PROCESS AUTOMATION

INSTALLATION AND OPERATION MANUAL

6000 SERIES
PURGE/PRESSURIZATION SYSTEM

PEPPERL+FUCHS
PROTECTING YOUR PROCESS

With regard to the supply of products, the current issue of the following document is applicable:

The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship".

Contents

Part No. 514443 Drawing No. 129-0268A (TDOCT-1372BENG) 07/2010

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Safety note and symbols used

It is strongly urged that you follow all instructions and recommendations in this manual, in addition to all applicable codes, standards, and local requirements. Failure to do so voids all warranties, both implicit and explicit, and relieves the manufacturer of all liability.

Symbols used


Attention

This symbol calls your attention to instructions or requirements that must be followed. Failure to observe the instructions and information that this symbol calls attention to may result in the failure of the device and any devices or systems connected to it.


Note

This symbol draws your attention to important information.

Warning

This symbol warns the user of potential danger. Failure to observe this warning may lead to personal injury or death and/or property damage.

This symbol accompanies a list of tools you will need to install the unit.

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General instructions regarding ATEX

1. The guidelines

The guideline 94/9/EG determines the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II of the directive.

The guideline 1999/92/EG is addressed to the operator/ user of facilities in explosive areas and governs the safety regulations of persons during installation, handling and maintenance.

Furthermore local laws and rules for electrical installations and accident prevention have to be observed.

2. General information for this manual

Preconditions for handling and operating the series 6000 controller safely are basic knowledge of safety regulations and additional training and experience explosion protection.

This user manual contains important information and instructions to handle the series 6000 controller in explosive areas safely and to operate it according to guideline 94/9/EG.

This user manual in particular the safety instructions have to be observed by everybody who works with the components.

3. Responsibilities of users and installers

The user and/ or the installer is obligated to let only competent, trained persons work at the 6000 Control Unit who

- are familiar with the regulations about safety and accident prevention and briefed in handling of the component
- are trained to work on explosion protection equipment.
- know the appropriate instructions and rules for the installation, handling and maintenance of explosion protected equipment.
- read the safety chapter and danger warnings in this manual

4. General information about pressurized enclosures

The pressurized enclosure is one of most multifunctional applicable type of protection. It is based on a first flush operation which removes a potential, ignitable gas mixtures of the local environment from the enclosure. After the flush, the over-pressure will be maintained by adding as much pressurized air as necessary to compensate for the leaks of the enclosure or components. This constant over-pressure status protects against the diffusion of potentially explosive atmospheres.

During the flush the internal pressure will be up to 10-12 mbar, in the operation phase it is reduced to 2-3 mbar. Hot spots at single components inside the enclosure are monitored by temperature sensors (optional) and if required turned off. This assures that no unacceptable surface temperature will occur.

For this reason, the pressurized enclosure is especially suited for the use of non-Ex certified equipment in Ex-areas.

The enclosure has to be prepared specially for the use Ex p:

- all walls had to be additionally armed
- the doors had to be specially constructed
- tested for mechanical stability
- tested for overpressure resistance

5. Flush gas and pressurized air grades

The grade of flush gas has to relate to the pressurized air grades according to DIN ISO 8573-1 Class 1 to ensure a trouble free operation of the 6000 Series.

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Class	Particle		Water		Oil
	Size max in µm	Density max in mg/m³	Pressure dew point in °C	Water content in mg/m³	Residual oil content in mg/m³
1	0.1	0.1	-70	3	0.01
2	1	1	-40	120	0.1
3	5	5	-20	880	1
4	15	8	3	6.000	5
5	40	10	7	7.800	25
6			10	9.400	

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Certification information

Certification markings

PEPPERL+FUCHS

Twinsburg, OH 44087 USA www.pepperl-fuchs.com

Model 6000 Type X / Ex px

250 CF / 7.2 CM Max. Encl. Volume

CLASSIFIED c UL us 4S11

Class I, Division 1, Groups A, B, C, D
Class I, Zone 1, Group IIC T4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
Ex d [ib px] IIC T4 -20°C ≤ Ta ≤ 60°C

CE 0539 Ex

DEMKO 07ATEX 0705753X
II 2 G Ex d [ib px] IIC T4
IECEx UL08.0003X

SA c US 09.2188647

Class I, Division 1, Groups A, B, C, D T4
Class I, Zone 1, Groups IIC T4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
Class II, Groups E, F, G, Class III
Ex tD 21 T60°C AEx tD 21 T60°C -20°C ≤ Ta ≤ 50°C

CE 0539 Ex

II 2 GD Ex d [ib px] IIC T4 tD A21 IP6X T60°C
Sira 09ATEX9337X

Ex d [ib px] IIC T4 tD A21 IP6X T60°C
IECEx CSA09.0007X

PURGE CONTROL FOR USE IN HAZARDOUS LOCATIONS IN ACCORDANCE WITH THE NATIONAL FIREPROTECTION ASSOCIATION STANDARD FOR PURGED AND PRESSURIZED ENCLOSURES FOR ELECTRICAL EQUIPMENT NFPA 496-2003.

6000 Series main unit

PEPPERL+FUCHS

Twinsburg, OH 44087 USA www.pepperl-fuchs.com

Model EPV-6000- __-01

Type X / Ex p

250 CF / 7.2 CM Max. Encl. Volume

Class I, Division 1, Groups A, B, C, D
Class I, Zone 1, Group IIC T4
Class II, Groups E, F, G, Class III
Ex tD 21 T60°C AEx tD 21 T60°C
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
See main label on Model 6000 unit or 6000-CK kit.

Part of DEMKO 07ATEX 0705753X
IECEx UL08.0003X
II 2 G Ex ib [px] IIC T4

II 2 GD Ex d [ib px] IIC T4 tD A21 IP6X T70°C
Sira 09ATEX9337X
IECEx CSA09.0007X

6000 Series vent
(1 vent or 1st vent when more than 1 vent in use)

PEPPERL+FUCHS

Twinsburg, OH 44087 USA www.pepperl-fuchs.com

Model EPV-6000- __-02

Type X / Ex px

250 CF / 7.2 CM Max. Encl. Volume

Class I, Division 1, Groups A, B, C, D
Class I, Zone 1, Group IIC T4
Class II, Groups E, F, G, Class III
Ex tD 21 T60°C AEx tD 21 T60°C
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
See main label on Model 6000 unit or 6000-CK kit.

Part of DEMKO 07ATEX 0705753X
IECEx UL08.0003X
II 2 G Ex ib [px] IIC T4

II 2 GD Ex d [ib px] IIC T4 tD A21 IP6X T70°C
Sira 09ATEX9337X
IECEx CSA09.0007X

6000 Series vent
(2nd vent when more than 1 vent in use)

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Warning labels

WARNING - Conduit seal must be installed within 18 inches of the enclosure. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

WARNING - PRESSURIZED ENCLOSURE
This enclosure must not be opened unless the area atmosphere is known to be below the ignitable concentration of combustible materials or unless all devices within have been de-energized.

WARNING- To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing**.**
WARNING- Power must not be restored after the enclosure has been opened until combustible dusts have been removed and the enclosure re-pressurized. .

Certifications

Applied harmonized standards:

EN 60079-0 : 2006
EN 60079-1 :2004 with Corrigendum April 2006
EN 60079-11 : 2007
EN 60079-2 : 2004 with Corrigendum April 2006
EN 60529 : 1991 + A1 2000
EN 61241-0: 2004
EN 61241-1: 2004

Conditions of Safe use

1. Conduit seals shall be certified in type of explosion protection flameproof “d”, suitable for the conditions of use and correctly installed to the flameproof "d"enclosure.
2. Conduit seals shall be installed within 18 in. (450 mm) of the flameproof “d” enclosure.
3. When the purge control unit is mounted to an enclosure, the complete unit shall be evaluated to EN 60079-2: 2004 with Corrigendum April 2006.
4. The purge control unit has an operating temperature of 135 °C (T4 temperature class). This temperature shall be considered when mounted to an enclosure.
5. The device must be installed in accordance with the manufacturer’s installation drawing number 116-013UL-12.
6. Intrinsically safe cables extending from the flameproof "d" enclosure must be provided with at least 0.25 mm insulation thickness to maintain segregation between intrinsically safe circuits.
7. The cable entries may be used only in places where they are protected against the influence of mechanical danger.
8. In hazardous dust environments, regularly remove dust from the control unit enclosure to prevent excessive temperature rise.

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Purpose

The purpose of the Pepperl+Fuchs 6000 series Type X & Ex px, Zone 1 enclosure protection system is to allow the use of general purpose or non-rated electrical or electronic devices located in general purpose enclosures instead of explosion proof/ flameproof, Type 7 or 9 / Ex d enclosures or other means of protection for the rated area. Other purposes include heat, moisture, and dust contamination prevention.

Description

The 6000 series Type X & Ex px purge pressurization system protects general purpose equipment mounted in a standard enclosure. This allows the enclosure to be located and the equipment operated in a hazardous area. The hazardous area classification can be Class I, Division 1 / Zone 1. The 6000 series operates by controlling and monitoring compressed instrument air or inert gas through the protected enclosure(s) so as to remove and prevent the accumulation of flammable gas, vapors, or dust.

The 6000 series system features these main parts:

- Electronic processor (EPCU) housed in an explosion proof enclosure
- I.S. electrical/pneumatic manifold assembly
- I.S. user interface for programming and monitoring the system
- 316L stainless steel (UNS S31603) type 4X IP66 enclosure for EPCU and connections
- Pressure relief vent with flow and pressure monitoring at the exhaust.

The user interface allows programming of up to 4 switch inputs, temperature modules, enclosure power contacts, 2 auxiliary outputs, and various operational functions. Through the user interface menus, configuration of the standard information for set-up and operation of a system (purge time, flow rates, pressures, enclosure size, etc.) are easily programmed. Additional features allow inputs for system bypass, enclosure power on/off, temperature overload and activation of rapid exchange flow for cooling or auxiliary relay for separate cooling source, delay power shutdown, and more. The two auxiliary contact outputs can be configured to activate on most of the input switches or any of the configured alarm states for pressure, flows, and temperature.

The power for the solenoid valve on the manifold unit, inputs, the user interface controller (UIC), and EPV-6000 vent are provided by the EPCU through the internal galvanically isolated intrinsic safety barrier. No additional I.S. barrier is required.

The adjustable mounting bracket and the universally mountable vent make the 6000 system easy to install horizontal or vertical onto the enclosure. A component kit is available for custom installations that fit specific customer needs.

The 6000 control unit can monitor multiple enclosures and control and accept inputs from two (2) EPV-6000 vents.

The 6000 series provides a complete system for purging and pressurizing enclosures for hazardous location operation.

The 6000 series system can be set up for Class I & II/ Division 1 and Zone 1 & 21 applications in accordance with the NEC-NFPA 70, NFPA496, UL913, CSA C22.2 No.157, IEC60079-11, and EN60079-2. This system is suitable for SIL 2 in accordance with IEC61508.

Note

One (1) operations copy of this manual must be studied and retained by the system operator in addition to one (1) permanent file copy. User's agents are responsible for transferring this manual to the user/operator prior to start-up.

Note

The final certification of IEC61508 is pending.

Note

Component kit dust certifications pending.

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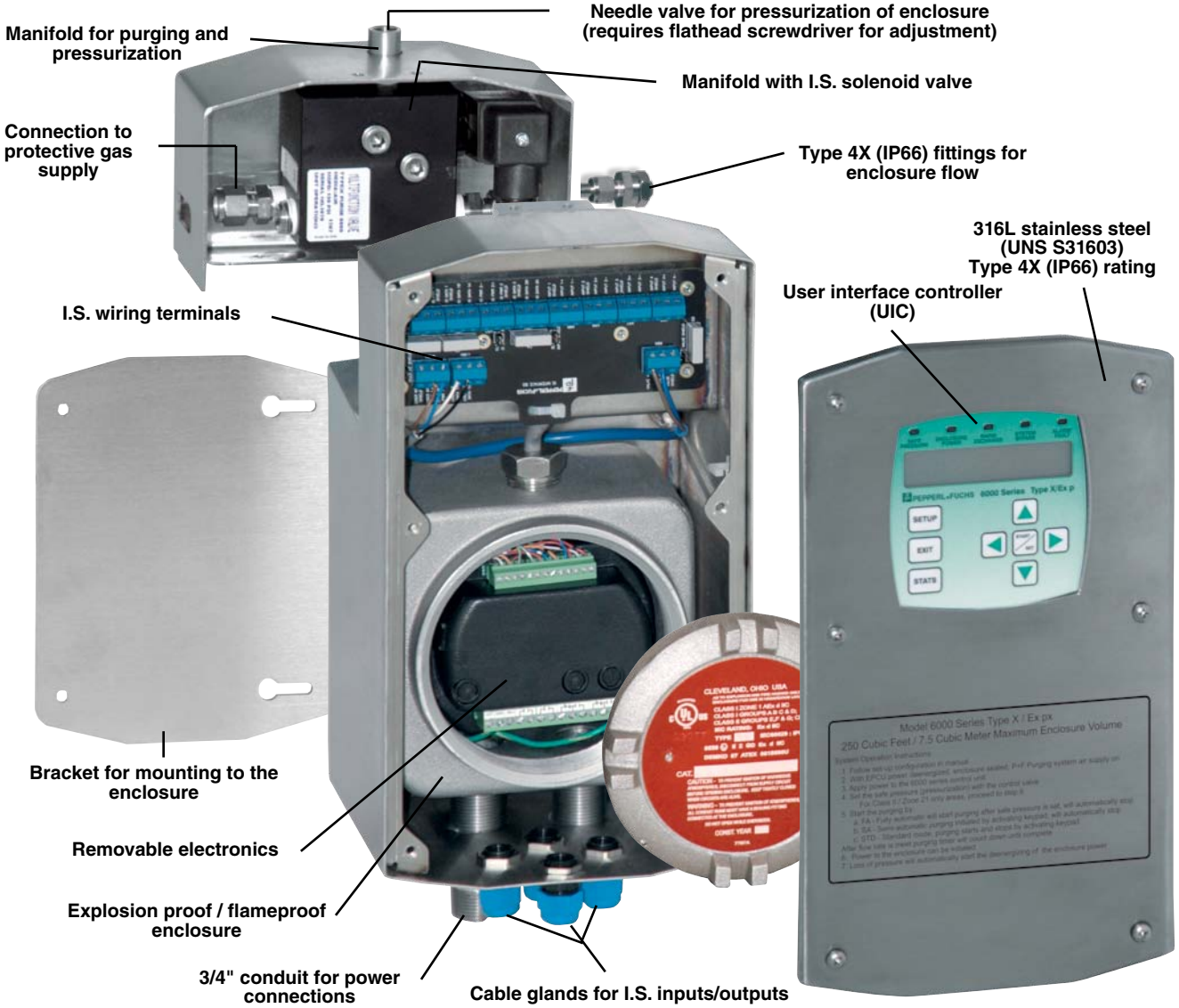
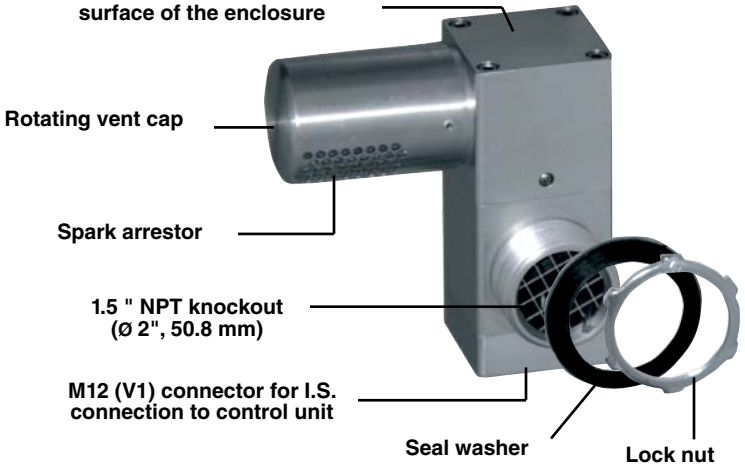


Main unit



Vent

The EPV-6000 vent is required.

I.S. temperature hub

I.S. temperature sensor

Temperature monitoring/ control accessories

Attention

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Electrical & pneumatic diagrams

6000 control unit power connections

General wiring notes

For power connections to the 6000 control unit and relay contacts:

1. All applicable local and national wiring codes **MUST** be followed when wiring to the unit.
2. Ground wire to be 14 AWG (2.08 mm^2). Strip length of ground to mate with pigtail under wire nut 11.1 mm to 12.7 mm (.437" to .5").
3. If a single wire is used, the maximum wire gauge to the pluggable terminal block is 14 AWG (2.08 mm^2).
4. If jumpering from one terminal to another at pluggable terminal block, the maximum wire gauge is 16 AWG (1.31 mm^2) for both wires.
5. Minimum wire gauge to the pluggable terminal block is 24 AWG (0.20 mm^2) (Based on connector, not code. Follow all applicable codes.).
6. Strip length of wires terminating into the screw terminals on the pluggable terminal block to be 5 mm to 7 mm (0.2" to 0.27").
7. Extra wire length of 31.75 mm (1.25") past top of opening in explosion proof / flame proof box to pluggable terminal block (Allows connector to be moved out of the way when changing electronics. Prevents repouring seals).
8. Wires to be neatly tucked back down past the lid threads before lid is placed on unit. The wires must not loop past the high point of the plastic cover. The wire nut should be tucked in last (If not, it may be difficult to access when changing electronics).
9. If using a single conduit seal, the other conduit on the 6000 control unit will need a cap for the end of the conduit with appropriate hazloc certifications (A standard 3/4" conduit cap will not work).
10. Conduit seals must be within 457.2 mm (18") of internal explosion proof / flame proof box, or within 387.3 mm (15.25") from the end of the conduit supplied with the 6000 unit.
11. When wiring to the terminal plug, it is easier to remove the plug, terminate the wires, then reconnect the plug.
12. When removing the pluggable terminal block, it is recommended that the electronics module be supported by pressing down on top of the EPCU to counter act the lifting force required to remove the connector.

I.S. wiring notes

For wires going to the I.S. interface board:

1. The wire strip length is to be between 4 mm and 6 mm (0.16" and 0.24")
2. The terminal blocks are rated for wire size of 16 AWG (1.31 mm^2) to 26 AWG (0.13 mm^2).
3. The only terminals that might have multiple connections are the shield connections. These must be crimped to a single pin before connecting to the board.
4. If cables are used (recommended for connections to the vents and UIC):
   - It is recommended that the cables be shielded. They must have a minimum internal conductor insulation of 0.25 mm (0.01") to be intrinsically safe.
   - The shield can left open or connected to the I.S. interface board. If connected to the I.S. interface board, the shield must be connected to earth ground through the capacitor on the I.S. interface board.

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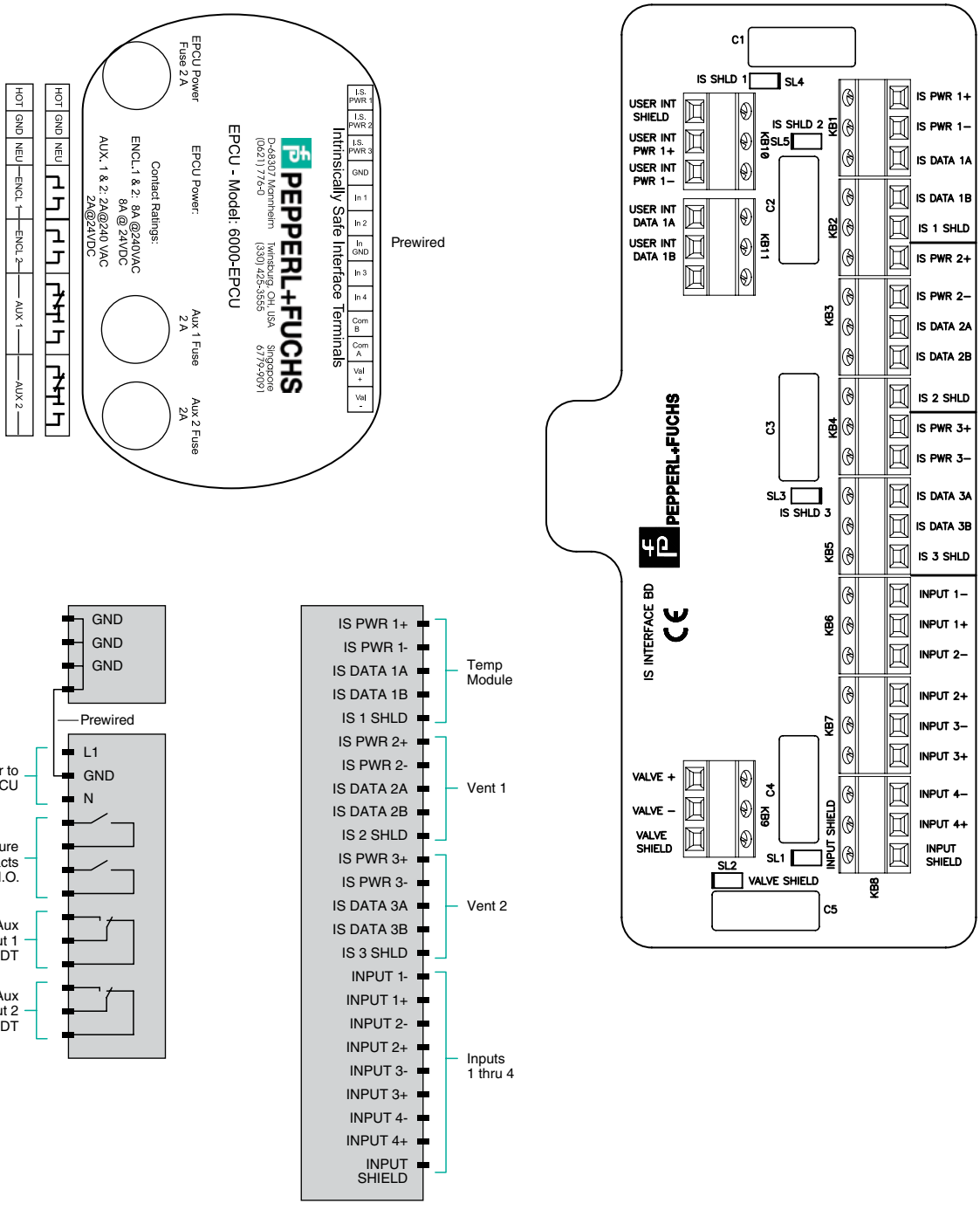
Electrical installation - power and I.S. wiring



Warning — Requires standard explosion proof seals to explosion proof/flameproof enclosure at a maximum distance of 457.2 mm (18").

Note — When removing the terminal block from the EPCU stack, place your hand on top of the plastic to support the stack when lifting the terminal block off the stack.

Note — The EPCU is prewired to the I.S. terminal board.

Note — Both enclosure power contacts are switched at the same time.

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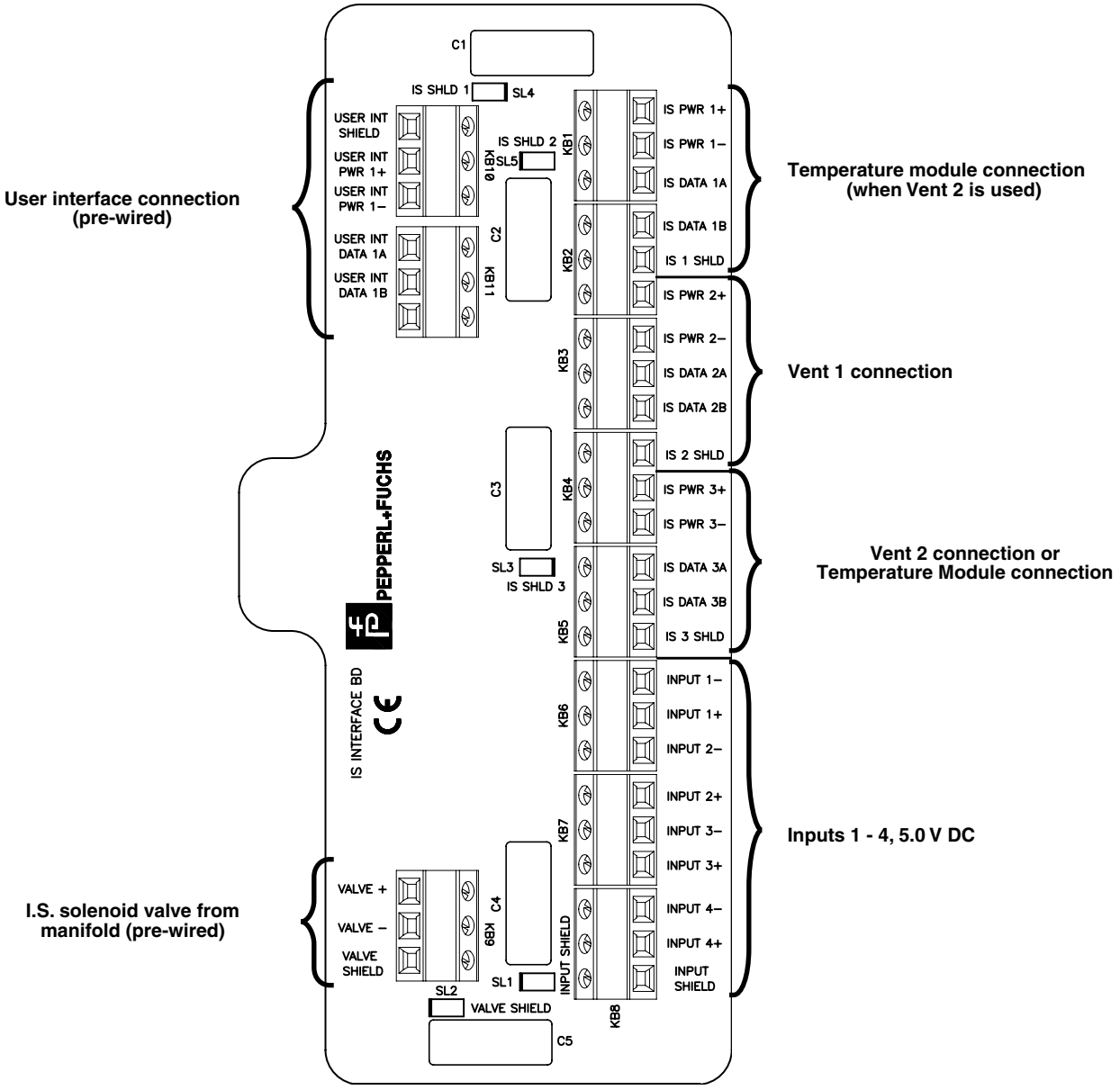

I.S. Interface board

Connector color code for the user interface, temperature module, and vent:

PWR +	BN (brown)
PWR -	BU (blue)
DATA_A	WH (white)
DATA_B	BK (black)

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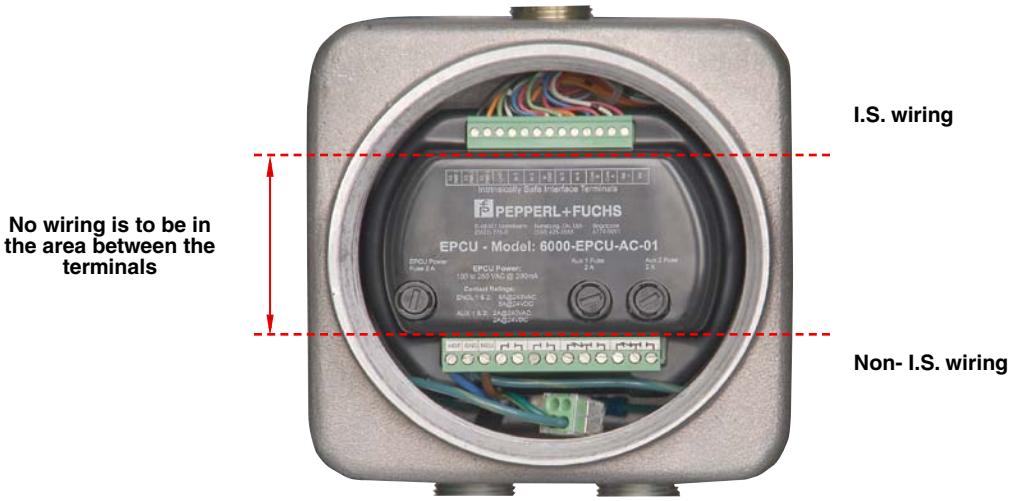

EPCU

Warning

Maintain a minimum space of 50.8 mm (2") between the I.S. wiring and the non - I.S. wiring. Make sure that the wiring is neatly tucked in to the explosion proof housing. Use wire ties if necessary. As a rule, no wires are to be in the area between the two terminals, as shown above.

Attention

WARNING: To prevent ignition of the flammable atmospheres, the wiring method must insure that if any wire is disconnected and extended to teh opposite terminal, a 50.8 mm (2") separation must be maintained.

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Pneumatic requirements

Protective gas supply

The protective gas supply to the enclosure system must be a clean, instrument quality compressed air or inert gas filtered to a minimum of 40 microns. It must contain no more than trace amounts of flammable gas, vapor, or dust.

The protective gas supply compressor intake must originate in a nonhazardous location. The suction duct passing through a hazardous location and the protective tubing and piping must be fabricated from noncombustible materials suitable for the prevailing hazardous and environmental conditions.

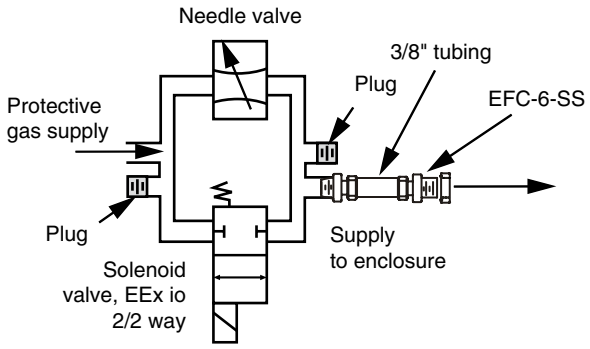
The protective gas supply provided must be able to handle the flow and pressure requirements for purging and pressurization (see page 66, Establishing connection sizes, lengths & bends).

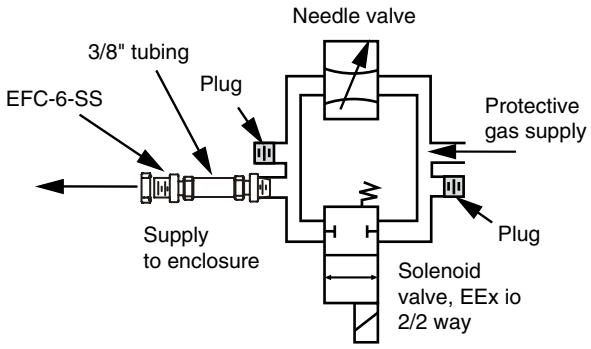
Pneumatic connections

The 6000 series system requires only two pneumatic connections to the protective enclosure, one for the exhaust for the vent mounting and the other for the protective gas supply for purging and pressurization. The vent requires a single 1 1/2" conduit knockout (Ø 50.8 mm [2"]) hole in the enclosure. A lock ring with gasket for sealing are provided. The control unit for the 6000 series provides a compression fitting with a lock ring and washer connected to a 3/8" tube. All tubing and fittings are 316L (UNS S31603) stainless steel. A single hole into the enclosure as noted on the mounting template will provide the installation for this fitting.

For replacement of this tubing use only 3/8" tubing with wall thickness of 0.35" (.889 mm).

The 6000 series control unit with the manifold can be top, bottom, right, or left hand mounted on the enclosure. However, the manifold connections may have to be reversed as shown below.





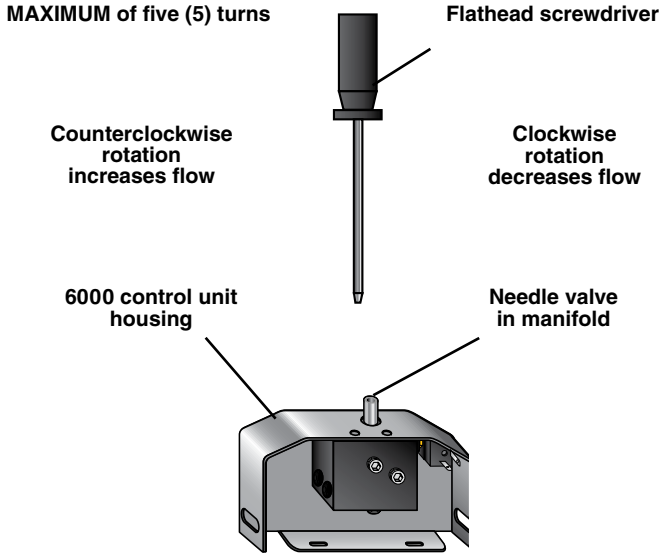
Pressurization adjustment

To adjust, use a flat head screw driver inserted into the needle valve of the manifold as shown. Turn clockwise to decrease the flow, counter-clockwise to increase the flow. The maximum number of complete rotations allowed is five (5).

Note Diagram shown is without plumbing. See the diagrams on the following page for plumbing installation.

Note Unit must be powered to get a pressure reading.

Note When delivered, the system is in its default mode (fully automatic [FA]). It may be easier to adjust safe pressure in standard (STD) or semiautomatic (SA) mode so that the system does not automatically begin purging when energized.



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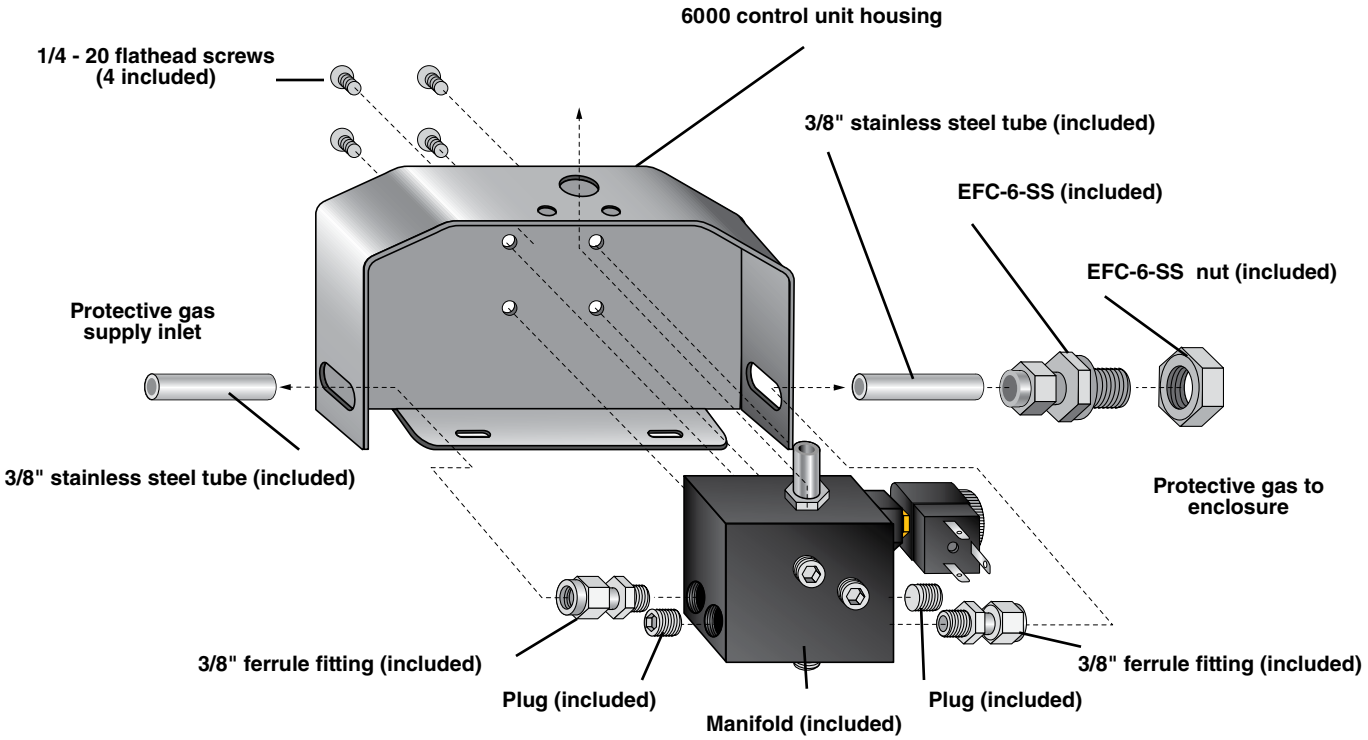
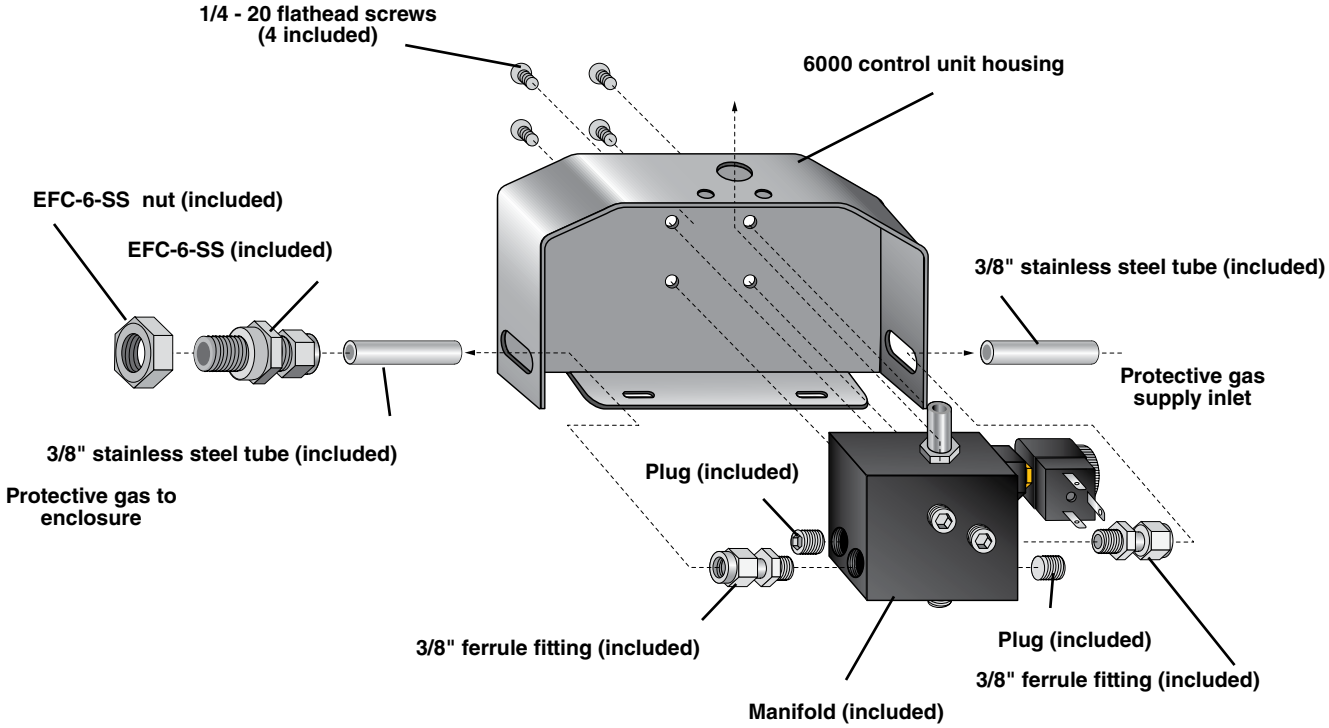
Mounting Instructions

Manifold assembly

Left hand mount



Right hand mount



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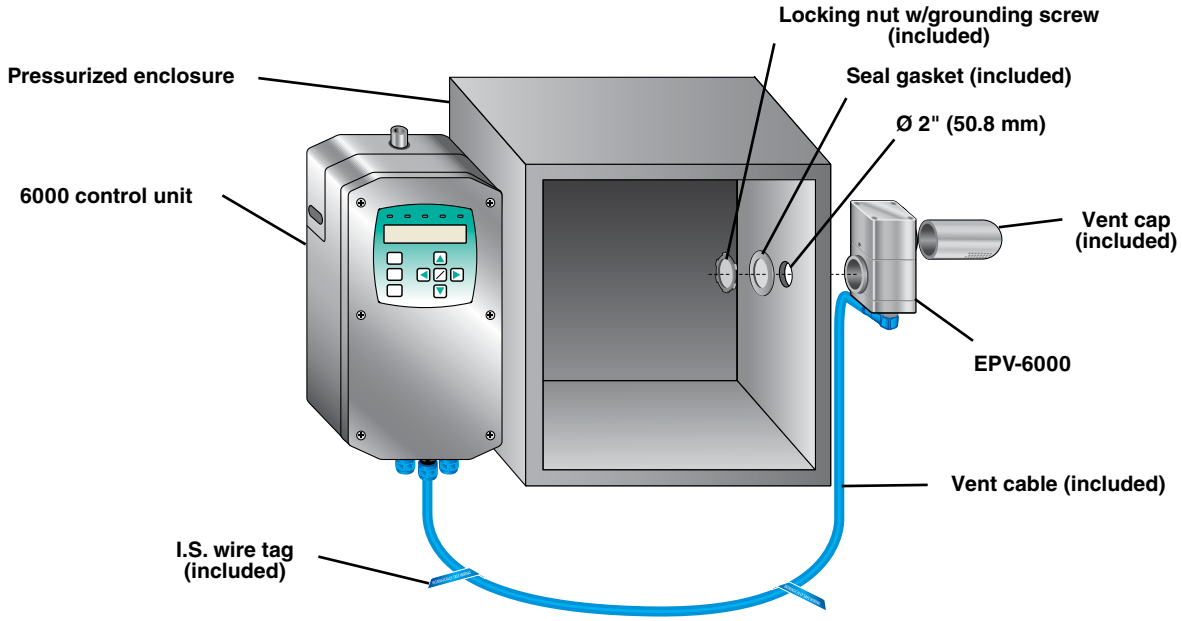
EPV-6000 vent

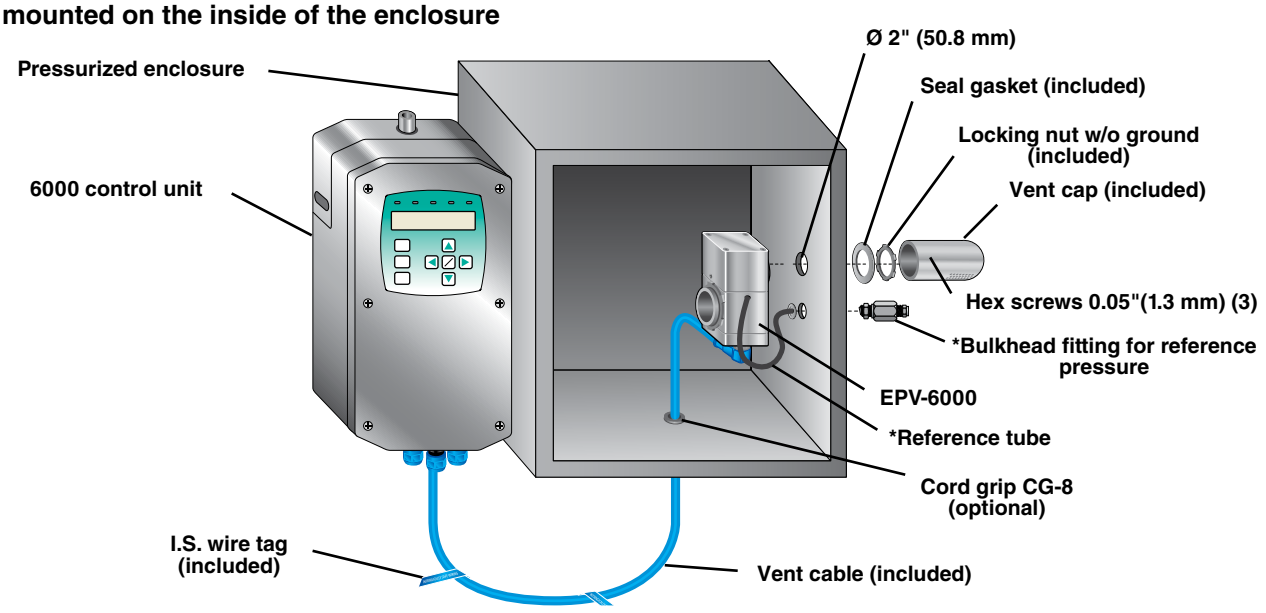
Tools:

1 1/2" NPT knockout (Ø 50.8 mm [2"] hole) for vent

Vent mounted on the outside of the enclosure



Vent mounted on the inside of the enclosure



*Reference tubing and hardware included with EPV-6000-SS models

Note: Vent is not gravity sensitive and can be installed in any orientation.

Warning: Cable to the vent is I.S. wiring and must be properly isolated from other wiring.

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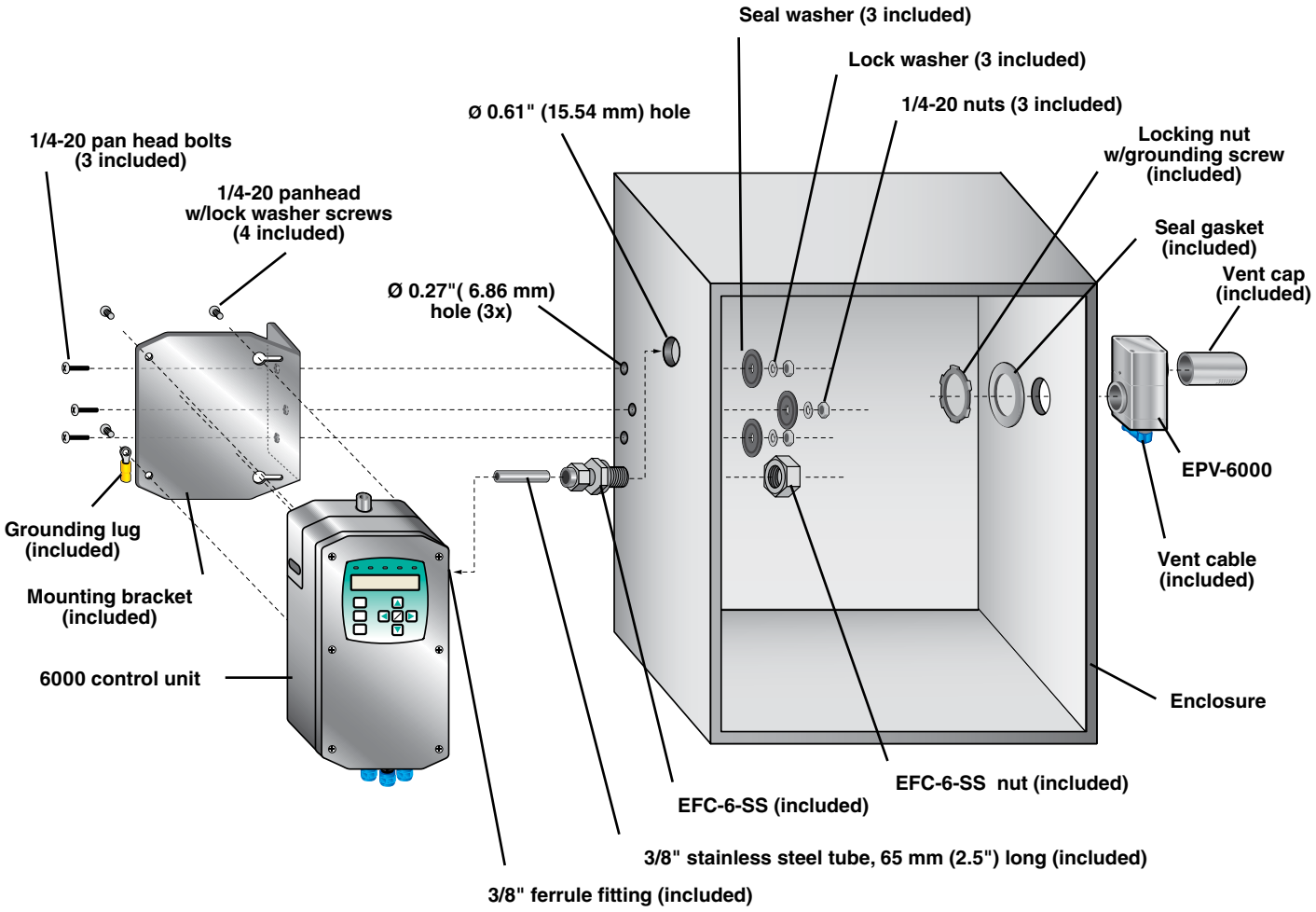
6000 Control unit with housing "WH"

Tools:

Appropriate sized drill bits or knockout holes
1 1/16" open end box wrench
Bolts: 1/4-20 (provided),
hole clearance = 6.86 mm (0.27") diameter
EFC-6-SS (provided):
hole clearance = 15.54 mm (0.61") diameter



1. Drill holes using template. Check the scale if printing an electronic version.
2. Assemble tubing and fitting to control unit. Install on the "Out" port of the correct side.
3. Bolt mounting plate to the enclosure. Type 4X washers must be mounted inside the enclosure. Tighten to 16.38 - 18.08 Nm (145 – 160 in-lb).
4. Put 2 of the mounting screws in the back of the control unit to align with the key holes in the mounting plate.
5. Hang the control unit onto the plate. Slide the unit towards the enclosure so that the EFC-6-SS fitting is in the proper location.
6. Tighten the 2 bolts. Put the other two mounting bolts in place and tighten.
7. Place the EFC-6-SS bolt in position and tighten.

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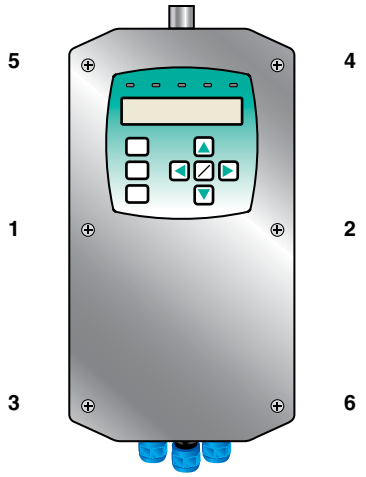
Tightening unit cover plate

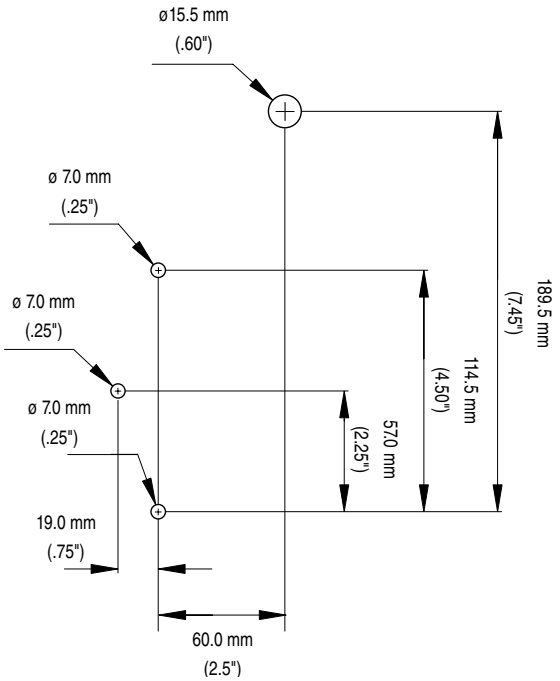
Warning

The screws on the unit cover plate must be tightened in the order shown on the diagram to the right. The torque specification on this is 0.113 Nm (1 in-lb).

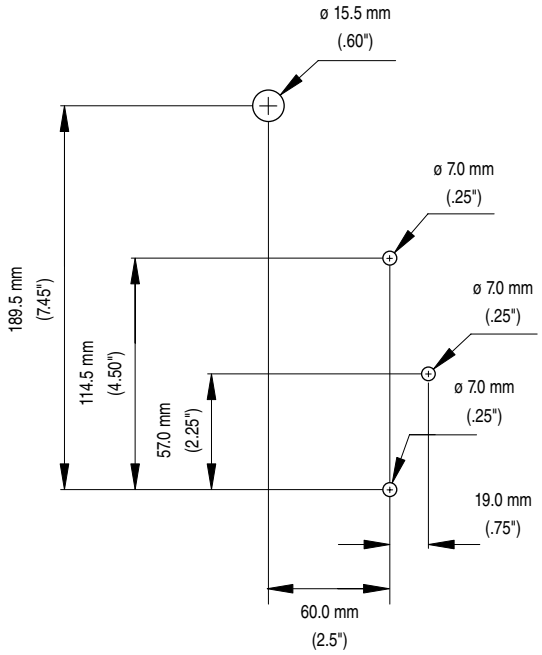
Failure to do so can leave the unit improperly sealed.



Left hand mounting template



Right hand mounting template



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6000 Series Component kit

Identification of components

User interface

Control unit and explosion proof / flameproof enclosure

Optional pneumatic manifold with solenoid

Component kit

EPV-6000

Attention

The EPV-6000 vent is required.

Atmospheric reference kit (6000-ACC-514482) for mounting vent inside the enclosure

Attention

The reference kit comes with the EPV-6000-SS vent but must be ordered when mounting the EPV-6000-AA vent inside the enclosure.

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Electrical diagrams

General wiring notes

For power connections to the control unit and relay contacts:

1. All applicable local and national wiring codes **MUST** be followed when wiring to the unit.
2. Ground wire to be 14 AWG (2.08 mm^2). Strip length of ground to mate with pigtail under wire nut 11.1 mm to 12.7 mm (.437" to .5").
3. If a single wire is used, the maximum wire gauge to the pluggable terminal block is 14 AWG (2.08 mm^2).
4. If jumpering from one terminal to another at pluggable terminal block, the maximum wire gauge is 16 AWG (1.31 mm^2) for both wires.
5. Minimum wire gauge to the pluggable terminal block is 24 AWG (0.20 mm^2)(Based on connector, not code. Follow all applicable codes.).
6. Strip length of wires terminating into the screw terminals on the pluggable terminal block to be 5 mm to 7 mm (0.2" to 0.27").
7. Extra wire length of 31.75 mm (1.25") past top of opening in explosion proof / flame proof box to pluggable terminal block (Allows connector to be moved out of the way when changing electronics. Prevents repouring seals).
8. Wires to be neatly tucked back down past the lid threads before lid is placed on unit. The wires must not loop past the high point of the plastic cover. The wire nut should be tucked in last (If not, it may be difficult to access when changing electronics).
9. If using a single conduit seal, the other conduit on the 6000 control unit will need a cap for the end of the conduit with appropriate hazloc certifications (A standard 3/4" conduit cap will not work).
10. Conduit seals must be within 457.2 mm (18") of internal explosion proof / flame proof box, or within 387.3 mm (15.25") from the end of the conduit supplied with the 6000 unit.
11. When wiring to the terminal plug, it is easier to remove the plug, terminate the wires, then reconnect the plug.
12. When removing the pluggable terminal block, it is recommended that the electronics module be supported by pressing down on top of the EPCU to counter act the lifting force required to remove the connector.

I.S. wiring notes

For wires going into the explosion proof / flame proof box on the I.S. side:

1. The wire strip length is to be between 5 mm and 7 mm (0.2" and 0.27").
2. The wire's gauge depends on the number of connections. Fewer wires allow for heavier gauge and will still meet the conduit seal fill requirement. See the applicable standards for fill requirement.
3. The terminal blocks are rated for wire size of 16 AWG (1.31 mm^2) to 28 AWG (0.08 mm^2).
4. If multiple wires need to land to a single terminal (e.g., the RS-485 bus) then these wires must be either crimped to a single pin, or grouped in an external junction box with one wire going in to the terminal.
5. The wires must have a minimum insulation thickness of 0.25 mm (0.01").
6. Extra wire length of 31.75 mm (1.25") past top of opening in explosion proof / flame proof box to pluggable terminal block (Allows connector to be moved out of the way when changing electronics. Prevents repouring seals).
7. Conduit seal on I.S. wiring side must be within 457.2 mm (18") of the explosion proof/flameproof box

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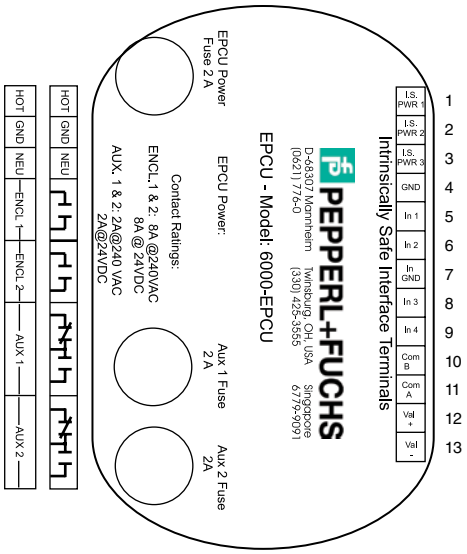
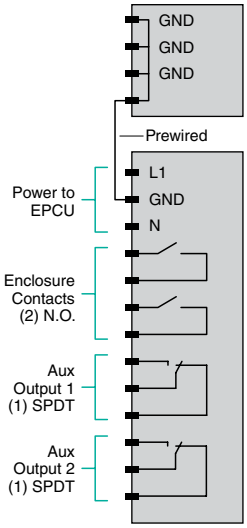
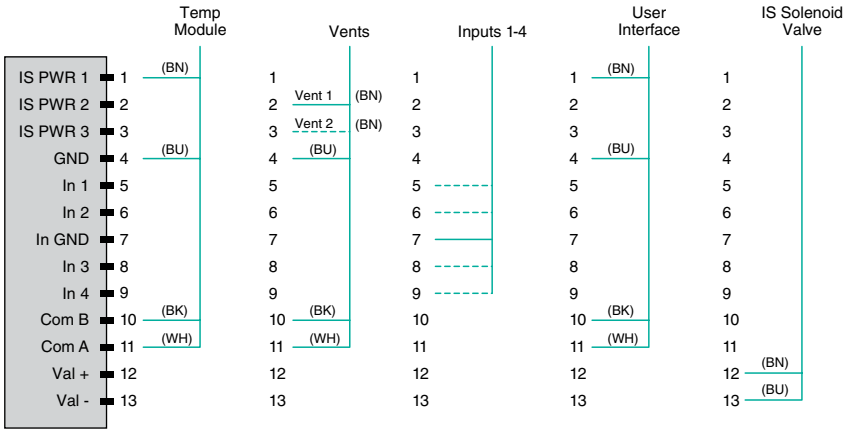
Electrical installation - power and I.S. wiring







Connections from I.S. termination board

Warning — Requires standard explosion proof seals to explosion proof/flame proof enclosure at a maximum distance of 457.2 mm (18").

Note — When removing the terminal block from the EPCU stack, place your hand on top of the plastic to support the stack when lifting the terminal block.

Note — The maximum distance between the control unit and the termination board is 3 meters.

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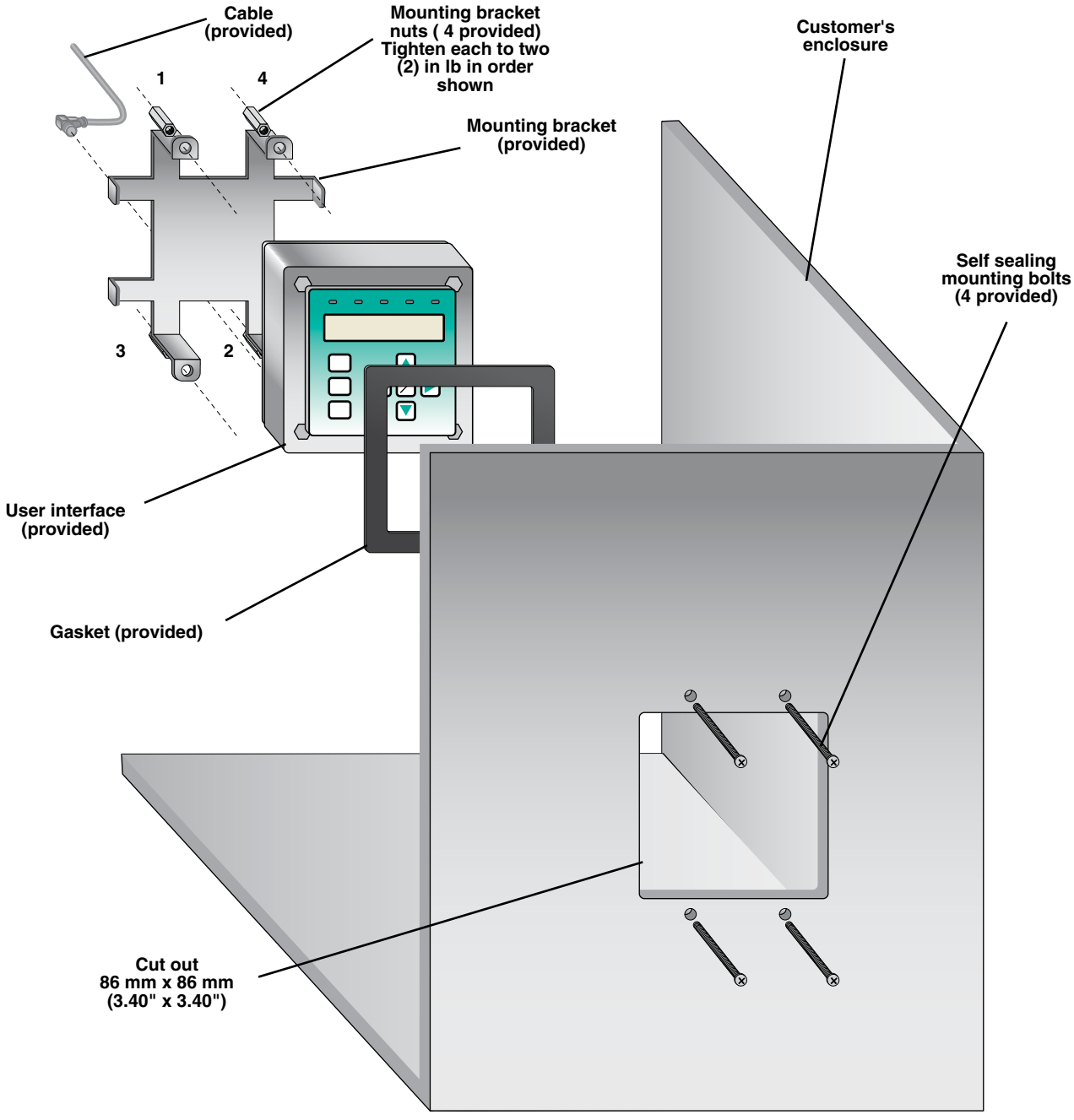
Component kit installation

User interface

Panel mount (internal mount, for hazardous area installation, NOT to be used in Dust, Class II/Zone 21 areas)



Mount the explosion proof enclosure and valve as desired. Follow all applicable electrical codes when required.

Note — When installing panel mount configuration, the installation must be evaluated for Type 4x rating by a third party NRTL authorized certification agency.

Warning — Enclosure must be made of metal and grounded.

Warning — Cut out must be no larger than dimensions specified in above drawing.

Note — The user interface must be mounted inside the pressurized enclosure to maintain the environmental ratings.

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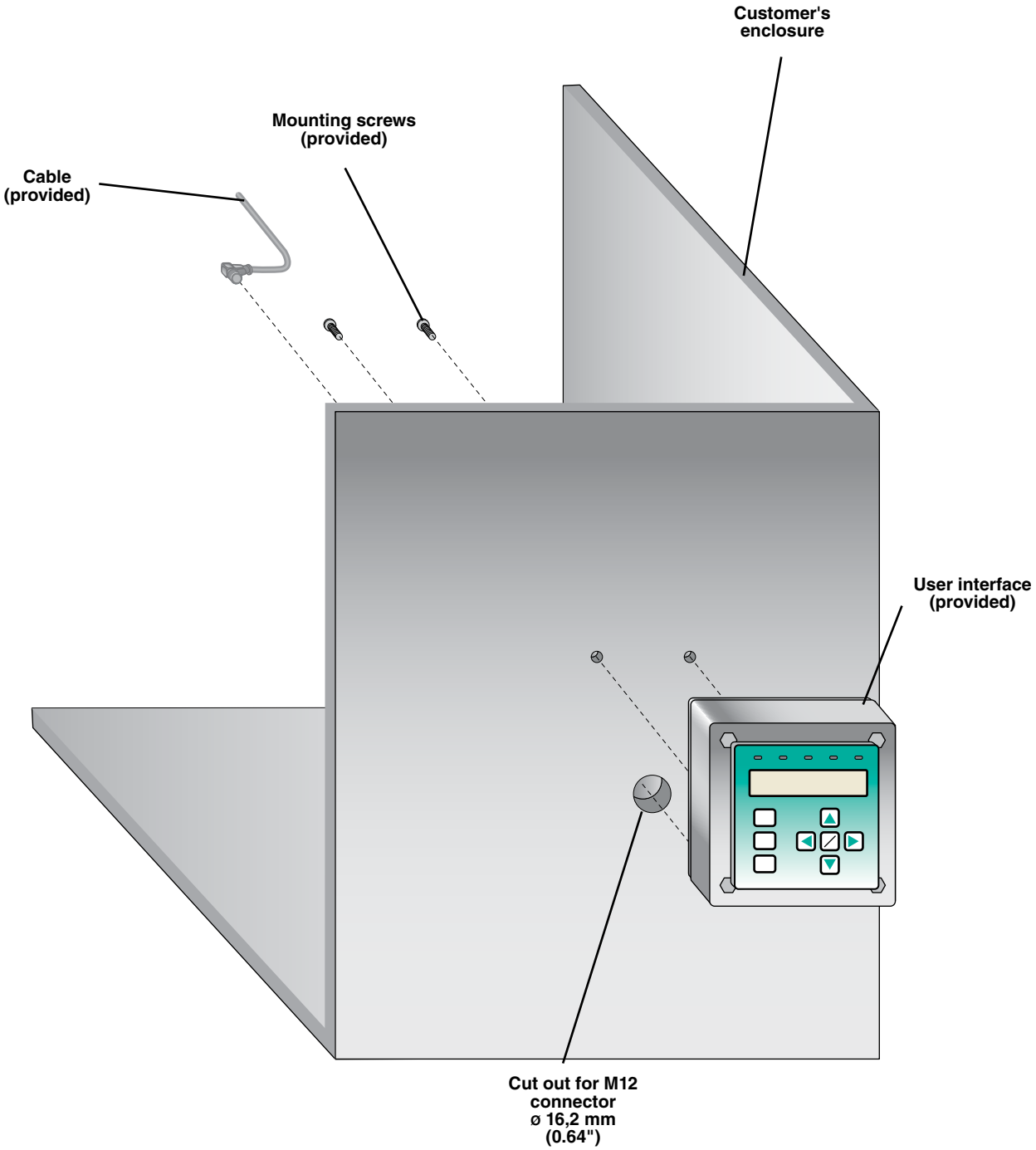
External mount (non-hazardous locations only)



Note: Environmental ratings are NOT maintained when mounted in this manner.

Warning: Mounting in this manner is not approved for hazardous area locations.

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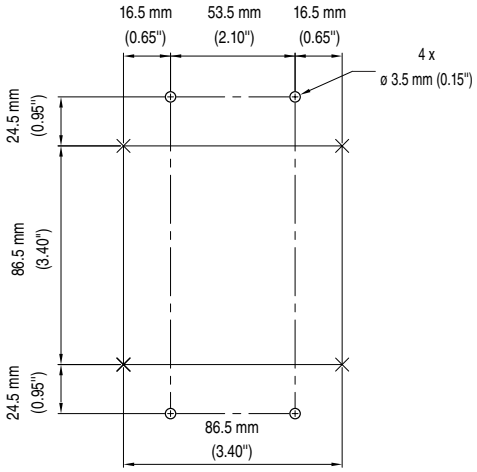
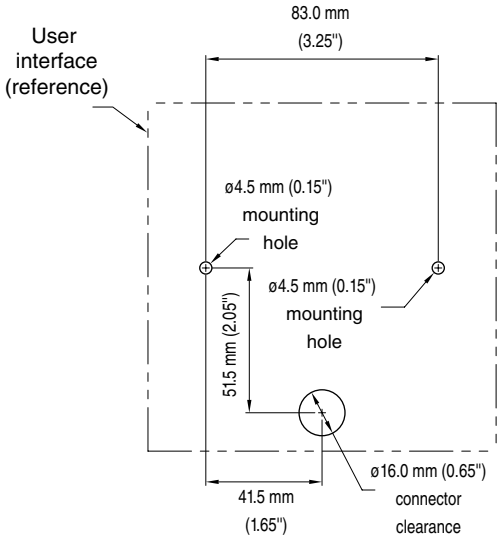
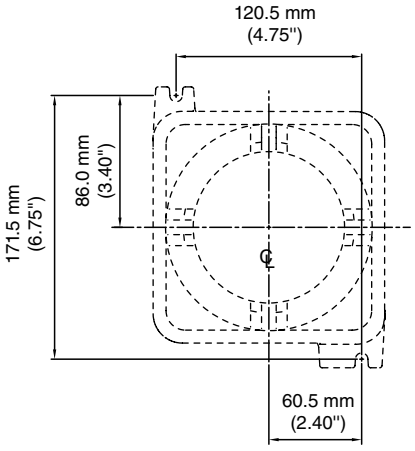
User Interface mounting template (panel mount)



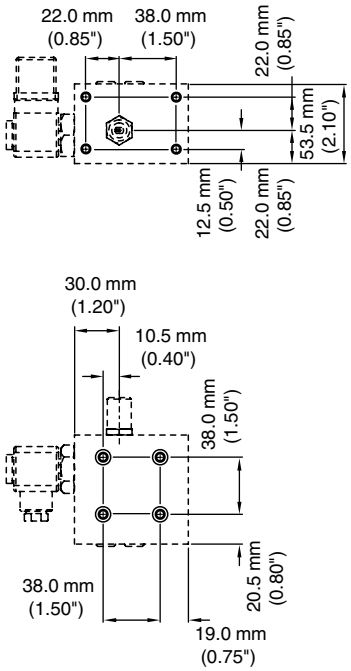
User interface mounting template (external mount)



EPCU mounting template



Solonoid mounting template



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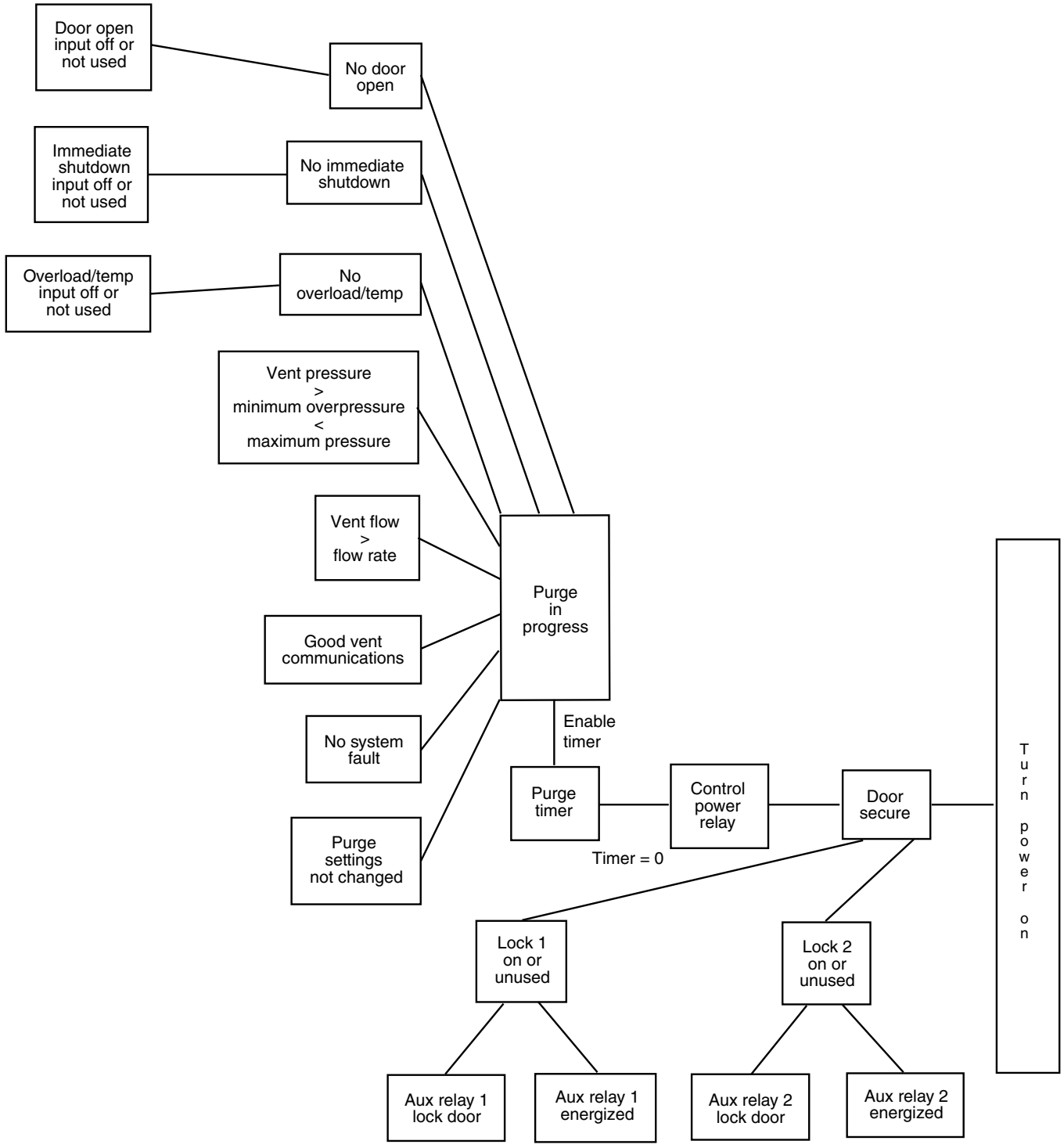
Sequence of events

Turning on power to the enclosure



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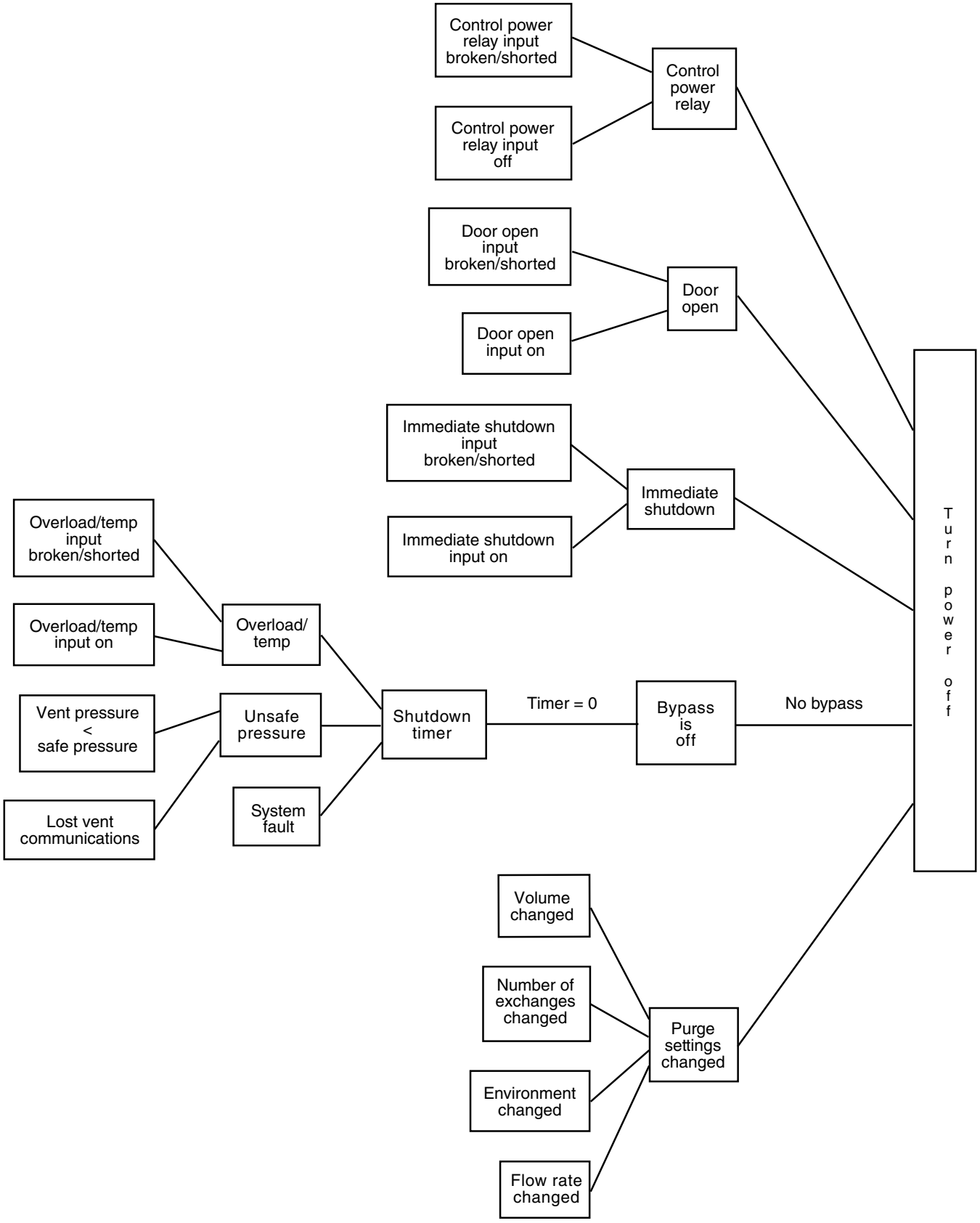
Turning off power to the enclosure



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Operation of the 6000 series and component kit

Operation

The 6000 series consists of the control unit and user interface mounted in a 316L (UNS S31603) stainless steel Type 4X (IP66) enclosure with the pneumatic solenoid valve mounted on the unit. The EPV-6000 series relief vent is separate and is mounted to the enclosure. The 6000 series control unit is also available as a kit. The kit consists of the key components of the system, the control unit, and the user interface. It does not include the enclosure. The manifold is an optional item. The user interface includes a panel-mount bracket so that it can be panel mounted to the customer's enclosure. The pneumatic valve for the protective gas can be supplied by the customer. The EPV-6000 relief vent is still required.

The components of the 6000 series control unit are listed below:

- EPCU mounted in an explosion proof/flameproof enclosure
- I.S. user interface with display and cable
- I.S. termination board (not included with "CK" kit version)
- Manifold with I.S. solenoid valve (not included with "CK" kit version)
- Flush mount Type 4X IP66 fitting for protective gas supply to enclosure with tube attached
- Type 4X cable glands for I.S. wiring to I.S. inputs, vents, and temperature modules
- 3/4" pipe nipples for power wires
- 316L (UNS S31603) stainless steel Type 4X enclosure for the 6000 series controller. (Not included with the Component Kit.)

The components of the EPV-6000 vent:

- EPV-6000 vent with stainless steel spark arrestor screen
- 1½" lock nut with grounding lug and gasket for attachment of vent to customer's enclosure
- One 5 m (16.4 ft.), quick disconnect cable; for connection to I.S. termination board inside 6000 series control unit.

Note

If ordering a stainless steel vent, an atmospheric reference kit is included.

The components of the 6000 series component kit are listed below:

- Control unit and explosion proof / flameproof enclosure
- 6000-UIC-01 user interface
- SMK-600-CK mounting hardware for 6000-UIC-01
- One 5 m (16.5 ft.), quick disconnect cable for 6000-UIC-01
- 6000-MAN-DV-01 pneumatic manifold w/solenoid (optional)
- EFC-6-SS flush mount connector

The 6000 series control unit and vent can be universally mounted to the customer's enclosure. Top, bottom, right-, or left-side mounting can be completed with only one control unit and vent. Mounting configuration does not need to be designated when ordering. One unit is used for enclosure sizes up to 7.2 m^3 (250 ft^3).

Electronic power control unit – EPCU

The EPCU houses the redundant microprocessors, enclosure power contacts, (2) auxiliary contacts, power supply module, galvanically isolated barriers for the inputs, vent(s), and temperature modules. The EPCU is easy to remove and install into the explosion proof enclosure that houses it.

The EPCU is available in 20 - 30 VDC or 100 - 250 VAC units. The enclosure power contacts are forced-guided safety relays. The auxiliary contacts can be user configured for different functions, depending on user requirements.

User interface controller - UIC

The 6000 series is user programmable for many of the configurable options available. This is done with the intrinsically safe user interface on the face of the unit, which can also be remote mounted. The user interface contains a 2 x 20 LCD that allows programming through a set of buttons on the menu driven unit. All configuration and options are programmed through this unit. There are also (5) LEDs for easy visual indication of operation:

- Safe pressure – This turns on (blue) when safe pressure is achieved inside the enclosure.
- Enclosure power – This is (red) when the enclosure power is off, and (green) when enclosure power is on. The enclosure power can be on only after a successful purge and a safe pressure is achieved. The bypass option allows power to remain on if safe pressure is lost.

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- Rapid Exchange® – The rapid exchange or purging flow rate turns on (blue) when the flow rate is measuring proper flow.
- System bypass – This turns on (yellow) when the system bypass is active. This should be used only when the area around the enclosure is known to be safe.
- Alarm fault – The (red) LED blinks when any alarm input is detected and is solid when there is an internal system fault.

Pneumatic manifold with I.S. solenoid

- Manifold with I.S. solenoid valve: The manifold system is mounted on the 6000 control unit providing a needle valve to set enclosure pressure and an I.S. solenoid valve that is used for purging (Rapid Exchange). Power for the I.S. solenoid valve is provided by the EPCU and is galvanically isolated. Regulated instrument-grade air or nitrogen is required.

The 6000 series unit can be ordered without the manifold so that customers can use their own method or valves for purging and pressurization. If a third-party electronic valve is used, the valve must be certified and installed in accordance with the hazardous location where the unit is operating. The use of the 6000 series manifold unit allows easy and correct installation of the system.

Requirements for purging/pressurization

Certifications allow the 6000 series to be used on enclosures in gas, dust, or both gas and dust hazardous atmospheres. Gas atmospheres require the purging of the enclosure. Dust atmospheres require the physical removal of all the dust that collects inside. Both gas and dust atmospheres require the following: 1) removing the dust, 2) sealing the enclosure, and then 3) purging the enclosure.

After these sequences, the pressure within the enclosure is above the minimum level. The equipment within the enclosure can then be energized.

Purge timing

When using the 6000 series in a gas or gas and dust location, the time for purging an enclosure can be based either on a known purge rate and time (fixed purge time), or based on the flow rate being measured from the vent (dynamic purge time). Both methods base the time on the flow measurement at the vent, and complete the process in steps. The EPCU will take the readings from the vent and use the appropriate reading (listed below) as the usable flow rate. For example, if the flow rate measurement from the EPV-6000 vent is 7 SCFM (198 l/m), the EPCU will use 5 SCFM (141 l/m) as the flow rate for evaluation. The flow rate measurement steps and corresponding enclosure pressures are as follows:

- 5 SCFM @ 1.3" wc (141 l/min @ 33 mm wc)
- 12 SCFM @ 2.5" wc (340 l/min @ 64 mm wc)
- 20 SCFM @ 3.1" wc (565 l/min @ 77 mm wc) Enclosure volume must be > 0.57 l (20ft^3)
- 30 SCFM @ 3.4" wc (850 l/min @ 86 mm wc) Enclosure volume must be > 0.85 l (30 ft^3)

Note Component kit dust certifications pending.

Note The following parameters must be entered for the purge time:

- Enclosure volume
- Number of exchanges.

Note Minimum purge time is 2 min

Fixed purge time

If the purge time must be held to a specific time, then this time is based on the known enclosure volume, number of volume exchanges, and flow rate through the vent. If the flow rate is below the required minimum, then the purging cycle will reset and will not start until the flow rate is above the selected rate. This set up does not allow purge flow to go below the value required and will not recalculate the time for purging if it goes above the required purge rate. This measurement method is the same type as was used in our previous system, the 4000 series. The actual time is calculated by the EPCU.

Dynamic purge time

Dynamic purge time allows the purge time to be updated based on the purge flow through the vent. This method is not dependent on a constant flow from the protective gas source. It bases the purge time on the measured flow and not a set flow. This is very useful when the protective gas supply pressure varies throughout the purging cycle or when it may vary from one installation to another.

The purge time will be based on the measurement of the vent and evaluation of this measurement from the EPCU. This allows recalculation of the time based on this measurement. During the dynamic purge time, the user-interface will display the purge time in a percentage starting with 0% and ending with 100% (purge time complete).

Purging modes

Purging start-up can be set in 3 different modes:

- STD – Standard mode requires the operator to

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engage the manifold solenoid valve manually when purging and manually disengage when a successful purging is complete.

- SA – Semi-automatic mode requires the operator to engage the manifold solenoid valve manually when purging. The EPCU will automatically disengage when a successful purging is complete.
- FA – Fully-automatic mode will automatically engage the manifold solenoid valve when safe pressure is detected and will automatically disengage when a successful purging is complete. This is the factory default setting.

The minimum purge time is 1 minute.

Note During the purging cycle, when the enclosure pressure reaches 0.25" wc [(6.4 mm wc), (0.625 mbar), (62 pa)] or higher, there will be a 5 second delay before the rapid exchange solenoid valve is activated. If the flow is enough through the vent to satisfy the required flow rate setting, then the timer will begin after 1 min. The update of the timer is in increments of 1 min in the Fixed Purge Time and % completed in the Dynamic Purge Time.

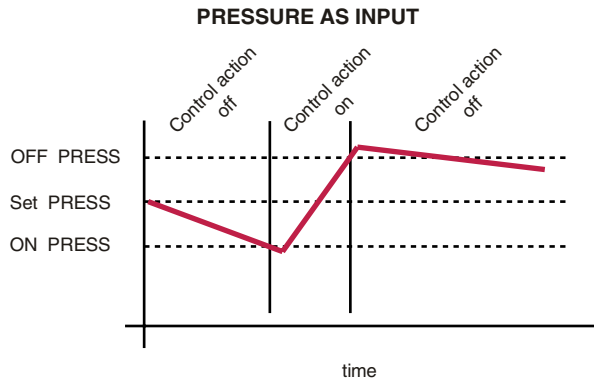
Pressure as Input

In the programming menu under "INPUT SETTINGS" for the optional pressure control. The pressure control is achieved within the enclosure by opening and closing a digital valve or manifold on the 6000 control unit. These two internal pressure set points can be controlled by the manifold or an outside source for pressure. The pressure function can manage the control outputs 1 or 2, or the control valve (manifold valve.

- The "ON PRESSURE" is the lowest pressure you want in the enclosure and will start the control action on when pressure goes below this value
- The "OFF PRESSURE" is when the valve shuts off. When the pressure is between these two values then nothing will happen
- The "ON PRESSURE" function is active until the "OFF PRESSURE" is reached

Note This function does not operate during purging cycle and only operates after purging and pressurization.

Note The "ON PRESSURE" always has to be lower than the "OFF PRESSURE". This cannot be reversed.



I.S. Inputs 1 - 4

There are (4) intrinsically safe inputs for activation of various outputs and actions by the EPCU. These inputs only accept a dry contact for activation and are supplied by the EPCU's galvanically isolated barrier. The configurations of the inputs for various actions are done through the user-interface controller. Only one function can operate per input. The intrinsically safe inputs can be configured through the UIC to activate the auxiliary relays, energize the rapid exchange valve, de-energize the enclosure contacts, and shut the system down, as well as other actions and outputs. To monitor wiring, the SRM-6000 (Sensor Resistor Module, not required, ordered separately) can be added to detect shorts or breaks in the inputs' wiring to the contacts.

Outputs

Enclosure 1 and Enclosure 2

There are (2) normally open dry contacts for the enclosure power that can be energized only after a successful purging and a minimum enclosure pressure is maintained. Loss of pressure will cause the contacts to de-energize unless the shutdown timer is activated or bypass mode is implemented. These contacts operate simultaneously.

Auxiliary 1 and Auxiliary 2

Also available are the Auxiliary 1 and Auxiliary 2 SPDT dry contact outputs. The auxiliary outputs are user configurable using the user-interface controller and can control various inputs or various conditions such as low pressure, loss of pressure, bypass implemented, Rapid Exchange valve on, enclosure above maximum pressure setting, etc. Both enclosure contacts and auxiliary contacts are forced-guided safety relays for functional safety.

STOP Warning Do not use auxiliary contact for power to enclosure(s).

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Warning

If powering auxiliary equipment with auxiliary 1 or auxiliary 2 outputs, the wiring methods used must be suitable for the hazardous area.

Temperature Inputs

The 6000-TEMP-01 temperature hub and 6000-TSEN-01 external temperature sensor(s) are designed to work only with the 6000 Purge and Pressurization system.

An averaging or maximum temperature input reading from the sensor(s) is used to control a solenoid valve or activate the auxiliary relay to cool or heat the enclosure, or warn of temperature problems.

In the programming menu, under "SENSOR SETUP", "EXT SENSOR COUNT", you can configure up to 3 sensors per temperature hub. Each temperature hub has one embedded temperature sensor. In the programming menu under "INPUT SETTINGS" you will select the "HUB", this must be selected if you want to include the hub as a sensor input.

Note

You may not want to include the temperature as an input if the sensor is not located near the device or process you are tracking the temperature of.

Once a "CONTROL ACTION" is selected, then select "SETPOINT TYPE" for the "AVERAGE" or "SINGLE PT".

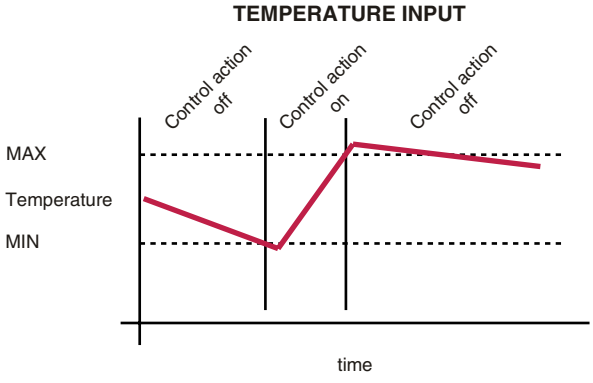
Note

If using more than one (1) sensor, you may want the control action to occur during the peak or average temperature of the sensors.

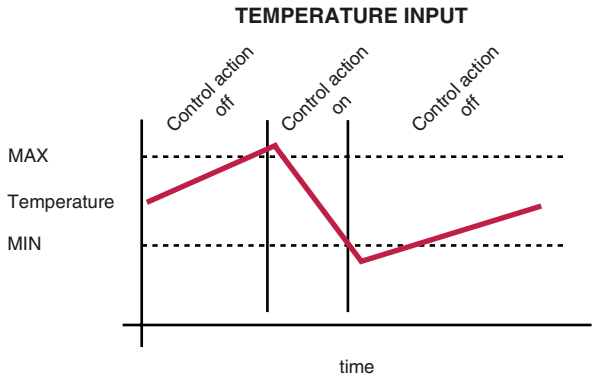
"ON SET POINT" and "OFF SET POINT" are the temperatures for the control action.

Note

The "ON SET POINT" can be greater than the "OFF SET POINT"



Low Temperature Control



High Temperature Control

EPV-6000 I.S. relief vent

The EPV-6000 vent exhausts excess pressure from the enclosure if the pressure with in the enclosure is above 1.0" (25.4 mm) wc and measures flow and pressure during operation. The 6000 series vent has a pressure transducer and thermal flow sensor that is connected to the 6000 EPCU and is intrinsically safe through the galvanic isolation barrier within the EPCU. The measurement of the flow is always at the exhaust of the pressurized enclosure; therefore, the vent is located on the enclosure(s) such that it is venting to the atmosphere.

When using the complete 6000 series system, the vent is connected to the I.S. termination board using the M12 (V1) connector and cable that come with the vent. If using the 6000 series component kit, the vent is connected to the EPCU as shown in the diagram on page 19 (brown wire to terminal 2, blue wire to terminal 4, black wire to terminal 10, white wire to terminal 11). The EPV-6000 vent can be mounted vertically or horizontally and is not gravity dependent. For corrosive environments, the EPV-6000 vent can be ordered with a stainless steel cap so that the body of the vent can be mounted in the enclosure with only the stainless steel cap exposed to the outside environment.

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Set-up procedures of 6000 series system

1. Ensure that electrical, mechanical, and pneumatic connections and requirements are meet to operate this system. Please refer to this manual and standards for explanation of requirements.
2. Apply power to the 6000 series system.
3. (Step 3 is for initial set-up of the system.) The factory default of the 6000 control unit is SA. To adjust the programming of the system, please see page 31 ("Programming menu") for instructions.
4. Verify that the "enclosure pressure control valve" stem is closed before applying pressure to the manifold.
5. Turn on the protective gas supply to the 6000 series system inlet on the manifold. Inlet pressure should be below 120 psig, (8.2 bar).
6. Larger cabinets may take longer to pressurize. Put the system in SA or STD modefor this procedure. Select the user interface display so that the enclosure pressure is showing. This should be reading less than 0.1" wc [(2.54 mm wc), (.25 mbar), (24.9 Pa)]. Slowly open the needle valve until you can feel air venting at the exhaust. Do not exceed 1.5" wc [(38.10 mm wc), (3.75 mbar), (374 Pa)].
7. If air is not exhausting at the vent, check for any obstructions or improper installation.
8. The system is ready to operate.

Operation of the 6000 series system

Gas hazardous location

- Follow "Set-up procedures of 6000 series system"
- Enclosure is sealed.
- Pressure is set to a value above a minimum of 0.25" wc [(6.4 mm wc), (.625 mbar), (62 Pa)], or the set value from the user input.
- Depending on how the purging mode is selected, purging the enclosure is required.
- After a successful purging, with the pressure in the enclosure above 0.25 wc [(6.4 mm wc), (.625 mbar), (62 Pa)], the enclosure is consider safe and power to the enclosure can be energized.
- If the safe pressure drops below 0.25 wc [(6.4 mm wc), (.625 mbar), (62 Pa)], power to the enclosure will be disconnected unless a time delay for shutting off power is implemented (see the requirements for time delay of power shut off).
- To energize the enclosure again, repeat the procedure.

Dust hazardous location

- Enclosure must be cleaned out of all combustible dust. Purging can not be done to clean out enclosure of combustible dust.
- Enclosure is immediately sealed upon removal of combustible dust.
- Pressure is set to a value above a minimum of 0.65" wc [(16.5 mm wc), (1.6 mbar), (162 Pa)], or the set value from the user input.
- With the pressure in the enclosure above 0.65 wc [(16.5 mm wc), (1.6 mbar), (162 Pa)], the enclosure is consider safe and power to the enclosure can be energized.
- If the safe pressure drops below 0.65" wc [(16.5 mm wc), (1.6 mbar), (162 Pa)], the power to the enclosure will be disconnected, unless a time delay for shutting off power is implemented (see the requirements for time delay of power shut off).
- To energize the enclosure again, repeat the procedure.

Dust and gas hazardous location

- Enclosure must be cleaned out of all combustible dust.
- Enclosure is sealed.
- Pressure is set to a value above a minimum of 0.65" wc [(16.5 mm wc), (1.6 mbar), (162 Pa)], or the set value from the user input.
- Depending on how the purging mode is selected, purging the enclosure is required.
- After a successful purging, with the pressure in the enclosure above 0.65" wc [(16.5 mm wc), (1.6 mbar), (162 Pascal)], the enclosure is consider safe and power to the enclosure can be energized.
- If the safe pressure drops below 0.65" wc [(16.5 mm wc), (1.6 mbar), (162 Pa)], the power to the enclosure will be disconnected, unless a time delay for shutting off power is implemented (see the requirements for time delay of power shut off).

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- To energize the enclosure again, repeat the procedure.

The combination of dust and gas requires the cleaning and sealing of the enclosure to clear out the dust hazard(s) and purging the enclosure to clear out the gas hazard(s). After these sequences, the enclosure can be energized. However, the pressure during operation must be sufficient to keep out the worst case hazard in the atmosphere/environment. In this application, dust.

Note Refer to "Conditions of Safe Use"

Start up label located on 6000 series control unit

Model 6000 Type X / Ex px

250 CF / 7.2 CM Maximum Enclosure Volume

System Operation Instructions

1. With Pepperl+Fuchs Purging system air supply on
2. Apply power to the 6000 series control unit.
3. Follow set-up configuration in manual.

   For GAS only areas proceed to step 5
   For DUST only areas proceed to step 4, Omit step 7
   For both GAS and DUST areas proceed to step 4
4. Clean all dust inside of enclosure.
5. With enclosure sealed,
6. Set safe pressure (pressurization) with the control valve.
7. Start the purging by:
   a. FA - Fully automatic will start purging after a safe pressure is set, will automatically stop.
   b. SA - Semi-automatic purging initiated by activating keypad, will automatically stop.
   c. STD - Standard mode, purging starts and stops by activating Keypad.

   After flow rate is met, purging timer will count down until complete.
8. Power to the enclosure can be initiated.
9. Loss of pressure will automatically start the deenergizing of the enclosure power.

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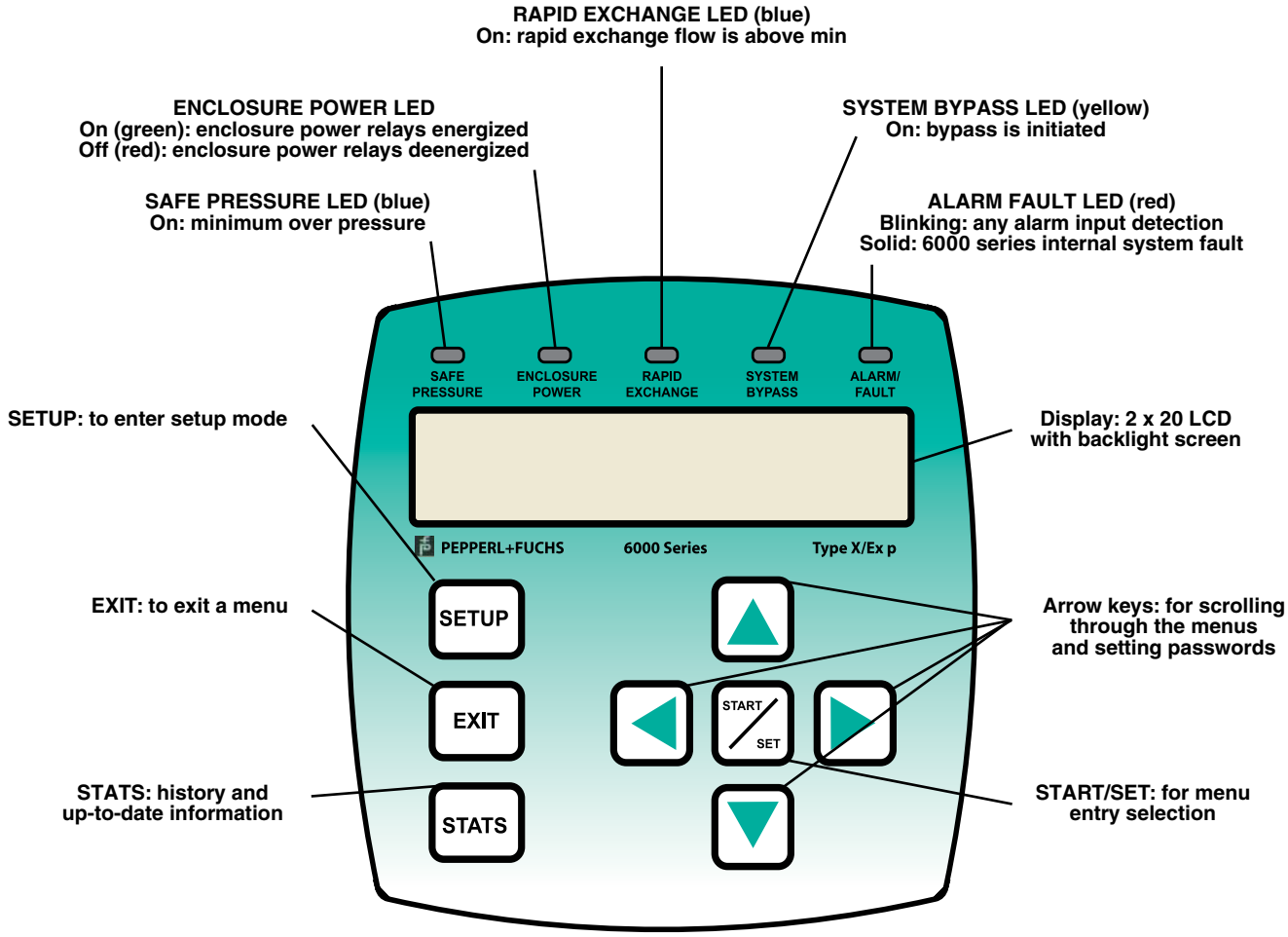
The user interface



Note

To turn LCD back light on and off, press the left and right arrow keys at the same time. The setting remains through the power cycles.

Note

To change the LCD contrast, press the up and down arrow keys at the same time. This will take you to the contrast screen. Then use the up and down arrow keys to adjust the contrast. Once the contrast level is selected, press the START/SET key to save setting. This setting remains through power cycles.

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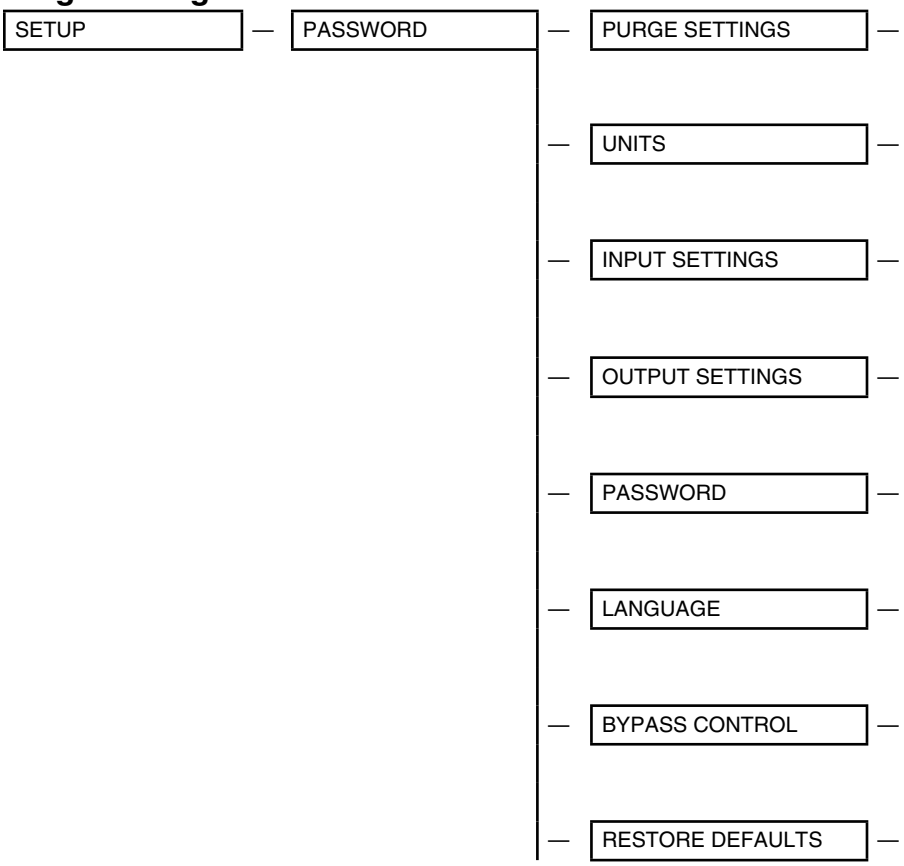
Programming menu



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Purge settings

PURGE SETTINGS				
	ENCLOSURE VOLUME	USER DEFINED	SETTING CORRECT Y/N	
	NUMB OF EXCHANGES.	4 - 19	SETTING CORRECT Y/N	
	PURGE FLOW	5	SETTING CORRECT Y/N	
		12	SETTING CORRECT Y/N	
		20	SETTING CORRECT Y/N	
		30	SETTING CORRECT Y/N	
		DYNAMIC	SETTING CORRECT Y/N	
	VENT FLOW CONTROL	ONE VENT	SETTING CORRECT Y/N	
		2 VENTS ADD FLOWS	SETTING CORRECT Y/N	
		2 VENTS LEAST FLOW	SETTING CORRECT Y/N	
	ENVIRONMENT	GAS, DUST, BOTH	SETTING CORRECT Y/N	
	PRESSURES	MAX OVER PRESSURE	XX.XX	SETTING CORRECT Y/N
		LOW PRESSURE	XX.XX	SETTING CORRECT Y/N
		MIN OVER PRESSURE	XX.XX	SETTING CORRECT Y/N
	TIMERS	PURGE TIMER	READ ONLY - FIXED TIME.	SETTING CORRECT Y/N
		SHUTDOWN TIMER	0 - 300 SEC.	SETTING CORRECT Y/N
		UNLOCK DOOR TIMER	0 - 300 MIN.	SETTING CORRECT Y/N
	OPERATION MODE	STD, SA, FA	SETTING CORRECT Y/N	

Units

UNITS	ENGLISH OR METRIC	SETTING CORRECT Y/N

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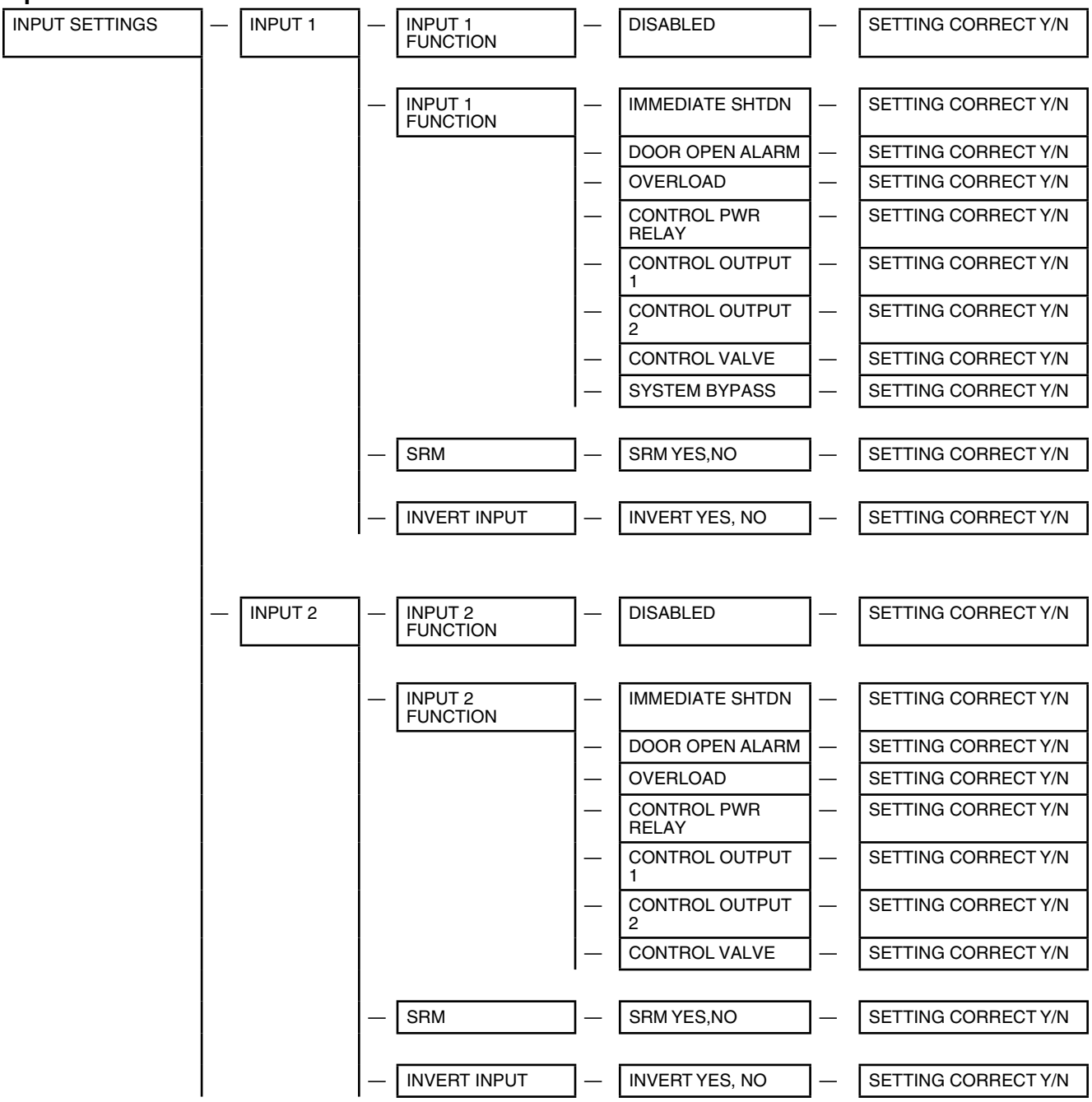
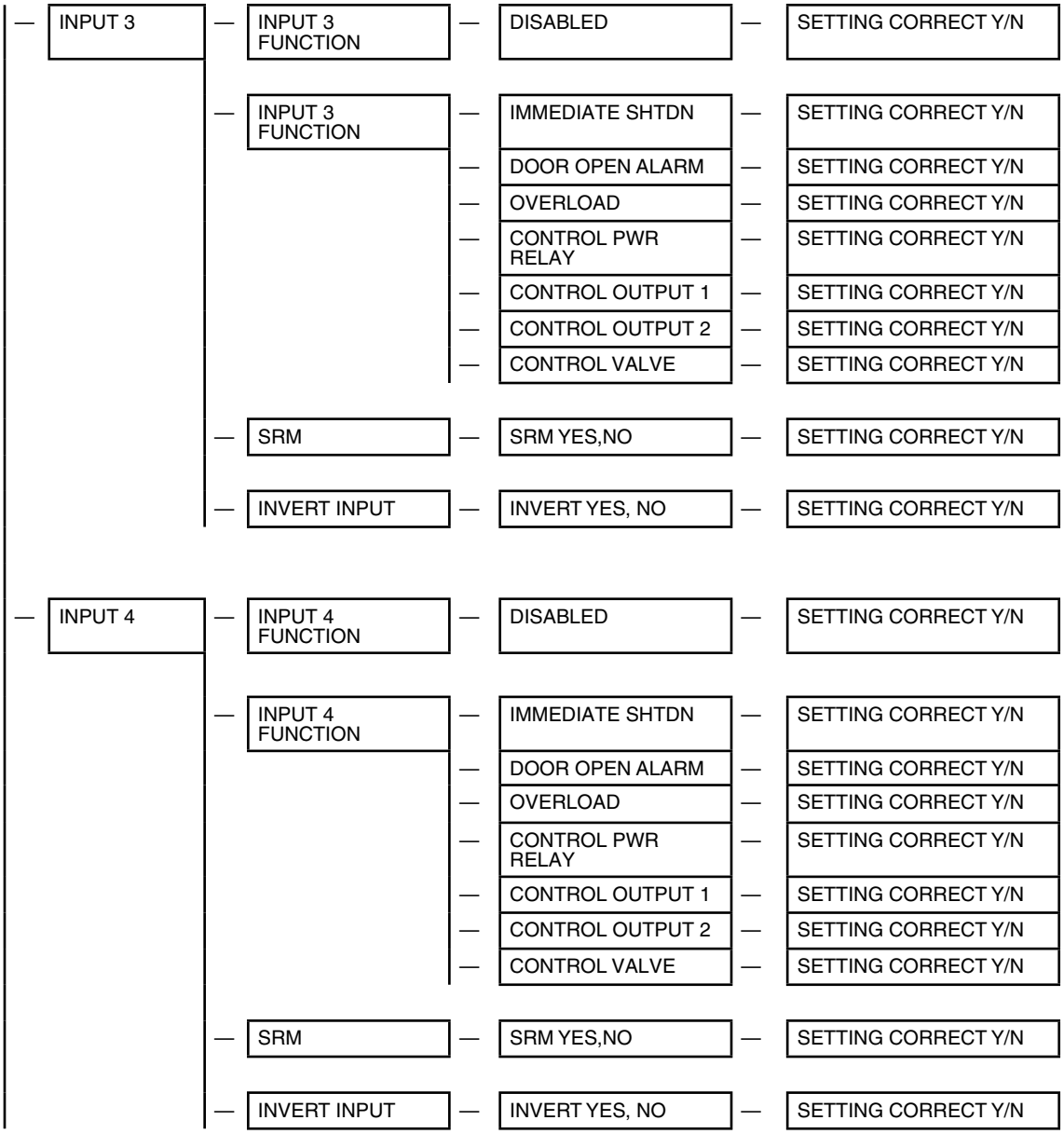
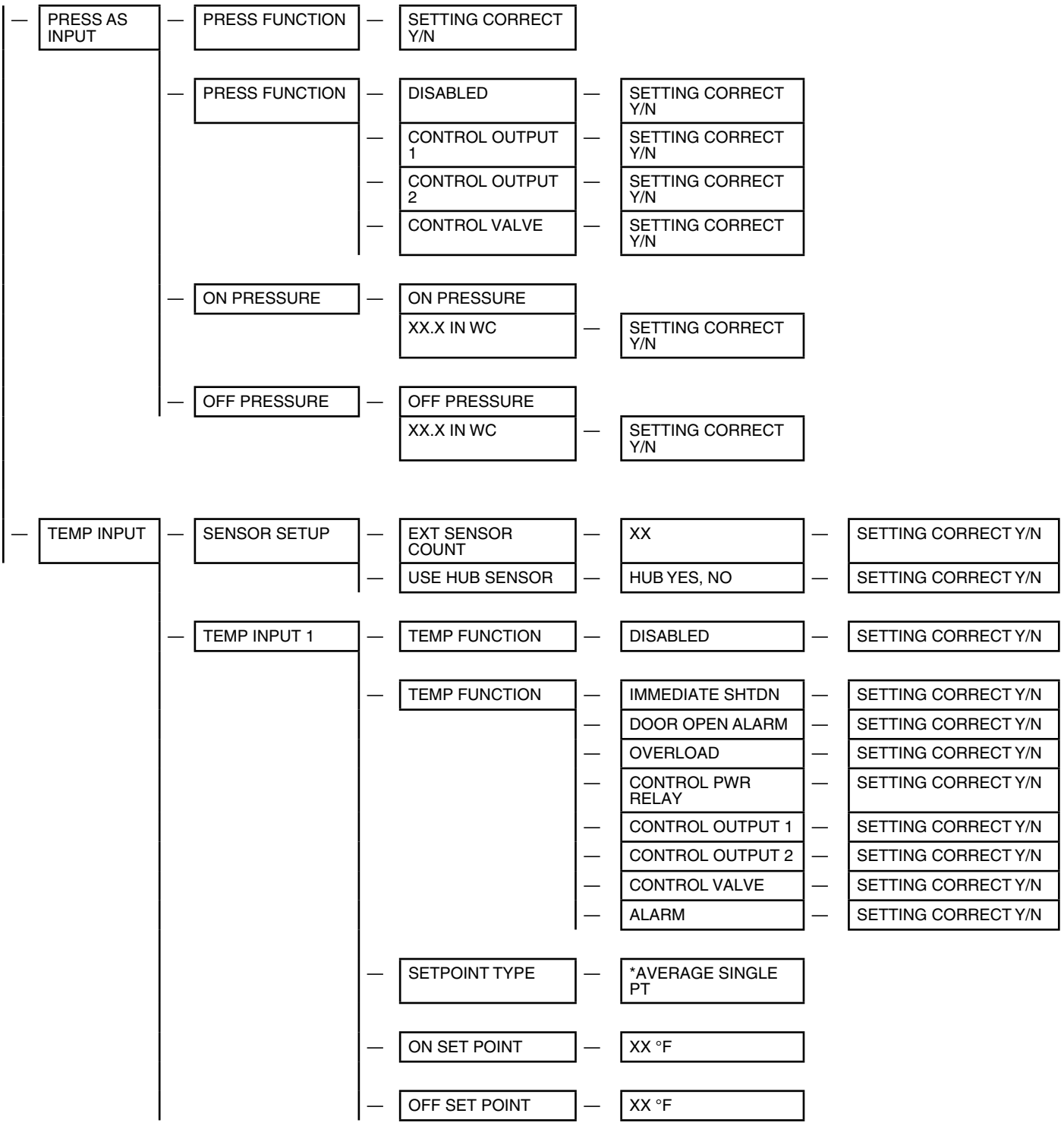
Inputs



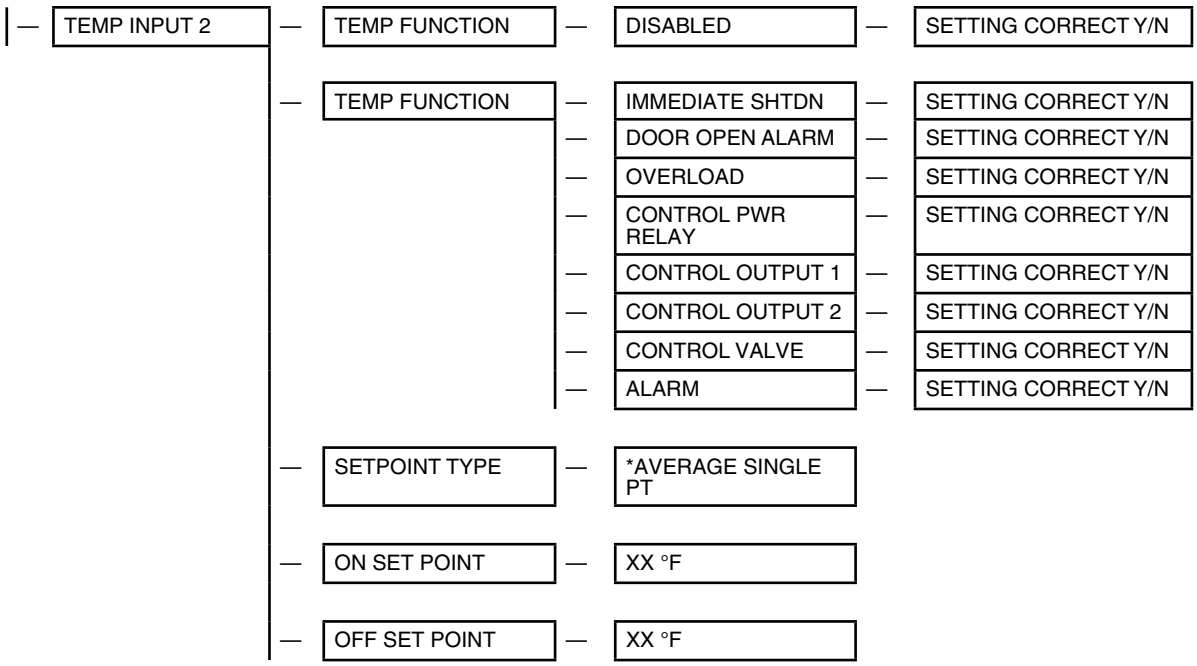
Part No. 514443 Drawing No. 129-0268A (TDOCT-1372BENG) 07/2010



Part No. 514443 Drawing No. 129-0268A (TDOCT-1372BENG) 07/2010



Part No. 514443 Drawing No. 129-0268A (TDOCT-1372BENG) 07/2010



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Outputs

OUTPUT SETTINGS	OUTPUT 1 FUNCTION	DISABLED	SETTING CORRECT Y/N
		IMMED SHUTDN ALARM	SETTING CORRECT Y/N
		DOOR OPEN ALARM	SETTING CORRECT Y/N
		OVERLOAD/TEMP ALARM	SETTING CORRECT Y/N
		MAX PRESSURE ALARM	SETTING CORRECT Y/N
		LOW PRESSURE ALARM	SETTING CORRECT Y/N
		LOST PRESSURE ALARM	SETTING CORRECT Y/N
		ANNOUNCE PURGE	SETTING CORRECT Y/N
		ANY ALARM	SETTING CORRECT Y/N
		ENCL DOOR LOCK	SETTING CORRECT Y/N
		SYS BYPASS ALARM	SETTING CORRECT Y/N
		TEMP INPUT 1 ALARM	SETTING CORRECT Y/N
		TEMP INPUT 2 ALARM	SETTING CORRECT Y/N
	OUTPUT 2 FUNCTION	DISABLED	SETTING CORRECT Y/N
		IMMED SHUTDN ALARM	SETTING CORRECT Y/N
		DOOR OPEN ALARM	SETTING CORRECT Y/N
		OVERLOAD/TEMP ALARM	SETTING CORRECT Y/N
		MAX PRESSURE ALARM	SETTING CORRECT Y/N
		LOW PRESSURE ALARM	SETTING CORRECT Y/N
		LOST PRESSURE ALARM	SETTING CORRECT Y/N
		ANNOUNCE PURGE	SETTING CORRECT Y/N
		ANY ALARM	SETTING CORRECT Y/N
		ENCL DOOR LOCK	SETTING CORRECT Y/N
		TEMP INPUT 1 ALARM	SETTING CORRECT Y/N
		TEMP INPUT 2 ALARM	SETTING CORRECT Y/N

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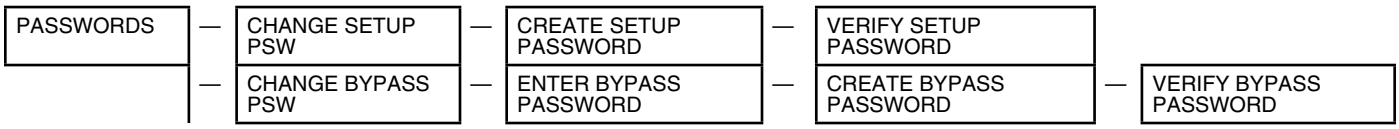
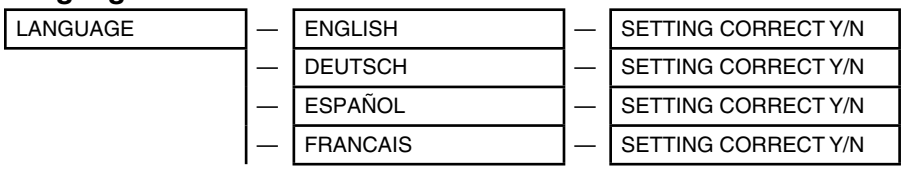
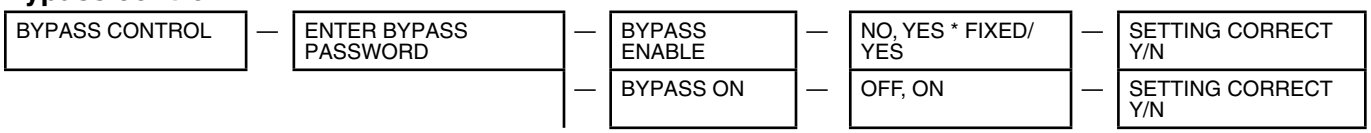
Password



Language



Bypass control



Restore defaults

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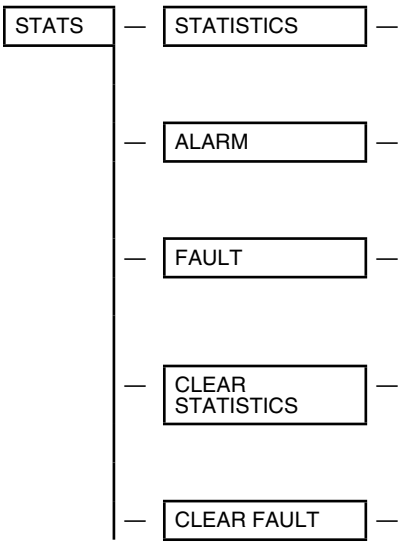
Stats



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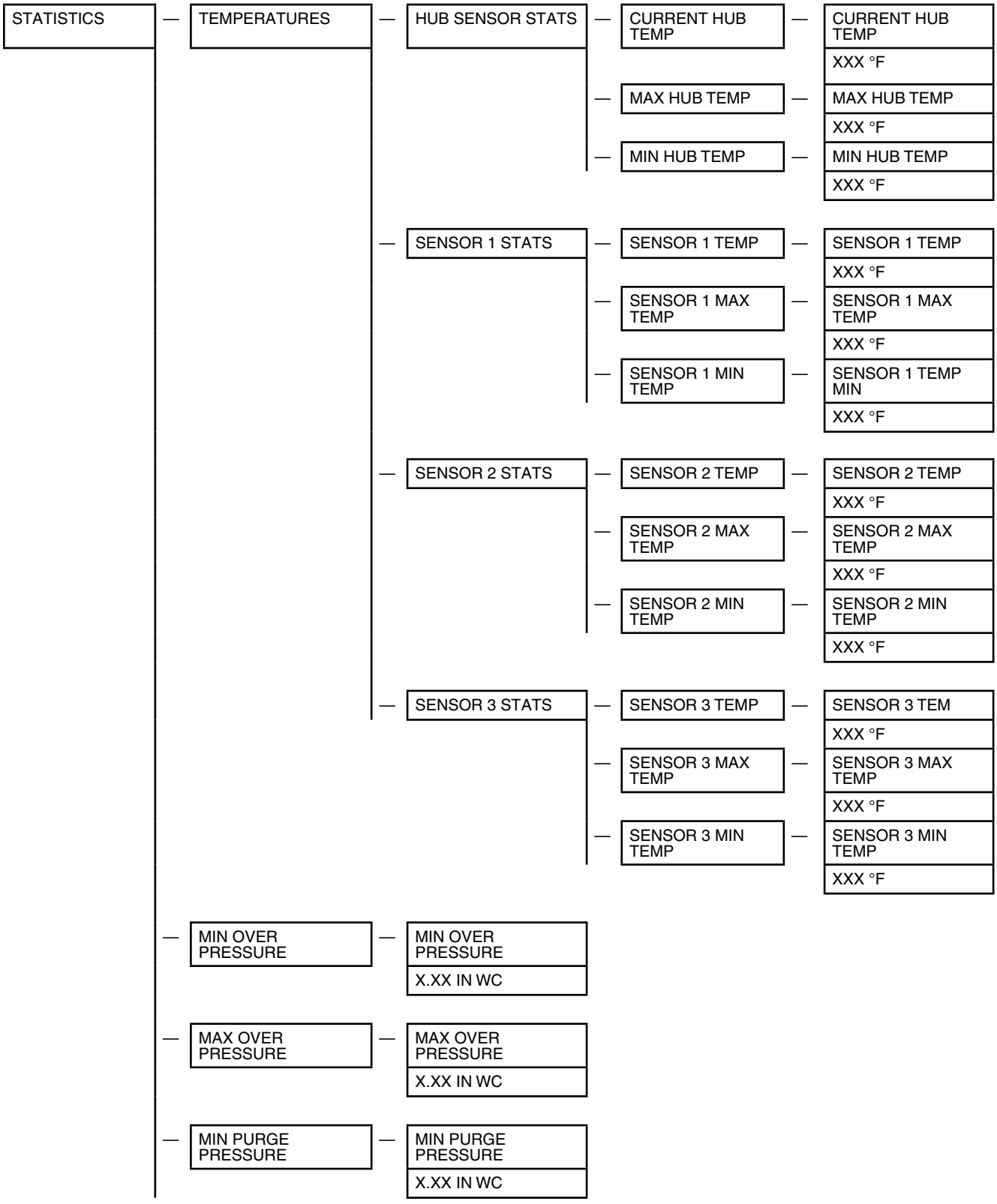
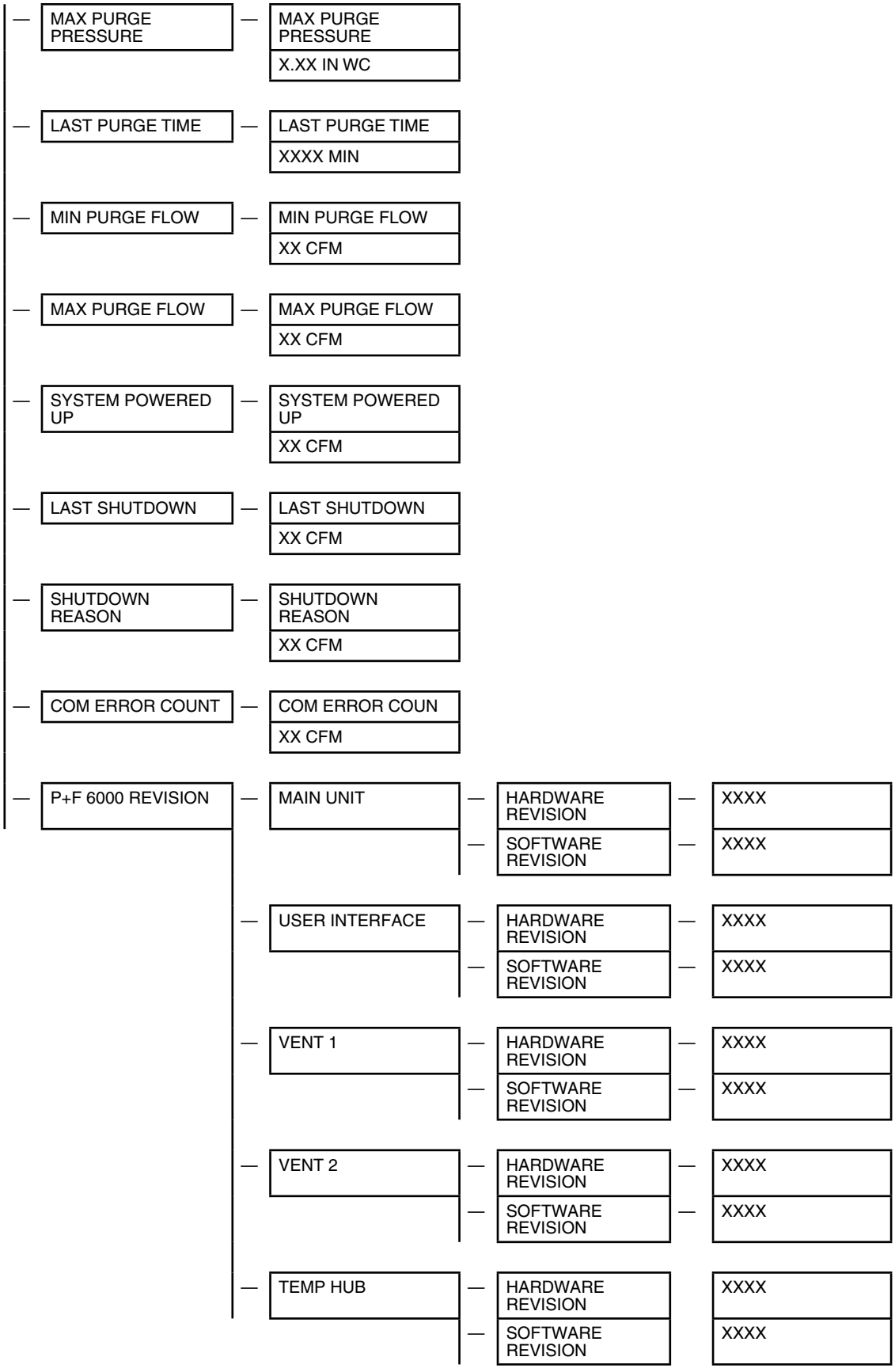
Statistics

This provides system operating information. These fields are read only.



Part No. 514443 Drawing No. 129-0268A (TDOCT-1372BENG) 07/2010



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Alarm

This provides the reason for the last system alarm.

ALARM
NONE
NO SAFE PRESSURE
MAX PRESSURE
INPUT 1 BROKE/ SHORT
INPUT 2 BROKE/ SHORT
INPUT 3 BROKE/ SHORT
INPUT 4 BROKE/ SHORT
DOOR OPEN
IMMEDIATE SHUTDWN
OVERLOAD SHUTDWN
LOST FLOW
13 V
9.5 V
TEMP INPUT 1
TEMP INPUT 2
PRESSURE AS INPUT

Fault

This provides the reason for the system fault.

FAULT
NONE
CONTROL OUTPUT 1
CONTROL OUTPUT 2
CONTROL VALVE
ENCLOSURE POWER RELAY
INPUT 1
INPUT 2
INPUT 3
INPUT 4
13 VOLT POWER
9.5 VOLT POWER
FLOW READING
CONFIG STORAGE
VENT 1 UPDATE
CRC MISMATCH
VENT 2 UPDATE
VALVE
VENT 1 FLOW UPDATE
VENT 2 FLOW UPDATE
TEMPERATURE UPDATE
INTERNAL RAM

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Clear statistics

CLEAR STATISTICS	—	CLEAR STATS Y 0R N	—	SETTING CORRECT Y/N

Clear fault

CLEAR FAULT	—	CLEAR FAULT Y 0R N	—	SETTING CORRECT Y/N

Operation screen

This provides the system information.

OPERATION SCREEN	—	MESSAGE SCREEN
	—	VENT 1 PRESSURE
	—	VENT 1 FLOW
	—	VENT 2 PRESSURE
	—	VENT 2 FLOW

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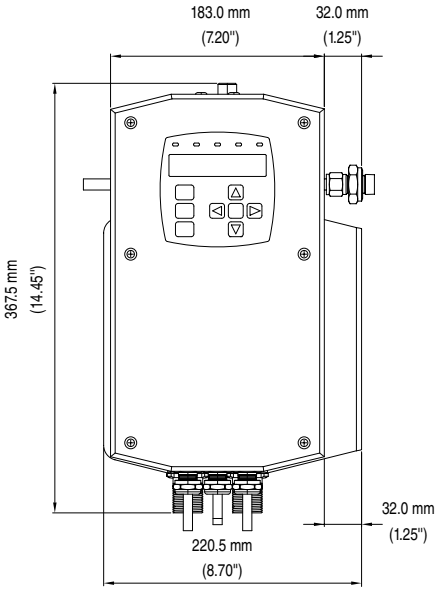
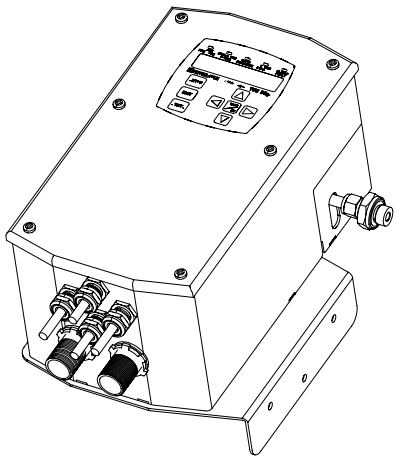
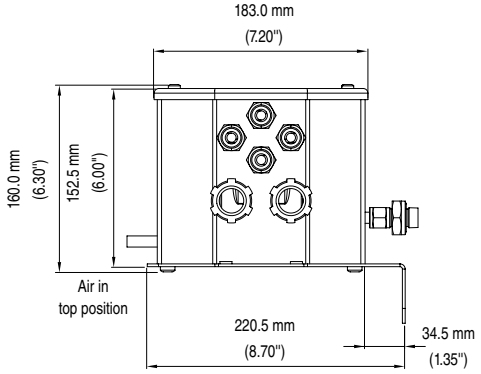
Germany: +49 621 776 2222 pa-info@de.pepperl-fuchs.com
Singapore: +65 6779 9091 pa-info@sg.pepperl-fuchs.com

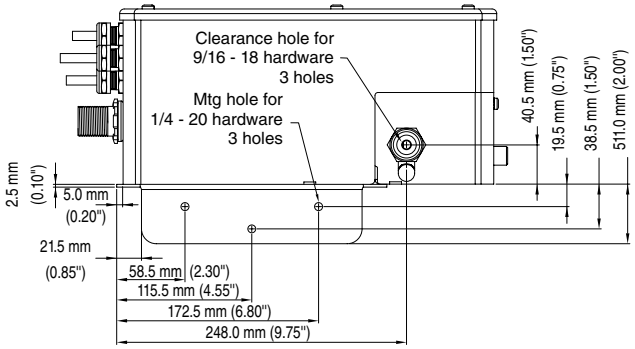
System dimensions

6000 series control unit

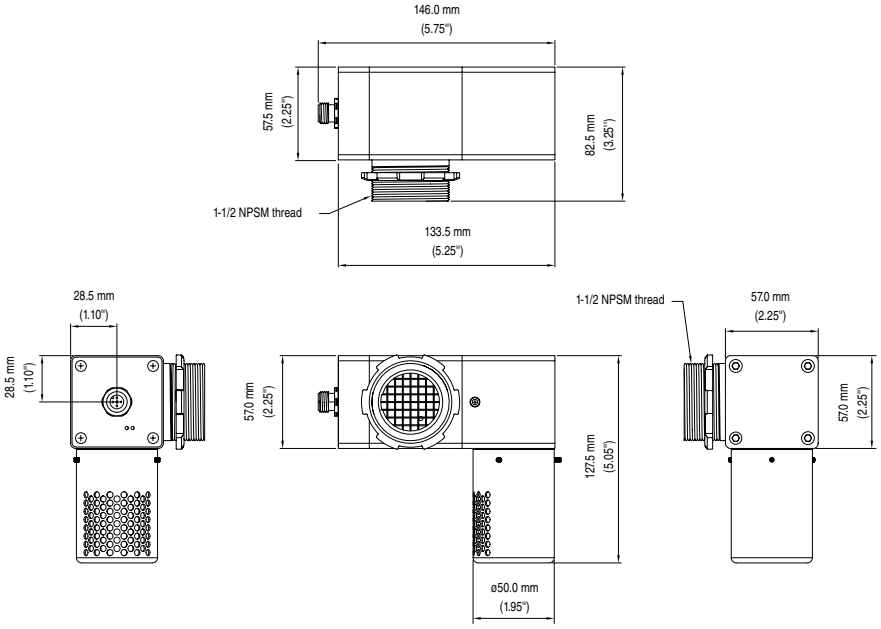








EPV-6000 vent



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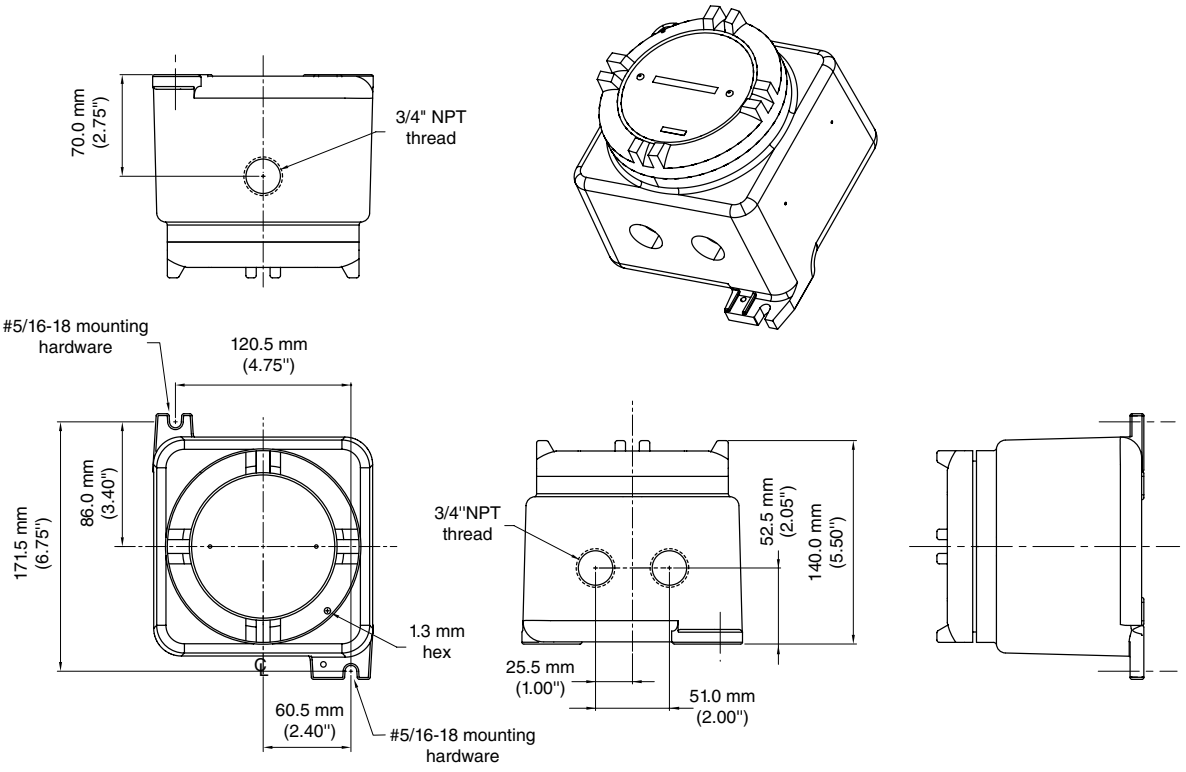
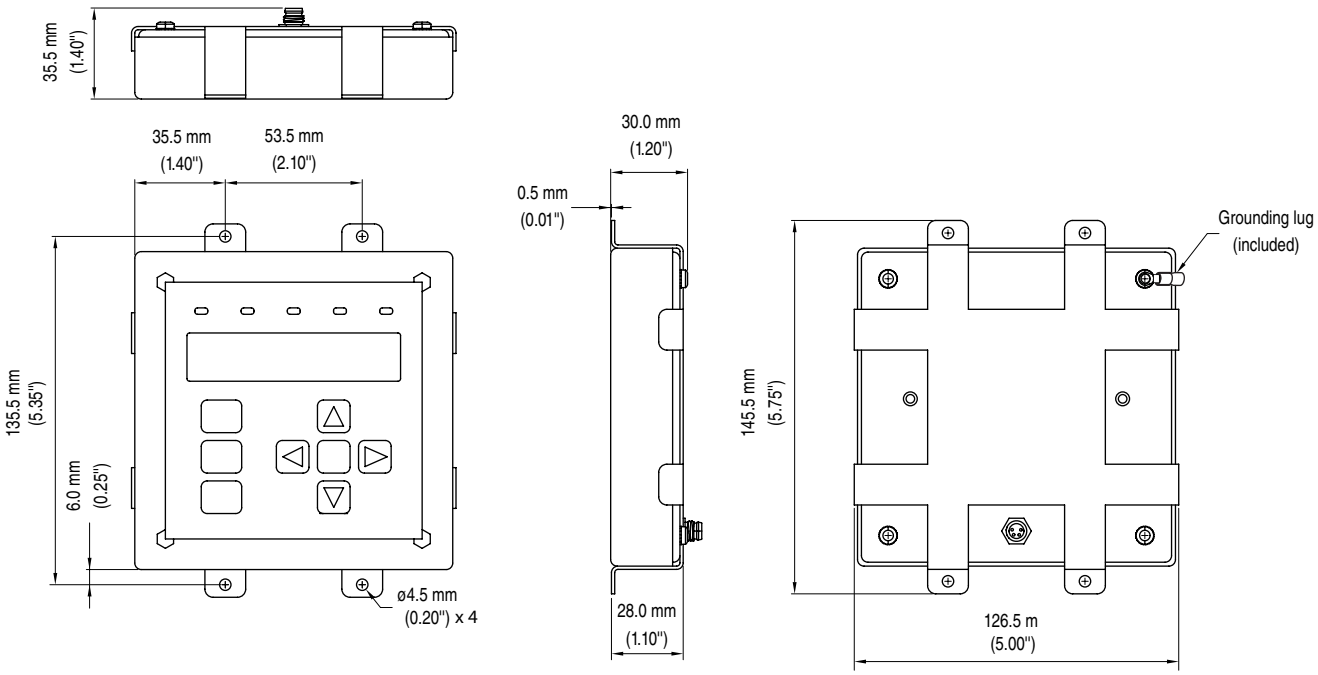
6000 series component kit

EPCU with Ex enclosure



User interface with mounting bracket (panel mount)



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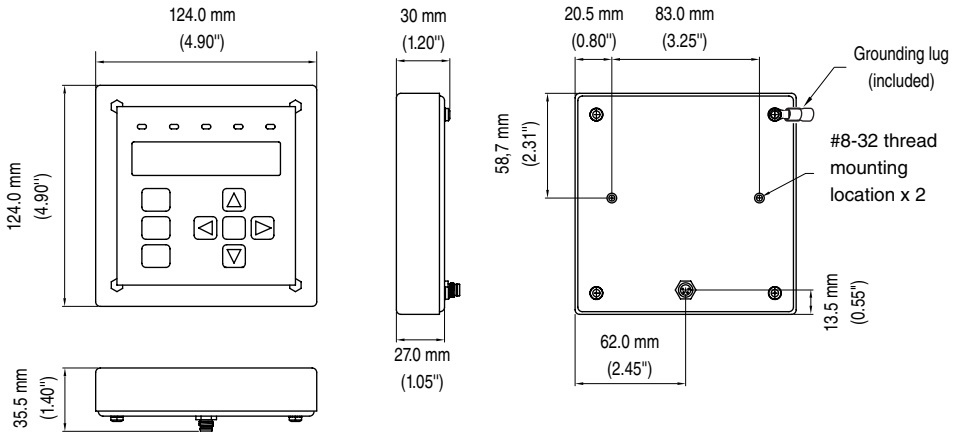
User-interface without mounting bracket (external mount)



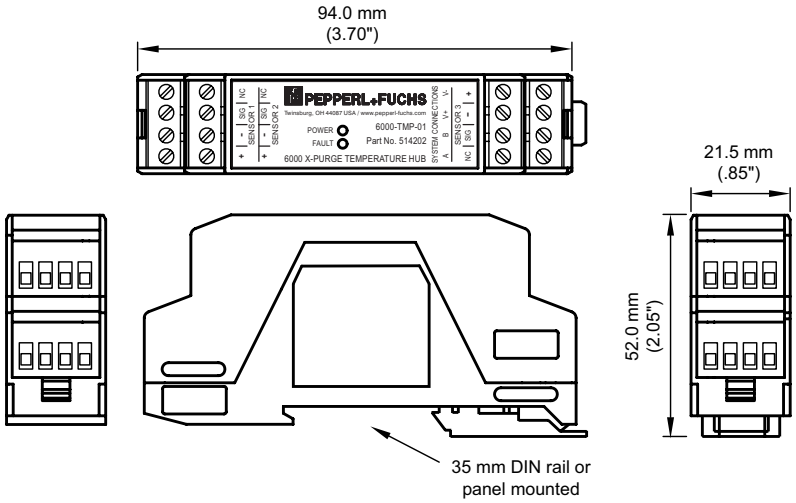
Note

The user-interface can be mounted either inside or outside the pressurized enclosure using the dimensions in the two previous drawings above.

STOP
Warning

Do not make the opening any larger than indicated in the cutout. Install with the gasket provided (panel mount only).

Temperature hub



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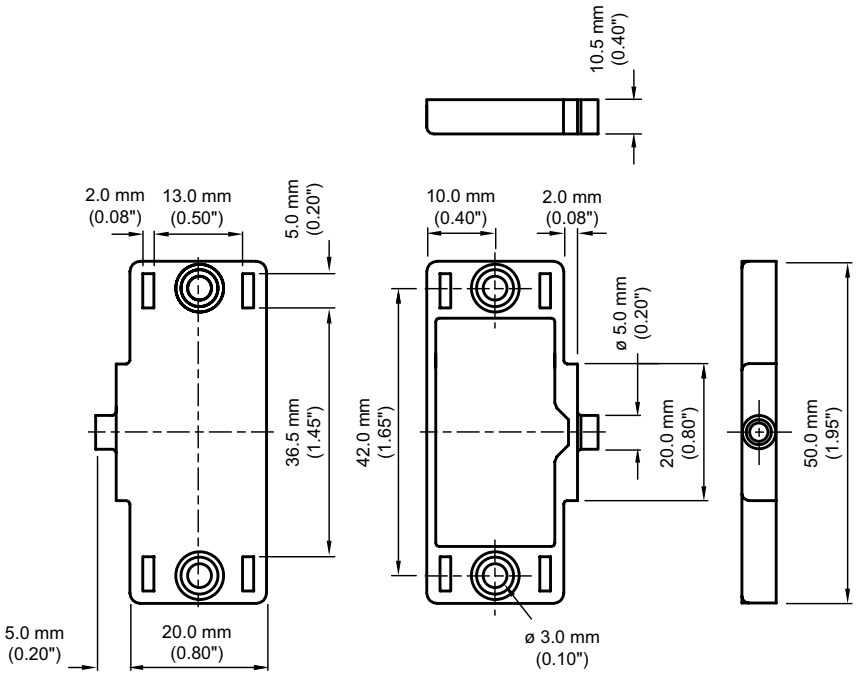
Temperature sensor



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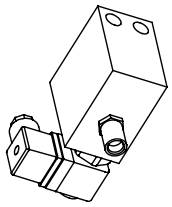
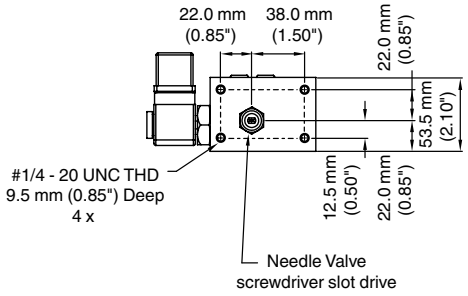
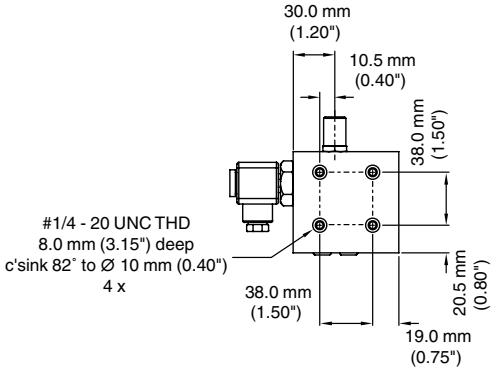
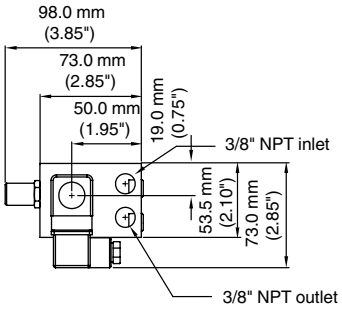
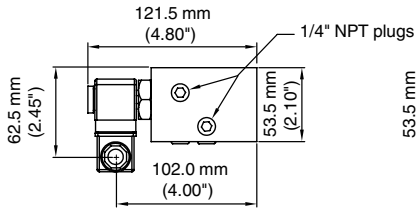
Solenoid

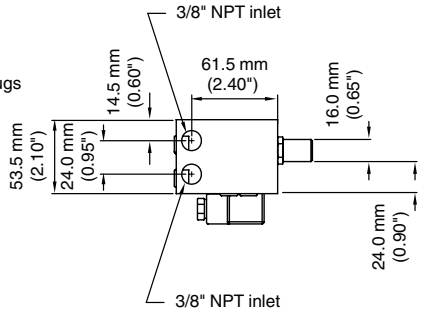


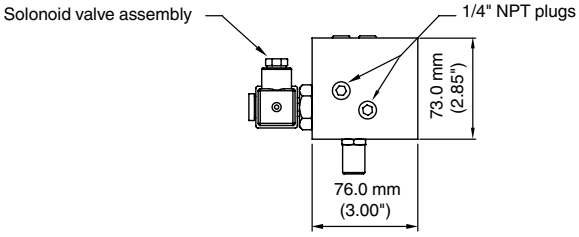












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General specifications

Enclosure volume: 7.2 m^3 (250 ft^3)

Number of volume exchange: 4 to 19

Hazardous environment: Gas, dust, or both

Operation mode for purging (rapid exchange valve)

STD: Manually ON and OFF
SA: Manually ON, automatically OFF
FA: Automatically ON and OFF

Electrical parameters

6000 series control unit

Power requirement:

AC version: 100 to 250 VAC/ 50-60 Hz / 0.2 A
DC version: 20 to 30 VDC / 0.6 A

Outputs:

ENC_1, ENC_2
Protected enclosure contacts: 8 A @ 240 VAC, resistive load
(Dry contacts (2) SPST N.O.) 8 A @ 24 VDC

AUX1 (output 1)
Auxiliary 1 contact output: 2 A @ 240 VAC, resistive load
(Dry contacts, SPDT) 2 A @ 24 VDC

AUX2 (output 2)
Auxiliary 2 contact outputs: 2 A @ 240 VAC, resistive load
(Dry contacts, SPDT) 2 A @ 24 VDC

Inputs:

Inputs 1,2,3,4: Contact input
5 VDC @ 2 mA,intrinsically safe
Temperature inputs: 6000-TEMP, intrinsically safe
Vent(s) EPV-6000: Intrinsically safe connection via connector
Up to 2 vents can be connected
User Interface module: Intrinsically safe connection via M8 (V31) connector
2x20 LCD backlight screen for menu driven set-up and operation

LED indication
Safe pressure: BLUE – Safe pressure is achieved
Enclosure power: GREEN- power on
RED – power off
Rapid exchange: BLUE – when purging is running
System bypass: YELLOW – when bypass is activated
Alarm fault: RED blinking - any alarm input detected
RED solid – 6000 series system fault

I.S. solenoid valve output
Refer to drawing 116-013UL-112. This can be found on our wed site, www.pepperl-fuchs.com

Operating conditions

Storage temp: -30 °C to +80 °C (-22 °F to +176 °F)

Operating temp:
6000 control unit: -20 °C to +60 °C (-4 °F to +140 °F)
EPV-6000 vent: -20 °C to +60 °C (-4 °F to +140 °F)

Pneumatic parameters

Protective gas requirement: Instrument grade air or inert gas

Pressure requirement: 20 to 120 psig
(1.4 bar to 8.3 bar)
(138 kPa to 827 kPa)
(Filter + regulator not provided)

Safe pressure minimum:
Gas: 0.25" wc (6.4 mm wc)
(0.625 mbar) (62 Pa)
Dust: 0.65" wc (16.5 mm wc)
(1.6 mbar) (162 Pa)
Gas+dust: 0.65" wc (16.5 mm wc)
(1.6 mbar) (162 Pa)

Purging flow rate increment and minimum enclosure pressures at flow rate. Minimum purge time is 2 min:
5 SCFM @ 1.3" wc, (141 l/min @ 33 mm wc)
(3.3 mbar), (324 Pa)
12 SCFM @ 2.5" wc, (340 l/min @ 64 mm wc)
(6.3 mbar), (623 Pa)
20 SCFM @ 3.1" wc, (565 l/min @ 77 mm wc)
(7.1 mbar), (772 Pa
30 SCFM @ 3.4" wc, (850 l/min @ 86 mm wc)
(8.5 mbar), (847 Pa)

Maximum flow rate measurement for enclosure size:

Enclosure volume	Flow rate
< 20 ft^3 (0.57 m^3)	5, 12 SCFM (141, 340 l/min)
20 to 30 ft^3 (0.57 to 0.85 m^3)	5, 12, 20 SCFM (141, 340, 565 l/min)
> 30 ft^3 (0.85 m^3)	5, 12, 20, 30 SCFM (141, 340, 565, 850 l/min)

Flow rate (pressurization): 0.01 SCFM (0.30 l/min) @0.25"
0.2 SCFM (5.6 l/mm) @ 0.75" and up (depends on enclosure seal)

Inlet fitting to manifold: 3/8" tubing (included)

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Outlet fitting from manifold: 3/8" bulkhead fitting (included)

Mechanical specifications

6000 control unit

Protection class (all electronics): Type 4X, IP66 pending

Weight: control unit: 25 lbs (11.4 kg)

Power connections: 3/4" NPT male pipe (explosion proof seals required)

I.S. input connections: Terminal connection inside 6000 series unit

Material:

- Enclosure: 316L (UNS S31603) stainless steel
- Manifold valve: Anodized 6082 aluminum
- Fittings: 316L (UNS S31603) stainless steel
- I.S. cable glands: M16 x 1.5 (5.5 - 10 mm) (4)

Terminal blocks EPCU:

- Power terminal block: Conductors 26-14 AWG (0.13 - 2.08 mm^2), torque 5-7 in-lbs (0.6 to 0.8 Nm)
- I.S. terminal block: Conductors 28 - 16 AWG (0.08 - 1.31 mm^2), torque 4 in-lbs (0.5 Nm)

EPV-6000 relief vent

Flow rate measurement

Flow rate is measured in increments, 5, 12, 20, 30 SCFM & Dynamic,

(141 l/min, 340 l/min, 565 l/min, 850 l/min, & Dynamic)

Protection class: Mounting fitting Type 4X, IP66

Weight: 3 lb (1.4 kg)

Power connections: M12 (V1) pin connector, intrinsically safe (mating connector with cable comes with vent for connection to the control unit)

Max cable length: 22 AWG (0.33 mm^2) wire = 5 m (16.5 ft)

Maximum run length 18.3 m (60 ft))

Mounting: Mounting can be any orientation to the enclosure. Not dependent on gravity.

Mounting hole: 1 ½" NPT knockout (Ø 2", 50.8 mm) hole, mounting with sealed nut

Material:

EPV-6000-AA-__: Marine grade anodized 6061T6 aluminum

EPV-6000-SS-__:

- Cap: 316L (UNS S31603)
- Body: Marine grade anodized 6061T6 aluminum

Spark arrestor assembly:

Protected with 304 (UNS S30400) stainless steel spark arrestor screen. Cap is movable so that opening can be positioned downwards.

User interface controller

Max cable length: 24 AWG (0.20 mm^2) wire = 12,2 m (40 ft)

Parts List

Control unit with housing

- (1) 6000 control unit
- (1) bracket for mounting control unit
- (1) EFC-6-SS
- (2) 3/8" stainless steel tube
- (1) 3/8" male ferrule fitting
- (4) ¼-20 flathead screws for mounting control unit to bracket
- (4) ¼-20 round head
- (4) Type 4X seal washer
- (4) ¼-20 bolts
- (1) EWN, enclosure warning nameplate
- (1) Installation/operation manual

EPV-6000 Vent

- (1) EPV-6000 vent
- (1) quick disconnect M12 (V1) cable 22 AWG (0.33 mm^2), 5 m (16.5 ft.)
- (1) reference fitting tubing kit (stainless steel version only)

Component kit

- (1) control unit
- (1) explosion proof / flameproof enclosure
- Bolts for mounting explosion proof / flameproof enclosure
- Washers/nuts for mounting explosion proof / flameproof enclosure
- (1) 6000-UIC-01 user interface
- (1) SMK-600-CK mounting hardware for 6000-UIC-01
- (1) quick disconnect M12 (V1) cable 24 AWG (0.20 mm^2), 5 m (16.5 ft.) for 6000-UIC-01
- (1) 6000-MAN-DV-01 pneumatic manifold w/solenoid
- Mounting screws for 6000-MAN-DV-01
- (1) EFC-6-SS flush mount connector

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Certifications

Complete Unit

09.2188647

Class I, Division 1, Groups A, B, C, D T4
Class I, Zone 1, Groups IICT4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
Class II, Groups E, F, G, Class III
Ex tD 21 T60 °C
-20 °C ≤ Ta ≤ 50 °C

4S11

Class I, Division 1, Groups A, B, C, D
Class I, Zone 1, Groups IIC T4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
Ex d [ib px] IIC T4
-20 °C ≤ Ta ≤ 60 °C

II 2 GD Ex d [ib px] IIC T4 tD A21 IP6X T60 °C
Sira 09ATEX9337X

Ex d [ib px] IIC T4 tD A21 IP6X T60 °C
IECEX CSA09.0007X

Component Kit

09.2188647

Class I, Division 1, Groups A, B, C, D T4
Class I, Zone 1, Groups IICT4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment

4S11

Class I, Division 1, Groups A, B, C, D
Class I, Zone 1, Groups IICT 4
Intrinsically Safe when installed per 116-013UL-12
[Ex i] Associated Equipment
Ex d [ib px] IIC T4
-20°C ≤ Ta ≤ 60 °C

DEMKO 07ATEX 0705753X
II 2 G Ex d [ib px] IIC T4
IECEx UL08.0003X

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Model number designators

Control unit

6000 - DV - S2 - UN - WH - AC

- AC - 100 - 250 V AC
- DC - 20 - 30 V DC

- WH - with stainless steel housing
- XE - with increased safety terminal box
- CK - component kit
- XD - with Ex de couplings

- S2 - Sil 2, IEC61508, standard

- DV - digital solenoid valve
- NV - no valve - digital valve

Vent

EPV - 6000 - AA - 01

- 01 - standard vent
- 02 - 2nd vent configuration

- AA - anodized aluminum
- SS - stainless steel

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Accessories

The following accessories are available for the 6000 series purge system

Model number	Description
EFC-6-SS	Flush mount connector (included with unit)
CG-8	1/2" cable gland
HR-SW00	Key switch (removable in one position)
SRM-6000	Short circuit, open circuit resistor module
6000-MAN-DV-01	I.S. manifold kit with solenoid valve
EWN-1	Warning metal tag
ETW-15	Temperature warning metal tag
	(1) EWN tag comes with every system ordered
6000-COUPLER-3/4-M20	3/4" NPT female to M20 female coupler for conduit, Ex de rated, nickel-plated brass
6000-COUPLER-3/4-M25	3/4" NPT female to M25 female coupler for conduit, Ex de rated, nickel-plated brass
6000-DCK-01	Explosion proof conduit seals for power EPCU and power to enclosure (1/2" NPT). Sealing material included
6000-JCK-01	Explosion proof conduit seals for power EPCU and power to enclosure with junction box (3/4" NPT). Sealing material included
6000-UIC-02	6000 user interface controller with bracket and cable
6000-ACC-514478	3/8" stainless steel tubing for manifold connection. 64 mm (2.5") long, 2 pcs
6000-ACC-514479	Mounting bracket with mounting screws for 6000 control unit
6000-ACC-514480	Mounting bolts for bracket to enclosure and control unit to bracket. 4 pcs.
6000-ACC-514481	3/8" filter and regulator with fitting for connection to 6000 series manifold
6000-ACC-514482	Atmospheric reference kit for mounting EPV-6000-AA vent **inside** enclosure
6000-ACC-514483	1 - 1/2" locknut **with** ground and gasket for EPV-6000 vent mounted **outside** enclosure
6000-ACC-514484	1 - 1/2" locknut **without** ground and gasket for EPV-6000 vent mounted **inside** enclosure
6000-ACC-514485	M12 vent cable for EPV-6000 with 4 I.S. tags
6000-TEMP-01	Temperature hub
6000-TSEN-01	Temperature sensor

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Appendix

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Supplement: NFPA 496 information

Enclosure & device design

Enclosure design requirements

1. All windows must be shatterproof and sized as small as possible.
2. All required markings must be placed on or near all enclosure doors and covers.
3. The enclosure must withstand an internal pressure of ten (10) inches (254 mm) of water without sustaining permanent deformation and resist all corrosive elements in the surrounding atmosphere.
4. All lightweight objects in the enclosure, such as paper or insulation, must be firmly secured.
5. The enclosure should be constructed from materials such as metal or anti-static polycarbonate to meet or exceed Type 4 or 12 performance requirements, but does not require third party approval.
6. The installation of obstructions or other barriers which block or impede the flow of protective gas must be avoided.
7. The creation of air pockets or other areas which trap flammable gases within the enclosure or devices must be avoided.
8. The enclosure should be located in an area where impact hazards are minimal.
9. If the enclosure is nonmetallic and contains equipment which utilizes or switches power loads greater than 2500 A, it must be constructed from substantially noncombustible materials, such as materials designed to meet or exceed ANSI/UL94 ratings of 94 V-0 or 94 5 V.

Adjacent enclosures

1. Adjacent enclosures must be protected by one of the following means:
   a. purged or pressurized in series with the protected enclosure;
   b. purged or pressurized separately; or
   c. protected by other means; e.g., explosion proof enclosures, hermetically sealed devices or intrinsic safe circuits.
2. Adjacent purged or pressurized enclosures must be designed to meet all construction requirements above.

Total Volume Calculation

1. The total volume of all pressurized enclosures, devices and wireways must be considered.
2. All enclosure, device, and wireway volumes must be calculated without consideration of internally consumed space.

Note

NFPA 496 defines the enclosure volume for generators, motors, and other rotating electric machinery to be the volume within the enclosure minus the volume of the internal components, e.g., rotors, stators, and field coils.

Device ventilation

1. Enclosed devices within the protected enclosure which do not exceed 20 cm^3 (1.22 in^3) of free volume do not require ventilation to the protected enclosure.
2. If the free volume of an internal device exceeds 20 cm^3 (1.22 in^3), it must be protected by one of the following means:
   a. ventilated on the top and bottom sides with 6.45 cm^3 (one [1] square inch) of opening for each 6555 cm^3 (four hundred [400] in^3) of volume within the internal protected enclosure, at a minimum diameter of 6.4 mm (one [1] quarter in. [1/4"]);
   b. purged in series with the protected enclosure or be purged separately; or
   c. protected by other means; e.g., explosion proof enclosures, hermetically sealed devices, or intrinsically safe circuits.

Temperature limitations

1. The enclosure must have no surface area which exceeds 80 percent of the flammable or ignitable substance's auto-ignition temperature.
2. Internal devices which exceed this temperature must be protected by one of the following manners:
   a. the device is enclosed in a chamber which is cUL or FM listed as a hermetically sealed device which prohibits the entrance of flammable or ignitable substance, and maintains a surface temperature below temperature limits;
   b. it can be proven by testing that the devices will not ignite the substance involved;
   c. the device is purged in a separate enclosure that bears an ETW (Enclosure Temperature Warning

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nameplate). Devices may only be accessed after power has been removed and the device has been allowed to cool to a safe temperature, or the area is positively known to be nonhazardous.

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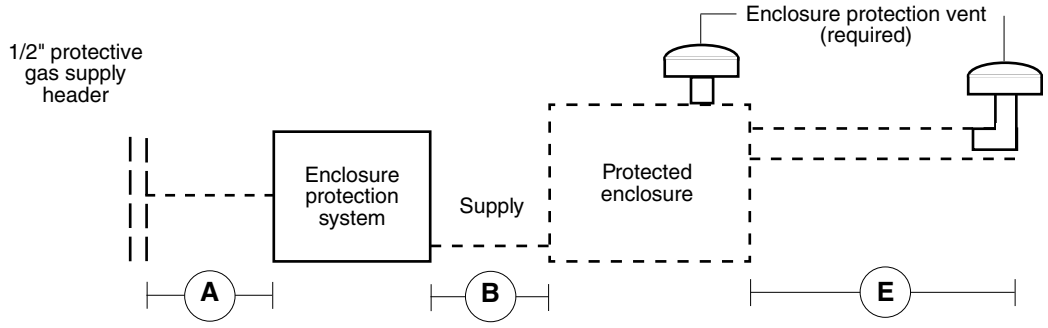
Establishing connection sizes, lengths & bends

Typical single protected enclosure connections with vent

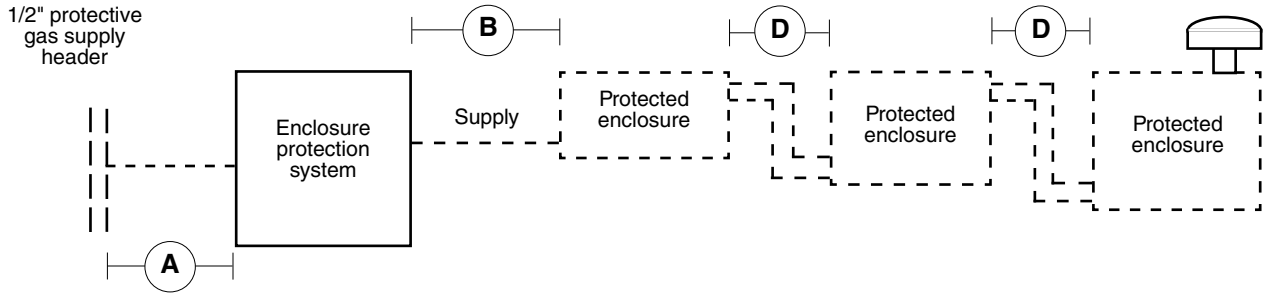


	A*	B*	D	E
Model 6000	System supply tubing	Enclosure supply	Multi - enclosure connections	Optional remote venting
*Tubing or pipe diameter Tubing and pipe must be fully reamed	1/2" O.D. tubing or 1/2" I.D. piping	3/8" O.D. tubing	1-1/2" I.D. pipe fully reamed	1-1/2" I.D. pipe fully reamed
Maximum tubing / pipe length and maximum number of bends / elbows	6.1 m (20 feet) 10 bends	6.1 m (20 feet) 5 bends	3.1 m (10 feet) 5 elbows	3.1 m (10 feet) 5 elbows

*Smaller tubing and longer lengths allowed but flow will be decreased

NOTE: Tube and pipe sizes are trade sizes and are NOT equal in inside diameter. **DO NOT** substitute tube for pipe with the same trade size.

Typical multiple protected enclosure connections



Helpful hints

To ensure adequate protective gas flow to the protected enclosure(s), all piping and tubing must be fully reamed.

Precautions must be taken to prevent crimping and other damage to protective gas piping and tubing.

When protecting multiple enclosures with a single enclosure protection system, the enclosures should be connected in series from the smallest to the largest to ensure adequate protective gas flow.

Note Flow rate will also be dependant on the regulated pressure source

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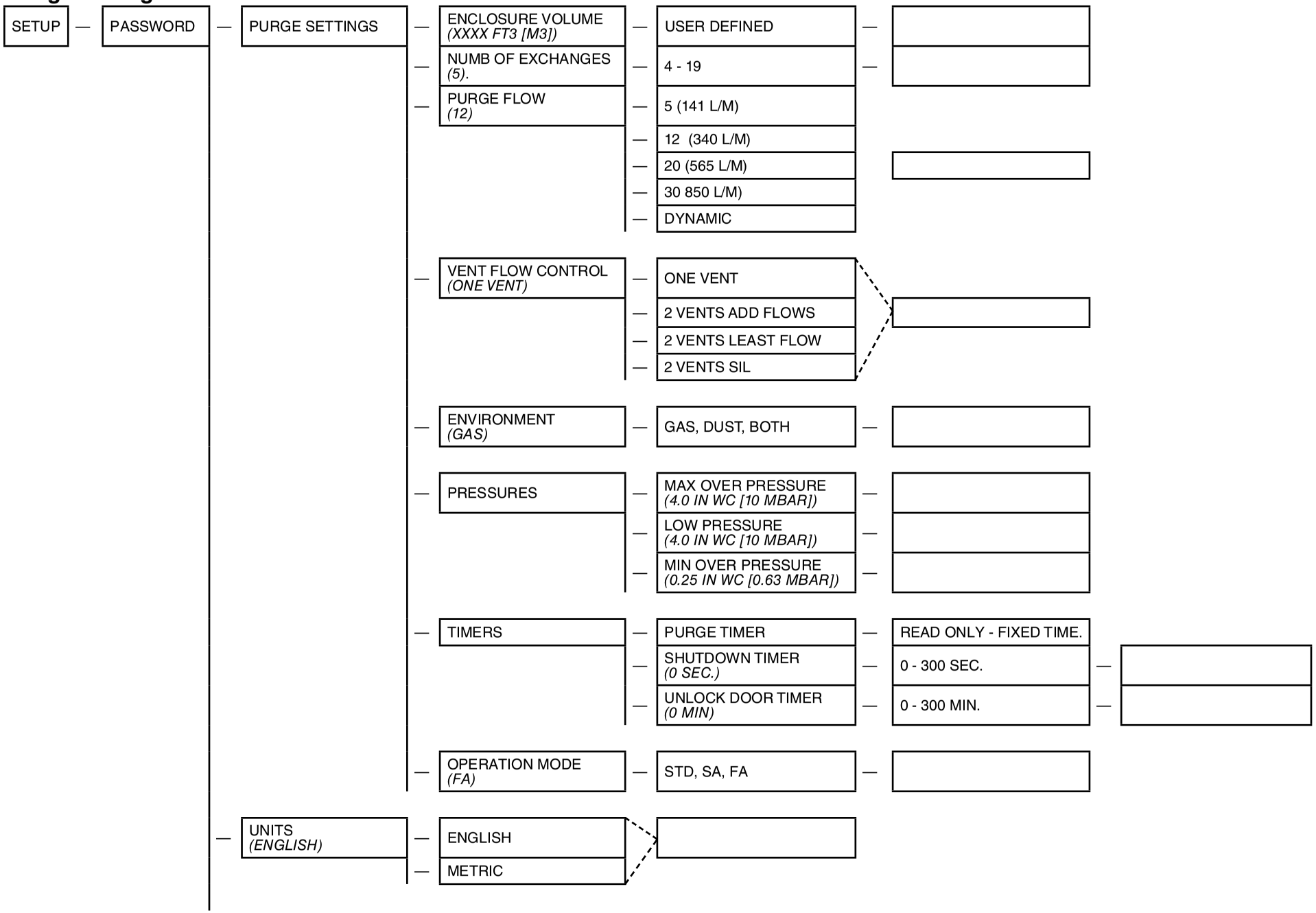
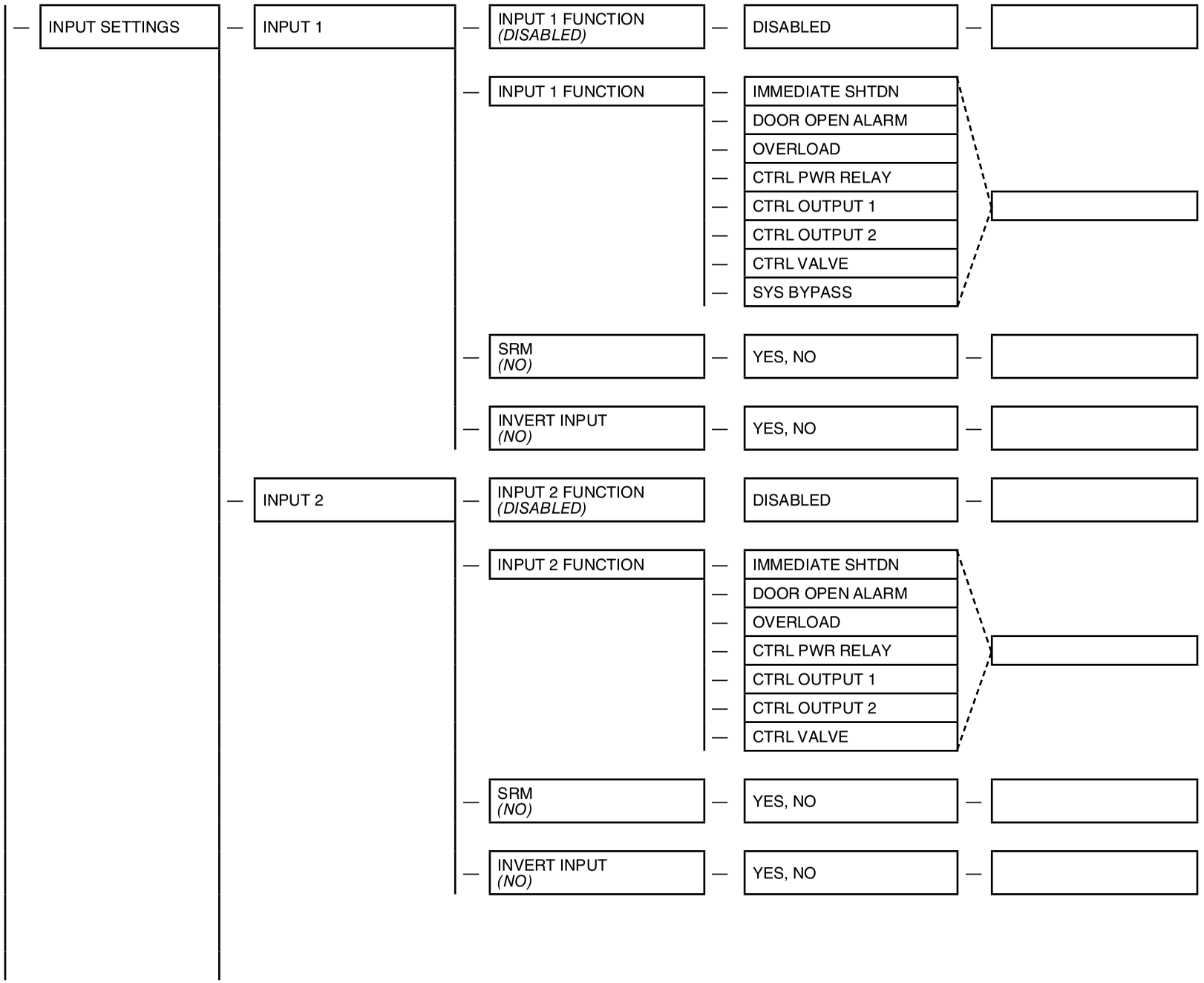
Programming worksheet





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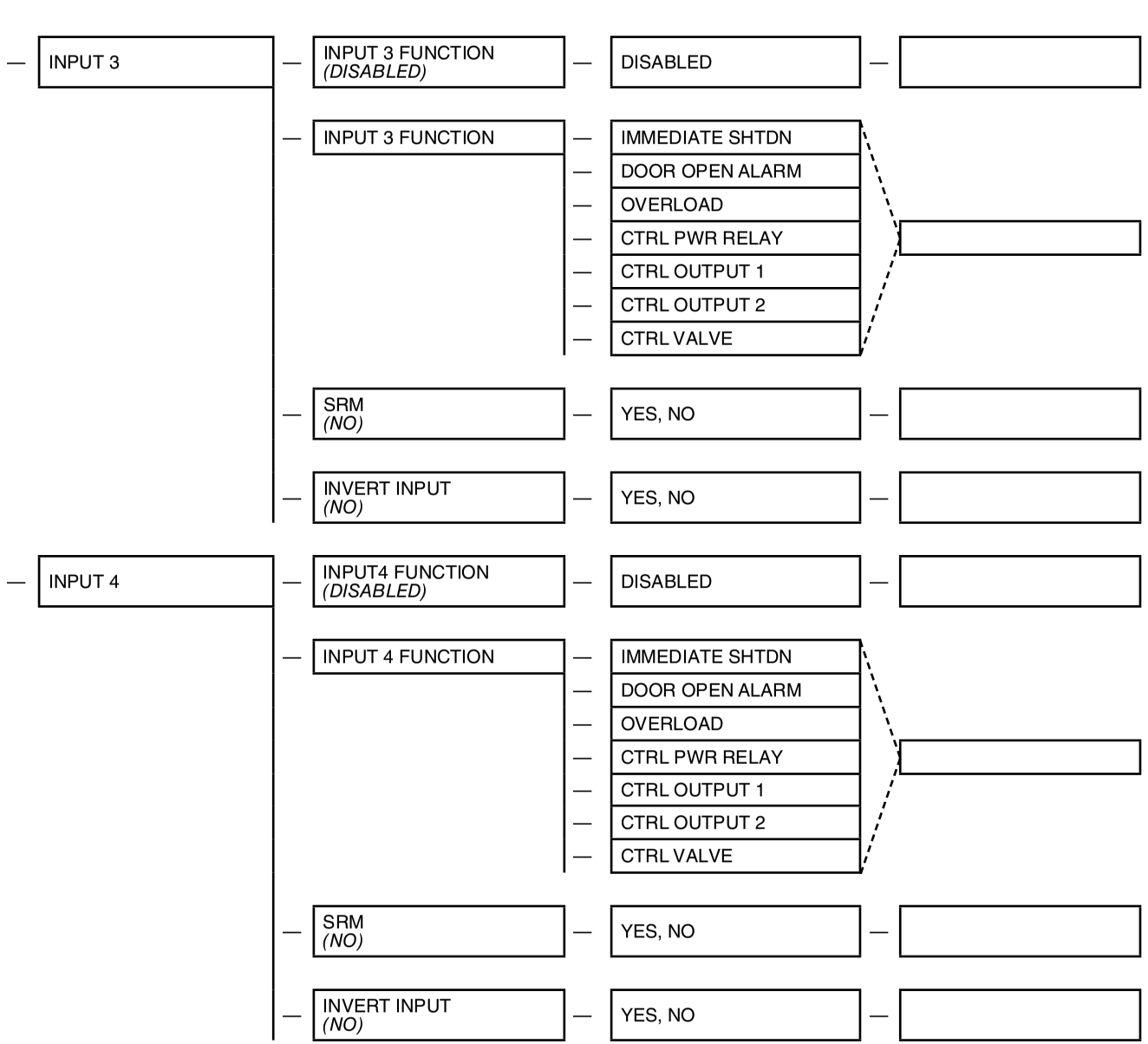

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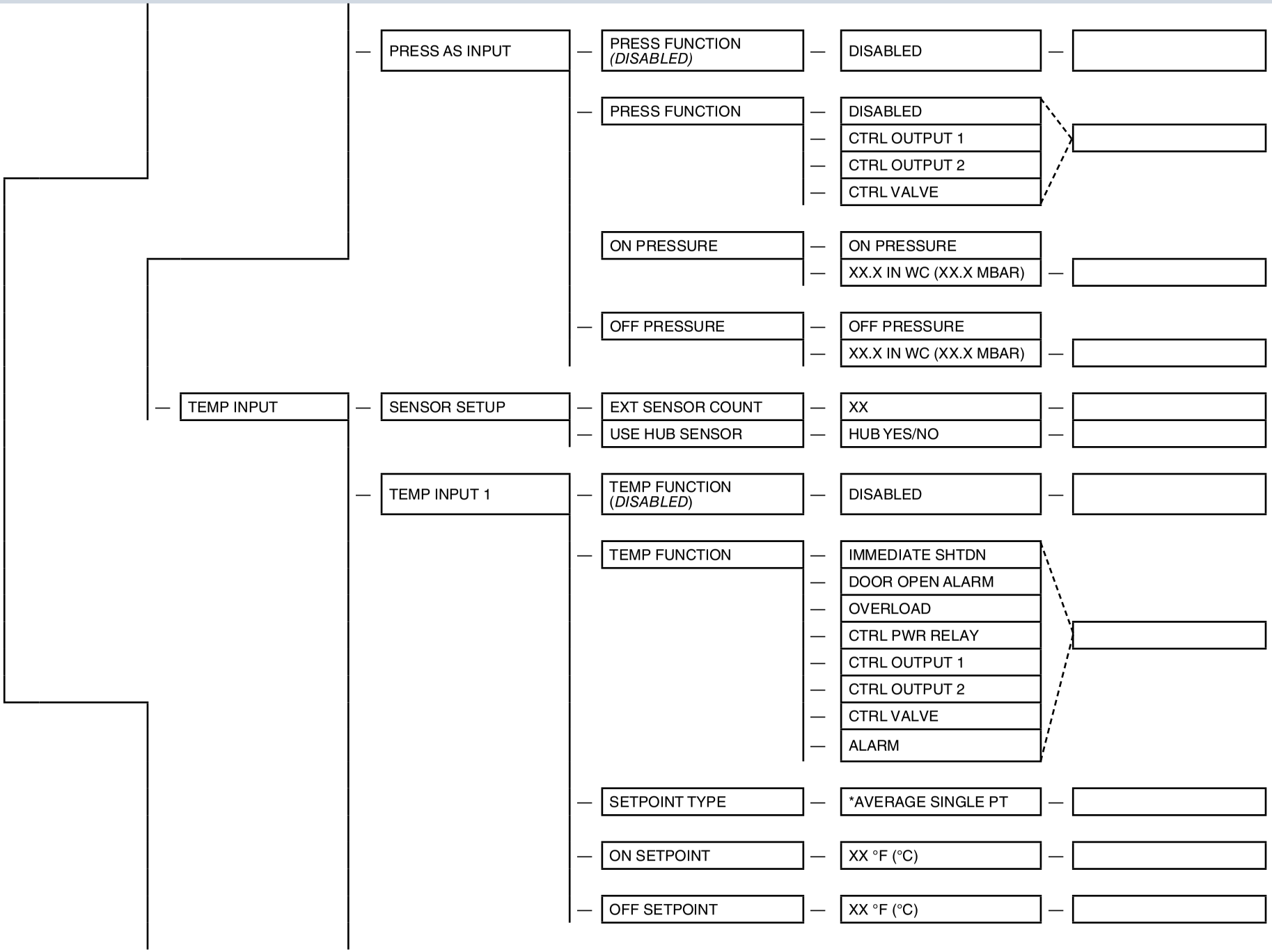

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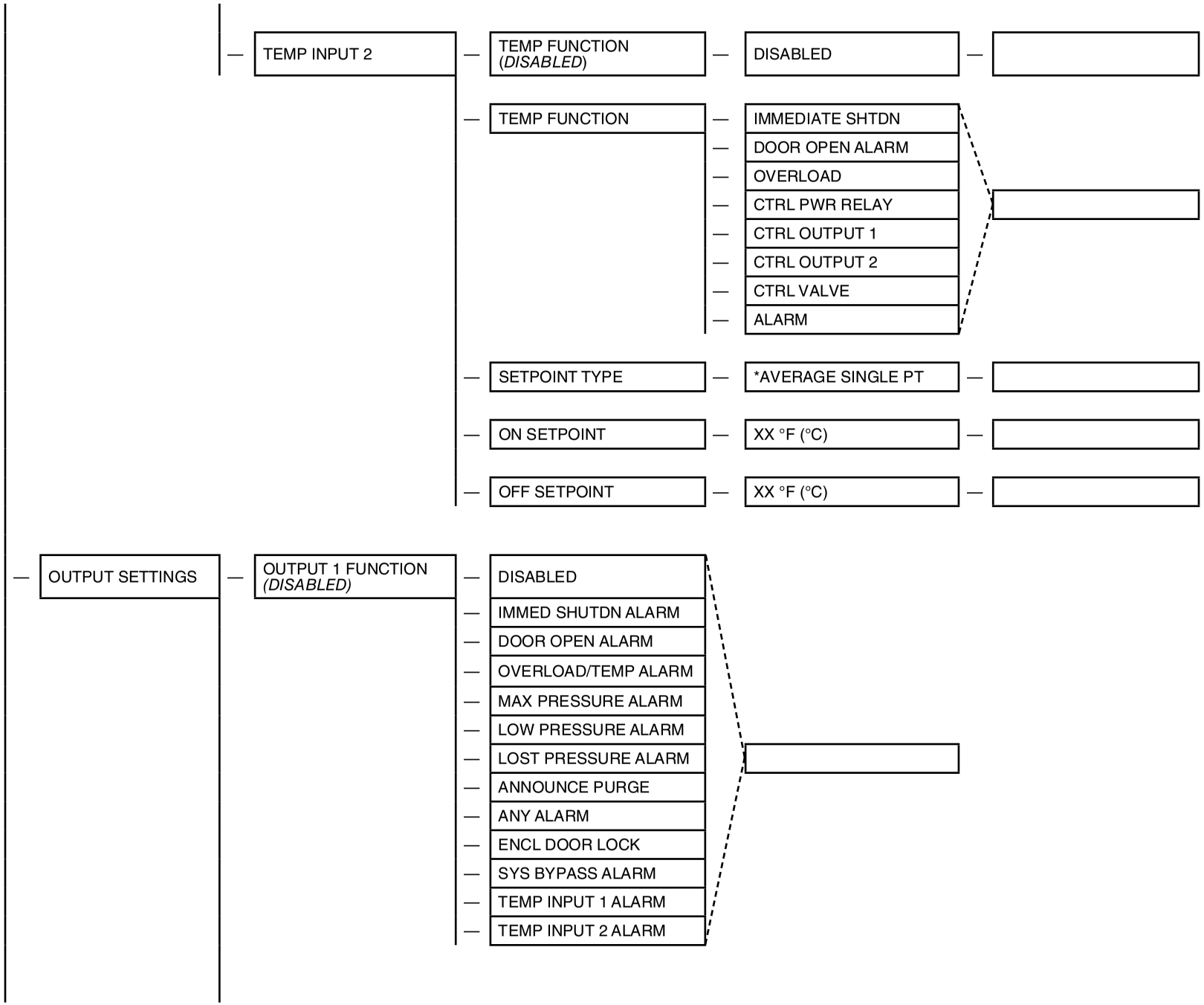

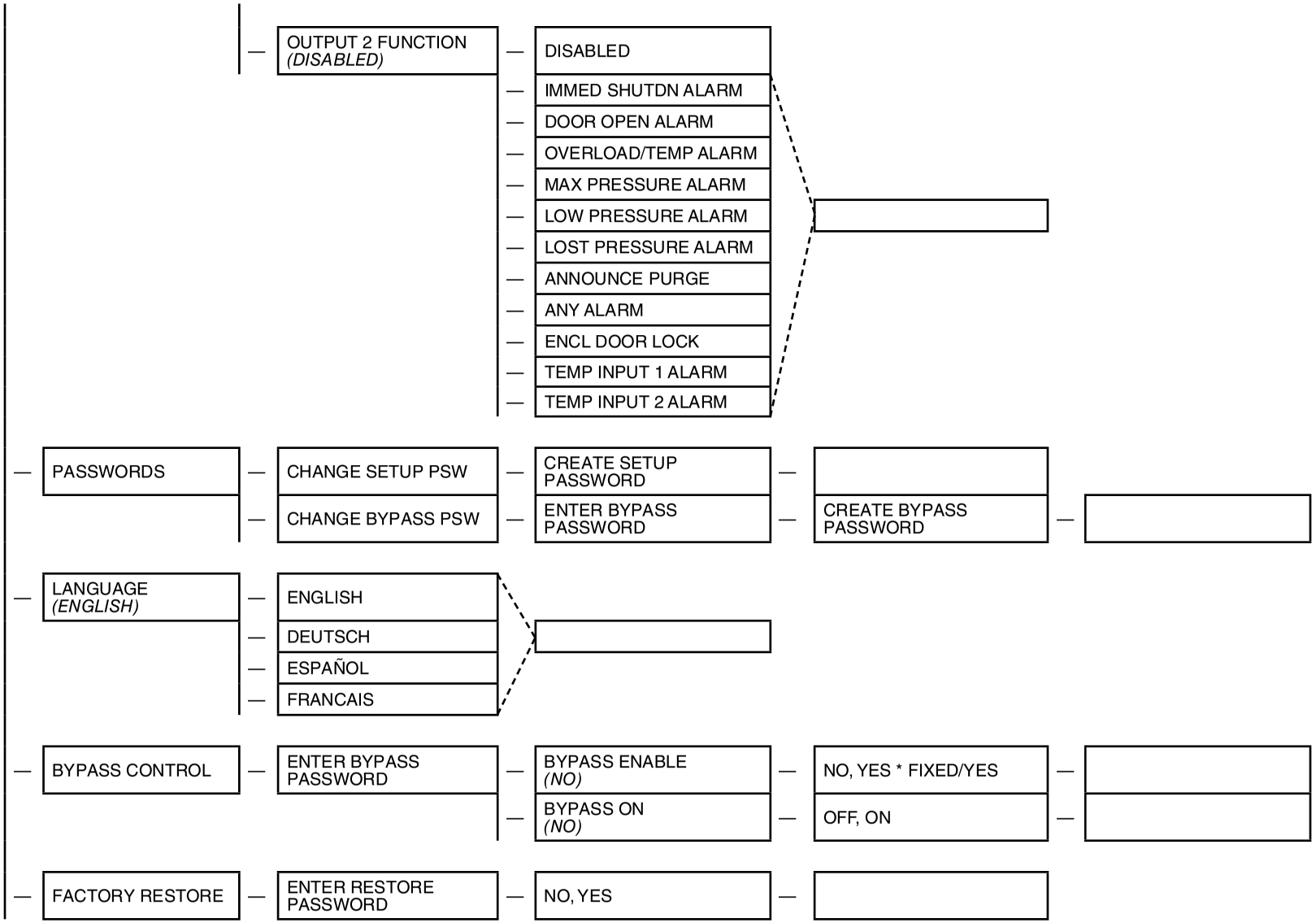

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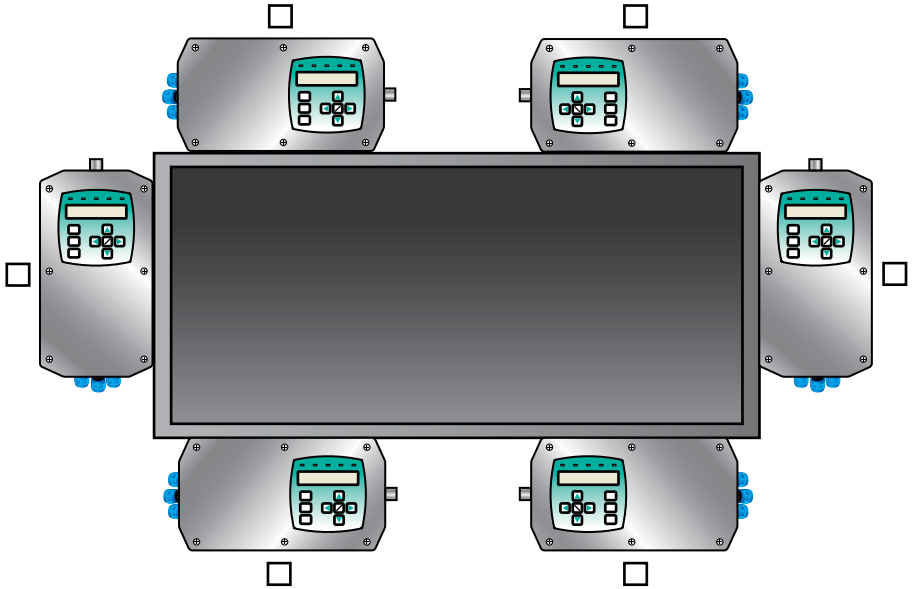
ARROW KEY SEQUENCE - 4 TO 8 STROKES EACH

SETUP PASSWORD								
BYPASS PASSWORD								

DATE:

NAME:



(Left hand mount is default)

Italicized items in parentheses are default settings

Additional charge for preconfiguration

Vent orientation not required

Notes:

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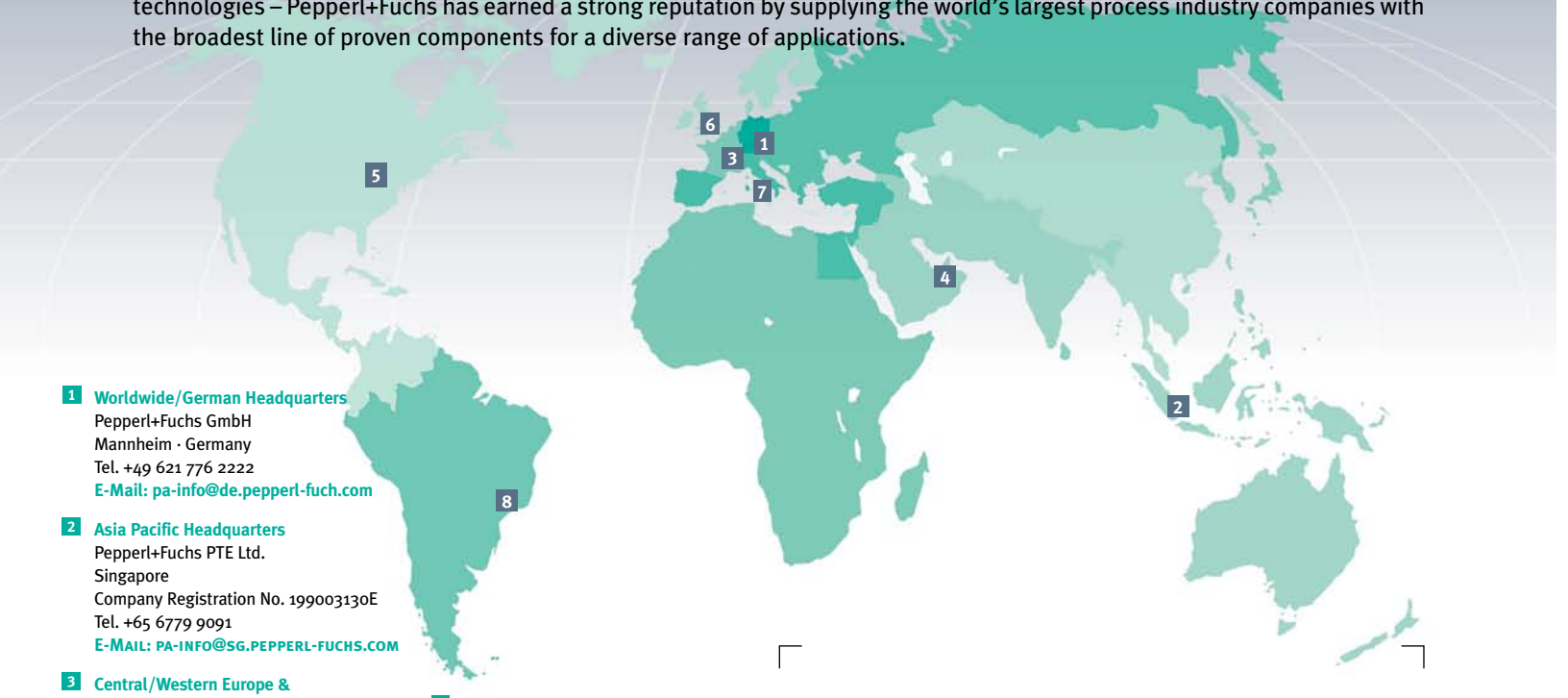

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