



# SPS 100 SILO PROTECTION SYSTEM

SILO PROTECTION SYSTEM





## Contents

3 Introduction

---

4 **Installation - (SPM 2403 Version)**

5 Installation Schematic (SPM 2403 Version)

6 Wiring Schematic (SPM 2403 Version)

7 Typical Silo Top Installation (SPM 2403 Version)

8 SPM 2403 Silo Pressure Monitor User Guide

---

11 **Installation - (DMU 03 Version)**

12 Installation Schematic (DMU 03 Version)

13 Wiring Schematic (DMU 03 Version)

14 Typical Silo Top Installation (DMU 03 Version)

15 DMU 03 Pressure Transmitter User Guide

---

16 ENT 7 High Level Alarm (All Versions) User Guide

---

19 System Test Certificate

20 Tanker Drivers Guide - SPS 100 Control Panel

21 Tanker Drivers Guide - System Operation



## Introduction

## SILO PROTECTION SYSTEM SPS-100

### General

The Silo Protection System SPS-100 is designed to meet the latest silo protection requirements. It provides a positive 'fail-safe' silo overflow prevention and silo over-pressure indication, the latter resulting from dirty or blocked filters.

### Features

The system features a specially designed and well proven high level sensing probe Type ENT7-STF installed in the top of the silo. This heavy duty sensor, which is not subject to maintenance, incorporates a unique STF<sup>®</sup> system test facility which checks full operational capability and sensing element integrity and the complete electrical wiring during the test cycle.

The silo pressure sensing unit SPM or DMU pressure transmitter provides the tanker driver and plant personnel indication of pressure build-up in the silo and gives an early audible and visual dirty 'Filter Alarm' with a subsequent High Pressure Alarm if the silo pressure continues to rise. The High Pressure Alarm then automatically closes the filling line shut-off valve. The System also incorporates a sensing device to detect that the plant compressor is providing sufficient pressure for shut-off valve operation and pulsed filter cleaning.

Access security to the Silo Protection System is provided in the form of a Key Switch which allows the system to be activated and the filling line shut-off valve to be opened. The valve cannot be opened if the silo is already full. A separate Key Switch is also provided to RESET the system after an alarm event has been triggered.

### SPS100 Versions

Two versions are currently available according to customers requirements. One using the SPM-2403 Silo Pressure Monitor and one using the DMU 03 Pressure Transmitter.





## Installation - with SPM Silo Pressure Monitor

See page 5 for overall system layout.

All wiring should be made using 0.75mm<sup>2</sup> multicore (screened if necessary).

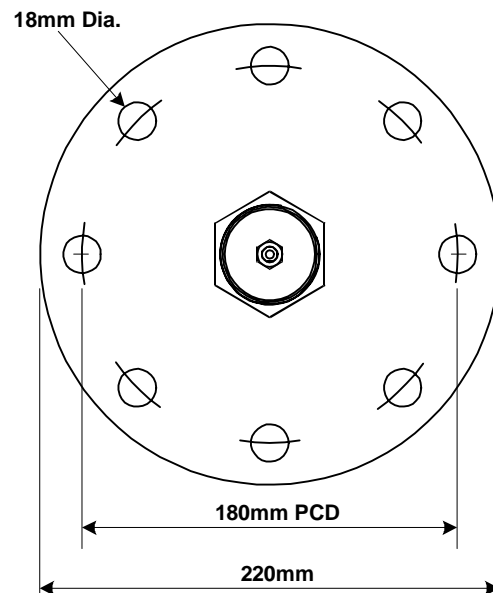
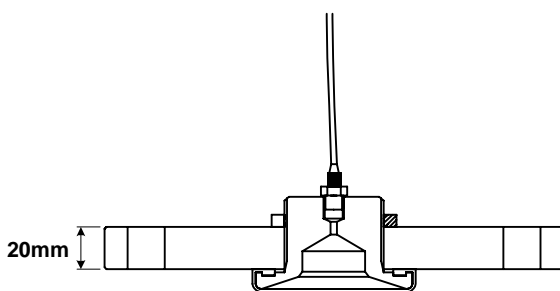
1. The SPS-100 Control Panel should be mounted on a suitable vertical surface not exposed to direct sunlight adjacent to the fill point.
2. The SPM-2403 unit and its associated flanged pressure sensor should be mounted in positions determined by the customer on top of the silo. The pressure connection between the SPM-2403 and the sensor should be made with 4mm o.d nylon tubing.

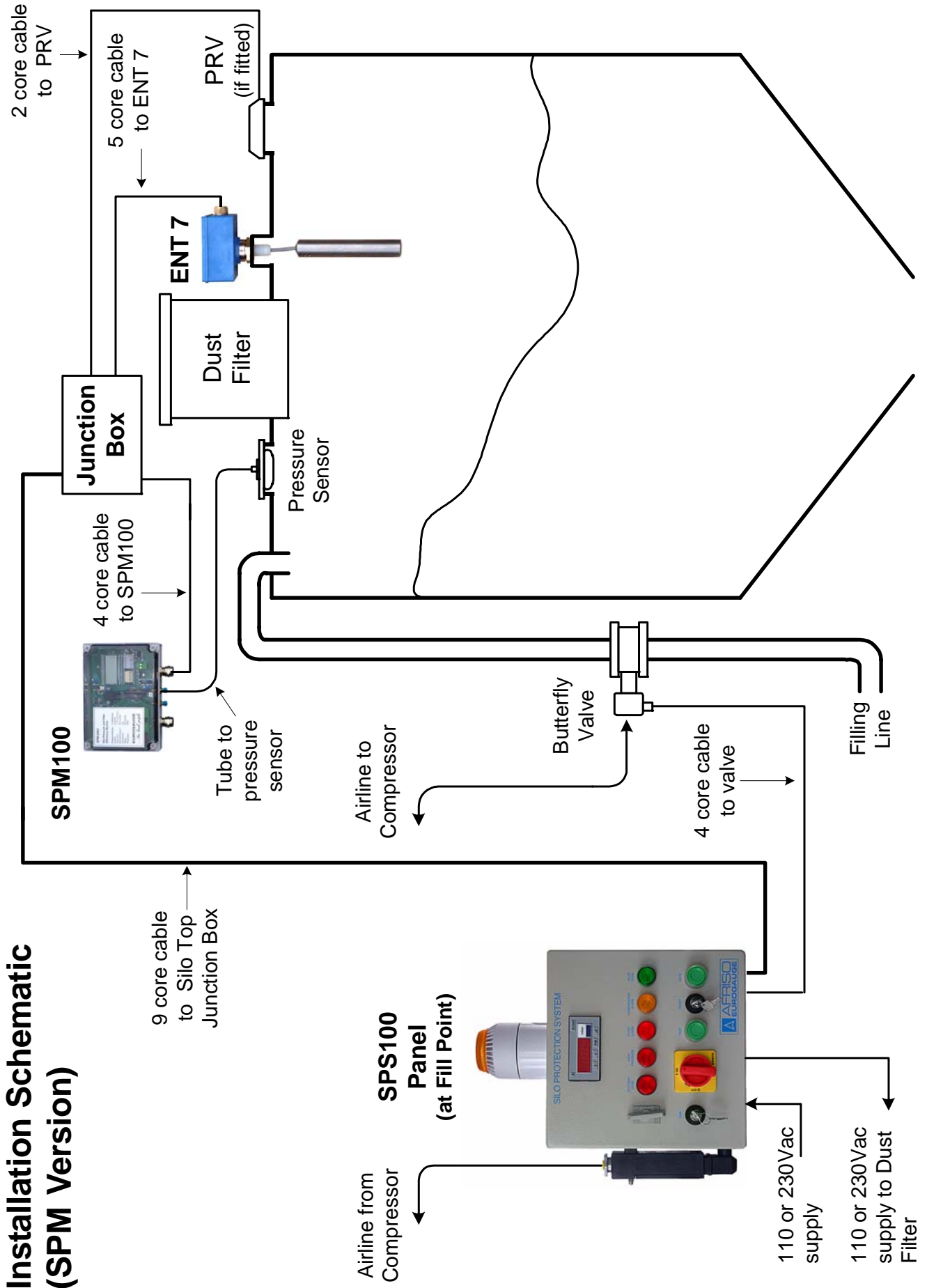
The SPM-2403 should be electrically connected to the control panel as per wiring diagram on page 6 and internal connections on page 9.

3. The ENT7 level switch should be mounted on top of the silo in a position determined by the customer and electrically wired to the control panel as per wiring diagram on page 6 and internal connections on page 17.
4. The fill pipe valve with its associated solenoid and switch/position indicator should be mounted in the fill pipe at a point to be determined by the customer and electrically wired to the control panel as per wiring diagram on page 6.
5. Using 4mm o.d nylon tube connect the pressure switch on the side of the SPS-100 control panel to the site compressor airline.
6. Dust filter electrical supply should be taken from SPS-100 control panel.

### SPM 2403 Pressure Pad Dimensions

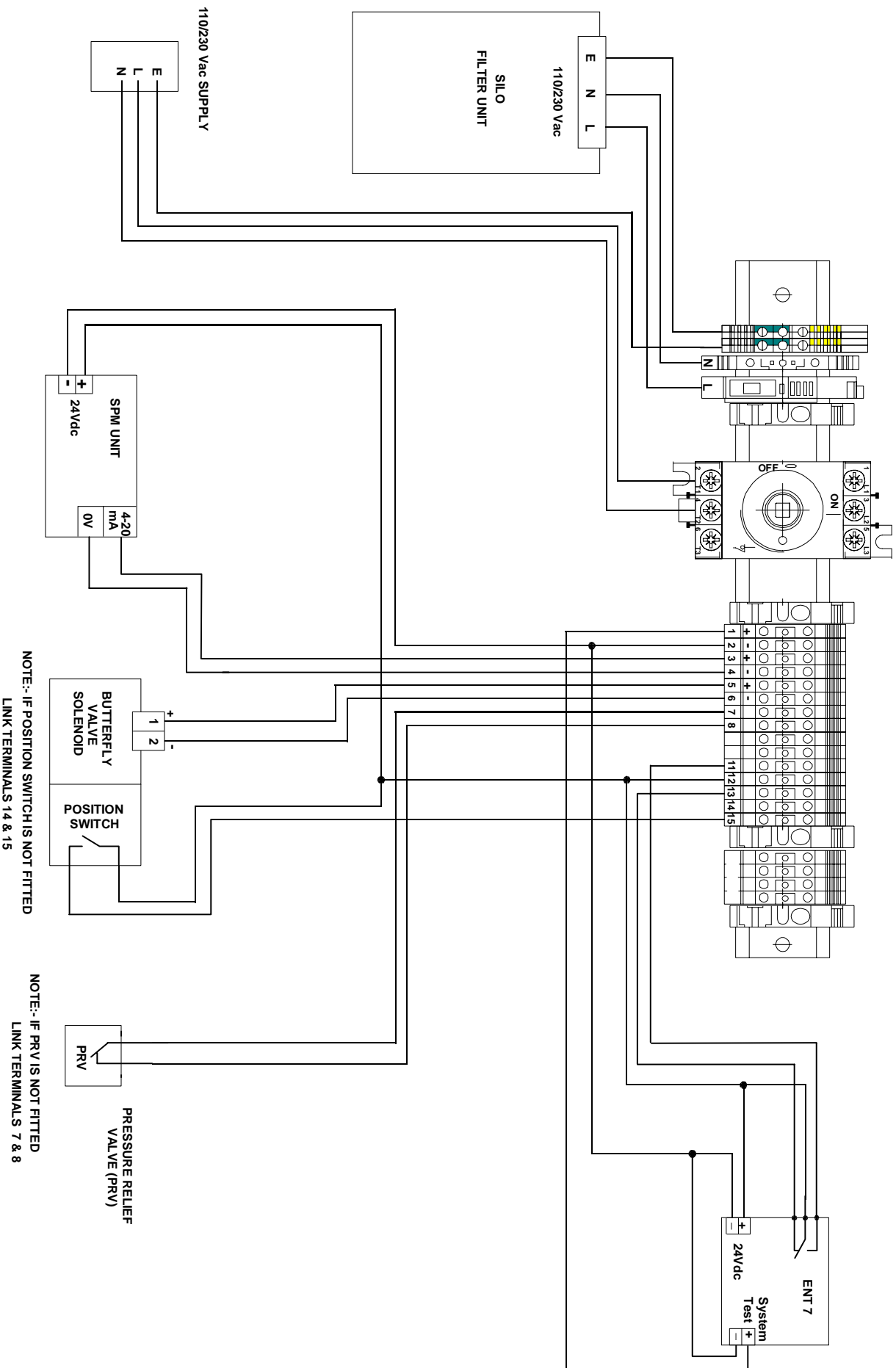
**Mounting Flange PN16 DN150**







### Wiring Schematic (SPM Version)





## Typical Silo Top Installation (SPM Version)





## SPM2403 Silo Pressure Monitor User Guide

### 1. Application

The SPM-2403 is designed to provide a reliable means of monitoring the pressure in silos as well as the differential pressure across filters during the pneumatic filling process.

### 2. Operation

The SPM-2403 utilises an electronic pressure transducer in conjunction with processing electronics to provide over and above the built-in display, a 4-20mA process output for remote indication or PLC input.

### 3. Installation

#### 3.1 General

The SPM-2403 unit is designed for outdoor mounting on any suitable flat vertical surface. Unscrew the four captive screws in the lid of the unit and **carefully** remove the lid. The base of the unit is then fixed to the mounting surface by means of four screws through the fixing holes in the base of the unit (see diagram on page 6 for fixing hole spacings).

#### 3.2 Wiring

Wiring to the SPM -2403 unit must be in suitable cable for the application conditions, and the installation must comply with all statutory requirements that may effect the complete installation.

Standard electric installation cable, suitable for a 24V dc supply must be used. Consideration must also be given to any special environmental conditions.

The instrument must be wired in accordance with the wiring diagram on page 9.

#### 3.3 Pressure Connections

The pressure connections to the units should be made with 3mm i.d / 5mm o.d. tubing. Observe the polarity shown on the outline diagram on page 9.

### 4. Commissioning

**4.1** Switch on the supply voltage and allow a few minutes for the unit to stabilise. Then proceed as follows to set the zero, relay switchpoint and failsafe using the controls shown in the diagram on page 3.

#### 4.2 Set Zero

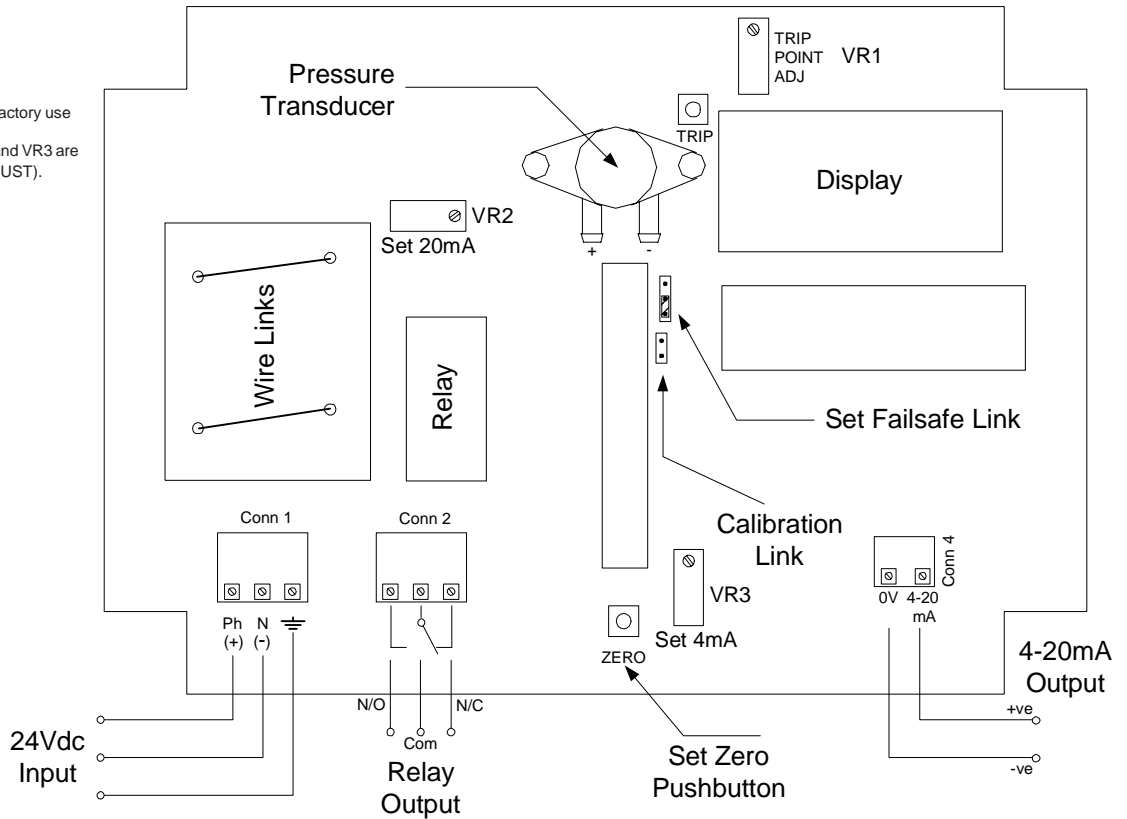
Pressing down the zero pushbutton on the PCB will set the display to zero and the output current to 4mA .



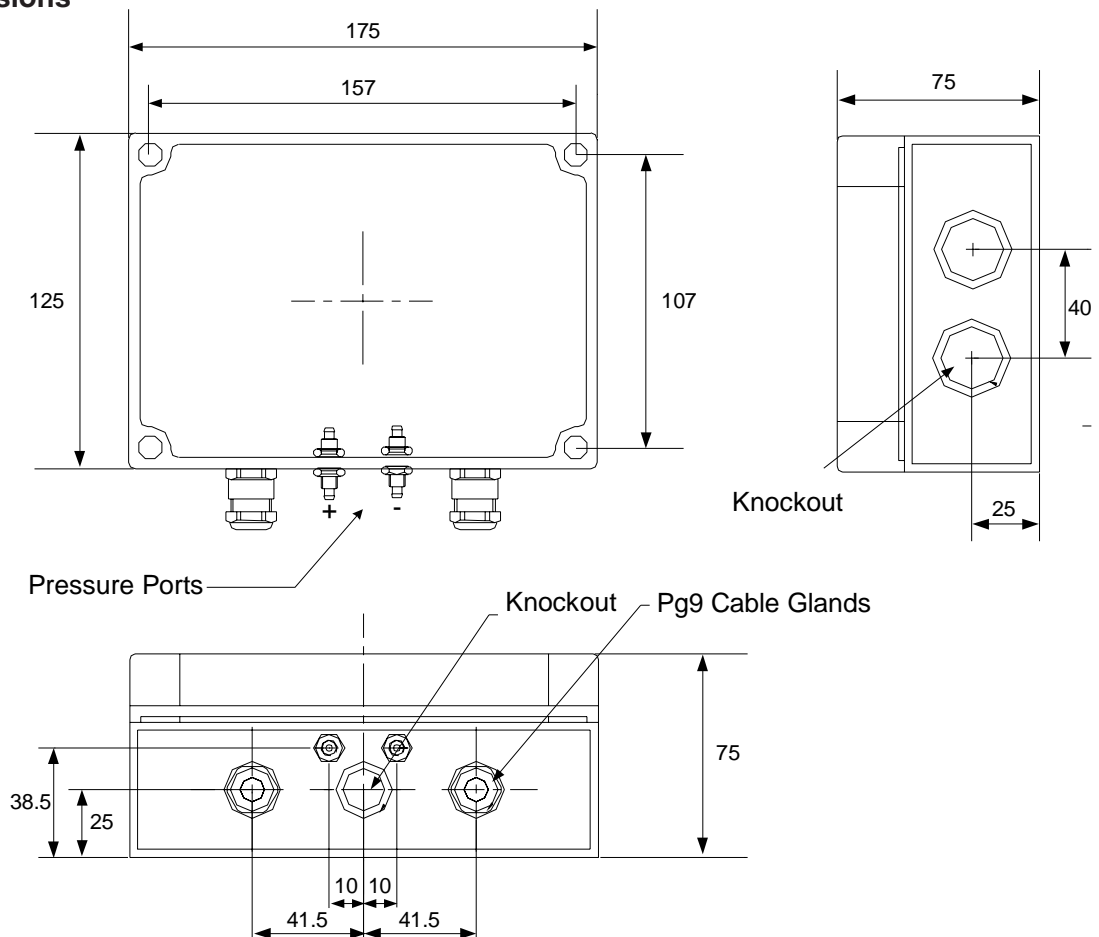


**5. Wiring Schematic and Controls**

**Notes:**  
 The calibration link is for factory use only and **is not** fitted.  
 The potentiometers VR2 and VR3 are factory set (DO NOT ADJUST).



**6. Dimensions**





### 7. Specification

Part Numbers	2403 01 0000	100mbar unit.
	2403 10 0000	1000mbar unit.
Supply	110/230V ac, 50/60Hz, 4VA, voltage selected by internal links. 24V DC version available to special order.	
Pressure Ranges	0-100mbar 0-1000mbar.	Note: The 4-20mA output is scaled relative to the pressure range specified by the Customer. For example 0-40mbar or 0-600mbar. The pressure ranges are factory set in system software and cannot be subsequently adjusted.
Overpressure	4 x maximum rated pressure.	
Display	3½ digit LCD display.	
Resolution	100mbar units ± 0.1 mbar : 1000mbar units ± 1 mbar.	
Display Accuracy	± 1% RDG. ± 1 digit. Note : Display indicates measured pressure in mbar.	
Signal Output	4-20mA proportional to displayed output.	
Relay Output	SPDT voltage-free, 250V ac / 3A, relay hysteresis 2%.	
Controls	Set zero - via pushbutton on PCB. Set relay switchpoint - via pushbutton and potentiometer on PCB. (Adjustable between 5% and 95%). Set fail-safe - via links on PCB. Factory default setting - high level (HL).	
Pressure Connections	Two ports for 3mm i.d. tubing (wall thickness 1mm).	
Protection	IP67.	
EMC Standards	Emissions	EN 50081-1
	Immunity	EN 50082-1 EN 61010-1
Housing	Wall mounting weatherproof polycarbonate with transparent front cover.	
Dimensions	175mm x 125mm x 75mm. Fixing Centres 157mm x 107mm.	
Weight	0.63kg.	
Note	We reserve the right to alter the design or specification of this product without prior notice.	



## Installation - with DMU03 Pressure Transmitter

See page 12 for overall system layout.

All wiring should be made using 0.75mm<sup>2</sup> multicore (screened if necessary).

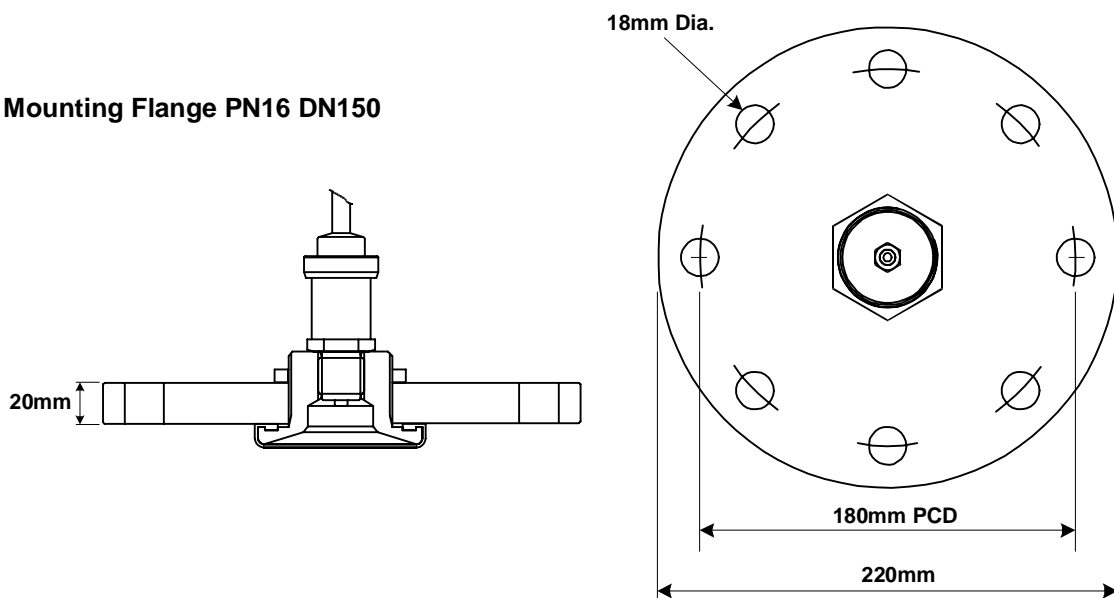
1. The SPS-100 Control Panel should be mounted on a suitable vertical surface not exposed to direct sunlight adjacent to the fill point.
2. The DMU 03 unit and its associated flanged pressure sensor should be mounted in positions determined by the customer on top of the silo.

The DMU 03 should be electrically connected to the control panel as per wiring diagram on page 13 and internal connections on page 15.

3. The ENT7 level switch should be mounted on top of the silo in a position determined by the customer and electrically wired to the control panel as per wiring diagram on page 13 and internal connections on page 17.
4. The fill pipe valve with its associated solenoid and switch/position indicator should be mounted in the fill pipe at a point to be determined by the customer and electrically wired to the control panel as per wiring diagram on page 13.
5. Using 4mm o.d nylon tube connect the pressure switch on the side of the SPS-100 control panel to the site compressor airline.
6. Dust filter electrical supply should be taken from SPS-100 control panel.

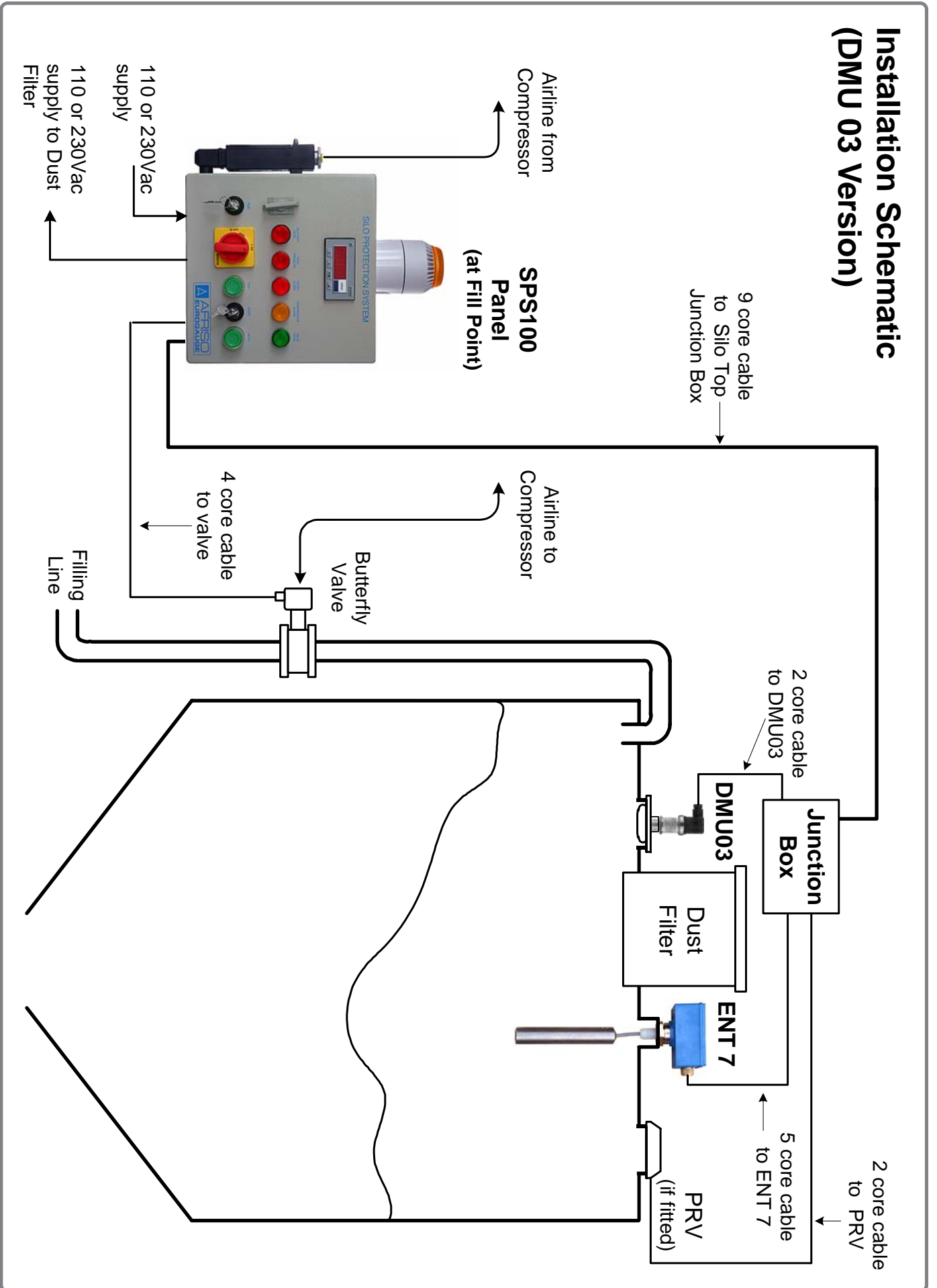
### DMU 03 Pressure Pad Dimensions

Mounting Flange PN16 DN150



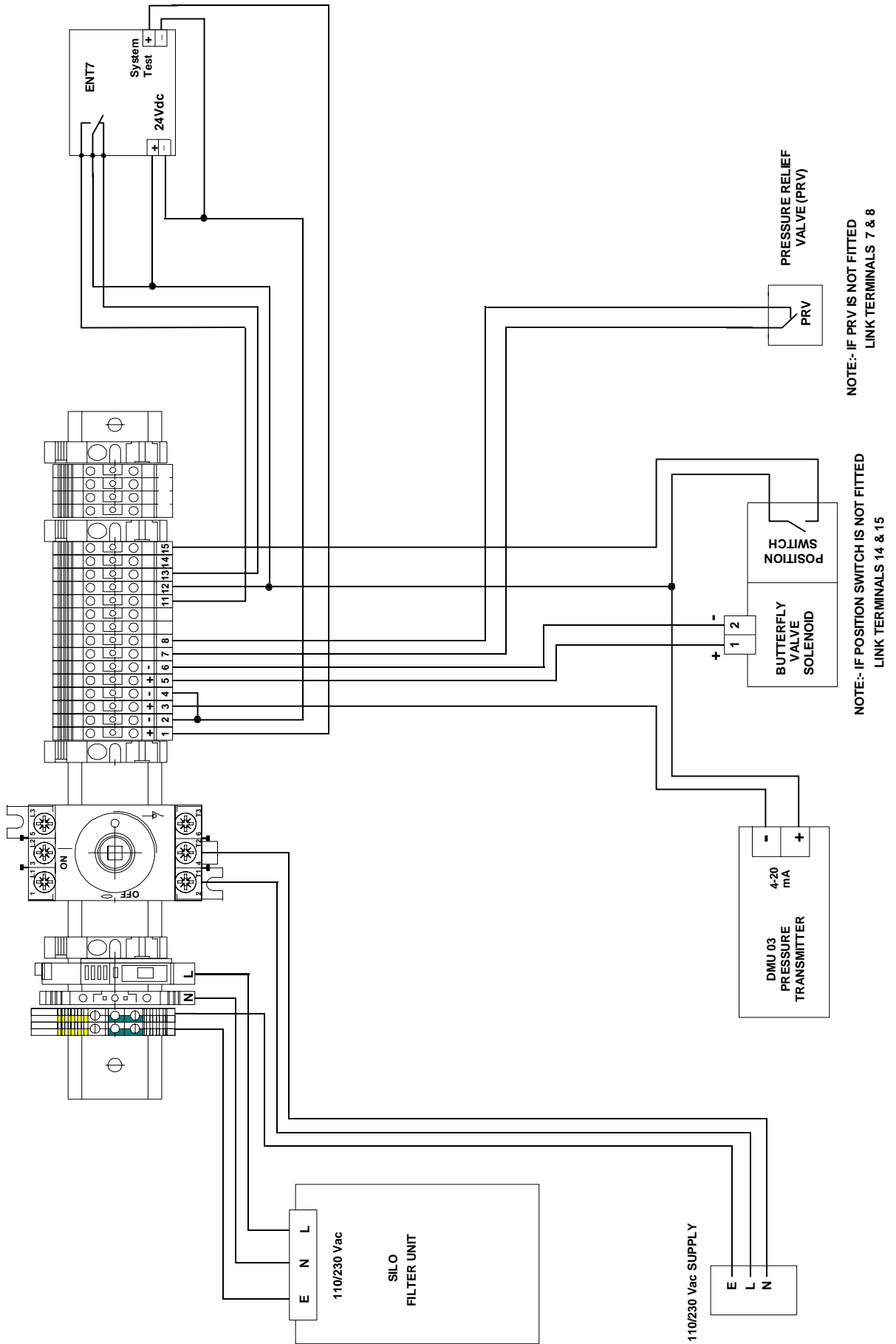


### Installation Schematic (DMU 03 Version)



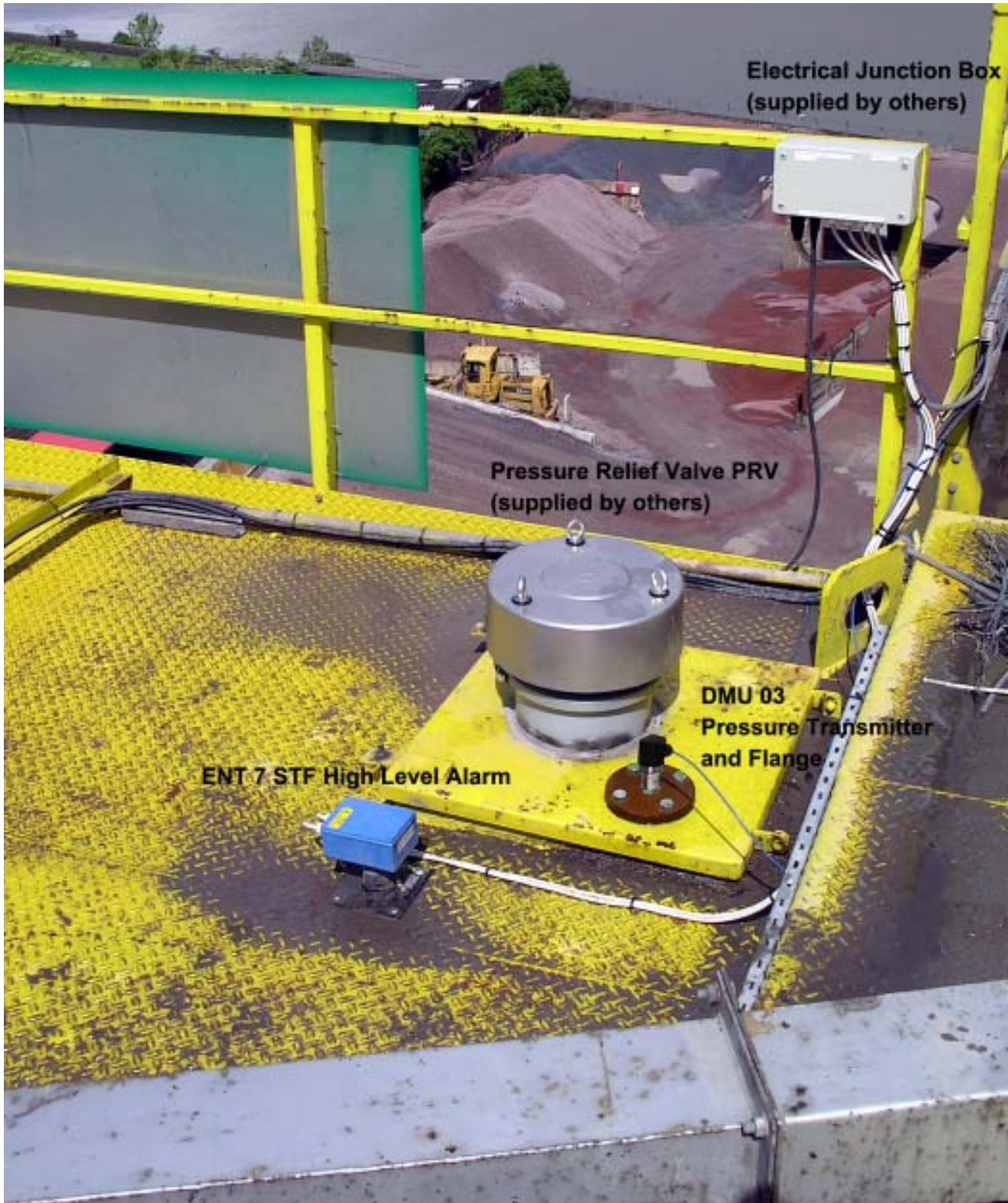


**Wiring Schematic  
(DMU 03 Version)**





### Typical Silo Top Installation (DMU 03 Version)





## DMU 03 Pressure Transmitter User Guide

### 1. Application

The DMU-03 range of pressure transmitters has been designed for the electronic measurement of low viscosity liquids in vessels, and air/gas pressures in industrial and marine applications.

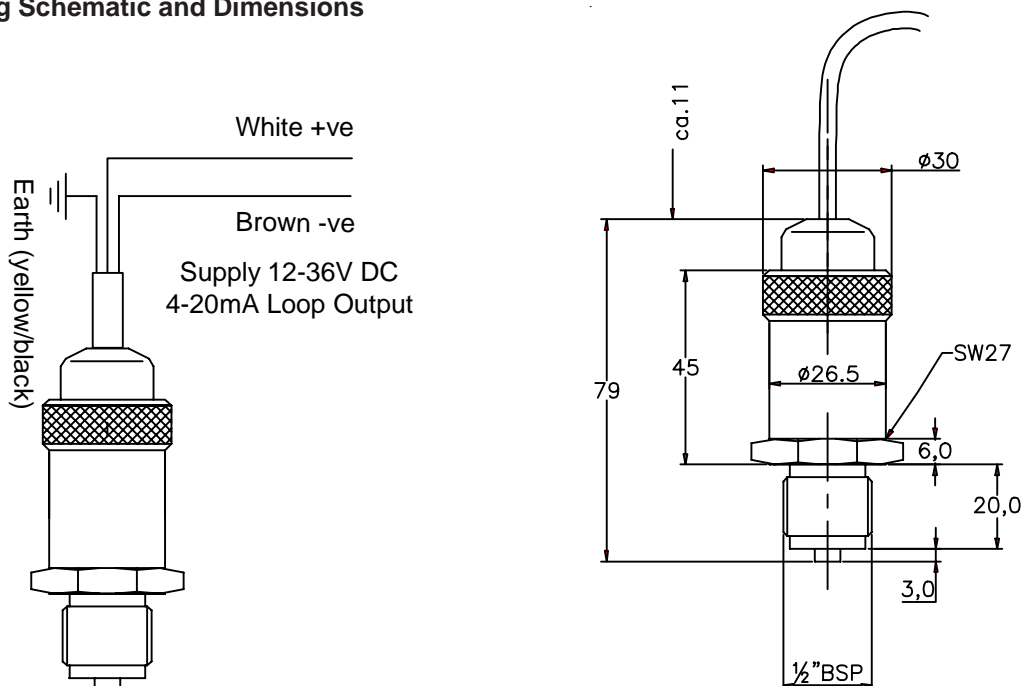
The two-wire loop powered transmitter is simply fitted to the bottom of the vessel for liquid applications or as required for air/gas applications and provides a 4-20mA output proportional to the liquid height/pressure or air/gas pressure in the vessel.

The small, compact robust stainless steel transmitter construction incorporates the latest piezo-resistive measurement technology with excellent stability and accuracy over a long service life.

### 2. Specification

Supply	12-36V DC (Ex version 12-28V DC).	
Ranges	0-100mbar up to 0-25bar.	
Output	4-20mA (maximum current < 30mA).	
Load	Maximum Load (ohms) = (Supply Voltage - 12)/0.02.	
Accuracy	< ± 0.5% FSD.	
Temperature	Ambient:	-25°C to +85°C.
	Medium:	-25°C to +125°C.
Materials	Housing:	S320 stainless steel.
	Membrane	S316 stainless steel.
	O'Ring seal	FKM.
Connections	Process:	½" BSP.
	Electrical:	Cable or Plug DIN 43650-A (IP65).
Integral Cable	6 metres 3-core vented	
EMC Standards	EN 50081-2 & EN 50082-2.	
Note:	We reserve the right to alter designs and specifications without notice.	

### 3. Wiring Schematic and Dimensions





## ENT 7 High Level Alarm User Guide

### 1. Application

The ENT7 Capacitance Level Switch is intended for high or low level detection of liquids, slurries, free-flowing powders and granular materials in silos, tanks, etc. The choice of electrode configuration makes the ENT7 equally useful with conducting as well as non-conducting products.

### 2. Operation

The unit operates on the principle of a changing electric field caused by the presence or absence of material around the electrode. This change, after amplification, is used to operate the output relay.

An internal Failsafe Switch offers the option of failsafe facilities for either high or low level alarms, LED indicators show the state of the output relay. A Multi-turn Sensitivity Control allows accurate adjustment of the switch point.

### 3. Installation

#### 3.1 Mechanical

The unit must be mounted in such a position that the maximum permissible ambient (external) temperature of 60°C is not exceeded.

Mounting is by either a 1" or a 1½" BSP parallel thread. When fitting the unit into the mounting boss, use a 'C' spanner on the metal boss, do **NOT** use the housing to turn the unit into the boss.

Make certain that the rubber sealing ring is in place before securing the cover and that the four cover screws are securely tightened down.

#### 3.2 Electrical

Connect the 24Vdc supply to the appropriate terminals on the 24Vdc terminal block; the connectors are removable. The earth connection is internally connected to the mounting boss, it must also be connected to a suitable earth point, the silo must **NOT** be relied on for earthing purposes.

The compression glands are for cables with an outer diameter of 5-8mm and must be securely tightened to prevent the ingress of dust or moisture and to ensure compliance with the IP65 physical protection.

### 4. Commissioning

Set the fail-safe switch to High Level (HL).

With the vessel **EMPTY**, use the trim tool provided on the inside of the instrument lid, or a small instrument screwdriver to adjust the multi-turn switchpoint control potentiometer.

**High Level (HL)** If the red alarm LED is on - turn the control clockwise until the green LED comes on, then turn the control clockwise one more turn.

If the green normal LED is on - turn the control anti-clockwise until the red LED comes on, then turn the control clockwise until the green LED comes on again and then turn the control clockwise for one more turn.

For maximum sensitivity the control may be turned by half a turn only and not one turn as described above.

### 5. Maintenance

No maintenance is normally required. However, it is advisable that the electrode is checked for any signs of damage or wear at intervals when the installation is cleaned.



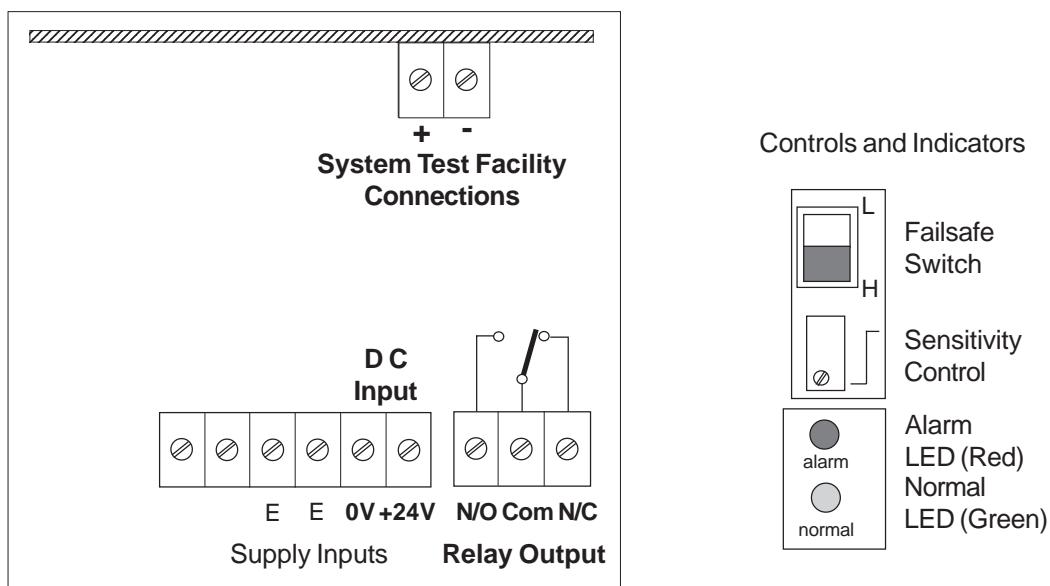


**6. Specification**

Supply	24 volt DC (20 - 28V), 4 Watts. Connect to '24V' terminals. Separate supply required for self-test board: 12 - 20 Volts DC.
Part Number	5443681410-STF, PP insulated flexible probe, M/S adjustable weight.
Capacitance Range	200pF ΔC, [100pF ΔC with 'H' setting - factory option only].
Sensitivity	<0.5pF @ Co = 10pF, <1.0pF @ Co = 100pF. Adjustable by multi-turn control - 10pF/turn.
Application	High or low level detection of liquids, slurries, free-flowing powders and granular materials depending upon the type of electrode chosen.
Output Switching	Single pole changeover contacts - voltage-free. Rating - 250V @ 4A max, 500 VA @ Cos Φ = 0.7, 100 watts D.C.
Indicators	LED (green) normal On when output relay energised. LED (red) alarm On when output relay de-energised.
Failsafe	High or low level failsafe selection by internal switch. High Level (maximum failsafe) - Electrode uncovered - relay energised - (green) normal LED on. Low Level (minimum failsafe) - Electrode covered - relay energised - (green) normal LED on.
Temperature	Ambient -20°.... 60°C. Electrode -20°.... 80°C.
Terminals	1 six way, 1 three way and 1 two way plug-in terminal blocks for Supply, Relay Output and System Test - for 1mm <sup>2</sup> conductor size.
Cable Entry	2 x Pg11 cable glands for 5-8mm diameter cable.
Housing	Glass loaded ABS. Protection IP65 (BS5490 / IEC529).
Mounting Boss	1½" BSP parallel, standard series.
Weight	Approximately 1.5kg (with stub electrode).
EMC Standards	Emissions EN 50081-1 Immunity EN 50082-1 EN 61010-1

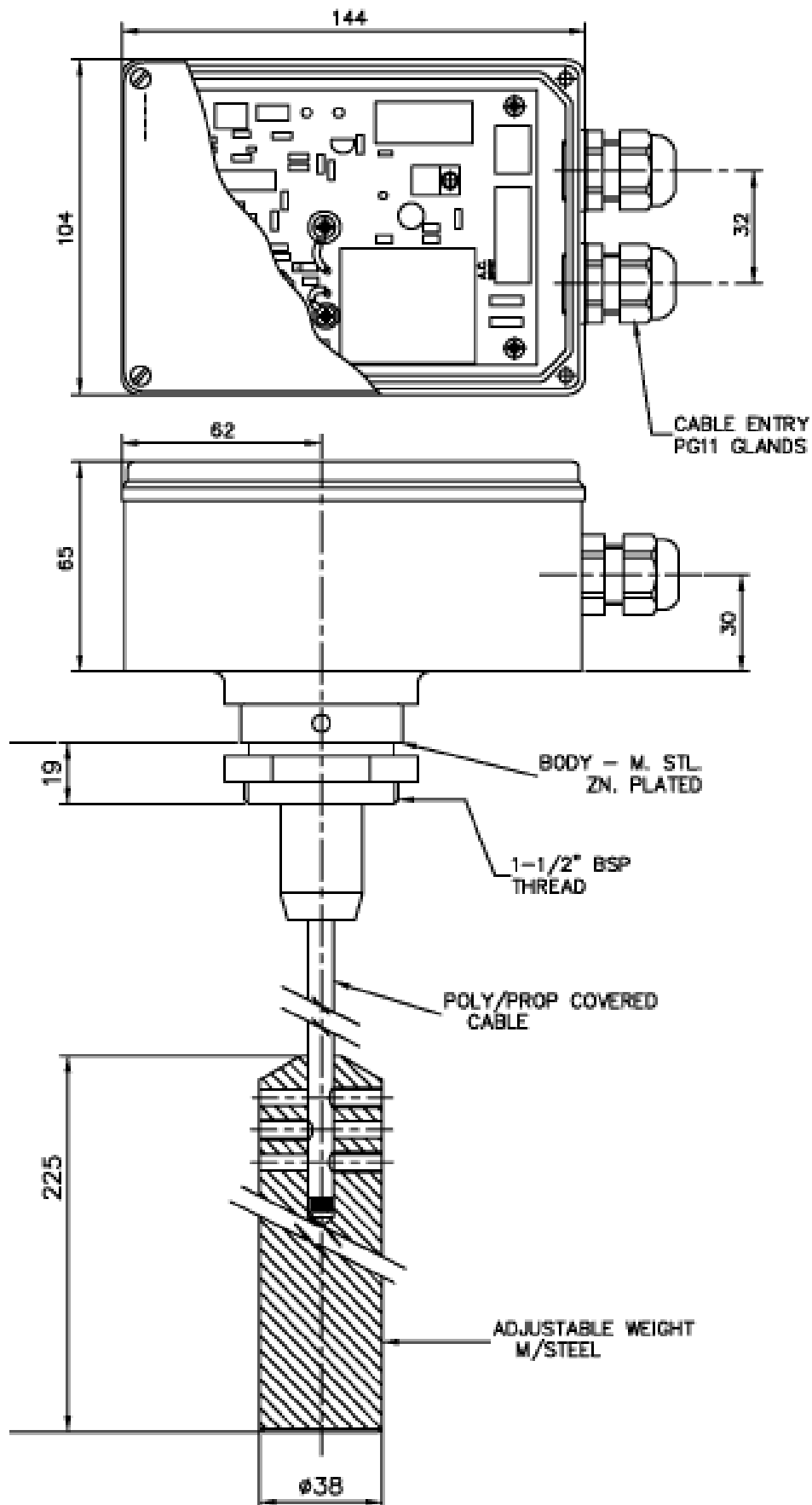
We reserve the right to alter the design or specification of this product without notice.

**7. Wiring Connections**





### 8. Outline and Dimensions





## Test Certificate

Sales Order Number:	Serial Number:	
Customer:		
Site Installed:		
<b>Test</b>	<b>Description</b>	<b>OK</b>
1	Wiring, Initialisation and Interconnection Checks.	
2	Run and Reset Function Checks.	
3	Test and Mute Switch Function Checks.	
4	High Level Alarm Simulation.	
5	Filter Alarm Simulation.	
6	High Pressure Alarm Simulation.	
7	Compressor Alarm Simulation.	
8	Shut-down Function Checks.	
9	DPM Anti-Tamper Check.	
10	Sounder Setting Check.	
<b>Settings</b>		
Pressure Settings	Filter Alarm: <b>40mbar</b>	High Pressure Alarm: <b>60mbar</b>
Timer Settings	Timer T1: <b>40 seconds</b>	Timer T2: <b>10 minutes</b>
Key Numbers	Run Key:	Reset Key:
Tested By: (Print and Sign Name)		Date:



### Tanker Drivers Guide - SPS 100 Control Panel





## Tanker Drivers Guide - System Operation

### Normal Filling Operation

1. Insert Key into **RUN** keyswitch and turn clockwise to activate system.
2. Press '**Test**' button to simulate silo high level/pressure alarm condition.
3. All panel lamps will light up, the alarm beacon/sounder will come on.
4. Release '**Test**' Button, the green lamp should remain on indicating the filling line shut-off valve is open.

*Note: If any alarm is showing, the filling line shut-off valve will not open. The amber '**Compressor Alarm**' light on the panel will come on when the site compressor is switched off or insufficient pressure is present to open the filling line shut-off valve. Switch on compressor !*

5. Commence filling of silo.
6. When the material level in the silo reaches the pre-set **HIGH LEVEL**, the red high level lamp lights, the audible alarm sounds and the beacon flashes.
7. **STOP FILLING** and blow out tanker filling hose immediately. The filling line shut-off valve will **AUTOMATICALLY CLOSE** 40 seconds after the high level alarm was reached !!
8. Press '**Mute**' button to silence the audible alarm, switch off system and remove key. Note: The pulsed air supply to the filter will continue for 10 minutes after which time it is closed down automatically by the system.

### Abnormal Rise in Silo Pressure

9. If the pressure in the silo rises due to a dirty filter, the '**Filter Alarm**' activates and the alarm sounder/strobe light comes on.
10. If pressure continues to rise, the '**High Pressure**' alarm lamp will come on, the filling line shut-off valve **CLOSES IMMEDIATELY** and the audible alarm stops but the beacon continues to flash.
11. **Abandon Silo filling operation and inform Site Supervisor**  
The silo filter system needs to be checked. Switch off system and remove key.



### **AFRISO EUROGAUGE LTD**

Imberhorne Lane, East Grinstead  
West Sussex. RH19 1RF  
United Kingdom

Tel: +44 (0)1342 323641

Fax: +44 (0)1342 315513

[www.eurogauge.co.uk](http://www.eurogauge.co.uk)

[sales@eurogauge.co.uk](mailto:sales@eurogauge.co.uk)

- 
- **RADAR and MICROPULSE**
  - **ULTRASONICS**
  - **PRESSURE TRANSMITTERS**
  - **VIBRATION SWITCHES**
  - **CAPACITANCE**
  - **Float Level Switches**
  - **Conductivity**
  - **Rotary Paddle and 'Plumb bob'**
  - **Magnetostrictive**
  - **Self-powered gauges**
  - **Oil/water Alarms**
  - **Leak Detectors**