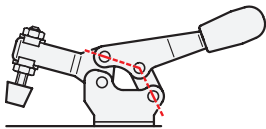Clamping arm

Operating lever

By using the **toggle principle** toggle clamps offer decisive advantages:

The clamping arm retracts to such an extent that the workpiece can be loaded and unloaded completely unobstructed.

Even the slightest forward movement of the operating handle brings the clamping arm with the spindle assembly over the workpiece.

As can be seen from the sketch, the position of the three toggle links will lead to a multiple of the input force applied to the operating handle.

In this position the toggle clamp is not yet fully engaged and any counter force will open it.

In this position all three pivots are perfectly aligned yielding the maximum **clamping force F_s** (dead center point).

The clamping force F_s exerted on the workpiece is mainly dependent on the following criteria:
- The input force which is applied to the operating handle
- The position of the spindle assembly on the clamping lever

Since the applied force on the lever by the operator is not known, the clamping force F_s shown in the table is only specified for pneumatic clamps.

The clamping force F_s can be altered by re-adjusting the position of the spindle assembly. The clamping force increases if the entire contact area of the bolt arrives on the workpiece prior to the toggle linkage reaching dead center point. This effect is illustrated clearly when using an elastic clamping pad.

In this position the toggle linkage has arrived in the over-center lock position and the operating lever has rached a firm stop and is thus prevented from opening until it is released by the operator.

The force which the clamp is capable of withstanding in this over-center lock position without suffering permanent deformation is known as holding force F_H. The holding force has a characteristic value (co-efficient) for toggle clamps and this value is mainly dependent on:

- The size (dimensions, geometry) of the toggle clamp
- The position of the spindle assembly on the clamping arm

In the tables the **holding force F_H** of the toggle clamps is given in each case in relation to a particular position (distance r) of the clamping arm.

On the standards sheets all clamps are shown in their clamping position. All references to force are given in N (Newton) / Lbf (pound-force).
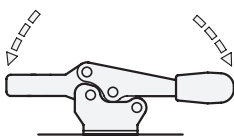
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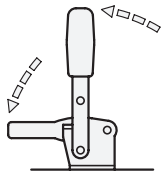
Vertical acting toggle clamps

Lever and clamping bar move in the same direction.

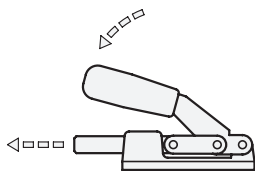In the clamped position the operating handle is in vertical position.

For applications where substantial forces and many tightening cycles occur „Longlife" versions are available.

Horizontal acting toggle clamps

Lever and clamping bar move in opposite direction.

In the clamped position the operating handle is in horizontal position (flat version).

Push-pull type toggle clamps

On these clamps the swinging movement of the operating handle is converted into an axial movement to push or pull the plunger.

With the exception of two versions (GN 841) they lock at the end of their stroke in both directions. For this reason they lend themselves for push or pull operations.
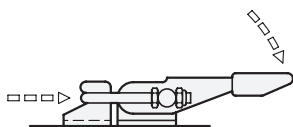
Latch type toggle clamps

For these clamps, the pivoting movement of the operating handle is transformed into an axial movement of the draw hook.

Latch type toggle clamps are available with and without locking mechanism.

Pneumatic toggle clamps

These toggle clamps combine the advantages of clamping by the toggle principle (clamp remains in the clamping position even in the event of air pressure loss!) with the advantages offered by pneumatics i.e.:

- Constant clamping force F_s independent of the operator
- Several clamps can be operated simultaneously
- Pneumatic toggle clamps can be energized from various operating points (remote control, co-ordinated and controlled by other machines)
- Some variants are available with an air cylinder which allows control via a proximity switch, to give an electrical impulse when the clamp has reached a specific position within its clamping cycle

Pneumatic toggle clamps are available as vertical and push rod versions.

1.1
1.2
1.3
1.4
2.1
2.2
2.3
2.4