



EX-PRESS pressurized enclosures Exp

Together with flameproof enclosures (= protection method Exd) the pressurized enclosure is the easiest way to allow the operation of 'non explosion protected' devices in hazardous areas. However, the (more economic) flameproof enclosure is limited in dimensions, so that the application of pressurized enclosures is often situated in the world of big housings. Other applications can be found in the analyser-sector.

Exp

The protection type "Exp" is used a.o. to install big switchboards in the hazardous gaszone. These housings of category 2G and/or 3G can be installed in respectively gaszones 1 and/or 2. Penetration of the dangerous atmosphere is prevented by maintaining a constant pressure using air or a protective gas. This overpressure can be maintained by a continuous flow.

The measures that should be taken in case of failure of the pressurization are divided according the zone and potential ignition sources.

Some time ago, the internal volume was purged 5 times before passing on the power to the internal electric/electronic components. Afterwards, people assumed all possible dangerous gasses (both heavier and lighter than air) were gone.

The latest edition of the EN 50016 does not allow this assumption any more. The manufacturer should now determine the purge volume needed by a double purge test. Testgasses are helium (= light gas) and carbon dioxide (heavy gas). The 5x-rule is thus tested by practical experience.

The temperature class (= maximum surface temperature of the enclosure) depends on the heat dissipation of the built-in electric components and the (partial) temperature classes of the components of the Exp-system itself.

ExpD

This protection type has been deduced from "Exp" and is used to place big switchboards in hazardous dustzones. These housings of category 2D and/or 3D can be installed in respectively dustzones 21 and/or 22.

The required prepurging for gasexplosion is not allowed for dustexplosion, because turbulence of the deposited dust would create a hazardous area. The below text is thus applicable for gas (Exp) except when mentioned.

The below mentioned standard prescribes specifically that the inside of the housing must be completely dust-free before switching on the pressurization system. Indeed, dust could have penetrated the housing while the system was out of service. The measures that should be taken in case of a failure are divided following area and potential ignition sources.

Certification

- Ex p system according EN 50016 / EN 60079-2
- Ex pD system according EN 61241-4
- Safety function test according EN954-1, category 3.



Pressurized enclosure system FS850

The pressurized enclosure system FS850 contains at least a control unit FS850S and a solenoid valve. Each can be mounted in- or outside the enclosure. Furthermore several remote controls (operation panels) are available to improve ergonomics of operation. It is also possible to connect intrinsically safe sensors to the control unit FS850S. The pressurized enclosure system EX-PRESS operates in two different models: Pressurisation using leakage compensation and Pressurisation using continuous flow of protected gas.

- Menu guided programmable operation modes

- leakage compensation / continuous flow
- digital solenoid valve / proportional solenoid valve
- pressure indication (purging volume) / flow indication (purging time)

- First system containing a proportional working pressure and flow sensory

No membrane switches, no screws or potentiometer to adjust pressure or flow thresholds.

- High availability because of regulated pressure and proportional valve

- high service reliability because of constant pressure
- no purge medium wasting, just the exact quantity to hold the pressure is needed
- increasing leakage caused by e.g. enclosure aging will be balanced and therefore sudden pressure failure will be prevented
- almost no flow noise and only a small protective gas consumption using a solid enclosure

- Purging with pressure regulation

- pressure sensitive parts of the enclosure like membrane switch panels or windows will not be overloaded
- purge volume accuracy is achieved by integration of the purge medium flow on the outlet
- 2 digital solenoid valve or proportional solenoid valve technique for continuous flow operation mode
- prevents overload and burst danger of the Ex p enclosure caused by disturbances at the outlet

- Terminal specifications

- 2-pole potential free terminals, switching capacity 250VAC / 5A / $\cos \phi \geq 0,7$
- integrated intrinsically safe interface for additional safety sensory
- valve fuse is exchangeable placed inside the control unit FS850S - no separate Ex e fuse box required
- the build-in spark lattice allows to let off the purge medium direct into the hazardous area

- Display

- on-line text messages of operation and malfunction states
- states of pressure or flow are anytime available
- displays menu and messages as plain text
- available languages: German, English, French and Dutch



- High safety standards

- dynamical drivers of the switch contacts
- automatical function test of the sensors and A/D transformer
- purge time security by 2 independent time generators
- installations in double stored in a EEPROM
- alarm messages on LC-Display
- many years of experience in pressurized enclosures according 50016 made the develop of this Ex p system possible
- approved function security according EN954-1, categorie 3

- Leakage compensation

After purging, the control unit FS850S holds the pressure inside the enclosure on at least 0,8 mbar. For that two different solenoid vane techniques are available : digital working solenoid valve (DSV) technique or proportional working solenoid valve (PSV) technique.

- Continuous flow

The control unit FS850S has moreover the operation mode "continuous flow" implemented. This

operation mode is necessary, for example, if an analyser could produce an explosive atmosphere inside the enclosure (containment system). The operation mode continuous flow purges the enclosure permanently. After the (pre-)purging procedure (purging process) a set-point flow rate is adjusted during normal operation. The monitored flow rate minimum is adjustable. The operation mode continuous flow can be realised using 2 digital solenoid valves as well as using one proportional solenoid valve.

Digital solenoid valve technique (SVD)

While purging, the SVD is activated and a big amount of purge medium flows inside the enclosure through a nozzle with a large cross-section. After purging, the control unit turns off the SVD. The leakage compensation is made by a bypass choke, with a very small adjustable cross-section (diameter 0,3 ... 1 mm), inside the valve. The protective medium that flows into the enclosure now is adequate to maintain a pressure of at least 0,8 mbar. The pressure is monitored by the control unit FS850S. The maximum and minimum pressure of the enclosure is programmable.

For purging, a common and a new integrating method is available:

1. Using the traditional method, purge quantity is a product of a pre-set minimum of flow rate and time. The flow rate depends on the size of the internal nozzle (diameter 1 ... 6 mm) of the valve and can be specified by matched charts. The common rule of purging must be considered: flow minimum is less than let in minus leakage loss. This purging method is named as time based purging method.

2. In contrast to the common one the integrating purging method measures the real volume flow through the enclosure outlet and adds it up to get the real purge volume. Besides, the flow rate is monitored, dependent on the size of the plate orifice of the control unit. If the flow rate sinks below its minimum, it will be ignored and it will not contribute to volume integration. Therefore we achieve a safe and economic purging method.

Pressure inside the enclosure will be observed by each purging method.

The digital solenoid valve technique has a considerable disadvantage: while purging process and normal operation, a constant rate of protective gas is needed. Of cause of safety the rate must be bigger than leakage rate of the enclosure. But wasting protective gas causes high costs in many applications.



Nota: According EN 50016 the purge time will be determined by a light testing gas (He) and a heavy testing gas (CO₂).

Proportional solenoid valve (SVP)

Using proportional solenoid valve technique stops wasting protective gas. The internal proportional working sensory equipment and a proportional valve as actuator are combined to a pressure feedback control system.

Advantages of pressure feedback control are:

1. Considerable less consumption of protective gas - additional costs for proportional valve will be amortised soon.
 2. Increased service reliability achieved by constant pressure inside enclosure - increasing leakage caused by e.g ageing of the enclosure will be balanced and sudden failure will be prevented.
 3. Almost no flow noise and only a small protective gas consumption using a solid enclosure.
- Another advantage using a proportional solenoid valve is; that pressure control is used even during purging. A set-point pressure will be achieved in the enclosure, while the flow volume, that leaves the enclosure, will be recorded and integrated through time, until the required purge volume is achieved.

Advantages of this method are:

1. A definite pressure while purging - pressure sensitive parts of the enclosure, like membrane switch panels or windows, will not be overloaded.
2. Purge volume accuracy is achieved by integration of the purge medium flow volume on the outlet. Wasting purge medium is no more a topic of today.

Operation panels

For the control unit FS850 several operating and visualising panels are available. The panels have the explosion protection class intrinsically safe and are very advantageous, particularly when the control unit is mounted inside the enclosure.

1. Common operating panels: BT854 and BT855 with
 - on/off switch
 - key-operated switch for bypass
 - LED indicator "Ready"
 - LED indicator "On"
2. Intelligent operating panel type BT851.0 and BT851.5.

This operation panel indicates operation and malfunction reports as text messages. Using the 4 membrane switches offers total command of the control unit. Status, momentary pressure and flow rate as well as remaining purge time are always available. The connection to the control unit counts only 3 wires.

Performance and service

The control unit is tested by DMT 99ATEXE003. A certificate for a complete pressurized enclosure consisting of Ex p - ignition capable apparatus - Exp control unit F850S can be delivered by Ysebaert NV. (= demand of directive 94/9/EC for zone 1/21 = category 2G/2D).

We offer you:

- only the components (integrators)
- construction and manufacturing of a custom Ex p enclosure in GRP, steel plate or stainless steel, according to your wishes