Nordson
MEASUREMENT & CONTROL

Series 9 - General

Full Guide

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Nordson
Measurement and Control Solutions
Bates Road,
Maldon, Essex CM9 5FA,
United Kingdom

Phone +44 (0)1621 852244
Fax +44 (0)1621 856180
www.ndc.com

Proprietary Notice

Series 9 - General Full Guide

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Contact Nordson

Online Support

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Nordson M&CS is a cloud-based portal that allows you to get product support by phone, ask a question, provide feedback, submit an RMA request or access information in our on-line knowledge database. You can browse the Nordson M&CS site or create a Nordson M&CS account.

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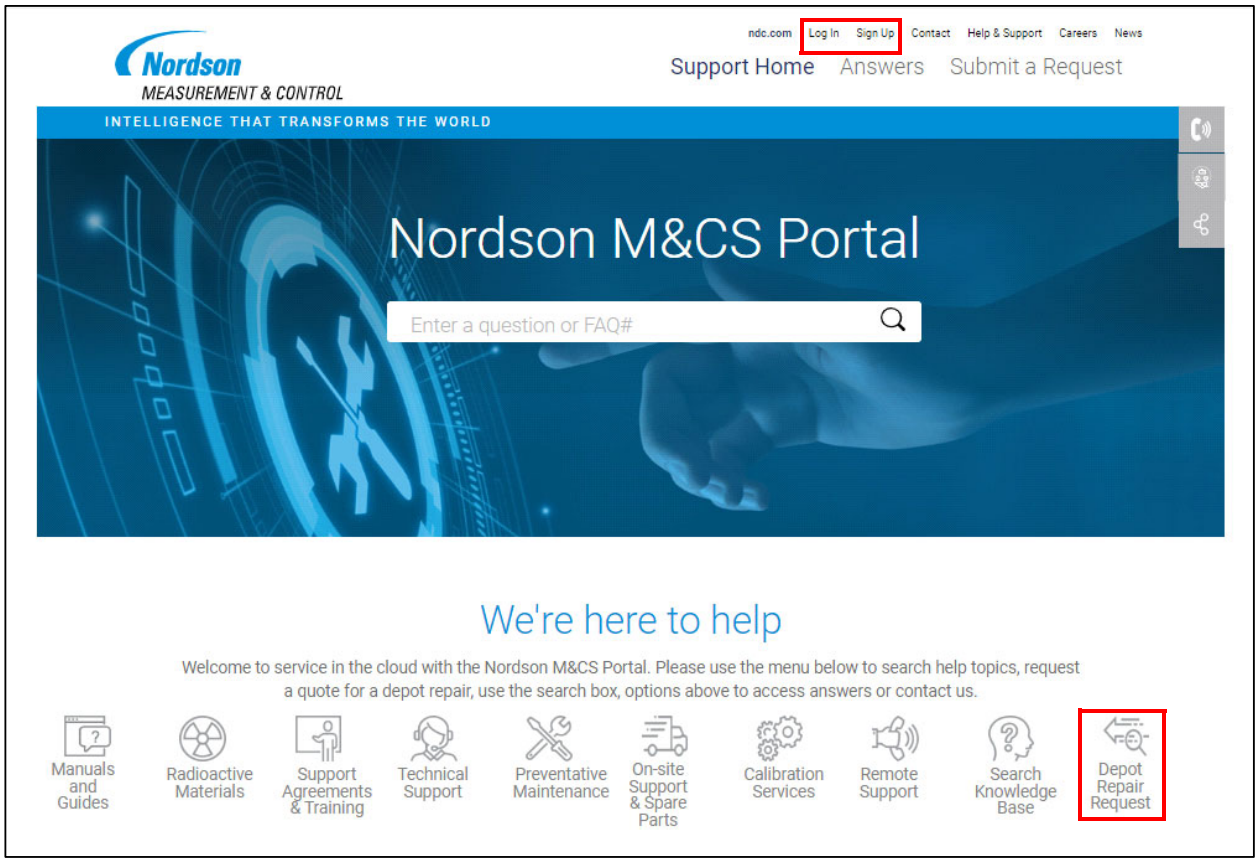
If the fault cannot be corrected using remote or on-site support, select **Depot Repair Request** at the bottom of the screen and follow the on-screen instructions.



See section on Servicing at the back of this manual for more information on returns and packaging.

Nordson Contact Numbers

Please have your sales order number at hand before contacting Nordson.

Americas	+1 626 939 3855
Asia Pacific	Nordson Asia Pacific Customer Service Toll-free contact numbers: • Thailand: 1 800 012 048 • Indonesia: 00 1803 016 4969 • Korea: 00 7981 420 30749 • Malaysia: 1 800 81 9290 • Taiwan: 00 801 128 027 • India: 000 800 0402 514 India Technical Service Manager (Rahul Rane) mobile number: +91 77559 08887 Singapore non toll-free number: +65 6579 2411 Email ID: osc-apac@ndc.com
Japan	+81 (0)3 5762 2766
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EMEA (Europe, Middle East, Africa)	Italy: +39 0331 454 207
	All other countries (English speaking): +44 1621 852244 Please select option 2 to be connected to the service team

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CHAPTER 1

1 Introduction

1.1 About This Manual

This manual describes the installation, operation, calibration and maintenance of Series 9 gauges and peripheral equipment. It is intended for use by installation personnel, suitably-qualified maintenance staff and trained operators.

As an aid to using the manual for installing and setting up the system, we have provided the following Quick Setup Guide, which gives the essential steps and takes you quickly to the sections that describe them.

1.2 Quick Setup Guide

The Series 9 gauge system is designed for ease of installation and setup. Just perform the key steps in the order given below.

Note: The procedure here assumes that your system includes a GCI. If it does not, you can still follow the procedure, but you will need to perform the setup steps using the GaugeToolsXL software and its user instructions.

1. Install the gauge system (see Chapter 4 - Installation).

   You might need to read the Overview (see Section 5.1 - Overview) and Data entry (see Section 5.3 - Data Entry) information in the Operation section before performing the following setup actions on the GCI.

2. Select the user language (see Section 6.6 - Local Settings).

3. Select the gauges (see Section 6.10.1 - Selecting Gauges).

4. Check that no error messages are displayed on the GCI (see Section 5.1.4 - Responding to Error Messages).

5. Name the gauge(s) and measurement channels from the factory defaults as desired (see Section 6.8 - Editing the Gauge and Measurement Names).

6. Reference the gauge (allowing the gauge to warm up for 2 hours first) (see Section 7.2.3 - Internal Referencing the Gauge).

7. Create a Product recipe based on factory settings sheet with the desired response time (see Section 6.4.1 - Creating a New Product).

8. Select the Product recipe (see Section 6.3 - Loading Products).

9. Auto-trim the gauge to the desired reading (see Section 7.2.1 - Using Auto-Trim).

10. Check and if necessary, adjust the gauge trim value against laboratory reference values (see Section 7.2.2 - Trim).

11. If there is a wide measurement range, perform a full-range calibration (see Section 7.2.4 - Performing Full-Range Calibration).

12. If the 4-20mA analogue outputs are being used, set the scaling over the full measurement range (see Section 6.10.3 - Configuring Analogue Outputs).

1.3 Associated Documentation

The following documents are associated with this manual.

- **Packaging Sheet** - detailing all dispatched items, for use as a delivery check list
- **GaugeToolsXL User's Guide**: 105/14033-01SA
- **GaugeToolsXL Installation Guide and Quick Start**: 105/14020-SA

1.4 Contact Information

For enquiries relating to the operation and use of the equipment described in this manual please refer to www.ndc.com, or the Contact section at the beginning of this manual, for company contact details.

CHAPTER 2

2 Safety Information

2.1 Warnings

- To avoid the risk of electric shock, isolate the mains supply to the equipment before carrying out any installation, maintenance or repair work.
- The gauge contains items that rotate at high speed and which could cause injury. Do not operate the gauge unless it is fully assembled.
- Compressed air can be dangerous. Where this is used, observe all relevant local regulations and follow normal operational good practice for handling compressed air.
- If the gauge is not installed and used in the manner prescribed in this manual, the safety protection afforded by the equipment may be impaired.

2.2 Cautions

- The gauge and associated equipment contain static-sensitive devices. During installation, maintenance or repair, observe standard electrostatic precautions to avoid damaging the equipment.
- Clean the gauge windows and external equipment surfaces with clean non-abrasive materials only, in accordance with the cleaning instructions (see Section 8.2 - Cleaning). If in doubt, contact Nordson.

CHAPTER 3

3 System Overview

Each Series 9 gauge installation is optimised specifically for a particular application, to suit the environment in which it will operate and to provide the appropriate process measurements.

3.1 System Components

The Series 9 gauge system has the following key components, which may be configured in a wide range of stand-alone and multi-gauge configurations.

- **Gauge**
- **Gauge Control Interface (GCI)**
- **Operator Terminal (OT)**
- **Power Hub (PH)**
- **Gauge Control Port (GCP)**
- **Switched Hub**
- **Hand-Held Gauge Interface (GI)**

The gauges and peripheral unit enclosures are available in various formats and materials for use in different environments. Each component (excluding the GI) may be supplied in some or all of the following.

Gauges	• Stainless steel, IP67 • Stainless steel, IP67, Atex certified option
Peripherals	• Molded ABS enclosed • Stainless steel enclosed (Atex option) • Aluminium panel-mounted

Gauge

Series 9 gauges are intelligent devices that perform all of the measurement and processing functions of the system internally, and provide direct outputs of the calibrated measurement values. They also generate the displays shown on the OT and GCI, which allows, for example, gauge firmware updates to be automatically reflected in all operator displays.

The gauges work on the principle that different product constituents absorb Near Infra-Red Light (NIR) at specific wavelengths. The gauges emit NIR light at these wavelengths and then accurately measure the amount reflected from the product. From this, they generate outputs that are directly proportional to the amount of each measured constituent in the product.

Part No. 120/16000-00SA

There is only one version of the enclosure - cast stainless steel 316L with Sapphire window and air purge window. They may be fitted with options, including water or vortec cooling, depending on environmental conditions.

By default, the gauges communicate with other system devices via Ethernet. They are powered from a 24Vdc supply, and connect to the system by means of a single cable carrying both data and power.

Gauge Control Interface (GCI)

The GCI provides supervisor-level access to up to 16 gauges within the same network. It includes an embedded universal power supply (input: 85 Vac – 264 Vac) that outputs 24Vdc for connection to a single Series 9 gauge.

The GCI provides an Ethernet port to a single gauge, 2 extra Ethernet ports to support “daisy chain” gauge networking, and an RJ45 external Ethernet port for quick connection to a computer.

The operating and display interface is a 10-inch, high-resolution capacitive touchscreen.

Features allow for direct interaction with the gauges for functions such as taking sample measurements and performing calibration, and for performing supervisor functions such as maintaining user passwords.

Part Nos. 120/16001-01SA (Standard), 120/16268-01SA (Stainless Steel)

Product definitions can be created through the GCI, each of which is a collection of settings for a specific gauge and measurement application. These are stored in the gauges and can be recalled from the GCI.

The GCI can be supplied with an option of up to 4 boards total (any combination). Combination specific to user requirements include (2) scalable analogue outputs, eight opto-isolated digital inputs and eight digital outputs. Fieldbus communications protocols supported by the GCI include the ProfibusDP and DeviceNet gateways.

Operator Terminal (OT)

The OT is dedicated to one individual gauge and is located near to it in the process. It includes an embedded universal power supply (input: 85 Vac – 264 Vac) that outputs 24Vdc for connection to a single Series 9 gauge.

The OT provides an Ethernet port to a single gauge, 2 extra Ethernet ports to support “daisy chain” gauge networking, and an RJ45 external Ethernet port for quick connection to a computer.

The operating and display interface is a 10-inch, high-resolution capacitive touchscreen. It enables the operator to carry out process-related tasks such as viewing measurement and product sampling.

The OT cannot change any process-critical gauge settings or perform any supervisory tasks.

Fieldbus communications protocols supported by the OT include the ProfibusDP and DeviceNet gateways.

Power Hub (PH)

The PH includes an embedded universal power supply (input: 85 Vac – 264 Vac) that outputs 24Vdc for connection to a single Series 9 gauge.

It is an integrated Ethernet hub that provides an Ethernet port to a single gauge, 2 extra Ethernet ports to support “daisy chain” gauge networking, and an RJ45 external Ethernet port for quick connection to a computer.

Part Nos. 120/16001-02SA (Standard), 120/16268-02SA (Stainless Steel)

Gauge Control Port (GCP)	
The GCP powers one gauge. It includes an embedded universal power supply (input: 85 Vac – 264 Vac) that outputs 24Vdc for connection to a single Series 9 gauge. The GCP is an integrated Ethernet hub that provides an Ethernet port to a single gauge, 2 extra Ethernet ports to support “daisy chain” gauge networking, and an RJ45 external Ethernet port for quick connection to a computer. The GCP can be supplied with an option for (2) scalable analogue outputs, eight opto-isolated digital inputs and eight digital outputs. Fieldbus communications protocols supported by the GCP include the ProfibusDP and DeviceNet gateways.	

Switched Hub	
The switched hub serves as a sealed 4-port switched Ethernet hub for the gauges in multi-gauge systems. It can also provide the interface for communication between the Series 9 network and a factory network, allowing only the required data to pass between the two.	Part No. 120/16435-01

Hand-Held Gauge Interface (GI)	
The GI connects to the PH, OT, GCI and GCP via an RJ45 Ethernet cable. It comprises a rugged 10-inch touch-screen tablet with IP65 sealing, and comes with a wrist strap for convenience. The GI runs the Android operating system, with access to the following: • Measurement display and trending • Product sampling • Gauge diagnostics • Gauge product configuration tools The GI includes an option to add a Docking station for measurement viewing in the control room.	 Part No. 120/16479-01SA

3.2 Configuration Examples

The following examples show typical configurations of Series 9 gauges to illustrate the application of the system components.

3.2.1 Single Gauge System

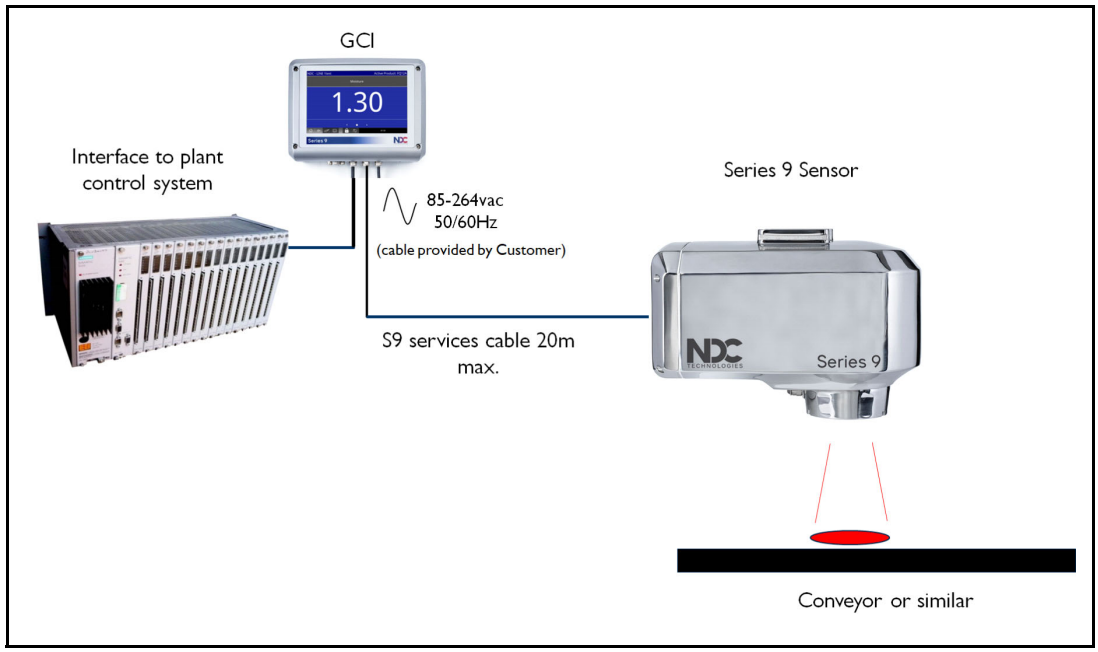


Figure 3-1 A single gauge system with GCI

Figure 3-1 shows a Series 9 gauge that is connected by a Services cable to the GCI (Gauge Control Interface). The GCI provides an interface to the plant control system via Ethernet and its analogue and digital I/O. The gauging system is powered from an 85-264 VAC, 50/60Hz cable that is provided by the customer to the GCI.

3.2.2 Multiple Gauge System

Example 1

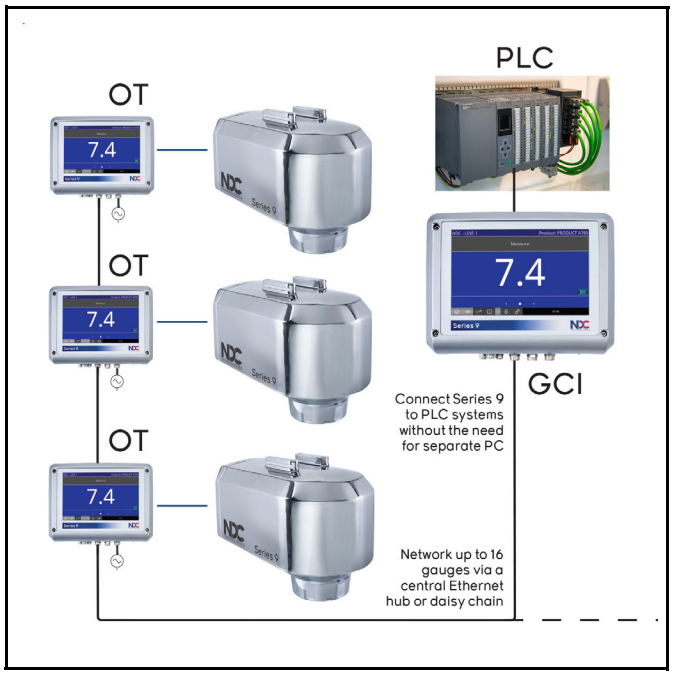


Figure 3-2 A multiple gauge system with GCI and OTs

Figure 3-2 shows a system with multiple gauges, each gauge connected to an OT (Operator Terminal). The OTs are daisy chained and connected to a central GCI (Gauge Control Interface). The GCI is connected to a PLC or SCADA system.

Example 2

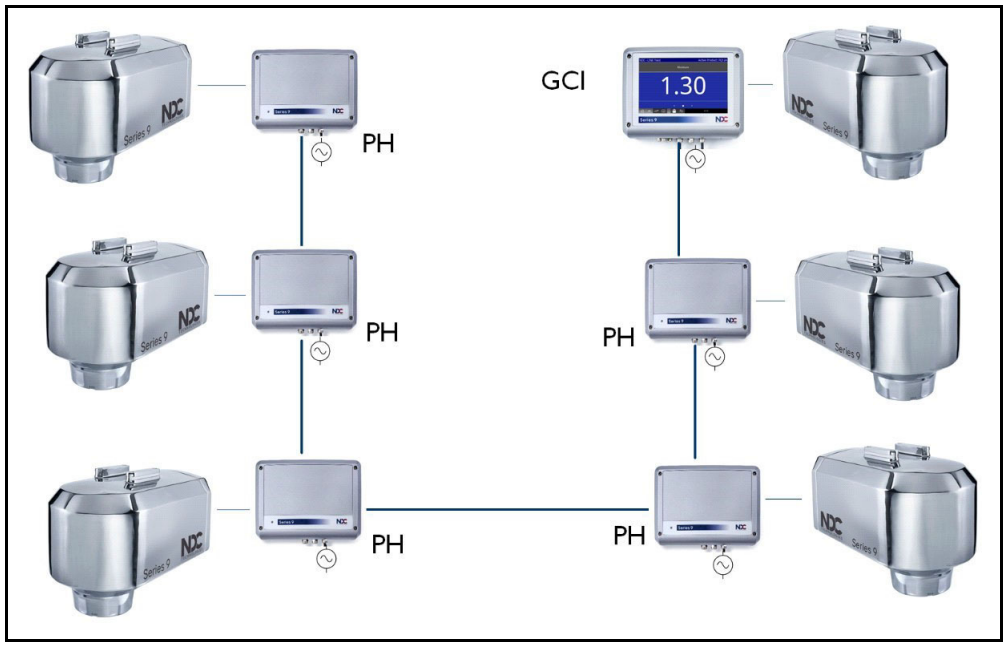


Figure 3-3 A multiple gauge system with GCI and PHs

Figure 3-3 shows a system with multiple gauges, each gauge powered from a PH (Power Hub). The PHs are networked together with a central GCI (Gauge Control Interface).

3.2.3 Portable Hand-Held Option

Figure 3-4 A GI connected to a Power Hub

Figure 3-4 shows a GI (Hand-Held Gauge Interface) that connects to a Power Hub. The connection is through an RJ45 patch cable. The GI is positioned near the gauge for sampling and configuration. There is an optional Docking station located in the control room for measurement viewing.

3.3 Air Purge Window

The Air Purge Window (APW) is used where the atmosphere in which the gauge is required to operate contains a high level of dust or other pollutants. Using a clean air supply, it reduces gauge window contamination by maintaining an area of positive air pressure over the window surface (see Section 4.7.3 - Fitting the Air Purge Window).

3.4 System Options

3.4.1 Air Flow Pressure Monitor Option

An optional air flow pressure monitor board is available inside the Series 9 gauge to alert the operator when the air supply has failed or not been turned back on after a system shutdown and cleaning (see Section 9.4 - Pressure Sense Option).

3.4.2 Internal Gating Option

This option enables the gauge to make reliable measurements of discontinuous products by switching the infra-red measurement system on only when there is product in the beam-patch area. It operates by using two infrared sensors located within the gauge to detect changes in the distance between the gauge window and the viewed surface.

The option is available with small and large beam patch (see Section 9.1 - Internal Gating Option).

3.4.3 Temperature Measurement Option

The temperature measurement option provides the ability to measure the temperature of the product at the gauge location or a remote location, and display the readings on one channel of the OT and GCI (see Section 9.2 - Temperature Measurement Option).

3.4.4 Water Cooling Option

Series 9 gauges can be fitted a water based heat exchanger with water inlet and outlet connectors. This allows cooling water to be circulated, enabling the gauge to work in high ambient temperatures (see Section 4.7.4 - Connecting Water Cooling).

3.4.5 Cooling

3.4.5.1 Temperature Monitoring

The Series 9 gauge has an internal temperature sensor that is used both as an input for the automatic cooling system and for over-temperature protection. It will output a temperature warning if the gauge exceeds 70°C/158°F and shut it down when it exceeds 75°C/167°F to reduce the maximum internal temperature and preserve the gauge electronics.

3.4.5.2 Vortex Cooling Option

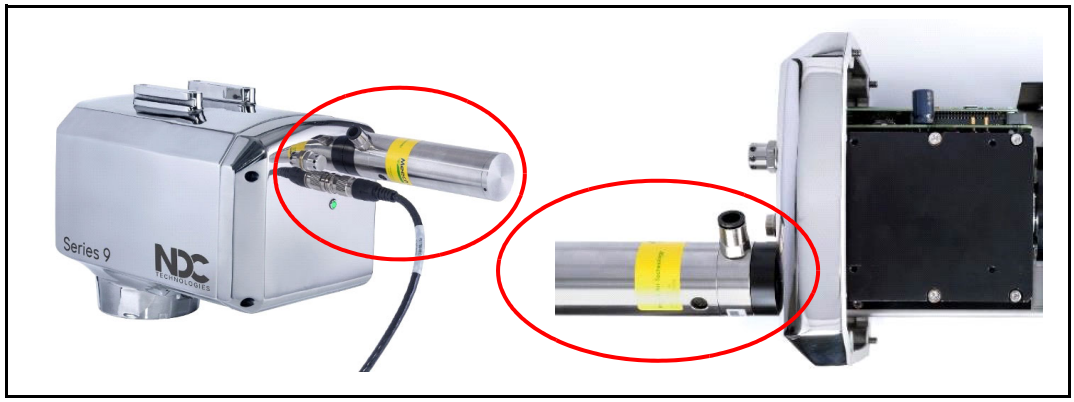


Figure 3-5 Integrated heat exchanger

The internal temperature of the gauge is typically 15°C/59°F above ambient. The Vortex cooling option is used for environments exceeding 50°C/122°F. This cooling option uses a vortex unit to create a cold air flow from a compressed-air supply, which is then circulated through a heat exchanger in the gauge (Figure 3-5). The vortex unit is close-coupled to the gauge, and factory-fitted as part of the assembly (see Section 9.3 - Vortex Cooling Option).

3.4.5.3 Cooler Solenoid Control (Sensor) Option

An optional cooler solenoid controller optimizes air usage by only cooling the gauge when needed (Figure 3-6).

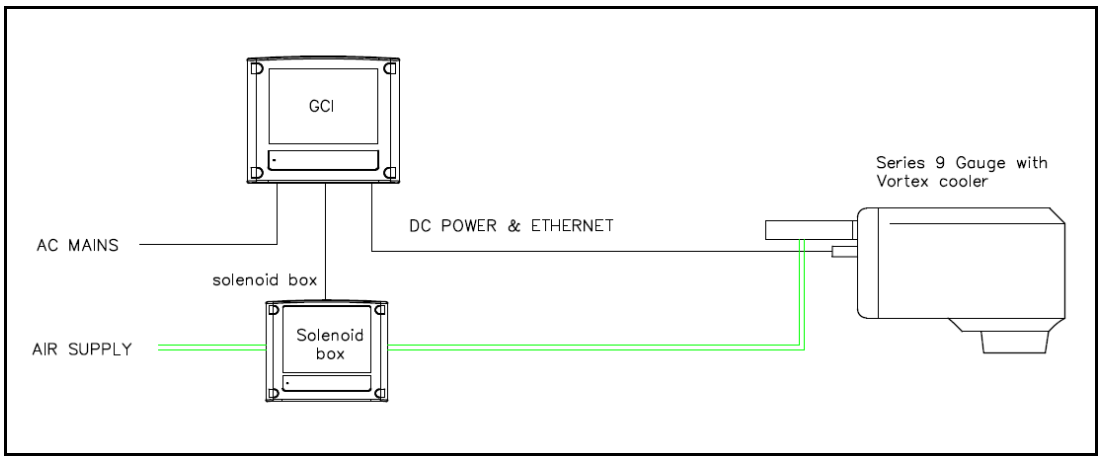


Figure 3-6 Cooler solenoid control option

3.4.6 Heater Option

The Heater option allows the gauge to operate in cold environments below 0°C/32°F down to -30°C/-22°F (see Section 9.7 - Heater Option).

3.4.7 Common Gauge Connector (CGC) Cable Option

This option is used in scanning applications, and connects a Nordson High Flex cable to a Common Gauge Connector on the Series 9 gauge (see Section 9.5 - Common Gauge Connector (CGC) Cable Option).

CHAPTER 4

4 Installation

4.1 Installation Good Practice

Observe the following points when selecting the mounting location for the gauge.

- **Product View**

  Choose the position for the gauge carefully so that it views only material that is representative of the product at the relevant stage in the process (see Section 4.7.1 - Positioning).

- **Site Requirements**

  Check that the mounting position and the available services conform to the Site Requirements (see Section 4.3 - Site Requirements).

- **Gauge Mounting**

  Ensure that the gauge support is rigid, and free from vibration during normal operation.

- **Atmospheric Contaminants**

  If the working environment has a high level of airborne contaminant (e.g. dust and dirt), attach an air line to the air purge window.

- **Electromagnetic Compatibility**

  Follow the EMC precautions (see Section 4.4 - EMC Precautions) to avoid interference from other equipment.

- **Ambient Light**

  Shield the gauge window and measuring area from direct sunlight as this may affect the sensitivity of measurements.

- **Peripheral Unit Location**

  Peripheral units such as the OT and GCI must be installed where the risk of mechanical damage is low.

4.2 Hazardous Environments

Series 9 Gauge

Standard Series 9 gauges are not suitable for installation in explosive gas or dust environments.

Nordson provides special versions of the Series 9 gauge and peripherals, which are certified for use in non-mining applications, dust or gas explosive atmospheres.

Please consult Nordson for details, which are covered by a separate user guide.

4.3 Site Requirements

The installation site for the Series 9 system components should meet the following environmental and supply requirements.

Environmental

Operating temperature range		
	Series 9 gauge	0°C - 50°C without cooling
		0°C - 70°C with cooling
	GCI, OT, GCP, PH	0°C - 50°C
Relative Humidity		
	Gauge, GCI, OT, GCP, PH	5% - 95% (non-condensing) over the full operating temperature range

Electrical

Mains supply	The power supply requirement is 100W through a single phase supply in the range: 85Vac - 264Vac, 47-63Hz

Equipment permanently connected to the mains supply should incorporate an accessible and clearly identifiable isolating device, such as a double-pole isolator switch or circuit breaker, positioned near to the equipment. Ensure that the isolator is appropriately rated for the cumulative load.

Air Supply

For Air Purge unit option:	
20 L/min, measured at the air purge window (see Section 4.7.3 - Fitting the Air Purge Window)	Air supply must be instrument quality – i.e. dry, clean and oil-free. Nordson uses a 40um element filter followed by a 0.01um coalescing filter to achieve this standard.

Water Supply

For gauge water cooling option:	
Ambient temp. up to 70°C	Clean water. Flow rate: 200mL/min, Temp: <25°C

4.4 EMC Precautions

Use the following guidelines to minimise the effects of electrical interference.

1. Ensure that the system is supplied with a clean mains supply (instrumentation supply).
2. Lay signal cables in a low-power signal conduit, and mains cables in low-power mains supply conduit.
3. Ensure that no part of the gauge/system or cabling is placed near sources of strong EMI (Electromagnetic Interference). Example sources of EMI:
    - Large electric motors
    - Welding equipment
    - Large static discharges
    - Infrared ovens
    - Microwave ovens
    - Large transformers
    - Transmitters
    - Power control circuits

    Note: Do not alter any cables or enclosures without prior permission from the Engineering Department at Nordson.

For advice or help on installation concerning EMC, please contact the Customer Care Helpdesk at Nordson.

4.5 Unpacking

1. Check against the courier's Delivery Note that all listed items have been delivered.
2. Unpack all equipment in a clean area. Retain the packaging for future use, if possible.
3. Retrieve and keep the documentation included in the packaging:

   Packing Sheet - which lists all supplied items
4. Check the equipment carefully for any signs of damage.
5. If any items are missing or damaged, notify the carrier, Nordson or the agent of Nordson (see Section 1.4 - Contact Information) as appropriate.
6. If the equipment is to be stored prior to installation, ensure that the storage conditions are suitable (see Section 4.6 - Storage).

4.6 Storage

Before installation, store the equipment in the environmental range:

Temperature:	0°C - 70°C
Humidity:	5% - 95% (non-condensing)

Include desiccant if there is any possibility of condensation. After storage, allow the equipment to reach ambient temperature before installation.

4.7 Installing the Gauge

4.7.1 Positioning

The following points should be taken into account when positioning Series 9 gauges.

Direct Viewing

When viewing the product directly, the gauge should be installed above a moving and continuous stream of product without gaps. Ideally, the depth of the product should be at least a few centimeters - enough to obscure the conveyor surface completely.

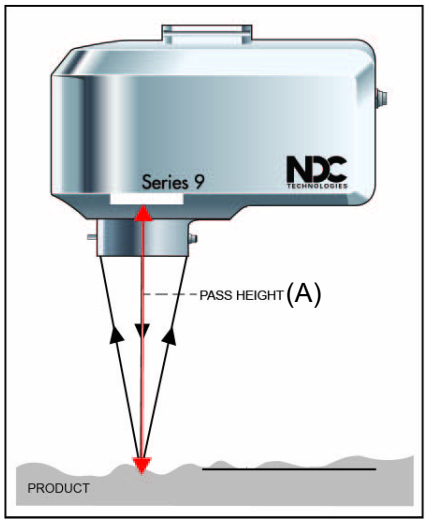
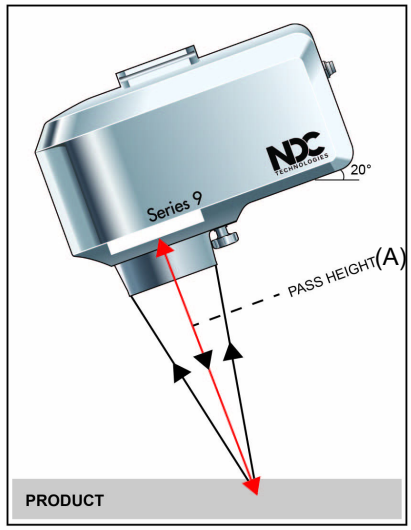
In most applications, the gauge should be fixed to a horizontal mounting so that the infrared beam is perpendicular to the surface of the product.		If there is a possibility of gaps in the product, the gauge must be mounted at an angle. This prevents direct reflection of the infrared beam from the conveyor surface into the gauge window, which could affect measurement accuracy.
		

Figure 4-1 Positioning the gauge

Position the gauge at the correct pass height from the product surface, according to the beam patch size (Figure 4-1). Fluctuations in the product surface should be kept within the allowable limits shown for the pass height.

Beam patch size	Large (60mm)	Medium (25mm)	Small (10mm)
Pass height (A) (measured from outside surface of window)	250 ±100mm	200 ±50mm	140 ±20mm

Window Viewing

Where the process is enclosed, the gauge can view the product through a glass or sapphire window. In this case:

- To prevent reflections, the gauge must be angled with respect to the window (Figure 4-2).
- A solid bed of product must be flowing against the viewing window. Otherwise, spurious reflections and the varying path length of the gauge beam may affect measurement accuracy.
- Arrangements must be made to keep the viewing window free from accumulated product.

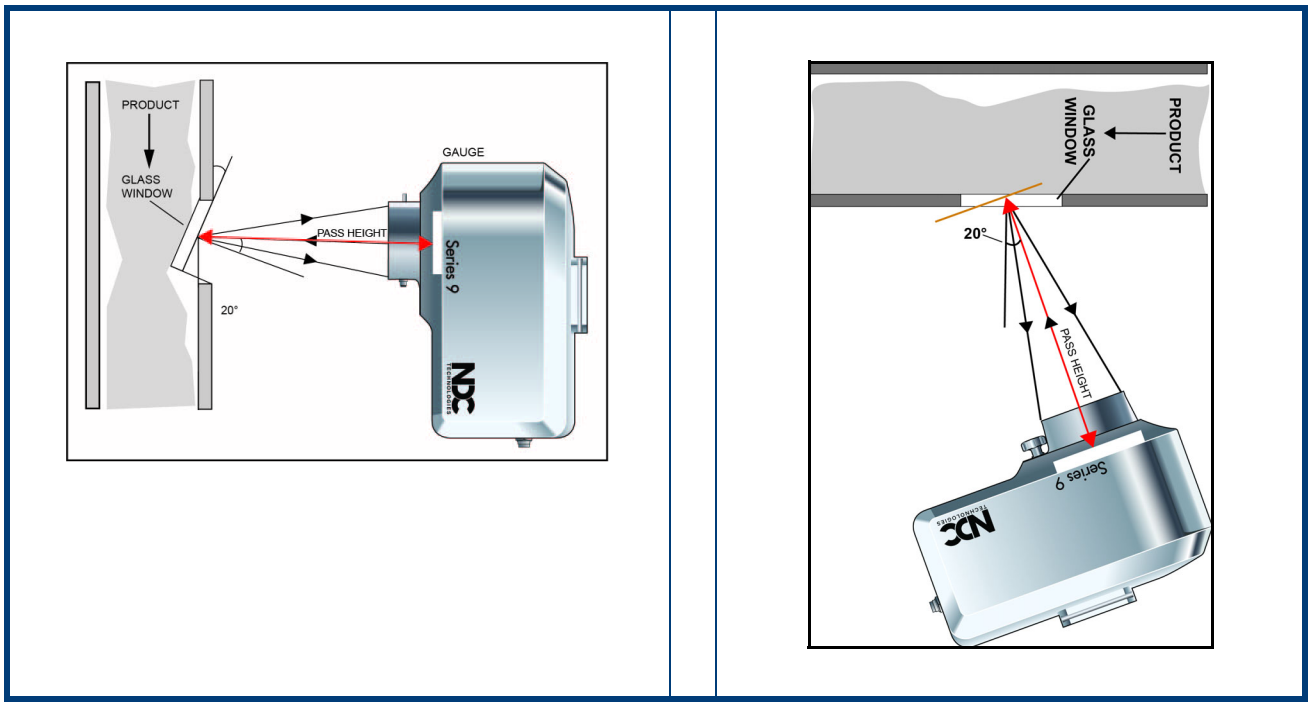


Figure 4-2 Positioning the gauge with respect to the window

Product Surface

Measurements after a dryer or conditioner are best taken as far down stream as possible to give the product a chance to equilibrate. If there is danger of the surface not representing the bulk product (from surface drying of a hot product, for example), then a plough or other mechanism should be installed just before the gauge location to turn over the product. This is essential to ensure that the measurements are representative of the bulk product.

Gauges Fitted with Internal Gating Option

The mounting height for gauges fitted with this option must take account of the thickness of the product. Refer to the gating option section (see Section 9.1 - Internal Gating Option) before mounting the gauge.

4.7.2 Mounting

The gauge may be attached to any suitable mounting bracket or frame, using the four M8 x 10mm mounting holes provided in the top of the case (Figure 4-3). Two sets of fixing screws suitable for attaching the gauge to mounting plates of different thickness are provided in the Series 9 Gauge Kit.

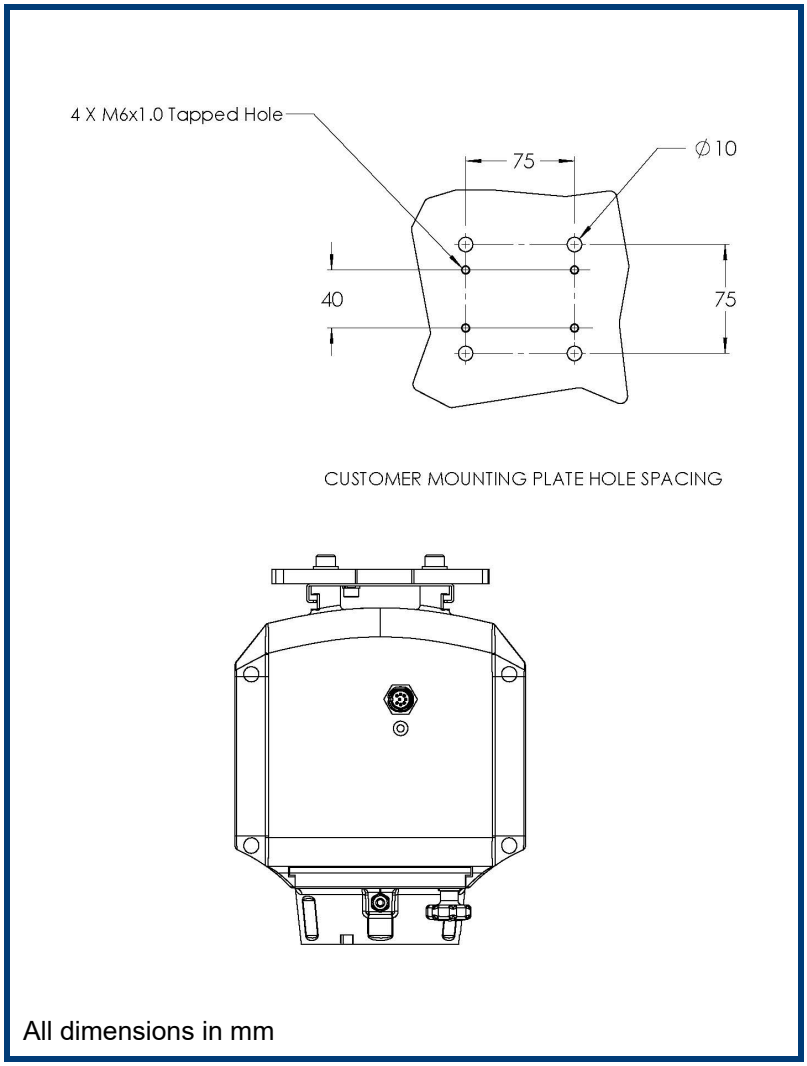


Figure 4-3 Mounting the gauge

The mounting must be rigid and vibration-free. The mounting arrangement must provide sufficient clearance for fitting and removing connectors, and enable the gauge to be positioned correctly with respect to the product. The mounting hole positions for the cast and stainless steel gauges are shown in Figure 4-4.

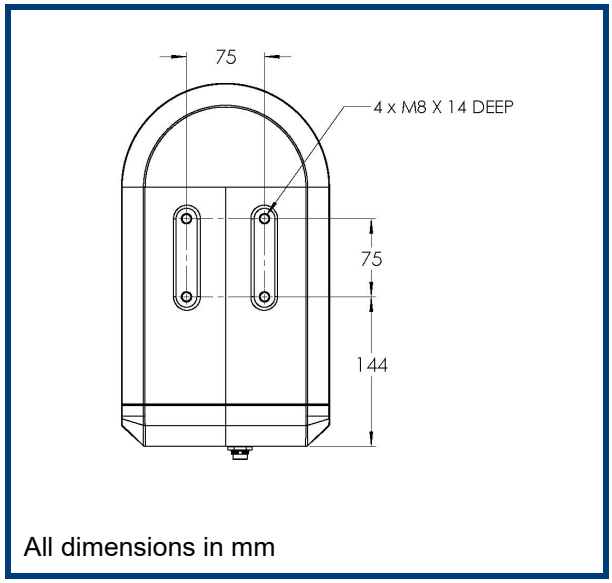


Figure 4-4 Mounting holes

For details of case and fitting dimensions, refer to the outline drawings (see Chapter 12 - Outline Drawings).

An easy, slide-mounting Adapter Plate is supplied with each gauge to facilitate safer manual handling and installation (Figure 4-5).

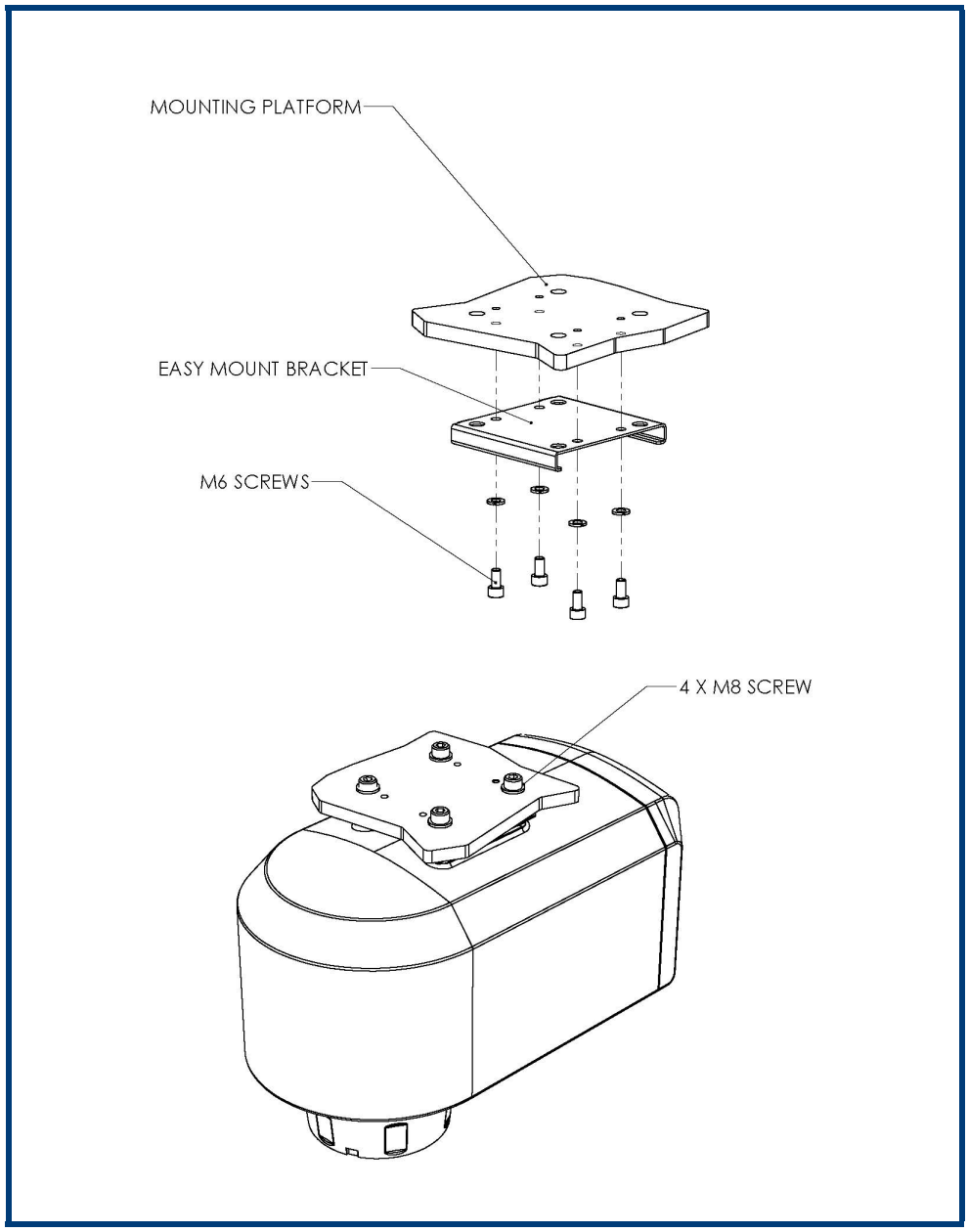


Figure 4-5 Easy slide-mounting adapter plate

Figure 4-6 Sliding the gauge into the bracket

The plate is first bolted to the mounting bracket over the production line and the Series 9 gauge is slid into the bracket, which supports the weight of the gauge (Figure 4-6). It is then simply locked into position with four (4) retaining bolts (Figure 4-7).

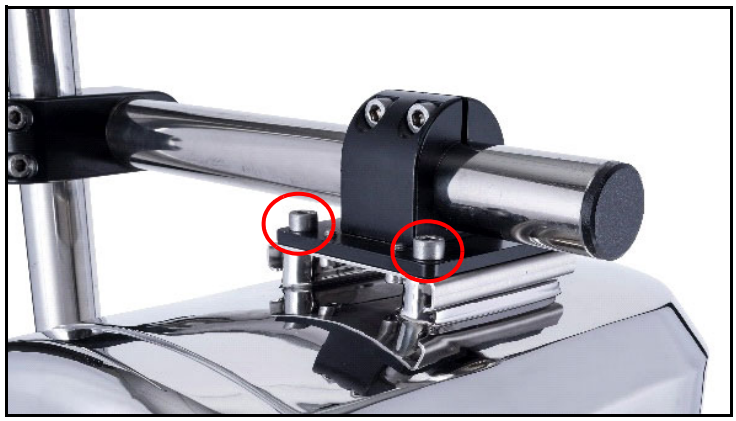


Figure 4-7 Retaining bolts

4.7.3 Fitting the Air Purge Window

The air purge window (APW) inhibits window contamination by maintaining a positive air pressure around the window area. It is secured to the gauge by a set screw that locates into a groove around the outside of the window bezel.

Fit the APW (Figure 4-8) as follows:

1. Check that the cylindrical insert and gaskets are located correctly in the air purge housing.

Figure 4-8 Air purge window (APW)

2. Fit the APW onto the gauge by sliding in place and fix by tightening the single captive thumbscrew.

3. Using 6mm diameter pipe, connect a clean, dry and oil-free air supply to the air connector.

4. Regulate the air supply (Figure 4-9).

Typically, the stated air flow (see Section 4.3 - Site Requirements) can be achieved from a 30 psi (2 Bar) supply delivered through 3m x 6mm Ø pipe (4mm inside Ø).

If an air-flow meter is not available, a reasonable assessment can be made by holding your hand a few centimetres below the air purge window and increasing the air pressure until you can feel a gentle air flow.

The figure given for air flow is, in any case, only a guide for a starting value and should be adjusted according to experience after a period of operation. If window contamination is significant, increase the air flow until it is reduced to an acceptable level.

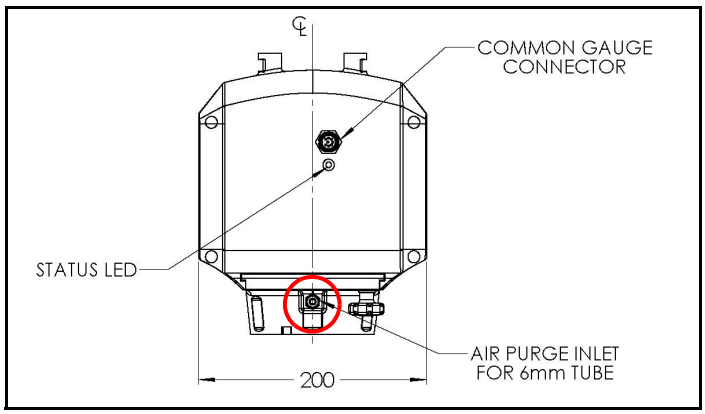
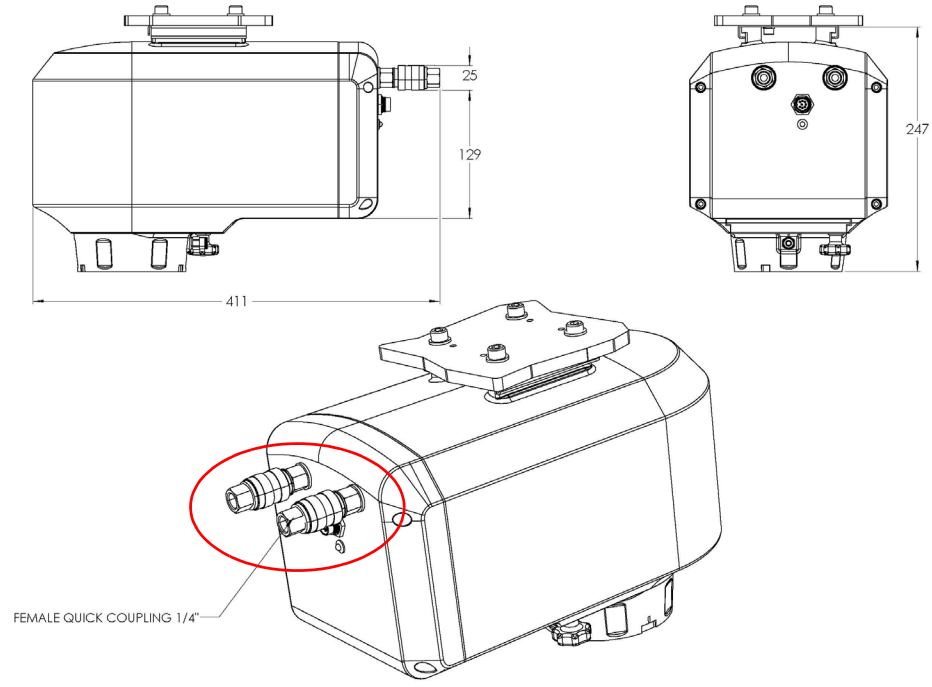


Figure 4-9 Air supply

4.7.4 Connecting Water Cooling

If the gauge is fitted with a water cooling option, connect the water supply to the water in/out connectors (Figure 4-10). The direction of water flow is not important. The water supply must comply with the specification given in the Site Requirements (see Section 4.3 - Site Requirements).



All dimensions in mm

Figure 4-10 Water supply

The gauge includes push-on connectors (thread size G1/4) to connect to an integrated heat exchanger to circulate cold water (Figure 4-11). For example, with an ambient temperature of 70°C/158°F, a water flow rate of 200ml/min (@22°C/70°F) will result in an internal gauge temperature of 50°C/122°F.

Figure 4-11 Water cooling connectors

Note that condensation on the outside of the enclosure may be an issue if the gauge is cooled-too much compared to the ambient temperature.

4.8 Installing Peripherals

4.8.1 Molded ABS Units

The mounting for the OT, GCI, Gauge Control Port and Switched Hub is identical. All units have four mounting holes through the rear of the enclosure, which can be used to fix them to a wall or other flat surface, or to the Nordson mounting plate option.

Make sure that the chosen location provides adequate clearance below the unit for insertion and removal of cables. The cables to the unit should be placed away from heavy-duty power cables and cables carrying high frequencies to other equipment.

To mount a peripheral unit (Figure 4-12):

1. Undo the 4 screws in the corners of the lid with an M5 Allen key and open the hinged lid.

2. Fix the unit to a suitable flat surface using the mounting holes.

3. Complete all electrical connections to the unit (see Section 4.9 - Electrical Connections).

4. Refit the lid and screw down tight.

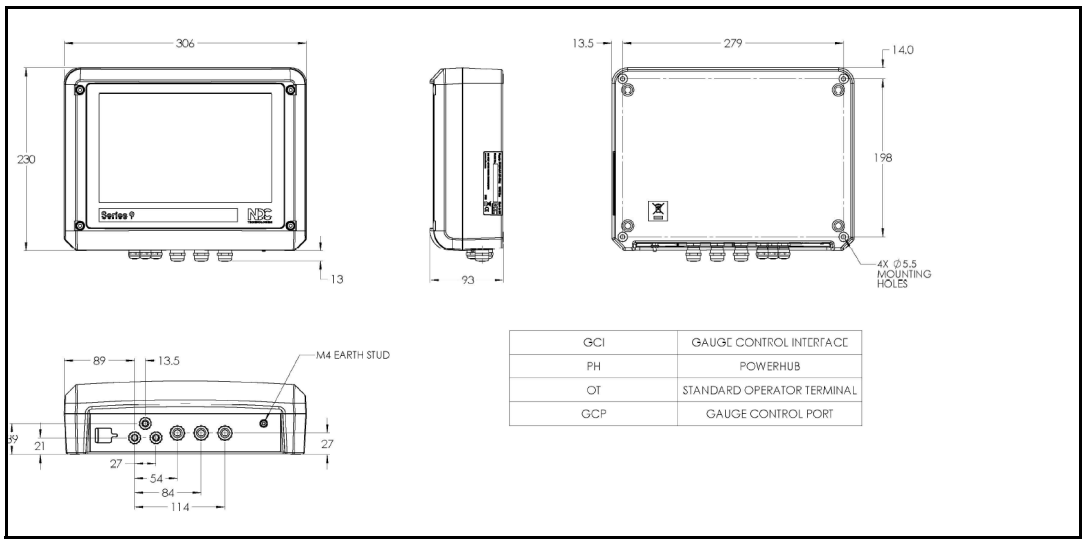


Figure 4-12 Mounting dimensions of peripheral units

4.8.2 Stainless Steel Units

Make sure that the chosen location provides adequate clearance below the unit for insertion and removal of cables. The cables to the unit should be placed away from heavy-duty power cables and cables carrying high frequencies to other equipment.

The mounting of the unit is made through 4 x M5 threaded boss at the rear and needs to be made through a suitable wall plate.

Complete all electrical connections to the unit (see Section 4.9 - Electrical Connections).

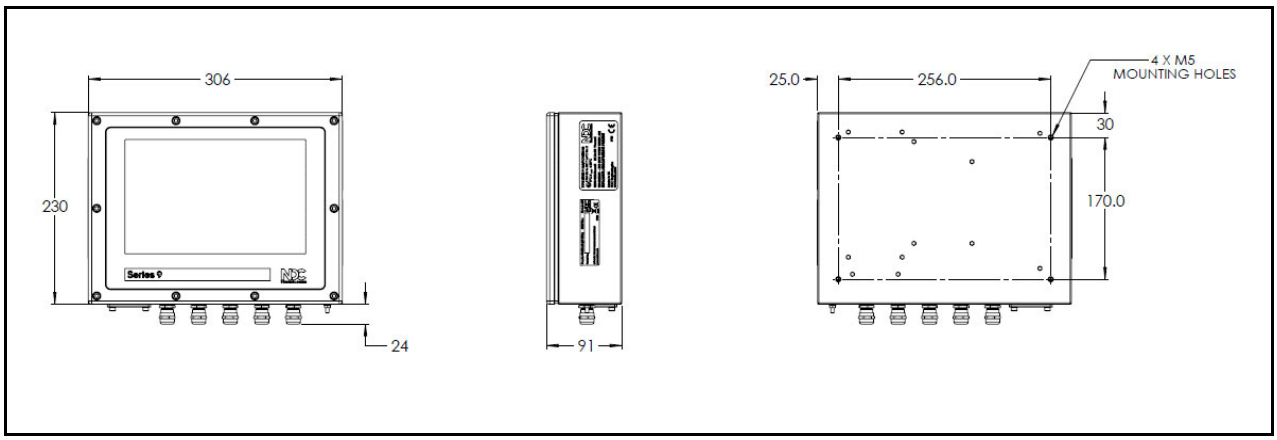


Figure 4-13 Mounting dimensions of stainless steel unit

See Figure 4-13. All dimensions are in mm.

4.8.3 Panel-Mounted Units

Some peripheral components, such as the GCI, are available for panel mounting into existing equipment. These comprise a front panel (1) with the working assemblies (pcb, touch screen, etc.) attached, and a rear cover (2). Both items are secured to the mounting panel by four threaded studs (3). See Figure 4-14.

Note: The maximum allowable mounting panel thickness is 9mm.

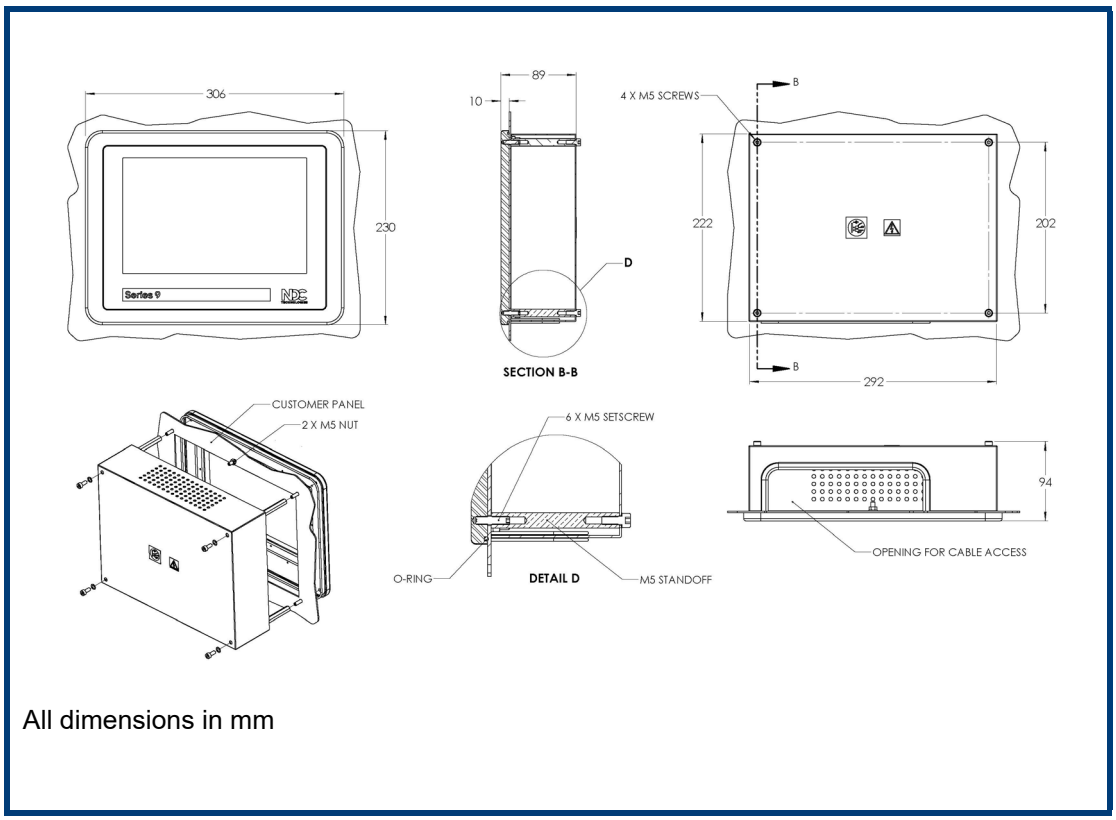
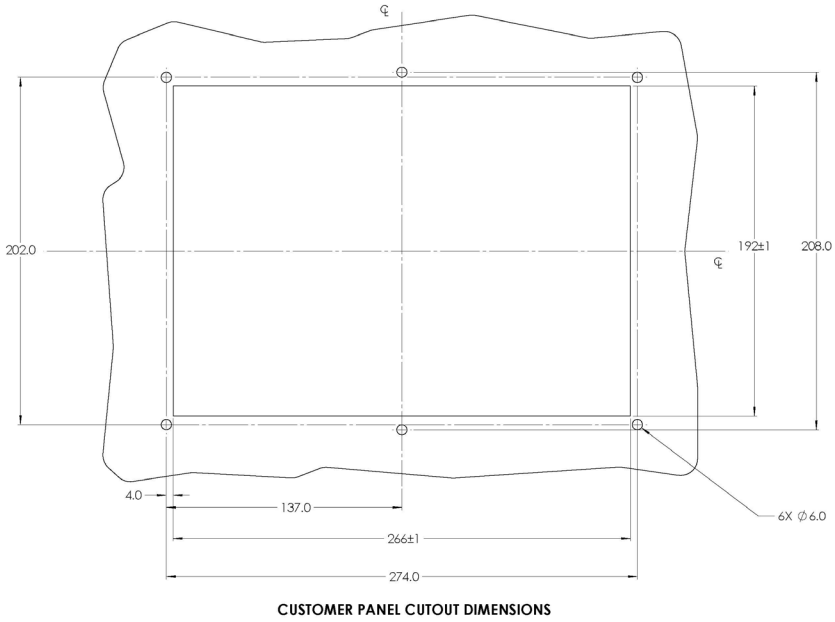


Figure 4-14 Panel mounting dimensions



All dimensions in mm

Figure 4-15 Customer panel cutout dimensions

To mount the unit:

1. Create the aperture and mounting holes in the relevant panel, as shown in Figure 4-15.
2. Fit the front panel and secure with the mounting studs.
3. Complete all electrical connections to the unit (see Section 4.9 - Electrical Connections).

   Note: The cables must be supported to prevent strain on the pcb connectors.
4. Fit the rear cover and secure with the screws supplied.

4.9 Electrical Connections

The following section provides details of the electrical connections for the Series 9 gauging system.

The electrical connection to the gauge is made through a supplied services cable with a circular screw lock connector. However, the gauge must be permanently connected to earth through one of its M8 mounting screw holes using a 4mm square (minimum) cross-sectional area earth braid (Figure 4-16).

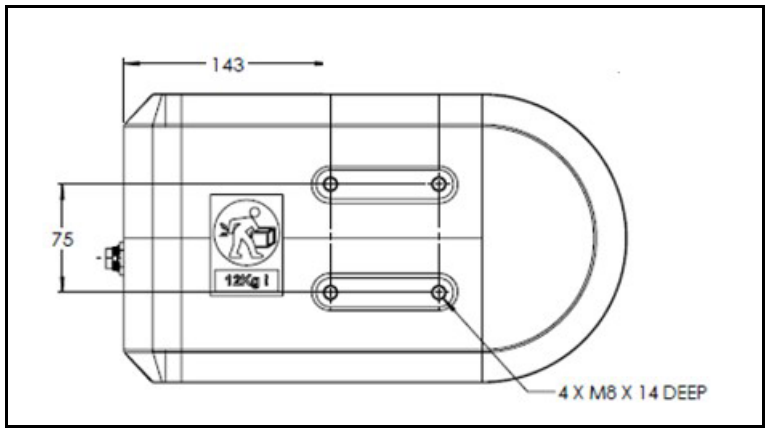


Figure 4-16 M8 mounting screw holes

All the peripherals must also be permanently connected to earth through its M4 earth stud using a 4mm square (minimum) cross-sectional area earth braid (Figure 4-17).

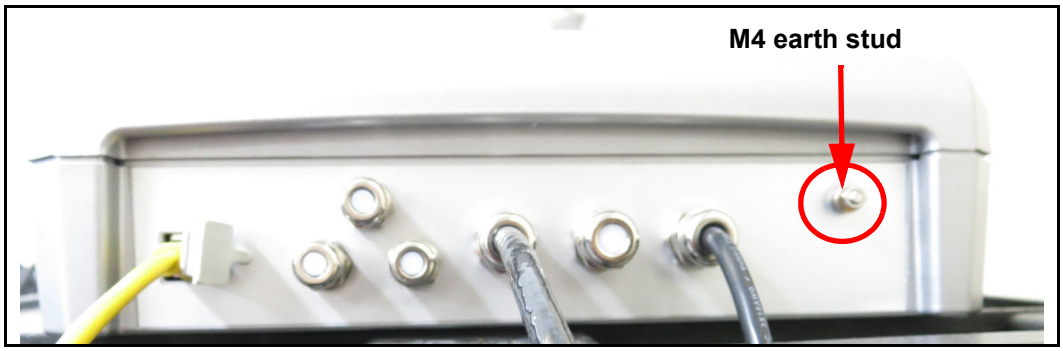


Figure 4-17 M4 earth stud

Connections to all the peripherals (GCI/GCP/OT/PH) are routed through cable glands and made to screw terminations that have a common arrangement, as per the following sections. The gland nut must be tightened with a torque wrench to 3.5Nm to form a good seal with the cable braids trapped in the gland, as per Figure 4-18.

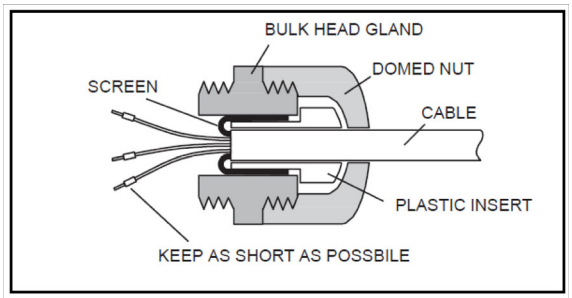


Figure 4-18 Gland nut

4.9.1 Mains Power Connection

The power supply requirement is 100W through a single phase supply in the range: 85Vac - 264Vac, 47-63Hz.

The mains power cable provided by the user, must be 3-core mains cable, double insulated, 18 AWG (minimum) wire gauge with an outside diameter in the range Ø6.0mm to Ø10.0mm to ensure it will seal in the cable gland.

The cable should be routed through the gland closest to the power terminals as shown in Figure 4-19, following the legend on the board, terminated from left to right; **1** = Earth, **2** = Neutral. **3** = Live.

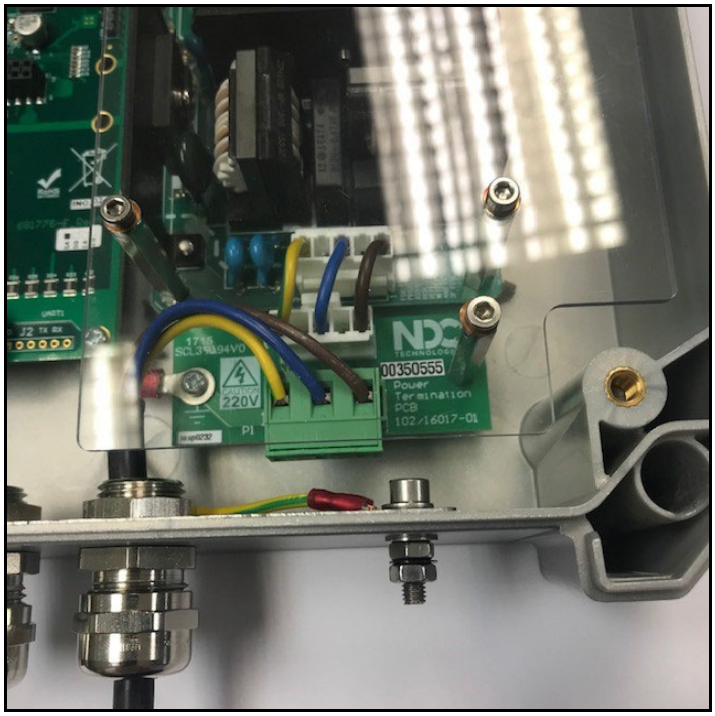


Figure 4-19 Mains power cable connection

4.9.2 Gauge Services Cable Connections

The gauge cable connector is first mated to gauge connector and locked in place using the connector screw lock ring in a clockwise motion.

The free end of the gauge cable is terminated to the screw terminals marked "ETH2 24V" using the following table. See Figure 4-20.

Wire Colour	"ETH2 24v" terminal	Function
Pair 1 White	Tx-	Ethernet Tx-
Pair 1 Orange	Tx+	Ethernet Tx+
Pair 2 White	Rx-	Ethernet Rx-
Pair 2 Green	Rx+	Ethernet Rx+
Pair 3 White	UNFUSED +	Power output +24Vdc
Pair 3 Brown	UNFUSED +	Power output +24Vdc
Pair 4 White	UNFUSED -	Power output 0Vdc return
Pair 4 Blue	UNFUSED -	Power output 0Vdc return

Figure 4-20 Gauge services cable connection

Note that the twists in the pairs must be continued up to the termination point.

The FUSED + and - terminals provide 24Vdc output power for other options.

4.9.3 Analogue and Digital Inputs and Outputs

The GCI and GCP can be populated with up to four input/output boards that can plugged in and stacked in two rows, as shown in Figure 4-21, for example.

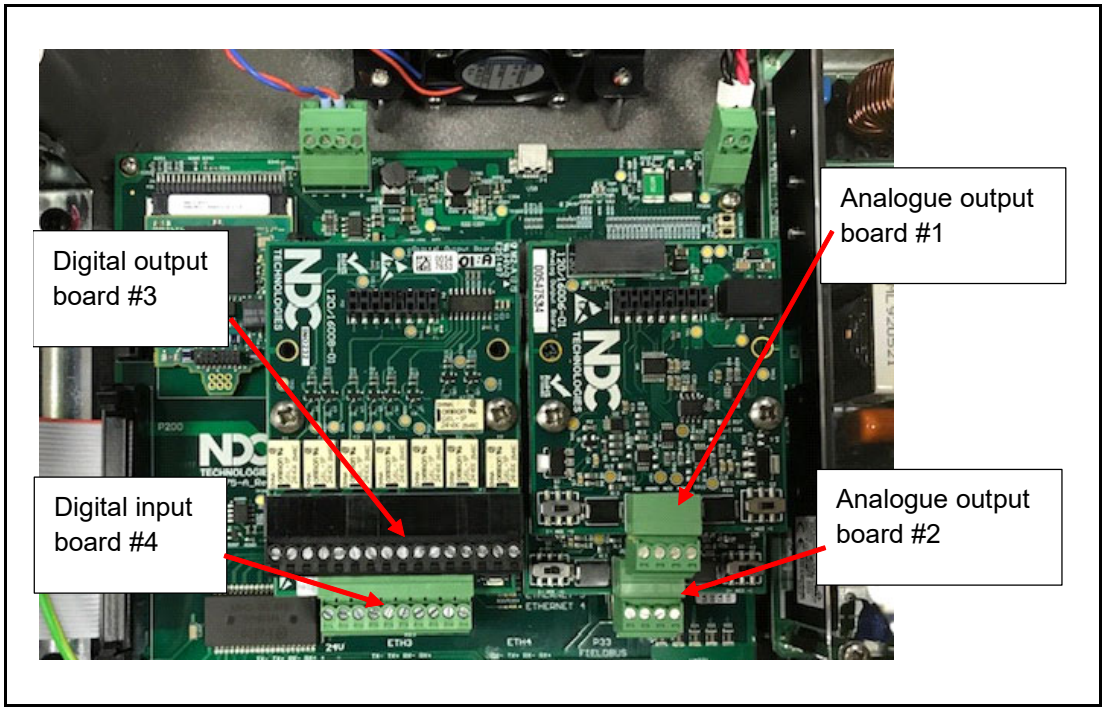


Figure 4-21 Input/output boards

4.9.3.1 Analogue Output Board

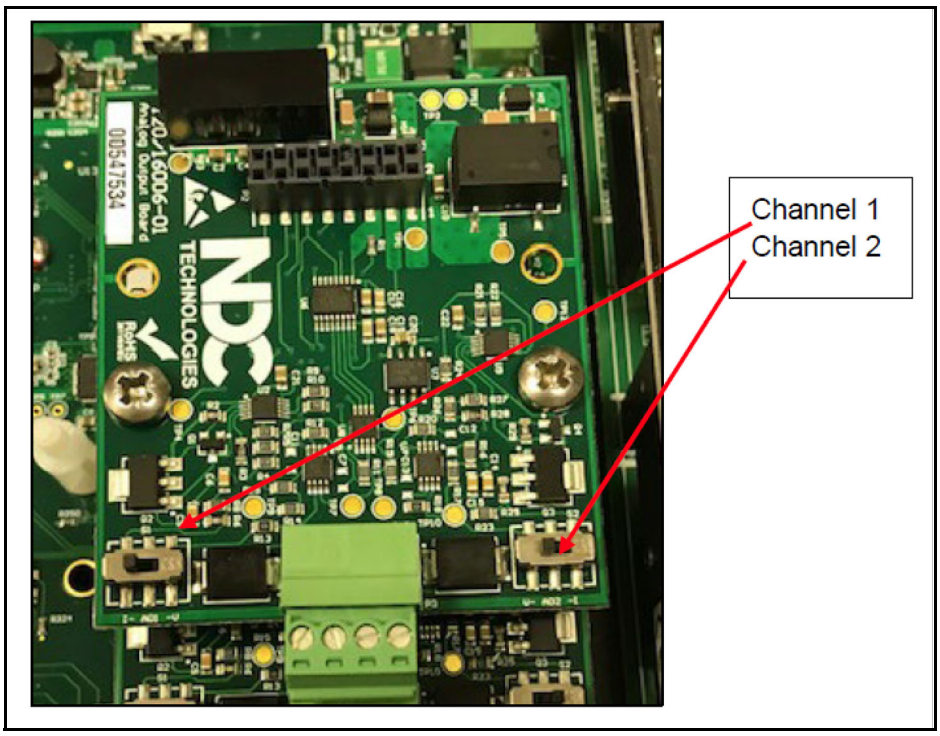


Figure 4-22 Analogue output board

Provides two isolated Analogue outputs that can be set for 0-10v (V) or 4-20mA (I) by the slide switches as shown on the board legend (as V and I) with the following connections.

Terminal Number Left to right	Function
1	Channel 1 +
2	Channel 1 -
3	Channel 2 +
4	Channel 2 -

4.9.3.2 Digital Outputs

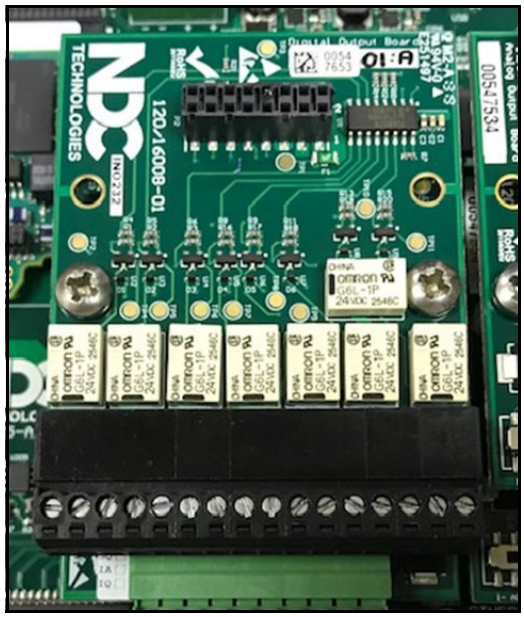


Figure 4-23 Digital outputs

Provides eight N/O relay contacts (125vac/60vdc/1A maximum ratings) with connections in the table below.

Terminal Number Left to right	Function
1 and 2	Relay contact 1
3 and 4	Relay contact 2
5 and 6	Relay contact 3
7 and 8	Relay contact 4
9 and 10	Relay contact 5
11 and 12	Relay contact 6
13 and 14	Relay contact 7
15 and 16	Relay contact 8

4.9.3.3 Digital Inputs

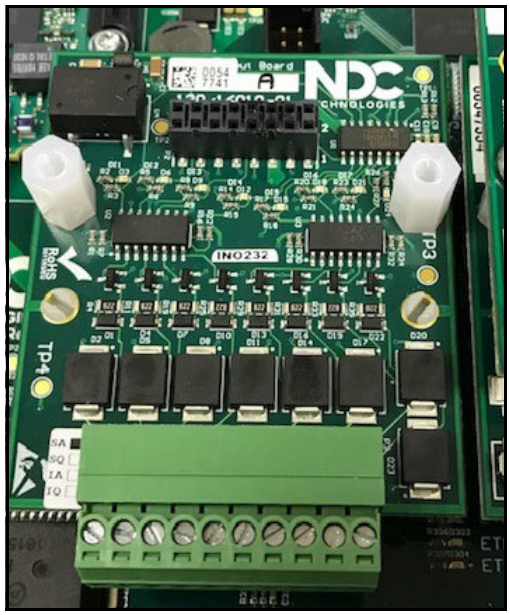


Figure 4-24 Digital inputs

Provides eight Opto-isolated inputs (Low 0vdc and High 3vdc-30vdc) with connections in the table below.

Terminal Number Left to right	Function
1	Input 1
2	Input 2
3	Input 3
4	Input 4
5	Input 5
6	Input 6
7	Input 7
8	Input 8
9 & 10	Common 0v

4.9.4 Ethernet Cable Connections

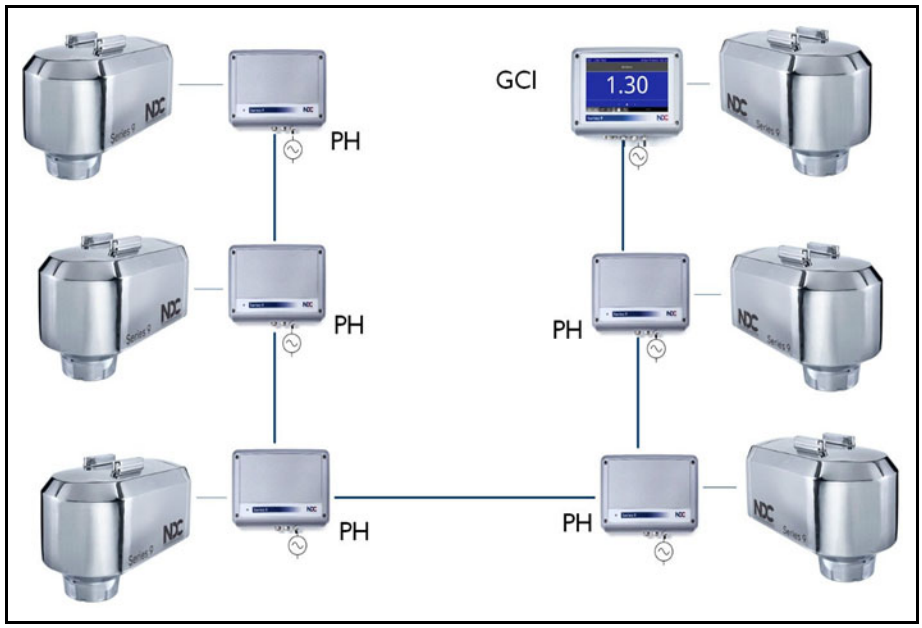


Figure 4-25 GCI/PH Ethernet connection

The communication between GCI/OT/GCP/PH units is through an Ethernet protocol, with the connection made through the screw terminal connectors marked "ETH3" and "ETH4" on the motherboard of each unit.

The cabling linking each unit together must be Industrial Cat5E type network cable (normally supplied) with an outside diameter in the range Ø6.0mm to Ø10.0mm, with connections made as per the table below for each end.

Wire Colour	"ETH3" "ETH4" terminal	Function
Pair 1 White	Tx-	Ethernet Tx-
Pair 1 Orange	Tx+	Ethernet Tx+
Pair 2 White	Rx-	Ethernet Rx-
Pair 2 Green	Rx+	Ethernet Rx+

Note that the twists in the pairs must be continued up to the termination point.

4.9.5 Switched Hub Connections

The switched hub provides eight switched Ethernet ports for connection to Series 9 gauges and peripherals, and for interfacing with a factory network, according to system requirements.

The connector functions are identified in Figure 4-26. Details of specific gauge, peripheral, power and other connections to the hub are given in the relevant sections.

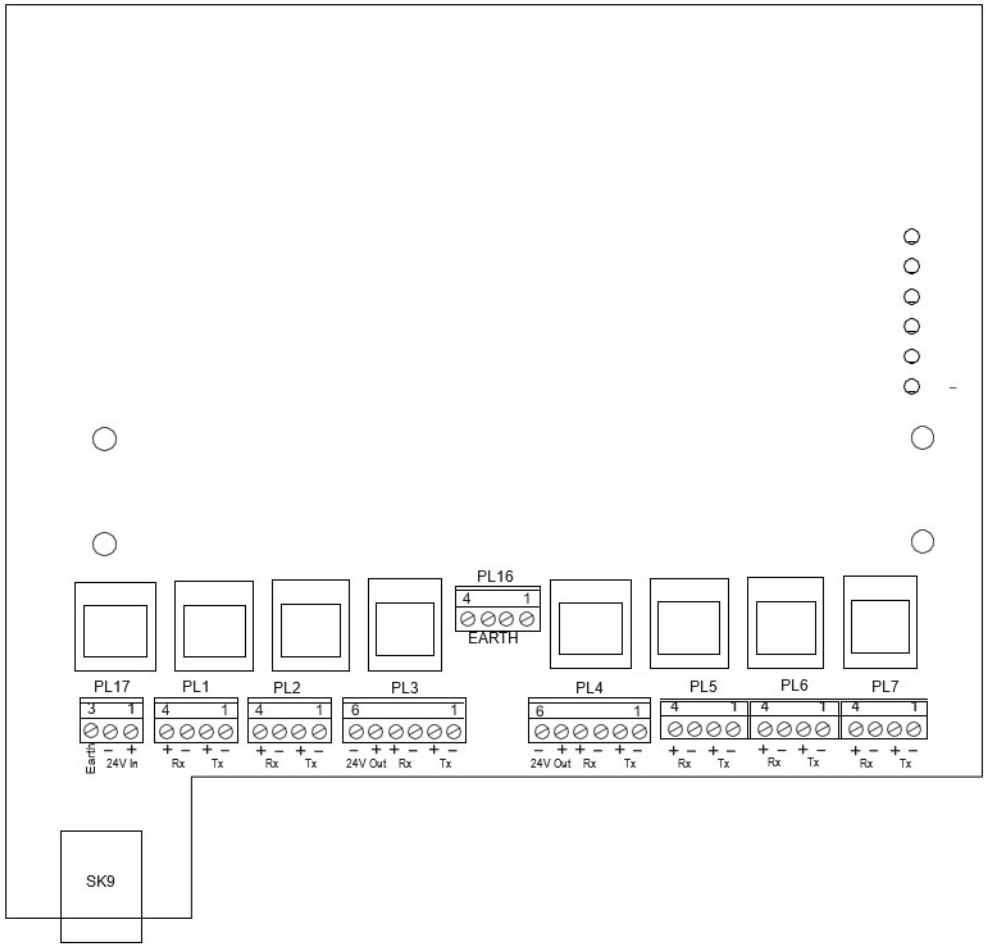


Figure 4-26 Switched hub connectors

Connector	Function
PL16	Earth connections
PL17	24vdc Power in
PL1, PL2, PL3, PL4, PL5, PL6, PL7	Ethernet connections to GCI, OT, PH, GCP and user network

Connector	Function
SK9	System services, typically for connection of laptop running GaugeToolsXL software.

4.9.5.1 Power Supply to Switched Hub

A Nordson 24V power supply unit (PSU) is supplied with the switched hub. This is connected to the switched hub as detailed below.

PSU Wire Colour	Function	Switched Hub
Red	+24V In	PL17 / 1
Blue	0V	PL17 / 2
Green	Earth (Ground)	PL16 / 1-4 (optional)

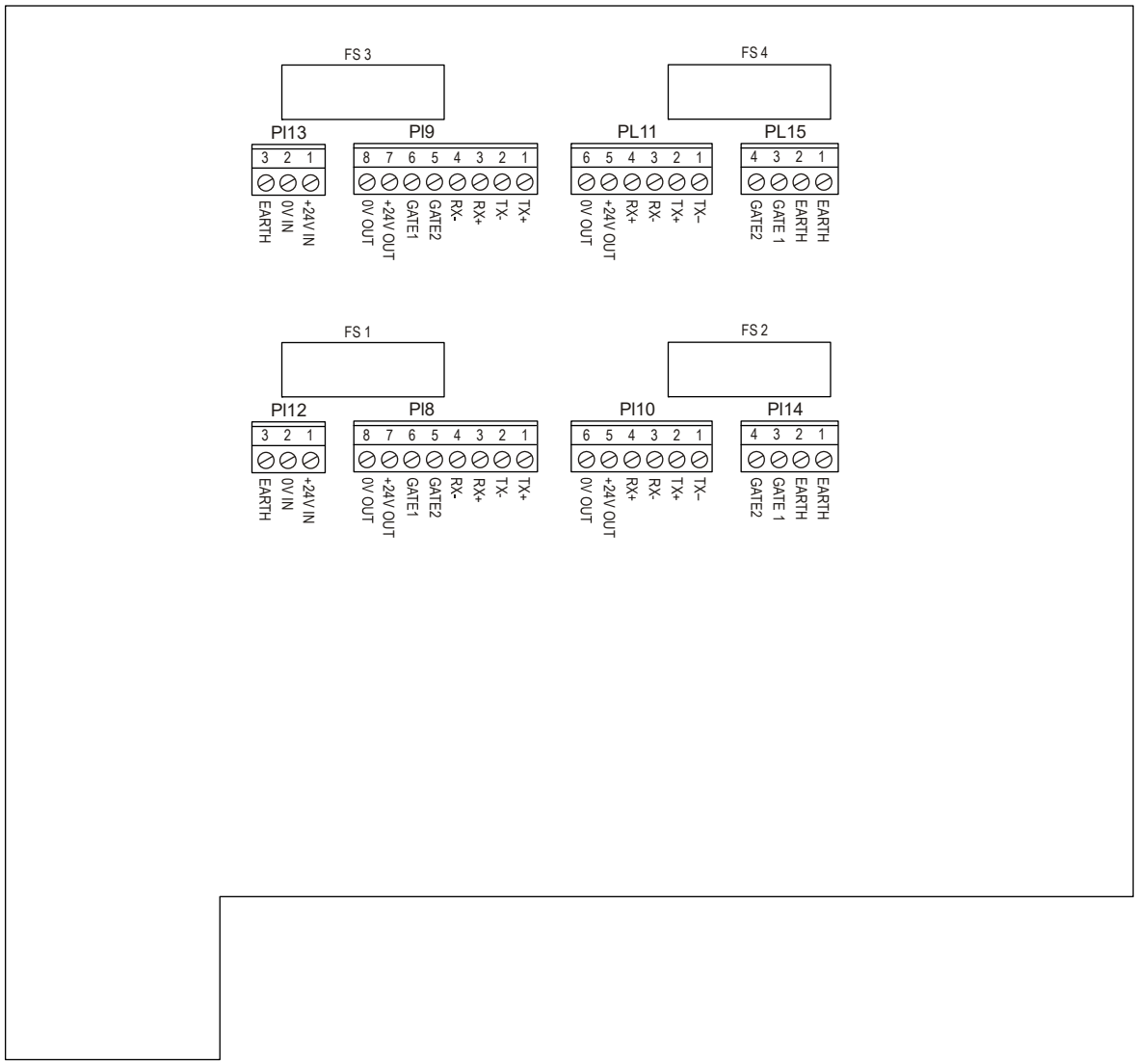


Figure 4-27 Power supply to switched hub connectors

Gauge 1 Connector	Gauge 2 Connector	Function
PL12	PL13	Power in
PL8	PL9	Ethernet and power to single-cable Series 9 Gauges
PL10	PL11	Ethernet and power out for connection to Series 9 peripherals
PL14	PL15	Earth and option function (Gate)

CHAPTER 5

5 Operation

5.1 Overview

The two Series 9 operator interfaces are:

- The **GCI (Gauge Control Interface)** which can monitor and control multiple gauges.
- The **OT (Operator Terminal)** which is dedicated to a single nearby gauge.

The GCI provides access to all user-controllable functions, subject to user passwords, including those used for gauge configuration and calibration. The OT provides access to the range of functions normally required for day-to-day operation. In all other respects, operation of the two interfaces is identical, and this section covers both.

In addition to these system interfaces, a standard web browser may be used to configure aspects of the Gauge Control Port (see Section 5.6 - Gauge Control Port Browser Interface), which has no user interface of its own.

5.1.1 Home Page

The default display for both the GCI and OT interfaces is a Home page, which appears automatically a few seconds after the interface is powered up.

A Home page displays up to four continuously-updated gauge measurements. Various other operating functions may be selected by touching the appropriate toolbar buttons on the bottom. See Section 5.1.3 - Toolbar Buttons.

A Home page may show a Trend chart in addition to the numeric gauge measurement. If there are at least two available Home pages, you can switch to a different Home page by touching one of the circle icons, or the **<** and **>** icons to scroll backward or forward.

On the GCI, the Home pages can display measurements from different gauges. On the OT, they can display measurements only from the single associated gauge.

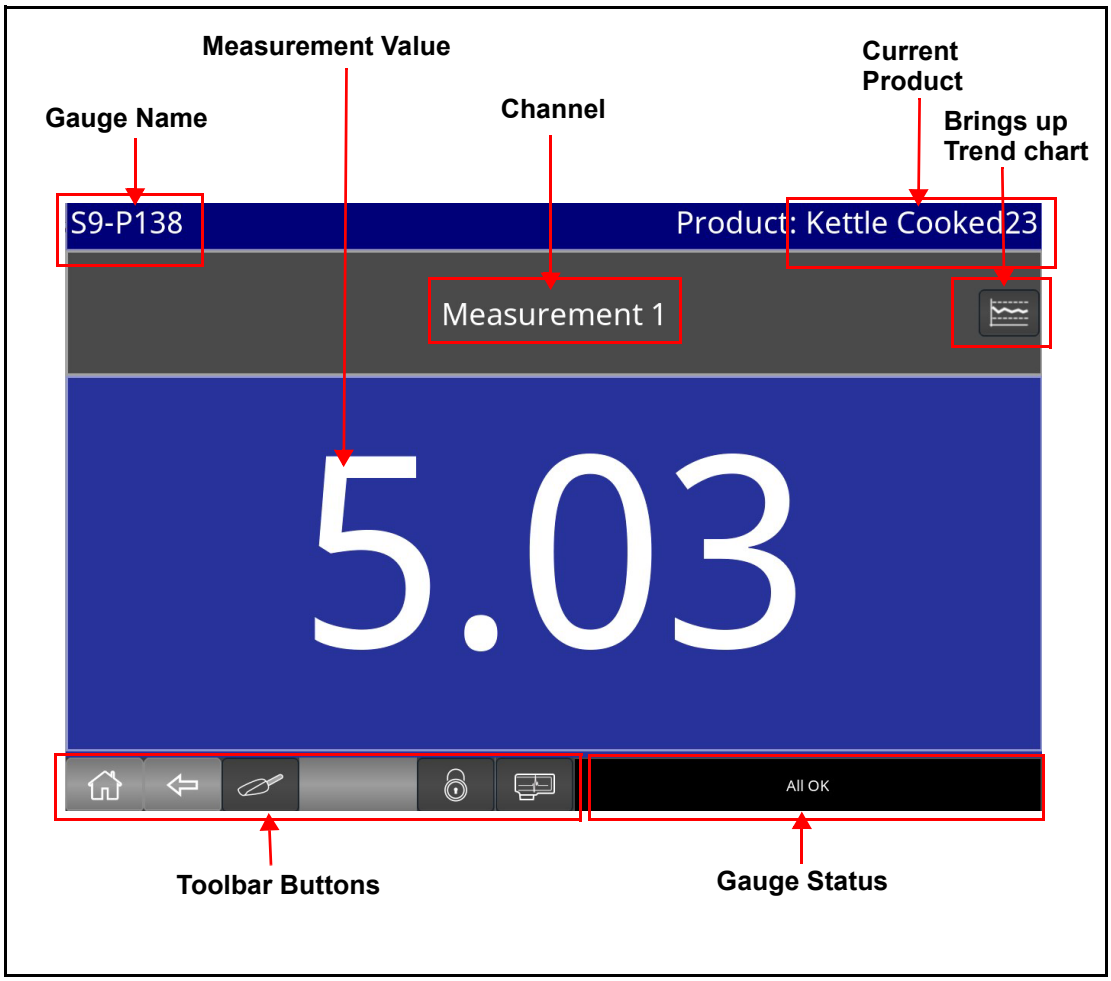


Figure 5-1 OT Home page

5.1.2 User Levels

The gauge supports 3 user levels:

- **Operator** – this is the default user. The user is automatically logged on as the Operator when the interface is powered up. This user does not require a password.
- **Supervisor** – this user requires a password. A user logged on as a Supervisor has access to more functions than the Operator user.
- **Engineer** – this user is primarily for use by Nordson engineers. It also requires a password. A user logged on as an Engineer has access to more functions than the Supervisor or Operator user. For example, an Engineer has the capability of configuring the analogue and digital outputs.

Section 5.2.1 - Logging In as Supervisor or Engineer shows how to log on as a Supervisor or Engineer.

The toolbar buttons shown on the bottom of the screen will vary, depending on which user is currently logged on, and whether the device is a GCI or OT. See Section 5.1.3 - Toolbar Buttons.

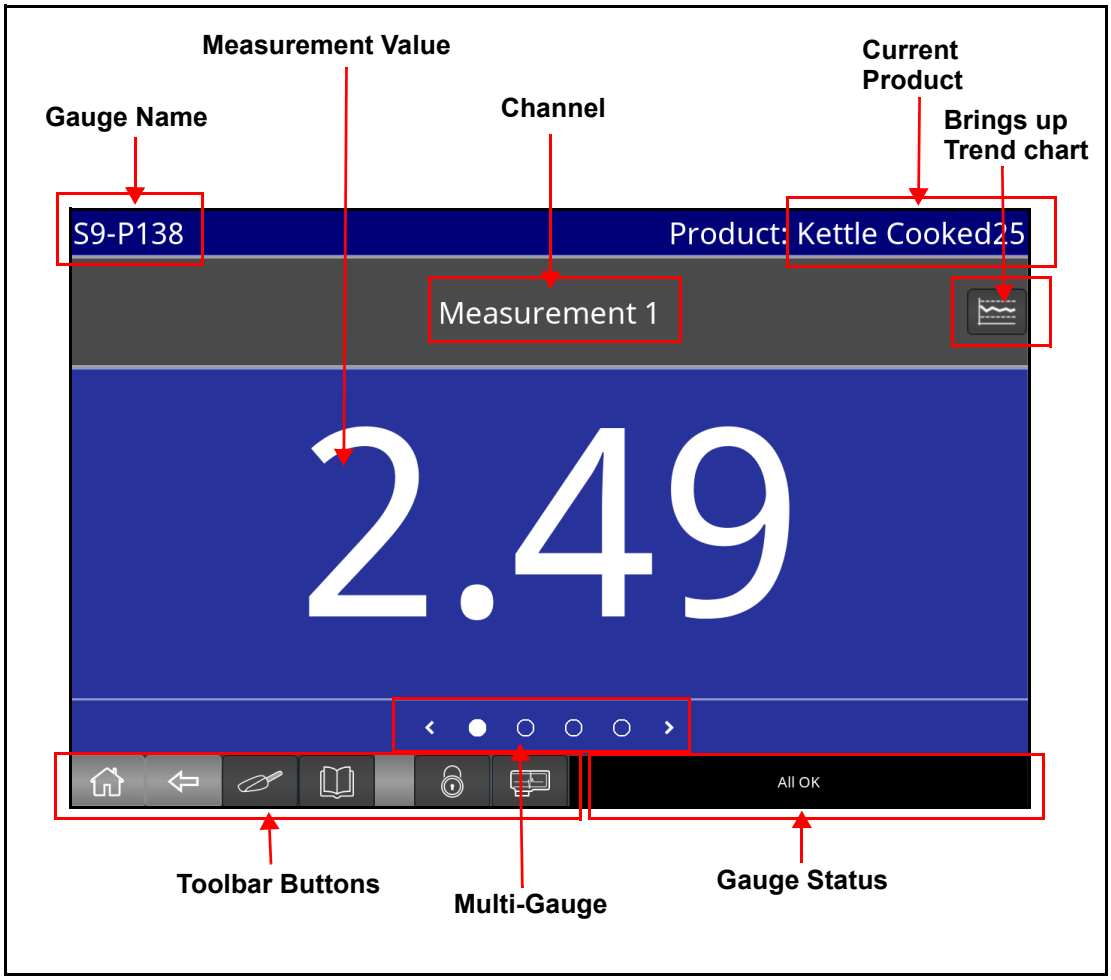


Figure 5-2 GCI Home page

Figure 5-3 shows a multi-gauge screen.

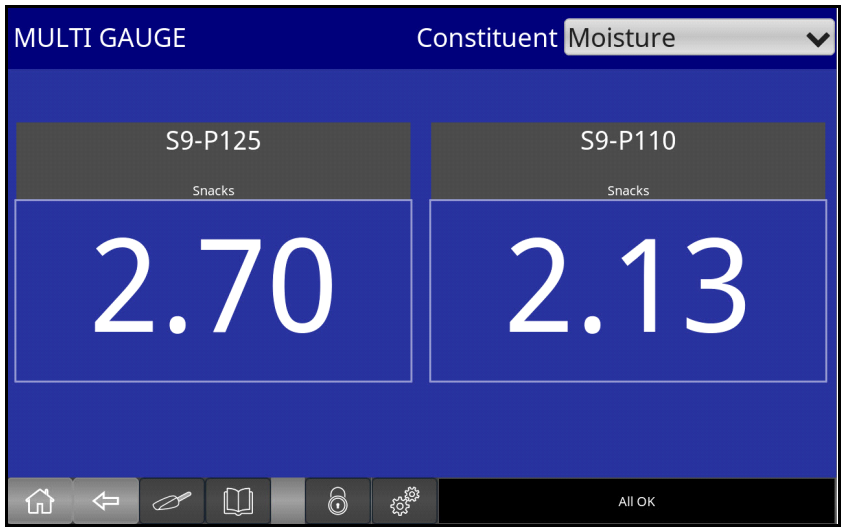


Figure 5-3 Multi-gauge screen

A tap from the multi-gauge screen takes you to the screen for a single gauge (Figure 5-4). Swipe to switch between these two screens.

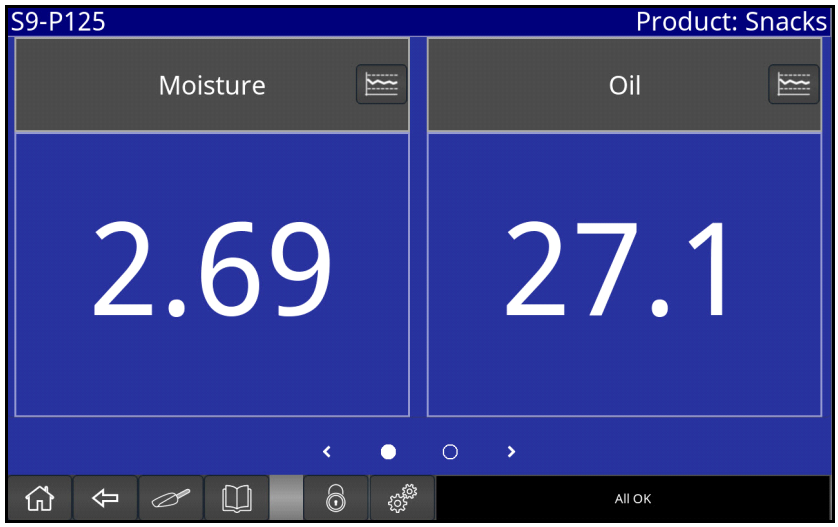


Figure 5-4 Single gauge screen

5.1.3 Toolbar Buttons

The toolbar buttons shown vary, depending on:

- whether the device is a **GCI** or an **OT**
- which user is currently logged on: **Operator**, **Supervisor** or **Engineer.** See Section 5.1.2 - User Levels.

These buttons are described below.

Button	Description
	**Home** – Brings up the Home page.
	**Back** – Returns to the previous page.
	**Sample** – Brings up the Sample page for taking sample measurements for calibration.
	**Product Selection** – This button is available to the Supervisor or Engineer, on the GCI only. It brings up the Load Product page for loading a Product.
	**Security** – This button brings up the Security page for logging in or out as a Supervisor or Engineer.
	**Gauge Diagnostics** – This button is available only to the Operator. It brings up the Gauge Diagnostics page.
	**Configuration** – This button is available only to a Supervisor or Engineer. It brings up the Settings page. Note that the Settings page differs, depending on whether the user is logged on as a Supervisor or Engineer, and whether the interface is a GCI or OT.
	**Gauge/Ref. Check** – This button appears on the Gauge Diagnostics page. It brings up the Gauge/Ref. Check page.

5.1.4 Responding to Error Messages

The Gauge Status is shown in the box on the bottom right of every screen (Figure 5-5). If the gauge(s) are functioning properly, the message “All OK” is displayed.

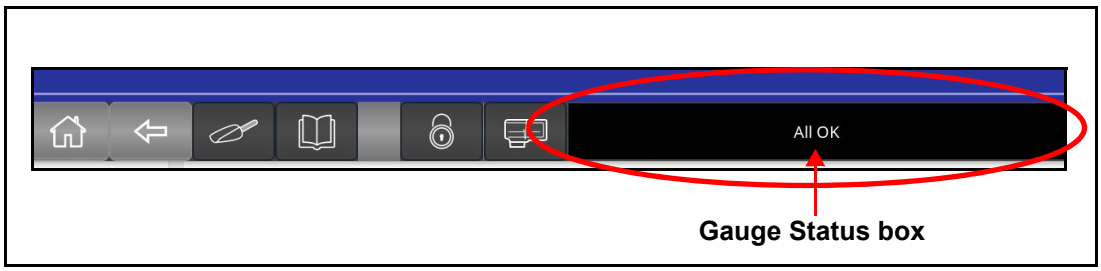


Figure 5-5 Gauge Status box

Touch the Gauge Status box to bring up the Gauge Status page (Figure 5-6). This page shows the Gauge Name, Status, IP Address and duration of uptime.

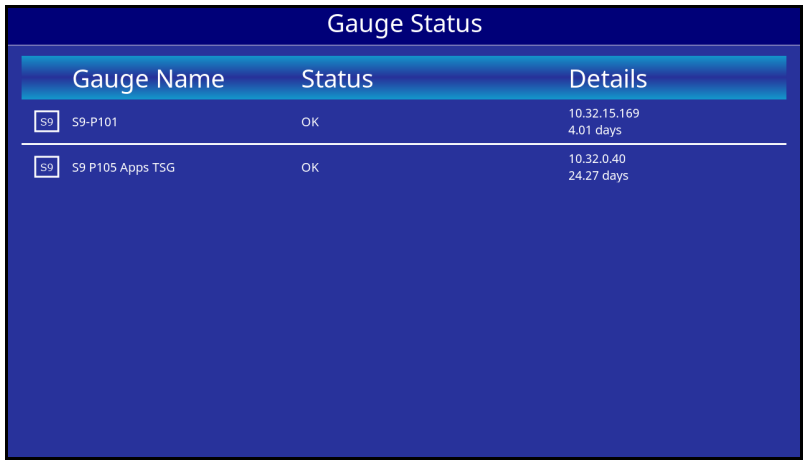


Figure 5-6 Gauge Status page

When a fault occurs on a gauge, it is indicated by a highlighted message in the Gauge Status box, in place of the normal “All OK” message. If there are multiple errors, the one with the highest priority is displayed.

1. Touch the highlighted error message to display the Gauge Status page.

   This lists all gauges with their current status, showing the gauge(s) generating errors.

2. Refer to the error message descriptions (see Section 10.1 - System Error Messages), and take the relevant actions to clear the error conditions.

3. As each error condition is cleared the associated error message is automatically removed. On removal of the last error, the message reverts to “All OK”.

5.1.5 Viewing the Software Version and Device Type

To display the page that shows the software version and device type (GCI or OT), slowly tap the Gauge Status box on the bottom right of the screen (Figure 5-5). After seven taps, that page should appear (Figure 5-7). If the page appears briefly, then disappears, continue tapping until it reappears.

The information shown on this page will be helpful if you are contacting Nordson for technical support.

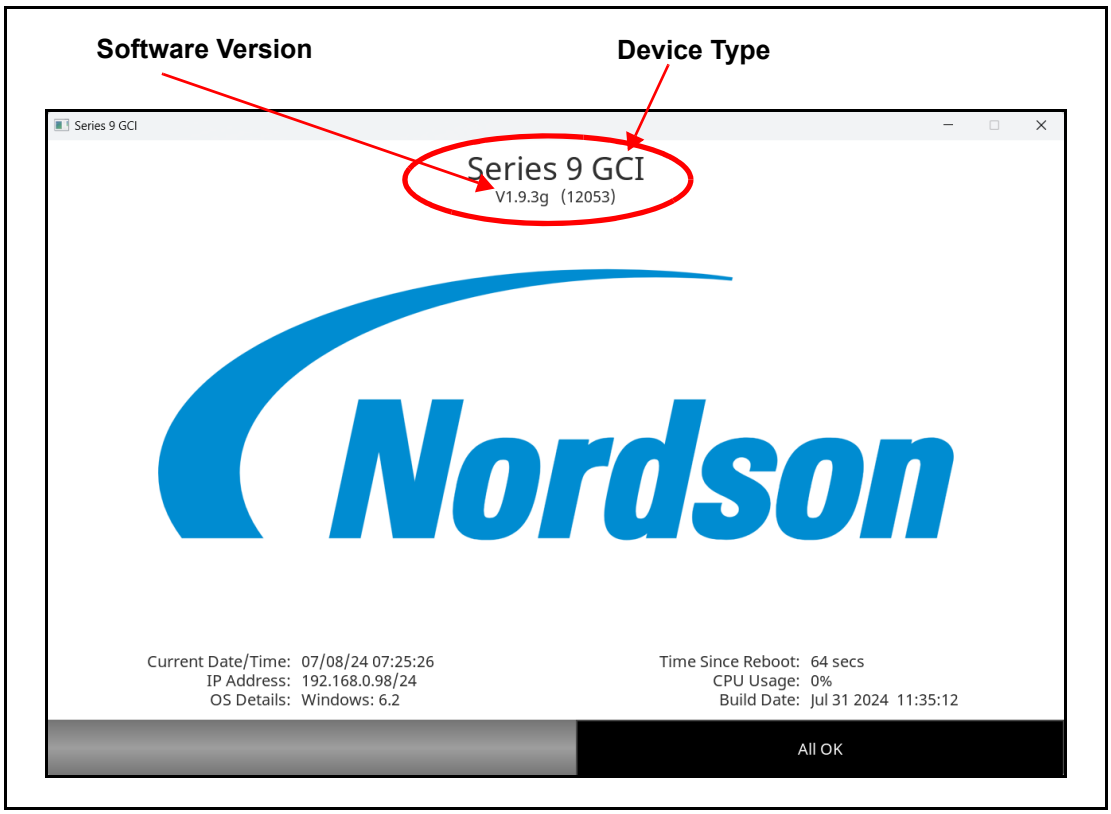


Figure 5-7 Device type and software version

Note: The information above (excluding the device type) is also accessible to a Supervisor or Engineer by selecting **Information** on the Local Settings page. See Section 6.6 - Local Settings.

5.2 Security

The gauge supports 3 user levels: **Operator**, **Supervisor** and **Engineer**. See Section 5.1.2 - User Levels for a description of these users.

Note: Auto Logout Feature

If you are logged in as a Supervisor or Engineer, and there is no screen activity (i.e., button touches) within the **Auto LogOff Time** period on the Local Settings page, you will automatically be logged out, the current user will revert to Operator, and the Home page will be displayed,

5.2.1 Logging In as Supervisor or Engineer

The Supervisor and Engineer users require a password. To log in as a Supervisor or Engineer:

1. Touch the  **Security** button. The Security page will appear (Figure 5-8).

Figure 5-8 Security page

2. The topmost button shows the user that is currently logged on. **Operator** is the default user.

   Touch the **Supervisor** or **Engineer** button.

3. Enter the password for Supervisor or Engineer using the displayed keyboard (Figure 5-9). See Section 5.3 - Data Entry.

   If the password that you entered is correct, you will be logged in as a Supervisor or Engineer.

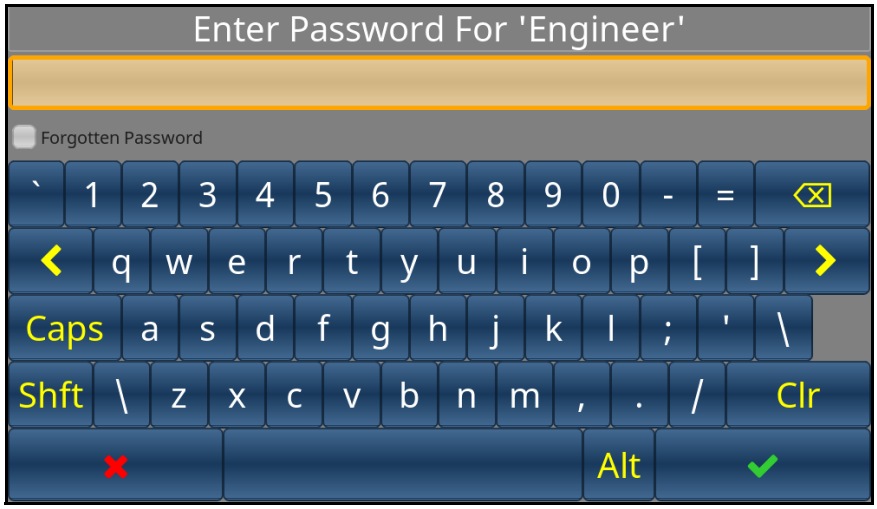


Figure 5-9 Keyboard for entering password

Note: If you have forgotten the Supervisor or Engineer password, check the **Forgotten Password** box in the displayed keyboard, and a message will appear with a code that you can provide to Nordson to obtain a temporary password.

5.2.2 Logging Out

The Log Out function is only relevant if you are currently logged on as a Supervisor or Engineer. To log out:

1. Touch the  **Security** button. The Security page will appear (Figure 5-8).
2. Touch the **Log Out** button.

   This will cause the current user to be set to Operator, and the Home page to be displayed.

5.3 Data Entry

Pages that allow any sort of data entry, such as a name or numerical value, have touch-sensitive fields which appear as white boxes. For example, Figure 5-10 shows editable boxes on the Edit Product page (which appears only on the GCI).

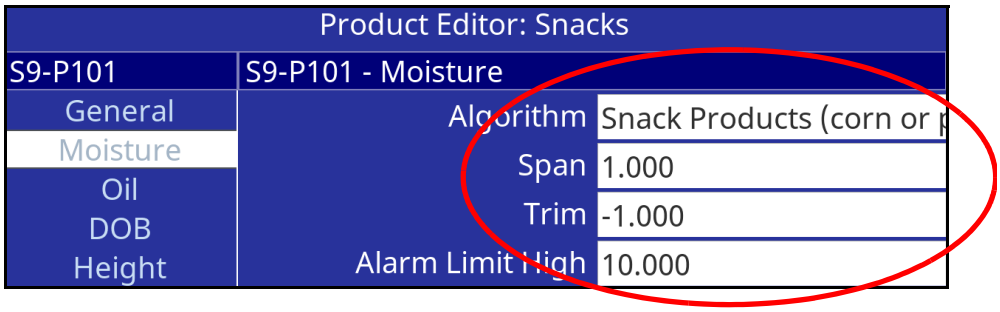


Figure 5-10 Editable boxes on Edit Product page

If a setting is shown in a lightly shaded gray box (such as the ones shown on the Gauge Diagnostics page, Figure 5-11), this indicates that it is read-only.

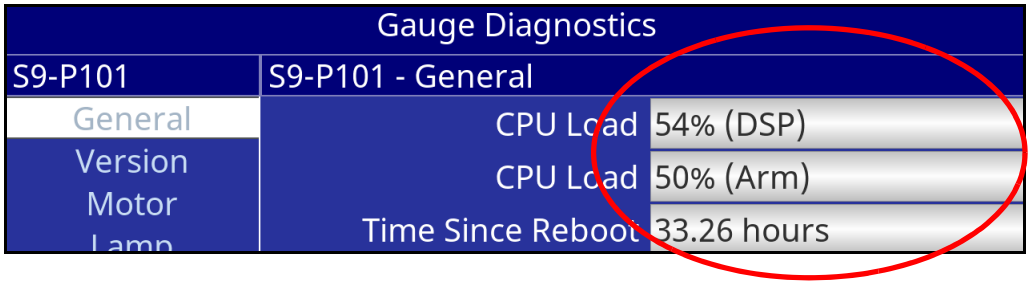


Figure 5-11 Lightly shaded gray boxes on Gauge Diagnostics page

When you touch a data entry field, a full-text keyboard or numerical keypad is displayed, as appropriate for the required entry.

If a new value is entered for a field in a product, that field is shown in a lightly shaded yellow color (Figure 5-12).

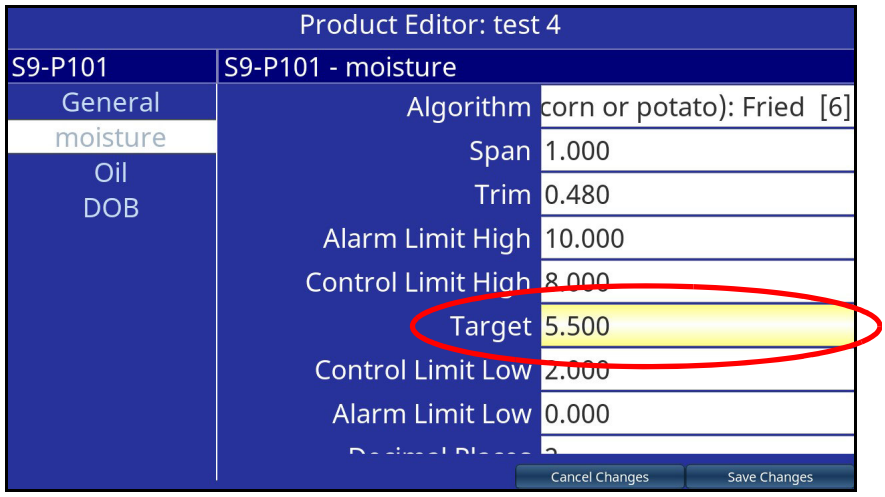


Figure 5-12 Changed value shown in box with light yellow background

There are several different versions of both the full-text keyboard and numerical keypads. The version displayed depends on the current interface language (see Section 6.6 - Local Settings), and on the particular data entry function.

5.3.1 Numerical Keypad

Figure 5-13 shows a sample numerical keypad that is displayed when the **Sample Time** box is touched on the Sample page. Note that the cursor that indicates the current position is denoted by the flashing vertical sign.

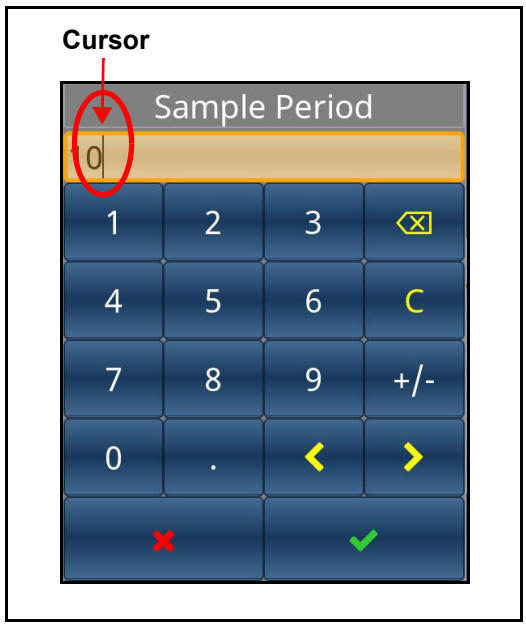


Figure 5-13 Sample numerical keypad

Selected keys appearing on the numerical keypad are described below.

Key	Function
	**Delete** – Deletes the character previous to the cursor
	**Clear** – Clears the current entry
	**+/-** – Changes the sign of the current value (e.g., to enter a minus sign (-) to designate the value as negative)
	**Decimal Point** – Inserts a decimal point
	**Back** – Moves the cursor back by one character
	**Forward** – Moves the cursor forward by one character
	**Cancel** – Cancels the current entry
	**Enter** – Confirms the current entry and closes the keypad

5.3.2 Full-Text Keyboard

Figure 5-14 shows a sample full-text keyboard that is displayed when the **Rename** button is touched on the Configure Products page (GCI only). Note that the cursor that indicates the current position is denoted by the flashing vertical sign.

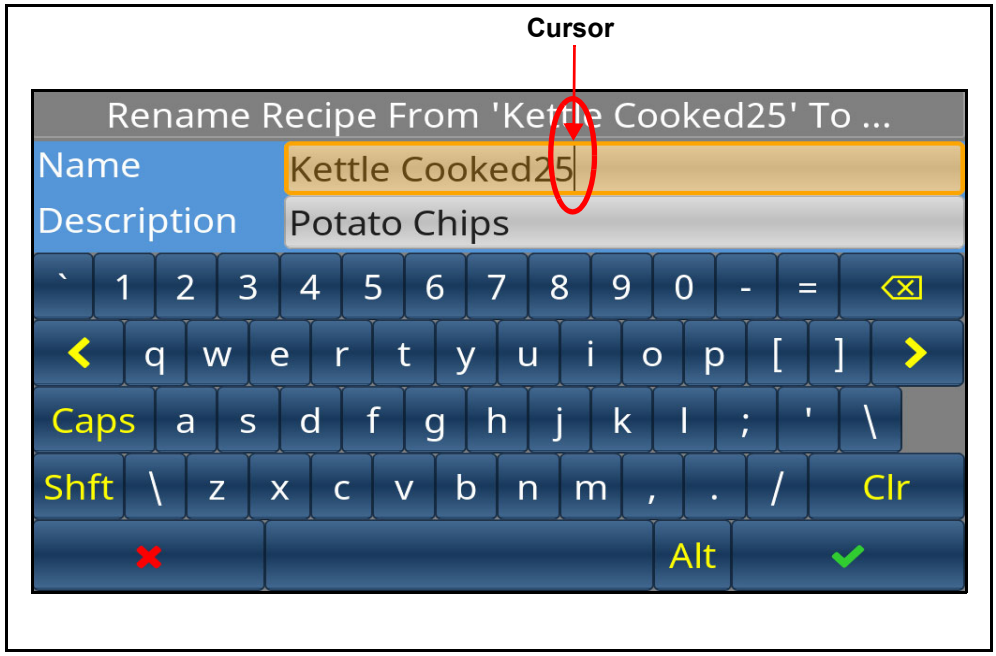


Figure 5-14 Sample full-text keyboard

Some of the keys (e.g., **Enter** and **Cancel**) on the full-text keyboard are identical to those on the numeric keypad. See Section 5.3.1 - Numerical Keypad for a description of those keys. Additional keys are described in the table below.

Key	Function
Caps	**Caps** - Toggles between upper-case and lower-case text entry. The alphabetical keys show the current state. Lower case is the default state.
Clr	**Clear** - Clears the current entry
Shft	**Shift** - Toggles Shift mode on and off. Shift mode is automatically canceled after a character is entered.

Key	Function
	**Alt** - Toggles full-text keyboards between alternative characters and the standard keypad display.
 , 	**Modified Characters** - Where relevant for the current language, these enable accented and other modified characters to be entered.
	**Pinyin** - Toggles between Pinyin and standard entry modes when the current language is Chinese.
	**Change** - Toggles the full-text keyboards between Hiragana, Katakana and standard entry modes when the current language is Japanese.

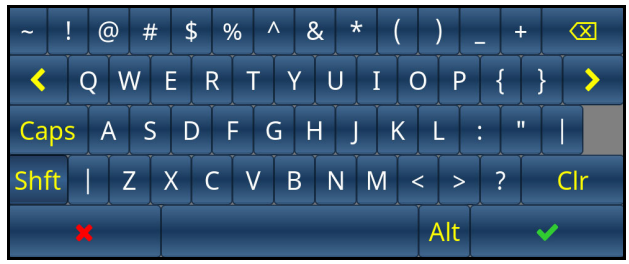
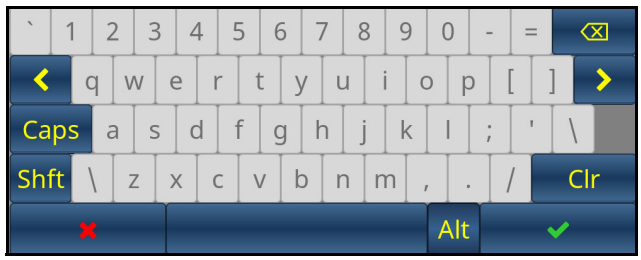
The full-text keyboard is included in the following three categories:

- Standard localised keyboard for languages using Roman and Cyrillic alphabets (see Section 5.3.3 - Standard Localised Keyboard)
- Chinese (see Section 5.3.4 - Chinese Keyboard)
- Japanese (see Section 5.3.5 - Japanese Keyboard)

5.3.3 Standard Localised Keyboard

The standard localised keyboard provides access to the basic Roman and Cyrillic character sets of upper and lower case letters, numbers and punctuation. It also supports language-specific alternative and modified characters.

There are several modes of operation, as shown in the table below.

Lower-case mode (Default) Toggle the **Caps** key to select this mode. This mode provides numbers and lower case letters.	
Caps mode Toggle the **Caps** key to select this mode. This mode provides numbers and upper case letters.	
Shift mode Touch the **Shft** key to select this mode. This mode provides punctuation characters and upper case letters. Shift mode is automatically canceled after a character is entered.	
Alternative mode Touch the **Alt** button to select this mode. This mode provides alternative characters appropriate to the current language. Alternative mode is automatically canceled after a character is entered.	

Modified Character mode Provides accented and other modified characters. Modified Character mode is automatically cancelled after a character is entered.	

5.3.3.1 Modified Characters

Where modified characters are available, one or more character modifier keys are added. These keys are displayed in orange, for example:

 or

To enter a modified character:

1. Touch the appropriate character modifier key.

   The modifier is entered in the text box, and keys that have modified alternatives are displayed.
2. If necessary, touch the **Shft** key to access other characters.
3. Do one of the following.

   - Touch the required character key. The character will appear in the text box, and the modified character mode will be cancelled.
   - Touch the **Space** key to exit modified character mode.

5.3.4 Chinese Keyboard

When the selected language (see Section 6.6 - Local Settings) is Chinese, the keyboard has two main operating modes.

Pinyin (default) Pinyin is a system for entering Chinese characters by spelling out their sound using standard Roman characters. Literally translated, Pinyin means 'spell sound' or the 'spelling of the sound'.	

Standard mode The keyboard operates as described for the standard localised keyboards (see Section 5.3.3 - Standard Localised Keyboard).	

The **Pinyin** key toggles between the two modes.

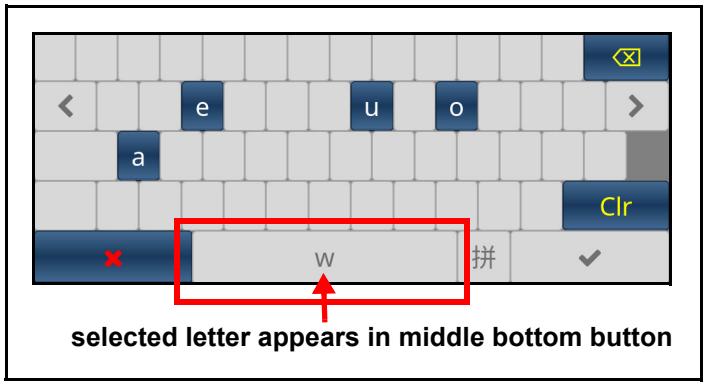
The general procedure for using Pinyin entry is as follows.

1. Select Pinyin mode.

   The keyboard enables only those letters that are valid for starting a character sound.

2. Touch the appropriate letter.

   This appears in middle bottom button, and the letters that are valid for continuing the sound are enabled on the keyboard.



selected letter appears in middle bottom button

3. Continue using the letter keys to spell out the required character sound until the number keys are enabled.

   At this point you can either:

   - continue to select letter keys to define the sound or;
   - select a number key to define the tone of the sound (approximately similar to adding an accent).

When a number key is selected, the top row of keys changes to display valid Chinese characters for the spelled sound.

4. Touch the required character, which then clears the roman letters and number in the middle bottom button.

5. Repeat this process to add all required characters.

Note: Extensive information on the Pinyin entry system can be found at: http://www.pinyin.info/ and http://en.wikipedia.org/wiki/Pinyin.

5.3.5 Japanese Keyboard

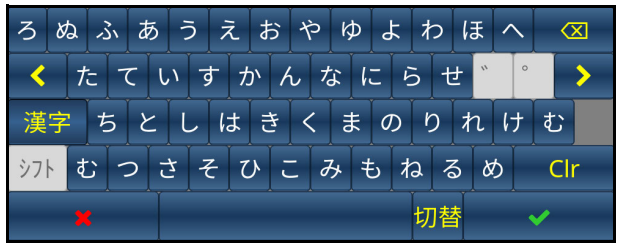
When the selected language (see Section 6.6 - Local Settings) is Japanese, the keyboard provides access to three writing systems, each of which has different operating modes.

Hiragana (default) In Hiragana, you can also access the Kanji entry system.	
Katakana The keyboard provides for direct entry of full- and half-width characters.	 
Standard The keyboard operates as described for the standard localised keyboards (see Section 5.3.3 - Standard Localised Keyboard).	

The **Change** key toggles between the three writing systems.

5.3.5.1 Hiragana

The Hiragana keyboard provides two systems of character entry.

Direct Hiragana mode in which characters selected on the keyboard are added directly to the text box.	
Kanji mode (default) Provides the ability to enter Kanji characters by selecting a sequence of Hiragana characters.	

The **Kanji** key toggles between the two systems.

Using Direct Hiragana Entry

1. Select the **Kanji** key.

2. Enter characters, as required, direct from the keyboard.

3. Use the 

   , 
   , or 
   key as necessary to access shifted characters and voiced modifiers (see Section 5.3.5.3 - Voiced Modifiers).

Using Kanji Entry

The general procedure for using Kanji entry is as follows.

1. Touch the required character key.

   This will narrow the keypad selection to only those characters that can still complete a Kanji character. The **Space** key shows selected character, with the total number of Kanji characters available for selection in parentheses.

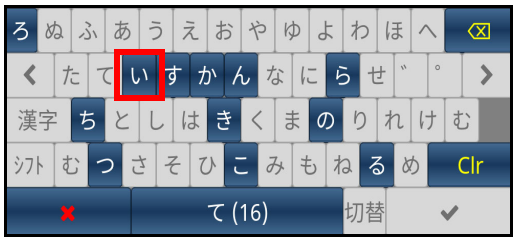
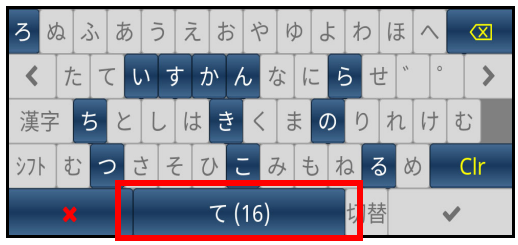
   For example, after touching the 

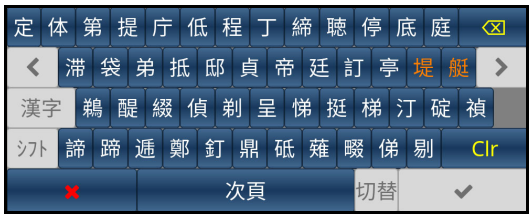
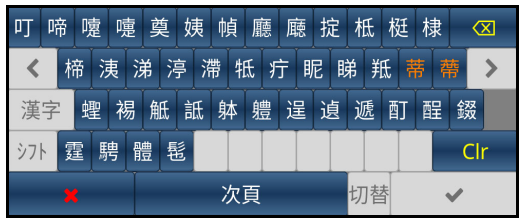
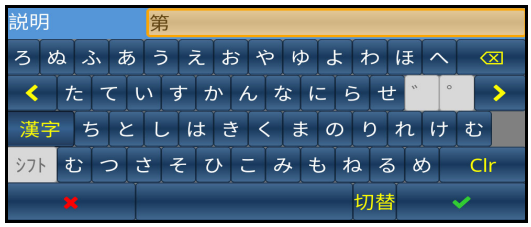
key, the keyboard shows this:

2. At this point you can do **either** of the following:

   - Narrow the search for Kanji characters by selecting further characters.
   - View currently available Kanji characters.

   The procedures are illustrated in the examples below.

Narrow the search	View Kanji characters
• Select another character. The number of keys available for further selection is reduced. 	• At any point in the process of entering characters, the **Space** key shows the number of available valid Kanji characters. Touch the key to view them. 

Narrow the search	View Kanji characters
• Continue to add keyboard characters. When the search cannot be narrowed any further, the available Kanji characters are displayed. 	• If there are more Kanji characters than it is possible to display, touch the **Space** key to view more. 
• Select the required Kanji character. The selected character will appear in the text box.  • The keyboard is now ready for entry of the next Kanji character. • Repeat this process to add all required Kanji characters.	• If the required Kanji character is available, select it to enter it into the text box. • If not, touch the **Delete** key to return to the narrowing process. 

Note: Extensive information on the Kanji entry system can be found at: http://en.wikipedia.org/wiki/Kanji

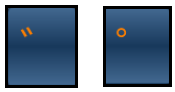
5.3.5.2 Katakana

The Katakana writing system provides several modes of operation:

Caps mode Use the 大文字 key to toggle in and out of Caps mode.	
Shift mode Use the シフト key to toggle in and out of Shift mode. Shift mode is automatically cancelled after a character is entered.	
Half width mode displays a keyboard of half-width characters. Use the **Change** 切替 key to toggle between half width and full width characters.	
Modified Character mode Use the シフト , ゛ , or ゜ key as necessary to access shifted characters and voiced modifiers (see Section 5.3.5.3 - Voiced Modifiers). Modified Character mode is automatically cancelled after a character is entered.	

5.3.5.3 Voiced Modifiers

The Hiragana and Katakana full-width modes support character modifiers for voiced and semi-voiced sound marks. The associated keys are displayed in orange.



To enter a modified character:

1. Touch the appropriate character modifier key.

   The keys that have modified alternatives are displayed.

2. If necessary, touch the 

key to access other characters.

3. Do one of the following.

   - Touch the required character key. The character will appear in the text box, and the modified character mode will be cancelled.

   - Touch the **Delete**  key. The modified character mode will be cancelled.

5.4 Gauge Interface

The Gauge Interface provides facilities for performing tasks related to a particular gauge. You can take sample measurements or make adjustments to the gauge.

5.4.1 Viewing Measurement Trends

It is possible to view a continuously-updated trend graph for any individual gauge measurement channel. This can be done from a Home page:

– Displaying a Trend from a Home Page

Touch the  **Home** button to bring up the Home page, then touch the  **Trend** button. Figure 5-15 shows the trend graph that appears on the Home page. The graph X-axis spans 60 seconds. If desired, it can be changed to 30 minutes or 12 hours, by touching the **30m** or **12h** button. Y-axis is centered on the average measured value over this time. The measured value for the selected measurement channel is shown in a box above the graph.

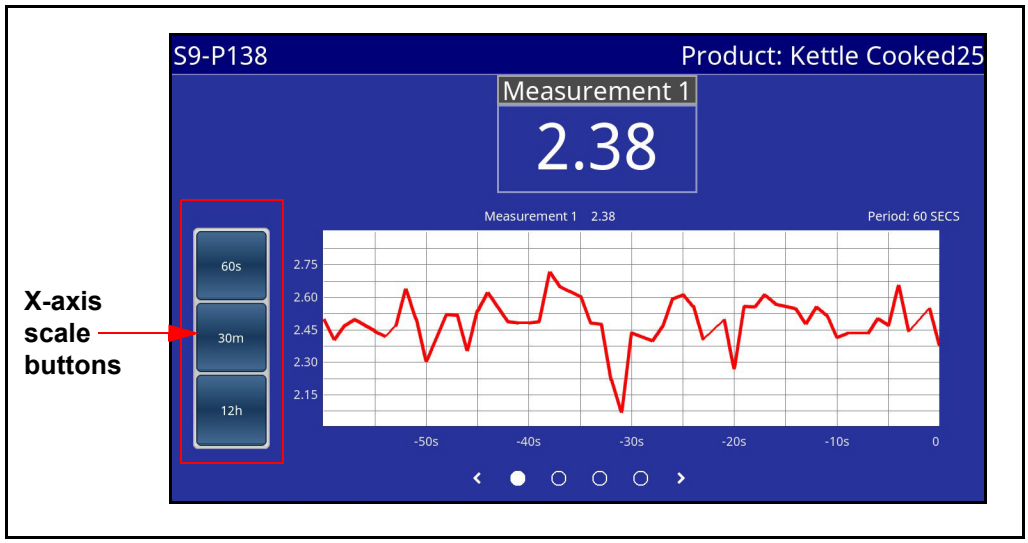


Figure 5-15 Trend graph on Home page

5.4.2 Sample Function

The sample function is used in conjunction with the Trim function for calibrating gauges against standard laboratory reference measurements. For information on its use, refer to the Calibration section (see Section 7.2.2.1 - Obtaining Samples and Calibration).

5.4.3 Trim Function

The Trim function is used in calibration procedures to align the gauge measurements with values obtained using laboratory reference samples. For information on it use, refer to the Calibration section (see Section 7.2.2 - Trim).

5.5 Gauge Diagnostics

The Gauge Diagnostics function provides facilities for:

- Viewing a range of diagnostic data from the gauge
- Re-referencing the gauge
- Conducting a reference check

5.5.1 Viewing Diagnostic Information

The Gauge Diagnostics page displays various diagnostic information about the gauge. Operators can access this page by touching the  **Gauge Diagnostics** button. Supervisors and Engineers can access this page by touching the  **Configuration** button, and then selecting  **Gauge Diagnostics** on the Settings page.

There are at least 4 groups of information that can be viewed on the Gauge Diagnostics page, selectable by touching **General**, **Version**, **Motor** or **Lamp** from the left pane of the screen. If your system includes options, additional groups will be accessible here as well.

The **General** group (Figure 5-16) displays information such as the internal temperature of the gauge and the window contamination level.

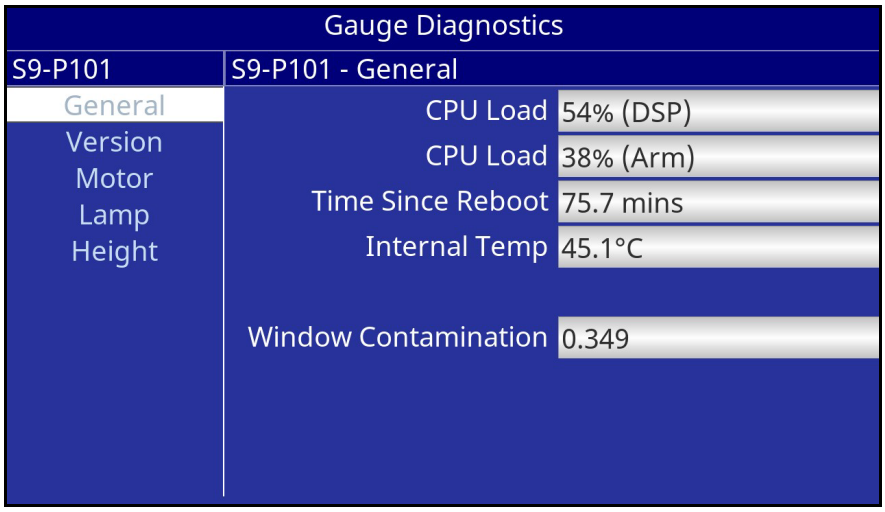


Figure 5-16 Gauge Diagnostics page – General group

The **Version** group (Figure 5-17) displays information about the version of the software and application in the gauge.

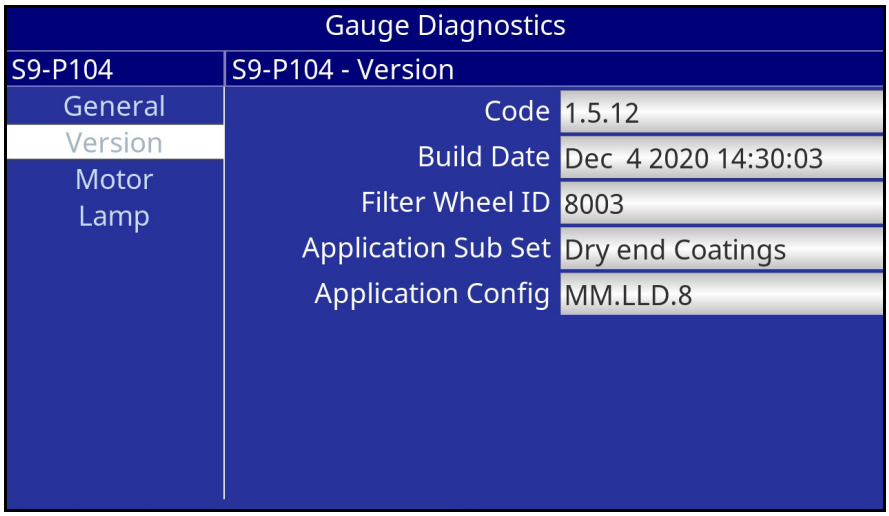


Figure 5-17 Gauge Diagnostics page – Version group

The **Motor** group (Figure 5-18) displays information about the motor, such as the target and current speeds.

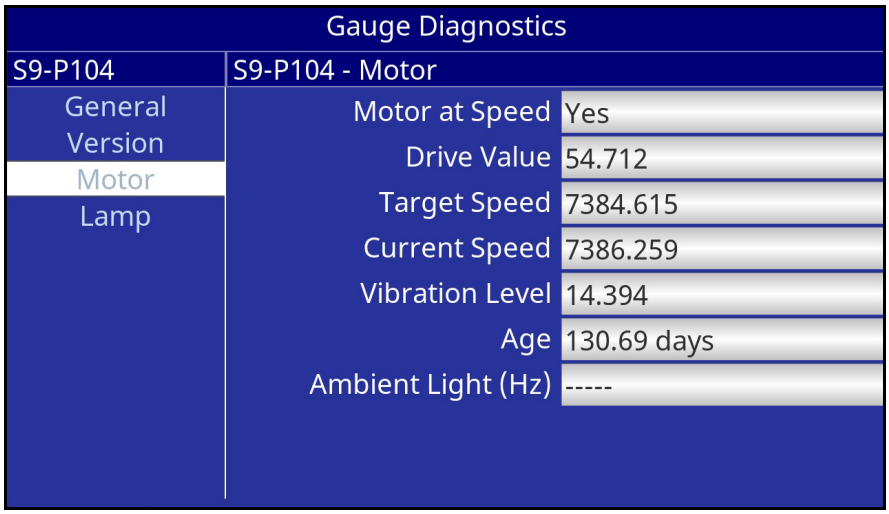


Figure 5-18 Gauge Diagnostics page – Motor group

The **Lamp** group (Figure 5-19) displays information about the lamp, such as the current and voltage.

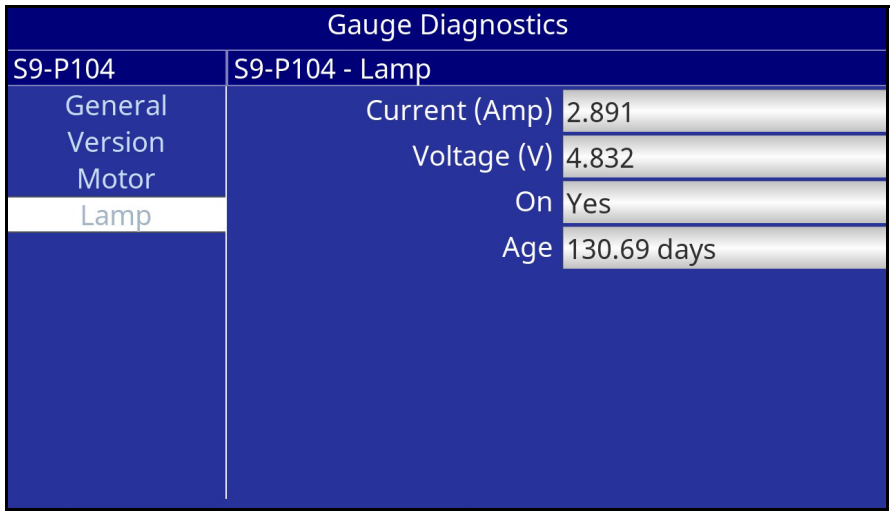


Figure 5-19 Gauge Diagnostics page – Lamp group

Section 10.1 - System Error Messages describes which parameters on the Gauge Diagnostics page to monitor when error messages are shown.

5.5.2 Performing an Internal Reference

This is described in the Calibration section (see Section 7.2.3 - Internal Referencing the Gauge).

5.5.3 Performing a Gauge Check

This is described in the Calibration section (see Section 7.2.5 - Checking Gauge Stability).

5.6 Gauge Control Port Browser Interface

The Gauge Control Port has no built-in user interface. Instead, its software includes a web server, which allows configuration functions to be presented on a PC running a standard web browser such as Chrome.

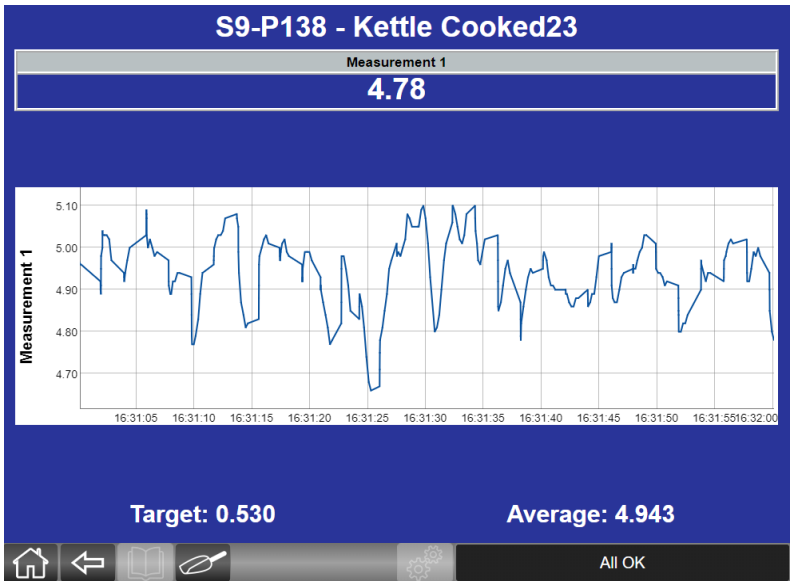
To use the web browser interface:

1. Obtain the IP address of the Gauge Control Port from the Factory Settings Sheet (see Section 1.3 - Associated Documentation).

2. Connect a PC network port to the Ethernet RJ45 connector on the Gauge Control Port.

3. Start a web browser on the PC and enter the Gauge Control Port IP address.

   The Gauge Control Port web page should be displayed, which provides access to functions and to other pages.



The functions provided by the browser interface operate in a similar way to the GCI, except that pop-up keyboards or numeric keypads are not displayed. Where a text or numeric entry is required, type it in using the PC keyboard.

The functions of the available buttons are as described in Section 5.1.3 - Toolbar Buttons. Use the PC mouse to make selections.

CHAPTER 6

6 Supervisor and Engineer Functions

This chapter discusses functions that can only be performed by users with security levels **Supervisor** and **Engineer**. Some of these functions are accessible only on the GCI. (Section 5.2.1 - Logging In as Supervisor or Engineer describes how to log in as a Supervisor or Engineer.)

6.1 Settings Page

Users logged on as a Supervisor or Engineer can access the Settings page by touching the  **Configuration** toolbar button. Icons on the Settings page vary, depending on whether the user is a Supervisor or Engineer, and whether the interface is a GCI or OT.

6.1.1 Supervisor – GCI

Figure 6-1 shows how the Settings page appears to a Supervisor logged on to a GCI.

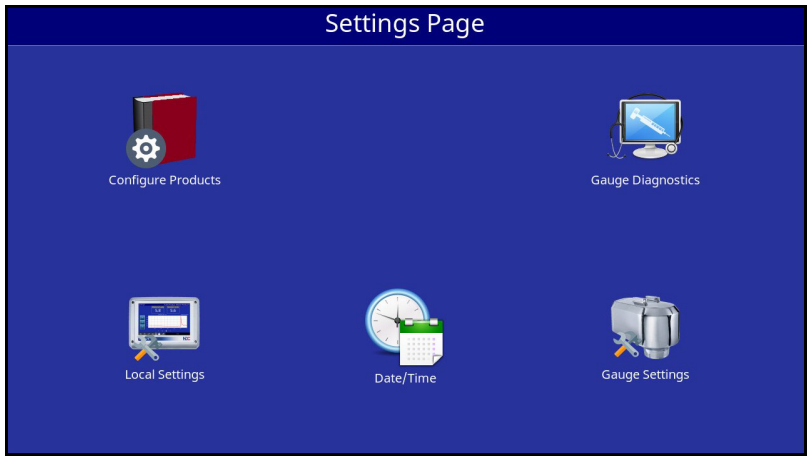


Figure 6-1 Settings page for a Supervisor on a GCI

6.1.2 Supervisor – OT

Figure 6-2 shows how the Settings page appears to a Supervisor logged on to an OT.

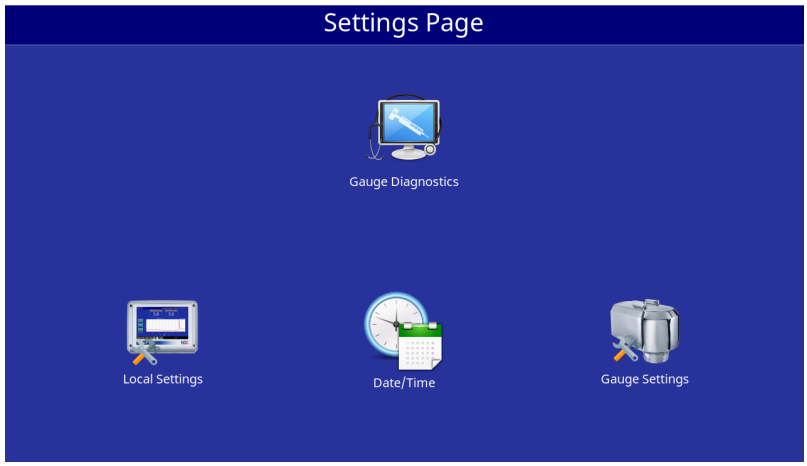


Figure 6-2 Settings page for a Supervisor on an OT

6.1.3 Engineer – GCI

Figure 6-3 shows how the Settings page appears to an Engineer logged on to a GCI.

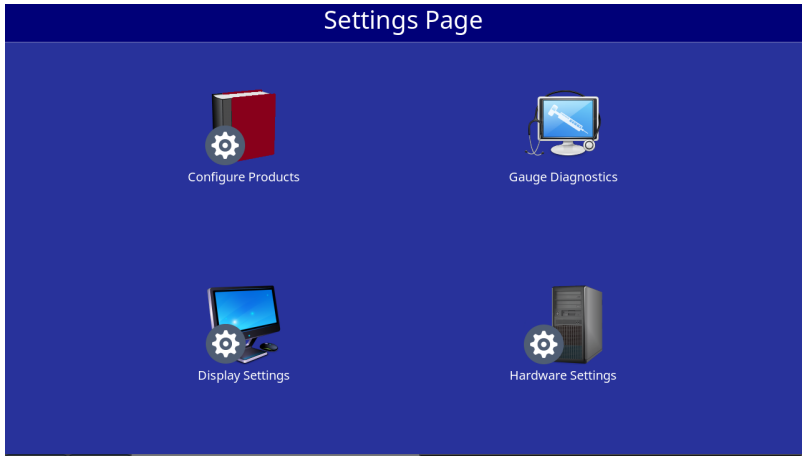


Figure 6-3 Settings page for an Engineer on a GCI

6.1.4 Engineer – OT

Figure 6-4 shows how the Settings page appears to an Engineer logged on to an OT.

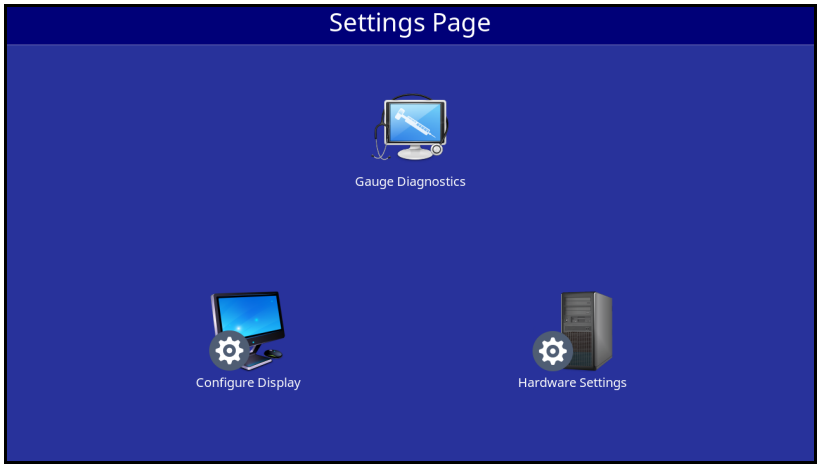


Figure 6-4 Settings page for an Engineer on an OT

6.2 About Products

Series 9 gauges have a small number of user-configurable settings that govern the way they measure. Products are named collections of these settings, stored in the individual gauges for recall as required. Their function is to enable gauges to be adjusted quickly and accurately whenever the process product is changed.

Normally, gauges are supplied with the required products pre-installed as part of the factory configuration. Details of these are provided on the Factory Settings Sheet (see Section 1.3 - Associated Documentation). These products may be modified, and new ones created, using the procedures described in this section.

Note: To avoid confusion in these instructions between the products stored in the gauges and the products from which the gauges are taking measurements, where necessary we have used the terms “gauge product” and “process product” respectively.

6.3 Loading Products

Note: This function is accessible on the GCI only.

This function can be used to recall a selected product in the system gauges. When this is done, the values stored in the product become the current gauge values for making measurements. They are also the values that will be modified by any changes made through the **Edit Product** function or through calibration adjustments.

1. Touch the  **Product Selection** button to open the Load Product page (Figure 6-5).

Figure 6-5 Load Product page

Alternatively, bring up the Configure Products page (Figure 6-6):

 **Configuration** >  **Configure Products**

2. Select the relevant product from the list.
3. Touch the **Load** button.

6.4 Managing Products

Note: The Configure Products page and its buttons are accessible on the GCI only.

To bring up the Configure Products page (Figure 6-6), touch the  **Configuration** button, then touch  **Configure Products**.

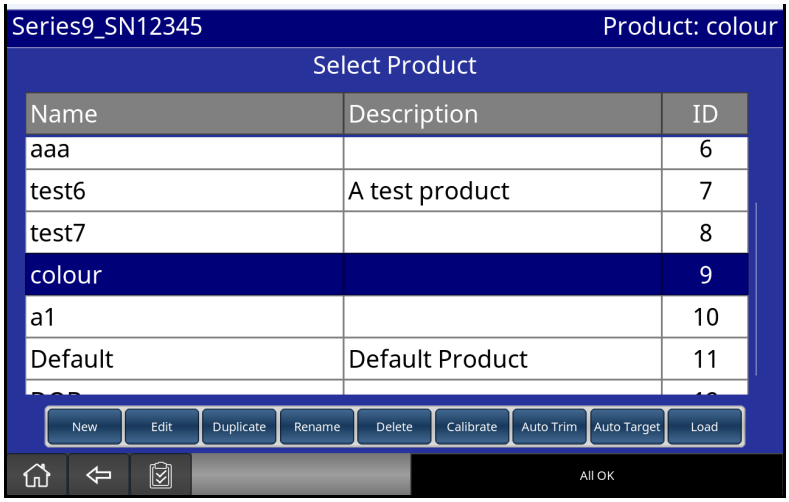


Figure 6-6 Configure Products page

The buttons on the Configure Products page are described below.

Note: The **Load** button on this page performs the same function as the **Load** button on the Load Product page (Figure 6-5) - that is, it loads a selected product.

6.4.1 Creating a New Product

The following procedure has the effect of creating and storing a new product in selected system gauges. In each gauge, the current gauge settings are used as the initial settings for the new product. The settings can then be changed by editing the product.

1. Open the Configure Products page (Figure 6-6):

    **Configuration >**  **Configure Products**

2. Touch the **New** button.
3. Enter a **Name** for the product using the keyboard provided.
4. Touch the **Description** box and enter a description of the product using the keyboard.
5. Touch the  **Enter** button to save the entry.
6. Follow the procedure below (Section 6.4.2 - Editing an Existing Product) to edit the settings in the product.

6.4.2 Editing an Existing Product

The Edit Product function allows the settings in the product to be adjusted according to requirements. Some of these settings are described below.

• **Algorithm**	The measurement algorithm supplied with the gauge is optimised for the intended gauge application. Refer to the Factory Settings sheet supplied with the equipment for the required algorithm. The algorithm should not be changed unless either: • the Factory Settings sheet specifies a different algorithm for different products, or; • the gauge is to be used for a different application to the one for which it was supplied. In this case, contact Nordson (see Section 1.4 - Contact Information) for advice on selecting an appropriate algorithm.
• **Trim**	Refer to Calibration overview (see Section 7.1 - Calibration Overview).
• **Span**	Refer to Calibration overview (see Section 7.1 - Calibration Overview).

• **Response Time**	Response Time is the time (in seconds) over which the gauge output is integrated. The appropriate value depends on the nature of the measured product. It should be short enough to indicate short-term rates of change whilst long enough to give a meaningfully stable measurement value.
• **Control and Alarm Limits Low/High**	The alarm outputs from the Series 9 system can be used to trigger visible warnings at the measurement thresholds specified in these two fields.

To edit product settings:

1. Open the Configure Products page (Figure 6-6):

 **Configuration >**  **Configure Products**

2. Select the product you wish to edit from the list.

3. Touch the **Edit** button, and the Edit Product page will appear (Figure 6-7).

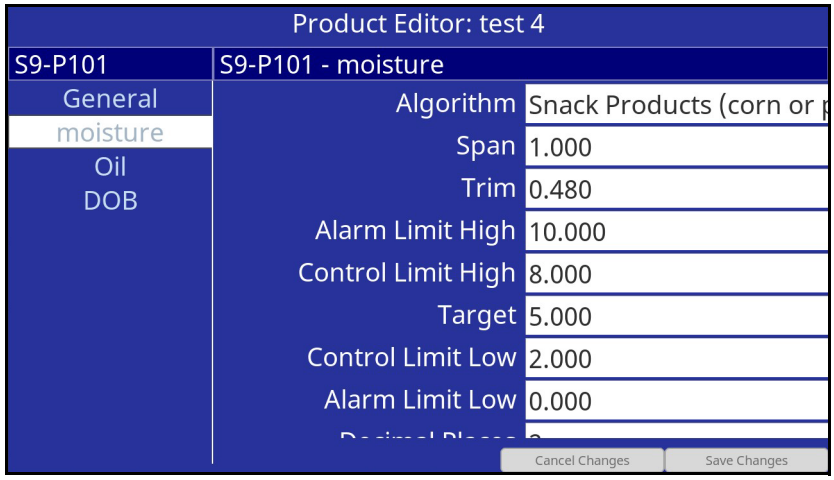


Figure 6-7 Edit Product page

4. The name of the gauge(s) and measurement channel(s) are shown in the left pane of the page. Select the channel you wish to edit. The settings for the selected channel will be displayed.

5. Set the values as needed.

6. Touch the **Save Changes** button. (This button and the **Cancel Changes** button are disabled until one or more changes have been made to the settings. If the **Cancel Changes** button is touched, the changes will be erased, and the settings will revert to their original values.)

6.4.3 Copying a Product

This procedure creates a new product, with all settings copied from an existing one.

1. Open the Configure Products page (Figure 6-6):

    **Configuration >**  **Configure Products**

2. Select the product you wish to copy from the list.
3. Touch the **Duplicate** button.
4. Enter a **Name** for the product using the keyboard provided.
5. Touch the **Description** box and enter a description of the product using the keyboard.
6. Touch the  **Enter** button to save the entry.

   The new product will be added to the list.
7. Edit the settings of the new product as required (see Section 6.4.2 - Editing an Existing Product).

6.4.4 Renaming a Product

To rename a product:

1. Open the Configure Products page (Figure 6-6):

    **Configuration >**  **Configure Products**

2. Select the product you wish to rename from the list.
3. Touch the **Rename** button.
4. Edit the **Name** entry for the product using the keyboard provided.
5. (Optional) Touch the **Description** box and edit the description of the product using the keyboard.
6. Touch the  **Enter** button to save the entry.

   The updated product name and description will appear in the list of products.

6.4.5 Deleting a Product

When a product is no longer needed, it can be removed permanently.

1. Open the Configure Products page (Figure 6-6):

    **Configuration >**  **Configure Products**

2. Select the product you wish to delete in the list.
3. Touch the **Delete** button.
4. Touch **OK** to confirm the deletion.

   The product will be removed from the list of products.

6.4.6 Calibrate

This is described in the Calibration section (see Section 7.2.2.1 - Obtaining Samples and Calibration).

6.4.7 Auto Trim

This is described in the Calibration section (see Section 7.2.1 - Using Auto-Trim).

6.4.8 Auto Target

Note: The Auto Target function is only available for the Current Product.

1. Touch the  **Configuration** button, then touch  **Configure Products** to bring up the Configure Products page (Figure 6-8).

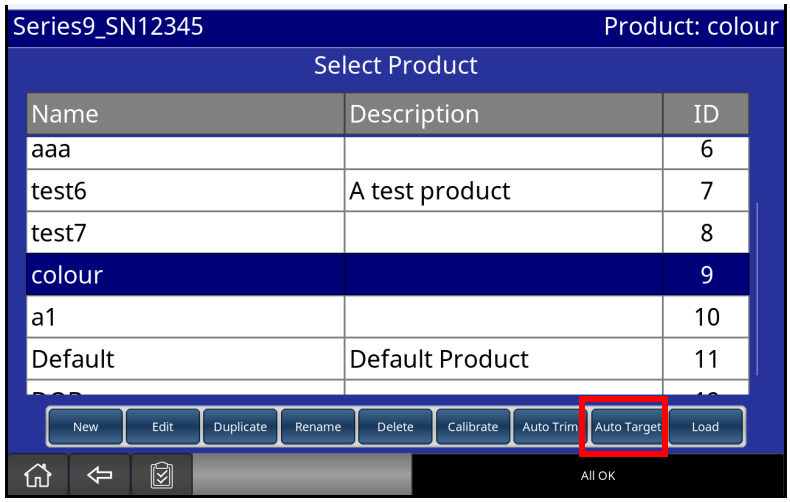


Figure 6-8 Configure Products page

2. The **Select Product** table lists all available products, along with a description and Product ID.

   Select the current product from the list. This will cause the **Auto Target** button to be enabled.

3. Touch the **Auto Target** button.

   This will bring up the Auto Target page (Figure 6-9).

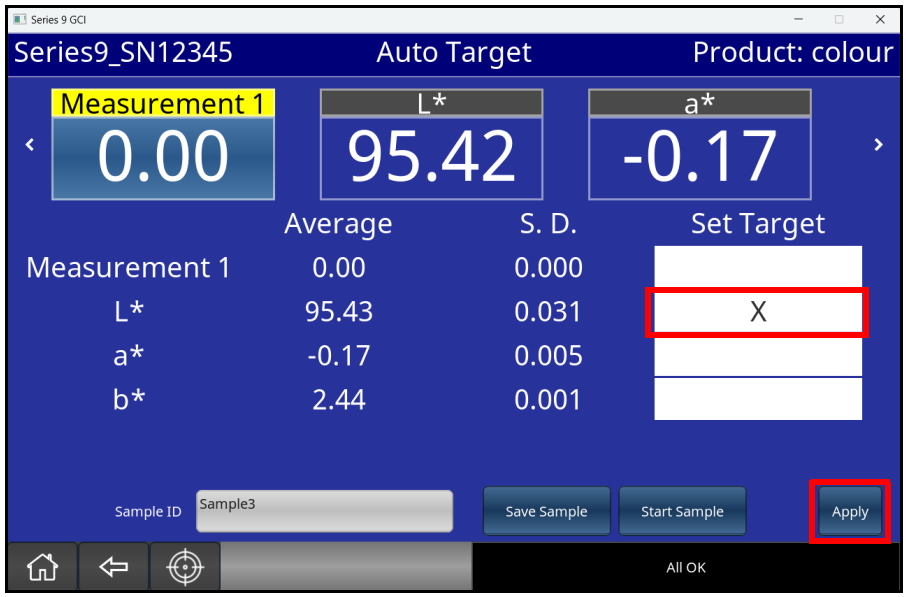


Figure 6-9 Auto Target page

4. Touch the **Start Sample** button.

5. The gauge will start sampling the product for 10 seconds. An indicator bar will appear, showing the progress of sampling. While this is occurring, a **Cancel Sample** button is also visible, which, if touched, will abort the sampling process.

6. When sampling is completed, the final average and standard deviation (S.D.) of the sampled values will remain on the screen (Figure 6-9). Touch the **Set Target** checkbox (and an “X” will appear in that box), then touch the **Apply** button. This sets the **Target** value of the selected measurement to the value of the **Average**. For example, in Figure 6-9, the **Target** value of measurement L* is set to 95.43.

   A **Sample ID** button will display the default Sample ID for the sample. This ID may be changed by touching that button, and using the keypad to enter a different ID. Additionally, there is a **Save Sample** button for saving the sample average and standard deviation values, along with the Sample ID.

6.5 Audit Trail

To view an Audit Trail of events that have occurred:

1. Touch the  **Configuration** button, then touch  **Configure Products** to bring up the Configure Products page (Figure 6-8).

2. Touch the  **Audit** button to bring up the Audit Trail page (Figure 6-10).

   A table will display a list of events by date/time, and if applicable, the user name.

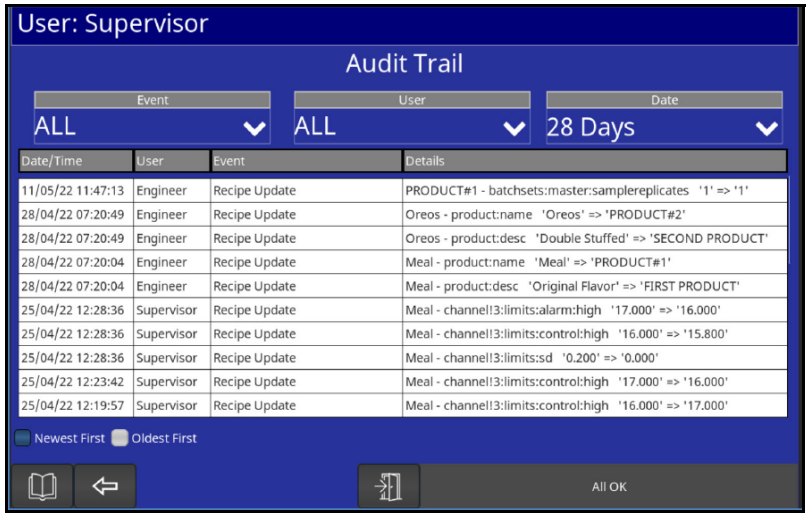


Figure 6-10 Audit Trail page

3. The events can be filtered by selecting any combination of Event, User name and Date range from the drop-down lists at the top of the screen.

4. There are 2 types of events: User and Recipe.

   Events such as a fault condition are not user-dependent, and therefore, do not have a User associated with them.

5. Either the newest or oldest events are listed first, depending on whether the **Newest First** or **Oldest First** box is selected at the bottom of the page.

6.6 Local Settings

1. Touch the  **Configuration** button to bring up the Settings page.

2. Open the Local Settings page by touching the icon(s) below.

Supervisor	 **Local Settings**
Engineer	 **Configure Display** (OT) or **Display Settings** (GCI) **>**  **Local Settings**

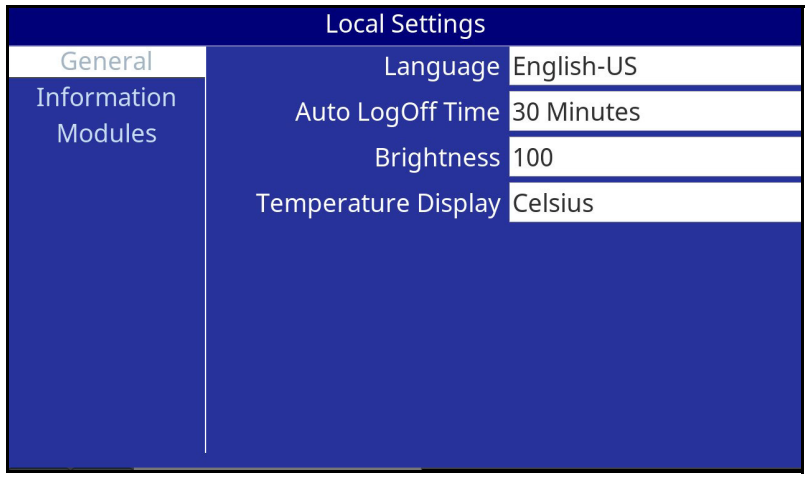


Figure 6-11 Local Settings page – General group

3. There are 3 groups of information in the left pane: **General**, **Information** and **Modules**.

4. The **General** group (Figure 6-11) includes the following settings:

   Language – selects the interface language for the GCI or OT.

   Auto LogOff Time – sets the period after which a Supervisor or Engineer will be automatically logged off if there is no screen activity.

   Brightness – sets the screen brightness.

   Temperature Display – sets whether the internal temperature on the Gauge Diagnostics page is shown in Celsius or Fahrenheit.

5. The **Information** group (Figure 6-12) displays information about the GCI/OT, including software version and build date, IP Address, CPU load and time since the last reboot.

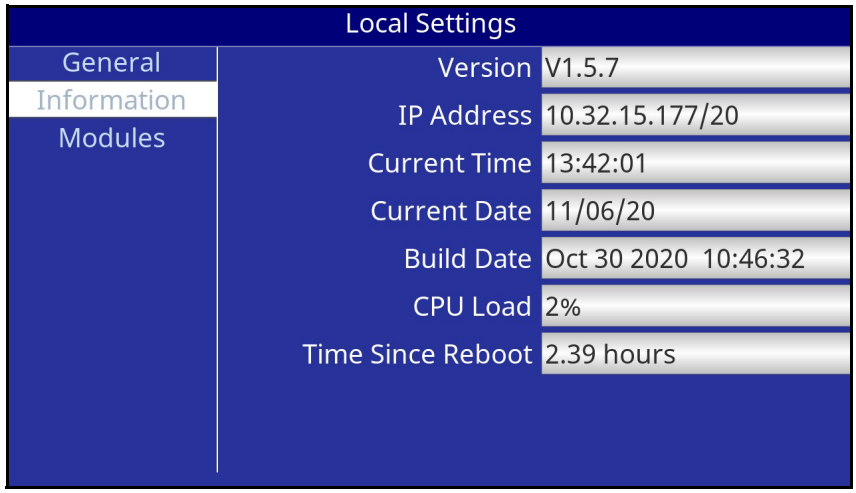


Figure 6-12 Local Settings – Information group

6. The **Modules** group displays information about the AnyBus module.

6.7 Setting the Date and Time

1. Touch the  **Configuration** button to bring up the Settings page.

2. Open the Set Date And Time page (Figure 6-13) by touching the icon(s) below.

Supervisor	 **Date/Time**
Engineer	 **Hardware Settings >**  **Date/Time**

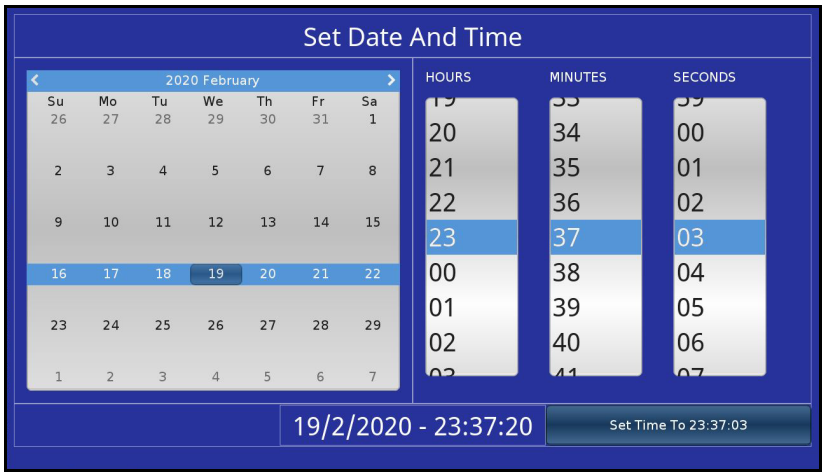


Figure 6-13 Set Date And Time page

The current date and time are displayed on the bottom of the page.

3. To change the date:

   a. Touch a date on the calendar.
   A **Set Date To <selected date>** button will appear.

   b. Touch the **Set Date To ...** button.

4. To change the time:

   a. Touch the **HOURS**, **MINUTES** and **SECONDS** lists to select the current time.

   b. Touch the **Set Time To ...** button.

6.8 Editing the Gauge and Measurement Names

The **Edit Names** function enables you to assign meaningful names to the gauge and to each of the measurement channels, in place of the factory defaults.

The assigned names are used throughout the GCI and OT functions. In particular, they appear on the Home pages to identify the displayed measurements.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Open the Gauge Settings page (Figure 6-14) by touching the icon(s) below.

Supervisor	 **Gauge Settings**
Engineer	 **Hardware Settings >**  **Gauge Settings**

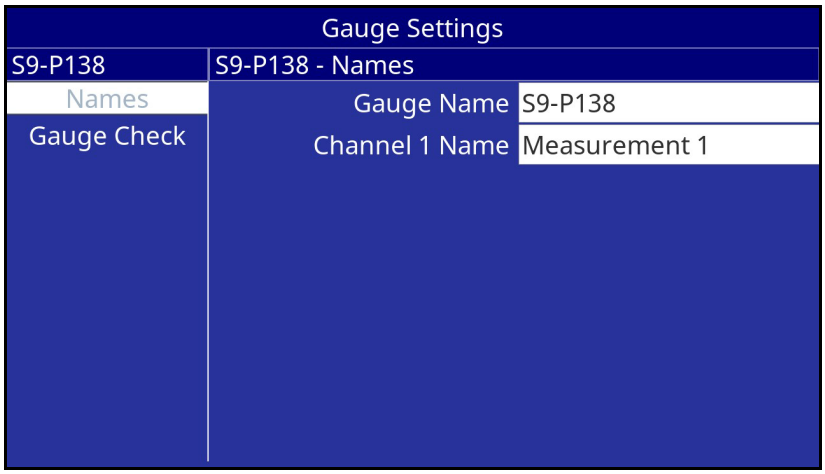


Figure 6-14 Gauge Settings page – Names group

3. "**Names**" should already be selected in the left pane. The **Gauge** and **Channel Names** appear to its right. Enter new names as required for the gauge and any of the channels.

   It is common practice for:

   - the **Gauge Name** to reflect its position in the process (e.g. Dryer 1 Exit).
   - each **Channel Name** to represent the constituent being measured (e.g. Moisture or Oil).

6.9 Setting the Automatic Gauge Check Interval

Gauge checking can be carried out automatically, at regular intervals by following the procedure below.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Open the Gauge Settings page (Figure 6-15).

Supervisor	 **Gauge Settings**
Engineer	 **Hardware Settings >**  **Gauge Settings**

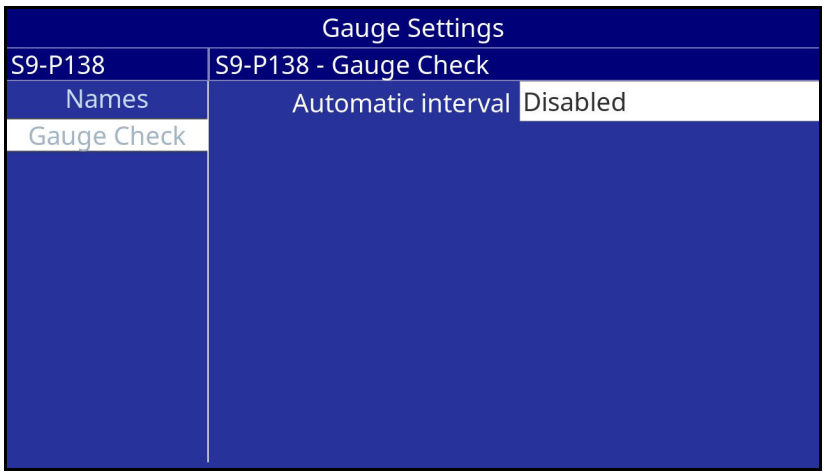


Figure 6-15 Gauge Settings page – Gauge Check group

3. Select **Gauge Check** in the left pane.

4. By default, **Automatic interval** is set to Disabled. To enable automatic gauge checking, touch the **Automatic interval** box, select the interval for gauge checking then select **OK**.

6.10 Engineer-Only Functions

This section describes functions that are accessible only to a user logged in as an Engineer. Selected functions below are accessible only on the GCI.

6.10.1 Selecting Gauges

Note: This function is accessible on both the GCI and the OT.

6.10.1.1 Adding Gauges to the GCI or OT

Using this procedure you can list all gauges available on the system, and select the one(s) you wish to be accessible from the particular GCI or OT. This is essential before functions, such as configuring a gauge or viewing its outputs, can be performed from the GCI or OT.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Configure Display** (OT) or **Display Settings** (GCI) icon.

3. Touch the  **Select Gauges** icon to open the Gauge Selection page (Figure 6-16).

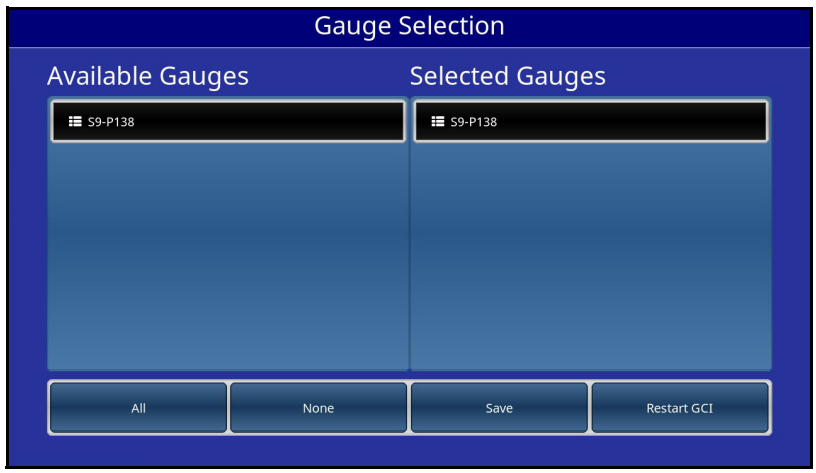


Figure 6-16 Gauge Selection page – GCI

4. Two lists are displayed: the **Available Gauges** list on the left shows a button for each available gauge, and the **Selected Gauges** list on the right shows the gauges that have been selected.

5. To select a gauge, touch the associated gauge's button in the **Available Gauges** list, and the selected gauge will appear in the **Selected Gauges** list. Alternatively, touch the **All** button to select all available gauges.

6. To remove a gauge from the list of selected gauges, touch its button in the **Selected Gauges** list. Alternatively, touch the **None** button to remove all the gauges from the **Selected Gauges** list.

7. When done making your selections, touch the **Save** button, then touch the **Restart GCI** or **Restart OT** button to restart the GCI/OT.

6.10.2 Configuring Network Settings

Note: These functions are accessible on both the GCI and the OT.

6.10.2.1 GCI/OT Network Setup

To set the IP Address and other network settings for the GCI/OT:

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Hardware Settings** icon.

3. Touch the  **Network Configuration** (OT) or **Configure Network** (GCI) icon to open the Network Settings page for the OT/GCI (Figure 6-17).

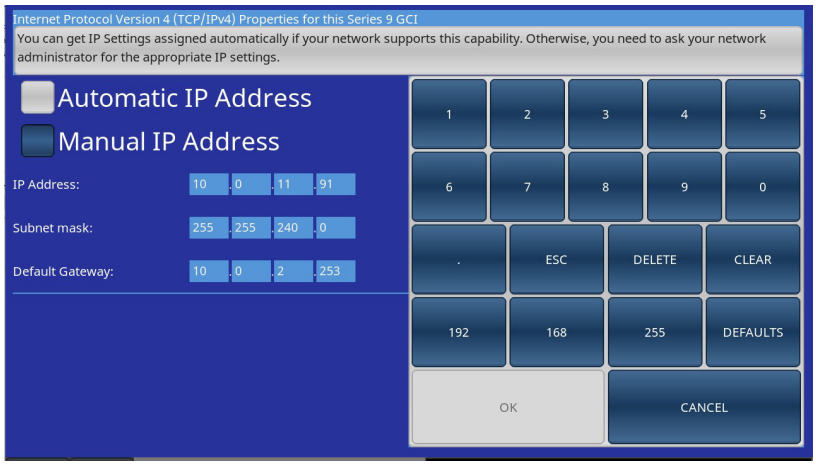


Figure 6-17 Network Settings page – GCI

4. If the GCI/OT IP settings will be assigned automatically, touch the **Automatic IP Address** box. That box will change to blue, to indicate that it has been selected.

5. Otherwise, to manually enter the IP settings for the GCI/OT:

   a. Touch the **Manual IP Address** box.
   That box will change to blue, to indicate that it has been selected.

   b. Individually touch each of the four fields that are separated by periods and use the keypad on the right to enter the **IP Address, Subnet mask** and **Default Gateway** settings for the GCI/OT.

   c. When done entering the values, touch the **OK** button on the keypad.

6.10.2.2 Gauge Network Setup

To set the IP Address and other network settings for the gauge:

1. Touch the Gauge Status box (Figure 5-5) to bring up the Gauge Status page (Figure 6-18).

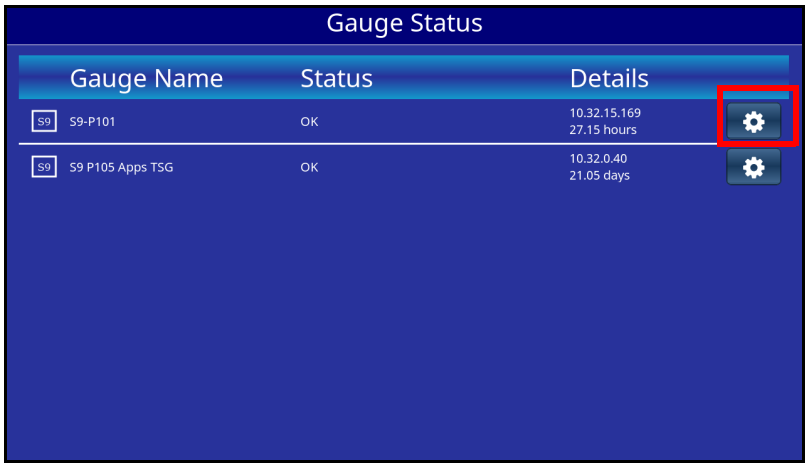


Figure 6-18 Gauge Status page

2. Touch the  gear button to open the Network Settings page for the gauge (Figure 6-19).

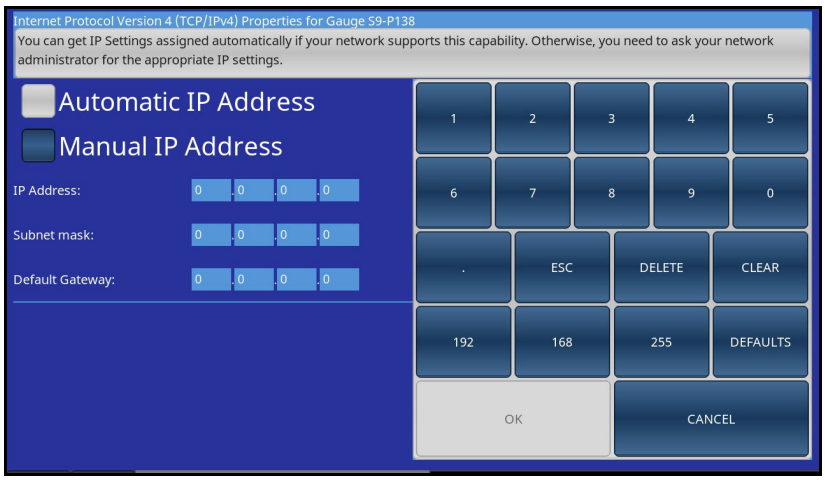


Figure 6-19 Network Settings page – Gauge

3. If the gauge IP settings will be assigned automatically, touch the **Automatic IP Address** box. That box will change to blue, to indicate that it has been selected.

4. Otherwise, to manually enter the IP settings for the gauge:

   a. Touch the **Manual IP Address** box.
   That box will change to blue, to indicate that it has been selected.

   b. Individually touch each of the four fields that are separated by periods and use the keypad on the right to enter the **IP Address, Subnet mask** and **Default Gateway** settings for the gauge.

   c. When done entering the values, touch the **OK** button on the keypad.

6.10.3 Configuring Analogue Outputs

Note: This function is accessible only on the GCI.

Four analogue outputs are available from a GCI or GCP. By default, they are assigned as 4-20mA current outputs representing the four measurement channels of a single gauge.

This function allows each of the outputs to be reconfigured according to requirements. For each output you can:

- Assign it to any available gauge, a gauge function (temperature or window contamination) or PID control.
- If a gauge is selected - assign it to any measurement channel of the gauge.
- Choose or manually set the low and high limits of the output.
- Choose the output type (current or voltage) and scaling.
  This selection must be matched by the slide switches on the GCI/GCP pcb (see Section 6.10.3.1 - Analogue Output Signal Selection).

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Hardware Settings** icon.

3. Touch the  **Analogue Outputs** icon to open the Analog Output Configuration page (Figure 6-20).

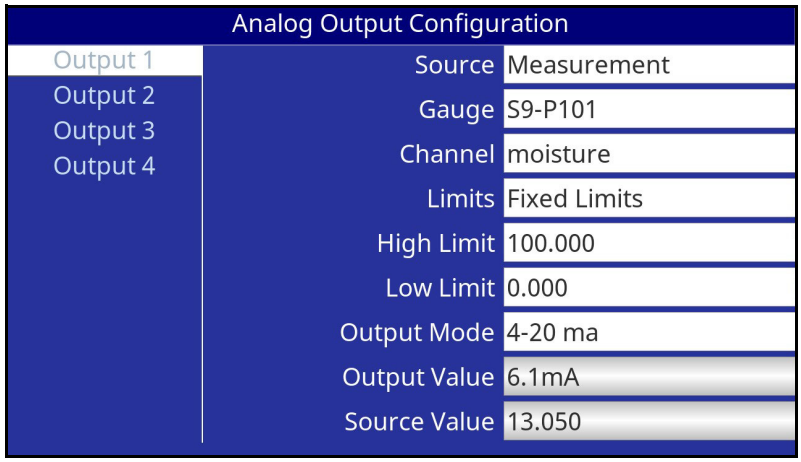


Figure 6-20 Analog Output Configuration page

4. There are four available analogue outputs, numbered 1 through 4, on the left pane. Select an output (e.g., Output 1).

5. Touch the **Source** box and select the source of the analog output - **Disabled**, **Measurement**, **Gauge Function** or **PID Control**. (Selecting **Disabled** will disable the analog output.) PID Control is covered in Section 6.10.4 - PID Control.

6. Touch the **Gauge** box and select a gauge.

7. If **Measurement** or **PID Control** was selected for **Source** in step **5**, touch the **Channel** box and select the measurement channel to be assigned to the output. PID Control is covered in Section 6.10.4 - PID Control.

8. If **Gauge Function** was selected for **Source** in step **5**, the analog output will indicate the value of the function selected by the **Function** box. Touch the **Function** box and select **Temperature** or **Window Contamination**.

9. By default, the **Limits** box is set to the following:

    - **Fixed Limits** – Allows you to set the low and high measurement values manually. This option provides a voltage or current output that is directly proportional to the analog output source.

    Additionally, if **Measurement** or **PID Control** was selected for **Source** in step **5**, there are two other choices for **Limits**:

    - **Control Limits** – Uses the **Control Limit Low** and **Control Limit High** values set in the product as the maximum and minimum current or voltage from the analogue output.

    - **Alarm Limits** – Uses the **Alarm Limit Low** and **Alarm Limit High** values set in the product as the maximum and minimum current or voltage from the analogue output.

10. If **Fixed Limits** was selected for **Limits** in step **9**:

    - Set **High Limit** to the measurement or function value corresponding to the maximum voltage or current from the analogue output.

    - Set **Low Limit** to the measurement or function value corresponding to the minimum voltage or current from the analogue output.

11. Touch the **Output Mode** box and select the analogue output: **0-10 V** or **4-20 ma**.

12. The **Output Value** box continuously updates to show the current value of the analogue output in V or mA. The **Source Value** box continuously updates to show the current value of the source of the analog output.

    (These boxes are shown in a lightly shaded gray background to indicate that they are not touchable boxes.)

6.10.3.1 Analogue Output Signal Selection

The analogue output signal selection is done through the slide switches of the analogue output board of the GCI/GCP. See Section 4.9.3.1 - Analogue Output Board.

6.10.4 PID Control

Note: This function is accessible only on the GCI.

A PID control loop can be enabled on any of the measurement channels in the Series 9 gauge, with its output through one of the optional analogue outputs in the GCI or GCP.

6.10.4.1 PID Control Applications

The PID output provides a 4-20mA / 0-10V control signal to automatically adjust an actuator to increase or decrease the parameter being measured, such as moisture in a drying or wetting process.

Possible applications could include moisture control through drying or water addition, or perhaps blending, such as gluten addition to flour to control protein levels through a suitable actuator (Figure 6-21).

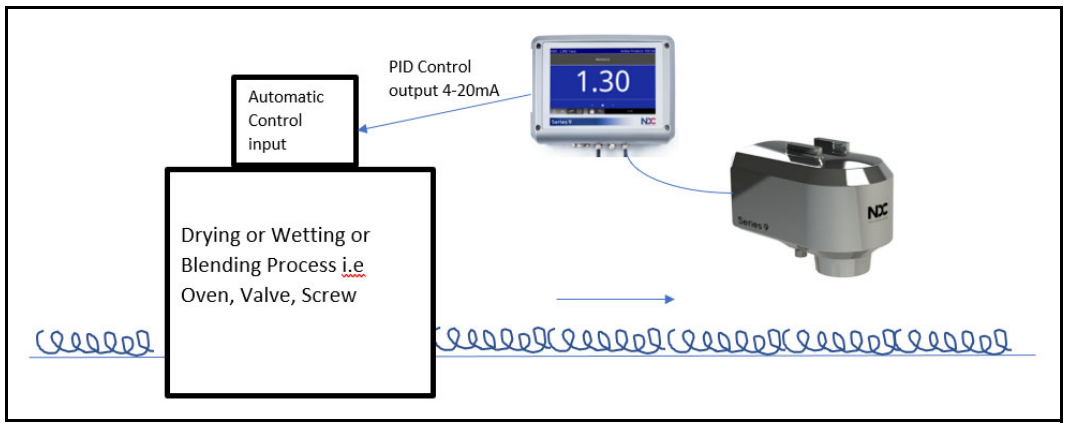


Figure 6-21 Controlling a Drying/Wetting/Blending process

An actuator for water addition could be a proportional valve like that shown in Figure 6-22, using the PID 4-20mA control output to change the flow rate of water into a process to reach the desired target level.

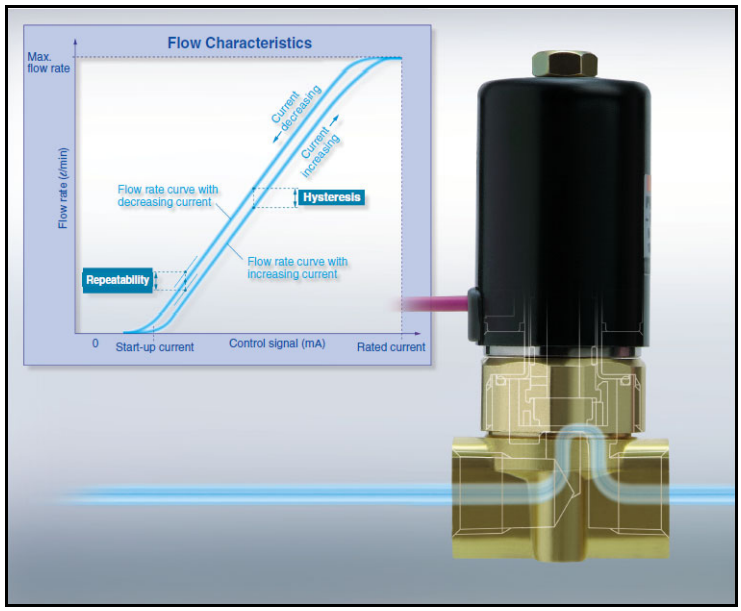


Figure 6-22 Controlling the flow rate of water

6.10.4.2 PID Algorithm

The Setpoint or Target is set through the Product recipe, and the error value (target – measured) is fed into the PID algorithm, as depicted in the block diagram in Figure 6-23.

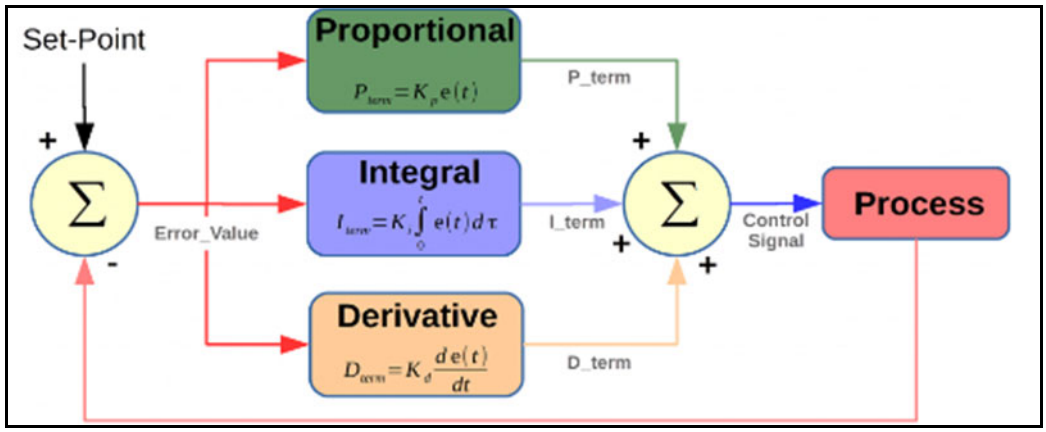


Figure 6-23 PID Algorithm

6.10.4.3 GCI Configuration

The GCI allows analogue outputs to be assigned to control outputs.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Hardware Settings** icon.

3. Touch the  **Analogue Outputs** icon to open the Analog Output Configuration page (Figure 6-24).

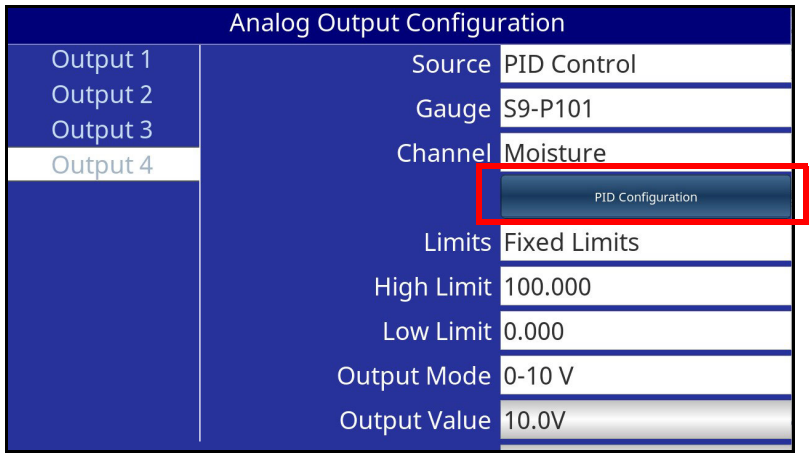


Figure 6-24 Analog Output Configuration page

4. Set the **Source** to PID Control.

5. Select the **Gauge** for the control loop.

6. Select the **Channel** for the control loop.

7. If the selected gauge channel supports PID Control, the **PID Configuration** button will be enabled. See Section 6.10.4.5 - PID Configuration. (If the **PID Configuration** button is disabled, the control loop is not available on that channel, and the analogue output will not change value.)

8. The remainder of the boxes on the Analog Output Configuration page are used to configure the analog output, i.e., allowing the output error to be scaled to the 0-10V or 4-20ma range. See Section 6.10.3 - Configuring Analogue Outputs.

6.10.4.4 PID Operation

Each PID loop uses the difference between the target value (set in the measurement recipe) and the active measurement value. The error value (target – current) is passed to the PID control loop, which applies the PID terms to the error.

Each PID controller can be configured using the PID Configuration page (Figure 6-25), accessed via the **PID Configuration** button on the Analog Output Configuration page (Figure 6-24).

6.10.4.5 PID Configuration

The PID Configuration page (Figure 6-25) is available for each PID control loop to set the PID terms, which can be adjusted empirically to provide stable control, i.e. for the moisture level to reach the target quickly and to stay at that level with little deviation.

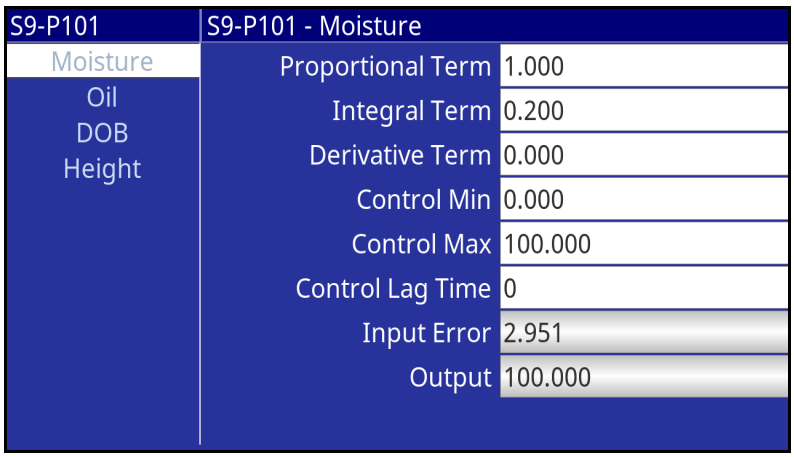


Figure 6-25 PID Configuration page

The following can be configured:

- **Proportional Term**, **Integral Term and Derivative Term** – These configure how the PID controller will act upon the error value.
- **Control Min and Max** – These limits are used to overcome integral windup and will cap the control values within the given limits. I.e. if an error is consistently in one direction, the control output will continue to be corrected in the opposite direction. The limits ensure that the control cannot be saturated by a large integral term, allowing the controller to recover more quickly once the control comes back into range.
- **Control Lag Time** – The control lag is the process reaction time to the point measured, and can be set between 0 and 600 seconds. This will delay the effect of the control by the given lag time.

The PID Configuration page also shows the following data:

- **Input Error** – The difference between the target and current measurement value.
- **Output** – The output from the PID controller (with the limits applied).

6.10.5 Configuring Digital Outputs

Note: This function is accessible only on the GCI.

Eight digital outputs are available from a GCI or GCP. These can be configured to provide status outputs corresponding to gauge measurement channels or gauge functions.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Hardware Settings** icon.

3. Touch the  **Digital Outputs** icon to open the Digital Output Configuration page (Figure 6-26).

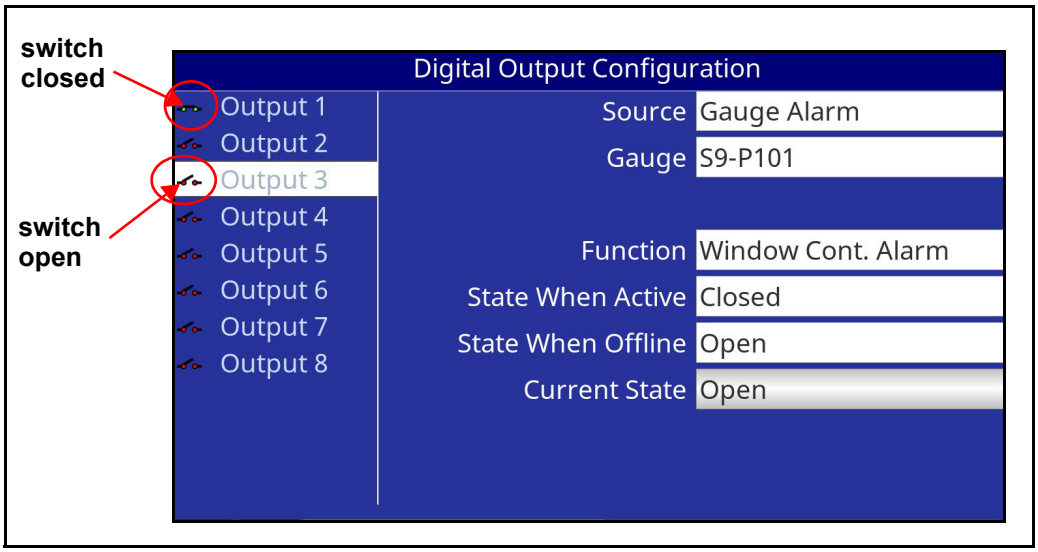


Figure 6-26 Digital Output Configuration page

4. There are eight available digital outputs, numbered 1 through 8, on the left pane. A switch open/closed icon, indicating the state of the output, appears before the output name. The icon is green if the switch is closed, red if the switch is open.

   Select an output from the left pane (e.g., Output 1).

5. Touch the **Source** box and select the source of the digital output - **Disabled, Measurement Alarm**, **Communication Alarm**, **Gauge Alarm**, **Gauge Warning** or **Gauge Function**. (Selecting **Disabled** will disable the digital output.)

6. Touch the **Gauge** box and select a gauge.

7. If **Measurement Alarm** was selected for **Source** in step **5,** touch the **Channel** box and select a measurement channel.

8. The digital output will indicate the state of the function selected in the **Function** box.

   If **Measurement Alarm** was selected for **Source** in step **5**, touch the **Function** box and select a measurement alarm condition: **High Alarm**, **Low Alarm** or **High/Low Alarm**.

   If **Gauge Alarm** was selected for **Source** in step **5**, touch the **Function** box and select a gauge alarm condition: **Any Alarm**, **Window Cont.** (Contamination) **Alarm**, **Temperature Alarm** or **Air Flow Alarm**.

   If **Gauge Warning** was selected for **Source** in step **5**, touch the **Function** box and select a warning occurrence: **Any Warning**, **Window Cont.** (Contamination) **Warning** or **Temperature Warning**.

   If **Gauge Function** was selected for **Source** in step **5**, touch the **Function** box and select a function: **Sampling In Progress**, **Sample Paused** or **Cooler Control**.

9. Touch the **State When Active** box and select the state of the digital output when the alarm/warning condition or function selected in step **8** is occurring or active – **Open** or **Closed**.

10. Touch the **State When Offline** box and select the state of the digital output when the alarm/warning condition or function selected in step **8** is not occurring or offline – **Open** or **Closed**.

11. The **Current State** box continuously updates to show the current state of the digital output – **Open** or **Closed**.

    (This box is shown in a lightly shaded gray background to indicate that it is not a touchable box.)

6.10.6 Configuring Digital Inputs

Note: This function is accessible only on the GCI.

Eight digital inputs are available from a GCI or GCP. These can be associated with various gauge functions, depending on the options fitted on the gauge.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Hardware Settings** icon.

3. Touch the  **Digital Inputs** icon to open the Digital Input Configuration page (Figure 6-27).

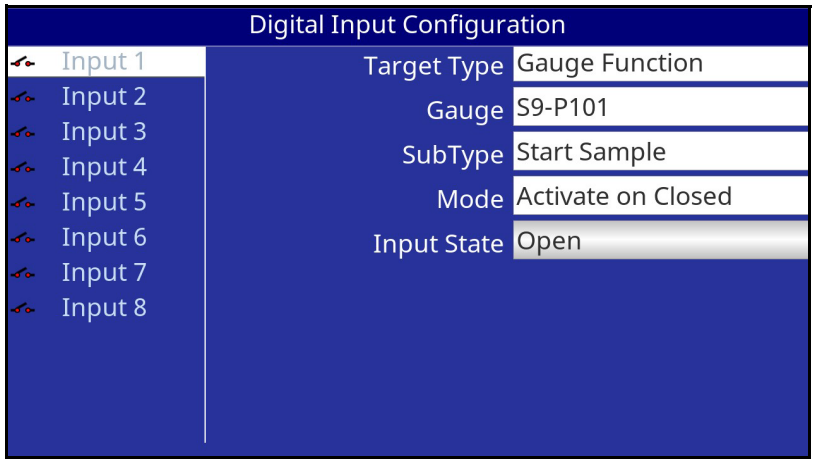


Figure 6-27 Digital Input Configuration page

4. There are eight available digital inputs, numbered 1 through 8, on the left pane. A switch open/closed icon, indicating the state of the input, appears before the input name. The icon is green if the switch is closed, red if the switch is open.

   Select an input (e.g., Input 1).

5. Touch the **Target Type** box and select the type for the digital input - **Disabled**, **Gauge Function** or **GPIO** (General-purpose input/output). (Selecting **Disabled** will disable the digital input.)

6. Touch the **Gauge** box and select a gauge.

7. If **Gauge Function** was selected in step **5**, the following selections are available in the **SubType** box: **Start Sample** (start collecting a sample), **Sample Collect** (continue collecting a sample), **Sample Pause** (pause sample collection) and **External Gating**.

   If **GPIO** was selected in step **5**, there will be sixteen available GPIO sub inputs/outputs for the **SubType**.

8. Touch the **Mode** box and select whether the input should be activated when it is open or closed – **Activate on Open** or **Activate on Closed**.

9. The **Input State** box continuously updates to show the current state of the digital input – **Open** or **Closed**.

   (This box is shown in a lightly shaded gray background to indicate that it is not a touchable box.)

6.10.7 Configuring Product Lines

This applies to Series 9 systems with multiple gauges.

The Product Lines feature allows gauges to be split into separate groups, referred to as "lines", making them simpler to identify and manage. If multiple lines are defined, the Home page will show each line as a grouped page, and the user will be able to scroll between lines.

Note: This function is accessible only on the GCI.

1. Touch the  **Configuration** button to bring up the Settings page.

2. Touch the  **Display Settings** icon.

3. Touch the  **Configure Product Lines** icon.

   The Configure Product Lines page will appear (Figure 6-28).

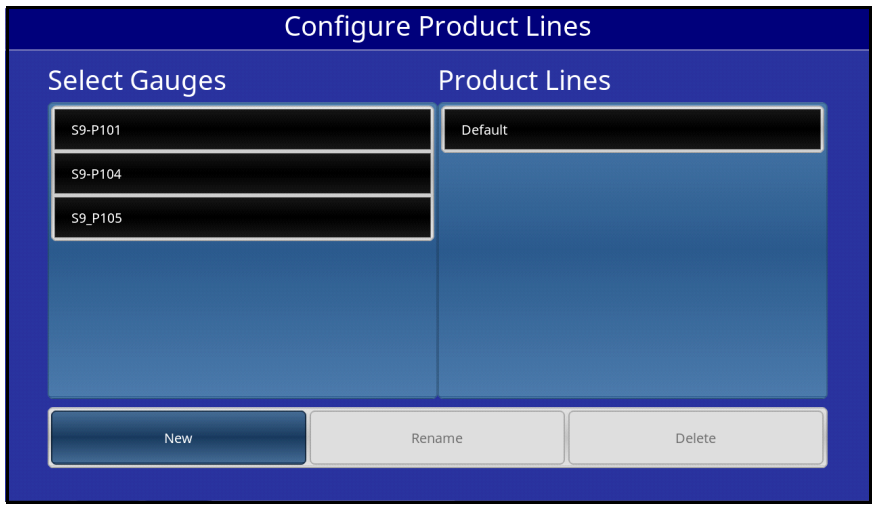


Figure 6-28 Configure Product Lines page

By default, all gauges are included in the line named "Default". This line cannot be renamed or deleted. The "Default" line is not a real product line, but acts as a place holder for gauges that have not yet been assigned to a line.

– To add a new product line:

a. Touch the **New** button and enter a name for the line.

b. Assign one or more gauges to the line by touching the gauge buttons under “Select Gauges”.

Those buttons will turn black when touched to indicate that they are selected.

– To rename a product line:

a. Select the line by touching its button.

b. Touch the **Rename** button and enter the new name for the line.

– To delete a product line:

a. Select the line by touching its button.

b. Touch the **Delete** button.

Note that there is no confirmation before the line is deleted.

6.10.7.1 Loading Products

When the  **Product Selection** button is touched to bring up the Load Product page, and multiple lines are configured, the user will be prompted to select a line. The selection dialog displays the names of the configured lines, except the “Default” line. Gauges belonging to the “Default” line are listed individually.

The user may select a product line, or one of the unassigned gauges.

Selecting a gauge takes the user to the Product Load page for the gauge. When a line is selected, the Load Product page for the line is displayed. This lists the products that are common to all gauges assigned to the line. Once a product is selected and the **Load** button is pressed, that product will be sent to all gauges in that line.

Notes:

1. If the **Product Selection** button is touched and lines are configured, but not all gauges are selected in those lines, the user will be presented with a list to select a line or gauge.

2. If the **Product Selection** button is touched and no lines are configured except the Default line, the user will be prompted to select a single gauge.

3. Product loads from the Configure Product page (accessed by touching the **Configuration** button and then **Configure Products**) will still be performed on a single gauge.

CHAPTER 7

7 Calibration

7.1 Calibration Overview

All Series 9 gauges are configured and pre-calibrated during manufacture to suit the specific applications for which they are supplied. Consequently, new gauges can normally be put into service immediately, subject only to verifying the calibration.

The gauges should then be stable and provide consistently accurate measurements over long periods. However, if you wish to check the stability of the gauge output at any time, this can be done using the external ARS or Gauge Check function of the GCI (see Section 7.2.5 - Checking Gauge Stability).

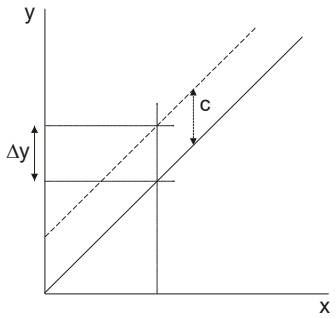
Calibration requirements of Series 9 gauges are limited to adjustment of the output using Trim and Span values only.

Trim

The Trim value applies a positive or negative offset to the final output. It can be adjusted to increase or decrease the gauge output to align with the local laboratory reference method values.

In most circumstances, this is sufficient calibration for a gauge measuring at a target value. Even if the pre-calibrated Span is not optimum for the product over a wider measurement range, making a Trim-only adjustment will produce high-accuracy results at or near the target with minimum effort.

The default Trim value is 0.00. The graph shows the effect (Δy) on the gauge output of a change in Trim value.

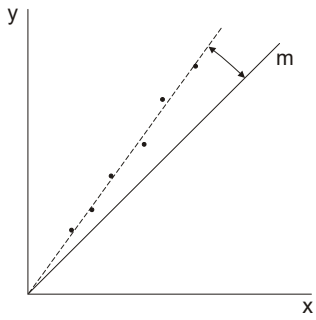


c = Trim	x = Laboratory reference	y = Gauge output

Span

The Span value changes the slope of the gauge output: that is, the change in output for any given change in absorption by the measured product. For some applications, Span adjustment may be needed to align the gauge measurements with laboratory reference samples over a range of values, as illustrated below. In such cases, it is necessary to perform a full-range calibration.

The default Span value is 1.00.



m = Slope of line	x = Laboratory reference	y = Gauge output

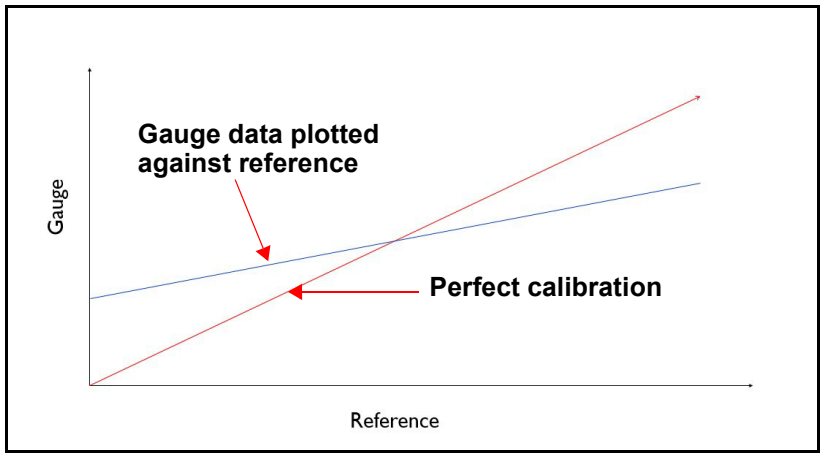
Example

The following example illustrates how the Span and Trim adjust the calibration.

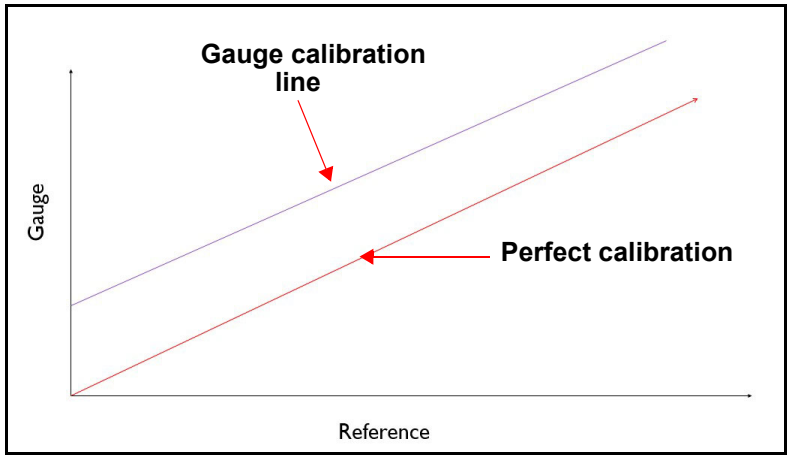
The figure below shows 2 lines:

- The red line is the perfect calibration
- The blue line is the gauge data that was collected and plotted against the reference method.

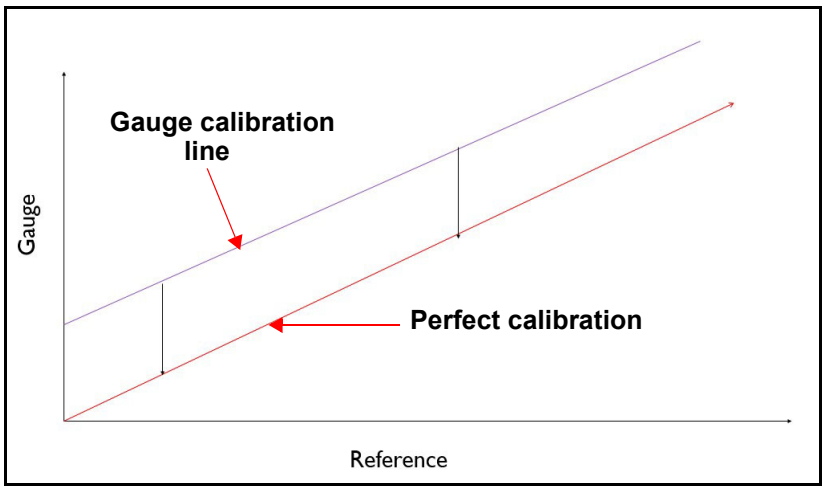
  The gauge is reading high at the low end, and low at the high end. Therefore, the Span needs to be adjusted.



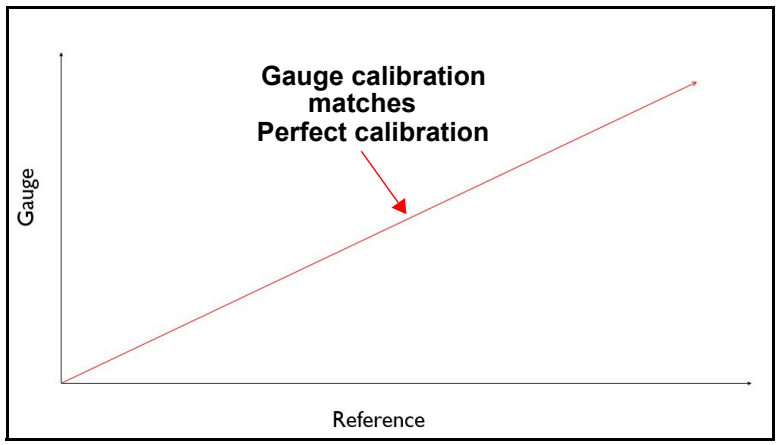
The Span changes the measurement sensitivity. The gauge calibration line is now at the same sensitivity as the perfect calibration (same gradient).



The next step is to move the gauge calibration line down the Y-Axis so that the readings lie on the perfect calibration line. This is done by adjusting the Trim.



Finally, the calibration data matches the perfect calibration line. The gauge is calibrated and therefore, validation can now take place.



7.1.1 When to Calibrate

When	What you should do	Notes
• **After installing a new gauge**	• Internal reference the gauge (see Section 7.2.3 - Internal Referencing the Gauge)	This is essential. Do not omit.
	• Auto-trim (see Section 7.2.1 - Using Auto-Trim)	Optional. Can make the fine Trim adjustment easier to perform, but not essential.
	• Trim (see Section 7.2.2 - Trim)	Essential. Ensures measurements at/near target are accurate.
	• Full range calibration (see Section 7.2.4 - Performing Full-Range Calibration)	Necessary only if accurate measurements are required over a range of values.
• **After changing source lamp or filter wheel motor**	• Internal reference the gauge (see Section 7.2.3 - Internal Referencing the Gauge)	Essential.
• **On change of product**	• Check trim against samples of new product and adjust if necessary	Confidence check.
• **Whenever check of long-term accuracy is required**	• Stability check (see Section 7.2.5 - Checking Gauge Stability)	Confidence check.

7.2 Calibration Procedures

7.2.1 Using Auto-Trim

Note: The Auto-Trim function is only available for the Current Product.

The GCI Auto-Trim function is intended as an initial method of adjusting the gauge to provide approximately correct outputs at the target values. It is very quick and easy to use, and does not require the preparation of special laboratory samples.

Auto-Trim should **not** be used in place of the Trim procedure (see Section 7.2.2 - Trim) where accurate gauge readings are required.

The values obtained using Auto-Trim automatically update the current gauge products (see Section 6.2 - About Products).

1. Touch the  **Configuration** button, then touch  **Configure Products** to bring up the Configure Products page (Figure 7-1).

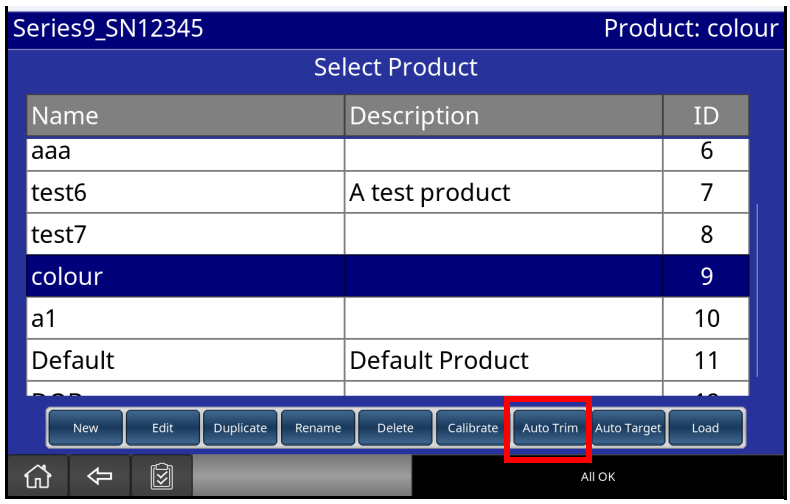


Figure 7-1 Configure Products page

2. The **Select Product** table lists all available products, along with a description and Product ID.

   Select the current product from the list. This will cause the **Auto Trim** button to be enabled.

3. Touch the **Auto Trim** button.

   This will bring up the Auto Trim – Trend page (Figure 7-2), showing the gauge reading and a Trend graph of the measurement.

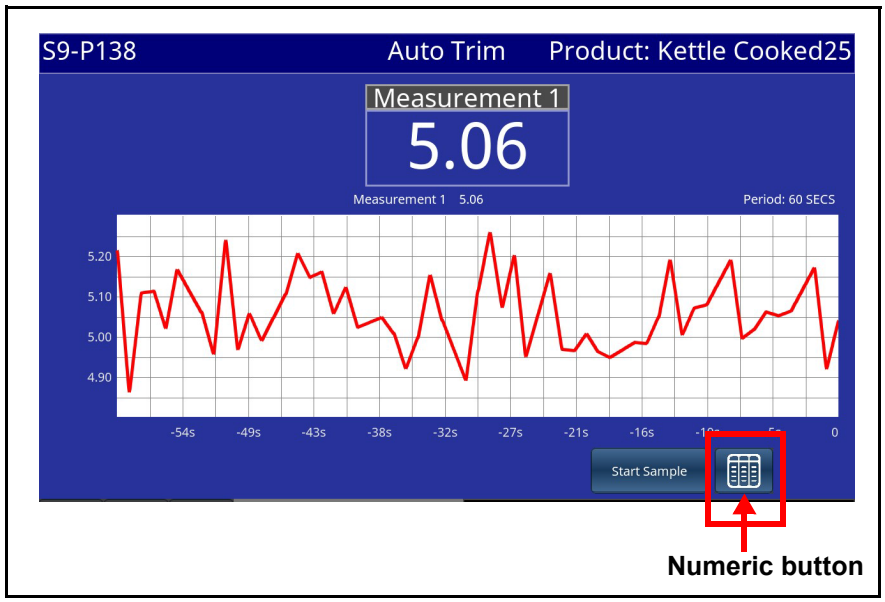


Figure 7-2 Auto Trim – Trend page

4. Touch the Numeric button on the lower right side of the page to display the Auto Trim – Statistics page (Figure 7-3). (When this button is touched, it will be replaced by the Trend button, which, if touched, will re-display the Auto Trim – Trend page.)

Figure 7-3 Auto Trim – Statistics page

5. Touch the **Start Sample** button.

6. The gauge will start sampling the product for 10 seconds. An indicator bar will appear, showing the progress of sampling (Figure 7-4). While this is occurring, a **Cancel Sample** button is also visible, which, if touched, will abort the sampling process.

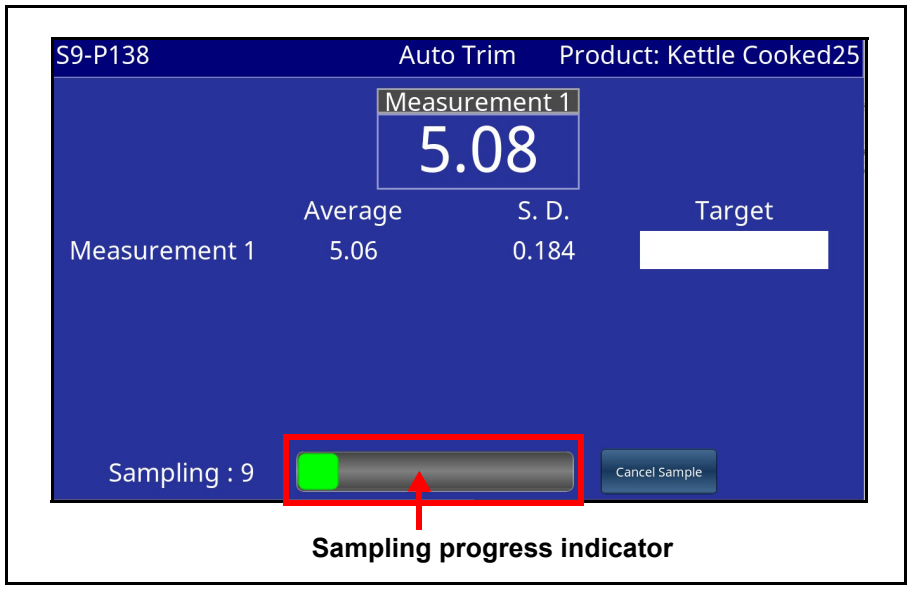


Figure 7-4 Sampling in progress

7. When sampling is completed, the final average and standard deviation (S.D.) of the sampled values will remain on the screen (Figure 7-5). Enter the target value in the **Target** box and touch the **Apply** button.

   A **Sample ID** button will display the default Sample ID for the sample. This ID may be changed by touching that button, and using the keypad to enter a different ID. Additionally, there is a **Save Sample** button for saving the sample average and standard deviation values, along with the Sample ID.

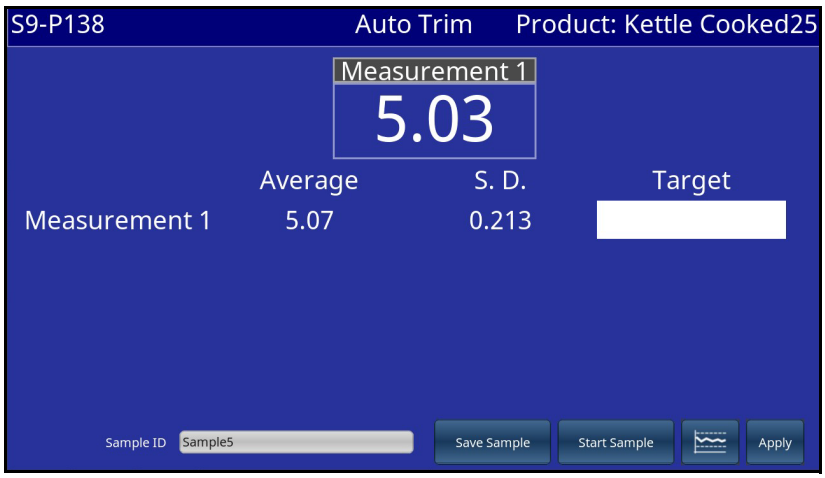


Figure 7-5 Sampling completed

8. Touch the **Apply** button to apply the calculated trim automatically, and the trimmed measurement will update on the screen.

7.2.2 Trim

The Trim function is used in calibration procedures to align the gauge measurements with values obtained using laboratory reference samples.

A manual Trim adjustment is conducted in two distinct phases:

- Obtaining the sample data on which the new trim value will be based.
- Calculating and applying the new Trim value to update the stored gauge products.

These are described below.

7.2.2.1 Obtaining Samples and Calibration

This process involves taking a number of gauge readings and corresponding laboratory reference samples with the product at or near the target values. Data from these samples can then be used to determine the optimum gauge Span and Trim values.

Sample Collection Notes

- The gauge must be mounted 1m from the sampling point.
- Use the sampling function within the GCI or OT to collect a timed sample.
- During the gauge sampling period:
  - Collect material from the top surface.
  - Collect material from where the gauge has viewed.
  - Collect multiple material samples.
- Use a sealable bag or container to store the sample.
  - If using a bag, expel the air and consider double bagging.
- Reference the material as soon as possible.
  - Mix the sample prior to referencing.
  - Always run duplicate reference analysis to help reduce reference error.

Procedure

Note: This function uses the Sample function, and is accessible on both the GCI and the OT.

1. Touch the  **Sample** button on the Home page to bring up the Sample page for the relevant gauge.

   This page shows the gauge reading and a Trend graph of the measurement (Figure 7-6).

   The Numeric button on this page, when touched, switches to the Sample – Statistics page (Figure 7-7). This will cause a Trend button to appear in its place, which, if touched, will re-display the Sample – Trend page.

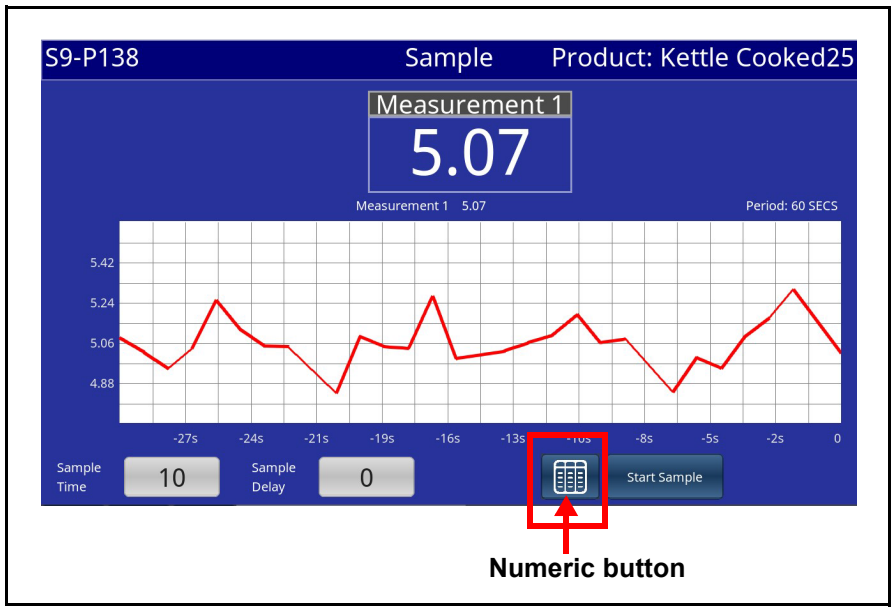


Figure 7-6 Sample – Trend page

2. Enter the **Sample Time** and **Sample Delay** values (in seconds):

   - **Sample Time** is the period over which measurements will be recorded and averaged. Set this to the time it takes to walk from the GCI or OT to the sampling location by the Series 9 gauge.

   - **Sample Delay** sets a delay between touching the start button and the start of sampling. Set this to the time it takes to collect sufficient material to allow multiple replicate reference tests to be carried out.

3. View the Trend graph to ensure that the process is steady. When the production process is stable and the constituents to be calibrated are approximately at the target levels, touch the **Start Sample** button to start sampling.

   If a delay has been set, the delay time will count down to 0 before sampling starts.

4. The screen will switch to the Sample – Statistics page (Figure 7-7), and the gauge will start sampling the product for as long as the sample time. An indicator bar will appear, showing the progress of sampling. While this is occurring, a **Cancel Sample** button is also visible, which, if touched, will abort the sampling process.

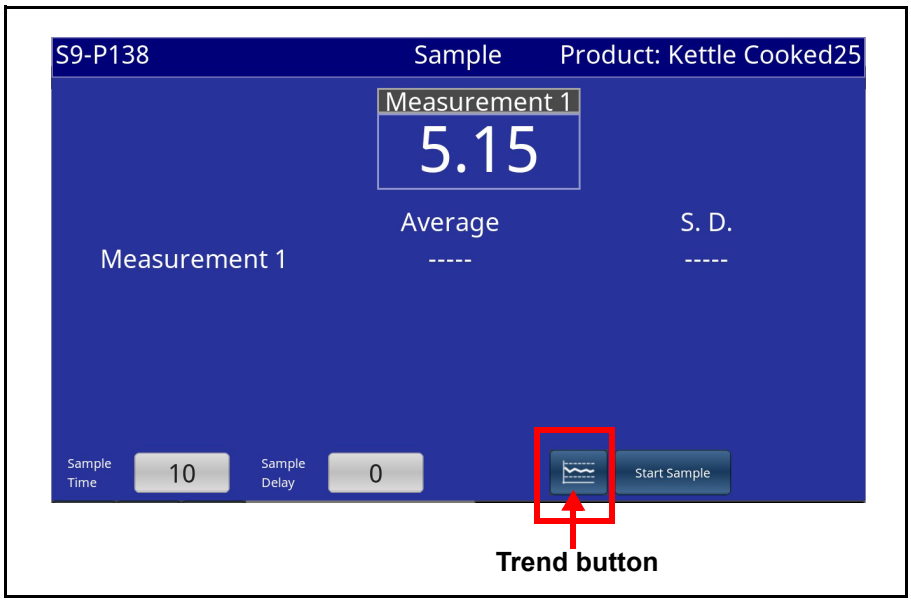


Figure 7-7 Sample – Statistics page

5. Throughout the sample period, collect the product samples from the process line and place them in sealed containers for laboratory analysis.

   For meaningful results, the product samples must be taken from just after the gauge location, and over the same time periods as the gauge records the samples.

6. Sampling stops automatically after the **Sample Time**, and the average and standard deviations (S.D.) of the measurement are displayed (Figure 7-8).

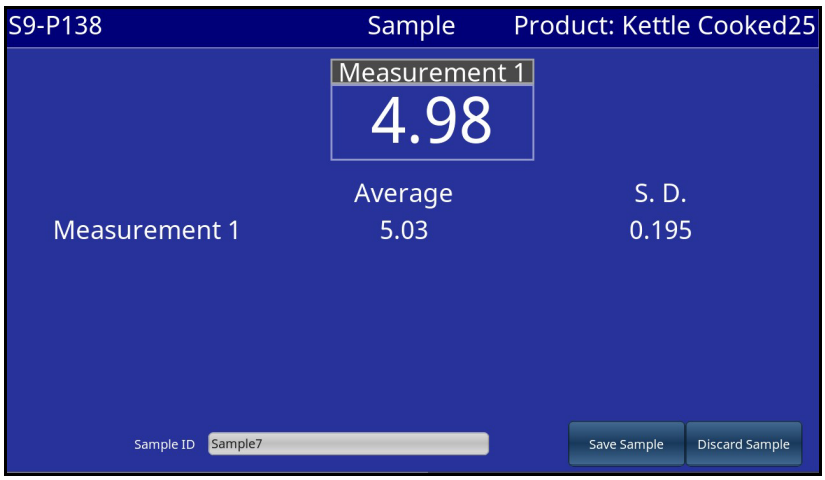


Figure 7-8 Sample page, sampling completed

7. The **Sample ID** button shows the default Sample ID that has been assigned to that sample. That ID can be changed, if needed, by touching that button and entering a new ID.

   The displayed values can be saved for comparison with the laboratory-determined values by touching the **Save Sample** button. If the sample is saved, then it will be added into the Calibration Tool for the active Product. (Touching the **Discard Sample** button will cause those values to be discarded. If the sample is discarded, the Sample ID will not increment.)

   When collecting a gauge sample using the Sample Function, the Span and Trim values being used at the time are recorded. The Calibration Tool uses the stored Span and Trim values to re-calculate each data point to allow all sample data with reference values collected for the selected Product to be included in the calibration calculation.

8. Repeat the procedure multiple times (typically 10) to obtain a representative collection of gauge readings and corresponding reference samples.

9. Process the reference samples according to your established laboratory method to obtain the reference values.

10. You can use the embedded calibration tools to adjust the gauge reading to your laboratory reference method.

11. To use the Calibration Tool, you must login as either the Supervisor or Engineer:

    - There must be sample data collected and saved to the associated Product.
    - A minimum of **5** data points – with reference values – are required for the Calibration Tool to calculate new calibration settings.

12. Touch the  **Configuration** button, then touch  **Configure Products**.

13. Select the required product, then press **Calibrate** (Figure 7-9).

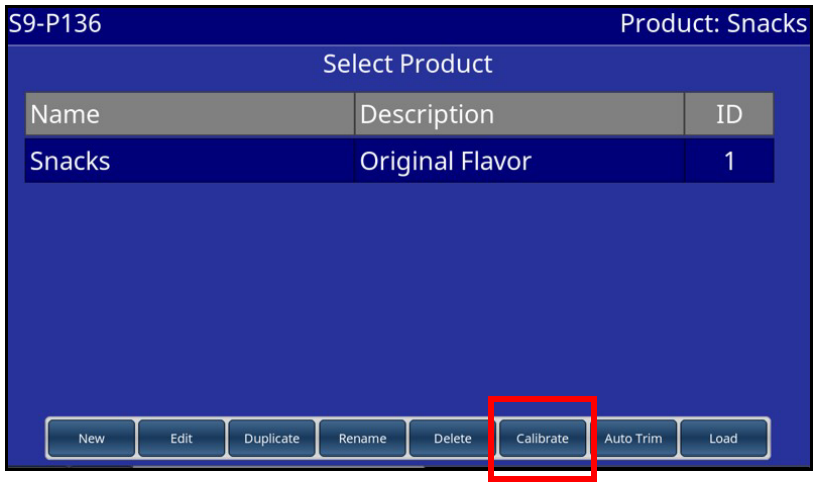


Figure 7-9 Press Calibrate button

14. Enter the laboratory reference value into the **Lab** column:

    a. Select the corresponding cell - the box will highlight in red (Figure 7-10).

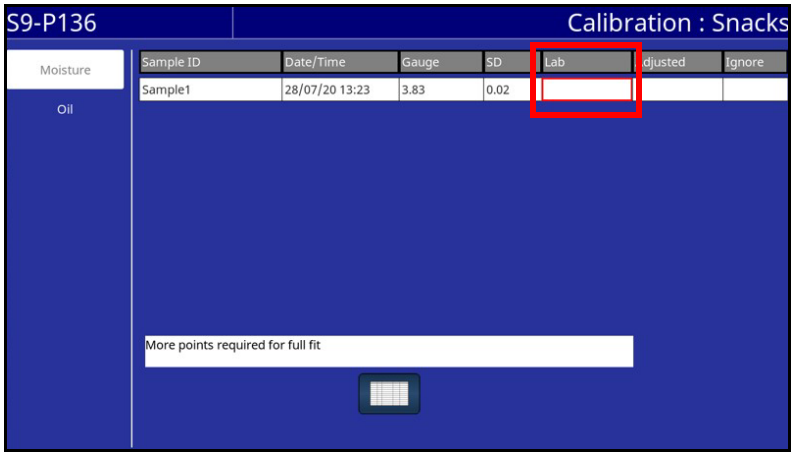


Figure 7-10 Lab cell highlighted in red when selected

b. Select the cell again and enter the lab value (Figure 7-11).

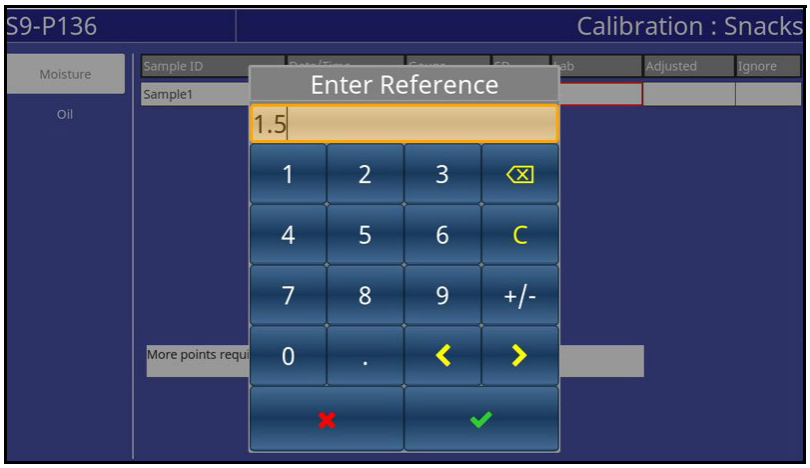


Figure 7-11 Enter lab value

c. Repeat for the other component measurements.

15. As soon as 5 reference values have been entered into the table, the Calibration Tool will fill in the **Adjusted** column with the data re-calculated to the suggested calibration settings (Figure 7-12).

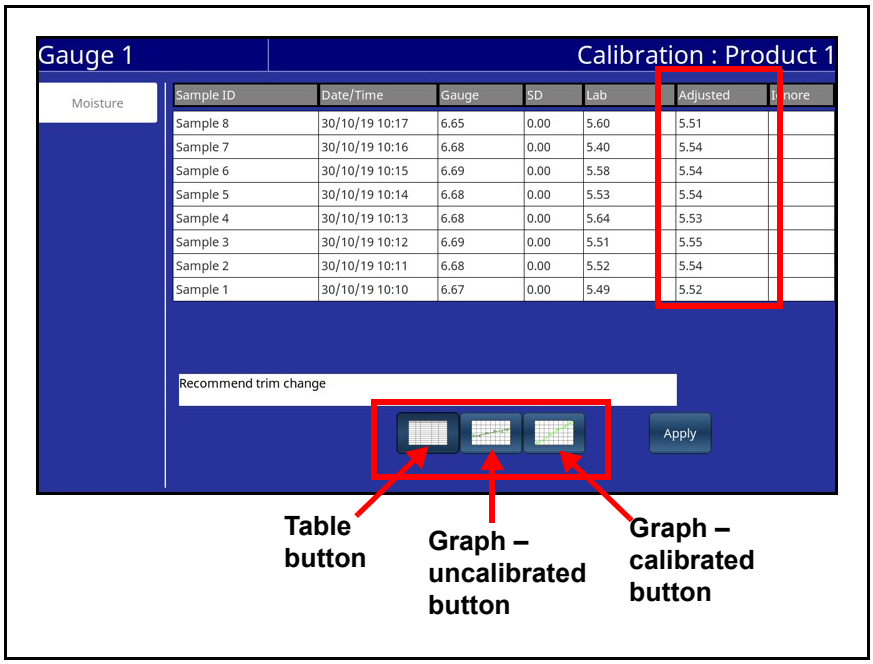


Figure 7-12 Adjusted column shows re-calculated data

16. Three new buttons will appear next to the **Table** button when 5 or more reference values have been entered (Figure 7-12):

    - **Graph - uncalibrated**
    - **Graph - calibrated** (with new Span & Trim settings)
    - **Apply** - allows the new settings to be applied to the associated product

17. Press the **Graph - uncalibrated** button  to view the data all normalised to Span = 1, Trim = 0 (Figure 7-13).

    The best-fit line through the data shows the type of calibration fit required. If the line is parallel to the perfect calibration line, then this represents a 'Trim Only' calibration. If the best-fit line shows a slope change to the perfect calibration line, this represents a full 'Span & Trim' calibration.

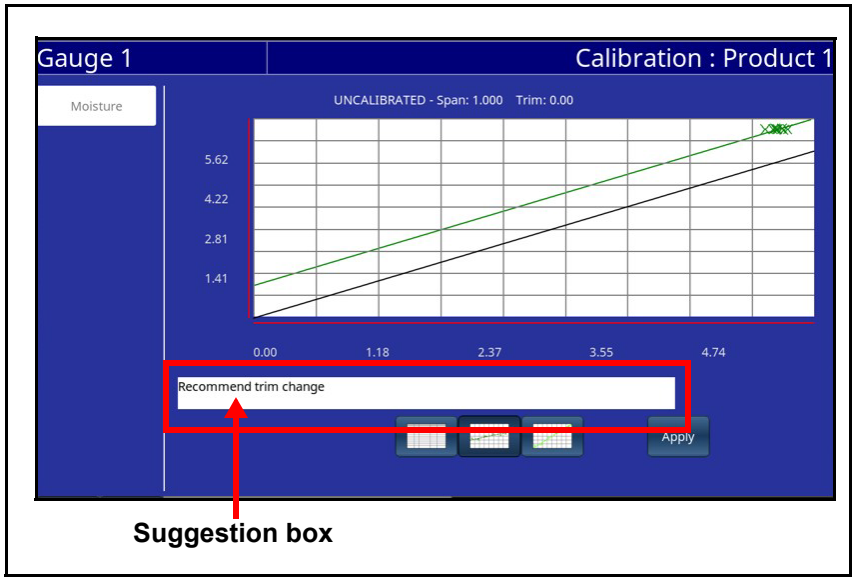


Figure 7-13 Uncalibrated Graph with Span = 1, Trim = 0

The **Suggestion** box notifies what type of calibration change is required. It will also show instructions if insufficient data is available.

18. Press the **Graph - calibrated** button  to view the data with the new calibration settings applied (Figure 7-14).

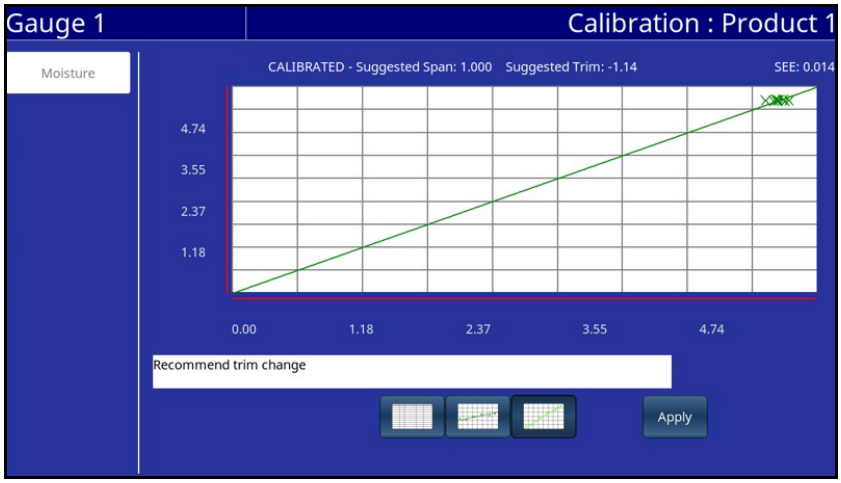


Figure 7-14 Calibrated Graph

19. When satisfied with the suggested calibration settings, press **Apply** and then press **Ok** (Figure 7-15). This will download the new calibration settings to the selected product. If this is the active product, the new settings will also be downloaded into the gauge.

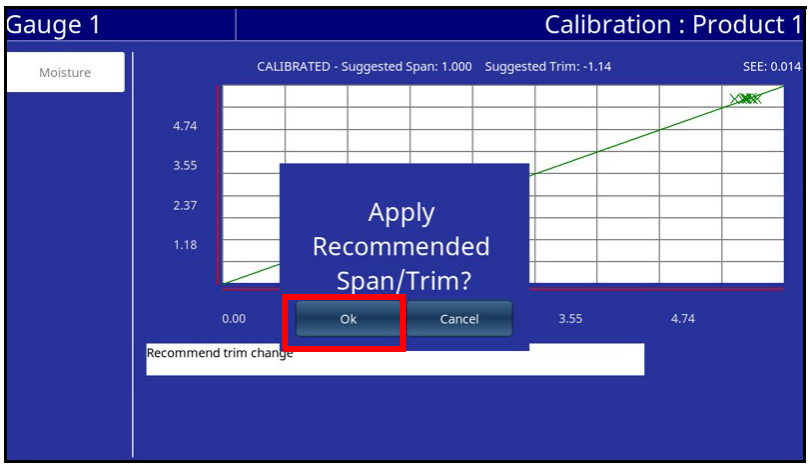


Figure 7-15 Press Ok to apply new calibration settings

20. If there are any statistical outlier data points, these will be highlighted in two ways:

- **Table view** – the associated **Adjusted** cell will be filled in orange (Figure 7-16)

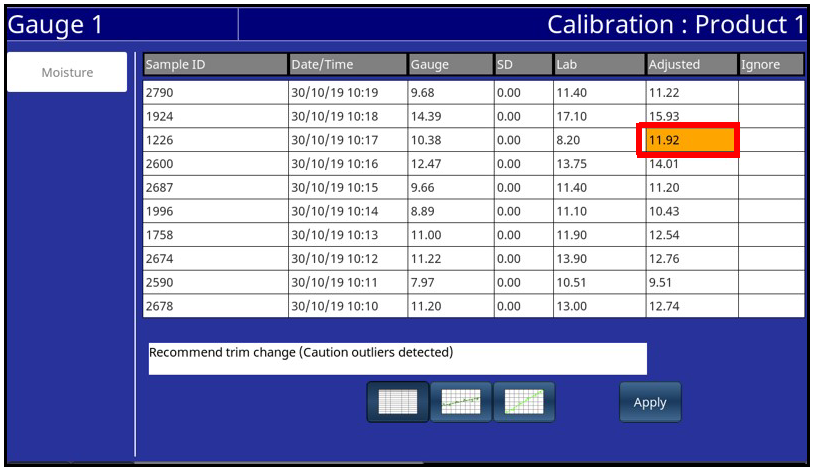


Figure 7-16 Outlier cell is filled in orange

- **Graph view** – the data point will be shown in red (Figure 7-17)

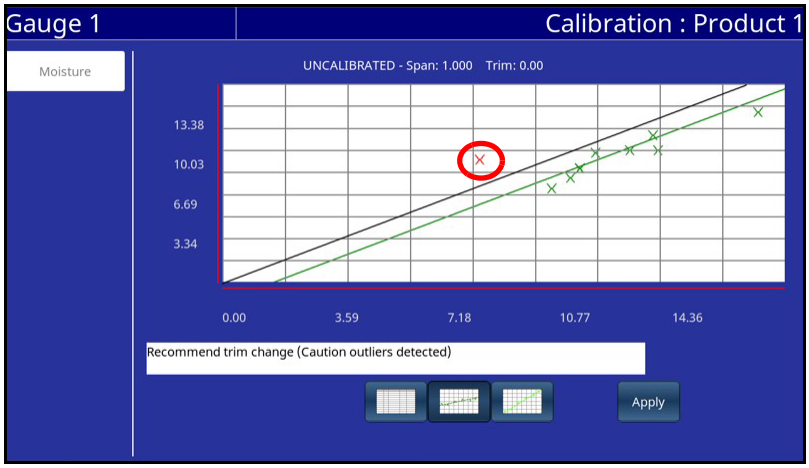


Figure 7-17 Outlier data point is shown in red

The **Suggestion** box will also indicate that an outlier is present in the given suggested calibration change comment.

- The outlier data point will be included in the calibration calculation unless the associated **Ignore** cell is crossed (Figure 7-18).

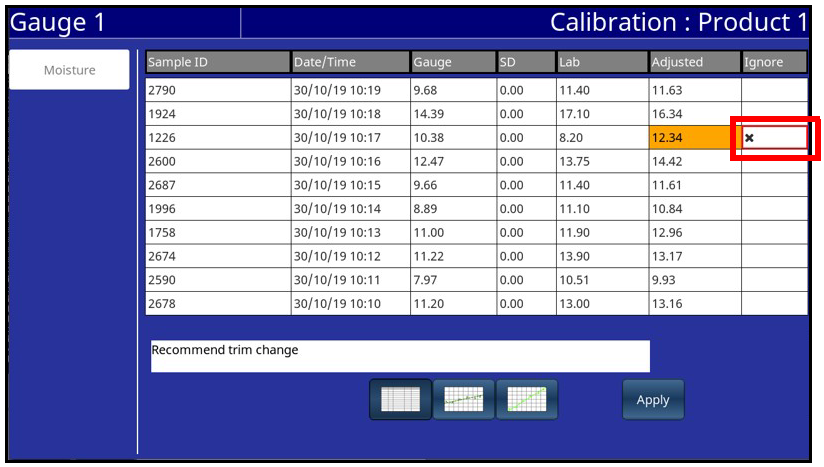


Figure 7-18 Ignore cell is crossed

With the outlier ignored, the **Suggestion** box returns to a standard calibration change recommendation.

7.2.2.2 Calculating and Applying Trim

Note: This function is accessible only on the GCI.

This procedure saves a Trim adjustment in a product, based on values obtained using the Sample function.

1. Obtain the appropriate sample data as described above.

2. Touch the  **Configuration** button, then touch  **Configure Products** to bring up the Configure Products page (Figure 7-19).

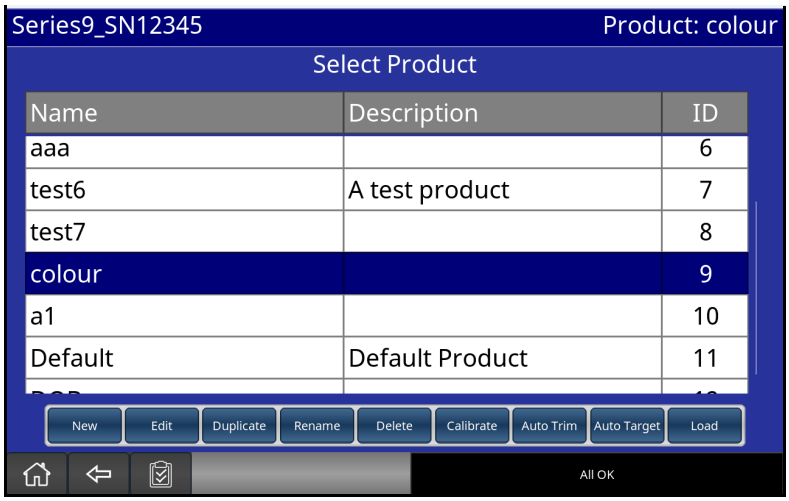


Figure 7-19 Configure Products page

3. Select the product from the table, then touch the **Edit** button to edit the product (Figure 7-20).

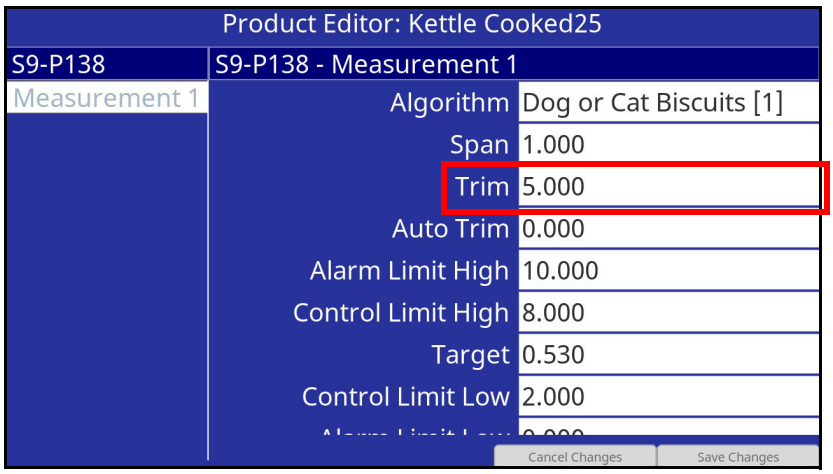


Figure 7-20 Enter new Trim value in product

4. Calculate the new **Trim** value:

$$T_1 = T_0 + (Lab_M - G_M)$$

where:

T_1 = New Trim value

T_0 = Current Trim value

Lab_M = Average of laboratory reference values

G_M = Average of gauge sample measurements

5. Enter the new Trim value in the **Trim** box.

6. Touch the **Save Changes** button to save the Trim value in the product. (If the **Cancel Changes** button is touched, this will cause that value to be discarded.)

7.2.3 Internal Referencing the Gauge

7.2.3.1 Performing an Internal Reference

Note: This function is accessible only to an Engineer on both the GCI and OT.

1. Touch the  **Configuration** button, and then touch  **Gauge Diagnostics** on the Settings page.

2. Touch the  **Check** button to bring up the Gauge/Reference Check page (Figure 7-21).

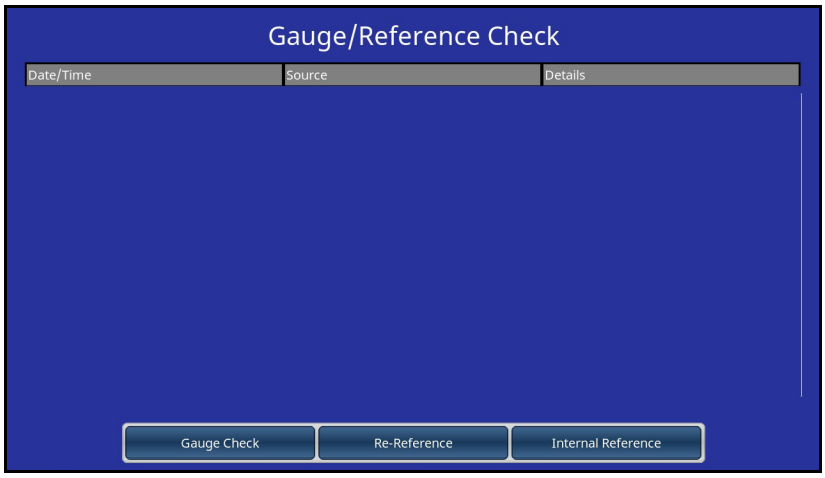


Figure 7-21 Gauge/Reference Check page

3. Touch the **Internal Reference** button to start the process.

   A ten-second countdown is displayed while the sampling is in progress, followed by a success or fail message.

7.2.3.2 Using the External ARS

The external ARS can be used to check the stability of the Series 9 gauge by presenting diffuse reflectance target. It is also used to retrain the internal reference standard in the event of a failure of the on-board computer and losing the factory settings.

The external ARS target is housed in a robust plastic enclosure, and can be simply mounted onto the Air Purge Window using built-in magnets.

If a standard air purge window is fitted, it is **not** necessary to remove it in order to fit the ARS.

Attach the ARS to the gauge as follows:

1. Shut off the air supply to the air purge assembly, where fitted.
2. Insert the ARS into the window bezel as far as it will go, until it snaps in place.

ARS

ARS mounted to gauge

3. Touch the  **Configuration** button, and then touch  **Gauge Diagnostics** on the Settings page.
4. Touch the  **Check** button to bring up the Gauge/Reference Check page (Figure 7-21).
5. Touch the **Re-Reference** button to start the process.

   A ten-second countdown is displayed while the sampling is in progress, followed by a success or fail message. When finished, the system waits for the user to remove the ARS, and then it teaches the internal ARS.

7.2.3.3 Re-Reference Failed

If a fail message is displayed, it indicates that the correction required is beyond the capability of the normal Re-Reference process.

Note: The number in the message has no operational significance, but may be required by Nordson to assist with diagnosis of the problem. Please make a note of the number.

Possible causes are:

- **Gauge window contaminated, or ARS window contaminated externally.**

  In this case, clean the window(s) and repeat the Re-Reference procedure.

- **ARS not fitted correctly, or not allowed to equalise to the ambient temperature.**

  Check, and then repeat the Re-Reference procedure.

- **ARS contaminated internally.**

  This can happen as a result of poor storage conditions, resulting in the formation of water vapour within the unit. In this case, return the ARS to Nordson.

- **Gauge faulty.**

  If the error is not caused by contamination as described, it is possible that the gauge is faulty. In this case, contact Nordson.

7.2.4 Performing Full-Range Calibration

In most circumstances, adjustment of Trim (see Section 7.2.2 - Trim) is sufficient to provide accurate measurements around a target value.

Where the application requires measurement across a range of values, however, it may be necessary to perform a full-range calibration involving the determination of optimum values for both Trim and Span.

This is not generally recommended for routine calibration because it is time consuming and requires product to be made with a wide variation in the levels of the measurement parameters.

Note: The easiest way to do a full-range calibration is to use the Calibration Tool within the GCI (see Section 7.2.2.1 - Obtaining Samples and Calibration).

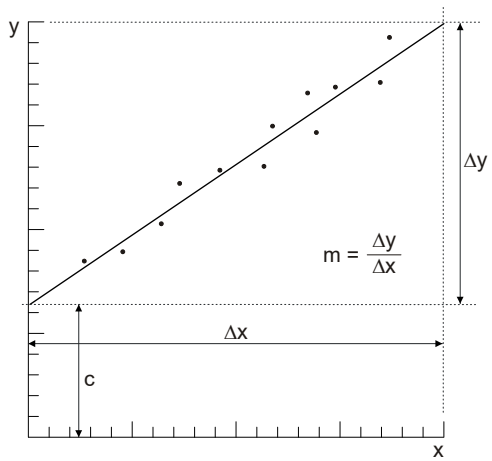
The general method described here can be used as an alternative.

1. To provide a starting point for the full-range calibration, set the gauge Trim using the Auto-Trim procedure (see Section 7.2.1 - Using Auto-Trim).

2. Obtain gauge and laboratory sample data over the required measurement range using the Sample function (see Section 7.2.2.1 - Obtaining Samples and Calibration).

   The accuracy of the predicted Span value depends on the measurement range over which data is collected, and the number of samples taken. As a guide, the range should cover at least 70% to 130% of the target value, with a minimum of ten samples.

3. Perform a linear regression (least squares or orthogonal) using the laboratory reference value as the independent variable (x) and the gauge output as the dependent variable (y).



The equation of the best-fit line is given by:

$$y = mx + c$$

where

m is the slope of the best-fit line

c is the y intercept of the best-fit line

4. Calculate the new Span value S_1 from:

$$S_1 = S_0 / m$$

where S_0 is the original Span (as used during data collection).

5. Calculate the new Trim, T_1 from:

$$T_1 = (T_0 - c) / m$$

where T_0 is the original Trim value (as used during data collection).

6. Enter the calculated values of **Trim** and **Span**, using the GCI Edit Product function (see Section 6.4.2 - Editing an Existing Product).

7.2.5 Checking Gauge Stability

Series 9 gauges are self-compensating for factors such as aging of their internal source lamp, and are substantially unaffected by ambient light or environmental temperature changes within their operating temperature range. Consequently, the gauges should be stable and provide consistent measurements over long periods of operation.

If you wish to check this for any reason, it can be done using either of the methods described below.

Note: By far the most common reason for drift in the gauge output is window contamination. It is vital, therefore, that the window is kept clean during normal operation, either by regular cleaning or by fitting an Air Purge window. The window should be cleaned before any reference check is performed.

Checking the Gauge Output with the External ARS

To do this, you will need a product (see Section 6.2 - About Products) with a **Span** value of 1.00 and a **Trim** value of 0.00.

1. If necessary, create a new product (see Section 6.4.1 - Creating a New Product) with a Span value of 1.00 and a Trim value of 0.00, and save it with a meaningful name such as Stability Check.

2. Load the product to the gauge to be tested.

3. Fit the external ARS to the gauge (see Section 7.2.3.2 - Using the External ARS).

4. Check the gauge outputs on the Home page and record for future reference.

5. Remove the external ARS and load the normal operating product.

6. Repeat this procedure at intervals and check that the gauge output remains consistent over time.

Using the Gauge Check Function

Note: This function is accessible only to a Supervisor or Engineer on both the GCI and OT.

This function can be used without loading a special product. It checks the gauge output against the internal reference standard and provides a date- and time-stamped percentage reading, which represents the deviation from ideal.

It is important to understand that this is a very sensitive check, and that some deviation from 0% is normal. As an indication, a reading of 100% is equivalent to the threshold for failure of the internal reference procedure (see Section 7.2.3 - Internal Referencing the Gauge). Anything below 30% is insignificant for all practical purposes.

1. Touch the  **Configuration** button, and then touch  **Gauge Diagnostics** on the Settings page.

2. Touch the  **Check** button to bring up the Gauge/Reference Check page (Figure 7-21).

3. Touch the **Gauge Check** button to start the check.

   The screen will show a 10-second countdown and then display a table showing the result of the gauge check (and references), together with previous results (Figure 7-22).

   The **Details** column provides an indication of how good the check or reference was with a traffic light system (green, yellow, red) to give a quick indication of good (<3%), marginal (3 to 5%), or bad results (>5%).

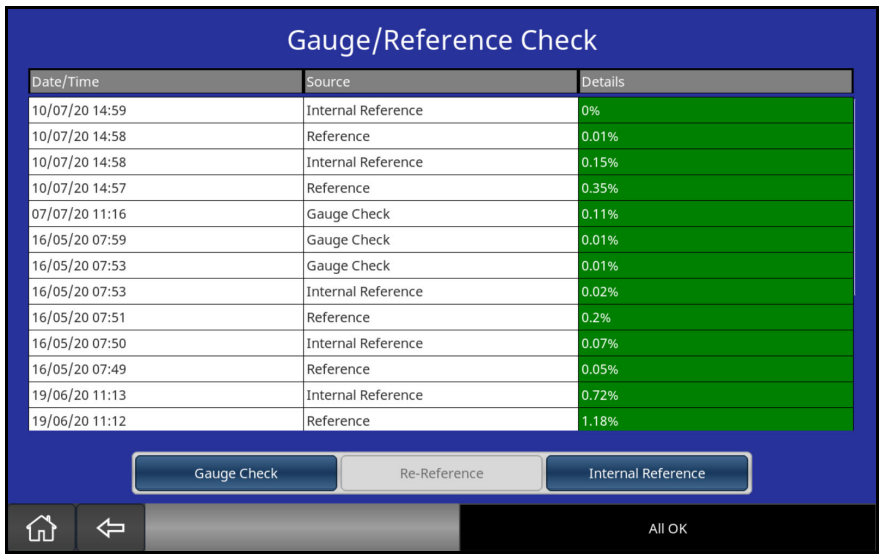


Figure 7-22 Gauge/Reference Check results

CHAPTER 8

8 Maintenance and Spares

This chapter covers general cleaning of Series 9 components, and corrective maintenance to the level of the parts designated as customer replaceable items.

8.1 Warnings and Cautions

When carrying out any maintenance on the system, observe the following to avoid injury to personnel and damage to the equipment.

BATTERY WARNING

There is a rechargeable PCB-mounted battery in the Series 9 sensor – **NO attempt should be made by the user to replace it.** If there are issues regarding this, please consult Nordson or their representative.

- If the gauge has been operating in very high temperature environment, allow adequate time for it to cool before handling.
- Compressed air can be dangerous. Isolate the Air Purge window compressed air supply before working on a gauge.
- Do not power up the gauge when the case is open. The filter wheel rotates at a very high speed, and could cause injury.
- Gauge maintenance must be carried out in a clean room away from the working area of the equipment.
- While the gauge case is open, take care not to touch any optical surfaces.
- When working on any system components, observe standard anti-static precautions.

8.2 Cleaning

External surfaces of gauges and other system components should be cleaned periodically with a damp non-abrasive cloth only.

Keep cables and connectors free from contaminants that could cause chemical damage.

Clean gauge windows as described below.

Caution: If solvents are needed to remove contamination, it is essential to consult the Customer Care Department of Nordson or their agent first, giving precise details of the solvent.

8.2.1 Cleaning Gauge Windows

Clean the gauge window using a soft lint-free cloth.

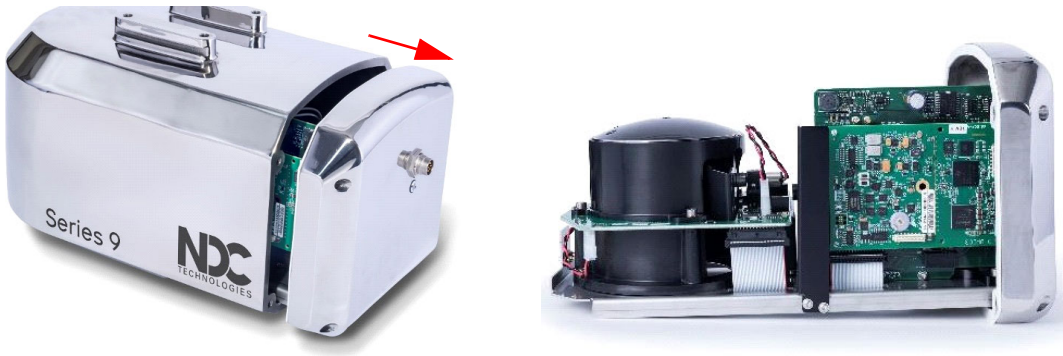
Where necessary, use warm water and a mild detergent. **Do not use abrasive cleaners of any kind**.

If a solvent is needed to remove contaminants, contact Nordson or their agents first.

8.3 Replacing the Gauge Source Lamp Assembly

To replace the Source Lamp Assembly:

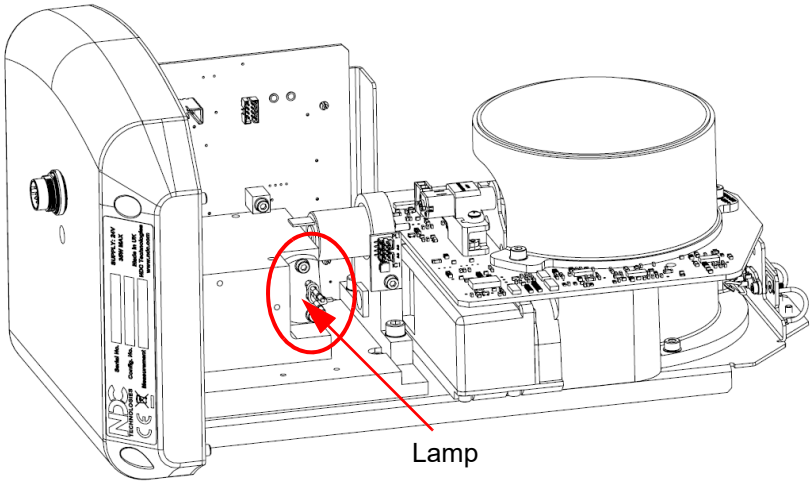
1. Remove power from the gauging system.
2. Disconnect the services cable from the sensor.
3. Using a 4 mm Allen key, undo the 4 fixings screws within the corners of the sensor lid and carefully slide the chassis out from the enclosure.



Slide chassis out from enclosure

4. Place the chassis facing downwards on a flat, clean surface.

5. Locate the lamp, as indicated in the figure below.



6. Unplug the two lamp assembly leads.

7. Undo the two lamp fixing screws with a 2.5mm Allen key, and withdraw the lamp assembly from its mounting.

8. Fit the new lamp and reassemble the sensor following the reverse of this procedure. **Take care not to touch the lamp glass as this may cause lamp failure**.

   If accidental contact is made, clean the glass with isopropyl alcohol (IPA).

9. Switch the gauge on and allow 2 hours for it to reach full operating temperature, then internal reference the gauge (see Section 7.2.3 - Internal Referencing the Gauge).

8.4 Replacing the Filter Wheel Motor

To replace the filter wheel motor:

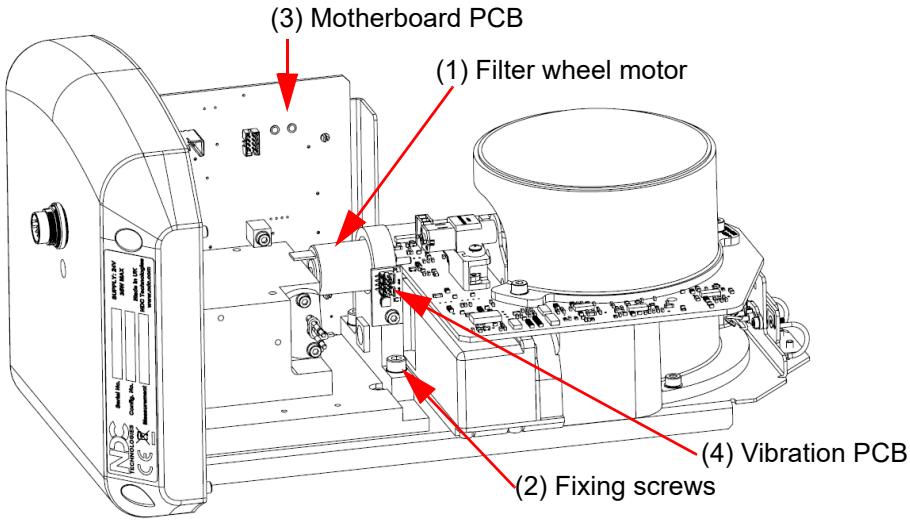
1. Remove power from the gauging system.

2. Disconnect the services cable from the sensor.

3. Using a 4 mm Allen key, undo the 4 fixings screws within the corners of the sensor lid and carefully slide the chassis out from the enclosure. See figure in step 3 of Section 8.3 - Replacing the Gauge Source Lamp Assembly.

4. Place the chassis facing downwards on a flat, clean surface.

5. Locate the filter wheel motor (1), as indicated in the figure below.

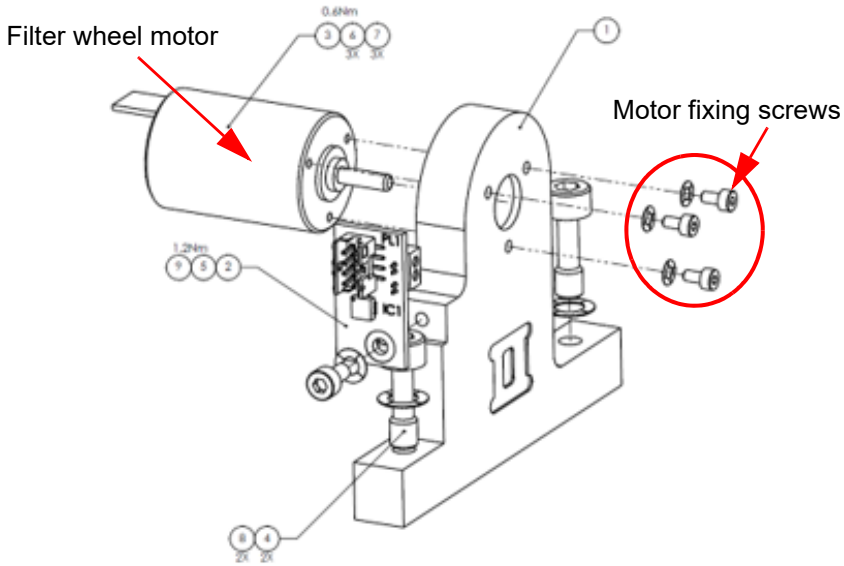


6. Unplug the filter wheel motor ribbon cable connector from the motherboard PCB (3).
7. Unplug the vibration PCB (4) ribbon cable connector.
8. Undo the filter wheel motor assembly fixings screws (2) with a 4 mm Allen key.
9. **Lift the filter wheel assembly away from the Chassis. Do not touch the optical surfaces of the filter wheel**.

   If accidental contact is made, clean the optical surfaces with isopropyl alcohol (IPA).
10. Note the orientation of the filter wheel, with the bush containing the grub screw towards the end of the motor shaft.
11. Loosen the grub screw and carefully withdraw the filter wheel from the motor shaft.

    If the filter wheel does not come off easily, do not attempt to pull it off as this may damage the motor bearings. Instead, grip the wheel by its edges and use a small Allen key or similar tool to push the motor spindle out from the wheel.

12. Remove the 3 x motor fixing screws using a 1.5 mm Allen key, as shown in the figure below.



13. If the instrument is within the warranty period, return the faulty motor to Nordson for replacement. If not, discard the motor.

14. Fit the filter wheel to the new motor.

    If the wheel is a tight fit, do not attempt to push it on while holding the motor. Place the back end of the motor shaft against a hard surface and then push the filter wheel on as far as it will go.

15. Tighten the filter wheel grub screw.

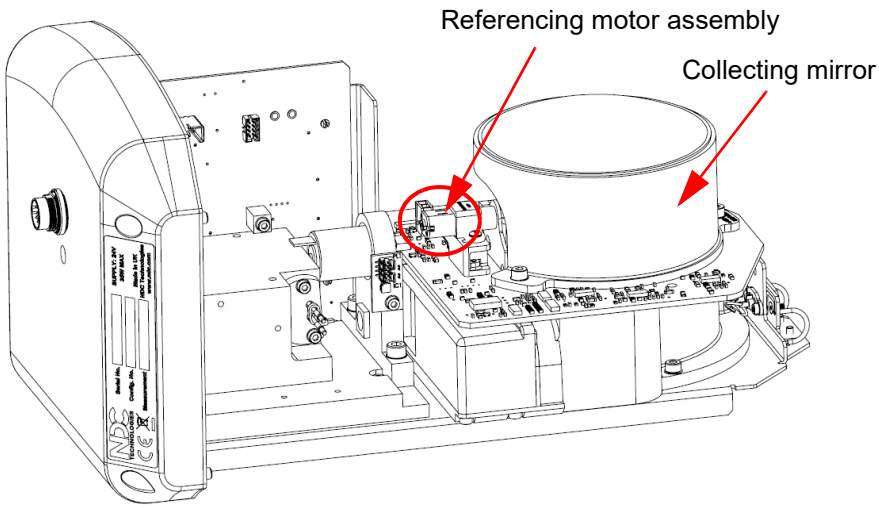
16. Fit the motor assembly, and reassemble the sensor, following the reverse of the previous steps.

17. Switch the gauge on and allow 2 hours for it to reach full operating temperature, then internal reference the gauge (see Section 7.2.3 - Internal Referencing the Gauge).

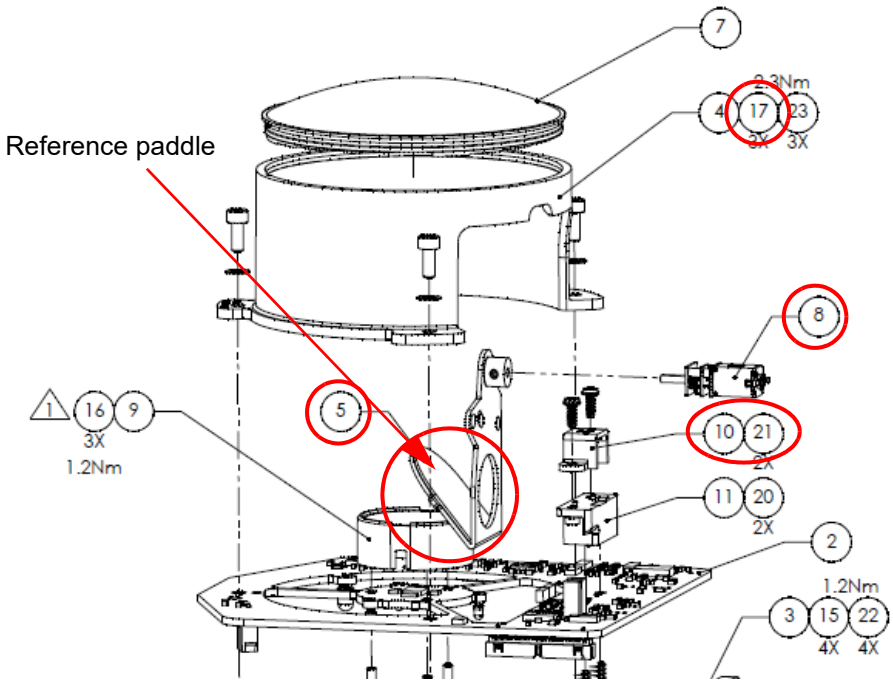
8.5 Replacing the Referencing Motor

To replace the referencing motor:

1. Remove power from the gauging system.
2. Disconnect the services cable from the sensor.
3. Using a 4 mm Allen key, undo the 4 fixings screws within the corners of the sensor lid and carefully slide the chassis out from the enclosure. See figure in step 3 of Section 8.3 - Replacing the Gauge Source Lamp Assembly.
4. Place the chassis facing downwards on a flat, clean surface.
5. Locate the referencing motor, as indicated in the figure below.



6. Remove the collecting mirror by removing the 3 x M4 screws (item 17 below) with a 3 mm Allen key, then carefully lift and store it away.



7. Carefully unplug the motor lead, remove the two pozi drive screws securing the reference motor clamp (8,10,21) and lift away the motor and reference paddle (5).

8. Remove the reference paddle from the motor shaft by undoing the grub screw and sliding it off the shaft.

9. Fit the reference paddle to the new motor, by sliding along the motor shaft until it bottoms out and tightening the grub screw.

10. Reassemble the parts, following the reverse of the previous steps.

11. Switch the gauge on and allow 2 hours for it to reach full operating temperature, then internal reference the gauge (see Section 7.2.3 - Internal Referencing the Gauge).

CHAPTER 9

9 System Options

The options described in this section apply to some or all of the gauges and applications of the Series 9 system covered by this manual.

9.1 Internal Gating Option

This option enables the gauge to make reliable measurements of discontinuous products by switching the infra-red measurement system on only when there is product in the beam-patch area. It operates by using two infrared sensors located within the gauge to detect changes in the distance between the gauge window and the viewed surface. If the distance is greater than a defined threshold - indicating that there is no product in the beam patch - the gauge is gated off.

The option is available with small and large beam patch.

The gauge should be positioned as shown below, and installed in accordance with the installation instructions (see Section 4.7 - Installing the Gauge).

The gating function can only operate correctly with a solid background (i.e., a product moving on a solid belt or with a background target).

In all cases, it is important that no metallic or reflecting surfaces are present within 20mm of the visible gauge patch at all distances, this applies even when the product is absent.

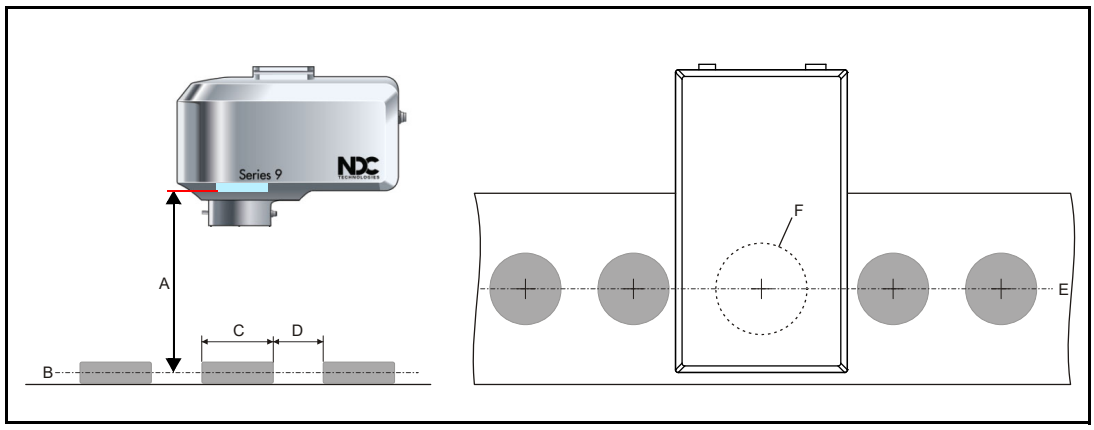


Figure 9-1 Gating function

			Small beam patch	Large beam patch
	A	Nominal gate distance	140mm ±1mm	250mm ±5mm
	B	Mean height of product		
	C	Minimum product size	30mm	85mm
	D	Minimum product separation	8mm with AI Self learning, otherwise 25mm	8mm with AI Self learning otherwise 85mm
	E	Gauge window centre line		
	F	Gauge window		

Note: If the product is changed after gauge installation to one of significantly different thickness, the gating operation may become unreliable. In this case, the gauge should be repositioned to correct the pass height, as above, and the gating should then be recalibrated.

9.1.1 Gauge Mounting Information

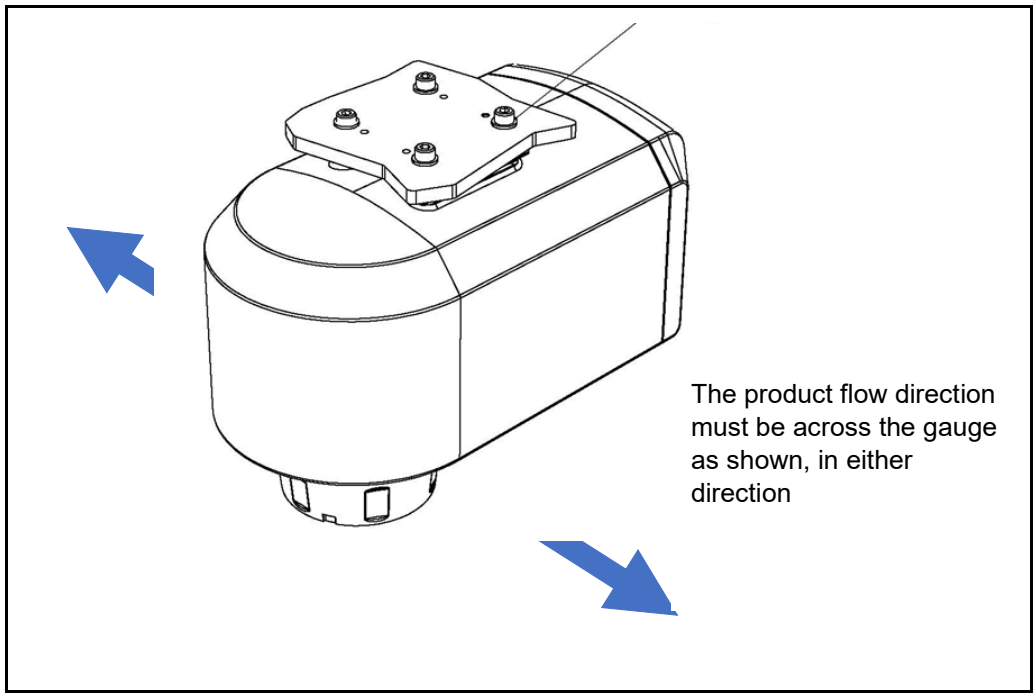


Figure 9-2 Product flow direction

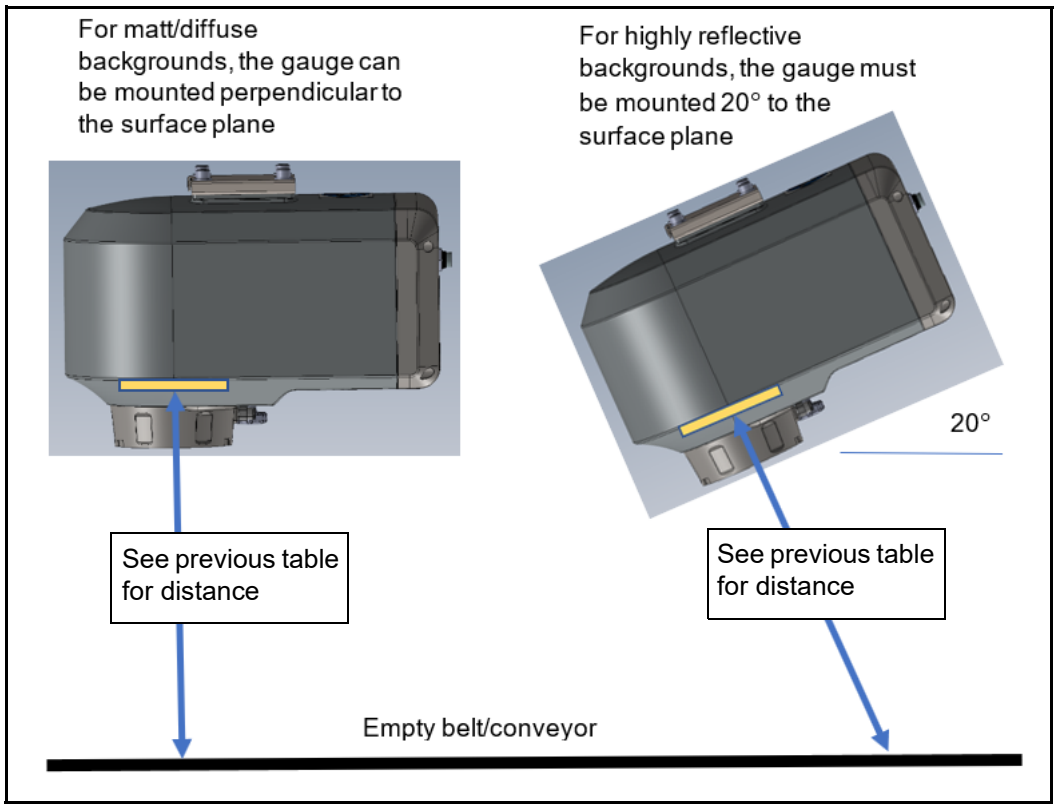


Figure 9-3 Mounting the gauge

9.1.2 Gating Setup

To ensure reliable operation for any particular product, the gating sensors must be calibrated for product thickness, using the GCI.

1. Log in as a Supervisor or Engineer.
2. Touch the  **Configuration** button to bring up the Settings page.
3. Engineer only: Touch the  **Hardware Settings** icon.
4. Touch the  **Gauge Settings** icon.
   This will bring up the Gauge Settings page.
5. Select **Height** from the left pane for the gauge of interest to show the following Height Settings page that is only displayed when the gating/height hardware option is fitted. Figure 9-4 shows the factory default with height disabled and Self learning gating mode enabled.

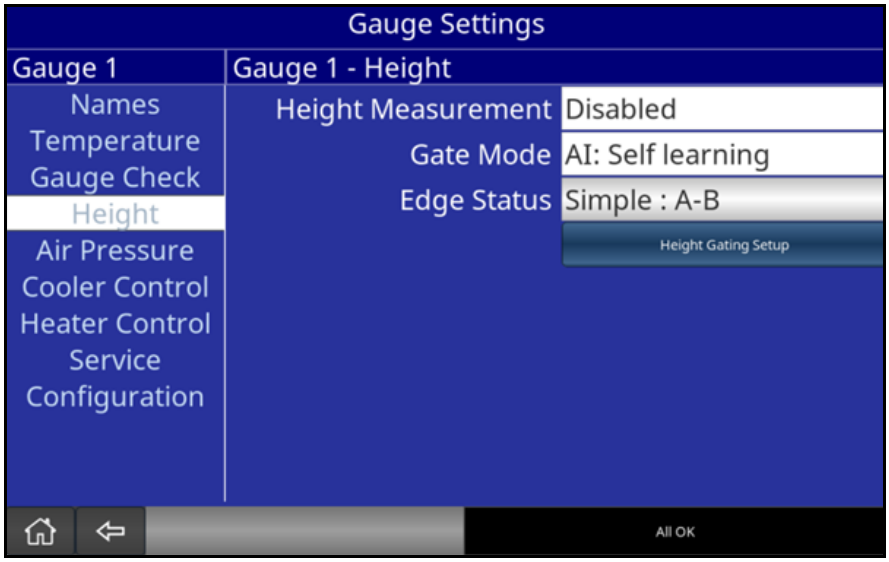


Figure 9-4 Height Settings page (factory default)

9.1.3 Gating Mode

The following gate modes can be selected from the **Gate Mode** box (Figure 9-5), shown here with **AI: Self learning** selected:

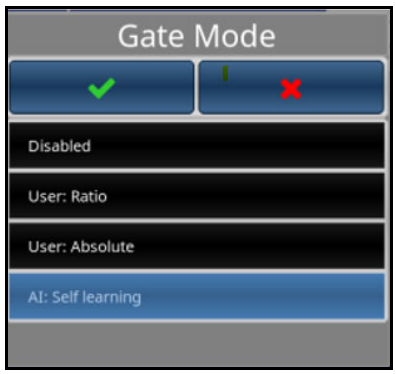


Figure 9-5 Gate modes

AI: Self learning – In this mode, the gauge learns the best configuration and gating thresholds automatically with the process running live, given that the background condition is learnt previously.

Disabled – This enables the user to switch off the gating system so that the gauge measurements are running freely from the gating system, which is useful for measurement calibration purposes where samples are presented manually and gating is not needed.

User: Ratio and **User: Absolute** – In these gating modes, the gating thresholds are learnt by manually presenting product and background conditions rather than with live conditions, and used under special circumstances as advised by Nordson M&CS.

9.1.4 AI: Self learning Steps

Press the **Height Gating Setup** button, and page one of the following pages will appear. (The **Height Gating Setup** button will not be displayed if the **Gate Mode** is set to Disabled.)

Figure 9-6 Default learn live product page

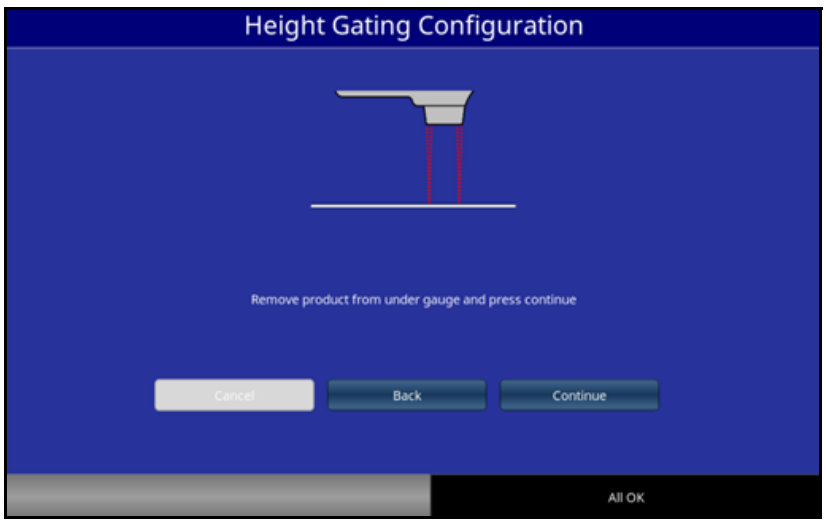


Figure 9-7 Learn background page

Figure 9-6 is the default page that allows gating to be taught on live product, while Figure 9-7 is the page to teach the gauge the background. The live product learning system needs to

have been taught what the no product state looks like, so if this is not known, Figure 9-7, the learn background page is shown.

In normal operation, the background only needs to be retaught if it changes significantly, e.g., belt change or gauge mounted differently. The learn background page can be accessed from the default page by pressing the **Learn background** button.

9.1.4.1 Learning on Live Product

Figure 9-8 Learn live product page

Figure 9-8 is displayed if the background is known. If the background needs to be retaught, touch the **Learn background** button and see Section 9.1.4.2 - Learn Background.

The Learn live product page should be used when the product line is flowing normally. For best results, ensure the following:

- The ratio of product to no product is within the range 1:4 and 4:1 (i.e., product is seen between 20% and 80% of the time)
- The product rate should be at least 60 per minute (1 per second)

1. To start the training, press the **Continue** button.
2. The gauge will collect data for around 10 seconds and update the progress for each of the three passes (each taking around 3 seconds).
3. At the end of the process, the result will be displayed. If setup was successful, the page will look similar to Figure 9-9.

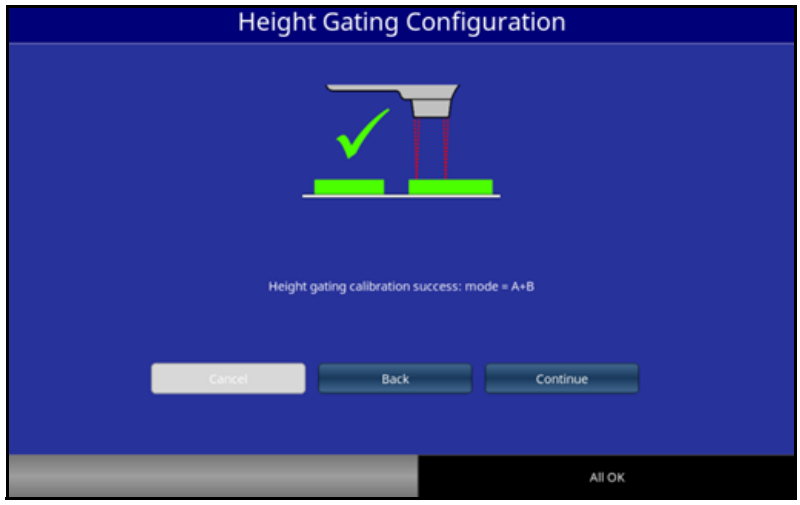


Figure 9-9 Height gating calibration successful

9.1.4.2 Learn Background

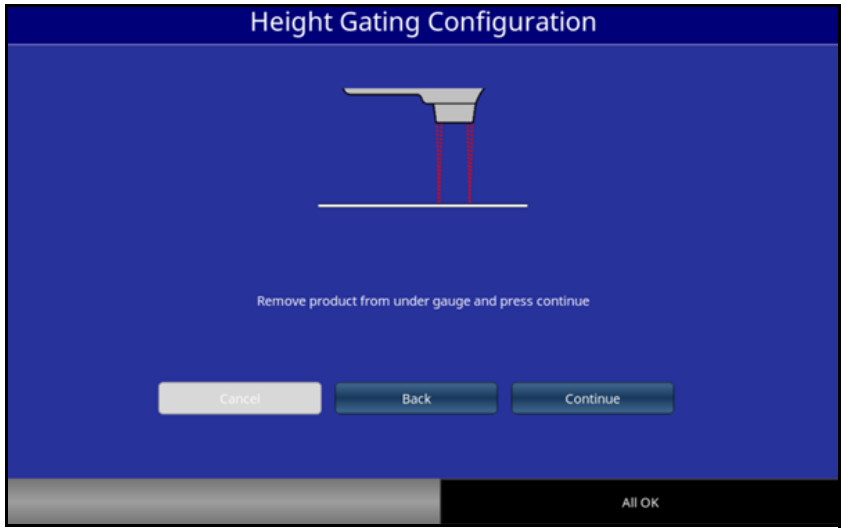


Figure 9-10 Learn background screen

In Learn background mode, Figure 9-10 will be displayed.

Note that there should be no product under the gauge when the sample is made.

Press **Continue** to start the measurement.

At the end of the sample, the GCI will go back to the default Learn on live product screen, as described in Section 9.1.4.1 - Learning on Live Product, ready to sample on live data.

9.1.5 Gating Mode – Ratio or Absolute

In both these Gating Modes, when the **Height Gating Setup** button is pressed, the user is first prompted to remove product (Figure 9-11).

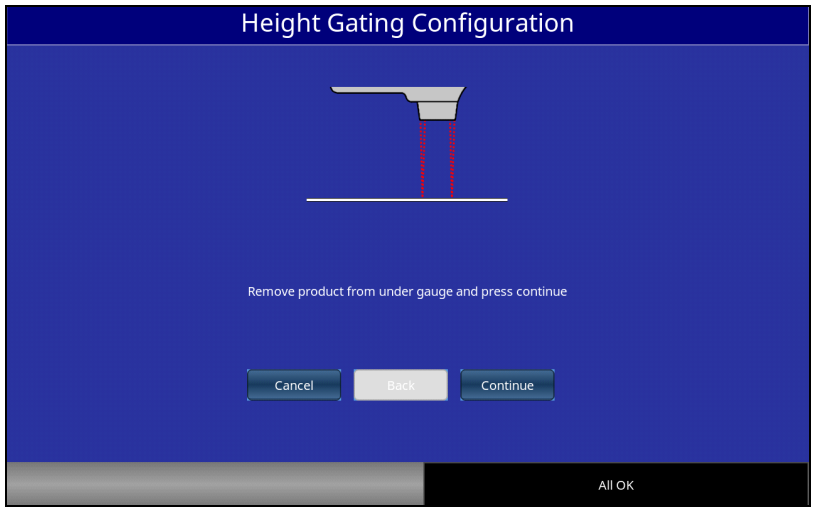


Figure 9-11 Prompt to remove product

After pressing **Continue**, the gauge will sample some data and then prompt the user to show the gauge product (Figure 9-12).

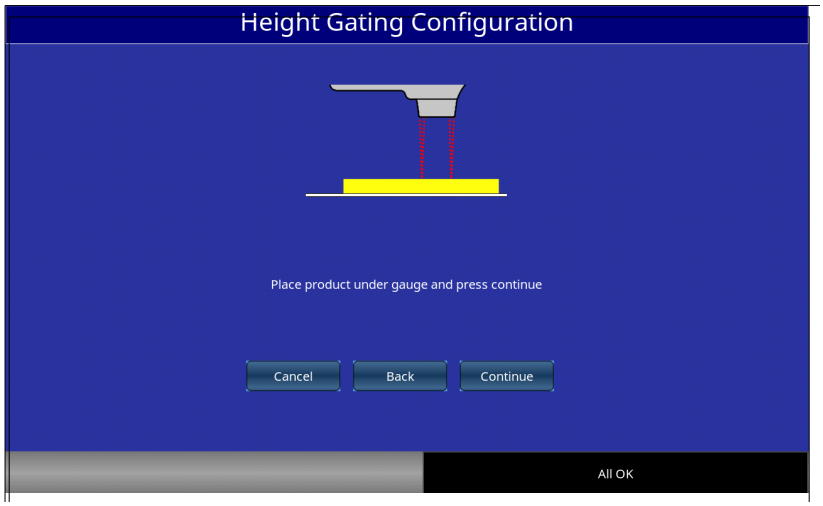


Figure 9-12 Prompt to show product

After pressing **Continue**, the gauge will sample some data and then show the result of the height calibration. If setup is successful, the screen will look similar to Figure 9-13.

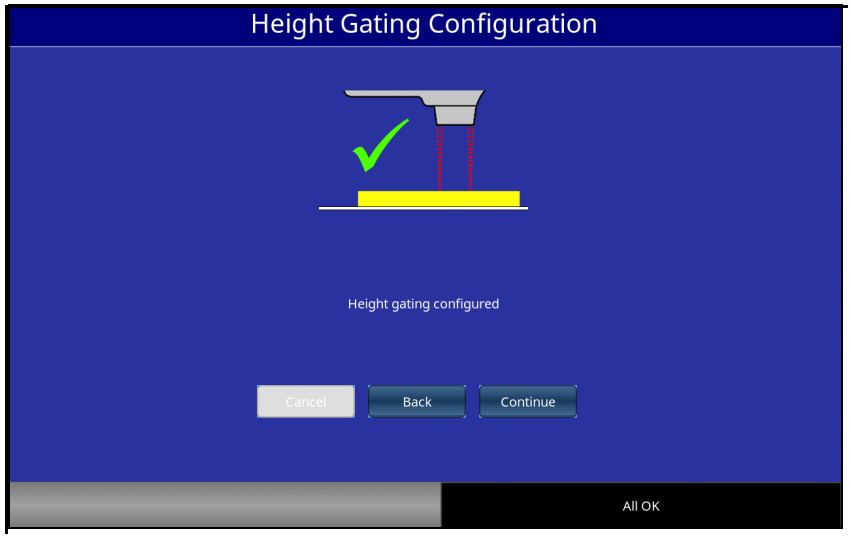


Figure 9-13 Height gating successfully configured

9.1.6 Height Measurement

The height measurement will only be available when a factory height calibration is present, which is only undertaken when the height option is ordered or as part of the color measurement option.

To enable the height measurement channel, select the **Height Measurement** box and enable it from the drop down as shown in Figure 9-14, requiring a gauge reset to complete:

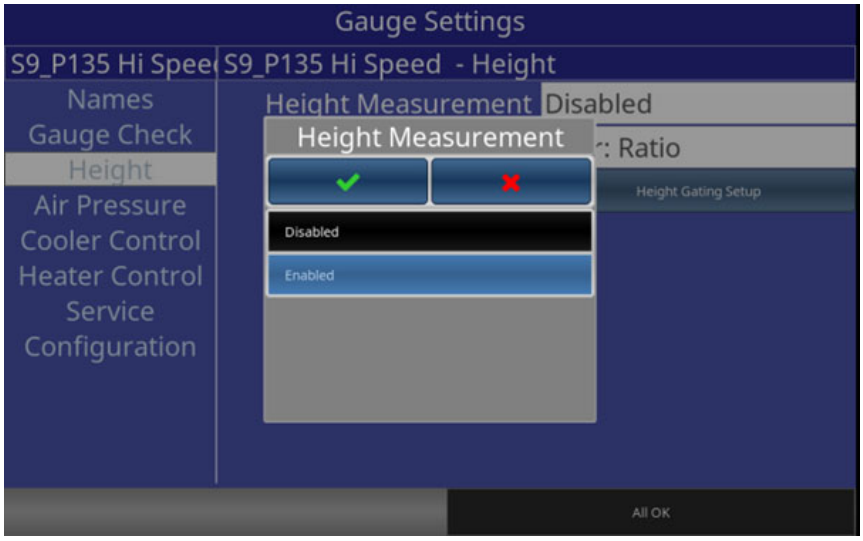


Figure 9-14 Enable the Height Measurement

After the reset, the Height Settings page will show additional parameters (Figure 9-15) and the product height will be shown as one of the measurement channels of the gauge:

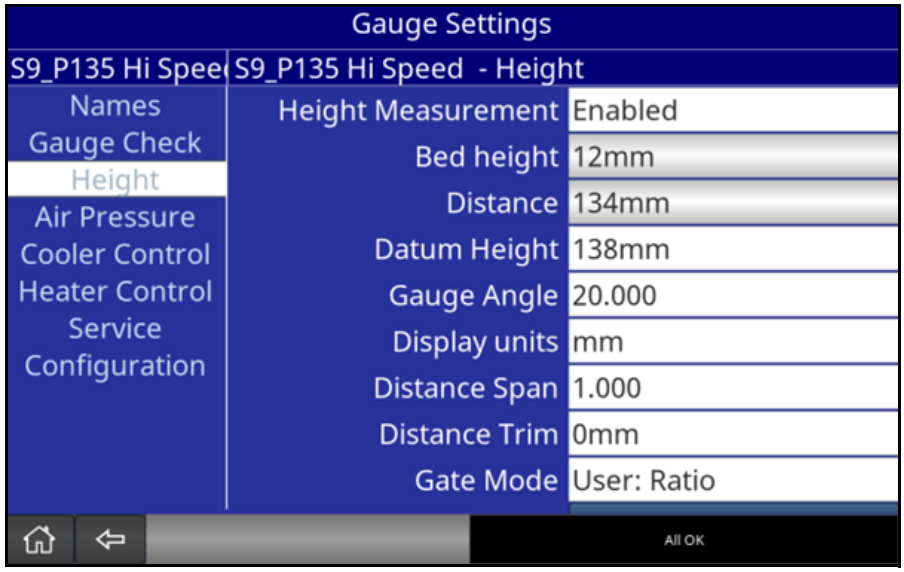


Figure 9-15 Height Settings page with height parameters

The Height parameters are explained as follows:

Bed height (display only) – Shows the current bed or product height from the datum point, which is usually the surface of the conveyor belt and is updated dynamically.

Distance (display only) – Shows the current distance from the gauge window to the surface being viewed and updated dynamically.

Datum Height (entry box) – Set this to the distance from the surface of the gauge's viewing window to a datum point which is used for the bed/product height calculation (zero point) and usually the surface of the conveyor belt.

Gauge Angle (entry box) – Set to the orientation of the gauge which is either 0 deg or 20 deg.

Display units (entry box) – Set to either mm or inches.

Distance Span (entry box) – Allows a Distance Span correction to be set from the 1.000 default.

Distance Trim (entry box) – Allows a Distance Trim correction to be set from the 0.000 default.

9.2 Temperature Measurement Option

The temperature measurement option provides the ability to display the temperature of the product on one channel of the OT and GCI. It uses an externally mounted, self-contained IR temperature sensor in an IP65 sealed housing, that is connected via a 20 m cable (total length from gauge to temperature sensor) to the Series 9 gauge housing (Figure 9-16).

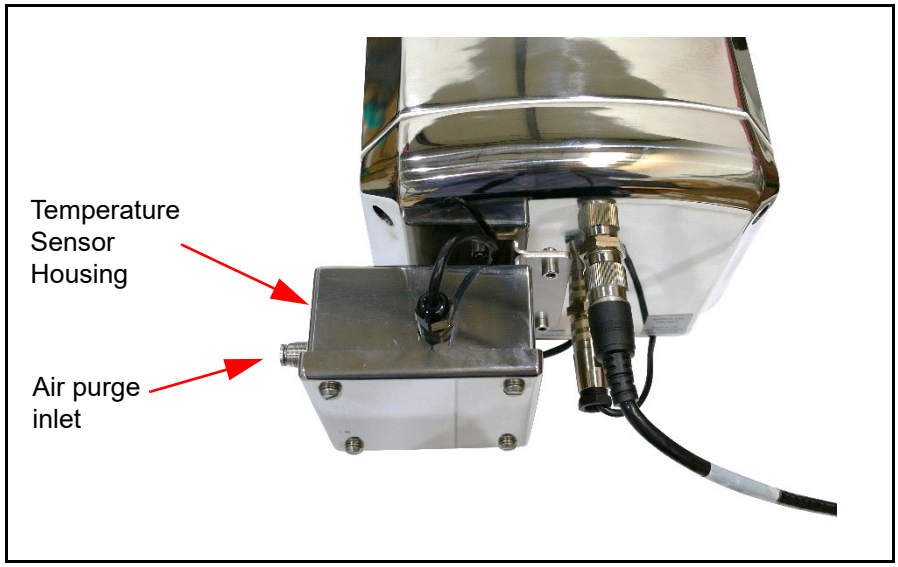


Figure 9-16 Temperature sensor housing

The temperature sensor can operate in the range 0°C -120°C. It delivers real-time measurement of product temperature in a different location to the gauge's NIR measurement(s), The measurement signal is treated like the other gauge measurement signals, and is output via the network or, where fitted, analogue output arrangements.

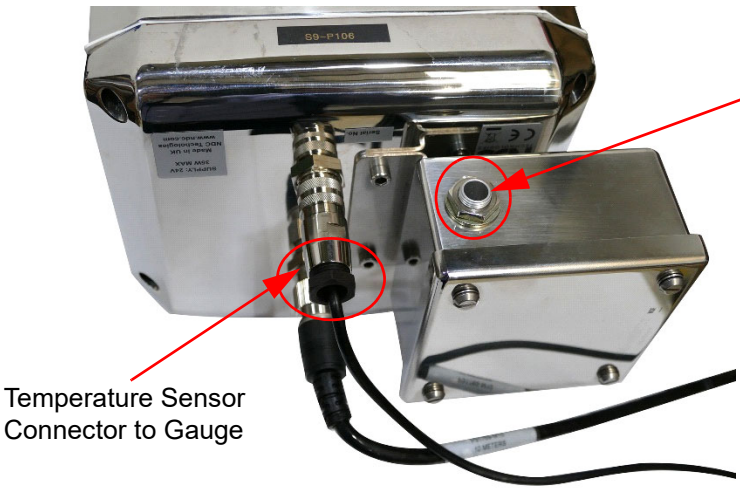


Figure 9-17 Temperature sensor connector and window

The temperature sensor can be fitted to the lid of the Series 9 gauge, as shown in Figure 9-16 and Figure 9-17, using the supplied screws, or it can be positioned remotely, limited by the 20 meter cable.

Temperature Sensor Air Purge

The temperature sensor is surrounded by an air purge assembly. This reduces contamination of the sensor window, and improves measurement stability by keeping the sensor at a constant temperature.

Installation

There are no additional installation requirements, other than the connection of an air supply to the sensor air purge assembly. The air supply connecting point is located on the underside of the gauge, and is made through a quick release fitting, using a 6mm outside diameter tube to a regulated filtered air supply that is dry and clean (oil and dust-free).

- **Air pressure = < 0.5 bar**
- **Air volume = ca. 1 m³/h**

Calibration of Temperature Output

The temperature output can be calibrated via the Analog Output Configuration page on the GCI (Figure 9-18).

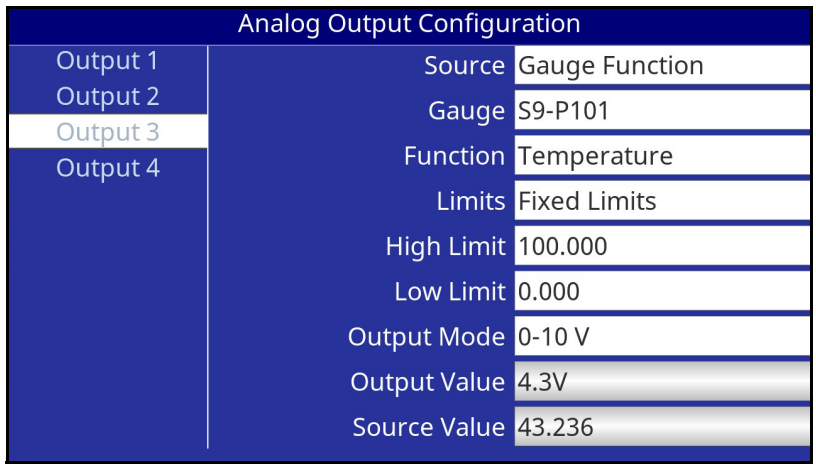


Figure 9-18 Analog Output Configuration page

To bring up this page:

1. Log in as an Engineer.
2. Touch the  **Configuration** button to bring up the Settings page.
3. Touch the  **Hardware Settings** icon.
4. Touch the  **Analogue Outputs** icon.
5. Select an output from the left pane (e.g., Output 3).
6. Set the **Source** to Gauge Function.
7. Set the **Function** to Temperature.
8. The temperature output is calibrated via the **High Limit**, **Low Limit** and **Output Mode** fields.
9. The **Output Value** field shows the current value of the analogue output, and the **Source Value** shows the temperature value.

Temperature Measurements and Emissivity

The temperature measurements and product emissivity are accessible through the Gauge Settings page on the GCI (Figure 9-19).

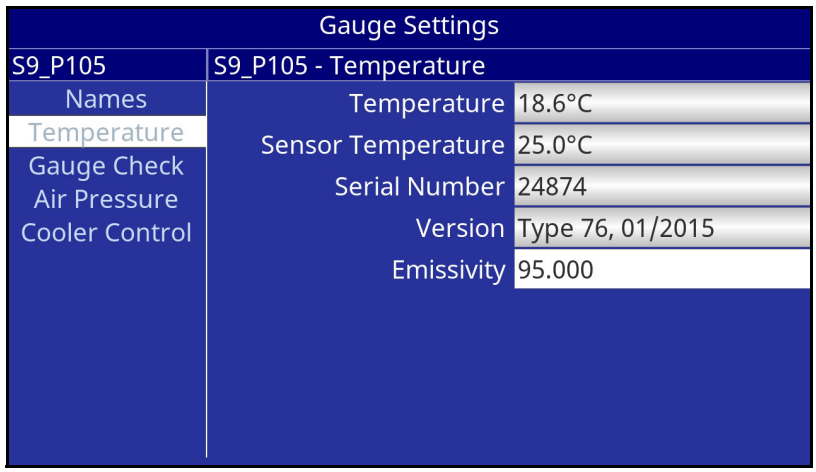


Figure 9-19 Gauge Settings – Temperature page

To bring up this page:

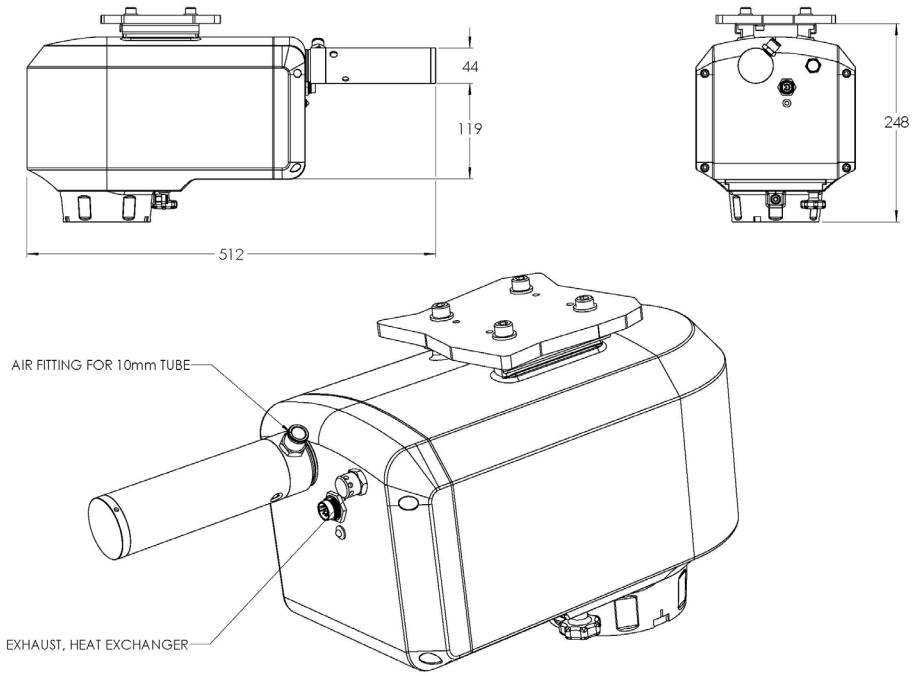
1. Log in as a Supervisor or Engineer.
2. Touch the  **Configuration** button to bring up the Settings page.
3. Engineer only: Touch the  **Hardware Settings** icon.
4. Touch the  **Gauge Settings** icon.
5. Select **Temperature** from the left pane.
6. The **Temperature** field shows the measured temperature of the product.
7. The **Sensor Temperature** field shows the sensor body temperature.
8. The default emissivity factor is 95%, which is suitable for measuring the temperature of most materials.

   If the measured product materials has a significantly different emissivity, enter the appropriate value in the **Emissivity** field.

9.3 Vortex Cooling Option

This cooling option uses a vortex unit to create a cold air flow from a compressed-air supply, which is then circulated through the gauge interior.

The option comprises the vortex unit, factory-fitted to the gauge, and a filter module to provide clean and dry air (Figure 9-20).



All dimensions in mm

Figure 9-20 Vortex cooling option

Installation

WARNING: COMPRESSED AIR CAN BE DANGEROUS.
Do not operate the cooler at pressures above 10.3 Bar (150psi).
Do not operate with input air above 43°C (110°F)

Use the following assembly drawing (Figure 9-21) to connect the air set.

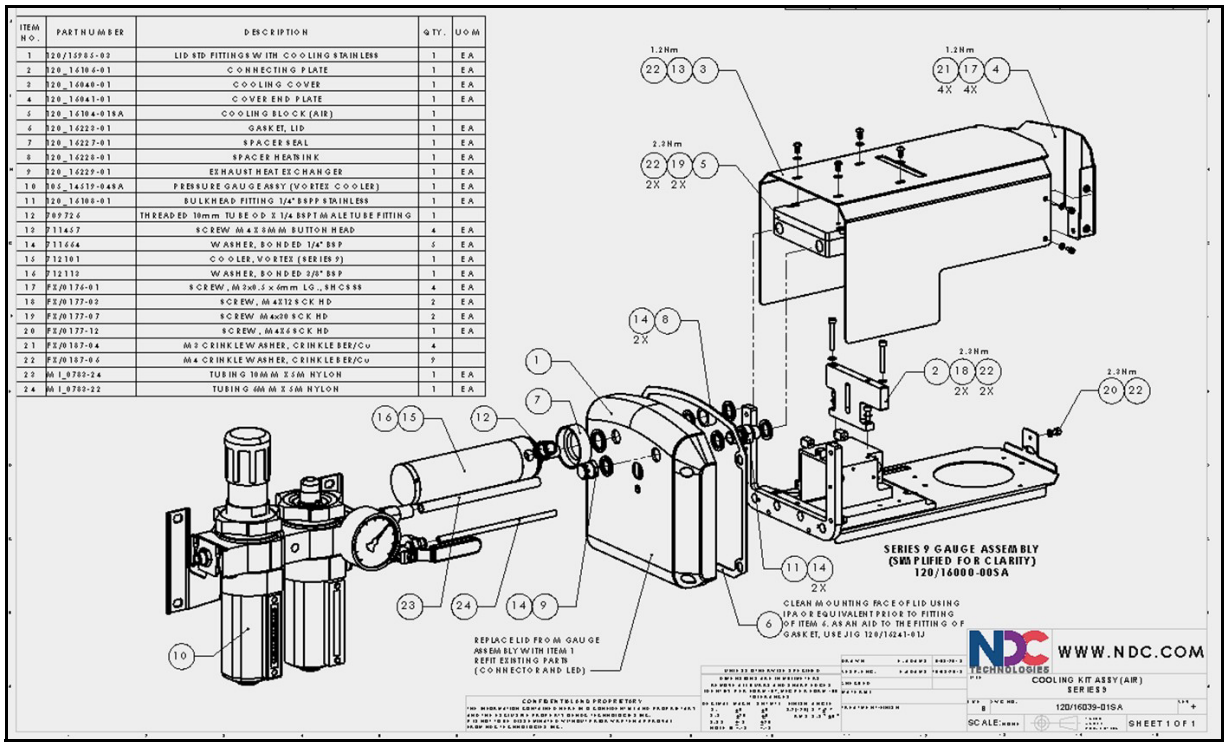


Figure 9-21 Vortex cooling assembly drawing

Connect a 7 bar supply to the filter regulator unit using a ½ inch diameter tube.

1. Set the air purge valve to the fully-open position.
2. Adjust the air pressure control for a reading on the pressure gauge of:
   - **4 Bar, (60psi)** for ambient temp. **45°C to 60°C**
   - **5.5 Bar, (80psi)** for ambient temp. **60°C to 70°C**

9.3.1 Vortex Cooler Control

It is possible to automatically control the Series 9 Vortex cooler option using an external solenoid to keep the internal temperature of the gauge at 35°C. The advantage of this is that it saves compressed air and prevents the gauge from being over-cooled.

The solenoid is driven by one of the digital outputs (optional) in the GCI, which is configured through the Digital Output Configuration page, shown in Figure 9-22 for Output1.

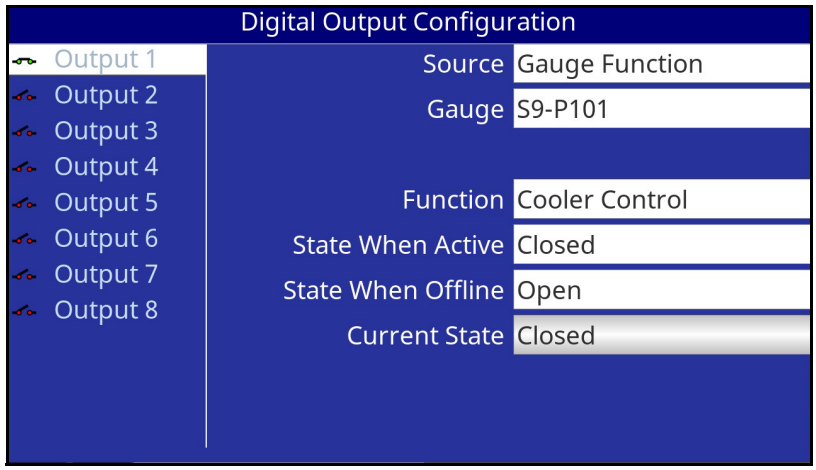


Figure 9-22 Digital Output Configuration page

To bring up this page:

1. Log in as an Engineer.
2. Touch the  **Configuration** button to bring up the Settings page.
3. Touch the  **Hardware Settings** icon.
4. Touch the  **Digital Outputs** icon.
5. Select an output from the left pane (e.g., Output 1).
6. Set the **Source** to Gauge Function.
7. Set the **Function** to Cooler Control.
8. The **States** refer to the actual relay contacts being either open or closed circuit.

9.3.1.1 Electrical Connections

The air solenoid electrical connections can be made as follows, assuming the solenoid control voltage is 24vdc, using one of the relay contacts, shown in Figure 9-23 for Output 1.

Note: The output is protected by a fuse and the solenoid must not consume more than 1Amp at 24vdc.

The solenoid must also be fitted with a protective the fly back diode, as shown in Figure 9-23.

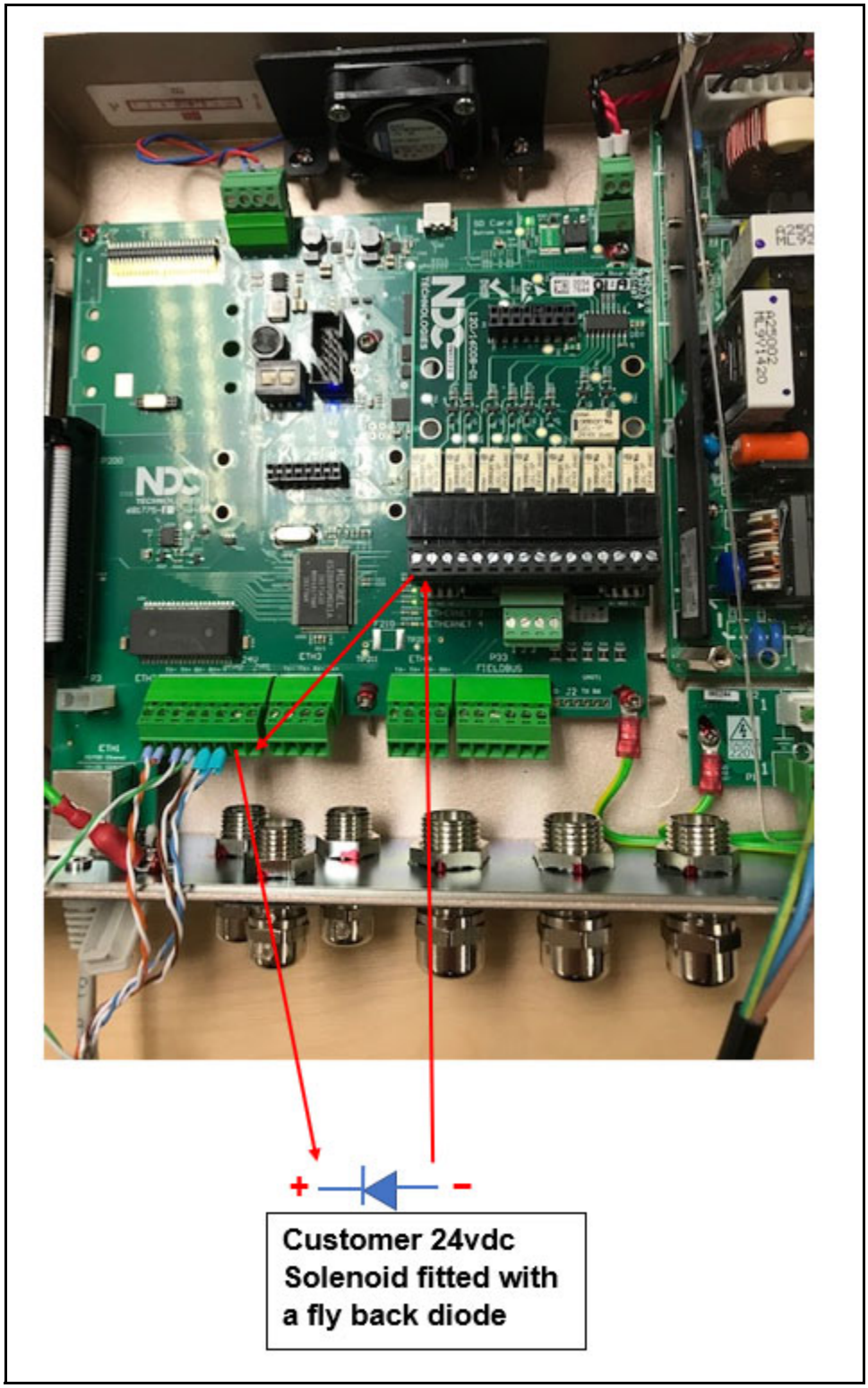


Figure 9-23 Solenoid fitted with fly back diode

9.4 Pressure Sense Option

The Series 9 gauge uses an Air Purge Window (APW) to keep the window surface clean, which is essential in dirty environments, as contamination on the window will affect the accuracy of the measurement.

The Air purge window relies on a good flow of air to be effective, requiring at least 20L minute.

The pressure sense option is a system that incorporates a calibrated restrictor and pressure sensor (0 to 4 Bar) in the gauge to monitor the air pressure, and has alarm indicators if the pressure/flow drops below or exceeds configurable levels.

9.4.1 Installation

The Series 9 sensor includes two ports with quick release fittings for 6mm diameter tubing, as per Figure 9-24:

- The upper port marked **IN** should be connected to a regulated clean air supply that can deliver 2bar and 20 L/min., measured close to the inlet port.
- The lower port marked **OUT** should be connected to the APW.

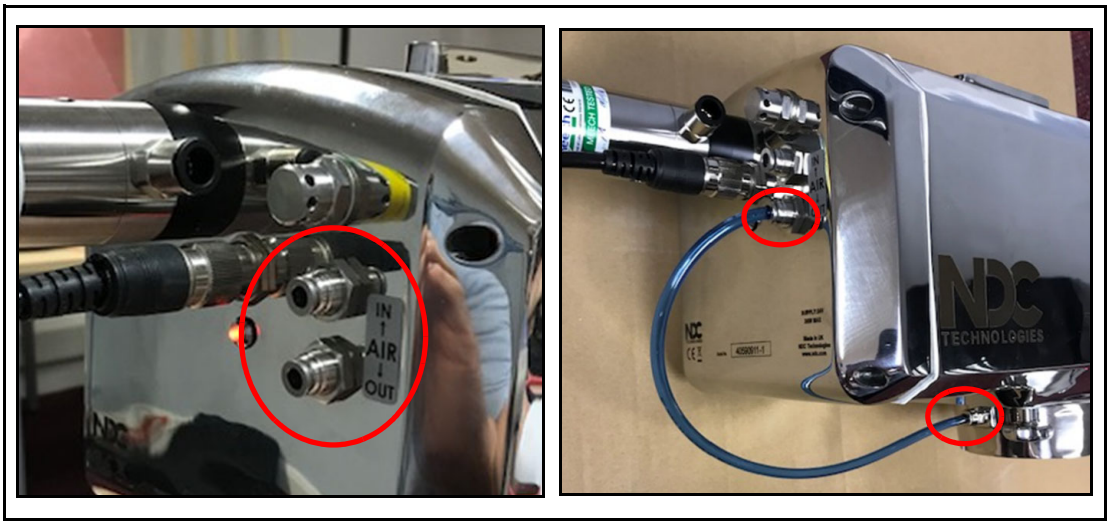


Figure 9-24 IN and OUT ports

9.4.2 GCI Air Pressure Settings and Alarms

Using the GCI:

1. Log in as a Supervisor or Engineer.

2. Touch the  **Configuration** button to bring up the Settings page.

3. Engineer only: Touch the  **Hardware Settings** icon.

4. Touch the  **Gauge Settings** icon.
   This will bring up the Gauge Settings page.

5. Select **Air Pressure** from the left pane to show the Air Pressure settings screen (Figure 9-25).

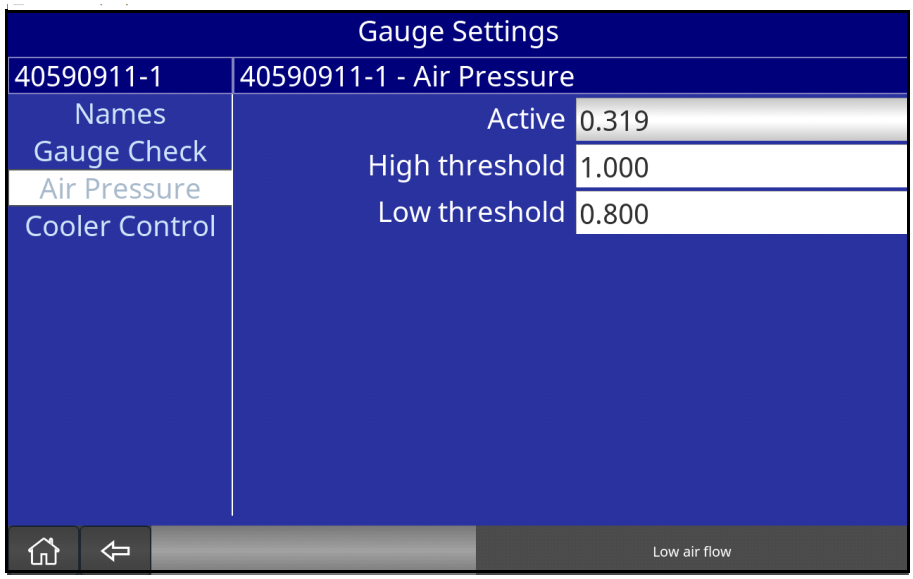


Figure 9-25 Gauge Settings – Air Pressure page

6. The **Active** value shows the actual pressure being measured.

   Note that the internal air restrictor has been factory set, so that with 1.5 Bar at the inlet, the flow rate to the Air Purge Window will be 20L/min.

   The pressure measurement is linear, but is not scaled to any particular pressure units. However, it will display an active value of 0.85 with 1.5 Bar inlet pressure, so the inlet pressure should be adjusted at the regulator to show a level of 0.85.

7. The **High** and **Low thresholds** are the alarm level settings.

   The **Low threshold** is set to be 0.80, so any air pressure/flow rate drop will result in a Low Air Flow alarm, as shown in Figure 9-26.

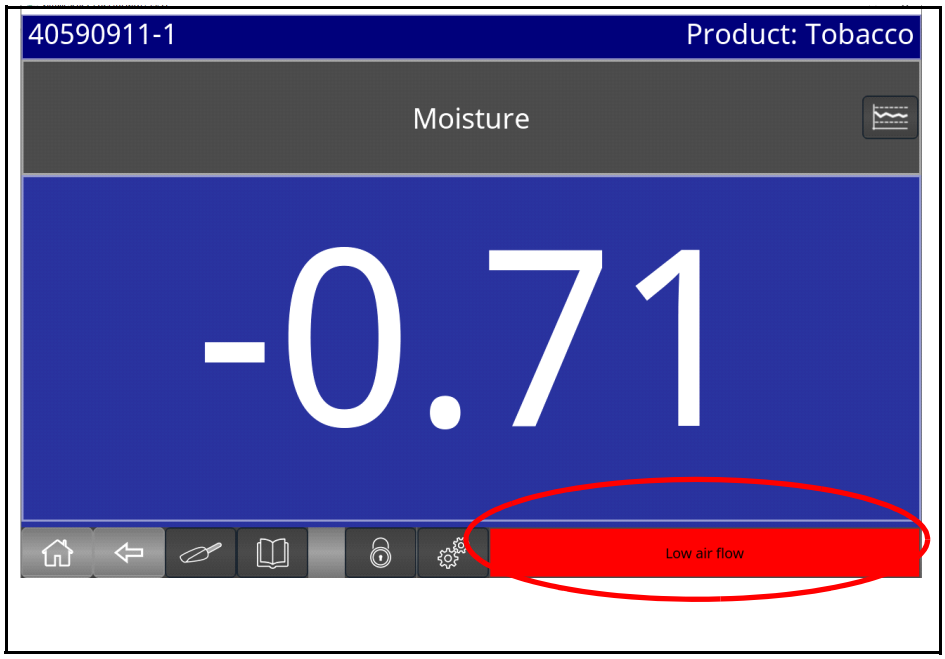


Figure 9-26 Low air flow alarm

9.5 Common Gauge Connector (CGC) Cable Option

For scanning applications, the Series 9 gauge can be supplied with a Common Gauge Connector (Figure 9-27) as an option to interface with Nordson's High Flex robotic cable 105/14876-01SA (Figure 9-28).

Figure 9-27 Common Gauge Connector

Figure 9-28 Cable 105/14876-01SA

The tail end of the cable can be fitted into one of the Series 9 peripherals through the large cable gland (Figure 9-29).

Figure 9-29 Connect cable to large cable gland on Series 9 peripheral

The wire and terminal designations into the Series 9 peripheral are shown in the schematic (Figure 9-30) and photo (Figure 9-31) below.

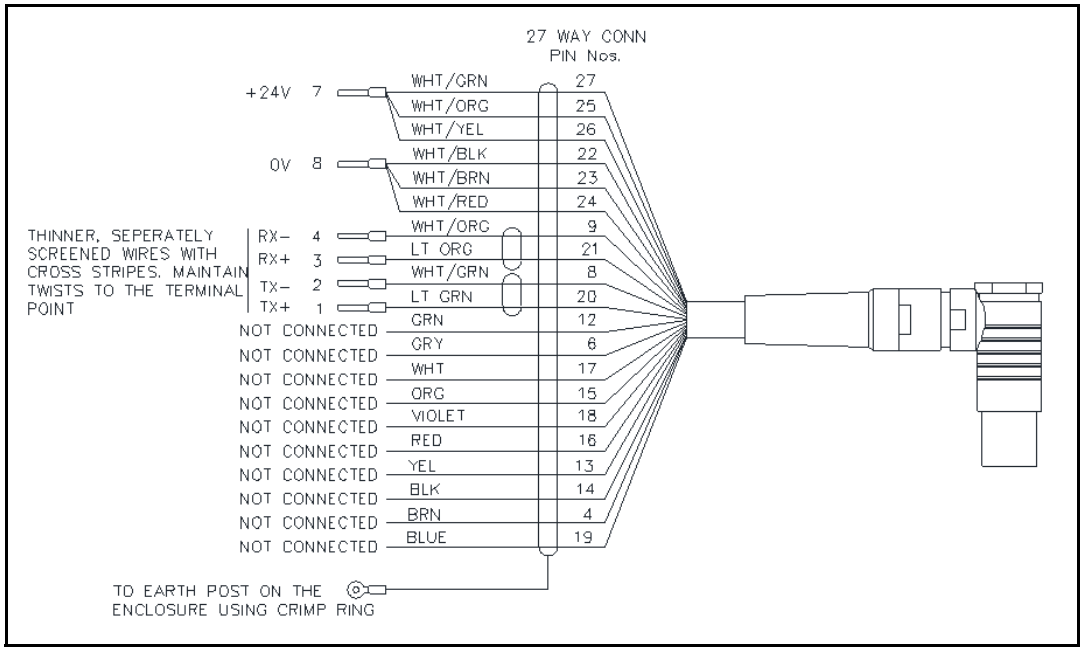


Figure 9-30 Wiring schematic for connecting to Series 9 peripheral

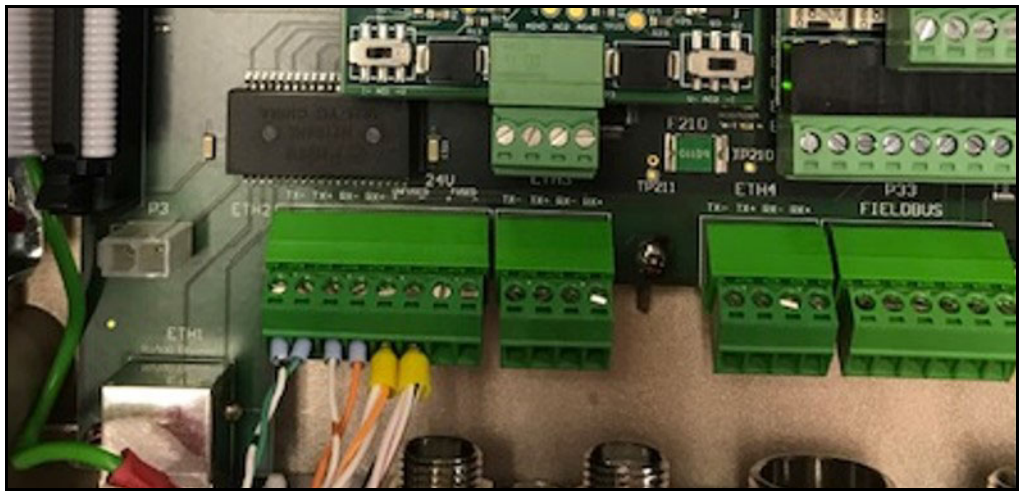


Figure 9-31 Terminal designations for connecting to Series 9 peripheral

9.6 BSDU (Batch Sample Display Unit) Operation on Series 9 GCIs

The BSDU option provides a report of sample data via a TCP/IP port when sample data is collected.

9.6.1 Enabling BSDU Operation

BSDU is a purchased option, and is enabled by Nordson at the time of the gauge order. It is also available as an upgrade.

9.6.2 IO Configuration

The GCI will need to have a digital input card fitted. Then, log in as an Engineer and navigate to the Digital Input Configuration page:

1. Touch the  **Configuration** button to bring up the Settings page.
2. Touch the  **Hardware Settings** icon.
3. Touch the  **Digital Inputs** icon to open the Digital Input Configuration page (Figure 9-32).

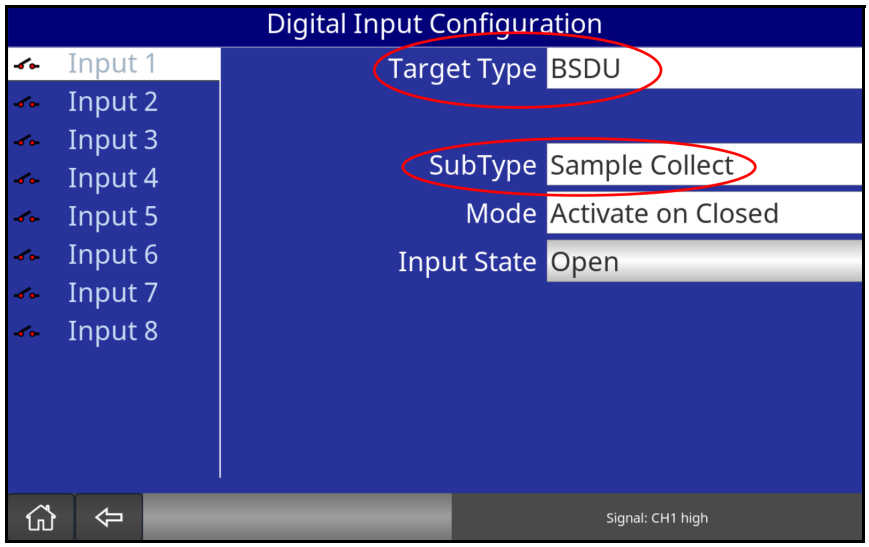


Figure 9-32 Digital Input Configuration page

4. Select an input from the left pane.

5. To set the input to provide BSDU functionality, set the **Target Type** to BSDU and then select the correct **SubType**.

   Two **SubType** options are available:

   1. **Sample Collect**

      This input will control the duration of the sample. When the input is active, the sample data will be collected. I.e. the sample will start when the input is first activated and finish when the input is deactivated, and the report will then be generated.

   2. **Sample Pause**

      This input allows data within a sample period to be ignored. While this input is active, data will not be added to the sample data. This will also affect the utilisation percentage e.g. if this input is active for 10% of a sample period, the utilisation figure will drop to 90% (i.e. 90% of the sample period had valid data).

9.6.3 Diagnostics and Settings

If the BSDU is correctly enabled, an additional group, **BSDU** will be displayed on the Local Settings page (Figure 9-33). If this is not available, see Section 9.6.1 - Enabling BSDU Operation.

1. Touch the  **Configuration** button to bring up the Settings page.
2. Open the Local Settings page by touching the icon(s) below.

Supervisor	 **Local Settings**
Engineer	 **Display Settings >**  **Local Settings**

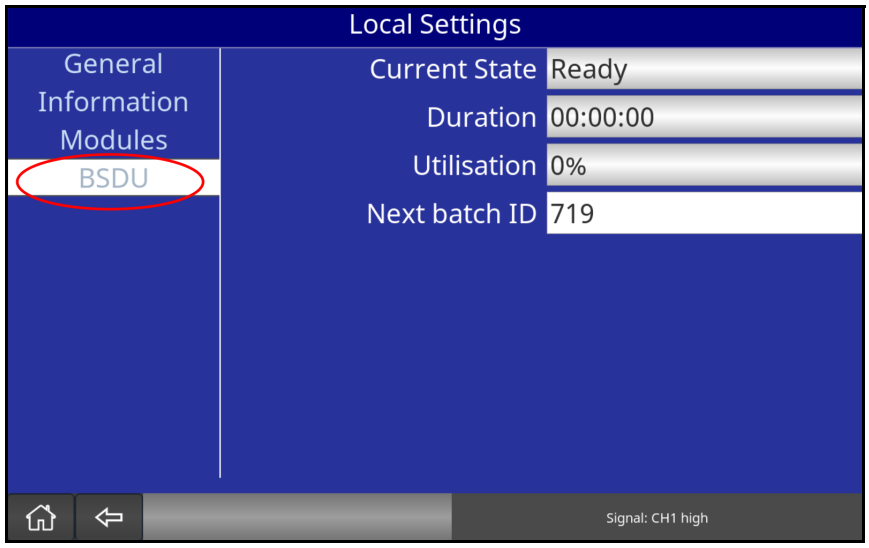


Figure 9-33 Local Settings page - BSDU group

This page displays the current state – “Ready”, “Sampling” or “Paused”, and the duration and utilisation of the active sample (utilisation is the percentage of the time the sample has not been paused while active).

The user can also see and change the next batch ID. This batch ID will be auto-incremented on each batch event.

9.6.4 Report Output

The BSDU report is generated on TCP port **25333**. The GCI listens on port 25333 for connections and will then service all live connections with the same data.

To view the report data, use a terminal program such as puTTy (Figure 9-34):

1. Type in the IP address of the GCI – enter your GCI's IP address here.
2. Type in the BSDU port number (25333).
3. For PuTTy, make sure that the **Raw** connection type is selected.

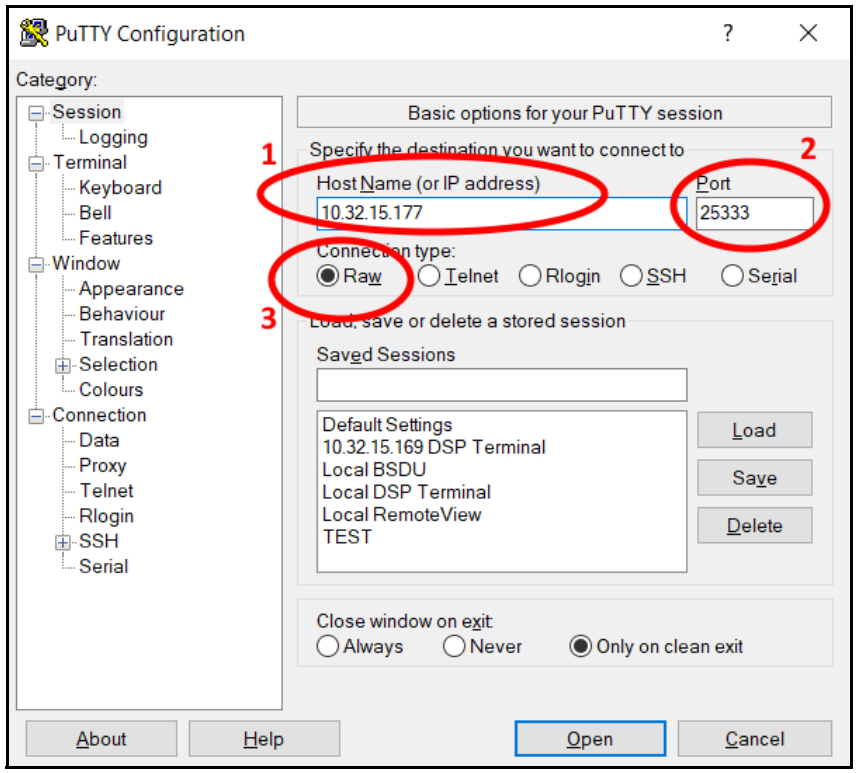


Figure 9-34 PuTTy terminal program

When the terminal connects, you should see a header message in the form (Figure 9-35):

```
BSDU Reports
============
```

Figure 9-35 Header

Each time a report is created (on the completion of each batch), a report will be generated that will contain a header section, and then a section for each gauge connected to the GCI.

The header section will contain:

- Batch number
- Duration
- Utilisation

Each gauge section will contain:

- Gauge name
- Active recipe name
- A report line for each channel. Each line will contain the channel name, the sample average and the sample SD in brackets.

An example of a report is given below (Figure 9-36).

```
        Batch No : 878
        Duration : 00:00:05
    Utilisation : 100%

           Gauge : S9-P101
          Recipe : Snacks
        Moisture : 2.000 (0.123)
             Oil : -5.752 (2.231)
             DOB : 25.565 (46.118)

           Gauge : 22649-2 PrediktIR II
          Recipe : Wood chips
        Moisture : 8.040 (0.095)

           Gauge : Haze RX #4 (Paul)
          Recipe :
          Haze 1 : 1.289 (0.009)
               Y : -0.003 (0.000)
               X : 0.430 (0.008)
               h : 2.433 (0.034)

========================================
```

Figure 9-36 Sample Report

9.7 Heater Option

The Series 9 heater option can be used to extend the lower ambient operating temperature of the gauge down to -30°C/-22°F for extremely cold environments.

It uses an internal heat source to keep the gauge internal temperature above 0°C/32°F, and needs to be powered from a separate 24v 60W power supply provided by the user.

The gauge uses thermostats to control the internal temperature between 10°C/50°F to 20°C/68°F. As a safety feature, it also includes an over-temperature switch to cut the heater power if the internal temperature exceeds 80°C/176°F.

A power cable assembly is supplied with the option, that plugs into the lower connector on the rear of the gauge (screw lock) as shown in Figure 9-37, with connections to the external power supply as follows:

- **Red:** 24vdc or vac (60W)
- **Blue:** 0v
- **Green:** Earth

Figure 9-37 Power cable connection

CHAPTER 10

10 Troubleshooting

10.1 System Error Messages

Series 9 gauges have built-in diagnostics to monitor certain key operating parameters and to provide appropriate error messages on the GCI and OT. The following table provides brief explanations of the messages together with the recommended action. Some of the diagnostic parameters listed in the table are shown on the Gauge Diagnostics screen (see Section 5.5.1 - Viewing Diagnostic Information) - if this is the case, those parameters are marked “Yes” in the “Shown on Gauge Diag. screen” column of the table.

Note: There may be more than one error condition at a time. The errors are priority-rated, and the highest priority one is displayed in the Gauge Status box, on the bottom right corner of the screen (see Section 5.1.4 - Responding to Error Messages).

In the event of an error message, check the listed possible causes and take the appropriate remedial actions. If these do not clear the error, please contact Nordson for advice.

Error message	Diagnostic Parameter		Fault State	Recommended Action
	Diag. parameter and units	Shown on Gauge Diag. screen		
Lamp voltage low error	Lamp voltage (V)	Yes	V_L < 0.95 X nominal (4.8V or 4V)	If lamp current is also low, lamp power supply failure: **change mother PCB.** If lamp current is high, lamp failure: **change lamp.** (see Section 8.3 - Replacing the Gauge Source Lamp Assembly)
Lamp voltage high error	Lamp voltage (V)	Yes	V_L > 1.05 X nominal (4.8V or 4V)	Lamp power supply failure: **change mother PCB.**

Error message	Diagnostic Parameter		Fault State	Recommended Action
	Diag. parameter and units	Shown on Gauge Diag. screen		
Lamp current low error	Lamp current (A)	Yes	I_L < 0.9 X nominal (2.9A or 2.7A)	If lamp voltage is also low, lamp power supply failure: **changemother PCB.** If lamp voltage is normal, lamp failure: **change lamp.** (see Section 8.3 - Replacing the Gauge Source Lamp Assembly)
Lamp current high error	Lamp current (A)	Yes	I_L > 1.1 X nominal (2.9A or 2.7A)	If lamp voltage is also high, lamp power supply failure: **change mother PCB, also lamp.** If lamp voltage is not high, lamp failure: **change lamp.** (see Section 8.3 - Replacing the Gauge Source Lamp Assembly)
Lamp hours exceeded	Lamp running time (days/hours)	Yes	lamp run hours > 43800	Warning, lamp requires replacement: **change lamp** (see Section 8.3 - Replacing the Gauge Source Lamp Assembly)
FW motor hours exceeded	FW motor running hours (days/ hours)	Yes	motor run hours > 43800	Warning, filter motor requires replacement: **change motor** (see Section 8.4 - Replacing the Filter Wheel Motor)
N/A	FW target motor speed (rpm)	Yes	N/A	N/A
FW motor failure	FW motor speed (rpm)	Yes	Software unable to control motor speed to target to within 10rpm	Motor control failure. Try resetting gauge, if fault per-sists: **change motor.** (see Section 8.4 - Replacing the Filter Wheel Motor)

Error message	Diagnostic Parameter		Fault State	Recommended Action
	Diag. parameter and units	Shown on Gauge Diag. screen		
Excessive vibration	FW motor vibration (raw)	Yes	Excessive vibration detected at motor mount >100	Warning, vibration detected: **change motor** (see Section 8.4 - Replacing the Filter Wheel Motor)
Window contaminated	Window contamination level (calibrated units 0.0 to 1.0)	Yes	WC value > 0.5: Warning WC value > 1: Fault	WC value > 0.5: **window needs cleaning** WC value > 1: **window cleaning fault** (see Section 8.2.1 - Cleaning Gauge Windows)
Gauge temperature is too low	Internal Temperature (°C)	Yes	<0°C	Check ambient temperature (0 to 50°C)
Gauge temperature is too high	Internal Temperature (°C)	Yes	>70°C	Check ambient temperature (0 to 50°C)
Gauge temperature is too high and the gauge should shutdown	Internal Temperature (°C)	Yes	>75°C	Check ambient temperature (0 to 50°C)
N/A	Time since last reboot (days/ hours)	Yes	N/A	N/A
N/A	Firmware version	Yes	N/A	N/A
Excessive Installation vibration	Installation vibration on demand (raw)	No	Installation vibration, measured with the filter wheel not running >100	Excessive Installation vibration: **check mounting**
Window contamination board fault	Window contamination board connected (YES or NO)	No	Raw window contamination level <200	Check window contamination board connections

Error message	Diagnostic Parameter		Fault State	Recommended Action
	Diag. parameter and units	Shown on Gauge Diag. screen		
Gauge power supply fault	+24V power supply (Voltage)	No	+24V rail < +20V	Gauge power low: **check 24vdc connection**
mother PCB 12V power fault	+12V mother PCB supply (Voltage)	No	±12V mother PCB >±5% error	Mother PCB fault: **change mother PCB**
signal PCB 12V power fault	+12V signal PCB supply (Voltage)	No	±12V signal PCB >±5% error	Signal PCB fault: **change signal PCB**
signal PCB 5V power fault	+5V signal PCB supply (Voltage)	No	±5V signal PCB >±5% error	Signal PCB fault: **change signal PCB**
primary reference signal error	signal channel 1	No	Signal cannot be kept within required limits	Reference signal error: **check with Nordson**
primary sample signal error	signal channel 2	No	Diag	Sample signal error: **is gauge looking at product?**
auxiliary reference signal error	signal channel 3	No	Signal cannot be kept within required limits	Reference signal error: **check with Nordson**
auxiliary sample signal error	signal channel 4	No	Signal cannot be kept within required limits	Sample signal error: **is gauge looking at product?**
low window air purge pressure	Air purge flow (L/min)	No	The desired 20L/min gives a raw value of 5000 units and anything below this will give an error.	Low window air purge pressure: **check air supply**
internal standard failed	internal standard error	No	Internal standard fails to deploy correctly	Internal standard error: **check with Nordson**
Motherboard ID fault	Motherboard present (startup check)	No	Cannot read Motherboard ID	Check motherboard connections
Signal board ID fault	Signal board present (startup check)	No	Cannot read signal board ID	Check signal board connections

10.2 Series 9 Gauge Status Light

The Series 9 gauge has a LED located on rear panel which can be used for diagnostics purposes (Figure 10-1).

Figure 10-1 Gauge Status Light

On power up, the Status light will flash alternately between red and green to show that the gauge is powered and initialising. After a minute and half, the light will turn green, flashing off every few seconds as a live heart beat.

If a gauge error occurs, the LED will flash in sequence, showing the most significant error first.

The sequence starts with an off period, followed by a sequence of alternating green and red. The number of red flashes in the sequence gives an indication of the most significant error as follows:

- **1** Signal error (low or high signal error)
- **2** Temperature error
- **3** Voltage error (one or more power rails are at invalid levels)
- **4** Window contamination
- **5** Motor error (main filter wheel motor or internal reference motor)
- **6** Lamp error (lamp failure detected)
- **7** Communications error
- **8** Air flow error
- **10** Self-test conditions (e.g. incorrect hardware configuration)

Note: Only error states will trigger these sequences, not warning states - E.g. temperature warnings will not trigger the status LED sequence.

If the gauge undergoes a soft reset, the Status LED will be orange until the gauge restarts.

CHAPTER 11

11 Reference

11.1 Specifications

11.1.1 Gauge

Dimensions		
	Enclosure material	Stainless steel 316L
	Window material	Sapphire
	Width	200 mm
	Height	247 mm
	Length	348 mm
	Weight including APW	12.5 Kg *Cable/gland clearance : 100 mm*
Environmental sealing		IP67 NEMA 6
Pollution degree		Degree 1
Ambient Temperature Range		
	Storage	0^{o}C - 70^{o}C
	Operating	0^{o}C - 50^{o}C (70^{o}C with water or vortex air cooling)
Cable length (Data and power)		10 or 20 metres as standard
Cable type		CAT5e
Power Supply		+24V d.c. +10% -20%, 30W
Working Distance from window : Sampling area		250 mm +/- 100 mm : beam patch 60 mm diameter 200 mm +/- 50 mm : beam patch 25 mm diameter 140 mm +/- 25 mm : beam patch 10 mm diameter

External Temperature Option	
Temperature sensor	
Sample patch size	25 mm diameter at 250 mm distance
Working distance	250 mm +/- 100 mm
Measurement Range	0°C to 120°C
Accuracy	+/- 1°C (+/- 2°F)
Repeatability	+/- 0.5% of reading or +/- 0.5 °C, whichever is the greater over the full temperature range
Measurement output	One of the four available gauge measurement channels
Air supply required	approximately 1 m^3/h, clean, dry, instrument-quality air
Environmental rating	IP65 (NEMA-4)

11.1.2 OT, GCI, GCP, PH

Dimensions - Molded Composite Material		
	Width	306 mm
	Height	230 mm +26 mm large gland clearance
	Depth	93 mm **Note:** Above values do not include cable clearance and connector removal clearance.
	Weight	3 Kg excluding connected cables
Dimensions - Stainless Steel (GCI, OT)		
	Width	306 mm
	Height	230 mm +26 mm large gland clearance
	Depth	91 mm **Note:** Above values do not include cable clearance and connector removal clearance or mounting strap dimensions.
	Weight	6 Kg excluding connected cables
Environmental sealing		IP65 NEMA 4
Pollution degree		Degree 1
Ambient Temperature Range		
	Storage	0^oC - 70^oC

	Operating	0°C - 50°C
Relative humidity		5% to 95% (non-condensing) over the full operating temperature range
Power supply input		85-264vac 50/60Hz, 100W via screw terminals

Inputs / Outputs		
	Standard communications	Ethernet - 2 x screw terminal ports, 1 x RJ45
	Optional communications	Profibus DP or DeviceNet
	Optional analogue board (GCI & GCP)	2 x 4-20 mA /0 to 10vdc isolated
	Optional Digital input board (GCI & GCP)	8 x Opto-isolated inputs (Low 0vdc and High 3vdc-30vdc)
	Digital output board (GCI & GCP)	8 x Normally Open relay contacts (125vac/60vdc/1A maximum ratings)

11.1.3 Switched Hub

Dimensions		
	Width	250 mm
	Height	208 mm +26 mm large gland clearance
	Depth	66 mm **Note:** Above values do not include cable clearance and connector removal clearance.
	Weight	1.5 Kg excluding connected cables
Environmental sealing		IP65 NEMA 4
Pollution degree		Degree 1
Atex Certification		Zone 22 (non-mining applications, dust explosive atmospheres)
Enclosure		Molded composite material
Ambient Temperature Range		
	Storage	0°C - 70°C
	Operating	0°C - 50°C
Relative humidity		5% to 95% (non-condensing) over the full operating temperature range
Power supply		24V d.c. +/-20%, 5W

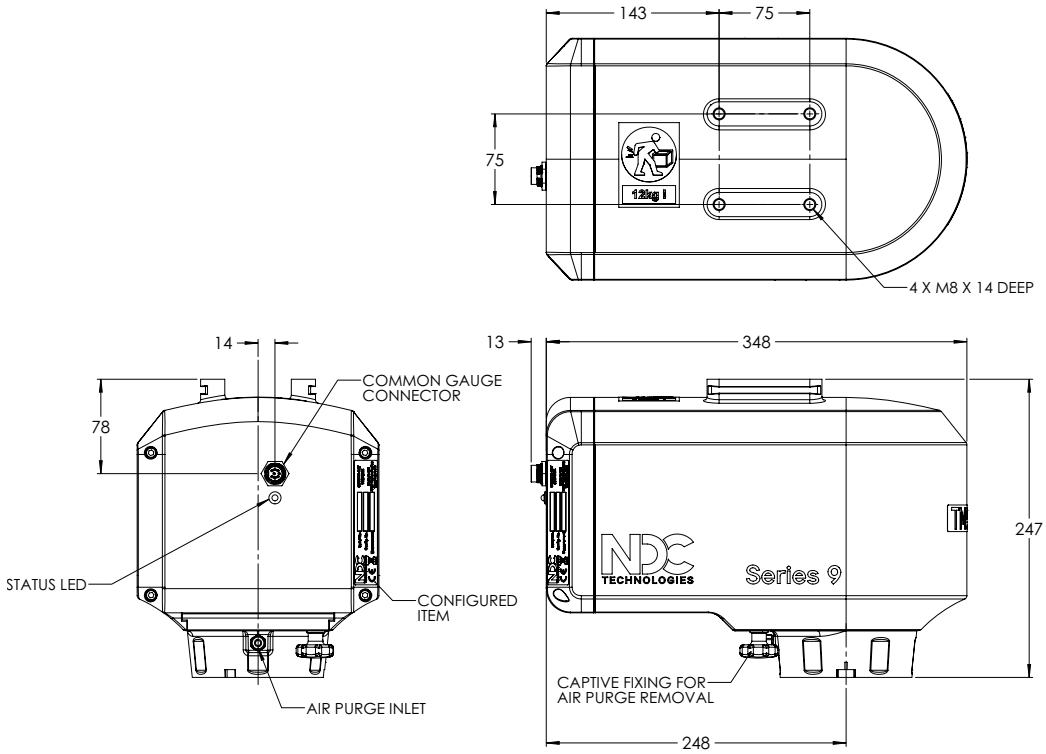
Inputs / Outputs		
	Communications	Ethernet - 7 x screw terminal ports, 1 x RJ45

11.1.4 Nordson Power Supply Units

Dimensions		
	Width	265 mm (305 including cable glands)
	Width	60 mm
	Depth	40 mm
	Weight	Approx 0.75 Kg
Environmental sealing		IP65 NEMA 4
Atex Certification		Zone 22 (non-mining applications, dust explosive atmospheres)
Pollution degree		Degree 1
Enclosure		Aluminium
Ambient Temperature Range		
	Storage	0°C - 70°C
	Operating	0°C - 50°C
Relative humidity		5% to 95% (non-condensing) over the full operating temperature range
AC Input		90-264Vac, single phase, 1.5-0.75A, 47-63Hz
DC Output		96W Maximum, 24Vdc, 4A

12 Outline Drawings

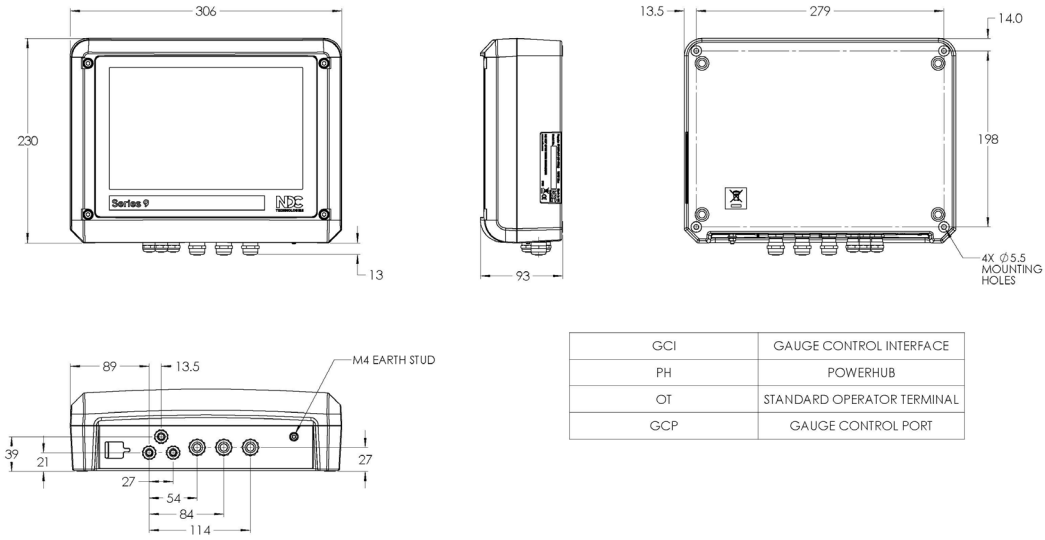
12.1 Gauge



	All dimensions in mm

12.2 Peripheral Units

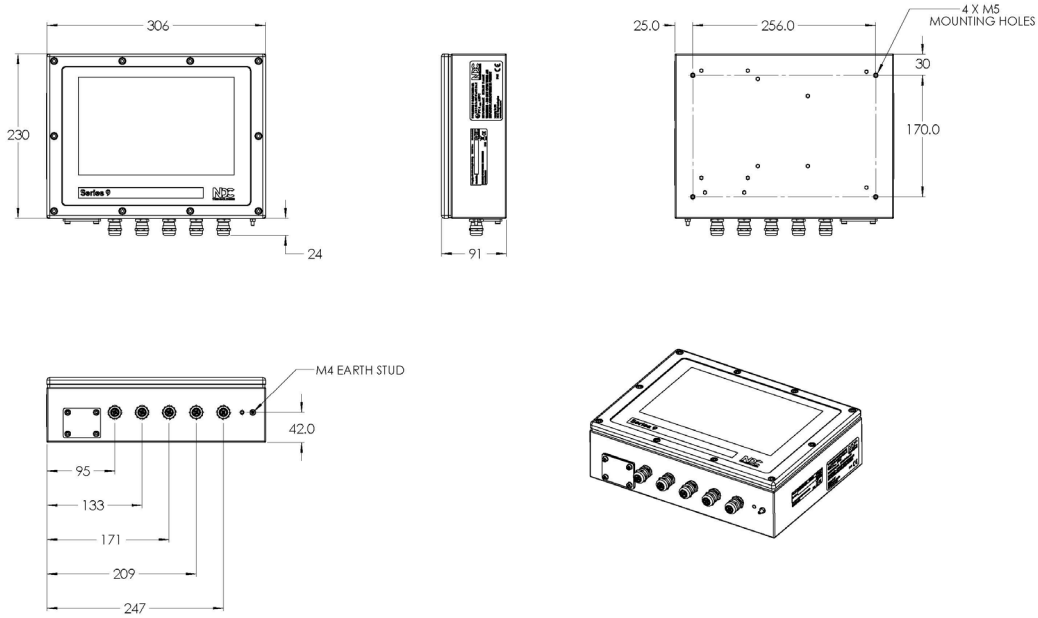
12.2.1 GCI, PH, OT, GCP



GCI	GAUGE CONTROL INTERFACE
PH	POWERHUB
OT	STANDARD OPERATOR TERMINAL
GCP	GAUGE CONTROL PORT

	All dimensions in mm

12.2.2 GCI / PH Stainless Steel



	All dimensions in mm

CHAPTER 13

13 Servicing, Returns and Recycling

13.1 Servicing and Returning your Equipment

Your instrument was carefully inspected electrically and mechanically prior to shipment. It should be free of surface defects and scratches, and it should be in perfect working order upon receipt. If any indication of damage is found, file a claim with the carrier immediately, prior to using the instrument. If no damage is apparent, proceed by using this manual to install and setup this instrument. Save the shipping carton and packing material for future storing or shipment of the instrument.

If the instrument failure cannot be corrected using remote technical support or onsite (field service engineer), the instrument must be returned to the factory (depot) for service. Include a full description of the instrument failure and the mode of operation the instrument was in at the time of failure. Also include a contact person to discuss the instrument failure.

Before returning equipment for service, follow instructions as given in section Online Support at the beginning of this manual. **We will issue you with an RMA number to return your product to our repair facility. Please do not send your equipment to us without first having the RMA.**

Use the original packaging/carton for returning the equipment, but if the original packaging is unavailable, ship in a carton providing sufficient protection. Send the instrument to the Asia, Europe, or USA office, whichever is closest to you or to the office indicated by your sales engineer. Place the RMA number on the outside of the carton and include a purchase order number and any other information specific to your instrument. Field warranty service is available if the customer pays travel expenses by advance purchase order. All service operations should be performed by skilled electronics technicians, who have been trained by Nordson Measurement & Control.

13.2 Recycling, Disposal and Sustainability

Nordson Measurement & Control provides intelligent measurement and control solutions to help you focus on your unique mission in a more sustainable way. Better for your people. Better for your bottom line. Better for the planet. For this reason, Nordson encourages its customers to recycle and dispose of equipment in a way which is responsible and encourages sustainability.

Please check the following before disposing of your equipment:

- Is the equipment worth repairing? If in doubt, contact Nordson Service.
- If you are aware of any hazardous materials in your equipment, ensure qualified personnel take responsibility for its disposal. Some examples of hazardous substances include lead, mercury, cadmium, chromium VI, flame retardants, plasticizers, fluorescent tubes, monitors containing cathode ray tubes and products containing capacitors. Nordson is compliant with the European WEEE and the most current RoHS Directive.
- Can you re-use or recycle any constituent parts? For example, if the housing/chassis is made of metal, it can be recycled by your local authority. Ensure qualified personnel take responsibility for dismantling the equipment.

If the equipment does need to be disposed of, please dispose of it in a way that does not harm the environment.

For more general information about Nordson's corporate social responsibility, see https://www.nordson.com/en/about-us/corporate-responsibility

Warranty

1. All sales of Nordson Measurement & Control products are subject to the contractual terms and conditions of the Order pursuant to which they were sold to Buyer, including Warranty terms. The following terms are a general summary of the contractual Warranty terms, NOT a revision or alternative to the contractual terms, and are presented as merely a point of reference for your information. The contractual Warranty is the complete and exclusive statement of all Nordson Measurement & Control warranties to Buyer. In the event the following terms are in conflict with any of the contractual Warranty terms, the contractual Warranty terms shall be deemed to control.

   The warranty terms contained herein are expressly in lieu of any and all other warranties, expressed or implied, including any warranty of merchantability or fitness for a particular purpose. In no event shall Nordson Measurement & Control be liable for any incidental, consequential or special damages, including but not limited to, any loss of business, income or profits, expenses incurred for time when the system is not in operation, and any labor costs relating to or arising out of the performance, functioning or use of the system.

   Purchaser assumes the risk for use of this product and agrees to indemnify and hold Nordson Measurement & Control harmless for any and all damage to person or to property resulting therefrom.

   Nordson Measurement & Control grants no license under any patent rights except the right, under only such patents as may be owned or acquired by Nordson Measurement & Control, to use the product sold hereby for the purpose for which it is sold. Nordson Measurement & Control does not warrant that the product or its use does not infringe any patent owned by persons other than Nordson Measurement & Control.

2. Nordson Measurement & Control guarantees all products to be free from defects in material and workmanship for the following periods[1]:

   - Product and peripherals – 2 years from shipment
   - Source lamp – 5 years from shipment
   - Filter wheel motor – 5 years from shipment
   - Spare parts – 1 year from shipment
   - Replacement lamps and motors supplied under warranty – 1 year or up to the original 5 year warranty from shipment of the sensor, whichever is longer

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[1] Refer to the contractual terms and conditions of the Order for usage of the warranty.

During this period, Nordson Measurement & Control will repair or at its option replace, free of all charges for parts and labor, any Nordson Measurement & Control parts determined by it to have been broken or damaged due to causes other than improper application, abuse or negligence. Nordson Measurement & Control's obligation to repair or replace shall not extend to expendable parts which are subject to normal operating wear.

Nothing in this paragraph 2 will require Nordson Measurement & Control to make repairs or replacements where:

A. The product has been repaired, other than by an authorized Nordson Measurement & Control dealer or a Nordson Measurement & Control employee, or altered in any way without the prior written consent of Nordson Measurement & Control; or

B. The product has not been properly maintained in accordance with any operating and maintenance manual supplied therewith; or

C. The product has been damaged as a result of fire, flood, war, insurrection, civil commotion, acts of God or any other cause beyond the control of Nordson Measurement & Control or Buyer.

3. Nordson Measurement & Control's liability shall be limited to the obligations set forth in Paragraph 2. These shall be the Buyer's sole and exclusive remedies, whether in contract, tort or otherwise, provided, however, that in lieu thereof, Nordson Measurement & Control at its option may replace the entire product on an exchange basis or refund the purchase price against the return of the defective product.

4. Nordson Measurement & Control will not be responsible for failure to provide service or parts due to shortage of materials, labor or transportation strikes or delays, or any causes beyond Nordson Measurement & Control's control.

5. Unless otherwise specified by Nordson Measurement & Control, all warranty repairs will be made at Nordson Measurement & Control's facility. The customer shall be responsible for all expenses of packing, freight and insurance in connection with the shipment of products to Nordson Measurement & Control for repair. Nordson Measurement & Control will pay the cost of returning the equipment to customer.

   If it is mutually determined by the buyer and Nordson Measurement & Control that the examination, replacement or repair takes place at the buyer's facility, then the buyer will be responsible for Nordson Measurement & Control's travel and living expenses incurred in traveling to and from the buyer's facility, and during the time of the visit, as well as the cost of field labor and replacement parts unless the parts being repaired or replaced are determined to have been defective, in which event the cost of said repaired or replacement parts shall be borne by Nordson Measurement & Control. These travel and living expenses will be billed to the buyer at actual cost to Nordson Measurement & Control.

6. No person, including any Nordson Measurement & Control distributor, agent or representative, is authorized to assume any liability on behalf or in the name of Nordson Measurement & Control, and Nordson Measurement & Control shall not be bound to any understandings, representations, or agreements with respect to warranties except as set forth in this policy.

7. Nordson Measurement & Control requests immediate notification of any claims arising from damage in transit in order to determine if carrier responsibility exists. If damaged equipment arrives, save the shipping container for inspection by the carrier and telephone Nordson Measurement & Control as soon as possible.