

## Modulating control valves PN16 with magnetic actuators

**MXG461...**  
**MXF461...**

with positioning control and position feedback  
for control of hot and chilled water systems

---

Mixing or straight-through valves with magnetic actuators for modulating control of hot and chilled water systems in closed circuits.

- Fast positioning time ( 1 s), high-resolution stroke (1 : 1000)
- Equal-percentage or linear valve characteristic (user-selected)
- High rangeability
- Switch-selected control signal: DC 0 ...10 V / DC 2 ...10 V or DC 4 ... 20 mA
- DC 0 ... 20 V phase cut control signal with SEZ91.6 external interface
- Wear-free inductive stroke measurement
- Robust, no maintenance required
- Fail-safe feature: A → AB closed when de-energised
- Positioning control, position feedback and manual control

---

### Use

The MXG461... (screwed fitting) and MXF461... (flange fitting) valves are mixing or straight-through valves with a pre-mounted magnetic actuator. The magnetic actuator incorporates an electronic module for position control and positioning feedback. Control path A → AB is closed when the valve is de-energised.

**Caution**      **The valve is suitable for straight-through or three-way applications and may be installed only in a mixing arrangement. The direction of flow MUST be as indicated on the valve (A->AB).**

The fast positioning time, high resolution and high rangeability make these valves ideal for modulating control of chilled and hot water systems in closed circuits. Their sturdy construction makes maintenance and regular servicing unnecessary and ensures a long service life.

## Types

---

The MX...461... valves are available with screwed or flange fittings:

<b>MXG461...</b>	Screwed valves	DN08 ... DN50
<b>MXF461...</b>	Flanged valves	DN08 ... DN65

For detailed type codes, see 'Sizing'.

## Ordering

---

- For screwed valves, the required number of ALG... coupling sets must be ordered as a separate item (see 'Accessories').
- When using flanged valves in straight-through applications, a blank flange is required. If needed, this must be ordered as a separate item (see 'Accessories').

When ordering, please state the quantity, product description and type code of each item.

*Example: 1 flanged valve, type MXF461.40-20 and 1 blank flange, type Z155/40*

## Principles / Construction

---

See data sheet CA1N4028E for a detailed description.

### Automatic control

The control signal is converted by a microprocessor in the electronics module into a phase-cut output signal which generates a magnetic field in the core. This causes the only moving part, the armature, to change its position in accordance with the interacting forces (magnetic field, counter-spring, hydraulics etc.). The armature responds rapidly to any change in signal, transferring the corresponding movement directly to the control disc, enabling fast changes in load to be corrected quickly and accurately.

The valve position is measured continuously.

The positioning controller ensures an exactly proportional relationship between the control signal and the valve stroke.

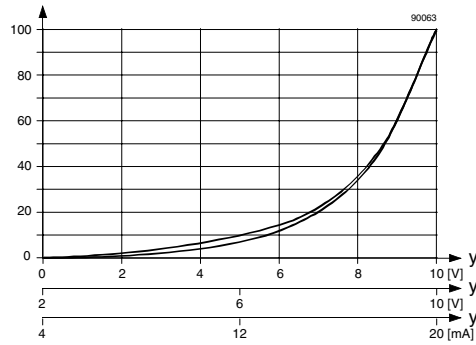
In the event of a power failure, or if the power is switched off, the spring force closes the valve automatically (control path ports A → AB).

Valve characteristic

*Equal-percentage*

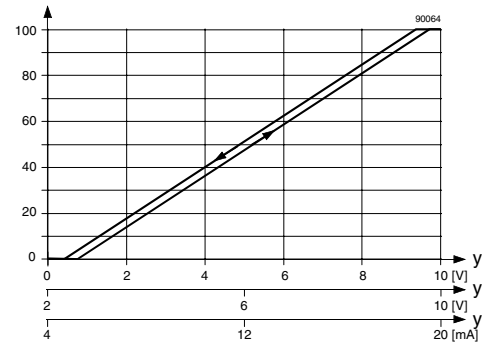
*Linear*

Volumetric flow  
 $\dot{V}$  [%]



Control signal

Volumetric flow  
 $\dot{V}$  [%]



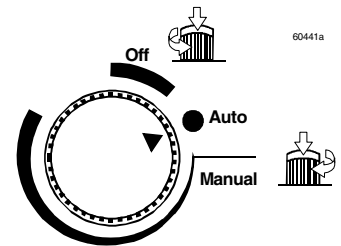
Control signal

**Manual control**

The valve control path (ports A → AB) can be opened manually to between 80 and 100% of the full stroke (depending on DN) by pressing the hand-wheel inwards and turning it clockwise (MANUAL setting). This disables the control signal from the controller.

To disable automatic control of the valve, press the hand-wheel inwards and turn it anti-clockwise (to the OFF position). The valve will close.

For automatic control, the hand-wheel must be set to the AUTO position (the hand-wheel will spring out).



**LED indicators**

The two-colour LED display indicating operating status can be viewed by opening the cover of the electronics module (see diagram on page 8)

<b>LED green</b>	On continuously	Automatic mode: 'Auto' (normal, no faults)
	Flashing	<ul style="list-style-type: none"> <li>– Mechanically set to 'Manual'</li> <li>– Mechanically set to 'Off'</li> <li>– Currently in 'Calibration' mode</li> </ul>
<b>LED red</b>	On continuously	<ul style="list-style-type: none"> <li>– General fault</li> <li>– General calibration error</li> <li>– Microcontroller fault</li> </ul>
	Flashing	– Faulty AC 24 V supply (e.g. too low)
<b>LED</b>	Off	<ul style="list-style-type: none"> <li>– No AC 24 V supply</li> <li>– Faulty electronics module</li> </ul>

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

**Z155/...** Blank flange for flanged valves DN08 ... DN65, see also page 6.

**ALG...** Coupling sets (black cast iron) for MXG461... screwed valves (to ISO49 / DIN2950). The type ALG... coupling set comes complete with nut, cover and gasket.

The required number of coupling sets must be ordered as a separate item.

Type	External thread [inches]	Internal thread [inches]	Weight [kg]
<b>ALG15</b>	G1B	Rp½	0,35
<b>ALG20</b>	G1¼B	Rp¾	0,60
<b>ALG25</b>	G1½B	Rp1	0,75
<b>ALG32</b>	G2B	Rp1¼	1,20
<b>ALG40</b>	G2¼B	Rp1½	1,45
<b>ALG50</b>	G2¾B	Rp2	2,20

**SEZ91.6** External interface for DC 0 ... 20 V phase cut control signal. See data sheet CA1N5143E.

Sizing

4-wire-connection

Note: As a rule, preference should be given to 4-wire connections.

Valve type	DN [mm]	kvs [m³/h]	Δp <sub>vmax</sub>		P <sub>NA</sub> <sup>1)</sup> [VA]	P <sub>med</sub> <sup>1)</sup> [VA]	P <sub>NT</sub> [VA]	Wire cross-section [mm²]			
			[kPa]	[bar]				0,75	1,5	2,5	4,0
<b>MX...461.15-0.6</b>	08/15	0,6	300	3	22	4	38	33	65	110	160
<b>MX...461.15-1.5</b>	10/15	1,5	300	3	22	4	38	33	65	110	160
<b>MX...461.15-3.0</b>	15	3,0	300	3	22	4	38	33	65	110	160
<b>MX...461.20-5.0</b>	20	5,0	300	3	22	4	38	33	65	110	160
<b>MX...461.25-8.0</b>	25	8,0	300	3	22	4	38	33	65	110	160
<b>MX...461.32-12</b>	32	12	300	3	22	4	38	33	65	110	160
<b>MX...461.40-20</b>	40	20	300	3	36	7	60	20	36	60	100
<b>MX...461.50-30</b>	50	30	300	3	36	9	60	20	36	60	100
<b>MXF461.65-50</b>	65	50	300	3	45	12	75	15	30	50	80

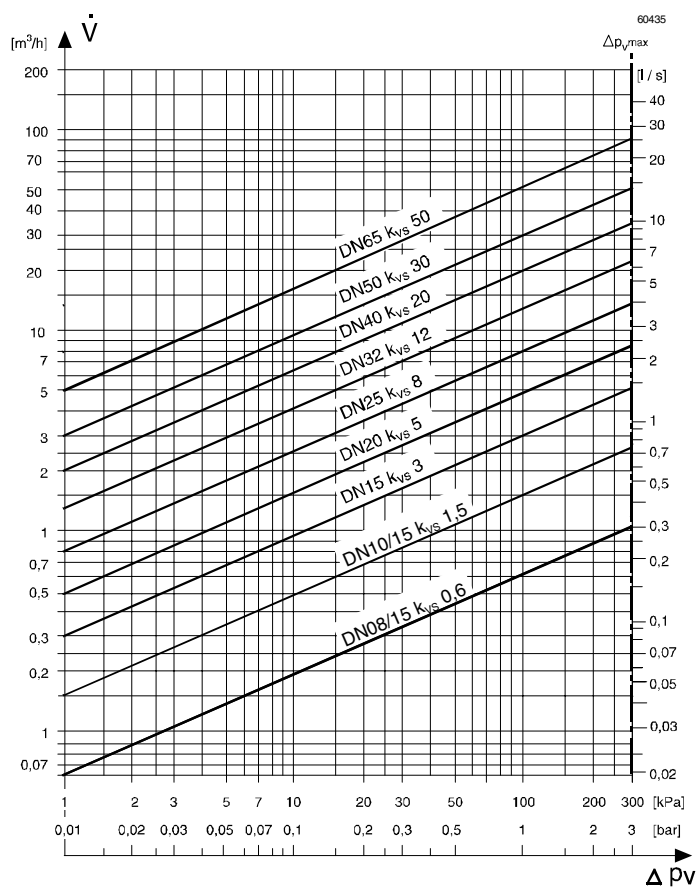
3-wire-connection

Valve type	DN [mm]	kvs [m³/h]	Δp <sub>vmax</sub>		P <sub>NA</sub> <sup>1)</sup> [VA]	P <sub>med</sub> <sup>1)</sup> [VA]	P <sub>NT</sub> [VA]	Wire cross-section [mm²]			
			[kPa]	[bar]				0,75	1,5	2,5	4,0
<b>MX...461.15-0.6</b>	08/15	0,6	300	3	22	4	38	11	21	36	53
<b>MX...461.15-1.5</b>	10/15	1,5	300	3	22	4	38	11	21	36	53
<b>MX...461.15-3.0</b>	15	3,0	300	3	22	4	38	11	21	36	53
<b>MX...461.20-5.0</b>	20	5,0	300	3	22	4	38	11	21	36	53
<b>MX...461.25-8.0</b>	25	8,0	300	3	22	4	38	11	21	36	53
<b>MX...461.32-12</b>	32	12	300	3	22	4	38	11	21	36	53
<b>MX...461.40-20</b>	40	20	300	3	36	7	60	7	12	20	33
<b>MX...461.50-30</b>	50	30	300	3	36	9	60	7	12	20	33
<b>MXF461.65-50</b>	65	50	300	3	45	12	75	5	10	17	26

- Δp<sub>vmax</sub> = Max. admissible pressure differential with valve closed
- P<sub>NA</sub> = Nominal power (at 45 °C). Fuse protection (slow blow) min. 1.5 x nominal power. Local installation regulations must be observed.
- P<sub>med</sub> = Mean operating power
- P<sub>NT</sub> = Nominal transformer power
- kvs = Flow rate to IEC534-2-4  
Control path A → AB : Tolerance ± 5 %,  
Control path B → AB : Tolerance ±10 %
- L = Max. cable length. With 4-wire connections, the maximum permissible length of the separate 1.5 mm² Cu signal cable is 200 m.
- 1) = All data relates to a supply of AC 24.0 V

## Water flow chart

Flow / pressure-differential relationship.  $k_{vs}$  signifies the volume of water  $\dot{V}$  in  $m^3/h$  which flows through the open valve at a pressure differential  $\Delta p_v$  of 100 kPa (1 bar). See data sheet CA1N4023E for notes on calculating the value of  $k_{vs}$ .



## Recommendation

Water systems should be cleaned, flushed and treated in accordance with current good practice, as described, for example, in the BSRIA Application Guides AG 8/91 and AG 2/93. For other relevant information, see CIBSE Guide B (Section 7).

## Mounting

Mounting and operating instructions are printed on the actuator and on the electronics module.

The valve is suitable only for straight-through or three-way applications and may be installed only in a mixing arrangement. In the case of the straight-through valve, strict observance of the direction of flow is essential.

Valve must be mounted in the vertical or horizontal position only. The control head must NOT be mounted below the horizontal.

## Protection standard

- *Upright mounting:*  
with PG13.5 cable gland supplied by installer IP54
- *Horizontal mounting:*  
with PG13.5 cable gland supplied by installer IP31

## Access for installation

It is essential to maintain the specified minimum clearance above and to the side of the actuator and/or electronics module. See also 'Dimensions' on page 10.

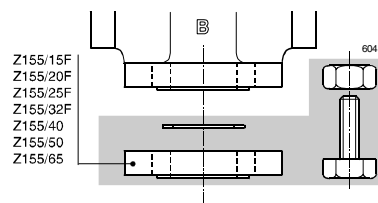
- DN08/15 ... DN32 = 100 mm
- DN40 ... DN65 = 150 mm

## Straight-through valves

Only three-way MX...461... valves are supplied. They may be used as straight-through valves by closing off port 'B':

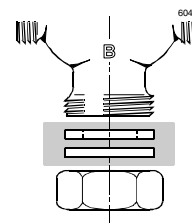
MXF461... flanged valves in straight-through applications

Port 'B' can be sealed with part Z155/... which must be ordered as a separate item.  
The blank flanges come complete with seal, screws, spring washers and nuts.  
DN15 ... DN32 Blank flange (Z155/15F ... Z155/32F)  
DN40 ... DN65 Blank flange (Z155/40 ... Z155/65)



MXG461... screwed valves in straight-through applications

Port 'B' can be sealed with the accessories supplied (cover, gasket and the nut for the type ALG.. coupling).  
The requisite number of ALG... coupling sets (to ISO49 / DIN2950) must be ordered as a separate item.  
Each ALG.. coupling set comprises a nut, threaded insert and gasket.



## Installation

- The type MXG461... screwed valves are flat-faced to facilitate sealing with the gaskets supplied.
- The use of hemp, tape or thread-sealing compound must be avoided.
- The actuator must not be lagged.
- For notes on electrical installation, see page 8, 'Terminal layout'.

## Maintenance

The valves and actuators require no maintenance or service. The valve stem is sealed from external influences by a maintenance-free O-ring gland.

Should the valve electronics prove faulty, the electronics module should be exchanged.

Replacement parts

Electronics module	Nominal size
ASE1	DN15 ... DN32
ASE2	DN40 ... DN65

A mounting instruction is enclosed with the electronics module (No. 35678).

### Warning

**Under operating conditions within the limits defined by the application data, the actuator will become hot, but this does not represent a fire risk. Always maintain the minimum clearance specified (see 'Dimensions', page 10).**

## Technical data

Electrical interface	Power supply	For use with low voltage only (SELV, PELV)
	Supply voltage	AC 24 V, 50/60 Hz (concentric transformer winding)
	Max. voltage tolerance	+20/ -15 %
	Control signal (user-selected)	DC 0 ...10 V, DC 2 ...10 V oder DC 4 ... 20 mA
	Input impedance	> 100 kOhm (load < 0.1 mA) at DC 0(2) ...10 V
	Load impedance	100 Ohm at DC 4 ... 20 mA control signal
	Nominal power	See table 'Sizing'
	Position feedback	Stroke measurement: inductive
	Output	DC 0...10 V corresponding to 0...100 % flow or 0...100 % stroke
	Max. rating	2 mA
	Non-linearity	± 2 % of full scale

Product specific data	Applications	To EN60730	
	Nominal pressure	PN16	
	Operating pressure $p_{max}$	1 MPa (10 bar)	
	Pressure differential $\Delta P_{vmax}$	See tables 'Sizing'	
	Leakage at $\Delta P_v = 0.1$ MPa (1bar)	A → AB Max. 0.02 % $k_{vs}$ (to IEC534-4) B → AB Depends on application data (< 0.2 % $k_{vs}$ )	
	Admissible media	Water of recommended quality to VDI2035, or water/glycol mixtures with max. 50% glycol	
	Temperature of medium	2 ...120 °C	
	Ventilkennlinie	Equal percentage $n_{gl} = 5,3$ to VDI/VDE2173 (factory setting) or linear (user selected), optimised in low opening range (to IEC534-2-4)	
	Stroke resolution $\Delta H / H_{100}$	1 : 1000 (H = stroke)	
	Hysteresis	Typically 3 %	
	Type of operation	Modulating	
	Manual adjustment	Yes, with hand-wheel (see description of operation)	
	Position with actuator de-energised	A → AB closed	
	Orientation	Upright to horizontal or below horizontal. Note that orientation affects protection standard	
	Positioning time	≤ 1 s	
	Materials (valve body)	Housing parts	Cast iron (GG20)
		Inner valve	CrNi steel (X12CrNi S18 8)
Seat		Brass (CuZn39Pb3)	
Valve stem seal		EPDM (O-ring)	
Bellows		Tombac (CuSn6), bronze (CuSn9), CrNi steel	
Electrical connection	Connection terminal	Screw terminals	
	– per terminal, with wire (no lug)	2 x 1,5 mm <sup>2</sup> or 1 x 2,5 mm <sup>2</sup>	
	– per terminal with wire (no lug)	2 x 1,5 mm <sup>2</sup> or 1 x 2,5 mm <sup>2</sup>	
	– per terminal with wire	2 x 1,5 mm <sup>2</sup> , 2 x 2,5 mm <sup>2</sup> or 1 x 4 mm <sup>2</sup>	
Cable entry	2 for PG13.5 , G½ or M20x1.5		
Weight, Dimensions	Weight (including packaging)	See 'Dimensions'	
	Dimensions	See 'Dimensions'	
General ambient conditions	<i>Operation:</i>	To IEC721-3-3	
	– Environmental requirements:	In accordance with Class 3K5	
	Ambient temperature	– 5 ... 45 °C	
	Humidity	≤ 95 %rh / max. 29 g/m <sup>3</sup>	
	– Biological requirements	In accordance with Class 3B2	
	– Chemically active substances	In accordance with Class 3C1	
	– Mechanically active substances	In accordance with Class 3M2	
	<i>Storage and transport::</i>	To IEC721-2	
	– Environmental requirements:		
	Ambient temperature	– 25 ... 70 °C	
Humidity	< 95 %rh at 40 °C		
– Mechanically active substances	In accordance with Class 2M2		
Product safety	Safety (electrical)	Protection class III (VDE 0100, Part 410A2)	
	SELV requirements	To EN60730, also PELV compatible	
	ESD requirements	Connect valves to functional earth (e.g. metal pipework)	
	Protection standard (mechanical)	To EN60730	
	– Orientation:		
	Upright to horizontal	IP54 (with PG13.5 cable gland)	
	Below horizontal	IP31 (with PG13.5 cable gland)	
	CE -requirements	In compliance with 73/23EEC, 89/336/EEC	
	Approval	Tested to EN60730 and EN60730-2-8	
	EMC standard	EN50081-1, EN50081-2, EN50082-1, EN50082-2	

**Terminal layout**

**Warning**

**Functional earth (TE) must be connected to the pipework.**

G0 of the transformer **must** be earthed in the case of 3-wire connections, and may be earthed with 4-wire connections.

**Terminal layout for 4-wire connections (preferred option)**

60432B	1	G0	⊥	AC 24 V
	2	G	~	AC 24 V
	3	Y	⊖	Control signal input +
	4	YM	⊖	Control signal reference voltage (-)
	5	X	⊖	DC 0 ...10 V stroke signal output (position feedback, reference voltage = G0)
	6	YF	⊖	Override control input

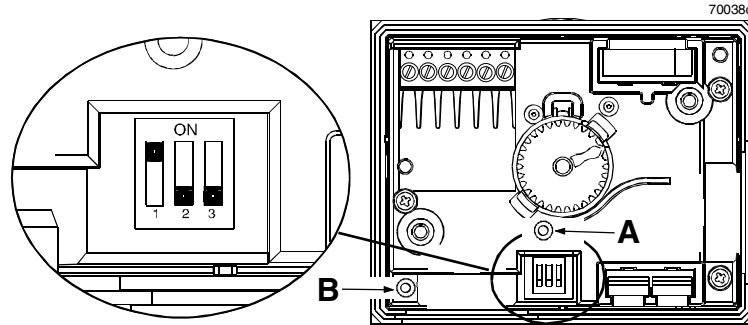
**Terminal layout for 3-wire connections**

60438B	1	G0	⊥	AC 24 V
	2	G	~	AC 24 V
	3	Y	⊖	Control signal input + (Reference voltage = G0)
	4			
	5	X	⊖	DC 0 ...10 V stroke signal output (position feedback, reference voltage = G0)
	6	YF	⊖	Override control input

**Forced control feature (Input terminal YF/6)**

AC 0 V (bridge G0 – YF) : Control path A → AB closed.  
 AC 24 V (bridge G – YF) : Control path A → AB open.  
 DC 1 ... 9 V at YF : Continuously variable low limit control, 10 ... 90 % volume flow (the higher value YF or Y takes priority).  
 This function is available with valves with a date of manufacture of 990701 or later.

**Configuration switches**



Switch	OFF	ON
1 Characteristic	Linear	Equal percentage *
2 Control signal	DC 0...10 V *	DC 2 ...10 V or DC 4 ... 20 mA
3 Volts or mA	DC 0(2)...10 V *	DC 4 ... 20 mA

\* Factory setting: equal percentage valve characteristic, DC 0 ...10 V control signal.

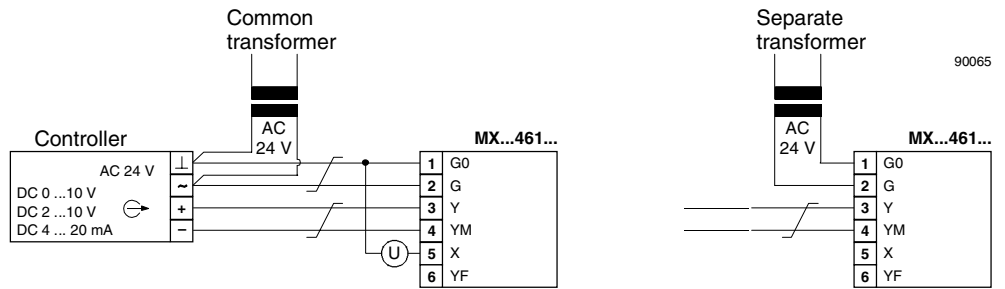
**Calibration**

The MX...461...P magnetic valves are factory-calibrated at 0 % and 100 % stroke. When commissioning the valves, however, (especially under extreme conditions of use) there may still be some leakage via control path A → AB with a 0 % stroke control signal (DC 0 V, DC 4 mA or DC 2 V). In this case, the valve can be recalibrated simply and quickly as follows. Use a pointed implement (2 mm diameter) to operate the button in the opening [ A ] in the terminal housing. While recalibration is in progress, the LED [ B ] in the electronics module will flash green for approximately 10 seconds. The valve will be briefly closed and fully opened.



## Connection examples

### Connection to controller with 4-wire output (preferred option)

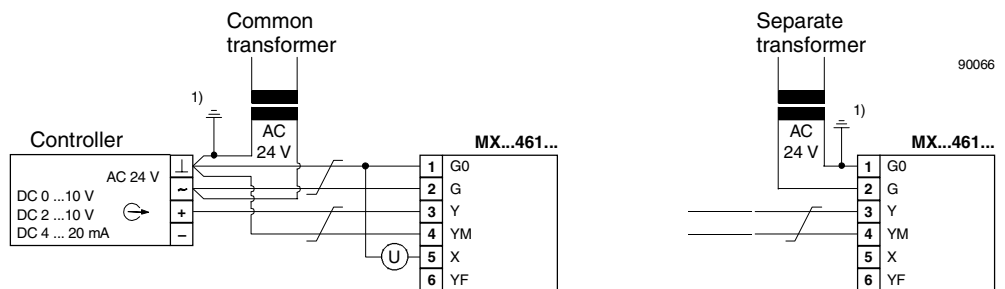


Indication of valve position (only where required). DC 0 ...10 V → 0 ...100 % volumetric flow



Twisted pairs. If the cables for the AC 24 V supply and the control signal DC 0 ...10 V (DC 2 ...10 V, DC 4 ... 20 mA) are routed separately, twisted pairs are not required for the AC 24 V cable.

### Connection to controller with 3-wire output



1) No earthing required for KLIMO or MULTIREG controllers.

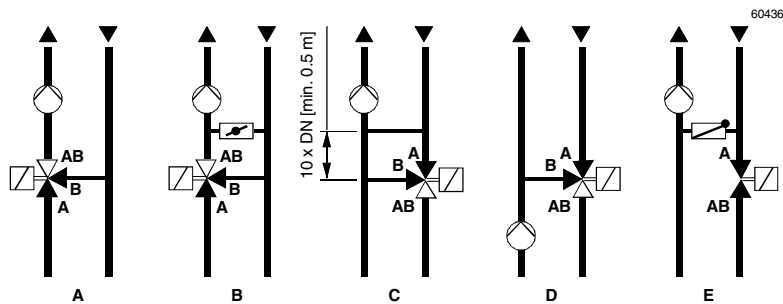
## Application example

### Hydraulic circuits

The examples below show the principles only, without installation-specific details.

#### Caution

The valve is suitable for straight-through or three-way applications only, and may be installed **ONLY** in a mixing arrangement as shown in examples A to E below.



A Mixing circuit

B Mixing circuit with bypass (underfloor heating)

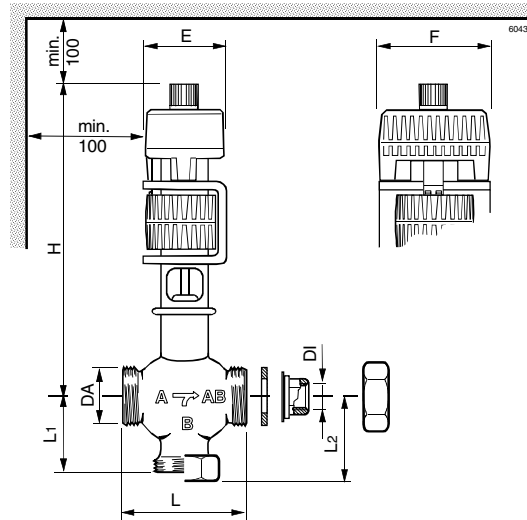
C Injection circuit

D Diverting circuit

E Injection circuit with straight-through valve

## Dimensions

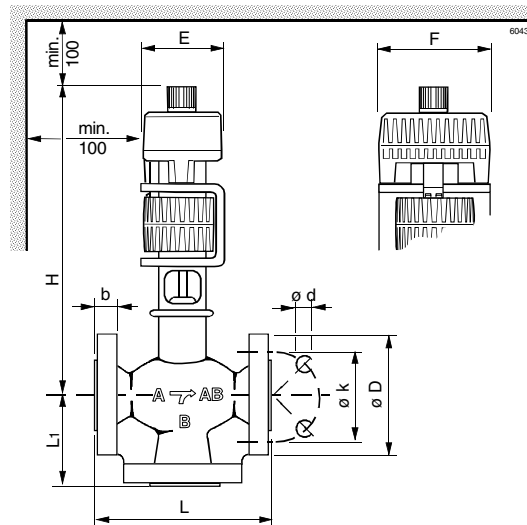
### MXG461...P Screwed valves with electronics module



- DA = External thread G...B to ISO228/1
  - DI = Internal thread Rp... to ISO7/1
  - Screwed fittings to ISO49 / DIN2950
  - \* When used as straight-through valve
- W Weight (including packaging) in kg

Valve type	DI [inches]	DA [inches]	L	L1	L2 *	H	E	F	W
MXG461.15-0.6P	Rp½	G1B	80	42,5	51	240	80	100	3,8
MXG461.15-1.5P	Rp½	G1B	80	42,5	51	240	80	100	3,8
MXG461.15-3.0P	Rp½	G1B	80	42,5	51	240	80	100	3,8
MXG461.20-5.0P	Rp¾	G1½B	95	52,5	61	260	80	100	4,2
MXG461.25-8.0P	Rp1	G1½B	110	56,5	65	270	80	100	4,7
MXG461.32-12P	Rp1½	G2B	125	67,5	76	285	80	100	5,6
MXG461.40-20P	Rp1½	G2¼B	140	80,5	94	320	80	100	9,3
MXG461.50-30P	Rp2	G2¾B	170	93,5	109	340	80	100	11,9

### MXF461...P Flanged valves with electronics module



- Counter-flanges must be supplied by the installer.
  - Flange dimensions to ISO7005-2 / DIN2533, PN16
- W Weight (including packaging) in kg

Valve type	L	L1	D	b	k	d	H	E	F	W
MXF461.15-0.6P	130	65	95	14	65	4x14	250	80	100	5,8
MXF461.15-1.5P	130	65	95	14	65	4x14	250	80	100	5,8
MXF461.15-3.0P	130	65	95	14	65	4x14	250	80	100	5,8
MXF461.20-5.0P	150	75	105	16	75	4x14	260	80	100	7,0
MXF461.25-8.0P	160	80	115	16	85	4x14	272	80	100	8,0
MXF461.32-12P	180	90	140	18	100	4x18	285	80	100	11,0
MXF461.40-20P	200	100	150	18	110	4x18	322	80	100	15,4
MXF461.50-30P	230	105	165	22	125	4x18	340	80	100	19,8
MXF461.65-50P	290	125	185	22	145	4x18	392	80	100	28,6

© 2000 Siemens Building Technologies AG  
Subject to technical changes