revision
12 2016

VFPIP/VFPIM/VFPI 15-25

Pressure independent control valves, DN15-DN25 with integrated flow limiter for thermal emitters and differential pressure regulator

VFPIP/VFPIM/VFPI valves are intended for use in fan-coil units, air handling units, chilled beams, etc.

They can be used as constant flow limiters in constant volume systems (without an actuator) or as true PICVs in variable volume systems (with an actuator).

The VFPIP/VFPIM/VFPI valves are temperature control valves with full authority over the entire flow range. This means that each individual terminal receives the flow required even in part load conditions. The VFPIP/VFPIM/VFPI valves do not require any setting ratio calculation or valve authority calculation.

The valves are available in three models, VFPIM that has measuring ports included, VFPIP that has measuring port outlets sealed (can be added later if needed) and VFPI that do not have any measuring ports at all.

The valves have a compact design that allows them to be mounted in small spaces such as fan-coils or narrow supply spaces.

The valves are supplied with a plastic lid which can also be used to close them manually.

Function

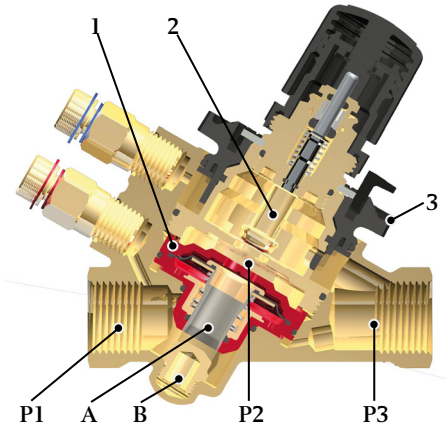
The VFPIP/VFPIM/VFPI valves offer remarkable adjustment flexibility. They can be accurately set to a specific flow rate value and allow precise modulating control.

Water flow through a valve varies as a function of the area of passage and the pressure differential across that valve. Thanks to the integrated differential pressure regulator (1) the differential pressure across the valve seats remains constant, meaning that the flow is only dependent of the area of passage. The control valve (2) has equal percentage flow caracteristics. It is also possible to set any flow rate value and to maintain it stable. Since flow rate is the only parameter to be considered, choosing the suitable valve is easy and fast.

As the differential pressure variations are instantly corrected, temperature variations and adjustment movements are considerably reduced while the valve and moving devices' lifespans are improved.

Short facts

- **Precise hydronic blance gives an increased confort and reduces energy consumption**
- **Accurate flow control, stable maximum flow rate and compensated variations in differential pressure result in a steady and enduring system**
- **Flow adjustable pre-setting knob offer a remarkable adjustment flexibility**
- **Easy selection as no authority nor ratio calculations are needed**



1. differential pressure regulator, 2. regulating valve for flow adjustment, 3. flow presetting knob, A. shutter, B. seat, P1. incoming pressure, P2. pressure below seat, P3. outgoing pressure

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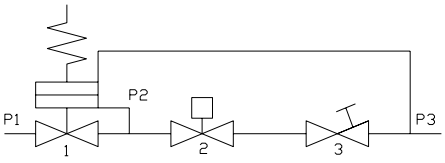


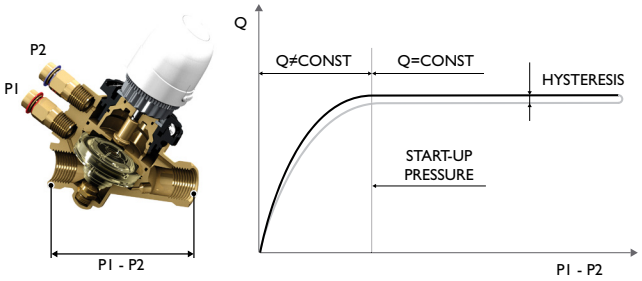
The valves' maximum adjustment matches the maximum flow rate allowed by the pipe size, on the basis of the values established by international standards.

The graduated adjustment knob (3) allows the flow rate to be set without disassembling the actuator. The percentage value, indicated on the scale, matches the maximum flow rate percentage. This value can be changed by turning the adjustment knob until it reaches the selected position (matching the percentage indicated on the scale). A locking mechanism ensures that the valve set values are not changed inadvertently.

Application

The valves are used to control hot and cold water (with max. 50 % glycol) in heating and cooling systems. Typical applications are fan-coil units (FCU), air handling units (AHU), chilled beams (CB), air curtains, heating/cooling interface units and heat exchangers.
VFPIP/VFPIM/VFPI valves can also be used as maximum flow limiters (without an actuator).

Start-up pressure



Using a differential pressure gauge to measure the pressure drop the valve absorbs, allows checking whether the valve is in the operating range (and, therefore, whether the flow is constant) by simply verifying that the measured value P1 - P2 is higher than the start-up value.

If the ΔP measured value is lower than the start-up value, then the valve works as a fixed orifice valve.

The start-up value varies with the flow setting of the valve.

Each valve has its own max start-up pressure. This is the differential pressure that is needed by the valve in its 100 % flow pre-setting in order to be able to function properly as a PICV. The lower the flow preset setting, the lower the required start-up pressure will be. This is why it is designated as max start-up pressure for the 100 % flow setting.

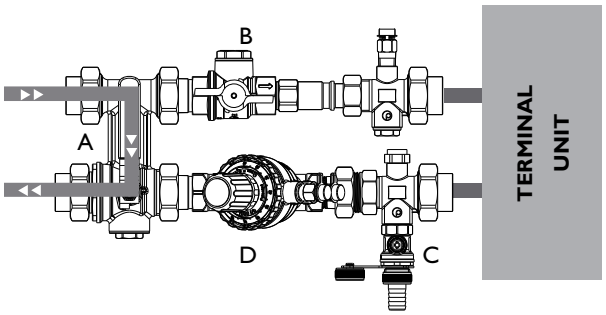
Before installation

Before filling the terminal unit system with water, make sure the main pipeline has been flushed and most of the dirt and debris have been flushed away. Always comply with local or applicable flushing, however, in order to get the longest life and the best performance from the Valves, Industrietechnik does not accept any liability for improper or wrong use of this product.

Always protect the pressure regulator by using strainers upstream of the valve making sure the water quality complies with UNI 8065 standards (Fe < 0.5 mg/kg and Cu < 0.1 mg/kg).

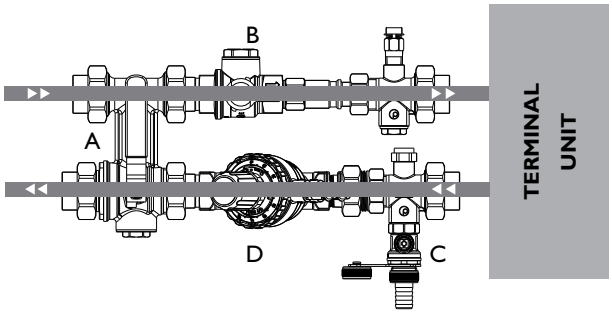
Furthermore, the iron oxide in the water passing through the control valve (PICV) should not exceed 25 mg/kg (25 ppm).

To ensure that the main pipework is cleaned appropriately, flushing bypasses should be used without flushing through the pressure regulator of the PICV, thereby preventing debris that might clog the valve (see figure below).



Flushing of main pipe line

A: Bypass mode B: Closed C: Closed D: Open

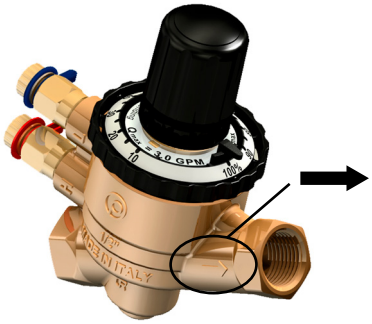


Normal use

A: Normal mode B: Open C: Closed D: Open

Installation

The valve has to be mounted with the arrow pointing in the direction of the flow.



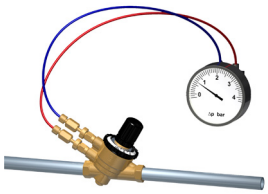
Mounting it in the wrong direction may damage the system and the valve itself.

If flow reversal is possible, a non-return valve should be mounted.

Commissioning

Commissioning is very easy to perform, design flow rates can be modified at any time and at low costs.

Since it is not necessary to commission the valve after its installation, the valve can work immediately after it has been assembled, for example, on the floors where works are already finished.



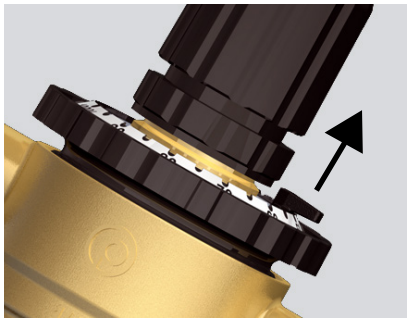
It is however necessary to be sure that the valve is actually working in the operating range. In order to verify this, just measure the differential pressure across the valve, as shown in the picture.

If the measured differential pressure is higher than the start-up pressure, the valve is actually keeping the flow constant at the set value.

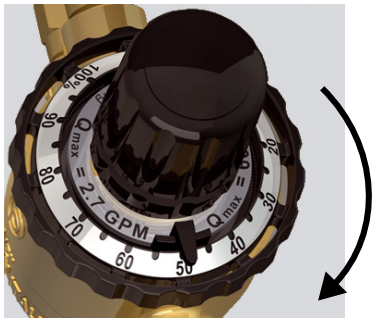
In order to adjust the flow rate, just set the selected value using the adjustment knob (see below).

Flow preset

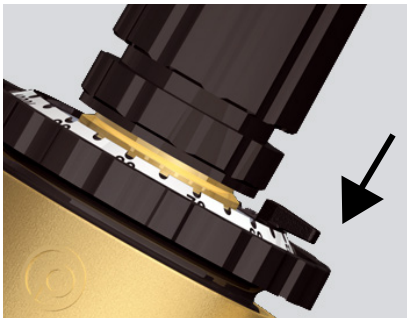
To set the selected flow, follow these steps:



Lift the lock pin to unlock the selector



Turn the selector to the target position



Press the lock pin to lock the selector in the final position

Flow pre-setting table for VFPIP and VFPIM DN15 - DN25

	Flow rate (l/h)				
Pre-setting %	**150**	**600**	**780**	**1000**	**1500**
100	150	600	780	1000	1500
90	135	540	702	900	1350
80	120	480	624	800	1200
70	105	420	546	700	1050
60	90	360	468	600	900
50	75	300	390	500	750
40	60	240	312	400	600
30	45	180	234	300	450
20	-	120	156	200	-
10	-	60	78	100	-

Flow pre-setting table for VFPI, DN15 - DN20

	Flow rate (l/h)		
Pre-setting %	**150**	**600**	**900**
100	150	600	900
90	135	540	810
80	120	480	720
70	105	420	630
60	90	360	540
50	75	300	450
40	60	240	360
30	45	180	270
20	-	120	180
10	-	60	90

Models

Models without measuring port connectors

Model	Connection	Nominal diameter	Max. start-up pressure	Max. flow rate	ΔP max
VFPI15-150	G½"	DN15	20 kPa	150 l/h	600 kPa
VFPI15-600	G½"	DN15	25 kPa	600 l/h	600 kPa
VFPI15-900	G½"	DN15	30 kPa	900 l/h	600 kPa
VFPI20-600	G¾"	DN20	25 kPa	600 l/h	600 kPa
VFPI20-900	G¾"	DN20	30 kPa	900 l/h	600 kPa

Models with measuring port connectors but no measuring

Model	Connection	Nominal diameter	Max. start-up pressure	Max. flow rate	ΔP max
VFPIP15-150	G½"	DN15	20 kPa	150 l/h	600 kPa
VFPIP15-600	G½"	DN15	25 kPa	600 l/h	600 kPa
VFPIP15-780	G½"	DN15	35 kPa	780 l/h	600 kPa
VFPIP20-1000	G¾"	DN20	30 kPa	1000 l/h	600 kPa
VFPIP20-1500	G¾"	DN20	35 kPa	1500 l/h	600 kPa
VFPIP25-1500	G1"	DN25	35 kPa	1500 l/h	600 kPa

Models with measuring

Model	Connection	Nominal diameter	Max. start-up pressure	Max. flow rate	ΔP max
VFPIM15-150	G½"	DN15	20 kPa	150 l/h	600 kPa
VFPIM15-600	G½"	DN15	25 kPa	600 l/h	600 kPa
VFPIM15-780	G½"	DN15	35 kPa	780 l/h	600 kPa
VFPIM20-1000	G¾"	DN20	30 kPa	1000 l/h	600 kPa
VFPIM20-1500	G¾"	DN20	35 kPa	1500 l/h	600 kPa
VFPIM25-1500	G1"	DN25	35 kPa	1500 l/h	600 kPa

Technical data

Pressure class	PN25 (25 bar)
Flow characteristics	Equal percentage
Rangeability	50 ~ 100 : 1
Stroke	2.7 mm
Connection	VFPIP/VFPIM (DN15-25) and VFPI (DN15) internal pipe thread according to ISO 228 VFPI (DN20) external pipe thread according to ISO 228
Media	Hot or cold water, cooling systems (max. 50 % glycol)
Leakage	0.01% of maximum flow, Class IV IEC 60534-4.
Temperature range	-10...120°C
Valve position	Normally open. Valve position is closed when used with a normally closed on/off thermal actuator.

Material

Body	
VFPIM/VFPIP	Brass CW602N (CZ121)
VFPI	Brass CW617N (CZ122)
Plug parabol	Brass CW614N (CZ132)
Stem	Stainless steel
Packing box	O-ring EPDM
Pressure regulator	EPDM, stainless steel and high resistance polymer

Suitable actuators and adapters

Actuators for 2.7 mm stroke

Thermal actuators

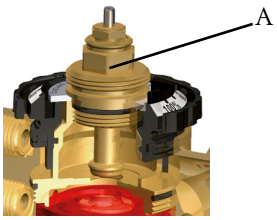
Model	Control signal	Supply voltage	Adapter (*)
SE1C230	On/Off, NC	230 V AC	ADV11
SE1C24	On/Off, NC	24 V AC/DC	ADV11

Electromechanical actuators

Model	Control signal	Supply voltage	Adapter (*)
SE1.2F24/PT	3-point	24 V AC	ADV12
SE1.2F230/PT	3-point	230 V AC	ADV12
SE1.2M24-3.2/PT	0...10 V DC	24 V AC	ADV12

* Adapters must be ordered separately.

Control characteristics curve

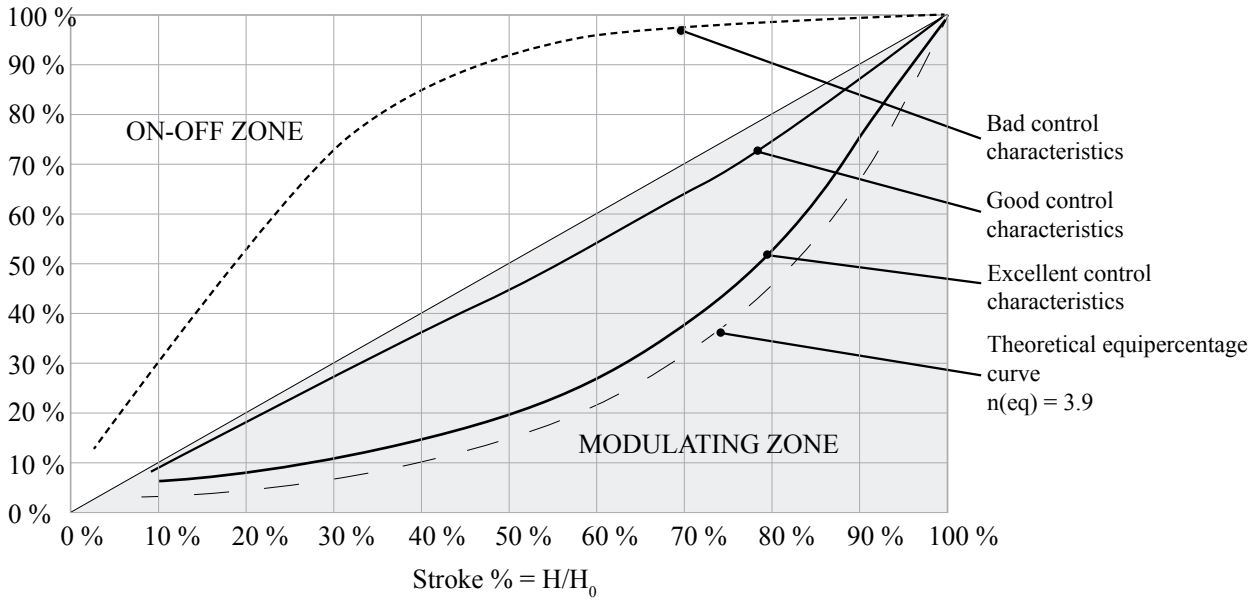


Operating on the position of the control valve's stem A will modify the valve Kv, hence the flow rate.

The relation between Kv and stroke is shown in the graph below.

Typical control valve characteristics curves

K_v % = K_v/K_{vmax}

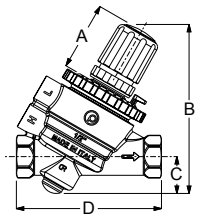


Combining the VFPIM valve characteristics with heat exchanger results in a linear control system.

H = current lift of the control valve; H varies from 0 to H_0
H_0 = maximum lift of the control valve;
Kv = valve flow factor at lift = H
Kv_{max} = valve flow factor at lift = H_0

Note: Control curve characteristics may change depending on the valve version.

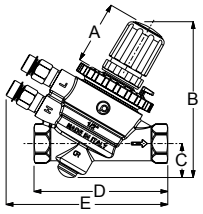
Dimensions for VFPIP/ VFPIM and VFPI valves, DN15-DN20



VFPIP

Manual valve

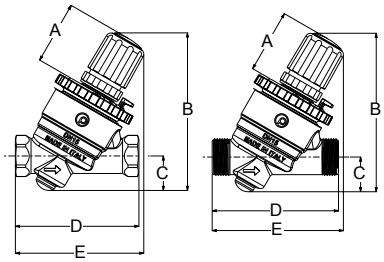
Model	A (mm)	B (mm)	C (mm)	D (mm)
VFPIP15-150	47	115	25	99
VFPIP15-600	47	115	25	99
VFPIP15-780	47	115	25	99
VFPIP20-1000	47	115	25	108
VFPIP20-1500	47	115	25	108



VFPIM

Manual valve

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIM15-150	47	115	25	99	120
VFPIM15-600	47	115	25	99	120
VFPIM15-780	47	115	25	99	120
VFPIM20-1000	47	115	25	108	120
VFPIM20-1500	47	115	25	108	120

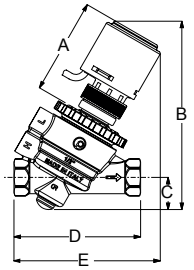


VFPI15 VFPI20

Manual valve

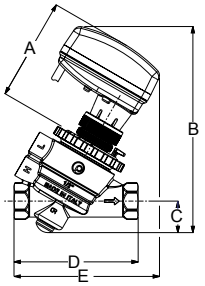
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPI15-150	46	115	25	90	93,5
VFPI15-600	46	115	25	90	93.5
VFPI15-900	46	115	25	90	93.5
VFPI20-600	46	115	25	91.5	95
VFPI20-900	46	115	25	91.5	95

Estimated dimensions with actuators for VFPIP valves, DN15-DN20



Valve with thermal actuator

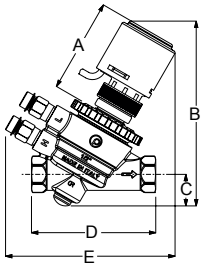
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIP15-150	75	147	25	99	114
VFPIP15-600	75	147	25	99	114
VFPIP15-780	75	147	25	99	114
VFPIP20-1000	75	147	25	108	117
VFPIP20-1500	75	147	25	108	117



Valve with electromechanical actuator

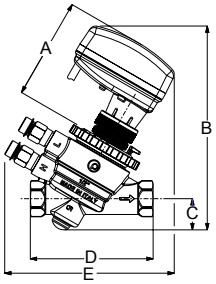
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIP15-150	82	164	25	99	116
VFPIP15-600	82	164	25	99	116
VFPIP15-780	82	164	25	99	116
VFPIP20-1000	82	164	25	108	116
VFPIP20-1500	82	164	25	108	116

Estimated dimensions with actuators for VFPIM valves, DN15-DN20



Valve with thermal actuator

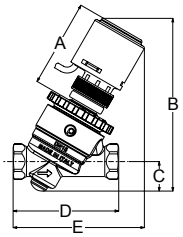
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIM15-150	75	147	25	99	135
VFPIM15-600	65	133	25	99	135
VFPIM15-780	65	133	25	99	135
VFPIM20-1000	65	133	25	108	135
VFPIM20-1500	65	133	25	108	135



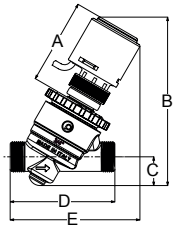
Valve with electromechanical actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIM15-150	82	164	25	99	137
VFPIM15-600	82	164	25	99	137
VFPIM15-780	82	164	25	99	137
VFPIM20-1000	82	164	25	108	137
VFPIM20-1500	82	164	25	108	137

Estimated dimensions with actuators for VFPI valves, DN15-DN20



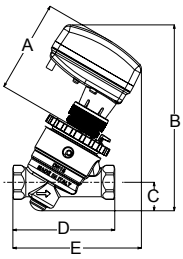
VFPI15



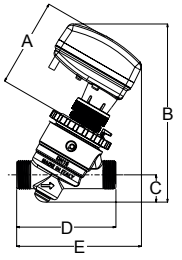
VFPI20

Valve with thermal actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPI15-150	75	147	25	90	112
VFPI15-600	75	147	25	90	112
VFPI15-900	75	147	25	90	112
VFPI20-600	75	147	25	91,5	113,5
VFPI20-900	75	147	25	91,5	113,5



VFPI15

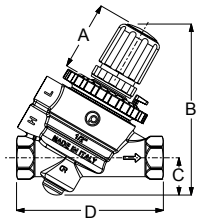


VFPI20

Valve with electromechanical actuator

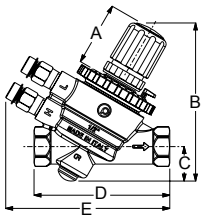
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPI15-150	82	164	25	90	115
VFPI15-600	82	164	25	90	115
VFPI15-900	82	164	25	90	115
VFPI20-600	82	164	25	91.5	115
VFPI20-900	82	164	25	91.5	115

Dimensions for VFPIP and VFPIM valves, DN25



Manual valve, VFPIP

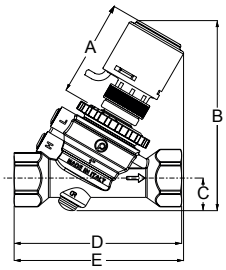
Model	A (mm)	B (mm)	C (mm)	D (mm)
VFPIP25-1500	47	115	25	130



Manual valve, VFPIM

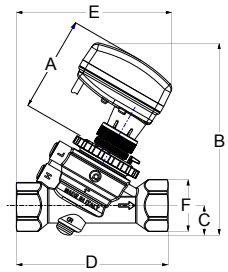
Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIM25-1500	47	115	25	130	134

Estimated dimensions with actuators for VFPIP and VFPIM valves, DN25



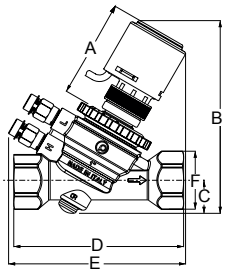
VFPIP valve with thermal actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
VFPIP25-1500	75	147	25	130	131



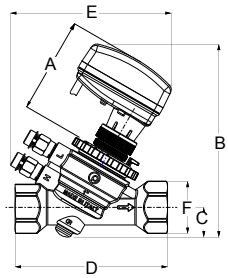
VFPIP valve with electromechanical actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
VFPIP25-1500	82	164	25	130	134	44.5



VFPIM valve with thermal actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
VFPIM25-1500	75	147	25	130	135	44.5



VFPIM valve with electromechanical actuator

Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
VFPIM25-1500	82	164	25	130	138	44.5

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