B. Product Specification

1.0 Cylinder Design

4.75 and 6.00 Cyls: 1 piece design - rectangular block type cylinder with integral CE head and separate removable OE head.

7.00 - 23.00 Cyls: 1 piece design - barrel type cylinder with integral CE head and separate removable OE head. 7.00 and 8.00 storage cylinders have separate CE head. 11.50" - 12.50" pipeline cylinders have liners.

26.00 and 26.50 Cyls: 2 piece design - clam shell type cylinder with integral CE head and separate removable OE head.

2.0 Cylinder Valve Location

4.75 and 6.00 Cyls. Valves located in cylinder block, tangential to bore, inlet and discharge directly opposed with top suction and bottom discharge.

7.00 - 23.00 Cyls. Valves located in cylinder barrel, tangential to bore, inlet and discharge directly opposed and offset with top suction and bottom discharge.

26.00 and 26.50 Cyls. Valves located in cylinder and OE head, tangential to conical sections, inlet and discharge configured for top suction and bottom discharge.

3.0 Cylinder Cooling

All cylinder sizes have the option of being provided with jackets for forced water cooling.

4.75 Cyl: Rectangular block type configuration with plate manifolded jackets on either side. Forced water cooling is optional.

6.00 - 15.00 Cyls. Choice of jacketted or non-jacketted type configuration. Outer heads on 11.50" sizes and up are jacketted. Forced water cooling is optional.

17.50 - 23.00 Cyls: Barrel cylinder is jacketted with cooling loop integral to casting, bottom inlet and top outlet. Outer heads have independent jackets with bottom inlet and top outlet. Forced water cooling is optional.

26.00 - 26.50 Cyls. Clam shell cylinder is jacketted with separate cooling loops for head and cylinder, each loop integral to casting, bottom inlet and top outlet. Forced water cooling is optional.

4.0 Cylinder Gas Connections

Top suction and bottom discharge gas connections. Flange connections are machined to conform to the dimensional requirements of ANSI B16.5.
Round Flange Connections

<table>
<thead>
<tr>
<th>CYLINDER SIZE (IN)</th>
<th>RATING (LBS)</th>
<th>SIZE (IN)</th>
</tr>
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<tbody>
<tr>
<td>4.75</td>
<td>900</td>
<td>3</td>
</tr>
<tr>
<td>6.00</td>
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<td>20.50</td>
<td>300</td>
<td>10</td>
</tr>
<tr>
<td>23.00</td>
<td>150</td>
<td>12</td>
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</table>

Rectangular Flange Connections (Non ANSI B16.5)

<table>
<thead>
<tr>
<th>CYLINDER SIZE (IN)</th>
<th>SIZE (IN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.00</td>
<td>24 x 6</td>
</tr>
<tr>
<td>26.50</td>
<td>24 x 6</td>
</tr>
</tbody>
</table>

5.0 Capacity Control / Unloading

5.1 Clearance Bottle Connection Plug (C.B.C. Plug) Located in outer head, option to shorten to increase clearance. See cylinder specifications for exact range of clearance available for each cylinder. Standard on all cylinders.

5.2 Clearance Pocket (optional) Variable volume, screw operated, located in head end. Clearance chamber sealed by piston and ring arrangement.

5.3 Unloaders (optional) Pneumatically actuated plug type depressor unloader. Located on suction valve on OE only. Required on each suction valve/end. Air to load.

6.0 Instrumentation OE and CE indicator holes, 2 per end, drilled, tapped and plugged (1/2" NPT).

7.0 Protective Coatings Interior surface: sprayed with rust preventive oil.

8.0 Bore Non lined, 32 RMS finish, 1/16" counter bore.

Option Nose to end lined bore, interference fit, positively locked with a dowel. Slip fit liner on 26" and 26.5" cylinders only.

Pneumatically actuated fixed volume pockets located in outerhead are available. Air to load.
9.0 Piston Assembly

Piston and rod assembly is held together by piston nut and locking setscrew.

Option: Supernut Style Piston Nut

9.1 Piston Design Configuration

4.75 - 10.50 Cyls. Solid, 1 piece design, cast gray iron.

11.50 – 13.00 Cyls. Cored cast iron, 1 piece design (non vented).

15.00 – 26.50 Cyls. Cored aluminum, 1 piece design (non vented). Pistons are anodized and Teflon impregnated, surface hardened to a depth of .02" to 385 – 400 Brinell hardness.

9.2 Piston Rings

Combination Rings Ring functions as a compression ring and rider band in one. On bores 10.50" and larger, ring is a single piece step cut with expanders on the 26.00" and 26.50" only. Rings smaller than 10.50" come as 2 piece.

10.0 Piston Rod

One piece heat treated alloy steel, 12-16 RMS finish in packing travel area, rolled threads. Rods are induction hardened in packing travel area (HRC = 50).

Option

Annealed Alloy Steel (HRC = 22 Max.) with D-R TC3 coating in packing travel area. HRC of coating = 70. 6-10 RMS finish.

Option

Age Hardened 17-4 PH Stainless Steel (HRC=26-33) with D-R TC3 coating in packing travel area. HRC of coating = 70. 6-10 RMS finish.

Option

Annealed Stainless Steel (Carpenter Custom 450) (HRC = 26 to 31) with D-R TC3 coating in packing travel area. HRC of coating = 70 6-10 RMS finish. Due to the availability issues associated with this material, please consult GFC Marketing before applying.

11.0 Piston Rod Packing

Full floating ring type, consisting of segmented rings attached by Inconel garter springs in annular cups, loaded by a bolted flange-like gland. Fully lubricated (one lube point ) and vented.

Option

Purged (see frame section under "distance piece").

Cases are jacketed for forced cooling on high pressure (> 2000 psig) cylinders 8.00" and smaller.

11.1 Ring Types and No.

4.75 - 8.00 Cyls. 3 types, 6 pairs: 1 breaker, 4 sealing and 1 vent ring.

9.00 - 10.50 Cyls. 2 types, 5 pairs: 4 sealing and 1 vent ring.

11.50 - 26.50 Cyls. 2 types, 4 pairs: 3 sealing and 1 vent ring.
11.2 Ring Descriptions

Pressure Breaker
Consists of a single, coated cast iron ring cut radially into equal segments. With pressure relief grooves on outer face. Zero end gap design. Rings located in cup closest to pressure. Used in packings rated over 1000 psig.

Sealing Rings
Comprised of one tangential cut teflon packing ring and one radial cut coated cast iron backup ring. This arrangement seals in one direction. Teflon ring always faces the pressure.

Vent Ring
Consists of one pair made up of two double acting tangentially cut Teflon packing rings. Ring pair located in flange end of case.

12.0 Cylinder Lubrication

12.1 System Configuration
Distribution Block Type - mechanical force feed lubricator driven off crankshaft with individual pumping unit(s) manifolded together and fed into divider block system. Divider valves w/cycle counters, filter(s), rupture disk, check valves and proximity switch included. 316 stainless steel tubing. Swagelok stainless steel fittings.

Option
(Standard when Pump to Point mechanical force feed lubricator driven off pressures exceed 3000 psig) crankshaft with individual pumping units for each lubrication feed. 316 stainless steel tubing. Swagelok stainless steel fittings. Check valves are included.

Option
Electric Driven Lubricator.

Option
Digital No-Flow Timer.

12.2 Lube Points
Two cylinder lube points, one centered at the top and the other at the bottom. One lube point for all packing with MAWP's < 2000 psig, two otherwise.

13.0 Valves

13.1 Valve Type

13.2 Valve Assembly
All cylinders have barrel type crabs and O-ring sealed valve covers. All assemblies are polarized so that an inlet valve cannot be installed in a discharge port.
### Valve Table

<table>
<thead>
<tr>
<th>BORE SIZE (IN)</th>
<th>VALVE SIZE</th>
<th>PRESSURE RATING PSIG (DIFF/STATIC)</th>
<th>NO. VALVES/ CORNER</th>
<th>LIFT (IN)</th>
<th>LIFT AREA (SQ. IN.)</th>
<th>EFFECTIVE FLOW AREA (SQ. IN.)</th>
<th>VALVE CLEAR. (CUIN)</th>
<th>INLET</th>
<th>DISCH</th>
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<td>8.96</td>
<td>23.97</td>
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</tr>
</tbody>
</table>

*High Pressure Valve

### Quality Assurance

14.0 All major components are visually and dimensionally inspected and their material content reviewed for compliance. Procedures are per D-R standard manufacturing specifications. Any records generated as a result are maintained at the factory.

- **Cylinder -** 1/2 hour hydrotest at 1.5 times MAWP. Chemical and physical Documentation provided: QAF-014 (assembly and test record)

- **Piston Rods -** Chemical, physical and magnetic particle. Documentation provided: None

- **Valving -** Leak tested. Documentation provided: None

**NOTE:** Additional dollars are required for the following (see pricing pages):
- Additonal QA/QC requirements outside the standard plan.
- Supplying documentation that normally isn't provided.
- Witnessing any tests or inspection points.