C2), press this button.
   - The value is ignored if it is not in the permitted limits (5% FS) or if the CP value is not stable.
Calibration - C2 (two-point pressure calibration)

Point 1 (P1) - The DPI 104 shows these displays:

1. The calibration point to be used for C2 - Point 1. This value is only adjustable for an absolute type DPI 104 (Table 8). C2 - Point 1 (Gauge) = 0000.0

Point 2 (P2)

1. The calibration point to be used for C2 - Point 2. This is the FS value and it is adjustable for the absolute and gauge type DPI 104 (Table 8).

5. Repeat steps 3 + 4 for each digit and for the decimal point. The value is ignored if it is not in the permitted limits (Table 8).

This value is then used as the Set Point (SP) for point 1 on the subsequent displays.

6. This sequence of displays will follow:

The SP value is followed by the measured pressure - CP. This sequence continues until you accept or reject the point 1 value.

7. When the pressure is stable:

To accept the new P1 value, press this button. The display shows the calibration point C2 - point 2 (C2).

To reject the new P1 value and move to the next calibration option (V2), press this button.

The value is ignored if it is not in the permitted limits (5% FS) or if the CP value is not stable.

Point 2 (P2) - If P1 has a permitted value, the DPI 104 shows these displays:

5. Repeat steps 3 + 4 for each digit. The value is ignored if it is not in the permitted limits (Table 8).

6. If P2 has a permitted value, the DPI 104 uses the new P1/P2 values to adjust the output (Vt):

Calibration - V2 (two-point voltage calibration)

Point 1 (P1) - The DPI 104 shows these displays:

1. The calibration point to be used for V2 - Point 1.

Point 2 (P2) - Use the same steps (1 to 5 above) to set C2 - Point 2. This is the FS value and it is adjustable for the absolute and gauge type DPI 104 (Table 8).

6. This sequence of displays will follow:

The SP value is followed by the measured pressure - CP. This sequence continues until you accept or reject the point 2 value.

7. When the pressure is stable:

To accept the new P2 value, press this button. The display shows “done”. The instrument then restarts.

To reject the new P2 value and move to the next menu option, press this button.
**Specification - General**

<table>
<thead>
<tr>
<th>Specification Data</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-10 to 50°C (14 to 122°F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 to 70°C (-4 to 158°F)</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP65 (Dust-tight, jets of water)</td>
</tr>
<tr>
<td>Materials</td>
<td>Acrylonitrile Butadiene Styrene (ABS)</td>
</tr>
<tr>
<td>Humidity</td>
<td>0 to 95% without condensation</td>
</tr>
<tr>
<td>Shock/Vibration</td>
<td>BS EN 61010:2001; Def Stan 66-31, 8.4 cat III</td>
</tr>
<tr>
<td>EMC</td>
<td>BS EN 61326-1:1998 + A2:2001</td>
</tr>
<tr>
<td>Safety</td>
<td>Electrical - BS EN 61010:2001; Pressure Equipment Directive - Class: Sound Engineering Practice (SEP);</td>
</tr>
<tr>
<td>Approved</td>
<td>CE Marked</td>
</tr>
<tr>
<td>Size</td>
<td>Diameter = 95 mm (3.74 in); Depth = 55 mm (2.2 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>350 g (12.5 oz)</td>
</tr>
<tr>
<td>Power supply</td>
<td>9V, Alkaline [MN1604] - Supplied; OR Use an external 12-24 V dc supply</td>
</tr>
<tr>
<td>Battery life</td>
<td>Up to one year for pressure measurements: Au (power save facility) - On; maximum/minimum, alarm, Vout, switch - All set to OFF</td>
</tr>
</tbody>
</table>

**Specification - Pressure measurement**

<table>
<thead>
<tr>
<th>Range: gauge (g), absolute (a), sealed gauge (sg)</th>
<th>Resolution</th>
<th>Maximum Working Pressure (MWP)</th>
<th>Media notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar*</td>
<td>psi*</td>
<td>Type</td>
<td>mbar</td>
</tr>
<tr>
<td>I-0.7/0 to 0.7 (-10.0) 0 to 10 g*</td>
<td>0.01</td>
<td>0.001</td>
<td>4</td>
</tr>
<tr>
<td>I-1.0/0 to 2.0 (-15.0) 0 to 30 g* or a</td>
<td>0.1</td>
<td>0.001</td>
<td>8</td>
</tr>
<tr>
<td>I-1.0/0 to 7.0 (-15.0) 0 to 100 g* or a</td>
<td>0.1</td>
<td>0.01</td>
<td>28</td>
</tr>
<tr>
<td>I-1.0/0 to 20 (-15.0) 0 to 300 g* or a</td>
<td>1</td>
<td>0.01</td>
<td>80</td>
</tr>
<tr>
<td>I-1.0/0 to 70 (-15.0) 0 to 1000 g* or a</td>
<td>1</td>
<td>0.1</td>
<td>140</td>
</tr>
<tr>
<td>0 to 200</td>
<td>0 to 3000 sg</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>0 to 350</td>
<td>0 to 5000 sg</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>0 to 700</td>
<td>0 to 10000 sg</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>0 to 1000</td>
<td>0 to 15000 sg</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>0 to 1400</td>
<td>0 to 20000 sg</td>
<td>100</td>
<td>1</td>
</tr>
</tbody>
</table>

* Negative ranges shown in ( ... ) - gauge units only.  

**Media notes:**  
1. Non-corrosive, non-conductive liquid or Non-corrosive, dry gas  
2. Media applicable to stainless steel [316]  
3. Media applicable to Inconel 625

<table>
<thead>
<tr>
<th>Accuracy (0 to FS)</th>
<th>0.7 bar (10 psi): 0.15% FS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units</td>
<td>kPa, MPa, kg/cm², psi, mbar, bar, mmHg, mmH₂O, mH₂O, inH₂O, inHg</td>
</tr>
<tr>
<td>Pressure connections</td>
<td>Ranges ≤ 700 bar (10000 psi): 1/4 NPT male OR G1/4 male</td>
</tr>
<tr>
<td></td>
<td>Ranges &gt; 700 bar (10000 psi): 9/16 x 18 male cone</td>
</tr>
</tbody>
</table>

**Specification - Electrical**

<table>
<thead>
<tr>
<th>Switch input</th>
<th>Maximum impedance: 200Ω (mechanical contact only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm output</td>
<td>Type: Open drain Field Effect Transistor (FET)</td>
</tr>
<tr>
<td></td>
<td>Maximum ImA: 250 mA; Maximum IV: 24 V dc</td>
</tr>
<tr>
<td>Analogue output</td>
<td>0 to 5 V dc; Minimum load: 500 Ω; Maximum zero offset error: 50 mV</td>
</tr>
<tr>
<td></td>
<td>Accuracy: 0.1% FS at 20°C (68°F) - User mode only.</td>
</tr>
<tr>
<td></td>
<td>Temperature coefficient: 0.007% FS / °C (0.0035% FS / °F)</td>
</tr>
<tr>
<td>RS232/Network capacity</td>
<td>For: IDOS UPM, external software, or up to 99 units in series (’daisy chain’).</td>
</tr>
</tbody>
</table>
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