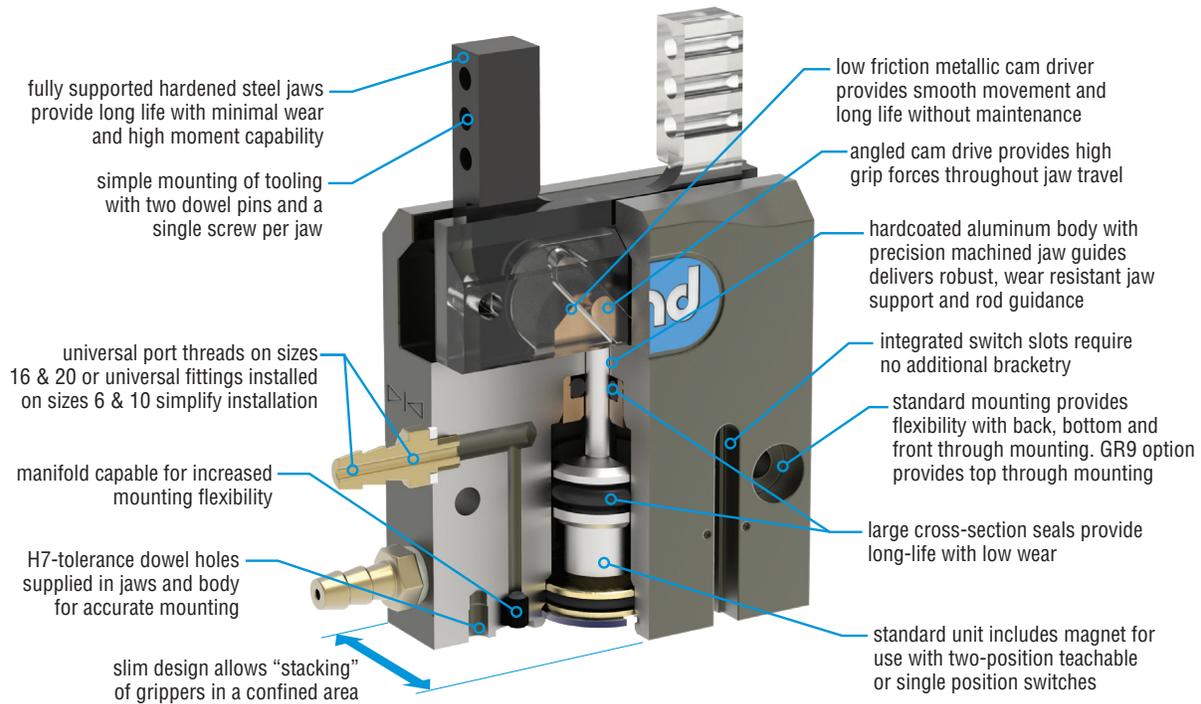


PARALLEL PNEUMATIC MICRO GRIPPER

GRA

Major Benefits

- Four sizes in metric design
- Offered with standard H7 tolerance dowel holes
- Switch ready for use with PHD single or two position teachable switches
- Optional manifold porting, mounting flange, and cleanroom lubrication provide additional application flexibility



Available on GRA-5-20x13

PNEU-CONNECT

- Provides seamless, cost-effective, pneumatic end-effector integration for collaborative robots

CLICK & GRIP

- Fast configuration and reconfiguration
- Flexibility with interchangeable components
- Design provides limited compliance—helpful during setups and around workers



Segments adjust in 15° increments and lock

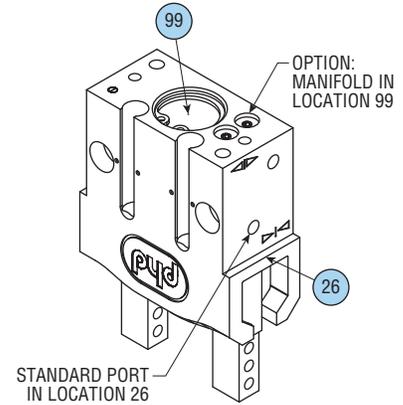


Go to phdinc.com/pneuconnect for more information.

ORDERING DATA: Series GRA Grippers

TO ORDER SPECIFY:
Product, Design No., Size,
Minimum Total Jaw Travel,
and any options required.

OPTIONS (Omit if not required)
MANIFOLD OPTION
 L11-UB99 - Manifold option in location 99
MOUNTING OPTION
 GR9 - Mounting flange in location 99
FLUID COMPATIBILITY
 V1 - Fluoroelastomer Seals and Lubricants
LUBRICATION
 Y4 - Cleanroom Grade Lubricant



DESIGN NO.
5 - Metric

GRA - 5 - 6 x 4 - L11-UB99

PRODUCT
Small Profile Precision Jaw
Movement Parallel Gripper

PRODUCT SIZE	BORE DIA.		MINIMUM TOTAL JAW TRAVEL	
	mm	inch	Total Travel Per Bore Size mm	inch equivalent
6	6	0.236	4	0.157
10	10	0.394	5	0.197
16	16	0.630	9	0.354
20	20	0.787	13	0.512

NOTE: Design No. indicates
metric mountings, dowel pin
holes, and ports.

SERIES JC1SD MAGNETIC SWITCHES

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

Includes one switch and installation directions.

SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES

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

NOTE: See Switches and Sensors section for additional switch information and complete specification. Switches must be ordered separately.

MATCHING CORDSET

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

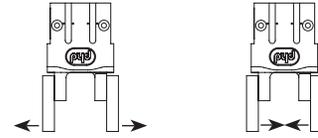


Options may affect unit length. See dimensional pages and option information details.

CAD & Sizing Assistance

Use PHD's free online Product Sizing and CAD Configurator at phdinc.com/myphd

SERIES GRA		
SPECIFICATIONS	IMPERIAL	METRIC
OPERATING AIR PRESSURE	30 psi min. to 120 psi max. air	2 bar min. to 8.3 bar max. air
OPERATING TEMPERATURE	-20°F min. to +180°F max.	-28°C min. to +82°C max.
GRIP REPEATABILITY	±0.0004 inch of original position	±0.01 mm of original position
RATED LIFE	10 million cycles	
LUBRICATION	Factory lubricated for rated life	



SIZE	MINIMUM TOTAL JAW TRAVEL		TOTAL CLOSE GRIP FORCE AT 87 psi [6 bar]		GRIPPER WEIGHT		DISPLACEMENT		CLOSE OR OPEN TIME 87 psi [6 bar]	MAXIMUM TOOLING LENGTH		GRIP FORCE FACTOR G_f			
	in	mm	lb	N	lb	kg	in ³	cm ³		INTERNAL GRIP		EXTERNAL GRIP			
										IMPERIAL	METRIC	IMPERIAL	METRIC		
6	0.158	4.0	2.55	11	0.08	0.036	0.005	0.08	0.030	1.18	30	0.024	1.5	0.029	1.89
10	0.197	5.0	8.2	37	0.163	0.074	0.016	0.26	0.030	1.77	45	0.080	5.2	0.094	6.10
16	0.354	9.0	18.2	81	0.36	0.16	0.063	1.03	0.040	3.15	80	0.167	10.8	0.209	13.5
20	0.512	13.0	27.7	123	0.62	0.28	0.134	2.20	0.105	3.94	100	0.254	16.4	0.318	20.5

SIZE	AXIAL FORCE		MAXIMUM INDIVIDUAL MOMENTS					
	F_a		M_x		M_y		M_z	
	lb	N	in-lb	N-m	in-lb	N-m	in-lb	N-m
6	3.25	14	3.50	0.40	1.70	0.19	1.70	0.19
10	12	53	10.0	1.1	5.0	0.56	5.0	0.56
16	25	111	25	2.8	25	2.8	20	2.3
20	40	178	45	5.1	45	5.1	30	3.4

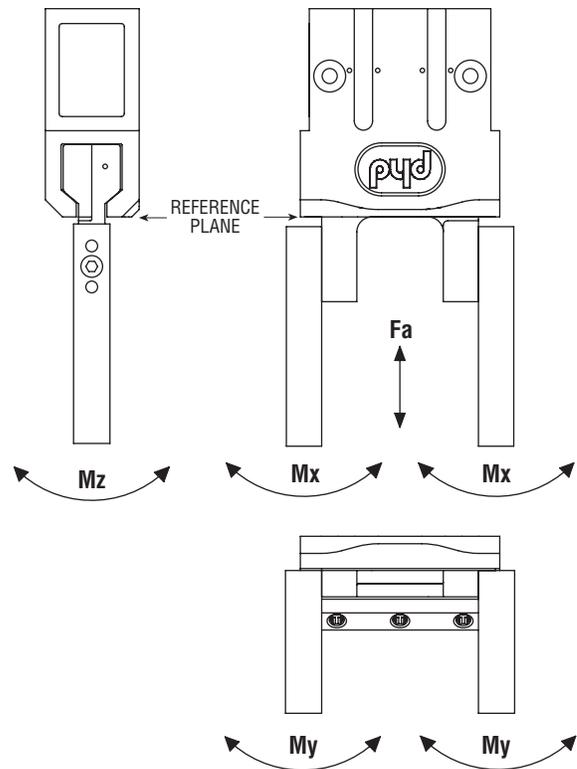
- F_a : Total for both jaws
- M_x : Maximum allowable moment per jaw, relative to the reference plane
- M_y : Maximum allowable moment per jaw, relative to the geometric center of the jaw finger
- M_z : Maximum allowable moment per jaw, relative to the reference plane

When calculating the value for F_a , include the tooling weight, part weight, external forces, and accelerations. When calculating values for M_x , M_y , and M_z , 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 (G_f) values given in the table on page 9 are for zero tooling length. As the grip point is moved away from the jaw surface, the applied moment causes jaw friction to increase, resulting in reduced effective grip force. Use the tooling length factor chart on page 9 to calculate the effective grip force for a specific grip point.

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.

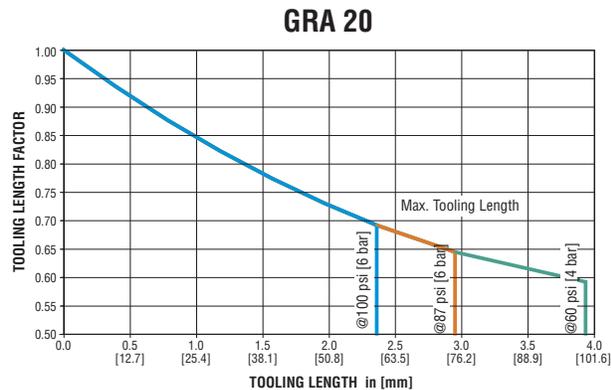
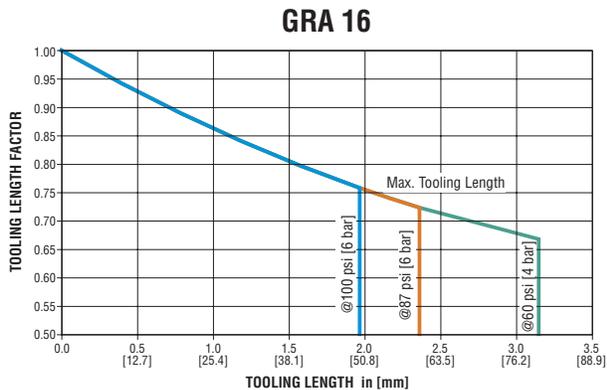
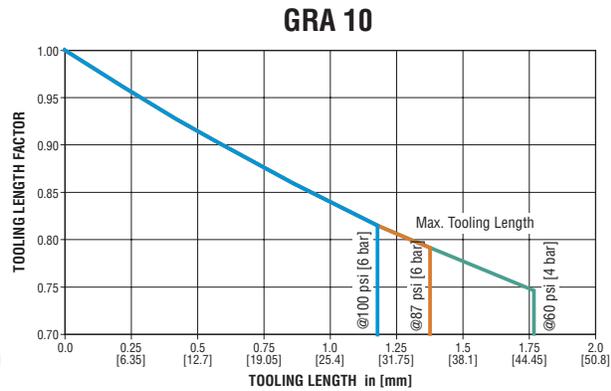
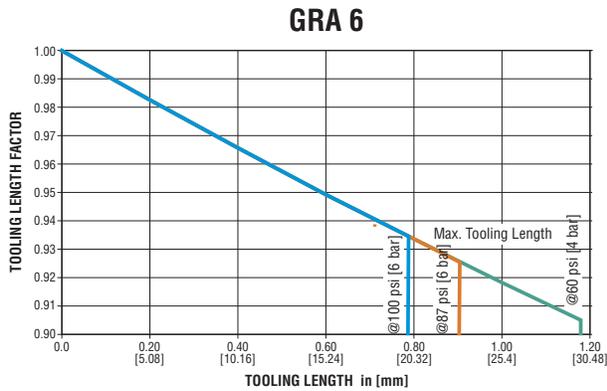


Application & Sizing Assistance

Use PHD's free online Product Sizing and Application at www.phdinc.com/apps/sizing

TOOLING LENGTH FACTOR

As the grip point is moved away from the jaw surface, the grip force is reduced due to additional friction generated by the grip induced moment. The tooling length factor allows calculation of the grip force at any grip point. The graph also indicates the maximum tooling length for each gripper size.



GRIP FORCE CALCULATION EQUATIONS:

IMPERIAL:

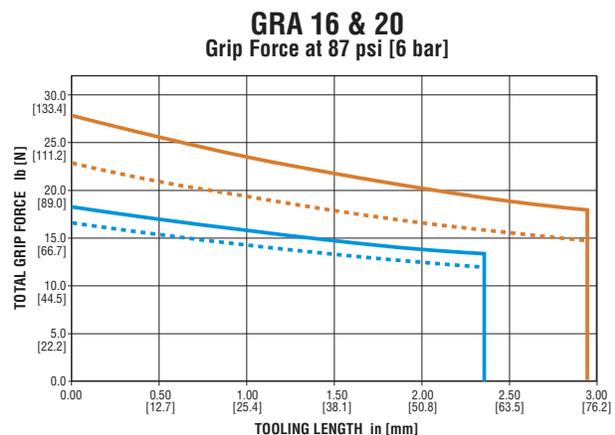
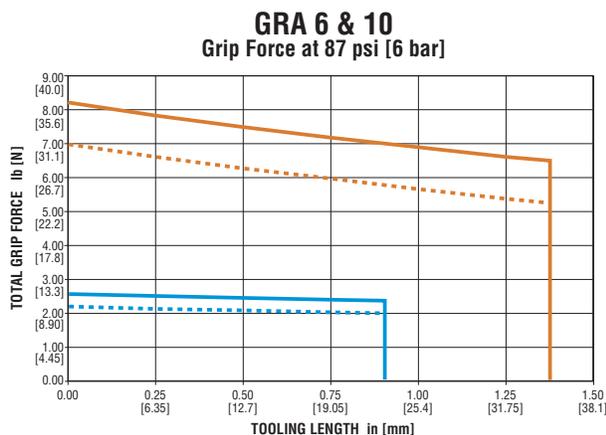
$$\text{Total Grip Force [lb]} = (\text{Pressure [psi]} \times G_f) \times \text{Tooling Length Factor}$$

METRIC:

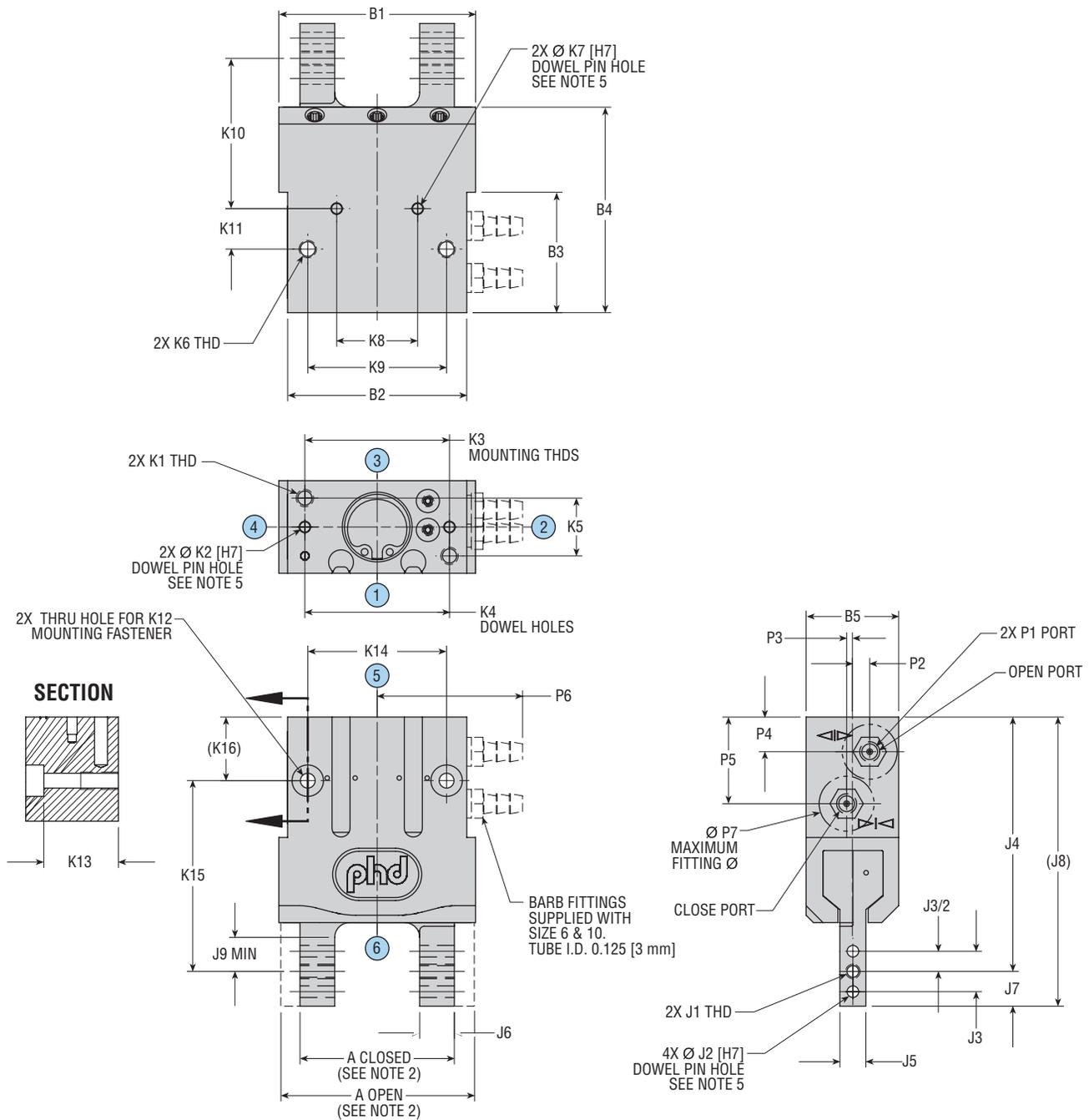
$$\text{Total Grip Force [N]} = (\text{Pressure [bar]} \times G_f) \times \text{Tooling Length Factor}$$

GRIP FORCE

Total gripping force relative to tooling length is shown below at 87 psi [6 bar] 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.



DIMENSIONS: Series GRA Grippers



NOTES:

- 1) METRIC INFORMATION SHOWN IN [] DESIGNATES mm
- 2) A OPEN REFLECTS SMALLEST POSSIBLE OPEN DIMENSION (+0.052/-0.000 [+1.3 mm/-0.0 mm])
A CLOSED REFLECTS LARGEST POSSIBLE CLOSED DIMENSION (+0.000/-0.024 [+0.0 mm/-0.6 mm])
- 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 DURING ASSEMBLY. PHD RECOMMENDS THE USE OF ANTI-SEIZE COMPOUNDS DURING ASSEMBLY.

CAD & Sizing Assistance

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All dimensions are reference only unless specifically tolerated.

DIMENSIONS: Series GRA Grippers

LETTER DIM	MODEL NUMBER							
	GRA-5-6x4		GRA-5-10x5		GRA-5-16x9		GRA-5-20x13	
	in	mm	in	mm	in	mm	in	mm
NOMINAL TOTAL JAW TRAVEL	0.157	4.0	0.198	5.0	0.353	9.0	0.511	13.0
A CLOSED	0.985	25.0	1.063	27.0	1.339	34.0	1.418	36.0
A OPEN	1.142	29.0	1.261	32.0	1.692	43.0	1.929	49.0
B1	1.220	31.0	1.339	34.0	1.772	45.0	2.008	51.0
B2	N/A	N/A	N/A	N/A	1.496	38.0	1.811	46.0
B3	N/A	N/A	N/A	N/A	1.0191	25.9	1.221	31.0
B4	1.355	34.4	1.518	38.6	1.784	45.3	2.110	53.6
B5	0.394	10.0	0.630	16.0	0.866	22.0	1.102	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	0.1969	5.00	0.2756	7.00	0.3937	10.00	0.4724	12.00
J4	1.535	39.0	1.850	47.0	2.224	56.5	2.618	66.5
J5	0.118	3.0	0.177	4.5	0.276	7.0	0.335	8.5
J6	0.197	5.0	0.236	6.0	0.354	9.0	0.394	10.0
J7	0.177	4.5	0.236	6.0	0.315	8.0	0.354	9.0
J8	1.713	43.5	2.087	53.0	2.540	64.5	2.972	75.5
J9 MIN	0.172	4.4	0.215	5.5	0.288	7.3	0.359	9.1
K1	M2.5 x 0.45 x 5 DP		M3 x 0.5 x 6.5 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	0.945	24.0	0.984	25.0	1.260	32.0	1.417	36.0
K4	0.6890	17.50	0.9843	25.00	1.2598	32.00	1.4173	36.00
K5	0.177	4.5	0.394	10.0	0.591	15.0	0.748	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	0.5120	13.00	0.5512	14.00	0.7874	20.00	0.8661	22.00
K9	0.945	24.0	1.063	27.0	1.181	30.0	1.417	36.0
K10	0.827	21.0	1.024	26.0	1.378	35.0	1.595	40.5
K11	0.295	7.5	0.315	8.0	0.315	8.0	0.354	9.0
K12	M2.5		M2.5		M3		M4	
K13	0.289	7.3	0.507	12.9	0.708	18.0	0.925	23.5
K14	0.945	24.0	1.063	27.0	1.181	30.0	1.417	36.0
K15	1.122	28.5	1.339	34.0	1.693	43.0	1.949	49.5
K16	0.413	10.5	0.512	13.0	0.531	13.5	0.669	17.0
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 4.5 DP	
P2	0.059	1.5	0.118	3.0	0.158	4.0	0.197	5.0
P3	0.039	1.0	0.019	0.5	0.138	3.5	0.158	4.0
P4	0.256	6.5	0.236	6.0	0.295	7.5	0.354	9.0
P5	0.610	15.5	0.709	18.0	0.750	19.1	0.945	24.0
P6	0.990	25.1	1.050	26.7	N/A	N/A	N/A	N/A
P7	0.256	6.5	0.374	9.5	0.512	13.0	0.512	13.0

CAD & Sizing Assistance

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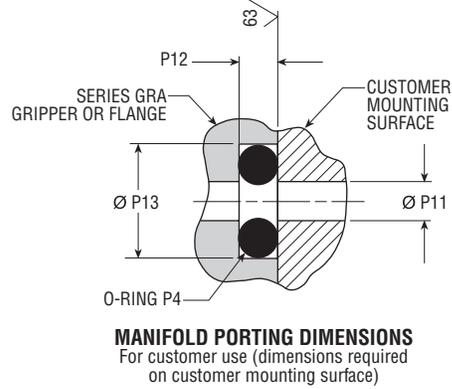
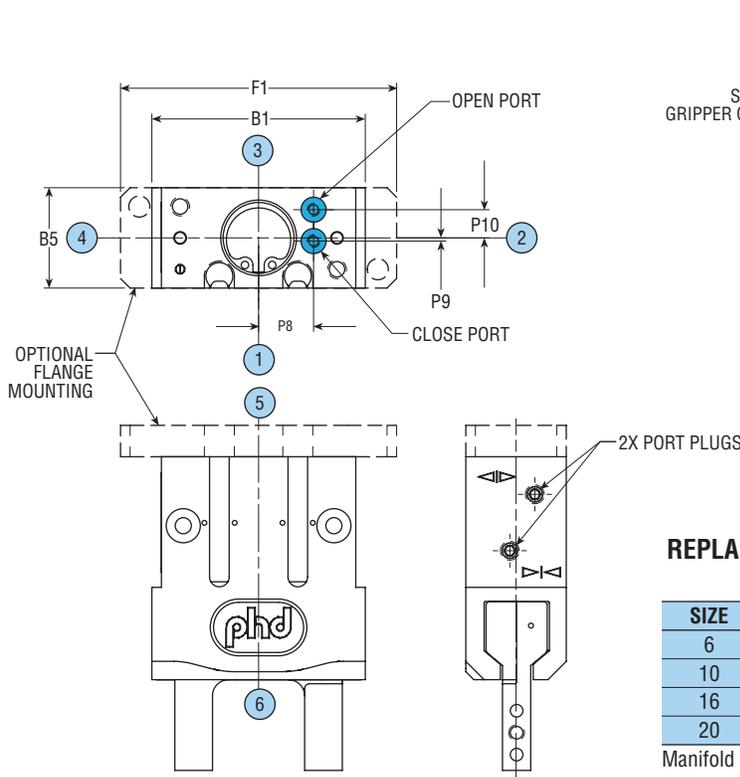
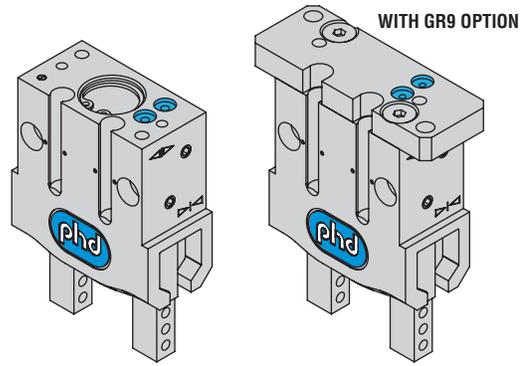
All dimensions are reference only unless specifically tolerated.

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 below.



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							
	GRA-5-6x4		GRA-5-10x5		GRA-5-16x9		GRA-5-20x13	
	in	mm	in	mm	in	mm	in	mm
P8	0.226	5.75	0.345	8.75	0.453	11.5	0.551	14.0
P9	0.099	2.5	0.020	0.5	0.118	3.0	0.138	3.5
P10	0.099	2.5	0.177	4.5	0.118	3.0	0.138	3.5
P11	0.047	1.2	0.047	1.2	0.047	1.2	0.047	1.2
P12	0.030	0.8	0.030	0.8	0.030	0.8	0.030	0.8
P13	0.158	4.0	0.158	4.0	0.158	4.0	0.158	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	
(F1)	1.653	42.0	1.850	47.0	2.047	52.0	2.499	63.5
(B1)	1.220	31.0	1.339	34.0	1.772	45.0	2.008	51.0
(B5)	0.394	10.0	0.630	16.0	0.866	22.0	1.102	28.0

NOTES:

- 1) CIRCLED NUMBERS INDICATE POSITIONS
- 2) *I.D. X CROSS-SECTION

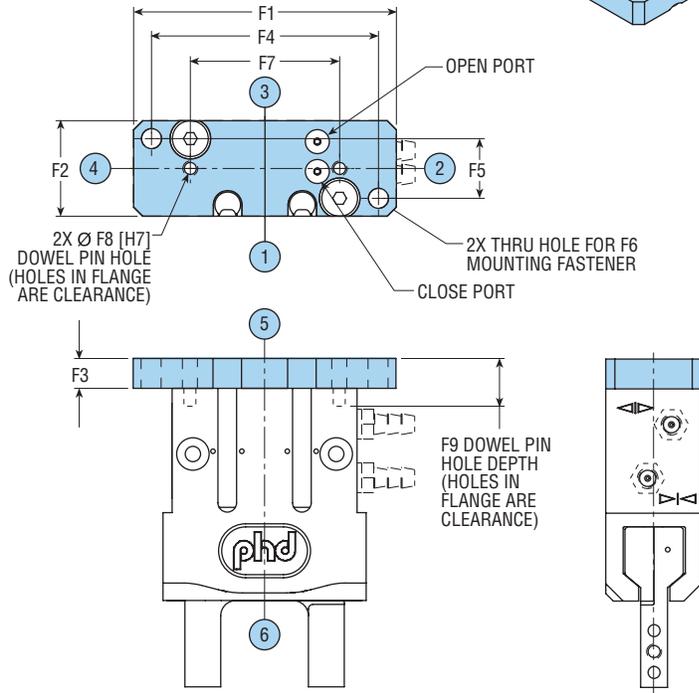
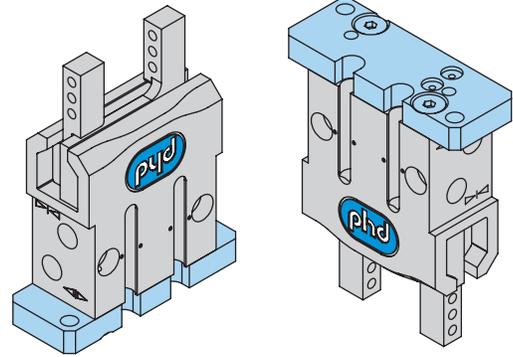
All dimensions are reference only unless specifically toleranced.

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 Kits chart.



FLANGE MOUNTING KITS

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

LETTER DIM	MODEL NUMBER							
	GRA-5-6x4		GRA-5-10x5		GRA-5-16x9		GRA-5-20x13	
	in	mm	in	mm	in	mm	in	mm
F1	1.653	42.0	1.850	47.0	2.047	52.0	2.499	63.5
F2	0.394	10.0	0.630	16.0	0.866	22.0	1.102	28.0
F3	0.197	5.0	0.197	5.0	0.236	6.0	0.236	6.0
F4	1.457	37.0	1.614	41.0	1.772	45.0	2.165	55.0
F5	0.177	4.5	0.394	10.0	0.591	15.0	0.748	19.0
F6	M2.5		M3		M3		M4	
F7	0.6890	17.5	0.9843	25.0	1.2598	32.0	1.4173	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	0.315	8.0	0.315	8.0	0.394	10.0	0.394	10.0

NOTES:

- 1) METRIC INFORMATION SHOWN IN [] DESIGNATES mm
- 2) GR9 OPTION INCLUDES SEALS BETWEEN BODY AND FLANGE

V1 FLUOROELASTOMER SEALS & LUBRICANTS

Fluoroelastomer seals and lubricants are available to achieve seal compatibility with certain fluids. Seal compatibility should be checked with the fluid manufacturer for proper application.

Y4 CLEANROOM GRADE LUBRICANT

Cleanroom grade lubricant replaces all standard lubricants.

All dimensions are reference only unless specifically tolerated.

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, just 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.



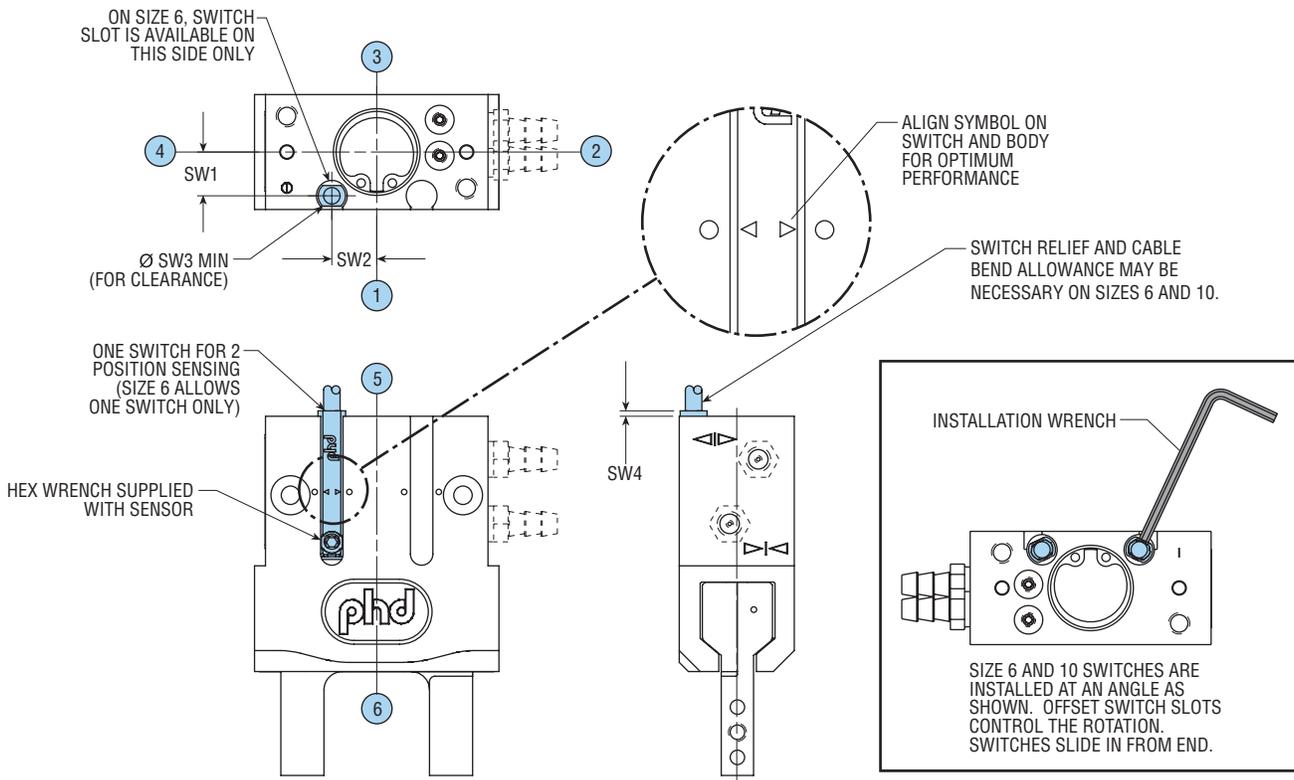
SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES

PART NO.	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							
	GRA-x-6x4		GRA-x-10x5		GRA-x-16x9		GRA-x-20x13	
	mm	in	mm	in	mm	in	mm	in
SW1	2.5	0.100	5.4	0.213	9.1	0.358	12.1	0.475
SW2	5.8	0.230	6.9	0.270	7.7	0.305	8.0	0.315
SW3	4.3	0.169	4.3	0.169	4.3	0.169	4.3	0.169
SW4	3.4	0.135	1.8	0.070	—	—	—	—

All dimensions are reference only unless specifically tolerated.

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

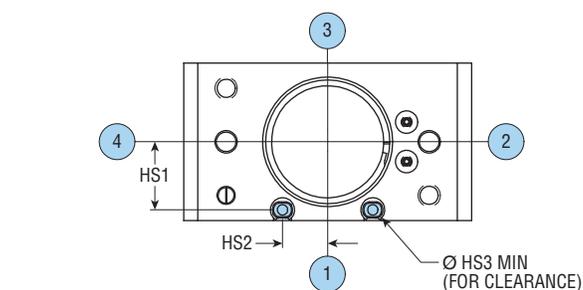
PART NO.	DESCRIPTION
JC1SDN-5	NPN (Sink), Solid State, 10-30 VDC, 5 meter cable
JC1SDP-5	PNP (Source), Solid State, 10-30 VDC, 5 meter cable
JC1SDN-K	NPN (Sink), Solid State, 10-30 VDC, Quick Connect
JC1SDP-K	PNP (Source), Solid State, 10-30 VDC, Quick Connect

Includes one switch and installation directions.

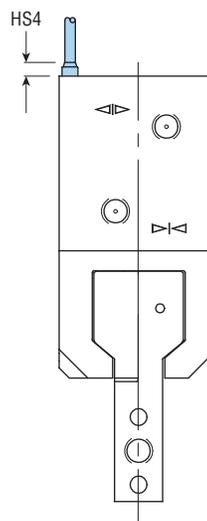
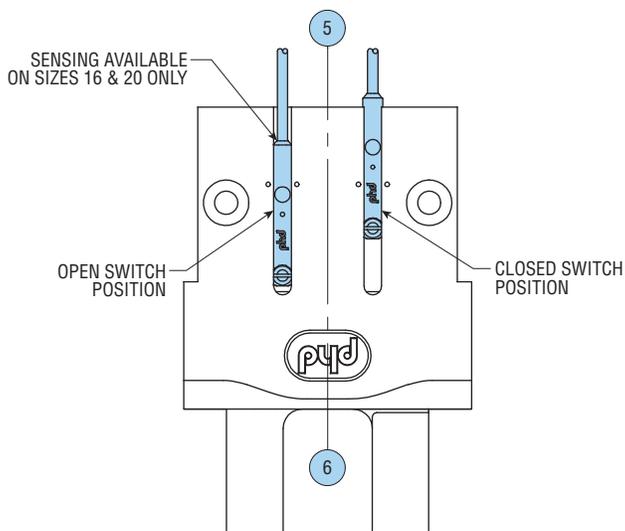
MATCHING CORDSET

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

NOTE: See Switches and Sensors section for additional switch information and complete specification. Switches must be ordered separately.



LETTER DIM	MODEL NUMBER			
	GRA-x-16x9		GRA-x-20x13	
	mm	in	mm	in
HS1	9.1	0.358	12.1	0.475
HS2	7.7	0.305	8.0	0.315
HS3	4.3	0.169	4.3	0.169
HS4	1.3	0.050	—	—



All dimensions are reference only unless specifically tolerated.