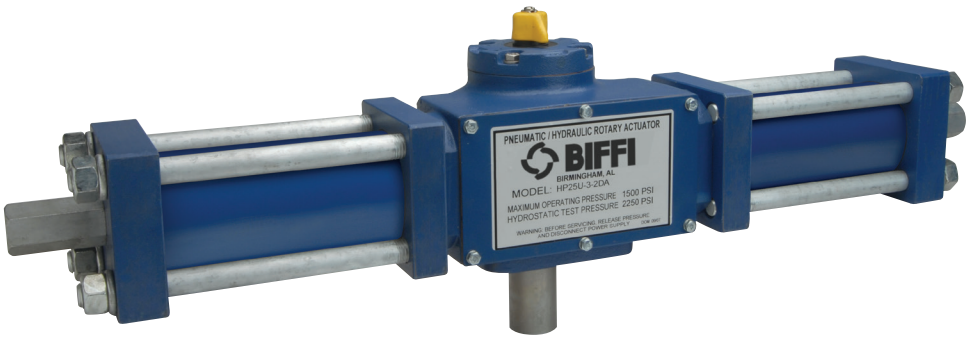
Product Data Sheet
VCTDS-03193-US Rev. 0
July 2023

Biffi Morin HP Series

Scotch Yoke Design

- HP Series - Direct gas/hydraulic actuator with ductile iron housing and carbon steel cylinders.
- Spring-return and double-acting actuators.
- Quarter-turn output torques to 240,000 lb-in.



BIFFI

Biffi Italia s.r.l. - Strada Biffi 165, 29017 Fiorenzuola d'Arda (PC) – **Italy PH:** +39 0523 944 411 – biffi_italia@biffi.it

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General Application

Designed specifically for automating quarter-turn pipeline valves, providing control for any quarter-turn ball, plug or butterfly valve application.

Technical Data

Supply pressure:	Up to 2250 psig (see torque chart)
Supply medium:	Any pneumatic or hydraulic fluid compatible with materials of construction

Temperature rating

Standard:	-20 to 210 °F
Optional:	-65 to 300 °F
Angular rotation:	90° (adjustable between 82 and 98°)
Mounting pattern:	ISO 5211
Protection:	IP66
Certification:	SIL3 rated

Features

- High pressure construction eliminates undesirable regulators and relief valves for supply pressures.
- Hydraulic dampening provides smooth “open-close” operation to prevent detrimental valve slamming.
- Ductile iron housing provides long life and durable, cost effective operation.
- High strength alloy steel or 17-4PH stainless output shaft transmits torque without fatigue.
- Sintered bronze or PTFE composite output shaft bushings eliminate side loading of valve stem to maximize stem packing performance.
- Strong, corrosion-resistant chrome-plated steel piston rod for enduring high-cycle applications.
- Sintered bronze piston rod bushings provide low-friction support and precise alignment to increase efficiency, reduce maintenance and extend actuator life.
- Heat-treated stainless steel thrust pin and rollers transfer piston force to yoke to reduce friction, for longer life and more efficient torque transmission.
- Polytetrafluoroethylene (PTFE) guide bands ensure low-friction piston guidance protecting cylinder walls from potential scoring and extending seal performance with a continuous cylinder wiping action.
- Bi-directional travel stops provide accurate valve rotation adjustment.
- NAMUR drive slot maintains a compact assembly for accessory-driven components with no couplings necessary.
- Tectyl-coated springs need no special tools to be disarmed safely and easily, reducing down time.
- Easily removable housing cover provides easy access for yoke mechanism inspection.

Designed with a Rugged Heart

Scotch Yoke Design

The heart of any scotch yoke actuator is the yoke. The HP actuator uses either 17-4PH or ductile iron for this critical area as standard.

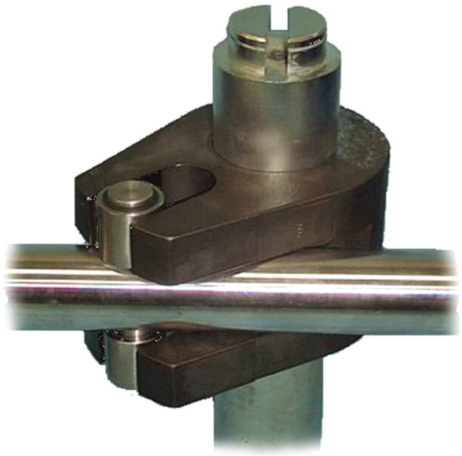
The yoke is the mechanism used to convert linear force to torque. The yoke is critical to actuator performance, it must be rugged, yet precisely machined to give long life at high efficiency - all our yoke designs meet this test.

Principles of Construction

Using high quality materials of construction and modern rugged design concepts provides the standard for high quality, low cost valve actuation.

The actuator housings are all machined from ductile iron castings. This produces a rugged, low cost product through reduced machining time and by eliminating wasteful excess material. Housings are then epoxy electro-coated inside and out for corrosion resistance. Any components that rotate or slide during operation, such as the high strength output shaft, chrome-plated piston rod, stainless steel thrust pin or the ductile iron piston, are all supported by replaceable friction reducing bearings.

Figure 1.



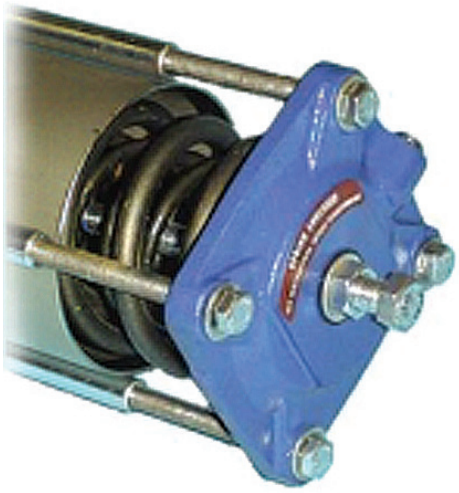
Bi-directional Travel Stops

Adjustable stops on each end cap provide the flexibility of accurate valve rotation positioning at the end of the “open” and “close” stroke. Both stops are located on the cylinder center line, the optimal position to maximize travel adjustment and eliminate any detrimental side loading on the travel stops. Adjustable from 82 to 98°.

Spring Designed for Safety

All spring-return models incorporate a “man safe” spring design that allows the actuator to be safely assembled and disassembled in the field without the need for special tools. The integral tie rods are bored and tapped to provide a means of loading and unloading the spring in a safe and convenient manner.

Figure 2.



Scotch Yoke Torque Characteristics (Symmetrical Shown)

Figure 3. Single Acting Spring-Return

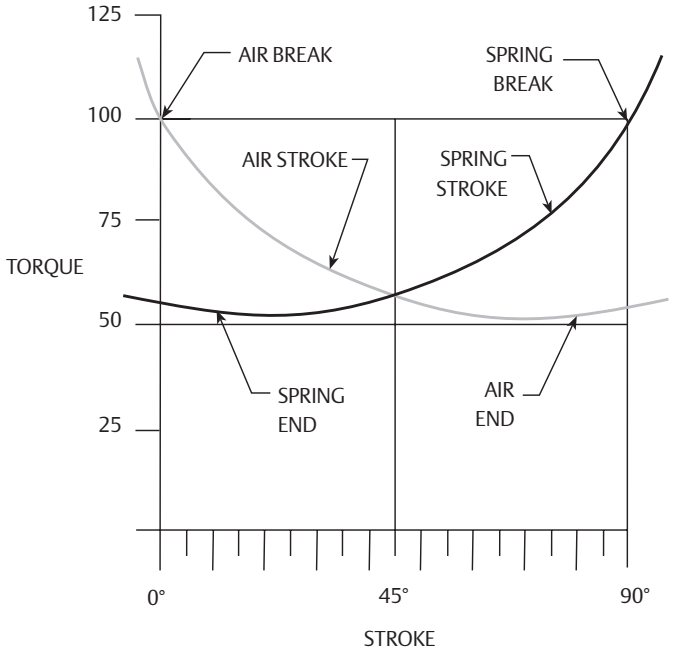
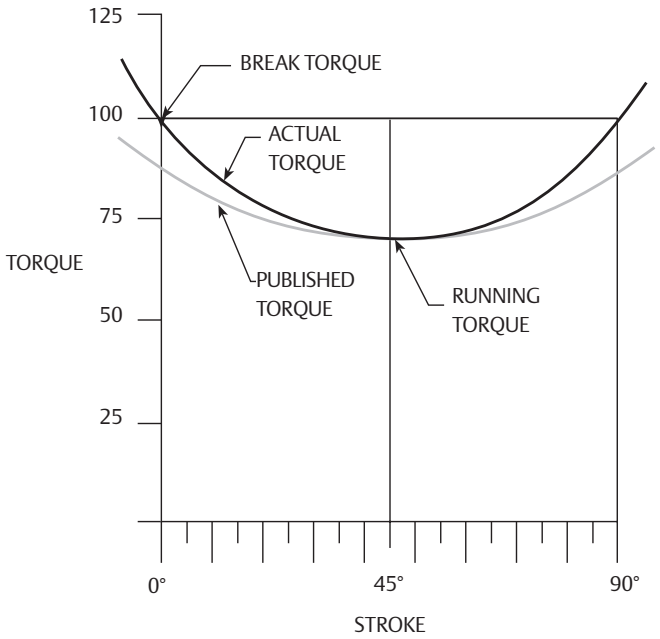
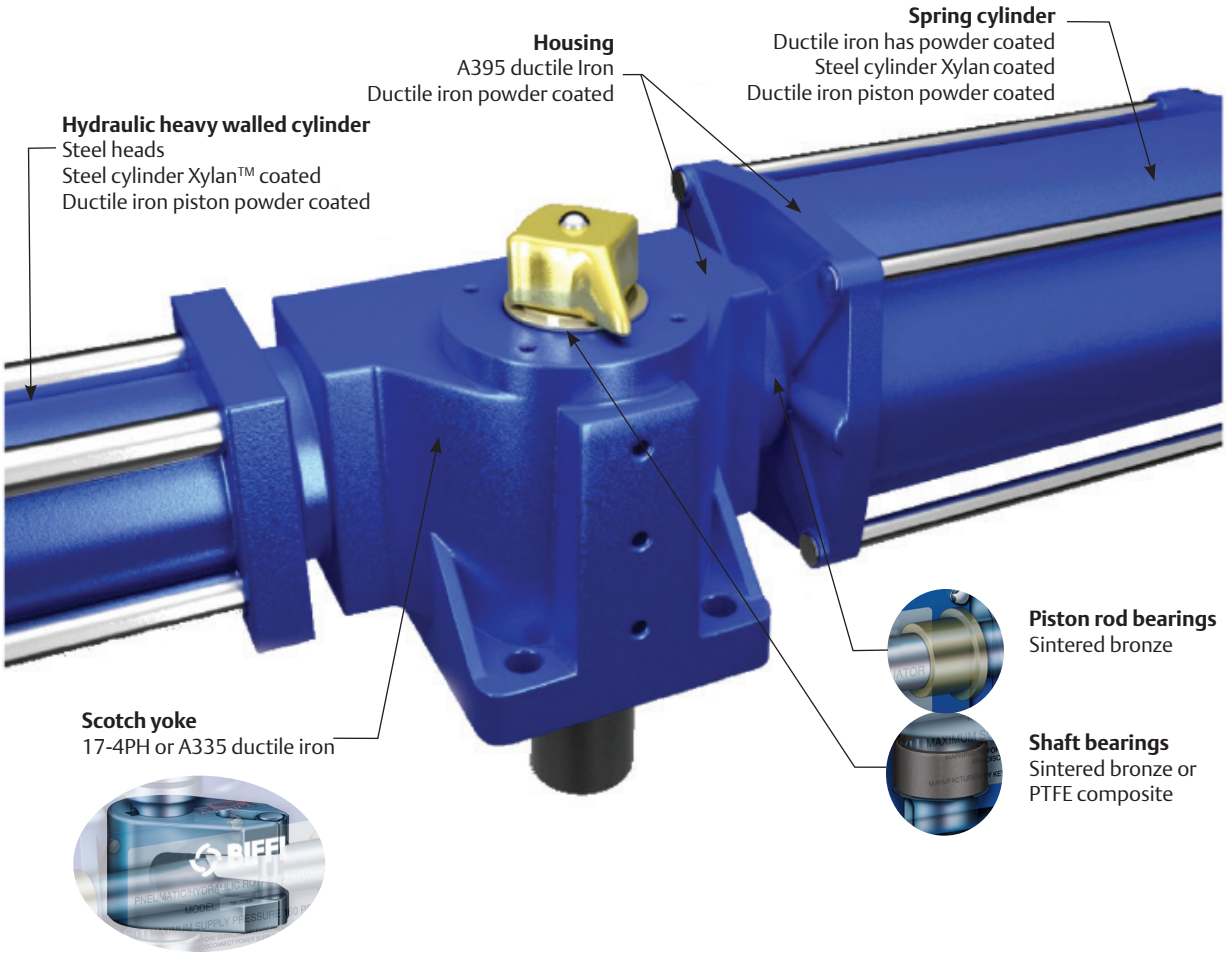


Figure 4. Double-acting Air to Air



Superior Materials of Construction Offer Long Life and Mean Less Downtime

Figure 5. Model HP15 is Standard with 17-4PH Shaft



Experts in Actuator Design

We understand that the most efficient design for one torque range is not the most efficient for another. Our actuators use the standard scotch yoke design for lower torque ranges and a side bar design for the higher torque ranges. This gives a rugged design with economic cost.

Figure 6. Standard Design, Scotch Yoke

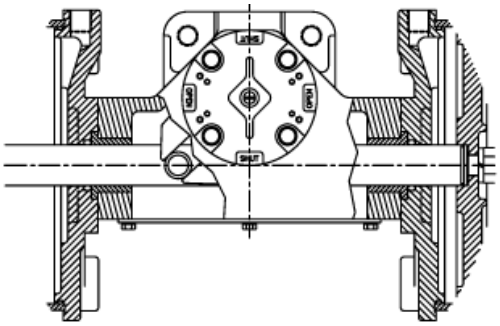
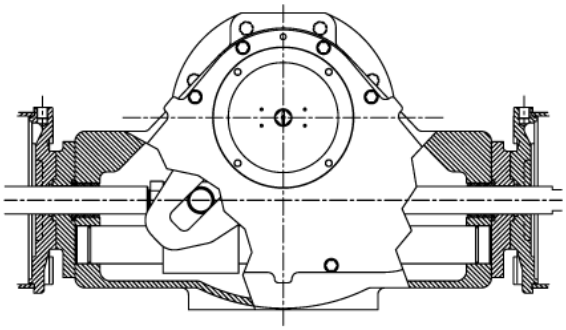


Figure 7. Side Bar Design, Scotch Yoke

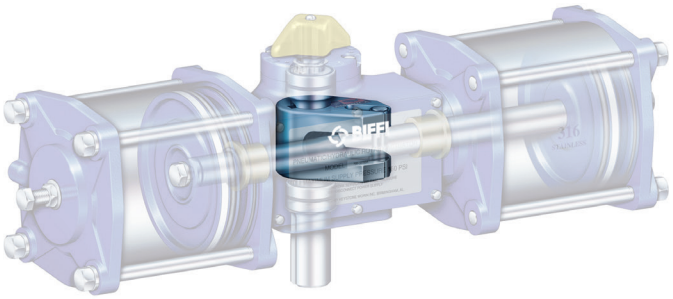


NOTE:
See Series HP IOM for a complete bill of materials.

Symmetrical and Canted Yokes

It's about fitting the torque curve of the actuator to the valve.
It's about lower cost, lighter weight, smaller actuators.
It's about CHOICE.

Figure 8. Standard Design, Scotch Yoke



Symmetric

Symmetrical yoke design offers the standard torque curve seen most often in relation to scotch yoke actuators. It offers the increased torque advantage at both ends of the 90° stroke as shown on the blue curve below. This torque curve covers most quarter-turn applications.

Canted

Canted yoke design moves the torque curve to where it's needed most, gaining as much as 35% more break and reseat torque for the same size actuator. The canted yoke curve is shown in red below. Canted yoke actuators allow selection of smaller, lighter, and less expensive actuator packages.

Figure 9. Standard Design, Scotch Yoke

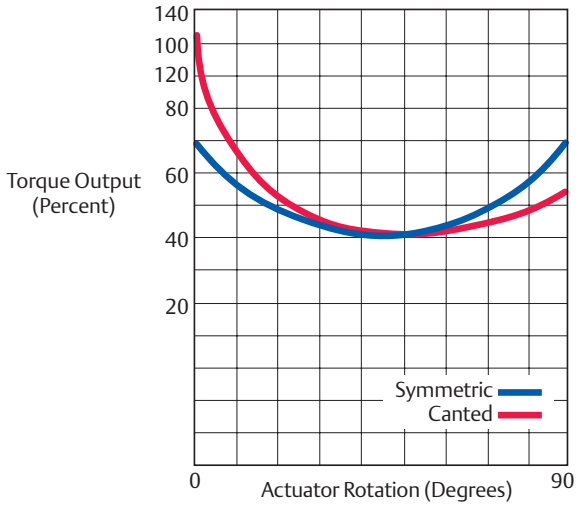


Table 1. Mechanical Data for Double-Acting

Actuator Model	Cylinder Bore (inch)	Stroke (inch)	Volume Cubic in 90° Stroke	Weight (lbs)	Symmetric		Canted	
					MOP* (psi)	MAP** (psi)	MOP* (psi)	MAP** (psi)
HP15-2-1DA	2.13	3	11	30	1900	2250	-	-
HP15-2-2DA	2.13	3	19	43	1500	2250	-	-
HP15-3-1DA	3.25	3	25	48	700	1500	-	-
HP15-3-2DA	3.25	3	47	61	600	1500	-	-
HP25-3-1DA	3.25	5	41	155	2000	2250	1500	2250
HP25-3-2DA	3.25	5	73	186	1600	2250	800	2250
HP25-4-1DA	4.25	5	71	160	1100	2250	1100	2250
HP25-4-2DA	4.25	5	133	196	900	2250	600	2250
HP30-4-1DA	4.25	6	85	365	2250	2250	2000	2250
HP30-4-2DA	4.25	6	151	401	2000	2250	800	2250
HP30-6-1DA	6.25	6	184	410	1100	2250	400	2000
HP30-6-2DA	6.25	6	349	491	1000	2250	1600	2250
HP30-8-1DA	8.26	6	321	460	600	1500	700	1700
HP30-8-2DA	8.26	6	624	591	500	1500	400	1500

Table 2. Mechanical Data for Spring-Return

Actuator Model	Cylinder Bore (inch)	Stroke (inch)	Volume Cubic in 90° Stroke	Weight (lbs)	Symmetric		Canted	
					MOP* (psi)	MAP** (psi)	MOP* (psi)	MAP** (psi)
HP15-2-1-023S	2.13	3	11	35	1900	2250	-	-
HP15-2-1-046S	2.13	3	11	45	1900	2250	-	-
HP15-2-1-072S	2.13	3	11	55	1900	2250	-	-
HP15-2-1-100S	2.13	3	11	75	1900	2250	-	-
HP15-3-1-100S	3.25	3	25	190	1000	1500	-	-
HP25-3-1-210S	3.25	5	41	250	2000	2250	2250	2250
HP25-3-1-420S	3.25	5	41	260	2000	2250	2250	2250
HP25-4-1-210S	4.25	5	71	260	1400	2250	1400	2250
HP25-4-1-420S	4.25	5	71	265	1400	2250	1400	2250
HP30-4-1-370S	4.25	6	85	440	2250	2250	2250	2250
HP30-4-1-740S	4.25	6	85	600	2250	2250	2250	2250
HP30-6-1-575S	6.25	6	184	1010	1500	2250	1500	2250
HP30-6-1-740S	6.25	6	184	910	1500	2250	1500	2250
HP30-6-1-1150S	6.25	6	184	1115	1500	2250	1500	2250
HP30-8-1-740S	8.26	6	321	1075	900	1500	900	1700
HP30-8-1-1150S	8.26	6	321	1160	900	1500	900	1700

NOTES:
* Maximum Operating Pressure (MOP) = The maximum pressure under normal operation producing the maximum allowable output torque.
** Maximum Allowable Pressure (MAP) = The static pressure allowed under normal operating conditions for a fully stroked actuator against the travel stop.

Table 3. Dimensional Data for Double-Acting (inches)

Actuator Model	A	B	C[1]	C[2]	D[1]	D[2]	E	F	G	J	K	L	M	Q	NPT[1] Ports	NPT[2] Ports	ISO Flange
HP15U-2-1DA	20.25	11.38	3.50	-	5.50	-	3.06	1.75	-	2.18	4.34	6.69	2.25	1.25	3/8	1/8	F12
HP15U-2-2DA	22.75	11.38	3.50	-	5.50	-	3.06	-	-	2.18	4.34	6.69	2.25	-	3/8	-	F12
HP15U-3-1DA	23.06	14.19	5.50	-	6.50	-	3.06	1.75	-	2.18	4.34	6.69	2.25	1.25	1/2	3/8	F12
HP15U-3-2DA	28.37	14.19	5.50	-	6.50	-	3.06	-	-	2.18	4.34	6.69	2.25	-	1/2	-	F12
HP25U-3-1DA	35.54	19.66	5.50	-	8.44	-	5.62	2.75	-	4.38	8.13	11.81	3.19	2.12	1/2	3/8	F16
HP25U-3-2DA	39.33	19.66	5.50	-	8.44	-	5.62	-	-	4.38	8.13	11.81	3.19	-	1/2	-	F16
HP25U-4-1DA	38.16	22.28	7.00	-	9.19	-	5.62	2.75	-	4.38	8.13	11.81	3.19	2.12	1/2	3/8	F16
HP25U-4-2DA	44.57	22.28	7.00	-	9.19	-	5.62	-	-	4.38	8.13	11.81	3.19	-	1/2	-	F16
HP30U-4-1DA	45.16	25.60	7.00	-	13.50	-	7.63	3.50	-	5.44	9.50	14.81	6.88	2.50	1/2	1/2	F30
HP30U-4-2DA	51.19	25.60	7.00	-	13.50	-	7.63	-	-	5.44	9.50	14.81	6.88	-	1/2	-	F30
HP30U-6-1DA	47.99	28.43	9.00	-	14.51	-	7.63	3.50	0.44	5.44	9.50	14.81	6.89	2.50	1/2	3/8	F30
HP30U-6-2DA	52.67	28.43	9.00	-	14.51	-	7.63	-	0.44	5.44	9.50	14.81	6.89	-	1/2	-	F30
HP30U-8-1DA	48.49	28.93	10.63	-	15.33	-	7.63	3.50	1.25	5.44	9.50	14.81	6.89	2.50	3/4	1/2	F30
HP30U-8-2DA	57.87	28.93	10.63	-	15.33	-	7.63	-	1.25	5.44	9.50	14.81	6.89	-	3/4	-	F30

Table 4. Dimensional Data for Spring-Return (inches)

Actuator Model	A	B	C[1]	C[2]	D[1]	D[2]	E	F	G	J	K	L	M	Q	NPT[1] Ports	NPT[2] Ports	ISO Flange
HP15U-2-1-023S	24.44	11.38	3.50	4.81	5.50	6.16	2.79	-	0.25	2.18	4.34	6.69	2.25	1.25	3/8	-	F12
HP15U-2-1-046S	24.59	11.38	3.50	4.81	5.50	6.16	2.79	-	0.25	2.18	4.34	6.69	2.25	1.25	3/8	-	F12
HP15U-2-1-072S	26.15	11.38	3.50	5.81	5.50	6.68	2.79	-	0.75	2.18	4.34	6.69	2.25	1.25	3/8	-	F12
HP15U-2-1-100S	26.15	11.38	3.50	7.12	5.50	7.31	2.79	-	1.38	2.18	4.34	6.69	2.25	1.25	3/8	-	F12
HP15U-3-1-100S	28.97	14.19	5.50	7.12	6.50	7.31	2.79	-	1.38	2.18	4.34	6.69	2.25	1.25	1/2	-	F12
HP25U-3-1-210S	46.45	19.66	5.50	11.50	8.44	11.44	4.75	-	2.00	4.38	8.13	11.82	3.19	2.12	1/2	-	F16
HP25U-3-1-420S	46.45	19.66	5.50	11.50	8.44	11.44	4.75	-	2.00	4.38	8.13	11.82	3.19	2.12	1/2	-	F16
HP25U-4-1-210S	49.08	22.28	7.00	11.50	9.19	11.44	4.75	-	2.00	4.38	8.13	11.82	3.19	2.12	1/2	-	F16
HP25U-4-1-420S	49.08	22.28	7.00	11.50	9.19	11.44	4.75	-	2.00	4.38	8.13	11.82	3.19	2.12	1/2	-	F16
HP30U-4-1-370S	57.49	25.60	7.00	13.50	13.50	16.75	6.94	-	2.69	5.44	9.50	14.81	6.88	2.24	1/2	-	F30
HP30U-4-1-740S	57.49	25.60	7.00	13.50	13.50	16.75	6.94	-	2.69	5.44	9.50	14.81	6.88	2.24	1/2	-	F30
HP30U-6-1-575S	62.98	28.43	9.00	17.00	14.50	18.50	6.35	-	4.44	5.44	9.50	14.81	6.88	2.50	1/2	-	F30
HP30U-6-1-740S	60.32	28.43	9.00	13.50	14.50	16.75	6.94	-	2.69	5.44	9.50	14.81	6.88	2.24	1/2	-	F30
HP30U-6-1-1150S	62.98	28.43	9.00	17.00	14.50	18.50	6.35	-	4.44	5.44	9.50	14.81	6.88	2.50	1/2	-	F30
HP30U-8-1-740S	60.82	28.93	10.63	13.50	15.33	16.75	6.94	-	2.69	5.44	9.50	14.81	6.88	2.24	3/4	-	F30
HP30U-8-1-1150S	63.49	28.93	10.63	17.00	15.33	18.50	6.35	-	4.44	5.44	9.50	14.81	6.88	2.50	3/4	-	F30

NOTES:
For drawings containing C[1], C[2], D[1], D[2], NPT[1], NPT[2] dimensions, see pages 12 and 13.
* Diameter dimension.

Dimensions

Figure 10. Double-Acting (HP15-2-1, HP15-3-1)

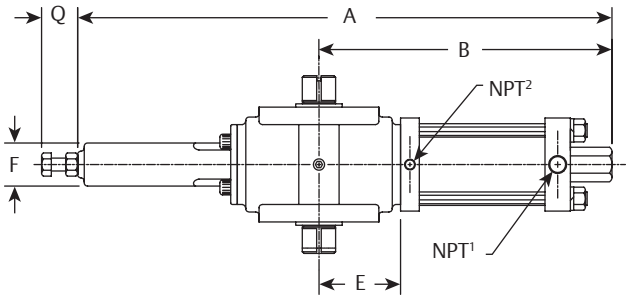


Figure 11. Double-Acting (HP15-2-2)

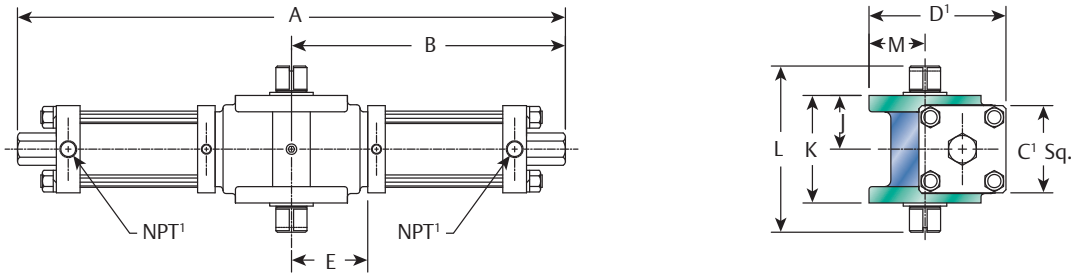


Figure 12. Spring-Return (HP15)

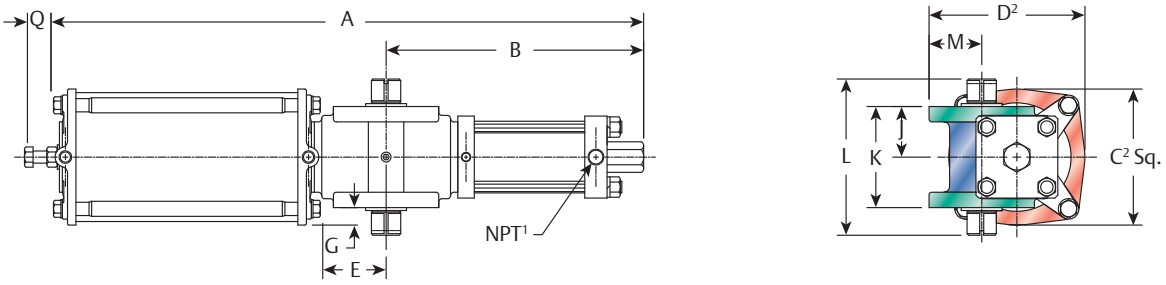


Figure 13. Double-Acting (HP25-3-1, 4-1; HP30-4-1, -6-1, -8-1)

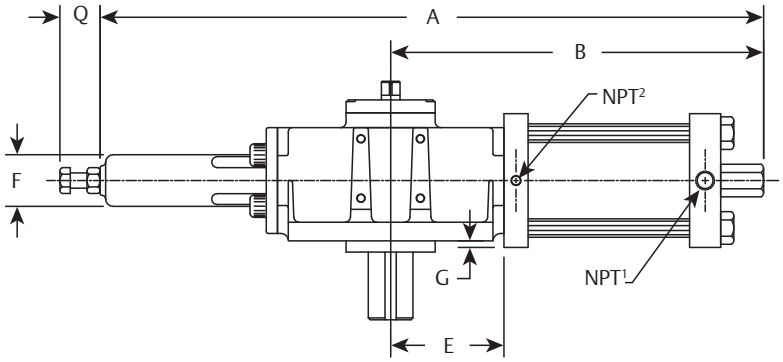


Figure 14. Double-Acting (HP25-3-2, -4-2; HP30-4-2, -6-2, -8-2)

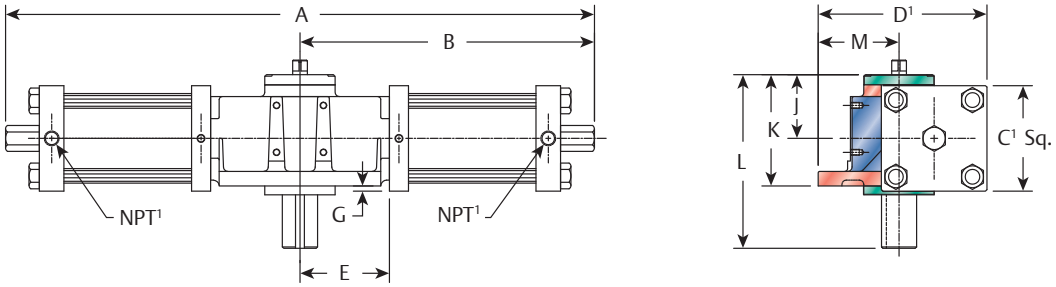
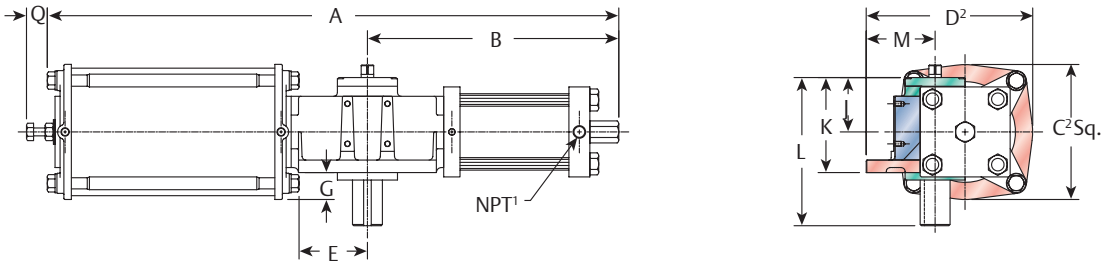


Figure 15. Spring-Return (HP25 and HP30)



Mounting Details

Figure 16. Model HP15
Top and bottom of housing (symmetrical) - ISO 5211-F12

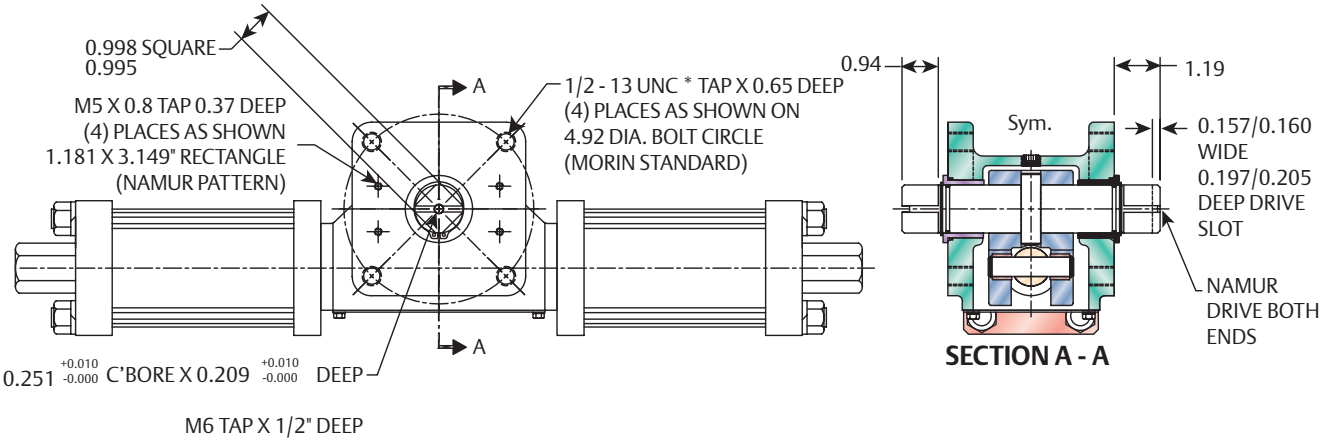


Figure 17. Model HP25
Bottom of housing - ISO 5211-F16

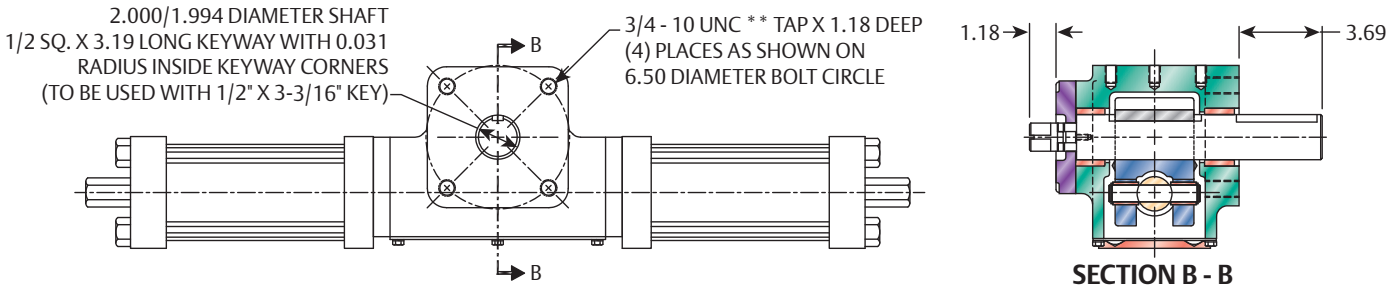


Figure 18. Model HP30

Bottom of housing - ISO 5211-F30

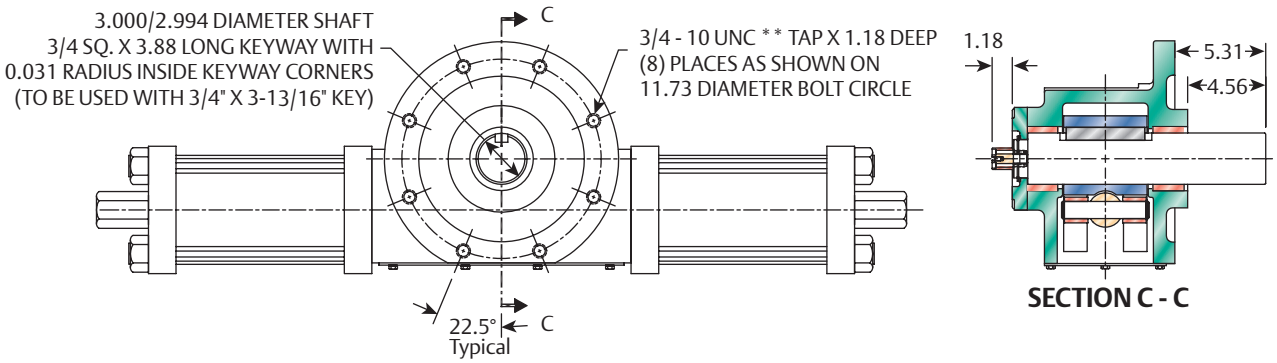


Figure 19. Model HP25 and HP30

Top of housing - mounting details

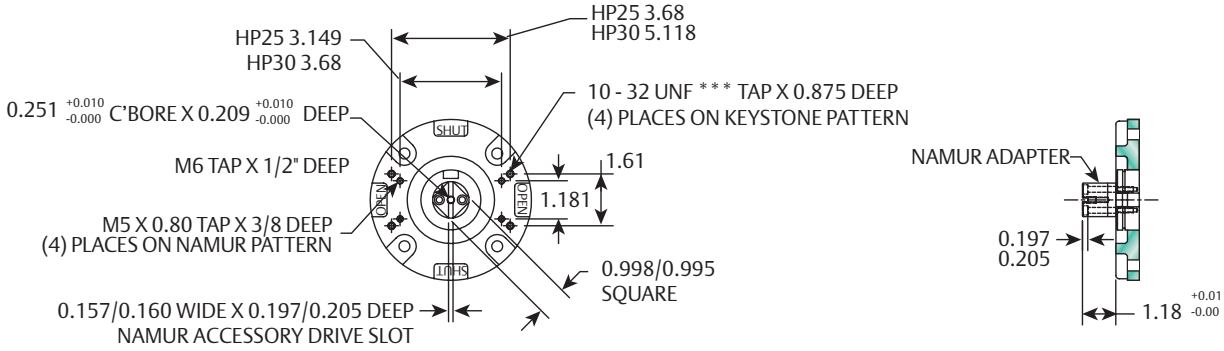


Table 5. Metric Thread Option

Metric Tap	Model Number
M12*	HP15
M20**	HP25 and HP30
M5***	HP25 and HP30

NOTE:

Replace “U” with “M” in order number designation.

Manual Options

A full range of manual accessories is available to provide the actuation package best suited for your application.

Figure 20.

Epoxy Painting (EX)

Offshore rated, three-part coating system for high level of environmental protection.

Figure 21.

Hydraulic Override (MHP)

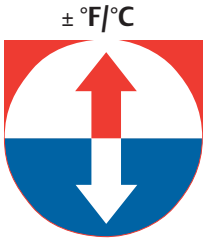
Manual operation when power is lost. Includes speed controls.

Figure 22.

Direct Mounting Cast Adapters

Many valve top works covered, including some ISO mounting. Assures economic but correct mounting alignment.

Figure 23.



High or Low Temperature Ratings

Standard rating of -20 to 210 °F / -29 to 99 °C covers most applications. Optional ratings down to -65 °F / -54 °C and up to 300 °F / 149 °C.

Selection Guide

Table 6.

Example:	HP -	30	U	C -	4 -	1 -	370S080 -	MHP
Model								
HP High Pressure gas/hydraulic								
Actuator Size								
15 1.5" Moment Arm								
25 2.5" Moment Arm								
30 3.0" Moment Arm								
Mounting Interface Bolting								
U UNC Mounting Threads								
M Metric Mounting Threads								
Yoke Design								
(blank) Symmetrical Yoke								
C Canted Yoke								
Nominal Cylinder Bore (inches)								
Number of Active Cylinders								
1 Single hydraulic cylinder on double-acting or spring-return								
2 Two hydraulic cylinders on double-acting								
Function								
Double-Acting / **Spring-Return**								
DA / See code from torque book								
Fail Closed (CW) ends in "0" (i.e. 218S080)								
Fail Open (CCW) ends in "1" (i.e. 218S081)								
Add on Option								
(blank) No options (standard configuration)								
DP1 Drain ports located 90 from std port								
DP2 Drain ports located 180 form std ports								
EX Epoxy paint								
G Grease fill - 3/4 fill in housing								
V High temp seals (FKM)								
HS Hole through length of output shaft for grease fitting of output shaft								
HD1 Hydraulic damper/speed control - full stroke								
MHP Manual hydraulic override								
K K-Mass fire-proofing								
LT Low temp. seals								
P1M Prox prep - 5/8" with Magnetic activator								
P1 Prox prep - 5/8" with Ferrous activator								
P2 Prox prep - 18 mm with Ferrous activator								
P3 Prox prep - 12 mm with Ferrous activator								
SF Stainless steel fasteners								
SO Stainless steel output shaft								
SSP Stainless steel springs								
TB PTFE bushing for output shaft and piston/rod								
TBO PTFE bushing for output shaft								
U U.H.M.W.P.E. Bushings								
(Other options available - consult your sales representative)								

Also Available

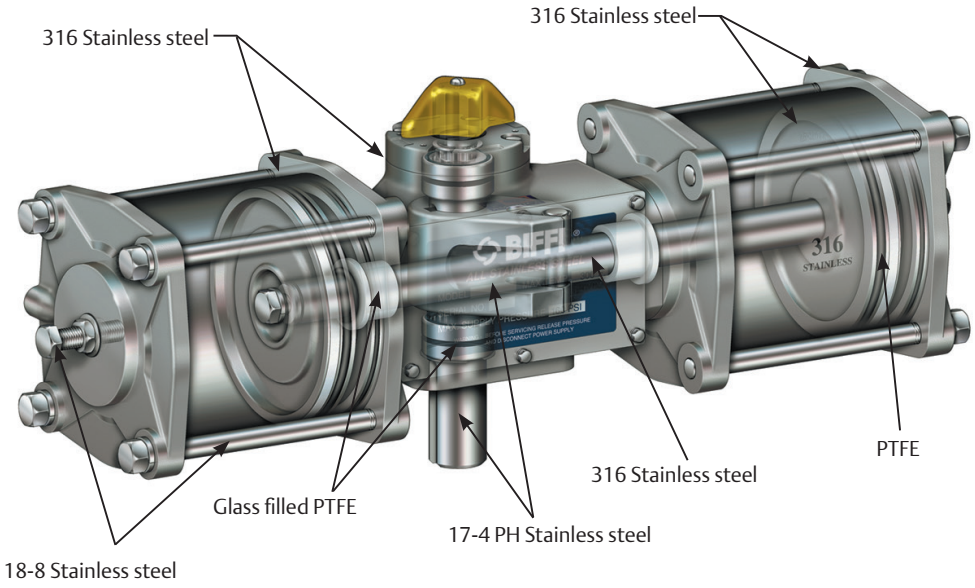
The S Series Actuator (All Stainless)

Setting an unrivaled standard in actuation at a price unexpectedly low for stainless steel.

- Up to 160 psig max operating pressure (see torque chart).
- Double-acting break torques to 240,000 lb-in.
- Spring end torques to 104,125 lb-in.

For additional information, refer to S Series data sheet.

Figure 24.



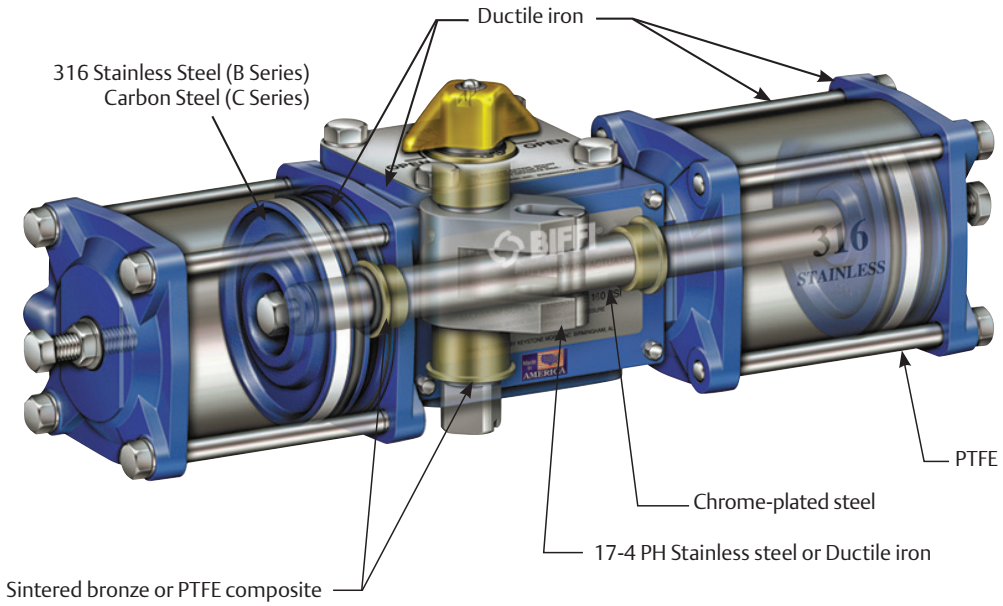
The B and C Series Actuators

Setting a new standard in actuation at a price you would expect from a commodity product.

- Up to 160 psig max operating pressure (see torque chart).
- Double-acting break torques to 1,400,000 lb-in.
- Spring end torques to 583,288 lb-in.

For additional information, refer to B and C Series data sheet.

Figure 25.



Biffi Italia s.r.l.
Strada Biffi 165
29017 Fiorenzuola d'Arda (PC)
Italy
T +39 0523 944 411

For complete list of sales and manufacturing sites, please visit
www.biffi.it or contact us at biffi_italia@biffi.it

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