Product catalogue

10

- At the heart of Flow control

Frese
Energy saving valves

New generation of
Dynamic Balancing Valves

Frese S

Why allocate more time and money than necessary balancing heating and cooling systems?
The new Frese S dynamic balancing valve is simple to select and easy to commission.
Just set the flow and the Frese S valve will ensure quick and reliable commissioning. Once set, no adjustments are required even if the pressure varies or the system is changed. Simply check that the pump pressure at the index valve is correct and the job is done. It is as simple as it gets.

The Frese S valve is compact by design and requires less space for installation as reliable flow is maintained even when installed next to a pipe bend or fitting. The clear scale on the lockable handle ensures that flow setting is simple and user friendly whilst the integral P/T plugs allow verification of pressure.

- Max differential pressure: 400 kPa
- Temperature range: -10 to+120°C
- Dimensions: DN15-DN50
- Material: DZR brass
- Flow range up to: 10,4 m^3/h
- Static pressure: PN25
- For cooling and heating applications

For more technical informations please see our website:

www.frese.eu

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HEATING & COOLING APPLICATIONS

DOMESTIC WATER APPLICATIONS

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and DS hereby certify that the organization

Frese A/S
Sorøvej 8
4200 Slagelse
Danmark

for the following field of activities

Development, production, sale and delivery of Automatic Balancing Valves, fittings and components for the HVAC and sanitary applications

has implemented and maintains a Management System
which fulfils the requirements of the following standard

DS/EN ISO 9001:2008

Issued on:	**2009-09-04**
Validity date:	**2010-09-08**
DS Certified since:	**1992-09-08**

Registration Number : DSC00112

René Wasmer
President of IQNet

Christian Ilsøe
Managing director

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Introduction

Scope

This section contains an account of why it is necessary to balance a water distribution system for the distribution of heating or cooling effects, the considerations that should be made before the system is designed, the result of balancing and the difference between a static and a dynamic balancing valve.

What is a balanced system??

Definition:
A distribution system is in balance when the flow in the whole system (through the component terminal lines, distributing lines and main distributing lines) corresponds to the flow rates that were specified for the design of the system.

The dimensioned "hydraulic" condition of operation can be simulated by means of the opening of all the valves regulating the flow depending on the temperature (room temperature, outdoor temperature or medium temperature) either as manual radiator valves, self-regulating thermostatic valves or electrically actuated valves.

In practice it is recommended that balance is established by means of a number of balancing valves that can be pre-set individually to an assessed orifice dimension. Together with the rest of the system they will then establish the exact flow resistances to ensure a correct distribution of the flowing medium.

Figure 2.1 shows an outline of a minor section of a balanced water distribution system. Referring to the figure below the distribution system is in balance when the system contains a number of regulation valves that have been pre-set to be mutually dependent so that the flow through the component terminal lines, distributing lines and main distributing lines corresponds to the flow rates that were specified for the design of the system.

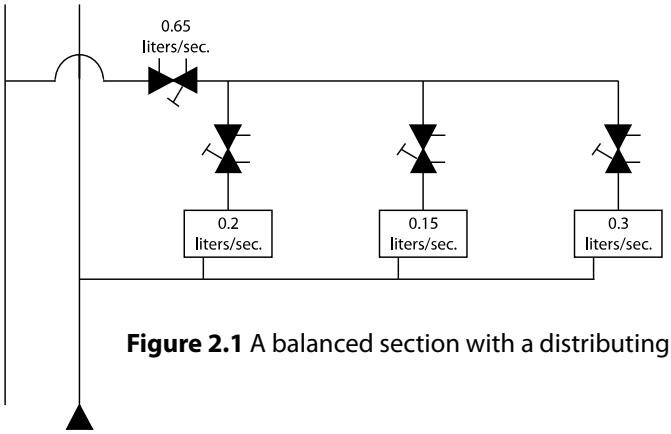


Figure 2.1 A balanced section with a distributing line for three terminals.

Introduction

In an analogue electric system the balancing valves are comparable with a variable resistance, and the resistance of the pipes with the corresponding wiring resistance, and the effective heating-/cooling surfaces with a load resistance (**Fig. 2.2**).

The distribution of the electric power through the component load resistances, distributing lines and main distributing lines, depends on the distribution of the resistance in the circuit, similarly to a water distribution system.

The need for Balancing

If the correct balancing of the system has not been established, this will result in an unequal distribution of the flow, so that there will be a surplus effect in some of the terminals, whereas the effect will be inadequate in others. The result of this will be that the wanted heating/chilling will not be ensured in all parts of the installation.
In practice it is not possible to make a correctly balanced system by manipulation of the piping or alteration of the pipe dimensions only.

Only a correct adjustment of the balancing valves shown in **figure 2.1** will ensure the correct distribution of the flow in the system.

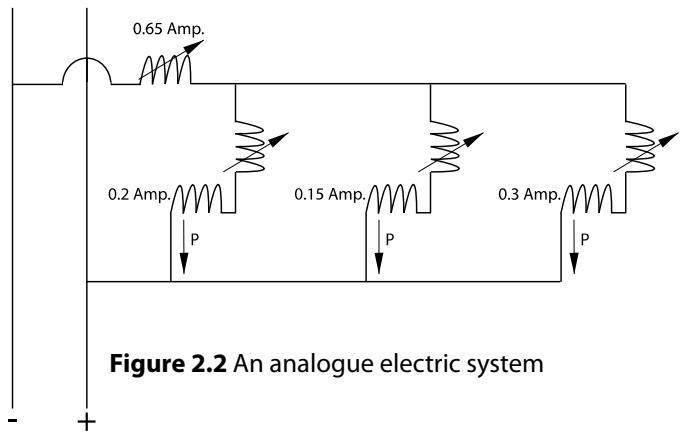


Figure 2.2 An analogue electric system

Design Considerations

The engineer in charge of the design and installation of a system should aim at:

- Substantial operating effectiveness
- Achievement of the required comfort at the lowest operating costs possible
- Avoiding unnecessary waste of energy resources.

For the design and selection of equipment for the balancing and control of a system the following should be taken into consideration:

(A) Type of application
(B) Type of the building in question
(C) The required room temperature/comfort
(D) Type of the hot domestic water supply
(E) Acceptable deviations from the comfort parameters
(F) Minimization of the primary energy
(G) Application of heat recycling
(H) Economic factors

The result of (C), (E) and (F) is very much dependent on the correct distribution of the flow in the system. Therefore the quality of the balancing should meet the the required comfort and energy efficiency.
The quality of the balancing is partly dependent on the type of the required balancing valves (static versus dynamic valves, ref. the following section), compared with the required adjustment method, and partly the design of the required components for the verification of the flow in the system.
The following quality parameters should be specified during the phase of design:

- Type of balancing valves
- Adjustment method
- Verification of flow, where and how?
- Acceptable deviations of the flow

Introduction

The result of Balancing

A satisfactorily balanced installation will show the following results:

- Correct flow in boilers and chillers
- Correct distribution of flow and effect in the whole system
- Compatibility between all flow rates in primary and secondary lines

These results will ensure the following benefits:

- The room temperature is adjustable within the specific deviations
- Energy saving as a result of the favourable conditions of the requipment that controls the energy transfer
- Achievement of the required indoor climate.

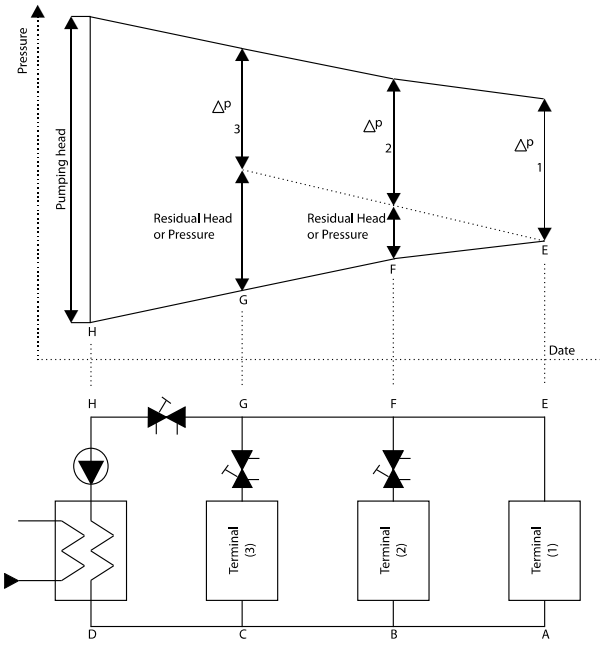
Why are balancing Valves required?

We answer that question on the basis of **figure 2.3**

The figure shows a schematic outline of a simple installation that contains a boiler/chiller, three identical terminals with the same flow requirement, and a pump to make the heat transfer medium, i.e. water or water/glycol circulate in the system. The top half of the diagram represents the pressure distribution throughout the schematic layout shown in the lower half of the diagram. The branch 'nodes' are indicated on both the distribution diagram and the schematic by the smae lettering.

In the piping there will be friction between the flowing medium and the pipe wall. This frictional loss makes the pressure decrease along the pipe in the direction of the flow. This will be seen from the falling pressure line between the branching points.

Figure 2.3 Simple installation and its pressure distribution



Introduction

The pressure drop Δp1 is referred to as the 'index circuit'.
The index circuit is the circuit that has the highest resistance to flow. It is normal for this to be the circuit most remote from the pump.
This pressure drop can be found by means of the equation $\Delta p1 = R_1 \times (q_v \times Þ)^n$, in which the resistance of the terminal R1 and the wanted flow q v are known values.

The pressure drop across the three identical terminals will be the same, provided the same flow is required through all of them, i.e. Δp1 = Δp2 = Δ p3.
In order to bring about this identical pressure drop across the terminals and associated piping it is necessary to connect another resistance in series with the resistances of the terminals, so that the residual pressure drop between branching points BF and CG can be absorbed.

If the installation in question is not equipped with balancing valves after terminals (2) and (3), the flow through the three terminals will vary so that terminal (3) will be exposed to the major flow, terminal (2) to a smaller flow, and terminal (1) to the smallest flow. In that case the system will not be in the required state of balance.

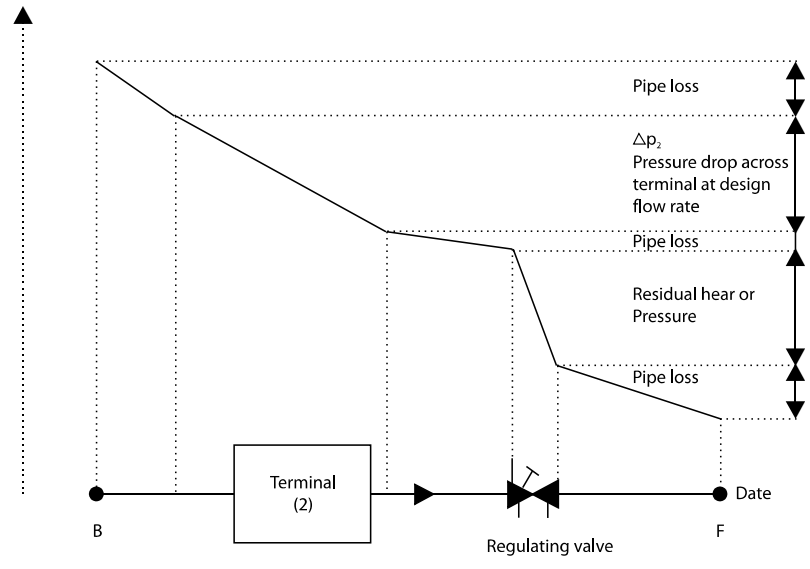
Figure **2.4** shows the distribution of the pressure drop between branching points BF. From this you will see that the adjustment of the regulating valve to the required resistance value has to be carried out with regard to not only the terminal but also the connecting pipes.

The final adjustment is usually carried out by indirect measurement of the flow through the regulating valve (ref. chapter 6) simultaneously with measurement of the flow through terminal (1).
The regulating valve to terminal (2) is to be adjusted to ensure that the proportion of the measured flow rates through terminals (1) and (2) is the same as the one between the indexed flow rates between the two terminals.

Hereafter the valve is adjusted to terminal (3) to ensure that the proportion between the measured flow rates through terminals (3) and (2) is the same as the one between the indexed flow rates between the two terminals.

This adjustment method is called the 'proportional method'.

Figure 2.4 Absorbing 'residual' pressure



Introduction

The Difference between a Static and a Dynamic Balancing Valve

Usually you will not find an indication of the resistance value of a valve in valve catalogues and data sheets. On the other hand, the producer always states a flow coefficient referred to as kv or cv (American products). This is also called the flow coefficient of the valve.

The flow coefficient of kv is defined to be the flow of water (density 1 kg/liter) through the valve, when the differential pressure across the valve is 1 bar. The designation of this flow is m^3/hour.
The flow coefficient of cv is defined as the flow of water (density 1 kg/liter) through the valve, when the differential pressure across the valve is 1 psi (lb/inch2). The designation of this flow is GPM (US gallon/min.).

Hereafter the mathematic coherence between the flow and the differential pressure of the valve can be expressed as follows:

$q_v = K_v \sqrt{\Delta/\rho_r}$ q_v in m^3/hour when Δp is in bar (gauge)

$q_v = c_v \sqrt{\Delta/\rho_r}$ q_v in GPM (US) when Δp is in psi

As regards the 2-position and balancing valves, the indicated flow coefficient of kv refers to the completely open valve.

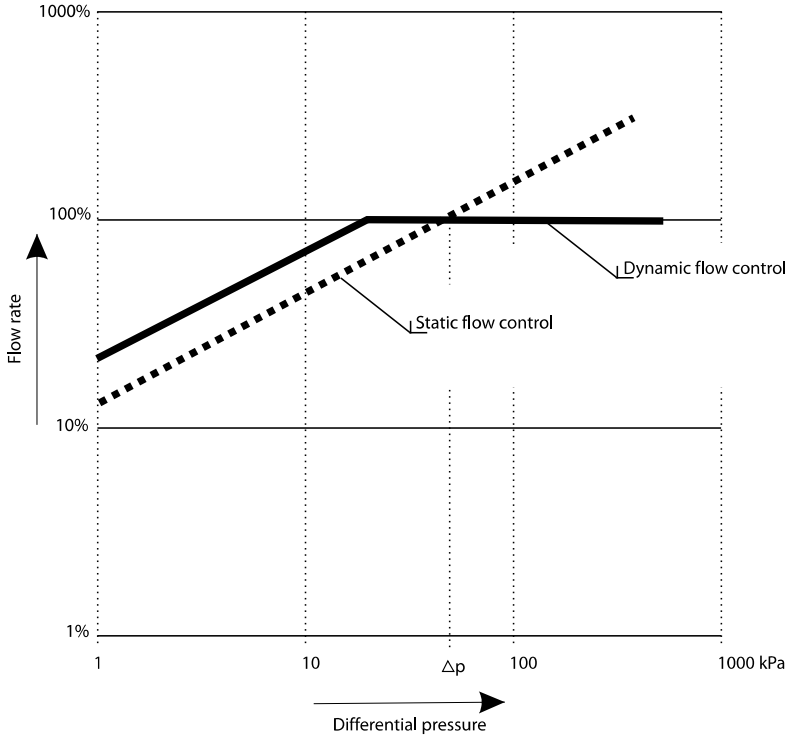
A feature of a static circuit balancing valve is that the open orifice area (kv value) can be changed manually and fixed into a static value. The kv value can now be obtained by referring to the hand wheel position in relation to the calibration graph of the valve.

The valve should be equipped with 2 pcs. isolation test plugs to which the measuring equipment for indirect flow measurement can be connected.

The valve can be pre-adjusted on the basis of a calculated pressure distribution in the whole HVAC installation. Please note that the calculation of large, complex installations may involve a considerable inaccuracy. Further, the valve can be pre-adjusted on the basis of an adjustment after the installation, e.g. according to the 'proportional method'.

A dynamic circuit balancing valve is a new balancing valve that was introduced on the market within the last few years. One of its features is that it can be pre-adjusted to a given flow and be locked to ensure this flow.

Figure 2.5 The valve features of a static circuit balancing valve and a dynamic circuit balancing valve respectively at a given pre-adjustment value.



Introduction

The valve is an automatic regulator valve that with a reference to the differential pressure automatically adjusts to the kv value necessary to maintain the required flow. The kv value of the valve automatically compensates for any changes of the differential pressure, so that the flow will never exceed the pre-set flow.

These valves are available in types that have been calibrated in the factory to the rated flow, and in types the indexed flow of which can be pre-adjusted by the user before or after the installation of the valve in the system, or from the outside as the system is working.
The valve can be used on the basis of the calculated flow without regard to the distribution of pressure in the system.

Figure 2.5 illustrates the difference between the static and the dynamic application in the form of flow variation as a function of the differential pressure across the valves at a given pre-adjustment.

As will be seen from the chart, the flow through the static valve will increase as the differential pressure increases, and decrease as the differential pressure falls, whereas the dynamic balancing valve will maintain a constant flow (within the regulation range) independently of the differential pressure within the dynamic balancing valve.

Further, please note that the indexed flow (100 %) through a static balancing valve will not be achieved unless the differential pressure across the valve is equal to the indexed differential pressure Δp.

When are Flow Measurement Devices equired?

Static Systems:
During the adjustment it should be possible to measure the flow through each terminal (coil in air-condition, not radiators in heating systems), distributing line, main distributing line and supply line.
The measurements will typically be carried out as an indirect measurement, i.e. measurement of the differential pressure converted into a flow value in relation to the k v value of the measured device. The measurements are carried out across each circuit-balancing valve with the k v value relative to the valve setting and the associated flow chart.
The accuracy of the measured flow is not likely to be better than +/- 25 % dependent on the hand wheel position. This inaccuracy should be taken into consideration in connection with the verification of the flow. Still, it is of no particular importance to the relative comparison between the flow through the individual terminals and distributing lines during the balancing procedure.

Dynamic Systems:
Dynamic valves will typically balance the system at an accuracy of +/- 5 % of the rated flow.
So, as direct measurements involve a degree of accuracy of +/- 25 %, it will be inappropriate to verify the flow through the individual terminals.
Instead, measurement/verification of the flow in the supply line is recommended.
For verification of the flow in the supply line it is recommended that a fixed orifice device is used with a specified accuracy which is +/- 5% above that of the measured flow.

Where are Balancing Valves required?

Figures 2.6 and **2.7** show a section of the same system, in which **figure 2.6** has been designed as a static system, and **figure 2.7** as a dynamic system. The section contains one supply line for 3 main distributing lines, each of which has 3 distributing lines with 3 terminals each (totally 27 terminals).

Introduction

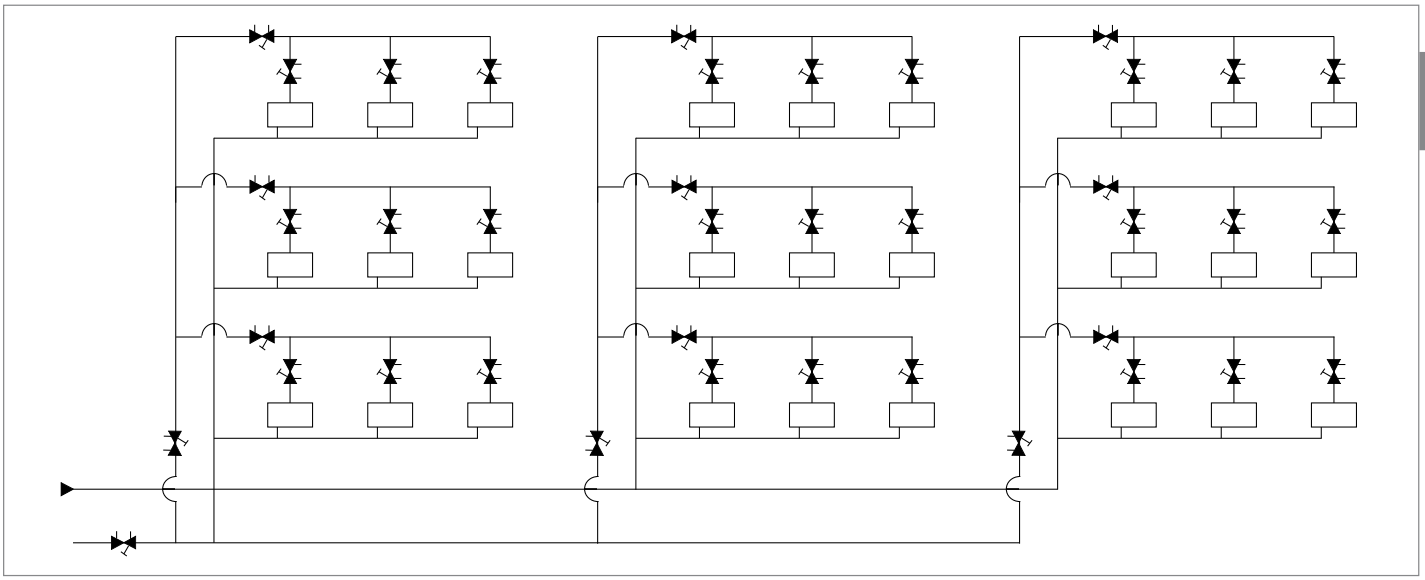


Figure 2.6 Water distribution system, static balancing

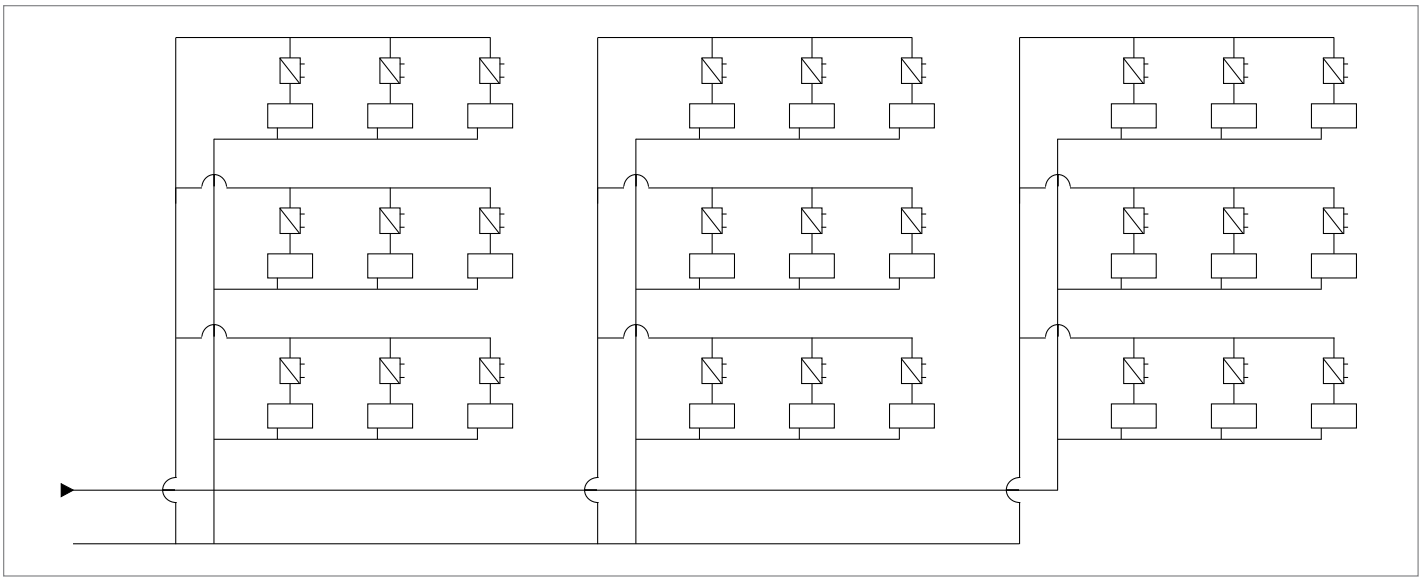


Figure 2.7 Water distribution system, dynamic balancing

In the static system each terminal has to be balanced in 9 groups of 3 terminals each. Hereafter the 9 terminal sections have to be balanced in 3 groups of 3 distributing lines each. After that the 3 main distributing lines have to be balanced. And finally the distributing line is adjusted to ensure the total design flow.

This balancing procedure requires one balancing valve per terminal, one balancing valve per distributing line, one balancing valve per main distributing line and one balancing valve in the supply line.

In the dynamic system the individual terminals can be adjusted independently of each other. This simply requires one balancing valve per terminal.

Introduction

Why use Dynamic Balancing instead of Static Balancing?

The adjustment of a dynamic system is quick and easy. All that is needed is the right pre-adjustment/balancing valve specified for the rated flow. There is no need for measurements for making comparisons between the flows of the individual balancing valves.

When the features of an installation are to be calculated, the only uncertain factor will be any inaccuracy in the calculated flow rate. When a dynamic balancing valve is used the uncertainty regarding the distribution of pressure in the installation and consequently the calculated kv values of the balancing valves is eliminated.

Balancing valves are only needed for the individual terminals. There is no need for balancing valves in the distribution lines, main distribution lines and supply lines.

The individual terminals are 100 % safe from overflow without regard to the load distribution in the installation and independent of the dynamic load variation in the installation. In an properly balanced static system overflow (up to 300-400 %) may occur through some of the terminals.

The rated flow can be changed in one or more sections of the installation without upsetting the balance in the rest of the system. If the dimensional basis of the whole system turns out to be wrong after the installation, a static system can only be re-adjusted if the whole installation is re- adjusted.

The result of the adjustment is better when compared to static balancing, because the rated flow is controlled at an accuracy of +/- 5%.

After the installation the system can be changed/extended/ restored without regard to the changes of the balance in the existing part of the system. In a corresponding static system this would often involve a change of the total design of the system.

From the foregoing, the following benefits of dynamic balancing can be stated:

- **Quick and easy adjustment**
- **Independent of errors/unreliabilities in the calculated distribution of pressure in the installation.**
- **Fewer balancing valves**
- **100 % safe from overflow**
- **Unproblematic re-adjustments**
- **More effective adjustment**
- **Great flexibility if the system is changed after the installation**

Due to these benefits the features of the system design will typically be as follows:

- **Cheaper installation**
- **Better comfort**
- **Greater flexibility**
- **More economical operation**

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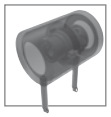
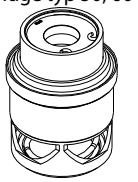
Quick Reference - Combining Cartridges and Housings



		Cartridge typ 10, 11, 20 	Cartridge typ 30, 40 	Cartridge typ 50, 60 
Female/Female	ALPHA DN15-25	25 - 2.448 l/h		
Female/Female	ALPHA DN25L-50		677 - 11.354 l/h	
Fixed end female/union	ALPHA DN15-25	25 - 2.448 l/h		
Fixed end female/union	ALPHA DN25L-40		677 - 11.354 l/h	
For unions with actuator	EVA DN15/20/25	25 - 2.448 l/h		
For couplings with actuator	EVA BASIC DN15	25 - 2.448 l/h		
For Flanges	ALPHA DN50			3.820 - 45.000 l/h
For Flanges	ALPHA DN65			3.820 - 45.000 l/h
For Flanges	ALPHA DN80			3.820 - 45.000 l/h
For Flanges	ALPHA DN100			3.820 - 90.000 l/h
For Flanges	ALPHA DN125			3.820 - 135.000 l/h
For Flanges	ALPHA DN150			3.820 - 180.000 l/h
For Flanges	ALPHA DN200			3.820 - 315.000 l/h
For Flanges	ALPHA DN250			3.820 - 540.000 l/h
For Flanges	ALPHA DN300			3.820 - 675.000 l/h
For Flanges	ALPHA DN350			3.820 - 855.000 l/h
For Flanges	ALPHA DN400			3.820 - 1.170.000 l/h
For Flanges	ALPHA DN450			3.820 - 1.485.000 l/h
For Flanges	ALPHA DN500			3.820 - 1.800.000 l/h
For Flanges	ALPHA DN600			3.820 - 2.520.000 l/h
For Flanges	ALPHA DN800			3.820 - 3.825.000 l/h

Frese ALPHA Cartridges

Application

Frese ALPHA Cartridges 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 fluctations in the differential pressure of the system.

Frese ALPHA Cartridges limits maximum flow in the system, and ensures the most economical operation.

Can be used in both variable and constant flow systems.

From small size valves (DN15) to big wafer types (DN800), from small heating units to district cooling applications, there is a Frese ALPHA Cartridge that guarantee the specified flow.

Benefits

- Quick and easy selection as only flow data are required.
- Security that the specified flow will not be exceeded.
- Easy to install according to pre-defined flow.
- 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 fluctations in the system.
- No main circuit or branch balancing valves needed in the system.
- Improved response to water hammer due to the chock absorption by the rubber diaphragm of the cartridge.

Features

- Removable cartridge solution simplifies flushing procedure
- No minimum straight pipe lengths required before or after the valve.
- Built-in optional P/T plugs for needle system.
- Minimized friction and noise due to the patented cartridge design based on the metal-rubber diaphragm-metal contact.

Frese ALPHA Cartridges

Function Frese ALPHA

The following applies to all flow control valves:

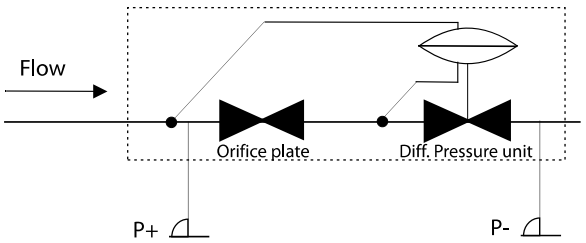
$$Q = Kv * \sqrt{\Delta p}$$

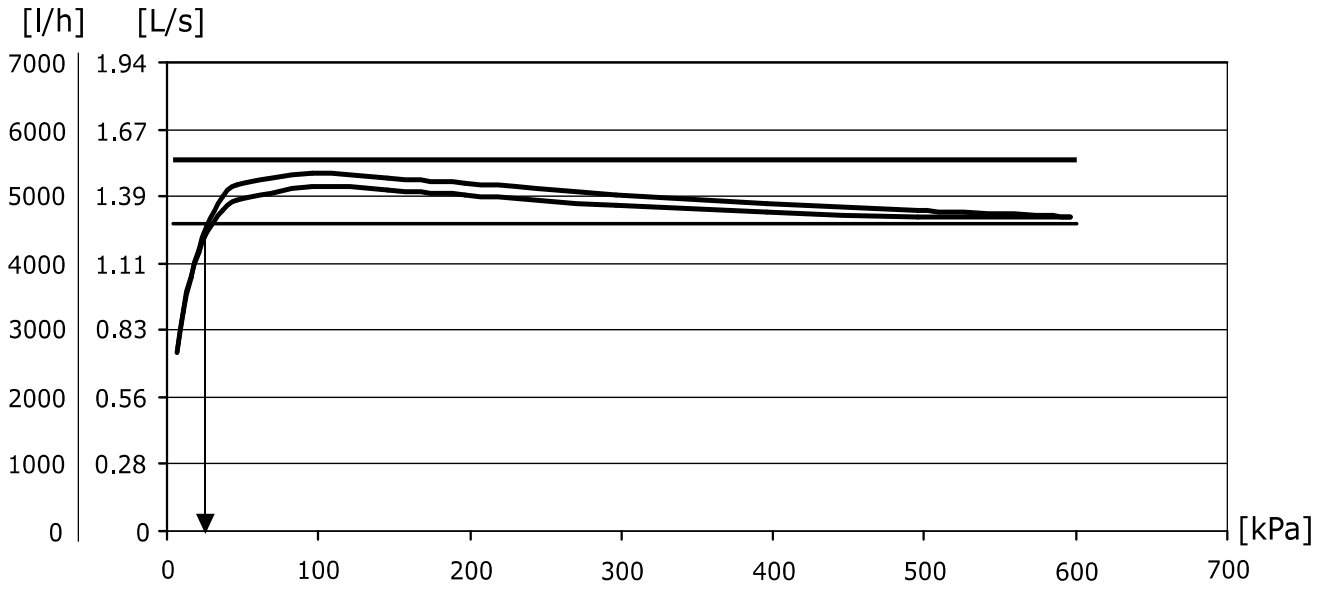
Q = Flow (m^3/h)
Kv = Opening area
Δp = Differential pressure (Bar)

The Frese ALPHA cartridges, react to pressure fluctuations
so that the differential pressure across the pre-adjustment unit is kept constant.
In that way a max. flow limit is ensured in accordance with the design.

Simplified outline ALPHA

Frese ALPHA valve



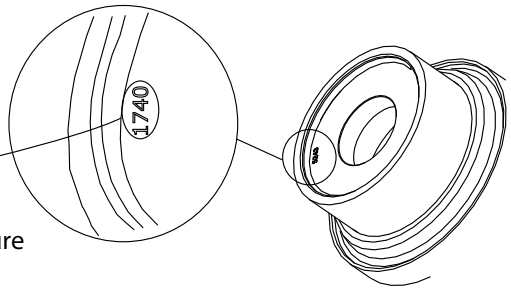


Schematic view of the flow development for cartridge type 40, Frese no. 49-44176. Nominal flow 1.388 l/s / 4.816 l/h. The cartridge enters the pressure range at 23 kPa and maintains the flow at a constant level all the way till 600 kPa.

Indication of flow rate on the orifice plate

A four-digit number on the orifice plate is identical with the last four digits in the Frese number. The cartridge can be identified by means of this number and the corresponding flow rate can be read from the above flow rate tables.

High Pressure Frese no.	Flow [gpm]	Flow [l/s]	Min. ΔP [kPa]
49-11740	3.52	0.222	16
49-11745	3.83	0.242	19
49-11750	4.12	0.260	21

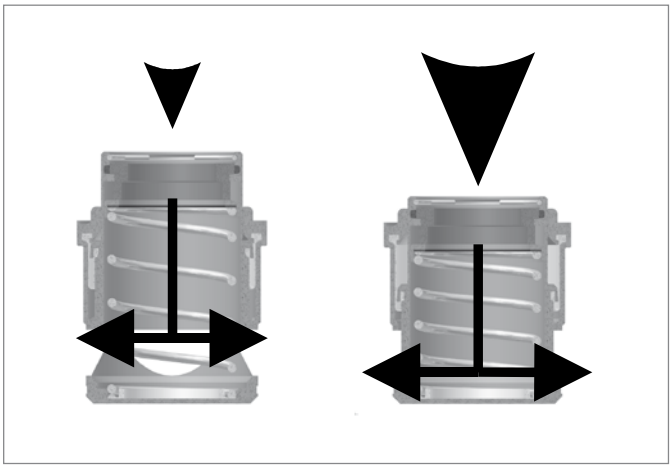


49= HP High Pressure
50= Low Pressure

Frese ALPHA Cartridges

Cartridge operation

When the pressure increases the spring will be compressed and thereby the piston will reduce the outlet area and vice versa. The result is a constant flow rate through the valve, independent of pressure fluctuations



Flow calculation

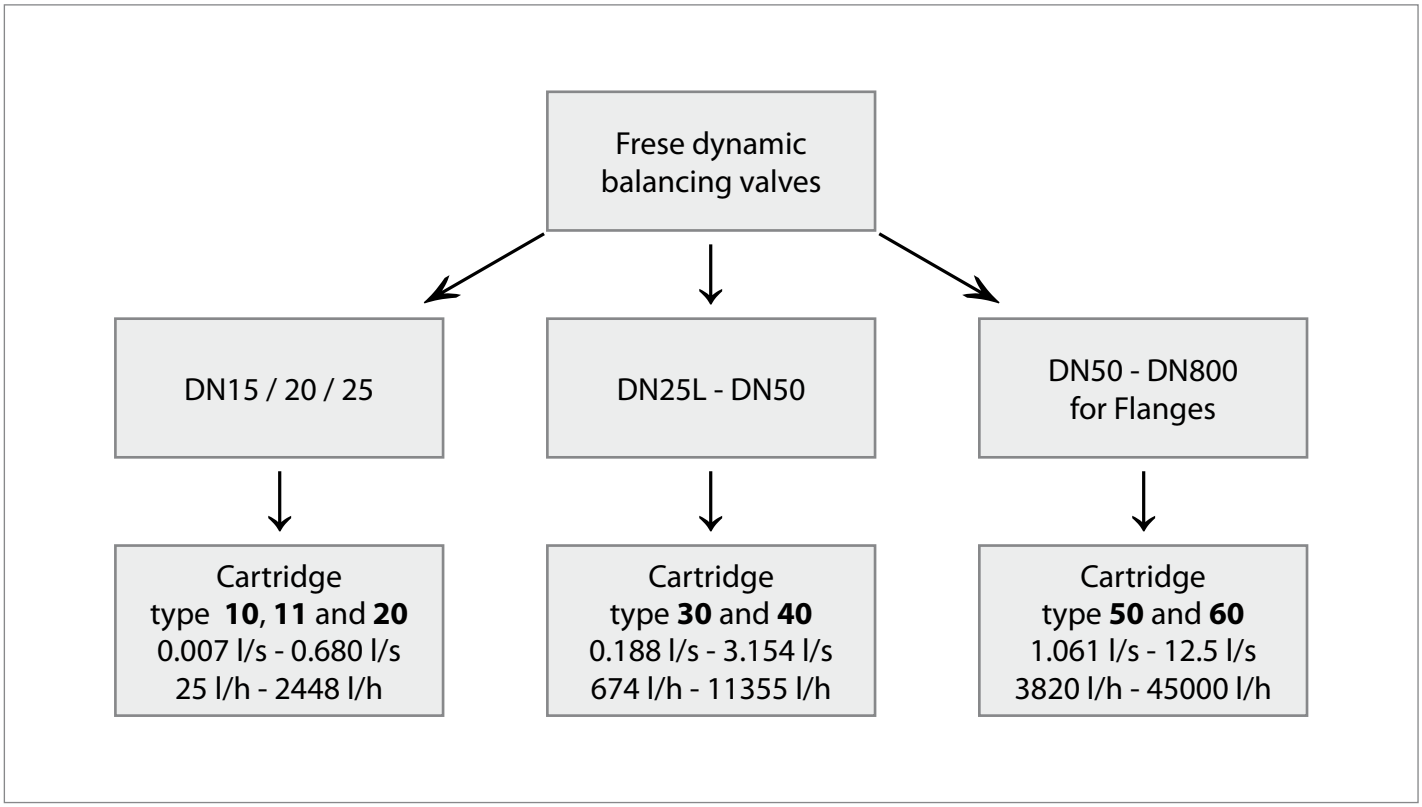
The flow through the valve can be identified by measuring the differential pressure (Δp) across the valve:

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 = m3/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

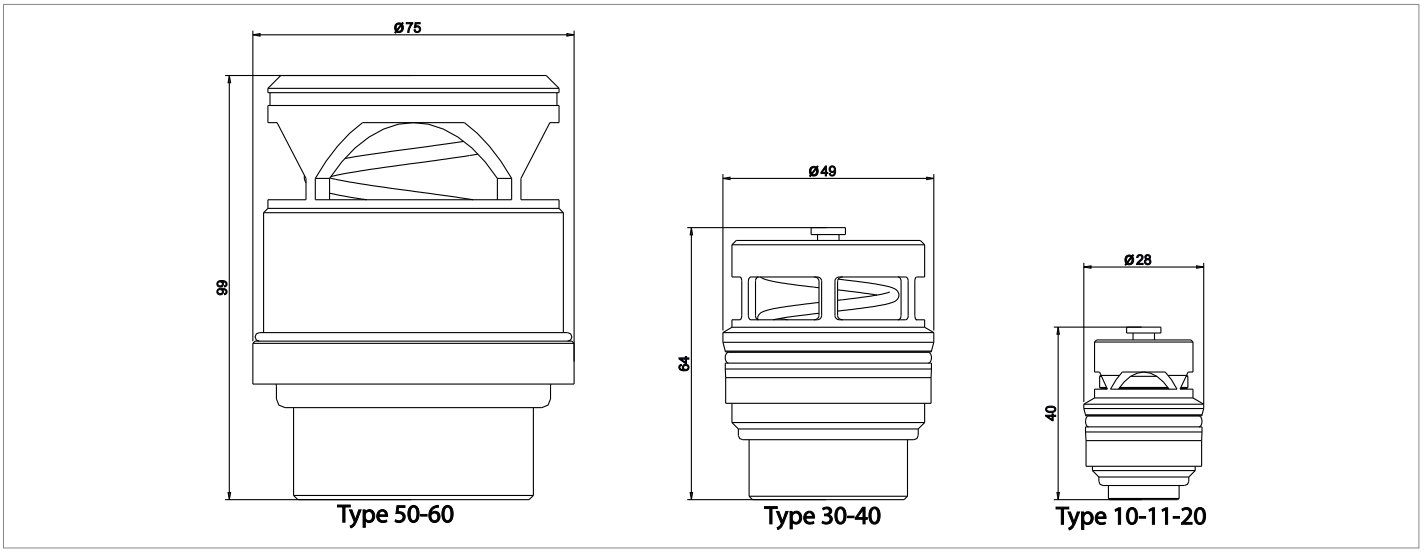


Frese ALPHA Cartridges

Technical data

Cartridge Material:	DZR Brass CW602N (Low pressure cartridges) DZR Brass CW 602N Tin/nickel plated (High pressure cartridges) AISI 304 (Wafer cartridges)
O-rings:	EPDM 281
Spring:	Stainless Steel 1.4310 (Low pressure & High pressure cartridges) AISI 316 (Wafer cartridges)
Diaphragm:	HNBR (Low pressure cartridges) HNBR reinforced (High pressure cartridges)
Medium Temperature:	-20 to + 120^{0}C

Dimensions



Specification text

High pressure cartridges
DN15 - DN50:

The cartridge (for automatic balancing valve) should be made of tin/nickel plated brass; There should be only one differential pressure control range up to 600kPa; The flow rate should be defined by replaceable orifice plate. The diaphragm should be made of reinforced HNBR, the O-rings should be made of EPDM.

Low pressure cartridges
DN15 - DN50:

The cartridge (for automatic balancing valve) should be made of brass; There should be only one differential pressure control range up to 350kPa; The flow rate should be defined by replaceable orifice plate. The diaphragm should be made of HNBR; the O-rings should be made of EPDM. umber. The cartridge can be identified by means of this number and the corresponding flow rate can be read from the above flow rate tables.

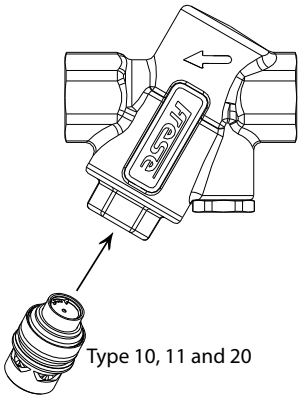
High pressure cartridges
DN50 - DN800:

The cartridge for automatic balancing valve (flanged housing) should be made of stainless steel; There should be only one differential pressure control range up to 600kPa; The flow rate should be defined by replaceable orifice plate. The diaphragm should be made of reinforced HNBR, the O-rings should be made of EPDM.

Frese ALPHA Cartridges

Cartridges for valves from DN15-DN25

High Pressure Frese no. **Max. Δp 600 kPa**	Low Pressure Frese no. **Max. Δp 350 kPa**	Flow [l/h]	Flow [l/s]	Flow [gpm]	Min. ΔP [kPa]	Kv
Cartridge type 10						
	50-11150	25	0.007	0.11	7	0,09
	50-11170	36	0.010	0.15	7	0,14
	50-11190	43	0.012	0.20	7	0,16
49-11210	50-11210	55	0.015	0.24	7	0,21
49-11230	50-11230	75	0.021	0.33	8	0,27
49-11260	50-11260	84	0.024	0.39	9	0,28
49-11290	50-11290	104	0.029	0.46	10	0,33
49-11300	50-11300	114	0.032	0.50	10	0,36
49-11320	50-11320	129	0.036	0.57	11	0,39
49-11350	50-11350	154	0.043	0.68	11	0,46
49-11370	50-11370	175	0.049	0.77	12	0,51
49-11400	50-11400	204	0.057	0.90	12	0,59
49-11430	50-11430	241	0.067	1.06	12	0,70
49-11460	50-11460	279	0.078	1.23	12	0,81
49-11490	50-11490	320	0.089	1.41	13	0,89
49-11510	50-11510	350	0.097	1.54	13	0,97
49-11540	50-11540	400	0.111	1.76	13	1,11
49-11570	50-11570	477	0.132	2.10	14	1,27
49-11620	50-11620	545	0.151	2.40	14	1,46
Cartridge type 11						
49-11725	50-11725	615	0.171	2.71	14	1,64
49-11730	50-11730	670	0.186	2.95	14	1,79
49-11735	50-11735	736	0.204	3.24	14	1,97
49-11740	50-11740	799	0.222	3.52	16	2,00
49-11745	50-11745	870	0.242	3.83	19	2,00
49-11750	50-11750	936	0.260	4.12	21	2,04
Cartridge type 20						
49-20700	50-20700	1020	0.283	4.49	22	2,17
49-20740	50-20740	1081	0.300	4.76	22	2,30
49-20770	50-20770	1195	0.332	5.26	22	2,55
49-20820	50-20820	1335	0.371	5.88	23	2,78
49-20860	50-20860	1483	0.412	6.53	23	3,09
49-20880	50-20880	1581	0.439	6.96	23	3,30
49-20920	50-20920	1774	0.493	7.81	24	3,62
49-20940	50-20940	1833	0.509	8.07	24	3,74
49-20990	50-20990	2080	0.578	9.16	25	4,16
49-21030	50-21030	2251	0.625	9.91	26	4,41
49-21060	50-21060	2319	0.644	10.21	27	4,46
49-21090	50-21090	2448	0.680	10.78	28	4,63



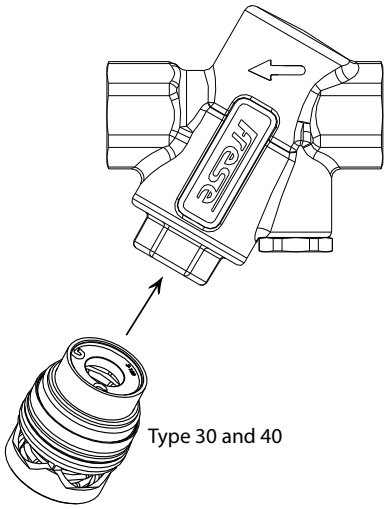
Type 10, 11 and 20

2

Frese ALPHA Cartridges

Cartridges for valves from DN25L-DN50

Cartridge type 30						
High Pressure Frese no. **Max. Δp 600 kPa**	Low Pressure Frese no. **Max. Δp 350 kPa**	Flow [l/h]	Flow [l/s]	Flow [gpm]	Min. ΔP [kPa]	Kv
49-33073	50-33073	674	0.188	2.97	12	1,95
49-33082	50-33082	861	0.239	3.79	12	2,49
49-33089	50-33089	1020	0.283	4.49	12	2,94
49-33094	50-33094	1136	0.315	5.00	12	3,28
49-33096	50-33096	1190	0.331	5.24	12	3,44
49-33098	50-33098	1272	0.353	5.60	13	3,53
49-33102	50-33102	1349	0.375	5.94	13	3,74
49-33107	50-33107	1485	0.413	6.54	13	4,12
49-33111	50-33111	1567	0.435	6.90	14	4,19
49-33112	50-33112	1631	0.453	7.18	14	4,36
49-33118	50-33118	1815	0.504	7.99	14	4,85
49-33124	50-33124	2001	0.556	8.81	15	5,17
49-33125	50-33125	2044	0.568	9.00	16	5,11
49-33129	50-33129	2171	0.603	9.56	16	5,43
49-33132	50-33132	2271	0.631	10.00	17	5,51
49-33135	50-33135	2380	0.661	10.48	17	5,77
49-33138	50-33138	2498	0.694	11.00	18	5,89
49-33142	50-33142	2639	0.733	11.62	18	6,22
49-33148	50-33148	2871	0.797	12.64	19	6,59
49-33156	50-33156	3191	0.886	14.05	21	6,96
49-33161	50-33161	3407	0.946	15.00	22	7,26
49-33163	50-33163	3486	0.968	15.35	22	7,43
Cartridge type 40						
49-44148	50-44148	3634	1.009	16	20	8,13
49-44152	50-44152	3681	1.023	16	21	8,03
49-44156	50-44156	4088	1.136	18	21	8,92
49-44164	50-44164	4315	1.199	19	21	9,42
49-44168	50-44168	4542	1.262	20	22	9,68
49-44173	50-44173	4769	1.325	21	22	10,17
49-44176	50-44176	4996	1.388	22	23	10,42
49-44182	50-44182	5450	1.514	24	24	11,12
49-44191	50-44191	5905	1.640	26	25	11,81
49-44194	50-44194	6360	1.767	28	26	12,47
49-44200	50-44200	6813	1.893	30	27	13,11
49-44205	50-44205	7267	2.019	32	28	13,73
49-44211	50-44211	7721	2.145	34	30	14,10
49-44217	50-44217	8176	2.271	36	31	14,68
49-44222	50-44222	8630	2.397	38	33	15,02
49-44229	50-44229	9084	2.523	40	34	15,58
49-44235	50-44235	9538	2.650	42	36	15,90
49-44241	50-44241	9990	2.776	44	38	16,21
49-44248	50-44248	10445	2.902	46	40	16,51
49-44250	50-44250	10900	3.028	48	42	16,82
49-44262	50-44262	11355	3.154	50	44	17,12

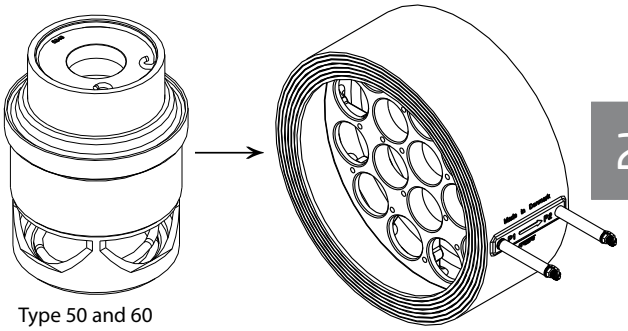


Type 30 and 40

Frese ALPHA Cartridges

Cartridges for valves from DN50-DN800

AISI 304 Frese no. **Max. Δp 600 kPa**	Flow [l/h]	Flow [l/s]	Flow [gpm]	Min. ΔP [kPa]	Kv
Cartridge type 50					
52-55179	3820	1.061	16.82	13	10,6
52-55184	3931	1.092	17.31	13	10,9
52-55189	4049	1.125	17.83	13	11,2
52-55194	4199	1.167	18.49	13	11,7
52-55200	4399	1.222	19.37	13	12,2
52-55206	4640	1.289	20.43	14	12,4
52-55213	4951	1.375	21.80	14	13,2
52-55220	5310	1.475	23.38	14	14,2
52-55227	5700	1.583	25.10	14	15,2
52-55235	6209	1.725	27.34	14	16,6
52-55243	6511	1.808	28.67	14	17,4
52-55251	7081	1.967	31.18	14	18,9
52-55260	7901	2.194	34.79	15	20,4
52-55269	8900	2.472	39.19	16	22,3
52-55279	10399	2.889	45.79	19	23,9
52-55287	11355	3.154	50.00	22	24,2
52-55292	12491	3.470	55.00	23	26,1
52-55298	13399	3.722	59.00	24	27,4
52-55303	14762	4.100	65.00	27	28,4
52-55308	15999	4.444	70.45	29	29,7
Cartridge type 60					
52-66285	17037	4.733	75.02	34	29,2
52-66292	18148	5.041	79.91	34	31,1
52-66301	18797	5.221	82.77	35	31,8
52-66305	19467	5.408	85.72	35	32,9
52-66312	20464	5.684	90.11	35	34,6
52-66319	21527	5.980	94.79	36	35,9
52-66326	22449	6.236	98.85	36	37,4
52-66332	23482	6.523	103.40	36	39,1
52-66338	24531	6.815	108.02	37	40,3
52-66344	25621	7.117	112.82	38	41,6
52-66349	26528	7.369	116.81	38	43,0
52-66356	27686	7.690	121.91	38	44,9
52-66362	29157	8.099	128.39	38	47,3
52-66367	29954	8.320	131.90	39	48,0
52-66373	30976	8.605	136.40	39	49,6
52-66379	32260	8.961	142.05	40	51,0
52-66385	33565	9.324	147.80	40	53,0
52-66391	34953	9.709	153.91	40	55,3
52-66393	36336	10.093	160.00	42	56,1
52-66398	37685	10.468	165.94	43	57,5
52-66400	38607	10.724	170.00	44	58,2
52-66407	40971	11.381	180.41	46	60,4
52-66407H	45000	12.500	198.19	49	64,3



Type 50 and 60

2

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Tel: +45 58 56 00 00
Fax: +45 58 56 00 91
frese@frese.dk

Frese ALPHA - Automatic Balancing valve

Application

The Frese ALPHA Valves are particularly designed and manufactured for the automatic balancing of heating and cooling circuits.
The Frese ALPHA Cartridges - the second generation cartridges - are an integral part of the Frese ALPHA Valves limiting the flow at the specified level even under fluctuating pressure conditions.
The patented design of these cartridges introduces a replaceable orifice plate for higher flexibility and a resistant diaphragm for higher accuracy. From small size threaded valves (DN15) to big flanged type valves (DN800), from small heating units to district cooling applications, Frese ALPHA Valves guarantee the hydraulic balance of the system regardless pressure fluctuations.

Benefits

- Balancing of the system takes place automatically even under fluctuating pressure conditions

Design

- No need to use balancing valves in the distribution lines, main distribution lines and supply lines.
- Less time to define the necessary equipment for a hydraulic balanced system.
- No impact if the calculated distribution of pressure in the installation is not accurate.
- Security that the specified flow is also the real one
- No requirements on pipe lengths before and after the valve

Installation

- Minimized commissioning time due to automatic balancing of the system
- Cartridge solution makes flushing procedure very easy
- No need for oversized pumps and oversized control valves

Operation

- Energy savings due to elimination of overflows
- Higher comfort due to correct distribution of water in the system and to optimized function of the control valves

Features

Wide product range covering all applications:

- sizes from DN15 to DN800
- different end connections (female/female, union connections, flanges)
- dezincification resistant brass, ductile iron.
- P/T plugs, drain, combi-drain.
- Kit solution with strainer and ball-valves, solution with integral ball-valve.

- Modifications & extensions of the system do not affect the hydraulic balance in the other parts of the system.

- Tamper resistant cartridge independent of flow regulation errors during commissioning and operation of the system.

- Self-cleaning cartridge not allowing dirt to compromise the accuracy of the valve.

- Resistant diaphragm between the moving parts of the cartridge eliminates friction, noise and impact from water hummer.

Frese ALPHA - Automatic Balancing valve

Female/Female threaded

A very simple and efficient solution for automatic balancing of heating/cooling circuits.

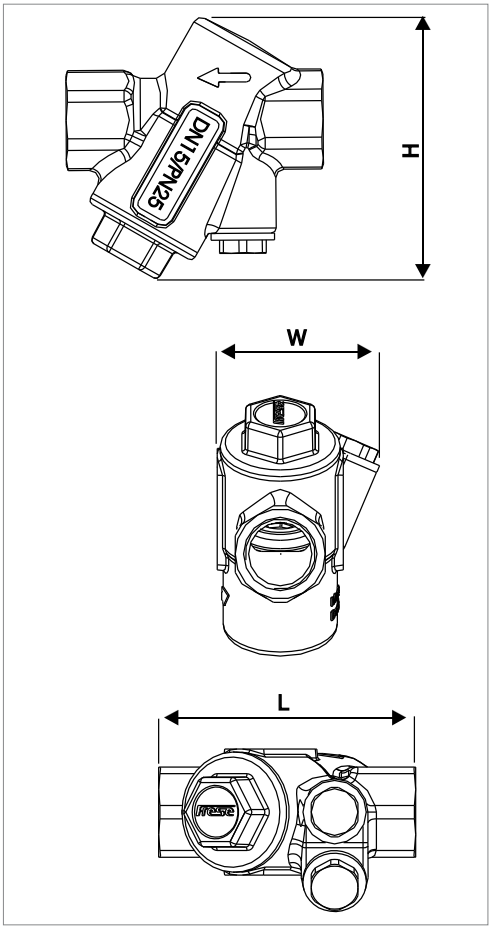
Technical data

Valve Housing: DZR brass, CW602N
O-rings: EPDM
Pressure class: PN25
Temperature: -20°C to + 120°C
Diff. Pressure Range: 7 - 600 kPa
Thread: ISO 228

Frese product numbers are marked with an X.
X represents the 5 different options available for different accessory features - see below.
E.g. 49-9041 = Frese ALPHA DN32 equipped with 2 pcs. 1" P/T-Plugs.

Flow Cartridge is selected from Cartridge Catalogues and ordered under individual numbers.

Frese no.	Dimensions
49-900X	DN15
49-901X	DN20
49-902X	DN25
49-903X	DN25L
49-904X	DN32
49-905X	DN40
49-906X	DN50



Accessories	1		2		4		5		6		L, W & H are stated in [mm]	
	2 pcs 1" P/T plugs		2 pcs 2" P/T plugs		Plug and drain valve		Combidrain and 2" P/T plugs		2 pcs P/T plugs		L	Net Weight [kg]
Dimensions	W	H	W	H	W	H	W	H	W	H		
15/20/25	55	94	71	133	63	95	71	133	49	75	77	~0.50
25L/32/40/50	80	126	91	164	83	127	91	164	68	115	123	~1.45

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets.

Specification text
The valve shall operate by means of an automatic balancing cartridge with replaceable orifice plate and internal diaphragm. The pressure class of the valve shall be PN25. The valve housing shall be made of DR brass.

Frese ALPHA - Automatic Balancing valve

ALPHA kit

A kit solution containing an Alpha Female / Female Valve, a strainer and two isolation ball-valves.

Technical data

ALPHA Valve:

Valve Housing: DZR brass, CW602N
O-rings: EPDM
Seal: PTFE
Pressure class: PN25
Temperature: -20°C to + 120°C
Diff. Pressure Range: 7 - 600 kPa
Flow range: See Cartridge Catalogue
Thread: ISO 228

Strainer:

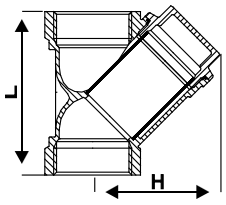
Valve Housing: DR, Dezincification Resistant Brass
Filter: Stainless steel
Seal: PTFE
Mesh: 32 (0,5 mm)
Pressure class: PN16
Temperature: -20 to + 150°C
Thread: ISO 228

Ball Valve:

Valve Housing: DR, Dezincification Resistant Brass
O-rings: EPDM
Seal: PTFE
Pressure class: PN20
Temperature: -20 to + 110°C
Thread: ISO 228

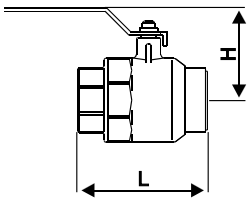
Strainer

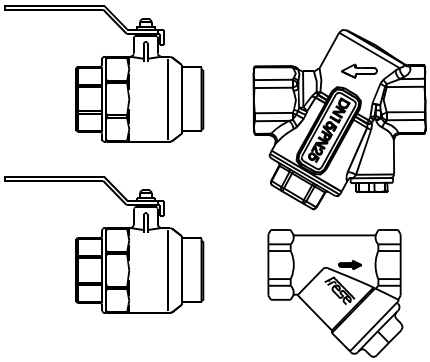
Dimensions	Weight [kg]	L [mm]	H [mm]
DN15	0.158	56	41
DN20	0.282	69	50
DN25	0.440	82	62
DN32	0.638	90	71
DN40	0.820	101	78
DN50	1.280	121	96



Ball Valve

Dimensions	Weight [kg]	L [mm]	H [mm]
DN15	0.195	62	44
DN20	0.327	73	47
DN25	0.502	85	55
DN32	0.869	106	75
DN40	1.348	113	82
DN50	2.371	135	94





Flow Cartridge is selected from Cartridge Catalogues and ordered under individual numbers.

Please see accessories for feature selec-

Frese no.	Dimensions
49-9466	DN15
49-9476	DN20
49-9486	DN25
49-9496	DN25L
49-9506	DN32
49-9516	DN40
49-9526	DN50

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. The pipe system should be properly ventilited to avoid the risk of air-pockets.

Specification text

The valve shall operate by means of an automatic balancing cartridge with replaceable orifice plate and internal diaphragm. The pressure class of the valve shall be PN25. The valve housing shall be made of DR brass. The housing of the strainer shall be made of DR brass; the filter shall be replaceable and made of stainless steel. The filter mesh shall be 32 (0.5 mm).

Frese ALPHA - Automatic Balancing valve

Fixed Female/Male for union connection

An automatic balancing valve with an integral ball valve and one union end for ease of installation

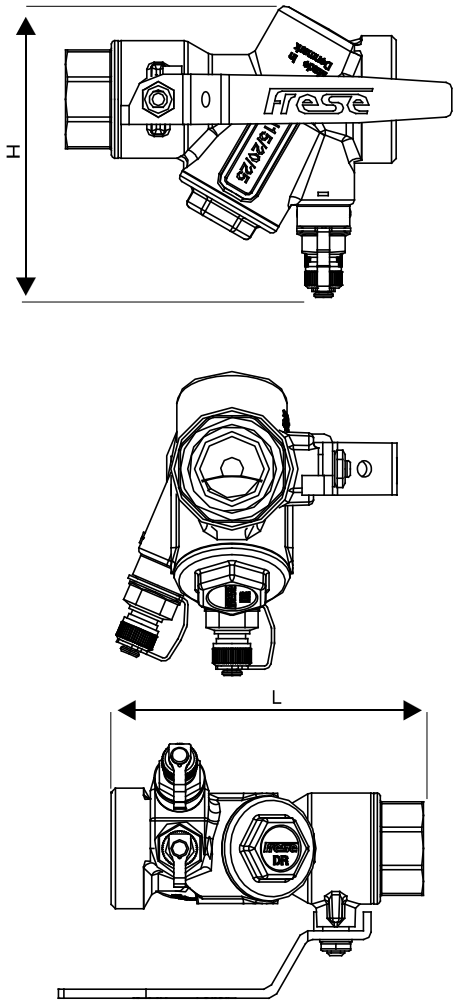
Technical data

Valve Housing: DZR brass, CW602N
O-rings: EPDM
Seal: PTFE
Pressure class: PN25
Temperature: -20°C to + 120°C
Diff. Pressure Range: 7 - 600 kPa
Flow range: See Cartridge Catalogue
Thread: ISO 228

Frese product numbers are marked with an X.
X represents the 3 different options available for different accessory features - see below.
E.g. 49-9431 = Frese ALPHA DN32 equipped with 2 pcs. 1" P/T-Plugs.

Flow Cartridge is selected from Cartridge Catalogues and ordered under individual numbers.

Frese no.	Dimensions
49-935X	DN15
49-937X	DN20
49-939X	DN25
49-941X	DN25L
49-943X	DN32
49-945X	DN40



Accessories	1		4		6		L, W & H are stated in [mm]	
								
	2 pcs 1" P/T plugs		Plug and drain valve		2 pcs P/T plugs		L	Net Weight [kg]
Dimensions	W	H	W	H	W	H		
15/20/25	87	94	95	95	81	75	107	~0.71
25L/32/40/50	124	126	127	127	112	115	160	~2.15

All threads are ISO type. Length is total valve length with one union connection. Length in mm.

* **Material in contact with water**

Frese no./ Lenght with one union	Male ends **DZR Brass ***	Frese no./ Lenght with one union	Soldering ends **Brass**
DN15	43-4310/132	15 mm	43-4102/127
DN20	43-4312/132	18 mm	43-4103/127
DN25	43-4314/146	22 mm	43-4104/129
		28 mm	43-4105/128
DN25L	43-5330/200	28 mm	43-5122/180
DN32	43-5332/200	35 mm	43-5123/197
DN40	43-5334/202	42 mm	43-5124/197

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets.

Specification text

The valve shall operate by means of an automatic balancing cartridge with replaceable orifice plate and internal diaphragm. The pressure class of the valve shall be PN25. The valve housing shall be made of DR brass. The housing shall have one fixed threaded end and one union end. The valve includes an integral ball valve with handle.

Frese ALPHA - Automatic Balancing valve

Fixed Female/Female for union connection

An automatic balancing valve with an integral ball valve and one union end for ease of installation

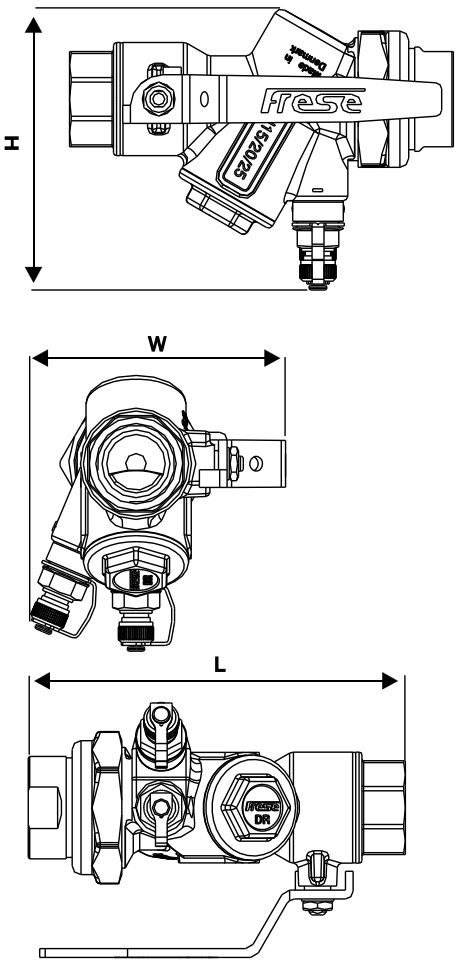
Technical data

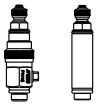
Valve Housing: DZR brass, CW602N
O-rings: EPDM
Seal: PTFE
Pressure class: PN25
Temperature: -20°C to + 120°C
Diff. Pressure Range: 7 - 600 kPa
Flow range: See Cartridge Catalogue
Thread: ISO 228

Frese product numbers are marked with an X.
X represents the 2 different options available for different accessory features - see below.
E.g. 49-9421 = Frese ALPHA DN32 equipped with 2 pcs. 1" P/T-Plugs.

Flow Cartridge is selected from Cartridge Catalogues and ordered under individual numbers.

Frese no.	Dimensions
49-934X	DN15
49-936X	DN20
49-938X	DN25
49-940X	DN25L
49-942X	DN32
49-944X	DN40



Accessories	1		5		L, W & H are stated in [mm]	
						
	2 pcs 1" P/T plugs		Combidrain and 2" P/T plugs		L	Net Weight [kg]
Dimensions	W	H	W	H		
15/20/25	87	94	103	133	129/129/146	~0.87
25L/32/40/50	124	126	135	164	195/195/200	~2.54

All threads are ISO type. Length is total valve length with one union connection. Length in mm.

Frese no./ Lenght with one union	Female ends **DZR Brass ***
DN15	43-4210/129
DN20	43-4212/129
DN25	43-4214/146
DN25L	43-5230/195
DN32	43-5232/195
DN40	43-5234/200

*** Material in contact with water**

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets.

Specification text

The valve shall operate by means of an automatic balancing cartridge with replaceable orifice plate and internal diaphragm. The pressure class of the valve shall be PN25. The valve housing shall be made of DR brass. The housing shall have one fixed threaded end and one union end. The valve includes an integral ball valve with handle.

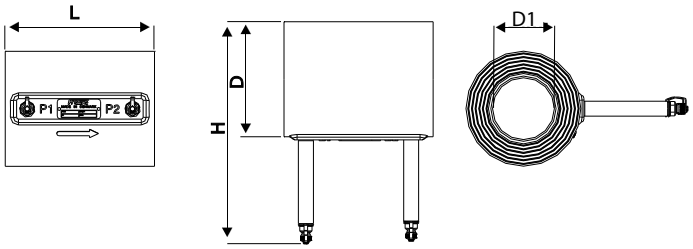
Frese ALPHA - Automatic Balancing valve

Flanged ductile iron

A wafer-type valve containing, depending on the size and the design flow, up to 85 Frese ALPHA cartridges

Technical data

Valve Housing: Ductile iron DIN 1693 GGG-40
O-rings: EPDM
Fasteners: AISI 306
Pressure class: PN16 (PN25)
Temperature: -20^{0}C to + 120^{0}C
Diff. Pressure Range: 13 - 600 kPa
Flow range: See Cartridge Catalogue



Frese no. (PN16)	Frese no. (PN25)	Dimensions	L [mm]	D [mm]	D1 [mm]	H [mm]	Net Weight [kg]	Cart./Valve (Pcs.)
-	49-9073	DN50	170	100	80	218	3.41	1
-	49-9083	DN65	170	119	80	237	4.91	1
-	49-9093	DN80	170	131	80	249	4.79	1
49-9103	49-9540	DN100	170	163	100	281	6.90	2
49-9163	49-9541	DN125	170	193	125	311	9.00	3
49-9113	49-9542	DN150	170	216	150	334	11.73	4
49-9123	49-9543	DN200	170	271	200	389	18.75	7
49-9133	49-9544	DN250	170	326	260	440	23.44	12
49-9143	49-9545	DN300	170	383	315	501	33.41	15
49-9153	49-9546	DN350	170	443	355	561	44.21	19
49-9173	49-9547	DN400	170	496	405	614	51.63	26
49-9183	49-9548	DN450	170	545	455	663	57.47	33
49-9193	49-9549	DN500	170	601	508	719	67.75	40
49-9203	49-9550	DN600	170	715	610	833	88.90	56
49-9213	-	DN800	170	880	760	998	127.30	85

Blind Caps can be fitted instead of cartridges if the full flow capacity is not required. Frese A/S can deliver the valve with the cartridges installed (Frese number i.e. 49-9073-01 instead of 49-9073). Valves are delivered with 4" P/T-Plugs. From DN100 the valves are delivered with an eye bolt.

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets.

Specification text

The valve shall operate by means of automatic balancing stainless steel cartridges with replaceable orifice plate and internal EPDM diaphragm. The pressure class of the valve shall be PN16/PN25. The valve housing shall be made of ductile iron type GGG40. The valve shall comply with flanges according to EN/ANSI standards.

Frese S
- Dynamic Balancing Valve

Application

Frese 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 fluctations in the differential pressure of the system.

Frese 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 fluctations 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.

Frese S
- Dynamic Balancing Valve

Function Frese S

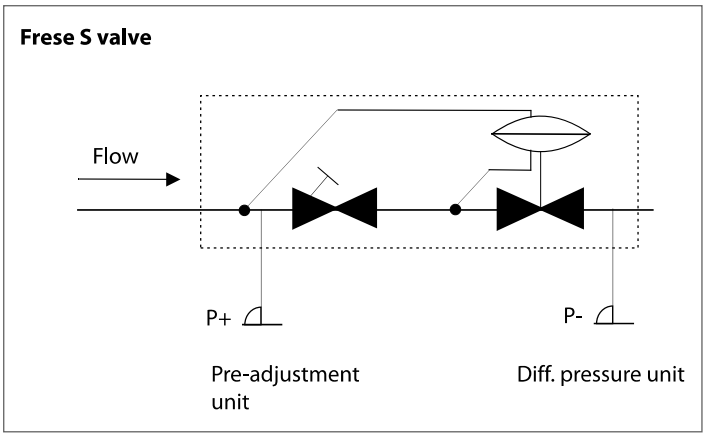
The following applies to all flow control valves:

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

Q = Flow (m^3/h)
kV = Opening area
Δp = Differential pressure (Bar)

The Frese S valves, react to pressure fluctations 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.

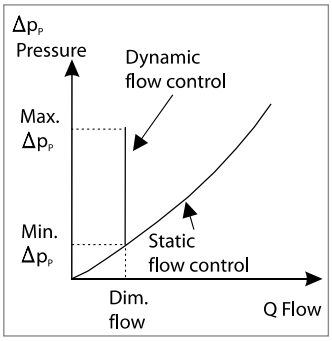
Simplified outline S



Flow characteristic

The illustration shows how the flow in a Frese 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 = m3/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

Frese 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. ΔP.

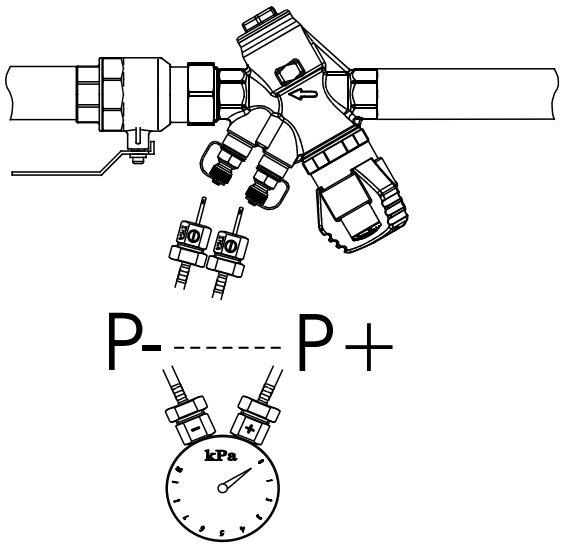
As previously mentioned, the Frese valve includes a differential pressure regulator, to keep the design flow limited under different pressure conditions. The flow rate itself, however, is only determined by the pre-setting in the same way as in any static valve.

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.

4

Measurement of the differential pressure across the valve



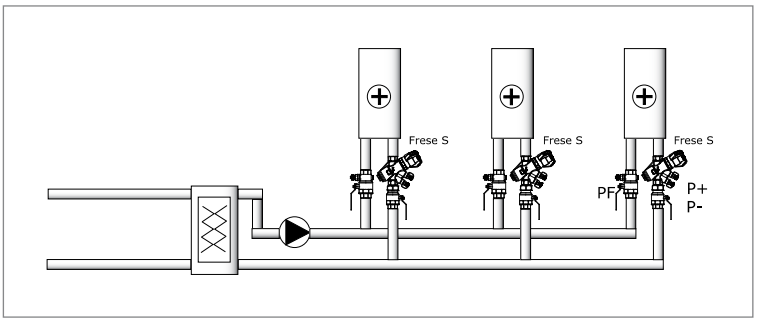
Frese S
- Dynamic Balancing Valve

Application sketches

Frese S system in circuit with heating surfaces

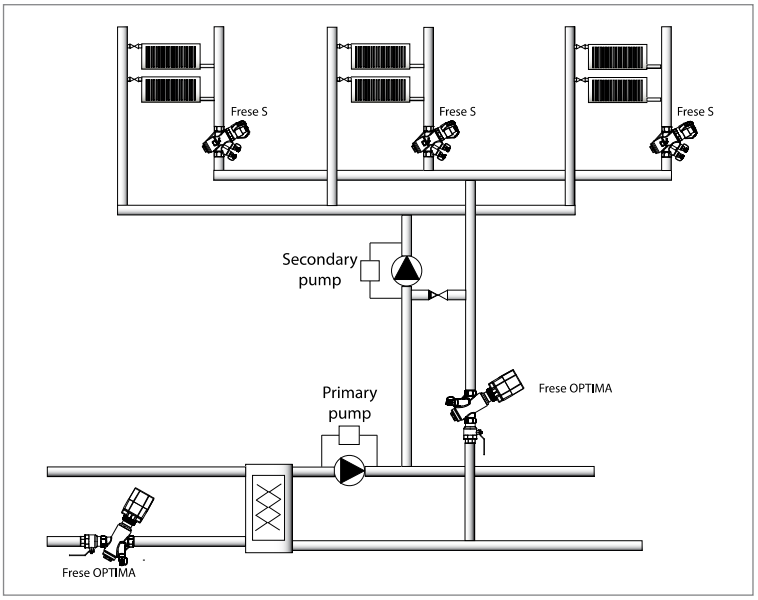
The system is easily balanced by adjusting the pump according to the required differential pressure across the critical valve (P+ - P-).

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.



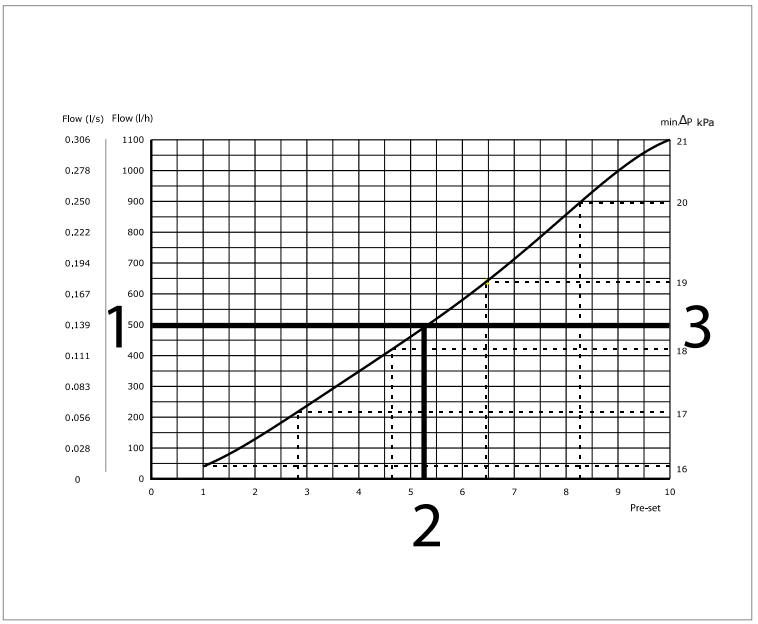
Flow rate example Frese S, DN15

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.

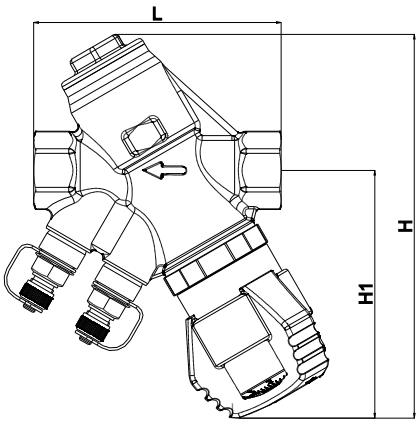


Frese S
- Dynamic Balancing Valve

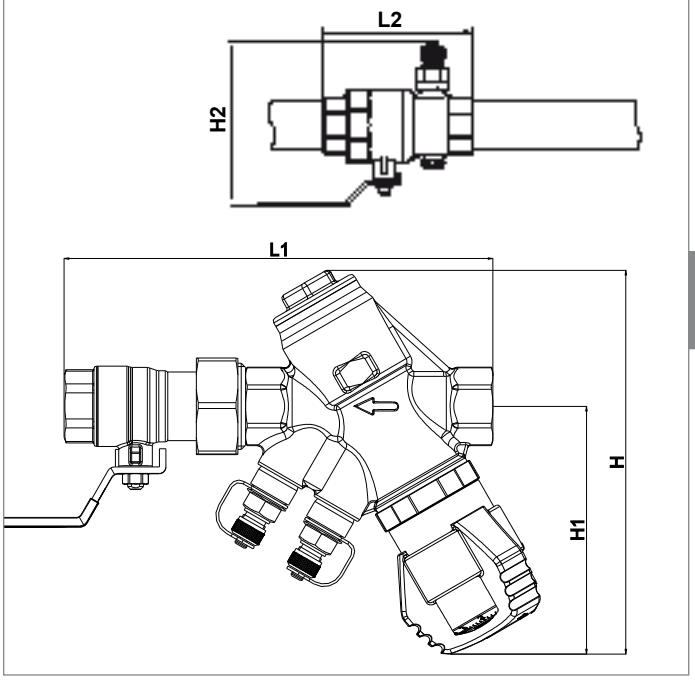
Technical data

Housing: DZR, Brass
DP controller: PPS 40% glass
Flow setting: PPO
Spring: Stainless steel
Diaghragm: HNBR
O-rings: EPDM
Pressure class: PN25 (without isolation valve)
PN16 (with isolation valve)
Max. differential pressure: 400 kPa (High pressure)
250 kPa (Low pressure)
Temperature range: -10^{0}C to + 120^{0}C

Frese S



Frese S with isolation valve



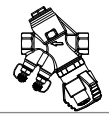
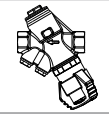
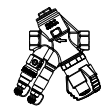
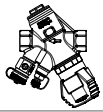
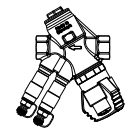
Dimension			DN15	DN20	DN25	DN32	DN40	DN50
Flow rate	l/s	HP	0.011 - 0.306	0.018 - 0.512	0.025 - 0.653	0.060 - 1.328	0.049 - 2.067	0.122 - 2.868
		LP	0.007 - 0.223	0.011 - 0.351	0.017 - 0.462			
	l/h	HP	40 - 1100	66 - 1850	89 - 2350	217 - 4800	175 - 7450	440 - 10350
		LP	25 - 804	41 - 1265	61 - 1663			
	gpm	HP	0.18 - 4.85	0.29 - 8.11	0.39 - 10.35	0.96 - 21.04	0.77 - 32.76	1.94 - 45.46
		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

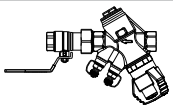
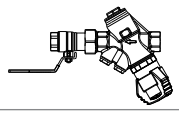
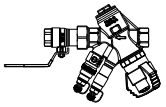
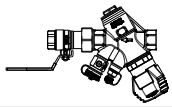
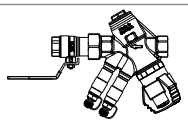
The valve should be a automatic balancing valve with the option of setting the flow without interference of operation.
The valve should include P/T plugs for the verification of differential pressure.
The valve should only be adjustable by means of a lockable handle.

Frese S
- Dynamic Balancing Valve

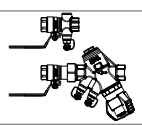
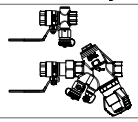
Frese S without Isolation Valve

		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

Frese S with Isolation Valve

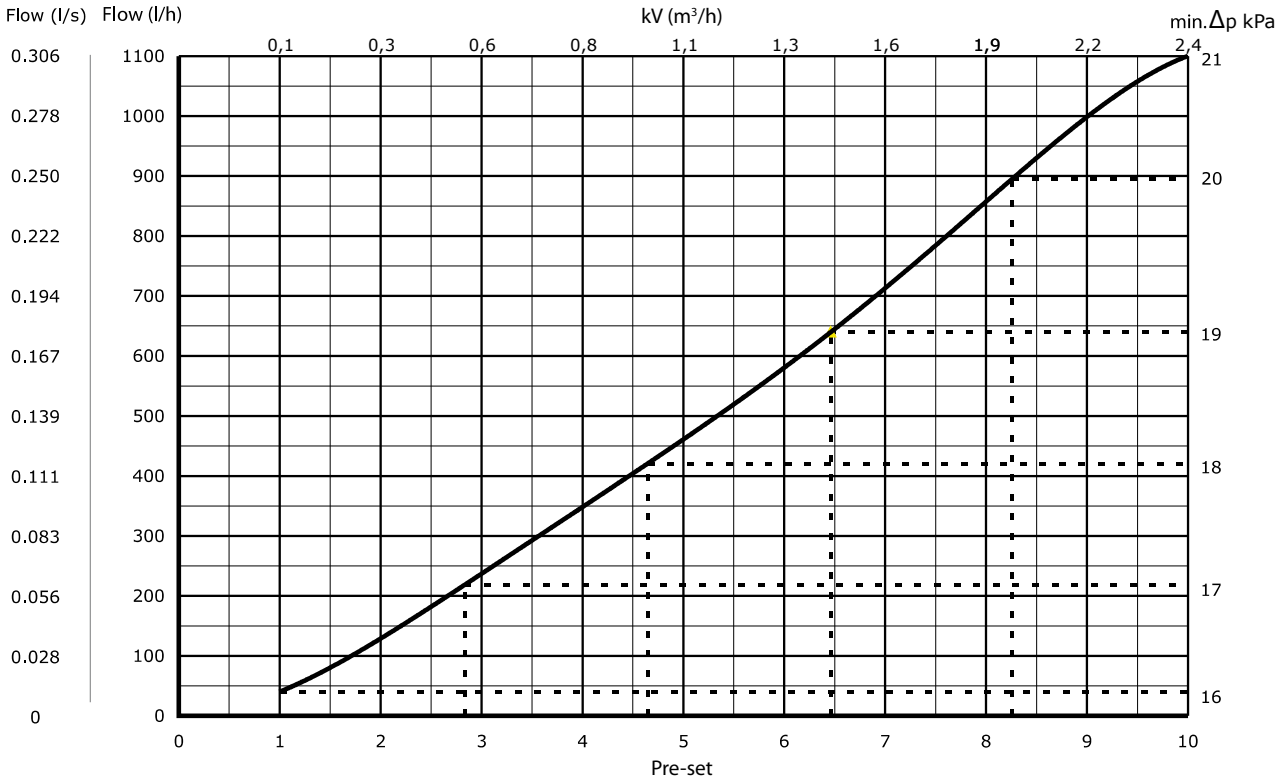
		DN15	DN20	DN25	DN32	DN40	DN50
PT Plugs		(HP) 53-2050 (LP) 53-2056	(HP) 53-2051 (LP) 53-2057	(HP) 53-2052 (LP) 53-2058	(HP) 53-2053	(HP) 53-2054	(HP) 53-2055
Plugs		(HP) 53-2060	(HP) 53-2061	(HP) 53-2062	(HP) 53-2063	(HP) 53-2064	(HP) 53-2065
2" PT plugs combi		(HP) 53-2070	(HP) 53-2071	(HP) 53-2072	(HP) 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

Frese S System

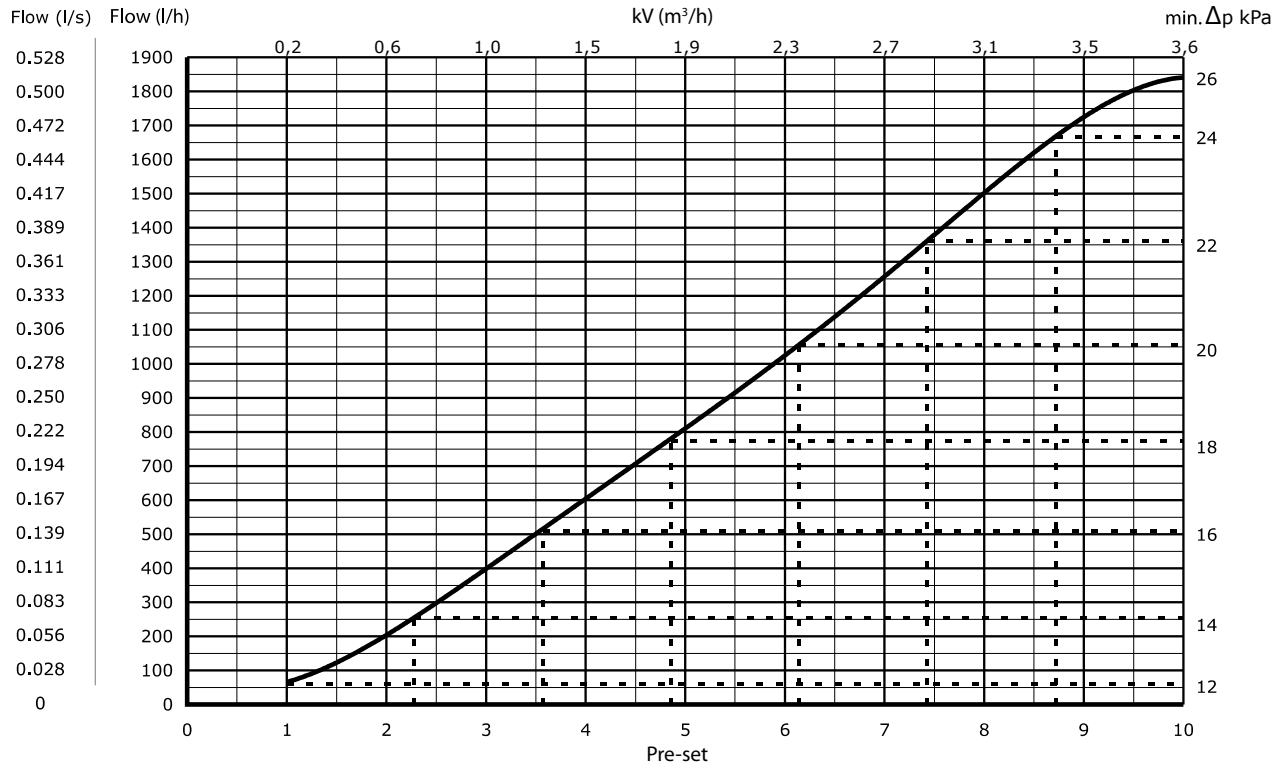
		DN15	DN20	DN25	DN32	DN40	DN50
PT plugs		(HP) 53-2120 (LP) 53-2126	(HP) 53-2121 (LP) 53-2127	(HP) 53-2122 (LP) 53-2128	(HP) 53-2123	(HP) 53-2124	(HP) 53-2125
Plug + 2 drain valves		(HP) 53-2130 (LP) 53-2136	(HP) 53-2131 (LP) 53-2137	(HP) 53-2132 (LP) 53-2138	(HP) 53-2133	(HP) 53-2134	(HP) 53-2135

Frese S
- Dynamic Balancing Valve

Flow rate graph Frese S, DN15 High Pressure



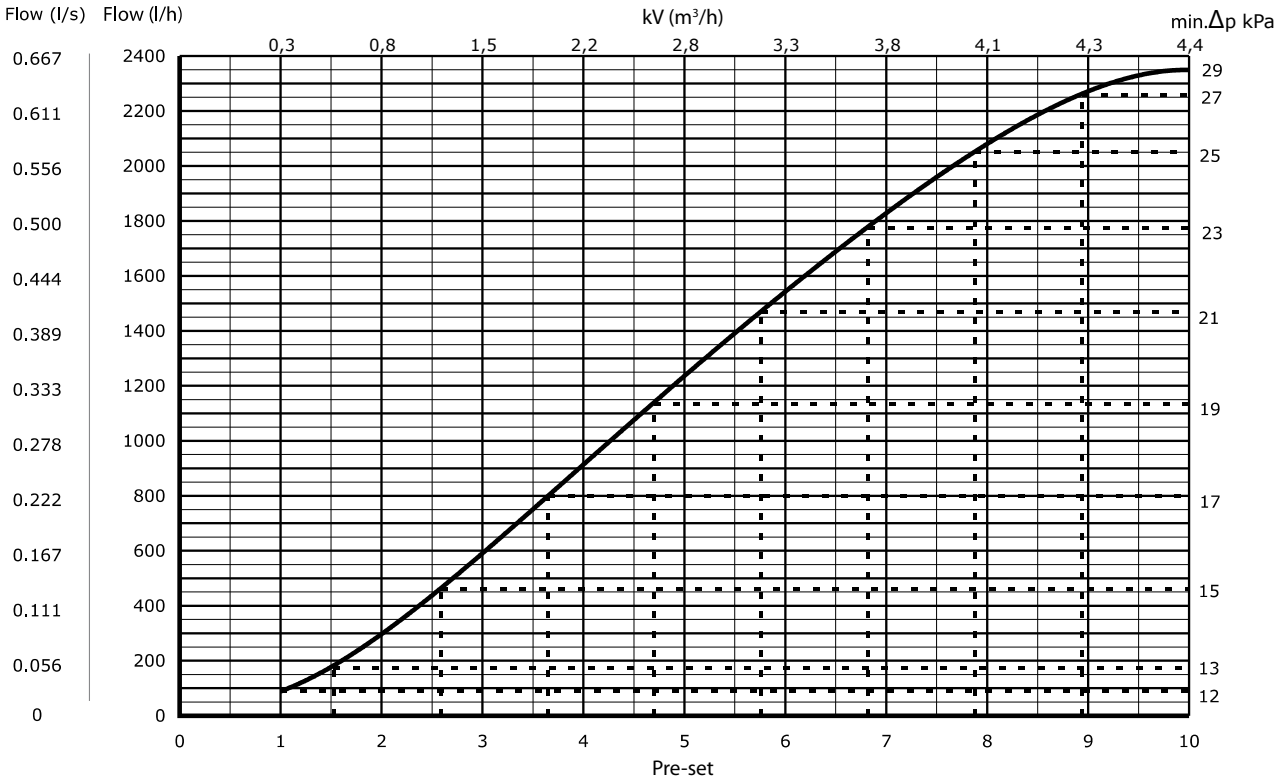
Flow rate graph Frese S, DN20 High Pressure



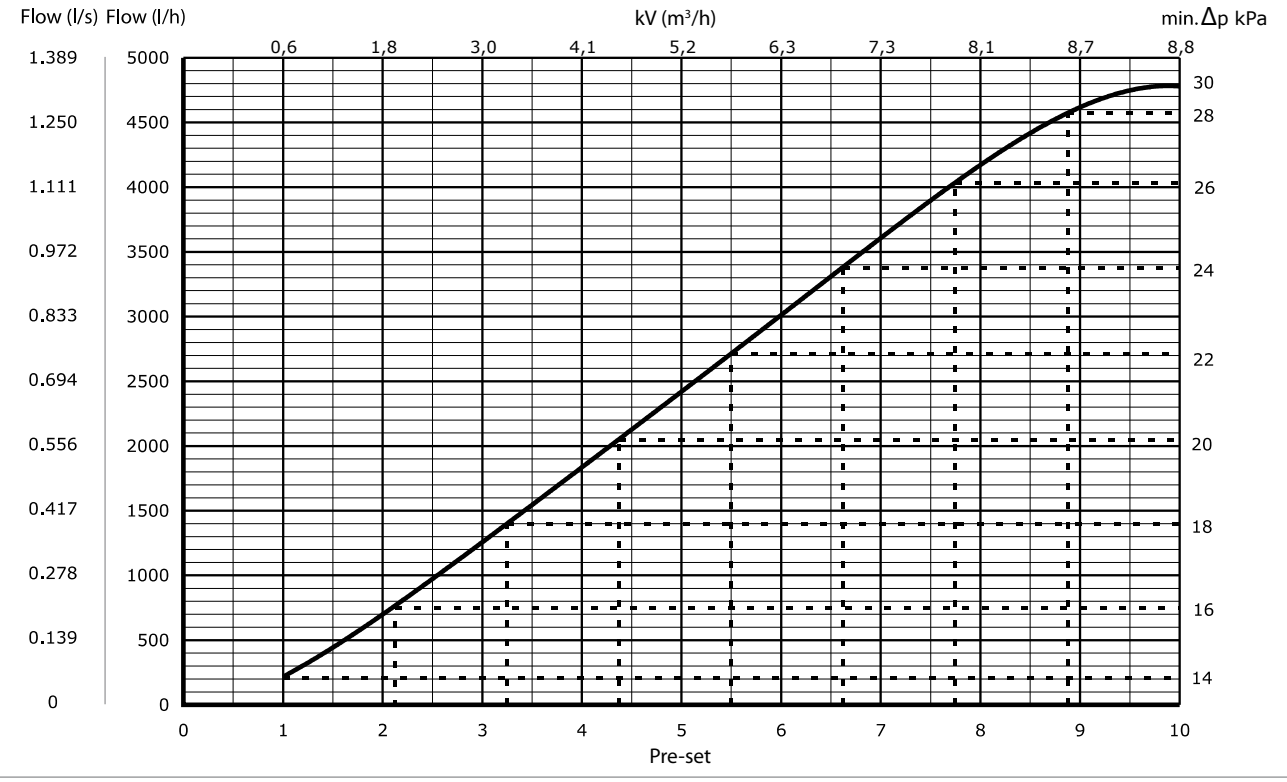
4

Frese S
- Dynamic Balancing Valve

Flow rate graph Frese S, DN25 High Pressure

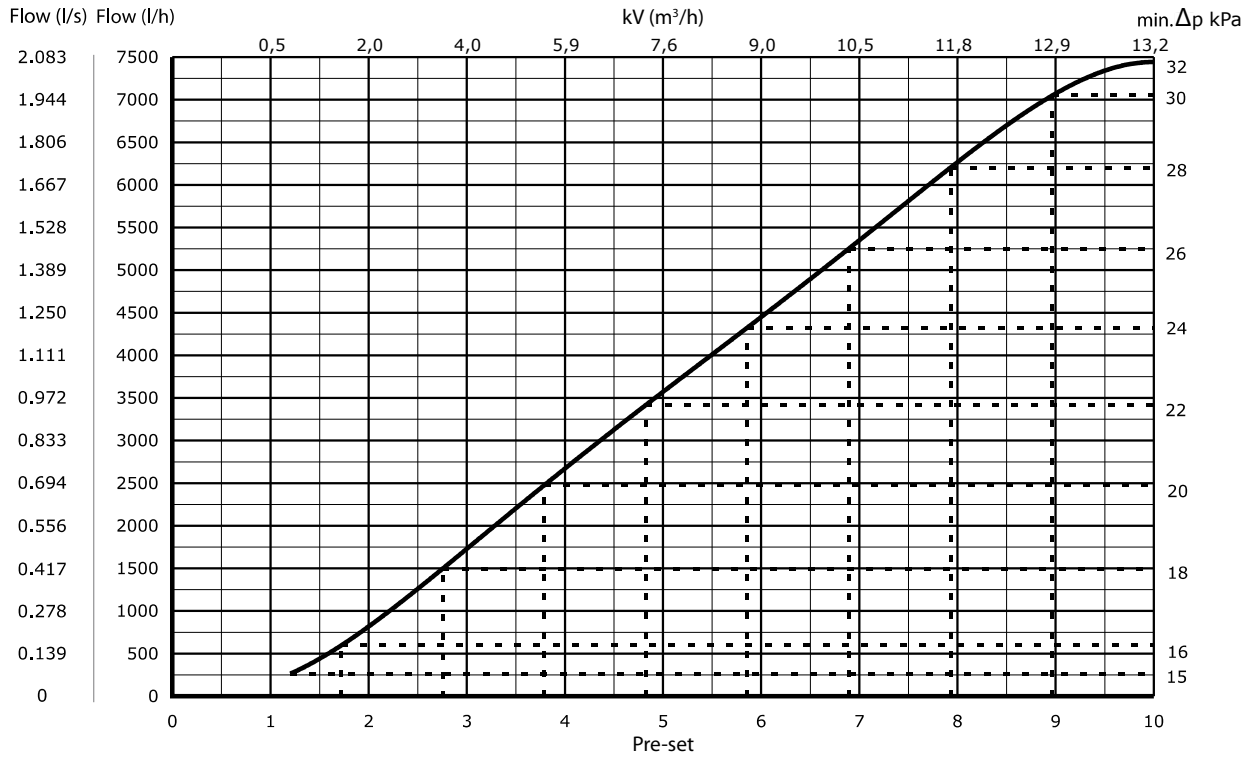


Flow rate graph Frese S, DN32 High Pressure

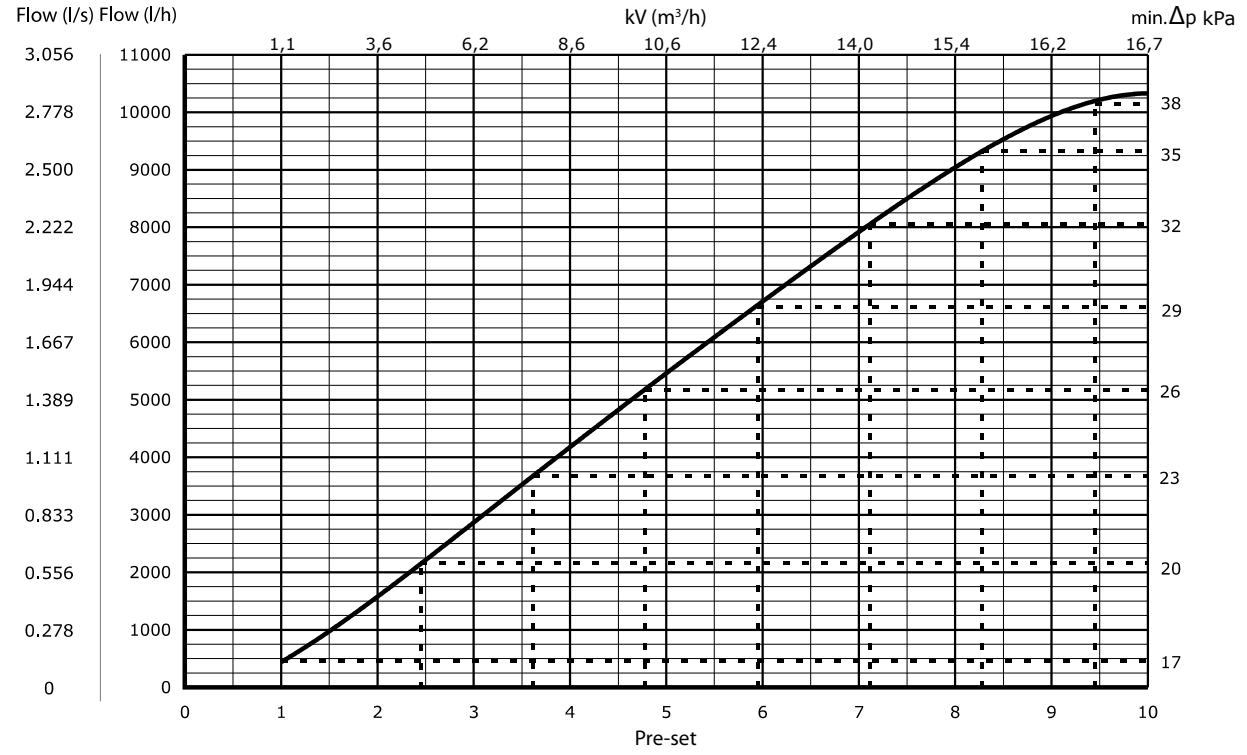


Frese S
- Dynamic Balancing Valve

Flow rate graph Frese S, DN40 High Pressure



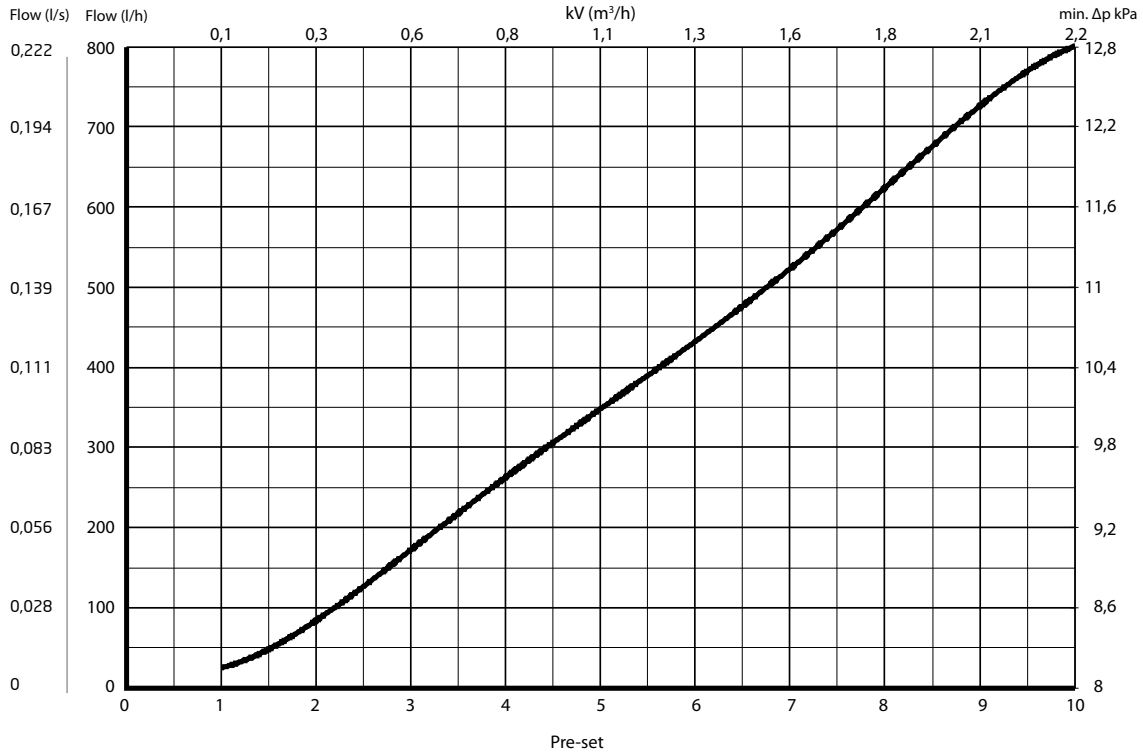
Flow rate graph Frese S, DN50 High Pressure



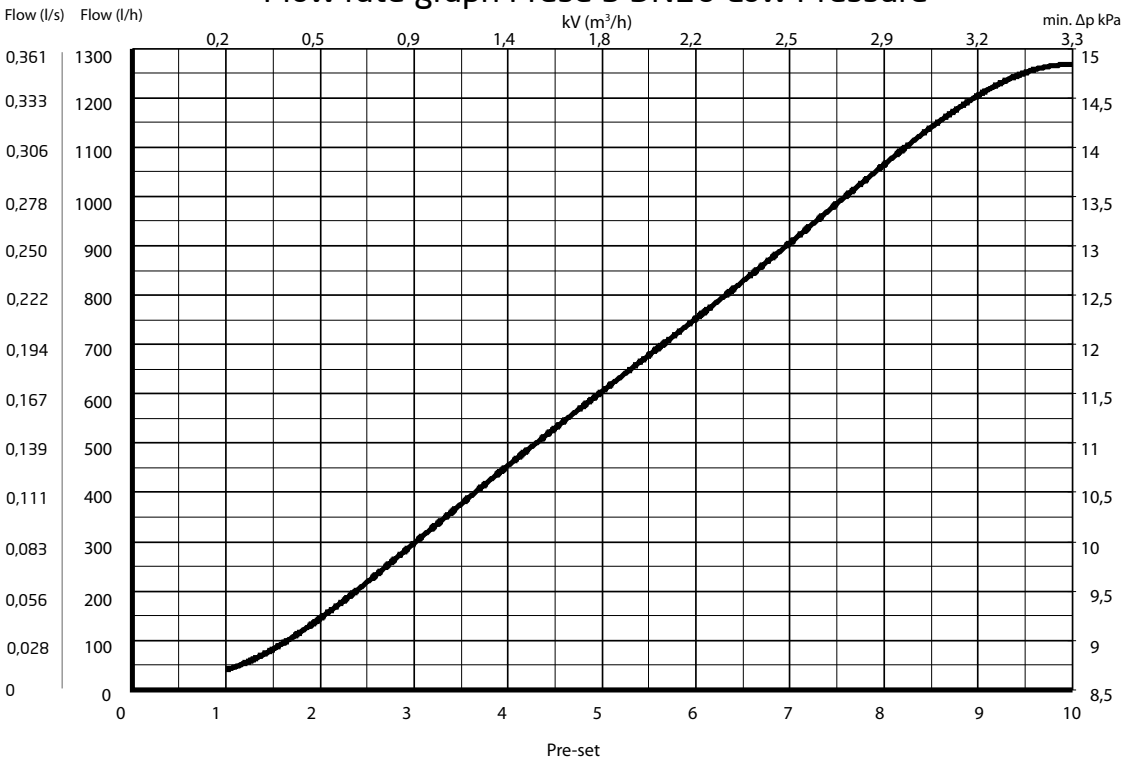
4

Frese S
- Dynamic Balancing Valve

Flow rate graph Frese S DN15 Low Pressure

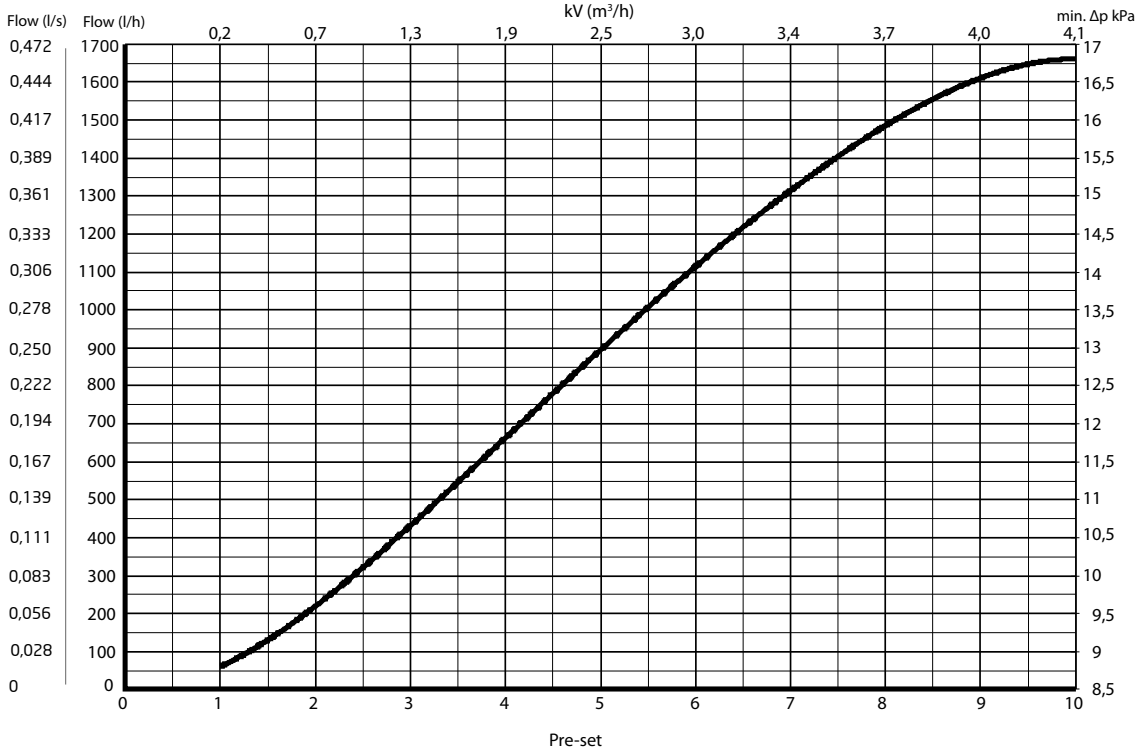


Flow rate graph Frese S DN20 Low Pressure



Frese S
- Dynamic Balancing Valve

Flow rate graph Frese S DN25 Low Pressure



Frese S DN15 LP

	Flow		
Pre-setting	**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

Frese S DN20 LP

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

Frese S DN25 LP

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

Frese S
- Dynamic Balancing Valve

Setting and Flow

Frese S DN15 HP

	Flow		
Pre-setting	**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

Frese S DN20 HP

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

Frese S DN25 HP

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

Frese S DN32 HP

	Flow		
Pre-setting	**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

Frese S DN40 HP

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

Frese S DN50 HP

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

Frese S
- Dynamic Balancing Valve

Documentation formular

Valve ID (own choise)	Valve type	Dimension	Pre-setting	Verified Δp [kPa]	Min. Δp (see flow rate graph) [kPa]	Flow

Pump type	Regulation mode	Set point

Installation

Signature	Date

Frese A/S
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Tel: +45 58 56 00 00
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Frese OPTIMA
- Pressure independent control & balancing valve

Application

Frese OPTIMA pressure independent control valve (PICV) is used in heating and cooling systems in applications with Fan Coil Units, Air Handling Units or other terminal unit applications.

Frese OPTIMA provides modulating control with full authority regardless of any fluctuations in the differential pressure of the system.

Frese OPTIMA combines an externally adjustable automatic balancing valve, a differential pressure control valve and a full authority modulating control valve.

Frese OPTIMA makes it simple to achieve 100% control of the water flow in the building, while creating high comfort and energy savings at the same time. An additional benefit is that no balancing is required if further stages are added to the system, or if the dimensioned capacity is changed.

Energy saving due to optimal control, lower flow and pump pressure. Maximized ΔT due to faster response and increased system stability.

Benefits

Design
- Less time to define the necessary equipment for a hydraulic balanced system (only flow data are required)
- No need to calculate valve authority
- Flexibility if the system is modified after the initial installation

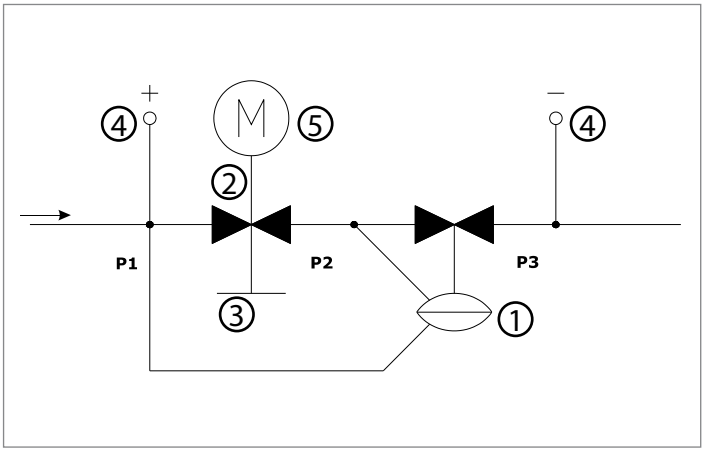
Installation
- No further regulating valves required in the distribution pipework when Frese OPTIMA is installed at terminals.
- Total number of valves minimized due to the 3-in-1 design
- Minimized commissioning time due to automatic balancing of the system
- Removable cartridge solution simplifies flushing procedure
- No minimum straight pipe lengths required before or after the valve.

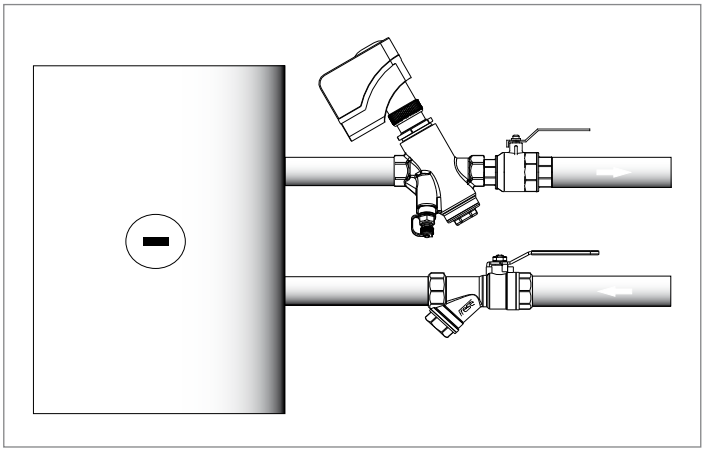
Operation
- High comfort for the end-users due to high precision temperature control
- Longer life due to less movements of the actuator

Features

- The presetting function has no impact on the stroke; Full stroke modulation at all times, regardless the preset flow.
- The constant differential pressure across the modulating control component guarantees 100% authority.
- Automatic balancing eliminates overflows, regardless of fluctuating pressure conditions in the system.
- Flushing through the valve is possible due to the removable cartridge feature
- Electrical actuator 0-10 V and 3 point control, normally closed
- Differential pressure operating range up to 400 kPa
- High flows with minimal required differential pressure due to advanced design of the valve
- More accurate control due to long 5.5 mm stroke
- Higher presetting precision due to stepless analogue scale

Frese OPTIMA
- Pressure independent control & balancing valve





Design

The design of Frese OPTIMA combines high performance with small size and compact construction. The main components of the valve are:

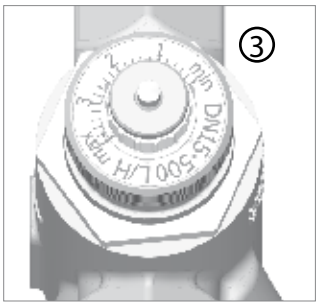
① The pressure control cartridge

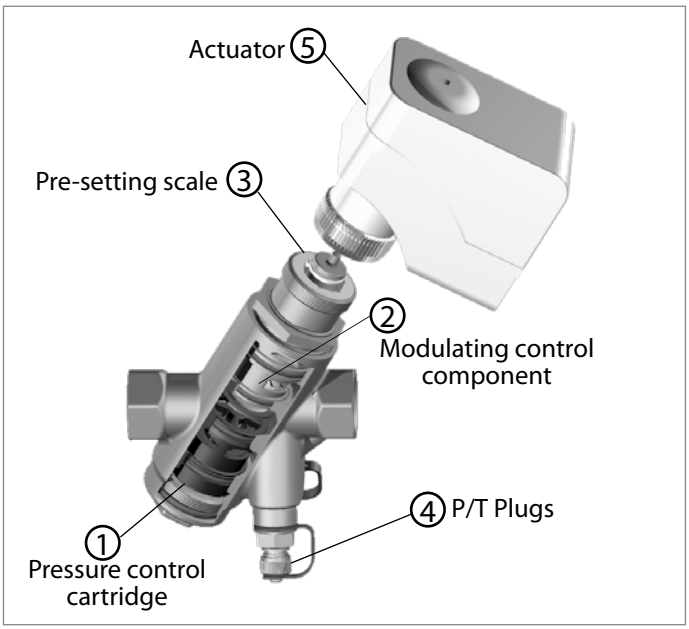
② The modulating control component

③ The presetting scale (not accessible when the actuator is mounted)

④ The P/T plugs (optional)

⑤ The electrical actuator





Function

The Frese OPTIMA is delivered with a commissioning cap allowing the flow to pass through the valve before the actuator is installed. The commissioning cap and cartridge features allow flushing through the valve before commissioning the system.

During flushing the the valve must be held in fully open position by the comissioning cap.

After flushing, the pressure control cartridge can be reinserted into the valve and the commissioning cap can be discarded allowing the user to adjust the presetting dial to the design flow. The presetting of the dial is user-friendly requiring only a simple flow vs. presetting graph. Once the flow is set, the actuator can be mounted and the valve ready to operate.

Manual operation

DN15-DN32
The actuator can then be operated manually with the help of a 3mm hex key.

DN40-DN50
The actuator can be operated manually by adjusting handle

Note
If the operation is performed manually without disconnecting from the power, the supply must be disconnected and then reconnected, whereby the actuator will start the calibration process and correctly adjust itself.

Frese OPTIMA
- Pressure independent control & balancing valve

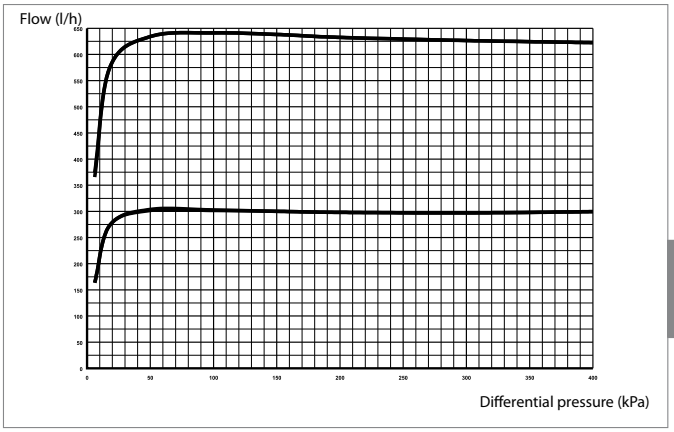
Operation principle

The innovative design of Frese OPTIMA introduces a modulating control component that retains 100% authority at all times. With the Frese OPTIMA, there are two independent movements for the presetting and the modulating function. During presetting, the inlet area moves radially without interfering with the length of the stroke. During modulating, the inlet area moves axial taking advantage of the full stroke. In the example below,the flow is modulated throughout the full range from 10 to 0V regardless of the preset flow (i.e. 625 l/h or 300 l/h).

Whilst the control component provides proportional modulation irrespective of the preset flow, the automatic balancing cartridge guarantees that the flow will never exceed the maximum preset flow. Regardless of pressure fluctuations in the system, the maximum flow is kept constant up to a maximum differential pressure of 400kPa.

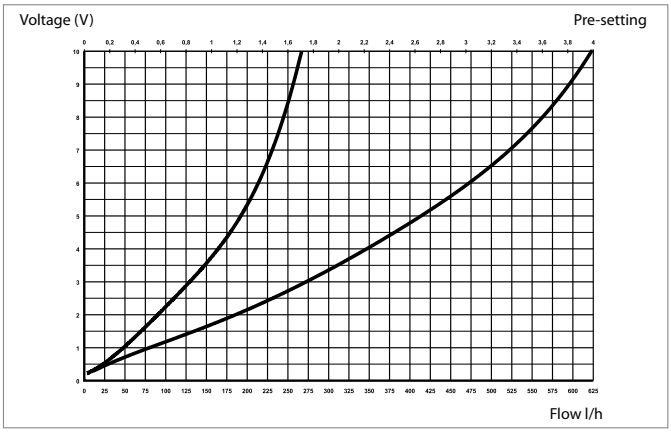
Flow rate vs. Differential Pressure

(Preset flow: 625 l/h, 300 l/h)



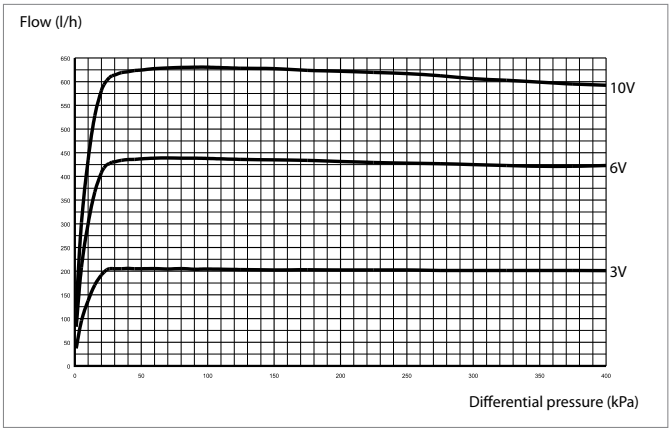
Flow rate vs. Voltage

(Preset flow: 625 l/h, 300 l/h)



Flow rate vs. Differential Pressure

(Voltage: 10V, 6V, 3V)



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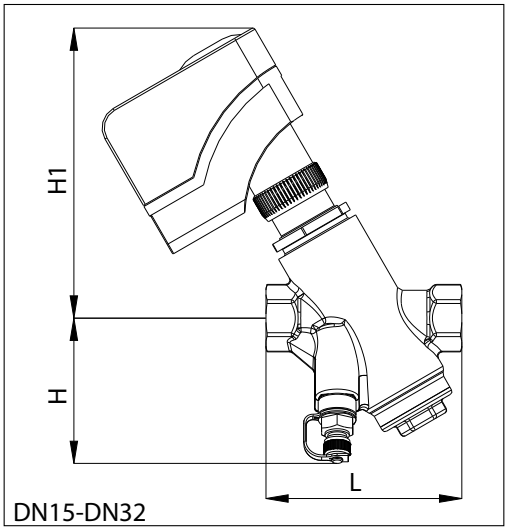
Frese OPTIMA
- Pressure independent control & balancing valve

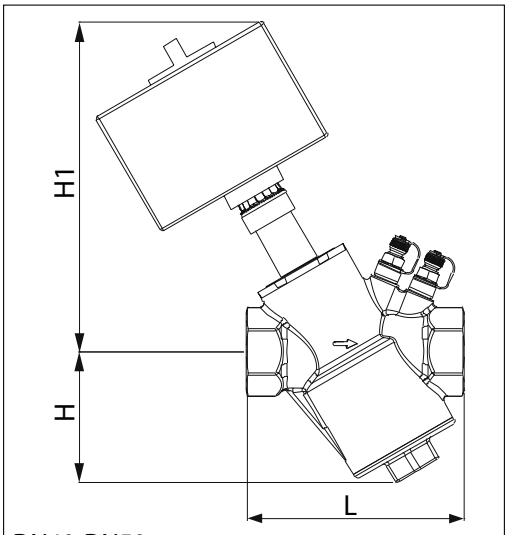
Technical data

Valve

Valve housing and flow setting: DZR Brass, CW602N
DP controller: PPS 40% glass
Spring: Stainless steel
Diaphragm: HNBR
O-rings: EPDM
Pressure class: PN25
Max. differential pressure: 400 kPa
Medium temperature range: 0°C to 120°C



DN15-DN32



DN40-DN50

The pipe system shall be properly ventilated to avoid risk of air pockets.
Glycolic mixtures up to 50% are applicable (both ethylene and propylene).
Frese A/S can accept no responsibility if another actuator is used instead of the Frese actuator

Technical data

Dimension			DN15	DN20	DN25	DN32	DN40	DN50
Flow rate	l/s	LF	0.022 - 0.174	0.036 - 0.292	0.064 - 0.478	0.129 - 0.849	0.562 - 1.974	0.612 - 2.385
		HF	0.068 - 0.479	0.081 - 0.566	0.081 - 0.566			
	l/h	LF	78 - 625	131 - 1050	231 - 1722	465 - 3056	2022 - 7105	2204 - 8586
		HF	244 - 1724	292 - 2039	292 - 2039			
	gpm	LF	0.34 - 2.76	0.58 - 4.63	1.02 - 7.59	2.05 - 13.47	8,90 - 31.28	9,70 - 37.80
		HF	1,08 - 7.60	1.29 - 8.99	1.29 - 8.99			
Kvs	m^3/h	LF	1.6	2.6	4.3	7.2	13.9	15,2
		HF	4.1	4.3	4.3			
Dimension mm	L		88	88	92	128	144	155
	H		65	65	66	72	87	93
	H1		145	145	145	152	219	225
Weight	kg		0.90	0.91	1,00	1.52	2.55	3.20

Frese OPTIMA
- Pressure independent control & balancing valve

Technical data

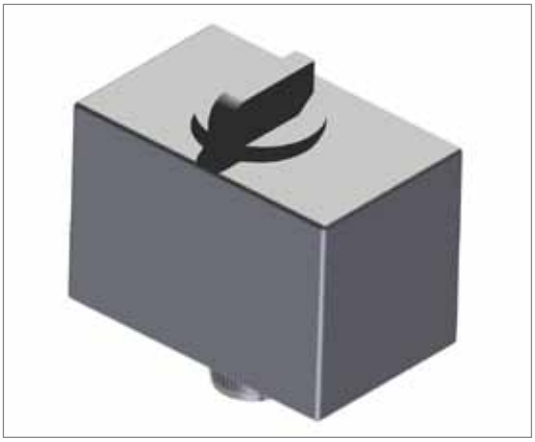
Actuator DN15-DN32

Characteristics: Electrical, modulating, normally closed
Protection class: IP 40 to EN 60529
Frequency: 50/60 Hz
Control signal: 0-10V DC, or 3 position
Actuating force: 250 N
Stroke: 5.5 mm
Running time: 150 s 3 position/75s 0-10V
Ambient operating conditions: +1^{0}C to 50^{0}C
Manual operation: 3 mm hexagonal key
Cable length: 1,5 m
Weight: 350 g

Modulating actuator 24V AC-DC / 0-10 V DC / 75s	53-1045
Modulating actuator 24 V AC / 3 pos / 150 s	53-1046
Modulating actuator 230 V AC / 3 pos. / 150 s	53-1047

Actuator DN40-DN50w

Characteristics: Electrical, modulating, normally closed
Protection class: IP 54 to EN 60529
Frequency: 50 Hz
Control signal: 0-10V DC, or 3 position
Actuating force: 400 N
Stroke: 6.5 mm
Running time: 170 s/43 s
Ambient operating conditions: -5^{0}C to 50^{0}C
Manual operation: Manual adjusting handle
Cable: Not included
Weight: 600 g



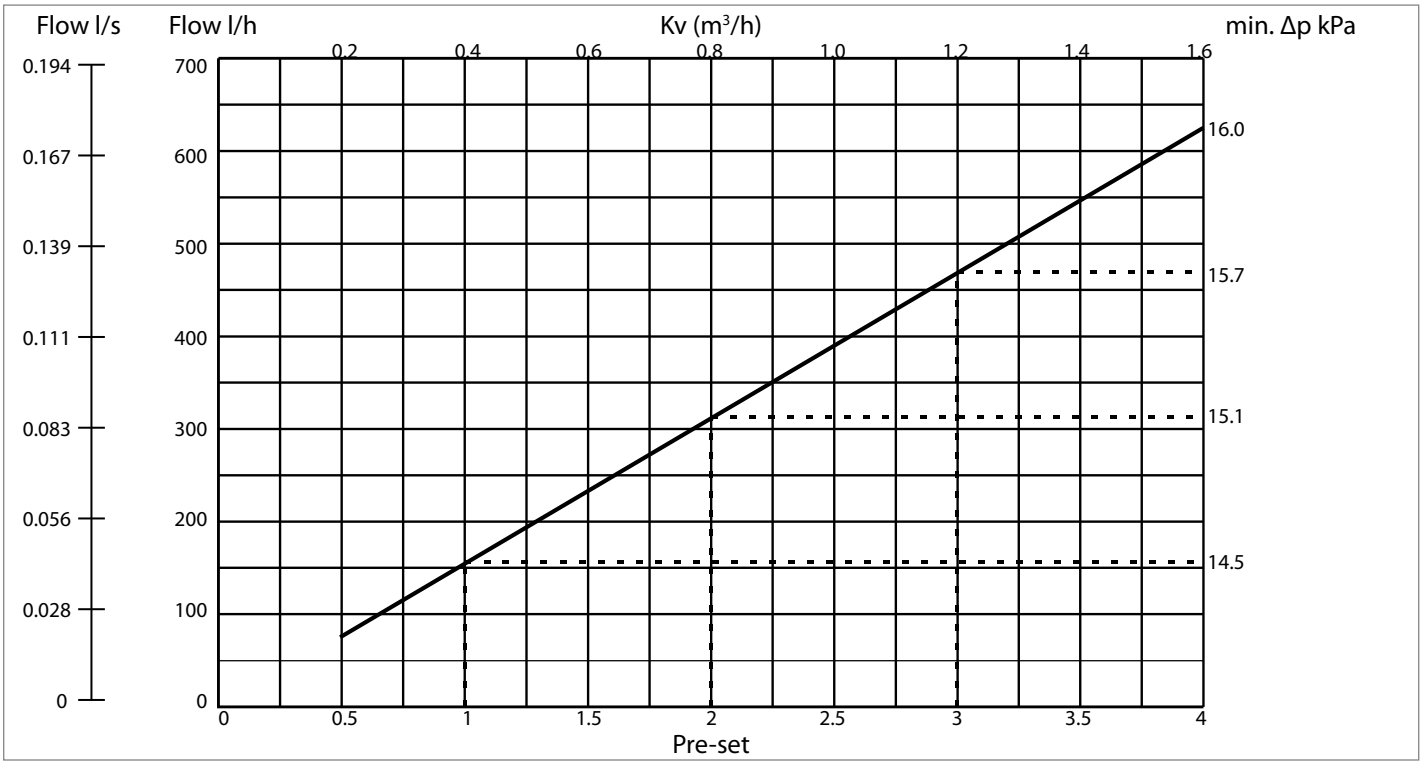
Modulating actuator 24 V AC / 0-10V DC / 43s	53-1052
Modulating actuator 24 V AC / 3 pos / 43s	53-1053
Modulating actuator 230 V / 3 pos. / 170s	53-1054

Product program

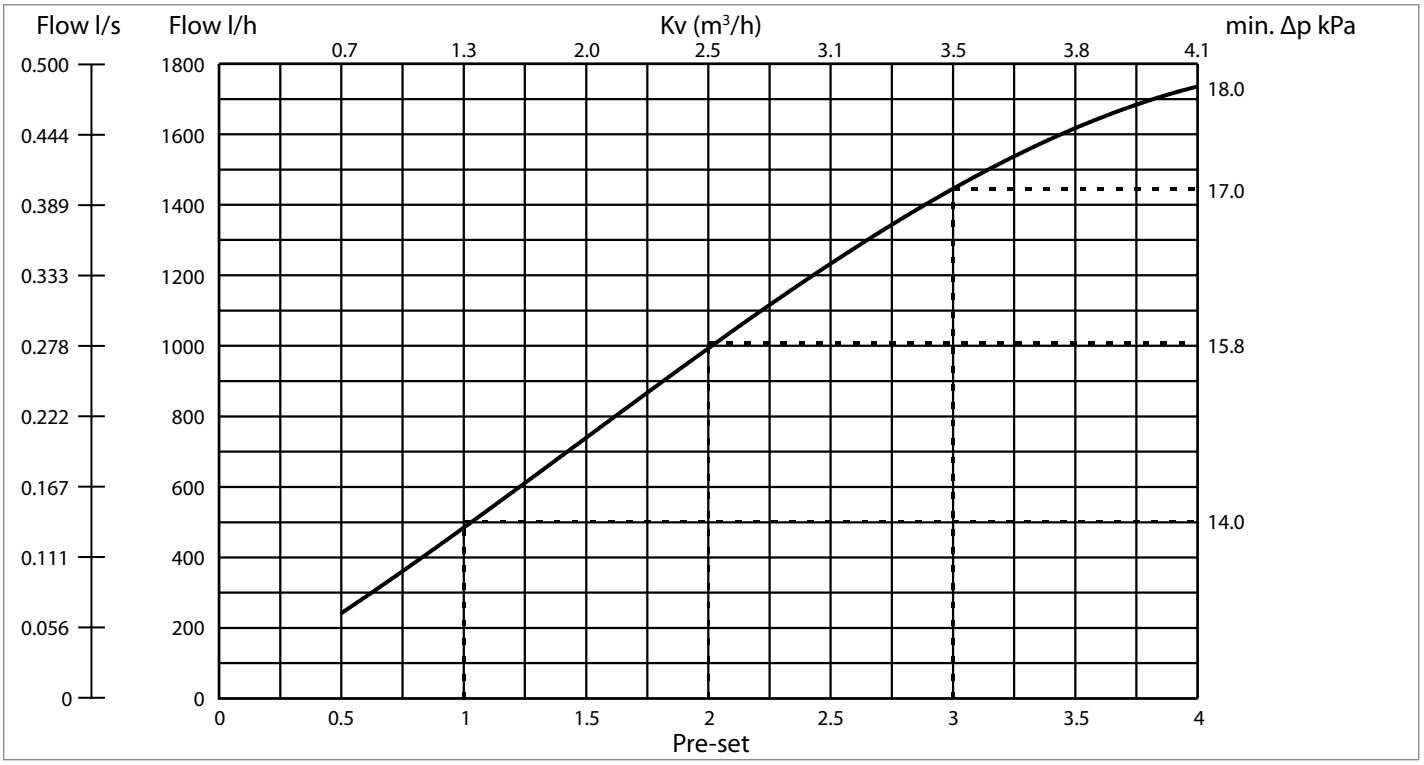
Frese OPTIMA							
		DN15	DN20	DN25	DN32	DN40	DN50
P/T Plugs		(LF) 53-1090 (HF) 53-1094	(LF) 53-1091 (HF) 53-1095	(LF) 53-1092 (HF) 53-1096	53-1093	53-1097	53-1098
Plugs		(LF) 53-1080 (HF) 53-1084	(LF) 53-1081 (HF) 53-1085	(LF) 53-1082 (HF) 53-1086	53-1083	53-1087	53-1088

Frese OPTIMA
- Pressure independent control & balancing valve

Frese OPTIMA DN15, Low Flow

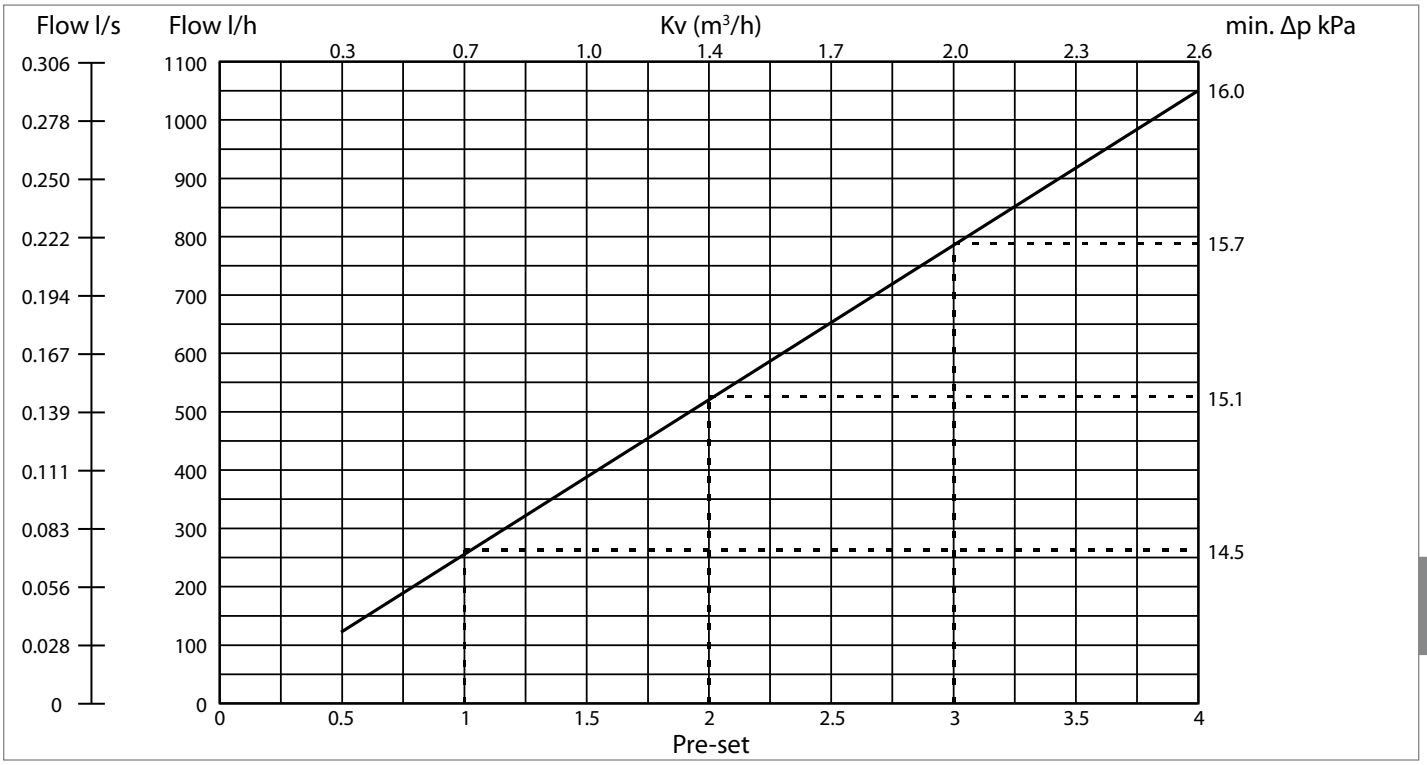


Frese OPTIMA DN15, High Flow

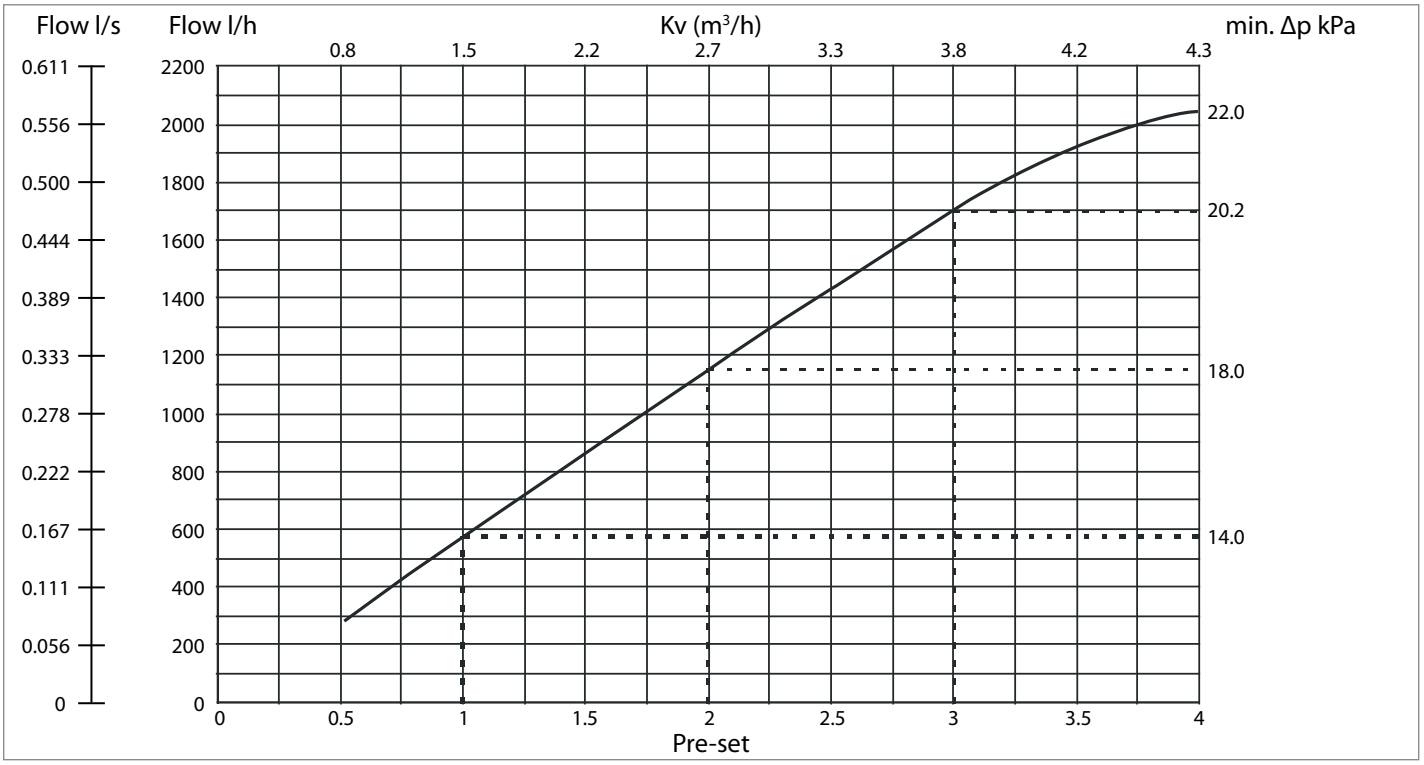


Frese OPTIMA
- Pressure independent control & balancing valve

Frese OPTIMA DN20, Low Flow



Frese OPTIMA DN20, High Flow



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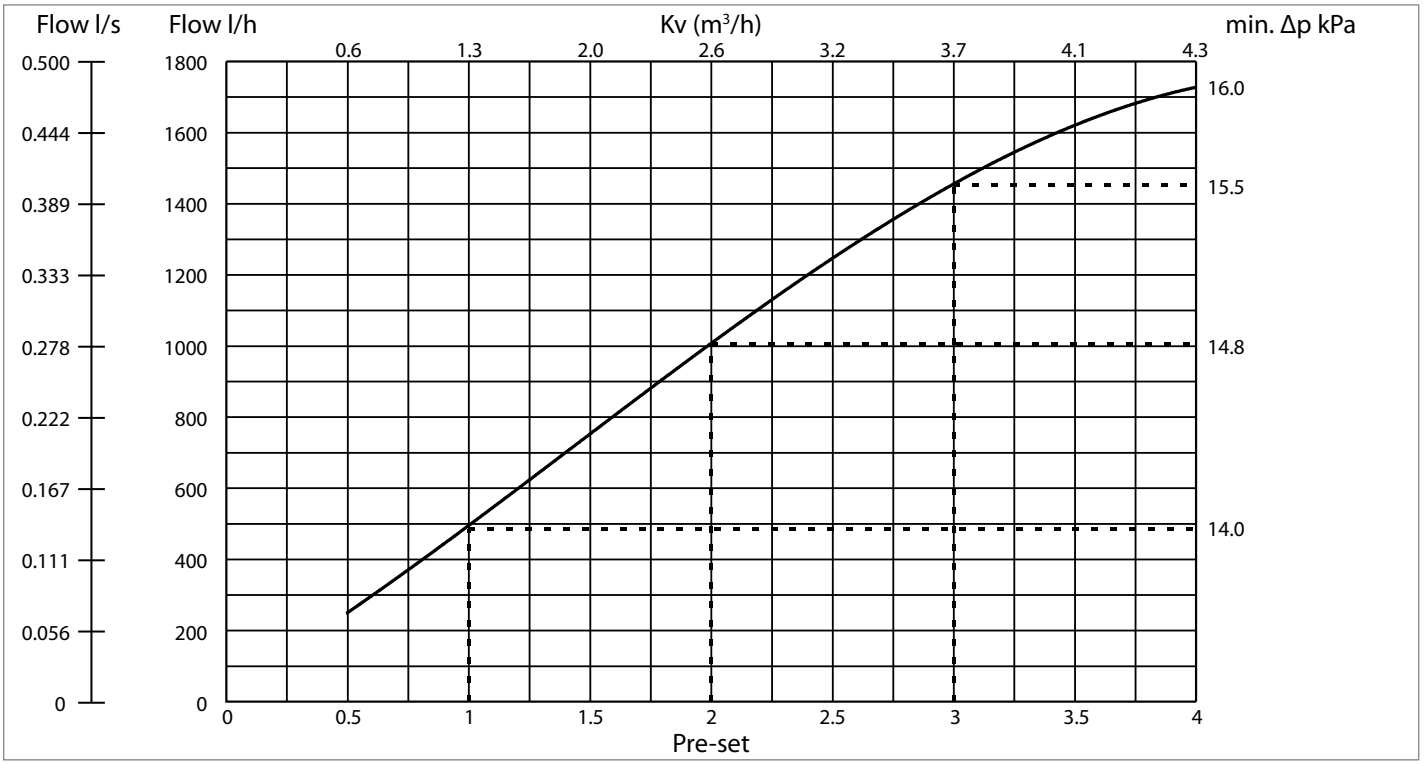
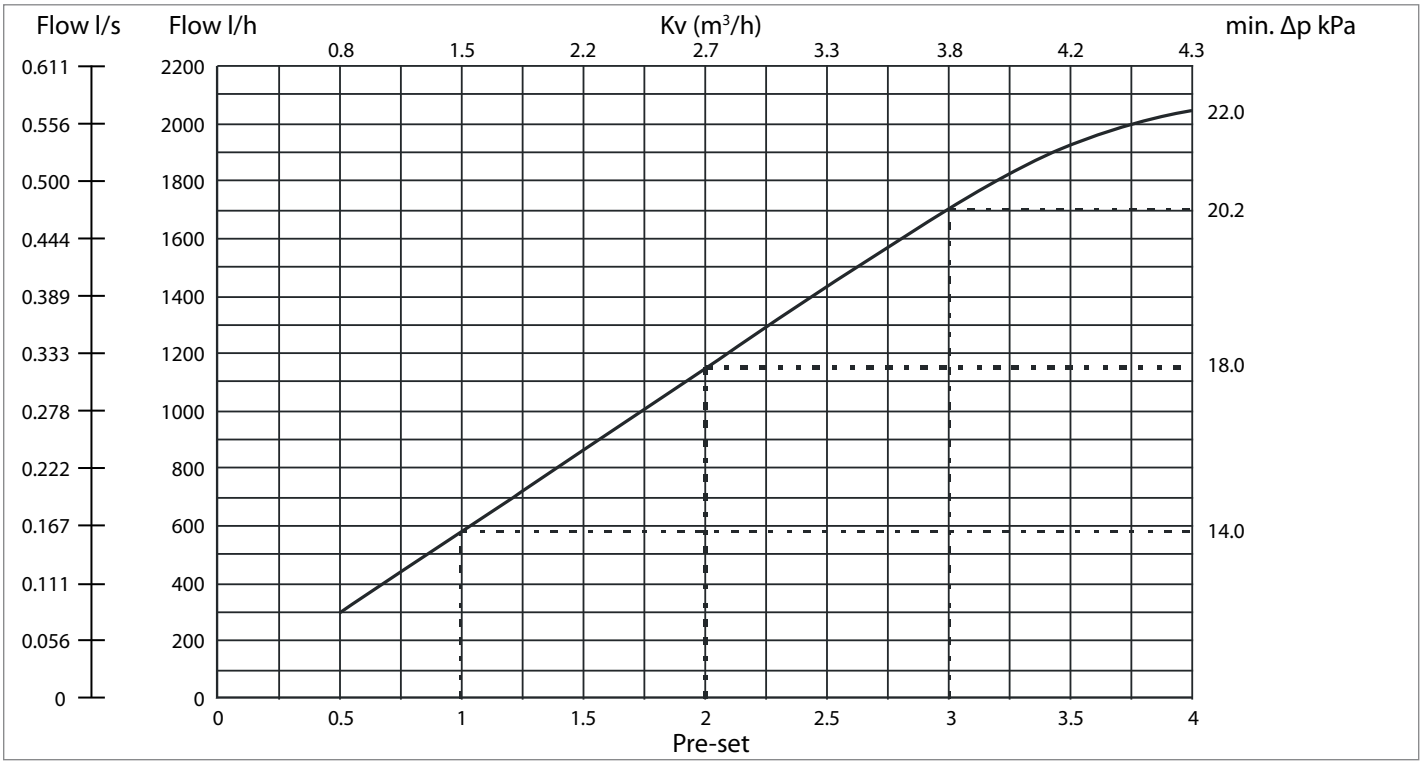
Frese OPTIMA
- Pressure independent control & balancing valve

Frese OPTIMA DN25, Low Flow

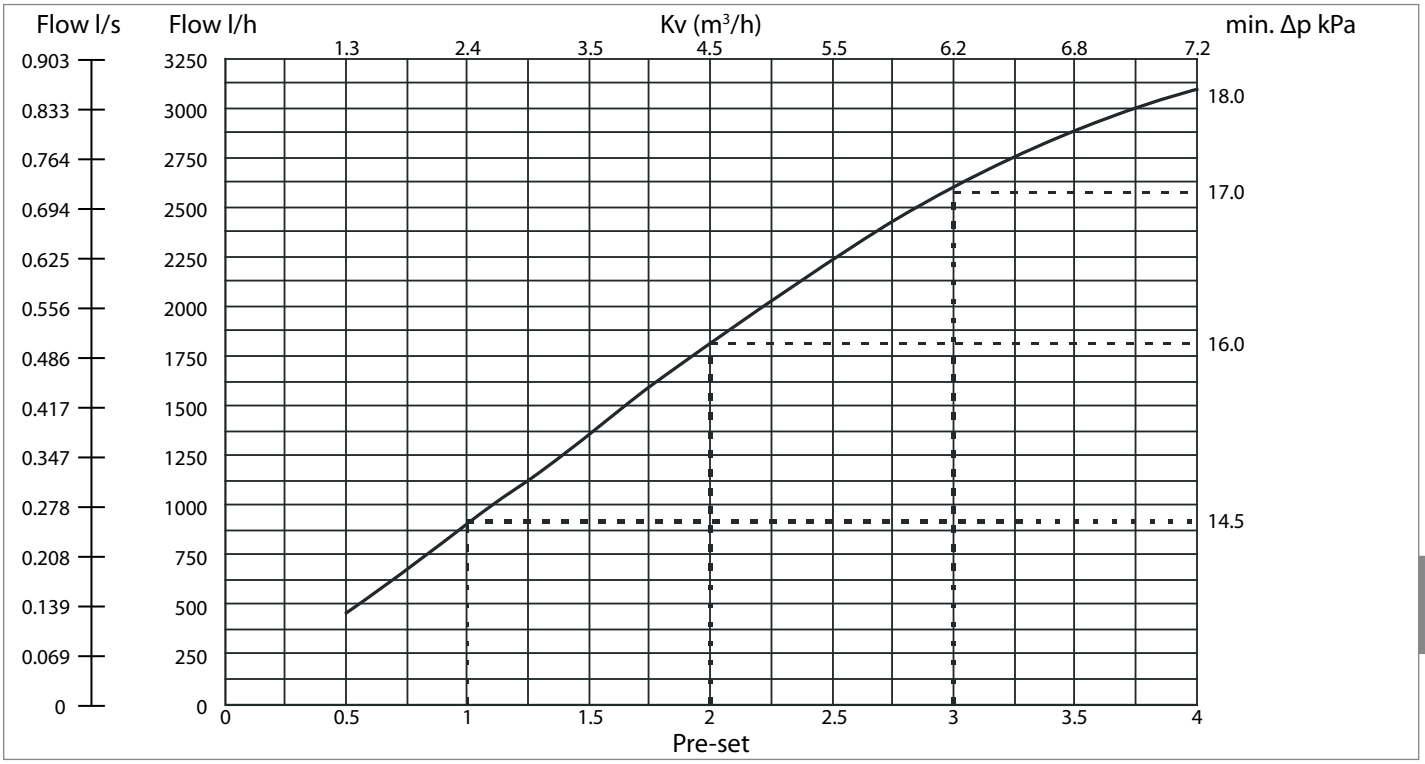


Frese OPTIMA DN25, High Flow

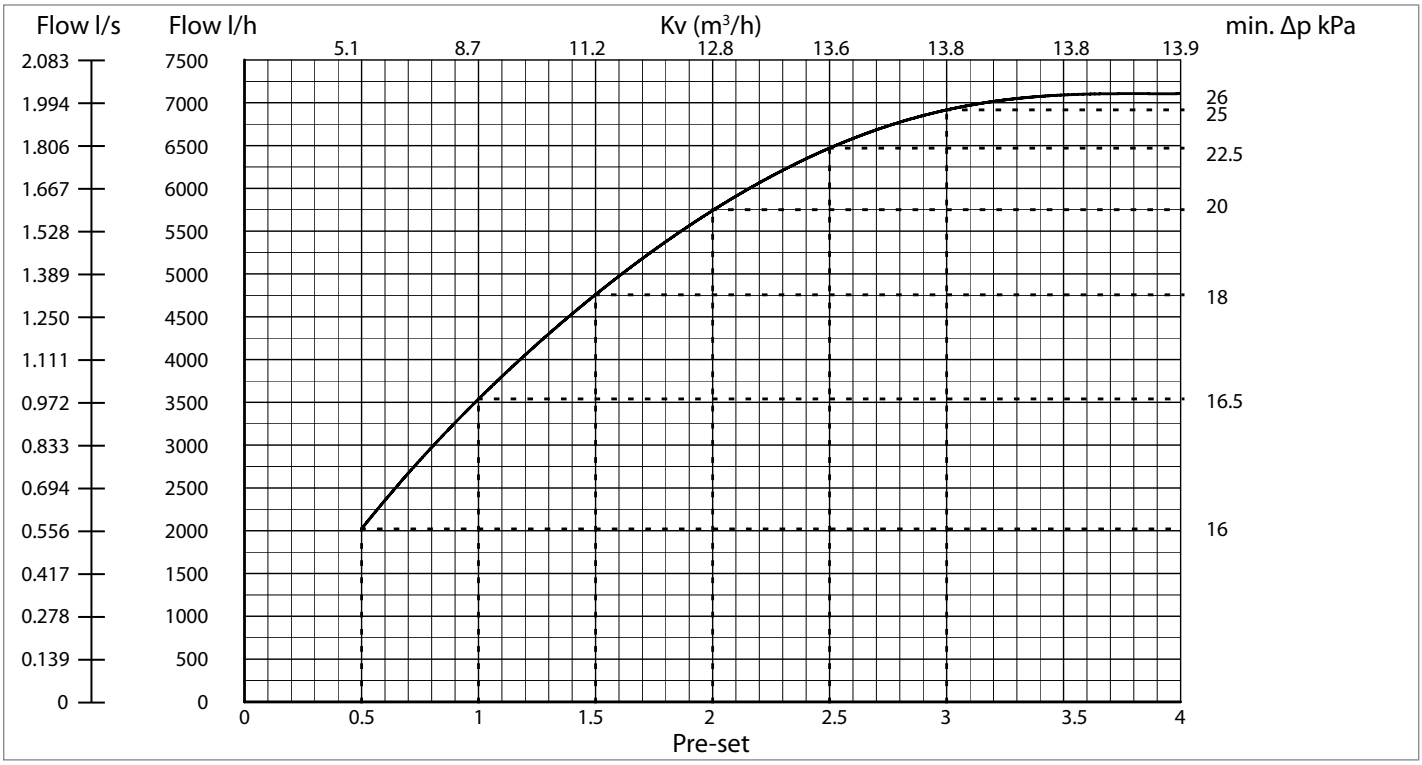


Frese OPTIMA
- Pressure independent control & balancing valve

Frese OPTIMA DN32



Frese OPTIMA DN40



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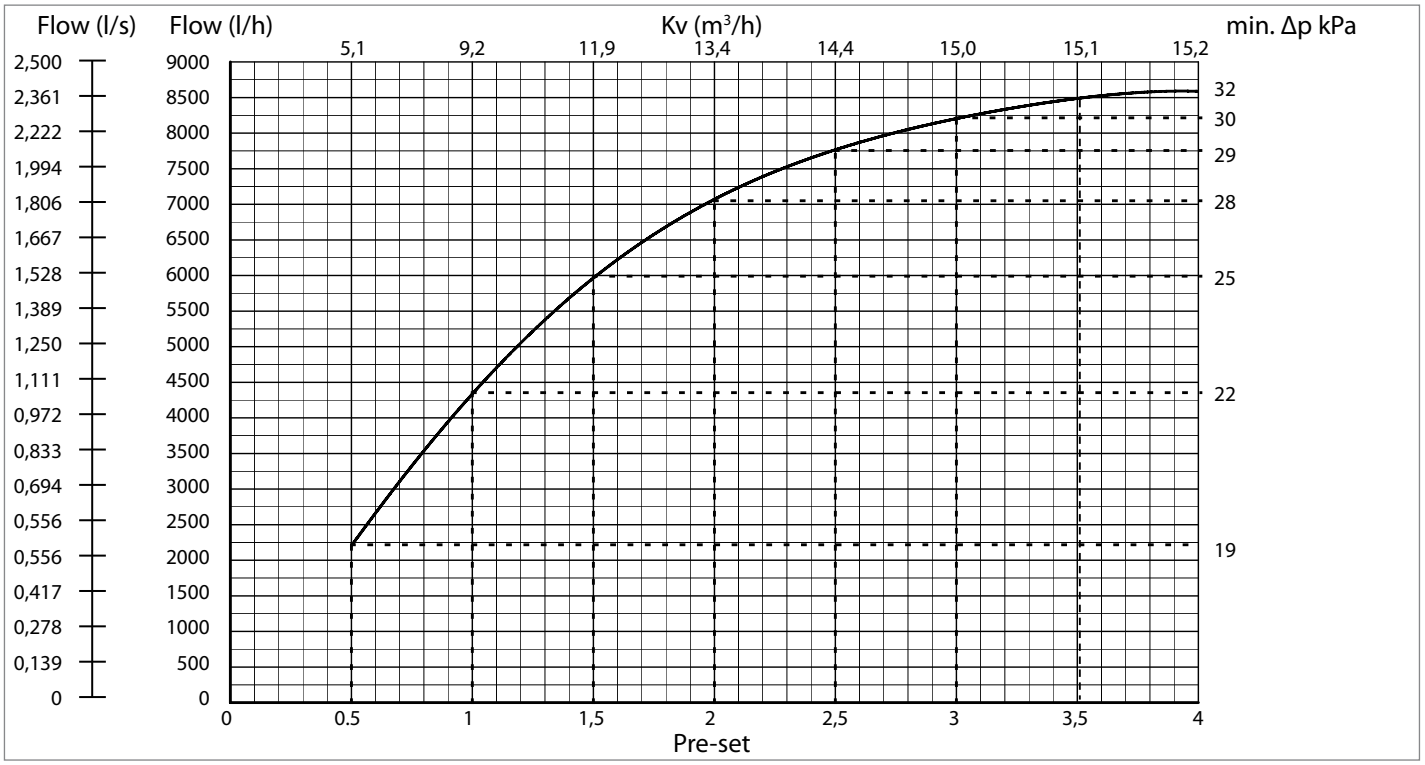
Frese OPTIMA
- Pressure independent control & balancing valve

Frese OPTIMA DN50, High Flow



Specification text

The actuated valve shall operate by means of an automatic balancing cartridge that can be removed without dismantling the valve. The presetting of the valve shall not influence the length of the stroke. The pressure class shall be PN25. The differential pressure operating range shall be up to 400kPa. The valve shall operate by means of an electrical modulating actuator.

Setting and Flow

	OPTIMA DN15 Low Flow			OPTIMA DN15 High Flow			OPTIMA DN20 Low Flow		
Pre-set	**Flow l/h**	**Flow l/s**	**Flow gpm**	**Flow l/h**	**Flow l/s**	**Flow gpm**	**Flow l/h**	**Flow l/s**	**Flow gpm**
0,50	78	0,022	0,34	244	0,068	1,08	131	0,036	0,58
0,75	117	0,033	0,52	372	0,103	1,64	197	0,055	0,87
1,00	156	0,043	0,69	501	0,139	2,20	263	0,073	1,16
1,25	195	0,054	0,86	630	0,175	2,77	328	0,091	1,44
1,50	234	0,065	1,03	759	0,211	3,34	394	0,109	1,73
1,75	274	0,076	1,20	886	0,246	3,90	459	0,128	2,02
2,00	313	0,087	1,38	1009	0,280	4,44	525	0,146	2,31
2,25	352	0,098	1,55	1128	0,313	4,97	591	0,164	2,60
2,50	391	0,109	1,72	1241	0,345	5,46	656	0,182	2,89
2,75	430	0,119	1,89	1347	0,374	5,93	722	0,201	3,18
3,00	469	0,130	2,06	1444	0,401	6,36	788	0,219	3,47
3,25	508	0,141	2,24	1532	0,426	6,74	853	0,237	3,76
3,50	547	0,152	2,41	1609	0,447	7,08	919	0,255	4,04
3,75	586	0,163	2,58	1673	0,465	7,37	984	0,273	4,33
4,00	625	0,174	2,75	1724	0,479	7,59	1050	0,292	4,62

Frese OPTIMA
- Pressure independent control & balancing valve

Setting and Flow

OPTIMA DN20 High Flow

Pre-set	Flow l/h	Flow l/s	Flow gpm
0,50	292	0,081	1,28
0,75	435	0,121	1,91
1,00	577	0,160	2,54
1,25	719	0,200	3,17
1,50	863	0,240	3,80
1,75	1007	0,280	4,43
2,00	1152	0,320	5,07
2,25	1296	0,360	5,70
2,50	1437	0,399	6,33
2,75	1573	0,437	6,92
3,00	1700	0,472	7,48
3,25	1815	0,504	7,99
3,50	1913	0,531	8,42
3,75	1990	0,553	8,76
4,00	2039	0,566	8,98

OPTIMA DN25 Low Flow

Flow l/h	Flow l/s	Flow gpm
231	0,064	1,02
357	0,099	1,57
486	0,135	2,14
617	0,171	2,72
749	0,208	3,30
878	0,244	3,87
1005	0,279	4,43
1128	0,313	4,96
1244	0,346	5,48
1352	0,376	5,95
1452	0,403	6,39
1540	0,428	6,78
1615	0,449	7,11
1676	0,466	7,38
1722	0,478	7,58

OPTIMA DN25 High Flow

Flow l/h	Flow l/s	Flow gpm
292	0,081	1,28
435	0,121	1,91
577	0,160	2,54
719	0,200	3,17
863	0,240	3,80
1007	0,280	4,43
1152	0,320	5,07
1296	0,360	5,70
1437	0,399	6,33
1573	0,437	6,92
1700	0,472	7,48
1815	0,504	7,99
1913	0,531	8,42
1990	0,553	8,76
2039	0,566	8,98

5

OPTIMA DN32

Pre-set	Flow l/h	Flow l/s	Flow gpm
0,50	465	0,129	2,05
0,75	692	0,192	3,05
1,00	921	0,256	4,05
1,25	1150	0,319	5,06
1,50	1377	0,382	6,06
1,75	1600	0,444	7,04
2,00	1816	0,504	7,99
2,25	2024	0,562	8,91
2,50	2221	0,617	9,78
2,75	2405	0,668	10,59
3,00	2574	0,715	11,33
3,25	2726	0,757	12,00
3,50	2858	0,794	12,58
3,75	2969	0,825	13,07
4,00	3056	0,849	13,45

OPTIMA DN40

Flow l/h	Flow l/s	Flow GPM
2022	0,562	8,90
2825	0,785	12,44
3538	0,983	15,58
4179	1,161	18,40
4758	1,322	20,95
5279	1,466	23,24
5741	1,595	25,27
6139	1,705	27,03
6470	1,797	28,48
6729	1,869	29,62
6916	1,921	30,44
7033	1,954	30,96
7090	1,969	31,21
7105	1,974	31,28
7105	1,974	31,28

OPTIMA DN50

Flow l/h	Flow l/s	Flow GPM
2204	0,612	9,70
3325	0,924	14,64
4337	1,205	19,09
5218	1,449	22,97
5963	1,657	26,25
6577	1,827	28,95
7070	1,964	31,12
7459	2,072	32,84
7766	2,157	34,19
8009	2,225	35,25
8024	2,279	36,11
8362	2,323	36,81
8486	2,357	37,36
8568	2,380	37,72
8586	2,385	37,80

Frese OPTIMA
- Pressure independent control & balancing valve

Documentation formular

Valve ID (own choise)	Valve type	Dimension	Pre-setting	Verified Δp [kPa]	Min. Δp (see flow rate graph) [kPa]	Flow

Pump type	Regulation mode	Set point

Installation

Signature	Date

Frese A/S
Sørøvej 8
DK- 4200 Slagelse
Tel: +45 58 56 00 00
Fax: +45 58 56 00 91
frese@frese.dk

Actuator Frese OPTIMA

Application

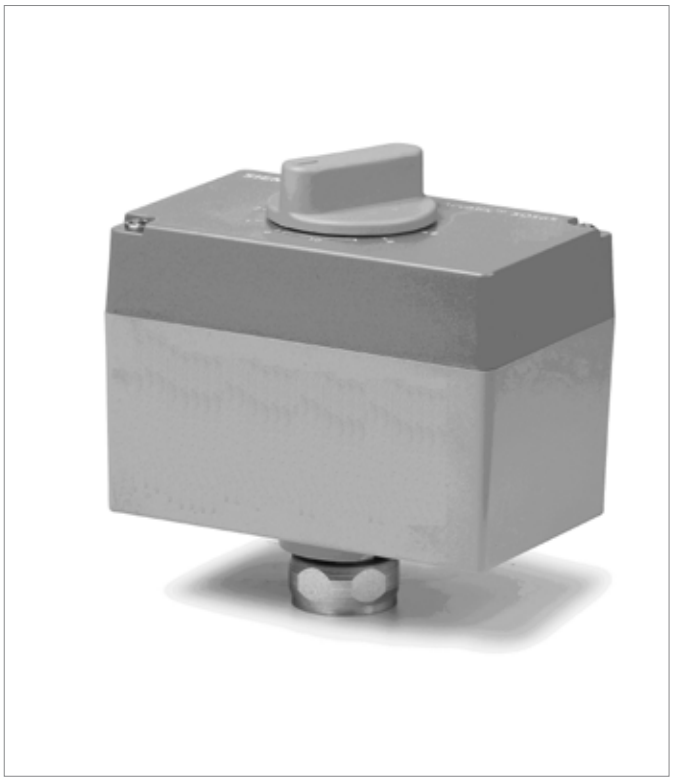
Proportional or 3-position modulating control of Frese OPTIMA valves in heating, ventilating and air conditioning systems.

Features actuator DN15-DN32

- Nominal stroke range 2.0...5.5 mm.
- 3-position or 0..10 V DC control signal.
- The stroke is adapted automatically to the valve.
- Direct assembly with union nut to the neck of the valve - no tools required.
- Manual operation by using a standard 3 mm hexagonal key.
- The actuator is short-circuit-proof and protected against polarity reversal.
- Plug-in cable for supply voltage and control signal.

Features actuator DN40-DN50

- Nominal stroke 6.5 mm.
- 3-position or 0..10 V DC control signal
- Direct assembly with union nut to the neck of the valve.
- Manual operation by using adjusting handle.



Approval

- Conformity to: EMC directive
- 89/336/EEC,93/68/EEC
- Low voltage directive
- 73/23/EEC

CE

Actuator Frese OPTIMA

Technical data actuator DN15-DN32

Supply voltage:	See "Types and Operation data
Frequency:	50/60 Hz
Manual operation:	3 mm Hexagonal key
Cable lenght:	1,5m
Protection class:	IP 40 acc. EN60529
Ambient conditions:	+1^{0}C...50^{0}C - Storage -5^{0}C...50^{0}C - Humidity 5...85% r.F.
Weight:	350 g
Nominal force:	>250N
Input impedance:	> 100 k Ohm (DC 0...10v)
Nominal stroke:	5,5mm

Technical data actuator DN40-DN50

Supply voltage:	See "Types and Operation data
Frequency:	50 Hz
Manual operation:	Adjusting handle
Cable lenght:	No cable
Protection class:	IP 54 acc. EN60529
Ambient conditions:	-5^{0}C...50^{0}C - Storage -5^{0}C...50^{0}C - Humidity 5...95% r.F.
Weight:	600 g
Nominal force:	>400N
Input impedance:	> 100 k Ohm (DC 0...10v)
Nominal stroke:	6,5mm

Types and Operation Data

Types	Valve Dim.	Function	Running time (50 Hz)	Supply voltage	Power Consumtion	Parallel operation No. of actuator
53-1045	DN15-DN32	DC 0..10 V	75s	AC/DC 24 V +/- 25%	2,5 VA	Max. 10
53-1046	DN15-DN32	3 - position	150s/5.5mm	AC 24 V +/- 20%	0,8 VA	Max. 24
53-1047	DN15-DN32	3 - position	150s/5.5mm	AC 230 V +/- 15%	6 VA	Max. 6
53-1052	DN40-DN50	DC 0..10 V	43s/6,5mm	AC 24 V +/- 20%	4,5 VA	Max. 10
53-1053	DN40-DN50	3 - position	43s/6,5mm	AC 24 V +/- 20%	2,0 VA	-
53-1054	DN40-DN50	3 - position	170s/6,5mm	AC 230 V +/- 15%	2,5 VA	-

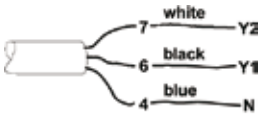
Ordering

When ordering, please give quantity, designation and type code. **Example** - 1pc, 3-position valve actuator, 24V-150, 53-1046.

Actuator Frese OPTIMA
DN15-DN32

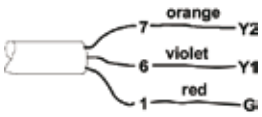
Connection cables

SSD31FRS
(53-1047)



Control signal CLOSE (AC 230 V)
Control signal OPEN (AC 230 V)
Neutral

SSD81FRS
(53-1046)



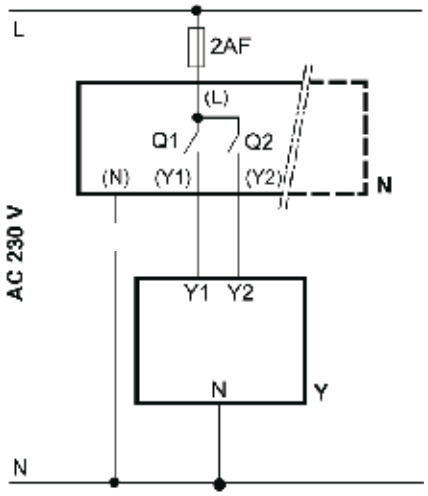
Control signal CLOSE (AC 24 V)
Control signal OPEN (AC 24 V)
System potential AC 24 V

SSD61FRS
(53-1045)

Control signal DC 0 ... 10 V
System neutral (- at DC 24 V)
System potential AC 24 V (+ at DC 24 V)

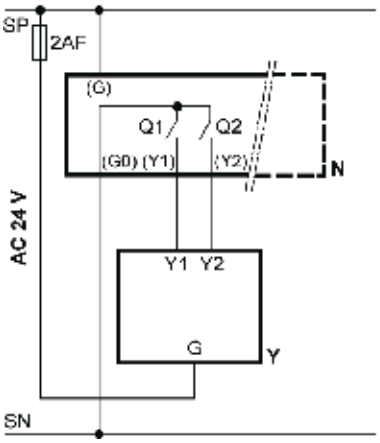
Connection diagrams

SSD31FRS
(53-1047)



N	Controller
Y	Actuator
L	System potential AC 230V
N	System neutral
Y1, Y2	Control signal OPEN, CLOSE
Q1, Q2	Controller contacts

SSD81FRS
(53-1046)



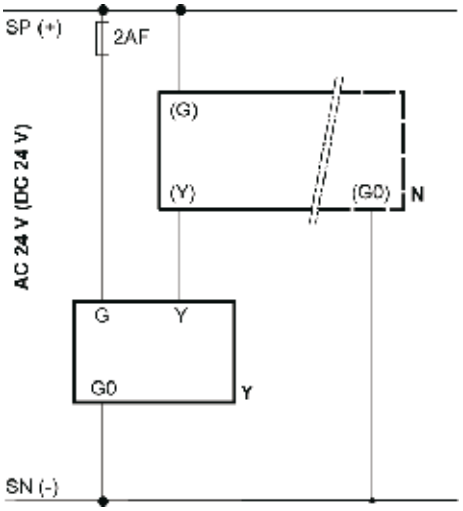
N	Controller
Y	Actuator
SP, G	System potential AC 24V
SN, G0	System neutral
Y1, Y2	Control signal OPEN, CLOSE
Q1, Q2	Controller contacts

5

Actuator Frese OPTIMA
DN15-DN32

Connection diagrams

SSD61FRS
(53-1045)

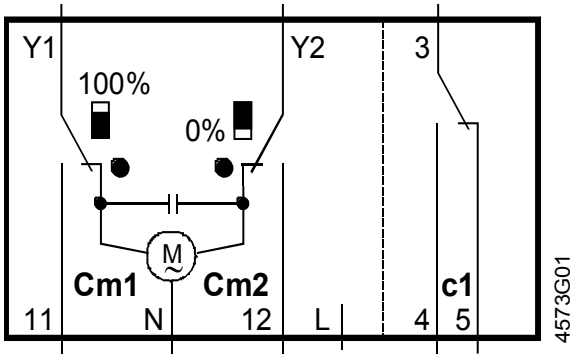


N	Controller
Y	Actuator
SP, G	System potential AC/DC 24V
SN, G0	System neutral
Y	Control signal

Actuator Frese OPTIMA
DN40-DN50

Internal diagrams

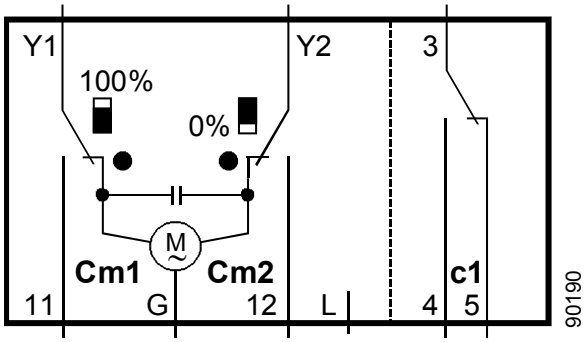
SQD35.00FRS
(53-1054)



AC 230 V, 3-Position

Cm1	End switch 100 % stroke
Cm2	End switch 0 % stroke
c1	Auxiliry switch ASC9.6 can be fitted
L	Potential free auxiliry terminal

SQD85.03FRS
(53-1053)



AC 24 V, 3-Position

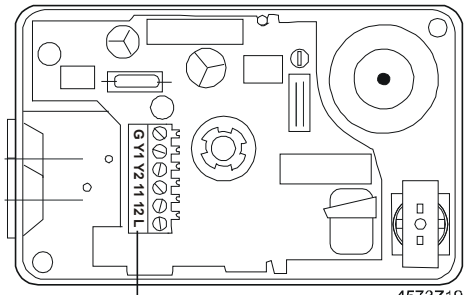
Cm1	End switch 100 % stroke
Cm2	End switch 0 % stroke
c1	Auxiliry switch ASC9.6 can be fitted
L	Potential free auxiliry terminal

Actuator Frese OPTIMA DN40-DN50

Function /mechanical design

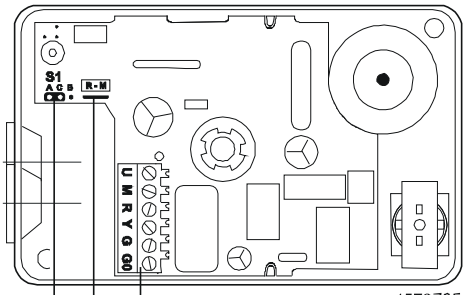
The reversible synchronous motor is driven by a 3-position or a proportional DC 0...10 V, DC 2...10 V or 0…1000 Ω control signal. The stroke is generated via an antilocking gear train.

SQD35.00FRS (53-1054) & SQD85.03FRS (53-1053)



1. Terminal strip

SQD65FRS (53-1052)



1. Terminal strip
2. Connector "lin" / "log"
3. R - M Bridge

3-position control signal:

Voltage at Y1	Stem extends, valve opens
Voltage at Y2	Stem retracts, valve closes
No voltage at Y1 or Y2	Actuator hold the current position

DC 0/2…10 V or 0…1000 Ω control signal:

The valve opens / closes in proportion to the control signal at Y or R.
At DC 0 V or 0 Ω the valve is closed (A --> AB).
When power supply is removed, the actuator maintains its current position.

5

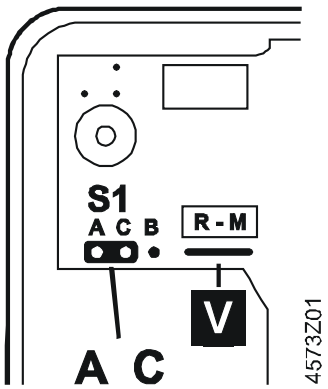
SQD65FRS (53-1052)

Selecting the flow characteristic-position control signal:

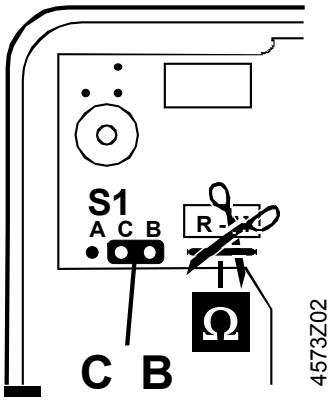
Position of S1

Connector S1 (under the cover, on the printed circuit board) can be repositioned to change the flow characteristic of valves from «equal percentage» to «linear»; in all cases the flow characteristic relates to the through-port of the valve.

S1 connected to A and C: equal-percentage flow characteristic (factory setting)



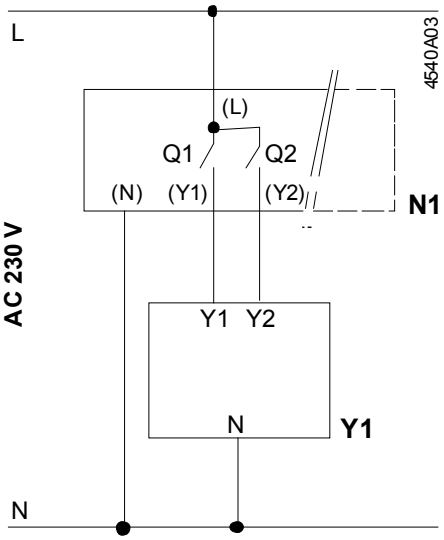
S1 connected to B and C: linear flow characteristic



Actuator Frese OPTIMA
DN40-DN50

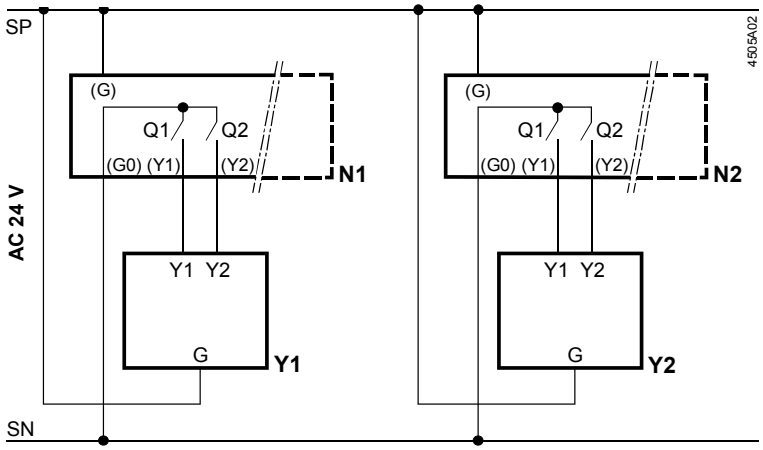
Connection diagrams

SQD35.00FRS (53-1054)



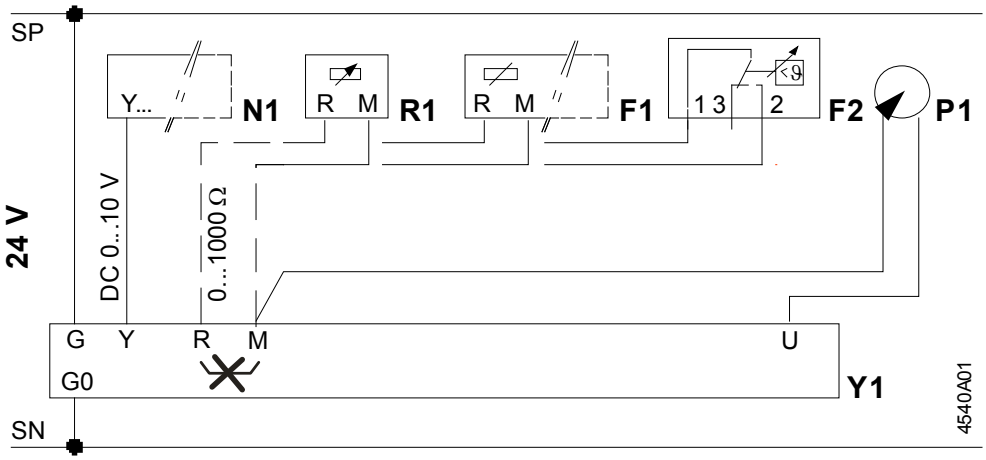
N1	Controller
Y1	Actuator SQD35.00FRS
Q1, Q2	Controller contacts
L	System potential AC 230 V
N	System neutral

SQD85.03FRS (53-1053)



N1, N2	Controller
Y1, Y2	Actuator SQD85.03FRS
Q1, Q2	Controller contacts
SP	System potential AC 24 V
SN	System neutral

SQD65FRS (53-1052)

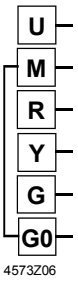


N1	Controller
Y1	Actuator SQD65FRS
R1	Position indicator 0...1000 Ω
F1	Frost protection 0...1000 Ω
F2	Frost protection thermostat Terminals 1-3 Frost danger Terminals 1-2 Normal operation
P1	Position transmitter DC 0.....10V
SP	System potential AC 24 V
SN	System neutral

Actuator Frese OPTIMA

Connection diagrams

Connection terminals
SQD65FRS (53-1052)

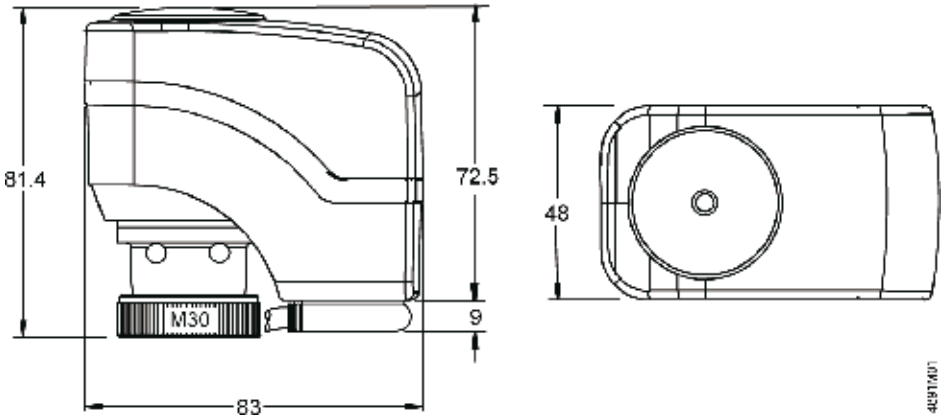


- U — Position indicator DC 0…10 V
- M — Measuring neutral (= G0)
- R — Signal input 0…1000 Ω
- Y — Signal input DC 0…10 V
- G — Operating voltage AC 24 V: system potential SP
- G0 — Operating voltage AC 24 V: system potential SN

Dimensions

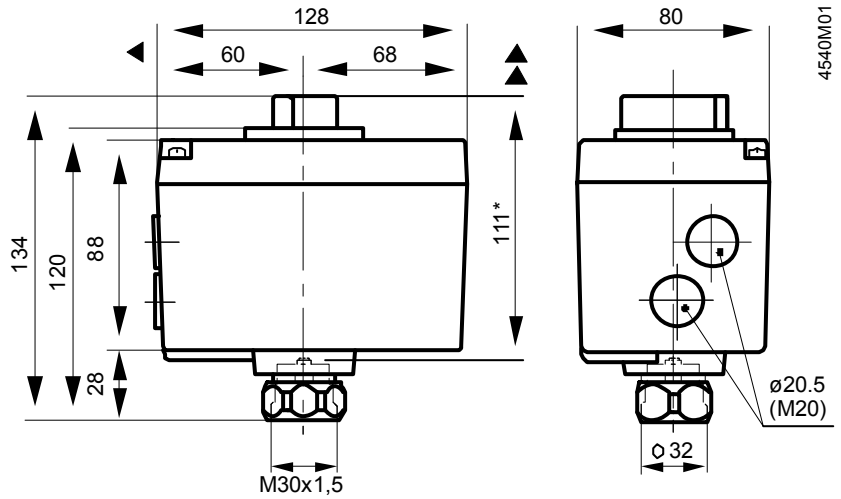
Actuator DN15-DN32

SSD31FRS (53-1047)
SSD81FRS (53-1046)
SSD61FRS (53-1045)



Actuator DN40-DN50

SQD35.00FRS (53-1054)
SQD85.03FRS (53-1053)
SQD65FRS (53-1052)



All dimensions in mm

Frese A/S
Sorøvej 8
DK- 4200 Slagelse
Tel: +45 58 56 00 00
Fax: +45 58 56 00 91
frese@frese.dk

Frese EVA
- on/off control & automatic balancing valve

Application

Frese EVA is a valve particularly designed for the balancing of cooling and heating units.

With its simple on/off control the valve can be used for many different applications, and at the same time advantage is derived from the dynamic control principles.

By means of Frese EVA the optimum flow rate is ensured in each control area. This flow rate is maintained in spite of pressure fluctuations in the system. A control area may be two fan coils for a hotel room or a calorifier for a sports centre.

Energy savings due to automatic flow control, lower flow and pump pressure. Maximized ΔT due to faster response and increased system stability.

Benefits

- Time consuming adjustment of the system is eliminated
- The valve automatically ensures the hydraulic balance, regardless of changing pressure conditions in the system

Design
- No need to use balancing valves in the distribution lines, main distribution lines and supply lines
- Less time to define the necessary equipment for a hydraulic balanced system
- No impact if the calculated distribution of pressure in the installation is not accurate
- Security that the specified flow is also the real one
- No requirements on pipe lengths before and after the valve

Installation
- Minimized commissioning time due to automatic balancing of the system
- No need for oversized pumps and oversized control valves

Operation
- Energy savings due to elimination of overflows
- Higher comfort due to correct distribution of water in the system and to optimized function of the control valves

Frese EVA with P/T plugs and Frese EVA Basic with actuators

Features

- Two valves in one. Replaces both the normal static valve (DRV) and two way valve
- No requirement on pipe lenghts before and after the valve
- Small compact product
- Built-in on/off function for electrically operated actuator (normally closed)
- The valve can easily be fitted into the system
- Integral optional P/T plugs on Frese EVA for needle system

Frese EVA
- on/off control & automatic balancing valve

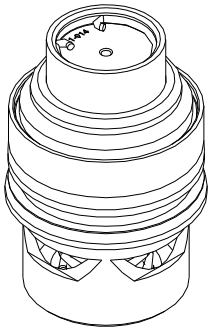
Function

The balancing occurs by means of a flow rate cartridge that keeps the differential pressure constant across an orifice.

In the wanted control range the pump supplies sufficient differential pressure to affect the spring and diaphragm of the cartridge.

Frese EVA ensures the optimum flow in each control zone to maintain the rated heat/cool transfer. This flow is maintained regardless of pressure fluctuations in the system.

See cartridge catalogue for further details.

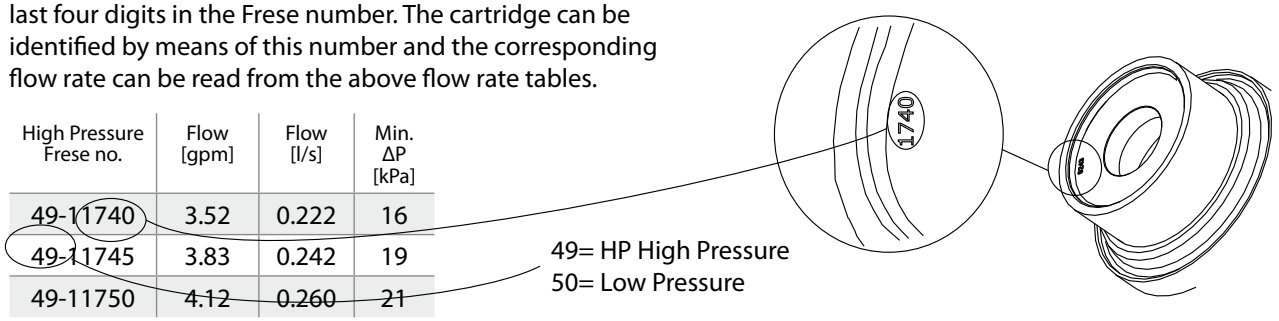


Cartridge

Indication of flow rate on the orifice plate

A four-digit number on the orifice plate is identical with the last four digits in the Frese number. The cartridge can be identified by means of this number and the corresponding flow rate can be read from the above flow rate tables.

High Pressure Frese no.	Flow [gpm]	Flow [l/s]	Min. ΔP [kPa]
49-11740	3.52	0.222	16
49-11745	3.83	0.242	19
49-11750	4.12	0.260	21



Text for technical specifications

Housing:
The Valve housing shall be made of Hot stamped Brass in DR quality. The valve shall regulate flow by means of a replaceable cartridge.
Pressure rating of the valve housing shall be PN16 or PN25.
The Kv Value of the valve housing inclusive the on/off control unit shall be no less than 3,0.

Control unit:
The Valve shall be NC (normally closed)
The valve shall be able to close completely against a DP of 4 Bar

Flow Regulator:

The flow regulating Cartridge shall be made of brass in DR quality.

The Cartridge shall offer the opportunity to change the flow by replacing an orifice plate without changing the entire cartridge.

The Cartridge shall operate in one pressure range only throughout the entire hydraulic system.

Frese EVA
- on/off control & automatic balancing valve

Product programme Frese EVA

1. Frese EVA

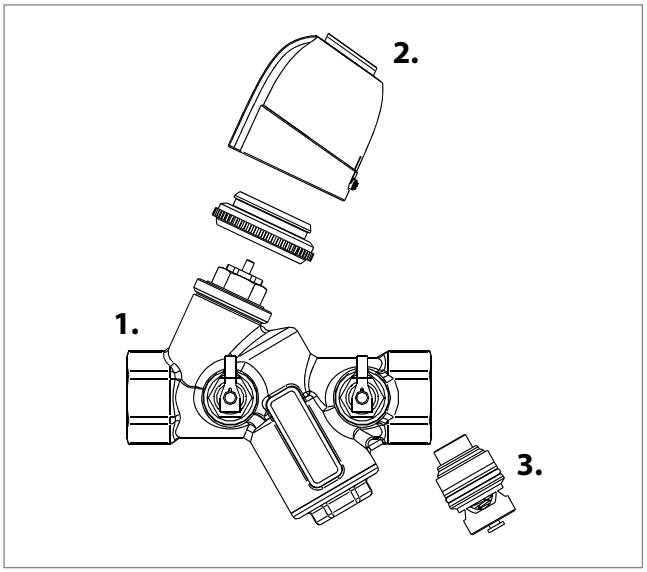
48-5803	48-5800	DN15	Kv 3,0
48-5804	48-5801	DN20	Kv 3,0
48-5805	48-5802	DN25	Kv 3,0

2. Actuator on/off, normally closed

	48-5515	24 volt	
	48-5518	230 volt	

3. Cartridge

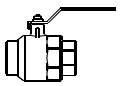
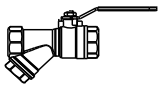
Frese no. 49 or 50-xxxx	Flow l/h	Flow l/s	Flow gpm	Min. DP kPa	DP Housing kPa	Min DP. total kPa
11150	25	0,007	0,11	7	0	7
11170	36	0,010	0,16	7	0	7
11190	43	0,012	0,19	7	0	7
11210	55	0,015	0,24	7	0	7
11230	75	0,021	0,33	8	0	8
11260	84	0,023	0,37	9	0	9
11290	104	0,029	0,46	10	0	10
11300	114	0,032	0,50	10	0	10
11320	129	0,036	0,57	11	0	11
11350	154	0,043	0,68	11	0	11
11370	175	0,049	0,77	12	0	12
11400	204	0,057	0,90	12	0	12
11430	241	0,067	1,06	12	1	13
11460	279	0,078	1,23	12	1	13
11490	320	0,089	1,41	13	1	14
11510	350	0,097	1,54	13	1	14
11540	400	0,111	1,76	13	2	15
11570	477	0,133	2,10	14	3	17
11620	545	0,151	2,40	14	3	17
11725	615	0,171	2,71	14	4	18
11730	670	0,186	2,95	14	5	19
11735	736	0,204	3,24	14	6	20
11740	799	0,222	3,52	16	7	23
11745	870	0,242	3,83	19	8	27
11750	936	0,260	4,12	21	10	31
20700	1020	0,283	4,49	22	12	34
20740	1081	0,300	4,76	22	13	35
20770	1195	0,332	5,26	22	16	38
20820	1335	0,371	5,88	23	20	43
20860	1483	0,412	6,53	23	24	47
20880	1581	0,439	6,96	23	28	51
20920	1774	0,493	7,81	24	35	59
20940	1833	0,509	8,07	24	37	61
20990	2080	0,578	9,16	25	48	73
21030	2251	0,625	9,91	26	56	82
21060	2319	0,644	10,21	27	60	87
21090	2448	0,670	10,78	28	67	95



Accessories

Extension piece for actuator	
h = 20 mm	48-5557
Strainer	
DN15	41-1132
DN20	41-1142
DN25	41-1152
Ball Valve	
DN15	38-5020
DN20	38-5022
DN25	38-5024
Strainer Ball Valve	
DN15	38-5040
DN20	38-5041
DN25	38-5042
Spindle Extension	
DN15/20	46-1072
DN25	46-1073
P/T-plugs	
1/4" x 60mm	48-0012
Combidrain 1/4" x 60mm	46-1073




6

Frese EVA Basic
- on/off control & automatic balancing valve

Product programme Frese EVA Basic

1. Frese EVA Basic

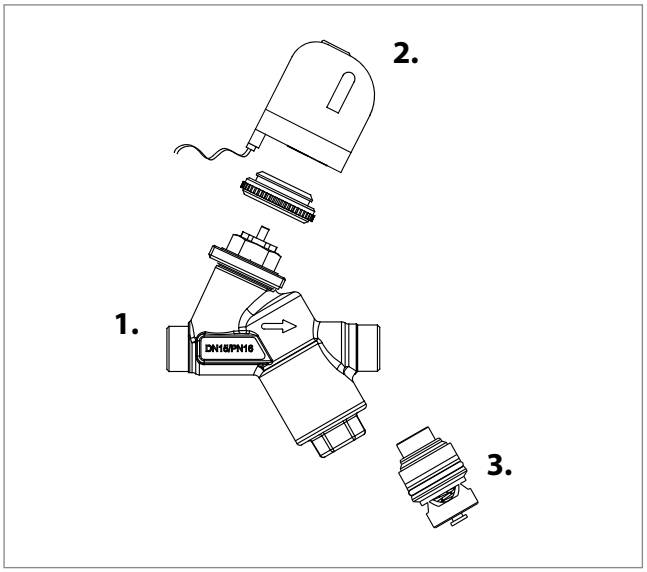
48-5803	48-5806	DN15	Kv 3,0

2. Actuator on/off, normally closed

	48-5515	24 volt	
	48-5518	230 volt	

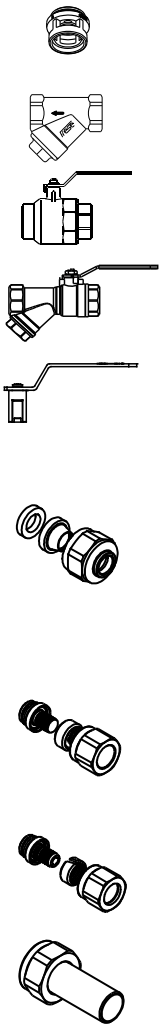
3. Cartridge

Frese no. 49 or 50-xxxx	Flow l/h	Flow l/s	Flow gpm	Min. DP kPa	DP Housing kPa	Min DP. total kPa
11150	25	0,007	0,11	7	0	7
11170	36	0,010	0,16	7	0	7
11190	43	0,012	0,19	7	0	7
11210	55	0,015	0,24	7	0	7
11230	75	0,021	0,33	8	0	8
11260	84	0,023	0,37	9	0	9
11290	104	0,029	0,46	10	0	10
11300	114	0,032	0,50	10	0	10
11320	129	0,036	0,57	11	0	11
11350	154	0,043	0,68	11	0	11
11370	175	0,049	0,77	12	0	12
11400	204	0,057	0,90	12	0	12
11430	241	0,067	1,06	12	1	13
11460	279	0,078	1,23	12	1	13
11490	320	0,089	1,41	13	1	14
11510	350	0,097	1,54	13	1	14
11540	400	0,111	1,76	13	2	15
11570	477	0,133	2,10	14	3	17
11620	545	0,151	2,40	14	3	17
11725	615	0,171	2,71	14	4	18
11730	670	0,186	2,95	14	5	19
11735	736	0,204	3,24	14	6	20
11740	799	0,222	3,52	16	7	23
11745	870	0,242	3,83	19	8	27
11750	936	0,260	4,12	21	10	31
20700	1020	0,283	4,49	22	12	34
20740	1081	0,300	4,76	22	13	35
20770	1195	0,332	5,26	22	16	38
20820	1335	0,371	5,88	23	20	43
20860	1483	0,412	6,53	23	24	47
20880	1581	0,439	6,96	23	28	51
20920	1774	0,493	7,81	24	35	59
20940	1833	0,509	8,07	24	37	61
20990	2080	0,578	9,16	25	48	73
21030	2251	0,625	9,91	26	56	82
21060	2319	0,644	10,21	27	60	87
21090	2448	0,670	10,78	28	67	95



Accessories

Extension piece for actuator	
h = 20 mm	48-5557
Strainer	
DN15	41-1132
Ball Valve	
DN15	38-5020
Strainer Ball Valve	
DN15	38-5040
Spindle Extension	
DN15/20	46-1072
Compression coupling	
39-1432	DN15 x Ø8 mm
39-1433	DN15 x Ø10 mm
39-1434	DN15 x Ø12 mm
39-1435	DN15 x Ø15 mm
PEX coupling	
31-2021	DN15 for Ø12 x 2 mm
31-2031	DN15 for Ø15 x 2,5 mm
31-2041	DN15 for Ø16 x 2 mm
Alu-PEX coupling	
31-2441	DN15 for Ø16 x 2 mm
Press coupling	
31-2831	DN15 for Ø15 mm



Frese EVA
- on/off control & automatic balancing valve

Technical data Frese EVA

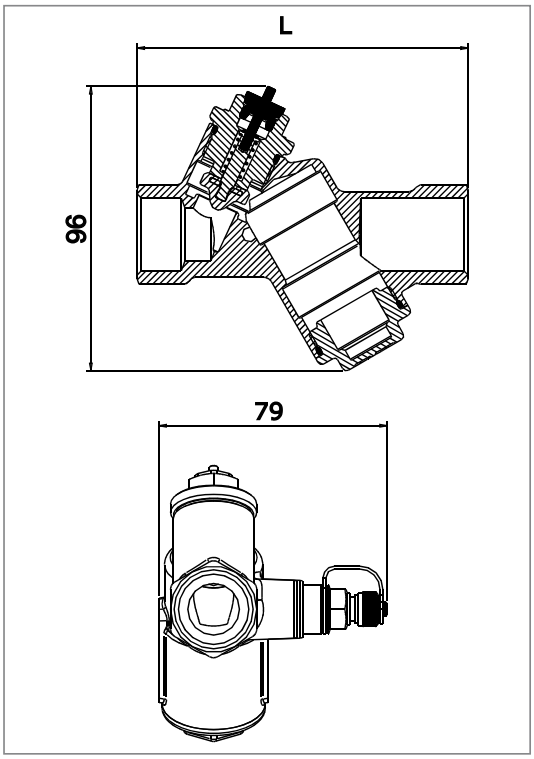
Valve Housing:	DZR Brass, CW602N
O-rings:	EPDM
Pressure class:	PN25
Temperature:	0 to + 95^{0}C
Ambient temperature:	0 to + 50^{0}C
Flow range:	See page 3
Max. differential pressure:	400 kPa
Weight:	0,7 kg
Dimension packaging in mm:	135 x 115 x 85

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets. See application example.
Valve height incl.actuator = 135 mm
Lenght of stroke = 2,15 mm

Frese A/S assumes no responsibility if another

Dimensions

	DN15	DN20	DN25
L	102	110	119



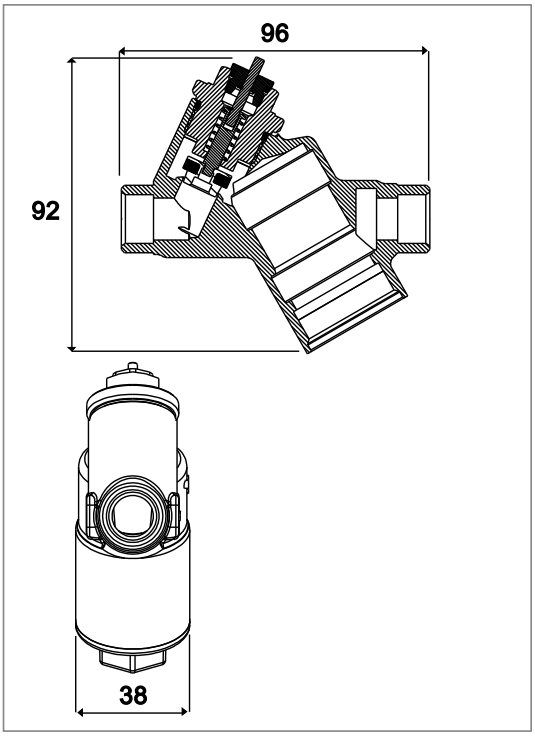
6

Technical data Frese EVA Basic

Valve Housing:	DZR Brass, CW602N
O-rings:	EPDM
Pressure class:	PN16
Temperature:	0 to + 95^{0}C
Ambient temperature:	0 to + 50^{0}C
Flow range:	See page 3
Max. differential pressure:	400 kPa
Weight:	0,7 kg
Dimension packaging in mm:	135 x 115 x 85

Glycolic mixtures (both ethylene and propylene) up to 50% are applicable with Frese Alpha. Strainer is recommended. The pipe system should be properly ventilited to avoid the risk of air-pockets. See application example.
Valve height incl.actuator = 135 mm
Lenght of stroke = 2,15 mm

Frese A/S assumes no responsibility if another actuator than the Frese actuator is used.

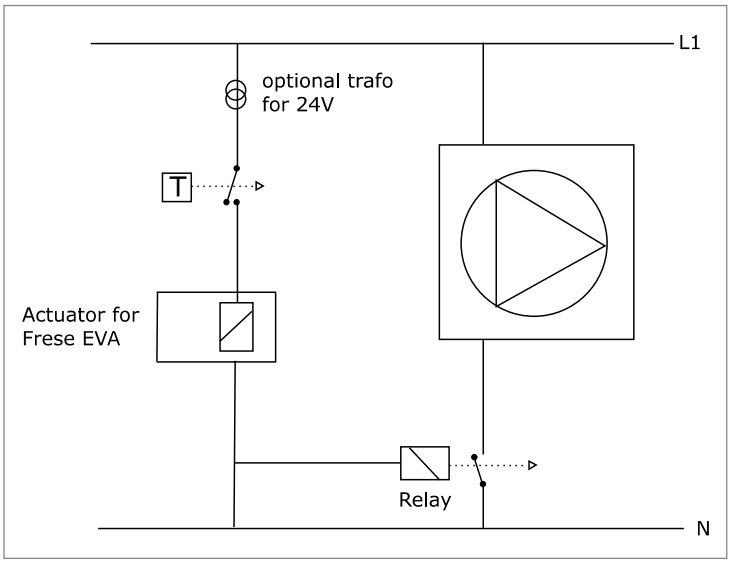


Frese EVA
- on/off control & automatic balancing valve

Electric Diagram

Example: You may let the valve signal run the fan engine of the unit, so that the fan engine is not running when the valve is closed.

The valve is "normally closed". The power consumption of the actuator is 2 Watt.

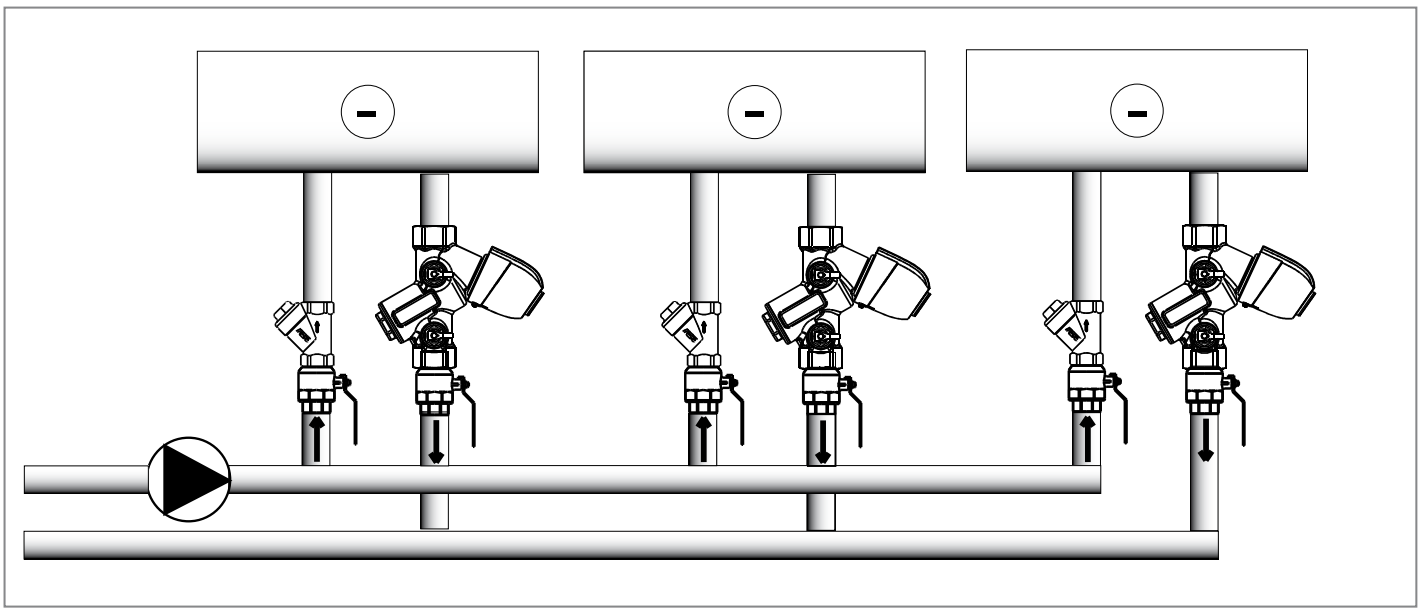


Application Example

The system is easily adjusted by adjusting the pump in accordance with the required differential pressure across the critical valve.

When this differential pressure is achieved, the system will automatically be balanced.

Min. Differential pressure = the lower limit of the operating range of the Alpha flow cartridge plus the pressure drop of the EVA valve at design flow.
See required min. Pressure of the cartridge on page 3.



Frese EVA
- on/off control & automatic balancing valve

Documentation formular

Valve ID	Valve type (EVA)	Dimension [DN]	Cartridge No.	DP_P measured [kPa]	Min. DP_P [kPa]	Flow [l/h]

6

Pump type

Regulation form

Set point

Installation

Signature	Date

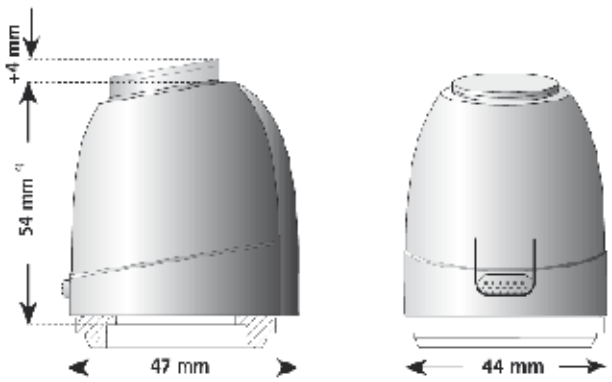
Frese A/S
Sorøvej 8
DK- 4200 Slagelse
Tel: +45 58 56 00 00
Fax: +45 58 56 00 91
frese@frese.dk

Actuator for Frese EVA

Type	48-5515	48-5518
On/off	On/off	On/off
Power supply	24V AC/DC	230V AC
Power consumption	1.8W	1.8W
Closing and opening time	Approx. 3 min.	Approx. 3 min.
Actuator travel	4 mm	4 mm
Force	100N	100N
Ambient temperature	0-60°C	0-60°C

Design

	Normally closed	Normally closed
Protection	IP 54	IP 54
Colour of housing	Greyish white	Greyish white
Valve adapter	Included	Included
Weight (without adapter incl. 1m wire)	100 g	100 g
Connection wire	2 x 0,75 mm² PVC	2 x 0,75 mm² PVC
Lenght of wire	1,0 m	1,0 m



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Tel: +45 58 56 00 00
Fax: +45 58 56 00 91
frese@frese.dk

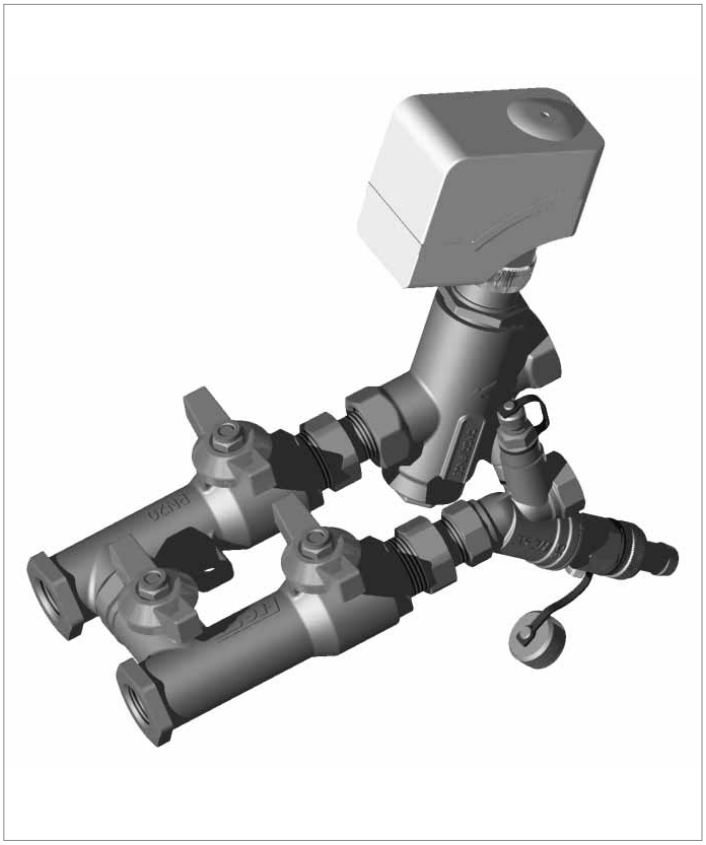
Frese MODULA
Complete solutions for balancing and temperature control

Application

The Frese MODULA is a compact and versatile valve system that combines the Frese range of automatic flow, pressure and temperature control valves with isolation, flushing, draining and measurement components within a prefabricated, tested and ready to install terminal connection assembly. The Frese MODULA integrates one of the following Frese pressure independent solutions:

- Frese ALPHA (Dynamic balancing valve)
-
- Frese S (Adjustable dynamic balancing valve)
- Frese EVA (Combined dynamic balancing and 2 port on/off valve)
- Frese OPTIMA (Pressure Independent Control Valve - PICV)
- Frese PV (Adjustable Differential Pressure Control Valve)

With isolation valves, strainer, drain/hose connection & P/T plug.



Benefits

The Frese MODULA assembly combines the benefits of Frese OPTIMA, EVA and ALPHA in addition to:

Design
- Minimized design time and risks due to complete solution
- Guaranteed performance of the complete system
- Compact design for limited space availability

Installation
- Minimized installation and commissioning costs
- Allows easy flushing and coil isolation
- Easy lagging of spindle extensions
- Simple attachment to existing hangers
- Integrated fitting lug for ease of installation

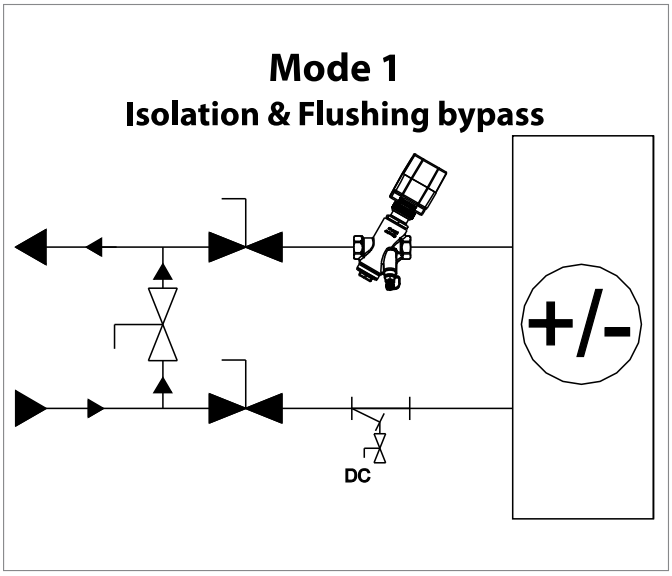
Operation
- High comfort with minimized operation and maintenance costs

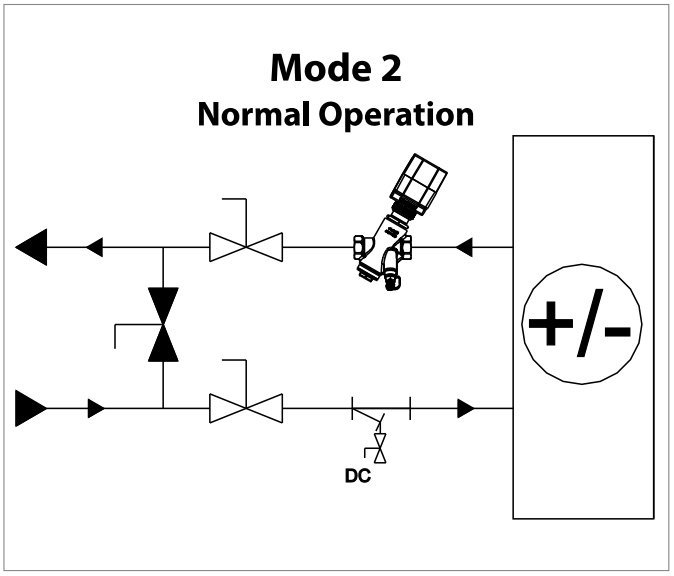
For a full understanding of ALPHA, EVA, S, PV and OPTIMA solutions please refer to the relevant Technotes.

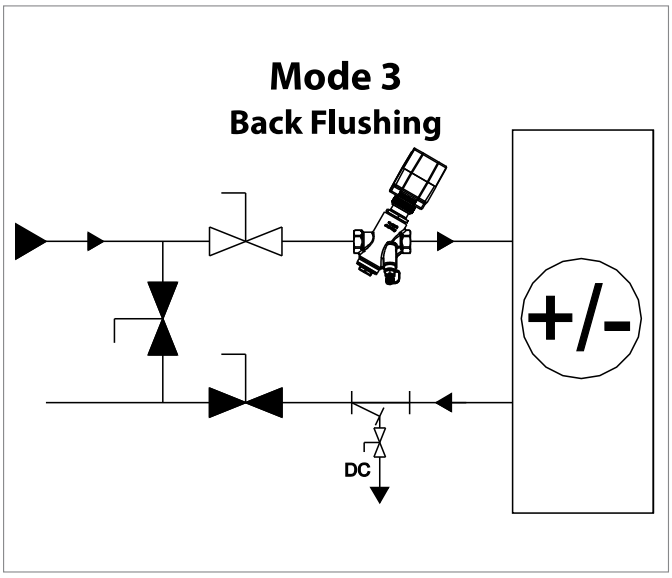
Features

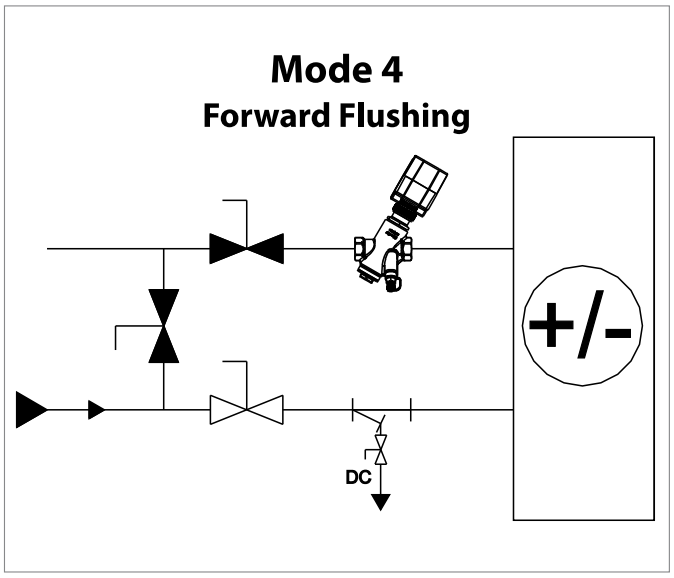
- Available in ½", ¾" and 1" end connections
- Patented Frese ALPHA, Frese S, Frese PV, Frese EVA or Frese OPTIMA technology
- Compact 80mm/130mm/170mm supply/return centres
- Integrated union joints for easy valve alignment
- ¾" T-handle isolation-valves for flow, return and bypass. Full port valves on flow and return
- Spindle extensions available
- Combinations with strainer, drain/hose connection, P/T plug available

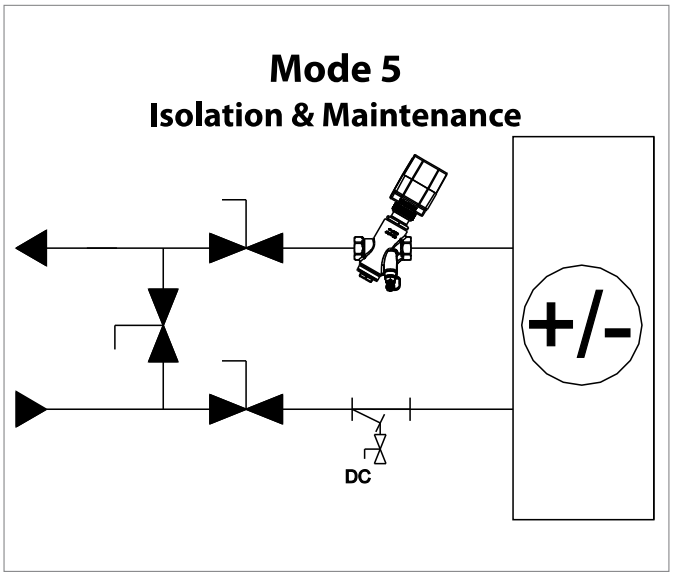
Frese MODULA
Complete solutions for balancing and temperature control











Frese MODULA
Complete solutions for balancing and temperature control

55	X		X	X		X		X		
Valve		Size/Center	Modula II combination		Valve plug		Flow/Pressure		Cartridge

Valve

55	MODULA II Kit
1	Frese OPTIMA
2	Frese ALPHA
3	Frese EVA
4	Frese EVA Basic
5	Frese S
6	Frese PV

Size/Center

1	DN15 - 80mm	4	DN15 - 130mm	7	DN15 - 170mm
2	DN20 - 80mm	5	DN20 - 130mm	8	DN20 - 170mm
3	DN25 - 80mm	6	DN25 - 130mm	9	DN25 - 170mm

Modula II combination

1	T-piece with 1" P/T-plug + drain and hose
2	T-piece with 1" P/T-plug + drain, hose and extension handle
3	Strainer with 1" P/T-plug + drain and hose
4	Strainer with 1" P/T-plug + drain, hose and extension handle
5	T-piece with 1" P/T- plug/plug
6	T-piece with 1" P/T- plug/plug and extension handle
7	Strainer with 1" P/T- plug/plug
8	Strainer with 1" P/T- plug/plug and extension handle
A	T-piece with 1" P/T-plug + drain and hose (Left hand mount)
B	T-piece with 1" P/T-plug + drain, hose and extension handle (Left hand mount)
C	Strainer with 1" P/T-plug + drain and hose (Left hand mount)
D	Strainer with 1" P/T-plug + drain, hose and extension handle (Left hand mount)
E	T-piece with 1" P/T-plug/plug (Left hand mount)
F	T-piece with 1" P/T-plug/plug and extension handle (Left hand mount)
G	Strainer with 1" P/T-plug/plug (Left hand mount)
H	Strainer with 1" P/T-plug/plug and extension handle (Left hand mount)

Valve plug

1	1" P/T Plug on valve
2	2" P/T Plug on valve
3	Plug

Flow/Pressure

L	Low Flow
H	High Flow
4	Low Pressure
5	High Pressure

Cartridge

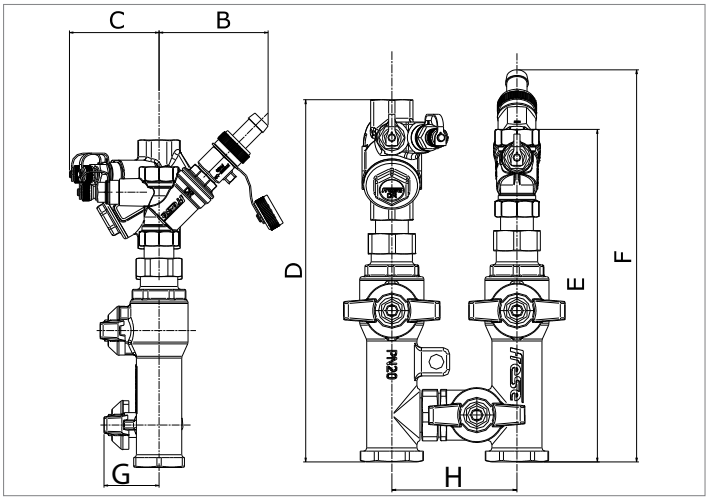
XXXX	Flow in l/sec. (X.XXX)

Example of order combination: 551-12-1-L

Specification text Frese MODULA:

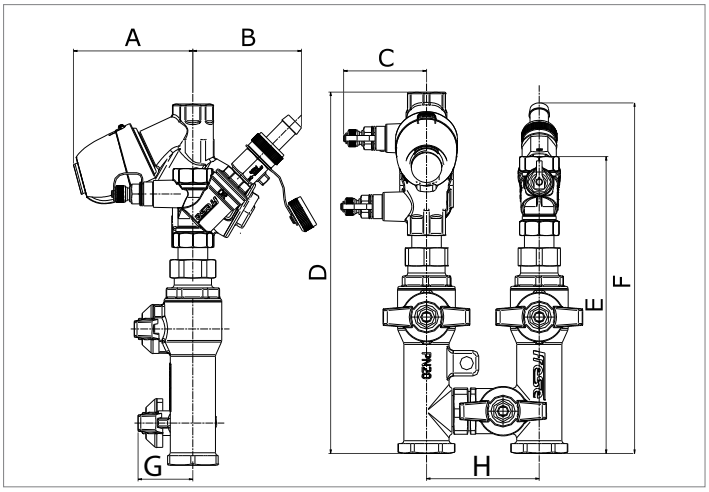
The valve system shall combine a dynamic balancing valve with a fixed 80mm distance supply/return component. The balancing valve can also be a combination valve for dynamic balancing and control. Frese ALPHA, EVA, ALPHA Cartridges, OPTIMA (see corresponding technote).

Frese MODULA
Complete solutions for balancing and temperature control



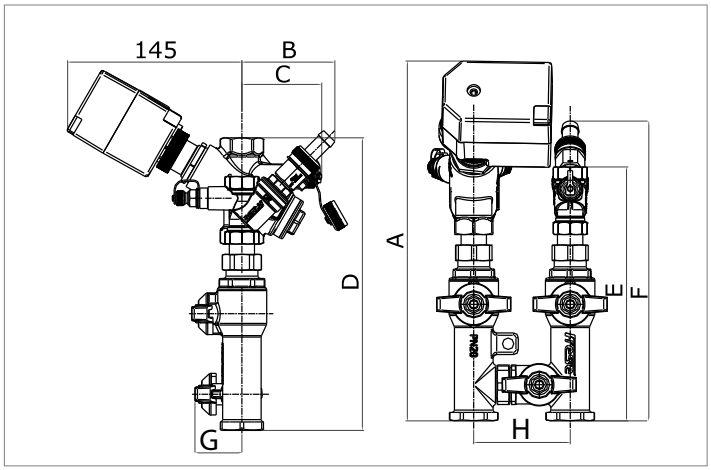
MODULA - ALPHA

	DN15	DN20	DN25	
A	79	87	97	
C	63/102	63/102	63/102	1" PT/**2" PT**
D	231	231	239	
E	211	230	257	
F	249	266	293	
G	41/**88**	41/**88**	41/**88**	Std. Handle/**Ext Handle**
H	80/130/170			



MODULA - EVA

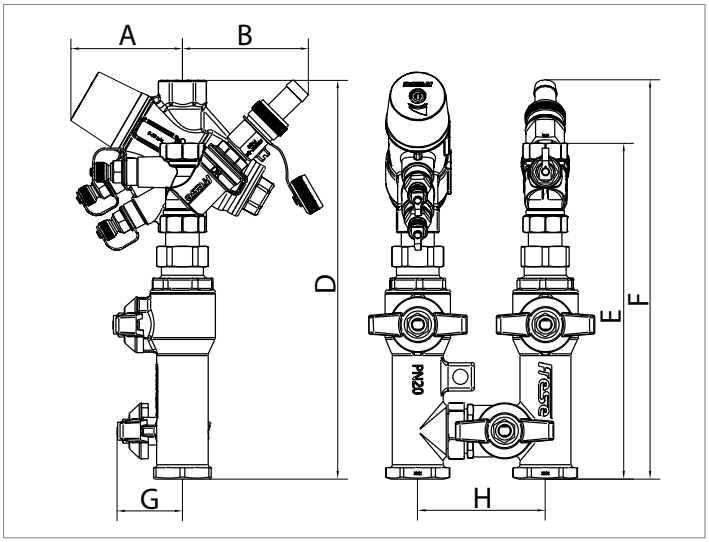
	DN15	DN20	DN25	
A	85	85	85	
B	79	87	97	
C	59/**98**	59/**98**	59/**98**	1" PT/**2" PT**
D	256	256	264	
E	211	230	257	
F	249	266	293	
G	41/**88**	41/**88**	41/**88**	Std. Handle/**Ext Handle**
H	80/130/170			



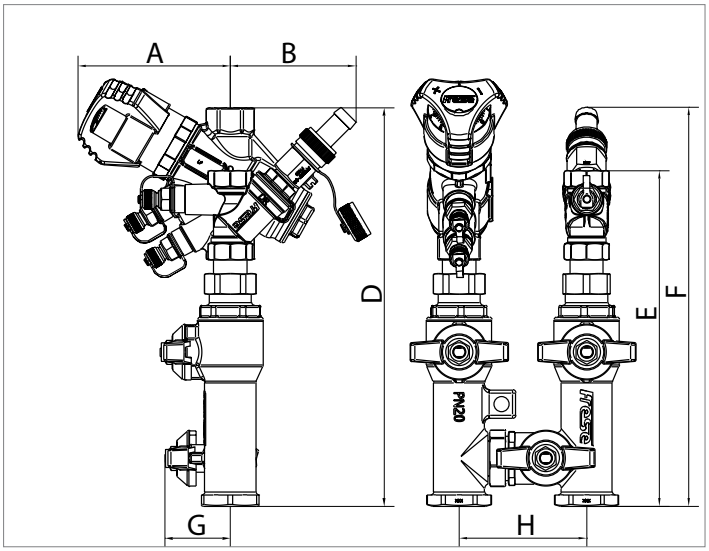
MODULA - OPTIMA

	DN15	DN20	DN25	
A	298	298	298	
B	79	87	97	
C	66/**100**	66/**100**	66/**100**	1" PT/**2" PT**
D	243	243	251	
E	211	230	257	
F	249	266	293	
G	41/**88**	41/**88**	41/**88**	Std. Handle/**Ext Handle**
H	80/130/170			

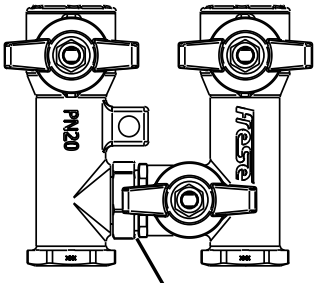
Frese MODULA
Complete solutions for balancing and temperature control



MODULA - PV				
	DN15	**DN20**	**DN25**	
A	70	73	91	
B	79	87	97	
D	250	251	257	
E	211	230	257	
F	249	266	293	
G	41/**88**	41/**88**	41/**88**	Std. Handle/**Ext Handle**
H	80/130/170			



MODULA - S				
	DN15	**DN20**	**DN25**	
A	96	98	102	
B	79	87	97	
D	250	251	257	
E	211	230	257	
F	249	266	293	
G	41/**88**	41/**88**	41/**88**	Std. Handle/**Ext Handle**
H	80/130/170			

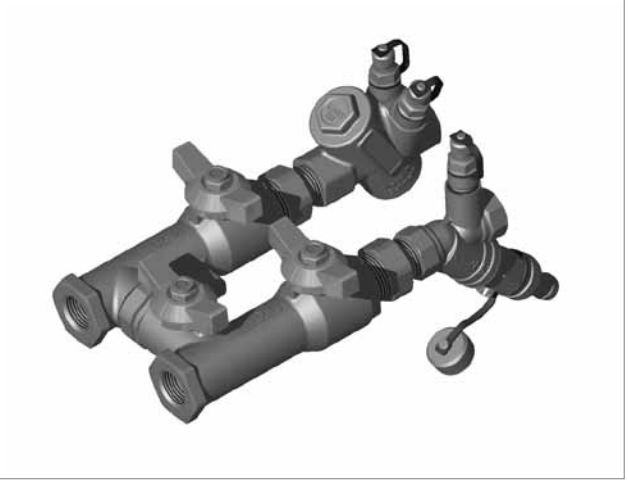


NOTE:
CENTER CONNECTION JOINTS SHOULD NOT BE DISASSEMBLED AS THIS CAN DAMAGE THE INTERNAL SEAL

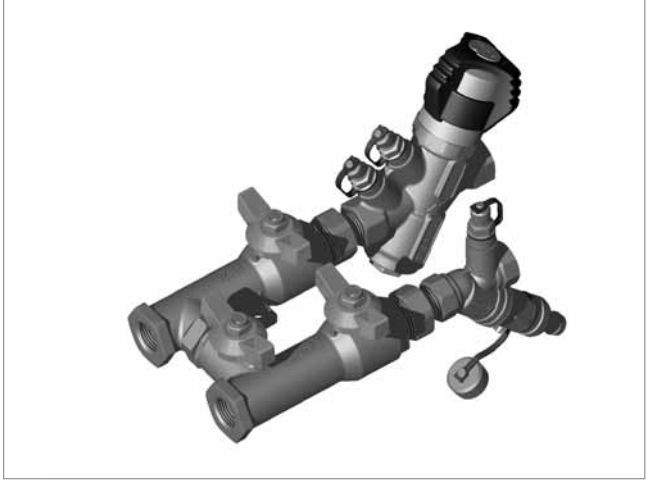
7

Frese MODULA
Complete solutions for balancing and temperature control

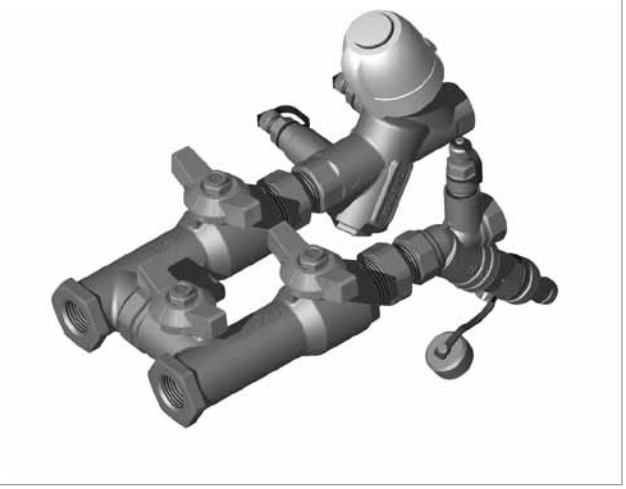
Frese ALPHA - MODULA



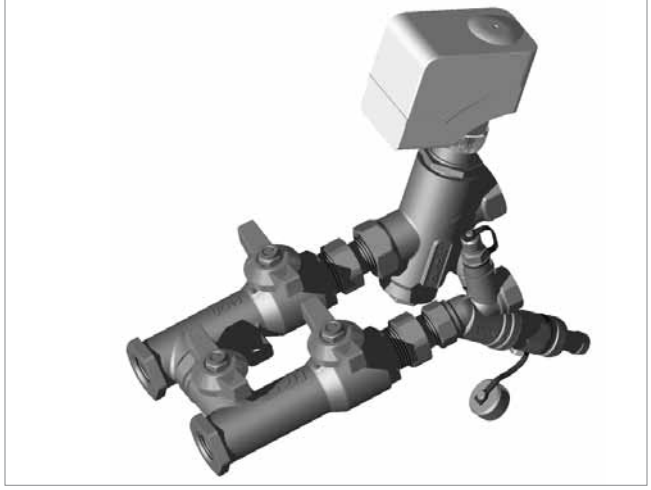
Frese S - MODULA



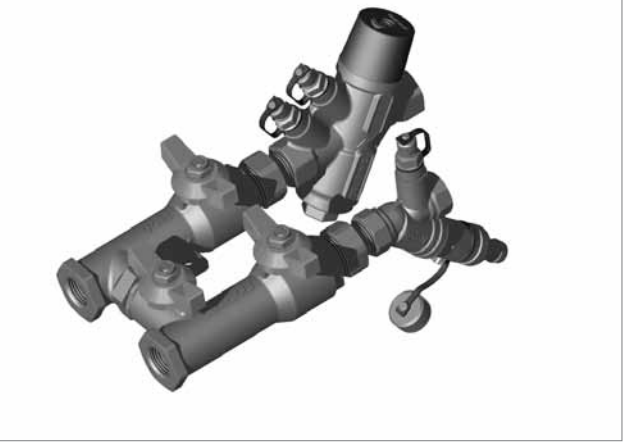
Frese EVA - MODULA



Frese OPTIMA - MODULA

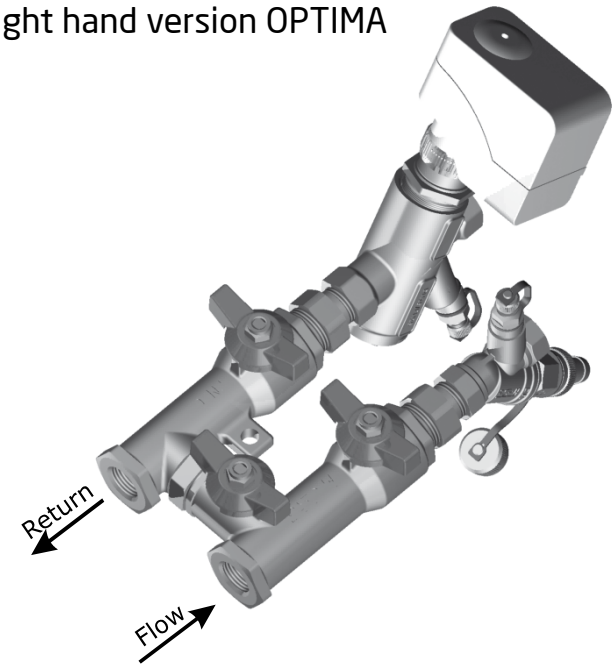


Frese PV - MODULA

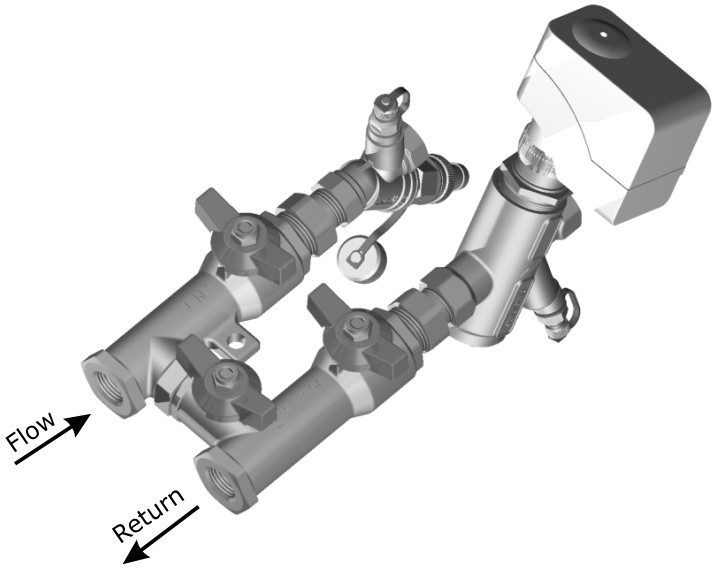


Frese MODULA
Complete solutions for balancing and temperature control

Right hand version OPTIMA



Left hand version OPTIMA



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Frese PV
- Adjustable differential pressure control valve

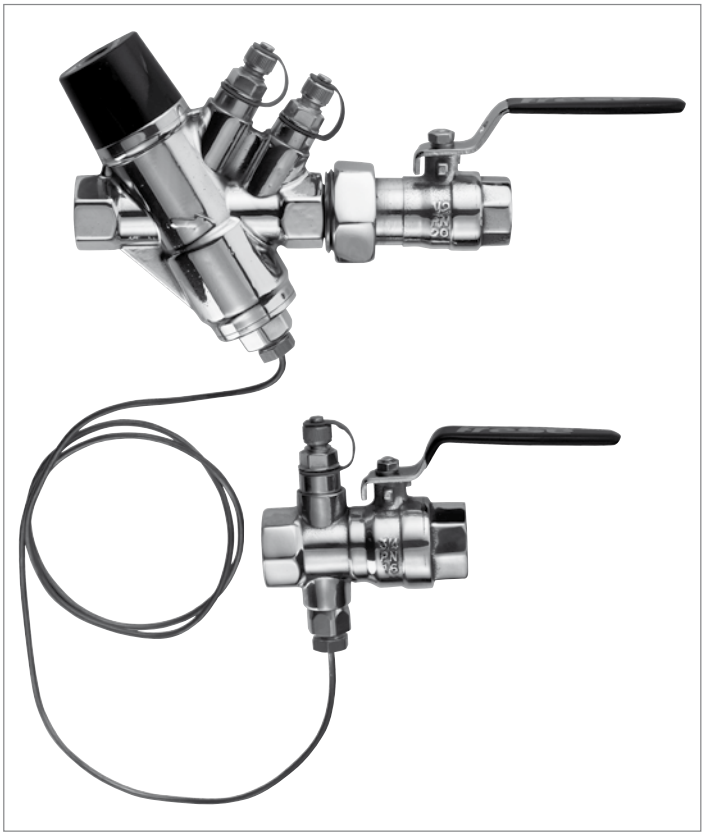
Application

Frese PV can be installed in domestic and commercial heating and cooling systems.

The valve is a dynamic, adjustable differential pressure control valve (DPCV) that ensures the differential pressure across the load or circuit is constant.

The valve ensures good modulating control and reduces the risk of noise from thermostatic radiator valves and 2-port control valves.

Frese PV can be installed in conjunction with Frese S (adjustable flow limiter) to provide 100% control of the flow and differential pressure regardless of pressure fluctuations in the system. See PVS Technote.



Benefits

- The valve offers three in-built functions: adjustable differential pressure control, isolation and P/T plugs for pressure verification
- Frese PV eliminates noise problems caused by over pressure
- Differential pressure can be set and adjusted on site
- Tamper-proof presetting device on top of the valve, meaning there is no need for the valve sealing after presetting
- Presetting is simple using the graphs shown on pages 9-13

Features

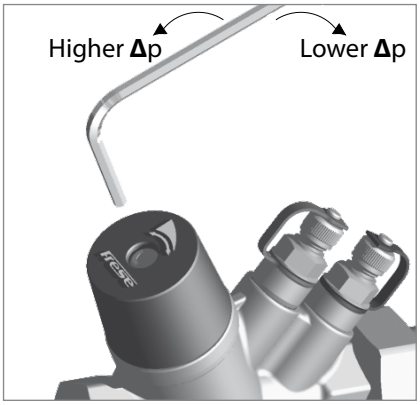
- Maximum differential pressure: 400 kPa
- Removable ΔP cartridge allows forward as well as back-flushing
- Size range: DN15 to DN50
- Maximum flow: 15m^3/h
- Built-in P/T plugs for ΔP verification

Frese PV
- Adjustable differential pressure control valve

Setting the valve

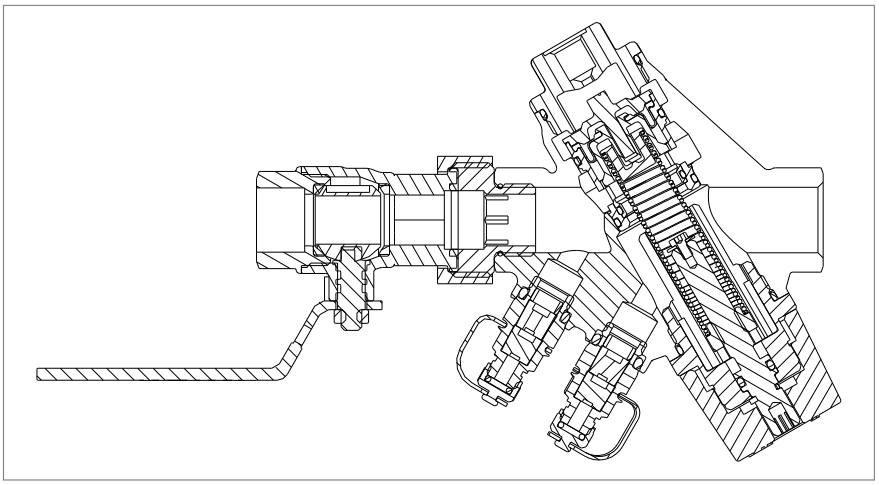
The valve is easily set by means of a 4mm hexagonal key. The flow rate of the valve can be determined from the flow rate graphs for the valve dimension in question.
See the flow rate graphs of the valve on pages 9 and 13 for further information about the Pre-setting.

To set the valve to the desired downstream differential pressure, the valve should be set at the minimum position and then adjusted in accordance with the presetting graphs.



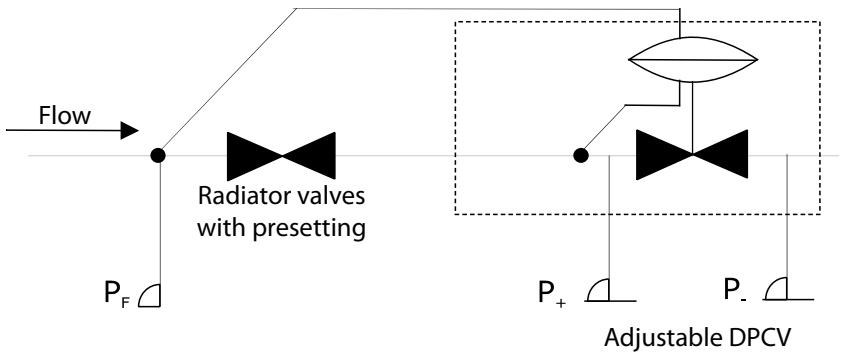
Design

Frese PV consists of a differential pressure regulation unit, isolating ball valve, P/T-plugs and partner valve which is installed in the flow.



Frese PV system fem./fem. with union and isolation ball valve

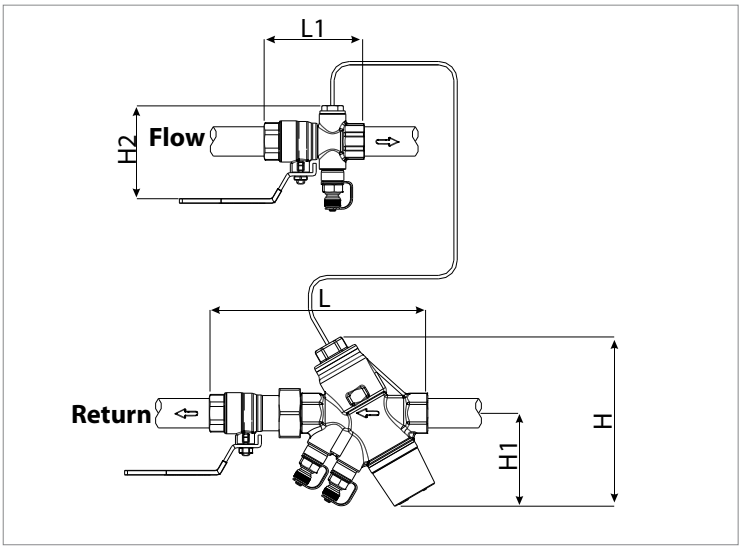
Simplified outline Frese PV



Frese PV
- Adjustable differential pressure control valve

Technical data

Housing: DZR, Brass
DP controller: PPS 40% glass
Flow setting: PPO
Spring: Stainless steel
Diaghragm: HNBR
O-rings: EPDM
Pressure class: PN16
Max. differential pressure: 400 kPa
Temperature range: -10^{0}C to + 120^{0}C
Capillary tube: Ø3, L = 1000mm



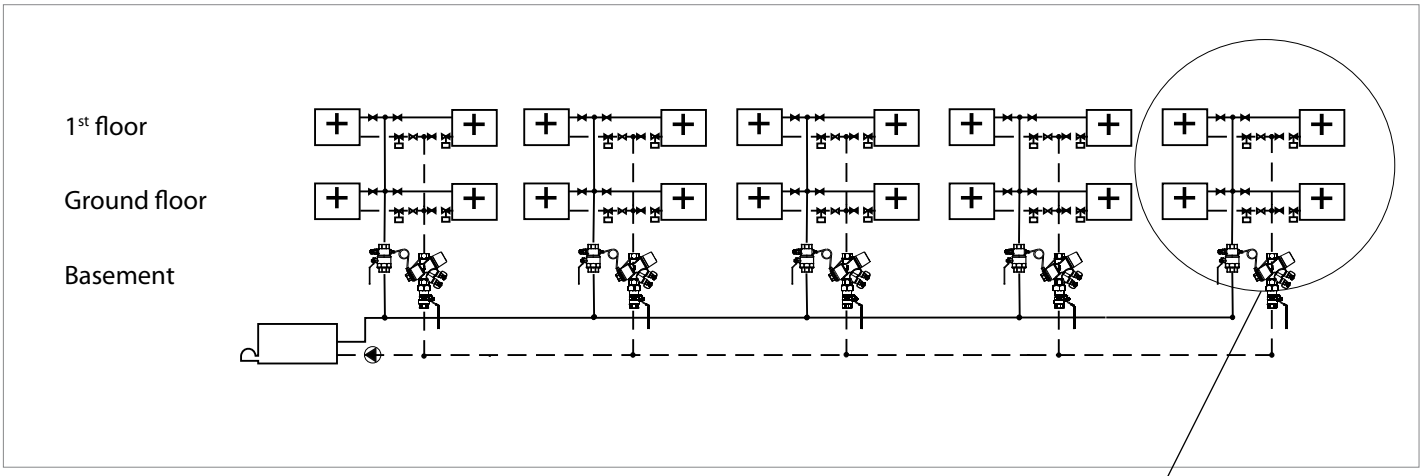
***Frese PV System** - Valve combination, capillary tube, isolation ball valve at the supply- and return line.*

Type		Frese PV								
Application		Two pipe systems								
Dimension		**DN15**		**DN20**		**DN25**		**DN32**	**DN40**	**DN50**
Control range	[kPa]	5-30	20-60	5-30	20-60	5-30	20-60	20-80	20-80	20-80
Flow rate	[l/s]	0,014-0,167	0,028-0,333	0,028-0,278	0,042-0,556	0,167-0,694	0,194-1,167	0,278-1,389	0,833-2,222	1,389-4,167
	[l/h]	50-600	100-1200	100-1000	150-2000	600-2500	700-4200	1000-5000	3000-8000	5000-15000
	gpm	0,22-2,65	0,44-5,29	0,44-4,41	0,66-8,82	2,65-11,02	3,09-18,52	4,41-22,05	13,23-35,27	22,05-66,14
Dimension mm	L	167		173		232		235	257	286
	H	127		130		166		166	184	196
	H1	70		73		91		91	97	106
	L1	75		82		95		100	108	127
	H2	95		103		111		135	145	164
Accuracy		+/- 7%		+/- 7%		+/- 7%		+/- 7%	+/- 7%	+/- 7%
	Kvs	3,6		4		9,5		11,4	16,4	17,9

Frese PV
- Adjustable differential pressure control valve

Example

Outline of the heating system in one of the sections. 5 staircases with 4 flats each. Pump and tank farther away than indicated in the example.



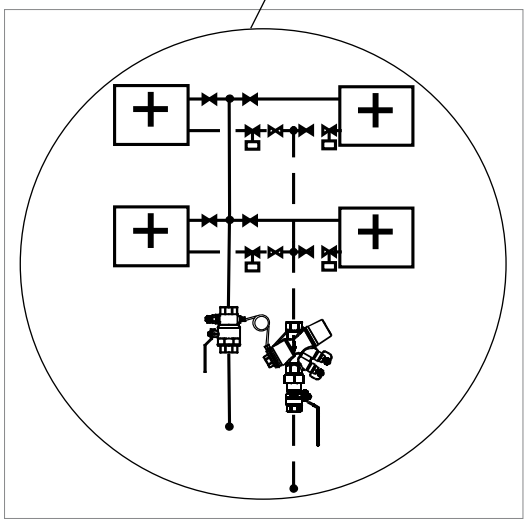
Evidently the pressure will be higher in the supply pipes near the pump than e.g. in the critical pipe.

In this case the purpose of Frese PV is to maintain pressure of approx. 12 kPa across the supply and the return line.

Specifying the characteristics of the building, the calorific requirement was rated at 125 l/h per flat.

Motor valves were chosen for the control of the flow. The Kvs-value of these should be as close to 0.36 m^3/h as possible. (125 l/h and 12 kPa),
$Q = Kv * \sqrt{\Delta p}$.

As already mentioned a differential pressure of 12 kPa should be maintained at a flow of 4 x 125 = 500 l/h.
From the scheme on page 3, which shows the technical data of Frese PV, a Frese PV DN15 will be suitable for the purpose.



Index Circuit

Frese PV
- Adjustable differential pressure control valve

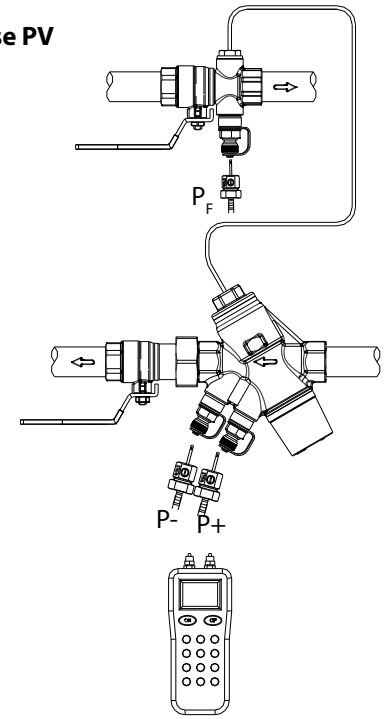
Example

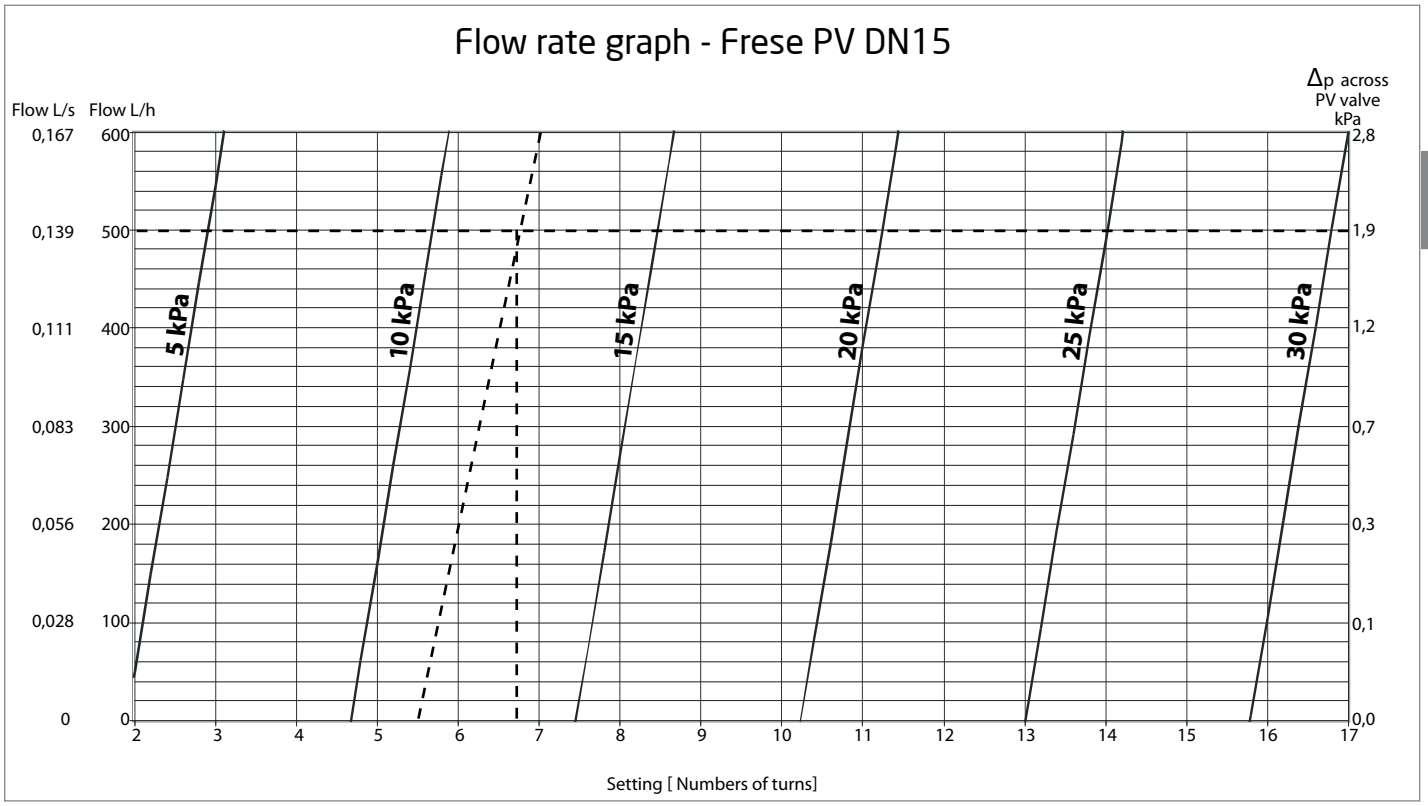
The adjustment setting of the Frese PV+ valve is specified on the basis of the graph. In order to make reading easier the graphs indicating the pressure in the circuit are arranged at intervals of 5 kPa. Still, the graphs can be offset according to the specified pressure of 12 kPa in our circuit.

In the given example we want to maintain 12 kPa in the circuit at a flow rate of 500 l/h. From the intersection of the 12 kPa graph and the horizontal line indicating 500 l/h a line perpendicular to the x-axis is made to read the pre-set value. Now you will see that the valve is to be pre-set by app. 7 turns on the scale.

The minimum pressure drop required will be 1.9 kPa across the valve.
Consequently, the total pressure drop required when rating the pump will be:
$\Delta P_P = \Delta P_S + \Delta P_V = 12 + 1.9 = 13.9$ kPa.
Now the pump can be throttled to operate at its optimum, by measuring from P_F to P- (ΔP_{pump}).
To verify that the calculated secondary pressure drop across the circuit is correct, measurements can be carried out from P_F to P+ , and should read 12 kPa as dimensioned.

Measurement of the differential pressure across the valve





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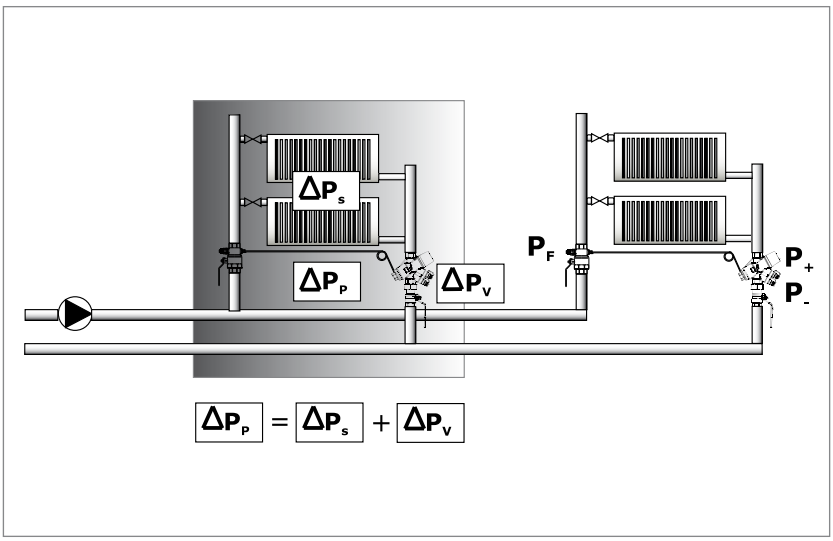
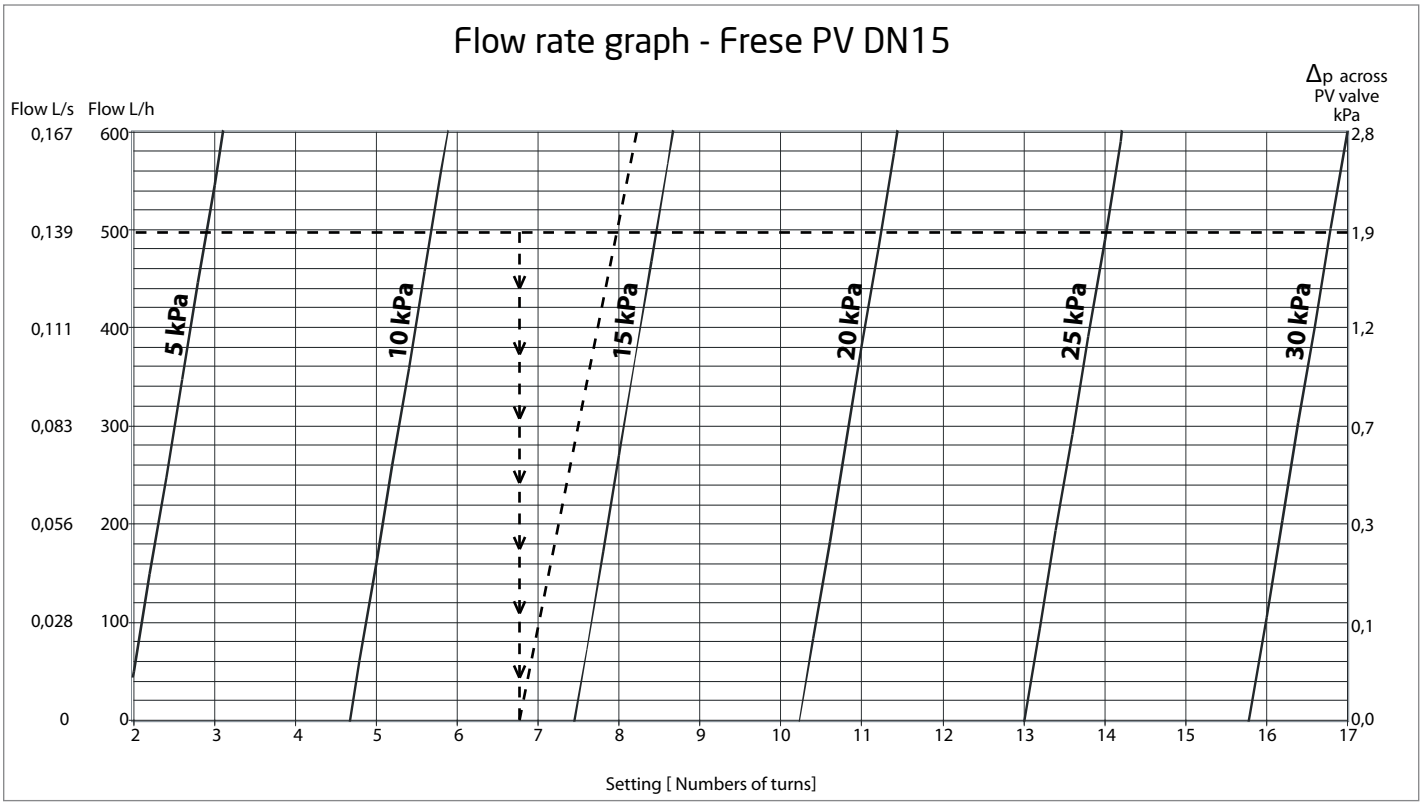
Frese PV
- Adjustable differential pressure control valve

Example

Please note:
As the flow is reduced in the circuit in question the pressure increases in reverse ratio to the flow, which is due to the P-band of the adjustment spring. The valve still compensates for this. However, the pressure will nowhere in the circuit be as high as the pump pressure that would have been available if Frese PV had not been installed.

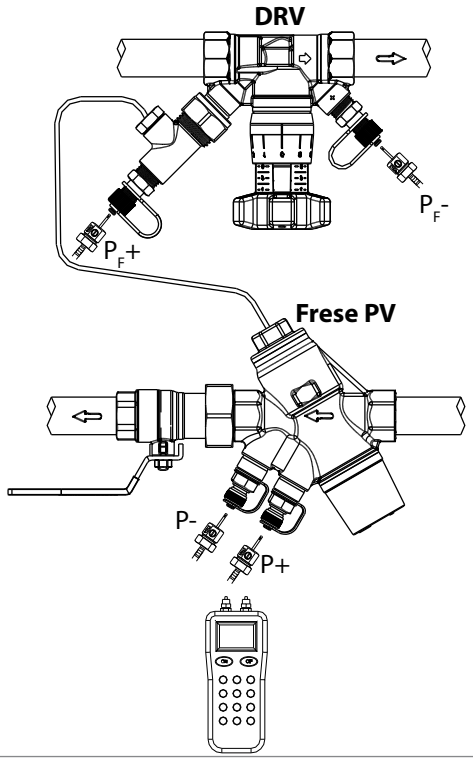
In this example the pressure increases to approx. 14 kPa as the graph is offset parallel to the course of flow. Furthermore, you can always read from the graph what the pressure in the circuit will be like at any flow rate below the rated 500 l/h.





Frese PV
- Adjustable differential pressure control valve

Frese PV & DRV system measurement of differential pressure and flow across the valve



Δp of the system is measured from P_F- to P+. The flow of the system is adjusted on the DRV valve by measuring Δp from P_F+ to P_F- and using the graphs from the DRV Instruction manual.

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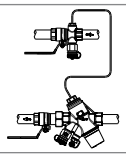
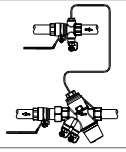
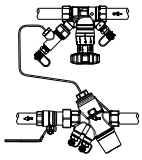
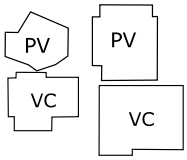
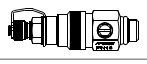
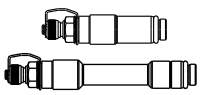
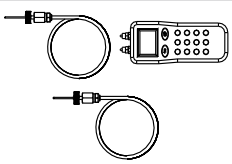
Frese PV
- Adjustable differential pressure control valve

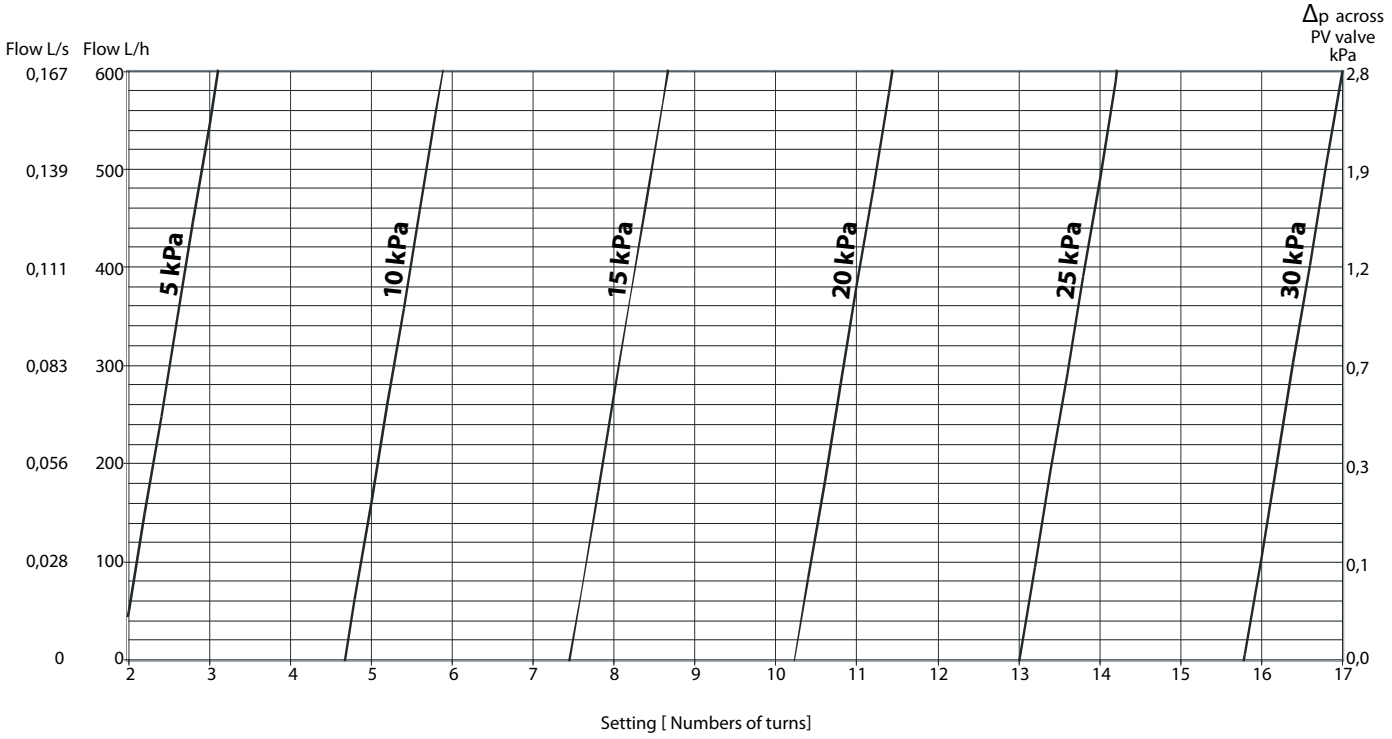
Product programme PV

	Dimension	DN15	DN20	DN25	DN32	DN40	DN50
With isolation ball-valves, 2 drain valves, plug, capillary tube and union connection.		53-3000 (5-30 kPa)	53-3001 (5-30 kPa)	53-3002 (5-30 kPa)	53-3003 (20-80 kPa)	53-3004 (20-80 kPa)	53-3005 (20-80 kPa)
With isolation ball-valves, 1" P/T plugs, capillary tube and union connection.		53-3010 (5-30 kPa) 53-3016 (20-60 kPa)	53-3011 (5-30 kPa) 53-3017 (20-60 kPa)	53-3012 (5-30 kPa) 53-3018 (20-60 kPa)	53-3013 (20-80 kPa)	53-3014 (20-80 kPa)	53-3015 (20-80 kPa)
With DRV, 1" P/T plugs, capillary tube and union connection. Adjust DRV according to Mounting instruction.		53-3030 (5-30 kPa) 53-3031 (20-60 kPa)	53-3032 (5-30 kPa) 53-3033 (20-60 kPa)	53-3034 (5-30 kPa) 53-3035 (20-60 kPa)	53-3036 (20-80 kPa)	53-3037 (20-80 kPa)	53-3038 (20-80 kPa)

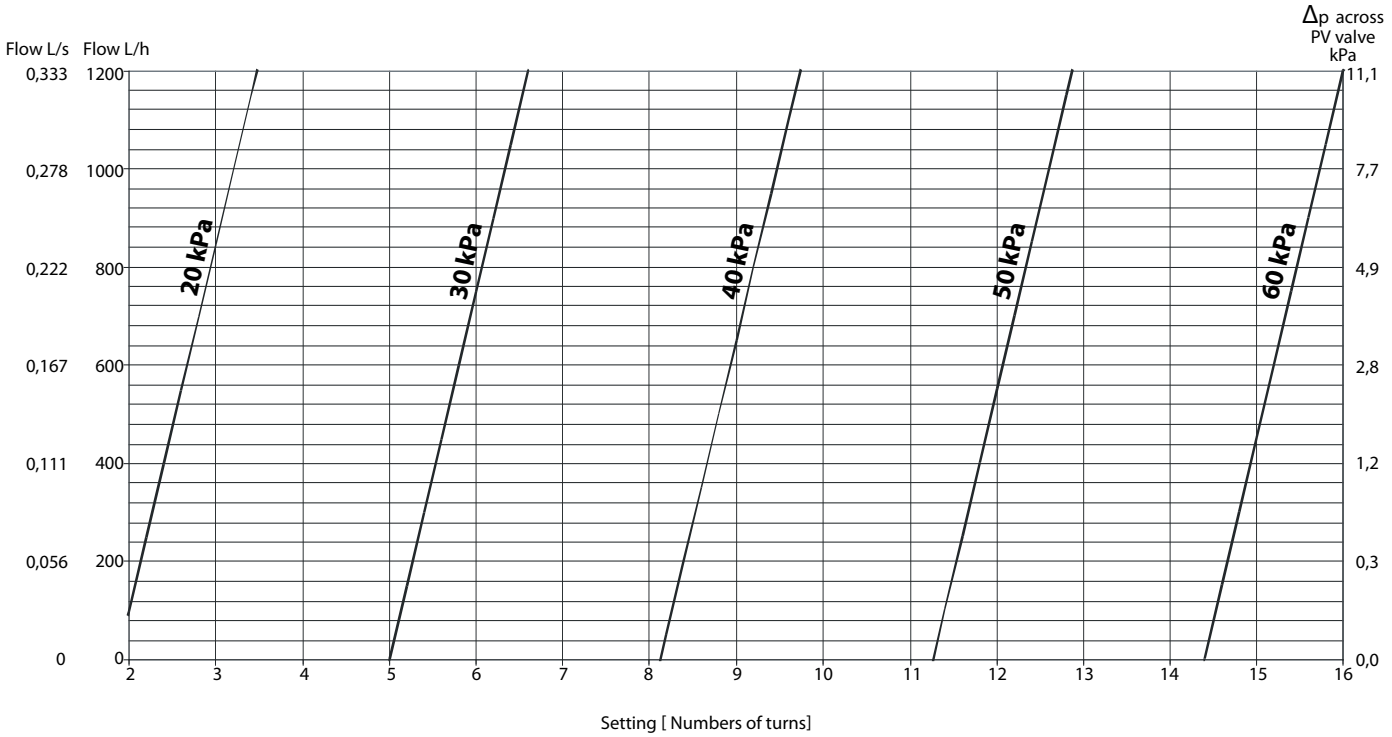
Accessories		Frese no.	Dim./DN	
Insulation jackets		38-0845	PV	15/20/25
		38-0854	PV	32/40/50
		38-0856	VC	15/20/25
		38-0848	VC	32/40/50
Spindle extension		46-1072 46-1073 46-1074 46-1075		15/20 25 32/40 50
Frese capillary tube 3mm x 1000 mm		48-0004		
Drain valve		48-0009		1/4" x 1/2
Plug		09-0548		
Combi drain valve		48-0015		1/4" x 1/2
P/T plugs Blue strip		48-0012 48-0013 48-0014		1/4" x 1" 1/4" x 2" 1/4" x 4"
Red strip		48-0018 48-0019 48-0021		1/4" x 1" 1/4" x 2" 1/4" x 4"
Frese manometer 2023P Digital differential pressure manometer hose kit and needles.		48-0022		
Hose kit incl. needles		48-0016		

Frese PV
- Adjustable differential pressure control valve

Frese PV DN15, 5-30 kPa



Frese PV DN15, 20-60 kPa



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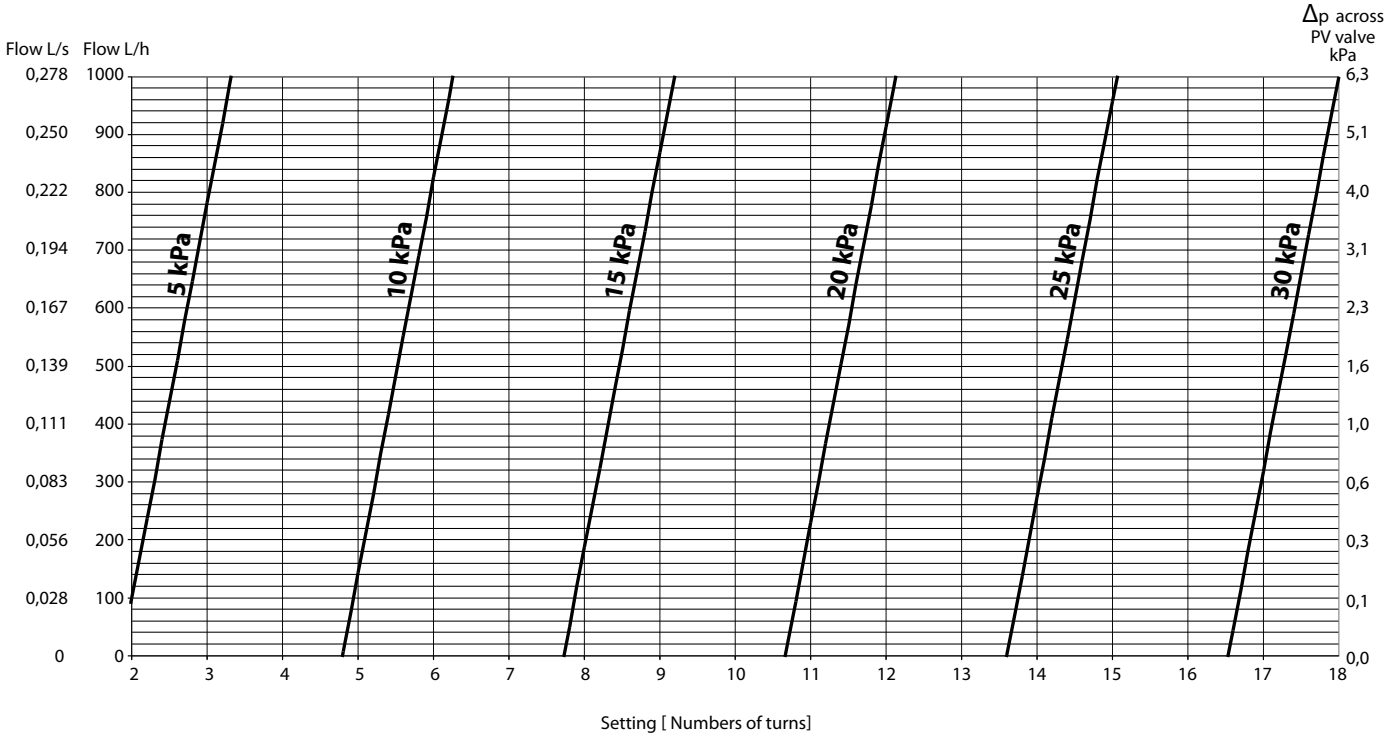
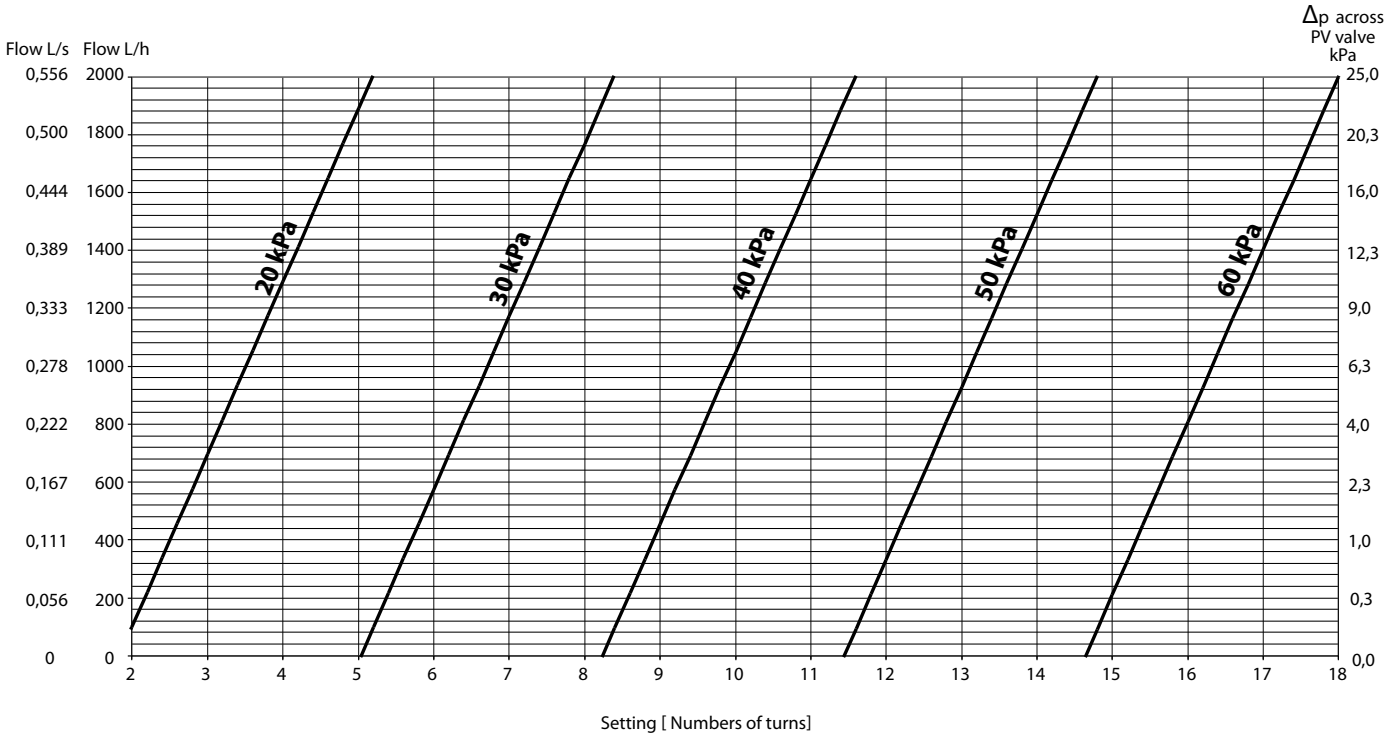
Frese PV
- Adjustable differential pressure control valve

Frese PV DN20, 5-30 kPa

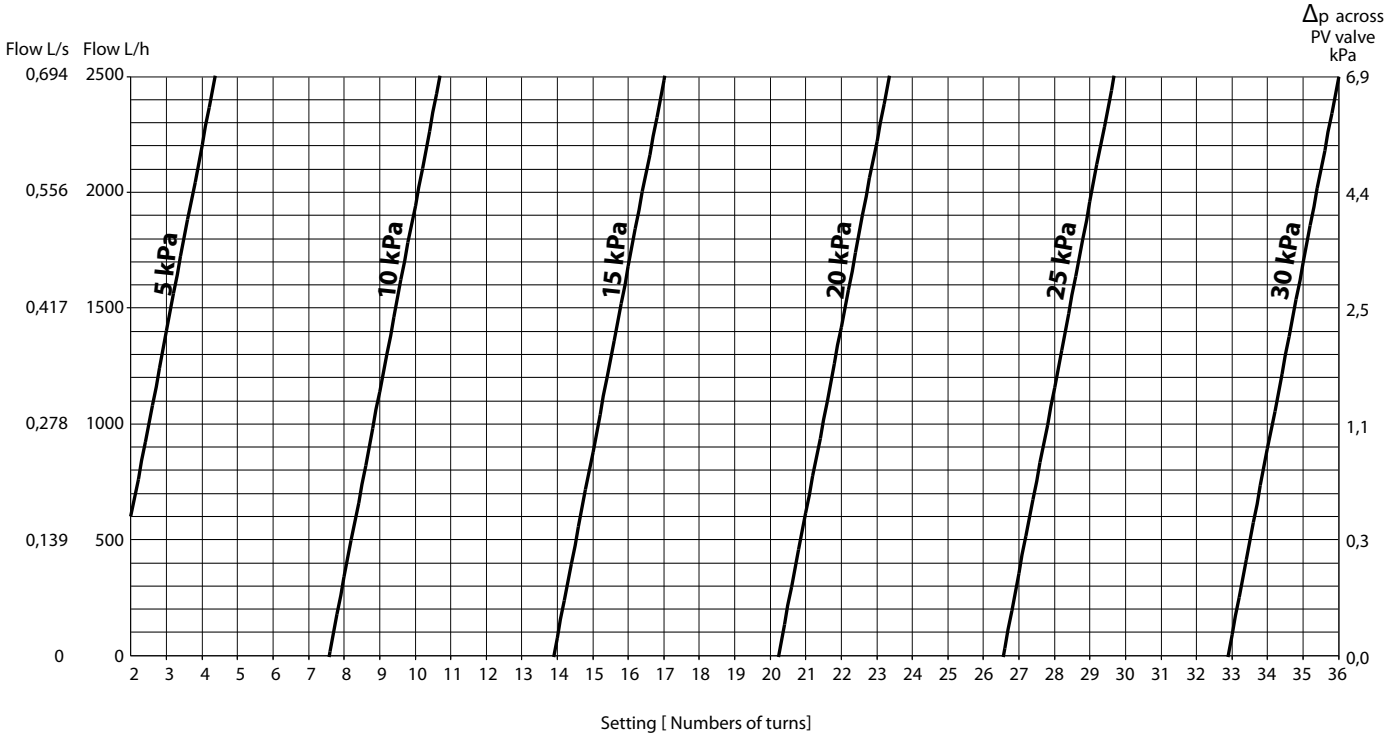


Frese PV DN20, 20-60 kPa

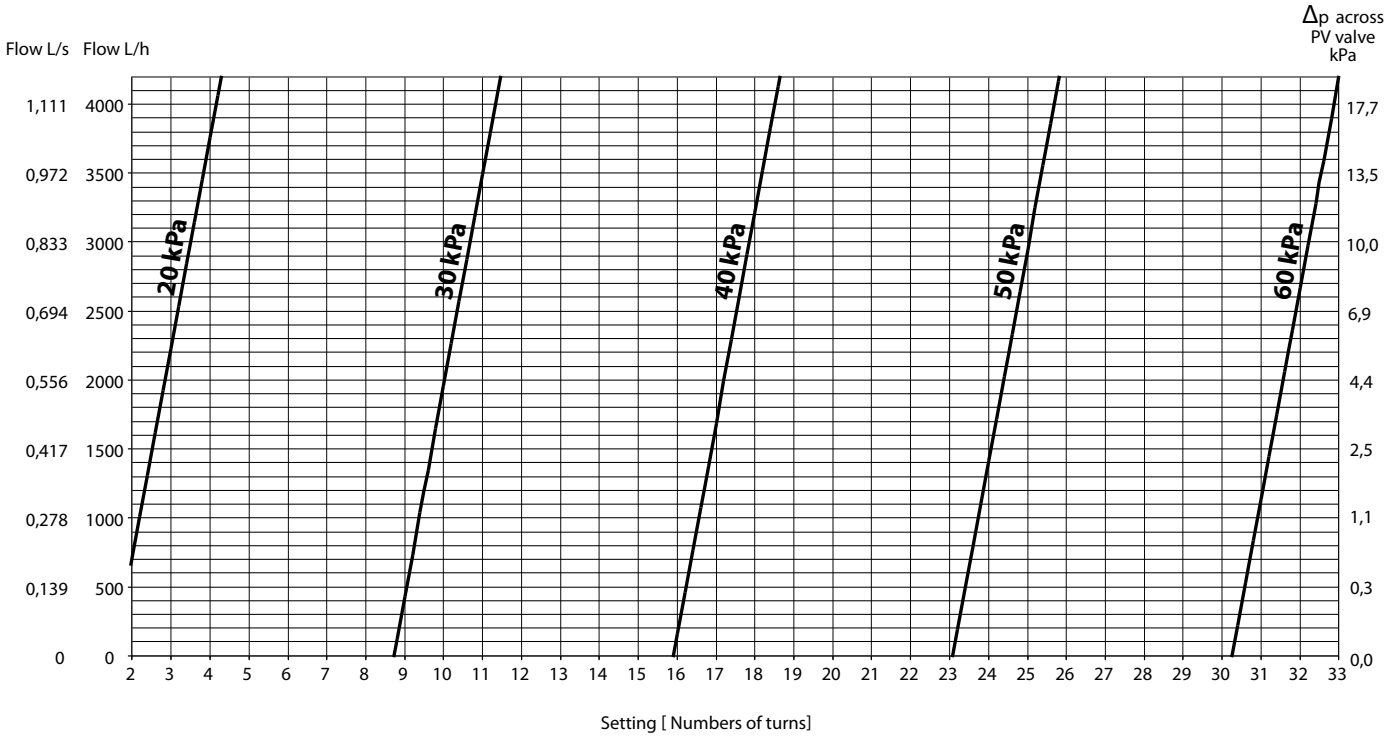


Frese PV
- Adjustable differential pressure control valve

Frese PV DN25, 5-30 kPa



Frese PV DN25, 20-60 kPa



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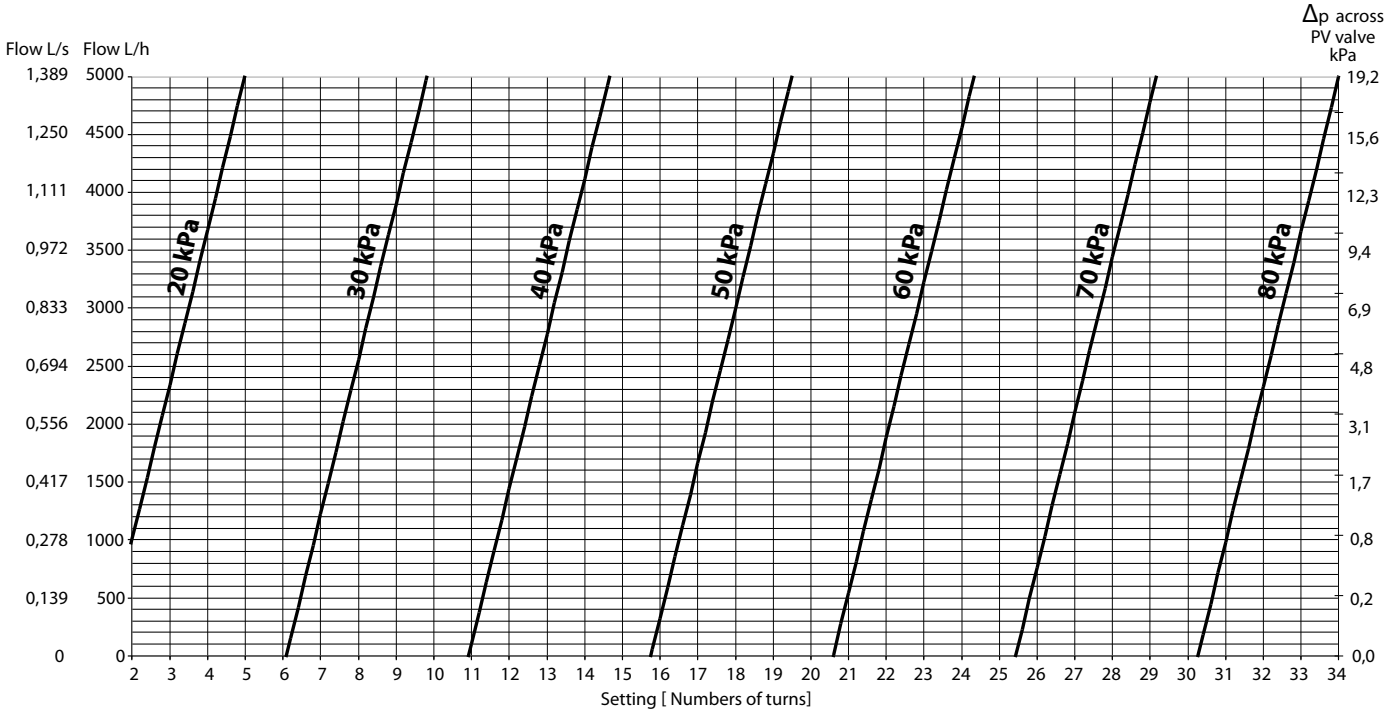
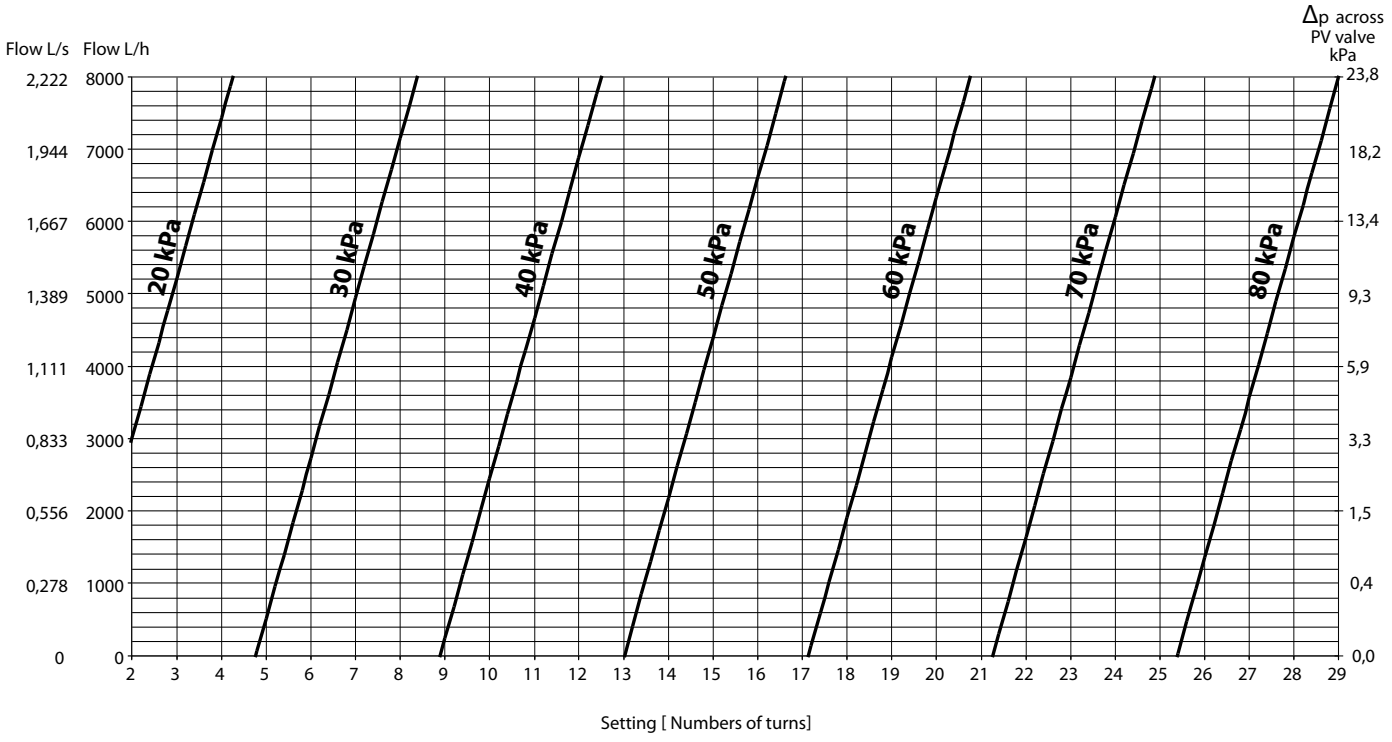
Frese PV
- Adjustable differential pressure control valve

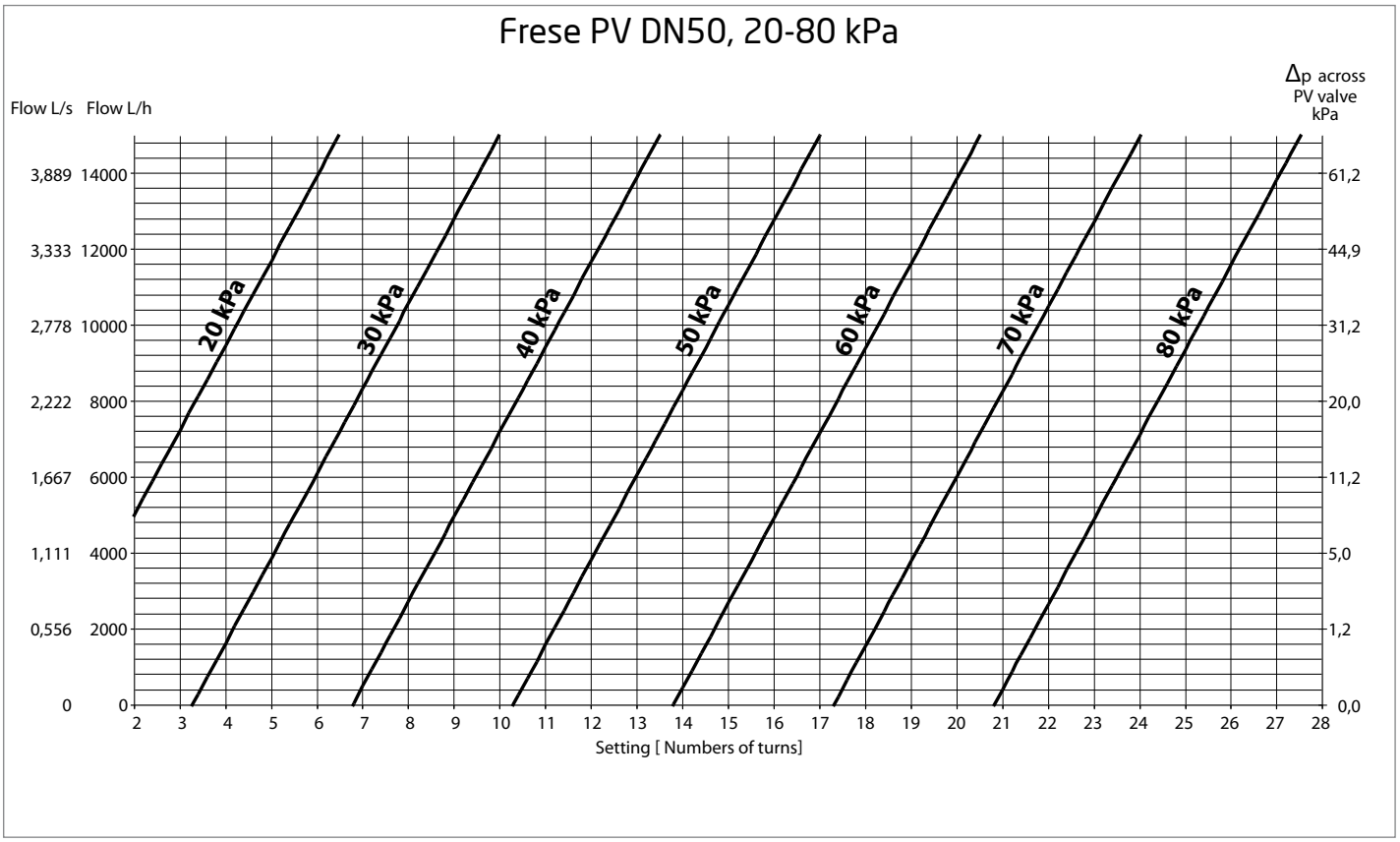
Frese PV DN32, 20-80 kPa



Frese PV DN40, 20-80 kPa



Frese PV
- Adjustable differential pressure control valve



Text for technical specifications

The valve should be a dynamic difference control valve with the option of setting the differential pressure on site without suspension of operation.

The valve should limit the differential pressure in a circuit.

The valve should include optional P/T plugs for the verification of differential pressure in circuit and across the valve.

The valve scale should only be adjustable by means of a key.

The valve should be permanently marked with an indicator for flow direction.

Pressure rating PN16.

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Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Application

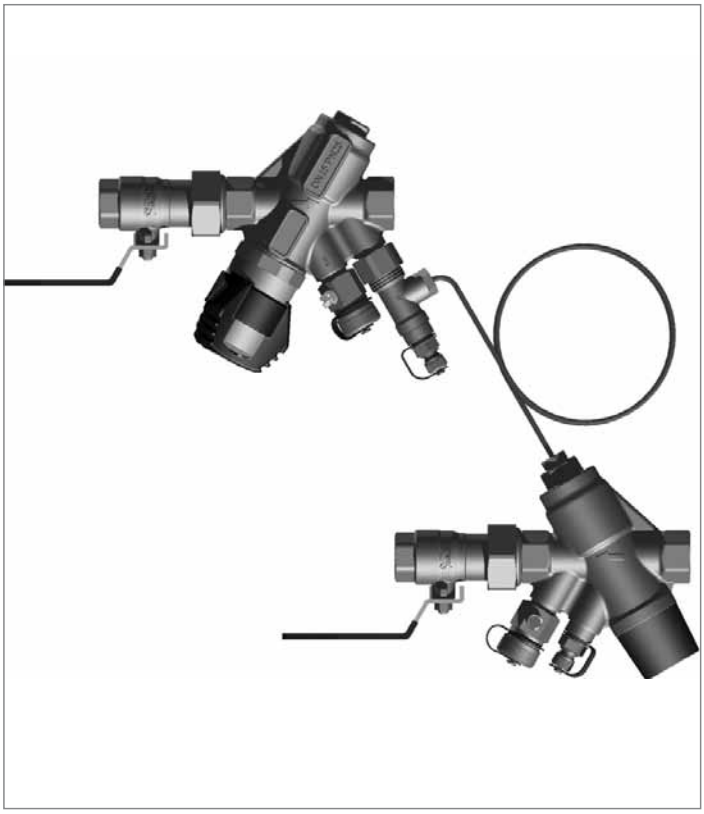
Frese PVS system can be installed in domestic and commercial heating and cooling systems.

Frese PVS system is a dynamic valve arrangement designed to regulate flow and differential pressure using the Frese S dynamic balancing valve positioned in the flow, and the Frese PV differential pressure control valve positioned in the return.

The PVS is supplied with capillary tube, isolation valves, drain valves, P/T plugs and unions as standard.

Frese PVS system ensures 100% flow and differential pressure regulation under all conditions, irrespective of any changes within the system, providing simple and trouble free commissioning.

The Frese PVS system operates by limiting the flow in the system and eliminating any noise caused by excess differential pressure.



Benefits

- Flow and differential pressure can be adjusted independently of each other.
- Setting the differential pressure can be easily adjusted after installation.
- Tamperproof presetting device fitted on the top of the valve.
- Simple presetting of flow and pressure.
- No additional commissioning required if the system design is changed.
- High levels of comfort and energy savings for the end user.

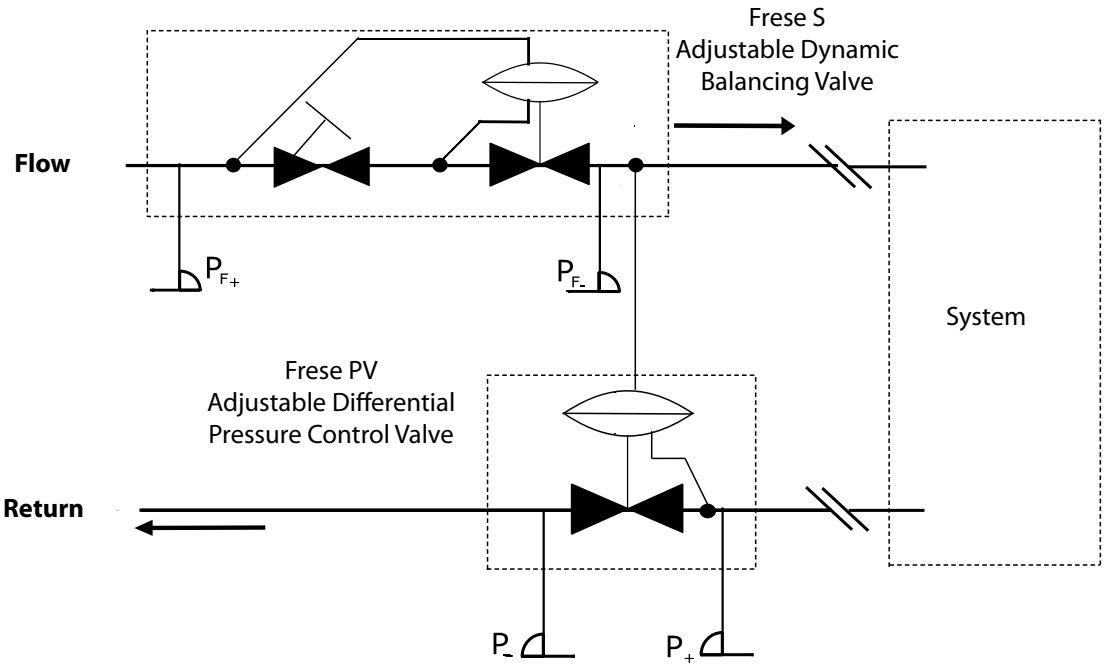
Features

- Size range: DN15 to DN50
- Maximum flow: 10.3m^3/h
- Maximum differential pressure 250kPa/400kPa
- Setting range: 5kPa to 80kPa
- Differential pressure regulation, flow regulation, isolation, drain and PT plugs as standard

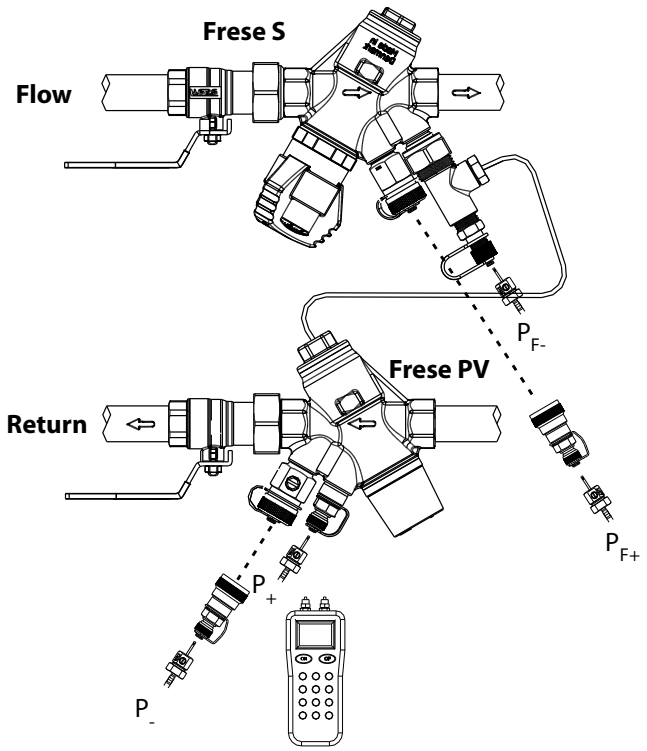
Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Design Frese PVS

Simplified outline Frese PVS



Frese PVS system measurement of differential pressure and flow across the valve



Design flow: Q is adjusted directly on Frese S (see graphs on the Pre-set diagram)

Differential pressure : ΔP_S is adjusted directly on Frese PV (see graphs on the Pre-set diagram)

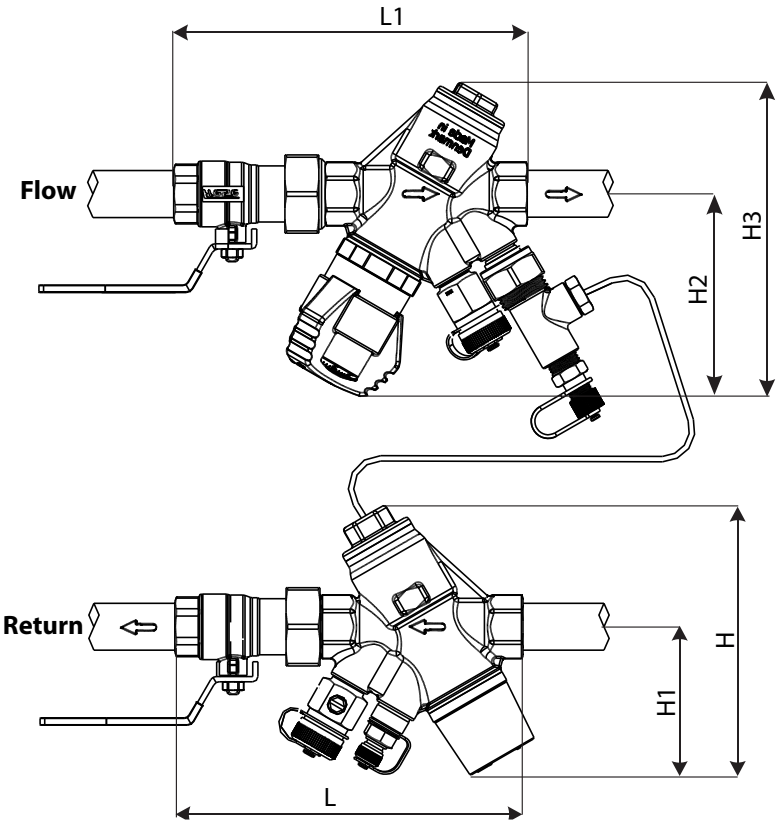
The flow in the system is verified by measuring minimum differential pressure (min. Δp) is available across the Frese S valve.
Measured from P_{F+} to P_{F-} (see graphs on the Pre-set diagram)

Δp of the system is measured from P_{F-} to P_+.

Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Technical data

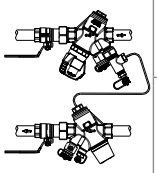
Housing: DZR, Brass CW602N
DP controller: PPS 40% glass
Flow setting: PPO
Spring: Stainless steel
Diaghragm: HNBR
O-rings: EPDM
Pressure class: PN16
Max. differential pressure: LP = 250 kPa
HP = 400 kPa
Temperature range: -10°C to + 120°C
Capillary tube: Ø3, L = 1000mm

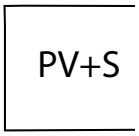


Type		Frese PVS								
Application		Two-pipe system								
Dimension		**DN15**		**DN20**		**DN25**		**DN32**	**DN40**	**DN50**
Version		LP	HP	LP	HP	LP	HP	HP	HP	HP
Control range	[kPa]	5-30	20-60	5-30	20-60	5-30	20-60	20-80	20-80	20-80
Pressure range	[kPa]	9-250	22-400	9-250	22-400	12-250	22-400	38-400	45-400	54-400
Flow rate [l/s]	PV	0,014-0,167	0,028-0,333	0,028-0,278	0,042-0,556	0,167-0,694	0,194-1,167	0,278-1,389	0,833-2,222	1,389-4,167
	S	0,007-0,223	0,011-0,306	0,011-0,351	0,018-0,512	0,017-0,462	0,025-0,653	0,060-1,328	0,049-2,067	0,122-2,868
	PVS	**0,014-0,167**	**0,028-0,306**	**0,028-0,278**	**0,042-0,512**	**0,167-0,462**	**0,194-0,653**	**0,278-1,328**	**0,833-2,067**	**1,389-2,868**
Dimension mm	L	167		173		232		235	257	286
	H	127		130		166		166	184	196
	H1	70		73		91		91	97	106
	L1	167		173		202		235	257	286
	H2	96		98		102		115	119	126
	H3	148		151		155		188	206	219

Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Product programme PVS

	Dimension	DN15	DN20	DN25	DN32	DN40	DN50
Frese PVS with 2 isolation valves, 2 drain valves, P/T plugs, capillary tube and union connections.		Frese PVS - LP 53-3040 Frese PV, 5-30 kPa & Frese S, LP	Frese PVS - LP 53-3041 Frese PV, 5-30 kPa & Frese S, LP	Frese PVS - LP 53-3042 Frese PV, 5-30 kPa & Frese S, LP	Frese PVS HP 53-3023 Frese PV, 20-80 kPa & Frese S, HP	Frese PVS HP 53-3024 Frese PV, 20-80 kPa & Frese S, HP	Frese PVS HP 53-3025 Frese PV, 20-80 kPa & Frese S, HP
		Frese PVS - HP 53-3026 Frese PV, 20-60 kPa & Frese S, HP	Frese PVS - HP 53-3027 Frese PV, 20-60 kPa & Frese S, HP	Frese PVS - HP 53-3028 Frese PV, 20-60 kPa & Frese S ,HP			

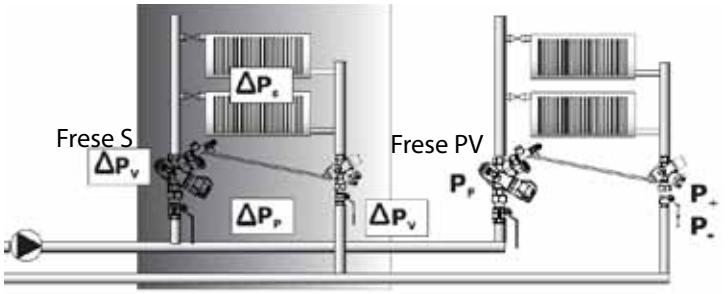
Accessories		Frese no.	Dim./DN
Insulation jackets	PV+S  PV+S	38-0845 38-0854	15/20/25 32/40/50
Spindle extension		46-1072 46-1073 46-1074 46-1075	15/20 25 32/40 50

Example

Please note:
As the flow is reduced in the circuit in question the pressure increases in reverse ratio to the flow, which is due to the P-band of the adjustment spring. The valve still compensates for this.

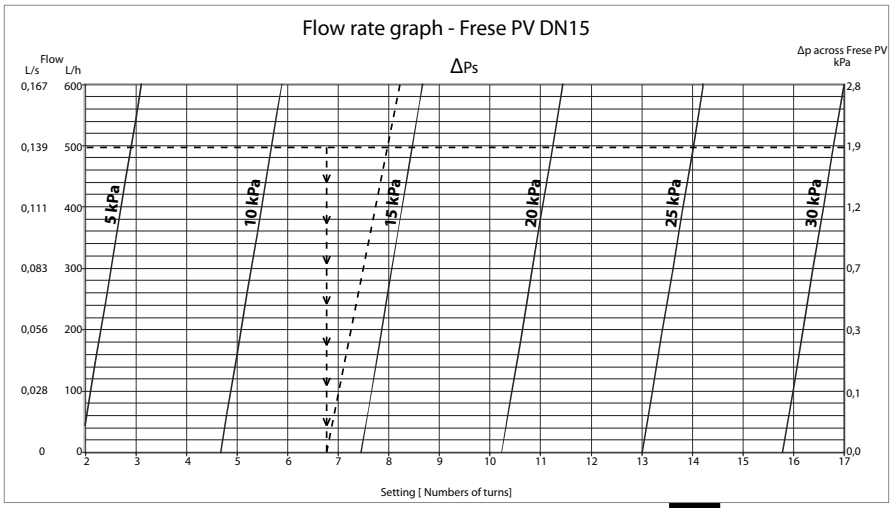
However, the pressure will nowhere in the circuit be as high as the pump pressure that would have been available if Frese PV had not been installed.

In this example the pressure increases to approx. 14 kPa as the graph is offset parallel to the course of flow. Furthermore, you can always read from the graph what the pressure in the circuit will be like at any flow rate below the rated 500 l/h.



$\Delta P_p = \Delta P_s + \Delta P_v$

ΔPp = Pump pressure
ΔPs = Differential pressure
ΔPv = Pressure loss across valve



Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Example

Frese PVS DN15 Low Pressure

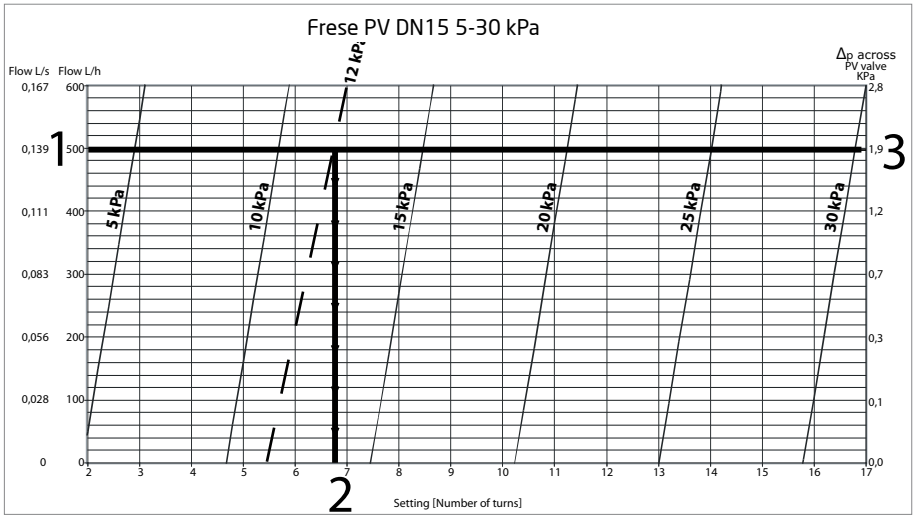
Design differential pressure 12 kPa
Design flow 0,139 l/s

Differential pressure setting Frese PV

1. The design flow is used as the point of reference for the setting. (See the graph)

2. In order to make reading easier the graphs indicating the pressure in the circuit are arranged at intervals of 5 kPa. Still, the graphs can be offset according to the specified pressure of 12 kPa in our circuit.
From the intersection of the 12 kPa graph and the horizontal line indicating 0,139 l/s a line perpendicular to the x-axis is made to read the pre-set value.
Pre-set app. 7 turns on the scale.

3. The minimum pressure drop required will be 1.9 kPa across the valve. (ΔP_{V2})

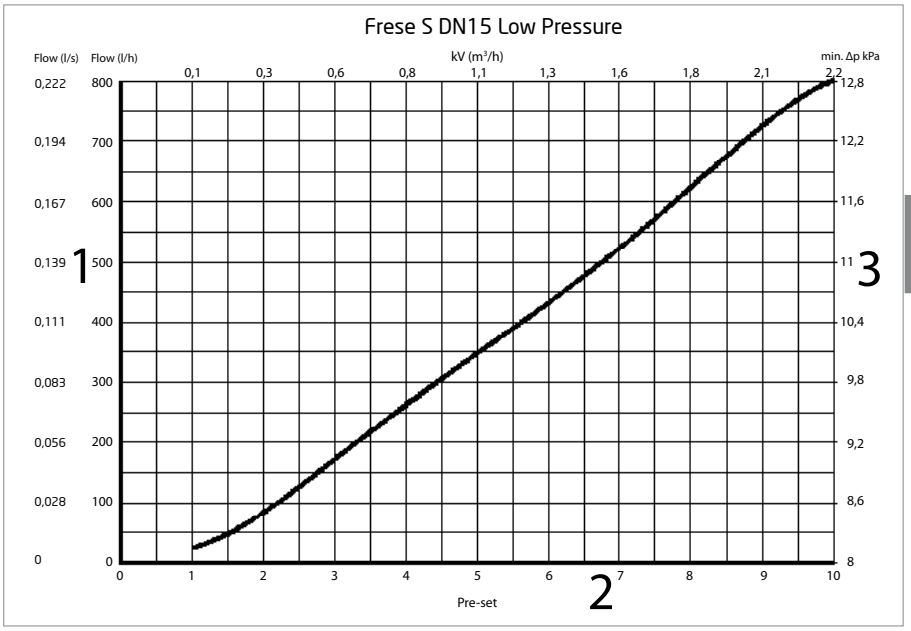


Flow setting Frese S

1. The design flow is used as the point of reference for the setting. (See the graph)

2. The pre-setting for the valve is found by means of the flow rate graph.
Setting = 6.7

3. The minimum pressure drop required will be 11 kPa across the valve. (ΔP_{V1})

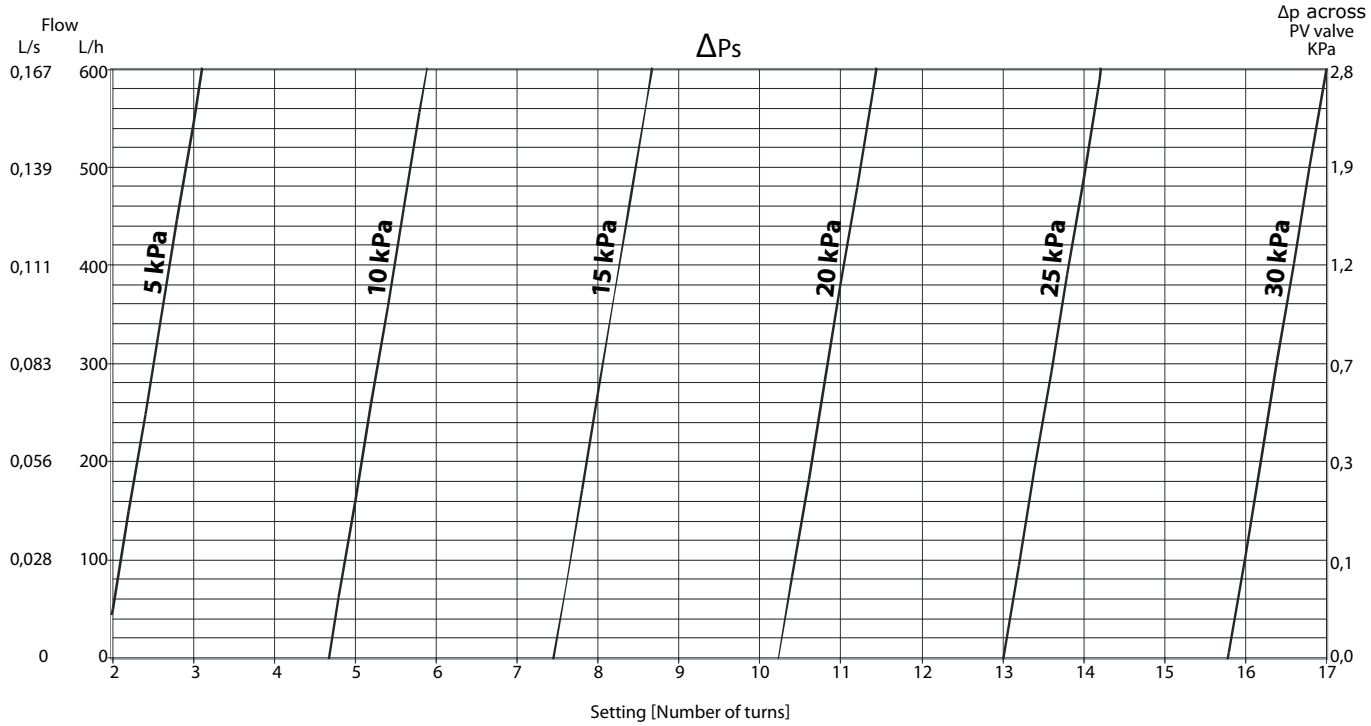


Total pump pressure
Calculation of the total pump pressure:
$\Delta Pp = \Delta Ps + (\Delta P_{V1+V2})$
$\Delta Pp = 12\ kPa + (11\ kPa + 1,9\ kPa) = 24,9\ kPa$

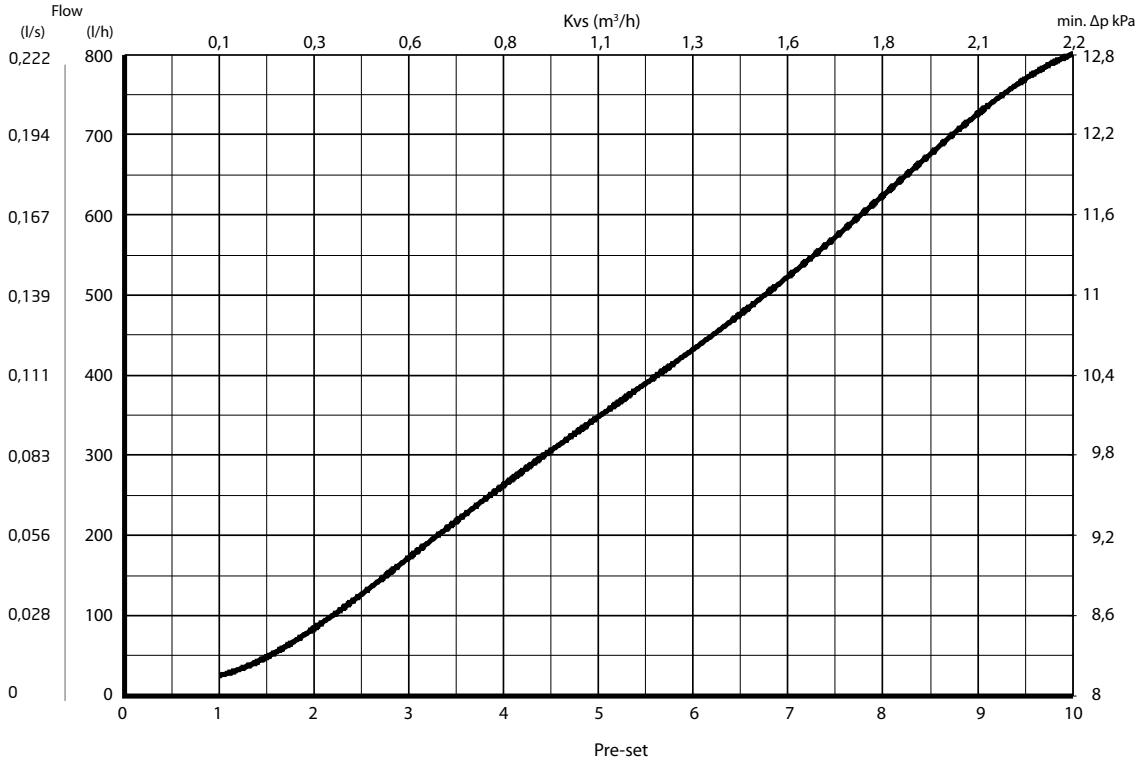
8

Frese PVS DN15 LP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN15 5-30 kPa

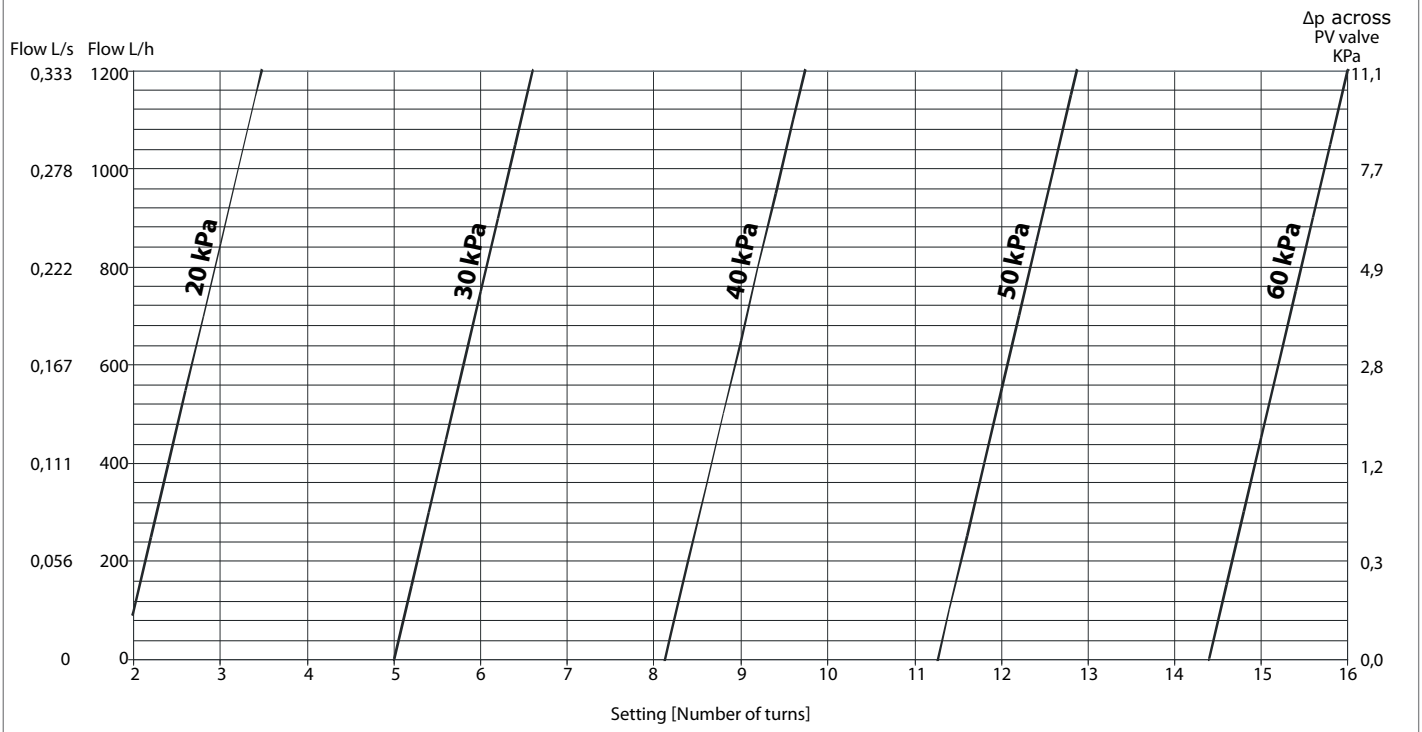


Frese S DN15 Low Pressure

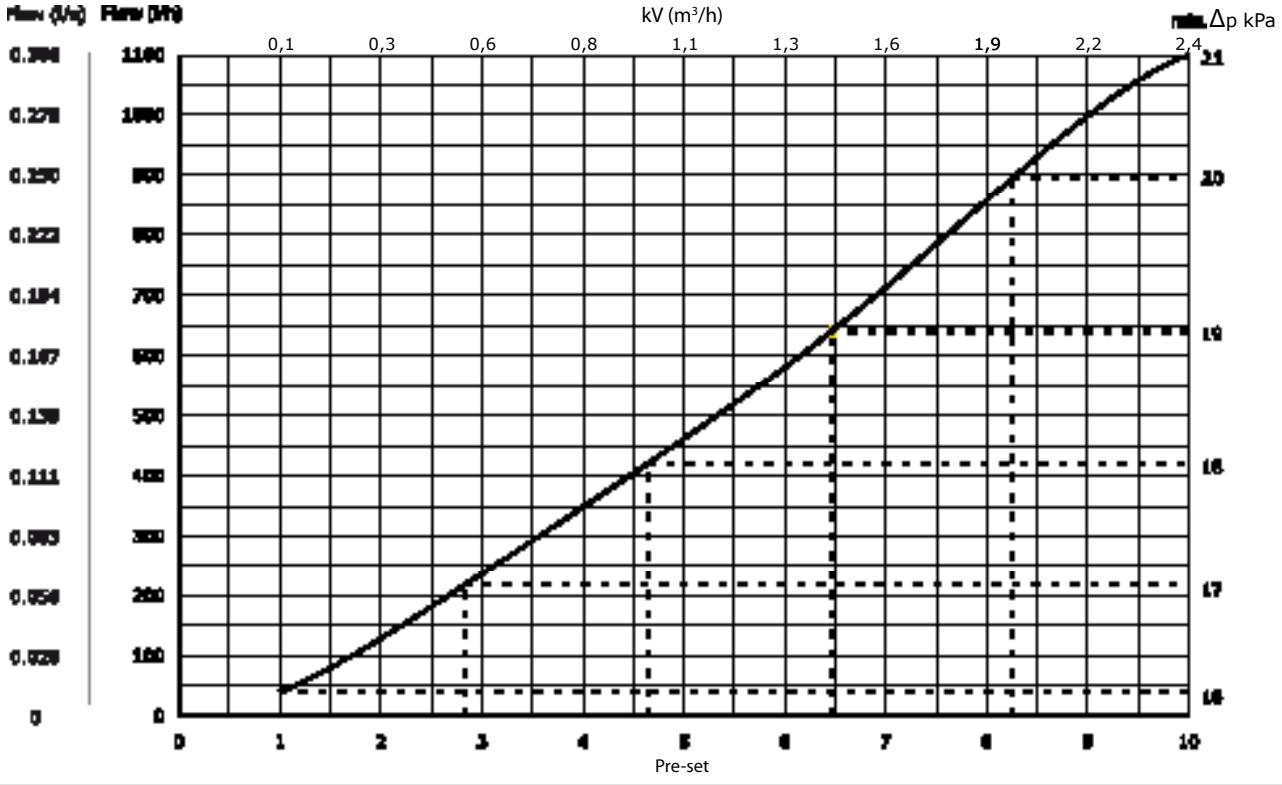


Frese PVS DN15 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN15 20-60 kPa



Frese S DN15 High Pressure



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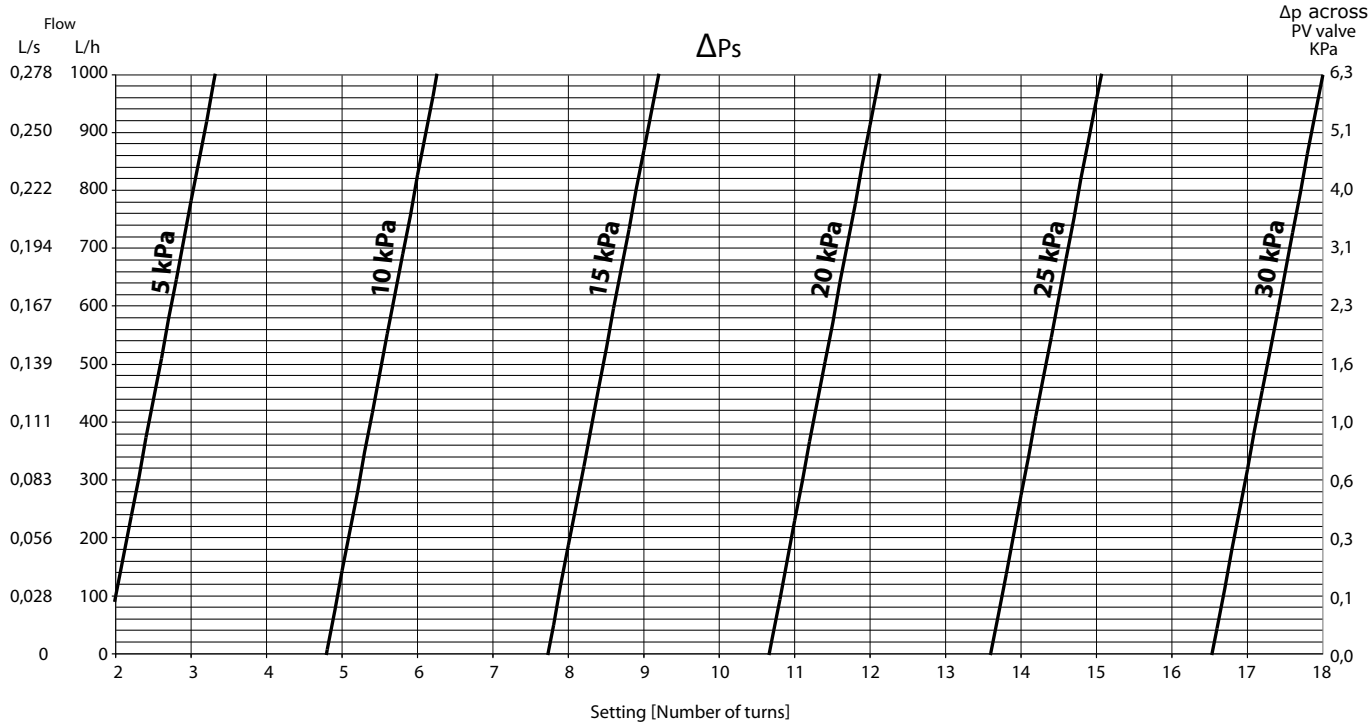
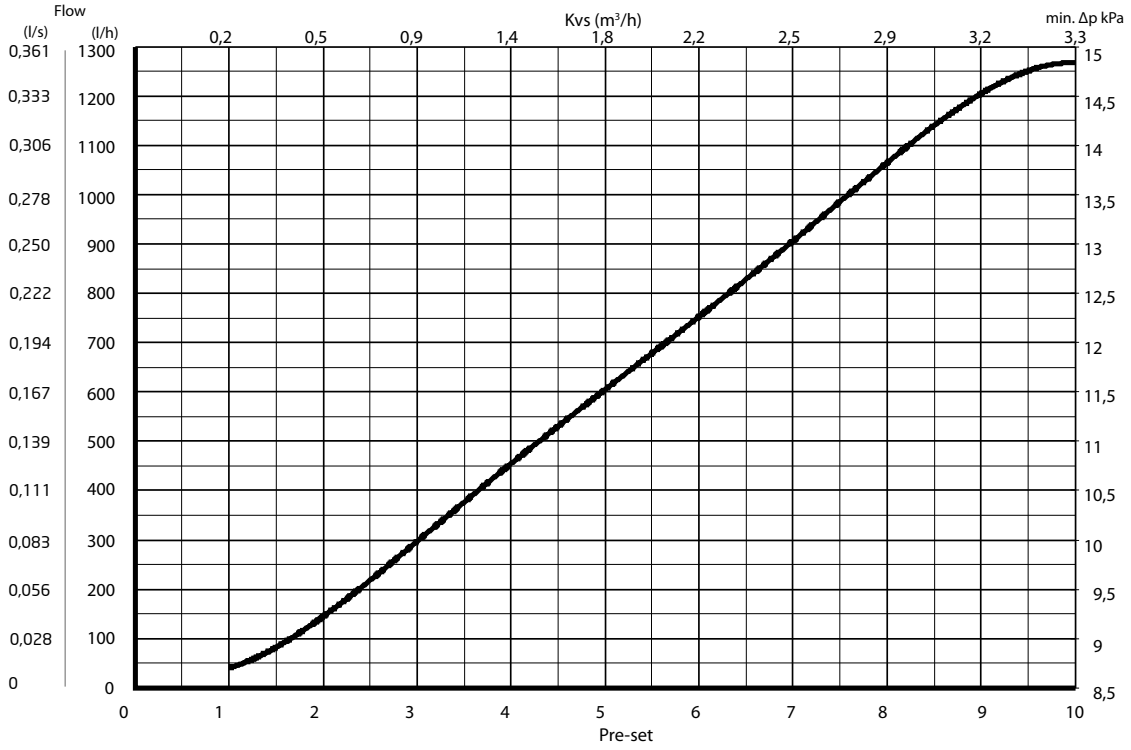
Frese PVS DN20 LP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN20 5-30 kPa

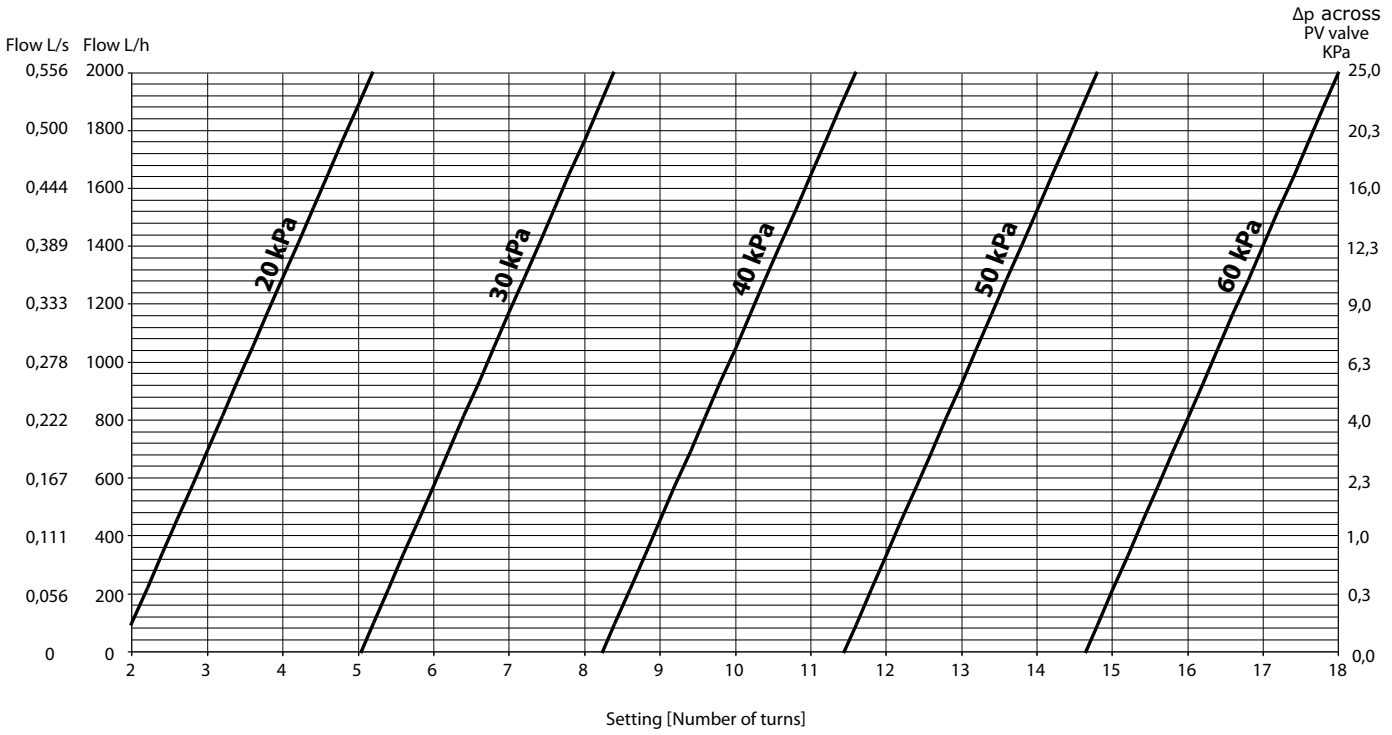


Frese S DN20 Low Pressure

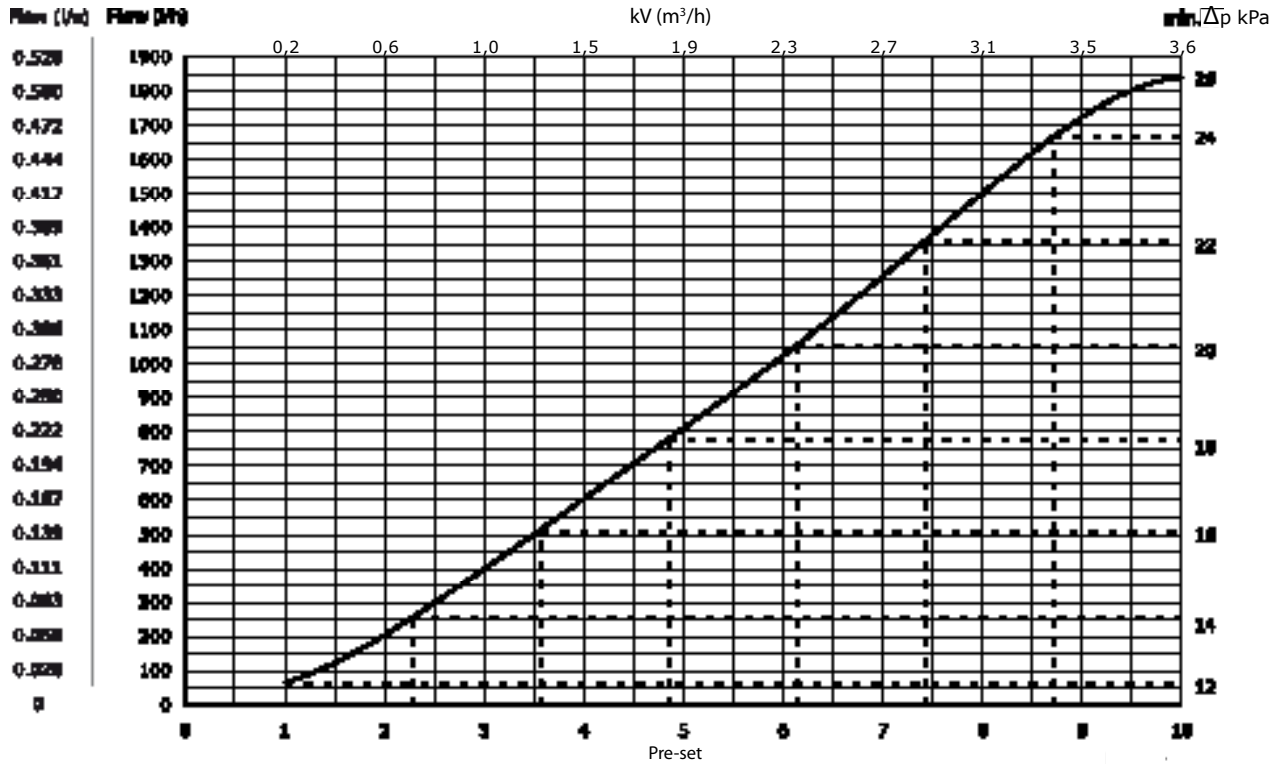


Frese PVS DN20 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN20 20-60 kPa



Frese S DN20 High Pressure



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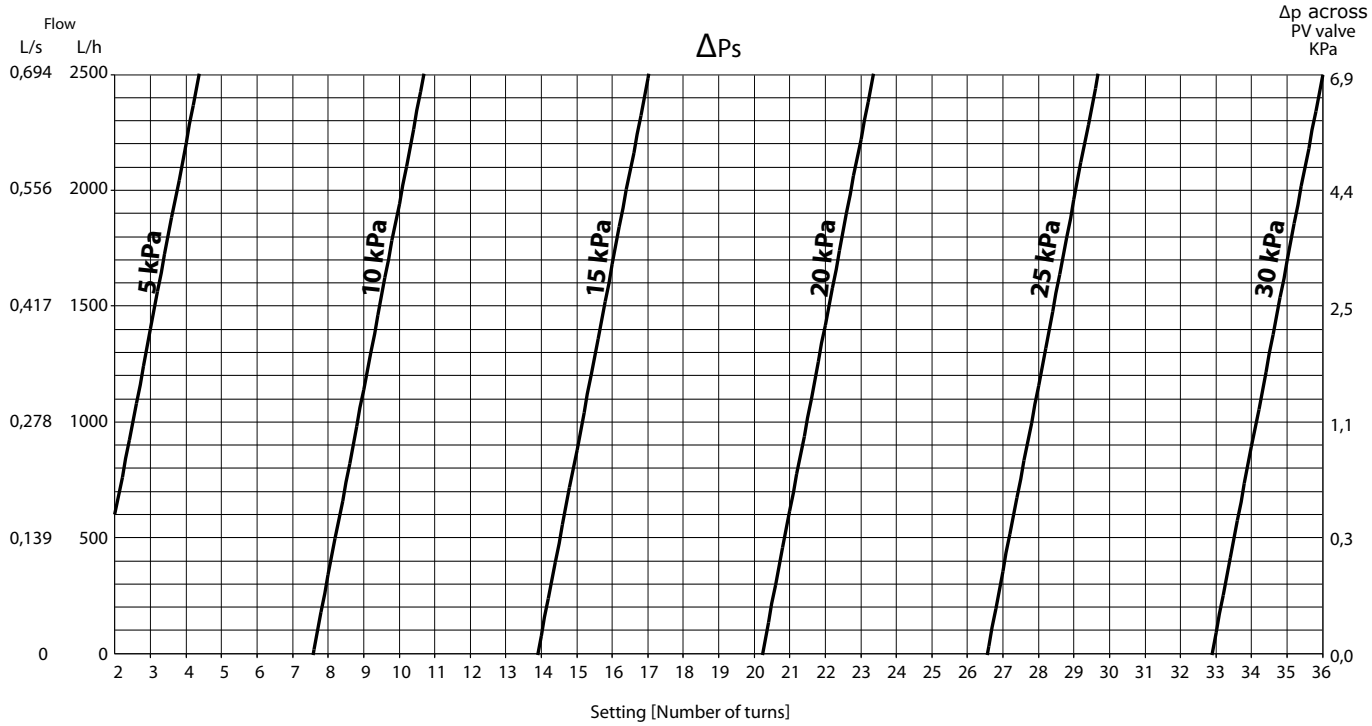
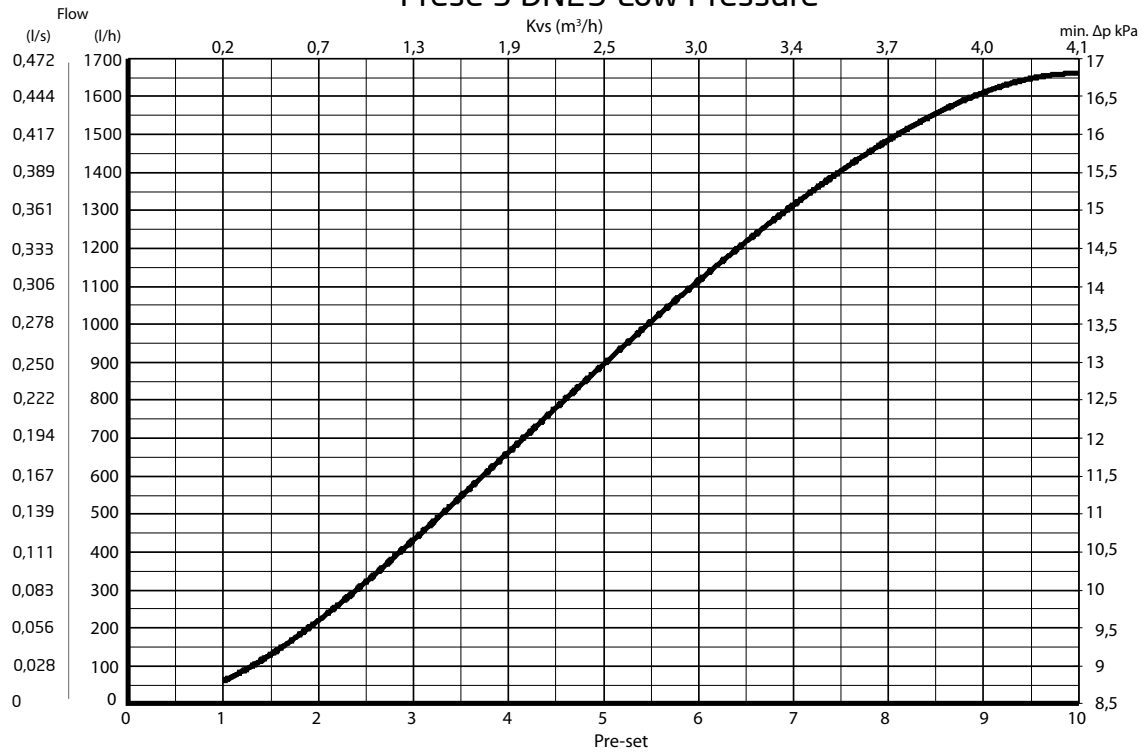
Frese PVS DN25 LP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN25 5-30 kPa

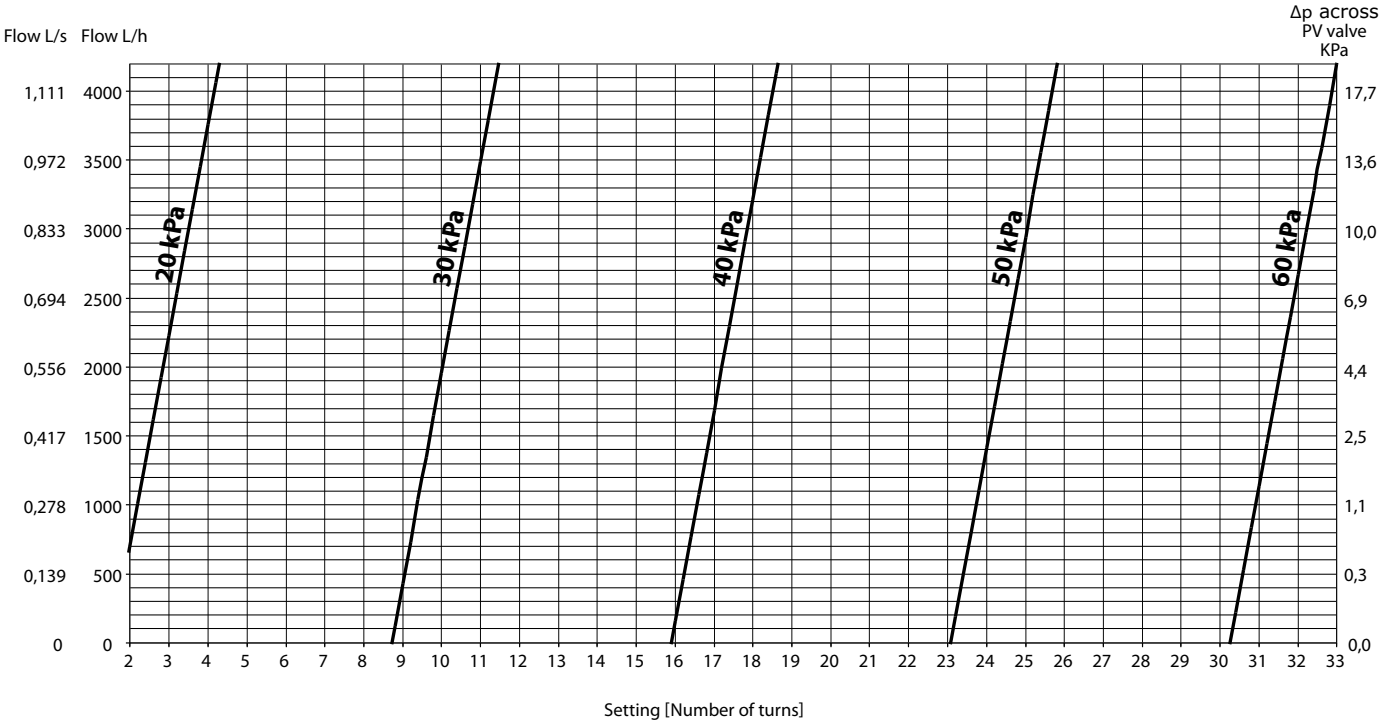


Frese S DN25 Low Pressure

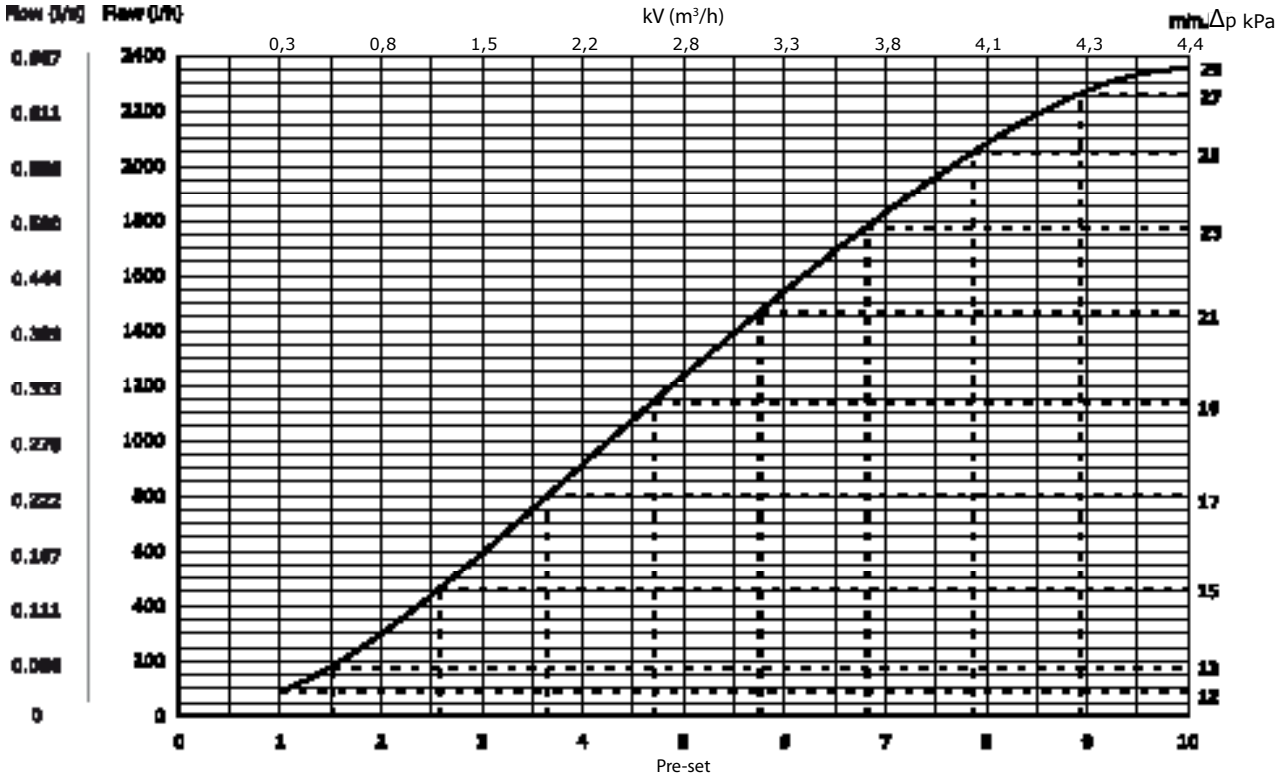


Frese PVS DN25 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN25 20-60 kPa



Frese S DN25 High Pressure



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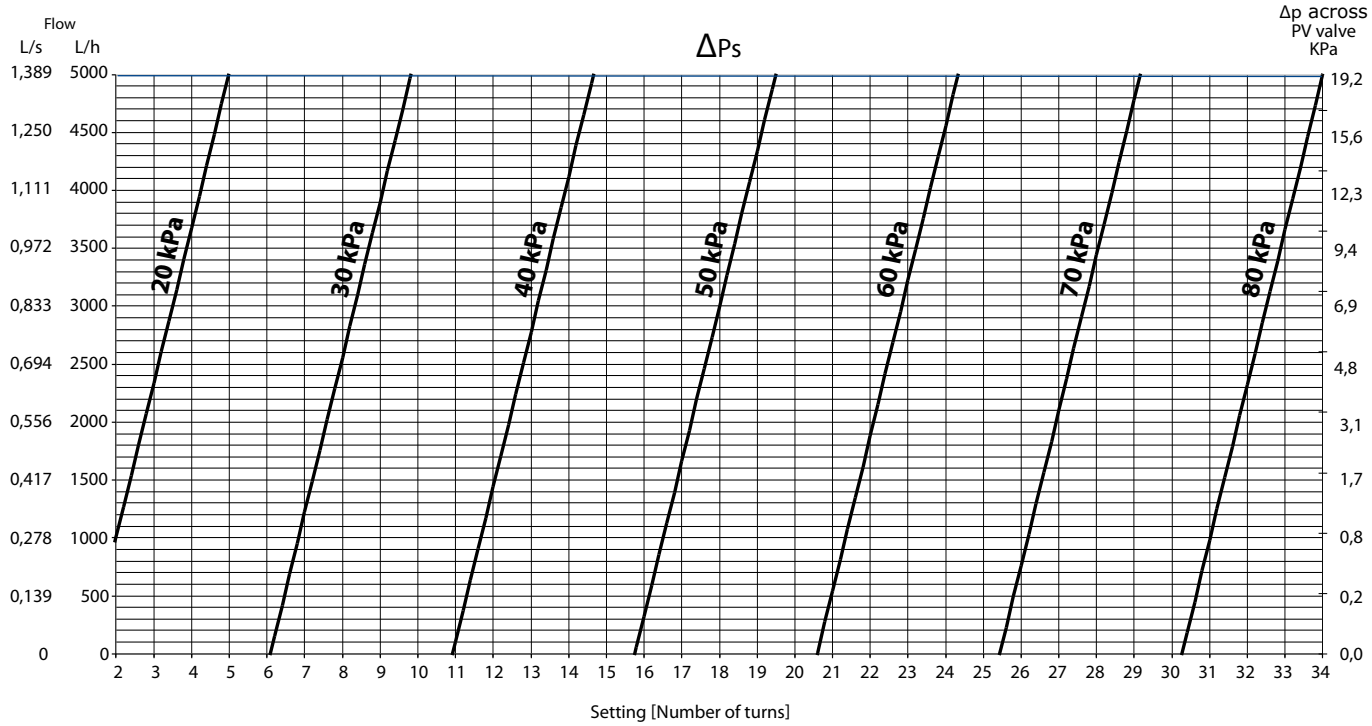
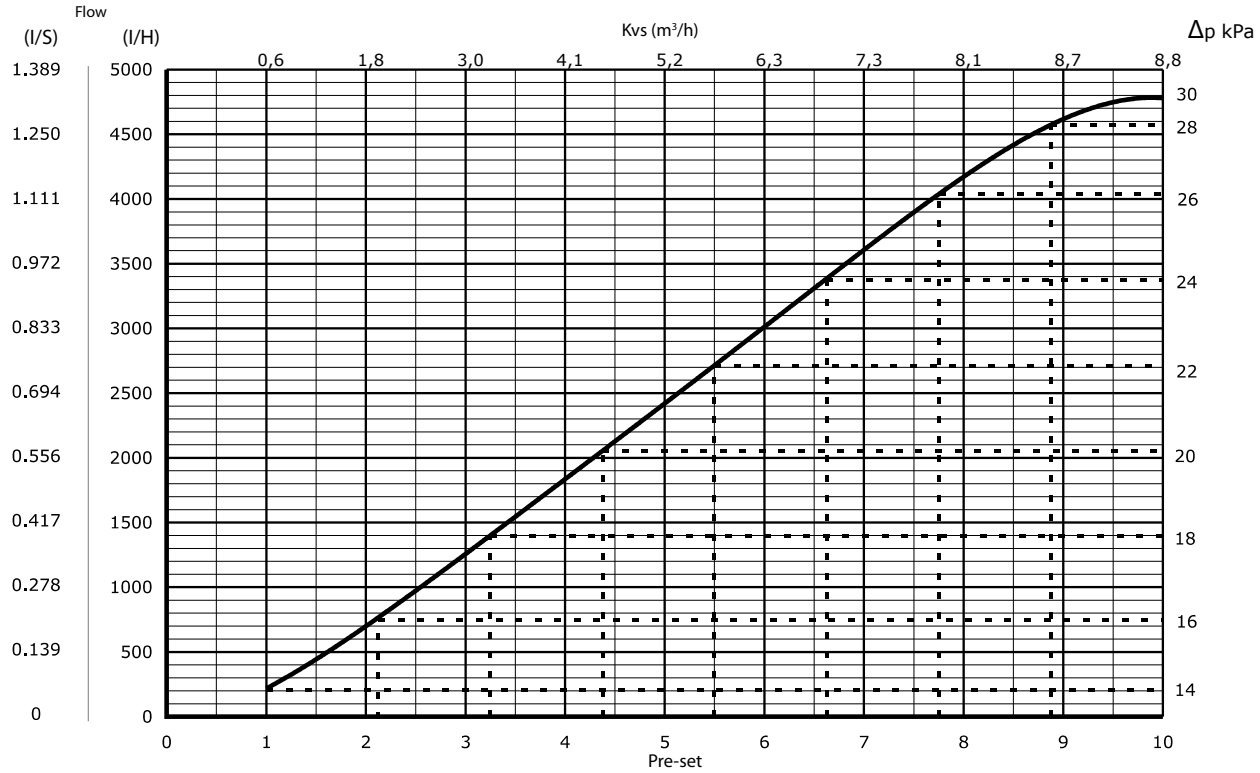
Frese PVS DN32 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN32 20-80 kPa

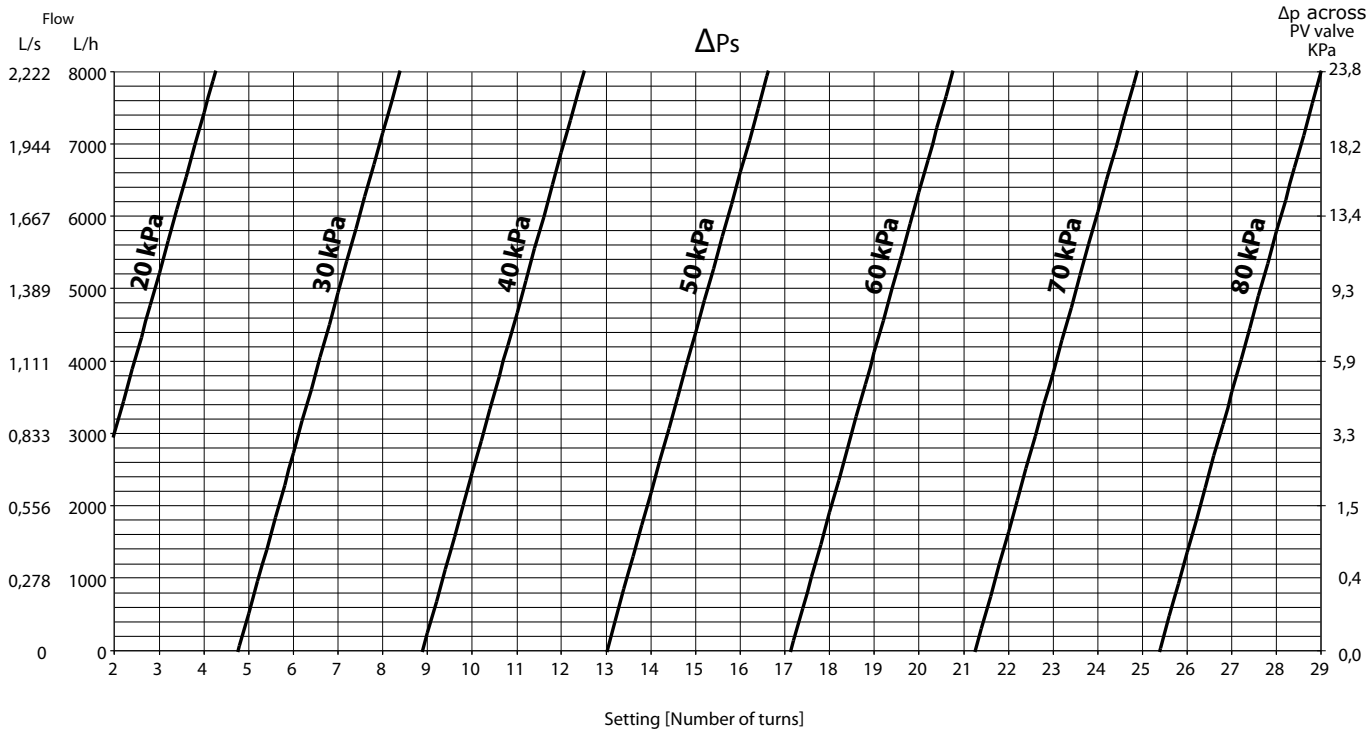


Frese S DN32 High Pressure

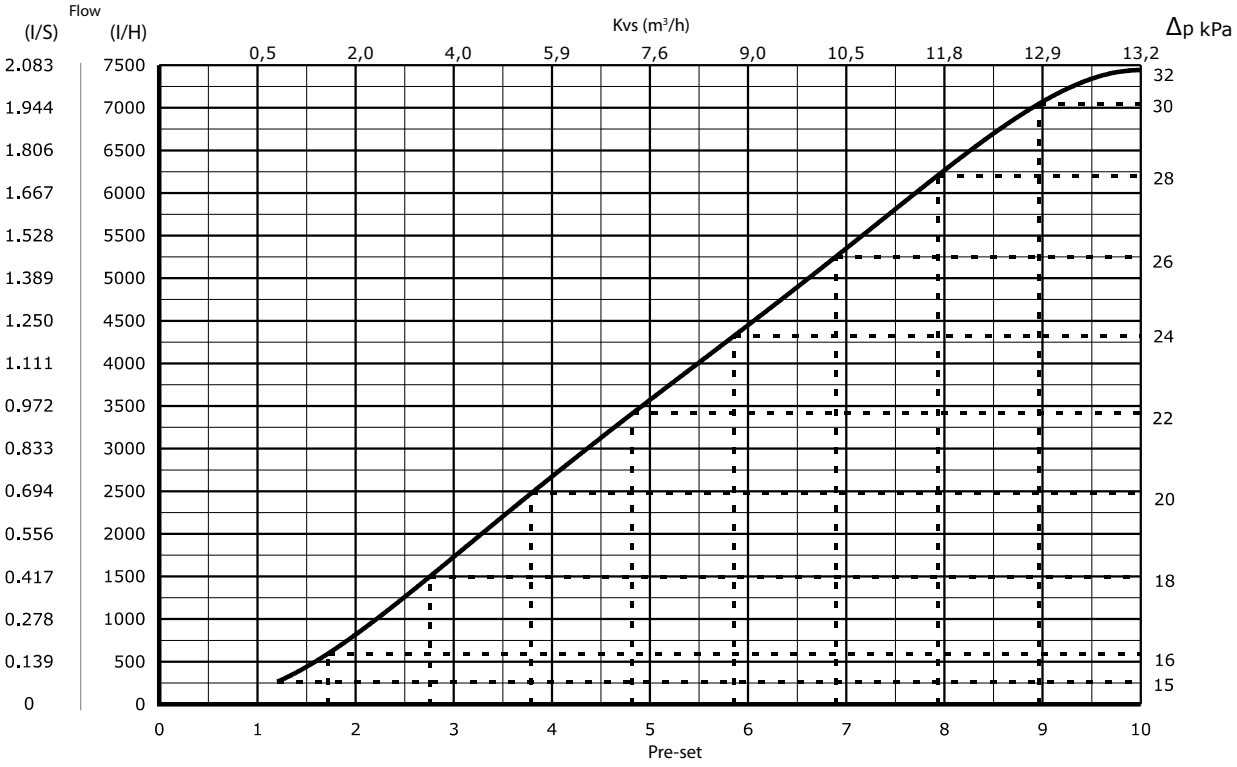


Frese PVS DN40 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN40 20-80 kPa



Frese S DN40 High Pressure



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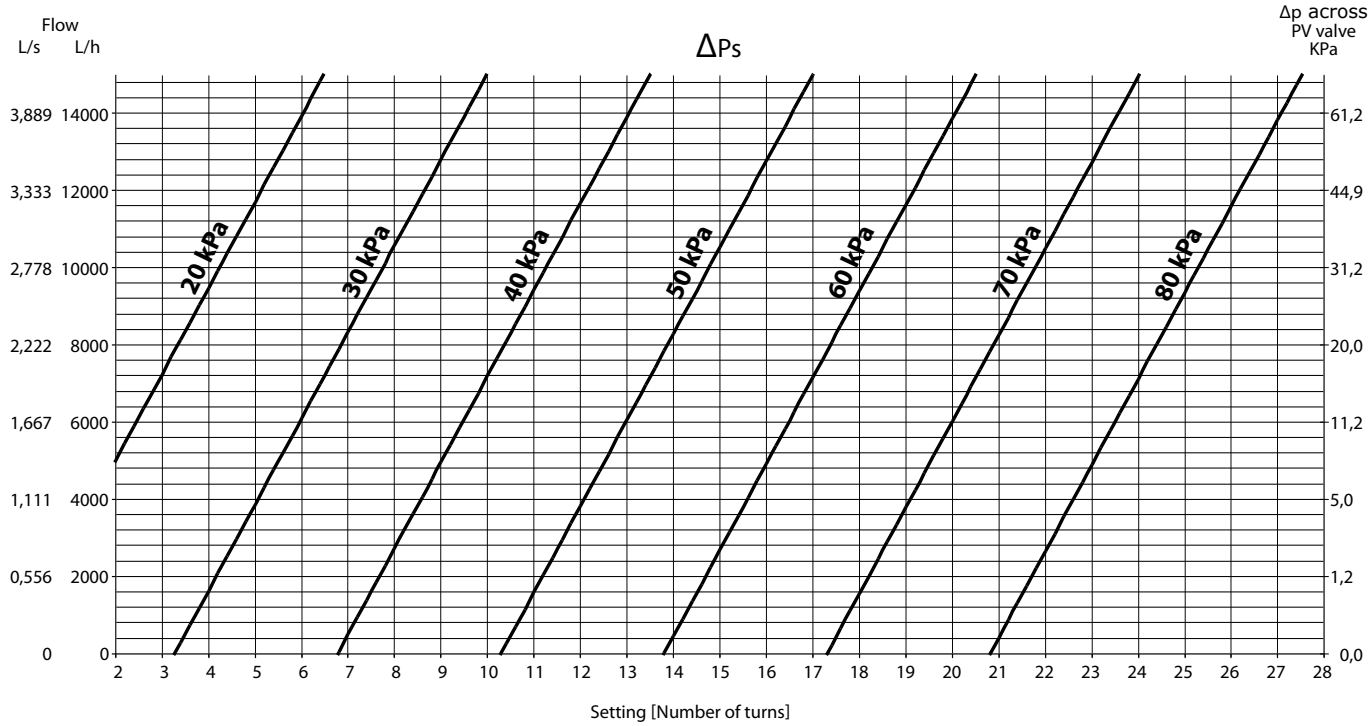
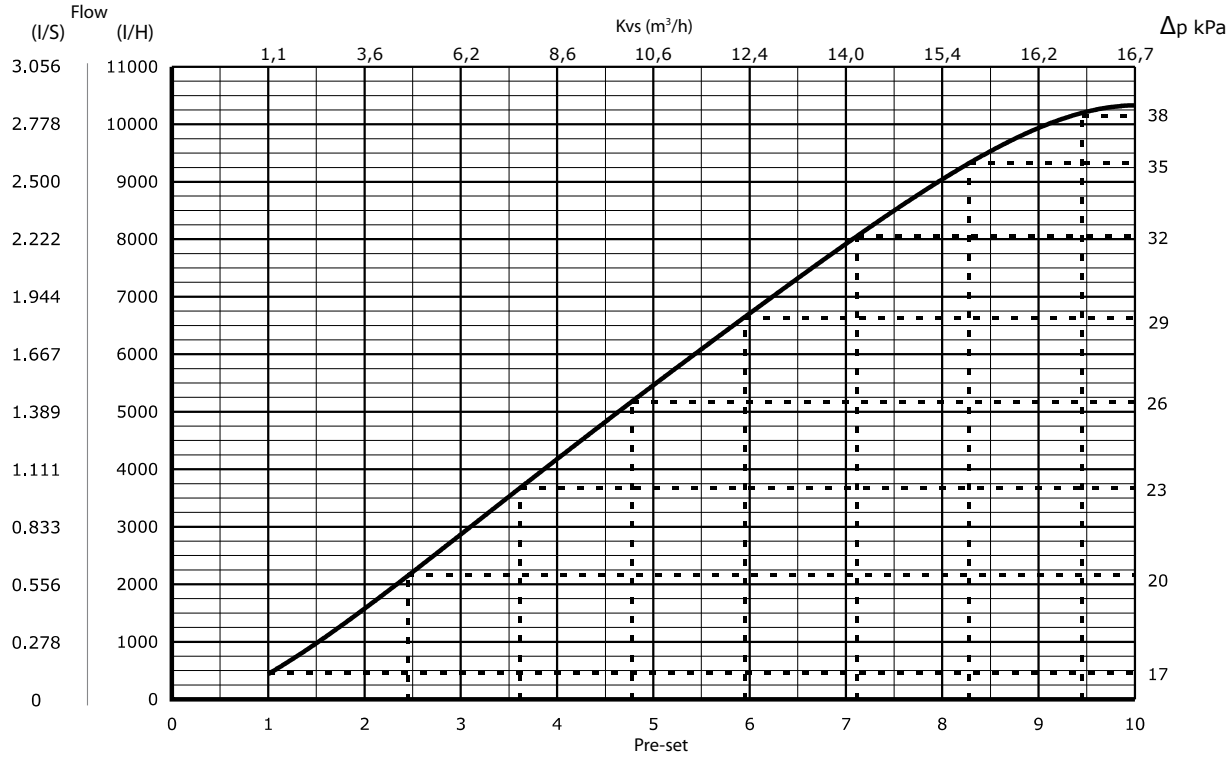
Frese PVS DN50 HP
- Dynamic Pressure and Flow Regulation Valve

Frese PV DN50 20-80 kPa



Frese S DN50 High Pressure



Frese PVS
- Dynamic Pressure and Flow Regulation Valve

Text for technical specifications

The valve should be a dynamic differential pressure and flow control valve with the option of setting the differential pressure and flow on site without suspension of operation.

The valve should limit the differential pressure in a circuit.

The valve should include optional P/T plugs for the verification of differential pressure in circuit and across the valve.

The differential pressure control valve scale should only be adjustable by means of a key.

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

The valve should be permanently marked with an indicator for flow direction.

Pressure rating PN16.

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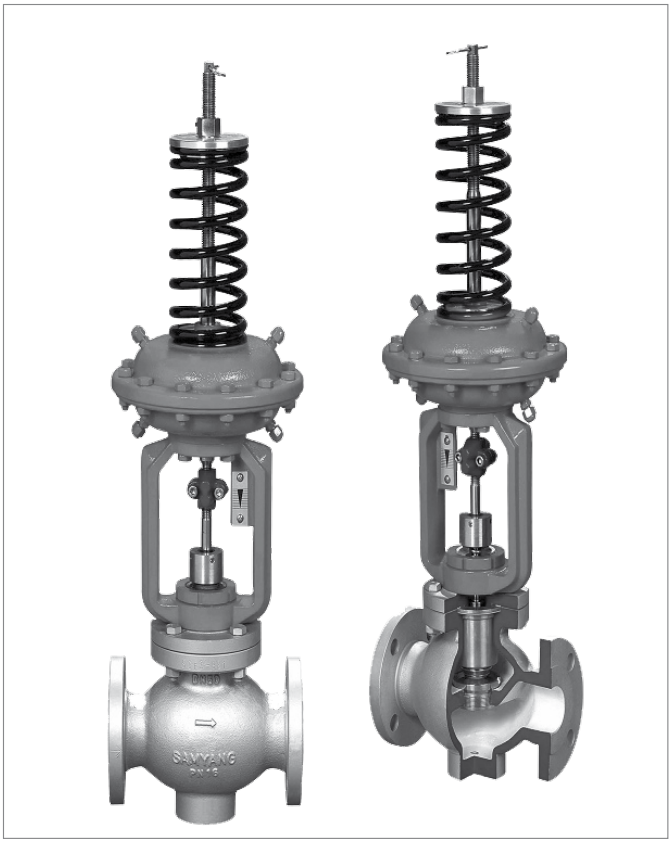
Frese YDF-2F
- Differential pressure control valve

Application

Frese YDF-2F is used in central heating-, ventilation-, and district heating systems.

This model is a high-performing differential pressure control valve installed in the supply or return piping line of loaded equipment and regulates the differential pressure.



Benefits

Design

- The valve construction integrated with the Equal % Cone provides additional wide range of control of differential pressure and flow.
- Being diaphragm split-system, there is no influence by temperature and being perfect balance type, solid set pressure-differential value is ensured.
- Strong construction guarantees high durability.
- Being diaphragm type, installation in the horizontal and the vertical position is possible.

Operation

- High comfort for the end-users due to no noise problems from control valves
- Easy adjustment of the pressure by Equal % Cone.

Features

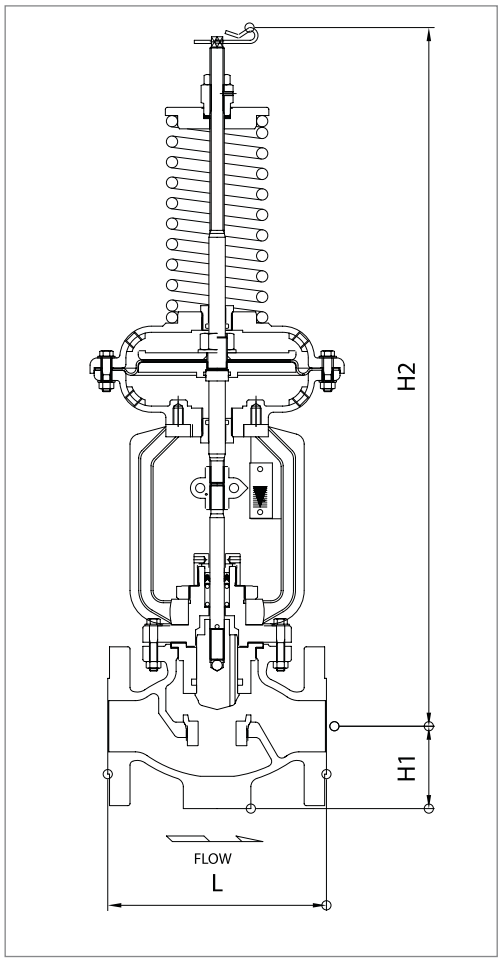
- Easy to install and adjust according to selection diagram.
- Maintenance time will be referred in acc. with whether leaking water visually.
- Valve lifting can be checked thru the installed indicator.
- Sizes from DN25 to DN150

Frese YDF-2F
- Differential pressure control valve

Specifications

Items		**YDF-2F**
Applicable pressure		PN16
Applicable fluid		Hot & cold water
Flow temperature		Max 170^{0}C
Construction		Diaphragm
Differential pressure adjustment range (kPa)		50-200
End connection		EN 1092-2 PN16
Materials	Body	Ductile Iron
	Diaphram	EPDM
Valve body pressure test		Water 24 Bar
Capillary tube		Standard 2m

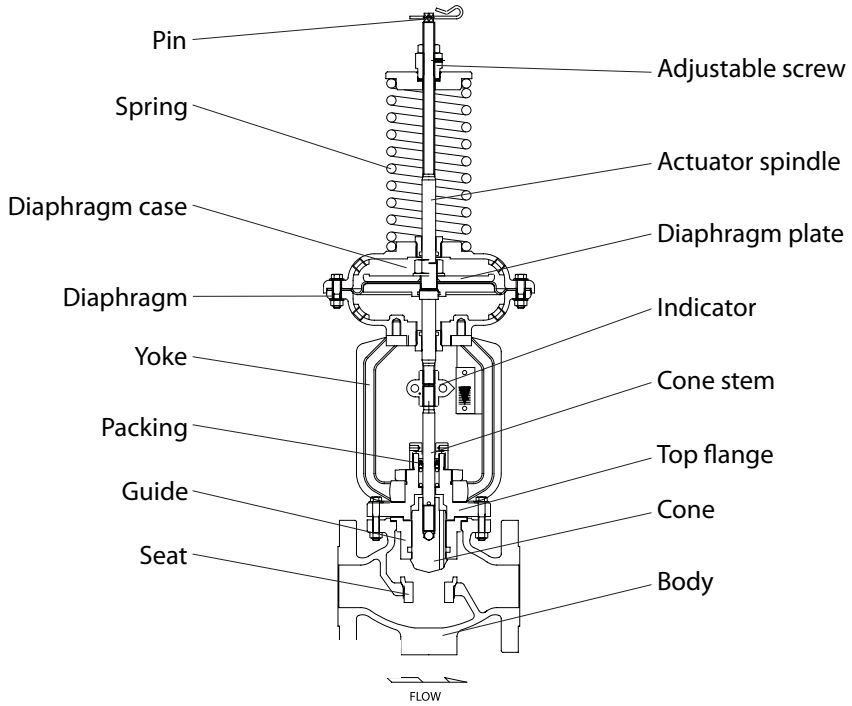
Technical data



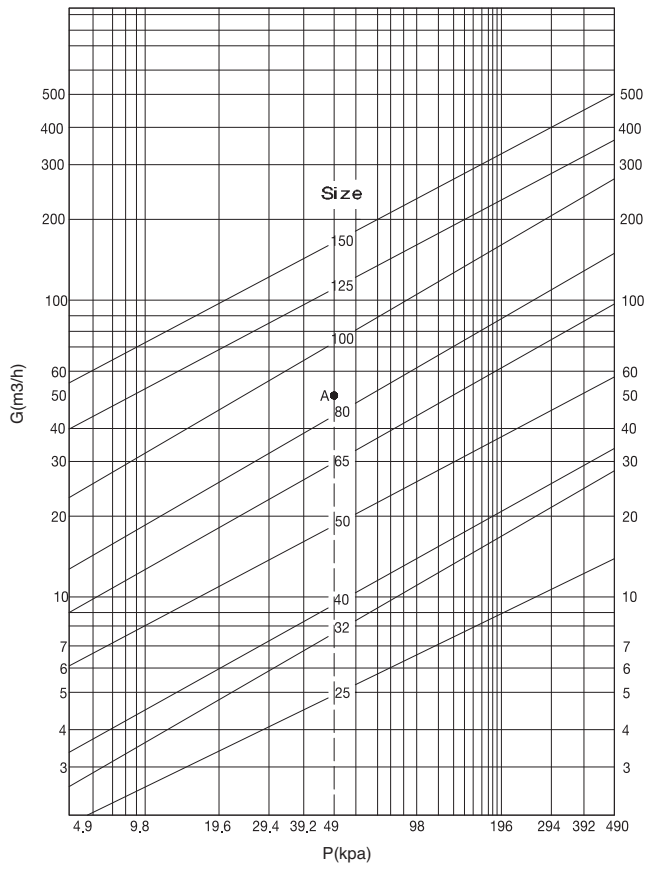
	Dimension			
Model	**YDF-2F**			
Size	L	H1	H2	Weight (kg)
DN25 (1″)	184	62.5	640	20
DN32 (11/4″)	180	70	650	26
DN40 (11/2″)	222	80	658	28
DN50 (2″)	254	95	670	41
DN65 (21/2″)	276	115	720	48
DN80 (3″)	298	120	720	56
DN100 (4″)	352	130	735	72
DN125 (5″)	400	150	775	130
DN150 (6″)	451	180	800	162

Frese YDF-2F
- Differential pressure control valve

Construction Drawing



Selection of valve size



$$Cv = \frac{1.167 \times Q \times \sqrt{r}}{\sqrt{\Delta P}}$$

Cv:	Coeffience of valve
Q:	Flow (m^3/h)
r:	density (water = 1)
Δ:	differential pressure across valve ($kg\ f/cm^2$)

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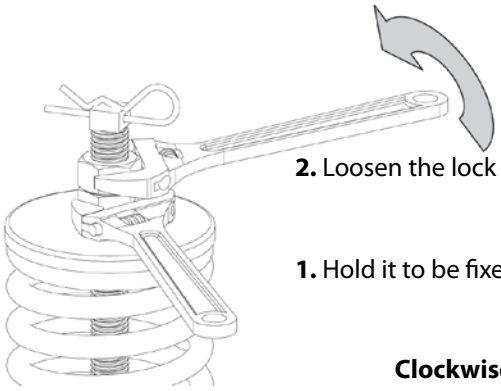
Frese YDF-2F
- Differential pressure control valve

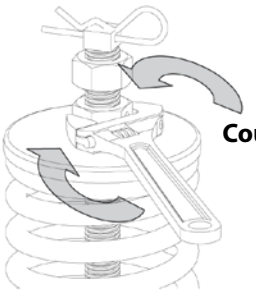
How to adjust differential pressure



2. Loosen the lock nut along the direction of arrow indicated

1. Hold it to be fixed until the lock nut is loosened

Clockwise:
increase of differential pressure



Counterclockwise:
ease of differential pressure

How to adjust differential pressure

Make sure to fully comprehend the following cautions in handling the products so that the product may display it performance.

1. Do not apply any impact on it
2. Avoid any place with dust or humidity when storing it
3. A special attention should be paid so that any impurities are not inserted into the product
4. When attaching it onto a pipe, the location should be free of sand or debris while a point of gasket should be also cleaned up
5. It should be installed on a place easy to access for repair

* The structure, dimensions and materials may be changed without any prior notice for the improvement of performance.

Maintenance tips

Stuffing nut box packing leaking

1. Locking after checking gate valve - Main valve locking
2. Pressure pipe valve locking
3. Slowly loosening after checking the height of the spring speciefied
4. Seperating the pressure pipe
5. Loosening after checking the height of indicator ^{0}Øs stamp thread
6. Slowly loosening Stuffing nut box
   - Stop diassembly if water continuously flows
7. Checking and replacing the packing and reversely assembling it

O-ring leaking

1. Checking and locking gate valve
2. Pressure pipe valve locking
3. Checking and slowly loosening the height of spring specified
4. Separating the pressure pipe
5. Loosening after checking the height of ^{0}Øs stamp thread
6. Disassembling the actuator
7. If it's rusty excessively, it should be ground with soft sand paper
8. Replace O-ring and assembling it

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Frese Commissioning Unit AC 6

Application

Frese AC 6 is used for the measurement of differential pressure and thereby flow in a given installation equipped with Frese valves.

A measuring the actual valve is selected in the menu.
Flow and required differential pressure will then be displayed.

The system is easily commissioned as the pump is adjusted in accordance with the required minimum differential pressure across the critical valve.

Min. differential pressure = the lower limit of the operating range of the valve/cartridge.

Once this differential pressure is available the system will automatically be balanced.

The Commissioning Unit is easily operated by means of the enclosed, detailed instruction for use.
A quick start guide is also included.

Frese no. 48-0025

Frese Commissioning Unit AC 6

Technical data

Operating temperature:	From 0°C to 95°C (ambient temperature) *Please note: The manometer should not be exposed to frost*
Static pressure:	Max. 20 bar
Differential pressure:	Max. 6 bar
Battery:	1 pcs. 9V
Weight:	615 g
Dimensions:	200 x 120 x 40

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Insulation jackets for Frese S and PV

Application

The insulation jackets have been specifically designed for the insulation of Frese S, and PV valves.

Insulation of valves may reduce the temperature in control room, boiler room, and pipe tunnels. Resulting in a more agreeable working temperature, reduced thermal loss and, consequently, better heat economy year after year.

Benefits

- Easy installation and removal

Features

- Fire resistant in accordance with the fire rating B2, DIN4102
- Resistant to most chemicals. Will not be attacked by dry rot or mold
- Does not absorb moisture and, unlike "wet" mineral wool does not become conductive to heat

Insulation jackets for Frese S and PV

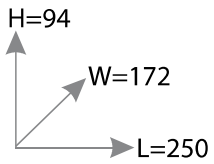
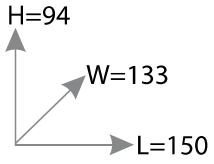
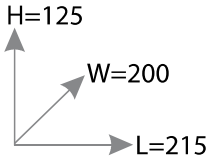
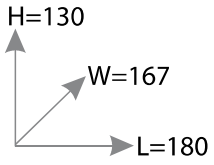
Technical data

Material: **EPP** (Expanded Polypropylene)
Water absorption: < 2,5 vol% at 20°C
Temperature range: up to 120°C
Insulating property: Lamda = 0.039 W/mk (20g/l)

(must only be used in heating applications)

Product programme

All measurements in mm.

Frese no. 38-0845 For Frese S and PV valve DN15/20/25		
Frese no. 38-0846 For combination ball valve in supply side of Frese S and PV DN15/20/25		
Frese no. 38-0854 For Frese S and PV valve DN32/40/50		
Frese no. 38-0848 For combination valve in supply side of Frese S and PV DN32/40/50		

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Frese Manometer 2023P

Application

Freses digital manometer for the measurement of differential pressure in a given installation equipped with Frese valves.

The manometer features are:

- **On/off**
- **Automatic reset**
- **Illuminated display**
- **"Out of measuring range"**
- **Hold function**
- **Hose kit incl. needles**

The manometer is easily operated by means of the enclosed, detailed instructions for use.

After measuring, the actual value is compared with the min. required differential pressure across the installed flow rate cartridge (see cartridge catalogue or Tech-Note).

The system is easily adjusted as the pump is adjusted in accordance with the required differential pressure across the critical valve.

Once this differential pressure is available the system will automatically be balanced.

Min. differential pressure = the lower limit of the operating range of the valve/ cartridge. See cartridge catalogue/ TechNote.

Freses handy manometer 2023P. Hose kit including needles.

Technical data

Operating temperature:	From 10°C to 50°C (ambient temperature) *Please note: The Manometer should be exposed to frost.*
Operating range:	7 bar
Overrange:	10 bar
Batteries:	Two pcs. AA *Please note: Batteries are not enclosed*
Environmental specifications:	IP67
Auto switch-off time:	12 minutes
Dimensions:	155 x 67 x 40 mm
Weight:	180 g

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Frese Strainers

Application

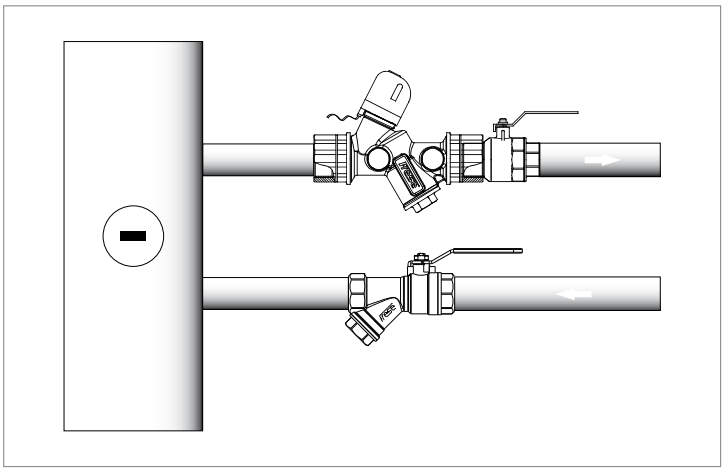
Frese strainers are particularly designed and manufactured in order to provide maximum protection of the pipeline equipment against particles and other impurities. They are necessary in all fluid, steam and non-flammable gas systems where the presence of dirt could result in high operating, maintenance and replacement costs.

The fluid enters the Frese strainer and passes into the interior of a cylindrical screen. While the fluid passes through the screen, all particles larger than the screen mesh are trapped in the screen. When the filter is removed from the strainer, it acts as a container for the accumulated impurities.

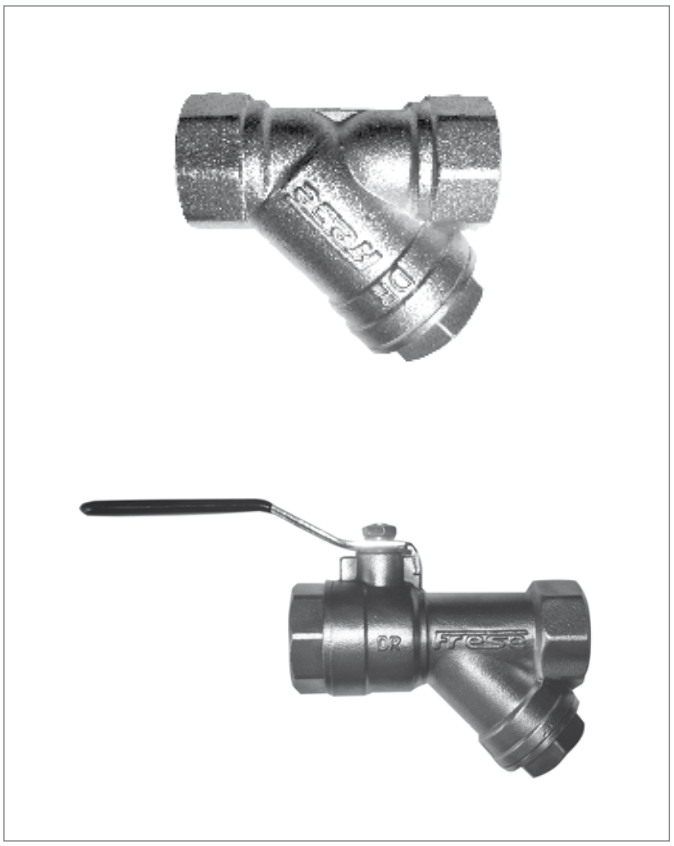
The Frese strainers can perform in both horizontal and vertical installations provided that the direction of flow, as marked on the strainer, is always respected and that the filter, for vertical pipes, is situated downwards.

Benefits

- Low installation costs.
- Trouble and noise free operation of the other components of the system, thus higher performance and lower operation costs.
- Longer life cycles thus less time and costs for maintenance and lower replacement costs over time.
- The filter can be easily replaced without removing the body of the strainer from the pipe.



A Frese strainer ball valve in the supply line combined with a Frese EVA (two way automatic balancing valve) in the return line of a cooling/heating unit.



Features

- The use of DR brass for the body and stainless steel for the filter provides excellent corrosion resistance.
- The design of the strainer ensures that the filter is positively sealed to the body ensuring better particle retention.
- The choice of the filter mesh (32, hole size 0.5 mm) ensures high filtering performance.
- A wide range of dimensions and operating temperatures gives the flexibility for use in different applications.

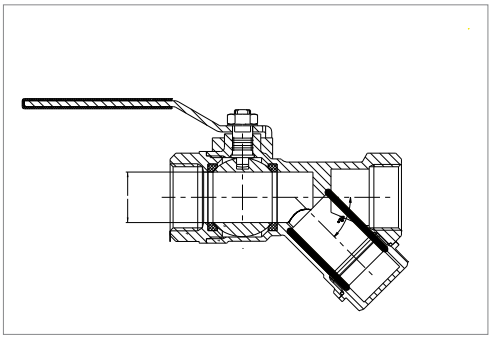
9

Frese Strainers

Frese Strainer Ball valve (2 in 1)

A very compact solution, important in applications where space is restricted and installation time is limited.

Technical data



Valve Housing: DR, Dezincification Resistant Brass
Filter: Stainless steel
Gasket: PTFE
Pressure rating
Temperature: (see temperature and pressure diagram)
Mesh: 32 (0.5mm)
Connections: fem/fem
Accessories: Spindle extention available

Frese no.	Dimensions	Kv	Weight (kg)	L (mm)	H (mm)
38-5040	DN15	2.7	0.316	77	40
38-5041	DN20	5.7	0.448	92	43
38-5042	DN25	6.5	0.810	115	49

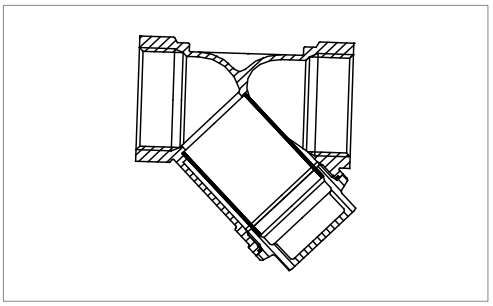
Specification text

The housing of the strainer ball valve should be made of DR brass; the filter should be replaceable and made of stainless steel. The filter mesh should be 32 (0.5mm). The pressure class should be PN20. The strainer should allow operation in temperatures up to 110^{0}C.

Frese Strainer

A very simple and efficient solution perfectly interacting with the other components of the system.

Technical data



Valve Housing: DR, Dezincification Resistant Brass
Filter: Stainless steel
Gasket: PTFE
Pressure rating: PN20
Temperature: -20^{0}C to 150^{0}C
Mesh: 32 (0.5mm)
Connections: fem/fem

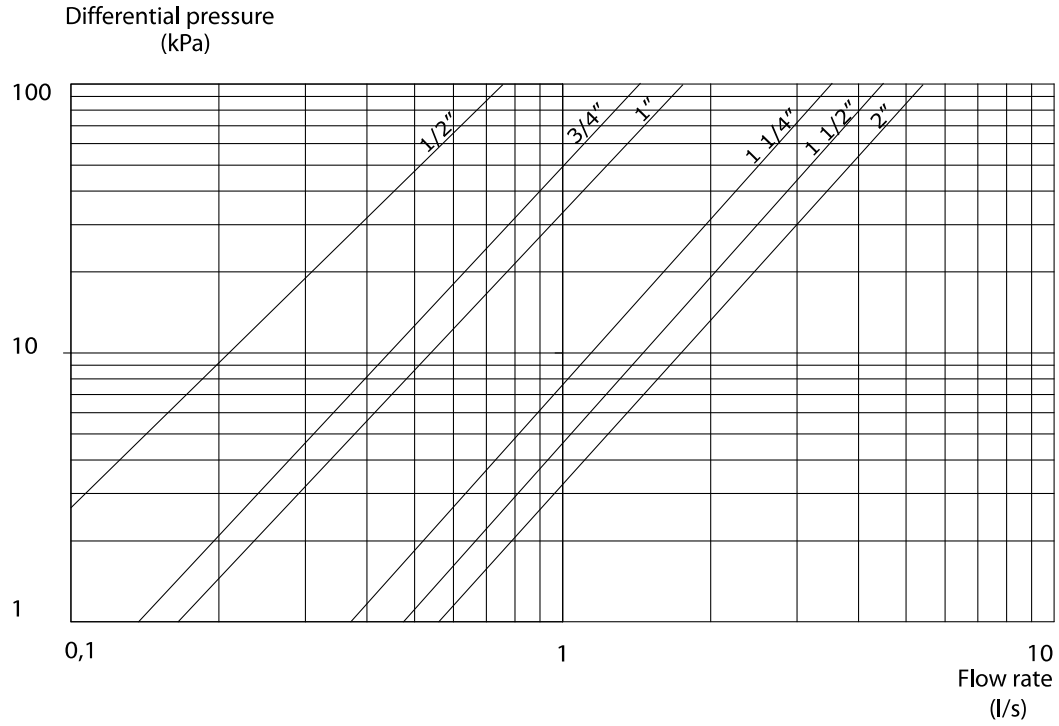
Frese no.	Dimensions	Kv	Weight (kg)	L (mm)	H (mm)
41-1132	DN15	2.7	0.158	56	41
41-1142	DN20	5.7	0.282	69	50
41-1152	DN25	6.5	0.440	82	62
41-1162	DN32	13.7	0.638	90	71
41-1172	DN40	17	0.820	101	78
41-1182	DN50	19	1.280	121	96

Specification text

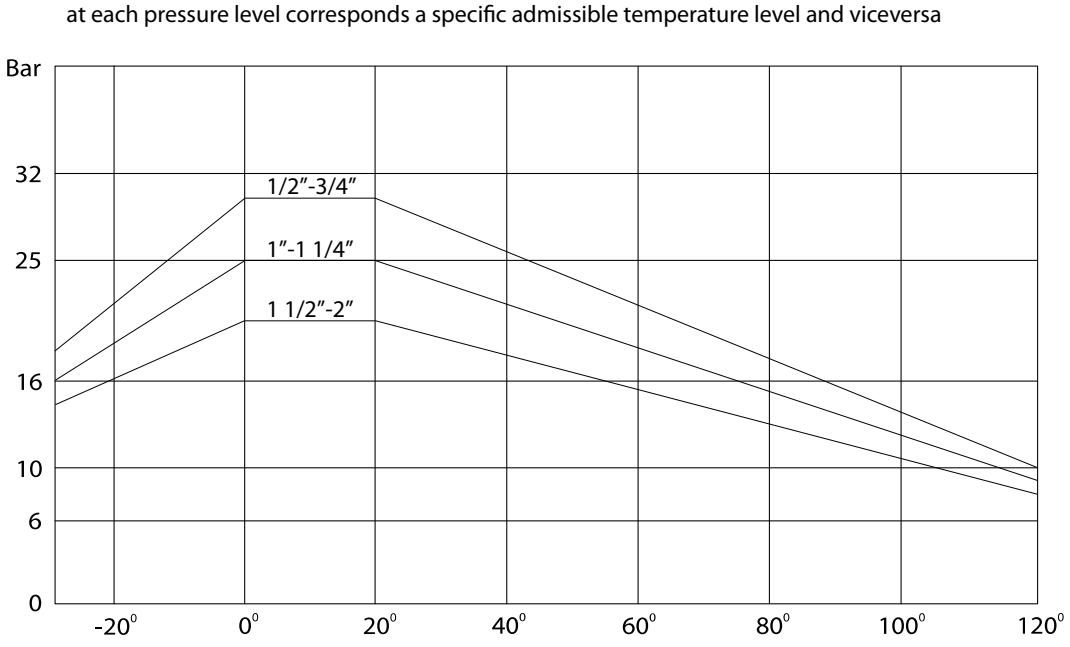
The housing of the strainer ball valve should be made of DR brass; the filter should be replaceable and made of stainless steel. The filter mesh should be 32 (0.5mm). The pressure class should be PN20. The strainer should allow operation in temperatures up to 150^{0}C.

Frese Strainers

Pressure drop graph



Pressure temperature diagram



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CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

Application

CirCon+ and TemCon+ are control valves designed for domestic hot water installations with circulation.

The valves automatically control the temperature of the water that circulates through the valves. Thus the thermal balance is ensured throughout the domestic hot water system. The valve is adjusted on a scale to a desired temperature in the interval between 37°C and 65°C.

TemCon+ is equipped with a by-pass located outside the thermal part of the valve.
So, TemCon+ is suited for hot water installations with bacterial problems, e.g. Legionella. Here a procedure of raising the temperature of the water to between 70°C and 80°C is carried out at certain intervals.

Advantages

CirCon+ and TemCon+

- The thermostatic element is located out of contact with the circulating water, and its dry location prevents scale problems.
- The setting of the valves is stepless between 37^{0}C and 65^{0}C at an accuracy of +/- 2^{0}C.
- Each valve is calibrated separately.
- The valves are coated with tin/nickel, which is an anti-corrosive coating.
- Wide range of couplings.

TemCon+:

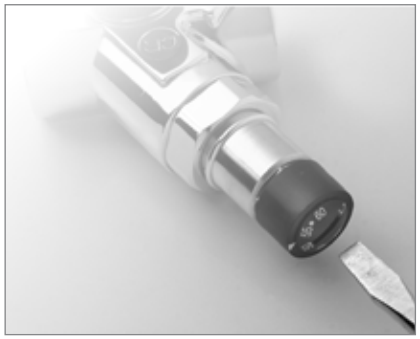
- By-pass for high temperature operation from 70^{0}C to 80^{0}C.
- By-pass adjustment occurs by hand or actuator.

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

CirCon+ Thermal control

CirCon+ controls on the basis of the temperature of the water that circulates through the valve. If the valve is set to a temperature of e.g. 50°C, and the temperature of the circulating water is under 50°C, the valve opens. If the temperature is over 50°C, the valve closes.

CirCon+ fem./fem. with scale and built-in isolation ball valve.

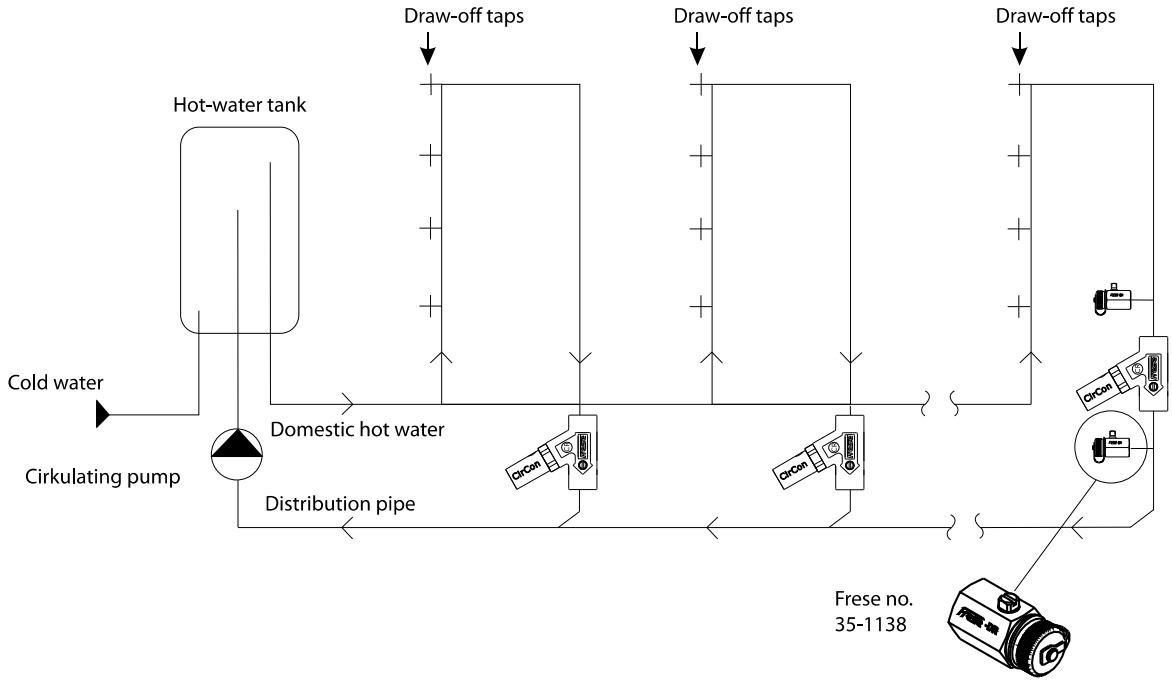


CirCon+
Temperature setting between 37°C and 65°C.
Remove the cap, and the temperature is easily set e.g. by a screwdriver as shown here.

Frese CirCon+ with press-couplings, and Frese CirCon+ with Cu-couplings.
Ready for installation!

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

Application Example - CirCon+



It is recommendable to install pressure test points on both sides of the critical CirCon+ valve in the installation for the verification of differential pressure.

Dimensioning example - CirCon+

CirCon+ is dimensioned on the basis of the thermal loss in the circuit, in which it is located. An example of dimensioning CirCon+ and the overall quantity of water for the circulating pump is described in the following.

In an installation with 4 floors and basement a circulation line is dimensioned.

The following parameters should be known for the calculation of the flow rate.

Length of pipe: 30 meters. Total length of pipe controlled by CirCon+.

Thermal loss: 9 W/meter pipe. Thermal loss in an external 27 mm pipe with 30 mm insulation and a difference of 40°C between room temperature and temperature of the fluid.

Δ temperature differential: 5°C. Temperature in hot-water tank 55°C. CirCon+ was set to 50°C on the scale. The flow rate of CirCon+ can be found from the following formula:

$$Q = \frac{(30m \times 9w/m) \times 0{,}86}{5^0C} = 46\ l/h$$

So, the total quantity of water from 3 delivery pipes to the circulating pump is approx. 138 l/h (3 x 46 l/h).

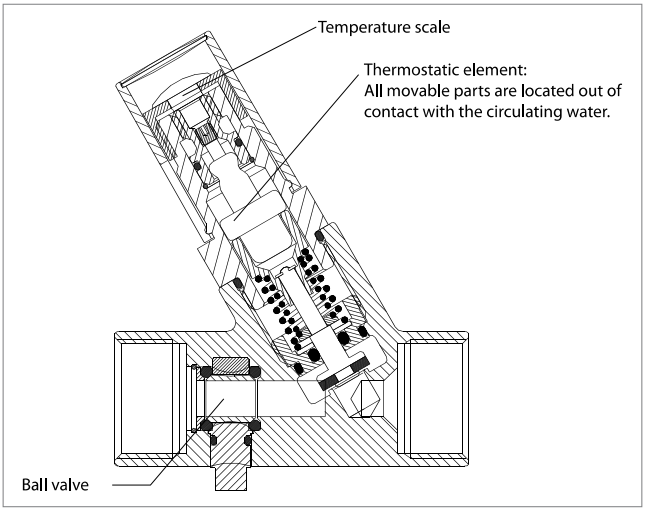
The Kv-value of CirCon+ at 46 l/h and a differential pressure of 10 kPa across the valve can be found from the following formula:

$$Kv = \frac{Q}{\sqrt{\Delta p}} = \left(\frac{46}{\sqrt{10}}\right) /100 = 0.15$$

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

Technical data - CirCon+

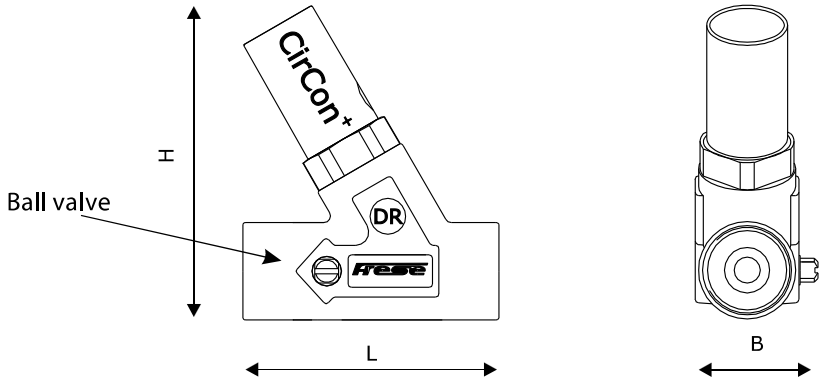
Materials:	
Valve body:	DZR Brass, CW602N
O-rings:	EPDM
Springs:	Stainless steel
Element:	Wax
Plastic parts:	POM, ABS, PC
Surface coating:	Tin/Nickel
Temperature range:	37°C - 65°C
Accuracy:	+/- 2°C < 100 kPa Dp
P-band:	10°C (Xp = 10K)
Max. Kv-value:	1.10 (m^3/l)
Recommended differential pressure:	3 - 10 kPa
Max. differential pressure:	100 kPa
Max. static pressure:	PN10
Pressure range:	PN16



CirCon+ DN20 fem./fem. with ball valve

Product programme - CirCon+

Dimension	Frese no.	Weight [kg]	L x B x H
DN15 fem./fem.	47-2800	0.5	63/32/96
DN20 fem./fem.	47-2801	0.5	63/32/96
DN20 fem./fem. with ball valve	47-2802	0.6	79/37/96
DN20 male/male with ball valve	47-2803	0.6	79/37/96
Ø12 Cu/Pex with ball valve	47-2809	0.8	139/37/96
Ø15 Cu/Pex with ball valve	47-2810	0.8	139/37/96
Ø18 Cu/Pex with ball valve	47-2811	0.9	155/37/96
Ø22 Cu/Pex with ball valve	47-2812	0.9	155/37/96
Ø15 Press with ball valve	47-2815	0.7	117/37/96
Ø 18 Press with ball valve	47-2816	0.7	117/37/96
Ø22 Press with ball valve	47-2817	0.8	120/37/96



All CirCon+ valves have the approval of the Danish VA-Authorities.

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

TemCon+ - Control at two operating temperatures

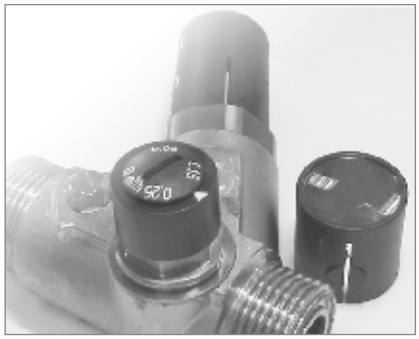
TemCon+ was designed to control at two sets of temperatures, i.e.:

Normal operating temperature:
Normal operation occurs at temperatures from approx. 50°C to 60°C. That is economic operation at low precise flow rates, which ensures a high level of comfort at all draw-off taps and exact temperature in all circuits.

That is the most frequently applied operating range of the valve.

High operating temperature:
High operating temperature is used at intervals for the pasteurization of domestic water at 70°C to 80°C.

TemCon+ fem./fem. valves with scale by-pass and actuator by-pass respectively both of them with built in isolation ball valve.

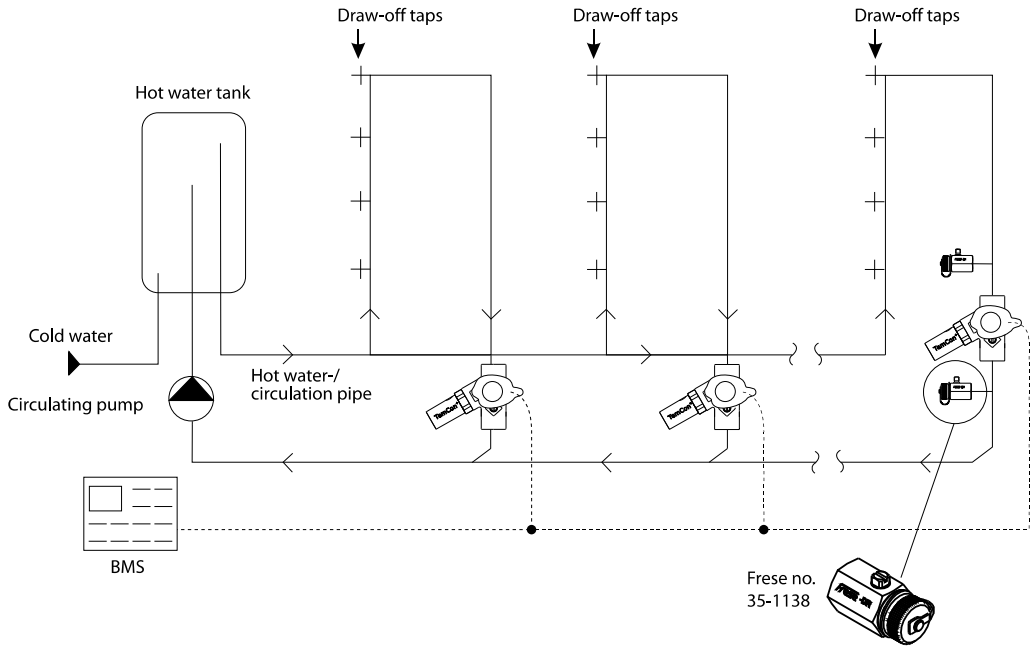


TemCon+
The plastic cap is dismantied by means of a screwdriver that fits into the slot in the cap. Hereinafter the manually operated by-pass can be set steplessly to a Kv-value between 0.0 and 0.3.

Frese TemCon+ with press-couplings, and Frese TemCon+ with Cu-couplings.
Ready for installation!

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

Application Example - TemCon+ Actuator operated by-pass



The control during high temperature operation occurs as the actuator mounted on the by-pass opens to a fixed Kv-value of 0.3.

It is recommendable to install pressure test points on both sides of the critical TemCon+ valve in the installation for the verification of differential pressure.

Dimensioning example - Acutaor operated by-pass

During normal operation:
During normal operation TemCon+ with actuator operated by-pass is dimensioned in the same way as thermal control (CirCon+ - see page 3).

High temperature operation:
The automatic heater or the BMS opens the by-pass to a fixed Kv-value of 0.3.
In this example a sufficient quantity of water is ensured to compensate for the thermal loss in the pipe.

In an installation with 4 floors and basement a circulation line is dimensioned.

Length of pipe: 30 meters.
Total length of pipe controlled by TemCon+.

Thermal loss (high temperature operation):
14 W/meter pipe.
Thermal loss in an external 27 mm pipe with 30 mm insulation (laminated Rockwool) and a difference of 60°C between room temperature and pasteurization temperature.

Δ temperature differential: 8°C.
Between a temperature of 800C in the hot-water tank and a temperature of 72°C after TemCon+.

The flow rate Q of the TemCon+ valve can be found from the following formula:

$$Q = \frac{(30m \times 14w/m) \times 0{,}86}{8^0C} = 45\ l/h$$

The minimum differential pressure of the TemCon+ valve at a constant Kv-value of 0.3 can be found from the following formula:

$$\Delta p = \left(\frac{45}{0.3*1000}\right)^2 = 2\ kPa$$

Hydraulic balance
The application of a circulating pump with proportional control of the pump pressure is recommendable if a fixed Kv-value of 0.3 is too much for the installation so that the hydraulic balance is upset. The pump compensates for increased flow by increasing the differential pressure.

CirCon+/TemCon+
- Thermostatic Valves for Domestic Water

Dimensioning example - adjustable by-pass

High temperature operation:

On the basis of the dimensioning example for actuator controlled by-pass and high temperature operation the flow rate is found from the formula:

$$Q = \frac{30 \times 14 \times 0{,}86}{8} = 45 \text{ l/h}$$

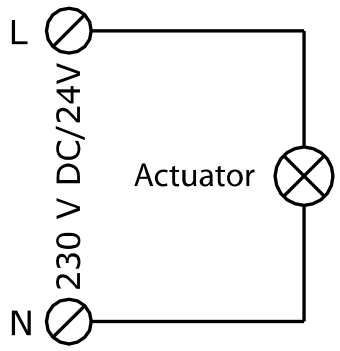
The differential pressure across TemCon+ at the given location in the system should be known in order to find the value of the adjustable by-pass.
Here we use 35 kPa across the valve. The value can be found from the formula:

$$Kv = \frac{Q}{\sqrt{\Delta p}} = \left(\frac{0.045}{\sqrt{0.35}}\right) = 0.08$$

Consequently, the by-pass should be opened to min. 0.08 to ensure a temperature of 72°C after the valve.

Normal operation:
During normal operation it is recommendable to close the adjustable by-pass to gain all the benefits of the thermal control of the TemCon+ valve.

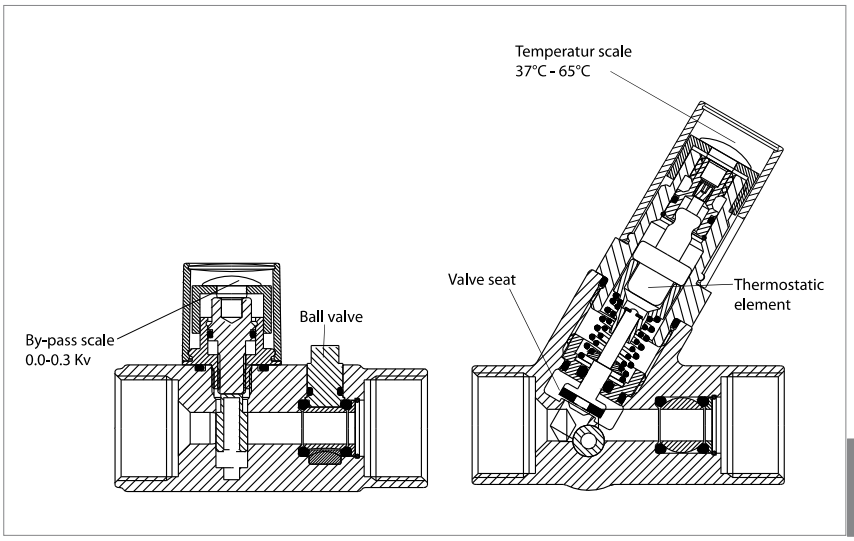
Wiring diagram



Installation of actuator.
The actuator must not be installed upside down!

Technical data - TemCon+

Materials:	
Valve body:	DZR Brass, CW602N
O-rings:	EPDM
Springs:	Stainless steel
Element:	Wax
Plastic parts:	POM, ABS, PC
By-pass:	Stainless steel
Surface coating:	Tin/Nickel
Temperature rating:	37°C - 65°C
Accuracy:	+/- 2°C < 100 kPa Dp
P-band:	10°C (Xp = 10K)
Max. Kv-value:	1.10 (m^3/l)
Recommended differential pressure:	3 - 10 kPa
Max. differential pressure:	100 kPa
Max. static pressure:	PN10
Max. temperature:	100°C
Pressure rating:	PN10



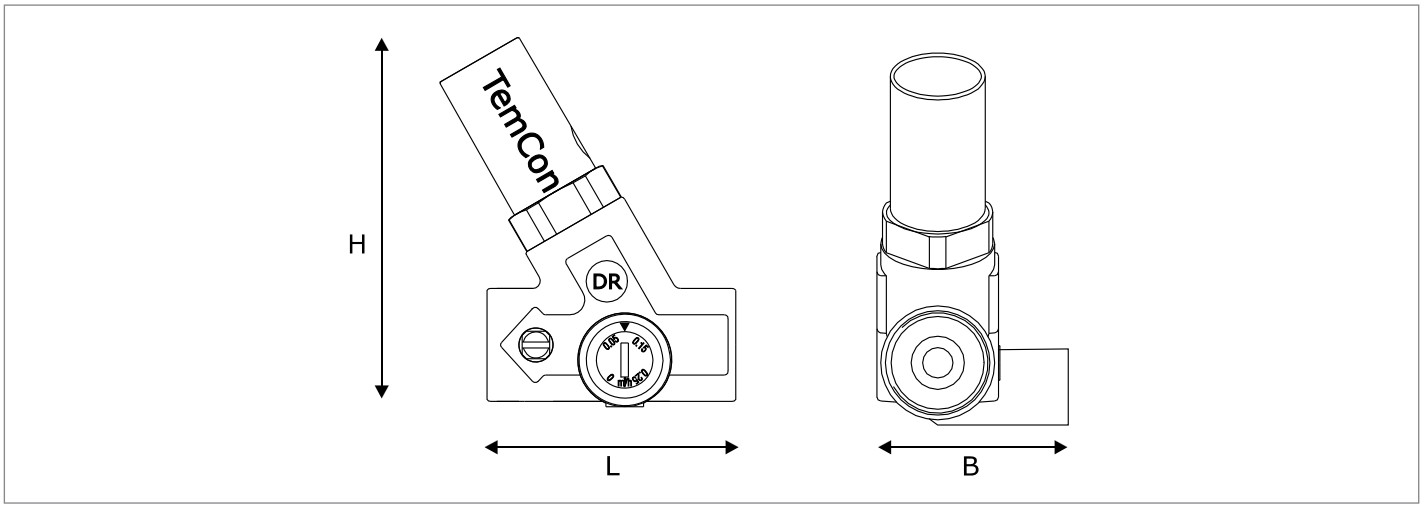
Section drawing of TemCon+ DN20 fem./fem. with ball valve

Actuator controlled by-pass:

Kv-value, open by pass:	0.3 (m^3/h)
Running time:	180 sec. from closed to fully open
Power consumption:	1,8W
Supply voltage:	24V DC/AC or 230 V AC

Product programme - TemCon+

Dimension	Frese no.	Weight [kg]	L x B x H
DN15 fem./fem.	47-2850	0.6	63/58/99
DN20 fem./fem.	47-2851	0.5	63/58/99
DN20 fem./fem. with ball valve	47-2852	0.6	79/58/99
DN20 male/male with ball valve	47-2853	0.6	79/58/99
Ø12 Cu/Pex with ball valve	47-2859	0.8	139/58/99
Ø15 Cu/Pex with ball valve	47-2860	0.8	139/58/99
Ø18 Cu/Pex with ball valve	47-2861	1.0	155/58/99
Ø22 Cu/Pex with ball valve	47-2862	0.9	155/58/99
Ø15 Press with ball valve	47-2867	0.8	117/58/99
Ø 18 Press with ball valve	47-2868	0.8	117/58/99
Ø22 Press with ball valve	47-2869	0.8	120/58/99
Accessories:			
Universal insulation	47-9001	0.03	165/73/118
Acutatorkit 230V	47-2866	0.15	79/86/120
Actuatorkit 24V	47-2865	0.15	79/86/120
Insulation for valve with actuator	47-9002	0.01	165/106/125



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Frese Mixing Valve MixCon

Application

MixCon is a fail-safe mixing valve for hot and cold water.

If the cold water fails the valve shuts off the hot water supply within 4 seconds.

The mixed water temperature is set by turning the plastic control handle towards "+" to obtain higher temperatures, and towards "-" to obtain lower temperatures.

The temperature setting of the valve is locked by dismantling the handle and turning it 180°. Then replace the handle.

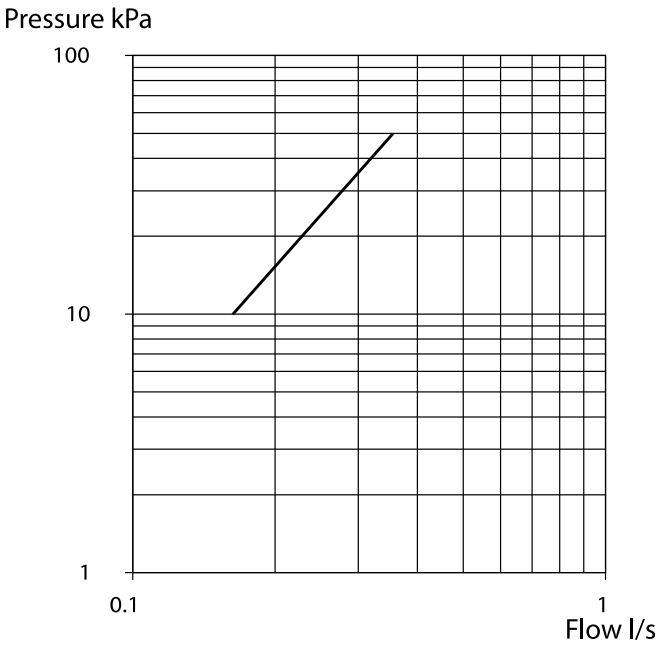
All MixCon mixing valves are tested separately and produced in accordance with the ISO 9001 Quality System to ensure uniform quality and functionality.

Pressure drop graph

Hot water temperature: 50°C

Cold water temperature: 12°C

Mixed water temperature: 40°C



Frese Mixing Valve MixCon

Technical data - MixCon+

Valve body: DR Brass
Control handle: EPDM
Springs: Stainless steel
Element: Wax
O-rings: EPDM

Pressure range:

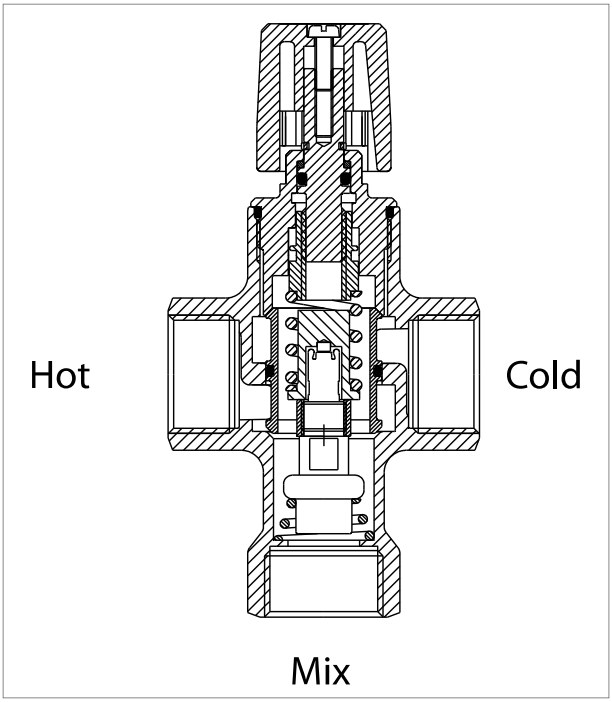
Max. pressure: 10 bar
Min. pressure: 0.2 bar
Max. pressure ratio: 5:1 (hot: cold or cold: hot)

Temperature:

Mixed water temperature: 30 - 60°C
Hot water temperature: 50 - 80°C
Cold water temperature: 5 - 30°C

The optimum protection against scalding is achieved if the mixed water temperature is at least 10°C below the hot water temperature.

Approval: Approved by the Danish VA-Authorities



Product programme/Dimensions

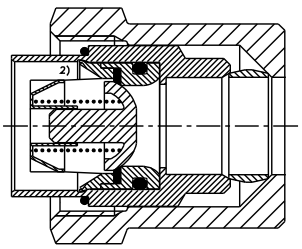
Dimension	Connection	Frese no.	H1 [mm]	H [mm]	L [mm]	Weight [g]
DN20	DN20/fem/fem/fem*	47-2643	54	132	70	520
DN20	Ø15/Cu-tube	47-2677	61	139	88	690
DN20	Ø22/ Cu-tube	47-2688	62	140	90	645

* 3/4" galvanized pipe

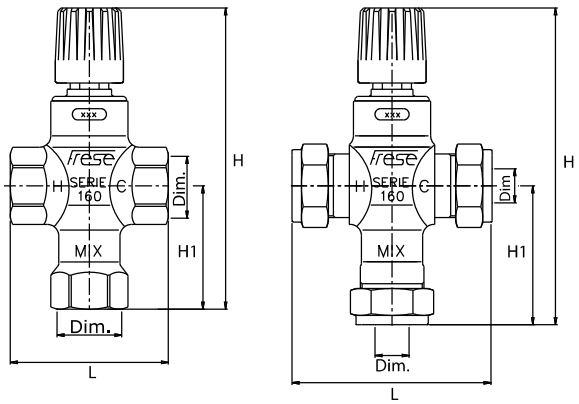
Accessories for male/male

Non-return cartridge	Frese no.
Ø15	38-0835
Ø22	38-0834

Non-return cartridge must be mounted on the hot and cold inlet, when installed in domestic water installation.



Section view of Non-return cartridge



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Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Y.K. Tower (50 Storey)	Commercial Building	Bahrain	Shadeed Engineering	
KK3 Hotel	Hotel	Bahrain	Habib Mudara	2006
Pearl Tower	Residential Building	Bahrain	GEMAC/Al Hamad	2007
Amwaj Residential Islands	Residential Building	Bahrain	GEMAC	2007
Y.K. Tower (50 Storey)	Commercial Building	Bahrain	Shadeed Engineering	2005
Manial Sheha Private Villa	Private Villa	Egypt	Egypt National Co.	2000
Tanta University (Faculty of Pharmacy)	Auditoriums	Egypt	University Consultation Office	2001
Manial Sheha Private Villa	Private Villa	Egypt	Egypt National Co.	2000
Tanta University (Faculty of Pharmacy)	Auditoriums	Egypt	University Consultation Office	2001
Nile Pharma	Factory	Egypt	Saboure Consulting Office	2002
Alexandria Library Conference Hall	Conference Hall	Egypt	Hamza Consultants	2002
El Rabwa Social Club	Social Club	Egypt	Alexandria Real Estate Co.	2002
F16 Workshop Facility	Workshop	Egypt	US Corps Of Engineers	2002
Arab Organization for Development - Phase 1&2.	Head Quarters	Egypt	R & A Consultants	2004
Aswan Club Hotel - Aswan.	Hotel	Egypt	Dr. Hakim El Afifi Office	2005
San Stefano Complex - Alexandria.	Hotel	Egypt	Dar Al Handasah	2005
Sharm El-Sheikh Airport - New Terminal.	Airport	Egypt	Dar Al Handasah	2005
National Bank Hospital.	Hospital	Egypt	Khalid El Rai	2005
San Stefano Complex.	Hotel Complex	Egypt	Dar El Handasah.	2005
Club of Aswan - Aswan.	Hotel	Egypt	Afifi Consultancy	2005
National Bank Hospital.	Hospital	Egypt	C Group. Eng. Khalid El Rai	2005
Mosque.	Mosque	Egypt	Afifi Consultancy	2005
Bio Farm	Factory	Egypt	C Group. Eng. Khalid El Rai	2006
Shooting Club	Social Club	Egypt	Dr. Maged Nagm	2006
60 Bed Hospital	Hospital	Egypt	Eng. Abdelsalam Mahroos	2006
Smash Club (Smart Village)	Social Club	Egypt	Dr. Mohamed Mahmoud (Saboure)	2006
Pakin	Factory	Egypt	Owner	2006
Maradive	Office Building	Egypt	MAK (Marwan Karawya)	2007
Scandik	Hotel	Egypt	Crown Home	2007
Nagi Wali Villa	Private Villa	Egypt	Eng. Khaled Fateen	2008
Fifth District Building	Office Building	Egypt	BAKRY Consultant Engineering	2008

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Vodafon Building - C3	Office Building	Egypt	SHAKER Consultancy Group.	2008
Carrefour	Hypermarket	Egypt	MED (Abd El-hamid Bakry)	2008
El Obour Mall	Shopping Mall	Egypt	MED (Abd El-hamid Bakry)	2008
Porto Marina	Residence Buildings	Egypt	MED (Abd El-hamid Bakry)	2008
El Fath Building	Residence Building	Egypt	MED (Abd El-hamid Bakry)	2008
Holiday Inn	Hotel	Jordan		2007
Sheraton Hotel	Hotel	Kuwait	Keo international consultants	1994
Sharq Waterfront	Commercial Building	Kuwait		1996
Maternity Hospital	Hospital	Kuwait		1998
Chamber of Commerce	Commercial Building	Kuwait		1996
Gulf Investment Co.	Commercial Building	Kuwait		1998
CRC Building		Kuwait		2000
Public Authority for Civil Identity	Commercial Building	Kuwait		1997
Bayan Palaces Complex	Eighteen Palaces	Kuwait	Keo international consultants	1986
Kuwait University	School	Kuwait	Keo international consultants	
Bayan Palaces Complex	Eighteen Palaces	Kuwait	KEO International Consultants	1986
Sheraton Hotel	Hotel	Kuwait	KEO International Consultants	1994
Sharq Waterfront	Commercial Building	Kuwait		1996
Chamber of Commerce	Commercial Building	Kuwait		1996
Public Authority for Civil Identity	Commercial Building	Kuwait		1997
Maternity Hospital	Hospital	Kuwait		1998
Gulf Investment Co.	Commercial Building	Kuwait		1998
CRC Building		Kuwait		2000
Kuwait University	School	Kuwait	KEO International Consultants	
SAS Radisons Hotel	Hotel	Oman	TSI	2000
Bala Mosque	Mosque	Oman	TSI	2000
SAS Radisons Hotel	Hotel	Oman	TSI	2000
Bala Mosque	Mosque	Oman	TSI	2000
Hotel Intercontinental, Qatar	Hotel	Qatar	Dar Al Handasah	2000
Airport expn., Qatar	Airport	Qatar	Meinhardt	2001
Qatar Dist. Co.		Qatar	Meinhardt	

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Al-Ahli Hospital	Hospital	Qatar	Dar Al Handasah	2002
Well Cornell Medical College	School	Qatar	KEO	
Hotel Intercontinental, Qatar	Hotel	Qatar	Dar Al Handasah	2000
Airport expn., Qatar	Airport	Qatar	Meinhardt	2001
Al-Ahli Hospital	Hospital	Qatar	Dar Al Handasah	2002
Lagoon Plaza	Residential Building	Qatar	M&Z Partners	2007
City Center Phase 2	Shopping Mall	Qatar		2007
Qatar Dist. Co.		Qatar	Meinhardt	
Well Cornell Medical College	School	Qatar	KEO	
Burj Al-Mohammadiyah Project, Madinah		Saudi Arabia	Juffali Brothers	2000
Burj Al-Mohammadiyah Project, Madinah		Saudi Arabia	Juffali Brothers	2000
Carrefour Hypermarket	Commercial Building	Saudi Arabia	Techno	2007
Hajj Terminal, Jeddah	Airport	Saudi Arabia	Dar Al Handasah/Bin Laden	2008
Abu Dhabi Trade Center	Commercial Building	UAE	Cansult	2001
Dubai Airport (Plant room for Concourse)	Airport	UAE	Int´l Bectel	2000
G+M+12, Sharjah	Commercial Building	UAE	Newform	2001
G+M+2, Sharjah	Commercial Building	UAE	Newform	2001
Marina Mall, Abu Dhabi	Commercial Building	UAE	Gibbs Int´l	2000
Planet Optical Disc, Dubai Airport	Airport	UAE	Planet Optical (client)	2001
Al Ain Teaching Facility	School	UAE	Keo international consultants	2001
Marriot Hotel	Hotel	UAE	Syna Dev.	2000
Al Musalla Tower	Commercial Building	UAE	W.S.Atkins	2000
Sahara Centre, Sharjah	Commercial Building	UAE	Kennedy & Donkins	2001
The Gardens, Jebel Ali	District Cooling	UAE	ETA - Khatib & Alami	2001
Al Ain University	School	UAE	Keo international consultants	
Wafi Mall Extn., Dubai	Commercial Building	UAE	WSP	
Childrens City, Dubai	Commercial Building	UAE	SPP/Dubai Municipality	
Jumeirah Villa-2	Private Villa	UAE	Engineer´s office	
Al Grome Plaza		UAE	Al Hamad	
The Tower (50 Storey)		UAE	Khatib & Alami	2002
Zabeel Palace Kitchen	Private Villa	UAE	Peter Huoson Buckle & Partners	2001

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Al Quez Office Block	Office Building	UAE	Engineer´s office	
World Trade Centre Hall 8	Commercial Building	UAE	RMJM	2002
World Trade Centre Halls 1 & 2	Commercial Building	UAE	RMJM	2002
Bakhita Building		UAE	Jain & Partners	
Emmar Bank	Bank	UAE	RMJM	
Arabian Ranches		UAE	Norr, Group	
B+G+M+26 Building for Al Sayegh		UAE	Gulf International	
B+G+M+23 Building for Al-Abbar		UAE	Gulf International	
B+G+M+4 for Dubai Real Estate Consultants		UAE	Al-Turath	
G+M+7 Storey Building for Al-Attar Consultants		UAE	Al-Turath	
Villa for H H Sheikh Mohammed Bin Rashid	Private Villa	UAE	Engineer´s office	
Nashad Building		UAE	Al Hamad	
Maqam Lab		UAE	Keo international consultants	
Hill Side Villas	Private Villa	UAE	ETA	
2 Villas at Safa	Private Villa	UAE	Gemac	
DWTC Hall 1 & 2		UAE	RMJM	
Mirage Hotel	Hotel	UAE	RPW	
Madinet Jumeirah	Hotel	UAE	RPW	
Dubai Marina		UAE	Mott Macdonald	2002
Womens College	School	UAE	Dar Al Handasah	2002
Womens Association		UAE	Shadeed Engineering	
Office Building	Office Building	UAE	Al Hamad	
Mirdiff Uptown House		UAE	Khatib & Alami	
Green Community Phase 1		UAE	Khatib & Alami	2004
Dubai Municipality Stores		UAE	Dubai Municipality project section	
Conference Palace Hotel PKG. 10A Hotels	Hotel	UAE	Keo international consultants	2003
Al Raha Hotel Bldg. & Shopping Complex		UAE	TEST	
Conference Palace PKG. 9 (Main Palace)		UAE	Keo international consultants	2003
Abu Dhabi Grand Hotel	Hotel	UAE	Keo international consultants	
Dubai Mens College	School	UAE	Dar Al Handasah	
Green Community Phase 1B (Villas)		UAE	Khatib & Alami	2004

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Green Community (Hotel and Terraced Apartments)		UAE	S & D / Gemac	2004
Dubai Free Zone Real Estate		UAE	RMJM	
Reef Mall	Commercial Building	UAE	RMJM	
45 Storey Hotel	Hotel	UAE	Archon	
Al Meraikhi Bldg. Abu Dhabi		UAE	Gemac	
4 Bldgs. At Emarat Hills		UAE	Ian Benham	
Villas at Emarat Hills		UAE	Frayland	
44 Storey Building		UAE	Arenco	
Cultural Centre	Commercial Building	UAE	Al - Hashmi	
Falcon Centre	Commercial Building	UAE	Gemac	
Garden´s Shopping Mall	Commercial Building	UAE	Gemac	2004
Palm Jumeirah Crescent		UAE	Palm District Cooling	2004
Dubai Airport (Plant room for Concourse)	Airport	UAE	Int´l Bectel	2000
Marina Mall, Abu Dhabi	Commercial Building	UAE	Gibbs Int´l	2000
Marriot Hotel	Hotel	UAE	Syna Dev.	2000
Al Musalla Tower	Commercial Building	UAE	W.S.Atkins	2000
Abu Dhabi Trade Center	Commercial Building	UAE	Cansult	2001
G+M+12, Sharjah	Commercial Building	UAE	Newform	2001
G+M+2, Sharjah	Commercial Building	UAE	Newform	2001
Planet Optical Disc, Dubai Airport	Airport	UAE	Planet Optical (client)	2001
Al Ain Teaching Facility	School	UAE	Keo international consultants	2001
Sahara Centre, Sharjah	Commercial Building	UAE	Kennedy & Donkins	2001
The Gardens, Jebel Ali	District Cooling	UAE	ETA - Khatib & Alami	2001
Zabeel Palace Kitchen	Private Villa	UAE	Peter Huoson Buckle & Partners	2001
The Tower (50 Storey)	Residential Building	UAE	Khatib & Alami	2002
World Trade Centre Hall 8	Commercial Building	UAE	RMJM	2002
World Trade Centre Halls 1 & 2	Commercial Building	UAE	RMJM	2002
Dubai Marina		UAE	Mott Macdonald	2002
Womens College	School	UAE	Dar Al Handasah	2002
Conference Palace Hotel PKG. 10A Hotels	Hotel	UAE	Keo international consultants	2003
Conference Palace PKG. 9 (Main Palace)		UAE	Keo international consultants	2003

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Green Community Phase 1		UAE	Khatib & Alami	2004
Green Community Phase 1B (Villas)		UAE	Khatib & Alami	2004
Green Community (Hotel and Terraced Apartments)		UAE	S & D / Gemac	2004
Garden´s Shopping Mall	Commercial Building	UAE	Gemac	2004
Palm Jumeirah Crescent		UAE	Palm District Cooling	2004
Motor City	Commercial, Residential & Hotels	UAE	WSP/Khatib & Alami/Edara	2007
Dubai Marina Quays	Residential & Commercial	UAE	Arif & Bintoak/Al Hamad	2007
Green Community Phase 2	Residential & Commercial	UAE	Khatib & Alami	2007
Julfar Tower		UAE		2007
Millenium Hotel		UAE		2007
Al Ain University	School	UAE	Keo international consultants	
Wafi Mall Extn., Dubai	Commercial Building	UAE	WSP	
Childrens City, Dubai	Commercial Building	UAE	SPP/Dubai Municipality	
Jumeirah Villa-2	Private Villa	UAE	Engineer´s office	
Al Grome Plaza		UAE	Al Hamad	
Al Quez Office Block	Office Building	UAE	Engineer´s office	
Bakhita Building		UAE	Jain & Partners	
Emmar Bank	Bank	UAE	RMJM	
Arabian Ranches		UAE	Norr, Group	
B+G+M+26 Building for Al Sayegh		UAE	Gulf International	
B+G+M+23 Building for Al-Abbar		UAE	Gulf International	
B+G+M+4 for Dubai Real Estate Consultants		UAE	Al-Turath	
G+M+7 Storey Building for Al-Attar Consultants		UAE	Al-Turath	
Villa for H H Sheikh Mohammed Bin Rashid	Private Villa	UAE	Engineer´s office	
Nashad Building		UAE	Al Hamad	
Maqam Lab		UAE	Keo international consultants	
Hill Side Villas	Private Villa	UAE	ETA	
2 Villas at Safa	Private Villa	UAE	Gemac	
DWTC Hall 1 & 2		UAE	RMJM	
Mirage Hotel	Hotel	UAE	RPW	
Madinet Jumeirah	Hotel	UAE	RPW	

Project references Middle East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Womens Association		UAE	Shadeed Engineering	
Office Building	Office Building	UAE	Al Hamad	
Mirdiff Uptown House		UAE	Khatib & Alami	
Dubai Municipality Stores		UAE	Dubai Municipality project section	
Al Raha Hotel Bldg. & Shopping Complex		UAE	TEST	
Abu Dhabi Grand Hotel	Hotel	UAE	Keo international consultants	
Dubai Mens College	School	UAE	Dar Al Handasah	
Dubai Free Zone Real Estate		UAE	RMJM	
Reef Mall	Commercial Building	UAE	RMJM	
45 Storey Hotel	Hotel	UAE	Archon	
Al Meraikhi Bldg. Abu Dhabi		UAE	Gemac	
4 Bldgs. At Emarat Hills		UAE	Ian Benham	
Villas at Emirates Hills		UAE	Frayland	
44 Storey Building		UAE	Arenco	
Cultural Centre	Commercial Building	UAE	Al - Hashmi	
Falcon Centre	Commercial Building	UAE	Gemac	
Dubai Health Care City	Office Complex	UAE		2007
Marina Quays	Residential Tower	UAE	Emaar	2007
Julfar Tower	Mixed Use Complex	UAE		2007
Millenium Hotel Extension	Hotel	UAE		2007
Dammam Towers	Mixed Use Complex	UAE	Buro Happold	2008
Horizon Towers	Mixed Use Complex	UAE		2008
Emirates Park Hotel	Hotel	UAE		2008
Business Park	Mixed Use Complex	UAE		2008

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
Landesbank Kiel	Bank	Denmark	Jørgen Wessberg		
Mercedes Danmark	Commercial Building	Denmark	Carl Bro		
Nokia	Commercial Building	Denmark	Steensen & Varming		
A.P. Møller (Esplanaden)	Commercial Building	Denmark	Carl Bro		
Terminal 3, Kastrup	Airport	Denmark	Steensen & Varming		
Baldersbo	Residential area	Denmark	Henrik Larsen		
Glostrup Boligselskab	Residential area	Denmark	Danacon		
Ingeniør skolen	School/University	Denmark	Cowi		
Odense Universitets Hospital	Hospital	Denmark	Cowi		
Glumsøparken	Residential area	Denmark	KAB		
TV2	TV-station	Denmark	NCC		
Danmarks Radio	TV-station	Denmark	Rambøll		
H & S Domicil	Society	Denmark	Steensen & Varming		
Hotel Hilton	Hotel	Denmark	Niras		
Hotel Marriott	Hotel	Denmark	Birch & Krogboe		
Kommunernes Landsforening	Society	Denmark	Ha Ca Frø		
Statoil Domicil	Commercial Building	Denmark	Birch & Krogboe		
Netto Centrallager	Commercial Building	Denmark	Birch & Krogboe		
Copenhagen University	School/University	Denmark	Cowi		
Rema 1000 Hovedlager	Commercial Building	Denmark	Skanska		
CCI Europe	Commercial Building	Denmark	Carl Bro		
Skanska Domicil	Commercial Building	Denmark	Cowi		
Maersk Data	Commercial Building	Denmark	Hes Klima KB		
Cowi Domicil Lyngby	Commercial Building	Denmark	Skanska		
Gram Fabrikkerne	Industry	Denmark	Rambøll		
Blücher	Commercial Building	Denmark	Rambøll		
Fisketorvet	Shopping Mall	Denmark	Skanska		
Tiscali/SAP	Commercial Building	Denmark	Midtconsult A/S		
Sparekassen Kronjylland	Bank	Denmark	Rambøll		
4YOU Hovedlager	Commercial Building	Denmark	Brøndum		
Bilka Horsens	Shopping Mall	Denmark			

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
Sydbank	Bank	Denmark	Esbensen A/S		
Vesterbro Boligforening	Residential area	Denmark			
Arla Ostemejeri	Industry	Denmark	Rambøll		
Ro's Torv	Shopping Mall	Denmark	Henrik Larsen		
BNP Paribas Headquarter, Paris	Commercial Building	France			
Atlantic building, Paris	Commercial Building	France			
Jewel of the sea	Cruise ship	Germany			
Hangar Fraport Frankfurt	Airport	Germany		AGO	2007
Hinitsa Hotel	Hotel	Greece	Envirotech		2000
Portohelli Hotel	Hotel	Greece	Envirotech		2001
Allied Irish Bank headquarter, Dublin	Commercial Building	Ireland			
Athlone Town Centr	Shopping Centre	Ireland	R. N. Murphy	Mercury Engineering	2007
Marynarska Business Park	Commercial Building	Poland	Danpo		2008
Trinity Park Phase II	Commercial Building	Poland	Danpo		2007
Office Park	Commercial Building	Poland	Danpo		2007
CER Poczta Polska (Polish Postal Services)	Warehouse hall	Poland	Danpo		2006
Pasaz Grunwaldzki (the Grunwaldzki passage)	Shopping centre	Poland	Danpo		2007
Akademia Swietokrzyska (the Swietokrzyska Academy)	School/University	Poland	Danpo		2006
Centro Colombo, Lissabon	Shopping Mall	Portugal			
Portugal Telecom headquarter	Commercial Building	Portugal			
Inclima		Spain			2004
Sistemec/Residencia	Residential area	Spain			2004
Obra		Spain			2004
Geriatrico en vigo	Residence for old people	Spain			2004
Hotel Elba en Almeria	Hotel	Spain			2004
Mc Donalds Baricentro	Restaurant	Spain			2004
Mc Donalds zubiarte	Restaurant	Spain			2004
Residencia de estudiantes	Residence of students	Spain			2004
Gonvarri		Spain			2004
Hotel don teodoro en la alberca	Hotel	Spain			2004
Centro civico Capiscol	Civic Center	Spain			2004

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
Tienda	Shopping Mall	Spain			2004
Sabeco		Spain			2004
Aparthotel	Hotel	Spain			2004
53 Viendas	Residential area	Spain			2004
Land Hotel	Hotel	Spain			2005
Hotel Ribera de duero	Hotel	Spain			2005
VITONIA BEACH CLUB	Residence	Spain		VECLIMA	2008
HOTEL BITACORA	Hotel	Spain		S. ARENCIBIA	2008
CC PALMERAS FUERTEVENTURA	Commercial Building	Spain		HUMICLIMA	2008
Obra HOTEL SUNWING	Hotel	Spain		INTERCLIMA DIEZ, S.L., ARBONA PIZA	2008
Obra HOTEL PRESTIGE LUCENA	Hotel	Spain		ARBONA PIZA - ICLIMA	2008
Obra HOTEL FLAMENCO CUNIL - CADIZ	Hotel	Spain		ARBONA PIZA - HUMICLIMA	2008
BIBLIOTECA CIUDAD REAL	Library	Spain		ENERMES CLM	2008
UPM-EDIFICIO LOM	School/University	Spain		MAINSA	2008
UPM-EDIFICIO AT	School/University	Spain		MAINSA	2008
UPM-EDIFICIO BT	School/University	Spain		MAINSA	2008
UPM-EDIFICIO FGP	School/University	Spain		MAINSA	2008
UPM-EDIFICIO LEF	School/University	Spain		MAINSA	2008
UPM-EDIFICIO LMA	School/University	Spain		MAINSA	2008
UPM-EDIFICIO SC	School/University	Spain		MAINSA	2008
RESIDENCIA SAN CLEMENTE	Residence	Spain		2C2E	2008
BODEGA MONTE LA REINA	Wine cellar	Spain		ENSITEC	2008
BODEGA MUDARA	Wine cellar	Spain		ENSITEC	2008
REHABILITACIÓN PALACIO DE COMUNICACIONES	Public building	Spain		INTERNACIONAL TECAIR	2008
COLEGIO PARACUELLOS	School/University	Spain		BENITO HERRERA	2008
PLANTA PANELES FOTOVOLTAICOS-ORENSE	Solar instalation	Spain		KLIMACAL	2008
COLEGIO ARANJUEZ	School/University	Spain		BENITO HERRERA	2008
CENTRO ENFERMEDADES RARAS	Health center/ Hospital	Spain		COFRICO	2008
238 VIVI TORREJON	Flats	Spain		INSSERCO	2008
SEDE BBVA SEVILLA	Bank	Spain		FRINORTE	2008
C.C. ARANJUEZ PLAZA	Commercial Building	Spain		ANCIN CLIMA	2008

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
HOTEL EN LEON	Hotel	Spain		COFRICO	2008
Kv. Hälleberget	Residential area	Sweden	JF Jansson Rör AB		2003
Polykemi AB	Industry	Sweden	Anderssons Rörinstallationer AB		2003
Kv. Idémannen	Science Park	Sweden	Sweco Theorells		2003
Saab	Industry	Sweden	YIT Sverige AB		2003
Bergshamra	Residential area	Sweden	YIT Sverige AB		2004
Kv. Klostret	Shopping Mall	Sweden	NCC Construction		2004
Kv. Osthyveln	Residential area	Sweden	NVS Installation AB		2004
Kv. Anna	Residential area	Sweden	GE VVS-Projektering AB		2004
Kv. Nunnan	Residential area	Sweden	GE VVS-Projektering AB		2004
Kv. Samson	Residential area	Sweden	Råå VVS-Byrå AB		2004
Cloetta Center	Sports facility	Sweden	NVS Installation AB		2004
Sannegårdshamnen 2	Industry	Sweden	EPG Konsult Samordnad VVS Teknik		2004
Kv. Gulsparven	Commercial Building	Sweden	Bengt Dahlgren AB		2004
Mjärdevi center, Linköping	Commercial Building	Sweden			
The Marmara Hotel	Hotel	Turkey			
Kirklees Schools PFI	School/University	UK		Airedale Mechanical	
Copthorne Hotel	Hotel	UK	Applied Energy	All Group	
Hilton Hotel	Hotel	UK	Applied Energy	All Group	
Marriot Hotel	Hotel	UK	Applied Energy	All Group	
Leicester LIFT	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Hardman Street	Commercial Building	UK	Waterman Gore	NG Bailey	
Comben House		UK		Haden Young	
Claredon Road		UK		Watsons	
New England Sea Food	Commercial Building	UK		Yorkshire Building	
Bristol Harbourside	Residential area	UK	Hoare Lea	Crown House Tech.	
Millbank EPH		UK	SI Sealy	Cross Services	
Beaconsview EPH		UK	SI Sealy	Cross Services	
Castleford EPH		UK	SI Sealy	Cross Services	
St James Oncology	Hospital	UK	Hoare Lea	Rotary Services	
IDCC LIFT		UK	EP consulting/Hulley & Kirkwood	J Tomlinson	

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
St Peters LIFT	School/University	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Gretna Green Hotel	Hotel	UK	Pricewise D&B	Pricewise	
Merrill College	School/University	UK	Pick Everard	Rosser & Russel	
Worcester BOSCH	Industry	UK		ESDP	
EDS Hook		UK		Westco	
Vencourt Hotel	Hotel	UK	Applied Energy	All Group	
ExxonMobil	Industry	UK	Foreman Roberts	Michael J Lonsdale	
D.V.L.A. Swansea		UK	Hoare Lea	Lorne Stewart	
Geest Foods		UK		Grenco Refrigeration	
Bernard Matthews		UK		Grenco Refrigeration	
Northumberland House	Commercial Building	UK	Elementa	Meica Services	
Merryfield Pre-School	School/University	UK		Merryfield Pre-School	
Heron House	Hotel	UK	IEI Building Services	Trox	
3 Olaf Street		UK	ARUP	Borahurst Ltd	
Unilever	Industry	UK		Grenco Refrigeration	
Farnborough Business Park	Commercial Building	UK	Foreman Roberts	Pipe Center-Slough	
Marble Arch Marriot Hotel	Hotel	UK	Applied Energy	All Group	
Mecca Bingo		UK		Warrens-Leeds	
Blenheim Business Park	Commercial Building	UK	Pricewise	David Ford Mech & Elec	
Hilton Metropole	Hotel	UK	Applied Energy	All Group	
Long Eaton Health Centre	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Oakington Reception		UK		GSL UK Ltd	
Westcotes Primary Care	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Swadlincote Primary Care	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Alfreton Primary Care	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Navigation Primary School	School/University	UK	SI Sealy	A. Longworth & Sons Ltd	
Austin Estates Primary		UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
St. Pauls Square		UK	Buro Happold	Marflow Engineering Ltd.	
Shell centre		UK	Hurley palmer Flatt	Shepherd Engineering	
Willowgarth High School	School/University	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Coleman Street		UK	EP consulting/Hulley & Kirkwood	J Tomlinson	

Project references Europe

PROJECT	TYPE	AREA	CONSULTANT	CONTRACTOR	YEAR
Lily II		UK		Marflow Engineering Ltd.	
Orchard School	School/University	UK		Silverback Bldg Serv Ltd	
Pomona Street		UK	Hoare Lea	Mitie Engineering	
Dartford Innov Center		UK		Marflow Engineering Ltd.	
Vincent Square		UK		Meica Services	
Moy Park Ltd		UK		Grenco Refrigeration	
Humberstone Health centre	Health center	UK	EP consulting/Hulley & Kirkwood	J Tomlinson	
Homeserve Phase 4		UK		Marflow Engineering Ltd	
Aldgate Union	Commercial Building	UK	WSP	MJN Colston	
Jarvis Ramada	Hotel	UK	Applied Energy	All Group	
Hilton Hotel	Hotel	UK	Applied Energy	All Group	
1 Millharbour, London	Residential Tower	UK	Hoare Lea	Haydon Mechanical Electrical	2007
160 Tooley Street, London	Office Building	UK	ARUP	Crown House Technologies	2007
Warwick Court, London	Office Building	UK	Sinclair Knight Mertz	WESTCO	2007
Banside Leisure Centre, Yorkshire	Leisure Centre	UK		Yorkshire Building Services	2007
22-26 Cursitor Street, London	Office Building	UK	Chapman Bathurst	MJ Lonsdale	2007
22 Marsh Wall, London	Residential Tower	UK	Hoare Lea	Haydon Mechanical Electrical	2008
Watermark Place, London	Office Building	UK	Waterman Building Services	NG Bailey	2008

Project references Far East

PROJECT	TYPE	AREA	CONSULTANT	YEAR
Sudan Water Treatment Plant	Plant	Malaysia		2005
Kuittho, Dewan Kuliah - Phase 2	School	Malaysia		2005
Shek Wu Hui Municipal Services building	Commercial building	Hong Kong		
Northbank Towers, Melbourne	Commercial building	Australia	Crane Distribution	2008

Frese A/S
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Frese OPTIMA
A new generation of dynamic valves

Frese Optima is designed to combine automatic balancing and absolute modulating control regardless the preset flow.

- Max diff. pressure: 400 kPa
- Temperature: 0 to 120°C
- Dimensions: DN15-DN50
- Material: DZR brass
- Static pressure: PN25
- For cooling and heating

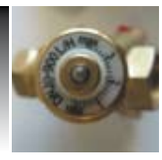
The innovative design of Frese Optima introduces an intelligent control valve that adjusts automatically to the preset flow in order to provide full modulating control. When the installer presets the valve according to the maximum designed flow, the stroke of the control valve remains the same thus providing 100% modulating control. In practical terms, Frese Optima ensures that there isn't any overflow and that below the design flow the actuator has absolute authority.

Furthermore, Frese Optima combines all those features that are necessary to ease the work of designers and installers: flushing is possible due to the cartridge solution selected for the dynamic balancing part of the valve; the wide (up to 400kPa) differential pressure range meets the requirements of most applications; the compact design and the user-friendly presetting unit guarantee easy installation and commissioning.

Frese balances efficiently HVAC systems all around the world. From cooling systems in the Middle East to heating systems in Scandinavia, Frese's products transform state of the art technology into every day solutions.

Danish production


Female/female threaded


Simple scale

Marynarska Business Park, Warsaw, Poland

This office building is one of the most important office investments in Poland in 2009. The total office space exceeds 45,000 m^2. The complex consists of four inter-connected buildings, three low-rise buildings and a tower The elevation is made from huge glass fragments finished with sandstone and steel. Inside the complex there is a green patio and a fountain. In addition to unique architectural features, this office building complies with the highest quality and technical standards.

3000 Frese EVA valves, with cartridges, p/t plugs and actuators on/off 230 V with the flow from 25 l/h to 2448 l/h, were selected to ensure the hydraulic balance of the heating/cooling circuit and the right temperature everywhere in the building. There was no need to install balancing valves in every section or on each storey, so expensive, time-consuming manual adjustment was avoided. Frese products was selected as the best technical and most economical solution.

For more information see: www.frese.eu

Frese
Energy saving valves