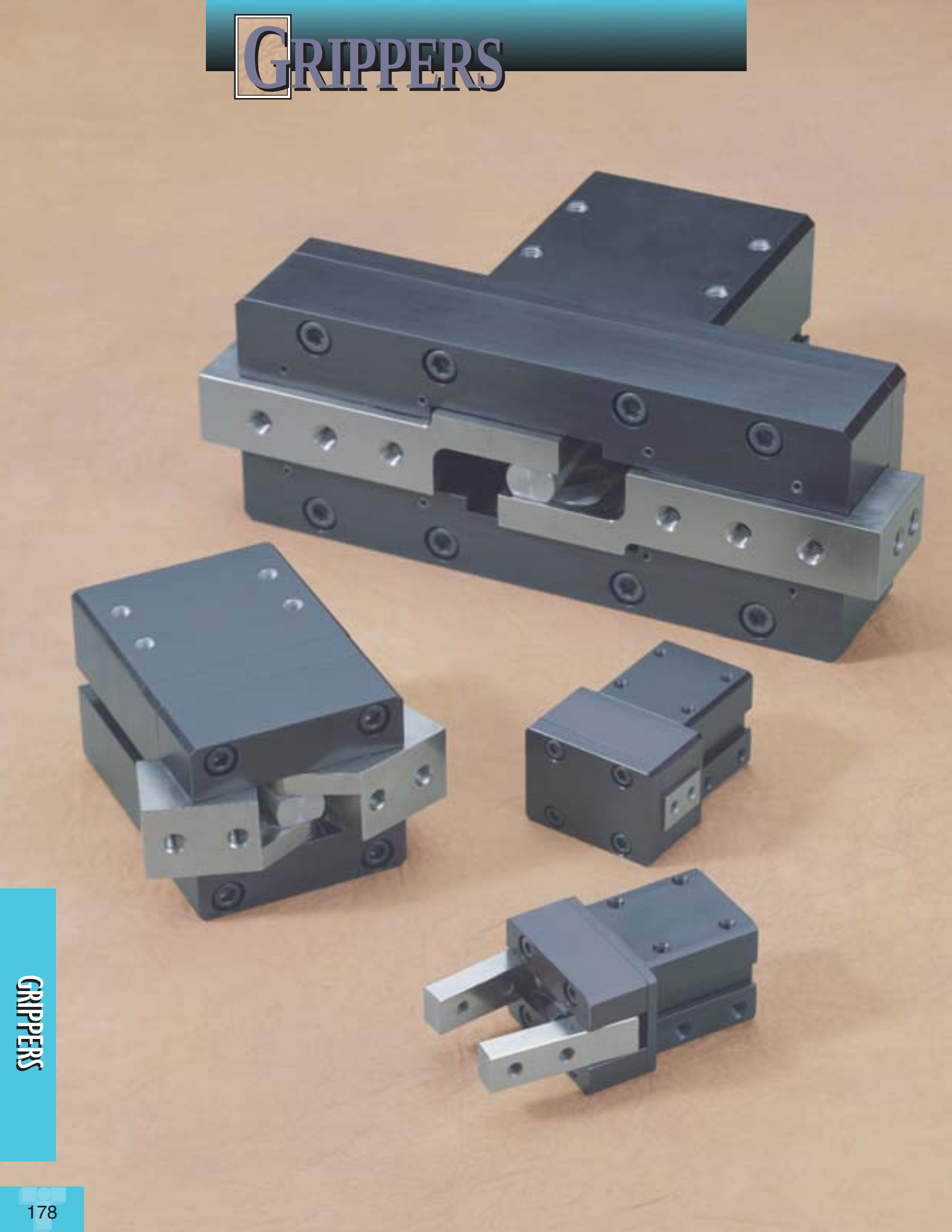
GRIPPERS

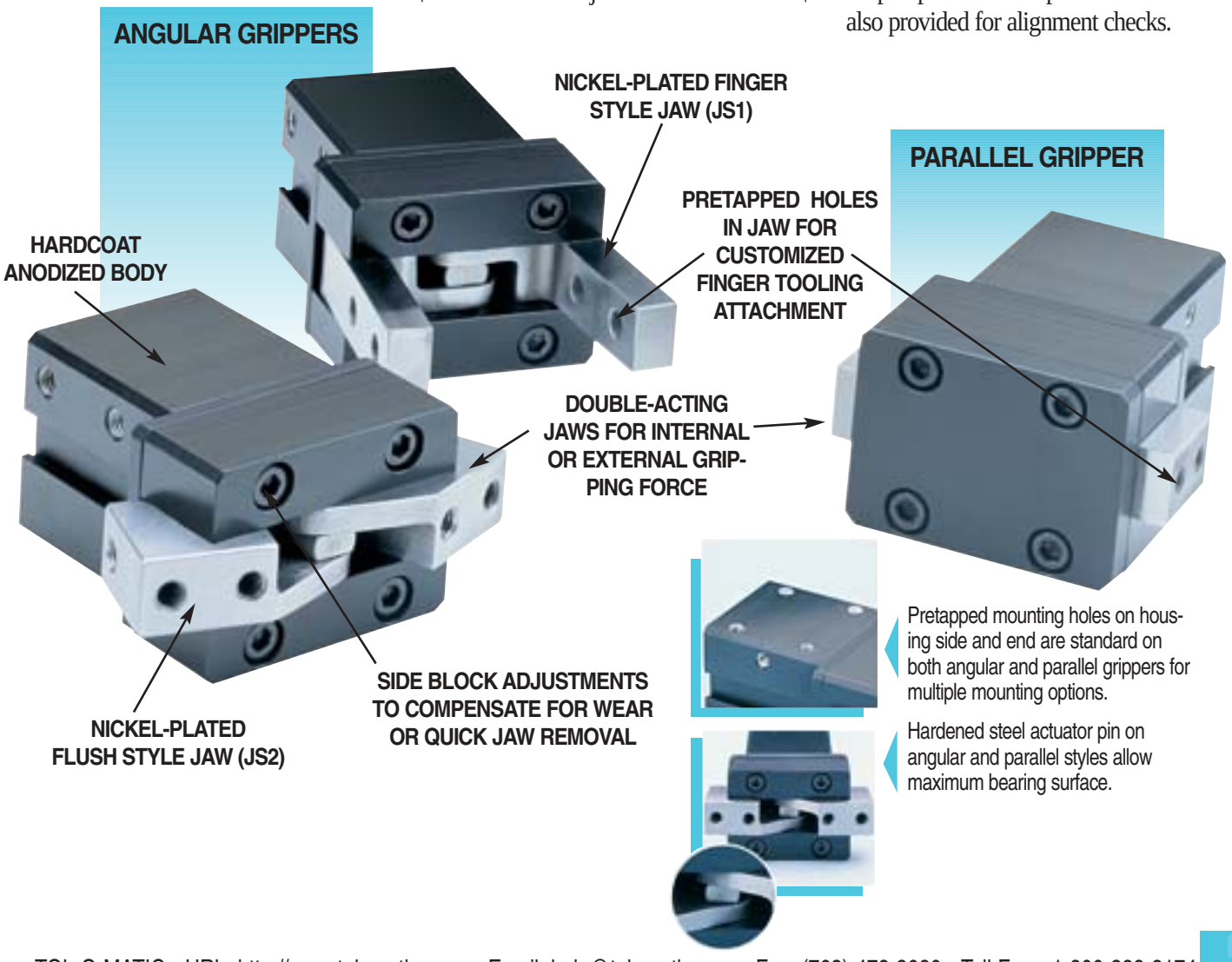


GRIPPERS

Tol-O-Matic's line of hardworking grippers are price competitive units, available in both angular and parallel styles and come in a range of six bore sizes (3/8", 5/8", 1", 1-1/2", 2" and 3") for a multitude of light- or heavy-duty "pick-and-place" applications.

All Tol-O-Matic grippers are designed with efficient, durable features and are prelubricated, making them long-lasting and dependable cycle after cycle. Double-acting for either internal or external gripping applications, these grippers are totally field repairable as well.

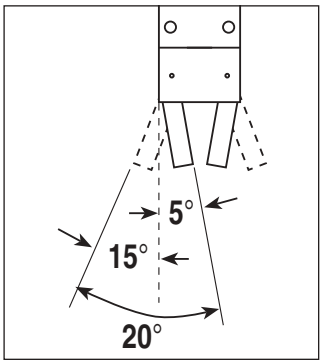
- ***Hardcoat anodized extruded body*** of light-weight 6063-T6 aluminum, features a smooth finished bore for long seal life with low breakaway.
- ***Gripper jaw design*** incorporates a hardened steel actuator pin for maximum cam bearing surface and precision-machined cam slot in jaw keeps backlash at a minimum. Side blocks eliminate side play of jaws, are adjustable to compensate for wear and can be easily removed for quick jaw replacement if necessary. Both jaw styles are nickel-plated for rust-resistance. For reduced jaw friction and longer life, the 1-1/2", 2" and 3" bore parallel grippers feature ball bearings riding on hardened steel rails in the jaw mechanism.
- ***High-performance internal components*** include an oil-impregnated bronze bearing, which provides a lubricated, low-friction guide surface for the piston shaft while stabilizing the piston. Efficient piston design incorporates a shock-absorbing bumper on the piston, effective on the extension stroke. Groove on the piston accommodates a magnet for signalling dc Hall-effect, Reed and ac Triac switches.
- ***Pretapped mounting holes*** on the housing sides and end allow for multiple mounting options and may be combined with Tol-O-Matic rack and pinion rotary actuators and other Tol-O-Matic rod cylinder slides utilizing adapter plates. Dowel pin holes are also provided for alignment checks.



ANGULAR GRIPPERS

Tol-O-Matic angular grippers are available in two different jaw styles. Finger jaw style (JS1) is available in four bore sizes of 3/8", 5/8", 1" and 1-1/2". Flush jaw style (JS2) is available in all six bore sizes of 3/8", 5/8", 1" , 1-1/2", 2" and 3".

Under normal operating conditions, these angular grippers have a life expectancy of 10 million cycles.



Jaw opening characteristics of each jaw style provides 20° of travel.

ANGULAR GRIPPER OPTIONS

OVERALL MODEL SPECIFICATIONS

	GPA038	GPA063	GPA100	GPA150	GPA200	GPA300
Bore Size (in.)	0.375	0.625	1	1.5	2	3
Max. Air Pressure (PSI)	100	100	100	100	100	100
Max. Air Pressure (bars)	6.9	6.9	6.9	6.9	6.9	6.9
Grip Force at 100 PSI (open) (lbs.)	1.8 @ L=.751"	6.0 @ L=1.0"	25 @ L=1.60"	59 @ L=1.0"	132 @ L=1.0"	368 @ L=1.0"
Grip Force at 100 PSI (open) (kgs.)	.82 @ L=19mm	2.72 @ L=25mm	11.34 @ L=25mm	26.76 @ L=25mm	59.87 @ L=25mm	166.9 @ L=25mm
Grip Force @ 100 PSI (closed) (lbs.)	1.6 @ L=.751"	5.1 @ L=1.0"	21 @ L=1.60"	53 @ L=1.0"	119 @ L=1.0"	346 @ L=1.0"
Grip Force @ 100 PSI (closed) (kgs.)	.73 @ L=19mm	2.31 @ L=25mm	9.53 @ L=25mm	24.04 @ L=25mm	53.97 @ L=25mm	156.9 @ L=25mm
Weight (lbs.) with JS1 Finger Jaw	0.09	0.22	0.61		NA	NA
Weight (kgs.) with JS1 Finger Jaw	0.04	0.10	0.28			
Weight (lbs.) with JS2 Flush Jaw	0.11	0.26	0.62	1.52	3.5	8.1
Weight (kgs.) with JS2 Flush Jaw	0.05	0.12	0.28	0.69	1.59	3.67
Operating Temp. (°F) (Buna-N seals)	0° to 180°F	0° to 180°F	0° to 180°F	0° to 180°F	0° to 180°F	0° to 180°F
Operating Temp. (°C) (Buna-N seals)	"-18° to 82°C"	"-18° to 82°C"	"-18° to 82°C"	"-18° to 82°C"	"-18° to 82°C"	"-18° to 82°C"
Operating Temp.* (°F) (Viton® seals)	0° to 240°F	0° to 240°F	0° to 240°F	0° to 240°F	0° to 240°F	0° to 240°F
Operating Temp.* (°C) (Viton® seals)	"-18° to 116°C"	"-18° to 116°C"	"-18° to 116°C"	"-18° to 116°C"	"-18° to 116°C"	"-18° to 116°C"
Max. Breakaway (PSI)	10	10	10	10	10	10
Max. Breakaway (bars)	0.69	0.69	0.69	0.69	0.69	0.69
Stroke	20°	20°	20°	20°	20°	20°

* 180°F (82°C) is the maximum operating temperature when using magnets. Therefore magnets should not be used with seals of Viton® material.

CALCULATING GRIP FORCE OF ANGULAR GRIPPERS

Jaw opening grip force:

$$GF = \frac{(P - 10)}{L} \times J_O$$

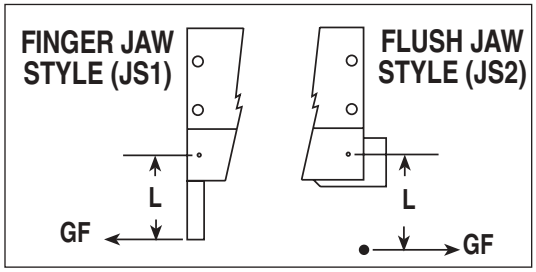
Jaw closing grip force:

$$GF = \frac{(P - 10)}{L} \times J_C$$

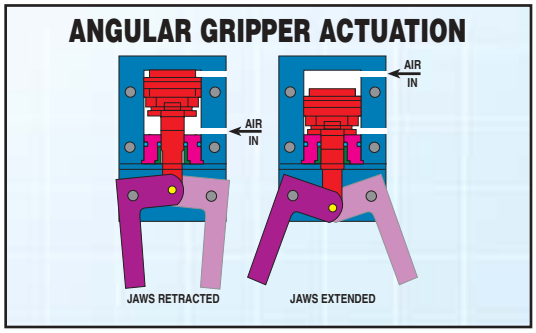
Where:

GF = Grip force (lbs.)
P = Applied system pressure (PSI)
L = Distance from jaw pivot to point of applied force (In)
J_O = Jaw opening multiplier constant (see chart)
J_C = Jaw closing multiplier constant (see chart)

MULTIPLIER CONSTANTS	GPA038	GPA063	GPA100	GPA150	GPA200	GPA300
J_O	.015	.070	.278	.663	1.473	4.103
J_C	.013	.057	.239	.589	1.328	3.847



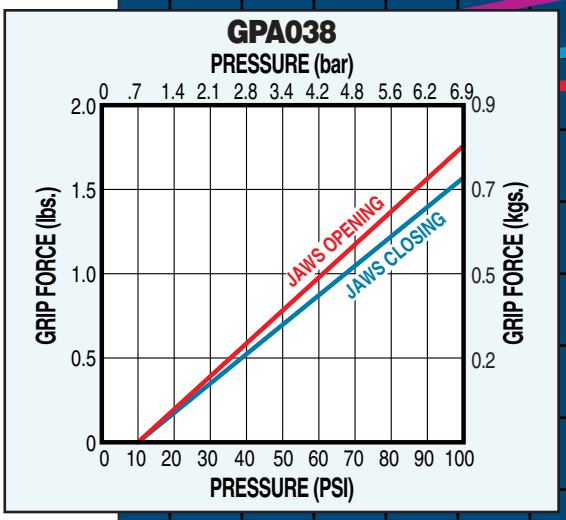
ANGULAR GRIPPER ACTUATION

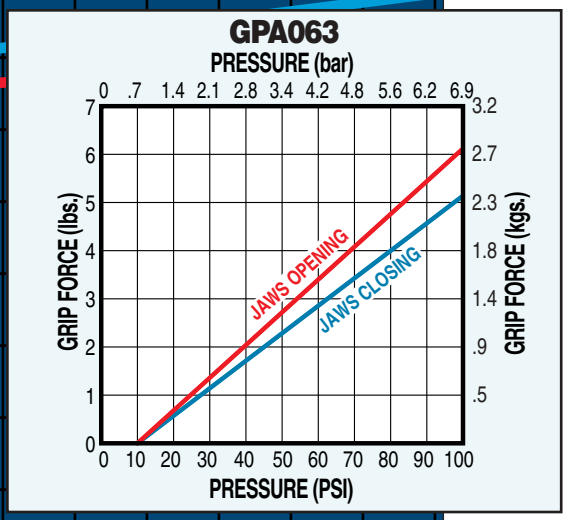


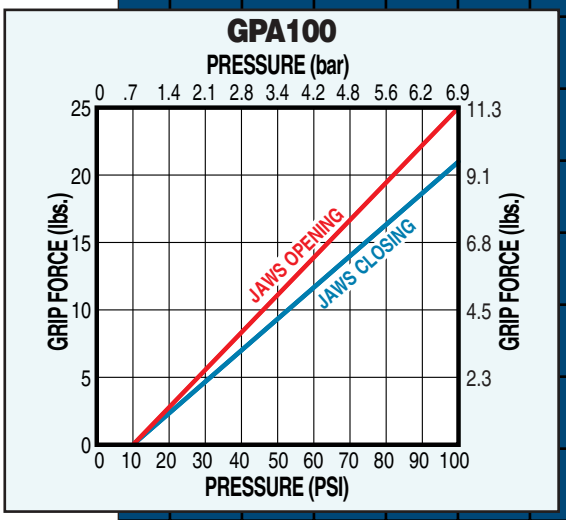
GRIPPERS

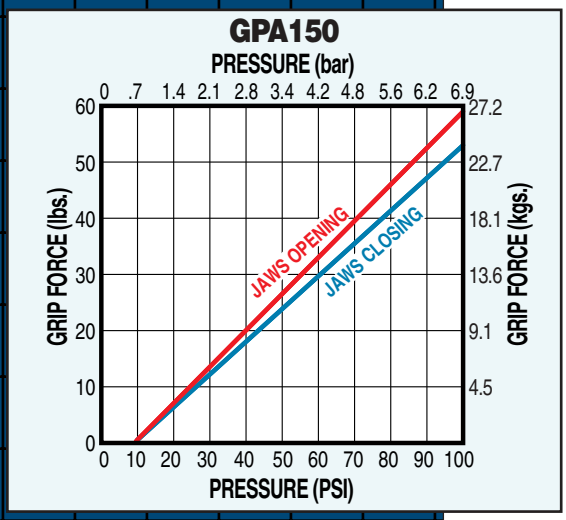
ANGULAR GRIPPER
PERFORMANCE DATA

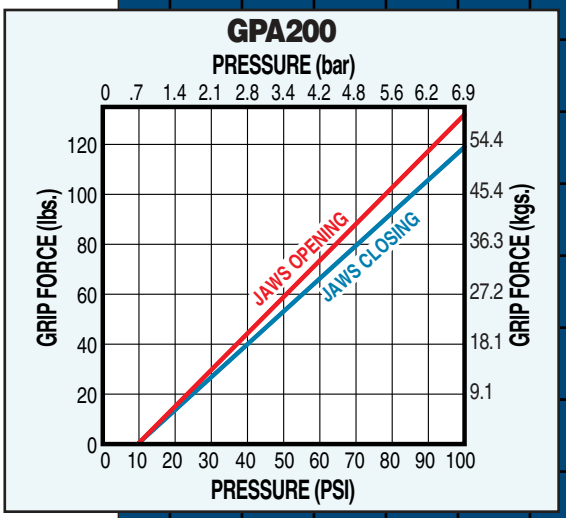
GRIP FORCE vs PRESSURE

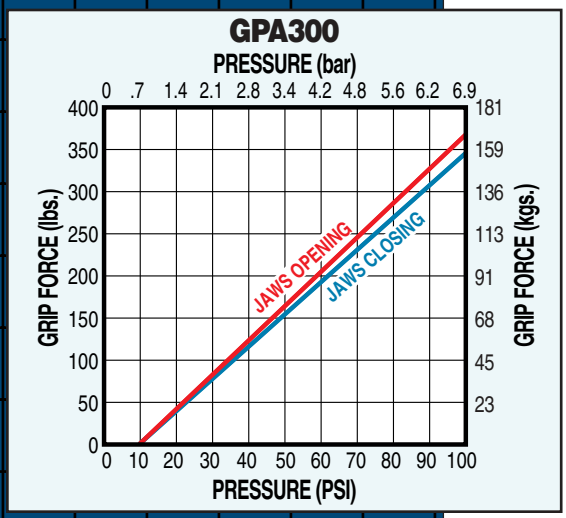






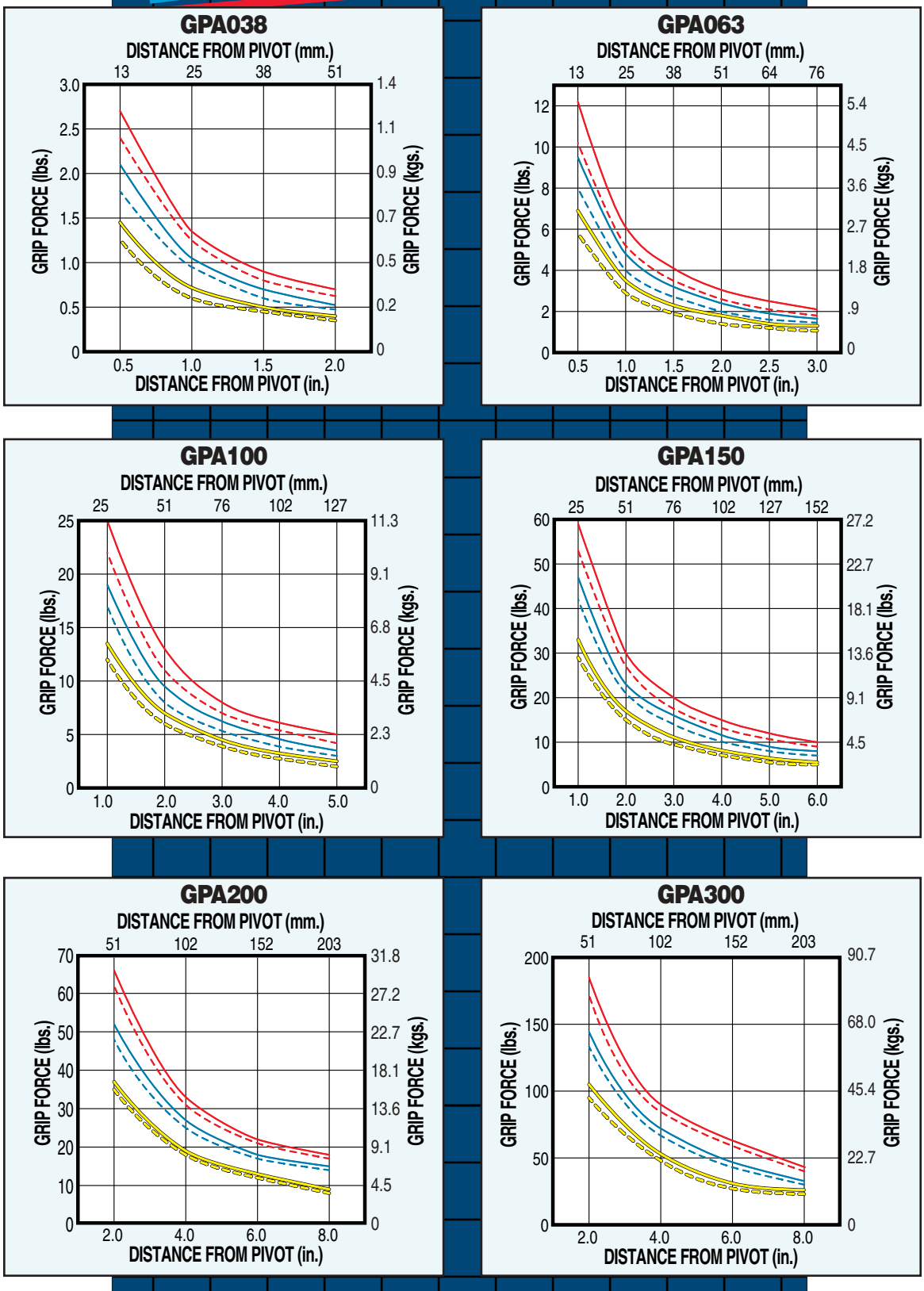






ANGULAR GRIPPER
PERFORMANCE DATA

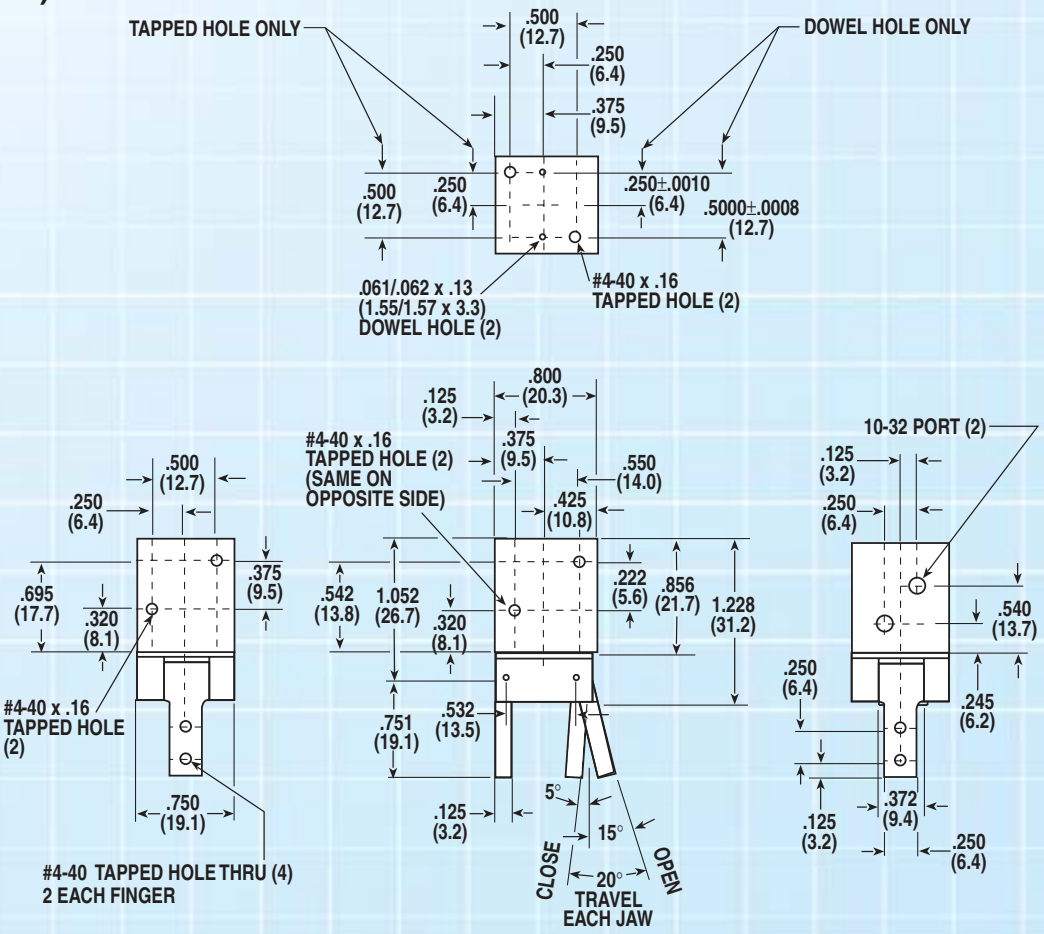
GRIP FORCE vs LENGTH TO PIVOT



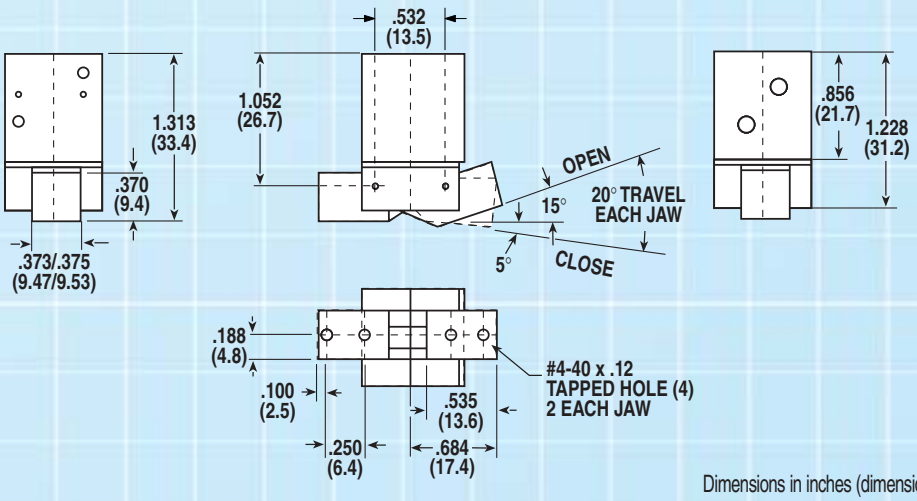
DIMENSIONAL DATA

GP.EXE
GP038.DWG
GP038.DXF

FINGER STYLE JAW (JS1)



FLUSH STYLE JAW (JS2)

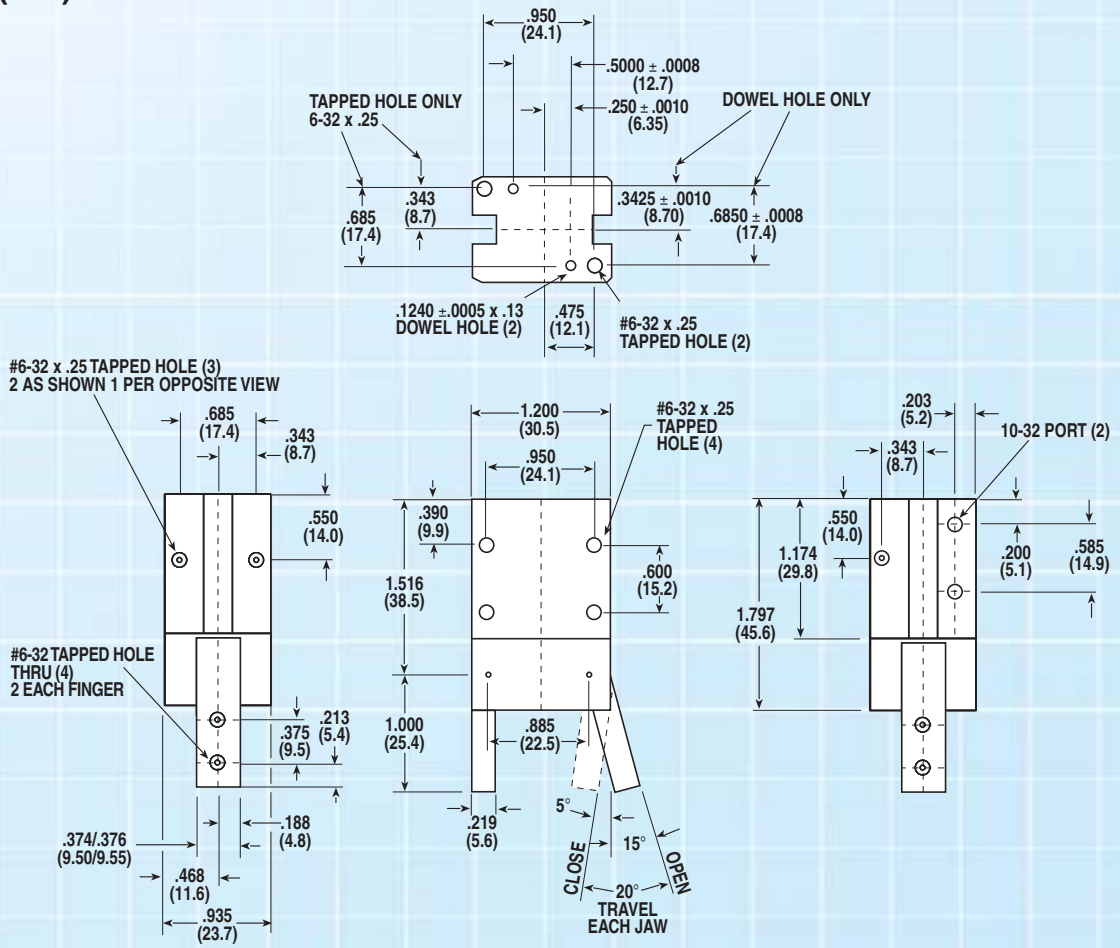


Dimensions in inches (dimensions in millimeters)

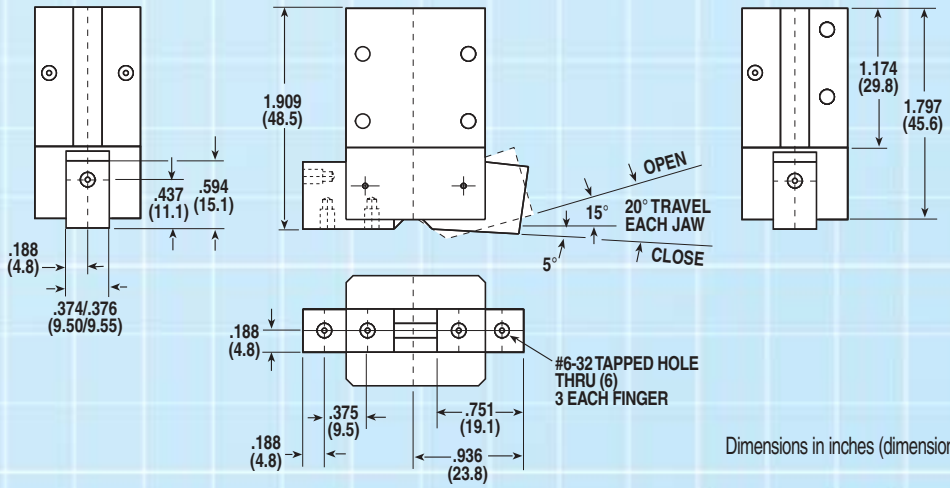
DIMENSIONAL DATA

GP.EXE
GP063.DWG
GP063.DXF

FINGER STYLE JAW (JS1)



FLUSH STYLE JAW (JS2)



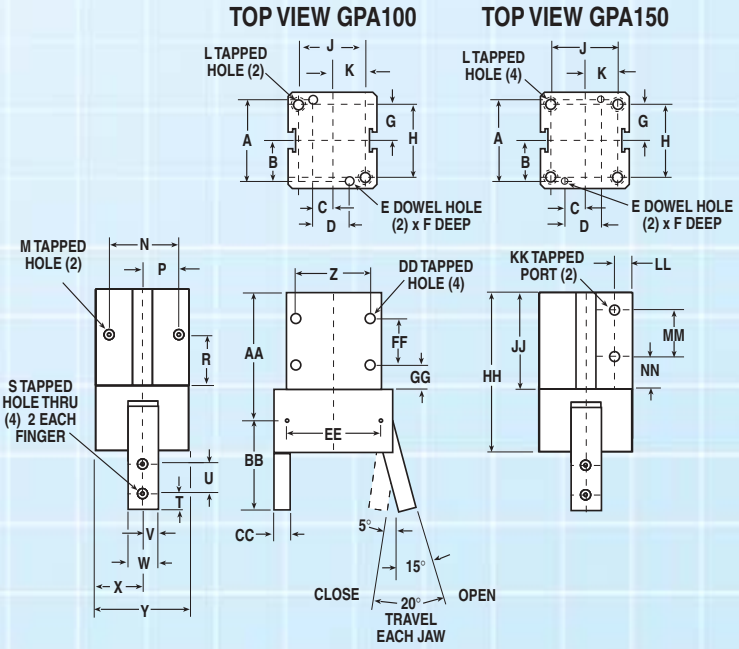
Dimensions in inches (dimensions in millimeters)

GPA100 & GPA150

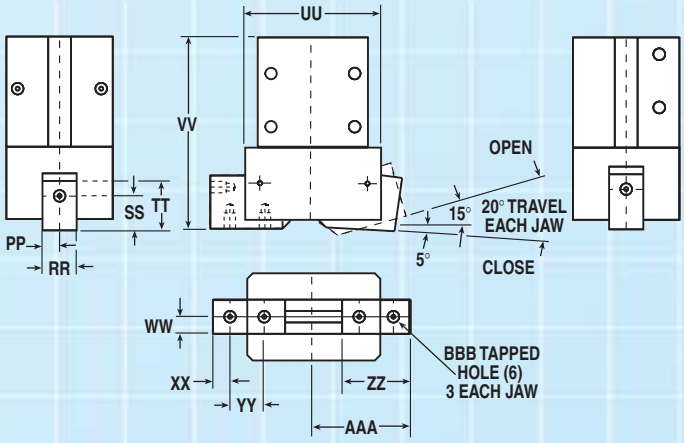
GP.EXE
GP100.DWG
GP100.DXF
GP150.DWG
GP150.DXF

DIMENSIONAL DATA

FINGER STYLE JAW (JS1)



FLUSH STYLE JAW (JS2)



GPA	100	150
A	1.115 ± .0008	1.6 ± .0008
B	0.5575 ± .0010	0.8 ± .0010
C	0.2875 ± .0010	0.5 ± .001
D	0.575 ± .0008	1 ± .0008
E	.124 / 0.1255	.1245 / 0.1235
F	0.2	0.25
G	0.5	0.75
H	1	1.5
J	1	1.5
K	0.5	0.75
L	#8-32 UNC -2B x .22	10-32 x .38
M	#8-32 UNC x .22	NA
N	1	NA
P	0.5	NA
R	0.75	NA
S	10-24 x .28	1/4-28 UNF-2B
T	0.312	0.375
U	0.625	1
V	0.25	0.375
W	.499/.501	0.75
X	0.6875	0.99
Y	1.375	1.98
Z	1	1.5
AA	1.952	2.637
BB	1.6	2
CC	0.33	0.437
DD	#8-32 x .22	10-32 X .38
EE	1.416	1.5
FF	0.875	1
GG	0.313	0.512
HH	2.377	3.075
JJ	1.5	2.012
KK	10-32	10-32
LL	0.25	0.615
MM	0.75	1.001
NN	0.5	0.676
PP	0.25	0.375
RR	0.5	0.75
SS	0.625	0.672
TT	0.812	0.859
UU	1.875	1.98
VV	2.539	3.215
WW	0.25	0.375
XX	0.187	0.311
YY	0.5	0.563
ZZ	0.875	1.103
AAA	1.25	1.435
BBB	10-24 x .28	1/4-28 x .44

Dimensions in inches

GPA	100	150
A	28.3 ± .020	40.6 ± .020
B	14.2 ± .025	20.3 ± .025
C	7.3 ± .025	12.7 ± .025
D	14.6 ± .020	25.4 ± .020
E	3.15/ 3.2	3.16/ 3.1
F	5.1	6.4
G	12.7	19.1
H	25.4	38.1
J	25.4	38.1
K	12.7	19.1
L	#8-32 UNC -2B x .22	10-32 x .38
M	#8-32 UNC x .22	NA
N	25.4	NA
P	12.7	NA
R	19.1	NA
S	10-24 x .28	1/4-28 UNF-2B
T	7.9	9.5
U	15.9	25.4
V	6.4	9.5
W	12.67/12.72	19.1
X	17.5	25.1
Y	34.9	50.3
Z	25.4	38.1
AA	49.6	67.0
BB	40.6	50.8
CC	8.4	11.1
DD	#8-32 x .22	10-32 X .38
EE	36.0	38.1
FF	22.2	25.4
GG	8.0	13.0
HH	60.4	78.1
JJ	38.1	51.1
KK	10-32	10-32
LL	6.4	15.6
MM	19.1	25.4
NN	12.7	17.2
PP	6.4	9.5
RR	12.7	19.1
SS	15.9	17.1
TT	20.6	21.8
UU	47.6	50.3
VV	64.5	81.7
WW	6.4	9.5
XX	4.7	7.9
YY	12.7	14.3
ZZ	22.2	28.0
AAA	31.8	36.4
BBB	10-24 x .28	1/4-28 x .44

Dimensions in millimeters

GRIPPERS

DIMENSIONAL DATA

GP.EXE
GP200.DWG
GP200.DXF
GP300.DWG
GP300.DXF

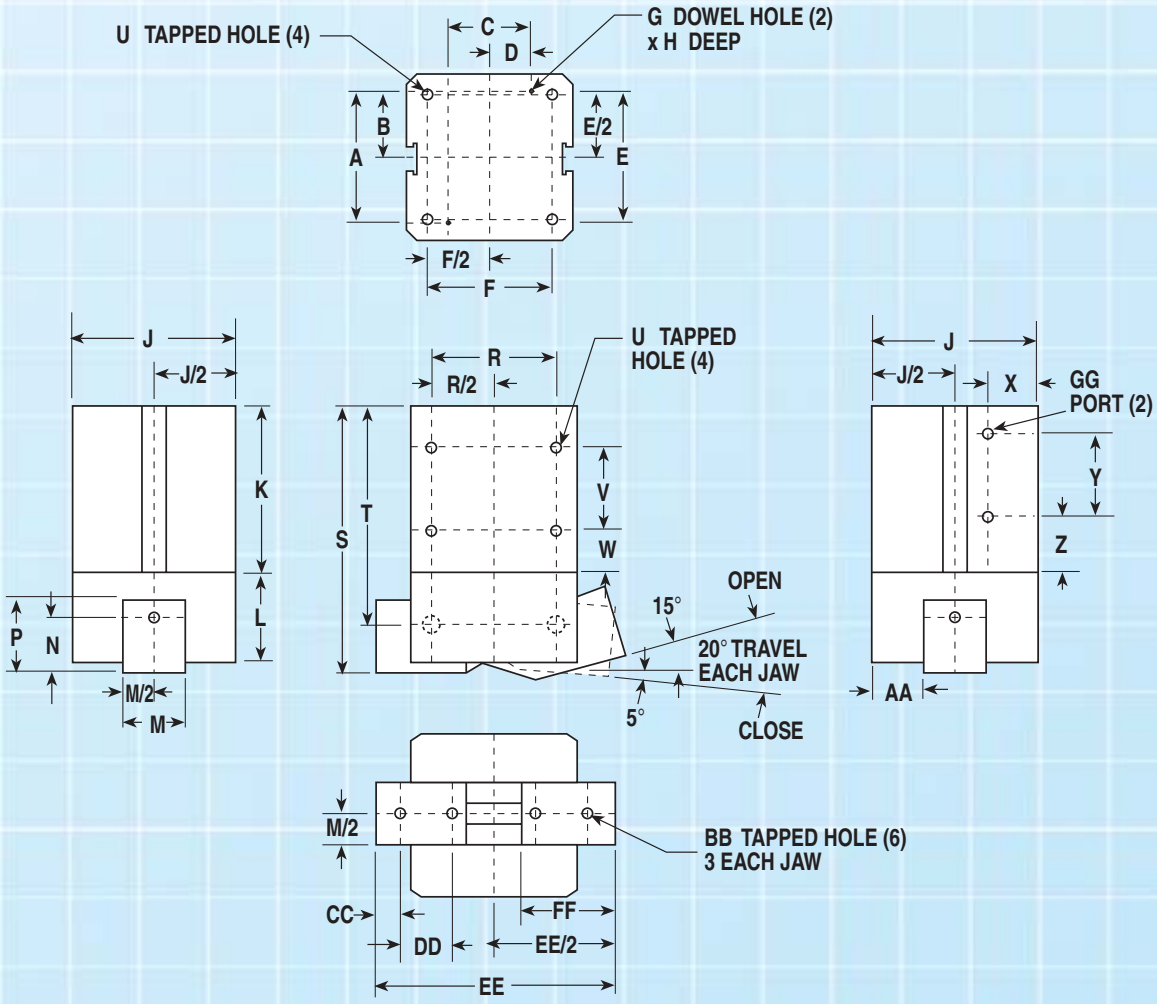
MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
GPA200	2.1000 ±.0008	1.050 ±.001	1.1000 ±.0008	0.550 ±.001	1.960	1.960	0.2485 0.2495	0.375	2.480	2.393	1.557	1.000	0.785	1.068	1.960	4.097	3.378	1/4-28 x .38"	0.800	0.865	0.615	1.100	0.862	0.740	1/4-28 x .38"	0.375	0.750	3.544	1.381	1/8-27 NPT
GPA300	3.0000 ±.0008	1.500 ±.001	1.8130 ±.0008	0.906 ±.001	2.750	2.750	0.2490 0.2500	0.375	3.500	3.550	2.086	1.040	1.118	1.558	2.323	5.876	4.758	5/16 x .5"	1.500	0.900	1.000	1.625	1.320	1.230	3/8-16 x.66"	0.500	0.847	4.821	1.847	1/8-27 NPT

Dimensions in inches

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
GPA200	53.340 ±.020	26.67 ±.025	27.940 ±.020	13.97 ±.025	49.78	49.78	6.312 6.337	9.53	62.99	60.78	39.55	25.40	19.94	27.13	49.78	104.06	85.80	1/4-28 x .38"	20.32	21.97	15.62	27.94	21.89	18.80	1/4-28 x .38"	9.53	19.05	90.02	35.08	1/8-27 NPT
GPA300	76.200 ±.020	38.10 ±.025	46.050 ±.020	23.01 ±.025	69.85	69.85	6.325 6.350	9.53	88.90	90.17	52.98	26.42	28.40	39.57	59.00	149.25	120.85	5/16 x .5"	38.10	22.86	25.40	41.28	33.53	31.24	3/8-16 x.66"	12.70	21.51	122.45	46.91	1/8-27 NPT

Dimensions in millimeters

FLUSH STYLE JAW (JS2)



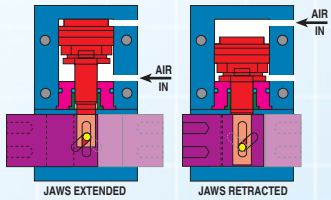
GRIPPERS

PARALLEL GRIPPERS

Tol-O-Matic parallel style grippers are available in 3/8", 5/8", 1", 1-1/2", 2" and 3" bore sizes. Larger bore sizes of 1-1/2", 2" and 3", utilize ball bearings on harden steel rails in the jaw mechanism for reduced jaw friction and longer life.

Under normal operating conditions, these parallel grippers have a life expectancy of 10 million cycles.

PARALLEL GRIPPER ACTUATION



OVERALL MODEL SPECIFICATIONS						
	GPP038	GPP063	GPP100	GPP150	GPP200	GPP300
Bore Size (in.)	.375	.625	1.00	1.50	2.00	3.00
Max. Air Pressure (PSI)*	100	100	100	100	100	100
Grip Force at 100 PSI (open) (lbs.)	3.1	8.1	21.2	49.5	95.7	208.7
Grip Force at 100 PSI (closed) (lbs.)	3.4	9.63	24.7	55.6	105.6	238.5
Weight (lbs.)	.09	.24	.63	2.54	6.5	13.3
Operating Temp. (°F) (Buna-N Seals)	0°-180°	0°-180°	0°-180°	0°-180°	0°-180°	0°-180°
Operating Temp. (°F) (Seals of Viton)	0°-240°	0°-240°	0°-240°	0°-240°	0°-240°	0°-240°
Max. Breakaway (PSI)	10	10	10	10	10	10
Stroke per Jaw (in.)	.125	.125	.200	.250	.34	.500
Total Stroke (in.)	.250	.250	.400	.500	.70	1.00

OVERALL MODEL SPECIFICATIONS (METRIC)						
	GPP038	GPP063	GPP100	GPP150	GPP200	GPP300
Bore Size (in.)	0.375"	0.625"	1.00"	1.50"	2.00"	3.00"
Max. Air Pressure (bars)*	6.9	6.9	6.9	6.9	6.9	6.9
Grip Force at 100 PSI (open) (kgs.)	1.4	3.7	9.6	22.5	43.4	94.7
Grip Force at 100 PSI (closed) (kgs.)	1.5	4.4	11.2	25.2	47.9	108.2
Weight (kgs.)	0.04	0.11	0.29	1.15	2.95	6.03
Operating Temp. (°C) (Buna-N Seals)	-18° to 82°	-18° to 82°	-18° to 82°	-18° to 82°	-18° to 82°	-18° to 82°
Operating Temp. (°C) (Seals of Viton)	-18 to 116°	-18 to 116°	-18 to 116°	-18 to 116°	-18 to 116°	-18 to 116°
Max. Breakaway (bars)	0.69	0.69	0.69	0.69	0.69	0.69
Stroke per Jaw (mm.)	3.18	3.18	5.08	6.35	8.89	12.70
Total Stroke (mm.)	6.35	6.35	10.16	12.70	17.78	25.40

* 180°F (82°C) is the maximum operating temperature when using magnets. Therefore magnets should not be used with the seals of Viton® material.

CALCULATING GRIP FORCE OF PARALLEL GRIPPERS

Jaw opening grip force:

$$GF = (P - 10) \times J_o$$

Jaw closing grip force:

$$GF = (P - 10) \times J_c$$

Where:

GF = Grip force (lbs.)

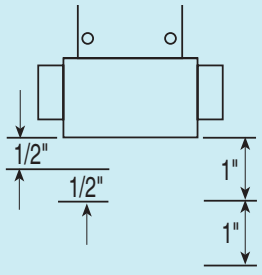
P = Applied system pressure (PSI)

J_O = Jaw opening multiplier constant (see chart)

J_C = Jaw closing multiplier constant (see chart)

MULTIPLIER CONSTANTS						
	GPP038	GPP063	GPP100	GPP150	GPP200	GPP300
J_o	.034	.090	.236	.550	1.052	2.319
J_c	.038	.107	.274	.618	1.173	2.650

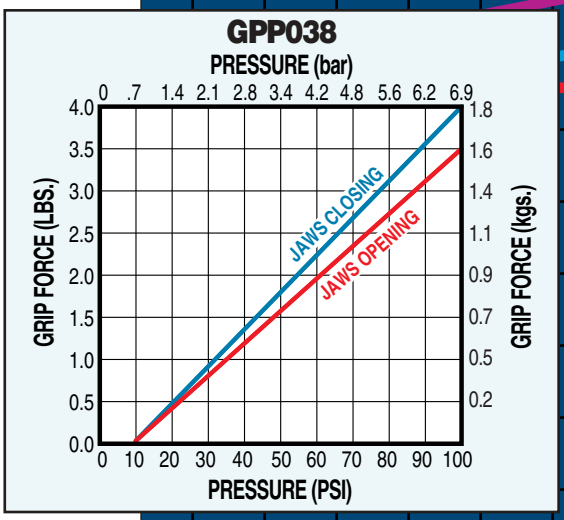
NOTE: For models GPP038 and GPP063, reduce grip force by 20% for each additional 1/2" (12.7mm) from jaw face. For models GPP100, GPP150, GPP200 and GPP300 reduce grip force by 20% for each additional 1" (25.4mm) from jaw face.

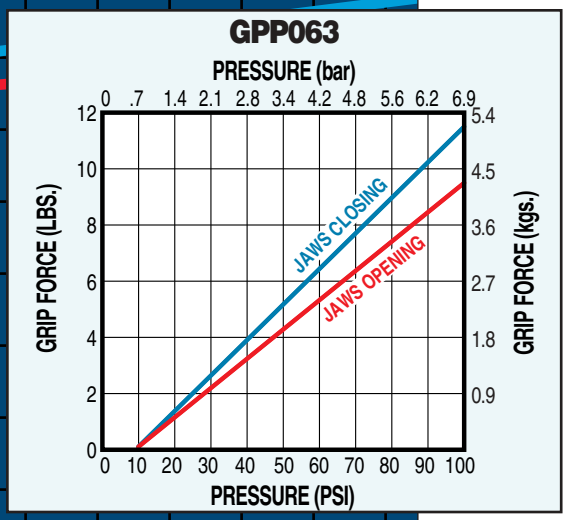


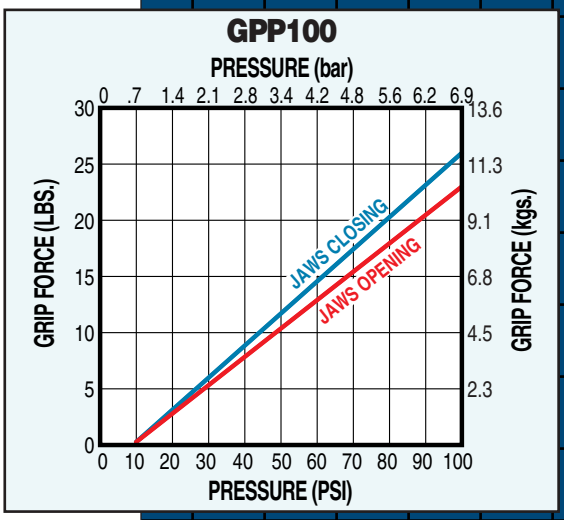
PARALLEL GRIPPER OPTIONS

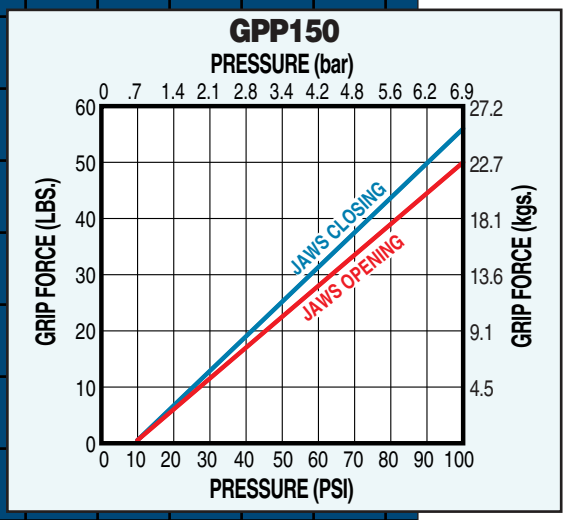
PARALLEL GRIPPER
PERFORMANCE DATA

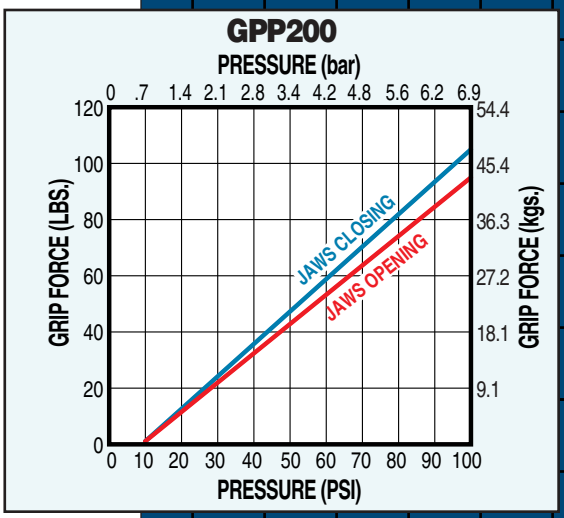
GRIP FORCE vs PRESSURE

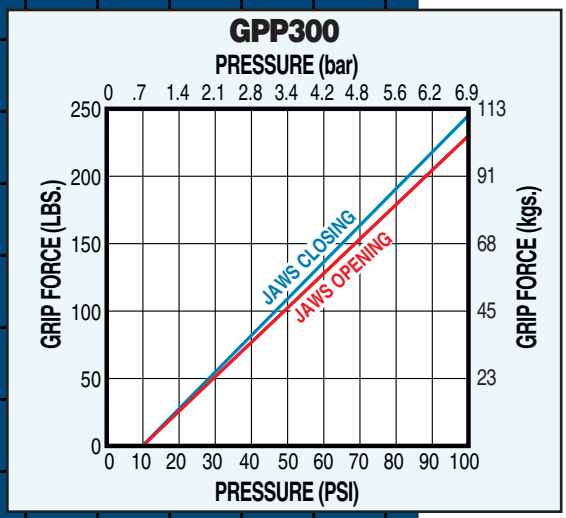






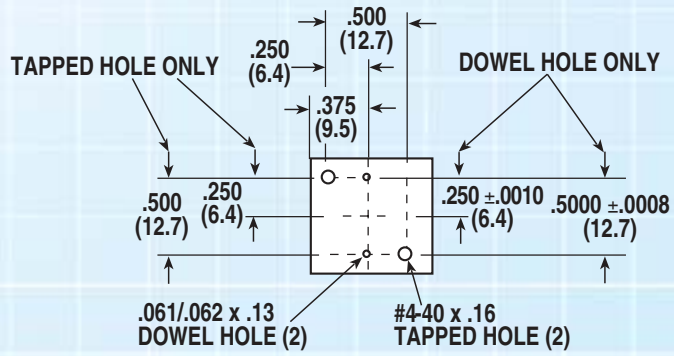


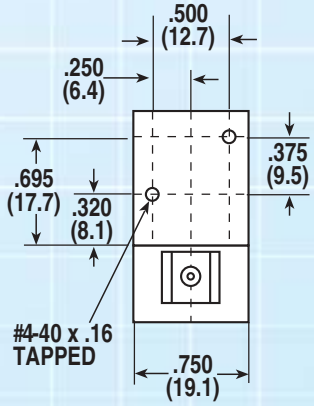


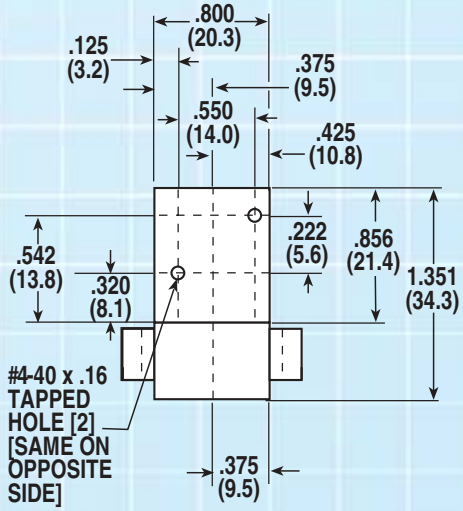


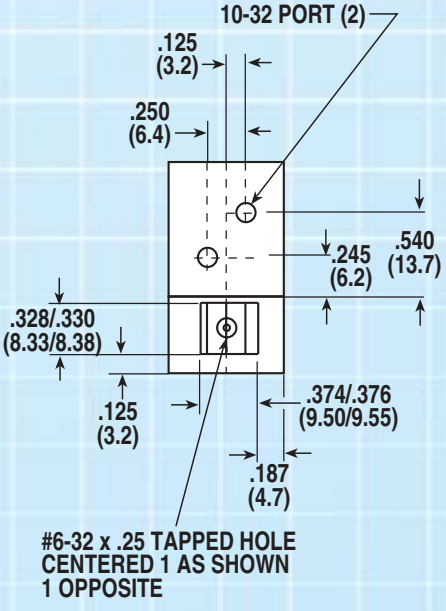
DIMENSIONAL DATA

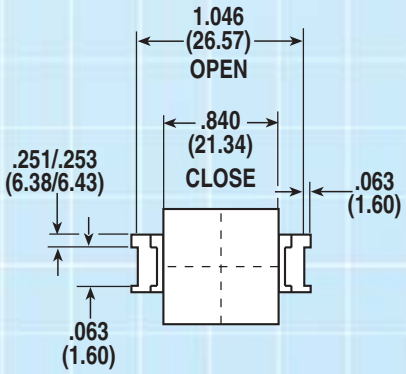
GP.EXE
GP038.DWG
GP038.DXF







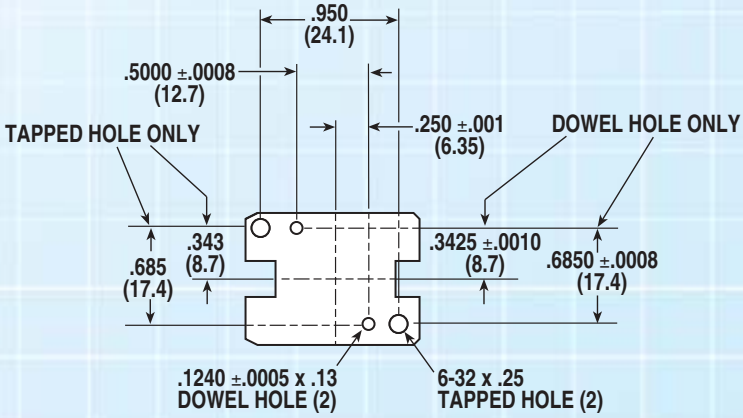


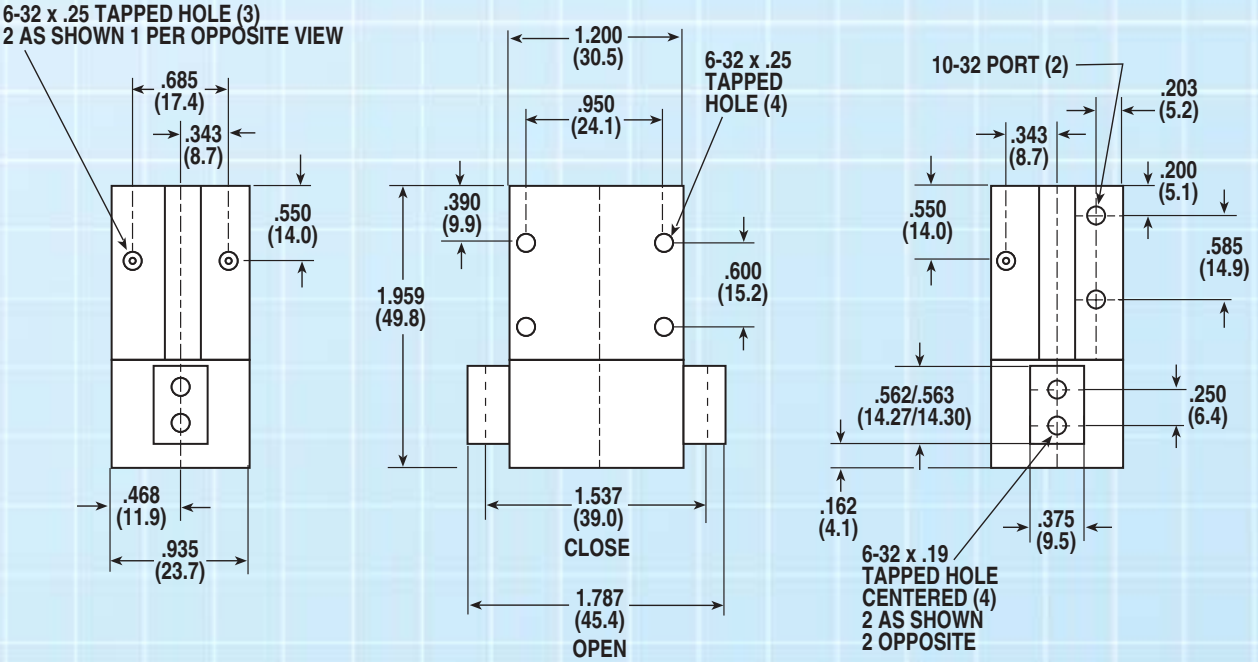


Dimensions in inches (Dimensions in millimeters)

Dimensional Data

GP.EXE
GP063.DWG
GP063.DXF

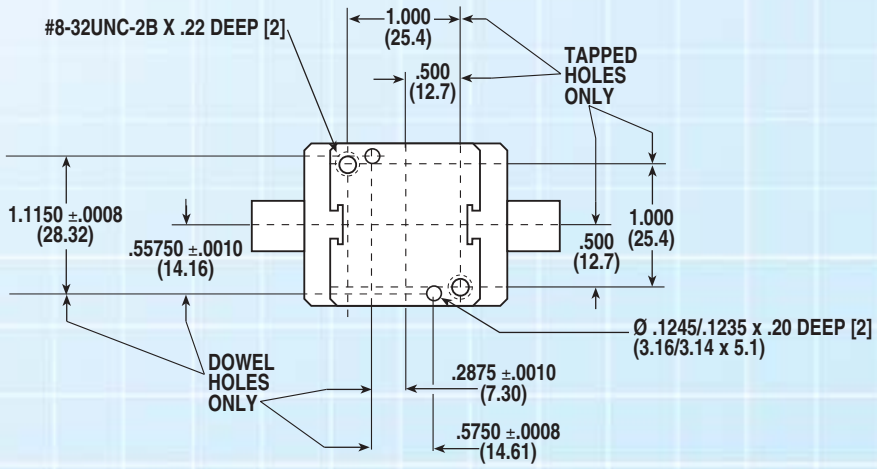


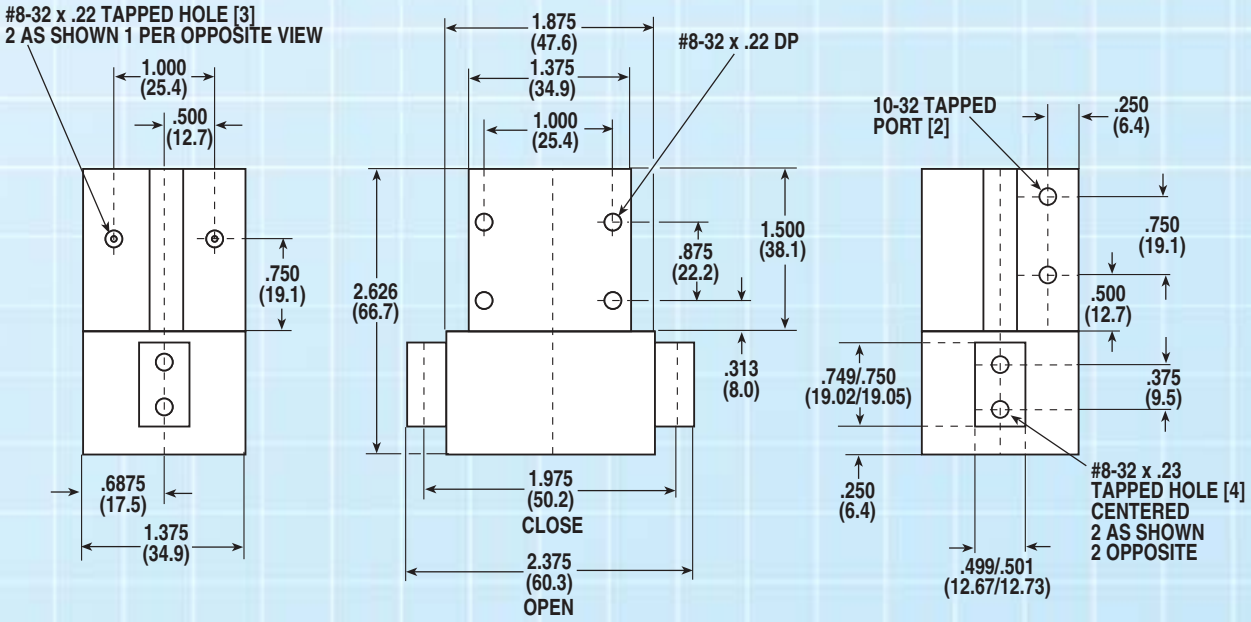


Dimensions in inches (Dimensions in millimeters)

DIMENSIONAL DATA

GP.EXE
GP100.DWG
GP100.DXF



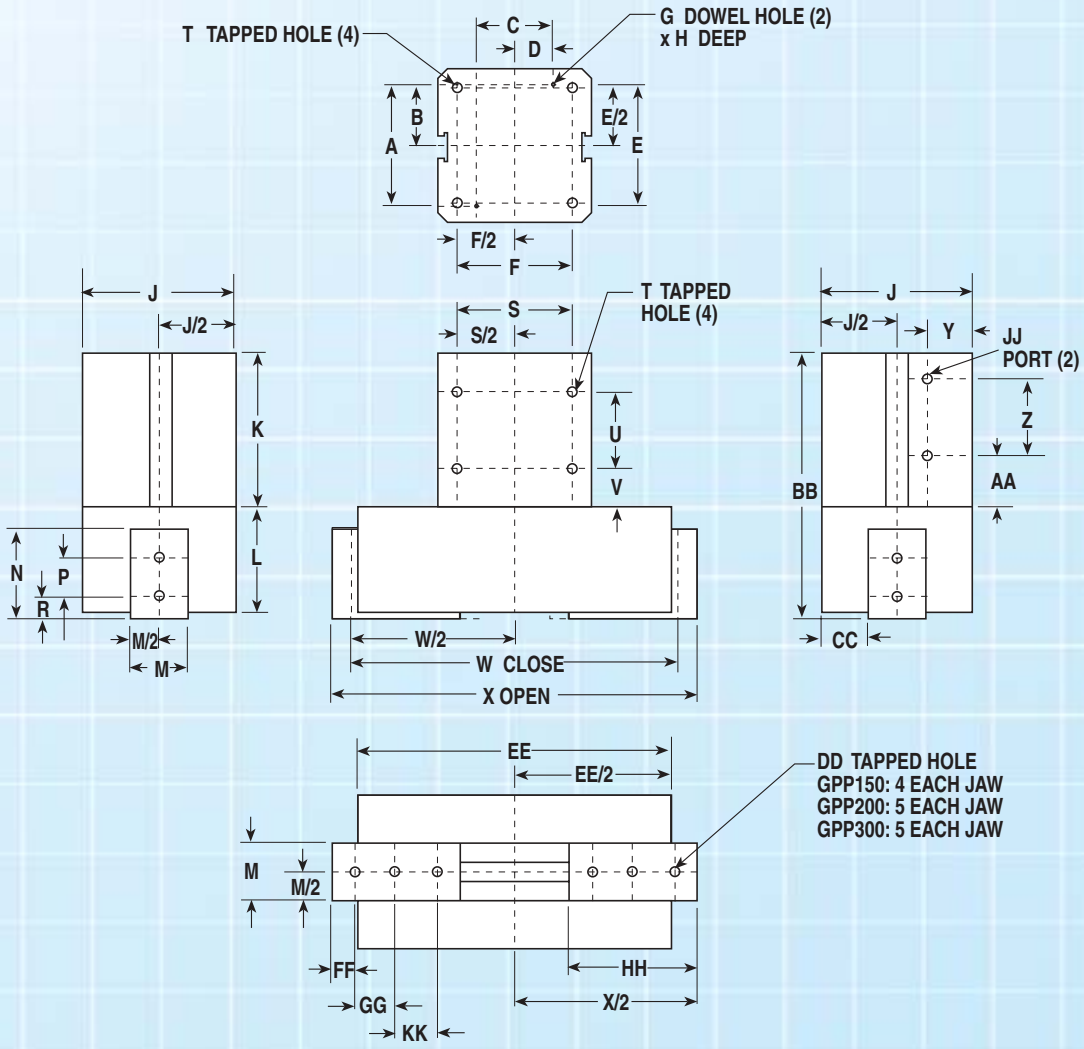


Dimensions in inches (Dimensions in millimeters)

GPP150, GPP200, GPP300

Dimensional Data

GP.EXE
GP150.DWG
GP150.DXF
GP200.DWG
GP200.DXF
GP300.DWG
GP300.DXF



MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK
GPP150	1.6000 ±.0008	.800 ±.001	1.0000 ±.0008	.500 ±.001	1.500	1.500	.1250 .1240	.250	1.980	2.012	1.390	.750	1.170	.500	.295	1.500	10-32 x .38"	1.000	.512	4.245	4.745	.615	1.011	.676	3.467	.615	10-32 x .50"	4.125	.500	.625	1.652	10-32	NA
GPP200	2.1000 ±.0008	1.050 ±.001	1.1000 ±.0008	.550 ±.001	1.960	1.960	.2490 .2500	.375	2.480	2.393	1.523	.693	1.048	.437	.313	1.960	1/4-28 x .38"	.800	.865	5.986	6.664	.615	1.100	.834	3.968	.893	1/4-28 x .38"	5.916	.574	.700	2.321	1/8-27	.700
GPP300	3.0000 ±.0008	1.500 ±.001	1.8130 ±.0008	.906 ± .001	2.750	2.750	.2490 .2500	.375	3.500	3.550	1.960	1.040	1.592	.544	.689	2.750	5/16-18 x .50"	1.500	.900	8.996	9.996	1.000	1.625	1.320	5.662	1.230	3/8-16 x .62"	8.874	.943	1.000	3.559	1/8-27	1.000

Dimensions in inches

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK
GPP150	40.640 ±.020	20.32 ±.025	25.400 ±.020	12.70 ±.025	38.10	38.10	3.175 3.150	6.35	50.29	51.10	35.31	19.05	29.72	12.70	7.49	38.10	10-32 x .38"	25.40	13.00	107.82	120.52	15.62	25.68	17.17	88.06	15.62	10-32 x .50"	104.78	12.70	15.88	41.96	10-32	NA
GPP200	53.340 ±.020	26.67 ±.025	27.940 ±.020	13.97 ±.025	49.78	49.78	6.325 6.350	9.53	62.99	60.78	38.68	17.6	26.62	11.10	7.95	49.8	1/4-28 x .38"	20.3	21.97	152.04	169.3	15.6	27.9	21.2	100.8	22.7	1/4-28 x .38"	150.27	14.58	17.78	58.95	1/8-27	17.78
GPP300	76.200 ±.020	38.10 ±.025	46.050 ±.020	23.01 ±.025	69.85	69.85	6.325 6.350	9.53	88.90	90.17	49.78	26.4	40.44	13.8	17.5	69.9	5/16-18 x .50"	38.1	22.9	228.5	253.9	25.4	41.3	33.5	143.8	31.2	3/8-16 x .62"	225.4	23.95	25.4	90.4	1/8-27	25.40

Dimensions in millimeters

GRIPPER - ORDERING

CONFIGURATOR EXAMPLE

MODEL, BORE, AND JAW STYLE | **ACCESSORIES AND OPTIONS**

1.			2.			3.			4.	5.		
G	P	A	0	6	3	J	S	2		K	X	1

The above example describes an Angular Gripper with 5/8" (0.625 in.) bore and Jaw Style Two (Flush). Optional items are one Hall-effect (Sinking) Quick Disconnect Switch with 5 meter lead.

Boxes above represent the number of fields available for each section and not all of them will be used in every application. Omit empty boxes when you construct your configurator number (placeholders are not required). For the above example, the order string as it is typed would appear as follows: **GPA063JS2KZ1.**

1. MODEL TYPE

Enter:

GPA for Angular Gripper
GPP for Parallel Gripper

2. BORE SIZE

Enter:

038 for 3/8" (0.375 in.)
063 for 5/8" (0.625in.)
100 for 1.00 in.
150 for 1 1/2" (1.5 in.)
200 for 2.00 in.
300 for 3.0 in.

3. JAW STYLE (Must Choose One)

Enter:

JS1 for Angular Jaw Style One (Finger)*
JS2 for Angular Jaw Style Two (Flush).
JS3 for Parallel Jaw Style Three (Flush).

* JS1 **not** available on 2" and 3" bore angular grippers.

When ordered with any actuator, all options and accessories listed will be factory installed unless specified. For special model and option requirements not shown, consult Tol-O-Matic, Inc.

4. SEALS

Enter:

Leave blank for standard Buna N
V for Viton®.
(Seals of Viton® material are not available when ordering switches)

5. SWITCHES

Enter:

BY for Form C Reed Switch 5-meter lead.
BX for Form C Reed Switch 5-meter lead Quick-disconnect
RY for Form A Reed Switch 5-meter lead.
RX for Form A Reed Switch 5-meter lead Quick-disconnect
CY for AC Triac Reed Switch 5-meter lead.
CX for AC Triac Reed Switch 5-meter lead Quick-disconnect
KY for Hall-effect (Sinking) 5-meter lead.
KX for Hall-effect (Sinking) 5-meter lead Quick-disconnect
TY for Hall-effect (Sourcing) 5-meter lead.
TX for Hall-effect (Sourcing) 5-meter lead Quick-disconnect

Enter:

Number of switches in third box.

NOTE: Only Universal Mini Hall-effect switches are available for 3/8", 5/8" and 1" bore Grippers

For the available field retrofit options and accessories, refer to kit listings on page 208 for part numbers.

For Assistance Call
1-800-328-2174
(Toll Free U.S. and Canada)
or
763-478-8000
Fax 763-478-8080

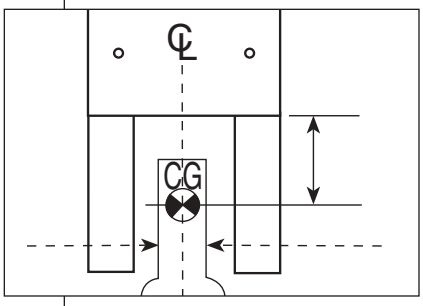
SELECTION GP

Grippers are used to move a multitude of various shaped objects in different sizes and weights. As a result, many factors need to be considered when choosing the right gripper for an application.

Movement, speeds, rotational speeds, center of gravity and inertias of the gripper, as well as the part it will be moving, all play a role in the selection process. When choosing a gripper, the following guidelines should be considered.

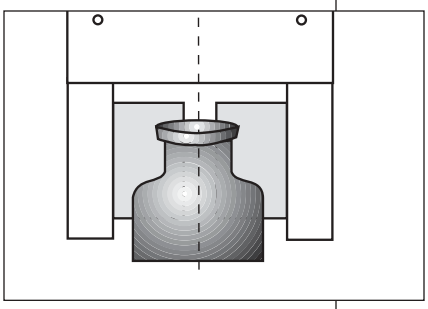
1. THE CENTER OF GRAVITY

The center of gravity of the part to be gripped should be on or as close to the center line of the gripper's bore axis as possible. The center of gravity of the part to be gripped should also be between the grip point of the jaws, as close to the gripper body as possible.



2. DETERMINE GRIPPER JAW AND FINGER SHAPE

Gripper jaws and finger tooling should conform to the shape of the part as closely as possible, particularly if the center of gravity is outside the grip point of the jaws.



3. DETERMINE THE GRIPPER JAW/FINGER COEFFICIENT OF FRICTION

Jaw/finger attachments should be of a material that will provide a high coefficient of friction when in contact with the part it will be moving.

For example steel finger tooling picking up a steel part has a low coefficient of friction (0.3). In contrast, rubber material in contact with steel has a coefficient of 1.0.

4. SAFETY FACTORS

Applying a safety factor will assure the grip force is adequate for the conditions of the application. Refer to the chart below for general guidelines in determining safety factor values. These should be used only as guidelines. For critical applications, please consult the factory for additional technical assistance regarding safety factors.

Review the 6 categories listed and assign a safety value for each (1, 2 or 3) if applicable to your application. Then take the sum of all values assigned, times the load weight to determine grip force required. Consult the grip force calculations on page 180 and 187, or grip force performance charts on pages 181, 182 and 188, for appropriate gripper model.

GENERAL SAFETY FACTOR GUIDELINES

Safety Value	1. Center of Gravity of Load	2. Conformation of Jaw Profile to Part	3. Coefficient of Friction Between Jaw/Finger and Part	4. Linear Movement of Gripper (jaw position)	5. Rotation of Part 180°(speed)	6. Deceleration of of Gripper Travel
1	Center of axis, grip distance 1" or less	Totally conforming	HIGH Rubber on Steel = 1	Jaws inline with travel	SLOW 5 seconds or more	Shock absorber or cushion
2	Center of axis, grip distance more than 1"	Semi-conforming	MEDIUM Plastic on Steel	—	MEDIUM 2-1/2 to 5 seconds	Bumper
3	Center of gravity outside of center axis	Non-conforming	LOW Steel on Steel = .3	Jaws 90° of inline	FAST 2-1/2 seconds or less	Hard stop