



Modulating control valves PN 16 with magnetic actuators

MXG461B...

for domestic water, cold water and hot water systems

- Short positioning time (< 2 s), high resolution (1 : 1000)
- Selectable valve characteristic: equal-percentage or linear
- High rangeability
- Operating voltage AC / DC 24V
- Selectable standard signal inputs DC 0/2...10 V or DC 0/4...20 mA
- DC 0...20 V Phs phase-cut signal input for Staefa controllers
- Indication of operating state, visible from the outside
- Position control and position feedback signal
- Wear-free inductive stroke measurement
- Spring return facility: A → AB closed when deenergized
- Low friction, robust and maintenance-free

Use

The MXG461B... valves are mixing or throughport valves. They are supplied with the magnetic actuator ready fitted, equipped with an electronics module for position control and position feedback. When deenergized, the valve's control path A → AB is closed. The short positioning time, high resolution and high rangeability make these valves ideal for modulating control of domestic water (mains water and water in open circuits), hot and cold water systems.

Type summary

| Type reference | DN | k _{vs} [m ³ /h] | Δp _{max} [kPa] | Δp _s [kPa] | S _{NA} [VA] | P _{med} [W] | I _N Fuse [A] | Wire cross-section [mm ²] | | |
|----------------|----|--|----------------------------|--------------------------|-------------------------|-------------------------|-------------------------------|---------------------------------------|-----|-----|
| | | | | | | | | 4-wire connection | 1,5 | 2,5 |
| MXG461B15-0.6 | 15 | 0,6 | 1000 | 1000 | 33 | 15 | 3.15 | 60 | 100 | 160 |
| MXG461B15-1.5 | 15 | 1,5 | 1000 | 1000 | 33 | 15 | 3.15 | 60 | 100 | 160 |
| MXG461B15-3 | 15 | 3 | 1000 | 1000 | 33 | 15 | 3.15 | 60 | 100 | 160 |
| MXG461B20-5 | 20 | 5 | 800 | 800 | 33 | 15 | 3.15 | 60 | 100 | 160 |
| MXG461B25-8 | 25 | 8 | 700 | 700 | 33 | 15 | 3.15 | 60 | 100 | 160 |
| MXG461B32-12 | 32 | 12 | 600 | 600 | 43 | 20 | 4 | 40 | 70 | 120 |
| MXG461B40-20 | 40 | 20 | 600 | 600 | 43 | 20 | 4 | 40 | 70 | 120 |
| MXG461B50-30 | 50 | 30 | 600 | 600 | 65 | 22 | 6.3 | 30 | 50 | 80 |

Δp_{max} = max. permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorised valve

Δp_s = max. permissible differential pressure (close off pressure) at which the motorised valve will close securely against the pressure (used as throughport valve)

S_{NA} = nominal apparent power for selecting the transformer

P_{med} = typical power consumption

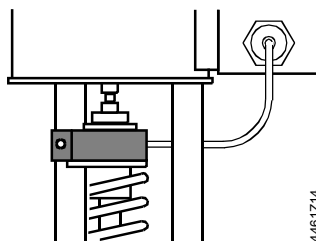
I_N = required slow fuse

k_{vs} = nominal flow rate of cold water (5 to 30 °C) through the fully openend valve (H₁₀₀) at a differential pressure of 100 kPa (1 bar)

L = max. cable length; with 4-wire connections, the max. permissible length of the separate 1.5 mm² copper positioning signal cable is 200 m

Accessories

Stem heating element
Z366



- For AC / DC 24 V / 10 W
- Required for medium temperatures < 0 °C

Order

When ordering, please give quantity, product name and type reference.

Example
1 valve MXG461B15-0.6 and
1 stem heating element Z366

Delivery

Valve body and magnetic actuator form one assembly and cannot be separated.
The brass / bronze fittings are part of the delivery.
The Z366 stem heating element is delivered in a separate package.

**Replacement
electronics module**
ASE12

Should the valve electronics prove faulty, the electronics module must be replaced by the ASE12 replacement electronics module.
Mounting Instructions 74 319 0404 0 are included.

Technical and mechanical design

For a detailed description of operation, refer to Data Sheet CA1N4028E.

Control operation

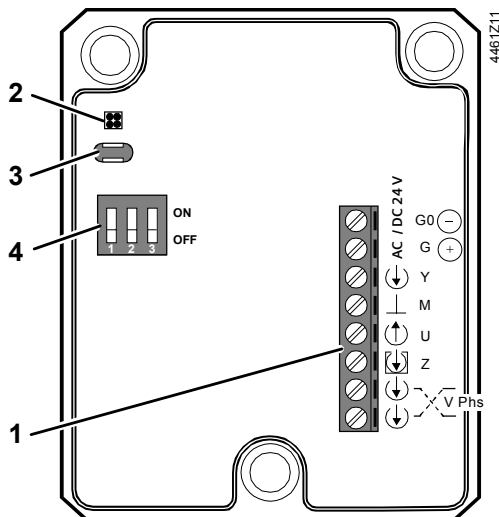
The electronics module converts the positioning signal to a phase-cut power signal which generates a magnetic field in the coil. This causes the armature to change its position in accordance with the interacting forces (magnetic field, counterspring, hydraulics, etc.). The armature responds rapidly to any change in signal, transferring the corresponding movement directly to the valve plug, enabling fast changes in load to be corrected quickly and accurately.

The valve's position is measured continuously. The internal positioning controller balances any disturbance in the system rapidly and delivers the position feedback signal. The valve stroke is proportional to the positioning signal.

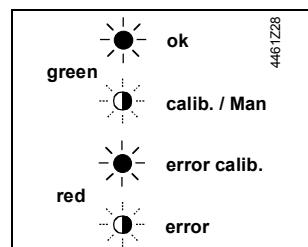
Control

The magnetic actuator can be driven by a Siemens controller or a controller of other manufacture that deliver a DC 0/2...10 V or DC 0/4... 20 mA output signal. To achieve optimum control performance, it is recommended to use a 4-wire connection. In case of DC power supply, a 4-wire connection is **mandatory!**

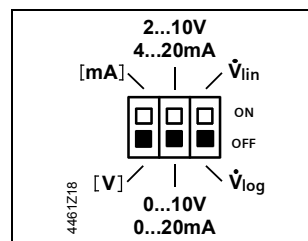
Operator controls and indicators in the electronics housing



- 1 Connection terminals
- 2 LED for indication of operating state



- 3 Slot for autocalibration
- 4 DIP switch for mode control



Spring return facility

If the positioning signal is interrupted, or in the event of a power failure, the valve's return spring will automatically close control path A → AB.

Indication of operating state

| LED | Indication | Function | Remarks, troubleshooting |
|-------|------------|---------------------------------------|--|
| Green | Lit | Control mode | Normal operation; everything o.k. |
| | Flashing | Calibration In manual control | Wait until calibration is finished (green or red LED will be lit) Hand wheel in Man or Off position |
| Red | Lit | Calibration error Internal error | Recalibrate (bridge contacts behind the calibration slot) Replace electronics module |
| | Flashing | Mains fault DC Supply - / + | Check mains network (outside the frequency or voltage range) DC supply + / - connection rectify |
| Both | Dark | No power supply Electronics faulty | Check mains network, check wiring Replace electronics module |

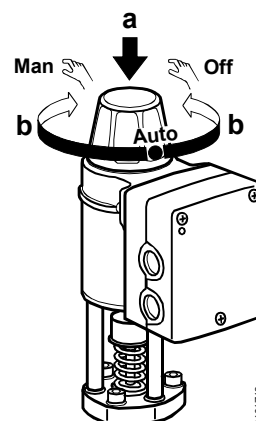
Manual control

By pressing (a) and turning (b) the hand wheel

- in clockwise (CW) direction, control path A → AB can be mechanically opened to between 80 and 90 %
- in counterclockwise (CCW) direction, the actuator will be switched off and the valve closed

As soon as the hand wheel is pressed and turned, neither the forced control signal Z nor the input signal Y or the phase-cut signal acts on the actuator. The green LED will flash.

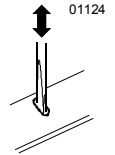
For automatic control, the hand wheel must be set to the Auto position. The green LED will be lit.



Calibration

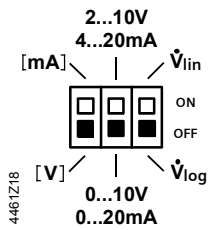
If the electronics module is replaced or the actuator turned through 180 °, the valve's electronics must be recalibrated. For that, the hand wheel must be set to Auto.

The printed circuit board has a slot (position 3, preceding page). Calibration is made by bridging the contacts located behind the slot using a screwdriver. The valve will then travel across the full stroke to store the end positions.



While calibration is in progress, the green LED will flash for about 10 seconds (also refer to «Indication of operating state»).

Configuration DIP switches



| Switch | Function | OFF (Default) | ON |
|--------------|---------------------------|------------------------------|------------------------|
| 1 | Positioning signal Y | [V] | [mA] |
| 2 | Positioning range Y and U | 0...10 V 0...20 mA | 2...10 V, 4...20 mA |
| 3 | Valve characteristic | V_{log} (equal percentage) | V_{lin} (linear) |

Assignment positioning signal Y: Voltage or current

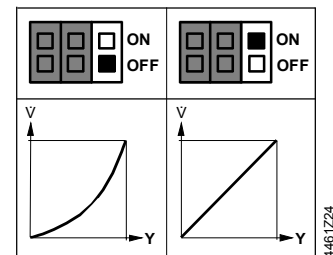
| Y | ON OFF | ON OFF |
|---|-----------|-----------|
| | 0...10 V | 2...10 V |
| | 0...20 mA | 4...20 mA |

Assignment positioning range Y and U: 0...10 V / 0...20 mA or 2...10 V / 4...20 mA

| U | ON OFF | ON OFF |
|--------------------|-----------|-----------|
| $R_i > 500 \Omega$ | 0...10 V | 2...10 V |
| $R_i < 500 \Omega$ | 0...20 mA | 4...20 mA |

Output signal U (position feedback signal) is dependent on the load resistance. Above 500 Ω , it is automatically a voltage signal, below 500 Ω a current signal.

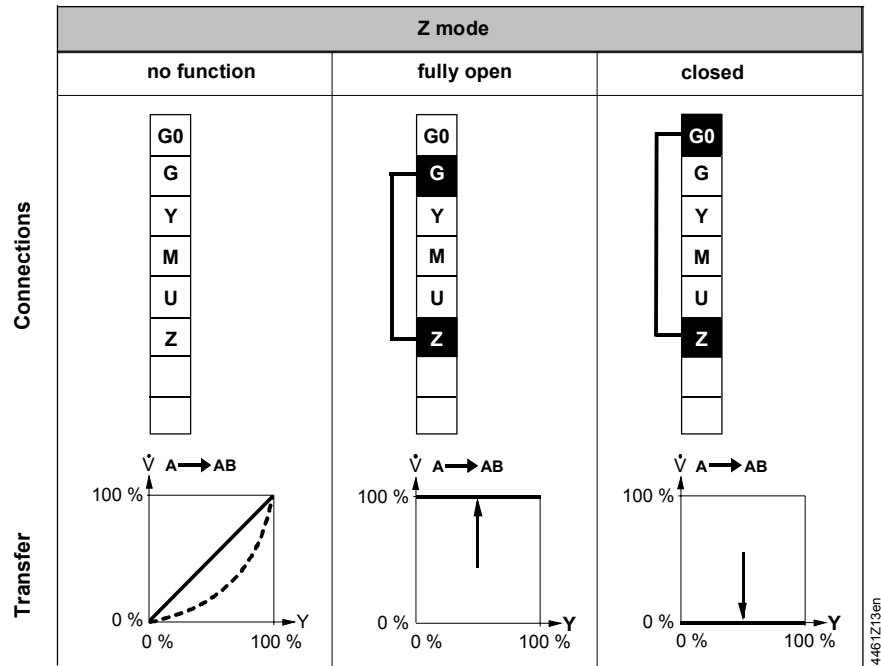
Selection of valve characteristic (Positioning signal against volumetric flow): Equal-percentage or linear



Forced control input

If terminal Z for the forced control input

- is not connected, the valve will follow the Y-signal or the phase-cut signal
- is connected to G, the valve will fully open via control path A → AB
- is connected to G0, the valve will close via control path A → AB

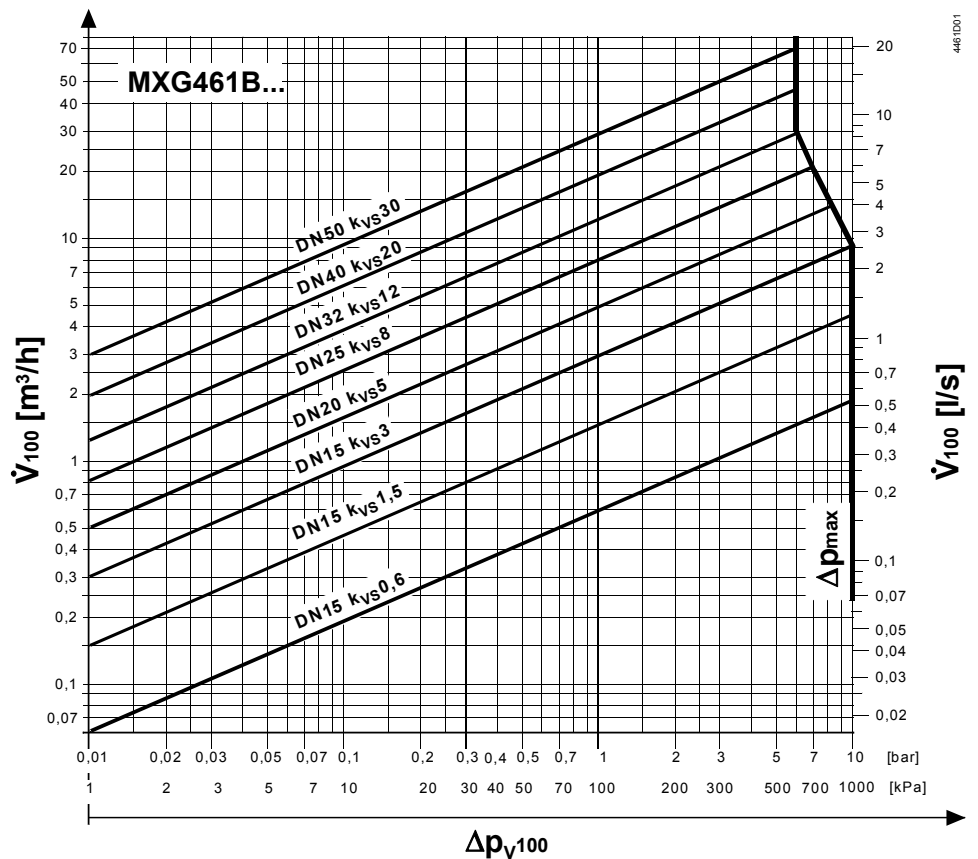


Signal priority

1. Hand wheel position Man (open) or Off
2. Forced control signal Z
3. Phase-cut signal
4. Signal input Y

Sizing

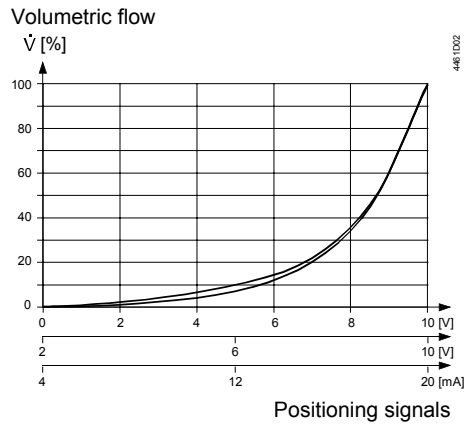
Flow chart



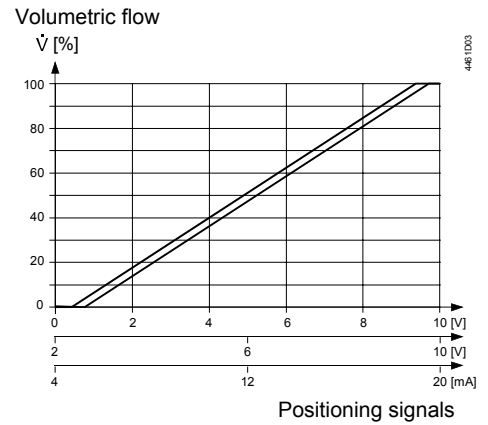
Δp_{V100} = differential pressure across the fully open valve and the valve's control path A → AB by a volume flow \dot{V}_{100}
 \dot{V}_{100} = volume flow through the fully open valve (H_{100})
 Δp_{max} = max. permissible differential pressure across the valve's control path for the entire actuating range of the motorised valve
 100 kPa = 1 bar ≈ 10 mWS
 1 m³/h = 0,278 l/s water at 20 °C

Valve characteristic

Equal percentage



Linear



Mounting notes

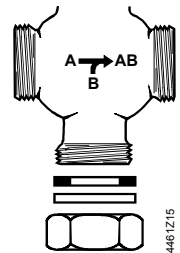
The valve is supplied complete with Mounting Instructions 74 319 0378 0.

Caution

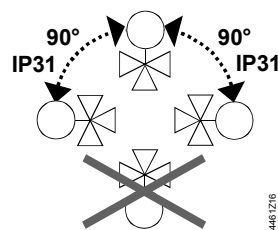
The valve may only be used as a mixing or throughport valve, not as a diverting valve. Observe the direction of flow!

When used as a throughport valve

The MXG461B... valves are supplied as three-port valves, but can also be used as throughport valves: In that case, close off port "B" with the accessories provided (nut, cover and gasket).

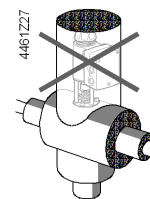
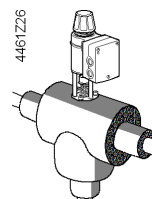
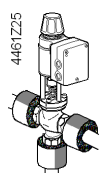


Orientation



Installation notes

- The MXG461B... valves are flat-faced allowing sealing with the gaskets provided
- Do not use hemp for sealing the valve body threads
- The actuator may not be lagged



For electrical installation, refer to «Connection diagrams».

Maintenance notes

The valves are maintenance-free.

The low friction and robust design make regular servicing unnecessary and ensure a long service life.

The valve stem is sealed from external influences by a maintenance-free gland.

If the red LED is lit, the electronics must be recalibrated or replaced.

Repair

Should the valve electronics prove faulty, the electronics module must be replaced by the ASE12 replacement electronics module (refer to Mounting Instructions 74 319 0404 0).

Caution

Always disconnect power before fitting or removing the electronics module.

After replacing the electronics module, calibration must be triggered in order to optimally match the electronics to the valve (refer to «Calibration»).



Disposal

The actuator must not be disposed of together with domestic waste. This applies in particular to the PCB.

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

Application-specific technical data must be observed.

If specified limits are not observed, Siemens Switzerland Ltd / HVAC Products will not assume any responsibility.

Technical data

Functional actuator data

| | | | |
|---------------------------------|-------------------------------------|---|---|
| • Power supply | Extra low-voltage only (SELV, PELV) | | |
| | • AC 24 V | Operating voltage | AC 24 V +20 / -15 % |
| | | Frequency | 45...65 Hz |
| | | Typical power consumption | P_{med} refer to table «Type summary» |
| | | Standby | < 1 W (valve closed) |
| | | Rated apparent power S_{NA} | refer to table «Type summary» |
| | | Required fuse I_N | slow, refer to table «Type summary» |
| | • DC 24 V | Operating voltage | DC 20...30 V |
| | | Current draw at DC 24 V | 0,5 A / 4 A (max.) |
| | • Input | Positioning signal Y | DC 0/2...10 V or DC 0/4...20 mA |
| Impedance | | DC 0/2...10 V | 100 k Ω // 5nF |
| | | DC 0/4...20 mA | 240 Ω // 5nF |
| Forced control | | | |
| Impedance | | | 22 k Ω |
| Close valve (Z connected to G0) | | < AC 1 V; < DC 0,8 V | |
| Open valve (Z connected to G) | | > AC 6 V; > DC 5 V | |
| No function (Z not wired) | | phase-cut- or positioning signal Y active | |
| • Output | Position feedback signal | Voltage | DC 0/2...10 V; load resistance > 500 Ω |
| | | Current | DC 0/4...20 mA; load resistance \leq 500 Ω |
| | Stroke measurement | | Inductive |
| | Nonlinearity | | \pm 3 % of end value |

Functional valve data

| | | |
|------------------------|---|---|
| | PN class | PN 16 to EN 1333 |
| | Permissible operating pressure ¹⁾ | 1,6 MPa (16 bar) |
| | Differential pressure $\Delta p_{\max} / \Delta p_s$ | refer to table «Type summary» |
| | Leakage rate at $\Delta p = 0,1 \text{ MPa (1 bar)}$ | A → AB max. 0,05 % k_{VS} (to DIN EN 1349) B → AB depending on operating conditions ($< 0,2 \text{ \% } k_{VS}$) |
| | Permissible media | domestic water, cold and hot water, water with anti-freeze; recommendation: water treatment to VDI 2035 |
| | Medium temperature ²⁾ | -20...130 °C |
| | Valve characteristic ³⁾ | equal percentage or linear, optimized near the closing point (refer to Data Sheet N4023) |
| | Stroke resolution $\Delta H / H_{100}$ | 1 : 1000 (H = stroke) |
| | Mode of operation | modulating |
| | Position when deenergized | A → AB closed |
| | Mounting position | upright to horizontal |
| | Positioning time | < 2 s |
| Materials | Valve body | CC491K (Rg 5) |
| | Covering flange | CC491K (Rg 5) |
| | Seat / plug | CrNi steel |
| | Valve stem seal | EPDM (O-ring) |
| Pipe connections | Fittings | bronze / brass |
| Electrical connections | Cable entries | 2 x $\varnothing 20,5 \text{ mm}$ (for M20) |
| | Connection terminals | screw terminals for 4 mm ² wires |
| | Min. cross-sectional area | 0,75 mm ² |
| | Max. cable length | refer to «Type summary» |
| Dimensions / weight | Dimensions | refer to «Dimensions» |
| | Weight | refer to «Dimensions» |
| Norms and standards | Degree of protection | IP 31 to IEC 60529 |
| | Conforming to | CE requirements UL 873 certified to Canadian standard C22.2 No. 24 C-Tick N 474 PED 97/23/EC: pressure-carrying parts Par. 1, section 2.1.4 / Par. 3, section 3 Fluid group 2 |
| | AC + DC: Immunity | Industrial IEC 61000-6-2 ⁴⁾ |
| | AC: Emissions | Residential IEC 61000-6-3 |
| | DC: Emissions | CISPR 22, class B |
| | Immunity (HF) | IEC 1000-4-3; IEC 1000-4-6 (10 V/m) |
| | Emissions (HF) | EN 55022, CISPR 22, class B |
| | Vibration ⁵⁾ | IEC 68-2-6 (1 g acceleration, 1...100 Hz, 10 min) |

¹⁾ Tested at 1.5 x PN (24 bar), similar to DIN 3230-3

²⁾ For medium temperatures $< 0 \text{ °C}$, the Z366 stem heating element is required

³⁾ Can be selected via DIP switch

⁴⁾ Transformer 160 VA (e.g. Siemens 4AM 3842-4TN00-0EA0)

⁵⁾ In case of strong vibrations, use high-flex stranded wires for safety reasons.

General environmental conditions

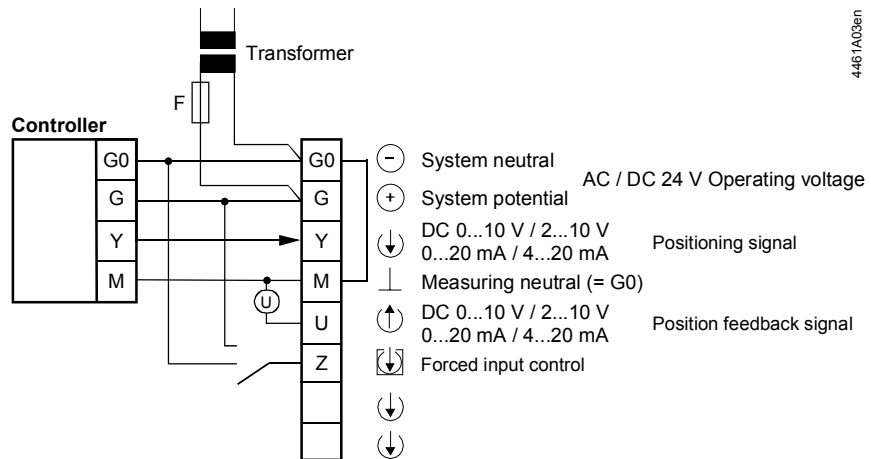
| | Operation IEC 721-3-3 | Transport IEC 721-3-2 | Storage IEC 721-3-1 |
|-----------------------|---------------------------------|---------------------------------|-------------------------------|
| Climatic conditions | Class 3K5 | Class 2K3 | Class 1K3 |
| Temperature | -5...+45 °C | -25...+70 °C | -5...+45 °C |
| Humidity | 5...95 % r.h. | 5...95 % r.h. | 5...95 % r.h. |
| Mechanical conditions | IEC 721-3-6 Class 6M2 | | |

Connection diagrams

Caution ⚠ **If controller and valve receive their power from separate sources, only one transformer may be earthed on the secondary side.**

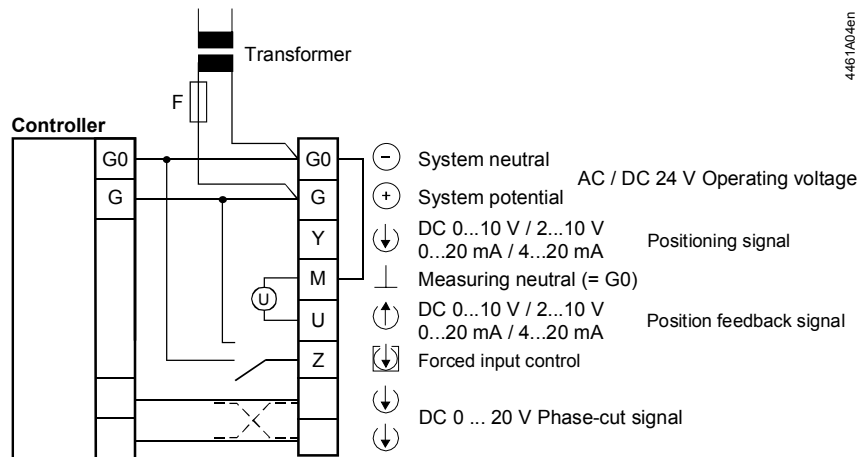
Caution ⚠ **In case of DC power supply, a 4-wire connection is mandatory!**

Controllers with
 DC 0...10 V
 DC 2...10 V
 DC 0...20 mA
 DC 4...20 mA



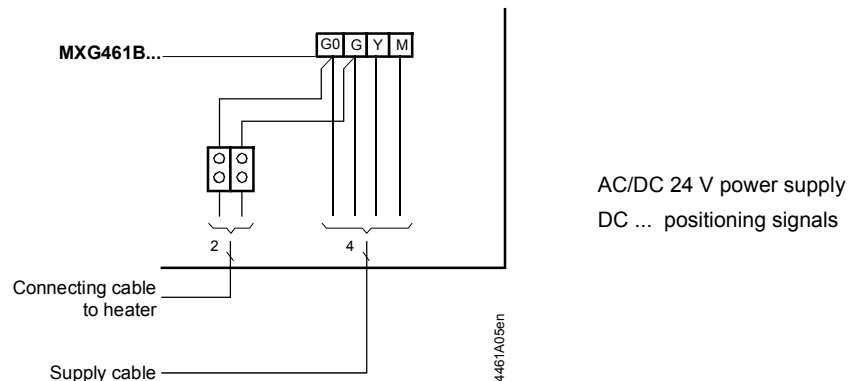
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Controllers with phase-cut
 DC 0...20 V



4461A04en

Stem heating element
 Z366

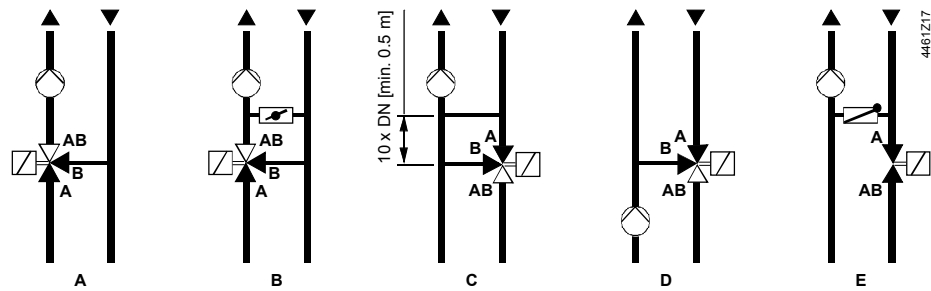


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Application examples

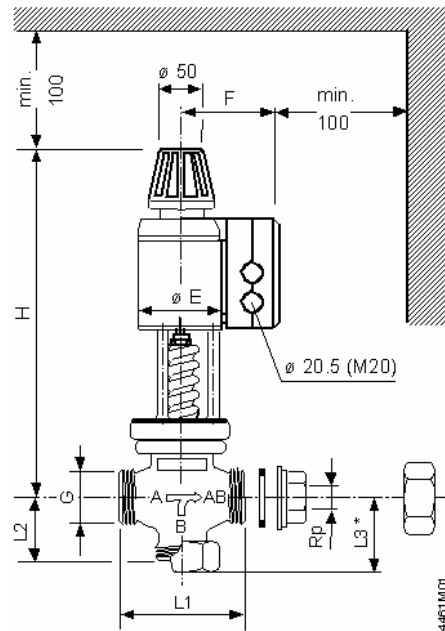
Hydraulic circuits

The examples shown below are basic diagrams with no installation-specific details.



- A Mixing circuit
- B Mixing circuit with bypass (underfloor heating system)
- C Injection circuit
- D Diverting circuit
- E Injection circuit with throughport valve

Dimensions



Externally threaded G...B to ISO 228/1
Internally threaded Rp... to ISO 7/1
Fittings to ISO 49 / DIN 2950
(supplied complete with flange gaskets)

| Type reference | DN | G [Zoll] | Rp [Zoll] | L1 [mm] | L2 [mm] | L3* [mm] | H [mm] | E [mm] | F [mm] | Weight ¹⁾ [kg] |
|----------------|----|-------------|--------------|------------|------------|-------------|-----------|-----------|-----------|------------------------------|
| MXG461B15-0.6 | 15 | G1B | Rp ½ | 80 | 42,5 | 50 | 340 | 80 | 115 | 7,1 |
| MXG461B15-1.5 | 15 | G1B | Rp ½ | 80 | 42,5 | 50 | 340 | 80 | 115 | 7,3 |
| MXG461B15-3 | 15 | G1B | Rp ½ | 80 | 42,5 | 50 | 340 | 80 | 115 | 7,3 |
| MXG461B20-5 | 20 | G1¼B | Rp ¾ | 95 | 52,5 | 60 | 339 | 80 | 115 | 7,7 |
| MXG461B25-8 | 25 | G1½B | Rp 1 | 110 | 56,5 | 64 | 346 | 80 | 115 | 8,5 |
| MXG461B32-12 | 32 | G2B | Rp 1¼ | 125 | 67,5 | 75 | 384 | 100 | 125 | 12,8 |
| MXG461B40-20 | 40 | G2¼B | Rp 1½ | 140 | 80,5 | 93 | 401 | 100 | 125 | 14,6 |
| MXG461B50-30 | 50 | G2¾B | Rp 2 | 170 | 93,5 | 108 | 402 | 100 | 125 | 18,6 |

* When used as a throughport valve
1) Weight incl. packaging