



ACVATIX™

## Modulating control valves with magnetic actuator, PN16

**M3P..FY**  
**M3P..FYP**

for chilled and low-temperature hot water systems or for systems with media containing mineral oils (M3P..FYP)

- **Fast positioning time (1 s), high-resolution stroke (1 : 1000)**
- **Positioning signal: DC 0...10 V or DC 4... 20 mA**
- **Fail-safe feature: 1 → 3 closed when de-energized**
- **Low friction, robust, no maintenance required**
- **Indication of operating state, position feedback and manual control**

### Use

The control valves are mixing or throughport valves with the ready fitted magnetic actuator for position control and position feedback. The short positioning time, high resolution and high rangeability make these valves ideal for modulating

- |  |   |
|--|---|
| <p>M3P..FY</p> <p>M3P..FYP</p> <p>Application examples</p> <p>M3P..FYP</p> | <ul style="list-style-type: none"> <li>• control of chilled and low-temperature hot water systems</li> <li>• control or dosing control of fluids containing mineral oil (SAE05...SAE50), mineral-oil-based diesel fuels, heat transfer oils</li> </ul> <p>in closed circuits.</p> <ul style="list-style-type: none"> <li>• Temperature control in mixing circuits for motor oil circulation, screw-compressors (compressed air) and fuel circuits for petrol and diesel oil</li> <li>• High pressure control for the calibration of components for electronic injection components</li> <li>• Control of cutting-oil emulsion for industrial grinding machines</li> </ul> |
|--|---|

## Type summary

Type reference		DN	k <sub>vs</sub> [m <sup>3</sup> /h]	Δp <sub>max</sub> [kPa]	Δp <sub>s</sub> [kPa]	Operating voltage	Positioning		Spring return
M3P..FY	M3P..FYP <sup>1)</sup>						signal	time	
M3P80FY	M3P80FYP	80	80	300	300	AC 24 V	DC 0...10 V or DC 4...20 mA	< 2 s	✓
M3P100FY	M3P100FYP	100	130	200	200				

<sup>1)</sup> for media containing mineral oils, heat transfer oils

DN = Nominal size

Δp<sub>max</sub> = max. permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorized valve

Δp<sub>s</sub> = max. permissible differential pressure (close off pressure) at which the motorized valve will close securely against the pressure (used as throughport valve)

k<sub>vs</sub> = nominal flow rate of cold water (5 to 30 °C) through the fully opened valve (H<sub>100</sub>) at a differential pressure of 100 kPa (1 bar)

Flanged valves MXF461.., MXF461..P	DN 15...65	datasheet N4455
Threaded valves MXG461.., MXG461..P	DN 15...50	

### Accessories

Set of blank flanges

Type reference	Description
Z155/80	Blank flange kit for flanged valve with DN 80. Contains blank flange, seal, screws, spring washers and nuts
Z155/100	Blank flange kit for flanged valve with DN 100. Contains blank flange, seal, screws, spring washers and nuts
SEZ91.6	External interface for DC 0...20 V phase cut control signal, refer to data sheet N5143

### Order

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

Delivery

Product number	Stock number	Description
M3P80FY	M3P80FY	Flanged valve with magnetic actuator
Z155/80	Z155/80	Set of blank flanges

Valve body and magnetic actuator form one assembly and cannot be separated.

The valve and blank flanges are packed and supplied separately.

### Replacement electronics module

ZM250

Should the valve electronics prove faulty, the electronics module must be replaced by the ZM250 replacement electronics module. Mounting Instructions no. 35731 are included.

Rev. no.

See overview, page 9.

### Technical and mechanical design

For a detailed description of operation, refer to data sheet CA1N4028E.

### Control operation

The control signal is converted in the terminal housing into a phase cut 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 control disc, enabling fast changes in load to be corrected quickly and accurately.

The valve position is inductively measured continuously. Any disturbance in the system is rapidly corrected by the internal positioning controller, which ensures that the control signal and the valve stroke are exactly proportional, and also provides a feedback signal indicating the valve position.

**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 4... 20 mA output signal.

To achieve optimum control performance, it is recommended to use a 4-wire connection.

**Spring return function**

If the positioning signal is interrupted, or in the event of a power failure, the valve's return spring will automatically close control path 1 → 3.

**Manual control**

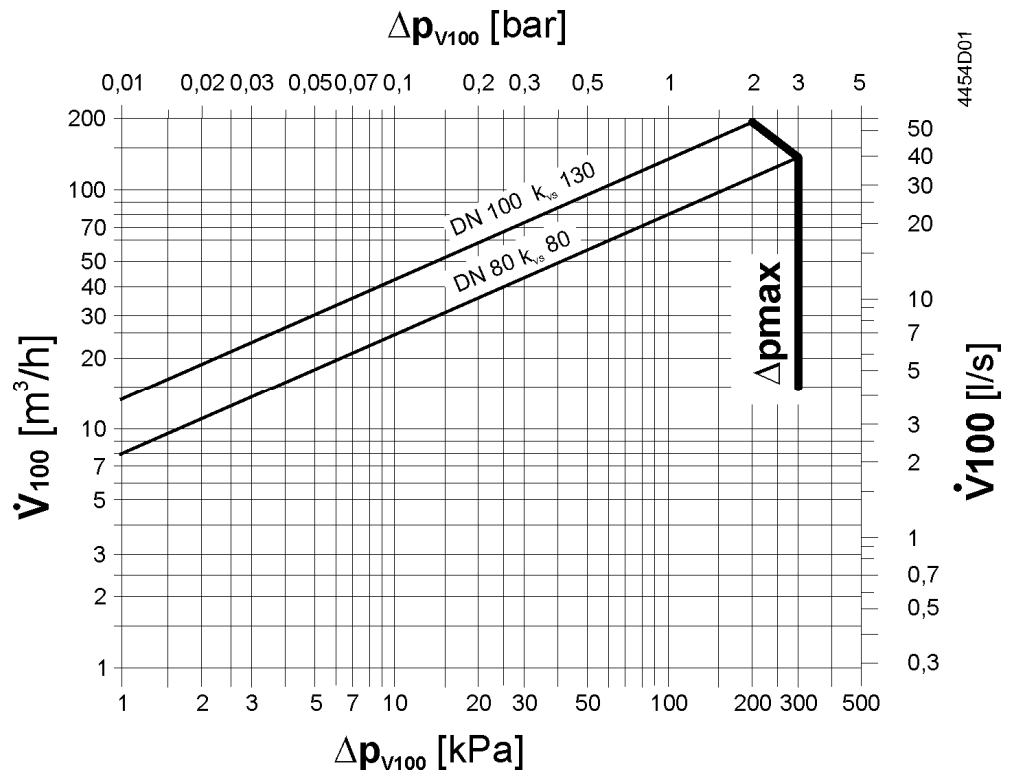
Control path ports 1 → 3 can be opened mechanically to between 0 and approximately 90 %, by turning the hand wheel clockwise.

The manual adjustment facility can also be used as a mechanical method of low limit control, i.e. the valve will exercise its normal control function between the manually-set position and the 100 % open position. For full-stroke automatic control, the hand wheel must be set to 0 (the counterclockwise end stop).

**Sizing**

**Flow chart**

**Water**



$\Delta p_{V100}$  = differential pressure across the fully open valve and the valve's control path 1 → 3 by a volume flow  $\dot{V}_{100}$

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

$\Delta p_{max}$  = max. permissible differential pressure across the valve's control path (ports 1-3, 2-3) for the entire actuating range of the motorized valve

100 kPa = 1 bar  $\approx$  10 mWC

1  $m^3/h$  = 0.278  $l/s$  water at 20 °C

**Water with Antifreeze**

For water with > 20 % antifreeze use following generic formula to calculate volumetric flow  $\dot{V}_{100}$ :

**Generic formula**

$$\dot{V}_{100} = \frac{Q_{100} \cdot 3600}{c \cdot \Delta T \cdot \rho} \quad [m^3/h]$$

- $\dot{V}_{100}$  = Volumetric flow [ $m^3/h$ ]
- $Q_{100}$  = Design energy demand [kW]
- $\Delta T$  = Temperature difference between flow and return [K]
- $c$  = specific heat capacity [kJ/kgK]
- $\rho$  = specific density [kg/ $m^3$ ]

When sizing valves for media other than water, note that the medium properties

- specific heat
- density
- kinematic viscosity

differ from water. All variables depend on temperature.

The design temperature is the lowest medium temperature in the valve.

### Note on viscosity

Viscosity may change considerably on temperature changes depending on the medium. Plant functionality may be impaired if the medium temperature does not guarantee viscosity values compatible with troublefree valve functioning.

Kinematic viscosity  $\leq 10 \text{ mm}^2/\text{s}$

Kinematic viscosity  $\nu$  [ $\text{mm}^2/\text{s}$ ] in HVAC plants always is lower than  $10 \text{ mm}^2/\text{s}$ , i.e. its influence on volume flow is negligible.

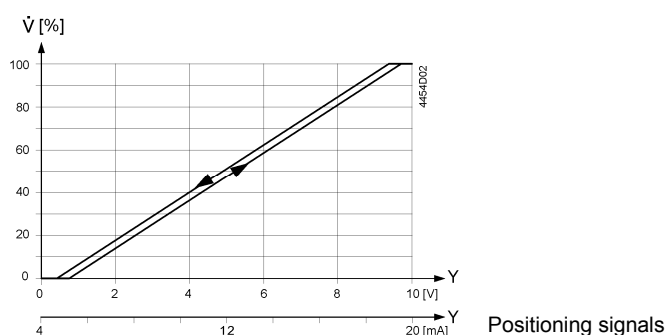
$> 10 \text{ mm}^2/\text{s}$

For details please contact your local Siemens branch office.

### Valve characteristic

#### Linear

Volumetric flow



### Connection type <sup>1)</sup>

The 4-wire connection to the valve should always be given preference!

4-wire connection

3-wire connection

Type reference	$S_{NA}$ [VA]	$P_{MED}$ [W]	$S_{TR}$ [VA]	$I_F$ [A]	Wire cross-section [ $\text{mm}^2$ ]		
					1.5	2.5	4.0
max. cable length L [m]							
M3P80FY	80	20	100	6.3	10	16	27
M3P100FY	120	30	150	10	6	10	17
M3P80FYP	80	20	100	6.3	10	16	27
M3P100FYP	120	30	150	10	6	10	17
M3P80FY	80	20	100	6.3	10	16	27
M3P100FY	120	30	150	10	6	10	17
M3P80FYP	80	20	100	6.3	10	16	27
M3P100FYP	120	30	150	10	6	10	17

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

$P_{med}$  = typical power consumption

$S_{TR}$  = Minimal required transformer power

$I_N$  = required slow fuse

L = max. cable length; with 4-wire connections, the max. permissible length of the separate  $1.5 \text{ mm}^2$  copper positioning signal wire is 200 m

<sup>1)</sup> All information at AC 24 V

## Engineering notes

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

Attention

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

**A strainer should be fitted upstream of the valve. This increases reliability.**

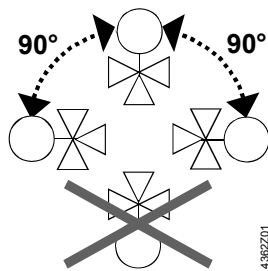
## Mounting notes

Two mounting instruction leaflets are enclosed with the valve: Ref. 35638 (valve) and reference 35731 (terminal housing).

Attention 

**The valve may only be used as a mixing or throughport valve, not as a diverting valve. Observe the direction of flow 1 → 3!**

## Orientation



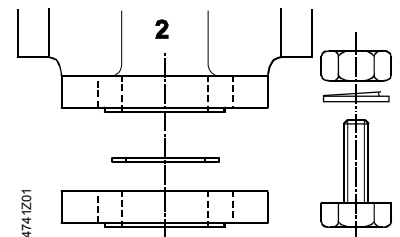
## Access for installation

It is essential to maintain the specified minimum clearance above and to the side of the actuator and/or electronics module! (refer to "Dimensions", page 9)

## Use as straight-through valves

Close off port '2' with the type Z155/... accessories, which must be ordered separately. For details see page 2.

The blank flange kit consists of a seal, screws, spring washers and nuts.



## Installation notes

- The actuator must not be lagged
- For notes on electrical installation, see "Connection terminals" respectively "Connection diagram", page 8.

## Maintenance notes

The valves and actuators 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.

## Repair

Should the valve electronics prove faulty, the electronics module should be replaced with replacement part ZM250. Mounting instructions are enclosed (Ref. 35731).

Warning 

**Always disconnect the power before fitting or removing the terminal housing. The terminal housing is calibrated and matched to the actuator, and should be replaced only by qualified personnel.**

**Warning** 

**Under operating conditions within the limits defined by the application data, the actuator will become hot, but this does not represent a burn risk. Always maintain the minimum clearance specified, refer to "Dimensions", page 9.**



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		M3P80FY	M3P100FY	
		M3P80FYP	M3P100FYP	
Power supply	Extra low-voltage only (SELV, PELV)			
	Operating voltage	AC 24 V, + 15 % / -10 %		
	Frequency	50...60 Hz		
	Typical power consumption $P_{med}$ stand by (valve closed)	20 W	30 W	
		< 2 W	< 2 W	
	Rated apparent power $S_{NA}$	80 VA	120 VA	
	Minimal required transformer power $S_{TR}$	100 VA	150 VA	
	Required fuse $I_F$	3.15 A, slow	5 A, slow	
Input	Positioning signal Y	DC 0...10 V or DC 4...20 mA		
	Impedance	DC 0...10 V DC 4...20 mA	> 400 k $\Omega$ // 30 nF (load < 0.1 mA) 100...120 $\Omega$ // 30 nF	
Output	Position feedback signal	DC 0...10 V (max. 9.7 V $\pm$ 0.2 V)		
	Max. load	max. 1.5 mA		
	Stroke measurement	Inductive		
	Nonlinearity	$\pm$ 3 % of end value		
Electrical wiring	Positioning time	< 2 s		
	Cable entry	2 x $\varnothing$ 13.1 mm		
	Connection terminals	Screw terminals for max. 1 x 4 mm <sup>2</sup> wire		
	Minimal wire cross-section	1.5 mm <sup>2</sup>		
	Maximum cable length	refer to "Connection type", page 4		
	Functional valve data	PN class	PN 16 to EN 1333	
Permissible operating pressure		1 MPa (10 bar)		
Differential pressure $\Delta p_{max}$ / $\Delta p_s$		refer to table "Type summary", page 2		
Valve characteristic		linear (to VDI / VDE 2173), optimized near the closing point		
Leakage rate at $\Delta p = 100$ kPa (1 bar)		1 $\rightarrow$ 3	max. 0.05 % $k_{vs}$	
		2 $\rightarrow$ 3	ca. 2 % $k_{vs}$ depending on operating conditions	

Materials	Permissible media	M3P..FY	chilled and low-temperature hot water, water with anti-freeze;
		M3P..FYP	recommendation: water treatment to VDI 2035 Mineral oils SAE05 ... SAE50, mineral-oil-based diesel fuels, heat transfer oils
	Medium temperature		1...120 °C
	Stroke resolution $\Delta H / H100$		> 1 : 1000 (H = stroke)
	Hysteresis		typically 3 %
	Position when deenergized		Control path 1 → 3 closed
	Mode of operation		Modulating
	Mounting position		upright to horizontal
	Manual operation		possible, up to 90%
	Valve body		EN-GJL-HB215
	Plug		CrNi steel
	Seat		Rg5, low-lead to DIN 50430, part 6
Dimensions / weight	Valve stem seal	M3P..FY	EPDM (O-Ring)
		M3P..FYP	Fluororubber – FPM product (Viton)
	Bellows		CrNi steel
Norms and standards	Dimensions		refer to "Dimensions", page 9
	Weight		refer to "Dimensions", page 9
Norms and standards	CE conformity		
	to EMV-requirements		2004/108/EC
	Immunity		EN 60730-1:2000/A16:2007 <sup>2)</sup>
	Emission		EN 60730-1:2000/A16:2007
	Electrical safety		EN 60730-1
	Protection class		Class III to EN 60730
	Pollution degree		Class 2 to EN 60730
	Housing protection		
	Upright to horizontal		IP31 to EN 60529
	Environmental compatibility		ISO 14001 (Environment) ISO 9001 (Quality) SN 36350 (Environmentally compatible products) RL 2002/95/EG (RoHS)
	Pressure Equipment Directive		PED 97/23/EC
	Pressure Equipment Directive		as per article 1, section 2.1.4
Fluid group 2		category I, Module A, with CE marking	

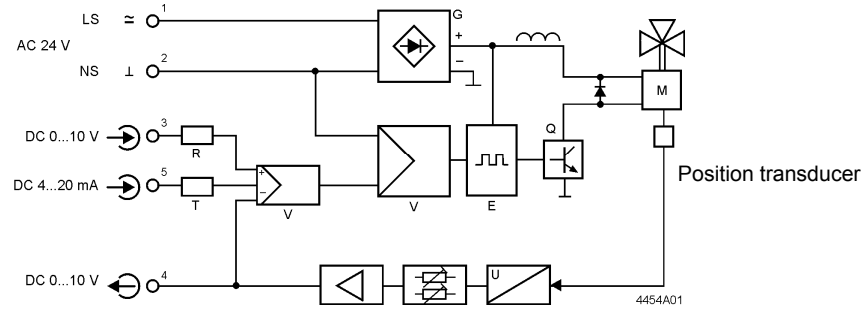
<sup>2)</sup> Transformer 160 VA (e.g. Siemens 4AM 3842-4TN00-0EAO)

**General environmental conditions**

	Operation EN 60721-3-3	Transport EN 60721-3-2	Storage EN 60721-3-1
Climatic conditions	Class 3K5	Class 2K3	Class 1K3
Temperature	2...+50 °C	-25...+70 °C	-5...+45 °C
Humidity	5...95 % r.h.	5...95 % r.h.	5...95 % r.h.
Mechanical conditions	EN 60721-3-6 Class 6M2		

# Diagrams

## Block diagram of the signal converter



Position feedback electronics with base/span adjustment

- |    |                          |   |                              |
|----|--------------------------|---|------------------------------|
| E  | Phase cut converter      | R | Input resistor               |
| G  | Bridge rectifier         | T | Voltage / current converter  |
| M  | Magnetic valve           | U | Position / voltage converter |
| Q  | Phase cut output         | V | Differential amplifier       |
| LS | System potential AC 24 V | → | Input                        |
| NS | System neutral           | ← | Output                       |

## Connection terminals

- |             |        |             |                          |
|-------------|--------|-------------|--------------------------|
| AC 24 V     | LS ≈ 1 | LS          | System potential AC 24 V |
|             | NS ⊥ 2 | NS          | System neutral AC 24 V   |
| DC 0...10 V | → 3    | DC 0...10 V | Positioning signal Y     |
| DC 0...10 V | ← 4    | DC 0...10 V | Position feedback signal |
| 4...20 mA   | → 5    | 4...20 mA   | Positioning signal Y     |
| 4454A02     | TE ⊕ 6 |             | Earthing                 |

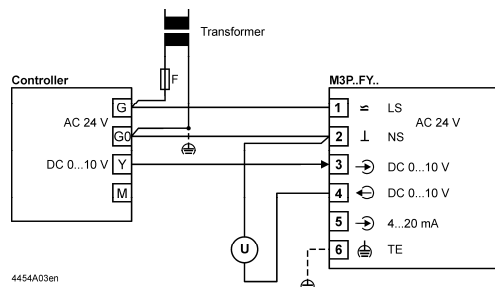
## Connection diagrams

**Warning** ⚠

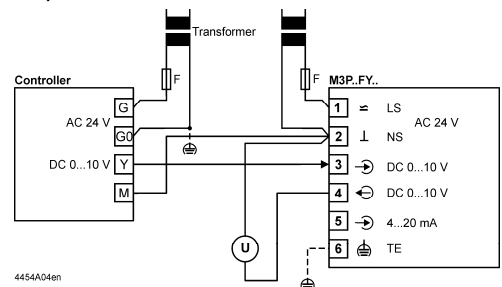
If the controller and the valves receive their power supply from separate sources, the valve transformer must not be earthed on the secondary side.

### Controllers with DC 0...10 V positioning signal

#### Common Transformer

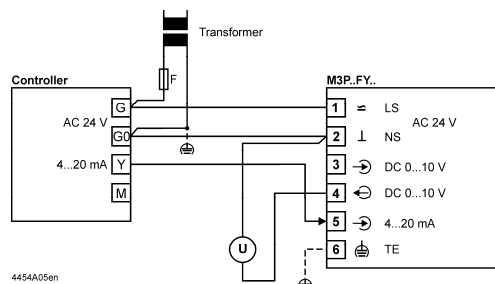


#### Separate Transformer

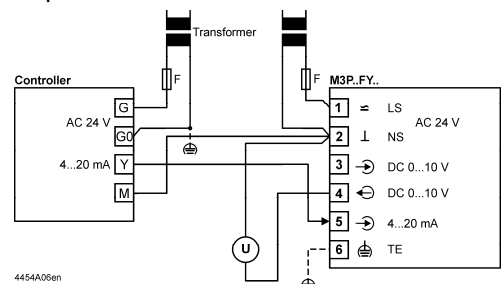


### Controllers with DC 4...20 mA positioning signal

#### Common Transformer



#### Separate Transformer

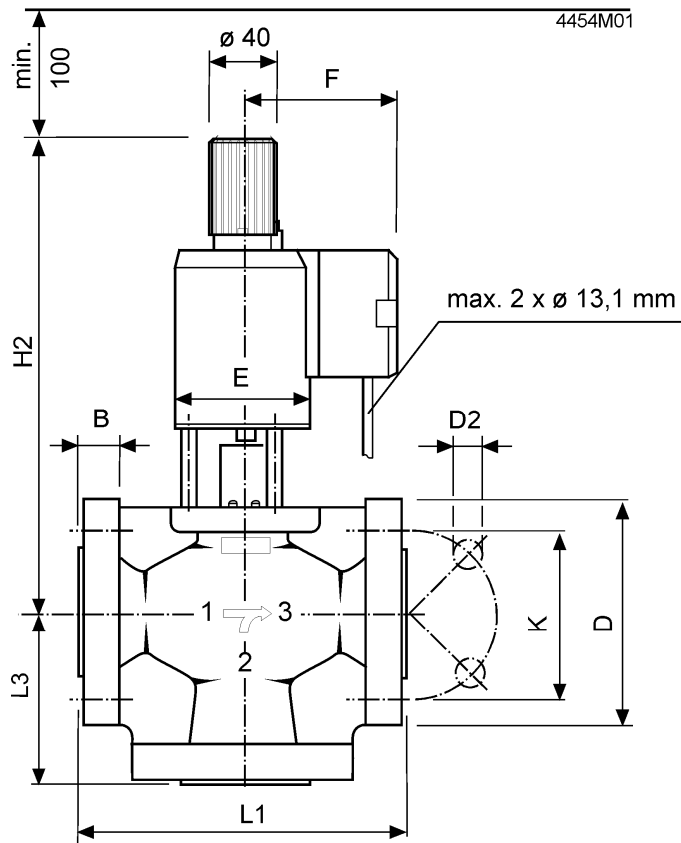


Ⓢ Indication of valve position (only if required). DC 0 ...10 V → 0...100 % volumetric flow  $V_{100}$



## Dimensions

All dimensions in mm



Type reference	DN	B	D	D2	K	L1	L3	H2	E	F	Weight
			ø	ø	ø			min.	ø		[kg]
<b>M3P80FY</b>	80	22	200	8x18	160	310	140	508	145	124	45.5
<b>M3P100FY</b>	100	24	220	8x18	180	350	160	570	145	124	59.0
<b>M3P80FYP</b>	80	22	200	8x18	160	310	140	508	145	124	45.5
<b>M3P100FYP</b>	100	24	220	8x18	180	350	160	570	145	124	59.0

Remarks:

- Counter-flanges must be supplied by the installer!
- Flange dimensions to ISO 7005-2

## Revision numbers

Type reference	Valid from manufacturing date	Type reference	Valid from manufacturing date
<b>M380FY</b>	12/09 <sup>1)</sup>	<b>M380FYP</b>	12/09 <sup>1)</sup>
<b>M3P100FY</b>	12/09 <sup>1)</sup>	<b>M3P100FYP</b>	12/09 <sup>1)</sup>

<sup>1)</sup> MMY = Month, Year of manufacturing

