## Components

### Base Construction – ZG

Hydraulic Cylinder

| ITEM NO. | A   | B   | C   | D   | E   | E1  | E2  | F   | G   | H   | J   | K   | L   | M   | N   | O   | P   | Q   | R   | Metric Threads |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------|
| ZG-25-300 | Ø .984 | Ø .630 | 11.811 | 15.748 | 18.685 | 20.620 | 23.555 | 2.205 | 2.598 | 1.811 | .787 | .138 | .139 | .709 | 1.693 | 1.142 | .433 | .354 | .236 | M 8x1.25x20 | SM 5x.80x10 |
| ZG-25-400 | Ø .984 | Ø .630 | 17.008 | 20.945 | 24.882 | 26.817 | 29.752 | 2.205 | 2.598 | 2.205 | 1.811 | 1.388 | 1.339 | .709 | 1.693 | 1.142 | .433 | .354 | .236 | M 10x1.5x30 | SM 5x.80x10 |
| ZG-40-500 | Ø 1.575 | Ø .866 | 11.811 | 15.748 | 18.685 | 20.620 | 23.555 | 2.205 | 2.598 | 1.811 | .787 | .138 | .139 | .709 | 1.693 | 1.142 | .433 | .354 | .236 | M 16x2.0x45 | SM 8x1.25x16 |

**NOTE:** “A” is the bore size of the ZG Base Construction Hydraulic Cylinder.
Components

Standardized system for molding internal threads

- SAE-rack design
- Off-the-shelf replacement parts
- Simplifies mold design
- Applicable to different design styles
- Technical and application support
- Rack sized to provide maximum stroke lengths

**Alignment Plate – ZS**

NOTE: Two required per Hydraulic Cylinder.

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<thead>
<tr>
<th>ITEM NO</th>
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<td>ZS-63</td>
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* M6 Metric head screw included.

**Flange – ZB**

NOTE: "A" is the bore size of the ZB Base Construction Hydraulic Cylinder.

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<th>Version</th>
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<td>.787</td>
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<td>.413</td>
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<td>3 qty. M 12x1.75x40 / 1 qty. M 16x2.0x45</td>
<td>Vers. 3</td>
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* Metric socket head cap screws included with Flange (see I).

NOTE: "A" is the bore size of the ZB Base Construction Hydraulic Cylinder.
### Components

#### S.A.E. Rack – ZZ

20 Degree Pressure Angle Gear Teeth

**NOTE:** Mating Gear to be supplied by moldmaker.

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**NOTE:** “A” is the bore size of the ZG Base Construction Hydraulic Cylinder.

#### CAM Riser – ZL

(for use with S.A.E. Racks)

**NOTE:** Appropriate angle to be put on by moldmaker.

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**NOTE:** “A” is the bore size of the ZG Base Construction Hydraulic Cylinder.
# Hydraulic Unscrewing Device

## Components

### Guideway – ZF

NOTES:
1. Two guideways are required per Rack or per Cam Riser.
2. Only one length is stocked and must be cut to length to fit for shorter Hydraulic Cylinders.
3. Metric flat head screws are included with Guideway (see II).

![Guideway Diagram]

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NOTE: “A” is the bore size of the ZG Base Construction Hydraulic Cylinder.

### MAINTENANCE REPLACEMENT PARTS ONLY

#### 1A End Caps (out) – ZHU

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<td>.846</td>
<td>.354</td>
<td>1/4” BSPP</td>
<td>2.047</td>
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<tr>
<td>ZHU-40</td>
<td>1.339</td>
<td>.354</td>
<td>1/2” BSPP</td>
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<tr>
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NOTE: BSPP = British Pipe Thread Parallel
Ø = Diameter in Inches

#### 1B End Caps (in) – ZHI

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<td>.433</td>
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<td>1/4” BSPP</td>
<td>1.378</td>
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<tr>
<td>ZHI-40</td>
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<td>.315</td>
<td>1/2” BSPP</td>
<td>1.378</td>
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<tr>
<td>ZHI-63</td>
<td>.630</td>
<td>.472</td>
<td>3/4” BSPP</td>
<td>1.850</td>
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NOTE: BSPP = British Pipe Thread Parallel

### Pipe Thread Adapters – ZG

Adapter converts male BSPT to female NPT.

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<tr>
<td>ZG4001</td>
<td>1/2” BSPT = 1/2” NPT</td>
</tr>
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<td>ZG6301</td>
<td>3/4” BSPP = 3/4” NPT</td>
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</table>

NOTE: All other dimensions in inches unless otherwise specified.

---

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<tr>
<th>ITEM NO.</th>
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<th>E</th>
<th>E3</th>
<th>F</th>
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<tr>
<td>ZHU-40</td>
<td>1.339</td>
<td>.354</td>
<td>1/2” BSPP</td>
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<tr>
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NOTE: BSPP = British Pipe Thread Parallel
Ø = Diameter in Inches

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NOTE: BSPP = British Pipe Thread Parallel
Ø = Diameter in Inches

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>O</th>
<th>R</th>
<th>P</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZHI-25</td>
<td>.433</td>
<td>.236</td>
<td>1/4” BSPP</td>
<td>1.378</td>
</tr>
<tr>
<td>ZHI-40</td>
<td>.512</td>
<td>.315</td>
<td>1/2” BSPP</td>
<td>1.378</td>
</tr>
<tr>
<td>ZHI-63</td>
<td>.630</td>
<td>.472</td>
<td>3/4” BSPP</td>
<td>1.850</td>
</tr>
</tbody>
</table>

NOTE: BSPP = British Pipe Thread Parallel
Thread Lead = 1/(Threads per inch) = 1/Pitch = Inches/Thread
Thread Length = Length of threads to be removed from the cap

**A. Stroke (Inches)**

**NOTE:** Limit switches should be used if possible to limit full cylinder travel. This will extend the seal life inside the hydraulic cylinder.

**a) Required revolutions (thread core)**

\[
\text{Required revolutions} = \frac{\text{Thread Length}}{\text{Thread Lead}} + \text{Safety (}.5 \text{ revolutions minimum)}
\]

**b) 1. Required stroke – Inches**

\[
\text{Required stroke} = \text{Gear Pitch Diameter} \times \pi \times \text{Required Revolutions}
\]

If required stroke is too long, a cogwheel transmission should be used.

**2. Length of Rack**

\[b_2 = x + y + b_1\]

**c) Stripper stroke (Inches)**

\[
\text{Stripper stroke} = \text{Cylinder Stroke} - \text{Required Rack Stroke}
\]
B. Control Cam Calculation

d) Moving Cam (α)

NOTE: Moves Main Stripper Plate in sync. with unscrewing thread.

\[
\tan \alpha = \frac{\text{Thread Lead}}{\text{Gear Pitch Diameter} \times \pi}
\]

e) Stripper Cam (β)

NOTE: Moves Anti-Rotational Stripper Plate or provides “BUMP” to shake part off.

\[
\tan \beta = \frac{\text{Stripper Height}}{\text{Stripper Stroke}}
\]

C. Unscrewing Force

These figures should only be used as a guideline, as many other factors will affect the calculation (material, variation of dimensions, material shrinkage, core surface area, temperature, lubricants, friction, etc.).

f) Residual Pressure (PSI)

\[= \frac{1}{100} \text{ of maximum injection pressure}\]

g) Effective core surface area (Square Inches or in², Outer Core Cylinder Shell)

Flat end of threaded core neglected, \(x\) 2 value for 45° triangle thread shape

\[= \text{major thread dia of the core} \times \pi \times \text{thread height} \times 2\]

h) Unscrewing torque (in-lbf)

\[= \text{Residual Pressure} \times \text{Effective core surface area} \times \text{major thread radius of core}\]

i) Unscrewing force rack (lbf)

\[= \frac{\text{Unscrewing Torque}}{\text{Gear pitch radius}} \times \text{number of cavities}\]

k) Hydraulic force (lbf)

NOTE: x 1.5 is 50% Safety Factor, if x 1.0 there would be no safety factor.

\[= \text{Unscrewing Force} \times 1.5\]
**Working Cylinder Stroke**

Unscrewing force available at different hydraulic pressures (PSI)

<table>
<thead>
<tr>
<th>A (piston)</th>
<th>B (shaft)</th>
<th>1,160 PSI</th>
<th>1,450 PSI</th>
<th>1,740 PSI</th>
<th>2,030 PSI</th>
<th>2,175 PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.984&quot;</td>
<td>0.630&quot;</td>
<td>887 lbf</td>
<td>1,102 lbf</td>
<td>1,326 lbf</td>
<td>1,529 lbf</td>
<td>1,664 lbf</td>
</tr>
<tr>
<td>0.1575&quot;</td>
<td>0.866&quot;</td>
<td>2,248 lbf</td>
<td>2,810 lbf</td>
<td>3,395 lbf</td>
<td>3,957 lbf</td>
<td>4,204 lbf</td>
</tr>
<tr>
<td>0.2480&quot;</td>
<td>0.1417&quot;</td>
<td>5,598 lbf</td>
<td>6,992 lbf</td>
<td>8,409 lbf</td>
<td>9,802 lbf</td>
<td>10,476 lbf</td>
</tr>
</tbody>
</table>

**NOTE:** "A" is the bore size of the ZG Base Construction Hydraulic Cylinder.

**Returning Cylinder Stroke**

Force available at different hydraulic pressures (PSI)

<table>
<thead>
<tr>
<th>A (piston)</th>
<th>B (shaft)</th>
<th>1,160 PSI</th>
<th>1,450 PSI</th>
<th>1,740 PSI</th>
<th>2,030 PSI</th>
<th>2,175 PSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.984&quot;</td>
<td>0.630&quot;</td>
<td>517 lbf</td>
<td>652 lbf</td>
<td>787 lbf</td>
<td>922 lbf</td>
<td>989 lbf</td>
</tr>
<tr>
<td>0.1575&quot;</td>
<td>0.866&quot;</td>
<td>1,574 lbf</td>
<td>1,978 lbf</td>
<td>2,361 lbf</td>
<td>2,743 lbf</td>
<td>2,967 lbf</td>
</tr>
<tr>
<td>0.2480&quot;</td>
<td>0.1417&quot;</td>
<td>3,777 lbf</td>
<td>4,721 lbf</td>
<td>5,665 lbf</td>
<td>6,587 lbf</td>
<td>7,081 lbf</td>
</tr>
</tbody>
</table>

**NOTE:** "A" is the bore size of the ZG Base Construction Hydraulic Cylinder.
# Applications

## APPLICATIONS

**Required D-M-E Component List**

### Application A

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZG-xx-yyyy</td>
<td>1</td>
<td>Hydraulic Cylinder</td>
</tr>
<tr>
<td>ZS-xx</td>
<td>2</td>
<td>Alignment Plate</td>
</tr>
<tr>
<td>ZB-xx-y</td>
<td>1</td>
<td>Flange-Version 3</td>
</tr>
<tr>
<td>ZZ-xx-yyyy</td>
<td>2</td>
<td>S.A.E. Rack</td>
</tr>
<tr>
<td>ZL-xx-yyyy</td>
<td>1</td>
<td>Cam Riser</td>
</tr>
<tr>
<td>ZF-yyyy</td>
<td>6</td>
<td>Guideways for Racks &amp; Cam</td>
</tr>
</tbody>
</table>

### Application B

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZG-xx-yyyy</td>
<td>1</td>
<td>Hydraulic Cylinder</td>
</tr>
<tr>
<td>ZS-xx</td>
<td>4</td>
<td>Alignment Plate</td>
</tr>
<tr>
<td>ZB-xx-y</td>
<td>1</td>
<td>Flange-Version 1</td>
</tr>
<tr>
<td>ZZ-xx-yyyy</td>
<td>1</td>
<td>S.A.E. Rack</td>
</tr>
<tr>
<td>ZF-yyyy</td>
<td>2</td>
<td>Guideways for Rack</td>
</tr>
</tbody>
</table>

### Application C

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZG-xx-yyyy</td>
<td>2</td>
<td>Hydraulic Cylinder</td>
</tr>
<tr>
<td>ZS-xx</td>
<td>4</td>
<td>Alignment Plate</td>
</tr>
<tr>
<td>ZB-xx-y</td>
<td>2</td>
<td>Flange-Version 1</td>
</tr>
<tr>
<td>ZZ-xx-yyyy</td>
<td>2</td>
<td>S.A.E. Rack</td>
</tr>
<tr>
<td>ZF-yyyy</td>
<td>4</td>
<td>Guideways for Racks</td>
</tr>
</tbody>
</table>

### Application D

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Qty</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZG-xx-yyyy</td>
<td>1</td>
<td>Hydraulic Cylinder</td>
</tr>
<tr>
<td>ZS-xx</td>
<td>2</td>
<td>Alignment Plate</td>
</tr>
<tr>
<td>ZB-xx-y</td>
<td>1</td>
<td>Flange-Version 2</td>
</tr>
<tr>
<td>ZZ-xx-yyyy</td>
<td>1</td>
<td>Cam Riser</td>
</tr>
<tr>
<td>ZF-yyyy</td>
<td>2</td>
<td>Guideways for Cam</td>
</tr>
</tbody>
</table>

### NOTE:

Moldmaker should provide limit switches for fully closed and for cylinder extended. Full cylinder extension should be avoided to improve internal cylinder seal life.

[**A complete Engineering Design Guide, plus separate example, are available at www.dme.net/hud**](http://www.dme.net/hud)
Safety Considerations: Moldmaker must fabricate boxes over the rack areas which move to protect against injury to personnel. Moldmaker must also use safety interlocks to prevent movement of unscrewing device if these protection boxes are removed for any reason. Also, sheet metal should be used to cover areas where the gears are, to prevent damage from loose debris falling between the gears and racks.