MiniPurge® Type X - ET
Size 1 Manual
ML 442

Important Note:

It is essential for safety that the installer and user of the Expo system follow these instructions.

Please refer to the standard for principles and definition.
These instructions apply only to the pressurizing system. It is the responsibility of the manufacturer of the pressurized enclosure to provide instructions for the enclosure.

Expo Technologies reserves the right to replace any component, with one of the equivalent functionality.

Contents

Section 1: Specification Sheet - MiniPurge® Type X Systems

Model No. (Example): 07 1 X LC / ss / ET / PO / WM (Note: Not all codes are applicable)

Purge System Type

07 = MiniPurge® System

Size

MiniPurge Purge flow rate:
1 = 225 Nl /min, 8 scfm

Approval / Certification

ATEX (Europe)
EN60079-0, EN60079-2, EN60079-11
Sira 01ATEX1295X
CE 2804 Ex II 2 (2) G D
Ex [pxb] ia IIC T5 Gb
Ex [pxb] ia IIIC T141°C Db
Tamb -20°C +55°C

IECEx (International)
EN60079-0, EN60079-2, EN60079-11
IECEx SIR 07.0027X
Ex [pxb] ia IIC T5 Gb
Ex [pxb] ia IIIC T141°C Db
Tamb -20°C +55°C

INMETRO (Brazil)
TÜV 12.1462X
Ex [pxb] ia IIC T5 Gb
Ex [pxb] ia IIIC T141°C Db
-20°C ≤ Ta ≤ +55°C

NFPA (USA)
NFPA 496, FM 3600, 3610, 3615, 3620
FM 1X8A4.AE
X-Purge Class I Div 1 Grp ABCD Tamb = 60°C
X-Purge Class II Div 1 Grp EFG Tamb = 60°C

CSA (Canada)
NFPA 496, CSA C22.2 No. 25, No. 30, No. 157
FM 1X8A4.AE
X-Purge Class I Div 1 Grp ABCD Tamb = 60°C
X-Purge Class II Div 1 Grp EFG Tamb = 60°C

UL (USA & Canada)
E190061
X-Purge Class I Div 1
Group A, B, C, D

Options as Required

MO = Manual Override
MK = MIU Mounting Kit (PO systems only)
WM = Wall Mounting Bars
HP = High Pressure Sensor

Power & Alarm (Signals)

PO = Pneumatic Output Signal
PA = Power and Alarm Terminal Switches Integral /PA Box
IS = Intrinsically Safe Power and Alarm Terminal

Timing Method

ET = Electronic Timer

MiniPurge Housing

ss = 316L Stainless Steel (NROB finish)
Neoprene "Top" Mount Gasket
pm = Panel Mount (Side/Front Mount) 316L Stainless Steel (NROB finish)

Pressurization Method

CF = Continuous Flow
LC = Leakage Compensation

CCC (China)
CNEX 2020312304000830
Ex [pxb] ia IIC T5 Gb
Ex [pxb] ia IIIC T141°C Db
Tamb -20°C +55°C

EAC Certification
TR CU 012/2011
RU C-GB.АЖ58.B.00906/20
1Ex [px] ia IIC T5 Gb
Ex [px] ia IIIC T141°C Db
-20°C ≤ Tamb ≤ +55°C

KOSHA Certificate
14-AV4BO-0215X
Ex [px] ia IIC T5
T_{amb} -20°C to +55°C

PESO Certificate
P577391/1
Ex [pxb] ia IIC T5 Gb

Certificates can be found in the accompanying booklet (ML499) or downloaded at www.expoworldwide.com.
**Not all model variations are certified under all certificates, refer to the certificate or consult Expo for more information.

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1.1 MiniPurge Control Unit Data

Supply Pressure:	Must be regulated at the inlet		
	Minimum 60 psi / 0.4 MPa / 4 bar		
	Maximum 115 psi / 0.8 MPa / 8 bar		
Air Quality:	Compressed air / Nitrogen to instrument quality		
Ambient Temperature:	-20°C to + 55°C		
Leakage Compensation (LC Model only)	Up to 60 Nl/min / 2 scfm to compensate for leakage of the enclosure		
Bulkhead Pipe Fittings:	Air Supply:	1/2" NPT	
	Output:	1/2" NPT	
	Signal:	1/8" NPT	
Visual Indicators:	Alarm (Red ●) / Pressurized (Green ●)		
	System Purging (Black ● / Yellow ●)		
Purge Time:	User selectable, in 1-minute intervals up to 99 minutes (-0+3 seconds)		
Flow & Pressure Sensors:	CF Model:	One sensor for both:	
		"Low Pressure and Flow":	1" WC / 250 Pa (2.5 mbar)
	LC Model:	"Low Pressure Sensor"	0.2" WC / 50 Pa (0.5 mbar)
		"Flow Sensor"	1.13" WC/ 280 Pa / (2.8 mbar)
Action on "Loss of Pressure":	"Alarm & Trip" or "Alarm Only". User-selectable.		
Housing Material	316L Stainless Steel		
Weight	Approx. 5.5 kg (12.1 lbs)		

1.2 Power & Alarm (Signals) Data

/PA Output:

MiniPurge Interface Unit (MIU/E1)	Stainless Steel, with terminals with front access cover. Ex e IIC T5 Gb / Ex tb IIIC T100°C Db IP66 Tamb: -20°C to +55°C Ex e IIC T4 Gb Tamb: -20°C to +60°C
Power Interlock Switch:	DPNO switch, contact ratings 250 Vac 4 Amps (AC-15) / 24V DC 4A, Ex d IIC T6 Gb / Ex tb IIIC T80°C Db.
Alarm Switch	SPCO switch, contact ratings 250 Vac 4 Amps (AC-15) / 24V DC 4A, Ex d IIC T6 Gb / Ex tb IIIC T80°C Db.

/IS Output:

Power Interlock Switch:	Volt-free contacts for the connection of Intrinsically Safe Circuits.
Alarm Switch	Volt-free contacts for the connection of Intrinsically Safe Circuits.

/PO Output

Power Interlock Switch:	2.3 barg outlet via 1/2" NPT Female connection.
Alarm / Pressurized Signal:	2.3 barg outlet via 1/2" NPT Female connection.

1.3 Relief Valve Unit and Purge Outlet Valve Data

System:		CF Model	LC Model
Type:		RLV25/ss	RLV25/FS/ss
Opening Pressure:		4" WC / 1 kPa (10 mbar)	4" WC / 1 kPa (10 mbar)
Purge Flow rate:		N/A (see Spark Arrestor)	8 scfm / 225 Nl/min
Material	Housing:	316L Stainless Steel	
	Gasket:	Neoprene	

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Spark Arrestor Unit (CF Systems Only)

Type:		SAU25
Purge / Dilution Flow Rate:		0.4 - 8 scfm / 10 – 225 Nl/min
		7 user-selectable orifice plates
Material:	Housing:	Stainless Steel
	Gasket:	Neoprene

Section 2: Specific Conditions of Use

1. When using the AO, AS and DT option, the recommendations for the additional requirements of Ex p apparatus contained within IEC 60079-14 shall be applied.
2. The installer/user shall ensure that the MiniPurge Control Unit is installed in accordance with the equipment certificate that covers the combination of the pressurized enclosure(s) and MiniPurge Control Unit.
3. The values of the safety parameters shall be set in accordance with the equipment certificate that covers the combination of the pressurized enclosure(s) and MiniPurge Control Unit.
4. This MiniPurge Control Unit shall be incorporated into equipment and the appropriate Conformity Assessment Procedures applied to the combination. The MiniPurge certificate does not cover the combination.
5. The purge controller, low temperature version, shall be protected by a system that ensures that it cannot be energised if the temperature of the controller logic air or purge controller falls below -20°C. This system shall utilise the RTDs that are fitted to the purge controller to provide the appropriate level of system integrity.
6. Where a Vortex cooler is fitted the hot air outlet pipe shall be kept free from obstructions and blockage.
7. The following routine tests are to be carried out:
   - The vortex cooler is functioning correctly. (H6 and H7 options ONLY)
   - The pneumatic logic isolator is functioning correctly (H6 and H7 options ONLY)
8. When using the 'LD' option, the LEDs have the following IS input parameters and it shall be supplied from a suitable intrinsically safe power supply for Zone 1 or Zone 2 depending on which zone the purge controller is being installed.
   - Ui = 30V, Ii = 100mA, Pi = 1W, Ci = 0 and Li = 0.

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Section 3: Application Suitability

MiniPurge Systems are certified for use in Hazardous Areas, where the hazardous area is non-mining (above ground) and the hazard is caused by flammable gasses, vapours, or dust. The system may be used in IECEx, ATEX Zone 1(21) - Category 2 and NEC 500 Class I, Div 1.

MiniPurge systems may be used for hazards of any gas group. However, apparatus associated with the MiniPurge system, such as Intrinsically Safe signalling circuits and flameproof enclosures containing switching devices may be limited in their gas group. The certification documentation supplied with any such devices must be checked to ensure their suitability.

The MiniPurge is designed for use under normal industrial conditions of ambient temperature, humidity, and vibration. Please consult Expo before installing the system in conditions that may cause stresses beyond normal industrial conditions.

This system is designed for use primarily with compressed air. Where other inert compressed gasses are used such as nitrogen, the user must take suitable precautions to prevent gas build-up. Where a risk of asphyxiation exists, a warning label must be fitted to the system. Refer to the relevant COSHH data sheet for more information.

The MiniPurge certification does not certify the enclosure on which the system is mounted. The complete installation shall be evaluated to the appropriate standards and regulations applicable to the final installation location.

The following materials are used in the construction of MiniPurge systems. If substances that will adversely affect any of these materials are present in the surrounding environment, please consult Expo for further guidance.

Stainless Steel	Aluminium	Acrylic	Polycarbonate
Mild (carbon) Steel	Nylon	Silicone Rubber	ABS
Brass	Polyurethane	Neoprene	Glass Filled Polyester

If the enclosure contains an internal source of release of flammable gas or vapour, the procedures for assessment of the release as given in local regulations should be used. Consult Expo for advice if required. The user must verify that the specifications of the Expo system e.g., pressure, continuous flow (dilution) rate and type of protective gas are correct for the specific application.

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Section 4: Description and Principle of Operation

4.1 General Principle

Purge and pressurization is one of the most common methods of ignition protection which allows the safe installation and operation of electrical equipment that is not approved for use in hazardous areas. Purge and pressurization is a two-step process completed before electrical equipment inside an enclosure is turned on.

During the initial purge process, clean compressed air or inert gas is supplied into the enclosure to displace any hazardous gas that has accumulated while the enclosure has not been pressurized. Once purged, the internal overpressure is maintained with clean air or inert gas. The duration of the purge process is normally ascertained by performing a purge test. The overpressure prevents hazardous gas from the surrounding atmosphere from entering the enclosure.

After purging and pressurization, the interior of the enclosure is now a safe area, power can be turned on and any equipment/devices housed can be operated.

4.2 MiniPurge Description and Operation

The MiniPurge® system is pneumatic in operation, with electrical interfaces. How the system operates is dependent on the system pressurization method:

a) CF – Continuous Flow

A Continuous Flow (CF) of air/gas is passed through the pressurized enclosure. Initially, this flow is verified and performs a purging phase. Once the purge is complete – the same airflow continuously flows into the enclosure at the same rate as selected for the purge to maintain an overpressure within the enclosure.

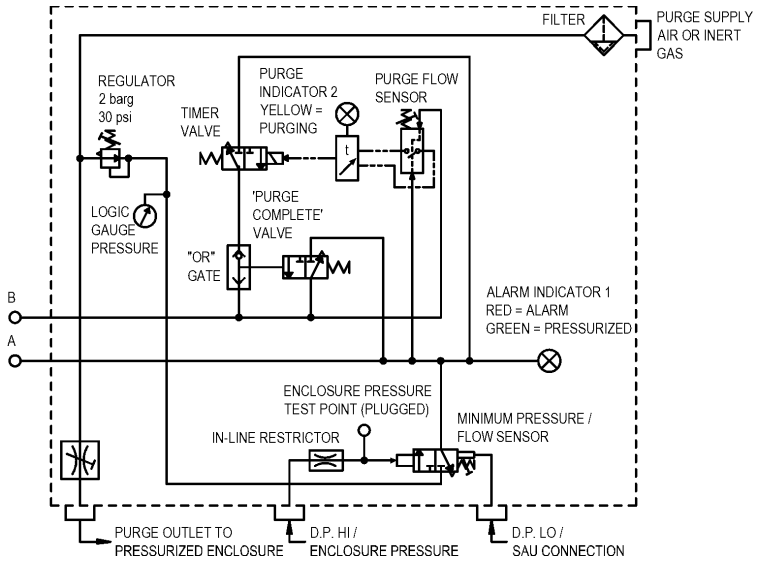

Figure 1 Continuous Flow Circuit Diagram

b) LC – Leakage Compensation

Initially, a high flow of air/gas is passed through the enclosure. This flow is verified and performs the purging phase. Once purged, the system automatically switches to leakage compensation mode. The Purge Outlet Valve is closed and the protective gas is supplied via an adjustable valve which reduces the flow rate while remaining high enough to compensate for enclosure leakage to maintain an enclosure overpressure.

Note: If leakage is less than 5 l/min then the Leakage Compensation Valve (LCV) will be awkward to set. You will find that the Relief Valve (RLV) spring will cycle open and close. If this happens contact our service department for advice.

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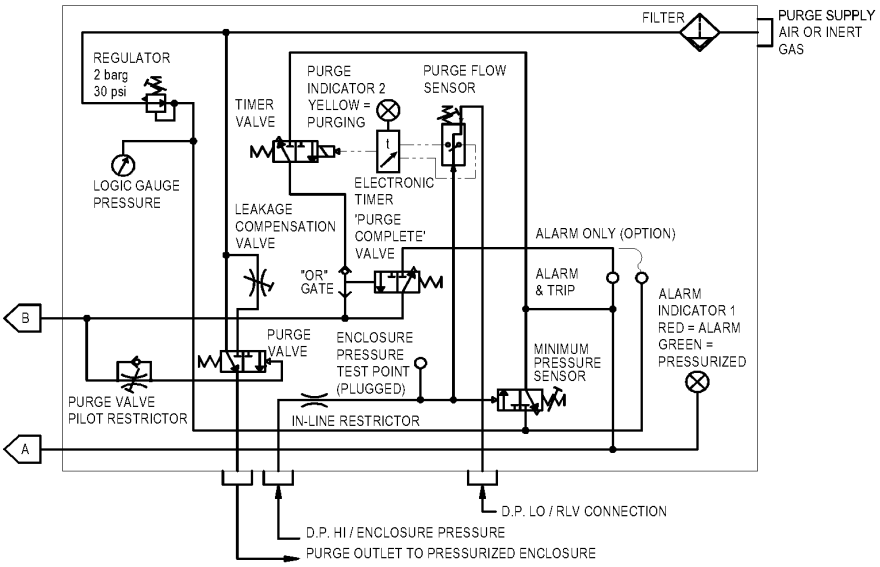

Figure 2 Leakage Compensation Circuit Diagram

c) Alarm Mode

In the event of pressure failure within the enclosure, the MiniPurge system will alarm in the form of visual indicators and a volt-free contact depending on the specification of the system. The default action on loss of pressurization is to alarm and automatically disconnect the power (A&T - Alarm and Trip). This can be changed by the user to Alarm Only (/AO) – refer to System Configuration/set-up.

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Section 5: Main Components

The MiniPurge system comprises up to three components dependent upon the system type:

System Type	Control Unit (CU)	Relief Valve (RLV)	Spark Arrestor Unit
Leakage Compensation	YES	YES	Integral to RLV
Continuous Flow	YES	YES	YES (SAU25)

Table 1 System Components

5.1 Control Unit (CU)

The Control Unit is the heart of the system. It contains the pneumatic logic circuit especially designed and built to control the functions required for purge and pressurization.

1) Air Supply Filter

A 40µm liquid/dust filter element is fitted as a precaution, to remove any impurities in the supply air/gas. The user must ensure that the air supply is of Instrument Air Quality. Refer to Installation for more details.

2) Minimum Pressure Sensor

The Minimum Pressure Sensor monitors the pressure inside the enclosure. When the pressure is below the minimum required for safe operation, the pressure sensor causes the system to reset and the Alarm / Pressurized indicator turns Red. The sensor is factory-calibrated and set to operate in falling pressure at or above the minimum specified pressure.

3) Purge Flow Sensor

The Purge Flow Sensor monitors flow through the Purge Outlet Valve. When the purge flow is above the minimum specified for purging, the sensor sends a signal that activates the purge timer. This sensor is factory-calibrated to operate on a falling flow rate at or above the minimum specified purge flow rate.

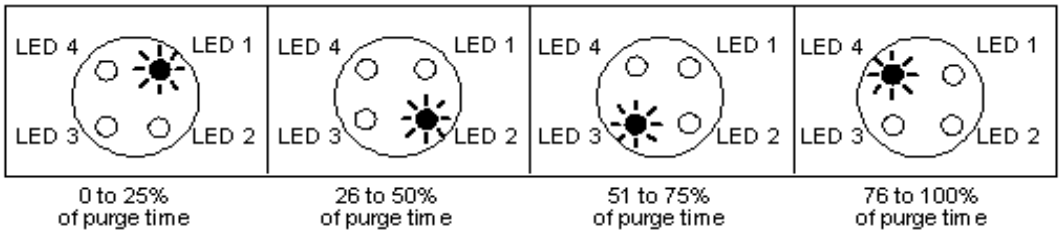
4) Visual Indicators

A high-contrast colour Rotowink indicator is fitted to provide enclosure pressure status and an LED module with 4 LEDs for purge indication.

Alarm / Pressurized Indicator	
Green	Pressurized
Red	Pressure Alarm (enclosure pressure low)

System Purging Indicator	
Black (LEDs OFF)	Purge flow too low (not in purge mode)
Yellow (flashing)	Purging (flow above minimum)

The purge cycle is indicated by the four LEDs which flash sequentially while the timer is running.



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5) Electronic Purge Timer

When both the enclosure pressure and the purge flow rate are correct, the Purge Flow Sensor activates the timer to start the purge timer. The timing period is selected using switches mounted on the timer module.

The Electronic Timer is powered by an intrinsically safe battery pack that needs regular replacement. Refer to the Maintenance for instructions.

6) Power and Alarm (signals) Options

The MiniPurge provides two outputs; power control and alarm/pressurized indication. Power control provides a signal to switch the power to the enclosure. The alarm output offers a passive signal to indicate remotely when the enclosure is not pressurized and an active signal when pressurized.

a) PO- Pneumatic Output

The power control and pressurized outputs are pneumatic signals, which may be used to operate other devices to provide power switching or alarm indication. The lack of any output signal indicates an incomplete purge and/or pressure alarm.

The pneumatic outputs can be connected to Expo's MIU/d box, a flameproof/explosion-proof enclosure (sold separately) with switches and connectors for power and alarm connection. Refer to the MIU/d Manual (ML303) for more information.

b) IS – Intrinsically Safe Output

The power control and alarm outputs are volt-free contacts suitable for use on Intrinsically Safe (IS) circuits which then provide power control or alarm outputs in a safe (unclassified) area. These contacts must only be connected to IS circuits as the switch contacts are in the hazardous area.

c) PA – Power and Alarm

A MiniPurge Interface Unit (MIU/e1) is fitted to the MiniPurge. The MIU/e is an Ex e terminal incorporating the terminal connection points for the alarm and interlock circuits. All contacts provided are volt-free (dry).

5.2 Relief Valve (RLV)

The Relief Valve unit is fitted to the enclosure to provide a means of limiting the maximum pressure experienced by the enclosure during operation. The RLV also incorporates a Spark Arrestor to prevent sparks being ejected from the enclosure into the hazardous area that maybe produced.
For Leakage Compensation systems, the RLV is combined with the flow measurement mechanism.

5.3 Calibrated Outlet Orifice/Spark Arrestor (SAU)

Continuous Flow systems incorporate the SAU25. This unit has a range of interchangeable calibrated orifice plates which are used to measure the purge flow through the enclosure.

5.4 Options

1) HP – High-Pressure Sensor

If the pressure in the pressurized enclosure rises above the setting of the High Pressure sensor, the controller resets cutting the power to the enclosure. An optional facility is available for generating an alarm or indicator when overpressure is detected. On systems with a High-Pressure sensor, the relief valve may be omitted.

Section 6: Installation of the System

The MiniPurge system shall be installed in accordance with relevant standards, such as IEC / EN 60079-14, NEC 500, NFPA 496 and any local codes of practice that are in force.

6.1 Control Unit (CU) Mounting

- The MiniPurge system should be installed either directly on or close to the enclosure.
- Generally, the most convenient arrangement is to install the Control Unit on the top of the enclosure however, can be mounted to the side or panel mounted within the enclosure.
- The Control Unit must be mounted vertically as shown in MiniPurge Configuration XBR-7TD0-003.
- The Control Unit can be mounted on the side of the enclosure using the rear mounting fixings.
- The Control Unit can be remotely mounted using the wall mounting bars (/WM option) and should be installed as close as possible to the enclosure.
- It should be installed so that the system indicators and certification labels may be readily observed.
- When the Control Unit is not mounted on the top of the enclosure, all piped connections to the enclosure from the Control Unit should be made using metallic tubes through suitable bulkhead connections.
- Refer to drawing XBR-7TD0-003 for more information

The Control Unit is mounted to the enclosure via M6 fixings, refer to the MiniPurge drawings for full cut-out and mounting details for all mounting configurations.

6.2 Relief Valve (RLV) and Spark Arrestor Unit (SAU) Mounting

- To achieve efficient purging the points where air enters and exits the enclosure should normally be at opposite ends of the enclosure.
- These items must be mounted vertically.
- The interior and exterior of the Spark Arrestor must be kept clean and free of debris which might affect the calibration of the device.
- The exterior of the Spark Arrestor should not be painted or blocked off in any way.

1) RLV

1. Cut the required mounting and outlet holes in the enclosure.
2. Secure the RLV to the enclosure with the supplied M5 fixings.

2)SAU (CF systems)

1. Cut a Ø26mm hole in the enclosure
2. Insert the SAU25 into the enclosure and secure it in place with via the M25 nut.
3. Connect the rear end of the SAU25 to SAU body inside the enclosure.

6.3 Connections to the Protective Gas Supply

- The MiniPurge® system should be connected to a protective gas supply, which is suitable for purging and pressurization.
- The supply pipe connection to the MiniPurge® must be appropriate for the maximum input flow rate for the application.
- The air supply must be regulated at a pressure less than the maximum inlet pressure.
- The air supply must be clean, non-flammable and from a non-hazardous location. The air should be of Instrument Air Quality. Although the purge control system will operate with lower air quality, its operational life will be adversely affected. The equipment that is being protected by the MiniPurge® may also suffer because of poor air quality.
  With reference to BS ISO 8573-1: 2010, Instrument Air is typically specified as:

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Particle Class 1
In each cubic metre of compressed air, the particulate count should not exceed 20,000 particles in the 0.1 to 0.5 micron size range, 400 particles in the 0.5 to 1 micron size range and 10 particles in the 1 to 5 micron size range.
Humidity or pressure dew point
The dew point, at line pressure, shall be at least 10°C below the minimum local recorded ambient temperature at the plant site. In no case, should the dew point at line pressure exceed +3°C.
Oil Class 2
In each cubic metre of compressed air, not more than 0.1mg of oil is allowed. This is a total level for liquid oil, oil aerosol and oil vapour.

- When an inert gas is being used to supply the purge system, the risk of asphyxiation exists. Refer to the *Application Suitability*.
- Before the connection of the air supply to the purge system, the supply pipework should be flushed through with instrument-quality air to remove any debris that may remain in the pipes. This must be carried out for at least 10 seconds for every meter of the supply pipe.
- Unless a supply shut-off valve has been fitted to the MiniPurge® system, an external shut-off valve with the same, or larger, thread size as the Control Unit inlet fitting should be fitted by the installer to prevent any restriction of purge flow.
- The purge air from the MiniPurge® Control Unit should be piped within the pressurized enclosure to ensure purging of potential dead air spots.
- The purge system is fitted with an internal regulator factory set to 2bar feeding the logic.

1. Pipe the protective gas supply to the ½" NPTF fitting on the side of the control unit.

6.4 Purge Air from the Control Unit to the Enclosure

When the Control Unit is mounted directly on the top of the enclosure, no connection will normally be necessary, as the purge air will discharge into the enclosure directly.

When the Control Unit is not mounted on the top of the enclosure, or where internal air distribution is necessary a connection should be made from the purge air outlet fitting on the bottom of the Control Unit (½" NPTF), the pipe should be rated at least to the same pressure as the supply pressure to the enclosure.
Note: Piping should be kept as short as possible and should be adequately sized to ensure that the full purge flow can be delivered.

6.5 Control Unit to the Enclosure Pressure Monitor

When the Control Unit is mounted on top of the enclosure, no connection will normally be necessary, as the enclosure pressure monitor point will sense directly inside the enclosure.

When the Control Unit is not mounted on the top of the enclosure or if there are fans, which may create localised low-pressure areas within the enclosure, it is necessary to pipe this connection. The connection is made to the enclosure pressure sensor fitting on the bottom of the Control Unit (1/8" NPTF).
Note: A small bore tube may be used as this circuit has virtually no flow. Expo recommends a 6mm O/D metal tube. Make sure that all connections are free of leaks.

6.6 Control Unit to the Flow Sensor

1) CF systems

A Differential Pressure Sensor is combined with the Minimum Pressure Sensor to measure the "DP HI (High) / Enclosure Pressure" within the enclosure and the pressure in the monitoring device at the back of the SAU "DP LO (Low) SAU Connection". The SAU25 has a 6mm push-in (M5) connector and the Control Unit has a 1/8" NPTF fitting.

1. Connect the SAU25 and Control Unit with suitable pipes and connectors, ensuring all connections are tight.

2) LC systems

A dedicated Purge Flow Sensor measures the differential pressure between the "DP HI (High) / Enclosure Pressure" and the pressure in the monitoring device at the back of the RLV "DP LO (Low) RLV Connection". The RLV has a 6mm push-in (M5) connector and the Control Unit has a 1/8" NPTF fitting.

1. Connect the RLV and Control Unit with suitable pipes and connectors, ensuring all connections are tight.

6.7 Multiple Enclosures

A single system can protect more than one enclosure. Where enclosures are connected and purged in "series" e.g., "Daisy Chained", the RLV and when using a CF system, the SAU25 should be fitted on the last enclosure with the Purge Inlet connected to the first enclosure. enclosures should not be connected in parallel.
The bore and length of the pipe or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. The pipe bore size should not be less than 25mm (1").

Note: Installing small bore pipe can lead to over pressurizing of all but the last enclosure. Consult Expo if advice on sizing is required

6.8 Power and Alarm (signals) Connections

- All power entering the enclosure shall be provided with a means of isolation. This requirement also applies to any external power sources, which are connected to equipment such as "volt-free" or "dry" contacts within the enclosure. Printer signal, network cards, etc need isolation.
- The MiniPurge is pneumatically operated and does not require power to operate. The power supply is for the pressurised enclosure which must be controlled by the MiniPurge system.
  Exception: Power to apparatus that is already suitable for the hazardous area does not need to be isolated by the MiniPurge system.

a) PO- Pneumatic Output

1. Connect the power interlock and alarm/pressurization signals to the corresponding 1/8" NPTF connector on the side of the Control Unit. Refer to Figure 3 below.

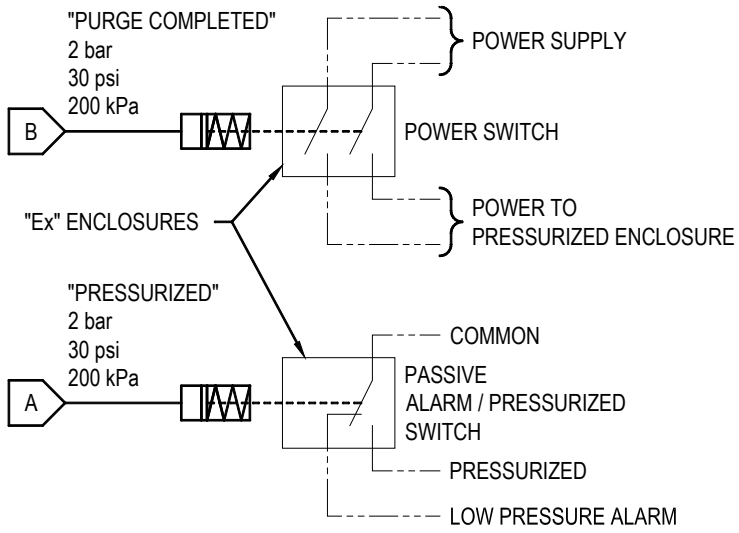

Figure 3 PO Circuit Diagram

Note: Refer to the MIU/d Manual (ML303) if connecting to Expo's MIU/d box for full installation and commissioning details.

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b) IS - Intrinsically Safe Output

1. Connect the corresponding power interlock and alarm/pressurization signal cables to the corresponding terminals inside the Control Unit. Refer to Figure 4 below.
2. Cable entry can be made either from the M20 (1/2" NPT) hole on the left-hand side or the bottom of the Control Unit (depending on the mounting option).

Note: A suitably rated cable gland/fitting must be used and the unused hole shall be blanked.

WARNING! The Control Unit must only be connected to IS Circuits only.

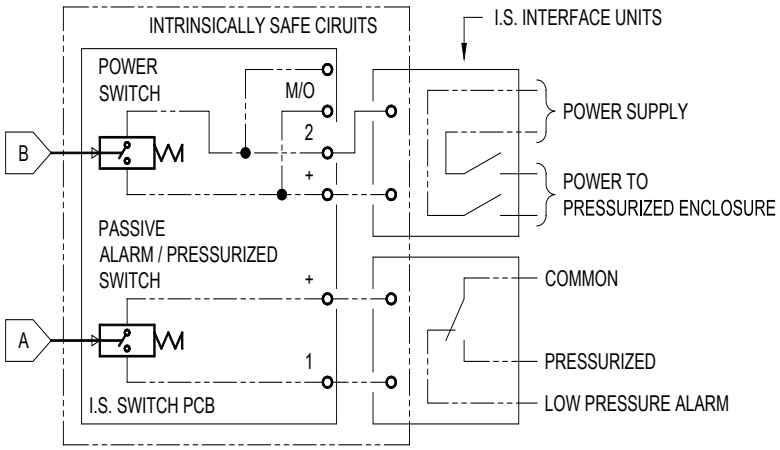


Figure 4 Intrinsically Safe (IS) Circuit Diagram

c) PA - Power and Alarm

- Cable entry (conduit or cable glands) into the MIU/e1 box must be suitably rated for the hazardous area. IP66 (or better) ingress protection must be provided by the use of seals or washers.
- When fastening the lid of the MIU/e, Ensure the bolts are torqued to 6 N·m to ensure the correct IP seal is maintained.

1. Cut/drill the required cable entries into either side of the MIU/e.
   Note: There are punch marks on the sides of the MIU/e which can be used as guides for cable entries
2. Remove the MIU/e lid and connect the alarm and power cables to the corresponding terminals inside the MIU/e terminal box as per the circuit diagram below (figure 5).
   Note: Terminals 1&2 are for the power supply for the enclosure not for the Control Unit. The MiniPurge Control Unit is a pneumatic system and does not require power.
3. Replace the MIU/e lid.

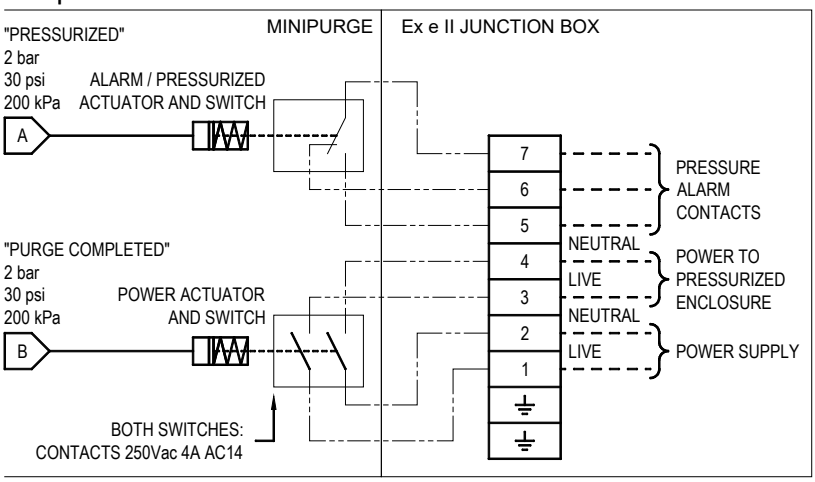


Figure 5. Ex de Power and Alarm (PA) Option

Note: Refer to ML358 MiniPurge Interface Unit MIU/e User Instruction Manual for further installation, commissioning and maintenance information.

Section 7: System Configuration / Set-up

7.1 Purge Time

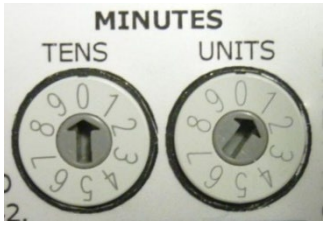
It is the user's responsibility to ensure the set purge time is adequate to "clean" the internal enclosure atmosphere. If no specific purge test has been performed on the enclosure, the purge time can be calculated:

$$\frac{\text{Enclosure internal volume (l / scfm) x required volume changes}}{\text{Purge flow rate (l/min / scfm)}}$$

The number of volume changes depends on the area certification requirements and the equipment contained within the enclosure. The required volume changes as per the standards

- NFPA 496 requires 4 volume changes
- IEC / EN 60079-2 requires 5 volume changes
- If the enclosure contains a motor 10 volume changes are required

Note: It is the user's responsibility to verify or enter this data on the enclosure and/or MiniPurge system nameplate.



The standard MiniPurge units have an adjustable electronic timer.

Rotate the adjuster dials using a small flat screwdriver to the purge time required.

Note: If the time is set to '00', the purge time will be indefinite.

7.2 Purge Flow Rate (Orifice Size Selection) - CF Systems

The purge flow rate is selected by placing the appropriate orifice plate in the SAU. The purge flow rates given in Table 2 are based on the standard setting of the flow sensor of 2.5mbar, 1" WC, 250Pa.

Orifice Plate Number	Continuous Flow Rate with 2.5 mbarg, 1" WC, 250 Pa flow sensor set point	
	N litre/minute	SCFM
A	10	0.4
B	25	0.9
C	40	1.4
D	65	2.3
E	90	3.2
F	135	4.8
G	180	6.4
NO ORIFICE	225	8.0

Table 2 Purge Flow Rates

Note: For LC systems the purge flow rate is set by the selection of the RLV and is not user-adjustable.

7.3 Action on Loss of Pressurization

The action on loss of pressurization can be set to ALARM ONLY (AO), or ALARM AND TRIP (A&T). ALARM AND TRIP is the factory default.

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It is the user's responsibility to make use of this alarm facility in accordance to the local code of practice for action on pressure or flow failure within the area of enclosure and MiniPurge operation. Most codes include the following recommendations:

Zone 1 Installations:

Alarm and automatic disconnect of power.

Exception: If the equipment inside the enclosure is suitable for use in Zone 2, the power trip may be performed manually, (no automatic power trip), if the pressure or flow failure persists for an unacceptable time.

Zone 2 Installations:

Alarm Only on pressure or flow failure with power being removed manually by turning off the air supply to the MiniPurge system if the failure persists for an unacceptable time.

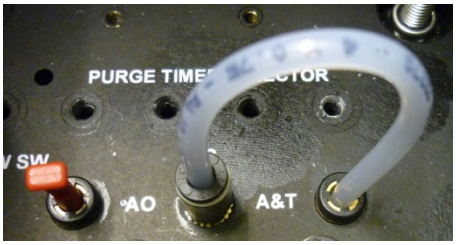
Class I Division 1 Installations:

Alarm and Automatic Trip of Power. Note: NFPA 496 states power to the circuits shall be permitted to be continued for a short period if immediate loss of power would result in a more hazardous condition and if both audible and visual alarms are provided at a constantly attended location.

Class I Division 2 Installations:

Where automatic timing is preferred, Alarm Only on pressure or flow failure with power being removed manually by turning off the air supply to the MiniPurge system if the failure persists for an unacceptable time.

The action on loss of pressurization is set by moving the jumper tube. The default setting is Alarm and Trip where the jumper tube is connected from C to A&T fittings, with a blanking plug in AO.



To change to Alarm Only (AO)

1. Unplug AO
2. Disconnect the jumper tube from A&T and connect to AO
3. Plug A&T with the blanking plug.

Consult Expo if in doubt or advice on settings is required.

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Section 8: Commissioning

Start by check that the system has been installed in accordance with this manual.

Ensure the supply pipe from the inlet to the MiniPurge system has been flushed to remove any debris or condensation.

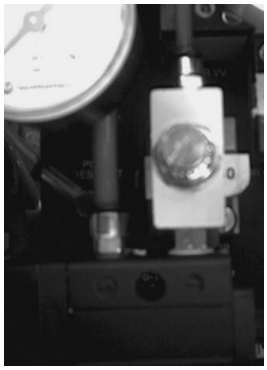
Connect a temporary pressure gauge or water manometer to the enclosure or MiniPurge system pressure test point (Remove the red plug on the low pressure sensor and connect 4mm OD nylon tube).

8.1 Continuous Flow (CF) Systems

1. Open the Flow Control Valve (FCV) until the alarm/pressurized indicator turns green. Turning the knob clockwise will reduce the flow and anti-clockwise will increase the airflow.
2. If the FCV is opened fully and the indicator has still not turned green, check the air supply pressure at the inlet to the control unit while flow is taking place. It must be above the minimum 4 bar/ 60 psig/ 400kPa specified.

3. Check that the internal logic gauge reads 2bar /30 psig/200kPa.
4. The electronic purge timer will start as soon as the 'alarm/pressurized' indicator turns from red (alarm) to green (pressurized).
5. Check that the time delay between the indicator flashing yellow and the application of power to the enclosure is not less than the minimum time required to purge the enclosure. When the purge time has been completed, the 'system purging' indicator will stop flashing.
6. After the power has been turned on by the Control Unit, the airflow will continue at the same rate to provide dilution as required.

8.2 Leakage Compensation Systems (LC)



1. Open the Leakage Compensation Valve (LCV) fully, turn the knob anti-clockwise. Clockwise will reduce the flow and anti-clockwise will increase the airflow.
2. Open the supply regulator SLOWLY and allow the enclosure pressure to rise until the RLV opens.
3. Check that the RLV opens at or below the figure specified in the documentation.
4. RLV tolerance of +0, -20% of default setting.
5. Repeat the test several times.
6. Open the supply regulator to between 4 and 8barg / 60 and 115psi / 400 and 800kPa and the purging flow will start.
7. Check that the internal logic gauge reads 2bar /30psi / 200kPa.
8. At this time, the "alarm/pressurized" indicator should be green, and the "system purging" indicator should be flashing yellow.

Note: If the "purging" indicator remains black, the flow through the RLV is below the minimum for which the flow sensor has been calibrated. Check the air supply pressure at the inlet to the control unit while purging is taking place. It must be above the minimum specified.

The electronic purge timer will start as soon as the "purging" indicator starts flashing yellow. Check that the time delay between the "purging" indicator flashing yellow and the application of power to the enclosure is not less than the minimum time required purging the enclosure. Times more than the minimum are permitted. If the time is too short it must be increased accordingly.

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After the power has been applied via the Control Unit, the purging valve will close and the air flow into the enclosure will be controlled by the LCV. The initial setting of fully open will normally be too high. It should now be adjusted to set the enclosure pressure and leakage. There are three possible situations:

a) Air continues to come out through the RLV Spark Arrestor after power has been applied in considerable quantity. The LCV is much too far open, and the airflow is holding the RLV open continuously.

   Close the LCV slowly. The enclosure pressure will start to fall as the flow decreases but eventually, the RLV will close and the enclosure pressure rise again. At this point, the RLV may start to open intermittently as the enclosure pressure rises to the point where it exceeds the RLV opening pressure. When the RLV opens the pressure will fall quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV.

b) If the RLV is opening intermittently the LCV is slightly too far open. When the RLV opens the enclosure, the pressure falls quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

   Continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the enclosure pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 5mbarg / 2" WC / 500 Pa and will be the "normal working pressure".

We recommend that the setting of the minimum pressure sensor be checked at this time.

1. Note the position of the LCV knob. (A pencil mark placed on the knob at "12 O'clock" can be used).
2. Slowly lower the enclosure pressure by closing the LCV further, counting the number of turns from the "normal working pressure" position.
3. Note the pressure at which the "alarm/pressurized" indicator turns from green to red and check that it is not lower than the figure given in the documentation.
4. Check also the "alarm" electrical contacts. As soon as the "alarm/pressurized" indicator turns red, the system will start to re-purge. If the Alarm and Trip function is selected the enclosure power will be switched off.
5. While it is re-purging return the LCV to its "normal working pressure" position so that, at the end of purging, the enclosure pressure should immediately settle down at the correct "normal" pressure.

c) If, at the end of purging, the enclosure pressure falls below the minimum pressure sensor setting and the LCV is fully open, the system will start to purge again. This is indicative of excessive leakage from the enclosure.

   In this case, check the enclosure for leakage, and reduce or eliminate the leaks. This time, at the end of purging, the enclosure should stay pressurized and the RLV action is as in a) or b) above. Proceed as described above.

8.3 Normal Operation

Turn the air supply on or off to start or stop the system. After this, the pressurizing and purging sequence is entirely automatic

8.4 High Pressure Valve

This valve is set at Expo and should not be changed. The function of this valve is to set the delay time of the purge system restarting after the maximum HP sensor pressure is reached.

Section 9: Maintenance of the System

The maintenance recommended for the system consists of the following items, supplemented by any additional local requirements imposed by the local Code of Practice.

9.1 Six-month check

- Expo recommends that the commissioning tests be repeated
- Check the RLV and all Spark Arrestors. Remove all debris & corrosion or replace with a spare.
- Check the condition of the air supply filter element. Clean or replace it, as necessary.

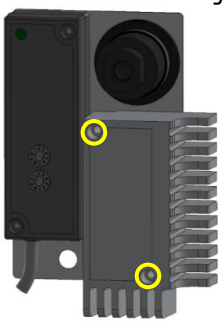
9.2 Every two-year checks

- Apparatus is suitable for the Hazardous Location
- There are no unauthorised modifications
- The air supply must be of the correct quality, Refer to installation.
- The interlocks and alarms function correctly
- Approval labels are legible and undamaged
- Adequate spares are carried
- The action on pressure failure is correct

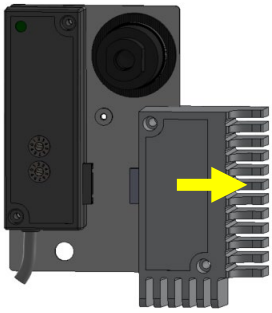
9.3 Electronic Timer Battery Replacement

The Intrinsically Safe Battery Pack should be changed at least every three years, and the commissioning tests repeated. After the timing phase has elapsed, the battery may be 'hot-swapped' in a hazardous environment without affecting the operation of the MiniPurge Ex px system.

- The battery may be hot-swapped in a hazardous location without affecting the operation of the MiniPurge System. The Battery MUST NOT be replaced during a purge cycle.
- After replacing the battery, the commissioning tests should be repeated.
- The battery module should be disposed of in accordance with the battery's Material Safety Data Sheet and any relevant local and national directives

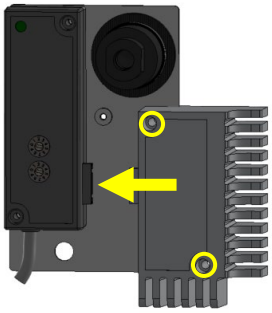


Use a flat-head screwdriver to loosen and remove the 2 retaining screws from the battery pack.



Pull the battery module away from the e-timer to unplug the battery from the e-timer.
WARNING! Pulling at an angle could break the E-timer connector.

Insert the screws and washers into the new battery module.



Fully plug the new battery module into the e-timer and tighten the 2 retaining screws.

9.4 Pressure sensor Check and calibration

If it is decided that the minimum pressure /purge flow sensor needs recalibrating it must be returned to Expo.

a) CF model

1. Unscrew the 60mm diameter diaphragm housing
2. Use a rubber pad (e.g. an eraser), to block the 12mm threaded hole in the top of the valve module.
3. The valve should operate and the pressure indicator should turn green.
4. If the above occurs, the sensor diaphragm needs recalibrating or replacing.

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b) LC model

1. Remove the female spade connectors from the underside of the sensor.
2. Connect a wire link across the sensor terminals.
3. The Electronic Timer should operate and the purge timer indicator will flash yellow.
4. If the above occurs, the sensor diaphragm needs recalibrating or replacing, if not, replace the IS Battery pack.

9.5 Filter cleaning

If the filter element needs cleaning the filter bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Section 10: Fault Finding

10.1 General Information

If the system does not behave in the manner described above, there is a fault. Some of the more likely faults are dealt with below. If the below solutions do not resolve the issue, or the system has a different issue not shown below, please contact Expo or your supplier for further assistance.

The system has been designed for ease of fault finding and the many of the components fitted are plug-in or manifold-mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo for investigation, with a full report of the fault and the system serial number.

As with any pneumatic system, the greatest enemies are water, oil, and dirt in the air supply. For this reason, the air system must always incorporate a dust and water filter. This can be part of the Expo system or can be provided by others. However, dirt can enter from other sources and it is vital therefore that the procedures described in Installation are carried out before using the system for the first time or following any disconnection of the pipe-work. Failure to perform this work may cause damage that will not be covered under warranty.

Before making the following checks verify that both the main air supply pressure to the purge system & the regulated pressure to the logic are as specified on the system specification sheet.

10.2 Pressurized indicator will not turn green or Purging indicator will not flash yellow

Fault Location	Cause	Solution
Air Supply	Inadequate air supply pressure or low flow rate.	• Check the air supply pressure at the MiniPurge inlet is stable between 4 - 8 Barg / 60 - 115 psi
Pipework	Air Inlet Pipe is incorrect, damaged or leaking.	• Replace pipe work ensuring the Inner Diameter is at least 12mm • Check for damage/air leaks – replace or repair damage, tighten any loose connectors
	Tubing from the Relief Valve or SAU flow sensing point is not airtight.	• Tighten any loose connectors and replace or repair any damaged tubing.

enclosure	Excessive leakage from the pressurized enclosure. Enclosure Build Quality	• Check all doors/openings are closed and sealed • Check for leaks down cable glands or conduit and seal as required • Check the leakage does not exceed the system flow rate • Increase air supply to compensate for leakage • Ensure the enclosure can withstand at least 1.5 times the RLV opening pressure
MiniPurge Control Unit	The Pressure/flow sensor setting is incorrect/out of calibration.	• Check the sensor operation (refer to the maintenance for details).

10.3 System Fails to Switch power on after Purge is complete

Fault Location	Cause	Solution
Power Supply	Mains Power not connected/ connected correctly Mains Power isolator/fuse in the OFF position / Faulty	• Check electrical connections are connected correctly and fully secure • Turn the isolator ON • Replace/repair faulty components
MiniPurge Control Unit	Purge Timer not switching Purge Time not correct	• Purge Timer is not complete – wait till the time has elapsed. • Press the indicator button on the timer valve. When the valve has timed out, the button should return up. • Consult Expo. • Set the timer to the minimum available purging time and check the system operates as accepted. Note: Ensure the purge time is returned to its original setting and checked before returning the system into service.
PO Option only	Low Pressure at Control Unit bulkhead or switch Power Switch faulty Tubing from to the switch is not airtight.	• Increase the pressure to the switches by adjusting the logic regulator inside the Control Unit. • Check the external power switch contacts close at the rate pressure (1.4barg if using Expo's MIU/d). • Check for damage/air leaks – replace or repair damage, tighten any loose connectors

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10.4 Relief Valve opens continuously or intermittently.

Fault Location	Cause	Solution
enclosure	Enclosure pressure is too high.	• Adjust the LCV / FCV to reduce the flow.
Relief Valve Unit	Debris on the RLV disk allows air to leak from the valve Relief Valve malfunction.	• Remove the RLV cover and clean the valve disk*. • Consult Expo.

*If it is necessary to remove the disk and spring from the RLV, draw a line around it with a pencil to allow accurate replacement before removal, otherwise the opening pressure may be affected.

10.5 system begins purging but the cycle fails to complete

Fault Location	Cause	Solution
Electronic Timer	The timer is set to 00 The intrinsically safe battery pack is discharged	• Reset the timer to the correct purge time. • Replace as necessary

10.6 System Alarms after purging and purge cycle is repeated. (LC Model)

Fault Location	Cause	Solution
enclosure	Enclosure pressure is too low.	• Check the enclosure pressure with a manometer or gauge • Adjust the LCV / FCV to increase the flow/pressure

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Section 11: Spare Parts

11.1 Common Spares

Model Number	Description
S0015/109	R/G Rotowink Indicator
S0188/072	Logics Regulator, 0-30 psi
S0015/135	Miniature Gauge, 40 mm diameter, 0-4 bar
S0188/007	Control Valve (FCV or LCV depending on model)
S0015/159	Air filter, manual drain
ETM-IS31-001	Intrinsically Safe Battery Pack

11.2 CF System Spares

Model Number	Description
HS1-1XX0-013	Pressure Sensor (2.5mbar/1.0" wc)
SAU25	Spark arrestor
RLV25-CF	Relief Valve
H02-S000-035	Orifice Plate Kit w/ 'C' clip

11.3 LC System Spares

Model Number	Description
HS1-1XX0-012	Low Pressure Sensor (0.5mbar/0.2" wc)
HS1-1XX0-014	Flow' Pressure Sensor (3.5mbar/1.4" wc)
RLV25-LC	Relief Valve
S0015/161	3/2 spool valve, pilot operated, spring return

Section 13: Drawings and Diagrams

Title	Drawing Number	Number of Sheets
07 SIZE 1 MINI PURGE GA	XBR-7000-002	3
MOUNTING DETAILS - SIZE 1MP	XBR-7TD0-004	1
CONFIGURATION - SIZE 07 1 MP	XBR-7TD0-003	1
MINIPURGE X CF SEQUENCE DIAGRAM	XBR-7TD0-041	1
MINIPURGE X LC SEQUENCE DIAGRAM	XBR-7TD0-040	1
MINIPURGE OPTION 'IS'	EP80-2-11	1
MANUAL OVERRIDE SWITCH HOOK-UP	AGE-WC00-207	1
Ex e JUNCTION BOX M/O GA	XSD-7TD0-013	1
MANUAL OVERRIDE SWITCH HOOK-UP	AGE-WC00-117	1

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Section 14: Certification

Certificates can be found in the accompanying booklet (ML499) or downloaded at www.expoworldwide.com

System	Certificate	Certificate Number
MiniPurge®	EU-Declaration of Conformity	SC004-CE*
	IECEx Certificate	IECEx SIR 07.0027X
	ATEX Certificate	01ATEX1295X
	INMETRO/TÜV	TÜV 12.1462X
	CCC Certificate	2020312304000830
	EAC Certificate	EA3C RU C-GB.Aж58.B.00906/20
	FM Certificate	1X8A4.AE
	UL Certificate	E190061
	Peso Certificate	P577391/1
	KOSHA Certificate	14-AV4BO-0215X
Electronic Timer	EU-Declaration of Conformity	SC039-CE*
	IECEx Certificate	FME 10.0001X
	ATEX Certificate	10 ATEX0003X
For PA Option Only		
Ex e junction box	EU-Declaration of Conformity	SC027-CE*
	IECEx Certificate	IECEx EXV 19.0057X
	ATEX Certificate	ExVeritas 19 ATEX0542X
	INMETRO/TÜV	TÜV 12.1463
	CCC Certificate	20203123000422
Ex d switches	IECEx Certificate	IECEx EPS 14.0092X
	ATEX Certificate	EPS 14 ATEX 1 766 X
	CCC Certificate	2020322304000843
	EAC Certificate	EA3C RU C-DE.AH07.B.04162/22

* Documents are attached to the manual.

Appendix

MiniPurge Interface Unit MIU/e User Instruction Manual
FM IOM Manual for MiniPurge (LC & CFHP)
FM IOM Manual for MiniPurge (CF)

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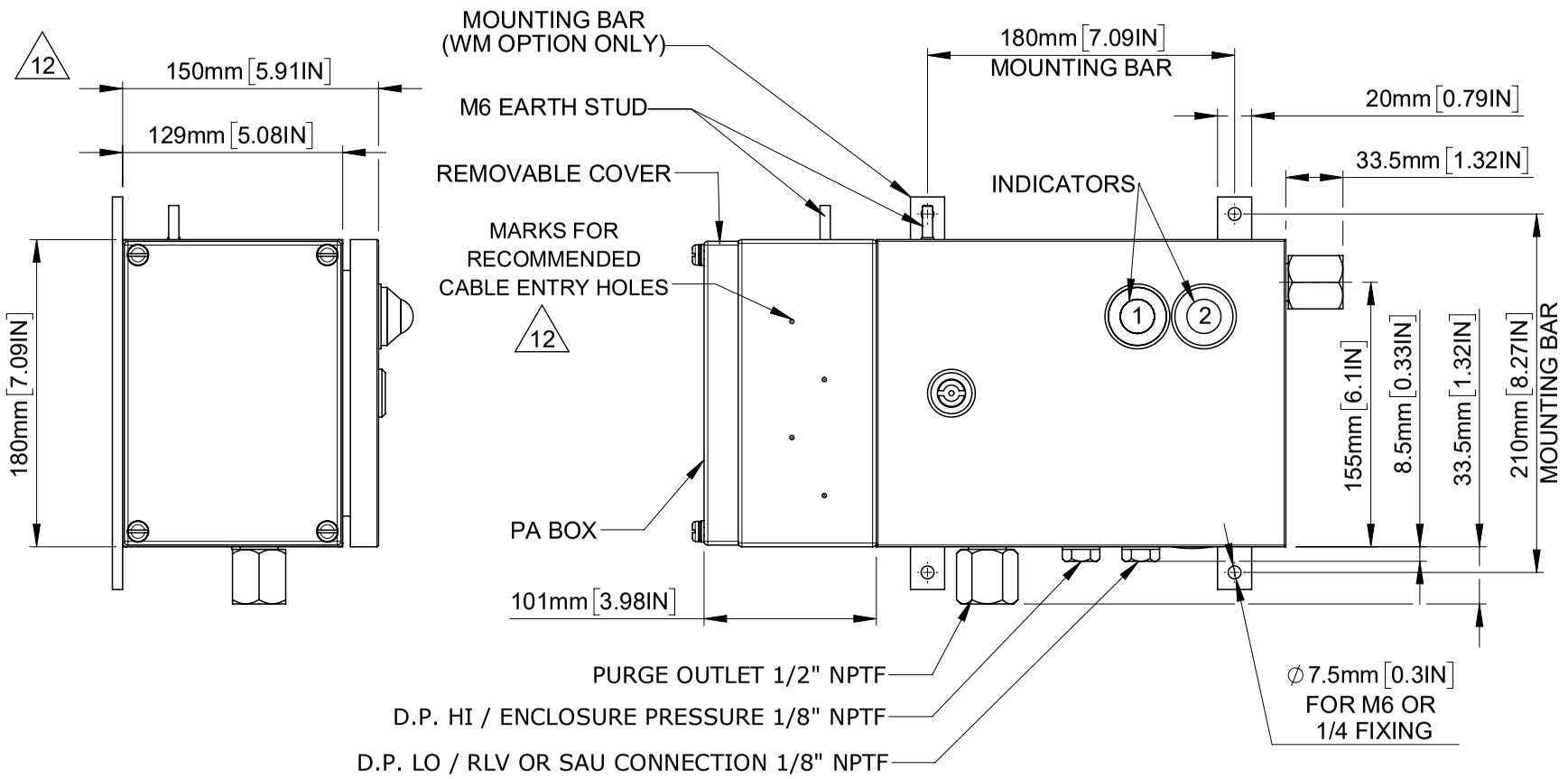
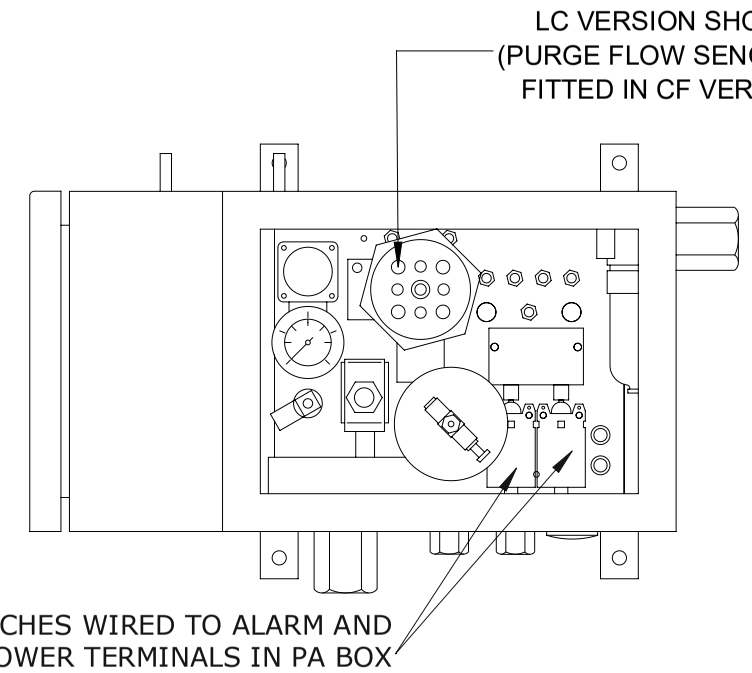
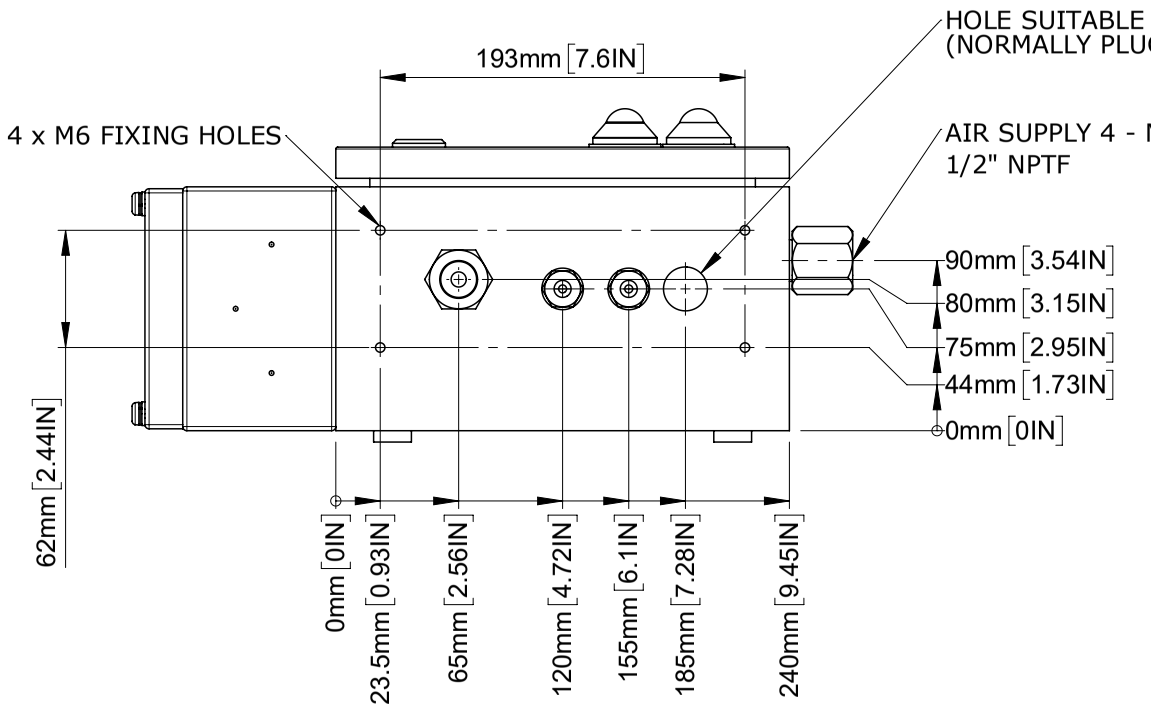
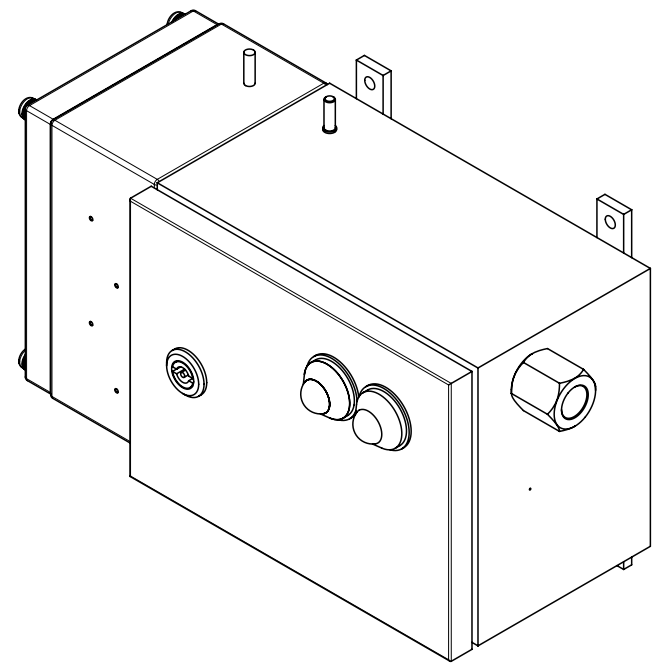
3RD ANGLE PROJECTION	GENERAL TOLERANCES TO ISO 2768 - m K																						UNLESS OTHERWISE STATED:	DO NOT SCALE
BS8888	LINEAR	>0.5 to 6	>6 to 30	>30 to 120	>120 to 400	>400 to 1000	>1000 to 2000	>2000 to 4000	EXTERNAL RADIUS & CHAMFER HEIGHTS	>0.5 to 3	>3 to 6	>6	ANGULAR (SHORTER LEG)	≤10	>10 to 50	>50 to 120	>120 to 400	>400	STRAIGHTNESS & FLATNESS	≤10	>10 to 30	>30 to 100	>100 to 300	>300 to 1000	>1000 to 3000	DIMENSIONS IN mm; [ ] DENOTES IMPERIAL REMOVE ALL BURRS AND SHARP EDGES 0.2 x 45° TYP; INTERNAL CORNERS R0.2 TYP	IF IN DOUBT ASK
		±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2.0		±0.2	±0.5	±1.0		±1°	±0°30'	±0°20'	±0°10'	±0°5'		0.05	0.1	0.2	0.4	0.6	0.8		





OPEN LID VIEW





ISOMETRIC VIEW

NOTES:
01) MINIPURGE MUST BE MOUNTED WITH PURGE OUTLET FITTING IN VERTICAL PLANE POINTING DOWN
02) REFER TO DRG XSD-7TD0-002 FOR MOUNTING DETAILS
03) MOUNTING BARS ARE OPTIONAL

12

REVISION	ECR No.	DRAWN	CHECKED	APPROVED	DATE
13	24/155	EC	SH	MC	23/07/2024
12	QDN-12443	CE	AR	AW	06/07/20
11	QDN-12436	CE	AR	MH	20/05/20

DRAWING No.: XBR-7000-002

LIFECYCLE STATE: RELEASED | REVISION: 13

TITLE: MINIPURGE SIZE 1X - PA OPTION

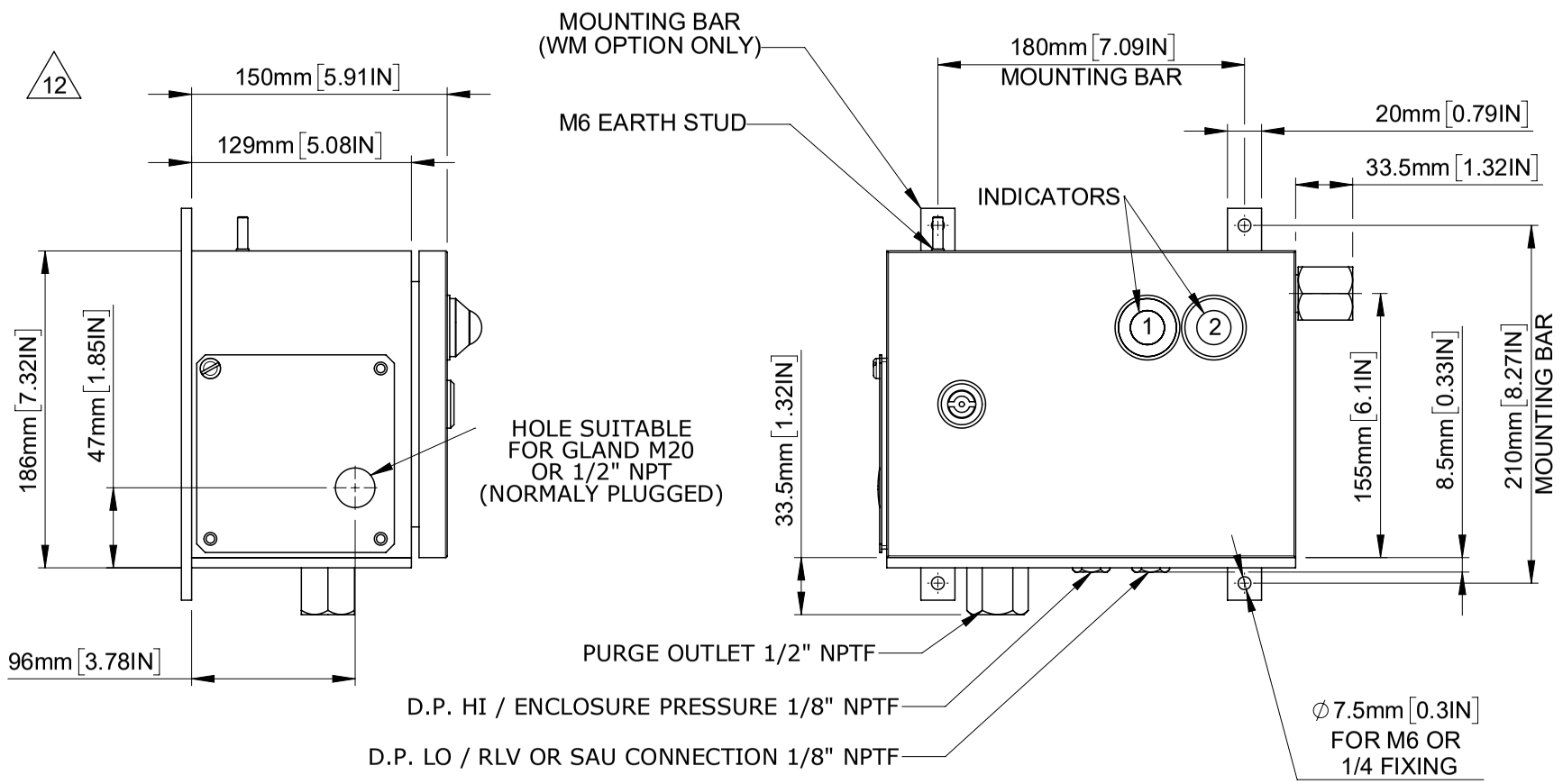
MATERIAL	SEE PART DETAILS	(MASS [Kg])
FINISH	SEE PART DETAILS	6.5
COMPLIANCE REQUIRED: REACH; RoHS & 3TG	SCHEDULE DOC. REF ✓	ML641 - MiniPurge/MotorPurge

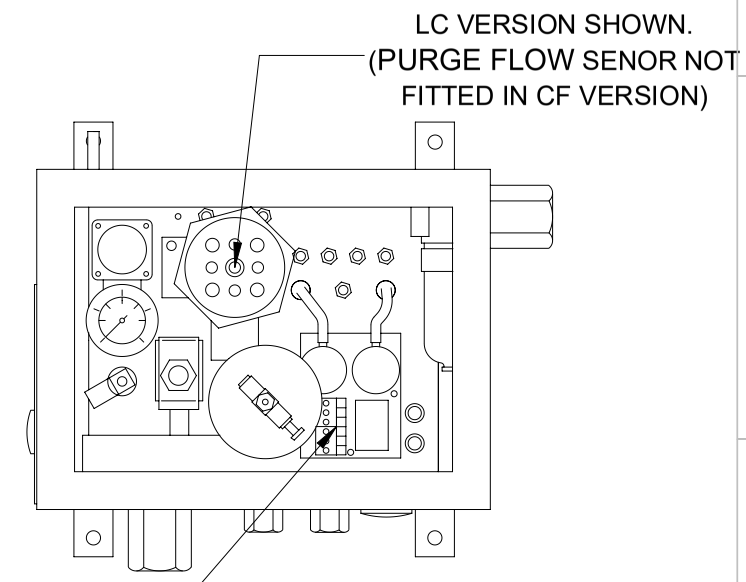
DRAWING TYPE: SCHEMATIC

SCALE: 1:4 | SIZE: A3 | SHEET: 1/4

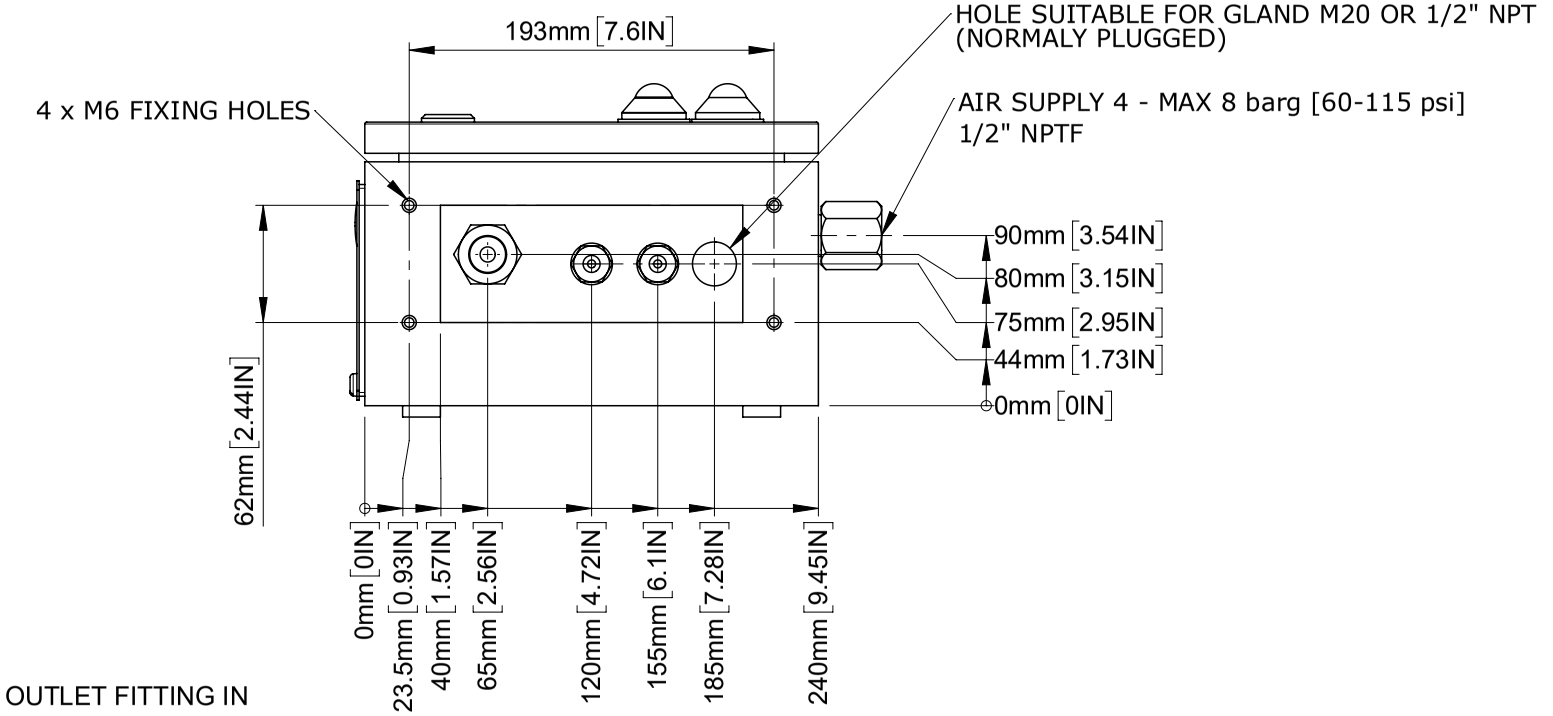
expo Technologies

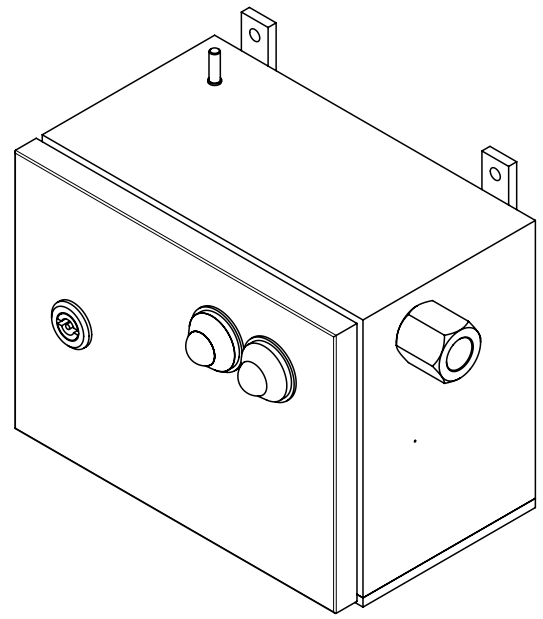
3RD ANGLE PROJECTION	GENERAL TOLERANCES TO ISO 2768 - m K																						UNLESS OTHERWISE STATED:	DO NOT SCALE
BS8888	LINEAR	>0.5 to 6	>6 to 30	>30 to 120	>120 to 400	>400 to 1000	>1000 to 2000	>2000 to 4000	EXTERNAL RADIUS & CHAMFER HEIGHTS	>0.5 to 3	>3 to 6	>6	ANGULAR (SHORTER LEG)	≤10	>10 to 50	>50 to 120	>120 to 400	>400	STRAIGHTNESS & FLATNESS	≤10	>10 to 30	>30 to 100	>100 to 300	>300 to 1000	>1000 to 3000	DIMENSIONS IN mm; [ ] DENOTES IMPERIAL REMOVE ALL BURRS AND SHARP EDGES 0.2 x 45° TYP; INTERNAL CORNERS R0.2 TYP	IF IN DOUBT ASK
		±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2.0		±0.2	±0.5	±1.0		±1°	±0°30'	±0°20'	±0°10'	±0°5'		0.05	0.1	0.2	0.4	0.6	0.8		





OPEN LID VIEW





ISOMETRIC VIEW

NOTES:
01) MINIPURGE MUST BE MOUNTED WITH PURGE OUTLET FITTING IN VERTICAL PLANE POINTING DOWN
02) REFER TO DRG XSD-7TD0-002 FOR MOUNTING DETAILS
03) MOUNTING BARS ARE OPTIONAL

12

REVISION	ECR No.	DRAWN	CHECKED	APPROVED	DATE
13	24/155	EC	SH	MC	23/07/2024
12	QDN-12443	CE	AR	AW	06/07/20
11	QDN-12436	CE	AR	MH	20/05/20

DRAWING No.: XBR-7000-002

LIFECYCLE STATE: RELEASED | REVISION: 13

TITLE: MINIPURGE SIZE 1X - IS OPTION

MATERIAL: SEE PART DETAILS (MASS [Kg]) | FINISH: SEE PART DETAILS 5.3

COMPLIANCE REQUIRED: REACH; RoHS & 3TG | SCHEDULE DOC. REF ✓ ML641 - MiniPurge/MotorPurge

DRAWING TYPE: SCHEMATIC | SCALE: 1:4 | SIZE: A3 | SHEET: 2/4

expo Technologies

3RD ANGLE PROJECTION	BS8888

GENERAL TOLERANCES TO ISO 2768 - m K

LINEAR	>0.5 to 6	>6 to 30	>30 to 120	>120 to 400	>400 to 1000	>1000 to 2000	>2000 to 4000
	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2.0

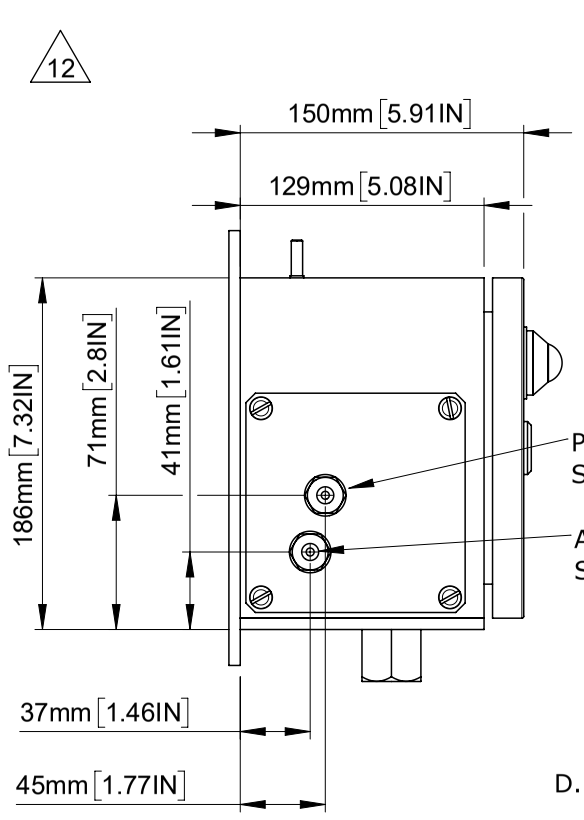
EXTERNAL RADIUS & CHAMFER HEIGHTS	>0.5 to 3	>3 to 6	>6
	±0.2	±0.5	±1.0

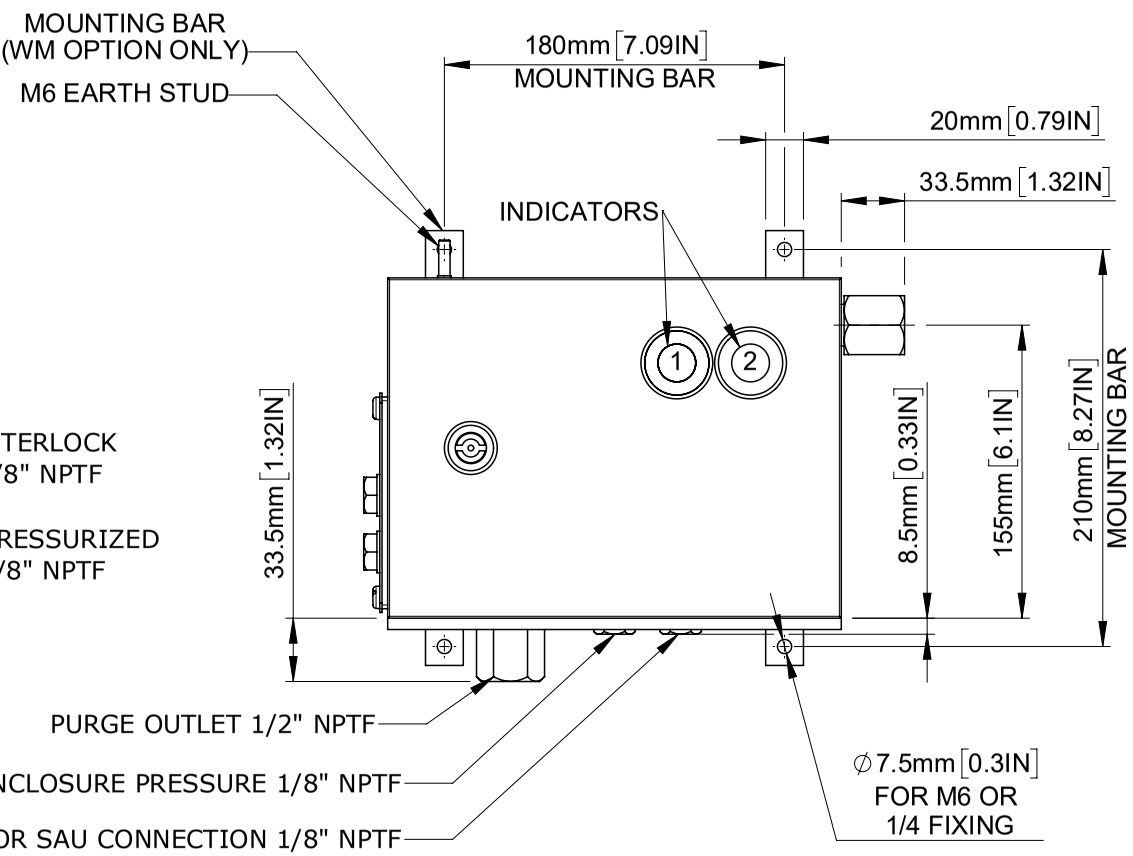
ANGULAR (SHORTER LEG)	≤10	>10 to 50	>50 to 120	>120 to 400	>400
	±1°	±0°30'	±0°20'	±0°10'	±0°5'

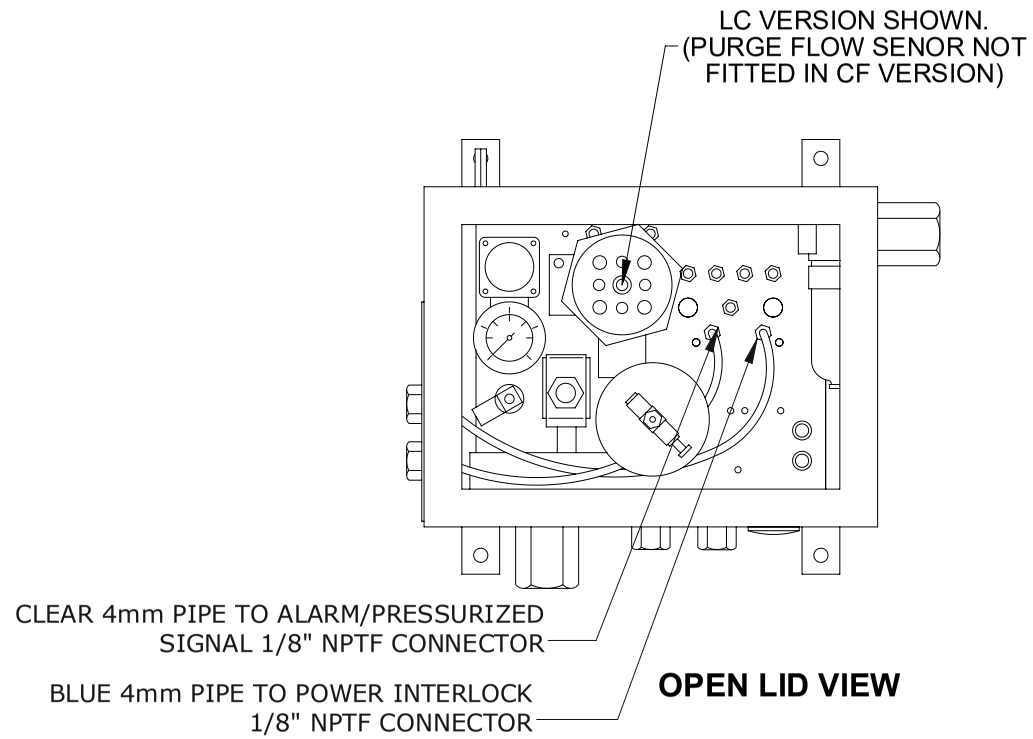
STRAIGHTNESS & FLATNESS	≤10	>10 to 30	>30 to 100	>100 to 300	>300 to 1000	>1000 to 3000
	0.05	0.1	0.2	0.4	0.6	0.8

UNLESS OTHERWISE STATED:
DIMENSIONS IN mm; [ ] DENOTES IMPERIAL
REMOVE ALL BURRS AND SHARP EDGES
0.2 x 45° TYP; INTERNAL CORNERS R0.2 TYP

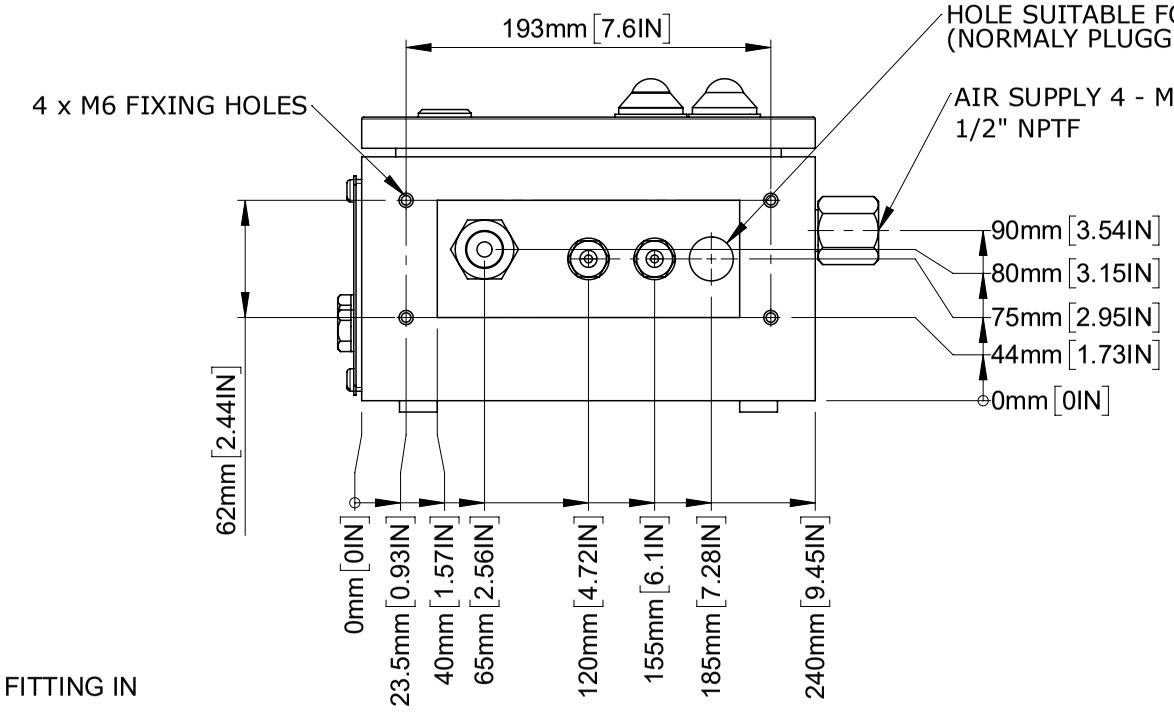
DO NOT SCALE
IF IN DOUBT ASK

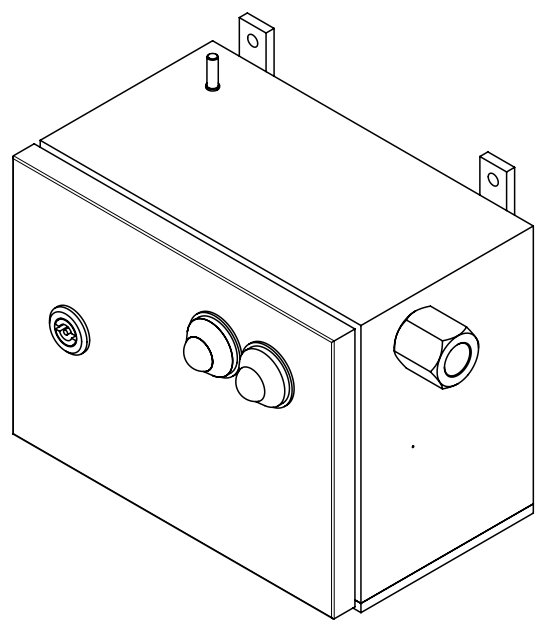






OPEN LID VIEW





ISOMETRIC VIEW

NOTES:
01) MINIPURGE MUST BE MOUNTED WITH PURGE OUTLET FITTING IN VERTICAL PLANE POINTING DOWN
02) REFER TO DRG XSD-7TD0-002 FOR MOUNTING DETAILS
03) MOUNTING BARS ARE OPTIONAL

REVISION	ECR No.	DRAWN	CHECKED	APPROVED	DATE
13	24/155	EC	SH	MC	23/07/2024
12	QDN-12443	CE	AR	AW	06/07/20
11	QDN-12436	CE	AR	MH	20/05/20

DRAWING No.: XBR-7000-002
LIFECYCLE STATE: RELEASED
REVISION: 13

TITLE: MINIPURGE SIZE 1X - PO OPTION

MATERIAL	SEE PART DETAILS	(MASS [Kg])
FINISH	SEE PART DETAILS	5.3

COMPLIANCE REQUIRED: REACH; RoHS & 3TG | SCHEDULE DOC. REF ✓ | ML641 - MiniPurge/MotorPurge

DRAWING TYPE: SCHEMATIC

SCALE	SIZE	SHEET
1:4	A3	3/4

expo Technologies

3RD ANGLE PROJECTION	BS8888

GENERAL TOLERANCES TO ISO 2768 - m K

LINEAR	>0.5 to 6	>6 to 30	>30 to 120	>120 to 400	>400 to 1000	>1000 to 2000	>2000 to 4000
	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2.0

EXTERNAL RADIUS & CHAMFER HEIGHTS	>0.5 to 3	>3 to 6	>6
	±0.2	±0.5	±1.0

ANGULAR (SHORTER LEG)	≤10	>10 to 50	>50 to 120	>120 to 400	>400
	±1°	±0°30'	±0°20'	±0°10'	±0°5'

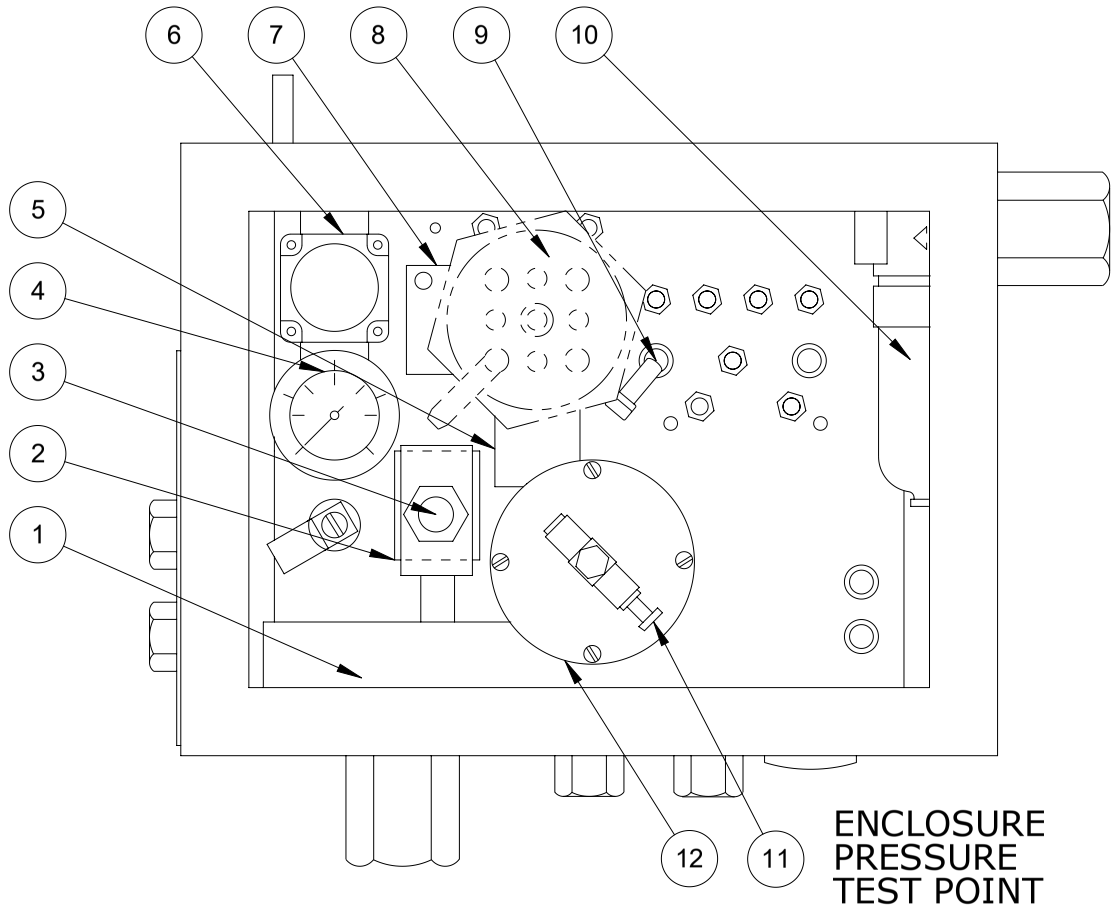
STRAIGHTNESS & FLATNESS	≤10	>10 to 30	>30 to 100	>100 to 300	>300 to 1000	>1000 to 3000
	0.05	0.1	0.2	0.4	0.6	0.8

UNLESS OTHERWISE STATED:
DIMENSIONS IN mm; [ ] DENOTES IMPERIAL
REMOVE ALL BURRS AND SHARP EDGES
0.2 x 45° TYP; INTERNAL CORNERS R0.2 TYP

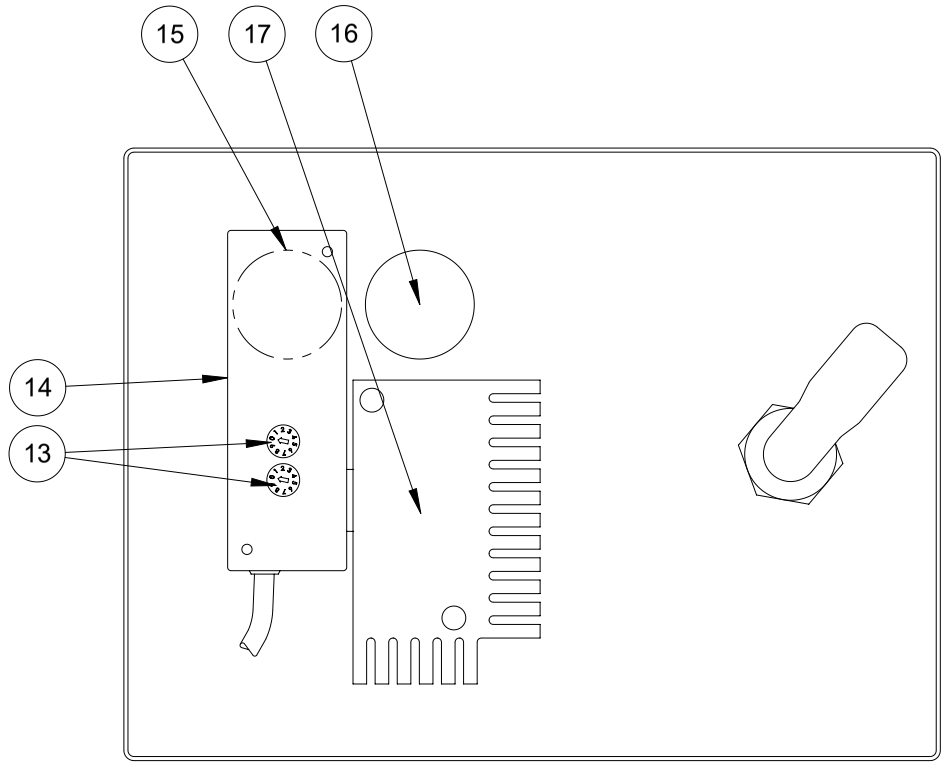
DO NOT SCALE
IF IN DOUBT ASK

LEAKAGE COMPENSATION (LC) SHOWN (ITEMS IN PHANTOM LINE REMOVED FOR CF AND REPLACED BY TIMER SWITCH)

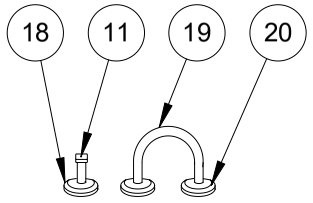
'PO' OPTION SHOWN, SWITCHES & TERMINALS ADDED FOR 'PA' & 'IS' SHOWN ON SHEETS 1 & 2



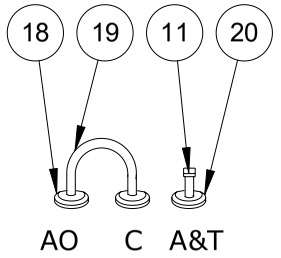
ENCLOSURE PRESSURE TEST POINT



VIEW OF INSIDE OF DOOR



ALARM AND TRIP



ALARM ONLY

12

1. PURGE VALVE (LC MODEL ONLY)
2. PURGE COMPLETE VALVE (BELOW ITEM 3)
3. LEAKAGE COMPENSATION VALVE
4. GAUGE, LOGIC AIR SUPPLY
5. "OR" GATE
6. LOGIC AIR SUPPLY REGULATOR
7. TIMER VALVE
8. PURGE FLOW SENSOR
9. BLACK COLLAR (PLUGGED)
10. MAIN AIR SUPPLY FILTER, MANUAL DRAIN
11. PLUG 4mm
12. MINIMUM PRESSURE SENSOR
13. PURGE TIME SELECTOR SWITCHES
14. ELECTRONIC TIMER
15. INDICATOR, "PURGING"
16. INDICATOR, "ALARM/PRESSURIZED"
17. I.S. BATTERY PACK
18. ALARM ONLY PUSH-IN FITTING
19. "ACTION ON ALARM" OPTION PIPE
20. ALARM AND TRIP PUSH-IN FITTING

REVISION	ECR No.	DRAWN	CHECKED	APPROVED	DATE
13	24/155	EC	SH	MC	23/07/2024
12	QDN-12443	CE	AR	AW	06/07/20
11	QDN-12436	CE	AR	MH	20/05/20

DRAWING No.: XBR-7000-002

LIFECYCLE STATE: RELEASED

REVISION: 13

TITLE: MINIPURGE SIZE 1X

MATERIAL: SEE PART DETAILS (MASS [Kg]): N/A

FINISH: SEE PART DETAILS

COMPLIANCE REQUIRED: REACH; RoHS & 3TG

SCHEDULE DOC. REF: ✓ ML641 - MiniPurge/MotorPurge

DRAWING TYPE: SCHEMATIC

SCALE: N.T.S

SIZE: A3

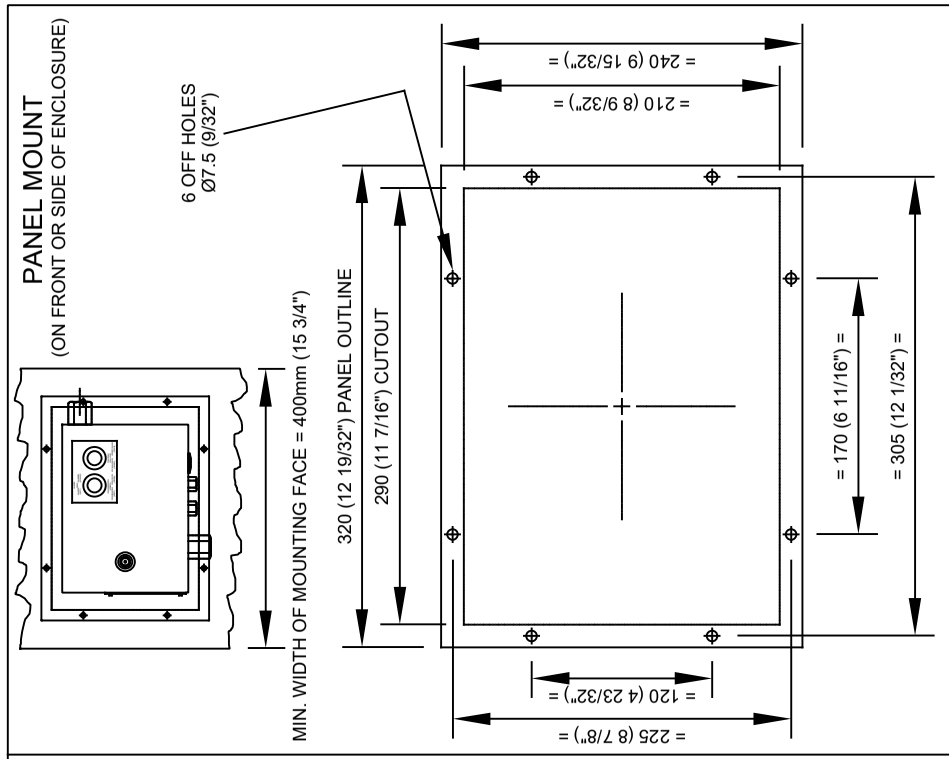
SHEET: 4/4

expo Technologies

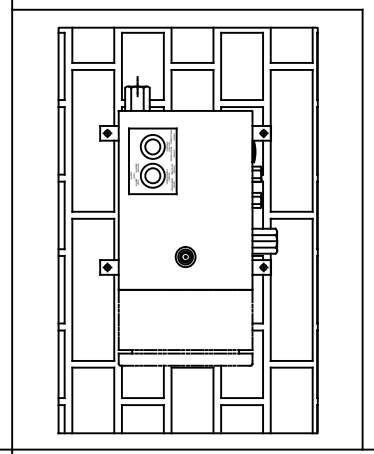
3RD ANGLE PROJECTION	DIMENSIONS IN mm [ ] DENOTES IMPERIAL	TOLERANCES UNLESS OTHERWISE STATED FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH	DECIMALS X ±0.5 X.X ±0.2 X.XX ±0.1 X.XXx ±0.05	ANGLE STD ±1°	DO NOT SCALE IF IN DOUBT ASK

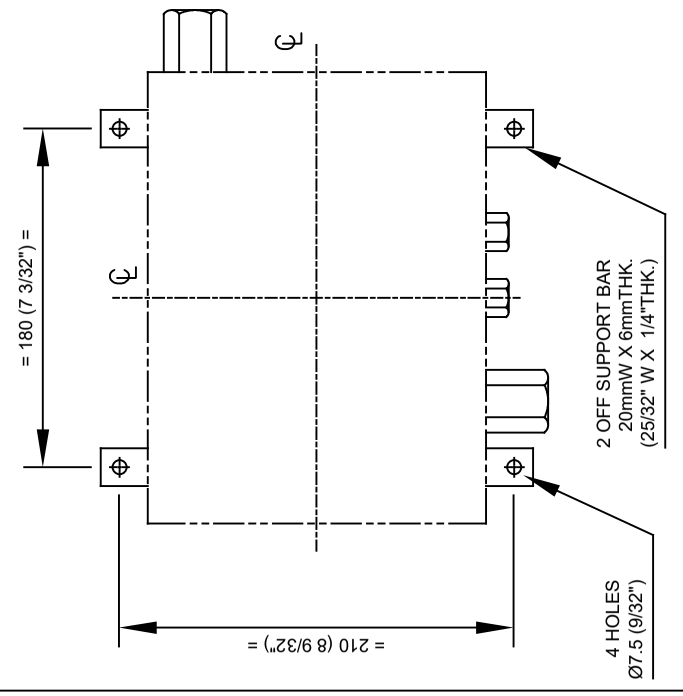
Sub MiniPurge Systems MOUNTING DETAILS

PANEL MOUNT
(ON FRONT OR SIDE OF ENCLOSURE)

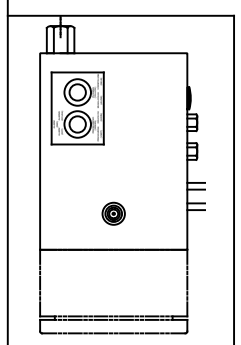


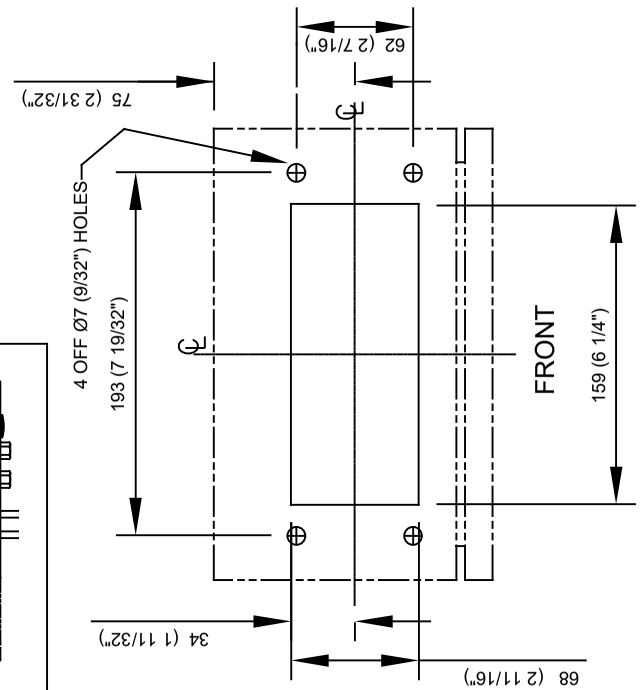
REMOTE MOUNT
(ON WALL OR PANEL)



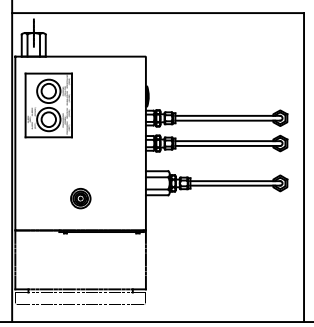


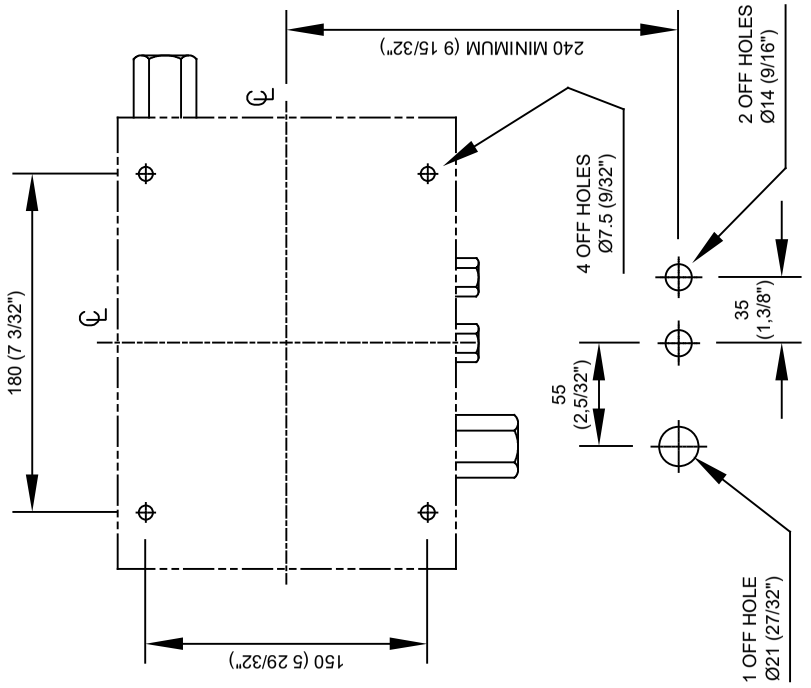
PREFERED OPTION DIRECT MOUNT
(ON TOP OF ENCLOSURE)





REAR MOUNT
(ON SIDE OF ENCLOSURE)





REVISION	MOD #	DATE	DRAWN	CHECKED	APPROVED
05	DQN-12456	22/10/20	CE	AR	MLC
04	4763	11/08/09			JPdB
03	3503	01/04/03			PAO

DRAWN DATE	CONTROLLED	MATERIAL
09/02/00		
DRAWING STATUS	REVISION	
CERT REL	05	FINISH
SCALE N.T.S	A3	

WEIGHT (Kg)

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE
MOUNTING DETAISL - SIZE 1MP

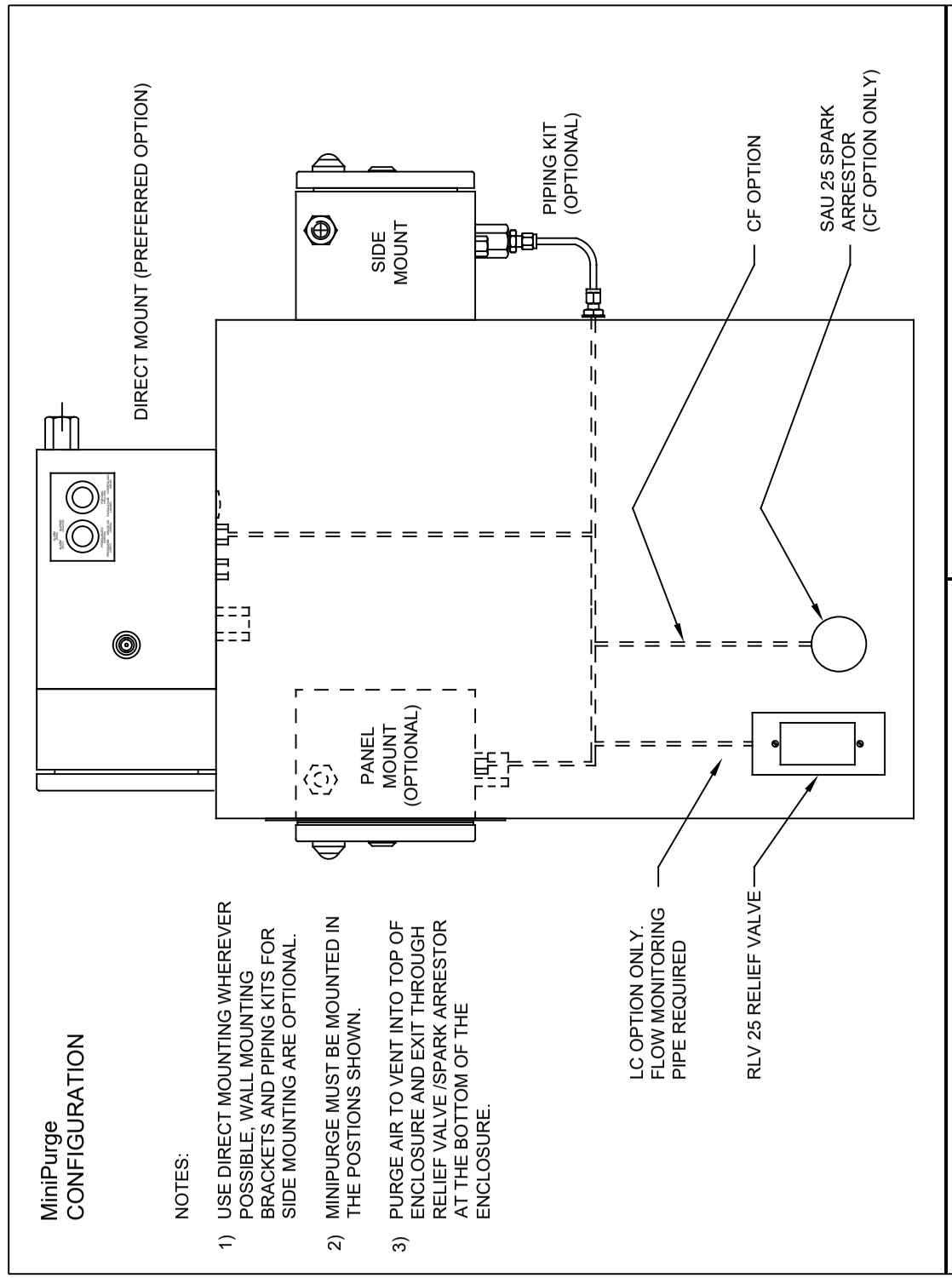
DRAWING No.
XBR-7TD0-004

SHEET No. 1 OF 1

expo Technologies

8	7	6	5	4	3	2	1

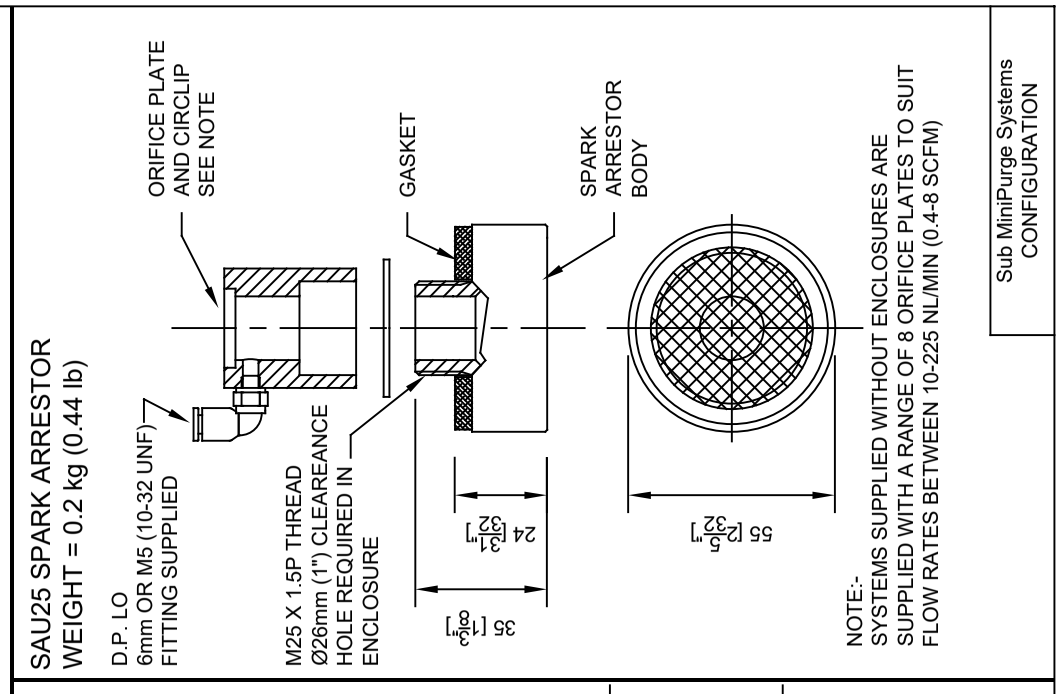
3RD ANGLE PROJECTION	DIMENSIONS IN mm [ ] DENOTES IMPERIAL	TOLERANCES UNLESS OTHERWISE STATED FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH	DECIMALS X ±0.5 X.X ±0.2 X.XX ±0.1 X.XXx ±0.05	ANGLE STD ±1°	DO NOT SCALE IF IN DOUBT ASK

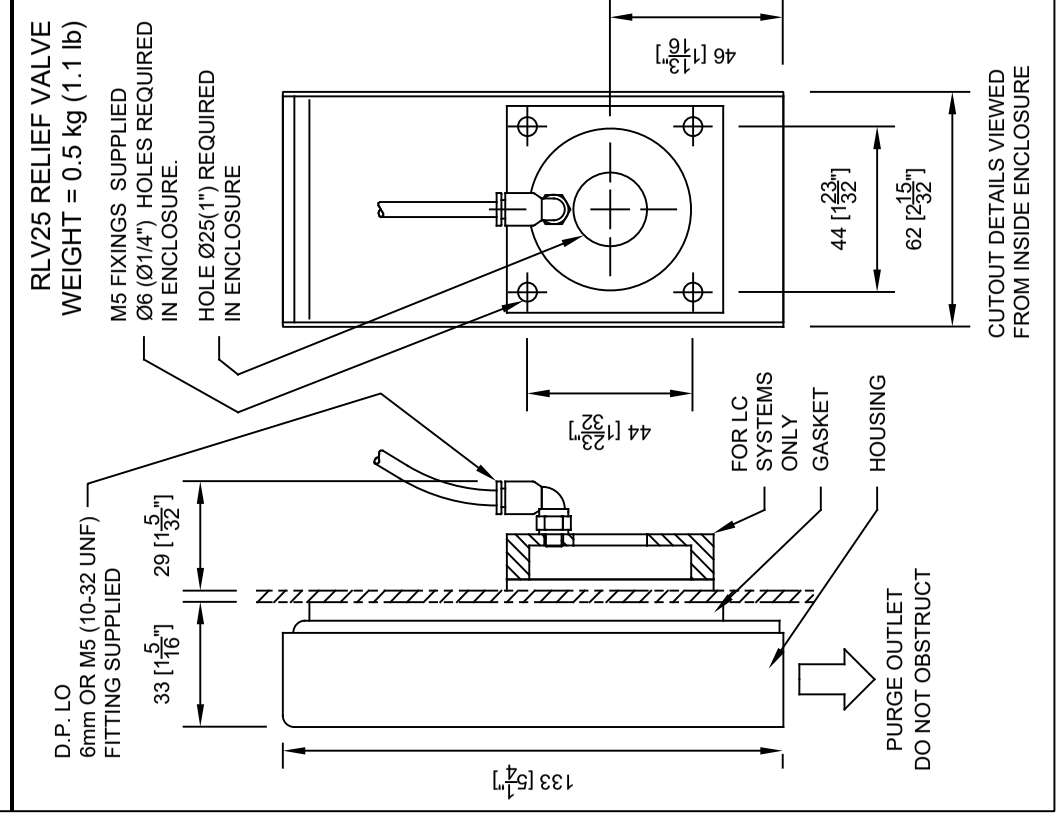


MiniPurge
CONFIGURATION

NOTES:

1) USE DIRECT MOUNTING WHEREVER POSSIBLE, WALL MOUNTING BRACKETS AND PIPING KITS FOR SIDE MOUNTING ARE OPTIONAL.
2) MINIPURGE MUST BE MOUNTED IN THE POSTIONS SHOWN.
3) PURGE AIR TO VENT INTO TOP OF ENCLOSURE AND EXIT THROUGH RELIEF VALVE /SPARK ARRESTOR AT THE BOTTOM OF THE ENCLOSURE.





REVISION	MOD #	DATE	DRAWN	CHECKED	APPROVED
05	DQN-12456	15/10/20	CE	AR	MLC
04	4783	11/08/09			JPdB
03	4385	21/12/07			MLC

DRAWN DATE	CONTROLLED
10/02/00	
DRAWING STATUS	REVISION
CERT REL	05
SCALE N.T.S	A3

MATERIAL

FINISH

WEIGHT (Kg)

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE
CONFIGURATION - SIZE 07 1 MP

DRAWING No.
XBR-7TD0-003

SHEET No. 1 OF 1

expo Technologies

8	7	6	5	4	3	2	1

3RD ANGLE PROJECTION

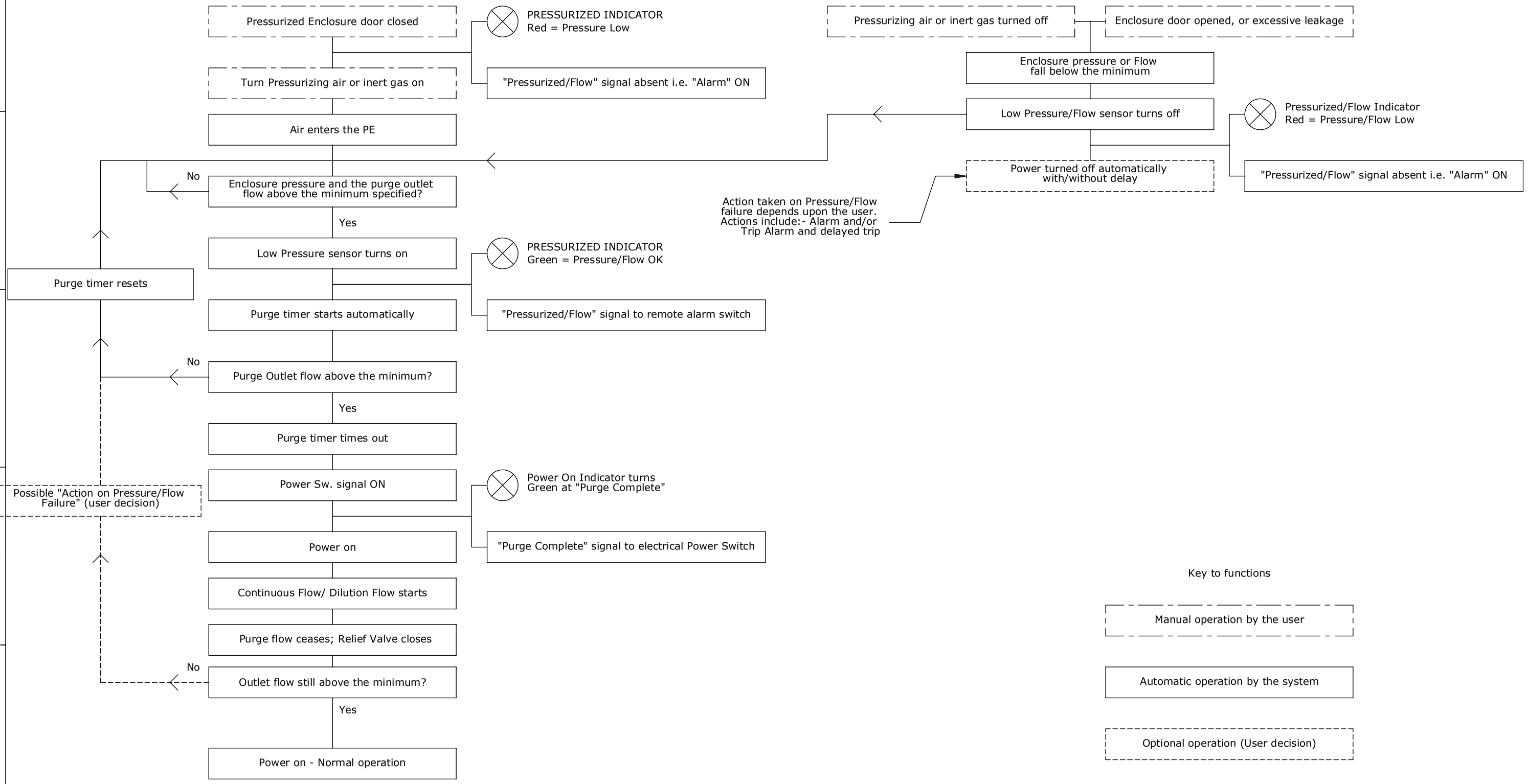
DIMENSIONS IN mm
[ ] DENOTES IMPERIAL

TOLERANCES UNLESS OTHERWISE STATED
FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH

DECIMALS
X ±0.5
X.X ±0.2
X.XX ±0.1
X.XXX ±0.05

ANGLE
STD ±1°

DO NOT SCALE
IF IN DOUBT ASK



Key to functions

Manual operation by the user

Automatic operation by the system

Optional operation (User decision)

THIS DRAWING IS REFERENCED TO
EXPO CERTIFICATION DRAWING EP99-2-4

REVISION	MOD No.	DATE	DRAWN	CHECKED	APPROVED
02	DQN-12436	18/05/2020	CE	RJ	MC
01	DRAWN	23/06/2010			JPdB

DRAWN DATE: 23/06/2010
DRAWING STATUS: RELEASED
REVISION: 02
SCALE: 1:1
A3

MATERIAL:
FINISH:
WEIGHT (Kg):

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE
MINIPURGE X CF SEQUENCE DIAGRAM

DRAWING No.
XBR-7TD0-041

SHEET No. 1 OF 1

expo Technologies

8	7	6	5	4	3	2	1

3RD ANGLE PROJECTION

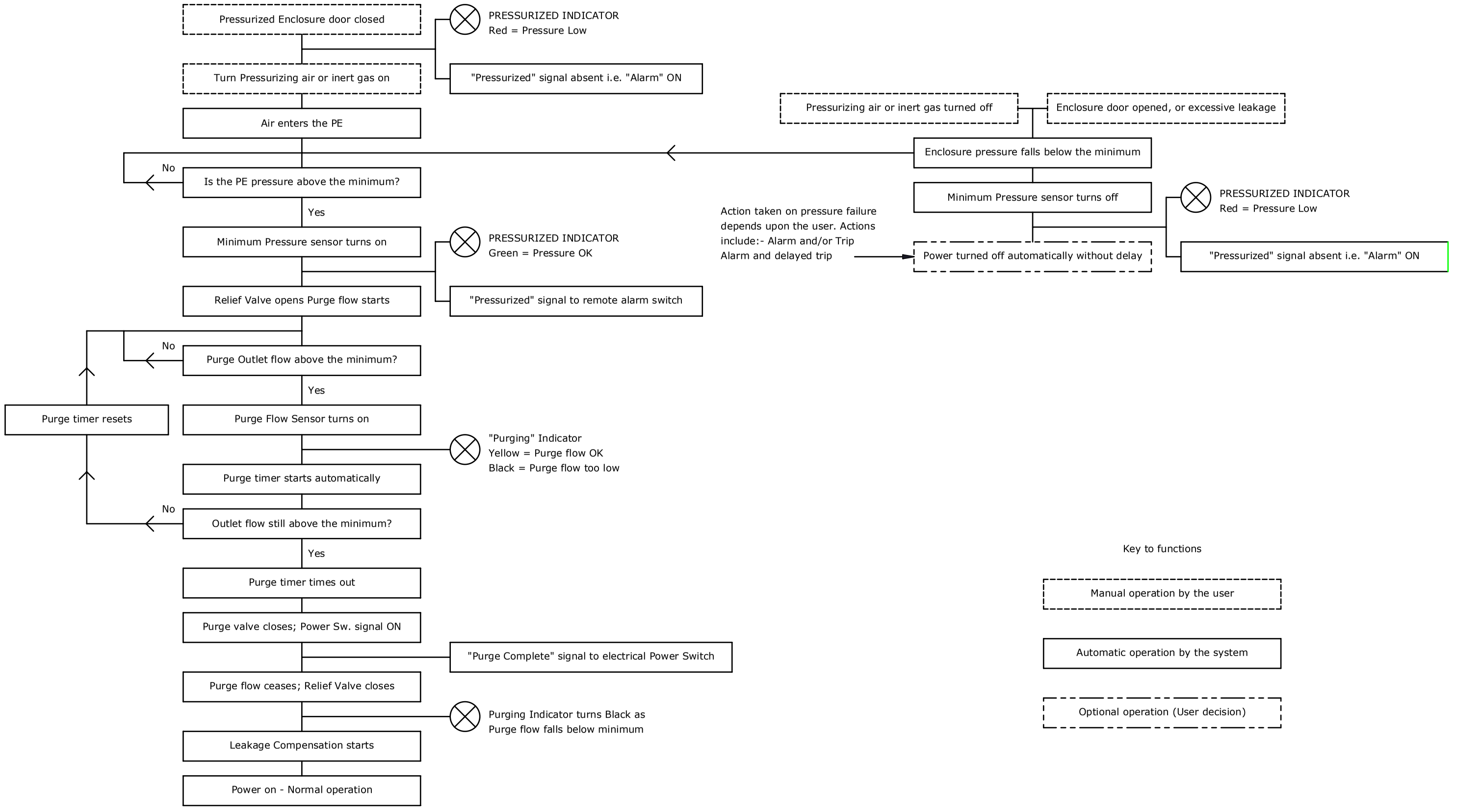
DIMENSIONS IN mm
[ ] DENOTES IMPERIAL

TOLERANCES UNLESS OTHERWISE STATED
FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH

DECIMALS
X ±0.5
X.X ±0.2
X.XX ±0.1
X.XXX ±0.05

ANGLE
STD ±1°

DO NOT SCALE
IF IN DOUBT ASK



THE RELEVANT EXPO CERTIFICATION DRAWING IS EP99-2-3

REVISION	MOD No.	DATE	DRAWN	CHECKED	APPROVED
03	DQN-12436	28/04/2020	AW	AR	MH
02	5434	20/12/2011			JPdB
01	DRAWN	23/06/2010			JPdB

DRAWN DATE: 23/06/2010
DRAWING STATUS: CERTIFIED
REVISION: 03
SCALE: 1:1
A3

MATERIAL:
FINISH:
WEIGHT (Kg):

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE
MINIPURGE X LC SEQUENCE DIAGRAM

DRAWING No.
XBR-7TD0-040

SHEET No. 1 OF 1

expo Technologies

3rd ANGLE PROJECTION

DIMENSIONS IN mm

DO NOT SCALE

Fig 1a Single channel interface circuit
e.g. "Y" or "Z" Pressurization Alarm circuit

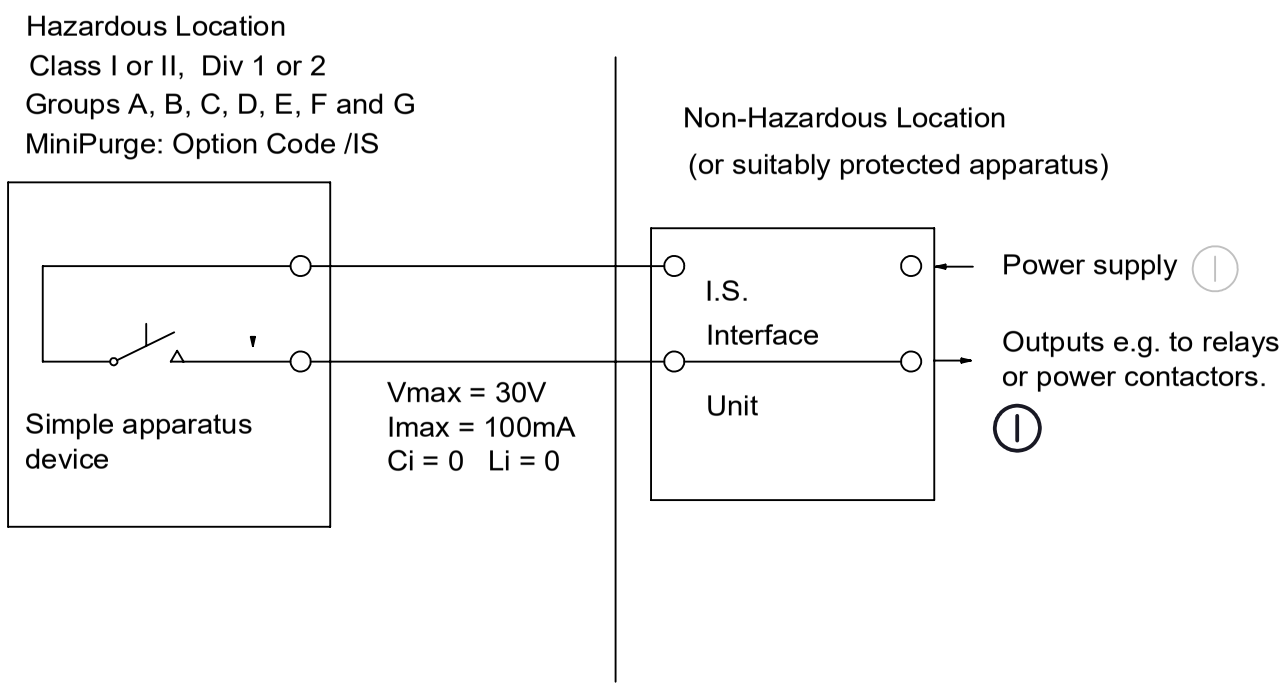
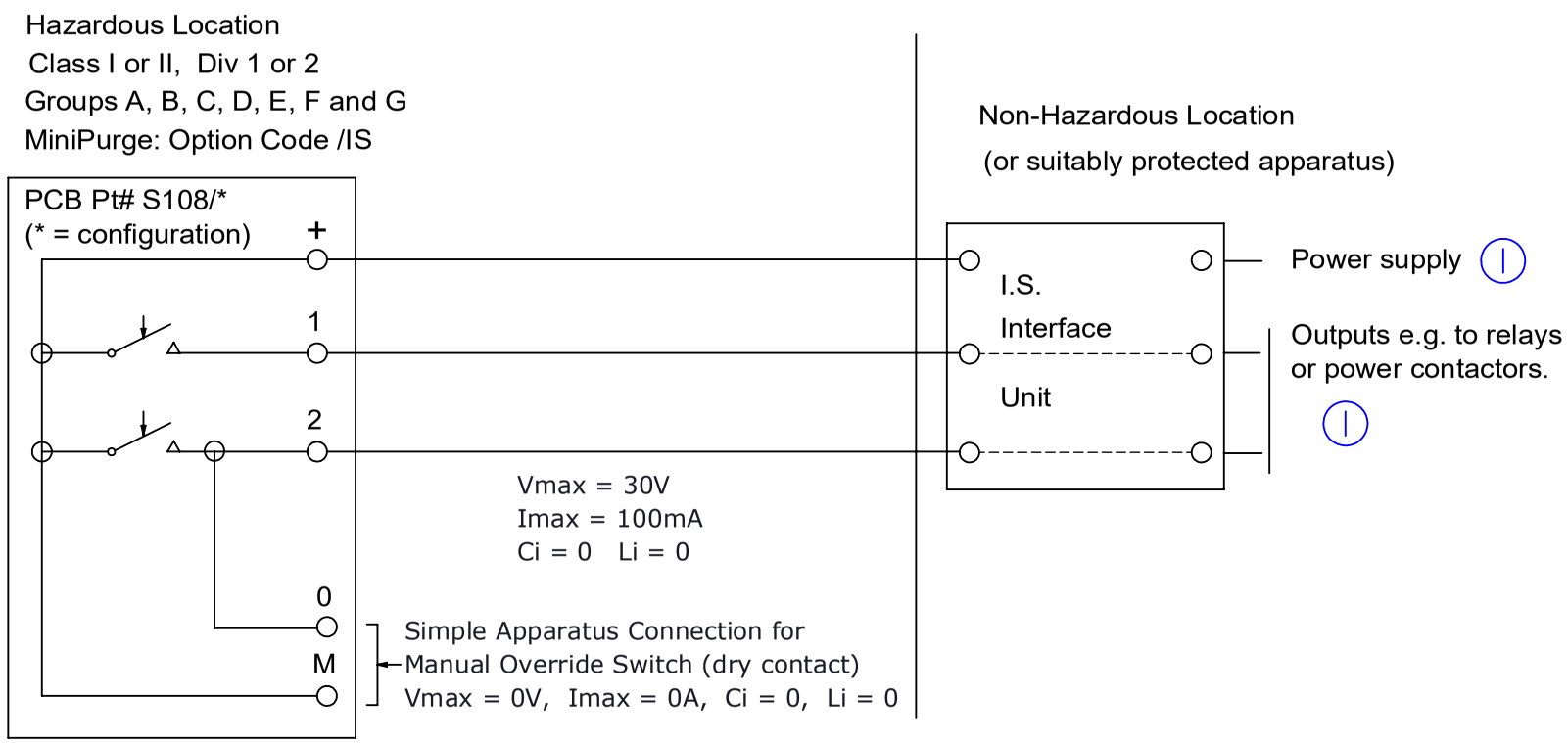


Fig 1b Multi-channel interface circuit
e.g. "X" pressurization Alarm & Power Control



Notes for both Fig 1a and Fig 1b

1 Electrical equipment connected to associated apparatus should not use or generate more than 250 volts

2 Installation shall be in accordance with the manufacturer's instructions and the National Electrical Code (ANSI/NFPA 70)

3 For guidance on Installation see ANSI/ISA RP12.6, (Installation of IS Instrument Systems in Class I Hazardous Locations)

(I) 4 Voc or Vt of associated apparatus is less than Vmax
Isc or It of associated apparatus is less than Imax
Ci plus capacitance of interconnecting cabling is less than Ca of the associated apparatus
Li plus inductance of interconnecting cabling is less than La of the associated apparatus

5 "Simple Apparatus" is a device that will not generate or store more than 1.2V, 0.1A, 25mW or 20uJ

6 For Gas Groups A, B permitted Imax for I.S., for V peak = 30V is 101 mA
Alternatively: For Gas Group A, B with Vpeak = 19.2V Imax for I.S. is 350mA.

REV.	MOD NUMBER	APPROVED DATE	APPROVED	DRAWN DATE: 13/07/2007		
4	4330	13/7/2007	MLC	DRAWING STATUS: Certified		
05	5076	01/11/2010	AMO	APP'D	CHK'D	DR'WN
06	5297	20/07/2011	AMO	AMO	AMO	AMO

THIS IS A CERTIFICATION DOCUMENT. ANY UNAUTHORISED CHANGE INVALIDATES APPROVAL.

Expo Technologies Limited SURREY KT7 0RH UNITED KINGDOM

TITLE: MINIPURGE OPTION 'IS'

JOB No:

CUSTOMER:

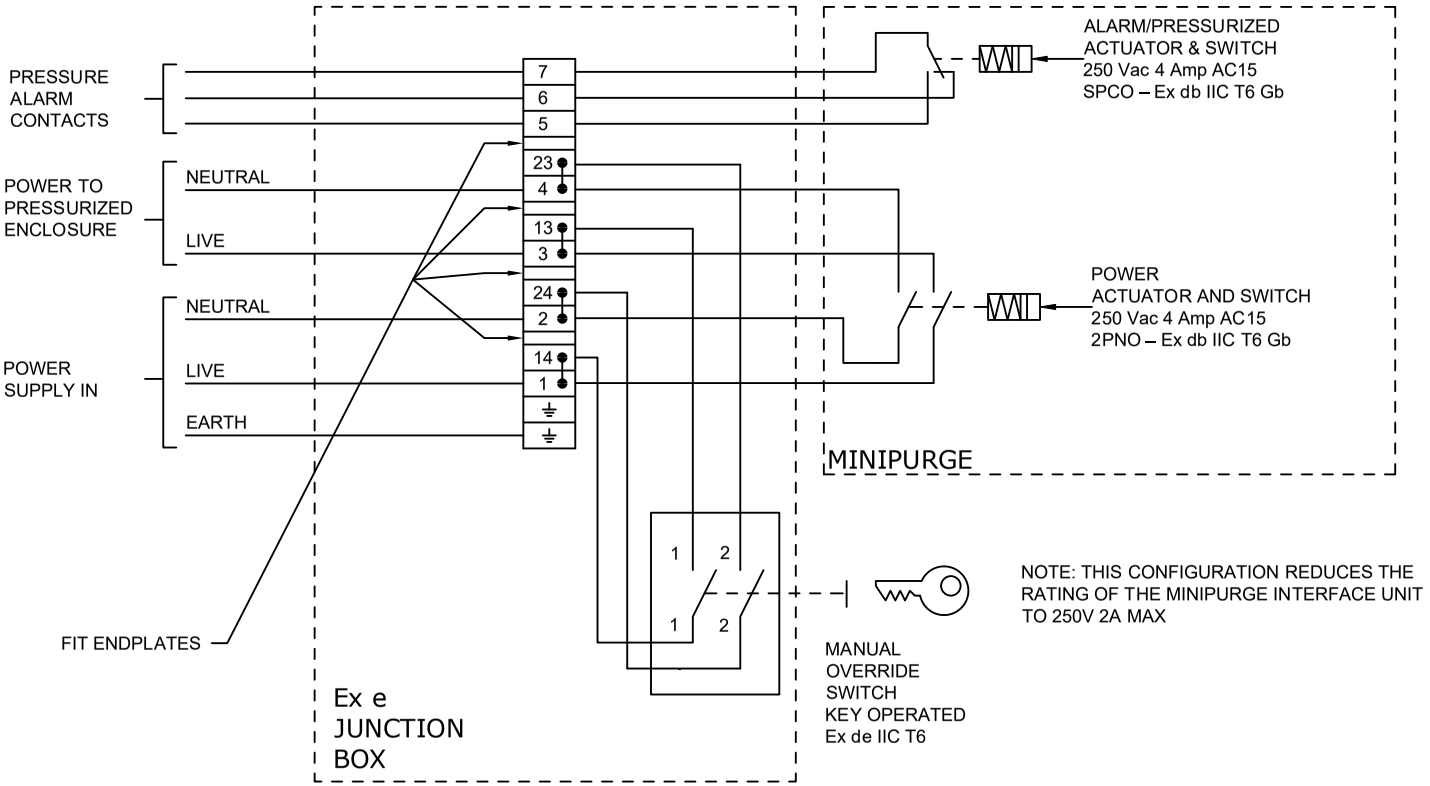
SCALE NTS

REV: 06

DRAWING No. EP80-2-11

SHEET No. 1 OF 1

8	7	6	5	4	3	2	1
3RD ANGLE PROJECTION	DIMENSIONS IN mm [ ] DENOTES IMPERIAL	TOLERANCES UNLESS OTHERWISE STATED FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH DECIMALS X ±0.5, X.X ±0.2, X.XX ±0.1, X.XXx ±0.05 ANGLE STD ±1°	DO NOT SCALE IF IN DOUBT ASK				



REVISION	MOD #	DATE	DRAWN	CHECKED	APPROVED
03	DQN-12429	05/05/20	AR	CE	MH
02	5481	08/02/12			JPdB
01	Drawn	09/06/11	BRD	PC	JPdB

DRAWN DATE	
09/06/2011	
DRAWING STATUS	REVISION
CERT REL	03
SCALE	
N.T.S	A3

MATERIAL

FINISH

WEIGHT (Kg)

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE
MANUAL OVERRIDE SWITCH HOOK UP

DRAWING No.
AGE-WC00-207

SHEET No. 1 OF 1

expo Technologies

8	7	6	5	4	3	2	1

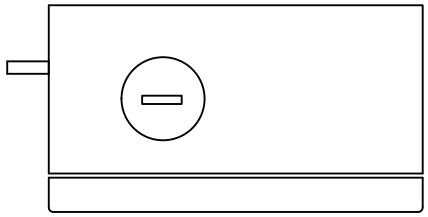
3RD ANGLE PROJECTION

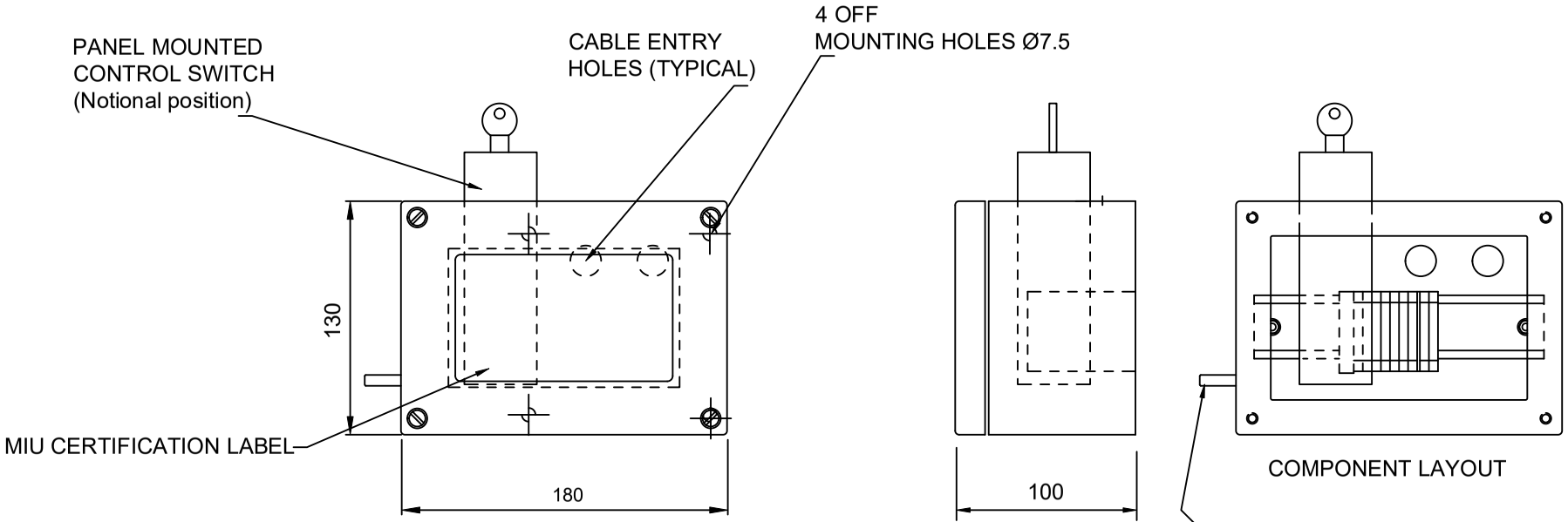
DIMENSIONS IN mm
[ ] DENOTES IMPERIAL

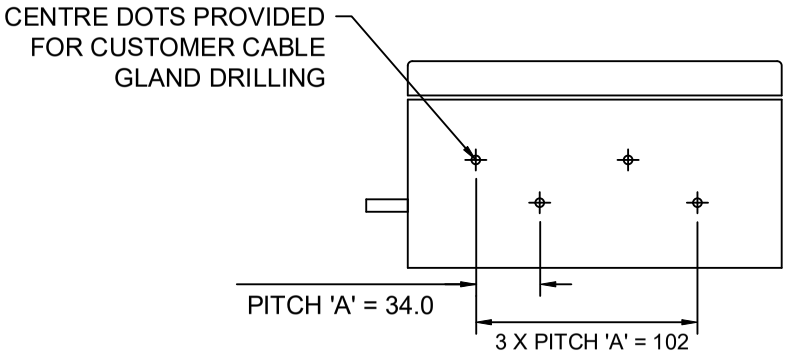
TOLERANCES UNLESS OTHERWISE STATED
FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH

DECIMALS: X ±0.5, X.X ±0.2, X.XX ±0.1, X.XXx ±0.05
ANGLE: STD ±1°

DO NOT SCALE IF IN DOUBT ASK







Maximum 13 current carrying terminals
Maximum current rating: 2 Amps / terminal @ 55°C
Maximum voltage: 400V

All dimensions typical.
Overall size ± 5 mm

REVISION	MOD #	DATE	DRAWN	CHECKED	APPROVED
01	DRAWN	05/05/20	AR	CE	MH

DRAWN DATE: 05/05/20
DRAWING STATUS: CERT REL
REVISION: 01
SCALE: N.T.S
A3

MATERIAL:
FINISH:
WEIGHT (Kg):

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE: Ex e JUNCTION BOX M/O GA

DRAWING No.: XSD-7TD0-013

SHEET No. 1 OF 1

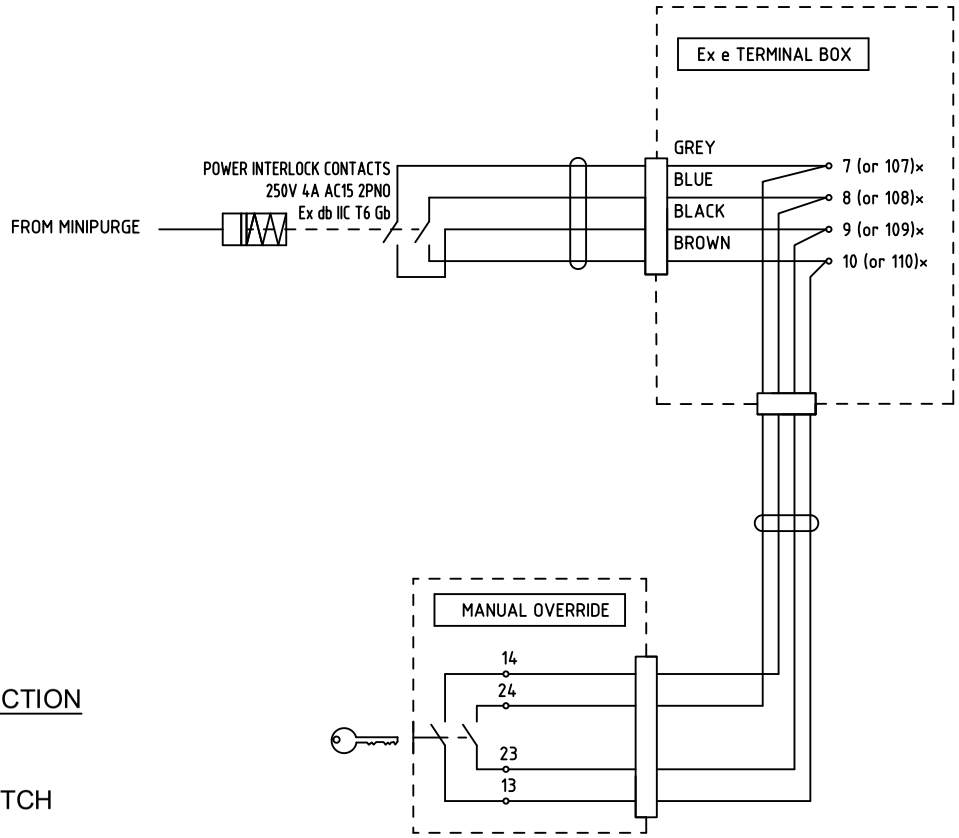
8	7	6	5	4	3	2	1

3RD ANGLE PROJECTION

DIMENSIONS IN mm
[ ] DENOTES IMPERIAL

TOLERANCES UNLESS OTHERWISE STATED
FLATNESS TO BE LESS THAN 0.4 OVER ANY 100mm LENGTH
DECIMALS X ±0.5, X.X ±0.2, X.XX ±0.1, X.XXx ±0.05
ANGLE STD ±1°

DO NOT SCALE IF IN DOUBT ASK



GLAND PLATE IN PURGE SYSTEM IS UNDRILLED.

CABLE GLANDS ARE NOT SUPPLIED.

* TERMINAL NUMBER ACCORDING TO PURGE SYSTEM TERMINAL LAYOUT DRAWING

MANUAL OVERRIDE FUNCTION

PART CODE /MO(BOX)

VIA KEY-OPERATED SWITCH
(2 POSITIONS 0-1)

GRP ENCLOSURE, IP66 1 X M20 ENTRY

SWITCH RATING
550VAC/10A (AC-15)
110VDC / 2.5A (DC-13)

TEMP RATING -60 TO +55°C

ATEX / IECEX / EAC / BRAZIL / CSA /
PESO / cULus
Ex db eb IIC T5 Gb
Ex tb IIIC T95°C Db

REVISION	MOD #	DATE	DRAWN	CHECKED	APPROVED
13	DQN-12472	01/04/21	AR	CE	AW
12	DQN-12446	20/07/20	AR	CE	AW
11	DQN-12429	05/05/20	AR	CE	MH

DRAWN DATE: 01/07/2013
DRAWING STATUS: CERT REL
REVISION: 13
SCALE: N.T.S
A3

MATERIAL
FINISH
WEIGHT (Kg)

Expo Technologies Limited
SURREY TW16 5DB UNITED KINGDOM

TITLE: MANUAL OVERRIDE SWITCH HOOK-UP

DRAWING No. AGE-WC00-117

SHEET No. 1 OF 1

expo Technologies

MiniPurge Interface Unit MIU/e
User Instruction Manual

Manufacturer: **Expo Technologies Ltd**, Unit 2 The Summit, Sunbury on Thames. UK.

Model Type & Rating:

MIU/e1	MIU/e2	MIU/e1/MO
400V / 7A	400V / 7A	400 V / 2A

Certificates:

Hazardous Area Marking Code:

IECEx EXV 19.0057X	ExVeritas 19 ATEX 0542X	TUV 12.1463
Ex eb IIC T5 Gb Ex tb IIIC T100°C Db Tamb -20°C to +55°C	⟨Ex⟩ II 2 G Ex eb IIC T5 Gb ⟨Ex⟩ II 2 D Ex tb IIIC T100°C Db Tamb -20°C to +55°C	Ex e IIC T5 Gb Ex tb IIIC T100º Db IP66 Tamb -20°C to +55°C
Ex eb IIC T4 Gb Tamb -20ºC to +60ºC	⟨Ex⟩ II 2 G Ex eb IIC T4 Gb Tamb -20°C to +60°C	Ex e IIC T4 Gb Tamb -20ºC to +60ºC

APPLICATION SUITABILITY

The MiniPurge Interface Units – MIU/e are certified for use in Hazardous Areas where the Hazardous Area is non-mining (i.e. above ground) and the hazard is caused by flammable gasses or vapours.
The systems may be used in ATEX/IECEx Gas Zones 1 & 2, Gas Groups IIA, IIB & IIC and in Dust Zones 21 & 22, Dust Groups IIIA, IIIB & IIIC.

The following materials are used in the construction of MIU/e: Stainless Steel, Steel, Brass, Copper, Polyamide, Silicone. If substances that will adversely affect any of these materials are present in the surrounding environment, please consult Expo Technologies for further guidance. This equipment is designed for use under normal industrial conditions of ambient temperature, humidity and vibration. Please consult Expo Technologies before installing this equipment in conditions that may cause stresses beyond normal industrial conditions.

WARNING - Only install, commission, inspect, maintain or fault find when safe to do so.

INSTALLATION

The MIU/e shall be installed in accordance with relevant standards, such as IEC 60079-14 and any local codes of practice that are in force.
The MIU/e shall be connected to the Purge and Pressurization system in accordance with the instructions given in the handbook supplied with the pressurization system.
The external earth connection of the MIU/e shall be connected to earth using minimum 4mm^2 conductor.

SELECTION OF CABLE, CABLE GLANDS AND CONDUCTORS IN CONDUIT

Cable glands or other cable entry devices shall be appropriately certified and suitable for the cable and the conditions of use and be installed in accordance with the manufacturer's instructions.
When the MIU/e application requires the hazardous area marking code:
Ex eb IIC T5 Gb, Tamb -20°C to +55°C there is no further guidance for the selection of cable and cable glands or conductors in conduit.
When the MIU/e application requires the hazardous area marking code:
Ex eb IIC T4 Gb, Tamb -20°C to +60°C the user shall select cable and cable glands or conductors in conduit that have a higher temperature rating than 83.2°C.

TERMINALS

MIU/e may be fitted with a combination of:
WDU2.5 terminals certified to DEMKO 14 ATEX 1338U & IECEx ULD 14.0005U.
SAK2.5 terminals certified to KEMA 97 ATEX 1798U & IECEx KEM06.0014U.
WPE2.5 Earth terminals certified to DEMKO 14 ATEX 1338U & IECEx ULD 14.0005U.

For all type of terminals: Tightening torque range: 0.4 to 0.8 Nm (WDU & WPE) & 0.4 to 0.6 Nm (SAK).
Conductor cross section maximum 2.5 mm^2, minimum 1.5 mm^2.
Type of connection is screwed - Solid copper conductors to be used.
Stripping length shall be 10 mm.
Only one conductor is allowed at each side of a terminal. Multiple conductors shall be crimped together before screwed into the terminal.

Maximum number of terminals: For Model MIU/e1 – Up to 18 current carrying terminals.
For Model MIU/e2 – Up to 33 current carrying terminals.
For Model MIU/e1/MO – Up to 13 current carrying terminals.

COMMISSIONING

The installation of the cable glands, electrical and earth connections shall be inspected for correct installation before the unit is put into service. The lid shall be correctly fitted.

MAINTENANCE

The condition of enclosure and associated cable glands shall be inspected for damage every six months. The terminals shall be inspected for tightness and gaskets inspected for damage.

FAULT FINDING

When wiring or signal fault occurs, check each terminated wire, terminals for tightness and gaskets for damage.
External faults such as broken switches within the Control Unit may also require investigation.

Installation, Operation and Maintenance Manual for MiniPurge®
Leakage Compensation (Model LC) and
MiniPurge® Continuous Flow with High Purge (Model CFHP)
conforming to NFPA 496

IMPORTANT NOTE It is essential, to ensure conformity with the standard, that the user of the system observes the following instructions.

Please refer to the latest standard for detailed requirements and definitions.

Contents:

Section 0 Description and Principle of Operation

All MiniPurge® pressurization systems provide:

a) a method of pressurizing a Pressurized Enclosure (PE) while at the same time compensating for any leakage, together with

b) a method of purging the enclosure, before power is turned on, to remove any flammable gas that may have entered the enclosure while it was not pressurized.

Type **Leakage Compensation (LC)** and **Continuous Flow with High Purge (CFHP)** systems comprise the following two major parts:

- A **Control Unit (CU)** containing as a minimum, for "Y" and "Z" Pressurization, a Leakage Compensation Valve (LCV), Minimum Pressure and Purge Flow sensing devices, and a "Pressurized"/"Alarm" indicator. The CU supplies a 'Pressurized' signal showing whether the PE pressure is satisfactory or not.

For Type "X" Pressurization, the CU has, in addition, a fully automatic Purging controller with a Purge timer and electrical power switch interlock.

Note: For "Y" Pressurization, the electrical equipment inside the protected enclosure shall meet the requirement for Division 2 or Class 2 locations.

- A **Relief Valve (RLV),** fitted to the PE, to provide a means of limiting the maximum pressure experienced by the PE during operation. The RLV model number has suffixes defining the diameter of the valve aperture (in millimeters) and material, e.g. RLV **/cs (Carbon Steel) or /ss (Stainless Steel). All RLVs incorporate a Spark Arrestor to prevent sparks being ejected from the PE through the RLV aperture.

CFHP systems with a Continuous Flow of air after purging have a calibrated Outlet Orifice which can be either within the Relief Valve (suffix **/cf) or a separate item type SA** or SAU**.

0.1 "Leakage Compensation" Systems, Model LC

A Leakage Compensation System, Model LC, is intended to have minimal flow after the initial purge time. The PE is built as leak tight as possible and the LC system merely tops up for any enclosure leakage. The system provides an initial high flow of purging air that leaves the PE through the Relief Valve. After the initial purging has been completed the Control Unit changes over to Leakage Compensation mode and the Relief Valve closes. The only flow thereafter is the flow through the "Leakage Compensation Valve" (LCV) which is adjusted so that the flow is enough to compensate for any leakage from the PE.

The Purging Flow rate is monitored by a separate "Purge Flow Sensor" located in the CU, which detects the differential pressure across the purge flow orifice located directly before the RLV. The Purge Flow Sensor is set to operate when the desired differential pressure is exceeded. The output from the Flow Sensor is indicated on the CU and on "X" Pressurization systems, used to operate the automatic purge timer. Both Enclosure Pressure and Purge Flow have to be correct before the Purge Timer can start.

0.2 "Continuous Flow after High Purge", Model CFHP System

The CFHP system construction is identical to a LC model, with the addition of one or more fixed Outlet Orifices to provide a deliberate "leak" at a known flow rate. The Outlet Orifice is pre-calibrated so that the pressure drop at the desired flow rate is known. The Minimum Pressure Sensor within the Control Unit will be set to the same value as the pressure drop. When the PE pressure exceeds the calibrated pressure the Continuous Flow must be taking place.

The Leakage Compensation Valve in the CU is opened sufficiently to provide enough air to compensate for any accidental leakage as well as to provide the Continuous Flow through the outlet orifice. In this way a high flow rate is provided during the initial purge period which is thereafter reduced to the desired Continuous Flow rate. Even if the PE had no accidental leakage there would still be a flow from the outlet orifice.

There are three ways of providing the calibrated Outlet Orifice. Please consult the system specification sheet to determine which has been supplied. The choice:

- Type SAU** where an Orifice disk is removable and can be easily changed by the user to give different flow rates according to the size of the PE and the available air supply capacity. (** denotes the metric thread size of the SAU body)

- Type SA** where the orifice size is fixed and the way to change the flow rate is either to change the setting

of the Minimum Pressure Sensor or to replace the SA with one of another size. (** denotes the nominal thread size of the SA body)

- For low flow rates, the Outlet Orifice may be incorporated within the Relief Valve making use of the existing Spark Arrestor. The Relief Valve will then have a suffix /CF**, where ** is the orifice size in millimeters.

Section 1 Installation of the System

The installation of the MiniPurge® system, the protective gas supply, any alarm device should be in accordance with the requirements of NFPA 496.

The electrical installation associated with the MiniPurge® system shall conform to the local codes and the relevant clauses of NFPA 496.

All electrical parts of the MiniPurge system shall be installed in accordance with the applicable requirements of the NEC for USA and CEC for Canada.

1.1 Installation of the Expo LC and CFHP Systems

1.1.1 The Expo system should be installed either directly on or as close as possible to the Pressurized Enclosure (PE). It should be installed so that the system indicators may be readily observed.

1.1.2 All parts of any system carry a common serial number. If installing more than one system, ensure that this commonality is maintained on each installation.

1.1.3 Any tubing, conduit and fittings used to connect to the PE should be metallic, or, if non-metallic, conform to the local codes for flammability ratings. No valve may be fitted in any tube connecting the Expo system to the PE.

1.1.4 The user or manufacturer of the PE shall determine the volume of the PE, the necessary purging volume, and the time to be allowed for purging, using the chosen Expo system purging flow rate. It is the user's responsibility to verify or enter this data on the PE and/or Expo system nameplate. Ask Expo if in doubt.

Example calculations:

a) If the PE external dimensions give a volume of 20 cubic feet, and it is NOT a motor, multiply the volume by four to get the Purging Volume i.e. 80 cubic feet. Divide the Purging Volume by the purge rate e.g. 32 cubic feet per minute, and round up to the next even minute above, i.e. Purging time would be 4 minutes.

b) If the PE is a motor, multiply the internal free volume by ten to get the Purging Volume. For the example above, Purging time would be 8 minutes.

For Type “Y” or “Z” Pressurization, the protected equipment may be permitted to be energized immediately where 25 Pa (0.1”WC) exist in the enclosure and the enclosure is known to be below the ignitable concentration of combustible material.

1.1.5 If the PE contains an internal source of release of flammable gas or vapor, the procedures for assessment of the release as given in NFPA 496 shall be observed.

1.1.6 User must take precaution if abnormal release of flammable gas or vapor within the enclosure can affect the external area.

1.1.7 Where a release of flammable gas or vapor within an enclosure can occur either in normal condition or abnormal operation, protection shall be provided by one of the step as specified in NFPA 496.

For more information on enclosure containing internal source of release or enclosure containing an open flame, contact Expo Technologies.

The user must verify that the specification of the Expo system e.g. pressures, continuous flow (dilution) rate and type of protective gas are correct for the specific application. If an inert protective gas is required, the Expo Control Unit can be specified to have Compressed Air for the control logic and Inert Gas for the protective gas to minimize Inert Gas consumption.

1.1.8 More than one PE can be protected by a single system. If PEs are connected and purged in “series” e.g. “Daisy Chained”, the Outlet Orifice must be fitted on the last enclosure with the Purge Inlet to the first enclosure. The bore and length of the tube or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. Advice on sizing can be obtained from Expo Technologies. The test pressure for all the enclosures should be 3 times the pressure inside the first enclosure when purging is taking place.

If PE’s are to be connected in parallel each enclosure must have its own outlet Relief Valve, Purge Flow Sensor and Pressure Sensor. System “Models” can be mixed e.g. Model LC for one enclosure and Model CF for another. An example would be a Gas Chromatograph instrument. Expo systems with this facility have option code “TW”.

1.2 Quality and Installation of the Pressurizing Air or Inert Gas Supply

1.2.1 The source of the compressed air must be in a non-classified area. Inert gas may be used as an alternative to compressed air.

1.2.2 All pipe connection for the protective gas shall be protected from mechanical damage; where the source of the compressed air intake line passes through a classified location, the construction shall be of non-combustible material, and designed to prevent leakage of flammable gases, vapours, or dust into the protective gas. It must be protected against mechanical damage and corrosion.

1.2.3 Unless a supply shut-off valve has been specially fitted within the Expo system, a valve with the same, or larger, thread size as the Control Unit inlet fitting shall be fitted externally. In addition, for "Y" and "Z" Pressurization systems, a suitable indicator shall be provided:

Note: To conform to NFPA: Any protected enclosure that can be isolated from the protective gas supply shall be equipped with an alarm and shall have this warning:

WARNING: PROTECTIVE GAS SUPPLY VALVE
This valve must be kept open unless the area atmosphere is known to be below the ignitable concentration of combustible materials or unless all equipment within the protected enclosure is de-energized.

1.2.4 The tubing and fittings used must conform to 1.1.3 above.

1.3 Provision and Installation of Alarm Devices

Expo Technologies systems have a Minimum Pressure Sensor set to a pressure of at least 0.1" WC (0.25 mbar). When the PE pressure is above this set point the Sensor produces a positive "Pressurized" signal. This is displayed on a Red/Green indicator. This signal can be used to operate an electrical contact for a remote "Alarm". The pneumatic signal may be supplied either

a) to a pressure operated switch (MiniPurge® Option Code /IS) suitable for an Intrinsically Safe circuit, in accordance with Expo drawing EP80-2-11, (or for a Non-Incendive circuit in Division 2), or

b) to a bulkhead fitting where it is available to the user (MiniPurge® Option Code /PO). This signal can be used to operate an external electrical switch either local (e.g. explosionproof) or remote in a non-classified area, or

c) to an external terminal box (MiniPurge Option® Code /PA). This option is available with an auxiliary switch(es) for signal and circuit control, assessable to user via the external junction box. This switch is suitable for use in the Hazardous Location in accordance to NEC500/505 requirements.

When the enclosure pressure falls below the set point of the Sensor the "Pressurized" signal is removed, i.e. the absence of the signal indicates a "Alarm" ("Pressure Failure") condition. The user must make use of this external alarm facility in accordance with NFPA 496 requirements, if the system "Alarm" indicator is not located in a place where it can be readily observed.

Example: The "Pressurized" signal can be used to produce an "Alarm" action by means of a conventional "pressure switch" set to operate at around 15 psi (1 bar). The "Pressurized" signal from the CU at 30 psi (2 bar) or more will hold the switch in the operated position until the CU detects a low pressure in the PE and removes the "Pressurized" signal. The Alarm switch will reset and its contacts can be used to operate a remote electrical alarm.

If the switch is located in the hazardous area it must either be part of an Intrinsically Safe circuit, or be suitably protected e.g. explosionproof. The pressure switch should be IS or explosionproof even if it is fitted within the Pressurized Enclosure.

For

Expo Technologies Tip: Exception: For a "Z Purge" system fitted in a Division 2 area, a non-classified switch inside the PE can be used to operate a remote Alarm provided its electrical supply comes from within the PE (i.e. NOT PROVIDING DRY CONTACTS). When the PE is in use the Alarm can operate normally in response to the pneumatic signal from the CU with option /PO. When the PE power is switched off there is no need for an alarm! Ask for the circuit diagram.

The Alarm switch can also be located in a nearby non-classified location. To get the best response time the switch should be as close as possible to the CU and the maximum length of tubing between the CU and the Alarm switch should not exceed 150 feet (45 m) unless "Quick Exhaust Valves" are used (please ask Expo if in doubt).

Note: No valves may be fitted between the Expo system and the alarm switch.

1.4 Power Supplies and their Isolation

1.4.1 All power entering the PE shall be provided with a means of isolation. This requirement also applies to any external power sources that are connected to "dry contacts" or "volt-free contacts" within the PE.

1.4.2 Electrical power for the protective gas supply shall be from a separate power source. If the same power source for the pressurized enclosure is used, it shall be power off before any service disconnects for the enclosure.

Exception: Power to Intrinsically Safe, or other apparatus, which is already suitable for the location, need not be isolated by the Expo Technologies system.

Expo Technologies Tip: It is recommended to fit dry or volt-free contacts in the non-classified area or inside an explosionproof box rather than inside the PE. Please ask Expo about "MiniPurge® Interface Units" (MIU).

In the case of "X" Pressurization, the isolation of the power must be controlled by the Expo system using the "Purge Complete" pneumatic signal to operate a "Power Switch" in a similar manner to that described in 1.3 above.

In the case of "Y" or "Z" Pressurization the power may be controlled manually by the user by the use of local isolating switch.

1.4.3 In accordance with NFPA 496, *Mini-X-Purge system shall be used on protected equipment requiring automatic shutdown, such as motors or transformers that could be overloaded or equipment that can develop higher temperature than the marked Temperature Class (temperature detector devices shall be provided to detect any increase in temperature).* Expo Mini-X-Purge® systems can have the "Action on Pressure Failure" (normally "Alarm and Trip") adjusted by the user to become "Alarm Only". In case of an alarm, it is the responsibility of the user to de-energize the protected equipment as soon as possible. The system may require the addition of an "Alarm Only Kit" (/AO) to perform this function. Please contact Expo Technologies Sales office for further details.

Exception: The power may remain connected for a short period if immediate cut-off could result in a more

hazardous condition and if audible and visual alarms are provided in a constantly attended location.

1.4.4 The Power (cut-off) Switch must be approved for the location or located in a non-classified area.

1.4.5 No valves are permitted between the Power Switch and the Expo system.

1.4.6 For "X" Pressurization, the PE door shall have fasteners that can be opened only by the use of a tool or key. Otherwise the additional requirements from NFPA 496 should apply.

1.4.7 Protection equipment containing hot parts requiring a cool-down period shall require the use of key or tool for opening.

Note: The door switch provided with the Expo system (when requested) can be either pneumatic or electric.

1.5 Marking

1.5.1 The MiniPurge® system carries a nameplate and a specification sheet, which give specific data such as serial and models numbers, Pressure Sensor settings, flow rates and purge time.

1.5.2 Other marking, for the PE, required by the standard includes:

> *"**WARNING - PRESSURIZED ENCLOSURE***
> *This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized"*
>
> *"Power shall not be restored after the enclosure has been opened until the enclosure has been purged for____minutes at a flow rate of_____."*

Expo note: It is understood that NFPA 496 requires the de-energization of all devices that are not suitable for the hazard e.g. devices that are not Explosionproof or Intrinsically Safe. For example, an explosionproof anti-condensation heater would not have to be de-energized.

1.5.3 If Inert Gas is used as the Protective Gas and a risk of asphyxiation exists, a suitable warning plate should be fitted to the PE.

Section 2 Operation of the System

2.1 Initial Commissioning

2.1.1 Check that the system has been installed in accordance with Section 1 of this manual.

2.1.2 Disconnect the supply pipe from the inlet to the Control Unit and blow clean air through for at least 5 seconds per foot of length (15 sec / metre) to remove any debris, oil and condensation.

2.1.3 Connect a temporary pressure gauge or liquid manometer to the PE or Control Unit “Pressure Test Point”, [on the LP Sensor, by the removal of the Red plug - 5/32” (4mm) OD nylon tube].

2.2 Commissioning Leakage Compensation (LC) and Continuous Flow High Purge (CFHP) ”X” Purge systems.

On LC and CFHP "X" Purge systems proceed as follows:

2.2.1 Open the Leakage Compensation Valve (LCV) to about 50% of its travel.

2.2.2 Open the supply shutoff valve SLOWLY and allow the PE pressure to rise until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

2.2.3 Open the supply shutoff valve fully and the purging flow will start.

2.2.4 Check that the internal logic gauge reads 30 psi (2 bar). If not, adjust the logic pressure regulator to suit (lift the red ring to unlock the knob first.)

2.2.5 At this time the “Pressurized” indicator should be Green and the “Purging” indicator should be Yellow. If the "Purging" indicator remains Black the flow through the Relief Valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure **at the inlet to the Control Unit while purging is taking place**. It must be above the minimum specified. The larger Super-Mini-X-Purge® system has a built-in gauge on the filter for this purpose.

2.2.6 On LC and CFHP "X" purge systems the purge timer will start as soon as the “Purging” indicator turns Yellow. Check that the time delay between the indicator turning Yellow and the application of power to the PE is not less than the minimum time required to purge the PE. Times in excess of the minimum are permitted and a tolerance of +25% is normally acceptable. If the time is too short it must be adjusted accordingly.

The system uses a pneumatic incremental timer which is adjusted by fully opening or closing one or more of five screwdriver-operated valves, arranged in a block on the control logic manifold – see GA Drawing. The opening of each valve incrementally provides a fixed number of minutes of purging time as in the following table

Valve:	1	2	3	4	5
Minutes:	2	4	8	8	16

Thus for a 12-minute purge time, valves 2 and 3 would be open and the others closed. For twenty-four minutes, 4 and 5 would be open and the others closed. **At least one valve must always be open and the screws must be at the appropriate limit of travel**.

2.2.7 After the power has been turned on by the Control Unit, the Purging Valve will close and the air flow into the enclosure will be controlled by the Leakage Compensation Valve (LCV). The initial setting of 50% open may be too high or too low. It should now be adjusted to set the PE pressure and leakage.

There are three possible situations:

a) Air continues to come out through the RLV Spark Arrestor after power has been turned on in considerable quantity. The LCV is too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not confuse this flow rate with that caused by excessive setting of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.1.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve may start to open intermittently as the PE pressure rises to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge. When the RLV opens the enclosure pressure falls quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

Then continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2" WC (5 mbar) and will be the "normal working pressure".

We recommend that the setting of the Minimum Pressure Sensor is checked at this time. Note the position of the LCV knob. Slowly lower the PE pressure by closing the LCV further counting the number of turns from the "normal working pressure" position. Note the pressure at which the "Pressurized" indicator turns Red and check that it is not lower than the figure given in the documentation. Check also the "Alarm" electrical contacts (if fitted).

As soon as the "Pressurized" indicator turns Red, the enclosure power will be switched off (see also 2.2.8 below) and the system will start to re-purge.

While it is re-purging return the LCV to its "Normal Working Pressure" position so that, at the end of purging the enclosure pressure should immediately settle down at the correct "normal" pressure. Finally re-adjust the LCV if necessary.

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not open far enough. The system will start to purge again. While it is purging open the LCV fully and check the enclosure for leakage. This time, at the end of purging, the enclosure should stay pressurized and the Relief Valve action be as in a) or b) above. It is likely that there is significant leakage from the enclosure and attempts to reduce the leakage will be time well spent.

CFHP systems are intended to have a Continuous Flow through the enclosure. The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number. Some CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized.

2.3 Commissioning Leakage Compensation (LC) and Continuous Flow/High Purge (CFHP) "Y" and "Z" Systems.

On LC and CFHP "Y" and "Z" Purge systems, proceed as follows:

2.3.1 Open the supply shutoff valve.

2.3.2 Adjust the Leakage Compensation Valve (LCV) so that the enclosure pressure rises to the point where the "Pressurized" indicator turns green.

2.3.3 Continue to raise the PE pressure until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

2.3.4 Lower the PE pressure until the "Pressuized" indicator turns Red. Check that the indicator turns Red at or above the pressure specified in the documentation. Check the external alarm contacts (if fitted).

2.3.5 Open the LCV again and set the PE pressure to a level around 50% of the RLV operating pressures. This "working" pressure is not critical. The "Pressurized" indicator should be Green.

2.3.6 Turn the Purge Control Valve "On". This will start the High Purge Flow and the "Purging" indicator should turn Yellow. If the "Purging" indicator remains Black the flow through the outlet valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure at the inlet to the Control Unit while purging is taking place. It must be above the minimum specified. (Super-Mini-Purge® systems have a built-in gauge on the filter for this purpose.) If the supply pressure is correct and the "Purging" indicator does not turn Yellow, there is too much leakage from the Pressurized Enclosure. Find and fix the leaks!

"Purging" does not start until the indicator turns Yellow

2.3.7 On LC and CFHP "Z" Purge systems the purge timing function is performed by the user. When the "Purging" indicator turns Yellow the Purge Flow is above the minimum required and the purge time can start. The user must ensure that the time delay between the indicator turning Yellow and the application of power to the PE is not less than the minimum time required to purge the PE as shown on the PE or Expo system nameplate.

Never turn on the power without purging first unless you have proved that the interior of the PE is gas free and checked that the "Pressurized" indicator is green!

2.3.8 After the purge time is completed the Purging Valve should be turned "Off". The High Purge Flow will cease and the air flow into the enclosure will then be controlled once again by the Leakage Compensation Valve (LCV), it should now be re-adjusted if necessary. The RLV should be closed and the enclosure pressure around 50% of the RLV opening pressure. If this is not so there are three possible situations:

a) Air continues to come out through the Spark Arrestor, after High Purge has been turned "Off", in

considerable quantity. The LCV is too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not confuse this flow rate with that caused by the excessive opening of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.1.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve will start to open intermittently as the PE pressure rises to the point where it exceeds the RLV opening pressure. When the RLV opens the pressure will fall quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge. When the RLV opens the enclosure pressure falls quickly to the point where the RLV re-closes and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

Continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2"WC (5 mbar) and will be the "normal working pressure".

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not open far enough. The LCV should be opened until the PE pressure is around the normal working pressure.

2.3.9 CFHP systems are intended to have a Continuous Flow through the enclosure. The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number. Some CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized.

2.3.10 "Y" and "Z" purge systems do not control the enclosure power. It is the responsibility of the user to switch off the power whenever the enclosure pressure falls below the minimum permitted i.e. when the "Pressurized" indicator turns Red.

2.4 Normal Operation

2.4.1 "X" Purge systems: Turn the air supply valve On or Off to start or stop the system, After this the Pressurizing and Purging sequence is entirely automatic.

2.4.2 "Y" and "Z" Purge systems are started and stopped in the same way as "X" purge system but the user must close the Power Switch only after the enclosure has been pressurized and purged sufficiently to ensure that the interior of the enclosure is gas free. It is the user's responsibility to shut off the power, as soon as possible after a pressure failure.

Section 3 Maintenance of the System

The maintenance recommended for the system consists of the following, supplemented by any additional local requirements imposed by the authority having jurisdiction.

3.1 Initial Maintenance

Expo recommends that the commissioning test be repeated at least every six months. They include checking the opening pressure of the Relief Valve, setting of the Minimum Pressure Sensor, the "Normal Working Pressure" of the enclosure and, for "X" Purge systems, the setting of the purge timer (as described in Section 2 of this manual).

In addition, the following checks are also recommended at that time:

- Check the RLV and any other Spark Arrestors. Remove any debris or corrosion, or replace the Spark Arrestor with a spare.

- Check the condition of the air supply filter element. Clean or replace it as necessary.

3.2 Routine Maintenance

At least every two years, the following additional checks are recommended:

- Apparatus is suitable for the Hazardous Location
- There are no unauthorized modifications
- The source of air is uncontaminated
- The interlocks and alarms function correctly
- Approval labels are legible and undamaged
- Adequate spares are carried
- The action on pressure failure is correct

Section 4 Fault Finding – LC and CFHP Systems

4.1 General

If the system does not behave in the manner described above there is a fault. Some of the more likely faults are dealt with below. If a cure cannot be effected by following the procedure shown below please call Expo (24 hour answering) or your supplier for further assistance.

The system has been designed for ease of fault finding and many of the components fitted are plug-in or sub-base mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo Technologies for investigation, with a full report of the fault and the system Serial number.

NOTE: As with any pneumatic system the greatest enemies are water, oil and debris in the air supply. For this reason a dust and water filter should always be fitted. But debris can enter from other sources and it is vital therefore that the procedures described in Section 2 is carried out before using the system for the first time, or following any disconnection of the pipework. Failure to perform this work may cause damage, which will not be covered under warranty.

Fault Finding

NOTE: Before making the following checks verify that the main supply pressure is between 60 and 115 psi (4-8 bar) at the Control Unit and, for X-Purge systems, the regulated pressure on the logic gauge is 30 psi (2 bar)

4.2 Minimum Pressure Alarm is ON Continuously ("Pressurized" Indicator is Red)

Possible cause 1: The Pressurized Enclosure (PE) pressure is too low. Try increasing the setting of the Leakage Compensation Valve (LCV) to raise the pressure in the PE.

Possible cause 2: Enclosure fault?

- Is the ACTUAL PE pressure below the setting of the Minimum Pressure Sensor? Check it with a manometer or gauge.
- Is there debris stuck on the face of the Relief Valve disk, perhaps held there because of the magnetic material?
- Has the PE door been closed and all conduit/cable glands sealed?
- Is the PE leaking too much?
- Has the pressure sensing tube been damaged?

Possible cause 3: System fault?

If checks above reveal that the PE is correct, the fault probably lies in the Control Unit. The basic operation of the Minimum Pressure Sensor can be checked by unscrewing the 2.4" (60mm) diameter diaphragm and, by using a finger, block the threaded hole in the top of the valve module. The valve should operate and the indicator should turn Green. If this works correctly and the enclosure pressure is above the setting of the Minimum Pressure Sensor it is likely that the Pressure Sensor diaphragm needs re-calibrating or replacing. (See 4.6)

4.3 Relief Valve Opens (Continuously or Intermittently)

Possible cause 1: The PE pressure is too high.

The Leakage Compensation Valve (LCV) is too far open. Adjust the LCV as described in Section 2 above.

Possible cause 2: Debris on the RLV disk allowing air to leak from the valve. Remove the RLV cover and clean the valve disk. The disk and spring may be removed from the RLV without affecting the calibration.

4.4 "Purging" Indicator Will Not Turn Yellow During Purging

Possible cause 1: Insufficient purging Flow due to inadequate air supply pressure. Check the air supply pressure at the inlet to the CU when flow is taking place. Excessive pressure drop in the supply pipe is a very common cause of this problem. The supply pipe must be at least as big as the CU inlet fitting, i.e. at least ½" NB (12 mm). Super-MiniPurge® systems with ¾" or 1" connections must have AT LEAST this internal diameter for supply and outlet tubing. Due to the high flows demanded from these large systems the need for adequate supply tubing is VITAL. If in doubt, or for long distances, install tubing that is at least 50% larger than the inlet size!

Possible cause 2: Excessive Pressurized Enclosure (PE) leakage. Check around the PE when flow is taking place. Any significant leakage must be cured. Has a Leakage Test been done? The total leakage should not exceed 10% of the Purge Flow Sensor setting. Check for leakage down the conduit through unsealed stopping boxes.

Possible cause 3: PE not strong enough. Repeat the PE pressure test. Is is recommended that the PE is tested to three times the Relief Valve opening pressure e.g. 12"WC (30 mbar) for systems with default settings. Has this been done?

Possible cause 4: The tubing from the RLV Flow Sensing point to the Purge Flow Sensor is not air-tight e.g. fitting nuts not tightened or tube damaged. Check and repair as necessary.

Possible cause 5: The Purge Flow Sensor is not operating correctly or out of calibration. The basic operation of the Purge Flow Sensor can be checked by unscrewing the 2.4" (60 mm) diameter diaphragm and by using a finger, block the threaded hole in the top of the valve module. The valve should operate and the indicator turn Yellow. If this works correctly and the flow through the Relief Valve is above the minimum required WITH THE RELIEF VALVE COVER FIRMLY SECURED IN PLACE the Sensor diaphragm needs re-calibrating or replacing.

4.5 System Fails to Switch Power On after the Purge Time has Elapsed? ("X"-Purge Systems Only)

Possible cause 1: Is power available? Is the power disconnect closed? Are the fuses or circuit breaker OK?

Possible cause 2: System fault? Timer not timed out?

a) Has the "Purging" indicator been Yellow for the whole of the purge time?

b) Is the logic pressure gauge at 30 psi (2 bar) ±10%.

c) Is there pressure at the Power Switch output bulkhead and at the Power Switch itself? Is the Switch set at 15 psi (1 bar)?

d) Is the pipe to the Power Switch airtight? The signal to the Power Switch bulkhead has a restrictor that limits the permissible leakage from the pipe.

e) Note the timer setting. Reset the timer to the minimum available purging period (see 2.2.6) and check operation on that purge time. If it works OK, increase the time progressively until either it is correct, or the system ceases to time out at all. In the latter case, there is an air leak in the timer circuit. (A leak in the timing circuit can cause the timer not to time out.) If possible, establish the source of the leak with soapy water and retest the system. This will involve removing the chassis from the Control Unit –be sure this is the cause before starting the work. It is VERY unusual!!

Ensure that the timer is returned to its original setting and the purge time checked before putting the system back into service.

Possible cause 3: Power Switch Fault. Check the operation of the Power Switch. It should close above 20 psi (1.4 bar).

4.6 Pressure Sensor Calibration

If it is decided that the Minimum Pressure Sensor or Purge Flow Sensor needs re-calibrating it can either be returned to Expo for this service or it can be done by the user as follows:

Disconnect the pressure sensing pipe from the top of the diaphragm. (It is a "push-in" quick release fitting; firmly push inwards the collar surrounding the pipe where it enters the fitting, and then pull the pipe outwards while maintaining the pressure on the collar). Unscrew the 2.4" (60 mm) diameter diaphragm housing from the top of the Sensor. Invert it and note the brass adjusting screw in the center. Turning the screw inwards (clockwise) will lower the setting. It is likely that the screw will be very stiff due to the locking sealant. If the screw cannot be moved the application of gentle heat in the area of the brass screw can often help. DO NOT OVERHEAT!

4.7 Filter Cleaning

If the filter element needs cleaning the transparent bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Expo Technologies tip: It is sometime easier, if the bowl is very tight, to remove the filter by undoing the fitting that holds the filter into the Control Unit. On Sub-Mini-X-Purge® systems it may be necessary to remove the Minimum Pressure Sensor diaphragm first.

Section 5 Annex of Options fitted

Refer to the annex of this manual for any options fitted as designated by the model code of the system

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Installation, Operation and Maintenance Manual for

MiniPurge® Continuous Flow (Model CF)

conforming to NFPA 496

IMPORTANT NOTE It is essential, to ensure conformity with the standard, that the user of the system observes the following instructions:

Please refer to the latest standard for detailed requirements and definitions.

(N.B. These instructions apply only to the Pressurizing system. It is the responsibility of the manufacturer of the Pressurized Enclosure to provide equivalent instructions for the Enclosure.)

Contents:

Section 0 Description and Principle of Operation

All MiniPurge® pressurization systems provide:

a) a method of pressurizing a Pressurized Enclosure (PE) while at the same time compensating for any leakage, together with

b) a method of purging the enclosure, before power is turned on, to remove any flammable gas that may have entered the enclosure while it was not pressurized.

Continuous Flow Systems, Model CF, allow air to flow through the PE continuously by having a fixed outlet aperture, which does not have any means of closure. The act of pressurizing the enclosure forces air to "leak" through the outlet aperture. The Control Unit admits sufficient air at the inlet to the PE to compensate for the air leaking out of the outlet aperture as well as from any other accidental leakage paths. The flow rate is constant both during purging and thereafter.

The Purging Flow rate is monitored by a separate "Purge Flow Sensor" located in the CU, which detects the differential pressure across the purge flow orifice located directly before the Outlet Orifice. The Purge Flow Sensor is set to operate when the desired differential pressure is exceeded. The output from the Flow Sensor is indicated on the CU and on "X" Pressurization systems, used to operate the automatic purge timer. Both Enclosure Pressure and Purge Flow have to be correct before the Purge Timer can start.

Type CF systems comprises the following major parts:

- A **Control Unit (CU)** containing as a minimum, for "Y" and "Z" Pressurization, a Flow Control Valve (FCV), Minimum Pressure and Purge Flow sensing devices, and a "Pressurized"/"Alarm" indicator. The CU supplies a "Pressurized" signal showing whether the PE pressure is satisfactory or not.

For Type "X" Pressurization, the CU has, in addition, a fully automatic Purging controller with a purge timer and electrical power switch interlock.

Note: For "Y" Pressurization, the electrical equipment inside the protected enclosure shall meet the requirement for Division 2 or Class 2 locations.

- A **Relief Valve (RLV)** fitted to the PE to provide a means of limiting the maximum pressure experienced by the enclosure during operation.

The RLV model number has suffixes giving the diameter of the valve aperture (in millimeters) and material, e.g. RLV **/cs (Carbon Steel) or /ss (Stainless Steel). All RLVs incorporate a Spark Arrestor to prevent sparks being ejected from the PE through the RLV aperture. The Relief Valve is fitted solely as a safety device and does not open in normal operation.

- An **Outlet Orifice**, which has been pre-calibrated so that the pressure drop at the desired flow rate is known. The Minimum Pressure Sensor within the CU will be set to the same figure as the pressure drop. When the PE pressure exceeds the calibrated pressure the Continuous Flow must be taking place.

The system is provided with one of the following types of calibrated Outlet Orifices. Please consult the system specification sheet to determine which has been supplied. The choice:

- Type SAU** where the Outlet Orifice disk is removable and can be easily changed by the user to give different flow rates according to the size of the PE and the available air supply capacity. (** denotes the metric thread size of the SAU body)

- SA** where the orifice size is fixed and the way to change the flow rate is either to change the setting of the Minimum Pressure Sensor or to replace the SA with one of another size. (** denotes the nominal thread size of the SA body)

- For low flow rates, the Outlet Orifice may be incorporated within the Relief Valve making use of the existing Spark Arrestor. The Relief Valve will then have a suffix /CF**, where ** is the orifice size in millimeters.

Section 1 Installation of the System

The installation of the MiniPurge® system, the protective gas supply, any alarm device should be in accordance with the requirements of NFPA 496.

The electrical installation associated with the MiniPurge® system shall conform to the local codes and the relevant clauses of NFPA 496.

All electrical parts of the MiniPurge system shall be installed in accordance with the applicable requirements of the NEC for USA and CEC for Canada.

1.1 Installation of the Expo CF System

1.1.1 The Expo system should be installed either directly on or as close as possible to the Pressurized Enclosure (PE). It should be installed so that the system indicators may be readily observed.

1.1.2 All parts of any system carry a common serial number. If installing more than one system, ensure that this commonality is maintained on each installation.

1.1.3 Any tubing, conduit and fittings used to connect to the PE should be metallic, or, if non-metallic, conform to the local codes for flammability ratings. No valve may be fitted in any tube connecting the Expo system to the PE.

1.1.4 The user or manufacturer of the PE shall determine the volume of the PE, the necessary purging volume, and the time to be allowed for purging, using the chosen Expo system purging flow rate. It is the user's responsibility to verify or enter this data on the PE and/or Expo system nameplate. Ask Expo if in doubt.

Example calculations:

a) If the PE external dimensions give a volume of 20 cubic feet, and it is NOT a motor, multiply the volume by four to get the Purging Volume i.e. 80 cubic feet. Divide the Purging Volume by the purge rate e.g. 32 cubic feet per minute, and round up to the next even minute above, i.e. purging time would be 4 minutes.

b) If the PE is a motor, multiply the internal free volume by ten to get the Purging Volume. For the above example, the Purging time would be 8 minutes.

For Type "Y" or "Z" Pressurization, the protected equipment may be permitted to be energized immediately where 25 Pa (0.1"WC) exist in the enclosure and the enclosure is known to be below the ignitable concentration of combustible material.

1.1.5 If the PE contains an internal source of release of flammable gas or vapor, the procedures for assessment of the release as given in NFPA 496 shall be observed. User must take precaution if abnormal release of flammable gas or vapor within the enclosure can affect the external area.

1.1.7 Where a release of flammable gas or vapor within an enclosure can occur either in normal condition or abnormal operation, protection shall be provided by one of the step as specified in NFPA 496.

For more information on enclosure containing internal source of release or enclosure containing an open flame, contact Expo Technologies.

The user must verify that the specification of the Expo system e.g. pressures, continuous flow (dilution) rate and type of protective gas are correct for the specific application.

1.1.8 More than one PE can be protected by a single system. If PEs are connected and purged in "series" e.g. "Daisy Chained", the Outlet Orifice must be fitted on the last enclosure with the Purge Inlet to the first enclosure. The Relief Valve may be fitted at any convenient location except when it has the option code /CF in which case it must be fitted on the last enclosure. The bore and length of the tube or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. Advice on sizing can be obtained from your Expo Technologies, sales office. The test pressure for all the enclosures should be 3 times the pressure inside the first enclosure when purging is taking place.

If PE's are to be connected in parallel each enclosure must have its own Outlet Orifice/Spark Arrestor, Relief Valve, Purge Flow Sensor and Pressure Sensor. System "Models" can be mixed e.g. Model LC for one enclosure and Model CF for another. An example would be a Gas Chromatograph instrument. Expo systems with this facility have option code /TW.

1.2 Quality and Installation of the Pressurizing Air or Inert Gas Supply

1.2.1 The **source of the compressed air** must be in a non-classified area. Inert gas may be used as an alternative to compressed air.

1.2.2 All pipe connection for the protective gas shall be protected from mechanical damage; where the source of the compressed air intake line passes through a classified location, the construction shall be of non-combustible material, and designed to prevent leakage of flammable gases, vapours, or dust into the protective gas. It must be protected against mechanical damage and corrosion.

1.2.3 Unless a supply shut-off valve has been specially fitted within the Expo system, a valve with the same, or larger, thread size as the Control Unit (CU) inlet fitting shall be fitted externally. In addition, for "Y" and "Z" Pressurization systems, a suitable nameplate shall be provided:

Note: To conform to NFPA: Any protected enclosure that can be isolated from the protective gas supply shall be equipped with an alarm and shall have this warning:

WARNING: PROTECTIVE GAS SUPPLY VALVE
This valve must be kept open unless the area atmosphere is known to be below the ignitable concentration of combustible materials or unless all equipment within the protected enclosure is de-energized.

1.2.4 The tubing and fittings used must conform to 1.1.3 above.

1.3 Provision and Installation of Alarm Devices

Expo Technologies systems have a Minimum Pressure Sensor set to a pressure of at least 0.1" WC (0.25 mbar). When the PE pressure is above this set point the Sensor produces a positive "Pressurized" signal. This is displayed on the Red/Green indicator. This signal can be used to operate an electrical contact for a remote "Alarm". The pneumatic signal may be supplied either

a) to a pressure operated switch (MiniPurge® Option Code /IS) suitable for an Intrinsically Safe circuit, in accordance with Expo drawing EP80-2-11 (or for a Non-Incendive circuit in Division 2), or

b) to a bulkhead fitting where it is available to the user (MiniPurge® Option Code /PO). It can then be used to operate an external electrical switch either local e.g. explosionproof, or remote in a non-classified area, or

c) to an external terminal box (MiniPurge Option® Code /PA). This option is available with an auxiliary switch(es) for signal and circuit control, assessable to user via the external junction box. This switch is suitable for use in the Hazardous Location in accordance to NEC500/505 requirements.

When the enclosure pressure falls below the set point of the Sensor, the "Pressurized" signal is removed, i.e. the absence of the signal indicates an "Alarm" ("Pressure Failure") condition. If the system "Alarm" indicator is not located in a place where it can be readily observed, the user must make use of this external alarm facility in accordance with NFPA 496 requirements.

Example: The "Pressurized" signal can be used to produce an "Alarm" action by means of a conventional "pressure switch" set to operate at around 15 psi (1 bar). The "Pressurized" signal from the CU at 30 psi (2 bar) or more will hold the switch in the operated position until the CU detects a low pressure in the PE and removes the "Pressurized" signal. The Alarm switch will reset and its contacts can be used to operate a remote electrical alarm.

If the switch is located in the hazardous area it must either be part of an Intrinsically Safe circuit, or be suitably protected e.g. explosionproof. The pressure switch should be IS or explosionproof even if it is fitted within the PE.

Expo Technologies Tip: Exception: For a "Z Purge" system fitted in a Division 2 area a non-classified switch inside the PE can be used to operate a remote Alarm provided its electrical supply comes from within the PE (i.e. NOT PROVIDING DRY CONTACTS). When the PE is in use the Alarm can operate normally in response to the pneumatic signal from the CU with option /PO. When the PE is switched off there is no need for an alarm! Ask Expo for the circuit diagram.

The Alarm switch can also be located in a nearby non-classified location. To get the best response time the switch should be as close as possible to the CU and the maximum length of tubing between the CU and the Alarm switch should not exceed 150 feet (45 m) unless "Quick Exhaust Valves" are used (please ask Expo if in doubt.)

Note: No valves may be fitted between the Expo system and the alarm switch.

1.4 Power Supplies and their Isolation

1.4.1 All power entering the PE shall be provided with a means of isolation. This requirement also applies to any external power sources that are connected to "dry contacts" or "volt-free contacts" within the PE.

1.4.1 Electrical power for the protective gas supply shall be from a separate power source. If the same power source for the pressurized enclosure is used, it shall be power off before any service disconnects for the enclosure.

Exception: Power to Intrinsically Safe, or other apparatus, which is already suitable for the location need not be isolated by the Expo Technologies system.

Expo Technologies Tip: It is recommended to fit dry or volt-free contacts in the non-classified area or inside an explosionproof box rather than inside the PE. Please ask Expo about "MiniPurge® Interface Units" (MIU).

In the case of "X" Pressurization, the isolation of the power must be controlled by the Expo system using the "Purge Complete" pneumatic signal to operate a "Power Switch" in a similar manner to that described in 1.3 above.

In the case of "Y" or "Z" Pressurization the power may be controlled manually by the operator using a local isolating switch.

1.4.2 In accordance with *NFPA496; Mini-X-Purge system shall be used on protected equipment requiring automatic shutdown, such as motors or transformers that could be overloaded or equipment that can develop higher temperature than the marked Temperature Class (temperature detector devices shall be provided to detect any increase in temperature).* Expo Mini-X-Purge® systems can have the "Action on Pressure Failure" (normally "Alarm and Trip") adjusted by the user to "Alarm Only". In case of an alarm, it is the responsibility of the user to de-energize the protected equipment as soon as possible. The system may require the addition of an "Alarm Only Kit" (/AO) to perform this function. Please contact Expo Sales office for further details.

Exception: The power may remain connected for a short period if immediate cut-off could result in a more hazardous condition and if audible and visual alarms are provided in a constantly attended location.

1.4.3 The Power (cut-off) Switch must be approved for the location or located in a non-classified area.

1.4.4 No valves are permitted between the Power Switch and the Expo system.

1.4.5 For "X" Pressurization, the PE door shall have fasteners that can be opened only by the use of a tool or key. Otherwise the additional requirements from NFPA 496 should apply.

1.4.6 Protection equipment containing hot parts requiring a cool-down period shall require the use of key or tool for opening.

Note: The door switch provided with the Expo system (when requested) can be either pneumatic or electric.

1.5 Marking

1.5.1 The MiniPurge® system carries a nameplate and a specification sheet, which give specific data such as serial and models numbers, Pressure Sensor settings, flow rates and purge time.

1.5.2 Other marking, for the PE, required by the standard includes:

> ***"WARNING - PRESSURIZED ENCLOSURE -*** *This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized"*
>
> *"Power shall not be restored after the enclosure has been opened until the enclosure has been purged for___minutes at a flow rate of___."*

Expo note: It is understood that NFPA 496 requires the de-energization of all devices that are not suitable for the hazard e.g. devices that are not Explosionproof or Intrinsically Safe. For example, an explosionproof anti-condensation heater would not have to be de-energized.

1.5.3 If Inert Gas is used as the Protective Gas and a risk of asphyxiation exists, a suitable warning plate should be fitted to the PE.

Section 2 Operation of the System

2.1 Check that the system has been installed in accordance with Section 1 of this manual.

2.2 Disconnect the supply pipe from the inlet to the Control Unit (CU) and blow clean air through for at least 5 seconds per foot of length (15 sec/metre) to remove any debris, oil and condensation.

2.3 Connect a temporary pressure gauge or liquid manometer to the PE or CU "Pressure Test Point" (on the Low Pressure Sensor, by the removal of the Red plug - 4mm OD nylon tube).

2.4 Open the supply shutoff valve. On "X" Purge systems check that the internal gauge reads 30 psi (2 bar). If not, adjust the logic pressure regulator to suit (lift the red ring to unlock the knob first.)

2.5 Adjust the Flow Control Valve (FCV) so that the enclosure pressure rises to the point where the "Pressurized" indicator turns Green.

2.6 Continue to raise the PE pressure until the Relief Valve (RLV) opens. Verify that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

2.7 Lower the PE pressure until the "Pressurized" indicator turns Red. Verify that the indicator turns Red at or above the pressure specified in the documentation. Check the external alarm contacts (if fitted).

Note: On Expo CF systems the Minimum Pressure Sensor set point may be significantly above the minimum of 0.1"WC (0.25 mbar) since it doubles as both the Pressure and the Purge Flow Sensor Set points of 1"WC (2.5 mbar) are common. Please check the documentation for the actual setting.

2.8 Open the FCV again and set the PE pressure to a level somewhere between the Minimum Pressure Sensor set point and the RLV opening pressures. This "working" pressure is not critical. Enough pressure to keep the "Pressurized" indicator Green is sufficient.

2.9 On "X" CF Purge systems the purge timer will start as soon as the "Pressurized" indicator turns Green. Check that the time delay between the indicator turning Green and the application of power to the PE is not less than the minimum time required to purge the PE. Times in excess of the minimum are permitted and a tolerance of +25% is normally acceptable. If the time is shorter than the minimum permitted, it must be adjusted accordingly.

MiniPurge® uses a pneumatic incremental timer which is adjusted by fully opening or closing one or more of five screwdriver-operated valves, arranged in a block on the control logic manifold – see GA Drawing. The opening of each valve incrementally provides a fixed number of minutes of purging time as in the following table

Valve:	1	2	3	4	5
Minutes:	2	4	8	8	16

Thus for a 12 minute purge time, valves 2 and 3 would be open and the others closed. For twenty-four minutes, 4 and 5 would be open and the others closed. At least one valve must always be open and the screws must be at the appropriate limit of travel.

2.10 On "Y" and "Z" Purge systems the purge timing and power control is performed manually by the user.

Never turn on the power without purging first, unless you have proved that the interior of the PE is gas free and checked that the "Pressurized" indicator is green!

2.11 On "X" CF Purge systems, once the purge time is completed the "Purge Complete" indicator turns Green. With both indicators Green, the power will be turned on by the CU. Using the FCV reduce the PE pressure to the point where both indicators turn Red and check that the power is automatically turned off. When the PE pressure is restored the system should

re-purge the PE before power is once again turned on.

2.12 After initial commissioning, the system is ready for normal operation:

a) “X” CF Purge systems: Turn the air supply valve On or Off to start or stop the system. After this, the Pressurizing and Purging sequence is entirely automatic.

b) “Y” and “Z” Purge systems are started and stopped in the same way as “X” Purge system but the user must close the Power Switch only after the enclosure has been pressurized and purged sufficiently to ensure that the interior of the enclosure is gas free. The power should be shut off as soon as possible after a pressure failure. This is also the user’s responsibility.

Section 3 Maintenance of the System

The maintenance recommended for the system consists of the following, supplemented by any additional local requirements imposed by the authority having jurisdiction.

3.1 Initial Maintenance

Expo recommends that the commissioning test be repeated at least every six months. They include checking the opening pressure of the Relief Valve, setting of the Minimum Pressure Sensor, the "Normal Working Pressure" of the enclosure and, for "X" Purge systems, the setting of the purge timer (as described in Section 2 of this manual).

In addition, the following checks are also recommended at that time:

- Check the RLV and any other Spark Arrestors. Remove any debris or corrosion, or replace the Spark Arrestor with a spare.

- Check the condition of the air supply filter element. Clean or replace it as necessary.

3.2 Routine Maintenance

At least every two years, the following additional checks are recommended:

- Apparatus is suitable for the Hazardous Location
- There are no unauthorised modifications
- The source of air is uncontaminated
- The interlocks and alarms function correctly
- Approval labels are legible and undamaged
- Adequate spares are carried
- The action on pressure failure is correct

Section 4 Fault Finding for CF Systems

4.1 General

If the system does not behave in the manner described above there is a fault. Some of the more likely faults are dealt with below. If a cure cannot be effected by following the procedure shown below, please call Expo (24 hour answering) or your supplier for further assistance.

The system has been designed for ease of fault finding and many of the components fitted are plug-in or sub-base mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo Technologies for investigation, with a full report of the fault and the system serial number.

As with any pneumatic system the greatest enemies are water, oil and debris in the air supply. For this reason a dust and water filter may be fitted. But debris can enter from other sources and it is vital therefore that the procedures described in Section 2 are carried out before using the system for the first time, or following any disconnection of the pipework. Failure to perform this work may cause damage which will not be covered under warranty.

Fault Finding

NOTE: Before making the following checks verify that the main supply pressure is between 60 and 115 psi (4-8 bar) at the Control Unit (CU) and, for “X” Purge systems, the regulated pressure on the logic gauge is 30 psi (2 bar)

4.2 Minimum Pressure Alarm is ON Continuously (“Pressurized” Indicator is Red)

Possible cause 1: The PE pressure is too low. Try increasing the setting of the Flow Control Valve (FCV) to raise the pressure in the PE.

Possible cause 2: Enclosure fault?

- Is the ACTUAL PE pressure below the setting of the Minimum Pressure Sensor? Check it with a manometer or gauge.

- Is the Outlet Orifice (if separate from the RLV) fitted correctly?

- Is debris stuck on the face of the Relief Valve disk, holding the valve open?

- Has the PE door been closed and all conduit/cable glands sealed?

Possible cause 3: Insufficient purging Flow due to inadequate air supply pressure. Check the air supply pressure **at the inlet to the CU** when flow is taking place. Excessive pressure drop in the supply pipe is a very common cause of this problem. The supply pipe must be at least as big as the CU inlet fitting, i.e. at least ½” NB.

Possible cause 4: Excessive PE leakage. Check around the PE when flow is taking place. Any significant leakage must be cured. Has a Leakage Test been done? The total leakage should not exceed 10% of the Continuous Flow rate.

Possible cause 5: PE not strong enough. Repeat the PE pressure test. FM recommend that the PE is tested to three times the Relief Valve opening pressure e.g. 12”WC (30 mbar) for standard systems. Has this test been done?

Possible cause 6: System fault?

Has the pressure sensing tube been damaged?

If checks above reveal that the PE is correct the fault probably lies in the CU. The basic operation of the

Minimum Pressure Sensor can be checked by unscrewing the 2.4" diameter diaphragm and, by using a finger, blocking the threaded hole in the top of the valve module. The valve should operate and the indicator should turn Green. If this works correctly and the enclosure pressure is above the setting of the Minimum Pressure Sensor it is likely that the Pressure Sensor diaphragm needs re-calibrating or replacing (See 4.5).

4.3 Relief Valve Opens (Continuously or Intermittently)

Possible Cause 1: The PE pressure is too high. The Flow Control Valve (FCV) is too far open. Adjust the FCV as described in Section 2 above.

Possible Cause 2: Debris on the RLV disk allowing air to leak from the valve. Remove the RLV cover and clean the valve disk. The disk and spring may be removed from the RLV without affect the calibration.

4.4 System Fails to Switch Power On after the Purge Time has Elapsed? ("X" Purge Systems Only)

Possible cause 1: Is power available? Is the power disconnect closed? Are the fuses or circuit breaker OK?

Possible cause 2: System fault? Timer not timed out?

a) Has the "Pressurized" indicator been Green for the whole of the purge time?

b) Is the logic pressure gauge at 30 psi (-0, +10%)

c) Is there pressure at the Power Switch output bulkhead and at the Power Switch itself? Is the Switch set at 15 psi?

d) Is the pipe to the Power Switch airtight? The signal to the Power Switch bulkhead has a restrictor that limits the permissible leakage from the pipe.

e) Note the timer setting and reduce the time down to a low setting to check operation on a short purge time. If it works OK, gradually increase the time until either the time is correct, or it ceases to time out at all. In the latter case, there is an air leak in the timer circuit.

If possible establish the source of the leak with soapy water and retest the system. This will involve removing the chassis from the CU –be sure this is the cause before starting the work. It is VERY unusual!!

Ensure that the timer is returned to its original setting and the purge time checked before putting the system back into service.

Possible cause 3: Faulty Power Switch. Check the operation of the Power Switch. It should close above 20 psi (1.4 bar).

4.5 Pressure Sensor Calibration If it is decided that the Minimum Pressure Sensor needs recalibrating it can either be returned to Expo Technologies for this service or it can be done by the user as follows:

Disconnect the pressure sensing pipe from the top of the diaphragm. (It is a "push-in" quick release fitting; firmly push inwards the collar surrounding the pipe where it enters the fitting and then pull the pipe outwards while maintaining the pressure on the collar). Unscrew the 2.4" (60mm) diameter diaphragm housing from the top of the Sensor. Invert it and note the brass adjusting screw in the centre. Turning the screw inwards (clockwise) will lower the setting. It is likely that the screw will be very stiff due to the locking sealant. If the screw cannot be moved the application of gentle heat in the area of the brass screw can often help. DO NOT OVERHEAT!

4.6 Filter Cleaning If the filter element needs cleaning the transparent bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Expo Technologies Tip: If the bowl is very tight, it is easier to remove the filter by undoing the fitting that holds the filter into the CU. On Sub-MiniPurge® systems it may be necessary to remove the Minimum Pressure Sensor diaphragm first.

Section 5 Annex of Options Fitted

Refer to the annexes of this manual for any options fitted as designated by the model code of the system.

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EU Declaration of Conformity CE

This declaration of conformity is issued under the sole responsibility of the manufacturer and EU authorised representative named above:

Object of the declaration:

Product Name:	MiniPurge Controller System
Product Options:	This declaration covers all variants associated with the above product

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

Type of Legislation:
Electromagnetic Compatibility Directive (EMC) 2014/35/EU
ATEX Directive 2014/34/EU

The Following harmonised standards and technical specifications have been applied:

Type of Legislation:	**General Standard:**	**Reference Standard:**
EMC Directive:	Generic standards - Immunity for industrial environments	EN 61000-6-2:2005
	Generic standards - Emission standard for industrial environments	BS EN IEC 61000-6-4:2007
ATEX Directive:	Equipment general requirements	EN IEC 60079-0:2018/AC:2020
	Equipment protection by intrinsic safety "i"	EN 60079-2:2014
	Equipment protection by pressurized enclosure "p"	EN 60079-11:2012

Notified Body:

NB Name:	ExVeritas
NB Number:	2804

Technical documentation and assessments are in the Expo Technologies confidential technical file SC004.

For and on behalf of Expo Technologies Ltd

John Paul De Beer
Managing Director

Date: 7th May 2024

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EU Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of the manufacturer and EU authorised representative named above:

Object of the declaration:

Product Name:	Electronic Timer Module (ETM-IS**_***)
Product Options:	This declaration covers all variants associated with the above product

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

Type of Legislation:
ATEX Directive 2014/34/EU

The Following harmonised standards and technical specifications have been applied:

Type of Legislation:	**General Standard:**	**Reference Standard:**
ATEX Directive:	Equipment general requirements	EN IEC 60079-0: 2018
	Equipment protection by intrinsic safety "i"	EN 60079-11: 2012

Notified Body:

NB Name:	ExVeritas
NB Number:	2804

Technical documentation and assessments are in the Expo Technologies confidential technical file SC039.

For and on behalf of Expo Technologies Ltd

John Paul De Beer
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EU Declaration of Conformity CE

This declaration of conformity is issued under the sole responsibility of the manufacturer and EU authorised representative named above:

Object of the declaration:

Product Name:	MiniPurge Interface Units (MIU/e)
Product Options:	This declaration covers all variants associated with the above product

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

Type of Legislation:
ATEX Directive 2014/34/EU

The Following harmonised standards and technical specifications have been applied:

Type of Legislation:	**General Standard:**	**Reference Standard:**
ATEX Directive:	Equipment general requirements	EN IEC 60079-0:2018
	Equipment protection by increased safety "e"	EN 60079-7:2015+A1:2018
	Equipment dust ignition protection by enclosure "t"	EN 60079-31:2014

Notified Body:

NB Name:	ExVeritas
NB Number:	2804

Technical documentation and assessments are in the Expo Technologies confidential technical file SC027.

For and on behalf of Expo Technologies Ltd

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Date: 7th May 2024

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