HYDROCAM®
The Ultimate in Flexible Cam Design
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The Ultimate in Flexible Cam Design

We’ve Changed the World of Cams! HYDROCAM® systems are reshaping the way metal stamping dies are designed and operated. They are simple to install and operate, and yet this innovative product, engineered and first brought to the market by READY Technology, does so much to take complexity out of die design. With HYDROCAM®, many dies suddenly become a lot simpler, and thanks to HYDROCAM®, fewer dies are now required for part manufacture.

Here’s How They Work: The vertical action of the press is transferred into a precise cam action using patented hydraulic technology. As the press ram lowers, it makes contact with the piston rod of the pump of HYDROCAM® (we call the pump the H1 unit), at which point oil from the pump is transferred through one or more high pressure hoses to one or more piercing or forming units (we call these H2 units). The H2 units do the work and pierce or form the stamping part. The H2 units then return to their original position after completing their work by means of nitrogen gas pressure which is regulated by an adjustable return built into the units. Simple, innovative, and yes, so versatile.

Yes, so Versatile! The beauty of HYDROCAM® lies in its versatility. The H2 unit can be positioned into locations previously unreachable with classic mechanical dies at virtually any angle, up or down, to meet your piercing and forming requirements. Ask yourself the question: How can I design HYDROCAM® into my tool? More and more die designers are designing HYDROCAM® into their tools and are reducing cost to their customers in the process.

Simple, Proven & Reliable

HYDROCAM® is:

• Ideal for piercing, forming or flanging requirements.
• In stock for fast delivery.
• Powerful. One H-1 can serve up to four identical H-2 units.
• Versatile. Mount the H-2 at any angle up to six feet away from H-1.
• Forceful. The H-2 can deliver from 1.6 to 26 metric tons of force.
• The Most Complete Line. H-2 units are available with 25, 50, 75 and 100 mm stroke lengths depending on model selected.

NOTE: HYDROCAM®’s unique design eliminates the thrusting force of the ram/ slide from the cam station, allowing the use of standard L-GIBS to position and guide the station. Providing a guidance system for a HYDROCAM® driven cam station is the responsibility of the customer. Neither, the H2 unit’s piston rod, nor its front mounting plate assembly is designed to provide cam station guidance. Contact your representative for application support.
HYDROCAM® Is Powerful, Compact and Reliable, and Oh, Yes, It’s Interchangeable!

**Powerful** - Our patented design provides more force than any other cam of its kind. H2 piercing/forming units are available in seven sizes providing up to 26 metric tons of force, giving you powerful force where you need it.

**Compact** - Our unique low profile design for the H2 units make installations in tight areas possible. The ability to mount the H1 unit up to six feet away from the H2 unit makes this the cam of choice for transfer dies by avoiding interference with drivers and aerial tooling blocks.

**Reliable** - There are hundreds of HYDROCAM® systems operating worldwide today, reliably stamping parts and meeting demanding production schedules. HYDROCAM® was the first hydraulic cam of its kind to come to market, and more HYDROCAM® systems make parts for more customers than any competing brand.

**Interchangeable** - We carry a large inventory of all sizes of H1 and H2 units. If a die crashes, or other reasons require replacement of any HYDROCAM® unit, we provide the service and support to get your production back up and running quickly.

Ideal for retrofits and engineering changes

**Before**
- Costly and complicated mechanical cams.
- Increased maintenance costs due to mechanical wear.

**After**
- HYDROCAM® makes retrofits easy.
- Decreased maintenance costs and downtime.
How To Select a HYDROCAM® System for Your Application

Basic Selection:
1. Determine tonnage required (piercing or forming force, plus stripping force), per unit to perform the necessary work. Note when using urethane or other mechanical methods for stripping, please add the appropriate stripping force.
2. After you calculate the forces, select the correct H-2 unit(s) required to do the work. Do not exceed 90% of the H-2 unit's available de-rated force (rated force, less return system force) from the chart below. Include the proper stroke length needed for each unit (see pages 6 and 7 for available stroke lengths).
3. Determine the correct size and number of H-1 pump(s). Group identical H-2 units together (tonnage and stroke), performing identical work (piercing, forming of flanging). One H-1 pump can operate up to four identical H-2 piercing/forming units (see chart on page 5).

Force of H2 Piercing/Forming Unit
This chart shows the effect of a nitrogen or oil return system on the force rating of each H2 unit.

- **Standard Rate** equals the effect of standard (minimum) return force at 100 bar (1,450 psi) on the H2 unit's force. Ideal for piercing applications that use a customer-provided stripper.
- **Maximum Rate** equals the effect of maximum return force at 150 bar (2,175 psi) on the H2 unit's force. Ideal for multiple piercing applications, special shape piercing, all forming and flanging.

Working Example: To pierce two holes, 0.250 inch diameter, through 0.125 thick mild steel, with 50,000 psi minimum tensile strength. We selected a 25mm stroke length for this example. (The working example uses piercing as the HYDROCAM application. HYDROCAM is also ideal for forming, flanging and other applications.)

**Step 1** Calculate the force.

**Force** = (Hole Ø × (π = 3.1416) × material thickness × material tensile strength) + recommended 10% stripping force

English example: (.250 in. × 3.1416 × .125 in. × 50,000 psi) + 10% = 4,909 lbs. + 491 lbs. = 5,400 lbs. (÷ 2000 lbs. = 2.7 U.S. tons)

Metric example: (6mm × 3.1416 × 3mm × 40 daN per mm²) + 10% = 2,262 daN + 226 daN = 2,488 daN (÷ 1000 N = 2.5 metric tons)

**Step 2** Select the rate. In this example use the standard rate for piercing.

**Step 3** Apply the Rule of Ninety: Never exceed 90% of the rated force. 5400 lbs. ÷ 0.90 = 6000 lbs.

**Step 4** Read across the above chart until the rated force exceeds your Rule of Ninety value. In this example 6,346 lbs. exceeds 6000 lbs.

**Step 5** Read up to the column heading. This is the H2 model you need. In this example, H2 model 3.2.

**FORCE WARRANTY:** The minimum force that a H2 Piercing/Forming unit is warranted to provide is listed in the maximum rate column. If the customer's determined application force for a cam station's tonnage exceeds 90% of the maximum rate force, the next larger or multiple H2 unit(s) must be selected.
This chart determines the appropriate H1 Pump for the H2 unit(s) selected. The chart also lists the H1 Pump’s piston rod travel (mm) next to the number of identical H2 units served.

You need to know the H2 model number, the number of H2 units required and the H2 stroke length before using this chart.

Always use the Rule of Ninety. The chart is based on using ninety percent of the total volume (VT) of the H1 Pumps listed, in determining the number of identical H2 units that can be supplied by an H1 pump.

Different stroke lengths or different H2 models may not be used with the same H1 Pump. No more than four H2 units may operate off a single H1 Pump.

When two or more identical H2 units are used to extend a gang pierce bar or forming pad, each H2 unit must have its own H1 Pump.

NOTE: Piston rod travel may vary slightly. This results from normal variations in connecting hose length(s), and the number and style of the turning fittings.

Use only approved hose and fittings.

Working Example:

H-2 | H-1 Model 5 | Model 8 | Model 13 | Model 20 | Model 40 | Model 66
---|---|---|---|---|---|---
Model 2 | 25 mm | 1 (12.99) | 2 (18.49) | 3 (23.98) | | |
| | 50 mm | 1 (18.49) | 2 (22.26) | 3 (29.64) | 4 (37.02) | |
Model 3.2 | 50 mm | 1 (25.44) | 2 (31.60) | 3 (22.79) | 4 (27.88) | |
| | 75 mm | 1 (25.57) | 1 (29.77) | 2 (22.79) | 3 (30.43) | 4 (25.59) |
Model 5 | 75 mm | 1 (35.96) | 1 (39.54) | 2 (21.74) | 4 (26.49) | |
Model 7.8 | 75 mm | 1 (25.44) | 2 (26.48) | 3 (35.96) | 4 (23.55) | |
Model 12.5 | 75 mm | 1 (37.17) | 1 (20.05) | 2 (22.35) | 3 (29.77) | 4 (37.19) | 4 (52.04) |
Model 20 | 75 mm | 1 (26.32) | 2 (29.77) | 3 (40.90) | | |
Model 31 | 75 mm | 1 (26.32) | 2 (29.77) | 3 (40.90) | | |
| | 100mm | 1 (30.94) | 1 (30.94) | | | |

Here is what you need to order:

<table>
<thead>
<tr>
<th>QTY</th>
<th>PRODUCT DESCRIPTION</th>
</tr>
</thead>
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<tr>
<td>2</td>
<td>H-2-3.2 Piercing unit with 25mm stroke and front plate</td>
</tr>
<tr>
<td>1</td>
<td>H-1-5 Pump with stroke gauge ring</td>
</tr>
<tr>
<td>1</td>
<td>RT2175-CP Nitrogen Control Panel</td>
</tr>
<tr>
<td>2</td>
<td>RT70181670-6 Hydraulic Hose 6 foot long with swivel fittings (specify lengths up to 6 foot)</td>
</tr>
<tr>
<td>2</td>
<td>RT52041JC55-6 Nitrogen Hose 6 foot long with swivel fittings (specify lengths up to 6 foot)</td>
</tr>
</tbody>
</table>

Note:
- Nitrogen return is standard, oil return can be specified as an option.
- Front plate is standard, direct punch can be specified as an option.
- Straight fittings will be supplied to connect the hoses when ordered as a system, elbow fittings can be specified as an option.
HYDROCAM® H-2 Piercing
Forming Unit Specifications

Compact Power with User Flexibility

Standard Features:
• H-2 unit comes with adjustable nitrogen return force. A control panel must be ordered to take full advantage of this feature.
• Machinable front plate for customers to mount their tooling.

Popular Options:
• Direct Punch Option. Piston rod will accept a head type punch. Punch size and shank limitations are noted on the H-2 dimension chart, see D8 below.
• Oil Return Option. Used on special applications. See page 12 for details.

Mounting Suggestions:
• Locate the H-2 unit in any orientation.
• Provide for hose access to the back and right front side of the H-2 unit.
• Provide a mounting platform that will support three times the total force of the H-2 unit.
• Locate the H-2 unit against a thrust key.
• The H-2 unit’s piston rod is designed to extend fully each stroke.
• The H-2 unit is designed to provide force, not guidance. As with any air, hydraulic or nitrogen cylinder, neither the H-1 Pump nor the H-2 unit is designed to withstand side-thrust forces. Properly guiding the tool and cam station will minimize wear to the cylinders and increase seal life. This is especially true in applications with long strokes, heavy or large tooling mounted, or in applications that approach the work in a non-perpendicular presentation.

HYDROCAM® H2 Piercing/Forming Unit

H2 Piercing/Forming Unit Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
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<tr>
<td>2</td>
<td>3.2</td>
<td>5</td>
<td>7.8</td>
<td>12.5</td>
<td>20</td>
</tr>
<tr>
<td>Per Unit</td>
<td>metric</td>
<td>Force</td>
<td>mm</td>
<td>inch</td>
<td>ton</td>
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<tr>
<td>L1 stroke 25 mm</td>
<td>108</td>
<td>4.252</td>
<td>128</td>
<td>5.039</td>
<td>141</td>
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<tr>
<td>L1 stroke 75 mm</td>
<td>N/A</td>
<td>5.992</td>
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<td>L1 stroke 100 mm</td>
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<tr>
<th>L2</th>
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<td>15</td>
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<td>126</td>
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<td>44</td>
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<td>50</td>
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<tr>
<td>8 H7</td>
<td>10 H7</td>
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<tr>
<td>M12 x 1.0</td>
<td>M16 x 1.5</td>
<td>M20 x 1.5</td>
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<td>15</td>
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<td>18</td>
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<td>25</td>
<td>.984</td>
<td>32</td>
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<td>M8</td>
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<td>M12</td>
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All dimensions are nominal unless tolerance is stated.
HYDROCAM® H-2 Piercing
Forming Unit Specs. (cont.)

NOTE: De-rated Force equals maximum force less standard (minimum) return force.
See H-2 dimension chart on previous page. All figures are nominal unless tolerance is stated.
Forces are rated in metric tons (1 metric ton = 1.1 U.S. ton)

<table>
<thead>
<tr>
<th>Metric Force Per Unit</th>
<th>Model 2</th>
<th>Model 3.2</th>
<th>Model 5</th>
<th>Model 7.8</th>
<th>Model 12.5</th>
<th>Model 20</th>
<th>Model 31</th>
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<tr>
<td>daN lbf.</td>
<td>1787</td>
<td>3932</td>
<td>4545</td>
<td>7094</td>
<td>11,319</td>
<td>18,819</td>
<td>28,817</td>
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<tr>
<td>cm³ lbf.</td>
<td>0.491</td>
<td>0.0300</td>
<td>0.804</td>
<td>0.0491</td>
<td>1.257</td>
<td>0.1198</td>
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<tr>
<td>daN</td>
<td>1,963</td>
<td>4,328</td>
<td>4,998</td>
<td>7,801</td>
<td>12,473</td>
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<td>cm³</td>
<td>0.0749</td>
<td>2.454</td>
<td>1.917</td>
<td>2.995</td>
<td>4.756</td>
<td>7.668</td>
<td>11.982</td>
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<tr>
<td>cm³</td>
<td>24.54</td>
<td>60.32</td>
<td>94.25</td>
<td>147.26</td>
<td>233.79</td>
<td>376.99</td>
<td>589.05</td>
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<td>cm³</td>
<td>N/A</td>
<td>3.681</td>
<td>5.751</td>
<td>8.986</td>
<td>14.267</td>
<td>23.005</td>
<td>35.946</td>
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<tr>
<td>cm³</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>19.023</td>
<td>30.674</td>
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<tr>
<td>cm³</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>311.72</td>
<td>502.65</td>
<td>785.40</td>
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<td>daN lbf.</td>
<td>176</td>
<td>396</td>
<td>453</td>
<td>707</td>
<td>1,154</td>
<td>1,794</td>
<td>2,180</td>
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<tr>
<td>daN lbf.</td>
<td>596</td>
<td>1,056</td>
<td>1,526</td>
<td>2,385</td>
<td>3,891</td>
<td>3,975</td>
<td>7,351</td>
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</tbody>
</table>

H-2 Piercing Forming Unit Specs.

Standard: Front Mounting Plate

Option: Direct Round Punch Mounting (Note: limits on punch shank diameter)

Front View
Optional Direct Punch Mount

Top View

Side View

Front View
Standard Front Plate
(plate is machinable)
HYDROCAM H-1 Pump Specifications

READY recommends using only a premium grade of hydraulic oil.

The H-1 pump is available in six standard sizes. Each pump has four ports to activate up to four identical H-2 units. The quantity, size, and stroke length of the H-2 units hosed to each pump determines the size and oil volume of the pump needed. Pumps can be up to six feet away from H-2 units. This allows you to free up critical die space and balance die loads.

Piston Rod Travel
Piston rod travel controls oil volume going to the H-2 unit(s). Our selection chart on page 5 provides the dimension for you. See page 10 for this calculation.

Optional Stroke Gauge Ring
Used as a visual gauge to assist in setup. Ring is located on top of pump body and made to the appropriate height based upon piston rod travel calculation. This stroke gauge ring is not a stop block and should be used for setup purposes only. See page 10 for this calculation.

Mounting Suggestions:
• The H-1 pump’s piston rod must be up and perpendicular to the ram.
• H-1 pump must be located at or above the H-2 unit’s elevation.
• Locate the H-1 anywhere in the die under the ram that provides ram balance and simple hose access to the H-2 unit(s).
• Locate the H-1 pump within six feet of the H-2 unit(s).
• Always use stop blocks.
• Die storage blocks are recommended.
• Never store pump with piston rod depressed or upside down.

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### HYDROCAM H-1 Pump Specifications

**Model** | **H dimension**
---|---
HYDRO CAM H1-5 | 21 mm (0.83 in)
HYDRO CAM H1-8 | 25 mm (0.98 in)
HYDRO CAM H1-13 | 25 mm (0.98 in)
HYDRO CAM H1-20 | 25 mm (0.98 in)
HYDRO CAM H1-40 | 30 mm (1.18 in)
HYDRO CAM H1-66 | 40 mm (1.57 in)

**NOTE:** READY understands that a few applications will exceed this guide. Contact your READY representative for application support.
### HYDRO CAM® H-1 Pump Specifications (cont.)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Model 5 cm³</th>
<th>Model 8 cm³</th>
<th>Model 13 cm³</th>
<th>Model 20 cm³</th>
<th>Model 40 cm³</th>
<th>Model 66 cm³</th>
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</thead>
<tbody>
<tr>
<td>VT Total Volume</td>
<td>3.051</td>
<td>4.882</td>
<td>7.933</td>
<td>12.205</td>
<td>24.409</td>
<td>40.275</td>
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<tr>
<td>V1 Vol./Stroke per mm</td>
<td>2.235 cm³</td>
<td>3.318 cm³</td>
<td>3.318 cm³</td>
<td>7.854 cm³</td>
<td>13.273 cm³</td>
<td>13.273 cm³</td>
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<tr>
<td>Ht 1 Die Open Height</td>
<td>133 mm</td>
<td>145 mm</td>
<td>195 mm</td>
<td>166 mm</td>
<td>195 mm</td>
<td>275 mm</td>
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<tr>
<td>Ht 2 Height of Base</td>
<td>41 inch</td>
<td>42 inch</td>
<td>57 inch</td>
<td>46 inch</td>
<td>50 inch</td>
<td>70 inch</td>
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<tr>
<td>Ht 3 Total Stroke</td>
<td>31 mm</td>
<td>32 mm</td>
<td>47 mm</td>
<td>34 mm</td>
<td>38 mm</td>
<td>58 mm</td>
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<tr>
<td>Ht 4 max. Volume Stroke</td>
<td>23 inch</td>
<td>24 inch</td>
<td>39 inch</td>
<td>26 inch</td>
<td>30 inch</td>
<td>50 inch</td>
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<td>Ht 5 Approach Stroke</td>
<td>8 mm</td>
<td>8 mm</td>
<td>8 mm</td>
<td>8 mm</td>
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<td>D1 Ø Piston Diameter</td>
<td>53.34 mm</td>
<td>65 mm</td>
<td>65 mm</td>
<td>100 mm</td>
<td>130 mm</td>
<td>130 mm</td>
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<tr>
<td>D2 Ø Rod Diameter</td>
<td>20 mm</td>
<td>25 mm</td>
<td>25 mm</td>
<td>50 mm</td>
<td>60 mm</td>
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<tr>
<td>D3 Ø Body Diameter</td>
<td>82 mm</td>
<td>100 mm</td>
<td>100 mm</td>
<td>147 mm</td>
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<td>182 mm</td>
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<td>D4 min. Ø (not supplied)</td>
<td>45 mm</td>
<td>55 mm</td>
<td>55 mm</td>
<td>95 mm</td>
<td>120 mm</td>
<td>120 mm</td>
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<td>D5 min. Ø Base Cross Corners</td>
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<td>141 mm</td>
<td>141 mm</td>
<td>203 mm</td>
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<td>D6 min. Ø Optional Gauge</td>
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<td>98 mm</td>
<td>145 mm</td>
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<td>Sq. 1 Base</td>
<td>90 mm</td>
<td>105 mm</td>
<td>105 mm</td>
<td>150 mm</td>
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<td>Sq. 2 Bolt Hole Pattern</td>
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<td>84 mm</td>
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<td>150 mm</td>
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<td>M (x4)</td>
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<td>M10</td>
<td>M10</td>
<td>M12</td>
<td>M16</td>
<td>M16</td>
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<td>P Piston Area cm²</td>
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<td>33.18 cm²</td>
<td>33.18 cm²</td>
<td>78.54 cm²</td>
<td>132.73 cm²</td>
<td>132.73 cm²</td>
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All dimensions are nominal unless tolerance is stated.
Additional HYDROCAM® System Calculations:

- Calculations are based upon the example as shown on page 4.
- These will assist in understanding optimal working conditions.
- It may be necessary to calculate your total system working pressure and total force required to drive the H-1 pump.

**Calculate the Required Total Volume of Oil:**

\[
VT = \text{Total # of H-2 units (N)} \times \text{Volume per mm of stroke (from H-2 chart on page 7)} \times \text{Stroke length of each H-2 unit (SL)}
\]

English: \( VT = 2 \text{ units} \times 0.0491 \text{ in}^3 \text{ per mm} \times 25 \text{ mm stroke length} = 2.455 \text{ in}^3 \)

Metric: \( VT = 2 \text{ units} \times 0.804 \text{ cm}^3 \text{ per mm} \times 25 \text{ mm stroke length} = 40.2 \text{ cm}^3 \)

For this example, we have chosen an H-1 5 pump, because the maximum volume of this size pump is 3.051 in³ (50 cm³) (from H-1 chart on page 9).

*Note:* Never use more than 90% of the H-1 units maximum oil volume.

**Calculating the H-1 Piston Rod Travel:**

\[
\text{Ht 5 (from H-1 chart on pg 9)} + \left( \frac{VT \text{ (from above calculation)}}{V1 \text{ (from H-1 chart on page 9)}} - 0.02 \text{ in} \right) = \text{Piston Rod Travel}
\]

English: \( 0.315 \text{ in} + \left( \frac{2.455 \text{ in}^3}{2.014 \text{ in}^3 \text{ per in} - 0.02 \text{ in}} \right) = 1.004 \text{ inch piston rod travel} \)

Metric: \( 8 \text{ mm} + \left( \frac{40.2 \text{ cm}^3}{2.235 \text{ cm}^3 \text{ per mm} - 0.50 \text{ mm}} \right) = 25.49 \text{ mm piston rod travel} \)

**Calculating “Optional” Stroke Gauge Ring Thickness (used for set-up):**

\[
\text{Ht 3 (from H-1 chart on pg 9)} - \text{Piston Rod Travel (from above calculation)} = \text{Stroke Gauge Ring Thickness}
\]

English: \( 1.22 \text{ in} - 1.004 \text{ in} = 0.216 \text{ inches} \)

Metric: \( 31 \text{ mm} - 25.49 \text{ mm} = 5.51 \text{ mm} \)

For this example, we will use the H-1-5 pump (refer to H-1 chart)

**Calculating Total Internal Working Pressure:**

\[
\text{Maximum System Working Pressure} \times \text{Required Tonnage (from Step #3 on pg. 4)} = \text{Total Working Pressure}
\]

English: \( (5,802 \text{ psi} ÷ 7,050 \text{ lbs.}) \times 6,000 \text{ lbs.} = 4,938 \text{ psi} \)

Metric: \( (400 \text{ bar} ÷ 3,198 \text{ daN}) \times 2,765 \text{ daN} = 346 \text{ bar} \)

**Calculating Total Required Force to Drive H-1:**

\[
\text{Piston Area of H-1 (from H-1 chart on pg. 9)} \times \text{Total Working Pressure (from above)}
\]

English: \( 3.464 \text{ in}^2 \times 4,938 \text{ psi} = 17,105 \text{ lbs. (2,000 lbs. = 8.6 U.S. tons)} \)

Metric: \( 22.35 \text{ cm}^2 \times 346 \text{ bar} = 7,733 \text{ daN} \) (1,000 N = 7.7 metric tons)
H1 Pump

- Piston
- Venting Plug
- Fill Port
- Rod Scraper
- Exhaust Valve
- Oil Sight Gauge
- Oil Level
- Green ‘O’ Seal
- Black ‘O’ Seal
- Oil Port Fitting
- Base
- Spring

H2 Unit

- Venting Plug
- Piston Plug
- Piston
- Guide Ring
- Front U-cup Seal - nitrogen
- Bush U-cup Seal - nitrogen
- Rod Scraper
- Oil Port
- Rear U-cup Seal - oil
- H2 Body (steel)
- Front Bush Body Seal
- Front Bush (bronze)
Oil Return Option

The oil return option can be an alternative to nitrogen, as a method of returning or retracting the H-2 unit. This option requires a hose from the H-2 unit to an external nitrogen/oil accumulator. The typical operating pressure of the forced oil return option is 100 bar (1450 psi). This option may require careful engineering analysis in order to calculate what is best for a customer’s application. READY can assist in this evaluation.

User Sequence Option

This option requires careful application engineering to determine feasibility. Engineering fees may apply. User sequence can allow customers to control the timing of their HYDROCAM® systems. The H-2 unit can be programmed to extend, dwell, and retract at nearly any point in the stroke. This allows for multiple actions to be performed in a single operation. Contact READY for the latest developments on this exciting HYDROCAM® system technology.

Direct Punch Option

This option is used when piercing round holes only. A metric punch of the proper size range can be used. The punch shank size is limited, and is listed on the bottom of the H-2 selection chart. By removing the standard front plate, the H-2 piston will accept a customer supplied head type punch. A special locking nut is included with this option. The direct punch option fits compact areas.

Design and Installation Guide

Selecting the Correct H2 Piercing/Forming Unit

1. Determine required cam station tonnage (piercing or forming force, plus total stripping force, plus nitrogen or oil return force). Do not exceed 90% of the H2 unit’s rated force (listed force, less return system force). See page 4.

2. Determine the number of H2 units needed for that tool’s applications.

3. Select the H2 unit’s stroke from those offered. A longer stroke could require a larger H2 unit.

4. Group identical H2 unit’s together (tonnage and stroke). Group identical cam actions together (number, size or shape piercing units, forming, flanging, notching).

5. Determine timing for the extension, dwell and retracting of the H2 unit’s piston rod.

6. Ball Lock Punch applications; Select a 50 mm or longer stroke H2 unit to provide additional space to remove the punch.

Selecting the Mounting Location for the H2 Piercing/Forming Unit(s).

1. Locate the H2 unit(s) in any three dimensional orientation, perpendicular to the work.

2. Provide for hose access to the back and right front side of the H2 unit. Custom porting is not available.

3. Provide a mounting platform that will support three times the total working force of the H2 unit. Locate the H2 unit against a thrust key.

4. The H2 unit is designed to provide force, not guidance.

5. The H2 unit’s Piston Rod is designed to extend fully. 

NOTE: HYDROCAM®s unique design eliminates the thrusting force of the ram/slide from the cam station, allowing the use of standard L-GIBS to position and guide the station. Providing a guidance system for a HYDROCAM® driven cam station is the responsibility of the customer. Neither, the H2 unit’s piston rod, nor its front mounting plate assembly is designed to provide cam station guidance. Contact your representative for application support.
Selecting the Correct H1 Pump

1. The H1 Pump is selected by using the information developed while selecting the H2 unit(s). (See calculation pages in the HYDROCAM® catalogue.) See page 4.
2. Select an H1 Pump that provides the H2 unit’s volume total within 90% of the H1 Pump’s total volume. Do not exceed 90%. See page 5.
3. The stroke gauge ring can be provided with the H1 Pump to develop the customer-supplied driver (kiss block) thickness and to ensure precise travel of the H1 Pump’s piston rod.
   Note: Machining tolerances may cause the mounting surfaces of the H1 Pump and/or driver to differ from the drawings. Determine the driver thickness from the finished surfaces, not the drawings.
4. One H1 Pump may serve up to a maximum of four identical H2 units.

Selecting the Mounting Location for the H1 Pump

1. The H1 Pump’s piston rod must be up and perpendicular to the ram/slide. Do not mount the H1 Pump in an inclined press or an inclined special machine.
2. Locate the H1 Pump’s oil supply ports above the H2 unit’s vent port elevation. See page 8.
3. Locate the H1 Pump anywhere in the die, under the ram/slide, that provides balance and simple hose access to the H2 unit(s). Avoid areas using spray lubrication.
4. Locate the H1 Pump within 2 meters (six feet) of the H2 unit(s).
5. Rotate the H1 Pump prior to mounting to ensure access and viewing of the Pump’s sight gauge.

   NOTE: As with any air, hydraulic or nitrogen cylinder, neither the H1 Pump nor the H2 unit is designed to withstand side-thrust forces. Properly guiding the tool and cam station will minimize wear to the cylinders and increase seal life.

Special Timing of the H2 Unit’s Piston Rod Extension, Dwell and Retraction.

Request the help of your representative to select a:
1. Larger H1 Pump to begin cam extension later in the stroke.
2. Nitrogen cushion to begin cam extension earlier in the stroke.
3. Sequenced Solenoid Technology (SST) for special timing requirements.
4. Hydraulic or air cylinder, pressure system for special machine applications.

Design Procedure -
H1 Pump’s Piston Rod Driver

1. Machine smooth and parallel, the tool’s mounting surfaces for the H1 Pump (lower) and the customer-supplied driver (upper). The diameter of the driver’s contact surface is a minimum of twice the diameter of the H1 Pump’s piston rod. This contact surface must be smooth and parallel with no mounted holes. Use a 45 Rockwell C plate for the driver.

2a. If the H1 Pump’s stroke gauge ring is available, mount and use it to develop the travel of the H1 Pump’s piston rod. The measurement from the base of the H1 Pump, to the top of the mounted stroke gauge ring determines the die-closed position of the customer-supplied driver’s contact surface. Use this measurement to calculate the length of the customer-supplied driver. We recommend that the stroke gauge ring be removed and stored on the tool prior to stroking the H1 Pump.

   OR ...

2b. Use the formula (Calculating the H1 Piston Rod Travel) from the HYDROCAM® catalogue to determine the length of the H1 Pump’s piston rod travel. See page 5 for the H1 selection and travel of piston. The measured height from the base of the H1 Pump, to the top of the piston rod extended, less the calculated piston rod travel, locates the die closed position of the contact surface of the customer-supplied driver. Use this measurement to calculate the length of the driver.

Nitrogen Return System

1. Always use a control panel.
2. For each H1 Pump, use at least one control panel that connects that H1’s associated H2 units.
3. Use O-ring style hose fittings.

   Note: We understand that a few applications will exceed this guide. Contact your representative for application support.
Connecting the H1 Pump, H2 Piercing/Forming Unit(s) and Nitrogen Return Control Panel. See page 8.

1. Minimize the number of fittings in the hose system.
2. Do not use a hose system that involves a fitting - to fitting - to fitting series of connections.
3. Hose each identical H2 unit to a H1 Pump with its own hose. Do not hose in series. Provide simple access for hose routing. Use only approved hose and fittings.
4. Provide additional hose length to ensure appropriate radius and safe routing. Avoid high spots in the oil hose route that will trap and create air pockets.
5. Maximum hose length is 2 meters (six feet). Do not substitute the supplied hydraulic hose with a smaller or lighter duty hose.
6. Rotating the H1 Pump 45° may simplify hose routing.
7. Avoid turning fittings. If a hose turn requires a turning fitting, select a 45° fitting as a first choice and a 90° fitting second. Use only BSPP-style fittings.

Required position of H1 as compared to H2 See above for proper positioning of the H1 Pump.

- Standard HYDROCAM® systems operate using a simple hydraulic driven extension with a nitrogen return and require no special conditions or procedures to operate them.
- DO NOT SUBSTITUTE ANY COMPONENT IN THIS SYSTEM! IMPROPER SUBSTITUTIONS MAY RESULT IN PERFORMANCE PROBLEMS AND/OR SAFETY HAZARDS.
- USE ONLY A PREMIUM GRADE HYDRAULIC OIL.
- As with any air, hydraulic or nitrogen cylinder, neither the H1 Pump nor the H2 unit is designed to withstand side-thrust forces. Properly guiding the tool and cam station will limit damage to the cylinders and increase seal life.
- THE MOST COMMON HYDROCAM® OPERATING PROBLEM IS AIR CAUGHT IN THE HOSE SYSTEM. ENSURE THAT YOU HAVE PROPERLY LOCATED THE H1 PUMP, AVOIDED HIGH SPOTS IN THE HOSE SYSTEM AND BLED THE SYSTEM OF AIR.
- Complete engineering assistance, seminars and service support are available should a need arise for any of our full line of metal forming products. Contact your representative for details.

<table>
<thead>
<tr>
<th>Model</th>
<th>H dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYDROCAM H1-5</td>
<td>21 mm (0.83 in)</td>
</tr>
<tr>
<td>HYDROCAM H1-8</td>
<td>25 mm (0.98 in)</td>
</tr>
<tr>
<td>HYDROCAM H1-13</td>
<td>25 mm (0.98 in)</td>
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<tr>
<td>HYDROCAM H1-20</td>
<td>25 mm (0.98 in)</td>
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<tr>
<td>HYDROCAM H1-40</td>
<td>30 mm (1.18 in)</td>
</tr>
<tr>
<td>HYDROCAM H1-66</td>
<td>40 mm (1.57 in)</td>
</tr>
</tbody>
</table>
PROVIDING A GUIDANCE SYSTEM FOR THE PIERCING OR FORMING STATION IS THE RESPONSIBILITY OF THE CUSTOMER. NEITHER THE H2 PIERCING/FORMING UNIT'S PISTON ROD NOR ITS FRONT MOUNTING PLATE ASSEMBLY IS DESIGNED TO PROVIDE CAM GUIDANCE.

H2 Unit

Oil Supply Port
Vent Plug
Piston
Anti-rotational Pillars
Front: Mounting Plate
Front View
Front Mounting Plate (plate is machinable)

H1 Pump

Driver (not supplied)
Fill Port
Exhaust Valve
Body
Base
(4) Oil Supply Ports
Oil Level
Sight Gauge
Stroke Gauge Ring

PROVIDING A GUIDANCE SYSTEM FOR THE PIERCING OR FORMING STATION IS THE RESPONSIBILITY OF THE CUSTOMER. NEITHER THE H2 PIERCING/FORMING UNIT'S PISTON ROD NOR ITS FRONT MOUNTING PLATE ASSEMBLY IS DESIGNED TO PROVIDE CAM GUIDANCE.
Control Panel - MODEL RT-2175-CP
READY Technology recommends the use of a control panel with all nitrogen return systems for each H-1 pump. Use at least one control panel per system. This NAAMS control panel is designed for remote mounting and is used to monitor or adjust nitrogen pressure in the H-2 unit. The panel is also equipped with a rupture plug for added safety. Each control panel includes the necessary hose and straight connectors to connect one H-2 unit. O-ring face connectors can also be supplied upon request.

Junction Block
For Self-Contained Systems
To fill or recharge nitrogen gas quickly and easily, order the quick disconnects:

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
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<td>4.49</td>
<td>0.98</td>
<td>3.68</td>
<td>0.87</td>
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</table>

HR-6 model shown above
* O-ring face connectors can also be supplied upon request.
Standard System Fittings - Nitrogen Gas

**BSPP Male Straight Connector**

- M-10: READY Part # RT1-100-3
- G-1/8: READY Part # RT4F40MX-S

**BSPP Male Elbow Connector**

- G-1/8: Male 45° Elbow
  - READY Part # RT4V40MX-S
- G-1/8: Male 90° Elbow
  - READY Part # RT4C40MX-S

**O-Ring Face Seal Fittings**

**BSPP Male Straight Connector**

- READY Part # RT4-2F40MLD-S

**BSPP Male 45° Elbow**

- READY Part # RT4-2V40MLD-S

**BSPP Male 90° Elbow**

- READY Part # RT4-2C40MLD-S

**Control Panel Hose**

**Important:** The hose length should be a minimum of 5% longer than the actual measured length. The additional length provides for the contraction of the hose length when pressurized.

**Note:** The inlet valve must be removed prior to hosing.

**O-Ring Face Seal Hose**

**37° JIC Hose**

- Part # RT52041C55-(*)
  - (*) = specify required hose length
- Part # RT520410655-(*)
  - (*) = specify required hose length

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Hose I.D.</th>
<th>Hose O.D.</th>
<th>Max. Operating Pressure</th>
<th>Burst Pressure</th>
<th>Min. Bend Radius</th>
<th>Thread Size</th>
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<td>50</td>
<td>18</td>
<td>16</td>
<td>16</td>
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</tr>
</tbody>
</table>

**Service Gauge Assembly**

This assembly is multi-functional. Use it to fill, empty, adjust, or take an accurate reading of pressure in the H-2 unit. Installation of this device will result in a nominal loss of pressure.

READY Part # RTUAL-04.0QDM

1. Casing
2. Pressure Adjusting Screw
3. Body
4. Threaded Plug
5. Inlet Valve
6. Outlet Valve
7. Retaining Ring
8. Circlips
9. O-ring
10. O-ring
11. O-ring
12. Gauge
Standard System Fittings - Hydraulic

**BSPP Male Straight Connector**  
G-1/4: READY Part # RT8F40M X-S  
G-3/8: READY Part # RT8F40M X-S

**BSPP Male 90° Connector**  
READY Part # RTBC 40M X-S  
READY Part # RTAC 40M X-S

**BSPP Male 45° Elbow**  
READY Part # RT8V40M X-S

**45° Swivel Nut Elbow**  
READY Part # RT8V6X-S

**90° Swivel Nut Elbow**  
READY Part # RTBC 6X-S

Flexible High Pressure Hoses and Connectors

- Minimize the number of fittings in the hose system.
- Do not use a hose system that involves a fitting – to fitting – to fitting series of connections.
- Hose each H-2 unit to an H-1 pump with its own hose. Do not hose in series. Provide simple access for hose routing.
- Provide additional hose length to ensure appropriate radius and safe routing. Avoid high spots in the oil hose route that will trap and create air pockets.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Hose I.D.</th>
<th>Hose O.D.</th>
<th>Max. Operating Pressure MPa / psi</th>
<th>Burst Pressure MPa / psi</th>
<th>Min. Bend Radius</th>
<th>Thread Size</th>
<th>A Hex</th>
<th>H Hex</th>
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<td>24,000</td>
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<td>13/16</td>
<td>7/8</td>
<td>1.42</td>
</tr>
</tbody>
</table>

*Standard hose lengths are 3' or 6'. Specify custom lengths if needed. All hose and connectors are available individually, as assemblies, or in bulk upon request.

READY Hand Pump of 1.8 Litre Capacity (250 bar maximum output)
Reduce HYDROCAM® Set-up Time By Using This Hand Pump. This Oil Hand Pump Can Be Used for Three Different Purposes:

1. Directly connected to the H-2 unit, it moves the piston to allow the toolmaker to align punch and die within the tool.
2. Filling the H-1 pump when the system is in the tool.
3. Filling the oil/nitrogen accumulator if using oil return option.
Call Us Today...

- for service and technical support
- to incorporate Hydrocam in your designs or engineering changes
Worksheet for READY HYDROCAM®

For Fast Quotes . . . Copy This and Fax READY the Details.

Name: ________________________  Title: ________________________

Company: ________________________

Address: ________________________

City: ________________________  State: ____________  Zip ____________

Telephone: ________________________  Fax: ________________________

Project, Part No.: ________________________

<table>
<thead>
<tr>
<th>Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Material: ________________________</td>
</tr>
<tr>
<td>Part Thickness: ________________________</td>
</tr>
<tr>
<td>Tensile Strength: ________________________ daN (PSI)</td>
</tr>
<tr>
<td>Stripping Force: ________________________</td>
</tr>
<tr>
<td>RAM Strokes/Minute: ________________________</td>
</tr>
<tr>
<td>RAM travel of press: ________________________ mm (inch)</td>
</tr>
<tr>
<td>CAM Stroke Length: ________________________</td>
</tr>
</tbody>
</table>

Proximity H1 Pump To Cam Unit

- The H1 pump will be connected by:
  - Hose Length ________________________
  - Special fittings needed ________________________

Are You Piercing Holes?

- Hole #1
- Hole #2
- Hole #3
- Hole #4

Punch/matrix clearance per side: ____________ (% of Part Thickness)

- What Type of Stripper?
  - Method used to strip ________________________
  - Is this used for all holes ________________________
  - Comments ________________________

- What CAM Stroke Length Needed?
  - H-2 #1 ________ mm (inch) to be piercing hole #1
  - H-2 #2 ________ mm (inch) to be piercing hole #2
  - H-2 #3 ________ mm (inch) to be piercing hole #3
  - H-2 #4 ________ mm (inch) to be piercing hole #4

- Do You Want Standard Front Plate: ____________
  - Or Direct Punch Mount Option: ____________

Please Note Special Concerns/Timing:

READY TECHNOLOGY, INC.
333 Progress Rd. • Dayton, OH 45449
937-866-7200 • 800-543-4355 • Fax 937-866-7226
e-mail: sales@readytechnology.com

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