



PROMINENT PROMIX “M” SYSTEM

P/N: 7746642-0-701

PROMIX M_0-1500X2-10.0DA

SKID PIPING COMPONENTS

DLTA0450PVT3600UD4031ENO DELTA SOLENOID PUMP SPEARS
SCHEDULE 80 FITTINGS
ASAHI 1/2" PVC/VITON TYPE 21 BALL VALVE
ACCUDRAW 500ML PVC CALIBRATION COLUMN
PRECISION SS NEAT POLYMER GAUGE
BLACOH 1/2"X1/4" CPVC/PTFE GAUGE ISOLATOR
PROMINENT 1/2" PVC BACK PRESSURE VALVE
BRAIDFLEX 70N 1/2"ID PVC TUBING
LEESON 3/4 HP 120VAC TEFC MOTOR
ASCO 1-1/2" BRASS SOLENOID VALVE 120VAC NC
ASCO SOLENOID VALVE DIN CONNECTOR
ASAHI 3/4" PVC GLOBE VALVE
KING ROTOMETER – 7200 & 7330 SERIES
STRATAFLO 3/4" & 1-1/2" BRASS CHECK VALVE
PRECISION SS POLYMER SOLUTION GAUGE
KOFLO 1-1/2" PVC CLEAR STATIC MIXER
SPEARS 1/4" PVC LABCOCK (CHAMBER DRAIN)
PROMINENT PVC 3 STAGE MIXING CHAMBER
PROMINENT PVC/SS INJECTION VALVE

ELECTRICAL PANEL COMPONENTS P/N: 7746569

FIBOX POLYCARBONATE AR12106CHSC PANEL
C3 CONTROLS IEC CONTACTORS 300-S09N30
C3 CONTROLS IEC OVERLOAD RELAY 300-B--2U12
C3 CONTROLS SELECTOR SWITCHES 22SS3-AC-X-H-BK
PHOENIX CONTACT SCREW TERMINALS & END BRACKETS
CBI ELECTRIC CIRCUIT BREAKERS QL SERIES

ProMinent® delta® Solenoid Diaphragm Metering Pumps

Overview: delta®

Ideal for applications requiring metering pump accuracy with minimal pulsation

(see [page 131](#) for spare parts, [page 138](#) for accessory kits and [page 138](#) for control cables)

- Continuous or pulsating dosing
- Configurable suction and delivery stroke duration
- Pump can be adapted to the dosing media
- Integrated optoGuard monitoring detects blocked dosing points, broken dosing lines and air or gas bubbles trapped in the dosing head
- Capacities: 2.0 gph (7.5 lph) to 19.8 gph (75.0 lph)
- Stroke length continuously adjustable from 0 - 100% (recommended range 30 - 100%)
- Acrylic, PVDF and stainless steel material versions
- Patented coarse/fine ventilation
- Optional detection and indication of diaphragm failure
- Adjustment and display of pump delivery from the keypad with choice of display in l/h or strokes/min
- Optional external auto-degassing solenoid kit available for outgassing media
- Large backlit graphic display
- External control options via voltage-free contacts with optional increase/reduce speed pulse
- Optional external control via standard 0/4-20 mA signal
- Interfaces for PROFIBUS® DP ([see page 138](#)) or CAN bus system
- 14-day process timer option for time and event-dependent dosing duties
- Connections for 2 stage level switch and flow monitor
- 3 LED displays for operation and warning and error message in plain text
- Optional concentration input for volume-proportional dosing



pk_1_131_2

ProMinent® delta® Solenoid Diaphragm Metering Pumps

Capacity Data

Capacity at Maximum Backpressure

delta® Pump Type	gph (l/h)	psig (bar)	strokes/ min.	Pre-primed suct. lift ft. (m)	Suction/Discharge connectors in.	lbs.	Shipping weights** (kg)
2508	2.0 (7.5)	363 (25)	200	19.6 (6)	3/8" x 1/2" (1/2" MNPT dis. only)	22-24	(10-11)
1608	2.1 (7.8)	232 (16)	200	16.4 (5)	3/8" x 1/4"	22-24	(10-11)
1612	3.0 (11.3)	232 (16)	200	19.6 (6)	3/8" x 1/4"	22-24	(10-11)
1020	5.0 (19.1)	145 (10)	200	16.4 (5)	1/2" x 3/8"	22-24	(10-11)
0730	7.7 (29.2)	102 (7)	200	16.4 (5)	1/2" x 3/8"	22-24	(10-11)
0450	12.9 (49.0)	58 (4)	200	9.8 (3)	5/8" ID hose barb standard*	22-24	(10-11)
0280	19.8 (75.0)	29 (2)	200	6.7 (2)	5/8" ID hose barb standard*	22-24	(10-11)

* (1/2" MNPT optional)

** Higher values are for SS

Note: Universal control cable necessary for external delta control. (see [page 138](#))

Unit pumping Polymer will have a capacity of 10.0 GPH Maximum Capacity.

Materials In Contact With Chemicals

Version	Dosing head	Suction/discharge connector	O-rings	Ball valves
PVT	PVDF	PVDF	PTFE	Ceramic
SST	Stainless steel	Stainless steel	PTFE	Ceramic
NPE	Acrylic	PVC	EPDM	Ceramic
NPB	Acrylic	PVC	Viton®	Ceramic

PTFE-coated dosing diaphragm

Dosing repeatability ± 2% when used in accordance with the operating instructions

Permissible ambient temperature -10°C to +45°C

Viton® is a registered trademark of DuPont Dow Elastomers.

ProMinent® delta® Solenoid Diaphragm Metering Pumps

Identcode Ordering System

DLTA

ProMinent® delta® series

Version:	Capacity:	Version:	Capacity:
2508	2.0 gph (7.5 l/h), 232 psi (16 bar)	0730	7.7 gph (29.2 l/h), 102 psi (7 bar)
1608	2.1 gph (7.8 l/h), 363 psi (25 bar)	0450	12.9 (49.0 l/h), 58 psi (4 bar)
1612	3.0 gph (11.3 l/h), 232 psi (16 bar)	0280	19.8 (75.0 l/h), 29 psi (2 bar)
1020	5.0 gph (19.1 l/h), 145 psi (10 bar)		

Liquid end materials:	
PV	PVDF (for models 1608, 1612, 1020, and 0730)
SS	SS
NP	Acrylic glass/PVC (for pump type 2508, 1608, 1612, 1020 & 0730)

Seals:	
T	PTFE seals
E	EPDM o-rings (NP only)
B	Viton® o-rings (NP only)

Liquid end version:	
0	W/o bleed valve, w/o springs (for SS liquid ends)
1	W/o bleed valve, with springs (for SS liquid ends)
2	With bleed valve, w/o springs
3	With bleed valve, with springs
4	W/o bleed valve, with springs (for high viscosity only)

Connection:	
0	1/2" x 3/8" tubing (for models 1020 & 0730); 5/8" hose barb (for models 0450 & 0280); 3/8" x 1/4" tubing (for models 1608 and 1612)
6	1/2" MNPT Connections (for models 0450 & 0280 and 2508)

Diaphragm failure indicator:	
0	Without diaphragm failure indicator
1	With diaphragm failure indicator

Labeling:	
0	Standard, with ProMinent logo

Electrical connection (± 10%):	
U	115-230 V, 50/60 Hz

Cable and plug with 6 ft (2 m) power cord, single phase:	
A	European plug
D	N. American plug, 115 V
U	N. American plug, 230 V

Relay:	
0	Without relay (Required with Profibus)
1	Fault annunciating relay, drops out
3	Fault annunciating relay, pulls in
4	Option 1 + pacing relay
5	Option 3 + pacing relay
A	Alarm indication + pump shut off
C	Option 1 + 4-20 mA analog output + fault output (24V 100 mA max.)
F	Auto-degassing valve (not available for version 2508)*
G	Auto-degassing valve + fault relay (not available for version 2508)*

Accessory kit:	
0	Not included
1	FV, IV, 15' Tubing (3/8" x 1/4") PVC (for model 1608)
1	FV, IV, 15' Tubing (3/8" x 1/4") PVDF (for model 1612)
1	FV, IV, 15' Tubing (1/2" x 3/8") PVC (for model 1020)
1	FV, IV, 15' Tubing (1/2" x 3/8") PVDF (for model 0730)
1	FV, IV, 5' Suction Tubing (1/2" x 3/8")
1	PVC (1/2" MNPT on Discharge) (for model 2508)
1	FV, IV, 15' Hose (5/8" ID) PVDF (for models 0450 & 0280)

Control Versions:	
0	Manual + External contact (multiplier/divider)
3	Manual + External with pulse control & analog control
4	Option U + 14 day timer*
5	Option 3 + 14 day Timer*
P	Option 3 + Profibus d Sub 9 (Relay must be 0)*
R	Option 3 + Profibus M12 (Relay must be 0)*
C	CANopen

Security:	
0	No Access Code
1	Access Code
Language:	
EN	English

Pause/Float:	
0	Standard

* Available April 2008

DLTA 0450 PV T 3 6 0 0 U D 4 0 3 1 EN 0

ProMinent®

product

solenoid-driven metering pumps

motor-driven metering pumps

pump spare parts & accessories

pump specifications

analytical instrumentation

analytical sensors

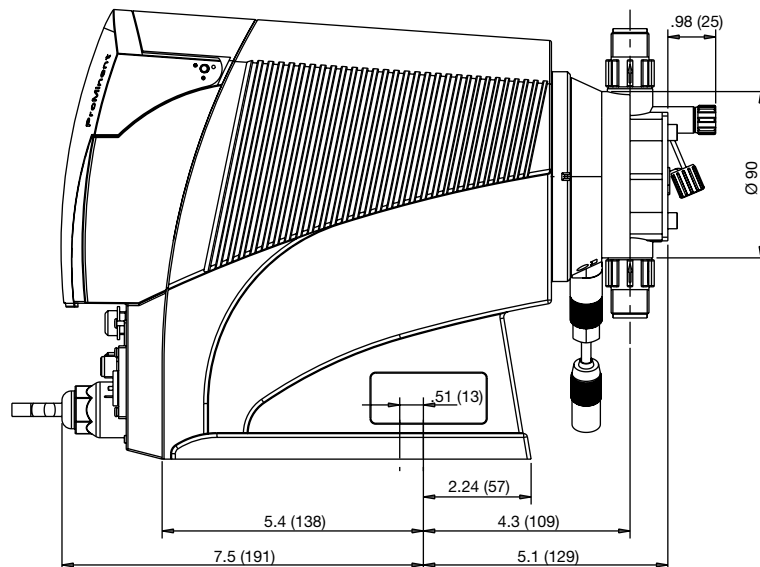
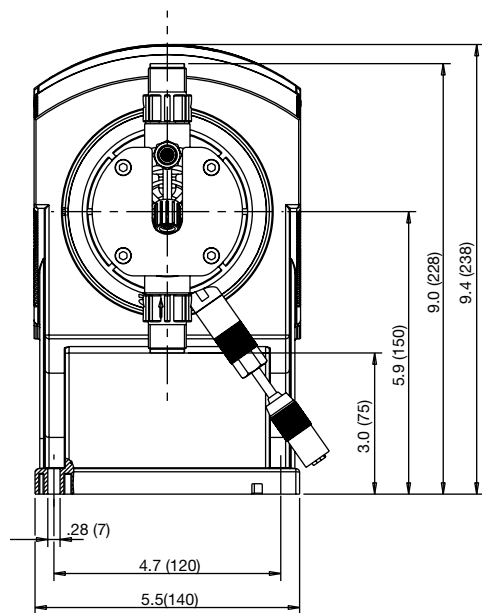
ProMinent® delta® Solenoid Diaphragm Metering Pumps

Dimensional Drawings

Dimensions in inches (mm).

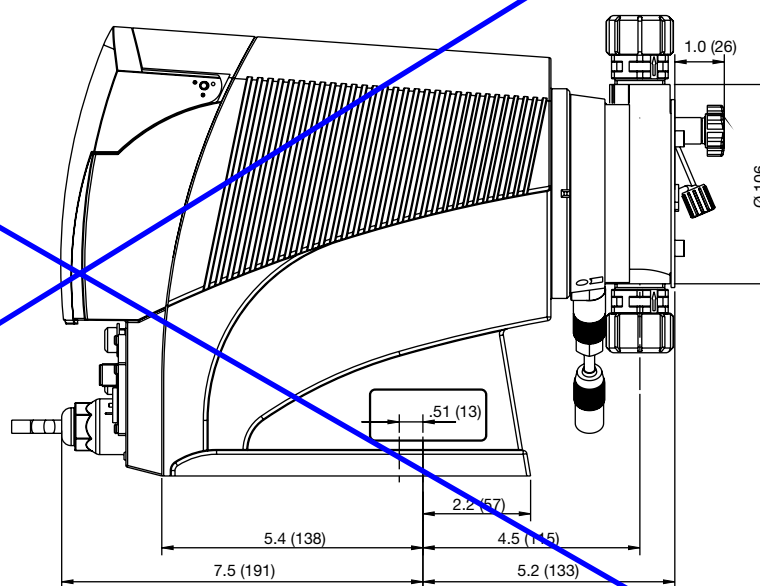
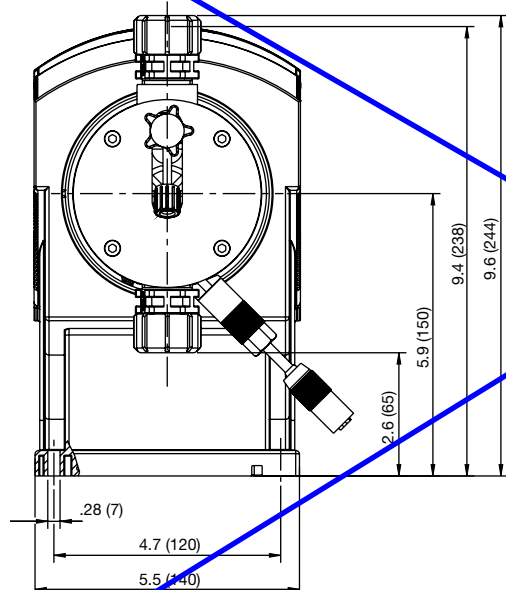
Ranges given, actual dimension dependant on liquid end material.

Dimensions of delta® type 1612 - 0730 PVT



dimensions in inches (mm)

Dimensions of delta® type 0450 - 0280 PVT

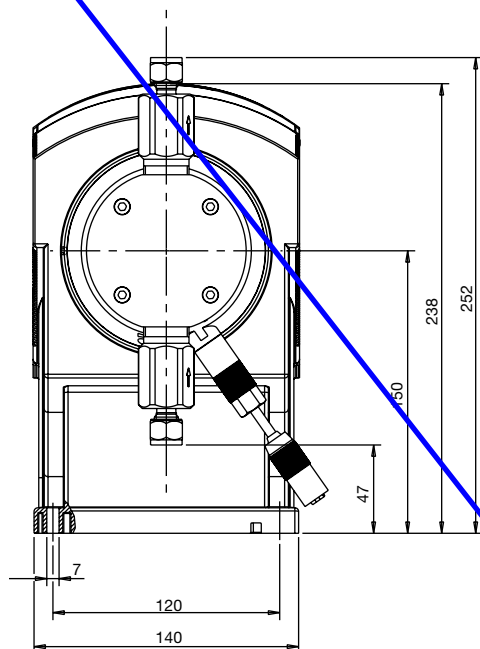


dimensions in inches (mm)

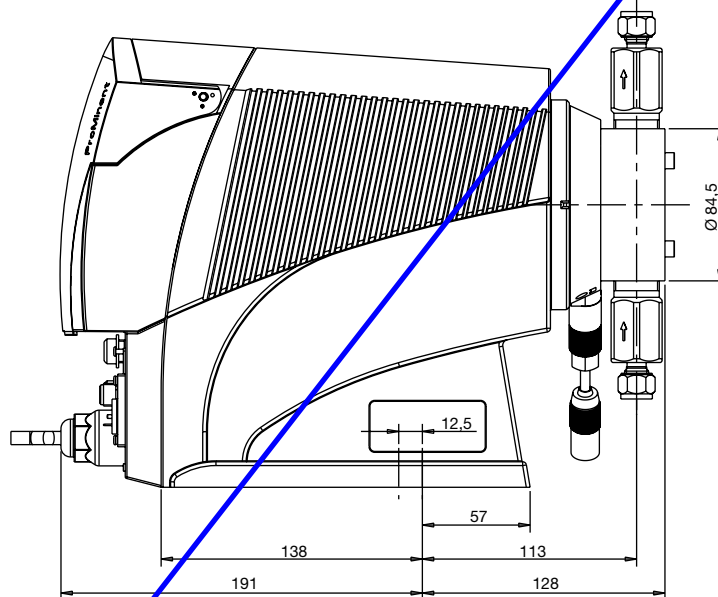
ProMinent® delta® Solenoid Diaphragm Metering Pumps

Dimensional Drawings

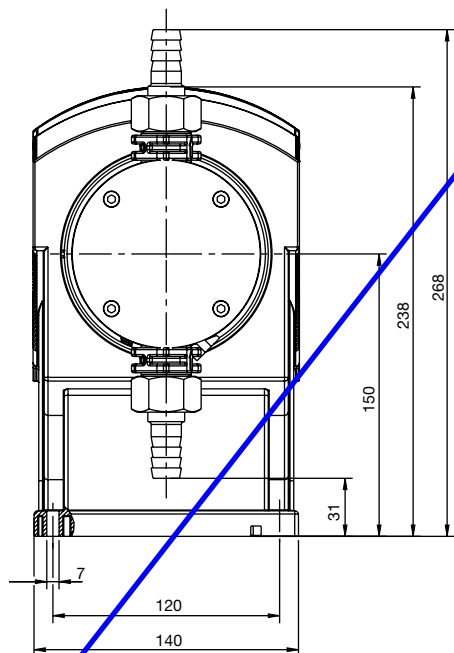
Dimensions of delta® type 1612 - 0730 SST



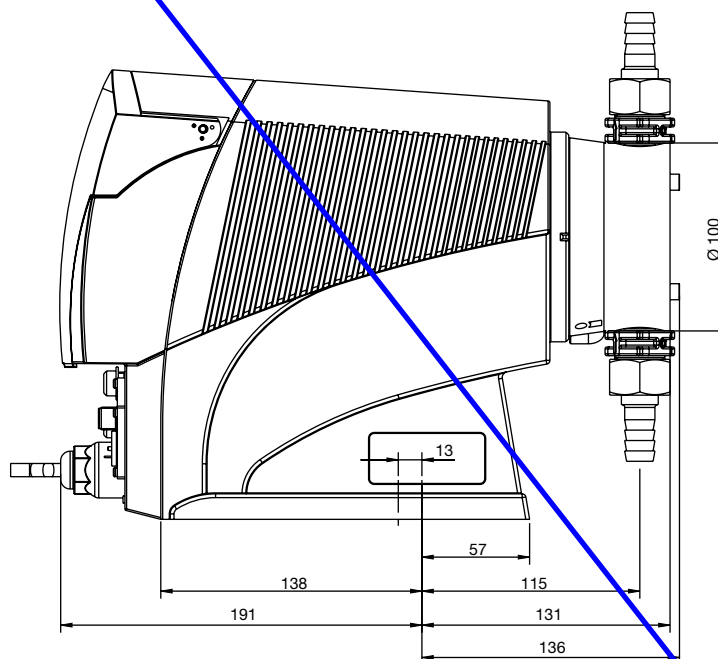
dimensions in inches (mm)



Dimensions of delta® type 0450 - 0280 SST

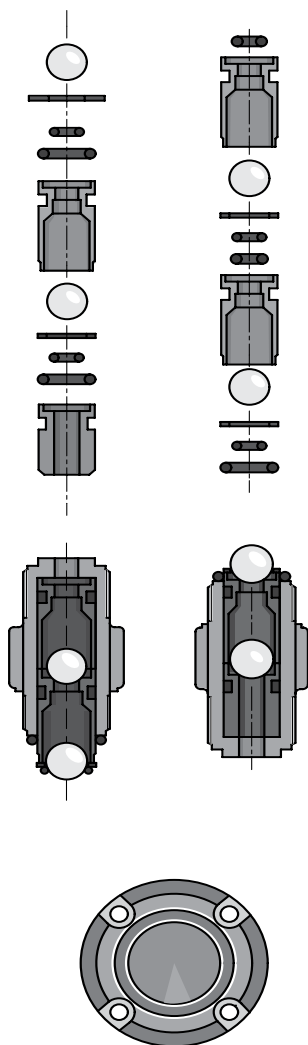


dimensions in inches (mm)



Solenoid Pump Spare Parts

delta®



Spare parts kits for delta®, consisting of:

- 1 diaphragm
- 1 suction valve set
- 1 discharge valve set
- 2 ball valves
- 1 set of O-rings
- 1 connector set

Stainless steel version without suction and discharge valve sets

Spare parts kit for delta®

Liquid End Version	Material Code	Part No.
1612	PVT	1027081
	SST	1027086
1608	PVT	1030225
1020	PVT	1027082
	SST	1027087
0730	PVT	1027083
	SST	1027088
0450	PVT	1027084
	SST	1027089
0280	PVT	1027085
	SST	1027090

Replacement diaphragms for delta® series

Liquid End Version	Material Code	Part No.
1612	all materials	1000248
1020	all materials	1000249
0730	all materials	1000250
0450	all materials	1000251
0280	all materials	1025075

Auto-degassing Retrofit Kit for delta® series

Version	Part No.
115V	1030928

pk_1_008

Operating Instructions

Solenoid metering pump delta®
with controlled solenoid drive optoDrive®



DLTA _____

Please enter the identcode of your device here.

Two sets of operating instructions are required for the safe and correct use of the metering pumps:

The product specific operating instructions manual
and the "General Operating Instructions ProMinent® Solenoid Metering Pumps".

The two are valid only when read in conjunction with one another.

**Please read through operating instructions manual carefully before use. Do not discard.
The operator shall be liable for any damage caused by installation or operating errors!**

Imprint:

Operating Instructions
Solenoid metering pump delta®
with controlled solenoid drive optoDrive®
© ProMinent Dosiertechnik GmbH, 2006

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5-11
69123 Heidelberg
Germany

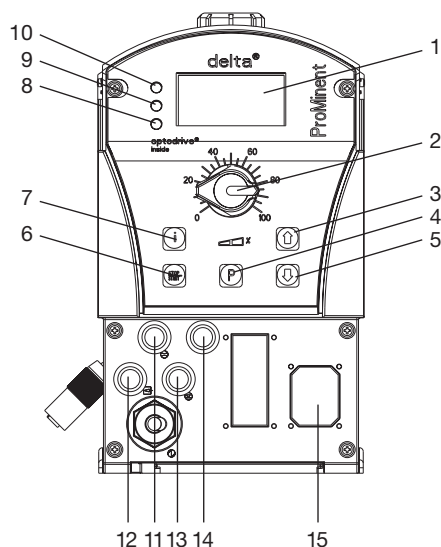
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Fax: +49 6221 842-419

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www.prominent.com

We reserve the right to make technical modifications.
Printed in Germany

Controls and key functions

Controls, Overview



- 1 LCD display
- 2 Stroke length adjustment knob
- 3 UP key
- 4 P key
- 5 DOWN key
- 6 STOP / START key
- 7 i key
- 8 Operating indicator (green)
- 9 Alarm indicator (yellow)
- 10 Fault indicator (red)
- 11 Socket "Dosing monitor"
- 12 Socket "External control"
- 13 Socket "Level switch"
- 14 Socket "Diaphragm failure monitor"
- 15 Relay (option)

Key functions

In continuous displays (operation)

In setting mode (settings)

STOP / START key



briefly pressed

stop pump,
start pump

stop pump,
start pump

P key



briefly pressed

start batch (only in operating mode "Batch"),
acknowledge error

Confirm entry - jump to the next
menu option or to continuous display

2 s pressed

go to setting mode

3 s pressed

jump to continuous display

i key



briefly pressed

toggle between the continuous displays

long pressed

go to the second level of the continuous display

briefly pressed

toggle between the continuous displays

Arrow keys UP or DOWN



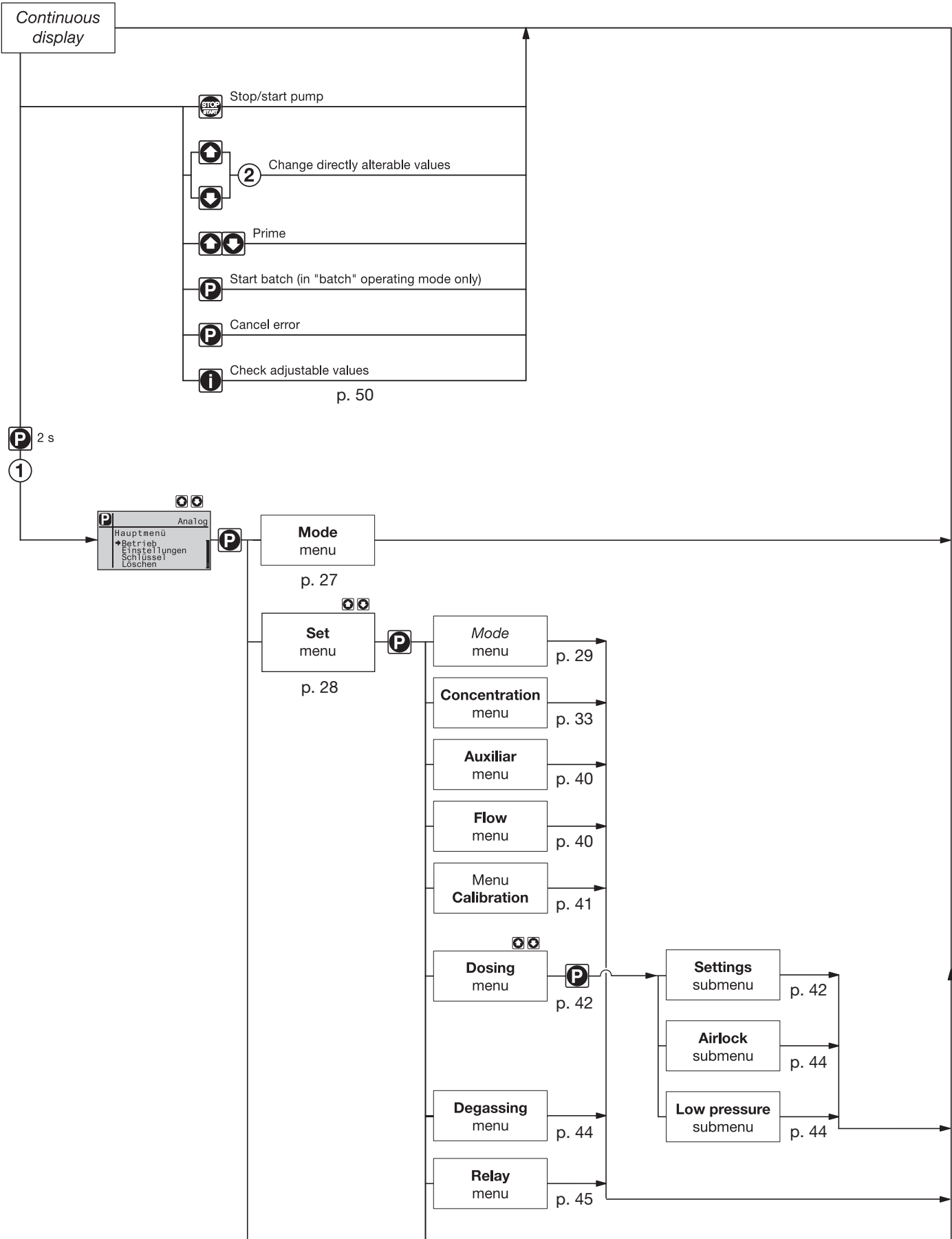
individually pressed
(until "Double arrow"
is displayed)

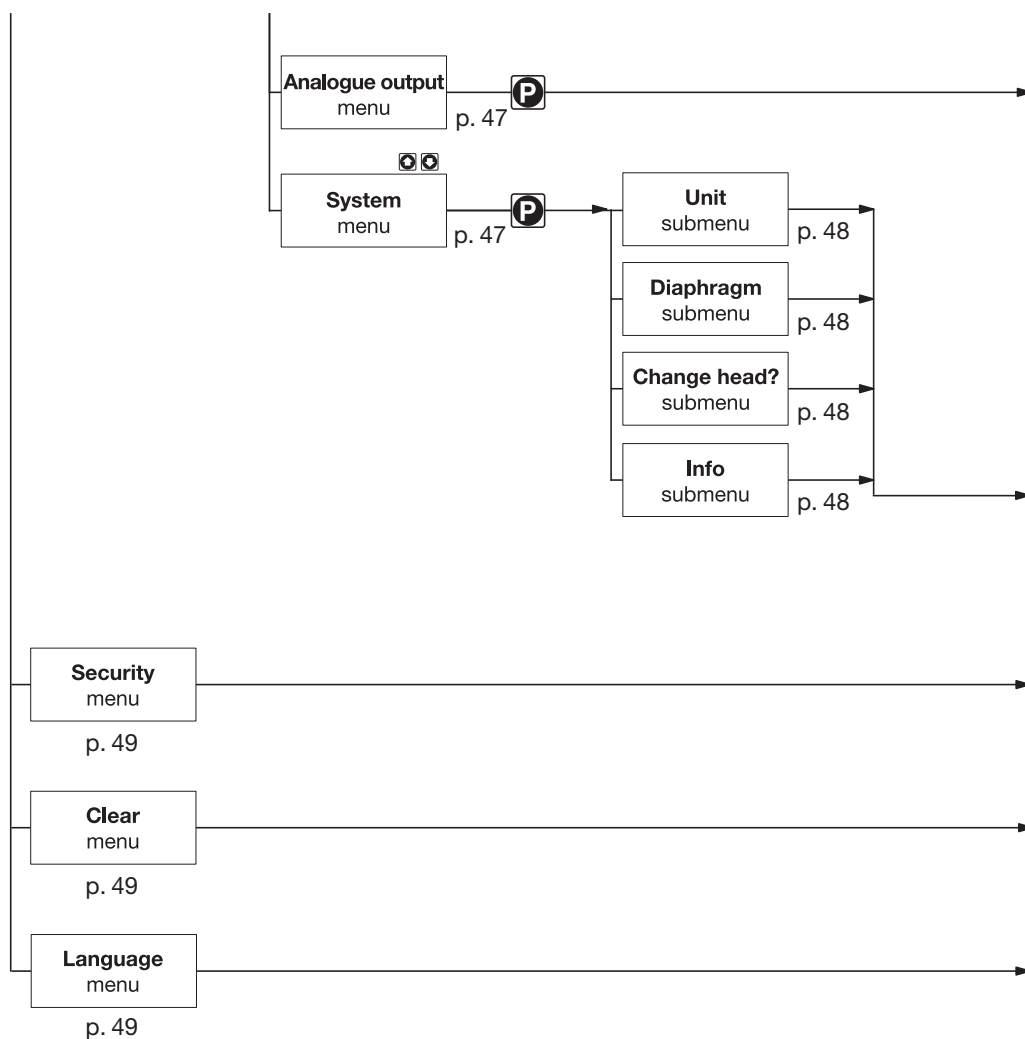
change directly adjustable variables

select another setting,
change individual figure or number
at the upper end of a selection,
effect like ESC key

simultaneously pressed

suction (in continuous display "stroke frequency")














































Permanent displays

	Operating mode "Analog" 0-20 mA	Operating mode "Contact" with memory and transformation factor 5	Operating mode "Batch" with memory and transformation factor 5	Operating mode "Manual"
Stroke frequency (strokes/ h)				
Stroke frequency (strokes/ min)				
Metering output				
Display "External"				
Factor				
Concentration				
<p> = variables which can be directly changed using the arrow keys UP or DOWN</p>				Identifier "m" only if function extension "Stroke memory" is activated

Secondary displays in the permanent display

Secondary display	Operating mode "Manual"	Operating mode "Batch" with memory and transfer factor 5	Operating mode "Contact" with memory and transfer factor 5	Operating mode "Analog" 0-20 mA
Stroke frequency (strokes/h)	12000  /h	12000  /h	12000  /h	12000  /h
Stroke frequency (strokes/min)	200  /min	200  /min	200  /min	200  /min
Metering output	80,00  /h ¹	80,00  /h	80,00  /h ¹	80,00  /h ¹
Factor			5 * 	
Remaining strokes		25,00  ²		
Batch size/remaining litres		000,833  ^{1,2}		
Total number of strokes	86500 	86500 	86500 	86500 
Total litres (metering volume)	576,67  ¹	576,67  ¹	576,67  ¹	576,67  ¹
Stroke length	65 % 	65 % 	65 % 	65 % 
Signal current (at input)				12,7 mA ³
Metering mode	 : slow,  : HV1	 : slow,  : HV1	 : slow,  : HV1	 : slow,  : HV1
Concentration	12,5 %c ⁴	12,5 %c ⁴	12,5 %c ⁴	12,5 %c ⁴

1 = only after completion of the CALIBRATION menu – also after each change of the operating mode

2 = only with function extension "Memory"

3 = only with current output

4 = only after completion of the CALIBRATION menu – also after each change of the operating mode

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Identcode

Please enter the Identcode listed on the rating plate under "Type" into the space below

DLTA	delta® series									
	2508	Pump type Capacity: 25 bar; 7.5 l/h								
	1608	16 bar; 7.8 l/h								
	1612	16 bar; 11.3 l/h								
	1020	10 bar; 19.1 l/h								
	0730	7 bar; 29.2 l/h								
	0450	4 bar; 49.0 l/h								
	0280	2 bar; 75.0 l/h								
	SS	Material liquid ends / valves Stainless steel / stainless steel								
	PV	PVDF/PVDF not for pump type 2508								
	NP	Plexiglass / PVC not for pump types 0450 and 0280								
	T	Material gaskets / diaphragm PTFE/PTFE-coated								
	S	PTFE/diaphragm in addition with FPM-coating for silicate-containing media								
	B	FPM / PTFE-coated								
	E	EPDM / PTFE-coated								
	0	Liquid end type without vent, without valve spring								
	1	without vent, with valve spring								
	2	with vent, without valve spring								
	3	with vent, with valve spring								
	0	Hydraulic connection standard connection according to technical data								
	5	connection pressure-side for hose 12/6, suction-side standard								
	0	Diaphragm failure monitor without diaphragm failure monitor								
	1	diaphragm failure monitor								
	0	Type with ProMinent Logo								
	U	Electrical connection universal control 100-240 V								
	A	Cables and connectors 2 m Europe								
	B	2 m Switzerland								
	C	2 m Australia								
	D	2 m USA / 115 V								
	1	2 m open end								
	0	Relay without relay								
	1	Alarm relay dropping out 1 x changeover 230 V – 8 A								
	3	3 Alarm relay picking up 1 x changeover 230 V – 8 A								
	4	As 1 + clock generator relay 2 x make contact 24 V - 100 mA								
	5	As 3 + clock generator relay 2 x make contact 24 V - 100 mA								
	A	Cut-off and alarm relay dropping out 2 x make contact 24 V – 100 mA								
	C	As 1 + 4-20 mA output 1 x make contact 24 V – 100 mA								
	F	with automatic degassing not for pump type 2508								
	0	Accessories no accessories								
	1	with foot and metering valve, 2 m suction and 5 m pressure line (only for types 1612, 1020, and 0730)								
	2	As 0 + measuring cup								
	3	As 1 + measuring cup								
	0	Control type Manual + external contact with pulse control								
	3	Manual + external contact with pulse control + Analogue 0/4-20mA								
	4	As 0 +14-day process timer								
	5	As 3 +14-day process timer								
	C	CANopen								
	P	As 3 + PROFIBUS® interface, DSab9								
	R	As 3 + PROFIBUS® interface, M12								
	0	Access code without access code								
	1	with access code								
	DE	Language German								
	EN	English								
	FR	French								
	ES	Spanish								
	0	Pause/level Pause break contact, level break contact								

DLTA

General User Information

Please read through the following user guidelines! Familiarity with these points ensures optimum use of the operating instructions.

On the folding page behind the title page, the overviews for “Controls and key functions” and “Operating/setting diagram” are listed.

The overview “Controls and key functions” can be left unfolded when reading the operating instructions.

Key points in the text are indicated as follows:

- Enumerated points
- Instructions

Working guidelines:

NOTE

A note is to facilitate your work.

and safety guidelines identified by pictographs (see Chap. 2)

The rating plate affixed to the title page is identical to the rating plate of the delivered pump such that a clear connection between the operating instructions and the pump is guaranteed.

Please state the Identcode and the serial number shown on the rating plate during any contact or order of replacement parts. Thus, the pump type and the material variants can be clearly identified.

1 About this pump

The solenoid metering pumps of the series delta® with controlled solenoid drive optoDrive® are microprocessor-controlled solenoid metering pumps with the following particularities:

- Continuous and pulsing operation
- Adaptation of the pump to dosing medium
- Detection of blocked metering points, broken metering lines and enclosed air or gas bubbles in the liquid end by the integrated injection control optoGuard.
- Capacity range 7.5 l/h, 25-2 bar
- Stroke length adjustment continuously between 0 - 100% (recommended 30 - 100%)
- Material versions PVDF and stainless steel
- Patented coarse / fine venting
- Diaphragm failure detection and signalling (option)
- Adjustment and display of the output alternatively as strokes/min or l/h via the keyboard
- Large, illuminated graphic display
- External control through potential-free contacts with optional impulse transfer and reduction
- Option of external control via standard signal 0/4-20mA
- Interface for PROFIBUS® or CANopen (option)
- Option 14-day process timer* for time- and event-dependent metering tasks
- Connection for 2-phase level switch
- 3 LED display for operation, warning and error messages in full text
- Concentration input for volume-proportional metering
- Automatic degassing
- Pump type 2508 with 7.5 l/h at 25 bar
- Material NP for pump types 2508, 1612, 1608, 1020, and 0730

2 Safety chapter

Identification of the notes on safety

The following terms are used in the present operating instructions to indicate the various severity levels of the danger:

WARNING: Characterizes a possibly hazardous situation. If not avoided, your life is in danger and serious injuries may result.

CAUTION: Characterizes a possibly hazardous situation. There is a danger of slight or minor injury or damage to property if these notes are disregarded.

The following warning signs are used in the present operating instructions to indicate different types of the danger:



Warning of danger area.



Warning of hazardous electrical voltage.



Warning of unexpected start.

Proper use

The pump may only be used for the dosing of liquid media!

The pump may only be used in compliance with the technical data and specifications stated in the operating instructions!

All other uses or modifications are prohibited!

The pump must not be used to dose gaseous media or solids!

The pump may only be operated by specially trained and authorised personnel!

You are obliged to observe the information in the operating instructions on the various life phases of the system!

Notes on safety



WARNING

- As soon as the pump has been connected to the mains, it may be that the device starts pumping!
Please take care that no hazardous dosing media can leak!
If you did not take any precautions, press the STOP/START key or immediately disconnect delta® from the mains!



WARNING

- The pump cannot be de-energised!
Disconnect the mains cable from the mains in the event of an electrical accident!
- Disconnect the mains cable from the mains before commencing any work at the pump!



WARNING

- Always relieve the pressure from the delivery unit first before commencing any work at the pump!
- Empty and rinse the liquid end before commencing any work at the pump if hazardous or unknown dosing media have been used!
- Pumps for radioactive media may not be shipped!



CAUTION

- The assembly and installation of ProMinent® metering pumps using third-party components which are not verified and recommended by ProMinent are not permitted and may result in personal injury and damage to property for which ProMinent will not be liable!
- When dosing aggressive media, the resistance of the pump materials used is to be observed (see ProMinent® Chemical Resistance List in the equipment catalogue or visit www.prominent.com)!
- If a different liquid end size is installed, the pump must be entered as other pump type in the settings menu!
- Please observe the relevant local regulations for the installation!!

Sound pressure level The sound pressure level is < 70 B (A)
at maximum stroke, maximum stroke frequency, maximum backpressure (water) pursuant to:
DIN EN 12639 (noise measurement at liquid pumps)

3 Storage, transport, and unpacking



CAUTION

- The centre of gravity of the pump is positioned quite at the back!
When lifting, the pump may tilt to the back if this note is disregarded!
- Only transport and store the pump in its original packaging!
- Protect the packaged pump also against moisture and exposure to chemicals!

Environmental conditions for storage and transport:

Storage and transport temperature: -10 to +50°C

relative humidity: < 92 % relative humidity, non-condensing

Please check the delivered unit for completeness:

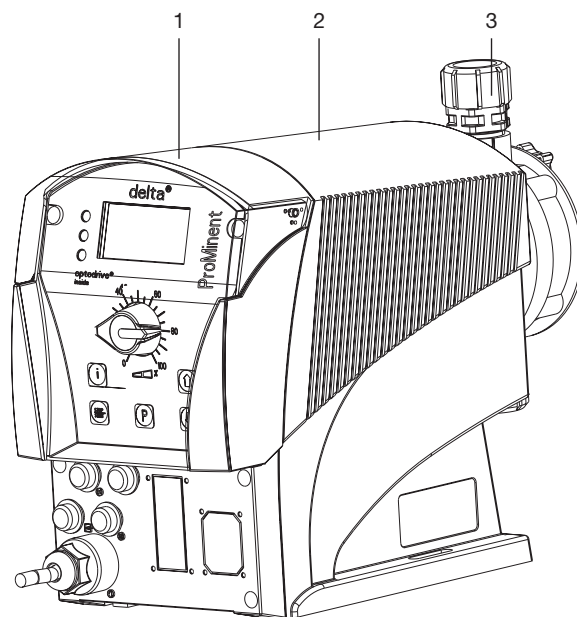
Scope of delivery

- Metering pump with mains cable
- Connecting kit for hose/pipe connection
- Operating instructions including EC Conformity declaration
- accessories, if any

4 Pump layout and controls

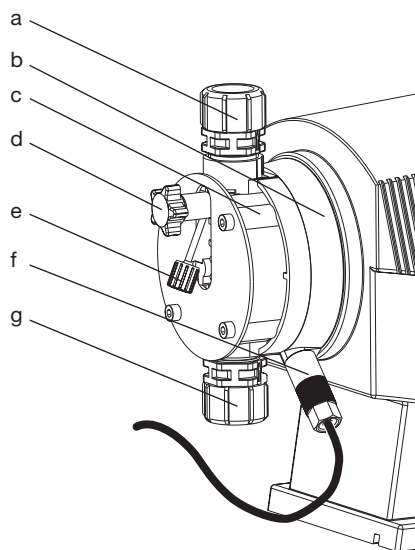
Please unfold the overview “Controls and key functions” on the folding page as supplement to this chapter.

4.1 Pump overview



- 1 Control unit
- 2 Drive unit
- 3 Delivery unit

Fig. 01



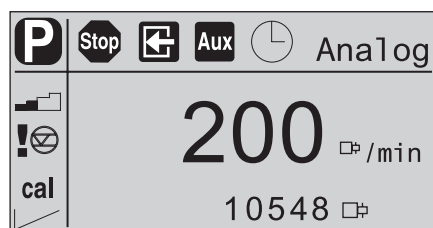
- a Pressure valve
- b End disc
- c Liquid end
- d Coarse-/fine ventilation valve
- e Bypass hose grommet
- f Diaphragm failure monitor
- g Suction valve

Fig. 02

4.2 Controls

Get familiar with the controls of delta® using the overview “Controls and key functions”!

Identifier The LCD display assists in the operation and adjustment of the pump with the following identifiers:



The identifiers have the following meanings:



Suction: The pump is presently taking in (both arrow keys pressed).



Symbol for P key: The pump is in the setting mode.



Key symbol: Locking (if a code was set. Flashes.).



Double arrow symbol: The value in the continuous display can be changed by pressing the arrow keys.



Info icon: Switching between the continuous displays is possible.



Stop: The pump was stopped with the STOP/START key (thus manually).



Pause: The pump was stopped using the pause contact.



Aux: The pump is presently pumping with the auxiliary frequency as stroke frequency. During this time, the pump is in the mode “Manual”.



Error: An error has occurred and the pump has stopped.



Stroke length: The pump is set to “Dosing” “slow” and this dosing mode is also active (below 61 strokes/min). Below 30 strokes/min, the operating indicator flashes in operation and is illuminated a bit longer at each completed stroke.
The symbol refers to the symbol located below the stroke adjustment knob.



Stroke length adjustment: Deviation from the stroke length from the value at the time of last locking of the setting menu.










Diaphragm failure: The diaphragm is fractured. The message is sent as warning or fault, depending on the setting.
The symbol shows the diaphragm in section.



Airlock: Air is in the delivery unit. The message is sent as warning or fault, depending on the setting.
The symbol shows the delivery unit with enclosed air bubbles.



Level: The level “Warning” in the store tank was undershot. When the symbol flashes, the level “Error” in the store tank was undershot and the pump stops.

	or		Flow:	A flow monitor is connected. Together with the exclamation mark, the symbol signals problems with the flow.
			Contact:	The pump is in the mode "Contact". The symbol closes with each contact signal.
			Contact signal:	The pump is in the mode "Batch". The symbol flashes with each contact signal.
p+			Excess pressure monitoring:	A narrowing or a closed shut-off valve on the pressure side results in an increase of the pressure exceeding the maximum permissible operating pressure. The message is sent as warning or fault, depending on the setting.
p-			no pressure:	There is a leakage on the pressure side, a line has burst or is broken. The message is sent as warning or fault, depending on the setting.
m			Memory:	The pump is in the mode "Contact" or "Batch": the additional function "Memory" was set.
0..20			0...20 mA:	The pump is in the mode "Analog". The processing type "0...20" is set.
4..20			4...20 mA:	The pump is in the mode "Analog". The processing type "4...20" is set.
			Straight:	The pump is in the mode "Analog". The processing type "Curve"- "Straight" is set.
			Upper sideband:	The pump is in the mode "Analog". The processing type "Curve"- "Upper sideband" is set.
			Bottom sideband:	The pump is in the mode "Analog". The processing type "Curve"- "Bottom sideband" is set.

NOTE

The pump shows the dosing quantity and the dosing output only in the calibrated state in l or l/h or in gal or gal/h.

5 Functional description

Functional principle Dosing is made as following: The metering diaphragm is pressed to the liquid end; due to the pressure in the metering head, the suction valve closes and the dosing medium flows from the liquid end through the pressure valve. Now, the metering diaphragm is removed from the liquid end; due to the vacuum in the liquid end, the pressure valve closes and fresh dosing medium flows into the liquid end through the suction valve. One work cycle is completed.

The metering diaphragm is driven by a solenoid which is controlled by an electronic control.

Thanks to the optoDrive® drive technology, the time sequence of the dosing flow can be exactly matched to the requirements of the relevant application. Thus, the user can set a slow pressure stroke for almost continuous dosing or a quick stroke e.g. for quickly clocked filling as needed. In both operating modes it is possible to decelerate the suction stroke alternatively (Fig. 3). For dosing media of higher viscosity, the main reason for inaccurate dosing can thus be prevented, viz an incomplete filling of the liquid end. In case of outgassing dosing media, the slow suction stroke prevents cavitation and thus increases the dosing accuracy. Fluctuations of the back-pressure in the dosing line which might result in undesired variations of the dosing quantity are automatically compensated for by the drive. Thus, a dosing accuracy is obtained which otherwise could only be obtained by using complex control circuits.

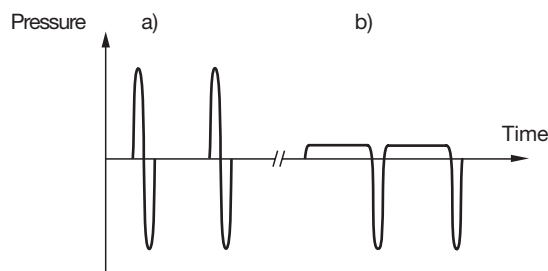


Fig. 3: Dosing modes: a) pulsating, b) almost continuous

The integrated injection control of the hydraulic metering parameters, optoGuard®, is integrated in the drive. It automatically detects blocked metering points or broken metering lines. Depending on the hydraulic installation situation, separate overflow valves and pressure sensors become superfluous and uncontrolled metering is prevented in case of broken lines. The guard also detects air or gasses (airlock) enclosed in the delivery unit. Thus, metering of incorrect quantities is prevented and the process safety is increased. The pertaining messages are shown on the pump's display. The plant operator can determine depending on the type of fault whether a message is to be sent to the process control system via the alarm relay and whether the metering is to be stopped automatically.

Dosing output The dosing output is determined by the stroke length, the stroke frequency as well as the stroke speed. The stroke length is adjusted in the range of 0 - 100% using the stroke length knob. The set dosing quantity is reproduced in a technically meaningful way only between 30 - 100%! The stroke frequency can be set in the range of 0 - 200 strokes using the arrow keys (not in the mode "Analog").

The continuous display "Stroke frequency (strokes / min)" includes decimal places if a stroke frequency is set in the continuous display "Stroke frequency" (strokes / min) which cannot be divided by 6 without remainder.

The stroke speed can be set in the menu "Dosing".

Operating modes The operating modes are selected in the menu "Mode".

Operating mode "Manual":

The stroke frequency is adjusted manually via the control unit.

Operating mode "Batch":

This operating mode offers the option to work with large transfer factors (up to 65535). The dosing can be activated by pressing the P key or by an impulse via the socket "external control" through a contact or a semiconductor switching element. A dosing quantity (batch) or a number of strokes can be preselected via the control unit.

Operating mode "Contact":

This operating mode offers the option to fine-tune with small reducing or transfer factors. The dosing can be activated by an impulse via the socket "external control" through a contact or a semiconductor switching element. With the option "Pulse Control", a dosing amount (batch) or a number of strokes (reducing or transfer factor 0.01 - 99.99) can be preselected via the control unit.

Operating mode "Analog":

The stroke frequency is controlled by an analogue current signal via the socket "external control". The processing of the current signal can be preselected via the control unit.

Functions The following functions can be selected in the menu "Set":

Function "Calibration":

The delta® can be operated in a calibrated state in all operating modes.

The corresponding continuous displays may then directly display the dosing quantity or the dosing output (in the secondary display). The calibration is maintained in the stroke frequency range between 0 - 200 strokes/min.

Function "Auxiliary frequency":

Facilitates the activation of a fixedly adjustable stroke frequency in the menu "Set" which can be activated via the socket "external control". This auxiliary frequency has priority over the stroke frequency settings of the operating modes.

Function “Flow”:

It stops the pump at very low flow in the dosing mode “pulsating”, if a dosing monitor is connected. The number of faulty strokes from which it is to be stopped can be set in the SET menu.

The following functions are available as standard:

Function “Level switch”:

Information about the fill level in the dosing tank is sent to the pump. For this purpose, a two-phase level switch must be installed; this switch is connected to the socket “Level switch”.

Function “Pause”:

The pump can be remotely stopped via the socket “external control”.

The function “Pause” has only an effect if operated via the socket “external control”.

The following functions are triggered by pressing a key:

Function “Stop”:

The pump can be stopped without being disconnected from the mains by pressing the STOP/START key.

Function “Prime”:

By simultaneously pressing both arrow keys, suctioning (short-time delivery at maximum frequency) can be activated.

Option relay The delta® has ports for two options.

Option “alarm relay”:

In the event of error messages, alarm messages or triggered level switch, a circuit can be closed (for alarm horn etc.) via the relay. The relay can be refitted through a recess in the control unit.

Option “alarm and clock generator relay”:

In addition to the alarm relay, a contact can be triggered with each stroke via the clock generator relay. The relay can be refitted through a recess in the control unit.

*Function
and fault indicator*

The three LED indicators and the identifier “Error” of the LCD display show the status and error modes (see also chapter 11):

LCD display An error is shown by the identifier “Error” and an additional, explaining symbol.

LED indicators **Operating indicator (green)**

The operating indicator is illuminated if no fault or alarm messages are received during the operation of the pump. It briefly extinguishes during each stroke.

Below 30 strokes/min, the operating indicator flashes in operation and is illuminated a bit longer at each completed stroke.

Alarm indicator (yellow)

The alarm indicator is illuminated if the electronics of the pump detects a condition which may result in a fault, e.g. “Level shortage 1st stage”.

Fault indicator (red)

The fault indicator is illuminated if an error occurs, e.g. “Level shortage 2nd stage”.

Hierarchy of operating modes, functions, and faults

The various operating modes, functions, and faults have different influences on whether and how the pump is dosing. The following list shows the influence:

1. Prime
2. Error, stop, pause
3. Auxiliary frequency
4. Manual, analogue, contact, batch

re:

1. “Prime” can be made in any mode of the pump (as long as it is functioning).
2. “Error”, “Stop”, and “Pause” stop everything but “Suction”.
3. The stroke frequency of the “auxiliary frequency” has always priority over the stroke frequency which specified an operating mode listed in item 4.

6 Mounting and Installation

6.1 Hydraulic installation



CAUTION

Please observe the notes in the “General Operating Instructions ProMinent® Solenoid Metering Pumps”!

Install the diaphragm failure monitor

- ▶ If a diaphragm failure monitor already exists, remove the plastic cap with the hexagonal head from the end disc.
- ▶ screw in the diaphragm failure monitor fingertight and liquid-tight into the hole (do not use any tools).

6.2 Electrical installation



WARNING

- The installation may only be performed by a specialist!
- Disconnect the pump from the mains during the installation!
- Risk of electric shock – This pump is supplied with a grounding conductor and grounding-type attachment plug. To reduce the risk of electric shock, be certain that it is connected only to a properly grounding-type receptacle.
- Please observe the relevant local regulations when installing the metering pump!
- When paralleling with inductive consumers, an own switching contact, e.g. a relay or contactor, must be installed!



CAUTION

The universal control cable, the external/contract cable and the level monitor cable must not be cut below a length of 1.20m! Otherwise, the cable detection for the cable will fail!

Mains connection The pump is to be connected to the mains using the mains cable.

*Paralleling
to inductive consumers*

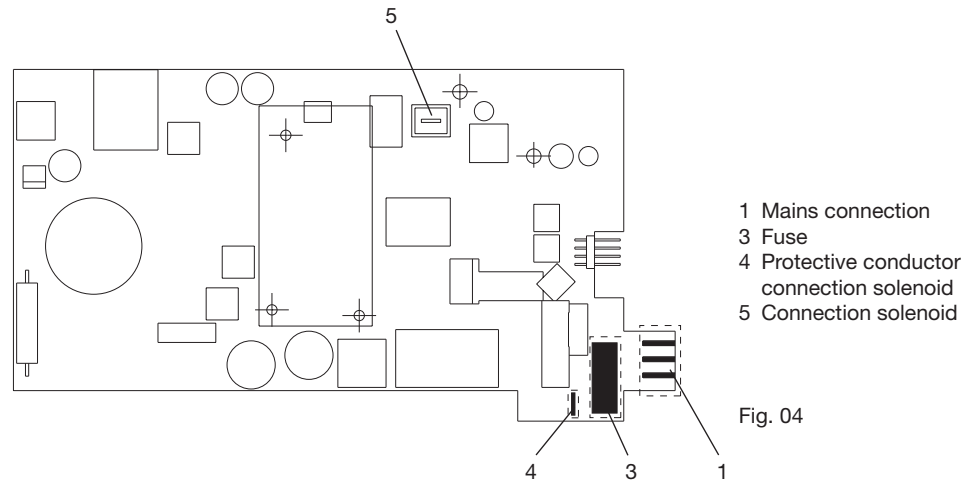
If the pump is connected to the mains in parallel to inductive consumers (e.g. solenoid valve, motor), it must be electrically separated from these consumers. Thus, damages by inducted voltage peaks are avoided when switching off.

- ▶ Install own contacts for the pump and supply with voltage through auxiliary contactor or relay.

If this is not possible, then:

- ▶ Connect in parallel a varistor (order no. 710912) or a RC element 0.22 µF/220 Ω (order no. 710802).

Power module
(in pump base)



Socket “External control” The socket “External control” is a five-pole mounting socket. It is compatible with the hitherto used two- and four-pole cables. The function “Auxiliary frequency” can only be used with a five-pole cable.

- Assignments at the pump** Electrical interface for “External Contact” - “Pause” - “Auxiliary frequency”:
- Voltage at open contacts: approx. 5 V
 - Input resistance: 10 kΩ
 - Control: potential-free contact (load: 0.5 mA at 5 V),
or: semiconductor switch (residual voltage < 0.7 V)
 - maximum impulse frequency: 25 impulses/s
 - required impulse duration: > 20 ms

Electrical interface for “External Analog”:

- Input load resistance (load): approx. 120 Ω
- Maximum current at input: 50 mA

Assignments at the pump

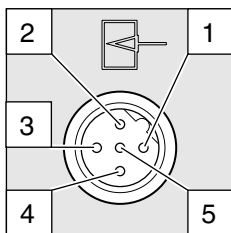


Fig. 05

Pin	Function	2-wire cable	5-wire cable
Pin 1	Pause	jumpered at Pin 4	brown
Pin 2	External Contact	brown	white
Pin 3	External Analog	–	blue
Pin 4	Ground	white	black
Pin 5	Auxiliary frequency	–	grey

Assignments at the plug

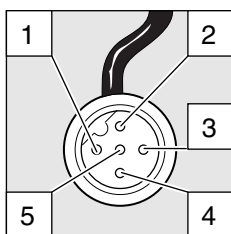


Fig. 06

Function “Pause”:

The pump does not function if

- the cable is connected and Pin 1 and Pin 4 are open.

The pump runs if

- the cable is connected and Pin 1 and Pin 4 are connected.
- no cable is connected (and Pin 1 is free).

Operating modes “Contact” and “Batch”

One or several dosing strokes are performed if Pin 2 and Pin 4 are connected for at least 20 ms. In addition, Pin 1 and Pin 4 must be connected.

Operating mode “Analog”

The stroke frequency of the pump can be controlled via a current signal. The current signal is applied between Pin 3 and Pin 4. In addition, Pin 1 and Pin 4 must be connected.

Function “Auxiliary frequency”

The pump runs with a preset stroke frequency, if Pin 5 and Pin 4 are connected. In addition, Pin 1 and Pin 4 must be connected. This function is factory-programmed to 200 strokes.

NOTE

For a hierarchy of the functions and operating modes see chapter 5!

Serial connection of two delta®

Connect in series two delta® as follows if you want to control through a current signal in the operating mode “Analog” (see paragraph 7.4.4):

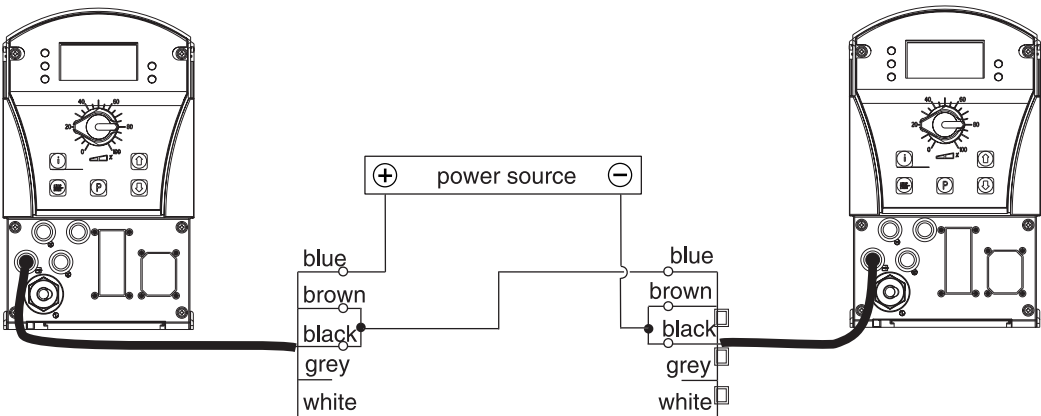


Fig. 07

Socket “Level switch” A 2-phase level switch with pre-alarm and switch-off at limit can be connected.

Assignments at the pump Electrical interface:

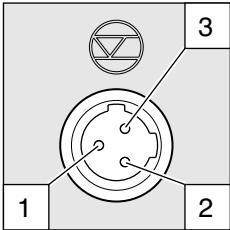


Fig. 08

- Voltage at open contacts: approx. +5 V
- Input resistance: 10 kΩ
- Control: potential-free contact (load: 0.5 mA at +5 V)
or: semiconductor switch (residual voltage < 0.7 V)

Assignments at the plug

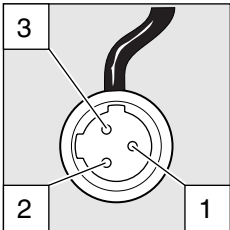


Fig. 09

	Function	3-wire cable
Pin 1	Ground	black
Pin 2	minimum pre-alarm	blue
Pin 3	minimum switch-off.	brown

Socket
"Dosing monitor" A dosing monitor can be connected.

Assignments at the pump

Electrical interface:

- Voltage at open contacts: approx. +5 V
- Input resistance: 10 k Ω
- Control: potential-free contact (load: 0.5 mA at +5 V)

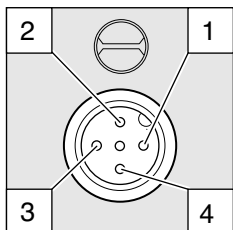
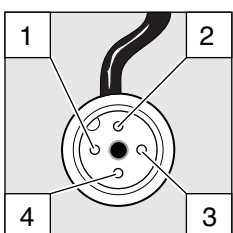


Fig. 10

Assignments at the plug

Function

4-wire cable



- | | |
|-------|----------------------|
| Pin 1 | Voltage supply (5 V) |
| Pin 2 | Coding |
| Pin 3 | Feedback |
| Pin 4 | Ground |

- | |
|-------|
| brown |
| white |
| blue |
| black |

Fig. 11

Socket
"Diaphragm failure sensor" A diaphragm failure sensor can be connected.

Assignments at the pump

Electrical interface:

- Voltage at open contacts: approx. +5 V
- Input resistance: 10 k Ω
- Control: potential-free contact (load: 0.5 mA at +5 V)

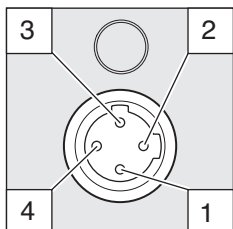
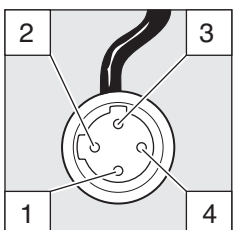


Fig. 12

Assignments at the plug

Function

4-wire cable



- | | |
|-------|----------------------|
| Pin 1 | Voltage supply (5 V) |
| Pin 2 | Coding |
| Pin 3 | Feedback |
| Pin 4 | Ground |

- | |
|-------|
| brown |
| white |
| blue |
| black |

Fig. 13

Relay

Output "Alarm relay"
(Identcode 1 and 3
or 6 and 7)

An alarm relay can be ordered as an option. It is used to send a signal in case of error messages of the pump and for the alarm message "Level shortage 1st stage" and the error message "Level shortage 2nd stage".

A cut-off relay is used to switch off in case of alarm messages of the pump and the error message "Level shortage 2nd stage".

The assignment of the messages to the relay states "dropping out" or "picking up" can be selected via the Identcode.

This behaviour is factory-programmed. If another switching function is required, the delta® can be reprogrammed in the RELAY menu (Chap. 7.5.7).

The relay can be refitted and is operative after insertion of the relay board (see "General Operating Instructions ProMinent® Solenoid Metering Pumps").

- Electrical interface
- Contact load: 230 V/8 A 50/60 Hz
 - Life cycle: > 200,000 switching cycles

Output "other relay"
(Identcode 4 + 5, 8 + 9, A+B)

An alarm and a clock generator output can be ordered as an option. The clock generator output is electrically isolated to a semiconductor switch through an optocoupler. The second switch is a relay.

This behaviour is factory-programmed. If another switching function is required, the delta® can be reprogrammed in the RELAY menu (Chap. 7.5.7).

The alarm/clock generator relay can be refitted (see "General Operating Instructions ProMinent® Solenoid metering Pumps").

- Electrical interface
- | for relay output | for semiconductor switch |
|--|--|
| • Contact load:
24 V/100 mA 50/60 Hz | • Residual voltage: RDSon < 8 Ohm, I off max. = 1 µA |
| • Mechan. life:
> 20 million switching cycles | • Maximum current: < 100 mA |
| | • Max. voltage: 24 V DC |
| | • Clock generator impulse duration: approx. 100 ms |

Output "Power output
plus relay"

As an option, a relay combined with a power output can be ordered. The relay switches either as alarm relay in case of error messages of the pump and for the alarm message "Level shortage 1st stage" and the error message "Level shortage 2nd stage".

The power output can signal one of the following variables to another device:

This behaviour is factory-programmed. If another switching function is required for the relay, the delta® can be reprogrammed in the RELAY menu (Chap. 7.5.7).

For the power output, the variable to be signalled can be selected in the ANALOGUE OUTPUT menu (Chap. 7.5.8).

The power output plus relay can be refitted and is operative after insertion of the board (see "General Operating Instructions ProMinent® Solenoid Metering Pumps").

- Electrical interface
- | for power output | for relay output |
|--------------------------------|--|
| Off-load voltage: 8 V | • RDSon < 8 Ohm, I off max. = 1 µA |
| Current range: 0 / 4 ... 20 mA | • Maximum current: < 100 mA |
| max. ripple: 80 µA ss | • Max. voltage: 24 V DC |
| max. load: 250 Ohm | • Clock generator impulse duration: approx. 100 ms |

Contact assignment at relay cable

Option "alarm relay"
(Identcode 1 and 2
or 6 and 7)

VDE cable	CSA cable	Contact
white	white	NO (normally open)
green	red	NC (normally closed)
brown	black	C (common)

other relays
(Identcode 4 + 5,
8 + 9, A + B)

VDE cable	Contact	Relay
yellow	NO (normally open)	Alarm relay
green	C (common)	Alarm relay
white	NO (normally open)	clock generator relay
brown	C (common)	clock generator relay

Option "Power output
plus relay"

VDE cable	Contact	Output
yellow	Current +	Power output
green	Current -	Power output
white	NO (normally open) or NC (normally closed)	Relay
brown	C (common)	Relay

7 Settings

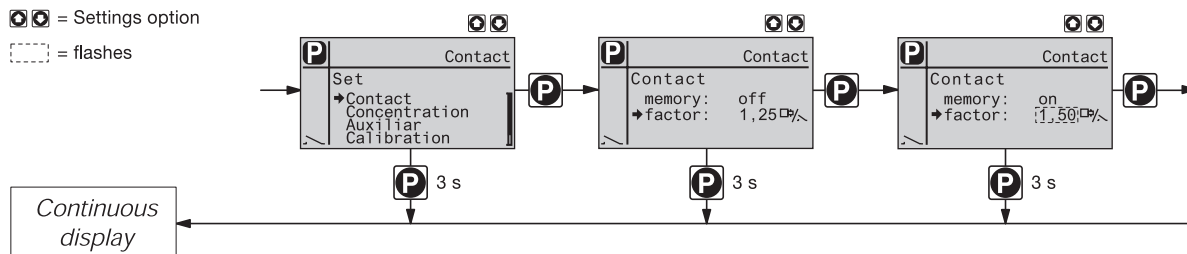
NOTE

- **Unfold the folding page behind the cover page for assistance! There, you will find the overviews for “Controls and key functions” and “Operating/setting diagram”.**
- **The pump will return to a continuous display if no key is pressed for 1 min.**

General information on the settings for delta®

☐☐ = Settings option

▭ = flashes



Confirm entry Briefly press the P key;
at the same time you will go to the next selection, the next menu option or to a continuous display.

Exit menu option without confirmation Press the UP key in the upper selection if no entry has been started (flashing bars);
You will return to the previous menu option or the previous menu – up to the main menu at the most.

Return to a continuous display Press the P key for 3 s;
the entry is cancelled and you will return to a continuous display.

Change adjustable variables Press the arrow keys UP or DOWN;
the figure between the flashing bars is counted up or down.

Confirm adjustable variables At “Changing of a figure”: press the P key 1x;
at the same time you will go to the next selection, the next menu option or to a continuous display.

7.1 Verification of adjustable variables

Before making any pump settings, the present settings of the adjustable variables can be checked:

Press the i key (“i” for “info”) when the pump shows a continuous display (the LCD display does not show the symbol for the P key).

After each activation of the i key, a different continuous display is shown; a double arrow is displayed on the top left. The number of continuous displays depends on the Identcode, the selected operating mode, and the connected additional devices (see overview “Continuous displays”).

The bottom line of the info displays (secondary displays) shows various information which, however, cannot be modified here.

The bottom line of the info display is accessed through a continuous display by pressing the i key when no double arrow is displayed on the top left. Keep the i key pressed until a small arrow appears and goes into the bottom line of the LCD display. Having reached the bottom line, release the i key briefly, then press the i key briefly to browse the info displays of the bottom line.

7.2 Accessing the setting mode

Press the P key for 2 seconds in any continuous display, and the pump goes to the setting mode.

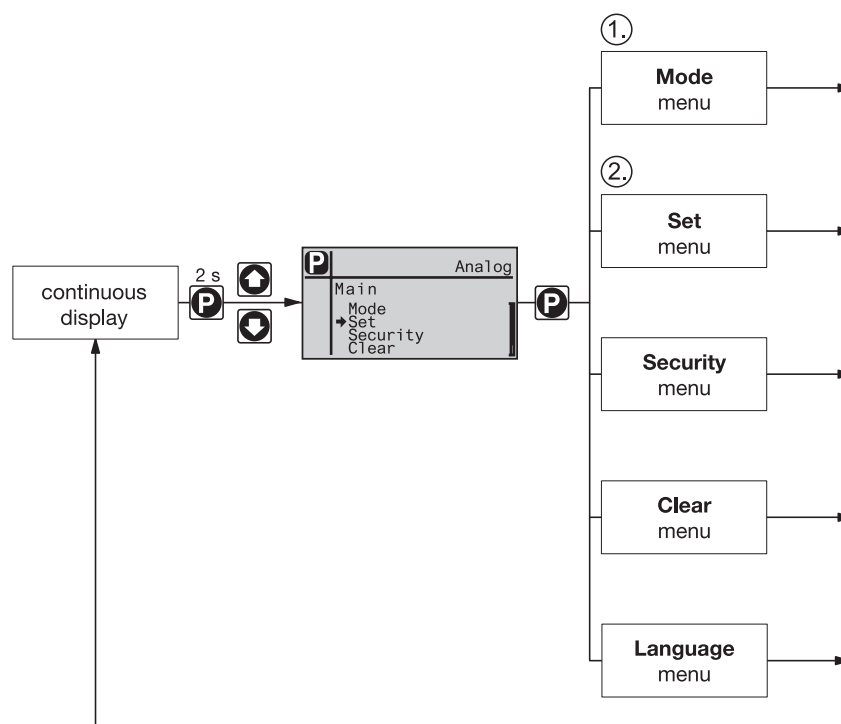
If in "Security" "Lock menu" or "Lock all" was set (key symbol top left), the access code has to be entered first after pressing the P key (arrow keys).

The following menus can be selected at first in the setting menu (see also overview "Operating/setting diagram"):

- Menu "Mode":
- Menu "Set":
- Menu "Security" (option)
- Menu "Clear"
- Menu "Language"

To adapt the pump to your process requirements, you must:

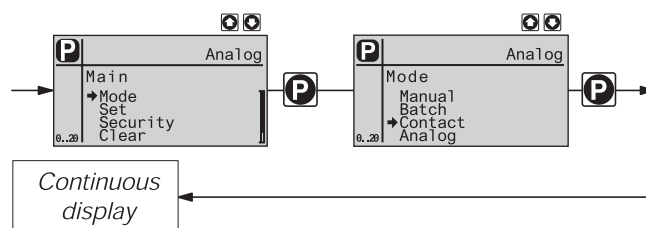
1. Select the operating mode in the menu "Mode".
2. Make the settings for this operating mode in the menu "Set".



7.3 Selection of the operating modes (menu "Mode")

The following operating modes can be selected in the menu "Mode" (some operating mode may be missing depending on the Identcode):

- Manual: for manual operation
- Batch: for batch operation
- Contact: for contact operation
- Analog: for current control



7.4 Settings for the operating mode (menu “Set”)

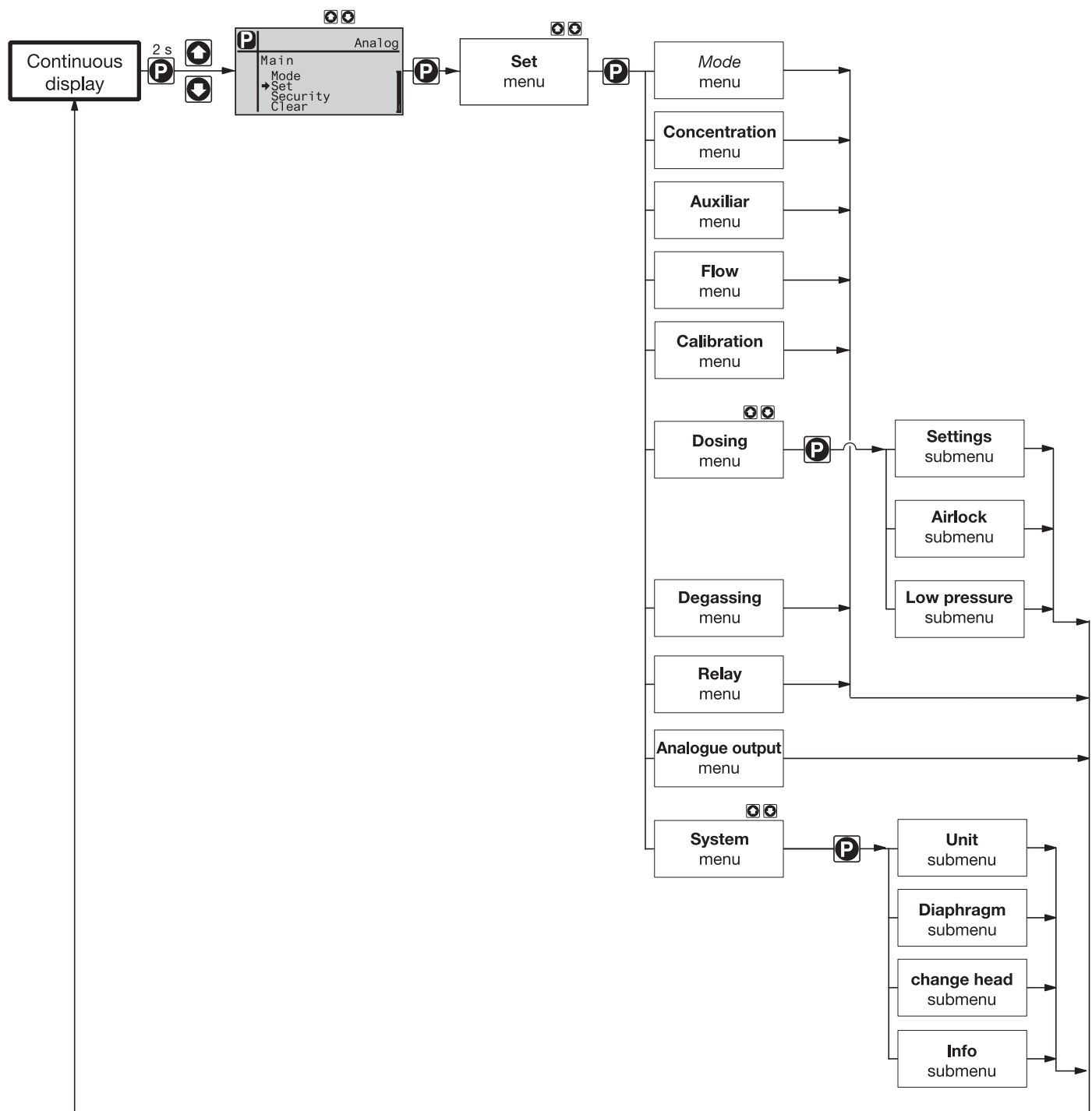
Depending on the selected operating mode, various settings can be made in the menu “Set”.

Setting menus are available for the following programmable functions in all operating modes:

- Concentration
- Auxiliary frequency
- Calibration
- Dosing
- System

See also Chapter 7.5!

Whether a further settings menu is available depends on the selected operating mode and the connected devices or modules.

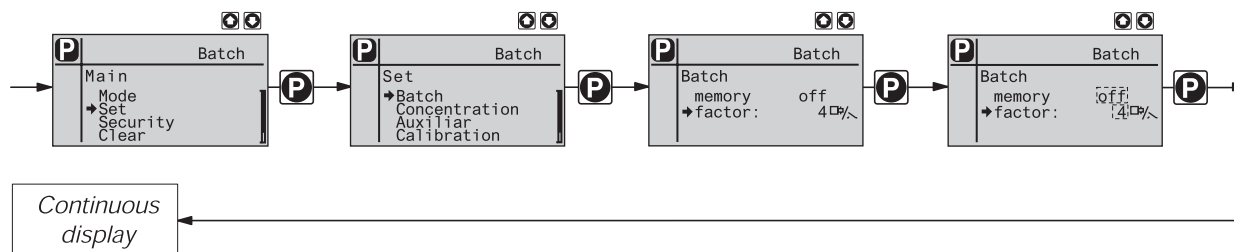


7.4.1 Settings for the operating mode “Manual”

Apart from the setting menus described in detail in Chapter 7.5, no further setting menus are available in the operating mode “Manual” in the menu “Set”.

7.4.2 Settings for the operating mode “Batch” (BATCH menu)

Apart from the setting menus described in detail in Chapter 7.5, the BATCH menu is available in addition in the operating mode “Batch” in the menu “Set”.



The operating mode “Batch” is a variant of the operating mode “Contact” (see first Chapter 7.4.3). Here, a stroke number can be preselected, too (no fractions, only integers between 1 and 65535). The operating mode “Batch” is designed for large dosing quantities.

The dosing can be activated by pressing the P key or by an impulse via the socket “external control”.

The number of the received impulses which could not yet be processed is stored by delta® in the stroke memory.



CAUTION

- When switching from the operating mode “Manual” to the operating mode “Batch”, the pump maintains the stroke frequency!
- The stroke frequency can also be adjusted in the operating mode “Batch”. It should be typically set to 200 strokes/min.

Function extension “Memory”

The function extension “Memory” (identifier “m”) can be activated in addition. With activated “Memory”, the delta® adds remaining strokes which could not be processed.

7.4.3 Settings for the operating mode “Contact”

Apart from the setting menus described in detail in Chapter 7.5, the menu “Contact” is additionally available in the operating mode “Contact” in the menu “Set”.

The operating mode “Contact” facilitates the triggering of individual strokes or a series of strokes.

The strokes can be triggered by an impulse via the socket “external control”.

This operating mode is designed to implement the received impulses into strokes with a reduction (fractions) or a small transfer.



CAUTION

- When switching from the operating mode “Manual” to the operating mode “Contact”, the pump maintains the stroke frequency!
- The stroke frequency can also be adjusted in the operating mode “Contact”. It should be typically set to 200 strokes/min.

The following types exist:

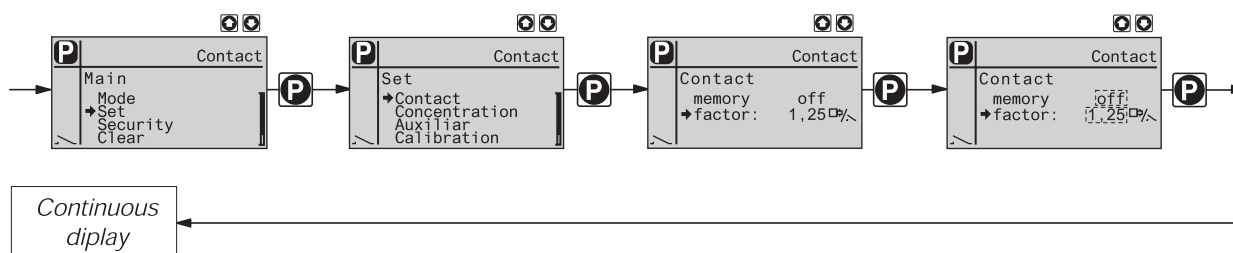
- Contact - Identcode: External contact 1:1 with pulse control
- Contact - Identcode: External contact with pulse control

Contact - Identcode: External contact 1:1 with pulse control

For the type “Contact - Identcode: external contact 1:1 with pulse control, the pump performs exactly one stroke with each impulse (Identcode: external contact 1:1 with pulse control). No entry can be made.

Contact - Identcode: external contact with pulse control

For the type “Contact - Identcode: external contact with pulse control”, the number of impulses a stroke is to follow can be entered. “Contact - Identcode: external contact with pulse control” was designed for small dosing quantities.



The number of strokes per impulse depends on the factor that can be entered. Thus, incoming impulses can be multiplied by a factor from 1.01 to 99.00 or reduced by a factor from 0.01 to 0.99:

“Number of performed strokes = factor x number of received impulses”.

Traditional pumps can only perform complete strokes. If no complete strokes result in the operating mode “Contact”, these are added in a memory until a complete stroke is given and then this stroke is performed (see e.g. pump gamma/L).

Thanks to its controlled solenoid, the delta® pump can also perform incomplete strokes.

Example: Setting: factor $F = 0.5$ and stroke length $H = 80\%$.
Then, one single impulse from the contact requires a stroke with a stroke length of $= f \times H$
 $= 0.5 \times 0.80 = 0.40 (\triangleq 40 \%)$
The delta® thus performs half a stroke with a stroke length of 40% for one single impulse!

Stroke length above 30% If a stroke length above 30% is set, the delta® does not perform any strokes with a calculated stroke length below 15% because of the accuracy. If strokes with a stroke length below 15% result, the pump adds these in a memory – even without “Memory” – until a stroke with a stroke length above 15% is given and then performs this stroke.

Example: Setting: factor $F = 0.1$ and stroke length $H = 100 \%$.
Then, one single impulse from the contact would require a stroke with a stroke length of $= f \times H$
 $= 0.1 \times 1.00 = 0.10 (\triangleq 10 \%)$
The calculated stroke length would be 10%, the delta® thus skips this stroke and waits for the next impulse. The delta® then performs a stroke with a stroke length of 20 % for a total of two impulses!

Calculated stroke length	Impulses (sequence)	Number of strokes (proportioning)
10 %	2 (1 / 1)	1 (- / 20 %)

From this, a further strategy for a processing of the contact signals follows:

If the product of factor f and stroke length H for one single impulse results in a number of complete strokes and in addition in an incomplete stroke below 15% which cannot be performed, the delta® then performs the number of complete strokes, with the exception of the last complete stroke. This stroke and the incomplete stroke which cannot be performed is divided into two equal incomplete strokes which can be performed.

Example: Setting: factor $F = 4.1$ and stroke length $H = 100\%$.

Then, one single impulse from the contact would require the following strokes with a total stroke length of $= f \times H$

$$= 4.1 \times 1.00 = 4.10 (\triangleq 410\%)$$

This results in 4 complete strokes (here with a stroke length of 100%) and 1 incomplete stroke of 10%.

Instead, the delta® performs 3 complete strokes (with a stroke length of 100%) and 2 incomplete strokes with a stroke length of 55% for one single impulse: 100 %, 100 %, 100 %, 55 %, 55 %!

Calculated stroke length	Impulses (sequence)	Number of strokes (proportioning)
410 %	1 (1)	5 (100 % / 100 % / 100 % / 55 % / 55 %)

The number of the received impulses which could not yet be processed is stored by delta® in the memory for strokes. When the STOP/START key is pressed or the function “Pause” is activated, the memory for the strokes is cleared.

For the type “Contact - Identcode: external contact with pulse control”, the pump, e.g. in connection with contact water gauges, can be optimally adapted to the relevant process.

Function extension “Memory”

The function extension “Memory” (identifier “m”) can be activated in addition. With activated “Memory”, the delta® adds remaining strokes which could not be processed.

7.4.4 Settings for the operating mode “Analog”

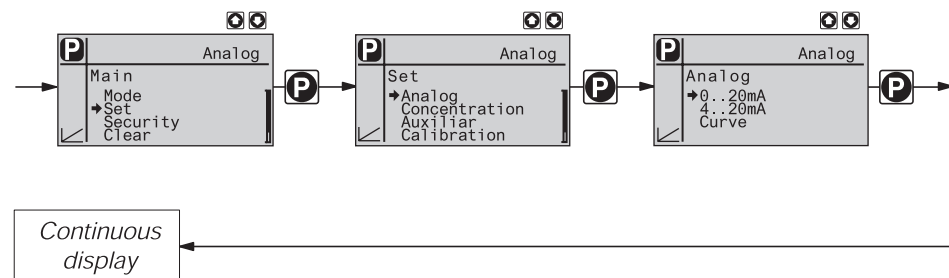
Apart from the setting menus described in detail in Chapter 7.5, the ANALOG menu is in addition available in the operating mode “Analog” in the menu “Set”.

The stroke frequency is controlled by an analogue current signal via the socket “external control”.

The continuous display “Signal current” of the 2nd level shows the incoming current.

Three processing types for the current signal can be selected:

- 0 - 20 mA: at 0 mA, the pump is idle -
at 20 mA, the pump operates at maximum stroke frequency.
Between these values, the stroke frequency is proportional to the current signal.



- 4 - 20 mA: at 4 mA, the pump is idle -
at 20 mA, the pump operates at maximum stroke frequency.
Between these values, the stroke frequency is proportional to the current signal.

For current signals below 3.8 mA, an error message is displayed and the pump stops (e.g. in case of cable break).

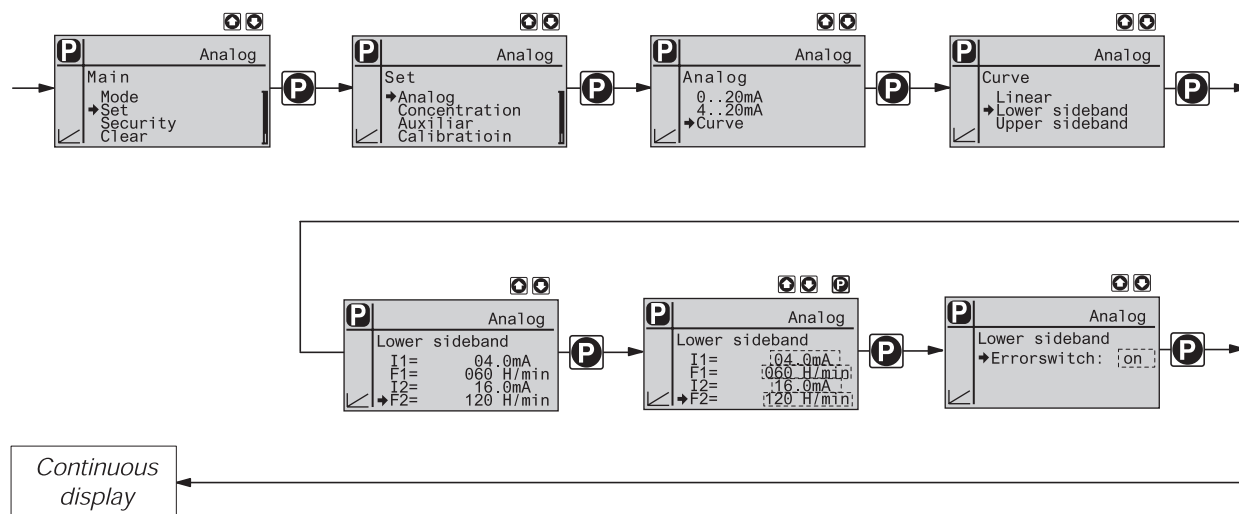
NOTE

The maximum stroke frequency can only be reduced in the processing mode “Curve”, not in the processing modes “0 .. 20” and “4 .. 20”.

- Curve: In the processing mode “Curve”, the behaviour of the pump can be freely programmed.

There exist three options:

- Straight
- Bottom sideband
- Upper sideband



Straight:

The LCD display shows the symbol “Straight”. Any stroke frequency behaviour of the pump proportional to the current signal can be entered. For this purpose, enter any two points P1 (I1, F1) and P2 (I2, F2) (F1 is the stroke frequency at which the pump is to operate at current I1); thus, a straight line and thus the behaviour is specified.

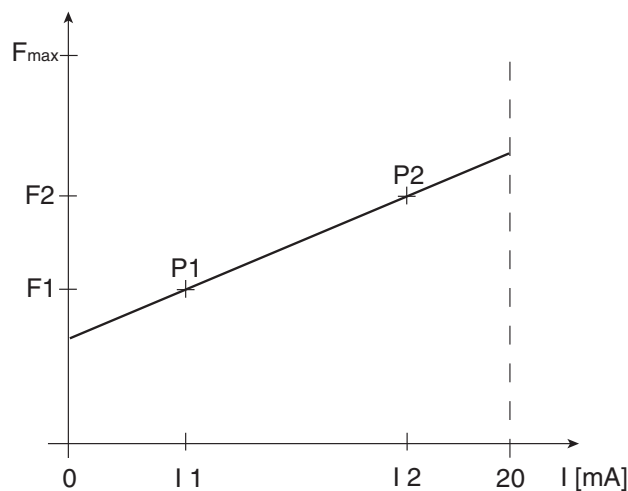


Fig. 14

NOTE

Draw a diagram similar to the one above - with values for (I1, F1) and (I2, F2) - to set the pump as desired!

Bottom/upper sideband:

With these processing modes, a metering pump can be controlled via the current signal as shown in the diagrams below.

However, two metering pumps for different dosing media can also be controlled via a current signal (e.g. an acid pump and an alkali pump via the signal of a pH sensor). The pumps must be electrically connected in series (see wiring diagram in Chapter 6.2).

Bottom sideband

e.g. alkali pump

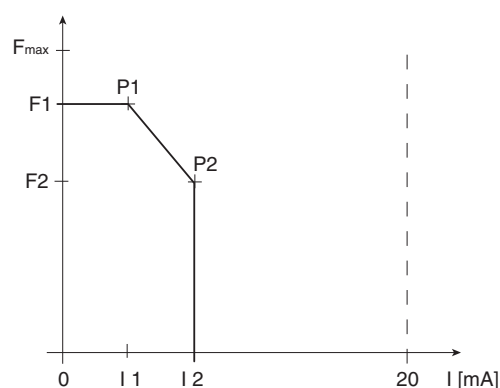


Fig. 15

Upper sideband

e.g. acid pump

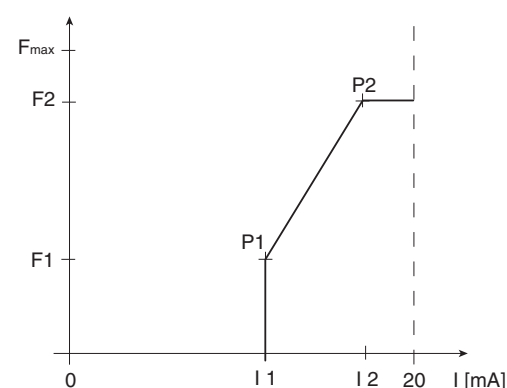


Fig. 16

Bottom sideband:

The LCD display shows the symbol “Bottom sideband“. Below I_1 , the pump operates with F_1 - above I_2 , the pump stops. Between I_1 and I_2 , the stroke frequency between F_1 and F_2 is proportional to the signal current.

Upper sideband:

The LCD display shows the symbol “Upper sideband“. Below I_1 , the pump stops - above I_2 , the pump operates with F_2 . Between I_1 and I_2 , the stroke frequency between F_1 and F_2 is proportional to the signal current.

The smallest processable difference between I_1 and I_2 is 4 mA.

Error processing An error processing can be activated for the processing mode “Curve” in the menu option “alarm signalling” (error). For current signals below 3.8 mA, an error message is displayed and the pump stops.

7.5 Settings for programmable functions (menu “Set”)

In the SET Menu, setting menus are available in all operating modes for the following programmable functions:

- Concentration (CONCENTRATION menu)
- Auxiliary frequency (AUX menu)
- Flow (FLOW menu) (only available if metering monitor connected)
- Calibration (CALIBRATION menu)
- Metering (DOSING menu)
- Relay (RELAY menu) (only available if relay connected)

and the menu

- System (SYSTEM menu)

7.5.1 Settings for the function “Concentration” (CONCENTRATION menu)

When pumping with concentration input, the desired concentration of the metering medium, which is desired later in the solving medium (e.g. the main flow), can be directly entered in the continuous display “mass concentration”.

- Entering of concentration:**
1. Select the mode
 2. In the SET menu, enter the data of the metering medium and the solving medium
 3. Enter the desired concentration in the continuous display “concentration”

NOTE

- The continuous display “concentration” will only be available if:
 - the pump is calibrated
 - the CONCENTRATION menu has been gone through in the mode used
 - and “concentration” was set to “on” (in the mode used).
- The continuous display “concentration” switches to the display mode “%” in case of concentrations exceeding 999.9 ppm.
- When switching between the modes, the pump saves the settings for each mode.
- If the pump is to display the concentration as volume concentration, “1.00” kg/l is to be entered for the mass density of the metering medium.

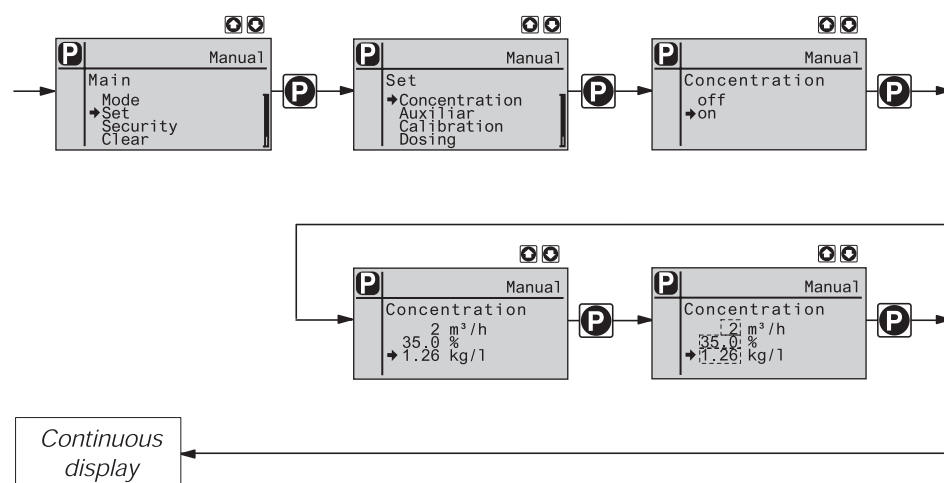
7.5.1.1 Operating mode MANUAL

Fig. 17: Section of the SET menu

The “concentration input” in the mode MANUAL is meant to meter a substance into a piping with a continuously flowing medium such that the substance is present there with a given mass concentration.

**CAUTION**

Risk of excessive concentrations!

System-technical precautions must be taken to prevent that the metering pump does not meter when the flow drops or stops!

Prerequisites Prerequisites are that:

- the flowing medium has the mass density of water ($1 \text{ kg/L} \hat{=} \text{g/cm}^3$)
- the mass concentration of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 35 %)
- the mass density of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: $1.26 \text{ kg/L} \hat{=} \text{g/cm}^3$)

The unit for the liquid volume must be set in the submenu “Unit” in the menu “System” (see Chap. 7.5.9.1)

**CAUTION**

The accuracy of the concentration heavily depends on the accuracy of the calibration of the metering pump and the accuracy of the data entered for the flow!

- ▶ Calibrate the metering pump if not already calibrated (see Chap. 7.5.4).
- ▶ Select the mode MANUAL (any existing settings from other modes remain stored)
- ▶ Select the CONCENTRATION menu in the SET menu
- ▶ Set “on” in the first menu option for working with the concentration display and then press the P key
- ▶ Set the flow and press the P key
- ▶ Set the mass concentration for the metering medium and press the P key
- ▶ Set the density of the metering medium – after pressing the P key, a continuous display appears
- ▶ Press the i key to switch in the continuous display for “concentration” (ppm or %)
- ▶ Use the arrow keys to enter the desired mass concentration.

**CAUTION**

- **Observe the decimal point!**
- **The value of the mass concentration is influenced both by changing the stroke frequency and the stroke length!**

NOTE

The value in the continuous display cannot be changed arbitrarily at the last figures using the arrow keys but only in increments which result from the initial data.

Adjustable value	Lower value	Upper value	Increment
Flow in m ³ /h	1	1000	1
Mass concentration in %	0.1	100	0.1
Mass density in kg/l	0.5	2.0	0.1

Tab. 1: Possible values for adjustable parameters

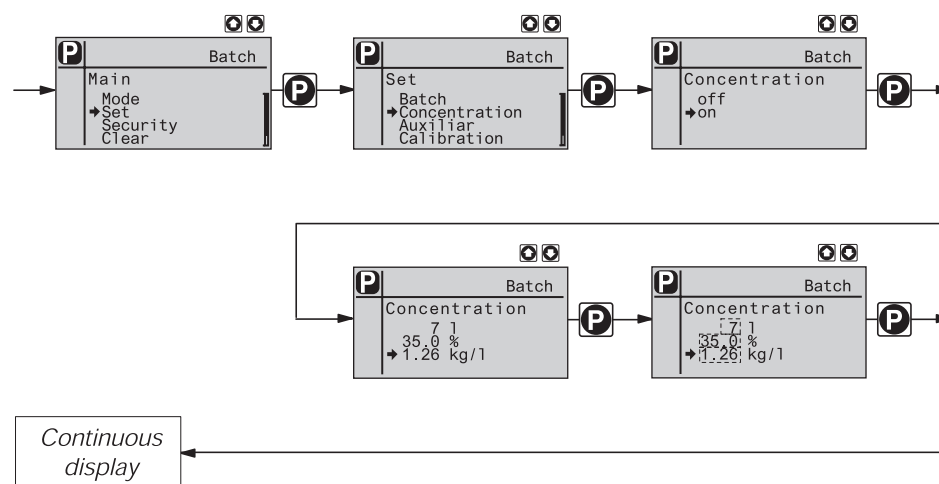
7.5.1.2 Operating mode BATCH

Fig. 18: Section of the SET menu

The “concentration input” in the mode BATCH is meant to meter a substance into a medium in a tank such that the substance is present there with a given mass concentration (preparation of a solution. Remember to mix!).

Prerequisites Prerequisites are that:

- the medium in the tank has the mass density of water (1kg/L)
- the mass concentration of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 35 %)
- the mass density of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 1.26 kg/L $\hat{=}$ g/cm³)

The unit for the liquid volume must be set in the submenu "Unit" in the menu "System" (see Chap. 7.5.6.1)



CAUTION

The accuracy of the concentration heavily depends on the accuracy of the calibration of the metering pump and the accuracy of the entered volume of the medium!

- ▶ Calibrate the metering pump if not already calibrated (see Chap. 7.5.4).
- ▶ Select the mode BATCH (any existing settings from other modes remain stored)
- ▶ Select the CONCENTRATION menu in the SET menu
- ▶ Set "on" in the first menu option for working with the concentration display and then press the P key
- ▶ Set the volume of the medium in the tank and press the P key
- ▶ Set the mass concentration for the metering medium and press the P key
- ▶ Set the density of the metering medium – after pressing the P key, a continuous display appears
- ▶ Press the i key to switch in the continuous display for "Concentration" (ppm or %)
- ▶ Use the arrow keys to enter the desired mass concentration.



CAUTION

- **Observe the decimal point!**
- **The value of the mass concentration is influenced both by changing the stroke frequency and the stroke length!**

NOTE

The value in the continuous display cannot be changed arbitrarily at the last figures using the arrow keys but only in increments which result from the initial data.

Adjustable value	Lower value	Upper value	Increment
Volume in l	1	100	1
Mass concentration in %	0.1	100	0.1
Mass density in kg/l	0.5	2.0	0.1

Tab. 2: Possible values for adjustable parameters

7.5.1.3 Operating mode CONTACT

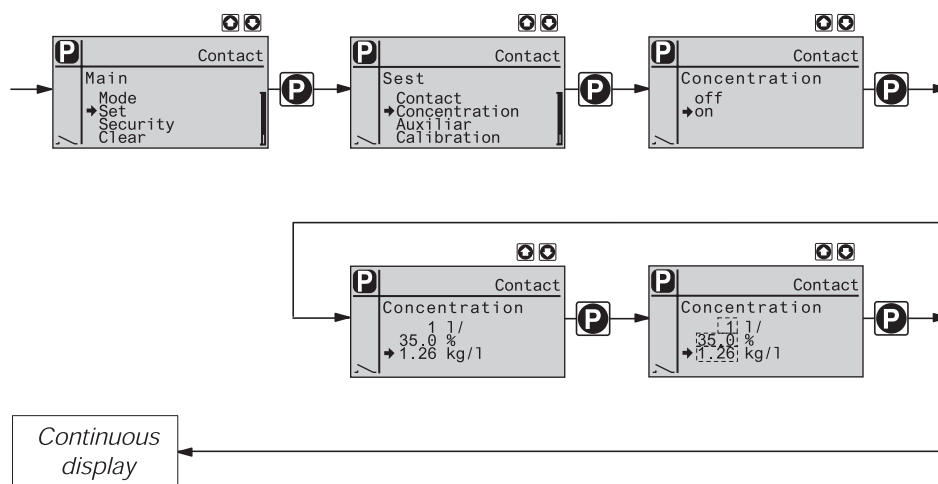


Fig. 19: Section of the SET menu

The “concentration input” in the mode CONTACT is meant to meter a substance into a piping with a variably flowing medium such that the substance is present there with a given mass concentration.



CAUTION

Risk of excessive concentrations!

System-technical precautions must be taken to prevent that the metering pump does not meter when the flow drops or stops!

Prerequisites Prerequisites are that:

- the flowing medium has the mass density of water (1kg/L)
- the mass concentration of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 35 %)
- the mass density of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 1.26 kg/L $\hat{=}$ g/cm³)
- a contact water meter has been installed hydraulically and has been connected to the external input of the metering pump.

The unit for the liquid volume must be set in the submenu “Unit” in the menu “System” (see Chap. 7.5.9.1)



CAUTION

The accuracy of the concentration heavily depends on the accuracy of the calibration of the metering pump and the accuracy of the data entered for the flow!

- ▶ Calibrate the metering pump if not already calibrated (see Chap. 7.5.4).
- ▶ Select the mode CONTACT (any existing settings from other modes remain stored)
- ▶ Select the CONCENTRATION menu in the SET menu
- ▶ Set “on” in the first menu option for working with the concentration display and then press the P key
- ▶ Set the contact distance and press the P key
- ▶ Set the mass concentration for the metering medium and press the P key
- ▶ Set the density of the metering medium – after pressing the P key, a continuous display appears
- ▶ Press the i key to switch in the continuous display for “Concentration” (ppm or %)
- ▶ Use the arrow keys to enter the desired mass concentration.



CAUTION

- Observe the decimal point!
- The value of the mass concentration is influenced both by changing the stroke frequency and the stroke length!

NOTE

The value in the continuous display cannot be changed arbitrarily at the last figures using the arrow keys but only in increments which result from the initial data.

Adjustable value	Lower value	Upper value	Increment
Contact distance in l/contact	0.1	100	0.1
Mass concentration in %	0.1	100	0.1
Mass density in kg/l	0.5	2.0	0.1

Tab. 3: Possible values for adjustable parameters

7.5.1.4 Operating mode ANALOG

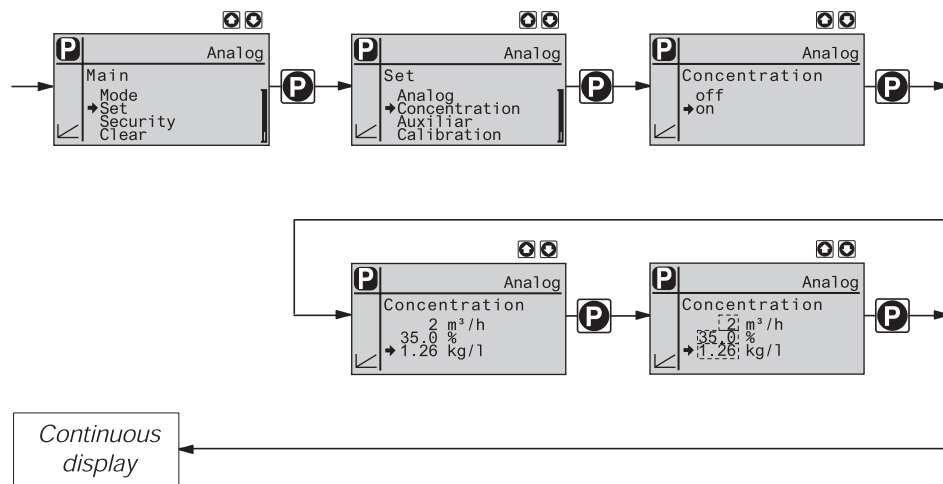


Fig. 20: Section of the SET menu

The “concentration input” in the mode ANALOG is meant to meter a substance into a piping with a variably flowing medium such that the substance is present there with a given mass concentration.



CAUTION

- **Risk of excessive concentrations!**
System-technical precautions must be taken to prevent that the metering pump does not meter when the flow drops or stops!
- **Verify after the setting whether the concentrations at different flows correspond to the desired result!**

Prerequisites Prerequisites are that:

- the flowing medium has the mass density of water (1kg/L)
- the mass concentration of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 35 %)
- the mass density of the metering medium is known (see safety data sheet of the metering medium, e.g. for 35 % sulphuric acid: 1.26 kg/L $\hat{=}$ g/cm³)
- a flow meter with analogue output has been installed hydraulically and has been connected to the external input of the metering pump.

The unit for the liquid volume must be set in the submenu “Unit” in the menu “System” (see Chap. 7.5.9.1)

Preparatory settings:

- ▶ Select the mode ANALOG (any existing settings from other modes remain stored)
- ▶ Set the type of processing for the current signal to “Curve” in the option ANALOG in the SET menu (see Chap. 7.4.4).
- ▶ Set the behaviour of the pump to “Straight”.
- ▶ Set $I_1 = 0\text{mA}$ and for $F_1 = 0$ strokes/min because the straight line has to pass through zero (0/0) (see Fig. 21).
- ▶ Set $I_2 = 20\text{mA}$ and $F_2 = 200$ strokes/min.
- ▶ Set “Error message” to “on” or “off” as desired.

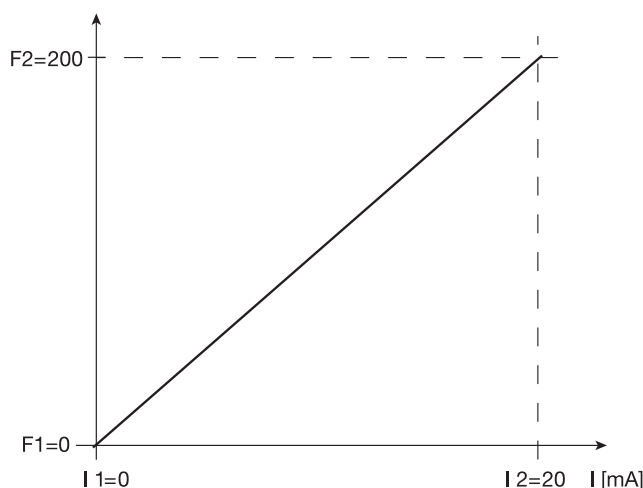


Fig. 21: How the straight line for “Concentration input” in the mode “Analog” has to look like



CAUTION

The accuracy of the concentration heavily depends on the accuracy of the calibration of the metering pump and the accuracy of the data entered for the flow!

- ▶ Calibrate the metering pump if not already calibrated (see Chap. 7.5.4).
- ▶ Select the CONCENTRATION menu in the SET menu
- ▶ Set “on” in the first menu option for working with the concentration display and then press the P key
- ▶ Set the maximum flow and press the P key
- ▶ Set the mass concentration for the metering medium and press the P key
- ▶ Set the density of the metering medium – after pressing the P key, a continuous display appears (ppm or %)
- ▶ Press the i key to switch to the continuous display for “Concentration”
- ▶ Use the arrow keys to enter the desired mass concentration.



CAUTION

- Observe the decimal point!
- The value of the mass concentration is influenced both by changing the stroke frequency and the stroke length!
- The adjustable value of the mass concentration limits the pump to a maximum because otherwise the increments for setting would be unacceptably high. If needed, change the stroke length (do not set below 30%)!

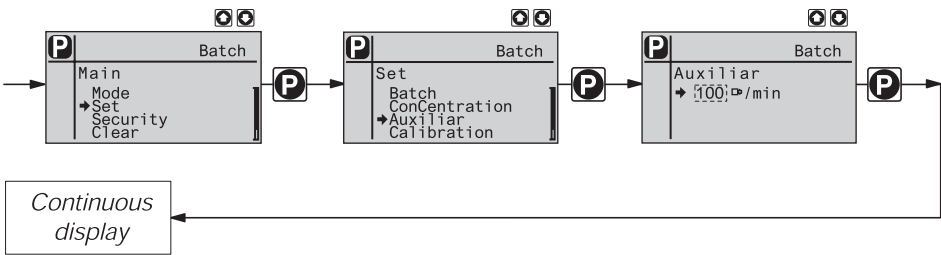
NOTE

The value in the continuous display cannot be changed arbitrarily at the last figures using the arrow keys but only in increments which result from the initial data. If needed, change the stroke length and re-adjust the concentration (the pump compensates through the stroke frequency).

Adjustable value	Lower value	Upper value	Increment
max. flow in m³/h	0.1	100	0.1
Mass concentration in %	0.1	100	0.1
Mass density in kg/l	0.5	2.0	0.1

Tab. 4: Possible values for adjustable parameters

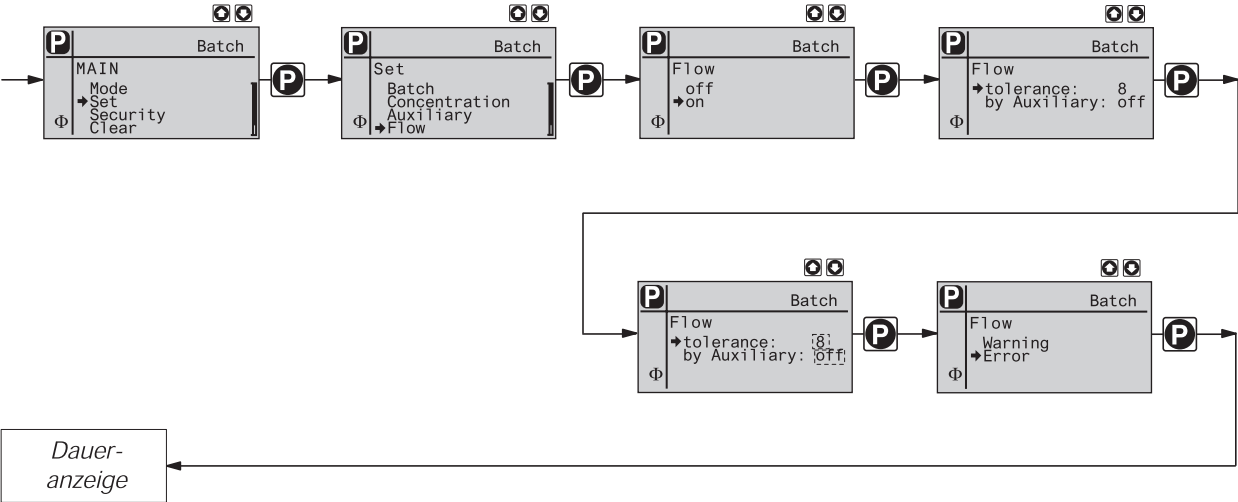
7.5.2 Settings for the function “Auxiliary frequency” (AUX menu)



The programmable function “Auxiliary frequency” facilitates the activation of an additional stroke frequency which can be fixedly set in the AUX menu. It can be activated via the socket “external control”. The identifier “AUX” is displayed in the LCD display if the auxiliary frequency is applied.

This auxiliary frequency has priority over the stroke frequency which is determined by the presently selected operating mode (see also Chap. 5 “Hierarchy of the Operating Modes”).

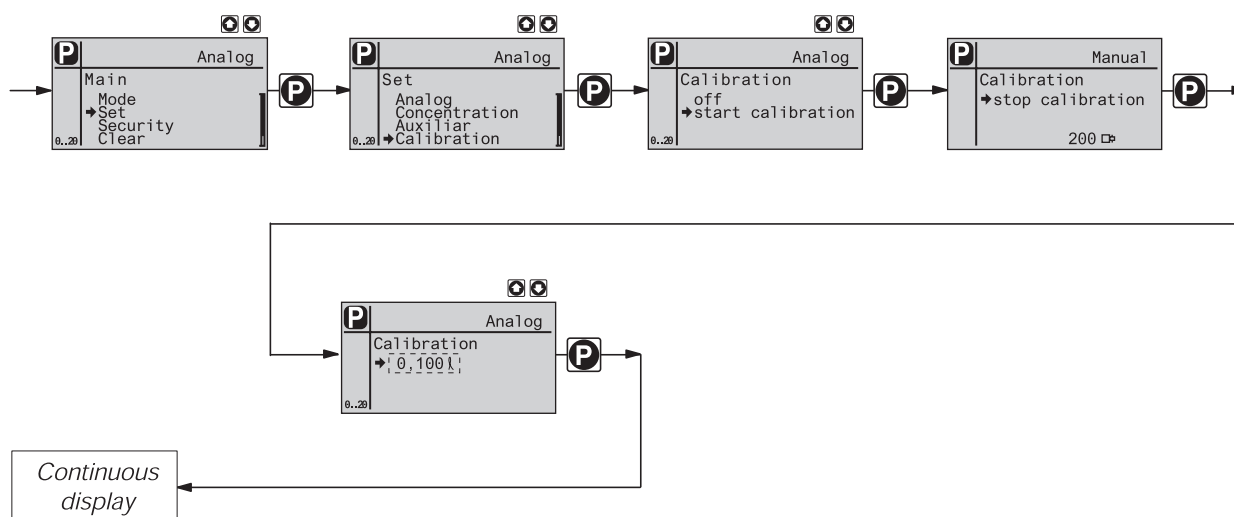
7.5.3 Settings for the function “Flow” (FLOW menu)



The FLOW menu is only displayed if a dosing monitor has been connected to the socket “Dosing monitor“. The dosing monitor registers the individual pressure strokes of the delta® at the pressure port given pulsed dosing (“Dosing” “fast”, DOSING menu) and reports them back to the delta®. If this feedback is missing consecutively as often as set in the FLOW menu in “Tolerance” (because of failure or insufficient dosing), this function stops the delta®. In the last menu option it can be selected whether this case is to result in an error or a warning.

The function “Flow” can only be deactivated for the operating mode “AUX” (auxiliary frequency).

7.5.4 Settings for the function “Calibration” (CALIBRATION menu)



The pump can also be operated in a calibrated state. The corresponding continuous displays then directly display the dosing quantity or the dosing output.

NOTE

- **Do not fall below 30 % stroke length!**
Otherwise, the calibration will be extremely inaccurate.
- **The calibration gets the more accurate the more strokes the pump performs during calibration (recommendation: at least 200 strokes).**



WARNING

If the dosing medium is a hazardous medium, the corresponding safety measures are to be taken during performance of the following settings instructions!

- Calibration**
- ▶ Insert the suction hose into a measuring cylinder with the dosing medium – the pressure hose must be connected finally (operating pressure, ...!)
 - ▶ take in the dosing medium (press both arrow keys simultaneously) if the suction hose is empty
 - ▶ note the filling height of the measuring cylinder
 - ▶ browse the continuous displays with the i key and check whether litres or gallons have been selected
 - ▶ if the wrong volume unit has been selected, select the SYSTEM menu and then the submenu UNIT
 - ▶ select the correct unit with the arrow keys and confirm by pressing the P key
 - ▶ select the CALIBRATION menu and access the first menu option by pressing the P key
 - ▶ select “Start Calibration” with the DOWN key
 - ▶ press the P key to start the calibration: the next menu option “Stop Calibration” is displayed, the pump begins to pump and shows the stroke number (the pump operates at the stroke frequency set in “MANUAL”)

- ▶ stop the pump after a reasonable number of strokes (e.g. 200) by pressing the P key
- ▶ determine the delivered dosing quantity (difference initial quantity - residual quantity)
- ▶ enter this quantity in the displayed menu option and then press the P key – the pump goes to the continuous display

The pump is calibrated.

The relevant continuous displays show the calibrated values.

7.5.5 Settings for the function “Dosing” (DOSING menu)

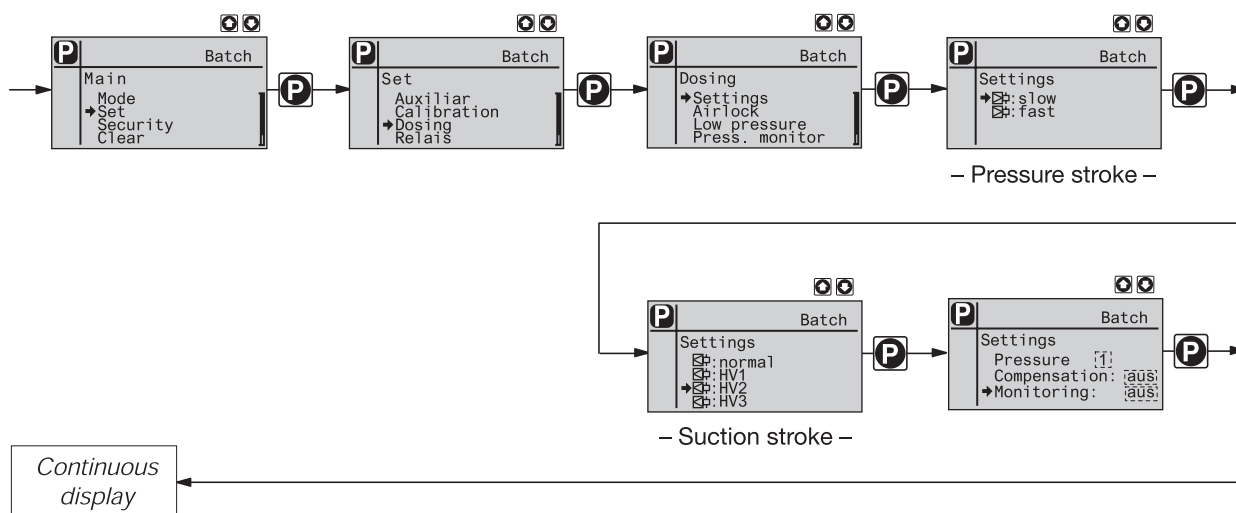
The menu “Dosing” branches into the following submenus:

1. Settings (metering)
2. Airlock
3. Low pressure

The last menu option of “Settings” offers the following functions:

- Pressure (stages)
- Compensation

7.5.5.1 Settings in the submenu “Settings” (dosing)



In the submenu “Settings” (metering), the time sequence of the metering flow of delta® can be exactly matched to the requirements of the relevant application.

Thus, the user can set a slow **pressure stroke** (“Dosing” “fast”) as required for pulsed dosing, e.g. for quickly clocked filling (Fig. 22a) or a slow pressure stroke (“Dosing”, “slow”) for quasi-continuous dosing, e.g. for processes requiring a good mixing (Fig. 22b)) as needed.

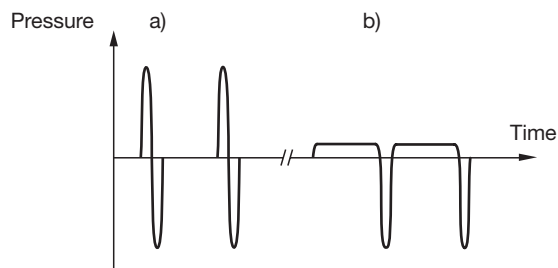


Fig. 22: a) pulsed dosing (fast pressure stroke - “Dosing” “fast”),
b) quasi-continuous dosing (slow pressure stroke - “Dosing” “slow”)

NOTE

Set a stroke length as large as possible to achieve a high accuracy during quasi-continuous dosing!

In both dosing modes it is possible to alternatively decelerate the **suction stroke**. In case of outgassing dosing media, the slow suction stroke prevents cavitation and thus increases the dosing accuracy (Fig. 23 b) and c)). For dosing media of higher viscosity, the main reason for inaccurate dosing can thus be prevented, viz an incomplete filling of the delivery unit.

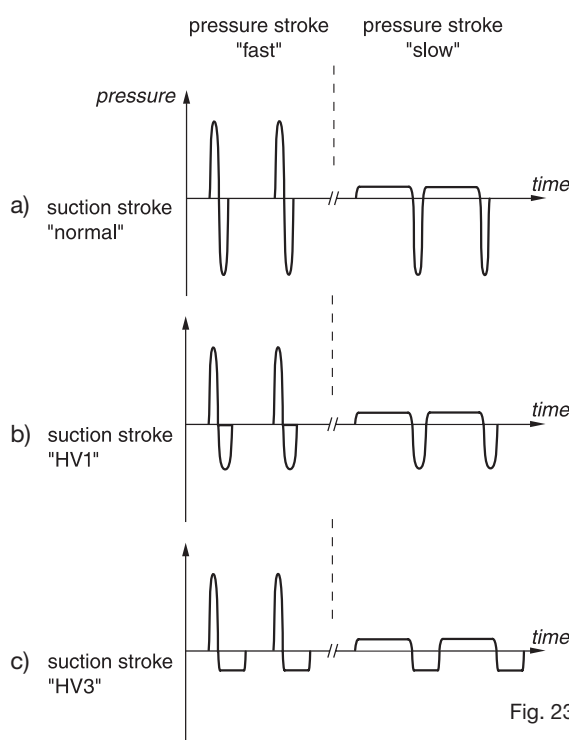


Fig. 23: pulsed and quasi-continuous operation with
a) standard suction stroke,
b) slightly delayed suction stroke,
c) maximum delayed suction stroke

Viscosity in mPa	Setting "Dosing"	Deceleration suction stroke	Max. stroke frequency	Remark
0...50	„normal“	none	200	
50...200	„HV1“	slight	160	
200...500	„HV2“	medium	120	for valves with spring
500...1000	„HV3“	maximum	80	for valves with spring

Tab. 5: Setting to decelerate the suction stroke depending on the viscosity of the dosing medium

The last menu option offers the following functions:

- Pressure (stages)
- Compensation

Pressure stages The nominal pressure of the pump can be reduced using the programmable function "Pressure stages".

Together with the pressure stage, the threshold of the permanently active excess pressure monitoring drops (responds at approx. 30 % excess of the nominal pressure, also pressure stage).



CAUTION

- If a different delivery unit size is installed, the pump must be switched to the corresponding type (see Chap. 7.5.9.4)!
- Select the nominal pressure as high as required and as low as possible! You will thus increase the safety of your system (reduced risk that lines will burst in case of obstruction)!

The following nominal pressure can be selected for these delivery unit sizes through the pressure stages:

Pressure stage/ delivery unit size	1	2	3	4
2508	4 bar	7 bar	10 bar	25 bar
1608	4 bar	7 bar	10 bar	16 bar
1612	4 bar	7 bar	10 bar	16 bar
1020	4 bar	7 bar	10 bar	-
0730	4 bar	7 bar	-	-

For the pump types 0450 and 0280, no setting is possible.

Compensation With the programmable function “Compensation”, you may minimise the effect of backpressure fluctuations and thus achieve a high metering accuracy.

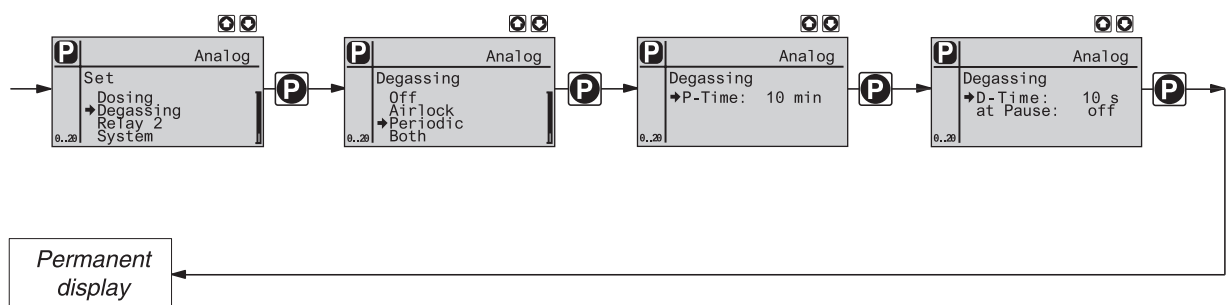
7.5.5.2 Settings in the submenu “Airlock”

If a message appears, this may mean that air is locked in the delivery unit (if a different option than “Never” was set in the submenu “Airlock”). Then, either no intake took place or gas bubbles are present in the delivery unit. These might have been taken in or created by outgassing or cavitation.

7.5.5.3 Settings in the submenu “Low pressure”

If a message appears, the delta[®] determined because of missing backpressure that leakage possibly occurred on the pressure side, a line burst or broke (if a different option than “Never” was set in the submenu “Low pressure”).

7.5.6 Settings for the function “Degassing”



The menu DEGASSING is only displayed if a degassing module is connected. The module is also immediately detected even with the pump in operation and the function is integrated into the operating menu (plug and play).

The function “Degassing” serves the controlled venting of the delivery unit if the pump is equipped with the option “degassing module” (can be refitted).

There exist two versions of the degassing module with different effects on the operating menu:

- Version with only 1 relay – to control the degassing valve. The menu DEGASSING replaces the menu RELAY.
- Version with 2 relays – one relay to control the degassing valve and one relay for free use. For this, the additional menu RELAY 2 is displayed below the menu DEGASSING.

The function “Degassing” can be triggered by three different kinds of action:

- by the internal signal “degassing” from the drive unit of the pump
- by the control unit periodically for the defined duration (both adjustable)
- if one of the two events occurs.
- If “Airlock” was selected in the menu, the internal signal “Airlock” triggers the degassing cycle. If the message appears again after the degassing cycle within 8 minutes, the control unit repeats the degassing cycle for a maximum of 3 times. If the message is still present, an error message is generated which has to be acknowledged by pressing the “STOP/START” key.

For “Airlock”, the possibility of a direct error or alarm message is no longer given for the signal “Airlock”. The corresponding menu option in the METERING menu is also masked out. The signal is only available for the function “degassing”.

- If “Periodic” was selected in the menu, the control unit triggers the degassing cycle periodically with the adjustable period (10 ... 1,440 min = 24 h) and the adjustable duration (“Met. time”: 0 ... 300 s = 5 min).
Triggering is always made at the beginning of a period. Thus, starting via the “STOP/START” key or connecting to supply voltage triggers a degassing cycle.
If the function “at pause” was set to “on” in the menu, degassing also takes place during a pause.
- If “Both” was selected in the menu, either the internal signal “Airlock” or the control unit triggers the degassing cycle. If one of the triggers occurs while the other one already triggered a degassing cycle, the result is two degassing cycles following each other.

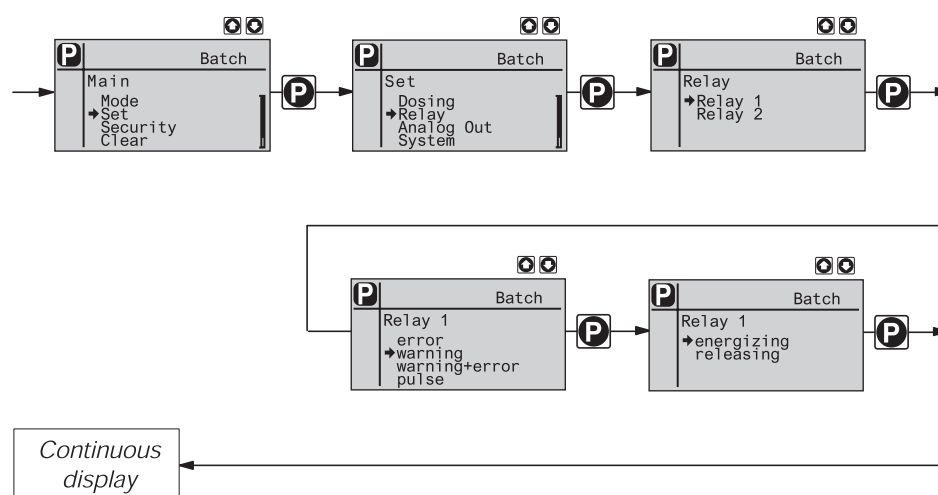
Course of the degassing cycle (automatically):

1. The pump control stops the current regular metering operation - the symbol “Stop” is displayed on the LCD screen.
2. After 1s, it opens the degassing of the delivery unit (via the degassing relay and the solenoid valve).
3. 1s later, the pump starts to work at its maximum possible stroke frequency (as for suctioning) – the symbol “Airlock” replaces the symbol “Stop” on the LCD screen.
4. The pump continues to work this way for the entire defined time.
5. As soon as the defined time has expired, the pump stops, the signal “Stop” appears again on the LCD screen.
6. After 1s, the pump control deactivates the degassing of the delivery unit.
7. After 1s, the symbol “Stop” disappears and the pump returns to its regular operation.

If the pump is in the “Stop” mode at the time of triggering (key “STOP/START”, pause, error), the start of the degassing cycle is delayed – up to the cancellation of this mode.

If the pump is set to the “Stop” mode during the degassing cycle, the pump control immediately goes to phases 5 and 6 (see above). Thus, the degassing cycle is cancelled in defined way. As soon as the “Stop” mode is cancelled, the degassing cycle starts from the beginning.

7.5.7 Settings for the function “Relay” (RELAY menu)



With the programmable function “Relay”, you can adapt the relays of the delta® to your requirements.

The relay can be reprogrammed to almost any setting using the function “Relay”.
Exception: The two 8 A alarm relays (1 and 2 in the Identcode) and the 8 A cut-off relays (6 and 7 in the Identcode) can only be reprogrammed from “picking up” to “dropping out” and vice versa.

Identcode feature		“Relay 1” (Relay with mechanical contacts)	“Relay 2” (Semiconductor relay)
4 + 5	Alarm relay and clock generator relay	Alarm relay	Clock generator relay
8 + 9	Cut-off relay and clock generator relay	Cut-off relay	Clock generator relay
A + B	Cut-off relay and warning relay	Alarm relay	Warning relay

Tab. 6: Allocations of relay combinations

You can determine whether the relevant relay is to be switched in response to a triggering event of the timer, in case of an alarm message, an error message or a stroke of the pump:

Settings in the RELAY menu	Effect
Alarm	The relay switches at an alarm message (yellow LED*).
Fault	The relay switches at an error message (red LED*).
Alarm+fault	The relay switches at an alarm message (yellow LED*) or an error message (red LED*).
Clock generator	The relay switches with every stroke.
Option	The relay is available for the option which was integrated as module.
Warn. + err. + stop	The relay switches at an alarm message (yellow LED*) or an error message (red LED*) or a stop (STOP/START key or pause).

Tab. 7: Selectable types of behaviour:

* see Chap. 11 “Troubleshooting”

You can also determine how the relevant relay is to behave when switched by the delta®. This can be influenced by you by setting PICKING UP / DROPPING OUT.

NOTE

The setting options for the function “Relay” are only given if a relay exists.

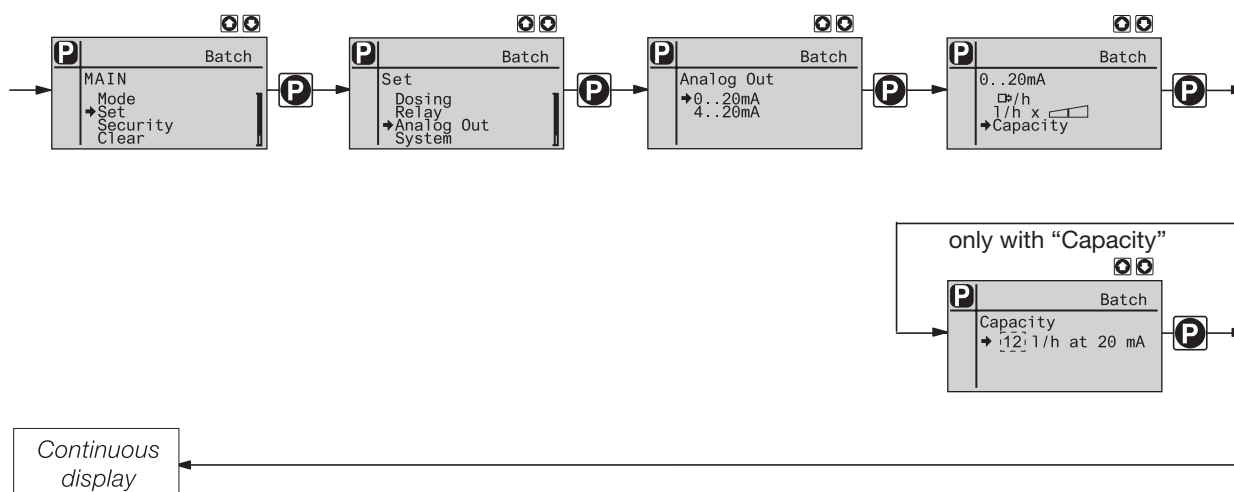
The following table summarised the behaviour of the available relay types according to Identcode as delivered:

Relay type	Behaviour
Warning relay	switches at an alarm message (yellow LED*).
Alarm relay	switches at an alarm message (yellow LED*) or an error message (red LED*).
Cut-off relay	switches at an error message (red LED*).
Clock generator relay	switches with every stroke of the pump.

Tab. 8: Behaviour of the relay types according to Identcode

* see Chap. 11 “Troubleshooting”

7.5.8 Settings for the function “Analogue output” (ANALOGUE OUTPUT menu)



With the programmable function “Analogue output”, you can adapt the signal of the power output of the delta® to your requirements.

The signal I of the power output signals one of the three following variables:

- Strokes / h
- Litres / h x stroke length (= present, mathematical metering output)
- Output (=metering output, value adjustable at 20 mA)

In the status “Stop” (because of fault or operation) or “Pause”, the power output delivers a current of 4mA (0mA).

The delta® calculates the signal for the present mathematical metering output “Litre / h” based on the following formula (for the range 4-20mA):

$$I(4...20) = 16 \times f/f_{\max} \times L/100 + 4$$

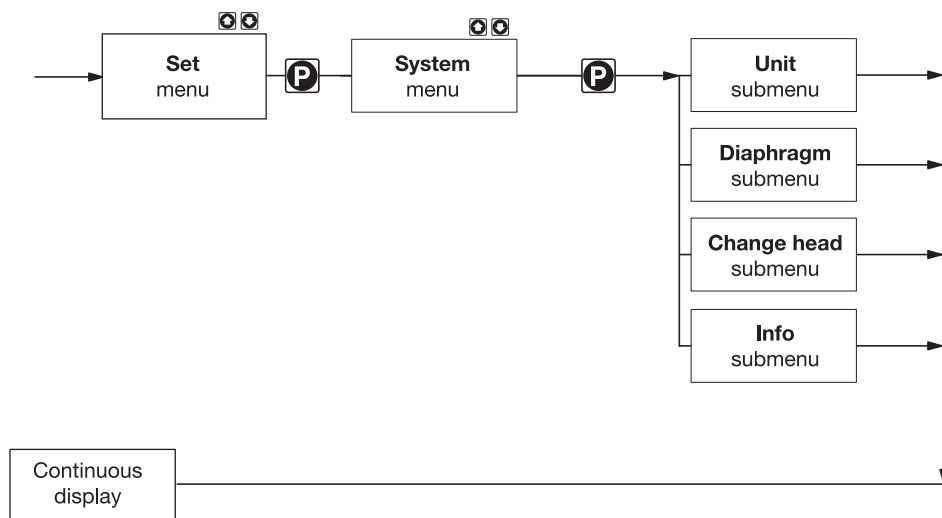
I = output current in mA
 f = stroke frequency in strokes/ min
 L = stroke length in %
 f_{max} = maximum frequency in strokes/ min

In the operating modes “Contact” and “Batch”, f is the stroke frequency which was set in the continuous display “Stroke frequency”.

7.5.9 Setting in the menu “System” (SYSTEM menu)

The menu “System” branches into the following submenus:

- Unit
- Diaphragm
- Info
- Change head?



7.5.9.1 Settings in the submenu “Unit”

In the submenu “Unit”, either litres or gallons (US) can be selected as unit of measure for the delta®.

7.5.9.2 Settings in the submenu “Diaphragm”

In the submenu “Diaphragm”, you may choose whether the delta® is to sent an alarm message or an error message in case of diaphragm failure.

7.5.9.3 Submenu “Info”

In the submenu “Info”, the following identification numbers can be read:

- Identcode ID
- Serial number SN
- Software control SW
- Hardware control HW
- Software drive AS
- Hardware drive AH
- *Name Module option* (e.g. proTIME)
- Software option OS
- Hardware option OH

7.5.9.4 Submenu “Change head?”

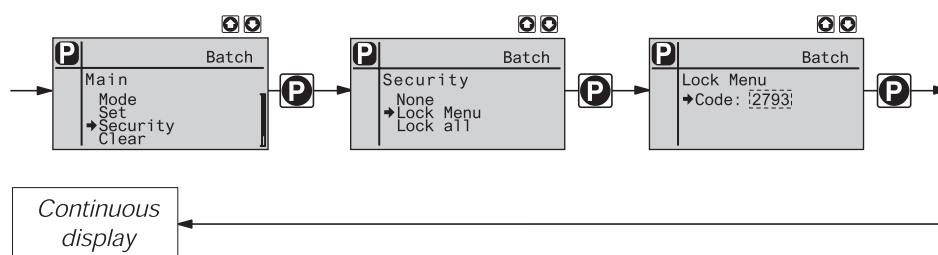


CAUTION

- If a different delivery unit size is installed, the pump must be re-programmed in the submenu “Change head?”!
- For demonstration purposes or when operating the pump without any metering medium, reprogramme to “Without liquid end”!

7.6 Setting of code (SECURITY menu)

In the SECURITY menu, it can be entered whether parts of the setting options are to be locked.



In the first menu option either “Lock menu” or “Lock all” or “none” can be set (both locks use the same number).

- Select “Lock menu” to lock the setting mode (item ① in the overview “Operating/setting diagram”, folding page). In the next menu option, enter the number to be used as code.
- Select “Lock all” to lock the possibility to change directly adjustable variables in the continuous displays (item ② in the overview “Operating/setting diagram”, folding page), in addition to the setting mode. In the next menu option, enter the number to be used as code.
- select “none” to cancel the set lock.

If a lock is set, the continuous display shows a padlock.

If you try to access a locked area, the LCD display shows a key and a flashing padlock. Enter the code using the arrow keys to bypass the lock.

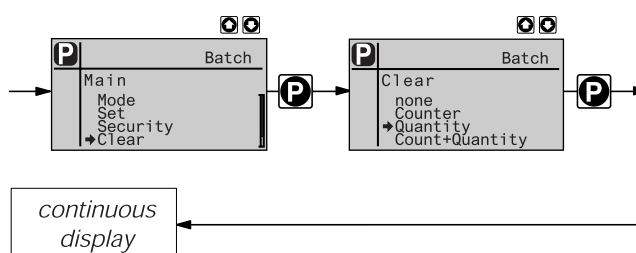
If the stroke adjustment knob was turned, the padlock flashes, the pump stops, an error message and a key are displayed. If you enter the code, the pump continues to dose and the error message disappears.

7.7 Clear total number of strokes or total number of litres (CLEAR menu)

In the CLEAR menu, either the stored total number of strokes or the total number of litres or both can be cleared (= reset to “0”). For this purpose, briefly press the P key to exit the menu.

- none
- counter (total number of strokes)
- quantity (total number of litres)
- count+quantity (both)

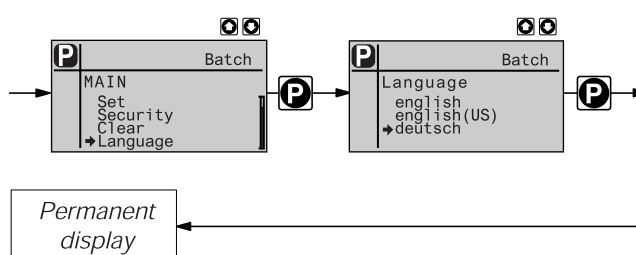
The values were counted up from commissioning of the pump or the last clearing.



7.8 Setting of language (LANGUAGE menu)

The desired operating language can be selected in the LANGUAGE menu.

When selecting “english (US)”, the decimal comma in the display changes to a decimal point.



8 Operation

In this chapter all operating options available to you are described, provided the delta® is in a continuous display (the LCD display does not show the symbol for the P key).

NOTE

- **Unfold the folding page behind the cover page for assistance! There, you will find the overviews for “Controls and key functions” and “Operating/setting diagram”.**
- **Please also note the overview “Continuous displays”. It shows which continuous displays are available in which operating mode and which variables can be directly changed from the relevant continuous display.**

8.1 Manual operation

Adjust stroke length The stroke length can be continuously adjusted in the range of 0 - 100 % using the stroke length adjustment knob. The recommended stroke length range in which the set dosing quantity can be reproduced in a technically meaningful way, amounts to 30 - 100 %.

The following operating options are available using the keys (see next figure):

Stop/start pump Stop the pump: press the STOP / START key.
Start the pump: press the STOP / START key again.

Start batch In the operating mode “Batch”: briefly press the P key.

Accessing the setting mode Press the P key for 2 seconds in any continuous display, and the delta® goes to the setting mode (see Chapter 7).
If in “Security” an access code was set for “Lock menu”, the access code has to be entered first after pressing the P key.

Check adjustable variables After each pressing of the i key, a different continuous display appears. The number of continuous displays depends on the Identcode, the selected operating mode, and the connected additional devices.

Change directly adjustable variables In order to change a variable (see below) directly in the relevant continuous display, press one of the arrow keys until the identifier “double arrow” is displayed and the variable is flanked by two flashing lines. The delay was programmed to prevent an accidental modification of the variables.
If a code was set in “Security” for “Lock all”, the code has first to be entered after pressing one of the arrow keys.

The directly adjustable variables are in detail:

Stroke frequency In the operating modes “Manual”, “Contact” and “Batch”:
The stroke frequency can be changed in the continuous display “Stroke frequency”.

Dosing output In the operating mode “Manual”:
The dosing output can be changed in the continuous display “Dosing output”.

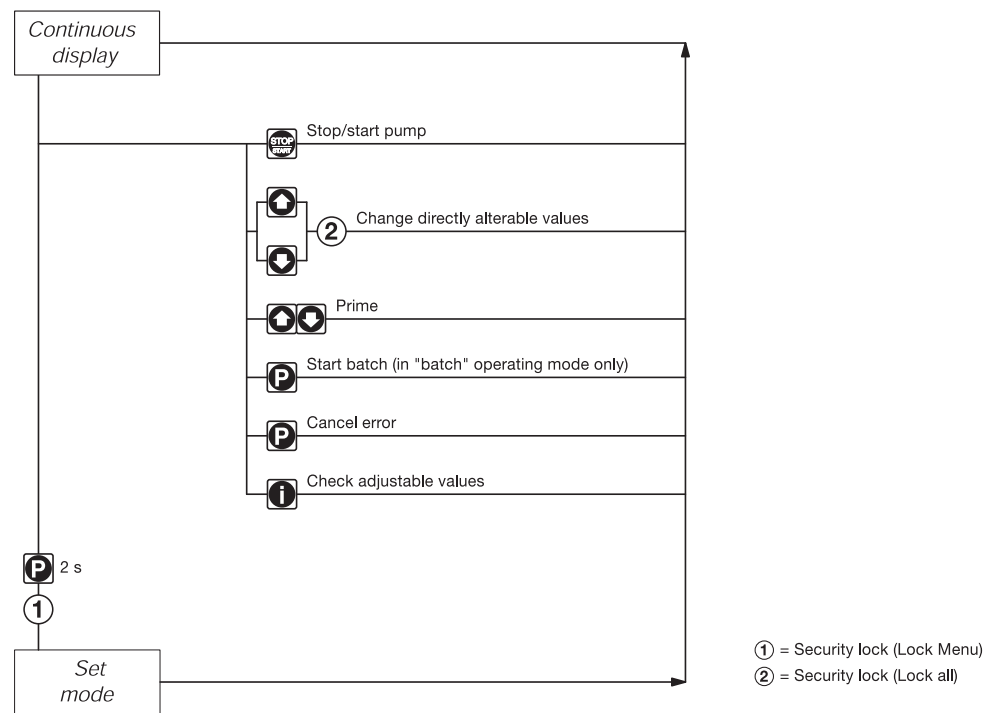
Factor The factor is the number of strokes which are triggered after an external impulse or by pressing the P key (only in the operating mode “Batch”).

In the operating mode “Batch”:
The factor can be changed from the continuous display “Remaining strokes”.
A few seconds after having set the factor, the delta® returns to the initial continuous display.

Batch size In the operating mode “Batch”:
The batch size can be changed from the continuous display “Batch size/residual litres”.
A few seconds after having set the batch size, the delta® returns to the initial continuous display.

Suction By simultaneously pressing both arrow keys, the function “Prime” is activated (in the continuous display “stroke frequency”).

Acknowledge errors Error indications are acknowledged by briefly pressing the P key.



8.2 Remote control

The pump can be remotely controlled via a control cable (see paragraph 6.2 and Chapter 7, as well as your system documentation).

9 Maintenance

- Maintenance intervals**
- Every three months, given normal load (approx. 30 % of continuous operation)
 - Shorter intervals in case of heavy load (e.g. continuous operation)

- Maintenance measures**
- Standard delivery units:
- ▶ Check the dosing diaphragm for damages (see Chap. 10)
 - ▶ Check the leakage holes for leaked dosing medium
 - ▶ Check the dosing lines at the delivery unit for tightness
 - ▶ Check the pressure and suction valve for tightness
 - ▶ Check the entire delivery unit for leakproofness (in particular the leakage hole! see Fig. 25)
 - ▶ Check for correct delivery: have the pump briefly take in (press both arrow keys simultaneously)
 - ▶ Check the electrical connections for integrity
 - ▶ Check the liquid end screws for tightness

Tightening torque for screws: 4.5 to 5 Nm

NOTE

For delivery units with coarse/fine valve:

- **Check the bypass line at the delivery unit for tightness.**
- **Check the vent valve for tightness.**
- **Check the pressure and bypass lines for kinks.**
- **Check the function of the coarse/fine valve.**

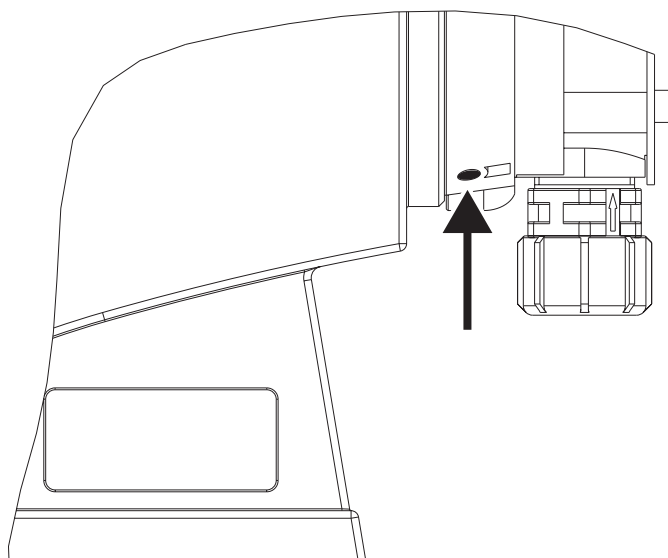


Fig. 25 Leakage hole

10 Repairs

NOTE

Repair measures which may only be performed by authorised persons or in the plant of the manufacturer:

- *Replacement of damaged mains connections*
- *Replacement of fuses and electronics controls*

Please contact your local ProMinent branch or agency!



WARNING

- Pumps for radioactive media may not be shipped!
They will not be accepted by ProMinent!
- Only return the metering pump for repair in a cleaned condition and with rinsed liquid end unit (see Chap. 12)! If despite thorough emptying and cleaning of the pump any safety precautions should be required, the necessary information must be listed in the “Safety declaration form”!

The “Safety declaration form” is material part of the inspection/repair order. An inspection or repair will only be made if the “Safety declaration form” has been correctly and fully completed by authorised and qualified personnel of the pump operator.

The form “Safety declaration form” is enclosed in the annex or can be downloaded from www.prominent.com.

Repair measures which may be performed by authorised persons (according to the safety chapter):

- Cleaning of a valve
- Replacement of the diaphragm



WARNING

- Protect yourself against the dosing medium if it is a hazardous one!
- Depressurise the system!

NOTE

Use the exploded views in the annex.

Cleaning of a pressure valve for types 0730, 1020, 1612, 1608, 2508

NOTE

- **Pressure and suction valves are different! Disassemble them one after each other to avoid any mistaking of the parts!**
- **Only use new parts which fit your valve (in form and chemicals resistance)!**
- **The pump must be newly set after the replacement of valves!**
- **Insert an Allen key or similar into the small hole of the pressure port and press out the valve inserts.**

Cleaning of a suction valve for types 0730, 1020, 1612, 1608, 2508

A suction valve is designed almost similar to a pressure valve.

However, please observe that:

- both valve inserts are identical here
- there is a distance sleeve in addition below the valve inserts
- a pre-formed gasket instead of an O-ring is located in the liquid end
- the flow direction of the suction port is inverse to that of the pressure port.

Cleaning of a pressure valve for types 0280, 0450

NOTE

- **Pressure and suction valves are different! Disassemble them one after each other to avoid any mistaking of the parts!**

- **Only use new parts which fit your valve (in form and chemicals resistance)!**

For the material type PVT, the ball seat is integrated in the liquid end, thus has to be cleaned separately!

For the material type PVT, the pressure valve is a double-ball valve!

- **The pump must be newly set after the replacement of valves!**

Cleaning of a suction valve for types 0280, 0450

A suction valve is designed almost similar to a pressure valve.

However, please observe that:

- the flow direction of the suction port is inverse to that of the pressure port.

Replacement of the diaphragm



WARNING

- **Protect yourself against the dosing medium if it is a hazardous one!**
 - **Depressurise the system!**
 - **Design-related several cubic centimetres of dosing medium could have accumulated after a leakage behind the diaphragm in the end disc!**
- ▶ Empty the delivery unit (turn the delivery unit upside down and let the dosing medium drain; rinse with a suitable medium; thoroughly rinse the liquid end if hazardous media have been used!)
 - ▶ Adjust the stroke adjustment knob to below 0% stroke when the pump is operating (the drive axis is then fixed)
 - ▶ Switch off the pump
 - ▶ Remove the hydraulic connections from the pressure and suction side
 - ▶ For the types with coarse/fine ventilation: First pull out the coarse/fine ventilation (star handle), then remove the covering screen of the delivery unit using a screwdriver
 - ▶ Remove the screws (1).

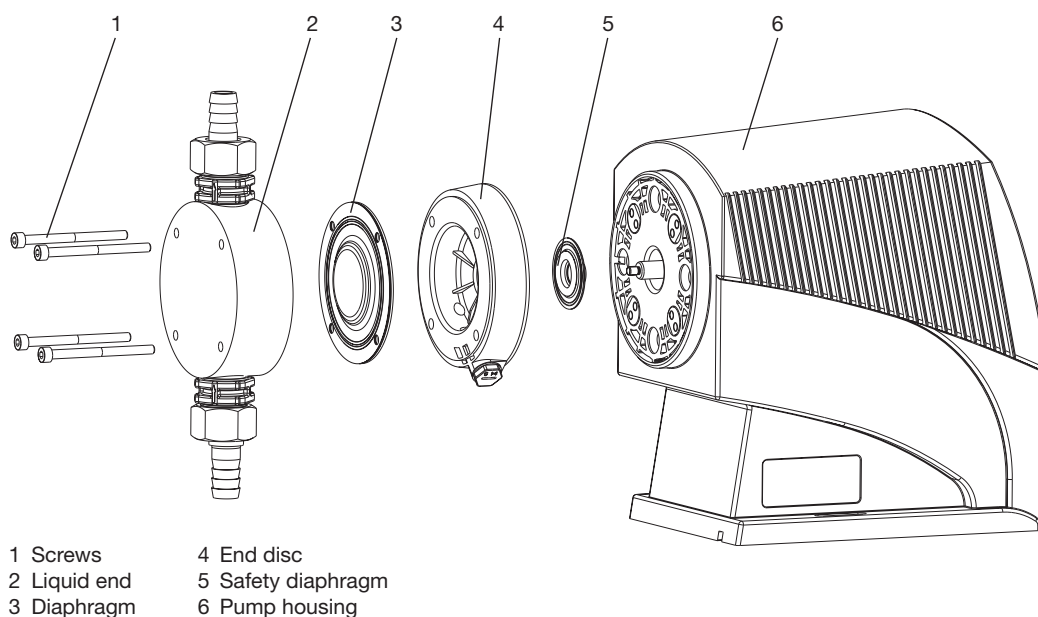


Fig. 26

- ▶ Remove the liquid end (2) with the screws (1) from the pump (see Fig. 26).
- ▶ Reposition the liquid end (2) with the screws - the screws (1) should be positioned in the holes of the diaphragm (3) but not in the pump housing!
- ▶ Grab the pump housing (6) with one hand and clamp the diaphragm (3) with the other hand between the liquid end (2) and the end disc (4). Loosen the diaphragm (3) from the drive axis by slightly and jerkily turning the liquid end (2) and the end disc (4) clockwise
- ▶ Remove the liquid end (2) with the screws (1) from the diaphragm (3) and unscrew them fully from the drive axis.
- ▶ Remove the end disc (4) from the pump housing (6)
- ▶ Check the condition of the safety diaphragm (5) and replace, if necessary.
- ▶ Push the safety diaphragm (5) onto the drive axis only until it is flush with the pump housing (6) - do not push further!
- ▶ Screw on the new diaphragm (3) onto the drive axis up to the stop by way of trial - this must be successful, otherwise the pump will not dose precisely later!
- ▶ Check whether the holes of the diaphragm are flush with those of the pump housing
- ▶ if not, start the pump and set the stroke length to 100%
- ▶ When the pump is running, slowly turn the diaphragm (3) clockwise until the 4 holes of the diaphragm are flush with those of the pump housing (6)
- ▶ Hold the diaphragm (3) in this position, set the stroke length to 0%, and stop the pump.
- ▶ Unscrew the diaphragm (3) again.
- ▶ Position the end disc (4) on the pump housing (6).

**CAUTION**

- The leakage hole must show to the bottom in the later installation position of the delta® (see Fig. 25)!
 - Position the end disc (4) directly in the correct position on the pump housing (6)! Do not twist the end disc on the pump housing to prevent that the safety diaphragm (5) distorts!
- Insert the diaphragm (3) into the end disc (4).
- Hold the end disc (4) and tighten the diaphragm (3) clockwise until it is seated firmly (the turning resistance of the return spring becomes noticeable).

**CAUTION**

- Do not excessively turn the diaphragm (3)!
 - The end disc (4) must remain in its position to prevent that the safety diaphragm distorts!
- Position the liquid end (2) with the screws (1) onto the diaphragm (3) and the end disc (4) (the suction port must show to the bottom in the later installation position of the pump)
- Screw down the screws (1) and tighten crosswise (tightening torques see above)
- For the types with coarse/fine ventilation: Let the covering screen of the delivery unit engage into the liquid end, then press the coarse/fine ventilation (star handle) into the liquid end.

NOTE

- Check the tightening torque of the screws after 24 hours of operation!

Tightening torques for screws: 4.5 to 5 Nm

Cleaning of diaphragm failure monitor**WARNING**

If the diaphragm failure monitor triggered a signal, it must be cleaned subsequently!

- First replace the diaphragm of the delivery unit (see above)!
- Unscrew the diaphragm failure monitor (flat wrench AF 15 permitted)
- Clean the diaphragm failure monitor with a suitable liquid - if possible with water (material Polysulphone)
- Test the connected diaphragm failure monitor: Immerge the front of the hemisphere fully into water - the continuous display must show a diaphragm failure. Dry the diaphragm failure monitor well - the continuous display may no longer show a diaphragm failure
- screw in the dry and clean diaphragm failure monitor fingertight and liquidtight into the hole (do not use any tools).

11 Remedy of malfunctions

**WARNING**

- Protect yourself against the dosing medium if it is a hazardous one!
- Depressurise the system before commencing any work in the pump!

delta® does not perform any suction despite full stroke movement and venting

Cause Crystalline depositions on the ball seat because of drying up of the valves.

- Remedy*
- Remove the suction hose from the store tank and thoroughly rinse the delivery unit.
- If not successful, remove and clean the valves (see Chap. 9).

Liquid leaks at the end disc

- Cause** The delivery unit leaks at the dosing diaphragm.
- Remedy**
- Re-tighten the screws in the liquid end crosswise (see Chap. 9)
 - If not successful, replace the diaphragm (see Chap. 10).
 - If a diaphragm failure has been displayed, clean the diaphragm failure monitor (see Chap. 10).

Green LED indicator (status display) is not illuminated

- Cause** No or wrong supply voltage applied.
- Remedy**
- Use the prescribed supply voltage according to the voltage specifications on the rating plate.

Error messages



Red LED is illuminated, the LCD display shows the symbol "Level", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.

- Cause** The liquid level in the store tank has reached "Level shortage 2nd stage".
- Remedy**
- Refill the store tank.

„i < 4 mA“ **Red LED is illuminated, the LCD display shows the symbol "i < 4 mA", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.**

- Cause** The delta® is in the operating mode "Analog", an error behaviour was programmed in the ANALOG menu and the control current has dropped below 4 mA.
- Remedy**
- Remove the cause of the low control current or
 - Set the programming of the error behaviour to "OFF" (see paragraph 7.4.4).

„i < 23 mA“ **Red LED is illuminated, the LCD display shows the symbol "i < 23 mA", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.**

- Cause** The delta® is in the operating mode "Analog", an error behaviour was programmed in the ANALOG menu and the control current has exceeded 23 mA.
- Remedy**
- Remove the cause of the high control current or
 - Set the programming of the error behaviour to "OFF" (see paragraph 7.4.4).



Red LED is illuminated, the LCD display shows the symbols "m" and "External", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.

- Cause** Stroke memory overflown
- Remedy**
- Remedy cause
 - Press the P key (Keep in mind the consequences for the process!)



Red LED is illuminated, the LCD display shows the symbol "Temperature", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.

- Cause** The pump is overloaded or the temperature is too high
- Remedy**
- Remedy cause
 - Press the P key (Keep in mind the consequences for the process!)



Red LED is illuminated, the LCD display shows the symbol "Stroke length adjustment", flashing, as well as the symbols for "Error" and "Stop", and the pump stops.

- Cause** The stroke adjustment knob was turned given a locked menu
- Remedy**
- Reposition stroke adjustment knob or enter the code

Error messages / alarm messages

(Fault messages which are displayed either as error messages or alarm messages, depending on the settings in the setting menu.)



Either the yellow LED is illuminated, the LCD display shows the symbol “Flow”, flashing, - or the symbols for “Error” and “Stop” are displayed together with the illuminated red LED and the pump stops.

Cause The metering monitor is not correctly connected.

Remedy ► Correctly connect the metering monitor.

► Press the P key.

Cause The metering monitor reports more faulty strokes than set in the FLOW menu.

Remedy ► Press the P key.

► Examine and remedy the cause.



Either the yellow LED is illuminated, the LCD display shows the symbol “Diaphragm”, flashing, - or the symbols for “Error” and “Stop” are displayed together with the illuminated red LED and the pump stops.

Cause Diaphragm is fractured

Remedy ► Replace the diaphragm and clean the diaphragm failure monitor (see Chap. 10)



Either the yellow LED is illuminated, the LCD display shows the symbol “Airlock”, flashing, - or the symbols for “Error” and “Stop” are displayed together with the illuminated red LED and the pump stops.

Cause Gas bubbles in the delivery unit (leak, outgassing medium, cavitation)

Remedy ► With the red LED illuminated, press the P key (Keep in mind the consequences for the process!)

► Vent the delivery unit and remedy the cause (seal the unit or slow down suction stroke)



„p+“ Either the yellow LED is illuminated, the LCD display shows the symbol “p+”, flashing, - or the symbols for “Error” and “Stop” are displayed together with the illuminated red LED and the pump stops.

Cause A narrowing or a closed shut-off valve on the pressure side

Remedy ► With the red LED illuminated, press the P key (Keep in mind the consequences for the process!)

► Remedy the narrowing or open the shut-off valve



„p-“ Either the yellow LED is illuminated, the LCD display shows the symbol “p-”, flashing, - or the symbols for “Error” and “Stop” are displayed together with the illuminated red LED and the pump stops.

Cause There is a leakage on the pressure side, a line has burst or is broken

Remedy ► With the red LED illuminated, press the P key (Keep in mind the consequences for the process!)

► Repair leak, remedy cause

Alarm messages

Yellow LED is illuminated, the LCD display shows the symbol “Warning Level” and flashes

Cause The liquid level in the store tank has reached “Level shortage 1st stage”.

Remedy ► Refill the store tank.

All other errors

Please contact your local ProMinent® branch or agency!

12 Decommissioning and disposal

Decommissioning



WARNING

- When decommissioning a pump, the housing and in particular the liquid end must in principle be cleaned of any chemicals and contaminations.
 - Protect yourself against the dosing medium if it is a hazardous one!
 - Depressurise the system!
- Disconnect the pump from the mains
- Empty the liquid end by turning the pump upside down and letting the dosing medium drain
- Rinse the liquid end with a suitable medium; thoroughly rinse the liquid end if hazardous media have been used!

Observe the storage conditions in case of a temporary decommissioning:

Storage temperature: -10 to +50 °C

Relative humidity: < 92 % relative humidity, non-condensing

Disposal



CAUTION

Electronic waste is hazardous waste!
Please observe the relevant local regulations!

13 Technical data

13.1 Performance data

delta® with 200 strokes/minute and 100% stroke length

Liquid end type	min. output at maximum backpressure			min. output at medium backpressure			Stroke no.	Connection size ãØ x iØ	Suction lift*	Priming lift**	Admissible pre-pressure suction side	Shipping weight approx.
	bar	l/h	ml/stroke	bar	l/h	ml/stroke						
2508	25	7.5	0.62	12.5	8.0	0.67	200	6x3/6x5 ¹	5	3.5 / 3.0 ¹	8	10 / 11 ¹
1608	16	7.8	0.65	8	8.2	0.69	200	8x5	5	3.5 / 3.0 ¹	8	10 / 11 ¹
1612	16	11.3	0.94	8	12.24	1.02	200	8x5	5	3.0 / 2.5 ¹	8	10 / 11 ¹
1020	10	19.1	1.59	5	19.2	1.6	200	12x9	5	3.5 / 3.0 ¹	5	10 / 11 ¹
0730	7	29.2	2.43	3.5	29.4	2.45	200	12x9	4	4.0 / 3.5 ¹	3	10 / 11 ¹
0450	4	49.0	4.08	2	51.5	4.29	200	DN 10	3	2.5 / 2.5 ¹	2	10 / 11 ¹
0280	2	75.0	6.25	1	75.6	6.3	200	DN 10	2	3.0 / 3.0 ¹	1	10 / 11 ¹

* Suction lift with filled suction line and filled liquid end

** Priming lift with clean as well as moistened valves. Priming lift with 100 % stroke lengths and free drain or opened vent valve

¹ For material type SST

13.2 Accuracies

Standard delivery units

Dosing accuracy -5 to +10 % at max. stroke length and max. operating pressure for all material types.

Reproducibility ±2 % given constant conditions and min. 30 % stroke length.
Given the correct adaptation of the stroke speeds and if "Compensation" is set to "on" (see Chap. 7.5.5 "Metering"), the delta® ensures constant conditions.

13.3 Viscosity

The dosing behaviour of the pump can be adapted to the viscosity of the dosing medium.

Viscosity in mPa	Setting "Dosing"	Deceleration suction stroke	Max. stroke frequency	Remark
0...50	"standard"	none	200	
50...200	„HV1“	slight	160	
200...500	„HV2“	medium	120	for valves with spring
> 500	„HV3“	maximum	80	for valves with spring

Tab. 7: Setting to decelerate the suction stroke depending on the viscosity of the dosing medium (see Chap. 7.5.3)

13.4 Material data

Liquid end

Type	Liquid end	Suction/ pressure port	Gaskets	Valve balls
NP	plexiglass	PVDF	PTFE	Ceramics
PV	PVDF	PVDF	PTFE	Ceramics
SS	Stainles steel 1.4404	Stainles steel 1.4404	PTFE	Ceramics

Pump

Housing	Polyphenylether (PPE with fibre glass)
Hood	Polyphenylether (PPE with fibre glass)
Cover	Polycarbonate
Electronics	Electronics components

13.5 Electrical data

Design: 100 - 230 V ±10 %, 50/60 Hz

Nominal rating	approx. 73 W
Nominal current	approx. 0.90 A / 0.55 A
Switch-on peak current	4 A / 8 A (recovering within approx. 50 ms)
Fuse	1.6 AT

Note Fuses must be approved according to VDE, UL, and CSA. E.g. Serie SPT , 1.6 A by the company of Schurter, order no. 0001.2506 according to IEC Publ. 127 - 2/3.

13.6 Environmental conditions

Temperatures Storage and transport temperature: -10 to +50 °C

Ambient temperature during function: -10 to +45 °C (drive and control)

Maximum temperatures for delivery units depending on material type:

	NP	PVT	SST
long-term at max. operating pressure	45 °C	50 °C	50 °C
for 15 min at max. 2 bar	60 °C	120 °C	120 °C

Humidity admissible relative humidity: 92 % relative humidity, non-condensing
use in humid and alternating atmosphere: FW 24 pursuant to DIN 50016

13.7 System of protection and protection class

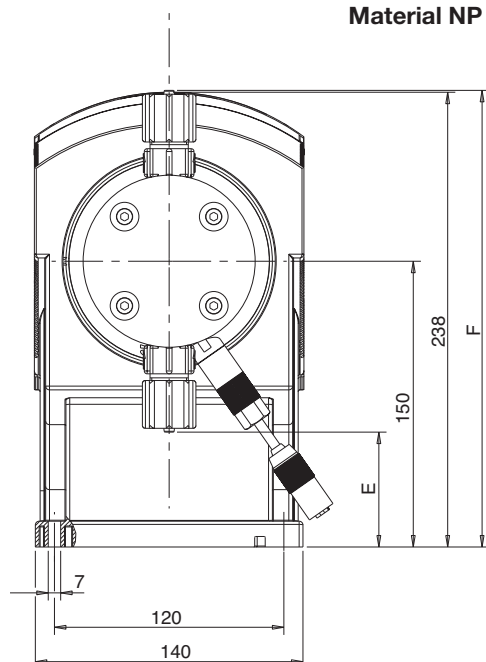
<i>System of protection</i>	Protection against contact and protection against moisture IP 65 pursuant to IEC 529, EN 60529, DIN VDE 0470 Part 1
<i>Safety requirements</i>	Protection class 1 - Mains connection with protective conductor

13.8 Compatibility

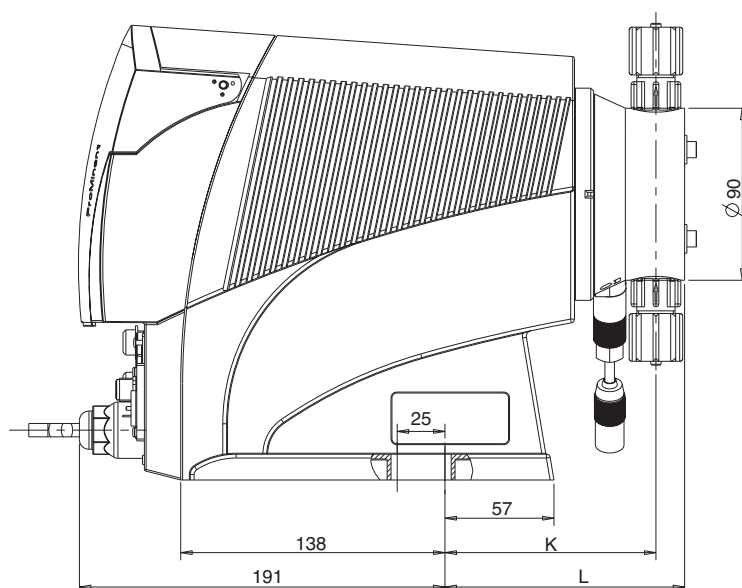
Some hydraulic components of delta® are identical with those of Beta® and gamma/ L. The following components and accessories are largely compatible to the pumps of the series Beta® and gamma:

- Control cable gamma/Vario, 2-, 4- and 5 wire for the function “external”
- Level switch 2-phase (gamma/Vario/Beta®)
- Dosing line cross-sections
- Standard connecting kit gamma
- Dosing tank
- Total height (distance between suction and pressure port)
- Identical use of accessories such as pressure-retaining valve, multifunctional valve, dosing monitor, and rinsing unit

Dimension sheet delta® type without vent valve
Material NP



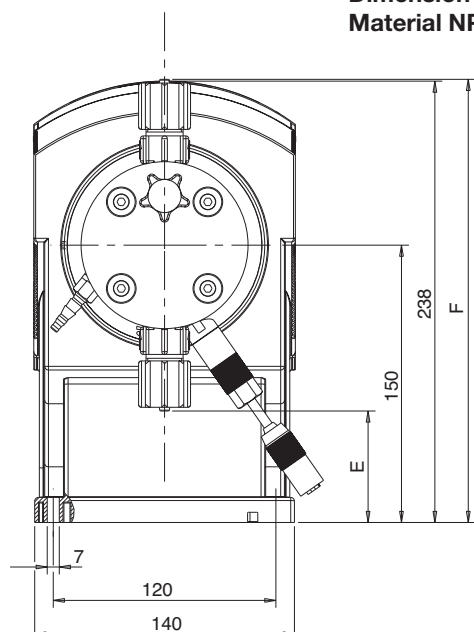
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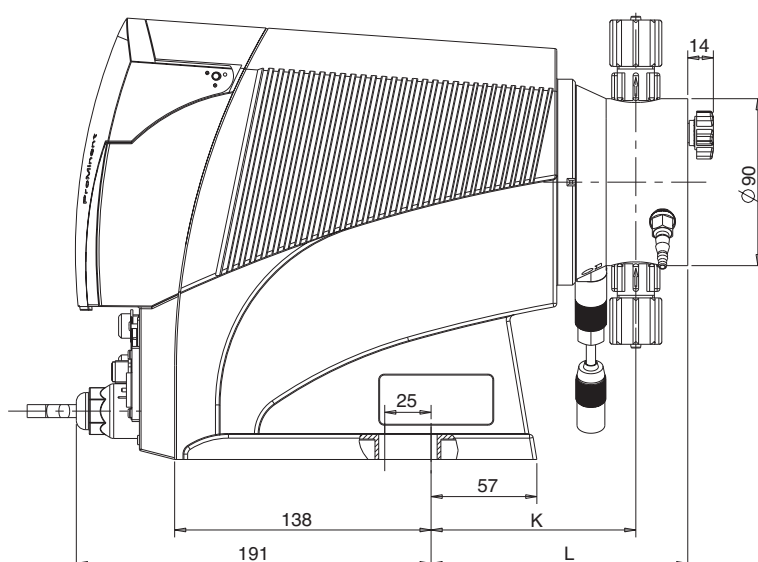
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	2508 / 1608	1612	1020	0730
E	63	60	54	53
F	235	239	245	246
K	110	110	112	112
L	125	125	127	127

Dimension sheet delta® type with vent valve
Material NP



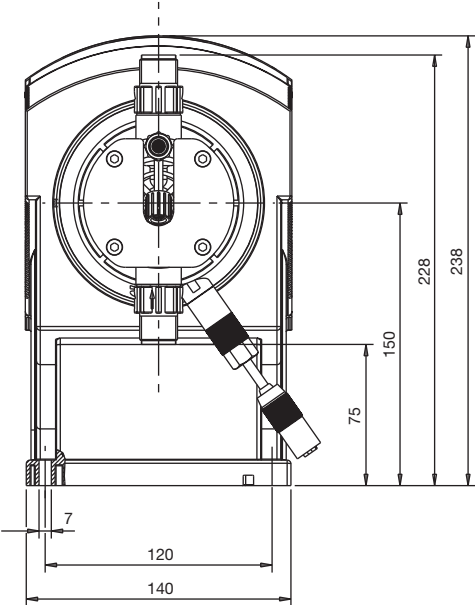
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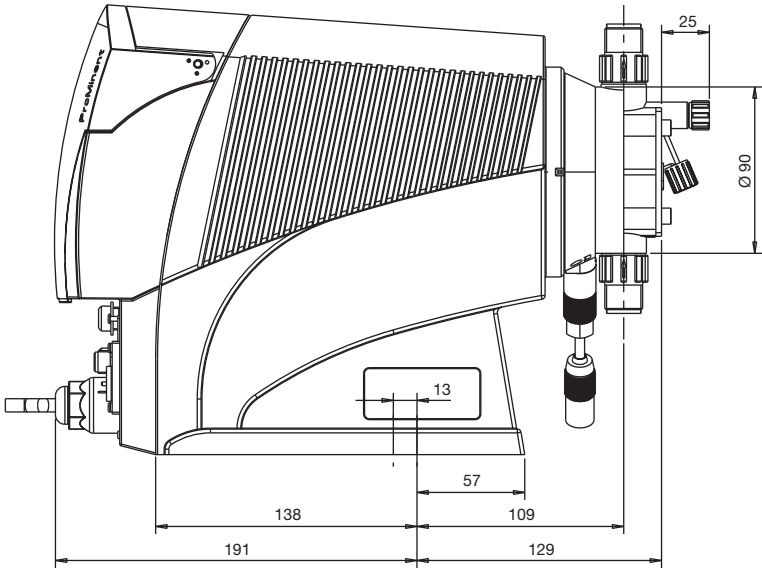
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	2508 / 1608	1612	1020	0730
E	63	60	54	53
F	235	239	245	246
K	110	110	112	112
L	138	138	140	140

Dimensions of delta® type 1612 - 0730
Material PV

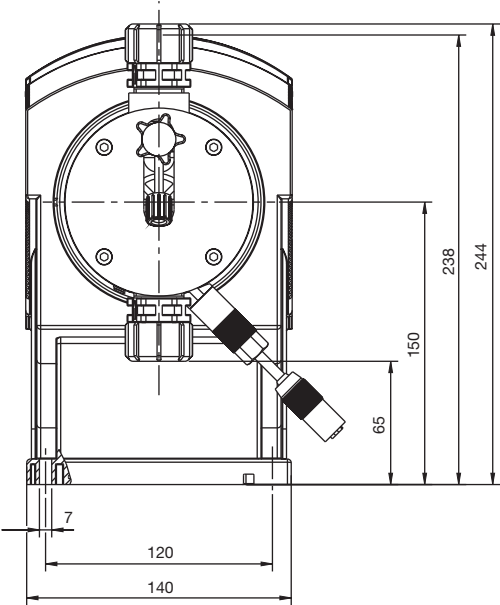


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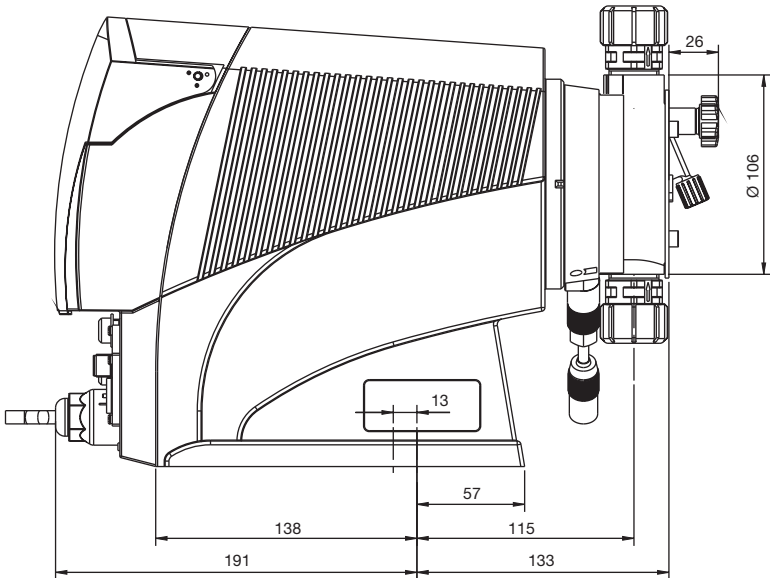


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Dimensions of delta® type 0450 - 0280
Material PV

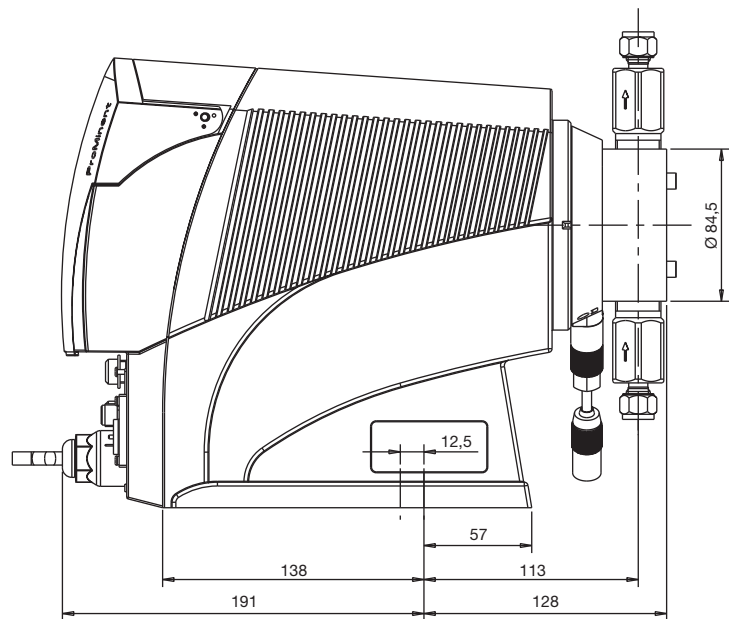
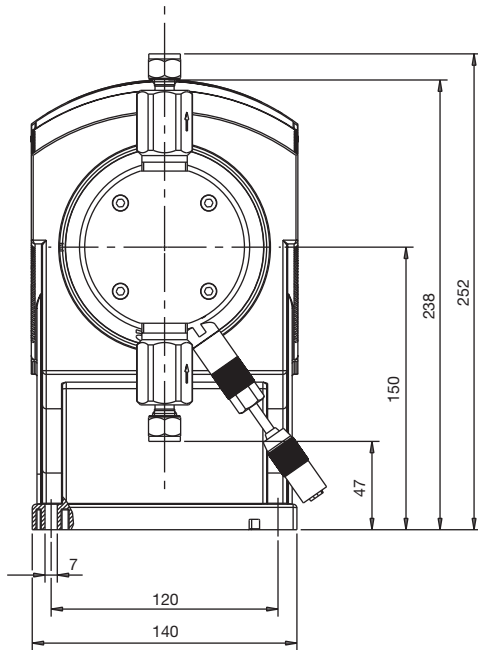


(dimensions in mm)



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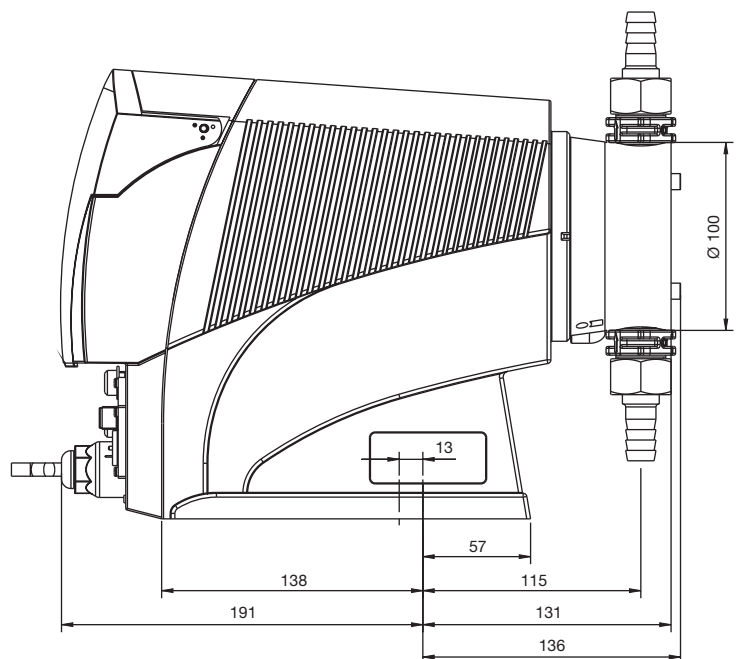
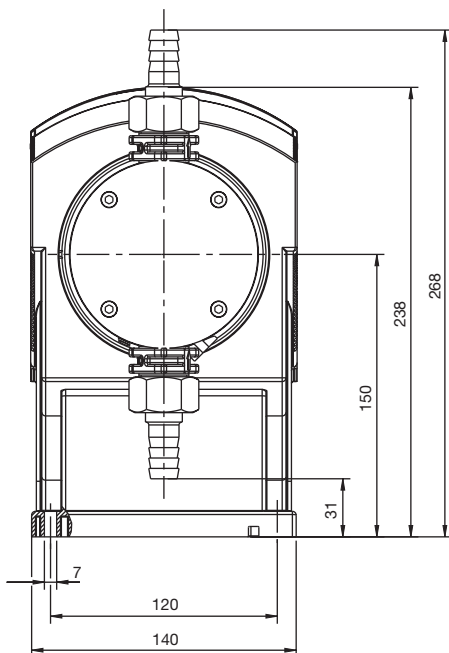
Dimensions of delta® type 1612 - 0730
Material SS



(dimensions in mm)

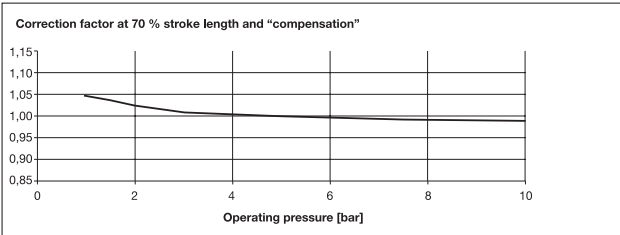
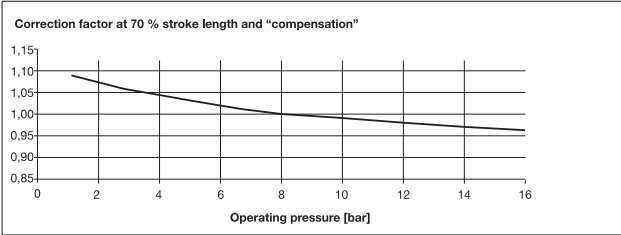
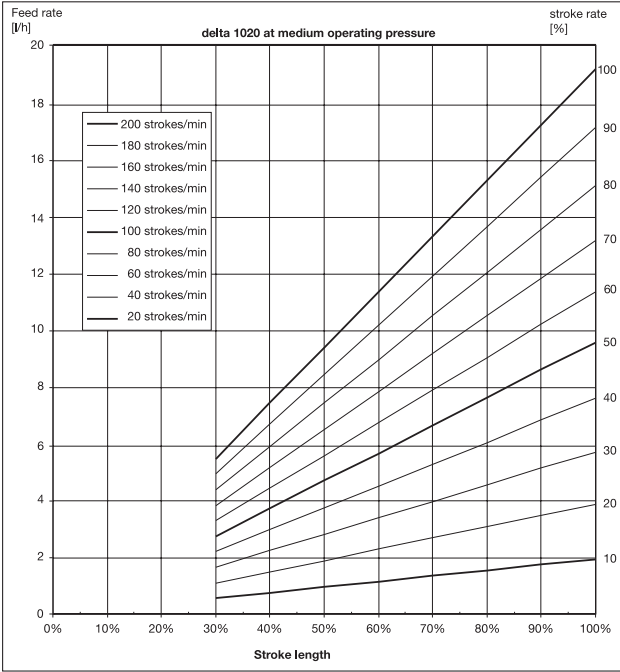
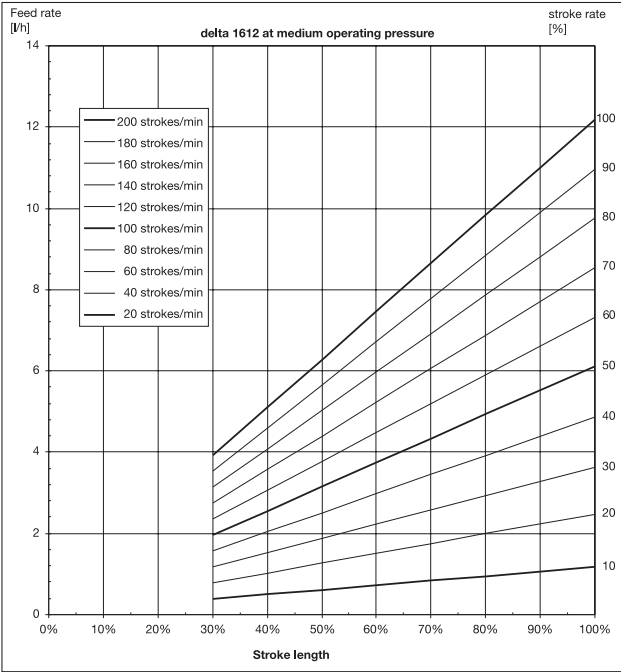
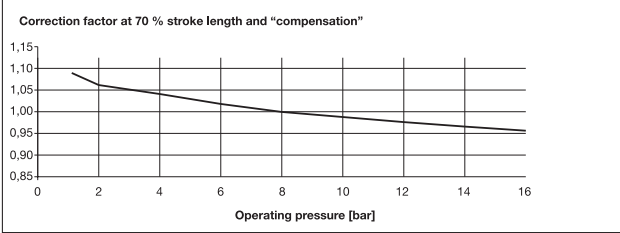
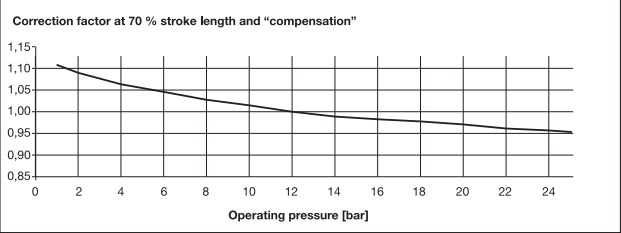
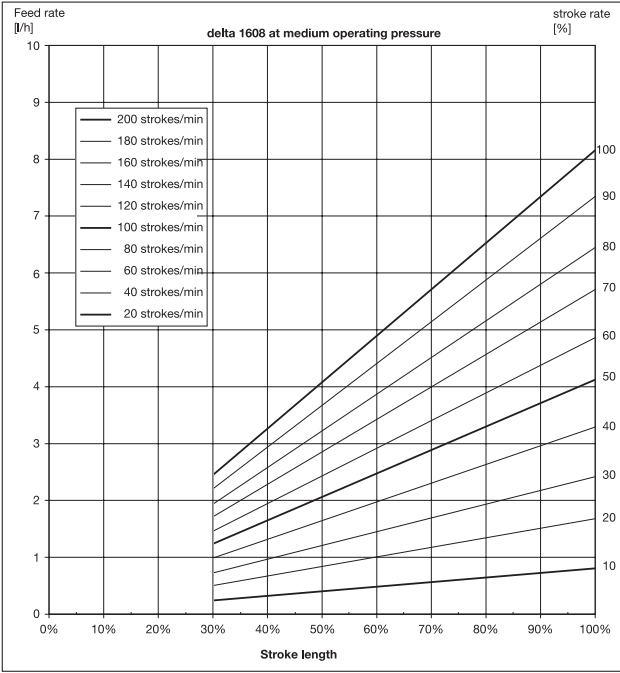
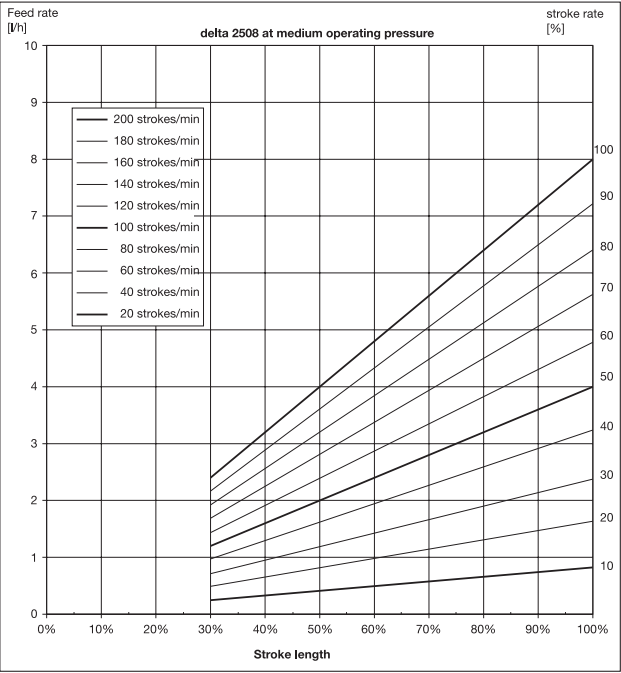
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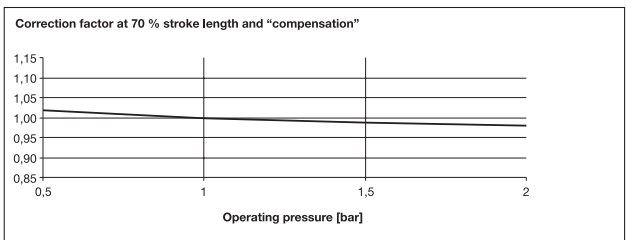
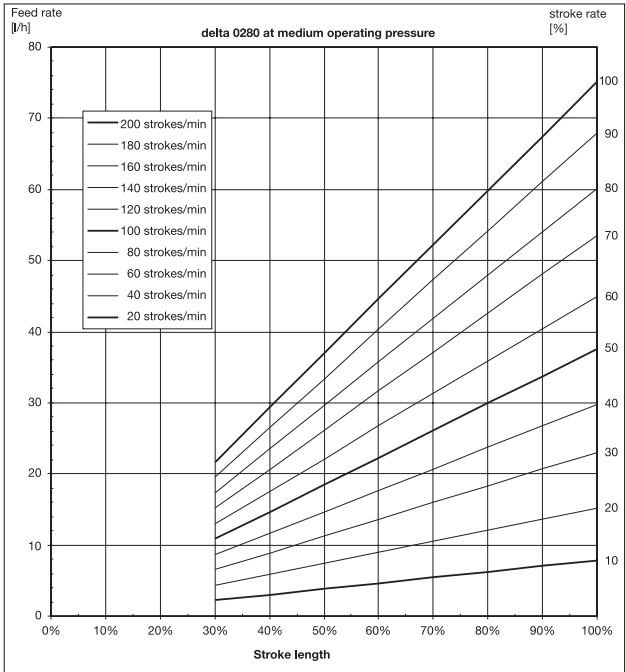
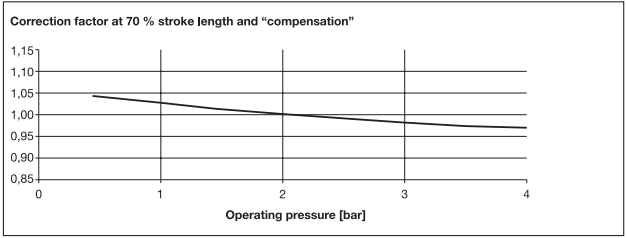
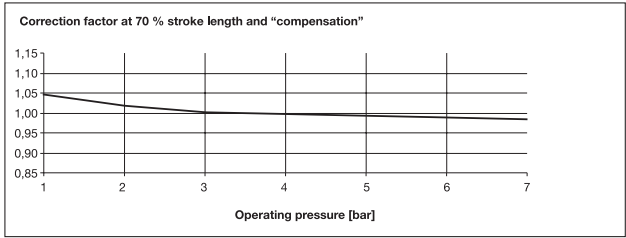
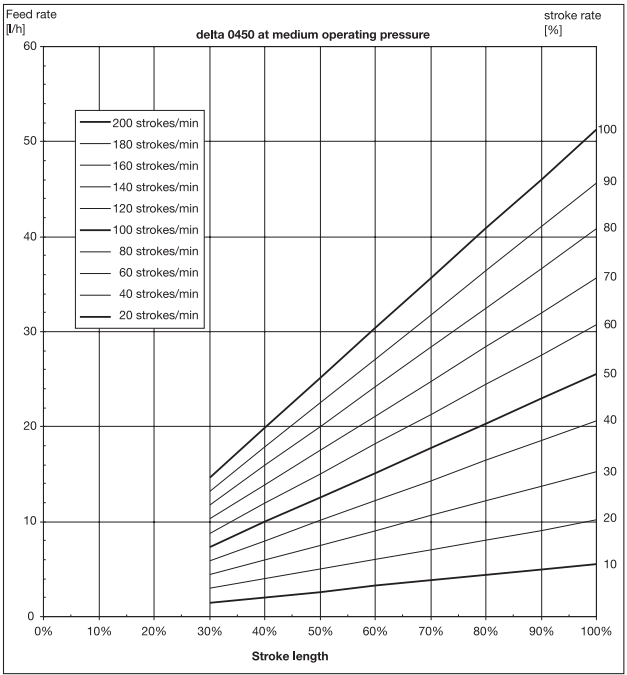
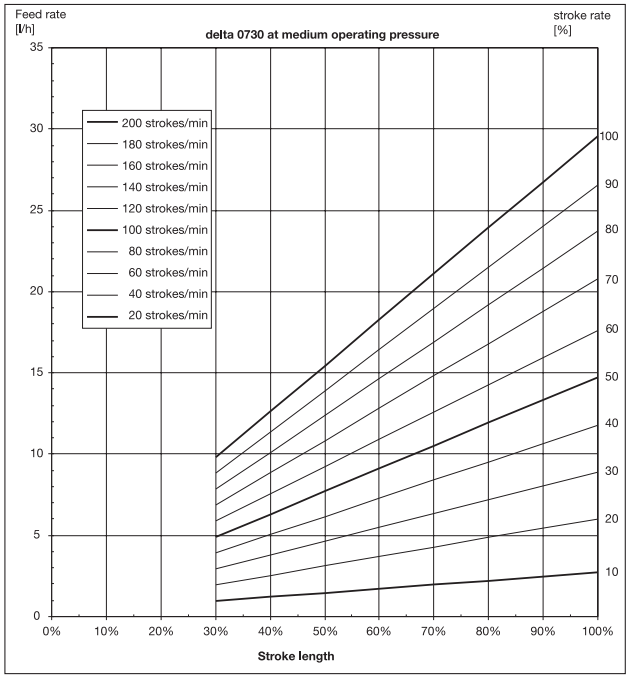
Dimensions of delta® type 0450 - 0280
Material SS



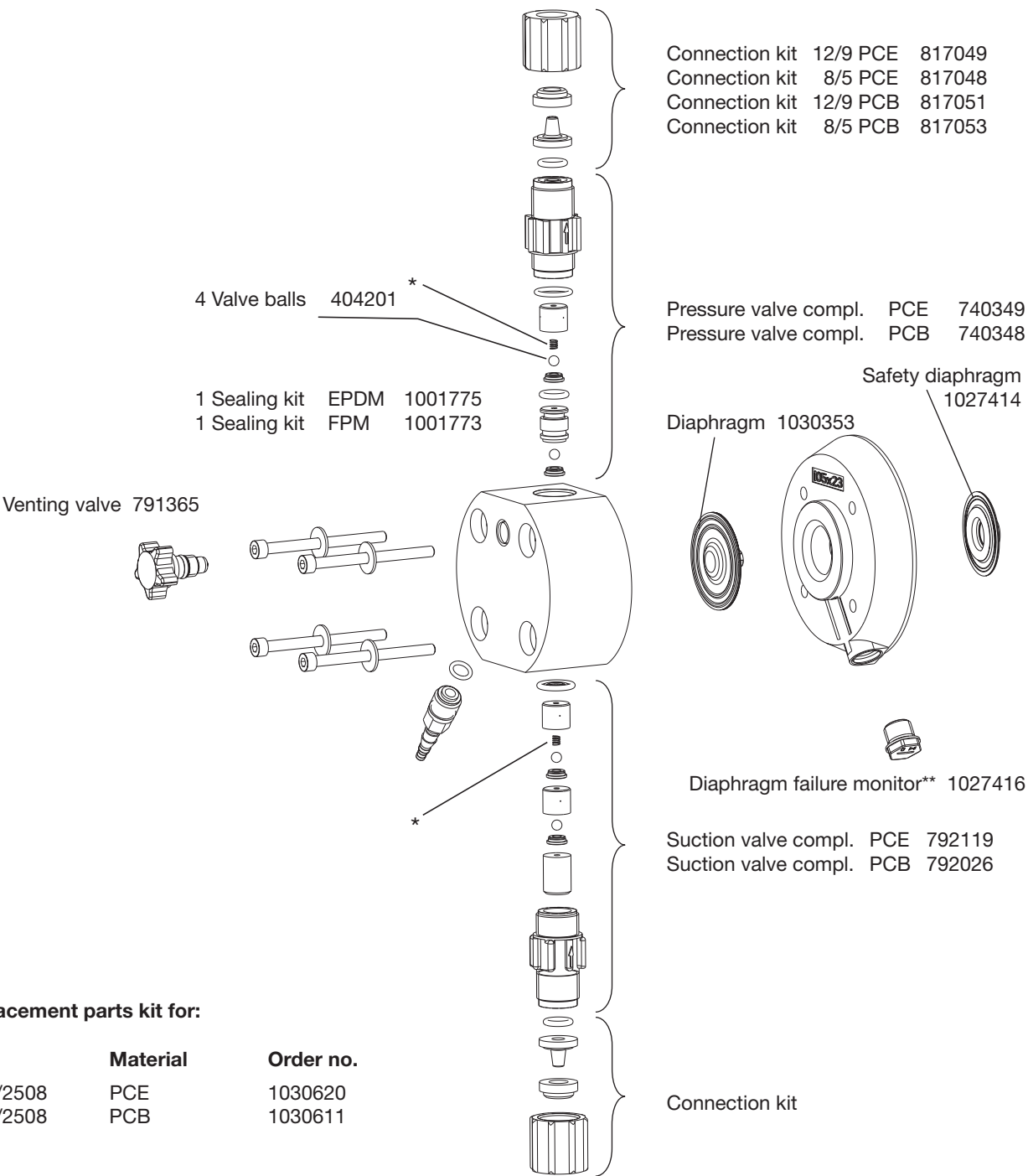
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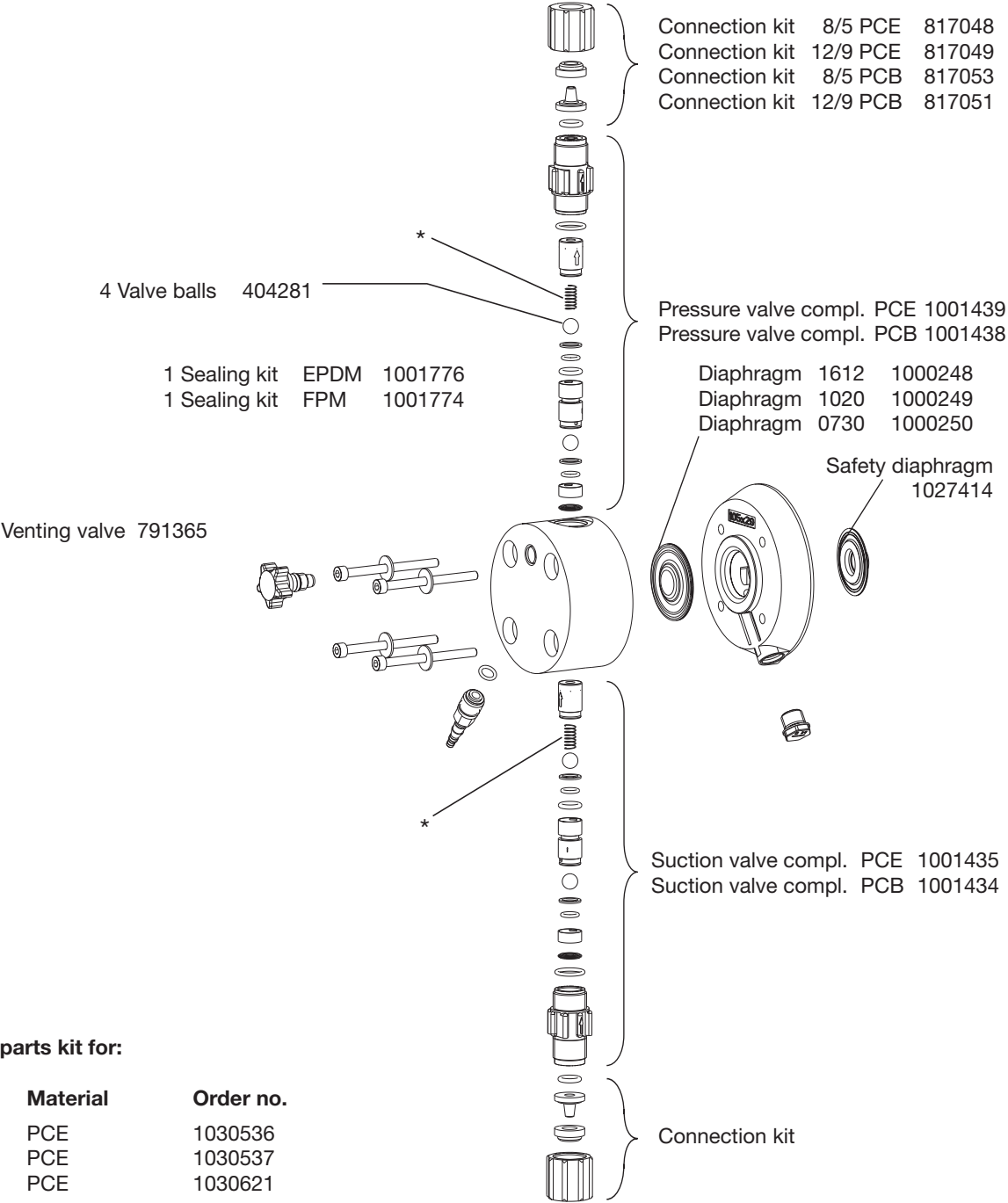


Delivery unit 1608/2508
NP with coarse/fine bleed



The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit 0730 - 1612
NP with coarse/fine bleed

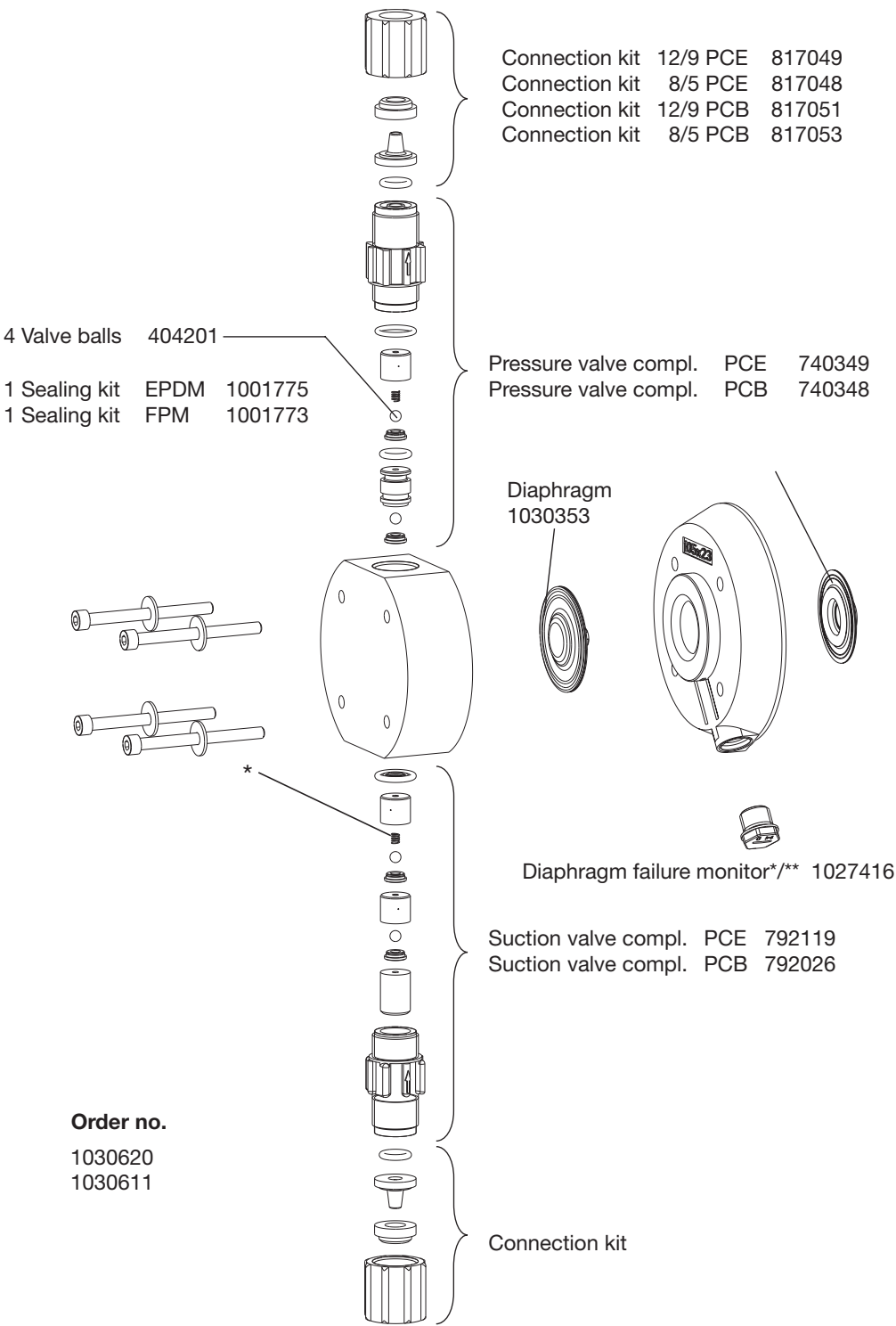


Replacement parts kit for:

Type	Material	Order no.
1612	PCE	1030536
1020	PCE	1030537
0730	PCE	1030621
1612	PCB	1030525
1020	PCB	1030526
0730	PCB	1030612

The following items are included in the replacement parts kit.
* special accessories

Delivery unit 1608/2508
NP without coarse/fine bleed

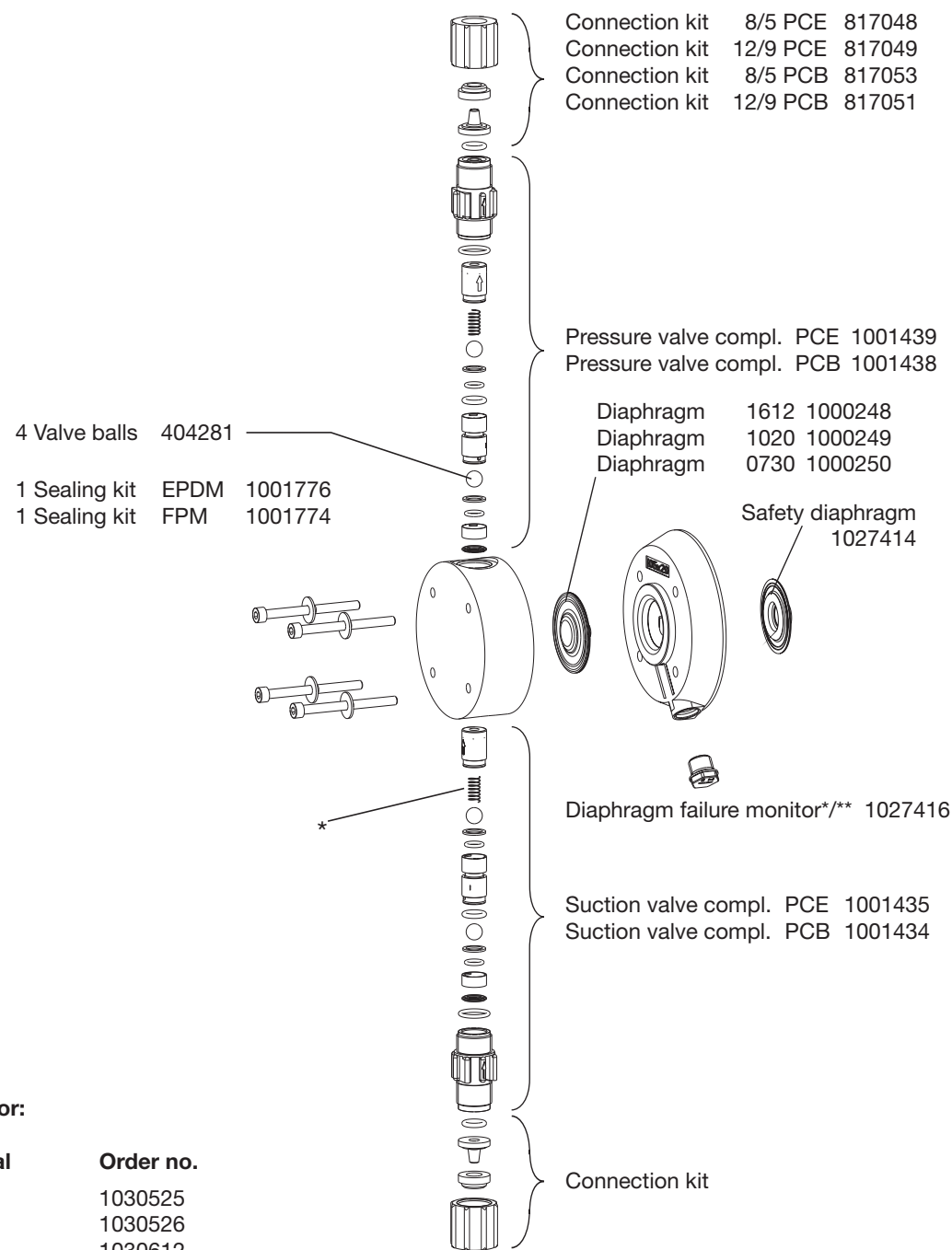


Replacement parts kit for:

Type	Material	Order no.
1608/2508	PCE	1030620
1608/2508	PCB	1030611

The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit 0730 - 1612
NP without coarse/fine bleed

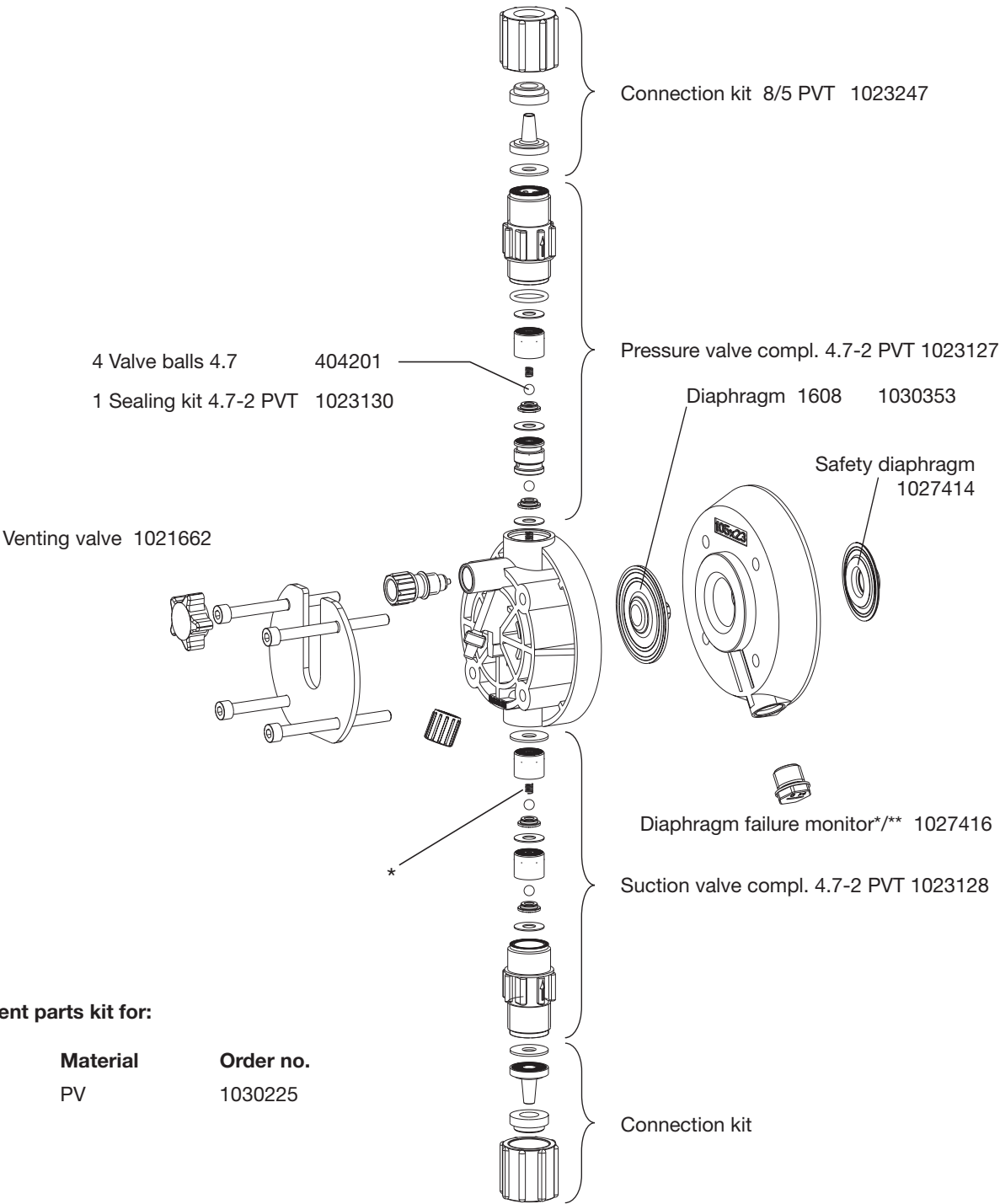


Replacement parts kit for:

Type	Material	Order no.
1612	PCB	1030525
1020	PCB	1030526
0730	PCB	1030612
1612	PCE	1030536
1020	PCE	1030537
0730	PCE	1030621

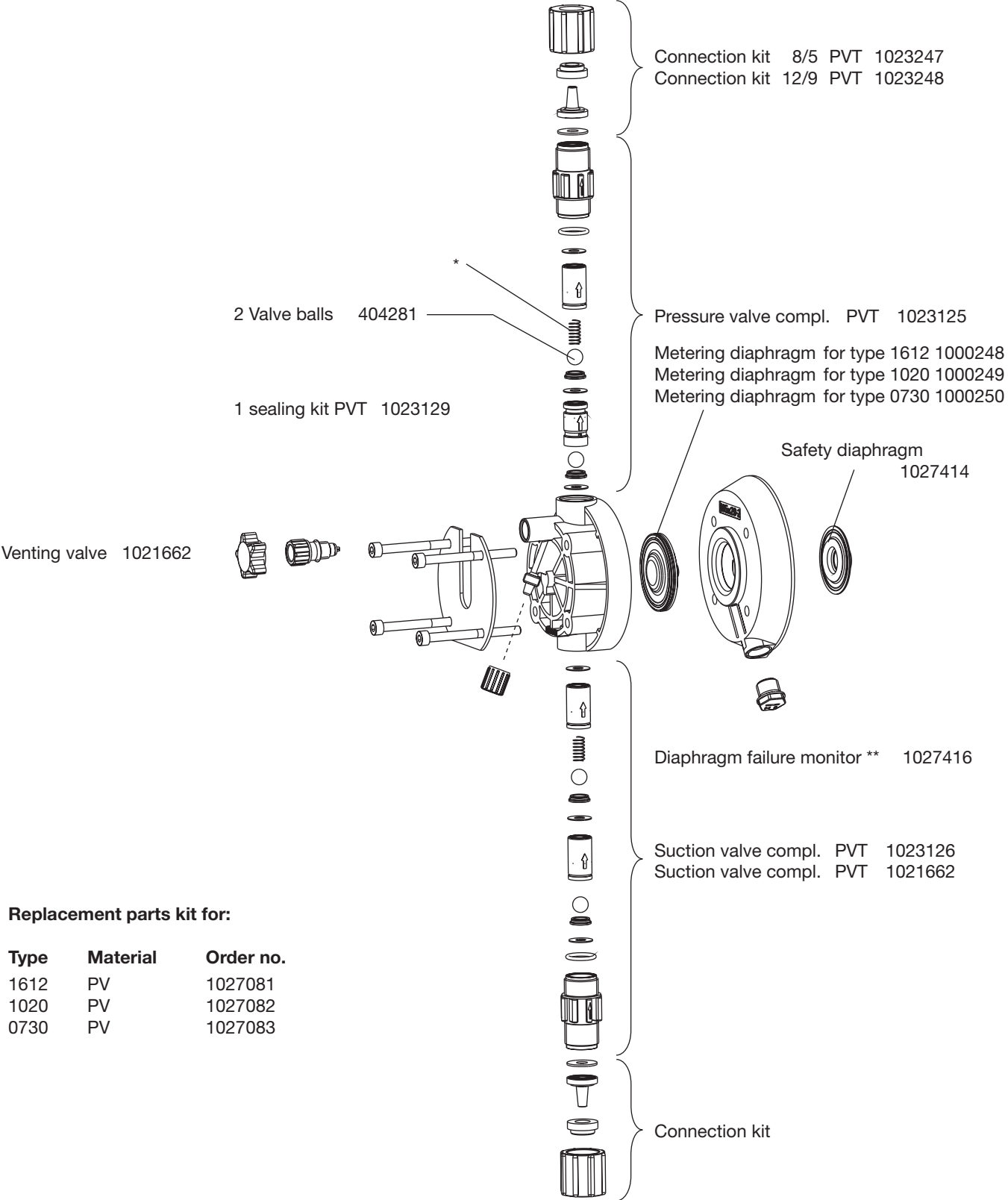
The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit 1608
PVT with bleed



The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit delta® for identcode type: 1612 - 0730 PV



The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit delta® for identcode type: 0450 - 0280 PV

The diagram shows an exploded view of the delivery unit delta. Components are arranged vertically and grouped with brackets and leader lines. Key parts include: connection kits at the top; valve balls, ball seat washers, and form compound gaskets in the middle; a venting valve on the left; safety and metering diaphragms on the right; and a diaphragm failure monitor and another valve assembly at the bottom. A replacement parts kit list is provided at the bottom left.

Connection kit	DN10	PPT	1027072
Connection kit	DN10	PVT	1027091
Connection kit	DN10	PCT	1027092
Connection kit	DN10	PVT	1017405

2 Valve balls	404277		
Ball seat washer PTFE	740063		
Form compound gasket	1019364		

Valve compl.	PVT	1002267
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Metering diaphragm for type 0450 1000251
Metering diaphragm for type 0280 1025075

1 elastomer sealing kit 1024159

Venting valve 1021662

Safety diaphragm 1027414

Diaphragm failure monitor **	1027416
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Valve compl.	PVT	1002267
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Connection kit

Replacement parts kit for:

Type	Material	Order no.
0450	PV	1027084
0280	PV	1027085

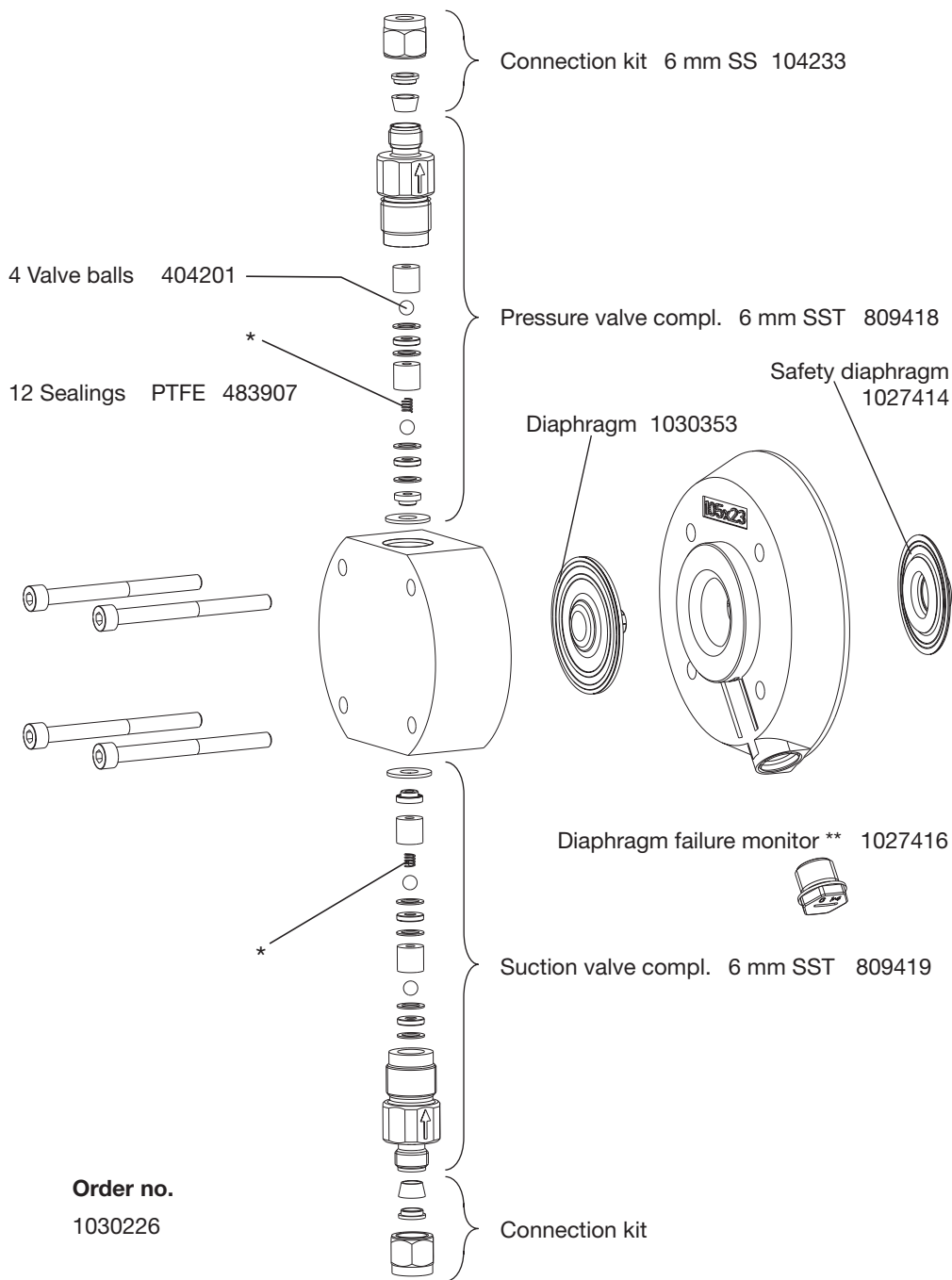
The following items are included in the replacement parts kit.

* special accessories

** not included in replacement parts kit

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Delivery unit 2508
SS



Replacement parts kit for:

Type	Material	Order no.
2508	SST	1030226

The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

Delivery unit delta® for identcode type: 1612 - 0730 SS

4 Valve balls 404281

4 ball seat washers 1005178

12 flat gaskets 483975

1 sealing kit EPDM 1001776

1 sealing kit FPM 1001774

Connection kit for type 1612 8/7 SS 104237

Connection kit for types 1020, 0730 12/10 SS 104245

Pressure valve compl. for type 1612 SS 809494

Pressure valve compl. for types 1020, 0730 SS 809446

Metering diaphragm for type 1612 1000248

Metering diaphragm for type 1020 1000249

Metering diaphragm for type 0730 1000250

Safety diaphragm 1027414

Diaphragm failure monitor ** 1027416

Suction valve compl. for type 1612 SS 809495

Suction valve compl. for types 1020, 0730 SS 809447

Connection kit

Replacement parts kit for:

Type	Material	Order no.
1612	SS	1027086
1020	SS	1027087
0730	SS	1027088

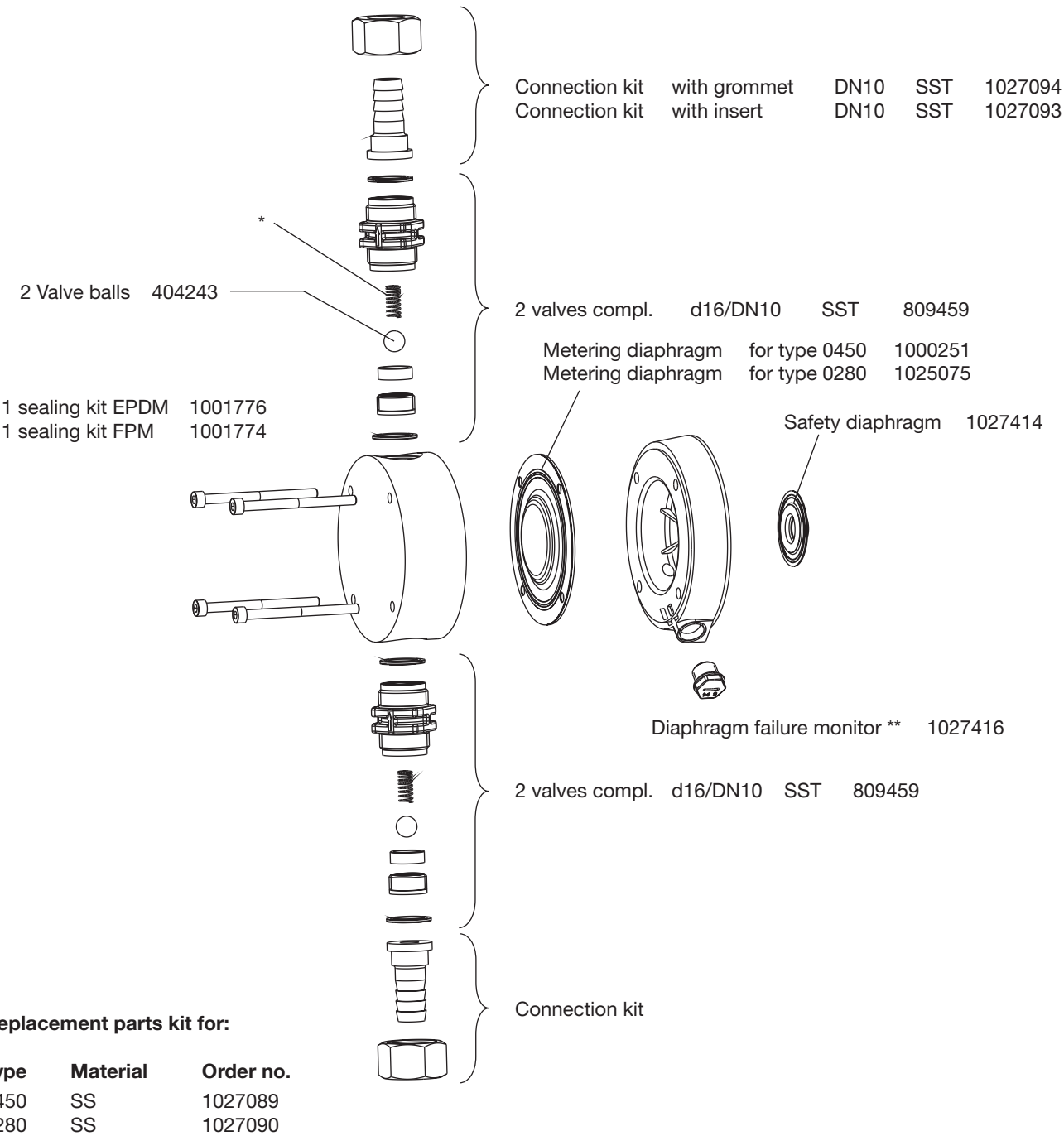
The following items are included in the replacement parts kit.

* special accessories

** not included in replacement parts kit

60_07-104_00_73-04

Delivery unit delta® for identcode type: 0450 - 0280 SS



The following items are included in the replacement parts kit.
* special accessories
** not included in replacement parts kit

EC Declaration of Conformity

We,

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.

Any modification to the product not approved by us will invalidate this declaration.

Product description : ***Metering pump, Series delta***

Product type : ***DLTA...***

Serial number : ***see type identification plate on device***

Relevant EC regulations : ***EC - machine regulation (98/37/EC)***
EC - low voltage regulation (2006/95/EC)
EC - EMC - regulation (2004/108/EC)

Harmonised standards used,
in particular : ***EN ISO 12100-1, EN ISO 12100-2, EN 563, EN 809,***
EN 60335-1, EN 60335-2-41,
EN 61000-3-2/3, EN 61000-6-1/2/3/4

Date/manufacture's signature :

18.10.2007

Dr. Johannes Hartfiel

The undersigned :

Dr. Johannes Hartfiel, assistant development manager

Safety declaration form

A completed form must always be returned with the equipment!

This declaration must only be completed and signed by an authorized member of the technical staff!

The equipment or its parts will only be repaired or serviced if it is accompanied by a correctly completed and signed safety declaration form. The work could be delayed if no form is returned.

Legally binding declaration

We hereby assure that:

1. The enclosed equipment

Type: _____

Serial No.: _____

is free from any

- ☐ toxic
- ☐ corrosive
- ☐ microbiological
- ☐ carcinogenic
- ☐ explosive
- ☐ radioactive substances
- ☐ or other substances that may be harmful to health.

2. The equipment was thoroughly cleaned before being shipped.

3. There is no hazard due to residual contamination.

4. The details given in this form are correct and complete.

Company / Institute: _____

Street: _____ Postcode, Town: _____

Tel: _____ Fax: _____

Surname, First name: _____ Position: _____

Date: _____

Legally binding signature

Company stamp

Die ProMinent Firmengruppe / The ProMinent Group

Stammhaus / Head office

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PVC SCHEDULE 80 FITTINGS

80-2-1000

Performance Engineered & Tested



SPEARS® Schedule 80 PVC fitting designs combine years of proven experience with computer generated stress analysis to yield the optimum physical structure and performance for each fitting. Material reinforcement is uniformly placed in stress concentration areas for substantially improved pressure handling capability. Resulting products are subjected to numerous verification tests to assure obtaining the very best PVC fittings available.

Full 1/4" Through 12" Availability

Spears® comprehensive line of injection molded PVC fittings offers a variety of configurations in molded Schedule 80 sizes 1/4" through 12" conforming to ASTM D 2467 and Spears® exclusive CL150 Flanges in sizes 1/2" through 16".

Exceptional Chemical & Corrosion Resistance

Unlike metal, PVC fittings never rust, scale, or pit, and will provide many years of maintenance-free service and extended system life.

High Temperature Ratings

PVC thermoplastic can handle fluids at service temperatures up to 140° F (60°C), allowing a wide range of process applications, including corrosive fluids.

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Substantially lower material costs than steel alloys or lined steel, combined with lighter weight and ease of installation, can reduce installation costs by as much as 60% over conventional metal systems.

Higher Flow Capacity

Smooth interior walls result in lower pressure loss and higher volume than conventional metal fittings.

Additional Fabricated Configurations through 36"

Extra large, hard-to-find, and custom configurations are fabricated from NSF Certified pipe. Fittings are engineered and tested to provide full pressure handling capabilities according to Spears® specifications.

Advanced Design Specialty Fittings

Spears® wide range of innovative, improved products include numerous metal-to-plastic transition fittings and unions with Spears® patented special reinforced (SR) plastic threads.

PVC Valves

SPEARS® PVC Valve products are available for total system compatibility and uniformity; see SPEARS® THERMOPLASTIC VALVES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS (V-4).



Sample Engineering Specifications

All PVC Schedule 80 fittings shall be produced by Spears® Manufacturing Company from PVC Type I, cell classification 12454, conforming to ASTM Standard D 1784. All injection molded PVC Schedule 80 fittings shall be Certified for potable water service by NSF International and manufactured in strict compliance to ASTM D 2467. All fabricated fittings shall be produced in accordance with Spears® General Specifications for Fabricated Fittings. All PVC flanges shall be designed and manufactured to meet CL150 bolt pattern per ANSI Standard B16.5 and rated for a maximum internal pressure of 150 psi, non-shock at 73°F.

PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

PVC Thermoplastic Pipe Temperature Pressure De-Rating

To determine the maximum internal pressure rating at an elevated temperature, simply multiply the pipe pressure rating at 73°F by the percentage specified for the desired temperature.

System Operating Temperature °F (°C)	73 (23)	80 (27)	90 (32)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)
PVC	100%	90%	75%	62%	50%	40%	30%	22%

NOTE: Valves, Unions and Specialty Products have different elevated temperature ratings than pipe.

Typical Material Properties

Properties	ASTM Test Method	PVC
Mechanical Properties, 73°F		
Specific Gravity, g/cm³	D 792	1.41
Tensile Strength, psi	D 638	7,000
Modulus of Elasticity, psi	D 638	440,000
Compressive Strength, psi	D 695	9,000
Flexural Strength, psi	D 790	13,200
Izod Impact, notched, ft-lb / in	D 256	.65
Thermal Properties		
Heat Deflection Temperature, °F at 66 psi	D 648	165
Thermal Conductivity, BTU / hr / sq ft / °F / in	C 177	1.2
Coefficient of Linear Expansion, in / in / °F	D 696	3.0 x 10 ⁻⁵
Flammability		
Limited Oxygen Index, %	D 2863	43
UL 94 Rating	94V-0	
Other Properties		
Water Absorption, % 24 hr.	D 570	.05
Industry Standard Color	White / Dark Gray	
ASTM Cell Classification	D 1784	12454
NSF Potable Water Approved	YES	

PVC Chemical Resistance

PVC is generally inert to most mineral acids, bases, salts and paraffinic hydrocarbon solutions. For more information on PVC chemical resistance refer to the Chemical Resistance of Rigid Vinyls Based on Immersion Test, published by the GEON® company.

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.



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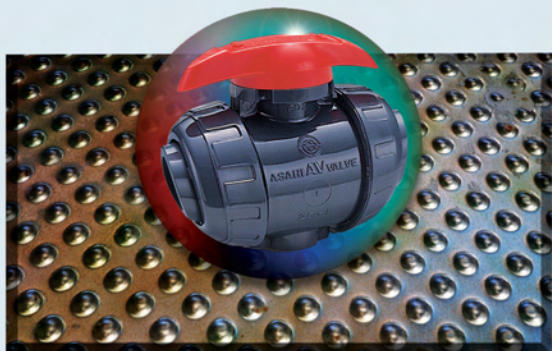
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Type 21 Ball Valve

Standard Features (Sizes 1/2" – 6")

- Pressure rated up to 230 psi (PVC, CPVC, PVDF)
- Double O-ring seals on stem for an added protection.
- Full bore, sizes 1/2" – 2"
- Full vacuum rated, all sizes
- Blocks in two directions, upstream and downstream, leaving full pressure on the opposite end of the valve
- Integrally molded ISO mounting pad for both manual and actuated operations
- Integrally molded base pad to mount valves securely or panel mounting
- PTFE seats with elastomeric backing cushions ensure bubble-tight shut-off and a low fixed torque, while at the same time compensating for wear
- True Union design for easier installation or repairs without expanding the pipe system
- Built-in spanner wrench on the handle for valve disassembly and assembly
- Two sets of end connectors (socket and threaded) included with all PVC and CPVC valves in sizes 1/2" – 2"
- CPVC threaded end connectors on sizes 1/2" – 1" come with stainless steel reinforcing rings

Options

- Pneumatic and electric actuators & accessories
- Stem extensions
- 2" square operating nut or "T" nut
- Locking and/or spring return handles
- Limit switches
- Vented Ball

Specifications

Sizes: 1/2" – 6"
Models: PVC & CPVC: Socket Threaded and Flanged (ANSI)
 PP & PVDF: IPS and Metric (DIN)
 Socket, Threaded, Butt and Flanged (ANSI)
Bodies: PVC, CPVC, PP and PVDF
Seats: PTFE backed with EPDM or FKM
Seals: EPDM or FKM or AFLAS®†

Sizes 1/2" - 4" PVC/EPDM/FKM Models available with NSF-61 Certification

† Trademark of Asahi Glass Co., Ltd.

Parts List (Sizes 1/2" – 2")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, CPVC, PP, PVDF
2	Ball	1	PVC, CPVC, PP, PVDF
3	Carrier	1	PVC, CPVC, PP, PVDF
4	End Connector	2	PVC, CPVC, PP, PVDF
5	Union Nut	2	PVC, CPVC, PP, PVDF
6	Stem	1	PVC, CPVC, PP, PVDF
7	Seat	2	PTFE
8	O-Ring (A)	2	EPDM FKM, Others
9	O-Ring (B)	1	EPDM FKM, Others
10	O-Ring (C)	2	EPDM FKM, Others
11	O-Ring (D)	1	EPDM FKM, Others
12	O-Ring (E)	1	EPDM FKM, Others
13	Stop Ring*	2	PVDF
14	Handle	1	ABS
4a	Ring**	2	304 Stainless Steel

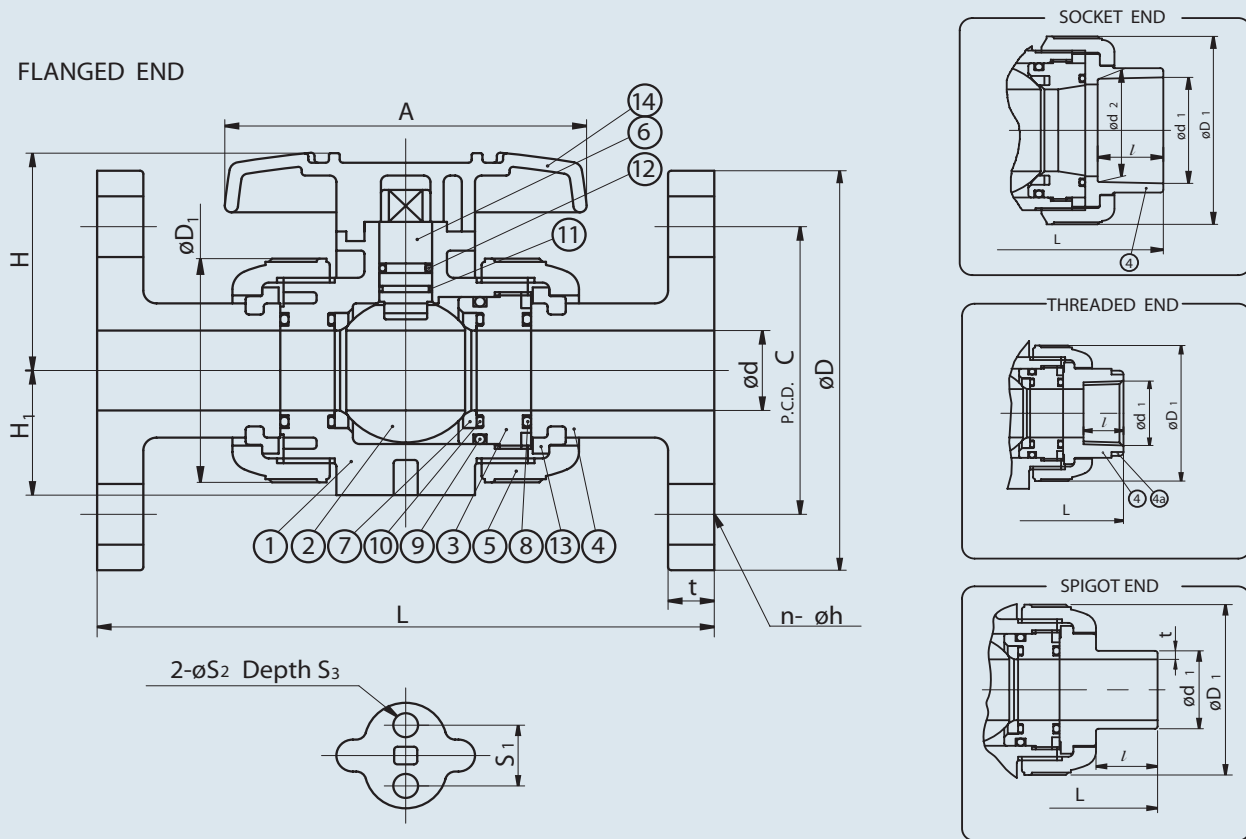
* Used for flanged end

** Used for CPVC body, threaded end, 1/2" – 1"



ASAHI/AMERICA

Rev. C 03-05



Dimensions (Sizes 1/2" – 2")

NOMINAL SIZE		d	FLANGED						SOCKET										
			ANSI CLASS 150				L	t	PVC, CPVC				PP, PVDF (DIN)			PP, PVDF (IPS)			
									ASTM SCH 80			L	DIN 16962			L	d1	l	L
			INCHES	mm	D	C	n	h	d1	d2	l		L	d1	d2				
1/2	15	0.59	3.50	2.38	4	0.62	5.63	0.47	0.848	0.836	0.875	4.45	0.768	0.760	0.57	3.90	0.83	0.87	4.45
3/4	20	0.79	3.88	2.75	4	0.62	6.77	0.55	1.058	1.046	1.000	5.08	0.965	0.957	0.63	4.49	1.03	1.00	5.08
1	25	0.98	4.25	3.12	4	0.62	7.36	0.55	1.325	1.310	1.125	5.75	1.240	1.232	0.71	4.84	1.30	1.13	5.75
1 1/4	32	1.26	4.62	3.50	4	0.62	7.48	0.63	1.670	1.655	1.250	6.46	1.553	1.543	0.81	5.47	1.65	1.25	6.46
1 1/2	40	1.57	5.00	3.88	4	0.62	8.35	0.63	1.912	1.894	1.375	7.24	1.947	1.937	0.93	5.83	1.89	1.37	7.24
2	50	2.01	6.00	4.75	4	0.75	9.21	0.63	2.387	2.369	1.500	8.23	2.461	2.445	1.08	6.93	2.36	1.50	8.23

NOMINAL SIZE		THREADED							SPIGOT (BUTT END)							
									PP,PVDF							
									DIN 3442		PP	PVDF				
									d1	<i>l</i>	t	t				
INCHES	mm	d1	<i>l</i>	L	D1	H	H1	A	d1	<i>l</i>	t	t	L	S1	S2	S3
1/2	15	1/2-14 NPT	0.59	4.02	1.89	2.03	1.14	3.62	0.787	0.728	0.098	0.075	4.882	0.75	0.29	0.43
3/4	20	3/4-14 NPT	0.67	4.72	2.36	2.34	1.38	3.94	0.984	0.866	0.106	0.075	5.670	0.75	0.29	0.43
1	25	1-11 1/2 NPT	0.79	5.16	2.76	2.68	1.54	4.33	1.260	0.886	0.118	0.094	6.063	0.75	0.29	0.43
1 1/4	32	1 1/4-11 1/2 NPT	0.87	5.91	3.23	3.17	1.85	4.76	1.575	1.024	0.146	0.094	6.850	1.18	0.35	0.59
1 1/2	40	1 1/2-11 1/2 NPT	0.98	6.42	3.94	3.50	2.17	5.16	1.969	1.260	0.181	0.118	7.638	1.18	0.35	0.59
2	50	2-11 1/2 NPT	1.10	7.76	4.96	4.04	2.60	6.26	2.480	1.417	0.228	0.118	8.819	1.18	0.35	0.59

Pressure vs. Temperature (PSI, WATER, NON-SHOCK)

NOMINAL SIZE		PVC				CPVC						PP				PVDF				
		30° F	71° F	106° F	121° F	30° F	71° F	106° F	121° F	141° F	176° F	-5° F	86° F	121° F	141° F	-5° F	71° F	106° F	141° F	176° F
INCHES	mm	70° F	105° F	120° F	140° F	70° F	105° F	120° F	140° F	175° F	195° F	85° F	120° F	140° F	175° F	70° F	105° F	140° F	175° F	210° F
1/2-2	15-50	230	170	150	30	230	170	150	120	75	55	150	110	90	55	230	185	150	115	85
2 1/2	65	230	170	150	NA	230	170	150	120	75	55	150	95	70	40	230	185	150	115	85
3	80	230	170	150	NA	230	170	150	85	55	40	150	95	70	40	230	185	150	100	70
4-6	100-150	150	150	150	NA	150	150	150	85	55	40	150	95	70	40	150	150	150	100	70

Sample Specification

All TYPE 21 Ball Valves, sizes 1/2" to 4", shall be of true union design with two-way blocking capability. All O-rings shall be EPDM or FKM with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stem shall have double O-rings and be of blowout-proof design. The valve handle shall double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. PVC conforming to ASTM D1784 Cell Classification 12454-A, CPVC conforming to ASTM D1784 Cell Classification 23567-A, PP Conforming to ASTM D4101 Cell Classification PP0210B67272 and PVDF conforming to ASTM D3222 Cell Classification Type II. The ball valves, except PP, shall have a pressure rating of 230 psi for sizes 1/2" to 3" and 150 psi for 4" (150 psi for PP, all sizes) at 70 ° F. Type 21 Ball Valves must carry a two-year guarantee, as manufactured by Asahi/America, Inc.

Cv Values

NOMINAL SIZE		Cv
INCHES	mm	
1/2	15	14
3/4	20	29
1	25	47
1 1/4	32	72
1 1/2	40	155
2	50	190
2 1/2	65	365
3	80	410
4	100	680

Weight (POUNDS)

NOMINAL SIZE		SOCKET THREADED	FLANGED
INCHES	mm		
1/2	15	0.44	1.10
3/4	20	0.66	1.54
1	25	1.10	2.70
1 1/4	32	1.54	3.30
1 1/2	40	2.64	4.40
2	50	4.40	8.15
2 1/2	65	6.17	8.80
3	80	9.70	13.00
4	100	24.00	26.67

Caution

- Never remove valve from pipeline under pressure.
- Always wear protective gloves and goggles.
- Watch out for trapped fluid in valve. It is safe to close valve before removing it from the pipeline.

Caution

- Do not use ball valves where media has suspended particles. Use the following valves:
Butterfly Valves – PVDF disc is most abrasion resistant and make sure of chemical compatibility.
Diaphragm Valves – Elastomeric diaphragm is designed for handling suspended particles.
- Volatile fluids such as sodium hypochlorite (NaClO) and hydrogen peroxide (H₂O₂) could be trapped and gasified within the valve. We can provide you with a Type 21 ball valve with a *vented ball* to relieve pressure build-up inside the valve.

Troubleshooting

What if the fluid still flows when valve is closed?

- Carrier is not properly tightened. Tighten it.
- PTFE seat is damaged or worn. Replace seat.
- Foreign material is caught between ball and PTFE seat. Remove material and clean.
- Ball is damaged or worn. Change ball.

What if fluid leaks outside of valve?

- Union nut not properly tightened. Retighten.
- Carrier is not properly tightened. Thread it in firmly.
- Carrier or face O-ring is damaged, worn, or missing. Replace O-ring.

What if handle does not rotate smoothly?

- Foreign material has formed on the ball or seat. Clean both.
- Internal part(s) chemically attacked or swollen. Refer to Asahi/America Chemical Resistance Chart for compatibility. Replace part(s) as required.
- Carrier over-tightened. Retighten properly.

What if handle rotates too freely?

- Stem is damaged. Replace stem.
- Handle is not engaged with stem. Disassemble and reengage. Inspect.
- Engaging part of stem and/or ball is damaged. Change stem and/or ball.

Serial No.

H – V027 E – 4

Ball Valve Type 21

User's Manual



Contents

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(2) General instructions for transportation, unpacking and storage	1
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ASAHI AV VALVES

(1) General operating instructions

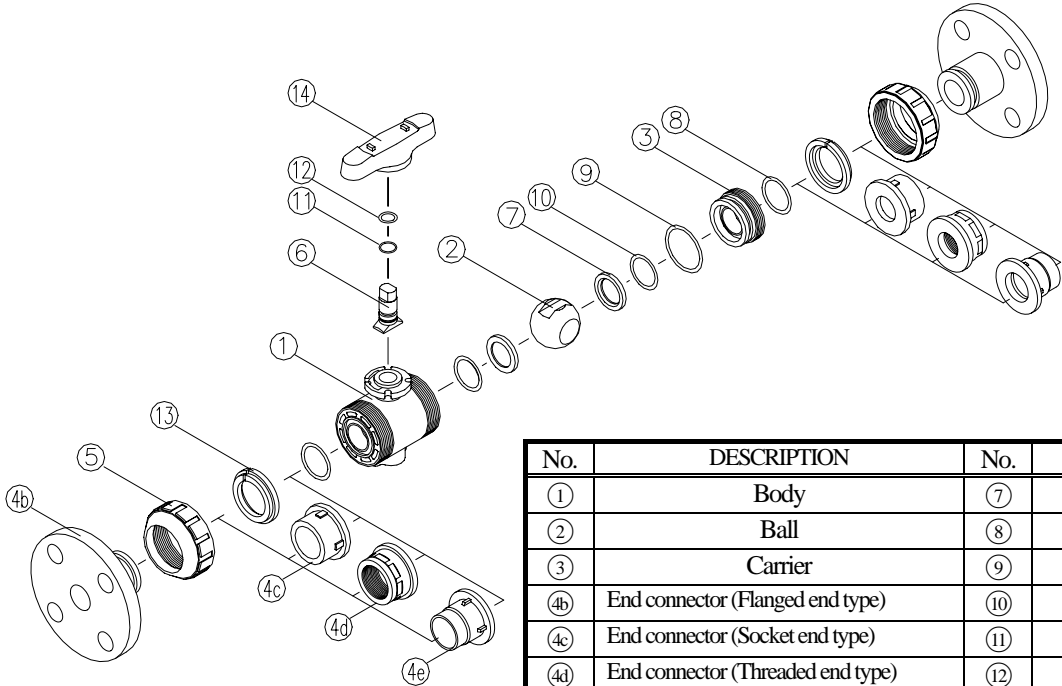
- Operate the valve within the pressure Vs temperature range.
(The valve can be damaged by operating beyond the allowable range.)
- Select a valve material that is compatible with the media, refer to “CHEMICAL RESISTANCE ON ASAHI AV VALVE”.
(Some chemicals may damage incompatible valve materials.)
- Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
- Do not use the valve on condition that fluid has crystallized.
(The valve will not operate properly.)
- Do not step on the valve or apply excessive weight on valve. (It can be damaged.)
- Do not exert excessive force in closing the valve.
- Make sure to consult a waste treatment dealer to dispose of the valves.
(Poisonous gas is generated when the valve is burned improperly.)
- Allow sufficient space for maintenance and inspection.
- Keep the valve away from excessive heat or fire. (It can be deformed, or destroyed.)
- The valve is not designed to bear any kind of external load. Never stand on or place anything heavy on the valve at anytime.
- Certain liquid such as H₂O₂, NaClO, etc may be prone to vaporization which may cause irregular pressure increases, which may destroy the valve.

(2) General instructions for transportation, unpacking and storage

- Keep the valve packed in the carton or box as delivered until installation.
- Keep the valve away from any coal tar, creosote (antiseptic for wood), termite insecticide, vermicides, and paint.
(This could cause swelling damage the valve.)
- Do not impact or drop the valve. (It can be damaged.)
- Avoid scratching the valve with any sharp object.

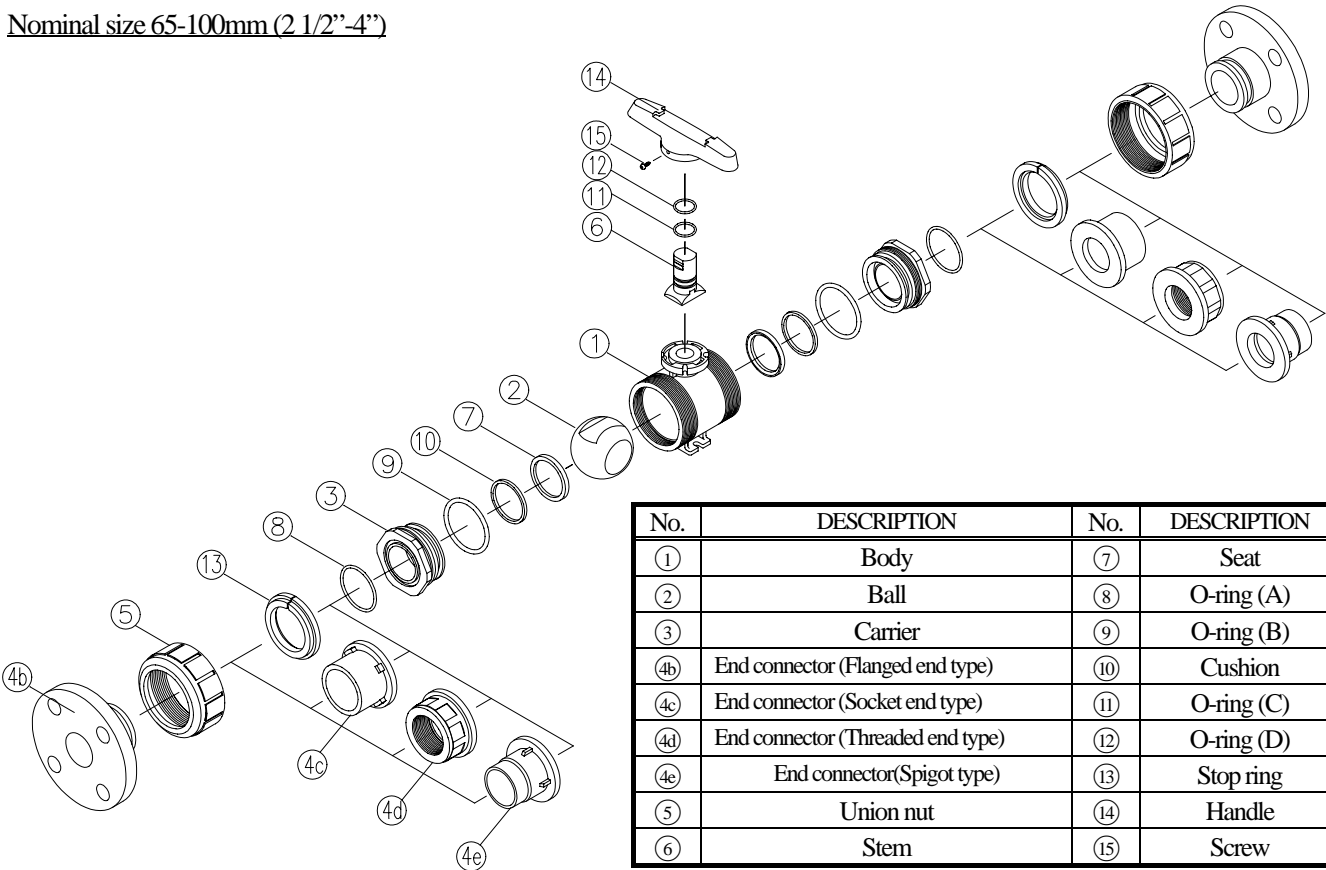
(3) Name of parts

Nominal size 15-50mm (1/2”-2”)



No.	DESCRIPTION	No.	DESCRIPTION
①	Body	⑦	Seat
②	Ball	⑧	O-ring (A)
③	Carrier	⑨	O-ring (B)
④b	End connector (Flanged end type)	⑩	O-ring (C)
④c	End connector (Socket end type)	⑪	O-ring (D)
④d	End connector (Threaded end type)	⑫	O-ring (E)
④e	End connector(Spigot type)	⑬	Stop ring
⑤	Union nut	⑭	Handle
⑥	Stem		

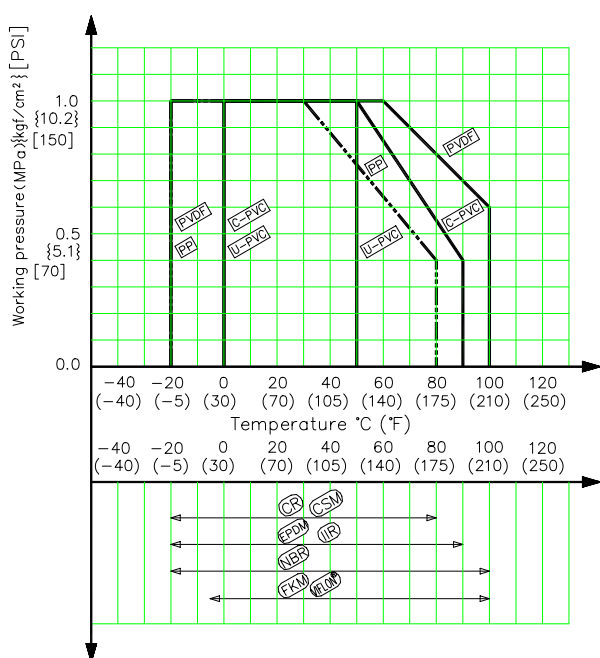
Nominal size 65-100mm (2 1/2”-4”)



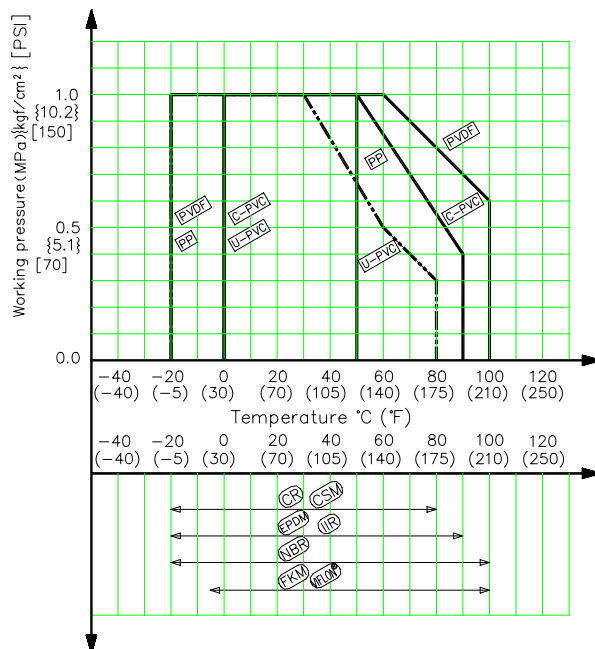
No.	DESCRIPTION	No.	DESCRIPTION
①	Body	⑦	Seat
②	Ball	⑧	O-ring (A)
③	Carrier	⑨	O-ring (B)
④b	End connector (Flanged end type)	⑩	Cushion
④c	End connector (Socket end type)	⑪	O-ring (C)
④d	End connector (Threaded end type)	⑫	O-ring (D)
④e	End connector(Spigot type)	⑬	Stop ring
⑤	Union nut	⑭	Handle
⑥	Stem	⑮	Screw

(4) Comparison between working temperature and pressure

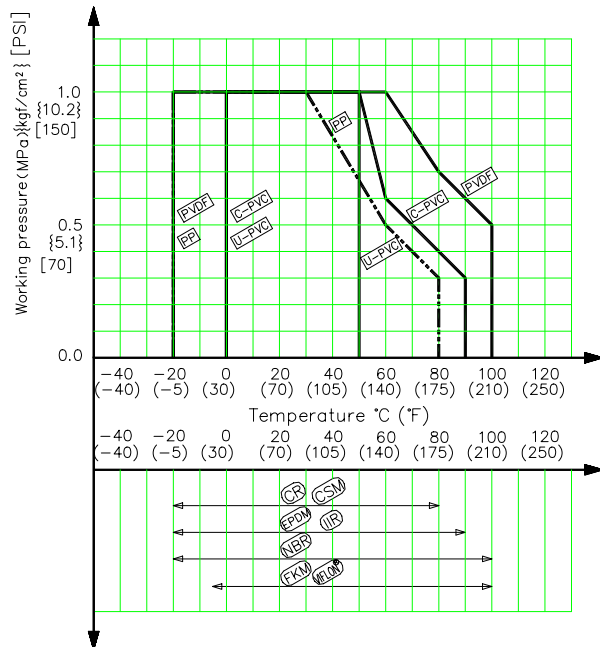
Nominal size: 15mm-50mm (1/2"-2")



Nominal size: 65mm (2 1/2")



Nominal size: 80mm, 100mm (3", 4")



Caution

Do not operate the valve beyond the range of working temperature and pressure.
(The valve can be damaged.)

(5) Installation procedure

Flanged type (Material: PVC, C-PVC, PP, PVDF)

Necessary items

- Torque wrench
- Spanner wrench
- AV gasket
- Bolt, Nut, Washer (For many flanges specification)

(When a non-AV gasket is used, a different tightening torque specification should be followed.)

Procedure

- 1) When the union nut ⑤ flange assembly set was removed or loosen from body ①, O-ring (A) ⑧ should be installed into carrier and body groove. (In either horizontal or vertical installation, if necessary apply a small amount of lubricant to O-ring to hold in place.) Align union nut and end connector with the body. Insure end connector mates with body and O-ring. Make certain union nut threads onto body smoothly. Tighten union nuts on each side valve until hand tight. Then using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.
- 2) Set the AV gasket between the flanges.
- 3) Insert washers and bolts from the pipe side, insert washers and nuts from the valve side, then temporarily tighten them by hand.



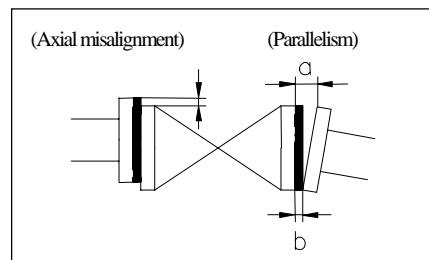
Caution

The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage the valve.

(A failure to observe them can cause destruction due to stress application to the pipe)

Unit : mm (inch)

Nom. Size	Axial Misalignment	Parallelism (a-b)
15-32mm (1/2"-1 1/4")	1.0mm (0.04")	0.5mm (0.02")
40-80mm (1 1/2"-3")	1.0mm (0.04")	0.8mm (0.03")
100mm (4")	1.0mm (0.04")	1.0mm (0.04")



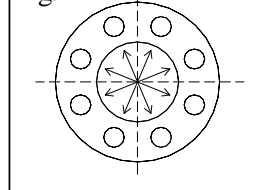
- 4) Tighten the bolts and nuts gradually with a torque wrench to the specified torque level in a diagonal manner. (Refer to fig.1.)

Recommended torque value

Unit: N·m [kgf·cm] [lb·inch]

Nom. Size	15-20mm (1/2"-3/4")	25-40mm (1"-1 1/2")	50, 65 mm (2", 2 1/2")	80, 100 mm (3", 4")
Torque value	17.5 { 179 } [155]	20.0 { 204 } [177]	22.5 { 230 } [230]	30.0 { 306 } [266]

Fig. 1



Caution

Avoid excessive tightening. (The valve can be damaged.)

Threaded type (Material : PVC, C-PVC, PP, PVDF)

Necessary items

- Sealing tape (A non-sealing tape can cause leakage.)
- Strap wrench (Do not use Pipe wrench.)
- Spanner wrench



Caution

Make sure that the threaded connections are plastic x plastic.
(Metallic thread can cause damage.)

Procedure

- 1) Wind a sealing tape around the external thread of joint, leaving the end (about 3mm) free.
- 2) Loosen the union nut (5) with a strap wrench..
- 3) Remove the union nut (5) and the end connector (4d).
- 4) Lead the union nut (5) through the pipe.
- 5) Tighten the external thread of the joint and the end connector (4d) hardly with hand.
- 6) Using a spanner wrench, screw in the end connector (4d) by turning 180° -360° carefully without damaging it.



Caution

Avoid excessive tightening. (The valve can be damaged.)

- 7) Make sure that the O-ring (A) (8) is mounted.
- 8) Set the end connector (4d) and union nut (5) directly on the body without allowing the O-ring (A) (8) to come off.
- 9) Tighten union nuts (5) on each valve until hand tight.
- 10) Using a strap wrench tighten union nuts uniformly on each on each side approx 90° -180° turns, 1/4 to 1/2 turns.



Caution

Avoid excessive tightening. (The valve can be damaged.)

Socket type (Material : PVC, C-PVC)

Necessary items

- Adhesive for hard vinyl chloride pipes
- Strap wrench (Do not use the pipe wrench)



Caution

Do not install a socket type valve where the atmospheric temperature is 5°C or lower.
(The valve can be damaged.)

Procedure

- 1) Loosen the union nut ⑤ with a strap wrench.
- 2) Remove the union nut ⑤ and end connector ④c.
- 3) Lead the union nut through the pipe.
- 4) Clean the hub part of the end connector ④c by wiping the waste cloth.
- 5) Apply adhesive evenly to the hub part of the end connector ④c and the pipe spigot.



Caution

Do not apply more adhesives than necessary.
(The valve can be damaged due to solvent cracking.)

Adhesive quantity (guideline)

Nom. Size	15mm (1/2")	20mm (3/4")	25mm (1")	32mm (1 1/4")	40mm (1 1/2")	50mm (2")	65mm (2 1/2")	80mm (3")	100mm (4")
Quantity (g)	1.0	1.3	2.0	2.4	3.5	4.8	6.9	9.0	13.0

- 6) After applying adhesive, insert the pipe quickly to the end connector ④c and leave it alone for at least 60 seconds.
- 7) Wipe away overflowing adhesive.
- 8) Make sure that O-ring(A) ⑧ is mounted
- 9) Set the end connector ④c and union nut ⑤ directly on the body without allowing the O-ring (A) ⑧ to come off.
- 10) Tighten union nut ⑤ hardly with hand.
- 11) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.



Caution

Avoid excessive tightening. (The valve can be damaged.)

Socket type (Material : PP, PVDF)

Necessary items

- Strap wrench (Do not use the pipe wrench.)
- Sleeve welder or automatic welding machine
- User's manual for sleeve welder or automatic welding machine

Procedure

- 1) Loosen the union nut with a strap wrench.
- 2) Remove the union nut ⑤ and the end connector.
- 3) Lead the union nut ⑤ through the pipe.
- 4) For the next step, refer to the user's manual for the sleeve welder or the automatic welding machine.
- 5) After welding, make sure that the O-ring (A) ⑧ is mounted.
- 6) Set the end connector ④c and the union nut ⑤ directly without allowing the O-ring (A) ⑧ to come off.
- 7) Tighten union nut ⑤ hardly with hand.
- 8) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.

**Caution**

Avoid excessive tightening. (The valve can be damaged.)

Spigot type (Material : PVDF)

Necessary items

- Strap wrench (Do not use the pipe wrench.)
- Automatic welding machine
- User's manual for automatic welding machine

Procedure

- 1) Loosen the union nut with a strap wrench.
- 2) Remove the union nut ⑤ and the end connector.
- 3) Lead the union nut ⑤ through the pipe.
- 4) For the next step, refer to the user's manual for the sleeve welder or the automatic welding machine.
- 5) After welding, make sure that the O-ring (A) ⑧ is mounted.
- 6) Set the end connector ④c and the union nut ⑤ directly without allowing the O-ring (A) ⑧ to come off.
- 7) Tighten union nut ⑤ hardly with hand.
- 8) Using a strap wrench tighten union nuts uniformly on each side approx 90° -180° turns, 1/4 to 1/2 turns.

**Caution**

Avoid excessive tightening. (The valve can be damaged.)

**Caution**

{15mm-50mm(1/2"-2")}

It is recommended to install the valve with the threaded carrier to the upstream side of the system.

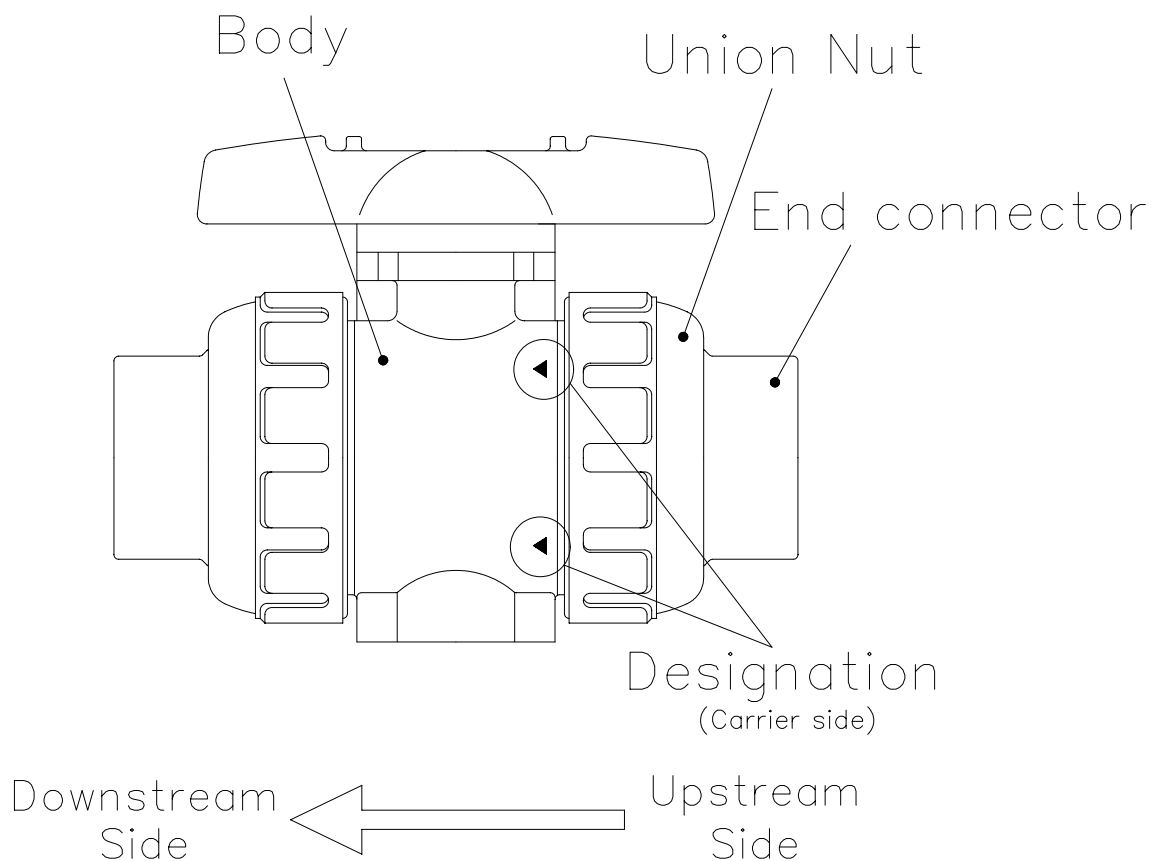
This allows for an increase safety factor and eliminating a threaded connection when used as a blocking valve.

This also allows the down stream union nut and end connector to be removed safely under pressure.

It increases the safety where there is no chance of thread leakage or accidentally removing the carrier.

The designation of the up stream side (non threaded carrier is marked as shown) on the body.

Nominal size 15mm - 50mm (1/2" – 2")



(6) Operating Procedure



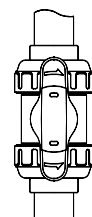
Caution

Avoid excessive tightening. (The valve can be damaged.)

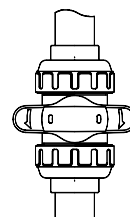
- Turn the handle gently to open or close.
(Turn the handle clockwise to close and counter clockwise to open.)

Fully closed The position of the handle should be perpendicular to the pipe.

Fully opened The position of the handle should be parallel to the pipe.



Fully opened



Fully closed

(7) Method of Adjusting Face Pressure between Ball and Seat

Necessary items

- Strap wrench
- Safety goggles
- Protective gloves
- Screwdriver (+) (only with nominal size 65~100mm)

Procedure

- 1) Completely discharge fluid from pipes.
- 2) Turn the handle to full close.
- 3) Loosen the right union nut and the left one ⑤ with a strap wrench.
- 4) Remove the body part from piping system.



Caution

Wear protective gloves and safety goggles as some fluid remains in the valve. (You may be injured.)

- 5) Pull the handle off the body part.



Caution

As for nominal size 65-100mm (2 1/2"-4"), loosen the screw ⑮ properly with a screwdriver before pulling it off..

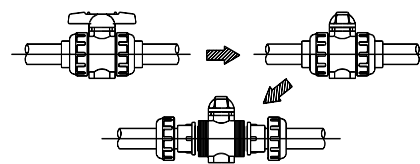
- 6) Engage the upper convex part of the handle with the concave part of the union ③.



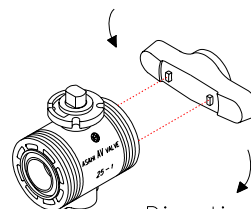
Caution

As for nominal size 15-50mm
Only the union ③ on the right side when viewed from the trademark (AV mark) can be adjusted.
As for nominal size 65-100mm
adjust the unions on both sides.

- 7) Make an adjustment by turning the union clockwise (to tighten it) or counter clockwise (to loosen it).
- 8) Make sure that the handle can be operated smoothly.
- 9) Assemble the valve by following the above procedure in the reverse order, starting at 6)



Direction where carrier is tightened



Direction where carrier is loosened

(8) Disassembling Method for Replacing Parts

Necessary items

- Strap wrench
- Safety goggles
- Protective gloves



Caution

Wear protective gloves and safety goggles as some fluid remains in the valve.
(You may be injured.)

<Disassembly>

Procedure

- 1) Completely discharge fluid from pipes.
- 2) Turn the handle to full close.
- 3) Loosen the right union nut and the left one ⑤ with a strap wrench.
- 4) Remove the body part from piping system.
- 5) Pull the handle off the body part.



Caution

As for nominal size 65-100mm (2 1/2"-4"), loosen the screw ⑮ properly with a screwdriver before pulling it off..

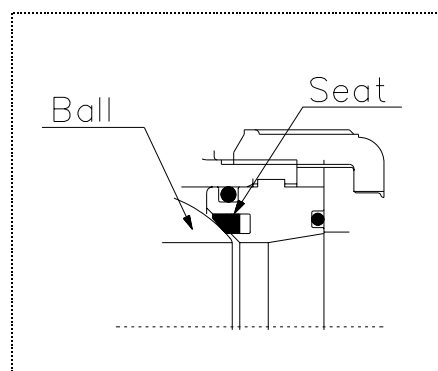
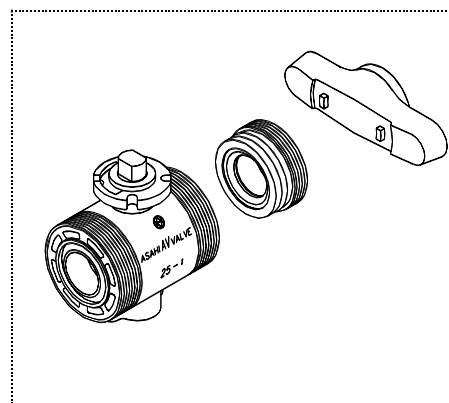
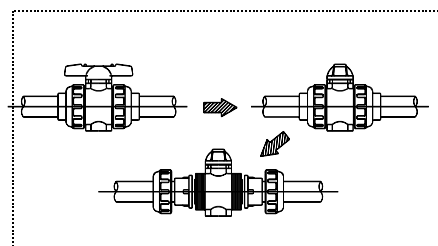
- 6) Engage the upper convex part of the handle with the concave part of the union.



Caution

As for nominal size 15-50mm
Only the union ③ on the right side when viewed from the trademark (AV mark) can be adjusted.
As for nominal size 65-100mm, adjust the unions on both sides.

- 7) In the engaged state, turn the handle ⑭ counter clockwise to loosen it and remove the union ③.
- 8) Remove the seat ⑦ carefully by hand without damaging it.
- 9) Push out the ball ② by hand.
- 10) Push out the stem ⑥ from the top flange side to the body side.



<Assembly>

Procedure

Carry out the assembly work in the reverse procedure from item 10)



Caution

With regard to item 8), before installing seat ⑦ on the valve, check the seat for its face and back.

(9) Mounting actuator, Ensaf and base (panel)

○ Attach actuator to the top flange

Procedure

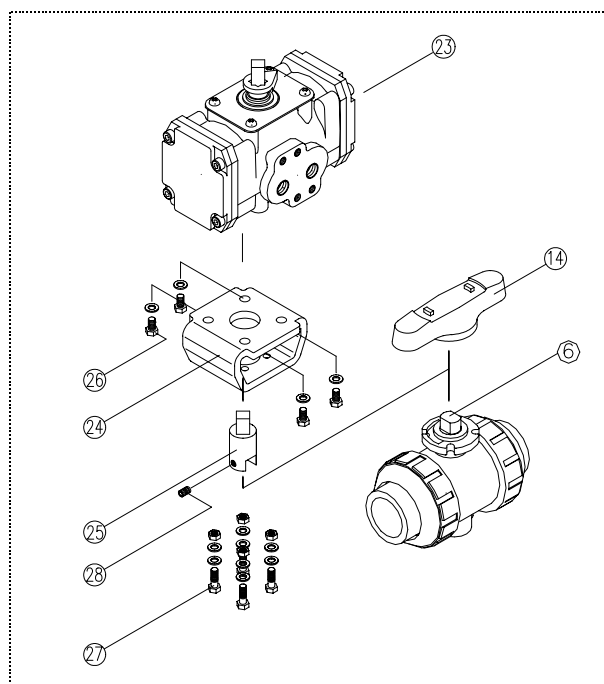
- 1) Remove the handle (14).



Caution

As for nominal 65mm-100mm, tighten the screw (15) properly before removing it.

- 2) Fix the stand (24) to actuator (23) with bolt (A).
- 3) Fix the stem (6) to the joint (25) with screw (B) (28).
- 4) Engage the joint (25) with actuator (23).
- 5) Fix the stand (24) to the top flange with bolt-nut (B) (27).
- 6) Make sure that the valve works smoothly, by operating actuator (23) by hand.



○ Attach Inserted metal to the bottom stand.

Procedure

Refer to the user's manual for the Inserted metal
(Commercially available.)

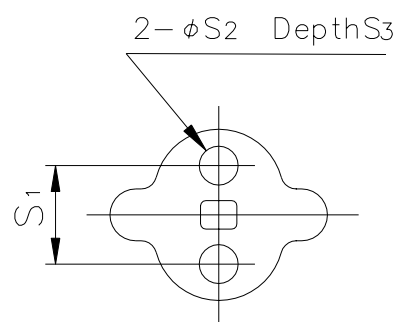
Bottom stand dimension

Unit; mm

Nom.Size	S1	S2	S3
15mm (1/2")	19	7.3	11
20mm (3/4")	19	7.3	11
25mm (1")	19	7.3	11
32mm (1 1/4")	30	9	15
40mm (1 1/2")	30	9	15
50mm (2")	30	9	15
65mm (2 1/2")	48	9	6
80mm (3")	55	11	7
100mm (4")	65	11	8

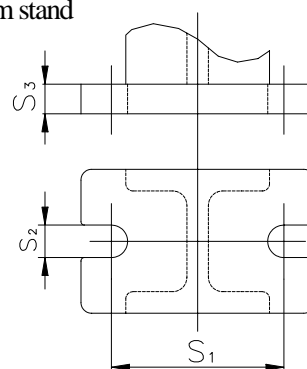
Nominal 15-50mm(1/2"-2")

Bottom stand



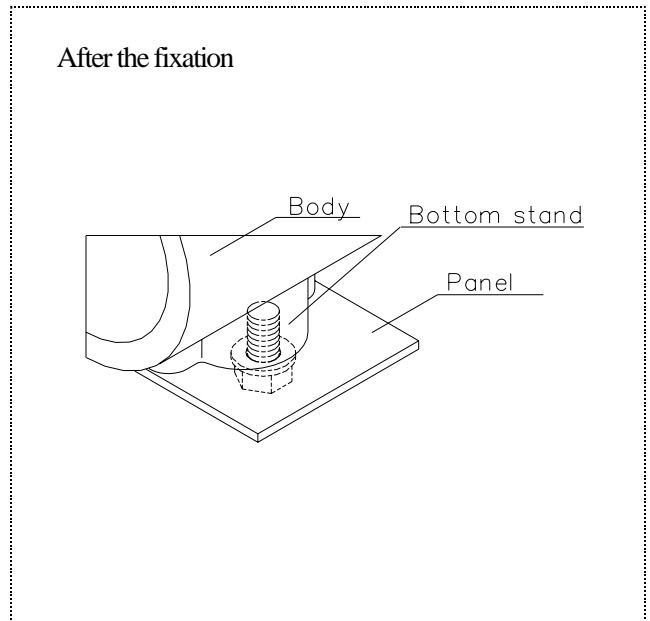
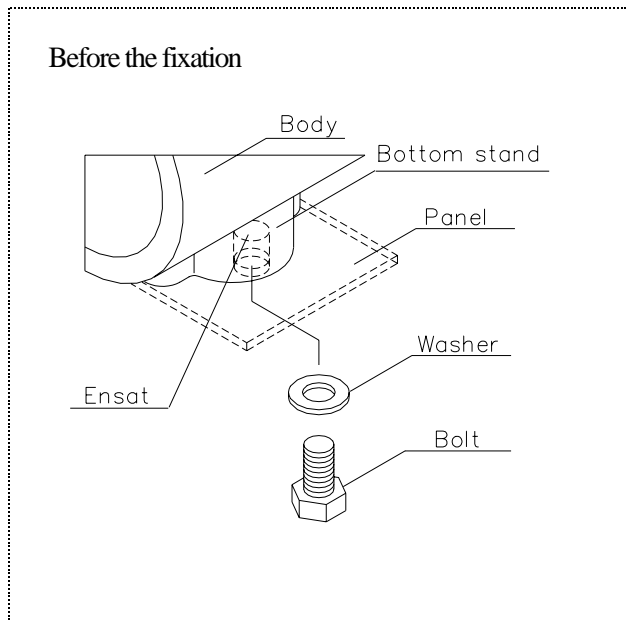
Nominal 65-100mm (2 1/2"-4")

Bottom stand

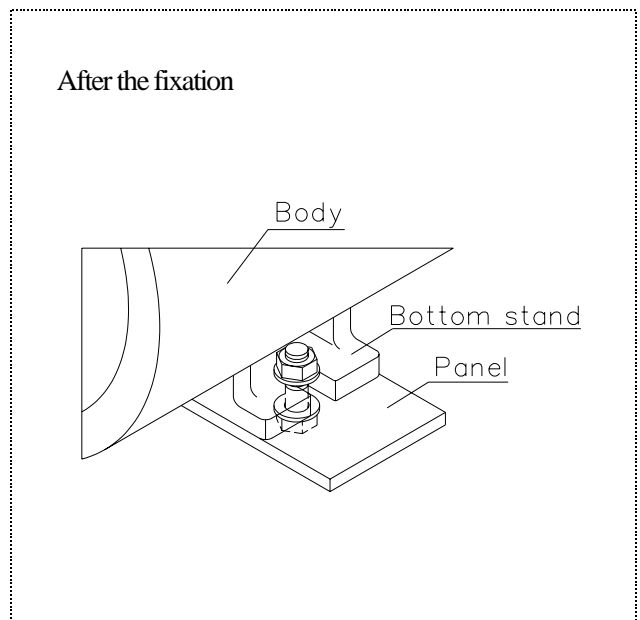
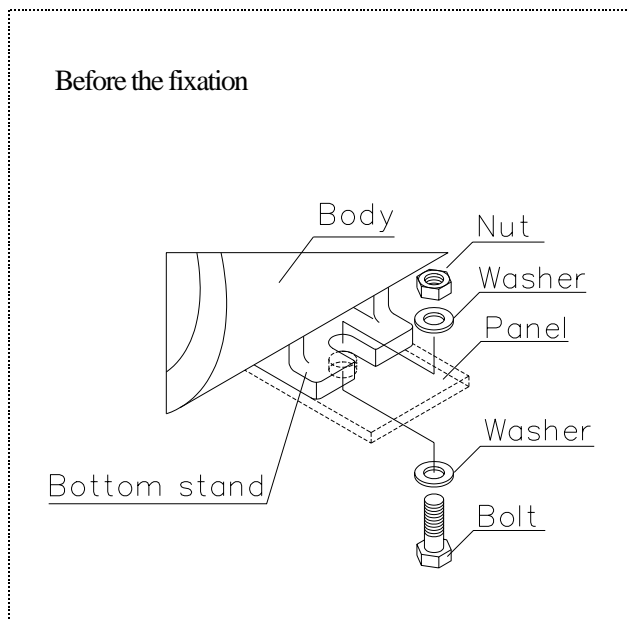


○ Fixation of bottom stand with panel

Nominal size: 15mm-50mm (1/2"-2")



Nominal size: 65mm-100mm (2 1/2"-4")



(10) Inspection items

○Inspect the following items.

(1)	Existence of scratches, cracks, deformation, and discoloring.
(2)	Existence of leakage from the valve to the outside.
(3)	Existence of leakage when the valve is opened fully at right or left.

(11) Troubleshooting

Problem	Cause	Treatment
Fluid leaks from the valve even when the valve is closed fully.	The carrier is loosened.	Adjust the face pressure between the ball and the seat. (Refer to page 9)
	The seat is scratched or worn.	Replace the seat with a new one.
	Foreign matter is in the valve.	Clean up.
	The ball is scratched or worn.	Replace the scratched ball with a new one.
Fluid leaks from the valve.	The union nut is loosened.	Tighten up the union nut.
	The carrier is loosened.	Adjust the face pressure between the ball and the seat. (Refer to page 9)
	The O-ring is scratched or worn.	Replace the O-ring with a new one.
The handle can not be turned smoothly.	Foreign matter is in the valve.	Clean up.
	Deformation. (By heat etc.)	Replace the parts.
The handle fails to engage.	The stem is broken.	Replace the stem with a new one.
	The engagement between the stem and the ball is broken.	Replace the stem and ball with new ones.

(12) Handling of residual and waste materials



Caution

In discarding remaining or waste materials, be sure to ask waste service company.
(Poisonous gas is generated.)

(13) Inquiries

ASAHI ORGANIC CHEMICALS INDUSTRY CO., LTD.

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Tel : (81) 3-3254-8177 Fax : (81) 3-3254-3474

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Tel : (65) 220-4022 Fax : (65) 324-6151

Europe Representative Office : Kaiser-Friedrich-Promenade 61 D-61348 Bad Homburg v. d. H. Germany.

Tel : (49) 6172-9175-0 Fax : (49) 6172-9175-25

Shanghai Branch Office : Room 1301-P Shanghai Kerry Center, 1515 Nanjing Xi Road, Shanghai China

Tel : (21) 5298-6900 Fax : (21) 5298-6556

ASAHI /AMERICA Inc. :35 Green Street P.O.Box 653 , Malden, Massachusetts 02148 U.S.A.

Tel : (1) 781-321-5409 Fax : (1) 781-321-4421

<u>Distributor</u>

Ball Valves Type 21



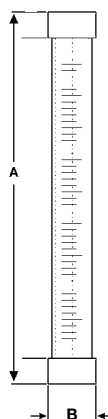
ASAHI AV VALVES

Pump & Systems Accessories

Calibration Columns

Calibration columns

Clear PVC calibration columns

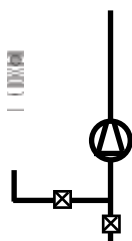


Cylinder size	Fitting size	Dimension (inches)		Threaded base, removable top	Threaded both ends
		A	B		
100 mL	1/2" NPT	10.75	1.39	7500137	7500127
250 mL	1/2" NPT	11.51	1.89	7350138	7500128
500 mL	1/2" NPT	12.75	2.39	7350139	7500129
1000 mL	1/2" NPT	16.75	2.77	7350130	7500135
2000 mL	1" FNPT	20.67	3.52	7500140	7500131
4000 mL	1" FNPT	22.66	4.52	7500141	7500132
10,000 mL	2" FNPT	23.16	6.91	7500134	7500133
20,000 mL	2" FNPT	42.69	6.91	7500142	7500136

Typical Application of Calibration Columns

Column w/removable top

Note: Top must be removed during calibration



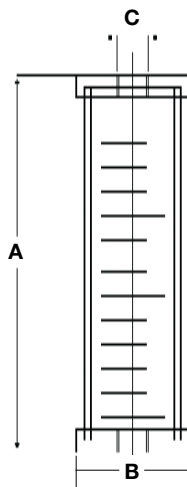
Column threaded both ends

Note: If plumbed as shown, a vent hole must be drilled into the top of the calibration column



Borosilicate Glass calibration columns with Viton® o-rings for Sulfuric Acid Applications

Glass cylinder with acrylic outer shield and 1/2" (316 SS) or 3/4" (PVDF, PVC) thick end flanges. All cylinders are bolted together using stainless steel rods with Viton O-rings for the glass seal and Buna N O-rings for the acrylic seal.



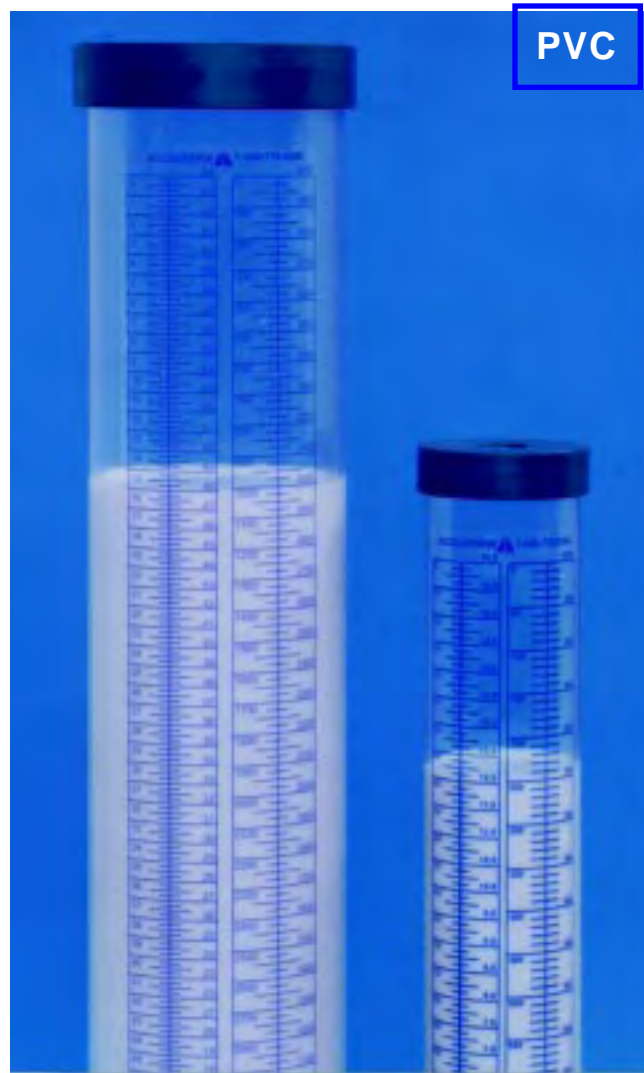
Cylinder size	Fitting size	Dimensions (inches)			Part No.
		A	B	C	
100 mL	1/2" CPVC	10.0	3.0	1/2	7500151
100 mL	1/2" PVDF	10.0	3.0	1/2	7500152
100 mL	1/2" SS	9.5	3.0	1/2	7500153
250 mL	1/2" CPVC	12.5	3.5	1/2	7500154
250 mL	1/2" PVDF	12.5	3.5	1/2	7500155
250 mL	1/2" SS	12.0	3.5	1/2	7500156
500 mL	1/2" CPVC	14.5	4.0	1/2	7500157
500 mL	1/2" PVDF	14.5	4.0	1/2	7500158
500 mL	1/2" SS	14.0	4.0	1/2	7500159
1000 mL	1/2" CPVC	16.75	4.75	1/2	7500160
1000 mL	1/2" PVDF	16.75	4.75	1/2	7500161
1000 mL	1/2" SS	16.25	4.75	1/2	7500162
2000 mL	1" CPVC	18.75	5.5	1	7500163
2000 mL	1" PVDF	18.75	5.5	1	7500164
2000 mL	1" SS	18.25	5.5	1	7500165
4000 mL	1" CPVC	22.5	6.5	1	7500166
4000 mL	1" PVDF	22.5	6.5	1	7500167
4000 mL	1" SS	22.0	6.5	1	7500168



ACCUDRAW® Calibration Cylinders



Polypropylene



PVC

ACCUDRAW® has been developed for the accurate calibration of metering pumps. Standard features include:

- translucent
- chemical resistant
- break resistant
- threaded or socket
- colored graduations and lettering
- PVC has dual scale USGPH & ml
- PVC sizes 100 - 20000 ml
- POLY sizes 100 - 4000 ml
- POLY meets ISO standards
- custom sizes and other materials (acrylic, glass) on request





ACCUDRAW®

Calibration Cylinders

"For Accuracy That Counts"

Sizing and Ordering Information

Polypropylene Construction

Size	Conn.	BC	BTC	BDC
100 ml	1/2" NPT	AC#1-100	AC#2-100	AC#3-100
250 ml	1/2" NPT	AC#1-250	AC#2-250	AC#3-250
500 ml	1/2" NPT	AC#1-500	AC#2-500	AC#3-500
1000 ml	1/2" NPT	AC#1-1000	AC#2-1000	AC#3-1000
2000 ml	1.0" NPT	AC#1-2000	AC#2-2000	AC#3-2000
4000 ml	1.0" NPT	AC#1-4000	AC#2-4000	AC#3-4000

BC = bottom connection only, open top

BTC= bottom and top connections

BDC= bottom connection and dust cover top

PVC Construction

Size/Scale	Conn	BC	BTC	BDC
100 ml/ 1.6 GPH	1/2" NPT	PV#1-100	PV#2-100	PV#3-100
250 ml/ 4 GPH	1/2" NPT	PV#1-250	PV#2-250	PV#3-250
500 ml/ 8 GPH	1/2" NPT	PV#1-500	PV#2-500	PV#3-500
1000 ml/ 16 GPH	1/2" NPT	PV#1-1000	PV#2-1000	PV#3-1000
2000 ml/ 32 GPH	1.0" NPT	PV#1-2000	PV#2-2000	PV#3-2000
4000 ml/ 64 GPH	1.0" NPT	PV#1-4000	PV#2-4000	PV#3-4000
10000 ml/ 160 GPH	2.0" NPT	PV#1-10000	PV#2-10000	PV#3-10000
20000 ml/ 320 GPH	2.0" NPT	PV#1-20000	PV#2-20000	PV#3-20000

Note: PVC cylinders available with socket weld connections.

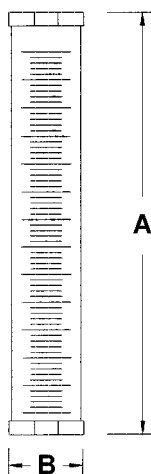
Add suffix "S" to model # e.g. PV#3-100S

For BSP threads, add suffix "B" to model # e.g. PV#3-100B

Dimensional Information

Polypropylene Construction

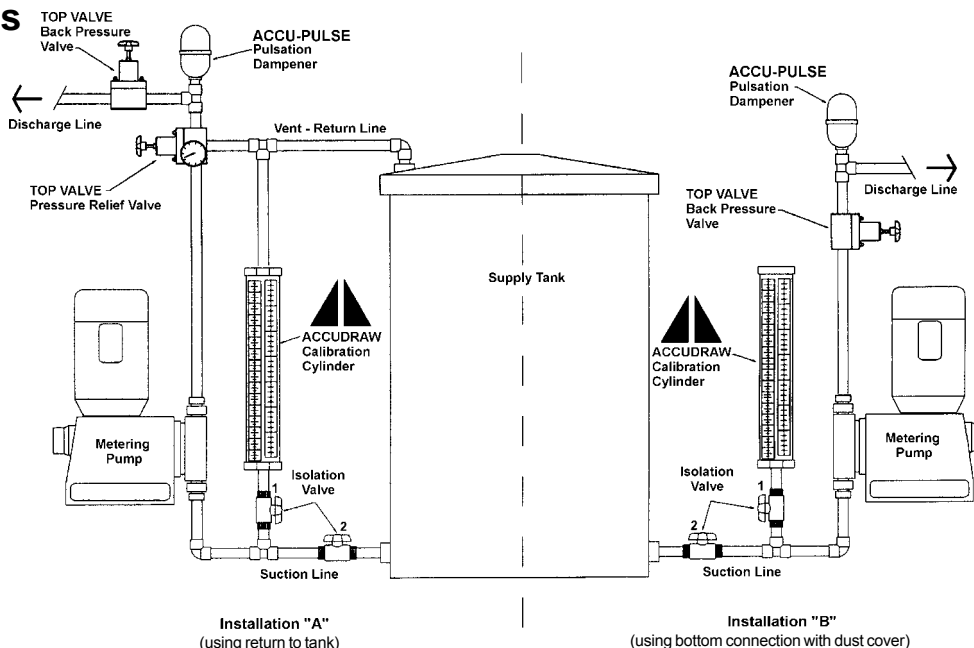
Model	Size (ml)	Dev (ml)	A (inches)	B (inches)
AC#1	100	1	9.88	1.38
AC#1	250	2	12.44	1.75
AC#1	500	5	14.1	2.33
AC#1	1000	10	17.19	2.63
AC#1	2000	20	20.88	3.38
AC#1	4000	50	23.56	4.38
AC#2/AC#3	100	1	9.25	1.38
AC#2/AC#3	250	2	11.63	1.75
AC#2/AC#3	500	5	13	2.32
AC#2/AC#3	1000	10	16.5	2.69
AC#2/AC#3	2000	20	19.5	3.38
AC#2/AC#3	4000	50	22.13	4.38



PVC Construction

Model	Size (ml)	Divisions (ml)	Size (GPH)	Divisions (GPH)	A (inches)	B (inches)
PV#1	100	1	1.6	0.02	10.24	1.388
PV#1	250	2	4	0.05	11.04	1.888
PV#1	500	5	8	0.05	12.25	2.388
PV#1	1000	10	16	0.125	16.24	2.765
PV#1	2000	20	32	0.25	20.16	3.517
PV#1	4000	25	64	0.25	22.16	4.521
PV#1	10000	200	160	2	22.64	6.906
PV#1	20000	200	320	2	42.19	6.906
PV#2/PV#3	100	1	1.6	0.02	10.75	1.388
PV#2/PV#3	250	2	4	0.05	11.51	1.888
PV#2/PV#3	500	5	8	0.05	12.75	2.388
PV#2/PV#3	1000	10	16	0.125	16.76	2.765
PV#2/PV#3	2000	20	32	0.25	20.67	3.517
PV#2/PV#3	4000	25	64	0.25	22.66	4.521
PV#2/PV#3	10000	200	160	2	23.16	6.906
PV#2/PV#3	20000	200	320	2	42.69	6.906

Installations



Conversion Factors

1 ml = 1 cc
 1000 ml = 1 liter
 ml/sec X 60 = ml/min
 1 US gal/min X 0.063 = liters/sec
 1 US gal = 3.786 liters

Distributed By:



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▲ ACCUDRAW® PVC Calibration Instructions

Note: Before starting either of the calibration procedures below, ensure that the pump is primed and void of any trapped air.

Using the USGPH scale: (scale is based on time, in one (1) minute volume discharge)

1. Fill the calibration to the top "0" mark on the USGPH scale.
2. Close isolation valve (#2) from supply tank, open isolation valve (#1) below cylinder and start the pump.
3. Use a stopwatch to measure the time of one (1) minute (60 seconds) and record the volume dispensed by the metering pump, using the draw down scale.
4. Adjust the pump volume control higher or lower to meet with your desired output.
5. Repeat above steps 1 through 4, until the desired output is met.
6. Divide the measured USGPH number by 60 to determine the **USGPM volume**, if required.

If you wish to shorten the time of dispensing for calibration by one half (1/2) or one quarter (1/4), you must multiply the measured volume by the same number used to divide the time by.

e.g. 10 USGPH in 1 minute equals
5 USGPH X 2 in 30 seconds or
2.5 USGPH X 4 in 15 seconds

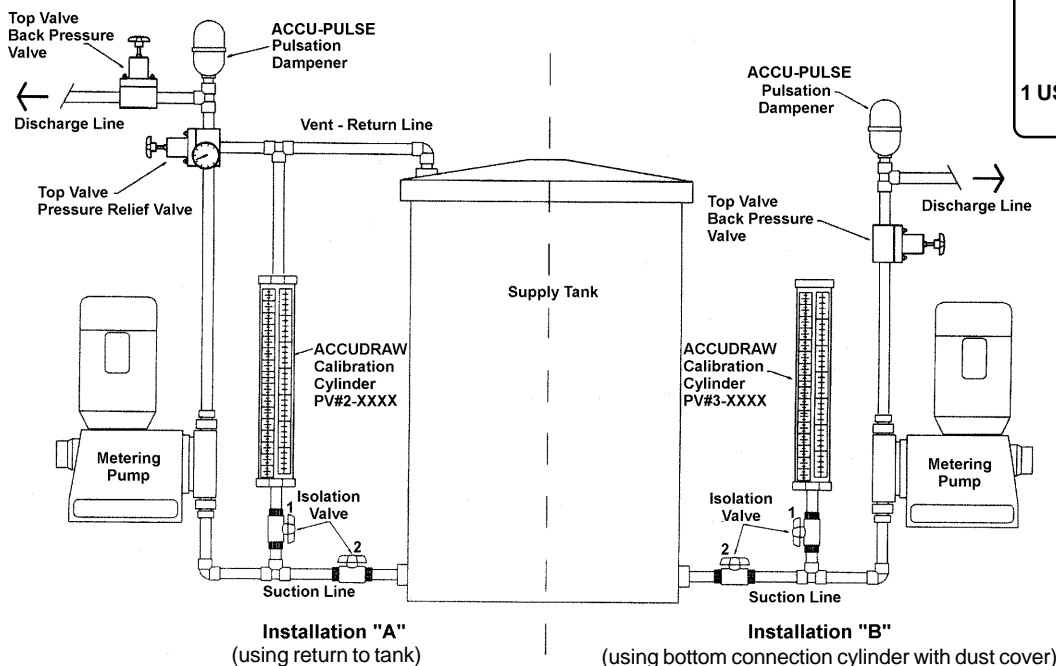
Using the ml scale: (scale is based on volume pumped, over any given time)

1. Fill the calibration cylinder to the top "0" mark on the ml scale.
2. Close isolation valve (#2) from supply tank, open isolation valve (#1) below cylinder and start the pump.
3. Use a stopwatch to measure the time it takes to pump down a given volume (ml) in 60 seconds.
4. Multiply the volume by 60 to determine the **ml per hour** volume, if required.
5. Adjust the pump volume control higher or lower to meet with your desired output.
6. Repeat above steps 1 through 5, until the desired output is met.

If you wish to shorten the time of dispensing for calibration by one half (1/2) or one quarter (1/4), you must multiply the volume by the same number used to divide the time by to determine ml per minute or hour.

e.g. 100 ml in 60 seconds equals
50 ml X 2 in 30 seconds or
25 ml X 4 in 15 seconds

Typical Installations ("A" and "B")



Conversion Factors
1 ml = 1 cc
1000 ml = 1 liter
ml/sec X 60 = ml/min
1 US gal/min X 0.063 = liters/sec
1 US gal = 3.786 liters

302LFW ALL SS BACK MOUNT

Our '300' series gauge line is a high quality line of stainless steel gauges. Hermetically sealing the gauge prevents dust, dirt or other contaminants from entering the case of the gauge and attacking the movement or internals of the gauge. Keeping out such contaminants prolongs the life of the gauge.

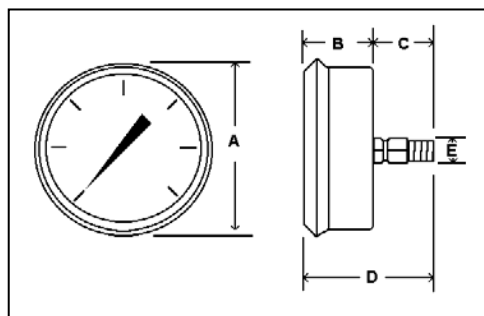
This gauge has been specifically designed with original equipment manufacturers in mind. It is typically used in chemical processing or food processing applications as well as any commercial or industrial application where stainless steel components are required.

SPECIFICATIONS:

- Available Dial Sizes: 1 ½", 2", 2 ½", 3 ½", 4"
- Available Connection Sizes:
1/8"MNPT on 1 ½" and 2"
1/4"MNPT on 2", 2 ½", 3 ½" and 4"
- Stainless Steel Case And Bezel
- SS Internals & Connection
- Connection Welded at Case
- 316SS Bourdon Tube
- Liquid Filled (Dry Available) (GLYCERINE)
- Accuracy : 1.5 % Full Scale
(Special Accuracy Available Upon Request)
- Dual Scale: PSI & Bar (x100=kPa)
Single Scale available from stock
- Ambient temperature: FILLED: 30°F to 160°F
DRY: -30°F to 180°F



RANGE	CODE	Major In	Minor In
30/0"VAC	A	5	0.5
30/0/15	CB	5	0.5
30/0/30	CC	10	1
30/0/60	CD	10	1
30/0/100	CE	20	2
30/0/150	CF	20	2
30/0/300	CH	50	10
0/15	B	2	0.2
0/30	C	5	0.5
0/60	D	10	1
0/100	E	20	2
0/160	F	20	2
0/200	G	40	5
0/300	H	50	5
0/400	I	50	5
0/600	K	100	10
0/1000	M	200	20
0/1500	N	200	20
0/2000	O	400	50
0/3000	P	500	50
0/5000	R	1000	100
0/10,000	U	1000	100
0/15,000	V	2000	200



		A	B	C	D	E	F	G
1 ½"	In	1.88	1.06	.89	1.95	1/8"	2.63	1.63
Dial	MM	48	27	23	50	NPT	67	42
2"	In	2.23	1.09	.71	1.99	1/8" OR	2.81	2.00
Dial	MM	57	28	23	51	1/4"NPT	72	51
2 ½"	In	2.80	1.28	1.19	2.46	1/4"	3.48	2.50
Dial	MM	71	33	30	63	NPT	88	64
3 ½"	In	3.83	1.14	1.08	2.20	1/4"	3.70	3.5
Dial	MM	97	29	27	56	NPT	94	89
4"	In	4.32	1.63	1.14	2.77	1/4"	5.20	3.87
Dial	MM	110	42	29	71	NPT	132	98

Note:

All Dial Size Gauges are Center Back Connection Except 3 ½" Dial Size which are Lower Back Connection

GUARANTEED PROTECTION!

SENTINEL DIAPHRAGM SEALS

Unconditionally **GUARANTEED**
for three years!

***Blacoh GUARANTEES** it's Sentinel Diaphragms and Seal bodies for three years from the date of purchase. If any failure occurs, Blacoh will replace your Diaphragm Seal at no cost to you!

(Guarantee does not apply to gauges or custom models)



SENTINEL DIAPHRAGM SEAL ►

Available in a variety of chemically resistant plastics and metals

▲ SENTINEL DIAPHRAGM SEAL

Protect & isolate all forms of system instrumentation from hazardous and corrosive process fluids

SENTINEL FLOW THRU ►

Prevents clogging of viscous process fluids

NEW

◀ SENTINEL "REVOLUTION"

All PVC construction and threaded housings are ideal for corrosive environments

USE A DIAPHRAGM SEAL TO:

- Protect & isolate all forms of system instrumentation from hazardous and corrosive process fluids
- Ensure gauge and switch accuracy
- Smooth out erratic pressure surges
- Extend the life of pressure instrumentation
- Protect gauges from freezing and slurries
- Receive accurate and consistent readings when working with corrosive or solids-laden fluids
- Replace expensive gauges with low cost utility gauges

SENTINEL FEATURES:

- Three year guarantee on diaphragms & seal bodies
- Accuracy of $\pm 2\%$ full deflection or better
- Pressure ranges up to 1000 PSI (68.95 BAR)
- 1/4" (6.35 mm) up to 3/4" (19.05 mm) inlet ports
- All standard models available from stock
- Bodies available in a full range of chemically resistant materials
- Custom models available

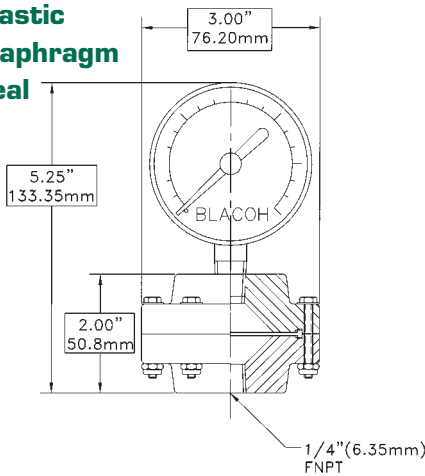
(800) 603-7867
www.Blacoh.com





SENTINEL DIAPHRAGM SEALS

Plastic Diaphragm Seal



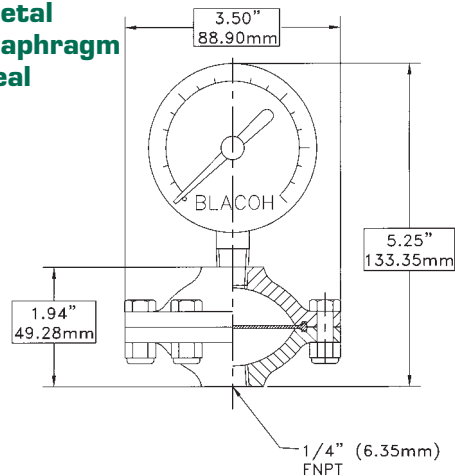
BODY MATERIALS:

POLYPROPYLENE
PVC
PVDF
CPVC

DIAPHRAGM MATERIALS:

PTFE
EPDM
VITON

Metal Diaphragm Seal



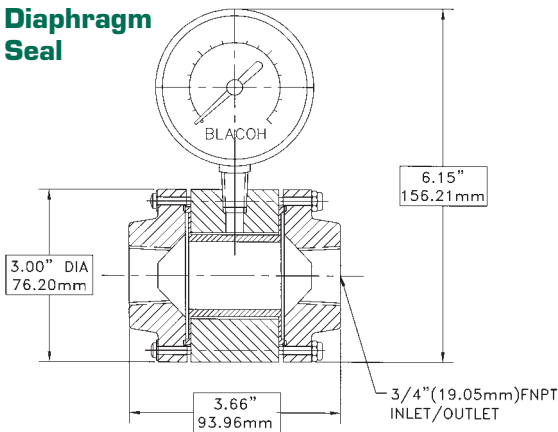
BODY MATERIALS:

316 STAINLESS STEEL
ALLOY 20
HASTELLOY C

DIAPHRAGM MATERIALS:

PTFE
EPDM
VITON

Flow-Thru Diaphragm Seal



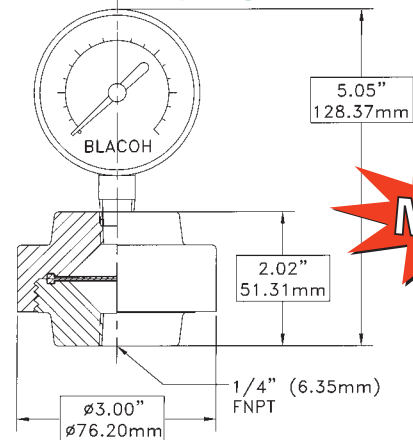
BODY MATERIALS:

PVC
POLYPROPYLENE

TUBE DIAPHRAGM MATERIALS:

EPDM
VITON

"Revolution" Diaphragm Seal



BODY MATERIALS:

PVC

DIAPHRAGM MATERIALS:

EPDM
VITON

Please call your local distributor:



Call for your **FREE**
Demonstration CD

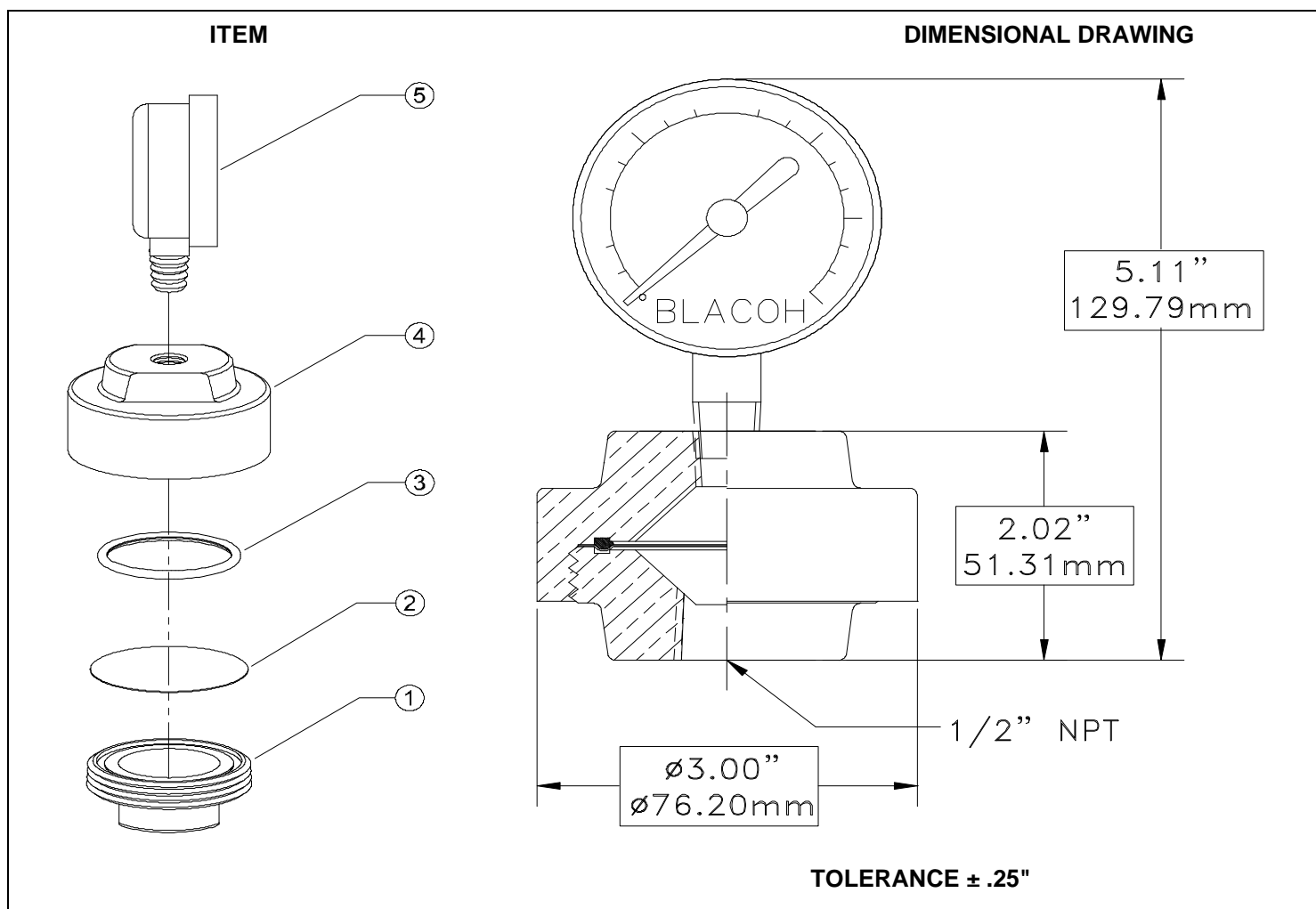
BLACOH
FLUID CONTROL

601 Columbia Ave., Bldg. D, Riverside, CA 92507 • USA
Tel: (800) 603-7867 or (951) 342-3100 • Fax: (951) 342-3101
E-mail: sales@blacoh.com • Website: www.blacoh.com

SENTINEL MODEL #:	RC00T-18-5
MAXIMUM PRESSURE:	200 PSI
WETTED HOUSING:	CPVC
NONWETTED HOUSING:	CPVC
FILL	GLYCERIN
DIAPHRAGM MATERIAL	PTFE
INLET:	1/2" FNPT

DESCRIPTION				
ITEM	PART #	QTY	Component	Material
1	11-27-5	1	Wetted Housing	CPVC
2	11-10	1	Diaphragm	PTFE
3	11-12	1	O-Ring	EPDM
4	11-24	1	Nonwetted Housing	CPVC
5	G18	1	Gauge	Stainless Steel -Brass - Liquid Filled

1/16/2008



BLACOH FLUID CONTROL, INC

RIVERSIDE, CA 92507 USA

TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101

E-mail: sales@blacoh.com web site: www.blacoh.com

INSTALLATION OF COMPLETE UNITS SUPPLIED WITH GAUGE

Pre-assembled (glycerin filled with gauge attached) SENTINEL Diaphragm Seals are easily installed into a piping system with the use of a close nipple and tee. PTFE tape should be used as the pipe sealant on all threads. Plastic models should be installed no more than hand tight. Plastic threads will expand as more pressure is applied. The use of tools may result in a cracked housing and possible leakage. Metal models should be tightened snug. A strap wrench can be used, but do not over tighten. The sharp edge of a close nipple can rupture the diaphragm.

Gauges on the SENTINEL Diaphragm Seal are filled with glycerin by the use of a vacuum evacuation method. **DO NOT DISASSEMBLE A PRE-ASSEMBLED Diaphragm Seal**, except for diaphragm replacement. Disassembly will lead to the loss of glycerin and a possibility of air entrapment. Air or any other gas allowed to enter the filled chamber will result in inaccurate gauge or switch readings.

INSTALLATION AND FILLING FOR DIAPHRAGM SEALS WITHOUT FACTORY INSTALLED GAUGES

1. Unassembled (unfilled without gauge) Diaphragm Seals must be completely filled with a temperature stable fluid. Glycerin, silicone or mineral oil are commonly used fluids. In addition, the gauge or other pressure instrument must also be filled with the fluid. All air must be removed from the chamber and the instrument to ensure accurate pressure/vacuum readings.
2. Pour liquid glycerin into the Diaphragm Seal (gauge side) until it reaches the top of the threads. Heating the glycerin to the temperature of hot tap water will thin it and ease the filling process. Tap the unit on a table to release any air bubbles. It is very important that no air remains in the glycerin side (gauge side) of the Diaphragm Seal.

If the Diaphragm Seal is to be installed on instrumentation other than a gauge, skip to step #6.

3. **DIAPHRAGM SEALS ON PRESSURE GAUGES**
The air in the Bourdon tube inside the gauge must be replaced with glycerin. Remove the snubber of the new gauge if possible. The snubber is the plug in the inlet of the gauge. It contains a very small hole, which will create difficulty in filling the gauge tube. Removal will not affect the gauge performance because the SENTINEL Diaphragm Seal produces the same needle dampening affect as a snubber does.
4. The bourdon tube in the gauge may now be filled. Slowly pour or inject glycerin into the gauge's inlet port. Remember, warming the glycerin will help. The best gauge fill method is to pull a vacuum of 15 in. Hg in the bourdon tube.
5. A thin wire should be inserted into the inlet to aid in releasing the trapped air in the tube. Skip to step #7.
6. **DIAPHRAGM SEALS ON PRESSURE INSTRUMENTS**
The pressure-sensing chamber of the instrument must be filled completely with glycerin allowing no air bubbles to remain. The instrument can then be installed onto a Sentinel Gauge Isolator.
7. When re-installing the gauge or instrument on the Diaphragm Seal, gently and lightly press up on the diaphragm with a blunt object (like the eraser end of a pencil) as the gauge is threaded on. Failing to do so may pressurize the Diaphragm Seal, leading to an inaccurate gauge pressure reading. While pressing up on the diaphragm, turn the gauge or instrument over and thread it into the Diaphragm Seal. Some glycerin will be lost during gauge installation - this is normal.

Standard Product Warranty: Blacoh Fluid Control warrants its products to be free of defective material and workmanship under normal use and service for two years from date of shipment. The remedy for any product defect covered under this warranty shall be limited to the replacement or repair of the defective part or parts and Blacoh will not be responsible for damages or injury caused to other products, machinery, buildings, property or person. This warranty shall be null and void if the product has been altered, misapplied, misused, or neglected of maintenance. Damage or loss resulting from over-pressurization of a product, whether from gas or fluid does not constitute a defect covered under this warranty nor will Blacoh be responsible in any way for any such damage or loss. Because Blacoh cannot anticipate or control the many different conditions under which its products may be used, Blacoh does not guarantee the applicability or suitability of its products for any particular use or purpose. Each user of Blacoh products should conduct its own tests to determine the suitability of each product for its intended uses or purposes. Blacoh products are sold with this limited warranty and each buyer assumes all responsibility for loss or damage, including consequential damage, arising from the handling and use of Blacoh products whether used in accordance with Blacoh's directions or otherwise. Statements concerning the possible use of Blacoh products are not intended as recommendations for any specific use of such products. This Standard Product Warranty shall be governed by and construed in accordance with the laws of the State of California.

Pump & Systems Accessories

Backpressure Valves

Pressure Relief Valves

Backpressure, antisiphon and pressure relief valves



In-line pressure relief valve (3 port)



Backpressure valve (2 port)



Backpressure valve on tee for pressure relief

Technical data

Size:

1/2"

Diaphragm

Materials:

PTFE-faced EPDM

Liquid Handling

Materials:

PP, PVC, PTFE, PVDF
316 Stainless Steel

Pressure Adjustment:

0-150 psig (0-10.3 bar)

Flow rates @ 45 psig (3.1 bar):

1/4" - 132 U.S. gph (500 L/h)

1/2" - 132 U.S. gph (500 L/h)

Flow rates @ 150 psig:

1/2" (PP, PVC) - 200 U.S. gph (757 L/h)

1/2" (PVDF, TT, SS) - 300 U.S. gph (1135 L/h)

3/4" - 300 U.S. gph (1135 L/h)

1" - 500 U.S. gph (1893 L/h)

1-1/2" - 900 U.S. gph (3407 L/h)

2" - 1200 U.S. gph (4542 L/h)

Max. Temperature:

PP - 195°F (90°C)

PVC - 140°F (60°C)

PTFE - 250°F (121°C)

PVDF - 250°F (121°C)

316 Stainless - 250°F (121°C)

Max. Pressure Rating 170 psig @ 120°F

Backpressure (2-port) valves may be used in-line to provide a constant discharge pressure for protection from siphoning, or they may be teed off of the discharge line for pressure relief, discharging back to the source tank or to the pump suction line to create a bypass.

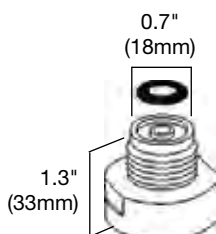
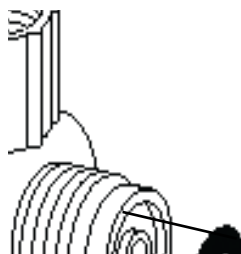
Pressure relief (3-port) valves are mounted in the discharge line, featuring a separate relief port which discharges back to the source tank or to the pump suction line to create a bypass.

Backpressure valves provide several functions: they improve repeatability by providing a constant discharge pressure; they provide antisiphon protection for discharge into pressurized water lines or vacuums, or where suction head exceeds discharge head; and they minimize pulsation when used in conjunction with a pulsation dampener.

In-line backpressure/antisiphon and pressure relief valves

These adjustable backpressure (2-port) and pressure relief (3-port) valves have FNPT ports and require tubing adapters for use with flexible tubing.

Can be adjusted with screwdriver.



Adapter included with all back-pressure/pressure relief valves. Optional use in the event of diaphragm failure.

DIMENSIONS: 1/4" to 1/2" valves

D	A (in)	B (in)	C (in)
1/4"	4.90	2.6	1.2
*1/4"	*3.5	*2.375	*0.75
1/2"	4.9	2.6	1.2
*1/2"	*5.5	*3.5	*1.125
3/4"	5.4	3.5	1.1
1"	5.7	3.9	1.4
1-1/2"	8.5	4.6	2.2
2"	8.5	4.6	2.2v

*Note: Dimensions apply to SS and PTFE valves only.

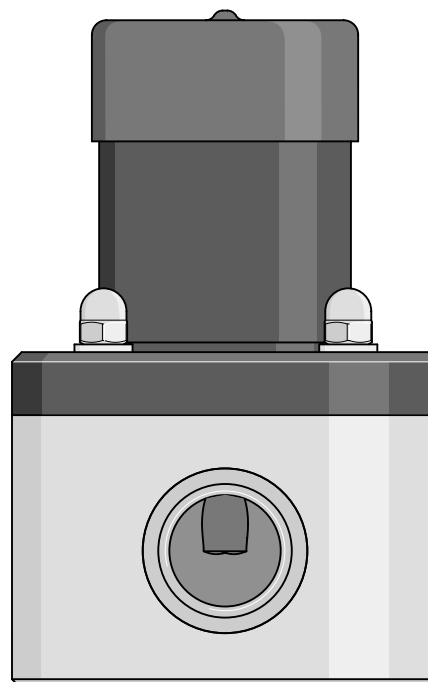
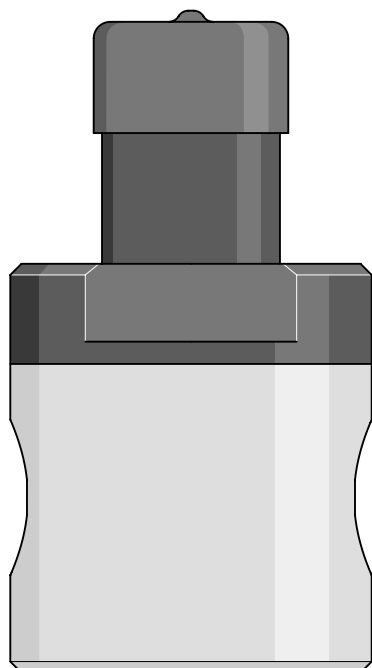
DIMENSIONS (for replacement valves only): 1/4" to 1/2" valves - SEE PG. 8

D	A (in)	B (in)	C (in)
1/4"	3.9	2.375	0.75
*1/4"	*3.5	*2.375	*0.75
1/2"	4.6	2.375	1.125
*1/2"	*5.5	*3.5	*1.125
3/4"	5.5	3.5	1.125
1"	5.8	3.5	1.25
1-1/2"	9.0	4.5	2.1
2"	9.0	5.0	2.1

*Note: Dimensions apply to SS, PVDF and PTFE valves only.

Operating Instructions

ProMinent® Backpressure and Pressure Relief Valves



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Description of Controls & Operation	5	Repair Service	7
Helpful Tips	5	Troubleshooting	7
Specifications	5	Dimensions	11

Read the operating instructions before installation and use. The warranty does not cover damages due to faulty operation. *Keep for reference and replacement information.*

BA B/PRVI 01 1/04 NA

Order no.7750089

ProMinent Fluid Controls, Inc.

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ProMinent Fluid Controls Ltd.

490 Southgate Drive, Guelph, Ontario N1G 4P5

e-mail: sales@prominent.cc

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Operating Instructions for ProMinent® Backpressure and Pressure Relief Valves

General Safety Considerations

Safety Operating Procedures

SAFETY INSTRUCTIONS

- Wear protective clothing and glasses when working with or near chemicals.
- Refer to the MSDS for all chemicals being used.
- Use only ProMinent® parts. Use of other parts may result in damage to equipment or injury.
- Flush all components that are in contact with chemicals prior to servicing.
- Secure all chemicals and equipment making them inaccessible to children and pets.
- Dispose of all chemicals and waste according to all local, state and federal regulations.
- Stop the flow of sample through the system prior to working on the pump.
- Do not exceed the maximum operating pressure.

UNPACKING

CHECK ALL EQUIPMENT FOR DAMAGE AND FOR COMPLETENESS AGAINST THE ORDER. REPORT INCORRECT ORDERS OR DAMAGES TO THE SELLER IMMEDIATELY.

The carton should contain:

1 Backpressure or Pressure Relief Valve as ordered
Accessories as ordered

INTRODUCTION

ProMinent® diaphragm pressure relief valves are designed to protect chemical feed systems from overpressure caused by defective equipment or by blockage in the chemical line. Chemical flows through the valve via an internal chamber. When the pressure in the chemical line exceeds the preset pressure of the valve, the diaphragm lifts off the seat and the chemical then flows out the bottom port back into the chemical tank. The relief pressure is adjustable from 0-150 psig by the adjuster in the top of the valve.

ProMinent® diaphragm backpressure valves are used to enhance the performance of the chemical feed pumps by providing a constant head pressure. These valves can also be used as an antisiphon valve. The diaphragm is held against the seat by an internal spring. The backpressure is adjustable from 0-150 psig. When the inlet pressure exceeds the preset pressure, the diaphragm lifts off the seat and the chemical flows to the injection point.



FUNCTION AND DESCRIPTION

The ProMinent® backpressure and pressure relief valves have been modified to include an optional diaphragm safety port to route the chemical in the event of a diaphragm failure. The optional diaphragm safety port fitting must be removed to adjust the backpressure screw. **NOTE: If the optional diaphragm safety port tubing adapter is not installed, upon diaphragm failure, chemical will come out thru the screwdriver adjustment slot.**

INSTALLATION

Pressure Relief Valve

Install as close to the chemical pump discharge valve as possible, without any other equipment, especially shut-off valves, between the pressure relief valve and the pump.



The relief port in the bottom of the valve should be vented back to the chemical tank or directly to the drain. No backpressure can be applied to the outlet of the valve. This will impair the valve's ability to relieve at the preset pressure. The valve should not be installed across the pump. That is, the valve should not be connected from the discharge of the pump to the suction side of the pump if there is a check valve in the suction line that could prevent pressure relief.

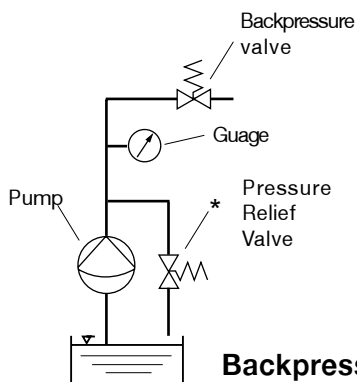
Back Pressure Valve

The backpressure valve can be installed anywhere in the discharge line, provided there is some downstream pressure at the dosage point via an injection valve or line pressure. If there is no downstream pressure, the backpressure valve should be installed at the dosage point to prevent drainage of the chemical line. The chemical must flow across the valve, in the direction of the arrow.

The performance of the backpressure valve will be enhanced with the installation of a pulsation dampener to smooth out the discharge/ suction cycles of the pump.

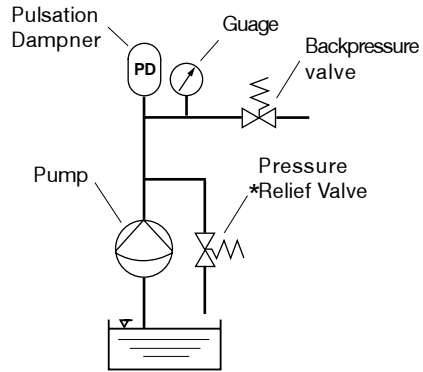
The pulsation dampener should be sized for the dosage volume of the pump head. For most applications, dampeners without diaphragms are acceptable. However some applications require dampeners with diaphragms.

Typical Installation

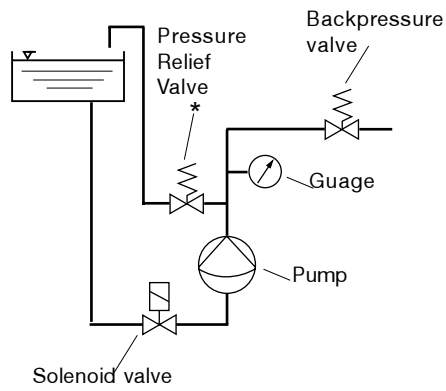


Backpressure valve to produce a constant pressure to pump against.

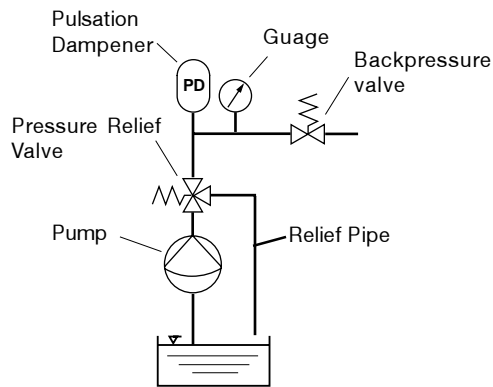
Backpressure valve in conjunction with a pulsation dampener.



Backpressure valve used when the suction pressure is high.



Pressure relief valve to protect pump from overpressure





DESCRIPTION OF CONTROLS AND OPERATION

Adjust the backpressure and the pressure relief valves by turning the pressure adjuster on the valves to the desired pressure. The valves have a screwdriver slot to adjust the pressure. Turning clockwise increases the pressure and counterclockwise decreases the pressure.

OR:

ADJUSTING THE PRESSURE ON THE VALVES

Remove the optional diaphragm safety port from the top of the valve by unscrewing it from the backpressure/pressure relief valve. The valves have a screwdriver slot to adjust the pressure. Turning clockwise increases the pressure and counterclockwise decreases the pressure. Replace the relief assembly by screwing it onto the backpressure/pressure relief valve.

HELPFUL TIPS

1L = 0.264 gallon

1000 mL = 1 L

1 bar = 14.5 psig

SPECIFICATIONS

Size:	1/4", 1/2", 3/4", 1", 1 1/2", 2" NPT or Socket
Diaphragm material:	PTFE-faced EPDM
Liquid handling materials:	PP, PVC, PTFE, PVDF, 316 Stainless Steel
Pressure adjustments:	0-150 psig
Flow rates at 45 psig:	1/4" - 132 gph 1/2" - 132 gph 3/4" - 235 gph 1" - 345 gph 1-1/2" - 740 gph 2" - 740 gph
Max. Temperature:	PP - 122°F PVC - 100°F PTFE - 250°F PVDF - 250°F 316 Stainless - 250°F

ATTACHING TUBING TO THE OPTIONAL DIAPHRAGM SAFETY PORT

Connector sets connect flexible tubing of different sizes to optional diaphragm safety port fitting. A connector set consists of hose nozzle, grip ring, union nut and gasket. All connector sets fit on optional diaphragm safety port with M20 X 1.5 threads. Part number includes two connector sets. One of the following connector sets are required to attach the tubing to the relief port:

PART NUMBERS

PP/VITON® for tubing size 1/4" x 3/16"	790872
PP/VITON® for tubing size 1/2" x 3/8"	740133
PP/EPDM for tubing size 1/4" x 3/16"	790885
PP/EPDM for tubing size 1/2" x 3/8"	740132
PP/EPDM for tubing size 1/4" x 1/2"	817163
PVC/VITON® for tubing size 1/4" x 3/16"	817050
PVC/VITON® for tubing size 1/2" x 3/8"	817055
PVC/VITON® for tubing size 1/4" x 1/2"	817068
PVC/EPDM for tubing size 1/4" x 3/16"	790871
PVC/EPDM for tubing size 1/2" x 3/8"	740160
PTFE for tubing size 1/4" x 3/16"	817201
PTFE for tubing size 1/2" x 3/8"	791199

Cut hose ends straight across

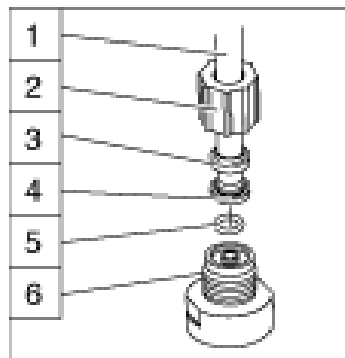
Push Union Nut (2) and clamping ring (3) onto tubing (1)

Push the tubing end (1) over the nozzle (4) to the stop.
Widen if necessary

Place the hose (1) with the nozzle (4) onto the optional diaphragm safety port fitting (6)

Tighten the union nut (2) while pressing in the tubing (1)

Pull the tubing connected to the optional diaphragm safety port fitting (6); then retighten the union nut



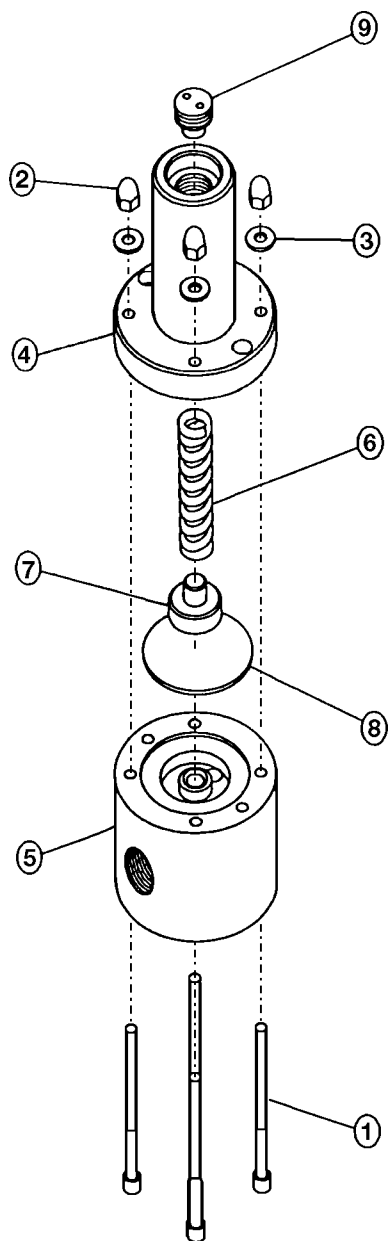
- 1 **Tubing**
- 2 **Union Nut**
- 3 **Clamping Ring**
- 4 **Nozzle**
- 5 **O-ring**
- 6 **Optional diaphragm
safety port fitting**

MAINTENANCE

Routinely look for leaks that could indicate a diaphragm rupture. Replacement of the diaphragm can be done without taking the valve out of the chemical line.

Replacing the diaphragm

- Relieve the pressure from the system.
- Flush the chemical lines prior to disassembling the valve.
- Unscrew the pressure adjuster to relieve the pressure from the diaphragm.
- Unscrew the valve top from the valve bottom **or** Remove the 4 bolts from the top of the valve.
- Lift off the top of the valve.
- Inspect the diaphragm and replace as necessary.
- Inspect the adjustment spring for rust or corrosion and replace if necessary.
- Replace the spring and the spring bumper into the top of the valve.
- Slide the top of the valve back over the bolts and Tighten the screws **or** Screw the valve top to the valve bottom and tighten.
- Screw in the pressure adjuster to approximately the same position it was prior to disassembly.
- Use a pressure gauge to adjust the valve to the desired pressure setting.



Example of a backpressure valve

SPARE PARTS

1. Bolts
2. Hex Nut
3. 1/4" Flat Washer
4. Valve Lid
5. Valve Body
6. Pressure Spring
7. Spring Plate
8. Diaphragm
9. Pressure Adjustment Screw

REPAIR SERVICE

Repairs must be done by ProMinent® Fluid Controls. Call your distributor or ProMinent® at (412) 787-2484 for a return goods authorization. DO NOT return any goods without authorization. All items must be free of hazardous chemicals and clean when returned.

TROUBLESHOOTING

Leaking: Check for clogs, diaphragm ruptures or corrosion of the spring.

Part Numbers and Accessories

1/4" FNPT Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PP	1009444	1009452
PVC	1009445	1009453
PVDF	1009446	1009454
316 SS	1009447	1009455

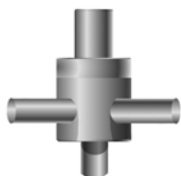
Backpressure
Valve (2 port)Tubing Adapters

(1 required per valve port): 1/4" x 3/16" tubing x 1/4" MNPT

PP/EPDM (PP1)	7358222
PP/Viton (PP2)	7358226
PVC/Viton (NP6)	7358223
PTFE (TT1)	7358224

1/2" FNPT Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PP	1006846	1006858
PVC	1006850	1006862
PVDF	1006854	1006866
316 SS	1008796	1008800

Pressure Relief
Valve (3 port)Tubing Adapters

(1 required per valve port): 1/2" x 3/8" tubing x 1/2" MNPT

PP/EPDM (PP1)	7358220
PP/Viton (PP2)	7358227
PVC/Viton (NP6)	7358221
PTFE (TT1)	7358225

3/4" FNPT Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PP	1006847	1006959
PVC	1006851	1006863
PVDF	1006855	1006867
316 SS	1008797	1008801

Part Numbers and Accessories (CONT.)**1" FNPT Valves**

Material	Backpressure Valve (2-port)	Pressure Relief Valve (3-port)
PP	1006848	1006860
PVC	1006852	1006864
PVDF	1006856	1006868
316 SS	1008798	1008802

1-1/2" FNPT Valves

Material	Backpressure Valve (2-port)	Pressure Relief Valve (2-port)
PP	1006849	1006865
PVC	1006853	1006865
PVDF	1006857	1006869
316 SS	1008799	1008803

2" FNPT Valves

Material	Backpressure Valve (2-port)	Pressure Relief Valve (2-port)
PP	1009448	1009456
PVC	1009449	1009457
PVDF	1009450	1009458
316 SS	1009451	1009459

Spare Diaphragms

1/4" - 1/2" valve PTFE/EPDM	1006813	1006813
3/4" - 1" valve PTFE/EPDM	1006814	1006814
1-1/2"-2" valve PTFE/EPDM	1006815	1006815

Part Numbers and Accessories

1/4" Socket Valves

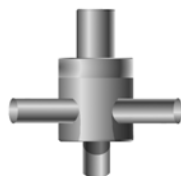
<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PVC	1019891	1019892
PVDF	1019893	1019894



Backpressure
Valve (2 port)

1/2" Socket Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PVC	1019883	1019884
PVDF	1019895	1019896



Pressure Relief
Valve (3 port)

3/4" Socket Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PVC	1019885	1019886
PVDF	1019897	1019898

1" Socket Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (3-port)</u>
PVC	1019887	1019888
PVDF	1019899	1019900

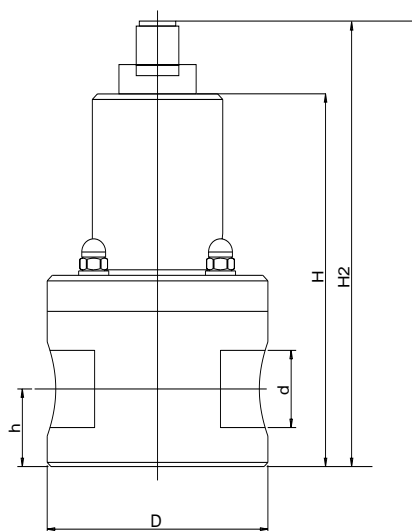
1-1/2" Socket Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (2-port)</u>
PVC	1019889	1019889
PVDF	1019901	1019901

2" Socket Valves

<u>Material</u>	<u>Backpressure Valve (2-port)</u>	<u>Pressure Relief Valve (2-port)</u>
PVC	1019891	1019891
PVDF	1019905	1019905

Dimensions



Valve size d [inches]	Thread type	h [mm]	h (in.)	D [mm]	D (in.)	H [mm]	H (in.)	H2 (mm)	H2 (in.)
1/4	NPT	31	1.2	65	2.6	125	4.9	158	6.2
1/2	NPT	31	1.2	65	2.6	125	4.9	158	6.2
3/4	NPT	28	1.1	88	3.5	136	5.4	169	6.7
1	NPT	36	1.4	98	3.9	145	5.7	178	7.0
1-1/2	NPT	56	2.2	118	4.6	229.5	9.0	260.5	10.3
2	NPT	56	2.2	118	4.6	229.5	9.0	260.5	10.3



FuelFLEX™ 65 PVC Fuel Tubing

Features and Benefits:

- Flexible and easy to install (65A durometer)
- Resists swelling and hardening
- Easy-to-identify transparent yellow

Recommended Applications:

- For intermittent use with petroleum-based products
- Fuel drain lines, vent tubes and overflow tubes
- Transfer of gasoline, heating oils, cutting compounds and coolants
- Lab handling of distillates
- NOT intended for use with foods or beverages

FuelFLEX 65 Cat. No.	Size, in.					Oper. Pressure, psig @ 73°F	Case Qty., ft.
	ID	x	OD	x	Wall		
8365-4230	3/32		3/16		3/64	54	100
8365-4245	1/8		1/4		1/16	62	100
8365-4295	3/16		5/16		1/16	48	100
8365-4335	1/4		3/8		1/16	40	100
8365-4390	5/16		7/16		1/16	36	100
8365-4430	3/8		1/2		1/16	30	100
8365-4465	7/16		5/8		3/32	40	100
8365-4515	1/2		3/4		1/8	40	100
8365-4570	5/8		7/8		1/8	34	100
8365-2605	3/4		1		1/8	30	50

BraidFLEX™ 70N Braided PVC Tubing

Features and Benefits:

- Now complies with NSF-51
- Complies with FDA CFR 21 for food packaging
- Embedded braid prevents material entrapment, ensures easy cleaning
- Easy to bend into place
- Flexible; permits tight clamping for leakproof connections
- Maximum working pressure clearly printed on tubing
- Clear tubing allows full visual flow monitoring

Recommended Applications:

- Transfer lines
- Higher-pressure applications, including lab, food and beverage use
- Pneumatic circuitry
- Cell culture
- Use with insert/barbed fittings
- NOT recommended for vacuum applications

BraidFLEX 70N Cat. No.	Size, in.					Oper. Pressure, psig @ 73°F	Case Qty., ft.
	ID	x	OD	x	Wall		
8470-4300	3/16		3/8		3/32	276	100
8470-7300	3/16		3/8		3/32	276	250
8470-4340	1/4		7/16		3/32	276	100
8470-7340	1/4		7/16		3/32	276	250
8470-4395	5/16		1/2		3/32	276	100
8470-4435	3/8		9/16		3/32	250	100
8470-7435	3/8		9/16		3/32	250	250
8470-4515	1/2		3/4		1/8	230	100
8470-7515	1/2		3/4		1/8	230	250
8470-4570	5/8		7/8		1/8	230	100
8470-7570	5/8		7/8		1/8	230	250
8470-2605	3/4		1		1/8	176	50
8470-7605	3/4		1		1/8	176	250
8470-2680	1		1-5/16		5/32	140	50
8470-7680	1		1-5/16		5/32	140	250
8470-2715	1-1/4		1-5/8		3/16	100	50
8470-2750	1-1/2		1-7/8		3/16	80	50
8470-2790	2		2-1/2		1/4	70	50



ELECTRIC MOTORS, GEARMOTORS AND DRIVES

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Product Features

List Price : \$ 498

[Contact Sales Office](#)

Catalog No 110057.00

Model C6C17FC6L

Product type AC MOTOR

Stock Stock

Description 3/4HP..1725RPM.56.TEFC./V.1PH.60HZ.CONT.

Information shown is for current motor's design

[View Outline](#) | [View Connection](#)

Engineering Data

Volts 115

Volts 208-230

Volts

F.L. Amps 10.8

F.L. Amps 5.4

F.L. Amps

S. F Amps 11.4

S. F Amps 5.7

S. F Amps

RPM 1725

Hertz 60

HP 3/4

Duty CONTINUOUS

TYPE CF

KW 0.56

Frame 56C

Serv. Factor 1.15

Phase 1

Max Amb 40

Design N

Code L

Insul Class B4

Protection NOT

Therm.Prot.

Eff 100%

Eff 75%

PF 64

UL Yes

CSA Yes

Bearing OPE 6203

CC Number

CE No

Bearing PE 6203

Load Type

Inverter Type

Speed Range NONE

Motor Wt. 28

Enclosure TEFC

Lubrication POLYREX EM

Nameplate 993500

Mounting C FACE

Rotation SELECTIVE CCW

Assembly

Shaft Dia. 5/8 IN

Ext. Diag. [005005.01](#)

Cust Part No MULTIPLE

Outline [028854-600B](#)

Ext. Diag2

Packaging B

Outline Dash No

Winding C634258

Carton Label Leeson Gen
Purpose

GROUP: 3 A

Iris

Paint STANDARD

Test Card 02

Form Factor

RMS Amps

Const Torque Speed
Range

Torque

Peak

AB Code

Peak@DegC

Resistance

Connection

Rework Status

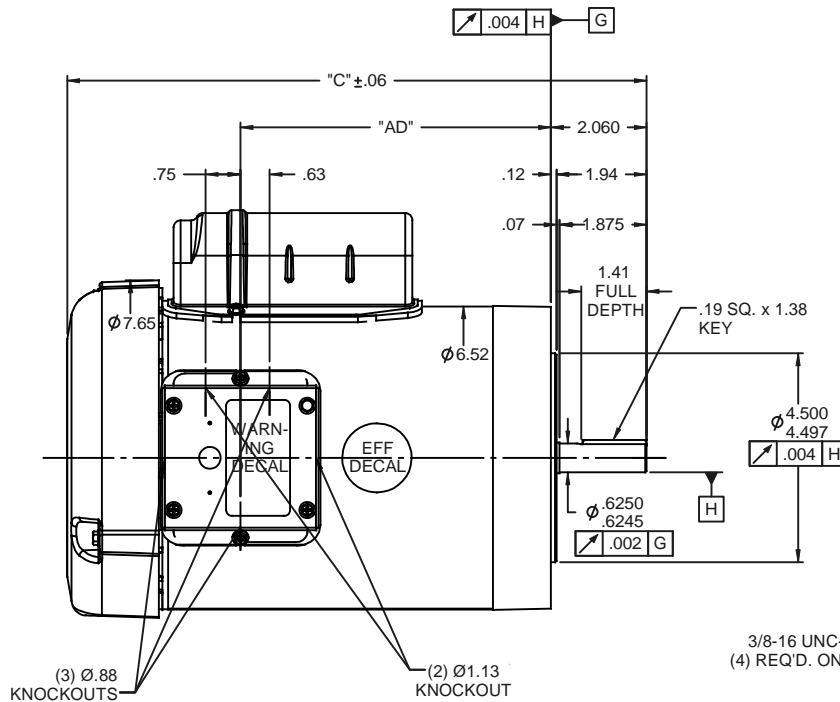
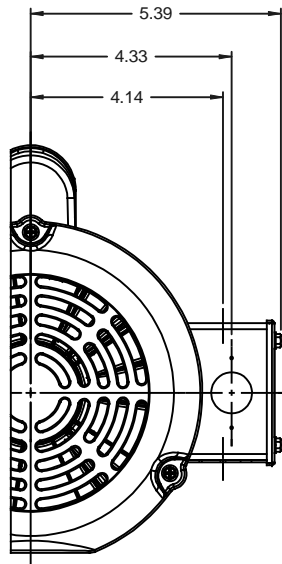
Rework TYPE

Explosion Proof NONE

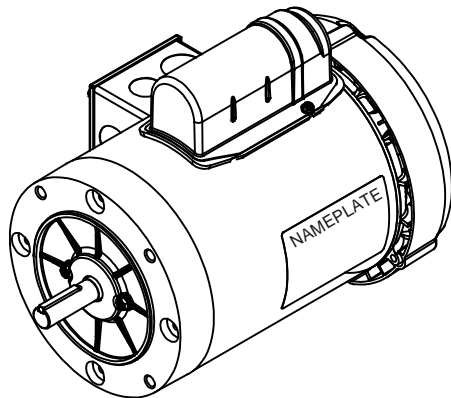
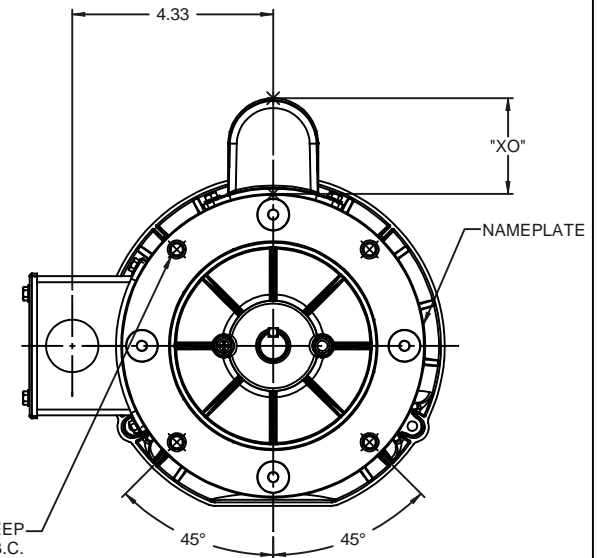
Temp Op Code

Brake Motors

Class		GROUP:		FORCE				
Class		GROUP:		VDC				
				ADC				
				Brake Coil OHMs @25 C				
Performance								
Torque UOM	OZ-FT	Inertia (WK²)	.08 LB-FT^2					
Torque	35.95(Full Load)	98.47(Break Down)	84.19(Pull Up)	114.48(Locked Rotor)				
CURRENT (amps)	5.46(Full Load)	15.2(Break Down)	19.2(Pull Up)	30.1(Locked Rotor)				
Efficiency (%)	0(Full Load)	67.8(75% Load)	61.3(50% Load)	46(25% Load)				
PowerFactor	64(Full Load)	55.3(75% Load)	44.6(50% Load)	31.6(25% Load)				
Load Curve Data @60 Hz, 230 Volts, 3/4 Horsepower								
Load	Amps	KW	RPM	Torque	EFF	PF	Rise By Resis	Frame Rise
0.0	4.13	0.172	1798	0.0	0.0	18.1	0.0	-
0.25	4.2	0.306	1786	8.85	46.0	31.6	0.0	-
0.5	4.45	0.456	1777	17.72	61.3	44.6	0.0	-
0.75	4.86	0.519	1766	26.79	67.8	55.3	0.0	-
1.0	5.42	0.792	1754	35.94	70.7	63.6	78.0	40.0
1.25	6.11	0.978	1740	45.3	71.5	69.6	90.0	45.0
1.5	6.97	1.191	1723	55.09	70.8	74.3	0.0	-
1.75	7.97	1.421	1703	64.75	88.9	77.4	0.0	-
						SOURCE: CALCULATED GROUP: 3		



3/8-16 UNC-2B x .56 DEEP
(4) REQ'D. ON A Ø5.875 B.C.

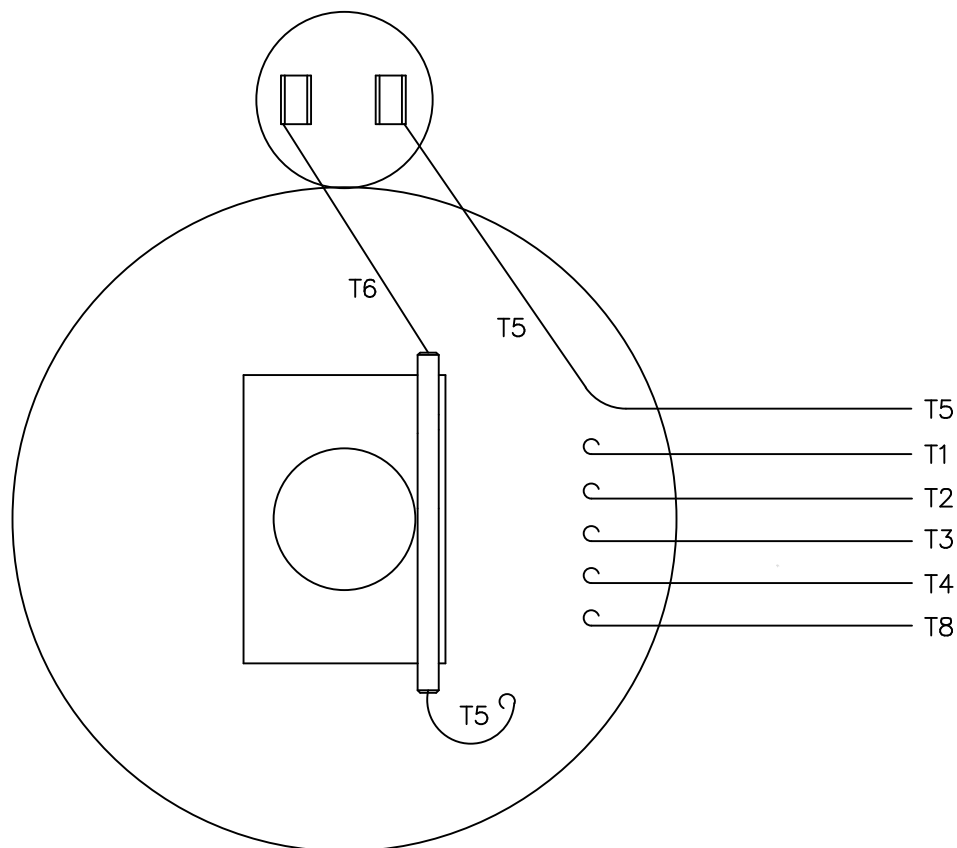


NOTES:
1) GASKETS THROUGHOUT

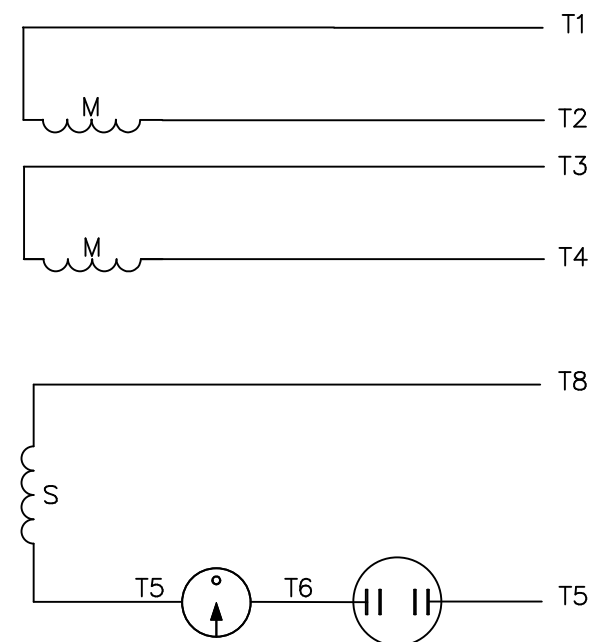
DASH NO.	"C"	"AD"	CAP	DASH	XO
500	10.48	4.69			
550	10.98	5.19			
600	11.48	5.69			
650	11.98	6.19			
700	12.48	6.69			
750	12.98	7.19			
800	13.48	7.69	A	1.61	
850	13.98	8.19	B	2.08	
			C	2.32	

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VIEW FROM OUTSIDE OF MOTOR AT SWITCH END.



LINE LEADS



	ROTATION FACING LEAD END	L1	L2	JOIN
HIGH VOLT	C.C.W.	T1	T4 T5	T2,T3 T8
	C.W.	T1	T4 T8	T2,T3 T5
LOW VOLT	C.C.W.	T1,T3 T8	T2,T4 T5	---
	C.W.	T1,T3 T5	T2,T4 T8	---

27	UPDATED TO CURRENT STANDARDS	DBT	05/27/97	TOLERANCES UNLESS OTHERWISE SPECIFIED		LEESON ELECTRIC CORPORATION								
26	ADDED PAGE 32(114787) & PAGE 33(114788) PG	KAZ	12/20/95											
25	ADDED PAGE 31	DL	KAZ	04/19/95	DECIMALS		DRAWN ADH 8/6/73					TITLE EXT. WIRING DIAGRAM TYPE "C" W/O PROTECTOR		
24	ADDED PAGES 29 & 30	DL	KMM	03/30/95	.00	± .01								
23	ADDED PAGE 28		KMM	01/27/95	.000	± .005	CH'K'D.		MAT'L. DECAL - 004012				BRF	
22	REDRAWN ON CAD	KH	SAW	10/28/94	.0000	± .0005	APPR. JCW 3/9/76							
NO.	REVISION	BY	DATE	FRACTIONS	± 1/64	SCALE 1=1		FINISH					SIZE A	DRAWING NO. 005005-01
THIS DRAWING IN DESIGN AND DETAIL IS OUR PROPERTY AND MUST NOT BE USED EXCEPT IN CONNECTION WITH OUR WORK ALL RIGHTS OF DESIGN AND INVENTION ARE RESERVED				ANGLES		± 1/2°								
				INCH/MM				FMF MGI-2.4B						

Lubrication Instructions For Ball Bearing Motors

Lubrication

This motor is supplied with pre-lubrication ball bearings. No lubrication required before start up.

Relubrication Intervals

The following intervals are suggested as a guide:

SUGGESTED RELUBRICATION INTERVALS		
HOURS OF SERVICE PER YEAR	H.P. RANGE	RELUBE INTERVAL
5,000	Sub Fractional to 7 1/2 10 to 40 50-200	5 Years 3 Years 1 Year
Continuous Normal Applications	Sub Fractional to 7 1/2 10 to 40 50 to 200	2 Years 1 Year 9 Months
Season Service Motor Idle 6 Months or More	All	1 Year (Beginning of Season)
Continuous High Ambients Dirty or Moist Locations High Vibrations Where Shaft End is Hot (Pumps-Fans)	Sub Fractional to 40 50 to 200	6 Months 3 Months

Lubrication

Use high quality ball bearing lubricant. Use consistency of lubricant suitable for class of insulation stamped on nameplate as follows:

LUBRICATION CONSISTENCY				
INSULATION CLASS	CONSISTENCY	TYPE	TYPICAL LUBRICATION	FRAME TYPE
B & F F & H	Medium	Polyurea	Shell Dolium R and/or Chevron SR1 2	Sub Fractional to 447T All

Procedure

If motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215T frame and smaller. Use 2 to 3 strokes on NEMA 254T thru NEMA 365 T frame. Use 3 to 4 strokes on NEMA 404T frames and larger. On motors having drain plugs, remove drain plug and operate motor for 20 minutes before replacing drain plug.

On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA 215T frame and smaller. Insert 3 to 5 inch length on larger motors. For motors having drain plug and operate motor for 20 minutes before replacing drain plug.

CAUTION: Keep lubricant clean. Lubricate motors at standstill. remove and replace drain plugs at standstill. Do not mix petroleum lubricant and silicone lubricant in motor bearings.



ELECTRIC MOTORS, GEARMOTORS AND DRIVES

LEESON ELECTRIC

GRAFTON, WISCONSIN 53024-0241 U.S.A.
TEL (262)377-8810 FAX (262)377-9025 www.leeson.com

A Subsidiary of Regal-Beloit Corporation

Installation Maintenance Instructions

AC Induction Motors

Installation

After unpacking, check for damage. Be sure that shaft rotates freely. Before making electrical power connections, check for proper grounding of motor and application. All electrical contacts and connections must be properly insulated and enclosed. Couplings, belts, chains or other mounted devices must be in proper alignment, balance and secure to insure safe motor operation.

Electrical Wiring

Prior to connecting to the power line, check nameplate for proper voltage and rotation connection. This motor should be installed in compliance with the National Electrical Code and any other applicable codes. Voltage at motor not to exceed + or -10% of nameplate. Authorized person should make all electrical connections.

Mounting

This motor should be securely mounted to the application. Sufficient ventilation area should be provided to insure proper operation.

RECOMMENDED COPPER WIRE & TRANSFORMER SIZE

SINGLE PHASE MOTORS - 230 VOLTS						
H.P.	TRANSFORMER KVA	DISTANCE - MOTOR TO TRANSF. IN FT.				
		100	150	200	300	500
1 1/2	3	10	8	8	6	4
2	3	10	8	8	6	4
3	5	8	8	6	4	2
5	7 1/2	6	4	4	2	0
7 1/2	10	6	4	3	1	0

THREE PHASE MOTORS - 230 & 460 VOLTS							
H.P.	VOLTS	TRANSFORMER KVA	DISTANCE - MOTOR TO TRANSF. IN FT.				
			100	150	200	300	500
1 1/2	230	3	12	12	12	12	10
1 1/2	460	3	12	12	12	12	12
2	230	3	12	12	12	10	8
2	460	3	12	12	12	12	12
3	230	5	12	10	10	8	6
3	460	5	12	12	12	12	10
5	230	7	10	8	8	6	4
5	460	1/2	12	12	12	10	8
7 1/2	230	7 1/2	8	6	6	4	2
7 1/2	460	10	12	12	12	10	8
10	230	10	6	4	4	4	1
10	460	15	12	12	12	10	8
15	230	15	4	4	4	2	0
15	460	20	12	10	10	8	6
20	230	20	4	2	2	1	000
20	460		10	8	8	6	4
25	230		2	2	2	0	000
25	460	Consult	8	8	6	6	4
30	230	Local	2	1	1	00	0000
30	460	Power	8	6	6	4	2
40	230	Company	1	0	00	0000	300
40	460		6	6	4	2	0
50	230		1	0	00	0000	300
50	460		4	4	2	2	0
60	230		1	00	000	250	500
60	460		4	2	2	0	00
75	230		0	000	0000	300	500
75	460		4	2	0	00	000





ELECTRIC MOTORS
GEARMOTORS AND DRIVES

Motor Trouble-Shooting Chart

Caution:

1. Disconnect power to the motor before performing service or maintenance.
2. Discharge all capacitors before servicing motor.
3. Always keep hands and clothing away from moving parts.
4. Be sure required safety guards are in place before starting equipment.

<u>Problem:</u>	<u>Like Causes:</u>	<u>What To Do:</u>
Motor fails to start upon initial installation.	Motor is miswired. Motor damaged and rotor is striking stator. Fan guard bent and contacting fan.	Verify motor is wired correctly. May be able to reassemble; otherwise, motor should be replaced. Replace fan guard.
Motor has been running, then fails to start.	Fuse or circuit breaker tripped. Stator is shorted or went to ground. Motor will make a humming noise and the circuit breaker or fuse will trip. Motor overloaded or load jammed. Capacitor (on single phase motor) may have failed. Starting switch has failed.	Replace fuse or reset the breaker. Disassemble motor and inspect windings and internal connections. A blown stator will show a burn mark. Motor must be replaced or the stator rewound. Inspect to see that the load is free. Verify amp draw of motor versus nameplate rating. First discharge capacitor. To check capacitor, set volt-ohm meter to RX100 scale and touch its probes to capacitor terminals. If capacitor is OK, needle will jump to zero ohms, and drift back to high. Steady zero ohms indicates a short circuit; steady high ohms indicates an open circuit. Disassemble motor and inspect both the centrifugal and stationary switches. The weights of the centrifugal switch should move in and out freely. Make sure that the switch is not loose on the shaft. Inspect contacts and connections on the stationary switch. Replace switch if the contacts are burned or pitted.
Motor runs but dies down.	Voltage drop. Load increased.	If voltage is less than 10% of the motor's rating contact power company or check if some other equipment is taking power away from the motor. Verify the load has not changed. Verify equipment hasn't got tighter. If fan application verify the air flow hasn't changed.
Motor takes too long to accelerate.	Defective capacitor Faulty stationary switch. Bad bearings. Voltage too low.	Test capacitor per previous instructions. Inspect switch contacts and connections. Verify that switch reeds have some spring in them. Noisy or rough feeling bearings should be replaced. Make sure that the voltage is within 10% of the motor's nameplate rating. If not, contact power company or check if some other equipment is taking power away from the motor.
Motor runs in the wrong direction.	Incorrect wiring.	Rewire motor according to wiring schematic provided.
Motor overload protector continually trips.	Load too high. Ambient temperature too high. Protector may be defective. Winding shorted or grounded.	Verify that the load is not jammed. If motor is a replacement, verify that the rating is the same as the old motor. If previous motor was a special design, a stock motor may not be able to duplicate the performance. Remove the load from the motor and inspect the amp draw of the motor unloaded. It should be less than the full load rating stamped on the nameplate. Verify that the motor is getting enough air for proper cooling. Most motors are designed to run in an ambient temperature of less than 40°C. (Note: A properly operating motor may be hot to the touch.) Replace the motor's protector with a new one of the same rating. Inspect stator for defects, or loose or cut wires that may cause it to go to ground.

Motor Trouble-Shooting Chart

10/13/00 (continued)

<u>Problem:</u>	<u>Like Causes:</u>	<u>What To Do:</u>
Motor vibrates.	<p>Motor misaligned to load.</p> <p>Load out of balance. (Direct drive application.)</p> <p>Motor bearings defective.</p> <p>Rotor out of balance.</p> <p>Motor may have too much endplay.</p> <p>Winding may be defective.</p>	<p>Realign load.</p> <p>Remove motor from load and inspect motor by itself. Verify that motor shaft is not bent. Rule of thumb is .001" runout per every inch of shaft length.</p> <p>Test motor by itself. If bearings are bad, you will hear noise or feel roughness. Replace bearings. Add oil if a sleeve of bearing. Add grease if bearings have grease fittings.</p> <p>Inspect motor by itself with no load attached. If it feels rough and vibrates but the bearings are good, it may be that the rotor was improperly balanced at the factory. Rotor must be replaced or rebalanced.</p> <p>With the motor disconnected from power turned shaft. It should move but with some resistance. If the shaft moves in and out too freely, this may indicate a preload problem and the bearings may need additional shimming.</p> <p>Test winding for shorted or open circuits. The amps may also be high. Replace motor or have stator rewound.</p>
Bearings continuously fail.	<p>Load to motor may be excessive or unbalanced.</p> <p>High ambient temperature.</p>	<p>Besides checking load, also inspect drive belt tension to ensure it's not too tight may be too high. An unbalanced load will also cause the bearings to fail.</p> <p>If the motor is used in a high ambient, a different type of bearing grease may be required. You may need to consult the factory or a bearing distributor.</p>
The motor, at start up, makes a loud rubbing or grinding noise.	Rotor may be striking stator.	Ensure that motor was not damaged in shipment. Frame damage may not be repairable. If you cannot see physical damage, inspect the motor's rotor and stator for strike marks. If signs of rubbing are present, the motor should be replaced. Sometimes simply disassembling and reassembling motor eliminates rubbing. Endbells are also sometimes knocked out of alignment during transportation.
Start capacitors continuously fail.	<p>The motor is not coming up to speed quickly enough.</p> <p>The motor is being cycled too frequently.</p> <p>Voltage to motor is too low.</p> <p>Starting switch may be defective, preventing the motor from coming out of start winding.</p>	<p>Motor may not be sized properly. Verify how long the motor takes to come up to speed, Most single phase capacitor start motors should come up to speed within three seconds. Otherwise the capacitors may fail.</p> <p>Verify duty cycle. Capacitor manufacturers recommend no more than 20, three-second starts per hour. Install capacitor with higher voltage rating, or add bleed resistor to the capacitor.</p> <p>Verify that voltage to the motor is within 10% of the nameplate value. If the motor is rated 208-230V, the deviation must be calculated from 230V.</p> <p>Replace switch.</p>
Run capacitor fail.	<p>Ambient temperature too high.</p> <p>Possible power surge to motor, caused by lightning strike or other high transient voltage.</p>	<p>Verify that ambient does not exceed motor's nameplate value.</p> <p>If a common problem, install surge protector.</p>

LEESON ELECTRIC CORPORATION

BOX 241 GRAFTON, WISCONSIN 53024-0241 U.S.A.

Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage
- High Flow Valves for liquid, corrosive, and air/inert gas service
- Industrial applications include:
 - Car wash
 - Laundry equipment
 - Air compressors
 - Industrial water control
 - Pumps

Construction

Valve Parts in Contact with Fluids		
Body	Brass	304 Stainless Steel
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
	DC Watts	AC			General Purpose		Explosionproof	
		Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	99257	-	99257	-
F	-	20.1	48	240	272610	-	272614	-
H	30.6	-	-	-	-	74073	-	74073
H	40.6	-	-	-	-	238910	-	238914

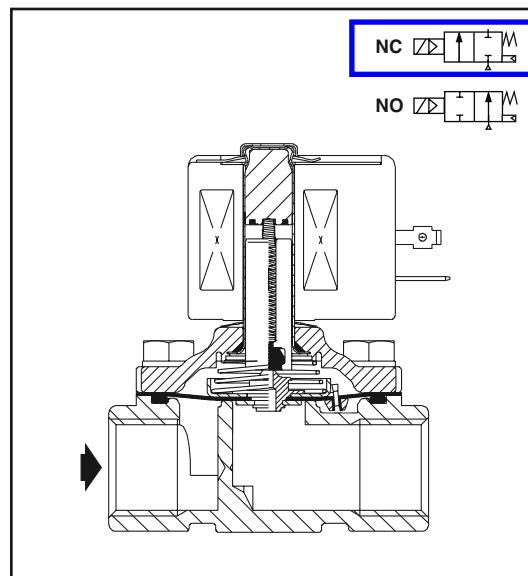
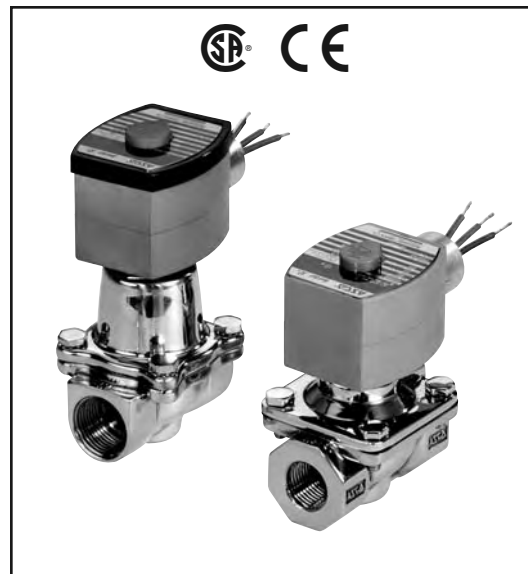
Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I.

Optional: RedHat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9.

(To order, add prefix "EF" to catalog number, except Catalog Numbers 8210B057, 8210B058, and 8210B059, which are not available with Explosionproof enclosures.)
See *Optional Features Section* for other available options.



Nominal Ambient Temp. Ranges

RedHat II/
RedHat AC: 32°F to 125°F (0°C to 52°C)

RedHat II DC: 32°F to 104°F (0°C to 40°C)

RedHat DC: 32°F to 77°F (0°C to 25°C)
(104°F/40°C occasionally)

Refer to *Engineering Section* for details.

Approvals

CSA certified. RedHat II meets applicable CE directives.

Refer to *Engineering Section* for details.

Specifications (English units)

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Operating Pressure Differential (psi)								Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC													
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC	
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																				
3/8	3/8	1.5	①	150	125	-	40	40	-	180	150	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F	
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G093	5D	○	-	-	-	10.1/F	11.6/F	
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G001	6D	○	-	-	-	6.1/F	11.6/F	
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G006	5D	○	-	-	-	17.1/F	-	
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F	
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G094	5D	○	-	-	-	10.1/F	11.6/F	
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G087	7D	●	17.1/F	11.6/F	
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G002	6D	○	-	-	-	6.1/F	11.6/F	
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G007	5D	○	-	-	-	17.1/F	-	
1/2	3/4	4	5	-	300	-	-	300	-	180	125	8210G227	5D	○	-	-	-	17.1/F	40.6/H	
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G088	7D	●	17.1/F	11.6/F	
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G009	9D	○	-	-	-	6.1/F	11.6/F	
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G095	8D	○	-	-	-	10.1/F	11.6/F	
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G003	11D	○	-	-	-	6.1/F	11.6/F	
3/4	3/4	6	0	-	-	-	200	180	180	-	77	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H	
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-	
1	1	13	0	-	-	-	100	100	80	-	77	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H	
1	1	13	0	150	125	125	-	-	-	180	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-	
1	1	13	5	150	150	100	125	125	125	180	150	8210G004	12D	○	-	-	-	6.1/F	11.6/F	
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-	
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G078 ②	13P	-	-	-	-	17.1/F	-	
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B055 ‡	32D	-	-	-	-	-	30.6/H	
1 1/4	1 1/8	15	0	150	125	125	-	-	-	180	-	8210G055	43D	●	-	-	-	16.1/F	-	
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G008	16D	○	-	-	-	6.1/F	11.6/F	
1 1/2	1 1/4	22.5	0	-	-	-	100	100	80	-	77	8210B056 ‡	33D	-	-	-	-	-	30.6/H	
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210G056	44D	●	-	-	-	16.1/F	-	
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022	18D	●	-	-	-	6.1/F	11.6/F	
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	-	-	-	6.1/F	11.6/F	
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	●	-	-	-	6.1/F	11.6/F	
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																				
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G033	23D	●	-	-	-	10.1/F	11.6/F	
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F	
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G034	23D	●	-	-	-	10.1/F	11.6/F	
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G030	37D	●	10.1/F	11.6/F	
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G012 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F	
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G035	25D	●	-	-	-	10.1/F	11.6/F	
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G038	38D	●	10.1/F	11.6/F	
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C013	24D	●	-	-	-	-	16.8/F	
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G013	46D	●	-	-	-	16.1/F	-	
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-	
1	1	13	5	-	-	-	125	125	125	-	180	8210D014	26D	●	-	-	-	-	16.8/F	
1	1	13	5	150	150	125	-	-	-	180	-	8210G014	47D	●	-	-	-	16.1/F	-	
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-	
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D018	28D	●	-	-	-	-	16.8/F	
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G018	48D	●	-	-	-	16.1/F	-	
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-	
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D032	29D	●	-	-	-	-	16.8/F	
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G032	49D	●	-	-	-	16.1/F	-	
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210 103	30P	●	-	-	-	-	16.8/F	
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	-	-	-	16.1/F	-	
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210 104	27P	●	-	-	-	-	16.8/F	
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/F	-	

① 5 psi on Air; 1 psi on Water.

② Valve provided with PTFE main disc.

③ Valve includes Ultem (G.E. trademark) piston.

④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.

⑤ ○ Safety Shutoff Valve; ● General Purpose Valve.

Refer to Engineering Section (Approvals) for details.

⑥ Valves not available with Explosionproof enclosures.

⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.

⑧ AC construction also has PA seating.

⑨ No disc-holder.

⑩ Stainless steel disc-holder.

‡ Must have solenoid mounted vertical and upright.

Specifications (Metric units)

Pipe Size (ins.)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Operating Pressure Differential (bar)							Max. Fluid Temp. °C		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC												
				Air-Inert Gas	Water	Light Oil @ 300 SSU	Air-Inert Gas	Water	Light Oil @ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	10	1.89	①	10	9	-	3	3	-	82	65	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	16	2.57	0	10	10	-	3	3	-	82	65	8210G093	5D	○	-	-	-	10.1/F	11.6/F
3/8	16	2.57	0.3	14	10	9	9	7	7	82	65	8210G001	6D	○	-	-	-	6.1/F	11.6/F
3/8	16	2.57	0.7	21	21	21	-	-	-	79	-	8210G006	5D	○	-	-	-	17.1/F	-
1/2	11	1.89	①	10	9	-	3	3	-	82	65	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	16	3.43	0	10	10	-	3	3	-	82	65	8210G094	5D	○	-	-	-	10.1/F	11.6/F
1/2	16	3.43	0	10	10	9	3	3	-	79	65	-	-	-	8210G088	7D	●	17.1/F	11.6/F
1/2	16	3.43	0.3	14	10	9	9	7	7	82	65	8210G002	6D	○	-	-	-	6.1/F	11.6/F
1/2	16	3.43	0.3	21	21	21	-	-	-	79	-	8210G007	5D	○	-	-	-	17.1/F	-
1/2	19	3.43	0.3	-	21	-	-	21	-	82	52	8210G227	5D	○	-	-	-	17.1/F	40.6/H
3/4	16	3.86	0	10	10	9	3	3	-	79	65	-	-	-	8210G088	7D	●	17.1/F	11.6/F
3/4	19	4.29	0.3	9	9	9	7	6	5	82	65	8210G009	9D	○	-	-	-	6.1/F	11.6/F
3/4	19	4.29	0	10	10	-	3	3	-	82	65	8210G095	8D	○	-	-	-	10.1/F	11.6/F
3/4	19	5.57	0.3	17	10	7	9	9	9	82	65	8210G003	11D	○	-	-	-	6.1/F	11.6/F
3/4	19	5.14	0	-	-	-	14	12	12	-	25	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	19	5.14	0	24	21	14	-	-	-	93	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-
1	25	11.14	0	-	-	-	-	7	6	-	25	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H
1	25	11.14	0	10	9	9	-	-	-	82	-	8210G051	41D	●	8210G089	45D	●	16.1/F	-
1	25	11.14	0.3	10	10	7	9	9	9	82	65	8210G004	12D	○	-	-	-	6.1/F	11.6/F
1	25	11.57	0	21	16	8	-	-	-	93	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	25	11.57	0.7	21	21	21	-	-	-	79	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	29	12.86	0	-	-	-	7	7	6	-	25	8210B055 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	29	12.86	0	10	9	9	-	-	-	82	-	8210G055	43D	●	-	-	-	16.1/F	-
1 1/4	29	12.86	0.3	10	10	7	9	9	9	82	65	8210G008	16D	○	-	-	-	6.1/F	11.6/F
1 1/2	32	19.29	0	-	-	-	7	7	6	-	25	8210B056 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	32	19.29	0	10	9	9	-	-	-	82	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	32	19.29	0.3	10	10	7	9	9	9	82	65	8210G022	18D	●	-	-	-	6.1/F	11.6/F
2	44	36.86	0.3	10	9	6	3	3	3	82	65	8210G100	20P	●	-	-	-	6.1/F	11.6/F
2 1/2	44	38.57	0.3	10	9	6	3	3	3	82	65	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	16	2.57	0.0	10	10	9	9	9	6	82	65	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	16	2.57	0.3	17	14	14	17	14	14	82	82	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
1/2	16	3.43	0	10	10	9	9	9	6	82	65	8210G004	23D	●	-	-	-	10.1/F	11.6/F
1/2	16	2.57	0	10	10	7	9	9	6	82	65	-	-	-	8210G030	37D	●	10.1/F	11.6/F
1/2	16	3.43	0.3	17	14	14	17	14	14	82	82	8210G012 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
3/4	19	4.71	0	10	10	9	9	9	6	82	65	8210G035	25D	●	-	-	-	10.1/F	11.6/F
3/4	16	2.57	0	10	10	7	9	9	6	82	65	-	-	-	8210G038	38D	●	10.1/F	11.6/F
3/4	19	5.57	0.3	-	-	-	17	14	14	-	82	8210C013	24D	●	-	-	-	-	16.8/F
3/4	19	5.57	0.3	17	14	14	-	-	-	82	-	8210G013	46D	●	-	-	-	16.1/F	-
1	25	11.14	0	9	9	9	-	-	-	82	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	25	11.14	0.3	-	-	-	9	9	9	-	82	8210D014	26D	●	-	-	-	-	16.8/F
1	25	11.14	0.3	10	10	9	-	-	-	82	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	29	12.86	0	9	9	9	-	-	-	82	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	29	12.86	0.3	-	-	-	9	9	9	-	82	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	29	12.86	0.3	10	10	9	-	-	-	82	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	32	19.29	0	9	9	9	-	-	-	82	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	32	19.29	0.3	-	-	-	9	9	9	-	82	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	32	19.29	0.3	10	10	9	-	-	-	82	-	8210G032	49D	●	-	-	-	16.1/F	-
2	44	36.86	0.3	-	-	-	9	9	9	-	65	8210 103	30P	●	-	-	-	-	16.8/F
2	44	36.86	0.3	9	9	9	-	-	-	82	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	44	38.57	0.3	-	-	-	9	9	9	-	65	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	44	38.57	0.3	9	9	9	-	-	-	82	-	8210G104	51P	●	-	-	-	16.1/F	-

① 0.3 bar on air; 0.0 bar on Water.

② Valve provided with PTFE main disc.

③ Valve includes Ultem (G.E. trademark) piston.

④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.

⑤ Safety Shutoff Valve; ● General Purpose Valve.

Refer to Engineering Section (Approvals) for details.

⑥ Valves not available with Explosionproof enclosures.

⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.

⑧ AC construction also has PA seating.

⑨ No disc-holder.

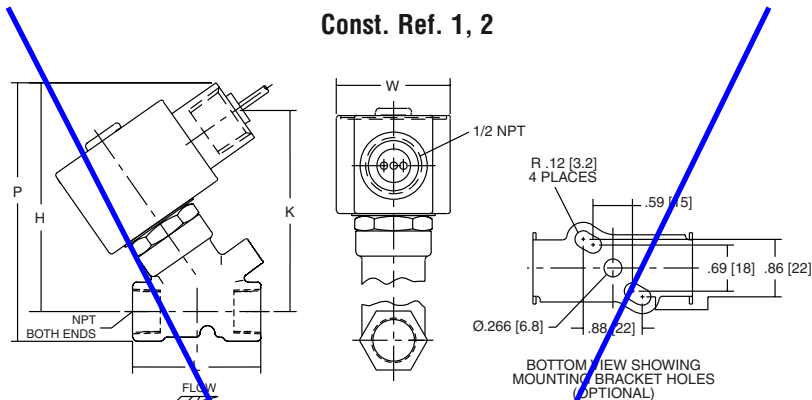
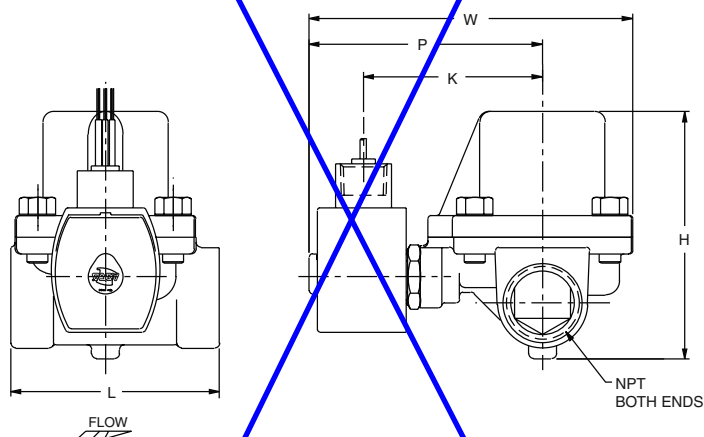
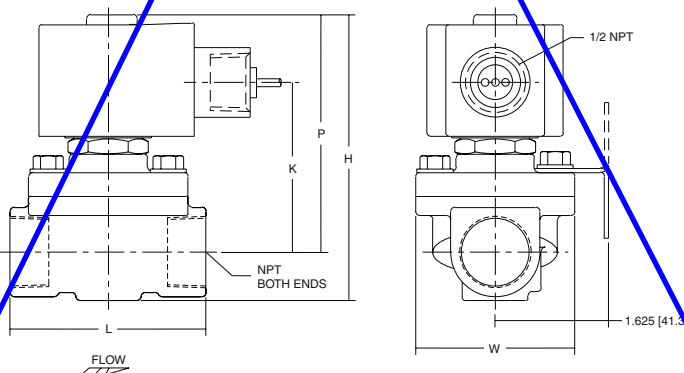
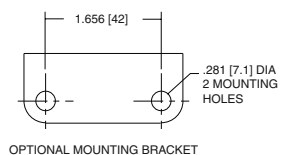
⑩ Stainless steel disc-holder.

‡ Must have solenoid mounted vertical and upright.

Dimensions: inches (mm)

Const. Ref.		H	K	L	P	W
1*	ins.	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	ins.	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
5	ins.	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	ins.	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	ins.	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	ins.	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	ins.	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10*	ins.	5.25	X	2.81	4.59	2.31
	mm	133	X	71	117	59
11*	ins.	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	ins.	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
13	ins.	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
15*	ins.	5.34	X	3.75	4.47	3.84
	mm	136	X	95	114	98
16	ins.	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18	ins.	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	ins.	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	ins.	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	ins.	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	ins.	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	ins.	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	ins.	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	ins.	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	ins.	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	ins.	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

* DC dimensions slightly larger.

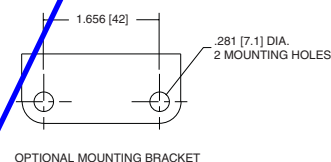
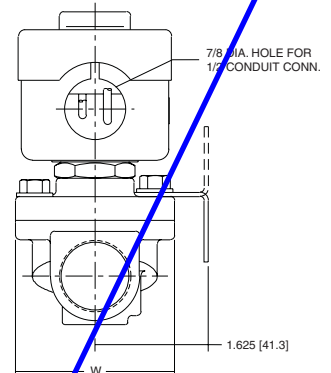
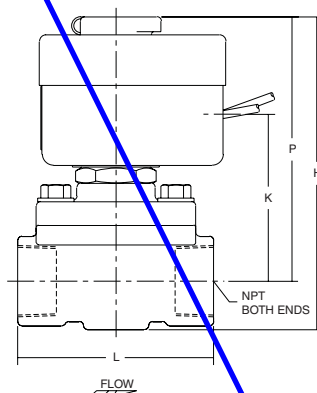
IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.**Const. Ref. 13****Const. Ref. 5-9, 11, 20, 21, 23, 25, 27, 38**

Dimensions: inches (mm)

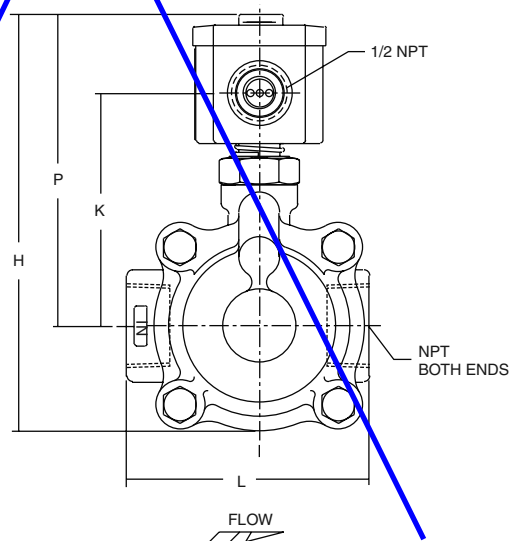
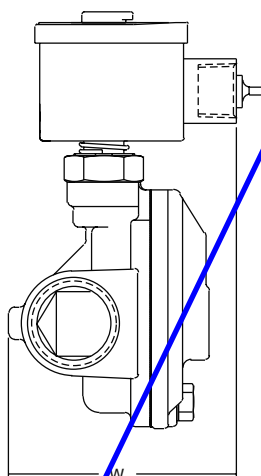
Const. Ref.		H	K	L	P	W
30	ins.	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	ins.	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	ins.	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	ins.	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	ins.	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	ins.	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	ins.	7.66	X	4.38	6.56	3.91
	mm	195	X	111	167	99
37	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	ins.	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	ins.	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	ins.	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	ins.	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	ins.	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	ins.	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	ins.	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	ins.	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	ins.	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	ins.	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	ins.	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	ins.	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	ins.	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

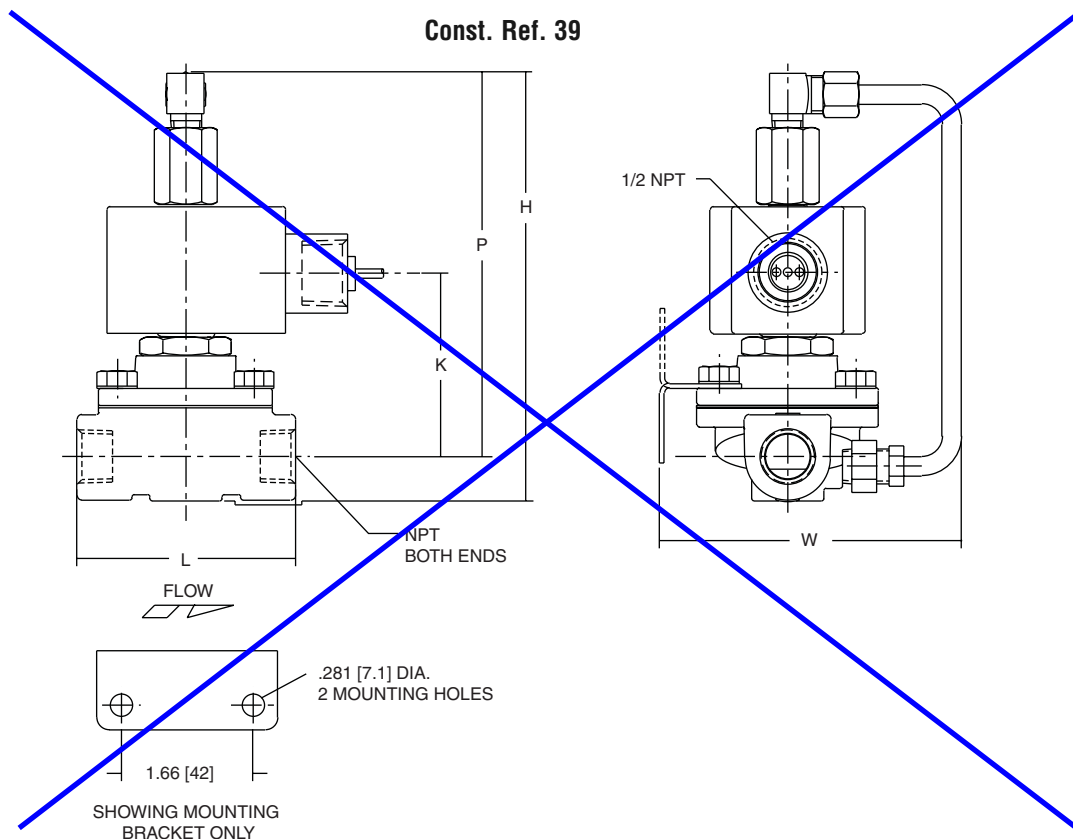
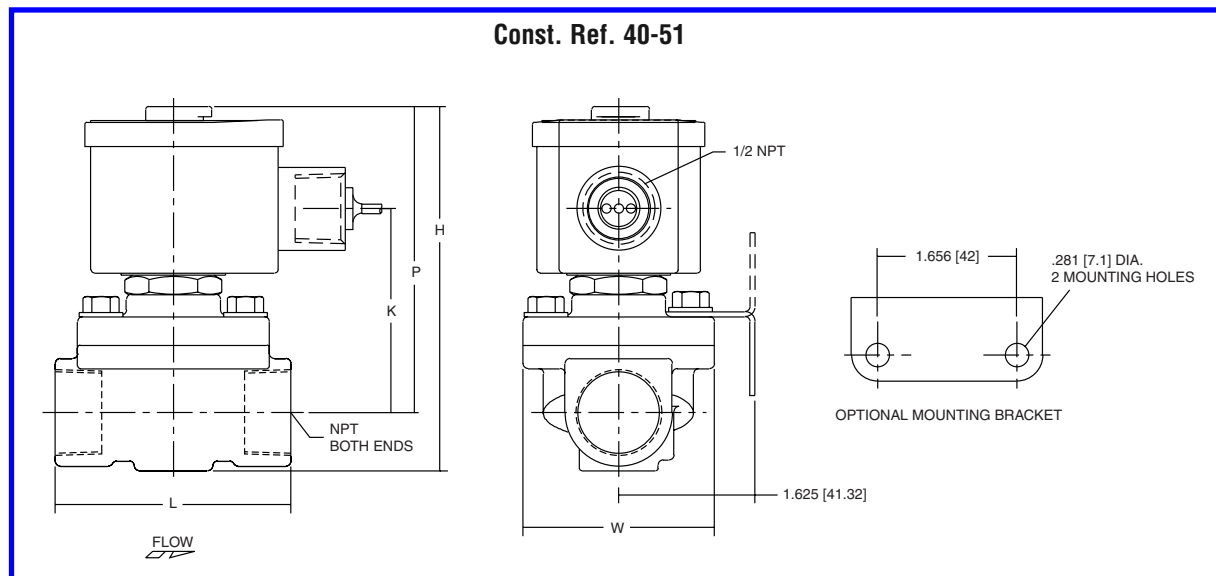
IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Const. Ref. 10, 15, 24, 26-36



Const. Ref. 12, 16, 18



Dimensions: inches (mm)
Const. Ref. 39

Const. Ref. 40-51


ASCO's electrical connection devices are designed using the DIN 43650/ISO 4400 or DIN 46244 (Pg 9P) form standards consistent with our solenoid valve coil designs and permitting industry interchangeability. Each size is available for user wiring or factory prewired installations. Other options include 1/2" conduits, and LED/VDR models.

Features

- Glass fiber reinforced polyamide housing and lid
- IP65 protection against moisture entry and washdown when properly installed with gaskets
- **LED:** Light Emitting Diode. A solid-state diode that emits light to indicate power to the connector
- **VDR:** Varistor absorbing the self-inductance of the coil. The VDR is there to protect the coil or controller against supply over-voltage or peak
- Maximum voltage 240 Volts



Size 11 mm, Form B

Part Number	Description	Orientation	Rotatable	Figure
290413-001	1/2" conduit	Ground Down	180°	A
289281-001	1/2" conduit with LED/VDR	Ground Down	180°	A
290414-001*	PG 9 cable gland	Ground Down	180°	B
290415-120	PG 9 cable gland with LED/VDR 120/AC-DC	Ground Down	180°	B
290415-240	PG 9 cable gland with LED/VDR 240/AC-DC	Ground Down	180°	B
290415-024	PG 9 cable gland with LED/VDR 24/AC-DC	Ground Down	180°	B
285483-015**	4.5' leads with LED 120/AC-DC PVC	Ground Up	No	B
285482-015**	4.5' leads with LED 24/AC-DC PVC	Ground Up	No	B
285481-018**	6' leads with stripped ends	Ground Down	180°	B

Available in 10 pack; part number 226061-001-

**Also available in 9', 16', and 33' lengths. Consult factory.

Figure A

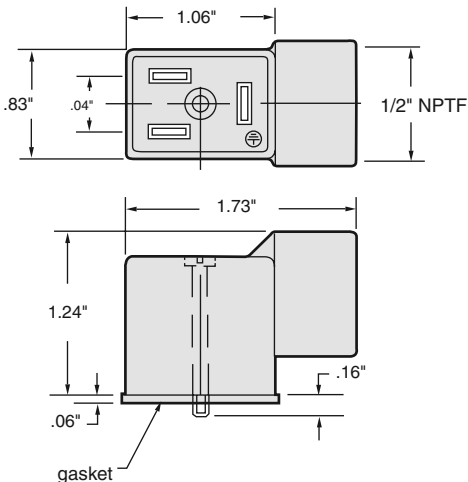
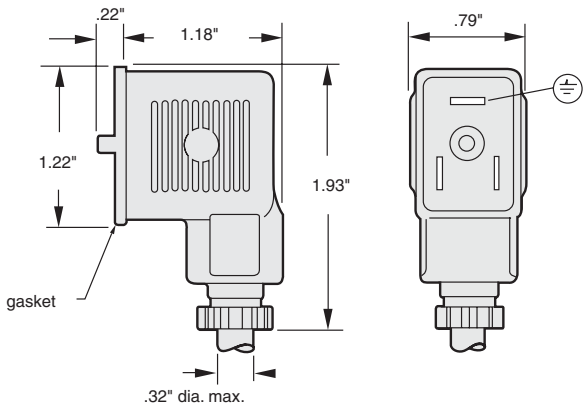


Figure B



Size 18 mm, Form A

Part Number	Description	Orientation	Rotatable	Figure
290410-001	1/2" conduit	Ground Up	90°	C
289280-001	1/2" conduit with LED	Ground Up	90°	C
290411-001*	PG 9 cable gland	Ground Up	90°	D
290412-120	PG 11 cable gland with LED/VDR 120/AC-DC	Ground Up	90°	D
290412-240	PG 11 cable gland with LED/VDR 240/AC-DC	Ground Up	90°	D
290412-024	PG 11 cable gland with LED/VDR 24/AC-DC	Ground Up	90°	D
290412-048	PG 11 cable gland with LED/VDR 48/AC-DC	Ground Up	90°	D
285480-015**	4.5' leads with LED 120/AC-DC PVC	Ground Up	No	D
290409-015**	4.5' leads with LED 240/AC-DC PVC	Ground Up	No	D
285479-015**	4.5' leads with LED 24/AC-DC PVC	Ground Up	No	D
272852	6' leads with North American outlet plug	Ground Up	No	D
272852-003	6' leads with North American outlet plug (rotated 90 degrees)	Ground Up	No	D
285478-015**	4.5' leads with stripped ends	Ground Up	No	D

*Available in 50 pack; part number 266615.
 **Also available in 9', 16', and 33' lengths. Consult factory.

Figure C

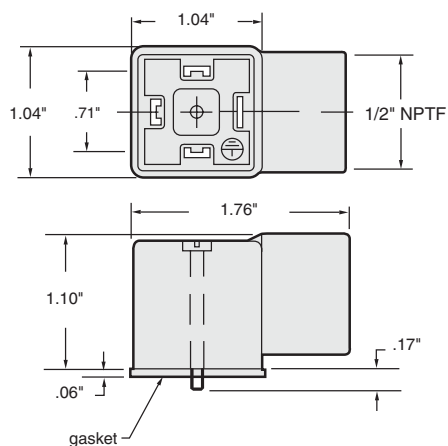
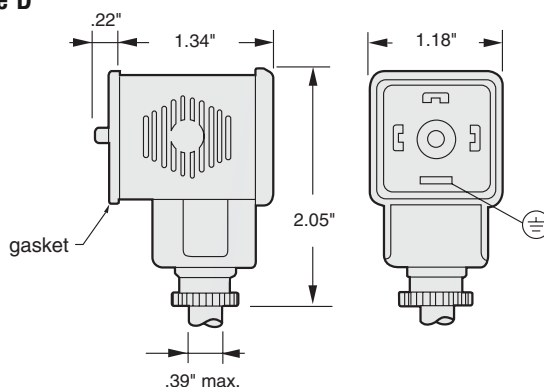


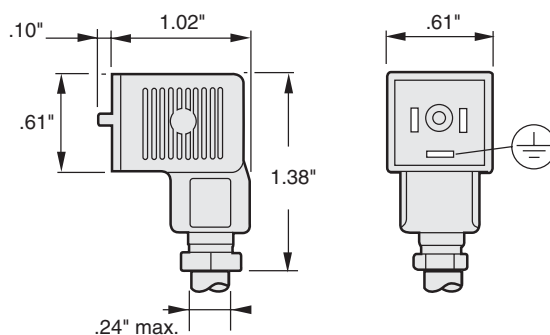
Figure D



Size 9.4 mm, Form C

Part Number	Description	Orientation	Rotatable
290417-001	PG 7 cable gland	Ground Up	180°
290418-001	PG 7 cable gland LED/VDR 120-240/AC 50/60	Ground Up	180°
289278-001	PG 7 cable gland LED/VDR 48-120/AC 50/60	Ground Up	180°
289282-001	PG 7 cable gland LED/VDR 48-120/DC	Ground Up	180°
289277-001	PG 7 cable gland LED/VDR 6-48/AC-DC	Ground Up	180°
290416-013**	4.5' leads with LED 120/AC-DC PVC	Ground Up	No
285485-015**	4.5' leads with LED 24/AC-DC PVC	Ground Up	No
272852-004**	6' leads	Ground Up	No

**Also available in 9', 16', and 33' lengths. Consult factory.



Installation & Maintenance Instructions

2-WAY INTERNAL PILOT-OPERATED SOLENOID VALVES HUNG DIAPHRAGM — 3/8, 1/2 AND 3/4 NPT NORMALLY CLOSED OPERATION

BULLETINS

8210

8211

Form No.V5825R1

DESCRIPTION

Bulletin 8210's are 2-way, normally closed, internal pilot operated solenoid valves. Valve body and bonnet are of brass construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure.

Bulletin 8211's are the same as Bulletin 8210's except the solenoids are equipped with an enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Group C or D, and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Group E, F or G. The explosion-proof/watertight solenoid enclosure is shown on a separate sheet of Installation and Maintenance Instructions, Form No. V-5380.

Bulletin 8210 and 8211 valves with suffix 'HW' in the catalog number are specifically designed for hot water service.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized and opens when solenoid is energized.

MANUAL OPERATOR (Optional)

Valves with suffix 'MO' in catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power. To operate valve manually, push in knurled cap and rotate clockwise 180°. Disengage manual operator by rotating knurled cap counterclockwise 180° before operating electrically.

MANUAL OPERATOR LOCATION (Refer to Figure 3)

Manual operator (when shipped from factory) will be located over the valve outlet. Manual operator may be relocated at 90° increments by rotating valve bonnet. Remove bonnet screws (4) and rotate valve bonnet with solenoid to desired position. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.

If valve is installed in system and is operational, proceed in the following manner:

WARNING: Depressurize valve and turn off electrical power supply.

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove bonnet screws (4) and rotate valve bonnet to desired position.
3. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.
4. Replace solenoid enclosure and retaining clip or cap.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures refer to chart. The temperature limitations listed are for UL applications. For non UL applications, higher ambient and fluid temperature limitations are available. Consult factory. Check catalog number on nameplate to determine maximum temperatures.

Construction	Coil Class	Catalog Number Prefix	Maximum Ambient Temp. °F.	Maximum Fluid Temp. °F.
A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	122	180
	H	HT	140	180
D-C Construction (Direct Current)	A, F or H	None, FT or HT	77	150
Catalog Numbers Suffixed 'HW' A-C Construction (Alternating Current)	A	None or DA	77	210
	F	DF or FT	77	210
	H	HT	122	210

POSITIONING/MOUNTING

Valve may be mounted in any position. For mounting bracket (optional feature) dimensions, refer to Figure 1.

PIPING

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point. **IMPORTANT:** Valves with suffix 'HW' in the catalog number have a special diaphragm material which is specifically compounded for hot water service. This material can be attacked by oil and grease. Wipe the pipe threads clean of cutting oils and use teflon tape to seal pipe joints.

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with connections for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages it will spring upwards. Rotate to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the solenoid base sub-assembly and core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand for only an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power and depressurize valve before making repairs. It is not necessary to remove valve from pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check electrical system by energizing solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to the valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figure 2)

Turn off electrical power supply and disconnect coil leads. Proceed in the following manner:

1. Remove retaining cap or clip, nameplate and cover. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove spring washer, insulating washer and coil. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washer at each end of coil if required.

VALVE DISASSEMBLY (Refer to Figures 2 and 3)

Depressurize valve and turn off electrical power supply. Proceed in the following manner:

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket.
3. Remove valve bonnet screws (4) and valve bonnet.
4. For normal maintenance, it is not necessary to disassemble the manual operator (optional feature) unless external leakage is evident. To disassemble remove stem pin, manual operator stem, stem spring and stem gasket.
5. Remove core spring, core/diaphragm sub-assembly and body gasket. CAUTION: Do not damage or distort hanger spring between core/diaphragm sub-assembly.
6. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
2. Replace body gasket and core/diaphragm sub-assembly. Locate the bleed hole in core/diaphragm sub-assembly approximately 45° from the valve outlet.
3. Replace core spring with wide end in core first; closed end protrudes from top of core.
4. If removed, replace manual operator stem, stem spring, stem gasket and stem pin.
5. Replace valve bonnet and bonnet screws (4). Torque bonnet screws (4) in a crisscross manner to 110 ± 10 inch pounds.
6. Replace bonnet gasket and solenoid base sub-assembly. Put solenoid base sub-assembly to 175 ± 25 inch pounds.
7. Replace solenoid enclosure and retaining cap or clip.
8. After maintenance, operate the valve a few times to be sure of proper opening and closing.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils
Specify Valve Catalog Number,
Serial Number and Voltage.

PARTIAL VIEW OF MOUNTING BRACKET (OPTIONAL)

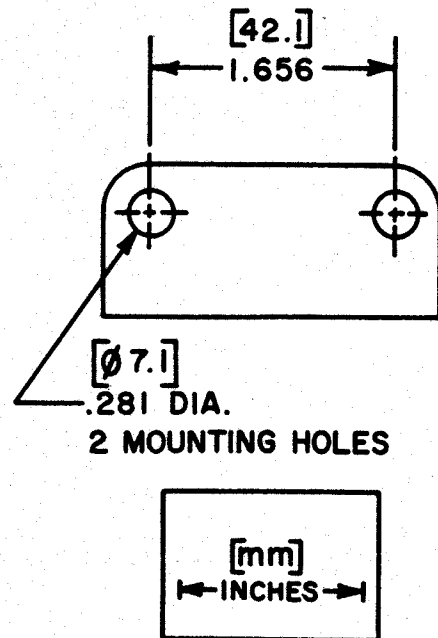


Figure 1.

Dimensions For Mounting Bracket
(Optional Feature)

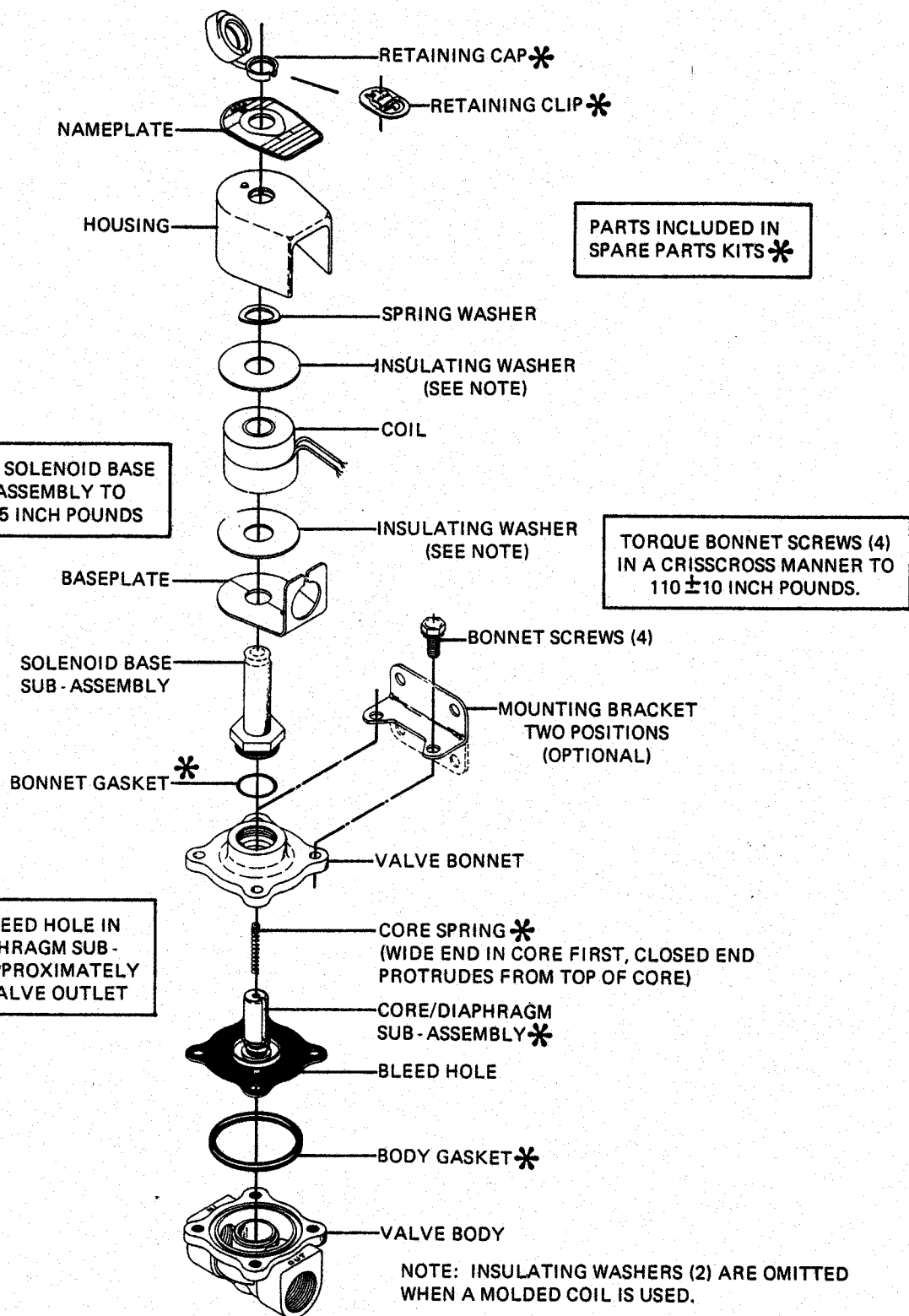


Figure 2.

Bulletin 8210 — 3/8, 1/2 & 3/4 N.P.T. — A-C Construction
General purpose solenoid enclosure shown.

For explosion-proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.

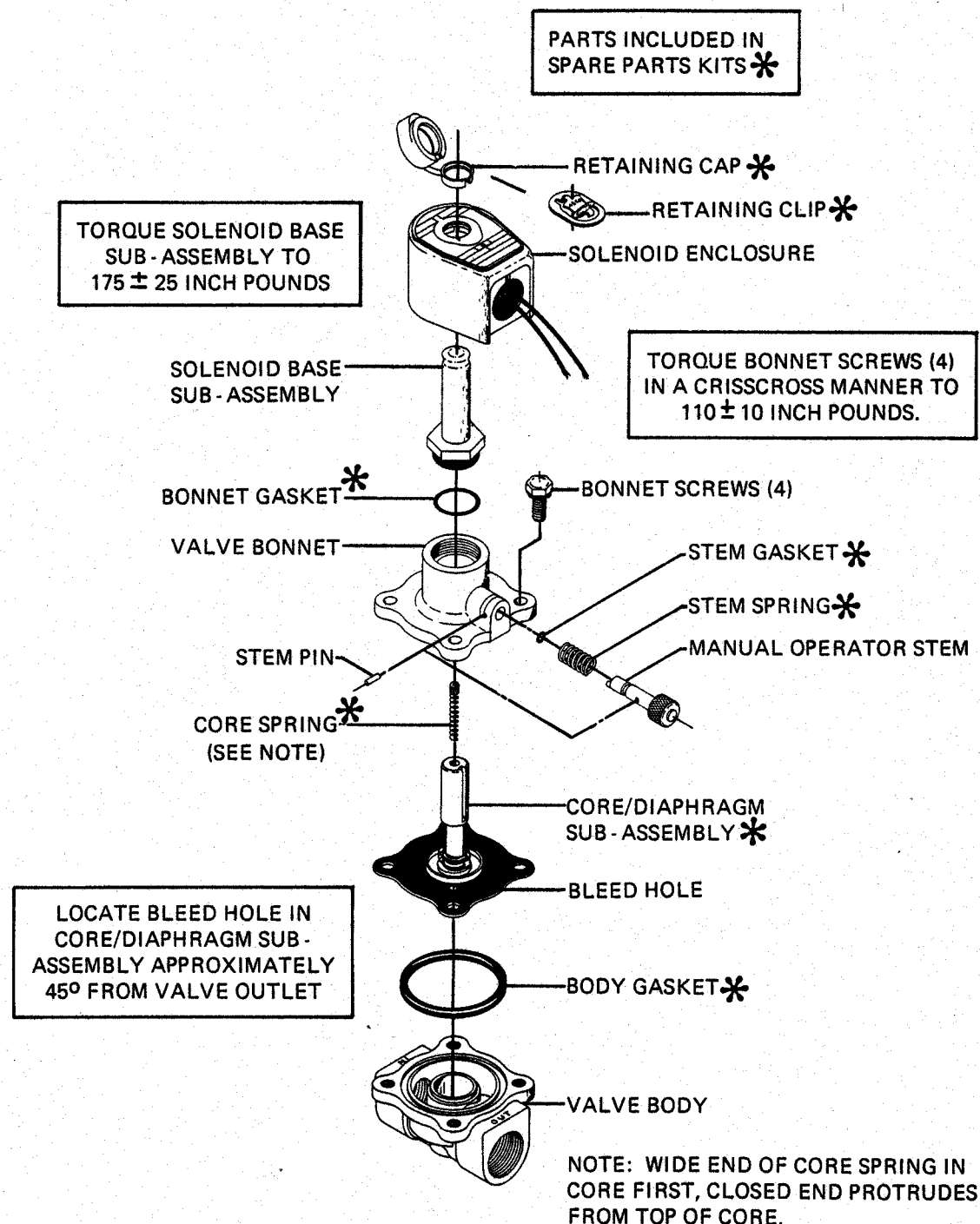


Figure 3.

Bulletin 8210 — Manual Operator
General purpose solenoid enclosure shown.
For explosion-proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.



Specifications			
Sizes:	1/2" - 4"		
Bodies:	PVC and PP		
Models:	Flanged ANSI	1/2" - 4"*	
	Socket PVC	1/2" - 2"	
	PP**	1/2" - 1"	
	Thread PVC	1/2" - 2"	
	PP	1/2" - 1"	
Plug:	PP		
Seals:	EPDM or FKM		

* 2-1/2" - 4": Outside stem and yoke type
** DIN Socket also available

Standard Features (Sizes 1/2" - 4")

- Used for efficient throttling of flow
- Positive shut-off
- Displays excellent flow regulating characteristics throughout the entire lift of the disc
- All sizes rated for full vacuum service
- EPDM seals. FKM optional

Parts List/Thd-Soc (Sizes 1/2" - 2")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, PP
2	Bonnet	1	PVC, PP
3	Stem	1	PVC, PP
4	Gland	1	PVC, PP
5	Gland Nut	1	PVC, PP
6	Sheet Gasket	1	EPDM, Others
7	Gland Packing	2	EPDM, Others
8	Disc	1	PP
9	Stem Holder	1	PP
13	Ring	1	Stainless Steel 304
14	Hand Wheel	1	PP
15	Nut	1	PVC
16	Washer	1	PVC

Sample Specification

All Globe Valves shall be of a thermoplastic construction and have no metal part that comes in contact with media. Sizes 1/2" through 2" shall be of union bonnet design, 2-1/2" through 4" shall be of outside stem and yoke type. PVC shall conform to ASTM D1784 Cell Classification 12454-A and PP conforming to ASTM D4101 Cell Classification PP0210B67272. PVC valves shall be rated to 150 psi at 70 degrees F sizes 1/2" thru 2" 110 psi at 70 degrees F sizes 2-1/2" thru 4". PP rated to 110 psi at 70 degrees F sizes 1/2" thru 4", as manufactured by Asahi/America, Inc.

Parts List/Flanged (Sizes 1/2" - 4")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, PP
2	Bonnet	1	PVC, PP
3	Stem	1	PVC, PP
4	Gland	1	PVC, PP
5	Gland Nut	1	PVC, PP
6	Gland Gasket	1	EPDM, FKM
7	Gland Packing	1	EPDM, FKM
8	Disc	1	PP
9	Stem Holder	1	PVC, PP
10	Stem with Trapezoid Screw	1	Copper Alloy
11	Bolt, Nut, Washer	8	Stainless Steel 304
12	Stud Bolt, Nut	2	Stainless Steel 304
13	Stem Support	1	PP
14	Hand Wheel	1	PP
15	Nut (A)	1	PVC (1/2" - 2")
		2	Stainless Steel 304
16	Washer	1	PVC (1/2" - 2")
		1	Stainless Steel 304
17	Reinforcing Ring	1	Stainless Steel 304
18	Inserted Nut	1	Copper Alloy
19	Stem Metal Insert	1	Steel
20	Inserted Metal	1	Bronze

* PVC nut and washer on sizes 1/2" through 2"

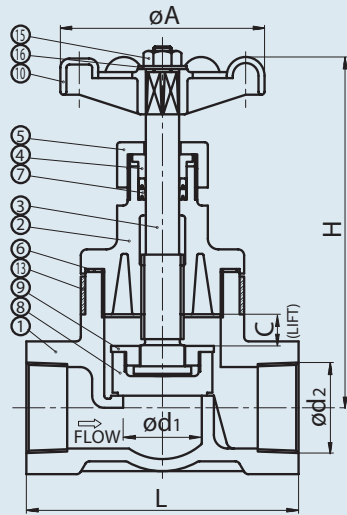
Pressure vs. Temperature (PSI, WATER, NON-SHOCK)

NOMINAL SIZE		PVC			PP		
		30° F 70° F	71° F 105° F	106° F 120° F	-5° F 70° F	71° F 120° F	121° F 175° F
1/2 - 1 1/2	15-40	150	150	110	110	95	65
2	50	150	150	95	110	75	45
2 1/2 - 3	65-80	110	110	95	110	60	35
4	100	110	80	65	110	60	35

Globe Valves

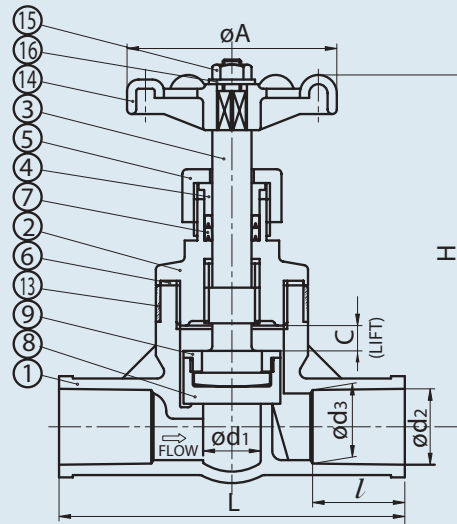
SOCKET AND THREADED END

1 1/2" — 2"



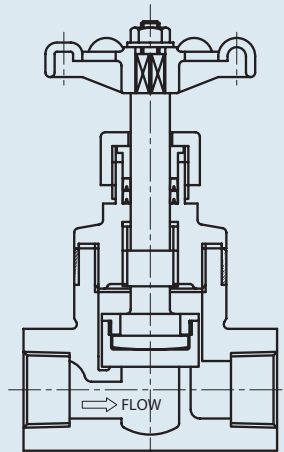
SOCKET END

1/2" — 1 1/4"

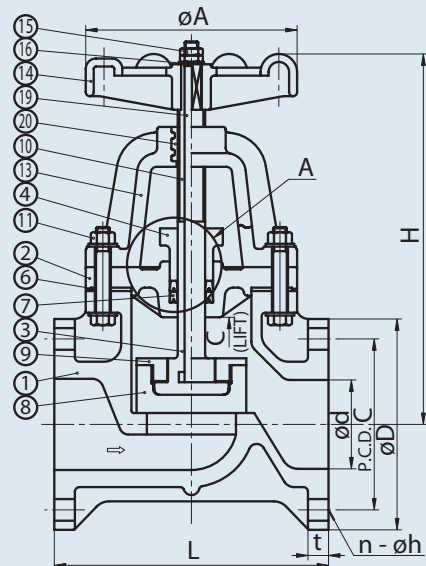


THREADED END

1/2" — 1 1/4"

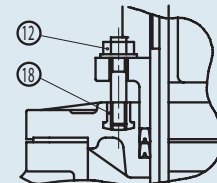
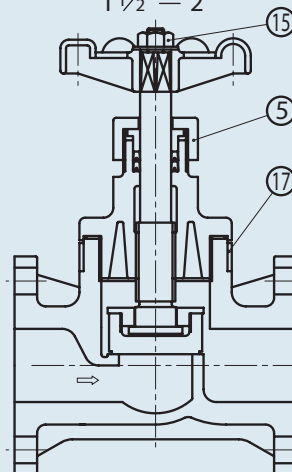


FLANGED 2 1/2" — 4"



FLANGED

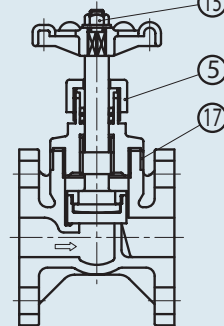
1 1/2" — 2"



DETAIL OF "A"

FLANGED

1/2" — 1 1/4"



Dimensions (INCHES)

NOMINAL SIZE		FLANGED										SOCKET AND THREADED										Cv VALU- ES
		WT. (LBS)	d	C	D	L	t	LIFT C	H (open)	n	h	WT. (LBS)	THREADED		SOCKET			LIFT C	d1	H (open)	A	
IN.	mm												d2	L	d2	L	l					
1/2	15	0.88	0.71	2.38	3.50	3.35	0.47	0.31	5.20	4	0.62	0.66	NPT 1/2	3.35	0.85	4.33	1.18	0.32	0.59	5.20	2.60	4.1
3/4	20	1.10	0.94	2.75	3.88	3.74	0.55	0.31	5.51	4	0.62	1.10	NPT 3/4	3.74	1.06	5.12	1.38	0.32	0.71	5.51	2.60	6.4
1	25	2.20	1.10	3.12	4.25	4.33	0.55	0.43	6.34	4	0.62	1.10	NPT 1	4.33	1.33	5.91	1.58	0.43	0.98	6.34	3.58	9.7
1 1/4	32	2.90	1.46	3.50	4.62	5.31	0.63	0.51	6.57	4	0.62	1.30	NPT 1 1/4	5.32	1.67	5.32	0.98	0.51	1.38	6.58	3.58	18.0
1 1/2	40	4.41	1.61	3.88	5.00	7.48	0.63	0.79	9.06	4	0.62	2.70	NPT 1 1/2	5.51	1.91	5.51	0.98	0.79	1.61	9.06	5.31	22.0
2	50	5.30	2.05	4.75	6.00	7.87	0.63	0.94	9.92	4	0.75	3.50	NPT 2	7.09	2.38	7.09	1.06	0.95	2.05	9.92	5.31	29.0
2 1/2	65	13.25	2.64	5.50	7.00	8.66	0.71	1.38	13.58	4	0.75	—	—	—	—	—	—	—	—	—	7.28	57.0
3	80	15.00	3.07	6.00	7.50	9.45	0.71	1.38	14.13	4	0.75	—	—	—	—	—	—	—	—	—	7.28	78.0
4	100	22.00	3.94	7.50	9.00	11.42	0.71	1.57	16.50	8	0.75	—	—	—	—	—	—	—	—	—	7.28	115.0

Serial No.	H – V015 E – 1
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Stop valve
"Globe Valves"

User's Manual

Contents

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(11) Inquires	9



ASAHI AV VALVES

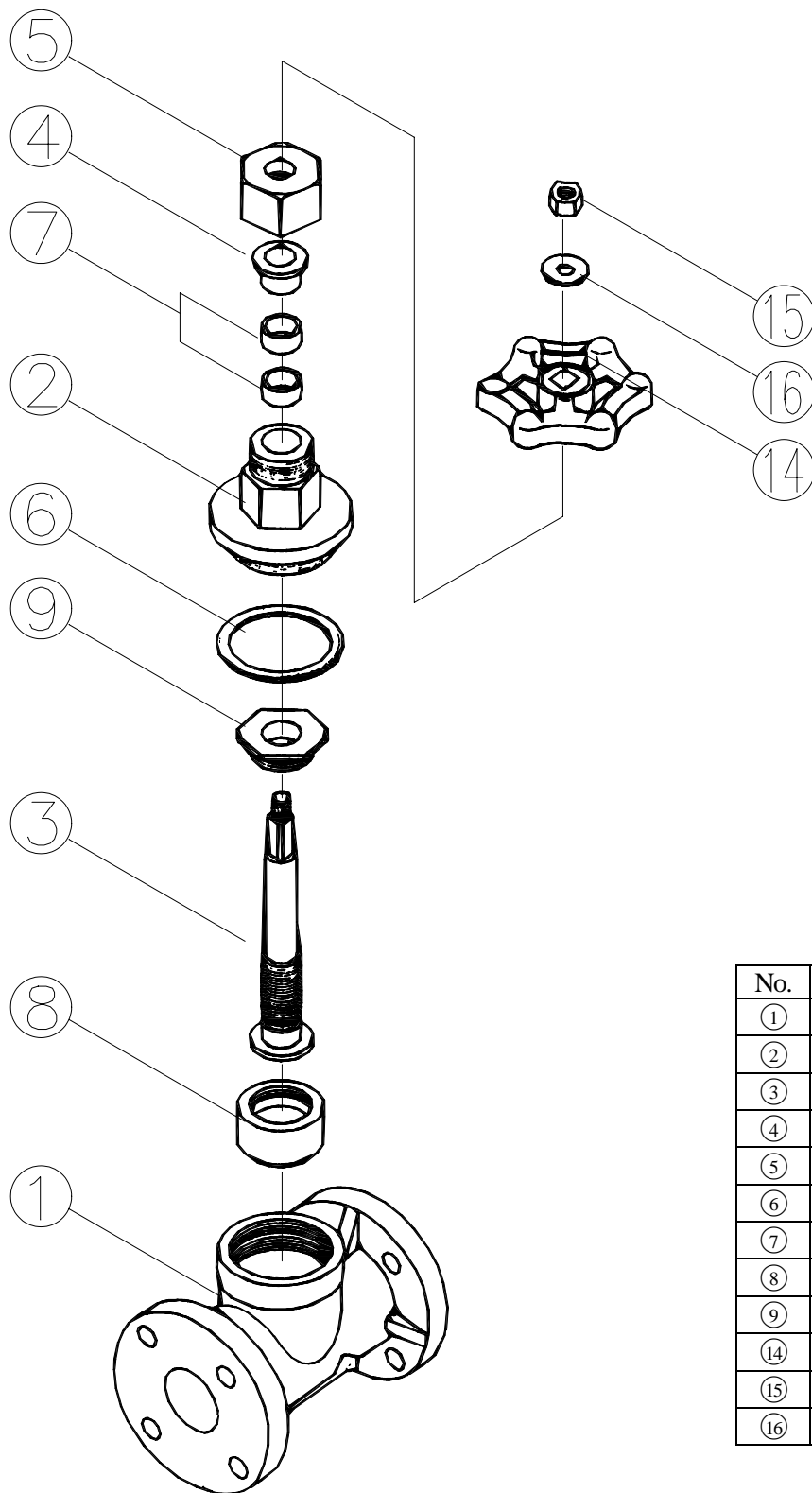
(1) General operating instruction

- Operate the valve within the pressure Vs temperature range.
(The valve can be damaged by operating beyond the allowable range.)
- Select a valve material that is compatible with the media, refer to “CHEMICAL RESISTANCE ON ASAHI AV VALVE”.
(Some chemicals may damage incompatible valve materials.)
- Do not use the valve to fluid containing slurry. (The valve will not operate properly.)
- Do not use the valve on condition that fluid has crystallized.
(The valve will not operate properly.)
- Do not step on the valve or apply excessive weight on valve. (It can be damaged.)
- Do not exert excessive force in closing the valve.
- Make sure to consult a waste treatment dealer to dispose of the valves.
(Poisonous gas is generated when the valve is burned improperly.)
- Allow sufficient space for maintenance and inspection.
- Keep the valve away from excessive heat or fire. (It can be deformed, or destroyed.)
- The valve is not designed to bear any kind of external load. Never stand on or place anything heavy on the valve at anytime.

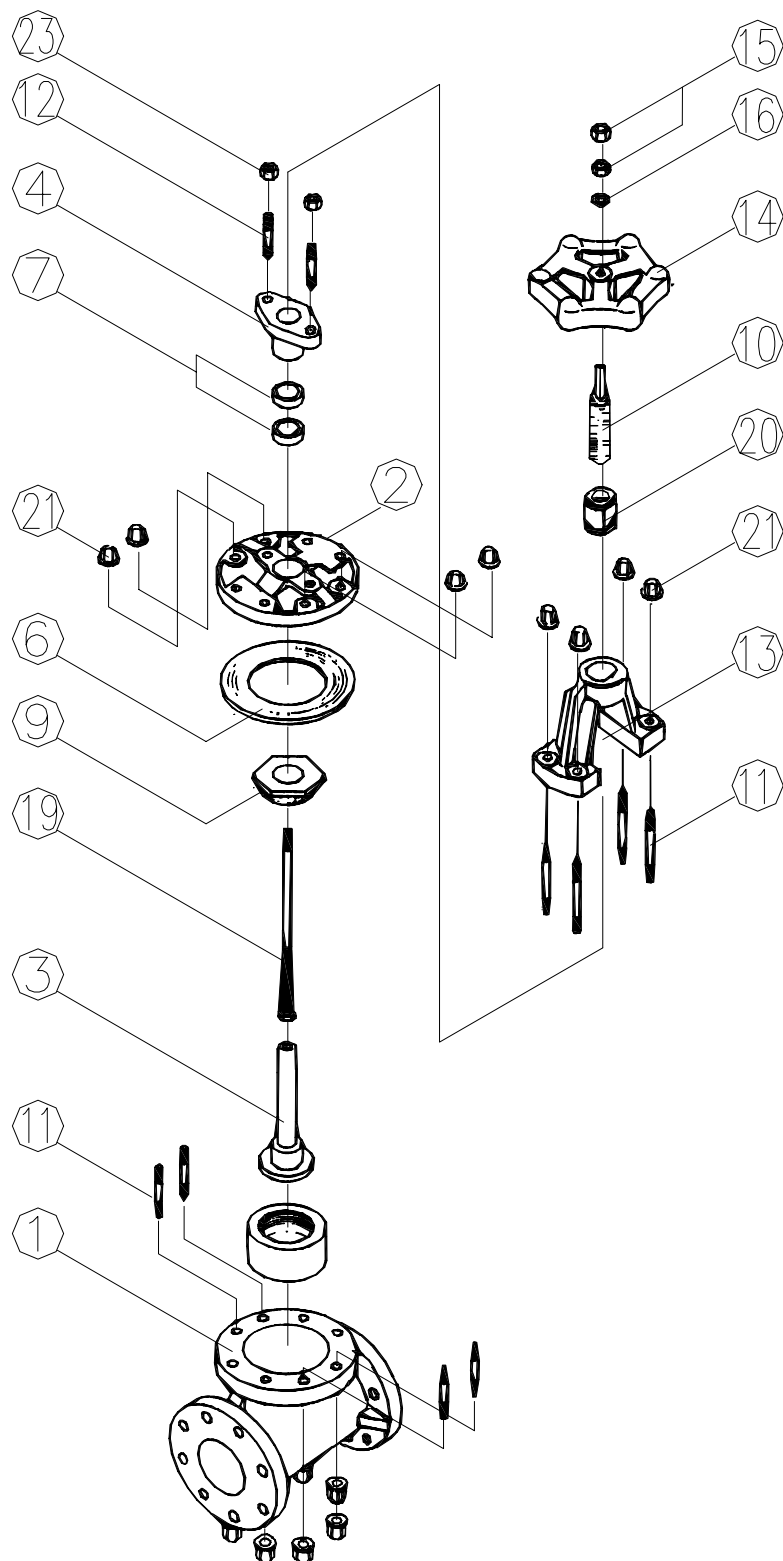
(2) General instructions for transportation, unpacking and storage

- Keep the valve packed in the carton or box as delivered until installation.
- Keep the valve away from any coal tar, creosote (antiseptic for wood), termite insecticide, vermicides, and paint. (This could cause swelling damage the valve.)
- Do not impact or drop the valve. (It can be damaged.)
- Avoid scratching the valve with any sharp object.

(3) Name of parts

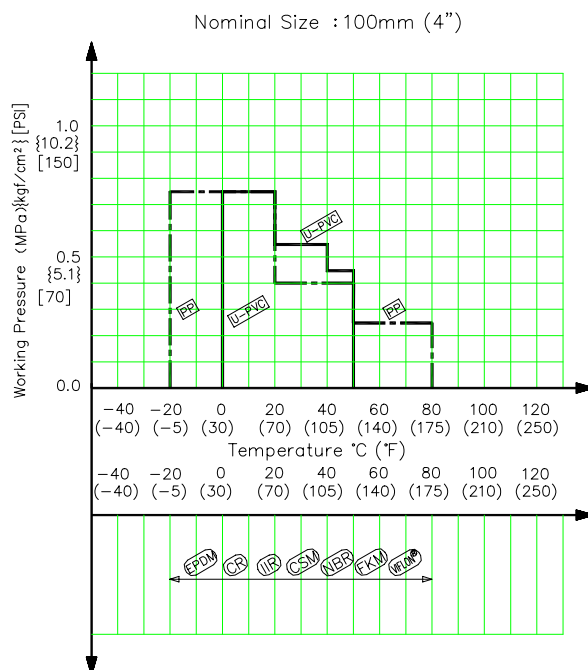
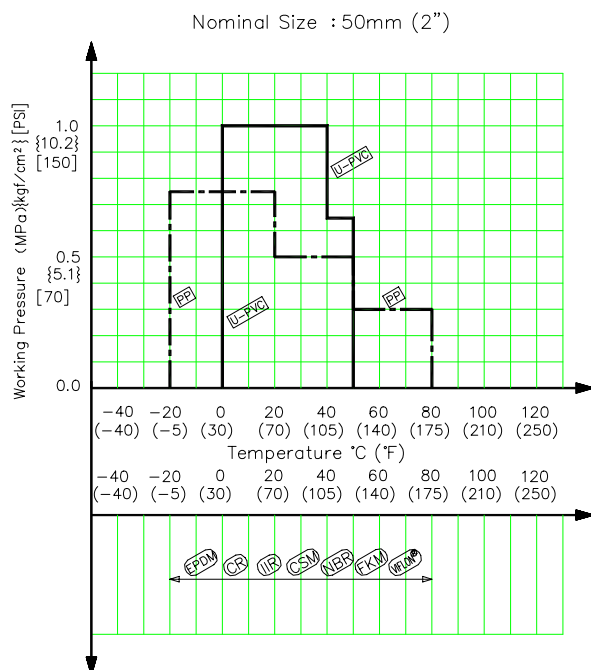
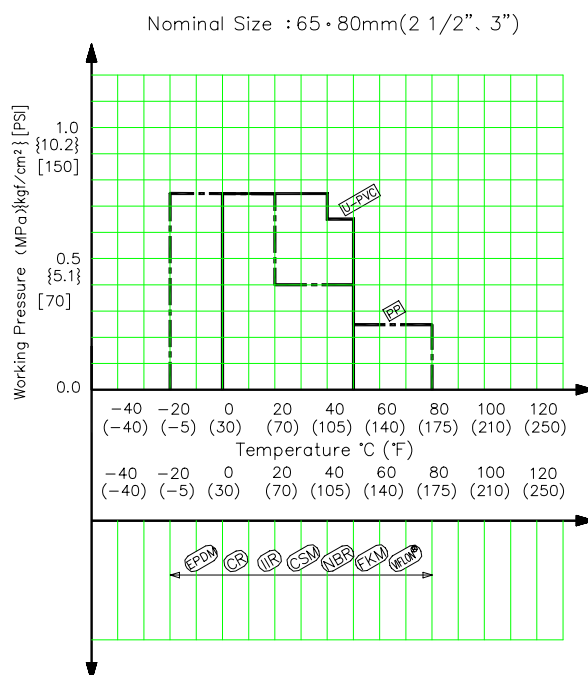
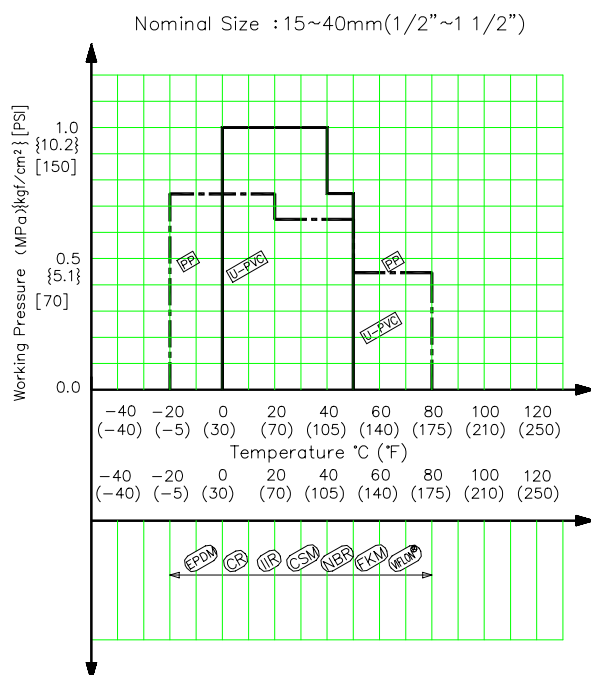


No.	Parts of name
①	Body
②	Bonnet
③	Stem
④	Grand
⑤	Grand nut
⑥	Sheet gasket
⑦	Grand packing
⑧	Disc
⑨	Stem holder
⑭	Hand wheel
⑮	Nut(A)
⑯	Washer



No.	Parts of name
①	Body
②	Bonnet
③	Stem
④	Grand
⑥	Sheet gasket
⑦	Grand packing
⑧	Disc
⑨	Stem holder
⑩	Stem with trapezoid screw
⑪	Bolt • nut
⑫	Stud bolt • nut
⑬	Support of stem
⑭	Hand wheel
⑮	Nut(A)
⑯	Washer
⑳	Inserted metal
㉓	Lock nut

(4) Comparison between operating temperature and pressure



Caution

Do not operate valve beyond the range of working temperature and pressure.
(The valve can be damaged.)

(5) Installation procedure

Flanged type

Necessary items

- Torque wrench
- Spanner wrench
- AV gasket
- Bolt, Nut, Washer (For many flanges specification)

(When a non-AV gasket is used, a different tightening torque instruction should be followed.)

Procedure

- 1) Set the AV gasket between the flanges.
- 2) Insert washers and bolts from the pipe side, insert washers and nuts from the valve side, then temporarily tighten them by hand.



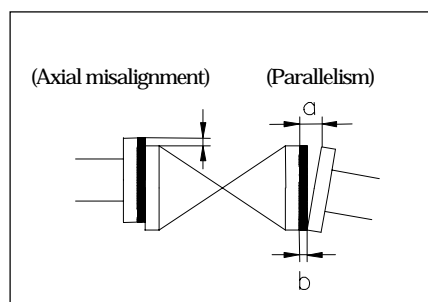
Caution

The parallelism and axial misalignment of the flange surface should be under the values shown in the following table to prevent damage the valve.

(A failure to observe them can cause destruction due to stress application to the pipe)

Unit : mm (inch)

Nom. Size	Axial misalignment	Parallelism (a-b)
15-32mm (1/2"-1 1/4")	1.0 (0.04)	0.5 (0.02)
40, 80mm (1 1/2", 3")	1.0 (0.04)	0.8 (0.04)
100mm (4")	1.0 (0.04)	1.0 (0.04)



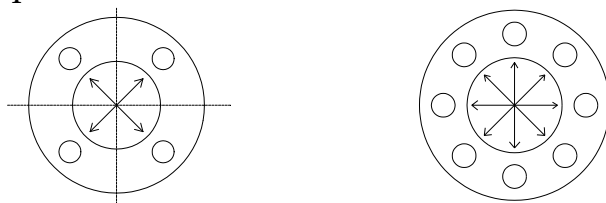
- 3) Using a torque wrench, tighten the bolts and nuts gradually to the specified torque in a diagonal manner.
(Refer to fig.1.)

Recommended torque value

Unit: N-m {kgf-cm} [lb-inch]

Nom. Size	15-20mm (1/2"-3/4")	25-40mm (1"-1 1/2")	50, 65mm (2", 2 1/2")	80, 100mm (3", 4")
Torque value	17.5{179}[155]	20.0{204}[177]	22.5{230}[200]	30.0{306}[266]

Fig. 1



Caution

Avoid excessive tightening. (The valve can be damaged.)

Threaded type

Necessary items

- Sealing tape (A non-sealing tape can cause leakage.)
- Strap wrench (Do not use Pipe wrench.)
- Spanner wrench



Caution

Make sure that the threaded connections are plastic x plastic.
(Metallic thread might damage the body cap.)

Procedure

- 1) Wind a sealing tape around the external thread of joint, leaving the end (about 3mm) free.
- 2) Tighten the external thread of the joint and the body ① lightly by hand.
- 3) Using a strap wrench, screw it in by turning 90° -180° carefully without damaging it.



Caution

Avoid excessive tightening. (The valve can be damaged.)

Socket type (Material : PVC, C-PVC)

Necessary items

- Adhesive for hard vinyl chloride pipes
- Strap wrench



Caution

Do not install a socket type valve where the atmospheric temperature is 5°C or lower.
(The valve can be damaged.)

Procedure

- 1) Clean the body ① by wiping with the waste cloth.
- 2) Apply adhesive evenly to the body ① and the pipe spigot.



Caution

Do not apply more adhesives than necessary.
(The valve can be damaged due to solvent cracking.)

Adhesive quantity (guideline)

Nom. Size	15mm (1/2")	20mm (3/4")	25mm (1")	32mm (1 1/4")	40mm (1 1/2")	50mm (2")	65mm (2 1/2")	80mm (3")	100mm (4")
Quantity (g)	1.0	1.3	2.0	2.4	3.5	4.8	6.9	9.0	13.0

- 3) After applying adhesive, insert the pipe quickly to the body ① and leave it alone for at least 60 seconds.
- 4) Wipe away overflowing adhesive.



Caution

Avoid excessive tightening. (The valve can be damaged.)

(6) Operating Procedure

- Open and close the valve by rotating the hand wheel.
- The top of the travel stop will be flush with the top of the hand wheel when the valve is fully closed.



Caution

The valve is designed only for manual operation.
(The use of assist device may damage the valve.)

(7) Disassembly and assembly procedure for parts replacement

Necessary items

- Torque wrench
- Protective gloves
- Spanner wrench
- Goggles



Caution

Wear protective gloves and goggles because some fluid is left in the body.
(You can be injured by working without them.)

<Disassembly>

- 1) Drain fluid completely from the pipeline.
- 2) Turn handle of valve clockwise until it stops. (Do not force it.)

<Nominal size : 15-50mm(1/2"-2")>

- 3) Loosen the bonnet ② and release the body ①.
- 4) Release the nut (A) ⑮ and remove the handle wheel ⑭.
- 5) Loosen the gland nut ⑤ and remove the grand packing ⑦.
- 6) Loosen the stem ③ and remove from the bonnet ②.

<Nominal size : 65-100mm(2 1/2"-4")>

- 3) Loosen the bolt·nut ⑪ and remove the bonnet ② from the body ①.
- 4) Remove the nut (A) ⑮, then put up the hand wheel ⑭.
- 5) Remove the stem with the trapezoid screw ⑩ from the support of stem ⑬.
- 6) Loosen the stud bolt·nut ⑫, then remove the grand packing ⑦.
- 7) Loosen the stem ③ and remove from the bonnet ②.

<Assembly>

- 1) The produce of assembly is the almost reverse of its disassembly.
- 2) After assembly, make sure that the valve can be fully opened and closed smoothly.

(8) Inspection items

- Inspect the follow items ;

(1)	Existence of scratches, cracks, deformation, and discoloring.
(2)	Existence of leakage from the valve to the outside.
(3)	Existence of leakage when the valve is opened fully at right or left.

(9) Troubleshooting

Problem	Cause	Treatment
Fluid is leaking past the fully closed position.	Solid particles have lodged in the valve.	Clear the solid particles from the valve.
	The seat and disc are scratched.	Replace the seat and disk with new one.
The handle spins freely.	The stem is broken.	Disassemble bonnet and replace the stem.
	The stem holder is broken.	Disassemble bonnet and replace the stem.
Valve leaks between body and bonnet.	Bonnet bolts have loosened.	Re-tighten bolts & nuts.
	Media has crystallized	Disassemble and clean on a regular basis.

(10) Handling of residual and waste materials**Caution**

In discarding remaining or waste materials, be sure to ask a waste service company.
(Poisonous gas is generated.)

(11) Inquiries**ASAHI ORGANIC CHEMICALS INDUSTRY CO., LTD.**

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ASAHI /AMERICA Inc. :35 Green Street P.O.Box 653 , Malden, Massachusetts 02148 U.S.A.
Tel : (1) 781-321-5409 Fax : (1) 781-321-4421

Stop valve



ASAHI AV VALVES

7330 Series

Union ends simplify installation and maintenance. With the Teflon float option these meters are excellent for applications where no metal is preferred. Socket weld end connections available

Description

Metering Tube

Molded Polysulfone

Internal Components

316L Stainless Steel, Teflon®
Polysulfone or Hastelloy® C-276

Inlet/Outlet Fittings

NPT, Vertical
Socket weld end connections available.

Fitting Material

Standard: PVC
Optional: PVDF

Elastomers

Standard: Viton
Optional: Buna N, EPR, and Kalrez®

Options

Alarm

Latching Reed Switch

Certified Calibrations

Conform to ISA RP 16.6

Scales

Can be produced in any volumetric unit



Polysulfone Tube

Performance

Capacities

.5 to 100 GPM – Water (Teflon® float)
1.5 to 150 GPM – Water (Metal float)

Scale

127 mm (5")
Direct reading, detachable

Accuracy

± 3% of Full Scale Flow
± 5% of Full Scale (120 & 150 GPM Metal floats)
± 6% of Full Scale (Teflon® floats)

Turndown

10:1 to 12.5:1 unless otherwise indicated

Repeatability

1/2%
1% (120 & 150 GPM Metal floats)
1% (Teflon floats)

Max Temperature

PVC Fittings – 130° F (54° C)
PVDF Fittings – 200° F (93° C)

Max Pressure

PVC Fittings – 150 psig (sizes 41W - 72W)
PVC Fittings – 125 psig (size 90W - 103W)
PVDF Fittings – 150 psig (sizes 41W - 72W)
PVC Fittings – 125 psig (size 90W - 103W)

Ambient Temperature

33° F to 125° F (1° C to 52° C)

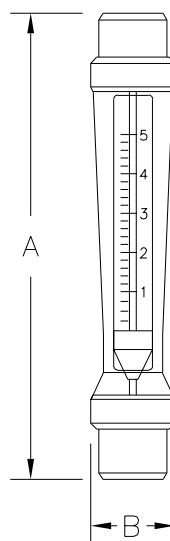
Alarm Options:

Latching Reed Switch

A latching reed switch is available for all 7300, 7600 and 7900 Series flowmeters. The switch is reed type and uses a biasing magnet to create a latching feature. The switch is classified as a simple apparatus by UL, FM, etc. and may be suitable for hazardous use when connected to an intrinsic safety barrier. Check your local electrical code for wiring specifications.

Switch Specifications

Switch Type: SPDT
Max Contact Voltage: 100 Vdc
Max Contact Current: 0.2 A
Max Contact Power: 4 W
Breakdown Voltage: 200 Vdc



Refer to specification table on page 11

7330 Series

Specifications:

Polysulfone Tube

Order Number	Flow Range Water	Float Material	Float Number	Alarm Option	Dimensions (Inches)		Connection Size
					A	B	
41W	.5 GPM	PVDF	4-TSL-01	no	10	1.375	1/2" FNPT
42W	1 GPM	Teflon®	4-TSL-02	yes	10	1.375	1/2" FNPT
43W	1.5 GPM	316L SS	4-SSL-01	yes	10	1.375	1/2" FNPT
44W	3 GPM	316L SS	4-SSL-02	yes	10	1.375	1/2" FNPT
45W	1.6 GPM	Hastelloy®	4-HSL-01	yes	10	1.375	1/2" FNPT
46W	3.2 GPM	Hastelloy®	4-HSL-02	yes	10	1.375	1/2" FNPT
51W	2.4 GPM	Teflon®	5-TSL-01	yes	10	1.750	3/4" FNPT
52W	5 GPM	Teflon®	5-TSL-02	yes	10	1.750	3/4" FNPT
53W	6 GPM	316L SS	5-SSL-01	no	10	1.750	3/4" FNPT
54W	10 GPM	316L SS	5-SSL-02	yes	10	1.750	3/4" FNPT
55W	6.3 GPM	Hastelloy®	5-HSL-01	yes	10	1.750	3/4" FNPT
56W	10.6 GPM	Hastelloy®	5-HSL-02	yes	10	1.750	3/4" FNPT
61W	7.6 GPM	Teflon®	6-TSL-01	yes	12	2.250	1" FNPT
62W	10 GPM	Teflon®	6-TSL-02	yes	12	2.250	1" FNPT
63W	15 GPM	Teflon®	6-TSL-03	yes	12	2.250	1" FNPT
64W	20 GPM	Teflon®	6-TSL-04	yes	12	2.250	1" FNPT
65W	12 GPM	316L SS	6-GVL-01	yes	12	2.250	1" FNPT
66W	18 GPM	316L SS	6-SSL-02	yes	12	2.250	1" FNPT
67W	25 GPM	316L SS	6-SSL-03	yes	12	2.250	1" FNPT
68W	35 GPM	316L SS	6-SSL-04	yes	12	2.250	1" FNPT
69W	13 GPM	Hastelloy®	6-HSL-01	yes	12	2.250	1" FNPT
70W	19 GPM	Hastelloy®	6-HSL-02	yes	12	2.250	1" FNPT
71W	26.5 GPM	Hastelloy®	6-HSL-03	yes	12	2.250	1" FNPT
72W	37 GPM	Hastelloy®	6-HSL-04	yes	12	2.250	1" FNPT
90W	40 GPM	Teflon®	9-TSL-00	yes	16	3.785	2" FNPT
91W	60 GPM	Teflon®	9-TSL-01	yes	16	3.785	2" FNPT
92W	80 GPM	Teflon®	9-TSL-02	yes	16	3.785	2" FNPT
94W	100 GPM	Teflon®	9-TSL-04	yes	16	3.785	2" FNPT
99W	60 GPM	316L SS	9-SSL-00	yes	16	3.785	2" FNPT
95W	80 GPM	316L SS	9-SSL-01	yes	16	3.785	2" FNPT
96W	100 GPM	316L SS	9-SSL-02	yes	16	3.785	2" FNPT
97W	120 GPM	316L SS	9-SSL-03	yes	16	3.785	2" FNPT
98W	150 GPM	316L SS	9-SSL-04	yes	16	3.785	2" FNPT
100W	84 GPM	Hastelloy®	9-HSL-01	yes	16	3.785	2" FNPT
101W	106 GPM	Hastelloy®	9-HSL-02	yes	16	3.785	2" FNPT
102W	126 GPM	Hastelloy®	9-HSL-03	yes	16	3.785	2" FNPT
103W	160 GPM	Hastelloy®	9-HSL-04	yes	16	3.785	2" FNPT

Caution: Polysulfone should not be used in direct sunlight or any other significant sources of Ultra-Violet light.

Ordering:

Use the following guide to determine the specific product number you require.

7	3	3	1	3	6	3	A	6	7	W
Meter Series	Fitting Material		Float Material		O-Ring Material		Optional Alarm	Order Number		
	PVC - 3		316L SS - 2		EPR - 1		Without Alarm - 0	See Specifications Table		
	PVDF - 7		Hastelloy® C-276 - 4		Buna-N - 2		One Alarm - A			
			Teflon - 6		Viton® - 3					
			PVDF - 7		Kalrez® - 4					

Example: 7331 - 3 - 2 - 1 - 0 - 54W

7200 Series

A real value in general purpose rotameters. Vertical connections are from 3/8" NPT to 2" NPT

Description

Metering Tube

Machined Cast Acrylic

Internal Components

316L Stainless Steel

Inlet/Outlet Fittings

NPT, Vertical

Fitting Material

Standard: **PVC** (not for air service)
Optional: 316 Stainless Steel, Brass, Aluminum

Elastomers

Standard: EPR
Optional: Buna-N, **Viton®**

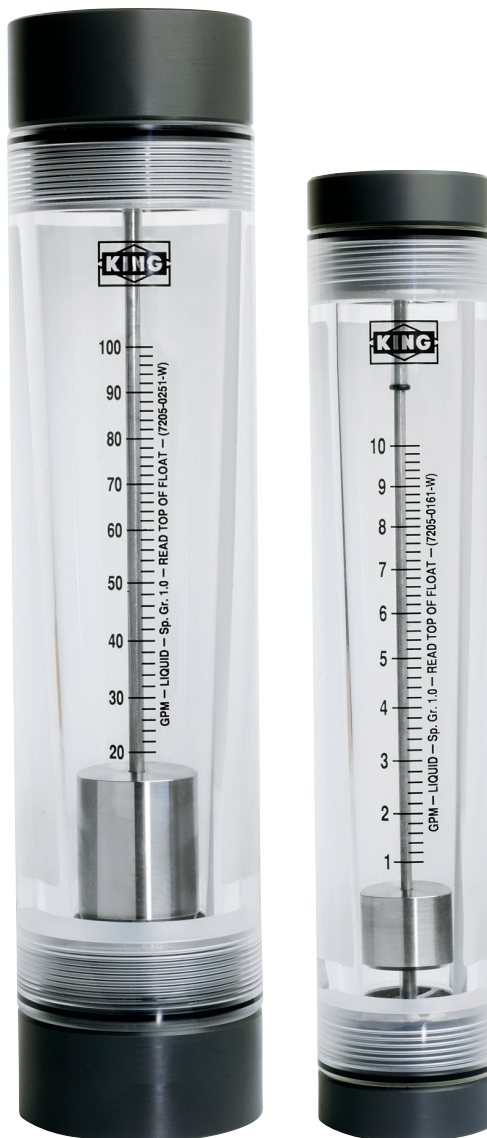
Options

Certified Calibrations

Conform to ISA RP 16.6

Scales

Can be produced in any volumetric unit



AcrylicTube

Performance

Capacities

1 to 200 GPM — Water
4 to 245 SCFM — Air

Scale

127 mm (5")
Direct reading

Accuracy

± 3% to ± 6% of Full Scale Flow
See specifications table

Turndown

10:1 to 12.5:1, unless otherwise indicated

Repeatability

1% to 2%
See specifications table

Max Temperature

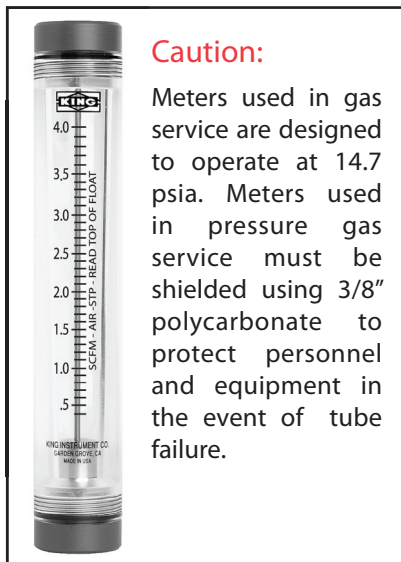
Water — 130° F (54° C)
Air — 100° F (38° C)

Max Pressure

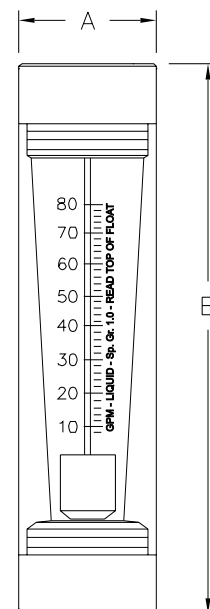
Water — 150 psig
Air — 100 psig

Ambient Temperature

33° F to 125° F (1° C to 52° C)



Refer to specification table on page 7



7200 Series Specifications:

Acrylic Tube

Order Number	Flow GPM - Water	Flow SCFM - Air	F.S. Accuracy±/ Repeatability	Press. Drop (In. / W.C.)	Connection Size	Dimensions A	Dimensions B
0051	1	4	3%/2%	2.9	3/8" FNPT	1.375"	8.25"
0052	1	4	3%/2%	2.9	1/2" FNPT	1.375"	8.25"
0061	2	8	3%/2%	5.2	3/8" FNPT	1.375"	8.25"
0062	2	8	3%/2%	5.2	1/2" FNPT	1.375"	8.25"
0071	3.5	14	3%/2%	9.5	3/8" FNPT	1.375"	8.25"
0072	3.5	14	3%/2%	9.5	1/2" FNPT	1.375"	8.25"
0081	5	20	3%/2%	13.1	3/8" FNPT	1.375"	8.25"
0082	5	20	3%/2%	13.1	1/2" FNPT	1.375"	8.25"
0151	5	20	3%/1%	10	1" FNPT	2.000"	10.25"
0161	10	43	3%/1%	12	1" FNPT	2.000"	10.25"
0171	15	62	3%/1%	18	1" FNPT	2.000"	10.25"
0181	21	86	3%/1%	22	1" FNPT	2.000"	10.25"
0191	30.5	—	3%/1%	26	1" FNPT	2.000"	10.25"
0201	40	—	6%/2%	32	1 1/2" MNPT	2.000"	12.06"
0211	50	—	6%/2%	38	1 1/2" MNPT	2.000"	12.06"
0221	40	165	4%/1%	18	2" FNPT	3.000"	13.25"
0231	60	245	4%/1%	25	2" FNPT	3.000"	13.25"
0241	80	—	4%/1%	30	2" FNPT	3.000"	13.25"
0251	100*	—	4%/1%	35	2" FNPT	3.000"	13.25"
0261	120*	—	6%/2%	45	2" FNPT	3.000"	13.25"
0271	160*	—	6%/2%	60	2" FNPT	3.000"	13.25"
0281	200*	—	6%/2%	80	2" FNPT	3.000"	13.25"

* These meters have less than 10:1 turndown.

Order Number	Flow Range	Actual Turndown
0251	20 - 100 GPM	5:1
0261	30 - 120 GPM	4:1
0271	45 - 160 GPM	3.55:1
0281	55 - 200 GPM	3.63:1

Max. Pressure		Max. Temp	
Water	Air	Water	Air
150 psig	100 psig	130°F	100°F

Ordering:

Use the following guide to determine the specific product number you require.

7	2	0	5	0	1	9	1	3	3	W
Meter Series				Order number from specifications table above				Fitting Material	O-Ring Material	Fluid To Be Metered
								Brass - 1	EPR - 1	GPM—Liquid - W
								316L SS - 2	Buna-N - 2	SCFM—Air - A
								PVC - 3	Viton® - 3	
								Aluminum - 6		

Example: 7205 - 0281 - 3 - 1 - W

All position line check valves

STAINLESS STEEL POPPET

No. 400

No. 400 Check Valves with metal poppets are ruggedly constructed and are suitable for a wide variety of applications including hot water, cold water, steam, oil, gas, compounds and chemicals.

The one-piece body is cast brass; the poppet is stainless steel for a metal-to-metal seal. Like the No.300, a sensitive spring allows this valve to be used in any position. Working pressure 200 lbs. WOG, 75 lbs. steam. Maximum temperature 300° F. Not for air compressor service.



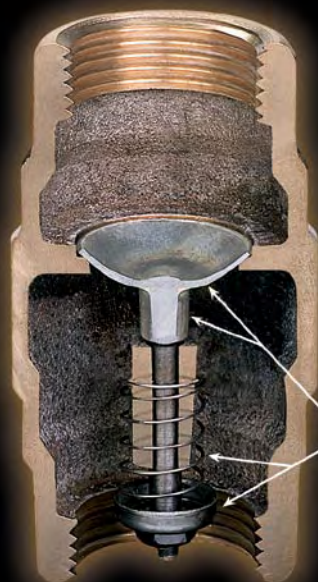
One-piece cast brass for a lifetime of service.

No. 400 Specifications

Pipe Size	400 Series Part No.	Over-all Length	Valve Weight
3/8"	400-038	2.63"	0.50 lb
1/2"	400-050	2.69"	0.65 lb
3/4"	400-075	3.31"	0.90 lb
1"	400-100	3.69"	1.25 lb
1 1/4"	400-125	4.57"	2.00 lb
1 1/2"	400-150	4.88"	2.35 lb
2"	400-200	5.56"	3.80 lb

NPT threaded

NO.400



Proprietary stainless steel poppet assures perfect seating and sensitive operation.

Our '300' series gauge line is a high quality line of liquid filled gauges. The glycerine filling helps dampen the effects of pulsation and vibration, while also perpetually lubricating the movement (and keeping contaminants such as dirt away from all moving parts) which will extend the life of the gauge.

This gauge has been specifically designed with original equipment manufacturers in mind. It is typically used in chemical processing or food processing applications as well as any commercial or industrial application where stainless steel components are required.

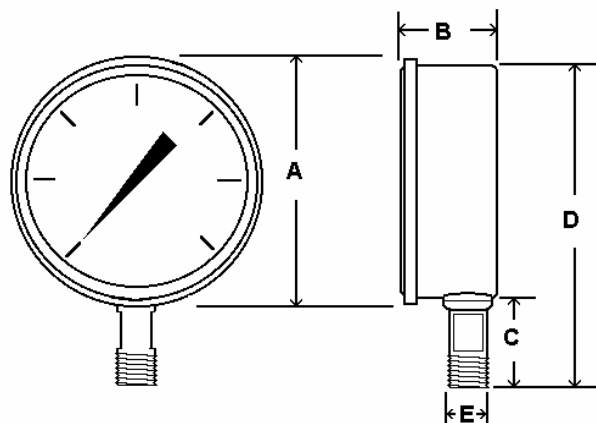
SPECIFICATIONS:

- Available Dial Sizes: 2 1/2", 4", 6"
- Available Connection Sizes:
 - 1/4" MNPT on 2", 2 1/2" and 4"
 - 1/2" MNPT on 4" and 6"
- Stainless Steel Case and Crimped Bezel
- SS Internals
- 316 SS Bourdon Tube & Connection
- Connection Welded to Case
- Liquid Filled (Dry Available) (GLYCERINE)
- Accuracy : 2 1/2" Dial Size = 1.5 %
4" and 6" Dial Size = 1 %
- Dual Scale: PSI & Bar (x100=kPa)
(Single Scale available)
- Ambient temperature: FILLED: 30°F to 160°F
DRY: -30°F to 180°F

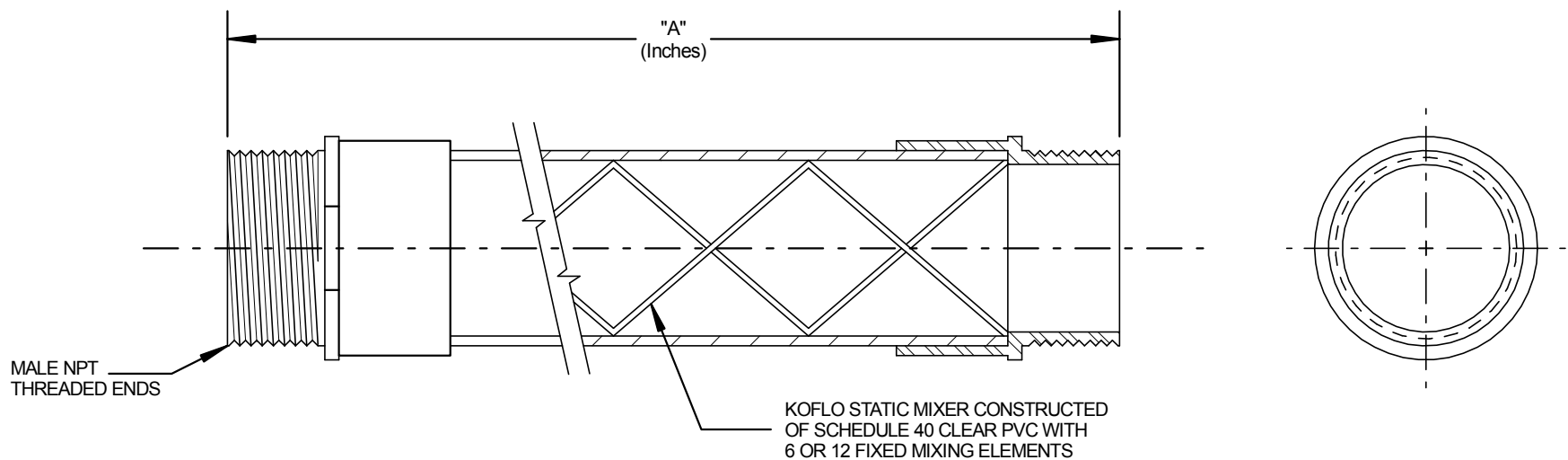


RANGE	CODE	Major In	Minor In
30/0"VAC	A	5	0.5
30/0/15	CB	5	0.5
30/0/30	CC	10	1
30/0/60	CD	10	1
30/0/100	CE	20	2
30/0/150	CF	20	2
30/0/300	CH	50	10
0/15	B	2	0.2
0/30	C	5	0.5
0/60	D	10	1
0/100	E	20	2
0/160	F	20	2
0/200	G	40	4
0/300	H	50	5
0/400	I	50	5
0/500	J	100	10
0/600	K	100	10
0/800	L	100	10
0/1000	M	200	20
0/1500	N	200	20
0/2000	O	400	50
0/3000	P	500	50
0/4000	Q	500	50
0/5000	R	1000	100
0/6000	S	2000	200
0/10,000	U	2000	200
0/15,000	V	2000	200


Some ranges not available in all dial sizes, please call with your particular application



		A	B	C	D	E
2 1/2" Dial	In	2.67	1.30	1.04	3.50	1/4" NPT
	MM	68	33	26	89	
4" Dial	In	4.32	1.63	1.25	5.57	1/4" or 1/2" npt
	MM	110	42	32	141	
6" Dial	In	6.54	1.70	1.68	8.22	1/4" or 1/2" npt
	MM	166	43	43	210	

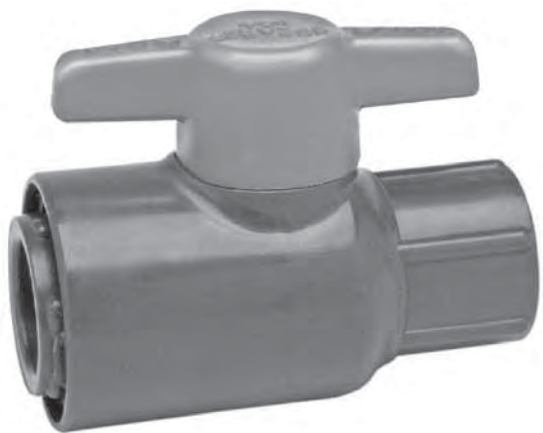


Size	6 Element Model Number	"A" 6 Element	12 Element Model Number	"A" 12 Element
3/8"	3/8-40C-4-6-2	6-1/2	3/8-40C-4-12-2	11
1/2"	1/2-40C-4-6-2	7	1/2-40C-4-12-2	12
3/4"	3/4-40C-4-6-2	9	3/4-40C-4-12-2	15
1"	1-40C-4-6-2	11	1-40C-4-12-2	18
1-1/4"	1.25-40C-4-6-2	14	1.25-40C-4-12-2	25
1-1/2"	1.5-40C-4-6-2	15	1.5-40C-4-12-2	28
2"	2-40C-4-6-2	19	2-40C-4-12-2	35

		Koflo Corporation 309 CARY POINT DR. CARY, IL 60013	
		SCALE: NONE	APPROVED BY <i>JLF</i>
DATE: 1/18/94		REVISED 10/15/01	
CUSTOMER:		REVISED 5/22/08	
		REVISED 6/12/09	
MODEL NO: CLEAR PVC SCHEDULE 40 MIXER		DRAWING NUMBER: KD-993	



LAB BALL VALVES



Sample Engineering Specification

All thermoplastic valves shall be sealed unit Lab type constructed from PVC Type I, ASTM D 1784 Cell Classification 12454 or CPVC Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or Viton®. All valves shall have double stop Polypropylene handle. All 1/4" valves shall have optional field installable male thread and tubing end connector adapters. All valves shall be certified by NSF International for use in potable water service. All valves shall be pressure rated at 150 psi for water at 73°F, as manufactured by Spears® Manufacturing Company.

Quick-View Valve Selection Chart

Valve Size	O-ring Material	PVC Part Number ¹			Pressure Rating
		Socket	Threaded	Threaded with Kit	
1/4	EPDM	1522-002	1521-002	1529-002	150 psi Non-Shock Water @ 73°F
	Viton®	1532-002	1531-002	1539-002	
3/8	EPDM	1522-003	1521-003	N/A	
	Viton®	1532-003	1531-003	N/A	

¹: For CPVC Valves, add the letter "C" to part number listed (e.g., 1521-002C)

Valve & Adapter Kit

Kit allows multiple connection options. Adapters use O-ring seals for easy connection to threaded valve. Complete Kit includes:

- 1 – 1/4" Threaded Valve
- 2 – 1/4" O-ring Sealed Mpt x Mpt Adapters
- 2 – 1/4" O-ring Sealed Mpt x Barb Adapters (for 3/8" I.D. tubing)
- 2 – EPDM or Viton® O-rings (AS568A-013 size)
- 1 – End Connector Wrench

Features – PVC, CPVC

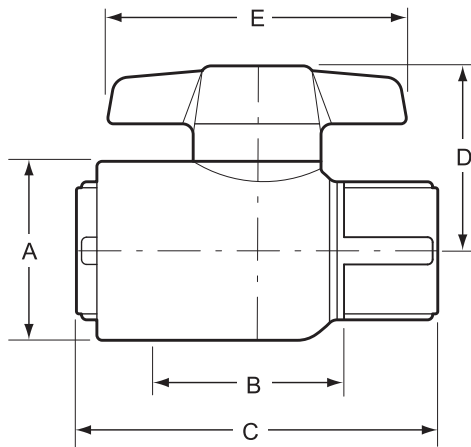
This versatile quarter-turn shutoff valve is ideally suited for a variety of laboratory, system monitoring and OEM applications. Available in IPS sizes 1/4" - 3/8" with socket or threaded end connectors, plus 1/4" threaded Valve & Adapter Kit to provide multiple connection options.

- Chemical & Corrosion Resistant PVC or CPVC Construction
- Maintenance-Free Sealed Unit
- Individual Valve or Multi-functional Valve & Adapter Kit
- Schedule 80 Full-Bore Design
- High Impact Polypropylene Handle
- EPDM or Viton® O-rings
- PTFE Floating Seat Design
- Sizes 1/4" - 3/8" Pressure Rated to 150 psi @ 73°F
- NSF Certified for Potable Water use
- Assembled with Silicone-Free, Water Soluble Lubricant

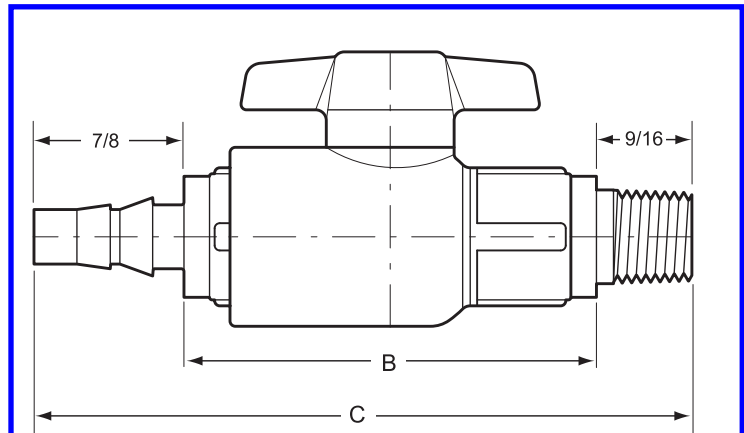


LAB VALVE WITH ADAPTER KIT

LAB BALL VALVES



Basic Valve



Valve with Adapter Kit

Dimensions, Weights & C_v Values

Nominal Size	Dimension Reference (inches, ± 1/16)					Approx. Wt. (Lbs.)		C _v ² Values
	A	B ¹	C	D	E	PVC	CPVC	
1/4	1-1/16	15/16	2-1/8	1-1/16	1-3/4	.10	.11	10
1/4 w/Kit	1-1/16	2-7/16	3-7/8	1-1/16	1-3/4	.14	.15	6
3/8	1-5/16	1	2-3/16	1-1/4	2	.12	.13	24

1: Valve Lay Length

2: Gallons per minute at 1 psi pressure drop. Values calculated from valve laying length, based on derivative of Hazen-Williams equation with roughness factor of C=150.

Temperature Pressure Rating

System Operating Temperature °F (°C)		73 (23)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)
Valve Pressure Rating psi (MPa)	PVC	150 (1.03)	124 (.85)	100 (.69)	75 (.52)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)
	CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.69)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	-0- (-0-)

NOT FOR USE WITH COMPRESSED AIR OR GASES

ProMix M Series PVC Mixing Chamber

SPECIFICATIONS:

- Material: PVC
- Volume: 3.2 Gallons
- Water Inlet Connection: ¾" NPT
- Polymer Inlet Connection: ¾" NPT
- Polymer Solution Outlet Connection: ¾" NPT
- Maximum Chamber Pressure: 150 PSIG
- Normal Operating Pressure: 100 PSIG
- Recommended Running Temp: +50°F - 100°F
- Weight: 75 lbs.
- Motor Horsepower: 3/4
- Motor Frame: 56C, TEFC
- Voltage: 120VAC, 60Hz, 1 Phase
- Direct Coupled Motor & Sealed Bearing

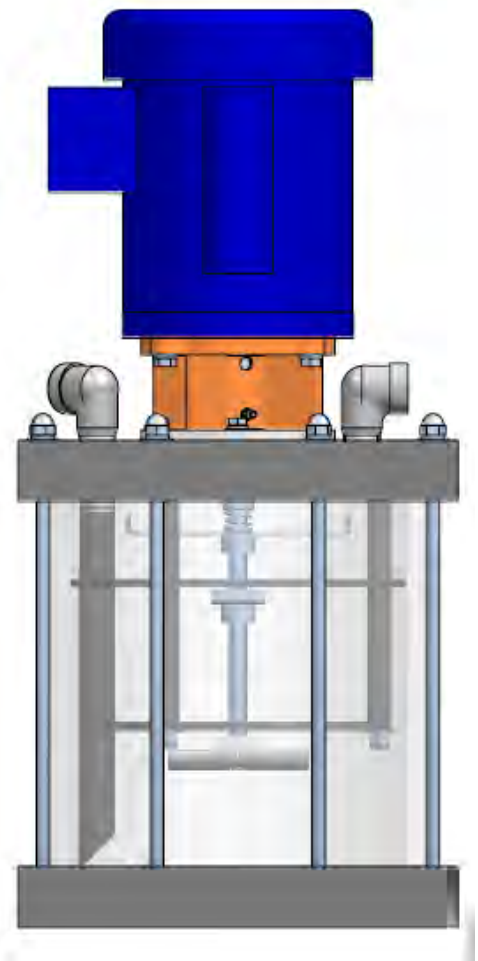
DESCRIPTION:

- Three Distinct Mixing Zones
- Three Different Mixing Blades for delivery of proper energy.

1st Zone = The first mixing blade delivers high shear at the precise point of polymer injection, creating immediate dispersion before agglomeration takes place.

2nd Zone = The second mixing blade induces a vortex and draws solution down through the center of the chamber from Zone 1 and forces the solution outward to the sides and then down into Zone 3.

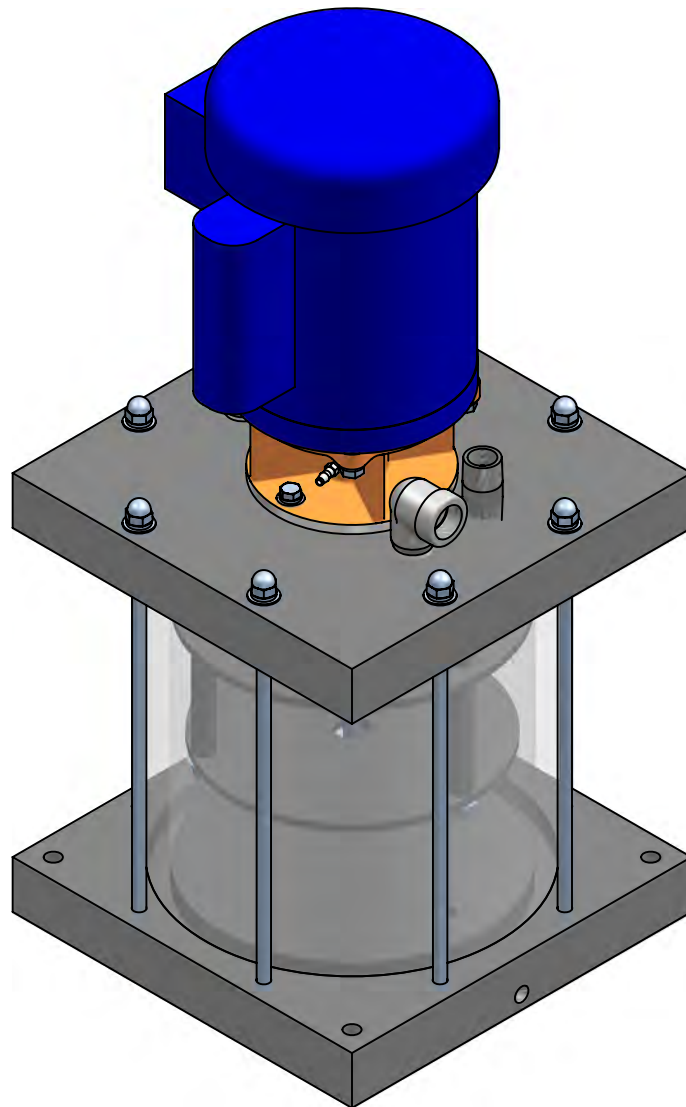
3rd Zone = The third mixing blade gently agitates/blends the active polymer solution before it exits the chamber through the bottom of the discharge tube.



PROMIX "M" SERIES

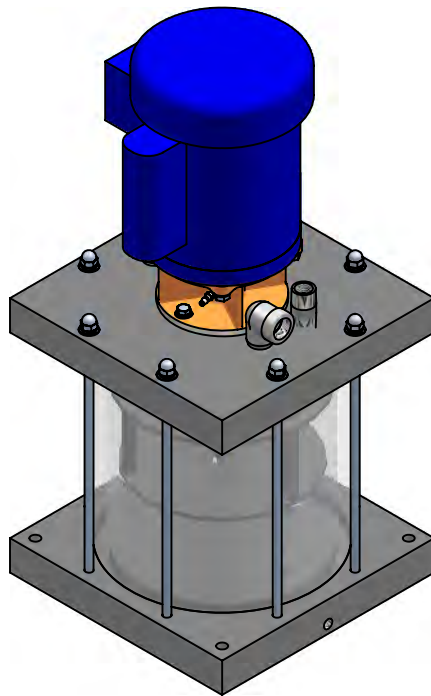
MECHANICAL SEAL REPLACEMENT

03/08/10 REV 0 GJS



The following is the recommended list of tools required to replace the mechanical seal:

1. 9/16" socket wrench with 3/8" drive
2. 5/8" socket wrench with 3/8" drive
3. 9/16" box wrench
4. 5/8" torque wrench capable of 15ft-lbs
5. 1/8" pin punch
6. 1/8" hex allen wrench
7. 8" channel locks
8. Small flat head screw driver
9. Ball peen hammer



In order to replace the mechanical seal, you first have to remove the upper mounting plate assembly from the mixing chamber.

1. Flush and drain the mixing chamber.
2. Remove the power from the mixing motor.
3. Using a 5/8" socket wrench, remove the (8) mounting studs, nuts and washers.
If all the studs do not come out as shown, use the 8" channel locks to remove the studs from the bottom plate.

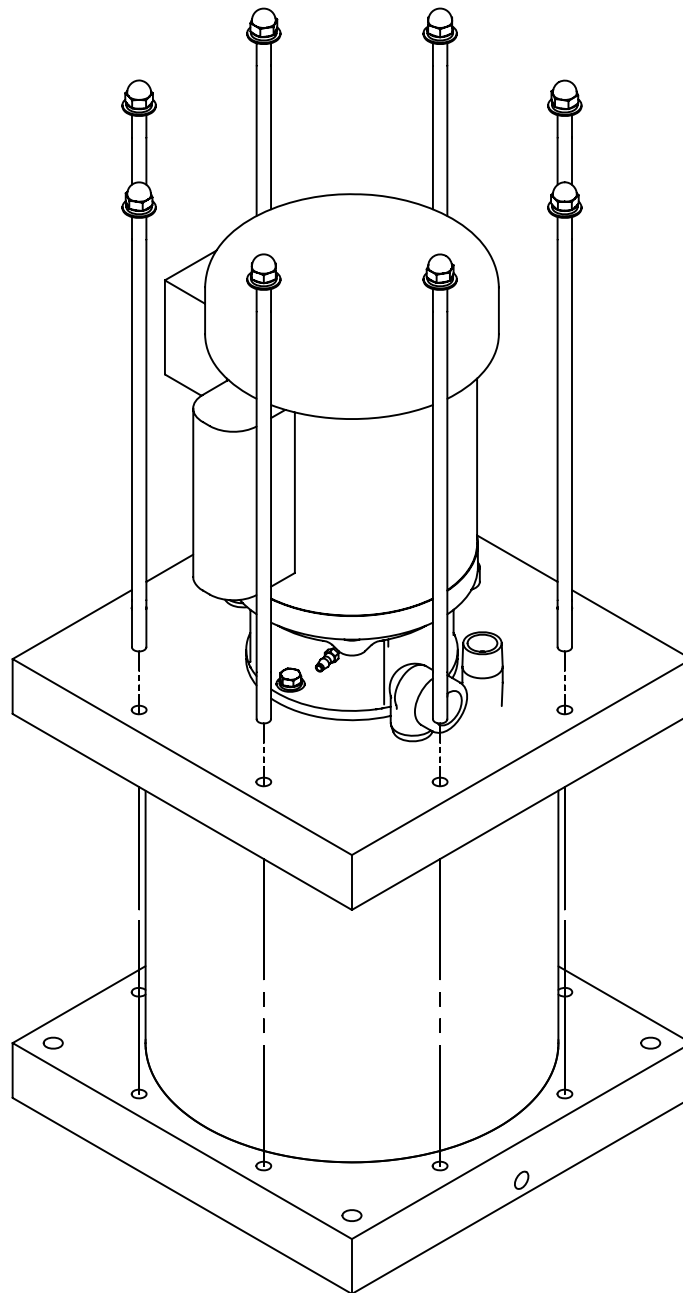


FIGURE 1

4. NOTE: Make note of the motor position on the top mounting plate. This will be helpful when reassembling the unit. Using equal force, lift the entire top mounting plate assembly with the motor out of the mixing chamber and turn on its side.

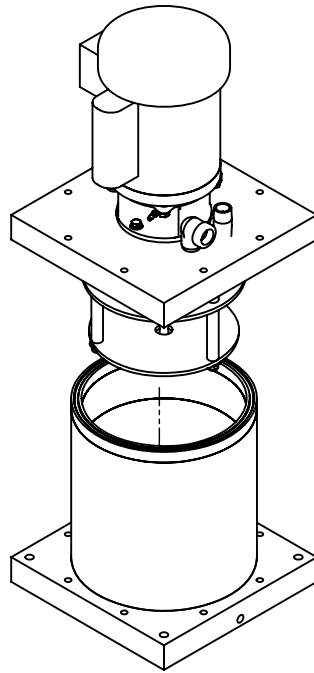


FIGURE 2

5. NOTE: Support the agitator prop so that there is no force on the mixer shaft. Failure to do so can cause the shaft to be damaged. Using an 1/8" pin punch and hammer, carefully remove the split pin from the agitator prop.

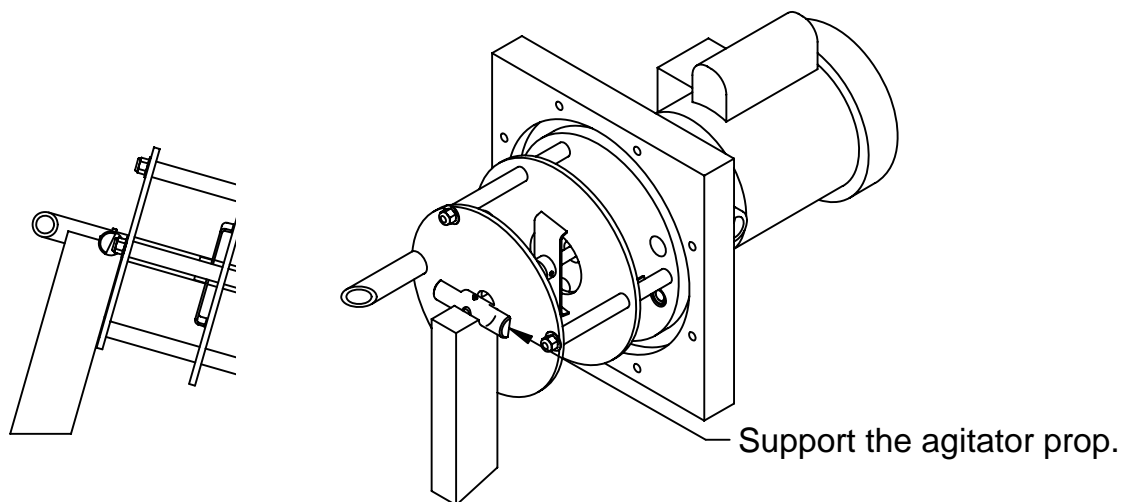


FIGURE 3

6. Turn the entire assembly on the fan shroud.
7. Using a 9/16" socket wrench, remove the (3) baffle retaining nuts and washers.

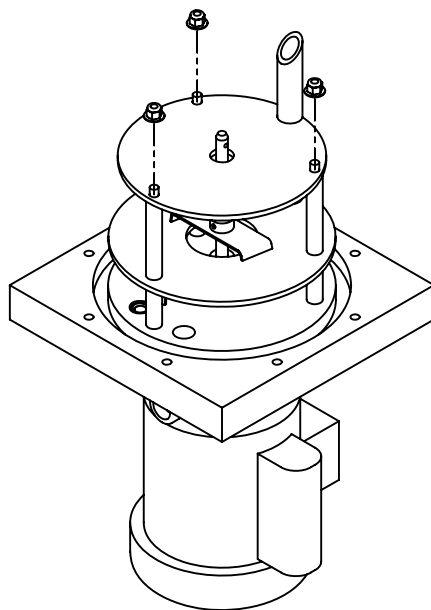


FIGURE 4

8. Remove the bottom baffle.

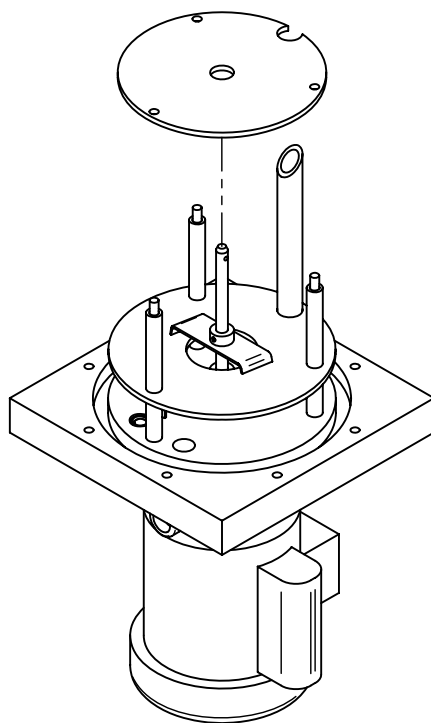


FIGURE 5

9. Remove the bottom baffle spacers.

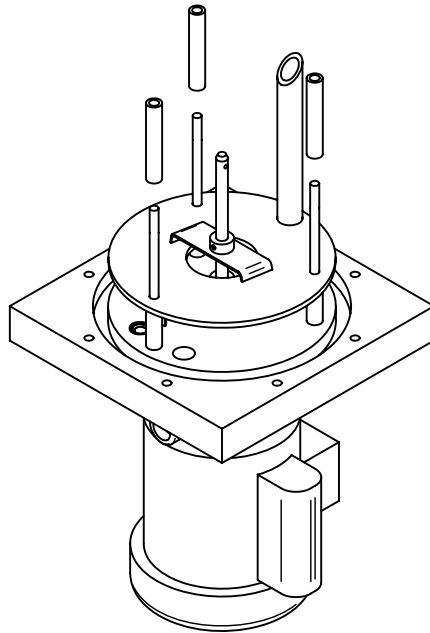


FIGURE 6

10. Using an 1/8" allen wrench, loosen the (2) blade retention set screws and carefully remove the secondary blade. Making sure not to damage the surface of the shaft.

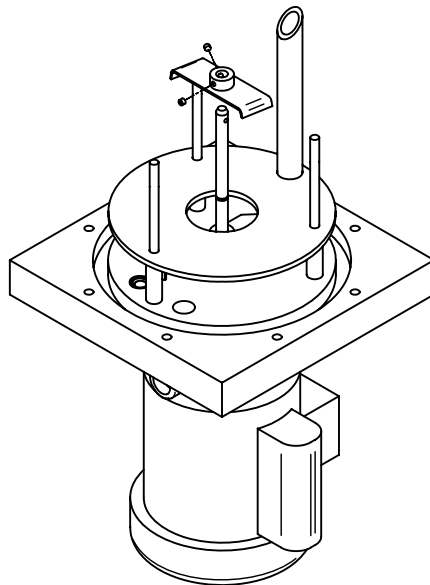


FIGURE 7

11. Remove the upper baffle.

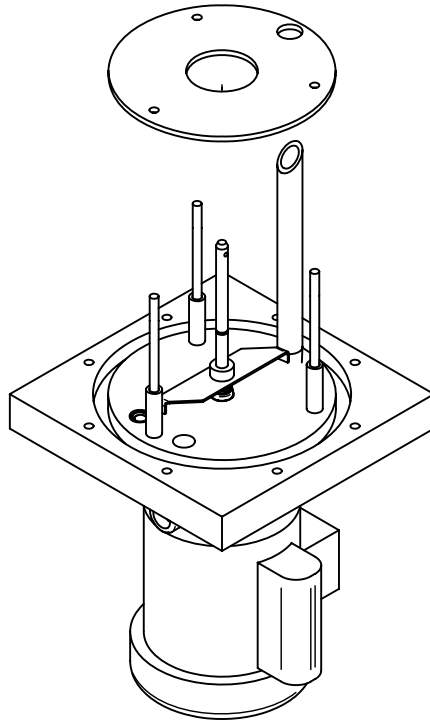


FIGURE 8

12. Remove upper baffle spacers.

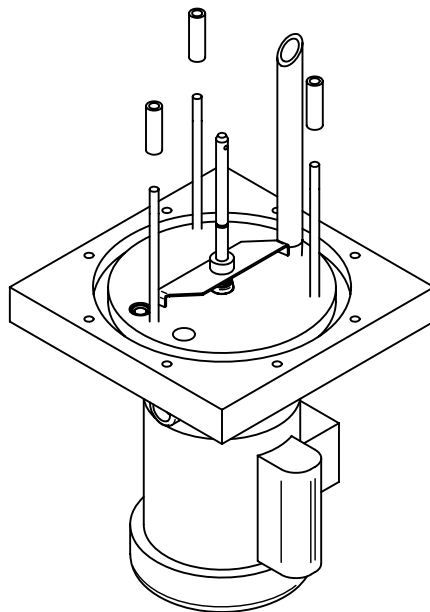


FIGURE 9

13. Using an 1/8" allen wrench, loosen the (2) blade retention set screws and carefully remove the primary blade. Making sure not to damage the the surface of the shaft.

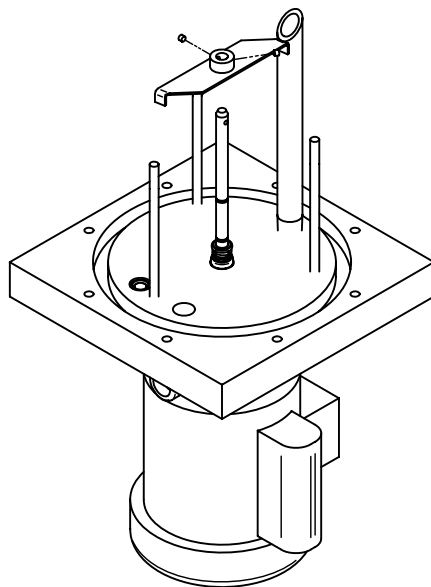


FIGURE 10

14. Remove the lower spring portion of the mechanical seal. Making sure not to damage the the surface of the shaft.

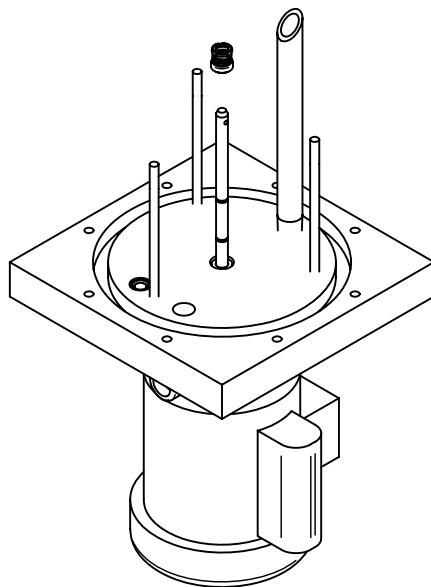


FIGURE 11

15. Using a 9/16" box wrench, remove the (4) mixer motor bolts. Do not remove the motor flange from the top mounting plate.

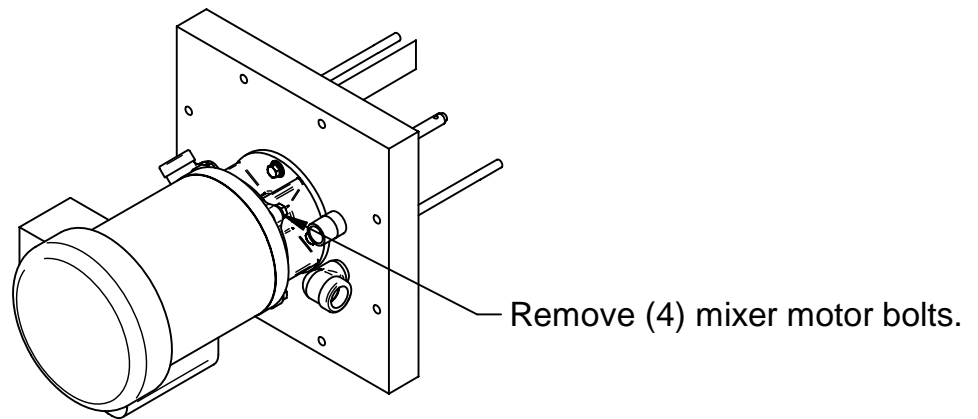


FIGURE 12

16. Gently raise the top mounting plate assembly from the motor. NOTE: The shaft will still be attached to the motor.

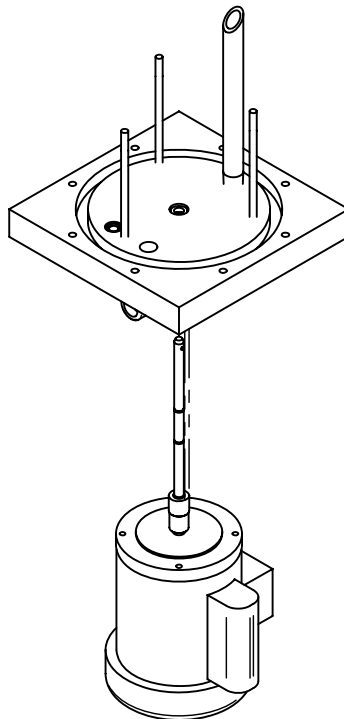


FIGURE 13

17. Using a small flat blade screwdriver, gently pry the upper mechanical seal seat from the top mounting plate. Making sure not to damage the seal recess. Inspect and clean the seal recess.

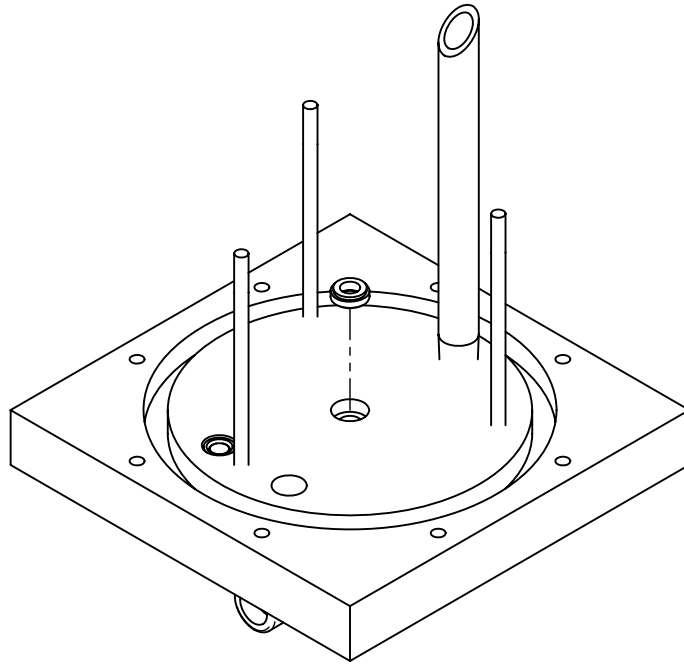


FIGURE 14

18. Inspect and clean the mixer shaft.
19. Lubricate the shaft with a light multipurpose oil.

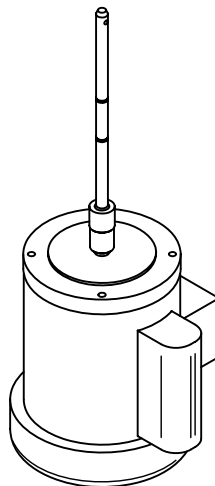


FIGURE 15

20. Lubricate the rubber outer diameter of the stationary upper mechanical seal seat with a light multipurpose oil. Using your finger to apply force and a very clean soft cloth, press the upper mechanical seal into the top mounting plate. This is a light press fit.
21. Slide the entire top mounting plate assembly over the mixer shaft until the flange is lined up with the motor.
NOTE: From step 4, realign the motor to its original position with the mounting plate.
22. Install the (4) mixer motor bolts and tighten.
23. Lubricate the rubber inner diameter of the rotating lower spring portion of the seal with a light multipurpose oil. Check both seal surfaces to assure they are free of any foreign matter. Install the lower spring portion of the mechanical seal onto the shaft so that the faces of the seals face each other.
NOTE: Seal faces should not be lubricated. Never use grease or heavy oil as an installation lubricant. Do not get any dirt or oil on the face of the seal.

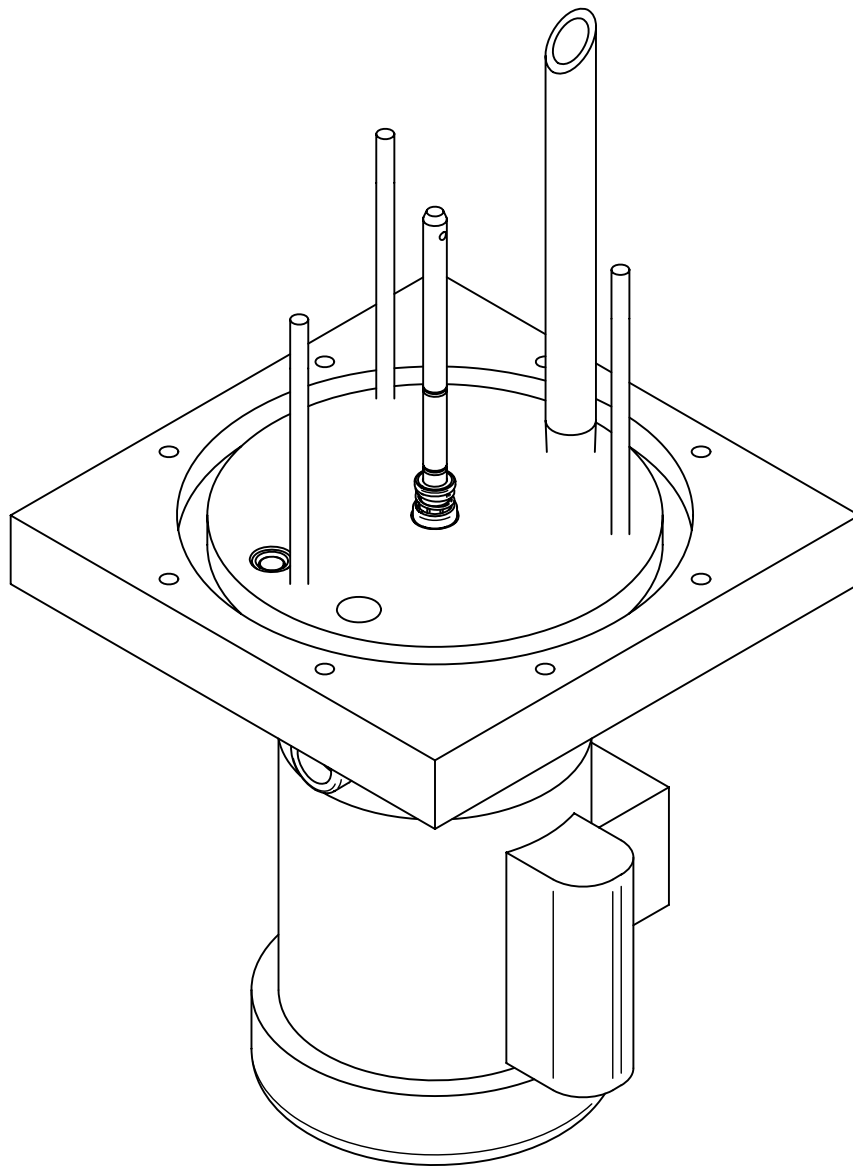


FIGURE 16

24. Install the the primary blade (High sheer blade) on the mixer shaft with the blade collar facing away from the top mounting plate. Use the agitator prop pin hole as a guide and align the blade so that it is 90 degrees from the pin hole.
25. Align the set screw so that it falls into the pre-machined groove on the mixer shaft and tighten. This will pre-load the mechanical seal.

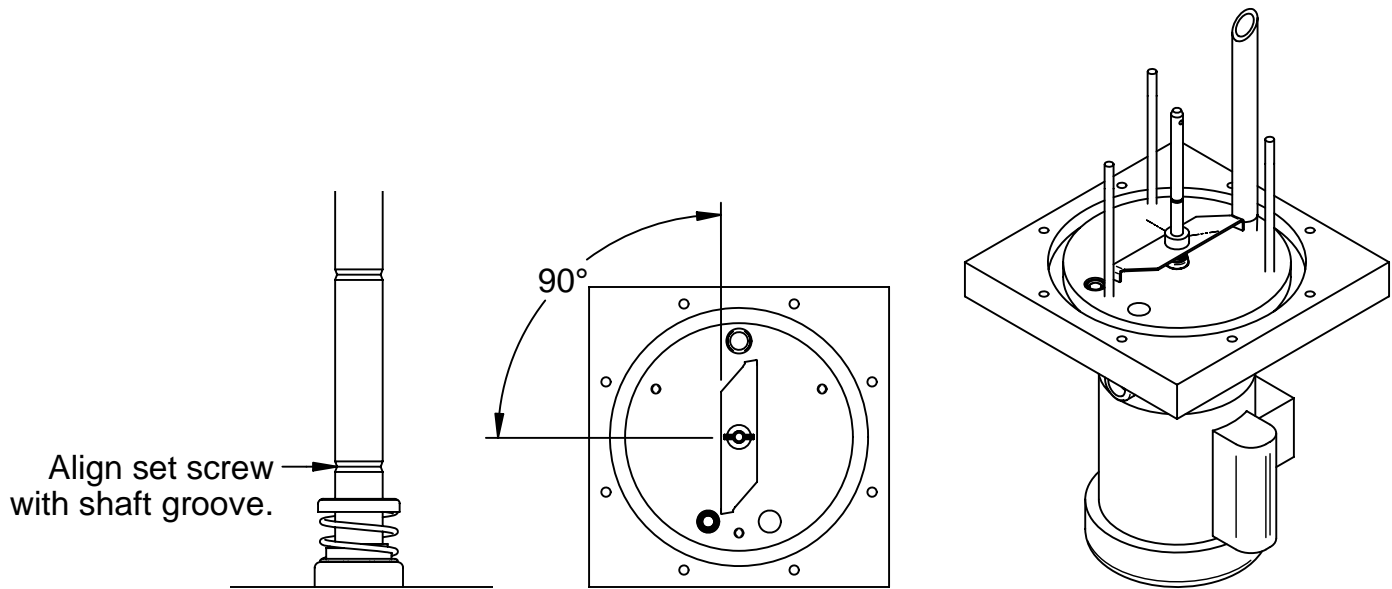


FIGURE 17

26. Install the short spacers on the baffle mounting studs.
27. Slide the Upper baffle (The larger of the two) onto the discharge pipe and mouting studs until the baffle sits flush with the spacers.

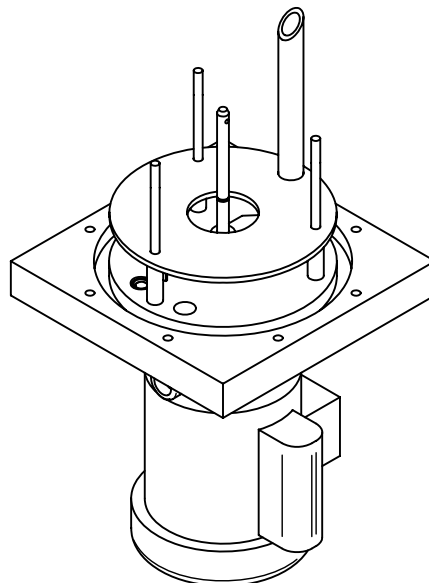


FIGURE 18

28. Install the the secondary blade (Velocity blade) on the mixer shaft with the blade collar facing away from the top mounting plate. Use the primary blade as a guide and align the secondary blade so that it is 90 degrees from the primary blade or inline with the agitator prop pin hole.
29. Align the set screw so that it falls into the pre-machined groove on the mixer shaft and tighten.

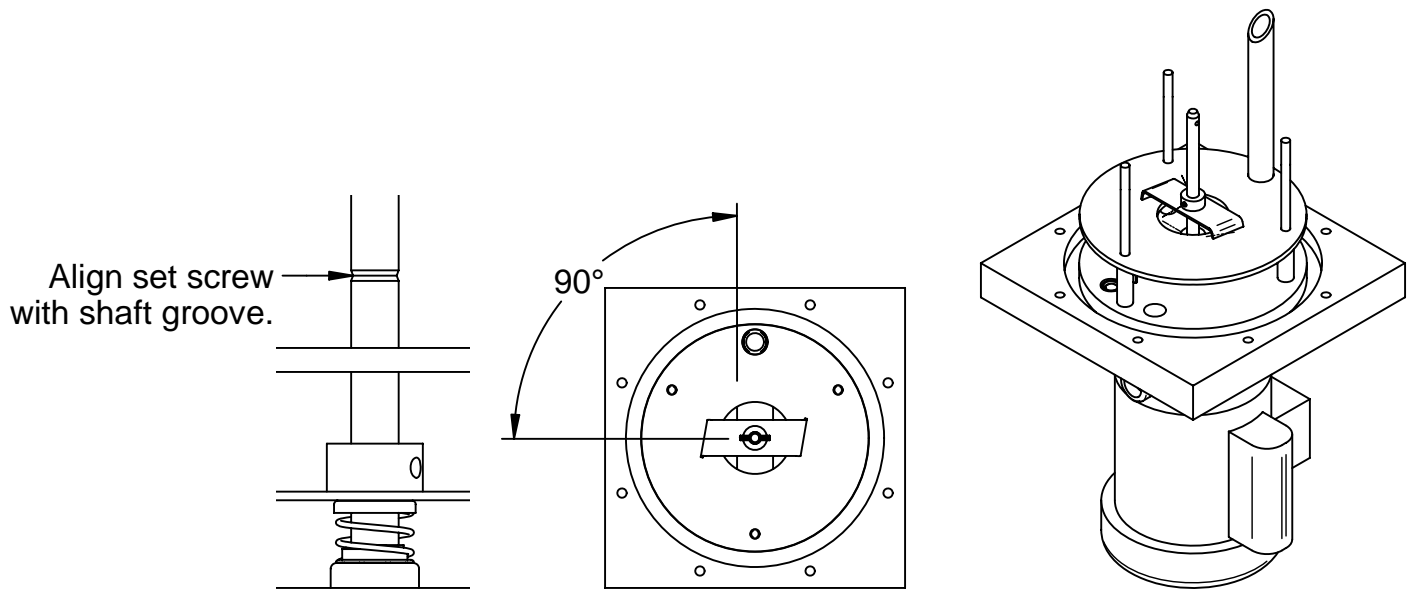


FIGURE 19

30. Install the longer spacers on the baffle mounting studs.
31. Slide the bottom baffle onto the discharge pipe and mounting studs until the baffle sits flush with the spacers. Reuse the flat washers and nylock nuts to secure.

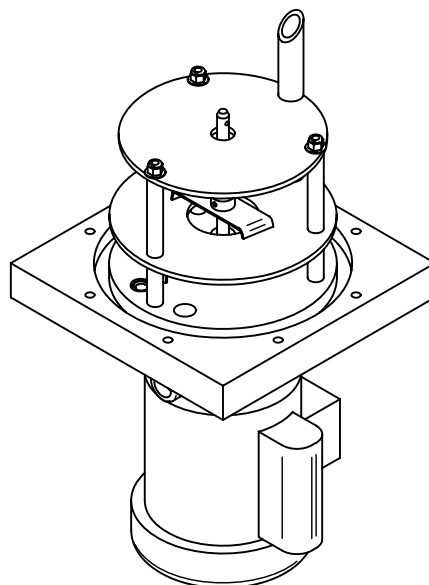


FIGURE 20

32. Install the agitator prop onto the mixer shaft aligning the the split pin holes.
NOTE: Support the agitator prop so that there is no force on the mixer shaft. Failure to do so can cause the shaft to be damaged. Install the split pin through the prop and the mixer shaft. The flat side of the agitator prop to face towards the bottom baffle as shown.

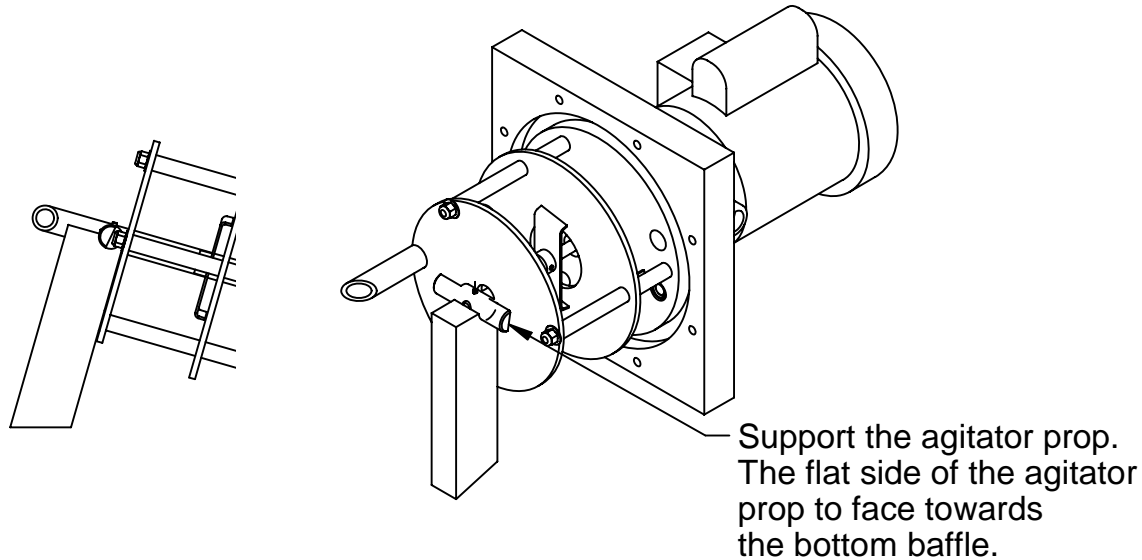


FIGURE 21

33. Inspect the chamber O-ring for any damage and install the entire top plate assembly back into the mixing chamber.

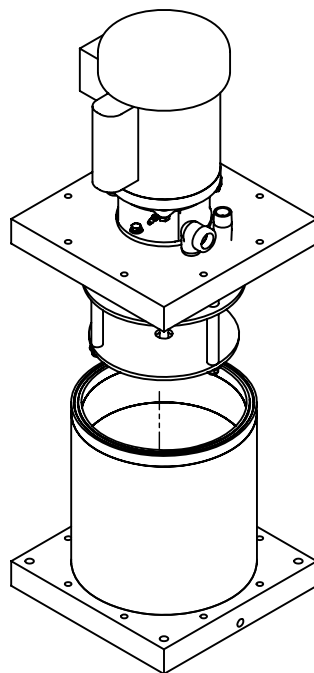


FIGURE 22

34. Install the nuts onto the mounting studs first until they are tight. Install the studs, lock washers and flat washers into the top and bottom mounting plates.
35. Using a 5/8" torque wrench, torque the (8) studs in a star pattern to 15 Ft-Lbs. When installed the studs will be flush with the bottom of the bottom mounting plate.

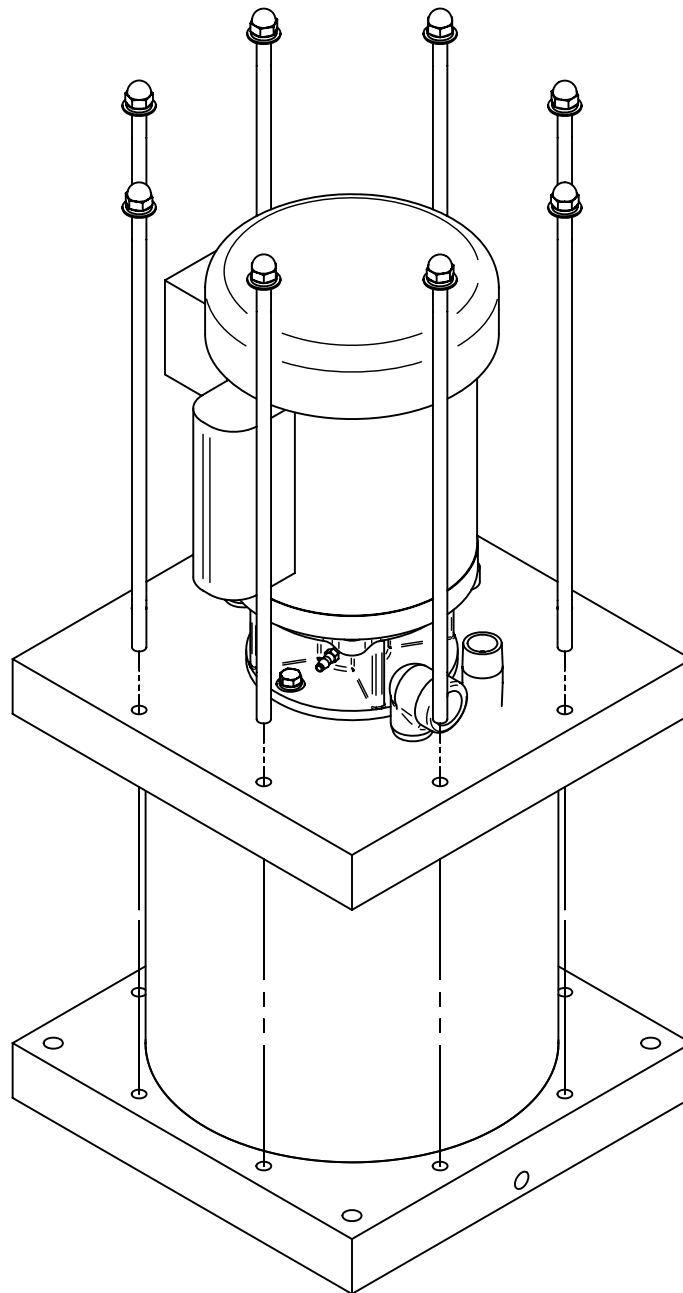


FIGURE 23

36. Completed assembly.

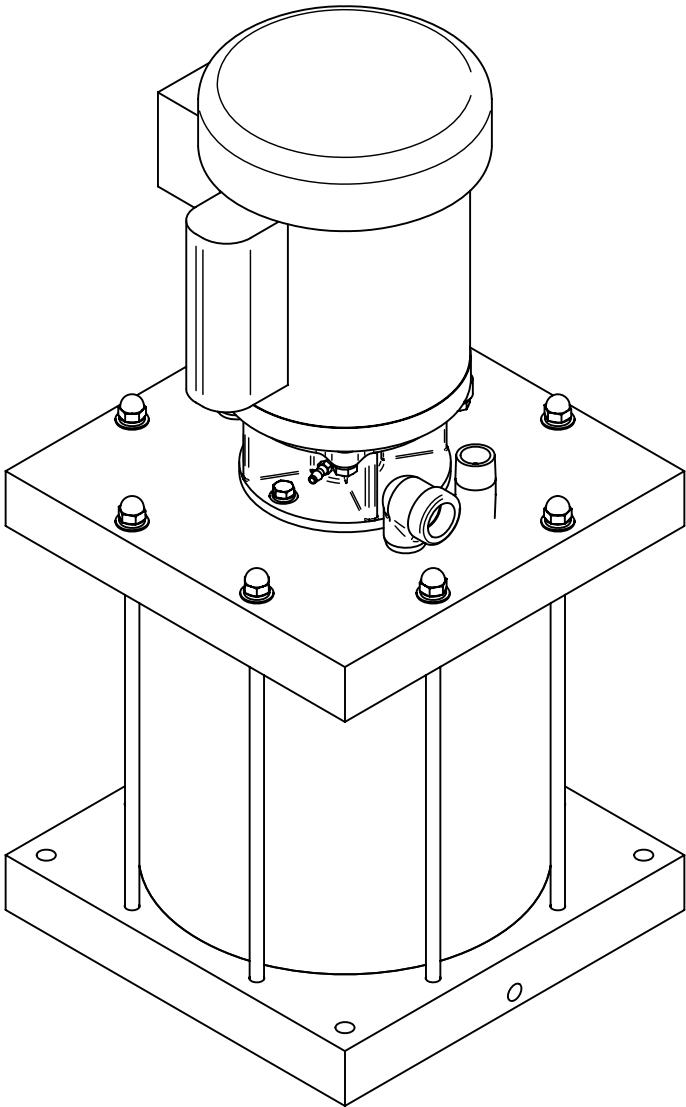


FIGURE 24

ProMix PVC Injection Valve

SPECIFICATIONS:

- Material: PVC & 316SS
- Polymer Inlet Connection: ½" NPT
- Mixing Chamber Connection: ¾" NPT
- Location: Top Side of Mixing Chamber
- Spring Pressure: 27 PSIG
- Maximum Operating Pressure: 150 PSIG
- Normal Operating Pressure: 100 PSIG
- Weight: < 1 lbs

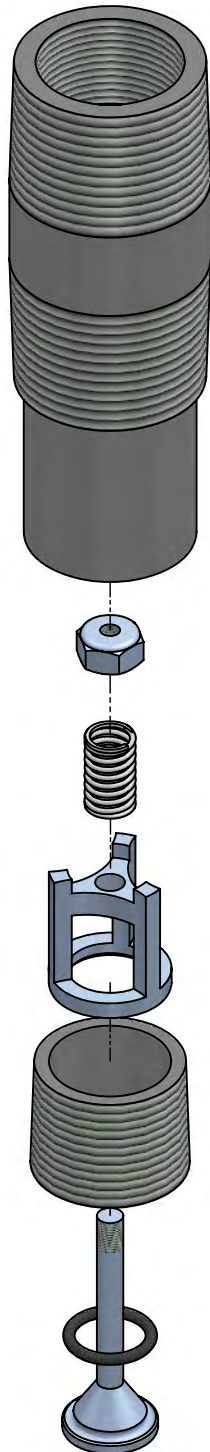
DESCRIPTION:

- Pass through design with large openings straight to the injection point.
- The injection tip can easily be unscrewed from the main body so that it can be cleaned periodically or during plant shut downs.



PROMIX "M" AND "S" SERIES INJECTION VALVE CLEANING

03/08/10 REV 0 GJS



The following is the recommended list of tools required to replace the mechanical seal:

1. 5/16" socket wrench
2. Small flat head screw driver
3. 8" channel locks
4. Teflon tape
5. Formula-8 PTFE paste sealant or equivalent

1. Disconnect power to the polymer injection pump.
2. Using a flat head screw driver or 5/16" socket wrench, loosen the hose clamp and remove it from the injection valve hose barb. Drain the polymer in the hose into a suitable container.

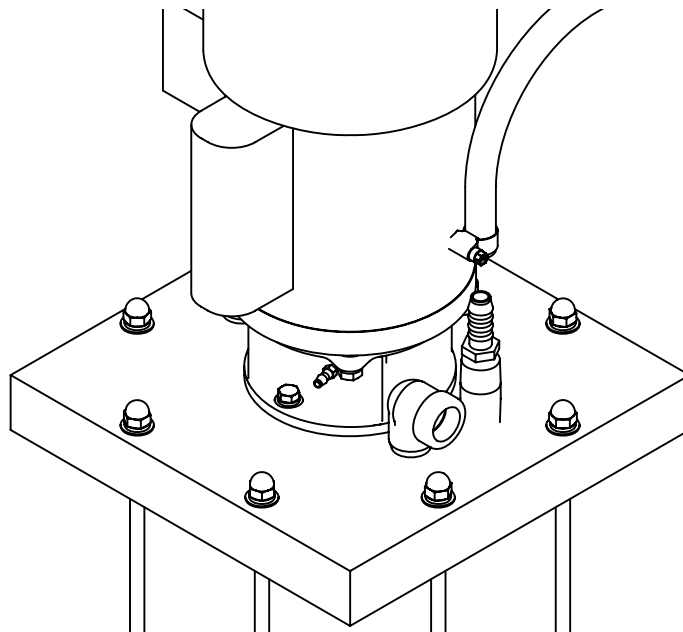


FIGURE 1

3. Using 8" channel locks, turn the valve assembly counter clockwise and lift the valve straight out.

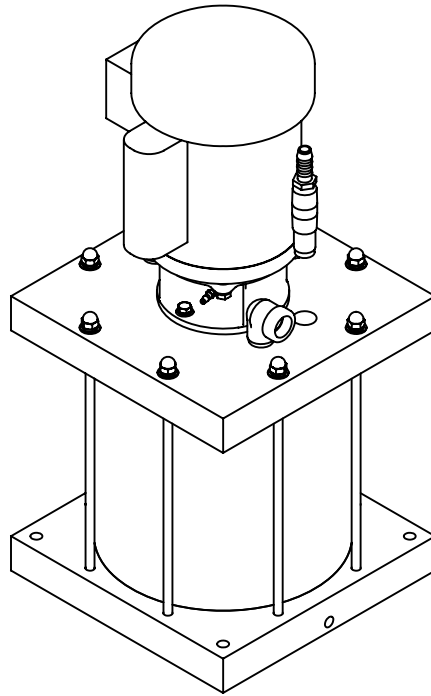


FIGURE 2

4. Using 8" channel locks, remove the injection valve adapter assembly from the injection valve body.

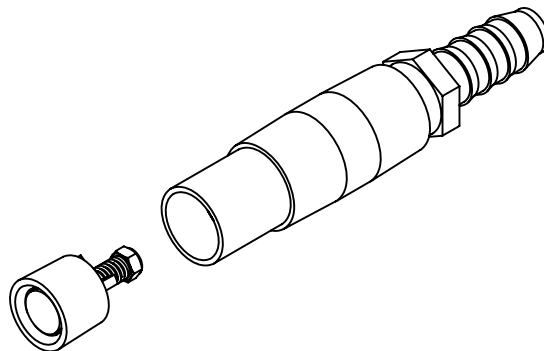


FIGURE 3

5. Clean the valve body and the valve adapter assembly under warm water until the polymer is clear. Press the injection valve open and check the o-ring for damage. Replace if necessary. O-ring P\N 7746470. No further dissassembly of the valve is required to replace the o-ring.

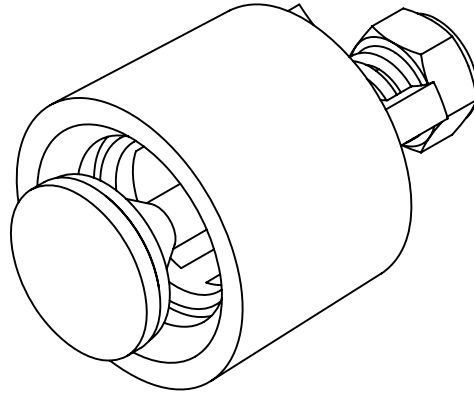


FIGURE 4

6. Ensure all parts are clean and completely dry before re-assembling.
7. Apply a small amount of Formula-8 sealant and teflon tape to the injection valve adapter.
8. Insert the adapter into the smooth side of the valve body. Do not over tighten.

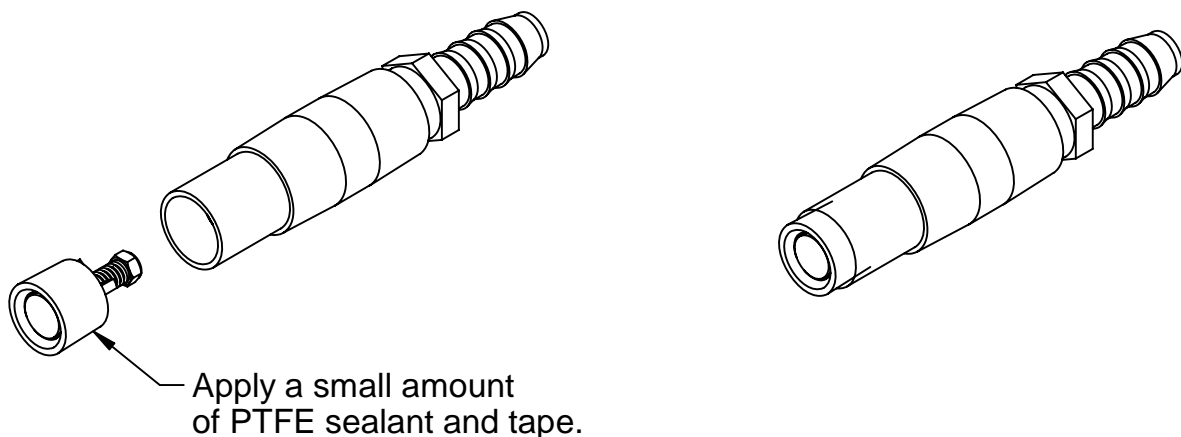


FIGURE 5

9. Apply a small amount of Formula-8 sealant and teflon tape to the injection valve body.
10. Insert the valve assembly into the top mounting plate of the mixing chamber and tighten.

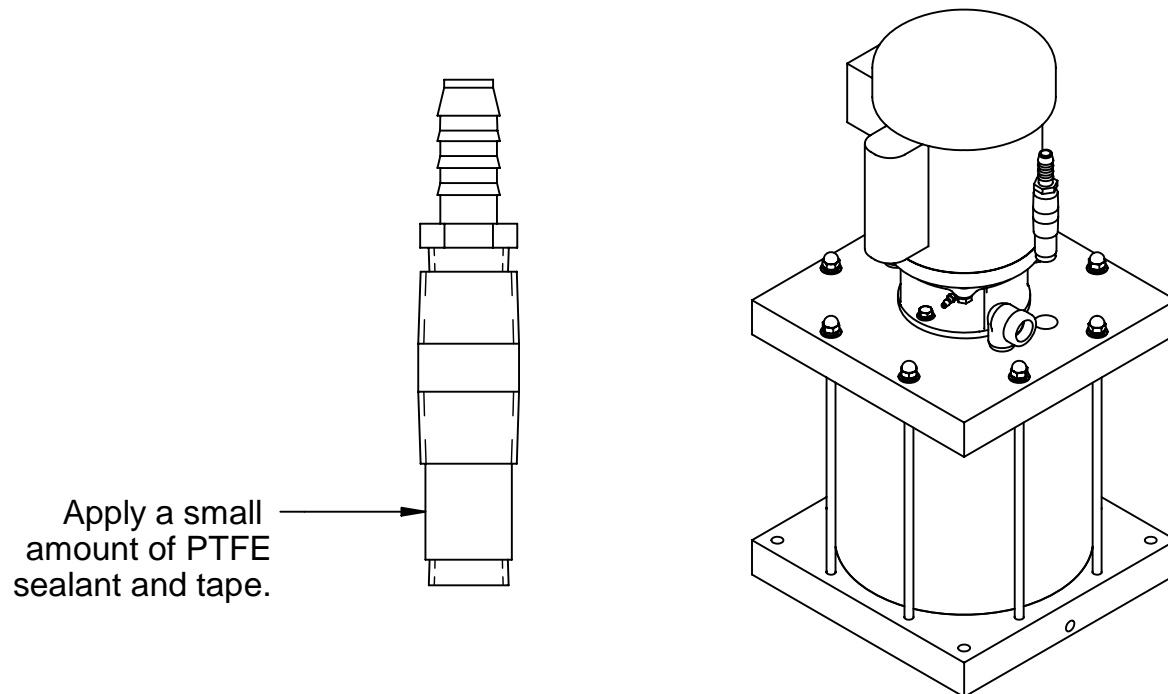


FIGURE 6

11. Re-install hose and tighten the hose clamp.
12. Pre-prime the polymer and the system is ready to run

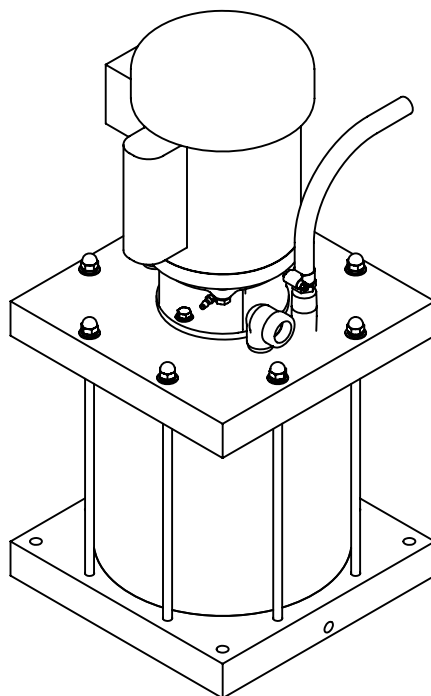


FIGURE 7



FIBOX

Enclosing innovations

NEW



**ARCA – Upgrade to
the 21st Century**

ARCA Enclosures – Upgrade to the 21st Century



Fibox's new ARCA non-metallic enclosures provide users of classic electrical junction boxes an easy upgrade path to a high performance enclosure featuring 21st century technology. Precision, injection molded, ARCA enclosures feature superior chemical resistance and the wide temperature utilization range of polycarbonate plastic. Available in classic sizes, these enclosures feature industry standard dimensions and panels.

ARCA enclosures advance beyond tradition to meet and exceed the growing demands of 21st century applications. ARCA's rugged construction achieves a unique appearance without sacrificing robustness. The stylized cover features an overlapping design providing superior protection of the formed-in-place PUR gasket.

ARCA enclosures are available as a screw cover enclosure, a hinged screw cover enclosure, or a hinged enclosure with latches. Select from a variety of latch options. Enclosure covers are available as either opaque or transparent clear. Complete ranges of mounting plates, fixed inner panels and hinged inner panels are available, in metal or non-metallic versions.

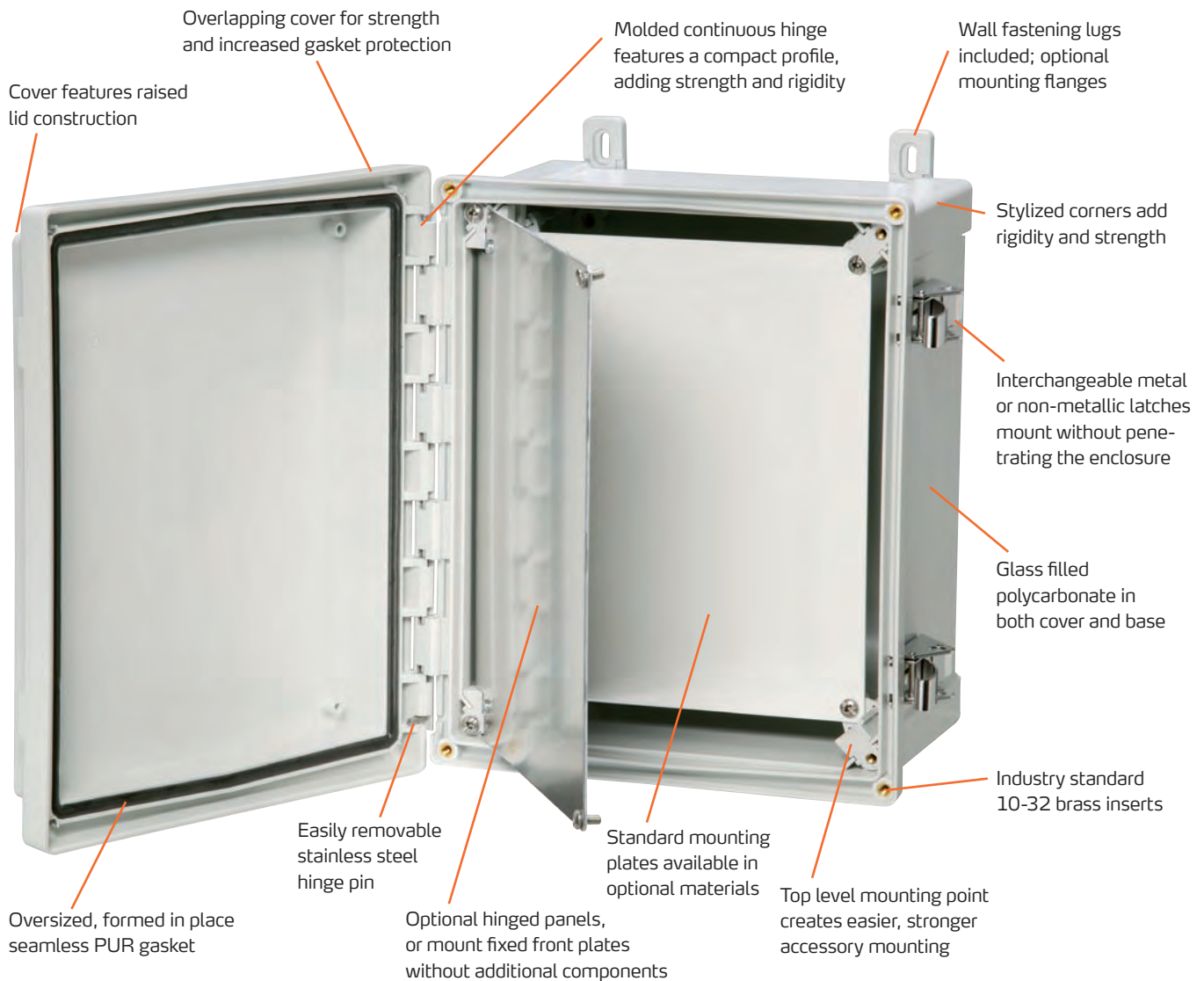
ENCLOSURES

Catalog Number			Enclosure Size	Panel Catalog Number	Panel Size	Enclosure Mounting	Exterior Overall
Screw Cover	Hinged Screw Cover	Hinged with Latch*	A x B x C	Number	h x w	F x G	H x W x D
AR664SC	AR664CHSC	AR664CHSSL	6.0 x 6.0 x 4.0	ABP66	4.9 x 4.9	6.7 x 4.0	7.6 x 7.4 x 4.7
AR664SCT	AR664CHSCT	AR664CHSSLT	(152 x 152 x 102)		(124 x 124)	(170 x 102)	(192 x 188 x 120)
AR865SC	AR865CHSC	AR865CHSSL	8.0 x 6.0 x 5.0	ABP86	6.7 x 4.9	8.7 x 4.0	9.5 x 7.4 x 5.7
AR865SCT	AR865CHSCT	AR865CHSSLT	(203 x 152 x 127)		(171 x 124)	(220 x 102)	(242 x 189 x 145)
AR1086SC	AR1086CHSC	AR1086CHSSL	10.0 x 8.0 x 6.0	ABP108	8.9 x 6.9	10.7 x 6.0	11.5 x 9.3 x 6.7
AR1086SCT	AR1086CHSCT	AR1086CHSSLT	(254 x 203 x 152)		(225 x 175)	(271 x 152)	(291 x 237 x 171)
AR12106SC	AR12106CHSC	AR12106CHSSL	12.0 x 10.0 x 6.0	ABP1210	10.8 x 8.9	12.7 x 8.0	13.5 x 11.4 x 6.7
AR12106SCT	AR12106CHSCT	AR12106CHSSLT	(305 x 254 x 152)		(275 x 225)	(322 x 203)	(342 x 289 x 171)
AR14127SC	AR14127CHSC	AR14127CHSSL	14.0 x 12.0 x 7.0	ABP1412	12.8 x 10.8	14.8 x 10.0	15.5 x 13.3 x 7.7
AR14127SCT	AR14127CHSCT	AR14127CHSSLT	(356 x 305 x 178)		(324 x 275)	(375 x 254)	(393 x 339 x 196)
AR16148SC	AR16148CHSC	AR16148CHSSL	16.0 x 14.0 x 8.0	ABP1614	14.8 x 12.9	16.7 x 12.0	17.8 x 15.5 x 8.7
AR16148SCT	AR16148CHSCT	AR16148CHSSLT	(406 x 356 x 203)		(376 x 328)	(424 x 305)	(452 x 394 x 221)
AR181610SC	AR181610CHSC	AR181610CHSSL	18.0 x 16.0 x 10.0	ABP1816	16.7 x 14.9	18.7 x 14.0	19.8 x 17.5 x 10.7
			(457 x 406 x 254)		(424 x 378)	(475 x 356)	(503 x 444 x 272)

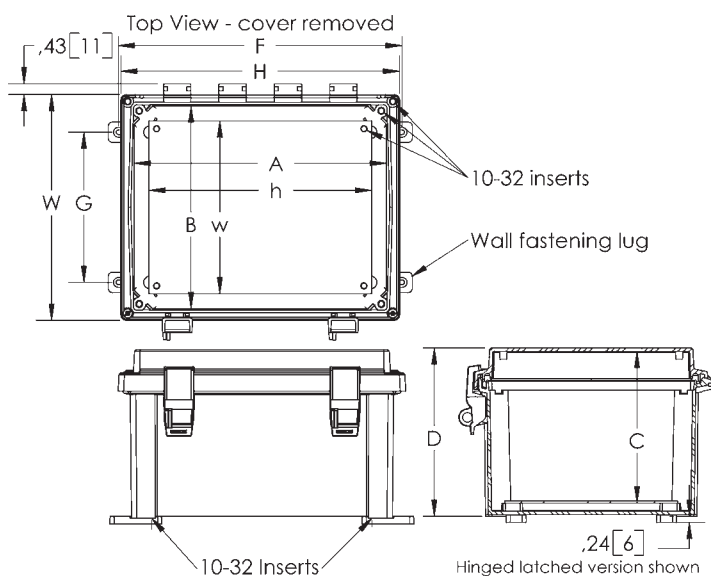
* Latch options available - metallic latch shown

P/N suffix T denotes transparent cover

ARCA is a trademark of Fibox Inc.



DRAWINGS



TECHNICAL INFORMATION

PROPERTY

Environmental ingress	UL Type 4, 4X, 6, 6P, 12 and 13
Impact resistance	Impact rating per UL 508/UL 50
NRTL Listing	Underwriters Laboratories UL, cUL Listed under UL 508
Temperature Range: °Celsius	-40° . . +140°C
Short term °Fahrenheit	-40° . . +284°F
Temperature Range: °Celsius	-40° . . +80°C
Long term °Fahrenheit	-40° . . +175°F
Electrical insulation	Totally insulated
Color	RAL 7035 - Light gray
Cover screws and hardware	10-32, stainless steel
Accessory mounting screws	10-32, stainless steel
Gasket	Formed in place polyurethane (PUR)
Flammability rating	Enclosure flammability rating per UL 508
Toxicity	Non-Toxic, halogen free, RoHS compliant

Data subject to change without notice.

Fibox Enclosures

Fibox, a privately owned Finnish company, is one of the largest enclosure manufacturers in the world, and is the market leader in thermoplastic enclosures used for protecting electrical and electronic components operating in hostile environments. Fibox enclosures are manufactured in modern factories located in Finland, Germany, China and Republic of Korea.

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ABOUT FIBOX

1000 CHOICES TO MEET YOUR DEMANDING ENVIRONMENTS

The Fibox range of standard enclosures provides the designer with over 1000 choices for packaging electrical and electronics equipment operating in hostile environments. Fibox enclosures comply with UL 50/508 and EN 60529. Most of our enclosures have achieved Type ratings of NEMA 4X, 6 and 6P, and Ingress ratings of IP 66/IP 67. Enclosure performance is verified by independent laboratory testing and on-going monitoring of production. Fibox brand accessories make our enclosures more functional and are easy to use. Standard solutions exist for panel management, hinged inner doors, and air ventilation.

CUSTOMIZED ENCLOSURES TO EXPAND YOUR OPTIONS

To increase the range and flexibility of our packaging solutions, Fibox has developed a comprehensive range of services, permitting cost effective customization for specific applications. The two most important of these are machining services and customized tooling. Our advanced CNC machinery can supply enclosures with holes, cutouts and openings to your specification. For large OEM volumes, our sophisticated, multiple slide tooling permits cost effective modification of any side of the enclosure. CAD drawings of standard enclosures are available at www.fiboxusa.com to aid the engineer in creating the most cost effective customization.

New!

Have you been looking for a line of IEC Contactors that save panel space, with features

that make them easy to install, and are rated

and approved to perform in a broad range of application

requirements anywhere in the world? c3controls' Series 300

Non-Reversing and Series 310 Reversing Contactors satisfy those

requirements and give you more! DIN rail and panel mounting, shared accessories,

IP20 guarded terminals, multi-point coils, a wide variety of accessories – and of

course c3controls quality are just a few of the features that will make Series 300

and Series 310 Contactors ideal for your application.



series
300

series
310

IEC Contactors

TECHNICAL DATA

CERTIFICATIONS

Conformity to Standards:

UL 508

CSA C22.2 No. 14

IEC 60947-1, 60947-4-1

Certifications:

UL File #: E236197, E68568



CE Marked (per EU Low Voltage Directive 73/23/EEC and 93/68/EEC)

GENERAL SPECIFICATIONS

Maximum Operating Voltage:

UL/CSA: 600V AC

IEC: 690V AC

Impulse Voltage Withstand:

6kV (9 ~ 40A), 8kV (50A ~ 105A)

Terminal Protection:

IP20

Maximum Power Ratings:

5HP @ 460V AC (4kW @ 400V AC) to

75HP @ 460V AC (55kW @ 400V AC)

Ambient Operating Temperature:

-25 to 55° C (-13 to 131° F)

Pollution Degree:

3

See pages 35 - 38 for comprehensive electrical, mechanical, environmental and construction specifications.

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Series 310 Reversing	30
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IT'S EASY TO BUILD YOUR OWN CONTACTOR

Simply pick the code number from each of the sections below and combine them to build your part number. See page 4 for more detailed directions.

IEC Non-Reversing Contactors



Example: To build one of our most popular Contactors, the part number would be **I + II + III** or **300-S40N30D00**



I. NON-REVERSING CONTACTORS (3 NORMALLY OPEN POLES)

CODE	MAX. Ie (A)		RATINGS FOR SWITCHING AC MOTORS - AC-2, AC-3, AC-4											LIST
			kW (50Hz)				HP (60Hz)							
			3 PHASE				1 PHASE		3 PHASE					
			230V	400/415V	500V	690V	115V	230V	200V	230V	460V	575V		
300-S09N30	9	25	2.2	4	5.5	5.5	1/2	1-1/2	3	3	5	7-1/2	\$ 12.00	
300-S12N30	12	25	3	5.5	7.5	7.5	3/4	2	3	3	7-1/2	10	\$ 18.00	
300-S18N30	18	32	4	7.5	10	10	1	3	5	5	10	15	\$ 23.00	
300-S25N30	25	45	7.5	11	15	15	1-1/2	3	5	7-1/2	15	15	\$ 29.00	
300-S32N30	32	60	9	15	18.5	18.5	2	5	10	10	20	25	\$ 35.00	
300-S40N30	40	60	11	18.5	25	30	3	5	10	10	25	25	\$ 48.00	
300-S50N30	50	90	15	22	30	35	3	7-1/2	15	15	30	40	\$ 59.00	
300-S65N30	65	110	18.5	30	40	45	5	10	20	20	40	50	\$ 67.00	
300-S80N30	80	110	22	37	45	45	5	15	20	25	50	60	\$ 77.00	
300-S95N30	95	140	25	45	55	55	7-1/2	15	25	30	60	75	\$133.00	
300-S105N30	105	140	30	55	65	65	10	20	30	40	75	75	\$153.00	

II. COIL VOLTAGE CODE

AC COIL VOLTAGE CODES															
VOLTAGE	12	24	48	110	120	208	220	230	240	277	380	400	400 ~ 415	440	480
50Hz	G	H	K	D	—	—	M	N	—	—	Q	AM	R	S	—
60Hz	B	C	J	—	D	L	—	—	F	P	—	—	—	—	R
50/60Hz	XB	XC	XJ	XD	—	—	XAJ	XN	XF	—	—	XAM	—	XQ	—

DC COIL VOLTAGE CODES

VOLTAGE	12	24	24 ~ 28	48	42 ~ 48	110	125	110 ~ 125	250	220 ~ 250	LIST
-S09 to -S25	ZB	ZC	—	ZK	—	ZD	ZQ	—	ZP	—	\$ 8.00
-S32 to -S40	ZB	ZC	—	ZK	—	ZD	ZQ	—	ZP	—	\$ 28.00
-S50 to -S105	—	—	YC*	—	YK*	—	—	YL*	—	YE*	\$131.00

*NOTE: Can also be actuated with an AC control voltage.

III. AUXILIARY CONTACT CONFIGURATION

CODE	DESCRIPTION	LIST
00	Without Auxiliary Contacts (Contactors 300-S25 to 300-S105 only)	\$ —
10	1 Normally Open*	\$4.00
01	1 Normally Closed*	\$4.00

*NOTE: Integral right side mounted on 9A ~ 18A contactors, front mounted on 25A ~ 105A contactors.



SOME OF OUR POPULAR CONFIGURATIONS:

IEC NON-REVERSING CONTACTORS

CATALOG NUMBER	DESCRIPTION	LIST
300-S09N30D10	Non-Reversing, 9A, 3 Pole, 120V AC Coil, 1 NO Auxiliary Contact	\$16.00
300-S09N30ZC10	Non-Reversing, 9A, 3 Pole, 24V DC Coil, 1 NO Auxiliary Contact	\$24.00
300-S25N30D10	Non-Reversing, 25A, 3 Pole, 120V AC Coil, 1 NO Auxiliary Contact	\$33.00

IEC NON-REVERSING CONTACTORS

c3controls Series 300 Contactors are ideal for motor, actuator, solenoid, and other power switching applications where panel space is a premium and device modularity is required to satisfy virtually any application requirement. cULus and CE Markings make them suitable for use anywhere in the world. Small size, IP20 guarded terminals with dual terminal markings, and shared accessories will help reduce your total installed costs and enhance the features and performance of your equipment. Just look and see what the Series 300 has to offer.

Product features include:

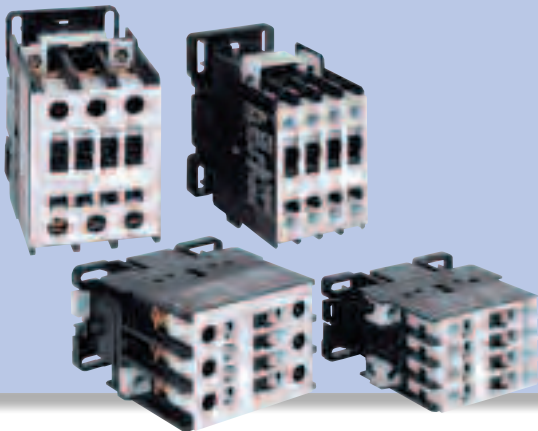
- Compact size – five (5) frame sizes for devices rated from 9A to 105A. Contactors rated 15HP @ 460V (11kW @ 400V) are only 45mm (1.77") wide reducing panel area requirements – smaller enclosures can be used for lower installed costs.
- AC and DC operating coils for control circuit application flexibility. 50A to 105A DC operated devices feature electronic coil control and can be actuated with AC or DC control voltages.
- Environmentally friendly contacts are cadmium free and non-metallic materials are asbestos, halogen, and cadmium free.
- IP20 guarded terminals prevent accidental contact with live parts.
- Dual IEC and NEMA terminal markings for ease of wiring anywhere in the world.
- Device identification marker for labeling contactors and front mounted auxiliary contacts simplifies trouble shooting in panels with many contactors.
- 35mm DIN rail mounting for all contactors from 9A to 105A for fast and easy installation and removal or panel mounting for more secure installation in high shock and vibration applications.
- Modular design allows Series 320 Overload Relays to be easily installed or can be used with the complete range of Series 330 Motor Protection Circuit Breakers and accessories.
- Combination head terminal screws allow the use of straight, phillips, or posidrive screwdrivers. Allen head screws on 50A through 105A contactors make it easy to apply the proper terminal tightening torque for secure conductor connections.
- Snap-on front mounted auxiliary contacts install without the use of tools for lower installed costs. Single circuits available so you only purchase what you need.



UNIQUE PRODUCT FEATURES

3 AND 4 TERMINAL COILS

4 terminal coils on 9A ~ 25A contactors and 3 terminal coils on 50A to 105A contactors are easily accessible on contactor and overload relay assemblies or contactor and motor protection circuit breaker assemblies. The control circuit can be wired from the line side or the load side of the contactor, whichever is most convenient for the installation. Control circuit wire runs can be minimized, and the devices can be easily substituted in your existing equipment without disturbing or changing your control wires. So no matter what components are being used, Series 300 Contactors can be easily and quickly wired, reducing your labor and installation costs.





IEC OVERLOAD RELAYS Series 320

Need reliable, accurate overload and phase-loss protection for your motors? c3's Series 320 Bimetallic Overload Relays provide unmatched protection and can be directly installed on all Series 300 IEC Contactors, saving you time and panel space. Plus, cULus and CE markings make them applicable worldwide.



Conformity to Standards:

UL 508
CSA C22.2 No. 14
IEC 60947-1, 60947-3

Certifications:

UL File #: E68568 (Guide NKCR, NKCR7)
CE Marked (per EU Low Voltage Directive
73/23/EEC and 93/68/EEC)



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Trip Characteristics and
Circuit Diagrams 56

Dimensions 57

IT'S EASY TO BUILD YOUR OWN OVERLOAD RELAY

Simply pick the code number from each of the sections below and combine them to build your part number. See page 1 for more detailed directions.

IEC Bimetallic Overload Relays

320-B

/ II

Example: To build one of our most popular Overload Relays, the part number would be **320-B + II** or **320-B2D18**



**NEW
EXPANDED
PRODUCT
OFFERING!**

I. OVERLOAD RELAY TYPE

CODE	DESCRIPTION
320-B	Bimetallic Overload Relay

Our Series 320 Bimetallic Overload Relays are available in five frame sizes for motor full load currents from 0.28 ~ 112A.

**DISCOUNT
SCHEDULE C**

320-B1*** Available March '07.

II. OVERLOAD RELAY FRAME SIZE AND CURRENT ADJUSTMENT RANGE

CODE	INSTALLS ON CONTACTOR	CURRENT ADJUSTMENT RANGE	LIST
1C40	-M07, -M09, -M12, -M16	0.28 ~ 0.4	\$21.50
1C63	-M07, -M09, -M12, -M16	0.4 ~ 0.63	\$21.50
1C80	-M07, -M09, -M12, -M16	0.56 ~ 0.8	\$21.50
1D12	-M07, -M09, -M12, -M16	0.8 ~ 1.2	\$21.50
1D18	-M07, -M09, -M12, -M16	1.2 ~ 1.8	\$21.50
1D28	-M07, -M09, -M12, -M16	1.8 ~ 2.8	\$21.50
1D40	-M07, -M09, -M12, -M16	2.8 ~ 4.0	\$21.50
1D63	-M07, -M09, -M12, -M16	4.0 ~ 6.3	\$21.50
1D80	-M07, -M09, -M12, -M16	5.6 ~ 8.0	\$21.50
1U10	-M07, -M09, -M12, -M16	7.0 ~ 10.0	\$21.50
1U12	-M07, -M09, -M12, -M16	8.0 ~ 12.5	\$21.50
1U15	-M07, -M09, -M12, -M16	10 ~ 15	\$21.50
1U17	-M07, -M09, -M12, -M16	11 ~ 17	\$21.50
2C40	-S09, -S12, -S18, -S25, -S32, -S40	0.28 ~ 0.4	\$23.50
2C63	-S09, -S12, -S18, -S25, -S32, -S40	0.4 ~ 0.63	\$23.50
2C80	-S09, -S12, -S18, -S25, -S32, -S40	0.56 ~ 0.8	\$23.50
2D12	-S09, -S12, -S18, -S25, -S32, -S40	0.8 ~ 1.2	\$23.50
2D18	-S09, -S12, -S18, -S25, -S32, -S40	1.2 ~ 1.8	\$23.50
2D28	-S09, -S12, -S18, -S25, -S32, -S40	1.8 ~ 2.8	\$23.50
2D40	-S09, -S12, -S18, -S25, -S32, -S40	2.8 ~ 4.0	\$23.50
2D63	-S09, -S12, -S18, -S25, -S32, -S40	4.0 ~ 6.3	\$23.50
2D80	-S09, -S12, -S18, -S25, -S32, -S40	5.6 ~ 8.0	\$23.50
2U10	-S09, -S12, -S18, -S25, -S32, -S40	7.0 ~ 10.0	\$23.50
2U12	-S09, -S12, -S18, -S25, -S32, -S40	8 ~ 12.5	\$23.50
2U15	-S09, -S12, -S18, -S25, -S32, -S40	10 ~ 15	\$23.50
2U17	-S09, -S12, -S18, -S25, -S32, -S40	11 ~ 17	\$23.50
2U23	-S09, -S12, -S18, -S25, -S32, -S40	15 ~ 23	\$23.50
2U32	-S09, -S12, -S18, -S25, -S32, -S40	22 ~ 32	\$23.50
3U40	-S32, -S40	25 ~ 40	\$37.50
4U50	-S50, -S65, -S80	32 ~ 50	\$45.00
4U57	-S50, -S65, -S80	40 ~ 57	\$45.00
4U63	-S50, -S65, -S80	50 ~ 63	\$45.00
4U70	-S50, -S65, -S80	57 ~ 70	\$45.00
5U80	-S95, -S105	63 ~ 80	\$53.00
5U97	-S95, -S105	78 ~ 97	\$53.00
5X11	-S95, -S105	90 ~ 112	\$53.00

SOME OF OUR POPULAR CONFIGURATIONS:

IEC BIMETALLIC OVERLOAD RELAYS

CATALOG NUMBER	DESCRIPTION	LIST
320-B1D80	5.6 ~ 8.0A Overload Relay for Installation on 300-M07 Contactor	\$21.50
320-B2U10	7 ~ 10A Overload Relay for Installation on 300-S09 Contactor	\$23.50
320-B2U23	15 ~ 23A Overload Relay for Installation on 300-S25 Contactor	\$23.50
320-B3U40	25 ~ 40A Overload Relay for Installation on 300-S40 Contactor	\$37.50
320-B4U50	32 ~ 50A Overload Relay for Installation 300-S50 Contactor	\$45.00
320-B5U97	78 ~ 97A Overload Relay for Installation on 300-S95 Contactor	\$53.00

AVAILABLE FRAME SIZES
FOR OVERLOAD RELAYS

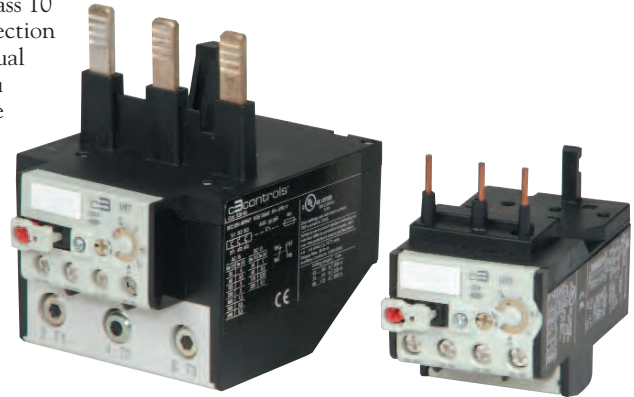


IEC BIMETALLIC OVERLOAD RELAYS

c3controls Series 320 Bimetallic Overload Relays provide thermal Trip Class 10 overload protection for single and three phase motors, and phase loss protection for three phase motors. Other features like IP20 guarded terminals with dual terminal markings, integral stop button, and direct mounting will help you reduce your total installed costs and enhance the features and performance of your equipment. Just look and see what the Series 320 Overload Relays have to offer.

Product features include:

- New Series 320-B1 Overload Relays for use with Series 300 IEC Mini Contactors.
- New Series 320-B1 Overload Relays include integral connection to auxiliary and coil terminations for ease of wiring during installation when installed on Series 300 IEC Mini Contactors.
- New Series 320-B1 Overload Relays share the same great features and benefits of the larger frame sizes.
- Trip Class 10 for reliable and accurate protection against overload conditions.
- Single phase sensitivity to protect motors against damaging phase loss conditions.
- Direct mounting to all contactors, including new 320-B1 Overload Relays for use with Series 300 IEC Mini Contactors.
- Dual IEC and NEMA terminal markings for ease of wiring anywhere in the world.
- Device identification marker for labeling overload relays simplifies troubleshooting in panels with many overload relays or starters.
- IP20 guarded terminals prevent accidental contact with live parts.
- Combination head terminal screws allow the use of straight, phillips or posidrive screwdrivers.
- Stop button for convenient and economical control circuit wiring.
- Ambient temperature compensation ensures reliable motor protection even in high temperature environments.



UNIQUE PRODUCT FEATURES



A – Automatic Reset Only
 AUTO – Automatic Reset and Test
 H – Manual Reset Only
 HAND – Manual Reset and Test

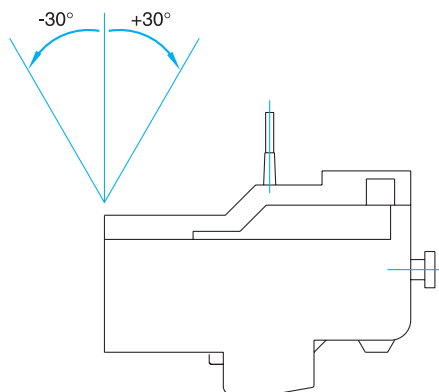
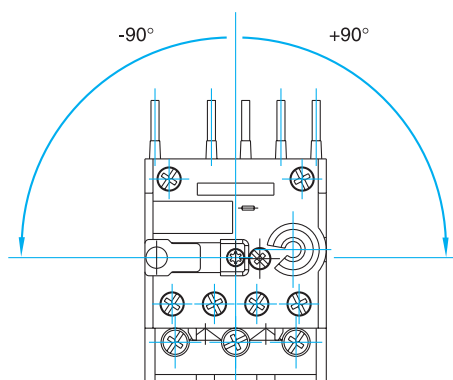
c3controls Series 320 Bimetallic Overload Relays feature a multi-function reset button enabling the user to select the reset mode – manual or automatic and whether or not to enable the test function.

When the reset button is pressed, with the test function enabled, the Normally Open (NO) contact closes and the Normally Closed (NC) contact opens to verify the control circuit functionality. In addition, the NC contact can be used in a “Stop” circuit. With the test function disabled, the NO and NC contacts do not change state when the reset button is pressed – preventing unauthorized personnel from operating the control circuit.

Multiple functions in a single device help you to reduce inventory and customize the overload relay operation to provide the performance and features you need for your specific application.

SPECIFICATIONS:

ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS						
		320-B1	320-B2	320-B3	320-B4	320-B5
ELECTRICAL GENERAL						
	UNITS					
Current Setting Range	A	0.28 ~ 17	0.28 ~ 32	25 ~ 50	40 ~ 80	63 ~ 112
Operating Frequency	Hz	0 ~ 400				
Power Dissipation per Pole	W	0.9 ~ 1.4	1.3 ~ 2.0	1.3 ~ 2.0	1.9 ~ 4.8	3 ~ 4.8
ELECTRICAL UL/CSA APPLICATIONS						
MAIN CIRCUITS						
Rated Operating Voltage, Ue	VAC	600				
Short Circuit Rating	kA	5	5	5	10	10
Maximum Fuse Size*	A	60	90	125	200	250
CONTROL CIRCUITS						
Pilot Duty Rating	AC	C600				
	DC	R300				
ELECTRICAL IEC APPLICATIONS						
MAIN CIRCUITS						
Rated Insulation Voltage, Ui	V	690				
Rated Impulse Voltage, Uimp	kV	6				
Rated Operating Voltage, Ue	VAC	690				
Maximum Rated Operating Current, Ie	A	17	32	50	80	112
Maximum Fuse Size*	A	40	63	100	125	250
CONTROL CIRCUITS						
Rated Insulation Voltage, Ui	V	690				
Rated Operating Current, Ie						
AC-15						
@ 24V AC	A	4				
@ 60V AC	A	3.5				
@ 120V AC	A	3				
@ 240V AC	A	2				
@ 415V AC	A	1.5				
@ 500V AC	A	0.5				
@ 690V AC	A	0.3				
DC-13						
@ 24V DC	A	1				
@ 60V DC	A	0.5				
@ 110V DC	A	0.25				
@ 220V DC	A	0.1				
Maximum Fuse Size (gL/gG)	A	6				
ENVIRONMENTAL						
Ambient Operating Temperature		-25 to +60° C (-13 to +140° F)				
Ambient Storage Temperature		-40 to +70° C (-40 to +158° F)				
Altitude	m/ft.	2,000/6,562				
*Varies by current setting range of overload relay.						



CONSTRUCTION SPECIFICATIONS						
		320-B1	320-B2	320-B3	320-B4	320-B5
CONSTRUCTION						
	UNITS					
Number of Poles		3				
Trip Class		10				
Pollution Degree		3				
INGRESS PROTECTION						
Main Circuit Terminals		IP20 (with wires connected)				
Control Circuit Terminals		IP20				
WEIGHT	kg	0.15	0.15	0.31	0.31	0.37
	lbs.	0.33	0.33	0.68	0.68	0.82
CONDUCTOR SIZE						
MAIN CIRCUITS						
UL/CSA	AWG	14 ~ 16	14 ~ 16	18 ~ 2	18 ~ 2	8 ~ 1/0
Solid	mm ²	2 x 1.5 ~ 6.0	2 x 1.5 ~ 6.0	1 x 6 ~ 35	2 x 6 ~ 35	1 x 25 ~ 35
Stranded	mm ²	2 x 1.5 ~ 6.0	2 x 1.5 ~ 6.0	1 x 6 ~ 35	2 x 6 ~ 35	1 x 25 ~ 35
Fine Strand with Sleeve	mm ²	2 x 1.5 ~ 10.0	2 x 1.5 ~ 10.0	2 x 6 ~ 35	3 x 6 ~ 35	1 x 25 ~ 35
Terminal Torque	Nm	4.0 ~ 6.0	4.0 ~ 6.0	4.0 ~ 6.0	4.0 ~ 6.0	14 ~ 26
	Lb-in.	35 ~ 53	35 ~ 53	35 ~ 53	35 ~ 53	124 ~ 230
CONTROL CIRCUITS						
UL/CSA	AWG	18 ~ 14				
Solid	mm ²	2 x 1 ~ 2.5				
Stranded	mm ²	2 x 1 ~ 2.5				
Fine Strand	mm ²	2 x 1 ~ 2.5				
Fine Strand with Sleeve	mm ²	2 x 1 ~ 2.5				
Terminal Torque	Nm	1.4 ~ 2.3				
	Lb-in.	12.4 ~ 20.4				

SEPARATE MOUNTING ADAPTERS



Separate mounting adapters enable Series 320 Overload Relays to be installed separately from a contactor on a 35mm DIN rail or with fixing screws to a panel.

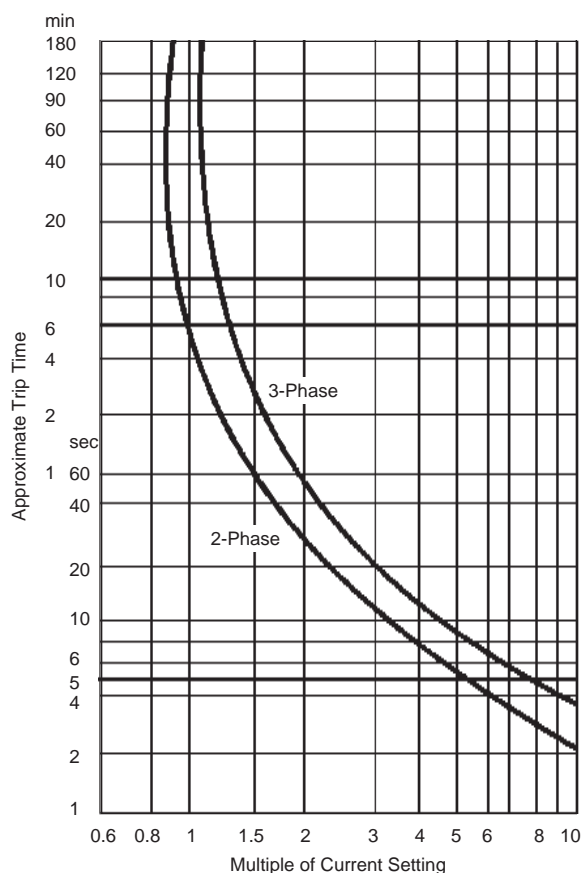
CODE	FOR USE WITH	LIST
320-BSMA2	320-B2*** Overload Relays	\$7.00
320-BSMA4	320-B3*** and 320-B4*** Overload Relays	\$12.00
320-BSMA5	320-B5*** Overload Relays	\$15.00

DISCOUNT
SCHEDULE

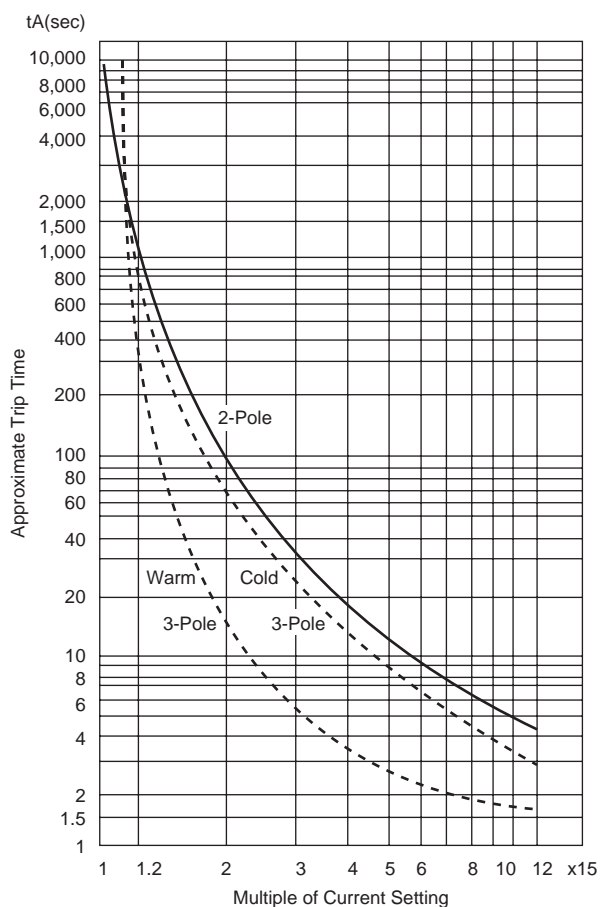
C

TRIP CHARACTERISTICS

320-B1***, 320-B2***, 320-B3***, & 320-B4***

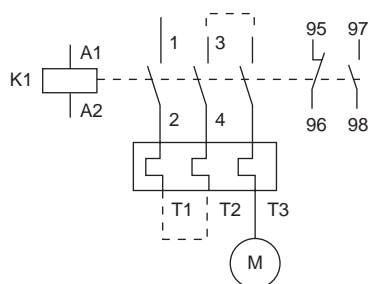


320-B5***

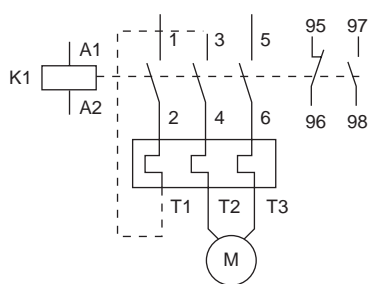


CIRCUIT DIAGRAMS

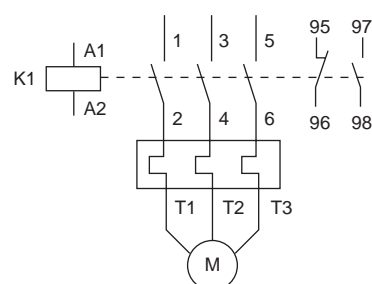
1-PHASE



2-PHASE

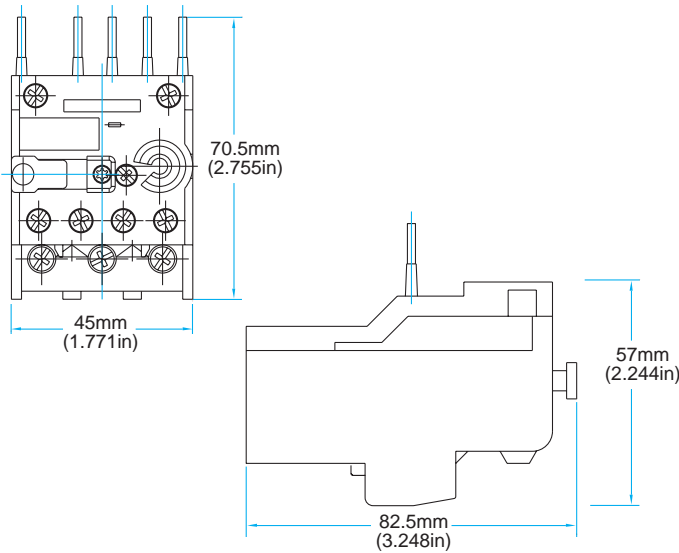


3-PHASE

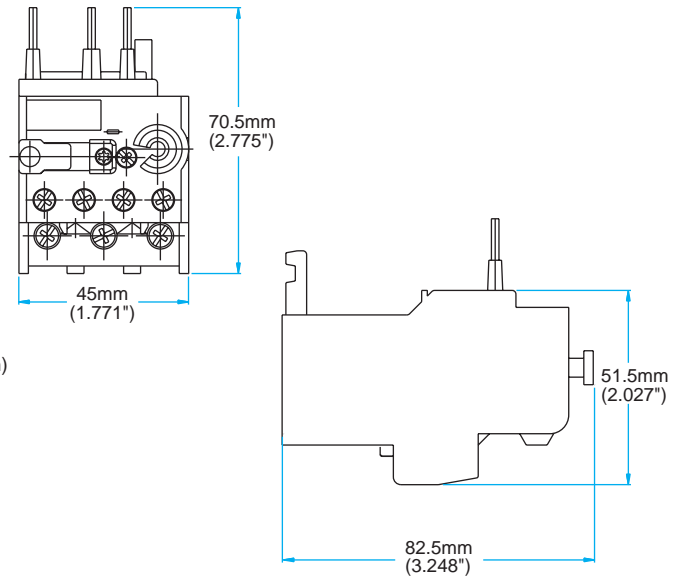


SERIES 320 IEC BIMETALLIC OVERLOAD RELAYS

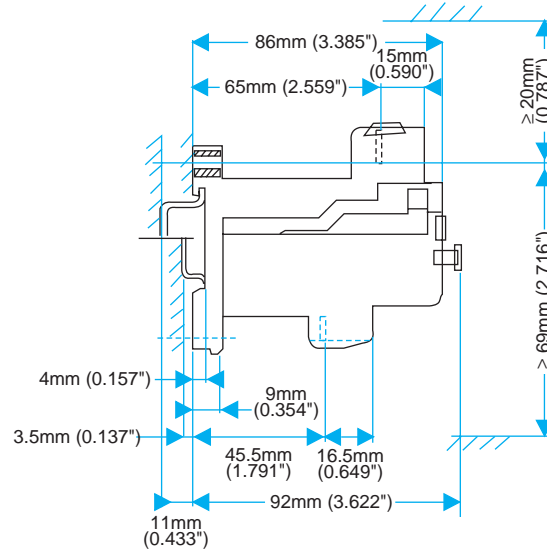
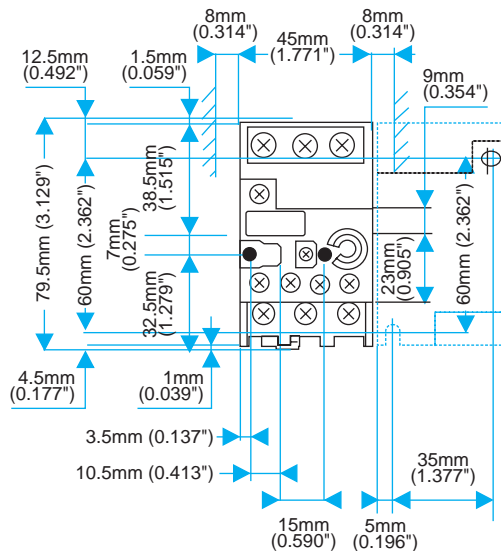
320-B1***



320-B2***



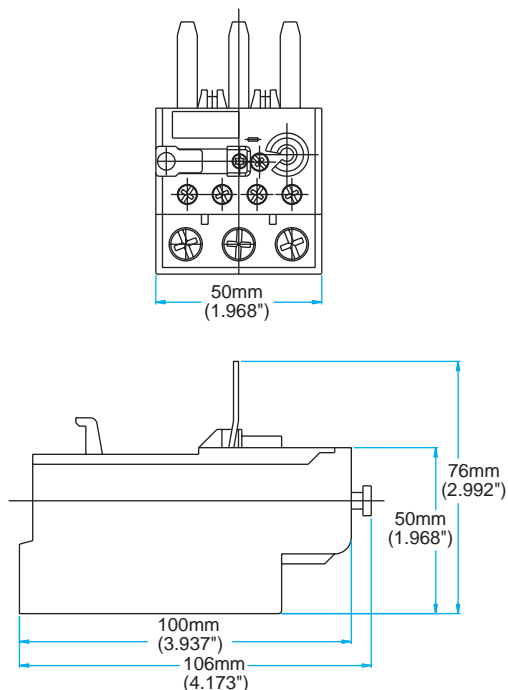
320-B2* WITH SEPARATE MOUNTING ADAPTER
320-BSMA2**



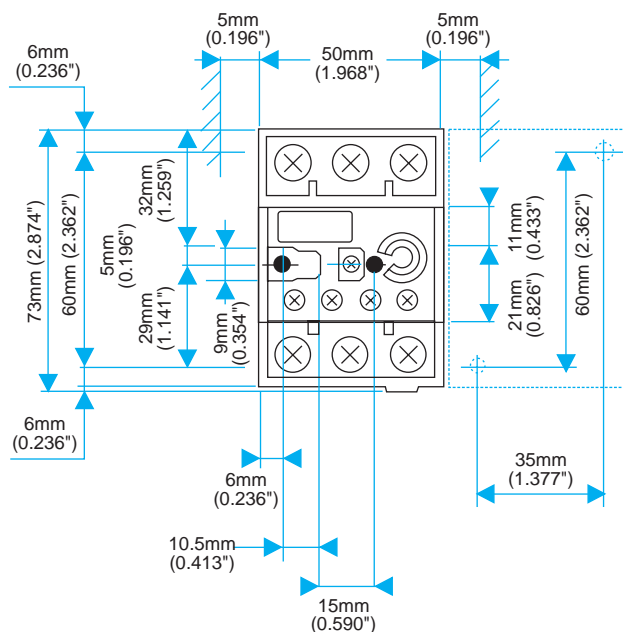
**VISIT WWW.C3CONTROLS.COM
TO DOWNLOAD CAD DRAWINGS**

SERIES 320 IEC BIMETALLIC OVERLOAD RELAYS (CONT.)

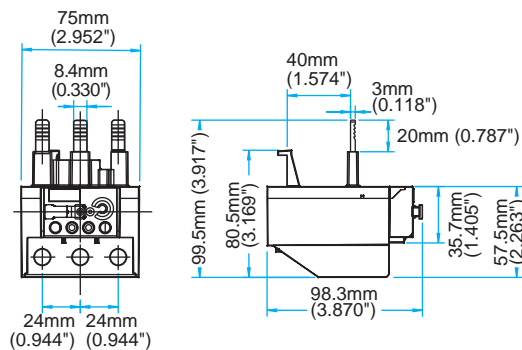
320-B3*** OR 320-B4***



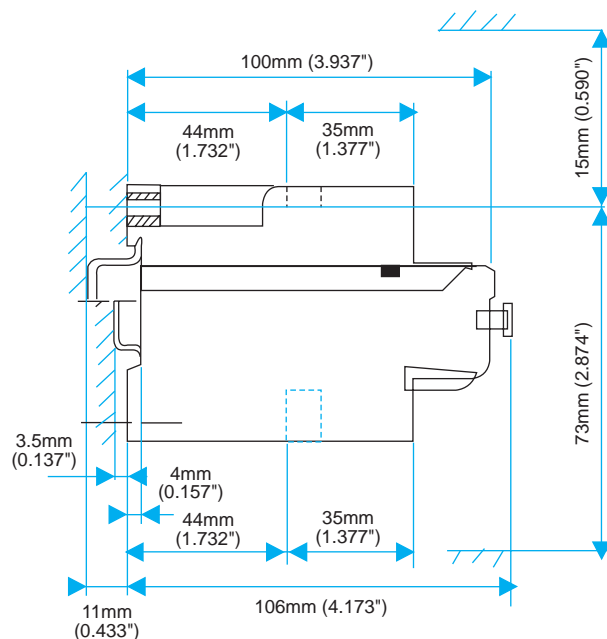
320-B3*** OR 320-B4*** WITH
SEPARATE MOUNTING ADAPTER
320-BSMA4



320-B5***



320-B5*** WITH SEPARATE
MOUNTING ADAPTER
320-BSMA5



IT'S EASY TO BUILD YOUR OWN SELECTOR SWITCH

Simply pick the code number from each of the sections below and combine them to build your part number. See page 1 for more detailed directions.

Selector Switches

I II - III IV V

Example: To build one of our most popular Selector Switches, the part number would be **I + II + III + IV + V** or **22SS3AC-XHBK**



I. BASIC SELECTOR SWITCH OPERATOR FUNCTION

CODE	POS./FUNCTION	LIST
22SS2	2/Maintained	\$10.00
22SRL	2/Spring Return, R to L	\$13.00
22SS3	3/Maintained	\$10.00
22SAC	3/Spring Return, L & R to C	\$13.00
22SLC	3/Spring Return, L to C	\$13.00
22SRC	3/Spring Return, R to C	\$13.00

Our 22mm Selector Switches come with integral contacts ready for field wiring.

HANDLE POSITIONS

2-POSITION



3-POSITION



II. CIRCUIT DESIGNATION BASED ON OPERATOR FUNCTION

2-POSITION CONTACT BLOCK CIRCUIT DESIGNATION

HANDLE POSITION

CODE	LEFT	RIGHT	LIST
G	X	O	\$ 6.00
H	O	X	\$ 6.00
GH	X	O	\$11.00
	O	X	
GG	X	O	\$11.00
	X	O	
HH	O	X	\$11.00
	O	X	

3-POSITION CONTACT BLOCK CIRCUIT DESIGNATION

HANDLE POSITION

CODE	LEFT	CENTER	RIGHT	LIST
AB	X	O	O	\$11.00
	O	X	O	
AC	X	O	O	\$11.00
	O	O	X	
AD	X	O	O	\$12.00
	X	O	X	
AF	X	O	O	\$12.00
	X	X	O	
BC	O	X	O	\$11.00
	O	O	X	
BD	O	X	O	\$12.00
	O	X	X	
BF	O	X	O	\$12.00
	X	X	O	
CD	O	O	X	\$12.00
	O	X	X	
CE	O	O	X	\$12.00
	X	O	X	
DE	O	X	X	\$12.00
	X	O	X	
DF	O	X	X	\$12.00
	X	X	O	
EF	X	O	X	\$12.00
	X	X	O	

O = OPEN X = CLOSED

III. CLAMP RING

CODE	DESCRIPTION	LIST
X	Polyester (Type 4X)	—
M	Aluminum (Type 4)	\$2.00

IV. HANDLE TYPE

CODE	DESCRIPTION	LIST
H	Standard	\$5.00
L	Lever	\$5.00
G	Guarded*	\$8.00

*NOTE: Only available with a polyester clamp ring.

V. HANDLE/INSERT COLOR

CODE	HANDLE COLOR	INSERT COLOR
BK	Black	White
BE	Blue	White
GN	Green	White
GY	Grey	White
RD	Red	White
WE	White	Black
YW	Yellow	Black

CONTACT BLOCKS ARE AVAILABLE TO ADD TO BASIC OPERATORS TO INCREASE THE NUMBER AND TYPE OF CONTACTS. UP TO THREE BLOCKS WITH TWO CIRCUITS EACH MAY BE ADDED GIVING A TOTAL OF EIGHT CONTACTS PER OPERATOR. BLOCKS SIMPLY SCREW ON THE BACK OF THE OPERATOR. REFER TO PAGE 220 FOR DETAILS.

DISCOUNT
SCHEDULE

B

MIX AND MATCH ANY COLOR AND SELECTOR SWITCH HANDLE



Standard

Standard

Standard

Standard

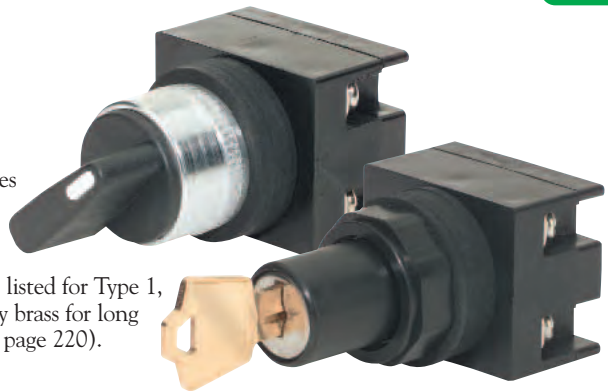
Standard

Lever

Guarded

22MM NEMA STANDARD & KEYED SELECTOR SWITCHES

With our unique universal cam design, c3controls 22mm NEMA Selector Switches offer multiple functions in a single device eliminating the need to install separate devices to perform individual functions based on contact block configuration. All operators feature polyester housings, are UL Listed, and are rated Type 4/4X as standard for watertight and corrosion resistance. In addition, operators are also listed for Type 1, 2, 3, 3R, 12 and 13, and meet global standards requirements. Keys are extra heavy brass for long life. Add-on contact blocks are available for up to eight circuits per operator (see page 220).



UNIQUE PRODUCT FEATURES

SAVE TIME & MONEY - WITH C3CONTROLS, ONE CAM DOES IT ALL!



1. One-Cam does it all vs. our competitors who need up to fifteen cams to perform the same function. This One-Cam design eliminates the need for multiple cam configurations and selector switch configuration nightmares, saving time, inventory, money, and ensuring 100% cam selection configuration accuracy.
2. Our revolutionary U-Cup seal is infused with a Teflon coating to eliminate cracking when exposed to harsh conditions such as heat, dryness and sunlight.
3. All frictional parts are molded with an internal self-lubricant to provide outstanding wear and smooth cam operations without troublesome greases used by others that attracts dust and other particles in the area.

ADD-ON CONTACT BLOCKS FOR 2 & 3-POSITION SELECTOR SWITCHES*

ADD-ON CONTACT BLOCK SELECTION FOR 3-POSITION SELECTOR SWITCHES					
CIRCUIT DESIG.	HANDLE POSITION			CONTACT BLOCK TYPE	LIST
	LEFT	CENTER	RIGHT		
A	X	O	O	22CBNO	\$ 6.00
B	O	X	O	22CBNC	\$ 6.00
C	O	O	X	22CBNO	\$ 6.00
D	O	X	X	22CBDB	\$ 8.00
E	X	O	X	22CBEM	\$ 8.00
F	X	X	O	22CBDB	\$ 8.00
AB	X	O	O	22CBNONC	\$11.00
	O	X	O		
AC	X	O	O	22CB2NO	\$11.00
	O	O	X		
AE	X	O	O	22CBNOEM	\$12.00
	X	O	X		
AF	X	O	O	22CBNODB	\$12.00
	X	X	O		
BC	O	X	O	22CBNONC	\$11.00
	O	O	X		
BD	O	X	O	22CBNCDB	\$12.00
	O	X	X		
BF	O	X	O	22CBNCDB	\$12.00
	X	X	O		
CD	O	O	X	22CBNODB	\$12.00
	O	X	X		
CE	O	O	X	22CBNOEM	\$12.00
	X	O	X		
DE	O	X	X	22CBDBEM	\$12.00
	X	O	X		
DF	O	X	X	22CB2DB	\$12.00
	X	X	O		
EF	X	O	X	22CBDBEM	\$12.00
	X	X	O		

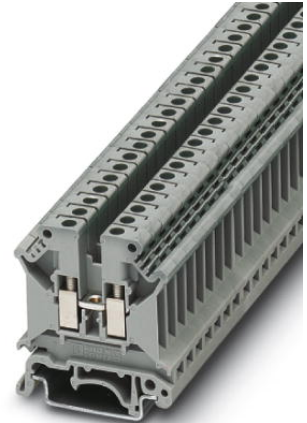
ADD-ON CONTACT BLOCK SELECTION FOR 2-POSITION SELECTOR SWITCHES				
CIRCUIT DESIG.	HANDLE POSITION		CONTACT BLOCK TYPE	LIST
	LEFT	RIGHT		
G	X	O	22CBNC	\$6.00
H	O	X	22CBNO	\$6.00
GH	X	O	22CBNONC	\$11.00
	O	X		
GG	X	O	22CB2NC	\$11.00
	X	O		
HH	O	X	22CB2NO	\$11.00
	O	X		

O = OPEN X = CLOSED

*Specify the Circuit Designation code(s) from the charts above when ordering add-on contact blocks for all types of 22mm NEMA selector switches. To include an add-on contact block in your part builder number, simply add a hyphen (-) after the completed number and then the circuit designation code desired. For multiple add-on contact blocks, place a hyphen between each additional code.

UK 5 N

Order No.: 3004362



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3004362>

Feed-through modular terminal block, Type of connection: Screw connection, Cross section: 0.2 mm² - 6 mm², AWG 24 - 10, Width: 6.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15, NS 32



Commercial data

GTIN (EAN)	4017918090760
sales group	A000
Pack	50 pcs.
Customs tariff	85369010
Weight/Piece	0.00922 KG
Catalog page information	Page 343 (CL-2009)

Product notes

WEEE/RoHS-compliant since:
01/01/2003



<http://www.download.phoenixcontact.com>
Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads.

Technical data

General

Number of levels	1
Number of connections	2
Color	gray

Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	42.5 mm
Height NS 35/7,5	47 mm
Height NS 35/15	54.5 mm
Height NS 32	52 mm

Technical data

Maximum load current	41 A (with 6 mm ² conductor cross section)
Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I _N	32 A
Nominal voltage U _N	800 V
Open side panel	ja

Connection data

Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section stranded min.	0.2 mm ²
Conductor cross section stranded max.	4 mm ²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	10
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²

2 conductors with same cross section, stranded min.	0.2 mm ²
2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Cross-section with insertion bridge, solid max.	4 mm ²
Cross-section with insertion bridge, stranded max.	4 mm ²
Type of connection	Screw connection
Stripping length	8 mm
Internal cylindrical gage	A4
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals



Certification

ABS, BV, CB, CCA, CSA, CUL, DNV, GL, GOST, KEMA, KR, LR, NK, PRS, RS, UL

Certification Ex:

CUL-EX, FM, GL-EX, IECEx, KEMA-EX, UL-EX

CSA

Nominal voltage U_N	600 V
Nominal current I_N	40 A
AWG/kcmil	28-10

CUL

Nominal voltage U_N	600 V
Nominal current I_N	30 A
AWG/kcmil	30-10

UL

Nominal voltage U_N	600 V
Nominal current I_N	30 A
AWG/kcmil	30-10

Accessories

Item	Designation	Description
------	-------------	-------------

Assembly

3003224	ATP-UK	Partition plate, Length: 56 mm, Width: 1.5 mm, Height: 59 mm, Color: gray
3022218	CLIPFIX 35	Snap-on end bracket, for 35 mm NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 8 and ZB 8/27, terminal strip marker KLM 2 and KLM, width: 9.5 mm, color: gray
3003020	D-UK 4/10	End cover, Length: 42.5 mm, Width: 1.8 mm, Height: 35.9 mm, Color: gray
1201442	E/UK	End clamp, for assembly on NS 32 or NS 35/7,5 DIN rail
1024014	EA 5	Single covers, color: transparent
1024085	EA 5-WS	Single covers, for covering one terminal block, with black symbol (lightning flash) snap fit, color: transparent/yellow
0201595	FB-150 METER	Cross connection rail, for fixed bridging of identical inputs and outputs, made of Cu, nickel-plated, 1 m long
1201028	NS 32 AL UNPERF 2000MM	G rail 32 mm (NS 32)
1201280	NS 32 CU/120QMM UNPERF 2000MM	G-profile DIN rail, deep-drawn, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201358	NS 32 CU/35QMM UNPERF 2000MM	G-profile DIN rail, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201002	NS 32 PERF 2000MM	G-profile DIN rail, material: Steel, perforated, height 15 mm, width 32 mm, length 2 m
1201015	NS 32 UNPERF 2000MM	G-profile DIN rail, material: Steel, unperforated, height 15 mm, width 32 mm, length 2 m
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: Steel, galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m

1201730	NS 35/15 PERF 2000MM	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
0204110	STL 10N/5N	Step bracket, Color: aluminum
0204107	STL 35/ 5	Step bracket, Color: white aluminum
1302215	TS-K	Separating plate, Length: 22.7 mm, Height: 30.5 mm, Color: gray
2303608	ZSR	Distance piece, metal, for branches of FB-150, with screw and thrust washer
0200017	ZSR-EX	Distance piece, metal, for branches of FB-150, with screw and thrust washer

Bridges

0201155	EB 2- 6	Insertion bridge, Number of positions: 2, Color: gray
0201142	EB 3- 6	Insertion bridge, Number of positions: 3, Color: gray
0201139	EB 10- 6	Insertion bridge, Number of positions: 10, Color: gray
0201456	FB 2- 6-EX	Fixed bridge, Number of positions: 2, Color: aluminum
0201469	FB 3- 6-EX	Fixed bridge, Number of positions: 3, Color: aluminum
0201029	FB 5- 6	Fixed bridge, Number of positions: 5, Color: aluminum
0201184	FB 10- 6	Fixed bridge, Number of positions: 10, Color: aluminum
0201281	FB 10- 6-EX	Fixed bridge, Number of positions: 10, Color: aluminum
0201524	FB 100- 6	Fixed bridge, Number of positions: 100, Color: aluminum
0203438	FBI 2- 6	Fixed bridge, Number of positions: 2, Color: aluminum
0203250	FBI 10- 6	Fixed bridge, Number of positions: 10, Color: silver
0201650	FBI 100- 6	Fixed bridge, Number of positions: 100, Color: aluminum
0201867	FBI 20- 6	Fixed bridge, Number of positions: 20, Color: aluminum
1302338	IS-K 4	Bridge bar isolator, Color: gray
0301505	ISSBI 10- 6	Bridge bar isolator, Number of positions: 10, Color: silver
0201485	KB- 6-EX	Chain bridge, Number of positions: 1, Color: silver
0202280	LB 10-6 BU	Jumper, Number of positions: 10, Color: blue
0202358	LB 10-6 GY	Jumper, Number of positions: 10, Color: gray
0202293	LB 10-6 RD	Jumper, Number of positions: 10, Color: red
0202303	LB 100-6 BU	Jumper, Number of positions: 100, Color: blue
0202345	LB 100-6 GY	Jumper, Number of positions: 100, Color: gray
0202316	LB 100-6 RD	Jumper, Number of positions: 100, Color: red
2303239	USBR 2-7	Switching jumper, Color: silver

2305538	USBRJ 2-7	Switching jumper, Number of positions: 2, Color: silver
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Marking

1007222	SBS 6:UNBEDRUCKT	Marker cards for modular terminal blocks, color: white
1004115	WS 3- 6	Warning plate, with 2 plastic screws, across 3 terminal blocks, pitch 6 mm
1004209	WS 4- 6	Warning plate, with 2 plastic screws, across 4 terminal blocks, pitch 6 mm
1004403	WS 5- 6	Warning plate, with 2 plastic screws, across 5 terminal blocks, pitch 6 mm
1050499	ZB 6:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

Plug/Adapter

0309523	KSS 3- 6	Short circuit connector, Number of positions: 3, Color: black
0301547	KSS 6	Short circuit connector, Number of positions: 2, Color: black
0201744	MPS-MT	Metal part
3001132	PS-UK 2,5 B/E	Test plugs, Color: red
3001239	PS-UK 2,5 B/Z-6	Test plugs, Color: red
3001462	PS-UK 3-5/Z-6	Test plug
0601292	PSB 3/10/4	Female test connector, Color: silver
0201304	PSBJ 3/13/4	Female test connector, Color: silver
0201647	RPS	Reducing plug, Color: gray

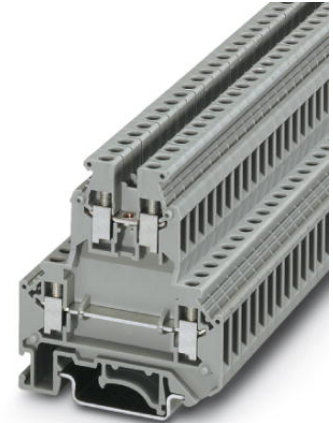
Diagrams/Drawings

Circuit diagram




UKK 5

Order No.: 2774017

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=2774017>

Double-level terminal block, Cross section: 0.2 mm² - 4 mm²,
AWG: 24 - 12, Connection type: Screw connection, Width: 6.2 mm,
Color: gray, Mounting type: NS 35/7.5, NS 35/15, NS 32

Commercial data

GTIN (EAN)	 4 017918 068301
sales group	A210
Pack	50 pcs.
Customs tariff	85369010
Catalog page information	Page 357 (CL-2009)

Product notes

WEEE/RoHS-compliant since:
01/01/2003



[http://
www.download.phoenixcontact.com](http://www.download.phoenixcontact.com)
Please note that the data given
here has been taken from the
online catalog. For comprehensive
information and data, please refer
to the user documentation. The
General Terms and Conditions of
Use apply to Internet downloads.

Technical data**General**

Number of levels	2
Number of connections	4
Color	gray

Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	56 mm
Height NS 35/7.5	62 mm
Height NS 35/15	69.5 mm
Height NS 32	67 mm

Technical data

Rated surge voltage	6 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current I_N	32 A
Nominal voltage U_N	500 V

Connection data

Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	4 mm ²
Conductor cross section stranded min.	0.2 mm ²
Conductor cross section stranded max.	4 mm ²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	12
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²

2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	1.5 mm ²
Cross-section with insertion bridge, solid max.	4 mm ²
Cross-section with insertion bridge, stranded max.	2.5 mm ²
Type of connection	Screw connection
Stripping length	8 mm
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals



Certification

CCA, CSA, CUL, DNV, GL, GOST, KEMA, PRS, RS, UL

Accessories

Item	Designation	Description
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Assembly

2778521	ATP-UKK 3/5	Partition plate, Length: 64 mm, Width: 2.5 mm, Height: 67 mm, Color: gray
3022218	CLIPFIX 35	Snap-on end bracket, for 35 mm NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 8 and ZB 8/27, terminal strip marker KLM 2 and KLM, width: 9.5 mm, color: gray
2770024	D-UKK 3/5	End cover, Length: 56 mm, Width: 2.5 mm, Height: 62 mm, Color: gray
2770817	DG-UKK 3/5	End cover, Length: 56 mm, Width: 2.5 mm, Height: 62 mm, Color: gray

2770794	DP-UKK 3/5	Spacer plate, Length: 56 mm, Width: 2.5 mm, Height: 66.5 mm, Color: gray
1201413	E/UK 1	End clamps, for supporting the ends of double-level and three-level terminal blocks, width: 10 mm, color: gray
0201595	FB-150 METER	Cross connection rail, for fixed bridging of identical inputs and outputs, made of Cu, nickel-plated, 1 m long
1201028	NS 32 AL UNPERF 2000MM	G rail 32 mm (NS 32)
1201280	NS 32 CU/120QMM UNPERF 2000MM	G-profile DIN rail, deep-drawn, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201358	NS 32 CU/35QMM UNPERF 2000MM	G-profile DIN rail, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201002	NS 32 PERF 2000MM	G-profile DIN rail, material: Steel, perforated, height 15 mm, width 32 mm, length 2 m
1201015	NS 32 UNPERF 2000MM	G-profile DIN rail, material: Steel, unperforated, height 15 mm, width 32 mm, length 2 m
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801733	NS 35/ 7,5 PERF 2000MM	DIN rail, material: Steel, galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201756	NS 35/15 AL UNPERF 2000MM	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 PERF 2000MM	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNPERF 2000MM	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
2770215	TS-KK 3	Separating plate, Length: 14 mm, Height: 16 mm, Color: gray

Bridges

0201155	EB 2- 6	Insertion bridge, Number of positions: 2, Color: gray
0201142	EB 3- 6	Insertion bridge, Number of positions: 3, Color: gray
0201139	EB 10- 6	Insertion bridge, Number of positions: 10, Color: gray
0203250	FBI 10- 6	Fixed bridge, Number of positions: 10, Color: silver
0201650	FBI 100- 6	Fixed bridge, Number of positions: 100, Color: aluminum
0201867	FBI 20- 6	Fixed bridge, Number of positions: 20, Color: aluminum
1302338	IS-K 4	Bridge bar isolator, Color: gray
0301505	ISSBI 10- 6	Bridge bar isolator, Number of positions: 10, Color: silver

0202280	LB 10-6 BU	Jumper, Number of positions: 10, Color: blue
0202358	LB 10-6 GY	Jumper, Number of positions: 10, Color: gray
0202293	LB 10-6 RD	Jumper, Number of positions: 10, Color: red
0202303	LB 100-6 BU	Jumper, Number of positions: 100, Color: blue
0202345	LB 100-6 GY	Jumper, Number of positions: 100, Color: gray
0202316	LB 100-6 RD	Jumper, Number of positions: 100, Color: red
1413230	SBRN 2-7	Switching jumper, Color: silver
2303239	USBR 2-7	Switching jumper, Color: silver
2305538	USBRJ 2-7	Switching jumper, Number of positions: 2, Color: silver

Marking

1007222	SBS 6:UNBEDRUCKT	Marker cards for modular terminal blocks, color: white
1004115	WS 3- 6	Warning plate, with 2 plastic screws, across 3 terminal blocks, pitch 6 mm
1004209	WS 4- 6	Warning plate, with 2 plastic screws, across 4 terminal blocks, pitch 6 mm
1004403	WS 5- 6	Warning plate, with 2 plastic screws, across 5 terminal blocks, pitch 6 mm
1050499	ZB 6:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

Plug/Adapter

0309523	KSS 3- 6	Short-circuit connector, Number of positions: 3, Color: black
0301547	KSS 6	Short-circuit connector, Number of positions: 2, Color: black
3000625	PS-UKK 5	Test plugs, Color: red
3000641	PS-UKK/E	Test plugs, Color: red
0601292	PSB 3/10/4	Female test connector, Color: silver
0201304	PSBJ 3/13/4	Female test connector, Color: silver
0201647	RPS	Reducing plug, Color: gray

USLKG 5

Order No.: 0441504



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=0441504>

Ground terminal block with screw connection, cross section: 0.2 - 4 mm², AWG: 24 - 10, width: 6.2 mm, color: Green-yellow

Commercial data

EAN	4017918002190
Pack	50 Pcs.
Customs tariff	85369010
Weight/Piece	0.02081 KG
Catalog page information	Page 281 (CL-2007)

Product notes

WEEE/RoHS-compliant since:
01/15/2005



<http://www.download.phoenixcontact.com>
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Technical data

General

Note	When aligning with a feed-through terminal block with the same shape, an end cover must be interposed with insulation voltages of > 690 V
Number of levels	1
Number of connections	2

Color	green-yellow
Insulating material	PA
Inflammability class acc. to UL 94	V0

Dimensions

Width	6.2 mm
Length	42.5 mm
Height NS 35/7,5	47 mm
Height NS 35/15	54.5 mm
Height NS 32	52 mm

Technical data

Rated surge voltage	8 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-2
Open side panel	nein

Connection data

Conductor cross section solid min.	0.2 mm ²
Conductor cross section solid max.	6 mm ²
Conductor cross section stranded min.	0.2 mm ²
Conductor cross section stranded max.	4 mm ²
Conductor cross section AWG/kcmil min.	24
Conductor cross section AWG/kcmil max	10
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule without plastic sleeve max.	4 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.25 mm ²
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm ²
2 conductors with same cross section, solid min.	0.2 mm ²
2 conductors with same cross section, solid max.	1.5 mm ²
2 conductors with same cross section, stranded min.	0.2 mm ²

2 conductors with same cross section, stranded max.	1.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, min.	0.5 mm ²
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	2.5 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, min.	0.25 mm ²
2 conductors with same cross section, stranded, ferrules without plastic sleeve, max.	1.5 mm ²
Type of connection	Screw connection
Stripping length	8 mm
Screw thread	M3
Tightening torque, min	0.6 Nm
Tightening torque max	0.8 Nm

Certificates / Approvals



Certification

ABS, BV, CCA, CSA, CUL, DNV, GOST, KEMA, KR, LR, PRS, RS, UL

Certification Ex:

IECEX, KEMA-EX

CSA

AWG/kcmil	28-10
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CUL

AWG/kcmil	26-10
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UL

AWG/kcmil	26-10
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Accessories

Item	Designation	Description
Assembly		
1201028	NS 32 AL UNPERF 2000MM	G rail 32 mm (NS 32)


E/NS 35 N

Order No.: 0800886

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=0800886>

End clamp, width: 9.5 mm, color: gray

Commercial data

GTIN (EAN)	 4 017918 129309
sales group	B220
Pack	50 pcs.
Customs tariff	39269097
Catalog page information	Page 318 (NTK-2010)

Product notesWEEE/RoHS-compliant since:
02/01/2005

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www.download.phoenixcontact.com](http://www.download.phoenixcontact.com)
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here has been taken from the
online catalog. For comprehensive
information and data, please refer
to the user documentation. The
General Terms and Conditions of
Use apply to Internet downloads.

Technical data**General data**

Height	32.8 mm
Length	48.6 mm
Width	9.5 mm
Material	PA
Color	gray

Q-Series Miniature Circuit Breakers



Product Type		QL	QY	QZ	QDC
Standard Ampere Ratings (A)			0.1 – 63 (1 pole)	0.1 – 60 (UL 1077)	0.1 – 63 (1 pole)
			0.1 – 50 (2 poles)	5 – 50 (IEC 60947-2)	0.1 – 50 (2 poles)
		0.1 – 25	20 – 100 (2p parallel)		20 – 100 (2p parallel)
			110 – 150 (3p parallel)		110 – 150 (3p parallel)
Number of Poles		1, 2, 3, 1+N, 3+N	1, 2	1, 2, 3, 1+N, 3+N	1, 2
			2, 3p parallel		2, 3p parallel
					2 poles in series
					2 poles in series
Rated Voltage (V)		120V AC (1p)	80V DC	120V AC (1p)	80V DC
		120/240V AC(2p)	125V DC (1, 2p & 2p parallel)	240V AC (1p)	125V DC (1, 2p & 2p parallel)
		240V AC (1p)	Polarity sensitive	240/415V AC (2, 4p)	250V DC (2p in series)
		240/415V AC 2, 4p)		277V AC (1p)	Polarity sensitive
Approvals & Interrupt. Capacity (kA)	VDE (EN 60947-2)	6kA (240/415V AC)	10kA	3kA (240/415V AC)	10kA
	CE	✓	✓	✓	✓
	cULus (UL489_CSA)	10kA (120/240V AC)			
	UL489A	✓	10kA		
Mounting Options	cURus (UL1077_CSA)	✓		5kA (1p, 120V ac)	
				5kA (277/480V ac)	
	Dual Mounting (DIN & Mini)	✓	✓	✓	✓
	DIN Rail	✓	✓	✓	✓
Tripping curves	Surface Clip	✓	✓	✓	✓
	Plug-in		✓		✓
Resistance to shock		I, 9, KM	OP, U2, I, 9	I, 2, 3, 9	OP, U2, I, 9
Vibration			IEC 60068-2-27, 5G/30ms half sine wave		
Operating temperature			IEC 77/IEC 60068-2-6, 3G/10-150Hz		
Optional Accessories			-40°C to +65°C		
Features		– Aux. switch		– Trip alarm	
		– Aux. switch + trip alarm		– Bus bar	
		– Handle lock			
		– Compact 13mm/module width		– Hydraulic-magnetic technology	
		– Precision tripping		– Suitable for isolation	
		– Temperature independent trip point		– Mid trip handle	

Q-Series Miniature Circuit Breakers

Features



QL

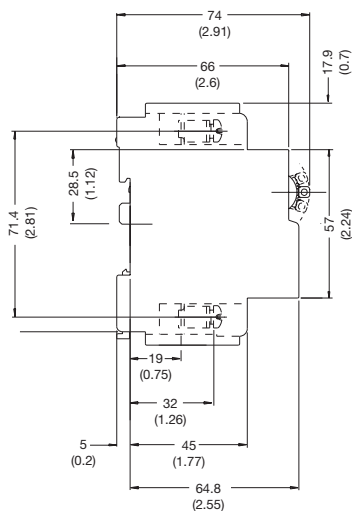
- AC circuit breaker
- UL 489 Listed
- VDE, CSA, CE Approved
- One and two pole units
- Current ratings up to 25A

QY

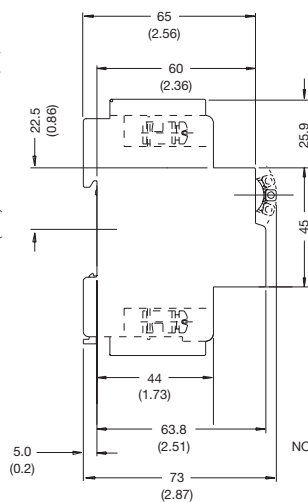
- DC circuit breaker
- UL 489A listed
- VDE & CE Approved
- One and two pole units
- Current ratings up to 150A
- 80V dc & 125V DC

QDC

- DC circuit breaker
- VDE and CE Approved
- One and two pole units
- Current ratings up to 150A
- 80V DC 125V DC and 250V DC (250V DC 2 poles in series)



DUAL MOUNT



DIN RAIL MOUNT

NOTE: DIMENSIONS IN BRACKETS ARE IN "INCHES"

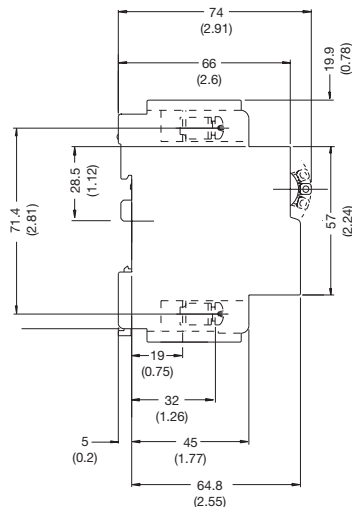
QY/QDC, 2 & 3 POLES
BRIDGED IN PARALLEL

Features

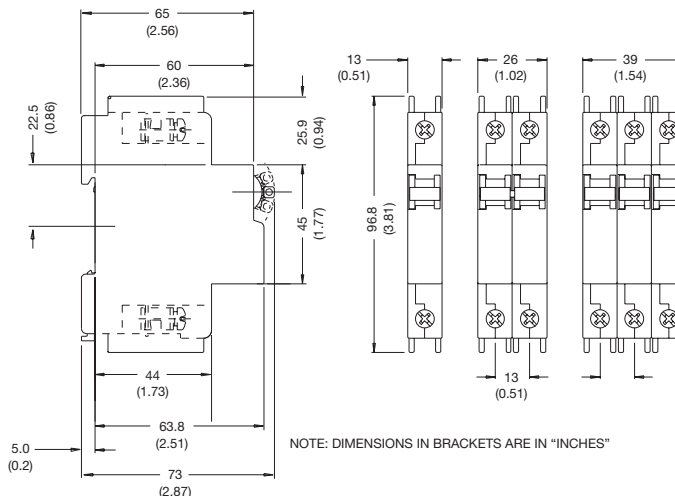


QZ

- AC circuit breaker
- UL 1077 Recognized
- VDE, CE, CSA certified
- One, two and three pole units
- Current ratings up to 60A



DUAL MOUNT



DIN RAIL MOUNT

NOTE: DIMENSIONS IN BRACKETS ARE IN "INCHES"

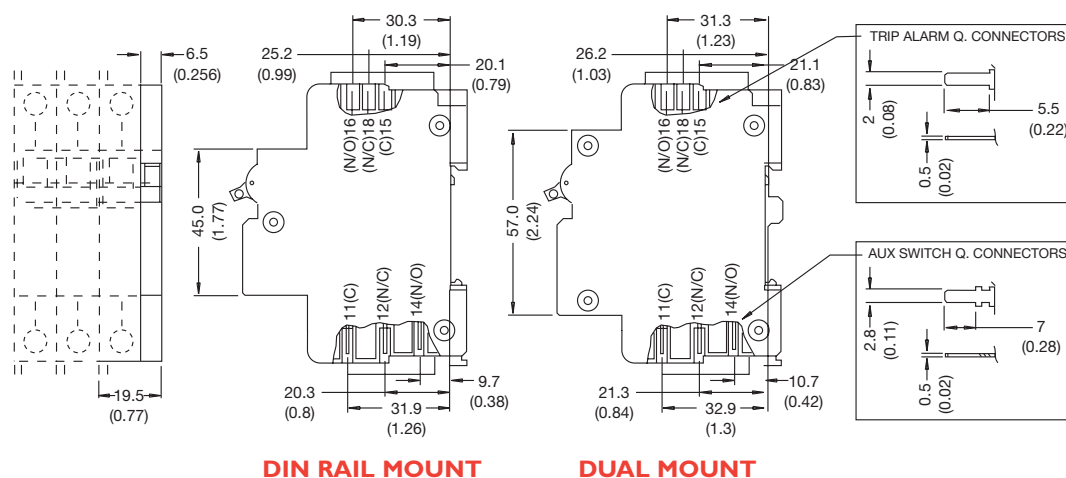
Q-Series Miniature Circuit Breakers

Features

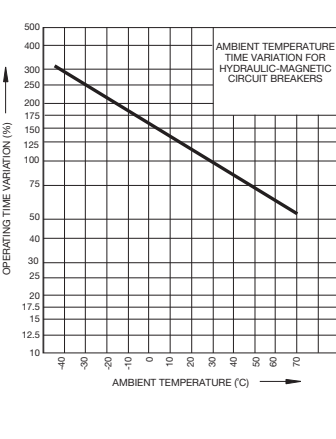
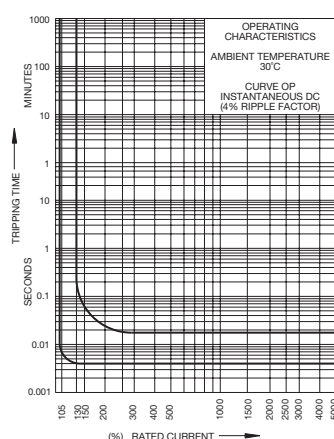
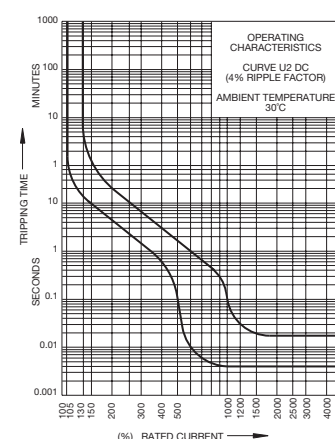
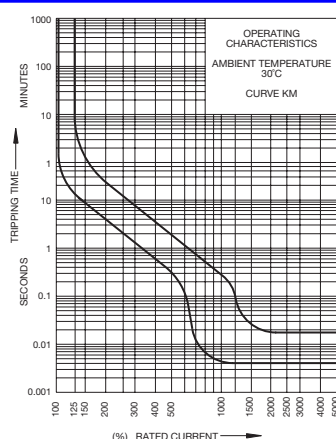
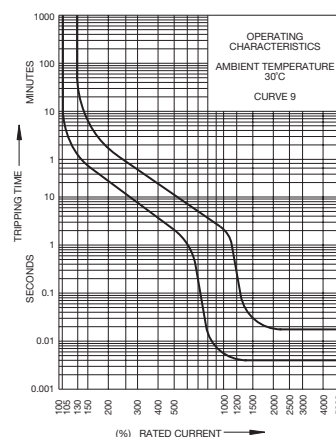
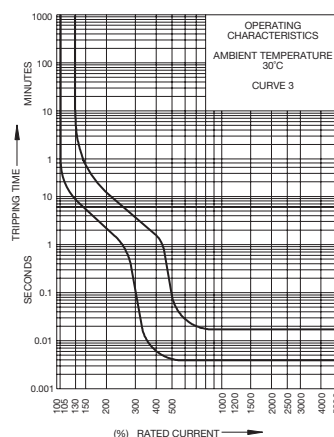
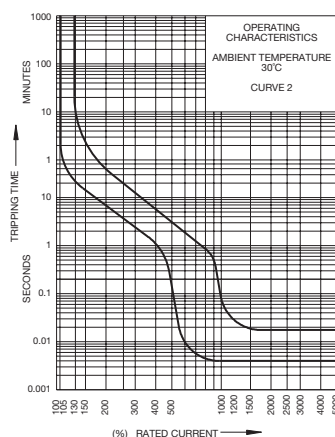
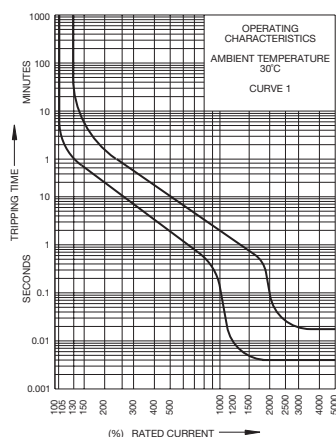


Auxiliary switch, Trip alarm, Combo

- AC and DC voltages
- UL 489 listed
(5A, 250V AC; 0.5A, 80V DC Auxiliary; 0.5A, 125V DC Trip alarm)
- IEC 60947-5-1 approved
(5A, 250V AC; 0.5A, 110V DC Auxiliary; 0.5A, 125V DC Trip alarm)
- Factory fitted
- Compact 6.5mm width
- Attached to right hand side of circuit breaker
- Available on Dual and DIN rail mounting



Standard Time Delay Curves



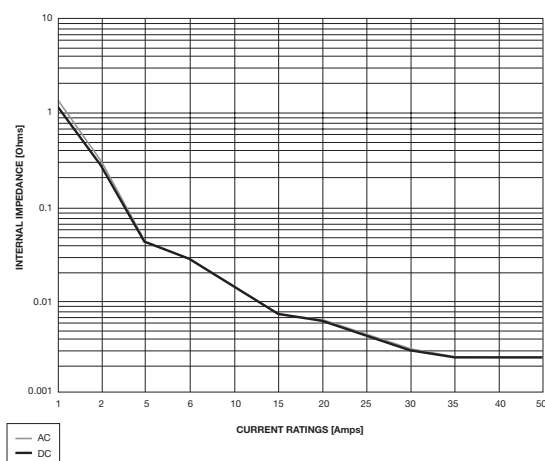
Q-Series Miniature Circuit Breakers

Long Code

Long Code			
Group 1: Frame Type	Code	Frequency	Approvals
	QL	AC	UL 489
	QY	DC	UL489A,VDE, CE
	QZ	AC	CURus,VDE,CE
	QDC	DC	EN 60947-2, CE
Group 2:	Code	Description	Comments
	N	Neutral	Leave blank if not applicable
	S	Switch	
Group 3: Auxiliary	Code	Description	Comments
	A	Auxiliary Switch	Leave blank if not applicable
	T	Trip Alarm	
	AT	Auxiliary Switch + Trip Alarm	
Group 4: Number of Poles	Code	Description	Comments
	1	Single Pole	
	2	Double Pole	
	3	Triple Pole	
	4	Four Pole	
Group 5: Module width	Code	Description	Comments
	13	13mm	
	18	18mm	
	19	19.5mm	
	26	26mm	
Group 6: Mounting	Code	Description	Comments
	D	DIN – 45mm Escutcheon	
	DM	Dual Mount – DIN & Mini-Rail, 57mm Escutcheon	
	PI	Plug-in, DIN	
	P2	Plug-in, Dual Mount	
Group 7: Time Delays	Code	Description	Comments
	1	Curve 1	
	2	Curve 2	
	3	Curve 3	
	9	Curve 9	
	U2	Curve U2	
	KM	Curve KM	
	OP	Instantaneous	
Group 8: Current Ratings	Code	Description	Comments
	0.1	0.1A	
	0.2	0.2A	
	0.5	0.5A	
	01	1A	
	1.5	1.5A	
	02	2A	
	2.5	2.5A	
	03	3A	
	04	4A	
	05	5A	
	06	6A	
	10	10A	
	15	15A	
	16	16A	
	20	20A	
	25	25A	
	30	30A	
	32	32A	
	35	35A	
	40	40A	
	45	45A	
	50	50A	
	60	60A	
	63	63A	
	70	70A	
	80	80A	
	100	100A	
	125	125A	
	150	150A	
Group 9:	Code	Description	Comments
	B0	80V DC Bottom Connected (Positive at bottom)	Leave blank if not applicable
	B1	125V DC Bottom Connected (Positive at bottom)	
	B2	250V DC Bottom Connected (Positive at bottom)	
	Z	DC – Bridged (Link not supplied)	

Example codes: **QY-1(13)-D-U2-20A-B1**
QDC-2(13)-DM-U2-50A-B2
QL-A-2(13)-D-9-25A
QZ-N-AT-4(13)-DM-60A

INTERNAL IMPEDANCE vs CURRENT RATING



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