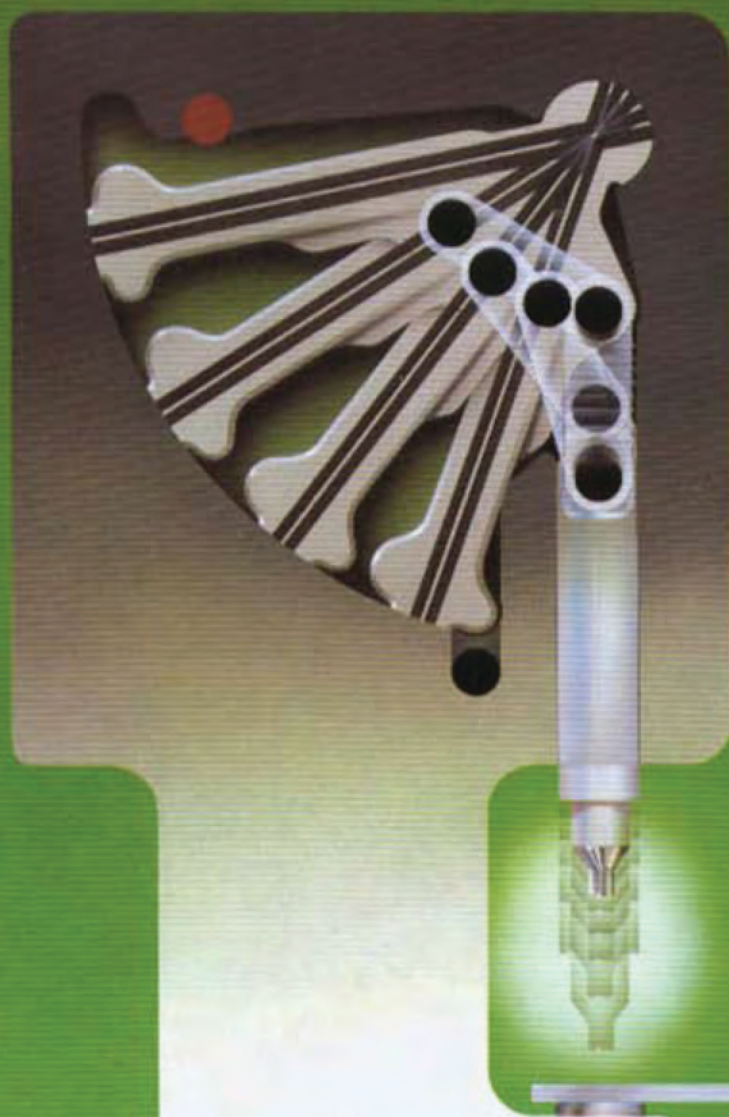


THIN Air Powered Toggle Presses



TOG-L-LOC® (CLINCHING)



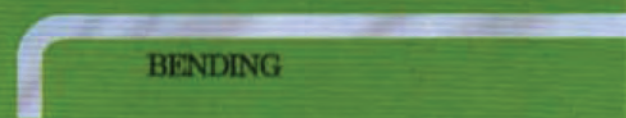
PIERCING



RIVETING

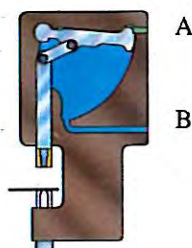
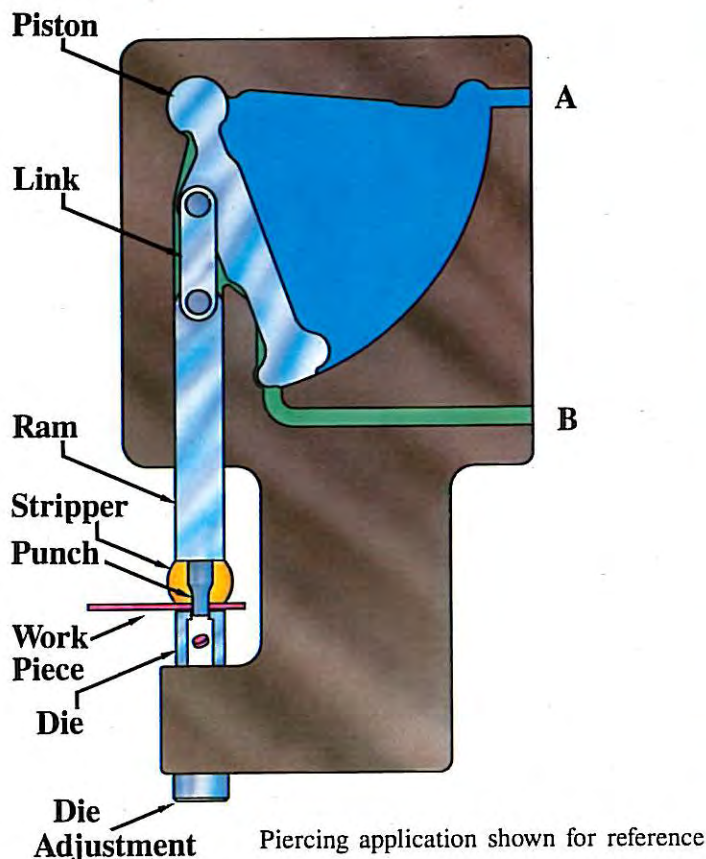


STAMPING

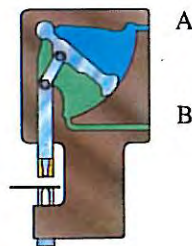


BENDING

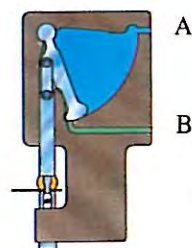
BLM[®]



Air pressure at port "B" holds the piston and ram in the return position.



Air pressure at port "A" swings the piston through an arc, driving the ram and the toggle linkage.

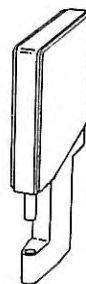


Maximum force is achieved as the linkage "Toggles" or goes to center.

Advantages & Features

BTM's patented "THIN" air powered toggle presses produce high forces using 80 psi (5.5 bars) air pressure! The "THIN" profile allows for close stacking. These extremely simple and rugged presses have only three moving parts. A unique, pivoting, rectangular, piston drives the non rotating ram through a force multiplying toggle linkage. This quick acting mechanism drastically reduces air consumption as compared with conventional pneumatic cylinders doing the same work. BTM press bodies are constructed of light weight, aircraft aluminum, hardcoated to a Rockwell C-70 for excellent wear characteristics.

Patented
THIN
Design



A BTM 1 Ton, Punch & Button Press is only 1.5 inches (38 mm) wide & weighs 15 lbs. (6.8 kg.).

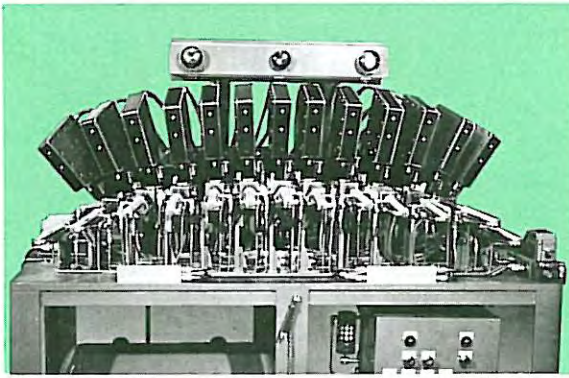
Air consumption of BTM Toggle press compared with conventional pneumatic cylinders.

Air Supply	Required Force	Stroke	Device	Air used per complete cycle
80 psi (5.5 bar)	2000 lbs. (8896N)	2.25" (57.15mm)	1 Ton BTM Press	256 in. ³ (652 cm ³)
80 psi (5.5 bar)	2000 lbs. (8896N)	2.25" (57.15mm)	6" dia. (152.4mm) Cylinder	798 in. ³ (2084 cm ³)

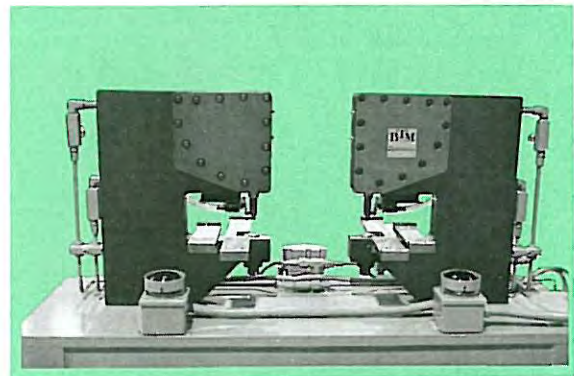
The BTM Press uses 68% less air than the cylinder requires in the example. Stroke limiters are available to further reduce air consumption.



For formula and chart see page 32



BTM Air Toggle Presses may be mounted on close centers for simplified automation and special machine building.



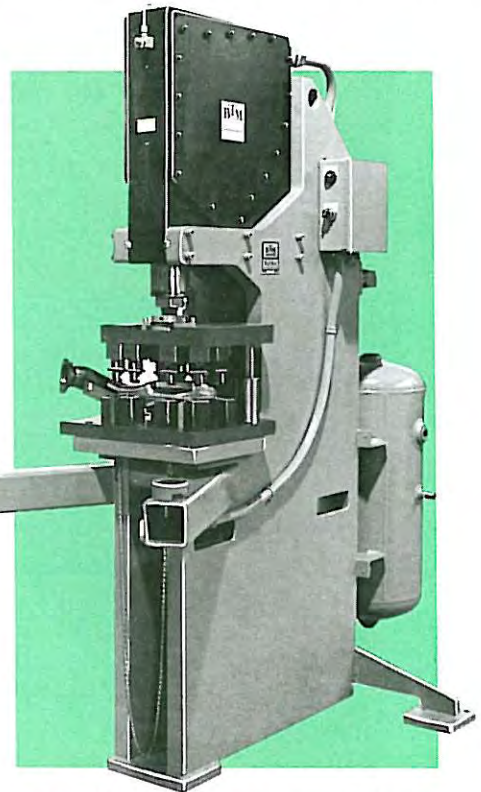
Simple fixtures can be built quickly with BTM presses.

BTM air powered toggle presses can perform all the typical operations of other presses, but within a smaller space and using only a small amount of air. Presses can be quickly tooled and easily mounted in any position.

Self-equalizing models facilitate access over flanges or channels. Bench, floor and tooling models can be equipped with die set tooling to quickly accommodate a multitude of applications.

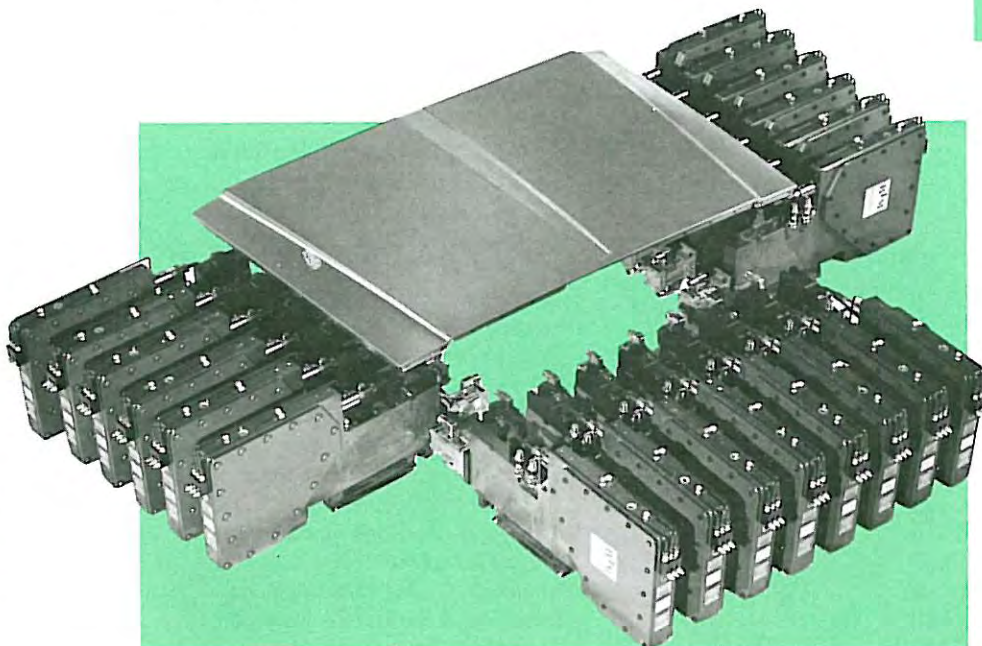
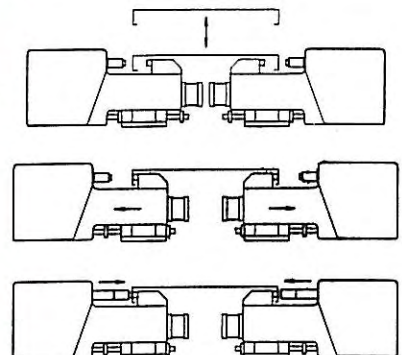
Various options and accessories are available to help you build machines quickly and cost effectively. These include; special rams, modified press bodies, control packages, and stroke limiters for improved cycle time with less air consumption. Special presses for unusual applications may also be developed.

For over 25 years BTM Corporation has offered complete design and build services to help you solve your production problems. Call our sales engineering department and let us help you apply our presses to your next application.



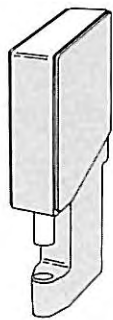
A BTM 20 ton floor press is shown with optional die set tooling and control package.

Self-Equalizing Toggle Presses allow easy load and unload of parts with flanges or channels.

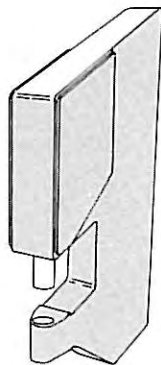


Contents

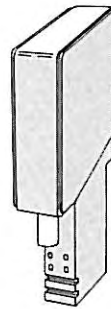
1 & 2 Ton Presses



PB
(Punch & Button)



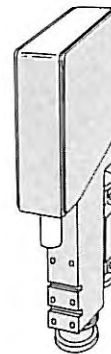
PB6
(Punch & Button)



FM
(Front Mount)

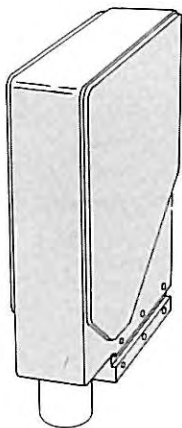


H
(Head)

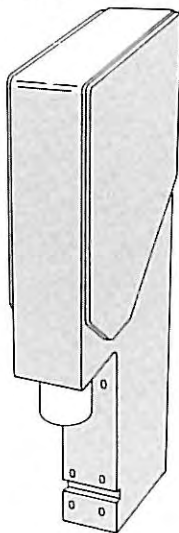


EU & REU
(Equalizing)
(Reverse Equalizing)

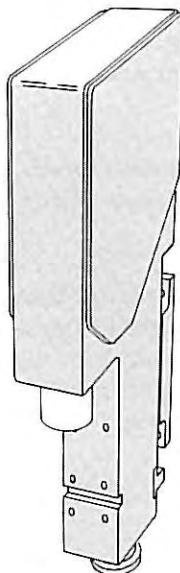
5 & 10 Ton Presses



H
(Head)

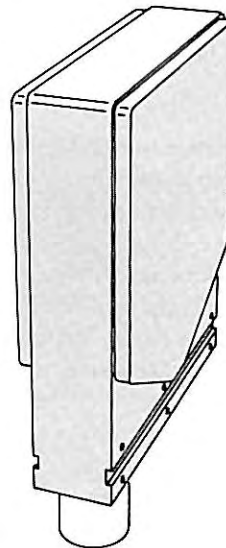


FM
(Front Mount)

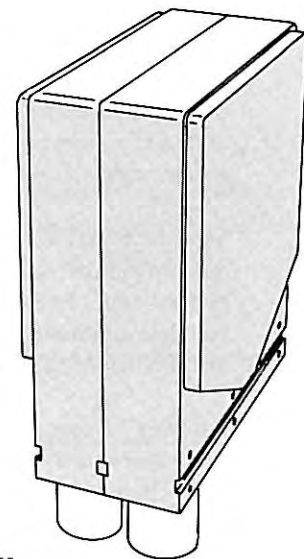


EU & REU
(Equalizing)
(Reverse Equalizing)

20 & 40 Ton Presses



H
(Head)

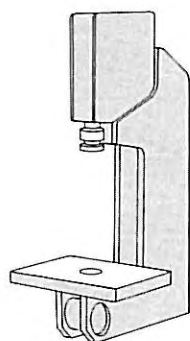


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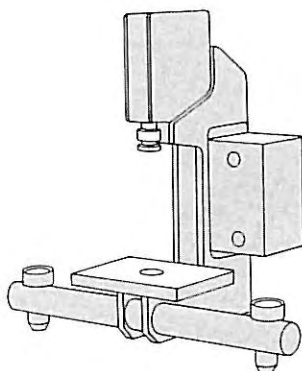
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Contents & Specials

2 Ton

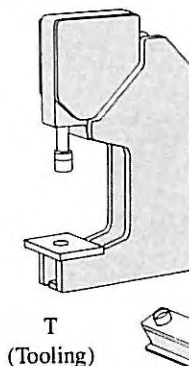


T
(Tooling)

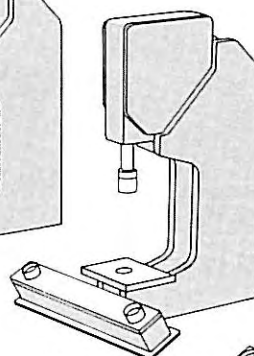


B
(Bench)

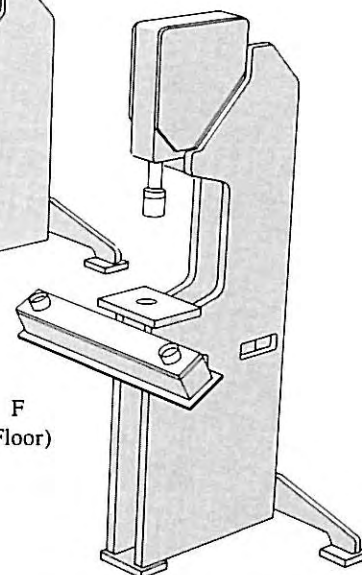
5 & 10 Ton



T
(Tooling)



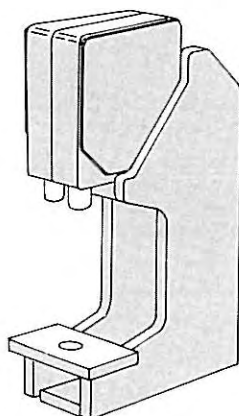
B
(Bench)



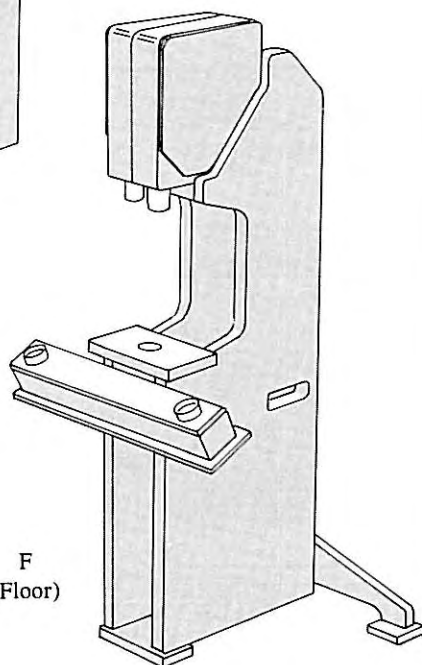
F
(Floor)

20 & 40 Ton

Page

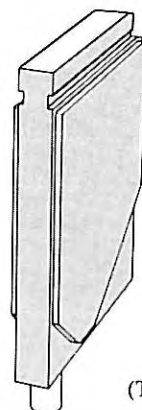


T
(Tooling)

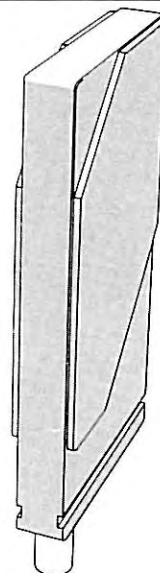


F
(Floor)

Specials



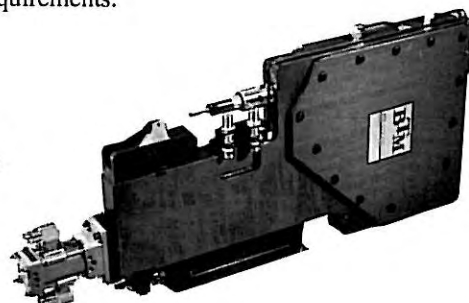
TM
(TopMount)



Long
Stroke
Up to 10"
on 4 & 8
Ton Models

Special presses and modifications to standard presses are available. BTM can also supply completely tooled presses. Contact our Sales Engineering Department for assistance with your special press requirements.

P5 EU
(Equalizing)
Complete with
Tooling



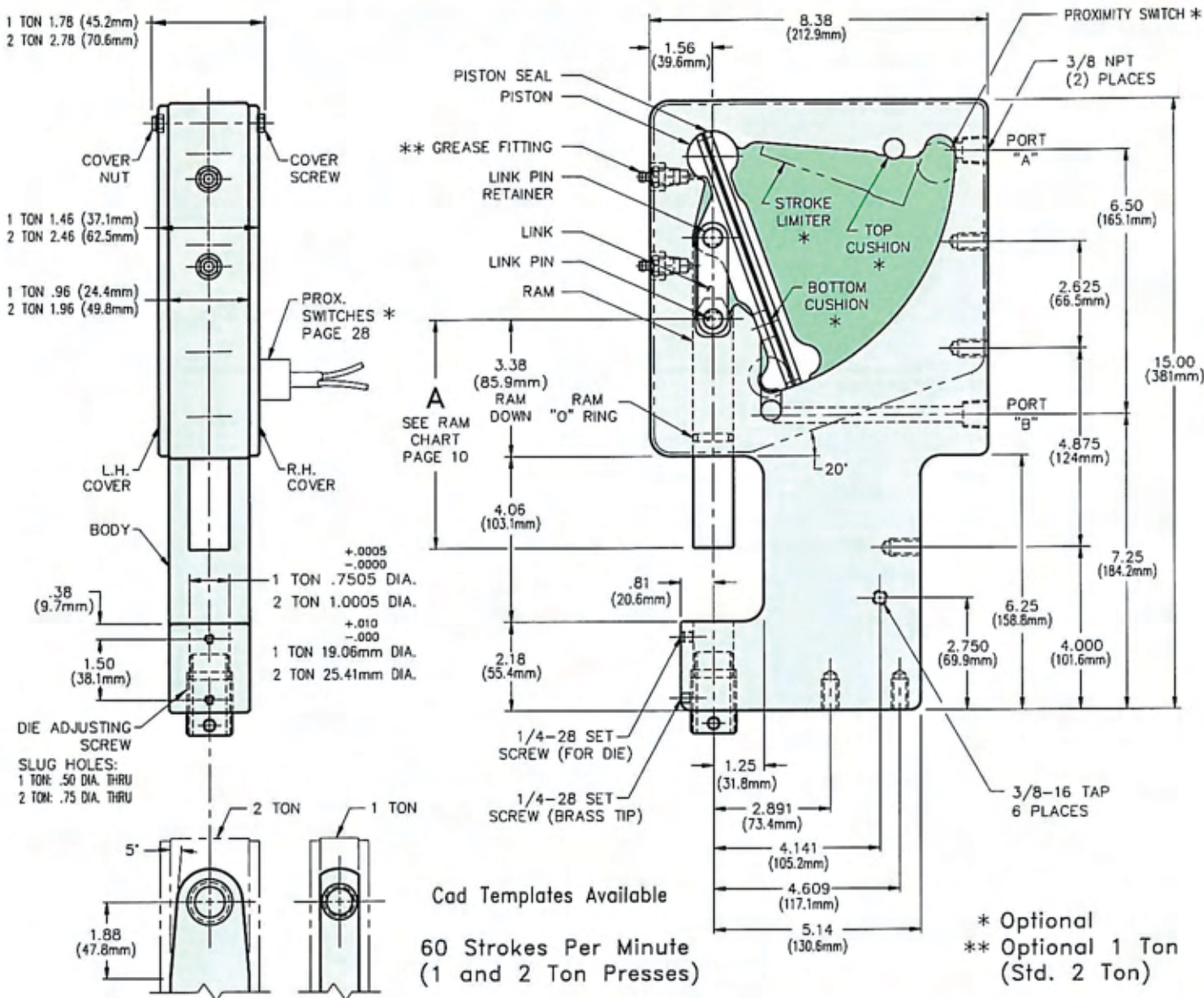
PB Models (Punch and Button)

PIPB x 1.50 (38.1mm) Stroke 001495 - 15 lbs. (6.8 kg)

P2PB x 1.50 (38.1mm) Stroke 001497 - 25 lbs. (11.4 kg)

PIPB x 2.25 (57.2mm) Stroke 001498 - 15 lbs. (6.8 kg)

P2PB x 2.25 (57.2mm) Stroke 001500 - 25 lbs. (11.4 kg)



Components PIPB

Description	No. Req'd	BTM No.
P1PB x 1.5 Body	1	000079
P1PB x 2.25 Body	1	000080
Piston	1	000115
Piston Seal	2	000056
Link	1	000118
Link Pin	2	000122
Ram - 75 Series	1	See Pg. 10
R.H. Cover	1	000125
L.H. Cover	1	000126
Cover Screw	13	000127
Cover Nut	13	000078
Ram "O" Ring	1	000149
Grease Fitting	2	Optional
Sealant	1	000273
Seal Kit	1	000798
Top Cushion	1	001269
Bottom Cushion	1	000829
Stroke Limiter	1	000826
Die Adj. Screw	1	013677
Brass Set Scr.	1	004687
Die Set Scr.	1	000148

How to Order Presses

6 P2PB x 2.25 PT100 BC TC EPRL EPEL SS-1 TOOLING

Quantity	Model	Stroke 1.5, 2.25 or Special	Ram Style See Page 10	Bottom Cushion	Top Cushion	Proximity Switches See Page 28	Strippers See Page 11	Consider Tooling See Page 11
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How to Order Components

Qty.	P2 Link Description	000120 BTM No.
------	------------------------	-------------------

* Denotes Options

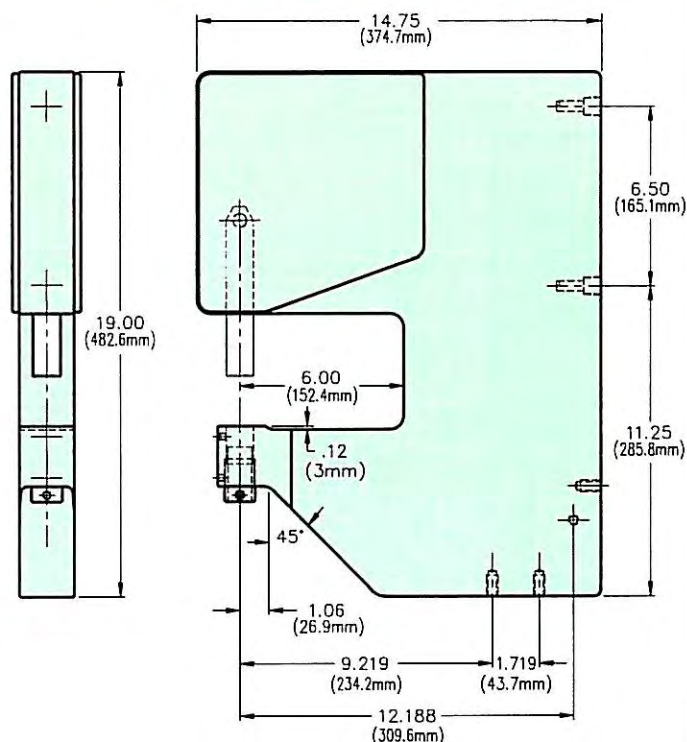
Note: Use "O" Ring No. 000821 in P2PB & PB6.
Use No. 000150 in P2H & FM.

Components P2PB

Description	No. Req'd	BTM No.
P2PB x 1.5 Body	1	000083
P2PB x 2.25 Body	1	000084
Piston	1	000117
Piston Seal	2	000058
Link	1	000120
Link Pin	2	000124
Link Pin Retainer	2	000121
Ram - 100 Series	1	See Pg. 10
R.H. Cover	1	000125
L.H. Cover	1	000126
Cover Screw	13	000129
Cover Nut	13	000078
Ram "O" Ring	1	See Note
Grease Fitting	2	000050
Sealant	1	000273
Seal Kit	1	000800
Top Cushion	1	001271
Bottom Cushion	1	000591
Stroke Limiter	1	000828
Die Adj. Screw	1	013678
Brass Set Scr.	1	004687
Die Set Scr.	1	000148

PB6 Models (6 Inch Throat)

For components and dimensions not shown, see P1PB and P2PB on page 6.

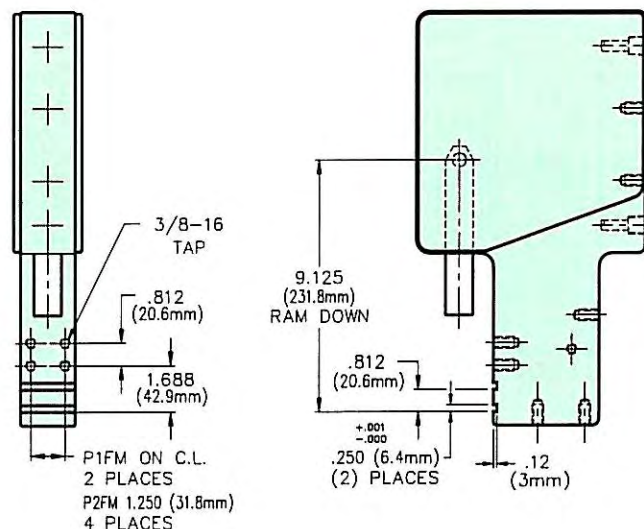


Cad Templates Available

Model	Ass'y. No.	Body No.	Weight
P1PB6 x 1.50 (38.1 mm) Stroke	001501	000085	26.5 lbs. (12 kg.)
P1PB6 x 2.25 (57.2 mm) Stroke	001504	000086	26.5 lbs. (12 kg.)
P2PB6 x 1.50 (38.1 mm) Stroke	001503	000089	48.5 lbs. (22 kg.)
P2PB6 x 2.25 (57.2 mm) Stroke	001506	000090	48.5 lbs. (22 kg.)

FM Models (Front Mount)

For components and dimensions not shown, see P1PB and P2PB on page 6.

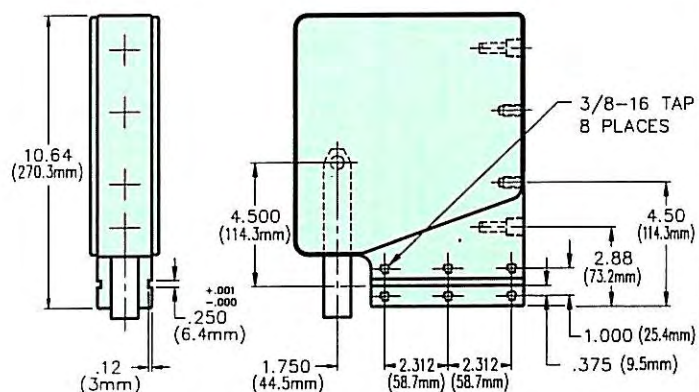


Cad Templates Available

Model	Ass'y. No.	Body No.	Weight
P1FM x 1.50 (38.1mm) Stroke	001507	000948	14 lbs. (6.4 kg.)
P1FM x 2.25 (57.2 mm) Stroke	001510	000951	14 lbs. (6.4 kg.)
P2FM x 1.50 (38.1 mm) Stroke	001509	000950	23 lbs. (10.5 kg.)
P2FM x 2.25 (57.2 mm) Stroke	001512	000953	23 lbs. (10.5 kg.)

H Models (Head)

For components and dimensions not shown, see P1PB and P2PB on page 6.



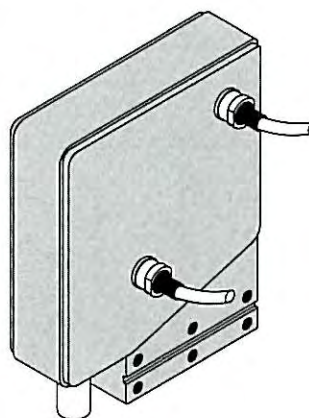
Cad Templates Available

Model	Ass'y. No.	Body No.	Weight
P1H x 1.50 (38.1 mm) Stroke	001519	000103	12.5 lbs. (5.7 kg.)
P1H x 2.25 (57.2 mm) Stroke	001522	000104	12.5 lbs. (5.7 kg.)
P2H x 1.50 (38.1 mm) Stroke	001521	000107	20.0 lbs. (9.1 kg.)
P2H x 2.25 (57.2 mm) Stroke	001524	000108	20.0 lbs. (9.1 kg.)

* Options

Electrical Proximity Sensors
See Page 28

Stroke Limiter Limits upstroke to suit your requirements
See Page 6



Cushions on up and downstrokes
See Page 6

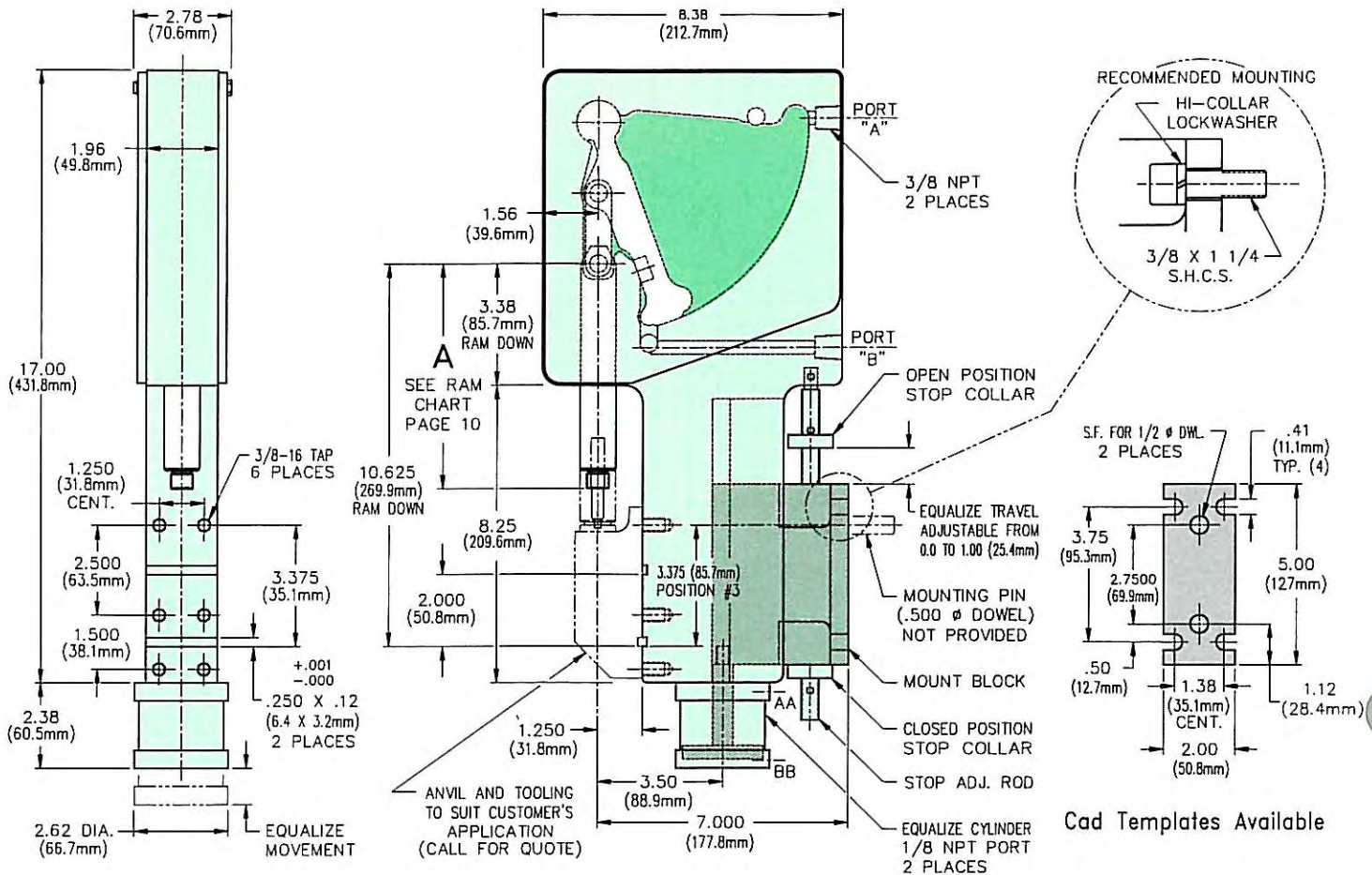
Presses are available with metric threads

Special, Tooling
Call for quote

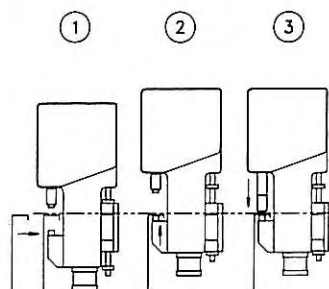
EU Models
(Equalizing Unit)

P2EU x 1.50 (38.1mm) Stroke 012878 - 30 lbs. (13.6 kg)

P2EU x 2.25 (57.2mm) Stroke 006210 - 30 lbs. (13.6 kg)



How Equalizing Works (Standard - Punch on Ram)



- ① Open Position - Part load and unload.
- ② Equalize Position - Die advanced to part.
- ③ Closed Position - Ram extended to perform work.

How to Order Presses

Quantity	Model	Stroke	Ram Style	Bottom Cushion	Top Cushion	Proximity Switches	Strippers	Consider Tooling
6	P2EU x 2.25	PT100	BC	TC	EPRL	EPEL	SS-1	TOOLING
		1.50, 2.25 or Special	See Page 10			See Page 28	See Page 11	See Page 11

How to Order Components

Qty.	Description	BTM No.
1	Piston	000117

* Denotes Options

Contact BTM's Sales Department for equalize strokes greater than 1.00 (25.4 mm)

For further information, see pages 33-35 in the technical section.

Components P2EU

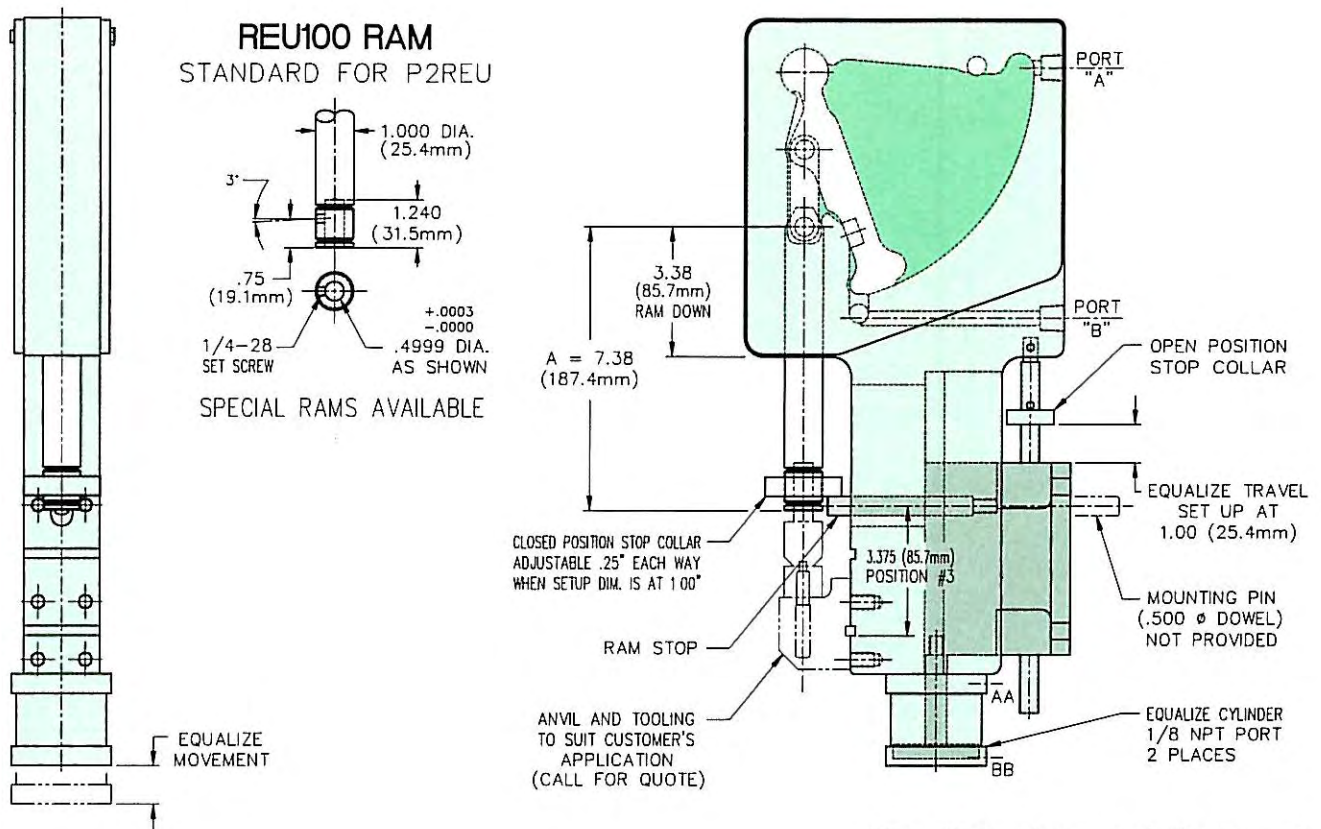
Description	No. Req'd	BTM No.
P2EU x 1.50 (38.1mm) Body	1	012879
P2EU x 2.25 (57.2mm) Body	1	006211
Piston	1	000117
Piston Seal	2	000058
Link	1	000120
Link Pin	2	000124
Link Pin Retainer	2	000121
Ram - 100 Series	1	See Pg. 10
R.H. Cover	1	000125
L.H. Cover	1	000126
Cover Screw	13	000129
Cover Nut	13	000078
Ram "O" Ring	1	000150
Grease Fitting	2	000050
Sealant	1	000273
Seal Kit	1	000800
Top Cushion	1	001271
Bottom Cushion	1	000591
Stroke Limiter	1	000828
Equalizing Air Cylinder	1	006157
Stop Adjust Rod	1	013079
Stop Adjust Collar	2	006162
Mount Block	1	006139
3/16 Dia. x 1/2 Roll Pin	2	013088
3/16 Dia. x 1 3/4 Roll Pin	1	013087

2 Ton Reverse Equalizing (2 Position) Presses

BTM

REU Models
(Reverse Equalizing Unit)

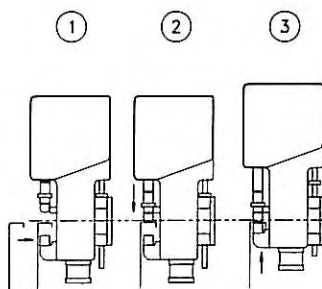
P2REU x 1.50 (38.1mm) Stroke 013126 - 30 lbs. (13.6 kg)
P2REU x 2.25 (57.2mm) Stroke 013076 - 30 lbs. (13.6 kg)



Cad Templates Available

For dimensions and items not shown, see P2EU, page 8.

How Equalizing Works (Reverse - Die on Ram)



- ① Open Position - Part load and unload.
- ② Equalize Position - Die advanced to part.
- ③ Closed Position - Ram extended to perform work.

How to Order Presses

Quantity	Model	Stroke 1.50, 2.25 or Special	Standard Ram Style	Bottom Cushion	Top Cushion	Proximity Switches See Page 28	Consider Tooling See Page 11
6	P2REU x 2.25	REU100	BC	TC	EPRL	EPEL	TOOLING

How to Order Components

Qty.	Description	BTM No.
1	Piston	000117

* Denotes Options

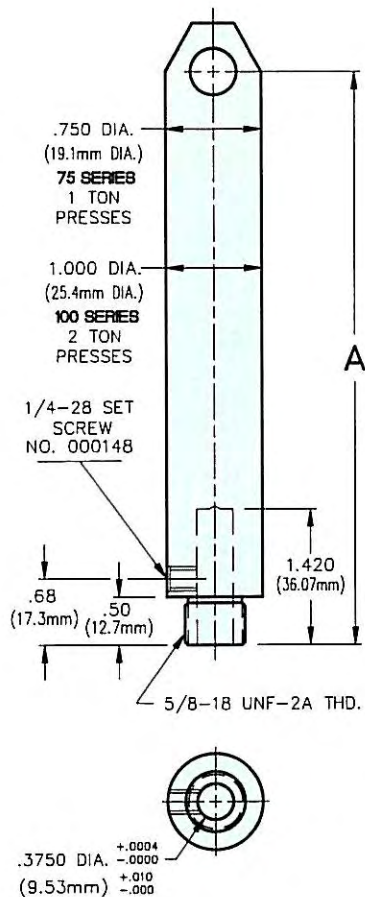
Contact BTM's Sales Department for equalize strokes greater than 1.00 (25.4 mm)

For further information, see pages 33-35 in the technical section.

Components P2REU

Description	No. Req'd	BTM No.
P2REU x 1.50 (38.1mm) Body	1	013136
P2REU x 2.25 (57.2mm) Body	1	013077
Piston	1	000117
Piston Seal	2	000058
Link	1	000120
Link Pin	2	000124
Link Pin Retainer	2	000121
REU100 Ram	1	013117
R.H. Cover	1	000125
L.H. Cover	1	000126
Cover Screw	13	000129
Cover Nut	13	000078
Ram "O" Ring	1	000150
Grease Fitting	2	000050
Sealant	1	000273
Seal Kit	1	000800
Top Cushion	1	001271
Bottom Cushion	1	000591
Stroke Limiter	1	000828
Equalizing Air Cylinder	1	006157
Stop Adjust Rod	1	013079
Stop Adjust Collar	1	006162
Mount Block	1	006139
3/16 Dia. x 1/2 Roll Pin	1	013088
3/16 Dia. x 1/4 Roll Pin	1	013087
Ram Stop	1	013081

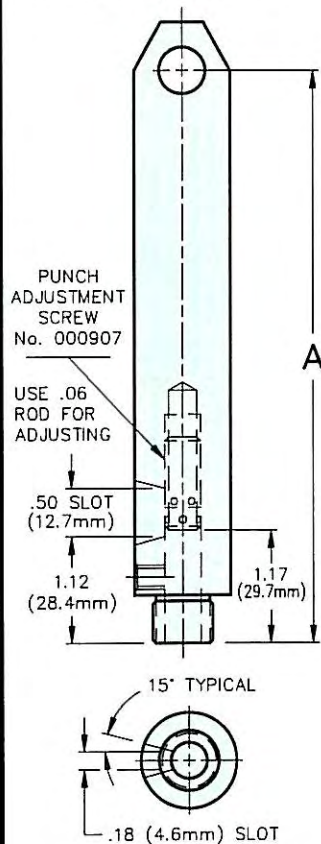
PT - 75
PT - 100



SEE PAGE 11 FOR PUNCHES AND STRIPPERS THAT CAN BE USED WITH THIS RAM
NOTE: A PUNCH LENGTH OF 2.50 (63.5mm) IS REQUIRED

PTA - 75
PTA - 100

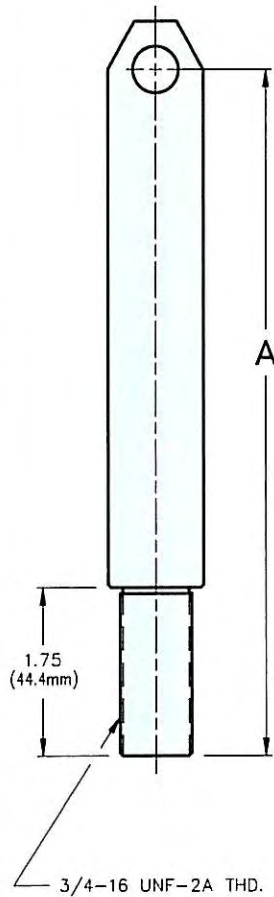
FOR $\pm .12$ (3mm) TOOL ADJUSTMENT



PTA RAMS ARE IDENTICAL TO PT RAMS EXCEPT AS SHOWN

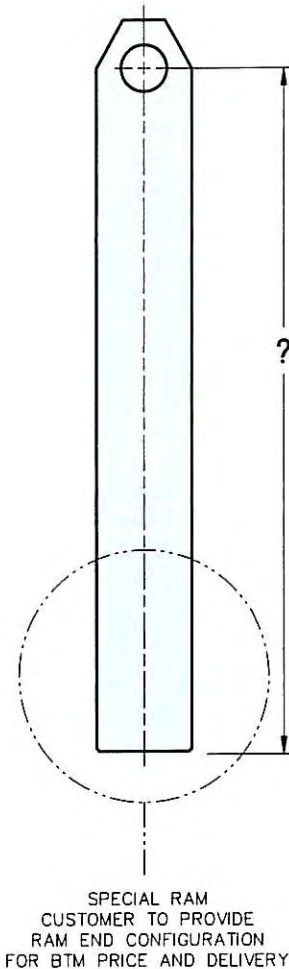
SEE PAGE 11 FOR PUNCHES AND STRIPPERS THAT CAN BE USED WITH THIS RAM
NOTE: A PUNCH LENGTH OF 2.25 (57.2mm) IS REQUIRED

TE - 75
TE - 100



USE WITH DIE SET ADAPTER PAGE 13

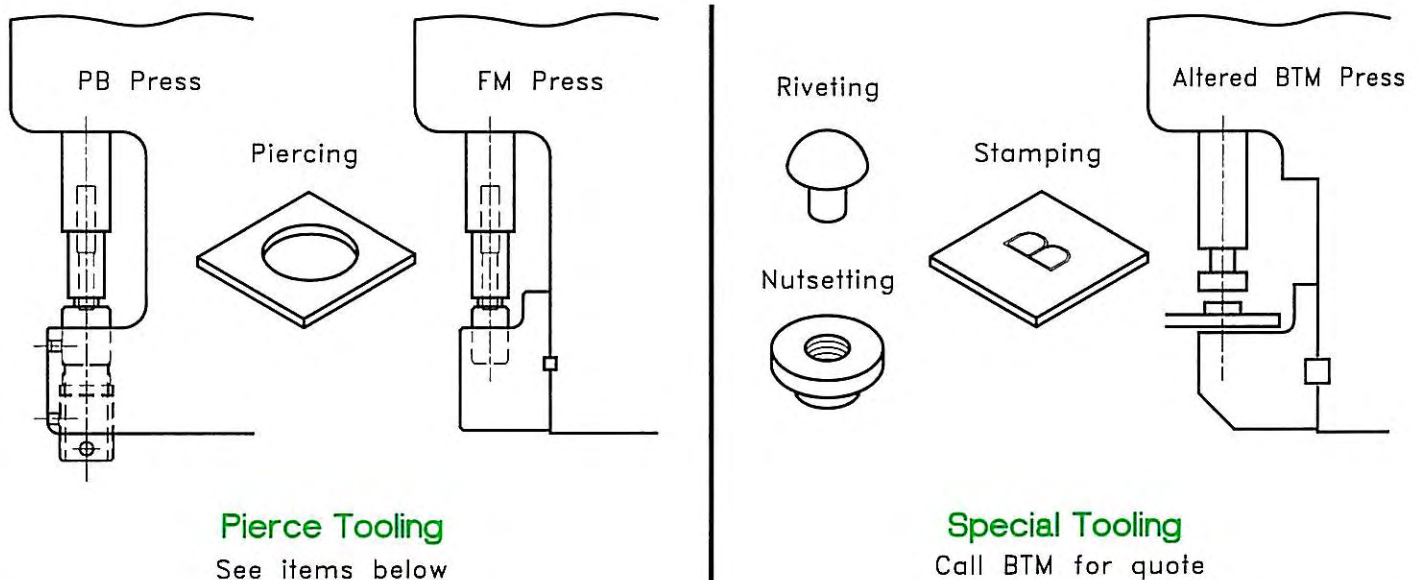
S - 75
S - 100



SPECIAL RAM
CUSTOMER TO PROVIDE
RAM END CONFIGURATION
FOR BTM PRICE AND DELIVERY

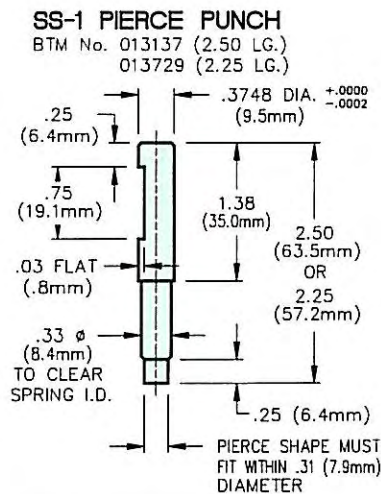
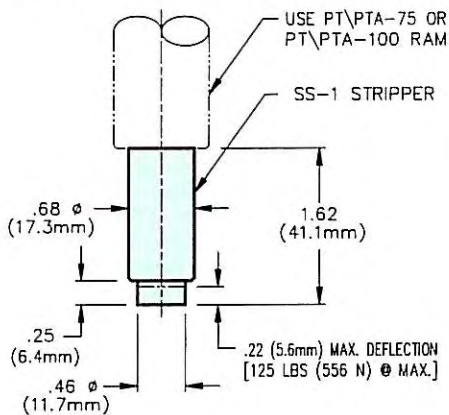
SERIES	PRESS MODEL	RAM STYLE	STROKE	A DIM.	BTM NO.
75 SERIES RAMS 1 TON PRESSES	PB PB6 FM H	PT	1.50 (38.1mm)	5.94 (150.9mm)	000130
			2.25 (57.2mm)	6.25 (158.8mm)	000131
		PTA	1.50 (38.1mm)	6.25 (158.8mm)	000904
			2.25 (57.2mm)	7.12 (180.8mm)	000144
		TE	1.50 (38.1mm)	7.88 (200.2mm)	000145
			2.25 (57.2mm)	PER CUSTOMER	TO BE ASSIGNED
100 SERIES RAMS 2 TON PRESSES	PB PB6	PT	1.50 (38.1mm)	5.94 (150.9mm)	000334
			2.25 (57.2mm)	6.25 (158.8mm)	000335
	FM	PT	1.50 (38.1mm)	5.94 (150.9mm)	000133
			2.25 (57.2mm)	6.25 (158.8mm)	000134
	H	PTA	1.50 (38.1mm)	6.25 (158.8mm)	000905
			2.25 (57.2mm)	7.12 (180.8mm)	000146
	2EU	TE	1.50 (38.1mm)	7.88 (200.2mm)	000147
			2.25 (57.2mm)	PER CUSTOMER	TO BE ASSIGNED
	ALL	S	1.50 (38.1mm)	PER CUSTOMER	TO BE ASSIGNED
			2.25 (57.2mm)	PER CUSTOMER	TO BE ASSIGNED

Examples of Tooling Set-Ups

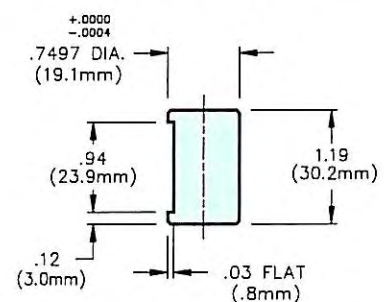


Standard Strippers, Punches and Dies

SS-1 STRIPPER
BTM ASS'Y NO. 000157

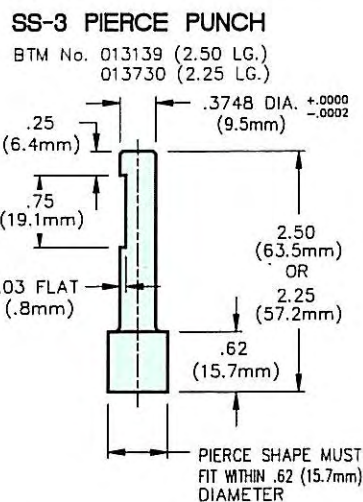
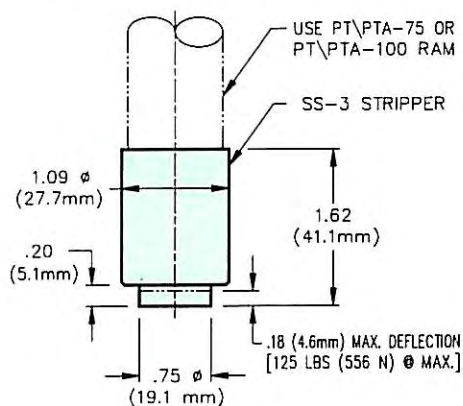


1 TON PIERCE DIE
BTM NO.013138

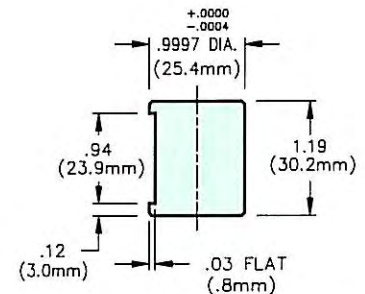


Matched Punch & Die Sets - Fax Pierce
Punch Shape For Quote To Punch Tech, Inc.
(Division of BTM) Fax: 810-364-6030

SS-3 STRIPPER
BTM ASS'Y NO. 000168



2 TON PIERCE DIE
BTM No. 013140



Matched Punch & Die Sets - Fax Pierce
Punch Shape For Quote To Punch Tech, Inc.
(Division of BTM) Fax: 810-364-6030

B and T Models

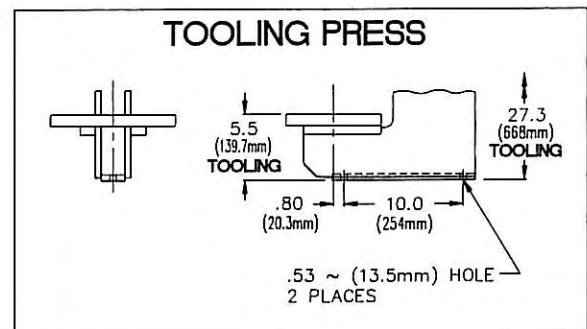
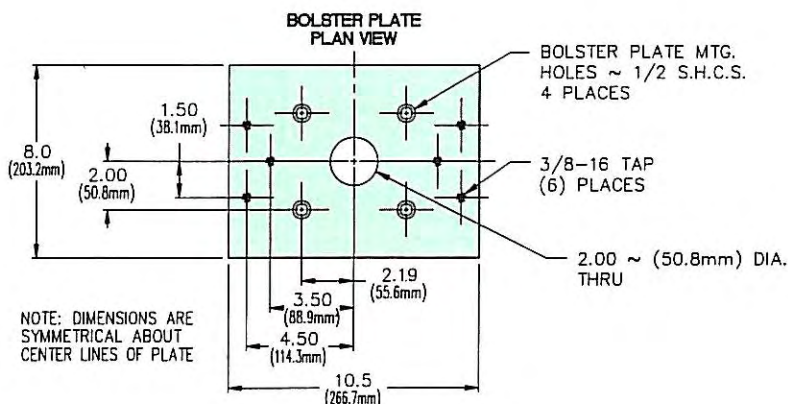
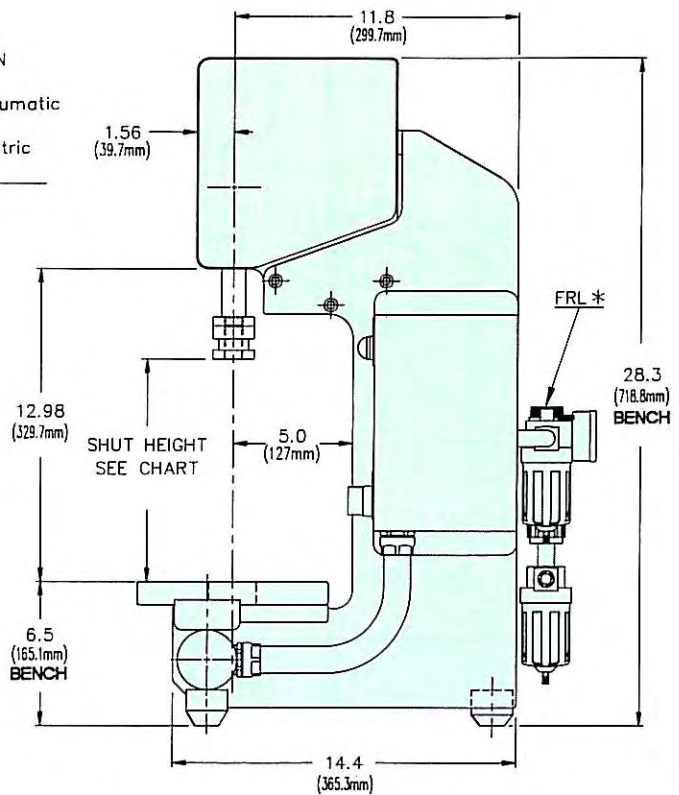
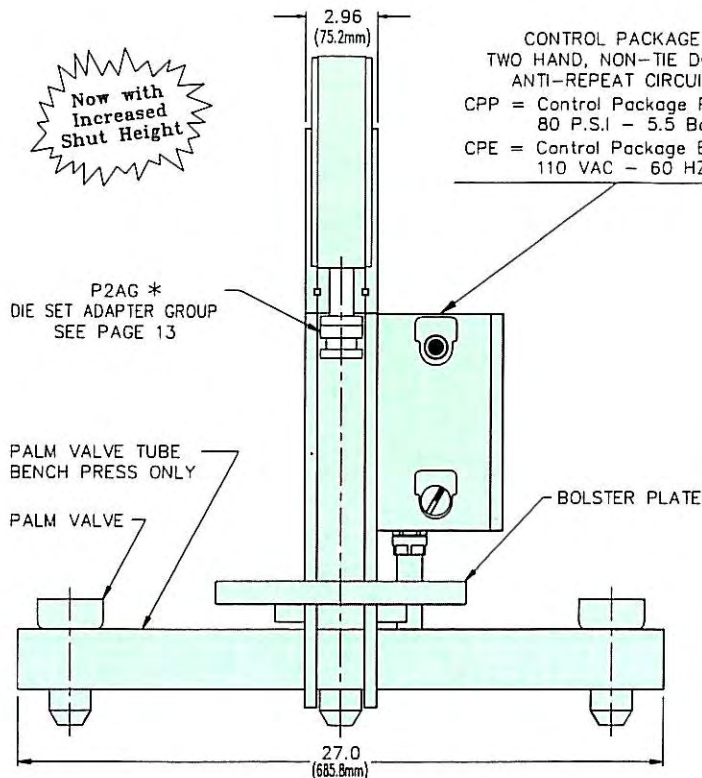
(Bench and Tooling)

P2B x 1.50 (38.1mm) Stroke 000842 - 100 lbs. (45 kg)

P2B x 2.25 (57.2mm) Stroke 000843 - 100 lbs. (45 kg)

P2T x 1.50 (38.1mm) Stroke 000844 - 100 lbs. (45 kg)

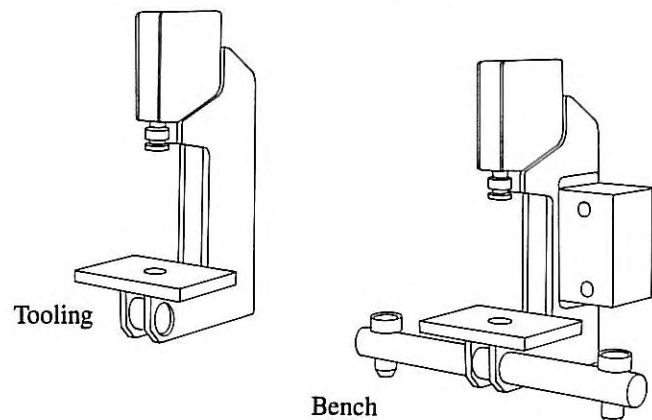
P2T x 2.25 (57.2mm) Stroke 000845 - 100 lbs. (45 kg)



STROKE	SHUT HEIGHT
1.50 STROKE (38.1mm)	9.25 (235mm) MAX. 8.25 (209.5mm) MIN.
2.25 STROKE (57.2mm)	8.50 (216mm) MAX. 7.50 (190.5mm) MIN.

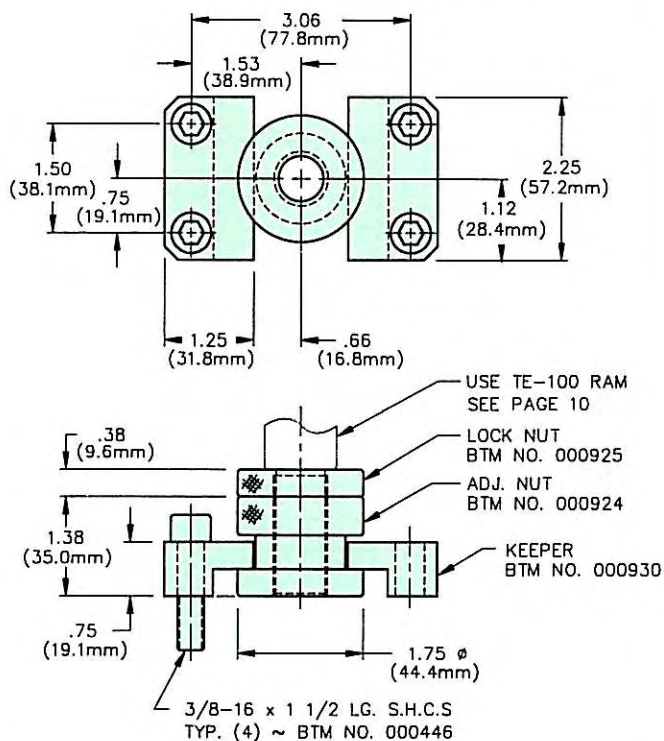
How to Order Presses										
6	P2B x 2.25	TE-100	DSAG	BC	TC	CPP	EPRL	EPEL	FRL	TOOLING
Quantity	Model	Stroke 1.50, 2.25 or Special	Ram Style See Page 10	Die Set Adapter See Page 13	Bottom Cushion	Top Cushion	Control Package Specials Available	Proximity Switches See Page 28	Filter, Regulator Lubricator	Consider Tooling See Page 11

* Denotes Options

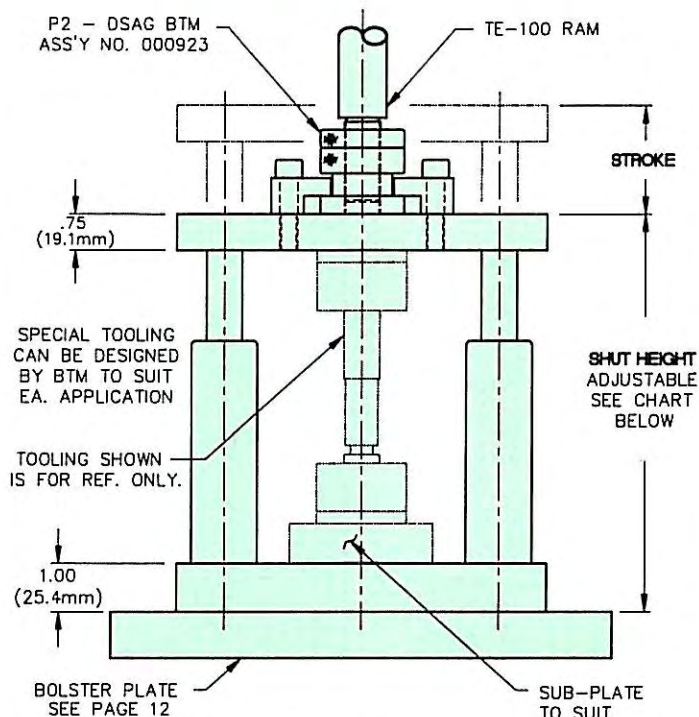


P2 - DSAG

(DIE SET ADAPTER GROUP)
BTM ASS'Y NO. 000923
(USED TO ADJUST SHUT HEIGHT)



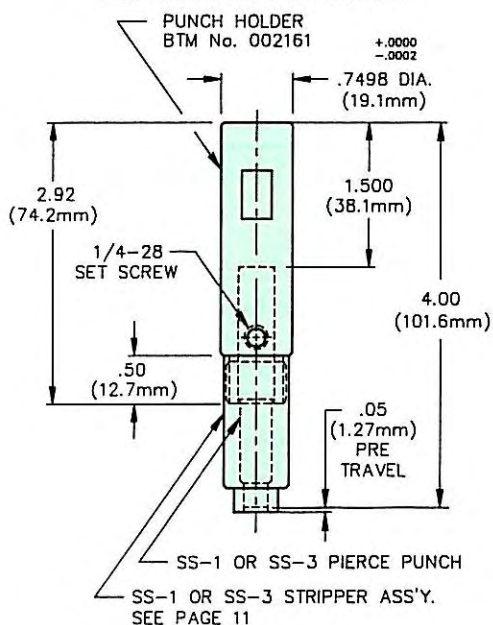
DIE SET INFORMATION



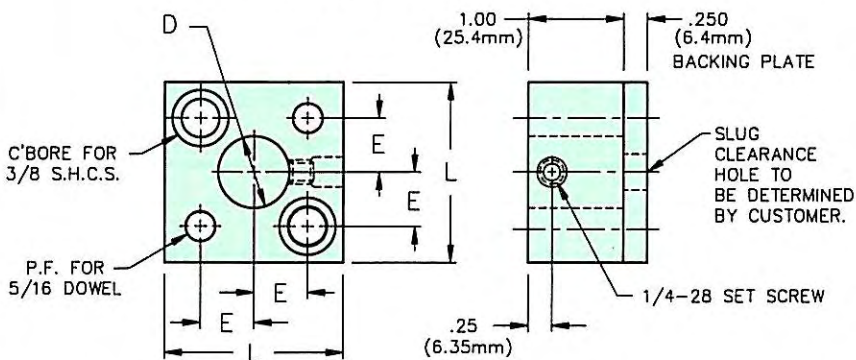
STROKE	SHUT HEIGHT
1.50 STROKE (38.1mm)	9.25 (235mm) MAX. 8.25 (209.5mm) MIN.
2.25 STROKE (57.2mm)	8.50 (216mm) MAX. 7.50 (190.5mm) MIN.

PUNCH HOLDER ASS'Y.

BTM No. 013426 W/SS-1
BTM No. 013427 W/SS-3
BALL LOCK RETAINERS AVAILABLE



RETAINER ASSEMBLY (RETAINER AND BACKING PLATE) BALL LOCK RETAINERS AVAILABLE



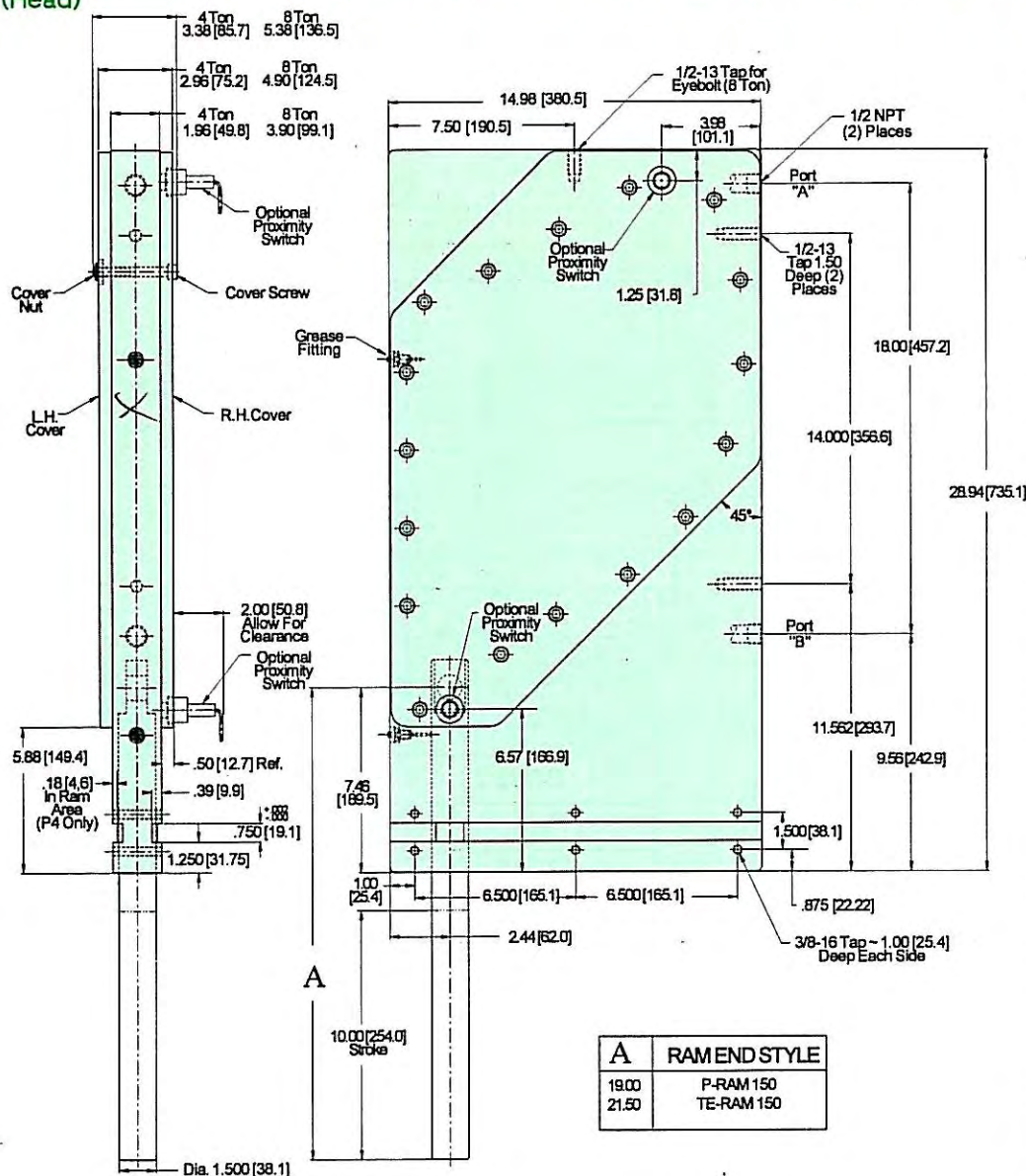
BTM No.	D DIA. +.0003 -.0000	L	E ±.0005
013142	.7499 (19.1mm)	1.88 (47.8mm)	.5625 (14.2mm)
013143	.9999 (25.4mm)	2.25 (57.2mm)	.7500 (19.1mm)

Punch Holder Assembly and Retainers may be used in any size press
See "DIE SET INFORMATION" above for example.

4 & 8 Ton Long Stroke H Presses

H Models (Head)

P4H x 10" Stroke ~BTM No. 000440 - 104 lbs. (47 Kg.) P8H x 10" Stroke ~BTM No. 000454 - 180 lbs. (82 Kg.)

[illegible]

Distance from Bottom (inches)	Force (lbs.) P4	Air Consumption per single stroke (cu. in.) P4	Force (lbs.) P8	Air Consumption per single stroke (cu. in.) P8
0		RAM DOWN		RAM DOWN
0.01	48250	190	96500	380
0.02	20800	186	41600	372
0.03	12490	183	24980	366
0.04	10250	180	20500	360
0.06	8400	180	16800	360
0.12	6240	174	12480	348
0.24	4920	167	9840	334
0.50	4650	155	9300	310
0.75	3280	147	6560	294
1.00	2675	139	5350	278
1.25	2200	134	4400	268
1.50	2050	127	4100	254
1.75	1960	122	3930	244
2.00	1830	117	3660	234
2.25	1750	112	3500	224
2.50	1680	108	3360	216
3.00	1520	99	3040	198
3.50	1480	91	2960	182
4.00	1360	84	2720	168
4.50	1200	77	2400	154
5.00	1020	70	2040	140
6.00	950	57	1900	114
7.00	890	44	1780	88
8.00	840	31	1680	62
9.00	870	17	1740	34
10.00	890	RAM UP	1780	RAM UP

Components

P4H

Description	No. Req'd	BTM No.
P4H Body 10" Stroke	1	000441
Piston	1	000443
Piston Seal	2	000051
R.H. Link Plate	1	000444
L.H. Link Plate	1	000445
Link Pin	2	000264
Ram - 150 Series	1	See Pg. 15
R.H. Cover	1	000447
L.H. Cover	1	000448
Cover Screw	17	000268
Cover Nut	17	000270
Ram Wiper	1	000272
Ram "O" Ring	1	000271
Grease Fitting	2	000050
Sealant - Cover	1	000273
Top Cushion	1	004315
Bottom Cushion	1	000813

How to Order Presses

6	P4H x 10	P150	EPRL	EPEL	RL	SS-4	TOOLING
Quantity	Model	Stroke	Ram Style See Page 15	* Proximity Switches See Page 30	* Ram Latch See Page 21	* Strippers See Page 21	* Consider Tooling See Page 21

How to Order Components

2	P4 Piston	000443
Qty.	Description	BTM No.

Components

P8H

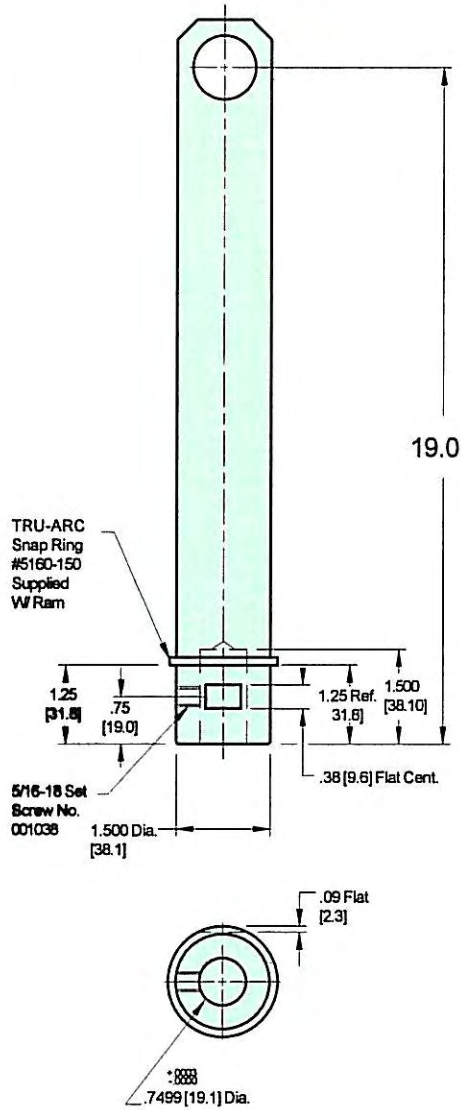
Description	No. Req'd	BTM No.
P8H Body 10" Stroke	1	000455
Piston	1	000457
Piston Seal	2	000060
R.H. Link Plate	1	000458
L.H. Link Plate	1	000459
Link Pin	2	000265
Ram - 150 Series	1	See Pg. 15
R.H. Cover	1	000447
L.H. Cover	1	000448
Cover Screw	17	000269
Cover Nut	17	000270
Ram Wiper	1	000272
Ram "O" Ring	1	000271
Grease Fitting	2	000050
Sealant - Cover	1	000273
Top Cushion	1	004316
Bottom Cushion	1	000813

★ Denotes Options

150 Series Rams For P4 & P8 Presses

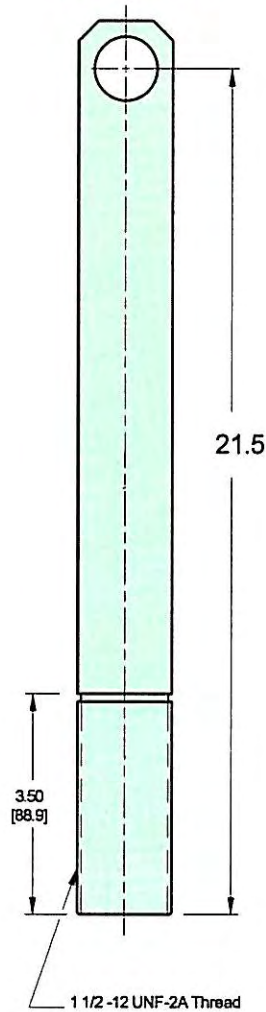


P-150



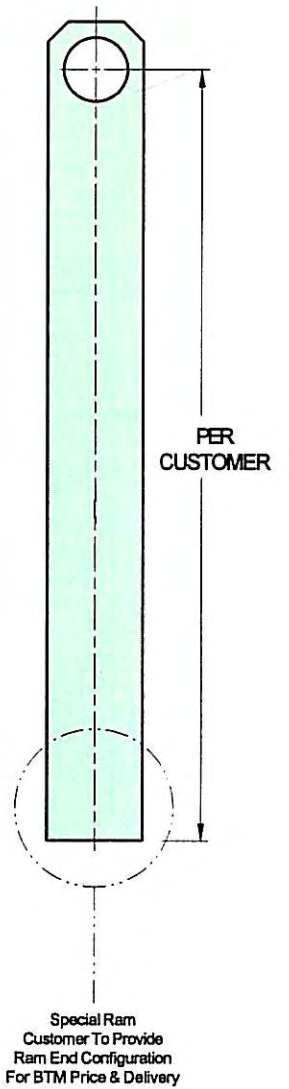
BTM No. 000276

TE-150



BTM No. 000285

S-150



TO BE
ASSIGNED

See Pages 21-23 For Options & Accessories

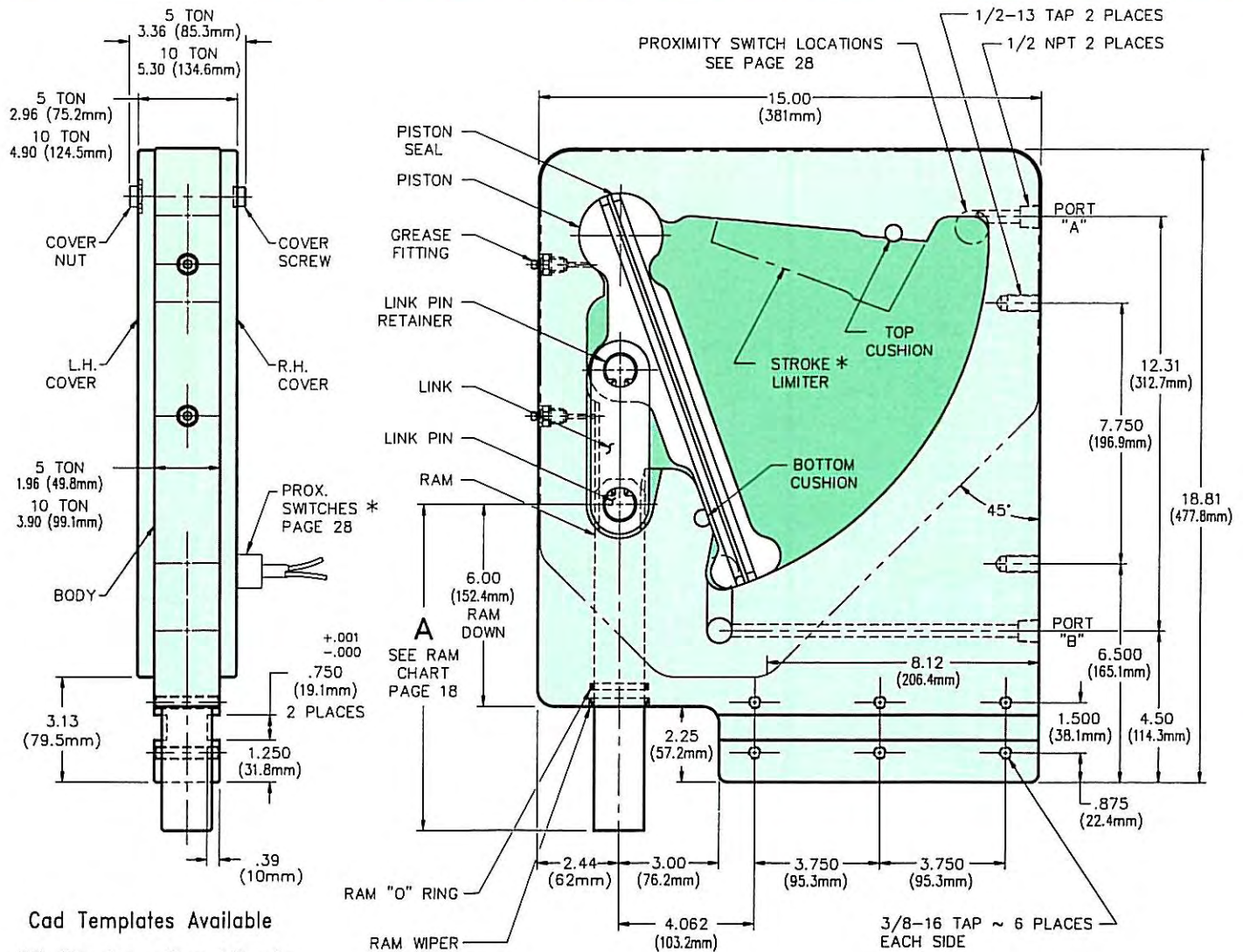
H Models (Head)

P5H x 3.00 (76.2mm) Stroke 001541 - 70 lbs. (32 kg)

P5H x 4.50 (114.3mm) Stroke 001542 - 70 lbs. (32 kg)

P10H x 3.00 (76.2mm) Stroke 001543 - 120 lbs. (55 kg)

P10H x 4.50 (114.3mm) Stroke 001544 - 120 lbs. (55 kg)



Cad Templates Available

60 Strokes Per Minute
(5 and 10 Ton Presses)

Components

P5H

Description	No. Req'd	BTM No.
P5H x 3.00 (76.2mm) Body	1	000247
P5H x 4.50 (114.3mm) Body	1	000248
Piston	1	000259
Piston Seal	2	000051
Link	1	000261
Link Pin	2	000264
Link Pin Retainer	2	000263
Ram - 150 Series	1	See Pg. 20
R.H. Cover	1	000266
L.H. Cover	1	000267
Cover Screw	15	000268
Cover Nut	15	000270
Ram Wiper	1	000272
Ram "O" Ring	2	000271
Grease Fitting	2	000050
Sealant - Cover	1	000273
Seal Kit	1	000804
Top Cushion	1	004315
Bottom Cushion	1	004315
Stroke Limiter *	1	000814

How to Order Presses

6 P10H x 4.50 P175 EPRL EPEL RL SS-4 TOOLING

Quantity	Model	Stroke 3.00, 4.50 or Special	Ram Style See Page 18	Proximity Switches See Page 28	Ram Latch See Page 19	Strippers See Page 19	Consider Tooling See Page 19
2	P5						

How to Order Components

Qty.	Description	BTM No.
2	P5 Piston	000259

* Denotes Options

Components

P10H

Description	No. Req'd	BTM No.
P10H x 3.00 (76.2mm) Body	1	000249
P10H x 4.50 (114.3mm) Body	1	000250
Piston	1	000260
Piston Seal	2	000060
Link	1	003203
Link Pin	2	000265
Link Pin Retainer	2	000263
Ram - 175 Series	1	See Pg. 20
R.H. Cover	1	000266
L.H. Cover	1	000267
Cover Screw	15	000269
Cover Nut	15	000270
Ram Wiper	1	006731
Ram "O" Ring	1	006732
Grease Fitting	2	000050
Sealant - Cover	1	000273
Seal Kit	1	000805
Top Cushion	1	004316
Bottom Cushion	1	004316
Stroke Limiter *	1	000815

5 & 10 Ton FM Presses

BTM

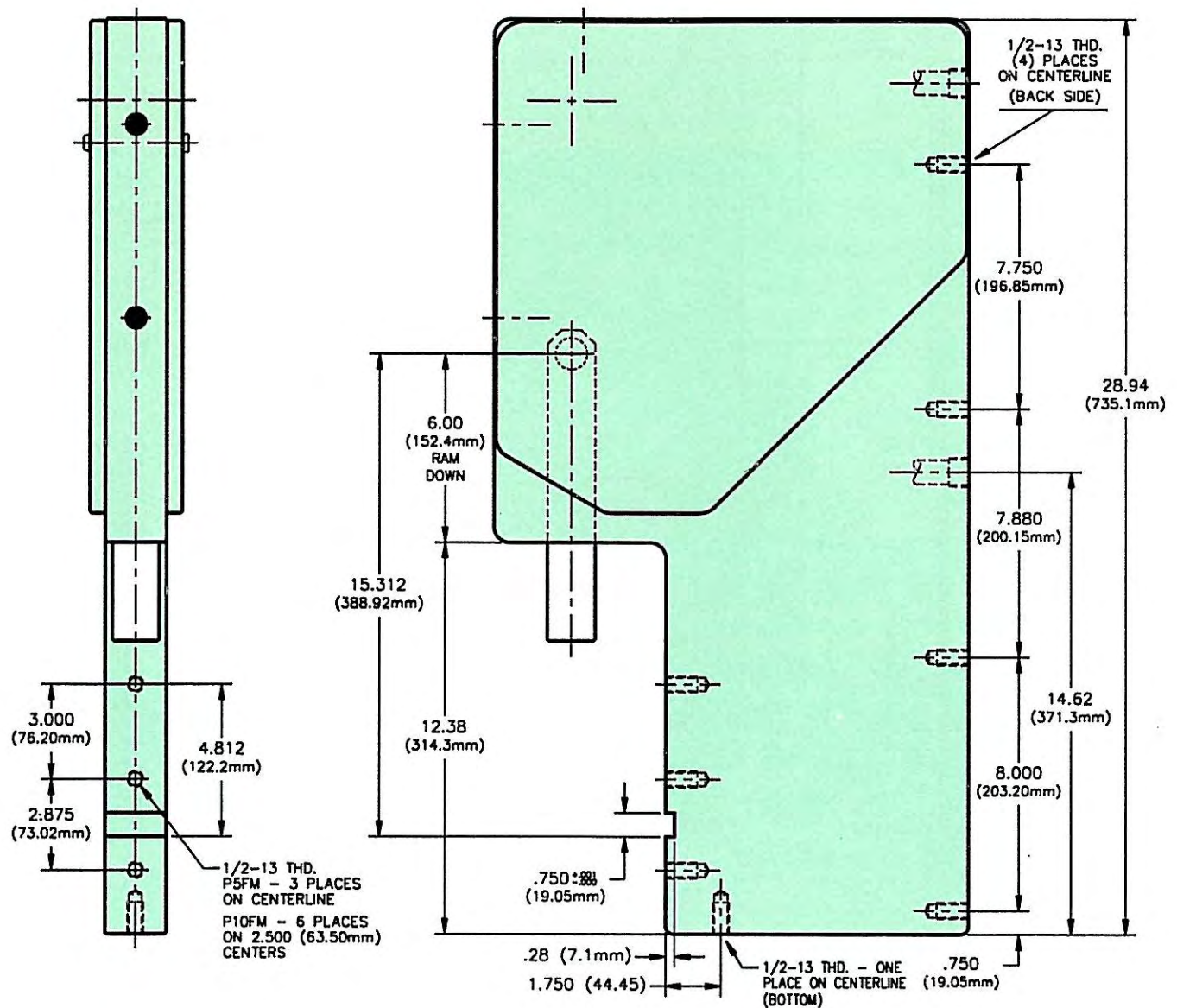
FM Models (Front Mount)

P5FM x 3.00 (76.2mm) Stroke 001549 - 90 lbs. (41 kg)

P5FM x 4.50 (114.3mm) Stroke 001550 - 90 lbs. (41 kg)

P10FM x 3.00 (76.2mm) Stroke 001551 - 155 lbs. (70 kg)

P10FM x 4.50 (114.3mm) Stroke 001552 - 155 lbs. (70 kg)



Components P5FM

Description	No. Req'd	BTM No.
P5FM x 3.00 (76.2mm) Body	1	000255
P5FM x 4.50 (114.3mm) Body	1	000256

Components P10FM

Description	No. Req'd	BTM No.
P10FM x 3.00 (76.2mm) Body	1	002571
P10FM x 4.50 (114.3mm) Body	1	003804

For components not shown,
see P5H & P10H on page 14.

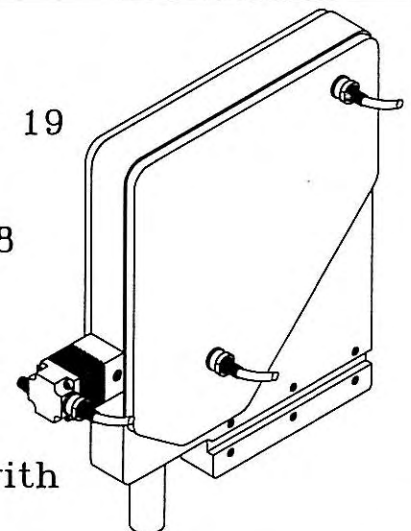
*Options

Ram Latch - See page 19

Electrical Proximity
Switches - See page 28

Stroke Limiter -
Limit upstroke to suit
your requirements.

Presses are available with
metric threads.



EU Models (Equalizing Unit)

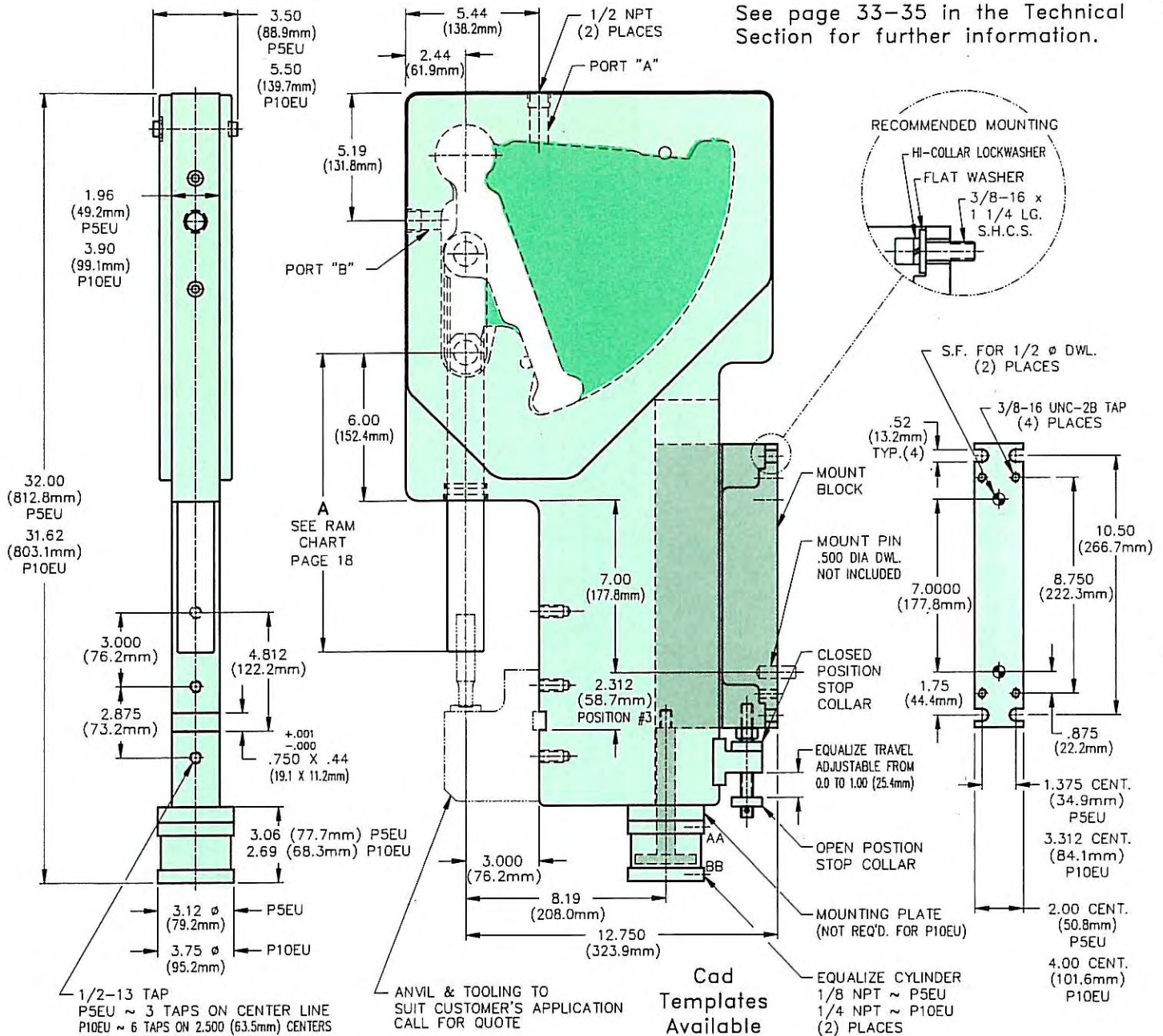
P5EU x 3.00 (76.2mm) Stroke 006761 - 125 lbs. (57 kg)

P5EU x 4.50 (114.3mm) Stroke 006762 - 125 lbs. (57 kg)

P10EU x 3.00 (76.2mm) Stroke 006736 - 215 lbs. (98 kg)

P10EU x 4.50 (114.3mm) Stroke 013201 - 215 lbs. (98 kg)

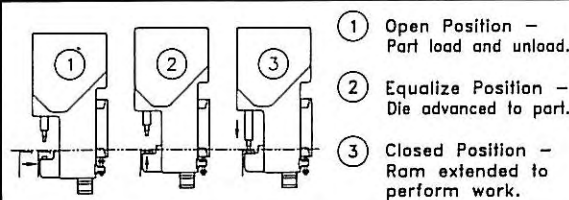
See page 33-35 in the Technical Section for further information.



Components

P5EU

Description	No. Req'd	BTM No.
P5EU x 3.00 (76.2mm) Body	1	013074
P5EU x 4.50 (114.3mm) Body	1	013075
Piston	1	000259
Piston Seal	2	000051
Link	1	000261
Link Pin	2	000264
Link Pin Retainer	2	000263
Ram - 150 Series	1	See Pg. 20
R.H. Cover	1	000266
L.H. Cover	1	000267
Cover Screw	15	000268
Cover Nut	15	000270
Sealant - Cover	1	000273
Ram Wiper Seal	1	000272
Ram "O" Ring	1	000271
Seal Kit	1	000804
Top Cushion	1	004315



Bottom Cushion	1	004315
Grease Fitting	2	000050
Mount Block	1	006773
Extension - Cylinder	1	013475
Cylinder Mount Plate	1	013191
Equalizing Air Cylinder	1	013192
Stop Collar	2	006162
Stop Block	1	006641
Stop Adjust Rod	1	006767
3/16 Dia. X 1/2 Roll Pin	1	013088
1/2 - 20 Hex Nut	1	013458

Components

P10EU

Description	No. Req'd	BTM No.
P10EU x 3.00 (76.2mm) Body	1	013195
P10EU x 4.50 (114.3mm) Body	1	013196
Piston	1	000260
Piston Seal	2	000060
Link	1	003203
Link Pin	2	000265
Ram - 175 Series	1	See Pg. 20
Cover Screw	15	000269
Ram Wiper Seal	1	006731
Ram "O" Ring	1	006732
Seal Kit	1	000805
Top Cushion	1	004316
Bottom Cushion	1	004316
Mount Block	1	006733
Extension-Cylinder	1	013190
Equalizing Air Cylinder	1	013197
Stop Block	1	006370

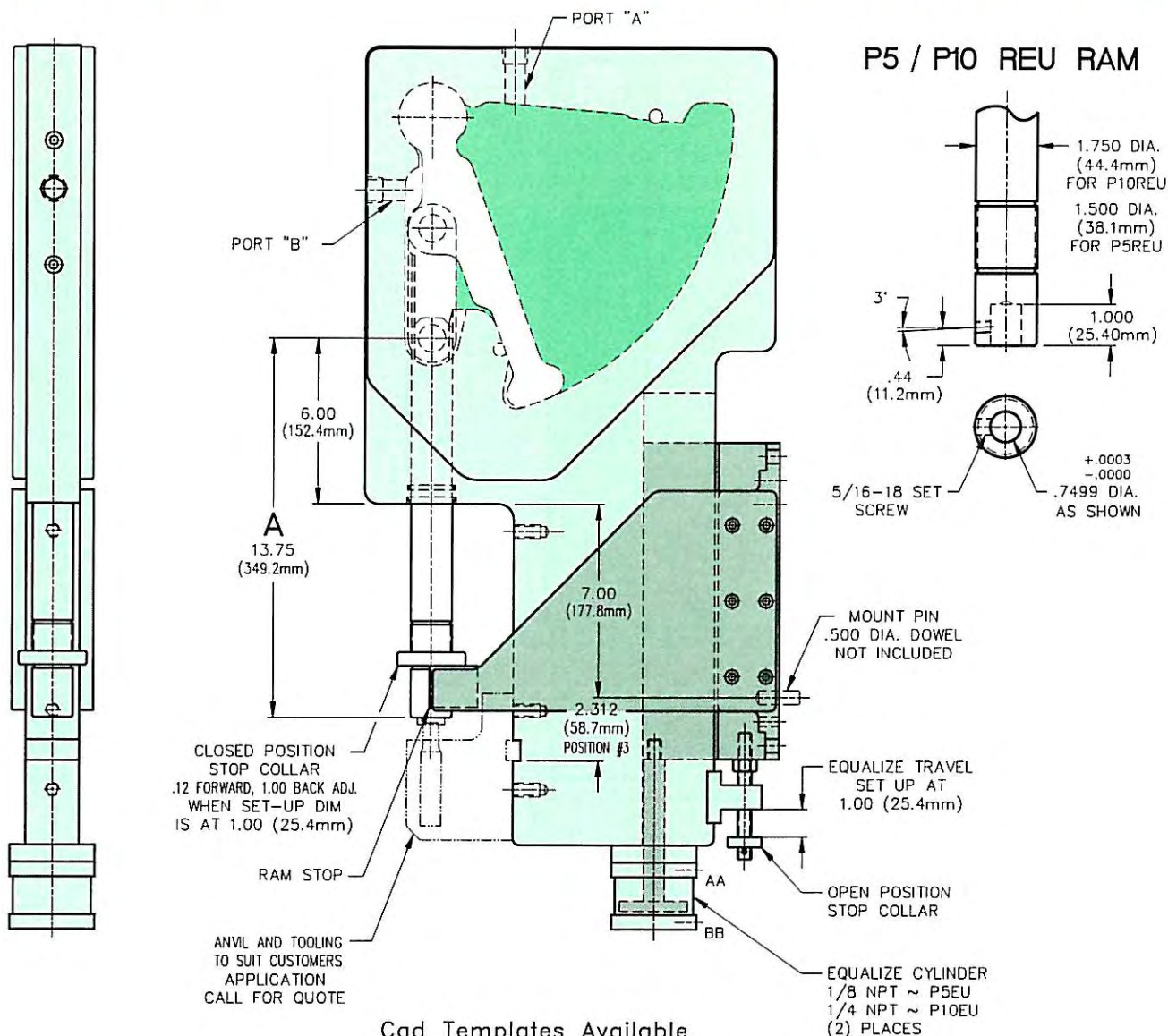
5 & 10 Ton Reverse Equalizing (2 Position) Presses

BTM

REU Models
(Reverse Equalizing Unit)

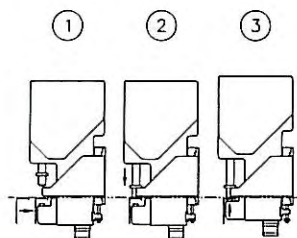
P5REU x 3.00 (76.2mm) Stroke 013200 - 135 lbs. (61 kg)

P10REU x 3.00 (76.2mm) Stroke 013202 - 225 lbs. (102 kg)



Cad Templates Available

How Equalizing Works (Reverse - Die on Ram)



- ① Open Position - Part load and unload.
- ② Equalize Position - Die advanced to part.
- ③ Closed Position - Ram extended to perform work.

How to Order Presses

Quantity	Model	Stroke	Ram Style	Proximity Switches	Ram Latch	Strippers	Consider Tooling
6	P10REU x 3	REU175	EPRL	EPRL	RL	SS-4	TOOLING
		3, 4.5 or Special (EU)	See Page 18 (EU)	See Page 28	See Page 19	See Page 19	See Page 19
		3 or Special (REU)	See Components at Right (REU)				

How to Order Components

Qty.	Mount Block	006368
	Description	BTM No.

* Denotes Options

For dimensions and components not shown, see P5EU & P10EU on page 16.

See pages 33-35 in the Technical Section for further information.

Components

P5REU

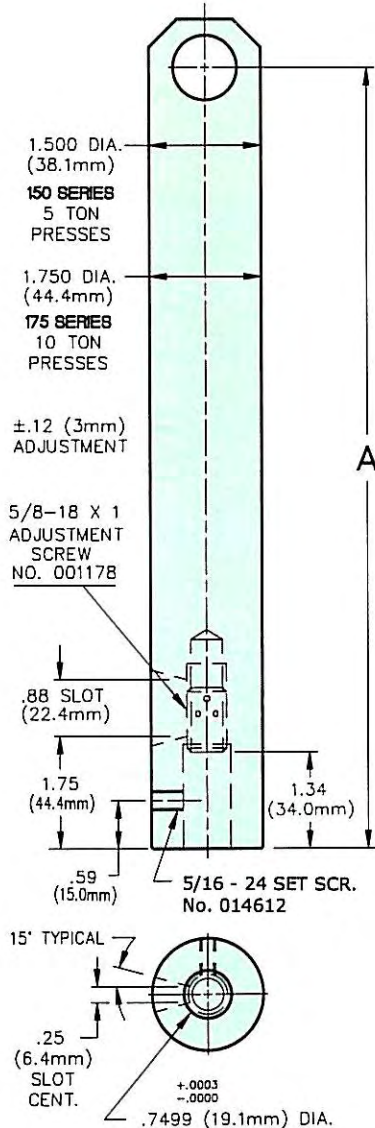
Description	No. Req'd	BTM No.
Ext. Rod	1	020633
P5REU Ram	1	013194
Mount Block	1	006368
Stop Collar (Closed Pos.)	1	013216
Ram Stop	1	006519
R.H. Equalize Side Plate	1	006366
L.H. Equalize Side Plate	1	006367
Key 3/8 x 3/8 x 3/4	2	007027
Key 1/2 x 1/2 x 8	2	007011
Air Cylinder	1	020632

Components

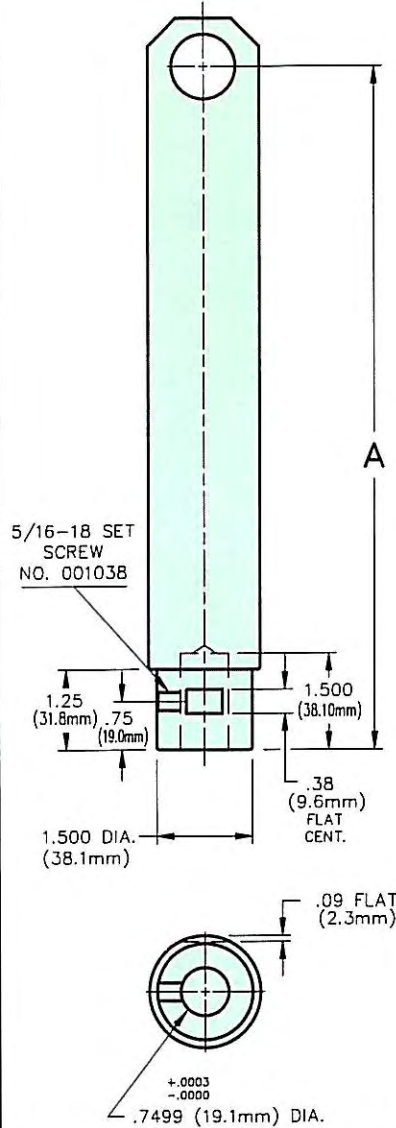
P10REU

Description	No. Req'd	BTM No.
P10REU Ram	1	013198
Mount Block	1	013484
Stop Collar (Closed Pos.)	1	013216
Ram Stop	1	013199
R.H. Equalize Side Plate	1	006366
L.H. Equalize Side Plate	1	006367
Key 3/8 x 3/8 x 3/4	2	007027
Key 1/2 x 1/2 x 8	2	007011

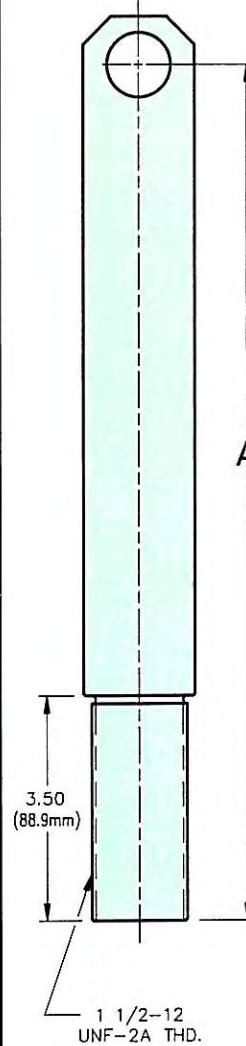
PA - 150
PA - 175



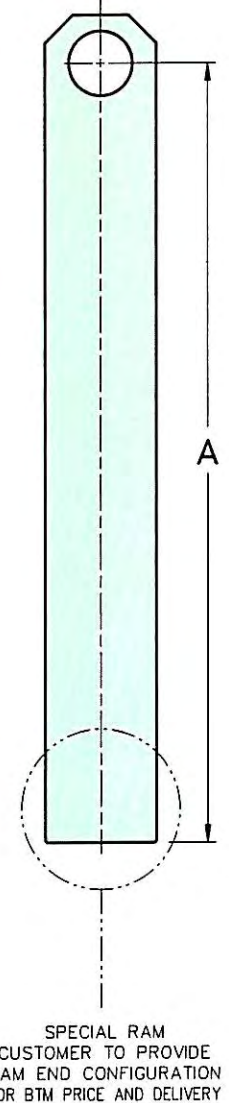
P - 150*
P - 175



TE - 150
TE - 175



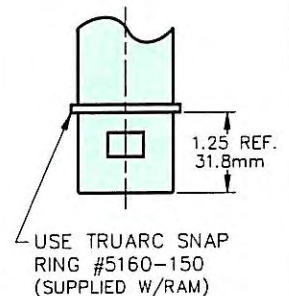
S - 150
S - 175



SPECIAL RAM
CUSTOMER TO PROVIDE
RAM END CONFIGURATION
FOR BTM PRICE AND DELIVERY

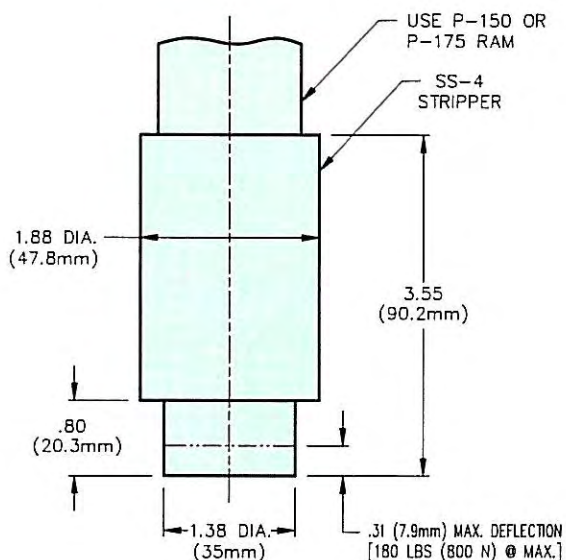
SERIES	PRESS MODEL	RAM STYLE	STROKE	A DIM.	BTM NO.
150 SERIES RAMS 5 TON PRESSES	H	PA	3.00 (76.2mm)	11.97 (304.0mm)	001177
			4.50 (114.3mm)	13.47 (342.1mm)	002773
	FM	P*	3.00 (76.2mm)	10.62 (269.7mm)	000274
			4.50 (114.3mm)	12.12 (307.8mm)	000275
	EU	TE	3.00 (76.2mm)	13.30 (337.8mm)	000283
			4.50 (114.3mm)	14.80 (375.9mm)	000284
	ALL	S	3.00 (76.2mm)	PER CUSTOMER	TO BE ASSIGNED
			4.50 (114.3mm)		
175 SERIES RAMS 10 TON PRESSES	H	PA	3.00 (76.2mm)	11.97 (304.0mm)	013109
			4.50 (114.3mm)	13.47 (342.1mm)	013110
	FM	P	3.00 (76.2mm)	10.62 (269.7mm)	004886
			4.50 (114.3mm)	12.12 (307.8mm)	004887
	EU	TE	3.00 (76.2mm)	13.30 (337.8mm)	005687
			4.50 (114.3mm)	14.80 (375.9mm)	004893
	ALL	S	3.00 (76.2mm)	PER CUSTOMER	TO BE ASSIGNED
			4.50 (114.3mm)		

* P-150 RAMS USE A
SNAP RING TO BACK
UP STRIPPER.

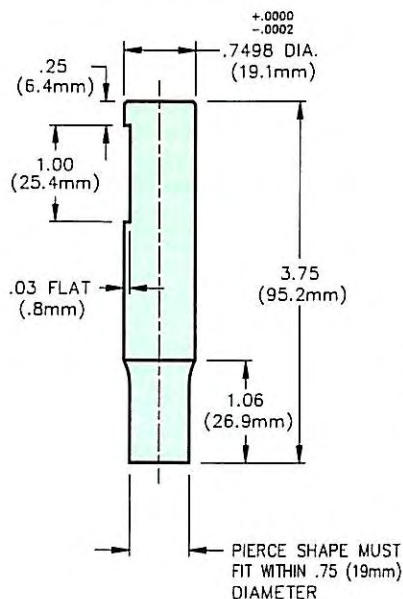


Strippers, Punches and Dies

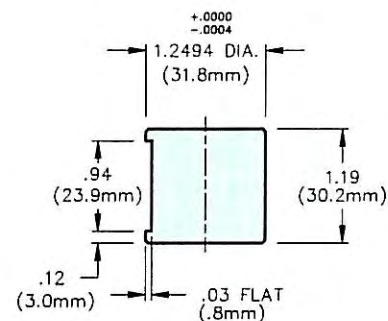
SS-4 STRIPPER
BTM ASS'Y NO. 000286



SS-4 PIERCE PUNCH
BTM No. 013149

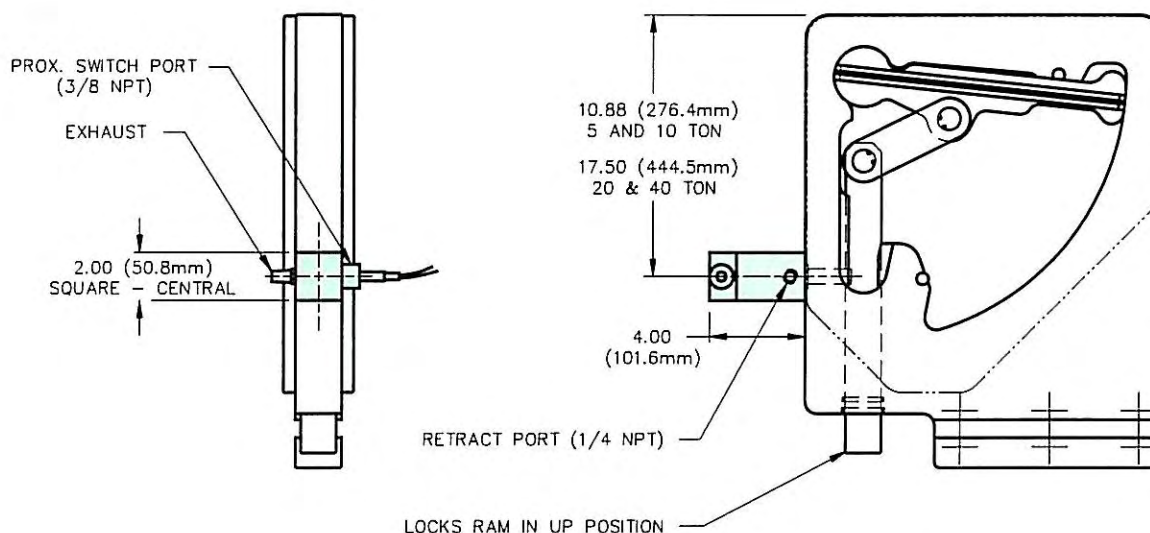


SS-4 PIERCE DIE
BTM No. 013150



Matched Punch & Die Sets - Fax Pierce
Punch Shape For Quote To Punch Tech, Inc.
(Division of BTM) Fax: 810-364-6030

Ram Latch with Proximity Switch



The ram latch prevents the ram from drifting down, and is used to facilitate tool changes with the air off.

Available on 5, 10, 20 and 40 Ton Presses
Models: H, FM, EU, REU, T, B or F.
(H Shown)

NOTE: 2 Ram Latches are required for 40 Ton Presses. Located on center-line of rams.

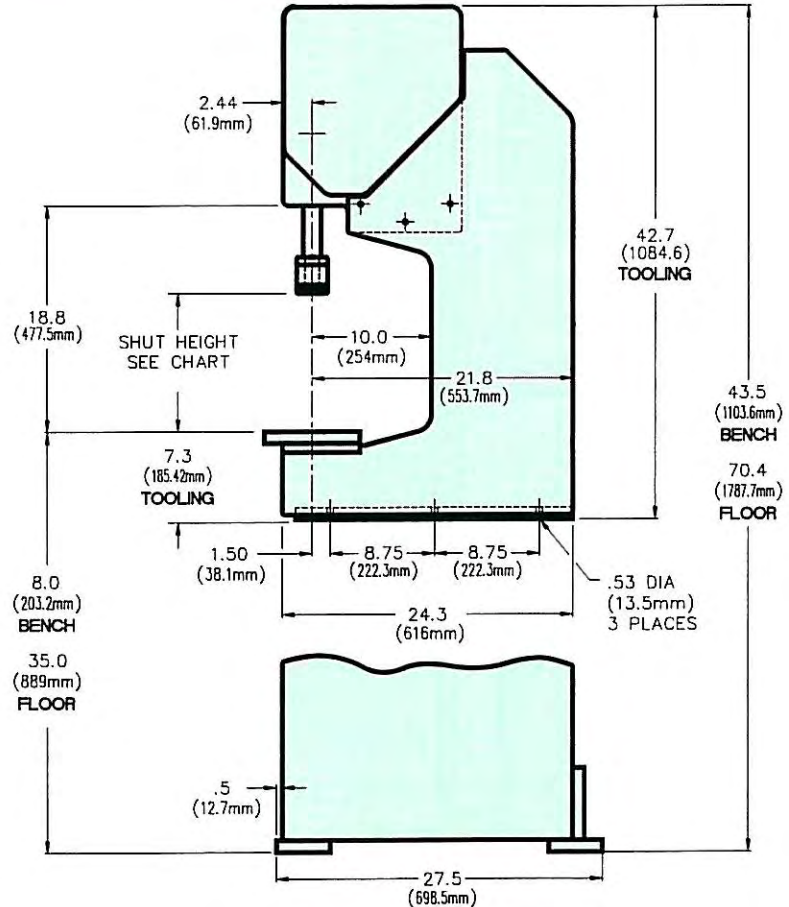
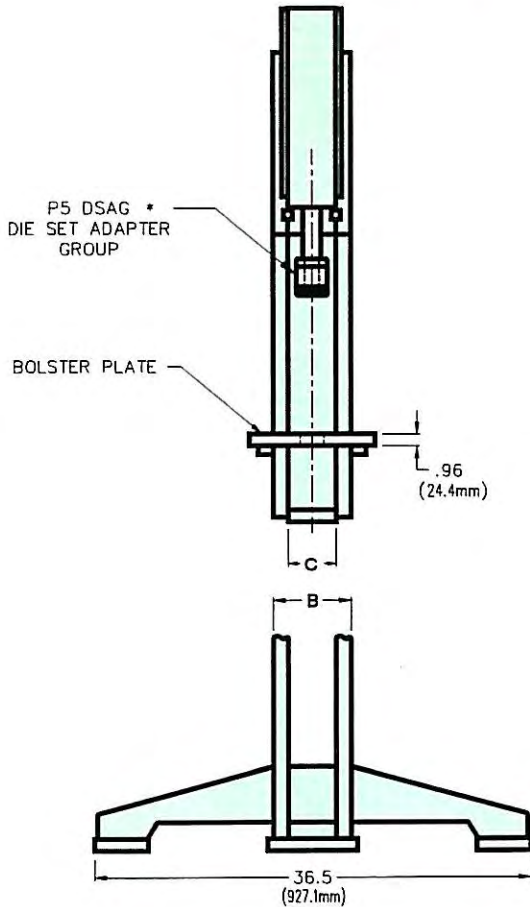
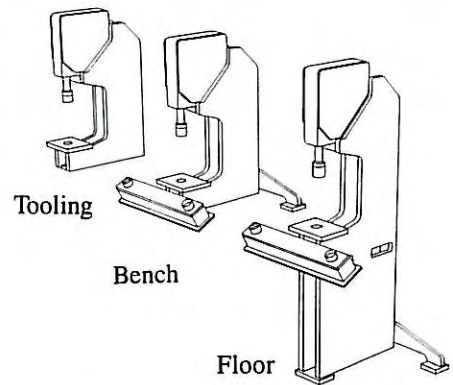
Retract port, and prox. switch location positioned by customer. See page 28.

B, F and T Models (Bench, Floor and Tooling)



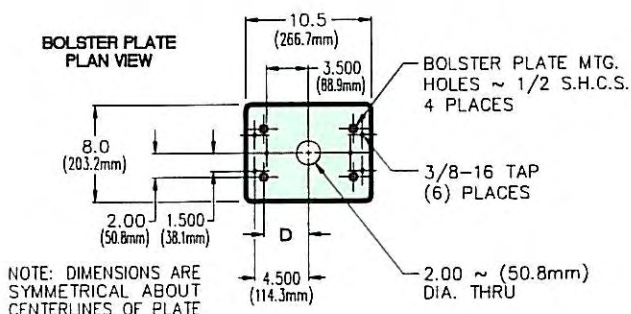
P5B x 3.00 (76.2mm) Stroke 000846 - 310 lbs. (141 kg)
 P5B x 4.50 (114.3mm) Stroke 000847 - 310 lbs. (141 kg)
 P5F x 3.00 (76.2mm) Stroke 000850 - 450 lbs. (205 kg)
 P5F x 4.50 (114.3mm) Stroke 000851 - 450 lbs. (205 kg)
 P5T x 3.00 (76.2mm) Stroke 000848 - (136 kg)
 P5T x 4.50 (114.3mm) Stroke 000849 - (136 kg)

P10B x 3.00 (76.2mm) Stroke 000852 - 700 lbs. (318 kg)
 P10B x 4.50 (114.3mm) Stroke 000853 - 700 lbs. (318 kg)
 P10F x 3.00 (76.2mm) Stroke 000856 - 835 lbs. (380 kg)
 P10F x 4.50 (114.3mm) Stroke 000857 - 835 lbs. (380 kg)
 P10T x 3.00 (76.2mm) Stroke 000854 - 560 lbs. (255 kg)
 P10T x 4.50 (114.3mm) Stroke 000855 - 560 lbs. (255 kg)



PRESS	B	C	D
5 TON	3.2 81.3mm	1.96 49.8mm	2.19 55.6mm
10 TON	6.4 162.6mm	3.90 99.1mm	3.75 95.3mm

STROKE	SHUT HEIGHT
3.00 STROKE (76.2mm)	11.50 (292.1mm) MAX. 10.50 (266.7mm) MIN.
4.50 STROKE (114.3mm)	10.00 (254.0mm) MAX. 9.00 (228.6mm) MIN.

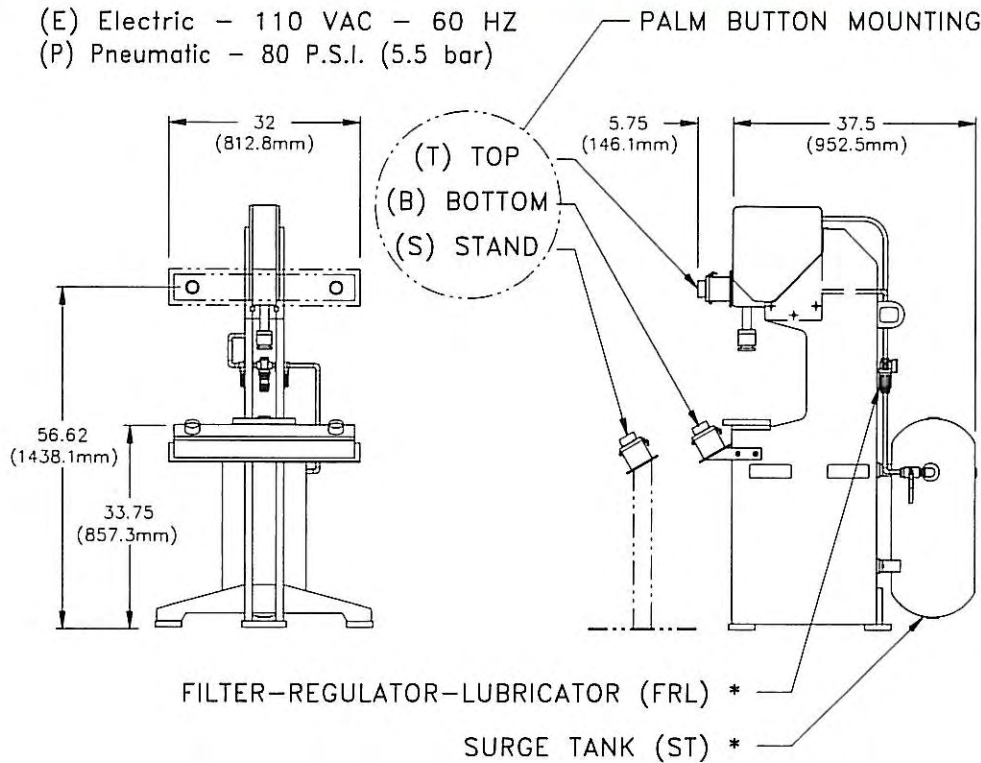


How to Order Presses											
Quantity	Model	Stroke	Ram Style	TE is Standard	Die Set Adapter	Ram Latch	Proximity Switches	Controls	Consider Tooling		
		3.00, 4.50 or Special	TE is Standard	See Page 18	See Page 21	See Page 19	See Page 28	See Page 21	See Pages 11, 13, 19 & 21		

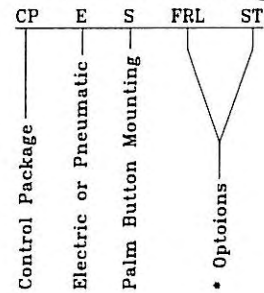
* Denotes Options

CONTROL PACKAGES (CP)

(E) Electric - 110 VAC - 60 HZ
(P) Pneumatic - 80 P.S.I. (5.5 bar)



How to Order Control Packages

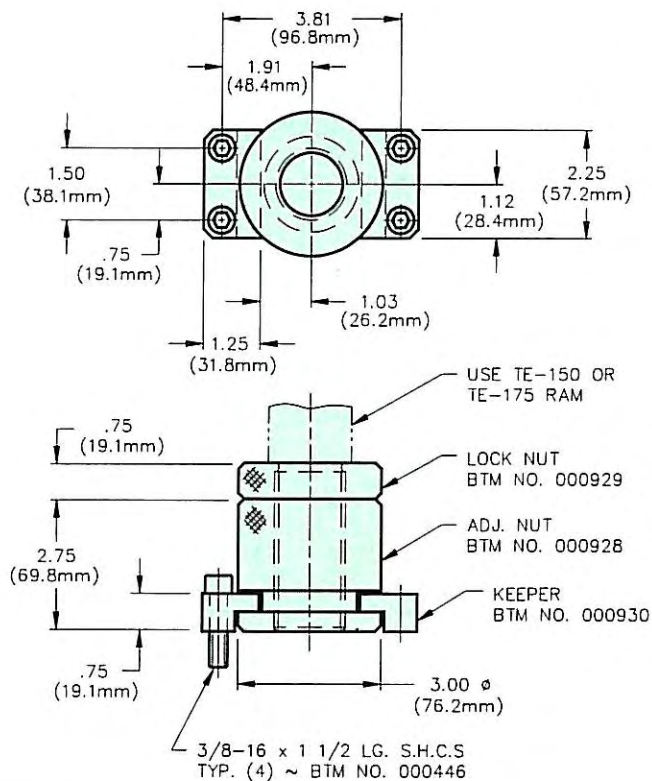


Standard Control Package logic is 2 hand, anti tie down, anti repeat.

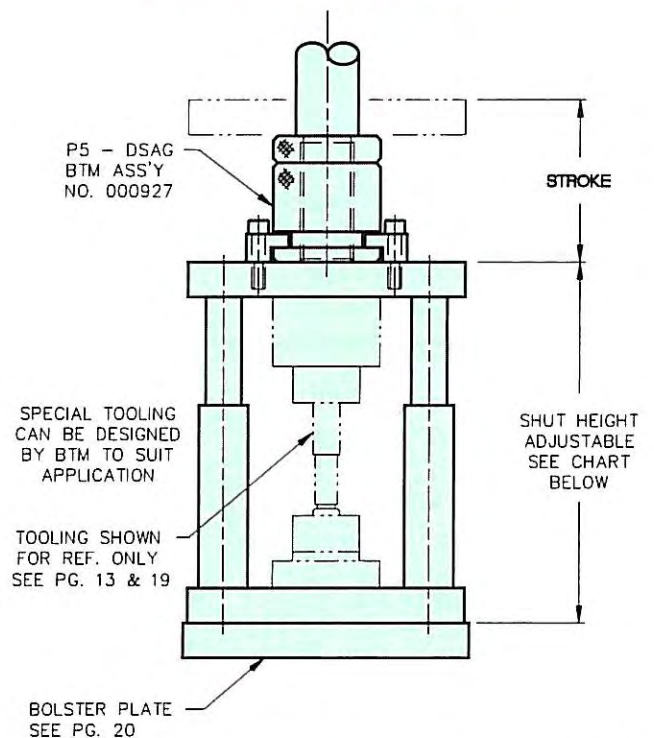
Special Control Packages are available.

P5 - DSAG

(DIE SET ADAPTER GROUP)
BTM ASS'Y NO. 000927



DIE SET INFORMATION

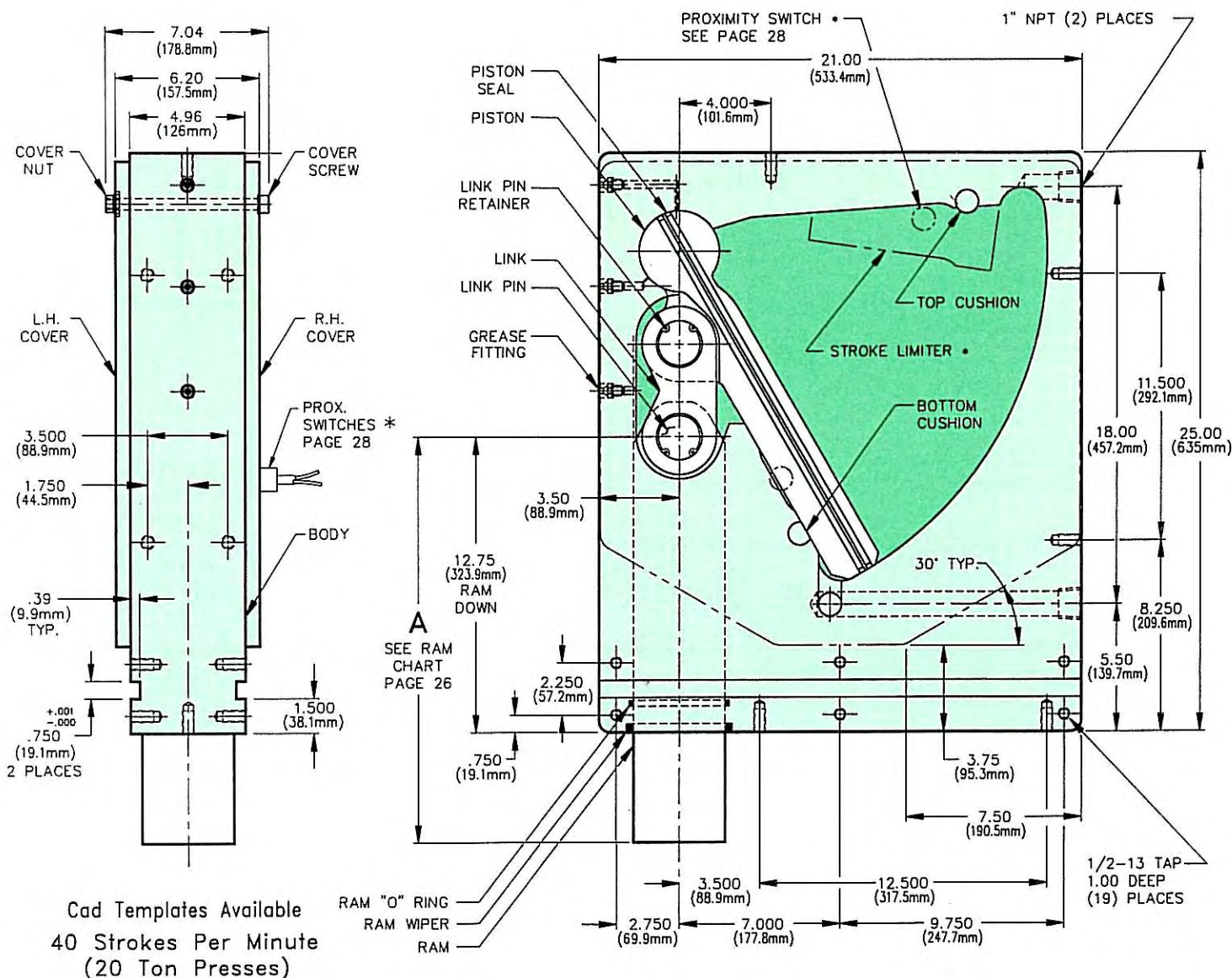


STROKE	SHUT HEIGHT
3.00 STROKE (76.2mm)	11.50 (292.1mm) MAX. 10.50 (266.7mm) MIN.
4.50 STROKE (114.3mm)	10.00 (254.0mm) MAX. 9.00 (228.6mm) MIN.

H Models (Head)

P20H x 3.00 (76.2mm) Stroke 001556 - 345 lbs. (157 kg)

P20H x 4.50 (114.3mm) Stroke 001557 - 345 lbs. (157 kg)



Cad Templates Available
40 Strokes Per Minute
(20 Ton Presses)

Components

P20H

Description	No. Req'd	BTM No.
P20H x 3.00 (76.2mm) Body	1	000422
P20H x 4.50 (114.3mm) Body	1	000423
Piston	1	000424
Piston Seal	2	000431
Link	1	000425
Link Pin	2	000426
Link Pin Retainer	2	000432
Ram - 400 Series	1	See Pg. 26
R.H. Cover	1	000429
L.H. Cover	1	000430
Cover Screw	17	000436
Cover Nut	17	000437
Ram Wiper	1	000434
Ram "O" Ring	1	000433
Grease Fitting	3	000050
Sealant - Cover	1	000273
Seal Kit	1	000809
Top Cushion	2	004318
Bottom Cushion	2	004318
Stroke Limiter	1	000823

How to Order Presses

Quantity	Model	Stroke	Ram Style	Proximity Switches	Ram Latch	Die Set Adapter	Consider Tooling
6	P20H x 4.50	T-400	EPRL EPEL	RL	DSAG	TOOLING	
		3.00, 4.50 or Special	See Page 26	See Page 28	See Page 19	See Page 27	See Pgs. 11, 13, 19 & 27

How to Order Components

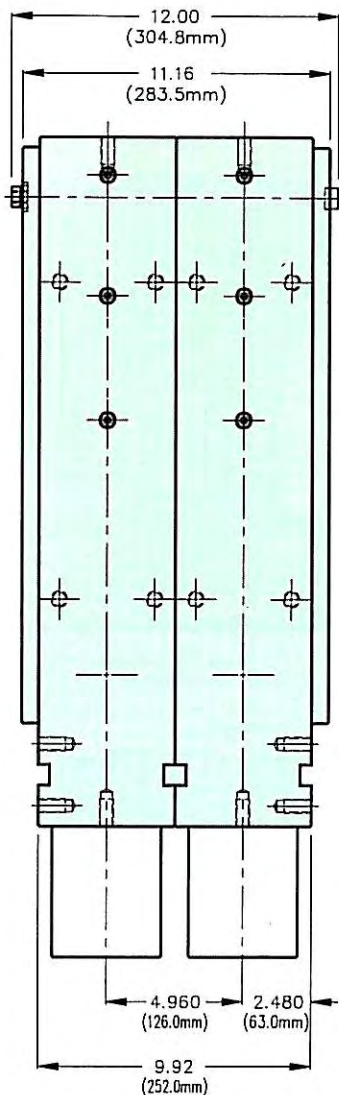
Qty.	Description	BTM No.
2	P20 Link	000425

* Denotes Options

H Models (Head)

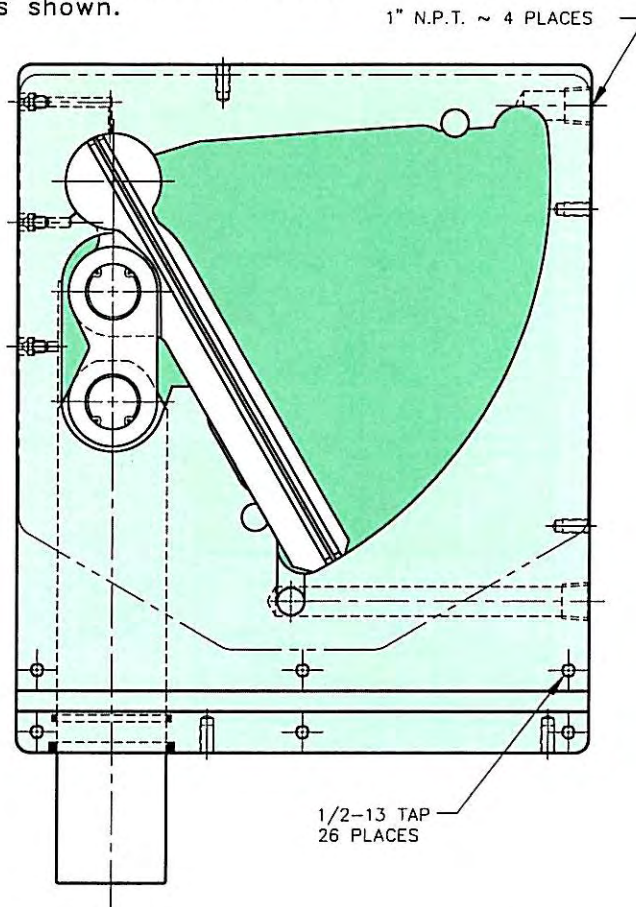
P40H x 3.00 (76.2mm) Stroke 003899 - 660 lbs. (300 kg)

P40H x 4.50 (114.3mm) Stroke 003900 - 660 lbs. (300 kg)



NOTE:

Dimensions are identical to P20H except as shown.



Cad Templates Available

40 Strokes Per Minute
(40 Ton Presses)

Components

P40H

Description	No. Req'd	BTM No.
P40H x 3.00 (76.2mm) Body	1	013144
P40H x 4.50 (114.3mm) Body	1	013145
Piston Set	1	004615
Piston Seal	4	000431
Link	1	004614
Link Pin	2	004616
Link Pin Retainer	2	000432
Ram - 400 Series	2	See Pg. 26
R.H. Cover	1	000429
L.H. Cover	1	000430
Cover Screw	17	004618
Cover Nut	17	000437
Ram Wiper	2	000434
Ram "O" Ring	2	000433
Grease Fitting	6	000050
Sealant - Cover	1	000273
Seal Kit	1	004617

How to Order Presses

6	P40H	4.50	T-400	EPRL	EPEL	RL	DSAG	TOOLING
Quantity	Model	Stroke 3.00, 4.50 or Special	Ram Style See Page 26	• Proximity Switches See Page 28		• Ram Latch See Page 19	• Die Set Adapter See Page 27	• Consider Tooling See Fgs. 11,13,19 & 27

How to Order Components

Qty.	Description	BTM No.
2	P40 Link	004614

* Denotes Options

F and T Models (Floor and Tooling)

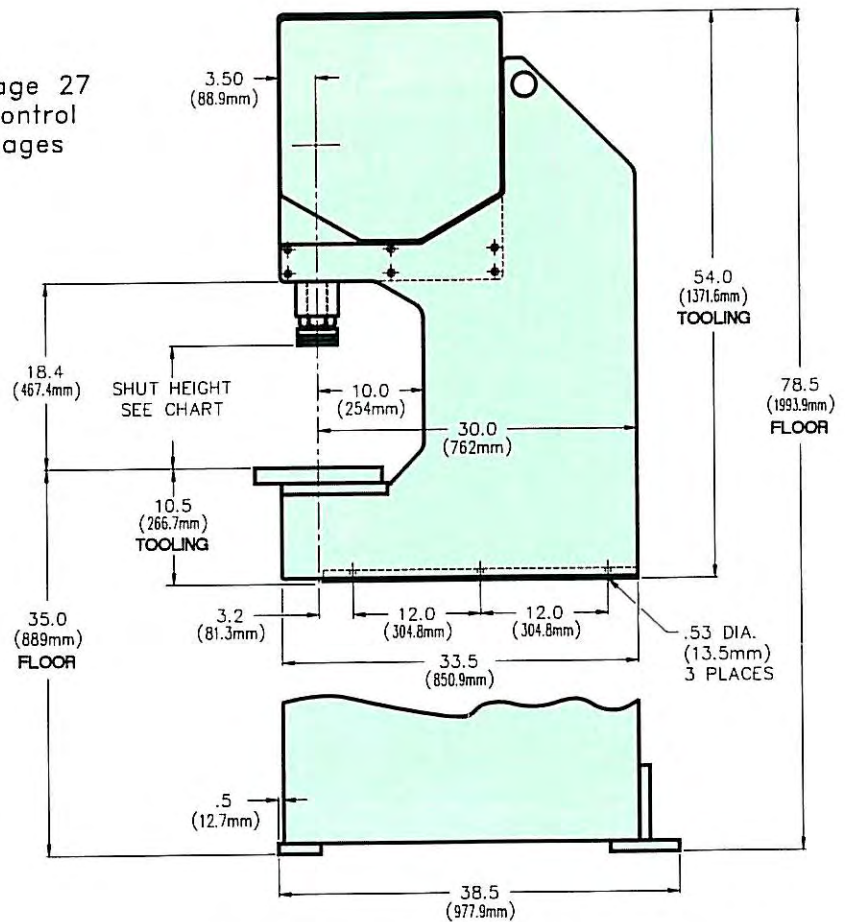
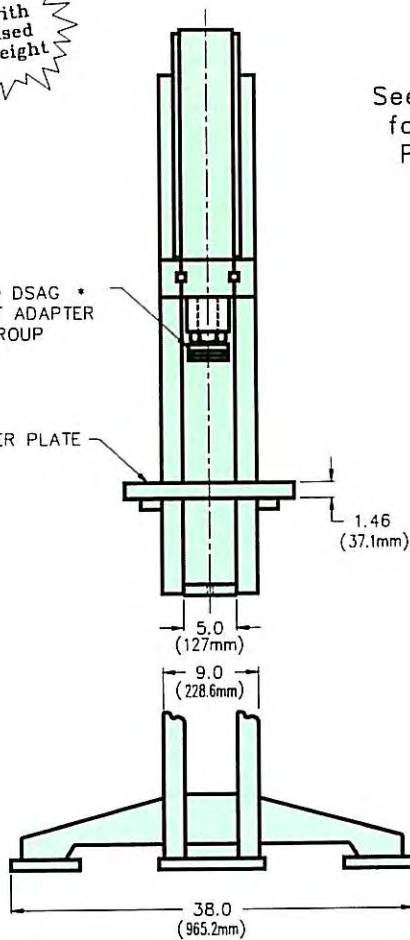
P20F x 3.00 (76.2mm) Stroke 000862 - 2600 lbs. (1182 kg)
 P20F x 4.50 (114.3mm) Stroke 000863 - 2600 lbs. (1182 kg)
 P20T x 3.00 (76.2mm) Stroke 000860 - 1550 lbs. (705 kg)
 P20T x 4.50 (114.3mm) Stroke 000861 - 1550 lbs. (705 kg)

Now with
Increased
Shut Height

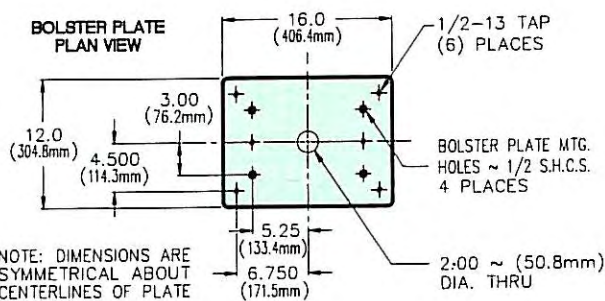
See page 27
for Control
Packages

P20 DSAG *
DIE SET ADAPTER
GROUP

BOLSTER PLATE

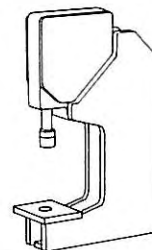


BOLSTER PLATE
PLAN VIEW

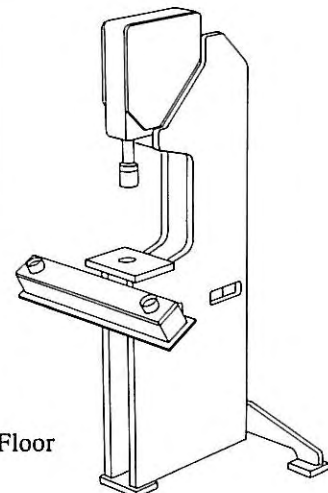


NOTE: DIMENSIONS ARE
SYMMETRICAL ABOUT
CENTERLINES OF PLATE

STROKE	SHUT HEIGHT
3.00 STROKE (76.2mm)	12.50 (317.5mm) MAX. 11.50 (292.1mm) MIN.
4.50 STROKE (114.3mm)	11.00 (279.4mm) MAX. 10.00 (254.0mm) MIN.



Tooling



Floor

How to Order Presses

6 P20F 4.50 T-400 DSAG RL EPRL EPEL CP E S FRL TOOLING

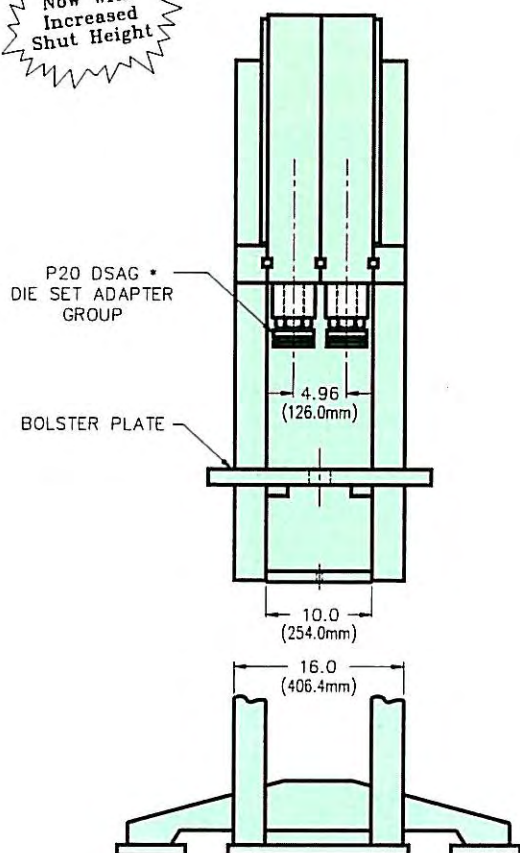
Quantity	Model	Stroke 3.00, 4.50 or Special	Ram Style T is Standard See Page 26	* Die Set Adapter See Page 27	* Ram Latch See Page 19	* Proximity Switches See Page 28	* Controls See Page 27	* Consider Tooling See Pages 11,13,19, & 27
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* Denotes Options

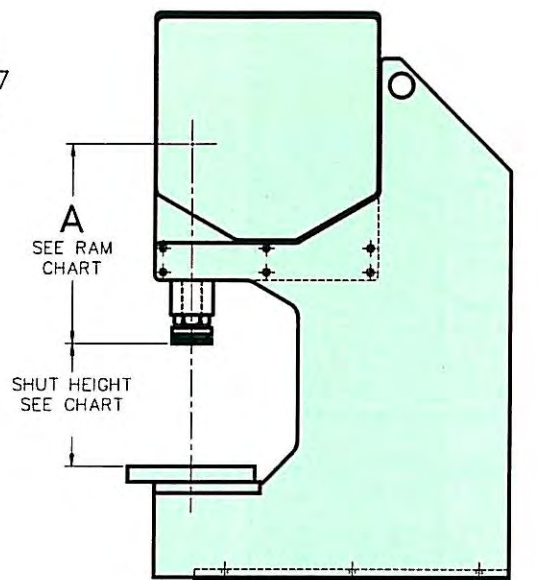
F and T Models (Floor and Tooling)

P40F x 3.00 (76.2mm) Stroke 003905 - 2950 lbs. (1338 kg)
 P40F x 4.50 (114.3mm) Stroke 003906 - 2950 lbs. (1338 kg)
 P40T x 3.00 (76.2mm) Stroke 003903 - 1895 lbs. (860 kg)
 P40T x 4.50 (114.3mm) Stroke 003904 - 1895 lbs. (860 kg)

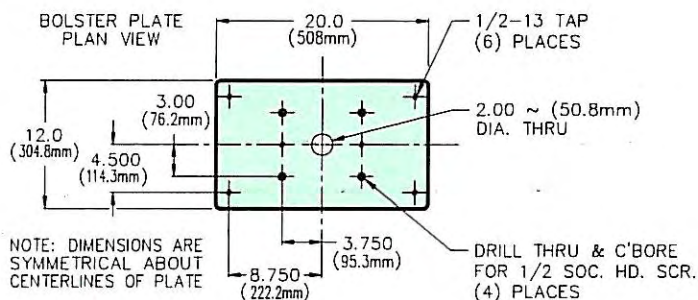
Now with
Increased
Shut Height



See page 27
for Control
Packages



NOTE: DIMENSIONS ARE IDENTICAL TO 20 TON
VERSIONS EXCEPT AS SHOWN.



NOTE: DIMENSIONS ARE
SYMMETRICAL ABOUT
CENTERLINES OF PLATE

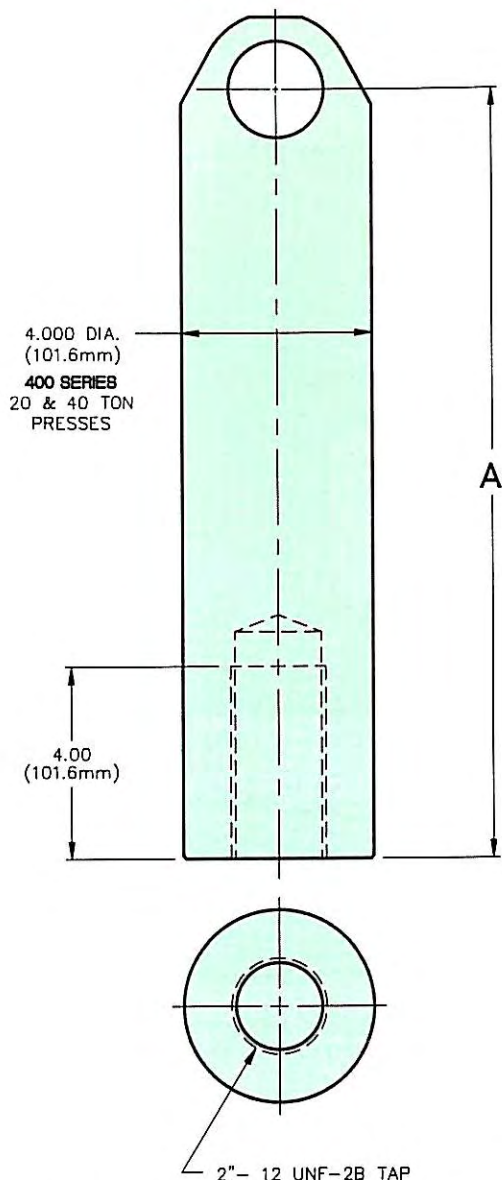
How to Order Presses										
6	P40F	4.50	T-400	DSAG	RL	EPRL	EPEL	CLE	S	FRL TOOLING
Quantity	Model	Stroke 3.00, 4.50 or Special	Ram Style T is Standard See Page 26	Die Set Adapter See Page 27	Ram Latch See Page 19	Proximity Switches See Page 28	Controls See Page 27	Consider Tooling See Pages 11, 13, 19, & 27		

* Denotes Options

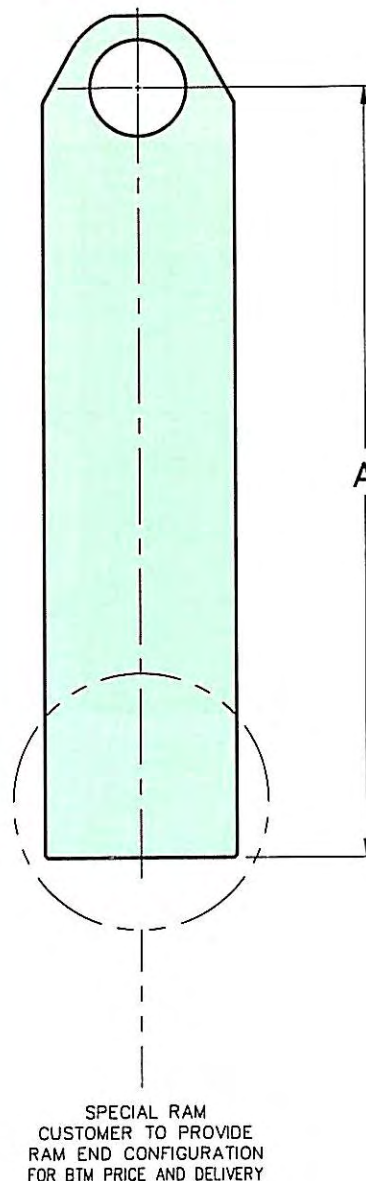
Tooling

Floor

T - 400

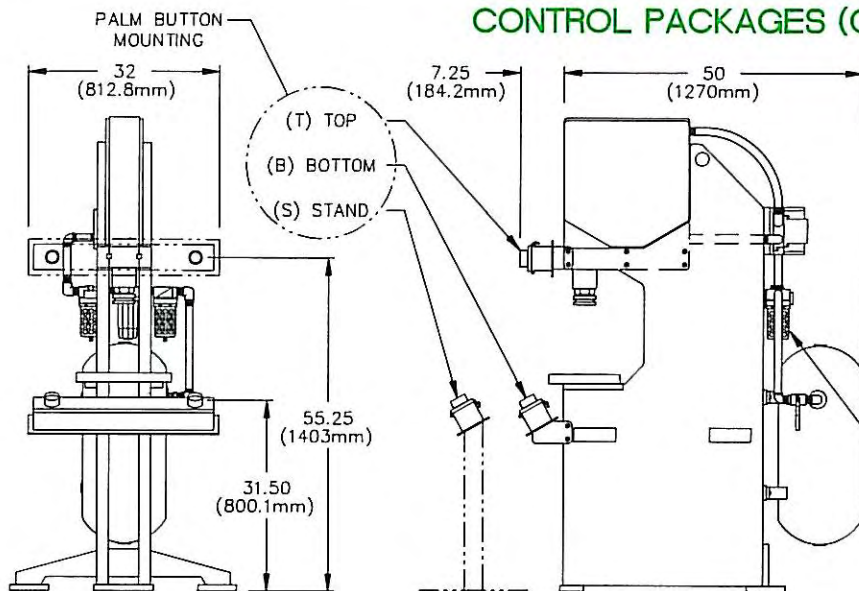


S - 400

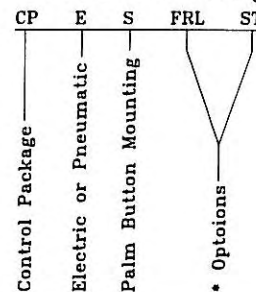


SERIES	PRESS MODEL	RAM STYLE	STROKE	A DIM.	BTM NO.
400 SERIES RAMS FOR 20 & 40 TON PRESSES	ALL	T	3.00 (76.2mm)	16.00 (406.4mm)	007607
			4.50 (114.3mm)	17.50 (444.5mm)	007947
		S	3.00 (76.2mm)	PER CUSTOMER	TO BE ASSIGNED
			4.50 (114.3mm)	PER CUSTOMER	TO BE ASSIGNED

CONTROL PACKAGES (CP)



How to Order Control Packages



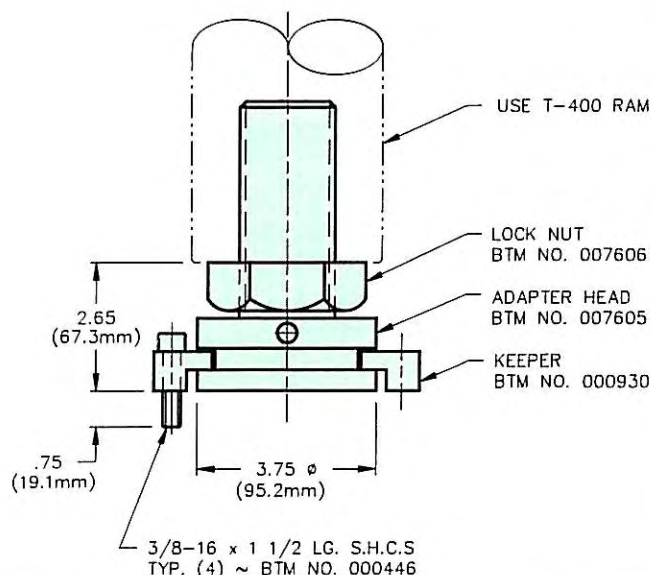
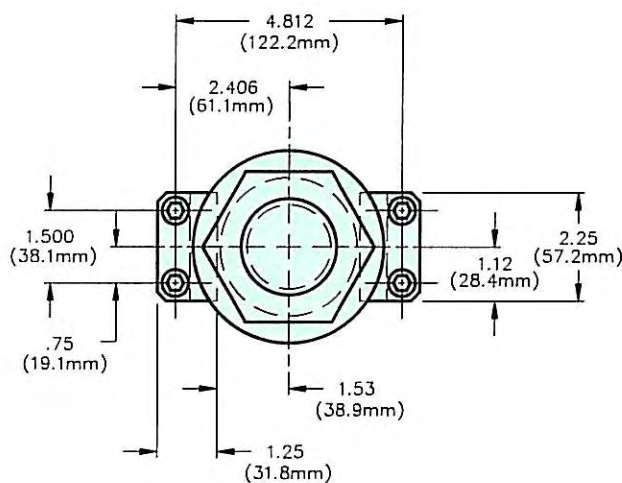
Standard Control Package Logic is 2 hand, anti tie down, anti repeat.

Special Control Packages are available.

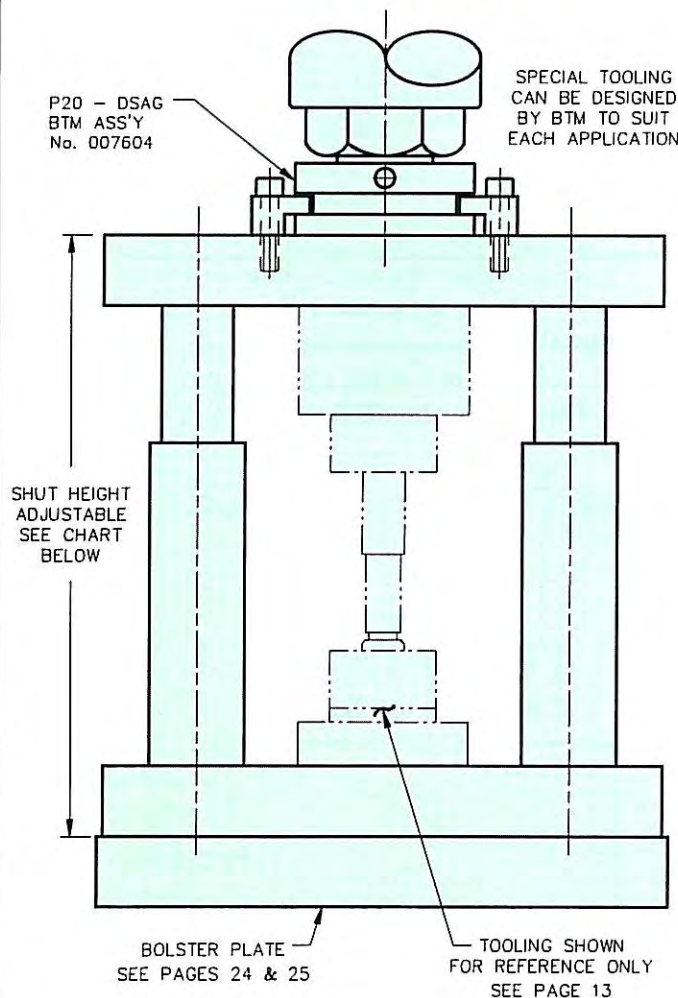
(E) Electric - 110 VAC - 60 HZ
(P) Pneumatic - 80 P.S.I. (5.5 bar)

P20 - DSAG

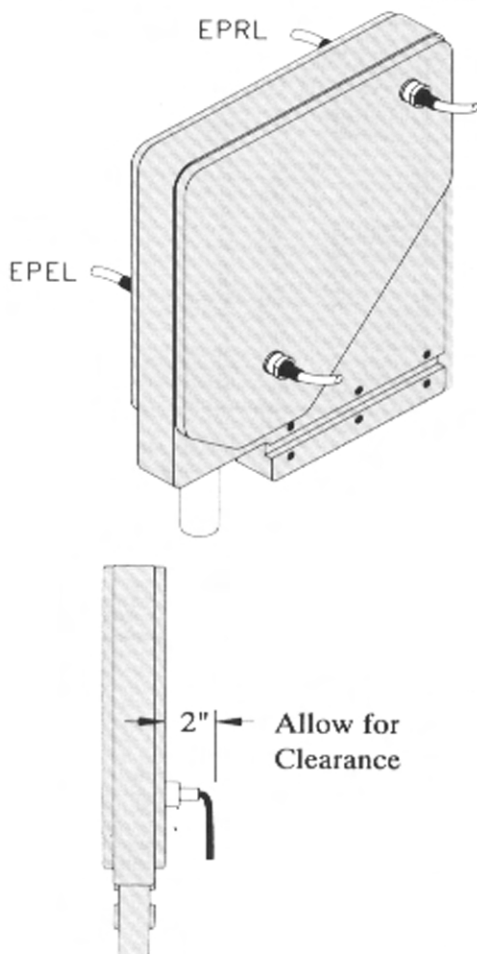
(DIE SET ADAPTER GROUP)
BTM ASS'Y NO. 007604



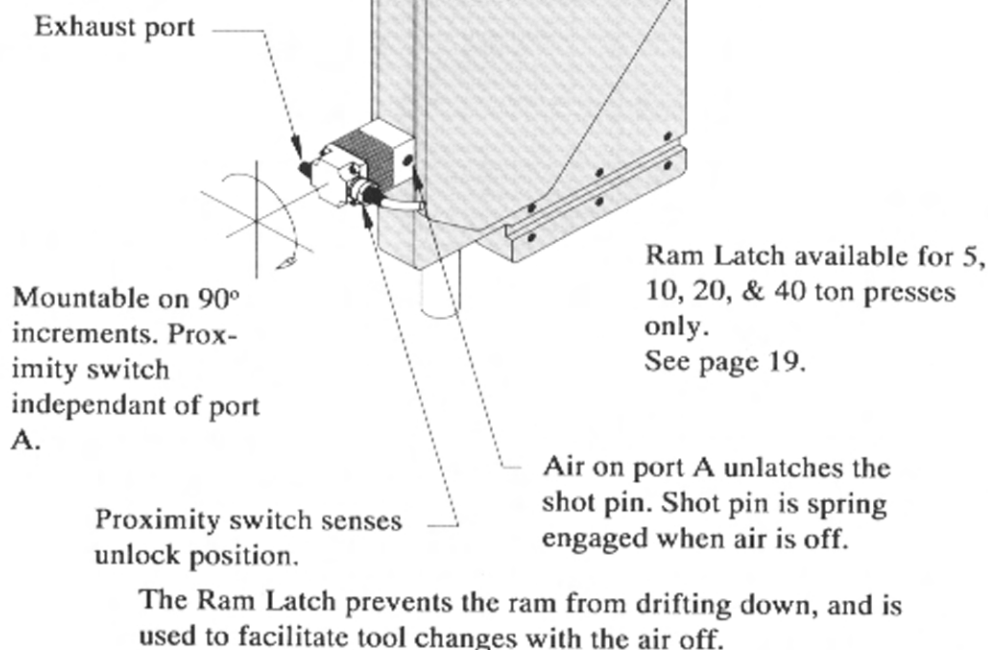
DIE SET INFORMATION



STROKE	SHUT HEIGHT
3.00 STROKE (76.2mm)	12.50 (317.5mm) MAX. 11.50 (292.1mm) MIN.
4.50 STROKE (114.3mm)	11.00 (279.4mm) MAX. 10.00 (254.0mm) MIN.



Ram Latch



Ordering Information

How to Order Proximity Switches

EP	R	L
Electrical Proximity	R = Retracted E = Extended	L = Left Hand R = Right Hand

Components Proximity Switch

Description

Standard Proximity switch
2 wire, AC / DC
Honeywell Microswitch.
Others are available.
This switch can be used
on all press sizes, models
and positions EPRL, EPEL,
etc.

BTM No.

006266
Includes mounting
adapter

Proximity Switch Specifications

AC - Normally Open (DC Available)		AC SENSOR LOAD VAC
Operating Voltage Range 20-260 VAC	Supplied with 6' cable - 3 wire	
Load Current Maximum 500 mA		

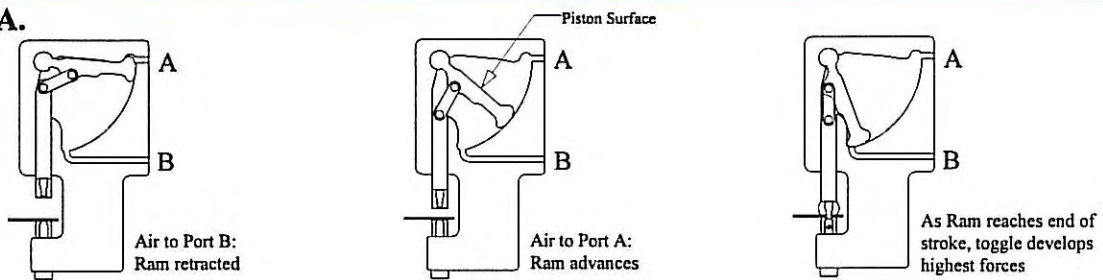
Safety:

User's Responsibility: Each person who is to operate and maintain the unit must be familiar with all safety precautions before attempting to use or service the press equipment. The owner of the machine is responsible to train and supervise all personnel as to safety precautions. The customer must provide proper guarding to protect personnel from moving machinery.

1.0 How It Works:

The BTM toggle press produces high forces using 80 psi air pressure. The toggle mechanism multiplies the force of the air pressure acting on the piston surface. Force is generated on a curve; as the press ram advances force output increases, with maximum force produced at the end of the stroke. (Figure A.)

Figure A.



1.1 Press Sizing:

Accurate calculation of the *required force* and *work stroke* is necessary in order to perform the work without over-taxing the press. Calculating force for piercing and shearing is relatively straightforward. Calculations for operations such as coining, crimping, clinching and riveting can be more complex, requiring special formulas and/or tryout. BTM's application engineering department offers assistance in press sizing. Call BTM at 810-364-4567 for information. Chart 1.5 shows *calculated* forces at incremental distances from the end of the stroke for each BTM press model. This chart is to be used with your force calculation and work stroke requirement to select the appropriate press model.

1.2 Determining Work Stroke

Required:

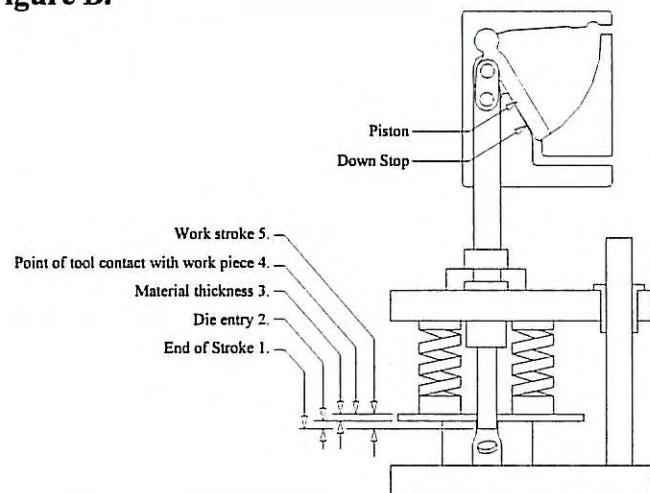
Work Stroke is figured backwards from the fully extended end of the press stroke (piston on down stop). (Figure B.)

1. End of Stroke
2. Entry of the punch into the die beyond the work piece.
3. Material Thickness
4. Point of tool contact with work piece.
5. Distance from point of tool contact with work piece to end of full stroke = work stroke.

Example:

- | | |
|-----------------------|-------------------|
| 2. Material Thickness | = .91 mm - .036" |
| 3. Punch Penetration | + .76 mm - .030" |
| 4. Work Stroke | = 1.68 mm - .066" |

Figure B.



1.3 Force Calculation:

The example below demonstrates press sizing based on *piercing* force requirements and is useful for other operations as well. Several factors must be considered, including the shear strength and thickness of the material to be pierced, length of cut of the pierced hole, and the amount of punch entry or work stroke. Shear strength values for a variety of materials are provided in chart 1.7 for your convenience. BTM recommends adding a *50% safety factor* to the force requirement calculation to compensate for other variables such as friction, die springs, dull cutting tools, lifting of dies (3.7) and operating pressure fluctuations.

A.	Shear strength of material	=	_____
B.	Thickness of material	=	_____
C.	Length of cut (circumference)	=	_____
Multiply AxBxCx1.5 (Safety Factor)		=	<u>Force Required</u>

Example: Force required to pierce a .25" (6.4mm diameter hole in .036" (.9mm) thick mild steel.

A.	Shear strength (see chart 1.7)	=50,000 psi	(344.7Nmm ²)
B.	Material Thickness	=.036"	(.9mm)
C.	Length of cut (of .25" dia hole)	=.78"	(19.8mm)
Multiply (AxBxC) & add 50% safety factor (x1.5)		=2106 lbs.	(9215N)

Force required at the point where tooling contacts the work piece. (.066" - 1.68mm in example 1.2)

1.4 Press Selection:

After determining the force required with safety factor, the work stroke must be considered in selecting the appropriate press model. Use chart 1.5 to verify that the press you are considering produces the required force at the distance from the end of the stroke where your tooling will contact the work piece. If it does not, a larger press is required. *In the example provided in 1.2 & 1.3, a two ton BTM press would be an appropriate choice to perform the piercing operation.*

1.5 BTM Toggle Press

Force Chart: (On facing page)

This chart lists forces exerted by the press ram at incremental distances from the end of the stroke. Note that the toggle mechanism develops a force curve (Figure C), with force increasing as the ram advances. All forces are rated at 80 psi (5.5 bars) air pressure to the BTM press.

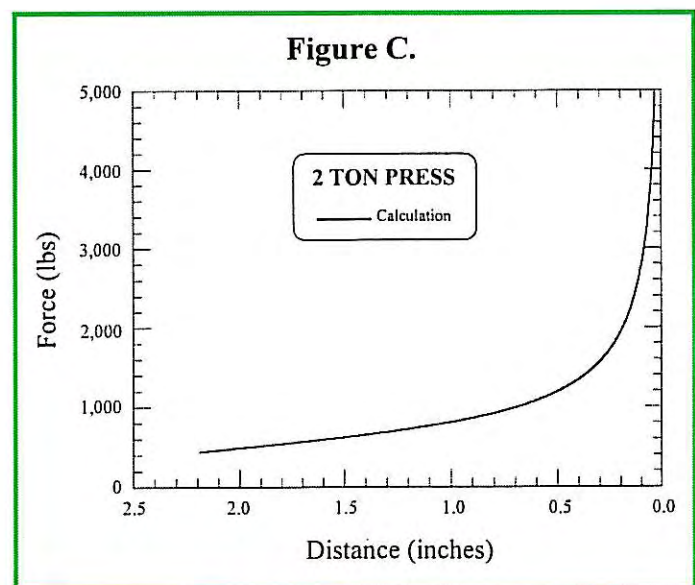


Chart 1.5 Force at Stroke Distance

Distance from Bottom of Stroke	BTM Press Model					
	1 Ton	2 Ton	5 Ton	10 Ton	20 Ton	40 Ton
	Force output in pounds and Newtons at 80 psi (5.5 bar)					
.00" .00mm						
.01" 0.25 mm	4483 19,941	8965 39,878	22526 100,201	45053 200,406	122515 544,974	245031 1,089,952
.02" .05 mm	3161 14,061	6321 28,117	15906 70,753	31812 141,507	86297 383,866	172593 767,737
.03" 0.75 mm	2577 11,441	5145 22,886	12960 57,649	25920 115,298	70255 312,510	150509 625,015
.06" 1.5 mm	1804 8,025	3609 16,054	9113 40,537	18225 81,069	49357 219,551	98714 439,102
.12" 3.0 mm	1261 5,609	2523 11,223	6392 28,433	12785 56,870	34594 153,882	69188 307,763
.24" 6.1 mm	878 3,906	1755 7,807	4466 19,866	8933 39,736	24171 107,518	48341 215,031
.50" 12.7 mm	593 2,638	1186 5,276	3041 13,527	6082 27,054	16457 73,204	32914 146,409
.75" 19.0 mm	474 2,108	949 4,221	2452 10,907	4903 21,810	13268 59,019	26536 118,038
1.00" 25.4 mm	402 1,788	804 3,576	2100 9,341	4200 18,683	11364 50,550	22728 101,099
1.25" 31.75 mm	351 1,561	701 3,118	1859 8,269	3717 16,534	10059 44,745	20118 89,489
1.50" 38.1 mm	310 1,379	621 2,762	1679 7,469	3359 14,942	9089 40,430	18178 80,860
1.75" 44.45 mm	276 1,228	552 2,455	1539 6,846	3077 13,687	8326 37,036	16653 74,076
2.00" 50.8 mm	244 1,085	487 2,166	1423 6,330	2847 12,664	7703 34,265	15406 68,529
2.25" 57.15 mm	—	—	1326 5,898	2652 11,797	7176 31,920	14352 63,841
2.50" 63.5 mm	—	—	1242 5,525	2483 11,045	6719 29,888	13438 59,775
3.00" 76.2 mm	—	—	1099 4,889	2197 9,773	5945 26,445	11890 52,889
3.50" 88.9 mm	—	—	976 4,341	1952 8,683	5282 23,495	10565 46,995
4.00" 101.6 mm	—	—	863 3,839	1725 7,673	4669 20,769	9337 41,533
4.50" 114.3 mm	—	—	749 3,332	1497 6,659	4051 18,020	8103 36,925

Chart 1.6 Force Required to Pierce Holes *Without Safety Factor

Metal Thickness	Hole Diameters							
	.125" 3.0mm	.250" 6.0mm	.375" 9.0mm	.500" 12.0mm	.625" 15.0mm	.750" 21.0mm	.875" 21.0mm	1.000" 25.0mm
	Force in Tons & KiloNewtons Required For Piercing Round Holes in Mild Steel*							
.020" 0.5 mm	.22 2.0	.45 4.0	.7 6.20	.8 7.1	.95 8.5	1.25 11.1	1.5 13.3	1.65 14.7
.030" 0.7 mm	.3 2.7	.6 5.3	.9 8.0	1.2 10.7	1.5 13.3	1.8 16.0	2.1 18.7	2.4 21.4
.040" 1.0 mm	.45 4.0	.82 7.3	1.25 11.1	1.65 14.7	2.1 18.7	2.45 21.8	2.9 25.8	3.2 28.5
.050" 1.2 mm	.52 4.6	1.00 8.9	1.5 13.3	2.0 17.8	2.45 21.8	2.9 25.8	3.4 30.2	3.9 34.7
.060" 1.5 mm	.6 5.3	1.2 10.7	1.8 16.0	2.36 21.0	2.95 26.2	3.54 31.5	4.13 36.7	4.72 42.0
.070" 1.7 mm	.7 6.2	1.45 12.9	2.0 17.8	2.8 24.9	3.5 31.1	4.2 37.4	4.9 43.6	5.5 48.9
.100" 2.5 mm	1.0 8.9	2.0 17.8	3.0 26.7	4.0 35.6	5.0 44.5	6.0 53.4	7.0 62.3	8.0 71.2
.150" 3.7 mm	—	3.0 26.7	4.5 40.0	6.0 53.4	7.5 66.7	9.1 81.0	10.5 93.4	12.2 108.5
.250" 6.0mm	—	4.9 43.6	7.4 65.8	9.8 87.2	12.3 109.4	14.7 130.8	17.2 153.0	19.7 175.3
.500" 12.0 mm	—	—	—	19.7 175.3	24.6 218.8	29.5 262.4	34.4 306.0	39.4 350.5

1.6 Piercing Force

Requirements:

This chart shows the force required to pierce round holes (of various diameters) in mild steel (of various thickness.) A 50% safety factor should be added to these numbers when sizing your press.

1.7 Piercing Materials Other Than Mild Steel:

Piercing force required for material other than mild steel can be calculated using the rated shear strength (see chart 1.7) and the formula given at 1.3. The chart 1.7 provides shear strength & multiplication factors for other common materials. Multiply the factor for your material by the force shown in chart 1.6.

Ex: Piercing a .500" (12mm) hole in .050" (1.2mm) mild steel requires 2 Tons. To pierce the same hole in the same thickness of Aluminum 1060-0 multiply 2 Tons x .14 (chart 1.7) = .28 Ton.

Chart 1.7 Material Strengths

Material	Multiplication Factor	Shear Strength
Aluminum 1060-0	.14	7,000 psi 48.26 N/mm ²
Nylon	.24	12,000 psi 82.74 N/mm ²
Copper	.52	26,000 psi 179.26 N/mm ²
Aluminum 2011-T3	.64	32,000 psi 220.63 N/mm ²
Brass	.72	36,000 psi 248.21 N/mm ²
Aluminum 2014-T6	.84	42,000 psi 289.58 N/mm ²
Steel Mild Low Carbon	1.00	50,000 psi 344.74 N/mm ²
Steel Stainless 409	1.30	65,000 psi 448.16 N/mm ²
Steel Stainless 304 L	1.62	81,000 psi 558.47 N/mm ²
Steel Stainless 321	1.66	83,000 psi 572.26 N/mm ²

2.0 Press Specifications:

BTM Toggle Press bodies are made from 6061-T6 Aluminum (45,000 psi tensile strength) and are hard coat anodized to a Rockwell C70 surface hardness. Pistons, links, pins, and rams are steel. Piston seals are molded V block style.

2.1 Tolerances:

The following are tolerances that can be expected for the dimensions given in this catalog (unless specified otherwise):

2 place decimal (.00).....+/- .010" (+/-0.25mm)
 3 place decimal (.000)..... +/- .005" (+/-0.13mm)
 4 place decimal (.0000)..... +/- .0005" (+/-0.01mm)
 Ram rotation..... +/- 15'

2.2 Air Consumption

BTM Press Volume Chart:

Volume is shown in cubic inches and cubic centimeters per full cycle.						
Amount of Stroke in Use	BTM Press Model					
	1 Ton	2 Ton	5 Ton	10 Ton	20 Ton	40 Ton
.03" 0.75 mm	4.8 78.7	9.6 157.4	18.8 308.1	37.6 616.2	310.0 5080.0	620.0 10160.0
.06" 1.5 mm	6.6 108.2	13.2 216.4	37.4 612.9	74.8 1225.8	378.8 6207.4	757.6 12414.8
.12" 3.0 mm	9.2 150.8	18.4 301.6	56.2 921.0	112.4 1842.0	447.8 7338.1	895.6 14676.2
.24" 6.1 mm	12.2 199.9	24.4 399.8	65.4 1071.7	130.8 2143.4	585.4 9593.0	1170.8 19186.0
.50" 12.7 mm	18.4 301.5	36.8 603.0	84.2 1379.8	168.4 2759.6	723.2 11851.1	1446.4 23702.2
.75" 19.0 mm	22.0 360.5	44.0 721.0	103.0 1687.9	206.0 3375.8	826.6 13545.5	1653.2 27091.0
1.00" 25.4 mm	25.8 422.8	51.6 845.6	121.6 1992.7	243.2 3985.4	929.8 15236.7	1859.6 30473.4
1.25" 31.75 mm	29.0 475.2	58.0 950.4	131.0 2146.7	262.0 4293.0	1033.2 16931.1	2066.4 33862.2
1.50" 38.1 mm	31.8 521.1	63.6 1042.2	149.6 2451.5	299.2 4903.0	1067.6 17494.8	2135.2 3498.6
1.75" 44.45 mm	34.4 563.7	68.8 1127.4	168.4 2759.6	336.8 5519.2	1102.0 18058.5	2204.0 36117.0
2.00" 50.8 mm	37.6 616.2	75.2 1232.4	177.6 2910.3	355.2 5820.6	1171.0 19189.2	2342.0 38378.4
2.25" 57.15 mm	39.8 652.2	79.6 1304.4	187.0 3064.4	374.0 6128.8	1205.4 19753.0	2410.8 39506.0
2.50" 63.5 mm	—	—	196.4 3218.4	392.8 6436.8	1239.8 20316.7	2479.6 40633.4
3.00" 76.2 mm	—	—	205.8 3372.5	411.6 6745.0	1274.2 20880.4	2548.4 41760.8
3.50" 88.9 mm	—	—	215.2 3526.5	430.4 7053.0	1355.2 22207.7	2710.4 44415.4
4.00" 101.6 mm	—	—	224.4 3677.3	488.8 7354.6	1412.0 23138.5	2824.0 46277.0
4.50" 114.3 mm	—	—	261.8 4290.1	523.6 8580.2	1549.8 25396.7	3099.6 50793.4

2.2.1 Calculating Air Consumption:

To determine air consumption in cubic feet or liters per minute use the following formula. Metric versions shown in green.

Formula:

$$\text{CFM} = \frac{\text{Press volume} \times \text{cycles} / \text{min}}{1728}$$

$$\text{SCFM} = \frac{(14.7 + \text{pressure})}{14.7} \times \text{CFM}$$

$$\text{Air Volume} = \text{press volume} \times \text{cycles} / \text{min}$$

$$\text{Consumption} = \frac{1 + \text{pressure}}{1} \times \text{press volume}$$

Example: 1 ton press with 1.5" (38 mm) stroke
 volume = 31.8 in³ (521.1 cm³) (See Chart)
 60 cycles / minute
 at 80 psig (5.5 bar)

Solution:

$$\text{SCFM} = \frac{14.7 + 80}{14.7} \times \frac{31.8 \times 60 \text{ cycles} / \text{min.}}{1728}$$

$$\text{SCFM} = 7.1$$

$$\text{Litres} / \text{Min} = \frac{1 + 5.5}{1} \times 0.521 \text{ dm}^3 \times 60 \text{ cycles} / \text{min}$$

$$\text{Litres} / \text{Min} = 203$$

Note: BTM Presses may be ordered with stroke limiters to reduce air consumption. See catalog page for your model.

2.3 Air & Valving Requirements:

BTM Toggle Presses are operated by compressed air. The recommended maximum pressure is 80 psi (5.5 bars). Air must be clean and dry. Valving and piping should be greater than or equal to the press ports, or determined by the air requirements of the total number of presses when multiple presses are piped together. A filter and pressure regulator must be incorporated into the air supply line. Light in-line lubrication is also recommended, but not required.

2.4 Surge Tank Sizing:

A surge tank is recommended when operating a 20 or 40 ton press, when piping multiple presses together or when a press is used in an air starved environment. Air supply lines must be adequately sized. (See 2.3.) Use the following formula to determine surge tank size:

Formula:
$$\frac{\text{Press volume in cubic inches (See Chart 2.2)} \times (14.7 + \text{Operating Pressure})}{14.7} \div 231 = \text{Surge Tank volume in Gallons}$$

$$\frac{\text{Press Volume in cubic centimeters (See Chart 2.2)} \times (1 + \text{Operating Pressure})}{1} \div 1000 = \text{Surge Tank volume in Litres}$$

Example:

20 Ton Press x 4.5" (114.3mm) Stroke
Volume = 1549.8 in³ (25396.7c.c) See Chart
Operating Pressure = 80 psi (5.5 bar)

Solution:

$$1549.8 \times \frac{(14.7 + 80)}{14.7} \div 231 = 43 \text{ Gallon Surge Tank}$$

$$25396.7 \times \frac{(1+5.5)}{1} \div 1000 = 163 \text{ Litre Surge Tank}$$

3.0 Application of BTM Toggle Presses:

Sound engineering principles should be adhered to when tooling and mounting BTM presses. Some guidelines follow.

3.1 Press Set-Up:

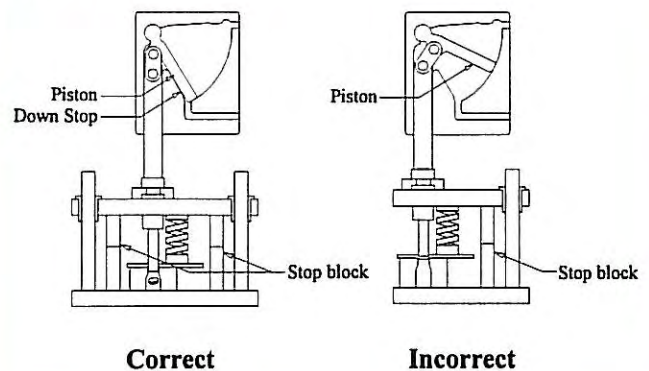
To attain maximum life from an Air Toggle Press, the work must be performed as near the end of the stroke as possible. *In all applications, the press must complete its stroke.* In piercing or shearing applications, the work will be performed above the end of the stroke and the tooling will continue through the work piece to complete the stroke. In other operations such as coining, clinching and riveting, the tooling must be adjusted so that the press reaches the end of the stroke as the work is completed. (Figure D.) *No hesitation of the ram is permissible during the work stroke.*

The recommended method of set-up is to adjust the tooling back so that the press can be fully cycled without contacting the work piece. A series of gradual adjustments are then made using 80 psi supply pressure, until the press completes the work. If the press hesitates or stalls above the bottom of the stroke using this method, it is undersized for the operation.

3.2 Stop Blocks:

When using stop blocks in a die, the press piston must be allowed to reach the internal stop. Stop blocks must be set-up so that the press completes the work and contacts the stop blocks when the piston meets the internal stop. The stop blocks are only required to balance the force being applied to the work piece. If installed incorrectly, the stop blocks and press mechanism will absorb the force meant to be applied to the work piece. (Figure D.)

Figure D.



3.3 Press Mounting:

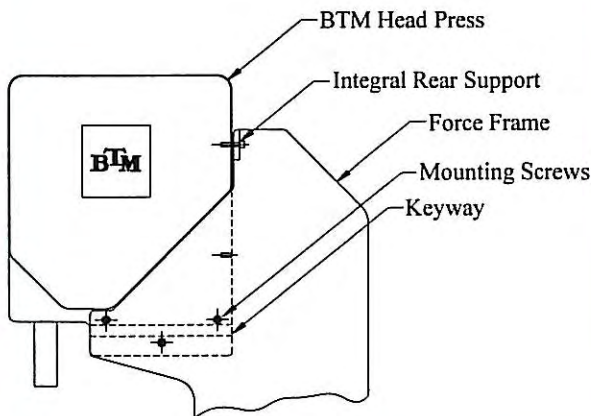
The BTM Air Toggle Press produces high forces which must be contained by the press mounting to ensure maximum life. When constructing force frames for press mounting, rigidity is essential to minimize deflection of the press ram.

Head model (H) presses must be mounted so that **both** keyways are in direct shear and directly tied to an integral rear support and frame. (Figure E.)

Equalizing (EU & REU) presses have dowel pin holes to be used for precise location. Piping and clearance must allow for movement of the unit. (Figure F.)

Figure E.

BTM Head "H" Presses



3.4 Throat Depth:

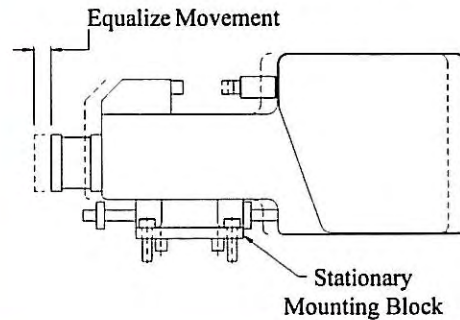
Designs incorporating deep throats must have sufficient force frames to inhibit deflection at the tooling. It is recommended that the tooling be mounted in a separate block affixed to the frame to provide final alignment. (Figure G.)

3.5 Anti-Rotation & Guides:

BTM Toggle Presses feature a $\pm 15^\circ$ non-rotating ram. The method of mounting tooling to the ram can affect the life and performance of the press and tooling. Alignment of the tooling and containment of the deflection are imperative. In critical appli-

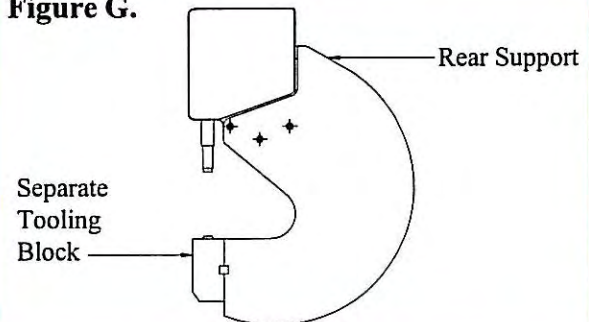
Figure F.

BTM "EU" & "REU" Presses



cations, usually where die clearance is less than .0005" (0.012mm) per side, it is recommended that an alignment guide be used. Sliding ways or posts and bushings are good techniques for this purpose.

Figure G.



3.6 Shut Height Adjustment:

Various methods of shut height adjustment are provided with standard BTM components. Rams with built-in adjusting screws (PA&PTA), adjustable die button support (PB models) and die set adapter groups (DSAG) are listed in catalog 98P.

3.7 Lifting With The Toggle Press:

Force produced when retracting the toggle press is reverse of the force curve. However, certain long stroke presses will not perform in accordance with the force curve near the retracted position. Consult BTM when considering the lifting of large tools with the retract stroke.

4.0 Equalizing Presses:

Equalizing presses are useful in applications where both the punch and die must move clear of the part for loading and unloading. Two types are available; Equalizing Units (EU) and Reverse Equalizing Units (REU). Both types provide two motions, for die positioning and punch entry.

4.1 EU Models:

EU models are used where the tooling mounted on the *press anvil* is the "first" motion (generally die positioning) and the tooling mounted on the *ram* is the "second" motion (generally punch entry).

How it works:

1. Press is mounted to a machine base, both die and ram tooling are retracted to allow loading of the part onto stationary gauging. The open position stop collar is used to adjust the die position away from the part. (Figure H.)
2. Air pressure at 40 psi (2.7 bar) is applied to port AA of the equalize cylinder, advancing the die to the part. The closed position stop collar is used to adjust the die position to the part.
3. Air pressure at 80 psi (5.5 bar) is applied to port A of the press, advancing the ram and punch to the work.
4. Air pressure is switched to port B, retracting the ram.
5. Air pressure is switched to port BB, retracting the die.

Figure H.

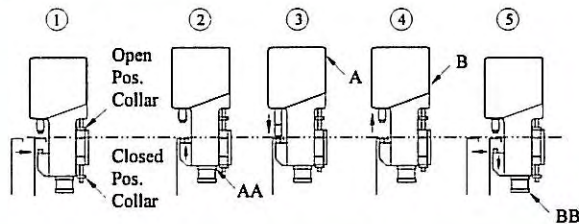
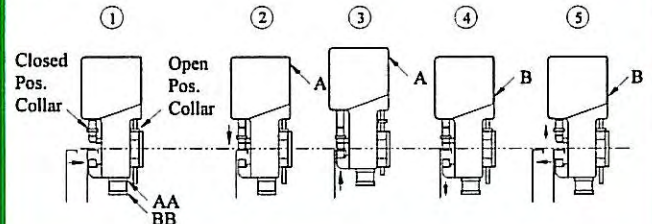


Figure I.



4.2 REU Models:

REU models are used where the tooling mounted on the *press ram* is the "first" motion (generally die positioning) and the tooling mounted on the *anvil* is the "second" motion (generally punch entry).

How it works:

1. Press is mounted to a machine base, both die and ram tooling are retracted to allow loading of the part onto stationary gauging. The open position stop collar is used to adjust the tooling position away from the part. The equalize cylinder acts as an air spring, with constant pressure at port BB. This pressure should be regulated to the minimum required to retract the tooling. Port AA is vented to atmosphere. (Figure I.)
2. Air pressure at port A advances the ram tooling (die) to the part. The closed position stop collar is used to adjust the die position relative to the part.
3. The remainder of the stroke is used to pull the (punch) tooling to the part, completing the work and compressing the air spring.
4. Air pressure is switched to port B, retracting the press ram. The first portion of this travel allows the air spring to extend, retracting the (punch) tooling.
5. The remaining ram travel retracts the (die) tooling from the part.

4.3 Design & Set Up:

EU Model (Figure H)

1. Designing an EU model into a machine and setting up the unit after installation are both performed with the unit in the closed position (air on port AA), and the open position stop collar threaded away from the mount block to its stop.
2. The closed position stop collar is then turned against the mount block until the open position collar is one inch from the mount block. This sets the unit to the position shown in the catalog drawings.
3. Tooling is designed in this position relative to the press keyway and the part position. The two stop collars may be used to fine tune the open and closed press positions.

REU Model (Figure I)

1. Designing an REU model into a machine and setting up the unit after installation are both performed with the unit in the closed position (air on port A), and the open position stop collar threaded away from the mount block to its stop.
2. The closed position stop collar is then turned against the stop block until the open position collar is one inch from the mount block. This sets the unit to the position shown in the catalog drawings.
3. Tooling is designed in this position relative to the press keyway and the part position. The two stop collars may be used to fine tune the open and closed press positions.

5.0 Maintenance:

Properly sized and applied, BTM Toggle Presses will provide a long service life. They require only regular lubrication and a clean, dry air supply. After extended service, seal replacement may be necessary. This is a relatively simple procedure and is outlined in 5.2.

5.1 Lubrication:

The BTM Air Toggle Press is a mechanical device using air as its power source and therefore

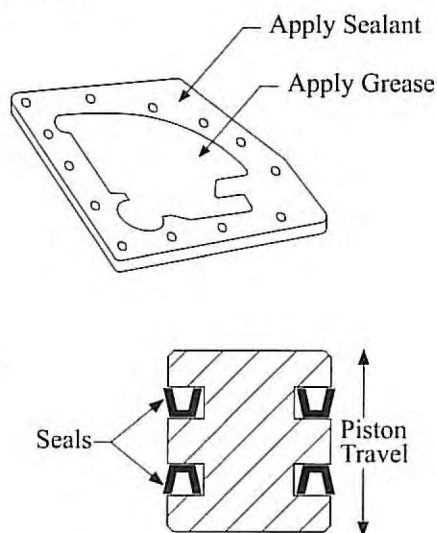
requires clean, dry air. A filter and pressure regulator must be incorporated into the air supply line. Light in-line lubrication is also recommended, but not required, as press seals are lubed for life at assembly. When incorporating in-line lubrication, use a light spindle oil in the lubricator (a reclassifier is also recommended). Lubrication is required every 20,000 cycles at grease fittings only. See lube tags on front of press assembly for specific lubrication instructions. Grease fittings are provided to lubricate the bearing and link pin areas on most presses. Use Chevron Rykotac Grease EP or equivalent at grease fittings. **Note:** Not all greases are compatible. If other grease will be used, you must verify its compatibility. Failure to follow recommended lubrication procedures will void warranty. A video is available upon request detailing general press maintenance and seal replacement procedures.

5.2 Seal Replacement:

Refer to the catalog page showing your press model to order seal kit.

- 5.2.1 Loosen all the cover plate nuts by two threads only. Apply air to either port (80 psi maximum). This will separate one of the cover plates from the press body.
- 5.2.2 Remove all the cover plates screws & nuts, and the cover plate. The opposite cover plate will usually remain sealed to the body, and may be tapped loose using a wood block and a mallet. Remove the second cover plate.
- 5.2.3 Position the press body with the ram horizontal to prevent the ram from falling out when the link pin is removed. Remove the retainer ring from the ram link pin. The link pins on P-1 models are pressed into one side of the link and do not have retaining rings. Tap the link pin out and slide the ram out of the body.
- 5.2.4 Remove the piston and link from the body, and remove the old seals from the piston.
- 5.2.5 Remove the ram O-Ring from the body. The O-Ring on PB models is located on the ram.
- 5.2.6 Clean all parts. Inspect all parts for signs of wear or damage.

- 5.2.7 Check the cover plates to see if a "pencil" outline of the press cavity is visible. (Figure J.) If it is not, align the cover plates with the body and outline the contour with a pencil. Repeat procedure on second cover plate.

Figure J.

- 5.2.8 Install new piston seals with "V" grooves facing the powered surfaces of the piston. (Figure J.) (opposite each other)
- 5.2.9 Install new ram O-Ring.
- 5.2.10 Grease and re-assemble the piston, link and ram into the press body.
- 5.2.11 Apply a thin layer of grease to the area of the cover plates inside the "pencil" line. Apply a thin layer of Accuflex* Sealant to the area outside the "pencil" line. (Figure J.) Do not apply sealant inside the line.
- 5.2.12 Assemble the cover plates to the press and torque screws according to the chart in (Figure K). Make sure all threads are free of sealant. A slight bypass of air is normal due to the rectangular seals.

*** Note Regarding Sealant**

BTM Air Toggle Presses manufactured after August 2001 use polyurethane sealant to seal the side cover plates. A tube of SIKAFLEX 221 is included with each BTM Seal Kit. Presses manufactured before August 2001 were sealed with RTV-108 silicone sealant. Silicone is no longer provided with BTM Seal Kits. Presses that were originally sealed with silicone can be re-sealed with SIKAFLEX 221.

Figure K.**Cover Screw Size & Torque**

	1 & 2 Ton	5 & 10 Ton	20 & 40 Ton
Screw Size	1/4	5/16	3/8
Torque in Ft / Lbs	9	23	50
Torque in N • m	12.2	31.2	67.8

5.3 Replacing Components:

Worn or damaged component parts may be replaced following the same procedure described at 5.2. Components are listed on the catalog 02P pages for each model. Presses may be returned to BTM for factory repair.

WARRANTY

BTM Corporation warrants its Air Toggle Presses against defects in material and workmanship for (1) million cycles or a period of (1) year after the ship date from BTM, whichever comes first. This warranty is limited to replacing or repairing at BTM's option, F.O.B. BTM's factory, any part found by BTM to be defective in materials and/or workmanship. Any application of a BTM product outside the intended use of the product or non compliant with the application guidelines in this catalog shall not be warranted by BTM Corporation. Furthermore, BTM will not be liable for any expenses incurred for repairs or replacement made outside BTM's facilities without written consent (or damages arising out of such replacements or repairs). Under no circumstances will BTM be held responsible for any consequential damages. The warranty is limited to the repair or replacement of the defective part(s) and does not include installation. This warranty is the only warranty extended by the seller in connection with any sale made hereunder and is in lieu of all other warranties, express, implied or statutory including warranties of merchantability and fitness for purpose.