Frese S1^{+} - Automatic Circuit Balancing Valve

Application

Frese S1^{+} is used in heating- and cooling systems for the distribution of flow in various sections of the system.

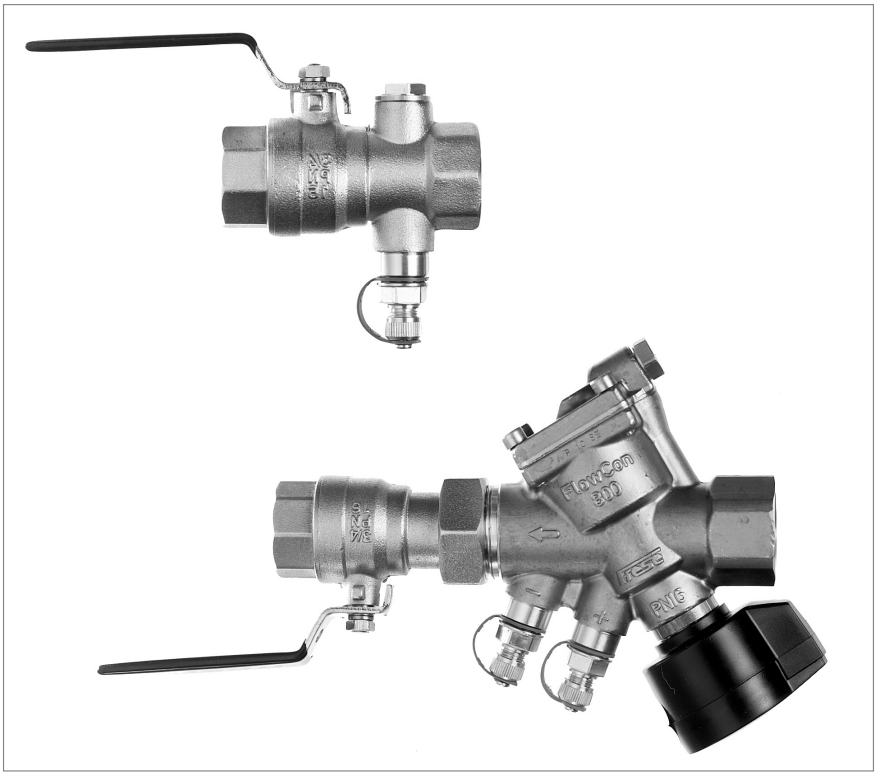
The balancing valves ensure problem-free balancing of the system.

The use of Frese S1^{+} valves is advantageous in all types of mixing circuits. The valves make the use of double shunt circuits superfluous, as they will automatically adjust to pressure fluctuations, if any, in the system.

Frese S1+ fem./fem. in compact design.

Advantages

- Easy to install and adjust according to pre-defined flow.
- 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.
- Built-in optional P/T ports for needle system.
- Systems with dynamic balancing are flexible, as they do not require re-adjustment of the "original" circuit in case the system is extended after installation.



Frese S1+ System fem./fem. with union and isolation ball valve.

Frese S1+ - Automatic Circuit Balancing Valve

Function Frese S1+

The following applies to all flow control valves:

$Q = Kv * \sqrt{\Delta p}$

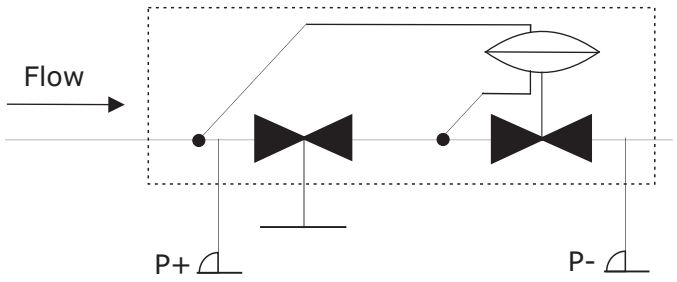
Flow ≈ opening area * the square of the differential pressure

As the opening area of static valves is invariable, the flow will change proportional to the pressure fluctuations in the system.

The Frese S1+ valves, on the other hand, react to pressure fluctuations so that the differential pressure across the pre-adjustment unit is kept constant. In that way a constant flow rate is ensured in accordance with the rating.

Simplified outline S1+

Frese S1+ valve



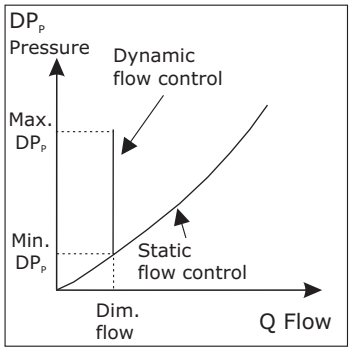
Pre-adjustment unit

Diff. pressure unit

Flow characteristic

The illustration shows how the flow in a Frese S1+ valve reacts in accordance to the pump pressure.

For comparison we have added a typical flow characteristic of a static valve in order to show the advantages of a dynamic valve.



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.

Frese S1+ - Automatic Circuit Balancing Valve

Setting the valve

The valve is easily set by means of the Frese operation key, and the pre-setting is read on the scale. The large digit on the scale shows tenth of a full turn. The flow rate of the valve can be determined from the flow rate graphs for the valve dimension in question.

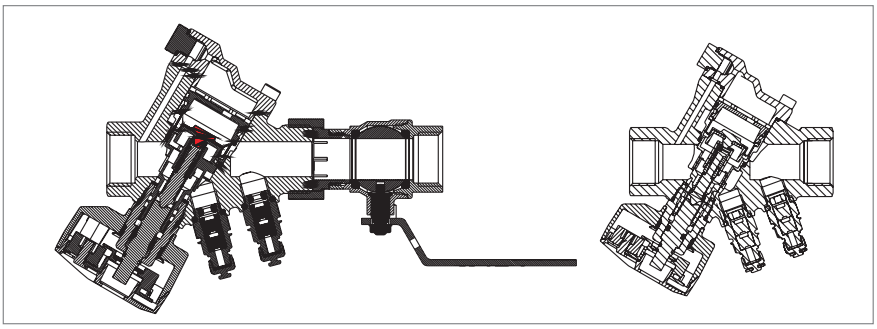
See the flow rate graphs of the valve on pages 8 to 10 for further information about the adjustment setting.

Please note:
The scale is for the adjustment of flow. The Frese S1+ valve can be turned below 0.0 and above 6.0. This is of no importance for the accuracy of the valve. The scale must not be dismantled. If you want to close the valve, use the isolation ball valve.

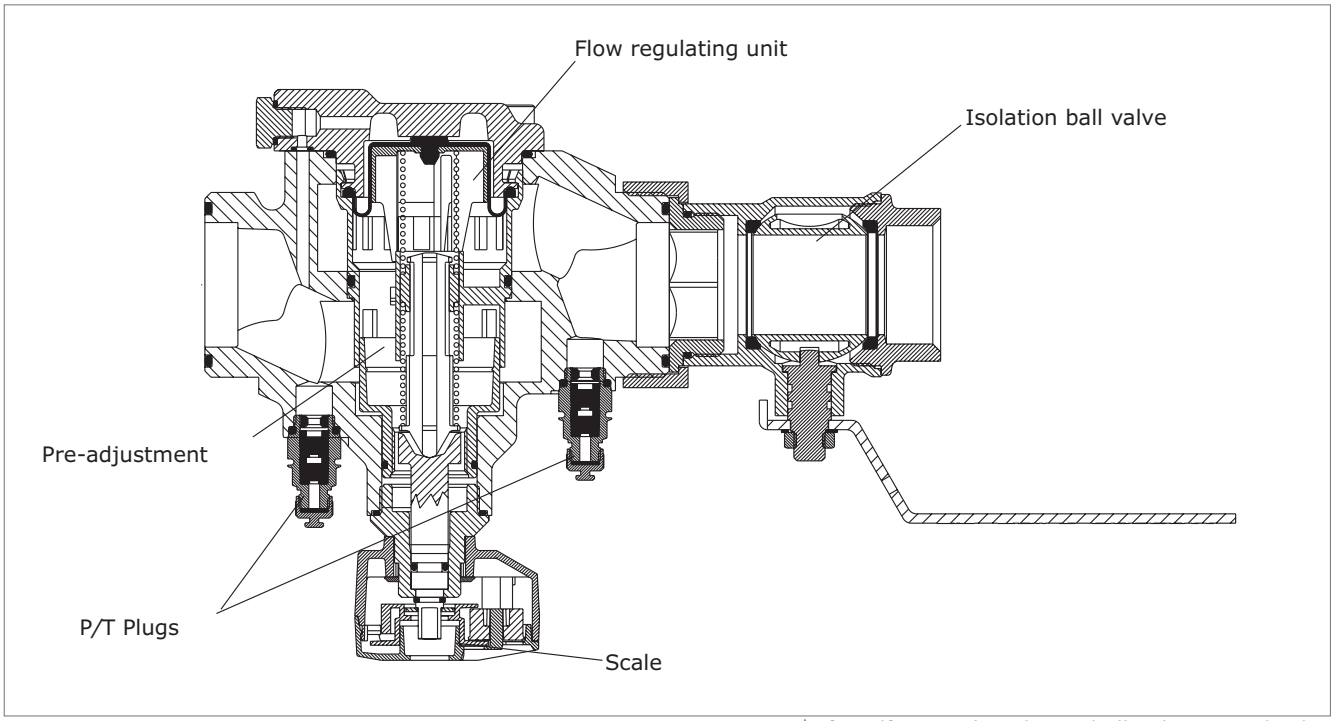
Design

Frese valves consist of:

Housing: Brass
Plastic: POM & PVDF
Diaphragm: HNBR
O-rings: EPDM
Springs: Stainless steel



Frese S1+ fem./fem. with and without isolation ball valve DN15/20/25



Frese S1+ fem./fem. with isolation ball valve DN32/40/50

Frese S1+ - Automatic Circuit 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.

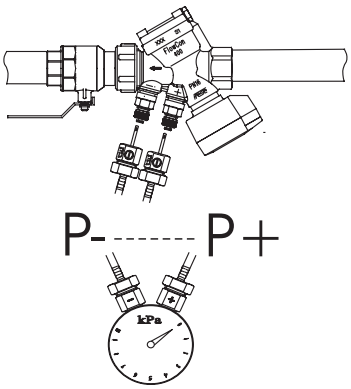
Direct flow rate verification can e.g. be carried out by ultrasonic equipment. On the basis of the measured velocity of the flow and the pipe dimension the software will compute a flow rate. The use of ultrasonic verification requires free access to the pipes as the sensors are fitted directly on those.

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.
As previously mentioned, the Frese valve includes a differential pressure regulator, to keep the rated flow constant 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 partly for verification of the flow, partly 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 12 and use it as documentation when verifying the different flow rates in the installation.

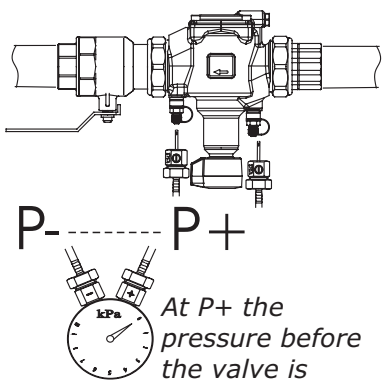
Frese 400 DN15, 800 DN15, and 1500 DN25

Measurement of the differential pressure across the valve



Frese 4000 DN32/40, and 7000 DN50

Measurement of the differential pressure across the valve



At P+ the pressure before the valve is verified!

Frese S1+ - Automatic Circuit Balancing Valve

Procedure of adjustment and verification

Before adjustment of the Frese S1+ valves you should make sure that:

- The pump is running at high pressure.
- The installation has been set for the rated flow. I.e. strainers are clean, motor valves open, radiator valves open at the given adjustment setting, and all other components in the system are open.

Then it only remains to:

- Set the Frese S1+ valves to the rated flow according to the flow rate tables.
- Reduce the pump pressure to what is required across the critical valve.
- At commissioning, verify the differential pressure across the valves and register pressure and flow rate by means of manometer and flow rate graph respectively.

In case a number of mixing loops are to be mutually balanced, the above guide lines should be followed, first throttling the primary pump for optimization of the supply system, then adjust the secondary pumps for optimization of the distribution system.

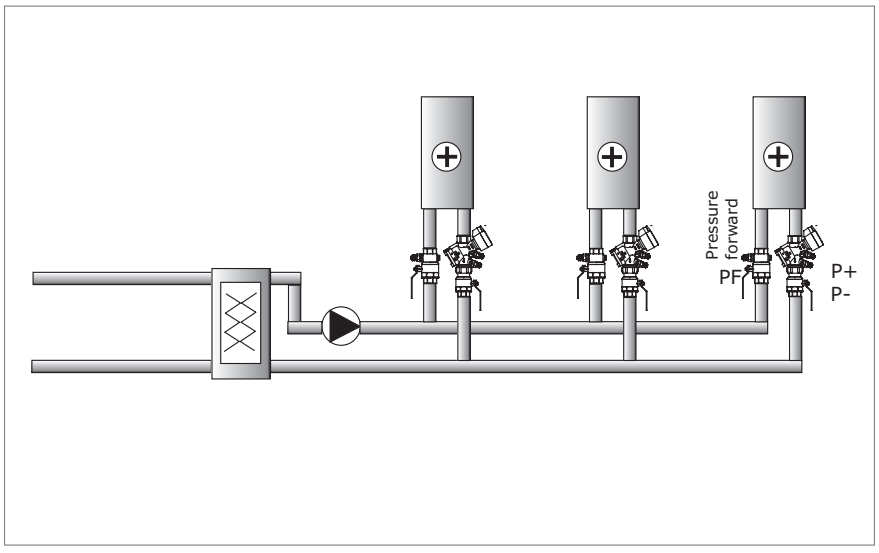
As a system with dynamic balancing requires fewer valves than a static system, it is recommendable to study the application examples on the following pages. Please note that on the secondary side of the mixing loops there are only valves at the places of consumption.

Application sketches

Frese S1+ 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 S1^{+} - Automatic Circuit Balancing Valve

Application sketches - continued

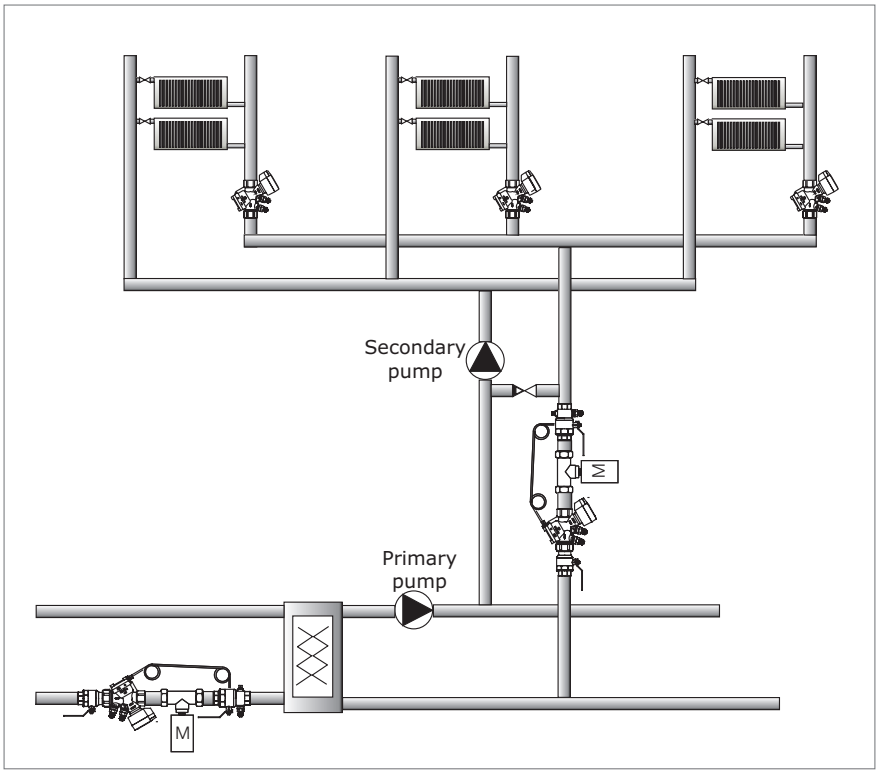
Frese S1^{+} in installation with mixing loops

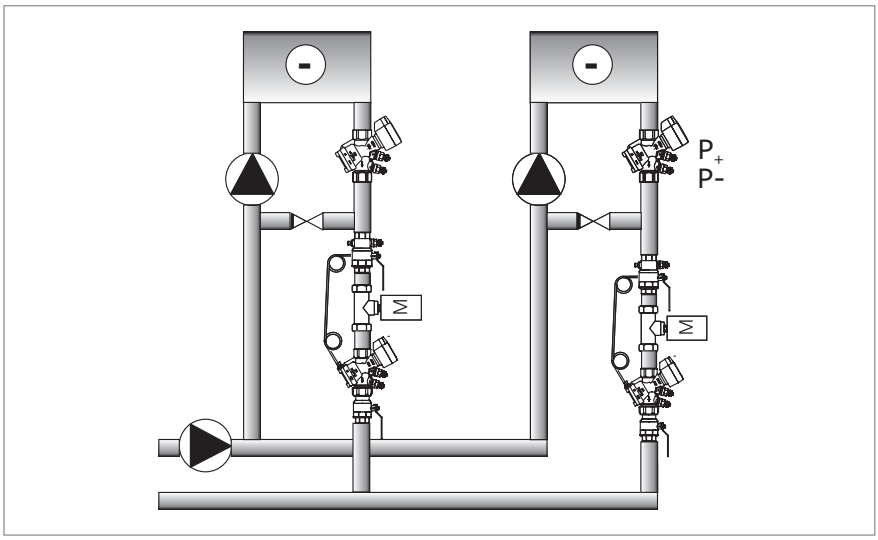
Please note:
The balance is controlled by the Frese S1^{+} valves fitted in each control zone. Major branch balancing valves are eliminated, even if the system may be larger and with far more branches than shown in this simplified outline.

If a static motor valve is installed, it is recommended to install a differential pressure regulator as well. (See separate tech-note for Frese PV).

Otherwise it will often occur that the motor valves placed nearest to the pump will have a high differential pressure across the valve, which results in poor modulating control.

In the example shown to the right the differential pressure is controlled by a Frese PV valve across the static motor valve.





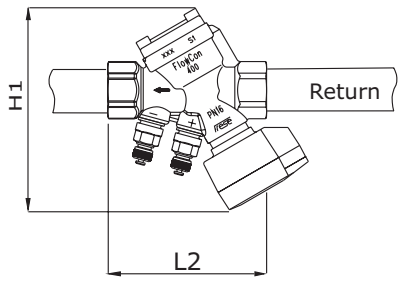
Frese S1+ - Automatic Circuit Balancing Valve

Technical data

Type		Frese S1+					
Dimension		DN15	DN20	DN25	DN32	DN40	DN50
Flow rate l/h		40-400	80-800	200-1500	400-4000	400-4000	1250-7000
Max pump pressure kPa (see graph for min.kPa)		120	120	120	120	120	120
Class		PN16	PN16	PN16	PN16	PN16	PN25
Max. temperature °C Min. temperature °C		120 -20	120 -20	120 -20	120 -20	120 -20	120 -20
Dimension mm.	L1	159	173	200	271	286	315
	L2	100	115	130			
	H	144	144	154	183	183	204
	L3	75	82	95	100	108	127
	H1	95	103	111	135	145	164

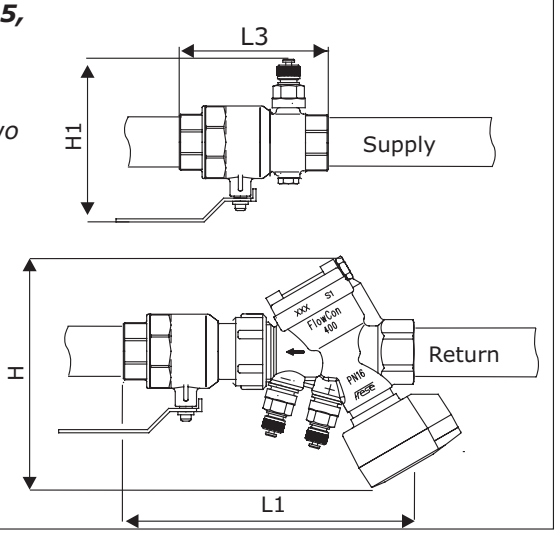
Frese S1+ DN15, DN20 & DN25

Valve fem./fem.



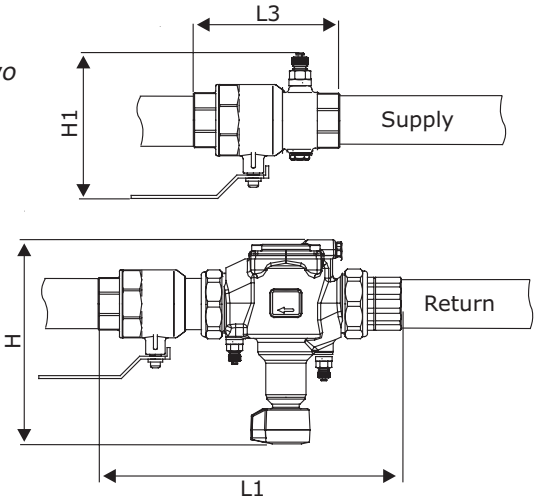
Frese S1+ System DN15, DN20 & DN25

Valve combination and two isolation ball valves.



Frese S1+
System DN 32/40/50

Valve combination and two isolation ball valves.

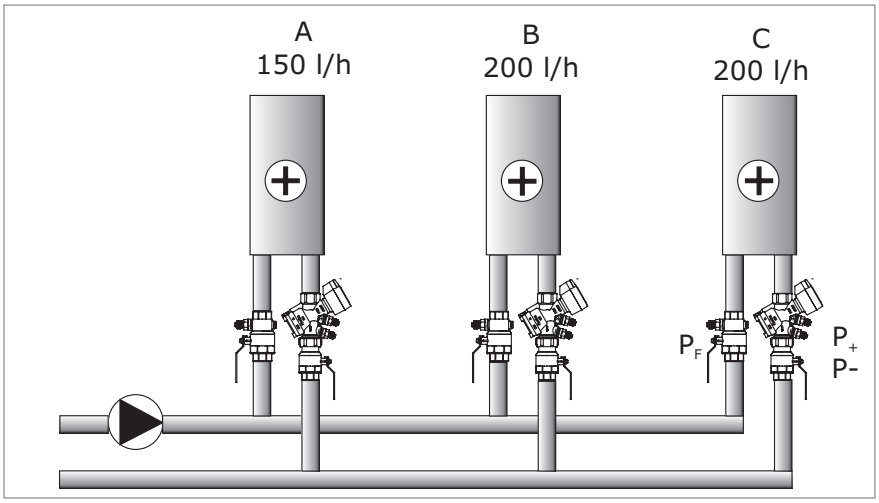


Frese S1^{+} - Automatic Circuit Balancing Valve

Adjustment example

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

The critical valve in this example is the remotest valve i.e. valve C. When the differential pressure is available, the system will automatically be balanced.



Flow rate example Frese S1^{+} 400 DN15

1. The rated flow is used as the point of reference for the overall rating of dynamic systems.

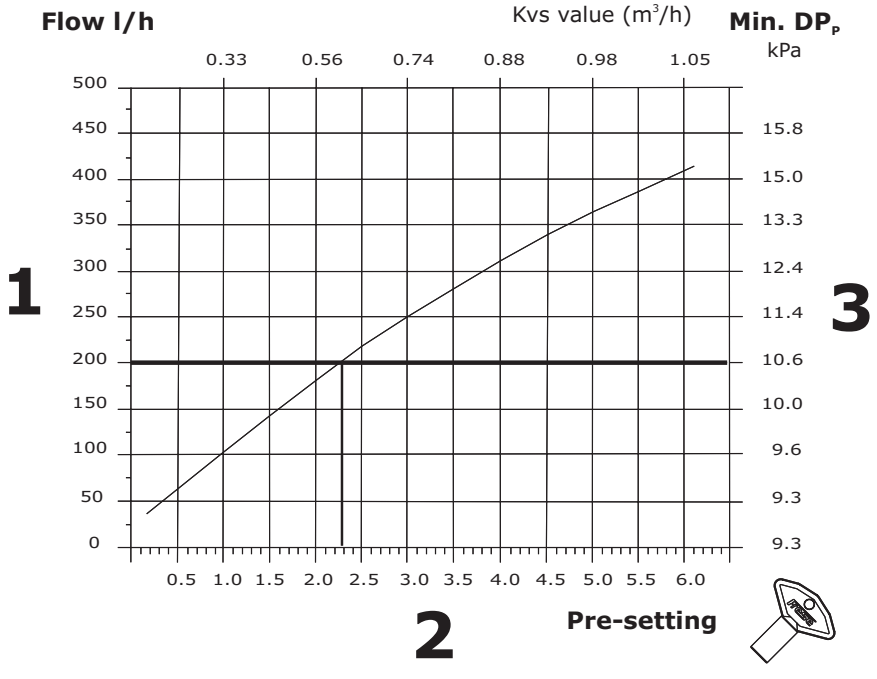
(See the graph below)

2. The pre-setting for each valve is found by means of the flow rate graph.

A = 1.6
B = 2.3
C = 2.3

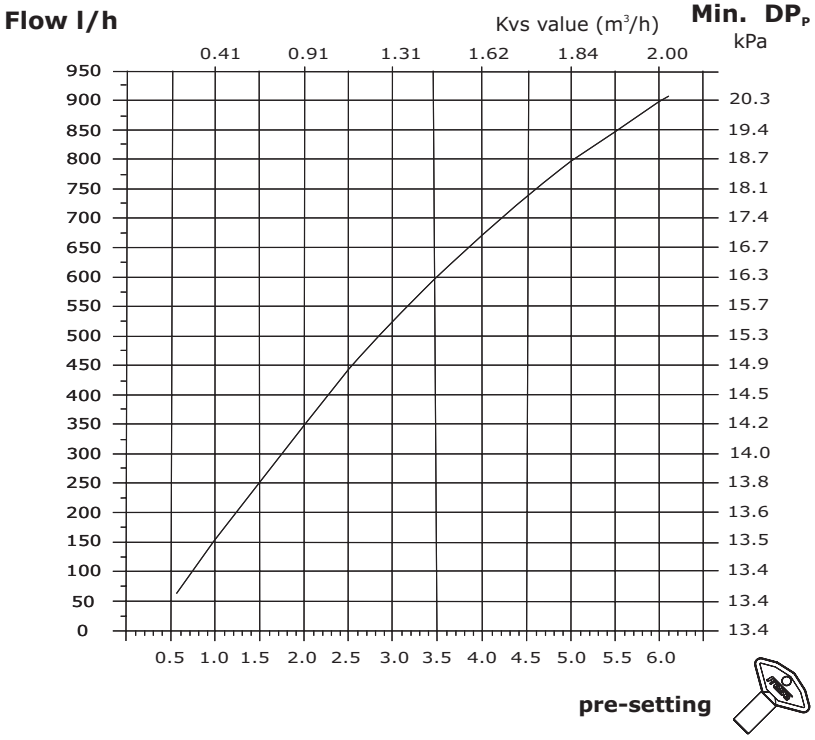
3. To the right in the graph you will see the minimum differential pressure required from the pump by each valve. Here the critical valve is particularly interesting.
C requires 10,6 kPa.

Flow rate graph Frese S1^{+} 400 DN15

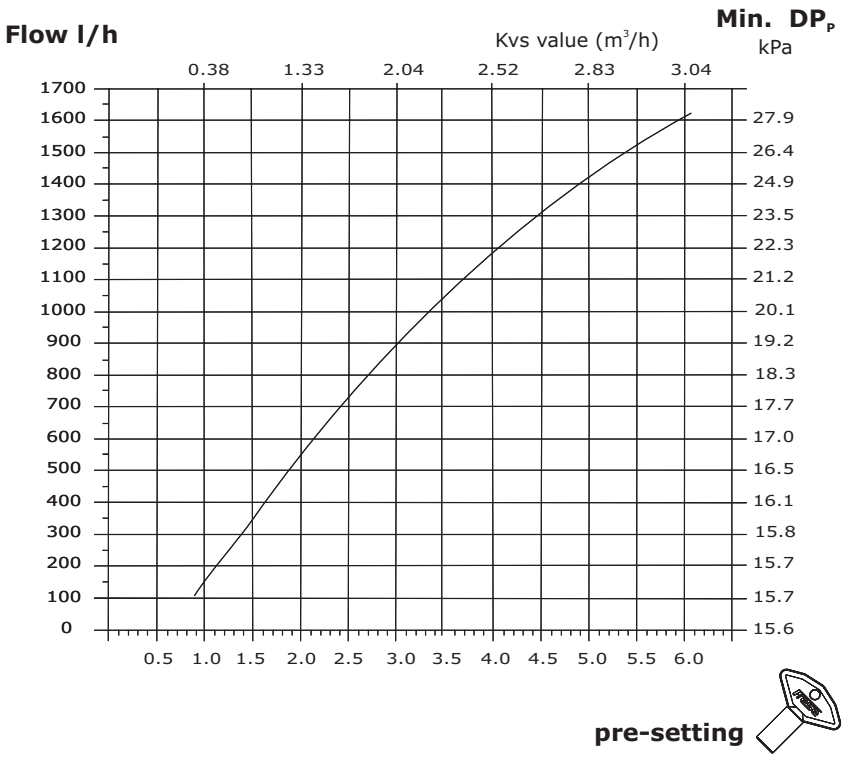


Frese S1+ - Automatic Circuit Balancing Valve

Flow rate graph Frese S1+ 800 DN20

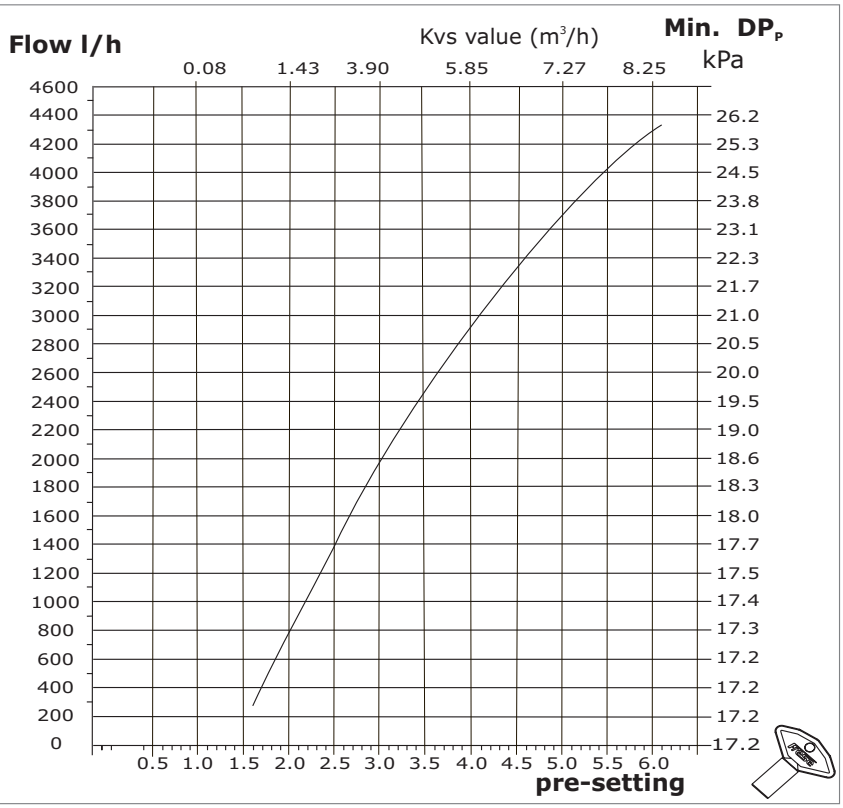


Flow rate graph Frese S1+ 1500 DN25

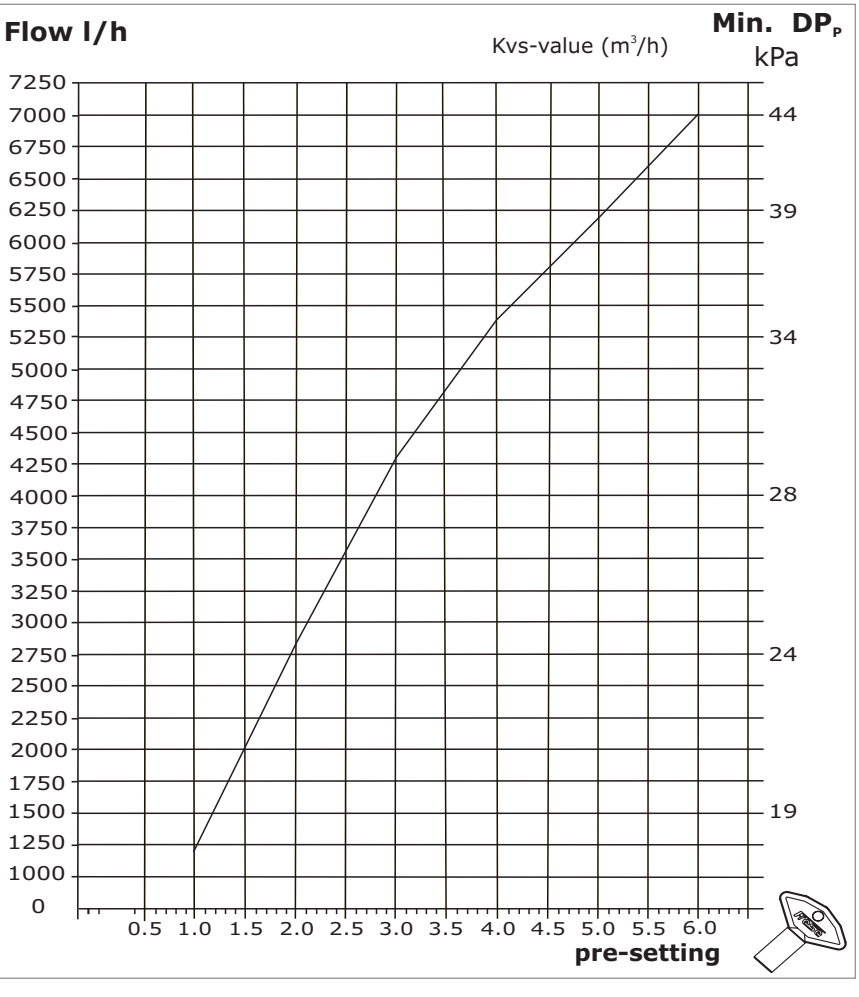


Frese S1+ - Automatic Circuit Balancing Valve

Flow rate graph Frese S1+ 4000 DN32/40

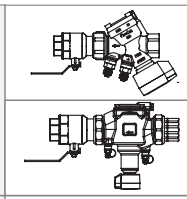
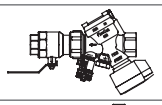
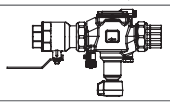
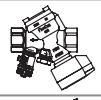
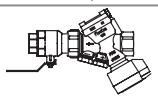
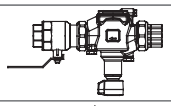
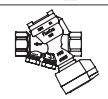
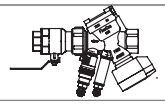
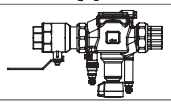
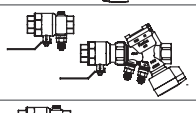
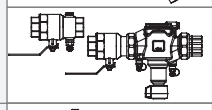
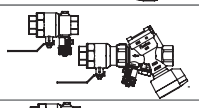
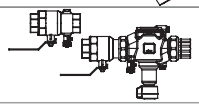
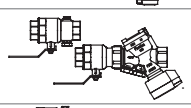
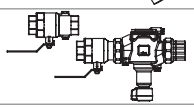


Flow rate graph Frese S1+ 7000 DN50



Frese S1+ - Automatic Circuit Balancing Valve

Product programme S1+

					Ball valve	P/T Plug	Drain valve	Combi-drain	2" P/T Plug	Plug
Frese S1+ F/F with P/T Plugs, Ball valve and union		48-5600	DN15	400	1	2				
		48-5620	DN20	800	1	2				
		48-5640	DN25	1500	1	2				
		48-5660	DN32	4000	1	2				
		48-5680	DN40	4000	1	2				
		48-5689	DN50	7000	1	2				
Frese S1+ F/F with P/T Plugs		48-5601	DN15	400		2				
		48-5621	DN20	800		2				
		48-5641	DN25	1500		2				
Frese S1+ F/F with Plug, Drain, Ball valve and union		48-5609	DN15	400	1		1			1
		48-5629	DN20	800	1		1			1
		48-5649	DN25	1500	1		1			1
		48-5664	DN32	4000	1		1			
		48-5684	DN40	4000	1		1			
		48-5673	DN50	7000	1		1			
Frese S1+ F/F with Plug and Drain		48-5607	DN15	400			1			1
		48-5627	DN20	800			1			1
		48-5647	DN25	1500			1			1
Frese S1+ F/F with two Plugs, Ball valve and union		48-5613	DN15	400	1					2
		48-5634	DN20	800	1					2
		48-5653	DN25	1500	1					2
		48-5666	DN32	4000	1					1
		48-5686	DN40	4000	1					1
		48-5694	DN50	7000	1					1
Frese S1+ F/F with P/T Plugs		48-5612	DN15	400						2
		48-5633	DN20	800						2
		48-5652	DN25	1500						2
Frese S1+ F/F with 2" P/T Plug, Combi-drain, Ball valve and union		48-5616	DN15	400	1			1	1	
		48-5639	DN20	800	1			1	1	
		48-5656	DN25	1500	1			1	1	
		48-5670	DN32	4000	1			1	1	
		48-5690	DN40	4000	1			1	1	
		48-5695	DN50	7000	1			1	1	
Frese S1+ System F/F with P/T Plugs, Ball valves and unions		48-5604	DN15	400	2	3				
		48-5624	DN20	800	2	3				
		48-5644	DN25	1500	2	3				
		48-5661	DN32	4000	2	3				
		48-5681	DN40	4000	2	3				
		48-5723	DN50	7000	2	3				
Frese S1+ System F/F with Plug, Drains, Ball valves and unions		48-5605	DN15	400	2		2			1
		48-5625	DN20	800	2		2			1
		48-5645	DN25	1500	2		2			1
		48-5662	DN32	4000	2		2			
		48-5682	DN40	4000	2		2			
		48-5724	DN50	7000	2		2			
Frese S1+ System F/F with Plugs, Ball valves and unions		48-5611	DN15	400	2					3
		48-5631	DN20	800	2					3
		48-5651	DN25	1500	2					3
		48-5665	DN32	4000	2					2
		48-5685	DN40	4000	2					2
		48-5725	DN50	7000	2					2

Frese S1+ - Automatic Circuit Balancing Valve

Documentation form for Frese S1+

Valve ID (own choise)	Valve type (S1)	Dimension [DN]	Pre-setting	Verified DP_P [kPa]	Min. DP_P (see flow rate graph) [kPa]	Flow (verified DP > min. DP) [l/h]

Installation	
Signature	Date

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 special operation key.

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