AVN 224S: SUT valve drive with safety function to DIN 32730

For controllers with a continuous (0…10 V and/or 4…20 mA) or switched output (2- or 3-point control). To activate the through valves or three-way valves in type series V/BUD, V/BUE, V/BUG, V/BUS and VUP, and the V/B6 series; and is also a safety device with a defined end position in case of a voltage failure or if a limiter responds. Suitable for valves that close against and with the pressure. The choice of characteristic (linear / equal-percentage / square) can be set on the positioner.

Housing made of self-extinguishing yellow plastic. DC motor, control electronics, LED display, maintenance-free gear unit made of sintering steel, spring assembly (package), installation column in stainless steel and mounting bracket made of cast light alloy for building onto the valve. Further characteristics: electronic, force-dependent switch-off using stop guides in the device or on the valve, automatic adaptation to the valve stroke, coding switch to select the characteristic and run-time. Pushbuttons on the outside of the housing for manual adjustment and to trigger a re-initialisation. Possibility of switching over the direction of action externally (voltage supply to connection 2a or 2b). Electrical connections (max. 2.5 mm²) with screwed terminals. Three break-out cable leadthroughs for M20×1,5 (2×) and M16×1,5. Installed position: vertically upright to horizontal.

<table>
<thead>
<tr>
<th>Type</th>
<th>Run-time Motor</th>
<th>Spring</th>
<th>Reset</th>
<th>Pushing force</th>
<th>Stroke</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve drive for valves: VUD / BUD, VUE / BUE, VUG / BUG, VUS / BUS and VUP</td>
<td>2 / 4 / 6</td>
<td>15…30</td>
<td>closed (NC)</td>
<td>1100</td>
<td>0…40</td>
<td>5,6</td>
</tr>
<tr>
<td>AVN 224S F132</td>
<td>2 / 4 / 6</td>
<td>15…30</td>
<td>open (NO)</td>
<td>1100</td>
<td>0…40</td>
<td>5,6</td>
</tr>
<tr>
<td>to match valve series: V / B6 and VXD, VXE, BXD, BXE</td>
<td>AVN 224S F132-5</td>
<td>2 / 4 / 6</td>
<td>15…30</td>
<td>closed (NC)</td>
<td>1100</td>
<td>14</td>
</tr>
<tr>
<td>AVN 224S F132-6</td>
<td>2 / 4 / 6</td>
<td>15…30</td>
<td>closed (NC)</td>
<td>1100</td>
<td>40</td>
<td>6,0</td>
</tr>
</tbody>
</table>

Positioner: 2)
- Control signal 1: 0…10 V, Rj = 100 kΩ
- Control signal 2: 4…20 mA, Rj = 50 Ω
- Position feedback signal: 0…10 V, load > 2.5 kΩ

Supply voltage: 24 V–1.5 ± 20%, 50…60 Hz
- 24 V–1.5 ± 15%
- with accessories 230 V–1.5 ± 15%

Degree of protection: IP 66 (EN 60529)

Power consumption: 7 W, 18 VA
- 230 V–1.5, 1 W, 24 V; installation as per MV 505894
- 100 V, 1 W, 24 V; installation as per MV 505894
- 230 V–1.5, 1 W, 24 V; installation as per MV 505894
- 100 V, 1 W, 24 V; installation as per MV 505894

Intermediate piece 5) (required for medium above 180 °C and up to 240 °C, MV 505902)

Motor

Spring

Accessories

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0372333 001</td>
<td>End stop guide (required for valves DN15 and reduction steps of types V / B6)</td>
</tr>
<tr>
<td>0372386 001</td>
<td>Honeywell with 20 mm stroke, MV 505903</td>
</tr>
<tr>
<td>0372378 001</td>
<td>Honeywell with 40 mm stroke or spindle ø14 mm, MV 505903</td>
</tr>
<tr>
<td>0372376 010</td>
<td>Siemens with 20 mm stroke or spindle ø10 mm, MV 505974</td>
</tr>
<tr>
<td>0372376 014</td>
<td>Siemens with 40 mm stroke or spindle ø14 mm, MV 505974</td>
</tr>
<tr>
<td>0372377 001</td>
<td>JCI DN15…150 with 14, 25 or 40 mm stroke or spindle ø10, 12 or 14 mm, MV 505975</td>
</tr>
<tr>
<td>0372378 001</td>
<td>Honeywell with 20 mm stroke, MV 506069</td>
</tr>
<tr>
<td>0372378 002</td>
<td>Honeywell with 38 mm stroke, MV 506069</td>
</tr>
<tr>
<td>0372386 001</td>
<td>LDM Typ RY113 R/M, MV P100000538</td>
</tr>
<tr>
<td>0372389 001</td>
<td>ITT-Dräger, DN 15…32, MV P100000376</td>
</tr>
<tr>
<td>0372389 002</td>
<td>ITT-Dräger, DN 40…50, MV P100000376</td>
</tr>
<tr>
<td>0372366 001</td>
<td>Siemens with 40 mm stroke or spindle ø14 mm, MV 505903</td>
</tr>
<tr>
<td>0372386 001</td>
<td>End stop guide (required for valves DN15…50 VXD, VXE, BXD, BXE)</td>
</tr>
<tr>
<td>0386263 001</td>
<td>Screwed cable fitting, M16 x 1,5</td>
</tr>
<tr>
<td>0386263 002</td>
<td>Screwed cable fitting, M20 x 1,5</td>
</tr>
</tbody>
</table>

*) Dimension drawing or wiring diagram available under the same number

1) The return travel time corresponds to a stroke of 14 to 40 mm and does not depend on the run-time that is set
2) Also for 2-point or 3-point depending on connection for 24 V–
3) Engineer the transformers for this value, otherwise functional faults may occur.
4) For higher medium temperatures (180 °C or 240 °C), an intermediate piece is necessary (see Accessories).
5) Intermediate piece is not required for the F132-6 version.
6) Combination with VUP and VUS: normally closed with F232, normally open with F132

Sauter Components

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Operation

After a new start, or after a start following activation of the emergency function (terminal 21), up to 45 s of waiting time will pass before the drive is available again. Depending on the type of connection (see the wiring diagram), the device can be used as a continuous-action drive (0...10 V and/or 4...20 mA), a 2-point drive (open-closed) or a 3-point drive (open-stop-closed). The runtime of the drive can be set with switches S1 and S2 according to the requirements in each case. Switches S3 and S4 are used to configure the characteristic (equal-percentage, linear or square).

The external pressure switches [PC1] allow manual adjustment of the position. This can only function if the emergency function (terminal 21) is electrically connected and has voltage. If one of the two pushbuttons is pressed for 5 seconds, the drive changes over to manual operating mode. Both the LEDs flash red and green. Pressing a pushbutton (OPEN/CLOSED) moves the drive in the relevant direction. Pressing a button again stops the drive. If a button is pressed once more for at least 5 seconds, the drive changes back to control mode. If an emergency function is executed during manual mode, the emergency function takes priority. The drive is always in control mode after an emergency function.

Initialisation and feedback signal

The drive does not initialise itself automatically. Voltage must be connected to terminals 1 and 21, and then it is necessary to switch over to manual mode (see Description of function). First, the valve stem must be connected with the drive shaft. This is done by moving the drive shaft out until the closing mechanism snaps shut. On version N0, the initialisation and assembly with the valve can only be carried out if the working spindle has been retracted beforehand.

As soon as the drive is connected to the valve, the safety screw must be fitted in the locking ring. Once the safety screw is fitted, a manual initialisation must be triggered. To do this, both the pushbuttons must be pressed for at least 5 seconds. The drive then moves to the lower stop guide of the valve. After this, it moves to the upper stop guide, and the distance measured is recorded and stored by a distance measurement system. The control and feedback signals are adapted to this effective stroke. After a voltage interruption or an emergency function, a new initialisation will not be performed and the values remain saved.

During the initialisation, the feedback signal is inactive or corresponds to a value of '0'. The shortest run-time is used for initialisation. The new initialisation is only valid once the entire procedure has been completed without interruptions. Pressing a pushbutton will interrupt the procedure.

If the valve drive detects a blockage, the feedback signal is set to 0 V after about 90 s in order to signal it. During this period, however, the drive will attempt to overcome the blockage. If it is possible to overcome the blockage, the normal control function is activated again and the feedback signal will be present again.

Safety function or emergency function

This valve drive and its safety function conform to DIN 32730. If the supply voltage fails or is switched off, or if a monitoring contact (STB / SDB) responds, the brushless DC motor releases the gear and the drive is moved into the respective end position (depending on the version) by means of the pre-tensioned spring. If this happens, the control function of the drive is disabled for 45 s so that the end position can be reached in every case. Both LEDs are lit during these 45 seconds. The reset speed is controlled with the help of the motor so that there can be no pressure surges in the pipe. The brushless DC motor is not only used to generate the holding force, but also as a brake by the integrated eddy current brake and as a motor for the control function. The drive does not re-initialise itself after an emergency function.

Connection as a 2-point valve drive (24 V)

This actuation (OPEN/CLOSED) can take place via two leads [PC2]. The voltage is applied to terminals 1, 2a and 21. Applying the voltage (24 V) to terminal 2b causes the coupling rod to move out and opens the valve. After this voltage is turned off, the drive moves to the opposite end position and closes the valve. In the end positions (valve stop guide, or when maximum stroke is reached) or in case of an overload, the electronic motor switch-off will respond (no limit switches).

The coding switch can be used to set the run-times. The characteristic cannot be selected in this case (resulting in the characteristic for the valve). The feedback signal is active as soon as the initialisation has been carried out and a voltage is present at terminal 21. Terminals 3i and 3u must not be connected.

Connection as 3-point valve drive (24 V)

The valve can be moved to any desired position by applying a voltage to terminals 2b (or 2a) and 21. If voltage is applied to terminals 1 and 2b, the coupling rod moves out and opens the valve. It moves in and closes the valve when the power circuit is closed via terminals 1 and 2a.

In the end positions (valve stop guide, or when maximum stroke is reached) or in case of an overload, the electronic motor switch-off will respond (no limit switches). The direction of the stroke can be changed by transposing the connections.

The coding switch is used to set the run-times. The characteristic cannot be selected in this case (resulting in the characteristic for the valve). The feedback signal is active as soon as the initialisation has been carried out and a voltage is present at terminal 21. Terminals 3i and 3u must not be connected.
Connection as 3-point valve drive with 230 V (accessory 0372332)
The accessory module is plugged into the terminal compartment and is then connected for 3-point mode. If this accessory is used, only control in 3-point mode is available, and the drive must be manually initialised together with the valve when putting into service. The coding switch on the base board can be used to select the run-times. The characteristic cannot be selected; it is governed by the characteristic of the valve.

There is a built-in switch in the module which is automatically moved into the correct position when the module is installed. With this application, the switching lever is in the upper position.

The accessory module is not suitable for 2-point control.

Connection to a control voltage (0...10 V and/or 4...20 mA)
The built-in positioner controls the drive dependent on the control signal from the controller, y.

The control signal used is a voltage signal (0...10 V–) to terminal 3u, or a current signal to terminal 3i. If a control signal is simultaneously present at both terminals (3u (0...10 V) and 3i (4...20 mA)), the input with the higher value takes priority.

Direction of action 1 (mains voltage to internal connection 2a):
As the control signal increases, the coupling rod moves out and opens the valve (control passage).

Direction of action 2 (mains voltage to internal connection 2b):
As the control signal increases, the coupling rod moves in and closes the valve (control passage).

The starting point and the control span are fixed settings. To set partial ranges (and only for voltage input 3u), a split range unit is available as an accessory (see Function of Split Range Unit); this is designed to be built into the drive.

After the supply voltage has been applied and after initialisation, the drive moves to between 0% and 100% of each valve stroke, according to the control signal. Thanks to the electronics and the distance measurement system, no strokes are lost and the drive does not require re-initialisation at periodic intervals. When the end positions are reached, this position is checked, corrected if necessary and the new value is stored. This guarantees that several drives of the same type can run in parallel. The feedback signal $y_0 = 0...10$ V corresponds to the effective valve stroke of 0 to 100%.

If the control signal 0...10 V is interrupted in direction of action 1, the spindle retracts completely and the valve is closed. So that the valve can be opened (direction of action 1), a voltage of 10V must be connected between terminals 1 and 3u, or it is necessary to switch over to direction of action 2.

The coding switch can be used to set the characteristic for the valve: linear, equal-percentage or square. Further switches can be used to select the run-times (can be used for the 2-point, 3-point or continuous functions).

LED display: the display consists of two-colour LEDs (red/green).

In automatic mode:
- both LEDs flashing red: initialisation
- upper LED lit red: upper stop guide or 'CLOSED' position reached
- lower LED lit red: lower stop guide or 'OPEN' position reached
- upper LED flashing green: drive is running, controlling towards 'CLOSED' position
- upper LED lit green: drive is stationary, last direction of running 'CLOSED'
- lower LED flashing green: drive is running, controlling towards 'OPEN' position
- lower LED lit green: drive is stationary, last direction of running 'OPEN'
- both LEDs lit green: waiting time after switching on or after emergency function
- no LED lit: no voltage supply (terminal 21)

In manual mode:
- upper LED lit red, lower red and green: upper stop guide or 'CLOSED' position reached
- upper LED lit red and green, lower red: lower stop guide, or 'OPEN' position reached
- upper LED flashing green, lower LED red and green: drive is running, controlling towards 'CLOSED' position
- upper LED flashing red and green, lower LED green: drive is running, controlling towards 'OPEN' position
- upper and lower LEDs flashing red and green: drive is stationary

Split range unit (accessory 0313529)
This accessory can be built into the drive or accommodated externally in an electrical distribution box.

The starting point $U_0$ and the control span $\Delta U$ can be set with the help of a potentiometer. This means that the control signal from the controller can be used to operate several regulating units in sequence or in a cascade. The input signal (partial range) is converted into an output signal of 0...10 V.
Engineering and installation notes
The penetration of condensate and dripping water, etc. into the drive along the valve stem must be avoided.
The drive is plugged directly onto the valve and is fixed with screws (no further adjustments are needed). The drive is automatically connected to the valve stem. Depending on the condition of the drive shaft when delivered and the type, its stroke is 0% or 100%.
The housing contains three break-open cable leadthroughs which are broken open automatically when the cable leadthrough is screwed in.
The DC motor/electronics concept guarantees that several valve drives of the same type can run in parallel. The cross-section of the connecting cable must be chosen according to the length of the line and the number of drives. With five drives connected in parallel and a line length of 50 m, we advise using a cable cross-section of 1.5 mm² (power consumption of the drive × 5).
As a maximum, the drive can be assembled with a 230 V module, one additional accessory component (auxiliary contact or potentiometer) and the split range unit.

Fitting outdoors. If the devices are fitted outdoors, we recommend that additional measures be taken to protect them against the effects of the weather.

Additional technical information
The yellow housing (consisting of the front and back sections and the connecting lid) only serves the purpose of a cover. The pushbuttons for manual adjustment are located on the front. The DC motor, the control electronics, the load-bearing parts and the maintenance-free gear unit are accommodated in the housing. The drive shaft and column are made of rustproof materials. The interior plates, the gear unit and the springs are made of steel. The valve axle guideway and the valve collar connection are made of die-cast aluminium.

Note on ambient temperatures: if the medium temperature in the valve is up to 110 °C, the ambient temperature may reach 60 °C. For medium temperatures above 110 °C, the ambient temperature must not exceed 55 °C, or insert accessory 0372336 180 (intermediate piece).

Auxiliary changeover switch

0372333 001 Switching capacity max. 250 V~, min. current 250 mA at 12 V (or 20 mA at 20 V)
Switching capacity max. 12...30 V~ max. current 100 mA

0372333 002 Switching capacity max. 250 V~, min. current 1 mA at 5 V
Switching capacity max. 0.1...30 V~, current 1...100 mA
Even if used only once above 10 mA or up to 50 V, the gold coating will be destroyed.
The switch can then be used only for higher switching outputs.

Warnings
• If the temperature of the medium in the valve is high, the drive columns and the shaft may also reach high temperatures.
• Drives with safety functions must be regularly checked to see that they are in working order (trial run).
• If a failure of the final control element could cause damage, additional protective precautions must be taken.
• It is forbidden to dismantle the springs in the device due to the high risk of injuries.

CE conformity

EN 61000-6-1  EN 1050  EN 60730-1
EN 61000-6-2  EN 14977  EN 60730-2-14
EN 61000-6-3  Over-voltage category III
EN 61000-6-4  Degree of pollution III

For AVN 224SF132-5 and AVN224SF132-6 with V6 / B6 valves
Pressure Equipment Directive 97/23/EEC. Category IV, Fluid Group II, Modules B+D
DIN 32730
Approval centre: TÜVCE-0035.
### Desired Character. curve

<table>
<thead>
<tr>
<th></th>
<th>Switch coding</th>
<th>Characteristic curve for valve</th>
<th>Characteristic curve for drive</th>
<th>Effective on valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal percentage</td>
<td>![Equal percentage symbol]</td>
<td>![Equal percentage graph]</td>
<td>![Equal percentage graph]</td>
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<td>Quadratic</td>
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<tr>
<td>Linear</td>
<td>![Linear symbol]</td>
<td>![Linear graph]</td>
<td>![Linear graph]</td>
<td>![Linear graph]</td>
</tr>
<tr>
<td>Equal percentage</td>
<td>![Equal percentage symbol]</td>
<td>![Equal percentage graph]</td>
<td>![Equal percentage graph]</td>
<td>![Equal percentage graph]</td>
</tr>
<tr>
<td>Linear</td>
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<td>![Linear graph]</td>
<td>![Linear graph]</td>
<td>![Linear graph]</td>
</tr>
</tbody>
</table>

= factory setting

### Run time per mm

<table>
<thead>
<tr>
<th>Run time per mm</th>
<th>Switch coding</th>
<th>Run time for 14 mm stroke</th>
<th>Run time for 20 mm stroke</th>
<th>Run time for 40 mm stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>2s</td>
<td>![2s symbol]</td>
<td>28s ± 1</td>
<td>40s ± 1</td>
<td>80s ± 2</td>
</tr>
<tr>
<td>4s</td>
<td>![4s symbol]</td>
<td>56s ± 2</td>
<td>80s ± 2</td>
<td>160s ± 4</td>
</tr>
<tr>
<td>6s</td>
<td>![6s symbol]</td>
<td>84s ± 4</td>
<td>120s ± 4</td>
<td>240s ± 8</td>
</tr>
</tbody>
</table>

= factory setting
Wiring diagram

Variant continuous

Variant 3pt

Variant 2pt

NC = closed without auxiliary energy (Normally closed)
NO = open without auxiliary energy (Normally open)

Dimension drawing

Accessories

0313529

0372336

0372334

0372333

0372336 180

0372336 240

Type                           a       b  c
AVN 224S F132/232 64    289  44
AVN 224S F132-5 58    289  38
AVN 224S F132-6 78    382  60

T (°C) a (mm) b (mm)
180  69,4  60
240 109,4 100

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