

## Principle and lay-out of the double acting actuator Series 31a - Type DAP

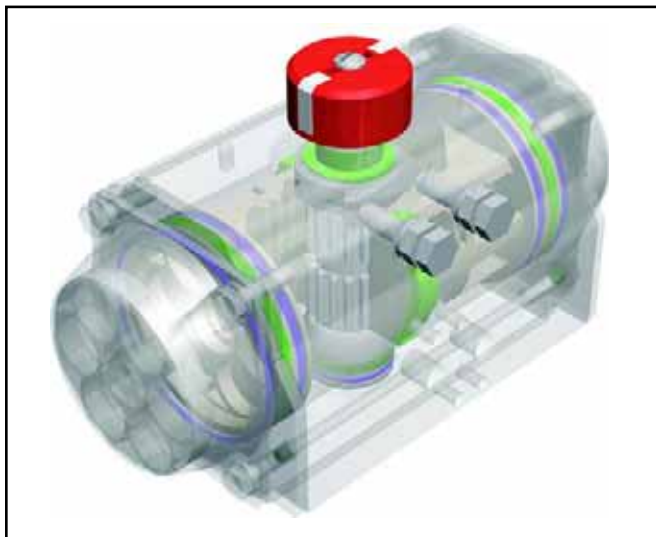


Fig. 1 - Principle of the double acting actuator

When port „2” is under pressure and port „4” is vented, both pistons move to the end positions, this then causes the drive shaft to start turning. By exchanging the pistons, it is possible to turn the drive shaft in the opposite direction.

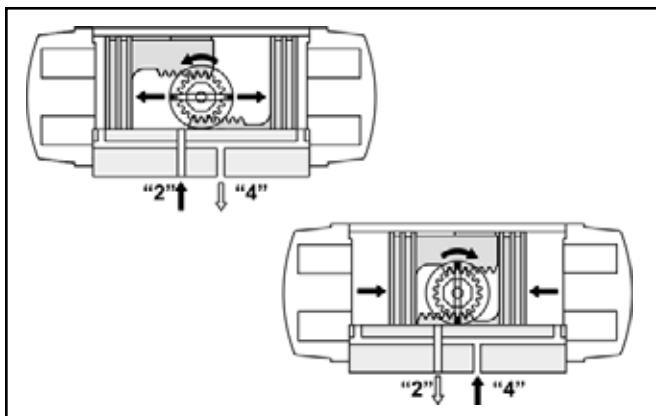


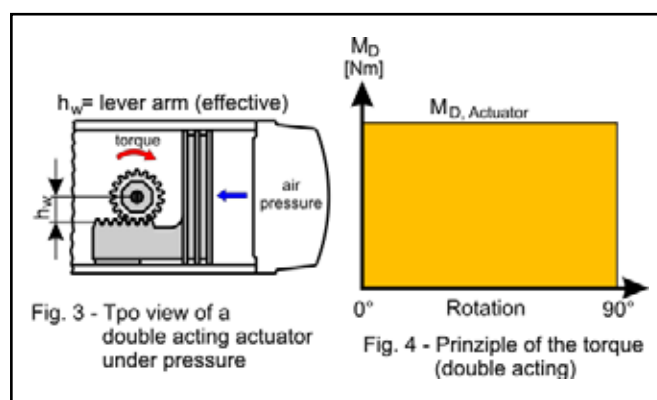
Fig. 2 - Principle of the double acting actuator under air pressure

When port „4” is under pressure, and port „2” vented, then both pistons move to the middle position. This also causes the drive shaft to start turning. By exchanging the pistons, it is possible to turn the drive shaft in the opposite direction.

With the rack and pinion construction, the out put torque of the actuator is obtained by multiplying the piston force (given by air supply) with the shaft radius ( lever or arm, see fig. 3) less friction loss ( efficiency).

The advantage of this construction, is the constant (linear) output torque (see fig. 4) in clockwise - and anti clockwise direction.

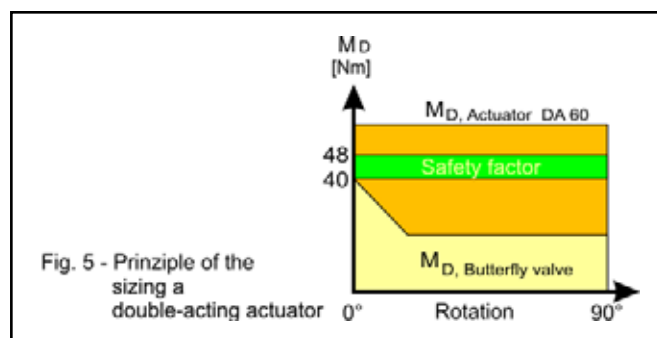
The recommended safety factor for double acting actuators in normal working conditions is 15 - 20 %.



### Lay-out example of a double acting actuator

- Specified by the manufacturer valve - torque = 40 Nm
- Safety factor = 40 Nm + 20 % = 48 Nm
- available air supply = 5 bar = 5 bar

The double acting actuator, which at 5 bar reaches at least 48 Nm, is the DAP 60.



## Principle and lay-out of the single acting actuator Series 31a - Type SRP

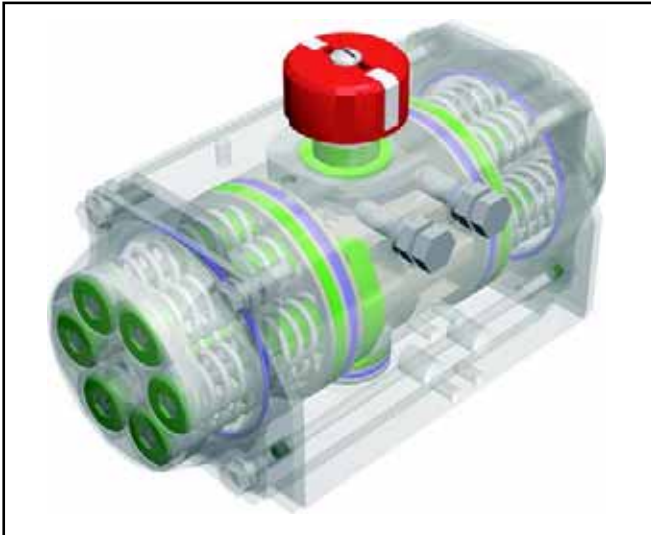


Fig. 6 - Principle of a single acting actuator

When port „2” is under pressure and port „4” is vented, both pistons move to the end position, this causes the springs to compress, and the drive shaft starts turning. It is also possible to turn the drive shaft in the opposite direction by exchanging the pistons.

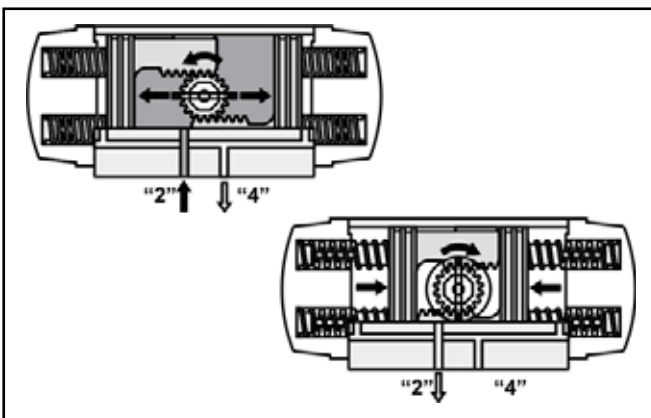


Fig. 7 - Principle of the double acting actuator under spring pressure

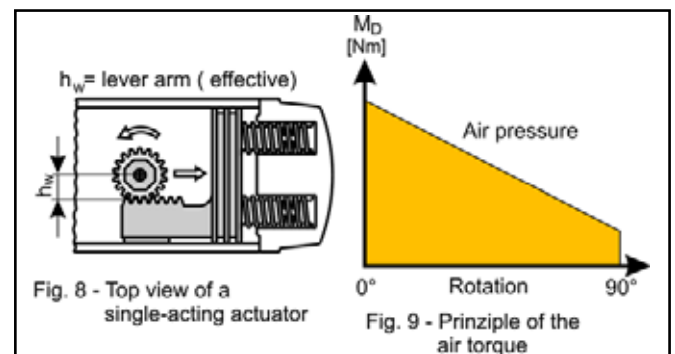
Because of the spring return force, safety closing of the valve by loss of air, or power failure is guaranteed. By exchanging the pistons, it is possible to turn the drive shaft in the opposite direction.

The operating torque for spring return actuators, is determined by means of the force of air pressure i.e. spring package. (see fig. 8 to 13).

The application torque is calculated by multiplying the air pressure output i.e. spring pressure output, on the pistons, with the corresponding lever arm. There are two cases to determine:

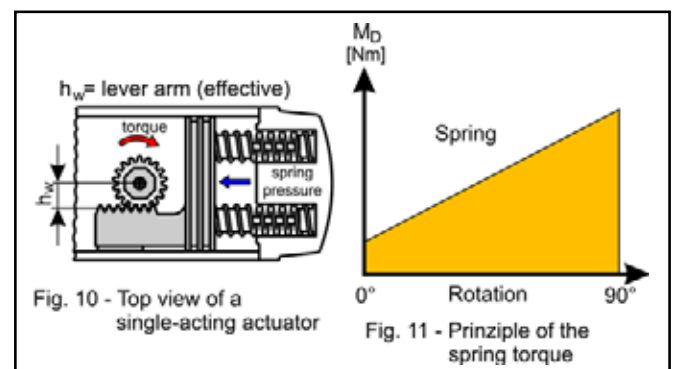
- **First case:**

The output torque is generated by air supply pressure at port „2” after compressing the springs, this is called „air torque”. In this case, the air pressure forces the pistons to move, which accordingly turns the shaft, from 0° - 90°. Preset by the pressure springs, the output torque run, progresses along the characteristic line of the spring. (see fig. 9). Beginning at (0°) the largest, and ending at, (90°) the smallest torque.



- **Second case:**

The output torque is generated by the spring return torque of the springs on the pistons ( when air failure ). This is specified as „Federmoment”. In this case the largest output torque is by 90° and the smallest at 0°. The process (see fig. 11) ist also based on the characteristic line of the spring.



The AT-Actuators have been optimised according to the previous described cases, so that they achieve a balanced torque, when the number of springs corresponds to the air pressure in bar (4 bar  $\Leftrightarrow$  4 springs on each side, see fig. 12).

For certain applications it is generally possible to create an unbalanced torque (see fig. 13). For this purpose, only the number spring packs to be used on each side is different to the incoming air pressure (e.g. 6 springs at 5,5 bar, or reversed).

With a spring return application of the actuator, two designs can be offered:

**air failure closing** and **air failure opening**.

The recommended safety factor for spring return actuators amounts to 20 - 25 %.

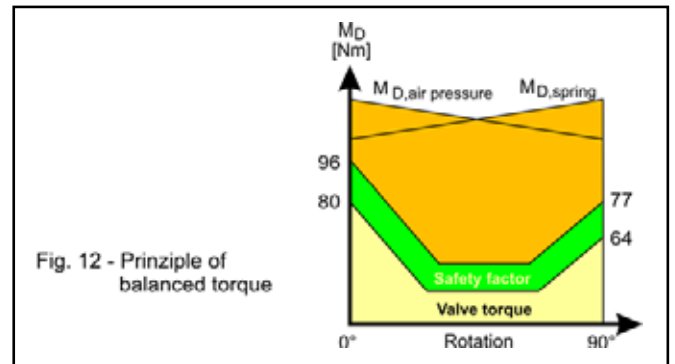
**Lay-out example für a single acting AT-Actuator**

**1. Safety closing by constant torque (by air failure):**

- Specified by the manufacturer valve - torque = 80 Nm
- Safety factor (individual acc. customer) = 80 Nm + 20 % = 96 Nm
- Available air supply = 5 bar

For these mentioned settings, the selected AT-actuator is the SRP 300 - 5 with the following characteristics:

- Spring torque by 0° = 105 Nm
- Spring torque by 90° = 165 Nm
- Air torque by 0° = 172 Nm
- Air torque by 90° = 112 Nm



**2. Safety opening by irregular torque ( by air failure):**

- Specified by the manufacturer valve- torque = 45 Nm
- Safety factor (individual acc. customer) = 45 Nm + 20 % = 54 Nm
- Available air supply = 5,5 bar

For the above mentioned settings, the selected actuator is the SRP 150 -5, with the following characteristics:

- Spring torque by 0° = 50,7 Nm
- Spring torque by 90° = 78,8 Nm
- Air torque by 0° = 95,6 Nm
- Air torque by 90° = 67,5 Nm

