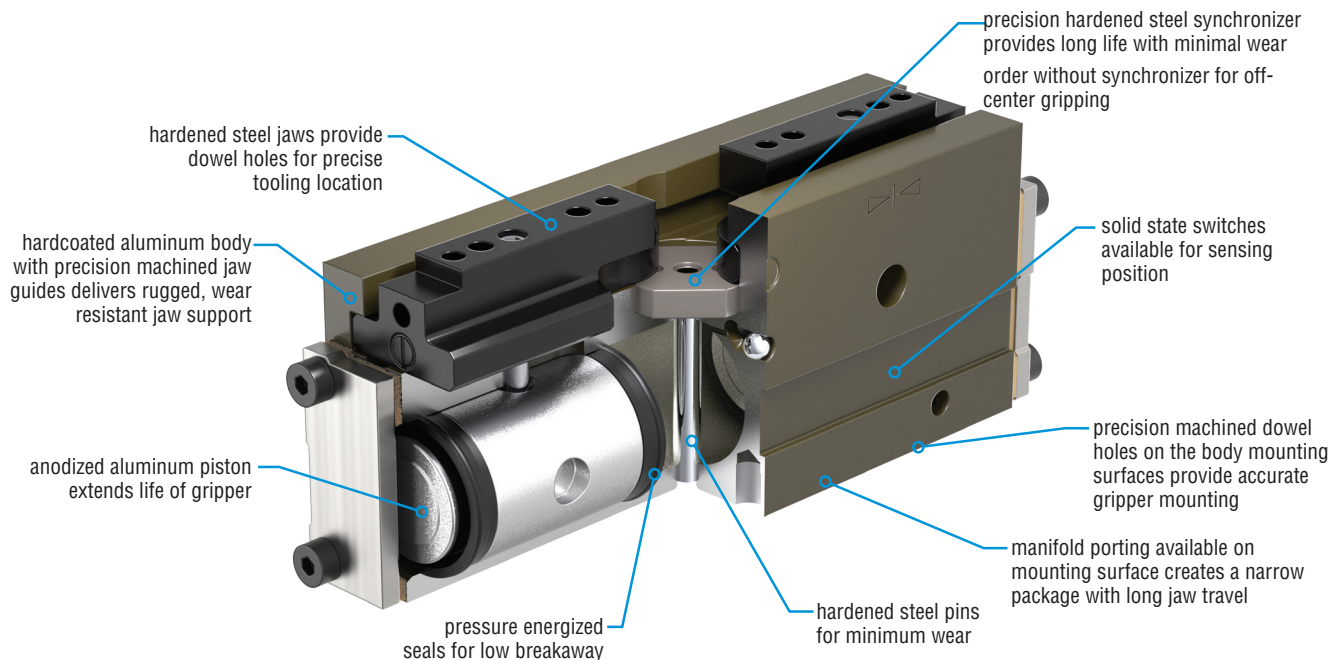


GRL

Major Benefits

- Synchronous jaw motion (may be ordered without synchronizer for offset gripping)
- Narrow width, low profile and long travel lengths
- Manifold porting option
- Two jaw travels per bore size
- Two sizes available in both imperial and metric versions
- 6 million cycles minimum rated life



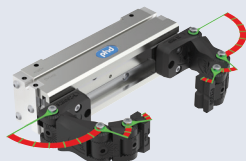
Available on GRL12-5-16x26

PNEU-CONNECT

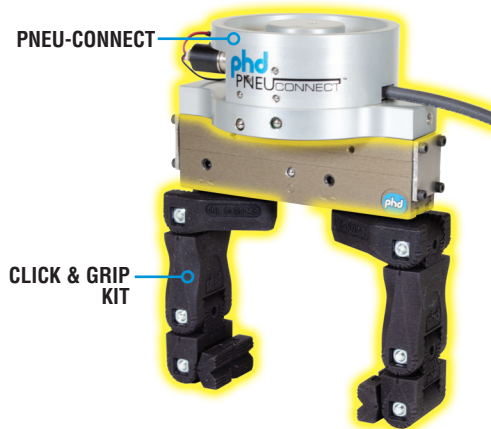
- Provides seamless, cost-effective, pneumatic end-effector integration for collaborative robots
- Kits with GRL Grippers are available with analog sensors that provide jaw position feedback

CLICK & GRIP

- Fast configuration and reconfiguration
- Flexibility with interchangeable components
- Ideal for cobot applications and proof of concept



Segments adjust in 15° increments and lock

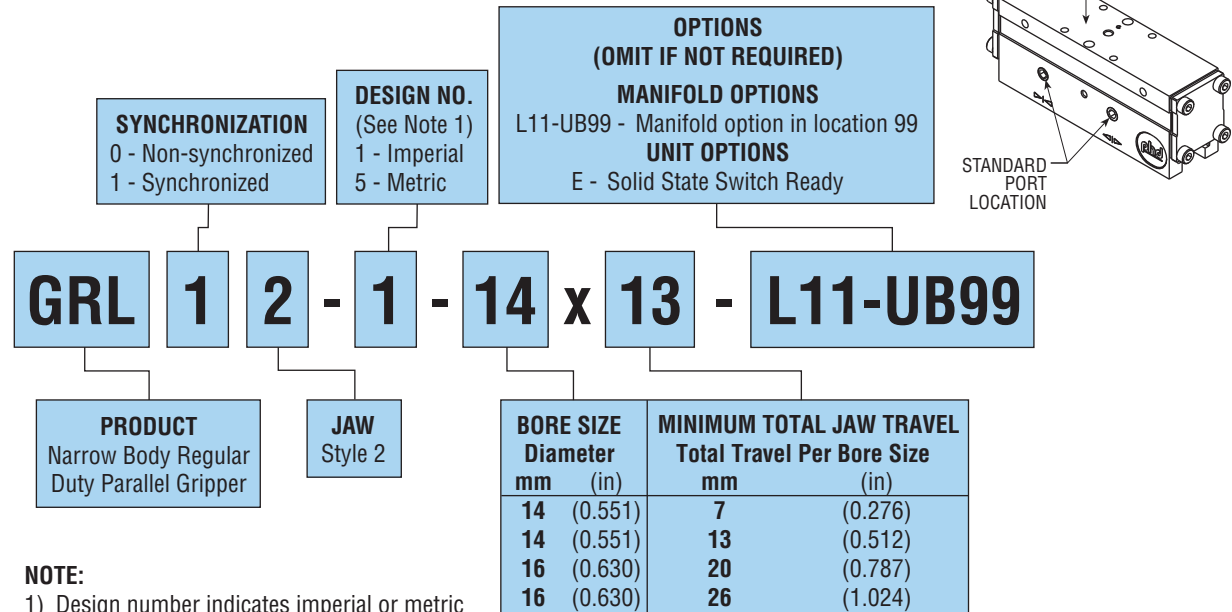


Go to phdinc.com/pneuconnect for more information.

ORDERING DATA: Series GRL Grippers

TO ORDER SPECIFY:

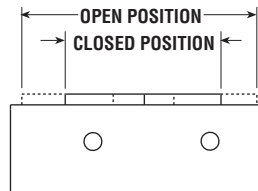
Product, Synchronization, Jaw, Design No.
Size, Total Jaw Travel, and Options required.



TOTAL JAW TRAVEL =
(OPEN POSITION - CLOSED POSITION)



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



5580 SWITCH REPLACEMENT CHART

SWITCH KIT NUMBER	REPLACEMENT KIT INCLUDES	JC1 SWITCH DESCRIPTION
55803-1-02	JC1HDN-5 switch with adaptor	NPN (Sink), Radial Sensing, 5 meter cable
55823-1	JC1HDN-K switch with adaptor	NPN (Sink), Radial Sensing, Quick Connect
55804-1-02	JC1HDP-5 switch with adaptor	PNP (Source), Radial Sensing, 5 meter cable
55824-1	JC1HDP-K switch with adaptor	PNP (Source), Radial Sensing, Quick Connect

For additional switch information, go to phdinc.com.

SOLID STATE SWITCH MOUNTING KIT

PART NO.	DESCRIPTION
68487-1	Switch Mounting Kit

Each mounting kit contains 1 6 mm square switch bracket and 1 mounting screw.

CORDSETS

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

Cordsets are ordered separately.

CAD & Sizing Assistance

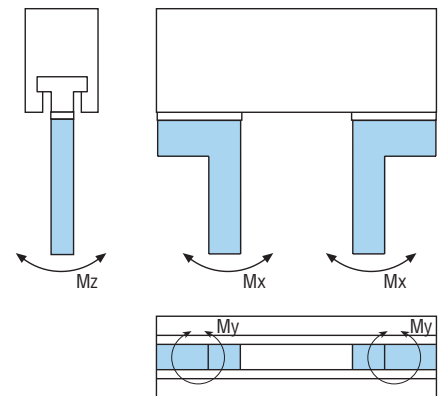
Use PHD's free online Product Sizing and CAD Configurator at phdinc.com/myphd

SPECIFICATIONS	SERIES GRL
OPERATING PRESSURE STANDARD UNIT	5 psi min to 100 psi max [0.4 bar min to 7 bar max] air
OPERATING TEMPERATURE	-20°F to +180°F [-28°C to +82°C]
RATED LIFE	6 million cycles minimum
GRIP REPEATABILITY	Within ±0.002 in [±0.05 mm] of original centered position
CYCLE TIME	See table below
LUBRICATION	Factory lubricated for rated life
MAINTENANCE	Field repairable

SIZE	MINIMUM TOTAL JAW TRAVEL		TOTAL CLOSE GRIP FORCE AT 87 psi [6 bar]		GRIPPER WEIGHT		CLOSE OR OPEN TIME 87 psi [6 bar]	DISPLACEMENT		GRIP FORCE FACTOR G _F			
										EXTERNAL GRIP		INTERNAL GRIP	
	in	mm	lb	N	lb	kg	sec	in ³	cm ³	IMPERIAL	METRIC	IMPERIAL	METRIC
GRL 14x7	0.28	7	28	124	0.18	0.08	0.085	0.067	1.1	0.32	21	0.32	21
GRL 14x13	0.51	13	30	132	0.24	0.11	0.100	0.128	2.1	0.34	22	0.34	22
GRL 16x20	0.79	20	41	182	0.39	0.18	0.110	0.245	4.0	0.47	30	0.47	30
GRL 16x26	1.02	26	41	182	0.47	0.21	0.120	0.319	5.2	0.47	30	0.47	30

MAX. ALLOWABLE MOMENTS ON GRIPPER JAWS

	GRLx2-x-14 x 7		GRLx2-x-14 x 13		GRLx2-x-16 x 20		GRLx2-x-16 x 26	
	in-lb	Nm	in-lb	Nm	in-lb	Nm	in-lb	Nm
M _x Per Jaw	24	2.7	30	3.4	45	5.1	55	6.2
Total Both Jaws (2 x M _x)	48	5.4	60	6.8	90	10	110	12
M _y Per Jaw	24	2.7	30	3.4	45	5.1	55	6.2
Total Both Jaws (2 x M _y)	48	5.4	60	6.8	90	10	110	12
M _z Per Jaw	20	2.3	25	2.8	35	4.0	45	5.1
Total Both Jaws (2 x M _z)	40	4.5	50	5.6	70	7.9	90	10



M_x, M_z: Allowable moments per jaw. Moments measured from the body surface.

M_y: Allowable moment per jaw. Moment measured from the jaw center.

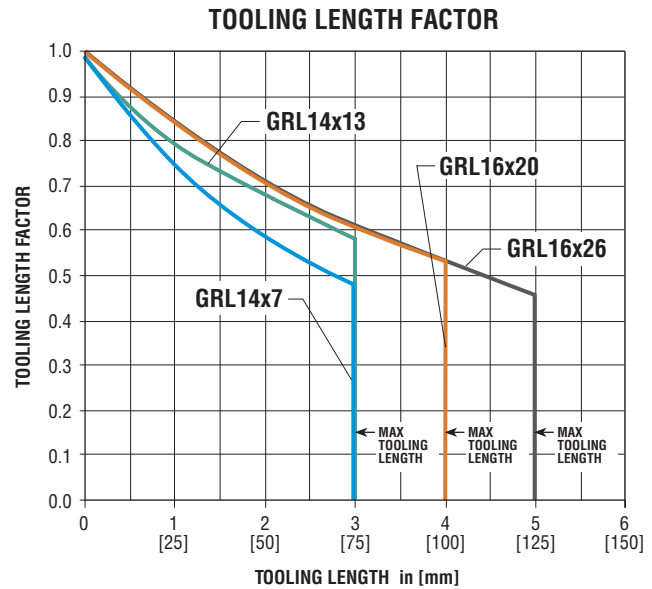
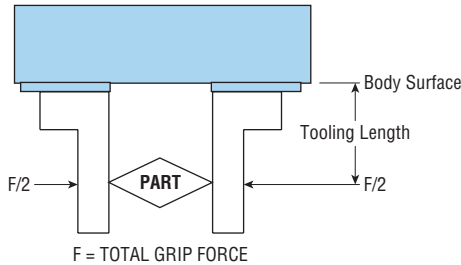
NOTE: When calculating values for M_x, M_y and M_z, include the grip force per jaw, tooling weight, part weight, external forces, and acceleration as applicable.

Application & Sizing Assistance

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

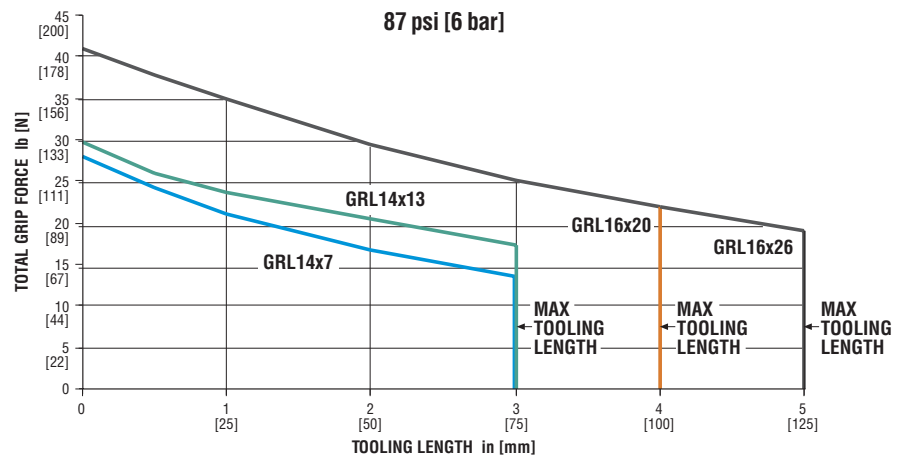
TOOLING LENGTH FACTOR

Jaw tooling should be designed so that the grip point is as close to the body surface as possible. As the grip point is moved away from the body surface, the applied moment causes jaw friction to increase, resulting in reduced effective grip force. The Grip Force Factor (G_f) values given in the table above are for zero tooling length (body surface).



GRIP FORCE

Total gripping force relative to tooling length is shown below at 87 psi [6 bar] actuating pressure. Grip force per jaw equals the total grip force divided by two. The chart 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:

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

GRIPPER CALCULATION EXAMPLE

Gripper: Series GRL Size 16 x 20

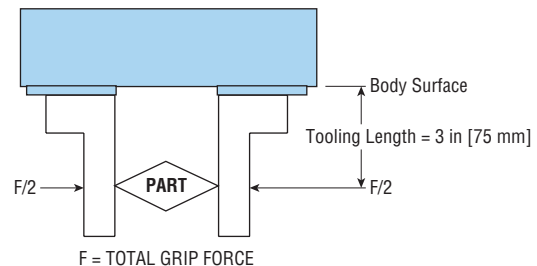
Common Parameters: Operating Pressure = 87 psi [6 bar]

Tooling Length = 3 in [75 mm]

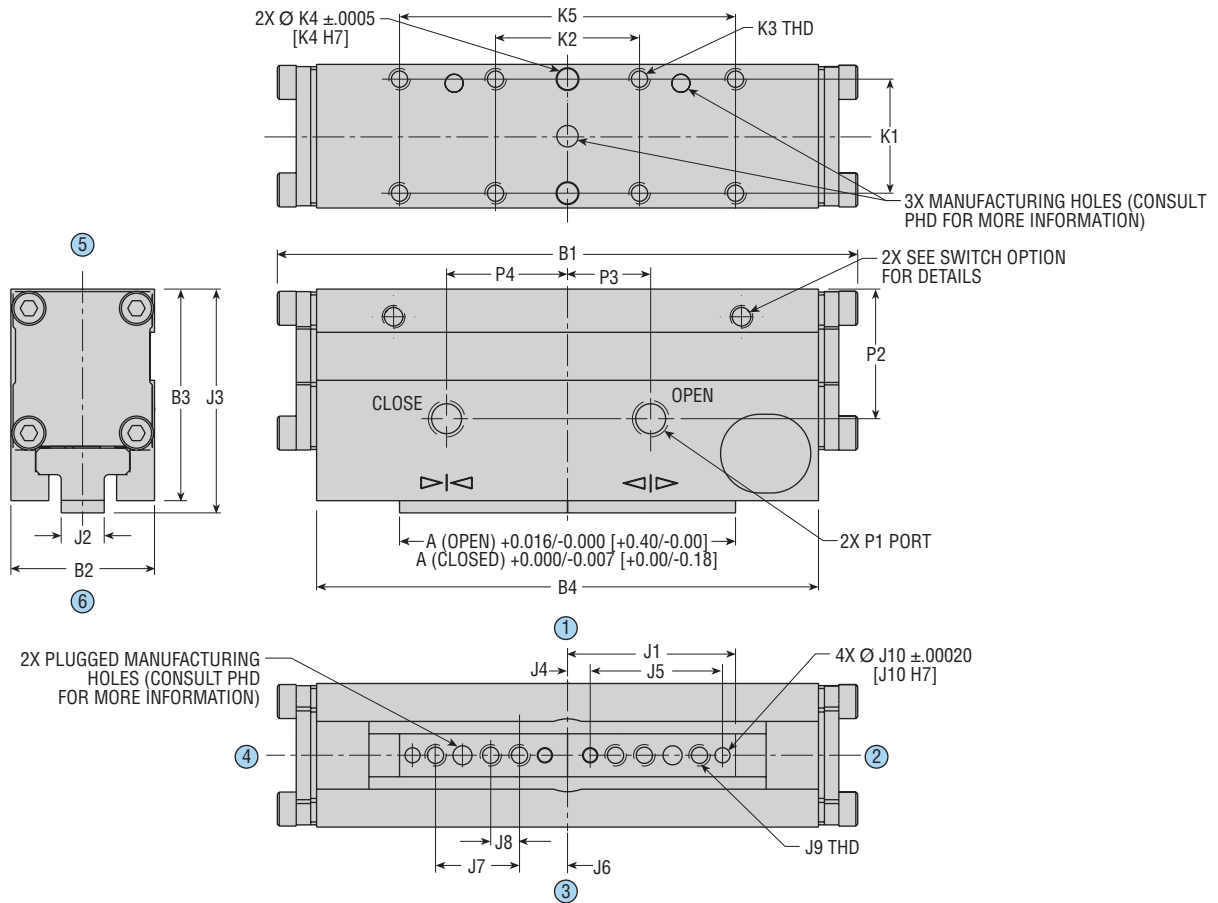
1. Determine Grip Force Factor $G_f = 0.47$ [30] (from table on previous page)
2. Determine Tooling Length Factor = 0.6 [0.6] (from Tooling Length Factor Graph)
3. Total Grip Force Calculations:

For Standard Unit: GRL12-1-16 x 20 [GRL12-5-16 x 20]

Total Grip Force = 87 psi x 0.47 x 0.6 = 25 lb [6 bar x 30 x 0.6 = 108 N]



DIMENSIONS: Series GRL Grippers



LETTER DIM	MODEL NUMBER							
	GRLx2-x-14x7		GRLx2-x-14x13		GRLx2-x-16x20		GRLx2-x-16x26	
	in	mm	in	mm	in	mm	in	mm
MIN TRAVEL PER JAW	0.138	3.5	0.256	6.5	0.394	10.0	0.512	13.0
A CLOSED	1.500	38.1	1.750	44.5	2.250	57.2	2.625	66.7
A OPEN	1.778	45.2	2.264	57.5	3.042	77.3	3.653	92.8
B1	2.316	58.8	3.022	76.8	3.905	99.2	4.614	117.2
B2	0.748	19.0	0.748	19.0	0.874	22.2	0.874	22.2
B3	1.102	28.0	1.102	28.0	1.230	31.2	1.230	31.2
B4	1.908	48.5	2.614	66.4	3.497	88.8	4.206	106.8
J1	0.750	19.1	0.875	22.2	1.125	28.6	1.313	33.3
J2	0.2240	5.69	0.2240	5.69	0.2240	5.69	0.2240	5.69
J3	1.162	29.5	1.162	29.5	1.281	32.5	1.281	32.5
J4	0.118	3.0	0.118	3.0	0.118	3.0	0.118	3.0
J5	0.5709	14.50	0.6890	17.50	0.9055	23.00	1.1024	28.00
J6	0.250	6.4	0.250	6.4	0.250	6.4	0.250	6.4
J7	0.312	7.92	0.438	11.11	0.625	15.88	0.750	19.05
J8	—	—	—	—	0.250	6.35	0.250	6.35
J9	4 x 4-40 x 0.190 DP	4 x M3 x 0.5 x 4.8 DP	4 x 4-40 x 0.190 DP	4 x M3 x 0.5 x 4.8 DP	6 x 5-40 x 0.190 DP	6 x M3 x 0.5 x 4.8 DP	6 x 5-40 x 0.190 DP	6 x M3 x 0.5 x 4.8 DP
J10	0.07893 x 0.118 DP	2.0 x 3.0 DP	0.07893 x 0.118 DP	2.0 x 3.0 DP	0.07893 x 0.118 DP	2.0 x 3.0 DP	0.07893 x 0.118 DP	2.0 x 3.0 DP
K1	0.594	15.1	0.594	15.1	0.656	16.7	0.656	16.7
K2	0.750	19.1	0.750	19.1	1.000	25.4	1.000	25.4
K3	4 x 4-40 x 0.150 DP	4 x M3 x 0.5 x 3.8 DP	4 x 4-40 x 0.150 DP	4 x M3 x 0.5 x 3.8 DP	8 x 5-40 x 0.197 DP	8 x M3 x 0.5 x 5.0 DP	8 x 5-40 x 0.197 DP	8 x M3 x 0.5 x 5.0 DP
K4	0.0947 x 0.157 DP	3.0 x 4.0 DP	0.0947 x 0.157 DP	3.0 x 4.0 DP	0.1259 x 0.157 DP	3.0 x 4.0 DP	0.1259 x 0.157 DP	3.0 x 4.0 DP
K5	—	—	—	—	1.772	45.0	1.772	45.0
P1	10-32	M5 x 0.8	10-32	M5 x 0.8	10-32	M5 x 0.8	10-32	M5 x 0.8
P2	0.675	17.1	0.675	17.1	0.778	19.8	0.778	19.8
P3	0.296	7.5	0.433	11.0	0.512	13.0	0.689	17.5
P4	0.354	9.0	0.630	16.0	1.220	31.0	1.575	40.0

NOTES:

- 1) NUMBERS IN [] ARE mm.
- 2) CIRCLED NUMBERS INDICATE POSITIONS.
- 3) ALL DIMENSIONS ARE CENTERED ON CENTERLINE OF UNIT UNLESS OTHERWISE SPECIFIED.

CAD & Sizing Assistance

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All dimensions are reference only unless specifically tolerated.

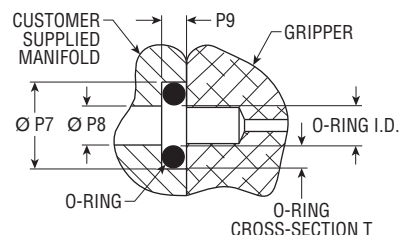
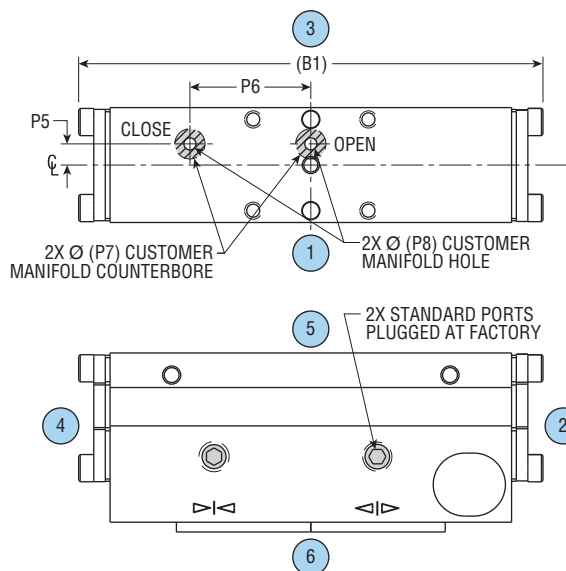
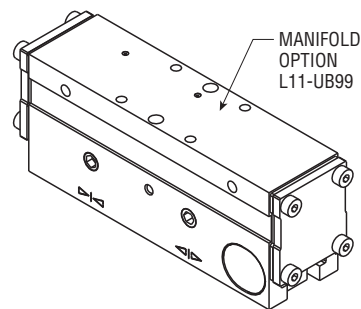
L11-UB99

MANIFOLD OPTION IN LOCATION 99

This option configures the gripper for manifold mounting on the standard mounting surface. The standard ports are plugged. O-rings are provided for sealing between the gripper and the manifold.

TYPE	MANIFOLD REPLACEMENT KIT NUMBER			
	GRLx2-x-14x7	GRLx2-x-14x13	GRLx2-x-16x20	GRLx2-x-16x26
IMPERIAL	68221-14-1-1	68221-14-1-1	68221-16-1-1	68221-16-1-1
METRIC	68221-14-5-1	68221-14-5-1	68221-16-5-1	68221-16-5-1

Manifold kit includes port plugs and o-rings.



MANIFOLD PORTING DIMENSIONS

FOR CUSTOMER USE
(DIMENSIONS REQUIRED
ON CUSTOMER MOUNTING SURFACE)

NOTES:

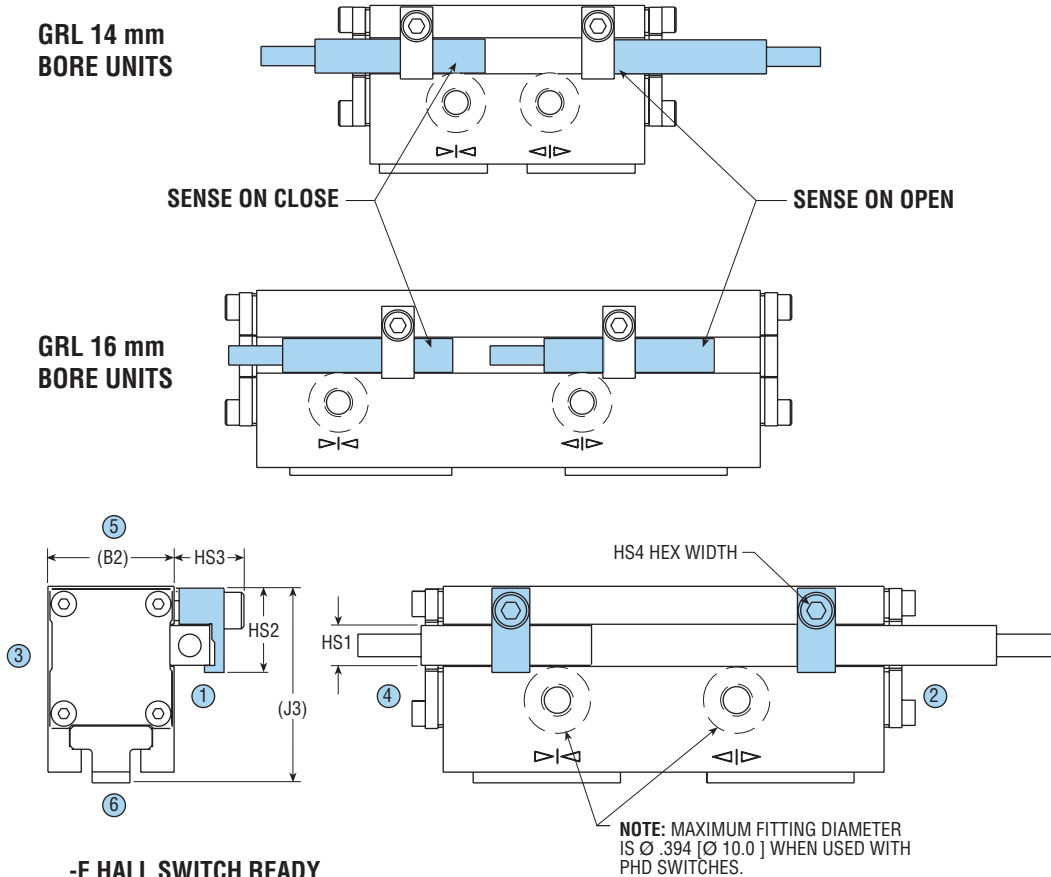
- 1) ALL DIMENSIONS ARE CENTERED ON CENTERLINE OF UNIT UNLESS OTHERWISE SPECIFIED.
- 2) CIRCLED NUMBERS INDICATE POSITIONS.

LETTER DIM	MODEL NUMBER							
	GRLx2-x-14x7		GRLx2-x-14x13		GRLx2-x-16x20		GRLx2-x-16x26	
	in	mm	in	mm	in	mm	in	mm
(B1)	2.316	58.8	3.022	76.8	3.905	99.2	4.614	117.2
P5	0.157	4.0	0.157	4.0	0.157	4.0	0.157	4.0
P6	0.787	20.0	0.787	20.0	1.378	35.0	1.378	35.0
P7	0.197	5.0	0.197	5.0	0.197	5.0	0.197	5.0
P7 O-RING (I.D. x T)	2 mm x 1.5 mm		2 mm x 1.5 mm		2 mm x 1.5 mm		2 mm x 1.5 mm	
P8	0.078	2.0	0.078	2.0	0.078	2.0	0.078	2.0
P9	0.048	1.2	0.048	1.2	0.048	1.2	0.048	1.2

E

SOLID STATE SWITCH READY

The -E option is comprised of magnets installed in the pistons to actuate PHD 6 mm square Solid State Switches. PHD Switches and mounting kits are required in addition to the -E option and are sold separately. See charts below for switches and mountings.



-E HALL SWITCH READY

LETTER DIM	MODEL NUMBER							
	GRLx2-x-14x7		GRLx2-x-14x13		GRLx2-x-16x20		GRLx2-x-16x26	
	in	mm	in	mm	in	mm	in	mm
(B2)	0.748	19.0	0.748	19.0	0.874	22.2	0.874	22.2
(J3)	1.162	29.5	1.162	29.5	1.281	32.5	1.281	32.5
HS1	6 mm SQUARE							
HS2	0.511	13.0	0.511	13.0	0.611	15.5	0.611	15.5
HS3	0.420	10.7	0.420	10.7	0.420	10.7	0.420	10.7
HS4	2.5 mm							

5580 SWITCH REPLACEMENT CHART

SWITCH KIT NUMBER	REPLACEMENT KIT INCLUDES	JC1 SWITCH DESCRIPTION
55803-1-02	JC1HDN-5 switch with adaptor	NPN (Sink), Radial Sensing, 5 meter cable
55823-1	JC1HDN-K switch with adaptor	NPN (Sink), Radial Sensing, Quick Connect
55804-1-02	JC1HDP-5 switch with adaptor	PNP (Source), Radial Sensing, 5 meter cable
55824-1	JC1HDP-K switch with adaptor	PNP (Source), Radial Sensing, Quick Connect

For additional switch information, go to phdinc.com.

CORDSETS

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

Cordsets are ordered separately.

SOLID STATE SWITCH MOUNTING KIT

PART NO.	DESCRIPTION
68487-1	Switch Mounting Kit

Each mounting kit contains:

- 1 6 mm square switch bracket
- 1 mounting screw

All dimensions are reference only unless specifically toleranced.