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Machining and Welding from our 120,000 sq ft. facility.

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(405) 793-9101

These products are covered by the following U.S. patents:
D700,681, 10,689,937

The Company.....1-3

Spools, Blocks, and Adapters.....4

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Hoby Horn founded Horn Equipment Company, LLC (HEC) in 1979 which is located in Moore, Oklahoma. HEC specializes in manufacturing, custom manufacturing, remanufacturing and rental of pressure control equipment for drilling, work over, snubbing, production and fracturing operations in the oil and gas industry. Our equipment undergoes engineering, machining, welding, stress relieving, assembling and testing processes.

- ① We carry a large inventory available for immediate shipment in our warehouses.
- ② We stress relieve all equipment in our heat oven over a specified time and heat range.
- ③ All pressure control equipment undergoes rigorous testing to over 1.5 times the rated pressure to ensure safe and reliable operation in our test booths



①



②



③

HEC currently holds the following certificates of authority to use API Monogram:
 API Spec 6A –Adapters and Spacer Spools, Valves, Flanged Connectors, Tees and Crosses

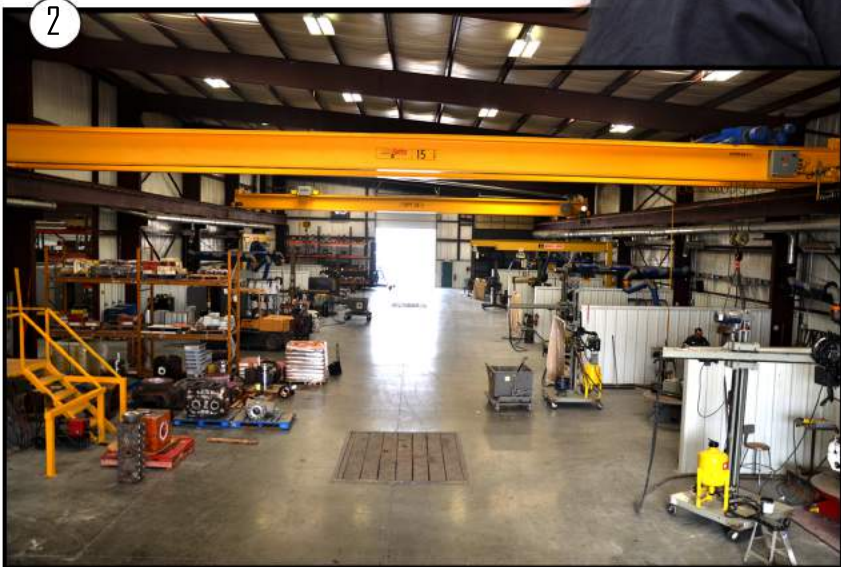
API Spec 16A – Ram BOP, Annular BOP, Drilling Spool, Adapter, Loose Connections



HEC has a top notch industrial welding facility dedicated to providing the best service available; qualified in SMAW (STICK), GMAW (MIG), FCAW (FLUX CORE), GTAW (TIG), AND SAW (SUBMERGED ARC) welding processes in 4130-75k. Inconel & Stainless Steel in-lay is available.

HEC offers these processes as completely computer-aided, semi-computer aided, or by hand from a certified welder.

Magnet-particle inspection comes standard; X-ray inspection available



- ① Turn-table aided SAW (Submerged Arc Welding) process on a remanufactured Spherical Blowout Preventer
- ② Welding facility
- ③ SMAW welding process on a remanufactured LWS door cavity
- ④ Computer aided SAW (Submerged Arc Welding) on ram bore cavity on a remanufactured Type-U style Blowout Preventer

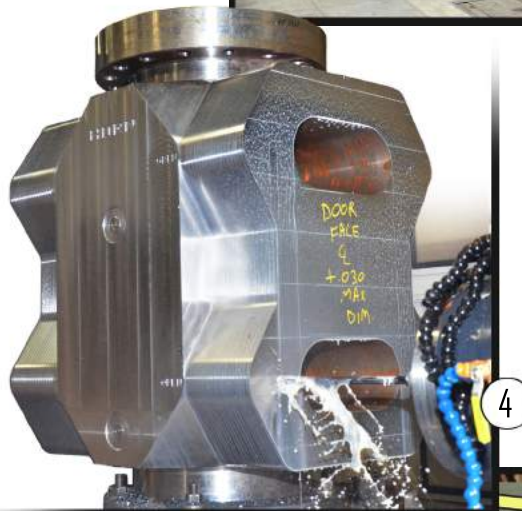


HEC offers a complete line of machining to fit the needs of our customers. Our CNC shop is equipped with horizontal and vertical mills, a vertical turret lathe, and a horizontal lathe. Our manual shop is equipped with multiple horizontal and vertical lathes and drill presses. We have the ability to manufacture or repair all types of oil field equipment.

All parts are thoroughly inspected after machining to ensure quality control. Our inspection process uses many different types of regularly calibrated measuring equipment including The FARO Arm (Coordinate Measuring Machine).



- ① Vertical Turret Lathes and Horizontal Lathes
- ② CNC Horizontal Mills
- ③ CNC Vertical Turret Lathe
- ④ Machining of Ram Change Ports on Our Own HDU Blowout Preventer
- ⑤ Horizontal Band Saw



HEC has the ability to manufacture practically any type of equipment; virtually any size or shape can be made. Stainless steel ring grooves and seal areas are also available. There is always a wide variety of flanges, spools, tees, studded adapters, flanged adapters, check valves, frac valves and frac heads in stock or fabricated in house for custom applications.

Sand separators, complete snubbing loops, and complete choke manifolds are also available via customer specifications. Contact a Horn Equipment Representative about your custom equipment needs.



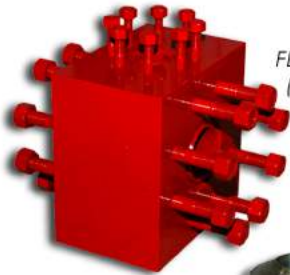
ADAPTERS
(FLANGED OR STUDED COMBINATIONS)



SPOOLS (ALL SIZES)



CHECK VALVES



TEES/BLOCKS
FLANGED OR STUDED
(ALL COMBINATIONS)

FLANGES
THREADED ADAPTERS



FRAC VALVES
(HYDRAULIC/MANUAL)



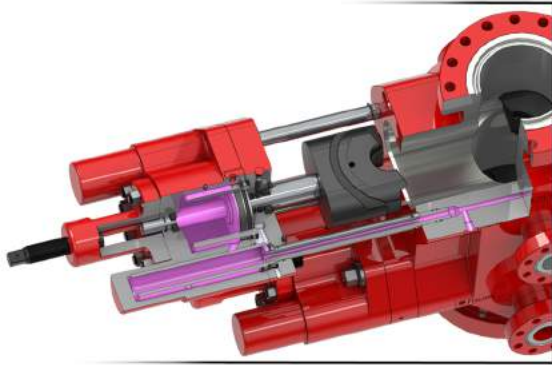
FRAC HEADS



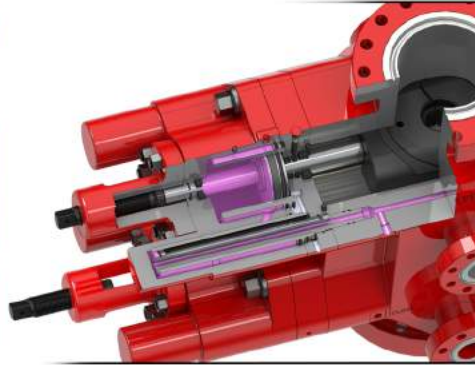
SAND SEPARATORS



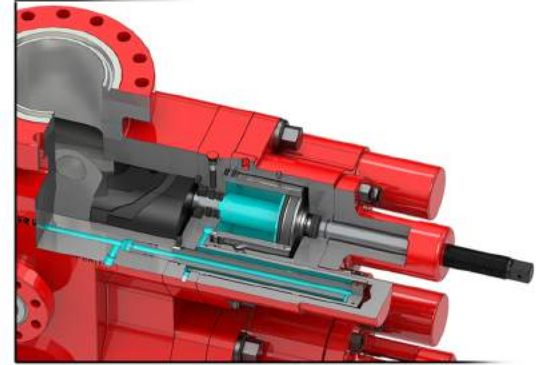
HORN RAM TYPE OPERATIONAL DATA




Bonnet Open, Ram in Closed Position



Bonnet Closed, Ram in Closed Position



Bonnet closed, Ram in Open Position

 Ram Closing and Bonnet Opening Operation

 Ram Opening and Bonnet Closing Operation

Operating Theory

The Horn Unit (HU) Ram Type BOP and well intervention equipment is operated hydraulically. The close diagram is shown in pink, is used to close the rams and seal off the well bore. The close hydraulics are also used to open the bonnets. With no well bore pressure or hydraulic pressure on the equipment, remove bonnet bolts from the body. With the bonnet bolts removed, applying hydraulic pressure to the close side will first close the rams, then once the rams are closed the hydraulic pressure will open the bonnets leaving them attached to the body by the ram change rods. Once the bonnets are opened the rams can be easily installed, removed, or serviced.

The open diagram shown in light blue, is used to open the rams. The open hydraulics can also be used to close the bonnets after they have been opened for service or ram installation. With the bonnet bolts removed, apply hydraulic pressure to the open side to move the rams into the open position. Once the rams are in the open position continue to apply hydraulic pressure to close the bonnets on the body. The hydraulic pressure should be maintained until the bonnet bolts are installed and torqued to the manufacturer specification.

All HU Models are supplied with clearly labeled "OPEN" and "CLOSE" ports located on opposite sides of the body. A mechanical lock screw allows the rams to be closed manually in case of loss of hydraulic closing pressure.

Operating Fluids - HU Ram Type BOP's have 1" NPT connections for the hydraulic operating system. CTHU Ram Type well intervention equipment has 3/4" NPT connections for the hydraulic operating system. Light hydraulic oil of 10 weight or equivalent or passivated water based fluid are suitable operating fluids. If water is used, it's important that the proper type and amounts of oil and antifreeze are added to prevent corrosion in the operating chambers and allow correct operation of the blowout preventer.

Operating Pressures - The rated continuous working pressure is 1,500 psi. However, pressure can exceed 1,500 psi in 10,000 and 15,000 well bore pressure blowout preventers in order to completely close the rams. Hydraulic pressure can be applied up to 3,000 psi in emergency situations. Optimal seal life can be attained if the hydraulic pressure is limited to 1,500 psi.

Operating Capacity

Standard bonnet operating fluid data for HU Ram Type are listed in the table below. One set of rams (2 rams) is the total number of rams it needed to completely seal a ram bore cavity. The closing ratio is the ratio between the pressure in the well bore and the operating-piston pressure needed to close the rams against a particular well head pressure. The opening ratio is the ratio between the pressure in the well bore and the operating piston pressure needed to open the rams.

| SIZE AND WORKING PRESSURE | Gallons to Open Rams (1 set) | Gallons to Close Rams (1 set) | Locking Screw Turns (Each End) | Closing Ratio | Opening Ratio |
|---------------------------|------------------------------|-------------------------------|--------------------------------|---------------|---------------|
| 5-1/8" 15M | 0.85 | 0.86 | 13.5 | 7.65:1 | 3.5:1 |
| 7 - 1/16" 5, 10, 15M | 1.3 | 1.3 | 18 | 6.9:1 | 2.2:1 |
| 11" 3, 5, 10M | 3.4 | 3.5 | 27 | 7.3:1 | 2.5:1 |
| 13 - 5/8" 3, 5M | 5.6 | 5.9 | 32 | 7.0:1 | 2.3:1 |
| 13-5/8" 10M | 5.5 | 5.8 | 32 | 7.0:1 | 2.3:1 |
| 20-3/4"-3M & 21-1/4"-2M | 8.2 | 8.8 | 48 | 7.0:1 | 2.2:1 |

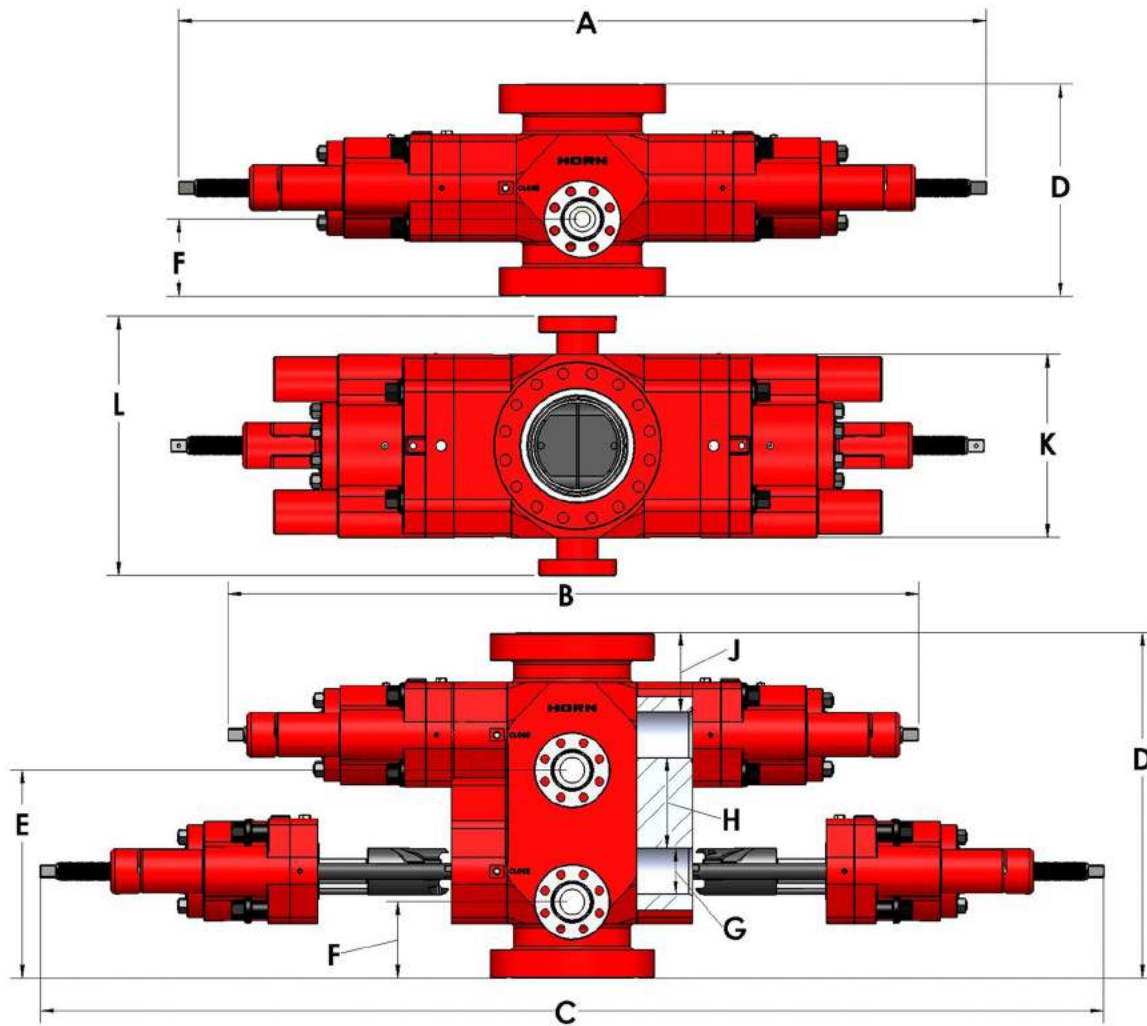
Routine cleaning and flushing of the hydraulics will ensure long life in the operation of the HU Ram Type. **Consult our HEC operations manual for information regarding cleaning procedures and routine maintenance.**

HORN HU PHYSICAL DESCRIPTION AND ENGINEERING DATA



The Horn Single Units and Horn Double Units line are made from 4130 grade forged steel for the utmost quality and strength. Standard specifications for HSU and HDU are listed in the charts. Any combination of studded top, studded bottom, flanged connection or side outlets are available upon request. Special application Horn Unit blowout preventers with unique specifications are available. Corrosion resistant ring and seal grooves are standard.

- A** - Over-all Length of Bonnets Closed, Locking Screws Unlocked
- B** - Over-all Length of Bonnets closed, Locking Screws locked
- C** - Over-all Length of Bonnets open, Locking Screws unlocked
- D1** - Height of Top Flange Face to Bottom Flange Face
- D2** - Height of Top Studded Face to Bottom Studded Face
- D3** - Height of Top Studded Face to Bottom Flanged Face
- D4** - Height of Top Flanged Face to Bottom Studded Face
- E** - Height of Top Outlet Center to Face
(corresponding # to flanged/studded configuration)
- F** - Height of Bottom Outlet Center to Face
(Corresponding # to flanged/studded configuration)
- G** - Height of Ram Bore
- H** - Distance Between Ram Bores (HDU ONLY)
- J** - Length of Top face to Top of Ram Bore
(Corresponding # to flanged/studded configuration)
- K** - Width of Body
- L** - Distance Between Outlets (Specified by Customer)

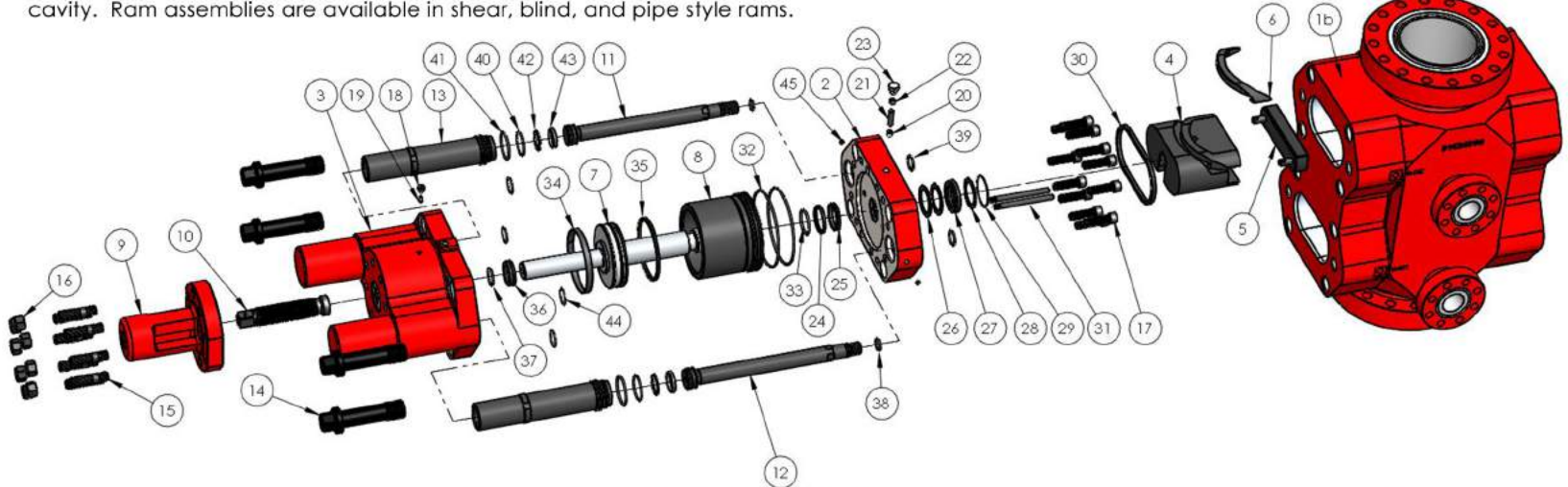


| Size | Pressure Rating (psi) | Bore (in.) | TOTAL ASSEMBLED WEIGHT (LBS) | | | | | | | | | | | | | | Flange x Stud (lb) (if applicable) | | | | | | | | |
|----------------|-----------------------|------------|------------------------------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|-----------|-----------|------------------------------------|-----------|---------|--------------------|------------------|--------------------|------------------------------------|--------|------|
| | | | A (in.) | B (in.) | C (in.) | D-1 (in.) | D-2 (in.) | D-3 (in.) | D-4 (in.) | E-1 (in.) | E-2 (in.) | F-1 (in.) | F-2 (in.) | G (in.) | H-1 (in.) | J-1 (in.) | | J-2 (in.) | K (in.) | Flange x Stud (lb) | Stud x Stud (lb) | Stud x Flange (lb) | Flange x Stud (lb) (if applicable) | | |
| 5-1/8" Single | 15,000 | 5-1/8 | 60.50 | 53.750 | 79.750 | 25.875 | 12.875 | 19.375 | 19.375 | - | - | - | - | - | - | - | - | 10.938 | 4.438 | 14.50 | 1680 | 1350 | 1500 | 1500 | |
| 5-1/8" Double | 15,000 | 5-1/8 | 60.50 | 53.750 | 79.750 | 39.750 | 26.000 | 33.250 | 33.250 | - | - | - | - | - | - | - | - | 9.875 | 10.938 | 4.438 | 14.50 | 3170 | 2730 | 2900 | 2900 |
| 5-1/8" Quad | 15,000 | 5-1/8 | 60.50 | 53.750 | 79.750 | 68.500 | 55.500 | 61.000 | 61.000 | - | - | - | - | - | - | - | - | 9.875 | 10.938 | 4.438 | 14.50 | 5510 | 5170 | 5340 | 5340 |
| 7-1/16" Single | 5,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 27.500 | 13.750 | 21.000 | 20.250 | - | - | 10.500 | 3.250 | 5.500 | - | - | - | 10.125 | 3.625 | 20.000 | 3,200 | 2,830 | 3,020 | 3,005 | |
| 7-1/16" Double | 5,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 44.188 | 30.438 | 37.688 | 36.938 | 27.094 | 19.844 | 10.500 | 3.250 | 5.500 | 11.188 | - | - | 10.125 | 33.625 | 20.000 | 6,400 | 6,050 | 6,235 | 6,220 | |
| 7-1/16" Single | 10,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 30.562 | 15.250 | 23.406 | 22.406 | - | - | 11.063 | 2.907 | 5.500 | - | - | - | 12.031 | 4.875 | 20.000 | 3,910 | 3,250 | 3,580 | 3,580 | |
| 7-1/16" Double | 10,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 48.625 | 33.313 | 41.344 | 40.469 | 29.125 | 21.192 | 11.063 | 2.907 | 5.500 | 12.562 | - | - | 12.031 | 4.875 | 20.000 | 7,470 | 6,810 | 7,140 | 7,140 | |
| 7-1/16" Single | 15,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 31.812 | 15.250 | 24.031 | 23.031 | - | - | 11.688 | 2.907 | 5.500 | - | - | - | 12.656 | 4.875 | 20.000 | 4,070 | 3,245 | 3,670 | 3,645 | |
| 7-1/16" Double | 15,000 | 7-1/16 | 82.00 | 74.00 | 109.50 | 49.875 | 33.313 | 42.094 | 41.094 | 29.750 | 20.969 | 11.688 | 2.907 | 5.500 | 12.562 | - | - | 12.656 | 4.875 | 20.000 | 7,615 | 6,790 | 7,215 | 7,190 | |
| 11" Single | 5,000 | 11 | 108.25 | 96.25 | 146.88 | 34.312 | 17.376 | 25.969 | 25.719 | - | - | 13.125 | 5.673 | 6.750 | - | - | - | 13.156 | 4.813 | 25.125 | 6,810 | 5,855 | 6,345 | 6,320 | |
| 11" Double | 5,000 | 11 | 108.25 | 96.25 | 146.88 | 54.500 | 37.564 | 46.157 | 45.907 | 32.625 | 24.032 | 13.125 | 5.673 | 6.750 | 13.438 | - | - | 13.156 | 4.813 | 25.125 | 13,285 | 12,330 | 12,820 | 12,795 | |
| 11" Single | 10,000 | 11 | 108.25 | 96.25 | 146.88 | 35.688 | 17.626 | 26.782 | 26.532 | - | - | 14.125 | 4.970 | 6.750 | - | - | - | 13.844 | 4.938 | 25.750 | 7,590 | 5,985 | 6,795 | 6,775 | |
| 11" Double | 10,000 | 11 | 108.25 | 96.25 | 146.88 | 55.875 | 37.814 | 46.970 | 46.720 | 33.312 | 24.157 | 14.125 | 4.970 | 6.750 | 19.124 | - | - | 13.844 | 4.938 | 25.750 | 14,180 | 12,740 | 13,460 | 13,420 | |
| 13-5/8" Single | 5,000 | 13-5/8 | 128.12 | 112.12 | 171.50 | 33.812 | 17.750 | 25.906 | 25.656 | - | - | 12.312 | 4.155 | 7.500 | - | - | - | 12.781 | 4.875 | 29.000 | 9,500 | 8,240 | 8,880 | 8,880 | |
| 13-5/8" Double | 5,000 | 13-5/8 | 128.12 | 112.12 | 171.50 | 55.875 | 39.812 | 47.970 | 47.718 | 33.625 | 25.468 | 12.312 | 4.155 | 7.500 | 14.562 | - | - | 12.781 | 4.875 | 29.000 | 18,800 | 17,540 | 18,18 | 18,180 | |
| 13-5/8" Single | 10,000 | 13-5/8 | 128.12 | 112.12 | 172.75 | 41.688 | 20.375 | 31.032 | 31.032 | - | - | 15.125 | 4.470 | 7.500 | - | - | - | 17.093 | 6.438 | 29.000 | 11,990 | 9,500 | 10,745 | 10,745 | |
| 13-5/8" Double | 10,000 | 13-5/8 | 128.12 | 112.12 | 172.75 | 66.624 | 45.314 | 55.969 | 55.969 | 40.062 | 29.407 | 15.125 | 4.470 | 7.500 | 17.438 | - | - | 17.093 | 6.438 | 29.000 | 22,595 | 20,070 | 21,350 | 21,350 | |

HORN HU BLOWOUT PREVENTER PARTS LIST

The following information applies to Horn Unit Ram Type model Blowout Preventers. All parts listed below are for Horn Single Unit or Horn Double Unit specific blowout preventers; however additional replacement parts may be available for different size blowout preventers from other manufacturers. The components of the Horn Unit Model are suitable as a replacement for most U style ram type blowout preventers. The same standards and quality service seals and packers that are used to produce the Horn Unit ram type blowout preventer are also utilized in our remanufacturing operations.

Ram assembly consists of one ram body, one front packer, and one top seal; two ram assemblies are needed to fit one blowout preventer ram cavity. Ram assemblies are available in shear, blind, and pipe style rams.



| Item | Description | Qty. (Single) | Qty. (Double) | 7 1/16" - 5m | 7 1/16" - 10m | 7 1/16" - 15m | 11" - 3,5,10m | 13 5/8" - 5m | 13 5/8" - 10m |
|------|-------------------------------------|---------------|---------------|--------------|---------------|---------------|---------------|--------------|---------------|
| 1a | Body, Single | 1 | - | 7-5HSU | 7-10HSU | 7-15HSU | 11-10HSU | 13-5HSU | 13-10HSU |
| 1b | Body, Double | - | 1 | 7-5HDU | 7-10HDU | 7-15HDU | 11-10HDU | 13-5HDU | 13-10HDU |
| 2 | Intermediate Flange | 2 | 4 | 03-0014 | 03-0014-1 | 03-0014-1 | 03-0023 | 03-0018 | 03-0019 |
| 3 | Bonnet | 2 | 4 | 03-0014-1 | 03-0014-2 | 03-0014-4 | 03-0024 | 03-0024-2 | 03-0024-1 |
| 4 | Ram (Blind Style Shown) | 2 | 4 | 31-3100 | 31-3100 | 310-3100 | 31-3107-1 | 31-3120-1 | 31-3120-1 |
| 5 | Ram Packer (Blind Style Shown) | 2 | 4 | 35-3500 | 35-3500 | 35-3500 | 35-3505 | 35-3501 | 35-3510 |
| 6 | Top Seal (Blind Style Shown) | 2 | 4 | 35-3504 | 35-3504 | 35-3504 | 35-3509 | 35-3513 | 35-3513 |
| 7 | Operating Piston | 2 | 4 | 03-0014-3 | 03-0014-3 | 03-0014-3 | 58-5816 | 58-5815 | 58-5814 |
| 8 | Operating Cylinder | 2 | 4 | 57-5707 | 57-5707 | 57-5707 | 57-5706 | 57-5705 | 57-5705 |
| 9 | Lock Screw Housing | 2 | 4 | 80-80002 | 80-80002 | 80-80002 | 80-80001 | 80-80000 | 80-80000 |
| 10 | Locking Screw | 2 | 4 | 50-5006 | 50-5006 | 50-5006 | 50-5005 | 50-5004 | 50-5004 |
| 11 | Ram Change Piston Open | 2 | 4 | 49-4906-1 | 49-4906-1 | 49-4906-1 | 49-4904-1 | 49-4902-1 | 49-4900-1 |
| 12 | Ram Change Piston Close | 2 | 4 | 49-4907-1 | 49-4907-1 | 49-4907-1 | 49-4905-1 | 49-4903-1 | 49-4901-1 |
| 13 | Ram Change Cylinder | 4 | 8 | 56-5602 | 56-5602 | 56-5602 | 56-5601 | 56-5600 | 56-5600 |
| 14 | Bonnet Bolt | 8 | 16 | 59-5903 | 59-5903-1 | 59-5901 | 59-5902-1 | 59-5901 | 59-5900 |
| 15 | Lock Screw Housing Stud | 16 | 32 | 1x4.25 | 1x4.25 | 1x4.25 | 1.25x5.25 | 1.50x6.25 | 1.50x6.25 |
| 16 | Lock Screw Housing Nut | 16 | 32 | 1" | 1" | 1" | 1-1/4" | 1-1/2" | 1-1/2" |
| 17 | Capscrew, Int. Fig. To Bonnet | 16* | 32* | 03-0055 | 03-0055 | 03-0055 | 03-0056 | 03-0056 | 03-0057 |
| 18 | Gland, Bleeder | 2 | 4 | 03-0002 | 03-0002 | 03-0002 | 03-0002 | 03-0002 | 03-0002 |
| 19 | Plug, Bleeder | 2 | 4 | 03-0001 | 03-0001 | 03-0001 | 03-0001 | 03-0001 | 03-0001 |
| 20 | Check Valve, Plastic | 2 | 4 | 03-0021 | 03-0021 | 03-0021 | 03-0021 | 03-0021 | 03-0021 |
| 21 | Plastic Packing | 2 | 4 | 03-0021-2 | 03-0021-2 | 03-0021-2 | 03-0021-2 | 03-0021-2 | 03-0021-2 |
| 22 | Screw, Plastic Packing | 2 | 4 | 03-0021-1 | 03-0021-1 | 03-0021-1 | 03-0021-1 | 03-0021-1 | 03-0021-1 |
| 23 | Pipe Plug, Plastic Packing | 2 | 4 | 03-0036 | 03-0036 | 03-0036 | 03-0036 | 03-0036 | 03-0036 |
| 24 | Plastic Energizing Ring | 2 | 4 | 03-0020-4 | 03-0020-4 | 03-0020-4 | 03-0041 | 03-0013-1 | 03-0013-1 |
| 25 | Plastic Packing Ring | 2 | 4 | 03-0020-5 | 03-0020-5 | 03-0020-5 | 03-0042 | 03-0013-2 | 03-0013-2 |
| 26 | Back-up Ring - Connecting Rod | 4 | 8 | 03-0020-1 | 03-0020-1 | 03-0020-1 | 03-0036 | 03-0036 | 03-0036 |
| 27 | Connecting Rod Seal (Mud Seal) | 2 | 4 | 03-0020-2 | 03-0020-2 | 03-0020-2 | 03-0008-1 | 03-0003 | 03-0003 |
| 28 | Washer - Connecting Rod | 2 | 4 | 03-0020 | 03-0020 | 03-0020 | 03-0043 | 03-0013 | 03-0013 |
| 29 | Spirolox retainer ring | 2 | 4 | 03-0020-3 | 03-0020-3 | 03-0020-3 | 03-0044 | 03-0013-3 | 03-0013-3 |
| 30 | Bonnet Gasket | 2 | 4 | 74-7409 | 74-7409 | 74-7409 | 74-7410 | 74-7411 | 74-7411 |
| 31 | Ram Guide Pins | 4 | 8 | 00-0001-1 | 00-0001-1 | 00-0001-1 | 00-0001 | 00-0001 | 00-0001 |
| 32 | Operating Cylinder Seal | 4 | 8 | 64-6456 | 64-6456 | 64-6456 | 64-6459 | 64-6459-2 | 64-6459-2 |
| 33 | Operating Piston Hydraulic Seal | 2 | 4 | 03-0014 | 03-0014 | 03-0014 | 03-0045 | 03-0013-4 | 03-0013-4 |
| 34 | Operating Piston Wear Band | 2 | 4 | 03-0020-7 | 03-0020-7 | 03-0020-7 | 03-0046 | 03-0010 | 03-0010 |
| 35 | Operating Piston Seal | 2 | 4 | 03-0020-8 | 03-0020-8 | 03-0020-8 | 03-0047 | 03-0013-5 | 03-0013-5 |
| 36 | Tail Shaft Seal | 2 | 4 | 03-0020-9 | 03-0020-9 | 03-0020-9 | 03-0048 | 03-0012 | 03-0012 |
| 37 | Tail Shaft Wiper O-ring | 2 | 4 | 64-6436-1 | 64-6436-1 | 64-6436-1 | 64-6438-1 | 64-6441 | 64-6441 |
| 38 | Ram Change Rod Seal to Body | 4 | 8 | 64-6430-1 | 64-6430-1 | 64-6430-1 | 64-6432 | 64-6434 | 64-6434 |
| 39 | Ram Change Rod Seal to Int. Flange | 4 | 8 | 64-6434-1 | 64-6434-1 | 64-6434-1 | 64-6436-1 | 64-6438 | 64-6438 |
| 40 | Ram Change Cyl. Seal to Int. Flange | 4 | 8 | 64-6441-1 | 64-6441-1 | 64-6441-1 | 64-6453-2 | 64-6448-2 | 64-6448-2 |
| 41 | Ram Change Cyl. Seal to Bonnet | 4 | 8 | 64-6445 | 64-6445 | 64-6445 | 64-6448 | 64-6451-3 | 64-6451-3 |
| 42 | Ram Change Piston Seal | 4 | 8 | 64-6437 | 64-6437 | 64-6437 | 64-6438-1 | 64-6441-1 | 64-6441-1 |
| 43 | Ram Change Piston Wear Band | 4 | 8 | 03-0009-3 | 03-0009-3 | 03-0009-3 | 03-0036 | 03-0009-1 | 03-0009-1 |
| 44 | Bonnet Bolt O-ring | 8 | 16 | 64-6411 | 64-6411-1 | 64-6411-2 | 64-6419-1 | 64-6411-2 | 64-6421-1 |
| 45 | 1/2" NPT Plug | 4 | 8 | 03-0036 | 03-0036 | 03-0036 | 03-0036 | 03-0036 | 03-0036 |

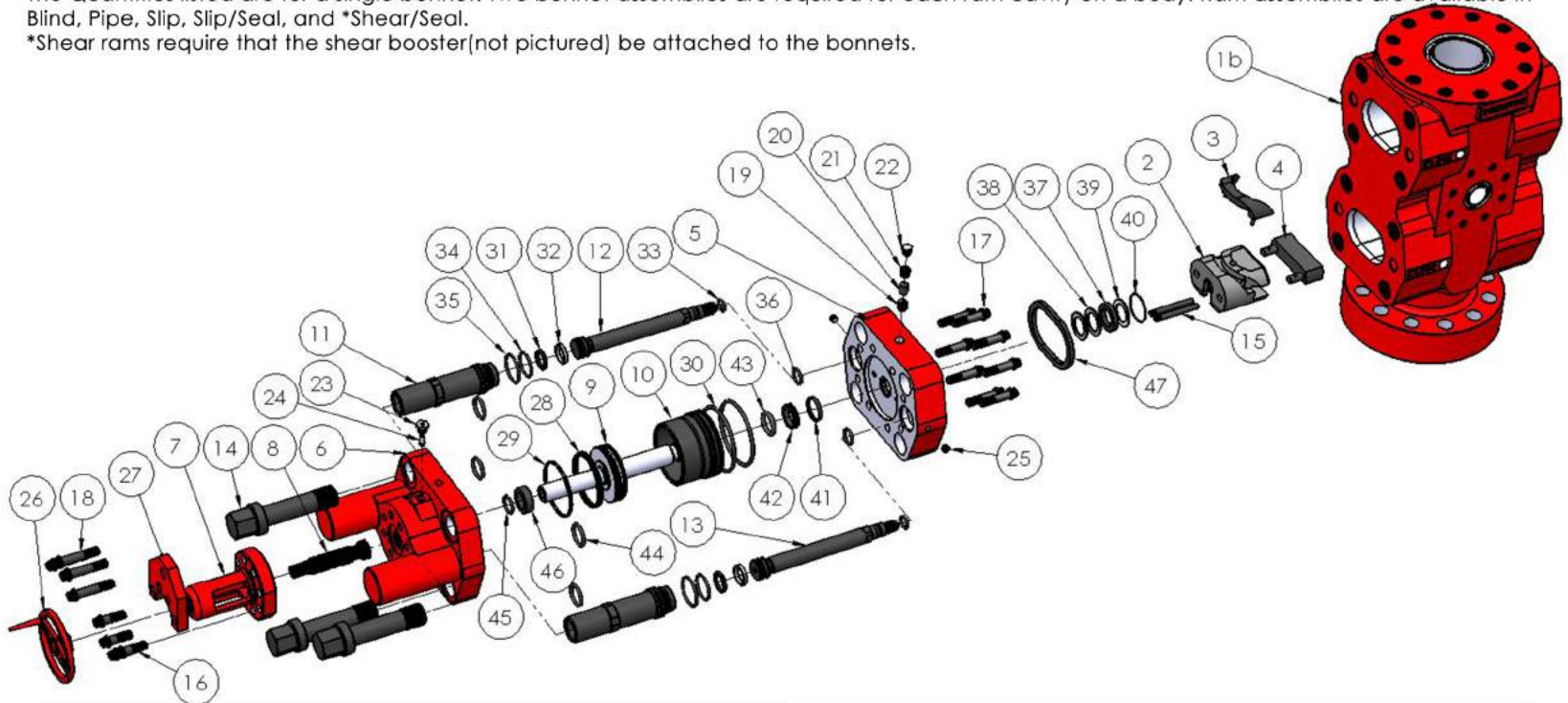
*13 5/8" require 24 for singles and 48 for doubles

HORN CTHU PARTS LIST

The following information applies to Horn Equipment Coil Tubing well intervention equipment. All parts listed below are for Single, Double, and Quad body.

The Quantities listed are for a single bonnet. Two bonnet assemblies are required for each ram cavity on a body. Ram assemblies are available in Blind, Pipe, Slip, Slip/Seal, and *Shear/Seal.

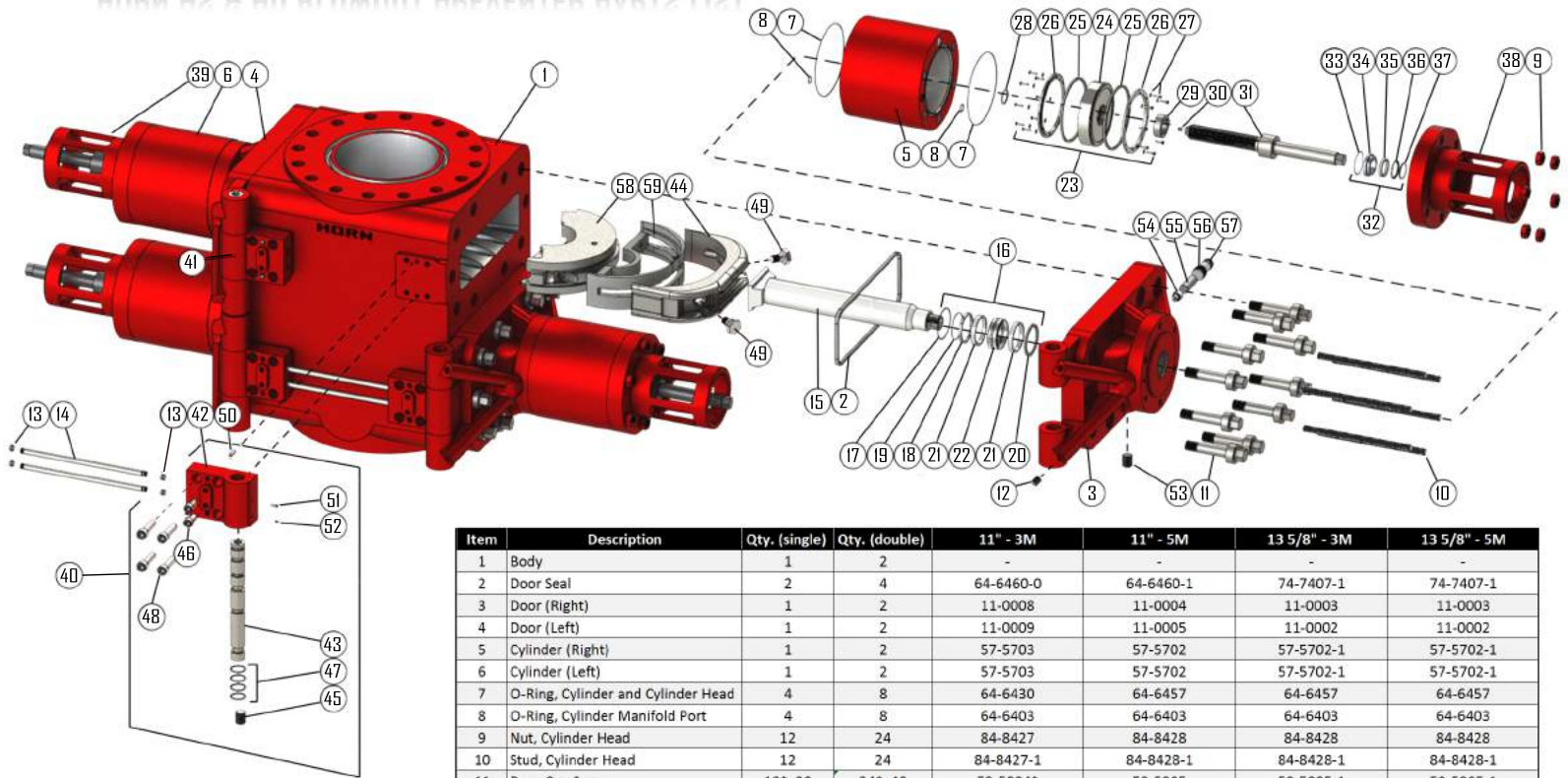
*Shear rams require that the shear booster(not pictured) be attached to the bonnets.



| ITEM # | PART # | QUANTITY | PART NAME |
|--------|-------------|----------|---|
| 1a | 5-15HSU | 1 | 5-1/8" 15M CTHU Single Body |
| 1b | 5-15HDU | 1 | 5-1/8" 15M CTHU Double Body |
| 1c | 5-15HQU | 1 | 5-1/8" 15M CTHU Quad Body |
| 2 | 06-0000 | 1 | 5-1/8" CSO CTHU Ram Block |
| 3 | 36-0008 | 1 | 5-1/8" CTHU Top Seal |
| 4 | 36-0000 | 1 | 5-1/8" CSO CTHU Front Packer |
| 5 | 03-0012 | 1 | Intermediate Flange |
| 6 | 03-0013 | 1 | Bonnet |
| 7 | 80-80004 | 1 | Lock Screw Housing |
| 8 | 50-5008 | 1 | Lock Screw |
| 9 | 58-5818 | 1 | Operating Piston |
| 10 | 57-5714 | 1 | Operating Cylinder |
| 11 | 56-5605 | 2 | Ram Change Cylinder |
| 12 | 49-4910 | 1 | Ram Change Piston Open |
| 13 | 49-4911 | 1 | Ram Change Piston Close |
| 14 | 59-5914 | 4 | Bonnet Bolts |
| 15 | 00-0001-2 | 2 | Ram Guide Pins |
| 16 | 03-0022-11 | 8 or 4 | Lock Screw Housing Bolts |
| 17 | 03-0022-12 | 8 | Intermediate Flange Bolts |
| 18 | 03-0022-15 | 0 or 4 | Lock Screw Housing Bolts with Lifting Plate |
| 19 | 03-0021-0 | 1 | Ball Check Valve 3/4" 10thd |
| 20 | 03-0021-2 | 1 | Plastic Packing |
| 21 | 03-0021-1-1 | 1 | Plastic Packing Screw 3/4" 10 thd x 3/4" long |
| 22 | 03-0036 | 1 | Pipe Plug 3/4" NPT FS |
| 23 | 03-0002 | 1 | Gland, Bleeder 3/8" HIP |
| 24 | 03-0001 | 1 | Plug, Bleeder 3/8" HIP |
| 25 | 03-0036 | 2 | 3/8" NPT Plug |
| 26 | 20777 | 1 | Handwheel, Manual Lock |
| 27 | 03-0036 | 1 | Lift Plate |

| ITEM # | PART # | QUANTITY | PART NAME |
|--------|-------------|----------|----------------------------------|
| 28 | 64-6461-3 | 1 | Operating Piston Seal |
| 29 | 03-0022-6 | 1 | Oper. Piston Wear Band |
| 30 | 64-6451-1-1 | 2 | Operating Cylinder Seal |
| 31 | 64-6465 | 2 | Ram Change Piston seal |
| 32 | 03-0022-7 | 2 | Ram Change Piston Wear Band |
| 33 | 64-6403 | 2 | Ram Change Rod Seal to Body |
| 34 | 64-6411-0 | 2 | Ram Change Cyl. seal to Int. Flg |
| 35 | 64-6411-1-1 | 2 | Ram Change Cyl. seal to Bonnet |
| 36 | 64-6410 | 2 | Ram Change Rod Seal to Int Flg |
| 37 | 03-0022-2 | 1 | Connecting Rod Seal (Mud Seal) |
| 38 | 03-0022-3 | 2 | Back-up Ring - Conecting Rod |
| 39 | 03-0022-4 | 1 | Washer - Connecting Rod |
| 40 | 03-0022-5 | 1 | Spirolox retainer ring |
| 41 | 03-0022-9 | 1 | Plastic Energizing Ring |
| 42 | 03-0022-8 | 1 | Plastic Packing Ring |
| 43 | 64-6451-1-2 | 1 | Operating Piston Hydraulic Seal |
| 44 | 64-6411 | 4 | Bonnet Bolt O-rings |
| 45 | 64-6410-1 | 1 | Tail Shaft Wiper O-ring |
| 46 | 03-0022-10 | 1 | Tail Shaft Seal |
| 47 | 74-7408-1 | 1 | Bonnet Gasket |

HORN HS & HD BLOWOUT PREVENTER PARTS LIST



The following information and part detail pertain to HORN HS & HD model blowout preventers. All parts listed below are Horn Equipment specific; however additional replacement parts are/may be available for different size blowout preventers from other manufacturers.

Total quantity shown HS and HD model ram blowout preventers.

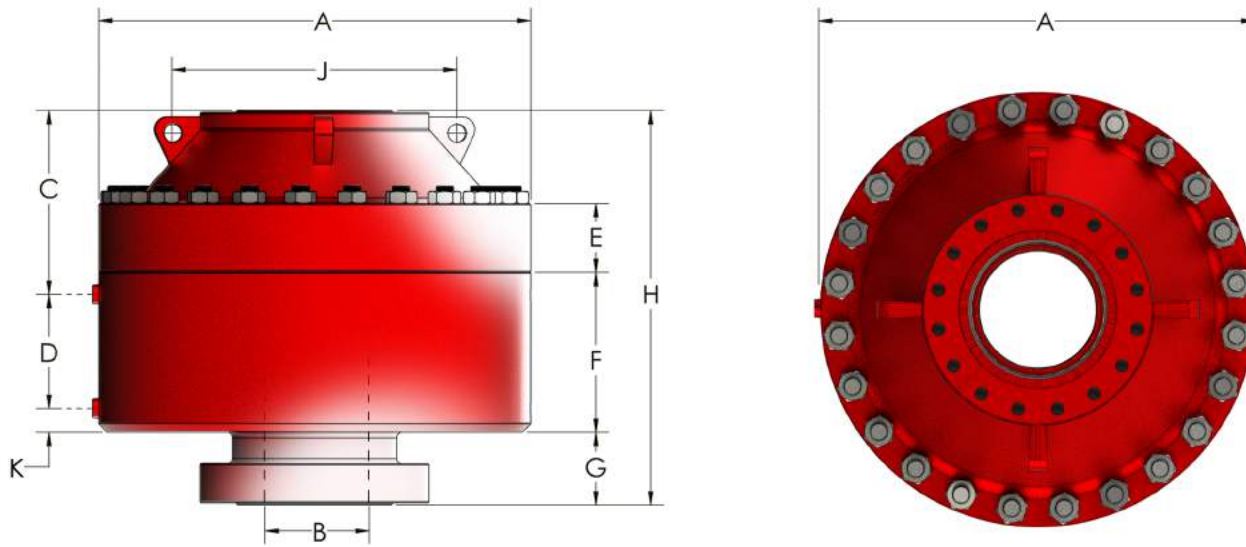
* For 11" - 3m Models Only

| Item | Description | Qty. (single) | Qty. (double) | 11" - 3M | 11" - 5M | 13 5/8" - 3M | 13 5/8" - 5M |
|------|------------------------------------|---------------|---------------|-----------|------------|--------------|--------------|
| 1 | Body | 1 | 2 | - | - | - | - |
| 2 | Door Seal | 2 | 4 | 64-6460-0 | 64-6460-1 | 74-7407-1 | 74-7407-1 |
| 3 | Door (Right) | 1 | 2 | 11-0008 | 11-0004 | 11-0003 | 11-0003 |
| 4 | Door (Left) | 1 | 2 | 11-0009 | 11-0005 | 11-0002 | 11-0002 |
| 5 | Cylinder (Right) | 1 | 2 | 57-5703 | 57-5702 | 57-5702-1 | 57-5702-1 |
| 6 | Cylinder (Left) | 1 | 2 | 57-5703 | 57-5702 | 57-5702-1 | 57-5702-1 |
| 7 | O-Ring, Cylinder and Cylinder Head | 4 | 8 | 64-6430 | 64-6457 | 64-6457 | 64-6457 |
| 8 | O-Ring, Cylinder Manifold Port | 4 | 8 | 64-6403 | 64-6403 | 64-6403 | 64-6403 |
| 9 | Nut, Cylinder Head | 12 | 24 | 84-8427 | 84-8428 | 84-8428 | 84-8428 |
| 10 | Stud, Cylinder Head | 12 | 24 | 84-8427-1 | 84-8428-1 | 84-8428-1 | 84-8428-1 |
| 11 | Door Cap Screw | 12*, 20 | 24*, 40 | 59-5904* | 59-5905 | 59-5905-1 | 59-5905-1 |
| 12 | Pipe Plug, Door and Body | 12 | 24 | 1/2" NPT | 1/2" NPT | 1/2" NPT | 1/2" NPT |
| 13 | O-Ring, Hinge Manifold | 8 | 16 | 64-6400 | 64-6402 | 64-6402 | 64-6402 |
| 14 | Manifold, Hinge (straight) | 2 | 4 | 61-6104 | 61-6102 | 61-6108 | 61-6108 |
| 15 | Ram Shaft | 2 | 4 | 58-5801 | 58-5802 | 58-5802 | 58-5802 |
| 16 | Ram Shaft Seal Assembly | 2 | 4 | 03-0025-2 | 03-0025-3 | 03-0025-3 | 03-0025-3 |
| 17 | Ram Shaft Packing Retainer Ring | 2 | 4 | 03-0027 | 03-0026 | 03-0026 | 03-0026 |
| 18 | Ram Shaft Holder, Wiper Ring | 2 | 4 | N/A | 03-0035 | 03-0035 | 03-0035 |
| 19 | Ram Shaft Wiper Ring | 2 | 4 | 64-6475 | 64-6476 | 64-6476 | 64-6476 |
| 20 | Ram Shaft Packing Ring | 2 | 4 | N/A | 64-6474 | 64-6474 | 64-6474 |
| 21 | Ram Shaft Packing | 4 | 8 | N/A | 64-6462 | 64-6462 | 64-6462 |
| 22 | Ram Shaft Brass Packing Adapter | 2 | 4 | 03-0025 | 03-0025-1 | 03-0025-1 | 03-0025-1 |
| 23 | Piston Assembly | 2 | 4 | 03-0015-0 | 03-0015 | 03-0015 | 03-0015 |
| 24 | Piston Body | 2 | 4 | 03-0015-3 | 03-0015-4 | 03-0015-4 | 03-0015-4 |
| 25 | Piston Rubber | 4 | 8 | 03-0033-1 | 03-0034 | 03-0034 | 03-0034 |
| 26 | Piston Retainer, Rubber | 4 | 8 | 03-0015-2 | 03-0016-1 | 03-0016-1 | 03-0016-1 |
| 27 | Piston Cap Screw/Lock Washer | 16 | 32 | 84-8429 | 84-8429-1 | 84-8429-1 | 84-8429-1 |
| 28 | Piston O-Ring | 2 | 4 | 64-6438 | 64-6441 | 64-6441 | 64-6441 |
| 29 | Locknut, Piston | 2 | 4 | 03-0015-1 | 03-0016 | 03-0016 | 03-0016 |
| 30 | Set Screw | 2 | 4 | 84-8423 | 84-8423-1 | 84-8423-1 | 84-8423-1 |
| 31 | Locking Shaft | 2 | 4 | 50-5002 | 50-5001 | 50-5001 | 50-5001 |
| 32 | Locking Shaft Seal Assembly | 2 | 4 | 03-0034-4 | 03-0034-5 | 03-0034-5 | 03-0034-5 |
| 33 | Locking Shaft Packing Retainer | 2 | 4 | 03-0028 | 03-0029 | 03-0029 | 03-0029 |
| 34 | Locking Shaft Thrust Bushing | 2 | 4 | 03-0034-3 | 03-0034-2 | 03-0034-2 | 03-0034-2 |
| 35 | Locking Shaft Packing | 2 | 4 | N/A | 64-6464 | 64-6464 | 64-6464 |
| 36 | Locking Shaft Holder, Wiper Ring | 2 | 4 | N/A | 03-0034-01 | 03-0034-01 | 03-0034-01 |
| 37 | Locking Shaft Wiper Ring | 2 | 4 | 64-6477 | 64-6478 | 64-6478 | 64-6478 |
| 38 | Cylinder Head, Right | 1 | 2 | 63-6301 | 63-6300 | 63-6300 | 63-6300 |
| 39 | Cylinder Head, Left | 1 | 2 | 63-6302 | 63-6300 | 63-6300 | 63-6300 |
| 40 | Hinge Bracket Assembly, Right | 1 | 2 | --- | --- | --- | --- |
| 41 | Hinge Bracket Assembly, Left | 1 | 2 | --- | --- | --- | --- |
| 42 | Hinge Bracket | 2 | 4 | 53-5302 | 53-5301 | 53-5302-1 | 53-5302-1 |
| 43 | Hinge Pin | 2 | 4 | 52-5202 | 52-5201 | 52-5204 | 52-5204 |
| 44 | Ram Holder | 2 | 4 | 29-2918 | 29-2910-1 | 29-2900 | 29-2900 |
| 45 | Hinge Pin Plug (Socket Head) | 4 | 8 | 1/2" NPT | 1/2" NPT | 1/2" NPT | 1/2" NPT |
| 46 | Hing Bracket Plug (Socket Head) | 4 | 8 | 1" NPT | 1" NPT | 1" NPT | 1" NPT |
| 47 | O-Ring Hinge Pin | 20 | 40 | 64-6406 | 64-6410 | 64-6431 | 64-6431 |
| 48 | Cap Screw, Hinge Bracket | 8 | 16 | 84-8414-1 | 84-8414-2 | 84-8414-2 | 84-8414-2 |
| 49 | Ram Retracting Screw | 4 | 8 | 60-60002 | 60-60002 | 60-60002 | 60-60002 |
| 50 | Dowel Pin | 4 | 8 | 84-8424 | 84-8425 | 84-8426 | 84-8426 |
| 51 | Retainer, Hinge Pin | 2 | 4 | 03-0005 | 03-0005 | 03-0005 | 03-0005 |
| 52 | Grease Fitting | 2 | 4 | 47-4763-2 | 47-4763-2 | 47-4763-2 | 47-4763-2 |
| 53 | Bleeder Plug, Door | 2 | 4 | N/A | 1/2" NPT | 1/2" NPT | 1/2" NPT |
| 54 | Check Valve | 2 | 4 | N/A | 03-0021 | 03-0021 | 03-0021 |
| 55 | Sealant, Secondary Seal | 2 | 4 | N/A | 03-0021-2 | 03-0021-2 | 03-0021-2 |
| 56 | Drive Screw | 2 | 4 | N/A | 03-0021-1 | 03-0021-1 | 03-0021-1 |
| 57 | Plug, Secondary Seal | 2 | 4 | N/A | 1" NPT | 1" NPT | 1" NPT |
| 58 | Ram Block | 2 | 4 | --- | --- | --- | --- |
| 59 | Ram Rubber | 2 | 4 | --- | --- | --- | --- |

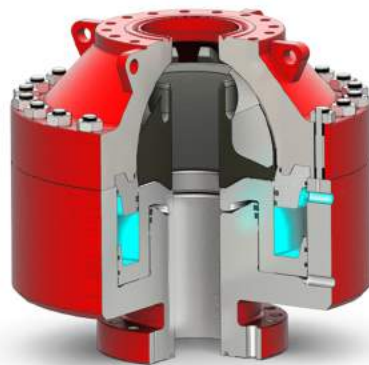
HORN HA PHYSICAL DESCRIPTION AND ENGINEERING DATA



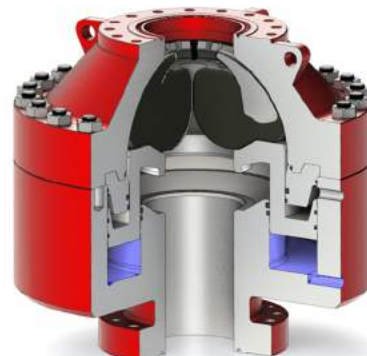
The following dimensions are for reference on all new manufactured HORN HA Blowout Preventers.



| Bore and Working Pressure | 7 - 1/16" - 5M | 7 - 1/16" - 5M w/ 10M Bottom Flange | 11" - 3M | 11" - 5M | 11" - 5M w/ 10M Bottom Flange | 13 5/8" - 5M | 13 5/8" - 5M w/10M Bottom Flange |
|---------------------------|----------------|-------------------------------------|----------|----------|-------------------------------|--------------|----------------------------------|
| A: (in.) | 29.000 | 29.000 | 39.875 | 44.750 | 44.750 | 50.000 | 50.000 |
| B: (in.) | 7.063 | 7.063 | 11.000 | 11.000 | 11.000 | 13.625 | 13.625 |
| C: (in.) | 13.813 | 13.813 | 14.500 | 18.000 | 18.000 | 20.625 | 20.625 |
| D: (in.) | 7.750 | 7.750 | 9.125 | 11.500 | 11.500 | 13.250 | 13.250 |
| E: (in.) | 6.313 | 6.313 | 5.000 | 6.885 | 6.885 | 8.000 | 8.000 |
| F: (in.) | 11.750 | 11.750 | 13.188 | 17.500 | 17.500 | 18.500 | 18.500 |
| G: (in.) | 6.750 | 7.688 | 6.500 | 8.750 | 9.750 | 8.250 | 11.250 |
| H: (in.) | 31.00 | 31.938 | 32.875 | 42.500 | 43.500 | 45.375 | 48.375 |
| J: (in.) | 20.50 | 20.500 | 28.000 | 30.250 | 30.250 | 33.000 | 33.000 |
| K: (in.) | 2.688 | 2.688 | 2.750 | 4.250 | 4.250 | 3.250 | 3.250 |
| Weight (dry) | 3,170 | 3340 | 5750 | 9470 | 9950 | 13630 | 14300 |
| Bonnet Nut Across Flats | 2.375 | 2.375 | 2.750 | 3.125 | 3.125 | 3.500 | 3.500 |
| Stud Torque (ft-lbs) | 900 | 900 | 1500 | 2200 | 2200 | 3100 | 3100 |



OPEN

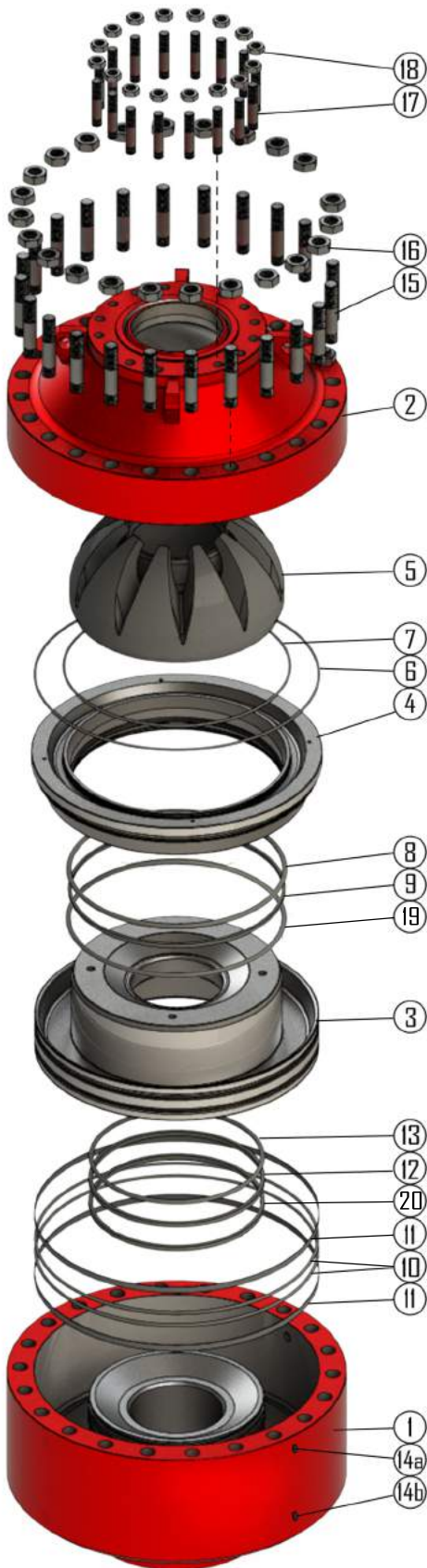


CLOSE

HORN HA Blowout Preventer can be operated via hydraulic connection ports located on each side of the lower body. Fluid capacities and body fitting sizes are listed to the right. All are reduced to a 1" NPT hydraulic connection.

| Bore and Working Pressure | 7 - 1/16" - 5M | 11" - 3M | 11" - 5M | 11" - 5M w/ 10M Bottom Flange | 13 5/8" - 5M | 13 5/8" - 5M w/10M Bottom Flange |
|---------------------------------|----------------|----------|----------|-------------------------------|--------------|----------------------------------|
| Hydraulic Body Fitting: NPT | 1 | 1 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 |
| Hydraulic Connection: NPT | 1 | 1 | 1 | 1 | 1 | 1 |
| Hydraulic Fluid Open: Gallons: | 3.21 | 6.78 | 14.59 | 14.59 | 17.41 | 17.41 |
| Hydraulic Fluid Close: Gallons: | 4.57 | 11.00 | 18.67 | 18.67 | 23.58 | 23.58 |
| Operating Pressure: PSI | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |

HORN HA BLOWOUT PREVENTER PART NUMBERS



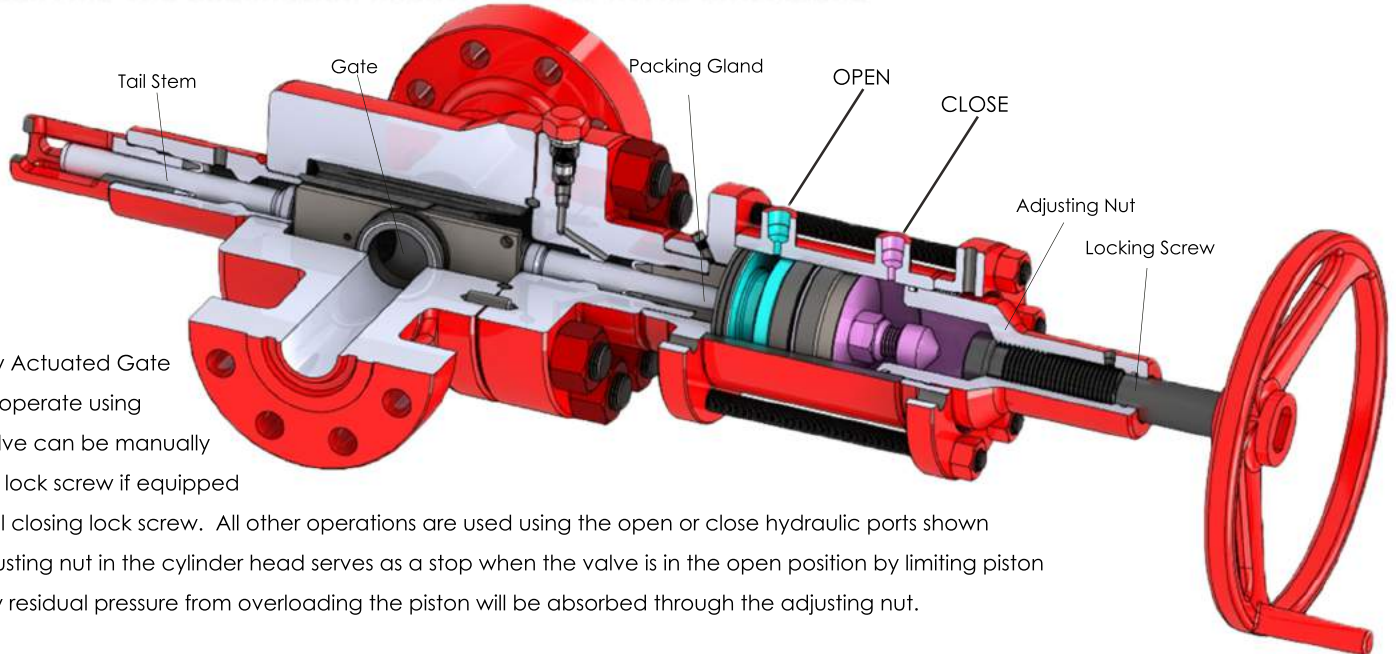
The following information and part detail pertain to all Horn Annular Blowout Preventers. All parts listed below are HORN HA specific; however additional replacement parts are/may be available for different size blowout preventers from other manufacturers. We use proper packing elements and seals that contribute to the blowout preventer working properly, reliably, and safely.

| Item | Description | Qty. | 7 - 1/16" - 5M | 11" - 3M | 11" - 5M |
|------|-----------------------------|------|------------------|-----------------|------------------|
| 1 | Body | 1 | 10-0005 | 10-0009 | 10-0013 |
| 2 | Lid | 1 | 10-0006 | 10-0010 | 10-0014 |
| 3 | Piston | 1 | 10-0007 | 10-0011 | 10-0015 |
| 4 | Adapter Ring | 1 | 10-0008 | 10-0012 | 10-0016 |
| 5 | Packing Element | 1 | 39-3900 | 36-3601 | 37-3700 |
| 6 | Adapter Ring to Body O-Ring | 1 | 81-8123-1 | 81-8130-1 | 81-8137 |
| 7 | Adapter Ring Lid O-Ring | 1 | 81-8121 | 81-8130 | 81-8133-1 |
| 8 | Inner Adapter Ring Wiper | 1 | 81-8100-1 | 81-8104 | 81-8108 |
| 9 | Inner Adapter Ring Seal | 1 | 81-8124 | 81-8126 | 81-8131 |
| 10 | Outer Piston Seal | 2 | 81-8125 | 81-8127 | 81-8137-1 |
| 11 | Piston Wear Band | 2 | 03-0030 | 03-0030 | 03-0030 |
| 12 | Stump Seal | 1 | 81-8102-2 | 81-8130-2 | 81-8137-2 |
| 13 | Stump Wiper | 1 | 81-8102-1 | 81-8106 | 81-8110 |
| 14 | Hydraulic Ports | 2 | 1" NPT | 1" NPT | 1 1/4 x 1" NPT |
| 15 | Studs | 24 | 1.50x10 | 1.750x9.25 | 2.0x11.50 |
| 16 | Nuts | 24 | 1 1/2 | 1 3/4 | 2 |
| 17 | Flange Stud | 12 | 1 3/8 - 8 x 7.50 | 1 3/8 - 8 x 7.0 | 1 7/8 - 8 x 9.50 |
| 18 | Flange Nut | 12 | 1 3/8 - 8 | 1 3/8 - 8 | 1 7/8 - 8 |
| 19 | Adapter Ring Wear Band | 1 | 03-0031 | N/A | 03-0031 |
| 20 | Stump Wear Band | 1 | 03-0030 | 03-0030 | 03-0030 |

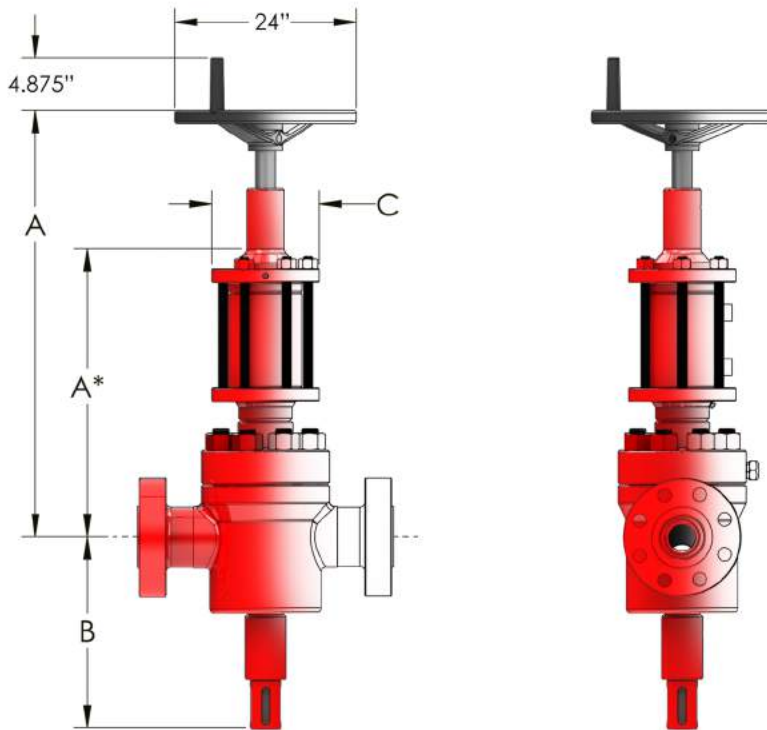
| Item | Description | Qty. | 11" - 5M w/ 10M Bottom Flange | 13 5/8" - 5M | 13 5/8" - 5M w/10M Bottom Flange |
|------|-----------------------------|------|-------------------------------|-----------------|----------------------------------|
| 1 | Body | 1 | 10-0013-1 | 10-0001 | 10-0001-1 |
| 2 | Lid | 1 | 10-0014 | 10-0002 | 10-0002 |
| 3 | Piston | 1 | 10-0015 | 10-0003 | 10-0003 |
| 4 | Adapter Ring | 1 | 10-0016 | 10-0004 | 10-0004 |
| 5 | Packing Element | 1 | 37-3700 | 38-3800 | 38-3800 |
| 6 | Adapter Ring to Body O-Ring | 1 | 81-8137 | 81-8138 | 81-8138 |
| 7 | Adapter Ring Lid O-Ring | 1 | 81-8133-1 | 81-8141 | 81-8141 |
| 8 | Inner Adapter Ring Wiper | 1 | 81-8108 | 81-8112 | 81-8112 |
| 9 | Inner Adapter Ring Seal | 1 | 81-8131 | 81-8139 | 81-8139 |
| 10 | Outer Piston Seal | 2 | 81-8137-1 | 81-8141-1 | 81-8141-1 |
| 11 | Piston Wear Band | 2 | 03-0030 | 03-0030 | 03-0030 |
| 12 | Stump Seal | 1 | 81-8137-2 | 81-8140 | 81-8140 |
| 13 | Stump Wiper | 1 | 81-8110 | 81-8114 | 81-8114 |
| 14 | Hydraulic Ports | | 1 1/4x1" NPT | 1 1/2x1" NPT | 1 1/2x1" NPT |
| 15 | Stud | 24 | 2.0x11.50 | 2.25x13 | 2.25x13 |
| 16 | Nut | 24 | 2 | 2 1/4 | 2 1/4 |
| 17 | Flange Stud | 12* | 1 7/8 - 8 x 9.50 | 1 5/8 - 8 x 8.5 | 1 5/8 - 8 x 8.5 |
| 18 | Flange Nut | 12* | 1 7/8 - 8 | 1 5/8 - 8 | 1 5/8 - 8 |
| 19 | Adapter Ring Wear Band | 1 | 03-0031 | 03-0031 | 03-0031 |
| 20 | Stump Wear Band | 1 | 03-0030 | 03-0030 | 03-0030 |

* 13 5/8 - 5M requires 16 flange nuts and studs

HORN DRILLING AND PRODUCTION HYDRAULIC GATE VALVE DIMENSIONS



The Hydraulically Actuated Gate Valve is sized to operate using 1500 psi. The valve can be manually closed using the lock screw if equipped with the optional closing lock screw. All other operations are used using the open or close hydraulic ports shown above. The adjusting nut in the cylinder head serves as a stop when the valve is in the open position by limiting piston movement. Any residual pressure from overloading the piston will be absorbed through the adjusting nut.



- The packing gland absorbs any overload from the piston when the valve is in the close position.
- The tail stem and the operating stem both have backseating shoulders that allow for complete replacement of stem packing while the valve is under working pressure.
- The tail stem acts as a balance for the operating stem, compensates for volume displaced in the gate valve chamber, as well as indicating whether the valve is open or closed.

The following dimensions and engineering information pertain to all Horn Equipment drilling and production hydraulically operated gate valves. All valves meet or exceed all applicable API standards.

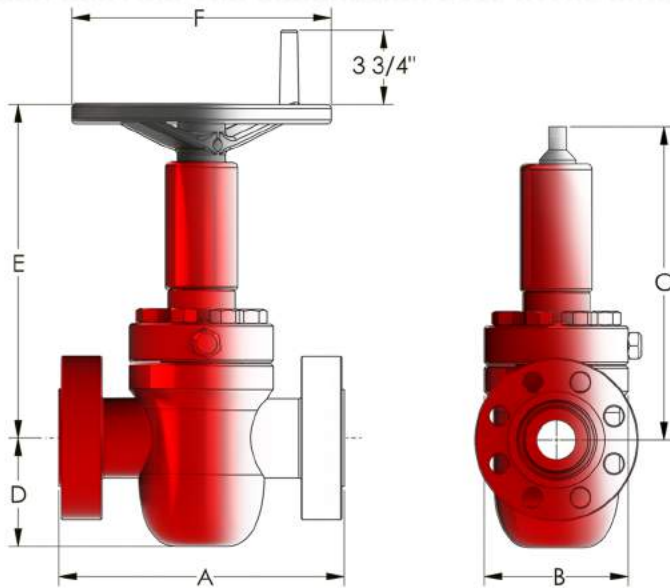
Additional valve sizes and specifications may be available.

*Disclaimer - Valve operation assumes proper maintenance and use of equipment.

Dimensional Data - API Hydraulic Gate Valve

| | | Minimum Bore | | | | | | |
|---------------------|--|------------------|---------|--------------------------|--------------|---------|--------------|---------|
| | | 1 13/16" | 2 1/16" | 2 1/16" | 3 1/8" | 3 1/16" | 4 1/8" | 4 1/16" |
| API Pressure Rating | | 10,000 15,000 | 3000 | 5000 10,000 15,000 | 3000 5000 | 10,000 | 3000 5000 | 10,000 |
| A | Center of Port to Top of Actuator With Manual Locking Screw (in.) | 30 1/2 | 38 3/8 | 30 1/2 | 35 1/2 | 36 7/8 | 40 | 44 |
| A | Center of Port to Top of Actuator Without Manual Locking Screw (in.) | 20 7/8 | 18 1/2 | 20 7/8 | 23 5/8 | 25 | 25 3/4 | 30 1/4 |
| B | Center of Port to Bottom of Stem Protector (in.) | 14 1/4 | 14 1/4 | 14 1/2 | 17 1/4 | 17 1/4 | 19 3/4 | 19 3/4 |
| C | Diameter of Cylinder Flange (in.) | 8 | 6 5/8 | 8 | 8 | 8 5/8 | 8 | 10 3/4 |

HORN DRILLING AND PRODUCTION GATE VALVE DIMENSIONS



The following dimensions and engineering information pertain to all Horn Equipment drilling and production manually operated gate valves. All valves meet or exceed all applicable API standards.

We deliver an industry standard gate valve designed to operate safely and reliably with lasting satisfaction in performance.

Additional valve sizes and specifications may be available.

Dimensional Data - API **3000** PSI Working Pressure

| | | Minimum Bore | | | |
|---|--|--------------|----------|----------|----------|
| | | 2 1/16" | 2 9/16" | 3 1/8" | 4 1/8" |
| | Nominal Flange Size (in.) | 2.063 | 2.563 | 3.125 | 4.063 |
| A | End-to-End, Flanged (Ring Joint) (in.) | 14 5/8 | 16 5/8 | 17 1/8 | 20 1/8 |
| B | Extreme Width of Body (in.) | 6 3/4 | 7 5/8 | 7 1/2 | 10 1/2 |
| C | Center of Port to Top of Stem Adapter (in.) | 13 | 33 13/16 | 16 13/16 | 18 7/16 |
| D | Center of Port to Bottom of Body (in.) | 5 5/8 | 6 1/2 | 7 3/8 | 9 1/8 |
| E | Center of Port to Top of Handwheel Rim (in.) | 15 3/8 | 16 1/8 | 19 1/16 | 20 11/16 |
| F | Handwheel O.D. (in.) | 14 | 14 | 14 | 18 1/2 |
| | API Ring Gasket | R-24 | R-27 | R-35 | R-39 |
| | No. of Turns - Full Open to Full Closed ±1/4 | 12 1/2 | 15 1/4 | 18 1/4 | 23 1/2 |
| | Weight (lbs) | 182 | 255 | 360 | 450 |

Dimensional Data - API **5000** PSI Working Pressure

| | | Minimum Bore | | | |
|---|--|--------------|----------|----------|----------|
| | | 2 1/16" | 2 9/16" | 3 1/8" | 4 1/8" |
| | Nominal Flange Size (in.) | 2.063 | 2.563 | 3.125 | 4.063 |
| A | End-to-End, Flanged (Ring Joint) (in.) | 14 5/8 | 16 5/8 | 18 5/8 | 21 5/8 |
| A | End-to-End, Butt Weld (in.) | - | - | - | 21 1/2 |
| B | Extreme Width of Body (in.) | 7 | 8 3/16 | 9 1/4 | 10 13/16 |
| C | Center of Port to Top of Stem Adapter (in.) | 15 1/8 | 15 15/16 | 16 13/16 | 18 7/16 |
| D | Center of Port to Bottom of Body (in.) | 5 5/8 | 6 1/2 | 7 3/8 | 9 1/8 |
| E | Center of Port to Top of Handwheel Rim (in.) | 17 3/8 | 18 1/8 | 19 1/16 | 20 11/16 |
| F | Handwheel O.D. (in.) | 14 | 14 | 18 1/2 | 18 1/2 |
| | API Ring Gasket | R-24 | R-27 | R-35 | R-39 |
| | No. of Turns - Full Open to Full Closed ±1/4 | 12 1/2 | 15 1/4 | 18 1/4 | 23 1/2 |
| | Weight (lbs) | 182 | 255 | 360 | 450 |

Dimensional Data - API **10000** PSI Working Pressure

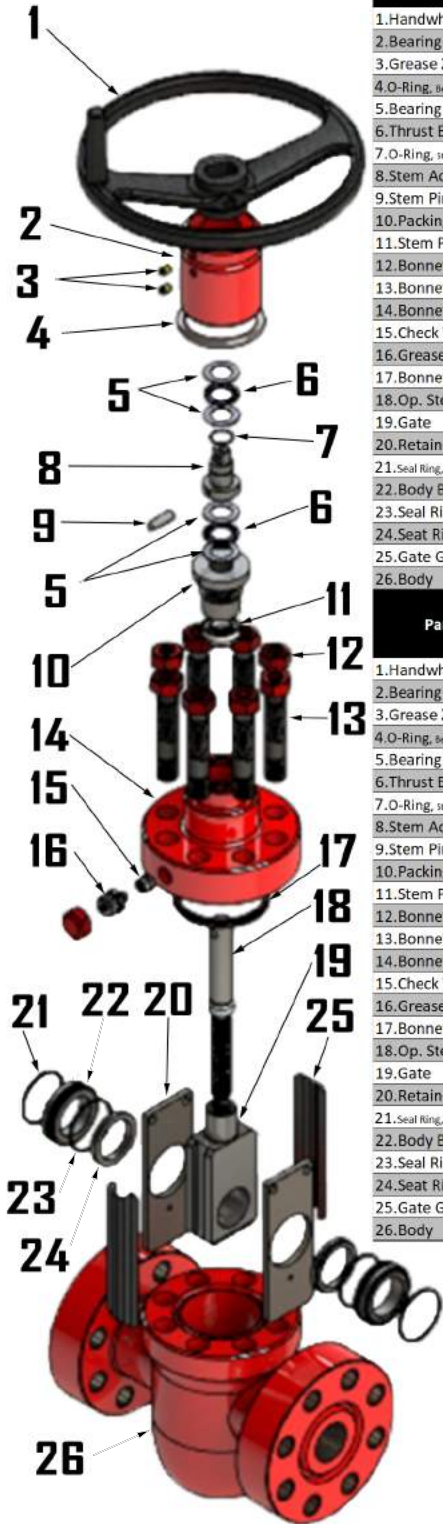
| | | Minimum Bore | | | |
|---|--|--------------|---------|---------|----------|
| | | 1 13/16" | 2 1/16" | 3 1/16" | 4 1/16" |
| | Nominal Flange Size (in.) | 1.813 | 2.063 | 3.063 | 4.063 |
| A | End-to-End, Flanged (Ring Joint) (in.) | 18 1/4 | 20 1/2 | 24 3/8 | 26 3/8 |
| B | Extreme Width of Body (in.) | 9 1/16 | 9 3/8 | 10 1/4 | 12 13/16 |
| C | Center of Port to Top of Stem Adapter (in.) | 15 1/8 | 15 1/8 | 16 7/8 | 19 11/16 |
| D | Center of Port to Bottom of Body (in.) | 5 3/4 | 5 7/8 | 8 1/16 | 10 1/16 |
| E | Center of Port to Top of Handwheel Rim (in.) | 17 3/8 | 17 3/8 | 18 1/16 | 20 15/16 |
| F | Handwheel O.D. (in.) | 14 | 18 1/2 | 24 | 24 |
| | API Ring Gasket | BX-151 | BX-152 | BX-154 | BX-155 |
| | No. of Turns - Full Open to Full Closed ±1/4 | 12 1/2 | 12 1/2 | 18 1/4 | 23 1/2 |
| | Weight (lbs) | 270 | 275 | 680 | 1057 |

Dimensional Data - API **15000** PSI Working Pressure

| | | Minimum Bore | |
|---|--|--------------|---------|
| | | 1 13/16" | 2 1/16" |
| | Nominal Flange Size (in.) | 1.813 | 2.063 |
| A | End-to-End, Flanged (Ring Joint) (in.) | 18 | 19 |
| B | Extreme Width of Body (in.) | 9 7/8 | 9 7/8 |
| C | Center of Port to Top of Stem Adapter (in.) | 15 1/8 | 15 1/8 |
| D | Center of Port to Bottom of Body (in.) | 5 7/8 | 6 1/8 |
| E | Center of Port to Top of Handwheel Rim (in.) | 17 3/8 | 17 3/8 |
| F | Handwheel O.D. (in.) | 18 1/2 | 18 1/2 |
| | API Ring Gasket | BX-151 | BX-152 |
| | No. of Turns - Full Open to Full Closed ±1/4 | 12 1/2 | 12 1/2 |
| | Weight (lbs) | 275 | 350 |



HORN PARTS LIST FOR MANUAL GATE VALVES

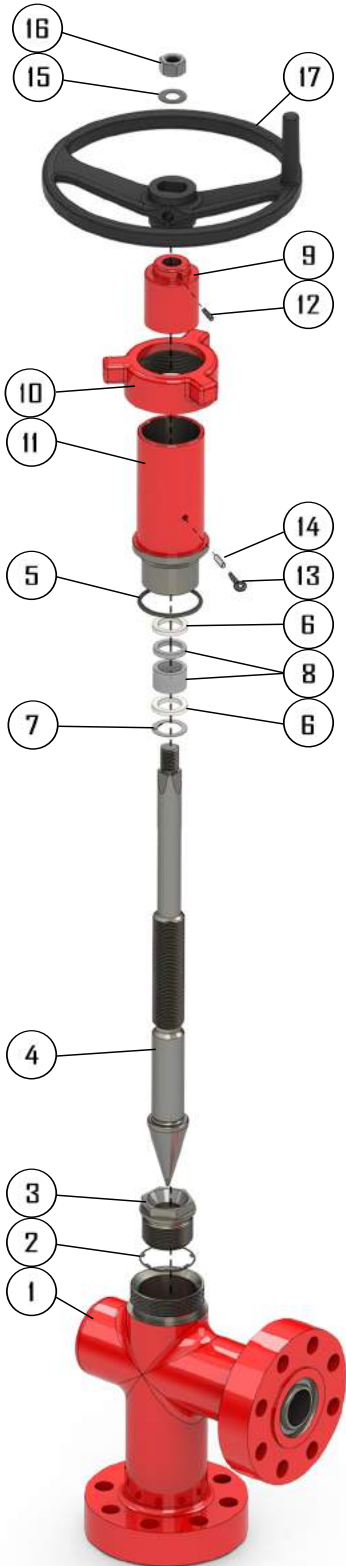


| Part | Qty | 1-13/16" 10M | 1-13/16" 15M | 2-1/16" 5M | 2-1/16" 10M | 2-1/16" 15M | 2-9/16" 5M | 2-9/16" 10M | 2-9/16" 15M | 3-1/8" 3M | 3-1/8" 5M | 3-1/16" 10M |
|---------------------------|--------|--------------|--------------|------------|--------------|-------------|------------|-------------|-------------|------------|-------------|-------------|
| 1.Handwheel | 1 | 19937-01 | 19937-10 | 19937-01 | 19937-01 | 19937-01 | 19937-01 | 19937-01 | 19937-01 | 19937-01 | 19937-01 | 19937-01 |
| 2.Bearing Cap | 1 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 | 47-4701 |
| 3.Grease Zerk | 1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 |
| 4.O-Ring, Bearing Cap | 1 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 | 64-6421-01 |
| 5.Bearing Race | 4 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 | 19108-01 |
| 6.Thrust Bearing | 2 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 | 5931-09 |
| 7.O-Ring, Stem Adaptor | 1 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 | 64-6410 |
| 8.Stem Adaptor | 1 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 | 47-4798 |
| 9.Stem Pin | 1 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 | 84-8417 |
| 10.Packing Glad | 1 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 | 47-4766 |
| 11.Stem Packing | 1 | SP2 | SP2 | SP2 | SP2 | SP2 | SP2 | SP2 | SP2 | SP3 | SP2 | SP2 |
| 12.Bonnet Nut | 8, 12* | 1.125" | 1.25" | 7/8" | 1.125" | 1.25" | 1.0" | 1.125" | 1.25" | 1.0" | 1.125" | 1.375" |
| 13.Bonnet Stud | 8, 12* | 1 1/8x5 1/4 | 1 1/4x5 3/8 | 7/8x4 | 1 1/8x 5 1/4 | 1 1/4x 6 | 1"x 4 3/8 | 1 1/8x 6.0 | 1 1/4x 7.25 | 1 x 4 | 1 1/8x5 1/8 | 1 3/8x6 1/2 |
| 14.Bonnet | 1 | 47-4716-1 | 47-4716-2 | 47-4716 | 47-4716-3 | 47-4716-4 | 47-4716-5 | 47-4716-6 | 47-4716-7 | 47-4716-8 | 47-4716-9 | 47-4716-10 |
| 15.Check Valve | 1 | 84-8413 | 84-8413 | N/A | 84-8413 | 84-8413 | N/A | 84-8413 | 84-8413 | N/A | N/A | 84-8413 |
| 16.Grease Fitting | 1 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 |
| 17.Bonnet Gasket | 1 | 47-4738 | 47-4738 | 47-4737 | 47-4735 | 47-4735 | 47-4732 | 47-4731-1 | 47-4730 | 47-4729 | 47-4729 | 47-4728 |
| 18.Op. Stem | 1 | 47-4799-06 | 47-4799-06 | 47-4799-06 | 47-4799-06 | 47-4799-06 | 47-4799-05 | 47-4799-05 | 47-4799-05 | 47-4799-04 | 47-4799-04 | 47-4799-04 |
| 19.Gate | 1 | 48-4825 | 48-4825 | 48-4824 | 48-4824 | 48-4824 | 48-4823-1 | 48-4823-1 | 48-4823-2 | 48-4823 | 48-4823 | 48-4823 |
| 20.Retainer Plate | 2 | 47-4774 | 47-4774 | 47-4773-1 | 47-4773-1 | 47-4773-1 | 47-4773 | 47-4773 | 47-4772-1 | 47-4772 | 47-4772 | 47-4772 |
| 21.Seal Ring, Body Bushin | 2 | 65-6526 | 65-6526 | 65-6522 | 65-6522 | 65-6522 | 65-6518 | 65-6518 | 65-6516-1 | 65-6515 | 65-6515 | 65-6515 |
| 22.Body Bushing | 2 | 47-4715 | 47-4715 | 47-4714 | 47-4714 | 47-4714 | 47-4712 | 47-4712 | 47-4712-1 | 47-4711 | 47-4711 | 47-4710 |
| 23.Seal Ring, Seat | 2 | 65-6525 | 65-6525 | 65-6521 | 65-6521 | 65-6521 | 65-6518-1 | 65-6518-1 | 65-6516 | 65-6514 | 65-6514 | 65-6514 |
| 24.Seat Ring | 2 | 47-4795 | 47-4795 | 47-4791 | 47-4791 | 47-4791 | 47-4788 | 47-4788 | 47-4788-1 | 47-4785 | 47-4785 | 47-4785 |
| 25.Gate Guide | 2 | 47-4761 | 47-4761 | 47-4760-1 | 47-4760-1 | 47-4760-1 | 47-4760 | 47-4760 | 47-4762-2 | 47-4759 | 47-4759 | 47-4759 |
| 26.Body | 1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

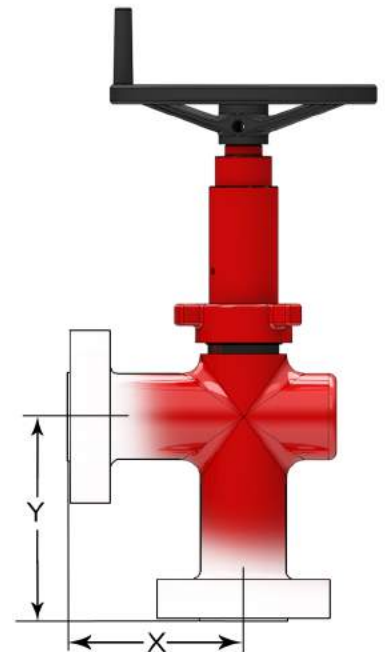
| Part | Qty | 3-1/16" 15M | 4-1/8" 3M | 4-1/8" 5M | 4-1/16" 10M | 4-1/16" 15M | 7-1/16" 3M x 6-1/8" | 7-1/16" 3M x 6-3/8" | 7-1/16" 5M x 6-1/8" | 7-1/16" 5M x 6-3/8" | 7-1/16" 10M |
|---------------------------|--------|-------------|------------|------------|-------------|-------------|---------------------|---------------------|---------------------|---------------------|-------------|
| 1.Handwheel | 1 | 19937-01 | 19937-01 | 19937-01 | 19937-03 | 19937-03 | 20774-02 | 20774-02 | 20774-02 | 20774-02 | 20774-02 |
| 2.Bearing Cap | 1 | 47-4702 | 47-4701 | 47-4701 | 47-4702 | 47-4702 | 47-4702 | 47-4702 | 47-4702 | 47-4702 | 47-4702-1 |
| 3.Grease Zerk | 1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 | 47-4763-1 |
| 4.O-Ring, Bearing Cap | 1 | 64-6421-3 | 64-6421-01 | 64-6421-01 | 64-6421-3 | 64-6421-3 | 64-6421-3 | 64-6421-3 | 64-6421-0 | 64-6421-3 | 64-6451A2 |
| 5.Bearing Race | 4 | 19310-01 | 19108-01 | 19108-01 | 19310-01 | 19310-01 | 19310-01 | 19310-01 | 19310-01 | 19310-01 | 19310-01 |
| 6.Thrust Bearing | 2 | 5931-10 | 5931-09 | 5931-09 | 5931-10 | 5931-10 | 5931-10 | 5931-10 | 5931-10 | 5931-10 | 5931-10 |
| 7.O-Ring, Stem Adaptor | 1 | 64-6410-2 | 64-6410 | 64-6410 | 64-6410-2 | 64-6410-2 | 64-6410-2 | 64-6410-2 | 64-6410-2 | 64-6410-2 | 64-6419-1 |
| 8.Stem Adaptor | 1 | 47-4797 | 47-4798 | 47-4798 | 47-4797 | 47-4797-1 | 47-4797 | 47-4797 | 47-4797 | 47-4797 | 47-4799 |
| 9.Stem Pin | 1 | 84-8418 | 84-8417 | 84-8417 | 84-8418 | 84-8418 | 84-8419 | 84-8419 | 84-8419 | 84-8419 | 84-8420 |
| 10.Packing Glad | 1 | 47-4765 | 47-4766 | 47-4766 | 47-4765 | 47-4766-1 | 47-4765 | 47-4765 | 47-4765 | 47-4765 | 47-4766-2 |
| 11.Stem Packing | 1 | SP3 | SP4 | SP2 | SP3 | SP4 | SP3 | SP3 | SP3 | SP3 | SP5 |
| 12.Bonnet Nut | 8, 12* | 1.25" | 1.125" | 1.25" | 1.625" | 1.875" | 1.125" | 1.125" | 1.375" | 1.375" | 1.5" |
| 13.Bonnet Stud | 8, 12* | 1 1/4x6 7/8 | 1 1/8x4.5 | 1 1/4x5.25 | 1 5/8x7.75 | 1 7/8x8.12 | 1 1/8x5 | 1 1/8-5 | 1 3/8x7 | 1 3/8 x 7 | 1 1/2x 7.25 |
| 14.Bonnet | 1 | 47-4716-11 | 47-4716-12 | 47-4717 | 47-4717-1 | 47-4717-2 | 47-4717-3 | 47-4717-3 | 47-4717-4 | 47-4717-4 | 47-4717-5 |
| 15.Check Valve | 1 | 84-8413 | N/A | N/A | 84-8413 | 84-8413 | 84-8413 | N/A | N/A | N/A | N/A |
| 16.Grease Fitting | 1 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 | 47-4763 |
| 17.Bonnet Gasket | 1 | 47-4726 | 47-4725 | 47-4725 | 47-4724-1 | 47-4720 | 47-4719 | 47-4719 | 47-4719 | 47-4719 | 47-4718 |
| 18.Op. Stem | 1 | 47-4799-07 | 47-4799-03 | 47-4799-03 | 47-4799-02 | 47-4799-01 | 47-4799-00 | 47-4799-00 | 47-4799-00 | 47-4799-00 | 47-4799 |
| 19.Gate | 1 | 48-4823-0 | 48-4822 | 48-4822 | 48-4821 | 48-4821-1 | 48-4820-1 | 48-4820-2 | 48-4820-1 | 48-4820-2 | 48-4820 |
| 20.Retainer Plate | 2 | 47-4771-1 | 47-4771 | 47-4771 | 47-4700 | 47-4769 | 47-4768 | 47-4768 | 47-4768 | 47-4768 | 47-4767 |
| 21.Seal Ring, Body Bushin | 2 | 65-6515-1 | 65-6512 | 65-6512 | 65-6512 | 65-6507 | 65-6502 | 65-6502 | 65-6502 | 65-6502 | 65-6500 |
| 22.Body Bushing | 2 | 47-4709 | 47-4708 | 47-4708 | 47-4707 | 47-4706 | 47-4705 | 47-4704 | 47-4705 | 47-4704 | 47-4703-1 |
| 23.Seal Ring, Seat | 2 | 65-6515-2 | 65-6508 | 65-6508 | 65-6508 | 65-6507-1 | 65-6504 | 65-6504 | 65-6504 | 65-6504 | 65-6501 |
| 24.Seat Ring | 2 | 47-4784-1 | 47-4782 | 47-4782 | 47-4780 | 47-4778 | 47-4799-07 | 47-4777 | 47-4799-07 | 47-4777 | 47-4776 |
| 25.Gate Guide | 2 | 47-4762-3 | 47-4758 | 47-4758 | 47-4757 | 47-4756 | 47-4755 | 47-4755 | 47-4755 | 47-4755 | N/A |
| 26.Body | 1 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

HORN PRODUCTION CHOKE PARTS LIST and DATA

HEC Production Chokes are available in a number of sizes and applications. Chokes offer a dependable and economical means of controlling moderate pressures depending on the service application. Consult a Horn Equipment Representative about availability regarding other sizes or custom applications not listed.



| Item No. | Description | 1" Maximum Orifice 2M to 10M PSI Working Pressure | 2" Maximum Orifice 2M to 5M PSI Working Pressure |
|----------|-----------------|---|--|
| 1 | Body | N/A | N/A |
| 2 | Gasket | 46-4629 | 46-4630 |
| 3 | Seat | 38132 | 40586 / 678605 |
| 4 | Needle | 19688-01R | 20731R |
| 5 | O-Ring | 64-6434-1 | 64-6443 |
| 6 | Junk Ring | 84-8430 | 84-8431 |
| 7 | Retainer Ring | 84-8432 | 84-8433 |
| 8 | J-Packing | SP1 | SP6H |
| 9 | Indicator | 46-4626 | 46-4627 |
| 10 | Bonnet Nut | 84-8438 | 84-8439-5m / 84-8440-10m |
| 11 | Bonnet | 14-1407 | 14-1408-5m / 14-1409-10m |
| 12 | Set Screw | 84-8434 | 84-8435 |
| 13 | Thumb Screw | 84-8436 | 84-8436 |
| 14 | Plug | 84-8437 | 84-8437 |
| 15 | Washer | - | - |
| 16 | Hex Bolt or Nut | - | - |
| 17 | Handwheel | 02774-03 | 02774-04 |



| Inlet | Outlet | Working Pressure (PSI) | Body Style | Dimensions | |
|---------------------------|---------------|------------------------|-----------------|------------|----------|
| | | | | X | Y |
| 1" Maximum Orifice | | | | | |
| 2 1/16" - 5M | 2 1/16" - 5M | 3000 | FLANGE x FLANGE | 6 7/8" | 8" |
| 2 1/16" - 5M | 2 1/16" - 5M | 5000 | FLANGE x FLANGE | 6 7/8" | 8" |
| 2 1/16" - 10M | 2 1/16" - 10M | 10000 | FLANGE x FLANGE | 7 11/16" | 8 13/16" |
| 2" Maximum Orifice | | | | | |
| 2 1/16" - 5M | 2 1/16" - 5M | 5000 | FLANGE x FLANGE | 8 15/16" | 11 7/16" |
| 2 1/16" - 10M | 2 1/16" - 10M | 10000 | FLANGE x FLANGE | 10 3/8" | 12" |
| 3 1/8" - 3M | 3 1/8" - 3M | 3000 | FLANGE x FLANGE | 8 7/8" | 11 3/8" |
| 3 1/8" - 5M | 3 1/8" - 5M | 5000 | FLANGE x FLANGE | 8 7/8" | 11 3/8" |
| 3 1/16" - 10M | 3 1/16" - 10M | 10000 | FLANGE x FLANGE | 10 3/8" | 11 3/4" |
| 4 1/16" - 3M | 4 1/16" - 3M | 3000 | FLANGE x FLANGE | 10 3/8" | 11 5/8" |
| 4 1/16" - 5M | 4 1/16" - 5M | 5000 | FLANGE x FLANGE | 10 1/8" | 12 5/8" |
| 4 1/16" - 10M | 4 1/16" - 10M | 10000 | FLANGE x FLANGE | 9 15/16" | 11 1/2" |



Terms and Conditions

Prices, Taxes and Payment. The price for the product manufactured, remanufactured or tested (collectively referred to as "Equipment" or "Work") by Horn Equipment ("HEC") is that reflected in the Purchase Order. All prices shown are in U.S. dollars and are F.O.B. HEC's shipping point. Any tax or other charges imposed by law on the sale or production of goods or the performance of services shall be paid by the Buyer, unless the law specifically provides that such payment must be made by HEC, in which case Buyer shall reimburse HEC for such payment as part of the purchase price. Custom duties, consular fees, insurance charges and other comparable charges will be borne by Buyer. HEC reserves the right to place a service charge on past due accounts at the highest rate permitted by law. Terms of payment are thirty (30) days from date of invoice unless otherwise stated in the quotation of HEC's order acknowledgment.

Warranty of Work. HEC Warrants to Buyer (and no other person or entity) its materials and workmanship for 12 months from the date of completion of the Work Order if the product manufactured is used in the manner it was intended, within the pressure range for which it was manufactured and is properly maintained. HEC warrants its materials and workmanship on remanufactured products for 12 months from the date of completion of the Work Order. Liability pertaining to products or parts not wholly of HEC's manufacture shall be limited to the extent of HEC's recovery from the manufacturer of such products or parts under its liability to HEC. Buyer's exclusive remedies for damages, failure to perform, or breach of this Work Order or warranty claim shall be (i) correction of same by retesting, adjustment or repair, at HEC's option, or (ii) refund of the amount paid by Buyer for that portion alleged to be defective not to exceed the total amount paid HEC for the Product or Work. HEC has no liability for Buyer's removal or reinstallation of products or equipment or for labor costs, expenses resulting of defects, recovery under general tort law or strict liability or for damages resulting from delays, loss of use, or other direct, indirect or consequential damages of any kind. THIS LIMITED WARRANTY AND REMEDY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER REMEDIES AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY, WORKMANSHIP OR FITNESS FOR ANY PARTICULAR PURPOSE, ALL OF WHICH ARE HEREBY DENIED BY HEC AND WAIVED BY BUYER, EXCEPT AS EXPRESSLY SET FORTH IN THIS AUTHORIZATION. Buyer acknowledges and agrees that HEC is only responsible for the specific services agreed upon in the Work Order, and HEC SHALL NOT BE LIABLE FOR ANY CONDITIONS, CONTAMINANTS OR INDEPENDENT SOURCES THAT IN THE OPINION OF HEC HAVE AFFECTED THE PRODUCT OR WORK PERFORMED. HEC shall not be responsible for any undisclosed conditions or contaminants to which the Product has been exposed, including any defective, pre-existing, concealed, hidden or not visible conditions, and Buyer shall notify HEC before it begins any work of any knowledge or information that may assist HEC in the performance of services. This warranty shall terminate and be of no further force or effect in the event Buyer or any person or entity other than HEC attempts or undertakes to remedy any of the Work performed by HEC that is claimed to be not as warranted or represented without first giving HEC written notice at of such claim and a reasonable opportunity to correct same.

Engineering and Service. Upon request, HEC will provide engineering and/or technical information regarding its products and uses and, if leasable, will provide personnel to assist Buyer in effecting field installations and/or field service. Any such information, service or assistance so provided, whether with or without charge, shall be advisory only.

Dispute Resolution. Any controversy arising or relating to this Lease shall be settled by arbitration in accordance with the rules of the Oklahoma Revised Uniform Arbitration Act, and judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction. Arbitration shall be held in Cleveland County, State of Oklahoma, and any question of law shall be decided in accordance with the laws of Oklahoma. Any language herein deemed invalid shall not affect any other clause, provision or paragraph herein.

Certificate of Completion. Buyer agrees to specify the Work it desires to have HEC perform in the Work Order and to inspect the Product or Work upon HEC's completion. Buyer agrees to notify HEC in writing of any clam, damage, defects, deficiencies, or failures in performance within 30 days of the event giving rise to the claim, damage, defects, deficiencies, or failures. To the extent they may validly do so, the parties agree that the Work will be deemed to be fully accepted without defect if no notice as required herein is received by HEC within 12 months of the completion of Work.

Final Inspection, Delivery and Acceptance. Inspection and acceptance of Product or Work must be made at HEC's plant or other shipping or receiving point designated by HEC and shall be conclusive except as regards latent defects. Delivery shall be in acceptance with the requirements in the Work Order, provided, in the event Buyer is unable to accept delivery upon completion of the Work in accordance with such requirements, Buyer agrees that (i) title and risk of ownership shall pass to Buyer on date of HEC's invoice, and (ii) Buyer will make payments within thirty (30) days after date of such invoice. HEC shall retain custodial risk of loss until delivery is made in accordance with such requirements. Shipment schedules are given as accurately as conditions permit and every effort will be made to make shipments as scheduled. HEC will not be responsible for deviations in meeting shipping schedules nor for any losses or damages to Buyer (or any third party) occasioned by deviations in the shipping schedule, whether due to Acts of God, orders bearing priority ratings established pursuant to law, fire, flood, shortages or failure of raw materials, supplies, fuel, power or transportation, breakdown of equipment or any other cause beyond HEC's reasonable control whether of similar or dissimilar nature than those enumerated. HEC shall have additional time within which to perform as may be reasonably necessary under the circumstances and shall have the right to apportion its production among its Buyers in such a manner as it may consider to be equitable. HEC reserves the right to furnish commercially equivalent or better substitutes for materials or to subcontract the Buyer's order or portions thereof as HEC deems necessary. In no event shall HEC be liable for any consequential damages resulting from failure or delay in shipment. If Buyer requires drawings, procedures, standards, or similar material for approval, shipping schedules are based on HEC having all required information and a firm order from Buyer which is enterable into production. Any hold points, witness points or the need for inspection by Buyer's representatives must be identified by Buyer at the time of quotation (if any) and/or placement in order that the effect on the prices or shipping schedules (if any) can be taken into account. Additional inspection or testing required by Buyer which affects normal production sequence will be considered as extending the shipping dates accordingly.

Limitation of Liability. Buyer acknowledges that it is the Buyer's responsibility to maintain the product manufactured, remanufactured or tested by HEC in accordance with the industry standards including but not limited to function testing of the Product. Buyer acknowledges that in the event any defect or damage occurs from Buyer's use of the product serviced by HEC, Buyer holds HEC harmless for any and all failures and agrees to indemnify HEC against claims by third parties for damages that are not resulting from the acts or negligence of HEC. Buyer agrees to hold HEC harmless from and against all claims, demands, losses, damages and causes of action of whatever kind or nature for loss of or damage to property arising from or attributable to the negligence of Buyer. Buyer agrees to hold HEC harmless from and against all claims, demands, losses, damages and causes of action of whatever kind or nature for the death(s) of or personal injury(ies) arising from or attributable to the negligence of Buyer. Buyer shall hold HEC harmless from and against all claims (including clean-up costs and loss(es) of oil, gas or hydrocarbons) arising from pollution, contamination, dumping or spilling of any substance resulting from the negligence of Buyer. HEC's total responsibility, if any, for any claims, damages, losses or liability arising out of or related to its performance of the Work Order or the Work covered hereunder shall not exceed the purchase price.

Indemnity. IN NO EVENT SHALL HEC, ITS OFFICERS, AGENTS, OWNERS, REPRESENTATIVES OR EMPLOYEES BE LIABLE UNDER ANY THEORY OR REMEDY (CONTRACT, IMPLIED WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY, OR OTHER LEGAL OR EQUITABLE THEORY) FOR ANY PUNITIVE, ANTICIPATED OR LOST PROFITS, DELAYS, LOSS OF USE, LOSS OF BUSINESS OPPORTUNITY, OR DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGES OR EXPENSE OF ANY KIND. HEC is not responsible for failures or damages resulting from Buyer's alteration, lack of proper maintenance or lack of compliance with recommended maintenance procedures, or which in HEC's judgment affect the Product. As a condition to bringing suit to enforce HEC's obligations hereunder, Buyer must give HEC written notice or any breach or failure of HEC within 30 days of its discovery. ALL INDEMNITY OBLIGATIONS AND/OR LIABILITIES HEREBY ASSUMED BY THE PARTIES SHALL BE: (I) SUPPORTED BY INSURANCE; (II) WITHOUT LIMIT; (III) AND WITHOUT REGARD TO THE CAUSE OR CAUSES THEREOF, INCLUDING, BUT NOT LIMITED TO, PREEXISTING CONDITIONS (WHETHER SUCH CONDITIONS BE PATENT OR LATENT).

H2S Disclosure. Buyer has disclosed to HEC all exposures of the Product serviced by HEC to H2S and understands the following: Carbon and low alloy steels and cast irons selected using NACE 15156-2 P1 are resistant to cracking under "defined" H2S conditions containing environments in oil and gas production but not necessarily immune to cracking under all sure conditions. Lab testing can only approximate field source conditions. HEC can only issue a limited certificate of compliance if the complete H2S history of the equipment cannot be or is not disclosed.

NOTES:

NOTES:



131 Sunnyslane Rd.
Moore, OK 73160
(405) 793-9101



www.hornequipment.com

405.793.9101 - 131 Sunnyslane Rd. - P.O. Box 6145 - Moore Oklahoma 73153