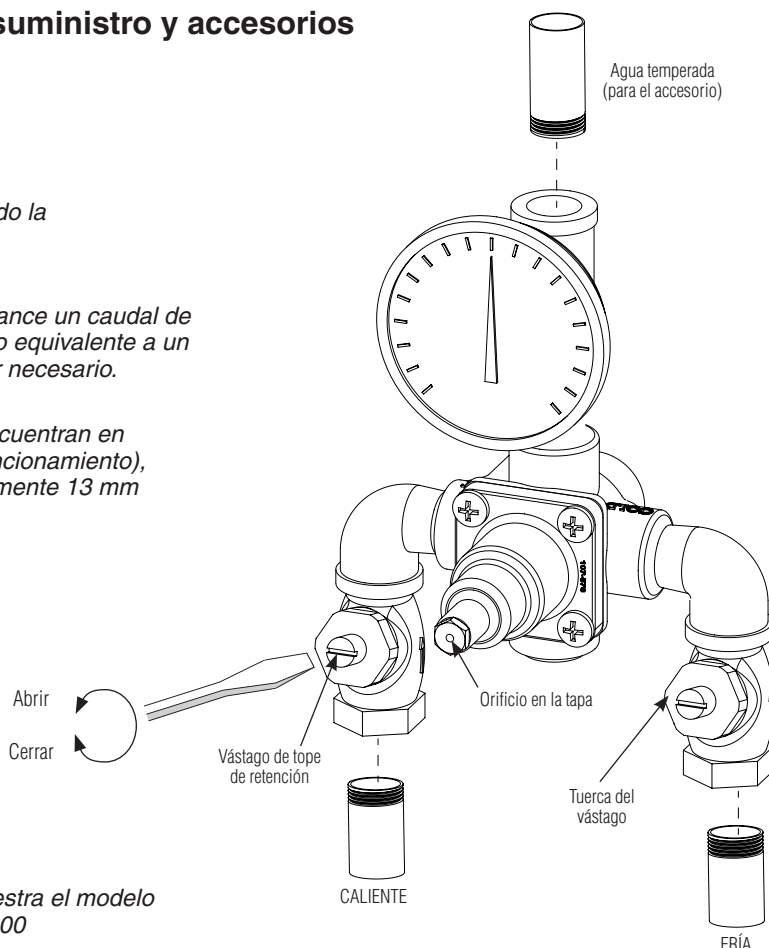


2 Conexión de las tuberías de suministro y accesorios

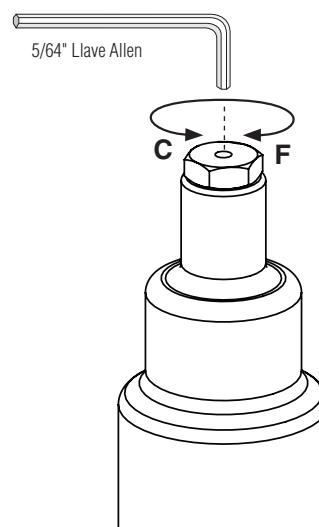
- ☒ Revise si hay filtraciones, presurizando la unidad LENTAMENTE.
- ☒ Revise la temperatura cuando se alcance un caudal de agua de 11 a 19 LPM (3 a 5 GPM) (lo equivalente a un lavado ocular o facial) y ajuste de ser necesario.
- ☒ Cuando los topes de retención se encuentran en la posición de apertura completa (funcionamiento), el vástago se extenderá aproximadamente 13 mm (1/2 pulg.) desde la tuerca.



Se muestra el modelo
S19-2000

3 Ajuste la temperatura con el agua corriendo

- ☒ Revise la temperatura cuando se alcance aproximadamente un caudal de agua de 11 a 19 LPM (3 a 5 GPM) (lo equivalente a un lavado ocular).
- ☒ Se debe revisar la temperatura final de este dispositivo y ajustarla, según sea necesario. La configuración estándar de la temperatura predeterminada de fábrica es de 29 °C (85 °F) (el rango de la válvula es de 18 °C a 32 °C [65 °F a 90 °F]). Para ajustar, inserte la llave Allen a través del orificio en la tapa, en el tornillo de ajuste. Consulte a las autoridades médicas o de seguridad correspondientes sobre la temperatura óptima recomendada para la aplicación en particular.



4 Pruebe la unidad ¡NO SE SALTE ESTE PASO!

Cierre la válvula de entrada de agua caliente o la válvula de retención de suministro para cortar el suministro de agua caliente. Con el suministro de agua caliente cerrado, verifique que siga fluyendo agua fría. Si el agua fría fluye correctamente, vuelva a abrir el suministro de agua caliente.

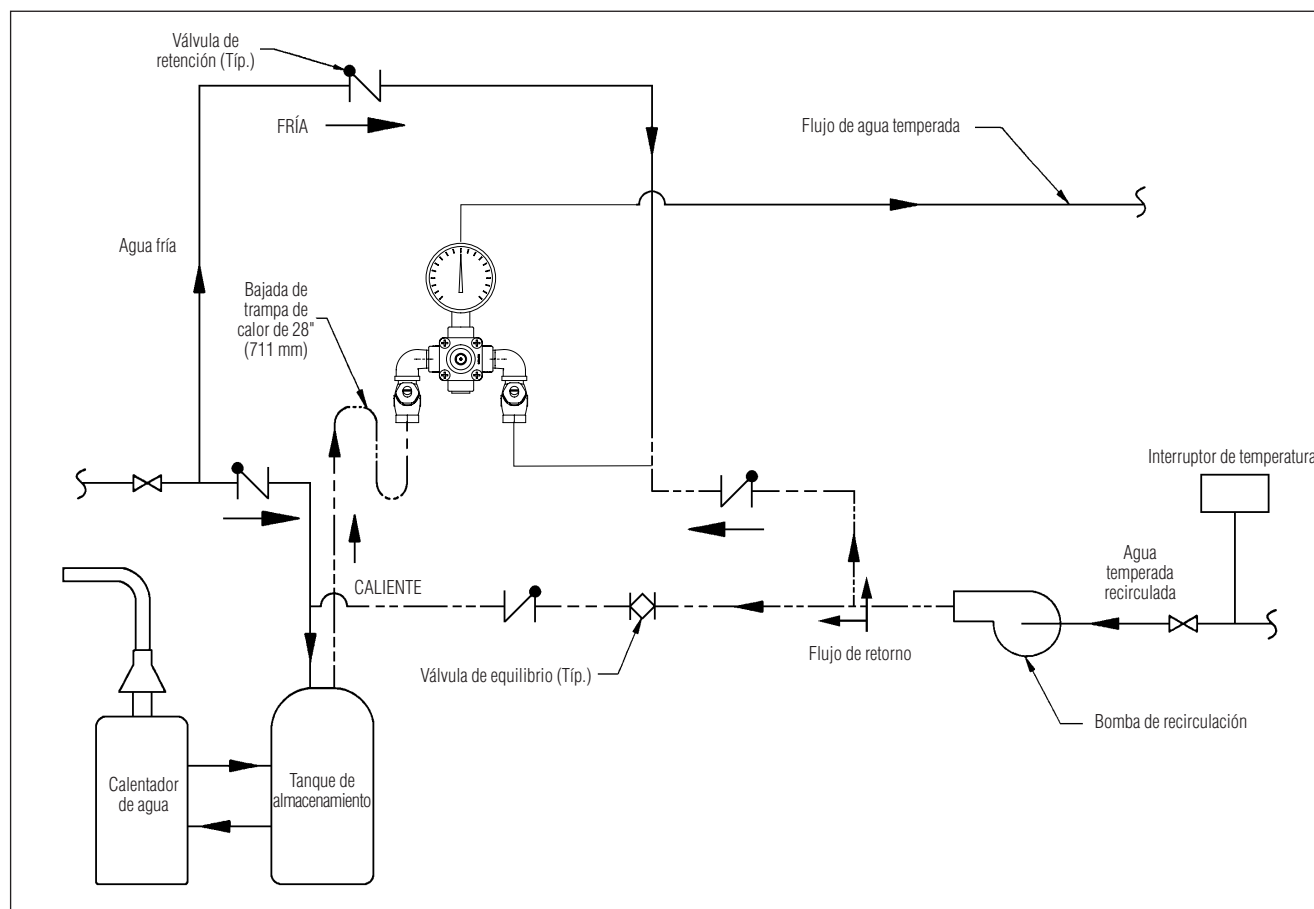
Cierre la válvula de entrada de agua fría o la válvula de retención de suministro para cortar el suministro de agua fría. Con el suministro de agua fría cerrado, verifique que se haya detenido el flujo de agua caliente a menos de 1,9 LPM (0,5 gpm). Si se detiene el agua caliente, vuelva a abrir completamente el suministro de agua fría.

- ☒ Pruebe el sistema semanalmente (abra el suministro de agua y verifique que el control de la temperatura establecida que se desea sea constante).

5 Instalación de recirculación opcional de agua



La recirculación del agua en el sistema proporciona regulación constante de la temperatura del agua. Purgue las tuberías de suministro completamente antes de terminar la instalación. Cierre todos los accesorios y etiquételos como no disponibles para usarse durante el proceso de recirculación.



1. Apague la bomba de recirculación y abra el suministro de agua en los accesorios de emergencia (se requiere un caudal de agua de 11 a 19 LPM [3 – 5 GPM]).
2. Deje que el agua corra a través del sistema hasta que alcance una temperatura constante. Si no obtiene la temperatura necesaria, consulte el paso n.º 3 en la página anterior para volver a ajustar la temperatura.
3. Tan pronto como el agua alcance la temperatura apropiada, encienda la bomba de recirculación (antes de proceder, asegúrese de que se haya alcanzado la temperatura adecuada en el sistema).
4. Revise la temperatura del agua en la bomba de retorno. Si la temperatura excede el nivel apropiado en 1 °C (2 °F), ajuste el interruptor del límite superior de temperatura (esto apagará la bomba). Espere hasta que la temperatura del agua de retorno esté a 3 °C (5 °F) por debajo del nivel apropiado y ajuste el interruptor del límite inferior (esto volverá a encender la bomba).
5. Abra completamente la válvula de equilibrio.
6. Desconecte todos los accesorios y asegúrese de que no fluya agua por el sistema (el tubo de entrada de agua fría debe sentirse tibio al tacto).
7. Deje que el sistema funcione sin agua durante 30 minutos o más. Si, después de treinta minutos, aumenta la temperatura del agua, puede volver a ajustar la temperatura cerrando lentamente la válvula de equilibrio hasta que se alcance la temperatura adecuada.

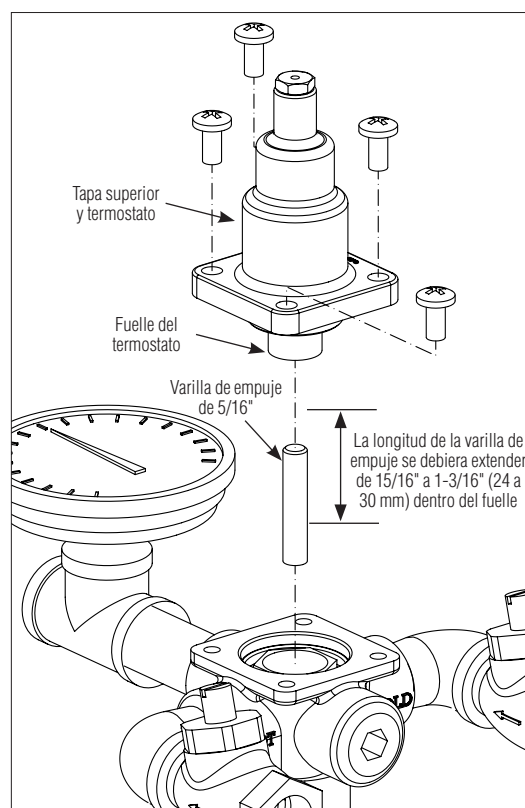
Solución de problemas de la válvula mezcladora termostática



Antes de intentar solucionar problemas de la válvula o desensamblar los componentes, revise lo siguiente:

- Que las válvulas de cierre o retención estén completamente abiertas (el vástago ranurado se extienda aproximadamente 13 mm (1/2 pulg.) a partir de la tuerca del vástago) y que estén abiertas todas las válvulas de retención de entrada y salida
- Que los tubos de entrada de agua caliente y fría estén conectados correctamente y que no existan conexiones cruzadas ni válvulas de cierre o retención con filtraciones.
- La salida del calentador de agua esté al menos a 11 °C (20 °F) por sobre la temperatura establecida.

Asegúrese de cerrar las válvulas de retención correspondientes antes de desensamblar la válvula, y vuelva a abrir las válvulas después de completar la inspección y la reparación.

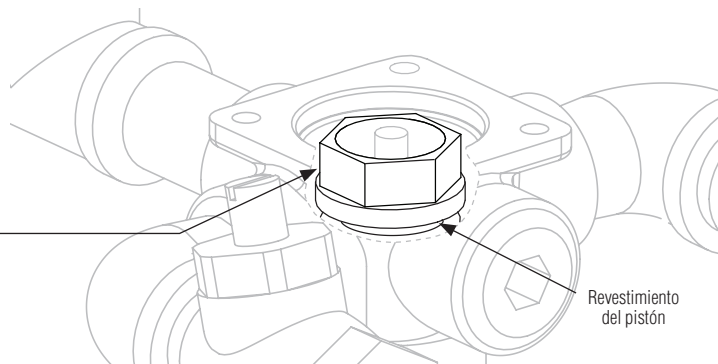


Problema	Causa	Solución
Filtraciones externas en el sistema	Es posible que se hayan dañado las juntas NPT o las juntas tóricas.	Reemplace las juntas NPT o las juntas tóricas, donde sea necesario. Para el reemplazo de las juntas tóricas, comuníquese con el representante local de Bradley y consulte por el kit (S65-170) de sellos de juntas tóricas.
No fluye agua caliente (fluye solamente agua fría)	Falló el termostato y, en consecuencia, se activó la retención de seguridad.	Inspección del termostato: 1. Retire el termostato y la tapa superior. 2. Inserte una varilla de empuje de 5/16 pulg. de diá. en el fuelle del termostato. 3. Marque la distancia en que la varilla de empuje se extiende dentro del fuelle (a temperatura ambiente, con 45 N [10 lb] de fuerza, la distancia debiera ser aproximadamente de 24 a 30 mm [15/16 pulg. a 1-3/16 pulg.]). 4. Si la longitud de la varilla de empuje no está en el rango apropiado, se debe reemplazar el termostato (no se puede reparar). Comuníquese con el representante local de Bradley y consulte por el Kit (S65-171) del termostato.
Flujo limitado de agua	Es posible que la entrada de la válvula de retención esté parcialmente cerrada o haya disminuido significativamente la presión de agua.	
	Se acumuló suciedad y desechos en la rejilla o asiento de retención, limitando el movimiento de cierre y retenciones.	Limpie las válvulas de cierre y retención: Retire el cierre y las retenciones, limpie el asiento y vuelva a ensamblar la válvula. No retire el asiento. Los componentes se pueden cepillar con un cepillo de alambre de tamaño pequeño para eliminar los desechos. Un par de pinzas funciona bien para sacar los desechos del asiento. Si es necesario reemplazar el cierre y las retenciones, comuníquese con el representante local de Bradley y consulte por el kit (S27-102: Bronce áspero o S27-292A: Cromo) de retención/cierre.
Fluctuación de la temperatura o temperatura incorrecta	Las secciones de cierre y retención de la válvula no se mueven libremente.	Limpie las válvulas de cierre y retención como se describe anteriormente.
	El termostato lentamente comienza a fallar.	Revise el termostato como se describe anteriormente o reemplácelo.
	La tubería de suministro de entrada hacia la válvula mezcladora se comparte con otras piezas del equipo que se usan solamente en forma periódica, tales como aparatos de lavandería o estaciones de flujo. Esto puede reducir la presión de entrada hacia la válvula mezcladora a menos de 3 PSI. Es posible que el tamaño de la tubería de suministro no sea lo suficientemente grande para dar suministro a la válvula y a los otros aparatos.	Aumente el tamaño de la tubería de suministro, vuelva a configurar la tubería de suministro o regule el uso del suministro.
	La recirculación no está equilibrada.	Revise la instalación de la recirculación en la página 19.
	El pistón no se mueve libremente y se debe limpiar.	Consulte la página siguiente para ver las instrucciones de desensamble y limpieza.

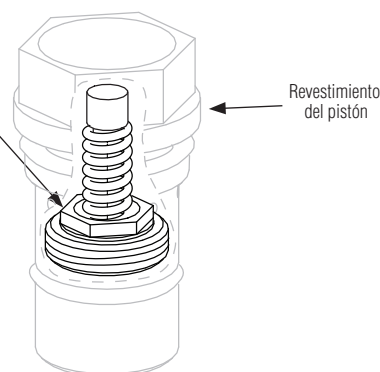
Solución de problemas: Desensamble y limpieza del pistón

A Retire la tapa superior y el conjunto del termostato según se muestra en la Página 20. Ponga la varilla de empuje de 5/8 pulg. a un costado.

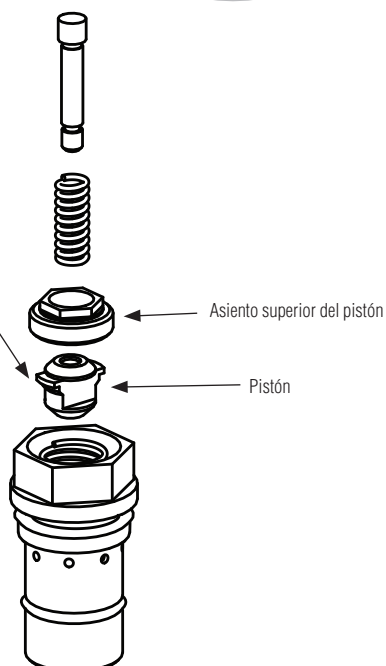
B Con una llave de cubo de 15/16 pulg., afloje el revestimiento del pistón del cuerpo de la válvula y saque las piezas con un alicate de punta de aguja.



C Con una llave de cubo de 1/2 pulg., afloje el asiento superior del pistón del revestimiento del pistón y saque las piezas con un alicate de punta de aguja.

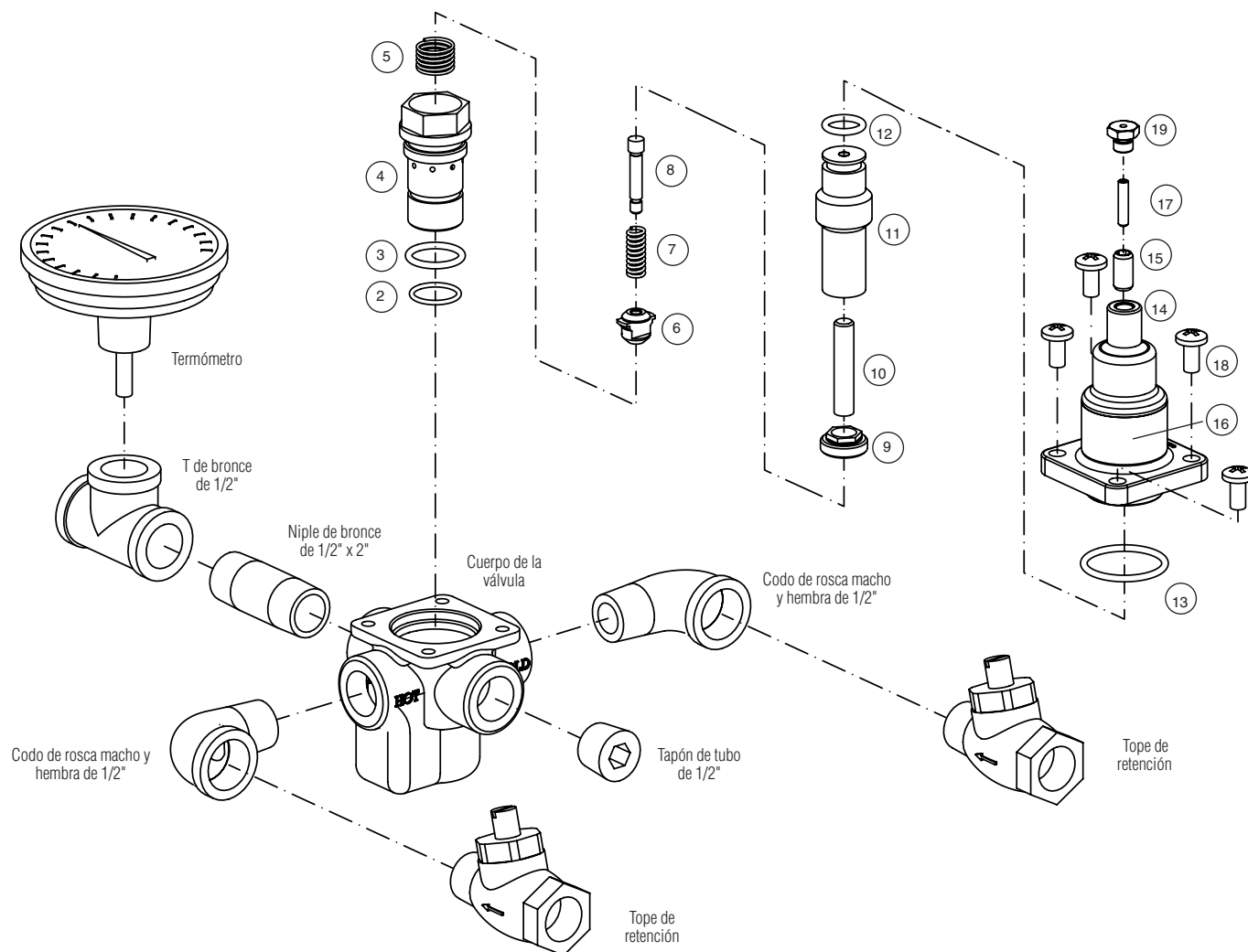


D Desmonte y limpie las piezas del conjunto del pistón con cualquier limpiador adecuado para la limpieza de bronce y acero inoxidable (de ser necesario, use una lija de grano 400 para pulir y afinar tanto el pistón como el revestimiento).



E Vuelva a ensamblar el conjunto del pistón. Empuje el mecanismo hacia arriba y hacia abajo varias veces para asegurarse de que el pistón se mueva suave y constantemente. Si es constante, repita el Procedimiento D hasta que se mueva libremente o cámbielo. Comuníquese con el representante local de Bradley y consulte por el Kit del pistón y revestimientos (número de pieza S65-172).

Desglose de piezas



Kit S65-171 del termostato

Artículo	Cantidad	Descripción
11	1	Termostato
12	1	Junta tórica
13	1	Junta tórica

Kit S65-172 del pistón y revestimientos

Artículo	Cantidad	Descripción
2	1	Junta tórica
3	1	Junta tórica
4	1	Revestimiento
5	1	Resorte
6	1	Pistón
7	1	Resorte
8	1	Tornillo de sobre- calentamiento
9	1	Asiento superior

Kit S65-170 de juntas tóricas

Artículo	Cantidad	Descripción
2	1	Junta tórica
3	1	Junta tórica
12	1	Junta tórica
13	1	Junta tórica

Kit S65-303 de la sección central

Artículo	Cantidad	Descripción
2	1	Junta tórica
3	1	Junta tórica
4	1	Revestimiento
5	1	Resorte
6	1	Pistón
7	1	Resorte
8	1	Tornillo de sobre- calentamiento
9	1	Asiento superior
10	1	Varilla de empuje
11	1	Termostato
12	1	Junta tórica
13	1	Junta tórica
14	1	Tapa de control
15	1	Tornillo de ajuste
16	1	Etiqueta
17	1	Tornillo de ajuste
18	4	Tornillo de 1/4
19	1	Tapa

Tuberías flexibles de conexión para el modelo S19-2000EFX

Cuando se usa con el modelo S19-292, el n.º de solicitud de pieza es 269-653 (se suministran 3 con la unidad).



Números de kit para acabado de bronce áspero. Comuníquese con Bradley para consultar por otras configuraciones.



A partir de noviembre de 2001, el pistón (artículo 7) reemplaza al soporte del sello y al sello como un repuesto directo.



A partir de junio de 2008, la tapa de control de bronce (artículo 15) se reemplazó por una tapa de plástico. Todos los componentes internos son idénticos.

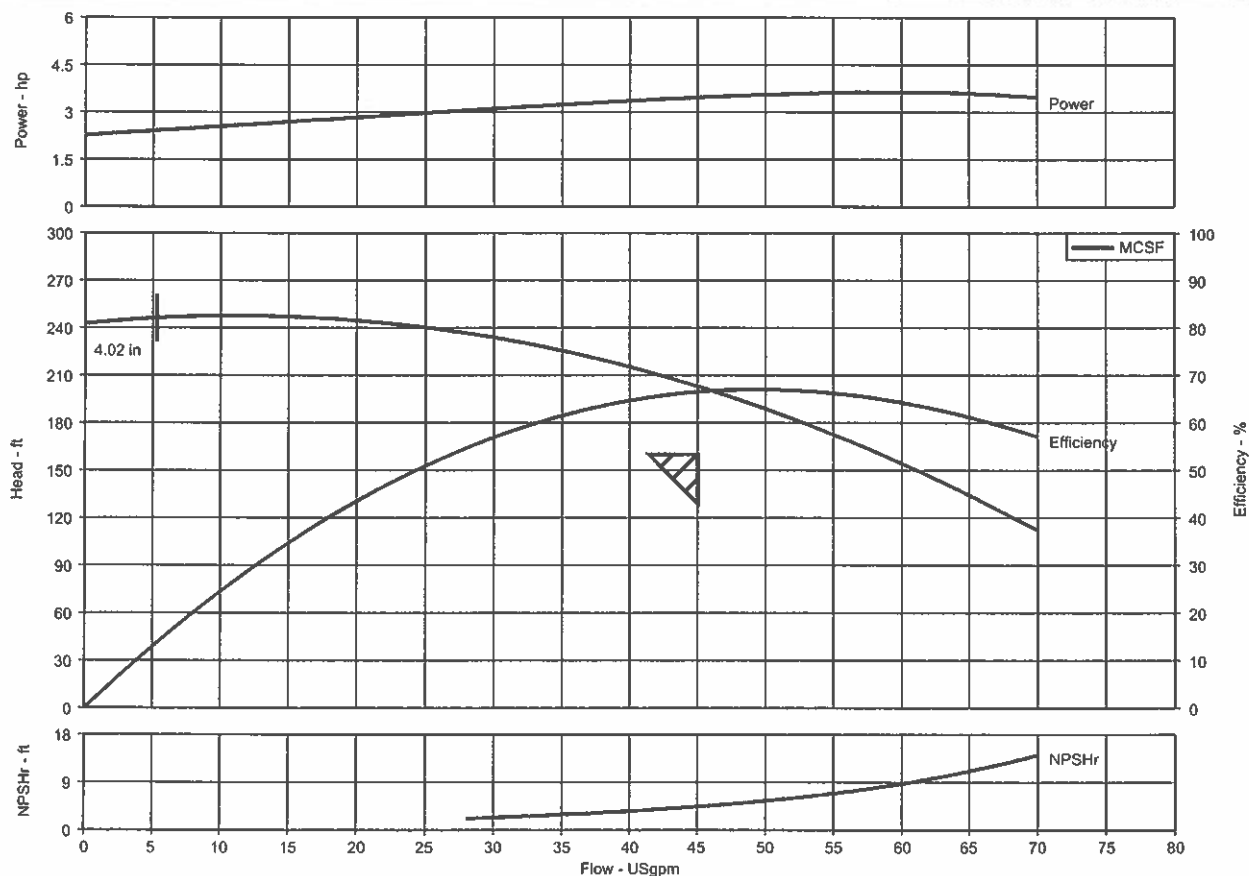


A partir de julio de 2012, se ha actualizado el control de ajuste de temperatura (artículos 15, 17 y 19) y con compatibles con todas las unidades que usen la tapa de control plástica (junio de 2008 hasta la actualidad).

Pump Performance Datasheet

Customer	:		Quote number	:	
Customer reference	:		Size	:	BVM(I/X)8-50
Item number	:	Default	Stages	:	5
Service	:		Based on curve number	:	BVM(I/X)8-50
Quantity	:	1	Date last saved	:	05 Jul 2013 8:48 AM

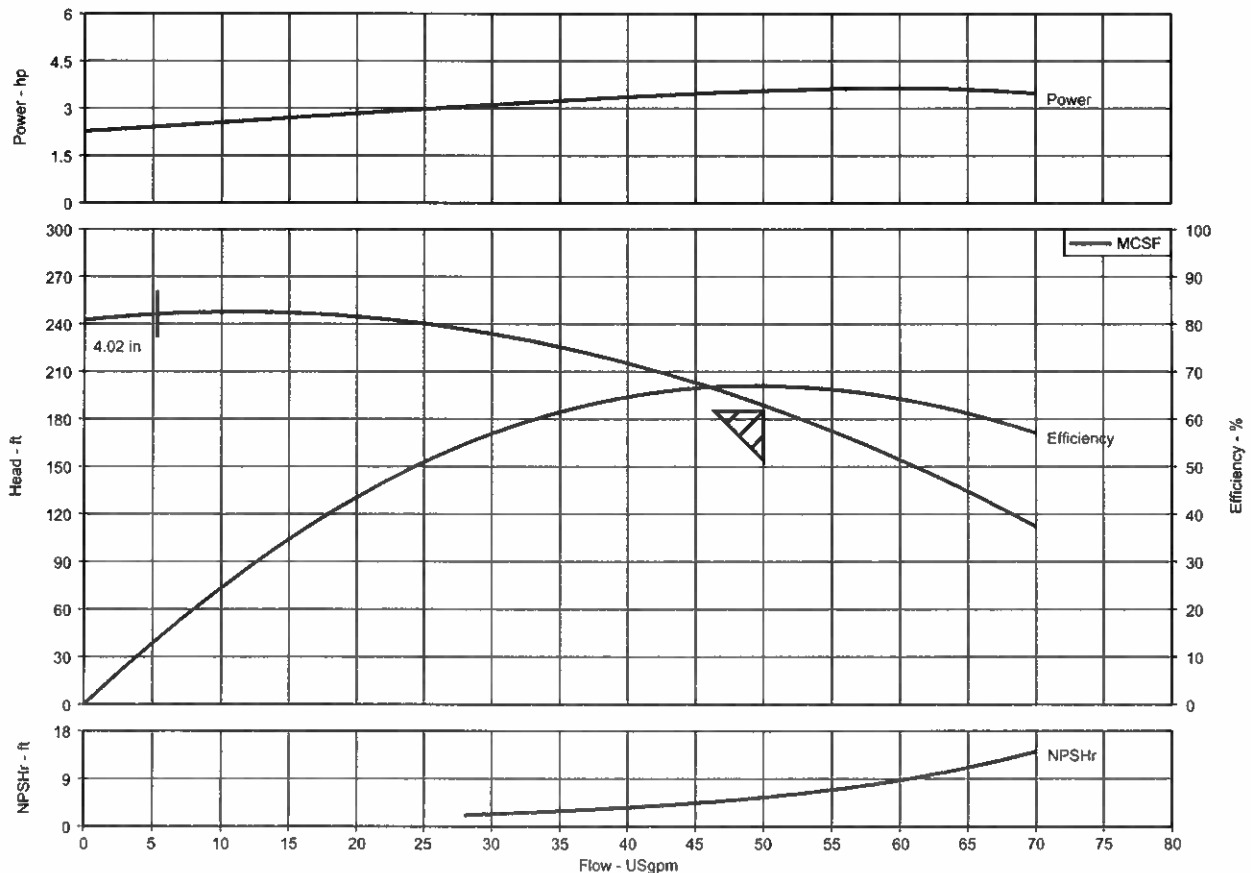
Operating Conditions		Liquid	
Flow, rated	: 45.00 USgpm	Liquid type	: -Water
Differential head / pressure, rated (requested)	: 160.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 203.0 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Performance		Viscosity, rated	: 1.00 cP
Speed, rated	: 3,450 rpm	Vapor pressure, rated	: 0.00 psi.a
Impeller diameter, rated	: 4.02 in	Material	
Impeller diameter, maximum	: 4.02 in	Material selected	: Not specified
Impeller diameter, minimum	: 4.02 in	Pressure Data	
Efficiency	: 66.50 %	Maximum working pressure	: 107.2 psi.g
NPSH required / margin required	: 4.43 / 0.00 ft	Maximum allowable working pressure	: 292.0 psi.g
nq (imp. eye flow) / S (imp. eye flow)	: 31 / 133 Metric units	Maximum allowable suction pressure	: N/A
MCSF	: 5.30 USgpm	Hydrostatic test pressure	: N/A
Head, maximum, rated diameter	: 247.7 ft	Driver & Power Data	
Head rise to shutoff	: 19.57 %	Driver sizing specification	: Rated power
Flow, best eff. point (BEP)	: 49.44 USgpm	Margin over specification	: 0.00 %
Flow ratio (rated / BEP)	: 91.02 %	Service factor	: 1.15 (used)
Diameter ratio (rated / max)	: 100.00 %	Power, hydraulic	: 2.31 hp
Head ratio (rated dia / max dia)	: 100.00 %	Power, rated	: 3.47 hp
Cq/Ch/Ce [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 3.64 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 5.00 hp / 3.73 kW (Fixed)



Pump Performance Datasheet

Customer	:		Quote number	:	
Customer reference	:		Size	:	BVM(I/X)8-50
Item number	:	Default	Stages	:	5
Service	:		Based on curve number	:	BVM(I/X)8-50
Quantity	:	1	Date last saved	:	05 Jul 2013 8:48 AM

Operating Conditions		Liquid	
Flow, rated	: 50.00 USgpm	Liquid type	: --Water
Differential head / pressure, rated (requested)	: 185.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 188.7 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Performance		Viscosity, rated	: 1.00 cP
Speed, rated	: 3,450 rpm	Vapor pressure, rated	: 0.00 psi.a
Impeller diameter, rated	: 4.02 in	Material	
Impeller diameter, maximum	: 4.02 in	Material selected	: Not specified
Impeller diameter, minimum	: 4.02 in	Pressure Data	
Efficiency	: 66.99 %	Maximum working pressure	: 107.2 psi.g
NPSH required / margin required	: 5.51 / 0.00 ft	Maximum allowable working pressure	: 292.0 psi.g
nq (imp. eye flow) / S (imp. eye flow)	: 31 / 133 Metric units	Maximum allowable suction pressure	: N/A
MCSF	: 5.30 USgpm	Hydrostatic test pressure	: N/A
Head, maximum, rated diameter	: 247.7 ft	Driver & Power Data	
Head rise to shutoff	: 28.60 %	Driver sizing specification	: Rated power
Flow, best eff. point (BEP)	: 49.44 USgpm	Margin over specification	: 0.00 %
Flow ratio (rated / BEP)	: 101.13 %	Service factor	: 1.15 (used)
Diameter ratio (rated / max)	: 100.00 %	Power, hydraulic	: 2.38 hp
Head ratio (rated dia / max dia)	: 100.00 %	Power, rated	: 3.56 hp
Cq/Ch/Ce [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 3.64 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 5.00 hp / 3.73 kW (Fixed)





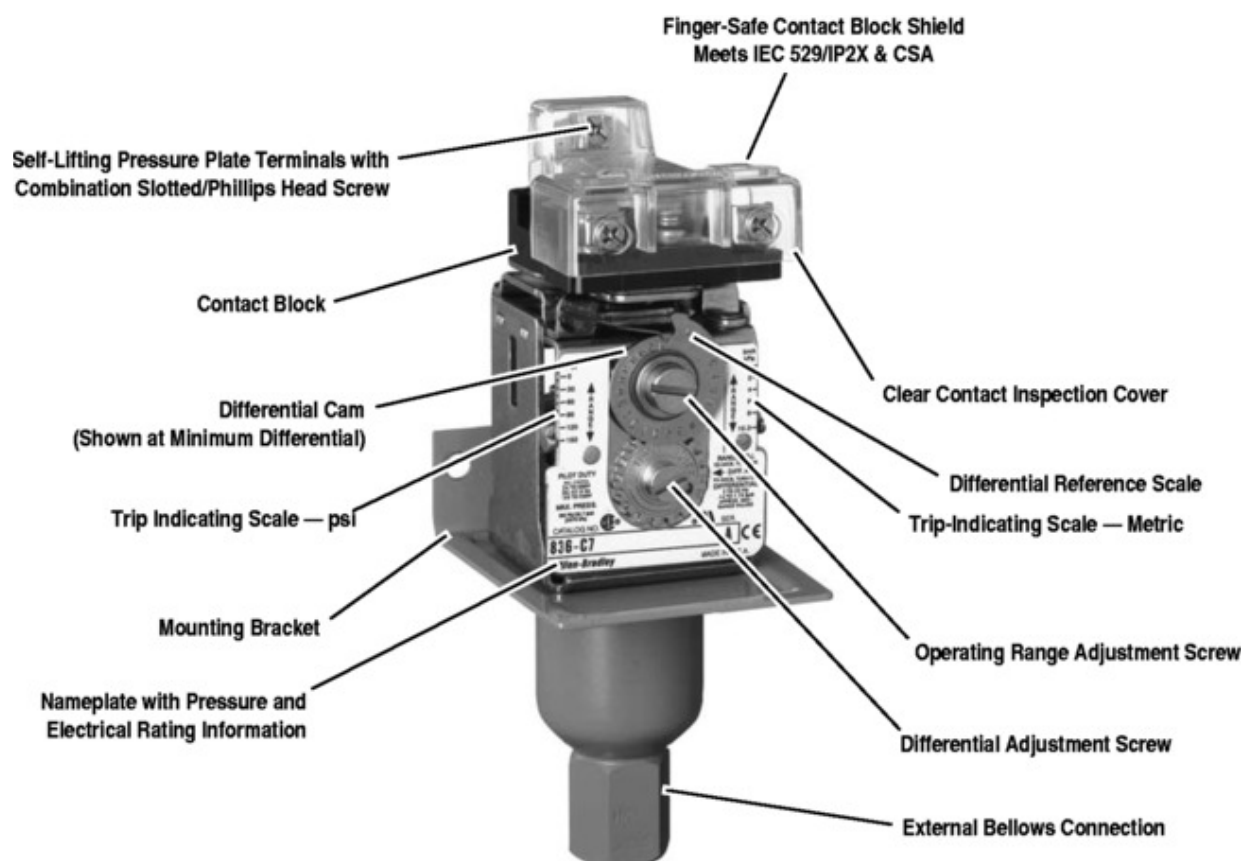
Bulletin 836 Pressure Controls, General Industrial

Product Overview

Bulletin 836 Pressure Controls

- Operating ranges from 30 in. Hg vacuum...900 psi
- Independently adjustable range and differential
- Copper alloy and stainless steel bellows
- 7/16-20 S.A.E. and 1/4 in. N.P.T.F. connections
- Variety of contact blocks available
- Open Type, Type 1, Type 4&13, Type 4X and Type 7&9 and 4&13 combination enclosures





Description

Bulletin 836 Pressure Controls are designed for general industrial use to control and detect pressure. Allen-Bradley Bulletin 836 Pressure Controls can be used in pneumatic and hydraulic systems. Pressure controls use copper alloy or stainless steel bellows. The design and high-quality components provide long life operation with air, water, oil, non-corrosive liquids, vapors, gases, and some corrosive liquids and gases.

Pressure controls feature snap-action precision switches equipped with silver contacts. The straight in-line and relatively friction-free construction provides accurate and consistent operation regardless of the angle at which the controls are mounted. Pressure controls are designed for easy adjustment of both trip and reset pressures.

Allen-Bradley Bulletin 836 Pressure Controls are used in many types of industries and applications. They can be used to control pneumatic systems, maintaining preset pressures between two values. Pressure controls can be used to detect overpressures of gases or liquids to protect machines, processes, and personnel. They can also be used to detect low pressures to protect equipment from loss of coolants and lubrication.

Bulletin 836 Pressure Controls are offered in a variety of styles to meet a wide range of applications. The devices are available in Type 1, 4 & 13, 4X, 7 & 9, and 4 & 13 combined and open type without enclosure for panel mounting. Pressure controls have a wide variety of contact modifications to meet most control circuit requirements. The controls have adjustable pressure ranges from 30 in. Hg vacuum...900 psi with corresponding differentials. Accessories and modifications are available to tailor the device to meet most application requirements.

Applications

- Air compressors
- Compressed air monitor systems
- Liquid level control
- Vacuum transfer systems
- High pressure alert
- Low pressure alert
- Monitor low and high Pressure

Style A — Small Size, Internal Copper Alloy Bellows

Style A

- Independently adjustable range and differential
- 7/16-20 SAE flare for 1/4 in. copper tubing connection
- Adjustable operating range — 30 in. Hg vacuum...375 psi
- Maximum line pressure — up to 750 psi
- Occasional surge pressure — up to 850 psi



Style C — Wider Ranges, External Bellows

Style C

- Independently adjustable range and differential
- 1/4 in N.P.T.F. internal pipe connection
- 3/8 in N.P.S.F. internal pipe connection (836-C1 and 836-C1A only)



Copper Alloy Bellows

- Adjustable operating range — 30 in. Hg vacuum...900 psi
- Maximum line pressure — up to 1300 psi
- Occasional surge pressure — up to 1600 psi

Type 316 Stainless Steel Bellows

- Adjustable operating range — 30 in. Hg vacuum...375 psi
- Maximum line pressure — up to 650 psi
- Occasional surge pressure — up to 650 psi

Refrigeration Controls - See Refrigeration Controls

Style H

- High-pressure refrigeration controls

Style L

- Low-pressure refrigeration controls

Style P

- High-pressure definite purpose controls



Standards Compliance

UL 508

UL 698 (Haz. Loc.)

UL 1604 (Haz. Loc.)

CSA 22.2 No. 14

NEMA ICS-2

IEC 529/IP2X

Certifications



File and Guide Numbers

UL		CSA	
File Number	Guide Number	File Number	Class

Bulletin 836	E14842	NKPZ	LR1234	3211-03
	E53048 (Haz. Loc.)	NOWT	LR11924 (Haz. Loc.)	3218-05
	Hazardous Location Enclosure not CE compliant. All other enclosed devices are CE compliant			

Technical Data

Technical Terms

Adjustable operating range — Total span within which the contacts can be adjusted to trip and reset.

Trip setting — Higher pressure setting at which value the contacts transfer from their normal state to a changed state.

Reset setting — Lower pressure setting at which value the contacts return to their normal state.

Adjustable differential — Difference between the trip and reset values.

Minimum differential — When the differential is set to the lowest pressure difference between trip and reset.

Maximum differential — When the differential is set to the widest pressure difference between trip and reset.

Maximum occasional surge pressure — Maximum surge pressure that can be applied to the actuator. Surges or transients can occur during startup and shutdown of a machine or system. Expressed in milliseconds, complex electronic instrumentation is required to measure the varying amplitude, frequency, and duration of this wave form. Extreme surges that occur approximately eight times in a 24-hour period are negligible.

Maximum line pressure — Maximum sustained pressure that can be applied to the bellows without permanent damage. The control should not be cycled at this pressure.

Positive pressure — Any pressure more than 0 psi. See Figure 2.

Trip setting — Increasing pressure setting when contacts change state.

Reset setting — Decreasing pressure setting when contacts return to their normal state.

Vacuum (negative pressure) — Any pressure less than 0 psi, inches of Hg vacuum. See Figure 2.

Trip setting — Decreasing vacuum setting when contacts change state.

Reset setting — Increasing vacuum setting when contacts return to their normal state.

psi — Pounds per square inch. Devices listed are in gauge pressure units which use atmospheric pressure as a

reference. Atmospheric pressure at sea level is approximately 14.7 psi or 30 in. Hg.

Operating range adjustment screw – This screw is used to adjust the trip setting by varying the force of the main spring.

Differential adjustment screw – This screw is used to adjust reset setting by varying the force of the differential blade spring.

Pressure media – There are many types of pressure media that are controlled. Examples include air, water, hydraulic fluids and other types of gases and liquids. The type of media and maximum system pressure will determine the type of actuator used for the pressure control application. See Pressure Control Selection.

Pressure connection – Common types of pressure connections used in control systems are 1/4 in. and 3/8 in. internal pipe threads, and 7/16 in. – 20 SAE copper tubing.

Contact configuration – There are many types of contact configurations available. Bulletin 836 Style A and C pressure controls offer a wide variety of contact configurations for both automatic operation and manual reset. See Modifications.

Figure 1
Graphics to illustrate technical terms

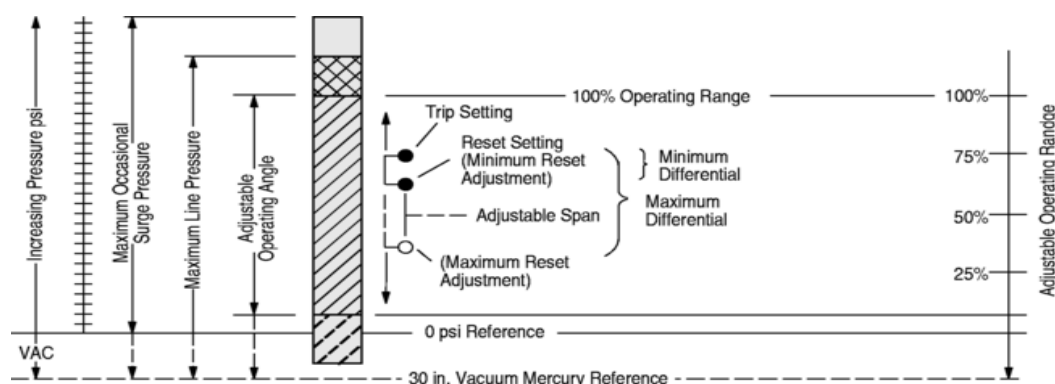
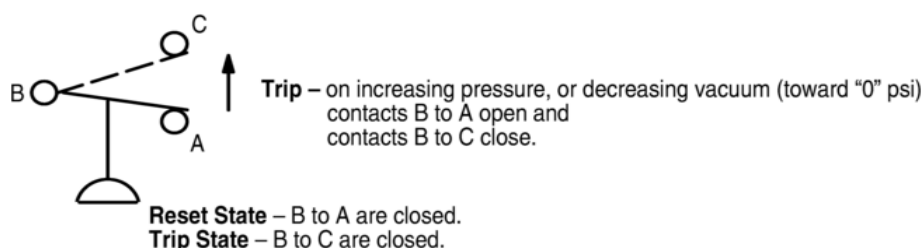


Figure 2
Positive pressure or vacuum



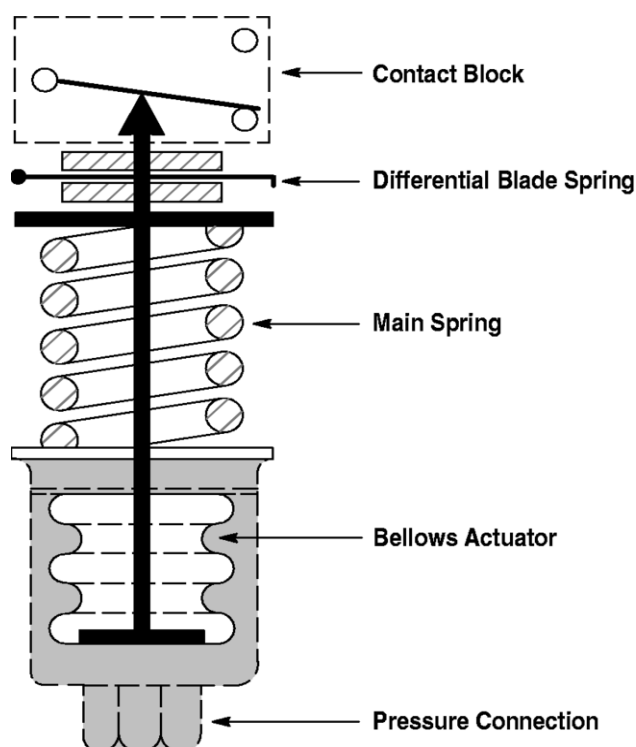
Theory of Operation

Bulletin 836 Pressure Controls are designed to open or close electrical circuits in response to changes in pneumatic (air or gas) or hydraulic (water or oil) pressure. Figure 3 is a simplified drawing of a pressure control.

The system pressure is connected to the control at the pressure connection. The system pressure is applied directly to the bellows. As pressure rises, the bellows exerts force on the main spring. When the threshold force of the main spring is overcome, it transfers the motion to the contact block, causing the contacts to actuate – this is referred to as the trip setting. As pressure decreases, the main spring will retract, causing the secondary differential blade spring to activate and return the contacts to their normal state – this is referred to as reset setting.

Varying the force of the main spring (by turning the operating range adjustment screw) determines where the contacts will trip. Varying the force of the secondary differential blade spring (by turning the differential adjustment screw) determines where the contacts will reset.

Figure 3
Basic mechanical structure



Applications for Control

Pressure controls can be used to either control or monitor a machine or process. Figure 4 shows a typical

control application. Here, pressure is controlled within predetermined high and low values. Figure 5 shows a typical monitoring application. Here, pressure is monitored between a high and low value, signaling when a preset limit has been exceeded.

Figure 4
Typical control application

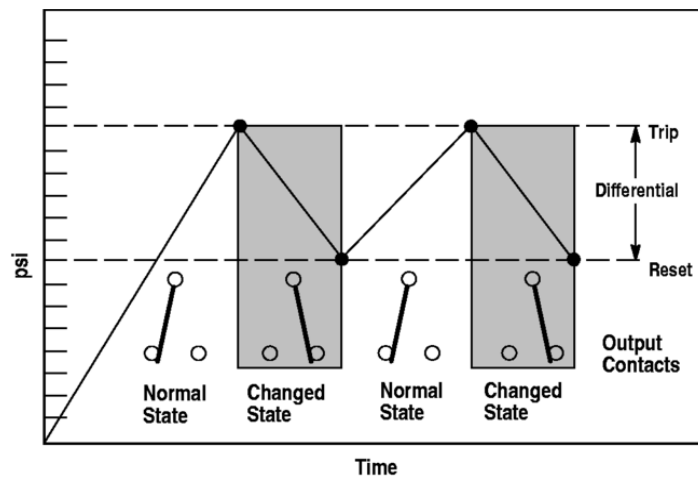
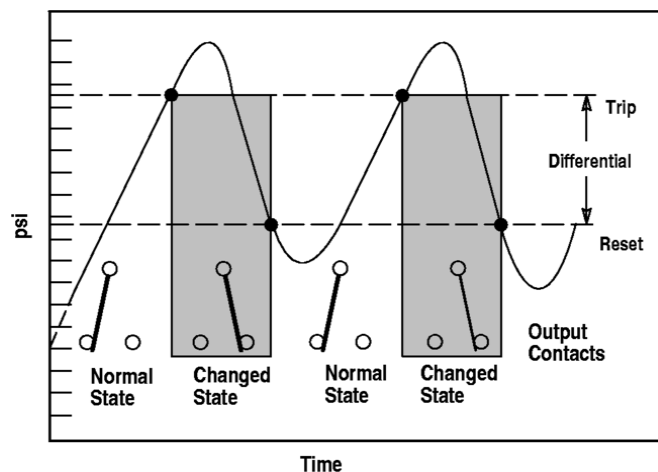


Figure 5
Typical monitoring application



Control Settings

Allen-Bradley controls are designed for ease of setting to help minimize installation time. Standard controls shipped from the factory are set at the maximum operating range and minimum differential. By following this simple two-step process, the control can be set to the specific requirements for each application. See Figure 6.

Step 1 – Adjust trip setting

The trip setting is achieved by turning the operating range adjustment screw. Turn the range screw counterclockwise to lower the trip setting, or clockwise to raise the trip setting. The approximate trip setting is shown on the indicating scale.

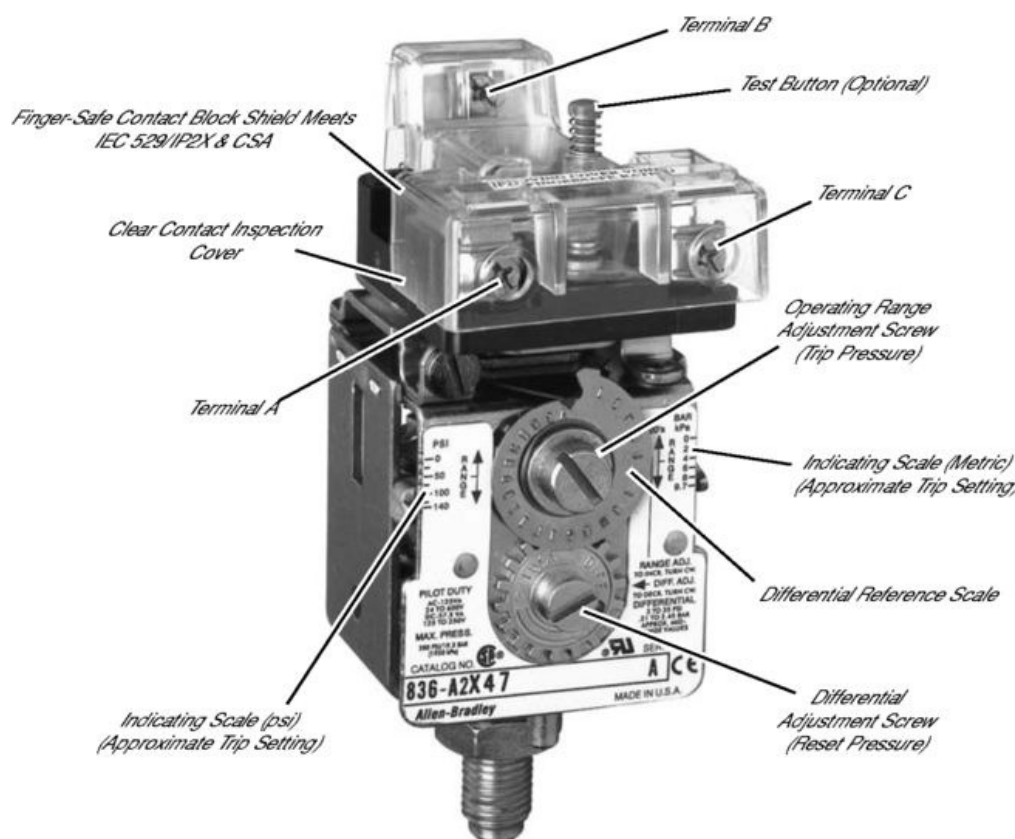
Note: Turning the operating range adjustment screw will change both the trip and reset settings in virtually equal increments.

Step 2 – Adjust reset setting

The reset setting is achieved by turning the differential adjustment screw counterclockwise to increase the differential, or clockwise to decrease the differential.

Note: Adjusting the differential has little or no affect upon the trip setting.

Figure 6
Trip and reset adjustment



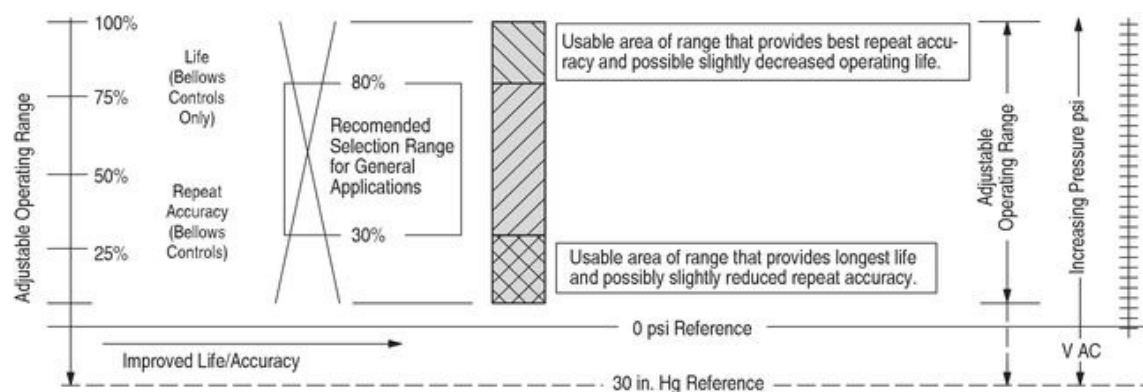
Repeat Accuracy and Mechanical Life

The design and construction of Bulletin 836 Styles A and C controls provide a typical repeat accuracy of + 0.5% or better. Repeat accuracy is based on percent of maximum range, evaluated from test data and calculated using the formula per ICS 2-225 standards.

Repeat accuracy and mechanical life of bellows type controls is graphically illustrated in Figure 7. For general

applications, controls selected where the contacts operate between 30...80% of the operating range and where the maximum line and surge pressures do not exceed the specified values will provide excellent life and repeat accuracy. For more specific applications, it is important to note that the controls are designed to operate **below** or **above** these values. However, there may be a small trade-off between the factors of repeat accuracy and mechanical life.

Figure 7
Repeat accuracy versus mechanical life graph



Standard Contacts

Snap-action contact operation

Contact blocks are single-pole, double-throw and can be wired to open or close on increasing or decreasing pressures.

Non-inductive ratings

5 A, 240V

3 A, 600V

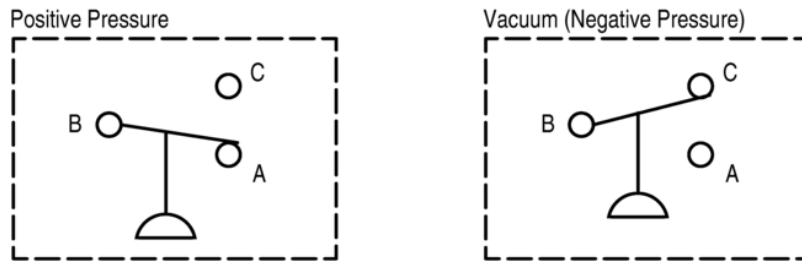
Control circuit ratings

AC - 125 VA, 24...600V

DC - 57.5 VA, 115...230V

Standard Contact Wiring Configurations

Single-pole double throw



Note: NEMA does not rate contacts to switch low voltage and current.

Bulletin 836 Styles A and C Pressure Controls are supplied with silver contacts. The devices are designed to deliver high-force snap action to the contacts. This provides exceptional contact fidelity at 24V DC I/O card current level entry when the control is protected in a suitable enclosure for the surrounding environment.

Special Controls

A large number of unlisted catalog modifications and complete devices are available for specific and OEM applications.

Special controls and modification service is available to meet many applications unique to the OEM market.

Please contact your local Rockwell Automation sales office or Allen-Bradley distributor for assistance with specific modified controls and accessories.

Temperature Range

Temperature range at +32 °F (0 °C) or below is based on the absence of freezing moisture, water, or other fluids that may solidify and impede operation of the control. Temperature ratings are as follows:

Operating:	-22... +150 °F (-30...+66 °C)
Storage:	-22...+200 °F (-30...+93 °C)

Factory-Set Pressure Controls

Rockwell Automation will factory set pressure controls to customer-specified values. Unspecified pressure controls shipped from the factory are set at the maximum operating range and minimum differential. See Factory Options.

Pressure Control Selection

The selection table below is an overview of the three types of Allen-Bradley Bulletin 836 Pressure Controls. Each type of control is suitable for use on many types of applications. Pressure ranges, pressure connections, enclosure types, and the compatibility of the actuator with different types of pressure media are given to

assist in the selection of which type of control to use.

	836 Style A	836 Style C	836 Style C
Actuator Type	Internal Bellows, Copper Alloy	External Bellows, Copper Alloy	External Bellows, Stainless Steel Type 316
Adjustable Operating Ranges	30 in. Hg Vacuum...375 psi	30 in. Hg Vacuum...900 psi	30 in. Hg Vacuum...375 psi
Adjustable Differentials	2...95 psi	0.2...125 psi	0.4...80 psi
Maximum Line Pressures	up to 750 psi	up to 1300 psi	up to 650 psi
Occasional Surge Pressures	up to 850 psi	up to 1600 psi	up to 650 psi
Pressure Media			
Air	•	•	•
Water	•	•	•
Hydraulic Fluids	•	•	•
Liquids: Corrosive ☐			•
Non-Corrosive	•	•	•
Gases: Corrosive ☐			•
Non-Corrosive	•	•	•
Enclosures			
Open Type	•	•	•
Type 1	•	•	•
Type 4 & 13	•	•	•
Type 4X		•	•
Type 7 & 9 and 4 & 13	•	•	•
Pipe Connections			
Pressure Connection	7/16 in.-20 SAE Flare for 1/4 in. Copper Tubing	1/4 in. N.P.T.F. Internal Pipe Thread or 3/8 in. N.P.S.F. Internal Pipe connection (836-C1 and 836-C1A only)	1/4 in. N.P.T.F. Internal Pipe Thread

☐ Corrosive liquids and gases compatible with Type 316 Stainless Steel.

Ordering Information

Ordering Bulletin 836 Pressure Controls

When ordering Bulletin 836 Pressure Controls, consider the following:

- Device style
- Occasional surge pressure
- Adjustable operating range

- Pressure media
- Adjustable differential
- Enclosure type
- Maximum line pressure
- Pressure connection

How to Order

Step 1: Basic Device

Select a catalog number for the basic device.

See Product Selection.

Step 2: Modifications

If required, add the appropriate modification suffix code(s) to the catalog number of the basic device.

See Modifications.

Step 3: Accessories

If required, select appropriate accessories.

See Accessories.

Step 4: Factory Options

Factory-set pressure controls.

See Factory Options.

Catalog Number Explanation

Note: Catalog numbers must not include blank spaces.

836 – A 1 A X9

a b c d

a	
Style of Device	
Code	Description
A	Internal Bellows
C	External Bellows

b
Pressure Specifications
See "Pressure Specifications" Style H High Pressure—Copper Alloy Bellows□ .

c	
Enclosure Type	
Code	Description
A	Type 1
E	Type 7 & 9 and 4 & 13 Combined Metallic (Aluminum)
J	Type 4 & 13 Metallic (Aluminum)
S	Type 4X Non-Metallic
None	Without Enclosure

d	
Modification	
Code	Description
X_	Add suffix codes in descending order whenever possible (see Modifications).

Conversion Factors

Conversion Factors (Rounded)	
	psi x 703.1 = mm/H ₂ O
	psi x 27.68 = in. H ₂ O
	psi x 51.71 = mm/Hg
	psi x 2.036 = in. Hg
	psi x 0.0703 = kg/cm ²
	psi x 0.0689 = bar
	psi x 68.95 = mbar
	psi x 6895 = Pa
	psi x 6.895 = kPa
Note: psi — pounds per square inch (gauge) H ₂ O at 39.2 °F/Hg at 32 °F	

Product Selection

Style A Internal Bellows — Copper Alloy Bellows ☐ With 7/16 in. — 20 SAE Flare for 1/4 in. Copper Tubing Connection

Standard pressure controls shipped from the factory are set at the maximum operating range and minimum differential.



Style A Internal Bellows —
Copper Alloy, Type 1



Style A Internal Bellows —
Copper Alloy, Type 4 & 13

Pressure Specifications				Enclosure Type	
Adjustable Operating Range [in. Hg Vacuum...psi]‡	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum psi		Open Type (Without Enclosure)	Type 1
		Line Pressure	Occasional Surge Pressure§	Cat. No.	Cat. No.
30 in. Vacuum...75	2...20♣	160	160	836-A1	836-A1A
6...140	3...35	280	340	836-A2	836-A2A
12...250	6...65	500	600	836-A3	836-A3A
16...375	8...95	750	850	836-A4	836-A4A

Style A Internal Bellows — Copper Alloy Bellows □ With 7/16 in. — 20 SAE Flare for 1/4 in. Copper Tubing Connection

Standard pressure controls shipped from the factory are set at the maximum operating range and minimum differential.

Pressure Specifications				Enclosure Type	
Adjustable Operating Range [in. Hg Vacuum...psi]‡	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum psi		Type 4 & 13	Type 7 & 9 and 4 & 13Δ
		Line Pressure	Occasional Surge Pressure§	Cat. No.	Cat. No.
30 Vacuum...75	2...20♣	160	160	836-A1J	836-A1E
6...140	3...35	280	340	836-A2J	836-A2E
12...250	6...65	500	600	836-A3J	836-A3E
16...375	8...95	750	850	836-A4J	836-A4E

□ Copper alloy bellows may be used on water or air, and other liquids or gases not corrosive to this alloy.

‡ For applications where settings approach 0 psi, select a control that has an adjustable range that goes into vacuum.

§ Transients (pulses) can occur in a system prior to reaching a steady-state condition. Surge pressures within published values generated during startup or shutdown of a machine or system, not exceeding eight times in a 24-hour period, are negligible.

♣ To determine differential in inches of mercury vacuum multiply value in table by 2.036 (or approximately 2).

Δ The combined Type 7 & 9 and 4 & 13 Hazardous Gas and Dust service enclosure is supplied with special gasket and O-ring seal to diminish/exclude moisture, fluids, and dust from entering the enclosure. Enclosures rated 7 & 9 only are not designed to restrict moisture from entering the enclosure, which is common to outdoor service. Enclosure is rated for the following environments:

CLASS I Groups C,D

CLASS II Groups E,F,G

CLASS III

Style C External Bellows — Copper Alloy Bellows □ With 1/4 in. N.P.T.F. Internal Pipe Connection

Standard pressure controls shipped from the factory are set at the maximum operating range and minimum differential.



*Style C External Bellows —
Copper Alloy, Type 1 With Pilot Light Option*



*Style C External Bellows —
Copper Alloy, Type 4 & 13*

Pressure Specifications				Enclosure Type		
Adjustable Operating Range [in. Hg Vacuum... psi]‡	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum psi		Open Type (Without Enclosure)	Type 1	Type 4 & 13
		Line Pressure	Occasional Surge Pressure§	Cat. No.	Cat. No.	Cat. No.
12 in. Vacuum...8♣	0.2...2.5♣	25	30	836-C1	836-C1A	—
30 in. Vacuum...10	0.4...6♣	65	75	836-C2	836-C2A	836-C2J
0.8...30	0.5...6	80	80	836-C3	836-C3A	836-C3J
30 in. Vacuum...45	1...12♣	175	190	836-C4	836-C4A	836-C4J
2...80	1...12	190	210	836-C5	836-C5A	836-C5J
30 in. Vacuum...100	2...25♣	300	375	836-C6	836-C6A	836-C6J
4...150	2.5...25	300	375	836-C7	836-C7A	836-C7J
6...250	4...45	500	650	836-C8	836-C8A	836-C8J
35...375	6...80	900	1200	836-C9	836-C9A	836-C9J
50...500	12...115	1300	1600	836-C10	836-C10A	836-C10J
50...650	16...115	1300	1600	836-C11	836-C11A	836-C11J
200...900	25...115	1300	1600	836-C12	836-C12A	836-C12J

Style C External Bellows — Copper Alloy Bellows □ With 1/4 in. N.P.T.F. Internal Pipe Connection

Standard pressure controls shipped from the factory are set at the maximum operating range and minimum differential.

Pressure Specifications				Enclosure Type	
Adjustable Operating Range [in. Hg Vacuum...psi]‡	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum psi		Type 4X	Type 7 & 9 and 4 & 13Δ
		Line Pressure	Occasional Surge Pressure§	Cat. No.	Cat. No.
12 in. Vacuum...8♦	0.2...2.5♣	25	30	—	—
30 in. Vacuum...10	0.4...6♣	65	75	836-C2S	836-C2E
0.8...30	0.5...6	80	80	836-C3S	836-C3E
30 in. Vacuum...45	1...12♣	175	190	836-C4S	836-C4E
2...80	1...12	190	210	836-C5S	836-C5E
30 in. Vacuum...100	2...25♣	300	375	836-C6S	836-C6E
4...150	2.5...25	300	375	836-C7S	836-C7E
6...250	4...45	500	650	836-C8S	836-C8E
35...375	6...80	900	1200	836-C9S	836-C9E
50...500	12...115	1300	1600	836-C10S	836-C10E
50...650	16...115	1300	1600	836-C11S	836-C11E
200...900	25...115	1300	1600	836-C12S	836-C12E

□ Copper alloy bellows may be used on water or air, and other liquids or gases not corrosive to this alloy.

‡ For applications where settings approach 0 psi, select a control that has an adjustable range that goes into vacuum.

§ Transients (pulses) can occur in a system prior to reaching a steady-state condition. Surge pressures within published values generated during startup or shutdown of a machine or system, not exceeding eight times in a 24-hour period, are negligible.

♣ To determine differential in. Hg vacuum, multiply value in table by 2.036 (or approximately 2).

Δ The combined Type 7 & 9 and 4 & 13 Hazardous Gas and Dust service enclosure is supplied with special gasket and O-ring seal to diminish/exclude moisture, fluids, and dust from entering the enclosure. Enclosures rated 7 & 9 only are not designed to restrict moisture from entering the enclosure, which is common to outdoor service. Enclosure is rated for the following environments:

CLASS I Groups C,D
CLASS II Groups E,F,G
CLASS III

♦ With 3/8 in. N.P.S.F. internal pipe connection.

Style C External Bellows — Type 316 Stainless Steel Bellows □ With 1/4 in. N.P.T.F. Internal Pipe Connection

Standard pressure controls shipped from the factory are set at the maximum operating range and minimum

differential.



*Style C External Bellows —
Type 4X Glass Reinforced Polyester Enclosure*



*Style C External Bellows —
Stainless Steel, Type 7 & 9 and 4 & 13 Combined*

Pressure Specifications				Enclosure Type				
Adjustable Operating Range [in. Hg Vacuum... psi]‡	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum psi		Open Type (Without Enclosure)	Type 1	Type 4 & 13	Type 4X	Type 7 & 9 and 4 & 13Δ
		Line Pressure	Occasional Surge Pressure§	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
30 in. Vacuum... 10	0.4...6♣	65	65	836-C60	836-C60A	836-C60J	836-C60S	836-C60E
0.8...30	0.4...6	65	65	836-C61	836-C61A	836-C61J	836-C61S	836-C61E
30 in. Vacuum... 100	2...25♣	270	270	836-C62	836-C62A	836-C62J	836-C62S	836-C62E
4...150	2.5...25	270	270	836-C63	836-C63A	836-C63J	836-C63S	836-C63E
6...250	4...45	450	450	836-C64	836-C64A	836-C64J	836-C64S	836-C64E
35...375	8...80	650	650	836-C65	836-C65A	836-C65J	836-C65S	836-C65E

□ Type 316 stainless steel bellows are available for more corrosive liquids or gases.

‡ For applications where settings approach 0 psi, select a control that has an adjustable range that goes into vacuum.

§ Transients (pulses) can occur in a system prior to reaching a steady-state condition. Surge pressures within published values generated during startup or shutdown of a machine or system, not exceeding eight times in a 24-hour period, are negligible.

♣ To determine differential in. Hg vacuum, multiply value in table by 2.036 (or approximately 2).

Δ The combined Type 7 & 9 and 4 & 13 Hazardous Gas and Dust service enclosure is supplied with special gasket and O-ring seal to diminish/exclude moisture, fluids, and dust from entering the enclosure. Enclosures rated 7 & 9 only are not designed to restrict moisture from entering the enclosure, which is common to outdoor service. Enclosure is rated for the following environments:

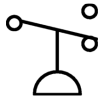
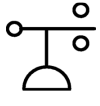
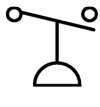
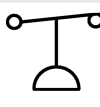
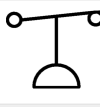
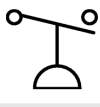
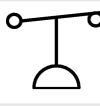
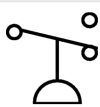
CLASS I Groups C,D
CLASS II Groups E,F,G
CLASS III

Ordering Modifications

Modifications are ordered by adding the appropriate modification suffix code to the catalog number of the basic device. Add suffix codes to the catalog number in descending order (highest number first).

Modifications

Contact Blocks — Trip pressure-indicating scales are supplied on controls with standard contact block.

Description	Rating	Symbol	Suffix Code	
Automatic Operation				
Standard Contact Block – Single-pole, double-throw, snap-action. Supplied when a contact block suffix is not added to the catalog number.	Control Circuit Rating: See Specifications on Standard Contacts		–	
Single-pole double-throw – slow-acting contact with no snap action. Contacts close on rise and close on fall with an open circuit between contact closures.	Control Circuit Rating: AC-125VA, 24...250V		□ ‡	X171
Single-pole single-throw, normally open – closes on rise.	0.5 Hp, 115V AC 1 HP, 230V AC Control Circuit Rating: AC-125 VA, 24...110V		□ ‡	X221
Single-pole single-throw, normally closed – opens on rise.	AC-345 VA, 110...600V DC-57.5 VA, 110...250V		□ ‡	X231
Single-pole single-throw, normally open – closes on rise.	1 Hp, 115V AC 1.5 Hp, 230V AC Control Circuit Rating: AC-600 VA, 110...600V		□ ‡	X321
Single-pole single-throw, normally closed – opens on rise.	DC-57.5 VA, 110...250V		□ ‡	X331
External Manual Reset (Not available in Type 4X Enclosures)§ ♣				
Single-pole single-throw, normally open – contacts open at a predetermined setting on fall and remain open until system is restored to normal run conditions, at which time contacts can be manually reset.	Non-inductive: 5 A, 240V 3 A, 600V Control Circuit Rating: AC-125 VA, 24...600V		□ § ♣ Δ	X140
Single-pole single-throw, normally closed – contacts open on rise and remain open until system is restored to normal run conditions, at which time contacts can be manually reset.	DC-57.5 VA, 115...230V		□ § ♣ Δ	X150
Single-pole double-throw, one contact normally closed – contact opens on rise and remains open until system is restored to normal run conditions, at which time contact can be manually reset. A second contact closes when the first contact opens.			□ § ♣ Δ	X15A

□ Contact blocks not available for field conversion or replacement.

‡ Minimum specified differential value approximately doubles.

§ Manual reset devices cannot be supplied with an adjustable differential. Inherent differential is approximately three times the differential of the corresponding adjustable differential control.

♣ Available only for replacement of complete open type control in an existing Type 1 or 4 & 13 enclosure. Replacement in a Type 7 & 9 enclosure is not available because it would void UL and CSA.

Δ Type 7 & 9 enclosures for manual reset devices are not also rated Type 4 & 13.

Note: NEMA does not rate contacts to switch low voltage and current. Bulletin 836 Styles A and C Pressure Controls are supplied with silver contacts. The devices are designed to deliver high force snap action to the

contacts. This provides exceptional contact fidelity at 24V DC I/O card current level entry when the control is protected in a suitable enclosure for the surrounding environment.

Modifications are ordered by adding the appropriate modification suffix code to the catalog number of the basic device. Add suffix codes to the catalog number in descending order (highest number first).

Modification	Description	Suffix Code
Oxygen/Nitrous Oxide Service	Bellows and fittings are specially prepared for oxygen and nitrous oxide service. The devices are tested with pure oxygen, bellows are plugged for protection from contamination, and a tag warning against contamination is applied.	X2
Tamper-Resistant Adjustment	Range and differential adjustment screws are designed so that after a setting has been applied to the control, the adjustment screws can be broken off with a pliers. Note: The “break-off” adjustment screw(s) will not be broken off unless a factory setting is given and the order specifies “Break-off Adjustment Screw(s)”. See Ordering Factory-Set Pressure Controls.	X4
Neon Pilot Light, 120V AC	A high intensity neon pilot light is available for 120V AC, 60 Hz applications and can be wired for ON or OFF operation. The current rating is 1.0 m A. □	X9
Red LED Pilot Light, 24V DC	A high intensity LED 24V DC pilot light is available to meet the requirements of the automotive, machine tool builders and other industries. The current rating is 22 mA and can be wired for ON or OFF operation. □	X15
Green LED Pilot Light, 24V DC	A high intensity LED 24V DC pilot light is available to meet the requirements of the automotive, machine tool builders and other industries. The current rating is 22 mA and can be wired for ON or OFF operation. □	X18

□ Not available on combined Type 7 & 9 and 4 & 13, Type 4X, and manual reset devices.

Ordering Accessories

Accessories are ordered as separate catalog numbers. Select the required accessories from the tables below.

Accessories

Pipe Adapter

Description	Cat. No.
1/4 in. male pipe adapter with copper seating washer for Style A only.	836-N1

Contact Block Replacement Kit

Description	Cat. No.
Kit consists of a standard contact block and instructions.	836-N2

Finger Safe Contact Block Cover

Description	Cat. No.
Clear contact block cover provides IP2X Finger-Safe protection.	41162-908-01

Hardware Kits for Mounting Open Type Controls in Special Enclosures

Description	Type	Material	Cat. No.
Hardware kits for mounting open type controls in special enclosures allow ease of connecting pressure lines to the enclosure. For use with Type 1 and Type 4 & 13 enclosures with wall thickness up to 0.25 in. (6.35 mm).	Style A Controls		
	Open type controls	Plated steel	836-N5
	Style C Controls		
	Open type controls	Brass	836-N8
		Stainless steel	836-N10

Angle Mounting Brackets

Description	Bracket Type	Cat. No.
For mounting one or two open type Bulletin 836 Style A Pressure Controls or Bulletin 837 Temperature Controls on an enclosure mounting plate.	Single bracket	836-N11
	Dual mounting bracket	836-N12

Steam and/or Corrosive Media Applications — Isolation Traps

Description	Type	Cat. No.
An isolation trap is available for high-temperature media applications from 150...600 °F or corrosive applications compatible with Type 316 stainless steel tubing and fittings. The isolation coil is inserted between the bellows of the pressure control and the elevated temperature line of the system. The isolation trap will fill with condensed water or can be filled with water or suitable fluid when installed. A silicone buffer fluid is available in a convenient dispenser. Copper alloy lower and higher pressure range bellows can be applied to many applications using the isolation trap. The silicone buffer fluid is used to isolate many corrosive substances from coming in contact with the bellows. The isolation trap is rated at 3000 psi working pressure. Not available for piston-type controls.	Isolation trap with two 1/4 in. male pipe fittings	836-N25
	Isolation trap with one 1/4 in. male and one 1/4 in. female pipe fitting	836-N26
	2 oz. of buffer fluid to fill bellows and tubing	836-N27



Isolation Trap and Silicone Buffer Fluid

Accessories are ordered as separate catalog numbers. Select the required accessories from the tables below.

External Fixed Pulsation Snubbers

Description	Type	Cat. No.
Controls are supplied as standard with an internal pulsation snubber. However, a control properly selected and used within the adjustable range values yet having a short bellows life is a good indication of the presence of extreme surge pressures. External fixed pulsation snubbers are available to provide additional dampening when extreme pulsations or surges are present. Recommended if more than eight line surges occur in a 24 hr. time period.	Snubber for Style A Controls	836-N6
	Snubber for Style C Controls	836-N7

Selectable Element Pulsation Snubbers

Description	Type	Cat. No.
Controls are supplied as standard with an internal pulsation snubber. However, a control properly selected and used within the adjustable range values, yet having a short bellows life, is a good indication of the presence of extreme surge pressures. Selectable element pulsation snubbers are supplied with five different elements to provide a selectable balance between maximizing pressure control life and minimizing control response time. Pulsation snubbers are supplied with the mid-range element already mounted and four other color-coded porosity elements included in the package.	Snubber for Style C Controls	836-N40

Selectable Pulsation Snubber Porosity Elements

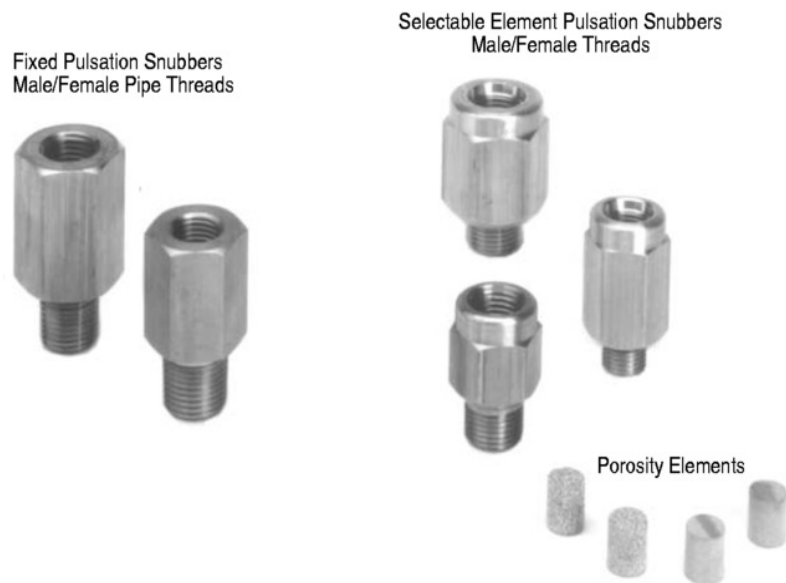
Description	Recommended Type of Service	Color Code	Porosity
Elements are color-coded for easy identification. Elements are available in five different porosities for a wide range of applications.	Viscous fluids (over 500 SSU) ☐	None	Coarser

Medium type oils (225...500 SSU) ☐	Black	↕
Water and light oils (30...225 SSU) ☐	Brown	
Low viscosity fluids (under 30 SSU) ☐	Green	
Air and other gases	Red	Finer
One of each of the above	—	Assorted

☐ SSU Saybolt Seconds Universal — units of viscosity measurement.

Note:Color code is located on end of element.

Pulsation Snubbers



Factory Options

Ordering Factory-Set Pressure Controls

When a specific factory setting is requested, the specific terminal connections must be specified — e.g., N.O. or N.C. It must also be specified whether the contact operation is occurring on either increasing or decreasing pressure. For example:

Normally Closed (N.C.) contacts to open at ☐ psi increasing pressure and close at ☐ psi decreasing pressure.

—OR—

Normally Open (N.O.) contacts to close at ☐ psi increasing pressure and open at ☐ psi decreasing pressure.

If minimum differential is not critical and the inherent minimum differential satisfies the application, specify the factory setting as follows:

Normally Closed (N.C.) contacts to open at ☐ psi increasing pressure. Minimum differential.

—OR—

Normally Open (N.O.) contacts to close at ☐ psi increasing pressure. Minimum differential.

☐ Specify psi (pounds per square inch) or, in. Hg vacuum (inches of mercury vacuum)

‡ Per ANSI B40.1 Grade 2A (0.5% accuracy full scale), Grade 3A (0.25% accuracy full scale).

If not specified, settings tolerances will be as shown in table below.

Pressure Range	Tolerance
30 in. Hg Vac....0 psi	+/- 1 in. Hg Vac.
> 0...100 psi	+/- 1 psi
> 100...300 psi	+/- 2 psi
> 300...500 psi	+/- 5 psi
> 500...1000 psi	+/- 10 psi
> 1000...5000 psi	+/- 50 psi

Quality analog “Test”‡ gauges are used when applying requested factory settings to these rugged industrial-grade pressure controls. (Gauges are calibrated and the accuracy is traceable to National Bureau of Standards.)

The actual requested setting is applied to the control by reading the set point directly from the test gauge being used. However, traceable gauge tolerance variance between source and user, and possible severe shock during shipping and installation, may contribute to the factory settings deviating slightly from the specified values. Slight recalibration can easily be accomplished upon final installation to meet specific requirements for the more demanding applications. When installed, the controls will perform with a repeat accuracy as established in the paragraph on Repeat Accuracy and Mechanical Life entitled “Repeat Accuracy and Mechanical Life”.

Special service is available to factory set controls on Digital Laboratory Instruments, up to 600 psi, when required for the more critical applications. An additional charge may be added for this service contingent upon setting tolerance and quantity.

Consult your local Rockwell Automation sales office or Allen-Bradley distributor.

Two Style A Controls In One Enclosure Bulletin 836 Style pressure controls which function independently may be mounted side by side in a single Type 1 enclosure. This design is ideal for installations where two controls would ordinarily be mounted. Each dual unit can be a combination of a Style A pressure control and a bulb and

capillary type temperature control. See respective product tables.

To order this arrangement, specify the two desired catalog numbers in their mounted position within the dual enclosure to form a single catalog number. The list price is the sum of the two Type 1 enclosed devices.

For more information on special controls, please contact your local Rockwell Automation sales office or Allen-Bradley distributor.

Refrigeration Controls



Description

Bulletin 836 Refrigeration Controls are similar to Bulletin 836 Style A Pressure Controls. However, refrigeration controls are constructed with additional pulsation dampening to filter out the severe pulsations generated by reciprocating refrigeration compressors. Pressure controls not supplied with the added snubber function may result in reduced bellows life. The reduced life results from pulsations severe enough to cause the bellows to "squeal" at the pump frequency or at the harmonic wave generated at specific pump loading demands. Refrigeration controls are supplied as standard with the pulsation snubber built into the stem of the bellows.

Allen-Bradley heavy-duty refrigeration controls have copper alloy bellows for use with noncorrosive refrigerants. The devices can be supplied as single Open Type devices or mounted in a Type 1 enclosure. Standard controls have 7/16 in. - 20 SAE male threads for a 45° flare fuel and lubricant fitting. Optionally, the refrigeration controls can be supplied with capillary tubing. The capillary terminates with 1/4 in. tubing, which is flared and supplied with a 7/16 in. - 20 female nut. To modify the standard pressure connection, add suffix "-36" (denotes 36 in.) to the catalog number. There is no price addition for changing to a capillary-type pressure connection. Example: Cat. No. **836-H11-XHC**, modified for a 36 in. capillary connection, is Cat. No. **836-H11-XHC-36**.

Style H — High Pressure Refrigeration Controls



Style H

- Copper alloy bellows with built-in pulsation snubber
- 7/16 in. — 20 SAE male thread for 45° flare fitting
- Adjustable operating range — 30...120 psi
- Maximum line pressure — 450 psi
- Occasional surge pressure — 800 psi
- With capillary and flare connection

Style L — Low Pressure Refrigeration Controls



Style L

- Copper alloy bellows with built-in pulsation snubber
- With capillary and tubing connection
- Adjustable operating range — 20 in. Hg vacuum...120 psi
- Maximum line pressure — 220 psi

Style P — High Pressure Definite-Purpose Refrigeration Controls



Style P

- Copper alloy bellows with built-in pulsation snubber
- 7/16 in. — 20 SAE male thread for 45° flare fitting
- Operating range — 30...700 psi
- Line and occasional surge pressure — 800 psi
- Fixed differential — 30 psi



*Style H High Pressure —
Copper Alloy, Open Type With Capillary
Adjustable Differential*



*Style L Low Pressure —
Copper Alloy, Open Type with capillary
Adjustable Differential*



*Style P High Pressure —
Copper Alloy, Open Type
Fixed Differential*

Style H High Pressure—Copper Alloy Bellows

Pressure Specifications				Enclosure Type		Contact Reference Number (See table below)
Adjustable Operating Range [psi]	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum Line Pressure [psi]	Limited Maximum Stop [psi]	Open Type Without Enclosure	Type 1	
				Cat. No.	Cat. No.	
30...270	30...80	600	—	836-H11-XHCS	836-H11-XHC	1
50...450	40...100	800	—	836-H11-BLCS	836-H11-BLC	1
100...285	40...90	600	285	836-H33-XKKS	836-H33-XKK	3
200...425	40...90	800	425	836-H33-BLKS	836-H33-BLK	3
125...280	60...120	800	280	836-H33-BKKS	836-H33-BKK	3

Customer Specified, Factory Locked Operating Range With Fixed Differential of 30 psi						
75...350	35	800	—	836-H33-XNAS	836-H33-XNA	3

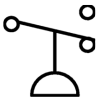
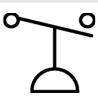
Style L Low Pressure—Copper Alloy Bellows □

Pressure Specifications			Enclosure Type		Contact Reference Number (See table below)
Adjustable Operating Range [in. Hg Vacuum... psi]	Adjustable Differential [psi] (Approximate Mid-Range Values)	Maximum Line Pressure [psi]	Open Type (Without Enclosure)	Type 1	
			Cat. No.	Cat. No.	
20 in. Hg Vacuum...120 psi	5...30‡	220	836-AL11-NKCS	836-AL11-NKC	1
20 in. Hg Vacuum...120 psi	9...50‡	220	836-AL32-NKCHS	836-AL32-NKCH	2

Style P High Pressure Definite Purpose—Copper Alloy Bellows □

Pressure Specifications				Enclosure Type		Contact Reference Number (See table below)
Adjustable Operating Range [psi]	Fixed Differential [psi]	Maximum Line Pressure [psi]	Limited Maximum Stop [psi]	Open Type (Without Enclosure)	Type 1	
				Cat. No.	Cat. No.	
30...700	30	800	—	836-P11-ARBS	836-P11-ARB	1

Contact Reference Number Table

Reference Number	Description	Symbol	Rating
1	Single pole double throw — automatically opens or closes on rise or fall.		Non-inductive: 5 A, 240V ... 3 A, 600V Control Circuit Rating: AC-125VA, 24...600V DC-57.5VA, 115...230V
2	Single pole single throw, normally open — closes on rise.		1 Hp, 115V AC 1.5 Hp, 230V AC Control Circuit Rating: AC-600VA, 110...600V DC-57.5VA, 110...250V
3	Single pole single throw, normally closed — opens on rise.		

□ Copper alloy bellows may be used on water or air, and other liquids not corrosive to this alloy.

‡ To determine differential in in. Hg vacuum, multiply the value in the table by 2.036 (or approximately 2).

Factory Options for Refrigeration Controls

Two Controls In One Enclosure

It is common in the industry to supply a low-pressure **Style L** and a high-pressure **Style H** mounted in a common, dual Type 1 enclosure. This factory option can be supplied with the low-pressure control on the left and the high-pressure control on the right. To order, combine the two desired Type 1 catalog numbers into a single number. Example: Low-pressure control **836-AL11-NKC-36**, plus high-pressure control **836-H11-BLC-36**, becomes an **836-AL11-NKC-36/836-H11-BLC-36**.

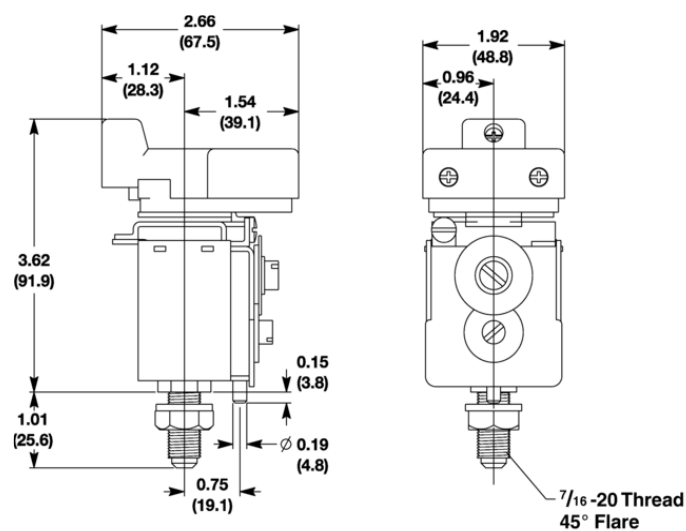


Two Style A Pressure Controls in One Type 1 Enclosure

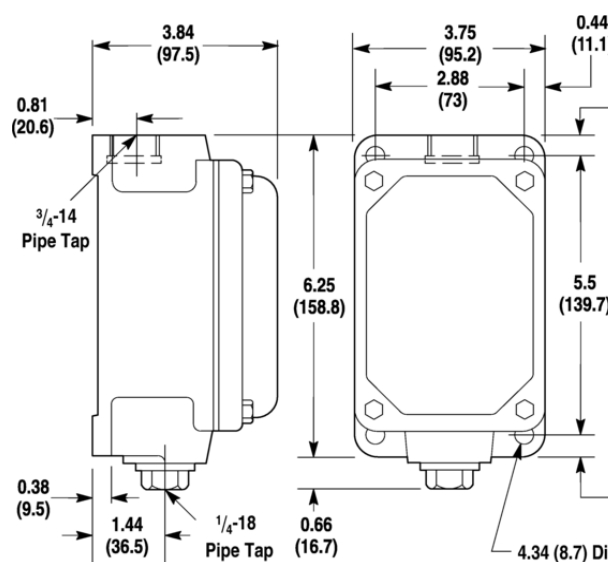
Approximate Dimensions and Shipping Weights

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

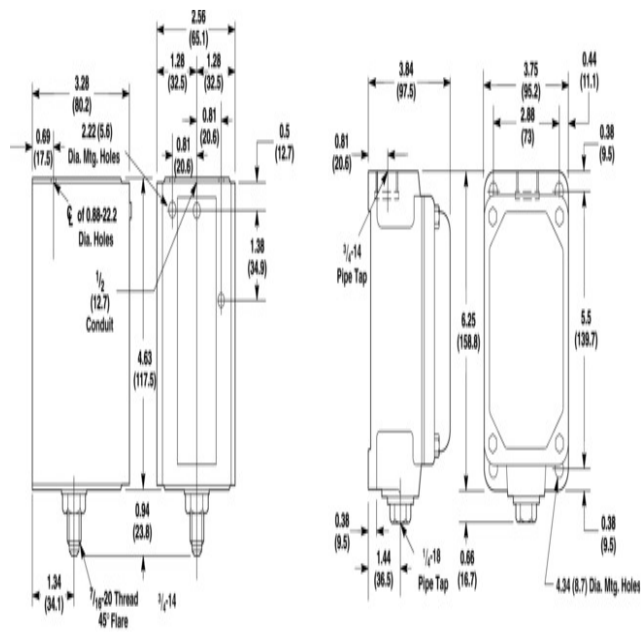
Style A



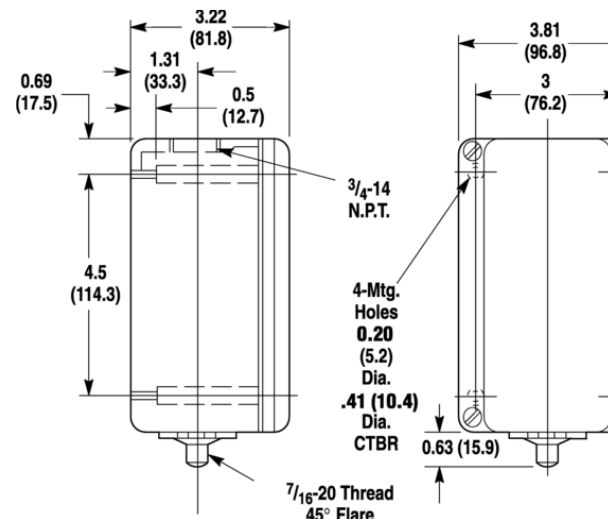
*Open Type
Approximate Shipping Weight 1 lb. (0.45 kg)*



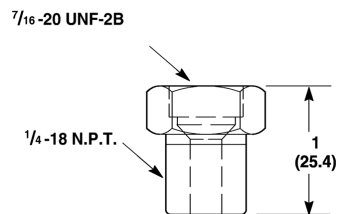
*Type 7 & 9 and 4 & 13
Approximate Shipping Weight 9 lbs (4.1 kg)*



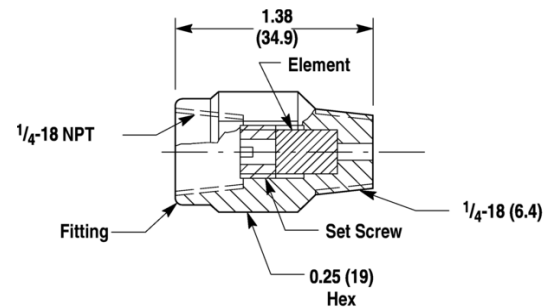
Type 1
Approximate Shipping Weight 2 lbs (0.91 kg)



Type 4 & 13
Approximate Shipping Weight 3 lbs (1.4 kg)

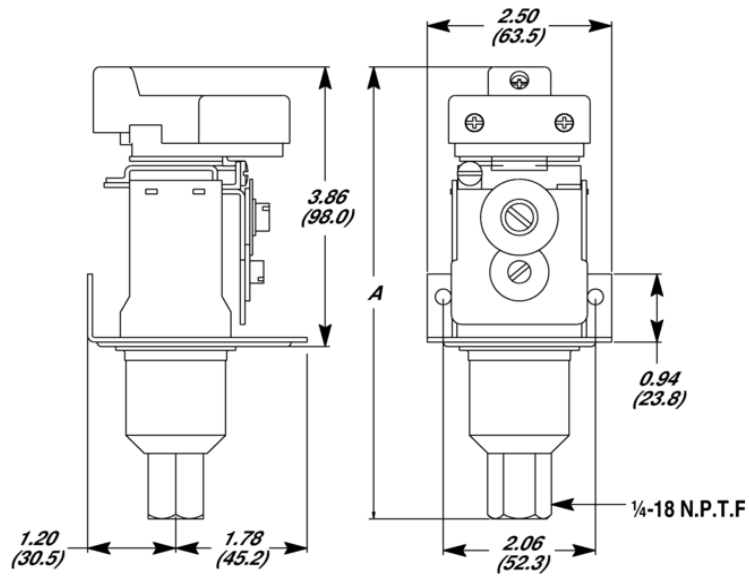


Cat. No. 836-N1
Approximate Shipping Weight 1/4 lb (0.1 kg)



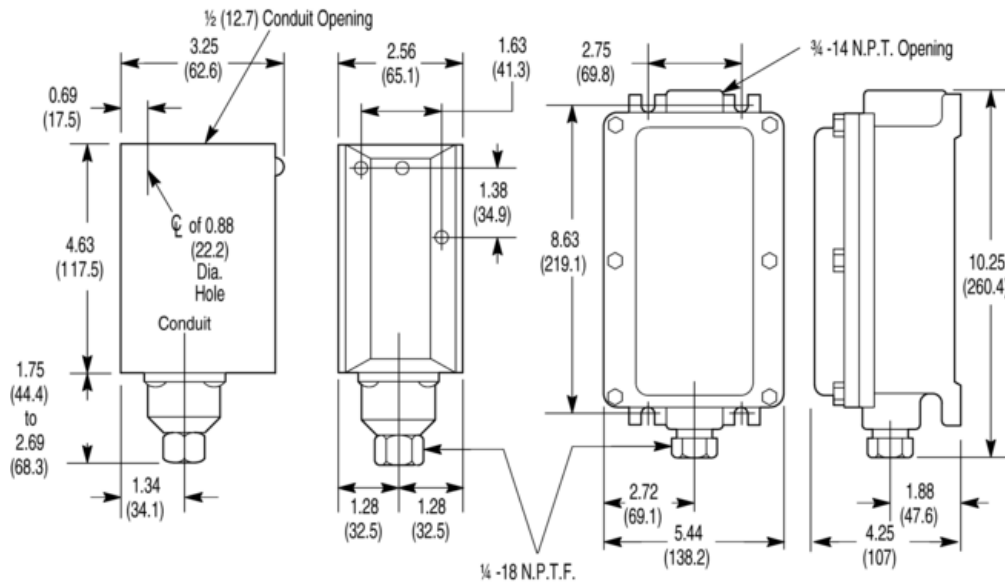
Cat. No. 836-N40
Approximate Shipping Weight 1/4 lb (0.1 kg)

Style C

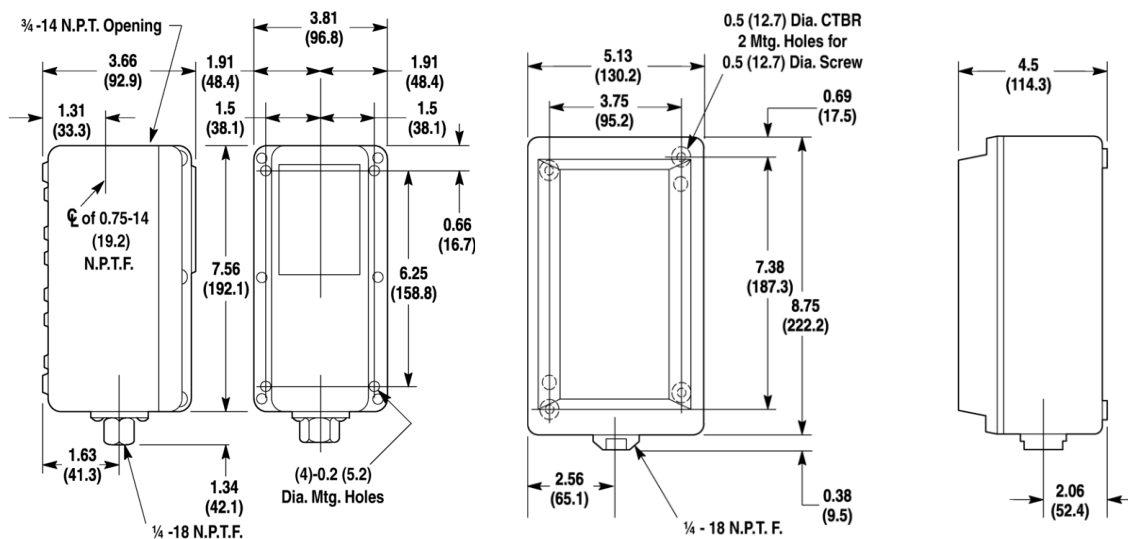


Open Type Approximate Shipping Weight 1.3 lbs. (.60 kg) □

Cat. No.	Dimension A
C2, C3, C60, C61	6.11 (155)
C4	5.99 (152)
C5, C64	5.94 (151)
C6, C62	6.29 (160)
C7, C63	6.24 (158)
C8, C9	5.56 (141)
C10, C11, C12, C65	5.78 (147)



Type 1
 Approximate Shipping Weight 2.0 (.9 kg)
 Type 7&9 and 4&13
 Approximate Shipping Weight 10 lbs. (4.5 kg)

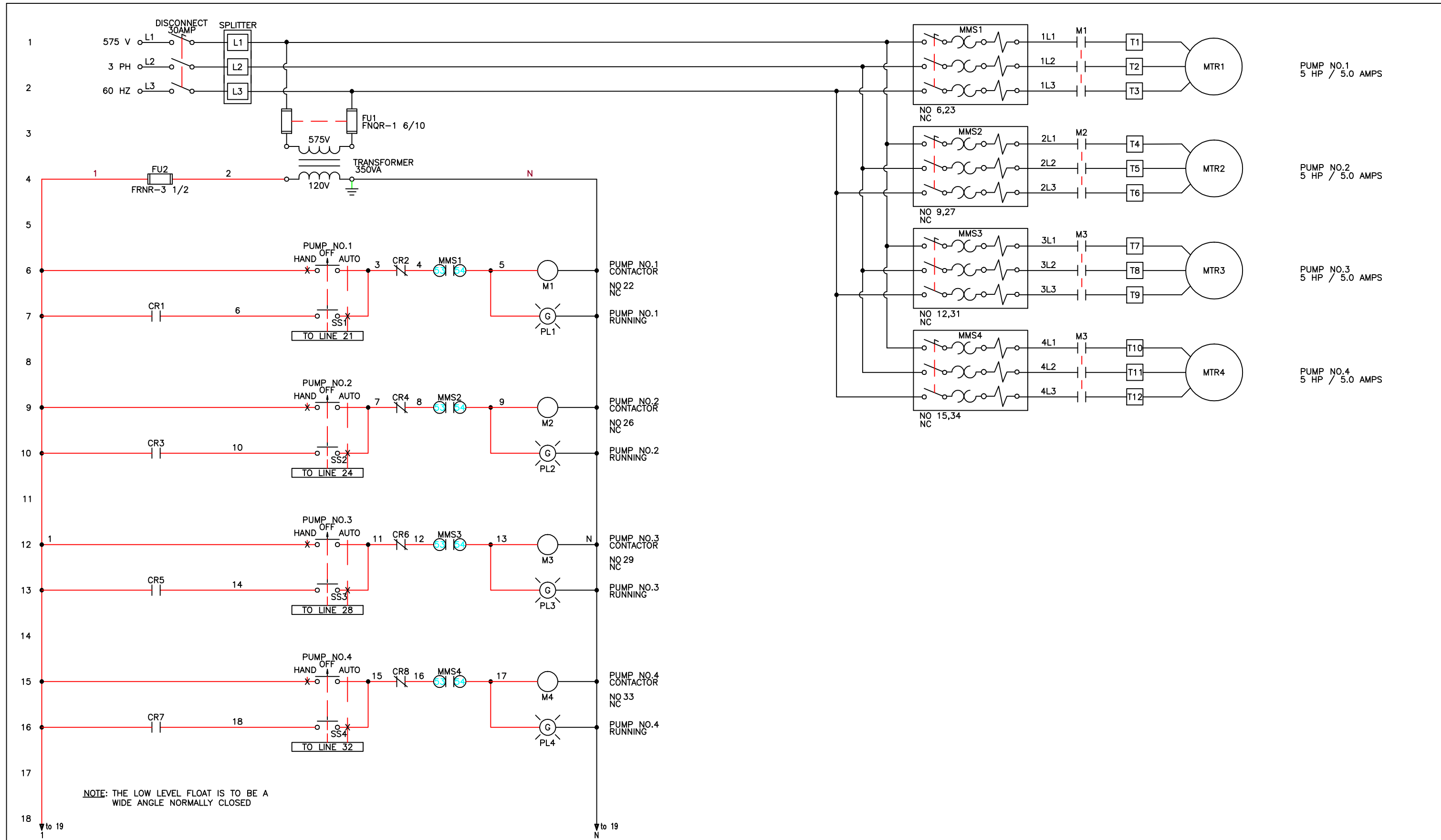


Type 4 & 13
 Approximate Shipping Weight 5 lbs (2.3 kg)

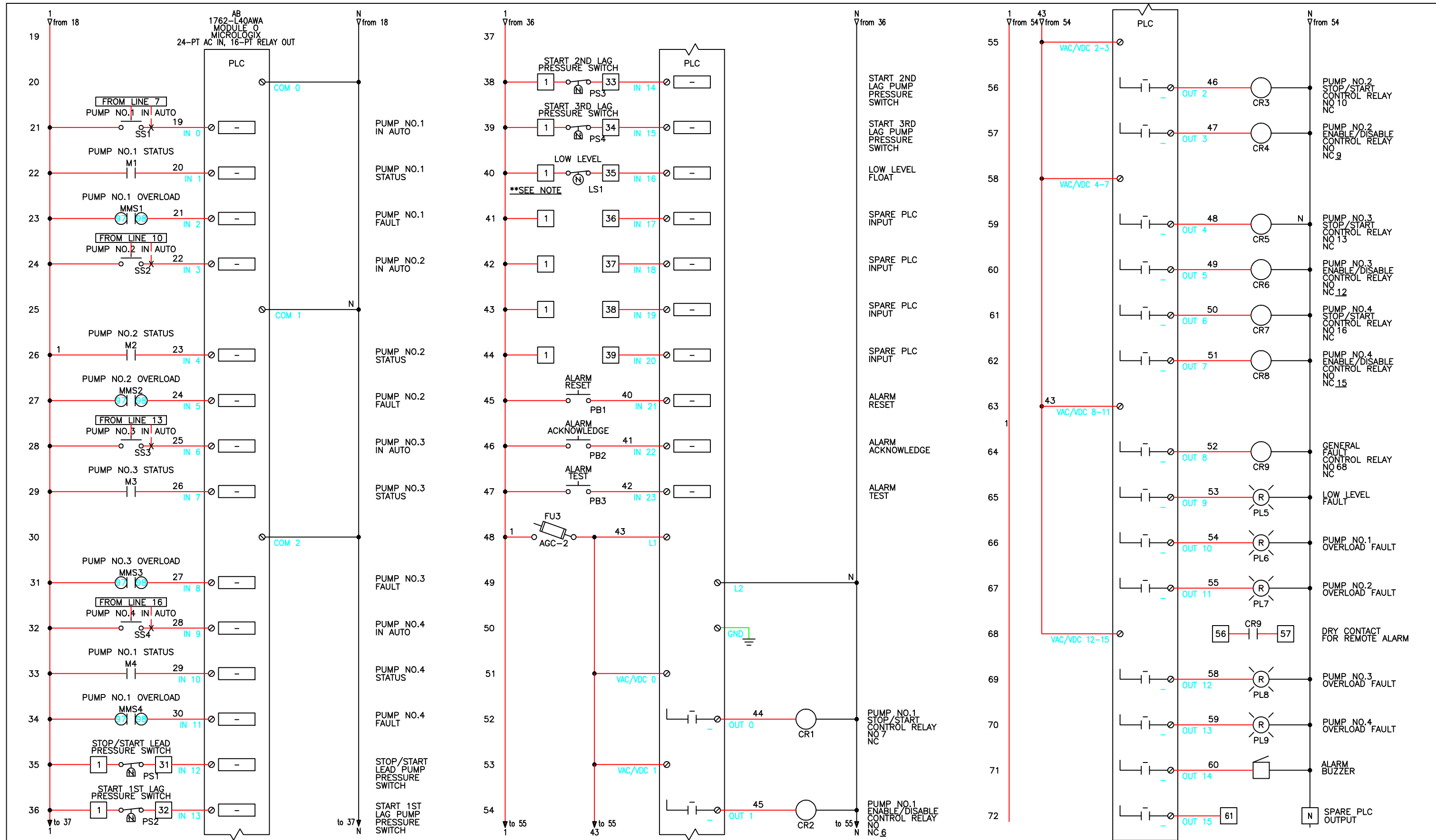
Type 4X
 Approximate Shipping Weight 6 lbs (2.7 kg)

□ Cat. No.s **836-C1** and **836-C1A**:

Require a 2 in. swing radius from centerline of pressure connection. Mount control on 7/8 in. minimum spacers
 Have a 3/8-18 N.P.S.F. internal pipe connection



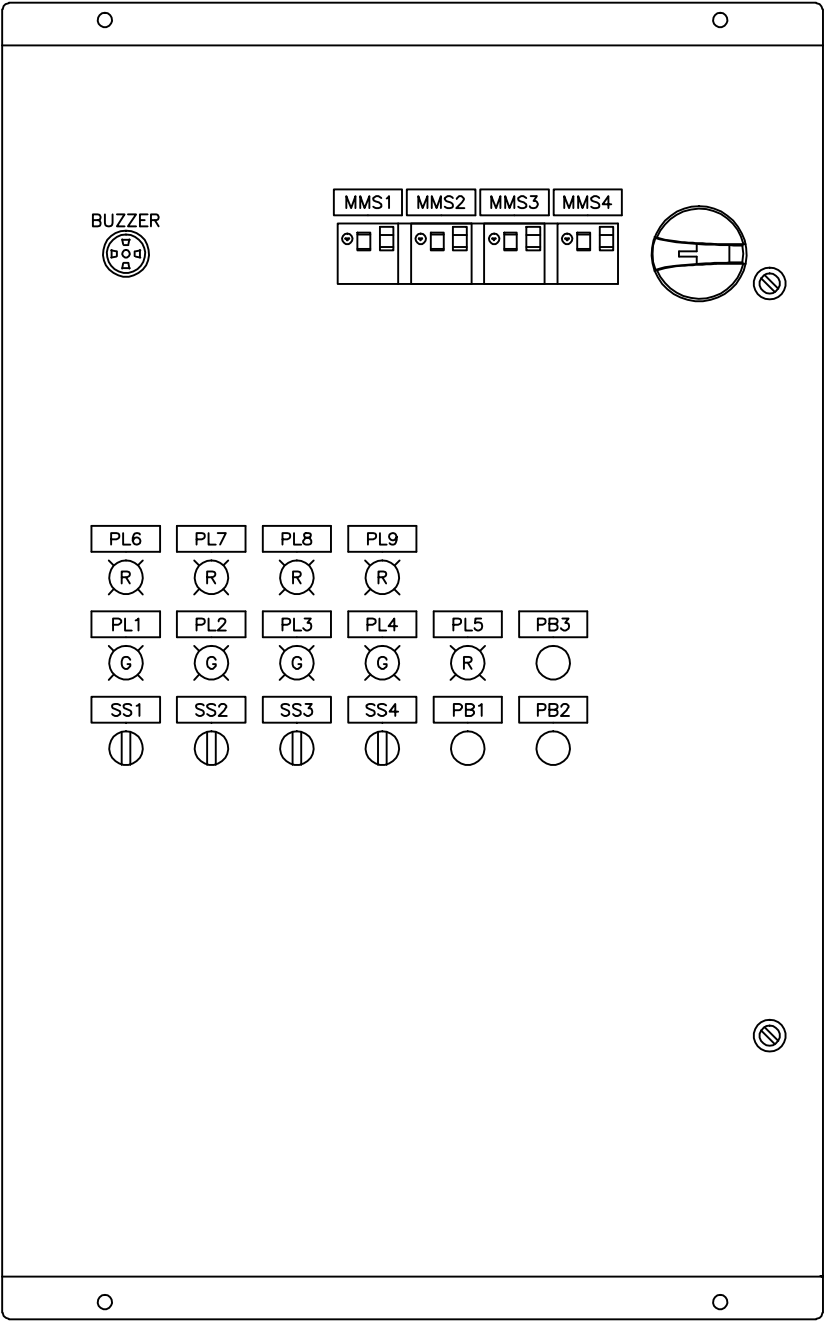
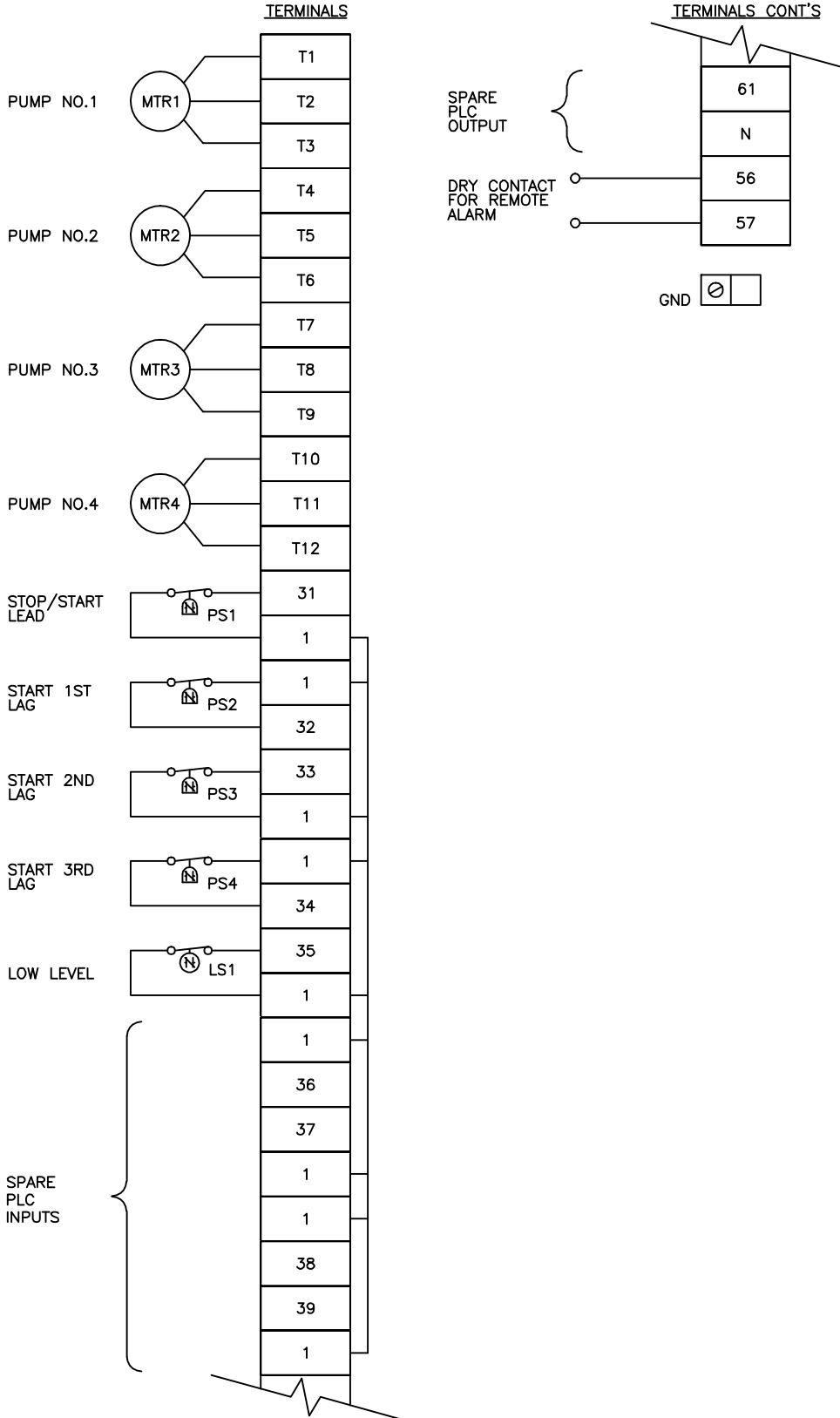
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							DESIGNED	P. RATIU		SCALE	N.T.S.	QUADPLEX PUMP CONTROL SYSTEM			
							DRAWN	P. RATIU		CAD REF.	PEN33566-4				
							DATE	JULY 08, 2013		SHT NO.	1 OF 3				
	REV	DESCRIPTION			BY	DATE	REV	DESCRIPTION			BY	DATE	DWG NO.	PE1249B-33566	REV



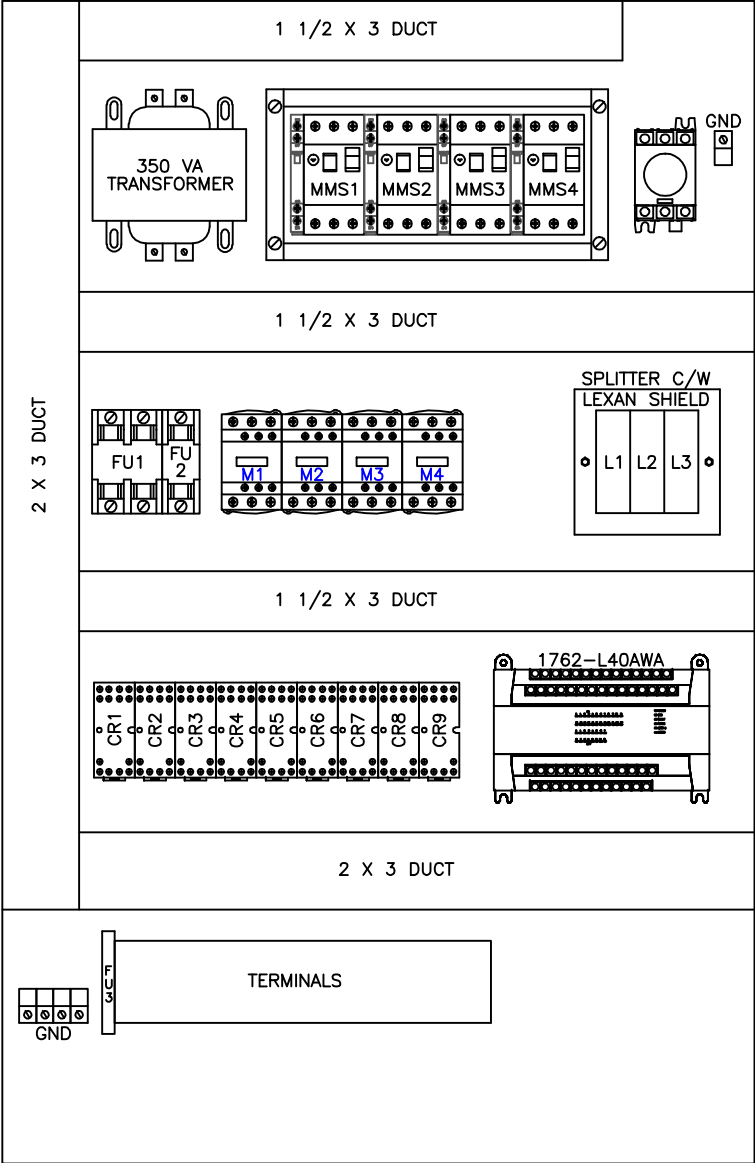
Pentair Canada Inc

269 Trillium Drive
KITCHENER, ONTARIO N2G 4W5
CANADA

REV	DESCRIPTION	BY	DATE	REV	DESCRIPTION	BY	DATE	REV'D	REF BAFFIN ISLAND	SCALE	N.T.S.	TITLE
								DESIGNED	P. RATIU	CAD REF.	PEN33566-5	QUADPLEX PUMP CONTROL SYSTEM
								DRAWN	P. RATIU	SHT NO.	2 OF 3	DWG NO. PE1249B-33566
								DATE	JULY 08, 2013			REV 0

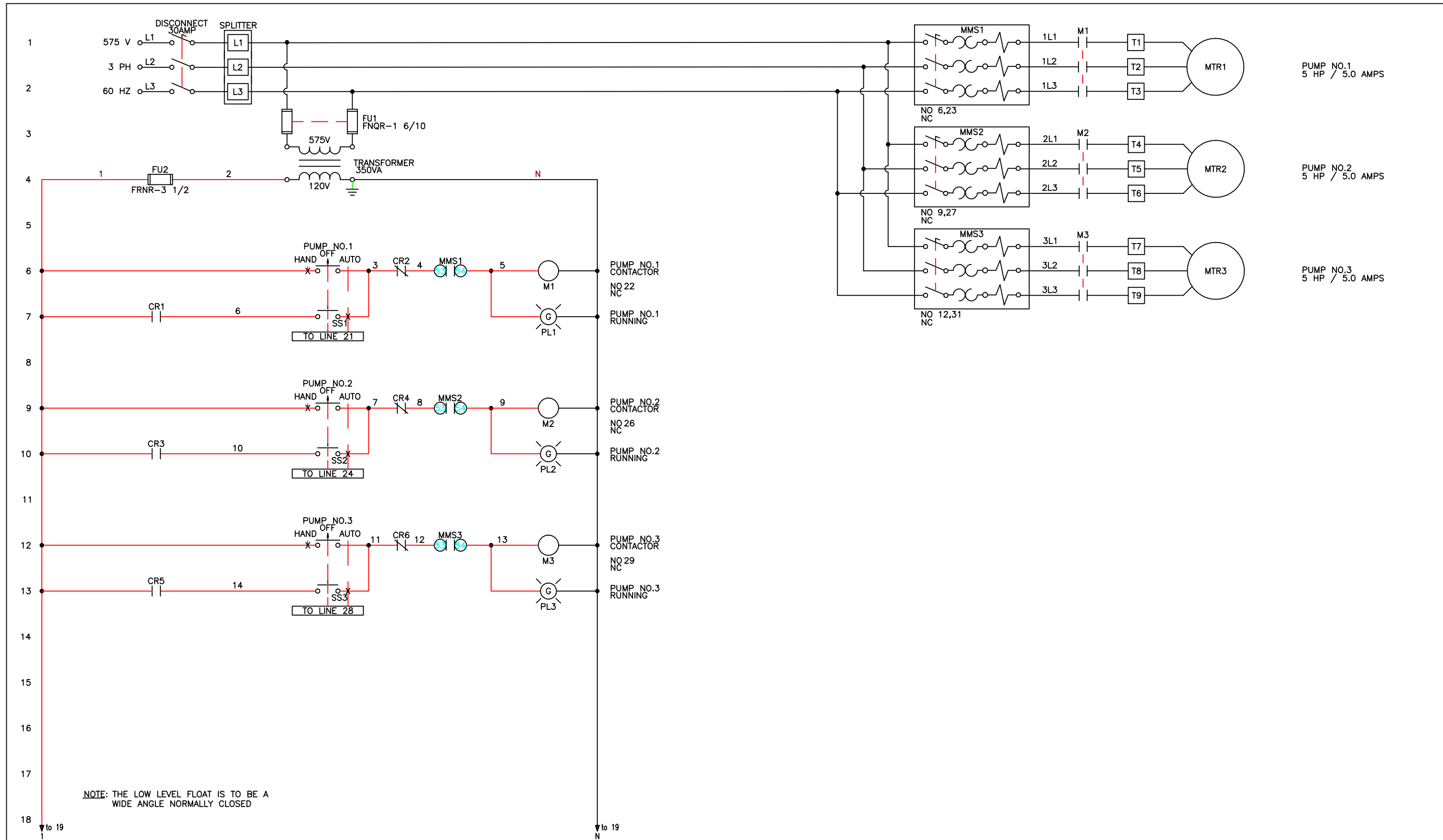


EEMAC 1 ENCLOSURE 36" X 24" X 9"

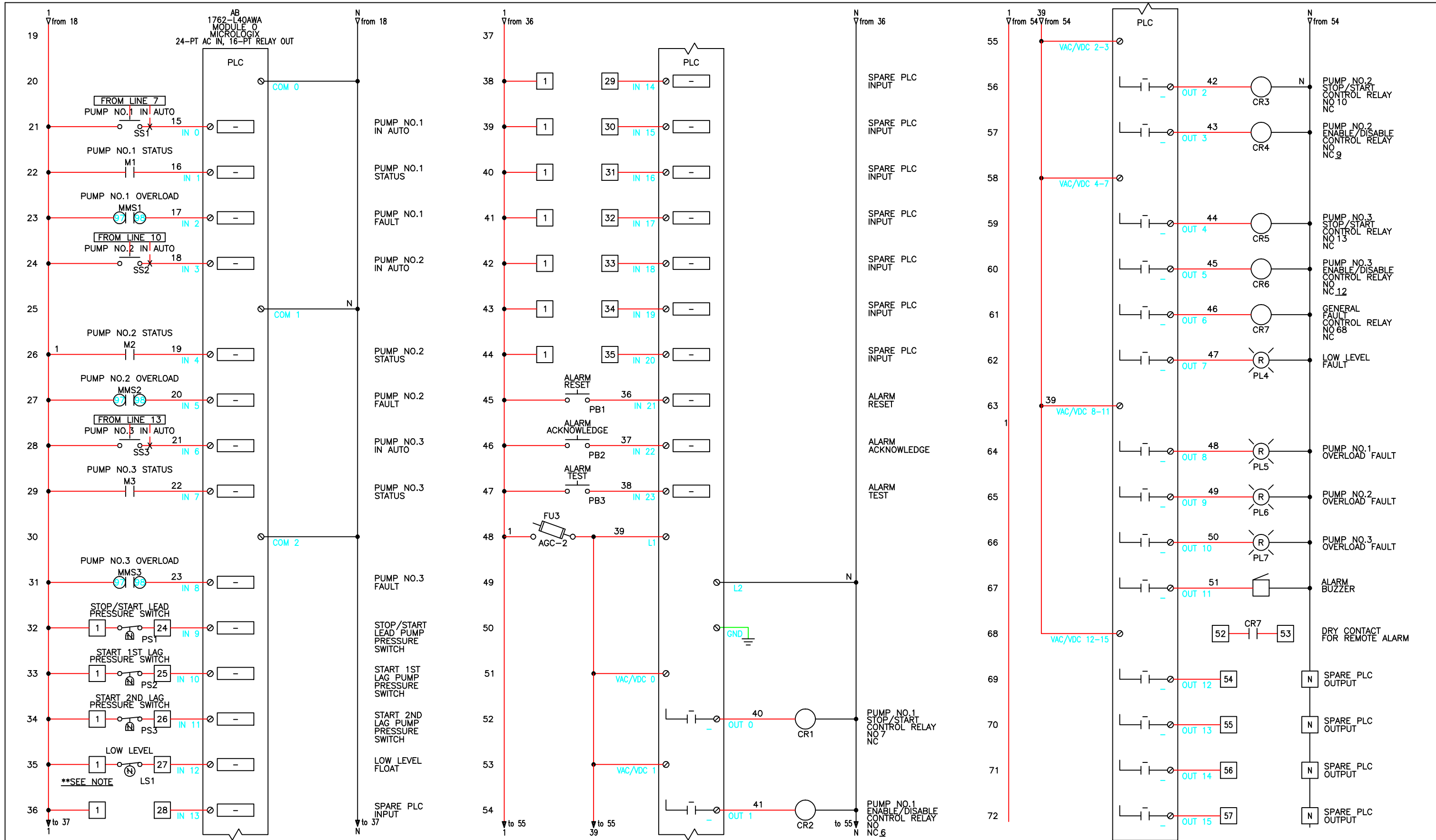


PANEL LAYOUT

Pentair Canada Inc 269 Trillium Drive KITCHENER, ONTARIO N2G 4W5 CANADA							REV'D	REF BAFFIN ISLAND		TITLE	
							DESIGNED P. RATIU		SCALE 3/16"=1"	QUADPLEX PUMP CONTROL SYSTEM	
							DRAWN P. RATIU		CAD REF. PEN33566-6		
							DATE JULY 08, 2013		SHT NO. 3 OF 3	DWG NO. PE1249B-33566	
REV	DESCRIPTION		BY	DATE	REV	DESCRIPTION		BY	DATE	REV 0	



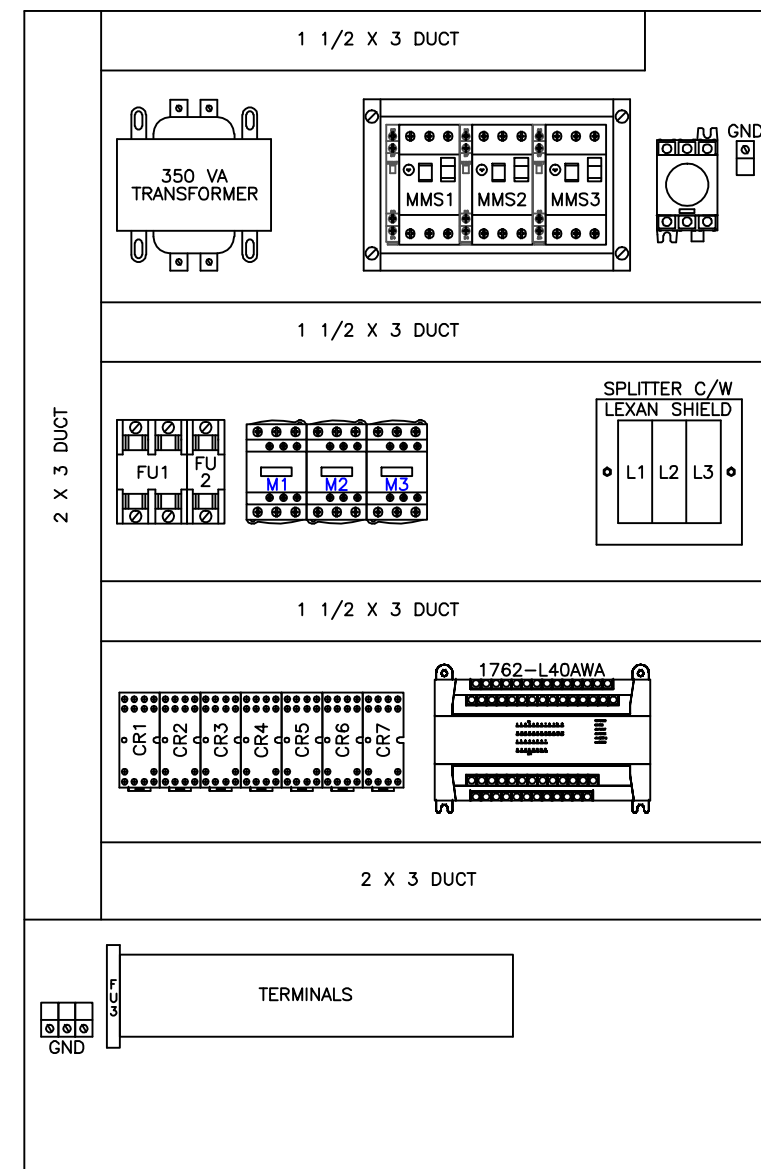
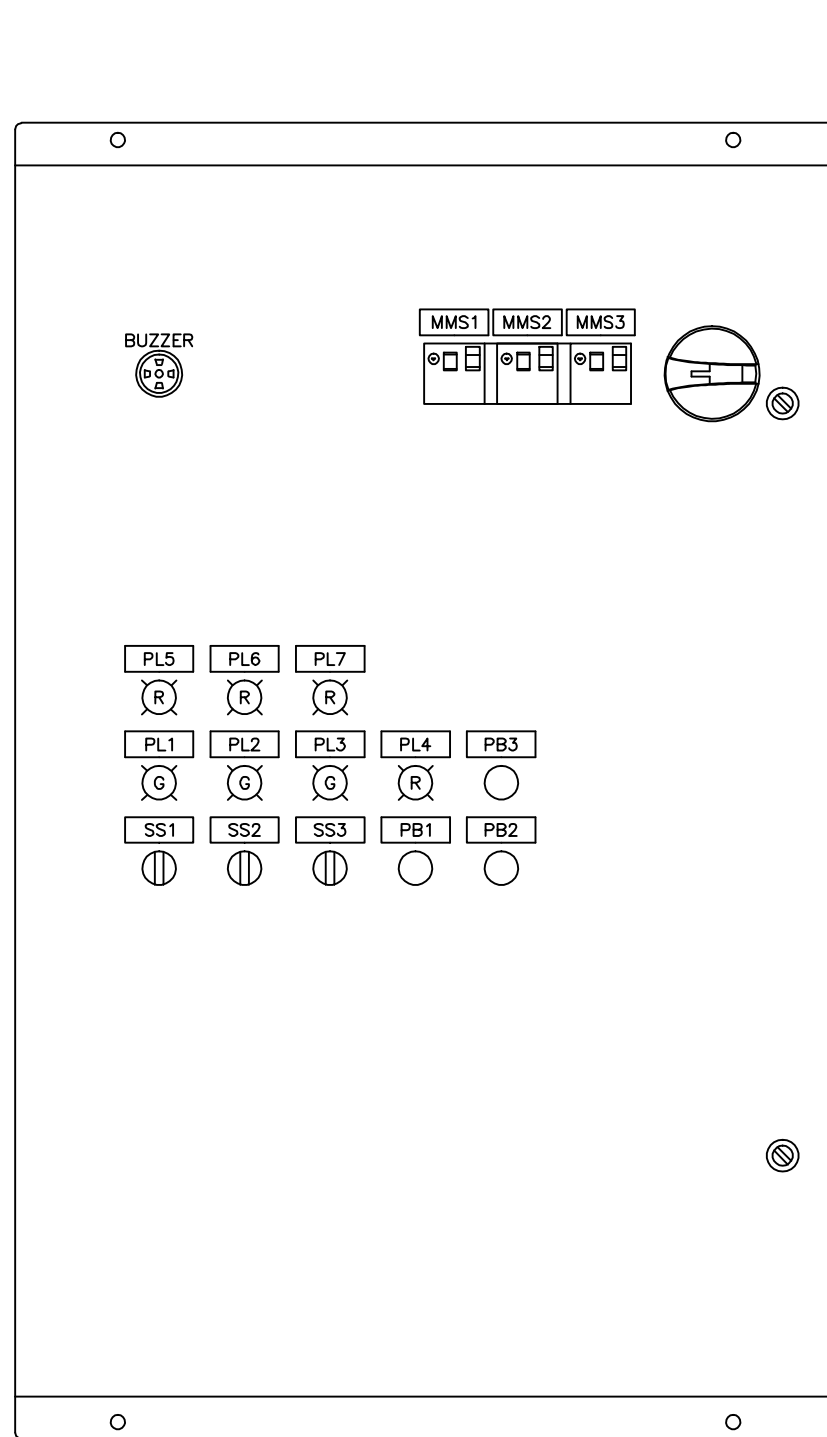
Pentair Canada Inc 269 Trillium Drive KITCHENER, ONTARIO N2G 4W5 CANADA								REV'D	REF BAFFIN ISLAND			TITLE										
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								DRAWN	P. RATIU		CAD REF.	PEN33566-1										
	REV	DESCRIPTION			BY	DATE	REV	DESCRIPTION			BY	DATE	DATE	JULY 05, 2013	SHT NO.	1	OF	3	DWG NO.	PE1249A-33566		REV



Pentair Canada Inc

269 Trillium Drive
KITCHENER, ONTARIO N2G 4W5
CANADA

REV		DESCRIPTION	BY	DATE	REV		DESCRIPTION	BY	DATE	REV'D	REF BAFFIN ISLAND		TITLE	
										DESIGNED	P. RATIU		SCALE N.T.S.	
										DRAWN	P. RATIU		CAD REF. PEN33566-2	
										DATE	JULY 05, 2013		SHT NO. 2 OF 3	
												DWG NO. PE1249A-33566		REV 0



EEMAC 1 ENCLOSURE 36" X 24" X 9"

WATER PRESSURE TANKS



WellMate™ premium steel pressurized water system tanks

- **Stainless Steel Service Connection** – “The Professional’s Choice”
- **Metal Air Valve Assembly** – “Field-Serviceable”
- **125 PSI Maximum Operating Pressure** – Four Sizes: SSWM14, SSWM20, SSWM25, and SSWM35

application

- Residential Water Systems
- Industrial, Commercial and Agricultural

specifications

Shell – Heavy gauge steel

Base – High-impact composite, ABS

Finish – Electrostatically applied, baked-on polyester paint

Water Cell – One piece seamless PVC, made from FDA listed material

Flange – 304SS

Service Connection – NPT threads, integral to flange

Air Valve – Nickel-plated brass, threaded for ease of service

certification



UL Classified to ANSI/NSF 61, Drinking Water System Components – Health Effects



► **Service Connection** – 304 stainless steel

► **Air Valve** – Nickel-plated brass

► **Maximum Operating Pressure** – 100 PSI on 16" and 20" tanks; 125 PSI on 24" tanks

► **Heavy Gauge Metal Construction** – Sturdy “welded wrapper and head design.” Built to last.

► **Polyester Paint Finish** – Electrostatically powder painted, then oven baked for a smooth high-gloss, appliance-quality finish. Resists corrosion.

► **Elongated, Seamless Water Cell** –

- Controlled 2-dimensional cell expansion

- Rugged, seamless “water cell” prevents the most common cause of pump failure – “waterlogging”

- Water never touches the steel tank material
- Translucent bag material facilitates manufacturing quality control inspection

► **NEW Stainless Service Connection** –

- Corrosion-resistant
- Stainless steel – the professional’s choice

► **Integral Stand Pipe** – Promotes complete flushing of the water entering/exiting the tank

► **Nitrogen-Rich Precharge** – Decreases air permeation three to four times over straight air precharge

► **40 PSI Precharge** – Ready for use with 40/60 pressure range systems. Enables installer to reduce pressure depending on pressure switch setting

► **Sturdy Base** – Tested-tough composite construction

► **Five Year Warranty** – Managed and provided by Pentair Water, the only U.S. pump manufacturer to design and manufacture fibrewound and steel tanks!

WellMate™ is a trademark of Pentair, Inc.

Myers

WATER PRESSURE TANKS



WellMate™ premium steel pressurized water system tanks

ordering information

Catalog Number	Maximum Capacity gal/liter	Diameter* inch/cm	Height* inch/cm	Precharge PSI/kPa	Connection Size Female	Drawdown in Gallons/Liter			Weight lbs/kg	Maximum Operating PSI
						20-40	30-50	40-60		
SSWM4	14 / 53	16 / 40.6	23 / 54.4	40 / 276	1" NPT	4.8 / 18.2	4.1 / 15.5	3.6 / 13.6	37 / 16.8	100
SSWM6SQ	19 / 72	20 / 51	21 / 53.3	40 / 276	1" NPT	6.9 / 26.1	5.8 / 21.9	5.0 / 18.9	49 / 22.2	100
SSWM6	19 / 72	16 / 40.6	27.5 / 70	40 / 276	1" NPT	6.9 / 26.1	5.8 / 21.9	5.0 / 18.9	44 / 20.0	100
SSWM9	32 / 121	16 / 40.6	43 / 109	40 / 276	1" NPT	11.6 / 43.9	9.8 / 37.1	8.5 / 32.2	60 / 27.2	100
SSWM10SQ	35 / 133	20 / 51	33 / 84	40 / 276	1" NPT	12.7 / 48.1	10.7 / 40.5	9.3 / 35.2	70 / 31.8	100
SSWM14	50 / 189	24 / 61	32.5 / 83	40 / 276	1-1/4" NPT	18.3 / 69.3	15.5 / 58.7	13.4 / 50.7	88 / 39.9	125
SSWM20	62 / 235	24 / 61	39.5 / 100	40 / 276	1-1/4" NPT	21.4 / 81.0	18.3 / 69.3	16.0 / 60.6	116 / 52.6	125
SSWM25	85 / 322	24 / 61	51 / 130	40 / 276	1-1/4" NPT	30 / 113.6	26 / 98.4	22 / 83.3	128 / 58.1	125
SSWM35	119 / 450	24 / 61	68 / 173	40 / 276	1-1/4" NPT	41.3 / 156.3	35.4 / 134.0	31.0 / 117.3	140 / 63.5	125

*Subject to change without notice.

Maximum Liquid Temperature: 120°F (49°C)

Maximum External (Ambient) Temperature: 125°F (52°C)

tank selection chart

Pump GPM	System Pressure Switch Setting – PSI					
	20-40		30-50		40-60	
	Run Times					
	1 Minute	2 Minute	1 Minute	2 Minute	1 Minute	2 Minute
5	SSWM6	SSWM9	SSWM6	SSWM10SQ	SSWM6	SSWM10SQ
7-1/2	SSWM9	SSWM10SQ	SSWM9	SSWM14	SSWM9	SSWM20
10	SSWM9	SSWM20	SSWM10SQ	SSWM20	SSWM10SQ	SSWM25
12-1/2	SSWM10SQ	SSWM20	SSWM14	SSWM25	SSWM14	SSWM25
15	SSWM14	SSWM25	SSWM14	SSWM14 (2)	SSWM20	SSWM20 (2)
20	SSWM20	SSWM20 (2)	SSWM20	SSWM20 (2)	SSWM25	SSWM25 (2)
30	SSWM25	SSWM25 (2)	SSWM14 (2)	SSWM25 (2)	SSWM20 (2)	SSWM25 (3)
50	SSWM20 + SSWM25	SSWM25 (3)	SSWM25 (2)	SSWM25 (4)	SSWM25 (2)	SSWM25 (5)
50	-	SSWM35 (2) + SSWM20	-	SSWM35 (3)	SSWM35 (2)	SSWM35 (4)

NOTE: Drawdown will be affected by operating temperature of the system, accuracy of the pressure switch and gauge, the actual precharge pressure, and rate of fill.

Pumps installed with a WellMate™ tank require a relief valve equal to the tank's maximum operating pressure. Relief valve must be capable of relieving entire flow of pump at relief pressure.

drawdown volume multiplier* (approx.)

Pump Off Pressure PSI	Pump Start Pressure – PSI							
	10	20	30	40	50	60	70	80
20	0.26							
30	0.41	0.22						
40		0.37	0.18					
50		0.46	0.31	0.15				
60			0.40	0.27	0.13			
70			0.47	0.35	0.24	0.12		
80				0.42	0.32	0.21	0.11	
90				0.48	0.38	0.29	0.19	0.10
100					0.44	0.35	0.26	0.17

*Utilize this chart if proper selection cannot be made using tank selection chart. Drawdown based on Boyle's Law.

tank sizing rule

Size tank for one gallon of draw-down for each gallon per minute at pump capacity.

EXAMPLE: For a 1 HP, 20 GPM unit pumping 25 gallons per minute on a 30-50 pressure switch setting, the properly sized WellMate™ tank is a SSWM25, which has a 26 gallon drawdown.

PROCEDURE:

1. Identify drawdown multiplier relating to specific application.
2. Insert multiplier (X) into the following formula:

$$\frac{\text{Pump GPM} \times \text{Minute Run Time}}{\text{Multiplier (X)}}$$

= Min. Tank Capacity Required

EXAMPLE:

An example of a 20 GPM pump with a minimum run time of 1 minute, installed on a 50-70 PSIG system pressure range:

$$\frac{20 \text{ GPM} \times 1 \text{ Minute}}{.24 \text{ (factor) from Drawdown Volume Multiplier chart}}$$

= 83.3 Minimum U.S. Gallon Tank Capacity Required

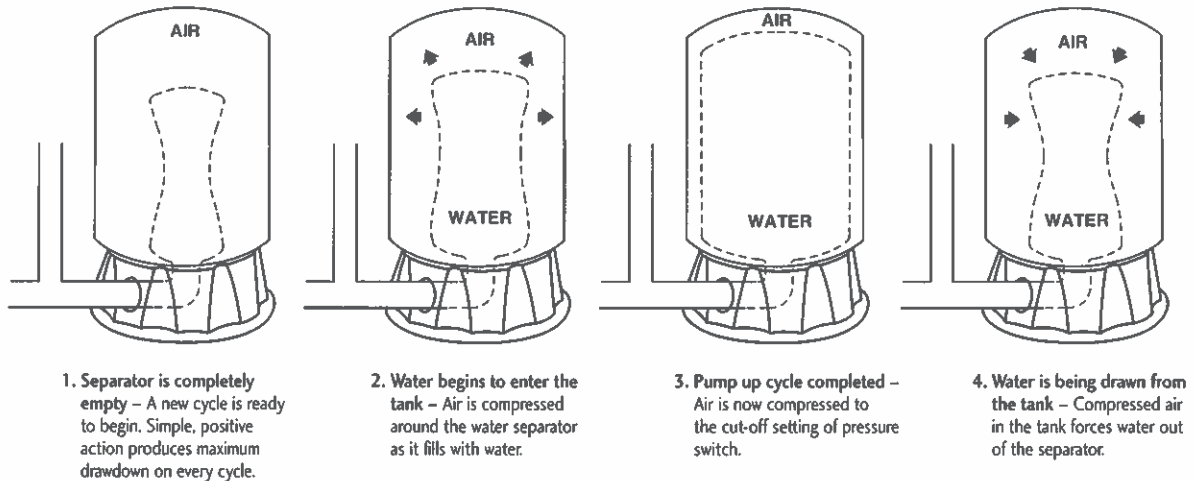
Referring to "Ordering Information" chart, the model SSWM25 has the closest U.S. gallon capacity that is greater or equal to the minimum volume requirement of 83.3 U.S. gallons.

WATER PRESSURE TANKS

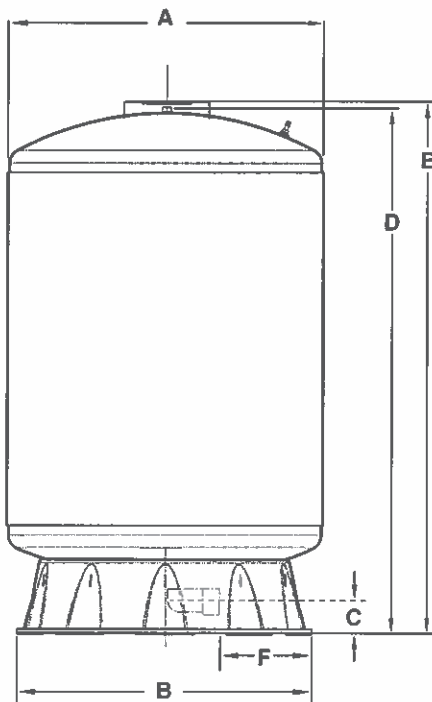


WellMate™ premium steel pressurized water system tanks

operating cycle



outline dimensions

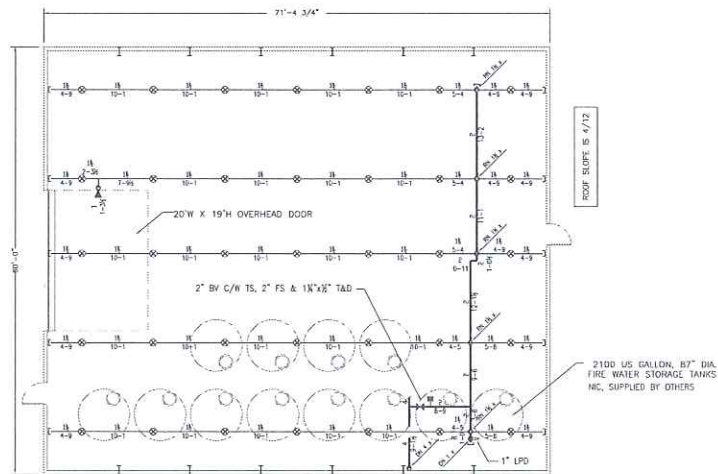


dimensional data

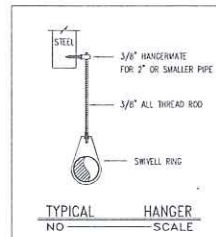
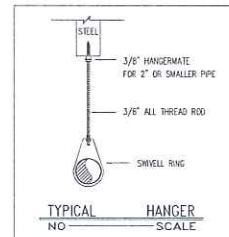
Catalog Number	Discharge NPT	A	B	C	D	E	F
SSWM4	1"	16.1	15.5	2.0	23.0	–	4.0
SSWM6	1"	16.1	15.5	2.0	27.8	–	4.0
SSWM9	1"	16.1	15.5	2.0	43.0	–	4.0
SSWM6SQ	1"	20.1	15.5	2.0	–	21.5	4.0
SSWM10SQ	1"	20.1	15.5	2.0	33.0	–	4.0
SSWM14	1-1/4"	24.1	22.7	2.5	33.2	–	7.2
SSWM20	1-1/4"	24.1	22.7	2.5	40.1	–	7.2
SSWM25	1-1/4"	24.1	22.7	2.5	51.5	–	7.2
SSWM35	1-1/4"	24.1	22.7	2.5	68.6	–	7.2

Dimensions (in inches) are for estimating purposes only.

Myers



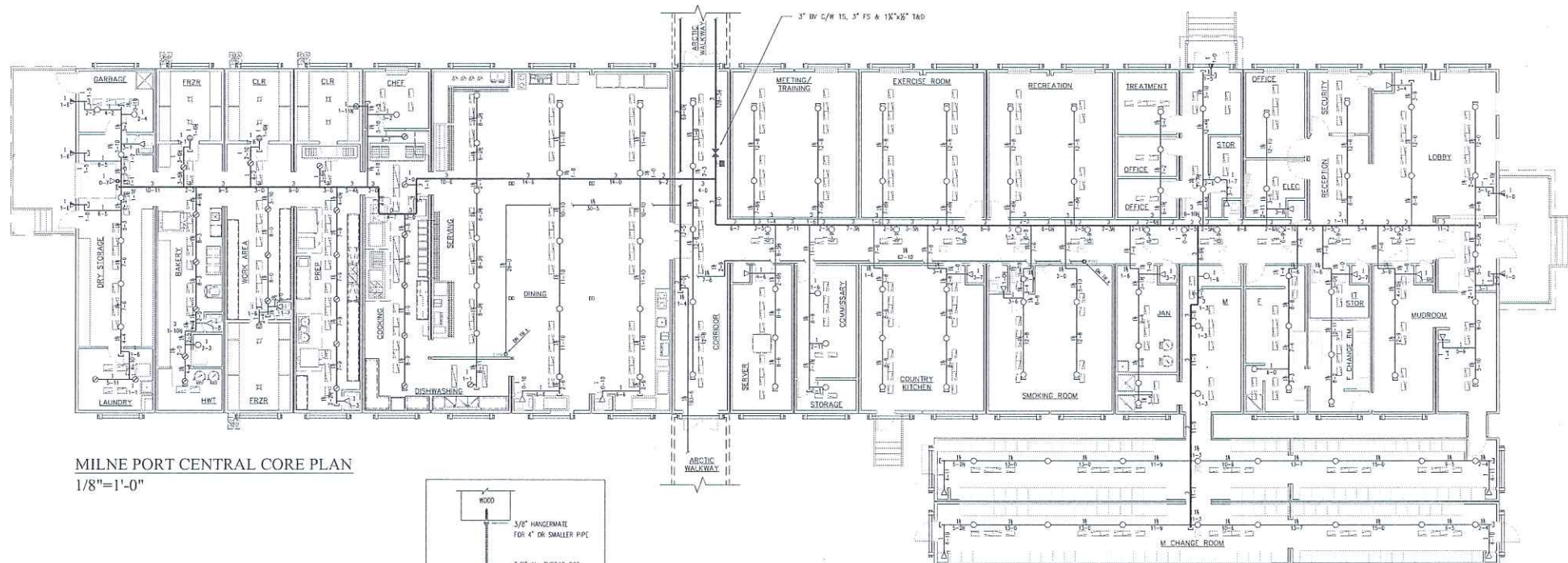
MILNE PORT WATER TREATMENT BUILDING PLAN
1/8"=1'-0"



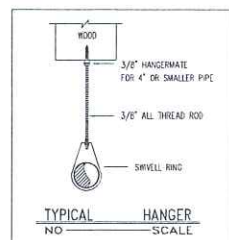
NOTES:

1. LINES TO BE SCH.10 BLK. PIPE (GRVD. ENDS) C/W SNAPLETS FOR HEADS, JOINED WITH GROOVED FITTINGS
2. MAINS TO BE SCH.10 BLK. PIPE (GRVD. ENDS) C/W GROOVED MECH TEES FOR LINES, JOINED WITH GROOVED FITTINGS

HATCH		VENDOR DATA REVIEW	
Doc Number	E349000-TX001-60-042-0002	Sub	01
Date Received	18 JUL 13	Review Grade	Next Submittal Status
☒ C1 - Proceed to next submission & status ☐ C2 - Proceed with exceptions as noted to next submission & status ☐ C3 - Do not proceed, revise as noted & resubmit ☐ C4 - No further submission required - Complete ☐ C4 - No further submission required - Cancelled ☐ C4 - No further submission required - Supercede		☐ Integral Review ☐ Certified Final ☐ Final ☐ As-Built Next Submittal Date: 18 AUG 13	
Packager Coordinator: Name: [Signature] Date: 1 AUG 13 REVIEWED ONLY FOR GENERAL CONFORMANCE WITH THE SUPPLEMENTAL NOTES. ACCEPTANCE BY THE DESIGNER DOES NOT WARRANT OR REPRESENT THAT THE INFORMATION CONTAINED ON THIS DRAWING IS EITHER ACCURATE OR COMPLETE. THE USER ASSUMES RESPONSIBILITY FOR CORRECT DESIGN DETAILS. DIMENSIONS SHALL REMAIN WITH THE PARTY SUBMITTING THE DRAWING DOCUMENT.			



MILNE PORT CENTRAL CORE PLAN
1/8"=1'-0"



NOTES:

1. LINES TO BE SCH.10 BLK. PIPE (GRVD. ENDS) C/W SNAPLETS FOR HEADS, JOINED WITH GROOVED FITTINGS
2. MAINS TO BE SCH.10 BLK. PIPE (GRVD. ENDS) C/W GROOVED MECH TEES FOR LINES, JOINED WITH GROOVED FITTINGS

REVISIONS	
NO.	DESCRIPTION
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2	ISSUED FOR CONSTRUCTION
3	ISSUED FOR AS-BUILT
4	ISSUED FOR FINAL REVIEW
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VIKING FIRE PROTECTION
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Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Cerabar T PMC131, PMP131, PMP135

Process pressure measurement

Pressure transducer with ceramic and metallic sensors

For absolute pressure and gauge pressure measurement up to 400 bar (6000 psi); Extremely stable, overload-resistant and reliable



Application

The Cerabar T is a pressure transducer for measuring absolute pressure and gauge pressure in gases, vapors, liquids and dusts.

Hygienic and threaded connections are available as process connections.

Your benefits

This compact pressure transducer impresses with its well-engineered construction:

- High reproducibility and long-term stability.
- Finely graduated measuring ranges from vacuum up to 400 bar (6000 psi)
- Ceraphire® ceramic sensor: corrosion-proof, abrasion-proof and extremely overload-resistant
- Deployed for pressure monitoring up to SIL 2 as per IEC 61508/IEC 61511-1
- Sensors
 - Dry capacitance ceramic sensor (Ceraphire®) for measuring ranges up to 40 bar (600 psi): overload-resistant, vacuum-proof, stable against alternating load
 - Piezoresistive sensor with metallic process isolating diaphragm for measuring ranges up to 400 bar (6000 psi)

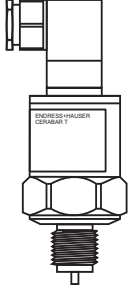
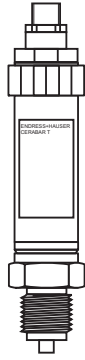
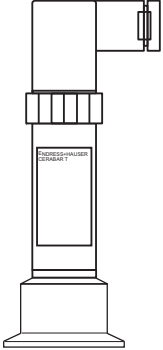
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Function and system design

Device selection

Cerabar T - Product family	PMC131	PMP131	PMP135
	 P01-PMC131xx-14-xx-xx-xx-000 With capacitive measuring cell and ceramic process isolating diaphragm (Ceraphire®)	 P01-PMP131xx-14-xx-xx-xx-000 With piezoresistive measuring cell and metallic process isolating diaphragm	 P01-PMP135xx-14-xx-xx-xx-000 With piezoresistive measuring cell and metallic process isolating diaphragm for hygienic applications
Field of application	Absolute pressure and gauge pressure	Absolute pressure and gauge pressure	Absolute pressure and gauge pressure in hygienic processes
Output	– Current output 4 to 20 mA	– Current output 4 to 20 mA – Voltage output 0 to 10 V – Switch output PNP	– Current output 4 to 20 mA – Switch output PNP
Process connections	Thread: – G ½ – ½ MNPT and ¼ FNPT – G ½, bore 11 mm (0.43 in)	Thread: – G ½ – ½ MNPT and ¼ FNPT – ½ MNPT, bore 4 mm (0.16 in) – G ¼ – ¼ MNPT, bore 3.5 mm (0.14 in) – M 20 x 1.5	Hygiene: – Clamp DN 22 (¾") – Tri-Clamp DN 25 to 38 (1" to 1½") – Tri-Clamp DN 40 to 51 (2") – G 1 – SMS 1½"
Measuring ranges	from –1 to 0 bar (–15 to 0 psi) / –100 to 0 kPa up to 0 to 40 bar (0 to 600 psi) / 0 to 4 MPa	0 to 1 bar (0 to 15 psi) / 0 to 100 kPa up to 0 to 400 bar (0 to 6000 psi) / 0 to 40 MPa	0 to 1 bar (0 to 15 psi) / 0 to 100 kPa up to 0 to 40 bar (0 to 600 psi) / 0...4 MPa
Process temperature range	–20 to +100 °C (–4 to +212 °F)	–25 °C to +70 °C (–13 to +158 °F)	–25 to +100 °C (–13 to +212 °F), +135 °C (275 °F) for max. 1 hour

Measuring principle

PMC131

The process pressure causes a slight deflection of the ceramic process isolating diaphragm of the sensor. The pressure-proportional change in capacitance is measured at the electrodes of the ceramic sensor. The ceramic sensor is a dry sensor, i.e. no fill fluid is required for the pressure transfer. This makes the sensor completely suitable for vacuums. Extremely high stability, comparable with the material Alloy, is achieved by using ultrapure Ceraphire® as the ceramic.

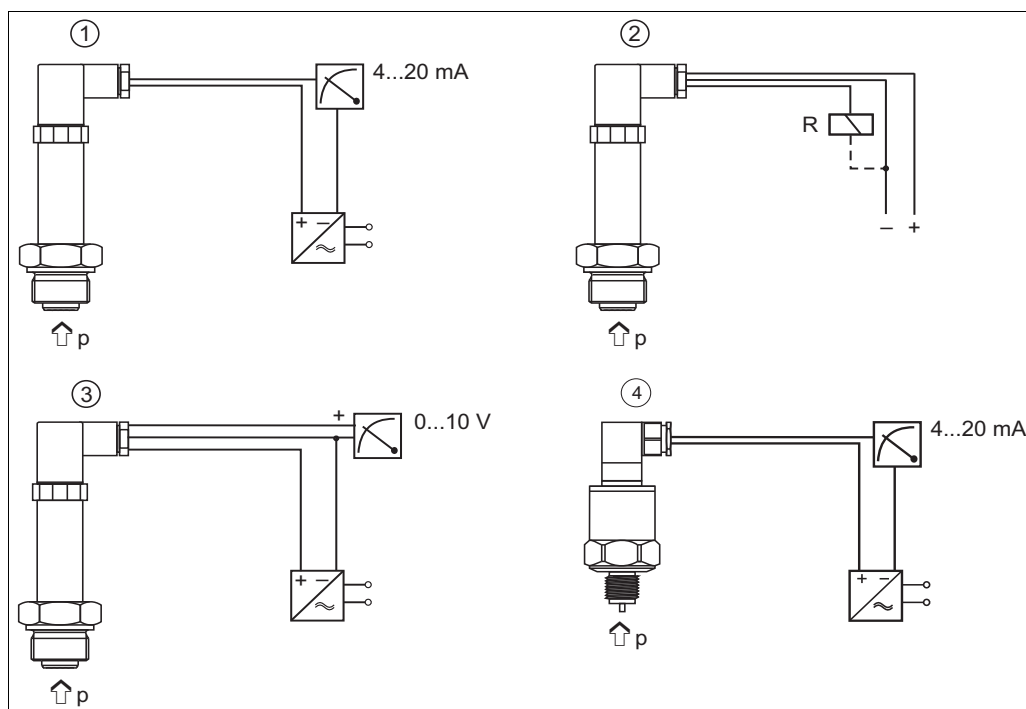
PMP131 and PMP135 with analog output

The process pressure acting upon the metallic process isolating diaphragm of the sensor is transmitted to a resistance bridge via a fluid. The pressure-proportional change of the bridge output voltage is measured and processed further.

PMP131 and PMP135 with switch output

The process pressure acting upon the metallic process isolating diaphragm of the sensor is transmitted to a resistance bridge via a fluid. A differential amplifier creates a standard signal from the pressure-proportional change in output voltage of the bridge. A comparator with an adjustable hysteresis compares this signal with the pre-set switch point and then activates the transistor output.

Measuring system



P01-PMx13xxx-14-xx-xx-xx-002

- 1 PMP131, PMP135: current output with transmitter power supply unit, e.g. RN 221N from Endress+Hauser
- 2 PMP131, PMP135: switch output with load, e.g. PLC, DCS, relay
- 3 PMC131: voltage output with transmitter power supply unit, e.g. RIA452 from Endress+Hauser
- 4 PMC131: current output with transmitter power supply unit, e.g. RN 221N from Endress+Hauser

Input

Measured variable	Absolute pressure or gauge pressure
Measuring range	up to 400 bar (6000 psi), → 20, "Ordering information" section

Output

Analog output (PMC131, PMP131, PMP135)

Output signal	Current output 4...20 mA, 2-wire version (PMC131, PMP131, PMP135) Voltage output 0...10 V, 3-wire version (PMP131)
Load	PMC131 $R_{Lmax} [\Omega] \leq (U_S - 11 \text{ V}) / 0.02 \text{ A}$ PMP131 and PMP135 (current output) $R_{Lmax} [\Omega] \leq (U_S - 12 \text{ V}) / 0.02 \text{ A}$ (R_{Lmax}: Maximum load resistance, U_S: Supply voltage) PMP131 (voltage output) Load resistance $R_{Lmax} \geq 5 \text{ k}\Omega$, current consumption $\leq 6 \text{ mA}$ Switch output (PMP131, PMP135)

Output signal	PNP switch output (positive voltage signal), rate depends on power supply voltage
Output current	■ Switch status ON: $I_a \leq 500 \text{ mA}$

- Switch status OFF: $I_a \leq 1 \text{ mA}$

Power max. 6 W

Switch frequency max. 10 Hz

Input PLC

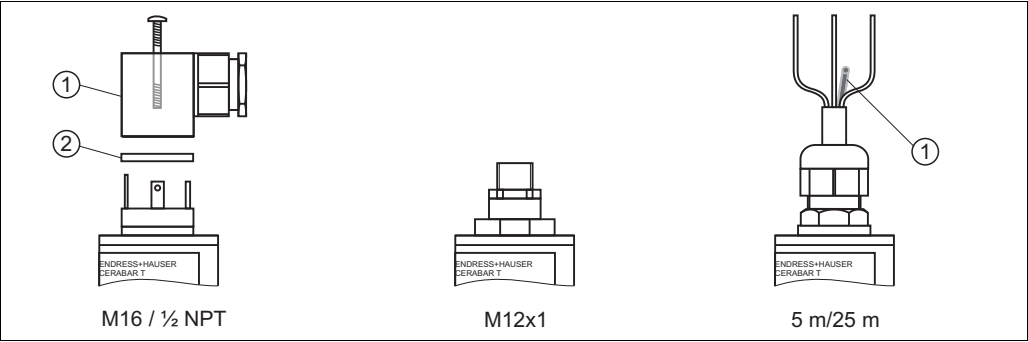
- Input resistance $R_i \leq 2 \text{ k}\Omega$
- Input current $I_i \geq 10 \text{ mA}$

Inductive loads To prevent electrical interference, only operate an inductive load (relays, contactors, solenoid valves) when directly connected to a protective circuit (free-wheeling diode or capacitor).

Power supply

PMC131

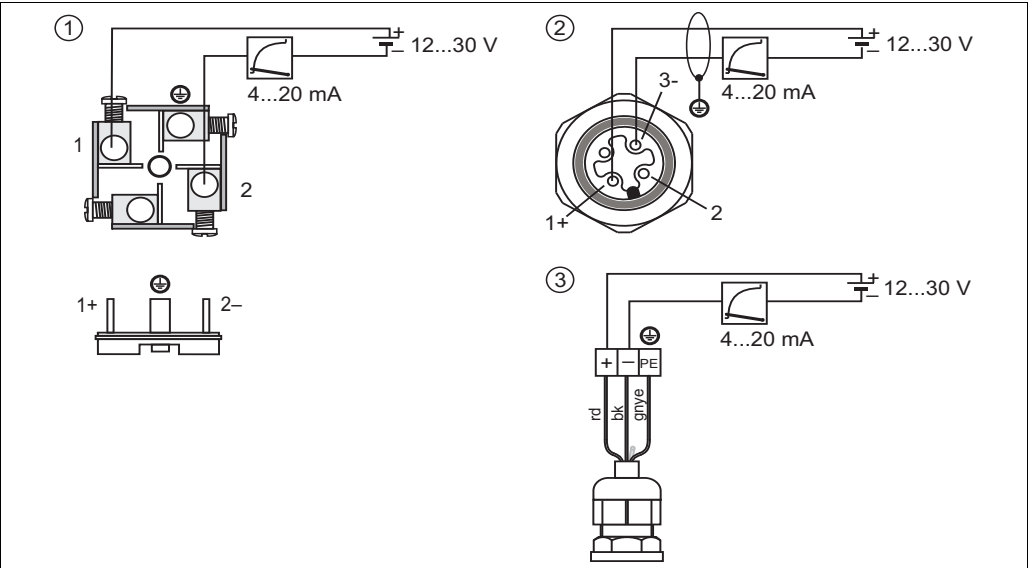
Plug/cable connection



P01-PMC131-xx-04-xx-xx-xx-001

Plug M 16 x 1.5 (DIN 43650/A), 1/2 NPT	Plug M 12x1	5 m (16 ft) / 25 m (82 ft) cable
① Plug-in housing		① Reference pressure line
② Gasket		

Electrical connection: Analog/current output

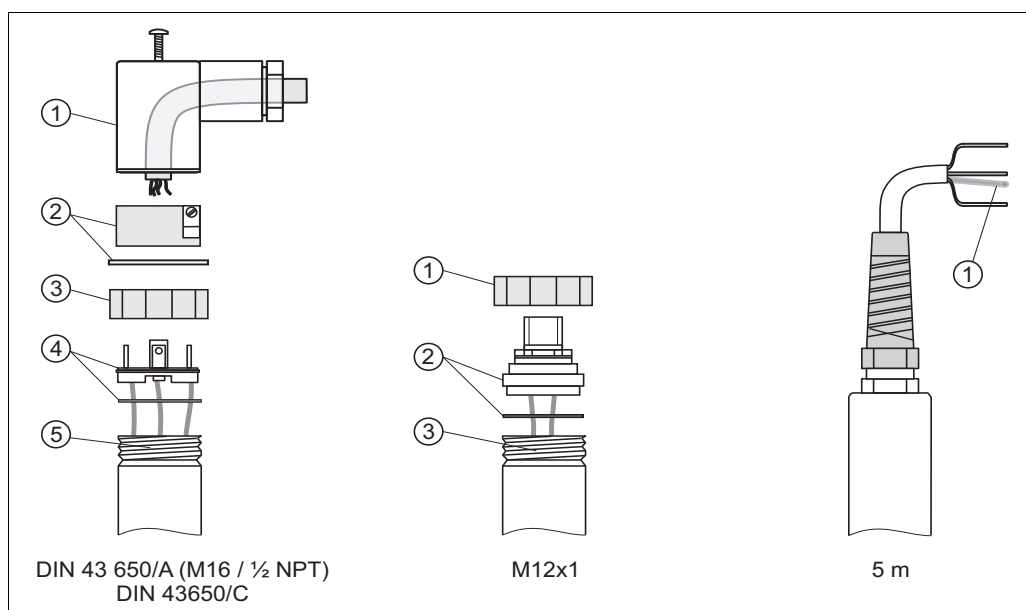


P01-PMC131-xx-04-xx-xx-xx-002

- 1 Plug M 16 x 1.5 (DIN 43650/A), 1/2 NPT
- 2 Plug M 12 x 1
- 3 Cable (rd = red, bk = black, gnye = green-yellow)

PMP131 and PMP135

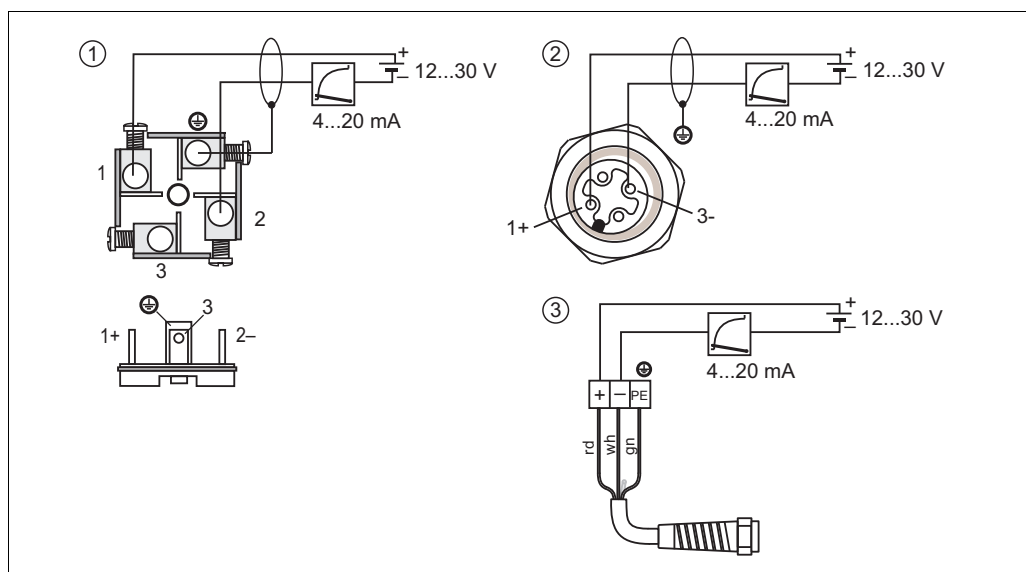
Plug/cable connection



P01-PMP13xxx-04-xx-xx-xx-001

Plug M 16 x 1.5 (DIN 43650/A), ½ NPT Plug DIN 43650/C	Plug M 12x1	5 m (16 ft) cable, only analog output
① Plug-in housing	① Coupling nut	① Reference pressure line
② Plug-in jack with gasket	② Connector with gasket	
③ Coupling nut	③ Operating potentiometer (inner)	
④ Plug with O-ring		
⑤ Operating potentiometer (inner)		

Electrical connection: Analog/current output

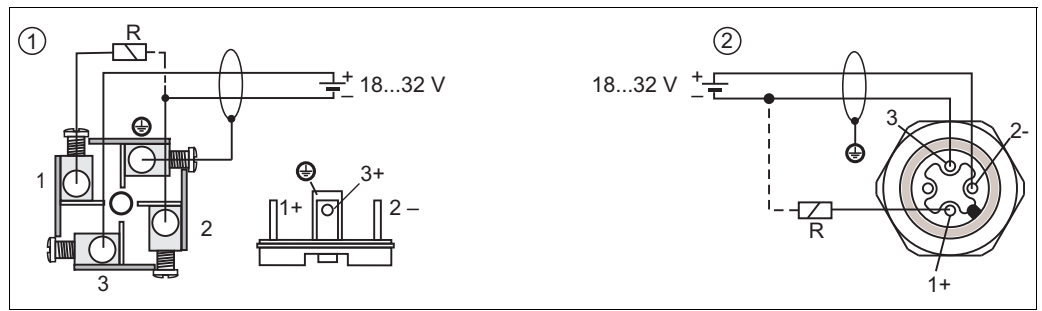


P01-PMP13xxx-04-xx-xx-xx-002

- 1 Plug M 16 x 1.5 (DIN 43650/A), ½ NPT and plug DIN 43650/C
 2 Plug M 12 x 1
 3 Cable (rd = red, wh = white, gn = green)

For electrical connection provided by customer use only shielded cable

Electrical connection (switch output)



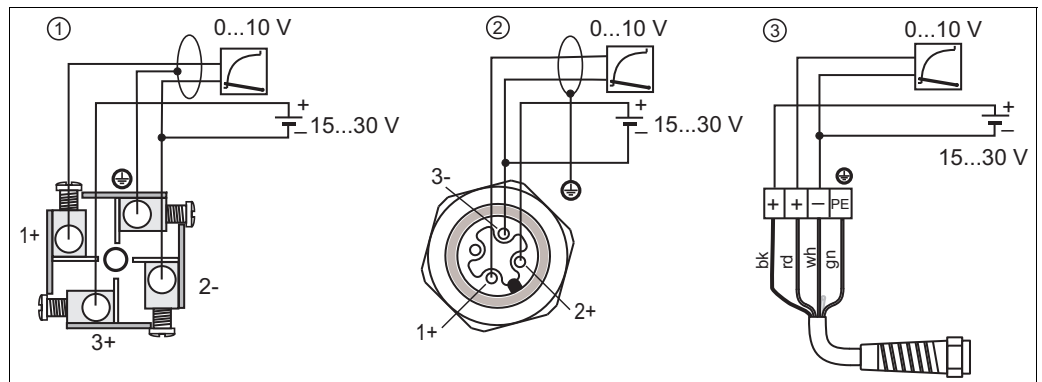
1 Plug M 16 x 1.5 (DIN 43650/A), ½ NPT

2 Plug M 12 x 1

R External load, e.g. relay, programmable logic controller, distributed control system

For electrical connection provided by customer use only shielded cable

PMP131 Electrical connection: Analog-/voltage output



1 Plug M 16 x 1,5 (DIN 43650/A), ½ NPT and plug DIN 43 650/C

2 Plug M 12 x 1

3 Cable (rd = red, wh = white, gn = green)

For electrical connection provided by customer use only shielded cable

Supply voltage

PMC131

11 to 30 V DC

PMP131 and PMP135 (current output, 2-wire version)

- For non-hazardous areas: 12 to 30 V DC
- Ex i: no-load voltage ≤ 26 V DC, short-circuit current ≤ 100 mA, power consumption ≤ 0.8 W

PMP131 (voltage output, 3-wire version)

- 15...30 V DC

PMP131 and PMP135 (switch output)

- 18 to 32 V DC, current consumption without load < 20 mA, with reverse polarity protection

Residual ripple

- Analog output: max. 5 % of supply voltage
- Switch output: max. 10 % of supply voltage

Cable entry

→ 20, "Ordering information" section.

Performance characteristics

Reference operating conditions as per DIN IEC 60770, $T_U = 25\text{ °C}$ (77 °F)

Long-term stability $\leq 0.15\text{ %}$ of URL per year

Reference accuracy Analog output The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770.

PMC131

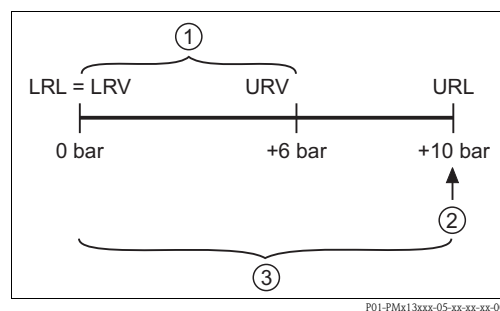
- $\leq 0.5\text{ %}$ of nominal value x TD
(extended specifications apply to customer-specific measuring ranges)

Example: PMC131 version "AIR"

- Nominal value = 10 bar (150 psi)
- Upper range value (URV) = 6 bar (90 psi)
- Lower range value (LRV) = 0 bar

Turn down (is set at factory):

- $\text{Nominal value} / (\text{URV} - \text{LRV}) =$
 $10\text{ bar (150 psi)} / 6\text{ bar (90 psi)} = 10:6$



Example: PMC131 version "AIR"

set span: 0 to 6 bar (0 to 90 psi);

nominal value = 10 bar (150 psi)

- 1 Span set and calibrated at the factory (measuring range)
 - 2 Nominal value $\cong$ Upper Range Limit (URL)
 - 3 Sensor measuring range
- LRL Lower Range Limit
 URL Upper Range Limit
 LRV Lower Range Value
 URV Upper Range Value

PMP131 and PMP135

- $\leq 0.5\text{ %}$ of URL

Switch point **PMP131 and PMP135**

- Deviation: $\leq 1\text{ %}$ of URL
- Non-reproducibility: $\leq 0.5\text{ %}$ of URL

Rise time (T90) **PMC131**
20 ms

PMP131 and PMP135
2 to 5 ms

Thermal change in the zero output and the output span**PMC131**

For customer-specific measuring-ranges: values are doubled

Zero output, -20 to +85 °C (-4 to +185 °F):

- typically 1.5 % of nominal value

Output span, -20 to +85 °C (-4 to +185 °F):

- Nominal value 0.4 to 40 bar (6 to 600 psi): typically 0.8 % of nominal value
- Nominal value 0.1 to 0.2 bar (1.5 to 3 psi): typically 1.0 % of nominal value

Temperature coefficient (T_K) for lower range value and span**PMP131 and PMP135 (analog output)**

Zero output:

- typically: 0.2 % of URL/10 K
- max.: 0.5 % of URL/10 K
- Nominal value ≤ 6 bar (90 psi): by 0.1 % of URL/10 K higher

Output signal:

- typically: 0.2 % of URL/10 K
- max.: 0.5 % of URL/10 K

PMP131 and PMP135 (switch output)

Switch point:

- typically: 0.2 % of URL/10 K
- max.: 0.5 % of URL/10 K

Operating conditions (installation)

Orientation

anywhere

Installation instructions**PMP131**

Process connection G ½ flush-mounted, max. torque 40 Nm (29.5 lbf ft)

Location dependence**PMC131**

without influence

PMP131 and PMP135

Position-dependent zero point shift can be corrected by potentiometer setting, →  17.

Operating conditions (environment)

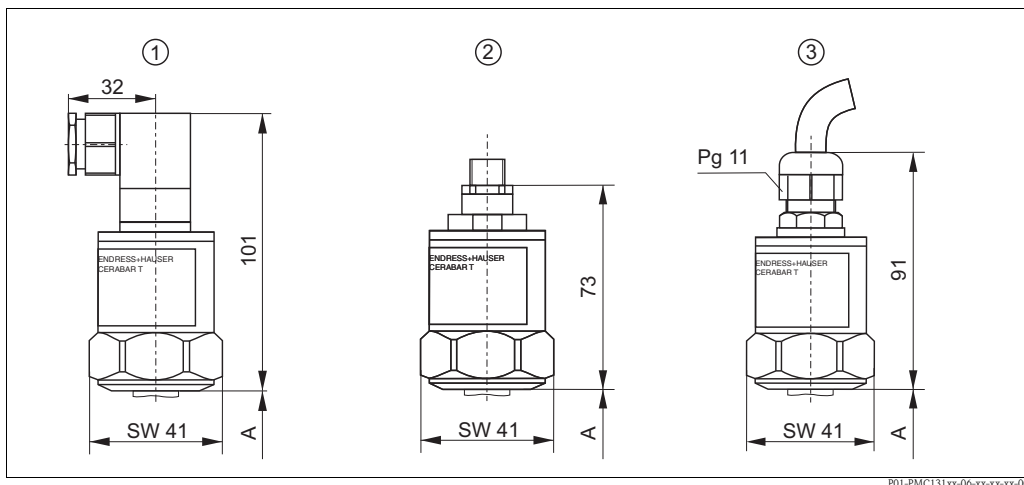
Ambient temperature range	PMC131 –20 to +85 °C (–4 to +185 °F)
	PMP131 and PMP135 ■ For non-hazardous areas: –25 to +70 °C (–13 to +158 °F) ■ Ex i: –25 to +65 °C (–13 to +149 °F)
Storage temperature range	PMC131 –50 to +100 °C (–58 to +212 °F)
	PMP131 and PMP135 –40 to +85 °C (–40 to +185 °F)
Climate class	PMC131 4K4H as per DIN EN 60721-3
	PMP131 and PMP135 4Z with Z = 70 °C (158 °F) as per VDI/VDE 3540
Degree of protection	PMC131 ■ Plug M 16 x 1,5 (DIN 43650/A), ½ NPT: IP 65/NEMA 4X ■ Plug M12x1: IP 65/ NEMA 4 ■ Cable: IP 68/NEMA 6P (1 mWS/24 h)
	PMP131 and PMP135 ■ Plug M 16 x 1,5 (DIN 43650/A), ½ NPT: IP 65/NEMA 4X ■ Plug M 12x1 and gauge pressure sensors: IP 65/NEMA 4X ■ Plug M 12x1 and absolute pressure sensors: IP 68/NEMA 6P (1 mWS/24 h) ■ Cable: IP 68/NEMA 6P (1 mWS/24 h)
Vibration resistance	4M5 as per DIN EN 60721-3
Electromagnetic compatibility	EMC in accordance with all the relevant requirements of the EN 61326 series. Details are provided in the Declaration of Conformity.

Operating conditions (process)

Process temperature range	PMC131 ■ -20 to +100 °C (-4 to 212 °F) ■ Devices for oxygen application: -10 to +60 °C (14 to 140 °F) (Version "S" for feature 30 "Sensor gasket") PMP131 -25 to +70 °C (-13 to +158 °F) PMP135 -25 to +100 °C (-13 to 212 °F), +135 °C (275 °F) for max. 1 hour Extreme jumps in temperature can result in temporary measuring errors. Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaller the temperature jump and the longer the time interval.
Overload resistance	→ 20, "Ordering information" section.
Vacuum resistance	PMC131 ■ with URV > 200 mbar (3 psi)/> 80 inH₂O/> 1.5 psi (100 mbar): 0 mbar_{abs} ■ with URV = 200 mbar (3 psi)/= 50 inH₂O or 80 inH₂O: 500 mbar_{abs} (7.5 psi_{abs}) (Versions "D12", "D38", "W6O", "S4N") ■ with URV = 20 mbar (0.3 psi) or 100 mbar (1.5 psi)/=1.5 psi (100 mbar)/=15 inH₂O or 30 inH₂O: 700 mbar_{abs} (10.5 psi_{abs}) (Versions "D10", "D3W", "D31", "Q4D", "V6F", "W6N", "W6R") PMP131 and PMP135 10 mbar_{abs} (0.15 psi_{abs})
Pressure specifications	■ The MWP (maximum working pressure) of the device is specified on the nameplate. It depends on the weakest element, with regard to pressure, of the selected components. See the following sections: – → 20 ff, "Ordering information" section, feature 50 "Measuring range; MWP; Nominal value; OPL" or "Sensor range; MWP; OPL". – → 12 ff, "Mechanical construction" section. The MWP specification on the nameplate is based on a reference temperature of +20 °C (68 °F) and can be present over an unlimited period of time. ■ The test pressure corresponds to the overload limit of the measuring device (Over Pressure Limit OPL) and must only be present for a limited period of time.

Mechanical construction

PMC131 Housing



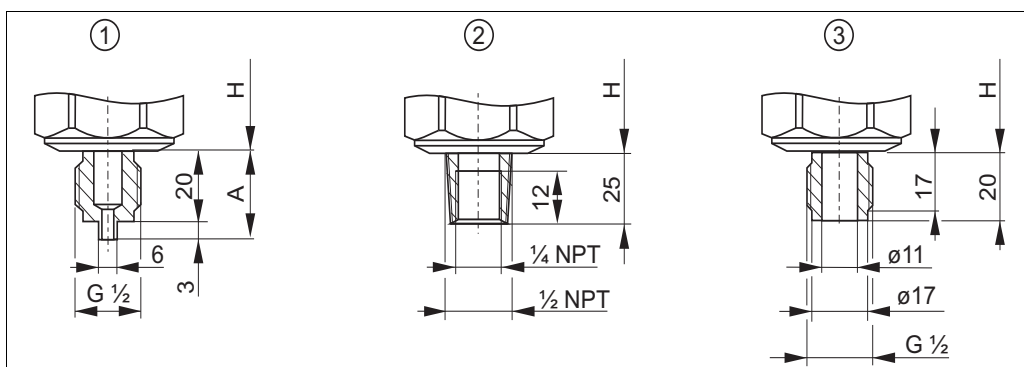
P01-PMC131xx-06-xx-xx-xx-001

Housing PMC131; Material AISI 304 (1.4301)

- 1 Versions A1, A2, B1, C1, C2: Plug M 16 or ½ NPT (ISO 4400), IP 65
- 2 Versions A5, B5, C5: Plug M 12, IP 65
- 3 Versions A3, A4, B3, C3: 5 m (16 ft) or 25 m (82 ft) cable, IP 68

→ See the following diagram for the height of process connection A

PMC131 Process connections



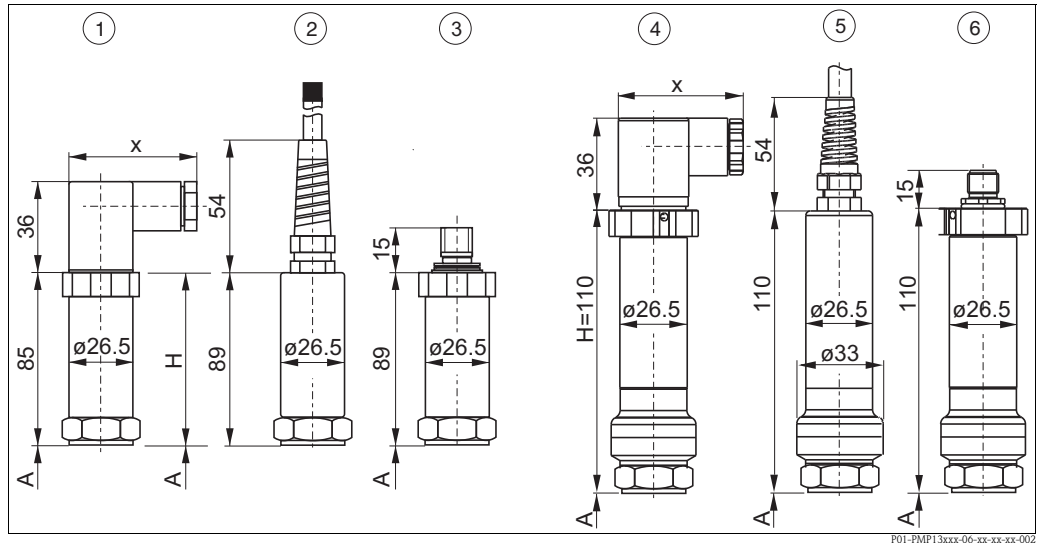
P01-PMC131xx-06-xx-xx-xx-002

Process connections PMC131; Material AISI 304 (1.4301)

- 1 Version 1: Thread ISO 228 G ½
- 2 Version 2: Thread ANSI ½ MNPT ¼ FNPT
- 3 Version 5: Thread ISO 228 G ½, bore 11 mm (0.43 in)

→ See respective housing for installation height H (previous figure)

PMP131 and PMP135 Housings



Housings PMP131 and PMP135; Material AISI 304 (1.4301)

1...3 PMP131 and PMP135 with sensor range up to 60 bar (900 psi)

4...6 PMP131 with sensor range up to 400 bar (6000 psi)

1 + 4 Versions A1, A2: Plug M 16 (DIN 43650/A) or 1/2 NPT (ISO 4400), IP 65; dimension x = 52 mm (2.05 in)

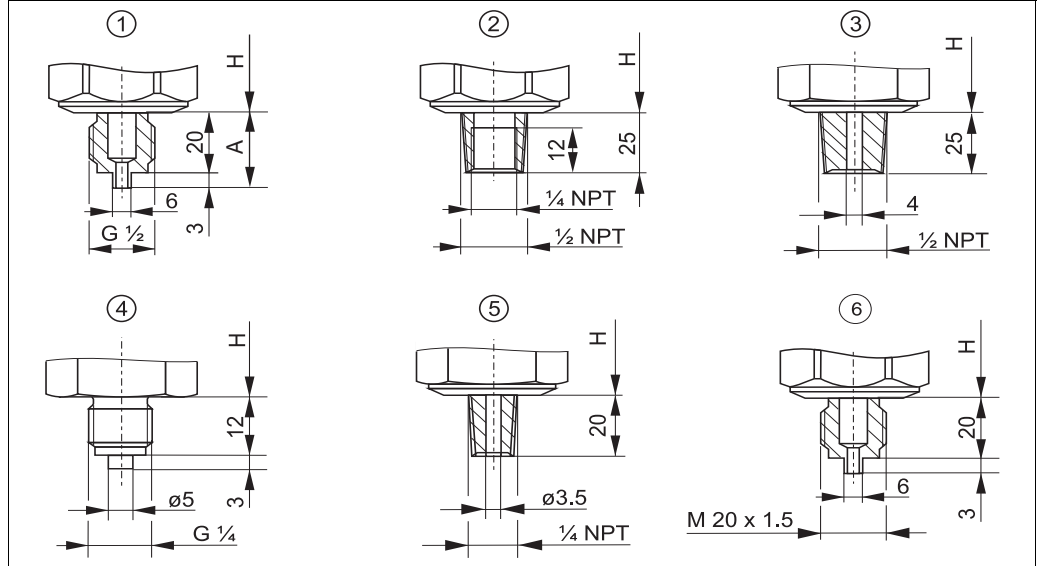
Version A5: Plug DIN 43650/C, IP 65; dimension x = 42 mm (1.65 in)

2 + 5 Version A3: 5 m (16 ft) cable, IP 68

3 + 6 Version A4: Plug M 12, IP 65

→ See the following figure for the dimensions of process connection A

PMP131 Process connections



Process connections PMP131; Material AISI 304 (1.4301)

1 Version 1: Thread ISO 228 G 1/2

2 Version 2: Thread ANSI 1/2 MNPT 1/4 FNPT

3 Version 3: Thread ANSI 1/2 MNPT, bore 4 mm (0.16 in) female

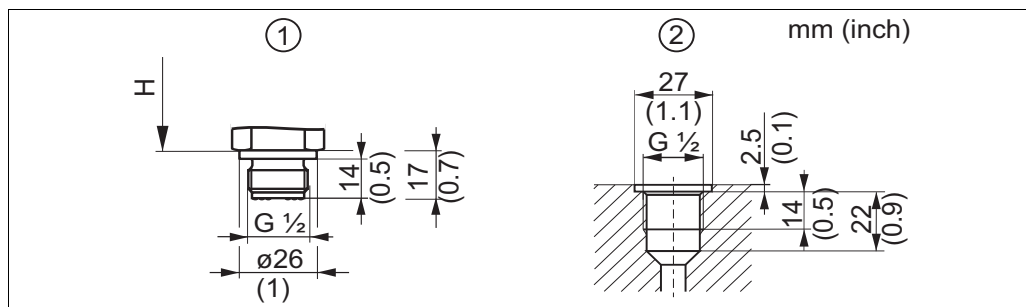
4 Version 4: Thread ISO 228 G 1/4

5 Version 5: Thread ANSI 1/4 MNPT, bore 3.5 mm (0.14 in) female

6 Version 6: Thread M 20 x 1.5

→ See respective housing for installation height H (figure above)

→ Process connections with AF 27 mm



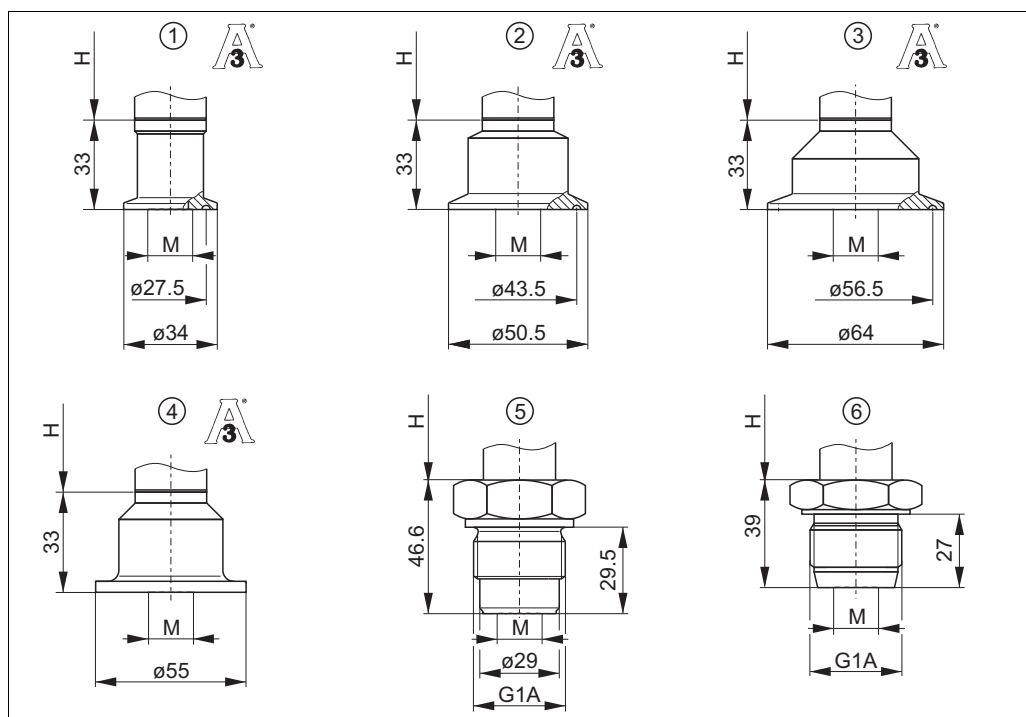
P01-PMP131xx-06-09-xx-xx-002

Process connection PMP131; Material AISI 304 (1.4301)

- 1 Version B: Thread ISO 228 G 1/2, Seal seat as per DIN 3852-A, AISI 304, flush-mounted
 2 Dimensions for tapped hole G 1/2 as per DIN 3852-11 form X

→ See respective housing for installation height H

PMP135 Process connections



P01-PMP135xx-06-xx-xx-xx-001

Process connections PMP135; Material AISI 316L (1.4435); Surface roughness of the surfaces in contact with the media $R_a \leq 0.8 \mu\text{m}$

M = Diaphragm diameter 17.2 mm (0.68 in)

- 1 Version F: Clamp 3/4" (ISO 2852) or DN 20 (DIN 32676), 3A
 2 Version G: Tri-Clamp 1" to 1 1/2" (ISO 2852) or DN 25 to DN 40 (DIN 32676), 3A
 3 Version H: Tri-Clamp 2" (ISO 2852) or DN 50 (DIN 32676), 3A
 4 Version S: SMS 1 1/2" PN 25, 3A
 5 Version N: G1A (ISO 228), with sealing surface for flush-mounted installation
 6 Version M: G1A (ISO 228), with metallic sealing taper, flush-mounted

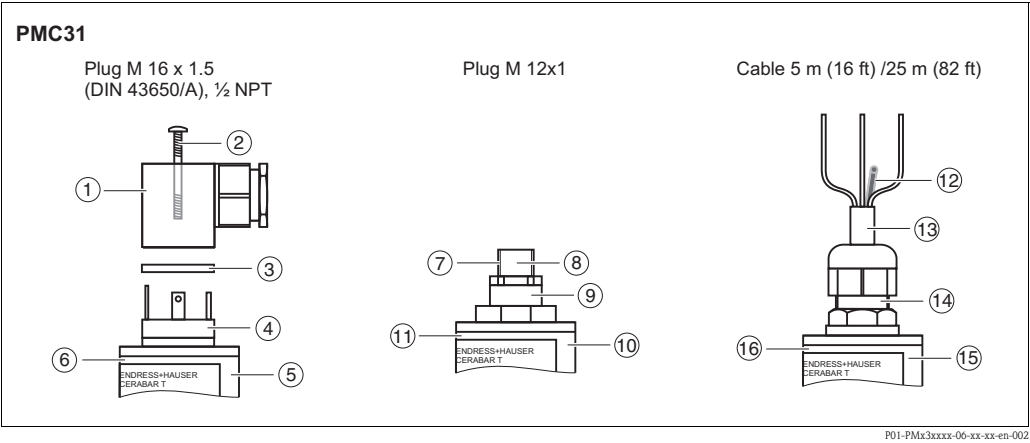
→ See respective housing for installation height H

Weights

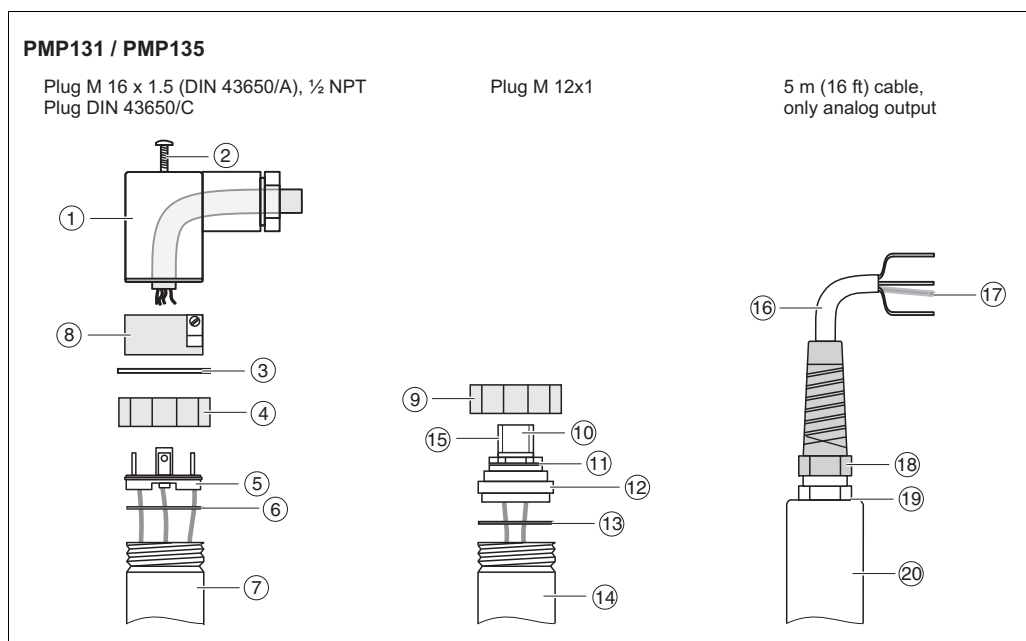
- PMC131: approx. 0.32 kg (0.71 lbs)
- PMP131:
 approx. 0.24 kg (0.53 lbs) up to 60 bar (870 psi),
 approx. 0.32 kg (0.71 lbs) up to 400 bar (5800 psi)
- PMP135: approx. 0.34 kg (0.75 lbs)

Material (not wetted)

Housing



Item number	Component part	Material
1	Plug housing	PA6 GF
2	Flat sealing	NBR
3	Screw M3 x 35	A2
4	Connection cover	PBT-FR
5	O-ring	NBR
6	Housing	1.4301
7	O-ring for connector	FKM
8	Inner connector	PA
9	M12 connector	GD-Zn, nickel-plated
10	O-ring	NBR
11	Housing	1.4301
12	Hose	PA
13	Cable	PE
14	Gland	PBT
15	O-ring	NBR
16	Housing	1.4301



P01-PMx3xxxx-06-xx-xx-en-003

Item number	Component part	Material
1	Plug housing	PA6 GF
2	Screw M3 x 35	A2
3	Flat sealing	NBR
4	Coupling nut	PA
5	Cover plug	PA66 GF
6	O-ring	NBR
7	Housing	1.4301
8	Plug	PA66 GF
9	Coupling nut	PA
10	Inner connector	PA
11	O-ring	NBR
12	M12 connector	GD-Zn, nickel-plated
13	O-ring	NBR
14	Housing	1.4301
15	O-ring for connector	FKM
16	Cable	PUR
17	Hose	PA
18	Anti-jackknife	PA
19	O-ring	NBR
20	Housing	1.4301

Fill oil:

- PMP131: Tegiloxan 3
- PMP135: Mineral oil, FDA number 21-CFR 172.882

Material (wetted)

Note!

The wetted device components are listed in the "Mechanical construction" (→ 12 ff) and "Ordering information" (→ 20 ff) sections.

Process connection

- PMC131/PMP131: AISI 304 (1.4301)
- PMP135: AISI 316L (1.4435)

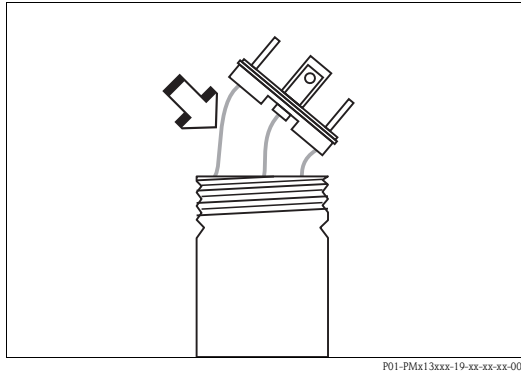
Process isolating diaphragm

- PMC131: Ceraphire® (99,9 % Al₂O₃), FDA number 21-CFR 186.1256
- PMP131, PMP135: AISI 316L (1.4435)

Operating elements

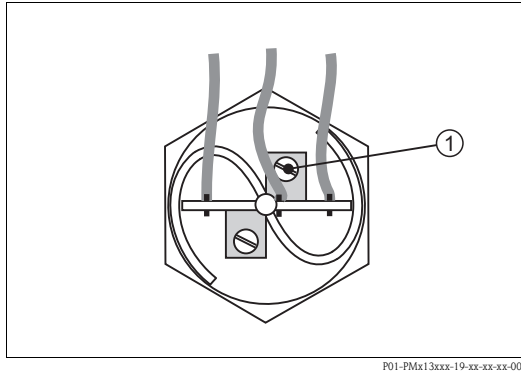
Operating elements

Position of operating elements



The potentiometer for operating the Cerabar T PMP131 and PMP135 with analog or switch output is located below the base of the plug.

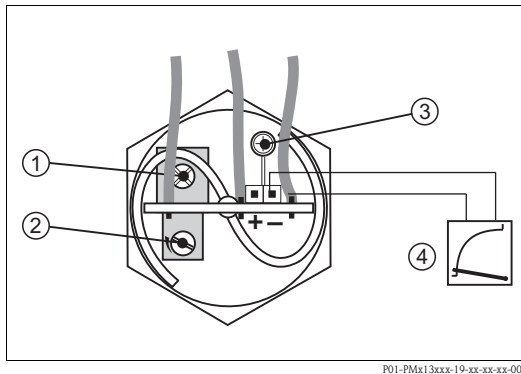
Analog output: Zero point adjustment



The zero point can be corrected for the Cerabar T PMP131 and PMP135 with analog output and plug version.

1 Potentiometer for zero point correction by $\pm 5\%$ of URL

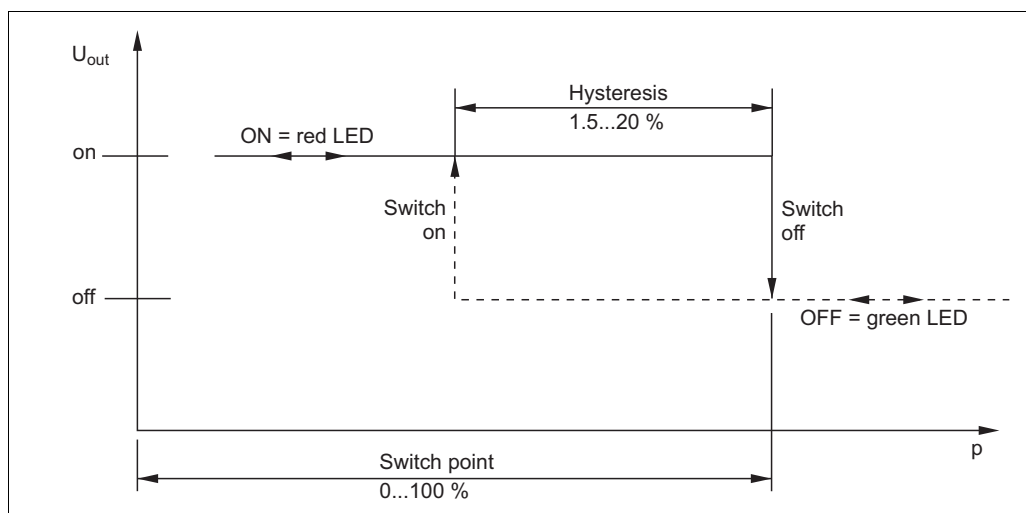
Switch output: Switch point and hysteresis adjustment



For the Cerabar T PMP131 and PMP135 with switch output, both the switch point and hysteresis can be adjusted.

This can also be carried out at atmospheric pressure using the enclosed test cable and a voltmeter.

- 1 Hysteresis adjustment 1.5 to 20 % of URL;
Factory setting 10 % of URL
- 2 Switch point adjustment 0 to 100 % of URL;
Factory setting 50 % of URL
- 3 LED color code for checking the switch status:
green = off; red = on
- 4 Connect voltmeter to test pins:
0 to 1 V corresponds to 0 to 100 % of URL



P01-PMP1 3xxx-05-xx-xx-en-001

Instructions for switch point and hysteresis (the percentage values refer to the URL)

U_a Output voltage
 p Acting pressure

Certificates and approvals

CE mark	The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
Ex approvals	All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas. See also →  26, "Safety Instructions" section.
Pressure Equipment Directive (PED)	This measuring device corresponds to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.
Functional safety SIL 2	The Cerabar T PMP131 and PMP135 pressure transducers with 4 to 20 mA electronics have been assessed by an independent body according to the standards IEC 61508/IEC 61511-1. These devices can be used for monitoring process pressure up to SIL 2. → For a detailed description of safety functions with Cerabar T, settings and characteristic quantities for functional safety, see the "Functional Safety Manual – Cerabar T SD00160P".
Suitability for hygienic processes	The Cerabar T PMP135 is suitable for the employment in hygienic processes. An overview of permitted process connections →  12 ff. Many versions meet the requirements of 3A-Sanitary Standard No. 74 and are certified by the EHEDG. Suitable fittings and seals must be used for hygienic design in accordance with 3A and EHEDG specifications. Note! The gap-free connections can be cleaned without residue using the usual cleaning methods.  
TSE Certificate of Suitability	Cerabar T PMP135 The following applies to wetted device components: They do not contain any materials derived from animals. No auxiliaries or operating materials derived from animals are used in production or processing. Process wetted device components are listed in the "Mechanical construction" and "Ordering information" sections.
Standards and guidelines	DIN EN 60770 (IEC 60770): Transmitters for controlling in systems used in industrial process technology Part 1: Methods for evaluating the operating behavior. DIN EN 61003-1, Edition:1993-12 Systems used in industrial process technology; Devices with analog inputs and two-point or multi-point behavior; Part 1: Methods for evaluating the operating behavior. DIN 16086: Electrical pressure measuring devices, pressure sensors, transmitters, pressure measuring devices Terms, specifications in data sheets. IEC 60529 Degrees of protection provided by enclosures (IP-Code). EN 61326: Electrical equipment for control technology and laboratory application – EMC requirements. IEC 61010 Safety requirements for electrical equipment for measurement, control and laboratory use. NAMUR Association for Standards for Control and Regulation in the Chemical Industry.
Registered trademarks	Ceraphire® Registered trademark of Endress+Hauser GmbH+Co. KG, Maulburg, Germany (→ see also www.endress.com/ceraphire)

Ordering information

PMC131

This overview does not mark options which are mutually exclusive.

10	Electrical connection:						
	A1	Plug ISO 4400, M 16, IP 65/NEMA 4X					
	A2	Plug ISO 4400, ½ NPT, IP 65/NEMA 4X					
	A3	5 m cable, IP 68/NEMA 6P					
	A4	25 m cable, IP 68/NEMA 6P					
	A5	Plug M 12, IP 65/NEMA 4					
	B1	Plug ISO 4400, M 16, IP 65, ATEX II 3 G Ex nA II T4					
	B3	5 m cable, IP 68, ATEX II 3 G Ex nA II T4					
	B5	Plug M 12, IP 65, ATEX II 3 G Ex nA II T4					
	C1	Plug ISO 4400, M 16, NEMA 4X, CSA GP					
	C2	Plug ISO 4400, ½ NPT, NEMA 4X, CSA GP					
	C3	5m cable, IP 68/NEMA 6P, CSA GP					
	C5	Plug M12, IP 65/NEMA 4, CSA GP					
20	Process connection:						
		1	Thread ISO 228 G ½, AISI 304				
		2	Thread ANSI ½ MNPT ¼ FNPT, AISI 304				
		5	Thread ISO 228 G ½ bore 11 mm, AISI 304				
30	Sensor seal:						
		E	EPDM				
		F	FKM Viton				
		S	FKM Viton, oxygen application				
40	Additional options:						
		1	Without additional equipment				
		S	GL (German Lloyd) marine certificate				
		2	Final inspection report				
50	Measuring range; MWP; Nominal value; OPL:						
				Measuring range	MWP (Maximum Working Pressure)	Nominal value	OPL (Over Pressure Limit)
				Sensors for gauge pressure			
			A1G	0 to 1 bar / 0 to 100 kPa	6.7 bar	1 bar	10 bar / 1 MPa
			A1H 1)	0 to 1.6 bar / 0 to 160 kPa	12 bar	2 bar	18 bar / 1.8 MPa
			A1K	0 to 2 bar / 0 to 200 kPa	12 bar	2 bar	18 bar / 1.8 MPa
			A1Q	0 to 4 bar / 0 to 400 kPa	16.7 bar	4 bar	25 bar / 2.5 MPa
			A1R 1)	0 to 6 bar / 0 to 600 kPa	26.7 bar	10 bar	40 bar / 4 MPa
			A1S	0 to 10 bar / 0 to 1 MPa	26.7 bar	10 bar	40 bar / 4 MPa
			A1T 1)	0 to 16 bar / 0 to 1.6 MPa	26.7 bar	20 bar	40 bar / 4 MPa
			A1V	0 to 20 bar / 0 to 2 MPa	26.7 bar	20 bar	40 bar / 4 MPa
			A1W 1)	0 to 25 bar / 0 to 2.5 MPa	40 bar	40 bar	60 bar / 6 MPa
			A1X	0 to 40 bar / 0 to 4 MPa	40 bar	40 bar	60 bar / 6 MPa
			A3C 1)	–1 to 0 bar / –100 to 0 kPa	6.7 bar	2 bar	10 bar / 1 MPa
			A3E 1)	–1 to 1 bar / –100 to 100 kPa	6.7 bar	2 bar	10 bar / 1 MPa
			A3G 1)	–1 to 3 bar / –100 to 300 kPa	16.7 bar	4 bar	25 bar / 2.5 MPa
			A3K 1)	–1 to 9 bar / –100 to 900 kPa	26.7 bar	10 bar	40 bar / 4 MPa
			A3N 1)	–1 to 15 bar / –0.1 to 1.5 MPa	26.7 bar	20 bar	40 bar / 4 MPa
			D10	0 to 100 mbar / 0 to 10 kPa	2.7 bar	0.1 bar	4 bar / 400 kPa
			D12 1)	0 to 200 mbar / 0 to 20 kPa	3.3 bar	0.2 bar	5 bar / 500 kPa
			D14	0 to 400 mbar / 0 to 40 kPa	5.3 bar	0.4 bar	8 bar / 800 kPa
			D3W	–20 to 20 mbar / –2 to 2 kPa	2.7 bar	0.2 bar	4 bar / 400 kPa
			D31 1)	–100 to 100 mbar / –10 to 10 kPa	3.3 bar	0.2 bar	5 bar / 500 kPa
			D38 1)	–200 to 200 mbar / –20 to 20 kPa	3.3 bar	0.4 bar	5 bar / 500 kPa
			D39 1)	–300 to 300 mbar / –30 to 30 kPa	5.3 bar	1 bar	8 bar / 800 kPa
PMC131				Order code			

→ For continuation of ordering information of PMC131, see the following page.

1) Span set and calibrated at the factory

PMC131 (continued)

50					Measuring range; MWP; Nominal value; OPL:			
					Measuring range	MWP (Maximum Working Pressure)	Nominal value	OPL (Over Pressure Limit)
					Sensors for gauge pressure			
				Q4D	0 to 1.5 psi	40 psi	1.5 psi	60 psi
				Q4F 1)	0 to 5 psi	80 psi	6 psi	120 psi
				Q4H	0 to 15 psi	100 psi	15 psi	150 psi
				Q4K	0 to 30 psi	180 psi	30 psi	270 psi
				Q4N 1)	0 to 50 psi	250 psi	60 psi	375 psi
				Q4R	0 to 150 psi	400 psi	150 psi	600 psi
				Q4S	0 to 300 psi	400 psi	300 psi	600 psi
				Q4T 1)	0 to 500 psi	600 psi	600 psi	900 psi
				V6F 1)	−1.5 to 1.5 psi	50 psi	3 psi	75 psi
				V6N 1)	−15 to 15 psi	100 psi	30 psi	150 psi
				V6R 1)	−15 to 30 psi	250 psi	60 psi	375 psi
				V6S	−15 to 60 psi	250 psi	60 psi	375 psi
				V6V	−15 to 150 psi	400 psi	150 psi	600 psi
				S4N 1)	0 to 50 inH ₂ O	50 psi	3 psi	75 psi
				S4Q 1)	0 to 100 inH ₂ O	80 psi	6 psi	120 psi
				W6N 1)	−15 to 15 inH ₂ O	40 psi	3 psi	60 psi
				W6O 1)	−80 to 80 inH ₂ O	50 psi	6 psi	75 psi
				W6R 1)	−15 to 30 inH ₂ O	50 psi	3 psi	75 psi
					Sensors for absolute pressure			
				A2G	0 to 1 bar / 0 to 100 kPa	6.7 bar	1 bar	10 bar / 1 MPa
				A2H 1)	0 to 1.6 bar / 0 to 160 kPa	12 bar	2 bar	18 bar / 1.8 MPa
				A2K	0 to 2 bar / 0 to 200 kPa	12 bar	2 bar	18 bar / 1.8 MPa
				A2Q	0 to 4 bar / 0 to 400 kPa	16.7 bar	4 bar	25 bar / 2.5 MPa
				A2R 1)	0 to 6 bar / 0 to 600 kPa	26.7 bar	10 bar	40 bar / 4 MPa
				A2S	0 to 10 bar / 0 to 1 MPa	26.7 bar	10 bar	40 bar / 4 MPa
				A2T 1)	0 to 16 bar / 0 to 1.6 MPa	26.7 bar	20 bar	40 bar / 4 MPa
				A2V	0 to 20 bar / 0 to 2 MPa	26.7 bar	20 bar	40 bar / 4 MPa
				A2W 1)	0 to 25 bar / 0 to 2.5 MPa	40 bar	40 bar	60 bar / 6 MPa
				A2X	0 to 40 bar / 0 to 4 MPa	40 bar	40 bar	60 bar / 6 MPa
				D20 1)	0 to 100 mbar / 0 to 10 kPa	3.3 bar	0.2 bar	5 bar / 500 kPa
				D22	0 to 200 mbar / 0 to 20 kPa	3.3 bar	0.2 bar	5 bar / 500 kPa
				D24	0 to 400 mbar / 0 to 40 kPa	5.3 bar	0.4 bar	8 bar / 800 kPa
				R4D 1)	0 to 1.5 psi	50 psi	3 psi	75 psi
				R4F 1)	0 to 5 psi	80 psi	6 psi	120 psi
				R4H	0 to 15 psi	100 psi	15 psi	150 psi
				R4K	0 to 30 psi	180 psi	30 psi	270 psi
				R4N 1)	0 to 50 psi	250 psi	60 psi	375 psi
				R4R	0 to 150 psi	400 psi	150 psi	600 psi
				R4S	0 to 300 psi	400 psi	300 psi	600 psi
				R4T 1)	0 to 500 psi	600 psi	600 psi	900 psi
995					Marking			
					1	Tagging (TAG), see additional spec.		
PMC131						Complete order code		

1) Span set and calibrated at the factory

PMP131

This overview does not mark options which are mutually exclusive.

10		Electrical connection:		
	A1	Plug ISO 4400, M 16, IP 65/NEMA 4X (DIN 43650/A)		
	A2	Plug ISO 4400, ½ NPT, IP 65/NEMA 4X		
	A3	5 m cable, IP 68/NEMA 6P		
	A4	Plug M 12, IP 65/NEMA 4X		
	A5	Plug DIN 43650/C, IP65, NEMA 4X		
20		Process connection:		
	B	Thread ISO 228 G ½, Seal seat as per DIN 3852, AISI 304, flush-mounted		
	1	Thread ISO 228 G ½, AISI 304		
	2	Thread ANSI ½ MNPT ¼ FNPT, AISI 304		
	3	Thread ANSI ½ MNPT bore 4 mm, AISI 304		
	4	Thread ISO 228 G ¾, AISI 304		
	5	Thread ANSI ¼ MNPT bore 3.5 mm, AISI 304		
	6	Thread M 20 x 1.5		
30		Output:		
	0	Analog current output 4 to 20 mA, SIL		
	D	Analog current output 4 to 20 mA, SIL, ATEX II 1/2 G Ex ib IIC T6		
	1	Analog current output 4 to 20 mA, SIL, ATEX II 2 G Ex ib IIC T6		
	5	Analog current output 4 to 20 mA, SIL, ATEX II 3 G Ex nA II T6		
	2	Switch output PNP, 3-wire		
	3	Switch output PNP, 3-wire, ATEX II 3 G Ex nA II T6		
	6	Analog voltage output 0...10 V		
40		Additional options:		
	1	Without additional equipment		
	S	GL/RINA marine approval		
	2	Final inspection report		
50		Sensor range; MWP; OPL:		
		Sensor range	MWP (maximum working pressure)	OPL (over pressure limit)
		Sensors for gauge pressure		
	A1G	0 to 1 bar / 0 to 100 kPa	2.7 bar	4 bar / 400 kPa
	A1H	0 to 1.6 bar / 0 to 160 kPa	4 bar	6.4 bar / 640 kPa
	A1N	0 to 2.5 bar / 0 to 250 kPa	6.7 bar	10 bar / 1 MPa
	A1Q	0 to 4 bar / 0 to 400 kPa	10.7 bar	16 bar / 1.6 MPa
	A1R	0 to 6 bar / 0 to 600 kPa	16 bar	24 bar / 2.4 MPa
	A1S	0 to 10 bar / 0 to 1 MPa	25 bar	40 bar / 4 MPa
	A1T	0 to 16 bar / 0 to 1.6 MPa	25 bar	64 bar / 6.4 MPa
	A1W	0 to 25 bar / 0 to 2.5 MPa	25 bar	100 bar / 10 MPa
	A1X	0 to 40 bar / 0 to 4 MPa	60 bar	160 bar / 16 MPa
	A1Z	0 to 60 bar / 0 to 6 MPa	60 bar	240 bar / 24 MPa
	A70	0 to 100 bar / 0 to 10 MPa	100 bar	400 bar / 40 MPa
	A71	0 to 160 bar / 0 to 16 MPa	160 bar	600 bar / 60 MPa
	A73	0 to 250 bar / 0 to 25 MPa	250 bar	600 bar / 60 MPa
	A74	0 to 400 bar / 0 to 40 MPa	400 bar	600 bar / 60 MPa
	Q4H	0 to 15 psi	40 psi	60 psi
	Q4K	0 to 30 psi	100 psi	150 psi
	Q4N	0 to 50 psi	160 psi	240 psi
	Q4R	0 to 150 psi	400 psi	600 psi
	Q4S	0 to 300 psi	400 psi	1500 psi
	Q4T	0 to 500 psi	1000 psi	2400 psi
	Q4V	0 to 1000 psi	1000 psi	3600 psi
	Q70	0 to 1500 psi	1500 psi	6000 psi
	Q73	0 to 3000 psi	3000 psi	9000 psi
	Q74	0 to 6000 psi	6000 psi	9000 psi
PMP131			Order code	

→ For continuation of ordering information of PMP131, see the following page.

50						Sensor range; MWP; OPL:		
						Sensor range	MWP (maximum working pressure)	OPL (over pressure limit)
						Sensors for absolute pressure		
					A2G	0 to 1 bar / 0 to 100 kPa	2.7 bar	4 bar / 400 kPa
					A2H	0 to 1.6 bar / 0 to 160 kPa	4 bar	6.4 bar / 640 kPa
					A2N	0 to 2.5 bar / 0 to 250 kPa	6.7 bar	10 bar / 1 MPa
					A2Q	0 to 4 bar / 0 to 400 kPa	10.7 bar	16 bar / 1.6 MPa
					A2R	0 to 6 bar / 0 to 600 kPa	16 bar	24 bar / 2.4 MPa
					A2S	0 to 10 bar / 0 to 1 MPa	25 bar	40 bar / 4 MPa
					A2T	0 to 16 bar / 0 to 1.6 MPa	25 bar	64 bar / 6.4 MPa
					A2W	0 to 25 bar / 0 to 2.5 MPa	25 bar	100 bar / 10 MPa
					A2X	0 to 40 bar / 0 to 4 MPa	60 bar	160 bar / 16 MPa
					A2Z	0 to 60 bar / 0 to 6 MPa	60 bar	240 bar / 24 MPa
					B70	0 to 100 bar / 0 to 10 MPa	100 bar	400 bar / 40 MPa
					B71	0 to 160 bar / 0 to 16 MPa	160 bar	600 bar / 60 MPa
					B73	0 to 250 bar / 0 to 25 MPa	250 bar	600 bar / 60 MPa
					B74	0 to 400 bar / 0 to 40 MPa	400 bar	600 bar / 60 MPa
					R4H	0 to 15 psi	40 psi	60 psi
					R4K	0 to 30 psi	100 psi	150 psi
					R4N	0 to 50 psi	160 psi	240 psi
					R4R	0 to 150 psi	400 psi	600 psi
					R4S	0 to 300 psi	400 psi	1500 psi
					R4T	0 to 500 psi	1000 psi	2400 psi
					R4V	0 to 1000 psi	1000 psi	3600 psi
					R70	0 to 1500 psi	1500 psi	6000 psi
					R73	0 to 3000 psi	3000 psi	9000 psi
					R74	0 to 6000 psi	6000 psi	9000 psi
995						Marking		
						1 Tagging (TAG), see additional spec.		
PMP131						Complete order code		

PMP135

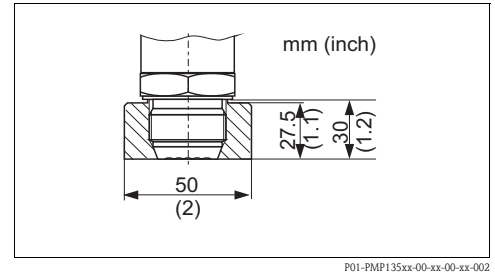
This overview does not mark options which are mutually exclusive.

10	Electrical connection:				
	A1	Plug ISO 4400, M 16, IP 65/NEMA 4X			
	A2	Plug ISO 4400, ½ NPT, IP 65/NEMA 4X			
	A3	5 m cable, IP 68/NEMA 6P			
	A4	Plug M 12, IP 65/NEMA 4X			
20	Process connection:				
	F	Clamp ISO 2852, DN 22 (¾"), AISI 316L, 3A, DIN 32676 DN 20, EHEDG			
	G	Tri-Clamp ISO 2852, DN 25 to 38 (1" to 1½"), AISI 316L, 3A, DIN 32676 DN 25 to 40, EHEDG			
	H	Tri-Clamp ISO 2852, DN 40 to 51 (2"), AISI 316L, 3A, DIN 32676 DN 50, EHEDG			
	M	Thread ISO 228, G 1, with metallic sealing taper, AISI 316L, flush-mounted, adapter 52005087			
	N	Thread ISO 228, G 1, with sealing surface for flush-mounted installation, AISI 316L, adapter 52001051			
	S	SMS 1½", PN 25, AISI 316L, 3A, EHEDG			
30	Output:				
	0	Analog 4 to 20 mA, SIL			
	D	Analog 4 to 20 mA, SIL, ATEX II 1/2 G Ex ib IIC T6			
	1	Analog 4 to 20 mA, SIL, ATEX II 2 G Ex ib IIC T6			
	5	Analog 4 to 20 mA, SIL, ATEX II 3 G Ex nA II T6			
	2	Switch output PNP, 3-wire			
	3	Switch output PNP, ATEX II 3 G Ex nA II T6			
40	Additional options:				
	1	Basic version			
	C	EN10204-3.1 material (wetted parts) inspection certificate			
	D	Final inspection report + EN10204-3.1 material (wetted parts) inspection certificate			
	2	Final inspection report			
50	Sensor range; MWP; OPL:				
			Sensor range	MWP (maximum working pressure)	OPL (over pressure limit)
			Sensors for gauge pressure		
	A1G		0 to 1 bar / 0 to 100 kPa	2.7 bar	4 bar / 400 kPa
	A1H		0 to 1.6 bar / 0 to 160 kPa	4 bar	6.4 bar / 640 kPa
	A1N		0 to 2.5 bar / 0 to 250 kPa	6.7 bar	10 bar / 1 MPa
	A1Q		0 to 4 bar / 0 to 400 kPa	10.7 bar	16 bar / 1.6 MPa
	A1R		0 to 6 bar / 0 to 600 kPa	16 bar	24 bar / 2.4 MPa
	A1S		0 to 10 bar / 0 to 1 MPa	25 bar	40 bar / 4 MPa
	A1T		0 to 16 bar / 0 to 1.6 MPa	25 bar	64 bar / 6.4 MPa
	A1W		0 to 25 bar / 0 to 2.5 MPa	25 bar	100 bar / 10 MPa
	A1X		0 to 40 bar / 0 to 4 MPa	60 bar	160 bar / 16 MPa
	Q4H		0 to 15 psi	40 psi	60 psi
	Q4K		0 to 30 psi	100 psi	150 psi
	Q4N		0 to 50 psi	160 psi	240 psi
	Q4R		0 to 150 psi	400 psi	600 psi
	Q4S		0 to 300 psi	400 psi	1500 psi
	Q4T		0 to 500 psi	1000 psi	2400 psi
			Sensors for absolute pressure		
	A2G		0 to 1 bar / 0 to 100 kPa	2.7 bar	4 bar / 400 kPa
	A2H		0 to 1.6 bar / 0 to 160 kPa	4 bar	6.4 bar / 640 kPa
	A2N		0 to 2.5 bar / 0 to 250 kPa	6.7 bar	10 bar / 1 MPa
	A2Q		0 to 4 bar / 0 to 400 kPa	10.7 bar	16 bar / 1.6 MPa
	A2R		0 to 6 bar / 0 to 600 kPa	16 bar	24 bar / 2.4 MPa
	A2S		0 to 10 bar / 0 to 1 MPa	25 bar	40 bar / 4 MPa
	A2T		0 to 16 bar / 0 to 1.6 MPa	25 bar	64 bar / 6.4 MPa
	A2W		0 to 25 bar / 0 to 2.5 MPa	25 bar	100 bar / 10 MPa
	A2X		0 to 40 bar / 0 to 4 MPa	60 bar	160 bar / 16 MPa
	R4H		0 to 15 psi	40 psi	60 psi
	R4K		0 to 30 psi	100 psi	150 psi
	R4N		0 to 50 psi	160 psi	240 psi
	R4R		0 to 150 psi	400 psi	600 psi
	R4S		0 to 300 psi	400 psi	1500 psi
	R4T		0 to 500 psi	1000 psi	2400 psi
995	Marking				
	1	Tagging (TAG), see additional spec.			
PMP135					Complete order code

Accessories

Welding neck with sealing taper

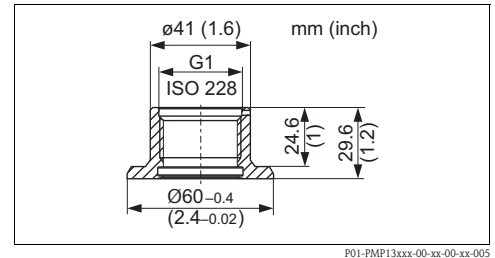
- Welding neck for flush-mounted installation of the process connection G1 A with metallic sealing taper (PMP135, version M)
Material: AISI 316L (1.4435)
Order number: 52005087
- with inspection certificate 3.1
Order number: 52010171



- Pressure sensor dummy for welding the welding neck without any problems with order number 52005087 or 52010171
Material: CuZn
Order number: 52005272

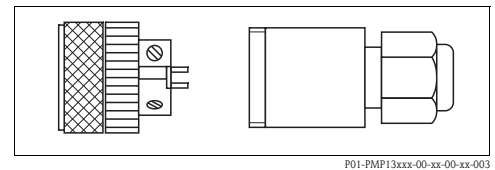
Welding neck with sealing surface

- Welding neck for flush-mounted installation of the process connection G1 A with sealing surface (PMP135, version N)
Material: AISI 316L (1.4435)
Gasket (enclosed): silicone O-ring
Order number: 52001051
- Optional with inspection certificate 3.1
Order number: 52011896



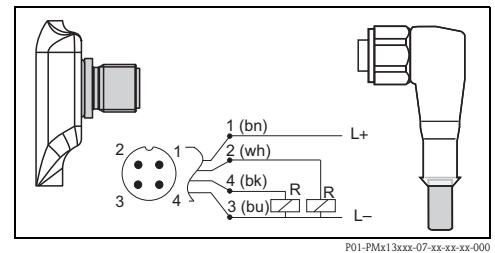
Plug-in jack

- Plug-in jack M 12x1, straight
Self-made connection to M 12x1 housing plug
Material: Handle body PA; Coupling nut CuZn, nickel-plated, degree of protection (inserted): IP 67
Order number: 52006263



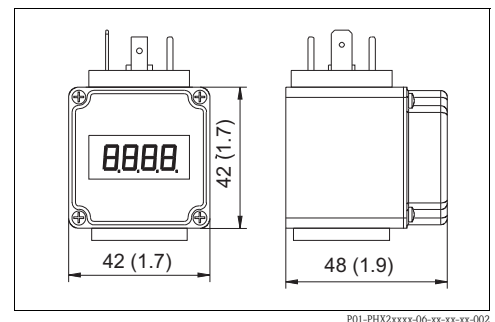
Connecting cable

- Cable, 4 x 0.34 mm² (AWG 21) with M12 socket, elbowed, screw plug, length 5 m (16 ft), sprayed cable
Materials: Body PUR
Coupling nut: Cu Zn/Ni, brass, nickered
Cable: PVC
Protection: IP 67 (fully locked)
order number: 52010285



Plug-on display PHX20/PHX21

- Plug-on display for electrical connections
 - PMC131 version A1, A2, B1, C1, C2
 - PMP131/135 version A1, A2.
 4-digit red LED display for looping into 4 to 20 mA circuit via elbow plug ISO4400, rotatable in 90° steps, programmable via 2 keys
Display range: -1999 to +9999
Degree of protection: IP 65
Material: Housing Pa6 GF30, front screen PMMA
Voltage drop: ≤5 V (corresponds to max. 250 Ω load)
Approval for PHX21: ATEX II 2G
Order number PHX20: 52022914
Order number PHX21: 52022915



Documentation

Field of Activities	■ Pressure measurement, powerful measuring devices for process pressure, differential pressure, level and flow: FA00004P/00/EN
Technical Information	■ EMC test procedures: TI00241F/00/EN
Operating Instructions	■ Cerabar T PMC131: KA00085P/00/A3 ■ Cerabar T PMP131: KA00103P/00/A3 ■ Cerabar T PMP135: KA00198P/00/A3
Functional Safety Manual (SIL)	■ Cerabar T PMP131, PMP135: SD00160P/00/EN

Safety Instructions

Certificate/Type of protection	Device	Documentation	Version in the order code
ATEX II 3 G Ex nA II T4 ¹⁾	PMC131	– XA00191P	B1, B3, B5
ATEX II 1/2 G Ex ib IIC T6 ATEX II 2 G Ex ib IIC T6 ATEX II 3 G Ex nA II T6 ¹⁾	PMP131, PMP135	– XA00142P – XA00191P	D 1 3, 5

- 1) In the event of applications in a Zone 2 explosive atmosphere (Ex nA explosion protection) protect the housing from impact.

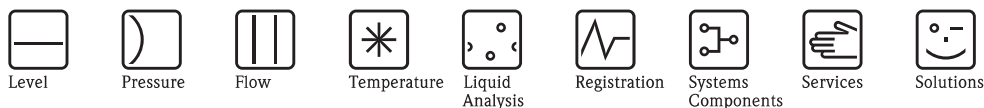
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Technical Information

Liquiline M CM42

Two-wire transmitter for Ex and non-Ex areas

Analog sensors: pH/ORP / Conductivity / Concentration / Resistivity

Digital sensors: pH/ORP / Oxygen / Conductivity



Application

Liquiline M CM42 is a modular two-wire transmitter for all areas of process engineering.

Depending on the ordered version, Liquiline has one or two analog current outputs or it can be connected to field buses as per FOUNDATION Fieldbus, PROFIBUS PA and HART protocol.

The transmitter is suitable for pollution degree 3.

The extremely robust, corrosion-resistant plastic version and the hygienic stainless steel version are designed for the following applications:

- Chemical processes
- Pharmaceuticals industry
- Foodstuff technology
- Applications in hazardous locations

Your benefits

- Cost-saving:
 - Simple commissioning with Quick Setup and Navigator (multifunction button)
 - Memosens: Plug & play of laboratory calibrated sensors
 - Predictive maintenance system detects when a sensor has to be cleaned, calibrated or replaced
 - Less storage thanks to modular design
 - Effective asset management thanks to Fieldcare and W@M
- Safe:
 - Memosens: Active display of cable interruption
 - User-guided commissioning, graphic display and plain text guidance
 - Approvals: ATEX, FM, CSA, NEPSI, TIIS
 - Code-protected commissioning and calibration
 - SIL2 measuring point: TÜV approval for pH glass with Memosens

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General features

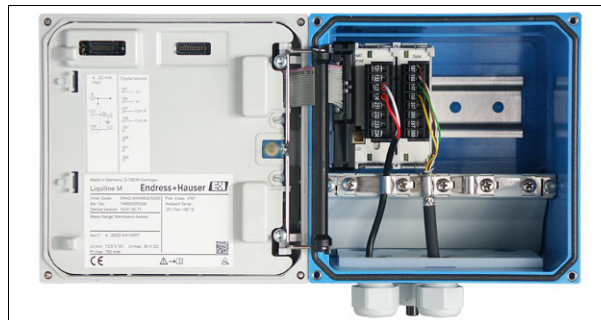
Memosens



Memosens makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- No galvanic corrosion
- Completely watertight
- Laboratory sensor calibration possible, thus increasing measured value availability
- Predictive maintenance thanks to recording of sensor data, e.g.:
 - Total hours of operation
 - Hours of operation with very high or very low measured values
 - Hours of operation with high temperatures
 - Number of steam sterilizations
 - Sensor condition

Modular design



Inside Liquiline (version with sensor module, without wiring)

a0010477



CPU and sensor module

a0010476

Quick setup

To the first measuring value within 1 minute

After setting up the few parameters in the Quick Setup menu, the measuring point is ready to measure. The first measured value is reliably displayed.

Navigator and plain text

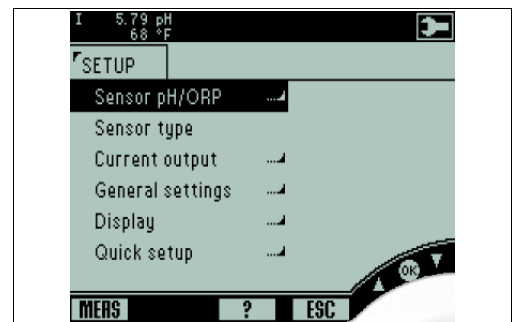
The unique operating concept sets new standards:

- Fewer user errors thanks to very easy operation
- Quick configuration with the Navigator.
- Intuitive configuration and diagnosis due to plain text display



Navigator

a0001984

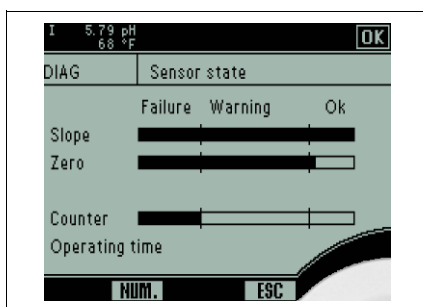


Plain text display

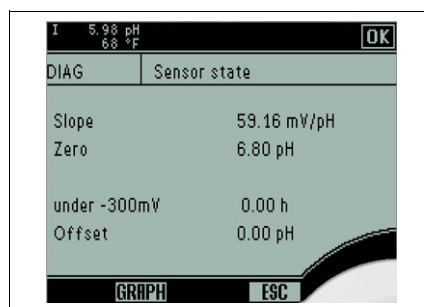
a0010403

Sensor monitor

You can find the sensor monitor in the DIAG menu. Important sensor data, incl. warning and alarm limits, are displayed either graphically or numerically.



Sensor monitor (example)



Sensor monitor (example)

Software packages

You can choose from the following from these software packages:

- Basic:
Standard application for the most common measuring points
- Advanced:
Highest degree of accuracy (medium compensation) and safety (Cal-Timer) in critical applications

Software package	Features		
	pH /ORP	Conductivity	Dissolved oxygen
Basic	Analog sensors - Offset and two-point calibration - Sample calibration - Calibration with standard buffers - Manual buffer - Temperature compensation - Temperature adjustment - Isotherm intersection - Simulation of current output - Self-diagnosis - Calibration stability settings - Clock Memosens sensors features like analog sensors plus: - Sensor information - Sensor monitoring	Analog sensors - Sample calibration - Temperature calibration: one-point - Temperature compensation: linear, NaCl, Ultrapure water (NaCl, HCl) - Simulation of current output - Self-diagnosis - Concentration measurement - Clock Memosens sensors features like analog sensors plus: - Sensor information - Sensor monitoring	Memosens sensors - Slope calibration - in air (100% rH) - in water (100% air saturated) - in air (with input of the absolute air pressure and of the relative humidity) - Zero point calibration - Sample calibration - Temperature adjustment - Simulation of current output - Self-diagnosis - Clock - Sensor information - Sensor monitoring
Advanced	Analog sensors - Medium compensation - Calibration timer - Sensor statistics - Logbooks - Data logbook Memosens sensors features like analog sensors plus: - Operating hours counter - Sterilizations counter	Software package "Basic" and also: Analog sensors - Logbooks - Data logbook - Calibration with separate installation factor (inductive measurement only) - Polarization detection (conductive measurement only) - Temperature compensation via user table - Two-point temperature adjustment: offset and slope Memosens sensors features like analog sensors plus: - Operating hours counter - Sterilizations counter - USP alarm and pre-alarm	

DAT memory modules

There are 3 different types of DAT module

■ **SystemDAT**

- For changing the sensor type, software updates (more recent software version) and changing the language package
- Part of the scope of delivery of the version ordered and available as an accessory
- Optional accessory

■ **FunctionDAT**

- For software upgrades (additional functionality)
- Extending the function scope (2nd current output)
- Optional accessory

■ **CopyDAT**

- Memory for own configuration settings
- Optional accessory

i A FunctionDAT is never available for a SIL device since the device already has all the possible functions and its functions can therefore not be extended.

A SystemDAT is also not available for the SIL device since it would not be possible to ensure the "functional safety" otherwise.

Safety**Code protection**

The device has a user administration function in order to avoid unscheduled changes to the measuring point.

Two different modes are available in the Advanced version:

■ **Standard**

- There are 3 fixed user roles (Operator, Maintenance, Expert).
- Each role has its own individual password. This password can be changed.
- No other user roles can be created.

■ **Advanced**

- You can create and manage a maximum of 15 user accounts. You need to be logged on as the expert to do so.
- You can assign each user one of 3 user roles (Operator, Maintenance, Expert).
- Several "Experts" are possible.
- One user ("Administrator") is already created at the factory (password: 4685).

**SIL**

A TÜV approved SIL2 version of Liquiline M CM42 is available (CM42-M* only).

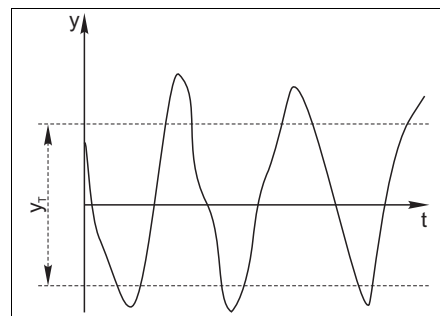
Safety functions:

- Safe output of the digitalized value at the current output
- Monitoring of the measured value for leaving a defined interval
- Safe calibration and justage

i You can get more information and safety manuals via:
www.endress.com/SIL

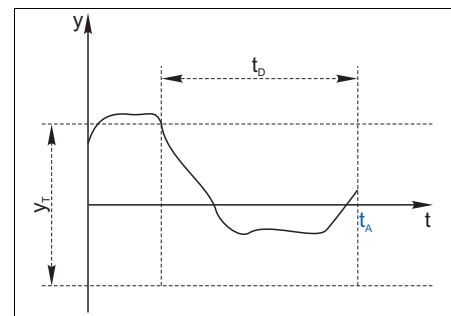
PCS: Live check

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a certain period (several measured values).



Normal measuring signal, no alarm

y Measuring signal
 y_T Fixed value for minimum signal fluctuation



Stagnating signal, alarm is triggered

t_D Set value for time interval
 t_A Time when the alarm is triggered

Reordering validated software

You can order new devices with older, validated software so you do not have to constantly validate new software versions of new devices. This is possible as long as allowed by the hardware version.

Special features

pH / ORP

Suitable sensors

- Analog and Memosens glass electrodes
- Analog and Memosens ISFET sensors
- Analog and Memosens ORP sensors
- Analog and Memosens Pfaudler electrodes
- Analog single electrodes (glass or antimony)

Sensor Condition Check (SCC)

Sensor condition check (SCC) monitors the electrode status and the degree of electrode aging. The status is displayed with the messages "Electrode OK", "Low abrasion" or "Change electrode". An error message is also output for the message "Change electrode". The electrode status is updated after every calibration.

Sensor Check System (SCS)

The sensor check system alerts to deviations of the pH glass impedance or reference impedance (analog sensors only) from the normal range, thus indicating possible failure due to pH electrode blocking or damage. In addition, the SCS detects glass breakage of glass electrodes and leakages of ISFET sensors.

Conductivity

Suitable sensors

Connection of all types of conductivity sensors:

- Analog and Memosens conductive sensors:
 - Two-electrode sensors
 - Four-electrode sensors
- Analog inductive sensors

Polarization monitoring

Polarization effects in the boundary layer between the sensor and the solution to be measured limit the measuring range of conductive conductivity sensors.

The transmitter can detect and indicate polarization effects using an innovative, intelligent signal evaluation process.

United States Pharmacopeia (USP) and European Pharmacopoeia (EP)

The requirements on ultrapure water in the pharmaceutical industry are specified by the American USP and the European EP.

The transmitter meets the USP/EP requirements on conductivity measuring systems:

- Precise temperature measurement at point of conductivity measurement
- Simultaneous display of uncompensated conductivity values and temperature possible
- Display resolution 0.01 $\mu\text{S}/\text{cm}$
- Exact adjustment of the transmitter in the factory with traceable precision resistances (optional)
- Exact adjustment of the sensors in the factory in accordance with ASTM D 1125-9 resp. ASTM D 5391-99 (optional)
- Temperature-dependent measured value monitoring acc. to USP and EP.

The "Advanced" software package provides the limit value functions for pharmaceutical waters acc. to USP and EP:

- Water for Injection (WFI) acc. to USP <645> and EP
- Highly purified water (HPW) acc. to EP
- Purified water (PW) acc. to EP

The uncompensated conductivity value and the temperature are measured with the USP and EP limit value functions. The measured values are compared with the tables described in the standards. If a limit value is exceeded, an alarm is displayed. Additionally, a pre-alarm can be defined to indicate undesired operation states before they occur.

Oxygen

Suitable sensors

Amperometric sensors:

- with Memosens technology
- 12 and 40 mm design

Application-optimized calibration models

The transmitter offers separate functions for zero-point calibration and slope calibration. This allows for optimum adaption to the process.

The calibration models range from simple slope calibration in vapour-saturated air to slope calibration with indication of absolute air pressure and relative humidity at measuring place.

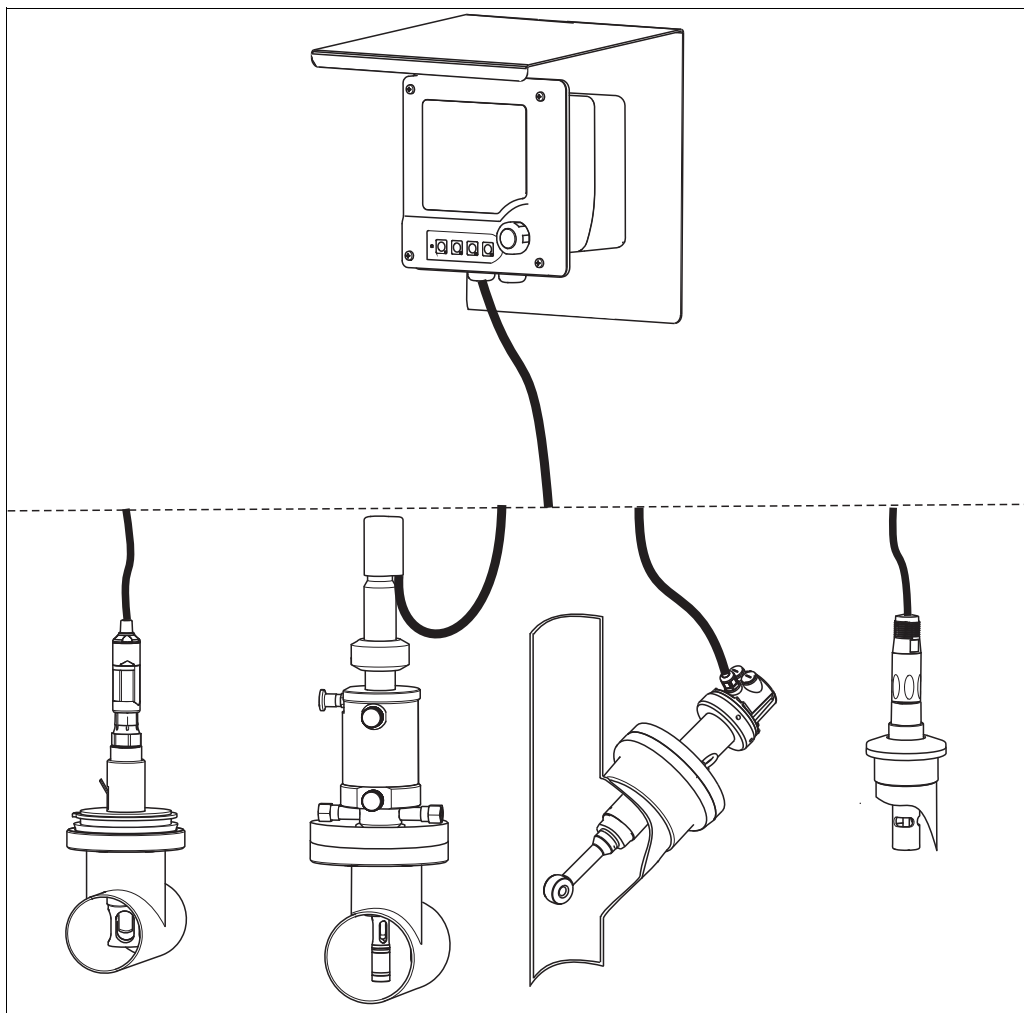
The latter model allows you to calibrate during operation as well as during sterilization or cleaning.

The transmitter has individual calibrations and sterilizations counters for sensor and membrane cap. The counter for the membrane cap can be reset after each cap replacement.

Measuring system

A complete measuring system comprises:

- Liquiline M CM42 transmitter with mounting plate (e.g. for wall mounting)
- Sensor and matching cable
- Fitting assembly (optional)
- Post mounting kit (optional)
- Weather protection cover (optional)



Measuring system: Examples

40002012

pH / ORP (analog sensor)

- CM42-P/R...
- Measuring cable CPK9
- Assembly Cleanfit CPA471
- Sensor Orbisint CPS11

Conductivity, inductive measurement (analog)

- CM42-I...
- Assembly Dipfit CLA111
- Sensor Indumax CLS50

Conductivity, conductive measurement (analog)

- CM42-C...
- Measuring cable CPK9
- Sensor Condumax CLS16

Memosens (digital sensor)

- CM42-K/M/N/O...
- Measuring cable CYK10
- (Assembly Unifit CPA442)
- Sensor CPS11D (pH: glass)/ CPS471D (pH: ISFET)/ COS22D/51D (oxygen) / CLS15D/16D/21D (conductivity, cond. meas.)

You can select from a wide variety of assemblies and sensors to set up your measuring point. You can find the corresponding information in the chapter "Accessories" resp. in the referenced documentations.

NOTICE

Effect of climatic conditions (rain, snow, direct sunlight etc.)

Impaired operation to complete transmitter failure

- When installing outside, always use the weather protection cover (accessory).

Input

Binary input (Memosens):
pH/ORP, Oxygen,
Conductivity



Measured variable

→ Documentation of the connected sensor

Measuring range

→ Documentation of the connected sensor

Cable specification

With Memosens	100 m (330 ft) max. cable length
---------------	----------------------------------

Ex specification

Intrinsically safe sensor circuit with type of protection: Ex ia IIC ¹⁾ Power limited sensor circuit with type of protection: Ex nL IIC ²⁾	
Max. output voltage U _o	5.04 V
Max. output current I _o	80 mA
Max. output P _o	112 mW
For connection to the special measuring cable CYK10	

1) CM42-*G*****, CM42-*X*****, CM42-*Z*****

2) CM42-*V*****

Analog input: pH / ORP

Measured variable

→ Documentation of the connected sensor

Measuring range

→ Documentation of the connected sensor

Cable specification

Without SCS	50 m (160 ft) max. cable length
With SCS	20 m (65 ft) max. cable length

Applicable temperature sensors

- Pt100
- Pt1000
- NTC 30K

Ex specification

Intrinsically safe sensor circuit with type of protection: Ex ia IIC ¹⁾ Power limited sensor circuit with type of protection: Ex nL IIC ²⁾		
Max. output voltage U _o	Glass electrode 10.08 V	ISFET 10.08 V
Max. output current I _o	4.1 mA	50.7 mA
Max. output P _o	10.2 mW	128 mW
Max. external inductance L _o	1 mH	1 mH
Max. external capacity C _o	250 nF	250 nF
Connection class acc. to NE116 ³⁾	SensISCO1X	-

1) CM42-*G*****, CM42-*X*****, CM42-*Z*****

2) CM42-*V*****

3) CM42-*G*****

When pH/ORP glass electrodes are connected to terminals 317, 318, 320, 111, 112 and 113, the device corresponds to connection class 1 as per NAMUR Recommendation NE116 (SensISCO). Terminals 315 and 316 may not be connected for this categorization.
The device is labeled SensISCO1X.

Input impedance

$> 1 \cdot 10^{12} \Omega$ (at nominal operating conditions)

Input leakage current

$< 1 \cdot 10^{-13} \text{ A}$ (at nominal operating conditions)

Analog input: Conductivity

Measured variable

→ Documentation of the connected sensor

Measuring range

→ Documentation of the connected sensor

Cable specification

Conductivity/resistivity, conductively measured ¹⁾ Two-electrode sensor 10 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 0.1 $\text{M}\Omega/\text{k}$ to 50 Ω/k 5 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 0.2 $\text{M}\Omega/\text{k}$ to 50 Ω/k 0.1 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$ / 20 $\text{M}\Omega/\text{k}$ to 50 Ω/k	100 m (330 ft) max. cable length 50 m (160 ft) max. cable length 15 m (50 ft) max. cable length
Conductivity, conductively measured Four-electrode sensor 10 $\mu\text{S}\cdot\text{k}$ to 1.5 $\text{S}\cdot\text{k}$ 0.1 $\mu\text{S}\cdot\text{k}$ to 20 $\text{mS}\cdot\text{k}$	100 m (330 ft) max. cable length 15 m (50 ft) max. cable length
Conductivity, inductively measured ²⁾	55 m (180 ft) max. cable length

1) with CYK71 or CPK9 cables or sensor fixed cable

2) with CLK5 cable or sensor fixed cable

Temperature sensor

- Pt100
- Pt1000

Ex specification, conductive sensors

 Intrinsically safe sensor circuit with type of protection: Ex ia IIC ¹⁾ Power limited sensor circuit with type of protection: Ex nL IIC ²⁾	
Max. output voltage U_o	10.08 V
Max. output current I_o	23 mA
Max. output P_o	57 mW
Max. external inductance L_o	300 μH
Max. external capacity C_o	50 nF

1) CM42-*G*, CM42-*X*, CM42-*Z*

2) CM42-*V*

Ex specification, inductive sensors

 Intrinsically safe sensor circuit with type of protection: Ex ia IIC ¹⁾ Power limited sensor circuit with type of protection: Ex nL IIC ²⁾	
Max. output voltage U_o	10.08 V
Max. output current I_o	64 mA
Max. external P_o	128 mW
For connection of the inductive sensors CLS50, CLS54	

1) CM42-*G*****, CM42-*X*****, CM42-*Z*****

2) CM42-*V*****

Output

Output signal	1 x 4 to 20 mA, potentially isolated against sensor circuit ¹⁾ 2 x 4 to 20 mA, potentially isolated against sensor circuit ²⁾ PROFIBUS PA ³⁾ FOUNDATION Fieldbus ⁴⁾												
Signal on alarm	3.6 to 22.0 mA (3.6 mA fixed value when using HART communication) digital via field bus ⁵⁾												
Load	Max. load with an supply voltage of 24 V: 500 Ω Max. load with an supply voltage of 30 V: 750 Ω												
Output signal range	3.6 to 22.0 mA												
Ex specification current output 4/20 mA	<table> <tr> <td colspan="2">  Intrinsically safe supply and signal circuits, passive </td></tr> <tr> <td>Max. input voltage U_i</td><td>30 V</td></tr> <tr> <td>Max. input current I_i</td><td>100 mA</td></tr> <tr> <td>Max. input P_i</td><td>750 mW</td></tr> <tr> <td>Max. internal inductivity L_i</td><td>29 μH (output 1) 24 μH (output 2)</td></tr> <tr> <td>Max. internal capacity C_i</td><td>1.2 nF (output 1) 0.2 nF (output 2)</td></tr> </table>	 Intrinsically safe supply and signal circuits, passive		Max. input voltage U_i	30 V	Max. input current I_i	100 mA	Max. input P_i	750 mW	Max. internal inductivity L_i	29 μ H (output 1) 24 μ H (output 2)	Max. internal capacity C_i	1.2 nF (output 1) 0.2 nF (output 2)
 Intrinsically safe supply and signal circuits, passive													
Max. input voltage U_i	30 V												
Max. input current I_i	100 mA												
Max. input P_i	750 mW												
Max. internal inductivity L_i	29 μ H (output 1) 24 μ H (output 2)												
Max. internal capacity C_i	1.2 nF (output 1) 0.2 nF (output 2)												
Ex specification PROFIBUS PA and FOUNDATION Fieldbus	<table> <tr> <td colspan="2">  Suitable for use as a field device in a FISCO system </td></tr> <tr> <td>Max. input voltage U_i</td><td>17.5 V</td></tr> <tr> <td>Max. input current I_i</td><td>380 mA</td></tr> <tr> <td>Max. input P_i</td><td>5.32 W</td></tr> <tr> <td>Max. internal inductivity L_i</td><td>< 10 μH</td></tr> <tr> <td>Max. internal capacity C_i</td><td>< 5 nF</td></tr> </table>	 Suitable for use as a field device in a FISCO system		Max. input voltage U_i	17.5 V	Max. input current I_i	380 mA	Max. input P_i	5.32 W	Max. internal inductivity L_i	< 10 μ H	Max. internal capacity C_i	< 5 nF
 Suitable for use as a field device in a FISCO system													
Max. input voltage U_i	17.5 V												
Max. input current I_i	380 mA												
Max. input P_i	5.32 W												
Max. internal inductivity L_i	< 10 μ H												
Max. internal capacity C_i	< 5 nF												

- 1) current output 1, potential isolation with Memosens; in sensor plug
2) current output 1 and current output 2 (optional)
3) for version with PROFIBUS PA
4) for version with FOUNDATION Fieldbus
5) with Profibus PA or FOUNDATION Fieldbus only

Current output, passive

Signal range	3.6 to 22.0 mA
Signal characteristics	Linear
Cable specification	Type: shielded cable, Ø 2.5 mm (14 AWG)

Wiring

Housing grounding

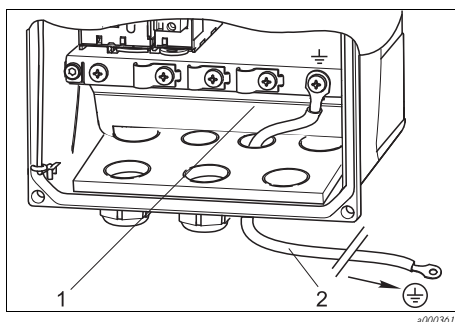
Plastic housing

⚠ WARNING

Electric voltage at ungrounded cable mounting rail

Not safe to touch

- Connect the cable mounting rail to the foundation ground with a separate functional ground $\geq 2.5 \text{ mm}^2$ (14 AWG).



Housing grounding

- 1 Fixing plate
2 $\geq 2.5 \text{ mm}^2$ ($\approx 14 \text{ AWG}$) functional ground

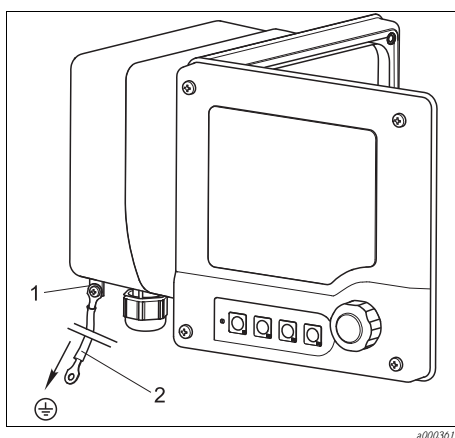
Stainless steel housing

⚠ WARNING

Electric voltage at ungrounded housing

Not safe to touch

- Connect the outer ground connection of the housing to the foundation ground with a separate wire (GN/YE) ($\geq 2.5 \text{ mm}^2 \approx 14 \text{ AWG}$).



Housing grounding

- 1 Outer ground connection
2 $\geq 2.5 \text{ mm}^2$ ($\approx 14 \text{ AWG}$) line (GN/YE)

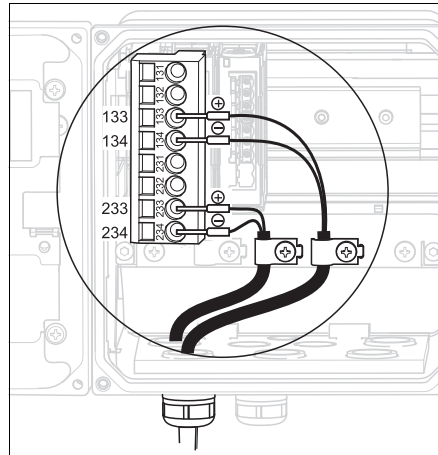
Supply and signal circuit

4 ... 20 mA

Connect the transmitter via a two-wire cable.

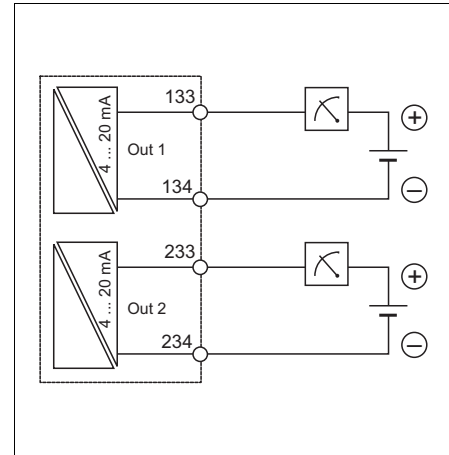
- i** How the shield is connected depends on the interference influence expected. To suppress electrical fields, it suffices to ground the shield at one end. If you also want to suppress interference from a magnetic alternating field, you must ground the shield at both ends.

The second current output is an option (see "Ordering information").



View in device (CPU module)

a0005037

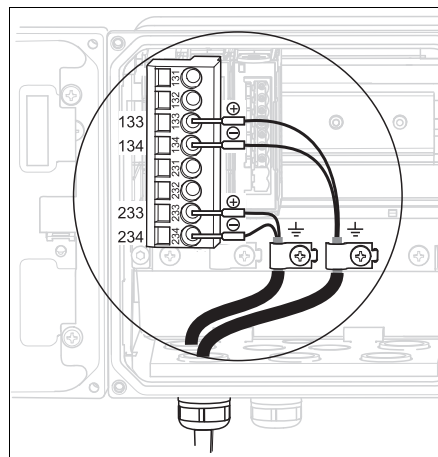


Wiring diagram

a0005038

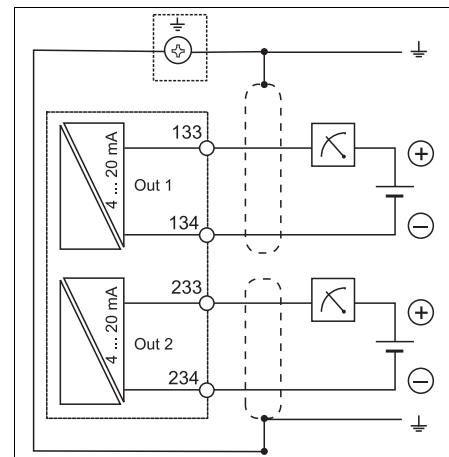
4 ... 20 mA / Hart®

- i** For safe communication via the HART protocol and for compliance with the NAMUR NE 21, use a two-wire cable shielded on each end.



View in device (CPU module)

a0002365



Wiring diagram

a0003100

PROFIBUS PA and FOUNDATION Fieldbus

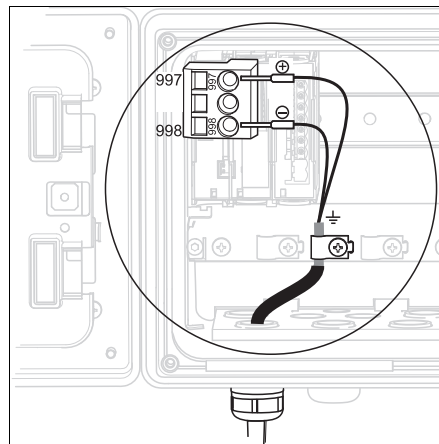
Always use a fieldbus cable that is grounded on both sides (device **and** PCS).

You can connect Profibus and FOUNDATION Fieldbus devices in various ways:

1. Shielded two-wire cable, "Hard grounding" (generally to be preferred to capacitive grounding)
2. Shielded two-wire cable, "Capacitive grounding" (shield grounded in device via a capacitor, accessory "C module" necessary)
Use it, if there is a risk of high equalizing currents. **Not applicable for Ex versions!**
3. Using the fieldbus connection socket (accessories)

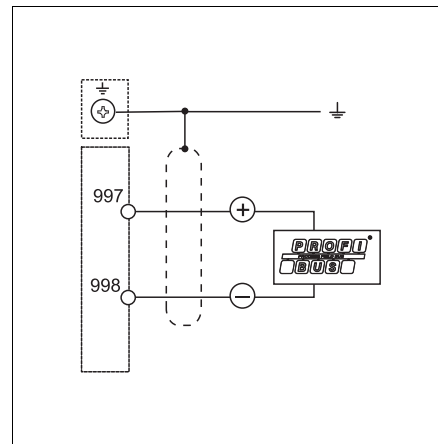
"Hard grounding"

- Place the cable shield on the "Fixing plate".
- Connect the cable wires as per the assignment.



View in device (CPU module)

a0004060

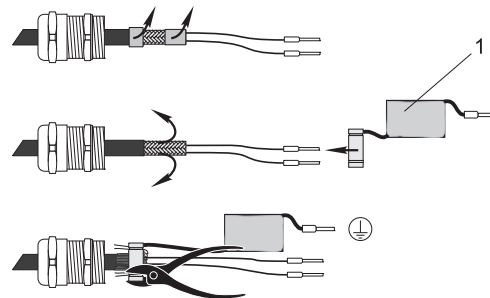


Wiring diagram

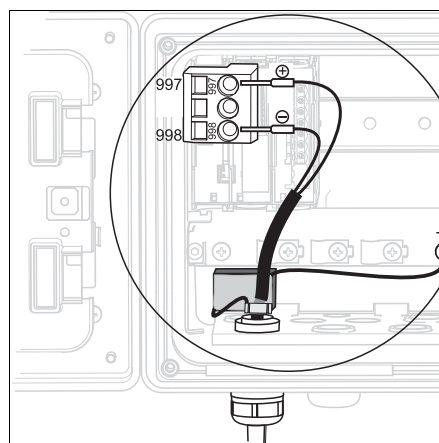
a0001640

"Capacitive grounding"

- Strip back the shield braiding, push the extension wire of the C module (pos. 1) onto the exposed shield and fasten the clip:

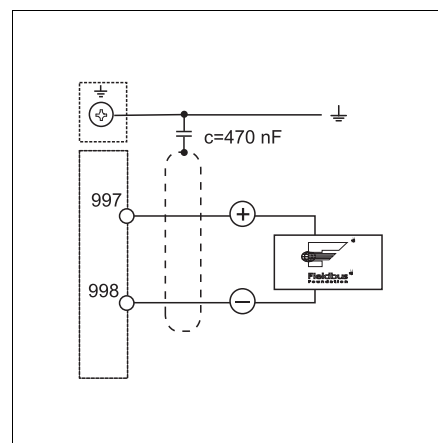


- Place the extension wire on the "Fixing plate".
- Connect the cable wires as per the assignment.



View in device (CPU module)

a0004071

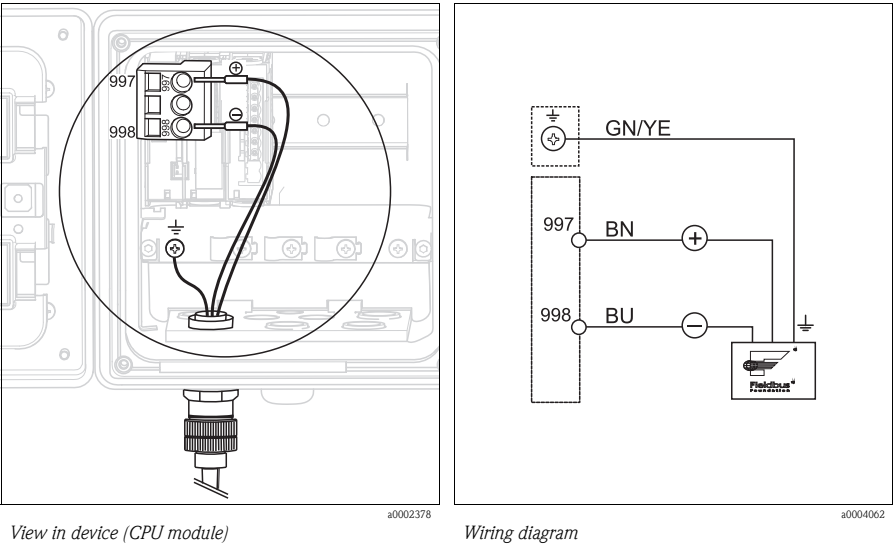


Wiring diagram

a0004073

"Fieldbus connection socket"

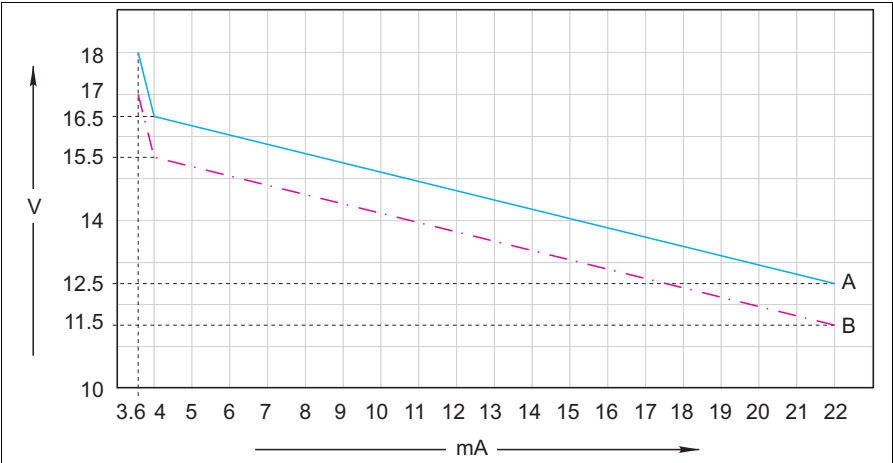
- Screw the fieldbus connection socket (accessories) into the housing bushing.
- Trim the connection cores of the socket to approx. 15 cm (5.9 ").
- Connect the cable cores as per the assignment. In doing so, you must place the cable shield (GN/YE) on the "Fixing plate".



Cable specification

Max. cable cross-section: 2.5 mm² (≈14 AWG), GND 4 mm² (≈12 AWG)

Supply voltage



Minimum supply voltage at transmitter to output current
A with HART communication
B without HART communication

a0008804

PROFIBUS / FOUNDATION Fieldbus: 9 to 32 V DC (non-hazardous location)
9 to 17.5 V DC (hazardous location)
Power consumption of the fieldbus: 22 mA

Sensor connection

Explanation of abbreviations in the following diagrams:

Abbreviation	Meaning
pH	Signal from pH membrane glass
Ref	Signal from reference electrode
Src	Source
Drn	Drain
PM	Potential matching
U ₊	Digital sensor supply
U ₋	
Com A	Digital sensor communication
Com B	
ϑ	Temperature signal
d.n.c.	Do not connect!

NOTICE

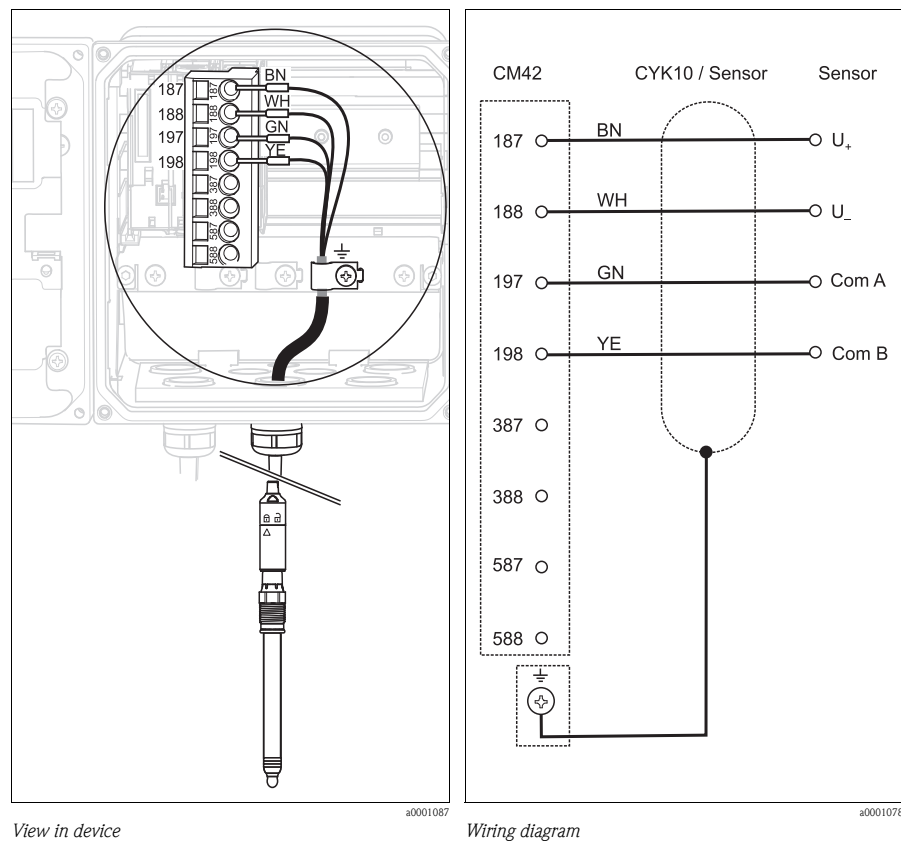
No shielding against electrical and magnetic interference

Interference can cause incorrect measurement results

- ▶ You must connect shielded connections and terminals with functional earth ($\perp$) (there is no protective earth ($\oplus$) for plastic housings).
- ▶ Since inductive conductivity sensors work with magnetic fields, avoid any magnetic interferences.

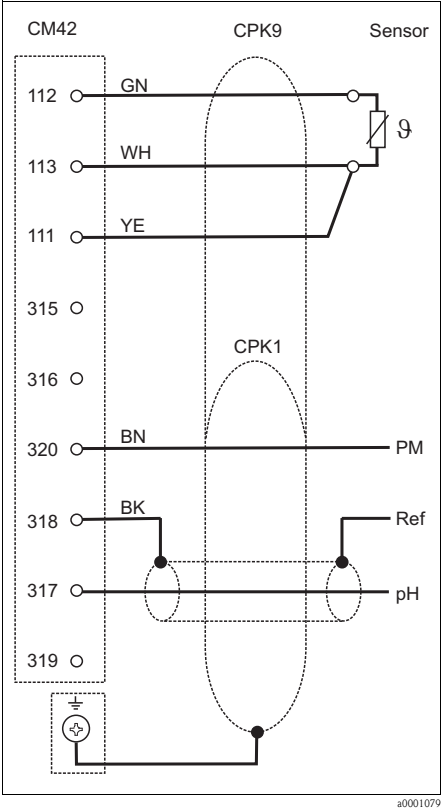
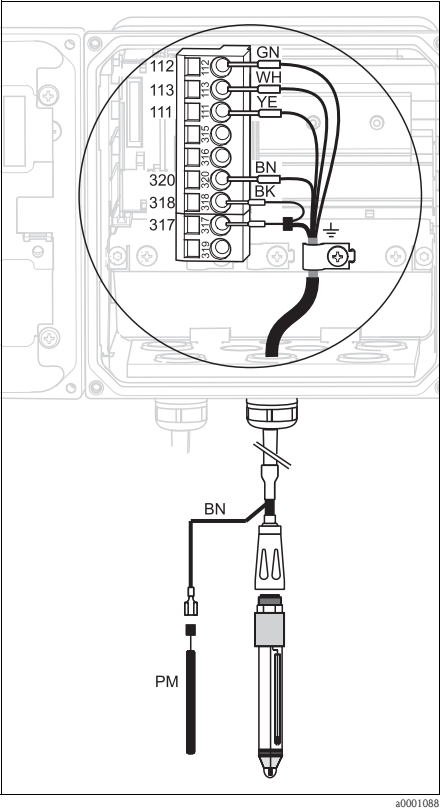
 Cable colors indicated as per IEC 757 (see CD-ROM).

Sensor connection: digital sensors (Memosens) pH/ORP/ISFET/Oxygen/ Conductivity

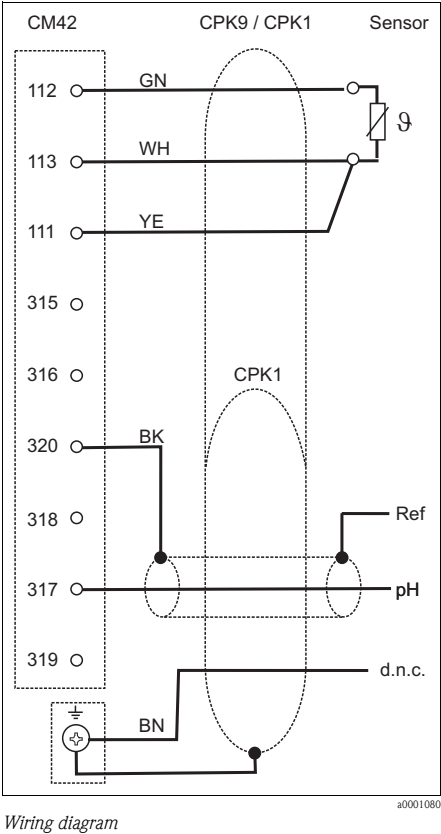
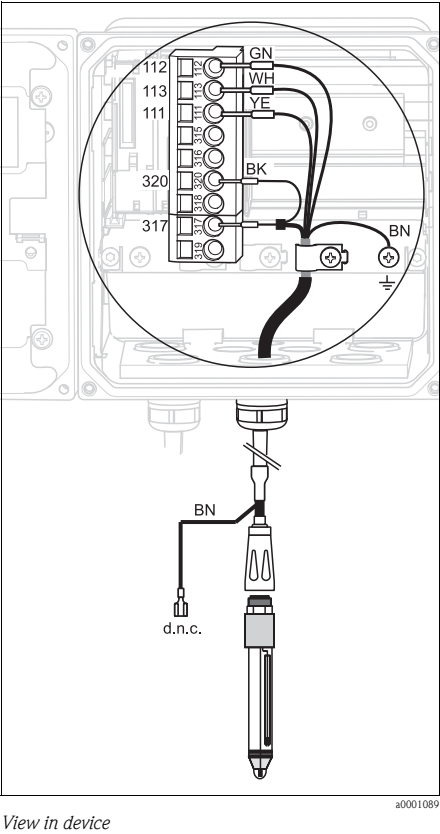


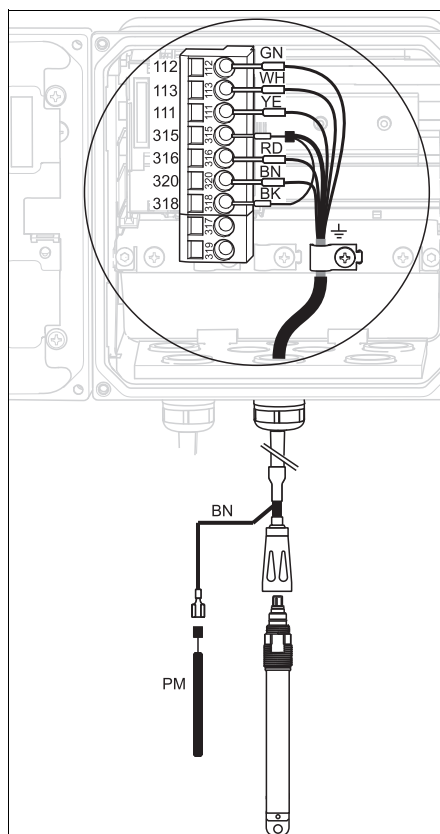
Sensor connection:
analog pH / ORP sensors

Glass electrodes with PML (symmetrical)



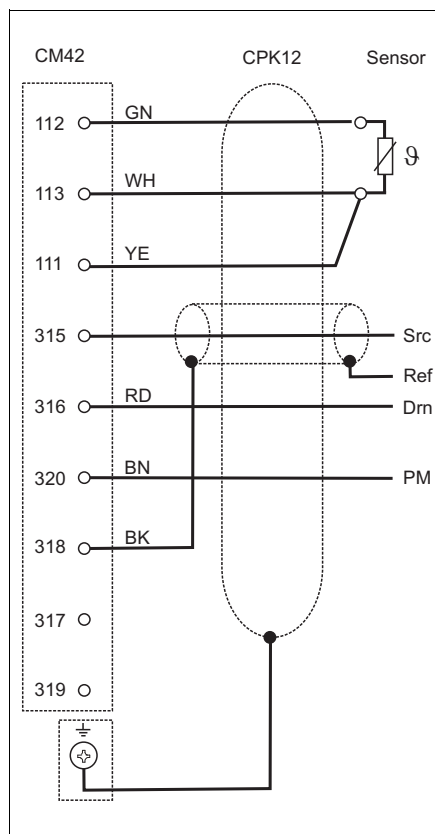
Glass electrodes without PML (asymmetrical)



ISFET sensors with PML (symmetrical)


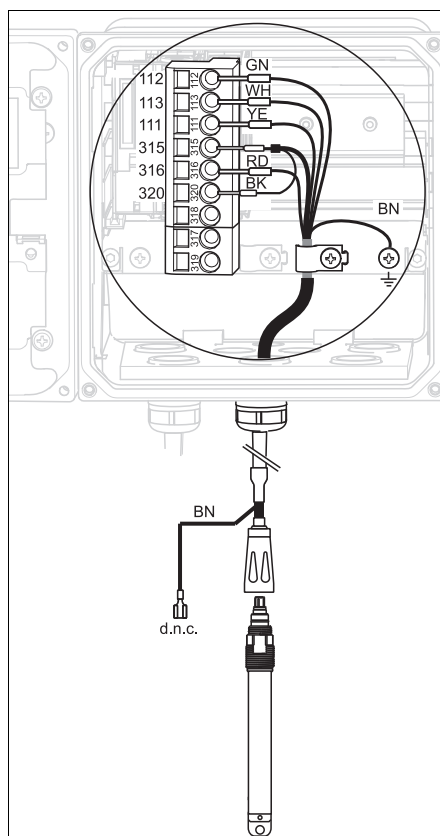
View in device

a0001090



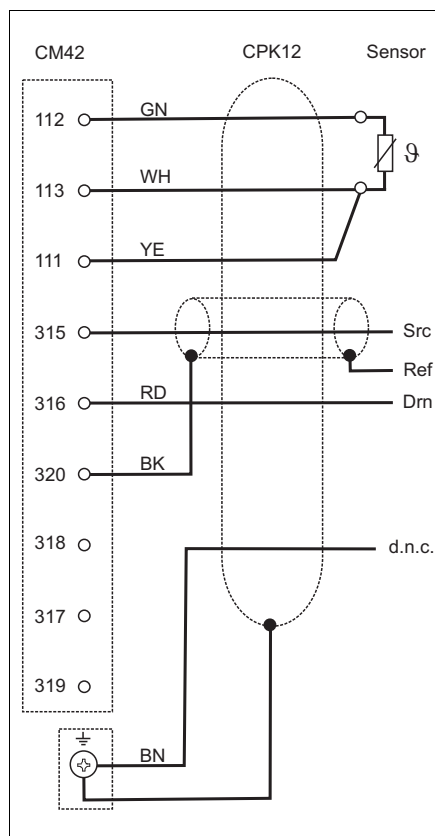
Wiring diagram

a0001076

ISFET sensors without PML (asymmetrical)


View in device

a0001084

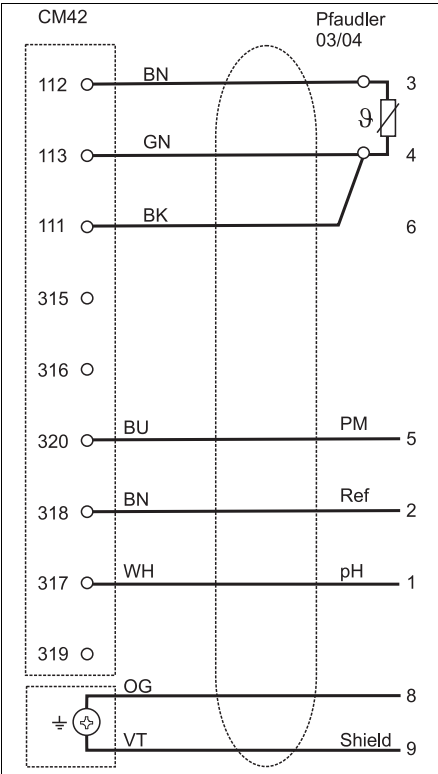


Wiring diagram

a0001077

Pfaudler electrodes

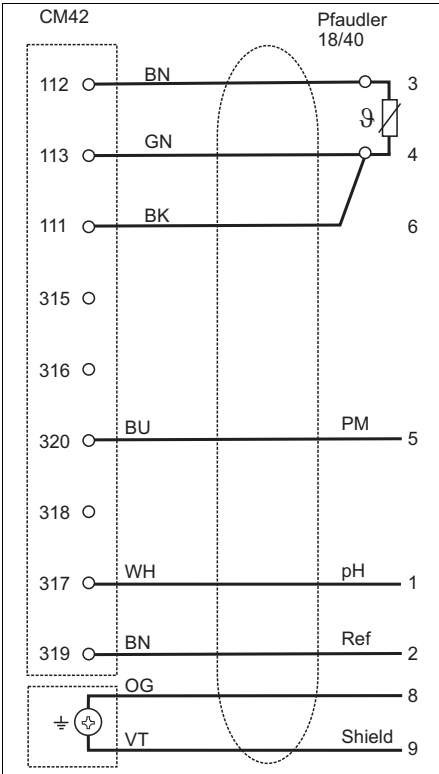
With PM (symmetrical)
Pfaudler electrode, absolute
Type 03 / Type 04



Wiring diagram

a0010467

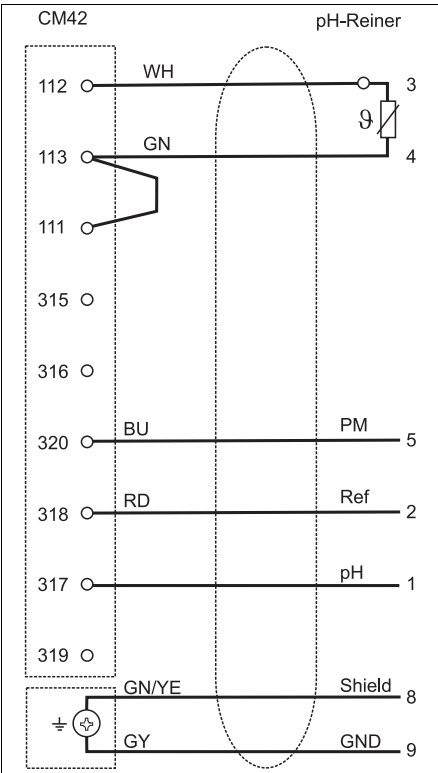
With PM (symmetrical)
Pfaudler electrode, relative
Type 18 / Type 40



Wiring diagram

a0010468

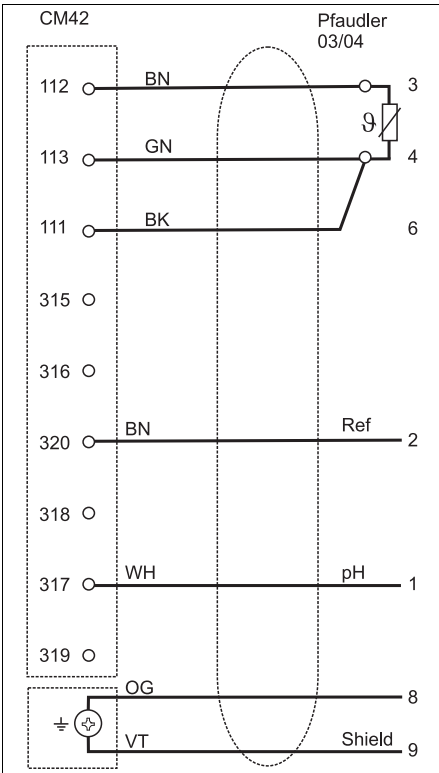
With PM (symmetrical)
pH Reiner



Wiring diagram

a0010469

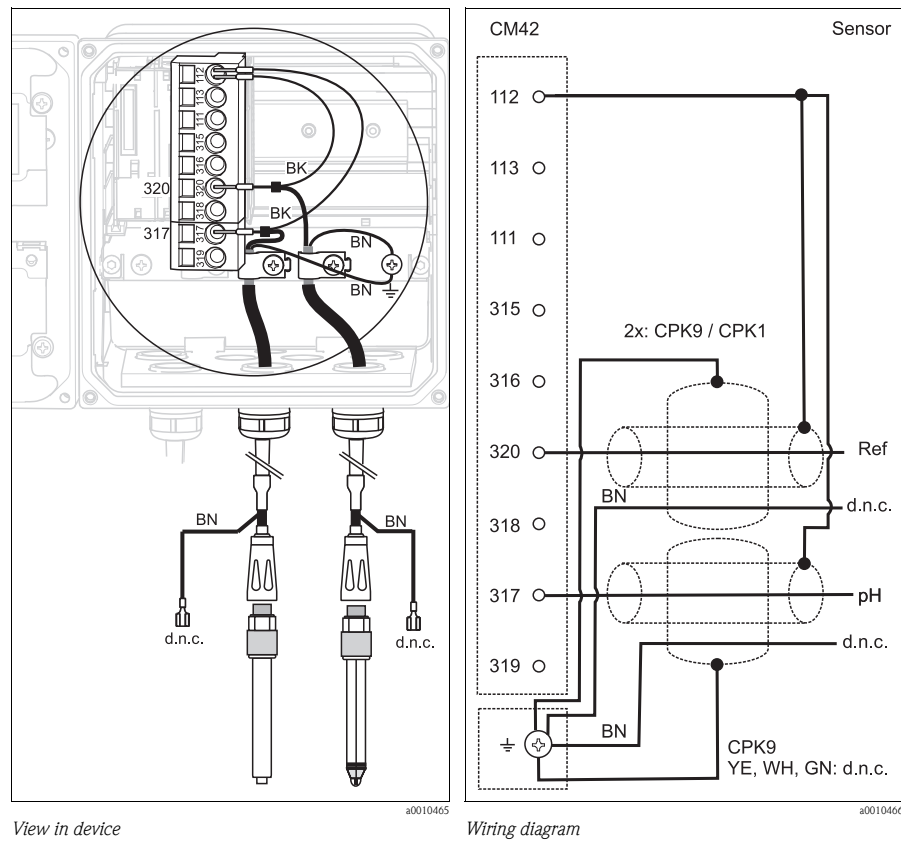
Without PM (asymmetrical)
Pfaudler electrode, absolute
Type 03 / Type 04



Wiring diagram

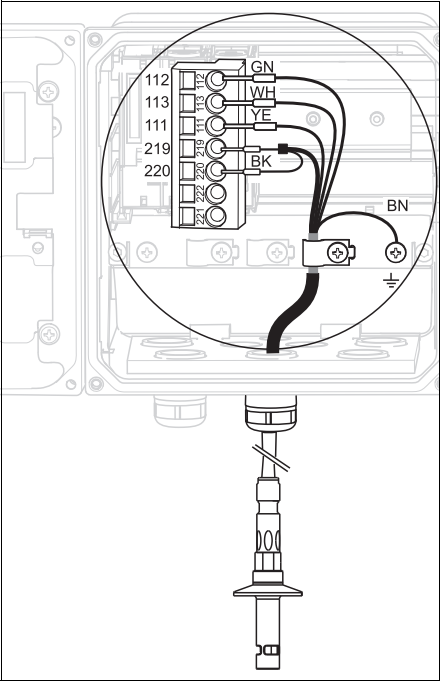
a0010470

Endress+Hauser



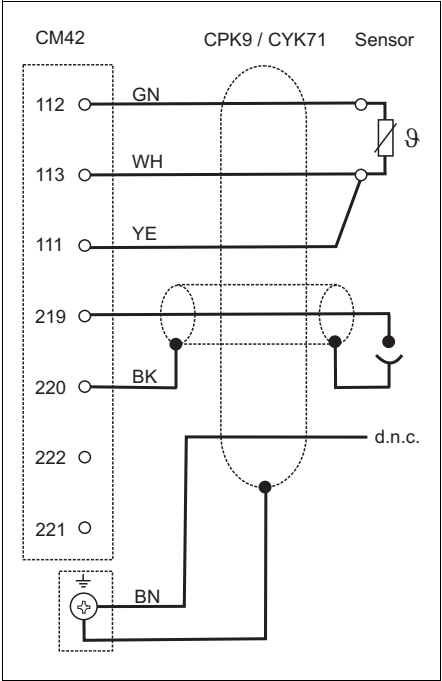
Sensor connection:
analog conductivity sensors

Conductive sensors, two-electrode sensors



View in device

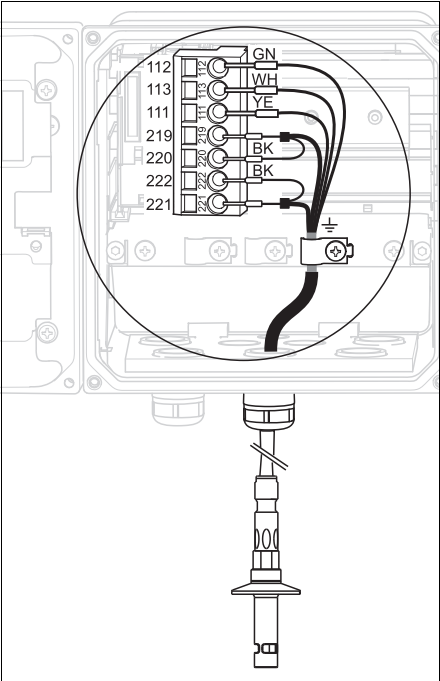
a0001086



Wiring diagram

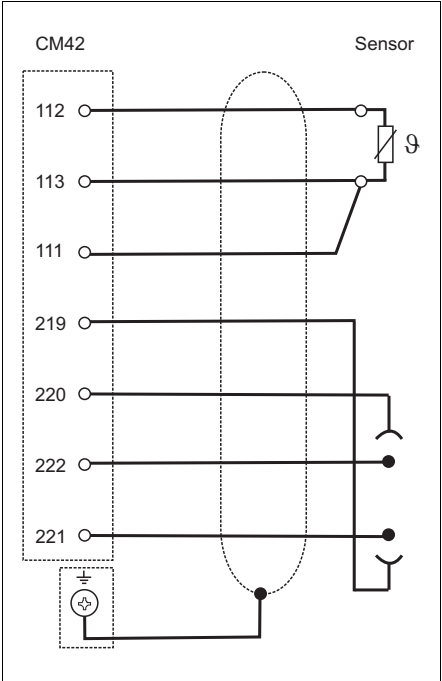
a0001083

Conductive sensors, four-electrode sensors



View in device (sensor module)

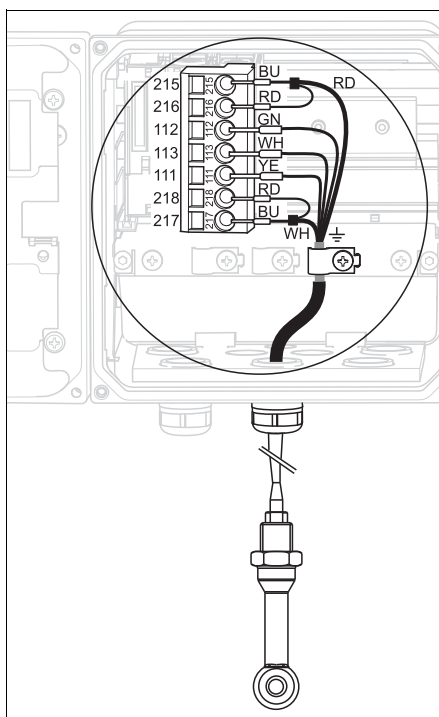
a0002363



Wiring diagram

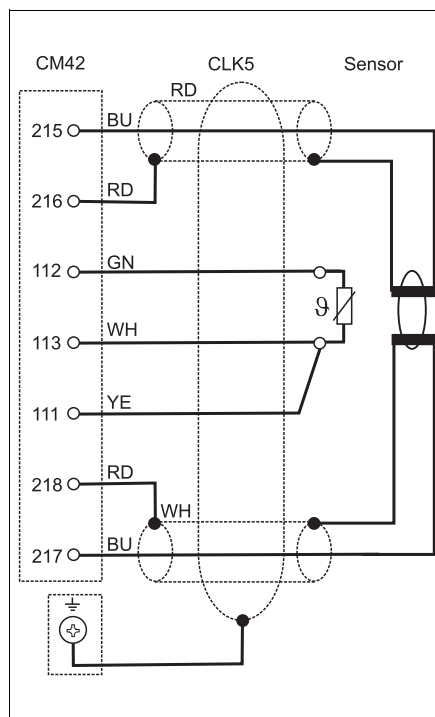
a0002371

Inductive sensors



View in device

a0001085



Wiring diagram

a0001082

Performance characteristics

Reference temperature	25 °C (77 °F) adjustable from –5 to 100 °C (23 to 212 °F) ⁶⁾
Response time of current output	t_{90} = max. 500 ms for an increase from 4 to 20 mA
Measured value resolution	→ Documentation of the connected sensor
Maximum measured error ⁷⁾	→ Documentation of the connected sensor

Current outputs, additionally	25 µA
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Repeatability	→ Documentation of the connected sensor
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Temperature compensation of the conductivity

Type of compensation	Range
none	
linear	α = 0.00 to 20.00 % / K
NaCl acc. to IEC 746-3	0 to 100 °C (32 to 212 °F)
natural waters acc. to IEC 7888	0 to 35 °C (32 to 95 °F)
Ultra-pure water NaCl	0 to 100 °C (32 to 212 °F)
Ultra-pure water HCl (for NH ₃ as well)	0 to 100 °C (32 to 212 °F)
4 user tables ¹⁾	

1) with software package "Advanced"

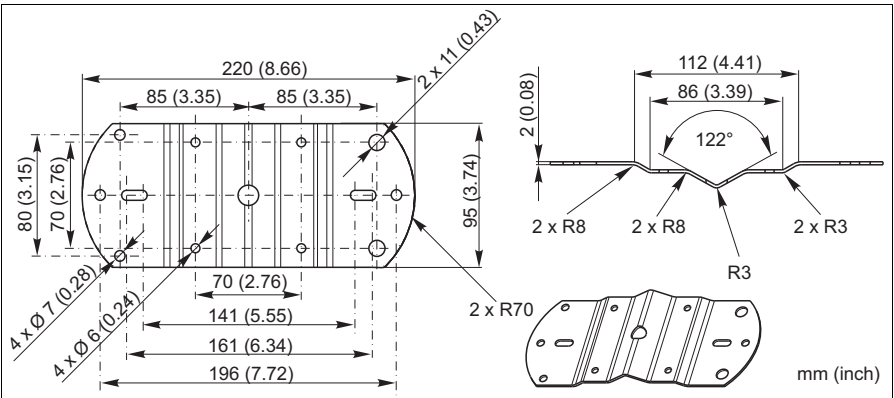
Temperature adjustment

Temperature offset	–5 to +5 °C (23 to 41 °F)
Temperature slope	0.9 to 1.1 ¹⁾

1) with software package "Advanced"

Installation

Mounting plate



6) with software package "Advanced"

7) acc. to DIN IEC 746 part 1, under nominal operating conditions

Weather protection cover

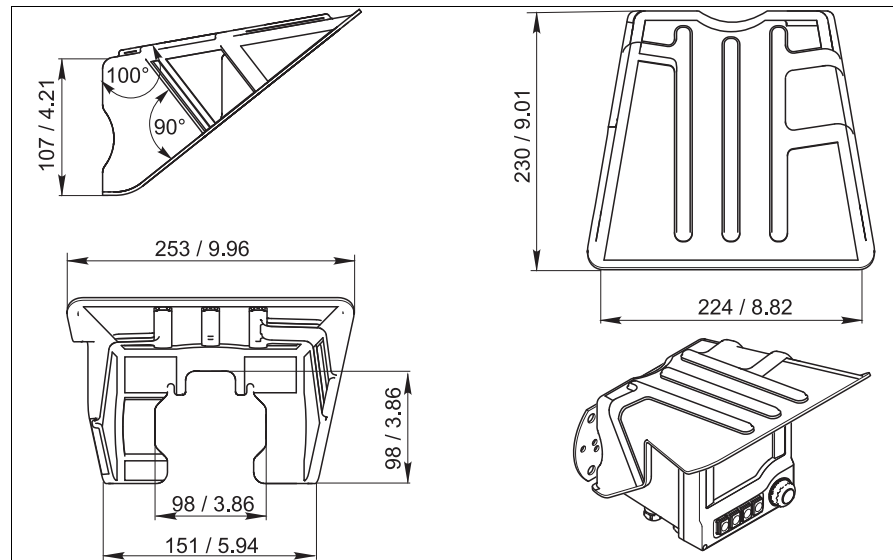
NOTICE

Effect of climatic conditions (rain, snow, direct sunlight etc.)

Impaired operation to complete transmitter failure

- When installing outside, always use the weather protection cover (accessory).

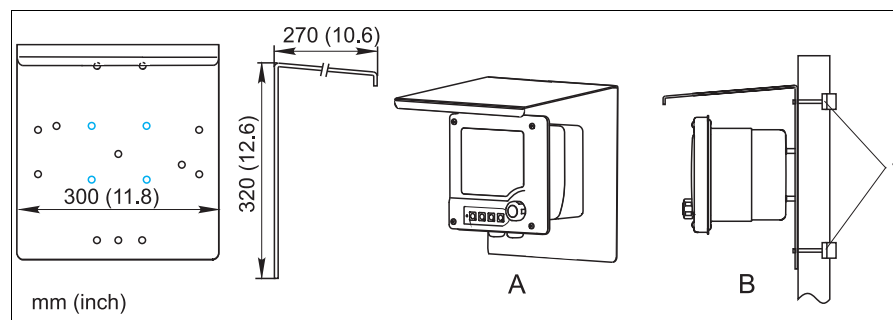
Plastic housing



Weather protection cover

a0001671-en

Stainless steel housing



Weather protection cover CYY101

- A Wall mounting
- B Pipe or round post mounting
- 1 Round post fixture (Accessories)

a0001676

- i** To fix the stainless steel weather protection cover CYY101 to vertical or horizontal pipes or round posts, you need the additional round post fixture, → "Accessories".