# The sheer power of air clamping at your command

Steel-Smith Pneumatic Toggle Clamps combine the unfaltering Steel-smith toggle action with the speed and efficiency of pneumatic actuators.

These clamps yield high-speed operations with secure and finely controlled clamping pressures. Any number of these clamps can be operated instantly at the touch of a switch and where required they can be arranged to operate in any desired clamping sequence. Pneumatic Toggle Clamps are available in a variety of actions and models to meet the various clamping requirements.



# **Advantages:**

- ► Pneumatic Toggle Clamps relieve operator of strenuous clamping movement
- A number of clamps can be used simultaneously
- ► A number of clamps with different sequences can be simultaneously operated
- One or more clamps can be controlled from the machine panel
- One or more clamps can be operated from different positions
- Clamps stay locked in the event of air failure
- Low air consumption with maximum leverage
- ► Large opening angle ensures easy component removal
- Assurance of a maximum power-to movement ratio
- Production time is reduced by 40%

## Introduction

#### What is a Pneumatic Toggle Clamp?

A Pneumatic Toggle clamp is a basically a Toggle Clamp actuated with a double acting pneumatic cylinder.

The Clamps consists of a double acting cylinder, a clamping arm, linkages for multiplying the applied force, and a base for mounting at the workplace on its base.

Air pressure in applied in the clamping port, which thereby moves the clamping arm to hold the work piece. A required clamping force is achieved and exerted on the work piece. Under this action the Toggle Clamp Holds the work piece firmly and positively. To unlock the clamp the air pressure is applied in the unclamping port.

#### **Pneumatic Toggle Action Force Factors**

#### Holding Capacity:

The holding capacity mentioned for each clamp refers to the maximum force, which the clamp can withstand after being overcentered without damage to the clamp and without the toggle unlocking due to distortion of the clamp.

The over-center dimension is carefully chosen in relation to the elasticity of the clamp to maximize clamping force while ensuring that the clamp locks closed even under vibration or intermittent loading.

For Hold Down Clamps, holding capacity is measured with the spindle at the nearest end of the clamping arm and will decrease as the spindle goes farther away from the clamping arm. In cases of DCTC & SSC series the holding capacity is measured considering the specified arm length and if the arm length is increased the holding capacity will decrease accordingly.

#### **Clamping Force:**

Clamping Force, the amount of force actually applied to the work piece by closing and locking the clamp, is generally less than the stated holding capacity. Actual clamping force depends on many factors including; spindle position (clamping arm length), cylinder bore, cylinder area, available air pressure and the clamps mechanical advantage. In most cases, the Clamping force is roughly 2 to 3 times the force exerted by the pneumatic cylinder.

#### ClampingArm Lengths:

Steel Smith strongly recommends using of clamping arms as per its specified data. Using heavier and longer clamping arms on smaller clamps may disturb the smooth movement of the clamp linkages and also a higher wear and tear in its pins & bushes. Please ask for data sheets on each clamp to know the maximum permissible clamp arm usage for that particular clamp.





#### **Toggle Principle:**

Toggle action clamps operate through a linkage system of levers and pivots. The fixed length levers, connected by pivot pins supply the action and clamping force. Toggle action has an over center lock point which is a fixed stop and linkage. Once in the over center position, the clamp cannot move or unlock unless the linkage is moved. All types of toggle clamps have same action, just oriented differently.

#### The Toggle Mechanism in a clamp has threefunctions:

I) To multiply applied load at the handle into a high clamping force to hold the work piece.

2) To create an over - center lock to prevent the clamp from opening & releasing the work piece until opened by the operator.

3) To rapidly open & close the clamp giving a maximum clearance in which to load & unload the work piece.



# **Types of Pneumatic Clamps**

#### Hold Down Action - Pneumatic Clamps

These clamps utilize the same basic design and operation as manual hold down, only they are operated pneumatically. As the clamp uses the toggle action principle it ensures that the clamp stays locked in the event of air failure. These clamps are extremely compact in design and feature a very low height, allowing free movement of operating tools in drilling, tapping, milling etc. The clamp units are completely self contained with a double acting cylinder and require only to be connected to the air line. The clamping arm exhibits a minimum 95° opening angle for easy unloading of workpiece and is available in two different options.

#### Hold Down Action - Pneumatic Clamps Fixed Cylinder

These Fixed Cylinder clamps are identical to the Hold Down Action Pneumatic clamps with the exception of Cylinder Mounting design. The outstanding characteristic of the clamp is that the cylinder does not move at all while the clamp is in operation. As there is no movement in the cylinder, fixed solid tubing can be used instead of flexible tubing in welding applications. The clamping arm exhibits a minimum  $80^{\circ}$  opening angle for easy unloading of workpiece and is available in two different options.



#### **Right Angle Hold Down Clamps**



Primarily these clamps belong to the same family of pneumatical hold down clamps with a exception of mounting flexibility. These clamps utilize the same basic design and operation as the pneumatic hold down clamps. In addition these clamps have a flexibility of mounting themselves on the side of the fixture and can also be mounted on top of the fixture. The clamps are used where a right angle model is desirable due to the space constraint. These clamps are nomenclatured as Right Angle Hold Down Clamps as the position of the cylinder is in the downwards perpendicular direction to the clamping unit. Due to these features these clamps can be accommodated in lesser area than the hold down clamps. The clamping arm exhibits a maximum 95° opening and is available in two different options. The typical applications of these clamps are on rotary indexing tables, wood working, injection moulding, PU mould closures, etc.

#### **H.V. Series Pneumatic Clamps**

These clamps are the air powered version of the manual H.V. Series. They comprise of a very strong and rugged toggle mechanism actuated by a double acting cylinder. The clamping arm is provided with the clamp and can be welded at any desired angle to suit the individual requirement of work pieces. These clamps carry the 'Over Centre Toggle Lock' principle for maximum safety as they remain in locked condition even in case of air failure. The clamps have almost all the features of the manual H.V. Series clamps. These clamps are available in three sizes off the shelf.





#### Straight Line Action Clamps

These clamps utilize the same basic design as manual straight line action clamps with an exception of pneumatic actuation. They are completely self contained with a double acting cylinder suitable to the clamp design and only need pressurised air connection. These cylinders are mounted in line with the plunger of the clamp. The to-and-fro motion of the cylinder operates the clamp. The cylinder piston extends the plunger of the clamp to achieve the lock position and vise versa for unlocking the clamp. The clamp plunger is drilled and tapped for easy loading of suitable adaptors. Plungers are hardened and ground which run in closed toleranced holes for smooth and accurate functioning of clamps. These clamps are widely used in fixtures where locating of components or holes is required and also in mini-automized presses.

#### **SSC-Series Pneumatic Clamps**

SSC Series Pneumatic Clamps are the solution to applications, which demands 'Precision', 'Performance' and the most important factor as far as fixturing is concerned 'Compactness'. These clamps have been specially designed by gathering information and suggestions from customers presently using Steel-Smith pneumatic clamps. The design helps a fixture manufacturer as far as space constrains is concerned.

These clamps are flexible from the maintenance point of view, with features like compatible to all standards, brands and types of pneumatic cylinders. The linkages, connector to piston rod, and the clamping device consists hardened bushings and pivot pins which are easily replaceable in case of wear outs. The clamping device comes with mounting holes, which can be according to the customer's requirement helping them to standardize on their clamping adaptors. The Mounting of the clamp can also be customized in case of substitutes. SSC - Series pneumatic clamps are available in cylinder size from 16mm bore to 63mm bore size.



# **Hold Down Action**

#### Model No: AOT - 2535 UB

Operating Pressure: 2 - 6 Bar Holding Capacity: 100 Kgs. Cylinder Stroke: 40mm Cylinder Bore: 16mm Port Size: M5





# **Hold Down Action**





Clamp Arm Opening: 95°



# Model No: AOT - 3586 SB

Operating Pressure: 2 - 6 Bar Holding Capacity: 250 Kgs. Cylinder Stroke: 50mm Cylinder Bore: 25mm Port Size: M5





Clamp Arm Opening: 95°



0 20.00 100.00 0 47.00 Ψ P -100.00 110.00 31.50 <u>M8</u> <sub>↓</sub>12.00 78.00 Ø 44.50 ത ₿ 314.00







### Model No: AOT - 57124 UB



Clamp Arm Opening: 100°





#### Model No: AOT - 57124 SB

Operating Pressure: 2 - 6 Bar Holding Capacity: 750 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 63mm Port Size: G 3/8

Clamp Arm Opening: 100°









Model No: AOT - 98125 UB Operating Pressure: 2 - 6 Bar



Clamp Arm Opening: 100°

## Model No: AOT - 98125 SB



# Hold Down Action - Fixed Cylinder

#### Model No: AOT - 3565 UB/FC

Operating Pressure: 2 - 6 Bar Holding Capacity: 250 Kgs. Cylinder Stroke: 50mm Cylinder Bore: 25mm Port Size: M5







#### Model No: AOT - 3565 SB/FC

Operating Pressure: 2 - 6 Bar Holding Capacity: 250 Kgs. Cylinder Stroke: 50mm Cylinder Bore: 25mm Port Size: M5



#### Model No: AOT - 5095 UB/FC

Operating Pressure: 2 - 6 Bar Holding Capacity: 500 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 40mm Port Size: G 1/8



#### Model No: AOT - 5095 SB/FC

Operating Pressure: 2 - 6 Bar Holding Capacity: 500 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 40mm Port Size: G 1/8



# Hold Down Action - Right Angle





Model No: AOT - 4085 UB / AOT - 4085 SB Operating Pressure: 2 - 6 Bar Holding Capacity: 400 Kgs. Cylinder Stroke: 80mm , Cylinder Bore: 40mm Port Size: G 1/4

AOT - 4085 UB



AOT - 4085 SB

#### Model No: AOT - 40125 UB / AOT - 40125 SB



Operating Pressure: 2 - 6 Bar Holding Capacity: 650 Kgs. Cylinder Stroke: 80mm , Cylinder Bore: 40mm Port Size: G 1/4 AOT - 40125 UB

AOT - 40125 SB

65.00

# **Pneumatic Clamps**

# **Straight Line Action**

#### Model No: AOT - 2530 HTC

Operating Pressure: 2 - 6 Bar Holding Capacity: 300 Kgs. Cylinder Stroke: 50mm Cylinder Bore: 25mm Port Size: M5

















630.00

35.00

П

#### Model No: AOT - 3231 HTC

Operating Pressure: 2 - 6 Bar Holding Capacity: 1200 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 40mm Port Size: G 1/4

#### Model No: AOT - 3550 HTC

Operating Pressure: 2 - 6 Bar Holding Capacity: 1600 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 40mm Port Size: G 1/4

#### Model No: AOT - 5560 HTC

Operating Pressure: 2 - 6 Bar Holding Capacity: 2500 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 63mm Port Size: G 3/8

#### Model No: AOT - 6750 HTC

Operating Pressure: 2 - 6 Bar Holding Capacity: 7500 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 63mm Port Size: G 3/8

# **SSC Series**

#### Model No: SSC - 1640

Operating Pressure: 2 - 6 Bar Holding Capacity: 250 Kgs. Cylinder Stroke: 40mm Cylinder Bore: 16mm Port Size: M5





#### Model No: SSC - 2550

Operating Pressure: 2 - 6 Bar Holding Capacity: 500 Kgs. Cylinder Stroke: 50mm Cylinder Bore: 25mm Port Size: M5



#### Model No: SSC - 4065

Operating Pressure: 2 - 6 Bar Holding Capacity: 800 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 40mm Port Size: G 1/4









# **SSC Series**

# Model No: SSC - 5065

Operating Pressure: 2 - 6 Bar Holding Capacity: 1500 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 50mm Port Size: G 1/4





#### Model No: SSC - 63100

Operating Pressure: 2 - 6 Bar Holding Capacity: 2500 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 63mm Port Size: G 3/8

## **H.V. Series**

Model No: AOT - BII - 200

Operating Pressure: 2 - 6 Bar Holding Capacity: 200 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 32mm Port Size: G 1/8







# **H.V. Series**

#### Model No: AOT - BII - 300

Operating Pressure: 2 - 6 Bar Holding Capacity: 300 Kgs. Cylinder Stroke: 80mm Cylinder Bore: 32mm Port Size: G 1/8



55.00 100.00 ŧ 25<sup>†</sup>00 25.00 160.00 110.00  $\bigcirc$ 25,00 Γ 12.00 M 20,00 300.00 40.00Sq 0.00 240.00

Model No: AOT - BII - 500 Operating Pressure: 2 - 6 Bar

Holding Capacity: 750 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 40mm Port Size: G 1/4



Model No: AOT - BII - 1000 Operating Pressure: 2 - 6 Bar Holding Capacity: 1000 Kgs. Cylinder Stroke: 100mm Cylinder Bore: 63mm Port Size: G 3/8



0.00 Œ 125.00 30,00 195.00 32.00 Ò 135.00 30,00 Г đ 15.00 M1 20.00  $(\Phi)$ 405.00 55.00 Sq 95.00 -300.00