



# Operating Instructions Swivel Unit

14.06.2016

KS ...  
KS... .2  
KS... .6

## 1. Description

The pneumatic swivel unit is a high performance tool designed for swivel and feed operations in the construction of jigs and fixtures. It is composed of a pneumatic cylinder, a metal housing with attachment options on all sides and an arm for holding the object to be swivelled.

During the swivel movement, in order to amplify the force, the pneumatic cylinder presses onto an integrated toggle level joint which in turn controls the arm's movement. The position control for the arm is realised by means of limit switches integrated in the housing. For stopping the swivel movement, the pneumatic cylinder is equipped with an integrated stop buffer.

## 2. Safety

The pneumatic swivel unit is not designed as a complete tool ready to be used, and therefore it is not equipped with its own safety equipment. Only when it is correctly installed in a production system, and a corresponding safety control system is added, will all the safety requirements be met.

Should any fault occur which places personnel at risk the swivel unit is to be switched off immediately. Maintenance work is only to be carried out when the machine is at a complete standstill and by suitably qualified specialists.

After maintenance work has been carried out the protection devices are to be refitted in the correct way.

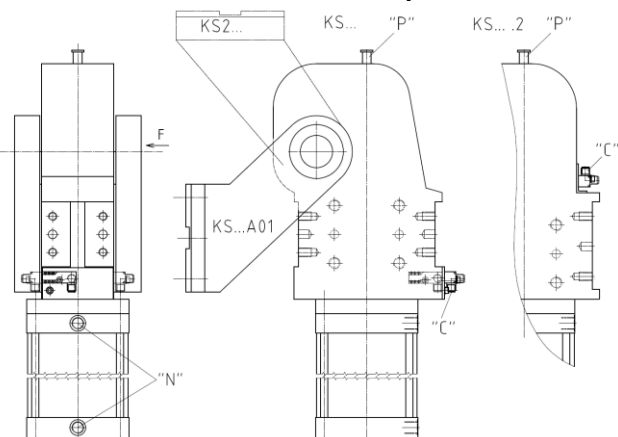


Figure 1: Principle of operation of the swivel unit

## 3. Installation of the swivel unit

- The swivel unit must be fitted to a sufficiently dimensioned support, where also the dynamic loads of the moving system have been considered. The attachment is carried out using cylinder head screws, the positioning is made using two dowel pins on either the front or the back of the swivel unit.
- Connect the compressed air supply between pneumatic control and the swivel unit (connection "N")

For buffering the return stroke (out and back) external throttled check valves must be used and adjusted to the corresponding speed of motion.

### Caution:

Moving heavy arms/contour pieces too fast can cause mechanical damage to the cylinder floor.

Do not allow the cycle time to drop below the minimum (2 sec. for opening / 2 sec. for closing). The guidelines for the maximum arm weight must be adhered to (see technical data sheet)!

## 4. Adjustment of the swivel unit

### Caution! Danger of crushing!

When the arm is being set, fingers could be severed or crushed! Do not reach into the swivel area while the swivel unit is in operation! Before any operation is commenced in the tool area the compressed air supply must be interrupted first!

Before making an adjustment with the installed swivelling application it must be secured by a suitable load suspension device.

The swivel arm of the swivel unit is secured by means of high performance ring tighteners. The installation position is adjusted to  $\pm 10'$  in the end position at delivery. If possible this connection should not be loosened again. The adjustment of the swivel unit should be made using suitable shims.

- Screw the feed unit to the holder arm.
  - Close swivel unit. Move the toggle lever joint into a position past dead centre until it locks audibly. Now the locking pin "P" is in the out position.
  - Measure the dimensional difference between the workpiece and the swivel unit.
  - Compensate the difference by adding suitable shims.
- Should it become necessary to loosen the ring tighteners the setting made by the manufacturer must not be changed by more than  $\pm 5'$ .

### Modification of the opening angle

Modification of the opening angle can only be carried out by the service staff of TÜNKERS® Maschinenbau GmbH by replacing the cylinder.

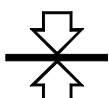
### Inductive query (T12)

Connect electro-coupling corresponding to the electrical design (see wiring diagram figure 2) onto the connection plug "C" and tighten the screws.

**Caution:** Operation using the wrong or an excessive voltage can lead to a short circuit and injury to personnel.

The function control of the integrated LEDs is as follows:

- green ..... operating voltage
- yellow ..... clamp is opened
- red ..... clamp is closed



**TÜNKERS®**  
SPANNSYSTEME

TÜNKERS® Maschinenbau GmbH  
Am Rosenkothen 8 • 40880 Ratingen  
Postfach 10 17 16 • 40837 Ratingen  
Tel. 02102 4517-0 • Fax 02102 445808  
Internet www.tuenkers.de



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## 5. BD Blocking System

The blocking system is a blocking unit driven by spring force which is activated in case of system pressure loss.

Barrel rollers cling to the piston rod and are jammed due to the forced guidance of the clamp. When pressure is applied upon the piston, the barrel rollers are lifted from their jammed position and the blocking unit releases the piston rods for operation. Due to the system this leads to a relative movement between the clamping element and the piston rod, which leads to an angular offset of about 2-5° on the swivel arm.

All of the blocking units installed are designed for an operating pressure of up to 6. Increasing the operating pressure does not result in an enhancement of the performance of the blocking unit but it can cause damage, malfunctioning or premature wear and tear. Therefore, the operating pressure applied to the blocking unit must be set and protected against changing with the aid of suitable means guaranteeing repeatability.

On principle, the blocking unit is designed for cyclic operation for the static holding and securing of the drive unit, preferable in the end positions.

If the emergency stop function is activated during the moving process, we recommend inspecting the jamming system after several 2000 emergency stops or once a year, respectively.

To do so, both opening pistons of the blocking unit are aerated and the drive cylinder of the swivel unit is loaded with a pressure of 6 bar. This ought not to result in a slip through / swivel motion of > 5°. After having activated the emergency stop function, the swivel unit is to be moved back into home position, i.e. opposite to the last swivel direction.

The follow-up time after an emergency stop is ca. 0.5 s with an assumed swivel time of the overall angle of 4 s.

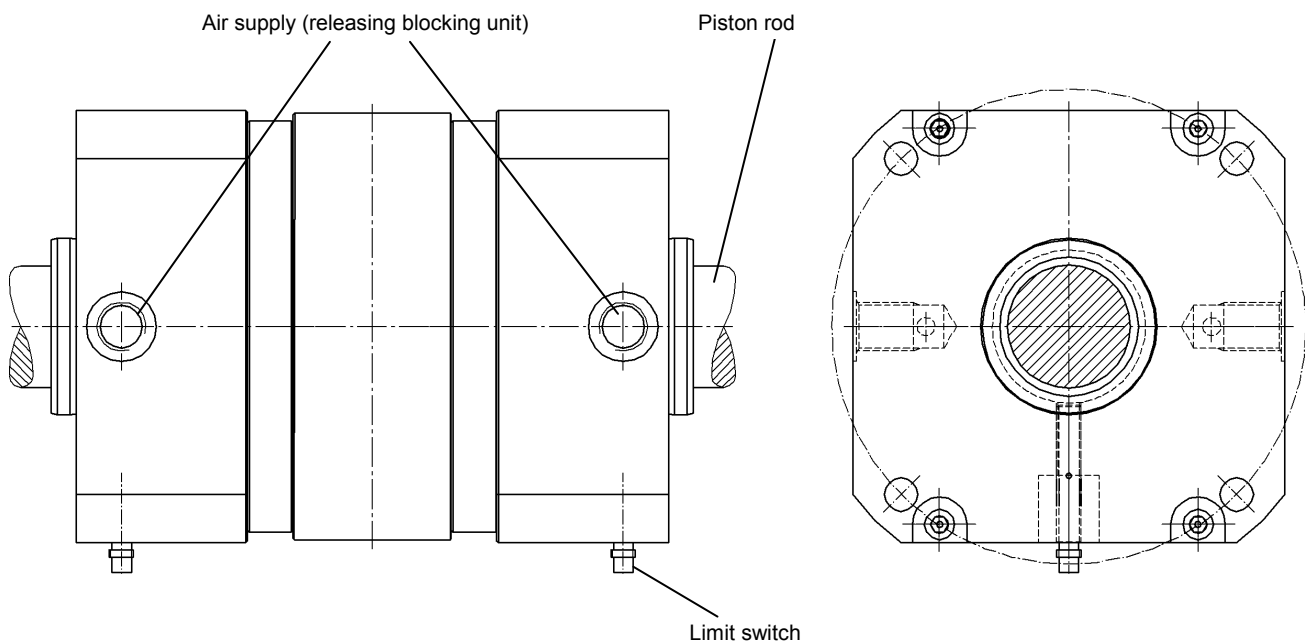
In this respect it needs to be considered that the follow-up time next to the swivelling speed and mass is also influenced by the control properties of the signal and control elements used.

With regard to the control, please also consider that the blocking is released ca. 0.2/0.3 s prior to activation of the swivel motion.

However, it is mandatory that quick-vent valves are provided for, as a gradually decreasing pressure has a direct effect on the follow-up time, see enclosed pneumatics circuit scheme for soft-start KS... BD.

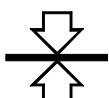
**Caution:** The sensors only allow the monitoring of the switching status. They do not serve the purpose of functional control.

**Caution:** The blocking unit must not be opened or disassembled. Energy is stored in the compressed springs. Any changes will inevitably lead to a reduction in operational safety and the loss of product warranty



### Adjustment of the limit switches

The limit switches are fully threaded into the piston rod. Then the end switches are slacked by 0.5 – 0.75 turns and secured. Then check electrically.



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Tel. 02102 4517-0 • Fax 02102 445808  
Internet [www.tuenkers.de](http://www.tuenkers.de)



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## 6. Assembling the ring clamping elements (S)

When adjusting or disassembling the clamping arm, the ring clamping elements used must always be fitted in accordance with the manufacturer's instructions.

1. Lightly oil the clamping elements (S). Do not use oil with molybdenum disulfide or high-pressure additives and do not use grease.
2. Slide on the swivel arm and fit the clamping element.
3. Manually tighten the tightening screws in a crosswise pattern and align the swivel arm while doing so.
4. Tighten the tightening screws in a crosswise pattern to half their recommended torque using a torque spanner. Then tighten them to their full torque in a crosswise pattern.
5. Tighten the tightening screws to their full torque in series a couple of times until all screws have stopped rotating.

Torques for ring clamping elements for the various swivel units:

Type	Number of screws	Torque per screw [Nm]
KS 80	15	17
KS 100	15	17
KS 125	12	41
KS 160	12	41
KS 200	12	41

## 7. Unlocking the swivel unit

When the toggle lever joint is in a position beyond dead centre the swivel unit may be mechanically unlocked and thereby opened by the locking pin "P".

**Caution! Danger of crushing!** When handling the locking pin "P" the swivel arm can open abruptly. Do not reach into the swivel range of the swivel arm!

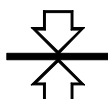
## 8. Replacement of the limit switch cartridge

- Dismantle the limit switch cartridge by loosening the screws.
- Set the new limit switch cartridge to the required opening angle and install it.

## 9. Maintenance

The pneumatic swivel unit is equipped with low-maintenance bearings and guides so that it can be used for large-scale serial production. The technical design of the swivel unit allows a service life of 2 million operating cycles without noticeable wear.

**Caution:** The housing is a fully-encapsulated design to protect the swivel unit from welding spatter. Therefore no special maintenance is necessary. However, damage can be caused to the swivel unit by cleaning with a steam jet or dry ice.



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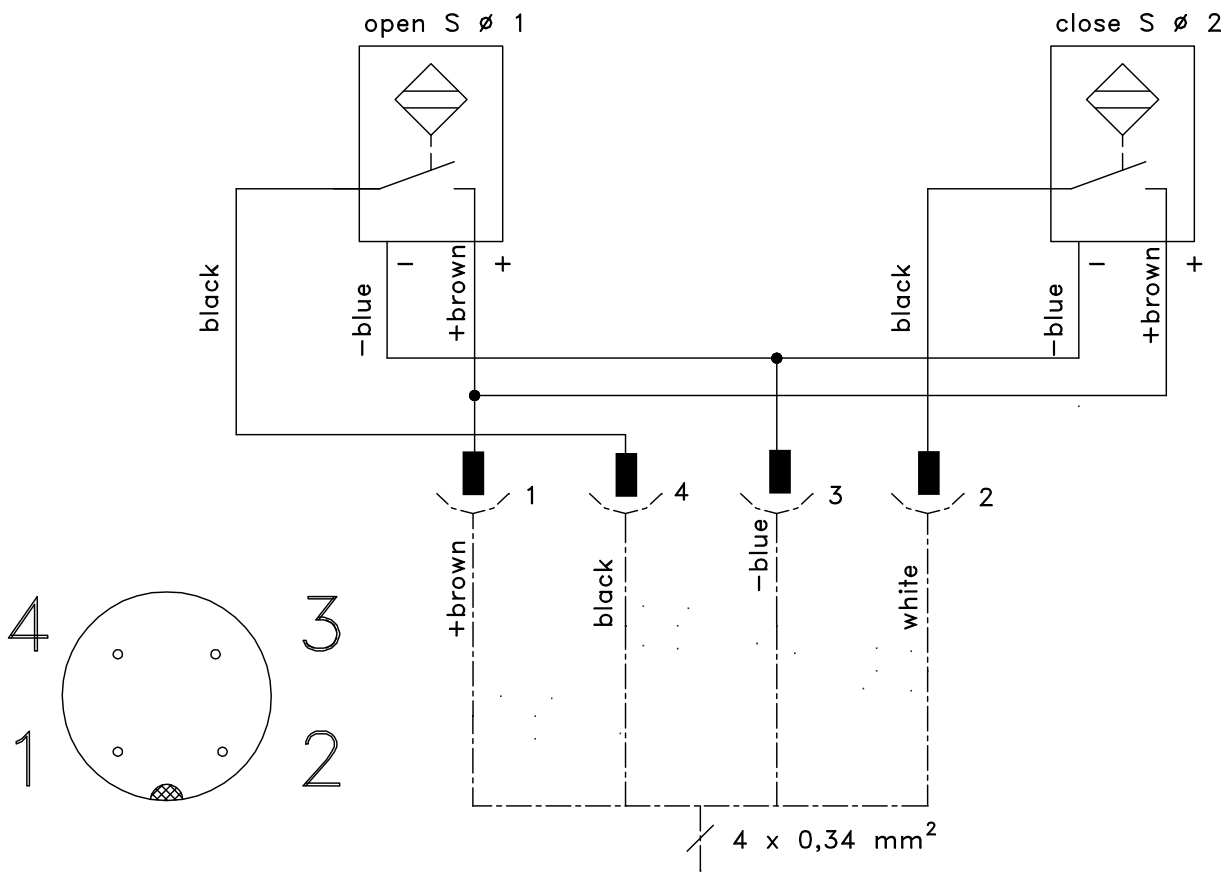
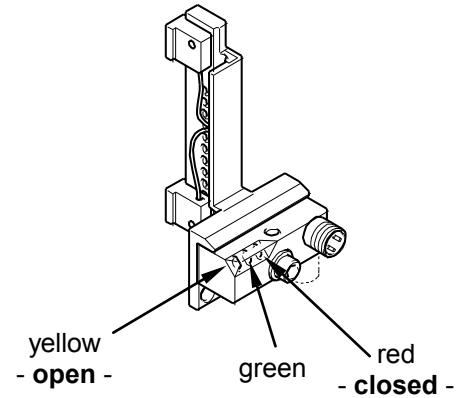


Figure 2

Technical Specifications

Inductive switch (Standard version)

Short circuit proof

Rated voltage 10-30 V

Working current 32 mA (one initiator connected with PLC)

Closer PNP exit



Subject to technical modifications.

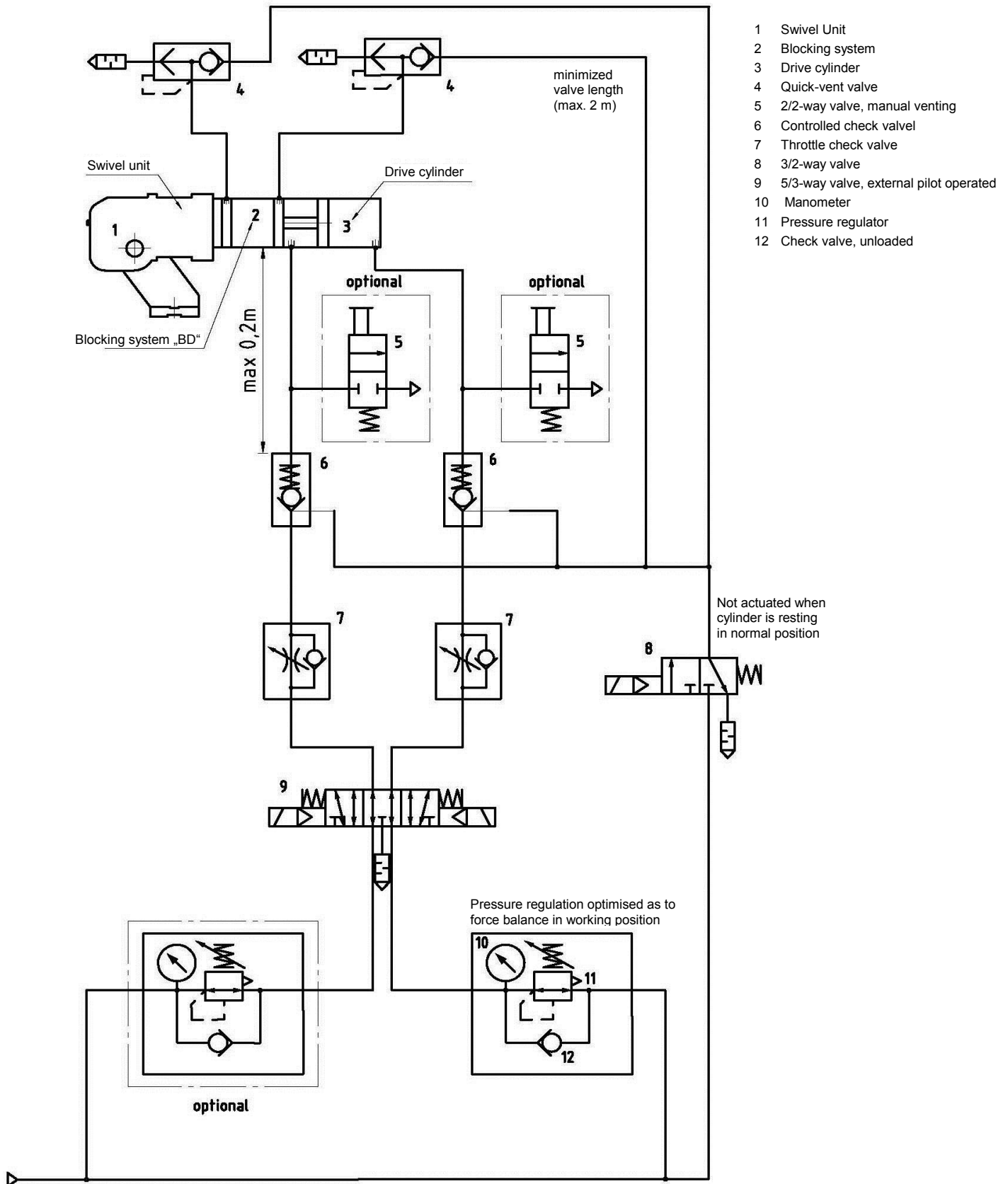
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# Pneumatic circuit diagram

Soft-start

KS... BD

Path-Step-Diagram see page 2



- 1 Swivel Unit
- 2 Blocking system
- 3 Drive cylinder
- 4 Quick-vent valve
- 5 2/2-way valve, manual venting
- 6 Controlled check valve
- 7 Throttle check valve
- 8 3/2-way valve
- 9 5/3-way valve, external pilot operated
- 10 Manometer
- 11 Pressure regulator
- 12 Check valve, unloaded

# Path-Step-Diagram

for Swivel Unit with blocking system

KS... BD

Pneumatic circuit diagram see page 1

Step	Swivel Unit	Valve Swivel	Blocking Unit	Valve Blocking Unit	System Pressure
a	Unlocked	Open / Middle P.	Locked	Closed	Pressure
b	Emergency Stop	Middle Position	Closed	Rested	No Pressure
c	Emergency Stop	Middle Position	Unlocked	Switched	Pressure
d	Unlocked	Opening	Opened	Switched	Pressure
e	Opened	Opening	Locked	Rested	Pressure

Step	Swivel Unit	Valve Swivel	Blocking Unit	Valve Blocking Unit	System Pressure
0	Closed	Middle Position	Closed	Rested	No Pressure
1	Closed	Closing	Closed	Rested	Pressure
2	Closed	Closing	Unlocked	Switched	Pressure
3	Unlocked	Opening	Locked	Rested	Pressure
4	Opened	Opening	Closed	Rested	Pressure
5	Opened	Opening	Unlocked	Switched	Pressure
6	Opened	Closing	Locked	Rested	Pressure
7	Locked	Closing	Closed	Switched	Pressure
8	Closed	Closing	Unlocked	Rested	Pressure
9	Closed	Closing	Closed	Rested	Pressure

