User Guide OI/FPD580–EN Rev. A

# StackFlowMaster FPD581, FPD583 and FPD585
# Stack gas metering systems

## Measurement made easy


### Introduction

StackFlowMaster FPD580 is designed for the monitoring of flow in ducts or stacks and uses a TORBAR (a multi-port, self-averaging pitot tube) as the primary measuring element. A differential pressure (DP) is created between the high pressure created when the flow impacts the upstream holes and the low (or static) pressure measured at the single downstream hole.

These Operating instructions provide installation, operation and maintenance procedures for the StackFlowMaster FPD580.

### For more information

Further publications for the StackFlowMaster FPD580 are available for free download from www.abb.com (see links and reference numbers below) or by scanning this code:

| | search for or click on: |
|---|---|
| StackFlowMaster FPD580 TORBAR probe Commissioning instructions | CI/FPD580/A–EN |
| StackFlowMaster FPD580 transmitter and interface unit A Commissioning instructions | CI/FPD580/B-EN |
| StackFlowMaster FPD580 transmitter and interface unit B / C / D Commissioning instructions | CI/FPD580/C-EN |
| 2600T Series Pressure Transmitters Operating instructions | IM/267C/269C |

Power and productivity for a better world™

# The Company

We are an established world force in the design and manufacture of measurement products for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

## Quality Control

The UKAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company and is indicative of our dedication to quality and accuracy.


*UKAS Calibration Laboratory No. 0255*

# Contents

# 1 Safety

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Publications Department.

## 1.1 Health & Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must be performed only by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

## 1.2 Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3rd edition 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

## 1.3 Symbols

One or more of the following symbols may appear on the equipment labelling:

| | |
|---|---|
|  | Protective earth (ground) terminal. |
|  | Functional earth (ground) terminal. |
|  | Direct current supply only. |
|  | Alternating current supply only. |
|  | Both direct and alternating current supply. |
|  | The equipment is protected through double insulation. |
|  | This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death.<br>The user should reference this instruction manual for operation and / or safety information. |
|  | This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier. |
|  | This symbol indicates that the marked item can be hot and should not be touched without care. |
|  | This symbol indicates the presence of devices sensitive to electrostatic discharge and indicates that care must be taken to prevent damage to them. |
|  | This symbol indicates the need for protective eye wear. |
|  | This symbol indicates the need for protective hand wear. |
|  | Recycle separately from general waste under the WEEE directive – see Section 1.5. |

## 1.4 Manual handling

**Caution.** Take care when unpacking and installing a StackFlowMaster – use appropriate manual handling techniques.

- The FPD585 enclosure weighs up to 40 kg (88 lb.) and may require a two man lift.
- The TORBAR probe measures up to 10 m (32.8 ft.) in length; the weight varies with length.

## 1.5 Product recycling and disposal (Europe only)

| | |
|---|---|
|  | Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August 2005. To conform to European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.<br>ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. |

**Note.** For return for recycling, contact the equipment manufacturer or supplier for instructions on how to return end-of-life equipment for proper disposal.

# 2 General information

StackFlowMaster FPD580 is supplied specifically for the application detailed on the tag-plate attached by a ring to the head of the TORBAR. Before installation, ensure the tag-plate information is correct for that application and matches the required specification. **Do not** use a StackFlowMaster for any other application without consulting ABB or an accredited agent.

The instructions in this publication detail the important basic information to ensure correct installation. However, it is the user's responsibility to ensure that suitably qualified personnel perform the installation to established and recognized engineering codes of practice.

Warnings in this publication and warning labels on both the StackFlowMaster and its containers / packaging must be observed.

**Warning.**

- Before drilling into a stack, or before carrying out any maintenance activity or component replacement, reduce the stack pressure to a safe level and remove all potentially injurious process material.
- The part of the TORBAR external to the stack may present a a burn hazard, especially if the maximum temperature of the process material exceeds 100 ºC (212 °F). Either lag or shield the exposed parts of the TORBAR to protect personnel or display clear warning signs to alert personnel to the possible hazard. Refer to Standard EN563: 1904 'Safety of Machinery – Temperatures of Touchable Surfaces'.
- Ensure there is suitable access for the installation. Refer to EN 15259 for further information.

It is the customer's responsibility to ensure the products, detailed in this publication, are not used for purposes other than those they are designed for.

Any modification to or adaptation of a StackFlowMaster may invalidate its certification.

It is the user's responsibility to ensure that adequate protection exists to prevent pressurization in excess of the maximum specified pressure for a StackFlowMaster, even in the event of a fire.

If there are any queries regarding the instructions in this publication, contact either ABB or their accredited agent before installing a StackFlowMaster.

## 2.1 Description

StackFlowMaster FPD580 is designed for the monitoring of flow in ducts or stacks and uses a TORBAR (a multi-port, self-averaging pitot tube) as the primary measuring element. A differential pressure (DP) is created between the high pressure created when the flow impacts the upstream holes and the low (or static) pressure measured at the single downstream hole.

### 2.1.1 FPD580 series products

**FPD581** – comprises:

- TORBAR probe designed specifically for stacks – 25 or 60 mm (1 or 2 in.) probe outside diameter
- Differential pressure transmitter 267CS (optional)

**FPD583** – comprises:

- TORBAR probe designed specifically for stacks – 25 or 60 mm (1 or 2 in.) probe outside diameter
- Differential pressure transmitter 267CS
- Manual interface unit (Type A)

**FPD585** – comprises:

- TORBAR probe designed specifically for stacks – 25 or 60 mm (1 or 2 in.) probe outside diameter
- Differential pressure transmitter 267CS
- Automatic interface unit:

  **B** control with zero and span check

  Interface unit B enables zero and span checking of the pressure transmitter without the need to change fittings or move the pressure transmitter. The interface unit records the actual and reference velocity of the stack to monitor the drift of the product

  A span check can be performed either manually by connecting a hand-held, regulated pressure supply to a gland at the enclosure, or automatically using an optional integral pressure regulator (PC1).

  **C** control with zero and span check and purging

  In addition to zero and span checking (see interface unit B), interface unit C includes a purge sequence that can be initiated either at timed intervals (the schedule can be programmed by the user), or manually (either remotely or using the controls at the enclosure).

  **D** control with purging

  See interface unit C for description of purging system.

**Recommendations:**

- Purging is recommended for particulate concentrations greater than 30 mg/m$^3$
- Enclosure heaters are recommended for enclosures situated in ambient temperatures less than 0 °C (32 °F)

# 3 TORBAR installation

## 3.1 Installation requirements

To meet accuracy specifications, install TORBAR at distances of **no less** than those shown in Fig. 3.1 from flow disturbances in the stack. If TORBAR is installed within distances less than those shown, absolute accuracy decreases BUT repeatability of measurement continues to be excellent due to the inherent averaging characteristics. ABB recommends that the system is calibrated in situ to reduce the impact of flow profile effects (see Section 7.2, page 20). If it is not possible to comply with this instruction and maximum accuracy is required, consult ABB.

If the flow profile is checked and found symmetrical at a particular point within the stack, install TORBAR at that position for optimum performance.

**Note.** ABB recommends that the operator consults with the local competent authority to ensure the location meets with their approval.

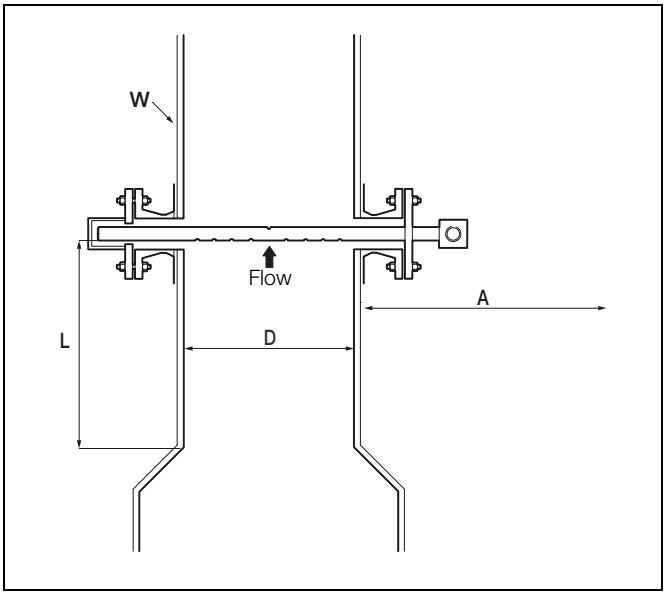



*Fig. 3.1 Installation requirements*

Key to Fig. 3.1

D = Stack internal diameter (diameter of flow path)

W = Stack wall thickness (including any refractory lining)

A = Available access
**Note.** Take care when the stack is surrounded by a wind shield

L = Upstream straight length

**Note.** A minimum of 8 upstream straight lengths (L) is required with no significant obstructions closer than 3D upstream from the TORBAR.

Select a location with sufficient access and clearance to install and remove TORBAR (refer to a relevant standard – for example, EN15259).

Referring to Fig. 3.2, install TORBAR:

- at right angles to the stack wall
- across the stack diameter
- aligned with the stack axis
- Where an end support is used, ensure both installation points are in line and 180° from each other – use laser measurement whenever possible

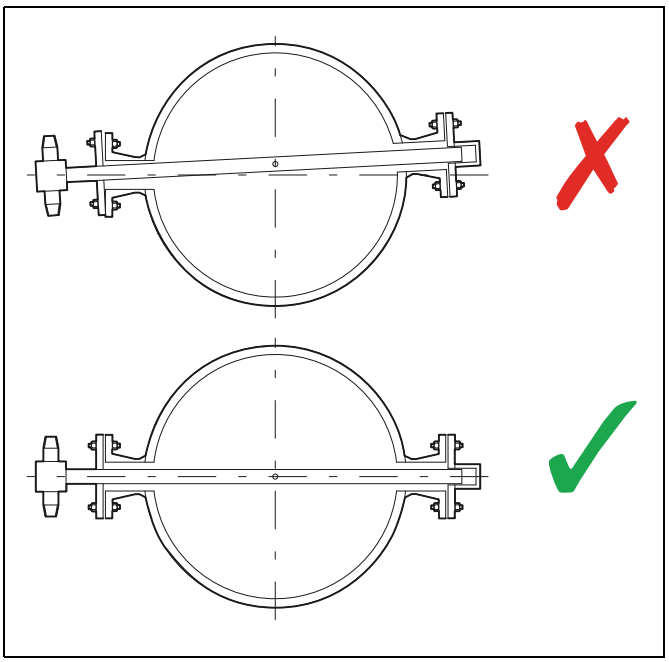


*Fig. 3.2 TORBAR alignment (viewed from above)*

To ensure an equal head of gas in both impulse pipes, the TORBAR probe is designed so that the impulse pipes are in the horizontal plane when the TORBAR is installed.

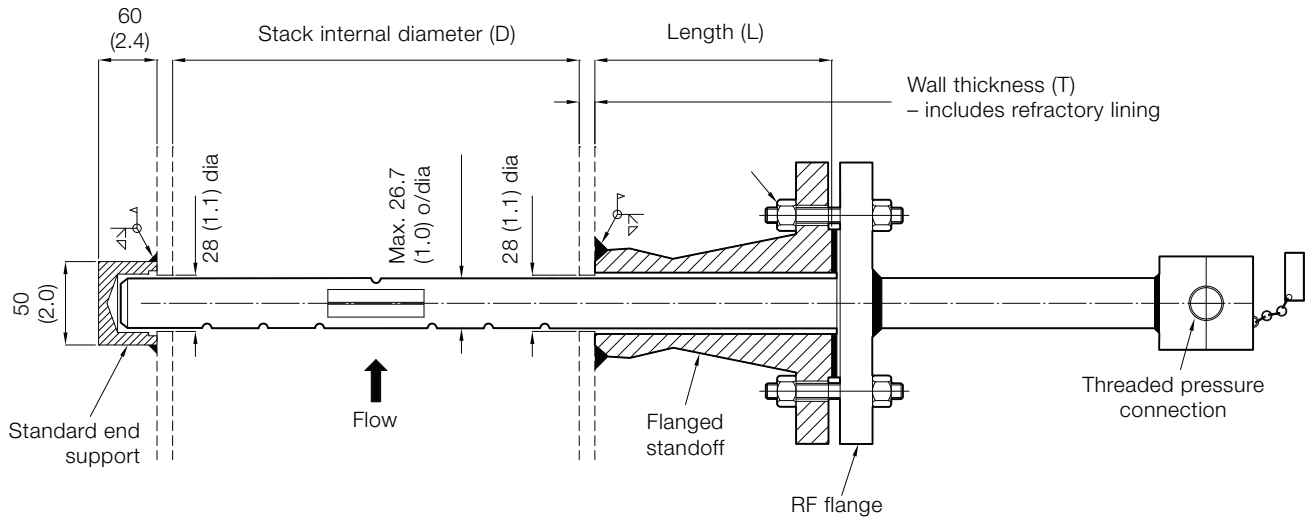
The direction of flow is indicated by a flow arrow on the integral manifold or head.

Do not install TORBAR where it would be susceptible to vibration. Vibration distorts the output signal and effects the structural limits of the TORBAR.

## 3.2 Dimensions

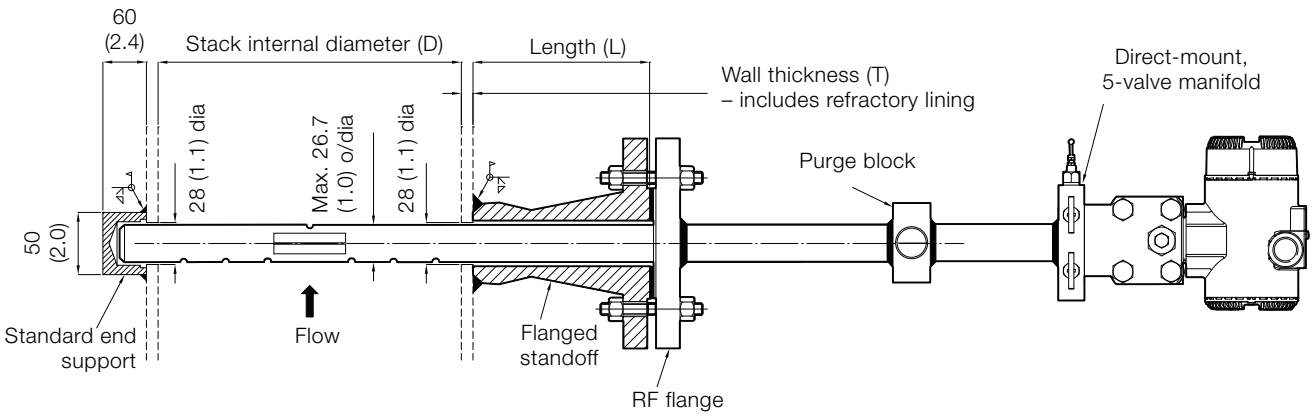
### 3.2.1 Probe – 25 mm (1.0 in.) diameter with weldcup end support (for remote transmitter)

Dimensions in mm (in.)



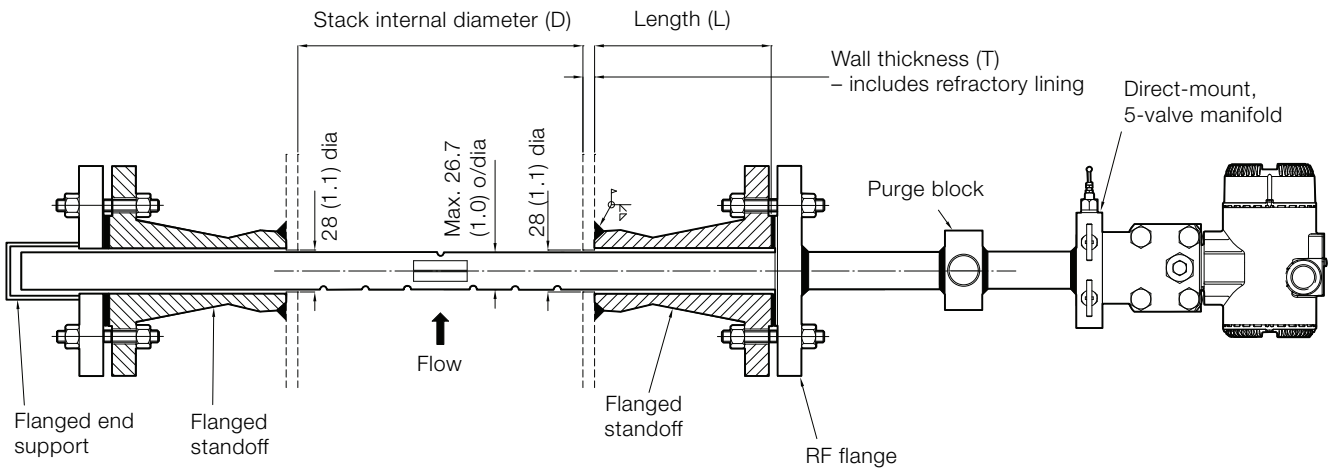

### 3.2.2 Probe – 25 mm (1.0 in.) diameter with weldcup end support (with integral transmitter)

Dimensions in mm (in.)



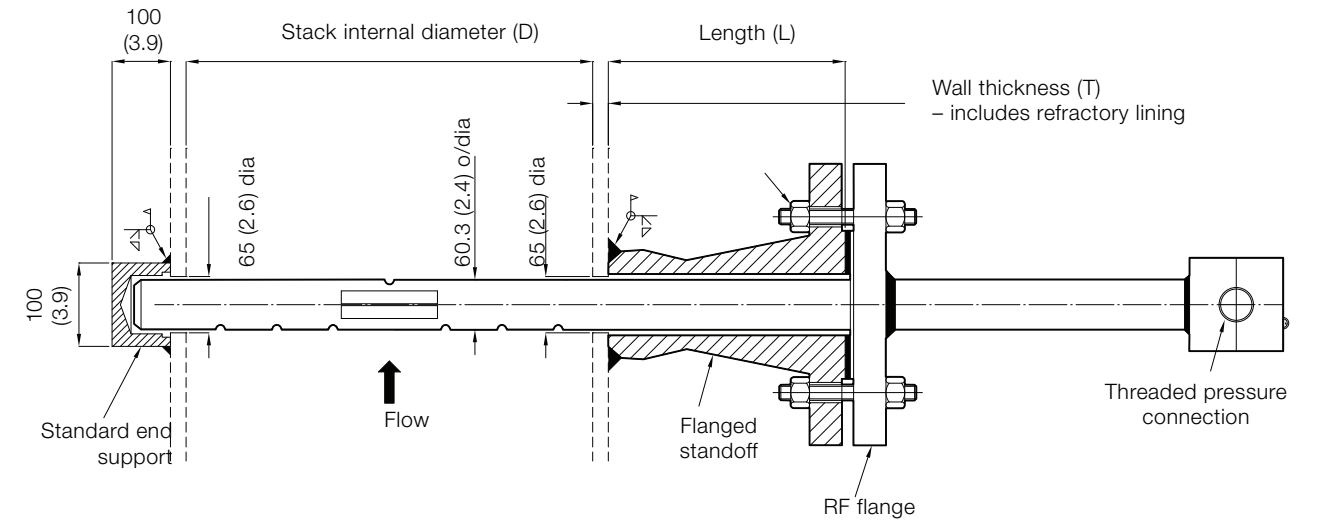
### 3.2.3 Probe – 25 mm (1.0 in.) diameter with flanged end support (with integral transmitter)

Dimensions in mm (in.)



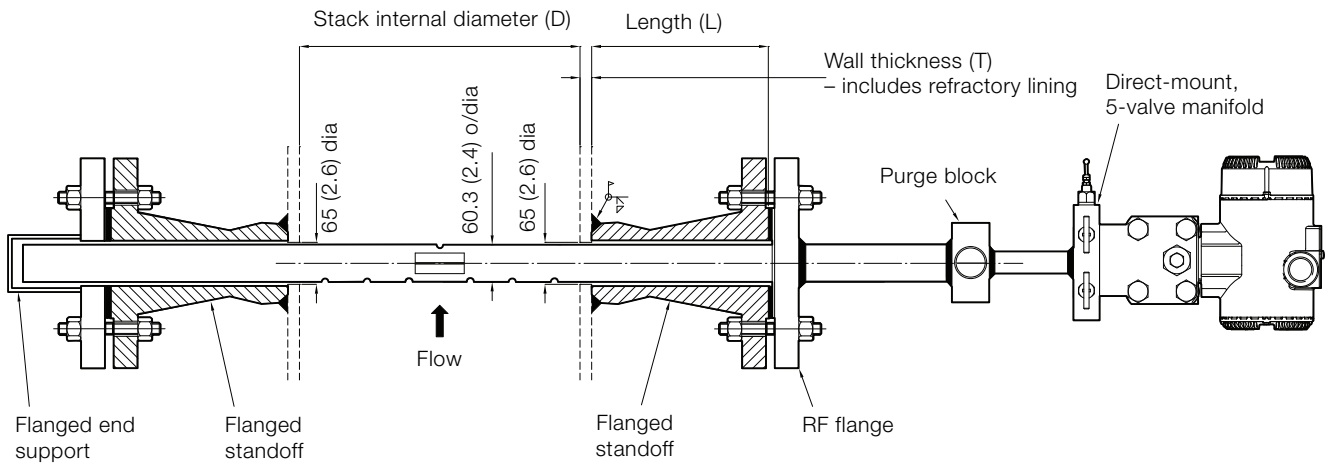

### 3.2.4 Probe – 60 mm (2.4 in.) diameter with weldcup end support (for remote transmitter)

Dimensions in mm (in.)



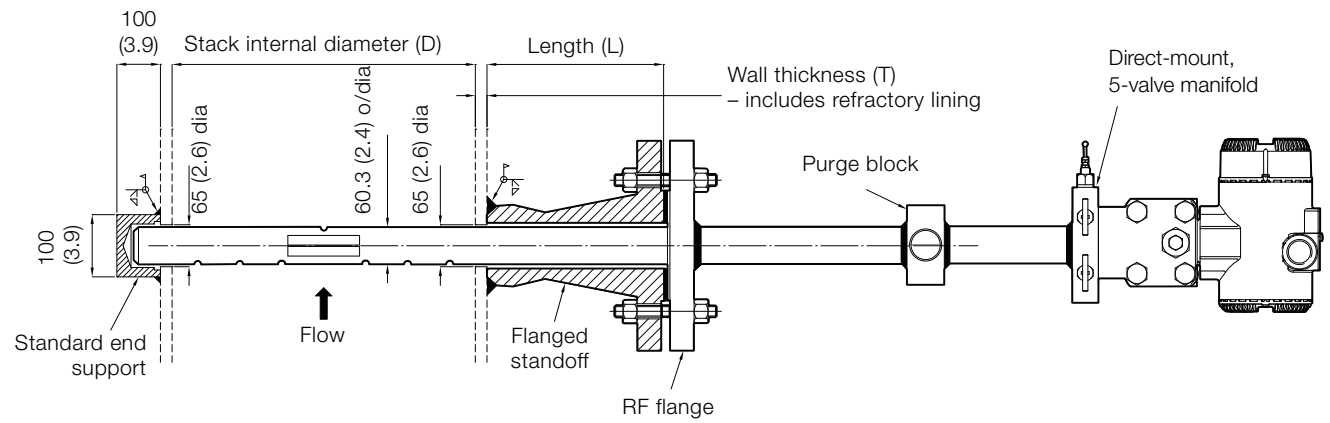
### 3.2.5 Probe – 60 mm (2.4 in.) diameter with flanged end support (for integral transmitter)

Dimensions in mm (in.)




### 3.2.6 Probe – 60 mm (2.4 in.) diameter with weldcup end support (with integral transmitter)

Dimensions in mm (in.)



### 3.3 Flanged pipe fitting (stand-off) installation

Install the flanged pipe fitting (stand-off) as follows:

1. Select the required insertion position and mark the stack.

> **Warning.** Before drilling into the stack, reduce the stack pressure to a safe level and remove all hazardous material

2. Drill a 6 mm (0.24 in) pilot hole at the marked position, then drill to the appropriate size – see Table 3.1.

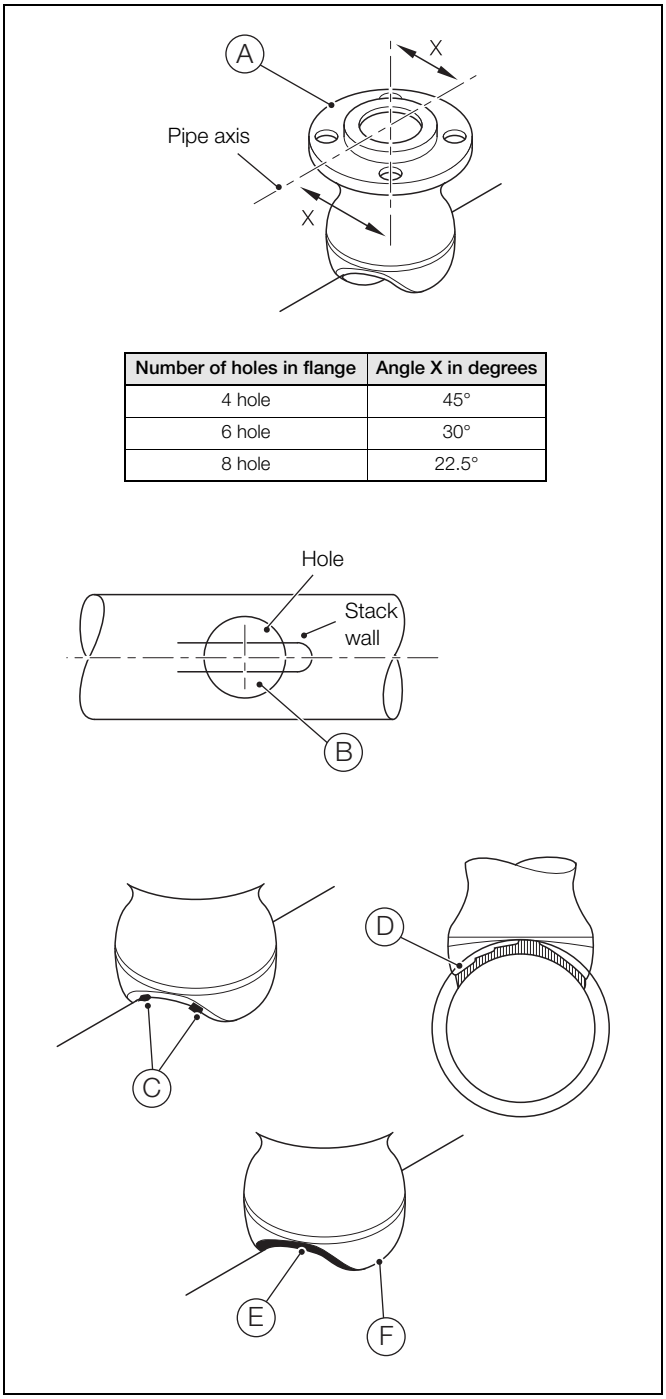
| Probe type | Probe design | Min. hole size in mm (in.) |
|---|---|---|
| F3, F4, F5 | No bayonet fitting (TP3) | 28 (1.1) |
| F5 | Bayonet fitting (TP3) | 51 (2.0) |
| G3, G5 | No two-piece construction (TP2) or bayonet fitting (TP3) | 65 (2.6) |
| G5 | Two-piece construction (TP2) and / or bayonet fitting (TP3) | 92 (3.6) |

*Table 3.1 Hole size*

3. Referring to Fig. 3.3:
   a. Place the flanged pipe fitting (stand-off) (A) centrally over the drilled hole and align it correctly to the axis of the stack (angle X) according to the number of bolt holes in the flange. Ensure it is perpendicular to the stack axis and square to the stack plane.
   b. Use suitable spacers (B) to raise the flanged pipe fitting (stand-off) off the stack to establish the necessary gap for full-penetration welding.
   c. Tack-weld at four points (C) midway between the crotch and the skirt sections of the fitting.
   d. Using a suitable piece of pipe, ensure the flanged pipe fitting (stand-off) is correctly aligned with the stack (see Fig. 3.2, page 5) and concentric with the hole.
   e. Remove the spacers (B).
   f. Apply a full penetration root run completely around the base of the flanged pipe fitting (stand-off) at the clearly-defined weld preparation line (D).
   g. Make reinforcing welds at the crotch bevelled areas (E) of the flanged pipe fitting (stand-off) to provide maximum weld at the crotch tapering to a minimum at the skirt (F).

> **Caution.** Weld only the bevelled portion of the flanged pipe fitting (stand-off) to prevent the integrity of the weld being compromised by any notch effect.

4. For F5 and G5 probe types, measure 180° around the stack to locate the installation point of the end support stand-off. Repeat steps 2 and 3.




| Number of holes in flange | Angle X in degrees |
|---|---|
| 4 hole | 45° |
| 6 hole | 30° |
| 8 hole | 22.5° |

*Fig. 3.3 Flanged pipe fitting (stand-off) installation*

## 3.4 Installing the TORBAR

### 3.4.1 Probe type F3 / G3 – flanged process connection without end support

Install the TORBAR as follows:

1. Install the flanged pipe fitting (stand-off) – see Section 3.3, page 9.
2. Position the gasket onto the TORBAR flange and carefully insert the TORBAR through the flanged pipe fitting (stand-off) until the two flanges mate squarely.
3. Turn the TORBAR until the flow arrow is positioned correctly.
4. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.
5. Check the TORBAR is installed correctly and aligned.

### 3.4.2 Probe type F4 – flanged process connection with end support

Install the TORBAR as follows:

1. Install the flanged pipe fitting (stand-off) – see Section 3.3, page 9.
2. Measure exactly 180° around the stack circumference and mark the stack.
3. Drill a 6 mm (0.24 in) pilot hole at the marked position, then drill to 33 mm (1.3 in.).
4. Insert the TORBAR through the flanged pipe fitting (stand-off) into the stack and check that the tip protrudes through the hole in the opposite stack wall when the two flanges mate squarely.
5. Position the end-support cup over the tip of the TORBAR, ensuring the tip is concentric with the hole and tack-weld the end-support cup in place.
6. Remove the TORBAR and complete the support cup full-penetration weld.
7. Position the gasket on the TORBAR flange and carefully insert the TORBAR through the flanged pipe fitting (stand-off) until the two flanges mate squarely, ensuring the tip of the TORBAR enters the end-support cup.
8. Turn the TORBAR until the flow arrow is positioned correctly.
9. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.
10. Check the TORBAR is installed correctly and aligned.

### 3.4.3 Probe type F5 / G5 – flanged process connection with flanged end support fitting

Install the TORBAR as follows:

1. Install the flanged pipe fitting (stand-off) – see Section 3.3, page 9.
2. Insert the TORBAR through the flanged pipe fitting (stand-off) into the stack and check that the tip protrudes through the hole in the opposite stack wall when the two flanges mate squarely.
3. Position the flanged pipe fitting (stand-off) over the tip of the TORBAR, ensuring the tip enters, and is concentric with, the end support stub.
4. Remove the TORBAR.
5. Position the gasket on the TORBAR flange and carefully insert the TORBAR through the flanged pipe fitting (stand-off) until the two flanges mate squarely, ensuring the tip of the TORBAR protrudes from the opposite flanged pipe fitting (stand-off).
6. Turn the TORBAR until the flow arrow is positioned correctly.
7. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.
8. Check the TORBAR is installed correctly and aligned.
9. Position a gasket on the flanged end support flitting, ensuring the integral support cup faces the tip of the TORBAR.
10. Fit the flanged end support flitting to the flanged pipe fitting (stand-off), ensuring the tip of the TORBAR enters the external support cup.
11. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.

### 3.4.4 Probe type TP2 – 2-piece construction, assembly before installation

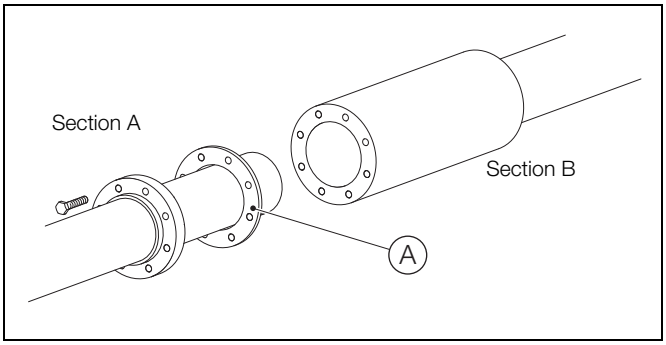



*Fig. 3.4 2-piece probe assembly*

Referring to Fig. 3.4:

1. Place the sealing gasket (A) over the extension sealing face on Section A.
2. Identify the upstream measurement holes on Section B and rotate Section A to align the upstream measurement holes of both sections.
3. Slide Section A onto Section B ensuring the hole alignment is maintained.
4. Insert and hand-tighten all connection screws.
5. Tighten the connection screws evenly to ensure effective gasket sealing.
6. Using suitable adhesive tape (for example, insulation tape that can be removed without leaving deposits) cover / block the upstream holes.
7. Connect a pneumatic pressure tester to the upstream fitting, apply a pressure of 20 mbar to the probe assembly and maintain for a minimum of 2 minutes. Ensuring the sealing tape remains in place, check the probe for leaks.

> **Note.** Ensure all sealing tape is removed before installing the probe.

### 3.4.5 Probe type TP2 – 2-piece construction, assembly during installation

Referring to Fig. 3.4:

1. Place the sealing gasket (A) over the extension sealing face on Section A.

> **Note.** During step 2, support Section A with a suitable brace to prevent it falling into the stack.

2. Partially insert Section A into the stack.
3. Identify the upstream measurement holes on Section B and rotate Section A to align the upstream measurement holes of both sections.
4. Slide Section A onto Section B ensuring the hole alignment is maintained.
5. Insert and hand-tighten all connection screws.
6. Tighten the connection screws evenly to ensure effective gasket sealing.
7. Insert the assembled TORBAR fully into the stack.

### 3.4.6 Probe type TP3 – bayonet fitting

Referring to Fig. 3.5, install the probe as follows:

1. Follow the installation steps in Section 3.4.3 up to step 8.
2. Place the end support with bayonet fitting over the TORBAR.
3. Once past the locks, turn the end support anti-clockwise until the arrow is facing in the direction of the flow. It is imperative that the arrow is orientated correctly in order for the Bayonet fitting to work.
4. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.

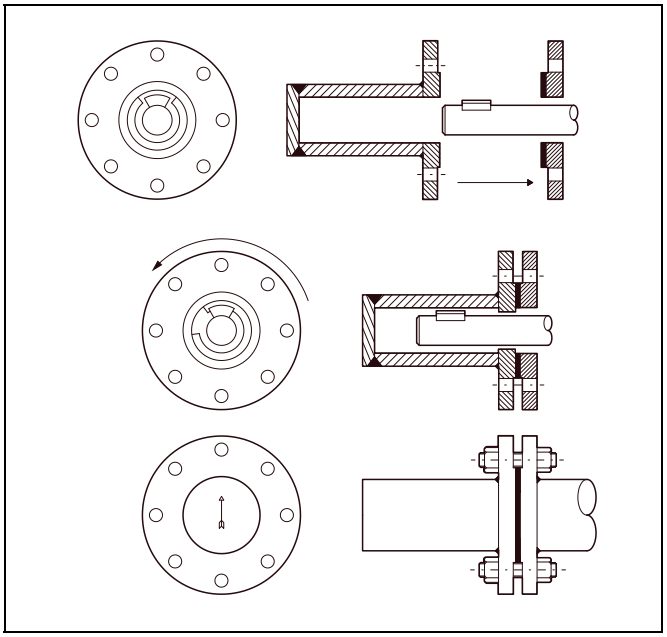


*Fig. 3.5 Bayonet fitting installation details*

# 4 Interface unit installation

## 4.1 General

When choosing a location for the interface unit enclosure, ensure the DP transmitter inside the enclosure is above the level of the TORBAR head.

It must be far enough above the TORBAR to enable the pneumatic tubing (see Section 6.3, page 18) to slope down towards the TORBAR connections at an incline of at least 25 mm per 300 mm (1 in. per 12 in.).

## 4.2 Enclosure dimensions

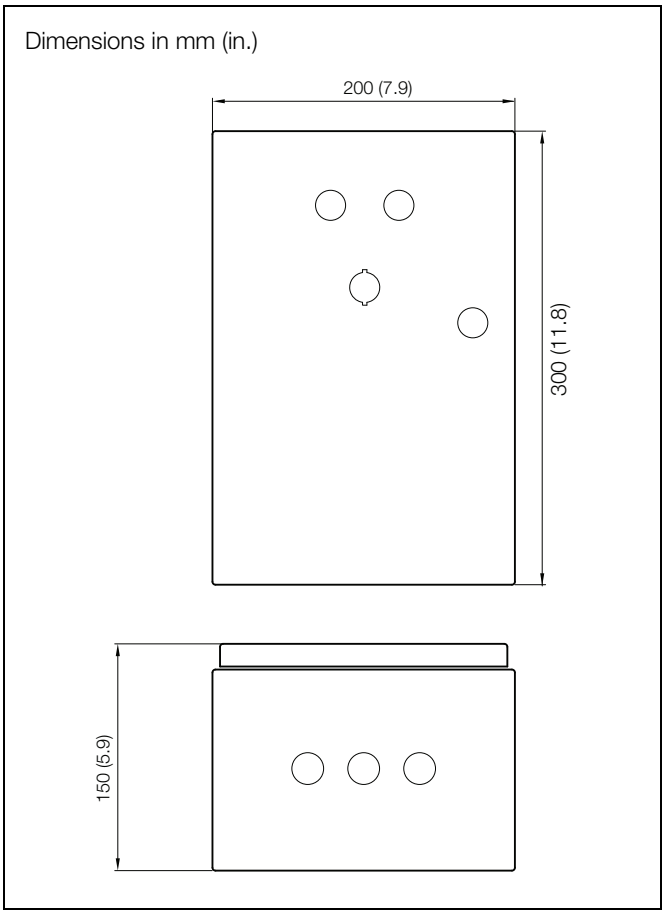



*Fig. 4.1 FPD583 manual interface unit dimensions*

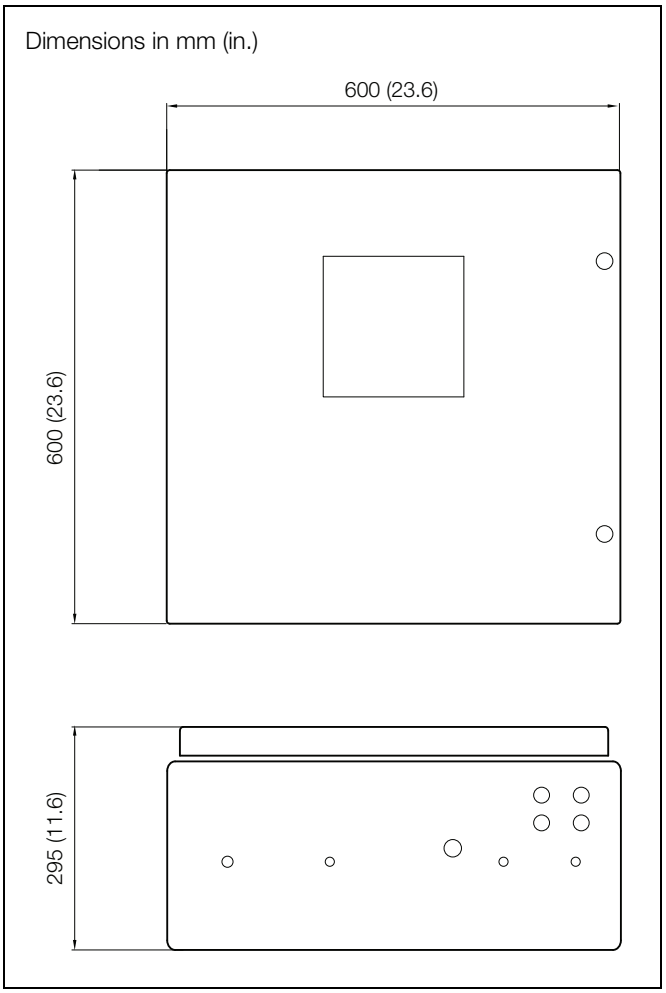



*Fig. 4.2 FPD585 automatic interface unit dimensions*

## 4.3 Mounting the enclosure

1. Referring to Fig. 4.3, fit the supplied mounting brackets to the enclosure as shown.
2. Using appropriate M8 fixings, attach the enclosure to a wall or panel that is rigid and free from excessive vibration.

**Note.** Mount the housing with the cable glands at the bottom to avoid fluid collection and entry if the cable glands are loosened.

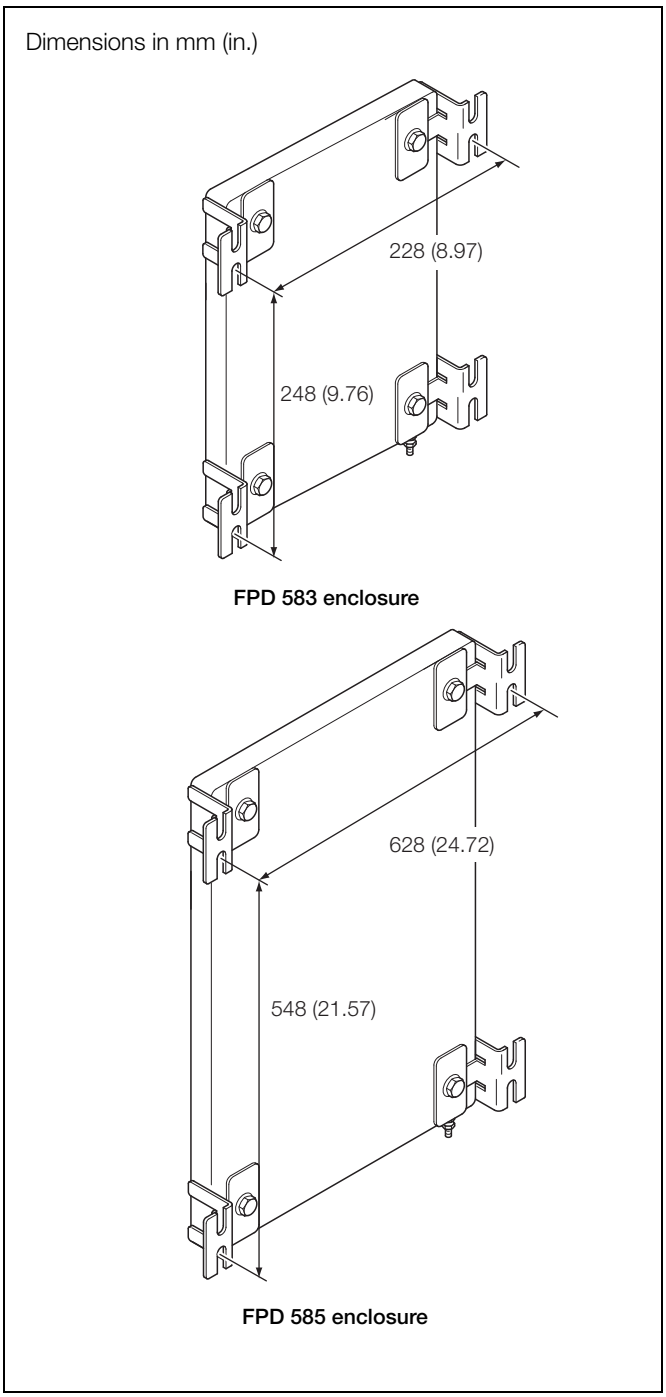



*Fig. 4.3 Enclosure mounting dimensions*

# 5 Electrical connections

**Caution.**

- Electrical connection must be performed only by suitably qualified personnel.
- Ensure mains supply cable is routed clear of heater mounting bracket (if fitted).

## 5.1 Temperature sensor

When the DP transmitter is mounted on the TORBAR, connect the temperature sensor to the transmitter.

For remote-mounted DP transmitters, connect the temperature sensor as follows:

1. Ensure the DP transmitter is powered-down.
2. Remove the DP transmitter termination cover.
3. Disconnect the temperature sensor wiring from the terminals and remove it from the cable entry.
4. Route the temperature sensor wiring through the cable entry and reconnect to the appropriate terminals – refer to the DP transmitter operating instructions (IM 267C/269C).
5. Power-up the DP transmitter.

## 5.2 FPD583 – interface unit A

**Warning.** Interface unit A is not fitted with a switch therefore an isolating device such as a switch or circuit breaker, conforming to local safety standards, **must** be fitted to the final installation. It must be fitted in close proximity to the interface unit within easy reach of the operator and must be marked clearly as the disconnection device for the interface unit.

Interface unit A is supplied with 3 x M20 cable glands to enable entry of the AC power and multi-core signal cables. Make connections as shown in Fig. 5.1.

The DP transmitter is connected to the '1+S' and '–' terminals observing the appropriate polarity at the transmitter. These terminals are active and supply power to one DP transmitter only. Make connections to terminals '+' and '1-S' to complete the mA loop.

Terminals '20, 21' and '30, 31' are passive contact out and provide signalling for the 'System Fault' and the 'Maintenance Mode' functions. This panel must be earthed.

**Note.** ABB recommends termination of the end of the multi core cable screen. Do not terminate the screen in such a way that an earth-loop is created.

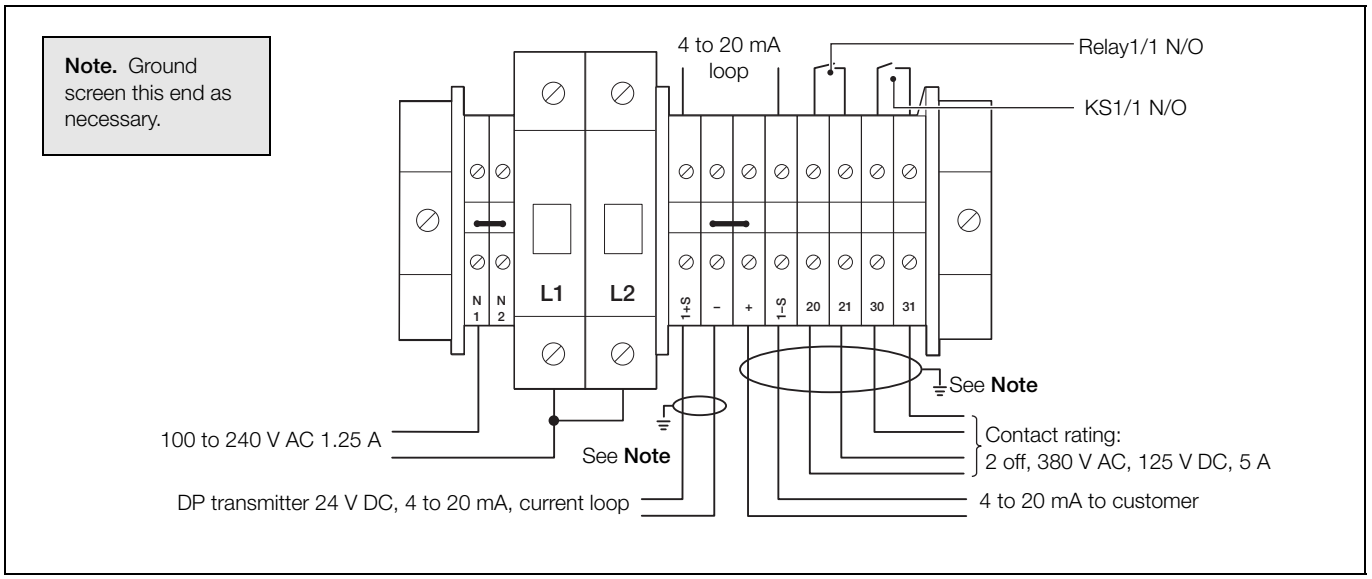



*Fig. 5.1 Interface unit A connections*

## 5.3 FPD585 – interface units B, C and D

Make connections to the DIN rail terminals as shown in Table 5.2.

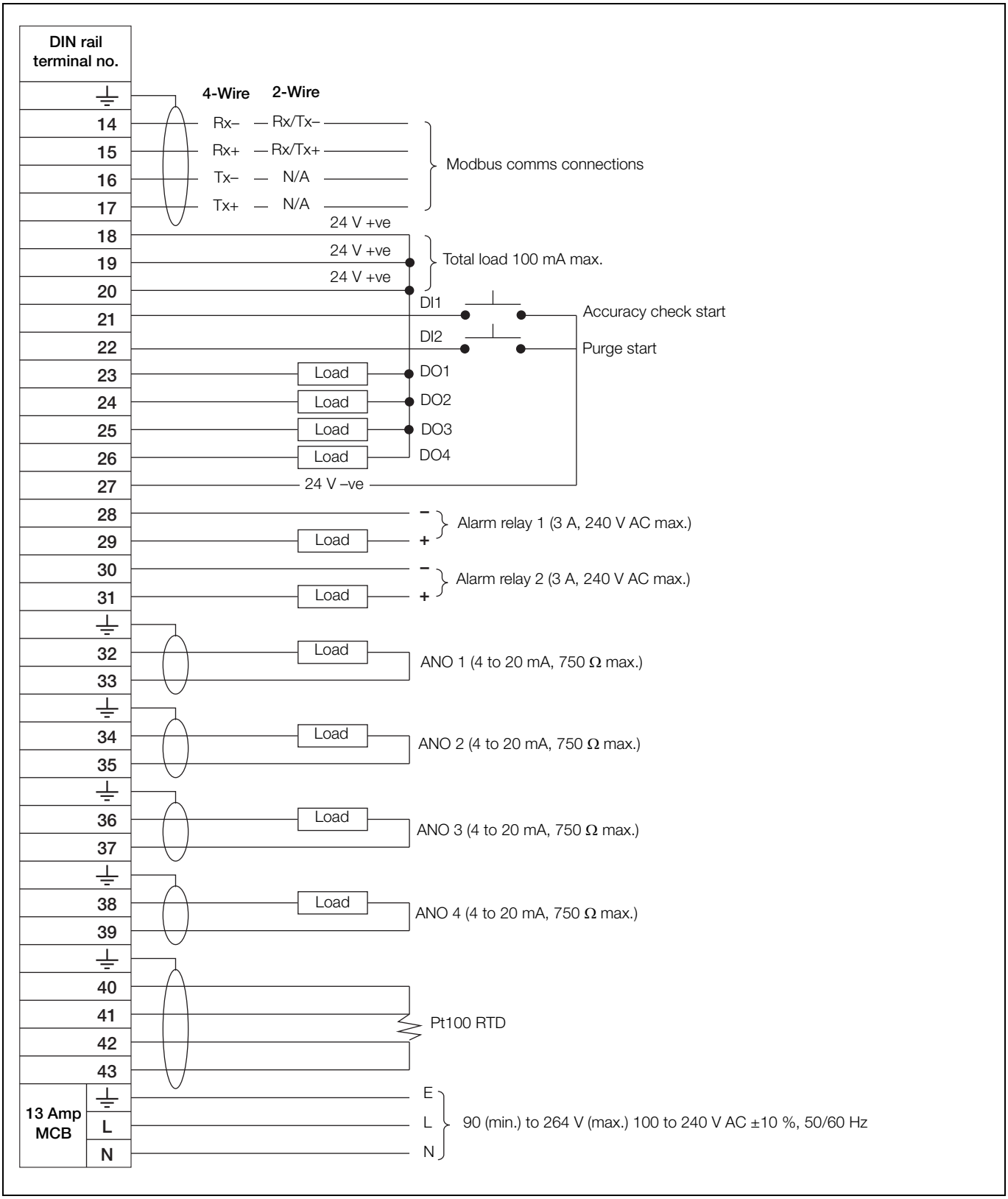



*Fig. 5.2 Interface unit B, C and D connections*

Make digital I/O, relay and analog output connections as shown in Fig. 5.3.

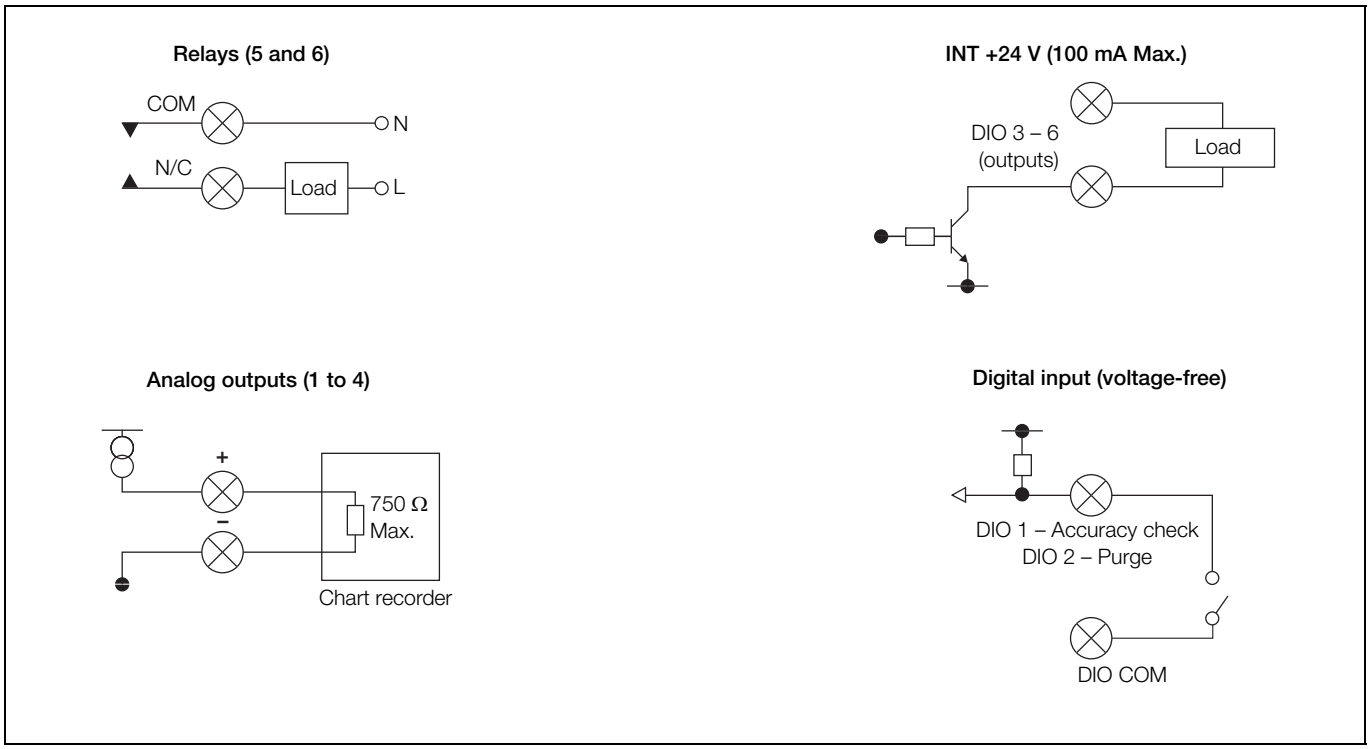



*Fig. 5.3 Digital I/O, relay and analog output connections*

# 6 Pneumatic connections

## 6.1 Integral DP transmitter

The DP transmitter is supplied fitted to the TORBAR ready for use. The assembly has passed hydrostatic pressure testing to ensure there are no leaks.

If there is a need to remove and refit the DP transmitter, use new manifold seals and ensure they are fitted correctly in the manifold recesses. Pressure test the assembly to ensure there are no leaks.

## 6.2 Remote DP transmitter

The DP transmitter is supplied fitted to a pipe-to-flange 5-valve manifold ready for use. The assembly has passed hydrostatic pressure testing to ensure there are no leaks.

If there is a requirement to remove and refit the DP transmitter, use new O-ring seals and ensure they are fitted correctly in the manifold recesses. Pressure test the assembly to ensure there are no leaks.

Connect the high-pressure connection (marked H) of the TORBAR to the high pressure side of the differential pressure instrument and the low pressure connection (marked L) to the low pressure side of the differential pressure instrument.

The remote DP transmitter must be connected to the TORBAR on site using impulse tubing, observing the following instructions:

- Mount the DP transmitter above the level of the TORBAR head, ensuring the tubing slopes down towards the TORBAR connections at an incline of at least 25 mm per 300 mm (1 in. per 12 in.).
- Use minimum 6 mm (0.25 in.) ID piping suitable for the pressure, temperature and process.
- Keep the tubing as short as possible but ensure the differential pressure measuring instrument can operate within its specified temperature limits.
- Support the tubing over its entire length and isolate it from sources of vibration or damage.
- Route the tubing from the high and low pressure connections as close together as possible to maintain equal temperatures.
- Do not route the tubing in areas where the ambient temperature may fluctuate.

## 6.3 FPD585 – interface units B, C and D

The DP transmitter is supplied fitted inside the enclosure. Referring to Table 6.1 and Fig. 6.1, connect the ports on the underside of the enclosure to the TORBAR, observing the following instructions:

- Ensure the DP transmitter is above the level of the TORBAR head and that the tubing slopes down towards the TORBAR connections at an incline of at least 25 mm per 300 mm (1 in. per 12 in.).
- Use minimum 6 mm (0.25 in.) ID piping suitable for the pressure, temperature and process.
- Keep the tubing as short as possible but ensure the DP transmitter can operate within its specified temperature limits.
- Support the tubing over its entire length and isolate it from sources of vibration or damage.
- Route the tubing from the high and low pressure connections as close together as possible to maintain equal temperatures.
- Do not route the tubing in areas where the ambient temperature may fluctuate.

| Connection | Size | Description | FPD585 Interface Unit B | FPD585 Interface Unit B with pressure regulator | FPD585 Interface Unit C | FPD585 Interface Unit C with pressure regulator | FPD585 Interface Unit D |
|---|---|---|---|---|---|---|---|
| Ⓐ | 1/4 in. BSP | Calibration air inlet | User to provide accurate pressure supply to check the span of the DP transmitter | User to provide filtered air supply | User to provide accurate pressure supply to check the span of the DP transmitter | User to provide filtered air supply | N/A – port blocked |
| Ⓑ | 1/2 in. BSP | TORBAR high pressure | Connect to high pressure side of TORBAR | Connect to high pressure side of TORBAR | Connect to high pressure side of TORBAR | Connect to high pressure side of TORBAR | Connect to high pressure side of TORBAR |
| Ⓒ | 1/2 in. BSP | Purge air supply | N/A – port blocked | N/A – port blocked | User to provide filtered air supply – max. pressure 6 bar (87 psi) | User to provide filtered air supply – max. pressure 6 bar (87 psi) | User to provide filtered air supply – max. pressure 6 bar (87 psi) |
| Ⓓ | 1/4 in. BSP | Transmitter exhaust | No connection necessary | No connection necessary | No connection necessary | No connection necessary | N/A – port blocked |
| Ⓔ | 1/2 in. BSP | TORBAR low pressure | Connect to low pressure side of TORBAR | Connect to low pressure side of TORBAR | Connect to low pressure side of TORBAR | Connect to low pressure side of TORBAR | Connect to low pressure side of TORBAR |

*Table 6.1 Pneumatic connections – see Fig. 6.1*

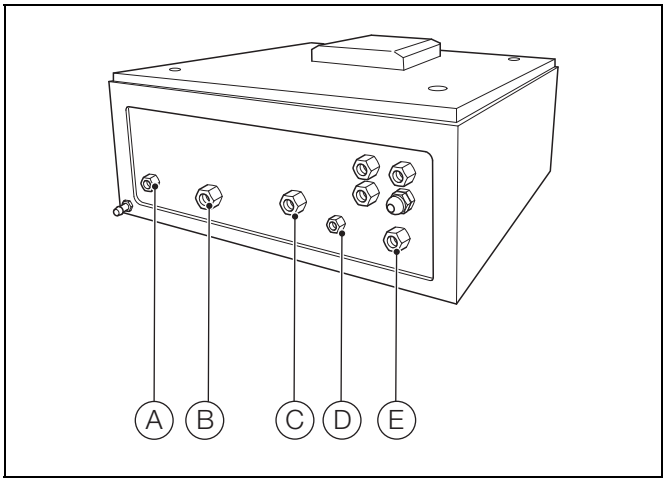



*Fig. 6.1 Interface unit B (without auto span check) – pneumatic connections*

# 7 Initial calibration

## 7.1 Zeroing the DP transmitter following installation

To ensure correct operation, the DP transmitter must be zeroed at the normal operating pressure of the process. – refer to the DP transmitter Operating Instructions (IM/267C/269C).

### 7.1.1 FPD581 and FPD583

The DP transmitter for the manual system is supplied mounted on a 5-valve manifold, either integrally to the TORBAR or remote-mounted.

Referring to Fig. 7.1:

1. Ensure the stack is at the normal operating pressure, the DP transmitter power supply is on and the transmitter has been allowed to warm up (refer to the transmitter's Operating Instructions IM/267C/269C).
2. Ensure vent valves V4 and V5 are closed).
3. Close isolation valves I2 and I3.
4. Open equalization valve E1. The DP transmitter should now indicate a value close to zero.
5. Zero the DP transmitter – (refer to the transmitter's Operating Instructions IM/267C/269C).
6. Open isolation valves I2 and I3.
7. Close equalization valve E1. The transmitter should now indicate flow. For information on fault diagnosis refer to Section 10.1, page 52.

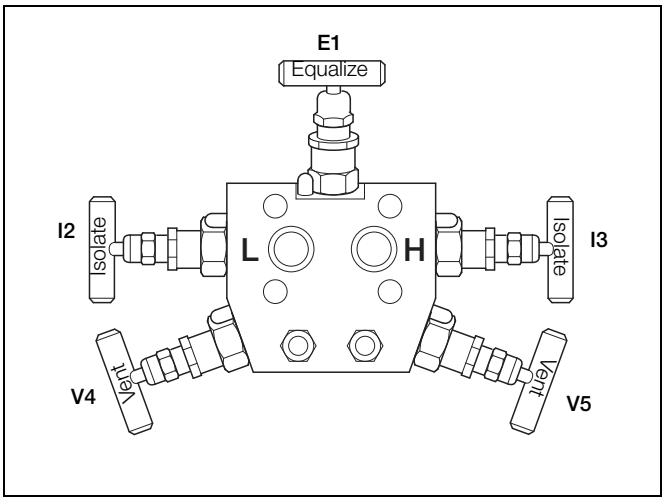



*Fig. 7.1 Valve identification (view from underside of manifold)*

### 7.1.2 FPD585

The DP transmitter for the FPD585 system is mounted inside the enclosure. To zero the transmitter, refer to Section 9.11.1, page 36.

## 7.2 Calibration following installation

The FPD580 series is supplied with a coefficient or 'K-factor' that is used in the calculations. An on-site calibration must be performed following the installation to correct the K-factor for the individual conditions and dimensions of the stack. This must be performed using a standard reference method; the preferred method is a manual pitot traverse as outlined in EN15259.

The DP transmitter is configured so that the upper range limit (URL) is represented by the calculated DP at the meter maximum flow (20 mA). Once the calibration information has been obtained, use the method detailed in Fig. 7.2 to implement any changes necessary.

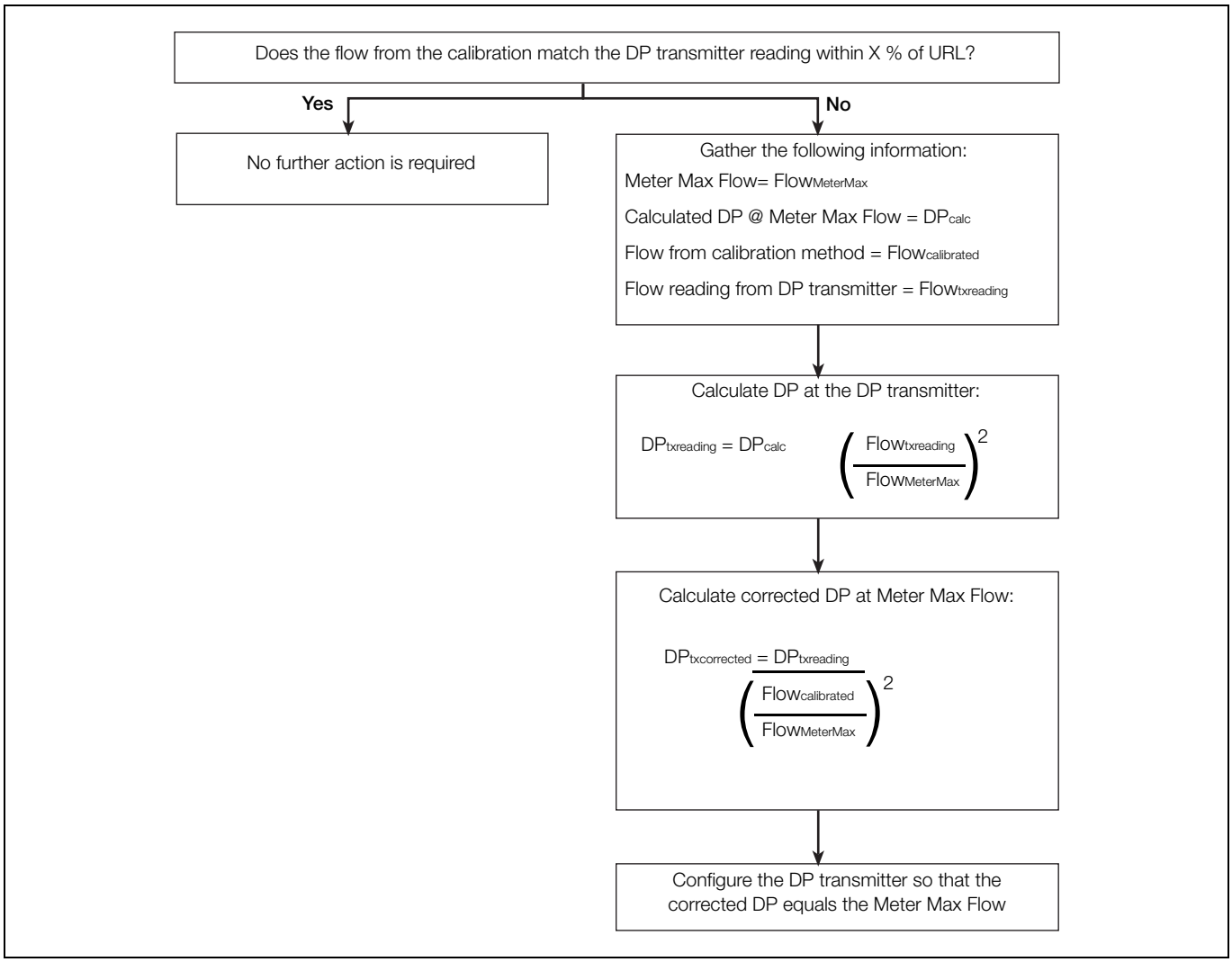



*Fig. 7.2 Method to correct DP following calibration*

**Example.**

**Gather the information:**

Meter Max Flow = 100 $m^3/h$
Calculated DP @ Meter Max Flow = 80 mbar
Flow measured at calibration = 50 $m^3/h$
Flow reading from DP transmitter at calibration = 60 $m^3/h$

**Calculate the DP reading at the DP transmitter:**

$DP_{txreading} = 80 * (60/100)^2$
$DP_{txreading} = 28.8$ mbar

**Calculate the corrected DP at Meter Max Flow:**

$DP_{corrected} = 28.8 / (50/100)^2$
$DP_{corrected} = 115.2$ mbar

# 8 Operation – FPD583

## 8.1 Description

The panel is supplied with a 2-position key switch and 2 indicator lights:

Green = Healthy

Red = Fault

With the key switch in the run position the interface unit monitors the health of the pressure transmitter. When the pressure transmitter is healthy the system provides a contact output on terminals 20 and 21.

### 8.1.1 Maintenance

Before working on the system, set the key switch to the 'MAINTAIN' position.

**Note.** The indicator lights are not lit but the system provides a contact output on terminals 30 and 31.

### 8.1.2 Fault

If a fault occurs, the transmitter's red indicator is lit and the contact output from terminals 20 and 21 is lost.

In case of an indicated fault, refer to the DP transmitter's Operating Instructions (IM 267C/269C).

### 8.1.3 Heater HC2 or HC3

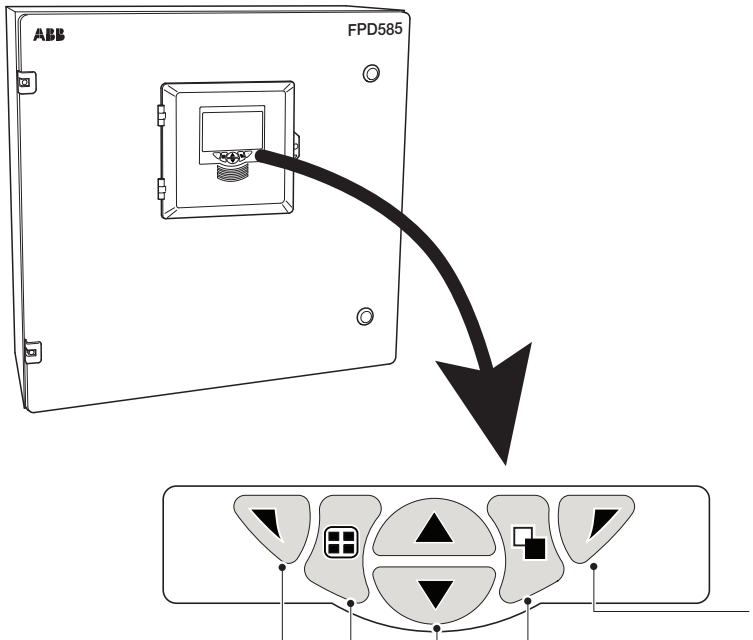
If the panel is fitted with the optional heater HC2 or HC3, adjust the thermostat to the required minimum temperature. The default setting is –5 °C (23 °F).

**Caution.** The heater remains hot for some time after power has been switched off.

# 9 Operation – FPD585

## 9.1 Front panel keys

FPD585 Interface Units B, C and D are operated using the front panel keys on the control unit. These keys enable local navigation and selection of all software options on all displays. Prompts associated with active keys are displayed on each screen.




**Navigation (right) key**:

selects the highlighted menu item, operation button or edits a selection.

**View key***:

toggles between –

*Operator* pages (1 to 5) when an *Operator* page is selected at the Group key.

*View* screens (*Alarms*, *Outputs*, *Signals*, *Chart* and *Diagnostic*) when the *Diagnostic View* screen is selected at the Group key.

*Log* screens (*Alarm*, *Event*, *Diagnostic* and *Calibration*) when the *Calibration Log* screen is selected at the Group key.

*Not enabled in *Configuration* mode.

**Up / Down keys**:

navigate up / down menus, highlight menu items and increase / decrease displayed values.

**Group key**:

toggles between the *Operator* page(s), *Diagnostic View* and *Calibration Log* screens.

Key not enabled in *Configuration* mode.

**Navigation (left) / Operator Level access key**:

displays or hides the operator menu associated with each view. It also cancels the menu without making a change or returns to the previous menu level.

*Fig. 9.1 Front panel keys*

## 9.2 Control unit operation modes

The control unit has 4 modes of operation. All modes are accessed from the *Operator* menu – see Fig. 9.2.

The 4 modes are:

- *Operating*: used to display real-time sensor values on *Operating Pages* – see Section 9.5, page 24.
- *View*: used to display diagnostic messages, alarms, output values, signals (including the flow rate where applicable) and (chart) traces – see Section 9.6, page 26.
- *Log*: used to display recorded events and alarms – see Section 9.7, page 28.
- *Configuration*: used to configure the transmitter – see Section 9.11, page 34.

## 9.3 Operator menus

**Note.** *Operator* menus **cannot** be accessed directly from the *Configuration* level.

Referring to Fig. 9.2, *Operator* menus (A) are accessed from any *Operating*, *View* or *Log* page by pressing the ▽ key (B).

To select *Operator* sub-menus (indicated by the ▶ arrow) press the ▽ key (C).

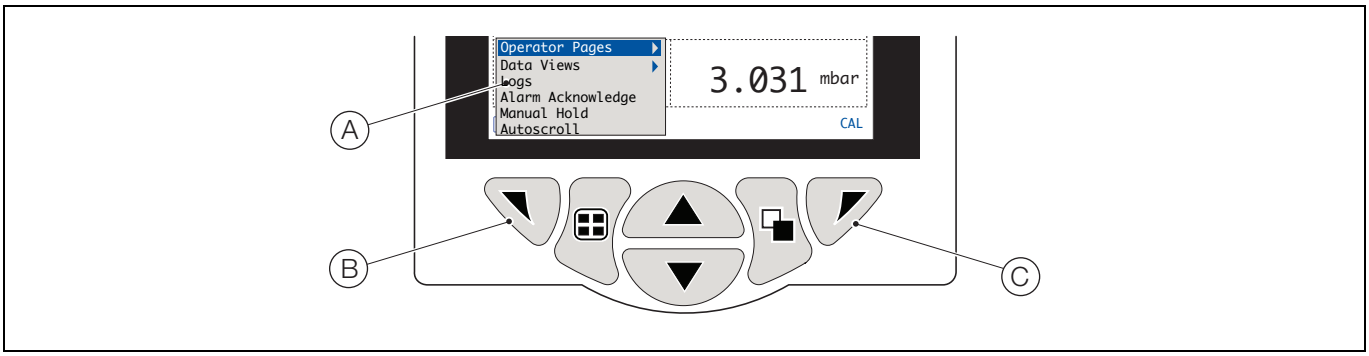



*Fig. 9.2 Operator menus*

*Operator* menus comprise:

- *Operator Pages* – select *Operator* pages
- *Data Views* – select: *Diagnostic view*, *Signals view*, *Chart view*, *Alarms view*, *Outputs view*
- *Logs* – select: *Accuracy check log*, *Alarm log*, *Audit log*, *Diagnostic log*
- *Alarm Acknowledge* – acknowledge process alarms
- *Manual Hold* – select to hold (freeze) current outputs and process alarms.

  **Note.** Active values are still indicated on the display.

- *Autoscroll* – available on *Operator* pages only – select to display *Operator* pages sequentially.
- *Media Card* – set media card online / offline.
- *Clear Logs* – enabled on *Log* pages only – select to clear:
  - log data for the current *Log* page
  - log data for all *Log* pages
- *Enter Configuration* – enabled on all pages – select to enter *Configuration* parameters via the *Access Level* – refer to Section 9.9.2, page 32 for access levels and password security options.

## 9.4 Navigation overview

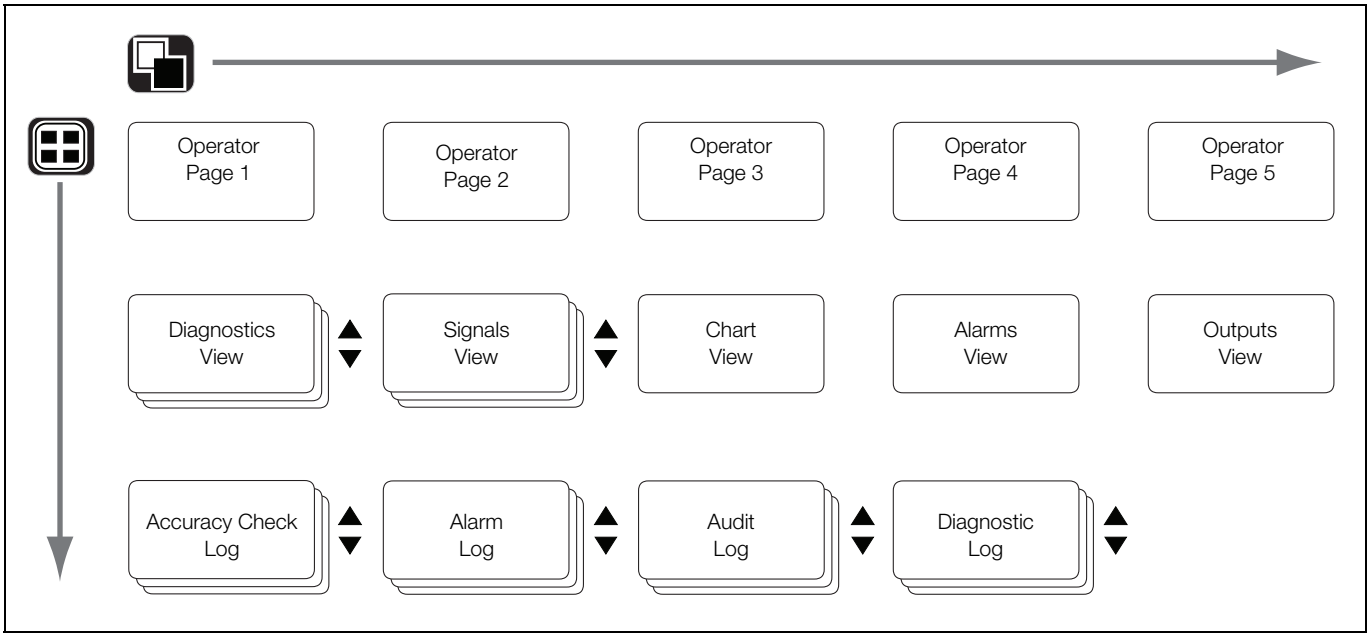
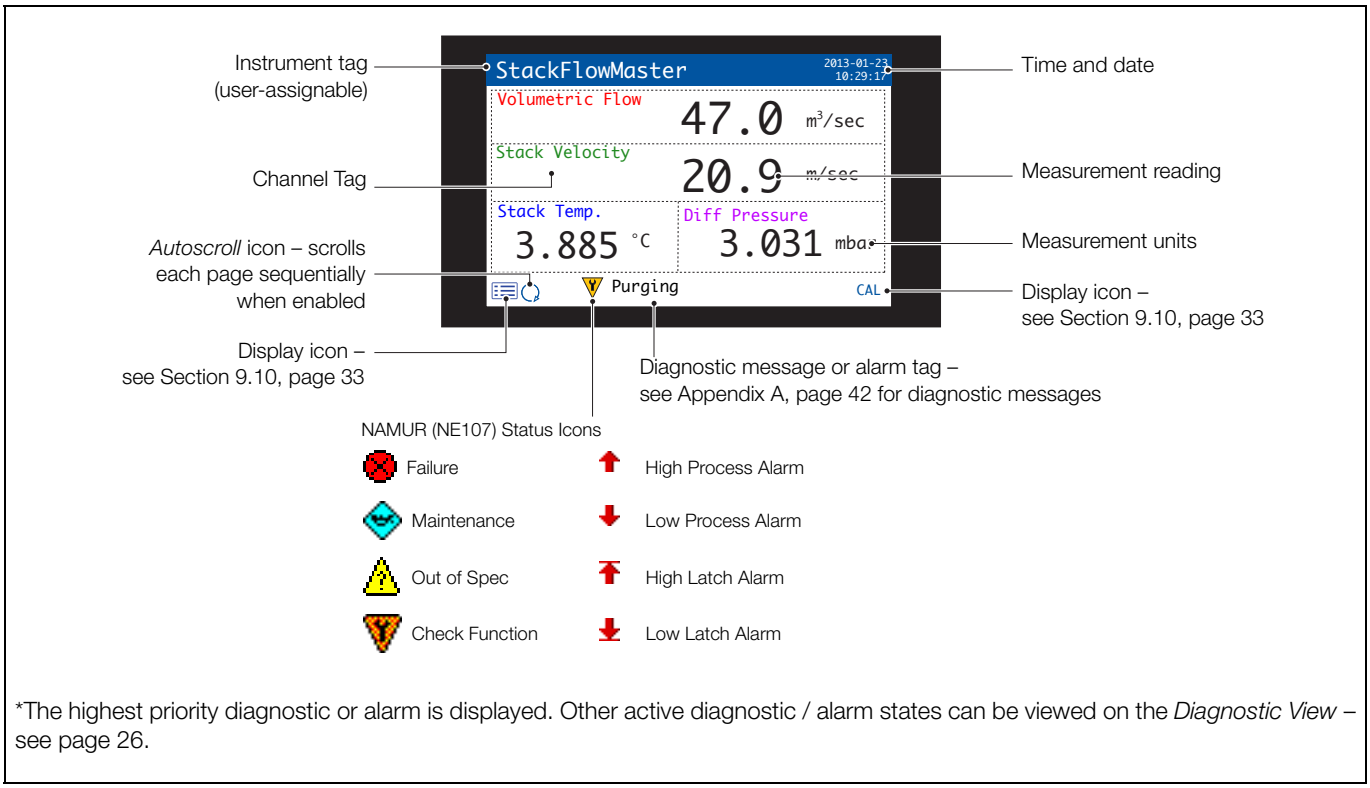



*Fig. 9.3 Menu navigation*

## 9.5 Operating mode

In operating mode, measured and calculated values are displayed in *Operator Pages*. A maximum of 5 *Operator Pages* can be enabled for display by assigning **Operator Templates** to each one – see Section 9.11.3, page 41.

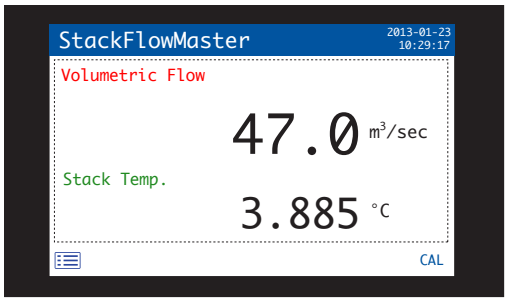
Fig. 9.4 shows *Operator Page 1* set to its default template `Qv, V, T, DP`, enabling the display of volumetric flow, stack velocity, stack temperature and differential pressure measurements.




*The highest priority diagnostic or alarm is displayed. Other active diagnostic / alarm states can be viewed on the *Diagnostic View* – see page 26.

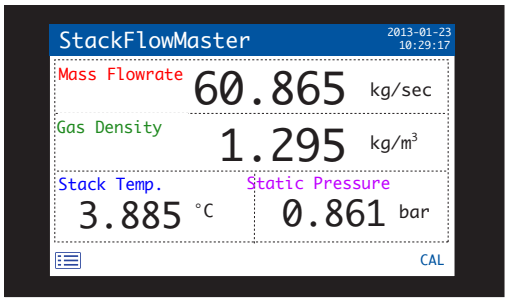
*Fig. 9.4 Operator Page 1 – default template Qv, V, T, DP*

Fig. 9.5 shows the remaining *Operator Page Templates* that can be assigned to any of the 5 Operator Pages.



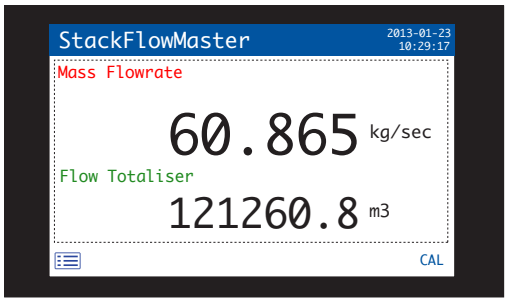

**Template Qv, T**

Volumetric flow and stack temperature display



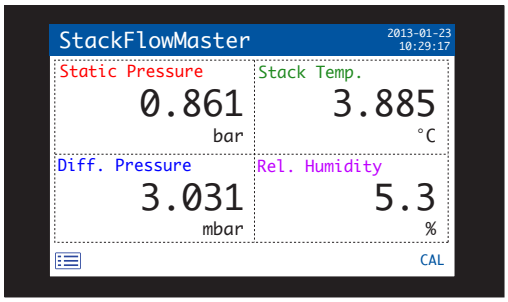

**Template Qm, p, T, SP**

Mass flow, gas density, stack temperature and static pressure display



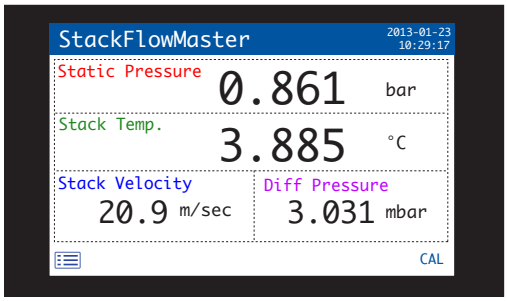

**Template Qm, Σ**

Mass flow and flow totalizer display



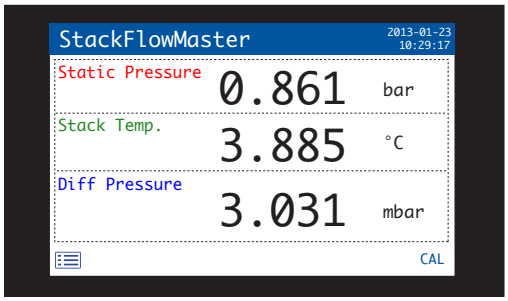

**Template SP, T, DP, RH**

Static pressure, stack temperature, differential pressure and relative humidity display



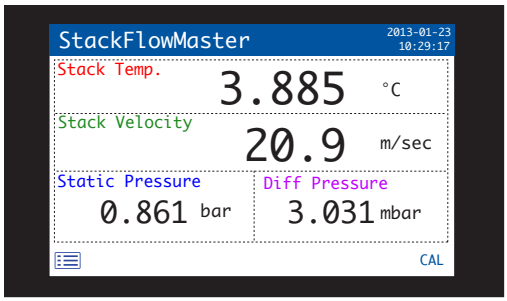

**Template SP, T, V, DP**

Static pressure, stack temperature, stack velocity and differential pressure display



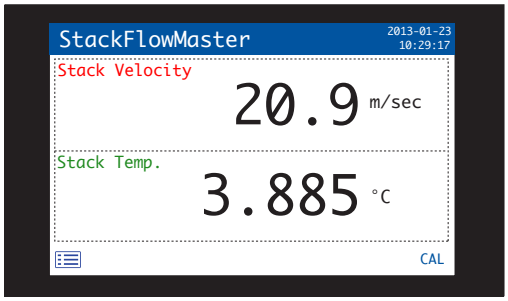

**Template SP, T, DP**

Static pressure, stack temperature and differential pressure display




**Template T, V, SP, DP**

Stack temperature, stack velocity, static pressure and differential pressure display




**Template V, T**

Stack velocity and stack temperature display

*Fig. 9.5 Operator Page templates*

## 9.6 View mode

Pages displayed in *View* mode comprise:

- *Diagnostics View*: used to display a list of diagnostic messages identified by priority and message – see Fig. 9.6.
- *Alarms View*: used to display a list of process alarms identified by source and status – see Fig. 9.7.
- *Outputs View*: used to display a list of alarms identified by analog output ID, output value and percentage of output value – see Fig. 9.8.
- *Signals View*: used to display a list of active signals and their values – see Fig. 9.9.
- *Chart View*: used to represent the probe readings as a color-coded trace – see Fig. 9.10.

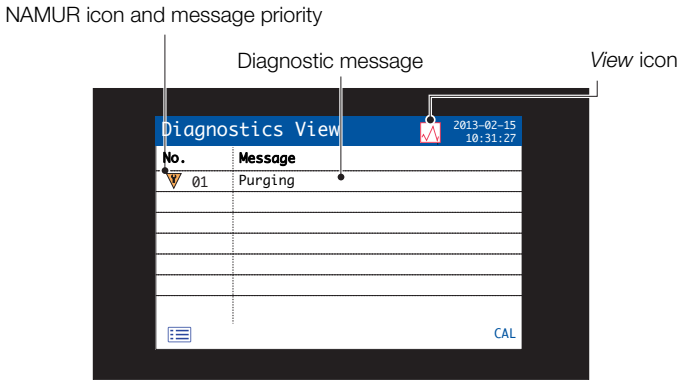



*Fig. 9.6 Diagnostics view*

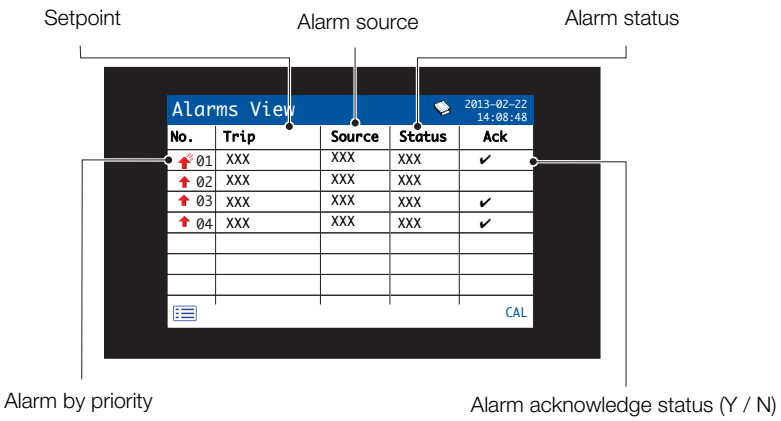



*Fig. 9.7 Alarms view*

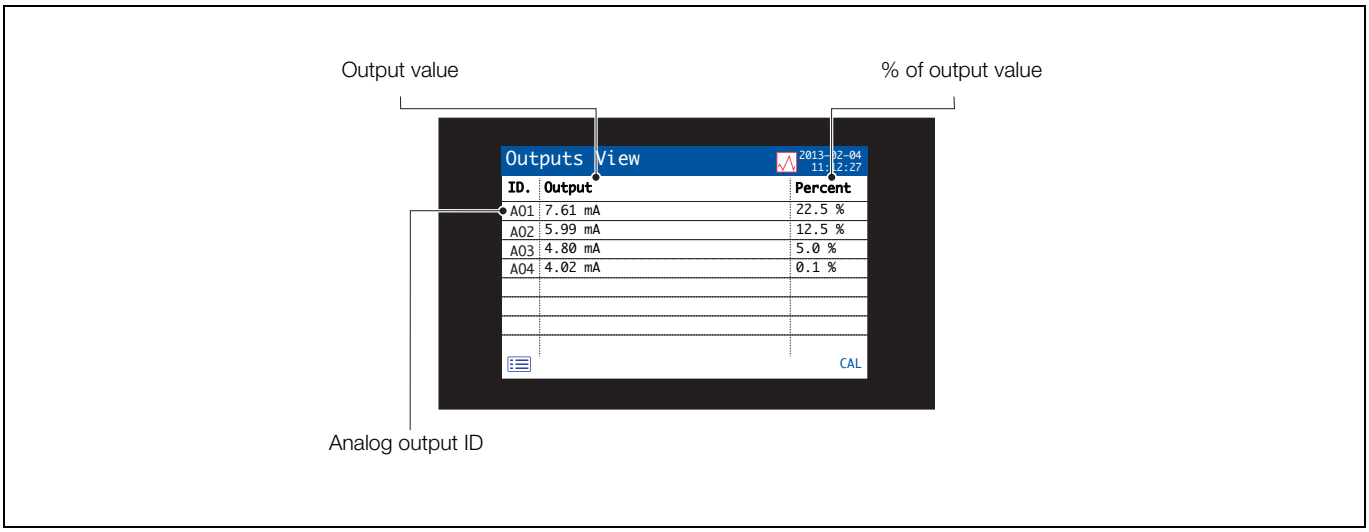



*Fig. 9.8 Outputs view*

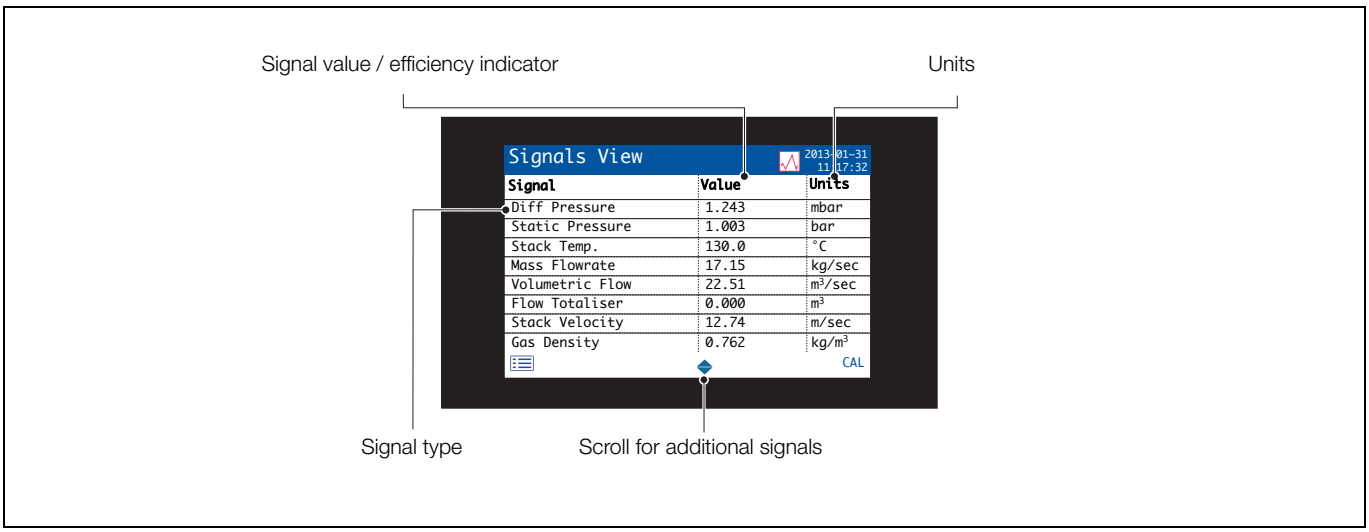



*Fig. 9.9 Signals view*

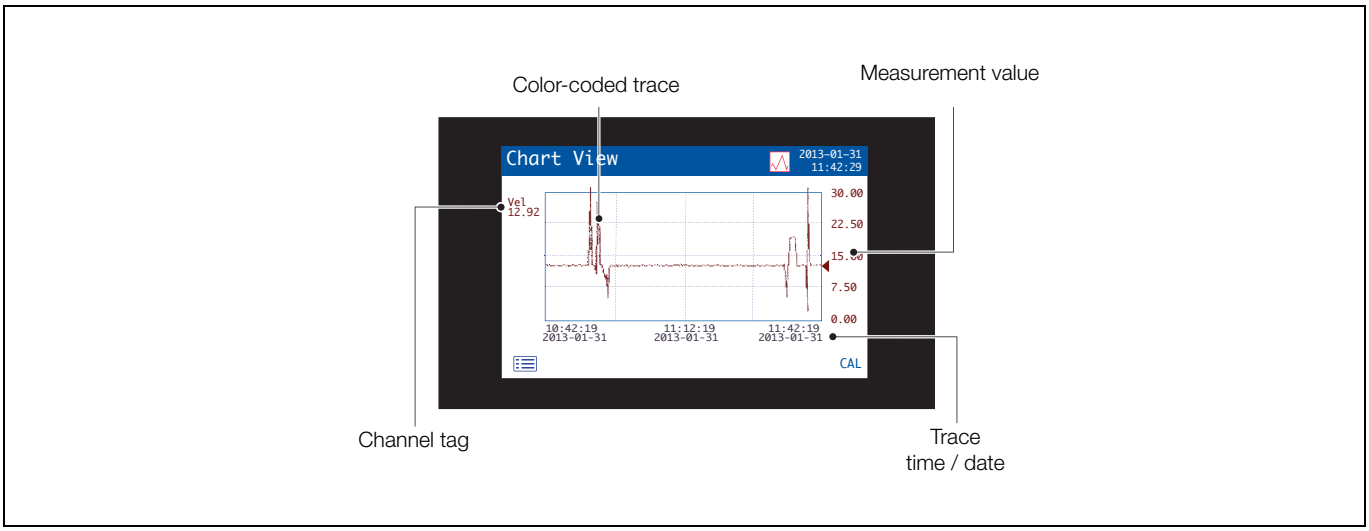


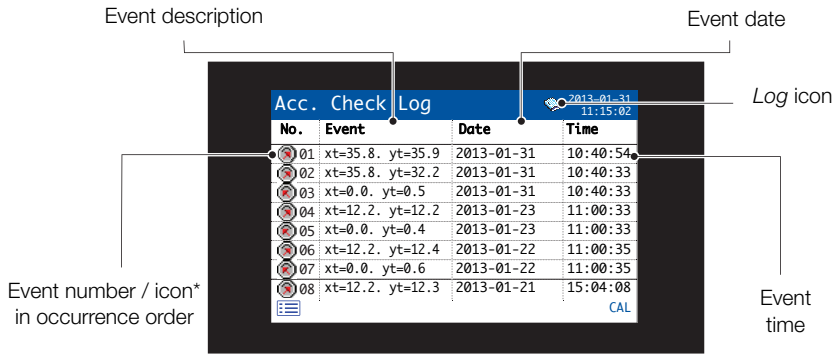

*Fig. 9.10 Chart view*

## 9.7 Log mode

*Log* mode pages display logged information in the sequence it occurred.

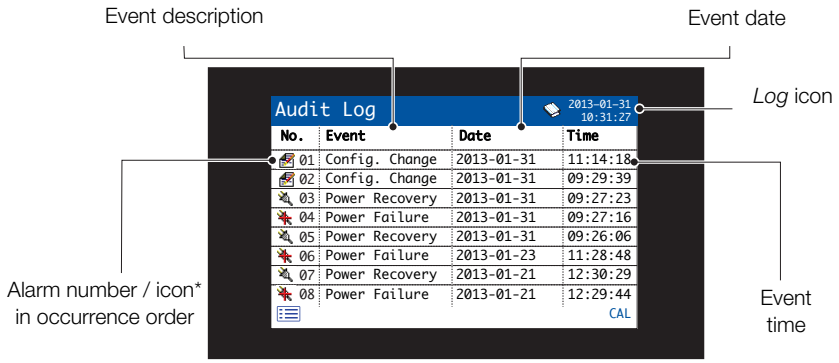
*Log* mode pages comprise:

- *Accuracy Check Log*: a history of completed accuracy check routines – see Fig. 9.11.
- *Alarm Log*: a history of alarm events.
- *Audit Log*: a history of system activity – Fig. 9.12.
- *Diagnostic Log*: a history of diagnostic events.




*Icons not displayed on *Alarm Log* or *Calibration Log*

*Fig. 9.11 Accuracy check log*




*Icons not displayed on *Alarm Log* or *Calibration Log*

*Fig. 9.12 Audit log*

### 9.7.1 Log entries

Examples of log entries together with a description are given in the following tables:

- *Accuracy check log* – Table 9.1.
- *Alarm Log* – Table 9.2.
- *Audit Log* – Table 9.3.
- *Diagnostic Log* – Table 9.4.

> **Note.** For a complete list of the diagnostic messages that may be displayed in the diagnostic log, see Appendix A, page 59.

| Log entry | Description |
|---|---|
| xt=xxx, yt=yyy | Accuracy check at zero<br>xt=xxx (reference stack velocity)<br>yt=yyy (actual stack velocity) |
| xt=xxx, yt=yyy | Accuracy check at span<br>(Span Check Pressure)<br>xt=xxx (reference stack velocity)<br>yt=yyy (actual stack velocity) |

*Table 9.1 Accuracy check log entries*

| Log entry | Description |
|---|---|
| | High process alarm |
| <Alarm tag> | Active |
| <Alarm tag> | Inactive |
| | Low process alarm |
| <Alarm tag> | Active |
| <Alarm tag> | Inactive |
| | High latch alarm |
| <Alarm tag> | Active |
| <Alarm tag> | Inactive |
| | Low latch alarm |
| <Alarm tag> | Active |
| <Alarm tag> | Inactive |

*Table 9.2 Alarm log entries*

| Log entry | Description |
|---|---|
| Power failure | Power failure |
| Power recovery | Power recovery |
| Config. Change | Configuration changed |
| Time/Date Change | Time and / or date changed |
| Daylight Saving | Time changed due to daylight saving |
| Media Online | Logged data continuously copied to media card |
| Media Offline | Logged data is not copied to media card |
| Media Inserted | Media card inserted |
| Media Removed | Media card removed |
| Too Many Files | TBC |
| Media Error | New files cannot be created on media card |
| Media Write Err. | Cannot write to media card |
| Media Formatted | Media card formatted or internal datalog memory cleared |
| File Created | TBC |
| File Deleted | TBC |

*Table 9.3 Audit log entries*

| Log entry | Description |
|---|---|
| No Response | The control unit cannot detect a response from the transmitter (failure of communication between control unit and transmitter) |
| Purging | Purge in progress |
| Acc.Chk.Failed | Accuracy check failed due to reading instability |
| Service Due | Scheduled service is due |

*Table 9.4 Diagnostic log entries*

## 9.8 Logging

Data recorded in the transmitter's internal memory can be archived to a removable Secure Digital (SD) card. The transmitter continuously records **all** data to its internal memory and keeps track of which data has been archived.

**Note.** ABB's DataManager Pro software can be used to store and view data archived from the transmitter.

The amount of time that data remains in the transmitter's internal memory depends on the sample rate – see Table 9.5. Sample data is saved to removable media as comma-separated files.

The following files are archived:

- Event log files (these files contain *Event Log, Alarm Log, Diagnostic Log* and *Accuracy Check Log* data)
- Data files
- Configuration files

The transmitter's internal memory supports a maximum of 10 *Data* and *Log* files only and a maximum of 8 Configuration files. Durations for continuous recording are shown in Table 9.5 (internal storage).

A 2Gb SD card has sufficient external storage capacity for >5 years data.

| 5 s | 10 s | 30 s | 1 m | 5 / 10 / 30 m | 1 hr |
|---|---|---|---|---|---|
| 30 days | 60 days | 180 days | 300 days | 300 days | 300 days |

*Table 9.5 Internal (flash) memory storage capacity*

### 9.8.1 SD card

**Caution.** To avoid potential damage or corruption to data recorded on an SD card, take care when handling and storing the card. Do not expose the card to static electricity, electrical noise or magnetic fields. When handling the card take care not to touch any exposed metal contacts.

There are two methods of archiving to an SD card:

- **An SD card is kept in the transmitter**

  Data is copied automatically to the media at set intervals.

  It is advisable to back-up critical data stored on an SD card regularly.

- **Data is copied to an SD card when required**

  When an SD card is inserted into the transmitter, the media status can be set to *Online* causing unarchived data to be copied to the media – see Section 9.11.7, page 49.

### 9.8.2 SD card insertion

Referring to Fig. 9.13:

1. Release door catch (A).
2. Open the door and insert the SD card (B).
3. Close the door and secure with catch (A).

### 9.8.3 SD card removal

Referring to Fig. 9.13:

1. Release door catch (A) and open the door.
2. Check red LED (C).

> **Note.** Red LED (C) is lit when the SD card is in use by the transmitter (online). Step 3 is applicable only if red LED (C) is lit.

3. Press switch (D) and wait until the LED goes out.
4. Remove SD card (B).

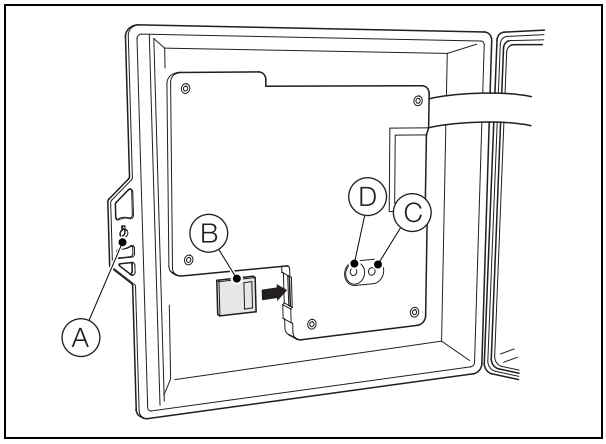



*Fig. 9.13 SD card insertion / removal*

The SD card can be inserted into an appropriate card reader attached to a PC and the data downloaded.

> **Note.** Data stored in the internal memory buffer can still be transferred to the archive media when the archive media is placed on-line again (providing it is not off-line so long that the un-archived data in the internal memory is overwritten).

### 9.8.4 Archive file types

All archive files created by the transmitter (except for configuration files) are assigned filenames automatically. Each type of archived file is assigned a different file extension.

The file type and extension for **Data** text files is '.DOO'

- <ddmmyy><hhmmss><instrument tag>.DOO

The file type and extension for **Event** log files (containing historical entries from the *Event, Calibration, Diagnostic* and *Alarm* logs is '.AOO'.

- <ddmmyy><hhmmss><instrument tag>.AOO

> **Note.**
>
> - The 'instrument tag' is set in the *Device Setup* level (see page 34) when the user has access at *Advanced* level – see Section 9.9, page 32.
> - The time and date are formatted according to the format set in *Display / Date & Time* level.
>
>  The transmitter's internal clock can be configured to adjust automatically at the start and end of *Daylight Saving* periods. – see page 34.

Configuration filenames are user-entered. The configuration file type and extension is '.cfg'.

### 9.8.5 Data files

Text format archived data is stored in a comma-separated value format and can be imported directly into a standard spreadsheet, for example, Microsoft® Excel.

Alternatively, you can carry out detailed graphical analysis of the data on a PC using ABB's DataManager data analysis software.

New data files are created in the following circumstances:

- The transmitter configuration is changed.
- One of the current files exceeds the maximum permissible size (a new file is created a 12:00 a.m. on the following day. Data is logged into the existing file continuously until the new file is created.
- When the daylight saving period starts or ends.
- When working files cannot be found / are corrupted.

### 9.8.6 Log files

The Alarm Event, Accuracy Check, Diagnostic and Event logs are archived into the same file. The filename is formatted as follows:

<ddmmyy><hhmmss><instrument tag>.AOO

### 9.8.7 Daylight saving

Files containing data generated during the daylight saving period have '~DS' appended to the filename.

## 9.9 Password security and access level

Passwords are entered at the *Enter Password* screen accessed via the *Access Level* – see Section 9.9.2.

### 9.9.1 Setting passwords

Passwords can be set to enable secure end-user access at 2 levels: *Standard* and *Advanced*. The *Service* level is password protected at the factory and reserved for factory use only.

Passwords can contain up to 6 characters and are set, changed or restored to their default settings at the *Device Setup / Security Setup* parameter – see page 38.

**Note.** When the transmitter is powered-up for the first time, the *Standard* and *Advanced* level levels can be accessed without password protection. Protected access to these levels must be allocated on-site as required.

### 9.9.2 Access Level

The *Access Level* is entered via the *Operator* menu / *Enter Configuration* menu option – see Section 9.3, page 23.

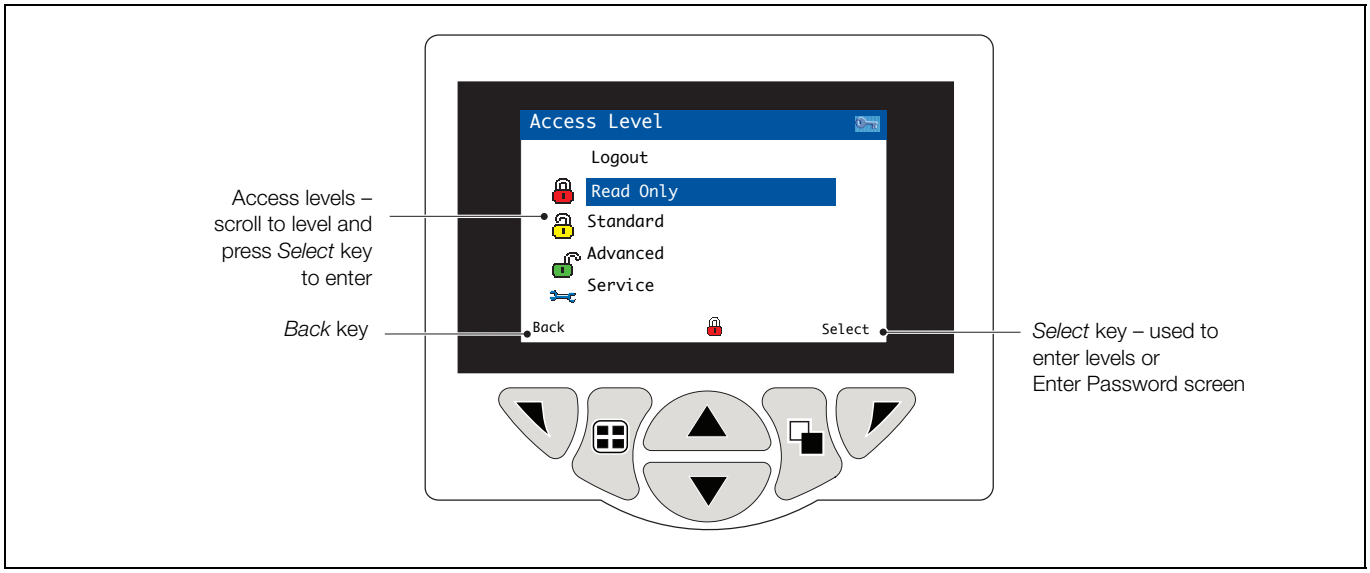



*Fig. 9.14 Access Level*

| Level | Access |
|---|---|
| Logout | Displayed after *Standard* or *Advanced* level are accessed. Logs the user out of current level. If passwords are set, a password must be entered to access these levels again after selecting *Logout*. |
| Read Only | View all parameters in read-only mode. |
| Standard | Enables access and adjustment of *Standard* parameters. |
| Advanced | Enables configuration access to all parameters. |
| Service Level | Reserved for authorized service personnel only. |

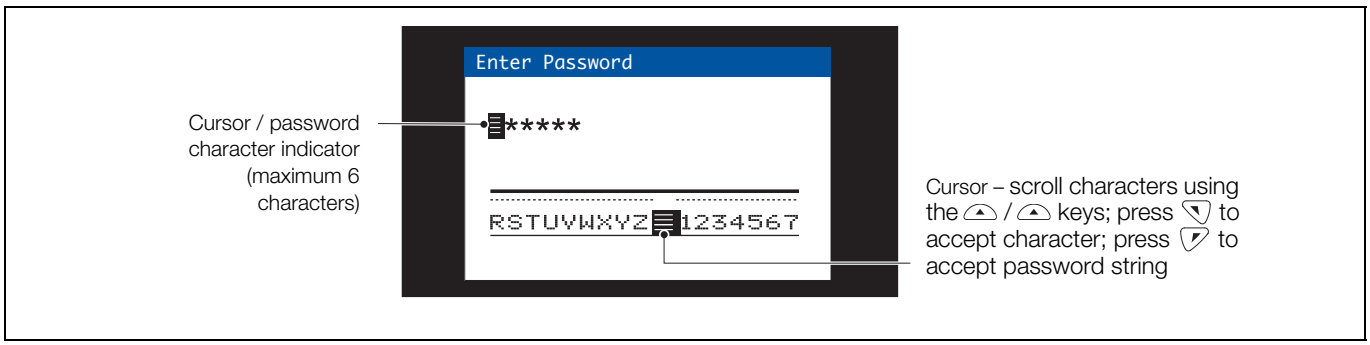



*Fig. 9.15 Enter Password screen*

## 9.10 Display icons

### 9.10.1 Alarm, hold and calibration icons

**Note.** When a diagnostic condition is detected the associated NAMUR icon plus the highest priority diagnostic message is displayed in the Status Bar when the control unit is in Operator View mode – refer to Appendix A, page 59 for a description of the NAMUR icons and diagnostic messages.

| | |
|---|---|
|  | *Alarm* – indicates a user-defined alarm condition (20-character) and flashes intermittently with an associated NAMUR diagnostic icon. |
|  | Hold – indicates that alarms / analog outputs are in a manual hold state. |
|  | Calibrating – indicates that a calibration is in progress. |
|  | Calibration failed – indicates that a calibration has failed. |

### 9.10.2 Title bar icons

| | |
|---|---|
|  | *Log* mode – indicates that one of the *View* pages is currently displayed (*Calibration, Alarm, Audit or Diagnostic*) |
|  | *View* mode – indicates that one of the *View* pages is currently displayed (*Diagnostics, Alarms, Outputs, Signals* or *Chart*) |
|  | SD card ready – indicates the SD card is online and ready for archiving. |
|  | SD card full – indicates the SD card is online and full. |
|  | External archive media on-line with % used indication |
|  | External archive media off-line with % used indication |
|  | External archive media not inserted (yellow flashing exclamation mark) |
|  | Media update in progress. Do not remove media while this symbol is displayed |
|  | External media 100% full, archiving stopped (green / grey icon, flashing white cross) |
|  | Warning! Too many files (green icon – media online, grey icon – media offline) |

### 9.10.3 Status bar icons

| | |
|---|---|
|  | *Operator* menu – displays the Operator menu when the left (◹) key is pressed. |
|  | *Autoscroll* – selected from the Operator menu (displayed when *Autoscroll* enabled). Indicates Operator pages are displayed sequentially. Disabled if 1 Operator page only is configured for display. |
| CAL | *Calibration* – shortcut access to the Calibration page when the right (◸) key is pressed. |
|  | *Service Level* – indicates that alarms and analog outputs are held. |
|  | *Advanced Level* – indicates that *Advanced Level* parameters are enabled for the current user. |
|  | *Standard Level* – indicates that the *Calibration Level* parameters are enabled for the current user. |
|  | *Read Only Level* – indicates that the transmitter is in *Read Only mode.* All parameters are locked and in cannot be configured. |

## 9.11 Configuration

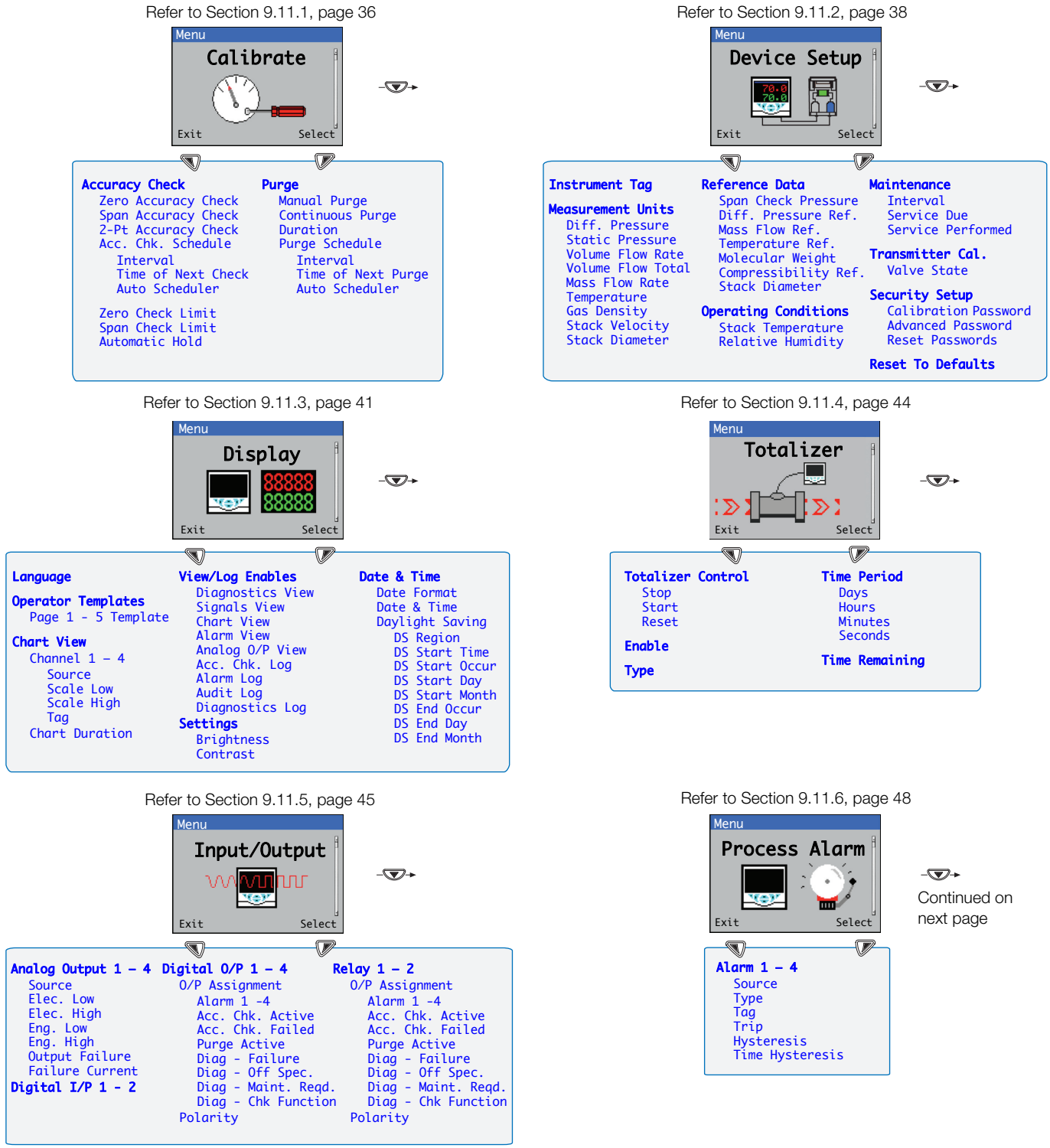
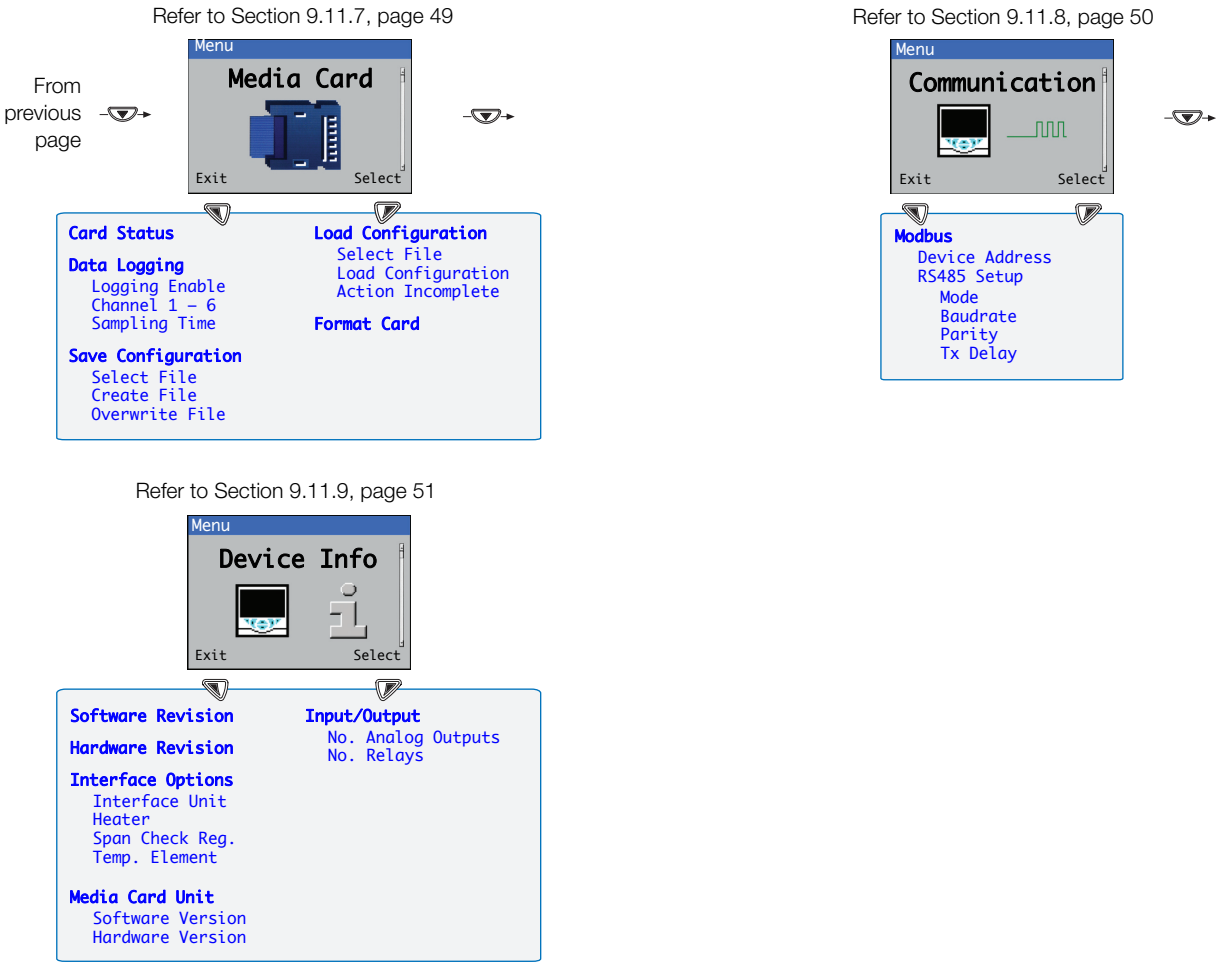


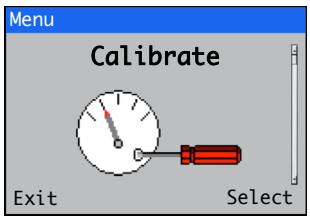

*Fig. 9.16 Configuration menu overview*




**Note**. *Service* level menus (not shown) are password-protected at the factory and intended for use by approved ABB service technicians only.

*Fig. 9.16 Configuration menu overview (Continued)*

### 9.11.1 Calibrate



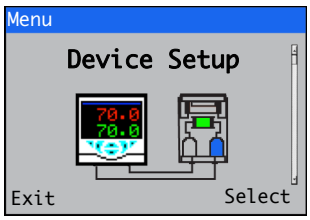

Access to the *Calibrate* menu is available via the *Standard and Advanced* levels only.

| Menu | Comment | Default |
|---|---|---|
| **Accuracy Check** | | |
| Zero Accuracy Check | Initiates a check on the zero point of the DP transmitter | |
| Span Accuracy Check | Initiates a check on the span point of the DP transmitter.<br>**Note.** This function requires an external regulated pressure source if a pressure regulator (PC1) is not installed – see Section 10.5.1, page 54. | |
| 2-Pt Accuracy Check | Initiates a check on the zero point followed by a check on the span point of the DP transmitter.<br>**Note.** This function requires an external regulated pressure source if a pressure regulator (PC1) is not installed – see Section 10.5.1, page 54. | |
| Acc. Chk. Schedule | | |
| Interval | Select the accuracy check frequency:<br>*Off / 1 Day / 2 Days / 3 Days / 4 Days / 5 Days / 6 Days / 1 Week / 2 Weeks / 3 Weeks / 4 Weeks / 3 Months / 6 Months / 1 Year* | 1 day |
| Time of Next Check | Displays the date and time that the next accuracy check is due to start. | Midnight |
| Auto Scheduler | Enable / disable the auto scheduler:<br>*Disabled / Zero Check / Span Check / Two Point Check* | Disabled |
| Zero Check Limit | Allowable deviation between reference zero and measured zero as a percentage of DP. | 4% |
| Span Check Limit | Allowable deviation between reference span and measured span as a percentage of DP. | 8% |
| Automatic Hold | Enable / disable automatic hold.<br>When enabled, the measurement signals are held when an accuracy check is performed. | Enabled |

*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Purge** | Used to clear particulate buildup from the TORBAR's sensing holes.<br>**Note.** Available only if the optional purge system is fitted. | |
| Manual Purge | Initiate a manual purge for the duration set below. | |
| Continuous Purge | Initiates a continuous purge for use during system commissioning.<br>**Caution.** To prevent damage to the TORBAR probe, **do not use** when the stack gas temperature exceeds 200°C (392 °F). | |
| Duration | Adjust the purge duration to between 10 and 300 seconds | 30s |
| Purge Schedule | | |
| Interval | Select a purge frequency:<br>*Off / 10 min / 15 min / 20 min / 30 min / 1 hour / 2 hours / 3 hours / 4 hours / 6 hours / 8 hours / 12 hours / 1 Day / 2 Days / 3 Days / 4 Days / 5 Days / 6 Days / 1 Week* | 1 Day |
| Time Of Next Purge | Displays the date and time that the next purge is due to start. | Midnight |
| Auto Scheduler | Enable / disable the auto scheduler. | Disabled |

### 9.11.2 Device setup




This level is used to access standard setup parameters.

| Menu | Comment | Default |
|---|---|---|
| **Instrument Tag** | The device (transmitter) identification tag. | StackFlowMaster |
| **Measurement Units** | StackFlowMaster is supplied pre-configured by the factory to suit the process. | |
| `Diff. Pressure` | Select the differential pressure units required.<br>See Table B.1, page 62 for available options. | mbar |
| `Static Pressure` | Select the static pressure units required.<br>See Table B.1, page 62 for available options. | bar |
| `Volume Flow Rate` | Select the volume flow rate units required.<br>See Table B.2, page 62 for available options. | $m^3$/sec |
| `Volume Flow Total` | Volume flow total units are set automatically, based upon the `Volume Flow Rate` units selected above and cannot be changed. See Table B.3, page 63 for a description. | $m^3$ |
| `Mass Flow Rate` | Select the mass flow rate units required.<br>See Table B.4, page 63 for available options. | kg/sec |
| `Temperature` | Select the temperature units required.<br>See Table B.5, page 63 for available options. | °C |
| `Gas Density` | Select the gas density units required:<br>*kg/m³* (kilograms per cubic metre) or *lb/ft³* (pounds per cubic foot). | kg/m3 |
| `Stack Velocity` | Select the stack velocity units required:<br>*m/sec* (metres per second) or *ft/sec* (feet per second). | m/sec |
| `Stack Diameter` | Select the stack velocity units required:<br>*m* (metres) or *ft* (feet). | m |

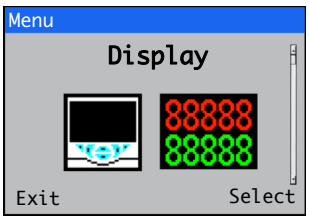
*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Reference Data** | StackFlowMaster is normally supplied pre-configured by the factory to suit the process. Reference data information comes from typical values supplied by the customer when specifying the system required. | |
| `Span Check Pressure` | Pressure at which the transmitter is checked during an accuracy span check (typically 10.00 or 60.00 mbar). | 60.00 mbar |
| `Diff. Pressure Ref.` | Reference differential pressure, taken from the reference information supplied by the customer when specifying the system required. | 15.14 mbar |
| `Mass Flow Ref.` | Reference mass flowrate, taken from the reference information supplied by the customer when specifying the system required. | 5.00 kg/sec |
| `Temperature Ref.` | Reference temperature, taken from the reference information supplied by the customer when specifying the system required. | 155.55 °C |
| `Molecular Weight` | Molecular weight of the flue gases. | 35.00 |
| `Compressibility Ref.` | Reference compressibility factor, taken from the reference information supplied by the customer when specifying the system required. | 0.90 |
| `Stack Diameter` | The stack diameter used to calculate the cross-sectional area of the stack at the measurement point. | 0.500 m |
| **Operating Conditions** | Fixed values for conditions that are not measured. | |
| `Stack Temperature` | Fixed stack temperature for when an RTD is not installed.<br>Used in the calculation to correct for density. | 176.85 °C |
| `Relative Humidity` | Fixed relative humidity value.<br>Used in the calculation to correct for wet volumetric flow. | 10.00 % |
| **Maintenance** | | |
| `Interval` | Select the interval between routine servicing:<br>*Off / 30 days / 60 days / 90 days / 180 days / 360 days / 365 days.* | 180 Days |
| `Service Due` | Shows the time remaining to the next service. | |
| `Service Performed` | Enables advanced and service users to confirm that a service has been completed. | |
| **Transmitter Cal.** | | |
| `Valve State` | Sets the valves to the zero position to enable a zero calibration to be performed on the transmitter. Refer to the transmitter Operating Instructions (IM 267C/269C).<br>Transmitter calibration states are:<br>*Tx Operational / End Calibration / Tx at zero / Enable Zero Cal.* | |

*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Security Setup** | See Section 9.9, page 32 for instructions on how to set passwords. | |
| `Calibration Password` | Sets the password to enable access at *Calibrate* level (not factory-set). | |
| `Advanced Password` | Sets the password to enable access at *Advanced* level (not factory-set). | |
| `Reset Passwords` | Clears all passwords. | |
| **Reset To Defaults** | Clears all set data and reverts to the default (factory) settings. | |

### 9.11.3 Display




Used to select the display language, setup *Operator* page templates (1 to 5), enable *Diagnostic*, *View* and *Log* functions, set the device's display brightness / contrast and set the time and date.

| Menu | Comment | Default |
|---|---|---|
| **Language** | Select the display language:<br>*English / Deutsch / Francais / Espagnole / Italiano / Dutch / Danish / Swedish / Finnish / Polish / Russian / Chinese / Japanese / Turkish / Portuguese*. | English |
| **Operator Templates** | One of 9 templates can be assigned to each of the operator pages to enable the display of the measured parameters in various configurations – see Fig. 9.4, page 24 and Fig. 9.5, page 25. | |
| Page 1 (to 5) Template | Assign a template:<br>*Off / Qv, V, T, DP / Qv, T / V, T / Qm, ∑ / SP, T, V, DP / T, V, SP, DP / Qm, p, T, SP / SP, T, DP / SP, T, DP, RH / Signals View / Alarms View / Outputs View / Alarm Event Log / Audit Log / Calibration Log / Diagnostics Log / Chart / Diagnostics*. | Page 1 – Qv, V, T, DP<br>Pages 2 to 5 – Off |
| **Chart View** | The chart can be configured to display the trend for 1, 2, 3 or 4 analog values. The engineering ranges for the process variable values are configured in the *Input/Output* menu – see page 45.<br>**Note**. This menu is displayed only when *Chart View* is *Enabled* at the *Operator Functions / Chart View*. | |
| Channel 1 (to 4) | | |
| Source | Select the process variable signal to be displayed on the chart – see Appendix C.1, page 63 for a list of available sources. | Stack Velocity |
| Scale Low | | 0.0000 |
| Scale High | | 30.000 |
| Tag | A 3-character, alphanumeric tag used to identify the parameter on the chart. | Vel |
| Chart Duration | Select the chart duration (signal sampling rate):<br>*1 hour / 2 hours / 4 hours / 8 hours / 12 hours / 16 hours / 20 hours / 24 hours*. | 1 hour |

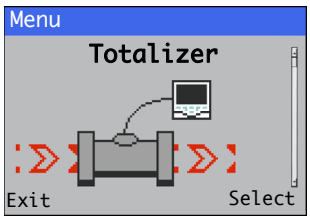
*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **View/Log Enables** | Enables / disables the *View and Log* functions. | |
| `Diagnostic View` | Refer to Section 9.6, page 26 for examples of *Operator Pages* in *View* mode. | Enabled |
| `Signals View` | | Enabled |
| `Chart View` | | Disabled |
| `Alarm View` | | Disabled |
| `Analog O/P View` | | Disabled |
| `Acc. Chk. Log` | Refer to Section 9.7, page 28 for examples of *Operator Pages* in *Log* mode. | Enabled |
| `Alarm Log` | | Disabled |
| `Audit Log` | | Enabled |
| `Diagnostics Log` | | Enabled |
| **Settings** | | |
| `Brightness` | Increase / decrease the display brightness to suit local environmental conditions. | 50 % |
| `Contrast` | Increase / decrease the display contrast to suit local environmental conditions. | 60 % |

*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Date & Time** | Set / format the date, local time and daylight saving start / end times. | |
| Date Format | Select the date format required:<br>*DD–MM–YYYY / MM–DD–YYYY / YYYY–MM–DD*. | YYY-MM-DD |
| Date & Time | Set the date and time.<br>The date is displayed in the format selected in *Date Format* (above); the time is displayed in the format *HR:MINS:SEC*. | 01.01.2000 |
| Daylight Saving | Set the daylight saving parameters. | |
| DS Region | Select the geographical region the daylight saving hours are based on:<br>■ *Off* – daylight saving is disabled.<br>■ *Europe* – selects standard daylight saving start and end times automatically.<br>■ *USA* – selects standard daylight saving start and end times automatically.<br>■ *Custom* – used to set custom daylight saving start and end times manually for regions other than Europe or USA.<br>**Note**. The *DS Start Time / DS Start Occur / DS Start Day / DS Start Month* menus (below) are enabled only when *Custom* is selected from the *DS Region* menu. | Off |
| DS Start Time<br>DS End Time | Sets the daylight saving start time and end time, selected from 1-hour increments. | 1<br>2 |
| DS Start Occur<br>DS End Occur | Select the occurrence of the *DS Start / End Day* within the *DS Start / End Month* (selected below) on which daylight saving is to start / end:<br>*First* / *Second* / *Third* / *Fourth* / *Last*<br>For example, to set daylight saving to start (or end) on the second occurrence of the of the *DS Start / End Day* selected below, select *Second*. | Last<br>Last |
| DS Start Day<br>DS End Day | Select the day of the week on which daylight saving is to start / end. | Sunday<br>Sunday |
| DS Start Month<br>DS End Month | Select the month in which daylight saving is to start / end. | March<br>October |

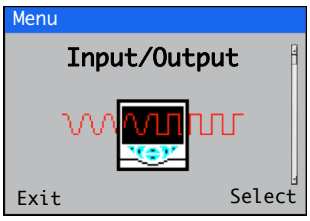
### 9.11.4 Totalizer




Used to set the card on / off status, select the process data to be logged, enter file configuration selection and save details and to format the media card.

| Menu | Comment | Default |
|---|---|---|
| **Totalizer Control** | | |
| Stop | Stops the totalizer. | |
| Start | Starts the totalizer. | |
| Reset | Resets the totalizer to zero. If the totalizer is operating when reset, it restarts immediately. | |
| **Enable** | Enable or disable the totalizer. | Enabled |
| **Type** | Select the type of totalizer:<br>*Continuous* / *Timed*. | Continuous |
| **Time Period** | If totalizer **Type** is set to **timed**, the time period is configurable. | |
| Days | | 1 d |
| Hours | | 0 h |
| Minutes | | 0 m |
| Seconds | | 0 sec |
| **Time Remaining** | If totalizer **Type** is set to **timed**, displays the time remaining. | |

### 9.11.5 Input/Output




*Input/Output* level enables configuration of analog outputs, digital inputs and outputs and relays.

| Menu | Comment | Default |
|---|---|---|
| **Analog Output 1 (to 4)** | The analog outputs can be configured to retransmit the process variable and temperature values and have a configurable range from 0 to 24 mA. | |
| Source | Select the analog signal to be assigned to the output – see Appendix C.1, page 63 for a list of available sources. | None |
| Elect. Low<br>Elect. High | The maximum and minimum engineering range output value (0 to 22 mA range). | 4.000<br>20.00 |
| Eng. Low<br>Eng. High | The maximum and minimum engineering range output value.<br>If the *Output Type* selection is logarithmic the *Eng Low* value is set automatically to 2, 3 or 4 decades below the *Eng High* value. | 0.000<br>100.0 |
| Output Failure | When enabled, the current output can be driven to a preset value if a *Failure* category diagnostic state occurs for the selected source. | Enabled |
| Failure Current | Set a preset value that the current output is driven to when a *Failure* category diagnostic state is present.<br>**Note.** Active only if **Output Failure** is Enabled. | 22.00 mA |
| **Digital I/P 1** | Use to initiate an accuracy check remotely. If an accuracy check or purge is in progress, the purge is put in a queue to take place following the completion of any current activity:<br>*Input Not Available / Start Zero Check / Start 2-Pt Check*. | Input Not Available / Start Zero Check (depending upon hardware) |
| **Digital I/P 2** | Use to initiate a purge remotely. If an accuracy check or purge is in progress, the purge is put in a queue to take place following the completion of any current activity:<br>*Input Not Available / Start Purge*. | Input Not Available / Start Purge (depending upon hardware) |

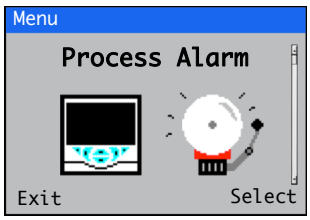
*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Digital O/P 1 (to 4)** | | |
| O/P Assignment | Select the digital signal to be assigned to the digital output – see Appendix C.2, page 63 for a list of available sources. | |
| Alarm 1 (to 4) | Process alarm 1 (to 4) is active. | Not Assigned |
| Acc. Chk. Active | Accuracy check in progress. | Not Assigned |
| Acc. Chk. Failed | The most recent accuracy check failed. | Not Assigned |
| Purge Active | Purge in progress. | Not Assigned |
| Diag - Failure | Active when any 'failure' diagnostic (see Appendix A, page 59) is active. | Not Assigned |
| Diag - Off Spec. | Active when any 'out of specification' diagnostic (see Appendix A, page 59) is active. | Not Assigned |
| Diag - Maint. Reqd. | Active when any 'maintenance required' diagnostic (see Appendix A, page 59) is active. | Not Assigned |
| Diag - Chk Function | Active when any 'check function' diagnostic (see Appendix A, page 59) is active. | Not Assigned |
| Polarity | Set the polarity of the digital output signal.<br>*Active High* – output is *high* if any of the signals assigned to the digital output are active. Output is *low* if none of the signals assigned to the digital output are active.<br>*Active Low* – output is *low* if any of the signals assigned to the digital output are active. Output is *high* if none of the signals assigned to the digital output are active. | Active High |

*Continued on next page…*

| Menu | Comment | Default |
|---|---|---|
| **Relay 1 (to 2)** | | |
| O/P Assignment | Select the digital signal to be assigned to the relay output – see Appendix C.2, page 63 for a list of available sources. | |
| Alarm 1 (to 4) | Process alarm 1 (to 4) is active. | Not Assigned |
| Acc. Chk. Active | Accuracy check in progress. | Not Assigned |
| Acc. Chk. Failed | The most recent accuracy check failed. | Not Assigned |
| Purge Active | Purge in progress. | Not Assigned |
| Diag - Failure | Active when a 'failure' diagnostic (see Appendix A, page 59) is in progress. | Not Assigned |
| Diag - Off Spec. | Active when an 'out of specification' diagnostic (see Appendix A, page 59) is in progress. | Not Assigned |
| Diag - Maint. Reqd. | Active when a 'maintenance required' diagnostic (see Appendix A, page 59) is in progress. | Not Assigned |
| Diag - Chk Function | Active when a 'check function' diagnostic (see Appendix A, page 59) is in progress. | Not Assigned |
| Polarity | Set the polarity of the relay output signal.<br>*Active Closed* – relay contacts are *closed* if any of the signals assigned to the digital output are active. Relay contacts are *open* if none of the signals assigned to the digital output are active.<br>*Active Open* – relay contacts are *open* if any of the signals assigned to the digital output are active. Relay contacts are *closed* if none of the signals assigned to the digital output are active. | Active Closed |

### 9.11.6 Process Alarm




Used to configure up to 4 independent process alarms.

| Menu | Comment | Default |
|---|---|---|
| **Alarm 1 (to 4)** | | |
| Source | Select the analog or digital signal for the process alarm source – see Appendices C.1 and C.2 on page 63 for lists of available sources. | None |
| Type | Select the alarm type from:<br>*High Process* / *Low Process* / *High Latch* / *Low Latch*. | Off |
| Tag | The alarm *Tag* is displayed as a diagnostic message and appears in the *Diagnostic Status Bar* and on the *Diagnostic View* page at *Operator* level – see page 24. | Alarm <n> |
| Trip | The alarm trip level in engineering units. | 0 |
| Hysteresis | The hysteresis trip level in engineering units. Activated at the alarm trip level but deactivated only when the process variable has moved into the safe region by an amount equal to the hysteresis value – see Process alarm examples (Figs. 9.17 and 9.18) below. | 0 |
| Time Hysteresis | If an alarm trip value is exceeded, the alarm does not become active until the *Time Hysteresis* value has expired. If the signal goes out of the alarm condition before the *Time Hysteresis* has expired, the hysteresis timer is reset. | 0 |

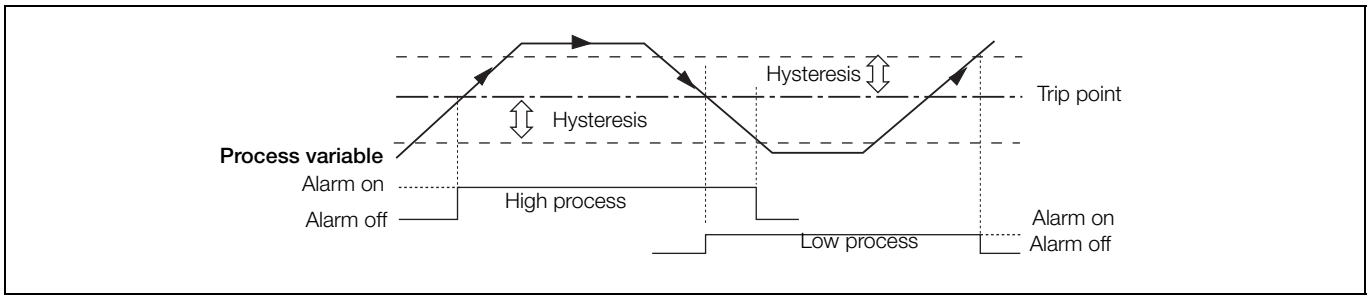



*Fig. 9.17 Process alarm example – high and low process alarm action*

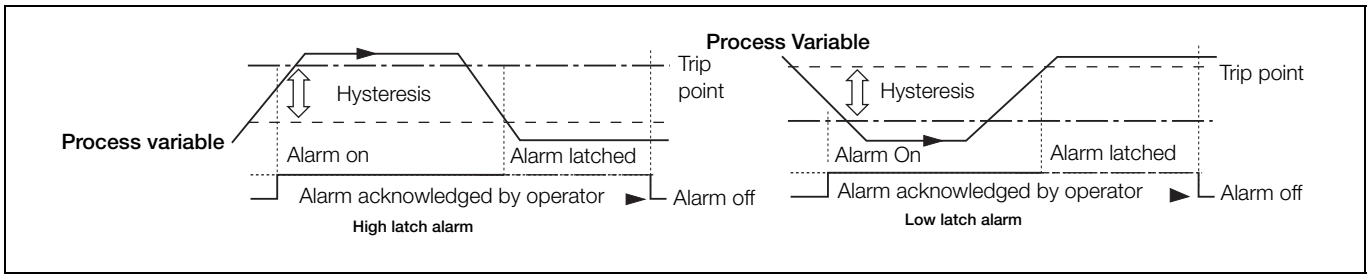
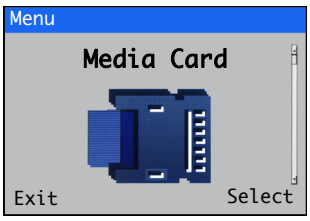



*Fig. 9.18 High and low latch alarm action*

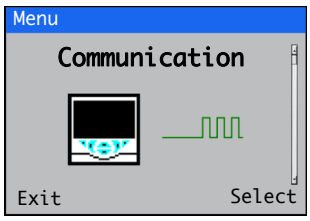
### 9.11.7 Media card




Used to set the card on / off status, select the process data to be logged, enter file configuration selection and save details and to format the media card.

| Menu | Comment | Default |
|---|---|---|
| **Card Status** | Indicates card status, *Removed / Inserted / Offline / Online*. | |
| **Data Logging** | | |
| `Logging Enable` | *Enables / Disables* data logging.<br>In *Enable* mode, data can be written to internal / external media.<br>In *Disable* mode, data is prevented from being written to internal / external media. | |
| `Channel 1 (to 6)` | | |
| `Sampling Time` | Select the rate at which data is to be sampled:<br>*5 sec / 10 sec / 30 sec / 1 min / 5 min / 10 min / 30 min / 1 hr*. | |
| **Save Configuration** | | |
| `Select File` | Enables a user-selected filename to be specified for the current configuration. | |
| `Create File` | Saves the current configuration as a new configuration. | |
| `Overwrite File` | Overwrites an existing configuration. | |
| **Load Configuration** | | |
| `Select File` | Selects a configuration file to be loaded from a list of previously saved files. | |
| `Load Configuration` | Loads the selected configuration file. | |
| `Action Incomplete` | | |
| **Format Card** | Select to format the SD card inserted into the transmitter's card reader.<br>**Caution.** Formatting destroys all data currently on the card. | |

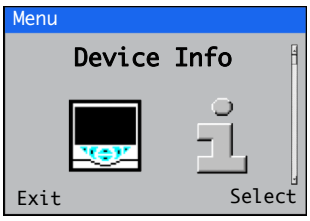
### 9.11.8 Communication




The *Communication* level is enabled only if an optional communications module is fitted.

| Menu | Comment | Default |
|---|---|---|
| **Modbus** | | |
| Device Address | Assign a unique network address (*1* to *247*) to enable the host system to identify the control unit on a Modbus link. | 1 |
| RS485 Setup | | |
| Mode | Select the Modbus serial communication serial link required:<br>*Off / 2-Wire / 4-Wire*. | 4-Wire |
| Baudrate | Select the communication transfer (baud) rate required:<br>*2400 / 4800 / 9600 / 19200 / 3800 / 56000 / 57600 / 115200*. | 19200 |
| Parity | Select the parity bit (transmission error-checking) condition required:<br>*None / Odd / Even*. | None |
| Tx Delay | Set a delay to the response from the transmitter in milliseconds. Maximum delay 100 ms. | 50 ms |

### 9.11.9 Device Info




Displays read-only factory-set parameters.

| Menu | Comment | Default |
|---|---|---|
| **Software Revision** | The transmitter's software version number. | |
| **Hardware Revision** | The transmitter's hardware version number. | |
| **Interface Options** | | |
| `Interface Unit` | Displays the system's Interface Unit type:<br>*B: Acc Chk Only / C: Acc Chk & Purge / D: Purge Only*. | |
| `Heater` | Displays the heater type (if fitted):<br>*Not Fitted / HC2: Heater Fitted*. | |
| `Span Check Reg.` | Displays the span check regulator type (if fitted):<br>*Not Fitted / PC1: Regulator Fitted*. | |
| `Temp. Element` | Displays the temperature element type (if fitted):<br>*Not Fitted / AT: Integral*. | |
| **Media Card Unit** | | |
| `Software Version` | | |
| `Hardware Version` | | |
| **Input/Output** | | |
| `No. Analog Outputs` | The number of analog outputs available. | |
| `No. Relays` | The number of relays available. | |

# 10 Maintenance and calibration

## 10.1 Troubleshooting

If a malfunction is suspected:

1. Check for leakage between the head of the TORBAR and the DP transmitter.

   **Note.** Compared to orifice plates and other primary flow elements, Averaging Pitot Tubes create small differential pressures. Therefore test all potential leak points carefully.

2. Check for partial or total blockages by testing that pressure is present at both outlets.
3. Using a reliable differential pressure measuring device such as a manometer or a calibrated differential pressure cell, check the actual differential pressure while flow is present.

Refer to the DP transmitter's Operating Instructions (IM 267C/269C) for procedures to be followed when error messages are shown on the transmitter display.

For other suspected problems, complete the checks in Table 10.1 to ensure correct installation.

| | |
|---|---|
| **Direction of flow** | Ensure the flow direction is in accordance with the arrow on the meter. If not, remove and reinstall the meter correctly. |
| **Mounting orientation** | Ensure the meter is oriented correctly to the stack with regard to flow direction and nature of the stack gases. Incorrect orientation can lead to metering errors and in some cases may damage the meter. |
| **Zeroing of the transmitter** | Zero the DP transmitter during installation and commissioning – refer to the transmitter's Operating Instructions (IM 267C/269C). |
| **Manifold valves** | The meter manifold is fitted with 5 valves – 4 on diametrically opposite sides of the meter (the HP and LP isolation and vent valves) and one on the axis of the pipeline (the equalization valve). During measurement, ensure the equalization valve and the vent valves are fully closed and the isolation valves are fully open. |
| **Setup/configuration of the meter** | Ensure the 4 to 20 mA output of the meter is set correctly and that any receiving equipment is configured for the same flowrate range. Refer to the DP transmitter's Operating Instructions (IM 267C/269C) for information on how to check the loaded configuration. |

*Table 10.1 Troubleshooting checks*

## 10.2 TORBAR removing and refitting

### 10.2.1 Flanged process connections – removing

**Warning.** Failure to reduce the stack pressure to a safe level and remove all hazardous material prior to removing the TORBAR could result in serious injury to personnel.

Remove the TORBAR as follows:

1. Reduce stack pressure to a safe level and remove all hazardous material.
2. Remove the flange securing bolts.
3. Remove the TORBAR.

### 10.2.2 Flanged process connections – refitting

Refit the TORBAR as follows:

1. Position the gasket onto the TORBAR flange and carefully insert the TORBAR through the flanged pipe fitting (stand-off) (ensuring the tip touches the opposite internal wall – models without end support, or enters the opposite fitting – models with end support) until the two flanges mate squarely.
2. Turn the TORBAR until the flow arrow is positioned correctly.
3. Fit the flange securing bolts and tighten equally and evenly, observing correct procedures appropriate to the flange.
4. Check the TORBAR is installed correctly and aligned.

## 10.3 General maintenance

TORBAR has no moving parts, therefore maintenance of the primary element is focussed on the quality of the measuring holes. The high and low pressure measuring holes may block in flows with particulate or suffer from corrosion / wear in the long term.

Perform the following maintenance as per the maintenance interval:

1. Check for internal leaks. If the stack is in normal operation, a DP reading unusually close to zero is an indication of an internal leak.
2. If a purge system is not installed, purge the TORBAR with compressed air to remove any blockages as follows:
   a. Close the manifold isolation valves.
   b. Open the purge valves and attach compressed air (maximum pressure 6 bar [87 psi]) to the purge block on the high and low pressure side.
   c. Purge for 1 minute.
   d. Detach the compressed air and close the purge valves.
   e. Open the manifold isolation valves.

**Note.** If a purge system is fitted, initiate a purge if required.

Perform annual maintenance in accordance with the following guidelines:

1. Referring to Section 10.2, remove the TORBAR from the stack.
2. Check the high and low pressure holes for signs of blockage. If blocked, refer to Step 2 above and purge the TORBAR with clean filtered compressed air to remove the blockage
3. Check the high and low pressure holes for signs of corrosion or wear. If this is found to be significant, replace the TORBAR.
4. Clean the outside of the unit using clean cloths and a suitable solvent. Take care not to damage the TORBAR and its pressure holes. **Do not use a wire brush**.
5. Flush impulse piping (if fitted), with compressed air to remove any accumulated particulate.

## 10.4 Zero and span accuracy check – FPD581 and FPD583

The zero and span accuracy check is used to confirm the system has not drifted out of acceptable limits. This check aids the completion of QAL3 as outlined in EN14181.

**Note.** The following procedure is applicable only to the FPD581 and FPD583 systems.

Referring to Fig. 10.1, check the zero and span measurement readings as follows:

1. Close isolation valves I2 and I3 fully.
2. Open equalisation valve E1.
3. Check that the DP reading on the display is approximately equal to zero. Record the actual and reference values together with the time and date of the reading.
4. Open vent valves V4 and V5.
5. Close equalisation valve E1.
6. Set a hand-held pressure source to 100 % of the full scale span of the transmitter (this may be different to the transmitter upper range limit or URL).
7. Connect the hand-held pressure source to the high pressure vent V5.
8. Check that the DP reading on the display is approximately equal to the transmitter span. Record the actual and reference values together with the time and date of the reading.
9. Close vent valves V4 and V5.
10. Open isolation valves I2 and I3 fully.
11. Use a control chart to ensure the recorded drift is acceptable.

    If the zero reading is outside acceptable limits, see Section 10.6.1, page 55 to correct it.

    If the span reading is outside acceptable limits, it may be corrected in situ ***by ABB service personnel only*** or the DP transmitter must be returned to the factory for re-calibration.

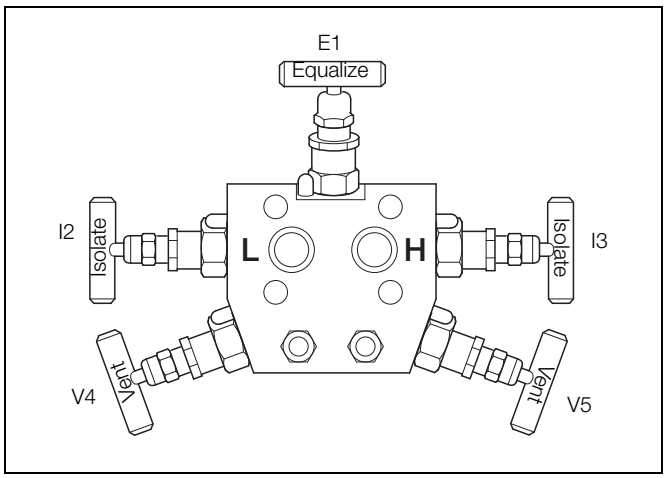



*Fig. 10.1 Valve identification (view from underside of manifold)*

## 10.5 Zero and span accuracy check – FPD585

### 10.5.1 Interface unit B and C

If a span pressure regulator is installed, zero and span measurement checks are performed using the control unit – see Section 9.11.1, page 36.

If a span pressure regulator is not installed:

1. Referring to Fig. 10.2, connect a calibrated air pressure regulator with gauge to connection (A) (*Calibration Air*) on the bottom of the control unit enclosure using 6 mm ($^1/_4$ in.) tubing.
2. Check the gauge on the pressure regulator is indicating zero.
3. Referring to to Section 9.11.1, page 36, enter the **Calibrate** level and select `Accuracy Check – Span Accuracy Check`.
4. Set the pressure regulator to either 10.0 mbar or 60.0 mbar.

   **Note.** The span check pressure is part of the reference data information supplied by the customer when specifying the system required. It is normally pre-programmed into the control unit by the factory to suit the process. To check the pre-programmed span check pressure, refer to page 39.

5. Select `Continue`.
6. When the span check is complete, select `Exit`.
7. Repeat steps 2 to 6 as necessary. If the transmitter span check fails continually, contact your local service organization to check the transmitter.

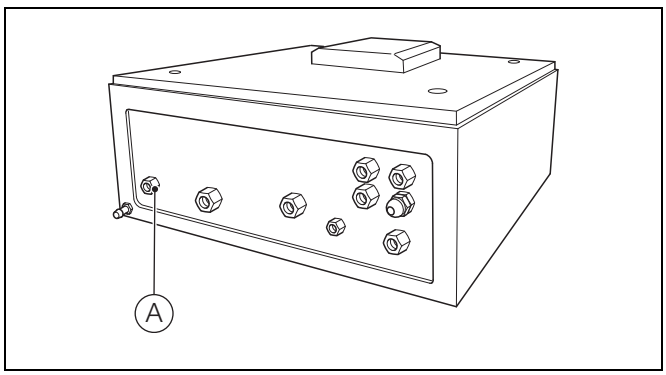



*Fig. 10.2 Calibration air inlet connection*

## 10.6 DP transmitter calibration

**Note.** This section is applicable only if the zero or span readings are out of limits (see Section 10.4, page 54, steps 3 and 8).

### 10.6.1 Zero calibration

Before starting correction, ensure the DP transmitter has reached its operating temperature (approx. 5 minutes after switch-on if the transmitter has already assumed ambient temperature). The correction must be made at zero flow (dp = 0). Refer to the transmitter operating instructions (IM 267C/269C).

### 10.6.2 Span calibration

This may be performed in situ ***by ABB service personnel only*** or the DP transmitter must be returned to the factory for re-calibration.

### 10.6.3 Checking and adjusting the span pressure regulator

**Caution.** The span pressure regulator is a high precision component that may be damaged if supplied with air at a pressure greater than 2.0 barg (29 psi).

**Note.** If the span pressure regulator's mounting angle is changed, the output from the regulator changes and must be re-adjusted.

Referring to Fig. 10.3:

1. Connect a clean, dry, regulated air supply with gauge to connection (A) (*Calibration Air*) on the bottom of the control unit enclosure using 6 mm (1/4 in.) tubing.
2. Adjust the supply pressure to between 2.0 and 4.0 barg (29 and 58 psi).
3. Pull the modulated air regulator adjuster (B) up to unlock it (red band exposed) and adjust until pressure gauge (C) indicates 2.0 barg (29 psi).
4. Push adjuster (B) down to lock it. Ensure the red band is not visible and the adjuster is locked.
5. Pull outlet pipe (D) from the outlet fitting of span pressure regulator (E).
6. Attach a pipe between the span pressure regulator's outlet fitting and a calibrated pressure gauge.
7. Check that the span pressure regulator's indicated outlet pressure corresponds to the pre-programmed span check pressure (10.0 or 60.0 mbar).

   **Note.** The span check pressure is part of the reference data information supplied by the customer when specifying the system required. It is normally pre-programmed into the control unit by the factory to suit the process. To check the pre-programmed span check pressure, refer to page 39.

**Note.** Steps 8 to 11 are applicable only if the outlet pressure from the span pressure regulator is incorrect.

8. Loosen locknut (F).
9. Turn adjustment screw (G) until the calibrated pressure gauge reads 10.0 or 60.0 mbar (as required).
10. Tighten locknut (F) hand tight and check the calibrated pressure gauge reads 10.0 or 60.0 mbar (as required). Without loosening locknut (F), turn adjustment screw (G) to make any final adjustments as required.
11. Fully tighten locknut (F) when the output pressure is correct.
12. Disconnect the calibrated pressure gauge from the span pressure regulator's outlet fitting.
13. Push outlet pipe (D) onto the outlet fitting of span pressure regulator (E).
14. Disconnect the air supply from connection (A) (*Calibration Air*) on the bottom of the control unit enclosure.

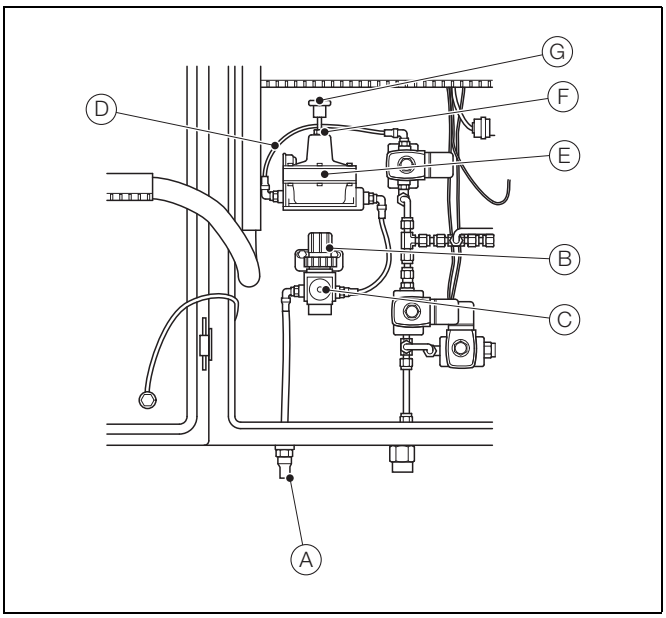



*Fig. 10.3 Checking / Setting the span pressure regulator*

# 11 Specification – probe

## Diameter

25 mm (1 in.) or 60 mm (2.36 in.)

## Insertion length

1 to 8 meters (3.3 to 26.25 ft.)

## Construction

Single piece

2-piece with centre coupling for unsupported lengths ≥5 m (16.4 ft.) (optional)

Bayonet-style lock within end support for large stacks at high temperatures (optional)

## Mounting

Flanged fittings (single or end-supported) – supplied by ABB or customer

PN10 RF in sizes DN 40, DN 50, DN80, DN 100 and DN 150

ASME 150 lb RF in sizes 1½, 2, 3, 4, 6 in. NB

## Temperature measurement

Optional, via integral RTD or remote thermocouple (for stack temperatures >600 °C [1112 °F])

## Fluid velocity

Up to 50 m/s (3 to 35 m/s for MCERTS approved systems)

## Process fluid

Combustion gases
(details of the gas composition are required by ABB for sizing)

## Process temperature limits

**316L and 321H stainless steel probes**

550 °C (1022 °F)

700 °C (1292 °F) with bayonet fitting option

**UNS N06625 Gr.2 probe**

900 °C (1652 °F)

1200 °C (2192 °F) *

**With remote transmitter**

As above, depending on probe material

**With integral transmitter**

180 °C (356 °F)

## Process pressure limits

Up to pressure rating of mounting flange at operating/design temperature

## Construction materials

**Probe**

316L stainless steel

321H stainless steel

UNS N06625 Gr.2

**Mountings**

Carbon steel

A105 carbon steel

316L stainless steel

321H stainless steel

UNS N06625 Gr.2

**Nuts and bolts**

ASTM A193 B7 / ASTM A194 2H

ASTM A193 8M / ASTM A194 8MA

**Gaskets**

Asbestos-free

Spiral wound 316 stainless steel (optional)

* possible but with limited probe life

DS/FPD580–EN

# 12 Specification – transmitter

## Type

ABB multivariable transmitter type 267CS

## Measuring range & span limits

| Sensor code | Upper range limit (URL) | Lower range limit (LRL) | Minimum span |
|---|---|---|---|
| A | 1 kPa<br>10 mbar<br>4 in. $H_2O$ | 0 | 0.05 kPa<br>0.5 mbar<br>0.2 in. $H_2O$ |
| C | 6 kPa<br>60 mbar<br>24 in. $H_2O$ | 0 | 0.2 kPa<br>2 mbar<br>0.8 in. $H_2O$ |

## Display

LCD display, plug-in and rotatable with optional back-lighting

## Communications

HART digital communication and 4 to 20 mA

Modbus RS485

## Electrical connections

$^1/_2$ to14 NPT

M20 x 1.5

## Electrical certification and hazardous atmospheres (FPD581 & FPD583 only)

**Note.** All interface units must be installed in safe area

ATEX Ex ia + ATEX EEx d + ATEX Ex nL

UL (future)

Factory Mutual (FM) – intrinsically safe (future)

Factory Mutual (FM) – explosion-proof (future)

Canadian Standard Association – explosion-proof (future)

## Construction materials

**Process isolating diaphragms**

Hastelloy™ C276

**Process flange, adapter, plugs and drain/vent valves**

Stainless steel

**Sensor fill fluid**

Silicone oil

**Sensor housing**

Stainless steel

**Mounting bracket**

Stainless steel

**Gaskets**

PTFE

**Nuts and bolts**

Stainless steel class A4-70 according to ISO 3506, conforming to NACE MR0175 Class II

**Electronics housing and cover**

Aluminum alloy with low copper content

Baked epoxy finish

Stainless steel

**Cover O-rings**

Viton™

DS/FPD580–EN

# 13 Specification – interface unit

## FPD583 MCERTS manual system

**Protection**
IP65 (NEMA 4) rated. Not suitable for use in hazardous area

**Electrical connection**
Via 3 x M20 plastic cable glands

**Thermostatic internal heater (optional)**
Power supply:
90 (min.) to 264 V (max.)
100 to 240 V AC ±10 %, 50 / 60 Hz

**Housing construction**
Epoxy painted steel

## FPD585 automatic system

**Protection**
IP65 (NEMA 4) rated – not suitable for use in hazardous area

**Process connections**
1/2 in. BSP stainless steel

**Supply air connection**
1/2 in. BSP stainless steel

**Electrical connection**
Via 4 x M20 plastic cable glands

**Thermostatic internal heater (optional)**
Power supply:
90 (min.) to 264 V (max.)
100 to 240 V AC ±10 %, 50 / 60 Hz

**Ambient temperature**
–20 to 50 °C (–4 to 122 °F) – below 0 °C requires heater option

**Air supply**
Max. 6 barg (87 psig)

**Display**
89 mm (3.5 in.) color TFT, 1/4 VGA (320 x 240 pixels)

**Display backlight**
White LED

**Operator switches**
6 keys accessible without opening the front door

**Power supply**
90 (min.) to 264 V (max.)
100 to 240 V AC ±10 %, 50/60 Hz

**Measured components**
Operating pressure
Operating temperature (optional)
Differential pressure

**Calculated components**
Mass flowrate
Volumetric flowrate
Velocity

**Digital inputs / outputs**
6

**Input Functions**
Remote purge activation
Remote zero check
Remote span check

**Output functions**
Out of service
Purge in process
Zero check in process
Span check in process
Zero check alarm
Span check alarm

**Analog outputs**
Up to 4 with retransmission of pressure, temperature, DP and flow

**Type**
Programmable, 4 to 20 mA

**Housing construction**
Epoxy painted steel

## Measurement performance

**System accuracy**
±2 %

**Repeatability**
≤ 2 % of measuring range

**Drift**
<0.5 % of measuring range

**Data logging parameters**
Temperature
Operating pressure
Differential pressure
Velocity
Mass flow

**Data storage and retrieval**
Internal – SD interface

**Sampling frequency**
1 to 180 seconds, fully-adjustable

DS/FPD580–EN

# Appendix A – Troubleshooting

## A.1 Diagnostic messages

The control unit is programmed to display diagnostic messages to provide information on servicing requirements and any other conditions that develop during operation.

All diagnostic messages displayed on the control unit are added to the control unit's audit log.

Table A.1 shows icon types, diagnostic messages and the criteria that causes the diagnostic messages to be displayed and cleared.

**Note.** The diagnostic icons in the following tables conform to NAMUR 107.

| Diagnostic Icon | NAMUR Status |
|---|---|
|  | Failure |
|  | Check function |
|  | Out of specification |
|  | Maintenance required |

| Icon | Diagnostic message | Possible Cause | Suggested Action |
|---|---|---|---|
|  | **No Response** | Communication failure to the 267CS transmitter.<br>The system continues to re-establish a connection. | Check the wiring between the 267CS transmitter and the control unit.<br>Ensure the 267CS transmitter is powered. |
|  | **NV Error Proc Bd** | NV error – processor board (CRC / Comms).<br>Failure of the processor / display board's non-volatile memory or permanent corruption of its data. | Cycle the control unit's power off and on again. If the problem persists check all configuration parameters and correct any errors. If the problem still persists contact your local service organization. |
|  | **NV Error Main Bd** | NV error – main board (CRC / Comms).<br>Failure of the main board's non-volatile memory or permanent corruption of its data. | Cycle the control unit's power off and on again. If the problem persists check all configuration parameters and correct any errors. If the problem still persists contact your local service organization |
|  | **NV Error Comm Bd** | NV error – comms board (CRC / Comms).<br>Failure of the communications board's non-volatile memory or permanent corruption of its data. | Cycle the control unit's power off and on again. If the problem persists check all configuration parameters and correct any errors. If the problem still persists contact your local service organization |
|  | **NV Error SW Key 1** | NV error – software key 1 (CRC / Comms)<br>Failure of the software key 1 board's non-volatile memory or permanent corruption of its data. | Cycle the control unit's power off and on again. If the problem persists check all configuration parameters and correct any errors. If the problem still persists contact your local service organization |
|  | **Accuracy Check** | An accuracy check of the DP transmitter is in progress.<br>This can be initiated remotely, manually at the enclosure or by a schedule. | The accuracy check diagnostic clears at the end of the accuracy check procedure.<br>Press Exit to stop the procedure if necessary. |
|  | **Purging** | A purge of the TORBAR probe is in progress.<br>This can be initiated remotely, manually at the enclosure or by a schedule. | The purging diagnostic clear sat the end of the purge procedure.<br>Press Exit to stop the procedure if necessary. |
|  | **In Hold Mode** | Output Hold is selected. Analog outputs and alarms are held. | To exit manual hold, press the menu key, scroll to Output Hold and deselect it. |
|  | **Tx. Calibration** | The valves are set to enable a zero calibration to be performed on the DP transmitter. | Ensure the DP transmitter is calibrated correctly – contact your local service organization.<br>Return the valves to the 'Operate' position (see the `Valve State` parameter in Section 9.11.2, page 39). |

*Table A.1 Diagnostic messages (Sheet 1 of 3)*

| Icon | Diagnostic message | Possible Cause | Suggested Action |
|---|---|---|---|
|  | **Tx. Isolation** | The valves are set to isolate the DP transmitter. | Ensure the DP transmitter has been reinstalled correctly. Perform a leak test if necessary. Contact your local service organization.<br>Return the valves to the 'Operate' position (see the `Valve State` parameter in Section 9.11.2, page 39). |
|  | **Int. Temp High** | Control unit internal temperature ≥60.0 °C (140 °F).<br>The internal temperature is higher than recommended and may result in damage. | Reduce the control unit's internal temperature.<br>If the enclosure is in direct sunlight, install a sunshade for protection. |
|  | **Int. Temp Low** | Control unit internal temperature ≤–20.0 °C (–4 °F).<br>The internal temperature is lower than recommended and may result in damage. | If heater HC2 or HC3 is fitted, ensure the thermostat and heater are working correctly. Ensure the thermostat is set to the correct temperature. If a heater is not fitted, contact your local service organization to have a heater fitted. |
|  | **Zero Out Of Spec** | Following completion of a zero check, the zero reading has drifted outside acceptable limits.<br>% of 'Span Check Pressure' > 'Zero Check Limit' | Check the zero check limit is correct. Calibrate the DP transmitter zero if necessary, – see Section 10.6.1, page 55. If the problem persists, contact your local service organization. |
|  | **Span Out Of Spec** | Following completion of a span check, the span reading has drifted outside acceptable limits<br>% of 'Span Check Pressure' > 'Span Check Limit' | Check the span check limit is correct. Check the accuracy of the span check pressure regulator (PC1) if fitted. If the problem persists, contact your local service organization. |
|  | **DP Out Of Range** | The differential pressure is out of range, status read from 267CS DP transmitter.<br>May be caused by a change in flow conditions. Diagnostic is disabled during accuracy check or purge. | Refer to the DP transmitter's Operating Instructions (IM 267C/269C).<br>If the problem persists, contact your local service organization. |
|  | **SP Out Of Range** | The static pressure is out of range, status read from 267CS DP transmitter.<br>May be caused by a change in flow conditions. | |
|  | **T Out Of Range** | The stack temperature is out of range, status read from 267CS DP transmitter.<br>May be caused by a change in flow conditions. Diagnostic is available only when an RTD is fitted (AT). | |
|  | **Acc.Chk Failed** | Accuracy check failed due to instability (zero check or span check). | Check the accuracy and stability of the span check pressure regulator PC1 (if fitted), or of the external pressure regulator.<br>If the problem persists, contact your local service organization. |
|  | **Acc.Chk. Missed** | Scheduled accuracy check missed due to one of the following:<br>1. Valves under manual control.<br>2. Transmitter isolated.<br>3. Power off (alarm is activated when power is restored). | Initiate an accuracy check either:<br>manually at the enclosure or<br>remotely or<br>wait for a scheduled accuracy check to begin (if schedule set). |
|  | **Acc.Chk. Aborted** | Accuracy check aborted by user. | Diagnostic message clears immediately. |

*Table A.1 Diagnostic messages (Sheet 2 of 3)*

| Icon | Diagnostic message | Possible Cause | Suggested Action |
|---|---|---|---|
|  | **Purge Missed** | Scheduled purge missed due to one of the following:<br>1. Valves under manual control.<br>2. Transmitter isolated.<br>3. Power off (alarm is activated when power is restored). | Initiate a purge:<br>manually at the enclosure<br>or<br>remotely<br>or<br>wait for a scheduled purge to begin (if schedule set). |
|  | **Purge Aborted** | Purge aborted by user. | Diagnostic message clears immediately. |
|  | **Service Overdue** | A maintenance interval is set and there is less than 1 day remaining until the next service is due. | Following a service, select the `Service Performed` parameter in the Device Setup menu (see Section 9.11.2, page 39) or contact your local service organization. |
|  | **Acc.Chk. Overdue** | Scheduled accuracy check missed (see **Acc.Chk. Missed** above) or current time > 'Time of Next Check'.<br>This could be due to one of the following:<br>1. A scheduled accuracy check has been delayed because a purge is in progress.<br>2. An accuracy check interval is configured but the auto scheduler is set to 'Off' (manual schedule). | Initiate an accuracy check:<br>manually at the enclosure<br>or<br>remotely<br>or<br>wait for a scheduled accuracy check to begin (if schedule set). |
|  | **Purge Overdue** | Scheduled purge missed (see **Purge Missed** above) or current time > 'Time of Next Check'.<br>This could be due to one of the following:<br>1. A scheduled purge has been delayed because an accuracy check is in progress.<br>2. An purge interval is configured but the auto scheduler is set to 'Off' (manual schedule). | Initiate a purge:<br>manually at the enclosure<br>or<br>remotely<br>or<br>wait for a scheduled purge to begin (if schedule set). |
|  | **Service Due** | A maintenance interval is set and there are less than 7 days remaining until the next service is due. | Contact your local service organization to arrange a service. |
| | **Acc Chk Complete** | An accuracy check has been completed successfully. | Diagnostic message clears immediately. |
| | **Purge Complete** | A purge has been completed successfully | Diagnostic message clears immediately |

*Table A.1 Diagnostic messages (Sheet 3 of 3)*

# Appendix B – Engineering unit options

| Selection | Description |
|---|---|
| Pa | Pascals |
| kPa | kilopascals |
| bar | bar |
| mbar | millibars |
| kgf/cm$^2$ | kilograms force per square centimeter |
| mm.wg | millimeters water gauge |
| atm | atmospheres |
| psi | pounds per square inch |
| in.wg | inches water gauge |

*Table B.1 Engineering unit options for differential pressure and static pressure*

| Selection | Description |
|---|---|
| m$^3$/sec | cubic metres per second |
| l/sec | liters per second |
| SCMS | standard cubic metres per second |
| NCMS | normal cubic metres per second |
| ft$^3$/sec | cubic feet per second |
| SCFS | standard cubic feet per second |
| NCFS | normal cubic feet per second |
| m$^3$/min | cubic metres per minute |
| l/min | litres per minute |
| SCMM | standard cubic metres per minute |
| NCMM | Normal cubic metres per minute |
| ft$^3$/min | cubic feet per minute |
| SCFM | standard cubic feet per minute |
| NCFM | normal cubic feet per minute |
| m$^3$/hr | cubic metres per hour |
| l/hr | liters per hour |
| SCMH | standard cubic metres per hour |
| NCMH | normal cubic metres per hour |
| ft$^3$/hr | cubic feet per hour |
| SCFH | standard cubic feet per hour |
| NCFH | normal cubic feet per hour |
| m$^3$/day | cubic metres per day |
| l/day | litres per day |
| SCMD | standard cubic metres per day |
| NCMD | Normal cubic metres per day |
| ft$^3$/day | cubic feet per day |
| SCFD | standard cubic feet per day |
| NCFD | normal cubic feet per day |

*Table B.2 Engineering unit options for volume flow rate*

| Selection | Description |
|---|---|
| $m^3$ | cubic metres |
| litres | liters |
| $Sm^3$ | standard cubic metres |
| $Nm^3$ | normal cubic metres |
| $ft^3$ | cubic feet |
| $Sft^3$ | standard cubic feet |
| $Nft^3$ | normal cubic feet |

*Table B.3 Engineering unit options for volume flow total*

| Selection | Description |
|---|---|
| kg/sec | kilograms per second |
| kg/min | kilograms per minute |
| kg/hr | kilograms per hour |
| kg/day | kilograms per day |
| t/sec | Tonnes per second |
| t/min | Tonnes per minute |
| t/hr | Tonnes per hour |
| t/day | Tonnes per day |
| lb/sec | pounds per second |
| lb/min | pounds per minute |
| lb/hr | pounds per hour |
| lb/day | pounds per day |

*Table B.4 Engineering unit options for mass flow rate*

| Selection | Description |
|---|---|
| ° C | degrees Celsius |
| ° F | degrees Fahrenheit |
| K | Kelvin |
| ° R | degrees Rankine |

*Table B.5 Engineering unit options for temperature*

# Appendix C – Signal sources

## C.1 Analog signal sources

The following analog signal sources can be assigned to any analog input or output:

None
Diff. Pressure
Static Pressure
Stack Temperature
Mass Flow
Volume Flow
Flow Total
Stack Velocity
Gas Density
Relative Humidity

## C.2 Digital signal sources

The following digital signal sources can be assigned to any digital output or relay:

None
Alarm 4 State
Alarm 7 State
Tx Failure
Tx Maintenance
Tx Function Check
Transmitter Failure
Transmitter Out of Spec.
Transmitter Function Check
2-Point Accuracy Check
Purge Operation

# Notes

# Products and customer support

## Automation Systems
For the following industries:
- Chemical & Pharmaceutical
- Food & Beverage
- Manufacturing
- Metals and Minerals
- Oil, Gas & Petrochemical
- Pulp and Paper

## Drives and Motors
- AC and DC Drives, AC and DC Machines, AC Motors to 1kV
- Drive Systems
- Force Measurement
- Servo Drives

## Controllers & Recorders
- Single and Multi-loop Controllers
- Circular Chart and Strip Chart Recorders
- Paperless Recorders
- Process Indicators

## Flexible Automation
- Industrial Robots and Robot Systems

## Flow Measurement
- Electromagnetic Flowmeters
- Mass Flowmeters
- Turbine Flowmeters
- Wedge Flow Elements

## Marine Systems & Turbochargers
- Electrical Systems
- Marine Equipment
- Offshore Retrofit and Refurbishment

## Process Analytics
- Process Gas Analysis
- Systems Integration

## Transmitters
- Pressure
- Temperature
- Level
- Interface Modules

## Valves, Actuators and Positioners
- Control Valves
- Actuators
- Positioners

## Water, Gas & Industrial Analytics Instrumentation
- pH, Conductivity and Dissolved Oxygen Transmitters and Sensors
- Ammonia, Nitrate, Phosphate, Silica, Sodium, Chloride, Fluoride, Dissolved Oxygen and Hydrazine Analyzers
- Zirconia Oxygen Analyzers, Katharometers, Hydrogen Purity and Purge-gas Monitors, Thermal Conductivity

## Customer support
We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.


## UK
ABB Limited
Tel:+44 (0)1946 830 611
Fax:+44 (0)1946 832 661

## USA
ABB Inc.
Tel: +1 215 674 6000
Fax: +1 215 674 7183



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## Client Warranty
Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:
- A listing evidencing process operation and alarm logs at time of failure.
- Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

# Contact us

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