



## S - Dynamic Balancing Valve

### Application

S is used in heating and cooling systems for the distribution of flow in various sections of the system.

The dynamic balancing valve ensures easy and reliable balancing of the system, regardless of any fluctuations in the differential pressure of the system.

S limits maximum flow in the system, and ensures the most economical operation.

Can be used in both variable and constant flow systems.



### Benefits

- Quick and easy selection as only flow data are required.
- Security that the specified flow will not be exceeded.
- Easy to install and adjust according to pre-defined flow.
- Flexibility if the system is modified after the initial installation
- Minimized commissioning time due to automatic balancing of the system.
- High comfort for the end-users due to right balance of the hydraulic system.
- The valves automatically find the hydraulic balance regardless of pressure fluctuations in the system.
- No main circuit or branch balancing valves needed in the system.
- Systems with dynamic balancing are flexible, as they do not require readjustment of the "original" circuit in case the system is extended after installation.

### Features

- Removable differential pressure cartridge solution simplifies flushing procedure
- No minimum straight pipe lengths required before or after the valve.
- Built-in optional P/T ports for needle system.
- Easy adjustment of the flow by the lockable handle.

# S - Dynamic Balancing Valve

Function S

The following applies to all flow control valves:

$$Q = kV \cdot \sqrt{\Delta p}$$

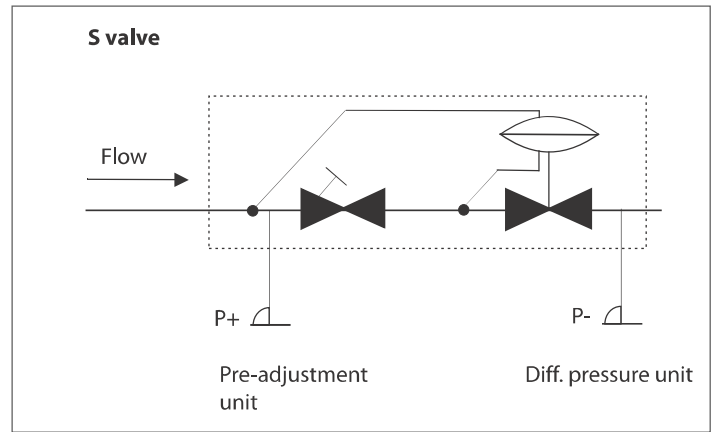
Q = Flow (m<sup>3</sup>/h)

kV = Opening area

Δp = Differential pressure (Bar)

The S valves, react to pressure fluctuations so that the differential pressure across the preadjustment unit is kept constant. In that way a max. flow limit is ensured in accordance with the design.

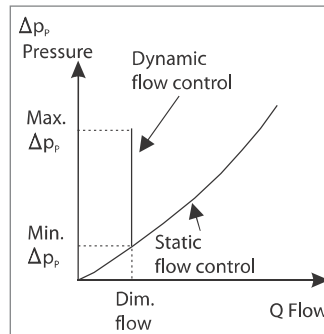
Simplified outline S



## Flow characteristic

The illustration shows how the flow in a S valve reacts in accordance to the pump pressure.

For comparison we have added a typical flow.



The differential pressure unit of the valve will work as soon as the differential pressure provided by the pump is sufficient. Consequently, the rated flow is maintained regardless of any pressure fluctuations in the system.

## Setting the valve

The valve is easily set, and the pre-setting is read on the scale. The flow rate of the valve can be determined from the flow rate graphs for the valve dimension in question.

See the flow rate graphs of the valve on pages 7 to 13 for further information about the adjustment setting.

Please note:

The scale is for the adjustment of flow. If you want to close the valve, use the version with isolation ball valve.

The handle can be locked after adjustment.

Remove cap marked Frese, and tighten with 5mm hexagonal key.



The flow through the valve can be identified by measuring the differential pressure (Δp) across the valve:

If the measured differential pressure is above the minimum Δp, the flow is the one stated on the graph for the valve.

If the measured differential pressure is below the minimum Δp, the flow can be found by using the formulas below.

### Flow Calculation

$Q = kV \cdot \sqrt{\Delta p}$	Q = m <sup>3</sup> /h Δp = Bar
$Q = kV \cdot 100 \cdot \sqrt{\Delta p}$	Q = l/h Δp = kPa
$Q = \frac{kV}{36} \cdot \sqrt{\Delta p}$	Q = l/s Δp = kPa

# S

## - Dynamic Balancing Valve

### Verification of dynamic systems

In general the flow rate in a system can be verified in two ways, i.e.:

- Direct flow rate verification in a circuit
- Measurement of the differential pressure across the balancing valve or metering station.

#### Direct flow rate verification

Can for example be carried out by ultrasonic equipment. On the basis of the measured velocity of the flow and the pipe dimension the software will compute a flow rate. The use of ultrasonic verification requires free access to the pipes as the sensors are fitted directly to the pipe.

**Measurement of the differential pressure** is the prevailing method.

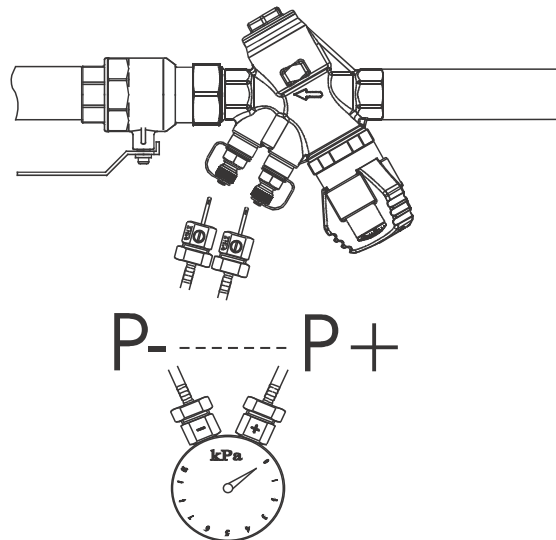
On dynamic valves the differential pressure across the valve is measured to determine whether the valve is within the pressure range or not.

Use the flow graphs to set the valve and verify the min.  $\Delta P$ .

As previously mentioned, the valve includes a differential pressure regulator, to keep the design flow limited under different pressure conditions. The flow rate itself, however, is only determined by the pre-setting in the same way as in any static valve.

Use the procedure as described for verification of the flow, and for optimization of the operation.

Once the differential pressure has been verified, the flow rate is given according to the flow rate graphs in this tech note. You may copy the form on page 11 and use it as documentation when verifying the different flow rates in the installation.



Measurement of the differential pressure across the valve

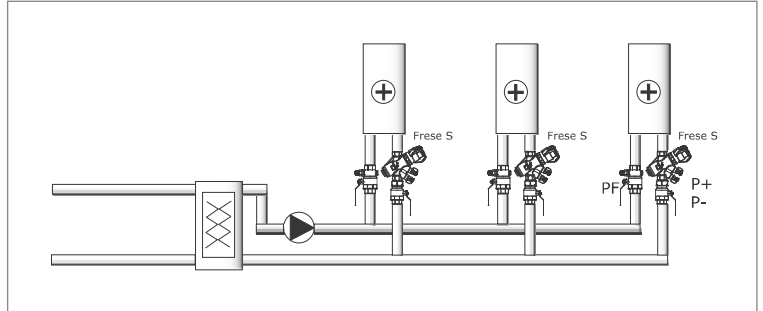
# S - Dynamic Balancing Valve

## Application sketches

### Frese S system in circuit with heating surfaces

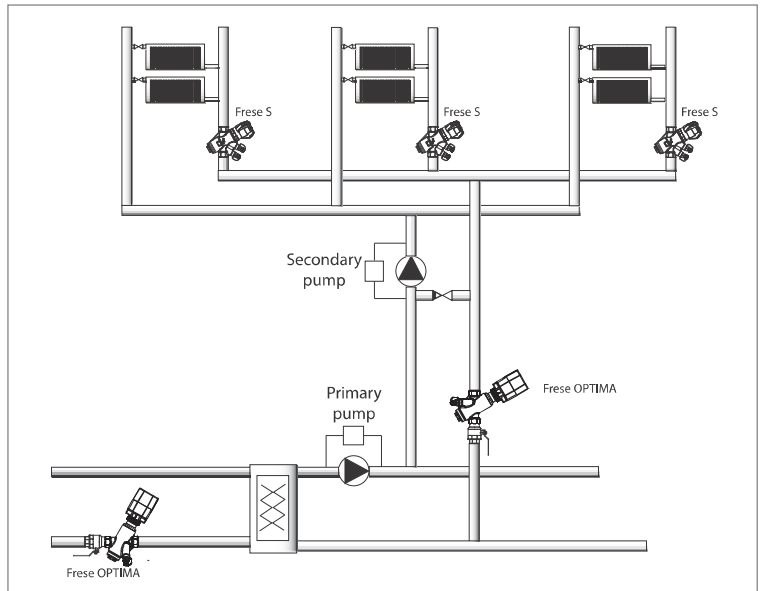
The system is easily balanced by adjusting the pump according to the required differential pressure across the critical valve (P+ - P-).

When the differential pressure is available the system will automatically be balanced.



### Frese S in installation with mixing loops

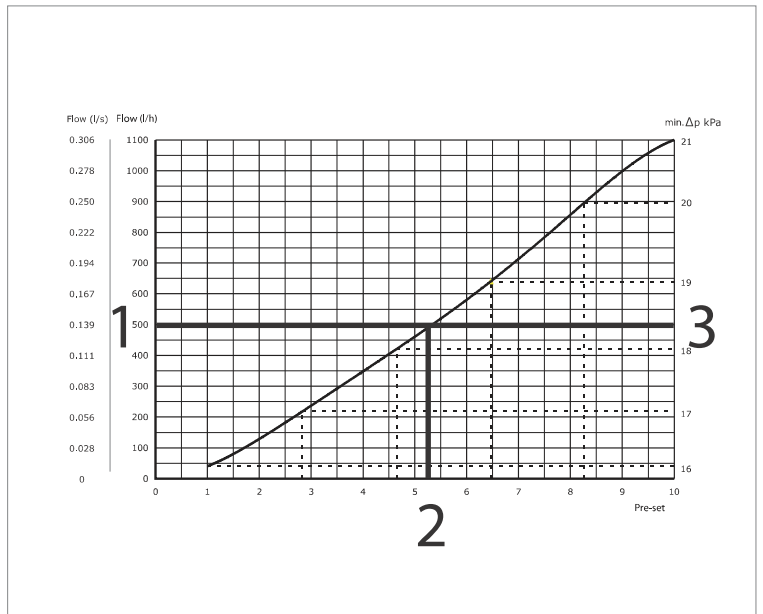
Please note:  
The balance is controlled by the Frese S valves fitted in each control zone. Major branch balancing valves are eliminated, even if the system may be larger and with far more branches than shown in this simplified diagram.



### Flow rate example S, DN15

Rated flow 500 l/h - 0,0139 l/s

1. The rated flow is used as the point of reference for the overall rating of dynamic systems. (See the graph)
2. The pre-setting for the valve is found by means of the flow rate graph. Setting = 5.2.
3. To the right in the graph you will see the minimum differential pressure required from the pump by each valve. Requires 18,3 kPa.

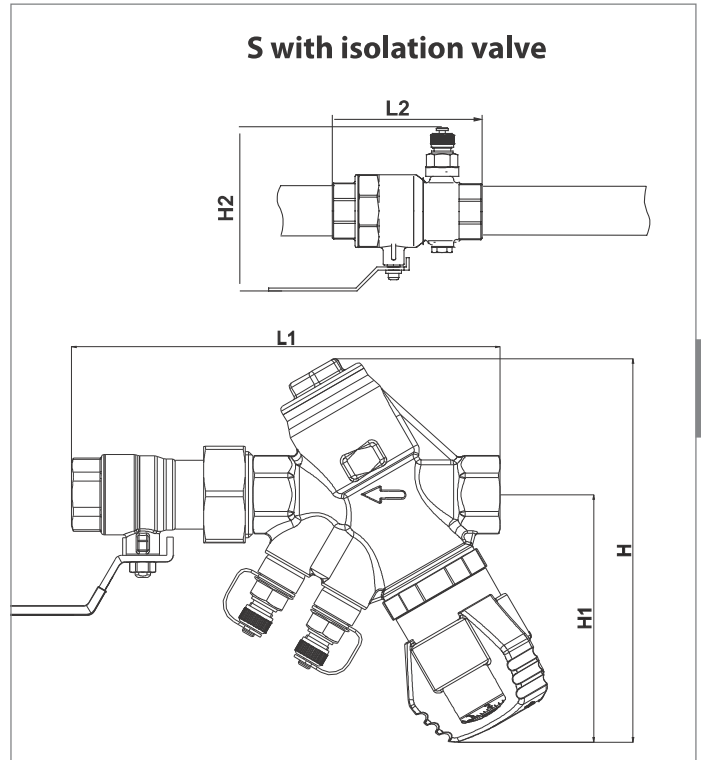
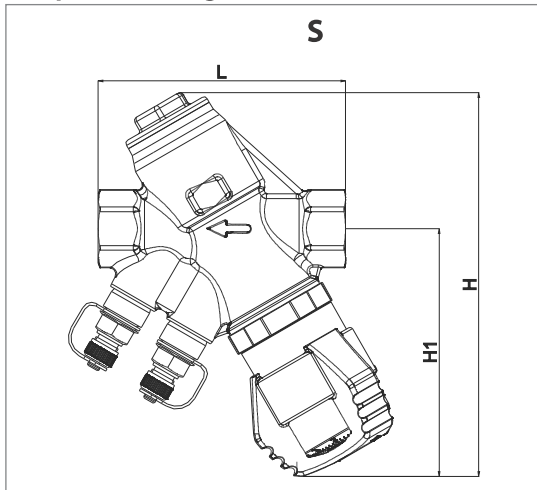


# Model S

## - Dynamic Balancing Valve

### Technical data

<b>Housing:</b>	DZR, Brass
<b>DP controller:</b>	PPS 40% glass
<b>Flow setting:</b>	PPO
<b>Spring:</b>	Stainless steel
<b>Diaphragm:</b>	HNBR
<b>O-rings:</b>	EPDM
<b>Pressure class:</b>	PN25 (without isolation valve) PN16 (with isolation valve)
<b>Max. differential pressure:</b>	400 kPa (High pressure) 250 kPa (Low pressure)
<b>Temperature range:</b>	-10°C to + 120°C



Dimension		DN15	DN20	DN25	DN32	DN40	DN50
Flow rate	l/s	HP	0.011 - 0.306	0.018 - 0.512	0.025 - 0.653	0.060 - 1.328	0.122 - 2.868
		LP	0.007 - 0.223	0.011 - 0.351	0.017 - 0.462		
	l/h	HP	40 - 1100	66 - 1850	89 - 2350	217 - 4800	175 - 7450
		LP	25 - 804	41 - 1265	61 - 1663		
	gpm	HP	0.18 - 4.85	0.29 - 8.11	0.39 - 10.35	0.96 - 21.04	0.77 - 32.76
		LP	0.11 - 3.54	0.18 - 5.57	0.27 - 7.32		
Dimension mm	L	96	97	103	132	144	155
	L1	167	173	202	235	257	286
	H	148	151	155	188	206	219
	H1	96	98	102	115	119	126
	L2	75	82	95	100	108	127
	H2	95	103	111	135	145	164
	KVs	HP 2.4/LP 2.2	HP 3.6/LP 3.3	HP 4.4/LP 4.1	8.8	13.2	16.7


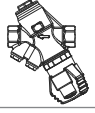



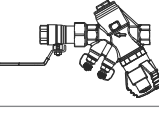
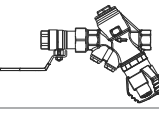
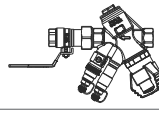
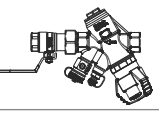
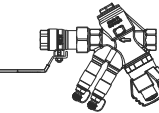
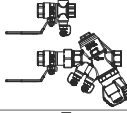
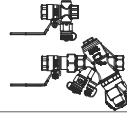
### Text for technical Specifications

The valve should be a automatic balancing valve with the option of setting the flow without interference of operation.

The valve should include P/T plugs for the verification of differential pressure.

The valve should only be adjustable by means of a lockable handle.

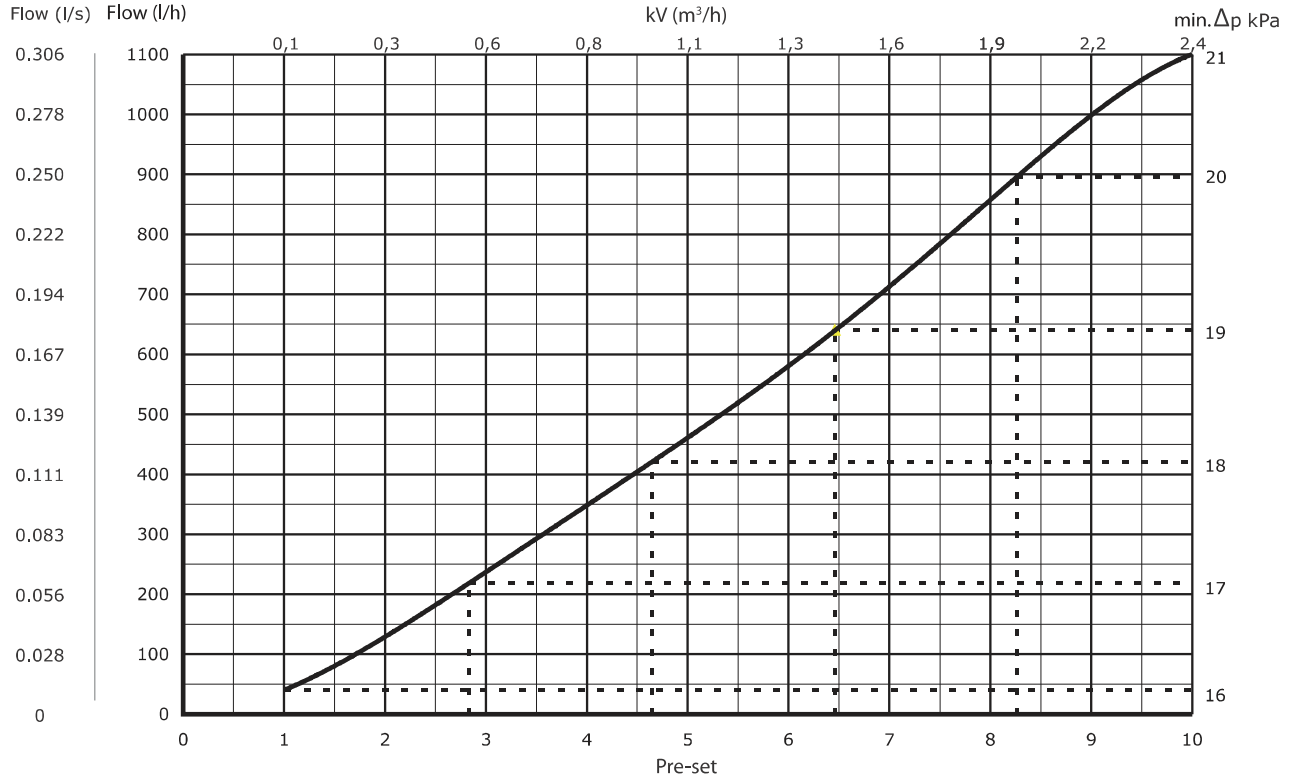
## S - Dynamic Balancing Valve

S without Isolation Valve							
		DN15	DN20	DN25	DN32	DN40	DN50
PT Plugs		(HP) 53-2000 (LP) 53-2006	(HP) 53-2001 (LP) 53-2007	(HP) 53-2002 (LP) 53-2008	(HP) 53-2003	(HP) 53-2004	(HP) 53-2005
Plugs		(HP) 53-2010	(HP) 53-2011	(HP) 53-2012	(HP) 53-2013	(HP) 53-2014	(HP) 53-2015
2" PT plugs combi		(HP) 53-2020	(HP) 53-2021	(HP) 53-2022	(HP) 53-2023	(HP) 53-2024	(HP) 53-2025
Plug + drain valve		(HP) 53-2030 (LP) 53-2036	(HP) 53-2031 (LP) 53-2037	(HP) 53-2032 (LP) 53-2038	(HP) 53-2033	(HP) 53-2034	(HP) 53-2035
2" PT plugs		(HP) 53-2040	(HP) 53-2041	(HP) 53-2042	(HP) 53-2043	(HP) 53-2044	(HP) 53-2045
S with Isolation Valve							
		DN15	DN20	DN25	DN32	DN40	DN50
PT Plugs		(HP) 53-2050 (LP) 53-2056	(HP) 53-2051 (LP) 53-2057	(HP) 53-2052 (LP) 53-2058	(HP) 53-2053	(HP) 53-2054	(HP) 53-2055
Plugs		(HP) 53-2060	(HP) 53-2061	(HP) 53-2062	(HP) 53-2063	(HP) 53-2064	(HP) 53-2065
2" PT plugs combi		(HP) 53-2070	(HP) 53-2071	(HP) 53-2072	(HP) 53-2073	(HP) 53-2074	(HP) 53-2075
Plug + drain valve		(HP) 53-2080 (LP) 53-2086	(HP) 53-2081 (LP) 53-2087	(HP) 53-2082 (LP) 53-2088	(HP) 53-2083	(HP) 53-2084	(HP) 53-2085
2" PT plugs		(HP) 53-2090	(HP) 53-2091	(HP) 53-2092	(HP) 53-2093	(HP) 53-2094	(HP) 53-2095
S System							
		DN15	DN20	DN25	DN32	DN40	DN50
PT plugs		(HP) 53-2120 (LP) 53-2126	(HP) 53-2121 (LP) 53-2127	(HP) 53-2122 (LP) 53-2128	(HP) 53-2123	(HP) 53-2124	(HP) 53-2125
Plug + 2 drain valves		(HP) 53-2130 (LP) 53-2136	(HP) 53-2131 (LP) 53-2137	(HP) 53-2132 (LP) 53-2138	(HP) 53-2133	(HP) 53-2134	(HP) 53-2135

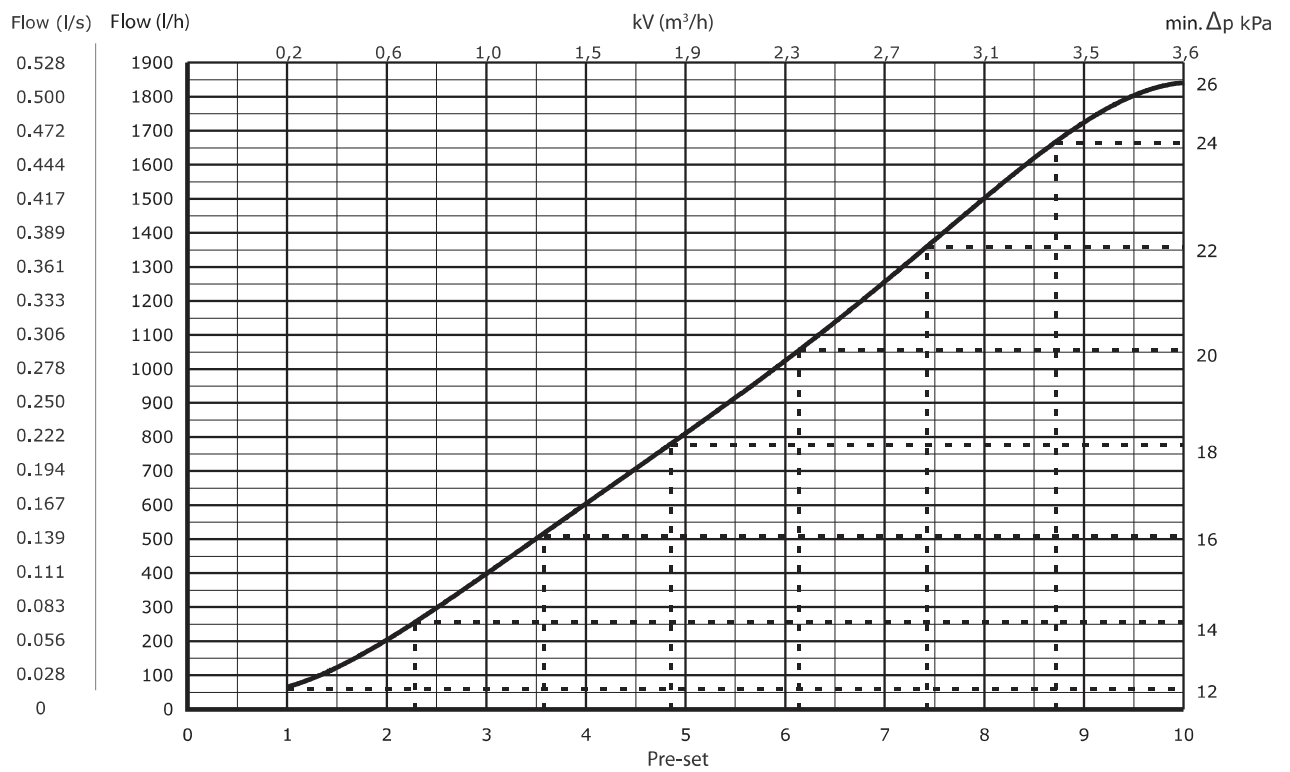


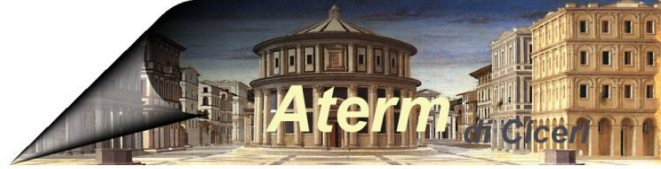
# S - Dynamic Balancing Valve

Flow rate graph S, DN15 High Pressure

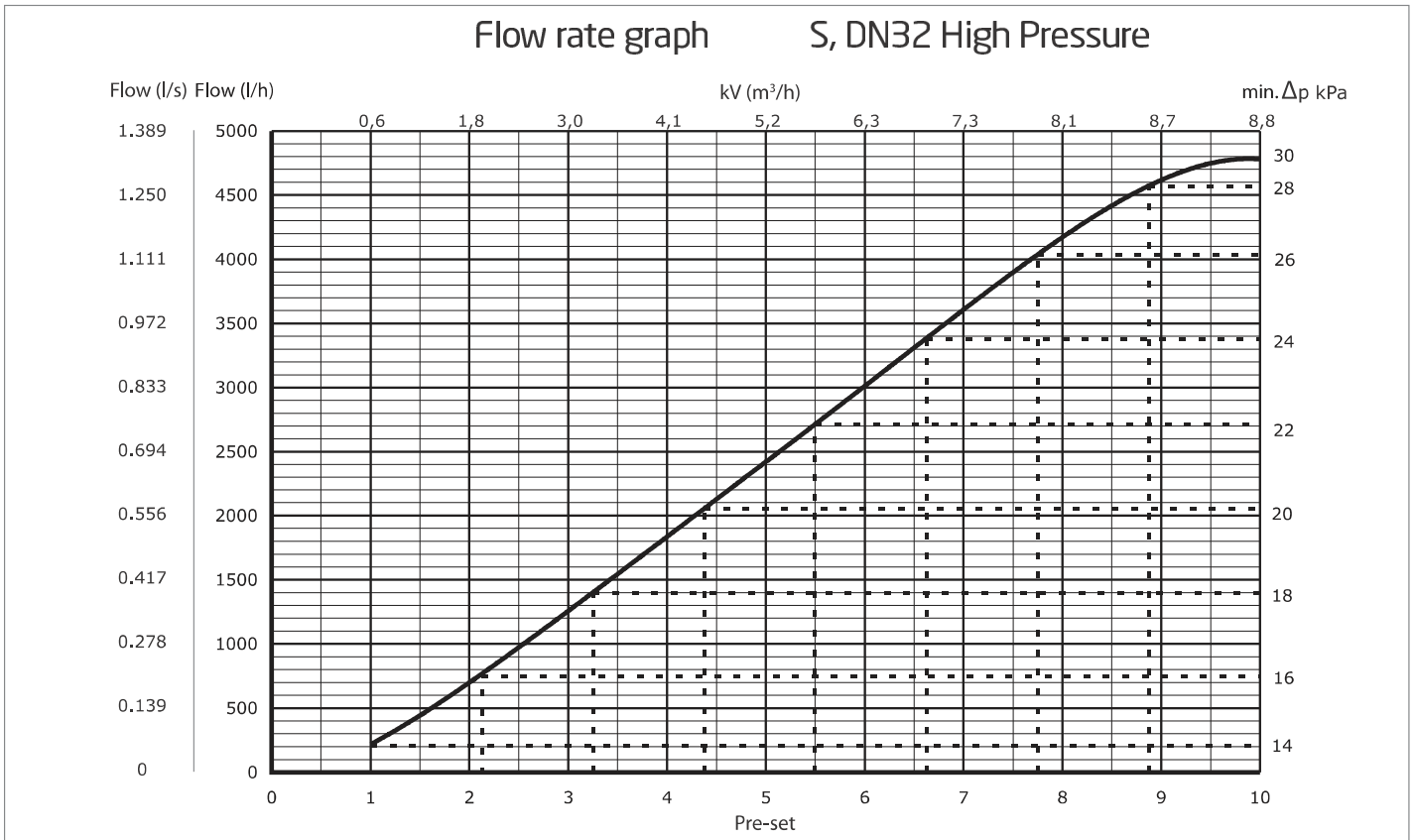
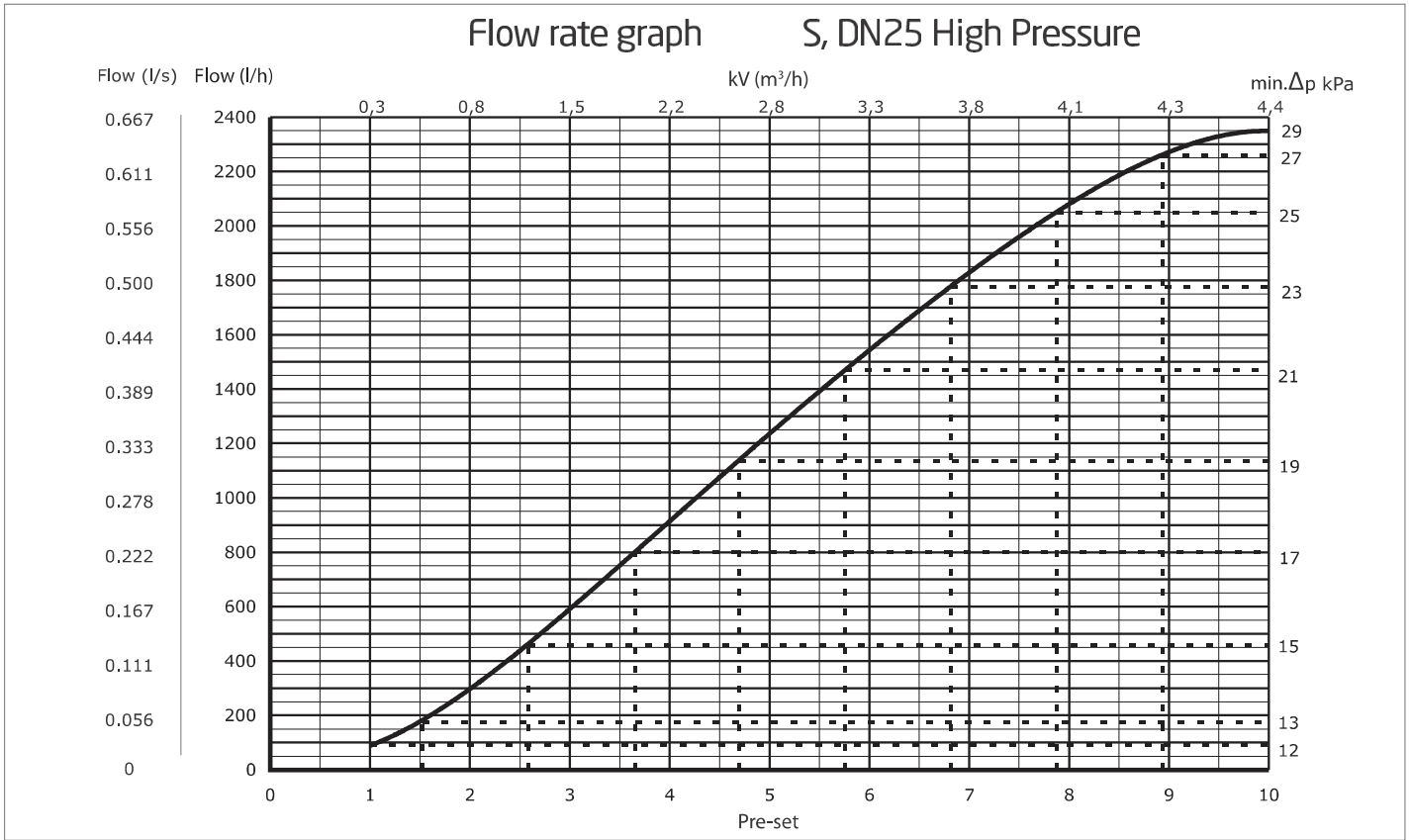


Flow rate graph S, DN20 High Pressure

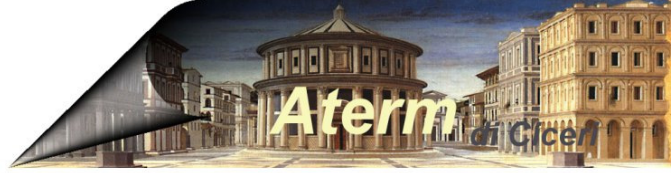




# S - Dynamic Balancing Valve

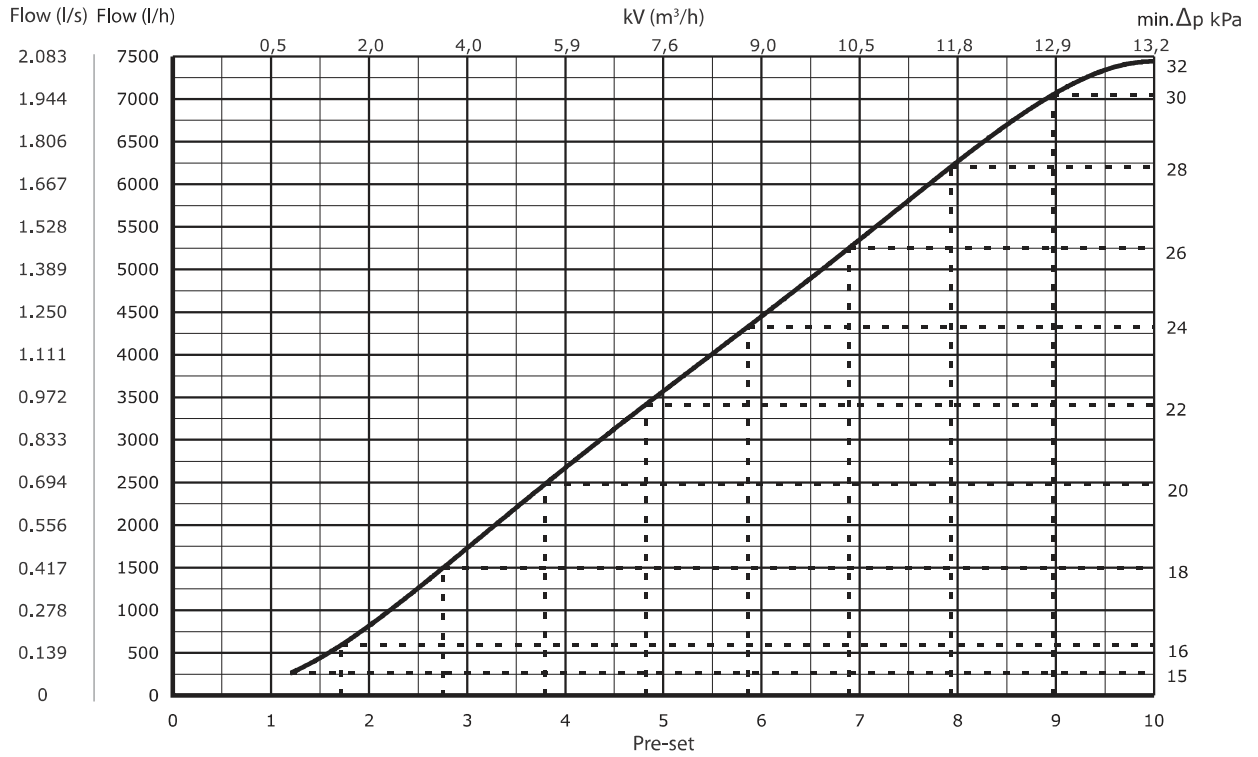




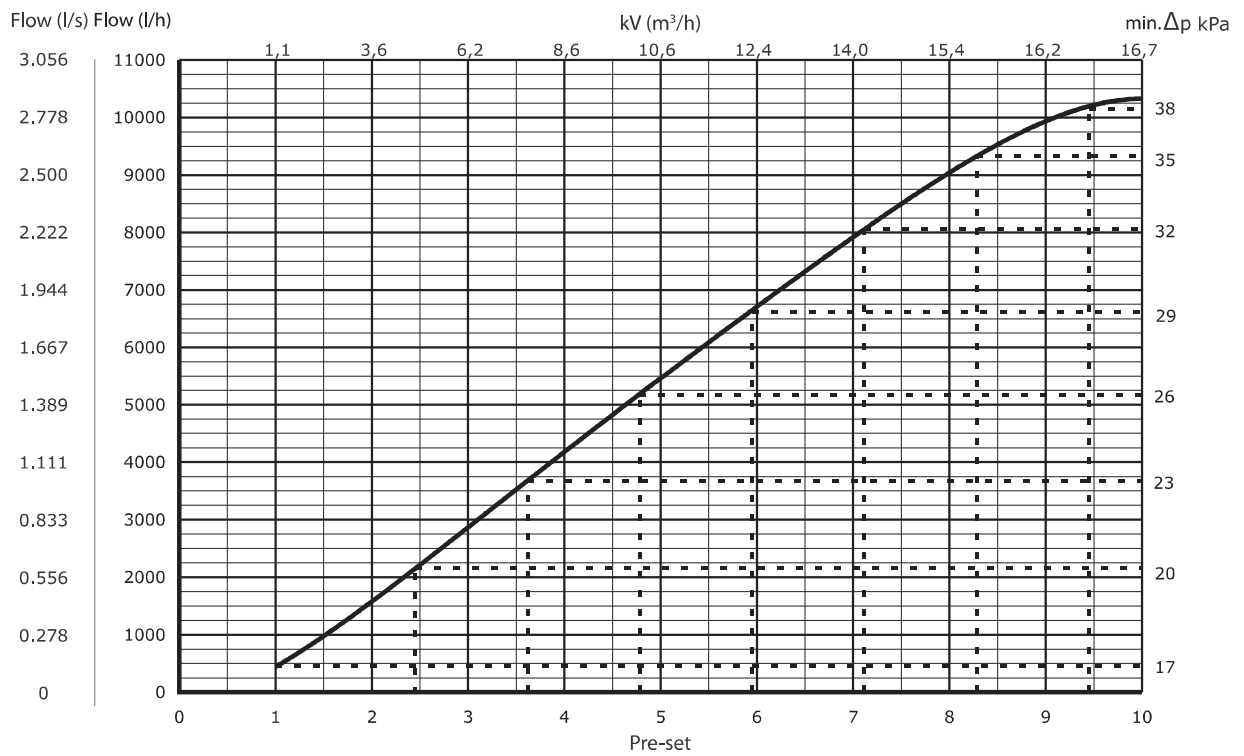


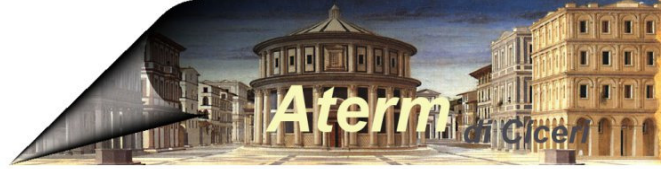
# S - Dynamic Balancing Valve

Flow rate graph S, DN40 High Pressure

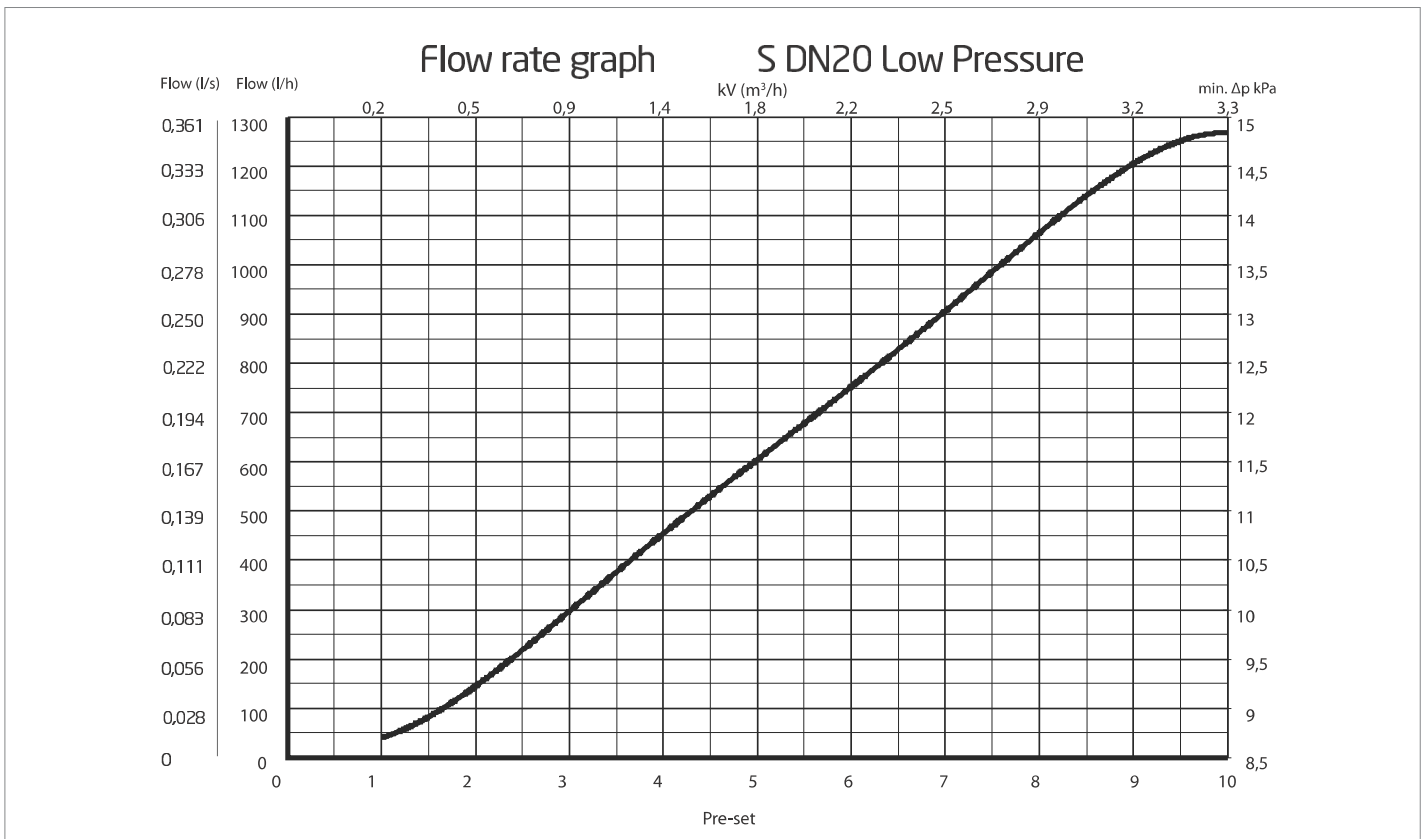
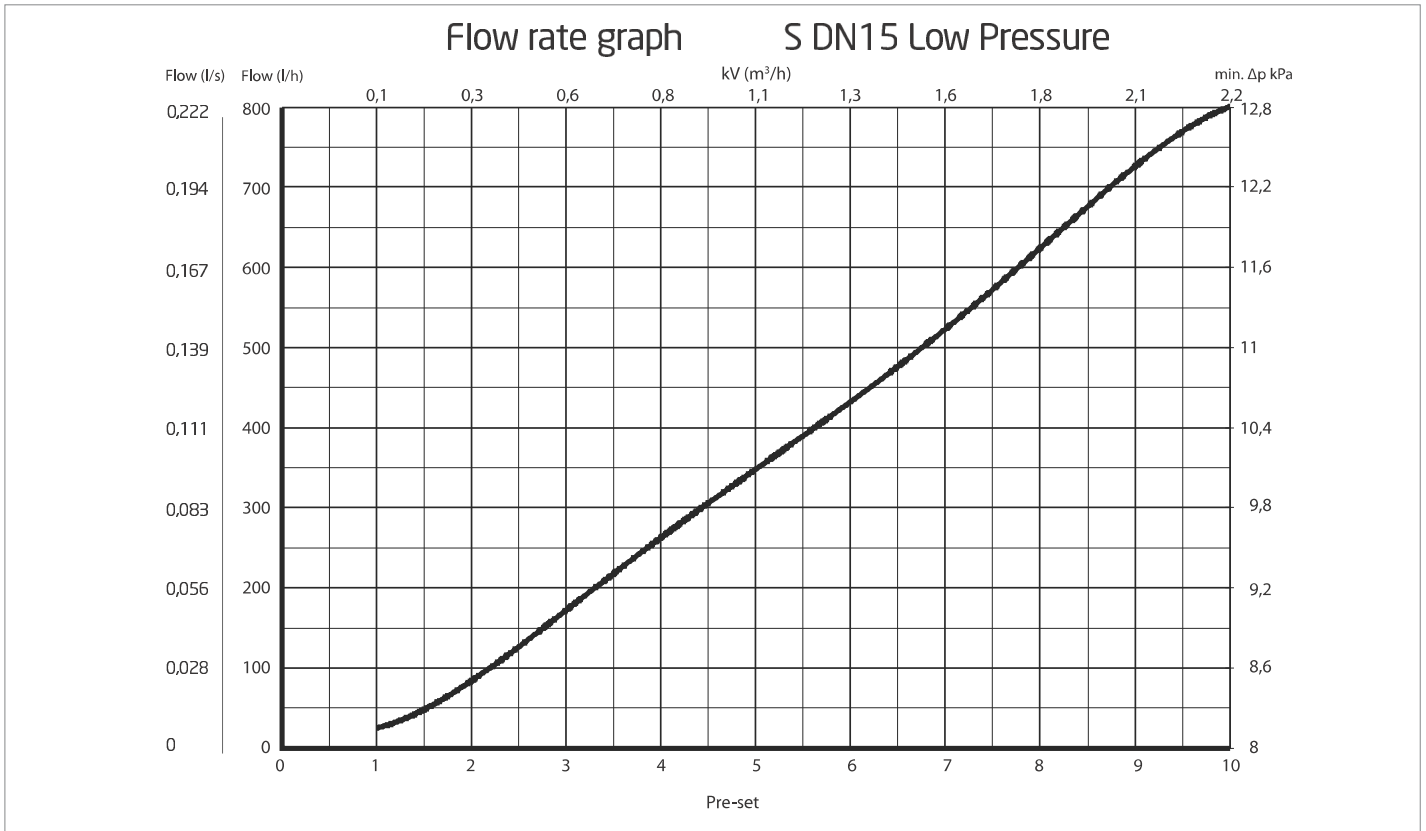


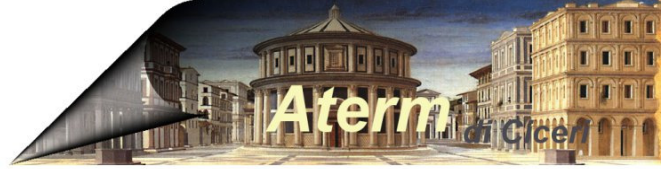
Flow rate graph S, DN50 High Pressure



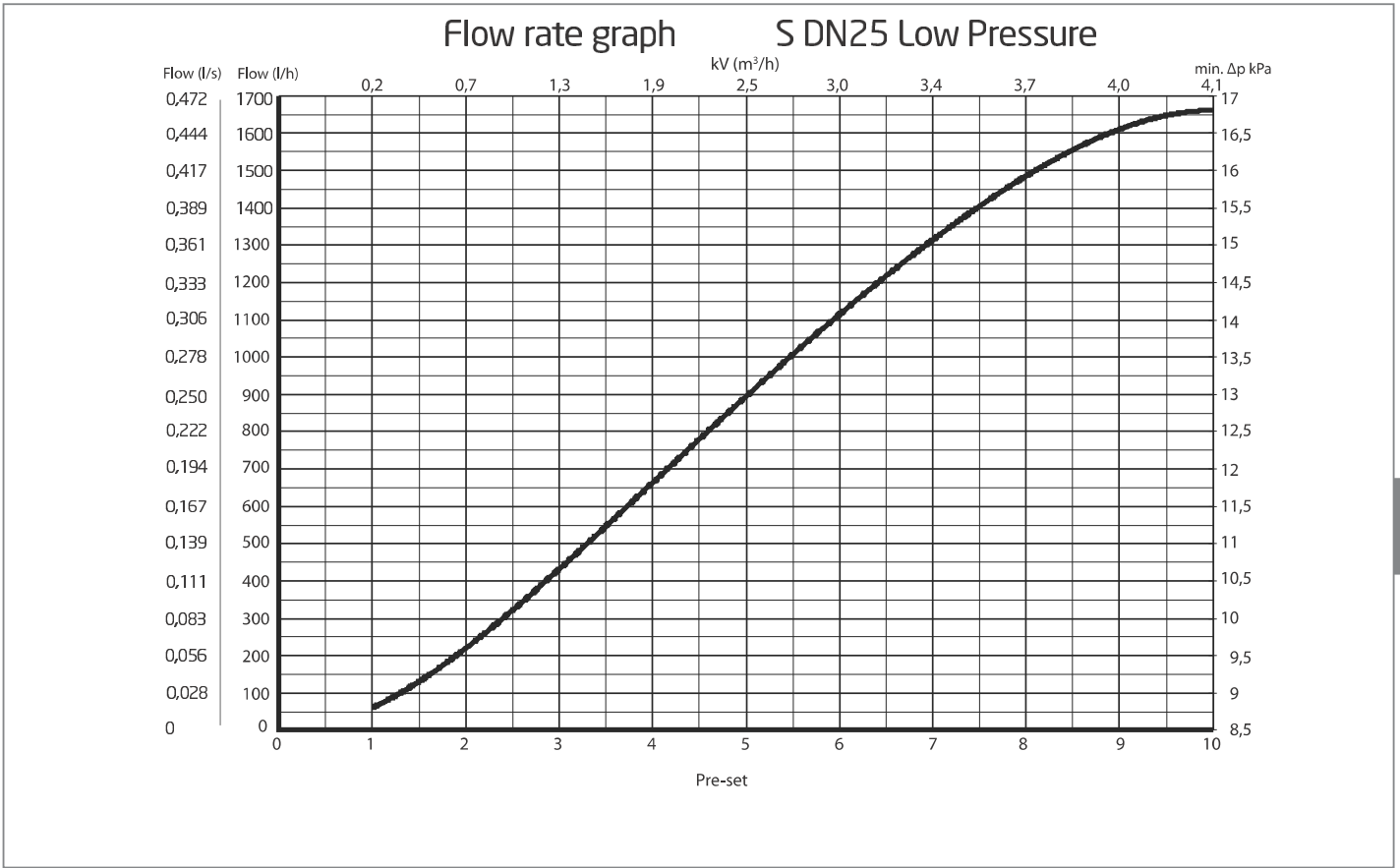


# S - Dynamic Balancing Valve





# S - Dynamic Balancing Valve



## S DN15 LP

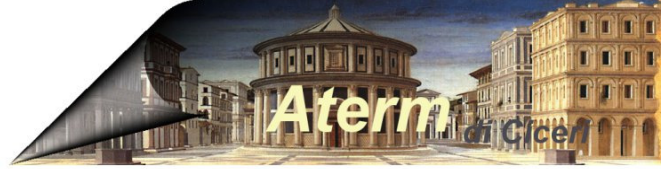
Pre-setting	Flow		
	l/h	l/s	gpm
1,00	25	0,007	0,11
1,50	48	0,013	0,21
2,00	84	0,023	0,37
2,50	127	0,035	0,56
3,00	172	0,048	0,76
3,50	218	0,061	0,96
4,00	263	0,073	1,16
4,50	306	0,085	1,35
5,00	348	0,097	1,53
5,50	390	0,108	1,72
6,00	433	0,120	1,90
6,50	477	0,132	2,10
7,00	524	0,145	2,31
7,50	573	0,159	2,52
8,00	625	0,174	2,75
8,50	678	0,188	2,98
9,00	728	0,202	3,20
9,50	772	0,214	3,40
10,00	804	0,223	3,54

## S DN20 LP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	41	0,011	0,18
1,50	82	0,023	0,36
2,00	145	0,040	0,64
2,50	218	0,061	0,96
3,00	297	0,083	1,31
3,50	377	0,105	1,66
4,00	455	0,126	2,00
4,50	531	0,147	2,34
5,00	605	0,168	2,66
5,50	678	0,188	2,99
6,00	752	0,209	3,31
6,50	828	0,230	3,65
7,00	906	0,252	3,99
7,50	985	0,274	4,34
8,00	1064	0,296	4,68
8,50	1139	0,316	5,01
9,00	1204	0,334	5,30
9,50	1249	0,347	5,50
10,00	1265	0,351	5,57

## S DN25 LP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	61	0,017	0,27
1,50	131	0,036	0,58
2,00	220	0,061	0,97
2,50	322	0,089	1,42
3,00	432	0,120	1,90
3,50	547	0,152	2,41
4,00	664	0,184	2,92
4,50	780	0,217	3,43
5,00	895	0,249	3,94
5,50	1007	0,280	4,43
6,00	1114	0,310	4,91
6,50	1218	0,338	5,36
7,00	1315	0,365	5,79
7,50	1405	0,390	6,19
8,00	1486	0,413	6,54
8,50	1557	0,432	6,85
9,00	1612	0,448	7,10
9,50	1650	0,458	7,26
10,00	1663	0,462	7,32



# S - Dynamic Balancing Valve

## Setting and Flow

### S DN15 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	40	0,011	0,18
1,50	80	0,022	0,35
2,00	129	0,036	0,57
2,50	182	0,051	0,80
3,00	237	0,066	1,04
3,50	293	0,081	1,29
4,00	348	0,097	1,53
4,50	404	0,112	1,78
5,00	461	0,128	2,03
5,50	519	0,144	2,29
6,00	581	0,161	2,56
6,50	645	0,179	2,84
7,00	713	0,198	3,14
7,50	784	0,218	3,45
8,00	858	0,238	3,78
8,50	931	0,258	4,10
9,00	999	0,278	4,40
9,50	1059	0,294	4,66
10,00	1100	0,306	4,85

### S DN20 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	66	0,018	0,29
1,50	123	0,034	0,54
2,00	204	0,057	0,90
2,50	298	0,083	1,31
3,00	398	0,111	1,75
3,50	501	0,139	2,21
4,00	604	0,168	2,66
4,50	707	0,196	3,11
5,00	810	0,225	3,57
5,50	916	0,254	4,03
6,00	1025	0,285	4,51
6,50	1138	0,316	5,01
7,00	1257	0,349	5,53
7,50	1379	0,383	6,07
8,00	1502	0,417	6,61
8,50	1620	0,450	7,13
9,00	1725	0,479	7,59
9,50	1804	0,501	7,94
10,00	1850	0,512	8,11

### S DN25 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	89	0,025	0,39
1,50	177	0,049	0,78
2,00	297	0,082	1,31
2,50	438	0,122	1,93
3,00	591	0,164	2,60
3,50	751	0,209	3,31
4,00	914	0,254	4,02
4,50	1076	0,299	4,74
5,00	1236	0,343	5,44
5,50	1391	0,387	6,13
6,00	1543	0,429	6,79
6,50	1689	0,469	7,43
7,00	1828	0,508	8,05
7,50	1960	0,544	8,63
8,00	2081	0,578	9,16
8,50	2187	0,607	9,63
9,00	2273	0,631	10,00
9,50	2331	0,647	10,26
10,00	2350	0,653	10,35

### S DN32 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	217	0,060	0,96
1,50	443	0,123	1,95
2,00	699	0,194	3,08
2,50	973	0,270	4,28
3,00	1257	0,349	5,53
3,50	1545	0,429	6,80
4,00	1836	0,510	8,08
4,50	2127	0,591	9,36
5,00	2420	0,672	10,65
5,50	2714	0,754	11,95
6,00	3012	0,837	13,26
6,50	3310	0,919	14,57
7,00	3607	1,002	15,88
7,50	3897	1,083	17,16
8,00	4172	1,159	18,36
8,50	4418	1,227	19,45
9,00	4618	1,283	20,33
9,50	4749	1,319	20,90
10,00	4800	1,328	21,04

### S DN40 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	175	0,049	0,77
1,50	439	0,122	1,93
2,00	818	0,227	3,60
2,50	1260	0,350	5,55
3,00	1730	0,480	7,61
3,50	2204	0,612	9,70
4,00	2672	0,742	11,76
4,50	3127	0,868	13,76
5,00	3571	0,992	15,72
5,50	4009	1,114	17,65
6,00	4449	1,236	19,58
6,50	4895	1,360	21,55
7,00	5350	1,486	23,55
7,50	5811	1,614	25,58
8,00	6267	1,741	27,59
8,50	6698	1,861	29,49
9,00	7072	1,964	31,13
9,50	7341	2,039	32,32
10,00	7450	2,067	32,76

### S DN50 HP

Pre-setting	Flow		
	l/h	l/s	gpm
1,00	440	0,122	1,94
1,50	976	0,271	4,29
2,00	1576	0,438	6,94
2,50	2214	0,615	9,75
3,00	2868	0,797	12,62
3,50	3525	0,979	15,52
4,00	4179	1,161	18,40
4,50	4824	1,340	21,24
5,00	5461	1,517	24,04
5,50	6089	1,691	26,80
6,00	6709	1,864	29,54
6,50	7321	2,034	32,23
7,00	7919	2,200	34,86
7,50	8497	2,360	37,41
8,00	9041	2,511	39,80
8,50	9530	2,647	41,95
9,00	9934	2,760	43,73
9,50	10216	2,838	44,97
10,00	10350	2,868	45,46