

DANLY

HYDROCAM[®]

The ultimate in flexible cam design*



* HYDROCAM is protected by U. S. and international patents.

HYDROCAM® – The standard cam with user flexibility

powerful • compact • reliable • interchangeable

HYDROCAM® transfers the vertical press stroke into a precise cam action patented hydraulic technology. Standard stocks units combine into systems. Customers can easily mount their own tooling to the machinable front plate creating a customized application.

Here is how HYDROCAM® operates:

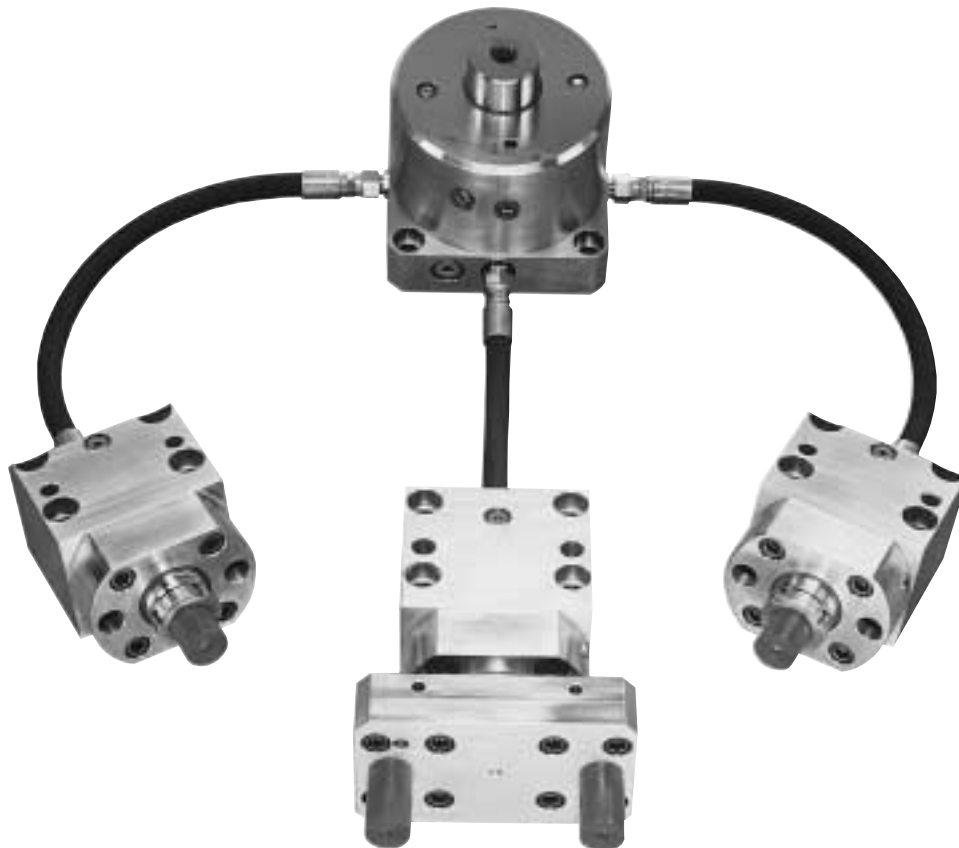
The press ram lowers, activating the piston rod of the **H1** pump. Hydraulic pressure or force is transferred high pressure hoses to one or multiple **H2** units.

The **H2** unit has an adjustable return force using proven nitrogen gas technology.

- One **H1** can serve up to four **H2** units.
- Mount the **H2** at any angle up to 2 meters away from **H1**.
- Each **H2** can deliver from 2 to 31 tons of force.
- **H2** units are available with 25, 50, 75 and 100 mm stroke lengths depending on model selected.
- **Ideal for retrofits and engineering changes.**

Index

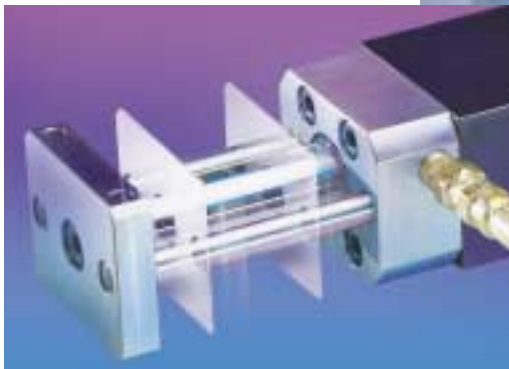
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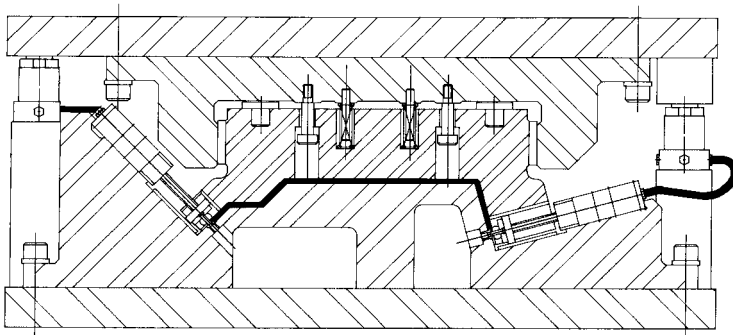
Piercing • Forming • Trimming

HYDROCAM® has been carefully designed for maximum user flexibility.

Our customers can easily mount the specialized tooling required for their application to our standard **HYDROCAM®** systems. Order standard units from stock.



HYDROCAM® systems shown with control panel option to monitor and adjust nitrogen pressure in the **H2** piercing/forming unit.



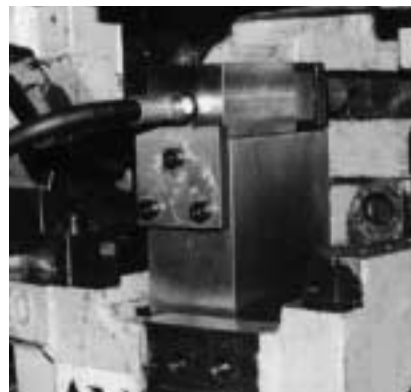
Automotive die ... piercing

HYDROCAM® – Ideal for retrofits and engineering changes



Before

- Costly and complicated mechanical cams.
- Increased maintained costs due to mechanical wear.



After

- **HYDROCAM®** makes retrofits easy.
- Decreased maintained costs and downtime.

HYDROCAM® – Selecting charts

Selecting chart H1

H1	Model						
	Model	5	8	13	20	40	66
VT Total Volume	cm ³	50	80	130	200	400	660
V1 Volume/Stroke mm	cm ³	2,23	3,32	3,32	7,85	13,27	13,27

Selecting chart H2

H2	Model							
	Model	2,0	3,2	5,0	7,8	12,5	20,0	31,0
Force	kN	19,63	31,98	49,98	78,01	124,73	199,98	309,97
VC Volume/Stroke mm	cm ³ /mm	0,49	0,8	1,26	1,97	3,11	5,03	7,85
Max. Force	kN	17,87	28,85	45,45	70,94	113,19	188,19	288,17
Return Force at 100 bar	kN	1,76	3,13	4,53	7,07	11,54	11,79	21,8

Note: 1kN = 102 kg

Quick selecting chart

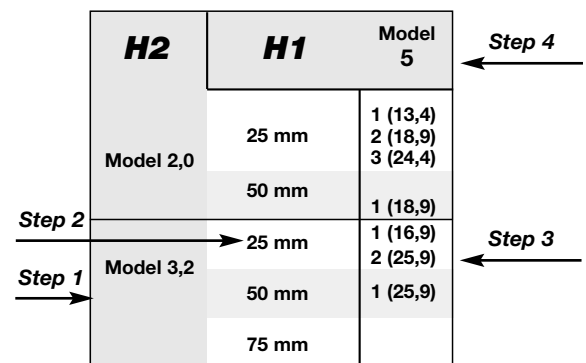
H2	H1	Model 5	Model 8	Model 13	Model 20	Model 40	Model 66
Model 2,0	25 mm	1 (13,4) 2 (18,9) 3 (24,4)	4 (22,7)				
	50 mm	1 (18,9)	2 (22,7)	3 (30,1) 4 (37,1)			
Model 3,2	25 mm	1 (16,9) 2 (25,9)	3 (26,0)	4 (32,0)			
	50 mm	1 (25,9)	1 (20,0)	2 (32,0)	3 (32,2) 4 (28,3)		
	75 mm		1 (26,0)	1 (26,0)	2 (23,2) 3 (30,9)	4 (26,0)	
Model 5,0	25 mm	1 (22,1)	2 (26,9)	3 (36,4)	4 (24,0)		
	50 mm		1 (26,9)	1 (26,9)	2 (24,0)	3 (22,2) 4 (26,9)	
	75 mm			1 (36,4)	1 (20,0)	2 (22,2) 3 (29,3)	4 (36,4)
Model 7,8	25 mm		1 (22,8)	2 (37,6)	3 (26,8)	4 (22,8)	
	50 mm			1 (37,6)	1 (20,5)	2 (22,8) 3 (30,2)	4 (37,6)
	75 mm				1 (26,8)	2 (30,2)	3 (41,4) 4 (52,5)
Model 12,5	25 mm			1 (31,4)	2 (27,8)	3 (25,5) 4 (31,4)	
	50 mm				1 (27,8)	2 (31,4)	3 (43,1)
	75 mm					1 (25,5)	2 (43,1)
	100 mm					1 (31,4)	1 (31,4)
Model 20,0	25 mm				1 (24,0)	2 (26,9)	3 (36,4) 4 (45,9)
	50 mm					1 (26,9)	2 (45,9)
	75 mm					1 (36,4)	1 (36,4)
	100 mm						1 (45,9)
Model 31,0	25 mm					1 (22,7)	2 (37,5) 3 (52,3)
	50 mm						1 (37,5)
	75 mm						1 (52,3)

Example:

Step 1 and 2 Locate the **H2** unit and its stroke. In this example: model 3.2, stroke 25 mm.

Step 3 Locate the number of **H2** units to the right of the stroke length. The **H1** pump's piston rod travel is listed next to that number in parentheses.

Step 4 Read up to the column heading. This is the **H1** model you need. In his example: **H1**, model 5.



HYDROCAM® – Calculations

Example:

Piercing of 2 holes on each ends of a formed part.

Hole diameter: 12 mm, Thickness of material 2 mm;

Material strenghtness: τ_{aB} 370 N/mm²

The piercing units makes a stroke of 17 mm before they were stopped by external tool stops.

Piercing unit **HYDROCAM H2**

$$A = d \cdot \pi \cdot s = 12 \text{ mm} \cdot \pi \cdot 2 \text{ mm} = 75,4 \text{ mm}^2$$

$$F = A \cdot \tau_{aB} = 75,4 \text{ mm}^2 \cdot 370 \text{ N/mm}^2 = 27898 \text{ N} = 27,9 \text{ kN}$$

Note the needed force F should be maximum of 80 % of the working force F_2 :

$$F_{2min} = \frac{F}{0,8} = \frac{27,9 \text{ kN}}{0,8} = 34,87 \text{ kN}$$

A = work surface

F = force

τ_{aB} = max. material tensile strenght

F_{2min} = working force

Need: Piercing unit **HYDROCAM 2 – 5 x 25**

Pump **HYDROCAM H1**

Needed volume for each piercing unit V_{N1}

$$V_{N1} = VC \cdot Hub = 1,26 \text{ cm}^3/\text{mm} \cdot 17 \text{ mm} = 21,42 \text{ cm}^3$$

$$VT = V_{N1} \cdot 2 = 21,42 \text{ cm}^3 \cdot 2 = 42,84 \text{ cm}^3$$

Note the needed volume should be maximum of 90% of the Total volume VT:

$$VT_{min} = \frac{V}{0,9} = \frac{42,84 \text{ cm}^3}{0,9} = 47,6 \text{ cm}^3$$

V_{N1} = working volume of H2

VC = volume/stroke H2 (cm³/mm)

Stroke = real stroke H2

VT_{min} = needed volume H1

VT = total volume

Need: Pump **HYDROCAM 1 – 5**

Max. Volume stroke $Ht4$

$$Ht4 = \frac{VT}{V1} = \frac{42,84 \text{ cm}^3}{2,23 \text{ cm}^3/\text{mm}} = 19,2 \text{ mm}$$

$V1$ = volume/mm stroke H1

$Ht4$ = max. working stroke H1

Total stroke H

$$H = Ht4 + Ht5 = 19,2 \text{ mm} + 8 \text{ mm} = 27,2 \text{ mm}$$

$Ht3$ = total Piston stroke H1

$Ht5$ = approach stroke H1

Optional stroke gauge ring thickness t

$$t = Ht3 - H = 31 \text{ mm} - 27,2 \text{ mm} = 3,8 \text{ mm}$$

HYDROCAM® – H2 Piercing unit

Compact power with user flexibility

The **H2** piercing unit can be ordered from Danly with high pressure hose and connectors you specify.

The **H2** has seven standard stock sizes. The amount of force needed determines the size. Units deliver from 2 up to 31 tons of force at any angle selected. Standard stroke lengths of 25, 50, 75 and 100 mm, depending on unit size.

Standard features:

- **H2** unit comes with adjustable nitrogen gas return force.
- Machinable front plate for customers to mount their tooling by application.
- Compact and interchangeable for today's demanding applications.

Popular options:

- **Control panel option:** DANLY recommends using this to monitor and adjust nitrogen return force.
- **Direct punch option:** Remove front plate and piston will accept a head type punch. Punch size and shank limitations are noted on the **H2** dimension chart, see D8 below. A special "lockung nut" must be ordered.
- **Oil return option:** Used on special applications. Must be engineered, please call Danly for support.

Mounting suggestions

- Mount **H2** units against keys.
- Provide a mounting platform that will resist any deflection.
- The standard front plate should be guided during work stroke. Avoid off-centered loading.
- Use always an stop block to limit the stroke of the unit **H2**.

Example how to order:

Size Stroke Option:
HYDROCAM® H2 – 5,0 x 25 + Standard front plate

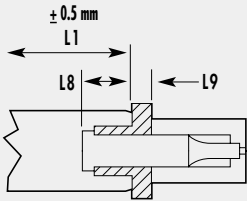
Note: 1 kN = 102 kg

H2 Chart Piercing unit

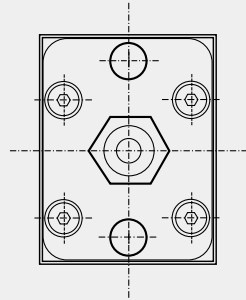
H2	Model						
	2,0	3,2	5,0	7,8	12,5	20,0	31,0
Force	20 kN	32 kN	50 kN	78 kN	125 kN	200 kN	310 kN
L1 Stroke 25 mm	108	128	141	149	172	190	211
L1 Stroke 50 mm	133	154	166	174	197	215	236
L1 Stroke 75 mm	-	179	191	199	222	240	261
L1 Stroke 100 mm	-	-	-	-	247	265	-
L2	8	10	10	12	15	15	20
L3	36	52	55	64	64	77	82
L4	31	42	45	48	55	63	70
L5 Stroke 25 mm	101	120	132	138	158	172	190
L5 Stroke 50 mm	126	145	157	163	183	197	215
L5 Stroke 75 mm	-	170	182	188	208	222	240
L5 Stroke 100 mm	-	-	-	-	233	247	265
L6	12	15	20	22	25	30	35
L7	6	8	10	12	16	20	24
B1	60	75	85	100	130	140	180
B2	44	55	65	76	100	110	140
B3	59	74	84	99	129	139	179
Ht1	50	60	70	80	100	110	150
Ht2	25	30	35	40	50	55	75
Ht3	25	30	35	40	50	55	75
Ht4	49	59	69	79	99	109	149
D1	20	25	32	40	50	70	85
D2 H7 (x2)	8	10	10	12	12	16	20
D3 H7 g6 (x2)	12	12	14	16	20	20	24
D4 Depth	M12x1,0 17	M16x1,5 17	M20x1,5 20	M30x2,0 21	M36x2,0 32	M48x2,0 38	M56x2,0 48
D5	15	18	20	26	32	32	32
D6 (DIN 75 Km) (x4)	8	10	10	12	16	16	20
D7 Piston-Ø	25	32	40	50	63	80	100
D8 Nominal head-Ø Punch shank-Ø	- -	13 10	16 13	23 20	28 25	35 32	43 40
D9 Thread size of bolt	M8	M10	M12	M16	M20	M20	M20
G	G 1/4	G 1/4	G 1/4	G 1/4	G 3/8	G 3/8	G 3/8

HYDROCAM® – H2 Specifications

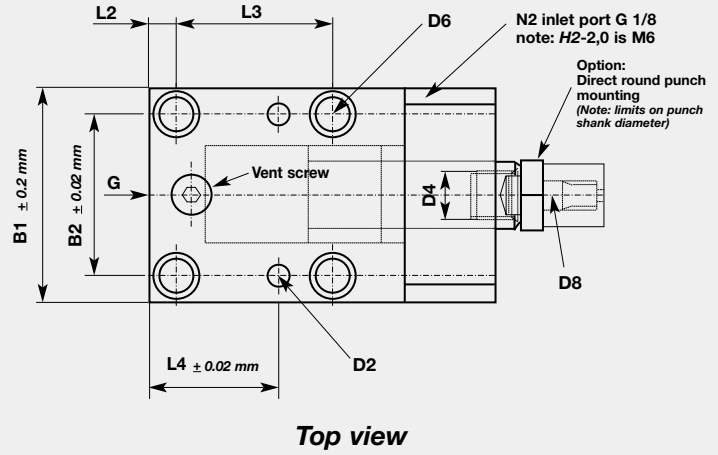
Direct punch option



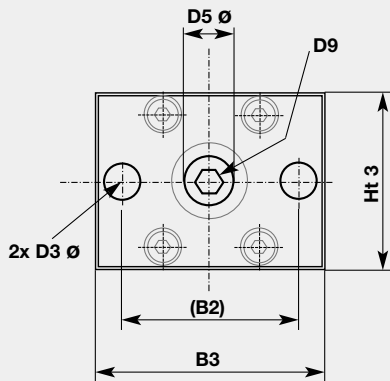
Direct punch
(enlarged view)



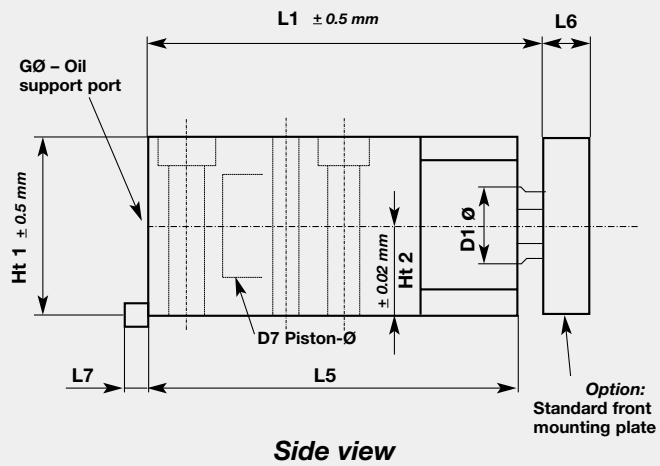
Optional: Direct punch mount



Option: Standard front mounting plate



*Option:
Standard front mounting plate*



Cutaway photo:



HYDROCAM® – H1 Pump

The **H1** pump is available in six standard sizes. Each pump has four ports to activate up to four **H2** units. The quality, size and stroke length of the **H2** units hoses to each pump determines the size and oil volume of the pump needed. Pumps can be up to six feet away from **H2** 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 **H2** unit(s). Our selection example on page 5 provides you the formulas for calculation.

Multiple **H2** units activated by a common pump will effect piston rod travel, find the quick select chart on page 4.

Optional stroke gauge ring

Used as a visual gauge to assist in set-up. 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. See quick select chart on page 4 and calculate example on page 5 how to calculate.

Mounting Suggestions:

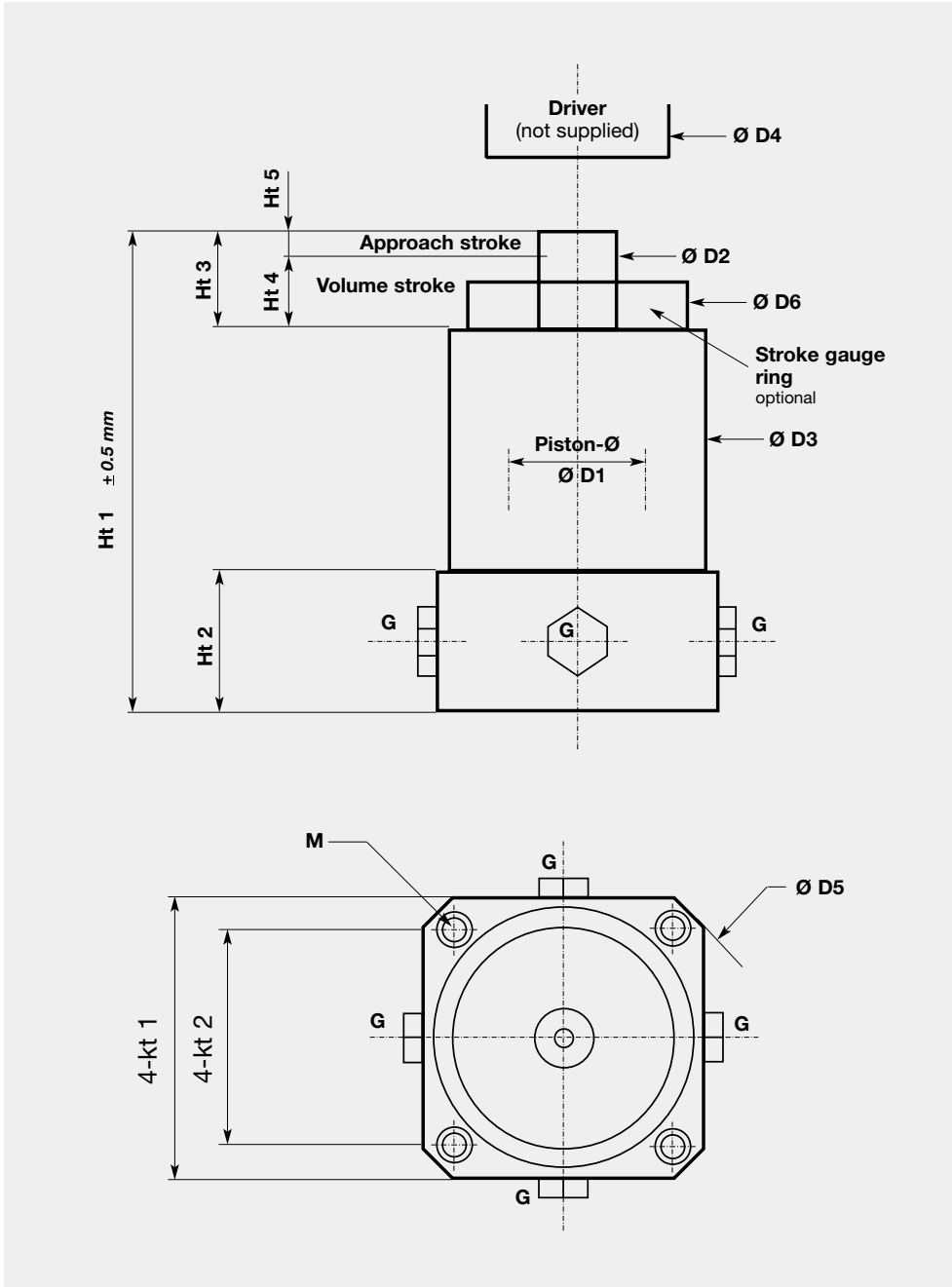
- The piston rod must always face up, perpendicular to ram/driver. Always activate piston rod with driver that is larger in diameter than the piston rod.
- Driver may need to be custom ground to exact working height during **HYDROCAM®** system set-up.
- Locate pump higher in elevation than all **H2** units it activates.
- Specify hose length and allow for safe access from pump to **H2** unit(s). Always use stop blocks.
- **Die storage blocks are recommended. Never store pump with piston rod depressed.**

H1 Chart Pump

H1		Model					
		5	8	13	20	40	66
VT Total volume	cm ³	50	80	130	200	400	660
V1 Volume/Stroke per mm	cm ³	2,23	3,32	3,32	7,85	13,27	13,27
Ht 1 Die open height	mm	133	145	195	166	195	275
Ht 2 Height of base	mm	41	42	57	46	50	70
Ht 3 Total stroke	mm	31	32	47	34	38	58
Ht 4 max. volume stroke	mm	23	24	39	26	30	50
Ht 5 Approach stroke	mm	8	8	8	8	8	8
D1 Piston-Ø	mm	53,34	65	65	100	130	130
D2 Rod-Ø	mm	20	25	25	50	60	60
D3 Body-Ø	mm	82	100	100	147	182	182
D4 min. (not supported)	mm	45	55	55	95	120	120
D5 Base cross corners	mm	120	141	141	203	246	246
D6 Optional gauge	mm	80	98	98	145	180	180
4-kt 1	mm	90	105	105	150	185	185
4-kt 2	mm	72	84	84	125	150	150
M (x4)	mm	Km 8	Km 10	Km 12	Km 12	Km 16	Km 16
G (x4)	BSPP	G 1/4	G 1/4	G 1/4	G 3/8	G 3/8	G 3/8
P Piston area	cm ²	22,3	33,2	33,2	78,5	132,7	132,7

Example how to order:
HYDROCAM® H1 – 20

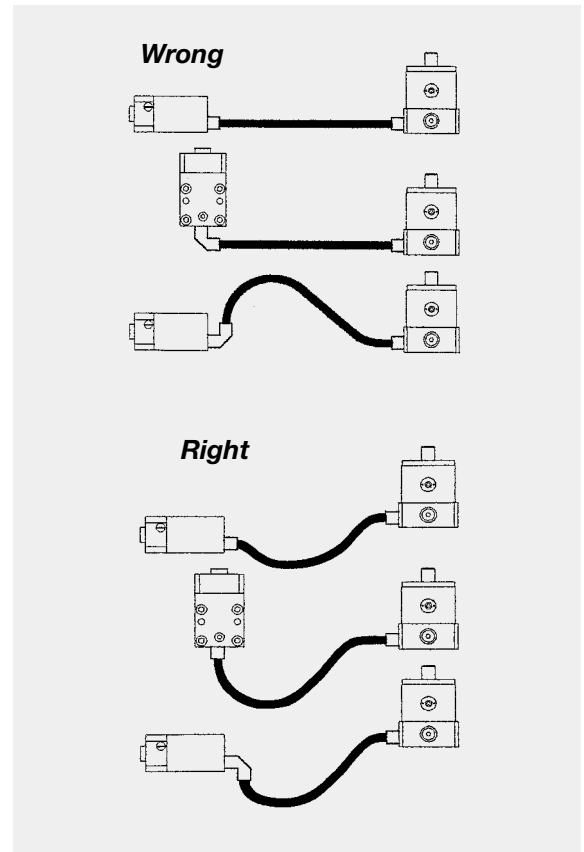
HYDROCAM® – H1 Specifications



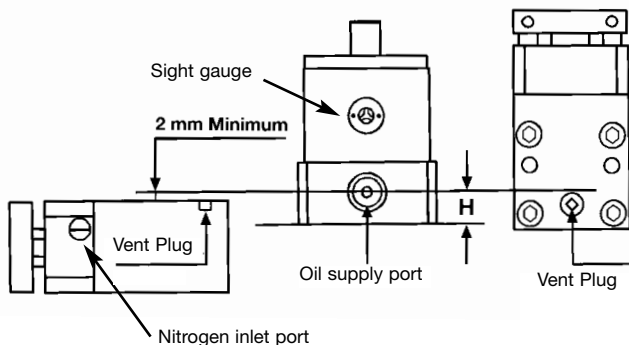
HYDROCAM® Installations guide

Connecting the H1 pump, H2 piercing unit(s) and Nitrogen return control panel.

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 m. 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 choice and a 90° fitting second. See page 12, 13 and 14 for accessories.



Required positions of H1 as compared to H2



NOTE: We understand that a few applications will exceed this guide. Contact your representative for application support.

Model	H dimensions
HYDROCAM H1-5	21 mm
HYDROCAM H1-8	25 mm
HYDROCAM H1-13	25 mm
HYDROCAM H1-20	25 mm
HYDROCAM H1-40	30 mm
HYDROCAM H1-66	30 mm

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 procedure 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 cylinder 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.

HYDROCAM® Cutaway photos

Follow the instructions for engineering and production to give a long lifetime of **HYDROCAM®** applications:

Installation H2

- The **H2** piercing units should always fixed by a thrust key.
- The pins gives only the position.
- The **H2** unit is designed to provide force, not guidance. 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. 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.

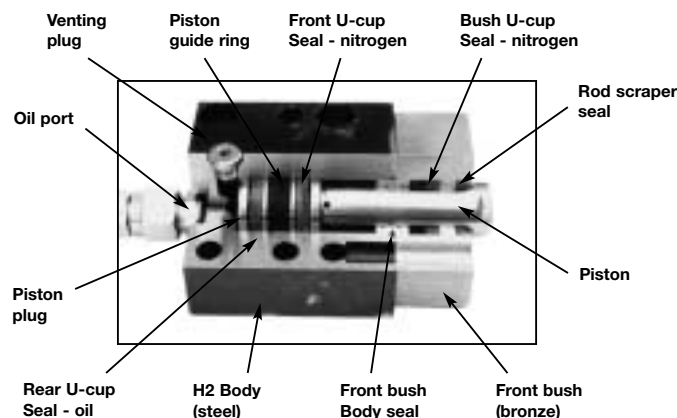
Note for secure:

Only use fittings and hoses which are proofed to run with 400 bar.

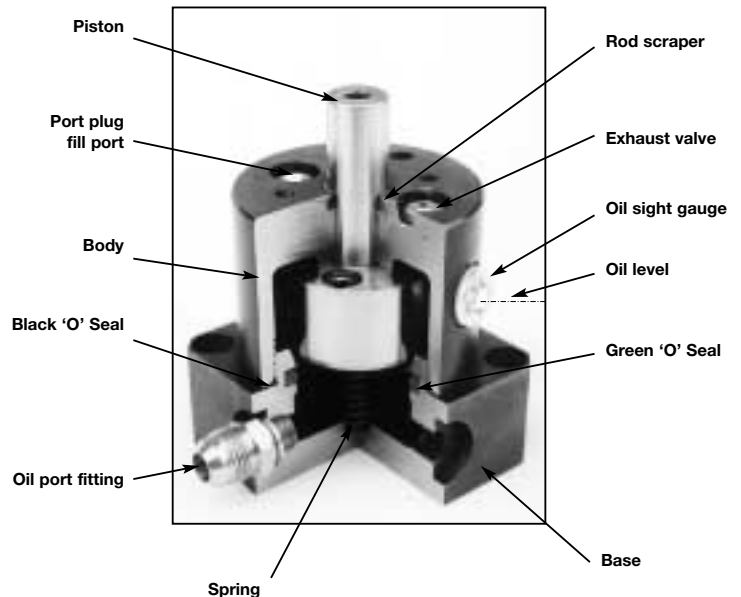
Installation H1

- Use max. hoses with 2 m.
- The Position of the piston should always be right angled and vertical to the driver.
- It don't work reverse.
- Put the Pump higher than the piercing unit(s).
- Limit the stroke of the tool with a stop block.
- Don't use more stroke than calculated, compare with the gauge stop ring thickness.
- Fill oil in up to the middle of the oil sight glass.
- Remove the air in the hoses with initial strokes.

H2



H1



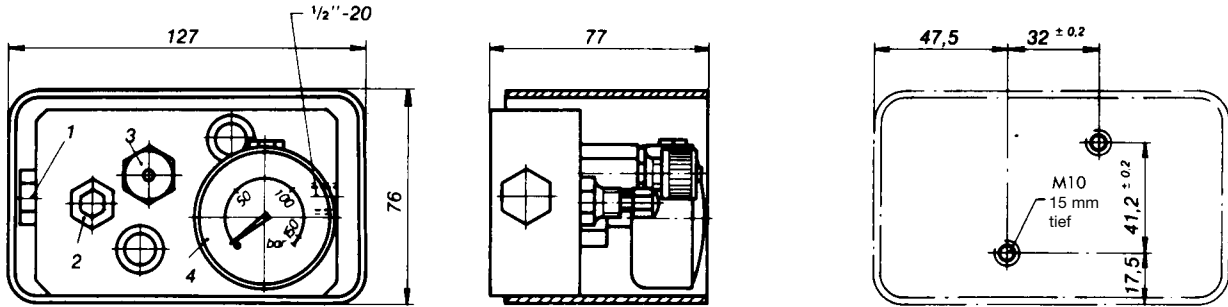
Nitrogen accessories control panel

Control panel KA 110-01-250

DANLY suggests to run each **H2** with a single Control Panel. It can use to fill with gas and monitor the pressure. Each control console has build in a safety plug.

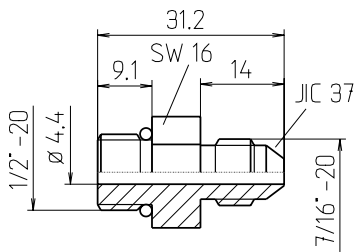
Order-No. KA11001-250

Location of mounting holes and fill connection



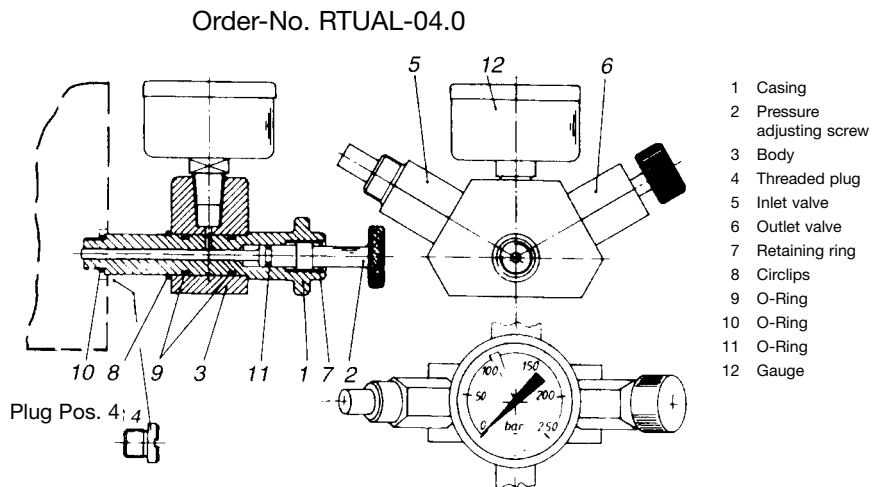
- 1. Safety plug
- 2. Inlet valve
- 3. Exhaust valve
- 4. Pressure gauge

Fitting NP1000-3 Order-No. NP1000-3



Fill and control panel RTUAL-04.0

This is a multi functional unit. Used to refill and monitor the pressure of gas filled **H2** systems.



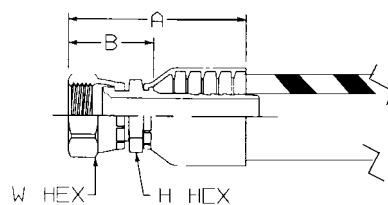
- 1 Casing
- 2 Pressure adjusting screw
- 3 Body
- 4 Threaded plug
- 5 Inlet valve
- 6 Outlet valve
- 7 Retaining ring
- 8 Circlips
- 9 O-Ring
- 10 O-Ring
- 11 O-Ring
- 12 Gauge

Hoses to connect the control panels

Important: The length should be 5% longer than the measured distance. While the systems are filled with high pressured gas the length of the hoses will be decreased under pressure.

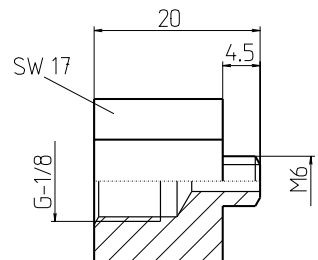
Note: Rebuild the inlet valve of the hoses units while working with an assembled control panel.

37° JIC Hose



Order-No. RT520410655-(*)
(*) = lenght of the hoses

Adaptor for H2-2,0 Order-No. HM6G18

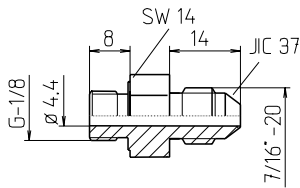


Part-No.		Hose I.D.	Hose O.D.	Max. oper. pressure (bar)	Min. Burst pressure (bar)	Min. Bend radius	Thread size	A	6-kt H	6-kt W	B
RT520410655-(*)	mm	4,8	10,9	345	1380	38	7/16-20	55	16	17	30

Nitrogen accessories fittings

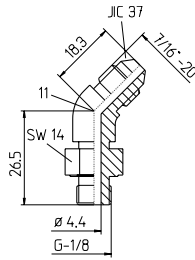
37° Fittings

Straight connector*



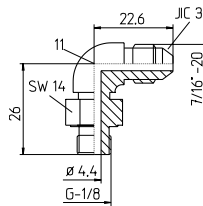
Order-No. RT4F40MX-S

Swivel nut elbow 135°*



Order-No. RT4V40MX-S

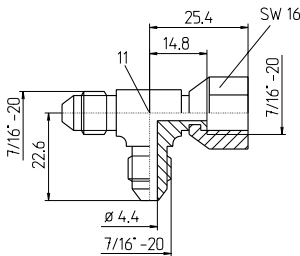
90° Degree elbow*



Order-No. RT4C40MX-S

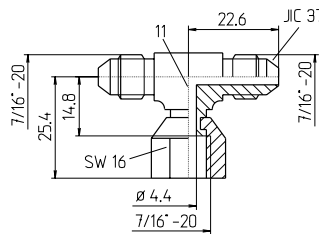
* not to connect directly at HYDROCAM

Swivel nut run tee



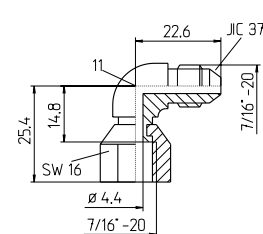
Order-No. RT4R6X-S

Swivel nut run tee



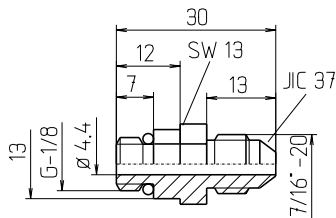
Order-No. RT4S6X-S

90° Degree elbow



Order-No. RT4C6X-S

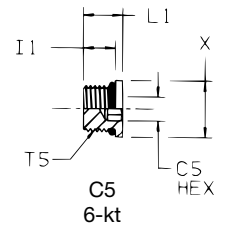
**Straight connector
Connector for HYDROCAM**



Order-No. NP1100-3

Hollow hex plug

Part-No.	T5		6-kt C5	I1	L1	X Ø	Torque (Nm)
VSTI-R1/8ED	G-1/8	mm	5	8	12	14	10
VSTI-R1/4ED	G-1/4	mm	6	12	17	19	30
VSTI-R3/8ED	G-3/8	mm	8	12	17	22	35



Quick connect fittings



Order-No.:

- RT-QDM-6554-A male
- RT-QDF-0202 (G1/4) Europa female

Connecting hose for nitrogen-gas-bottle



Order-No. NPLS01

Adaptor



Order-No. HDG14JIC12

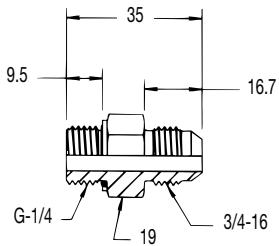
Quick connector



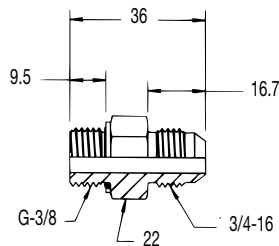
Order-No. RT-QDF-0202

Hydraulic fittings

Straight fittings

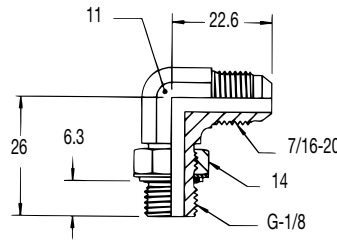


Order-No. HDG14

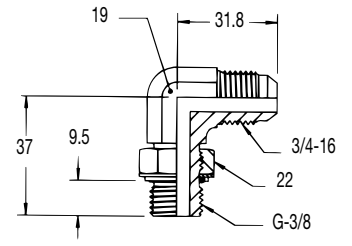


Order-No. HDG38

90° Swivel nut elbow fittings

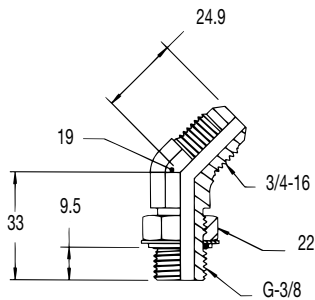


Order-No. H90G14



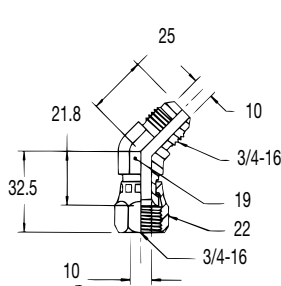
Order-No. H90G38

45° Swivel nut elbow



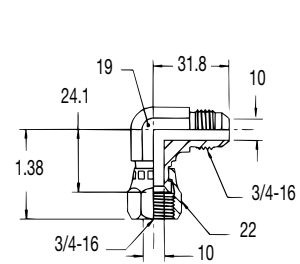
Order-No. H45G38

135° Swivel nut elbow



Order-No. HJIC135

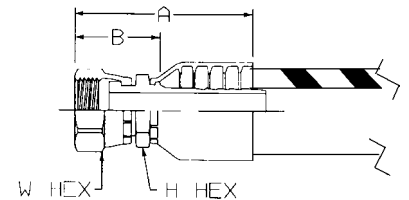
90° Swivel nut elbow fitting



Order-No. HJIC90

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 of connections.
- Hose each **H2** unit to an **H1** 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 pockets.



Hose to connect **H1** to **H2**

Part-No.		Hose I.D.	Hose O.D.	Max. oper. pressure (bar)	Min. Burst pressure (bar)	Min. Bend radius	Thread size	A	6-kt H	6-kt W	B
H1H2-10	mm	10	21	445	1780	180	3/4-16	61	18	22	34
H1H2-12	mm	12	25	415	1660	230	3/4-16	66	21	22	36

In case of order the hose length is needed.

DANLY 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 **H2** unit, it moves the piston to allow the toolmaker to align punch and die within the tool.
2. Filling the **H1** pump when the system is in the tool.
3. Filling the oil/nitrogen-accumulator if using oil return option.

Hand pump with hose and adapter fittings



1.

Extending **H2** piston rod



2.

Filling oil drive system



3.

Filling oil return system

DANLY suggest to use filtered oil SHELL TELLUS 32.

Order-No. HYDPUMPAS

Worksheet for DANLY HYDROCAM®

For fast quotes ... copy this and fax DANLY the details.

Name: _____ Title: _____
 Company: _____
 Address: _____
 City: _____ State: _____ Zip: _____
 Telephone: _____ Fax: _____
 Project, Part No.: _____

DANLY No:
Date:

Selection Criteria

Part material: _____
 Part thickness: _____
 Tensile strength: _____ N/mm²
 Stripping force: _____
 RAM travel of press: _____
 RAM Strokes/minute: _____
 CAM Stroke length: _____

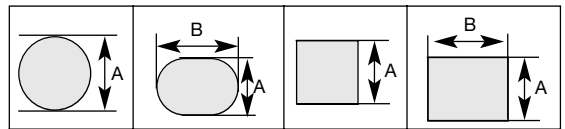
Proximity H1 pump to CAM unit

- The **H1** pump will be connected by:
 Hose length _____
- Special fittings needed: _____

Are you forming? Describe form:

Please note special concerns/timing:

Are you piercing holes?



	A mm	A mm	B mm	A mm	A mm	B mm
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?

- H2** #1 _____ mm to be piercing hole #1
- H2** #2 _____ mm to be piercing hole #2
- H2** #3 _____ mm to be piercing hole #3
- H2** #4 _____ mm to be piercing hole #4

Do you want a standard front plate: _____
or direct punch mount option: _____

Proximity nitrogen return control panel to CAM unit

- The control panel will be connected by:
- Hose length: _____
 - Special fittings needed: _____



The Innovator of Our IndustrySM

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