# LIBRA DN15÷32

Pressure independent control valves

MODEL		CONNECTION	DN	PN	STROKE [mm]	DPmax [kPa]	COMPATIBLE ACTUATORS AND FLOW RATES [l/h]	
WITH P/T PLUGS	WITHOUT P/T PLUGS						A5 (with VA90)	MVT203S/403S MVT503SB MPO/M3P (with VA90)
							Electro-thermal 125N	Electro-mechanical 200N
VLX1P	VLX1	1/2" M	15	16	4	600	375	375
VLX2P	VLX2	3/4" M	15				800	800
VLX3P	VLX3	1" M	20				1000	1000
VLX4P	VLX4	1 ¼" M	25				2000	2000
VLX5P	VLX5	1 ½" M	32				-	4000
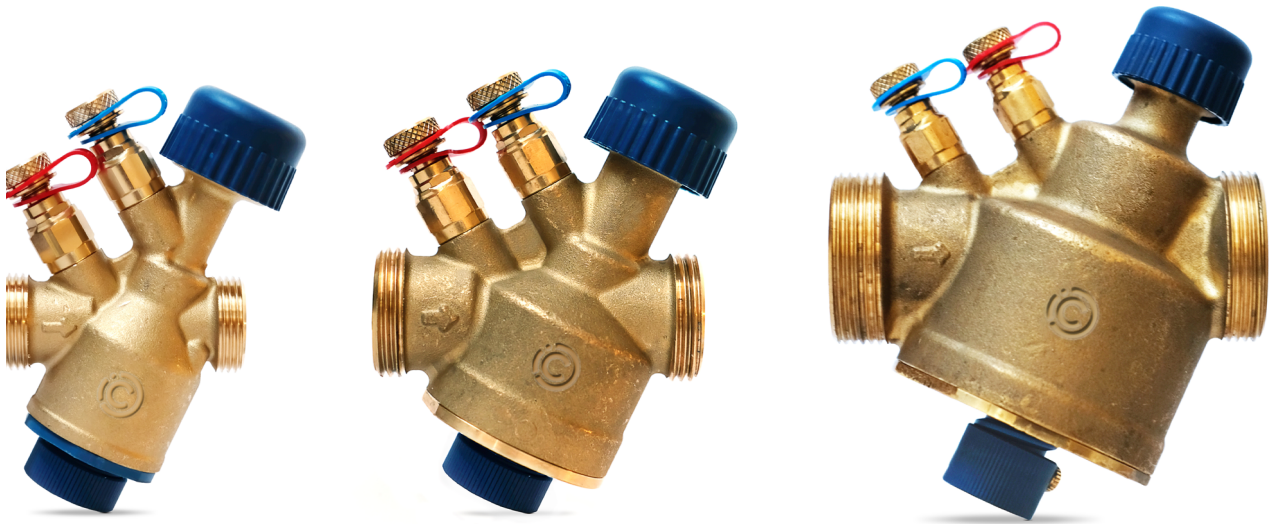
APPLICATION AND USE

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-ports (or 3-ports) to 2-ports valves driven primarily by the need to reduce excessive energy consumption of pumps and thermal losses through pipework.
In the selection of 2-ports 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-ports 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-ports 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.

The performances stated in this sheet can be modified without any prior notice.

DESIGN

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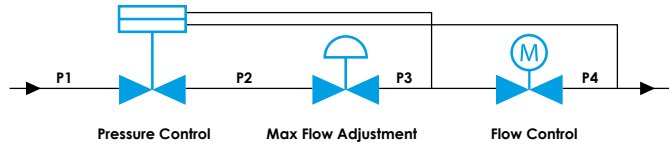
Pressure Control

A spring-operated diaphragm valve at the inlet of the valve automatically adjusts the differential pressure across the inlet and outlet ports to maintain a constant.
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 design 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 differential pressure is within the specified range, 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 the actuator 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.

- FLOW CONTROL
- PRESSURE REGULATION
- MAX FLOW REGULATION
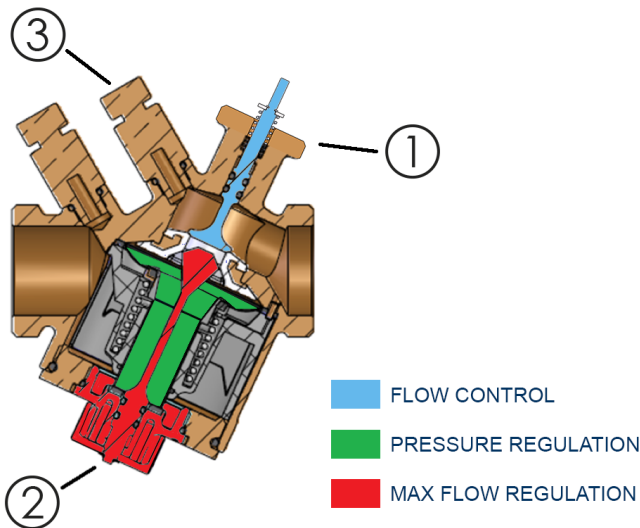
LIBRA valves can be motorized by A5 (with VA90 linkage) and MPO/M3P (with VA90 linkage) EAZY actuators equipped with a threaded M30x1.5 ring nut (Nickel Plated Brass) for an easy valve assembling (position ① of the figure on the left).
Significant set-up and commissioning time is saved by the ability 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.

Valves are normally open; they are open with the plug fully extended.
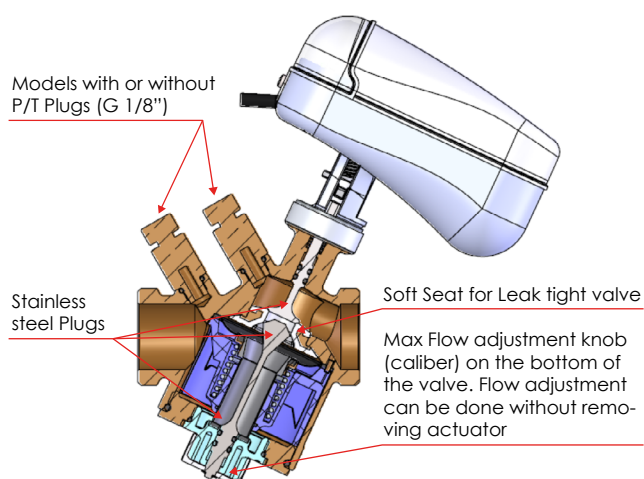
MANUFACTURING CHARACTERISTICS

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

TECHNICAL CHARACTERISTICS

CHARACTERISTIC	DESCRIPTION
Pressure class	PN16
Min. differential pressure	20-35 kPa* depending on caliber position (see table and charts below)
Max. differential pressure	600 kPa
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 with a lower maximum flow.

Models with or without P/T Plugs (G 1/8")

Stainless steel Plugs

Soft Seat for Leak tight valve

Max Flow adjustment knob (caliber) on the bottom of the valve. Flow adjustment can be done without removing actuator

The maximum flow and the minimum differential pressure are detailed in the following table.

CALIBER	VLX1/VLX1P		VLX2/VLX2P		VLX3/VLX3P		VLX4/VLX4P		VLX5/VLX5P	
	Qmax [l/h]	Min DP [kPa]	Qmax [l/h]	Min DP [kPa]	Qmax [l/h]	Min DP [kPa]	Qmax [l/h]	Min DP [kPa]	Qmax [l/h]	Min DP [kPa]
5	375	35	800	35	1000	35	2000	35	4000	35
4	300	30	575	30	750	30	1400	30	3000	35
3	240	25	360	25	480	25	840	25	1600	30
2	150	25	215	25	300	22	480	20	800	25
1	100	20	145	25	200	20	200	20	400	25

Intermediate positions are allowed. The flow setting can be read from the charts at the end of the document.

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.

Proper filters and dirt separator shall 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.

The water or water/glycol mixture must always be clean, free of debris and treated in accordance with VDI2035.

Pipe system shall be properly ventilated to avoid risk of air pockets.

We recommend the use of sealants such as adhesive sealants for pipes or Teflon tape.
When using hemp as a pipe sealant, make sure there are no threads left in the product or pipe.

**Non compliance with the warnings provided in this document will invalidate the warranty.**

COMMISSIONING

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 differential pressure 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 (for VLX5/VLX5P model use the locking screw to fix the position) 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 differential pressure 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 the minimum DeltaP specified at the current caliber position (i.e. 25kPa) it means the flow tolerance will 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 differential pressure at the sensor location. Usually the sensor is placed at the distance from the pump equal to 2/3 of the distance 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, differential pressure and energy consumption at the pump.
9. Run all two port valves to their closed positions. Measure and record the total flow rate, differential pressure and energy consumption at the pump. Calculate and report the overall energy saving achieved i.e. between full load and minimum load operation.
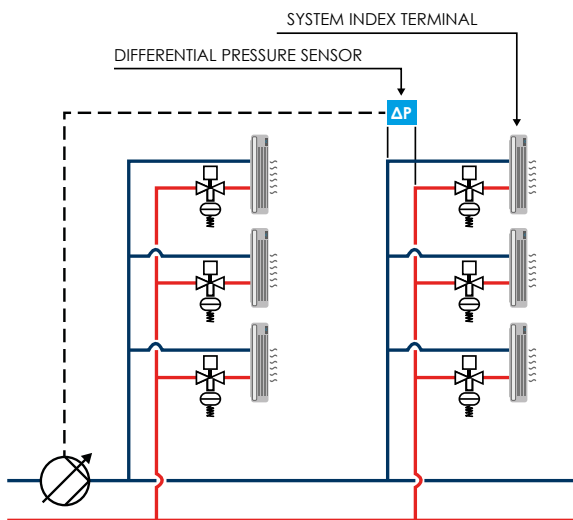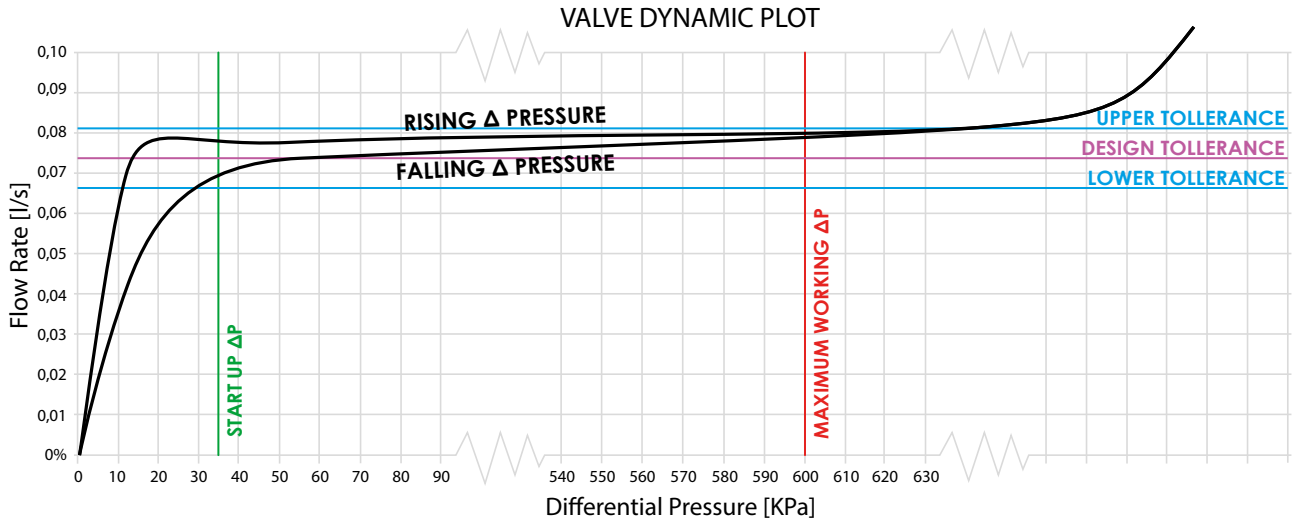

PICV CALIBER
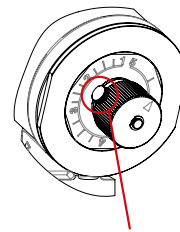
LOCKING SCREW (VLX5/VLX5P only)

DMP700

HYSTERESIS

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

VALVE DYNAMIC PLOT

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. Due to hysteresis, two repeatable flow readings can be obtained depending on whether the differential pressure 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 differential pressure. 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 differential pressure simultaneously increases rather than decreases.
Commissioned such that when a PICV is set to its required flow rate, the differential pressure 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 differential pressure 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 differential pressure 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)
55047-015   Thermal insulation for VLX1, VLX1P, VLX2 and VLX2P valves
55047-020   Thermal insulation for VLX3 and VLX3P valves
55047-025   Thermal insulation for VLX4 and VLX4P valves
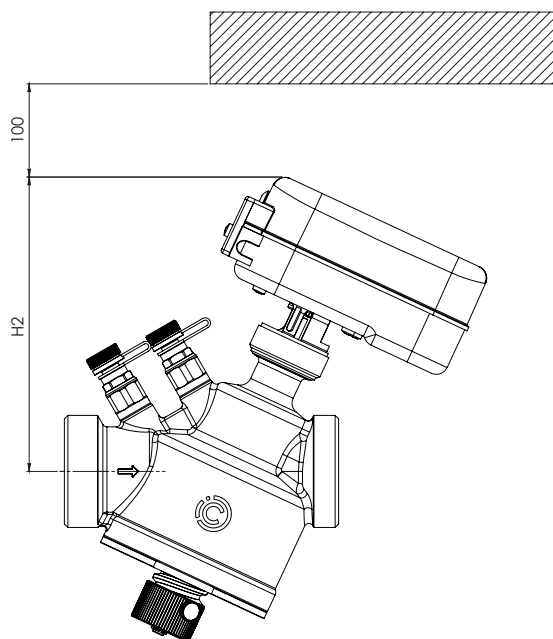**55047-032**   Thermal insulation for VLX5 and VLX5P valves

cod.	DN	a	b
CONNECTIONS			
89811-02	15 (1/2")	1/2" F	3/8" M
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
89811-05	32 (1 ½")	1 ½" F	1 ¼" M

DIMENSIONS [mm]

| Cod.	DN	B	L	H	h1	h2	D	I	Weight [kg]
VLX1	15	1/2"	65	108	50	58	115	24	0,343
VLX1P	15	1/2"	65	108	50	58	115	24	0,404
VLX2	15	3/4"	65	108	50	58	115	24	0,343
VLX2P	15	3/4"	65	108	50	58	115	24	0,404
VLX3	20	1"	82	111	51	60	117	24	0,543
VLX3P	20	1"	82	111	51	60	117	24	0,604
VLX4	25	1 ¼"	95	129	68	61	138	27	0,966
VLX4P	25	1 ¼"	95	129	68	61	138	27	1,027
VLX5	32	1 ½"	117	139	73	66	148	27	1,332
VLX5P	32	1 ½"	117	139	73	66	148	27	1,393
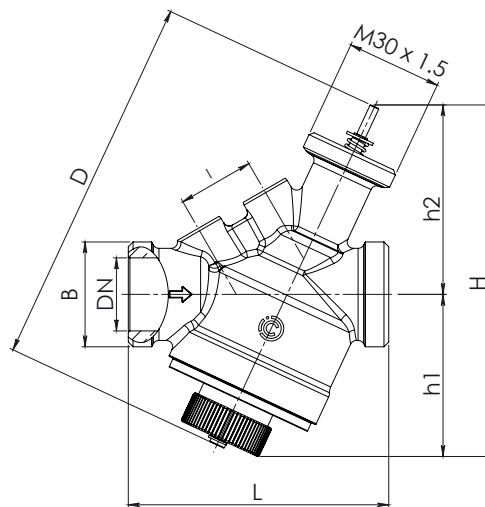
with MVT203S/MVT403S/MVT503SB   **with A5**   **with MPO/M3P**
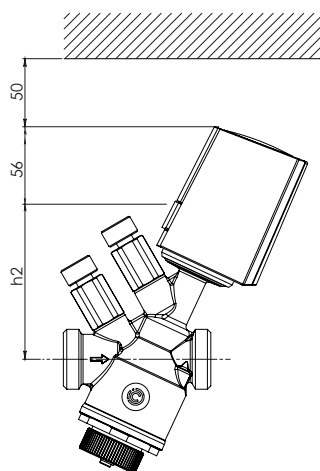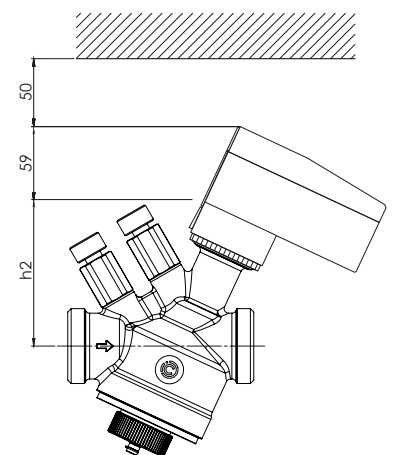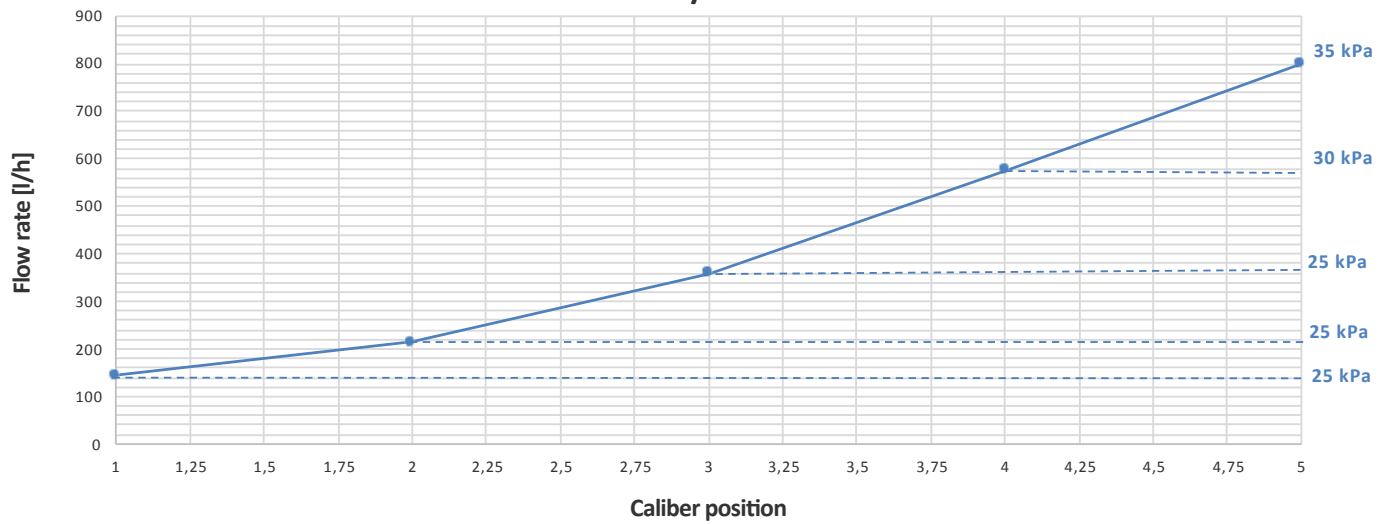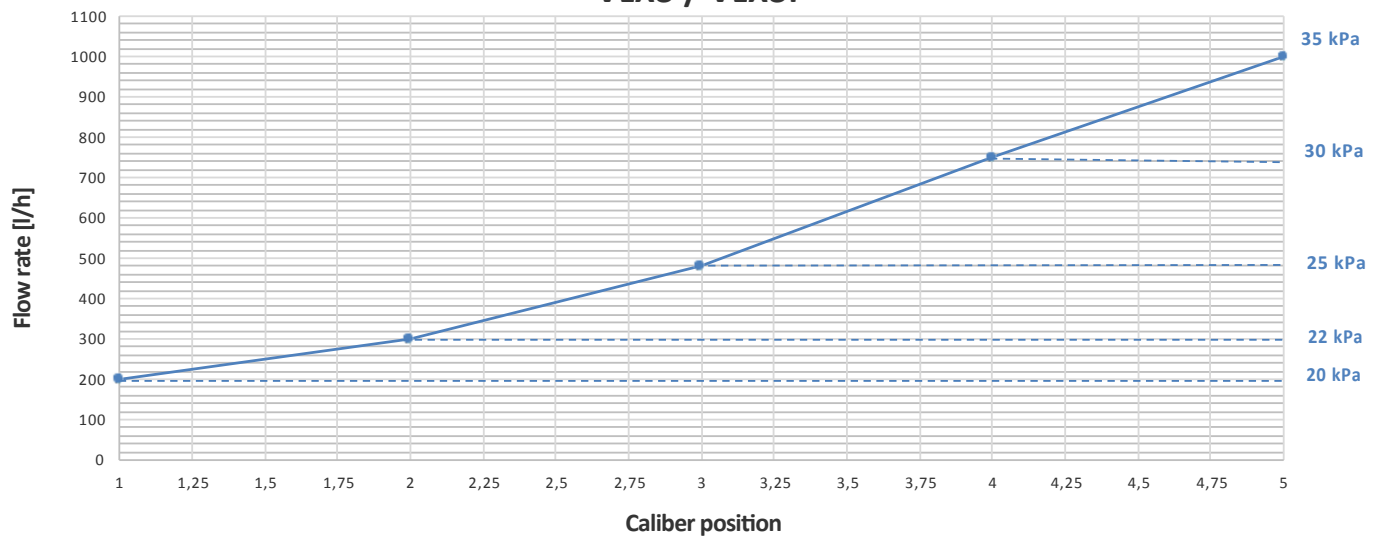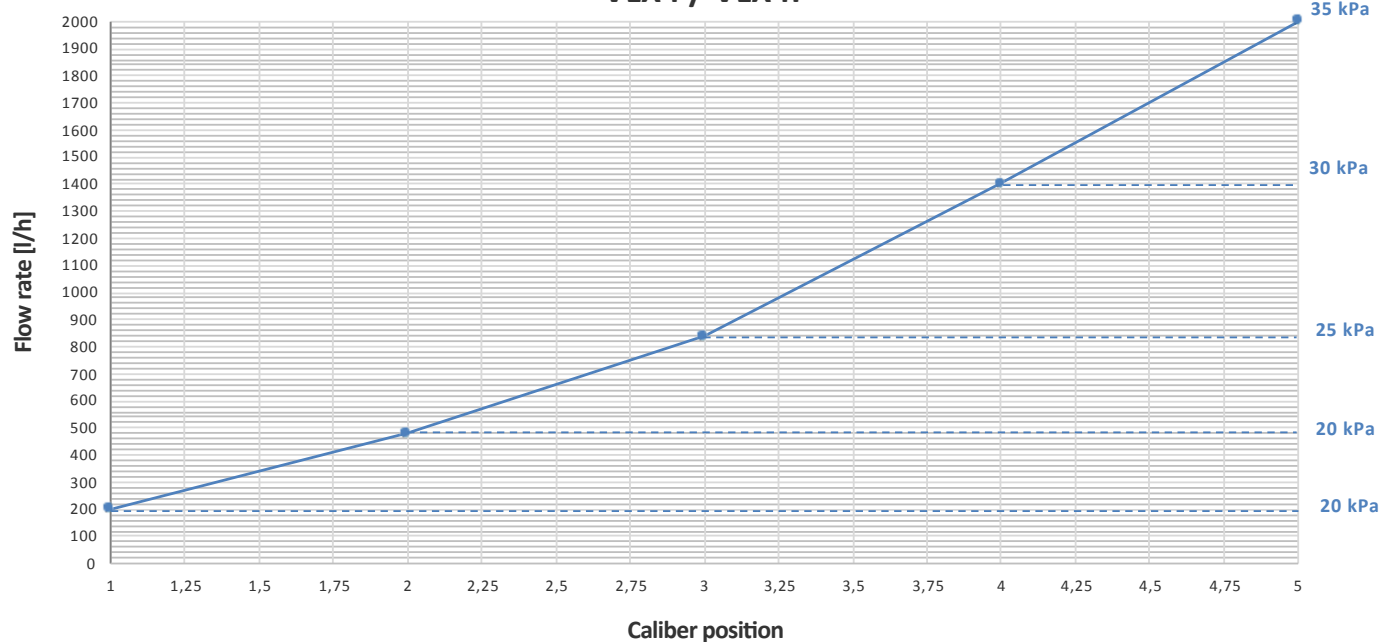
VLX1 / VLX1P
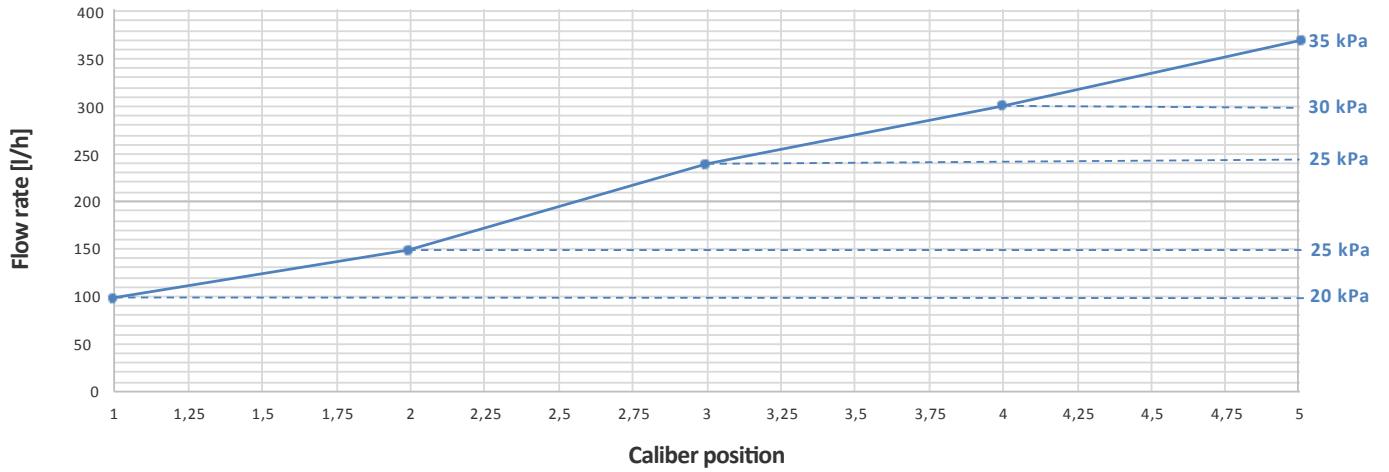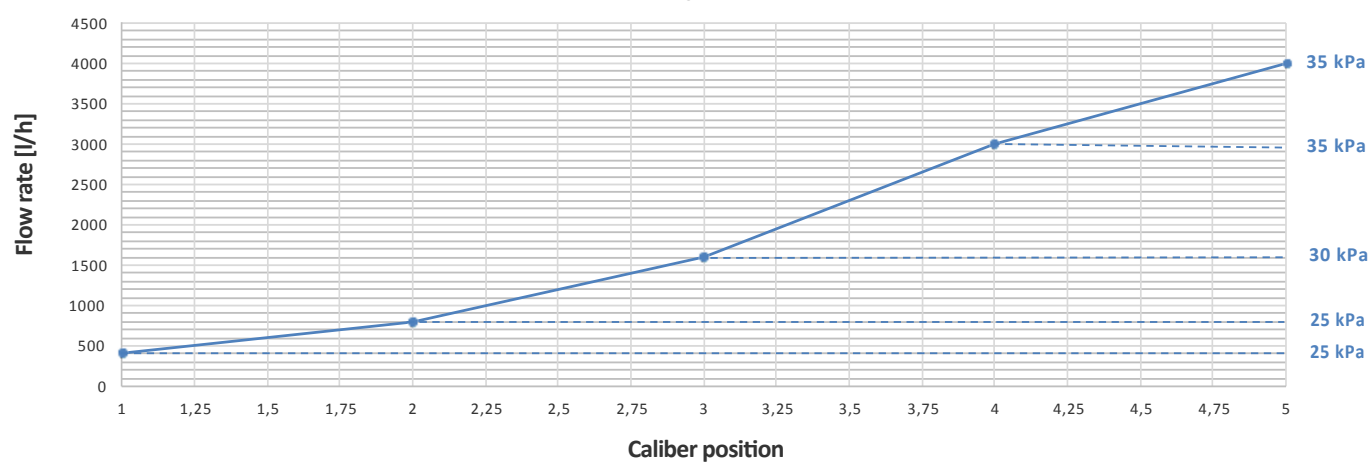

VLX2 / VLX2P

VLX3 / VLX3P

VLX4 / VLX4P

VLX5 / VLX5P

MODEL CODE AND ORDERING CODE

MODEL CODE	ORDERING CODE	P/T plugs	DN	Qmax [l/h]	DPmax [kPa]	Stroke [mm]	Electrothermal actuators	Motoric actuators
							A5 (with VA90)	MVT203S/403S MVT503SB MPO/M3P (with VA90)
VLX1	1373xx	NO	15	375	600	4	X	X
VLX1P	137309	YES					X	X
VLX2	1373xx	NO		800			X	X
VLX2P	137310	YES					X	X
VLX3	1373xx	NO	20	1000			X	X
VLX3P	137312	YES					X	X
VLX4	1373xx	NO	25	2000			X	X
VLX4P	137313	YES					X	X
VLX5	1373xx	NO	32	4000			X	X
VLX5P	137314	YES					X	X

Note: For use with actuator **MVT503SB** set Dipswitches #1 OFF, #2 OFF, #3 OFF and #4 OFF (factory setting) for stroke selection