Model 788DVC
DIGITAL CONTROL VALVES

DESCRIPTION

The Model 788DVC Digital Control Valve is designed to provide precise flow rate control and batch delivery of fluid products when used with an electronic batch control device such as the PetroCount. The Model 788DVC valve is automatically controlled by the PetroCount for low flow start-up, high flow rate control, low flow shutdown, and final shut-off. This also provides for maximum flowmeter accuracy by maintaining a constant flow rate with varying line pressures. The Model 788DVC features an external pilot control loop that consists of a normally-open solenoid pilot, a normally-closed solenoid pilot, strainer, and opening/closing speed controls.

DESIGN FEATURES

- Precision flow rate and batch control
- Modular construction - all internal parts including seat ring are removable as a cartridge assembly without removing the valve body from system piping.
- No diaphragms or stuffing boxes
- 45^0 body design assures high capacity
- Positive (bubble-tight) shut-off
- Linear control characteristics with uniform response speed
- Automatic check valve-no reverse flow
- Fail-safe closes on loss of electrical power

"AP" (AGGRESSIVE PRODUCTS) OPTION

The "AP" option valve cylinder incorporates a combination of seals and O-ring materials to provide optimum performance in aggressive product applications. This option includes reinforced cylinder heads, stat-o-seals, washers and gaskets. Specify "AP" Option at time of order when used on alcohols, MTBE, TAME and reformulated fuels.

⚠ WARNING

Do not operate this instrument in excess of the specifications listed. Failure to heed this warning could result in serious injury and/or damage to the equipment.

APPLICATIONS

Batch control with flow limiting capabilities when used with digital control devices such as the PetroCount or similar compatible devices.

PRINCIPLE OF OPERATION

The valves are pilot operated on a balanced piston principle. They are spring biased to a closed position. Pressure differential overcomes the force of the spring, causing the main valve to open and establish flow. The pilot control(s) vary the pressure on the spring side of the piston for position.

MAXIMUM OPERATING PRESSURE DIFFERENTIAL (M.O.P.D) ACROSS PILOTS

150 lb. Standard - 150 psid (1,035 kPa)
Optional - 285 psid (1,967 kPa)
300 lb. Standard - 740 psid (5,106 kPa)

FLANGE CONNECTIONS / RATINGS (DIN)

Valve Size	DIN PN16 MAX. WORKING PRESSURE @ 120°C	DIN PN25 MAX. WORKING PRESSURE @ 120°C	DIN PN40 MAX. WORKING PRESSURE @ 120°C	DIN PN64 (300 lbs.) MAX. WORKING PRESSURE @ 38°C
DN50 - DN300	16 bar	25 bar	40 bar	51 bar

Temperature Range: -20°F to 150°F (-29°C to 66°C) Optional 250°F (121°C)

FLANGE CONNECTIONS / RATINGS (ANSI)

Valve Size	MAXIMUM WORKING PRESSURE @ 100° F	
	150 lbs. ANSI	300 lbs. ANSI
2" - 8"	285 psi	740 psi

EMERSON. Process Management

MATERIALS OF CONSTRUCTION

Main Valve Body
Steel - ASTM-A216-GR-WCB
Main Valve Cylinder
2-4" Stainless Steel
6-8" Steel, Nickel Coated
Main Valve Piston
2-6" Stainless Steel
8" Bronze Standard
Stainless Steel - Optional
Seat Ring
2-6" Stainless Steel
8" Steel, Nickel Coated
O-Rings
Standard - Buna-N
Optional - Other O-Rings are available Neoprene†, EPR, all Viton, all Buna-N, Kalrez/Teflon ("AP" Valves)
Other Internal Parts
Stainless Steel
Pilot Valve Strainer/Needle Valve Body
Standard - Steel
Pilot Valve Strainer/Needle Valve Trim
Stainless Steel
Tubing and Fittings
Standard - Steel
Optional - Stainless Steel

STANDARD EQUIPMENT

Pre-wired solenoids (not for CENELEC execution)
Opening and closing speed controls
Self-cleaning strainer (Pilot Inlet)
Stainless steel solenoid pilots
Steel tubing and fittings

PRESSURE DROP

Refer to Publication DSVALVEC$_v$.

SOLENOID ELECTRICAL DATA

Voltage**	Current (Inrush)	Current (Holding)
110/50 Vac	0.71 amps	0.37 amps
120/60 Vac	0.65 amps	0.34 amps
220/50 Vac	0.36 amps	0.19 amps
240/60 Vac	0.33 amps	0.17 amps

** DC voltage and 440/480 Vac available upon request.

DOCUMENTATION & APPROVALS

UL and CSA Listed
Class I - Group C & D
Class II - Group E, F & G
Explosion Proof Nema Types 7C, 7D, 9E, 9F, 9G and Waterproof Nema Type 4
CENELEC EEx d II B T3 (Optional)

VALVE CAPACITY DATA

Valve Size	2"	3"	4"	6"	8"
*Cv - gpm	86	186	309	688	1,296

For capacities and pressure drops, please consult Publication DSVALVEC$_v$ "Capacity Charts for Valve Sizing."
*C_v based on wide open valve utilizing water at 60^{0}F (15.6^{0}C).

OPTIONAL EQUIPMENT

1. Manual Override
2. Valve Position Indicator
3. Stainless Steel Position Indicator - (Visual Only)
4. Position Indicator Switches
5. Thermal Relief
6. Stainless Steel Tubing and Fittings
7. Stainless Steel Piston
8. Pre-wiring for valves with CENELEC solenoids

RECOMMENDED SPARE PARTS

O-Rings

SHIPPING WEIGHT AND VOLUME (Approximate)

Valve Size	150 - 300 lbs. (ANSI Flanges)			
	lbs.	kgs.	Cubic Feet	Cubic Meters
2"	60	27.22	1.66	0.047
3"	105	47.63	2.36	0.067
4"	140	63.5	2.51	0.071
6"	250	113.4	4.84	0.137
8"	465	212	8.94	0.253

TYPICAL APPLICATIONS

The most common application of the 788DVC control valve is for truck loading. Figures 1 and 2 show the valve working with Turbines and PetroCount to precisely control flow rates, batch quantities and blend ratio's of various products being loaded.

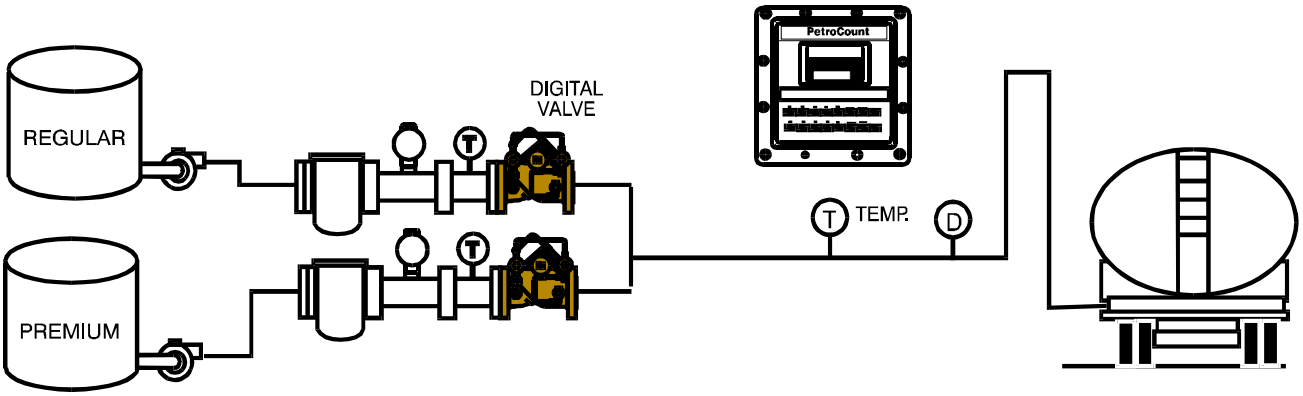


Figure 1 Truck Loading - Single Product/Blend

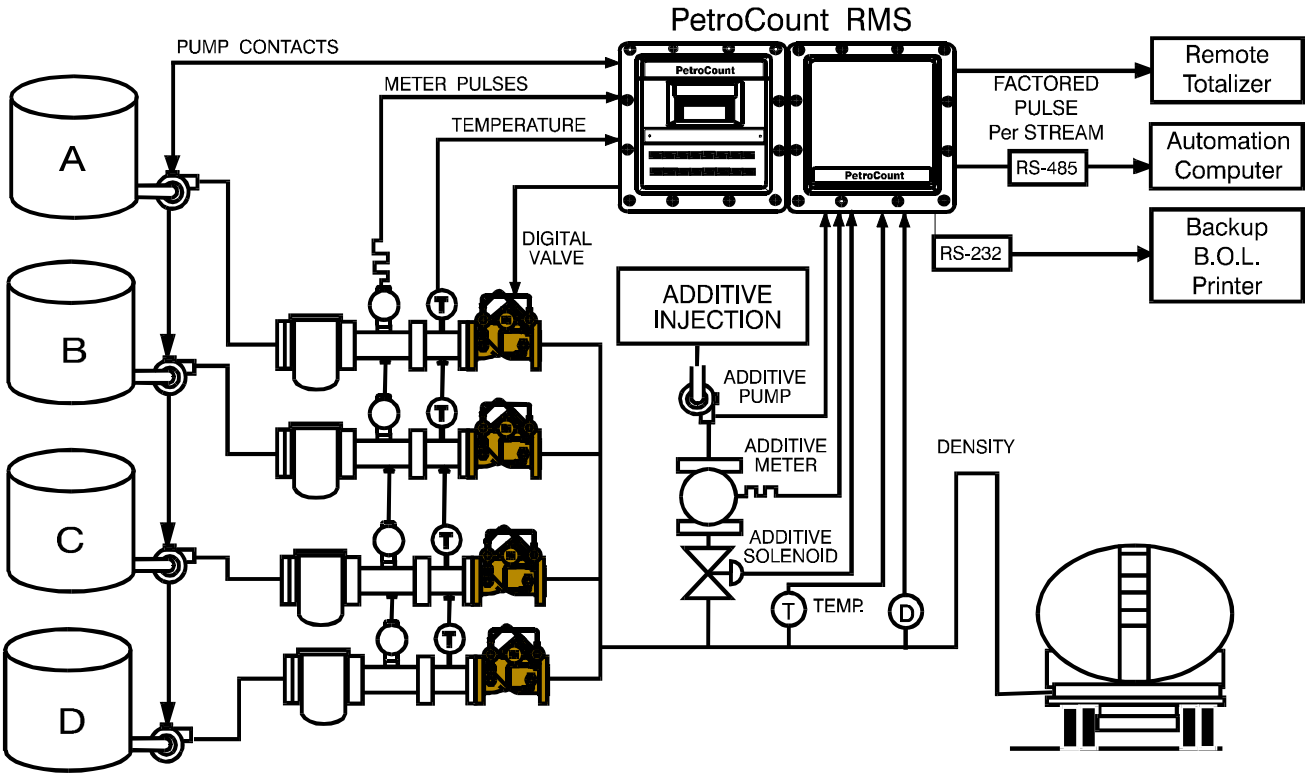
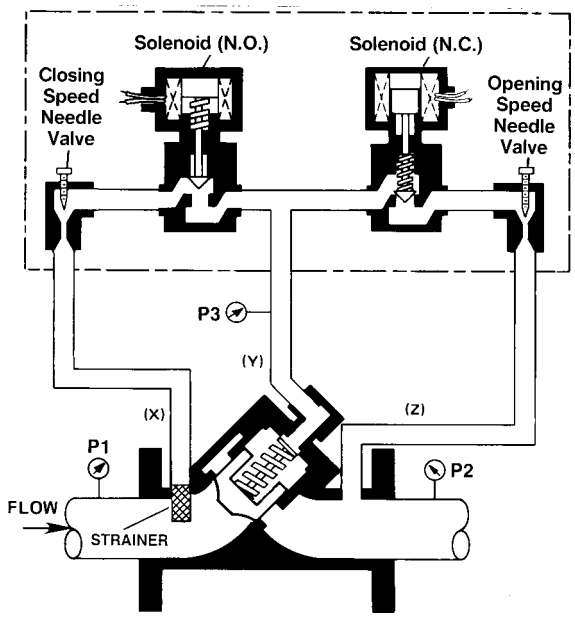


Figure 2 Truck Loading - Single Product/Multiple Blends

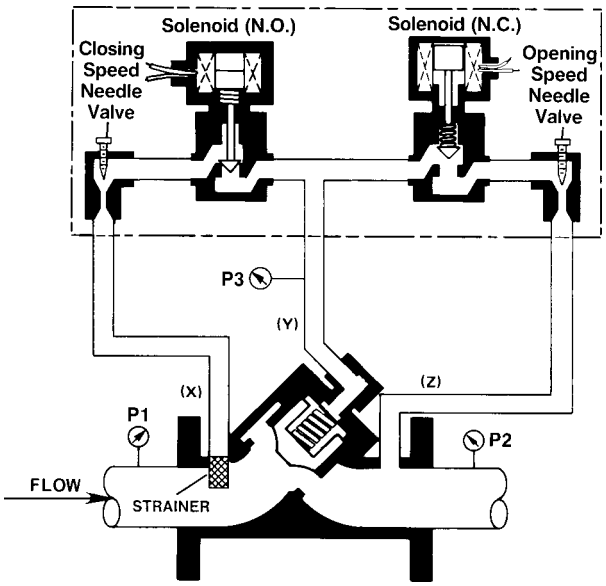


Closed or Closing Position - The normally closed solenoid is closed. The normally open solenoid is open. Y-Port (P3) to Z-port (P2) is closed. X-port (P1) and Y-port (P3) pressures are balanced. The main valve spring being the differential force, closes the piston and keeps it seated.

Figure 3 Closed or Closing Position

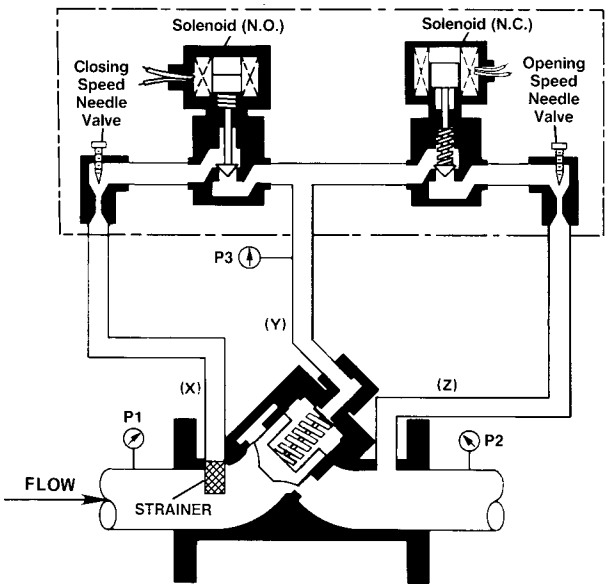
OPERATIONAL SEQUENCE

With both solenoids de-energized, the main valve is closed as shown in Figure 3. The main valve can be infinitely positioned anywhere between 0-100% open by digital control of the solenoids. With both solenoids energized, as shown in Figure 4, the valve begins to open. It will only open to the programmed flow rate set in the PetroCount. Normally, the PetroCount is programmed to digitally control low flow start-up rate, maximum flow rate, low flow rate before shut-off and no flow. The PetroCount will automatically energize and de-energize the solenoids to position the main valve to limit the required flow rate. When the required rates are reached the solenoids will be as shown in Figure 5. This hyraulically locks the main valve piston in position. Should flow increase, the valve will close slightly to adjust to the required rate. All of the positioning is done by digitally controlling the two solenoids as shown in Figures 3,4 and 5.



Opening Position - The normally closed solenoid is open. The normally open solenoid is closed. Y-Port (P3) is open to Z-port (P2). X-port (P1) is closed off by the normally open solenoid. The pressure on the bottom of the piston (P1) is greater than the pressure at (P3) plus the spring force; (P1 minus P2) is equal to or greater than the spring force. Therefore, (P1) pressure pushes the piston open.

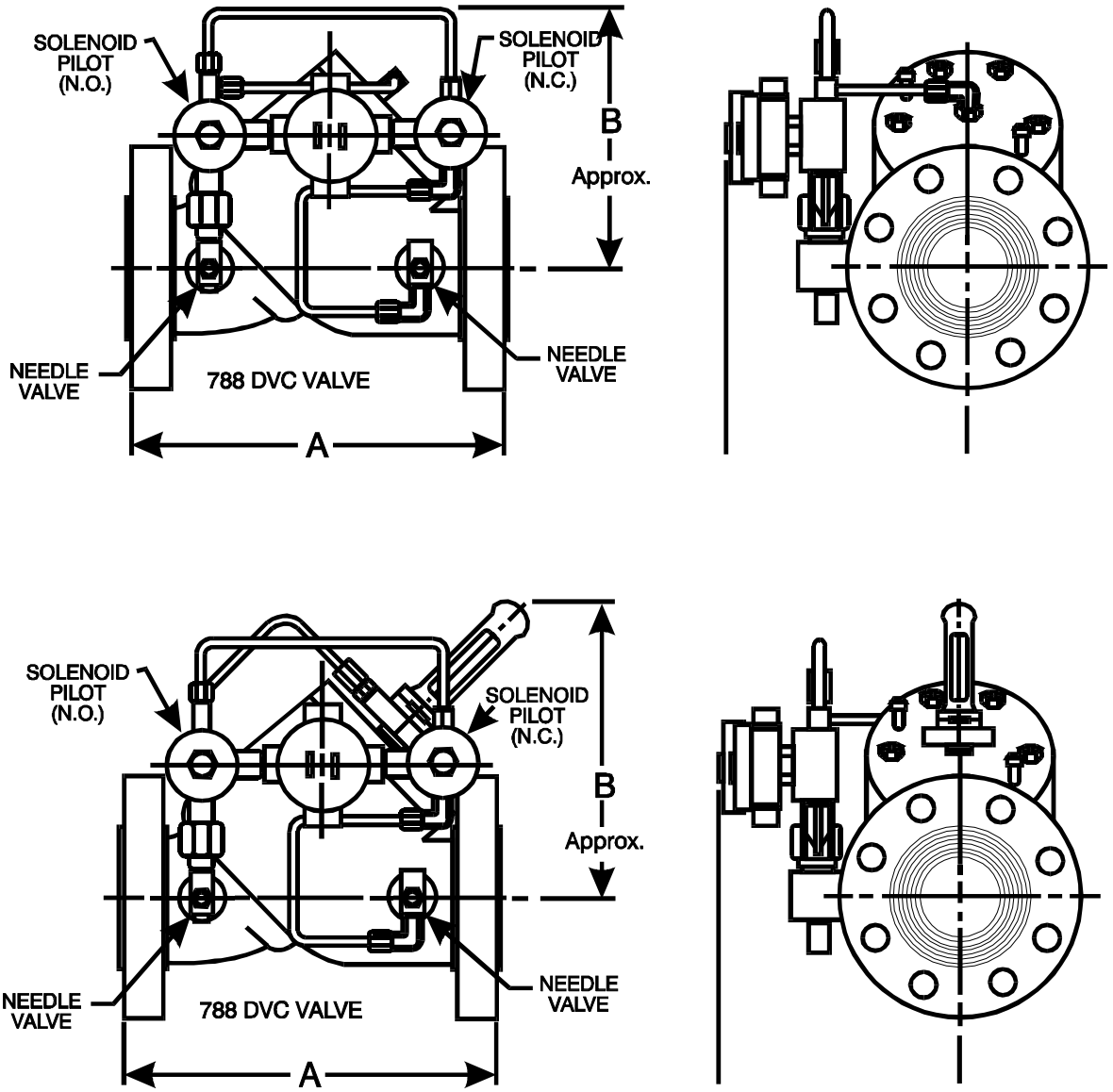
Figure 4 Full Open / No Control



Controlling Position - The normally closed solenoid is closed. The normally open solenoid is closed. Y-Port (P3) to Z-port (P2) is closed. X-port (P1) to Y-port (P3) is closed.
***Note*: The product cannot flow to or from the top of the piston (Y-port). The piston is hydraulically locked in position until the PetroCount commands the valve to open or close as required to maintain the desired flow rate.**

Figure 5 Controlling Position

Dimensions - Model 788DVC (For certified dimension prints, consult factory)



Valv Size	DIMENSION A (ANSI Flanges)				DIMENSION B (ANSI Flanges)	
	150 lbs.		300 lbs.		150 - 300 lbs.	
	Inches	mm	Inches	mm	Inches	mm
2"	10 1/4	260	10 1/2	267	10 7/8	276
3"	11	279	13 1/8	333	11 1/4	286
4"	13	330	14 1/2	368	11 1/2	292
6"	17	432	17 7/8	454	13 3/8	346
8"	22 1/4	565	23 1/4	591	17 3/4	451

PURCHASE SPECIFICATIONS

These valves shall be hydraulically operated, digitally solenoid controlled on-off valves using the flowing stream as the operating medium. The main valve shall be pressure balanced, single seated, piston operated with 45^0 body construction. All internal parts, including cylinder, spring, piston and seat ring shall be removed as a cartridge assembly without disturbing line connections. The pilot valves shall be direct acting, solenoid operated, two way valves. Two manual flow control valves shall be included in the pilot supply line to provide an adjustable opening and closing rate. The pilot supply line shall also include a strainer. These valves shall, in all respects, be similar or equal to a Model 788DVC digital control valve. There shall be no diaphragms operating in the main valve.

ORDERING INFORMATION

When ordering, the following information must be supplied:

1. Size
2. Flange connections
3. Product, product viscosity, product specific gravity
4. Minimum and maximum operating temperature
5. Minimum and maximum flow rate
6. Minimum, normal and maximum operating pressure
7. Control functions to be performed
8. O-Ring material
9. Control pilot materials
10. Tubing material
11. Main valve piston material
12. Voltage Required

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