



## Bulletin HY14-1483-B1/US Selection Guide

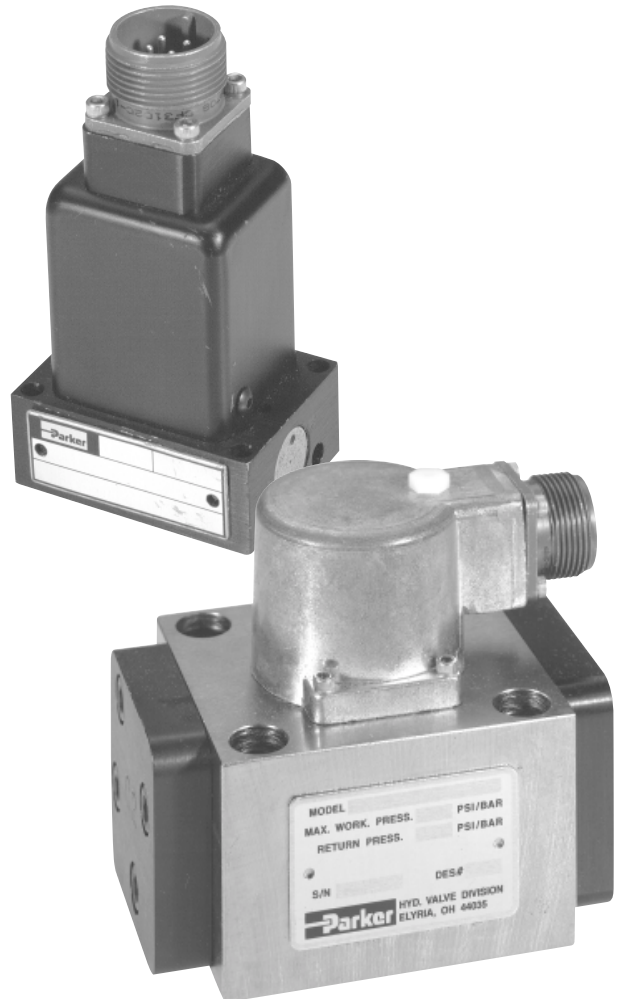
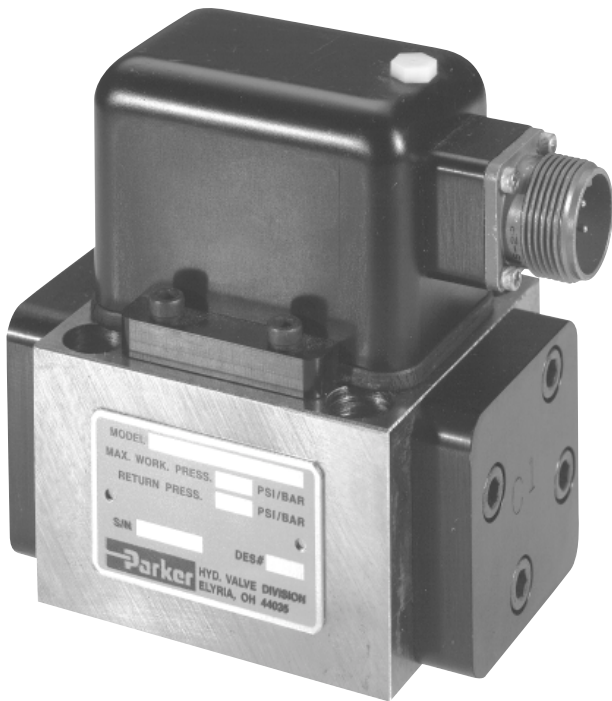
# Series DY Servovalves

*(Flapper - Nozzle Style)*

Effective: June 1, 2001

Supersedes: Bulletin 1483-B1 dated June 15, 1999

---



 **WARNING**

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

**Offer of Sale**

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the "Offer of Sale".

© Copyright 1999, 2001 Parker Hannifin Corporation, All Rights Reserved

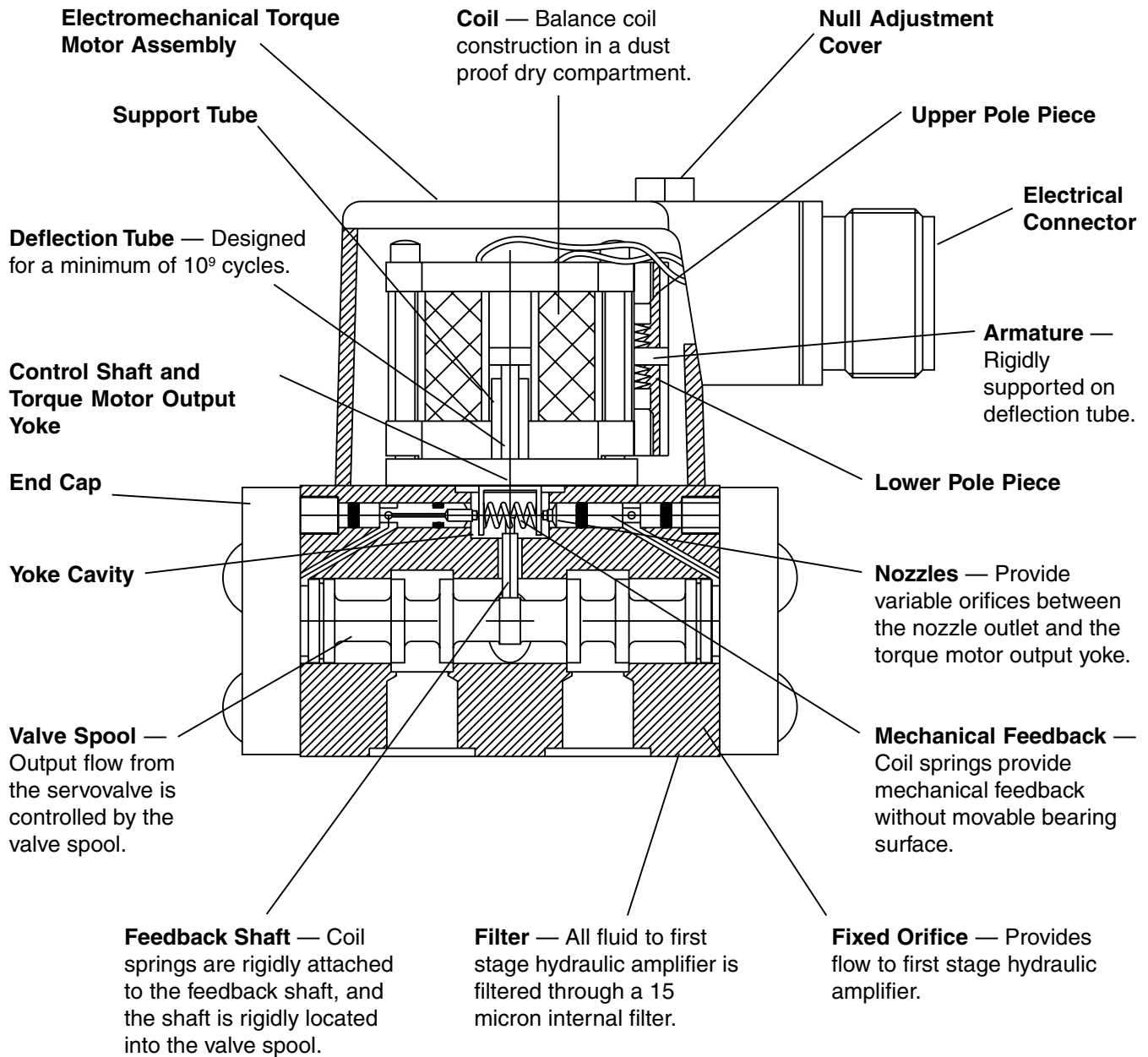
1483-B1-cvr.p65, bl, fl

**Contents**

---

<b>Introduction</b> .....	1-2
Typical Electrohydraulic Servo Valve Design Features .....	1
Construction Features and Component Functions .....	2
Terminology .....	2
<b>Performance Curves</b> .....	3
<b>Electrical Specifications</b> .....	4
<b>Dimensions</b> .....	5-12
Series DY01/05/10 .....	5
Series DY12 .....	6
Series DY15/25 .....	7
Series DY45 .....	8
Series DY90 .....	9
Series DY3H/6H .....	10
Series DY2S .....	11
Series DY1S .....	12
<b>Ordering Information</b> .....	13-14
Series DY01, 05, 10, 12, 15, 25, 45, 90 .....	13
Series DY3H/6H and 1S/2S .....	14
<b>Accessories</b> .....	15
<b>Offer of Sale</b> .....	16

### Typical Electrohydraulic Servo Valve Design Features



## Construction Features and Component Functions

The Parker Series BD valves share the same construction features, consisting of three sections: an electric torque motor, a double nozzle pilot (hydraulic amplifier), and a sliding spool second stage.

**Torque Motor:** The torque motor contains electrical coils, pole pieces, magnets and an armature assembly. The armature is supported on an inverted deflection tube, which also provides a fluid seal between the torque motor and the hydraulic section of the valve.

**Pilot Stage:** The inverted U-shaped yoke is attached to the armature shaft and positioned between two nozzles. Armature motion transferred through the shaft and inverted yoke varies the nozzle opening, causing a pressure differential. The mechanical feedback spring within the yoke cavity eliminates turbulent flow conditions around the feedback mechanism from high-velocity return fluid.

**Second Stage:** This area controls the output fluid flow. Through precisely matched flow edges on the valve

spool and the body, porting areas are opened and closed. By opening the supply pressure to either C<sub>1</sub> or C<sub>2</sub> control ports, fluid will flow through the valve and out the control port to return. This spool/body area is controlled by a feedback pin which is rigidly attached to the spool and the mechanical feedback spring of the pilot stage.

**Operation:** When there is no electrical input to the torque motor, the armature is positioned equally in the pole piece air gaps, balancing the permanent magnet force. As current is applied to the coils, the armature is deflected proportionally to the control signal. This causes a clockwise or counter-clockwise motion, depending on the polarity of the input control signal. The resultant torque moves the yoke between the two nozzles, causing a differential change in pressure which shifts the spool position, causing linear output flow. The feedback pin and mechanical spring assembly supply a negative counter-force to the torque motor force, giving the spool a repeatable proportional motion relative to the electrical signal.

## Terminology

**Coil Impedance:** The complex ratio of coil voltage to coil current resulting from energy transferred to and from the magnetic field. Coil impedance will vary with signal frequency, amplitude and other operating conditions. It can be approximated by the dc coil resistance (ohm) and coil inductance (henrys) measured at the signal frequency.

**Dither:** A low amplitude, high frequency signal superimposed upon an input control signal in order to minimize the effect of coulomb friction, hysteresis and deadband. Dither is expressed by the dither frequency (Hz) and the peak to peak dither current amplitude (mA).

**Hysteresis:** The difference in valve input current required to produce the same output as the valve is slowly cycled between plus and minus current. Expressed as a percentage of rated current.

**Internal Leakage:** The total internal flow from pressure to return with zero control signal. It is usually measured with control ports blocked. Leakage flow will vary with input current, generally being a maximum at the valve null called Null Leakage. Expressed in CIS or LPM (GPM).

**Load Pressure Drop:** The differential pressure between the control ports (that is the pressure across the load actuator).

**No Load:** Refers to conditions where there is zero load pressure drop. Expressed in Bar (PSI).

**Rated Current:** The specified input current of either polarity to produce rated flow. Rated current must be specified for a particular coil connection (differential, series or parallel) and does not include null bias current. Expressed in Milliampere (mA).

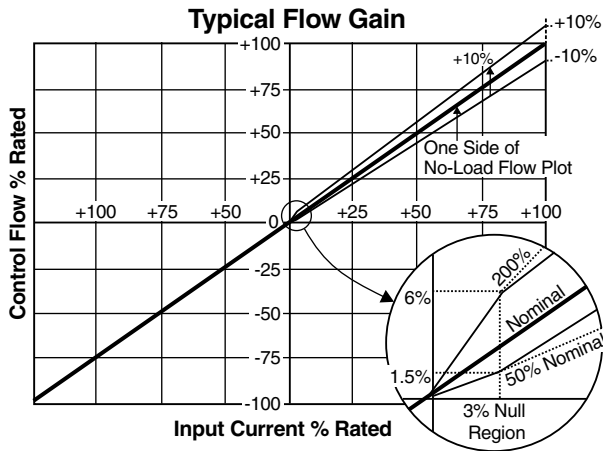
**Rated Flow:** The specific maximum control flow at the rated current and at a given supply pressure to the servovalve. The industry standard pressure drop (for rating purposes) across the servovalve is 69 Bar (1000 PSI).

**Torque Motor:** A type of electromagnetic motor producing linear or rotary motion proportional to the electrical command signal used in the input stage of servovalves.

**Valve Pressure Drop:** The sum of the differential pressures across the control orifices of the output stage. Valve pressure drop will equal the supply pressure, minus the return pressure, minus the load pressure drop. Expressed in Bar (PSI).

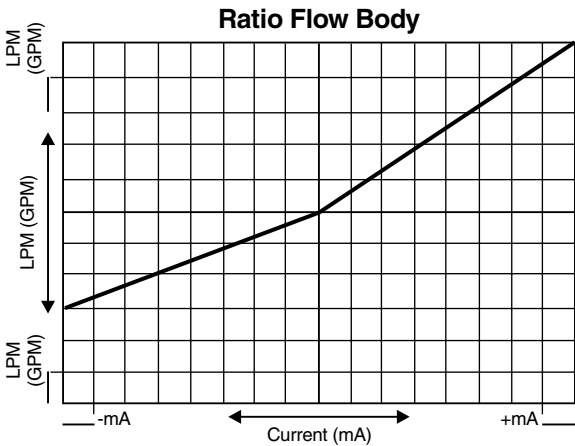
**Flow Gain**

The flow gain is the relationship of the control flow versus the input signal in any specified operating control area. Three operating areas are usually significant with flow control servovalves: (1) the null area, (2) the area where flow saturation effects do occur and (3) where this term is used without qualification it is assumed to mean **Normal Flow Gain**. Expressed as CIS/mA.



**Ratio Flow Body**

A ratio flow body cut may be used on cylinders with large rod to piston diameter ratios. Flow requirements for rod vs. blind cylinder ends may differ greatly during high speed motion. The valve output flow may be matched to the requirement, reducing the likelihood of cavitation.

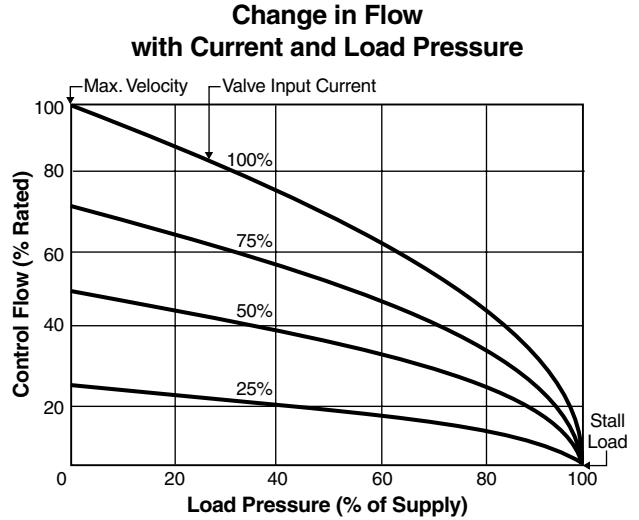


**Flow-Load Characteristics**

Control flow to the load will change with load pressure and valve current as shown below. These characteristics closely follow the theoretical square-root relationship for sharp-edged orifices as illustrated in the equation below:

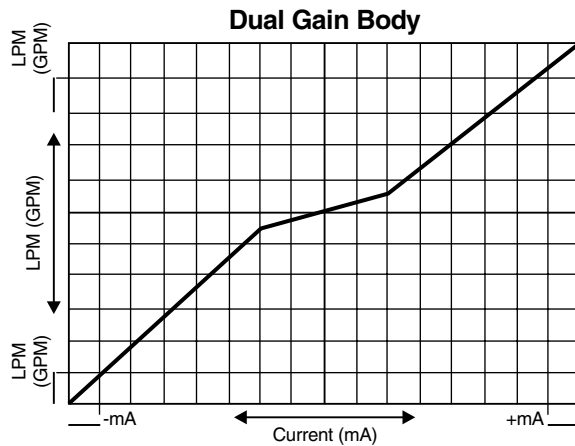
$$Q = K\sqrt{\Delta P}$$

Q = Control flow  
 K = Valve constant  
 $\Delta P$  = Valve pressure drop



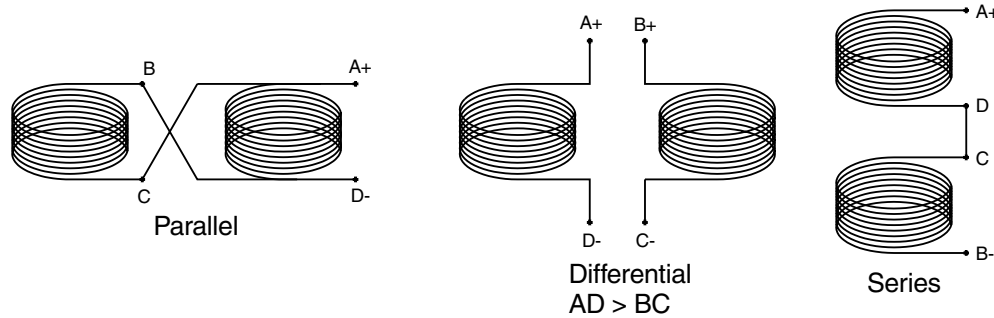
**Dual Gain Body**

A dual gain or "two speed" body cut may be used in applications where both high actuator speed and fine positioning requirements conflict for optimum valve sizing. By providing two distinct gain slopes, one valve can provide the solution of two requirements.



Coil Resistance Ohms	Optimal Current Range					
	Parallel Coils		Differential or Single coils		Series Coils	
	mA	VDC	mA	VDC	mA	VDC
200	50	5.0	50	10.0	25	10.0
80	80	3.2	80	6.4	40	6.4
40	150	3.0	150	6.0	75	6.0
22	200	1.1	200	2.2	100	4.4

The torque motor uses two coils of equal resistance and may be connected in parallel, series, or differential (push/pull).



**Flow Out C<sub>2</sub> Port When Energized as Shown**

**Performance**

**Null:** The condition where the servovalve supplies zero control flow at balanced load forces across the actuator.

**Null Bias:** The input current required to bring the servovalve to null, excluding the effects of valve hysteresis. Expressed as percent of rated current.

**Null Shift:** The change in full bias resulting from changes in operating conditions or environment. Expressed as percent of rated current.

**Deadband:** The region of no response where a control signal will not cause a corresponding pressure change of the controlled actuator.

**Frequency Response:** The complex ratio of servovalve control flow to input current as the current is varied sinusoidally over a range of frequencies. Frequency response is normally measured with constant input current amplitude and zero load pressure drop. Expressed as amplitude ratio, decibels and phase lag (degrees). Servovalve frequency response may vary with the input current amplitude, temperature, supply pressure and other operating conditions.

**Lap:** In a sliding spool valve, the relative axial position relationship between the fixed and movable flow-metering edges with the spool at null. Lap is measured as the total separation at zero flow of the straight line extensions of the nearly straight portions of the normal flow curve, drawn separately for each polarity. Expressed as percent of rated current.

**Symmetry:** The degree of equality between the normal flow gain of one polarity and that of reversed polarity,

measured as the difference in normal flow gain of each polarity. Expressed as a percent of the greater.

**Linearity:** Degree to which the normal flow curve conforms to the normal flow gain line with other operational variables held constant. Measured as the maximum deviation of the normal flow curve from the normal flow gain line. Expressed as a percentage of rated current.

**Pressure Gain:** With control ports blocked, the rate of change of load pressure increases with input current at zero control flow. Expressed in Bar (PSI)/mA.

**Threshold:** The increment required to change from an increasing output to a decreasing output. Expressed as a percentage of rated current.

**Auxiliary Pilot:** The isolation of output stage fluid flow, from the fluid flow to the valve pilot stage.

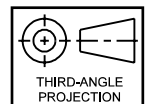
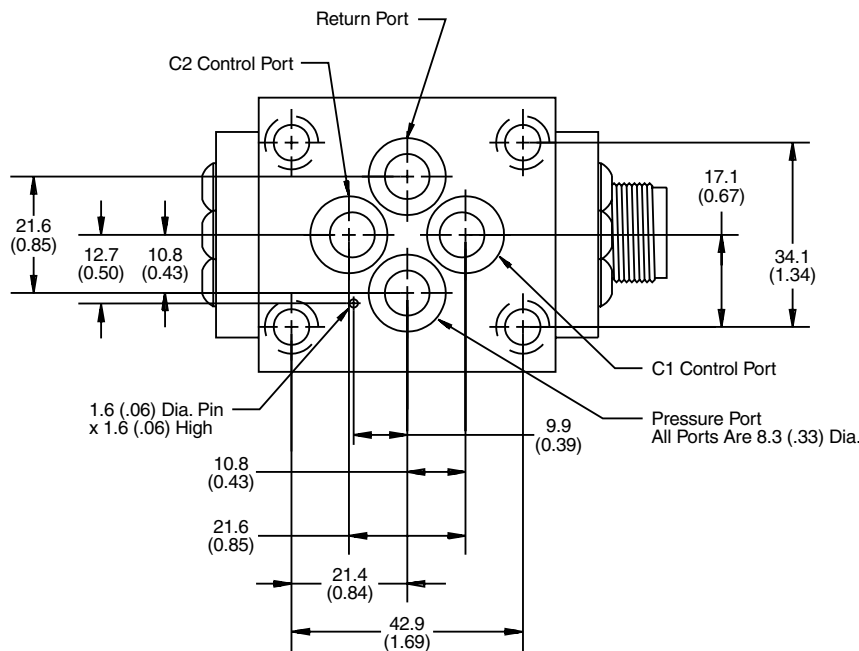
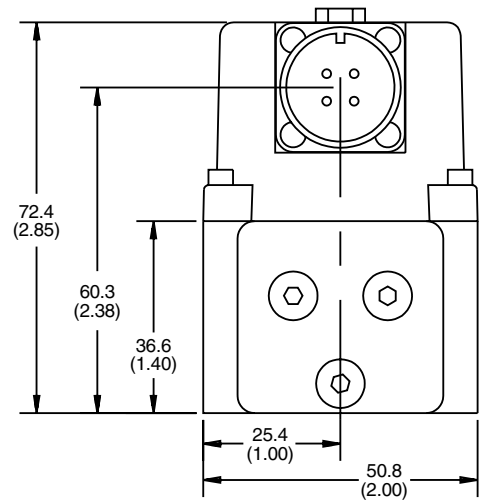
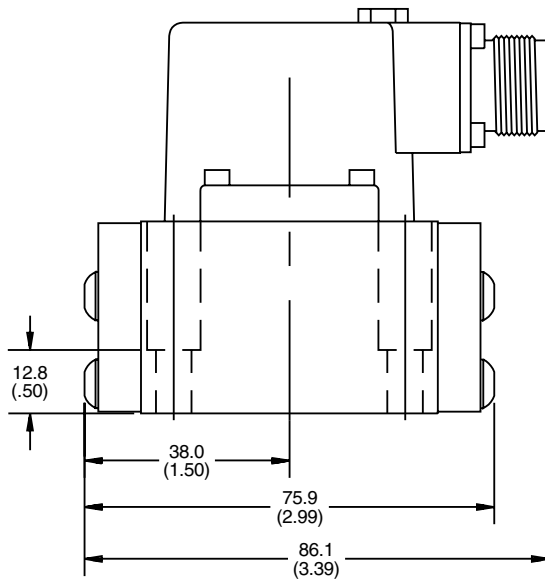
In the output area of the servovalve, various conditions of lap are a major considerations in selecting the proper valve for your application. These conditions are: (1) overlap or deadband and (2) underlap or open center. An overlap or deadband condition is most desirable when the servovalve is to be used in an open-loop circuit or where it is stroking a hydraulic motor and the zero or off position is of major importance. This condition is usually somewhere between 5% to 15% of rated current. The underlapped or open center condition is best incorporated in systems using variable pressure where it is desirable to use minimum amounts of hydraulic power when the servovalve is not doing any work.

**Specifications**

	DY01	DY05	DY10
<b>Operating Pressure</b>	350 Bar (5000 PSI)	350 Bar (5000 PSI)	350 Bar (5000 PSI)
<b>Frequency Response</b>	140 Hz @ 40%	>80 Hz @ 40%	>80 Hz @ 40%
<b>Basic Construction</b>	Spool and sleeve	Body and spool	Body and Spool
<b>Flow Options</b>	4, 6 & 11 LPM (1, 1.5 & 3 GPM)	1, 2, 4, 9 & 19 LPM (0.25, 0.5, 1, 2.5 & 5 GPM)	28 & 38 LPM (7.5 & 10 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

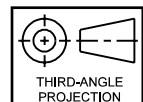
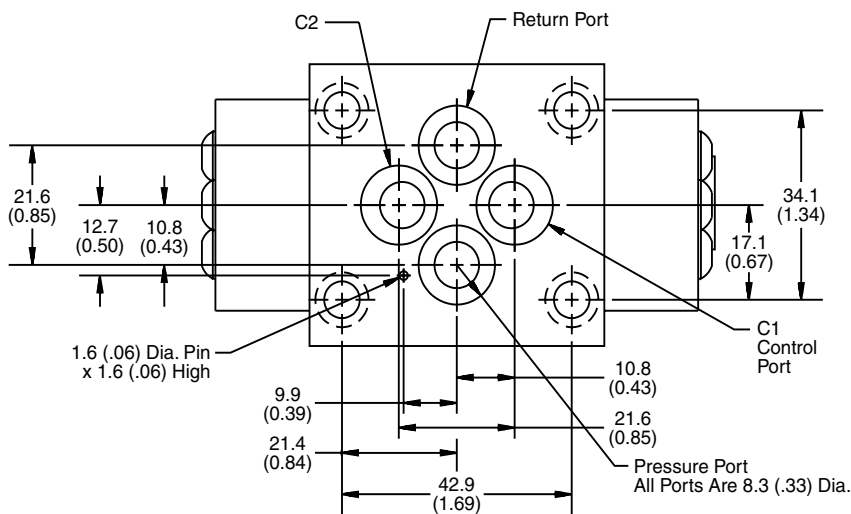
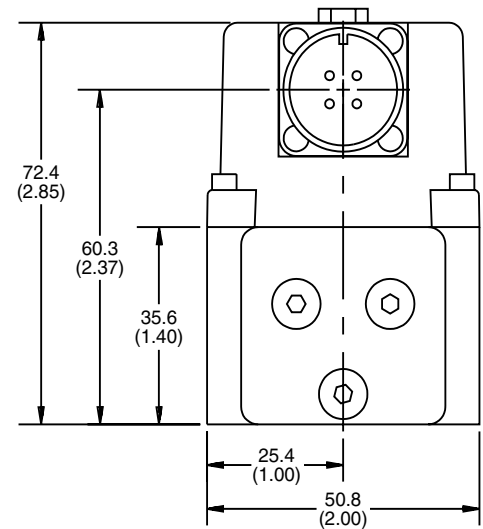
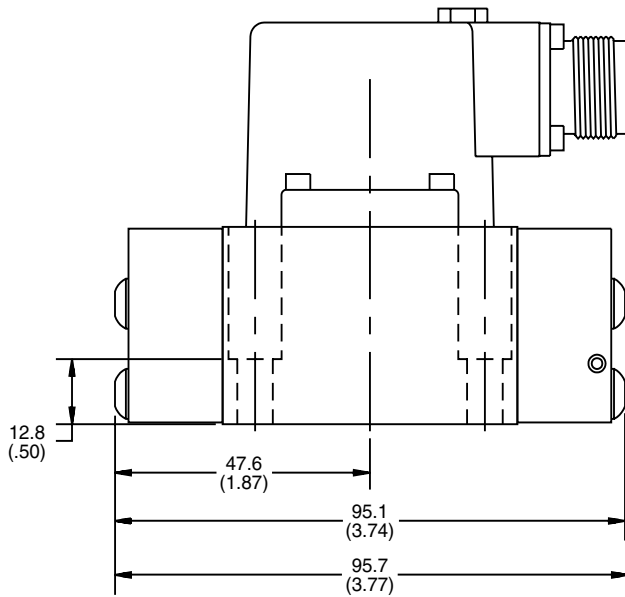


**Specifications**

<b>Operating Pressure</b>	350 Bar (5000 PSI)
<b>Frequency Response</b>	>80 Hz @ 40%
<b>Basic Construction</b>	Body and spool
<b>Flow Options</b>	47 & 57 LPM 12.5 & 15 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

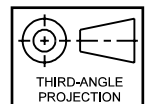
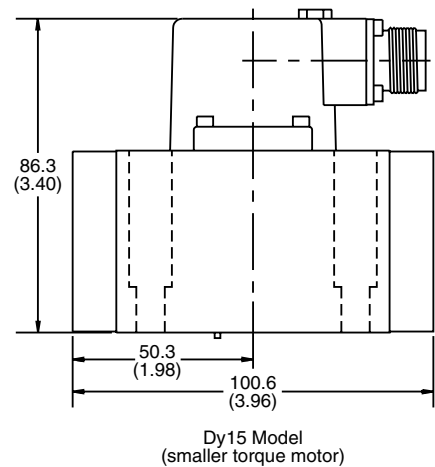
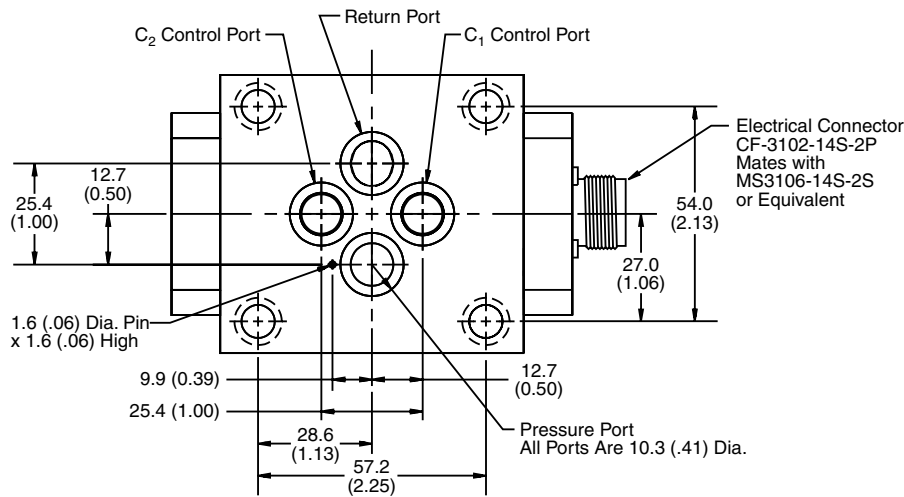
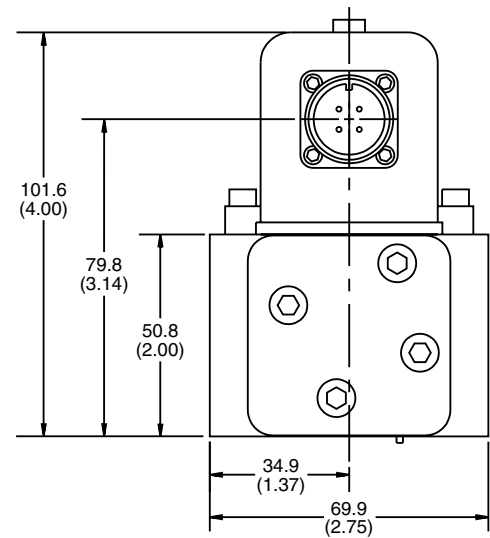
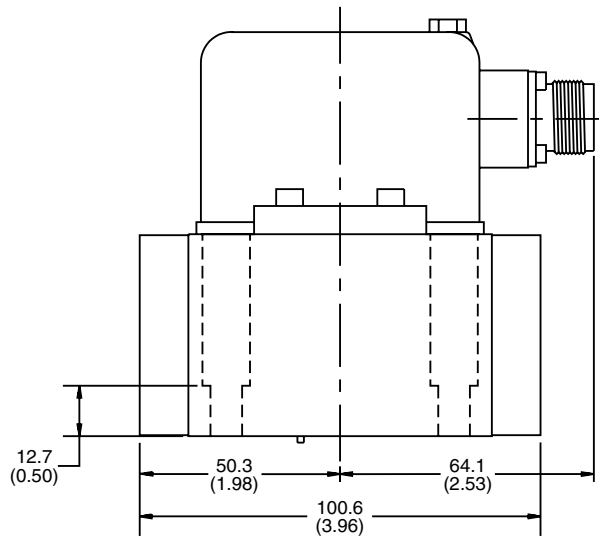


**Specifications**

	DY15	DY25
<b>Operating Pressure</b>	350 Bar (5000 PSI)	350 Bar (5000 PSI)
<b>Frequency Response</b>	>60 Hz @ 40%	>45 Hz @ 40%
<b>Basic Construction</b>	Body and spool	Body and spool
<b>Flow Options</b>	57, 76 & 95 LPM (15, 20 & 25 GPM)	95 & 114 LPM (25 & 30 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

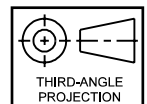
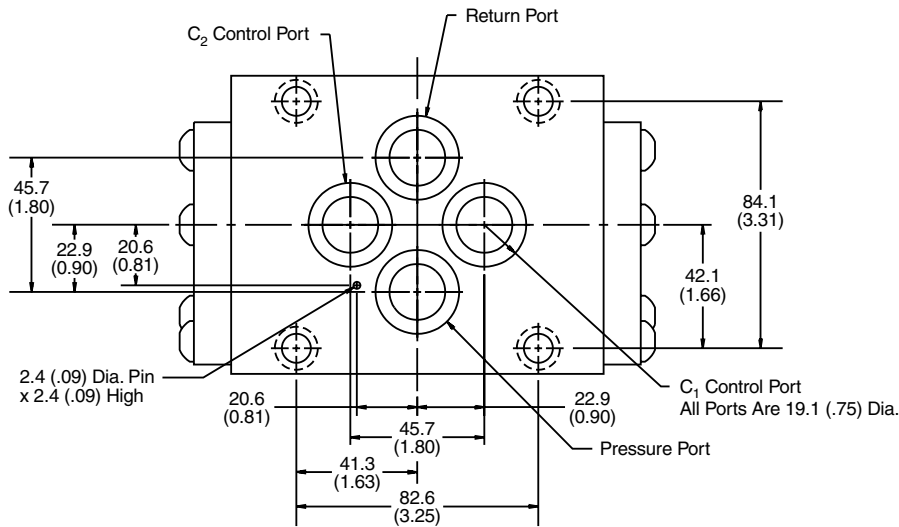
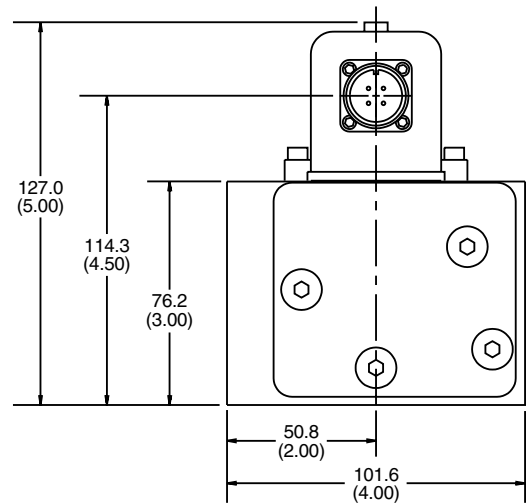
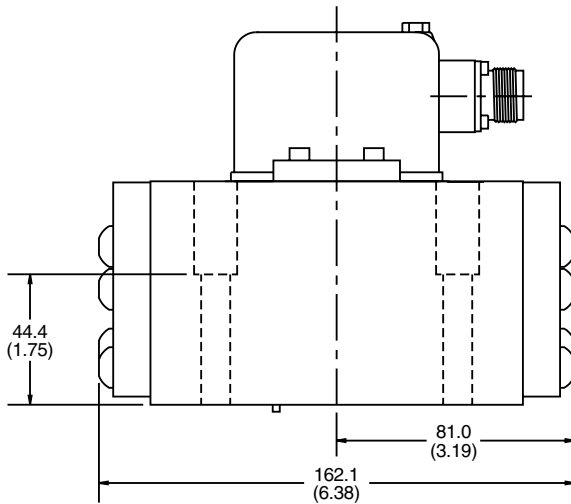


**Specifications**

<b>Operating Pressure</b>	350 Bar (5000 PSI)
<b>Frequency Response</b>	>30 Hz @ 40%
<b>Basic Construction</b>	Body and spool
<b>Flow Options</b>	151, 189 & 227 LPM (40, 50 & 60 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

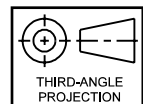
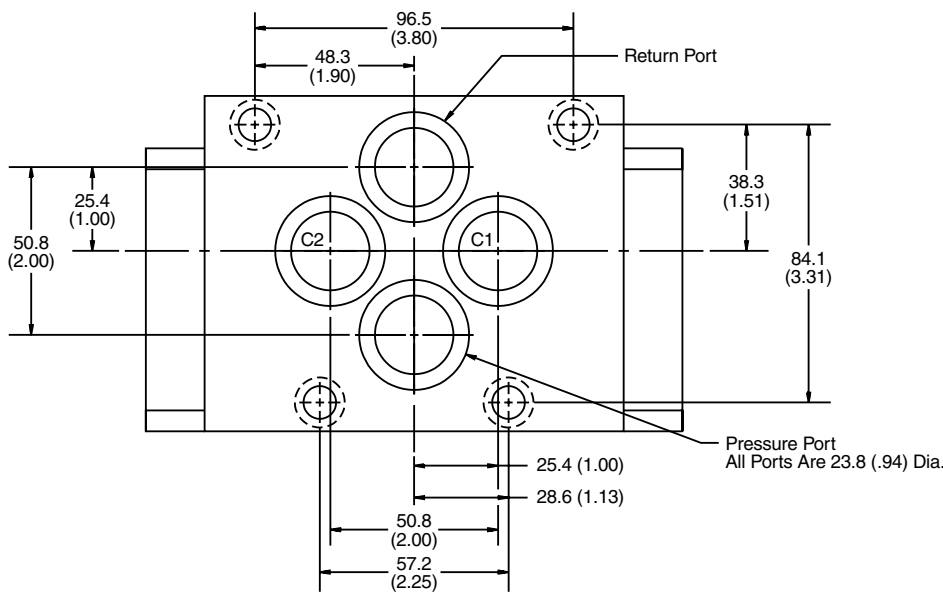
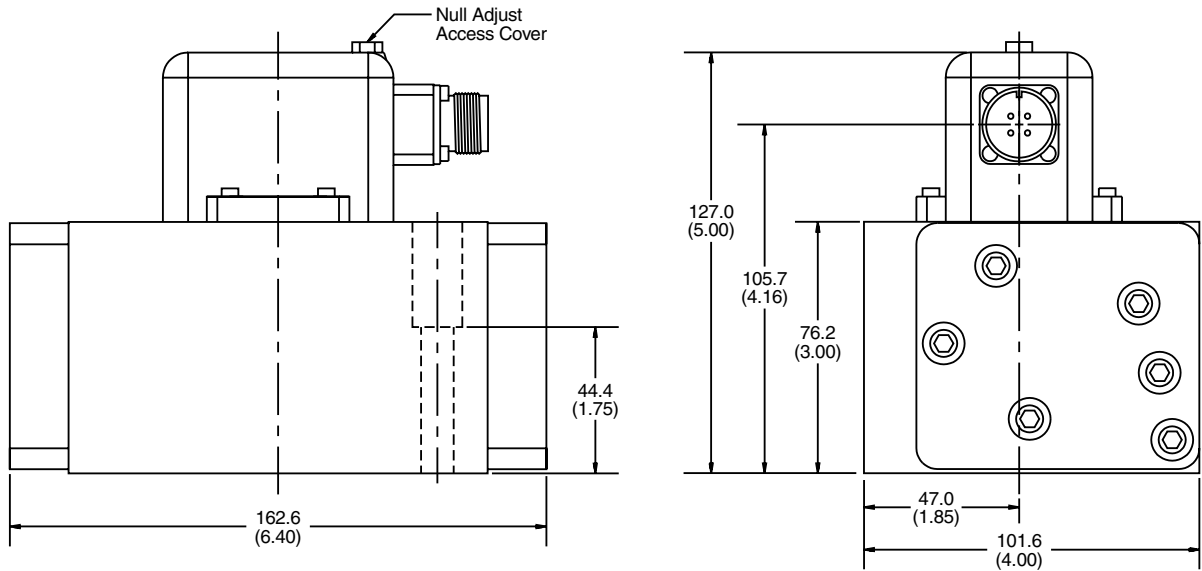


**Specifications**

<b>Operating Pressure</b>	350 Bar (5000 PSI)
<b>Frequency Response</b>	>20 Hz @ 40%
<b>Basic Construction</b>	Body and spool
<b>Flow Options</b>	302, 340 & 378 LPM (80, 90 & 100 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)



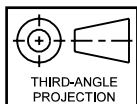
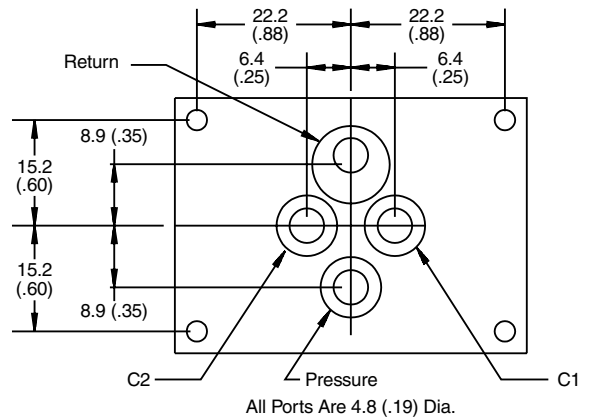
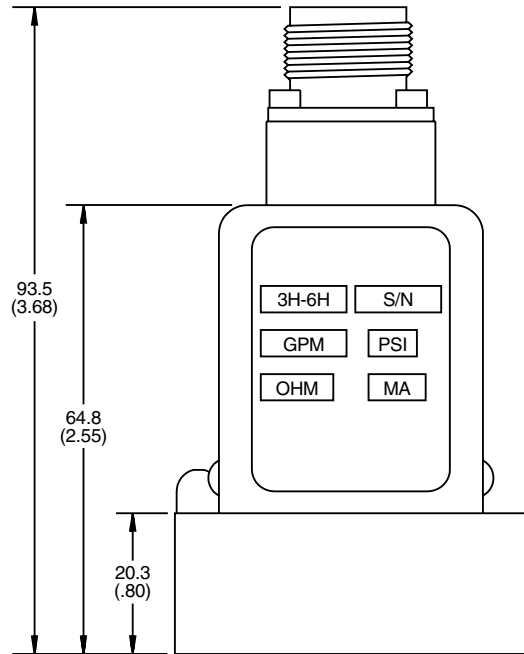
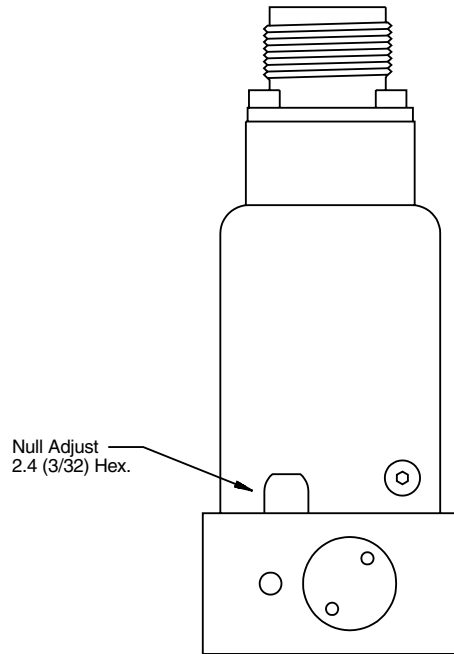
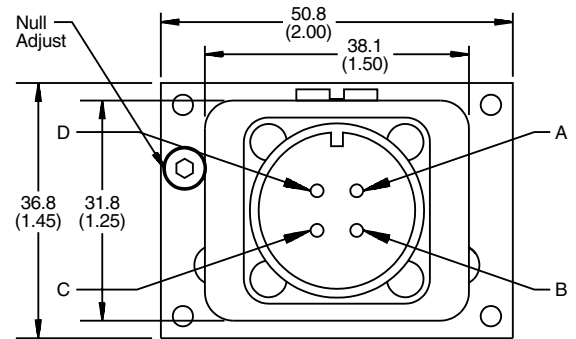
**Dimensions**

**Specifications**

	DY3H	DY6H
<b>Operating Pressure</b>	100 Bar (1500 PSI)	100 Bar (1500 PSI)
<b>Frequency Response</b>	170 Hz @ 40%	>130 Hz @ 40%
<b>Basic Construction</b>	Spool and sleeve	Spool and sleeve
<b>Flow Options</b>	11 LPM (3 GPM)	23 LPM (6 GPM)

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)



**General Description**

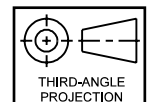
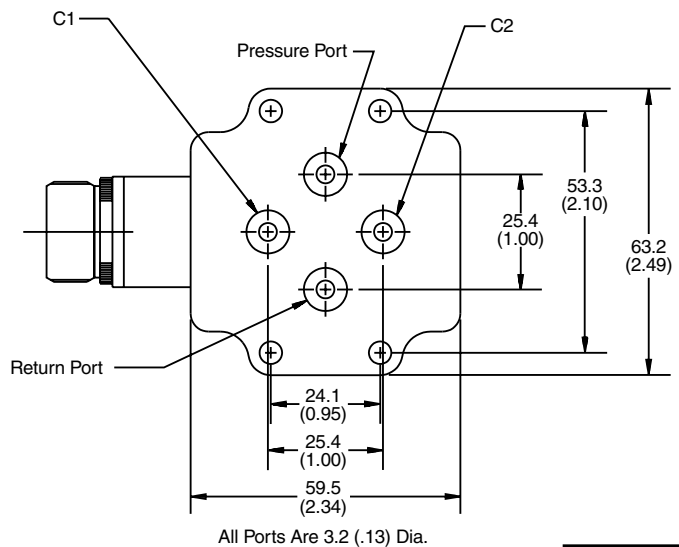
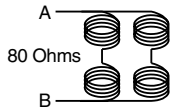
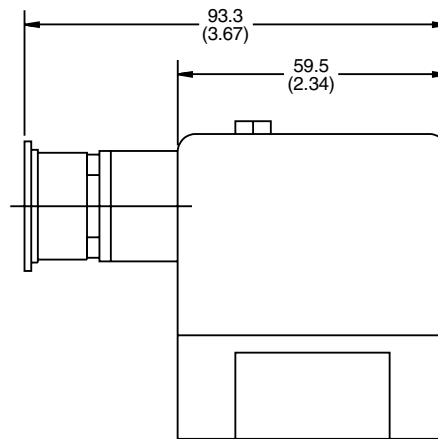
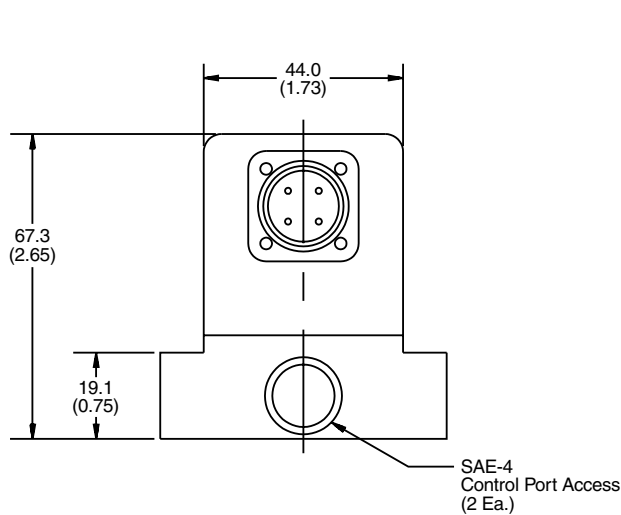
The Parker model 2S is comprised of two single-stage, 3-way pressure control valves in one valve body. Each half of the 2S valve is an independent valve with common supply and return ports. The two valve outputs (C<sub>1</sub> and C<sub>2</sub>) may be operated out of phase with each other producing a high gain pressure difference proportional to electrical input, or operated in phase producing a single higher flow 3-way pressure control valve.

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

**Specifications**

<b>Operating Pressure</b>	40 Bar (600 PSI)
<b>Pressure Recovery</b>	95%
<b>Usable Flow</b>	1.25 LPM (0.33 GPM)
<b>Quiescent Flow</b>	2.00 LPM (0.50 GPM)



**General Description**

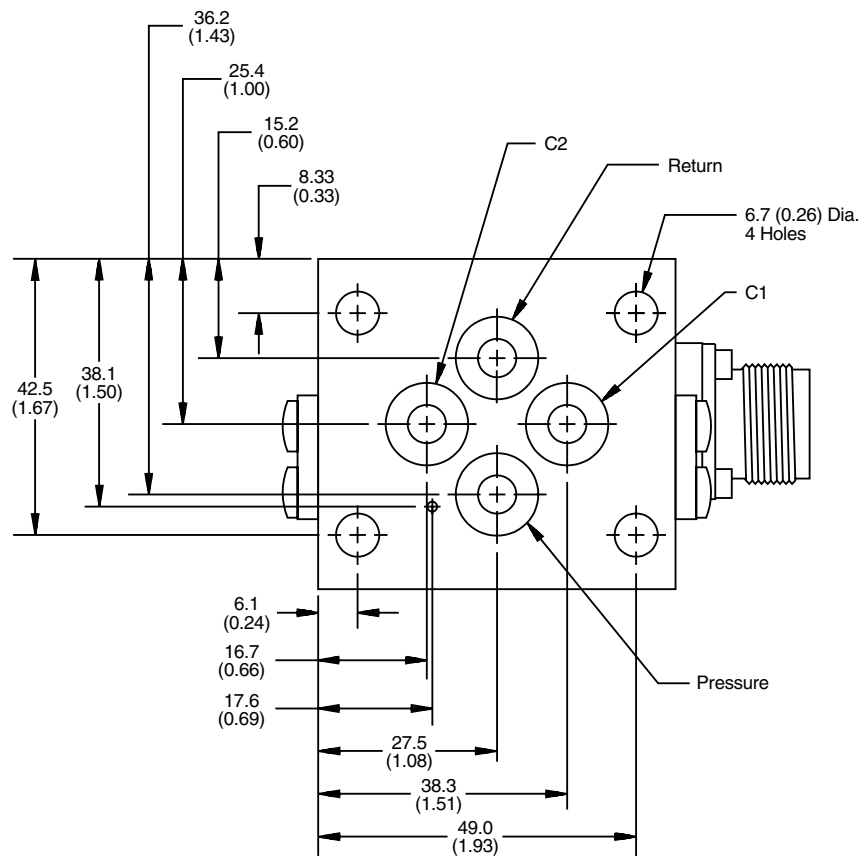
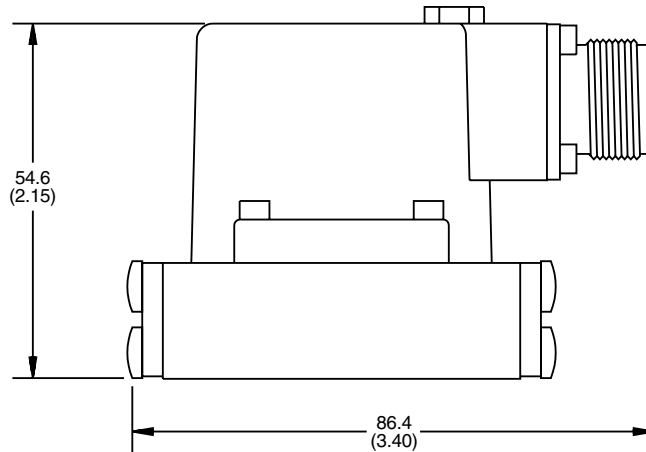
The Parker model 1S is an open-center, single-stage pressure control valve.

**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)

**Specifications**

<b>Operating Pressure</b>	7-90 Bar (100-1300 PSI)
<b>Pressure Recovery</b>	85%
<b>Usable Flow</b>	0.4 LPM (0.1 GPM)
<b>Quiescent Flow</b>	2.00 LPM (0.50 GPM)





**Series**

Code
DY01
DY05
DY10
DY12
DY15
DY25
DY45
DY90



**Options**

Code	Description
A	Standard
B	Stainless Steel



**Coils**

Code	Resistance	Parallel	Series
D	200 ohms	50 mA	25 mA
F	80 ohms	80 mA	40 mA
G	22 ohms	200 mA	100 mA
K	40 ohms	150 mA	75 mA

Current (mA) required to produce max flow.



**Wiring**

Code	Description	
	Connector Over	Flow P to C2 with:
C	port C1	(+) signal to A, C
D	port C1	(+) signal to B, D

Bolt Kit included with valve



**Seals**

Code	Description
N	Nitrile
V	Fluorocarbon

Code	Description
A	210 Bar (3000 PSI)
B	350 Bar (5000 PSI)



**Pressure**

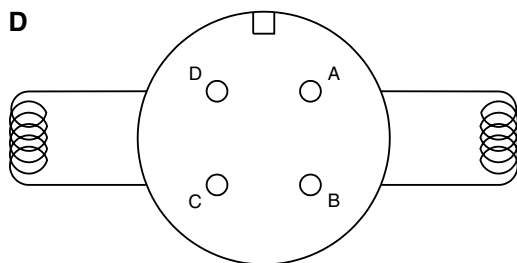


**Flow**

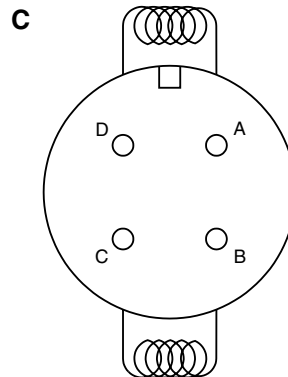
Code	Flow
<b>DY01</b>	0.8 kg (1.75 lbs.)
1	3.8 LPM (1 GPM)
3	11.3 LPM (3 GPM)
<b>DY05</b>	0.8 kg (1.75 lbs.)
1	3.8 LPM (1 GPM)
2.5	9.5 LPM (2.5 GPM)
5	19.0 LPM (5 GPM)
<b>DY10</b>	0.8 kg (1.75 lbs.)
7.5	28.0 LPM (7.5 GPM)
10	38.0 LPM (10 GPM)
<b>DY12</b>	1.0 kg (2.1 lbs.)
12.5	94.0 LPM (12.5 GPM)
15	56.0 LPM (15 GPM)
<b>DY15</b>	1.9 kg (4.2 lbs.)
15	57 LPM (15 GPM)
20	76 LPM (20 GPM)
25	9.5 LPM (25 GPM)
<b>DY25</b>	1.9 kg (4.2 lbs.)
25	94.0 LPM (25 GPM)
30	113.0 LPM (30 GPM)
<b>DY45</b>	7.4 kg (16.0 lbs.)
40	151.0 LPM (40 GPM)
50	189.0 LPM (50 GPM)
60	226.0 LPM (60 GPM)
<b>DY90</b>	8.0 kg (17.5 lbs.)
80	302.0 LPM (80 GPM)
90	340.0 LPM (90 GPM)
100	378.0 LPM (100 GPM)



**Factory Code**  
for special options

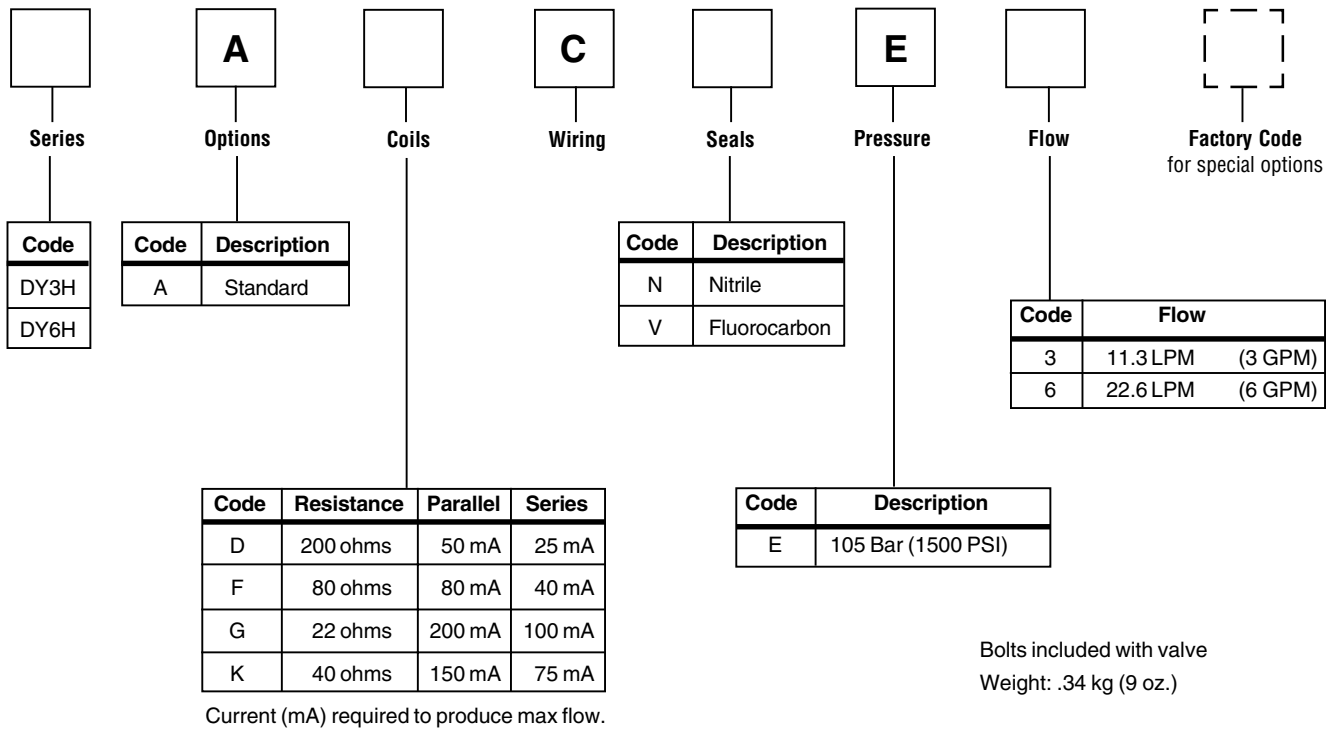


Connector Over C1  
Flow Out C2  
+ Signal to BD

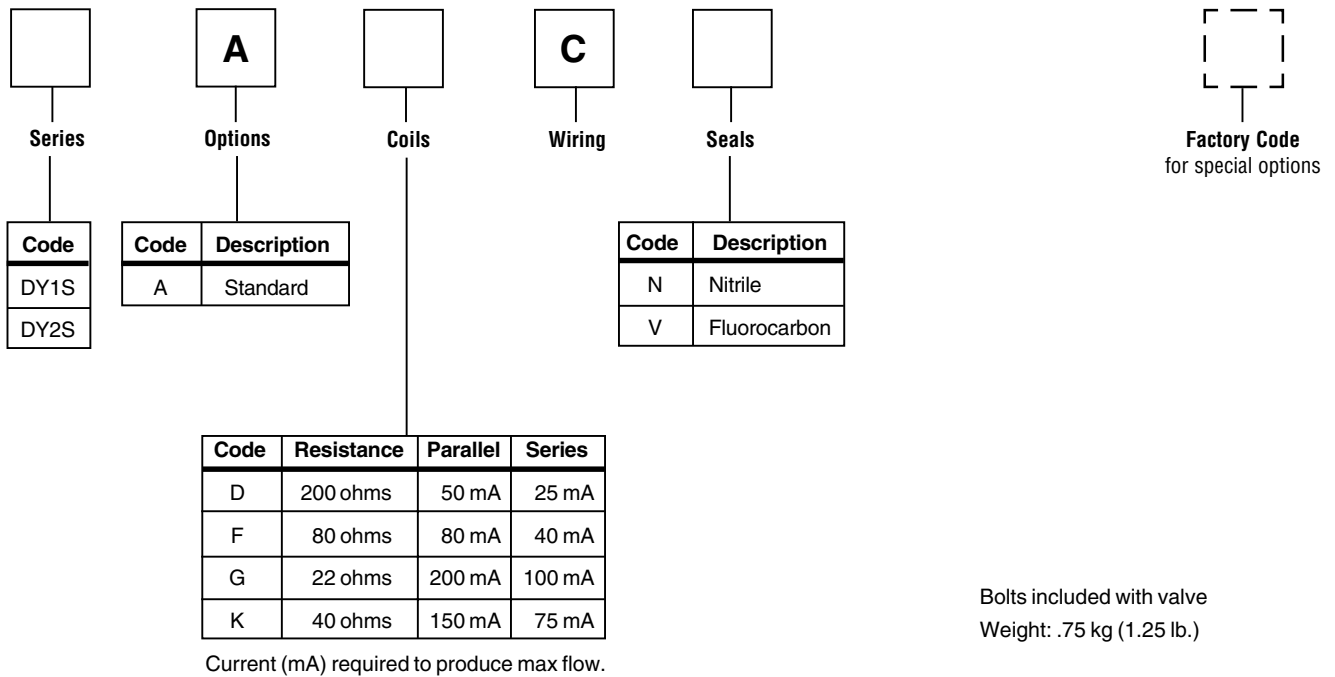


Connector Over C1  
Flow Out C2  
+ Signal to AC

**DY3H/6H**



**DY1S/2S**

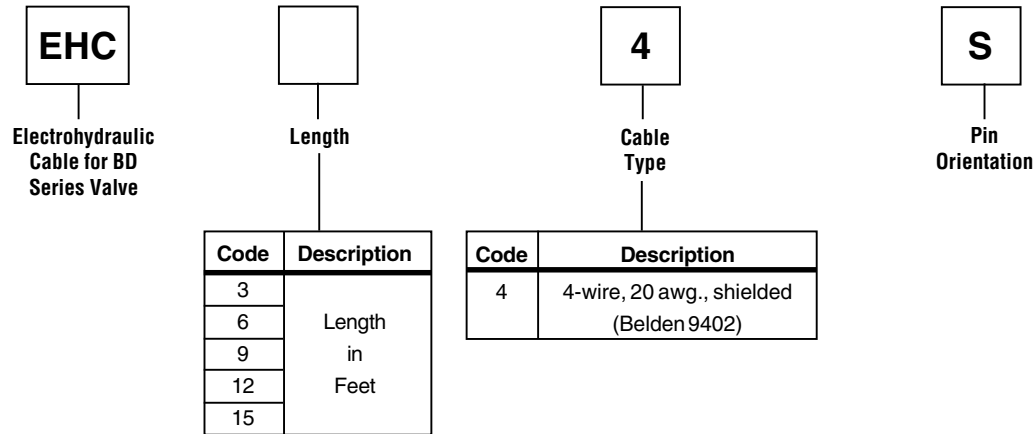


**Accessories**

Subplate	Port Size	Location	Bolt Kit*	Torque Spec.	Flushing Valve
<b>DY 01, 05, 10, 12, 1S</b>					
55-0100-1	3/8 NPTF	side	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
55-0100-2	SAE-6	side	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
55-0100-3	3/8 NPTF	bottom	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
55-0100-4	SAE-6	bottom	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
55-0100-5	1/4 NPTF	side	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
55-0100-8	SAE-8	side	(4) 1/4-20 x 3/4	17 ft. lb.	11-0500
<b>DY15 &amp; DY25</b>					
55-0300-1	1" NPTF	side	(4) 5/16-18 x 1	35 ft. lb.	11-0600
55-0300-2	SAE-6	side	(4) 5/16-18 x 1	35 ft. lb.	11-0600
<b>DY45</b>					
55-0200-1	1 1/2 NPTF	side	(4) 3/8-16 x 2 1/4	62 ft. lb.	11-0700
55-0200-2	SAE-24	side	(4) 3/8-16 x 2 1/4	62 ft. lb.	11-0700
<b>DY90</b>					
55-0900-1	SAE-28	side	(4) 3/8-16 x 2 1/4	62 ft. lb.	11-0800
<b>DY3H/6H</b>					
55-0800-1	1/4 NPTF	side	(4) 8-32 x 1	5 ft. lb.	11-0300
55-0800-2	SAE-4	side	(4) 8-32 x 1	5 ft. lb.	11-0300
<b>DY2S</b>					
55-0600-1	1/8 NPTF	side	(4) 10-24 x 1	5 ft. lb.	—

\*Bolts included with valves

**Cables**



## Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

**1. Terms and Conditions of Sale:** All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

**2. Payment:** Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

**3. Delivery:** Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

**4. Warranty:** Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

**NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.**

**5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.**

**6. Changes, Reschedules and Cancellations:** Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

**7. Special Tooling:** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges

paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**8. Buyer's Property:** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

**9. Taxes:** Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

**10. Indemnity For Infringement of Intellectual Property Rights:** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights. If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

**11. Force Majeure:** Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

**12. Entire Agreement/Governing Law:** The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

9/91-P



## Parker Hydraulics International Sales Offices

### USA

#### Parker Hannifin Corporation Hydraulic Valve Division

520 Ternes Avenue  
Elyria, OH 44035  
Tel: 440-366-5100  
Fax: 440-366-5253

#### Great Lakes Region

257 Huddleston Avenue  
Cuyahoga Falls, OH 44221  
Tel: 330-926-9120  
Fax: 330-926-9125

#### Chicago Region

500 South Wolf Road  
Des Plaines, IL 60016  
Tel: 847-294-2628  
Fax: 847-294-2630

#### Northeast Region

23 Vreeland Road  
Florham Park, NJ 07932  
Tel: 973-966-5500  
Fax: 973-966-5525

#### Pacific Region

16655 Noyes Avenue  
Irvine, CA 92606  
Tel: 949-660-7033  
Fax: 949-852-9577

#### Southern Region

1225 Old Alpharetta Road  
Alpharetta, GA 30005  
Tel: 770-619-9767  
Fax: 770-619-9806

#### Mobile Systems Division

595 Schelther Road  
Lincolnshire, IL 60069  
Tel: 847-821-1500  
Fax: 847-821-7600

### CAN

#### Canada

530 Kipling Avenue  
Toronto, Ontario M8Z 5E6  
Tel: 416-255-7371  
Fax: 416-255-2107

### MEX

#### Mexico

Calle 9, No. 6 Alce Blanco  
053370 Naucalpan  
Edo de Mexico  
Tel: 525-576-2411  
Fax: 525-358-1823

## Parker Europe

### A

#### Austria

**Parker Ermeto GmbH**  
Badenerstrasse 12, postbox 113  
A-2700 Wr. Neustadt, Austria  
Tel: 43-2622-23501-0  
Fax: 43-2622-66212

### B

#### Belgium

**Parker Hannifin S.A.-N.V.**  
Rue du Bosquet 15  
B-1400 Nivelles, Belgium  
Tel: 32-67 280-900  
Fax: 32-67 280-999

### CZ

#### Czech Republic

**Parker Hannifin**  
Dopravaku 723  
CZ-18400 Praha 8, Czech Republic  
Tel: 42-02-830 85 221  
Fax: 42-02-830 85 360

### DK

#### Denmark

**Parker Hannifin DK A/S**  
Industrigrønnen 11  
DK-2635 Ishøj, Denmark  
Tel: 45-4356 0400  
Fax: 45-4373 3107

### GB

#### England

**Parker Hannifin plc**  
66 Wakefield Road  
Ossett, West Yorkshire WF5 9JS  
England  
Tel: 44-1924-282200  
Fax: 44-1924-282299

### FIN

#### Finland

**Parker Hannifin Oy**  
Ylastontie 16  
FIN-01510 Vantaa, Finland  
Tel: 358-9-476 731  
Fax: 358-9-4767 3200

### F

#### France

**Parker Hannifin S.A.**  
7-14 rue de Fossé blanc  
Batiment F  
F-92238 Gennevilliers, France  
Tel: 33-1-4111 5390  
Fax: 33-1-4111 0119

### D

#### Germany

**Parker Hannifin GmbH**  
Gutenbergstrasse 38-40  
D-41564 Kaarst, Germany  
Tel: 49-2131-513-0  
Fax: 49-2131-513-230

### GR

#### Greece

**Parker Hannifin Corporation**  
Representation Office Athens  
8-10 Manis Street  
GR Piraeus 185-39, Greece  
Tel: 30-1-4184415  
Fax: 30-1-4184415

### H

#### Hungary

**Parker Hannifin Corporation**  
Budapest Representation Office  
Budapesti Képviseleti Iroda  
H-1148 Budapest, Hungary  
Vezer ut 156-158  
Tel: 36-1-252 8137  
Fax: 36-1-252 8129

### I

#### Italy

**Parker Hannifin SpA**  
Via Privata Archimede 1  
I-20094 Corsico,  
Milano, Italy  
Tel: 39-02-451921  
Fax: 39-02-4479340

### NL

#### The Netherlands

**Parker Hannifin B.V.**  
Edisonstraat 1  
NL-7570 AT Oldenzaal, Holland  
Tel: 31-541-585000  
Fax: 31-541-585459

### N

#### Norway

**Parker Hannifin AS**  
Berghagan, Langhus  
P.O. Box 3008  
N-1402 Ski, Norway  
Tel: 47-64-91 10 00  
Fax: 47-64-91 10 90

### PL

#### Poland

**Parker Hannifin Corporation**  
Parowcowa 8 B  
02-445 Warsaw, Poland  
Tel: 48-22-8634942  
Fax: 48-22-8634944

## Parker Hydraulics International Sales Offices

**P**

### Portugal

**Parker Hannifin Corporation**  
Rua Oscar de Silva, 1559-4 Dt. Tras  
Leca de Palmeira  
P-4450 Matosinhos, Portugal  
Tel: 35-1-2-9961526  
Fax: 35-1-2-9961527

**RUS**

### Russia

**Parker Hannifin Corporation**  
Komsomolsky Prospect 42,  
Office 434  
119827 GSP Moscow G-48, Russia  
Tel: 7-095-234 0054  
Fax: 7-095-234 0054

**E**

### Spain

**Parker Hannifin Espana S.A.**  
Industrial Las Monjas Parque  
Calle De Las Estaciones 8  
28850 Torrejon de Ardoz  
Madrid, Spain  
Tel: 34-91-6757300  
Fax: 34-91-6757711

**S**

### Sweden

**Parker Hannifin AB**  
Fagerstagatan 51  
Box 8314  
S-163 08 Spanga, Sweden  
Tel: 46-8-5979 5000  
Fax: 46-8-5979 5110

## Asia Pacific Group

**AUS**

### Australia

**Parker Hannifin Australia**  
9 Carrington Road  
Castle Hill, NSW 2154, Australia  
Tel: 61-2-9634-7777  
Fax: 61-2-9842-5111

**CHN**

### China

**Parker Hannifin Hong Kong Ltd.**  
Beijing Office  
Suite B9-B11, 21st fl., Hanwei Bldg.  
No. 7 Guanghai Road, Chaoyang District  
Beijing, 100004, People Republic of China  
Tel: 86-10-6561-0520  
Fax: 86-10-6561-0526

### Parker Hannifin Hong Kong Ltd.

Shanghai Office  
Room 1101, Peregrine Plaza  
1325 Huai Hai Road (M)  
Shanghai, 200031, People Republic of China  
Tel: 86-21-6445 9339  
Fax: 86-21-6445 9717

**HK**

### Hong Kong

**Parker Hannifin Hong Kong Ltd.**  
8/F, Kin Yip Plaza,  
9 Cheung Yee Street  
Cleung Sha Wan,  
Kowloon, Hong Kong  
Tel: 852-2428 8008  
Fax: 852-2480 4256

**IND**

### India

**Parker Hannifin India**  
701, Gateway Plaza  
Hiranandani Gardens, Powai  
Mumbai, 400076, Bombay, India  
Tel: 91-22-5771671  
Fax: 91-22-6290009

**J**

### Japan

**Parker Hannifin Japan, Ltd.**  
626 Totsuka-cho, Totsuka-ku  
Yokohama-shi 244, Japan  
Tel: 81-45-861-3811  
Fax: 81-45-864-5305

**ROK**

### Korea

**Parker Hannifin Asia Pacific Co. Ltd.**  
902 Dae Heung Bldg.  
648-23 Yeoksam-dong  
Kangnam-ku, Seoul, Korea 135-080  
Tel: 82-2-561 0414  
Fax: 82-2-556 8187

**NZ**

### New Zealand

**Parker Hannifin (N.Z.) Ltd.**  
103 Harris Road, East Tamaki  
Private Bag 14906, Panmure  
Auckland, New Zealand  
Tel: 64-9-273 8944  
Fax: 64-9-273 8943

**RP**

### Philippines

**Parker Hannifin Representative Office**  
Unit 205, Richville Corporate Centre  
1314, Commerce Avenue  
Madrigal Business Park, Ayala Alaban  
Muntinupa City, Philippines  
Tel: 63-2 809 5903  
Fax: 63-2 809 5864

**SGP**

### Singapore

**Parker Hannifin Singapore Pte. Ltd.**  
No. 11 4th Chin Bee Road  
Jurong Town, Singapore 619702  
Republic of Singapore  
Tel: 65-261 5233  
Fax: 65-265 5125

**RC**

### Taiwan

**Parker Hannifin Taiwan Co., Ltd.**  
87-1, No. 102, Sung Lung Road  
Taipei, Taiwan, R.O.C.  
Tel: 886-2 8787 3780  
Fax: 886-2 8787 3782

**T**

### Thailand

**Parker Hannifin Thailand Co., Ltd.**  
Muang Thai Phatra Office Tower II  
252/96 18th floor, Unit E  
Rachadaphisek Road  
Huaykwang, Bangkok 1j0320  
Tel: 662-693 3304  
Fax: 662-693 3307

## Latin American Group

**USA**

### Pan American Division

**Parker Hannifin Corporation**  
7400 NW Corporate Center Dr. STE. A  
Miami, Florida 33126  
Tel: 1-305 470 8800  
Fax: 1-305 470 8808

**RA**

### Argentina

**Parker Hannifin Argentina S.A.I.C.**  
Avda. Pte. Arturo U Illia 2064  
Villa Maipu, 1650 San Martin  
Prov. Buenos Aires, Argentina  
Tel: 54-1-752 4129  
Fax: 54-1-752 3704

**BR**

### Brazil

**Parker Hannifin Ind. e Com. Ltda.**  
Av. Lucas Nogueira Garcez 2181  
12300-000 Jacarei, SP, Brazil  
Tel: 55-12-354 5100  
Fax: 55-12-354 5262

**V**

### Venezuela

**Parker Hannifin deVenezuela S.A.**  
Edificio Draza PB-1 y PB-2  
Boleita Norte  
Caracas, Venezuela  
Tel: 58-2-238 5422  
Fax: 58-2-239 2272

## Africa

**ZA**

### South Africa

**Parker Hannifin Africa Pty. Ltd.**  
Parker Place  
10 Berne Avenue  
Aeroporto, Kempton Park  
Kempton Park 1620, South Africa  
Tel: 27-11-3927280  
Fax: 27-11-3927213



**Parker Hannifin Corporation**  
6035 Parkland Blvd.  
Cleveland, Ohio 44124-4141  
Telephone: (216) 896-3000  
Fax: (216) 896-4000  
www.parker.com

## **Parker Hannifin Corporation**

### **About Parker Hannifin Corporation**

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving nearly 400,000 customers worldwide.

### **Parker's Charter**

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

### **Product Information**

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

**The Aerospace Group** is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.



**The Climate & Industrial Controls Group** designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.



**The Fluid Connectors Group** designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.



**The Seal Group** designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.



**The Hydraulics Group** designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.



**The Filtration Group** designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.



**The Automation Group** is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.



**The Instrumentation Group** is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.





**Parker Hannifin Corporation**  
Hydraulic Valve Division  
520 Ternes Avenue  
Elyria, Ohio 44035 USA  
Tel: (440) 366-5200  
Fax: (440) 366-5253  
[www.parker.com/hydraulicvalve](http://www.parker.com/hydraulicvalve)

Bulletin HY14-1483-B1/US,  
1M, 6/01, PHD