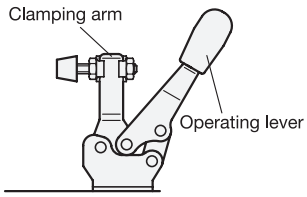
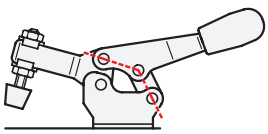


By using the **toggle lever principle** toggle clamps offer decisive advantages:

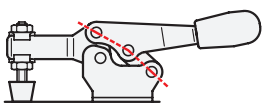
The clamping arm retracts to such an extent that the workpiece can be loaded and unloaded completely unobstructed.



Even the slightest forward movement of the operating lever brings the clamping arm with the contact pad over the workpiece.

As can be seen from the sketch, the position of the 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.



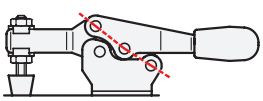
In this position all three pivots of toggle lever are perfectly aligned yielding the maximum **clamping force F_s** (dead centre point).

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 lever,
- the position of the clamping bolt on the clamping lever.

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

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



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

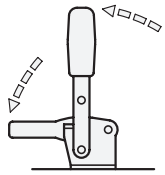
The force which the clamp is capable of withstanding in this over-centre lock position without suffering permanent deformation is known as holding force F_H. The holding force has a characteristic value (co-efficient) for toggle clamps and this value is mainly dependent on:

- the size (dimensions, geometry) of the toggle clamp,
- the position of the clamping bolt on the clamping arm.

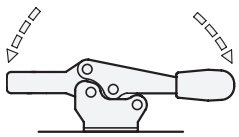
In the tables the **holding force F_H** of the toggle clamps is given in each case in relation to a particular position (distance r) of the clamping arm.

On the standards sheets all clamps are shown in their clamping position.

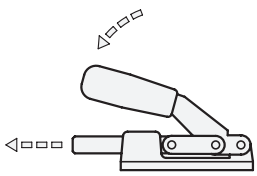
All references to force are given in N (Newton).



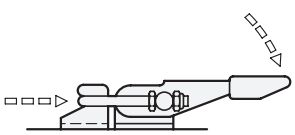
Vertical toggle clamps
Operating lever and clamping arm move in the same direction.
In the clamped position the operating lever is in vertical position.
For applications where substantial forces and many tightening cycles occur, „Longlife“ versions are available.



Horizontal toggle clamps
Operating lever and clamping arm move in opposite direction.
In the clamped position the operating lever is in horizontal position (flat version).



Push-pull type toggle clamps
On these clamps the swinging movement of the operating lever 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
On these clamps the swinging movement of the operating lever is converted into an axial movement to pull the hook.
Latch type toggle clamps are available with and without locking mechanism.