PROJECT SUBMITTAL:
2012600550-0-700-001

DATE:
09/19/12

DISTRIBUTOR:
MACAULAY CONTROLS CO.

PURCHASE ORDER #:
8827

PROJECT NAME:
NHCRWA

EQUIPMENT:
(QTY.1) AMMONIA ANALYZER PACKAGE

(QTY.1) CHLORINE & REDOX ANALYZER SYSTEM

1

GENERAL INFORMATION

PROMINENT WARRANTY
START-UP & INSTALLATION GUIDELINES
PUMP SELECTION TIPS
TROUBLESHOOTING GUIDELINES

2

AMMONIA ANALYZER PACKAGE

AEGIS CONTROLLER: AGIA0OPOO0PX00000SMO
DULCOMARIN CONTROLLER: DXCAW061MAPDEN01
DXMA A MODULE: DXMAAW2DEN01
DXMA M MODULE: DXMAMW0DEN01
DXMA I MODULE: DXMAIW0DEN01
DXMA N MODULE: DXMANW0DEN01
AMMONIA SENSOR: SERIES 201040 P/N: 1035557
PH ELECTRODE: PHEF-012-SE P/N: 1010511
CHLORINE SENSOR: CTE 1-CAN-10PPM P/N: 1023427
REDOX SENSOR: RHE-PT-SE P/N: 150094
RESISTANT THERMOMETER P/N: 305063
DGMA400T000
ACCUDRAW PVC CALIBRATION COLUMN
ASAHI PVC/VITON TYPE 21 BALL VALVES
THROTTLE MASTER NEEDLE VALVE
ASAHI PVC/VITON LABCOCK
PVC PRESSURE REGULATOR
SPEARS SCH.80 PVC PIPING & FITTINGS

3

CHLORINE & REDOX ANALYZER PACKAGE

DMTAW090R10E0020
DMTAAW090C10E0020
ORP SENSOR P/N: 1002534
TOTAL CHLORINE SENSOR P/N: 1007540
DGMA400T000
DGMA411T010
THROTTLE MASTER NEEDLE VALVE
ASAHI PVC/VITON LABCOCK
PVC PRESSURE REGULATOR
SPEARS SCH.80 PVC PIPING & FITTINGS

4

DRAWINGS

MECHANICAL DRAWING #: 2012600550-B-200-001
MECHANICAL DRAWING #: 2012600550-0-201-001
MECHANICAL DRAWING #: 2012600550-0-202-001

ProMinent Warranty

1) WARRANTY, REMEDY, DISCLAIMER: The warranties set out in this clause shall be conditional upon fulfillment of the Purchaser's contractual obligations, including all terms of payment. For sales of completed pumps and controllers, the warranty shall be conditional upon the Purchaser completing and returning the attached Warranty Validation Card. Seller warrants that the Drive Units and DULCOMETER Controllers will be of good workmanship and material for two (2) years from the date of purchase by owner of new equipment from an authorized distributor of manufacturer, but no longer than two and one-half (2-1/2) years from the date of shipment by manufacturer. All Dulcotest sensors are warranted for (6) months from the date of shipment by manufacturer. For sales of liquid ends, Bello Zon, Bono Zon, pump accessories, standard engineered products, custom designed items and items not manufactured by ProMinent, Seller warrants that the products will be of good workmanship and material for one (1) year from the date the goods are shipped by Seller. If purchaser claims that the goods are defective, he must permit Seller's personnel at Seller's option to inspect the goods on Purchaser's property. Purchaser shall not return the goods to Seller unless Purchaser obtains prior written approval of such from Seller. If, after inspection, Seller determines that the goods are defective, Seller will repair or replace goods at Seller's option and at Seller's cost. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED AND STATUTORY INCLUDING THE WARRANTIES OF FITNESS FOR PURPOSE AND MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. The warranty provided for herein shall not apply to any goods that become defective for the following reason:

(a) unsuitable or unreasonable use
(b) faulty assembly, installation or servicing by the Purchaser or any third party
(c) faulty or careless handling

2) DISCLAIMER OF TORT LIABILITY: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT SELLER SHALL NOT BE LIABLE IN TORT, WHETHER BASED ON NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF TORT LIABILITY, FOR ANY ACTION OR FAILURE TO ACT IN RESPECT TO THE MANUFACTURE, PREPARATION FOR SALE, OR DELIVERY OF THE GOODS. IT IS THE PARTIES' INTENT AND THE INTENT OF THIS PARAGRAPH TO ABSOLVE AND PROTECT SELLER FROM ANY AND ALL TORT LIABILITY.

3) EXCLUSIVE REMEDY: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT PURCHASER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, TORTIOUS CONDUCT OR ANY OTHER CAUSE OF ACTION AGAINST SELLER SHALL BE THE REMEDY PROVIDED IN PARAGRAPH TWO (2) ABOVE.

4) EXCLUSION OF CONSEQUENTIAL DAMAGES: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT UNDER NO CIRCUMSTANCES WILL SELLER BE LIABLE TO PURCHASER FOR ECONOMIC, SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES OF ANY KIND WHATSOEVER, INCLUDING BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS AND ANY OTHER LOSS CAUSED BY REASON OF THE NON-OPERATION OF THE GOODS. THIS EXCLUSION IS APPLICABLE TO CLAIMS FOR BREACH OF WARRANTY, TORTIOUS CONDUCT OR ANY OTHER CAUSE OF ACTION AGAINST SELLER.

5) ALL TERMS AND CONDITIONS OF SALE CONTAINED IN SELLER'S ACKNOWLEDGMENT/OFFER TO SELL APPLY AND ARE IN NO WAY ALTERED BY THIS WARRANTY VALIDATION CARD.

ProMinent Fluid Controls
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
(412)787-2484

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

SITE DELIVERY AND STORAGE CHECKLIST

1. **Check packing list for completeness and note any missing items immediately.**

2. **The skid may have been jarred during shipping. Inspect equipment and shipping container for damage before accepting delivery. Make note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping container until your system is started up.**

3. **Store equipment on firm level surface in original packing container. Do not store equipment where it may be exposed to extreme temperatures, precipitation, humidity, or dust. Avoid direct sunlight that could overheat and damage equipment.**

WARNING – PUMPS MAY BE FILLED WITH OIL WHICH COULD LEAK IF TILTED

Ambient Conditions for storage and transport:

Temperature:	**14°F to 120°F**
Air humidity:	**max. 95% relative humidity, non-condensing**

Please call if you have questions.

ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

PRE-INSTALLATION CHECKLIST

1. **Mount equipment on hard flat level surface. Stainless steel or FRP angle may be used to fasten skids down.**

2. **Do not install equipment in areas of extreme heat, cold, dust or humidity. Avoid areas where objects or fluids can drop from overhead.**

3. **Install piping so connections properly meet skid termination points. Do not "stretch" field installed piping to meet skid termination points. Stressed plastic piping will fail!**

4. **Check the tightness on all unions. Hand tighten only - no tools. Unions incorporate an o-ring seal. Ensure that the o-ring is seated properly before tightening.**

5. **Check the piping for breakage. The skid may have been jarred during shipping.**

6. **Allow provisions for draining the system piping. Skid components will require maintenance. Ensure that chemicals can be evacuated from skid piping and components.**

7. **Do not down-size piping to or from system. Piping should be at least equal in diameter to piping on skid and one or two sizes larger for long runs.**

8. **Install suction line strainer if one was not included with your packaged system**

9. **Avoid getting dirt in piping during installation. Plug ends of piping with rags if construction activities are underway. All debris must be flushed from piping before system start-up.**

10. **Check electrical connections to be sure proper voltage is supplied to unit.**

Please call if you have questions.

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ProMinent® SYSTEMS
QUICK START GUIDE

1. **Pressure Relief Valves and Back Pressure Valves (PRV's/BPV's) are NOT pre-adjusted. ProMinent adjusts valves for QC purposes, but valves must be opened before shipping to allow water to be drained out.**

2. **The PRV's should be set no higher than the lowest rated component – typically the pump. In any case, do not exceed 150 psi with plastic piping. Tighten the PRV only with the a proper sized screwdriver or the furnished adjusting wrench. An improper adjustment tool will damage the valve adjustment screw.**

No extraordinary start-up procedures are required. However, the following steps are recommended. WEAR SAFETY GLASSES WHILE WORKING ON CHEMICAL FEED EQUIPMENT!

a. **Unions tagged with Red Tape are purposely loosened prior to shipping. Check ALL unions for tightness and insure O-ring is properly seated before tightening. DO NOT OVERTIGHTEN! Hand tighten initially, and if necessary, apply one-eighth to one-quarter turn with properly sized wrench. DO NOT OVERTIGHTEN!**

b. **Start the pumps in manual control mode with water – DO NOT APPLY SYSTEM PRESSURE. CHECK MOTOR ROTATION! (clockwise, looking down towards pump). Open oil vent, if applicable. Check for leaks.**

c. **Check pulsation dampener fastener bolts' torque and inflate dampeners before applying system pressure (~80% of System Pressure). Set BPV for at least 15 psi pressure. Set PRV for rated pressure of weakest link in system.**

d. **Run the system in manual mode with water. Build pressure. Check for leaks! Correct all leaks before introducing chemical into the system.**

e. **Familiarize yourself with controls, check functionality of instruments, and verify correct pump output.**

f. **Run the system in automatic mode with water. Verify functionality of alarms and safety devices. Verify correct pump output and functionality of instruments.**

g. **Run the system in automatic mode with chemicals. Allow system to build pressure and check for leaks.**

Please call if you have questions.

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Pump Selection, Accessories and Installation Tips

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When selecting, installing and operating a pump and accessories, the following guidelines should be followed:

When selecting a pump, make allowances for extra capacity and working pressure, especially if the *fluid viscosity* is higher than that of water (note: Capacities in manuals pertain specifically to water at fixed pressures).

If in doubt about the *chemical compatibility* of the liquid end materials, valves, valve balls, O-rings, suction and discharge lines and accessories, refer to the Chemical Resistance List (page 8).

For varying, *corrosive media*, the corrosiveness of which is unknown, select the highest rated PTFE (TT) version. For *abrasive fluids*, or for use in the *food processing* industry, select the stainless steel (SS) version if compatible with the media.

The site of the metering pump should be easily accessible. The metering pump should be protected against the risk of being damaged mechanically. *High ambient temperatures, radiating heat and direct sunlight* should be avoided, if possible.

The metering pump should be provided with a *power supply* of its own. If connected in parallel to other equipment, the metering pump should be switched on and off by separate contacts, e.g. by relays or contactors. If the metering pump is paced externally, the maximum input pulse rate should match the maximum stroking rate.

All pumps are *self-priming.* The suction lift varies between 5 and 20 ft. (1.5 and 6 m), depending on the pump type (refer to Technical Data). The reduced suction lift for media having a specific gravity (density) higher than 1 can be evaluated as follows:

$$\text{Effective suction lift (f)} = \frac{\text{Rated suction lift, water}}{\text{S.G.}}$$

Note: Suction lift decreases with high altitude. Contact factory for pump selection.

Accessories and tips. . .

– The suction line should be. . .

- as short as possible.
- sloping upwards to eliminate vapor pockets.

– The discharge line should have. . .

- a drain valve when corrosive media is to be handled.

Installation Tip:

- Draining is achieved by means of a tee and bleed valve, or an adjustable pressure relief valve in the discharge line.

– A foot valve with ball check valve, ceramic weight and strainer facilitates. . .

- priming.
- prevents loss of prime.
- protects the liquid end against coarse impurities.

Installation Tip:

- Must install vertically, slightly above the bottom of the tank; directly under pump taking pump maximum suction lift into account.

Note: Pump capacity is effected if not installed properly or if plugged.

– Postive suction head (flooded suction)

- Recommended with media which tend to develop gases.
- Recommended with media which has high viscosity.

Installation Tips:

- Degassing pump must be used on suction lift applications, not flooded suction.
- Metering pump can be located at and fed from the foot of the supply tank.

– A ball-check-type injection valve

- Prevents back flow.

Installation Tip:

- Should be at the end of the discharge line; Teflon injection valves are not spring-loaded and must be oriented vertically into bottom of pipe for ball to seat.

Note: Pumps will not give consistent results without backpressure; our injection valve provides minimum backpressure when pumping into atmosphere.

– Backpressure valve

- Adjustable spring tension on a diaphragm.
- Ensures accurate metering and prevents siphoning.

Installation Tips:

- Must be in the discharge line or mounted onto the pump in the following cases:
  - √ When the discharge head is negligible (open-end discharge).
  - √ The metering pump discharges into a vacuum system or the positive suction head exceeds the discharge head.

Note: At least 15 psig differential pressure is required to provide repeatability of metering.

– Pulsation dampener

- Bladder type cavity with pressure gauge.
- Required for very long discharge lines.
- Required when high-viscosity media are handled.
- Required when a smooth flow profile is required.

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Pump Selection and Installation Tips Cont. . .

Installation Tips:

- Should be as close to the pump as possible.
- Set pressure at 90% of discharge line pressure.
- No further than 12 inches from the metering pump discharge, in direction of flow.

Note: Backpressure valve is required at point of injection, downstream of pulsation dampener. Consult ProMinent for verifications when discharge lines are greater than 100 feet.

– Pressure relief valve

- In form of an adjustable backpressure valve or 3-port relief valve.
- Protects metering pump against "dead head" (pumping against a closed valve).

Installation Tip:

- Must be close to the pump, upstream of the backpressure valve, for system protection.

Application Suggestions:

- Where the discharge line is hard piped.
- When pumping into high pressures.
- Where the discharge line has several check valves installed.

Note: Recommended for all motor-driven pumps.

– Viscous fluids

- Require valve springs to ensure balls seat properly.

Installation Tips:

- Should be spring-loaded for viscous media.
- Operation at a greater stroke length is better than operation at a higher stroking rate.
- The suction piping should be sized up by one pipe size and a pulsation dampener used.
- Select PP4/PP5 series pumps with special liquid ends for extremely high viscosities. Positive suction recommended.

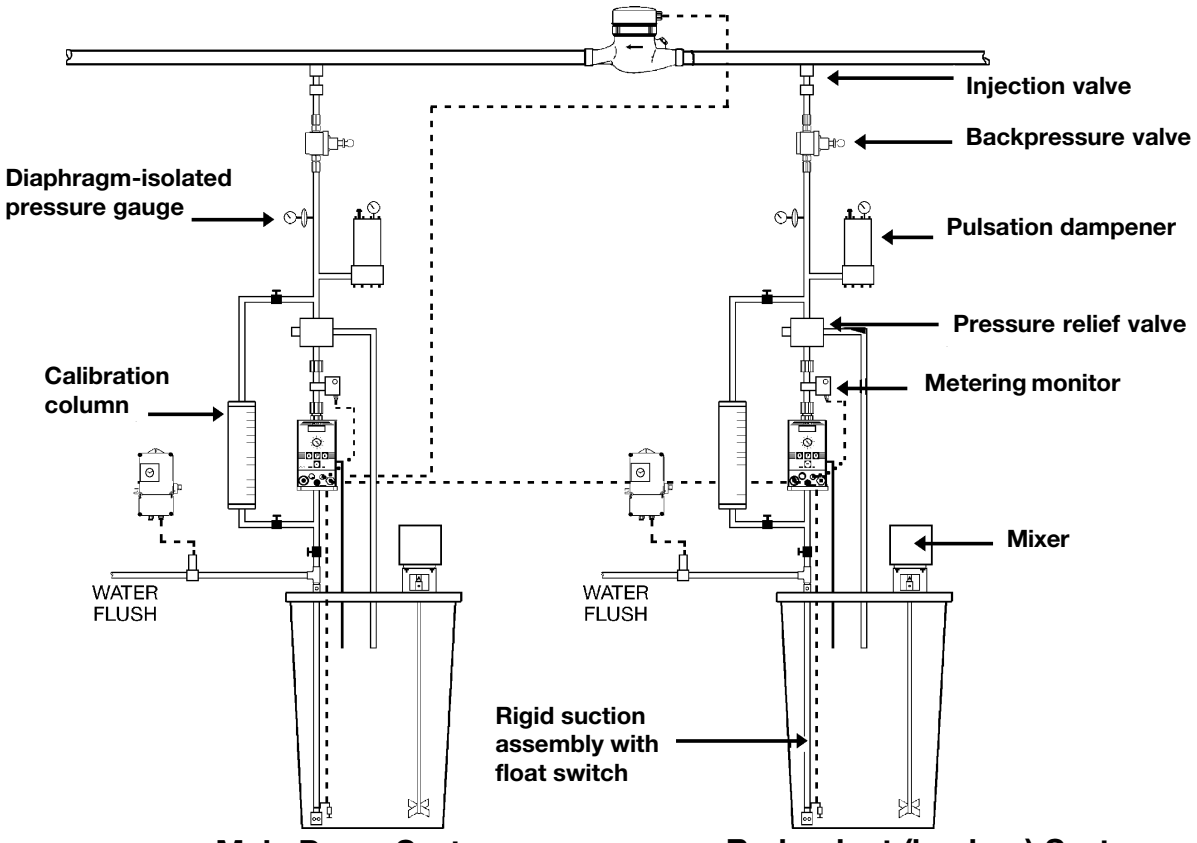
– Calibration column

- Draw down, graduated cylinder.
- Useful for setting up metering pump to reach desired capacity.
- Single pump dosing package can be equipped with a self-filling calibration assembly for application where the pump is installed above the tank (eliminates chemical handling).

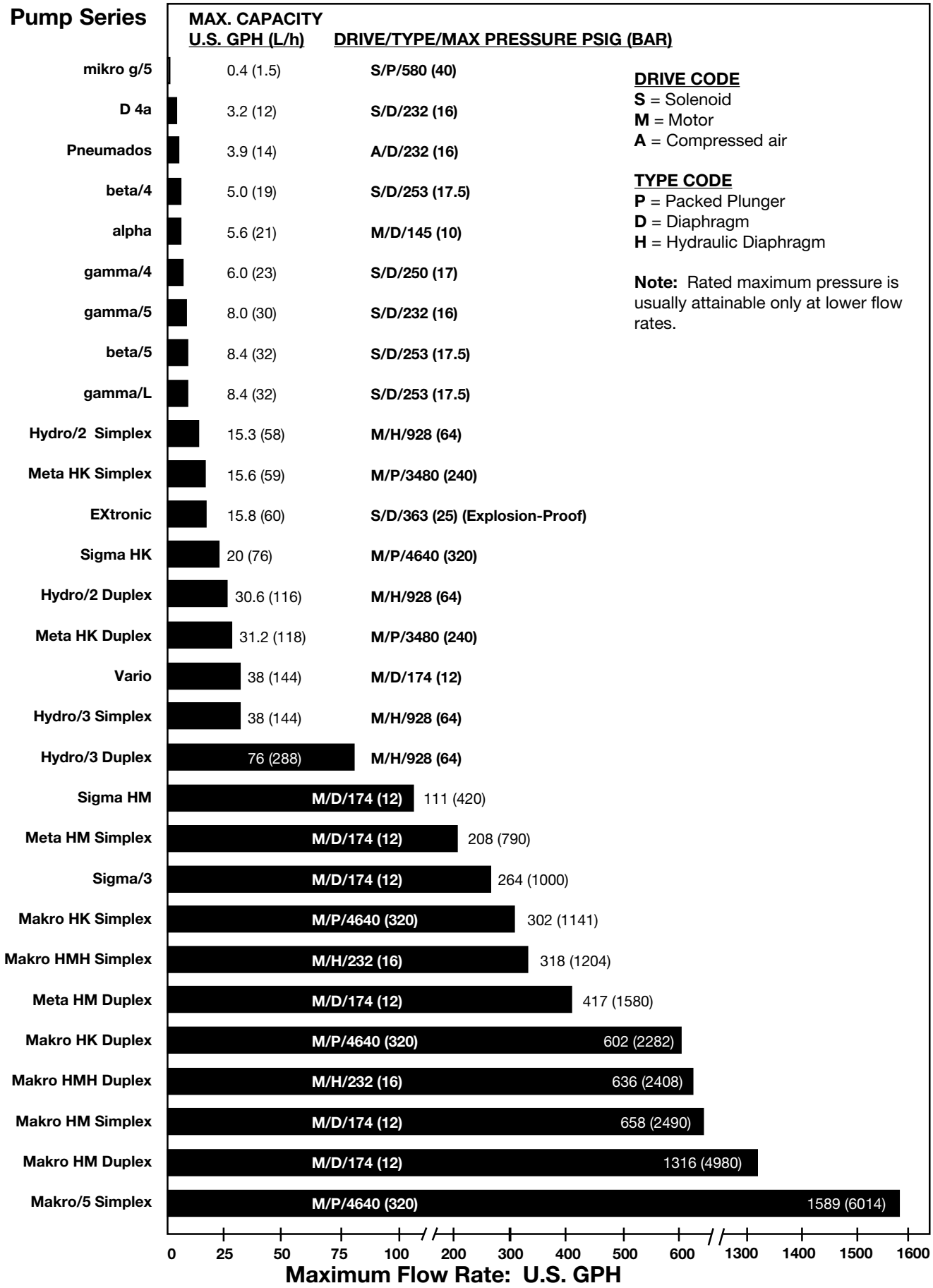
Installation Tip:

- Easy to install off the suction side of the metering pump with a ball valve to isolate from the tank.

APPLICATION OF PUMP ACCESSORIES FOR AN OPTIMAL METERING SYSTEM

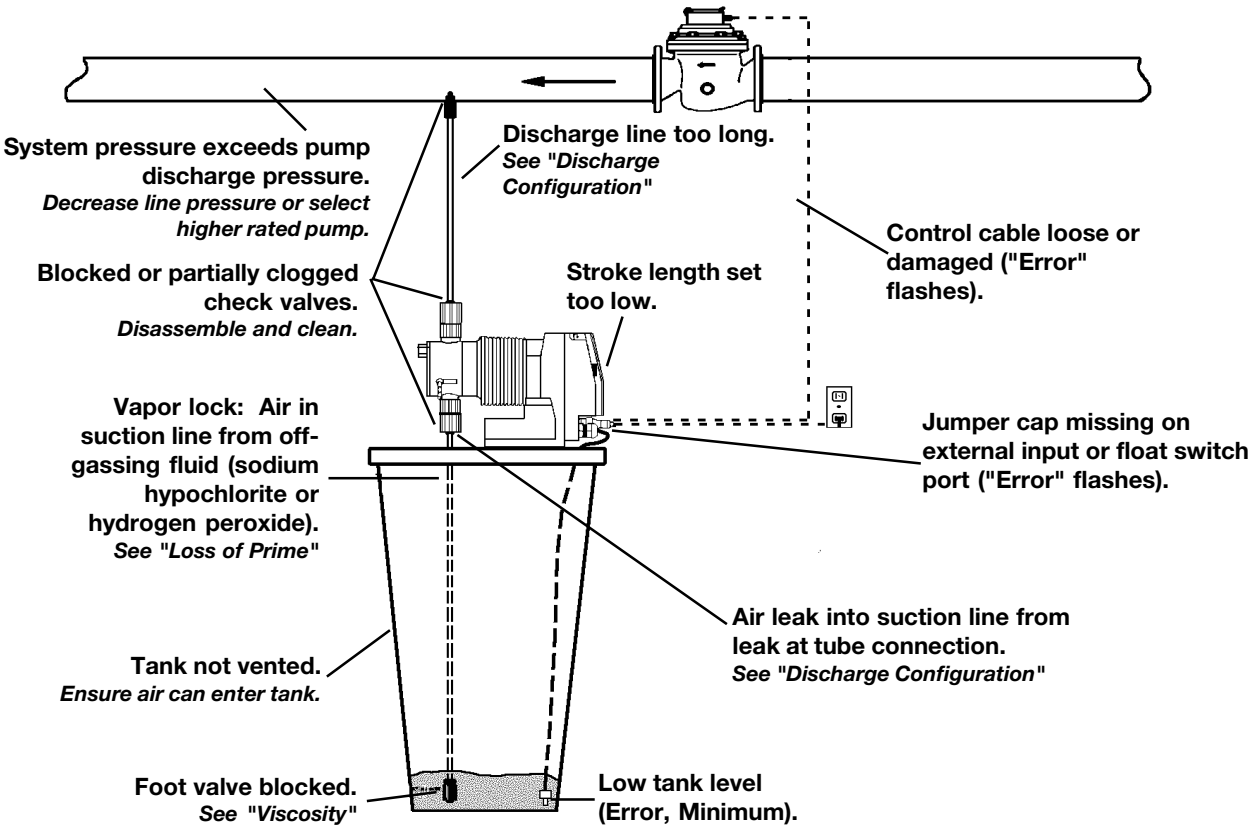


ProMinent® Metering Pump Selection Guide



Troubleshooting

TROUBLESHOOTING TYPICAL PROBLEMS



Metering pumps are affected by:

- Pressure
- Viscosity
- Suction conditions (length, line size, configuration)
- Discharge conditions (length, line size, configuration)

Take these precautionary measures

- Metering pumps should not be primed against pressure (open the bleed valve on the liquid end, where available, until product appears.
- Ensure all connections on suction side are "leak free," especially at the foot valve.
- If the chemical being pumped is compatible with water, it is helpful to prime the pump with water, if possible - this will help wet the pump seals when the pump is left idle for a long time.
- For metering pumps with high viscosity heads or with standard liquids with light duty springs, priming will take longer. It is sometimes easier to prime the metering pump with water.

Pressure

Problem:
Metering pump capacities are greatly effected by pressure.

Solution:
Must be calibrated at your process pressure to determine capacity.

Viscosity

Problem:
Products where viscosity increases with a decrease in temperature or aging are a potential problem for metering pumps. They can block up the foot valve and/or pump valves.

Solution:
The best solution is to keep the pump pumping continuously. If the pump will be off for an extended period of time it is best to FLUSH the pump head and foot valve.

Tip:
Where possible, install the metering pump in flooded suction (i.e. at the base of the tank).

Note:
Metering pumps require valve springs to ensure the valve balls seat properly.

Troubleshooting Cont. . .

Loss of Prime

Problem:
Introduction of air on the suction side of the pump caused by missing or blocked foot valve, poor connection at suction valve and/or foot valve or pumping from an empty tank.

Solution: Check fittings for air leaks, check chemical tank level.

Problem:
Pumping off-gassing products such as NaOCl, PAA or H_2O_2.

Solution:
Try to use metering pumps with a manually adjustable bleed valve or, preferably, a self-degassing liquid end.

Problem:
Using teflon tape on pump valves that are sealed by O-rings can prevent the valve from seating properly in pump head and may cause the operator to overtighten the valves therby over-compressing the seals and causing leaks.

Solution: Only use thread type on NPT joints where the threads are the seating mechanism. O-ring sealed joints should not have thread tape or pipe dope.

Siphoning

Problem:
When installing a metering pump at the base of a tote/bulk tank, the head pressure of the container will force product through the pump - siphoning.

Solution:
The surest way to prevent siphoning is to install a backpressure valve in the discharge line.

Note:
The backpressure valve will also improve the pump consistency.

Suction Configuration

[1] Size the piping/tubing no smaller than the metering pump manufacturer's specification.

[2] When drawing from the top of a drum, a foot valve must be used.

[3] When draining from the base of a tote/bulk tank, a strainer is recommended to prevent sediment from entering the metering pump valves.

[4] When draining from the base of tote/bulk tank with the pump mounted mid-way up the tote/tank, a check valve should be installed (foot valve without ceramic weight).

[5] As the tank level gets below the pump height, the output capacity of the metering pump will change unless a ball check valve is installed.

- KEEP IT SIMPLE.

Discharge Configuration

[1] Size pipe/tubing no smaller than the metering pump manufacturer's specification.

[2] Piping/tubing should be laid out such that the entire discharge line is full of product. If there are sags in tubing, there will be air at the highest point. As the amount of air varies, so will the capacity coming out of the injection valve.

[3] Where a pulsation dampener is used, the bladder pressure must be maintained.

ProMinent® Cooling Tower & Boiler Controllers

MicroFLEX Controllers

Features

- Controls Cooling Towers or Boilers
- Timed or Continuous Sample
- Boiler Blowdown
- Chemical Relay Timer
- Conductivity Input
- Water Meter Input
- CE Approved
- Web Browser Interface
- Supports "Bleed Then Feed"
- Dry Contact Alarm Relay
- Single 4-20mA Output
- Built-In Diagnostics
- "Configure and View" from remote locations
- Single point calibration
- Feed chemical based on water volume
- NEMA 4X Enclosure
- Detect leaks in the system
- Supports Percentage Time Bleed & Feed

SlimFLEX Controllers

Features

- Conductivity and Temperature Inputs
- Two Digital Inputs
- Four Relay Outputs
- 5-Key Universal Keypad
- 2 Line, 16 character LCD
- Built-In Diagnostics
- Built-In Web Server
- LAN Accessible
- pH Control
- ORP Control
- Dry Contact Alarm Relay
- Flow Switch
- Single 4-20mA Output
- NEMA 4X Enclosure
- 120VAC, 60Hz
- Built-In Diagnostics
- CE Approved

MultiFLEX Controllers

Features

- Control up to 4 Towers at once
- Control up to 8 Boilers at once
- Web Browser Accessible
- LAN Accessible
- Up to 14 Analog Inputs
- Twelve Digital Inputs
- Ten Relay Outputs
- Works with Trackster 3 Software
- 5-Key Universal Keypad
- 4 Line, 20 Character Backlit Display
- Easily Upgradeable with Plug-in Modules
- Fully Programmable
- Ethernet with user definable static IP address
- NEMA 4X Enclosure
- 120 or 240VAC 50/60Hz, Switch Selectable
- CE Approved
- Detect leaks in the system
- Supports "Percentage Time Bleed & Feed"

AEGIS Controllers

Features

- Inhibitor Feed Using PPM Setpoints
- Volumetric Timer Controls
- Relay Mirroring
- Optional Ethernet Communications
- MODBUS
- Industrial and Commercial Series
- Plug and Play Upgrades
- Works with Trackster 3 Software
- Aquatrac Thermal Flow Switch
- Easily Upgradeable with Plug-in Modules
- Program Chemical Feed
- CE Approved
- NEMA 4X Enclosure
- Variable Frequency Pump Controls
- Data Logging
- Drum Level Alarms
- ProMinent Pump integration

	Series
AGIA	**Aegis Controller Industrial version A**; Browser command & control with live views via 10 Base T TCP-IP Ethernet LAN port. User re-configurable I/O including 8 universal digital inputs for watermeter or contact sets, 5 ON/OFF powered relays for pump and valve control and 4 variable frequency pulse pump speed controls. Standard unit includes conductivity, temperature and 4-20mA inputs. Sensors not included.

	Base (built-in) conductivity, Inputs 'A' and 'B'.
0	none
1	CTF Cooling tower conductivity-temperature-flowswitch input (with BD relay)
2	Cooling tower conductivity-temperature input (with BD relay)
3	Boiler conductivity sensor input (with BD relay)
4	Condensate conductivity-temperature input (with BD relay)

	Expansion Slot #1, Inputs 'C' and 'D'.
XX	none
B1	single boiler conductivity with blowdown relay
BM	single boiler conductivity - monitor
B2	dual boiler conductivity with blowdown relay
BB	dual boiler conductivity - monitor
CC	boiler condensate conductivity/temp - relay
CN	boiler condensate conductivity/temp - monitor
PC	single boiler condensate ph - control
PN	single boiler condensate ph - monitor
CO	cooling tower conductivity/temp - relay
CM	cooling tower conductivity/temperature - monitor
PH	single cooling tower ph - control
PM	**single cooling tower ph - monitor**
PP	dual cooling tower ph - control
P2	dual cooling tower ph - monitor
PT	single ph/temp (temperature compensated ph)
OR	single orp - control
OM	single ORP - monitor
RR	dual orp - control
O2	dual ORP - monitor
OP	orp and ph - control
MM	ORP and pH - monitor
CR	single corrosion rate
DC	dual corrosion rate
CI	single 4-20ma input - control
IM	single 4-20mA input - monitor
2I	dual 4-20mA input 1 control
I2	dual 4-20ma input 2 controls
2M	dual 4-20mA input monitor
II	dual 4-20ma input (isolated) 1 control
I3	dual 4-20mA input (isolated) 2 controls
I4	dual 4-20mA input (isolated) monitor
IO	single 4-20ma output
OO	dual 4-20ma output

	Expansion Slot #2, Inputs 'E' and 'F'.
XX	none
B1	single boiler conductivity with blowdown relay
BM	single boiler conductivity - monitor
B2	dual boiler conductivity with blowdown relay
BB	dual boiler conductivity - monitor
CC	boiler condensate conductivity/temp - relay
CN	boiler condensate conductivity/temp - monitor
PC	single boiler condensate ph - control
PN	single boiler condensate ph - monitor
CO	cooling tower conductivity/temp - relay

CM	cooling tower conductivity/temperature - monitor
PH	single cooling tower ph - control
PM	**single cooling tower ph - monitor**
PP	dual cooling tower ph - control
P2	dual cooling tower ph - monitor
PT	single ph/temp (temperature compensated ph)
OR	single orp - control
OM	single ORP - monitor
RR	dual orp - control
O2	dual ORP - monitor
OP	orp and ph - control
MM	ORP and pH - monitor
CR	single corrosion rate
DC	dual corrosion rate
CI	single 4-20ma input - control
IM	single 4-20mA input - monitor
2I	dual 4-20mA input 1 control
I2	dual 4-20ma input 2 controls
2M	dual 4-20mA input monitor
IO	single 4-20ma output
OO	dual 4-20ma output

	4-20 mA input, Input 'G'
0	Standard feature. Input can be used for any 4-20mA input signal. (See sensor list for loop powered toriodal choices)

	Pump Output Type (includes 1 powered relay for blowdown)
P	Powered (120/240VDC) relays (4 max)
V	Variable frequency pulse out (4 max)
X	Combination of P and V (must select X for factory configuration)

	Factory configuration(assign inputs/outputs, etc.)
0	none
T	Cooling tower - factory configuration
B	Boiler - factory configuration
X	Factory configuration (must supply worksheet)

	Pre-wired power relay plug cables
0	none
1	one
2	two
3	three
4	four
5	five

	Pre-wired power relay plug box
0	none
1	one outlet
2	two outlets
3	three outlets
4	four outlets
5	five outlets

	Inhibitor on/off outputs (tower only)
0	none
1	one
2	two

	Timed biocide on/off outputs
0	none
1	one

2	two
3	three

	Internal boiler treatment on/off outputs
0	none
1	one
2	two
3	three
4	four
5	five

	Enclosure Option
0	Standard enclosure 7.5"W x 11.3"H
S	Standard enclosure with mains switch
E	Extra Large enclosure 16"W x 14"H
F	Extra Large enclosure 16"W x 1 w/mains switch

	Remote communications
0	standard option; Ethernet port
P	**Ethernet port w/Phone Modem**
M	**Ethernet port w/Modbus**
R	**Ethernet port W/Alarm Relay**
N	**Ethernet port w/Modbus And Alarm Relay**

	Operating Voltage
0	115 VAC 50/60 HZ
1	230 VAC 50/60 HZ

	Approvals (internal choice only - hidden)
01	Standard

ProMinent® DDC Analyzers

Overview: DDC

pk_5_045

The Multi-channel Measuring and Control System DULCOMARIN® II has the following features:

- 5.7", 1/4 VGA color display for ease of operation
- Integrated data logger with screen recorder: Directly view the measured data on the controller
- SD card and card reader included: simply transmit measured data to the PC as standard
- Control of one to 16 drinking water systems or filtration circuits in swimming pools
- CAN bus system: Simple wiring and can be subsequently upgraded
- Visualization*: Simple with embedded web server* and standard web browser
- LAN port*: Simple connection to PC or PC network or internet
- Operation possible using Apple® iPod or iPad (WLAN access point needed)
- Intelligent sensors: with CANopen bus, save the sensor data and stay within the optimum measuring range thanks to auto ranging
- Intelligent metering pumps: using CANopen bus obtain information on operating parameters, such as for instance: chemicals levels and pump capacity in the metering range of 0.19-272 gph (0.74 - 1,030 l/h)
- Standby metering pump for disinfectant (automatic switchover in the event of low level and pump malfunction)

Area of application drinking water (and general applications)

Using a power input module (I module), the following measuring parameters can be measured via 4-20 mA and displayed. These values are also available on the data logger/screen recorder, the web and OPC server:

- Flow (as disturbance variable for pH and chlorine control)
- UV intensity
- Conductivity
- Chlorine dioxide
- Chlorite
- Ammonia
- Fluoride

Pt100 resistance thermometer via a transducer

Display and control of free chlorine and total available chlorine
OPC server*: Simple connection to superordinate visualization systems

*optional

Area of application swimming pools

Remote calibration possible using Apple® iPod or iPad (WLAN access point needed)
Energy and chemical savings thanks to new EcoMode
Integral filter control
Bound chlorine: is reliably minimized via controller output and corresponding systems
OPC server*: Simple connection to superordinate visualization systems
Control of pool temperature via standard temperature controller (Pt100x needed)
High chlorination or night setback by means of contact via second parameter set
The decentralized modular DULCOMARIN® II system is designed for use in public swimming pools in compliance with DIN 19643. The system can be configured to meet the demand for a compact DULCOMARIN® II compact system or as a decentralized modular system DULCOMARIN® II DULCO®-Net.

The areas of application are determined in the identcode

Every drinking water measurement system or every filtration circuit features its own on-site calibration option for all measured variables.

What is the Eco!Mode operating mode?

Eco!Mode enables the circulation capacity to be reduced if the DIN hygienic parameters pH, redox, free and bound chlorine are within the permitted limits.

A circulation pump with frequency converter with an analog input is needed for this.

This reduction can be enabled depending on the DIN hygienic parameters, time and activation via a remote control input. A combination of the criteria is also possible. If the DIN hygienic parameters can no longer be met, then the circulation capacity is raised again to nominal capacity.

Lowering the pump capacity saves energy, thereby reducing CO_2 emissions.

Furthermore, when a set redox potential is reached, for instance 780 mV, signaling good disinfection of the water, then chlorine metering is either reduced gradually or in one step. If the DIN hygienic parameters can no longer be met, then chlorine metering is raised again to its standard set point.

What is a web server?

A web server is a software application that is implemented by the DULCOMARIN® II.

The web server provides web pages with information about measurements, control, sensor calibration and controller configuration to a PC with web browser (e.g. Microsoft® Internet Explorer).

The web server can be used to provide simple visualization of the DULCOMARIN® II without special visualization software being needed on the PC. The web server is independent of the PC operating system.

The DULCOMARIN® II is connected to a PC via a LAN/Ethernet port and the connection can be made directly, via a network or via the internet. The cables needed for direct connection to a PC or network are included.

Commercially available standard network components can be used for the cabling, router and WLAN access points etc.

The same information is available via the web server as on the DULCOMARIN® II itself, for instance the set points of all control variables can be changes, the various controller can be switched off and the pool/system names can be entered. Exceptions to this are the controller settings and bus configuration that can only be entered directly on the controller itself.

What is OPC?

OPC stands for Openness, Productivity, Collaboration (formerly OLE for Process Control) and designates a uniform and manufacturer-independent software interface. OPC Data Access (OPC DA) is based on Windows technology COM (Component Object Model) and DCOM (Distributed Component Object Model). In contrast, OPC XML is based on the internet standards XML, SOAP, and HTTP.

OPC is used wherever sensors, controllers, and controls from various manufacturers are used to form a common, flexible network. Without OPC, two devices require precise knowledge of the communication options of the other device to be able to exchange data. Extensions and replacement are therefore correspondingly difficult. With OPC, an OPC-compliant driver for each device has to be written only once. Ideally this driver is provided by the manufacturer. An OPC driver can be integrated easily in any major control and monitoring system without needing much in the way of adaptation.

ProMinent provides an OPC server/driver for the Multi-channel Measuring and Control System DULCOMARIN® II.

The examples shown below are suitable for applications in drinking water treatment and swimming pool systems.

ProMinent® DDC Analyzers

Overview: DDC

The multi-channel measuring and control system DULCOMARIN®II is suitable to control 1 to 16 filtration circuits or drinking water systems. The following bus modules are available for the control:

M module (measurement and controlling):

- Measurement and control of the pH value
- Measurement and display (optional control) of the ORP
- Measurement and display of the temperature of the sample water
- Sample water monitoring
- Measurement of free chlorine
- Measurement of combined chlorine (optional, calculated from total chlorine and free chlorine)

Chlorine sensors:

- Measurement of free chlorine and temperature
- Measurement of total available chlorine and temperature
- Measurement of combined chlorine as differential chlorine measurement

A module (controlling of metering pumps, analogue outputs):

- 3 frequency outputs to control metering pumps for pH correction, disinfection and flocculent metering
- 3 contact inputs to process pump alarm relays or tank fill level monitoring
- 4 freely programmable analogue outputs 4-20 mA for pH, ORP, free chlorine, combined chlorine or temperature

P module (controlling of peristaltic pumps, power supply of bus modules):

- Power relay pulse length control for pH value (e.g. controlling of peristaltic pump)
- Power relay pulse length control of disinfectant (e.g. controlling of chlorine electrolysis plant)
- Power relay limit value output to minimize combined chlorine
- Alarm relay
- Power supply of bus modules

N module (power supply of bus modules):

- Power supply of bus modules with no further function

R module (controlling of chlorine gas metering units):

- Controlling of a chlorine gas metering unit and processing of a position feedback potentiometer (0-10 kΩ) (only possible as external module)

Metering pumps with CANopen interface of the type Beta®, delta®, Sigma/ 1, Sigma/ 2, and Sigma/ 3

- Direct connection to the bus
- When using Beta®/4aCANopen metering pumps, the A module is not required (provided no current outputs are required).

I module (current input module)

- 2 current inputs active/passive (e.g. to connect 2-wire measuring transducers)
- 1 current inputs passive (e.g. to connect a magnetically-inductive flow meter)
- 2 digital inputs for sample water alarm and pause control

G module (limit value and alarm module)

- 2 potential-free changeover relays to signal alarm states
- Connected to other unites via the main bus cable using the T-distributor and 0.5m CAN connection cable supplied

ProMinent® DDC Analyzers

Technical Data

Measurement range:	pH:	-1 - 15
	Redox:	-1200 - +1200 mV
	Chlorine free:	0.01 - 10 ppm
	Chlorine total:	0.01 - 10 ppm
	Combined chlorine:	0.01 - 2 ppm
Temperature:	Pt 100 or Pt 1000, 28 to 302 ºF (-20 to +150 °C)	
Resolution:	0.01 pH / 1 mV / 0.01 ppm/l / 0.1 °C	
Reproducibility:	0.5 % of the measurement range (at 25 °C)	
Measurement inputs:	pH and Redox via terminal mV Chlorine via CANopen Bus	
Control type:	P/PI/PID-control	
Control:	Acid or alkali, chlorine	
Digital inputs:	Voltage free inputs (sample water, pause, 3 pump faults	
Signal current outputs:	4 x 0/4-20 mA (electrically isolated for each measured variable) Max. burden 600 Ω , range adjustable	
Control outputs:	Reed contacts, acid, alkali and chlorine (pulse rate for actuation of metering pumps) 2 relays (pulse length) make/break switches for actuation of solenoid valves or peristaltic pumps 250 V~, 3 A	
Alarm relay:	250 V ~3 A, 700 VA make/break switches	
Interfaces:	LAN, RS 232 as configuration interfaces, SD-expansion slot (for SD cards)	
Power supply:	85 - 265 V~, 50/60 Hz	
Ambient temp. :	23 to 118ºF (-5 to 45 °C)	
Storage temp. :	14 to 158ºF (-10 to 70 °C)	
Enclosure rating:	IP 65	
Climate:	Admissible relative humidity: 95% non condensing DIN IEC 60068-2-30	
Dimensions:	342 x 227 x 78 mm (WxHxD)	

Guaranteed CANopen specifications, all devices:

All devices meet the standardised CAN specification for hardware 2.0 (ISO99-1, ISO99-2). This includes the CAN protocol (ISO 11898-1) and details about the physical application layer in accordance with ISO 11898-2 (high speed CAN to 1Mbit/sec.) and ISO 11898-3 (Low speed CAN to 125kBit/sec).

The device complies with the CAN-Open specification CIA-DS401, the basis of the European standard EN50325-4. It complies with the controller device profile CiA-404.

Identcode Ordering System

DULCOMARIN® II DXC range

DXCa											
Mounting type											
W	Wall mounted (IP 65)										
S	Control cabinet (IP 54)										
	Version										
	0	with operating elements									
	D	with operating elements for use in drinking water/disinfection applications									
		Communication interfaces									
		0	None								
		5	Embedded Web Server, LAN including 5m LAN patch cable 1:1, LAN coupling, 5m crossover cable [1]								
		6	OPC server + embedded web server, LAN including 5m LAN patch cable 1:1, LAN coupling, 5m crossover cable [1]								
			Options								
			0	None							
			1	Videographic recorder with data logger including SD card and USB card reader for PC							
				Module 1:							
				M	M module, measurement module for pH, ORP, temperature						
				A	A module, control module: 3 pump and 4 analog outputs						
				I	I module, current input module, 3 mA, 2 digital inputs						
					Module 2:						
					0	Not in use					
					A	A module, control module: 3 pump and 4 analog outputs					
					M	M module, measuring module pH, ORP, temperature					
					I	I module, current input module, 3 mA, 2 digital inputs					
						Module 3:					
						P	P module, mains power module, 1 alarm relay, 3 solenoid valve relays				
						N	N module, mains power module without relay				
							Application:				
							S	Swimming pool			
							D	Drinking water/disinfection			
								Preset language:			
								EN	English		
									Approvals:		
									01	CE-mark	

DXCa W D 6 1 M A P D EN 01

The Identcode describes the **DULCOMARIN® II compact** controller.

1 The supplied cable is intended for the connection to a hub, switch, router, or Internet.
For a direct connection of the DULCOMARIN® II to a PC/MAC, the supplied LAN coupling and the crossover cable cat. 5 are required.
The maximum LAN cable length is approx. 100 m.
To operate the Web server on a PC we recommend using Microsoft Internet Explorer 5 or higher as browser.
The folling components are supplied in the DXCa package:
1 T-distributor, 1 connecting cable CAN,
1 termination resistor coupling and
1 termination resistor plug,
1 SC card, 1 card reader for PC.

Important note when ordering multi-channel measuring and control systems for drinking water and pool water applications:

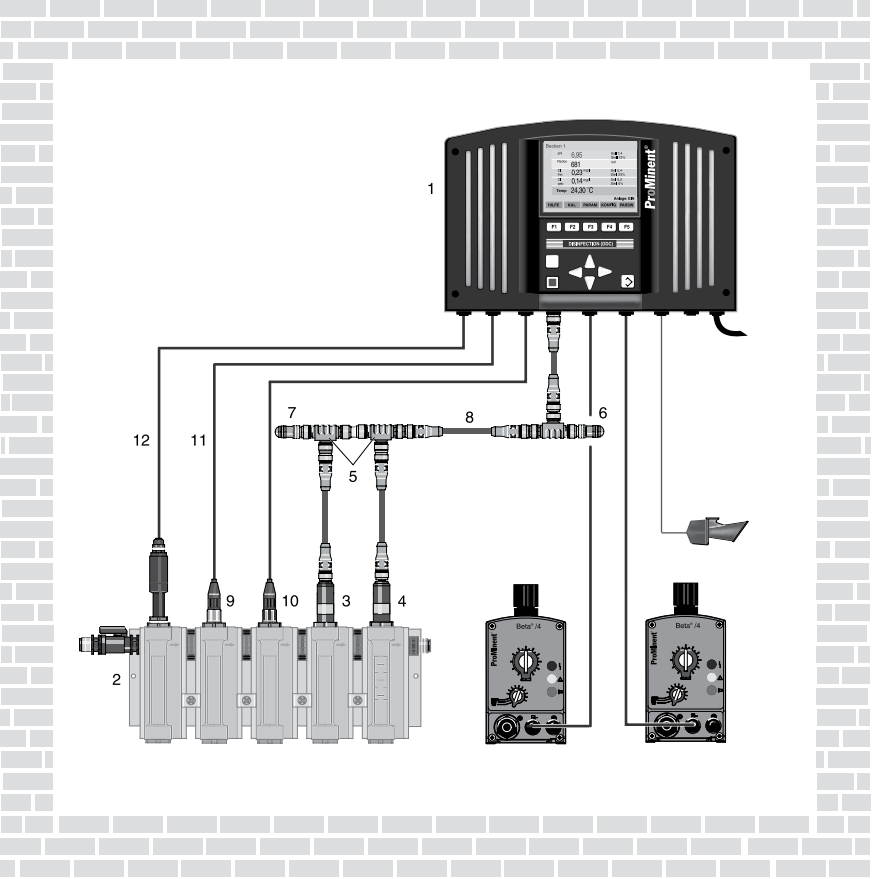
Drinking water application: In the identcode, a "D" for "Drinking water/disinfection" must be selected under "Version" and "Application". The description "System" will appear in the controller menu for the different drinking water lines.

Swimming pool water applications: In the identcode, a "0" for "with operating elements" must be selected under "Version" and the an "S" for "Swimming pool" under "Application". The description "Tank" will appear in the controller menu for the different filter circuits.

All adjustment options and the use of the different modules are identical with both applications.

ProMinent® DDC Analyzers

Configuration



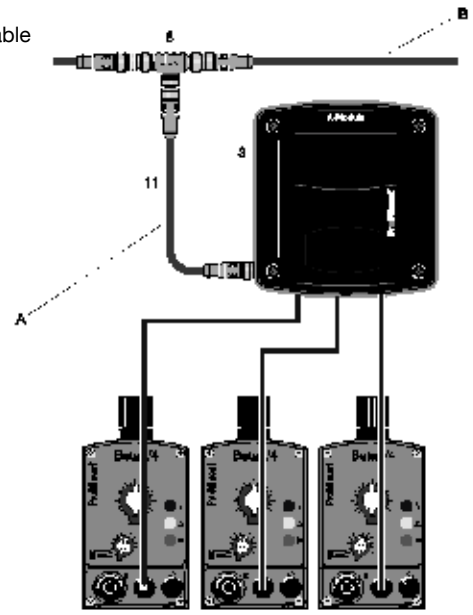
pk_5_020

The measurement and control system shown above for a single system comprises the following components (without metering equipment):

Item	Quantity	Name	Part No.
1	1	DULCOMETER® (DDC) central unit with actuator and measurement modules DXCa W 0 0 0 M A P 0 EN 01	
2	1	DULCOTEST® in-line probe housing DGMa 3 2 2 T 0 0 0	
3	1	Chlorine sensor CTE 1-CAN-10 ppm	1023427
4	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
5	3	T-distributors M12 5 pole CAN	1022155
6	1	Load resistor M12-coupler	1022154
7	1	Load resistor M12-plug	1022592
8	5	Connecting cable - CAN M12 5 (pole). 1.5 ft (0.5 m)	1022137
9	1	pH electrode	As per application
10	1	Redox electrode	As per application
11	2	Coaxial cable, 6 ft. (2 m) - SN6 - pre-assembled*	1024106
12	6 ft. (2 m)	2 wire cable	7740215

* other lengths available

A Stub cable
B Main BUS cable



pk_5_043

The A module permits the control of up to three metering pumps via pulse frequency. Possible metering combinations are:

- pH lowering and disinfectant and flocculent or
- pH raising and disinfectant and flocculent or
- pH lowering and pH raising and disinfectent

It includes 3 digital inputs to evaluate the alarm relay of metering pumps, 4 freely programmable standard signal outputs 0/4-20 mA to document measured values, or as control outputs.

For this connection, the T-distributor and the CAN connecting cable 0.5 m include in the scope of delivery are used.

To be noted: If Beta®/4CANopen metering pumps are used, no A modules are required!

The A module in the above example consists of the following components (without metering equipment):

Item	Quantity	Designation	Order No.
3	1	A module DXMa A W 20 00 01	
8	1	T-distributor M12 5P CAN	included in delivery
11	1	Connecting cable - CAN M12 5 (pole) 1.5 ft. (0.5 m)	included in delivery

The A module is connected to other units via the main bus train.

For connection to units which are not electrically isolated (e.g. PLC), an isolating amplifier, e.g. order no. 1033536, is required!

Identcode Ordering System CANopen Modules

Measurement Module for DULCOMARIN® II Series DXM

DXMa	Module:						
	M	M module, measuring module: pH, ORP, temperature					
	A	A module, control module: 3 pump and 4 analog outputs					
	R	R module, control module: chlorine gas metering unit with feedback					
	N	N module, mains power module without relay					
	P	P module, mains power module with relay, only mounting type "O"					
	I	I module, current input module, 3 mA inputs, 2 digital inputs					
	G	G module					
		Installation:					
		0	No housing, only P module (IP 00)				
		W	Wall mounting (IP 65)				
		E	Retrofit module (installation module for DXCa, IP 20)				
			Version:				
			0	With controls (only M module, mounting type W)			
			2	Without controls			
			3	Without controls (only mounting type "E" and "H"			
				Application:			
				0	Standard		
				S	Swimming pool (only M module)		
				D	Drinking water/disinfection (only I module)		
					Language default:		
					EN	English	
						Approvals:	
						00	No approval, only P module without housing
						01	CE mark
DXMa	A	W	2	D	EN	01	

Please note the following:

Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

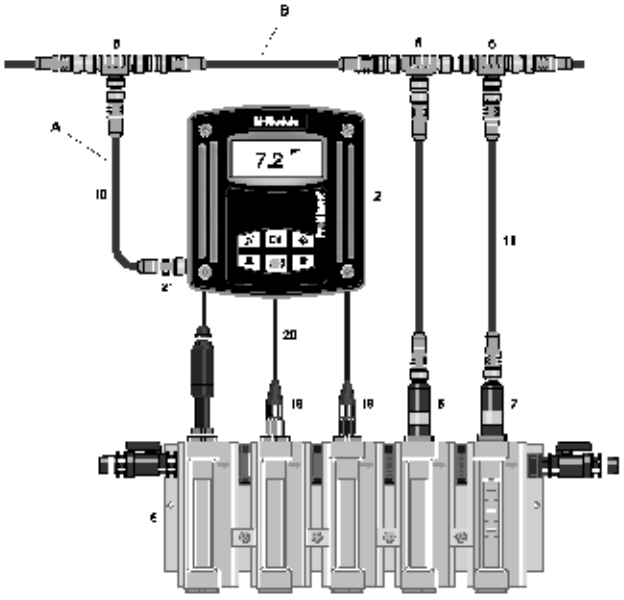
The update kit is free of change and one is also needed when ordering more than one upgrade module. The kit includes a SD memory card with the current software for the DULCOMARIN II and a description about how to perform the software update.

	Order No.
Update kit/DXC and modules	1031284

ProMinent® DDC Analyzers

M Module (Measuring Module)

A Stub cable
B Main BUS cable



pk_5_042

The M module with its illuminated graphic display and keypad displays the measured values and allows all sensors for the corresponding filter circuit to be calibrated on site.

The following measurements can be taken:

- pH value
- ORP potential
- **free chlorine** and **total available chlorine** (optional or combined chlorine is (calculated) and **sample water temperature using the temperature probe in the chlorine sensor or optionally using a separate Pt100/Pt1000 resistance thermometer**

The M module has 3 digital inputs for:

- sample water monitoring
- controlling breaks in filter backwashing
- Parameter changeover for Eco!Mode
- The M module is connected to the other bus modules via the main bus cable, using the T-distributor supplied and the 0.5 m CAN connection cable.

The M module in the above example comprises the following components:

Item	Number	Name	Part No.
2	1	M module DXMa M W 0 S EN 01	DXMa M W 0 S DE 01
5	1	In-line probe housing DGMa 3 2 2 T 0 0 0	DGMa 3 2 2 T 0 0 0
6	1	Chlorine sensor CTE 1-CAN-10 ppm	1023427
7	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
8	3	T-distributors M12 5 pole CAN	included in delivery
10	1	Connecting cable - CAN M12 5 (pole) 0.5 m	included in delivery
11	2	Connection cable - CAN M12 5 (pole) 0.5 m	included in delivery
18	1	pH sensor PHES 112 SE PHES 112 SE	150702 150092
19	1	ORP sensor PHES-Pt-SE	150703
20	2	Cable combination coax 2m-SN6-pre-assembled*	1024106
21	2m	Signal lead, sold by the meter 2 x 0.25 mm² Ø 4 mm	725122

* other lengths available

Identcode Ordering System CANopen Modules

Measurement Module for DULCOMARIN® II Series DXM

DXMa	Module:					
	M	M module, measuring module: pH, ORP, temperature				
	A	A module, control module: 3 pump and 4 analog outputs				
	R	R module, control module: chlorine gas metering unit with feedback				
	N	N module, mains power module without relay				
	P	P module, mains power module with relay, only mounting type "O"				
	I	I module, current input module, 3 mA inputs, 2 digital inputs				
	G	G module				
		Installation:				
		0	No housing, only P module (IP 00)			
		W	Wall mounting (IP 65)			
		E	Retrofit module (installation module for DXCa, IP 20)			
			Version:			
			0	With controls (only M module, mounting type W)		
			2	Without controls		
			3	Without controls (only mounting type "E" and "H"		
				Application:		
				0	Standard	
				S	Swimming pool (only M module)	
				D	Drinking water/disinfection (only I module)	
					Language default:	
					EN	English
						Approvals:
						00	No approval, only P module without housing
						01	CE mark

DXMa M W 0 D EN 01

Please note the following:

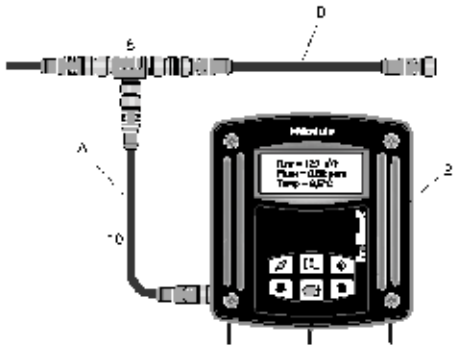
Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

The update kit is free of change and one is also needed when ordering more than one upgrade module. The kit includes a SD memory card with the current software for the DULCOMARIN II and a description about how to perform the software update.

	Order No.
Update kit/DXC and modules	1031284

I Module (Current Input Module)

A Stub cable
B Main BUS cable



AP_DC_001_SW

The I module with its illuminated graphic display and keypad is a current input module capable of processing 3 standard signals from sensors and two digital signals.

It can be used together with the multi-channel controller DULCOMARIN® II in drinking water and swimming pool applications. All measured variables are available in the screenwriter and web and OPC®server.

Two analog inputs are provided as 2-wire inputs and one as passive input.

The inputs can process the following values as 4-20 mA standard signals:

- Turbidity
- Flow
- UV intensity
- Conductivity (via DMTa transducer)
- Chlorine dioxide*
- Chlorite
- Ammonia
- Fluoride
- Pt100 resistance thermometer via a transducer
- Dissolved oxygen
- Hydrogen peroxide *

The I module has 2 digital inputs for:

- sample water monitoring and
- pause control

The flow information can be used as an interference variable for the control of chlorine, pH correction and chlorine dioxide.

* these measured variables can also be controlled

The I module is connected to other bus modules via the main bus cable using the T-distributor and 0.5 m CAN connection cable supplied.

The I module in the above example consists of the following components:

Item	Number	Name	Part No.
2	1	I module DXMa I W 0 D EN 01	-
8	1	T-distributors M12 5P CAN	included in delivery
10	1	Connecting cable - CAN, M12, 5 (pole), 0.5 m	included in delivery

Identcode Ordering System CANopen Modules

Measurement Module for DULCOMARIN® II Series DXM

DXMa	Module:	
	M	M module, measuring module: pH, ORP, temperature
	A	A module, control module: 3 pump and 4 analog outputs
	R	R module, control module: chlorine gas metering unit with feedback
	N	N module, mains power module without relay
	P	P module, mains power module with relay, only mounting type "O"
	I	I module, current input module, 3 mA inputs, 2 digital inputs
	G	G module
	Installation:	
	0	No housing, only P module (IP 00)
	W	Wall mounting (IP 65)
	E	Retrofit module (installation module for DXCa, IP 20)
		Version:
		0 With controls (only M module, mounting type W)
		2 Without controls
		3 Without controls (only mounting type "E" and "H"
		Application:
		0 Standard
		S Swimming pool (only M module)
		D Drinking water/disinfection (only I module)
		Language default:
		EN English
		Approvals:
		00 No approval, only P module without housing
		01 CE mark

DXMa I W 0 D EN 01

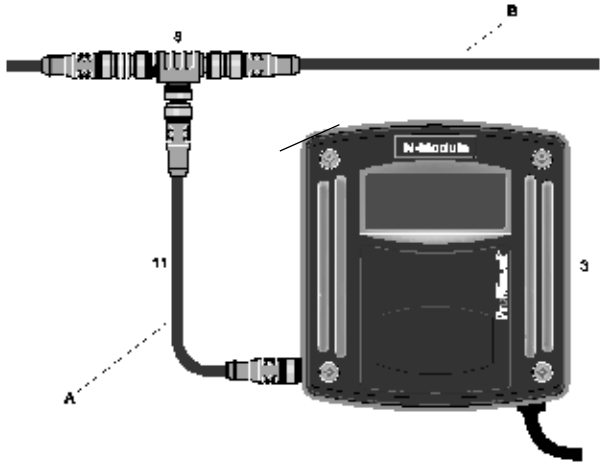
Please note the following:

Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

The update kit is free of change and one is also needed when ordering more than one upgrade module. The kit includes a SD memory card with the current software for the DULCOMARIN II and a description about how to perform the software update.

	Order No.
Update kit/DXC and modules	1031284

A Stub cable
B Main BUS cable



pk_5_043_C_power

The N module (power supply) is used to supply the bus modules with power and has no further function.

The number of N modules required can be seen from the table below. If P modules are used in a system, the number of N modules is reduced accordingly. The central unit always includes a power supply unit (N or P module).

How many additional N or P modules do you require?

Number filration circuits	Additional N or P modules	Number filtration circuits	Additional N or P modules
1	-	9	4
2	-	10	5
3	1	11	5
4	2	12	6
5	2	13	6
6	3	14	7
7	3	15	7
8	4	16	8

The N module requires power supply for operation and is connected to the other bus modules via the main bus train. For this connection, the T-distributor and the CAN connecting cable 0.5 m included in the scope of delivery are used.

The power module in the above example comprises the following components:

Item	Number	Designation	Part No.
3	1	Power-module DXMa N W 2 0 00 01	
8	1	T-distributor M12 5 Pol. CAN	included in delivery
11	1	Connecting cable - CAN M12 5 (pole) 1.5 ft. (0.5 m)	included in delivery

If you have any questions, please contact our sales department.

Identcode Ordering System CANopen Modules

Measurement Module for DULCOMARIN® II Series DXM

DXMa	Module:
M	M module, measuring module: pH, ORP, temperature
A	A module, control module: 3 pump and 4 analog outputs
B	B module, control module: chlorine gas metering unit with feedback
N	N module, mains power module without relay
P	P module, mains power module with relay, only mounting type "O"
I	I module, current input module, 3 mA inputs, 2 digital inputs
G	G module

	Installation:
0	No housing, only P module (IP 00)
W	Wall mounting (IP 65)
E	Retrofit module (installation module for DXCa, IP 20)

	Version:
0	With controls (only M module, mounting type W)
2	Without controls
3	Without controls (only mounting type "E" and "H"

	Application:
0	Standard
S	Swimming pool (only M module)
D	Drinking water/disinfection (only I module)

	Language default:
EN	English

	Approvals:
00	No approval, only P module without housing
01	CE mark

DXMa N W 0 D EN 01

Please note the following:

Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

The update kit is free of change and one is also needed when ordering more than one upgrade module. The kit includes a SD memory card with the current software for the DULCOMARIN II and a description about how to perform the software update.

	Order No.
Update kit/DXC and modules	1031284

ProMinent® DDC Analyzers

Spare parts and upgrade sets

Internal spare parts and upgrade sets for the DULCOMARIN® II cannot be ordered using the part number printed on the modules!

Modules have to be fully replaced (the exception to this is the N module).

The electrical unit for the central unit can only be replaced by a complete processor spare part.

Please use only the following identcodes when ordering identcodes:

Replacement central units

Replacement central unit: DXCAC001000#DE01 (without communications interface, # = please state "S" for applications in swimming pools and "D" for applications relating to drinking water).
Replacement central unit: DXCAC051000#DE01 (with web server, # = please state "S" for applications in swimming pools and "D" for applications relating to drinking water).
Replacement central unit: DXCAC061000#DE01 (with OPC and web server, # = please state "S" for applications in swimming pools and "D" for applications relating to drinking water).

External modules (replacement or upgrade modules):

- M module: DXMa M W 0 S EN 01 (with display)
- A module: DXMa AW2 0 00 01 (without display)
- N module: DXMa N W 2 0 00 01 (without display)
- R module: DXMa R W2 0 00 01 (without display)
- G module: DXMa G W2 0 00 01 (without display)
- P module: DXCa W 2 00 00 PS 00 01 (without display in large DXC housing)
- I module: DXMa I W 0 D D E 01 (with display)
- I module: DXMa I W 2 D 0 0 0 1 (without display)

Internal modules (replacement or upgrade modules):

M M module: DXMa M E3S 00 01
M A module: DXMa A E30 00 01
M P module: DXMa P03 00 00
M I module: DXMa I E 3 D 00 01
M N module: Order no. 732485, electrical set DXMaN 24 V/1A

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Ammonia-sensitive sensor for measuring ammonia in aqueous solutions

Brief description

This sensor can be used to measure ammonia (NH_3) in aqueous solutions. In an aqueous solution, ammonia is in a pH-dependent equilibrium with the ammonium ions (NH_4^+ ions). Provided the NH_4^+ ions are converted into ammonia by adding lye, the sensor also detects the resultant ammonia. The NH_4^+ ions themselves are not detected.

The ammonia sensor consists of a pH glass electrode and a reference electrode. Both the electrodes are in an electrolyte. The electrolyte is separated from the sample medium by a hydrophobic, gas-permeable membrane. The pH value of the electrolyte changes if NH_3 gas diffuses through the hydrophobic membrane. This local change in the pH value is measured at high resistance by the integrated pH electrode. JUMO ammonia sensors have the advantage of having ready-made membrane caps. There is no need to put the sensitive membrane on by hand. With the JUMO sensor, the membrane cap is quickly and easily replaced as a complete unit.

Monitoring ammonia leakage in refrigerating plants

Refrigerating plants (in indoor ice rinks or cold stores, for example) frequently use ammonia as a refrigerant. As ammonia (NH_3) is a toxic, pungent smelling, colorless gas, the systems are monitored for escaping ammonia (leakage). Firstly, gas sensors are used to monitor the ambient air (these are not supplied by JUMO) and secondly, the pipes and system components that carry the liquids are monitored for ammonia ingress. JUMO's ammonia-sensitive sensor can be used here. Measuring ammonia with a JUMO ammonia sensor gives a far more selective response than measuring the pH. The JUMO ammonia sensor can also be used in online analyzers/samplers or in the laboratory.

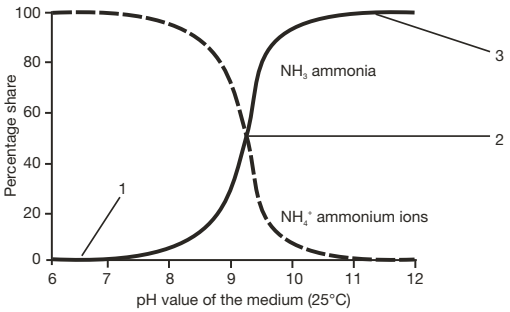
Type 201040/65-22-120/000

Membrane cap

Technical data

Measurement range:	0.01 - 9,999 ppm (= mg/l) NH_3
Temperature range:	0 - 50°C; -8 to +30°C for extra code 854 (low temperature electrolyte)
Pressure range:	up to 1 bar
Accuracy:	± 2 %
Length:	120 mm
Diameter:	12 mm
Connection:	Pg13.5 screw cap or plug cap
Shaft material:	PPO
Membrane cap material:	special PTFE membrane

Operative range



1 Only NH_4^+ ions (ammonium) present

2 The ratio of NH_4^+ ions (ammonium) to NH_3 (ammonia) is 1:1

3 Only NH_3 (ammonia) present

Note:

The presence of ammonia in the sample medium is heavily dependent on its pH value (see "operative range" diagram). In the acidic range, ammonium (NH_4^+) ions predominate, and are not detected by the sensor! At around 9.3 pH, the concentration ratio between the ammonia (NH_3) and the ammonium (NH_4^+) is about 1:1. Ammonia is only dominant in the reaction in the heavily alkaline range. The medium must not contain any substances that could damage the sensor membrane (such as oils, greases, particles of dirt or tensides).

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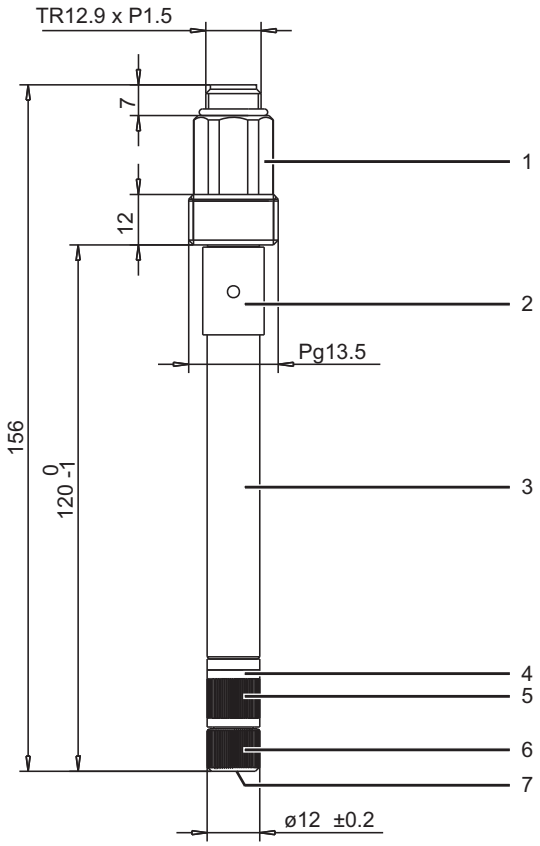
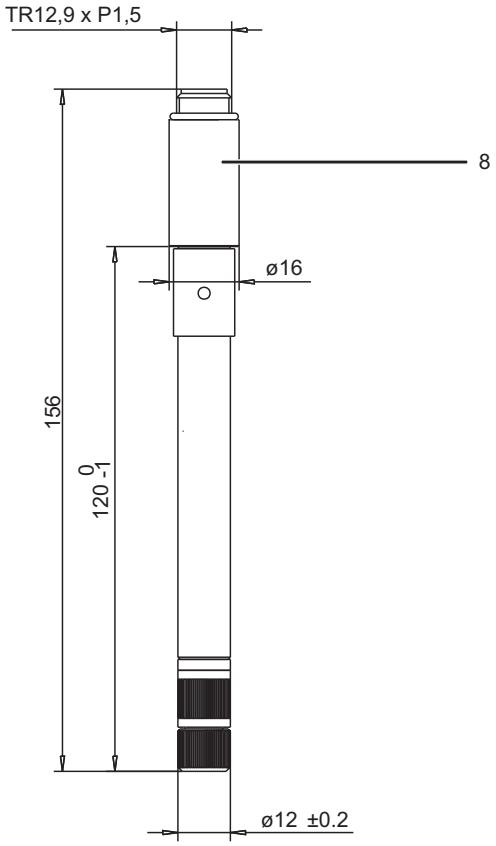
Dimensions





1 Pg 13.5 screw cap
2 Hose seal (silicon)
3 Shaft (PPO)
4 O-ring (FPM)
5 Pocket (PSU)
6 Membrane cap (1.4571 stainless steel)
7 Membrane (PTFE)
8 Plug cap

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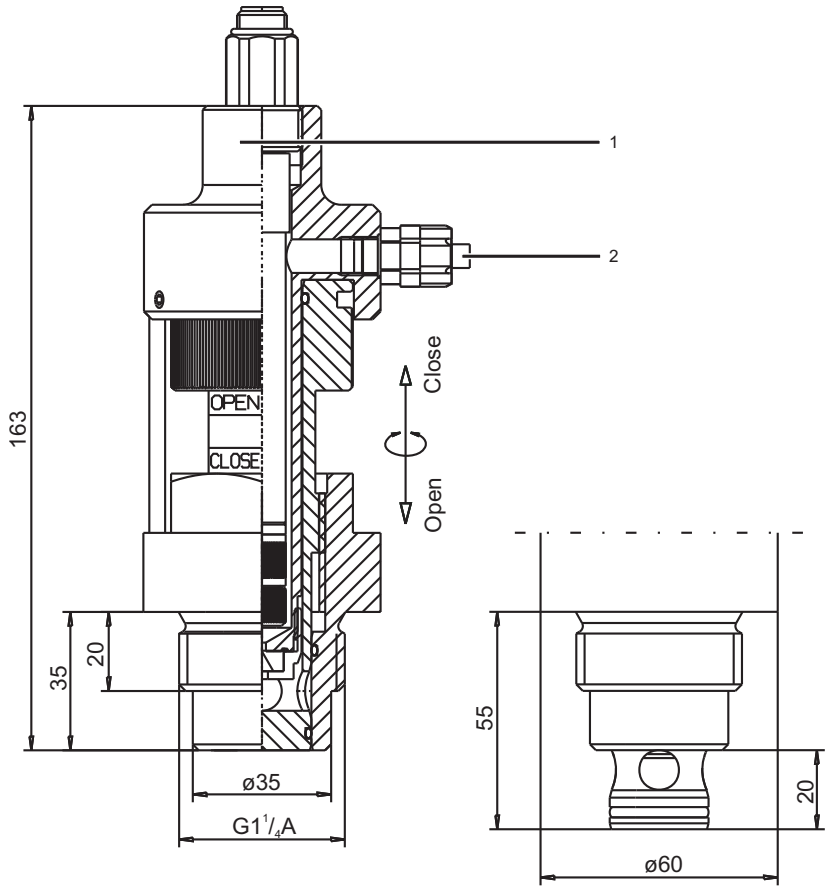
Accessories



1 Fitting material (PP)

2 G1/8A hose connection (POM)

Retractable assembly
Sales no.: 20/00379538
Optimum operating pressure 2 - 3 bar
Maximum operating pressure: 6 bar
Operating temperature range: -5 to +50°C

Other fittings
Flow-through fittings: data sheet 20.2810
Immersion fittings: data sheet 20.2820

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Order details:

		(1)	**Basic type**
	201040		gas-sensitive sensor
		(2)	**Basic type extension**
x	65		ammonia sensor
		(3)	**Connection**
o	21		plug cap
x	22		Pg 13.5 screw cap
		(4)	**Connection**
x	120		120 mm (standard)
		(5)	**Extra codes**
x	000		none
o	854		low temperature electrolyte

x = as standard
o = option

	(1)		(2)		(3)		(4)		(5)
Order code		/		-		-		/	
Order example	201040	/	65	-	22	-	120	/	000

Stock version

(delivery 3 working days after receipt of order)

Type	Brief description	Sales no.
201040/65-22-120/000	Ammonia sensor, Pg13.5 screw cap, 120 mm	20/00440655

Production version

(delivery 10 working days after receipt of order)

Type	Brief description	Sales no.
201040/65-22-120/854	Ammonia sensor, Pg 13.5 screw cap, 120 mm for use in highly concentrated refrigerants, -8 to +30°C	20/00478869

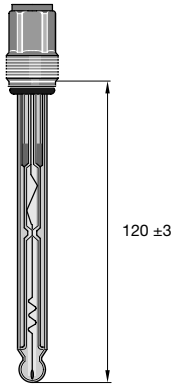
Accessories

(delivery 10 working days after receipt of order)

Type	Brief description	Sales no.
202822/107-55/87	Retractable assembly	20/00379538
202560/20-888-888-310-310-23/000	JUMO AQUIS 500 pH transmitter/controller	20/00480051
202560/10-888-888-310-310-23/000	JUMO AQUIS 500 pH transmitter/controller	20/00480048
	Maintenance kit for ammonia sensor	20/00449637
	Maintenance kit for ammonia sensor with low temperature electrolyte	20/00477746

ProMinent® DULCOTEST® Sensors

pH Combination Sensors With SN6

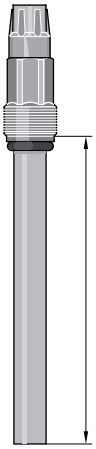


pk_6_022

PHED 112 SE

pH range: 1-12
Temperature: 32-176 °F (0-80 °C)
Max. pressure: 116 psi (8 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Double junction
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Potable, industrial water, lightly contaminated waste water, cooling tower water

	Part No.
PHED 112 SE	741036



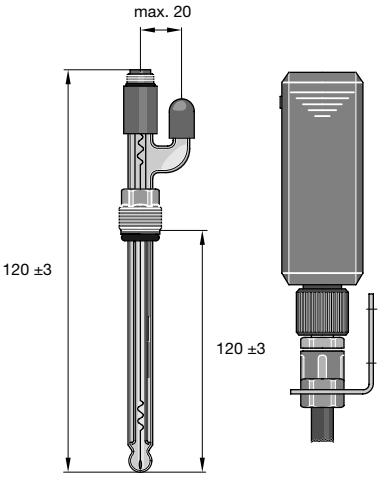
pk_6_007

PHEF 012 SE

HF

pH range: 1-12
Temperature: 32-122 °F (0-50 °C)
Max.pressure: 100 psi/7 bar
Min.conductivity: >150 µS/cm
Diaphragm: HDPE ring diaphragm, flat (Double Junction)
Glass membrane: flat membrane glass, largely resistant to hydrofluoric acid solutions
Electrode shaft: epoxy
Typical applications: achieves a significantly longer service life in hydrofluoric acidic fluids as compared to standard pH electrodes, e.g. in wastewaters from the chip industry or electroplating applications.
The electrode is protected against dirt by the flat glass membrane and the circumferential flat PE diaphragm.

	Part No.
PHEF 012 SE	1010511



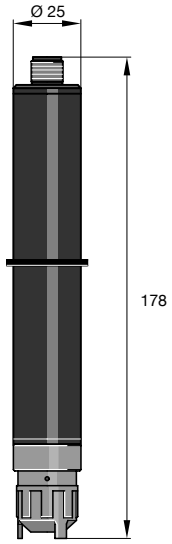
pk_6_021

PHEN 112 SE

pH range: 1-12
Temperature: 32-176 °F (0-80 °C)
Max. pressure: Atmospheric pressure
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
KCl electrolyte, refillable
Installation Length: 4.72“ (120 ±3 mm)
Typical applications: Waste water
Supplied without PE storage container and tubing

		Part No.
PHEN 112 SE		305090
Accessories:		
PE storage container with connectors and tubing		305058
We recommend installation approx. 1.5 - 3 ft. (0.5-1 m) above sample fluid level		
KCl solution 3 molar	250 ml	791440
KCl solution 3 molar	1000 ml	791441

Chlorine Sensors



pk_6_015

CTE 1-DMT

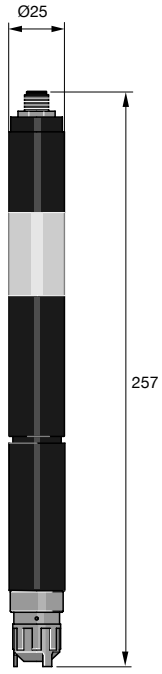
Measuring cell for use with the DMT “chlorine” measurement transducer.

Measured variable:	**Total chlorine**
Reference method:	DPD4
Measurement range:	0.01-10.0 mg/l
Power supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temperature measurement:	Via integrated Pt 1000: compensation carried out in DMT
Sensor output:	5-pin plug

Other data as for CTE 1 mA

	Part No.
CTE 1-DMT-10 ppm set with 50 ml electrolyte	1007540

Note: An assembly set 815079 is required for DLG III for initial installation of chlorine measuring cells.Signal leads, see sensor technology accessories, chapter 6.5.1



pk_6_084

CTE 1 -CAN

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

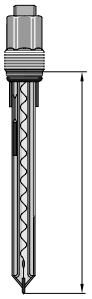
Measured variable:	**total chlorine**
Reference method:	DPD 4
Measurement range:	0.01 -10 mg/l
Power supply:	via CAN interface (11-30 V)
Temperature measurement:	via installed digital semiconducter element
Output signal:	uncalibrated, temperature compensated, electrically isolated
Compatibility:	CAN-Open bus systems

Additional data see CLE 3-mA

	Part No.
CTE 1-CAN-10 ppm set with 100 ml electrolyte	1023427

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorinesensors into the DLM III in-line probe housing

ORP Combination Sensors With SN6



pk_6_035

RHEP-Pt-SE

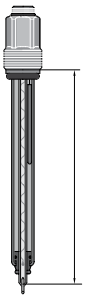
Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm)
Mounting hole: min. Ø 0.57“ (14.5 mm)
For installation in DGM (delivered before 1997) the assembly kit (Part No. 791219 has to be ordered additionally.
Typical applications: Swimming pools under pressure, potable and industrial water, lightly soiled wastewater, the electroplating and chemical industries, for higher temperatures and pressures.
Not suitable for media containing ozone

	Part No.
RHEP-Pt-SE	150094

RHEP-Au-SE

Technical data as type RHEP-Pt-SE, but with gold pin electrode.
Typical application: cyanide detoxification, ozone monitoring.
Not suitable for media containing chlorine

	Part No.
RHEP-Au-SE	1003875

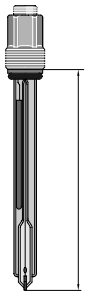


pk_6_034

RHER-Pt-SE

Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >50 µS/cm
Electrolyte with KCl supplement (salt rings in the reference electrolyte)
Diaphragm: PTFE ring diaphragm
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Municipal and industrial waste water, drinking and industrial water, chemical industry, paper manufacture, food industry. General, for water with distinct suspended solid content.

	Part No.
RHER-Pt-SE	1002534



pk_6_033

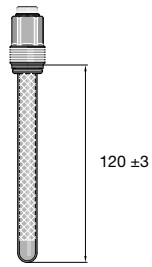
RHEX-Pt-SE

Temperature: 32-212 °F (0-100 °C)
Max. pressure: 232 psi (16 bar) at77 °F (25 °C); 87 psi (6 bar) at 212 °F (100 °C)
Min. conductivity: >500 µS/cm
Diaphragm: circular gap (solid electrolyte)
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Waste water, industrial water, process chemistry, emulsions, suspensions, fluids containing protein and sulphide (not chlorine/fluoride or when subject to temperature fluctuations). General, for water with high suspended solid content.
Not suitable for clear media

	Part No.
RHEX-Pt-SE	305097

ProMinent® DULCOTEST® Sensors

Temperature Sensors



pk_6_026

Temperature range: 0…100 °C
Max. pressure: 10 bar
Typical applications: Temperature measurement and pH temperature correction

	Part No.
Pt 100 SE	305063
Pt 1000 SE	1002856

ORP Identcode Description

Aid to selection of Redox electrodes see page 6

Identity Code Description (Type description)

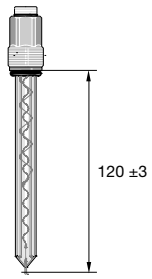
RHEX Pt SE

- ORP-combination probe
- **X**: with solid electrolyte and circular gap diaphragm
- **K**: with strong plastic shaft
- **P**: pressure tight to 87 psi (6 bar)
- **R**: with PTFE ring diaphragm
- **N**: refillable KCl electrode
- **S**: swimming pool electrode
- unspecified: standard gel-filled electrode

- **Pt:** Platinum electrode (pin)
- **Au:** Gold electrode (pin)

- **E**: internal mounting thread PG 13.5
- **S**: connector for SN6 coax plug

ORP Combination Sensors With SN6



pk_6_031

RHE-Pt-SE

Temperature: 32-140 °F (0-60 °C)
Max. pressure: 7.3 psi (0.5 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Swimming pool, atmospheric pressure installation, potable water, lightly contaminated water

	Part No.
RHE-Pt-SE	305001

RHES-Pt-SE

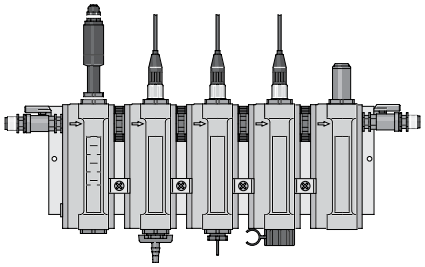
As RHE-Pt-SE but max. pressure 43.5 psi (3 bar)

Typical use: swimming pools during pressurisation, drinking water, slightly fouled industrial and wastewater

	Part No.
RHES-Pt-SE	150703

Sensor Accessories

DGMa Sensor Housings



pk_6_066

DGM modular in-line probe housing

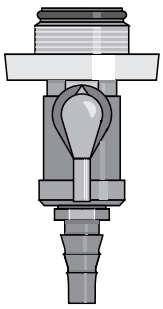
To accept conductivity, Pt 100, pH or ORP probes with PG 13.5 screw-in thread, or amperometric sensors with R 1" screw-in thread.

Advantages:

- Simple to assemble (already mounted on panel up to max. 7 units)
- Simple retrofit expansion possibility (see expansion modules)
- Module for monitoring flow of sampled water
- Simple to calibrate measured variables due to low sample water volume
- Ball valve on either end for adjusting and impeding flow

Each fully-assembled DGM is equipped with a single sampling cock.

Material:	Transparent PVC (all modules) FPM (seals) PP (calibration cup) PVC white (mounting panel)
Max. temperature:	60 °C
Max. pressure:	6 bar (30 °C) 1 bar (60 °C) 2 bar (with flow monitor, 30 °C)
Flow volume:	Up to 80 l/h (40 l/h recommended)
Flow sensor:	Reed contact max. switch power 3 W max. switch voltage 175 V max. switch current 0.25 A max. operating current 1.2 A max. contact resistance 150 m
Switch hysteresis:	approx. 20 %
Enclosure rating:	IP 65
Applications:	Potable, swimming pool water or water of similar quality with no suspended solids
Assembly:	Max. 5 modules pre-assembled onto baseboard: more than 5 modules, pre-assembled onto baseboard as custom version, priced accordingly.FPM = Fluorine Rubber



pk_6_071

Sampling tap for DGM

for PG 13.5 and 25 mm modules designed as a convenient ball valve.

	Part No.
PG 13.5 sampling tap	1004737
25 mm sampling tap	1004739

Expansion modules for DGM

For simple retrofit to an existing DGM.

	Part No.
Flow expansion module with scale in l/h	1023923
Flow expansion module with scale in gph	1023973
Flow sensor for flow expansion module (optional)	791635
Expansion module for PG 13.5 sensors	1023975
Expansion module for 25 mm sensors	1023976

Sensor Accessories

DGMa Identcode

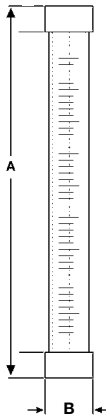
DGM — **In-line Sensor Housing**

A	**Series Version**
	Flow monitor module:
0	none
1	With l/h scale
2	With gph scale
3	With flow monitor, l/h scale
4	With flow monitor, gph scale
	Number of PG 13.5 modules:
0	none
1	One PG 13.5 module
2	Two PG 13.5 modules
3	Three PG 13.5 modules
4	Four PG 13.5 modules
	Note: add 15 mm mounting set for PHEP/RHEP sensors
	Number of 25 mm modules
0	none
1	One 25 mm module*
2	Two 25 mm modules*
	* 25 mm mounting set needed
	Material:
T	Transparent PVC
	Seal material:
0	Viton®
	Connections:
0	1/2" x 3/8" tubing adapters
1	PVC half-union connections with 1/4" MNPT adapter
	Versions:
0	Standard

Recommended accessories:	**Part I**
reference potential plug with SS pin	7916
flow sensor (spare)	7916
calibration cup (spare)	7912
Sampling Tap for PG 13.5 module	1004
Sampling Tap for 25 mm module	1004
Mounting set for 15 mm (PHEP/RHEP)	7912
Mounting set for 25 mm module (CLE, CTE, CGE, CDE, CDP, 0ZE)	7918
Bubble disperser for Cl sensor	7402
Bubble disperser for pH/ORP sensors	7917

DGM	A	4	0	0	T	0	0	0

Calibration columns

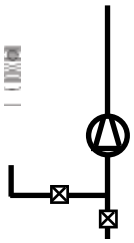


Clear PVC calibration columns

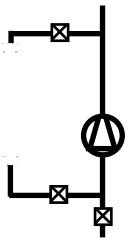
Cylinder size	Fitting size	Dimension (inches) A	B	Threaded base, removable top	Threaded both ends
100 mL	1/2" NPT	10.75	1.39	7500137	7500127
250 mL	1/2" NPT	11.51	1.89	7350138	7500128
500 mL	1/2" NPT	12.75	2.39	7350139	7500129
1000 mL	1/2" NPT	16.75	2.77	7350130	7500135
2000 mL	1" FNPT	20.67	3.52	7500140	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

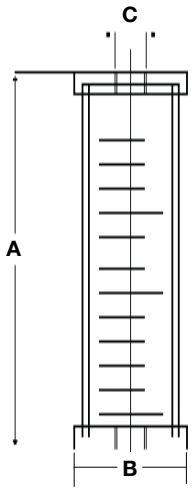


Column threaded both ends
Note: If plumbed as shown, a vent hole must be drilled into the top of the calibration column



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

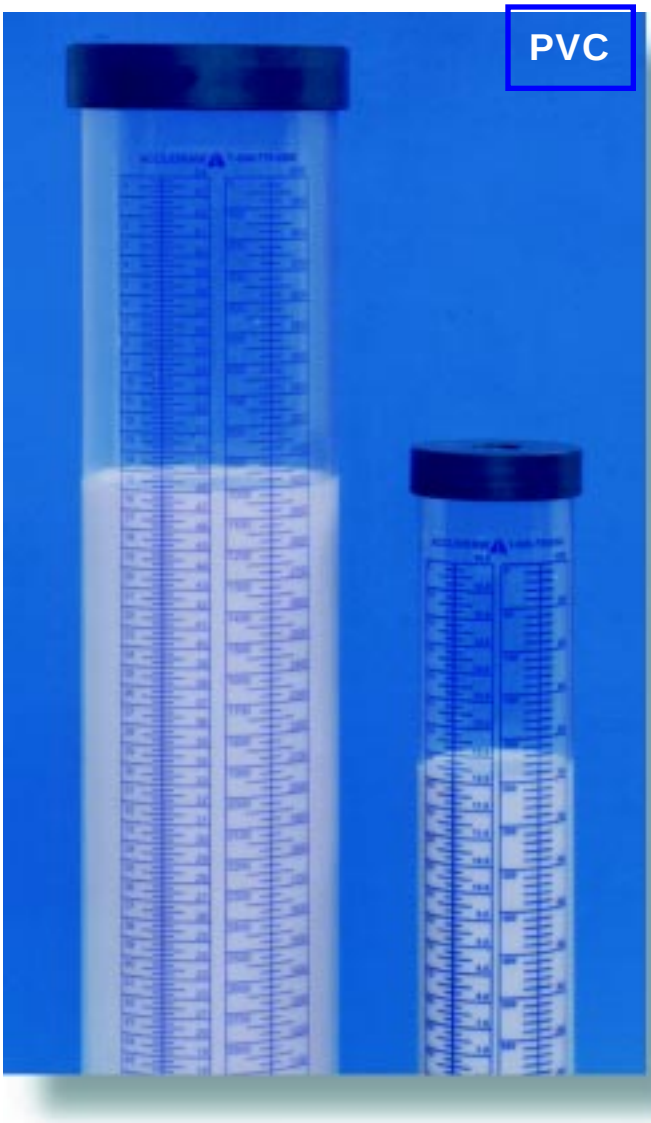
Glass cylinder with acrylic outer shield and 1/2" (316 SS) or 3/4" (PVDF, PVC) thick end flanges. All cylinders are bolted together using stainless steel rods with Viton O-rings for the glass seal and Buna N O-rings for the acrylic seal.



Cylinder size	Fitting size	Dimensions (inches) A	B	C	Part No.
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

Viton® and HYPALON® are registered trademarks of DuPont Dow Elastomers

ACCUDRAW® Calibration Cylinders



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

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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

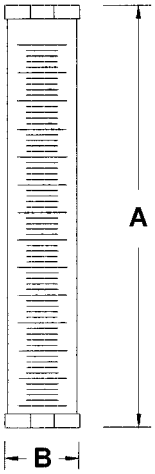
Size/Scale	Conn	BC	BTC	BDC
100 ml/ 1.6 GPH	1/2" NPT	PV#1-100	PV#2-100	PV#3-100
250 ml/ 4 GPH	1/2" NPT	PV#1-250	PV#2-250	PV#3-250
500 ml/ 8 GPH	1/2" NPT	PV#1-500	PV#2-500	PV#3-500
1000 ml/ 16 GPH	1/2" NPT	PV#1-1000	PV#2-1000	PV#3-1000
2000 ml/ 32 GPH	1.0" NPT	PV#1-2000	PV#2-2000	PV#3-2000
4000 ml/ 64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

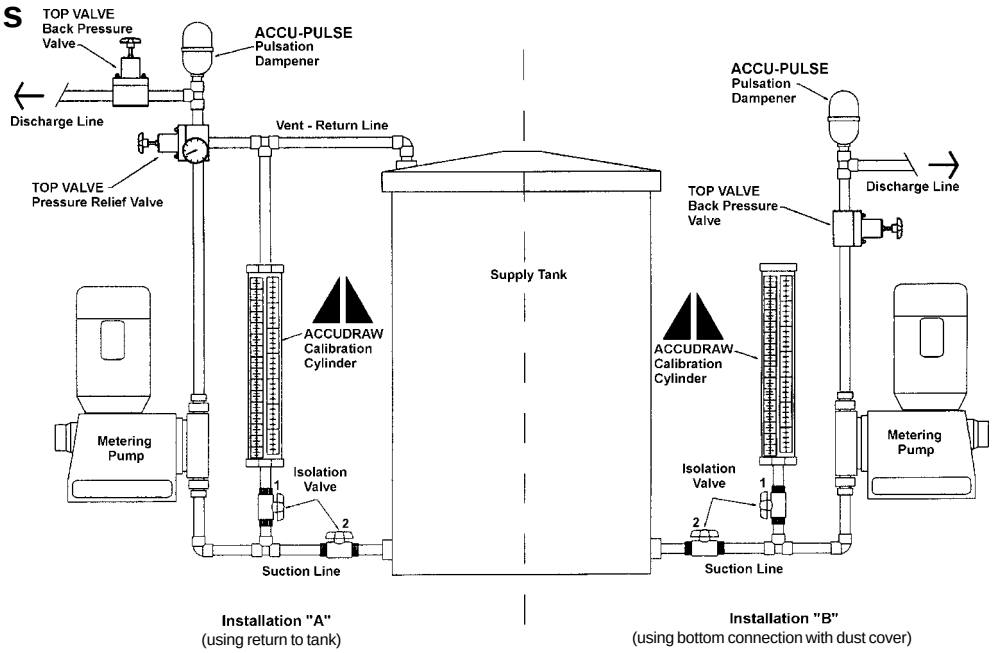
Model	Size (ml)	Dev (ml)	A (inches)	B (inches)
AC#1	100	1	9.88	1.38
AC#1	250	2	12.44	1.75
AC#1	500	5	14.1	2.33
AC#1	1000	10	17.19	2.63
AC#1	2000	20	20.88	3.38
AC#1	4000	50	23.56	4.38
AC#2/AC#3	100	1	9.25	1.38
AC#2/AC#3	250	2	11.63	1.75
AC#2/AC#3	500	5	13	2.32
AC#2/AC#3	1000	10	16.5	2.69
AC#2/AC#3	2000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



Installation "A"
(using return to tank)

Installation "B"
(using bottom connection with dust cover)

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

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Type 21 Ball Valve

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.

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

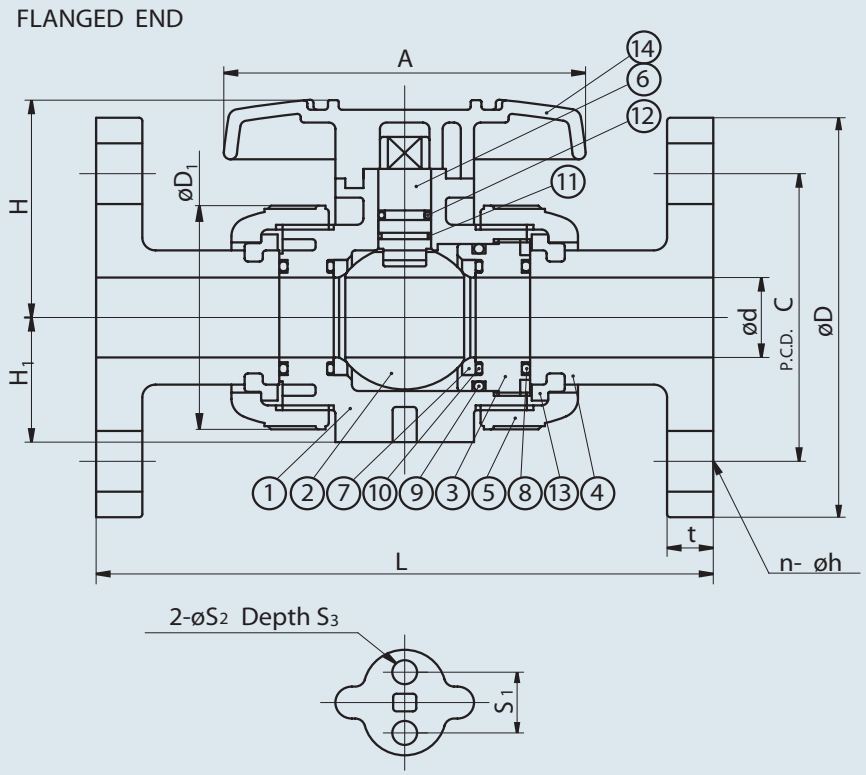
Options

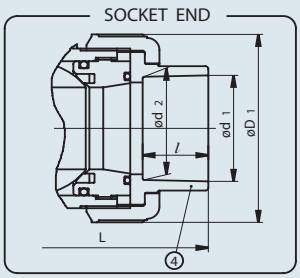
- Pneumatic and electric actuators & accessories
- Stem extensions
- 2" square operating nut or "T" nut
- Locking and/or spring return handles
- Limit switches
- Vented Ball

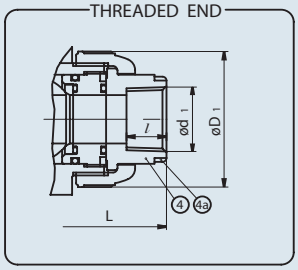
Parts List (Sizes 1/2" – 2")

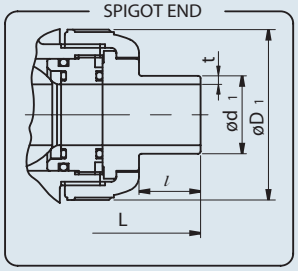
PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, CPVC, PP, PVDF
2	Ball	1	PVC, CPVC, PP, PVDF
3	Carrier	1	PVC, CPVC, PP, PVDF
4	End Connector	2	PVC, CPVC, PP, PVDF
5	Union Nut	2	PVC, CPVC, PP, PVDF
6	Stem	1	PVC, CPVC, PP, PVDF
7	Seat	2	PTFE
8	O-Ring (A)	2	EPDM, FKM, Others
9	O-Ring (B)	1	EPDM, FKM, 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"









Dimensions (Sizes 1/2" – 2")

NOMINAL SIZE			FLANGED						SOCKET										
			ANSI CLASS 150						PVC, CPVC				PP, PVDF (DIN)				PP, PVDF (IPS)		
									ASTM SCH 80				DIN 16962						
INCHES	mm	d	D	C	n	h	L	t	d1	d2	l	L	d1	d2	l	L	d1	l	L
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				
INCHES	mm	d1	l	L	D1	H	H1	A	d1	l	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 (H_2O_2) 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?

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

What if fluid leaks outside of valve?

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

What if handle does not rotate smoothly?

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

What if handle rotates too freely?

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

Precise Flow Control with Fine Adjustment of Corrosive and Ultra Pure Fluids

Throttle Master™ NEEDLE VALVES

Features

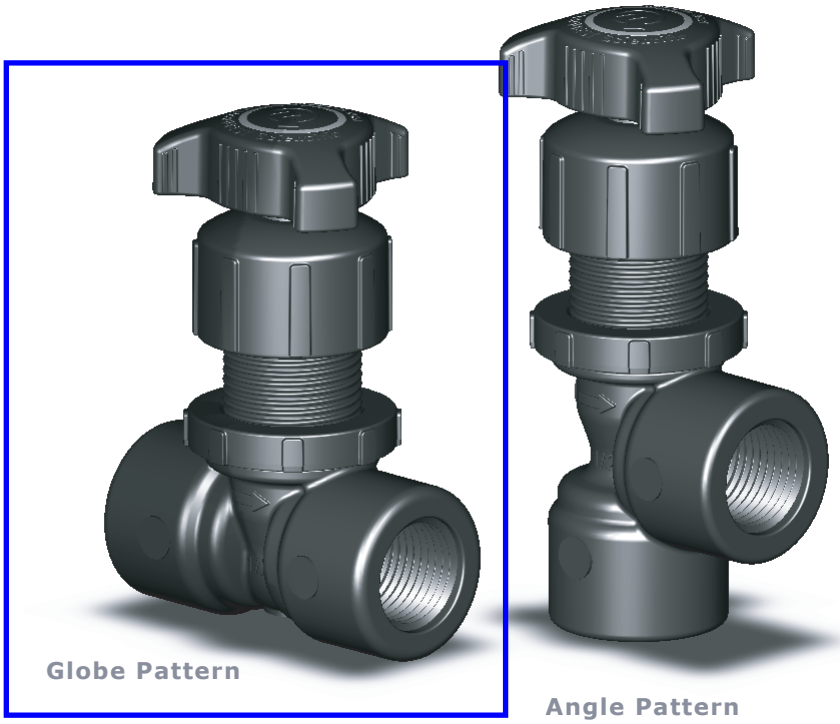
☐ *Benefits*

- **Needle Finish, SPI/SPE # 1**
  Bubble tight, low torque shut-off
- **Proven three prong, star handle. Tri-Oval geometry**
  Fast open/close operation
  Fine metering control
- **24 pitch metering thread**
  20% finer control adjustment
- **Integrally designed panel mounting**
  No fasteners required
  Mounts to panel thicknesses from 1/32" to 1/2"
- **PTFE, Teflon® sealed**
  Chemical resistance
  High Purity
- **No Elastomers (O-rings), metals or lubricants**
  No corrosion
  No contamination
- **Materials of Construction**
  PVC is NSF Std 14 & 61 Rated
  CPVC is NSF Std 14 & 61 Rated
  PP is natural (unpigmented), reinforced
  PVDF is NSF Std 14 & 61 Rated

Materials: **PVC, CPVC, PP, & PVDF**

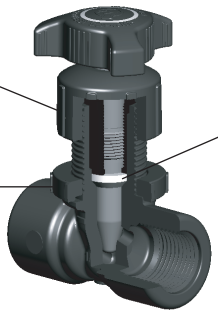
Connection Sizes: **1/4", 3/8", 1/2" FNPT**

Tubing Connections Available!



Cap acts as a gland nut. Any seal wear is compensated for by simple hand tightening.

Panel Nut Ring for easy mounting to bracket or panel.



Teflon® PTFE Seal isolates stem threads from fluid.

Why Marquest Scientific Throttle Master Needle Valves?

The Throttle Master Line represents the latest in computer generated solid modeling and flow analysis. The developed metering chamber provides for the most reliable stabilization and linearity of flow. Ultimate cross sectional geometry allows the manufacturing process to attain full material property potentials for the most demanding applications.

Custom Handles & Colored Ring Inserts are Available.
Please Contact our Sales Department

MARQUEST SCIENTIFIC
Fluid Handling Products

Teflon® is a Registered Trademark of E.I. DuPont.

Body

- **PVC:**☐ Polyvinyl Chloride
- **CPVC:** Chlorinated Polyvinyl Chloride
- **PP:**☐ Polypropylene, unpigmented homopolymer, glass & mineral reinforced

Seal

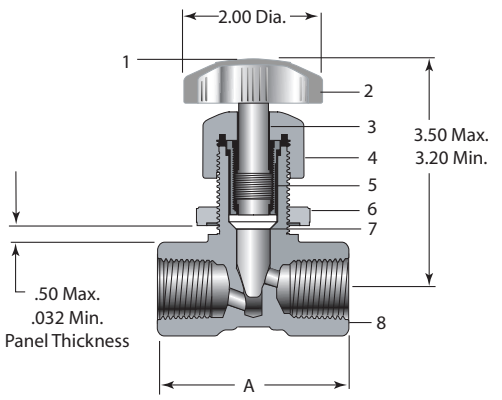
- Virgin PTFE, Teflon®

Choice of three sizes

- 1/4" x 1/4" FNPT
- 3/8" x 3/8" FNPT
- 1/2" x 1/2" FNPT

Tubing Connections are available. Please visit www.marquestscientific.com for more info.

DIMENSIONAL DATA - inches



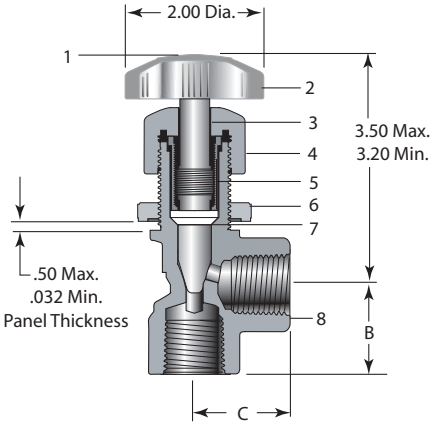
Globe Pattern

Dimensions

Size	A	B	C
1/4" FNPT	2.31	1.16	1.17
3/8" FNPT	2.39	1.19	1.21
1/2" FNPT	2.65	1.31	1.32

Parts List

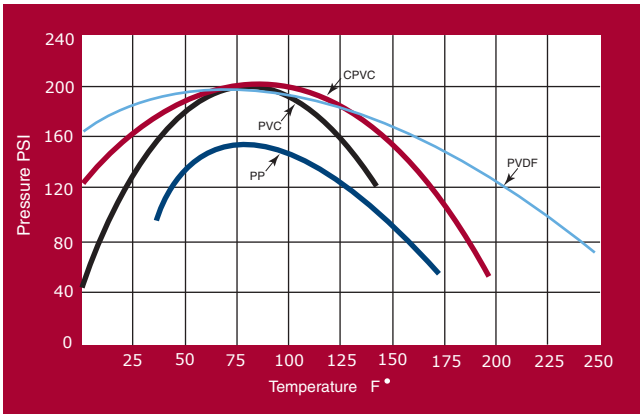
1. Colored Ring Insert
2. Handle☐☐
3. Needle☐☐
4. Cap
5. Threaded Ring Insert
6. Panel Nut
7. PTFE Teflon Seal
8. Body



Angle Pattern

PRESSURE/TEMPERATURE RANGE

Non-Shock



Flow Data

	1/4" & 3/8"		1/2"	
	Globe Pattern	Angle Pattern	Globe Pattern	Angle Pattern
Orifices Inlet☐ Outlet☐	**0.187" 0.187"**	**0.250" 0.187"**	**0.218" 0.218"**	**0.250" 0.218"**
Cv	**0.310**	**0.426**	**0.620**	**0.780**

HOW TO ORDER

NG - 250 - PVC

Model Number
- NG = Globe Pattern
- NA = Angle Pattern

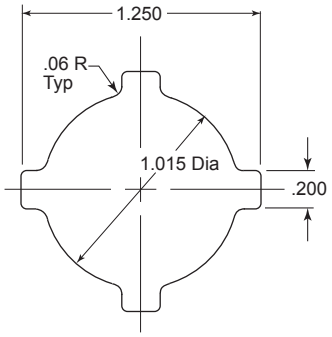
Connections
- 250 = 1/4" FNPT
- 375 = 3/8" FNPT
- 500 = 1/2" FNPT

Body Material
- PVC = Polyvinyl Chloride
- CPV = Chlorinated Polyvinyl Chloride
- PPR = Polypropylene, unpigmented homopolymer, glass & mineral reinforced ☐

Example Part Number **NG-500-PVC**
Globe pattern with 1/2" FNPT connections and a Polyvinyl Chloride Body

Mounting Template

When required, the template provides the outline of the hoie and orientation slots for a panel or bracket mounting. The orientation slots may be cut in multiple positions to allow versatility in mounting the valve to accomodate the piping alignment requirements.



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Fluid Handling Products

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Bulletin No. TMNV0804

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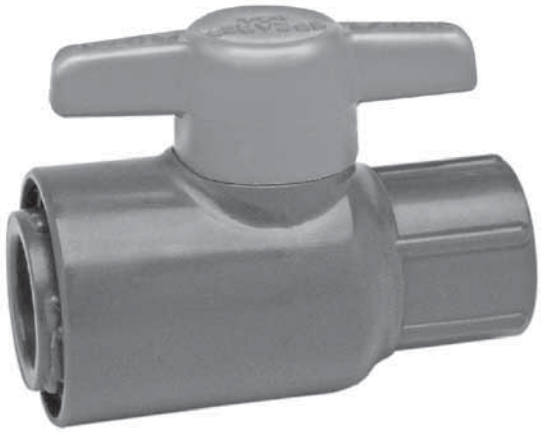
LAB BALL VALVES



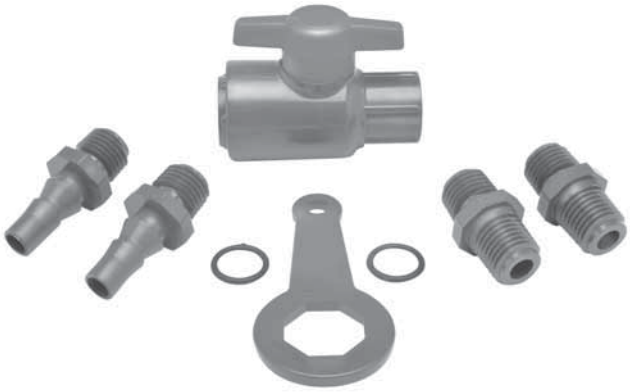
Features – PVC, CPVC

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

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.



LAB VALVE WITH ADAPTER KIT

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	

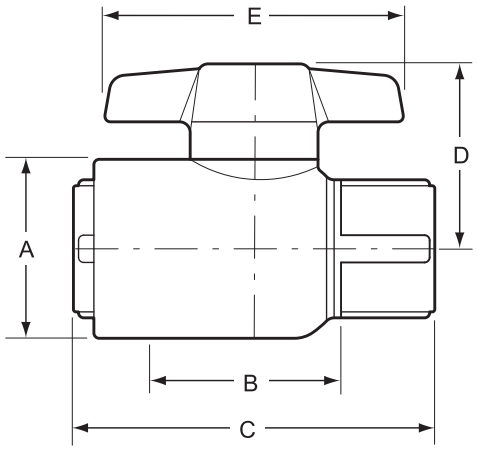
1: For CPVC Valves, add the letter "C" to part number listed (e.g., 1521-002**C**)

Valve & Adapter Kit

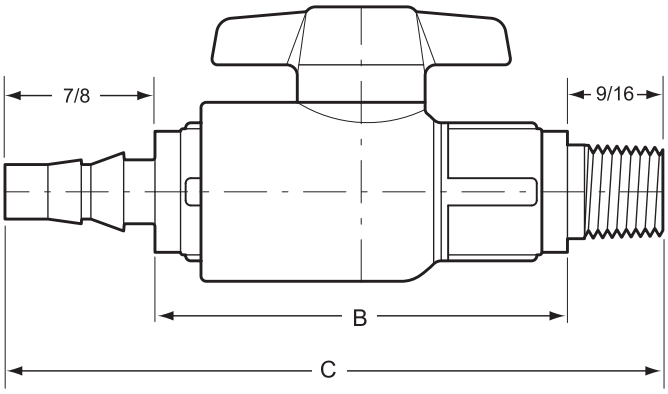
Kit allows multiple connection options. Adapters use O-ring seals for easy connection to threaded valve. Complete Kit includes:

1 – 1/4" Threaded Valve
2 – 1/4" O-ring Sealed Mpt x Mipt 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

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

Pressure Regulators

1/4″ to 1 1/2″ - PVC and Corzan® CPVC

Reliable Pressure Regulation

Hayward Pressure Regulators prevent downstream pressure from exceeding a preset pressure. When the upstream pressure increases beyond the set pressure of the regulator, the regulator prevents the downstream pressure from exceeding the set pressure.

Easy to Set Pressure

Hayward Pressure Regulators can be set by hand, no tools are needed, to control downstream pressures from 5 to 75 PSI. Each size regulator is designed to cover this complete pressure range with just one, non-wetted, plastic coated spring. There's no need to change springs for different pressure ranges as with ordinary regulators.

Molded Gauge Port

An integral molded 1/4″ NPT gauge port on the valve body makes installation of a gauge to monitor downstream pressure easy. No drilling, or extra fittings are needed.

No Corrosion Failure

These all plastic regulators have no metal parts and will never fail, jam, or stick because of rusted or corroded components. They also require no painting or epoxy coatings to survive corrosive environments.

Features

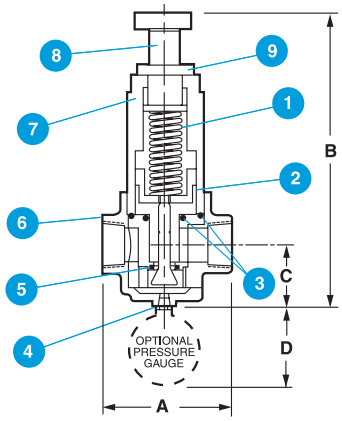
- No Metal Parts to Stick or Jam
- Hand Adjustable
- Molded Gauge Port
- Regulates from 5 to 75 PSI
- All Plastic, No Rust or Corrosion
- FPM Seals

Options

- Pressure Gauges
  - 0 to 30 PSI
  - 0 to 60 PSI
  - 0 to 160 PSI
- Gauge Guards

Corzan® is a registered trademark of Noveon, Inc.

Technical Information



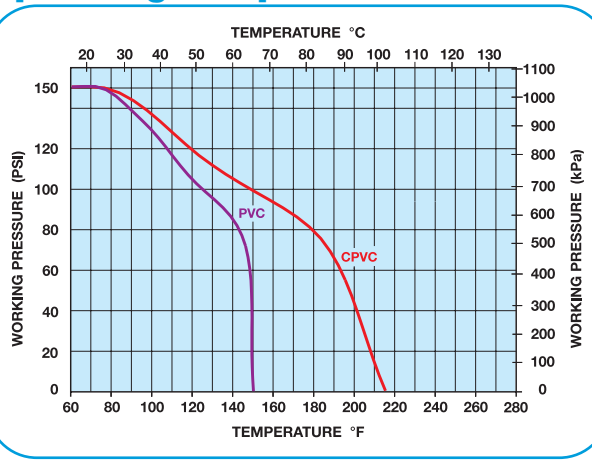
Parts List
Pressure Regulators

1. Spring (Plastic Coated)
2. Diaphragm Assembly
3. O-Ring Seals
4. Gauge Port
5. Square Cut Seal
6. Body
7. Bonnet
8. Stem
9. Locknut

Dimensions - Inches / Millimeters

Size	A	B	C	D	Weight (lb / kg)
1/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1/2″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
3/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16
1-1/2″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16

Operating Temperature/Pressure



Selection Chart

Size	Material	End Conn.	Seals	Pressure Setting	Pressure Rating
1/4″ to 1-1/2″	PVC or CPVC	Threaded	FPM	5 to 75 PSI	150 PSI @ 70°F Non-Shock

How to Size a Pressure Regulator

Pressure regulator selection is based on the desired flow, inlet pressure and the desired outlet pressure.

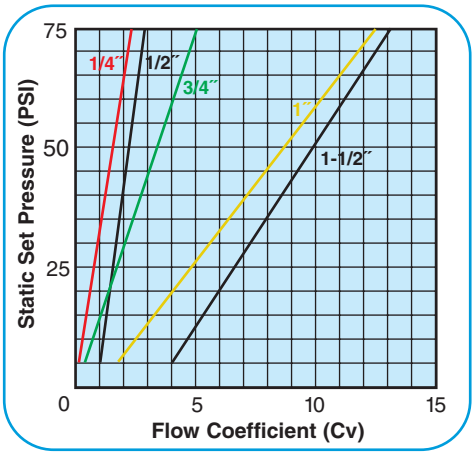
Example: A system requires a flow rate of 10 gpm at a set pressure of 30 PSI, and the inlet pressure is 50 PSI. From the graph at right, a 1″ regulator has a flow coefficient of 5.5 at a 30 PSI set pressure.

$\Delta P = (Q \div Cv)^2$ ΔP = Pressure Drop
$\Delta P = (10 \div 5.5)^2$ Q = Flow in GPM
$\Delta P = 3.3$ PSI Cv = Flow Coefficient

The 1″ regulator will meet the requirements because 3.3 PSI is less than the required pressure drop of 20 PSI (50 PSI inlet pressure less 30 PSI set pressure). The maximum flow rate in this example is:

$Q = Cv \sqrt{\Delta P}$
$Q = 5.5 \sqrt{20}$
$Q = 24.6$ gpm

Flow Coefficients



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.

Lower Installation Costs

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).

MADE IN THE U.S.A. WITH PRIDE

LPCB LOSS PREVENTION CERTIFICATION BOARD — NATIONAL ACCREDITATION OF CERTIFICATION BODIES

Quality Systems Certificate No. 293
Corporate Facilities, Sylmar, CA
Assessed to ISO 9001

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.

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/cm^3	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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Fax (303) 375-9546

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5395 West 1520 South
Salt Lake City, UT 84104
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

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Lawrenceville (Atlanta), GA 30043
(678) 985-1263 • (800) 662-6326
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Fax (630) 759-7515

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Auburn (Seattle), WA 98002
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Fax (253) 939-7557

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NORTHEAST
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ProMinent® DMT Transmitters

Overview: DMT

DULCOMETER® DMT type transmitters are compact 2-wire transmitters for measured variables pH, redox, chlorine, conductive conductivity, temperature.

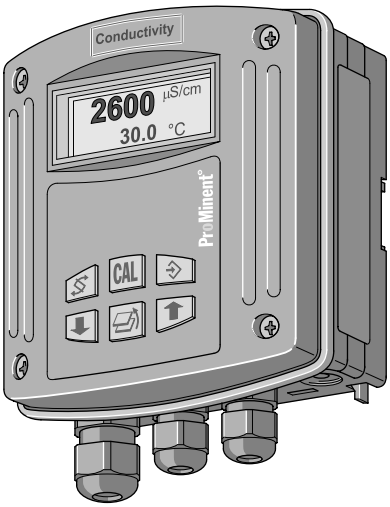
Easily combined with programmable memory controllers.

Summary of advantages:

- Reliable measurement due, e.g., to symmetrical input for pH and redox signals
- High level of operating safety, e.g. probe monitoring (pH), electrical isolation
- Simple flexible installation
- Full text user guidance
- Automatic buffer recognition (pH)
- Autoranging (conductivity)
- Compact design
- Switch between pH, redox and temperature

Applications: **process control, food and beverage industry, chemical and pharmaceutical industries, water treatment, waste water treatment, power stations**

Technical Data



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Measurement range:	pH -1.00 - 15.00 -1200…+1200 mV redox voltage 0.01…50.0 ppm/l chlorine -20 - +150 °C 1 µS/cm - 200 mS/cm (autoranging)
Cell constant:	0.006…12.0/cm for conductivity
Resolution:	pH 0.01 1 mV 0.1 % from measurement range for chlorine 0.1 °C Conductivity 1/1000 of display value (min. 0.001 µS/cm)
Reproducibility:	0.5 % from measurement range
Measurement input:	mV terminal (pH, redox); imput resistance >5 x 10^{11} Ω Chlorine terminal (DMT chlorine probes) Pt 100/1000 terminal Conductivity terminal (2 or 4 wire connector)
Correction variable:	Temperature via Pt 100/1000 (pH, chlorine, conductivity)
Correction range:	chlorine: 5 - 45 °C, pH: 0 - 100 °C, Cond: 0 - 100 °C
Current output:	4 - 20 mA, fault current 23 mA
Supply voltage:	16 - 40 V DC
Feed voltage:	2-wire transmitter, 16 - 40 V DC, nominal 24 V PROFIBUS® DP version, 16 - 30 V DC, nominal 24 V communication interface:
Communication interface:	PROFIBUS® DP (wall-mounted version only)
Ambient temperature:	-5 - +55 °C
Climatic conditions:	up to 95 % relative humidity (non-condensing)
Enclosure rating:	IP 65 (wall/pipe mounted) IP 54 (control panel installation)
Display:	graphical display
Housing:	PPE
Dimensions:	125 x 135 x 75 mm (WxHxD)
Weight:	approx. 450 g

A complete measuring station comprises the following:

- Measuring transducer DMTa (see Identcode)
- In-line probe housing: DGMa..., DLG III ..., immersible in-line probe housing (see section 6.5)
- Chlorine sensor (see section 6.3.1, dependent on Identcode)
- Assembly set for chlorine sensor (see section 6.5)
- pH sensor (see section 6.2.1, dependent on Identcode)
- Redox sensor (see section 6.2.4, dependent on Identcode)
- Temperature sensor Pt 100 /Pt 1000 (see section 6.2.3, dependent on Identcode)
- Conductivity sensor (see section 6.4.1)
- Sensor cable (see section 6.5)
- PROFIBUS®-DP connection accessories (see section 1.9.15)

PROFI® PROCESS FIELD BUS BUS

ProMinent® DMT Transmitters

Identcode Ordering System

DMT DULCOMETER® Transmitters

A	**Version**
	Type of Mounting:
W	Wall mounted (also pillar mounted)
S	Control panel installation[1]
	Version:
0	With ProMinent® logo
	Electrical connection:
9	Ring main 4-20 mA (two wire technology), operating voltage16 - 40 V DC, nominal 24 V DC (only if communication point = none)
5	PROFIBUS® DP, operating voltage 16 - 30 V DC, nominal 24 V DC (only if communication interface = PROFIBUS® DP)
	Communication interface:
0	None
4	PROFIBUS® DP (assembly type W only)
	Measured variable 1:
P	pH
R	Redox
T	Temperature
C	Chlorine
L	Conductivity
	Measured variable 2 (Correcting value):
1	Temperature Pt 1000/Pt 100
0	None (in the case of measured variable T)
	Enclosure rating:
0	Standard
	Language:
D	German
E	English
F	French
S	Spanish
I	Italian
	Presetting A, probe:
0	Standard ProMinent® buffer solution pH 4-7-10
D	Ref. buffer DIN 19266 pH 4-7-9
V	Variable buffer recognition
	Presetting B, probe:
0	Autom. temperature measurement (standard)
1	Manual temperature measurement
2	Autom./manual temperature measurement
9	No temperature measurement
	Presetting C, output:
0	Prop. measured variable (standard)
1	Manual adjustable current value
2	Proportional or manual
3	Proportional or manual hold
4	4 mA constant current

DMTA	A	W	0	9	0	R	1	0	E	0	0	2	0

The last four digits in the Identcode indicate the software presettings, e.g. cell constants for conductivity, temperature compensation etc.
0 = Standard setting.
The measuring transducer can be supplied with presettings already installed. Changes to the presettings can easily be carried out in the operating menu.

Note:

1) The panel-mounting variant does not have the back housing section.
2) AC Adapter (wall pack) PN/ 7500039

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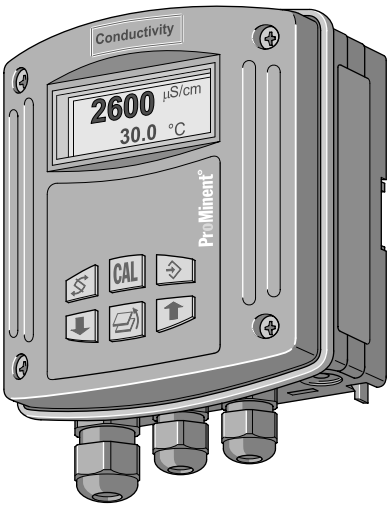
- High level of operating safety, e.g. probe monitoring (pH), electrical isolation
- Simple flexible installation
- Full text user guidance
- Automatic buffer recognition (pH)
- Autoranging (conductivity)
- Compact design
- Switch between pH, redox and temperature

Applications: **process control, food and beverage industry, chemical and pharmaceutical industries, water treatment, waste water treatment, power stations**

Technical Data



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Resolution:	pH 0.01 1 mV 0.1 % from measurement range for chlorine 0.1 °C Conductivity 1/1000 of display value (min. 0.001 µS/cm)
Reproducibility:	0.5 % from measurement range
Measurement input:	mV terminal (pH, redox); imput resistance >5 x 10^{11} Ω Chlorine terminal (DMT chlorine probes) Pt 100/1000 terminal Conductivity terminal (2 or 4 wire connector)
Correction variable:	Temperature via Pt 100/1000 (pH, chlorine, conductivity)
Correction range:	chlorine: 5 - 45 °C, pH: 0 - 100 °C, Cond: 0 - 100 °C
Current output:	4 - 20 mA, fault current 23 mA
Supply voltage:	16 - 40 V DC
Feed voltage:	2-wire transmitter, 16 - 40 V DC, nominal 24 V PROFIBUS® DP version, 16 - 30 V DC, nominal 24 V communication interface:
Communication interface:	PROFIBUS® DP (wall-mounted version only)
Ambient temperature:	-5 - +55 °C
Climatic conditions:	up to 95 % relative humidity (non-condensing)
Enclosure rating:	IP 65 (wall/pipe mounted) IP 54 (control panel installation)
Display:	graphical display
Housing:	PPE
Dimensions:	125 x 135 x 75 mm (WxHxD)
Weight:	approx. 450 g

A complete measuring station comprises the following:

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- Assembly set for chlorine sensor (see section 6.5)
- pH sensor (see section 6.2.1, dependent on Identcode)
- Redox sensor (see section 6.2.4, dependent on Identcode)
- Temperature sensor Pt 100 /Pt 1000 (see section 6.2.3, dependent on Identcode)
- Conductivity sensor (see section 6.4.1)
- Sensor cable (see section 6.5)
- PROFIBUS®-DP connection accessories (see section 1.9.15)

PROFI® PROCESS FIELD BUS BUS

ProMinent® DMT Transmitters

Identcode Ordering System

DMT **DULCOMETER® Transmitters**

A **Version**

Type of Mounting:
- W Wall mounted (also pillar mounted)
- S Control panel installation[1)]

Version:
- 0 With ProMinent® logo

Electrical connection:
- 9 Ring main 4-20 mA (two wire technology), operating voltage16 - 40 V DC, nominal 24 V DC (only if communication point = none)
- 5 PROFIBUS® DP, operating voltage 16 - 30 V DC, nominal 24 V DC (only if communication interface = PROFIBUS® DP)

Communication interface:
- 0 None
- 4 PROFIBUS® DP (assembly type W only)

Measured variable 1:
- P pH
- R Redox
- T Temperature
- C Chlorine
- L Conductivity

Measured variable 2 (Correcting value):
- 1 Temperature Pt 1000/Pt 100
- 0 None (in the case of measured variable T)

Enclosure rating:
- 0 Standard

Language:
- D German
- E English
- F French
- S Spanish
- I Italian

Presetting A, probe:
- 0 Standard ProMinent® buffer solution pH 4-7-10
- D Ref. buffer DIN 19266 pH 4-7-9
- V Variable buffer recognition

Presetting B, probe:
- 0 Autom. temperature measurement (standard)
- 1 Manual temperature measurement
- 2 Autom./manual temperature measurement
- 9 No temperature measurement

Presetting C, output:
- 0 Prop. measured variable (standard)
- 1 Manual adjustable current value
- 2 Proportional or manual
- 3 Proportional or manual hold
- 4 4 mA constant current

The last four digits in the Identcode indicate the software presettings, e.g. cell constants for conductivity, temperature compensation etc.
0 = Standard setting.
The measuring transducer can be supplied with presettings already installed. Changes to the presettings can easily be carried out in the operating menu.

DMTA A W 0 9 0 C 1 0 E 0 0 2 0

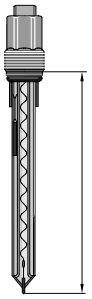
Note:

1) The panel-mounting variant does not have the back housing section.

2) AC Adapter (wall pack) PN/ 7500039

ProMinent® DULCOTEST® Sensors

ORP Combination Sensors With SN6



pk_6_035

RHEP-Pt-SE

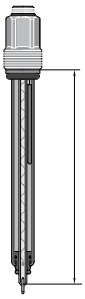
Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >150 µS/cm
Diaphragm: Ceramic
Installation length: 4.72“ (120 ±3 mm)
Mounting hole: min. Ø 0.57“ (14.5 mm)
For installation in DGM (delivered before 1997) the assembly kit (Part No. 791219 has to be ordered additionally.
Typical applications: Swimming pools under pressure, potable and industrial water, lightly soiled wastewater, the electroplating and chemical industries, for higher temperatures and pressures.
Not suitable for media containing ozone

	Part No.
RHEP-Pt-SE	150094

RHEP-Au-SE

Technical data as type RHEP-Pt-SE, but with gold pin electrode.
Typical application: cyanide detoxification, ozone monitoring.
Not suitable for media containing chlorine

	Part No.
RHEP-Au-SE	1003875

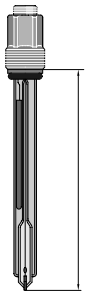


pk_6_034

RHER-Pt-SE

Temperature: 32-176 °F (0-80 °C)
Max. pressure: 87 psi (6 bar)
Min. conductivity: >50 µS/cm
Electrolyte with KCl supplement (salt rings in the reference electrolyte)
Diaphragm: PTFE ring diaphragm
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Municipal and industrial waste water, drinking and industrial water, chemical industry, paper manufacture, food industry. General, for water with distinct suspended solid content.

	Part No.
RHER-Pt-SE	1002534



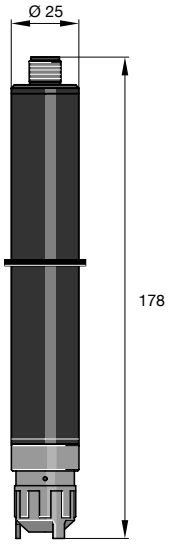
pk_6_033

RHEX-Pt-SE

Temperature: 32-212 °F (0-100 °C)
Max. pressure: 232 psi (16 bar) at77 °F (25 °C); 87 psi (6 bar) at 212 °F (100 °C)
Min. conductivity: >500 µS/cm
Diaphragm: circular gap (solid electrolyte)
Installation length: 4.72“ (120 ±3 mm)
Typical applications: Waste water, industrial water, process chemistry, emulsions, suspensions, fluids containing protein and sulphide (not chlorine/fluoride or when subject to temperature fluctuations). General, for water with high suspended solid content.
Not suitable for clear media

	Part No.
RHEX-Pt-SE	305097

Chlorine Sensors



pk_6_015

CTE 1-DMT

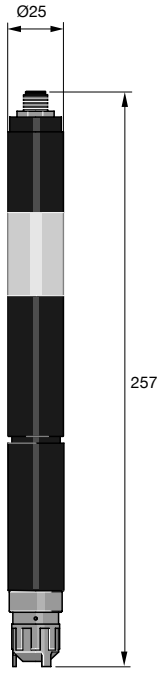
Measuring cell for use with the DMT “chlorine” measurement transducer.

Measured variable:	**Total chlorine**
Reference method:	DPD4
Measurement range:	0.01-10.0 mg/l
Power supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temperature measurement:	Via integrated Pt 1000: compensation carried out in DMT
Sensor output:	5-pin plug

Other data as for CTE 1 mA

	Part No.
CTE 1-DMT-10 ppm set with 50 ml electrolyte	1007540

Note: An assembly set 815079 is required for DLG III for initial installation of chlorine measuring cells.Signal leads, see sensor technology accessories, chapter 6.5.1



pk_6_084

CTE 1 -CAN

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

Measured variable:	**total chlorine**
Reference method:	DPD 4
Measurement range:	0.01 -10 mg/l
Power supply:	via CAN interface (11-30 V)
Temperature measurement:	via installed digital semiconducter element
Output signal:	uncalibrated, temperature compensated, electrically isolated
Compatibility:	CAN-Open bus systems

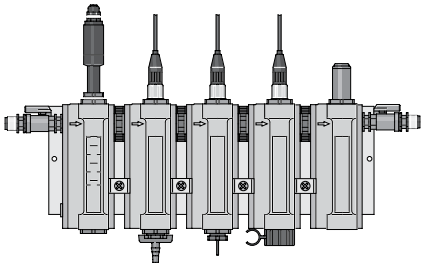
Additional data see CLE 3-mA

	Part No.
CTE 1-CAN-10 ppm set with 100 ml electrolyte	1023427

Note: You require assembly kit (Part No. 815079) for the initial installation of the chlorinesensors into the DLM III in-line probe housing

Sensor Accessories

DGMa Sensor Housings



pk_6_066

DGM modular in-line probe housing

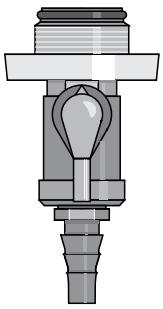
To accept conductivity, Pt 100, pH or ORP probes with PG 13.5 screw-in thread, or amperometric sensors with R 1" screw-in thread.

Advantages:

- Simple to assemble (already mounted on panel up to max. 7 units)
- Simple retrofit expansion possibility (see expansion modules)
- Module for monitoring flow of sampled water
- Simple to calibrate measured variables due to low sample water volume
- Ball valve on either end for adjusting and impeding flow

Each fully-assembled DGM is equipped with a single sampling cock.

Material:	Transparent PVC (all modules) FPM (seals) PP (calibration cup) PVC white (mounting panel)
Max. temperature:	60 °C
Max. pressure:	6 bar (30 °C) 1 bar (60 °C) 2 bar (with flow monitor, 30 °C)
Flow volume:	Up to 80 l/h (40 l/h recommended)
Flow sensor:	Reed contact max. switch power 3 W max. switch voltage 175 V max. switch current 0.25 A max. operating current 1.2 A max. contact resistance 150 m
Switch hysteresis:	approx. 20 %
Enclosure rating:	IP 65
Applications:	Potable, swimming pool water or water of similar quality with no suspended solids
Assembly:	Max. 5 modules pre-assembled onto baseboard: more than 5 modules, pre-assembled onto baseboard as custom version, priced accordingly.FPM = Fluorine Rubber



pk_6_071

Sampling tap for DGM

for PG 13.5 and 25 mm modules designed as a convenient ball valve.

	Part No.
PG 13.5 sampling tap	1004737
25 mm sampling tap	1004739

Expansion modules for DGM

For simple retrofit to an existing DGM.

	Part No.
Flow expansion module with scale in l/h	1023923
Flow expansion module with scale in gph	1023973
Flow sensor for flow expansion module (optional)	791635
Expansion module for PG 13.5 sensors	1023975
Expansion module for 25 mm sensors	1023976

Sensor Accessories

DGMa Identcode

DGM — **In-line Sensor Housing**

A — **Series Version**

Flow monitor module:

0	none
1	With l/h scale
2	With gph scale
3	With flow monitor, l/h scale
4	With flow monitor, gph scale

Number of PG 13.5 modules:

0	none
1	One PG 13.5 module
2	Two PG 13.5 modules
3	Three PG 13.5 modules
4	Four PG 13.5 modules

Note: add 15 mm mounting set for PHEP/RHEP sensors

Number of 25 mm modules

0	none
1	One 25 mm module*
2	Two 25 mm modules*

* 25 mm mounting set needed

Material:

T	Transparent PVC

Seal material:

0	Viton®

Connections:

0	1/2" x 3/8" tubing adapters
1	PVC half-union connections with 1/4" MNPT adapter

Versions:

0	Standard

Recommended accessories:	**Part I**
reference potential plug with SS pin	7916
flow sensor (spare)	7916
calibration cup (spare)	7912
Sampling Tap for PG 13.5 module	1004
Sampling Tap for 25 mm module	1004
Mounting set for 15 mm (PHEP/RHEP)	7912
Mounting set for 25 mm module (CLE, CTE, CGE, CDE, CDP, 0ZE)	7918
Bubble disperser for Cl sensor	7402
Bubble disperser for pH/ORP sensors	7917

DGM	A	4	0	0	T	0	0	0

Sensor Accessories

DGMa Identcode

DGM — **In-line Sensor Housing**

A — **Series Version**

Flow monitor module:

0	none
1	With l/h scale
2	With gph scale
3	With flow monitor, l/h scale
4	**With flow monitor, gph scale**

Number of PG 13.5 modules:

0	none
1	**One PG 13.5 module**
2	Two PG 13.5 modules
3	Three PG 13.5 modules
4	Four PG 13.5 modules

Note: add 15 mm mounting set for PHEP/RHEP sensors

Number of 25 mm modules

0	none
1	**One 25 mm module***
2	Two 25 mm modules*

* 25 mm mounting set needed

Material:

T	**Transparent PVC**

Seal material:

0	**Viton®**

Connections:

0	1/2" x 3/8" tubing adapters
1	**PVC half-union connections with 1/4" MNPT adapter**

Versions:

0	**Standard**

Recommended accessories:	**Part I**
reference potential plug with SS pin	7916
flow sensor (spare)	7916
calibration cup (spare)	7912
Sampling Tap for PG 13.5 module	1004
Sampling Tap for 25 mm module	1004
Mounting set for 15 mm (PHEP/RHEP)	7912
Mounting set for 25 mm module (CLE, CTE, CGE, CDE, CDP, 0ZE)	7918
Bubble disperser for Cl sensor	7402
Bubble disperser for pH/ORP sensors	7917

DGM	A	4	1	1	T	0	1	0

Precise Flow Control with Fine Adjustment of Corrosive and Ultra Pure Fluids

Throttle Master™ NEEDLE VALVES

Features

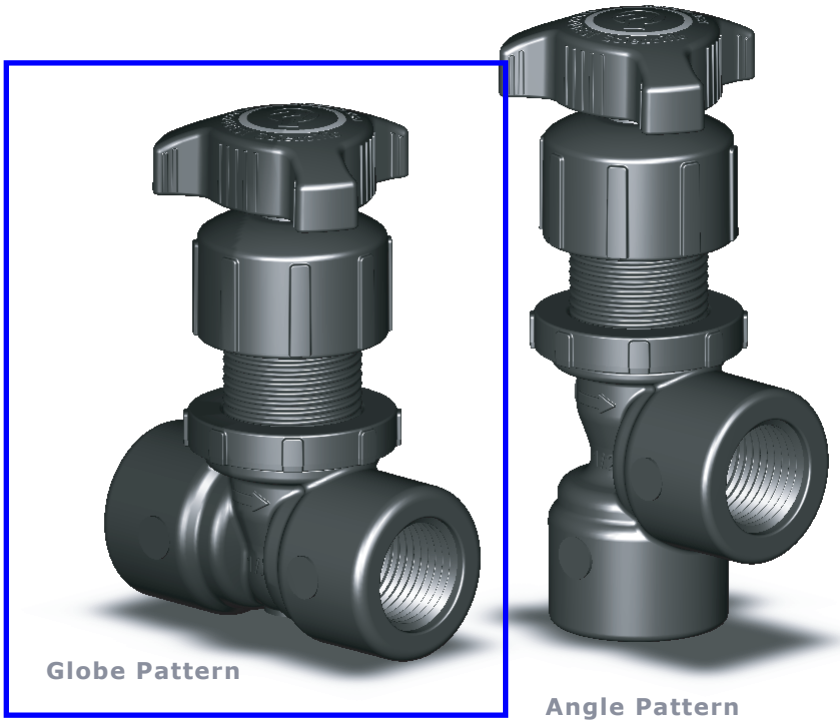
☐ *Benefits*

- **Needle Finish, SPI/SPE # 1**
  Bubble tight, low torque shut-off
- **Proven three prong, star handle. Tri-Oval geometry**
  Fast open/close operation
  Fine metering control
- **24 pitch metering thread**
  20% finer control adjustment
- **Integrally designed panel mounting**
  No fasteners required
  Mounts to panel thicknesses from 1/32" to 1/2"
- **PTFE, Teflon® sealed**
  Chemical resistance
  High Purity
- **No Elastomers (O-rings), metals or lubricants**
  No corrosion
  No contamination
- **Materials of Construction**
  PVC is NSF Std 14 & 61 Rated
  CPVC is NSF Std 14 & 61 Rated
  PP is natural (unpigmented), reinforced
  PVDF is NSF Std 14 & 61 Rated

Materials: **PVC, CPVC, PP, & PVDF**

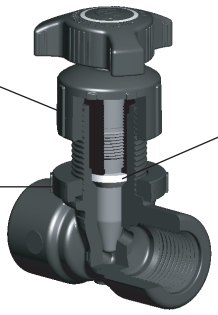
Connection Sizes: **1/4", 3/8", 1/2" FNPT**

Tubing Connections Available!



Cap acts as a gland nut. Any seal wear is compensated for by simple hand tightening.

Panel Nut Ring for easy mounting to bracket or panel.



Teflon® PTFE Seal isolates stem threads from fluid.

Why Marquest Scientific Throttle Master Needle Valves?

The Throttle Master Line represents the latest in computer generated solid modeling and flow analysis. The developed metering chamber provides for the most reliable stabilization and linearity of flow. Ultimate cross sectional geometry allows the manufacturing process to attain full material property potentials for the most demanding applications.

Custom Handles & Colored Ring Inserts are Available.
Please Contact our Sales Department

MARQUEST SCIENTIFIC
Fluid Handling Products

Teflon® is a Registered Trademark of E.I. DuPont.

Body

- **PVC:**☐ Polyvinyl Chloride
- **CPVC:** Chlorinated Polyvinyl Chloride
- **PP:**☐ Polypropylene, unpigmented homopolymer, glass & mineral reinforced

Seal

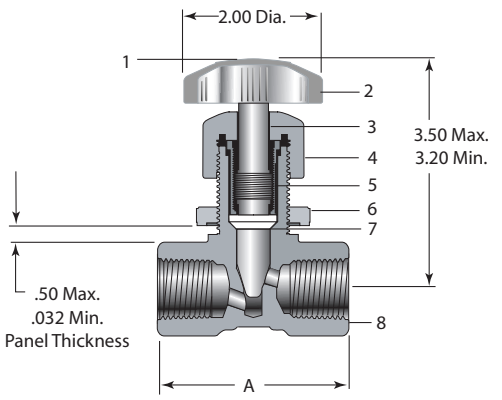
- Virgin PTFE, Teflon®

Choice of three sizes

- 1/4" x 1/4" FNPT
- 3/8" x 3/8" FNPT
- 1/2" x 1/2" FNPT

Tubing Connections are available. Please visit www.marquestscientific.com for more info.

DIMENSIONAL DATA - inches



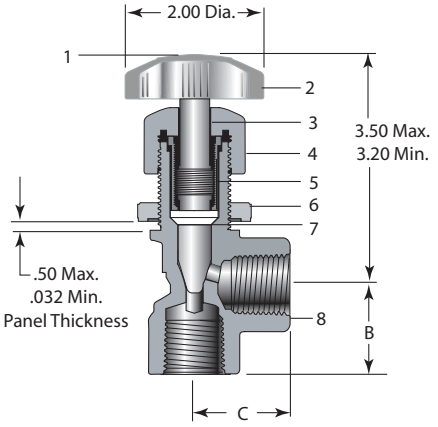
Globe Pattern

Dimensions

Size	A	B	C
1/4" FNPT	2.31	1.16	1.17
3/8" FNPT	2.39	1.19	1.21
1/2" FNPT	2.65	1.31	1.32

Parts List

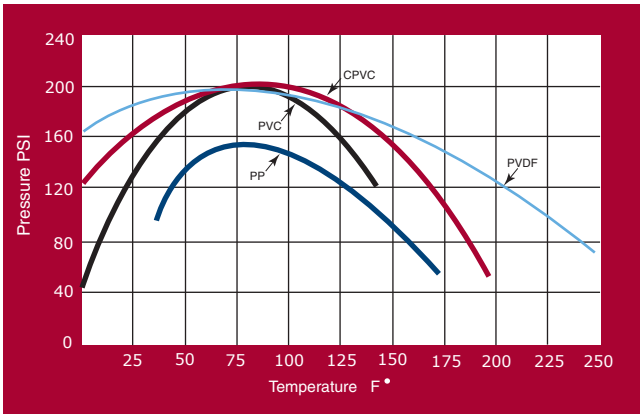
1. Colored Ring Insert
2. Handle☐☐
3. Needle☐☐
4. Cap
5. Threaded Ring Insert
6. Panel Nut
7. PTFE Teflon Seal
8. Body



Angle Pattern

PRESSURE/TEMPERATURE RANGE

Non-Shock



Flow Data

	1/4" & 3/8"		1/2"	
	Globe Pattern	Angle Pattern	Globe Pattern	Angle Pattern
Orifices Inlet☐ Outlet☐	**0.187" 0.187"**	**0.250" 0.187"**	**0.218" 0.218"**	**0.250" 0.218"**
Cv	**0.310**	**0.426**	**0.620**	**0.780**

HOW TO ORDER

NG - 250 - PVC

Model Number
- NG = Globe Pattern
- NA = Angle Pattern

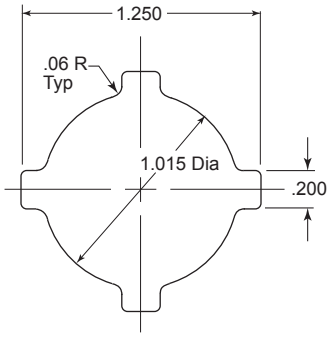
Connections
- 250 = 1/4" FNPT
- 375 = 3/8" FNPT
- 500 = 1/2" FNPT

Body Material
- PVC = Polyvinyl Chloride
- CPV = Chlorinated Polyvinyl Chloride
- PPR = Polypropylene, unpigmented homopolymer, glass & mineral reinforced ☐

Example Part Number **NG-500-PVC**
Globe pattern with 1/2" FNPT connections and a Polyvinyl Chloride Body

Mounting Template

When required, the template provides the outline of the hoie and orientation slots for a panel or bracket mounting. The orientation slots may be cut in multiple positions to allow versatility in mounting the valve to accomodate the piping alignment requirements.



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MARQUEST SCIENTIFIC
Fluid Handling Products

1702 East Via Burton Street Anaheim, CA 92806
714-491-9191 Fax: 714-491-9199
e-mail: sales@marquestscientific.com

Bulletin No. TMNV0804

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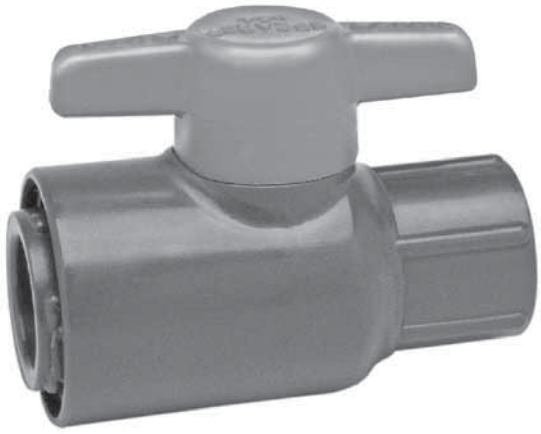
LAB BALL VALVES



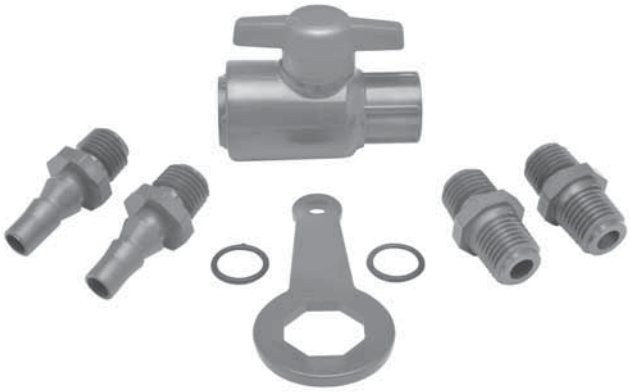
Features – PVC, CPVC

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

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.



LAB VALVE WITH ADAPTER KIT

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	

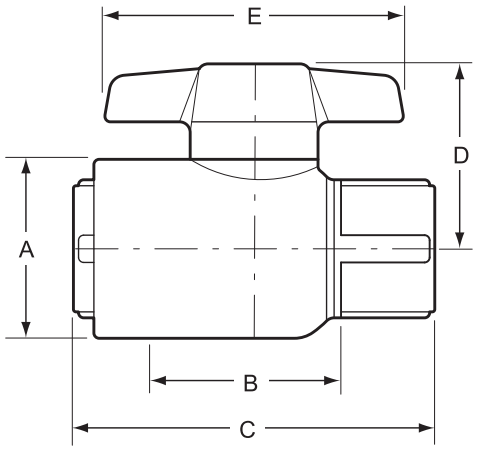
1: For CPVC Valves, add the letter "C" to part number listed (e.g., 1521-002**C**)

Valve & Adapter Kit

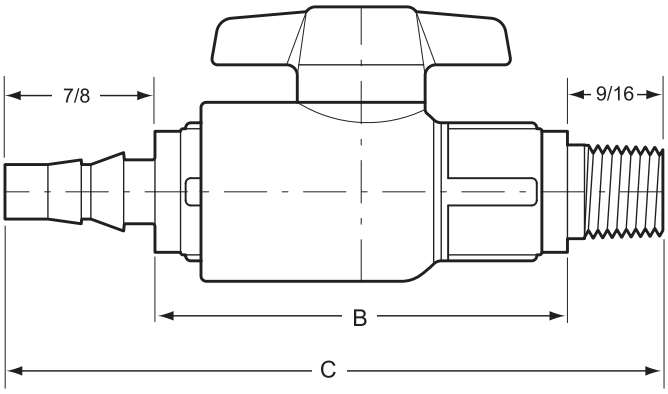
Kit allows multiple connection options. Adapters use O-ring seals for easy connection to threaded valve. Complete Kit includes:

1 – 1/4" Threaded Valve
2 – 1/4" O-ring Sealed Mpt x Mipt 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

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

Pressure Regulators

1/4″ to 1 1/2″ - PVC and Corzan® CPVC

Reliable Pressure Regulation

Hayward Pressure Regulators prevent downstream pressure from exceeding a preset pressure. When the upstream pressure increases beyond the set pressure of the regulator, the regulator prevents the downstream pressure from exceeding the set pressure.

Easy to Set Pressure

Hayward Pressure Regulators can be set by hand, no tools are needed, to control downstream pressures from 5 to 75 PSI. Each size regulator is designed to cover this complete pressure range with just one, non-wetted, plastic coated spring. There's no need to change springs for different pressure ranges as with ordinary regulators.

Molded Gauge Port

An integral molded 1/4″ NPT gauge port on the valve body makes installation of a gauge to monitor downstream pressure easy. No drilling, or extra fittings are needed.

No Corrosion Failure

These all plastic regulators have no metal parts and will never fail, jam, or stick because of rusted or corroded components. They also require no painting or epoxy coatings to survive corrosive environments.

Features

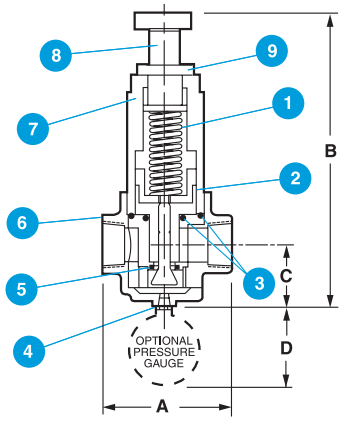
- No Metal Parts to Stick or Jam
- Hand Adjustable
- Molded Gauge Port
- Regulates from 5 to 75 PSI
- All Plastic, No Rust or Corrosion
- FPM Seals

Options

- Pressure Gauges
  - 0 to 30 PSI
  - 0 to 60 PSI
  - 0 to 160 PSI
- Gauge Guards

Corzan® is a registered trademark of Noveon, Inc.

Technical Information



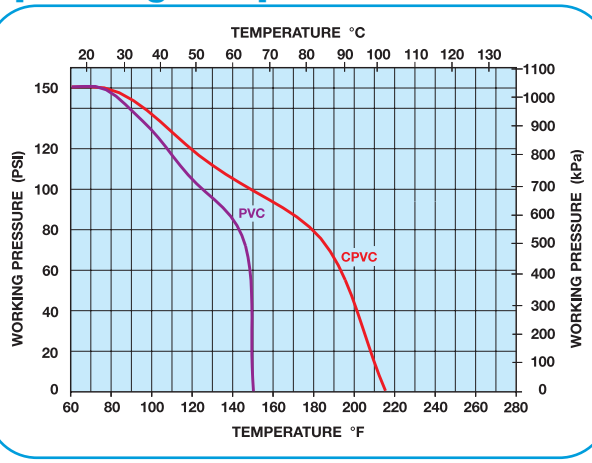
Parts List
Pressure Regulators

1. Spring (Plastic Coated)
2. Diaphragm Assembly
3. O-Ring Seals
4. Gauge Port
5. Square Cut Seal
6. Body
7. Bonnet
8. Stem
9. Locknut

Dimensions - Inches / Millimeters

Size	A	B	C	D	Weight (lb / kg)
1/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1/2″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
3/4″	4.13 / 105	9.25 / 235	2.13 / 54	2.38 / 60	1.38 / .63
1″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16
1-1/2″	5.50 / 140	14.00 / 356	3.00 / 76	2.38 / 60	4.75 / 2.16

Operating Temperature/Pressure



Selection Chart

Size	Material	End Conn.	Seals	Pressure Setting	Pressure Rating
1/4″ to 1-1/2″	PVC or CPVC	Threaded	FPM	5 to 75 PSI	150 PSI @ 70°F Non-Shock

How to Size a Pressure Regulator

Pressure regulator selection is based on the desired flow, inlet pressure and the desired outlet pressure.

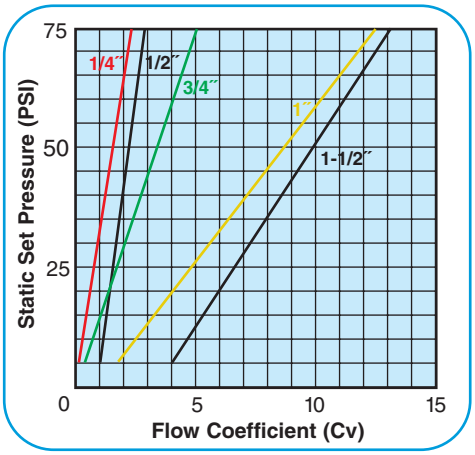
Example: A system requires a flow rate of 10 gpm at a set pressure of 30 PSI, and the inlet pressure is 50 PSI. From the graph at right, a 1″ regulator has a flow coefficient of 5.5 at a 30 PSI set pressure.

$\Delta P = (Q \div Cv)^2$ ΔP = Pressure Drop
$\Delta P = (10 \div 5.5)^2$ Q = Flow in GPM
$\Delta P = 3.3$ PSI Cv = Flow Coefficient

The 1″ regulator will meet the requirements because 3.3 PSI is less than the required pressure drop of 20 PSI (50 PSI inlet pressure less 30 PSI set pressure). The maximum flow rate in this example is:

$Q = Cv \sqrt{\Delta P}$
$Q = 5.5 \sqrt{20}$
$Q = 24.6$ gpm

Flow Coefficients



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.

Lower Installation Costs

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).

MADE IN THE U.S.A. WITH PRIDE

LPCB LOSS PREVENTION CERTIFICATION BOARD — NATIONAL ACCREDITATION OF CERTIFICATION BODIES

Quality Systems Certificate No. 293
Corporate Facilities, Sylmar, CA
Assessed to ISO 9001

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.

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/cm^3	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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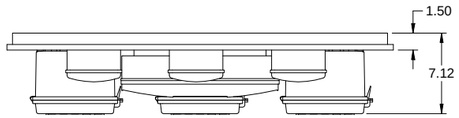

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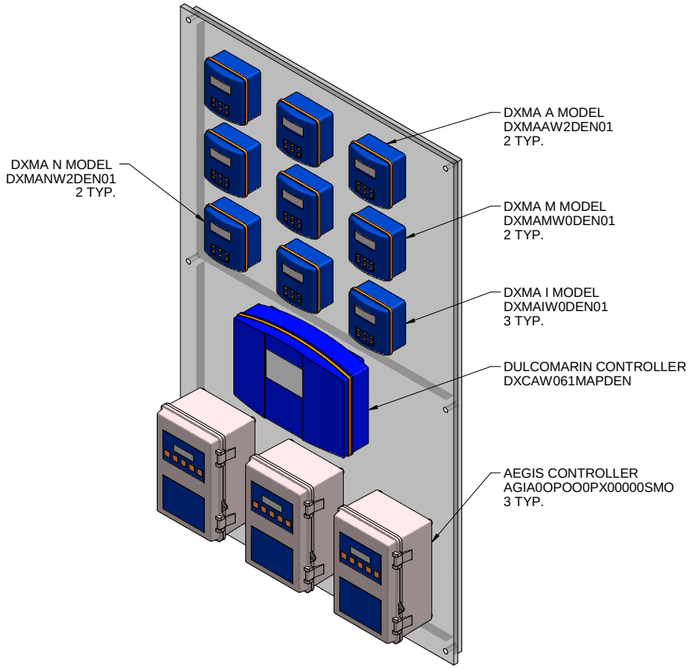

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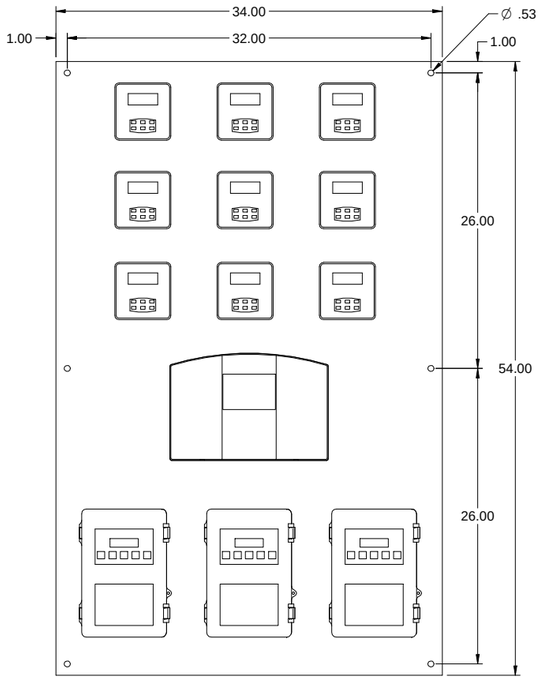
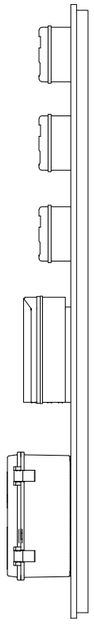


FRONT VIEW



SIDE VIEW

NOTES:

1. ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.

REV	DATE	DESCRIPTION	BY	APPD	REVD
B	09/12/12	SEPERATED CONTROLLER/PIPING	JDB		
A	08/24/12	ADDED "N" MODULES	JDB		
0	07/17/12	FIRST ISSUE	JDB		

REVISIONS

CUSTOMER: MACAULAY CONTROLS CO. (NHCRWA)

JOB No: 2012600550 | PURCHASE ORDER No: 8827

TITLE: AEGIS/DDC ANALYZER PACKAGE GENERAL ARRANGEMENT

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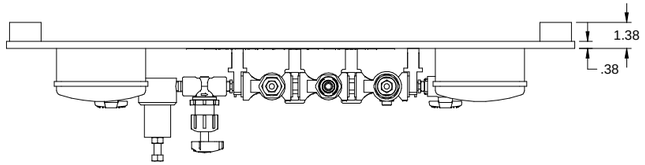
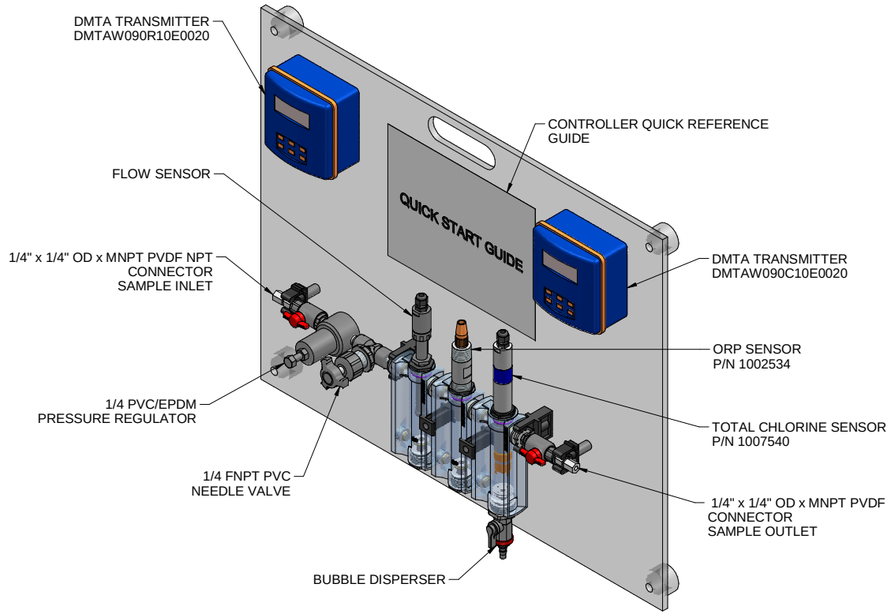
DWG No 2012600550-201 | REV A



PLAN VIEW



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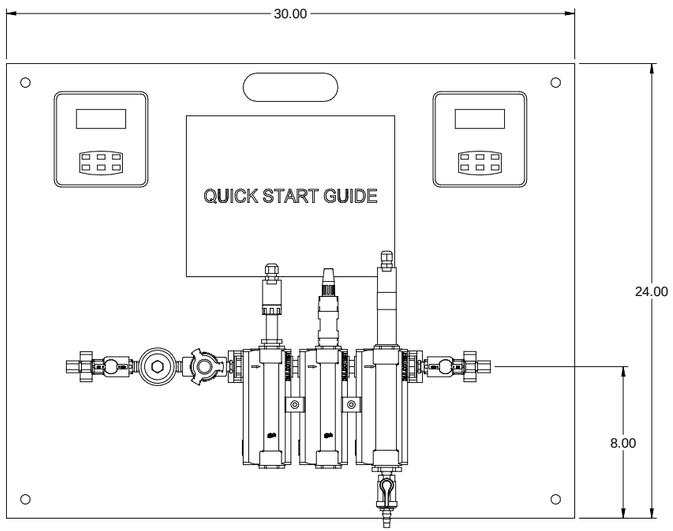
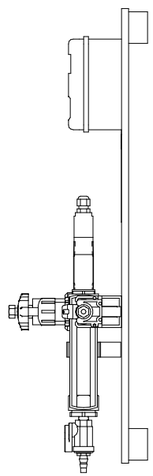


FRONT VIEW



SIDE VIEW

NOTES:

1. ALL PIPING AND FITTINGS SHALL BE 1/4" SCH. 80 PVC SOCKET WELD WITH VITON SEALS UNLESS OTHERWISE REQUIRED BY COMPONENTS.
2. ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.

REV	DATE	DESCRIPTION	BY	APPD	REVD
A	09/12/12	UPDATED IDENT CODE	JDB		
0	08/28/12	FIRST ISSUE	JDB		

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TITLE: DMTA ANALYZER PACKAGE GENERAL ARRANGEMENT

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DWG No 2012600550-201 | REV A | PAGE 1/1

DWG No	REV
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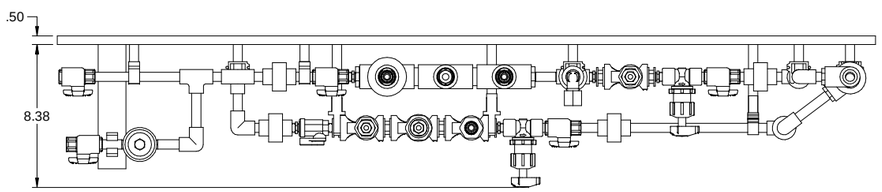

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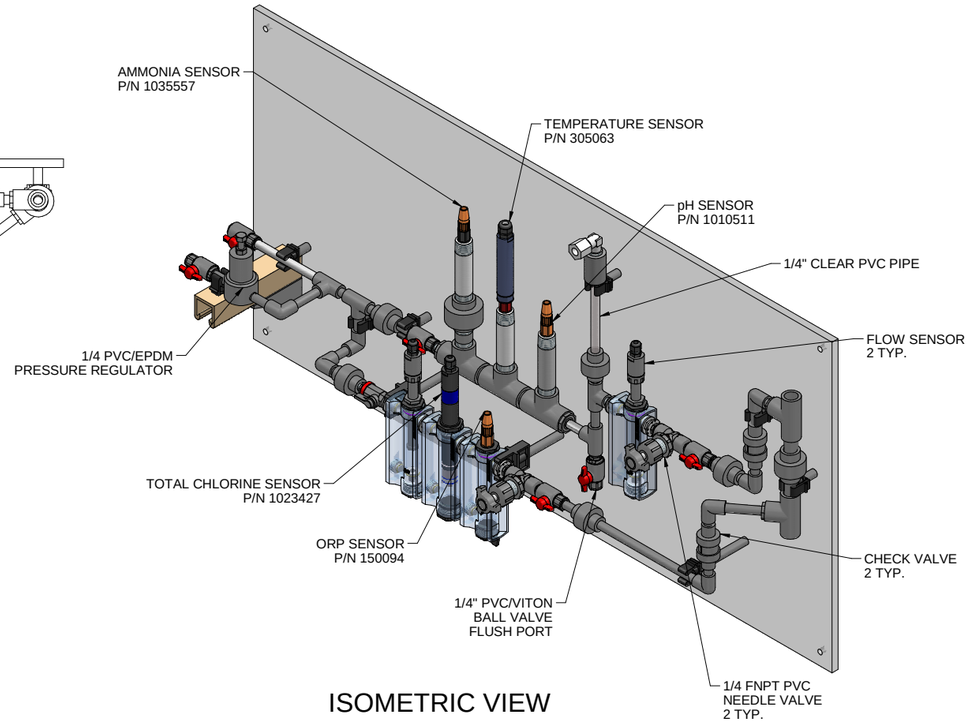

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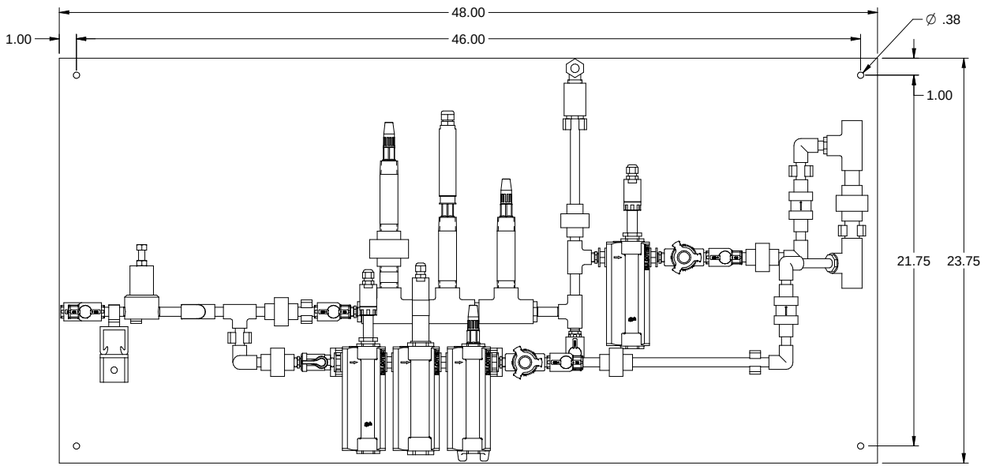
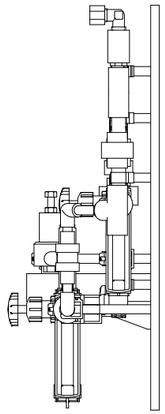


FRONT VIEW



SIDE VIEW

NOTES:

1. ALL PIPING AND FITTINGS SHALL BE 1/4" SCH. 80 PVC SOCKET WELD WITH VITON SEALS UNLESS OTHERWISE REQUIRED BY COMPONENTS.

2. QUANTITY OF (3) PANELS REQUIRED.

3. QUANTITY OF
   (1) 7746331 1/4" PVC/VITON SPEARS LABCOCK
   (2) 7741942 1" MPT X 1/4" FPT PVC REDUCER BUSHING
   (1) 7500131 2,000 mL PVC CALIBRATION COLUMN
   (1) 7741418 1/2" X 3" PVC NIPPLE
   (1) 7741552 1/2" PVDF JACO ELBOW
   TO BE SHIPPED LOOSE WITH PANELS.

4. ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.

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