



High Pressure Equipment
A **GRACO** Company

Valves, Fittings & Tubing for Hydrogen Applications

H₂



A World Leader in High Pressure Solutions for Hydrogen Applications

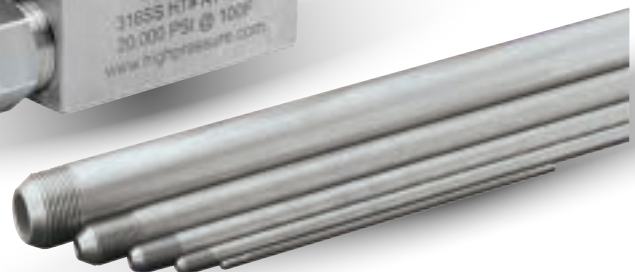
HiP has been in the forefront of providing high pressure valves, fittings and tubing to support our customers as they incorporate hydrogen in their zero-carbon energy strategies. The ongoing build-out of the hydrogen refueling infrastructure necessary to support the fuel cell powered trucks, buses, cars, forklifts and other equipment depends on products designed and built to meet the unique challenges of hydrogen. HiP is a worldwide leader in delivering safe and reliable products to handle the high pressures and extreme temperatures associated with handling hydrogen.

A Complete Line of Standard Hydrogen Products

Over the last 15 years, HiP has produced tens of thousands of valves and fittings for hydrogen applications. As demand has continued to increase, we have committed the resources to develop a complete line of standard products for use with hydrogen, all either in stock or available with short lead-times. We have engineered our high pressure valve stems, packing and associated soft goods to meet the unique requirements of hydrogen. The standard material for all HiP valve bodies and fittings is 316 stainless steel, which is hydrogen compatible. In addition, we offer a range of special materials such as hastelloy and monel.

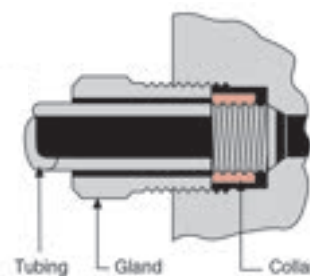
HiP Standard Hydrogen Products

- High pressure valves up to 60,000 psi
- Trunion style severe duty ball valves
- Metal and soft seat relief valves
- Block and bleed needle and ball valves
- Air operated valves for remote operation
- Fittings, tubing and accessories



High Pressure Coned & Threaded Connections

HiP hydrogen products use a high pressure coned and threaded connection which accommodates the high temperatures, high pressures and extreme conditions common in these applications.

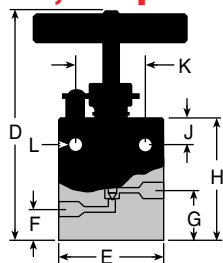


Medium Pressure Valves

High Pressure Equipment

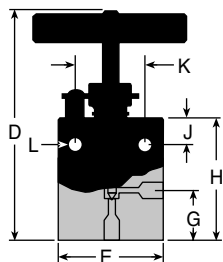


20,000 psi Service - Two Way Straight Valves



| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|----------------------|--------|-------|---------|------|----------|--------|------|----------|--------|--------|--------|--------|-----------|
| 1/4" O.D. | 20-11LF4-HYD | 20,000 | LF4 | 1/8" | 0.17 | 4-3/8" | 2" | 3/8" | 13/16" | 2" | 3/8" | 1-1/4" | 7/32" | 3/4" |
| 3/8" O.D. | 20-11LF6-HYD | 20,000 | LF6 | 13/64" | 0.45 | 4-3/8" | 2" | 3/8" | 13/16" | 2" | 3/8" | 1-1/4" | 7/32" | 3/4" |
| 9/16" O.D. | 20-11LF9-HYD | 20,000 | LF9 | 5/16" | 1.12 | 6-1/8" | 2-1/2" | 1/2" | 1-1/8" | 2-7/8" | 1/2" | 1-3/8" | 11/32" | 1" |
| 3/4" O.D. | 20-11LF12-HYD | 20,000 | LF12 | 7/16" | 2.29 | 7" | 3" | 3/4" | 1-1/2" | 3-3/4" | 5/8" | 1-3/4" | 7/16" | 1-3/8" |
| 1" O.D. | 20-11LF16-HYD | 20,000 | LF16 | 9/16" | 3.86 | 8-27/64" | 4-1/8" | 7/8" | 1-13/16" | 4-5/8" | 1-1/8" | 2-1/2" | 9/16" | 1-3/4" |
| 3/4" O.D. | 10-11LF12-HYD | 10,000 | LF12 | 33/64" | 3.65 | 7" | 3" | 3/4" | 11/2" | 3-3/4" | 5/8" | 1-3/4" | 7/16" | 1-3/8" |

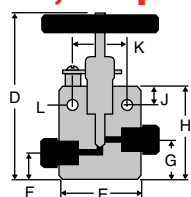
Two Way Angle Valves



| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|----------------------|--------|-------|---------|-------|----------|--------|---|---------|---------|--------|--------|--------|-----------|
| 1/4" O.D. | 20-12LF4-HYD | 20,000 | LF4 | 1/8" | 0.255 | 4-13/16" | 2" | — | 1-1/4" | 2-7/16" | 3/8" | 1-1/4" | 7/32" | 3/4" |
| 3/8" O.D. | 20-12LF6-HYD | 20,000 | LF6 | 13/64" | 0.675 | 4-13/16" | 2" | — | 1-1/4" | 2-7/16" | 3/8" | 1-1/4" | 7/32" | 3/4" |
| 9/16" O.D. | 20-12LF9-HYD | 20,000 | LF9 | 5/16" | 1.68 | 6-5/8" | 2-1/2" | — | 1-5/8" | 3-3/8" | 1/2" | 1-3/8" | 11/32" | 1" |
| 3/4" O.D. | 20-12LF12-HYD | 20,000 | LF12 | 7/16" | 3.435 | 7-1/2" | 3" | — | 2" | 4-1/4" | 5/8" | 1-3/4" | 7/16" | 1-3/8" |
| 1" O.D. | 20-12LF16-HYD | 20,000 | LF16 | 9/16" | 5.79 | 9-3/8" | 4-1/8" | — | 2-9/16" | 5-7/16" | 1-1/8" | 2-1/2" | 9/16" | 1-3/4" |
| 3/4" O.D. | 10-12LF12-HYD | 10,000 | LF12 | 33/64" | 5.475 | 7-1/2" | 3" | — | 2" | 4-1/4" | 5/8" | 1-3/4" | 7/16" | 1-3/8" |

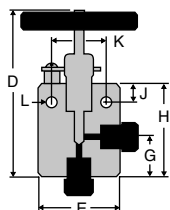
High Pressure Valves

30,000 psi Service - Two Way Straight Valves



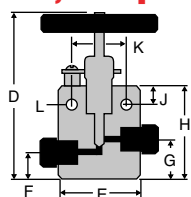
| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|---------------------|--------|-------|---------|------|---------|--------|--------|---------|----------|-------|--------|-------|-----------|
| 1/8" O.D. | 30-11HF2-HYD | 30,000 | HF2 | 1/16" | 0.04 | 3-1/4" | 1-1/2" | 11/16" | 15/16" | 1-13/16" | 5/16" | 7/8" | 9/64" | 3/4" |
| 1/4" O.D. | 30-11HF4-HYD | 30,000 | HF4 | 3/32" | 0.09 | 5-3/16" | 2" | 5/8" | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 3/8" O.D. | 30-11HF6-HYD | 30,000 | HF6 | 1/8" | 0.15 | 5-3/16" | 2" | 5/8" | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 9/16" O.D. | 30-11HF9-HYD | 30,000 | HF9 | 1/8" | 0.15 | 5-5/8" | 2-5/8" | 1" | 1-7/16" | 2-7/8" | 1/2" | 1-3/8" | 7/32" | 1-1/2" |

Two Way Angle Valves



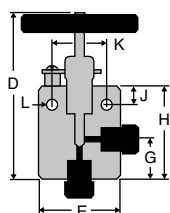
| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|---------------------|--------|-------|---------|-------|---------|-------|---|---------|----------|-------|--------|-------|-----------|
| 1/8" O.D. | 30-12HF2-HYD | 30,000 | HF2 | 1/16" | 0.06 | 3-1/4" | 11/2" | — | 15/16" | 1-13/16" | 5/16" | 7/8" | 9/64" | 3/4" |
| 1/4" O.D. | 30-12HF4-HYD | 30,000 | HF4 | 3/32" | 0.135 | 5-3/16" | 2" | — | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 3/8" O.D. | 30-12HF6-HYD | 30,000 | HF6 | 1/8" | 0.225 | 5-9/16" | 2" | — | 1-3/8" | 2-13/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 9/16" O.D. | 30-12HF9-HYD | 30,000 | HF9 | 1/8" | 0.225 | 5-5/8" | 25/8" | — | 1-7/16" | 2-7/8" | 1/2" | 1-3/8" | 7/32" | 1-1/2" |

60,000 psi Service - Two Way Straight Valves



| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|---------------------|--------|-------|---------|------|---------|--------|------|---------|---------|------|--------|-------|-----------|
| 1/8" O.D. | 60-11HF2-HYD | 60,000 | HF2 | 1/16" | 0.04 | 5-3/16" | 2" | 5/8" | 15/16" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 1/4" O.D. | 60-11HF4-HYD | 60,000 | HF4 | 1/16" | 0.04 | 5-3/16" | 2" | 5/8" | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 3/8" O.D. | 60-11HF6-HYD | 60,000 | HF6 | 1/16" | 0.04 | 5-3/16" | 2" | 5/8" | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 9/16" O.D. | 60-11HF9-HYD | 60,000 | HF9 | 1/16" | 0.04 | 5-5/8" | 2-5/8" | 1" | 1-7/16" | 2-7/8" | 1/2" | 1-3/8" | 7/32" | 1-1/2" |

Two Way Angle Valves



| Tubing | Catalog No. | psi | Conn. | Orifice | Cv | D | E | F | G | H | J | K | L | Thickness |
|------------|---------------------|--------|-------|---------|------|---------|--------|---|---------|----------|------|--------|-------|-----------|
| 1/8" O.D. | 60-12HF2-HYD | 60,000 | HF2 | 1/16" | 0.06 | 5-3/16" | 2" | — | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 1/4" O.D. | 60-12HF4-HYD | 60,000 | HF4 | 1/16" | 0.06 | 5-3/16" | 2" | — | 1" | 2-7/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 3/8" O.D. | 60-12HF6-HYD | 60,000 | HF6 | 1/16" | 0.06 | 5-9/16" | 2" | — | 1-3/8" | 2-13/16" | 1/2" | 1-3/8" | 7/32" | 1" |
| 9/16" O.D. | 60-12HF9-HYD | 60,000 | HF9 | 1/16" | 0.06 | 5-5/8" | 2-5/8" | — | 1-7/16" | 2-7/8" | 1/2" | 1-3/8" | 7/32" | 1-1/2" |

Air Operated Valves

Hipco Diaphragm Air Operators For Remote Operation

To 60,000 psi



Normally Open (Spring To Open/Air To Close)

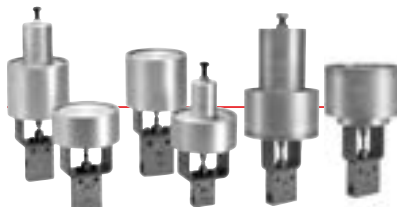
| Valve Series | Maximum Operating Pressure | Approximate Air Pressure to Seat Valve |
|------------------------------------|----------------------------|--|
| 20-11LF4-NO-HYD 20-12LF4-NO-HYD | 20,000 psi | 60 psi |
| 20-11LF6-NO-HYD 20-12LF6-NO-HYD | 20,000 psi | 85 psi |
| 20-11LF9-NO-HYD 20-12LF9-NO-HYD | 10,000 psi | 100 psi |
| 30-11HF4-NO-HYD 30-12HF4-NO-HYD | 30,000 psi | 60 psi |
| 30-11HF6-NO-HYD 30-12HF6-NO-HYD | 30,000 psi | 85 psi |
| 30-11HF9-NO-HYD 30-12HF9-NO-HYD | 30,000 psi | 85 psi |
| 40-11HF9-NO-HYD 40-12HF9-NO-HYD | 30,000 psi | 85 psi |
| 60-11HF4-NO-HYD 60-12HF4-NO-HYD | 60,000 psi | 70 psi |
| 60-11HF6-NO-HYD 60-12HF6-NO-HYD | 60,000 psi | 70 psi |
| 60-11HF9-NO-HYD 60-12HF9-NO-HYD | 60,000 psi | 70 psi |

Normally Closed (Air To Open/Spring To Close)

| Valve Series | Maximum Operating Pressure | Min. Adjusting Screw Torque | Approx. Air Pressure to Unseat Valve | Approx. Air Pressure to Fully Open Valve |
|------------------------------------|----------------------------|-----------------------------|--------------------------------------|--|
| 20-11LF4-NC-HYD 20-12LF4-NC-HYD | 20,000 psi | 40 in. lb. | 55 psi | 90 psi |
| 20-11LF6-NC-HYD 20-12LF6-NC-HYD | 15,000 psi | 60 in. lb. | 80 psi | 100 psi |
| 20-11LF9-NC-HYD 20-12LF9-NC-HYD | 10,000 psi | 75 in. lb. | 95 psi | 100 psi |
| 30-11HF4-NC-HYD 30-12HF4-NC-HYD | 30,000 psi | 40 in. lb. | 55 psi | 75 psi |
| 30-11HF6-NC-HYD 30-12HF6-NC-HYD | 30,000 psi | 60 in. lb. | 80 psi | 100 psi |
| 30-11HF9-NC-HYD 30-12HF9-NC-HYD | 30,000 psi | 60 in. lb. | 80 psi | 100 psi |
| 40-11HF9-NC-HYD 40-12HF9-NC-HYD | 30,000 psi | 60 in. lb. | 80 psi | 100 psi |
| 60-11HF4-NC-HYD 60-12HF4-NC-HYD | 60,000 psi | 50 in. lb. | 65 psi | 85 psi |
| 60-11HF6-NC-HYD 60-12HF6-NC-HYD | 60,000 psi | 50 in. lb. | 65 psi | 85 psi |
| 60-11HF9-NC-HYD 60-12HF9-NC-HYD | 60,000 psi | 50 in. lb. | 65 psi | 85 psi |

Hippo Piston Air Operators For Remote Operation

To 60,000 psi



Normally Open (Spring To Open/Air To Close)

Medium Duty

| Valve Series | Maximum Operating Pressure | Orifice Size | Approx. Air Pressure to Seat Valve |
|--|----------------------------|--------------|------------------------------------|
| 20-11LF4-MPO-NO-HYD 20-12LF4-MPO-NO-HYD | 20,000 psi | 1/8" | 95 psi |
| 20-11LF6-MPO-NO-HYD 20-12LF6-MPO-NO-HYD | 20,000 psi | 13/64" | 100 psi |
| 20-11LF9-MPO-NO-HYD 20-12LF9-MPO-NO-HYD | 10,000 psi | 5/16" | 100 psi |
| 30-11HF4-MPO-NO-HYD 30-12HF4-MPO-NO-HYD | 30,000 psi | 3/32" | 60 psi |
| 30-11HF6-MPO-NO-HYD 30-12HF6-MPO-NO-HYD | 30,000 psi | 1/8" | 60 psi |
| 30-11HF9-MPO-NO-HYD 30-12HF9-MPO-NO-HYD | 30,000 psi | 1/8" | 60 psi |
| 40-11HF9-MPO-NO-HYD 40-12HF9-MPO-NO-HYD | 30,000 psi | 1/8" | 60 psi |
| 60-11HF4-MPO-NO-HYD 60-12HF4-MPO-NO-HYD | 60,000 psi | 1/16" | 55 psi |
| 60-11HF6-MPO-NO-HYD 60-12HF6-MPO-NO-HYD | 60,000 psi | 1/16" | 55 psi |
| 60-11HF9-MPO-NO-HYD 60-12HF9-MPO-NO-HYD | 60,000 psi | 1/16" | 55 psi |

Normally Closed (Air To Open/Spring To Close)

Medium Duty

| Valve Series | Maximum Operating Pressure | Orifice Size | Minimum Adjusting Screw Torque | Approx. Air Pressure to Unseat Valve | Approx. Air Pressure to Fully Open Valve |
|--|----------------------------|--------------|--------------------------------|--------------------------------------|--|
| 20-11LF4-MPO-NC-HYD 20-12LF4-MPO-NC-HYD | 20,000 psi | 1/8" | 50 in.lb. | 70 psi | 95 psi |
| 20-11LF6-MPO-NC-HYD 20-12LF6-MPO-NC-HYD | 20,000 psi | 13/64" | 55 in.lb. | 70 psi | 95 psi |
| 20-11LF9-MPO-NC-HYD 20-12LF9-MPO-NC-HYD | 10,000 psi | 5/16" | 55 in.lb. | 70 psi | 95 psi |
| 30-11HF4-MPO-NC-HYD 30-12HF4-MPO-NC-HYD | 30,000 psi | 3/32" | 50 in.lb. | 60 psi | 75 psi |
| 30-11HF6-MPO-NC-HYD 30-12HF6-MPO-NC-HYD | 30,000 psi | 1/8" | 55 in.lb. | 60 psi | 75 psi |
| 30-11HF9-MPO-NC-HYD 30-12HF9-MPO-NC-HYD | 30,000 psi | 1/8" | 55 in.lb. | 60 psi | 75 psi |
| 40-11HF9-MPO-NC-HYD 40-12HF9-MPO-NC-HYD | 30,000 psi | 1/8" | 55 in.lb. | 60 psi | 75 psi |
| 60-11HF4-MPO-NC-HYD 60-12HF4-MPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 50 psi | 65 psi |
| 60-11HF6-MPO-NC-HYD 60-12HF6-MPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 50 psi | 65 psi |
| 60-11HF9-MPO-NC-HYD 60-12HF9-MPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 50 psi | 65 psi |

Normally Open (Spring To Open/Air To Close)

Heavy Duty

| | | | |
|--|------------|--------|--------|
| 20-11LF4-HPO-NO-HYD 20-12LF4-HPO-NO-HYD | 20,000 psi | 1/8" | 55 psi |
| 20-11LF6-HPO-NO-HYD 20-12LF6-HPO-NO-HYD | 20,000 psi | 13/64" | 55 psi |
| 20-11LF9-HPO-NO-HYD 20-12LF9-HPO-NO-HYD | 20,000 psi | 5/16" | 95 psi |
| 30-11HF4-HPO-NO-HYD 30-12HF4-HPO-NO-HYD | 30,000 psi | 3/32" | 35 psi |
| 30-11HF6-HPO-NO-HYD 30-12HF6-HPO-NO-HYD | 30,000 psi | 1/8" | 35 psi |
| 30-11HF9-HPO-NO-HYD 30-12HF9-HPO-NO-HYD | 30,000 psi | 1/8" | 35 psi |
| 40-11HF9-HPO-NO-HYD 40-12HF9-HPO-NO-HYD | 40,000 psi | 1/8" | 35 psi |
| 60-11HF4-HPO-NO-HYD 60-12HF4-HPO-NO-HYD | 60,000 psi | 1/16" | 30 psi |
| 60-11HF6-HPO-NO-HYD 60-12HF6-HPO-NO-HYD | 60,000 psi | 1/16" | 30 psi |
| 60-11HF9-HPO-NO-HYD 60-12HF9-HPO-NO-HYD | 60,000 psi | 1/16" | 30 psi |

Extra Heavy Duty

| | | | |
|--|------------|-------|--------|
| 20-11LF12-EHPO-NO-HYD 20-12LF12-EHPO-NO-HYD | 20,000 psi | 7/16" | 55 psi |
| 20-11LF16-EHPO-NO-HYD 20-12LF16-EHPO-NO-HYD | 20,000 psi | 9/16" | 55 psi |
| 30-11HF16-EHPO-NO-HYD 30-12HF16-EHPO-NO-HYD | 30,000 psi | 7/16" | 50 psi |

Normally Closed (Air To Open/Spring To Close)

Heavy Duty

| | | | | | |
|--|------------|--------|-----------|--------|--------|
| 20-11LF4-HPO-NC-HYD 20-12LF4-HPO-NC-HYD | 20,000 psi | 1/8" | 55 in.lb. | 35 psi | 50 psi |
| 20-11LF6-HPO-NC-HYD 20-12LF6-HPO-NC-HYD | 20,000 psi | 13/64" | 60 in.lb. | 35 psi | 50 psi |
| 20-11LF9-HPO-NC-HYD 20-12LF9-HPO-NC-HYD | 16,000 psi | 5/16" | 85 in.lb. | 60 psi | 75 psi |
| 30-11HF4-HPO-NC-HYD 30-12HF4-HPO-NC-HYD | 30,000 psi | 3/32" | 50 in.lb. | 30 psi | 40 psi |
| 30-11HF6-HPO-NC-HYD 30-12HF6-HPO-NC-HYD | 30,000 psi | 1/8" | 55 in.lb. | 30 psi | 40 psi |
| 30-11HF9-HPO-NC-HYD 30-12HF9-HPO-NC-HYD | 30,000 psi | 1/8" | 55 in.lb. | 30 psi | 40 psi |
| 40-11HF9-HPO-NC-HYD 40-12HF9-HPO-NC-HYD | 40,000 psi | 1/8" | 55 in.lb. | 30 psi | 40 psi |
| 60-11HF4-HPO-NC-HYD 60-12HF4-HPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 25 psi | 35 psi |
| 60-11HF6-HPO-NC-HYD 60-12HF6-HPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 25 psi | 35 psi |
| 60-11HF9-HPO-NC-HYD 60-12HF9-HPO-NC-HYD | 60,000 psi | 1/16" | 50 in.lb. | 25 psi | 35 psi |

Extra Heavy Duty

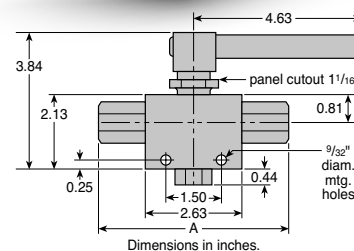
| | | | | | |
|--|------------|-------|-----------|--------|--------|
| 20-11LF12-EHPO-NC-HYD 20-12LF12-EHPO-NC-HYD | 20,000 psi | 7/16" | 60 ft.lb. | 35 psi | 60 psi |
| 20-11LF16-EHPO-NC-HYD 20-12LF16-EHPO-NC-HYD | 20,000 psi | 9/16" | 95 ft.lb. | 55 psi | 95 psi |
| 30-11HF16-EHPO-NC-HYD 30-12HF16-EHPO-NC-HYD | 30,000 psi | 7/16" | 90 ft.lb. | 50 psi | 85 psi |

Trunion Style Ball Valves

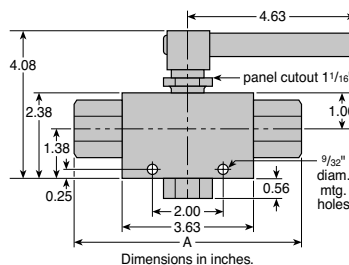
10,000, 15,000 and 20,000 psi Service

Two-Way Trunion Ball Valves - 90°

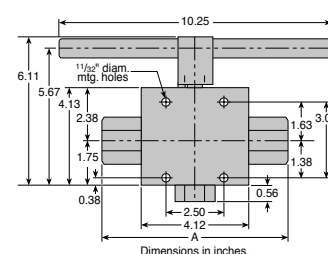
| Orifice | Tube Size | Connection | Pressure Rating | Minimum Orifice | Cv | A | Catalog No. |
|---------|-----------|------------|-----------------|-----------------|------|------|---------------|
| .187 | 1/4" | LF4 | 20,000 psi | .109 | 0.31 | 4.63 | 20-71LF4-HYD |
| | 3/8" | LF6 | 20,000 psi | .187 | 1.45 | 4.63 | 20-71LF6-HYD |
| | 9/16" | LF9 | 20,000 psi | .187 | 1.45 | 5.13 | 20-71LF9-HYD |
| | 1/4" | NPT | 15,000 psi | .187 | 1.45 | 4.63 | 15-71NFB-HYD |
| | 1/4" | HF4 | 20,000 psi | .094 | 0.20 | 4.63 | 20-71HF4-HYD |
| | 3/8" | HF6 | 20,000 psi | .125 | 0.45 | 4.63 | 20-71HF6-HYD |
| | 9/16" | HF9 | 20,000 psi | .187 | 1.45 | 4.87 | 20-71HF9-HYD |
| .375 | 3/8" | LF6 | 15,000 psi | .203 | 2.1 | 5.81 | 15-74LF6-HYD |
| | 9/16" | LF9 | 15,000 psi | .312 | 4.22 | 6.25 | 15-74LF9-HYD |
| | 3/4" | LF12 | 15,000 psi | .375 | 6.08 | 6.67 | 15-74LF12-HYD |
| | 1/4" | NPT | 15,000 psi | .250 | 2.70 | 5.63 | 15-74NFB-HYD |
| | 3/8" | NPT | 15,000 psi | .375 | 6.08 | 5.63 | 15-74NFC-HYD |
| | 1/2" | NPT | 15,000 psi | .375 | 6.08 | 5.63 | 15-74NFD-HYD |
| .500 | 3/4" | LF12 | 10,000 psi | .500 | 10.2 | 6.56 | 10-80LF12-HYD |



.187 Orifice



.375 Orifice



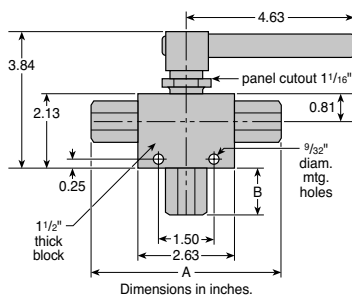
.500 Orifice

Trunion Style Ball Valves

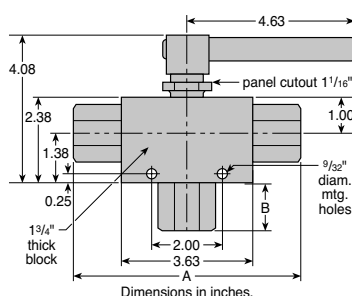
10,000, 15,000 and 20,000 psi Service

Three-Way Trunion Ball Valves

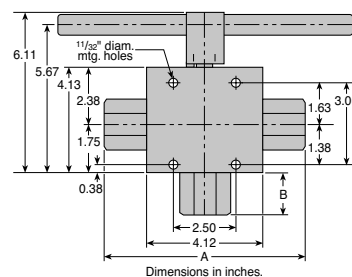
| Orifice | Tube Size | Connection | Pressure Rating | Minimum Orifice | Cv | A | B | 3-Way 90° Catalog No. | 3-Way 180° Catalog No. |
|---------|-----------|------------|-----------------|-----------------|------|------|------|-----------------------|------------------------|
| .187 | 1/4" | LF4 | 20,000 psi | .109 | 0.15 | 4.63 | 1.00 | 20-73LF4-HYD | 20-72LF4-HYD |
| | 3/8" | LF6 | 20,000 psi | .187 | 0.71 | 4.63 | 1.00 | 20-73LF6-HYD | 20-72LF6-HYD |
| | 9/16" | LF9 | 20,000 psi | .187 | 0.71 | 5.13 | 1.25 | 20-73LF9-HYD | 20-72LF9-HYD |
| | 1/4" | HF4 | 20,000 psi | .094 | 0.10 | 4.63 | 0.81 | 20-73HF4-HYD | 20-72HF4-HYD |
| | 3/8" | HF6 | 20,000 psi | .125 | 0.22 | 4.63 | 0.94 | 20-73HF6-HYD | 20-72HF6-HYD |
| | 9/16" | HF9 | 20,000 psi | .187 | 0.71 | 4.87 | 1.19 | 20-73HF9-HYD | 20-72HF9-HYD |
| .375 | 3/8" | LF6 | 15,000 psi | .203 | 1.6 | 5.81 | 1.06 | 15-76LF6-HYD | 15-75LF6-HYD |
| | 9/16" | LF9 | 15,000 psi | .312 | 1.67 | 6.25 | 1.06 | 15-76LF9-HYD | 15-75LF9-HYD |
| | 3/4" | LF12 | 15,000 psi | .375 | 2.40 | 6.67 | 1.18 | 15-76LF12-HYD | 15-75LF12-HYD |
| .500 | 3/4" | LF12 | 10,000 psi | .500 | 7.43 | 6.56 | 1.30 | 10-82LF12-HYD | 10-81LF12-HYD |



.187 Orifice



.375 Orifice



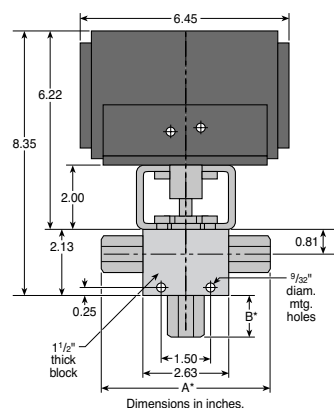
.500 Orifice

Ball Valve Actuators

High Pressure Equipment Company offers air operated actuators to accommodate remote operation.

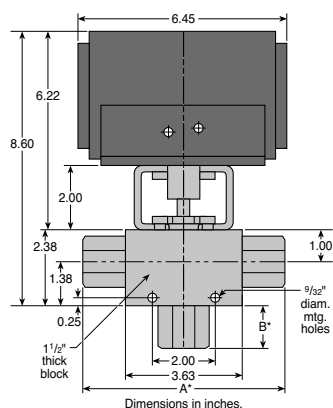
NOTE: These air operators are only for use with two-way and three-way diverter style valves.

To order: simply specify the appropriate ball valve catalog number and add the suffix “-TSR8-HYD” for air to open/spring to close, or “-TDA8-HYD” for air to open and close (double acting) or TSR20-HYD” for 0.500 orifice. For trunion only.



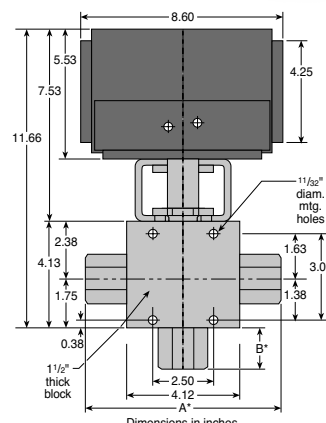
* Dimensions found within charts on pages 6.3-6.4

.187 Orifice



* Dimensions found within charts on pages 6.3-6.4

.375 Orifice

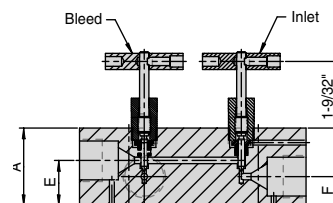
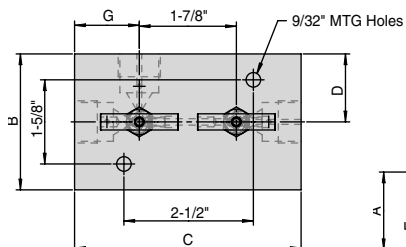


* Dimensions found within charts on pages 6.3-6.4

.500 Orifice

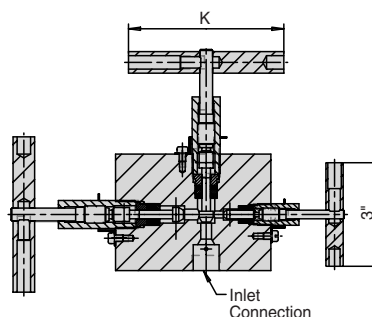
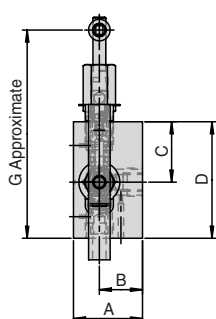
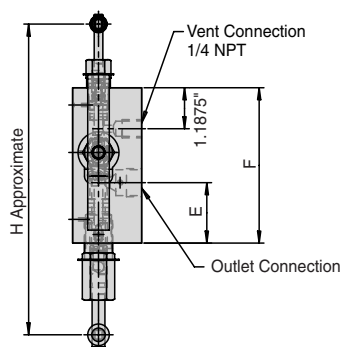
Block & Bleed Needle Valves

| Catalog No. | Connector | A | B | C | D | E | F | G |
|----------------|-----------|--------|--------|--------|---------|--------|--------|--------|
| 15-SBB-NFB-HYD | 1/4" NPT | 1-1/2" | 2-5/8" | 3-7/8" | 1-5/16" | 7/8" | 9/16" | 1" |
| 15-SBB-NFC-HYD | 3/8" NPT | 1-3/4" | 3" | 4-3/8" | 1-1/2" | 1-1/8" | 13/16" | 1-1/4" |
| 15-SBB-NFD-HYD | 1/2" NPT | 1-3/4" | 3" | 4-3/8" | 1-1/2" | 1-1/8" | 13/16" | 1-1/4" |
| 20-SBB-LF4-HYD | LF4 | 1-1/2" | 2-5/8" | 3-1/2" | 1-5/16" | 7/8" | 9/16" | 13/16" |
| 20-SBB-LF6-HYD | LF6 | 1-1/2" | 2-5/8" | 3-3/4" | 1-5/16" | 7/8" | 9/16" | 15/16" |
| 20-SBB-LF9-HYD | LF9 | 1-1/2" | 2-5/8" | 4-3/8" | 1-5/16" | 7/8" | 9/16" | 1-1/4" |



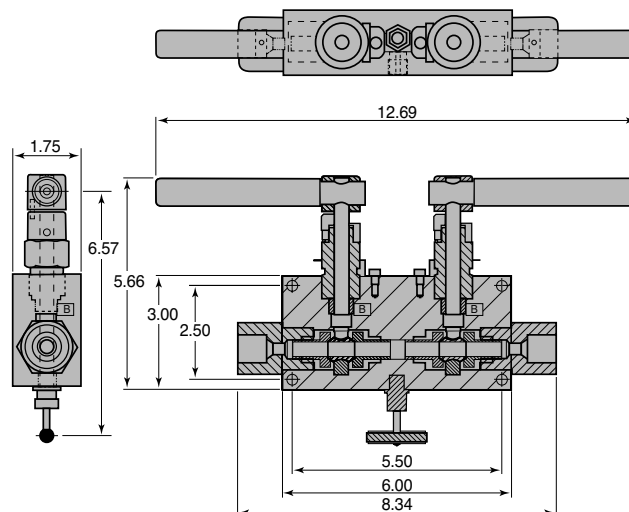
Double Block & Bleed Needle Valves

| Catalog No. | Inlet Connector | Outlet Connector | A | B | C | D | E | F | G | H | K |
|-----------------|-----------------|------------------|--------|--------|----------|--------|----------|--------|---------|---------|---------|
| 20-DBB-LF4-HYD | LF4 | LF4 | 2" | 1-1/4" | 1-3/16" | 2-3/4" | 1-3/16" | 3-1/2" | 4-5/8" | 7-3/16" | 3" |
| 20-DBB-LF6-HYD | LF6 | LF6 | 2" | 1-1/4" | 1-3/16" | 2-3/4" | 1-3/16" | 3-1/2" | 4-5/8" | 7-3/16" | 3" |
| 20-DBB-LF9-HYD | LF9 | LF9 | 2" | 1-1/4" | 1-3/4" | 3-3/8" | 1-3/4" | 4-1/2" | 6-1/16" | 9" | 4-1/2" |
| 20-DBB-LF12-HYD | LF12 | LF12 | 2-1/2" | 1-3/4" | 2-1/4" | 4-1/4" | 2-1/4" | 5" | 6-7/8" | 9-1/2" | 8-3/4" |
| 20-DBB-LF16-HYD | LF16 | LF16 | 3-1/2" | 2-1/2" | 2-13/16" | 5-1/4" | 2-13/16" | 6" | 8-7/16" | 11" | 10-1/4" |



Double Block & Bleed Ball Valves

| Catalog No. | Tube Size | Connector | Pressure Rating | Minimum Orifice | Cv |
|--------------------|-----------|-----------|-----------------|-----------------|------|
| 15-DBB-BV-NFB-HYD | 1/4" NPT | NFB | 15,000 | .250 | 2.70 |
| 15-DBB-BV-NFC-HYD | 3/8" NPT | NFC | 15,000 | .375 | 6.08 |
| 15-DBB-BV-NFD-HYD | 1/2" NPT | NFD | 15,000 | .375 | 6.08 |
| 15-DBB-BV-LF6-HYD | 3/8" | LF6 | 15,000 | .203 | 2.01 |
| 15-DBB-BV-LF9-HYD | 9/16" | LF9 | 15,000 | .313 | 4.22 |
| 15-DBB-BV-LF12-HYD | 3/4" | LF12 | 15,000 | .375 | 6.08 |



Fittings, Tubing & Accessories

To help you safely plumb your hydrogen system, HiP offers a complete range of fittings and accessories made from high tensile 316 stainless steel. Fittings include elbows, tees, and crosses for all tubing connection sizes, as well as union couplings, bulkhead couplings and tubing end caps. We also offer a family of adapters and couplings to help facilitate changes in tubing sizes.

HiP's standard tubing family is cold drawn 316 stainless steel, seamless, and is supplied in the 1/8" hard condition (not annealed). Tensile strength is approximately 40 percent higher than that of annealed tubing. Coned and threaded nipples are available to help connect your system.



Relief Valves

Metal Seat Relief Valves (Factory Set)

| Pressure Range | Orifice Size | Type of Service* | Assembly Part No. | Max Flow Capacity H2O (GPM) |
|----------------------|--------------|------------------|-------------------|-----------------------------|
| 1,500 to 2,999 psi | 1/4" | GAS OR LIQUID | 402633-03-HYD | 13 |
| 3,000 to 10,999 psi | 1/4" | GAS OR LIQUID | 402633-10-HYD | 25 |
| 11,000 to 20,999 psi | 3/16" | GAS OR LIQUID | 402633-20-HYD | 20 |
| 21,000 to 30,000 psi | 1/8" | GAS OR LIQUID | 402633-30-HYD | 10 |
| 30,001 to 45,000 psi | 7/64" | GAS OR LIQUID | 402633-45-HYD | 10 |
| 45,001 to 60,000 psi | 3/32" | GAS OR LIQUID | 402633-60-HYD | 8 |

*Valves not bubble tight on gas service.

Soft Seat Relief Valves (Factory Set)

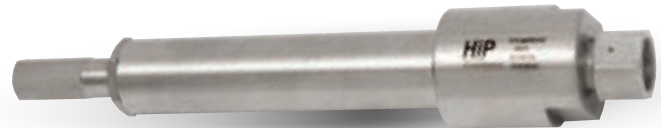
| Pressure Range | Orifice Size | Type of Service | Assembly Part No. | Max Flow Capacity H2O (GPM) |
|----------------------|--------------|-----------------|-------------------|-----------------------------|
| 1,500 to 2,999 psi | 3/16" | GAS OR LIQUID | 602923-03-HYD | 8 |
| 3,000 to 9,999 psi | 3/16" | GAS OR LIQUID | 602923-10-HYD | 14 |
| 10,000 to 19,999 psi | 1/8" | GAS OR LIQUID | 602923-20-HYD | 8 |
| 20,000 to 25,000 psi | 1/8" | GAS OR LIQUID | 602923-25-HYD | 10 |

Relief Valves (Field Adjustable)

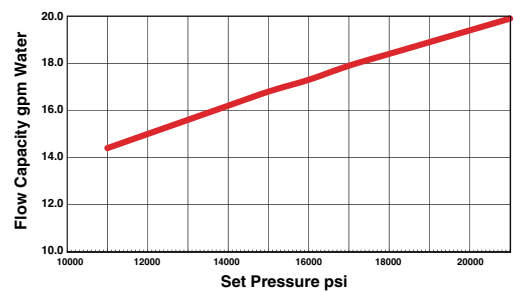
| Pressure Range | Orifice Size | Type of Service | Part Number | Cv |
|---------------------|--------------|-----------------|--------------|-----|
| 1,000 to 10,000 psi | 0.070 | GAS OR LIQUID | HIP-10RV-HYD | .12 |
| 10,001 - 20,000 psi | 0.070 | GAS OR LIQUID | HIP-20RV-HYD | .12 |

CE Marked Relief Valves

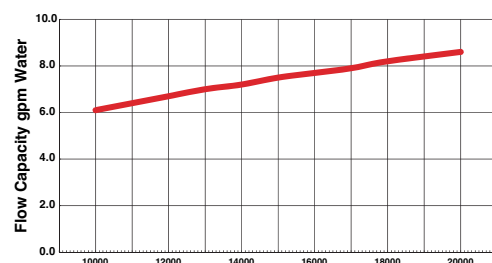
HiP relief valves are now available with CE marking. These products will proudly be marked with the CE symbol, signifying they comply with the stringent requirements of the Pressure Equipment Directive (PED). To order, add -CE to your relief valve part number.



402633-20 Relief Valve (Factory Set)



602923-20 Soft Seat Relief Valve (Factory Set)



High Pressure Equipment
A **GRACO** Company

2955 W. 17th Street
Erie, Pennsylvania 16505 U.S.A.
Phone: (814) 838-2028 • 1-800-289-7447
Fax: (814) 838-6075
E-Mail: hydrogensales@highpressure.com
www.HighPressure.com