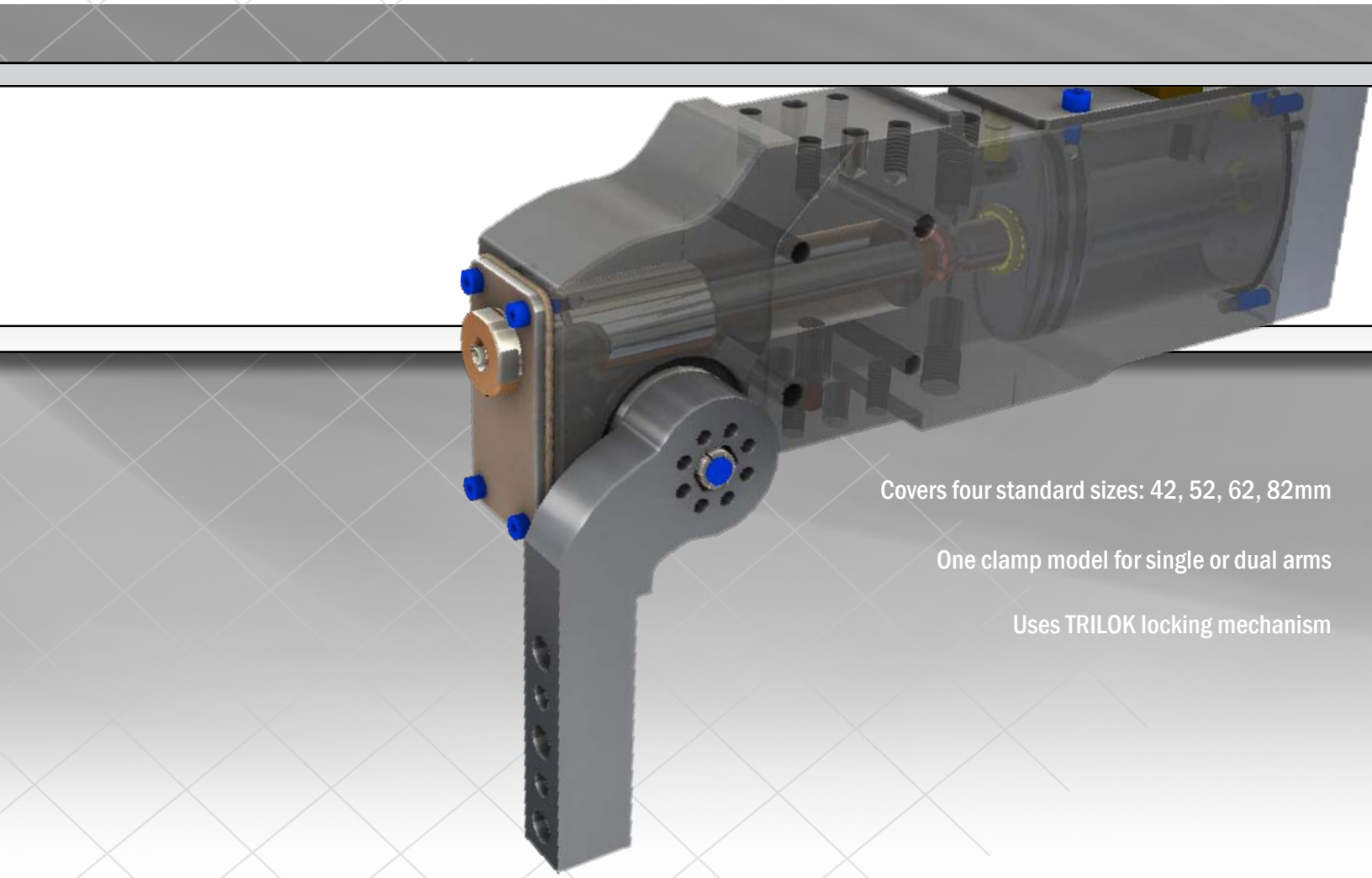
User Guide: **TPC Clamps**

Covers standard TPC42, TPC52, TPC62, and TPC82 clamp models.



Covers four standard sizes: 42, 52, 62, 82mm

One clamp model for single or dual arms

Uses TRILOK locking mechanism

BTM® CORPORATION
www.BTMcorp.com
810-364-4567

TABLE OF CONTENTS

Disclaimer: BTM Reserves the right to ammend the contents of this manual without notice. Contact BTM to verify the latest revision.

SAFETY

Caution!

Always disconnect air and electrical supply lines before working on or around power clamps!

INTRODUCTION

Thank you for selecting BTM's patented TPC model power clamp. Our goal is to provide our customers with the best value in power clamps available. This User's Guide is intended to help you get the most value from the product; please read it through carefully. If you have questions, call BTM at 810-364-4567. For service issues call our service pager at 810-340-3500 to leave a message and we will promptly return your call.

TPC CLAMP FEATURES

- Patented TriLok Mechanism for precision clamping and higher inertia loads.
- Sealed Mechanism - Lubricated for Life of Clamp
- Cushions Standard on Both Advance and Retract Ends
- Self Pumping Slide Rod Lubrication
- Integral Cylinder with Heavy Wall
- Body is constructed of Hard Coated Aircraft Aluminum
- Pin Arm Drive for versatile arm positioning & simplified arm change
- One clamp model for single and dual arm clamps
- Access to manually unlock clamp linkage
- Integrated proximity switches do not need to be readjusted when arm opening is changed.
- Top and Bottom porting

TPC CLAMP SPECIFICATIONS

- Equivalent Bore Sizes: 42.0mm [1.65"], 52.0mm [2.00"], 62.0mm [2.50"], & 82.0mm [3.25"] DIA.
- Easily Adjustable arm opening 30°, 45°, 60°, 75°, 90°, 105°, 120°
- Maximum cylinder stroke for 120° arm opening = TPC42 ~ 52.8mm [2.08"]
  TPC52 ~ 70.28mm [2.77"]
  TPC62 ~ 93.1mm [3.66"]
  TPC82 ~ 118.8mm [4.68"]
- Approx. Weight (without arms): TPC42 ~ 2.0 kg [4.5 lbs], TPC52 ~ 3.8 kg [8.4lbs], TPC62 ~ 5.7 kg [12.6 lbs], TPC82 ~ 13.6 kg [30.0 lbs]
- Operating Pressure: 2.75 to 7 BAR [40 to 100 PSI] (lubricated or non-lubricated compressed air)

~ Use Flow Controls to Reduce Impact.

- Holding Torque without Air = TPC42 ~ 165 Nm [122 ft-lbs]
  TPC52 ~ 290 Nm [214 ft-lbs]
  TPC62 ~ 450 Nm [330 ft-lbs]
  TPC82 ~ 745 Nm [550 ft-lbs]

- Clamping Torque at Hub = TPC42 ~ 43.4 Nm [32 ft-lbs @ 5.5 BAR [80 PSI]
  TPC52 ~ 89.5 Nm [66 ft-lbs @ 5.5 BAR [80 PSI]
  TPC62 ~ 257.6 Nm [190 ft-lbs @ 5.5 BAR [80 PSI]
  TPC82 ~ 496.2 Nm [366 ft-lbs @ 5.5 BAR [80 PSI]
- Clamp interchangability tolerance: ±0°15' (Clamp to Clamp)
- Arm repeatability in closed position: ±0°3'

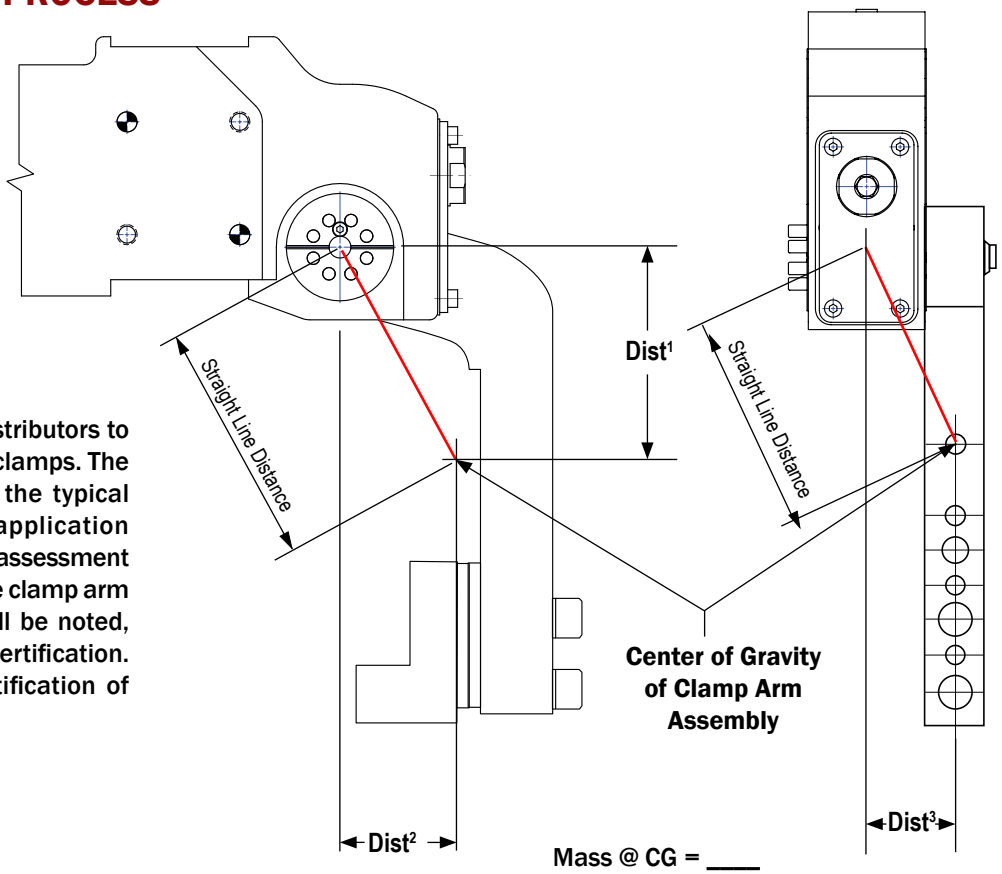
DESIGN GUIDELINES

BTM TPC model clamps, when properly applied, will meet the requirements of the warranty. Selecting the proper size clamp is based on both force and cycle time requirements. The cycle time is affected by the amount of mass on the moving arm assembly. The recommended cycle time is 1 second to open and 1 second to close for a 120° opening clamp.

- Determine the clamp size required for the application. *(Determined by force output requirements - see p. 6)*
- Determine the design of the clamp arm assembly, including the arm, shims, and clamping detail (N/C block).
- Determine the required distance the clamp arm pivot must be located from the clamping point due to the arm length and shape required.
- Determine the Center of Gravity of the clamp arm assembly and its straight line distance to the clamp pivot.
- Use the charts for each clamp to determine if the size clamp will be adequate to support the clamp arm assembly. If not, choose a larger size clamp. (see p. 5)
- When the requirements of the chart are met, the clamp is protected from misapplication by an internal fixed orifice which prevents the clamp from moving too fast causing premature failure. Operating a clamp outside the charted limits will void the warranty.
- Determine the closed clamp arm position and the degree of opening required. Be aware of clearance issues with other tooling and the clamp body itself when determining degree of opening. (see p. 21)
- Orient the clamp in the required mounting position relative to the arm pivot. Consider hose and wire connections, and accessibility to proximity switches.
- Reference the BTM provided template drawings for information on clamp mounting dimensions, arm styles, available arm openings, and port and proximity switch positions. *Contact BTM to ensure that your template drawing is up to date.*

APPLICATION APPROVAL PROCESS

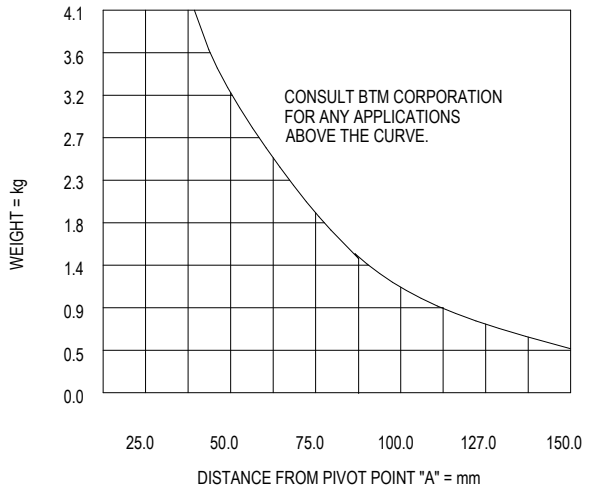
Please contact BTM's authorized Distributors to certify proper application of its TPC clamps. The figure depicted to the right shows the typical information that is required for application approval. Certification will include an assessment of the cycle rate and the weight of the clamp arm assembly. Any misapplications will be noted, and must be corrected to recieve certification. The warranty is dependant on certification of the application.



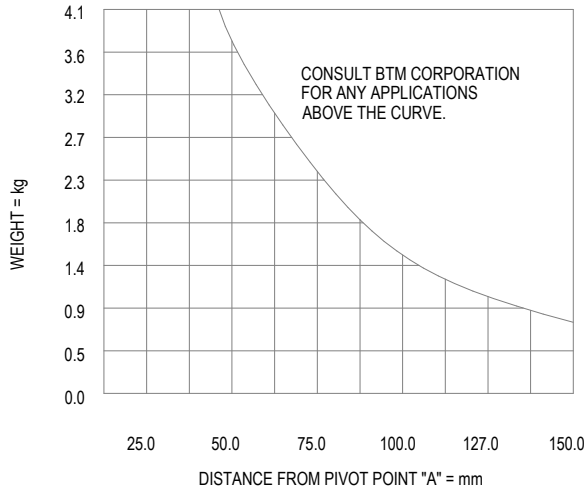
MAXIMUM ALLOWABLE WEIGHT ON CLAMP ARM ASSEMBLY

Refer to the charts below for model specific information regarding the recommended allowable weight on the arm at given distances from the pivot. The distance from Pivot Point is the straight line distance from the centerline of the clamp at the pivot point to the center of gravity of the clamp arm assembly. The center of gravity is figured using the weight of the arm plus the total weight mounted on the arm. When using dual arms, add the weight of the second arm to the total weight.

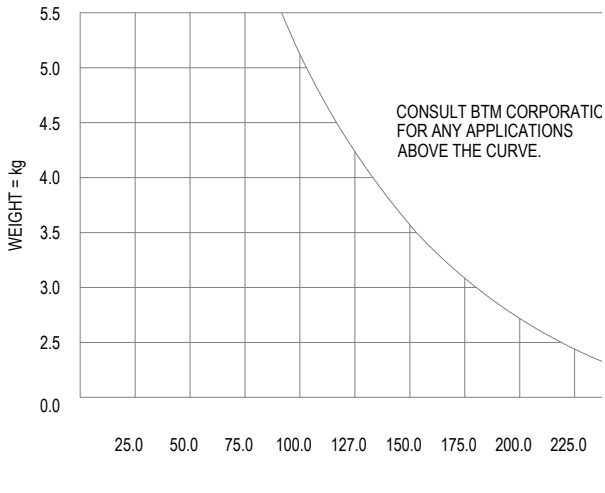
TPC 42



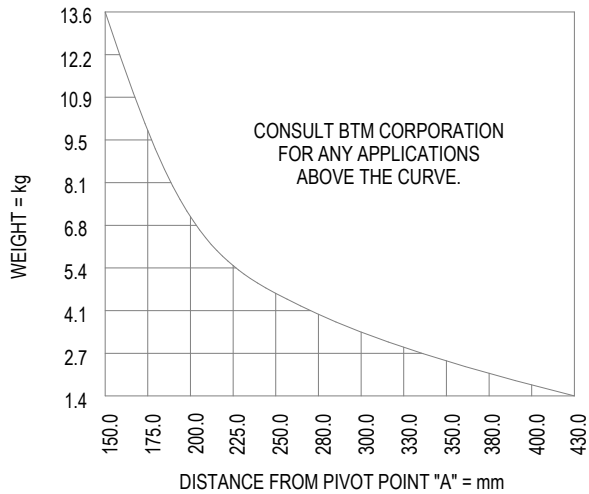
TPC 52



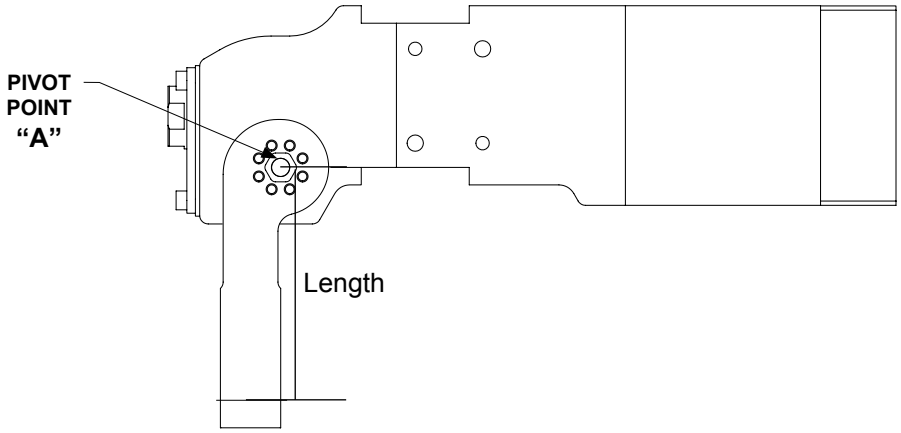
TPC 62



TPC 82



CLAMPING FORCE



TPC 42 CLAMPING FORCE	
BAR	7910 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	4.8 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPC 52 CLAMPING FORCE	
BAR	16500 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	10 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPC 62 CLAMPING FORCE	
BAR	46500 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	28.5 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

TPC 82 CLAMPING FORCE	
BAR	92000 x Line Pressure (BAR) / Length (mm) from POINT "A" to the center line of clamping contact area on clamp arm
PSI	55 x Line Pressure (PSI) / Length (in) from POINT "A" to the center line of clamping contact area on clamp arm

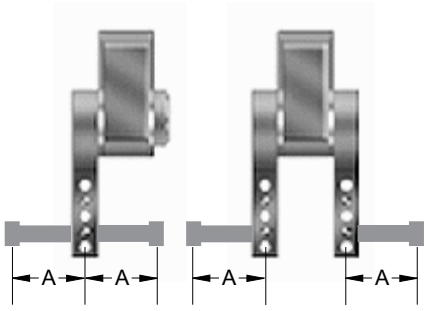
PERMISSIBLE CLAMP OFFSET DISTANCE

TPC 42
A = 30.0mm

TPC 52
A = 37.5mm

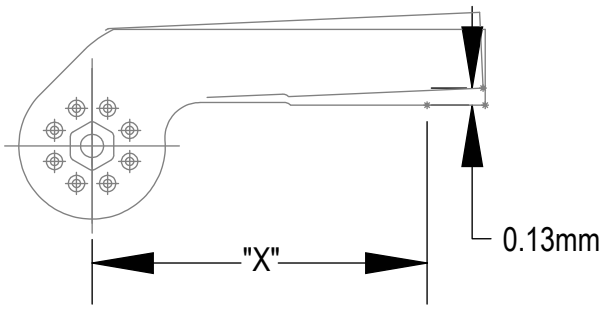
TPC 62
A = 75mm

TPC 82
A = 150mm



ARM DEFLECTION UNDER LOAD

Force on arm at “X” distance from pivot resulting in 0.13mm [.005”] Maximum deflection.



TPC 42	
“X” (mm)	Force (N)
125	88
100	144
75	200

TPC 52	
“X” (mm)	Force (N)
125	113
100	165
75	290

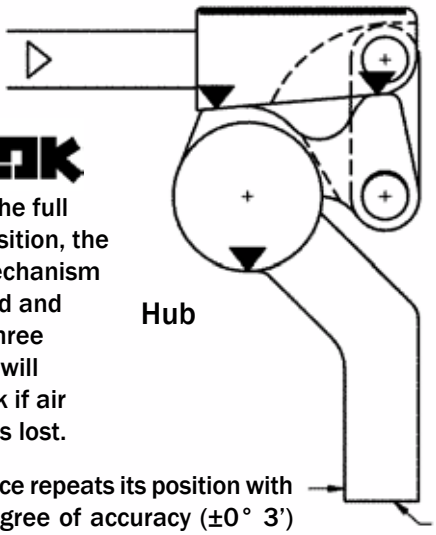
TPC 62	
“X” (mm)	Force (N)
250	156
225	200
200	245
175	289
150	378
125	489
100	734

TPC 82	
“X” (mm)	Force (N)
370	165
340	205
310	267
280	365
250	449
220	623
190	1005
160	1397
130	2073
100	3065

APPLICATION GUIDE

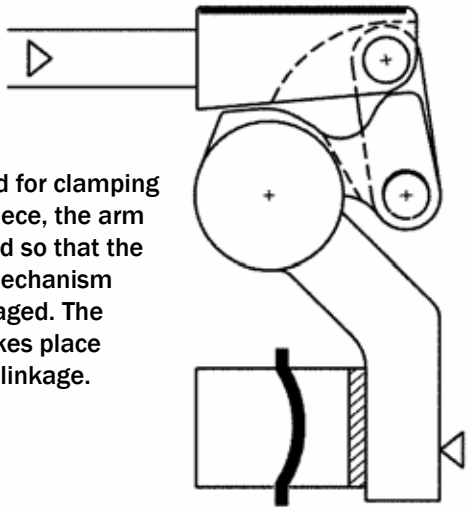
The TRI-LOK Mechanism:

BTM's patented TRI-LOK Mechanism can be used as a clamp, a part trap, or a precision back up.



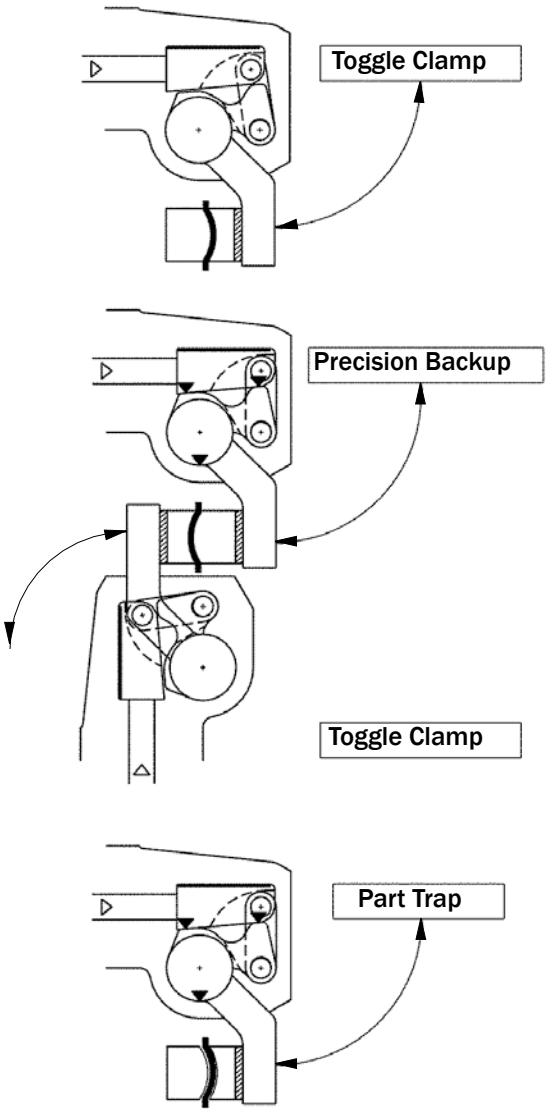
When in the full closed position, the clamp mechanism is engaged and locks at three points. It will not unlock if air pressure is lost.

This surface repeats its position with a high degree of accuracy (±0° 3') throughout the life of the clamp.

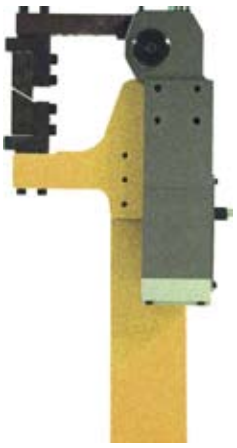


When used for clamping the workpiece, the arm is shimmed so that the TRI-LOK mechanism is not engaged. The locking takes place within the linkage.

Ways of Using the TRI-LOK Mechanism



HOW TO MOUNT THE CLAMP



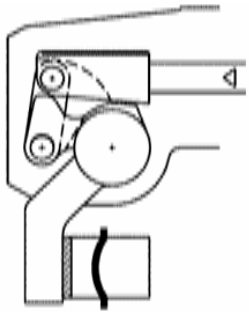
Oval style TPC clamps have standard NAAMS style mounting hole patterns. Always use dowel pins in addition to the mounting screws to maintain accurate location. Mounting screws should be tightened to the following torques:

TPC42 = [M6 Screw]	15 Nm (11 ft-lbs)
TPC52 = [M8 Screw]	37 Nm (27 ft-lbs)
TPC62 = [M10 Screw]	72 Nm (53 ft-lbs)
TPC82 = [M12 Screw]	126 Nm (93 ft-bls)

Weldments or other mounting provided for the clamp must be of sufficient rigidity to allow consistent delivery of the force required by the application.

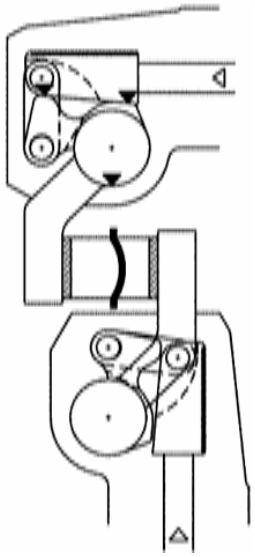
MOUNTING THE TPC CLAMP AS A TOGGLE CLAMP

When used for clamping the workpiece, the arm is shimmed so that the TRI-LOK mechanism is not engaged. The locking takes place within the linkage.



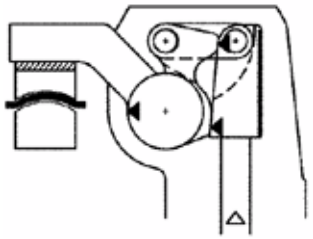
MOUNTING THE TPC CLAMP AS A PRECISION BACKUP

When using the TPC clamp as a precision backup, allow the clamp to fully close and engage the Tri-Lok mechanism. Because of the precision of the Tri-Lok mechanism, the TPC clamp will repeat its closed arm position ±0° 3'. Due to this precision, it is not necessary to use an external hard stop on the backup arm to maintain position. If an external hard stop is used, do not put more than 0.13mm [.005"] of press on the hard stop. Over-shimming of the hard stop could cause the clamp to remain locked in the closed position even after air pressure is applied to open the clamp. When mounting the back-up clamp, ***do not*** rotate the clamp 1° forward as this could have the same effect as an over-shimmed condition.



MOUNTING THE TPC CLAMP AS A PART TRAP

When used as a part trap, the clamp arm should be allowed to come fully closed, engaging the Tri-Lok mechanism. Shim the clamping detail to achieve the desired amount of clearance between the clamping detail and the part. When shimming the clamp detail, you should allow for the addition, or removal of shims to account for variances in the part thickness.



HOW TO ORDER

Use the following nomenclature to order TPC Clamps. See BTM provided drawing templates for more information.

CLAMP						LEFT ARM					RIGHT ARM					SWITCH
TPC	42	G	120	P	-	799308H	180	A	L	-	799308H	180	A	R	-	DC
CLAMP SERIES --	CLAMP SIZE --	PORT OPTION --	ARM OPENING --	HUB CONNECTION TYPE --		BTM NUMBER --	ARM POSITION --	ARM ORIENTATION --	ARM LOCATION --		BTM NUMBER --	ARM POSITION --	ARM ORIENTATION --	ARM LOCATION --		SWITCH STYLE --

CLAMP CALLOUT CODES

CLAMP SERIES
TPC

CLAMP SIZE
42, 52, 62, 82

PORT OPTION
N = N.P.T.
G = G

ARM OPENING (DEGREES)
30, 45, 60, 75, 90, 105, 120

HUB CONNECTION TYPE
P = PIN HUB

ARM CALLOUT CODES

BTM ARM NUMBER
LEAVE LEFT **OR** RIGHT ARM BLANK IF SINGLE ARM DESIRED.

ARM POSITION
0, 45, 90, 135, 180, 225, 270

ARM ORIENTATION
A = STANDARD
B = INVERTED

ARM LOCATION
L = LEFT SIDE OF CLAMP (VIEWED FROM FRONT)
R = RIGHT SIDE OF CLAMP (VIEWED FROM FRONT)

ARM CONNECTION STYLE
P = PIN HUB

SWITCH CALLOUT CODES

SWITCH STYLE

DC

AC

NS = NO SWITCH
(INCLUDES COVERS & SCRS.)

Use either arm position callout (L or R) for a single arm clamp. Use both arm position callouts for a dual arm clamp.
Note: If an order option is not required, leave it out of the order number. DO NOT use zeros (0) as place holders.

HOW TO READ THE LABEL

The label affixed to a BTM clamp contains the following information:

Job Number : Used for tracing information.

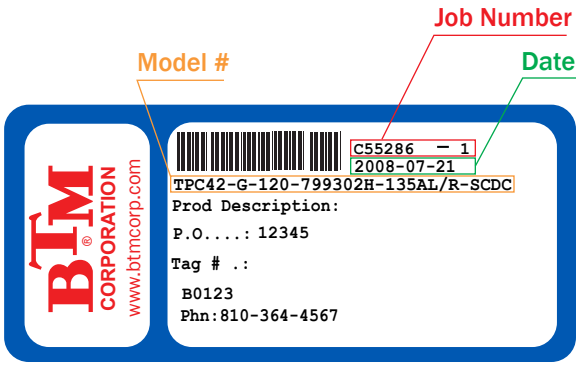
Date : Date clamp was shipped from BTM.

Model Number : Indicates Clamp size, port type, degree of arm opening, arm number, arm position and location, and switch number.

P.O. : Distributor purchase order to BTM.

Tag # : Indicates customer purchase order.

Contact Information : Distributor identification and contact number.



Typical BTM TPC clamp label

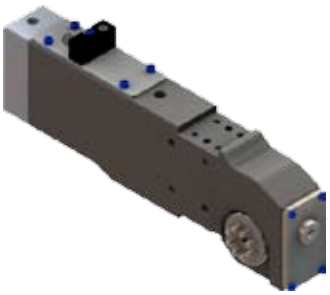
HOW TO ORDER REFERENCE SHEET

CLAMP

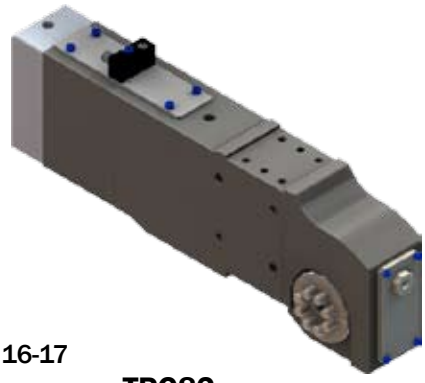
CLAMP SIZE

TPC42
Dimensions: see. p. 12-13

TPC52
Dimensions: see. p. 14-15



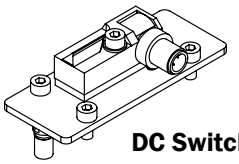
TPC62
Dimensions: see. p. 16-17



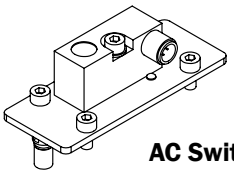
TPC82
Dimensions: see. p. 18-19

PORT OPTION - See Dimensions for more info. (TPC42= p.12, TPC52= p.14, TPC62= p.16, TPC82= p.18)

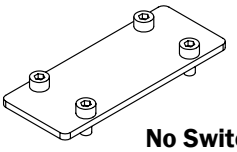
SWITCH



DC Switch



AC Switch



No Switch

ARMS

ARM LOCATION

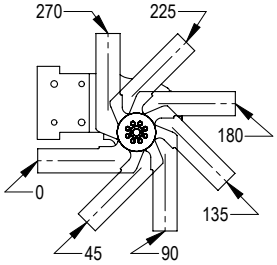
Left Arm

Dual Arms

Right Arm

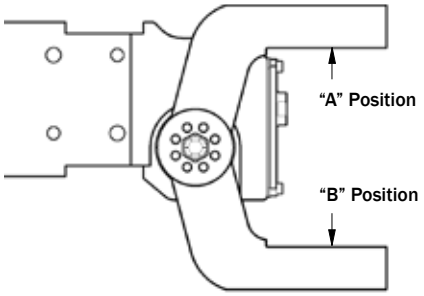
ARM POSITION

See pg. 21 for max arm opening tables



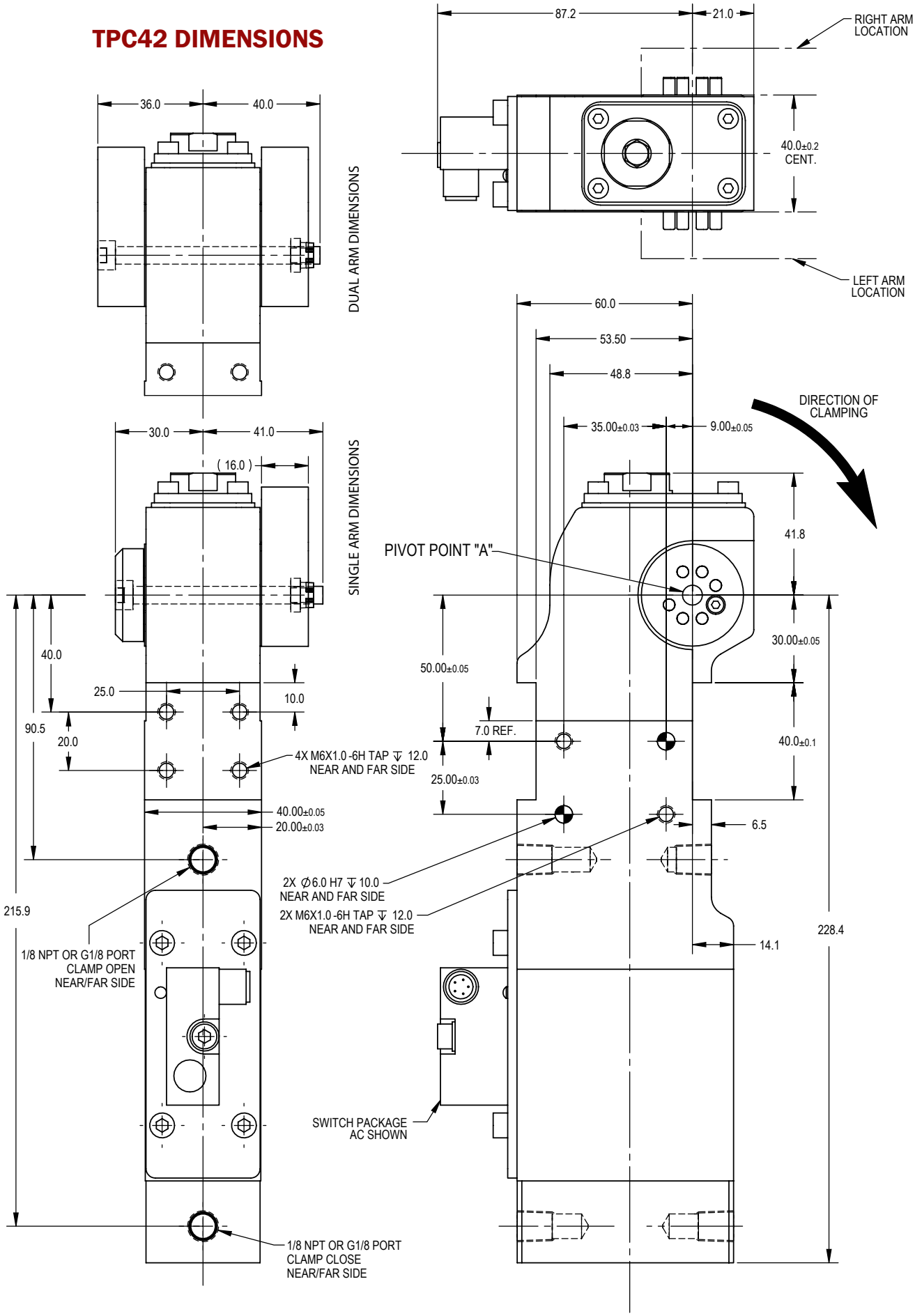
ARM ORIENTATION

See pg. 21 for max arm opening tables

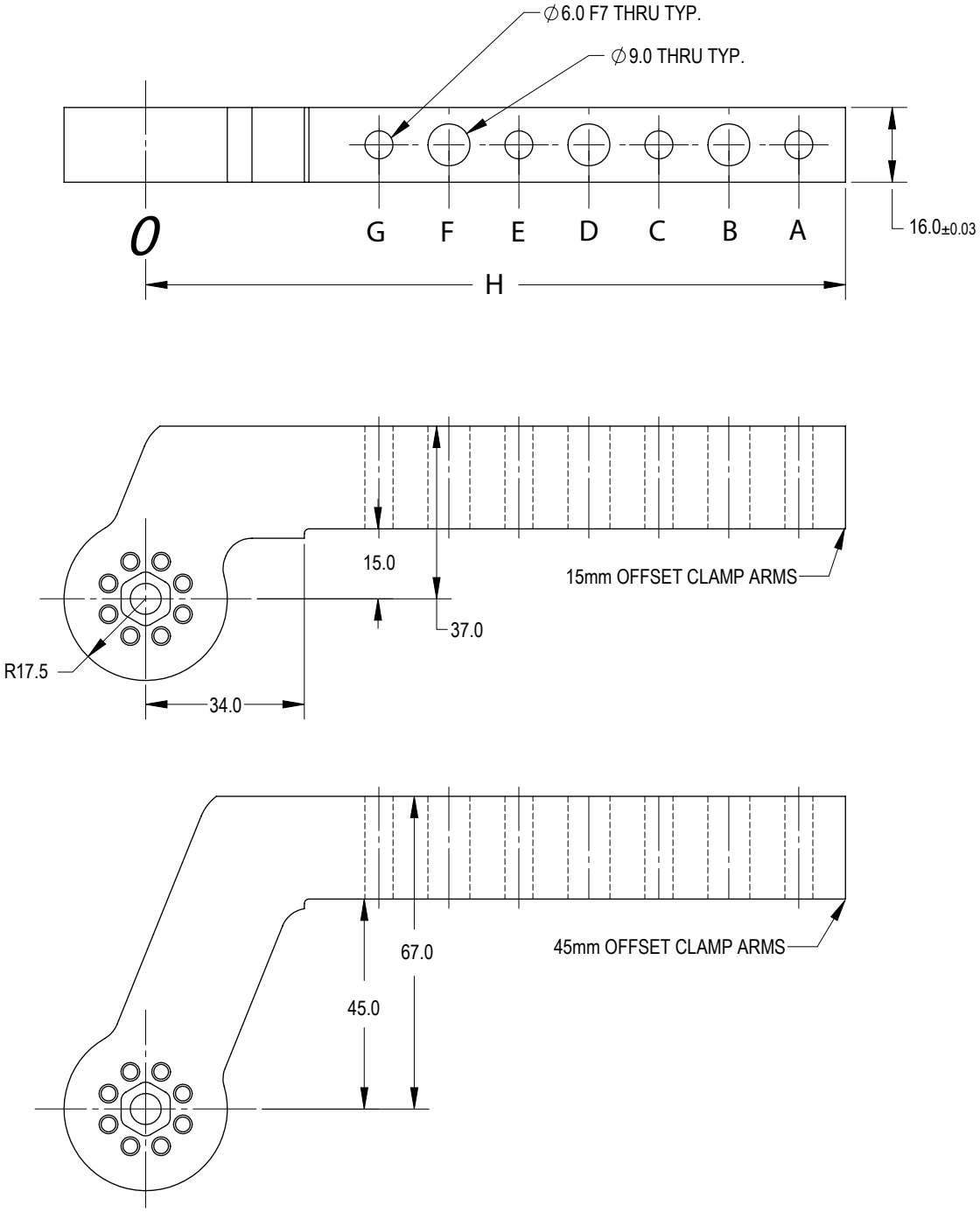


Clamp Shown in Closed Position

TPC42 DIMENSIONS

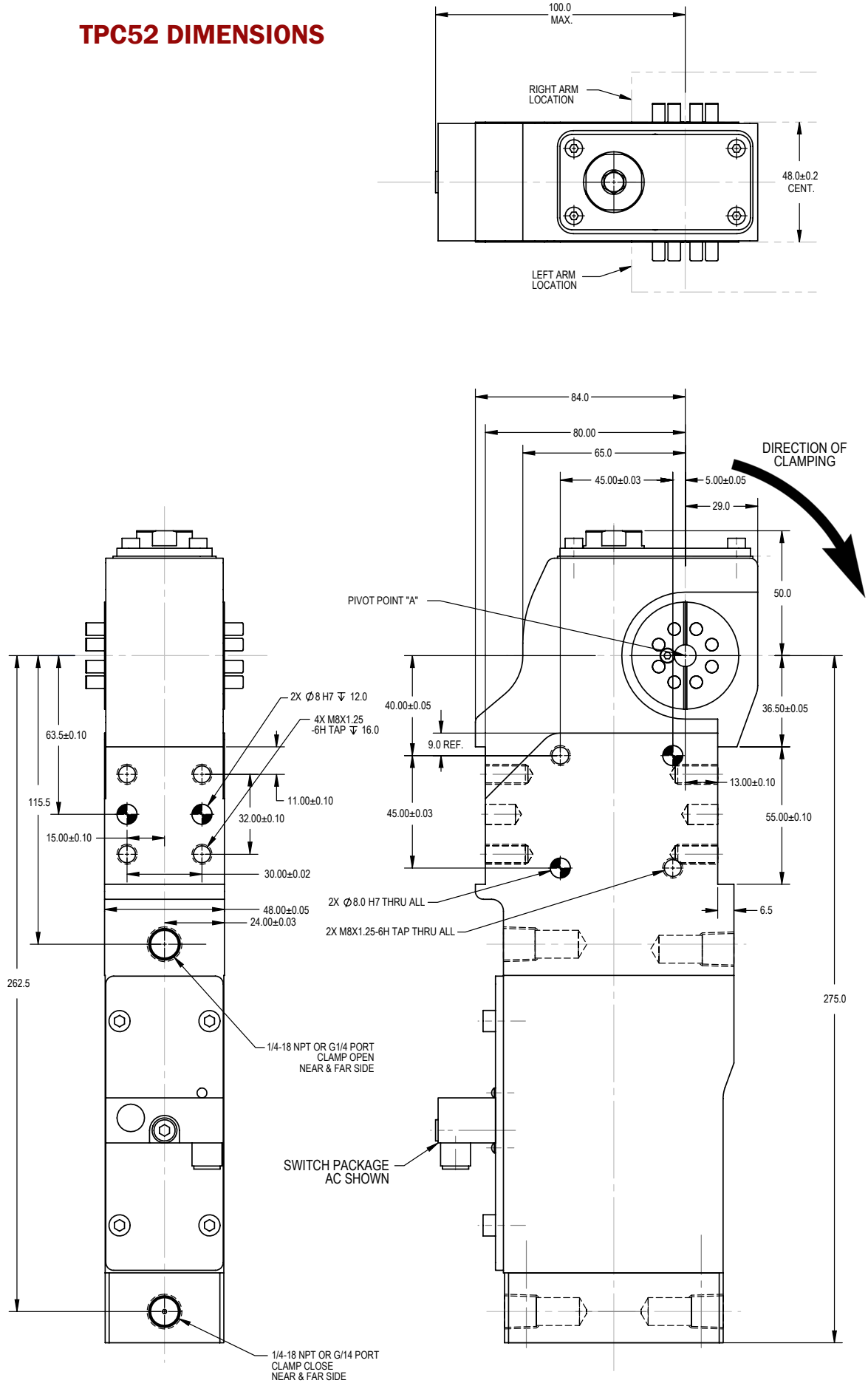


TPC42 CLAMP ARMS

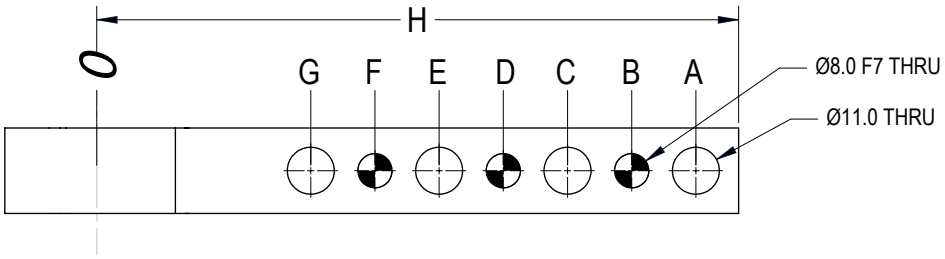


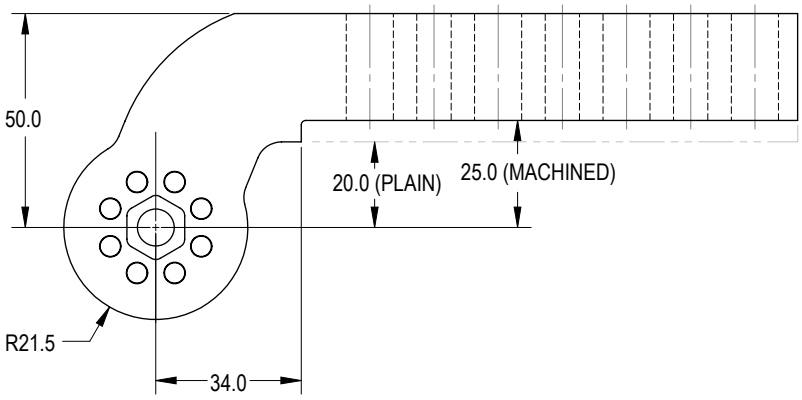
ARM STYLE									
Arm Type	BTM Number	"H"	"A"	"B"	"C"	"D"	"E"	"F"	"G"
15mm Offset Machined	799308H	90	80.00	65.00	50.00				
	799309H	120	110.00	95.00	80.00	65.00	50.00		
	799310H	150	140.00	125.00	110.00	95.00	80.00	65.00	50.00
45mm Offset Machined	799311H	90	80.00	65.00	50.00				
	799312H	120	140.00	125.00	110.00	95.00	80.00	65.00	50.00
	799313H	150	140.00	125.00	110.00	95.00	80.00	65.00	50.00

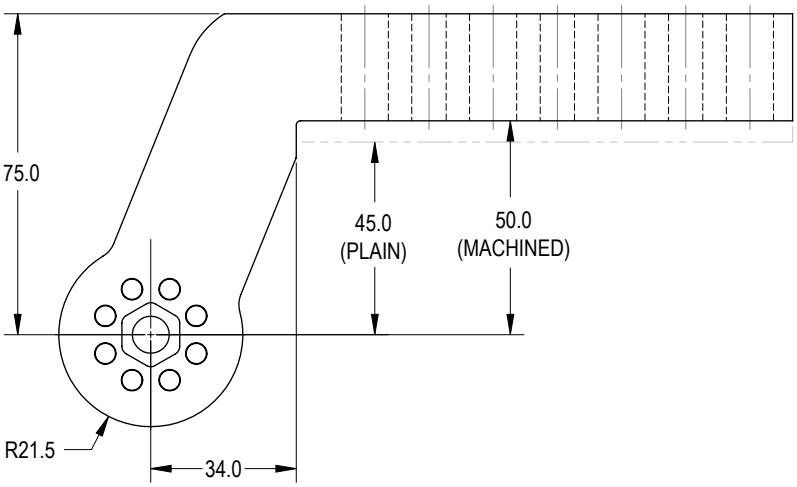
TPC52 DIMENSIONS



TPC52 CLAMP ARMS

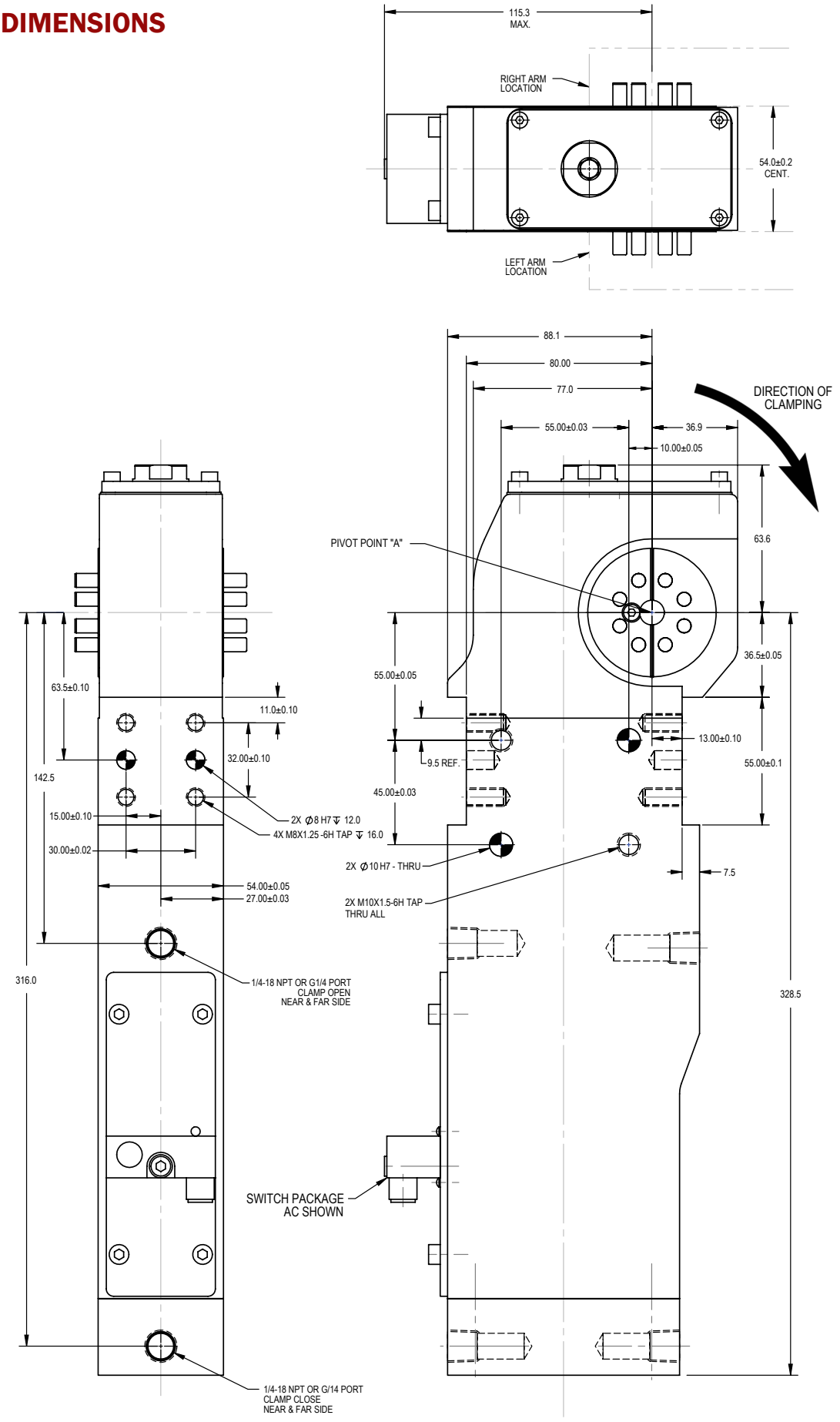




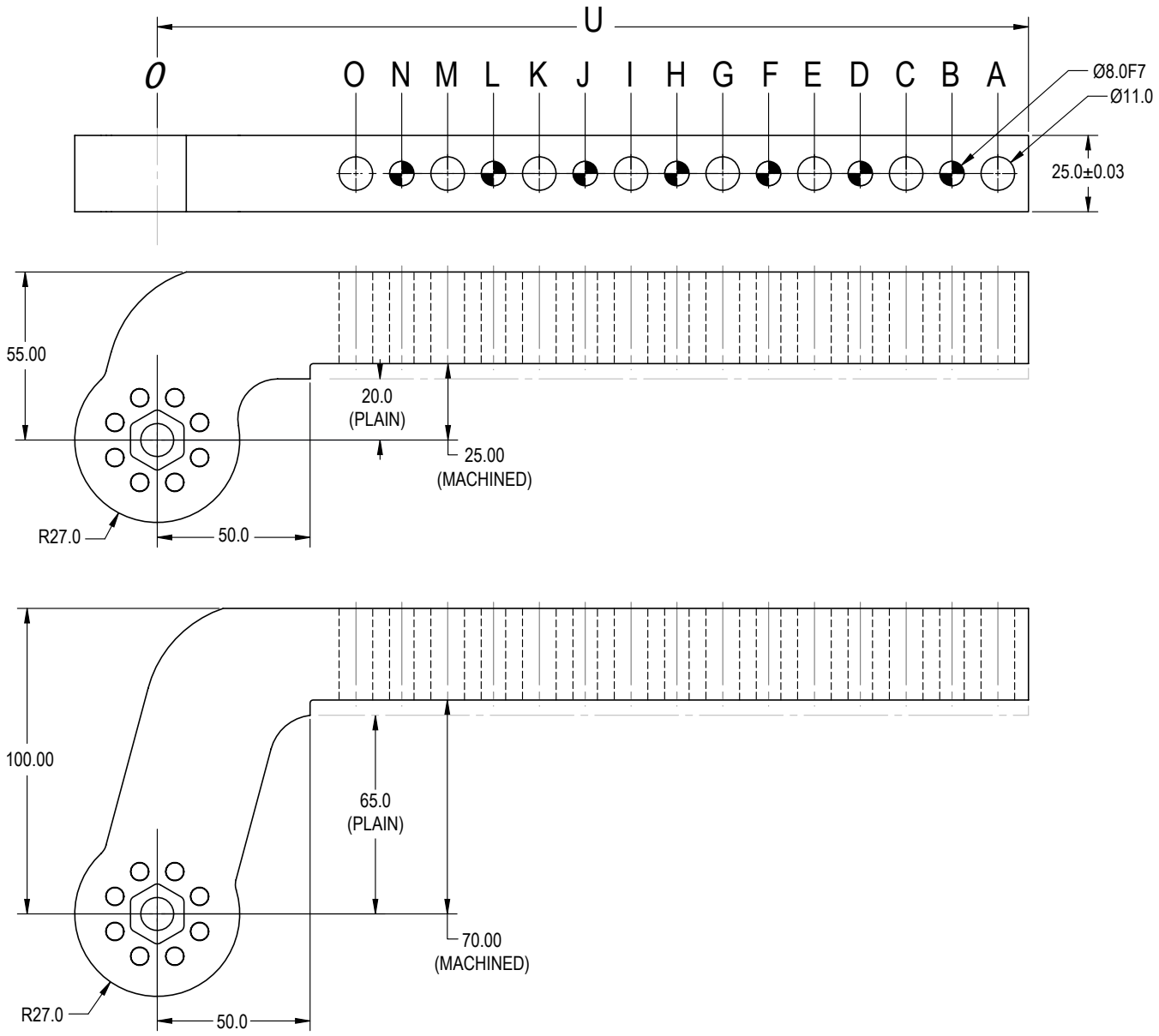


ARM STYLE										
Arm Type	NAAMS Code	BTM Number	"H"	"A"	"B"	"C"	"D"	"E"	"F"	"G"
20mm Offset Plain	ACA211M	733211H	90.0							
	ACA213M	733213H	150.0							
45mm Offset Plain	ACA221M	733221H	90							
	ACA223M	733223H	150.0							
25mm Offset Machined	ACA216M	733216H	90	80.00	65.00	50.00				
	ACA218M	733218H	150.0	140.00	125.00	110.00	95.00	80.00	65.00	50.00
50mm Offset Machined	ACA226M	733226H	90.0	80.00	65.00	50.00				
	ACA228M	733228H	150.0	140.00	125.00	110.00	95.00	80.00	65.00	50.00

TPC62 DIMENSIONS

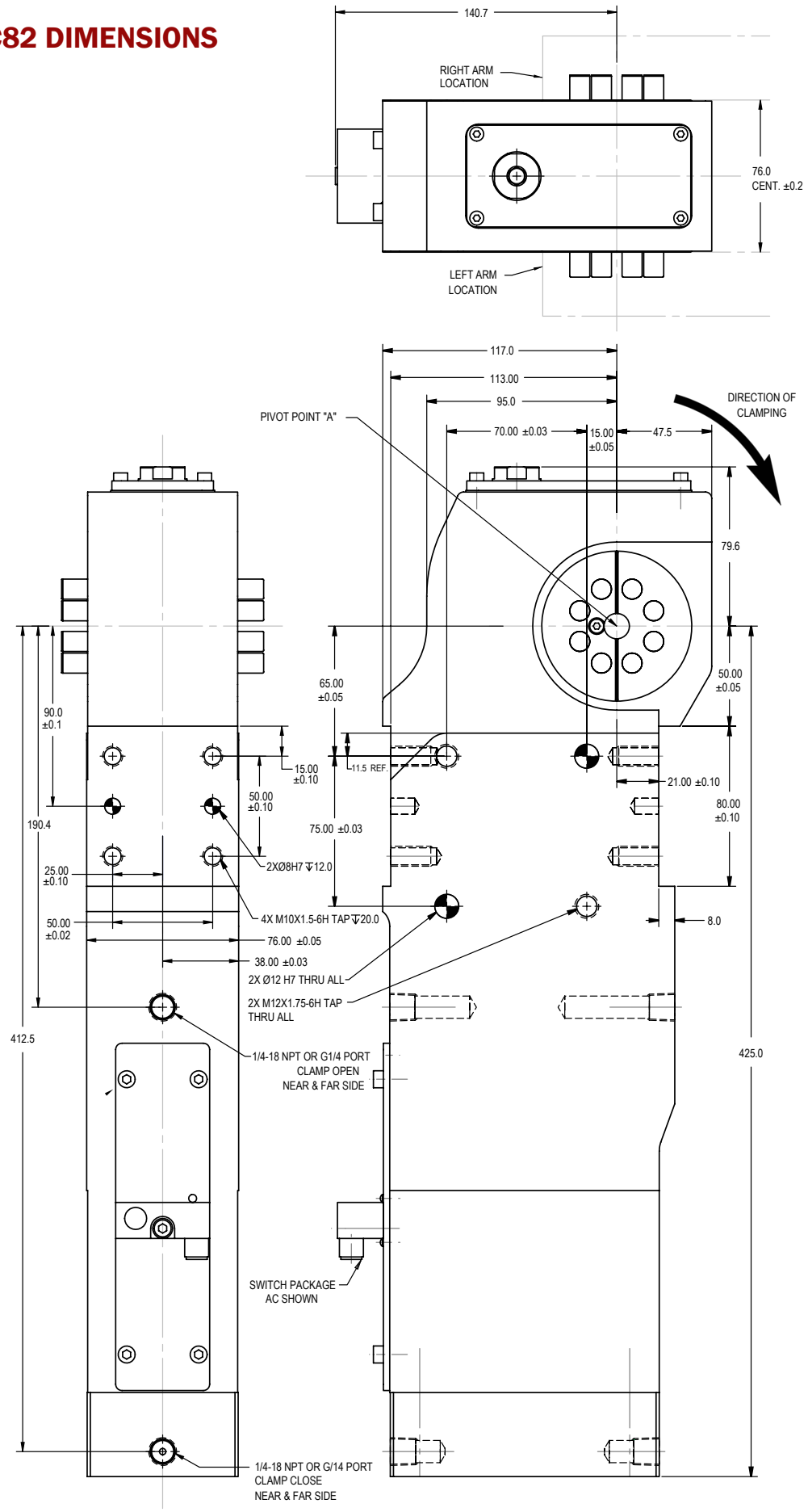


TPC62 CLAMP ARMS

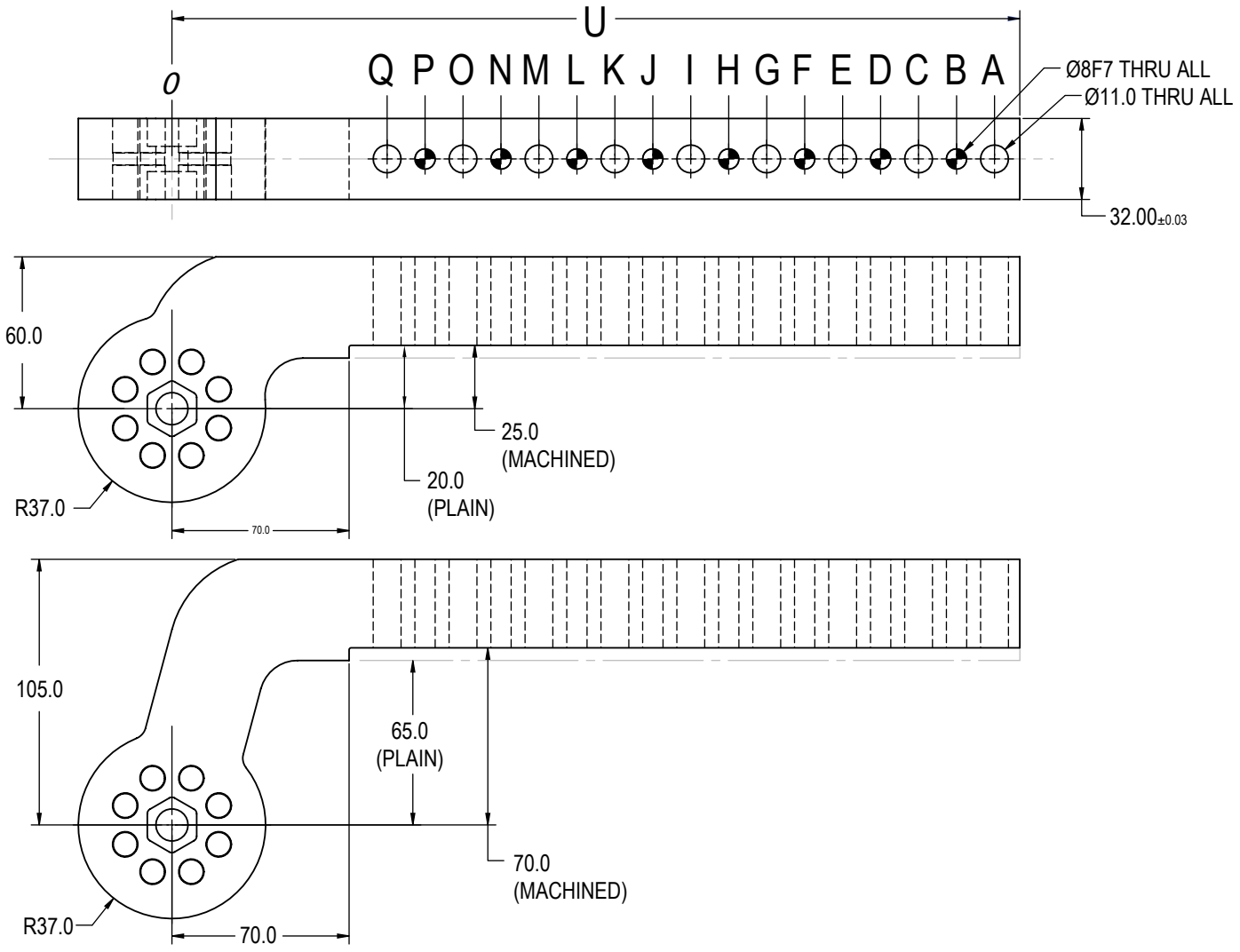


ARM STYLE																		
Arm Type	NAAMS Code	BTM Number	"U"	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"
20mm Offset Plain	ACA014M	723114H	165.0															
	ACA016M	723116H	225.0															
	ACA018M	723118H	285.0															
65mm Offset Plain	ACA026M	723126H	165.0															
	ACA028M	723128H	225.0															
	ACA030M	723130H	285.0															
25mm Offset Machined	ACA020M	723120H	165.0	155.00	140.00	125.00	110.00	95.00	80.00	65.00								
	ACA022M	723122H	225.0	215.00	200.00	185.00	170.00	155.00	140.00	125.00	110.00	95.00	80.00	65.00				
	ACA024M	723124H	285.0	275.00	260.00	245.00	230.00	215.00	200.00	185.00	170.00	155.00	140.00	125.00	110.00	95.00	80.00	65.00
70mm Offset Machined	ACA032M	723132H	165.0	155.00	140.00	125.00	110.00	95.00	80.00	65.00								
	ACA034M	723134H	225.0	215.00	200.00	185.00	170.00	155.00	140.00	125.00	110.00	95.00	80.00	65.00				
	ACA036M	723136H	285.0	275.00	260.00	245.00	230.00	215.00	200.00	185.00	170.00	155.00	140.00	125.00	110.00	95.00	80.00	65.00

TPC82 DIMENSIONS



TPC82 CLAMP ARMS



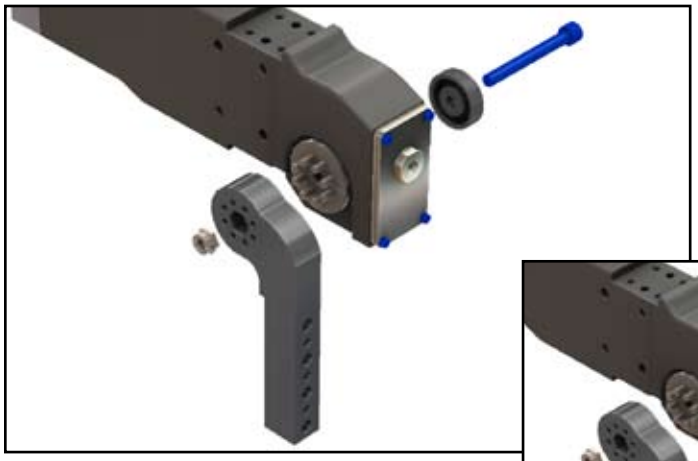
ARM STYLE																				
Arm Type	NAAMS Code	BTM No.	"U"	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"
20mm Offset Plain	ACA122M	7232122H	215.0																	
	ACA124M	7232124H	275.0																	
	ACA126M	7232126H	335.0																	
65mm Offset Plain	ACA142M	7232142H	215.0																	
	ACA144M	7232144H	275.0																	
	ACA146M	7232146H	335.0																	
25mm Offset Machined	ACA132M	7232132H	215.0	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00								
	ACA134M	7232134H	275.0	265.00	250.00	235.00	220.00	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00				
	ACA136M	7232136H	335.0	325.00	310.00	295.00	280.00	265.00	250.00	235.00	220.00	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00
70mm Offset Machined	ACA152M	7232152H	215.0	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00								
	ACA154M	7232154H	275.0	265.00	250.00	235.00	220.00	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00				
	ACA156M	7232156H	335.0	325.00	310.00	295.00	280.00	265.00	250.00	235.00	220.00	205.00	190.00	175.00	160.00	145.00	130.00	115.00	100.00	85.00

WELDING ON CLAMP ARMS:

Remove the clamp arm before welding on it, or attach the ground cable directly to the arm so as not to pass current through the bearings of the clamp mechanism. Damage to the clamp mechanism as a result of welding on the arm will not be warranted.

ARM MOUNTING FEATURES:

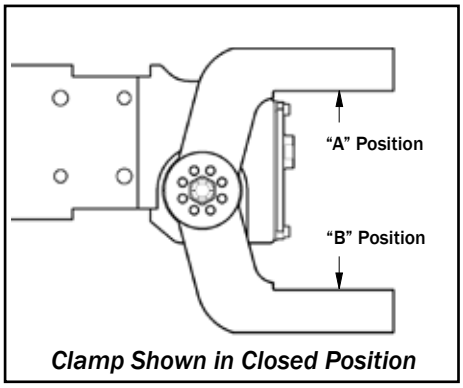
The BTM TPC clamp features a patented pin drive hub which simplifies arm changes and provides quick and easy positioning of the arm on either side of the clamp. Simply install the arm on one side of the clamp, and the cap on the other side, or install two arms on the same clamp. The (8) pins allow for easy positioning of the arm at 45^0 increments. The machined surface of the arm may be turned to face either way ("A" or "B" position).



Left Arm Position

Right Arm Position

Dual Position



Clamp Shown in Closed Position

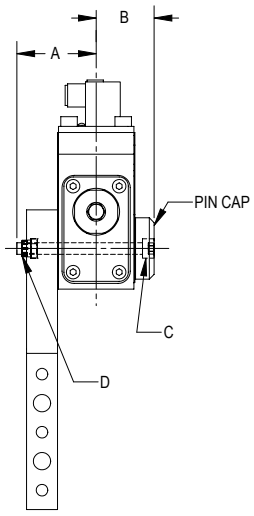
ARM SCREW TORQUE

TPC42 = [M6 Screw]	9.5 Nm (7 lb-ft)
TPC52 = [M8 Screw]	23 Nm (17 lb-ft)
TPC62 = [M10 Screw]	45 Nm (33 lb-ft)
TPC82 = [M12 Screw]	79 Nm (58 lb-ft)

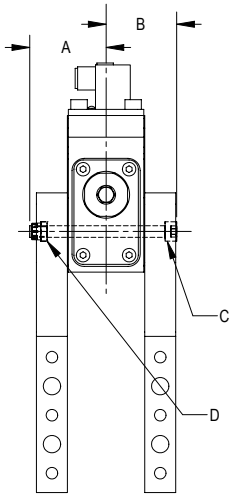
TPC ARM MOUNT KITS

These kits are automatically applied to your clamp order when you specify your arm configuration in the order code. For reference only.

Single Arm Mount Kit
Includes Arm Screw, Nut & Pin Cap.

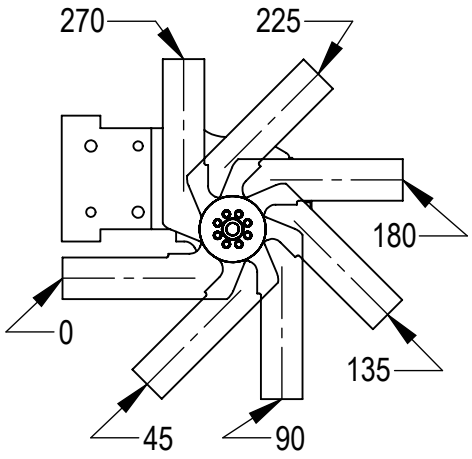


Dual Arm Mount Kit
Includes Arm Screw and Nut.



ARM MOUNT KITS						
Clamp	Arm Kit	A	B	C	D	Pin Cap
TPC42	Single Arm	41.0	30.0	SHCS: M6x1.0 X 65	M6 Flex-Loc Nut	799305A
	Dual Arm	46.0	36.0	SHCS: M6x1.0 X 70	M6 Flex-Loc Nut	—
TPC52	Single Arm	46.2	36.8	SHCS: M8X1.25 X 75	M8 Flex-Loc Nut Thin Ht.	795505A
	Dual Arm	52.4	45.7	SHCS: M8X1.25 X 90	M8 Flex-Loc Nut Thin Ht.	—
TPC62	Single Arm	56.7	43.4	SHCS: M10X1.5 X 90	M10 Flex-Loc Nut Thin Ht.	795605A
	Dual Arm	57.4	52.6	SHCS: M10X1.5 X 100	M10 Flex-Loc Nut Thin Ht.	—
TPC82	Single Arm	74.0	58.0	SHCS: M12X1.75 X 120	M12 Flex-Loc Nut Thin Ht.	795705A
	Dual Arm	71.0	71.0	SHCS: M12X1.75 X 130	M12 Flex-Loc Nut Thin Ht.	—

ARM MOUNTING OPTIONS



All clamps are shown in the closed position. The maximum counter-clockwise arm opening value is noted in degrees for the specified arm positions. Arm positions which interfere with the clamp body in either the close or open positions are not shown.

TPC42

STANDARD ARM ORIENTATION		
Arm Mounting Position Code	15 Offset Arm	45 Offset Arm
0	N/A	120°
45	120°	120°
90	120°	120°
135	120°	90°
180	90°	45°
225	45°	N/A
270	N/A	N/A

INVERTED ARM ORIENTATION		
Arm Mounting Position Code	15 Offset Arm	45 Offset Arm
0	N/A	N/A
45	N/A	N/A
90	120°	120°
135	120°	120°
180	120°	120°
225	90°	105°
270	45°	60°

TPC52

STANDARD ARM ORIENTATION		
Arm Mounting Position Code	20 & 25 Offset Arm	45 & 50 Offset Arm
0	120°	120°
45	120°	120°
90	120°	120°
135	90°	75°
180	45°	30°
225	N/A	N/A
270	N/A	N/A

INVERTED ARM ORIENTATION		
Arm Mounting Position Code	20 & 25 Offset Arm	45 & 50 Offset Arm
0	N/A	N/A
45	N/A	N/A
90	N/A	N/A
135	120°	120°
180	120°	120°
225	90°	105°
270	45°	60°

TPC62

STANDARD ARM ORIENTATION		
Arm Mounting Position Code	20 & 25 Offset Arm	65 & 70 Offset Arm
0	120°	120°
45	120°	120°
90	120°	120°
135	90°	75°
180	45°	30°
225	N/A	N/A
270	N/A	N/A

INVERTED ARM ORIENTATION		
Arm Mounting Position Code	20 & 45 Offset Arm	65 & 70 Offset Arm
0	N/A	N/A
45	N/A	N/A
90	N/A	N/A
135	120°	120°
180	120°	120°
225	75°	105°
270	30°	60°

TPC82

STANDARD ARM ORIENTATION		
Arm Mounting Position Code	20 & 25 Offset Arm	65 & 70 Offset Arm
0	N/A	120°
45	120°	120°
90	120°	120°
135	105°	75°
180	60°	30°
225	N/A	N/A
270	N/A	N/A

INVERTED ARM ORIENTATION		
Arm Mounting Position Code	20 & 25 Offset Arm	65 & 70 Offset Arm
0	N/A	N/A
45	N/A	N/A
90	N/A	N/A
135	120°	120°
180	120°	120°
225	75°	105°
270	30°	60°

CHANGING THE ARM DEGREE OF OPENING

TPC clamps are normally shipped unlocked and the degree of opening is set to the customer specified degree of opening.
Note: if the specified arm position does not allow this degree of opening, the clamp arm will be shipped loose.
Tools Required: *TPC42: 4mm allen wrench, 5mm allen wrench*
TPC52: 5mm allen wrench, 5mm allen wrench
TPC62: 5mm allen wrench, 6mm allen wrench
TPC82: 8mm allen wrench, 10mm allen wrench

Caution!

Always disconnect air and electrical supply lines before working on or around power clamps!

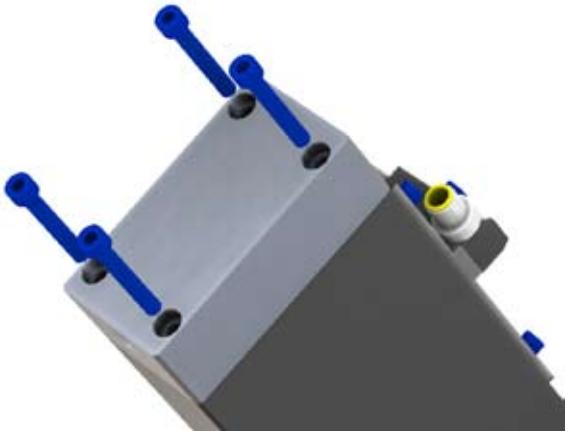
TO CHANGE THE DEGREE OF ARM OPENING ON A TPC CLAMP:

a. Make sure that the clamp is in the full open position by pulling back on the arm. If there is no arm on the clamp, use a screwdriver as a lever arm by placing the shaft between the arm mounting pins.
(See page 25 for instructions on how to manually unlock the TPC clamp when the air supply is disconnected.)

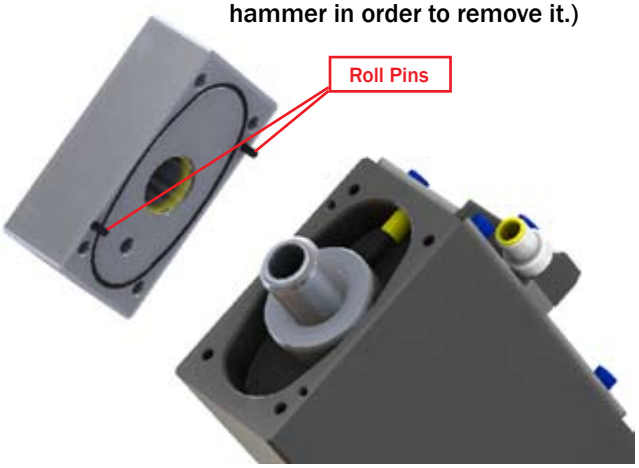
b. Remove the (4) socket head cap screws which fasten the cylinder end cap to the clamp body and remove the end cap. (You may have to tap the end cap loose from the roll pins with a soft blow hammer.)

Cylinder End Cap Screws

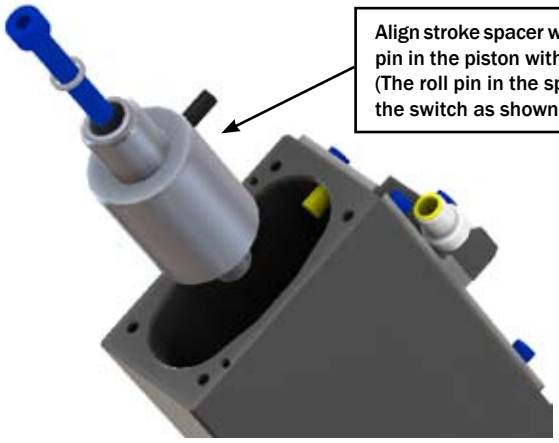
TPC42 = 4mm allen wrench
TPC52 = 5mm allen wrench
TPC62 = 5mm allen wrench
TPC82 = 8mm allen wrench



(You may have to tap the end cap loose from the roll pins with a soft blow hammer in order to remove it.)



c. Unscrew and remove the stroke spacer. Keep washer for re-use.



d. Install a new stroke spacer, and torque the screw into place to the specified torque.
NOTE: A cushion alignment tool must be used to prevent the cushion from rotating when the screw is tightened. Contact BTM for more information.

TORQUES				
Clamp	Spacer		Endcap	
	Screw	Torque	Screw	Torque
TPC42	M6	15 Nm (11 lb-ft)	M5	8.8 Nm (6.5 lb-ft)
TPC52	M6	15 Nm (11 lb-ft)	M6	15 Nm (11 lb-ft)
TPC62	M8	32 Nm (24 lb-ft)	M6	15 Nm (11 lb-ft)
TPC82	M12	100 Nm (75 lb-ft)	M10	71.9 Nm (53 lb-ft)

30° Spacer

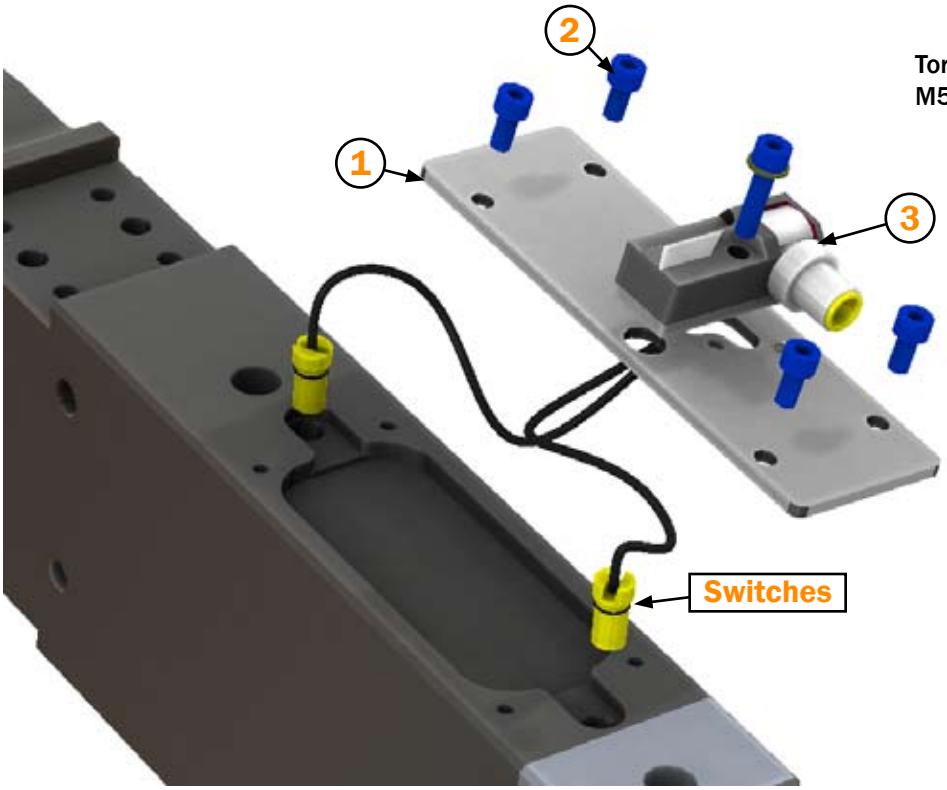
120° Spacer

Stroke spacers are available for clamp openings from 30° to 120°. See the chart to the right for available stroke spacers by clamp model.

STROKE LIMITERS				
Spacer	TPC42	TPC52	TPC62	TPC82
30°	799304A	795504A	795604A	795704A
45°	799301B	795501B	795601B	795701B
60°	799301C	795501C	795601C	795701C
75°	799301D	795501D	795601D	795701D
90°	799301E	795501E	795601E	795701E
105°	799301F	795501F	795601F	795701F
120°	799301G	795501G	795601G	795701G

STATUS CONTROLLER SWITCH OPTIONS

Status controller switch options are shown below. To replace a status controller switch, disconnect the air pressure to the clamp. Remove the four switch plate screws (2) and the screw which retains the status controller body (3). Lift up the switch plate (1) and carefully lift out the switches, removing them from the clamp body. Insert the switches of the replacement status controller through the clearance hole in the switch plate. Insert the switches into the recesses in the clamp body. Replace the switch plate (1), making sure that the lead wires are positioned in the machined grooves so they are not pinched between the plate and the clamp body. Tighten all the screws *(note the torque values on the diagram below)*. Visually check the clamp to ensure that it was reassembled correctly.

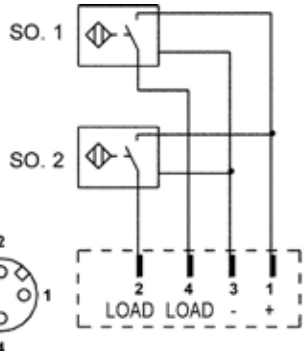


Torque Info:
M5 Screw = 8.8 Nm (6.5 lb-ft)

DET.	QTY.	DESCRIPTION	BTM NO.			
			TPC42	TPC52	TPC62	TPC82
1	1	Switch Cover Plate	799301SCDC	795501SCDC	795601SCDC	795701SCDC
2	4	M5 x 10 LG. S.H.C.S.	018490			
3	1	Prox Switch	AC		DC	
			025558		024216	

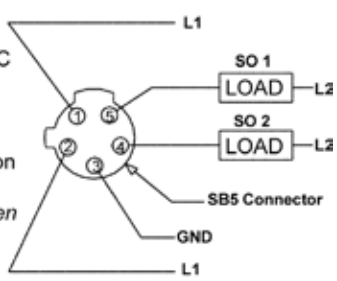
DC ~ Status Controller
Two Sensors
Supply Voltage: 10-30 VDC
Load Current: <150mA
Single Connector ~ 4-pin Micro

SO. 2 reads the closed position of the clamp.
If SO. 2 is required for the open position (transposed), order:
TSCDC



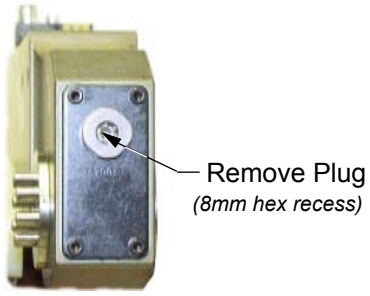
AC ~ Status Controller
Two Sensors
Supply Voltage: 20-250 VAC
Load Current: <100mA
Single Connector ~ SB5

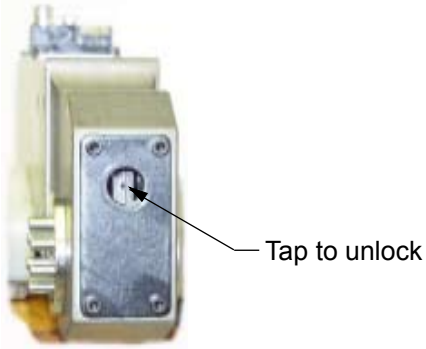
SO. 2 reads the closed position of the clamp.
If SO. 2 is required for the open position (transposed), order:
TSCAC

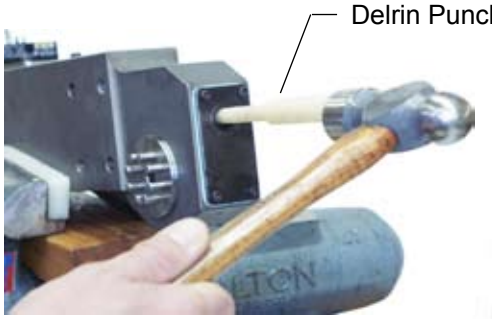


MANUALLY UNLOCKING THE TPC CLAMP

To unlock the TPC clamp, ***make sure that the air supply is disconnected***. Remove the front cover plug and and tap the linkage with a delrin punch to unlock the mechanism. Apply blue loctite to the threads of the plug. Replace the plug and tighten to 34 Nm (25 lb-ft).







The TPC clamp can also be unlocked by applying air pressure to the rod side of the cylinder with a rubber tipped nozzle.

Caution: Stay clear of clamp arm!

PREVENTATIVE MAINTENANCE

BTM TPC model power clamps are lubricated for life at the factory. The cylinder seals are self lubricating and do not require in line air lubrication.

AIR SUPPLY

BTM TPC model power clamps are designed to operate on 2.75 to 7 bars (40 to 100 psi) of clean, lubricated or non-lubricated air. *Note: Once lubricated air is used, it must continue to be used for the life of the clamp.*

USE OF FLOW CONTROLS

TPC model clamps have built in, non-adjustable, cylinder cushions. Flow control valves are not required if the weight of the clamp arm assembly falls within the charted specifications on page 5. Flow control valves may be added per customer preference or specification to reduce slamming of the clamp arm. Flow controls should be adjusted to achieve the required cycle rate, not exceeding the maximum rate of 1 second to open and 1 second to close for a 120^{0} opening clamp. Cycling the clamp faster than the maximum rate may result in premature failure and will void the warranty. If additional control is required for sequencing of multiple clamps, flow control valves can be added to adjust the cycle rate.

FIXED ORIFICES

TPC model power clamps employ fixed orifices which are machined into the ports in both the end cap and in the clamp body. These orifices are intended to protect the clamp from operating in excess of the recommended cycle rate relative to the mass of the arm.

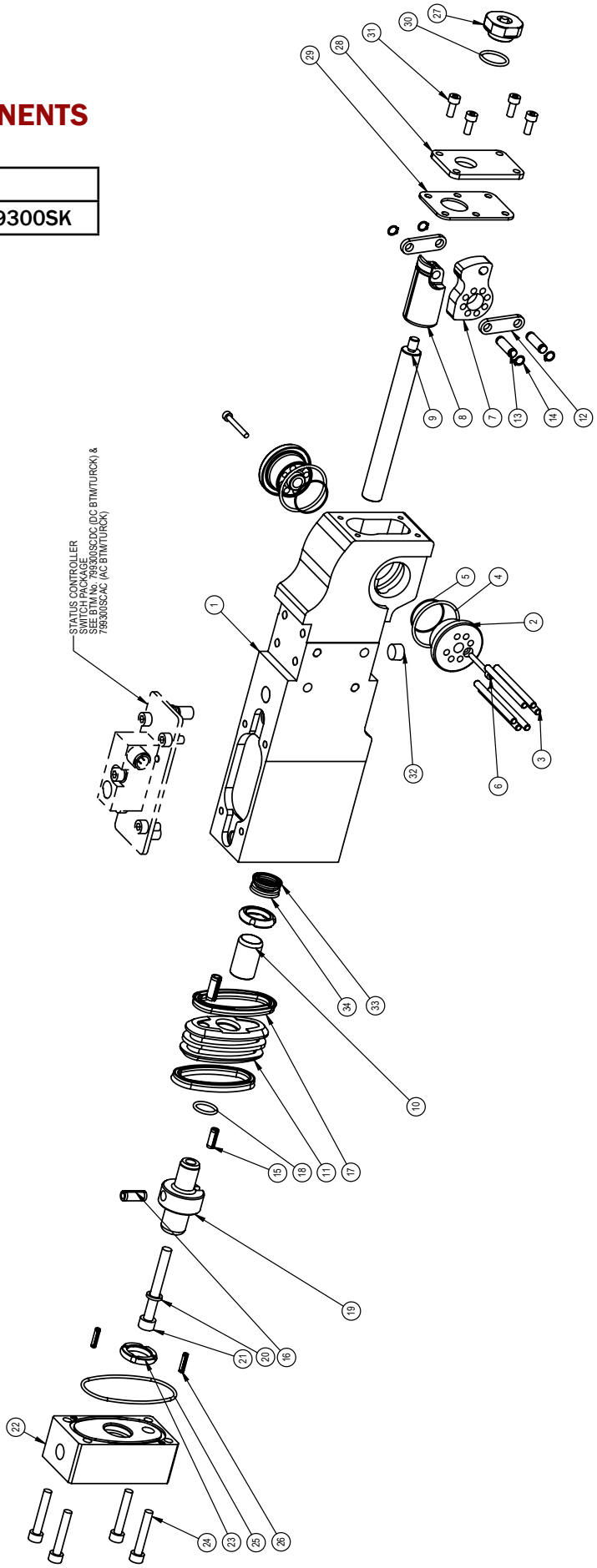
NOTE: Enlarging the clamps integral fixed orifices will void the warranty.

ORDERING SPARE PARTS

Due to the conditions of the clamp warranty, the unit is generally exchanged or repaired at the factory. If spare parts are required, contact BTM or a BTM Authorized Distributor. See the following page for a comprehensive list of TPC clamp components. *BTM recommends stocking proximity switches, hub o-rings, unlock plugs, arm mounting pins, bolts, and flex-loc nuts.*

TPC42 COMPONENTS

SEAL KIT	
TPC42	799300SK



TPC42 COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPC42: Body	CHART "A"
2	2	TPC42: Pin Hub	799303A
3	6	TPC42: Arm Mount Pin	799306A
4	2	Urethane O-Ring	038179
5	2	O-Ring .866 ID x .030	036944
6	2	SHCS: M3x 0.5 x 25	017266
7	1	TPC42: Drive Arm - Split Hub	799312A
8	1	TPC42: Slide Block	799310A
9	1	TPC42: Piston Rod	799309A
10	1	Front Cushion	CHART "B"
11	1	TPC42: Piston	799307A
12	2	TPC42: Link	799311A
13	2	TPC42: Link Pin	799313A
14	4	External Retaining Ring	036942
15	1	3/16 DIA. x 1/2 LG. Roll Pin	012629
16	2	1/4 DIA x 5/8 LG. Roll Pin	006245
17	2	Polypak Seal	028853
18	1	O-RING	004769
19	1	TPC42: Stroke Limiter	CHART "C"
20	1	Washer - .395 x .290 x .062	019130
21	1	SHCS: M6 x 1.0 x 50	014741
22	1	TPC42: End Cap	CHART "D"
23	2	Parker V6 Cushion Seal	018092
24	4	SHCS: M5 x 0.8 x 30	016452
25	1	SEAL: O-RING, 2-033 N674-70	018093
26	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
27	1	UPCP - Unlock Plug	772601A
28	1	MUCP52: Front Cover	741701A
29	1	TPC42: Front Cover Gasket - CORK/BUNA-N	799301J
30	1	O-RING	001417
31	4	SHCS: M4x0.7 x 10	018371
32	1	1/8 NPT LEVL - Seal Pipe Plug	014269
33	1	Polyseal: SQB	019186
34	1	Parker U-CUP Packing	018085

CHART "A" - TPC42 BODY	
Description	BTM Number
TPC42: Body - 1/8 NPT	799301A
TPC42: Body - G1/8	PD202701A

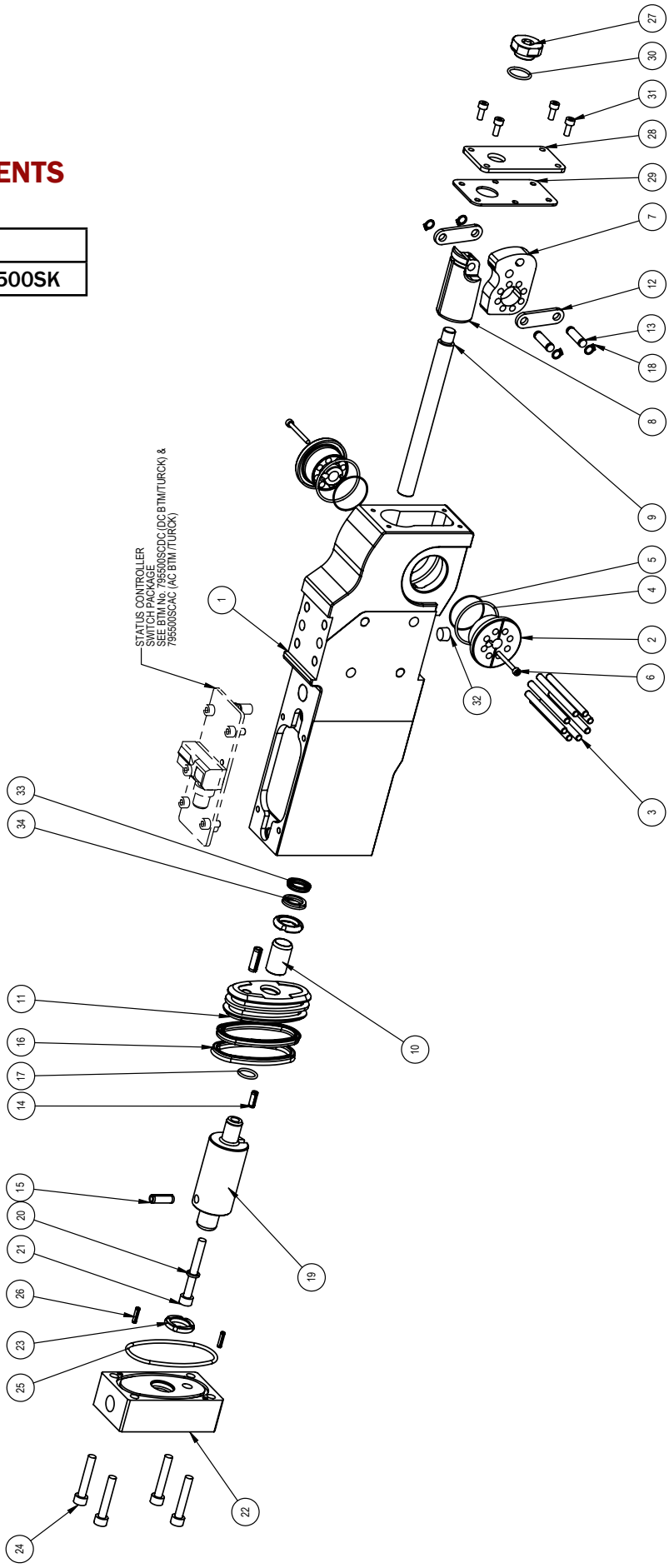
CHART "B" - FRONT CUSHION	
Cushion "A" Lengths	BTM Number
.400	727011A
.395	727016A
.390	727017A
.385	727018A
.380	727019A
.375	727020A
.370	727021A
.365	727022A
.360	727023A
.355	727024A
.405	727031A
.410	727032A
.415	727033A
.420	727034A
.425	727035A

CHART "C" - TPC42 STROKE LIMITER	
Description	BTM Number
30°	799304A
45°	799301B
60°	799301C
75°	799301D
90°	799301E
105°	799301F
120°	799301G

CHART "D" - TPC42 END CAP	
Description	BTM Number
1/8 NPT	799302A
G1/8	PD204702A

TPC52 COMPONENTS

SEAL KITS	
TPC52	795500SK



TPC52 COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPC52: Body	CHART "A"
2	2	TPC52: Pin Hub	795503A
3	8	TPC52: Arm Mount Pin	795506A
4	2	Urethane O-Ring	018694
5	2	O-Ring 1.134 ID x .030	033939
6	2	SHCS: M3x 0.5 x 30	018471
7	1	TPC52: Drive Arm	795508A
8	1	TPC52: Slide Block	795507A
9	1	TPC52: Piston Rod	727002A
10	1	Front Cushion	CHART "B"
11	1	TPC52: Piston	727001A
12	2	TPC52: Link	795509A
13	2	TPC52: Link Pin	795510A
14	1	3/16 DIA. x 1/2 LG. Roll Pin	012629
15	2	1/4 DIA. x 3/4 LG. Roll Pin	001058
16	2	Polypak Seal	019127
17	1	O-Ring	004769
18	4	External Retaining Ring	001237
19	1	TPC52: Stroke Limiter	CHART "C"
20	1	Washer - .395 x .290 x .062	019130
21	1	SHCS: M6 x 1.0 x 50	014741
22	1	TPC52: End Cap	CHART "D"
23	2	Parker V6 Cushion Seal	018092
24	4	SHCS: M6 x 1.0 x 35	016228
25	1	O-RING	018666
26	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
27	1	UPCP - Unlock Plug	772601A
28	1	MUCP62: Front Cover	737003A
29	1	TPC52: Front Cover Gasket - CORK/BUNA-N	795501J
30	1	O-RING	001417
31	4	SHCS: M4x0.7 x 10	018371
32	1	1/8 NPT LEVL - Seal Pipe Plug	014269
33	1	Polyseal: SQB	019186
34	1	Parker U-CUP Packing	018085

CHART "A" TPC42 BODY	
Description	BTM Number
TPC52: Body - 1/4 NPT	795501A
TPC52: Body - G1/4	795801A

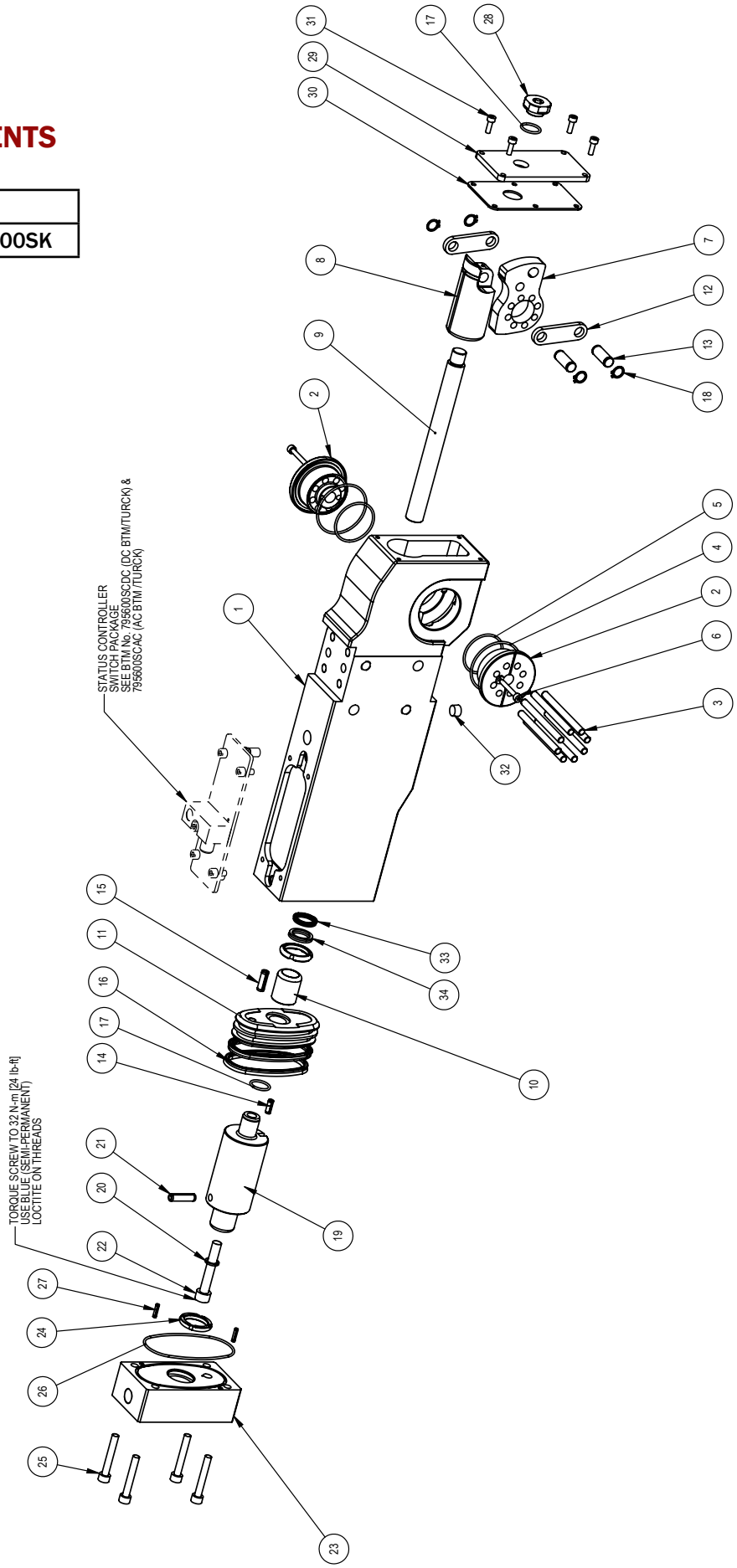
CHART "B" FRONT CUSHION	
Cushion "A" Lengths	BTM Number
.400	727011A
.395	727016A
.390	727017A
.385	727018A
.380	727019A
.375	727020A
.370	727021A
.365	727022A
.360	727023A
.355	727024A
.405	727031A
.410	727032A
.415	727033A
.420	727034A
.425	727035A

CHART "C" TPC52 STROKE LIMITER	
Description	BTM Number
30°	795504A
45°	795501B
60°	795501C
75°	795501D
90°	795501E
105°	795501F
120°	795501G

CHART "D" TPC52 END CAP	
Description	BTM Number
1/4 NPTF	795502A
G1/4	795802A

TPC62 COMPONENTS

SEAL KITS	
TPC62	795600SK



TPC62 COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPC62: Body	CHART "A"
2	2	TPC62: Pin Hub	795613A
3	8	TPC62: Arm Mount Pin - Dual	726001J
4	2	Urethane O-Ring	018695
5	2	O-Ring	012133
6	2	SHCS: M4x 0.7 x 30	018485
7	1	TPC62: Drive Arm	795612A
8	1	TPC62: Slide Block	795611A
9	1	TPC62: Piston Rod	726002A
10	1	Front Cushion	CHART "B"
11	1	TPC62: Piston	726001A
12	2	TPC62: Link	795608A
13	2	TPC62: Link Pin	795614A
14	1	3/16 DIA. x 1/2 LG. Roll Pin	012629
15	1	1/4 DIA x 3/4 LG. Roll Pin	001058
16	2	Polypak Seal	019128
17	1	O-RING	001417
18	4	External Retaining Ring	001238
19	1	TPC62: Stroke Limiter	CHART "C"
20	1	Washer - .500 x .377 x .06	019131
21	1	1/4 DIA. x 1" LG. Roll Pin	000875
22	1	SHCS: M8 x 1.25 x 50	018512
23	1	TPC62: End Cap	CHART "D"
24	2	Parker V6 Cushion Seal	017538
25	4	SHCS: M6 x 1.0 x 40	015764
26	1	O-RING	020606
27	2	1/8 DIA. x 1/2 LG. ROLL PIN	016350
28	1	Unlock Plug	772601A
29	1	Front Cover	741801A
30	1	Front Cover Gasket	795601J
31	4	SHCS M4X0.7 X 12	017973
32	1	1/8 NPT LEVL - SEAL PIPE PLUG	014269
33	1	Polyseal: SQB	019187
34	1	Parker U-CUP Packing	017536

CHART "A" TPC62 BODY	
Description	BTM Number
TPC42: Body - 1/4 NPT	795610A
TPC62: Body - G1/4	795901A

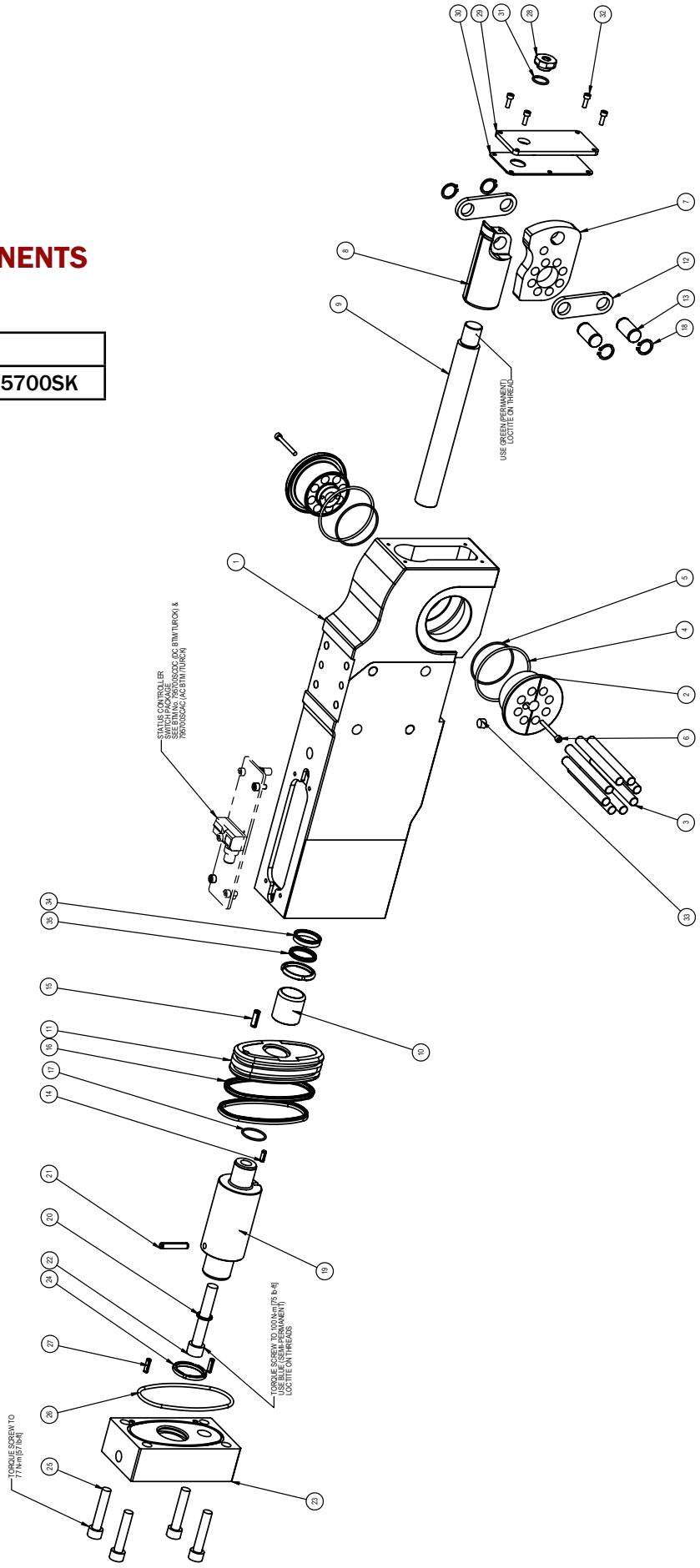
CHART "B" FRONT CUSHION	
Cushion "A" Lengths	BTM Number
.225	726028A
.230	726027A
.235	726026A
.240	726025A
.245	726024A
.250	726023A
.255	726022A
.260	726021A
.265	726020A
.270	726010A
.275	726030A
.280	726031A
.285	726032A
.290	726033A
.295	726034A

CHART "C" TPC62 STROKE LIMITER	
Description	BTM Number
30°	795604A
45°	795601B
60°	795601C
75°	795601D
90°	795601E
105°	795601F
120°	795601G

CHART "D" TPC62 END CAP	
Description	BTM Number
1/4 NPT	795602A
G1/4	795902A

TPC82 COMPONENTS

SEAL KITS	
TPC82	795700SK



TPC82 COMPONENTS

DET.	QTY.	DESCRIPTION	BTM NO.
1	1	TPC82: Body	CHART "A"
2	2	TPC82: Pin Hub	795703A
3	6	TPC82: Arm Mount Pin	795706A
4	2	Urethane O-Ring	018696
5	2	O-Ring	018093
6	2	SHCS: M4x 0.7 x 40	018487
7	1	TPC82: Drive Arm	795708A
8	1	TPC82: Slide Block	795707A
9	1	TPC82: Piston Rod	726502A
10	1	Front Cushion	CHART "B"
11	1	TPC82: Piston	726501A
12	2	TPC82: Link	795709A
13	2	TPC82: Link Pin	795710A
14	1	3/16 DIA. x 1/2 LG. Roll Pin	012629
15	2	1/4 DIA x 3/4 LG. Roll Pin	001058
16	2	Polypak Seal	019129
17	1	O-RING	003411
18	4	External Retaining Ring	027576
19	1	TPC82: Stroke Limiter	CHART "C"
20	1	Washer - .700 x .564 x .072	019132
21	1	1/4 DIA. x 1 3/8 LG Roll Pin	018049
22	1	SHCS: M12 x 1.75 x 75	016250
23	1	TPC82: End Cap	CHART "D"
24	2	Parker V6 Cushion Seal	018461
25	4	SHCS: M10 x 1.5 x 50	017050
26	1	O-RING	018459
27	2	3/16 DIA. x 5/8 LG. ROLL PIN	001645
28	1	UPCP - Unlock Plug	772601A
29	1	TPC82: Front Cover	795701J
30	1	TPC82: Front Cover Gasket - CORK/BUNA-N	795702J
31	1	O-RING	001417
32	4	SHCS: M4x0.7 x 12	017973
33	1	1/8 NPT LEVL - Seal Pipe Plug	014269
34	1	Polypak Seal	019430
35	1	Polypak Seal	034347

CHART "A" TPC82 BODY	
Description	BTM Number
TPC82: Body - 1/4 NPT	795701A
TPC82: Body - G1/4	796001A

CHART "B" FRONT CUSHION	
Cushion "A" Lengths	BTM Number
.395	726522A
.400	726514A
.405	726531A
.410	726532A
.415	726533A
.420	726534A
.425	726535A
.430	726536A
.435	726537A
.440	726538A

CHART "C" TPC82 STROKE LIMITER	
Description	BTM Number
30°	795704A
45°	795701B
60°	795701C
75°	795701D
90°	795701E
105°	795701F
120°	795701G

CHART "D" TPC82 END CAP	
Description	BTM Number
1/4 NPT	795702A
G1/4	796002A

BTM Corporation

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

QF 4.2.2 REV.2

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: Tri-Lok Clamp
Customer: BTM Standard
B/P Date/Lev: 7/18/2008
Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results: Action(s) Taken	New Sev	New Occ	New Det	New RPN
TPC62 Tri-Lok Clamp															
Provide material clamping for fabrication systems located in welding environments (1700 to 2280 in-lbs. Torque @ 60 to 80 P.S.I.) If BTM design guidelines are maintained	Loss of clamping torque	Workpiece not held with enough force and/or parts slip from fixture during work **Degraded output and/or impaired performance**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							
			3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
Remain locked in the clamped or closed position if air pressure is lost (4000 in-lbs. Torque Holding Capacity) If BTM design guidelines are maintained	Will not remain locked in closed position when air is lost	Workpiece may fall out of fixture in overhead applications **Machinery breakdowns**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: Tri-Lok Clamp

Customer: BTM Standard
B/P Date/Lev: 7/18/2008

Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results: Action(s) Taken	New Sev	New Occ	New Det	New RPN
			3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
Provide a precision backup location of a nest block or fixture block (90 deg. +/-3' Repeatability) (90 deg. +/-15' interchangeability) If BTM design guidelines are maintained	Loss of locational repeatability to N/C surface	Workpiece out of specification **Degraded output, partial or complete loss of function**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							
			3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							

BTM Corporation

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

QF 4.2.2 REV.2

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: Tri-Lok Clamp
Customer: BTM Standard
B/P Date/Lev: 7/18/2008
Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results: Action(s) Taken	New Sev	New Occ	New Det	New RPN
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
Provide arm rotation to allow clearance of material as it is loaded and unloaded into the fixture (30 to 120 degree arm rotation available) If BTM design guidelines are maintained	Arm rotates less than required	Part interferes with arm when loading or unloading **Machinery breakdowns,loss of production during operation**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							
		Surrounding equipment interferes with arm **Machinery breakdowns,loss of production during operation**	3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
	Arm remains in closed position when open signal is sent	Part remains in fixture unintentionally **Loss of production during operation, loss of function**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: Tri-Lok Clamp
Customer: BTM Standard
B/P Date/Lev: 7/18/2008
Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results: Action(s) Taken	New Sev	New Occ	New Det	New RPN
			3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
			5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							
			4	Defective or damaged proximity sensor **MTTR 10 min Replace Proximity Sensor**	2	(D) Machine controls will inherently be alerted of damaged sensor	3	**24**							
			4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
	Arm remains in open position when close signal is sent	Part will not be clamped in next cycle **Loss of production during operation, loss of function**	5	Defective, Worn or damaged piston seals **MTTR 30 min**	1	(P) Parker Polypak seals used (D) Air bypass detected at valve (D) Visual check of arm movement	5	**25**							
			5	Broken Piston attachment screw **MTTR 30 min**	1	(P) No grease applied under screw (P) Torque setting = 24 ft-lbs (D) Sensing of Prox target in open/closed position	3	**15**							
			3	Clamp Arm attachment screw over-torqued **MTTR 10 min**	1	(P) Always use calibrated torque wrench when attaching clamp arm (D) Visual check of arm movement	5	**15**							
		Surrounding equipment interferes with arm **Machinery breakdowns,loss of production during operation**	5	Broken Trilok mechanism part (Drive arm, link, etc.) **MTTR 30 min Replace Clamp**	1	(P) Always refer to User's Guide for maximum loads attached to arm (P) Machined orifice in end cap and body (D) Sensing of Prox target in open/closed position	2	**10**							

BTM Corporation

Potential Failure Mode and Effects Analysis
Machinery FMEA (MFMEA)

QF 4.2.2 REV.2

Prepared By: A. Sanders

Ass'y. Number: Various
Ass'y. Description: Tri-Lok Clamp
Customer: BTM Standard
B/P Date/Lev: 7/18/2008
Approved By:

Subsystem Name/Function & Performance Requirements	Potential Failure Mode(s)	Potential Effect(s) of Failure	▼	Sev	Potential Cause(s)/ Mechanism(s) of Failure	Occ	Current Design & Machinery Controls	Det	RPN	Recommended Corrective Action(s)	Person Responsible & Completion Date	Action Results				
												Action(s) Taken	New Sev	New Occ	New Det	New RPN
				4	Defective or damaged proximity sensor **MTTR 10 min Replace Proximity Sensor**	2	(D) Machine controls will inherently be alerted of damaged sensor	3	**24**							
				4	Defective or damaged proximity sensor seals **MTTR 10 min Replace seal**	1	(D) Air bypass detected around switch cover plate (D) Visual check of arm movement	5	**20**							
	Arm interferes with clamp body	Stop arm from fully opening **Partial or complete loss of function**		5	Incorrect machining of clamp arm u-cut **MTTR 15 min. Replace STC clamp arm**	2	(P) ES Testing, Functional test each clamp, Pre-ship validation (D) Sensing of Prox target in open/closed position	2	**20**							
	Clamp is "slamming' in open or closed positions **Excessive noise**	**Excessive noise, Machinery breakdowns**		2	No flow controls are installed or misadjusted **MTTR 30 min Add or adjust flow controls**	2	(P) Machined orifice in end cap and body (D) Noise will be evident.	2	**8**							

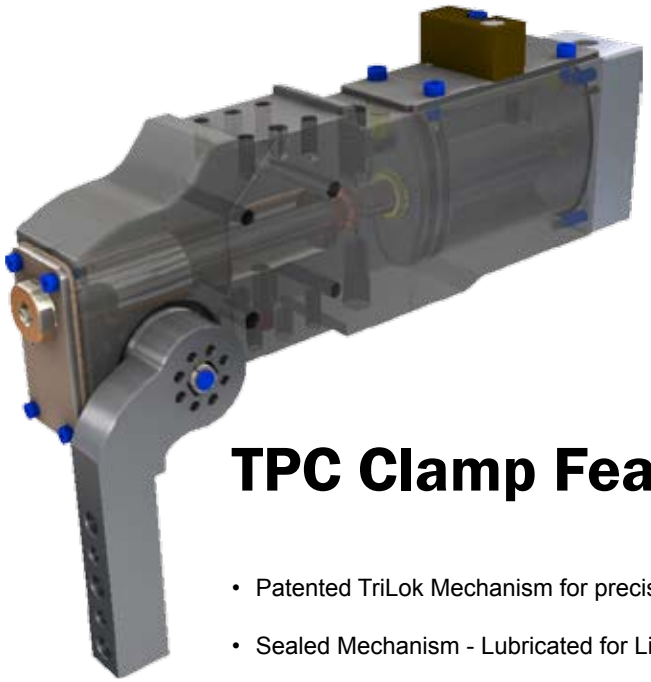
Warranty:

BTM Corporation warranties its TPC Clamps against defects in material and workmanship for for the life of the tool/program for which the clamp was originally sold.

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 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.

BTM®
CORPORATION



TPC Clamp Features

- Patented TriLok Mechanism for precision clamping and higher inertia loads.
- Sealed Mechanism - Lubricated for Life of Clamp
- Cushions Standard on Both Advice and Retract Ends
- Self Pumping Slide Rod Lubrication
- Integral Cylinder with Heavy Wall
- Body is constructed of Aircraft Aluminum, Hard coated to a Rockwell C-70 for Excellent Wear Characteristics
- Pin Arm Drive for versatile arm positioning & simplified arm change
- One clamp model for single and dual arm clamps
- Access to manually unlock clamp linkage
- Integrated proximity switches do not need to be readjusted when arm opening is changed
- Top and Bottom porting - 1/4 NPT or G 1/4

For more information, or to see our full line of products, please visit:

www.BTMcorp.com