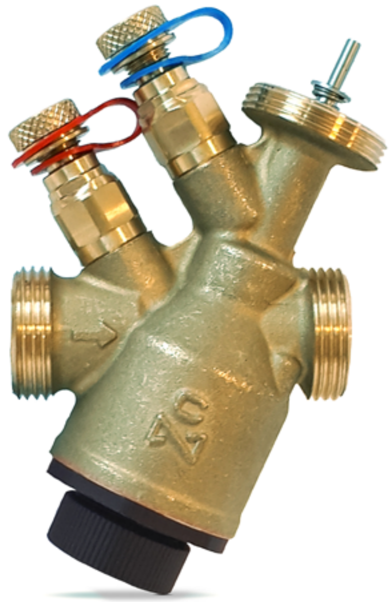
MODEL		CONNECTION	DN	PN	STROKE [mm]	DPmax [kPa]	COMPATIBLE ACTUATORS AND MAX FLOW RATES [l/h]	
WITH P/T PLUGS	WITHOUT P/T PLUGS						MCA24/230L MVR24/230C2 MVX52B	MVT203S MVT403S MVT503S
							ELECTRO-THERMAL 90N - 140N	ELECTRO-MECHANICAL 300N
VLX2P	VLX2	3/4" M	15	16	4	600	800	800
VLX3P	VLX3	1" M	20				1000	1000
VLX4P	VLX4	1 1/4" M	25				2000	2000

APPLICATION AND USE

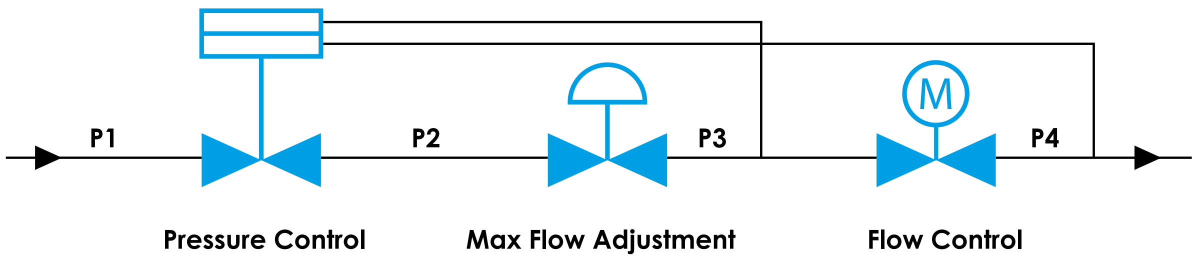
LIBRA pressure independent control valves are suitable for a wide range of hydronic applications in the building services industry.
Fan-coil units and chilled beams are probably the most familiar applications of pressure independent control valves with the move from 4-port (or 3-port) to 2-port valves driven primarily by the need to reduce excessive energy consumption of pumps and thermal losses through pipework.
In the selection of 2-port valves for use in variable-flow systems, particular attention is given to some of the issues that can arise in systems where pump speed is designed to change in response to thermal demand.
Fluctuations of flow initiated by the positioning of the 2-port valves in response to varying occupancy levels and heat losses causes pressure changes in the system, resulting in instability of flow through all the valves.
The system is effectively unbalanced, resulting in the valves 'hunting' as they constantly try to maintain control.
An unstable system has a direct impact on energy consumption, occupancy comfort, noise and maintenance costs.
To ensure accurate temperature control in the occupied spaces of buildings where the system pressure is maintained by a variable- or constant-speed pump installation, it is crucial that pressure fluctuations do not affect the flow through terminal units.
The solution is to install 2-port control valves that can maintain close control of flow independently of the system pressure variation caused by changes in pump speed or the operation of other valves.
Pressure-independent control valves are exactly what the name suggests. They maintain a constant pre-set differential pressure across a control valve such that control action of the valve is not affected by inlet-pressure instability.



DESIGN

The design of VLX.P valve combines high performance with small size and compact construction. The valve incorporates three critical functions.

Pressure Control
A spring-operated diaphragm valve at the inlet of the valve auto-



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matically adjusts the differential pressure across the inlet and outlet ports to maintain a constant value pre-set by adjusting the spring tension.

This ensures (providing the range of inlet pressure variations are within the valves specification) that the differential pressure across the flow control valve will remain constant within its specified tolerances.

Max Flow Adjustment

An adjustable orifice allows the flow through the valve to be adjusted to the designed flow rate. The orifice is combined with the function of the pressure-regulating valve, ensures that the design flow rate is maintained irrespective of varying inlet pressures.

Once the flow regulator has been pre-set to the desired flowrate and the pressure regulator adjusted to the required differential pressure, a constant pre-set flow will be maintained.

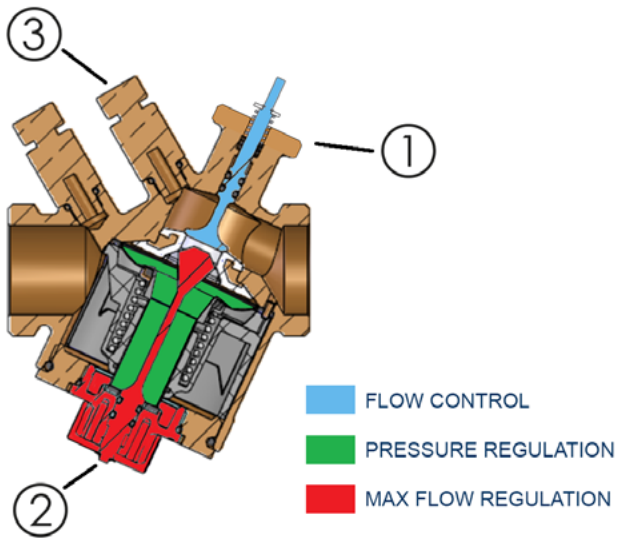
A valve that has the combination of pressure and flow regulation is an effective device for maintaining a constant flow rate through downstream pipework. These are essentially pressure-independent constant-flow valves without the valve control function and actuator. The addition of actuator and valve provides the control element to the valve.

Flow Control

The control function is a remotely actuated valve located downstream the pressure and flow regulators.

Opening and closing the control valve varies the flow through the valve, providing the control function that will respond to an input signal from a discrete terminal controller or a BMS.

The maximum flow is set by the flow regulator, and the required differential pressure is maintained by the pressure regulator — enabling the control valve to give accurate control independent of fluctuations of inlet or line pressure.



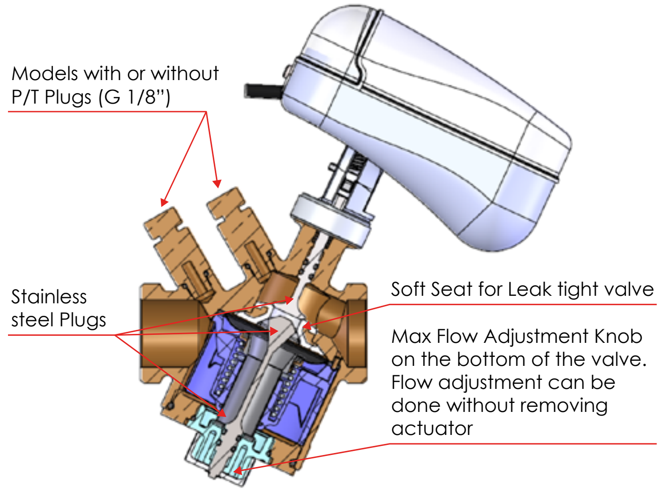
MANUFACTURING CHARACTERISTICS

Valve body	Brass CW 617
Plug	AISI 304
Flow setting Knob	IXEF GF40
Spring	AISI 302
Diaphragm	EPDM 70 Sh
O-rings	EPDM 70

TECHNICAL CHARACTERISTICS

Pressure class	PN16
Min. differential pressure	35kPa*
Max. differential pressure	600kPa
Fluid temperature	-10T120°C
Leakage	tight close-off
Pressure plugs connections	available on VLX.P models (Type M UNI-EN-ISO 228 1/8")

** This is the minimum requested differential pressure across the valve in order to minimize the flow tolerance. The valve can work with a lower differential pressure down to 25 kPa with a lower maximum flow*



INSTALLATION

Before mounting, make sure pipes are clean, free from weld slag and perfectly aligned with the valve body and not subjected to vibrations.
PICVs can be mounted in either the flow or return pipework serving terminal units. Consideration should be given to the flushing regime when deciding on the position of the PICV.
Strainers should always be installed on the main branch pipework feeding terminals served by PICVs, however strainers protecting each PICV need only be installed if the designer feels there is a risk of large contaminants circulating in the system.
The pre-commission cleaning routine should be designed to mitigate the risk of large contaminants being passed through the PICV.
Water or water/glycol mixture quality shall be in accordance to VDI 2035 and with temperature from -10 to 120°C. Maximum pressure rating of the LIBRA valves is 16 bar with maximum differential pressure of 600 kPa. VLX.P valves can be motorized by MVT.S, MVX52B, MCA230L or MCA24L and MVR24C2 or MVR230C2 Controlli actuators equipped with a threaded M30x1.5 ring nut (Nickel Plated Brass) for an easy valve assembling (position ① of the figure on the left).
Significant set-up and commissioning time is saved by the ability to adjust the flow regulation without removing the actuator.
With the actuator driven to the fully open position, the maximum design flow in litres/hour for the valve can be set by adjusting the graduated scale of the flow regulator (position ②). The differential pressure in kPa across the valve is set using the Pressure plug connectors (position ③) connected to a portable manometer.
Pipe system shall be properly ventilated to avoid risk of air pockets.
Valves are normally open; thus if they are not coupled with the actuator.

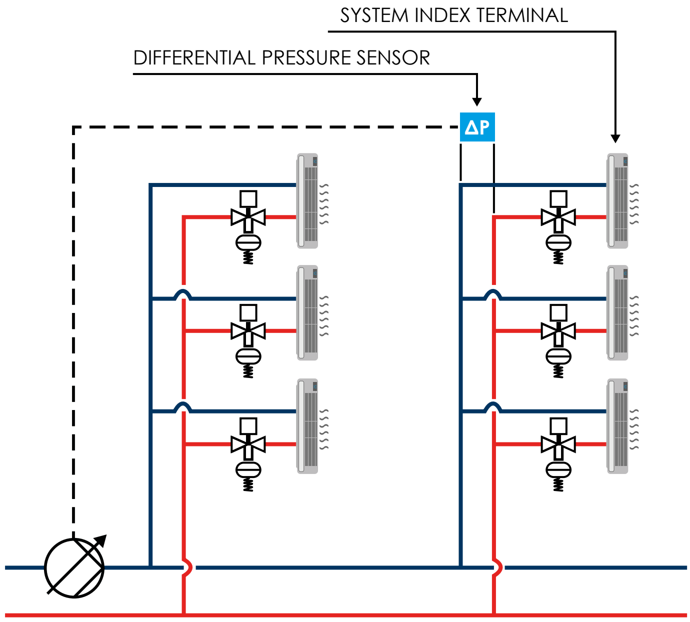
The flow rate will be the one indicated in the table below:

CALIBER POSITION	FLOW LIMITATION	MAX FLOW (l/h)		
		VLX2	VLX3	VLX4
1	20 %	160	200	400
2	40 %	320	400	800
3	60 %	480	600	1200
4	80 %	640	800	1600
5	100 %	800	1000	2000

Intermediate positions are allowed. Flow setting can be read from the below charts.

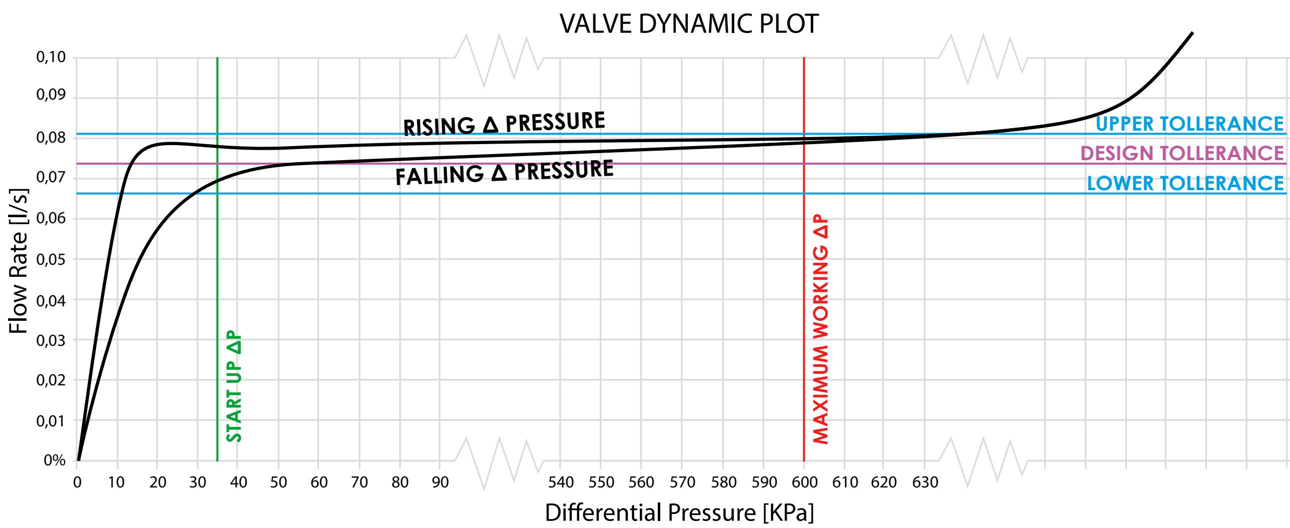
Each LIBRA valve can be set independently and in any order provided there is sufficient pressure available to enable its integral spring-operated diaphragm to operate. Branches close to the pump are most likely to have sufficient pressure at start up and are therefore an obvious place to start. The commissioning procedure is as follows:

1. For the selected VLX valve, ensure that the 2 port valve is fully open. Measure the pressure differential across its pressure tappings and confirm that the value obtained is greater than the minimum value indicated in the product brochure. If this is not the case investigate the causes and, if necessary, report to the designer.
2. Adjust the caliber to the specified design flow rate and record the setting.
3. Repeat the above process for all of the LIBRA valves on the branch.
4. Measure the flow rate indicated at the flow measurement device on the branch. Confirm that the value recorded is equal to the sum of the flows set at downstream LIBRA valves. If this is not the case investigate the causes and, if necessary, report to the designer.
5. Repeat this procedure until all LIBRA valves in the system have been set and their summated flows checked against upstream flow measurement devices.
6. Measure the differential pressure across the LIBRA valve on the system index terminal (usually the most remote terminal from the pump). Adjust the pump speed until the pressure differential across this valve is equal to the minimum value indicated in the product brochure. Please consider that if the valve on the system index terminal unit (the farthest valve from the pump) will experience a differential pressure lower than 35 kPa (i.e. 25 kPa) it means the flow tolerance be higher on that valve; instead all the others valves in the system will most probably experience a valve differential pressure higher than 35 kPa and therefore the energy saving benefit will not be affected significantly.
7. Determine the pressure differential at the sensor location. Usually the sensor is placed at the distance from the pump equal to 2/3 of the distence of the farthest terminal from the pump itself. Set the pump speed to control such that the value indicated at the sensor is maintained constant under all conditions.
8. Measure and record the total flow rate, pressure differential and energy consumption at the pump.
9. Run all two port valves to their closed positions. Measure and record the total flow rate, pressure differential and energy consumption at the pump. Calculate and report the overall energy saving achieved i.e. between full load and minimum load operation.



HYSTERESIS

The accuracy with which the flow rate setting is maintained also depends on whether the pressure differential across the valve is rising or falling. It can be seen from the following figure that there are distinct rising and falling pressure curves.



The difference between the two curves is often referred to as the valve's "hysteresis". The hysteresis effect is caused by the sealing elements in the pressure regulating part of the valve, although the spring and elastic membrane may also have some influence. This hysteresis effect can be seen in all self-acting spring operated PICVs and DPCVs. Due to hysteresis, two repeatable flow readings can be obtained depending on whether the pressure differential across the valve has risen or fallen to the value when the measurement is taken. Since the valves are factory tested on their rising pressure curves, the flow setting device indicates flows that correspond to a rising rather than decreasing pressure differential. For the reasons explained, the valve's proportional band and hysteresis may cause flow values to vary from their set values. These effects can be minimised by ensuring that systems are:

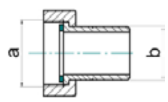
- Designed such that when a PICV opens to increase the flow rate to a terminal unit, its pressure differential simultaneously increases rather than decreases.
- Commissioned such that when a PICV is set to its required flow rate, the pressure differential across the valve is as close as possible to its final operating value.

Both of these objectives can be easily achieved by ensuring that during commissioning and subsequent system operation, pump pressure always reduces as PICVs close. The best way to achieve this is to set the pump speed controller such that a constant pressure differential is maintained at a differential pressure sensor located towards the index PICV i.e. the PICV located furthest from the pump. A single sensor located two thirds of the way along the index branch is satisfactory in systems with a uniform load pattern; alternatively multiple sensors across the most remote PICV controlled terminal branches can be used in systems with an unpredictable and varying load pattern. Controlling pump speed such that pump pressure is maintained constant should be avoided wherever possible. This solution inevitably results in large increases in pressure differential across PICVs as they close, resulting in the largest possible variations from set flow rate values, much better than standard two ports.

ACCESSORIES

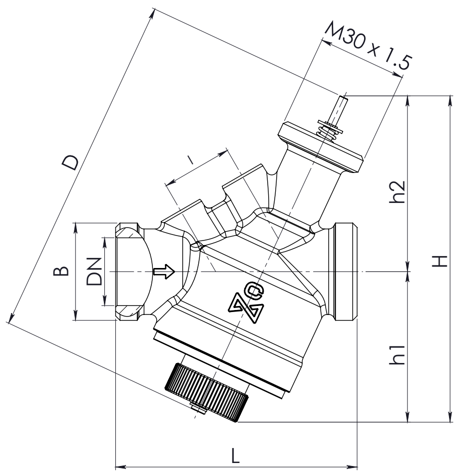
DMP700 differential pressure meter (700kPa max)

CONNECTIONS			
CODE	**DN**	**a**	**b**
89811-03	15 (3/4")	3/4" F	1/2" M
89811-01	20 (1")	1" F	3/4" M
89811-04	25 (1 ¼")	1 ¼" F	1" M

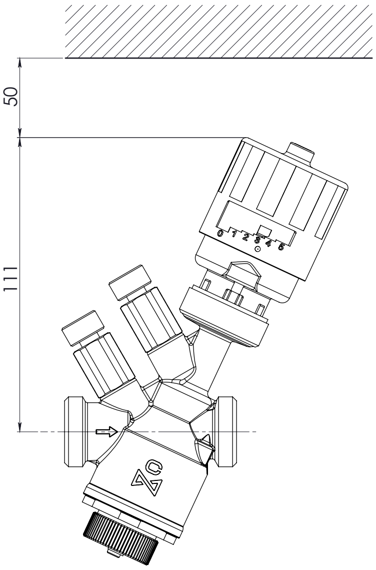


DIMENSIONS [mm]

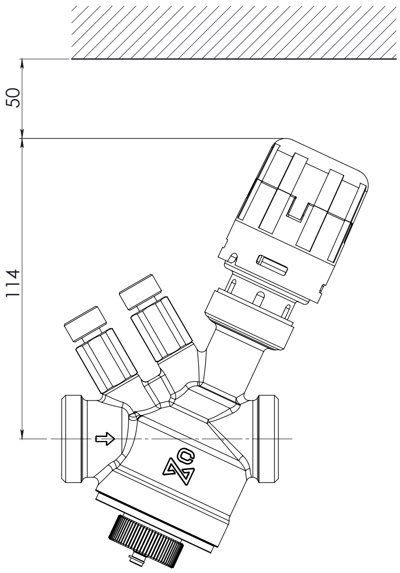
CODE	DN	B	L	H	h1	h2	D	I	Weight [Kg]	
									WITHOUT P/T PLUGS	WITH P/T PLUGS
VLX2	15	3/4"	65	108	50	58	115	24	0,343	0,404
VLX3	20	1"	82	111	51	60	117	24	0,543	0,604
VLX4	25	1 ¼"	95	129	68	61	138	27	0,966	1,027



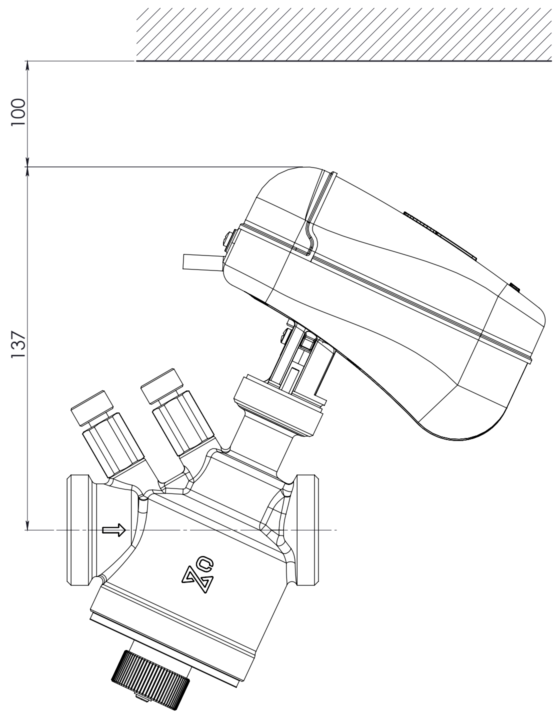
DN15 + MCA

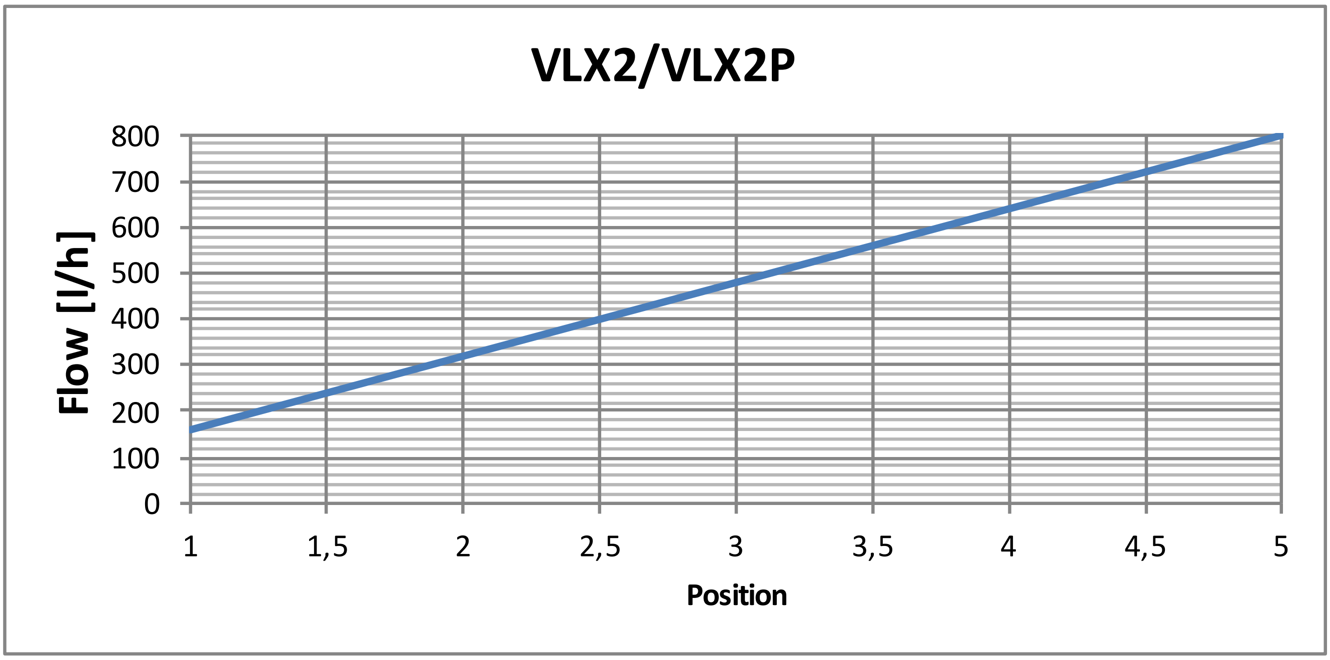


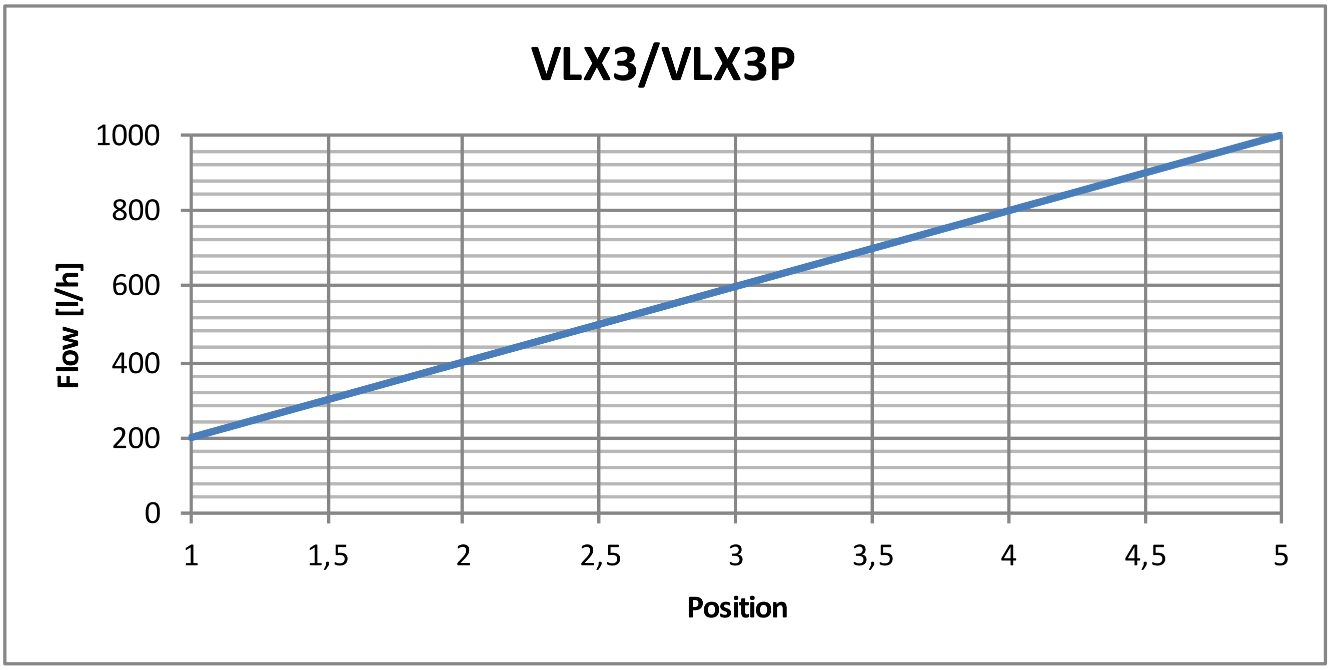
DN20 + MVX

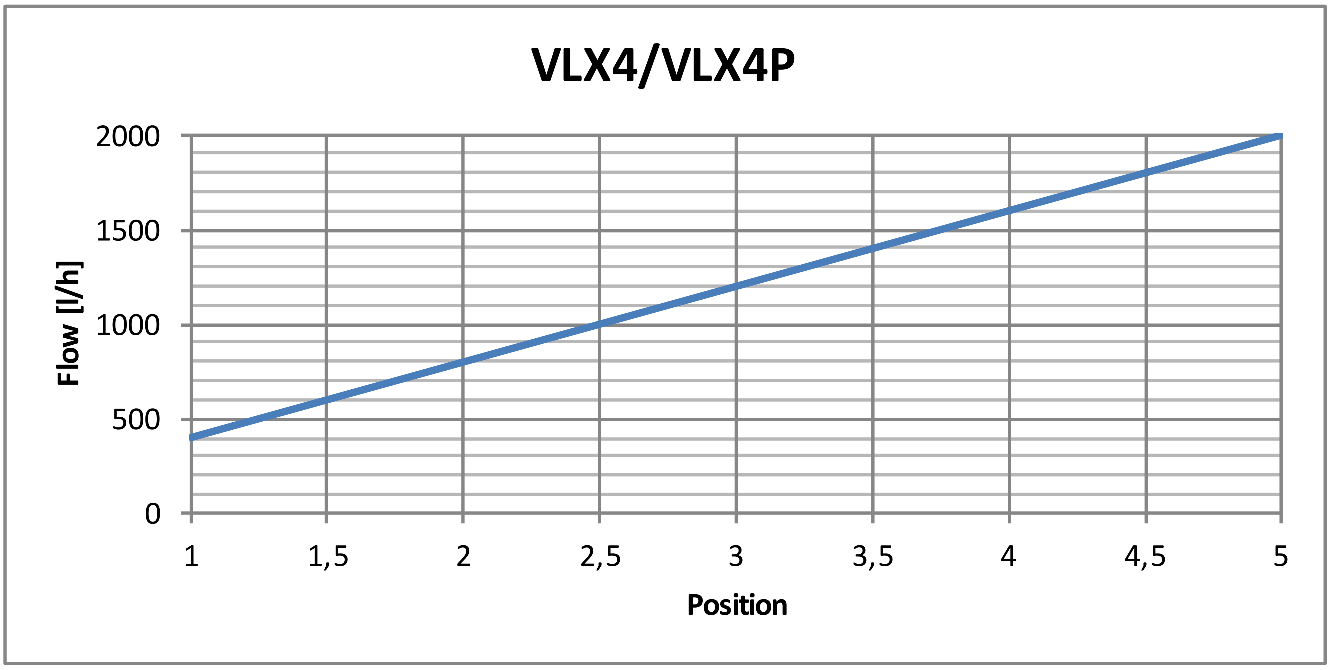


DN25 + MVT









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