



Information Sheet

Introduction to Purge and Pressurization



OVERVIEW

Purge and Pressurization is a method of protection used in hazardous locations to ensure that the interior of an electrical enclosure is free of flammable gas.

Pressurization is generally used for electrical equipment that cannot be protected by other means, either because it is too large to be made explosion-proof, or too high powered to use intrinsic safety.

A vast range of electrical equipment is regularly protected by this very flexible technique.

Using a suitable purge control system and pressurized enclosure, purge and pressurization, provides an equivalent degree of safety to Flameproof (Explosion-proof) or Intrinsic Safety techniques. It also offers significant advantages of safety and durability.

PRESSURIZATION PROCESS

The pressurization process is very simple. Purge gas, normally compressed air, keeps the internal pressure of an enclosure above the pressure outside. External flammable gas cannot enter the enclosure while it is pressurized.

Before power can be switched on, the enclosure must be purged to remove any flammable gas that may have entered the enclosure before it was pressurized. Purging is the action of replacing the air inside an enclosure with air known to be free of flammable gas.

FEATURES

- + Internationally recognized.
- + Flexible method protects a wide range of equipment.
- + Suitable for one-off equipment or volume production.
- + More than one enclosure can be pressurized in series.

INTERNATIONAL RECOGNITION

Purge and pressurization is an Internationally recognized method of protection for electrical equipment in hazardous locations. Expo products carry certifications and approvals from internationally recognized test laboratories. These confirm compliance with the appropriate standards. For IEC countries IECEx certification has been obtained. In Europe, conformity to the ATEX directive EC94/9 is compulsory. In North America the National Electrical Code or Canadian Electrical Code seeks conformance with NFPA496. The use of purge and pressurization systems approved to the appropriate standard ensures conformance with local requirements. Expo products carry multiple approvals making them truly global products.

TYPICAL APPLICATIONS

Computers
 Monitors
 Printers
 Barcode systems
 Data recorders
 Condition monitoring systems
 Instrumentation and electrical panels
 Electric motors
 Analyzers
 Motor control centers

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EXPO INFORMATION

Purge and Pressurization

PRACTICAL IMPLEMENTATION

Expo manufactures purge control systems and pressurized enclosures. These meet the needs of both local regulations and of the Global OEM who is serving several markets. This is complemented by a range of accessories which enable a full solution to be offered.

The main product ranges are :

Mini-X-Purge

MiniPurge™ is a range of purge and pressurization systems which cover enclosure sizes from small to very large. Carrying IECEx, ATEX (European) and FM and UL approvals, this flexible range meets the needs of the local installation and the global OEM. It employs pneumatic logic, thus remaining independent of electrical supply voltage, ensuring the simplest installation.



**Mini-X-Purge CF
Control Unit**

Mini-Z-Purge systems offer economic protection for Class I Division 2 or Zone 2 applications in accordance with NFPA 496 and IEC/EN60079-2. It offers the ease of use, clear indication and flexibility expected of Expo products.



**Mini-Z-Purge
CF Panel Mount**



**Mini-Z-Purge
LC Back Plate**

SmartPurge™ is a flexible microprocessor controlled system. It is ATEX certified, covering a wide range of applications. The programmable flexibility of this product ensures minimum design effort for the integrator. Clear LCD display gives useful status indication, and universal input voltage suits the Global OEM.



**Control Unit
(SPC-UV)**



**Remote Panel
(SRP-1)**

PRODUCT RANGE

To use purge and pressurization to protect equipment in a hazardous location the equipment must be housed in a suitable enclosure. The correct purge system can then be installed. In some cases, such as large electric motors, the equipment is already in a suitable enclosure. In most cases the enclosure is not leak tight and will not have the strength required to stay sealed under pressure. Expo designs and manufactures standard or customized enclosures specially suited to pressurization. To select a purge system, the Expo Purge System Selection Wizard can be used. This determines the classification of the hazardous location, and the size of the enclosure, and then selects a list of purge systems which may be suitable. This is refined based on the power and signals of the equipment and the acceptable purge time. Different sets of regulations have different methods to decide the purge time required. In general between 4 and 7 volume changes will meet the requirements. These requirements are summarized below.

	Purge Type	Purge Volume
North America Class I Division 1	Type X Automatic	4 x enclosure
Class I Division 2	Type Z Manual	4 x enclosure
IEC/Europe Zone 1	Type px Automatic	5x enclosure or Purge Test
IEC/Europe Zone 2	Type pz Manual	5x enclosure
Zone 2	Type Ex nZ or nP	No longer acceptable

There are also different methods of purging. Most purging is done using compressed air, but in certain cases inert gas is used. Fan generated air can also be used. When using compressed air either Leakage Compensation or Continuous Flow can be used. Continuous Flow passes the same flow rate during purge and afterwards. Leakage Compensation provides an initial high flow of air to purge, then reduces the flow to a small amount, just enough to compensate for leakage from the enclosure. With all but the smallest enclosures, Leakage Compensation systems are preferred, as they minimize the consumption of compressed air, and yet can have quite short purge times.

Where equipment is housed in more than one enclosure, enclosures can be purged in series using one purge system. Interconnection tubes must be of adequate size and other precautions taken. Expo can advise on this if required. The final consideration must be thermal management, as, in order to pressurize an enclosure, free ventilation is usually not possible. Expo can offer advice and solutions for thermal management of pressurized enclosures. Expo has decades of experience and can discuss and advise on specific application problems.

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Product Data Sheet


Mini-X-Purge

Control System for Leakage Compensation

For enclosures up to

1XLC/___/___ 60 cu ft, 1.35 m³
2XLC/___/___ 120 cu ft, 2.7 m³
3XLC/___/___ 240 cu ft, 5.4 m³

Ex [px] Zone 1 (21) IECEx Category 2 GD ATEX
X-Purge Class I Division 1 FM cULus





OPERATION

The MiniPurge system provides a full purge and pressurize system for Class I Division 1 Gp A-D, Zone 1 (21) IIC applications. When fitted to a suitable enclosure the system enables regular electrical equipment to be operated safely in a hazardous location.

Certified in compliance with IEC, European and American standards and codes, the system controls purge and pressurization process. Initially the system provides a high flow of protective gas, usually compressed air. The flow through the enclosure is verified by measuring where it exits at the Relief Valve. Provided the flow is sufficient the indicator shows yellow and the purge timing proceeds. At the end of the purge time the purge flow is switched off and only a small air flow is used to compensate for any leaks in the enclosure. This keeps the pressure inside the enclosure slightly higher than the outside pressure, preventing flammable gas entering the enclosure. Whilst this safe condition is maintained the system output enables power to be applied to the equipment, either directly or via a separate interface unit.

For dust applications [Ex pD] see certificate for "conditions for safe use".

COMPONENTS

The system consists of two components: the Control Unit (CU) and the Relief Valve (RLV). The CU controls the supply, measurement and flow of the protective gas, and provides the outputs to indicate status. The RLV allows the flow of purge gas, and provides the measurement of the flow through the enclosure then closes the outlet at the end of purging.

FEATURES

- + **One Model number:** includes the Control Unit (CU) and Relief Valve (RLV).
- + **Direct Mount:** no interconnecting pipe work. Reduced material and labor cost.
- + **Size:** Compact Control Unit and Relief Valve (No real-estate wastage around the purged enclosure).
- + **316L Stainless steel housings and fittings** for use in harsh environments.
- + **Purge Flow:** measured at the Relief Valve, outlet. Gives full compliance with standards. See IEC / EN 60079-2, NFPA 496 Chapter 3-4. "have passed through the purge enclosure".
- + **Multiple enclosures** may be purged in series.
- + **Independent of supply voltage.**
- + **Global approvals** so ideal for the OEM.

OUTPUTS

The system provides outputs for power interlock and alarm. The power output interlocks the power to the enclosure, and the alarm indicates if there is a failure of pressurization. The outputs can be either a pneumatic signal to operate a suitable interface unit, model /PO, or dry contacts for connection to Intrinsically Safe, model /IS or (IECEx & ATEX only) flameproof circuits, model /PA.

ACCESSORIES

Expo manufactures a range of interface units which will provide additional isolation either from the pneumatic output, or from the electric contacts. The most popular is the MIU dA (Ex d IIC T5) which provides 4 pole 12 Amp (UL) or 16 Amp (IEC) contacts for power, and a SPCO contact for alarm, operated from the pneumatic outputs.

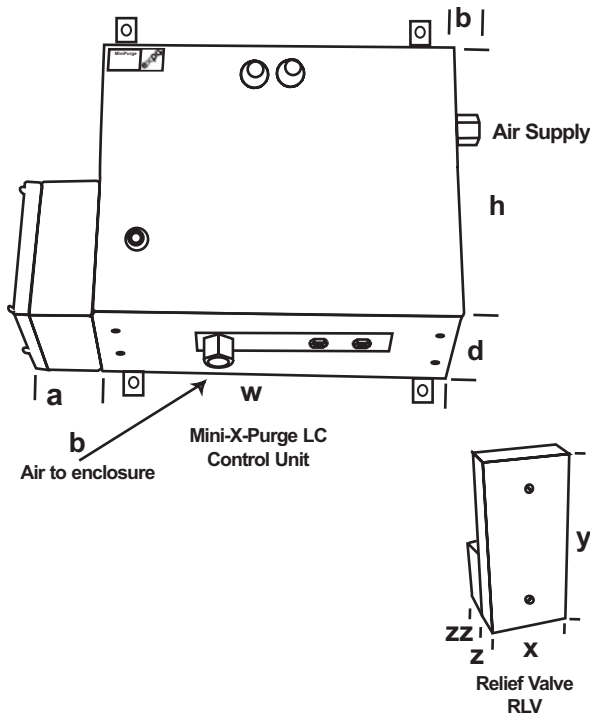
Expo also supplies enclosure cooling, operator interfaces, custom built and standard enclosures and a full technical support facility.

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Technical Specification MiniPurge

1XLC/___/___, 2XLC/___/___, 3XLC/___/___



Dimensions/Spec	1XLC/ss/___	2XLC/ss/___	3XLC/ss/___
Width w	9.5" 240mm	9.5" 240mm	14.2" 360mm
Height h	7.1" 180mm	9.5" 240mm	14.2" 360mm
Depth d	6.0" 150mm	6.0" 150mm	6.0" 150mm
RLV Width x	2.5" 62mm	3.5" 88mm	4.3" 110mm
RLV Height y	5.2" 133mm	6.7" 170mm	7.3" 185mm
RLV Ext Depth z	1.3" 33mm	1.5" 38mm	1.7" 42mm
RLV Int Depth zz	0.67" 17mm	0.67" 17mm	0.67" 17mm
T-box PA only a	4.0" 102mm	4.0" 102mm	4.0" 102mm
Fitting 1/2" NPT b	1.3" 33mm	1.3" 33mm	1.3" 33mm
Signals 1/8" NPT c	0.3" 8mm	0.3" 8mm	0.3" 8mm
Weight	12.1lb 5.5kg	13.3lb 6.1kg	33lb 15kg

COMMON SPECIFICATION

Purge Supply medium	Instrument quality compressed air or Inert gas Flammable gas free
Purge Supply pressure	Regulated pressure between Min 4 bar (60 psi) and Max 8 bar (115 psi)
Purge supply capacity	At least 1.5 times certified flow rate. See product code
Low pressure sensor setting	50 Pa, 0.5 mbar, 0.2"wc
Temperature	-20°C, -4°F to 55°C, 131°F
Materials of construction	CU and RLV enclosures , 316L st. steel
Relief Valve (RLV)	Magnetic operation (patented)
Opening pressure	1kPa, 10 mbar, 4" wc
Spark arrestor	Integral to RLV, 316 Stainless Steel mesh
/PO "Power Output"	2 bar 30 psi when power enabled no output for trip/disconnect
"Alarm Output"	No output pressure = Alarm 2 bar 30 psi when pressure OK
/IS	Dry contacts for switching intrinsically safe circuits "Power " contact closed to enable power, contact open for trip disconnect.
/PA	(IECEX & ATEX Only) Ex e IIC Junction Box and Integral Ex d IIC T5 Power (DPNO) and Alarm (SPCO) switches 6AAC1, 4AAC15

OPERATION

Type Number (example)
07 1 X LC/ss/PO/--

Size

- 1 Purge flow rate 8 scfm, 225 NI/min
- 2 Purge flow rate 16 scfm, 450 NI/min
- 3 Purge flow rate 32 scfm, 900 NI/min

Certification / Approval

X IECEx SIR 07.0027X Ex [px] Ex pD
Europe, ATEX category 2 GD
Cert no SIRA 01 ATEX 1295X
USA/Canada NFPA496(2003) CII Div 1
cUL E190061, FM 1X8a4AE

Pressurization method

LC Leakage Compensation after initial purge

Housing

ss Stainless Steel

Output see above

PO Pneumatic Output
IS Intrinsically Safe Output
PA Power and Alarm Output (IECEX & ATEX only)

Options

WM Wall Mounting bars

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Product Data Sheet

**IECEX
& ATEX
Certified!**

Mini-Z-Purge Control System for Continuous Flow

For enclosures up to
1ZCF/___/___ 17 cu ft, 0.39 m³

Z-Purge Class I Division 2

Ex [pz] Zone 2(22) IECEX Category 3 G D ATEX

Mini-Y- Purge 1YCF/___/___ 17 cu ft, 0.39 m³

Y-Purge Class I Division 1 Groups A, B, C & D

Ex [py] Zone 2(22) IECEX Category 3 GD ATEX



MiniPurge
CF panel mount

MiniPurge
CF back plate

FEATURES

- + **One Model number: includes Control Unit, Spark Arrestor Unit and Relief Valve.**
- + **Simple integrated mounting with little or no piping needed.**
- + **IECEX, ATEX, FM and cULus approvals covering IEC/EN 60079-2 and NFPA 496.**
- + **Clear visual status indication.**
- + **Remote Alarm contacts.**

COMMON SPECIFICATION

The Control Unit:

Purge Medium: Compressed Air or Inert Gas, clean, dry & free of flammable gasses.

Supply Pressure: 60 psi (4 bar)

Maximum working pressure: 115 psi (8 bar)

Temperature range: -20°C, -4°F to 55°C, 131°F

Supply Inlet 1/4 NPT(F): Connected with 1/2" (12mm) O/D [Min. 3/8" (10mm) I/D] pipe. 33ft (10 meter) Max Length

Relief Valve RLV25 (Full 1" bore)

Magnetic operation (patented) with integral spark arrestor.
Opening pressure 1kPa, 10 mbar, 4" wc

Spark Arrestor Unit - SAU25

User Selectable: supplied with 8 orifice plates for Purge
Flows of: **0.4, 0.9, 1.4, 2.3, 3.2, 4.8, 6.4 or 8.0 scfm**
(NI/min: 10, 25, 40, 65, 90, 135, 180, or 225)

Alarm Indicators: "Alarm" Red Indicates Low Pressure.
Green Indicates Pressure OK
Low Pressure Sensor "Alarm": setting 1" WC (2.5 mbar)

Permissible Enclosure Leakage: 2 scfm (60 NI/min)

Materials of Construction

Control Unit: 316L stainless steel mounting plate.

Spark Arrestor Unit: 316L stainless steel

Relief Valve: 316L stainless steel.

Weight: 5 lb (2.4kg) approx

OPERATION

For purged enclosures in Class I Division 2 Gp A-D or Zone 2 IIC Ex [pz] or Ex [py] and Zone 22 Ex pD.

The initial purge flow removes the gasses, which may be present in the area when the enclosure is closed. After the purge cycle has been completed it continues to maintain pressurization. For enclosures with an internal source of flammable gas or vapor release, the continuous flow can be set to reduce the concentration below 25% of the LFL (LEL). Reference must be made to IEC/EN 60079-2 or NFPA 496 Standards before applying.

The Continuous Flow (CF) Pressurizing system is designed for small to medium size purged enclosures. Typical Enclosure Size: 17 cu ft (0.39 m³) @ 3.2 scfm = 90 NI/min
Note: Enclosure sizes are based on 30-minute purge period. There is no restriction on this purge period.

COMPONENTS

The system has three components. The Control Unit controls air flow and monitors flow and pressure. The Spark Arrestor Unit (SAU) provides a protected fixed measuring orifice to measure flow through the enclosure. The Relief Valve (RLV) provides over-pressure protection for the enclosure. Preferred options are Panel Mount and Back Plate option. Panel Mount fits directly on the enclosure with minimum external space. Back Plate mounts either directly onto the outside of or remote from the enclosure.

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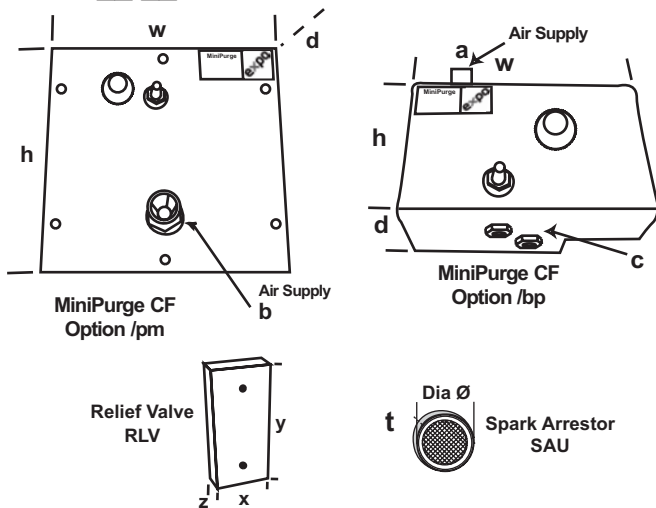


Technical Specification

Mini-Z-Purge Mini-Y-Purge

1ZCF/___/___ 17 cu ft, 0.39 m³

1YCF/___/___ 17 cu ft, 0.39 m³



Dimensions/Spec.		1ZCF/pm/___ 1YCF/pm/___		1ZCF/bp/___ 1YCF/bp/___	
Width	w	7.9"	200mm	7.8"	197mm
Height	h	7.9"	200mm	5.0"	127mm
Depth	d	2.4"	62mm	3.1"	79mm
RLV Width	x	2.4"	62mm	2.4"	62mm
RLV Height	y	5.2"	133mm	5.2"	133mm
RLV Depth	z	1.3"	33mm	1.3"	33mm
Fitting Length	a	1.0"	25mm	0.4"	11mm
Fitting NPT	b	1/4"		1/4"	
Signals NPT	c	1/8"		1/8"	
SAU Diameter	Ø	2.2"	55mm	2.2"	55mm
SAU Depth	t	1.4"	35mm	1.4"	35mm

Selection of Orifice Plate				
Orifice Plate #	Purge Flow		Enclosure Volume	
	scfm	NI/min	ft ³ (4 VC*)	m ³ (5 VC*)
1	0.4	10	3.0	0.06
2	0.9	25	8.3	0.15
3	1.4	40	10.5	0.24
4	2.3	65	17.2	0.39
5	3.2	90	24	0.54
6	4.8	135	36	0.81
7	6.4	180	48	1.08
8	8.0	225	60	1.35

*VC = Volume Changes (based on 30 minute purge time)

COMMON SPECIFICATION

Panel Mount

Model No. 1ZCF/pm/IS or /PO

Model No. 1YCF/pm/IS or /PO

Control Unit Location: Side or Front of purge enclosure

Back Plate

Model No. 1ZCF/bp/IS or /PO

Model No. 1YCF/bp/IS or /PO

Control Unit Location: Top, Side or Bottom of purge enclosure

Warning Label (loose) for User's calibration details, for mounting to purged enclosure.

"Alarm" Remote Output options:

/PO Pneumatic output"

"Alarm Output" Main supply 60 psi / 4 bar

Pressure Output "Pressure OK". No output "Alarm".

/IS Dry contacts for switching non-incendive or intrinsically safe circuits. "Alarm" open on loss of pressure.

Note on IS Output (Type Z and Ex pz Only)

IS output can be connected to Intrinsically Safe or non-incendive circuits, with the panel mount PM option, it can also be connected to general purpose (GP) circuit powered from inside the enclosure.

OPERATION

Type Number (example)

07 1 Z CF/bp/IS

Size

1 Purge flow rate 8scfm, 225 NI/min

Certification / Approval

Z North America Class I Division 2
FM 1X8a4AE, cUL E190061
IECEX SIR 07.0027X Ex [pz] Ex pD
Europe ATEX Category 3 GD
SIRA 01ATEX1295X Ex [pz] Ex pD

Y

North America Class I Division 1
For protecting Class I Division 2 equipment
FM 1X8a4AE, cUL E190061
IECEX SIR 07.0027X Ex [py] Ex pD
Europe ATEX Category 3 GD
SIRA 01ATEX1295X Ex [py] Ex pD

Pressurization method

CF Continuous flow

Housing

bp Back Plate

pm Panel Mount

Output

IS Intrinsically Safe Output

PO Pneumatic Output

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