



ACVATIX™

Control device PN25, safety function to DIN EN 14597 MK..5..

Preassembled valve-actuator combinations

-
- MK..533.. Operating voltage AC 230 V, 3-position control signal
 - MK..563.. Operating voltage AC 24 V, control signal DC 0...10 V, 4...20 mA or 0...1000 Ω
 - MK..563.. Choice of flow characteristic, position feedback, stroke calibration, LED status indication, override control
 - Electrohydraulic actuators
 - With safety function to DIN EN 14597
 - With position indicator
 - Optional functions with auxiliary switches and potentiometer
 - Nodular cast iron EN-GJS-400-18-LT valve body
 - DN 15...50
 - k_{vs} 0.16...40 m³/h

Use

Control devices with safety shut-off function per DIN EN 14597 for protection against excessive temperature and pressure in district heating, heating, ventilation and air conditioning systems.
For open and closed circuits (mind "Cavitation", refer to page 8).

Type summary

Control device	MKD533..		MKD563..		2-port valve							
Operating voltage	AC 230 V		AC 24 V		Δp_{\max}	Δp_s	DN	k_{vs}	S_v			
Positioning signal	3-position		DC 0...10 V, DC 4...20 mA, 0...1000 Ω							[kPa]	[kPa]	[m ³ /h]
	Product number	Stock number	Product number	Stock number								
	MKD533.15-0.16	S55329-M137-A100	MKD563.15-0.16	S55329-M137-A101	1200	2500	15	0.16	50 ... 100			
	MKD533.15-0.2	S55329-M138-A100	MKD563.15-0.2	S55329-M138-A101				0.2				
	MKD533.15-0.25	S55329-M139-A100	MKD563.15-0.25	S55329-M139-A101				0.25				
	MKD533.15-0.32	S55329-M140-A100	MKD563.15-0.32	S55329-M140-A101				0.32				
	MKD533.15-0.4	S55329-M141-A100	MKD563.15-0.4	S55329-M141-A101				0.4				
	MKD533.15-0.5	S55329-M142-A100	MKD563.15-0.5	S55329-M142-A101				0.5				
	MKD533.15-0.63	S55329-M143-A100	MKD563.15-0.63	S55329-M143-A101				0.63				
	MKD533.15-0.8	S55329-M144-A100	MKD563.15-0.8	S55329-M144-A101				0.8				
	MKD533.15-1	S55329-M145-A100	MKD563.15-1	S55329-M145-A101				1				
	MKD533.15-1.25	S55329-M146-A100	MKD563.15-1.25	S55329-M146-A101				1.25				
	MKD533.15-1.6	S55329-M147-A100	MKD563.15-1.6	S55329-M147-A101				1.6				
	MKD533.15-2	S55329-M148-A100	MKD563.15-2	S55329-M148-A101				2				
	MKD533.15-2.5	S55329-M149-A100	MKD563.15-2.5	S55329-M149-A101				2.5				
	MKD533.15-3.2	S55329-M150-A100	MKD563.15-3.2	S55329-M150-A101				3.2				
	MKD533.15-4	S55329-M151-A100	MKD563.15-4	S55329-M151-A101				4				
	MKD533.20-6.3	S55329-M153-A100	MKD563.20-6.3	S55329-M153-A101				20		6.3		
	MKD533.25-5	S55329-M154-A100	MKD563.25-5	S55329-M154-A101				2100		25	5	100 ... 200
	MKD533.25-6.3	S55329-M155-A100	MKD563.25-6.3	S55329-M155-A101							6.3	
	MKD533.25-8	S55329-M156-A100	MKD563.25-8	S55329-M156-A101	8							
	MKD533.25-10	S55329-M157-A100	MKD563.25-10	S55329-M157-A101	10							
	MKD533.32-16	S55329-M159-A100	MKD563.32-16	S55329-M159-A101	1100	1200	32	16	... 200			
	MKD533.40-12.5	S55329-M160-A100	MKD563.40-12.5	S55329-M160-A101	650	750	40	12.5				
	MKD533.40-16	S55329-M161-A100	MKD563.40-16	S55329-M161-A101				16				
	MKD533.40-20	S55329-M162-A100	MKD563.40-20	S55329-M162-A101				20				
	MKD533.40-25	S55329-M163-A100	MKD563.40-25	S55329-M163-A101				25				

DN = Nominal size

k_{vs} = Nominal flow rate of cold water (5...30 °C) through the fully open valve (H_{100}) by a differential pressure of 100 kPa (1 bar)

S_v = Rangeability k_{vs}/k_{vr}

k_{vr} = Smallest k_v value, at which the flow characteristic tolerances can still be maintained, by a differential pressure of 100 kPa (1 bar)

Accessories

Product number	Description	For control devices	Mounting location
ASC1.6	Auxiliary switch	MKD563..	1 x ASC 1.6
ASC9.3	Dual auxiliary switches	MKD533..	1 x ASC9.3 and 1 x ASZ7.3 or 1 x ASZ7.31 or 1 x ASZ7.32
ASZ7.3	Potentiometer 1000 Ω		
ASZ7.31	Potentiometer 135 Ω		
ASZ7.32	Potentiometer 200 Ω		

Ordering

Product number	Stock number	Designation
MKD533.40-25	S55329-M163-A100	Control device PN25, safety function to DIN EN 14597

Delivery Prior delivery valve and actuator are preassembled. The control device is preset to 50 % stroke. Accessories are packed and supplied separately.

Spare parts No spare parts available. The control device has to be replaced as a whole unit else approval for the safety function to DIN EN 14597 ceases.

Technical design

The functional principle and technical details are described in valve and actuator data sheets:

Product	Type	Data sheet
Electrohydraulic actuators	SKD..	N4561
2-port valves	VVF53..	N4405

Spring return facility The return spring causes the actuator to move to the «0 %» stroke position and closes the valve.

MK..533..
3-position

- Voltage on Y1 piston extends valve opens
- Voltage on Y2 piston retracts valve closes
- No voltage on Y1 and Y2 piston / valve stem remain in the respective position

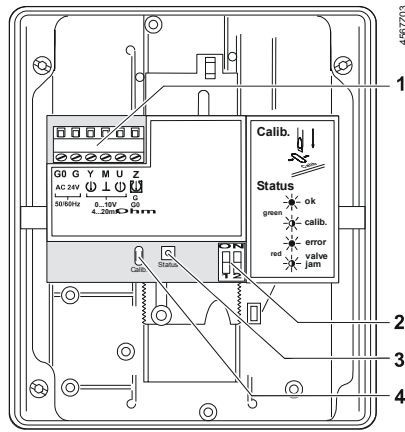
MK..563..
DC 0...10 V,
DC 4... 20 mA or,
0...1000 Ω

- Signal Y increasing: piston extends valve opens
- Signal Y decreasing: piston retracts valve closes
- Signal Y constant: piston / valve stem remain in the respective position
- Override control Z see description of override control input, page 5

Frost protection thermostat A frost protection thermostat or temperature detector can be connected to the MKD..563.. control device.





The added signals from the QAF21.. and QAF61.. cannot be connected. «Connection diagrams» for operation with frost protection thermostat or frost protection monitor refer to page 16.

Standard electronics
MK..563..



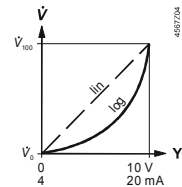
- 1 Connection terminals
- 2 Mode DIL switches
- 3 LED status indication
- 4 Slot for calibration

DIL switches
MK..563..

	Positioning signal Y Position feedback U	Flow characteristic
ON	 DC 4...20 mA	 lin = linear
OFF *)	 DC 0...10 V	 log = equal-percentage

*) Factory setting:
All switches OFF

Relationship between control signal Y and volumetric flow



Stroke calibration
MK..563..

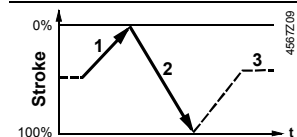
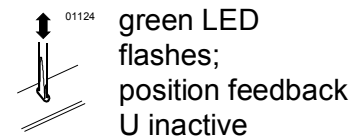
In order to determine the stroke positions 0 % and 100 % in the valve, calibration is required on initial commissioning:

Prerequisites

- AC 24 V power supply
- Red safety clamp is removed, see commissioning notes.
- Housing cover removed

Calibration

1. Short-circuit contacts in calibration slot (e.g. with a screwdriver)
2. Actuator moves to «0 %» stroke position (1) (valve closed)
3. Actuator moves to «100 %» stroke position (2) (valve open)
4. Measured values are stored








Normal operation

- | | |
|--|---|
| 5. Actuator moves to the position (3) as indicated by signals Y or Z | green LED is lit permanently; position feedback U active, the values correspond to the actual positions |
|--|---|

A lit red LED indicates a calibration error.
The calibration can be repeated any number of times.

Indication of operating state
MK..563..


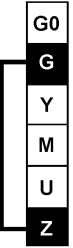
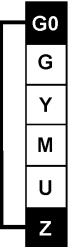
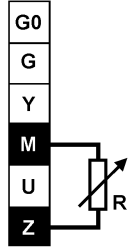
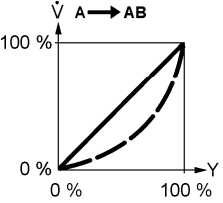
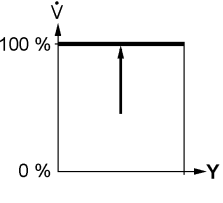
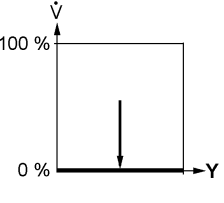
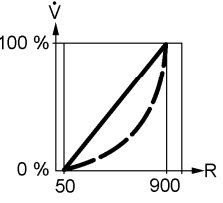
The LED status indication indicates operational status and is visible with removed cover.

LED	Indication	Function	Remarks, troubleshooting
Green	Lit 	Normal operation	Automatic operation; everything o.k.
	Flashing 	Calibration in progress	Wait until calibration is finished (LED stops flashing, green or red LED will be lit)
Red	Lit 	Faulty stroke calibration Internal error	Check mounting Restart stroke calibration (by short-circuiting calibration slot) Replace electronics
	Flashing 	Inner valve jammed	Check valve
Both	Dark 	No power supply Electronics faulty	Check mains network, check wiring Replace electronics

As a general rule, the LED can assume only the states shown above (continuously red or green, flashing red or green, or off).

Override control input Z
MK..563..

Override control input can be operated in following different modes of operation

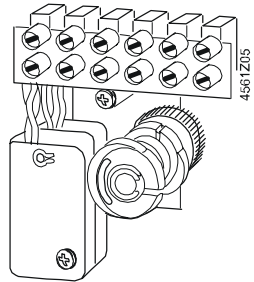
		Z-mode			
		no function	fully open	closed	override with 0...1000 Ω
Connections					
	Transfer				
		linear or equal-percentage • Z-contact not connected • Valve stroke follows Y-input	linear or equal-percentage • Z-contact connected directly to G • Y-input has no effect	linear or equal-percentage • Z-contact connected directly to G0 • Y-input has no effect	linear or equal-percentage • Z-contact connected to M via resistor R • Starting position at 50 Ω / end position at 900 Ω • Y-input has no effect

Note Shown operation modes are based on the factory setting «direct acting»
Y-input has no effect in Z-mode.

MK..533..

ASC9.3

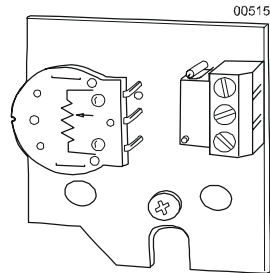
double auxiliary switch



adjustable switching points

ASZ7.3..

potentiometer



ASZ7.3: 0...1000 Ω

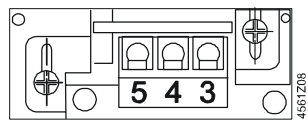
ASZ7.31: 0...135 Ω

ASZ7.32: 0...200 Ω

MK..563..

ASC1.6

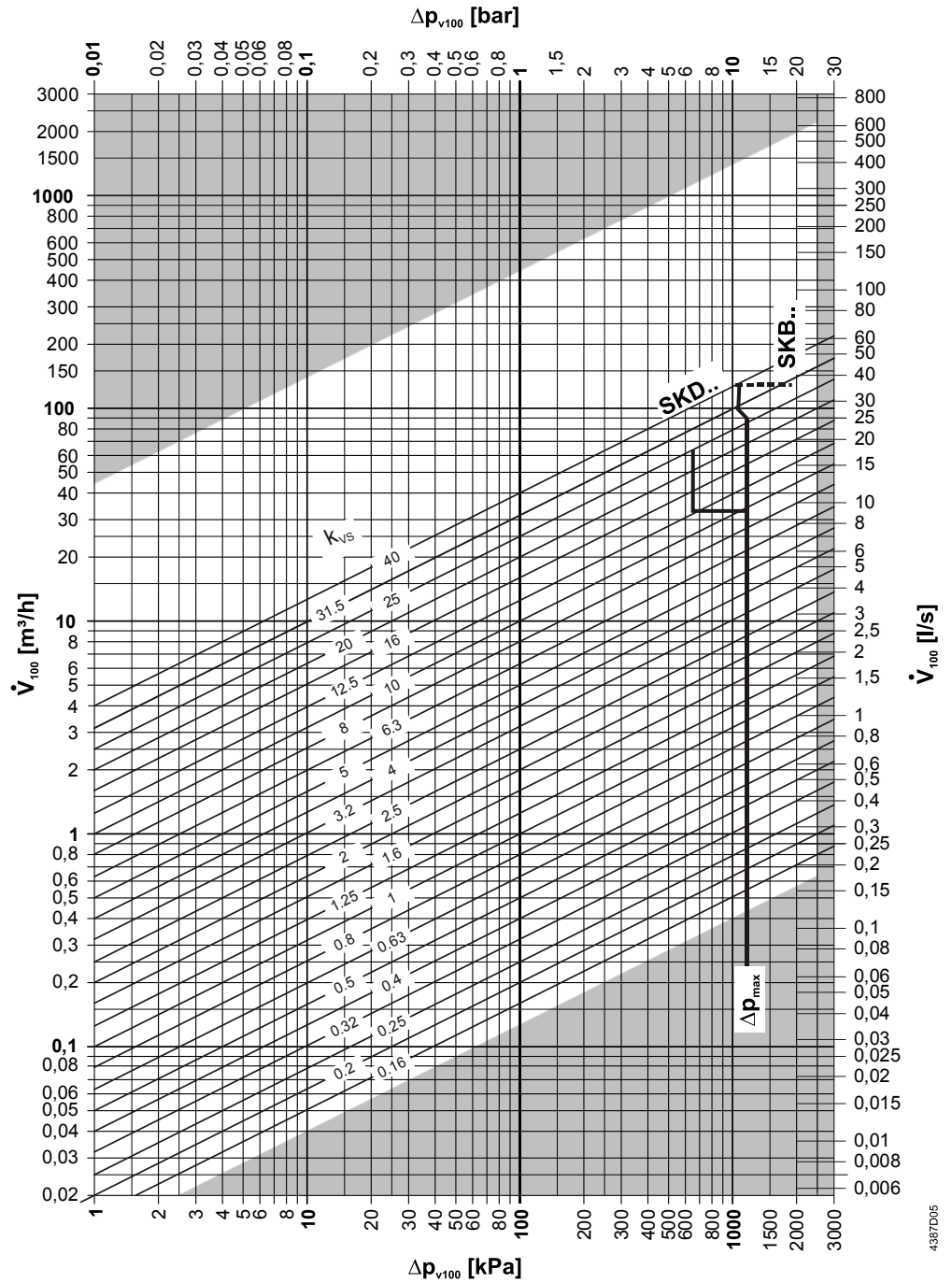
auxiliary switch



Switching point 0...5 % stroke

Sizing

Flow diagram



Δp_{max} = Maximum permissible differential pressure across the valve, valid for the entire actuating range of the motorized valve

Δp_{v100} = Differential pressure across the fully open valve and the valve's control path by a volume flow V_{100}

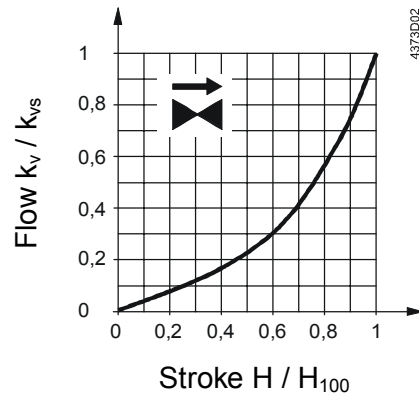
\dot{V}_{100} = Volume flow through the fully open valve (H_{100})

100 kPa = 1 bar \approx 10 mWC

1 m^3/h = 0.278 l/s water at 20 °C

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Valve flow characteristic



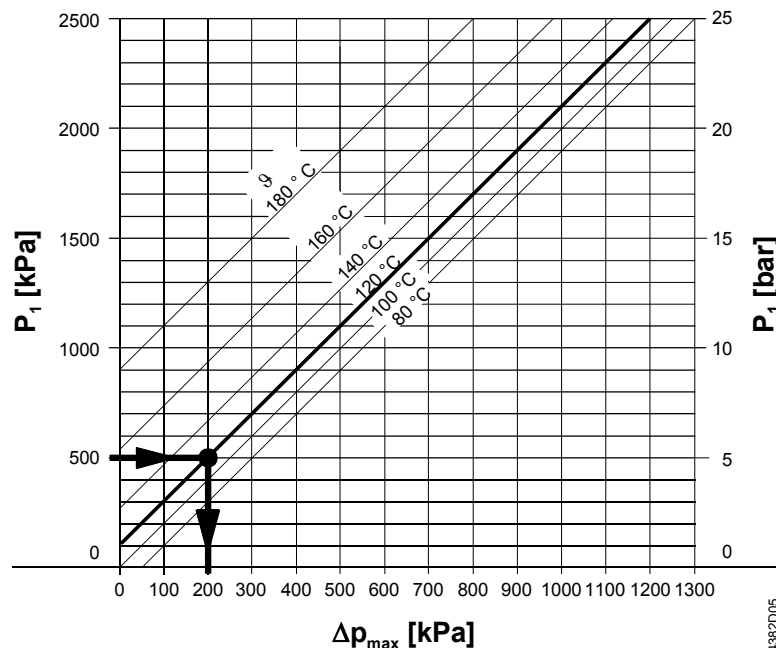
0...30 % → linear
 30...100 % → equal percentage
 $n_{gl} = 3$ as per
 VDI / VDE 2173

Cavitation

Cavitation accelerates wear on the valve plug and seat, and also results in undesirable noise. Cavitation can be avoided by not exceeding the differential pressure shown in the flow diagram on page 7 and by adhering to the static pressures shown below.

Note on chilled water

To avoid cavitation in chilled water circuits ensure sufficient counter pressure at valve outlet, e.g. by a throttling valve after the heat exchanger. Select the pressure drop across the valve at maximum according to the 80 °C curve in the flow diagram below.



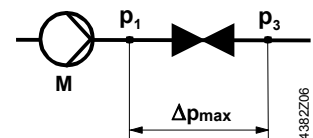
Δp_{max} = Differential pressure with valve almost closed, at which cavitation can largely be avoided

p_1 = Static pressure at inlet

p_3 = Static pressure at outlet

M = Pump

ϑ = Water temperature



High temperature hot water example:

Pressure p_1 at valve inlet: 500 kPa (5 bar)

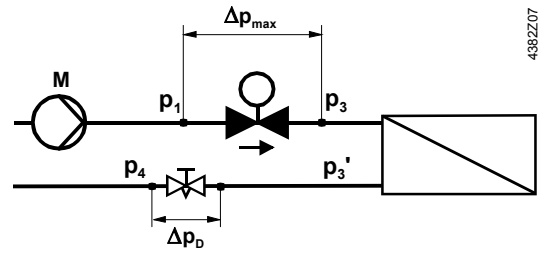
Water temperature: 120 °C

From the diagram above, it will be seen that with the valve almost closed, the maximum permissible differential pressure Δp_{max} is 200 kPa (2 bar).

Chilled water example:

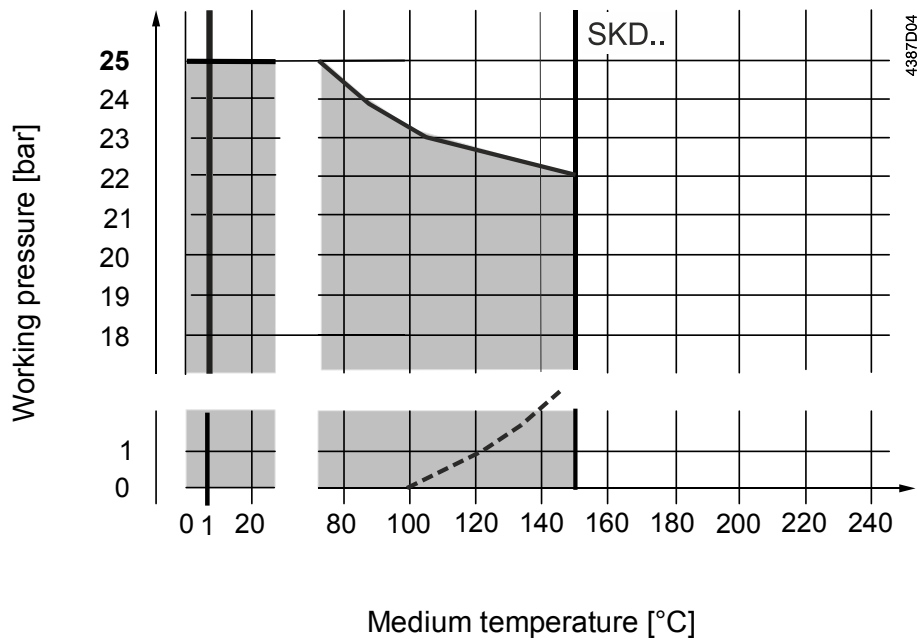
Spring water cooling as an example of avoiding cavitation:

- Chilled water = 12 °C
- p_1 = 500 kPa (5 bar)
- p_4 = 100 kPa (1 bar) (atmospheric pressure)
- Δp_{max} = 300 kPa (3 bar)
- $\Delta p_{3-3'}$ = 20 kPa (0.2 bar)
- Δp_D (throttle) = 80 kPa (0.8 bar)
- $p_{3'}$ = pressure after consumer in kPa



4382Z07

Working pressure and medium temperature
Fluids



4387D04



Working pressure and medium temperature staged as per ISO 7005
Current local legislation must be observed.

Engineering notes

We recommend installation in the return pipe, as the temperatures in this pipe are lower for applications in heating systems, which in turn, extends the stem sealing gland's life.

⚠ In open circuits the valve plug may seize as the result of scale deposits. We recommend that the valve should be exercised at regular intervals (two to three times per week).

A strainer **MUST** be fitted at the valve inlet

Ensure cavitation free flow (refer to page 8).

⚠ To ensure the reliability of the valve, we recommend the fitting of a strainer at the valve inlet even in closed circuits.

Conduct the electrical connections in accordance with local regulations on electrical installations as well as the internal or connection diagrams on page 16.

Caution ⚠ **Safety regulations and restrictions designed to ensure the safety of people and property must be observed at all times!**

Observe admissible temperatures, refer to «Use» on page 1 and «Technical data» on page 13.

If an auxiliary switch is required, its switching point should be indicated on the plant schematic.

Every actuator must be driven by a dedicated controller (refer to «Connection diagrams», page 16).

Mounting notes

Valve and actuator are preassembled and must be mounted and installed as a whole unit.

The control device is preset to 50 % stroke for flushing and pressure testing of the plant.

⚠ **Attention:** When removing anti-tamper screws approval for the safety function to DIN EN 14597 ceases!

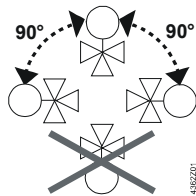
Mounting and installation instructions are by packed in the control device packing.

Control device	Installation instruction	
MKD...	–	74 319 0914 0
MK..563..	–	4 319 0326 0

The instructions for accessories are enclosed with the accessories themselves.

Accessories	Installation instructions		Accessories	Mounting instructions	
ASC1.6	G4563.3	4 319 5544 0	ASZ7.3	–	74 319 0247 0
ASC9.3	G4561.3	4 319 5545 0			

Orientation



Direction of flow

When mounting, pay attention to the valve's flow direction symbol →.
MK..5.. → Direction of action: closes against pressure

Commissioning notes



The manual adjuster must remain secured with anti-tamper screws as factory delivered.

When removing anti-tamper screws approval for the safety function to DIN EN 14597 ceases.

Valve stem retracts: valve opens = increasing flow

Valve stem extends: valve closes = decreasing flow

When commissioning the system, check the wiring and functions, and set any auxiliary switches and potentiometers as necessary, or check the existing settings.

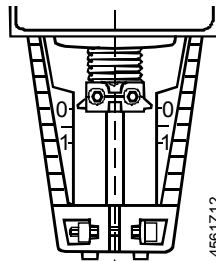
The actuator is driven to OPEN (valve open) until the red clamp, that fixes a stroke position of ca. 50 % can be easily removed. Voltage must be applied to either terminal 21 and Y1 to drive to OPEN, or voltage to G-G0 as well as Y > 70 %.



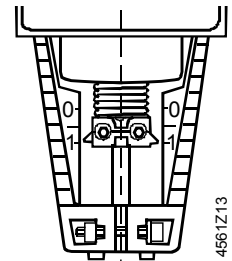
The safety function is only enabled after the red safety clamp is removed.

MKD..

Coupling fully retracted
→ stroke = 0%



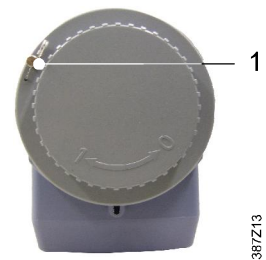
Coupling fully extended
→ stroke = 100 %



Automatic operation

The control device can only be operated in automatic mode, i.e. the red indicator marked «MAN» is not visible.

When removing anti-tamper screws (1) approval for the safety function to DIN EN 14597 ceases.



Maintenance notes



The MK..5.. control devices are equipped with maintenance-free gland materials.

When servicing the control device:

- **Never disassemble valve and actuator for maintenance or servicing else approval for the safety function to DIN EN 14597 ceases.**
- **Switch off pump of the hydronic loop**
- **Interrupt the power supply to the actuator**
- **Close the main shutoff valves in the system**
- **Release pressure in the pipes and allow them to cool down completely**
- **If necessary, disconnect electrical connections from the terminals**

Recommendation MK..563...: Trigger stroke calibration after servicing or maintenance.

Repair The control device has to be replaced as a whole unit else approval for the safety function to DIN EN 14597 ceases.



Warning

A damaged housing or cover represents an injury risk

- **NEVER uninstall an actuator from the valve**
- **Uninstall the valve-actuator combination (actuating device) as a complete device**
- **Use only properly trained technicians to uninstall the unit**
- **Send the actuating device together with an error report to your local Siemens representative for analysis and disposal**
- **Properly mount the new actuating device (valve and actuator)**

Parts could fly ultimately resulting in injuries from uninstalling an actuator with a damaged valve housing due to the tensioned return spring.

Sealing gland

It is not permitted to replace the sealing glands. In case of leakages, the control device has to be replaced as a whole unit else approval for the safety function ceases.

Disposal



The device contains electrical and electronic components and must not be disposed of together with domestic waste. This applies in particular to the PCB.

Before disposal the valve must be dismantled and separated into its various constituent materials.

Legislation may demand special handling of certain components, or it may be sensible from an ecological point of view.

Current local legislation must be observed.

Warranty

The technical data relating to specific applications are valid only in conjunction with the control devices listed in this data sheet under «Type summary», page 2.



Approval as actuating device with safety function as per DIN EN 14597 applies to the entire actuator. Approval as actuating device with safety function as per DIN EN 14597 expires if the actuator is separated from the valve. This also voids any guarantees on the part of Siemens Switzerland Ltd.

Technical data

		MKD533..	-	MKD563..	-	
Valve	PN class	PN 25 to ISO 7268				
	Working pressure	to ISO 7005 within the permissible "working pressure and medium temperature" according to the diagram on page 9				
	Flow characteristic	0...30 %	linear			
		30...100 %	equal percentage; $n_{gl} = 3$ to VDI / VDE 2173			
	Leakage rate	0...0.05 % of k_{vs} value to DIN EN 1349				
	Permissible media	cooling water, chilled water, low temperature hot water, high temperature hot water, water with anti-freeze; recommendation: water treatment to VDI 2035 Brine Steam				
	Medium temperature	Brine	+1...150 °C	-	+1...150 °C	-
		Steam	-	-	-	-
	Rangeability S_v	DN 15 / 20:	50...100			
		DN 25...50:	100...200			
Materials	Valve body	Nodular cast iron EN-GJS-400-18-LT				
	Stem	Stainless steel				
	Plug, seat	Stainless steel				
	Sealing gland	Stainless steel, silicon-free				
	Gland materials	FEPM O-ring, silicon-free				
Actuators						
Power supply	Operating voltage	AC 230 V		AC 24 V		
		± 15 %		-20 % / +30 %		
	Voltage tolerance			SELV / PELV		
	Frequency	50 or 60 Hz				
	Max. Power consumption at 50 Hz	17 VA / 12 W		14 VA / 10 W		
External supply cable fuse	<ul style="list-style-type: none"> Fuse slow 0.5...6 A Circuit breaker max. 6 A, Characteristic B, C, D according to EN 60898 Power source with current limitation of max. 6 A 		<ul style="list-style-type: none"> Fuse slow 1...10 A Circuit breaker max. 13 A, Characteristic B, C, D according to EN 60898 Power source with current limitation of max. 10 A 			

		MKD533..	-	MKD563..	-
Signal inputs	Control signal Y	3-position		DC 0...10 V, DC 4...20 mA or 0...1000 Ω	
Signal inputs	Terminal Y	Voltage Input impedance Current Input impedance Signal resolution Hysteresis		DC 0...10 V 100 kΩ DC 4...20 mA 240 Ω < 1% 1 %	
Signal inputs	Override control Z	Resistor Z not connected Z connected directly to G Z connected directly to G0 Z connected to M via 0...1000 Ω		1000 Ω No function, priority terminal Y Max. stroke 100 % Min. stroke 0 % stroke proportional to R	
Signal outputs	Position feedback U	voltage load impedance current load impedance		DC 0...9.8 V ±2 % > 10 kΩ DC 4...19.6 mA ±2 % < 500 Ω	
Operating data	Positioning time at 50 Hz				
	opening	120 s	-	50 s	-
	closing	120 s	-	15 s	-
	Spring-return time (closing)	5...25 s	-	5...25 s	-
	Nominal stroke	20 mm			
El. Connections	Cable entry	4 x M20 (Ø 20.5 mm)			
Materials	Actuator housing, bracket	Die-cast aluminum			
	Housing box and manual adjuster	Plastic			
Dimensions	Dimensions	Refer to "Dimensions", page 17			
	Weights	Refer to "Dimensions", page 17			
Norms	Electromagnetic compatibility (Application)	For residential, commercial and industrial environments			
	• EU Conformity (CE)	CE1T4563X4			
	• RCM Conformity	CE1T4566X5 ¹⁾			
	AC 230 V	CE1T4561X1			
		CE1T4564X1 ¹⁾			
	Product standards	EN 60730-x			
	Control device with safety function	DIN EN 14597 Temperature control devices and temperature limiters for heat generating systems; Actuator devices with safety functions in heat generating systems Registration no.: 1F170			
	Protection standard EN 60730	I		III	
	Housing protection standard Upright to horizontal	IP54 to EN 60529			
	Conform with C-tick			N474	
Environmental compatibility	The product environmental declaration contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).				
Pressure Equipment Directive	PED 97/23/EC				

¹⁾ The documents can be downloaded from <http://siemens.com/bt/download>.

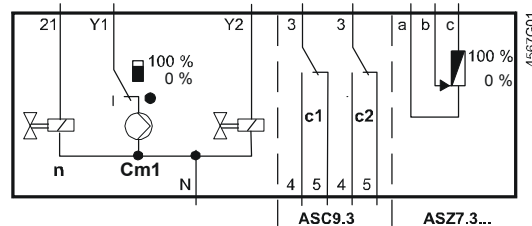
		MKD533..	-	MKD563..	-
Accessories with safety functions		As per article 3, section 1.4			
Fluid group 2		Category IV, with EC design examination module B, test authority number 0036			
Flange connections		to ISO 7005			
Accessories					
ASC1.6 Auxiliary switch	Switching capacity				AC 24 V, 10 mA...4 A ohm., 2 A ind.
ASC9.3 double auxiliary switch	Switching capacity per auxiliary switch	AC 250 V, 6 A ohm., 2.5 A ind.			
ASZ7.3 Potentiometer	Change in overall resistance of potentiometer at nominal stroke	ASZ7.3	0...1000 Ω		
		ASZ7.31	0...135 Ω		
		ASZ7.32	0...200 Ω		
	min. current in sliding contact	0.05 mA			
	expected lifetime	250'000 full lifts			
	max. current in sliding contact	2.5 mA			
	expected lifetime	100'000 full lifts			

¹⁾ The documents can be downloaded from <http://siemens.com/bt/download>.

Internal diagrams

MKD533..

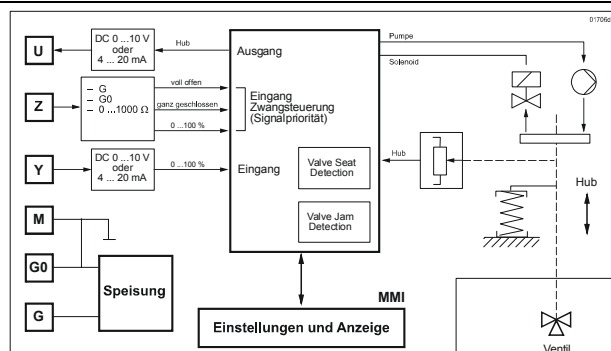
AC 230 V, 3-position



- Cm1** end switch
- n** solenoid valve for spring-return
- c1, c2** ASC9.3 double auxiliary switch
- a, b, c** ASZ7.. potentiometer
- Y1** Positioning signal «open»
- Y2** Positioning signal «close»
- 21** spring-return function
- N** neutral conductor

MKD563..

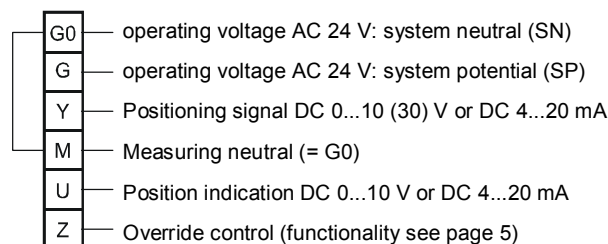
AC 24 V,
DC 0...10 V,
4...20 mA,
0...1000 Ω



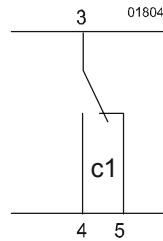
- U** position indication
- Z** override control
- Y** positioning signal
- M** measuring neutral
- G0** operating voltage AC 24 V: system neutral (SN)
- G** operating voltage AC 24 V: system potential (SP)

Connection terminals

MKD563..

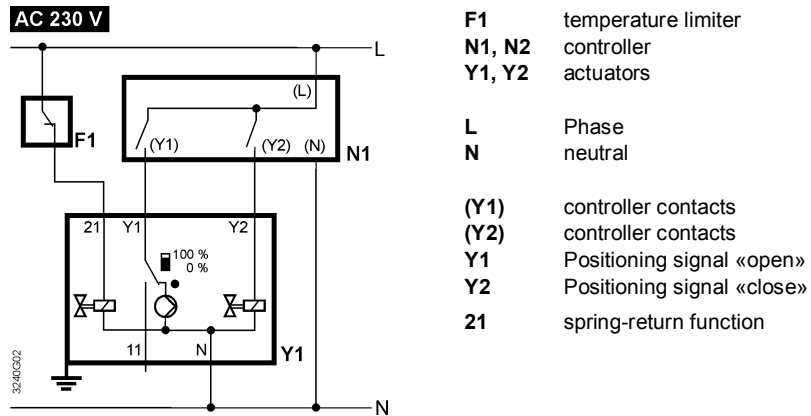


Auxiliary switch ASC1.6

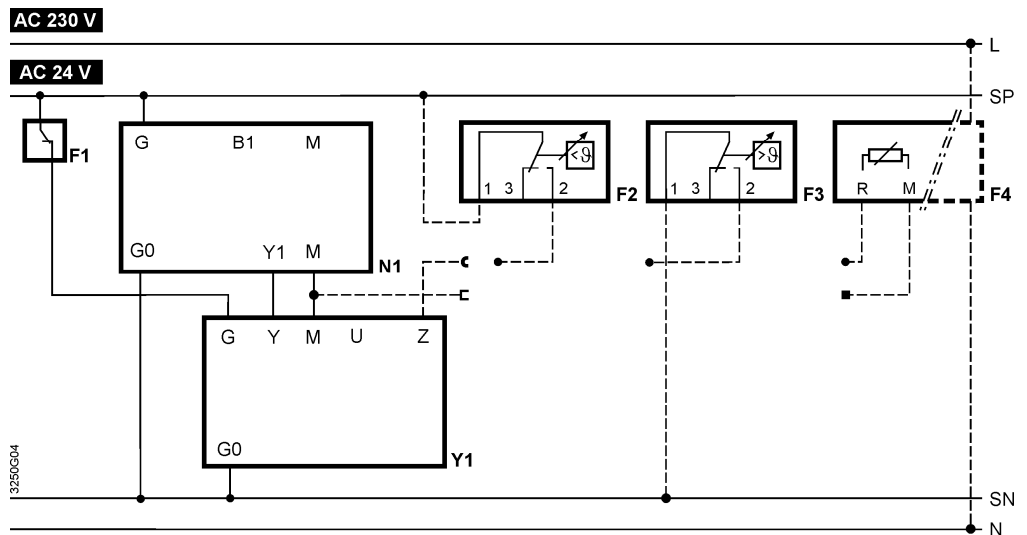


Connection diagrams

MKD533..., 3-position



MKD563..., DC 0...10 V, 4...20 mA, 0...1000 Ω

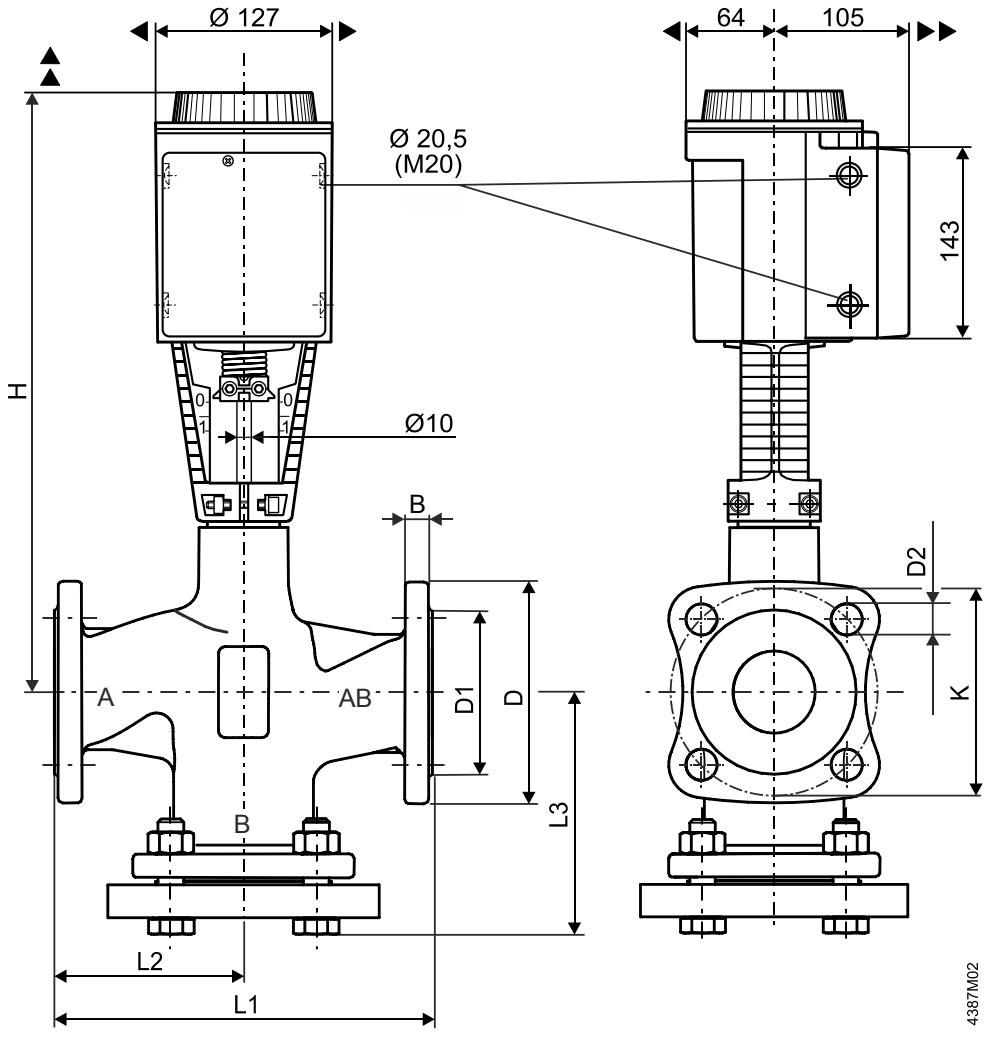


- * QAF21.. and QAF61.. frost protection monitor cannot be connected with control devices MK..5...

Dimensions

All dimensions in mm

MKD..



▶ => 100 mm Minimum clearance from ceiling or wall for mounting, connection, operation, maintenance etc.

▶▶ => 200 mm

DN	B	D Ø	D2 Ø	D1 Ø	K Ø	L1	L2	L3	H		kg	
									MKD..	-	MKD..	-
15	14	95	14 (4x)	46	65	130	65	87.5	363	-	8.1	-
20	16	105		56	75	150	75	99.5			9.2	-
25	15	115		65	85	160	80	104.5			10	-
32	17	140	19 (4x)	76	100	180	90	119	360	-	12.6	-
40	16	150		84	110	200	100	129			14	-
50	16	165		99	125	230	115	146			-	-

DN = Nominal size

Revision numbers for control devices MK..5..

Type	Valid from Rev.-No.	
MKD533..	Actuator , refer to data sheet N4561: SKD32.51	Valve , refer to data sheet N4405: VVF53..
MKD563..	Actuator , refer to data sheet N4561: SKD62	Valve , refer to data sheet N4405: VVF53..