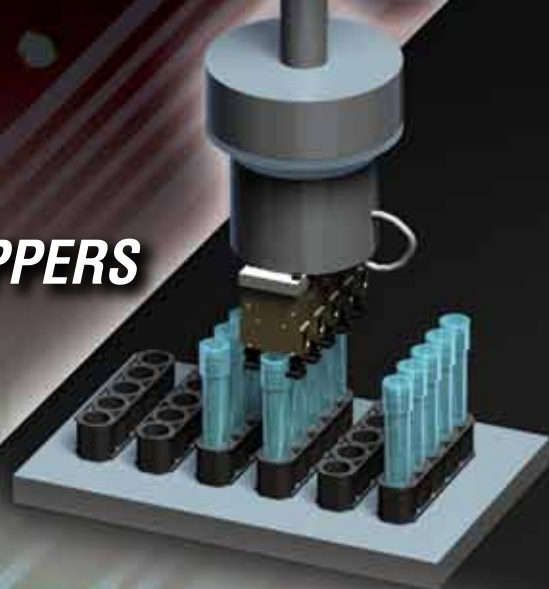


GRV *SERIES GRV ANGULAR GRIPPERS*

*Compact Precision Grippers Ideal for Medical,
Electronics, Assembly and Robotics*



5 Million Cycle Life
Flexible Mounting Capability

**ISO-9001
CERTIFIED**

Quality Management
System Certified

GRV01



PHD is a member of the
MAC Distributor Network

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SOLUTIONS FOR INDUSTRIAL AUTOMATION

www.phdinc.com

ORDERING DATA: SERIES GRV ANGULAR GRIPPERS

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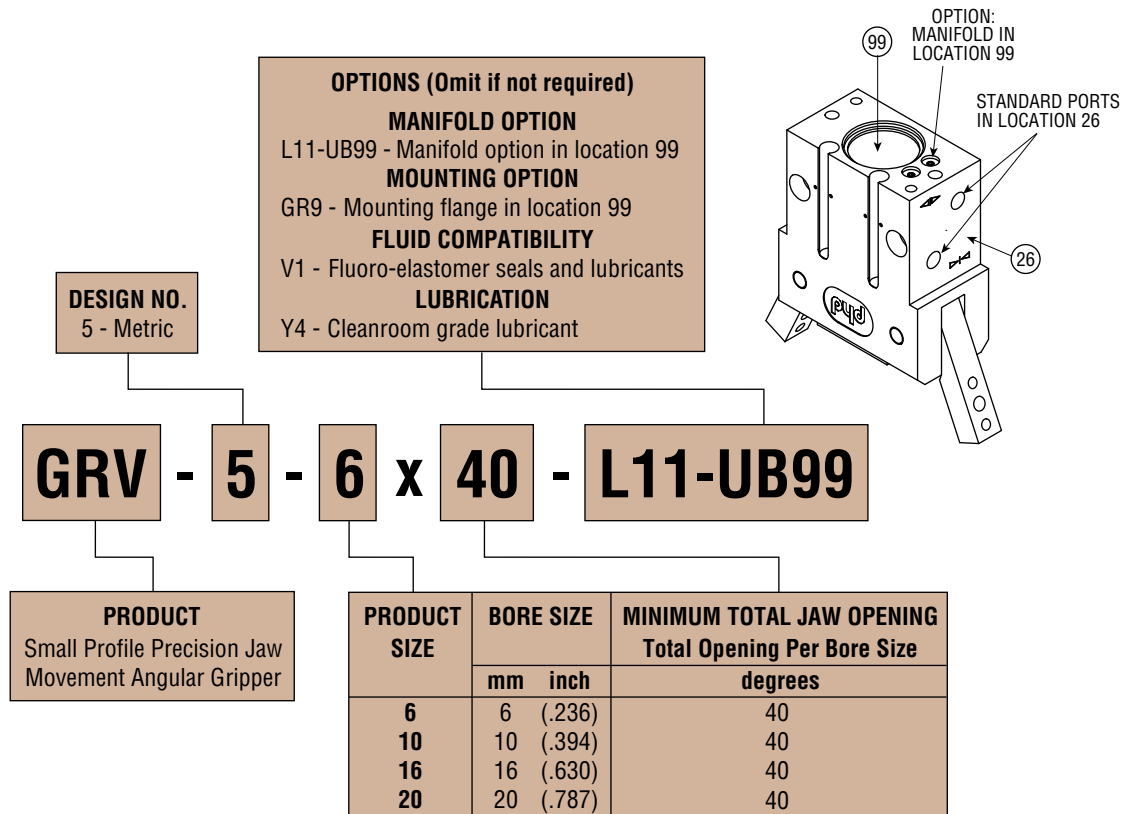
Options & Accessories
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Page 11

Exploded View & Parts List
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TO ORDER SPECIFY:

Product, Design No., Size, Minimum Total Jaw Opening, and any options required.



NOTES:

- Design No. indicates metric mountings, dowel pin holes, and ports.
- V1 option may reduce gripper life. PHD recommends reducing tooling inertia to 60% of maximum values for optimal life.

SERIES JC1SD MAGNETIC SWITCHES

PART NO.	SWITCH DESCRIPTION
JC1SDP-5	PNP (Source), Solid State, 10-30 VDC, 5 meter cable
JC1SDP-K	PNP (Source), Solid State, 10-30 VDC, Quick Connect
JC1SDN-5	NPN (Sink), Solid State, 10-30 VDC, 5 meter cable
JC1SDN-K	NPN (Sink), Solid State, 10-30 VDC, Quick Connect

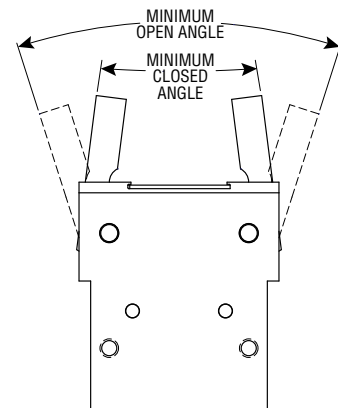
Includes one switch and installation directions. Series JC1SD Switches only function on 16 and 20 mm units. Series 6790 Reed Switches are not applicable.

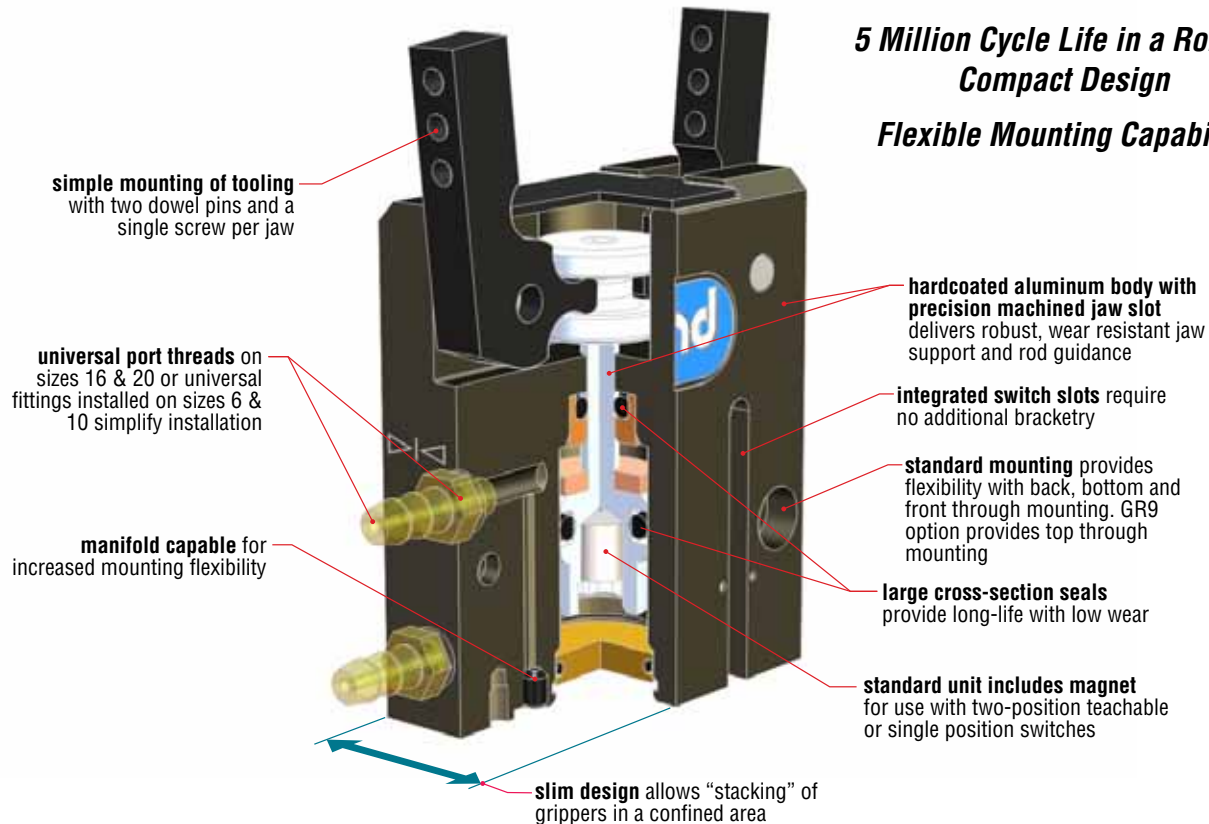
SERIES JC1ST 2 POSITION TEACHABLE MAGNETIC SWITCHES

PART NO.	SWITCH DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

Includes one switch and installation directions.

MINIMUM JAW TRAVEL = MINIMUM OPEN ANGLE + MINIMUM CLOSED ANGLE





5 Million Cycle Life in a Robust, Compact Design

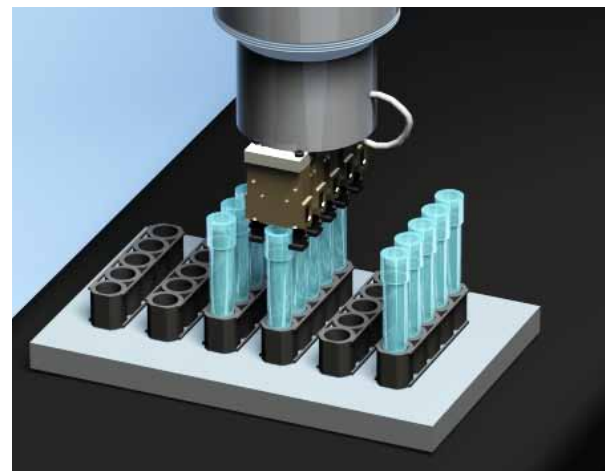
Flexible Mounting Capability

Major Benefits

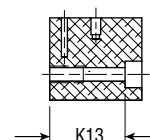
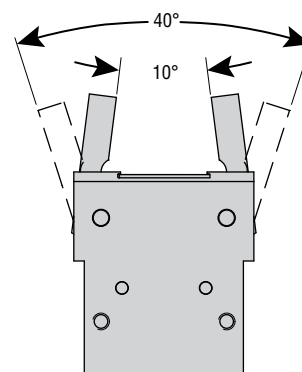
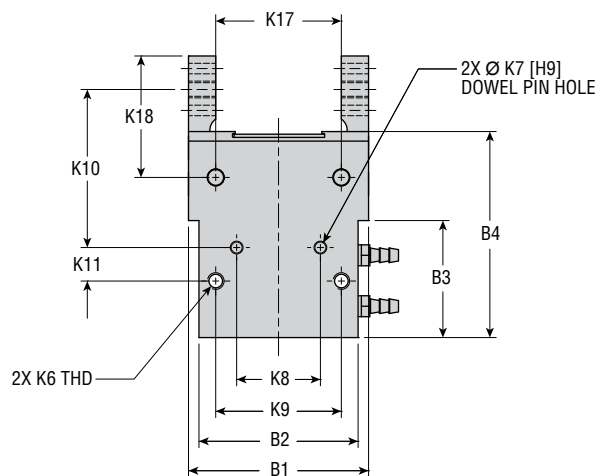
- Series GRV Gripper's compact, flexible design provides large moment capacities and long tooling lengths.
- Robust construction ensures long operating life.
- Double acting for use in both internal and external gripping applications.
- Manifold porting capability allows for nested gripper installation.
- Mounting provided from top (with option GR9), bottom, front, and back of gripper.
- Internal speed control is standard, no external speed control required.
- Standard with imperial / metric porting, metric mounting threads and dowel holes for global appeal.
- Supplied "switch-ready" for easy integration of optional magnetic position sensing switches.
- Magnetic sensing two-teachable position switch available to simplify set-up and integration.
- Standard four working day delivery reduces integration time.

Industry/Process Uses

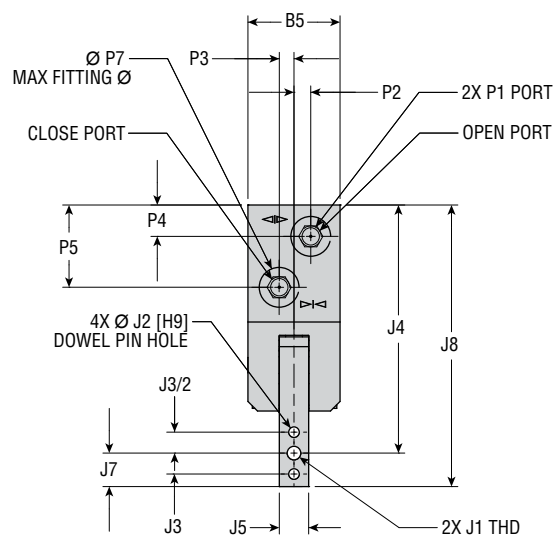
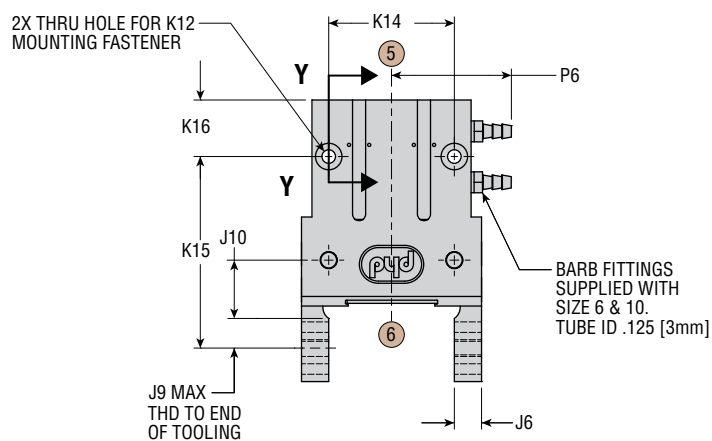
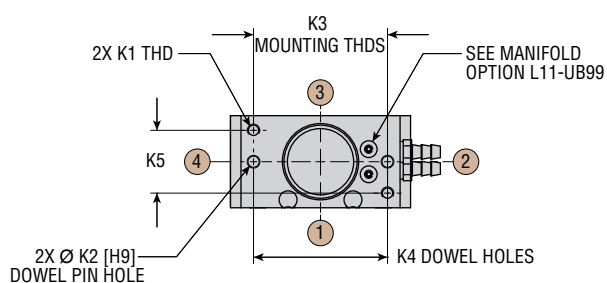
- Medical device manufacturing
- Semiconductor manufacturing
- Laboratory processing applications
- Clamping and fixturing during assembly operations
- Incorporation into space restricted processing and manufacturing equipment



Slim design allows multiple grippers in confined areas.



SECTION Y-Y



DIMENSIONS: SERIES GRV ANGULAR GRIPPERS

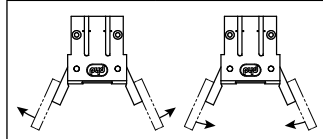
LETTER DIM	MODEL NUMBER			
	GRV-5-6 x 40	GRV-5-10 x 40	GRV-5-16 x 40	GRV-5-20 x 40
	mm	mm	mm	mm
TOTAL JAW TRAVEL	50°	50°	50°	50°
FULL OPEN	40°	40°	40°	40°
FULL CLOSED	-10°	-10°	-10°	-10°
B1	30.0	34.0	43.0	51.0
B2	—	—	38.0	46.0
B3	—	—	27.9	31.8
B4	36.7	41.9	49.2	55.1
B5	10.0	16.0	22.0	28.0
J1	M1.6 x 0.35	M2.5 x 0.45	M4 x 0.7	M5 x 0.8
J2	1.5	2.0	2.5	3.0
J3	5.00	7.00	10.00	12.00
J4	41.5	49.0	59.2	67.3
J5	3.0	4.5	7.0	8.5
J6	5.0	6.0	6.5	8.0
J7	4.0	6.0	8.0	9.5
J8	45.5	55.0	67.2	76.8
J9 MAX	3.8	5.3	7.1	8.4
J10	8.2	9.6	13.9	15.1
K1	M2.5 x 0.45 x 5 DP	M3 x 0.5 x 6 DP	M3 x 0.5 x 6.5 DP	M4 x 0.7 x 8 DP
K2	2.0 x 3.0 DP	2.0 x 3.0 DP	3.0 x 4.0 DP	4.0 x 4.0 DP
K3	24.0	25.0	32.0	36.0
K4	17.50	25.00	32.00	36.00
K5	4.5	10.0	15.0	19.0
K6	M3 x 0.5 x 6 DP	M3 x 0.5 x 6.5 DP	M4 x 0.7 x 8 DP	M5 x 0.8 x 10 DP
K7	2.0 x 3.0 DP	2.0 x 3.0 DP	3.0 x 4.0 DP	4.0 x 4.0 DP
K8	13.00	14.00	20.00	22.00
K9	24.0	27.0	30.0	36.0
K10	23.5	28.0	37.7	41.3
K11	7.5	8.0	8.0	9.0
K12	M2.5	M2.5	M3	M4
K13	7.3	12.9	18.0	23.5
K14	24.0	27.0	30.0	36.0
K15	31.0	36.0	45.7	50.3
K16	10.5	13.0	13.5	17.0
K17	19.0	22.0	30.0	35.0
K18	16.0	21.0	29.0	33.0
P1	M3 x 0.5 x 3 DP	M3 x 0.5 x 3 DP	M5 x 0.8 x 4.5 DP	M5 x 0.8 x 5 DP
P2	1.5	3.0	4.0	5.0
P3	1.0	.5	3.5	4.0
P4	6.5	6.0	7.5	9.0
P5	16.1	19.2	19.6	24.8
P6	24.7	26.7	N/A	N/A
P7	6.5	9.5	13.0	13.0

NOTES:

- 1) ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED
- 2) FULL OPEN REFLECTS LEAST POSSIBLE OPEN ANGLE. FULL CLOSED REFLECTS LARGEST POSSIBLE CLOSED ANGLE.
- 3) CIRCLED NUMBERS INDICATE POSITIONS
- 4) DESIGNATED \varnothing IS CENTERLINE OF UNIT
- 5) DOWEL PINS OR SPRING PINS OF THE SAME DIAMETER ARE RECOMMENDED. THIS PROVIDES A SMALL PRESS TO SLIGHT SLIP FIT. PHD RECOMMENDS THE USE OF ANTI-SEIZE COMPOUNDS DURING ASSEMBLY.

ENGINEERING DATA: SERIES GRV ANGULAR GRIPPERS

SPECIFICATIONS	SERIES GRV ANGULAR GRIPPER
OPERATING AIR PRESSURE	1 bar min. - 8.3 bar max. [15 psi min. - 120 psi max.]
OPERATING TEMPERATURE	-28°C to +82°C [-20°F to 180°F]
GRIP REPEATABILITY	0.025 mm [\pm 0.001 inch] of original position
RATED LIFE	5 million cycles
LUBRICATION	Factory lubricated for rated life



SIZE	MINIMUM TOTAL JAW OPENING ANGLE	GRIP FORCE FACTOR INTERNAL AND EXTERNAL		GRIPPER WEIGHT		DISPLACEMENT		CLOSE OR OPEN TIME at 6 bar [87 psi]	MAXIMUM TOOLING LENGTH		MAXIMUM TOOLING INERTIA	
		METRIC	IMPERIAL	kg	lb	cm ³	in ³		mm	in	kg-mm ²	lb-in ²
6	40°	13.7	0.0078	0.034	0.075	0.12	0.008	0.025	30	1.181	22.1	0.0753
10	40°	46	0.026	0.070	0.155	0.39	0.024	0.030	40	1.575	66.8	0.228
16	40°	179	0.102	0.141	0.311	1.31	0.080	0.040	60	2.362	255	0.870
20	40°	320	0.183	0.244	0.538	3.18	0.194	0.050	80	3.150	519	1.770

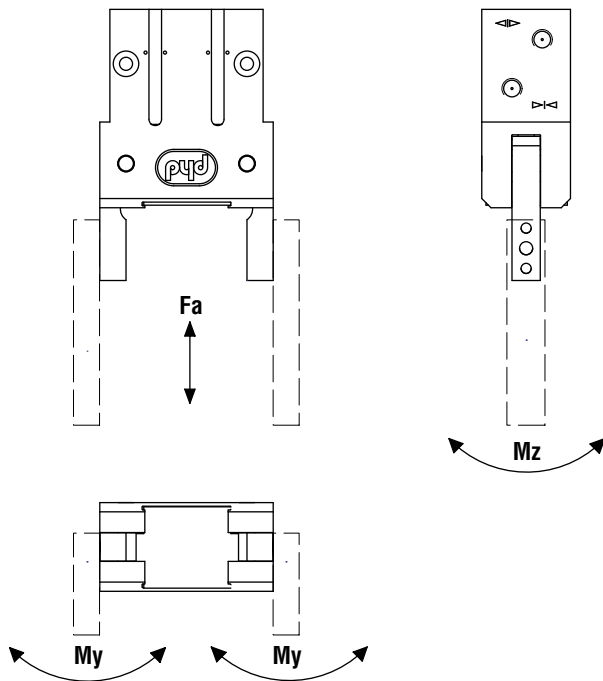
SIZE	AXIAL FORCE Fa		MAX. INDIVIDUAL MOMENTS			
	N	lb	My		Mz	
			Nm	in-lb	Nm	in-lb
6	13	3	0.23	2.00	0.14	1.20
10	44	10	0.9	8.0	0.6	5.0
16	89	20	2.8	25	2.3	20
20	133	30	5.1	45	3.4	30

Fa: Total for both jaws

My: Maximum allowable moment per jaw, relative to the pivot pin

Mz: Maximum allowable moment per jaw, relative to the pivot pin

When calculating the value for Fa, include the tooling weight, part weight, external forces, and accelerations. When calculating values for My and Mz, include the grip force per jaw, tooling weight, part weight, external forces, and accelerations as applicable.



RECOMMENDATIONS

Design tooling so that the grip point is as close to the gripper surfaces as possible. The grip force factor (Gf) values given in the table above apply at 0° jaw angle only.

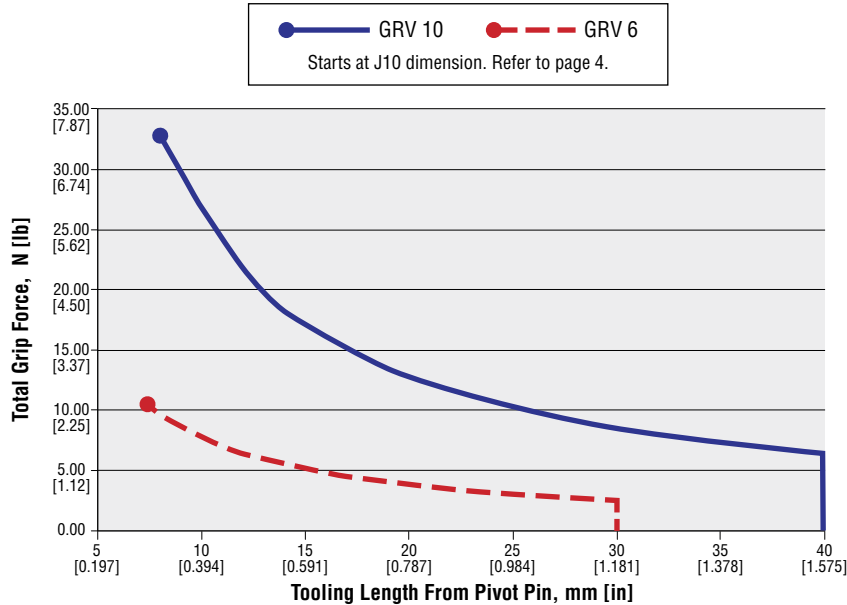
The maximum load that grippers can handle will vary based on: size of the part being picked up, shape of the part, texture of the part, speed at which the part is transferred, working pressure, shape of the fingers, etc.

ENGINEERING DATA: SERIES GRV ANGULAR GRIPPERS

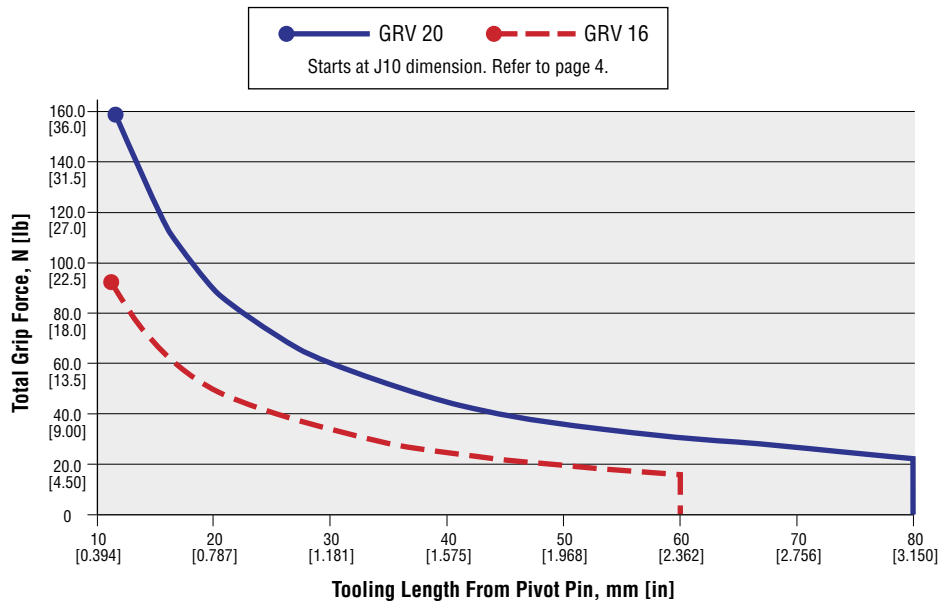
GRIP FORCE

Total gripping force relative to tooling length is shown below at 6 bar [87 psi] pressure. Grip force per jaw equals the total grip force divided by two. The graphs also indicate the maximum tooling length for each gripper size.

GRV 6 & 10 Grip Force at 6 bar [87 psi] with 0° jaw angle



GRV 16 & 20 Grip Force at 6 bar [87 psi] with 0° jaw angle



GRIP FORCE CALCULATION EQUATIONS:

IMPERIAL:
$$\text{Total Grip Force [lb]} = \frac{\text{Pressure (psi)} \times \text{Gf}}{\text{Distance from Jaw Pivot (in)}}$$

METRIC:
$$\text{Total Grip Force [N]} = \frac{\text{Pressure (bar)} \times \text{Gf}}{\text{Distance from Jaw Pivot (mm)}}$$

OPTIONS: SERIES GRV ANGULAR GRIPPERS

GR9 BOTTOM MOUNTING FLANGE

The GR9 option adds a flange with thru holes to the bottom of the gripper allowing for top mounting. Dowel pin holes in the flange are clearance to allow dowel pins to install in the body for accurate mounting. See chart for recommended dowel pin lengths.

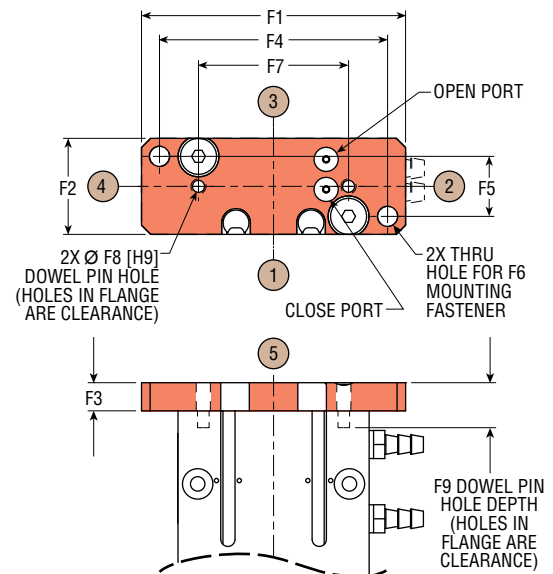
The GR9 option is sealed between the body and the flange to allow use of the L11-UB99 manifold option.

The GR9 flange is also available in kit form. See Flange Mounting Kit chart.

LETTER DIM	MODEL NUMBER			
	GRV-5-6x40	GRV-5-10x40	GRV-5-16x40	GRV-5-20x40
F1	42.0	47.0	52.0	63.5
F2	10.0	16.0	22.0	28.0
F3	5.0	5.0	6.0	6.0
F4	37.0	41.0	45.0	55.0
F5	4.5	10.0	15.0	19.0
F6	M2.5	M3	M3	M4
F7	17.5	25.0	32.0	36.0
F8	2.0 mm x 3.0 mm DP	2.0 mm x 3.0 mm DP	3.0 mm x 4.0 mm DP	4.0 mm x 4.0 mm DP
F9	8.0	8.0	10.0	10.0

NOTES:

- 1) ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED
- 2) GR9 OPTION INCLUDES SEALS BETWEEN BODY AND FLANGE



FLANGE MOUNTING KIT

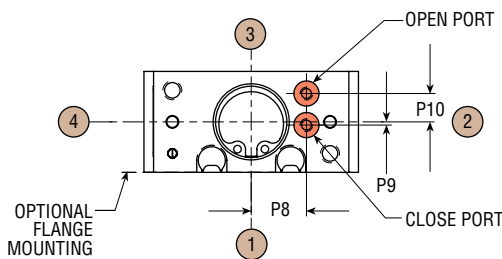
SIZE	KIT NUMBER
6	81867-06-5
10	81867-10-5
16	81867-16-5
20	81867-20-5

Kit includes: flange, manifold seals, assembly fasteners, and installation directions

L11-UB99 MANIFOLD PORTS

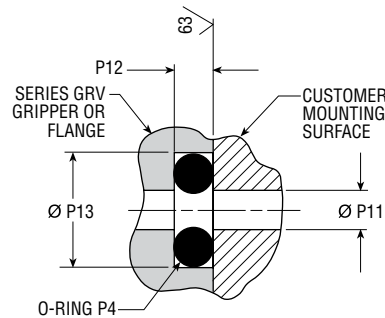
With this option the gripper is configured for manifold mounting on the indicated mounting face. The standard ports are plugged. O-ring seals are provided for mounting between the gripper and the manifold.

The manifold port option is also available in kit form. See the Manifold Conversion Kits chart.



NOTES:

- 1) ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED
- 2) CIRCLED NUMBERS INDICATE POSITIONS
- 3) *I.D. x CROSS-SECTION



MANIFOLD PORTING DIMENSIONS

For customer use (dimensions required on customer mounting surface)

REPLACEMENT MANIFOLD SEAL KITS

SIZE	KIT NUMBER
6	82013
10	82013
16	82013
20	82013

Manifold kit includes seals

MANIFOLD CONVERSION KITS

SIZE	KIT NUMBER
6	82014-06-5
10	82014-10-5
16	82014-16-5
20	82014-20-5

Manifold kit includes seals, port plugs, and installation directions

LETTER DIM	MODEL NUMBER			
	GRV-5-6x40	GRV-5-10x40	GRV-5-16x40	GRV-5-20x40
P8	5.75	7.75	11.5	14.0
P9	2.5	.5	3.0	3.5
P10	2.5	4.5	3.0	3.5
P11	1.2	1.2	1.2	1.2
P12	.8	.8	.8	.8
P13	4.0	4.0	4.0	4.0
P4 O-RING*	2 mm x 1 mm	2 mm x 1 mm	2 mm x 1 mm	2 mm x 1 mm

V1 FLUORO-ELASTOMER SEALS AND LUBRICANTS

Fluoro-elastomer seals and lubricants are available to achieve seal compatibility with certain fluids. Seal compatibility should be checked with the fluid manufacturer for proper application. PHD recommends reducing tooling inertia to 60% of maximum values for optimal life.

Y4 CLEANROOM GRADE LUBRICANT

Cleanroom grade lubricant replaces all standard lubricants.

ACCESSORIES: SERIES GRV ANGULAR GRIPPERS

SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCH

This switch provides the ability to identify two separately programmable jaw positions with a single switch. Programmable capability means no “fine-tuning.” With switch properly aligned, place jaws in desired position and program. Solid-state sensing technology provides a highly reliable switch. Elliptical housing allows for easy “drop-in” installation on sizes 16 and 20 only. Includes LED indicators for convenient means of positioning and programming. Available with cable or 8 mm threaded Quick Connect.



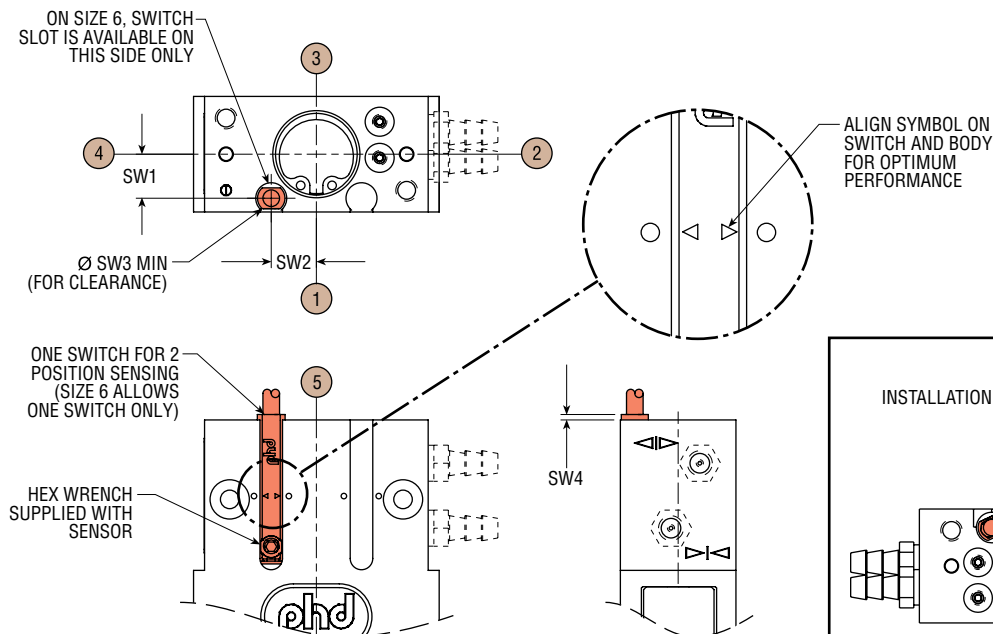
SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES

PART NO.	SWITCH DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

Includes one switch and installation directions

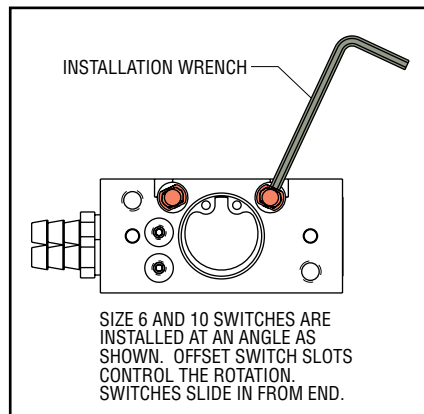
MATCHING CORDSET

PART NO.	DESCRIPTION
81284-1-001	M8, 4 pin, Straight Female Connector, 5 meter cable



LETTER DIM	MODEL NUMBER			
	GRV-5-6x40	GRV-5-10x40	GRV-5-16x40	GRV-5-20x40
SW1	2.5	6.9	9.1	12.1
SW2	5.8	5.4	7.7	8.0
SW3	4.3	4.3	4.3	4.3
SW4	2.2	—	—	—

NOTE: ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED



ACCESSORIES: SERIES GRV ANGULAR GRIPPERS

SERIES JC1SD MAGNETIC SWITCH

This switch provides the ability to identify a single jaw position. Solid-state sensing technology provides a highly reliable switch. Elliptical housing allows for easy “drop-in” installation. Includes LED indicator for convenient means of positioning. Available with PNP or NPN output. Available with cable or 8 mm threaded Quick Connect.

NOTE: Series JC1SD Switches only function on 16 and 20 mm units. Series 6790 Reed Switches are not applicable.



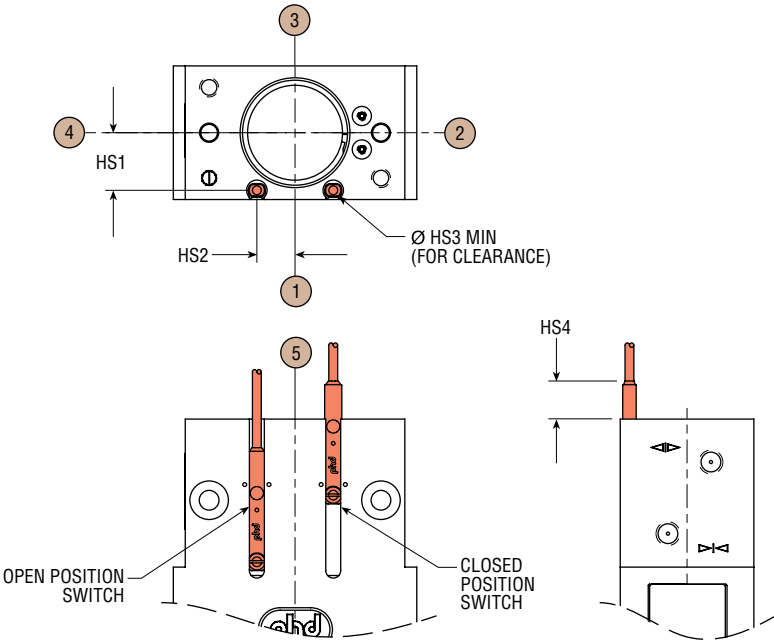
SERIES JC1SD MAGNETIC SWITCHES

PART NO.	SWITCH DESCRIPTION
JC1SDP-5	PNP (Source), Solid State, 10-30 VDC, 5 meter cable
JC1SDP-K	PNP (Source), Solid State, 10-30 VDC, Quick Connect
JC1SDN-5	NPN (Sink), Solid State, 10-30 VDC, 5 meter cable
JC1SDN-K	NPN (Sink), Solid State, 10-30 VDC, Quick Connect

Includes one switch and installation directions

MATCHING CORDSET

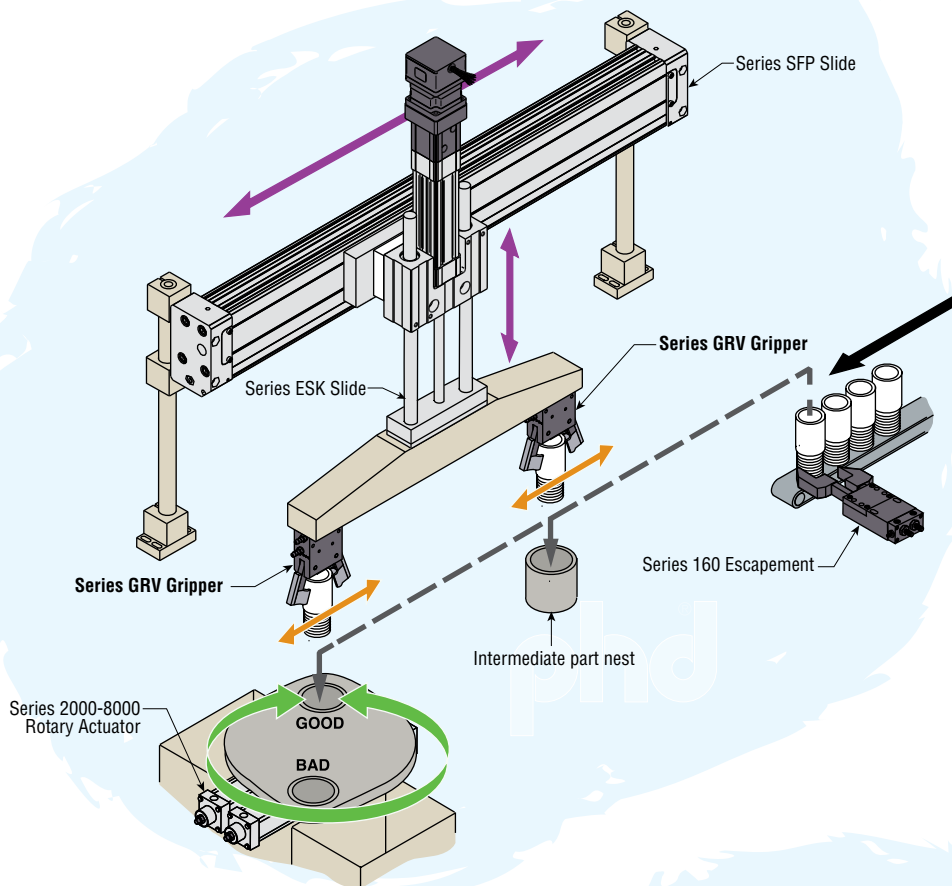
PART NO.	DESCRIPTION
63549-02	M8, 3 pin, Straight Female Connector, 2 meter cable
63549-05	M8, 3 pin, Straight Female Connector, 5 meter cable



LETTER DIM	MODEL NUMBER	
	GRV-5-16x40	GRV-5-20x40
HS1	9.1	12.1
HS2	7.7	8.0
HS3	4.3	4.3
HS4	14.7	14.2

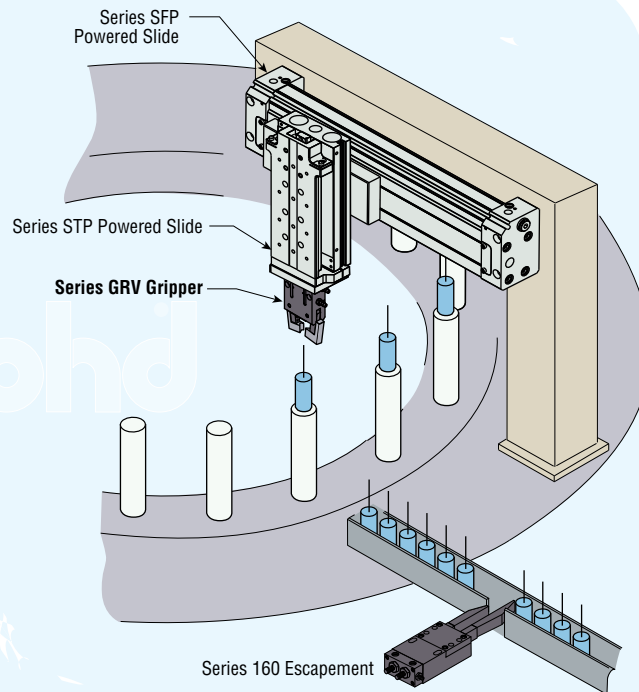
NOTE: ALL DIMENSIONS ARE REFERENCE ONLY UNLESS SPECIFICALLY TOLERANCED

APPLICATIONS: SERIES GRV ANGULAR GRIPPERS

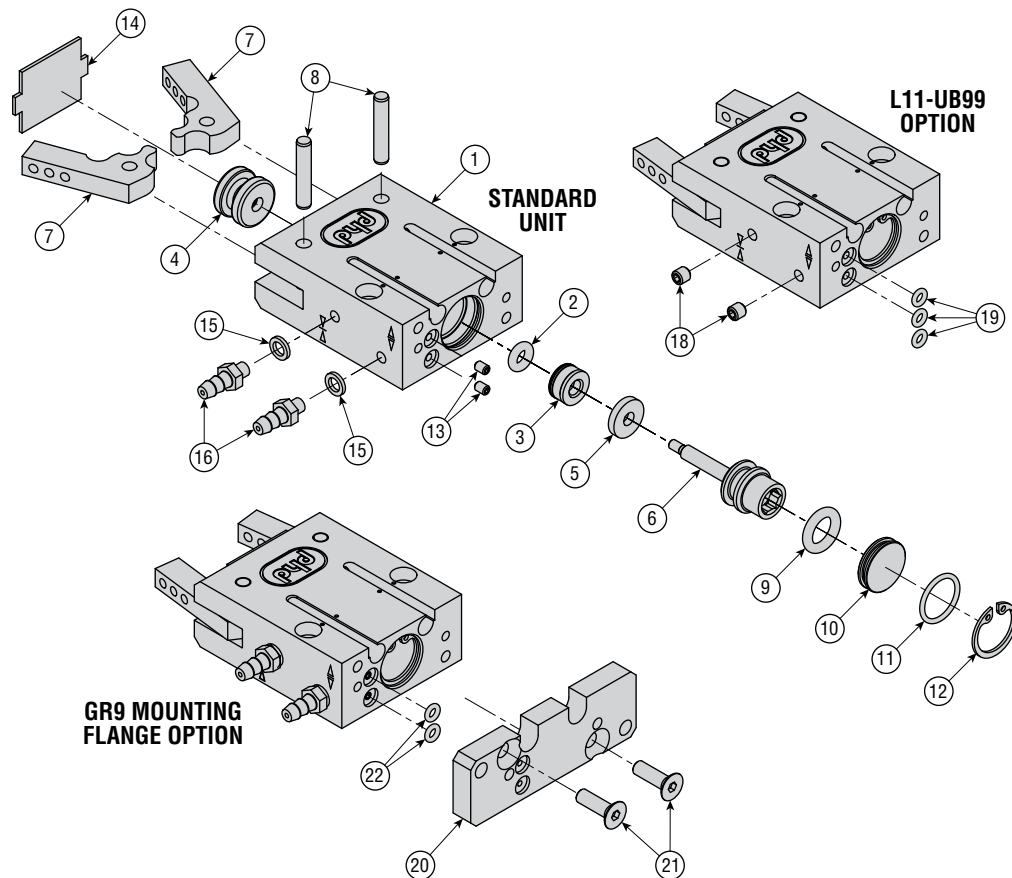


Two Series GRV grippers, two powered slides, a rotary actuator, and an escapement are used to check thread length in this quality control application. The parts are escaped from a conveyor, then placed into a fixture. Once part checking is complete, a pick-and-place device separates the parts as either good or bad.

A Series GRV gripper along with two powered slides are used in this multi-function system. This system automates the assembly and quality control of syringes used in medical industry systems.



EXPLODED VIEW & PARTS LIST: SERIES GRV GRIPPERS



KEY	DESCRIPTION	PART NUMBER
1	Finished Body	Full unit description followed by -H2410
2	Rod Seal	Part of seal kit -H9000
3	Rod Seal Retainer	Part of seal kit -H9000
4	Driver	Full unit description followed by -H5610
5	Shock Pad	Full unit description followed by -H1800
6	Piston & Rod Assembly	Full unit description followed by -H1000
7	Jaw	Full unit description followed by -H2600
8	Dowel Pin (Jaw Pivot)	Full unit description followed by -H2621
9	Piston Seal	Part of seal kit -H9000
10	Bore Plug	Full unit description followed by -H3100
11	Bore Plug Seal	Part of seal kit -H9000
12	Retaining Ring	Full unit description followed by -H7101, or part of seal kit -H9000
13	Set Screw (Manifold Plug)	—
14	Jaw Slot Cover	—
15	Metric Barb Washer	Part of fitting kit -H2800
16	Metric Fitting Barb	Part of fitting kit -H2800
18	Set Screw (Port Plug)	Part of conversion kit -H9091
19	O-Ring Seal (Manifold)	Part of conversion kit -H9091, or part of seal kit -H9090
20	Mounting Flange	Part of flange kit -H9055
21	Mounting Flange To Body SFHCS	Part of flange kit -H9055
22	O-Ring Seal (Mounting Flange)	Part of flange kit -H9055, or part of seal kit -H9090