

Frese OPTIMA Compact EP DN50-DN80

Application

Frese OPTIMA Compact EP (Extended Performance) pressure independent balancing & control valves (PIBCV) are used in applications with high demands concerning temperatures and differential pressures. Such as district heating and low temperature cooling applications.

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

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

Frese OPTIMA Compact EP 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 - always one
- Flexibility if the system is modified after the initial installation

Installation

- No further regulating valves required in the distribution pipework when Frese OPTIMA Compact EP is installed at the units
- Total number of valves minimized due to the 3-in-1 design
- Minimized commissioning time due to automatic balancing of the system
- No minimum straight pipe lengths required before or after the valve

Operation

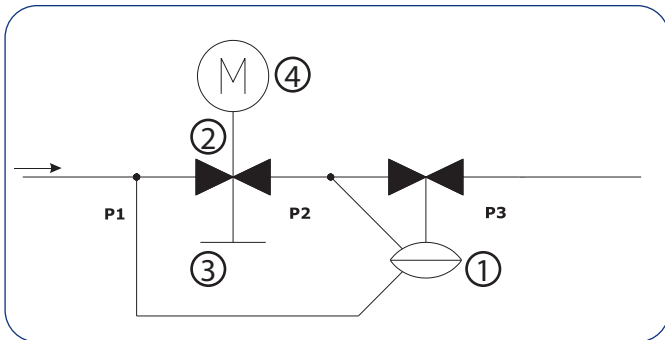
- High comfort for the end-users due to high precision temperature control
- Longer life due to less movements of the actuator



Features

- The presetting function has no impact on the stroke; Full stroke modulation at all times, regardless the preset flow
- Regulation characteristic remains unchanged regardless of 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
- Motoric actuator 0-10 V, 4-20 mA and 3 point control
- Differential pressure operating range up to 1200 kPa
- High flows with minimal required differential pressure due to advanced design of the valve
- Small dimensions due to compact housing
- Higher presetting precision due to stepless analogue scale
- Rangeability > 100:1

Frese OPTIMA Compact EP DN50-DN80



Design

The design of Frese OPTIMA Compact EP combines high performance and a compact design.

The main components of the valve are:

- ① Differential pressure control
- ② Modulating control component
- ③ Presetting scale
- ④ Actuator



Function

The Frese OPTIMA Compact EP can be flushed and commissioned before the actuator is installed.

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.

For lowest energy consumption, check the differential pressure at the index valve to set the pump at minimum speed.

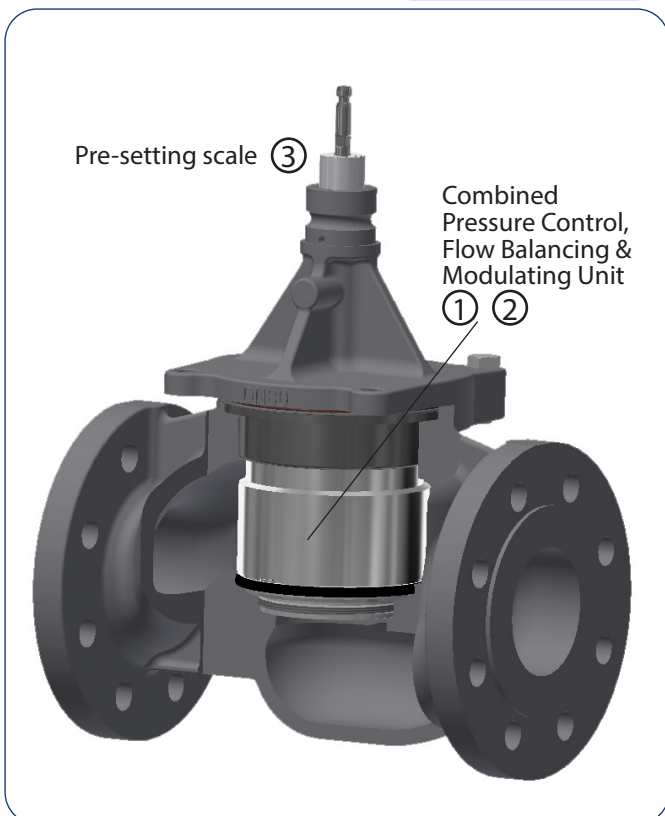
Operating Pressure

Frese OPTIMA Compact EP DN50-DN80 can operate to a maximum differential pressure of 1200 kPa (12 bar)

Close Off Pressure

The Frese OPTIMA Compact EP is capable of closing against the following differential pressure to EN 1349 Class IV:

DN50-DN80: 1200 kPa - based on 800N actuator force



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Operation principle

The innovative design of Frese OPTIMA Compact EP features a modulating control component that retains 100% authority at all times.

With the Frese OPTIMA Compact EP, there are two independent movements for the presetting and the modulating function.

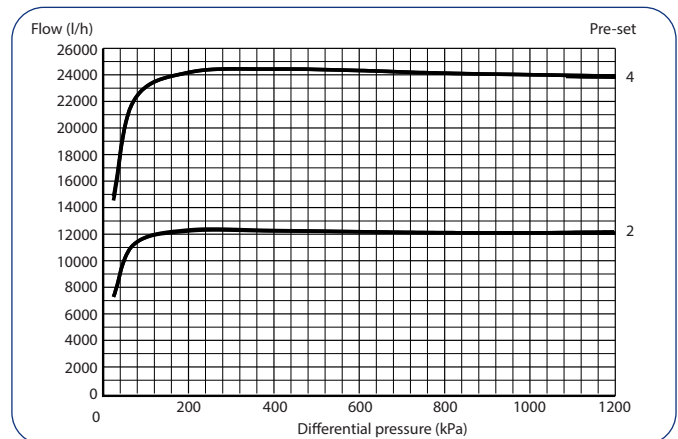
During presetting, the inlet area moves radially without interfering with the length of the stroke. During modulating, the inlet area moves axial taking advantage of the full stroke. Whilst the control component provides proportional

modulation irrespective of the preset flow, the automatic balancing 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 1200 kPa.

Flow rate vs. Differential Pressure

Preset flow: 24000 l/h, 12000 l/h



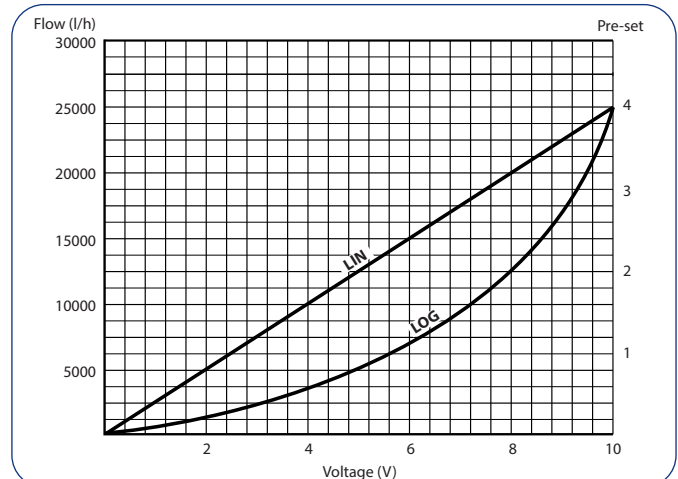
Flow rate vs. Voltage

Preset flow: 25000 l/h

Valve Characteristic:

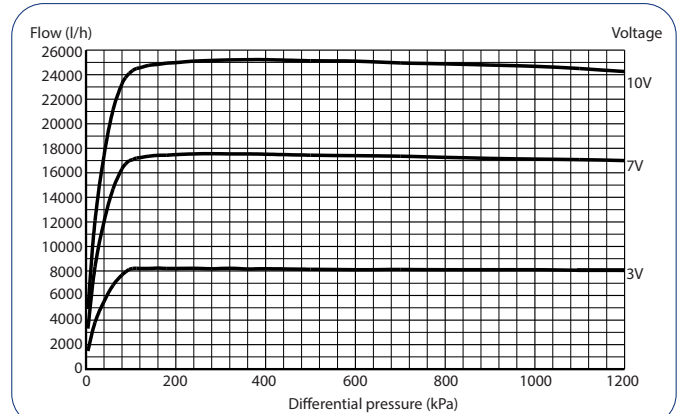
Frese OPTIMA Compact EP valve design has a linear control characteristic. The control characteristic is independent of the flow setting and available pressure.

Because of the independent characteristic the actuator setting can be used to change the valve response from linear to logarithmic (Equal Percentage).



Flow rate vs. Differential Pressure

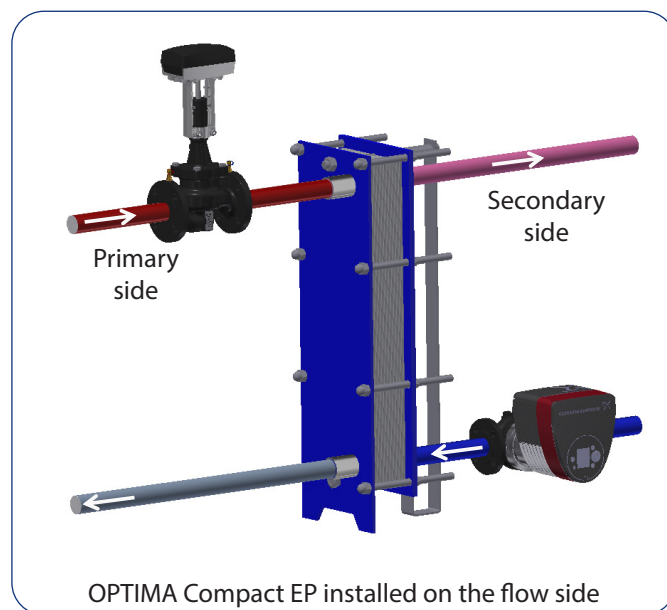
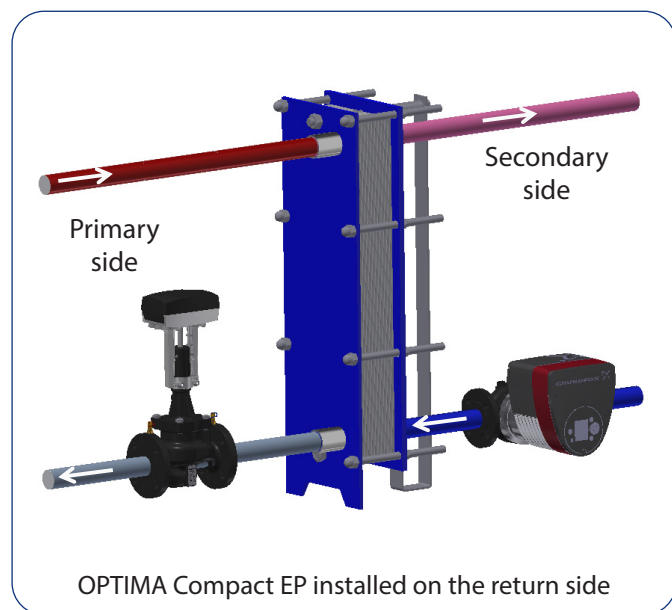
Voltage: 10V, 7V, 3V
(Linear actuator characteristic)



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Application Diagrams

Frese OPTIMA Compact EP can be installed in any heating and cooling system where full pressure independent modulating control is required. The valve can be installed both on the flow and return side of a plate heat exchanger, as long as the temperature and differential pressure specifications are taken into consideration.



Frese OPTIMA Compact EP sizing example

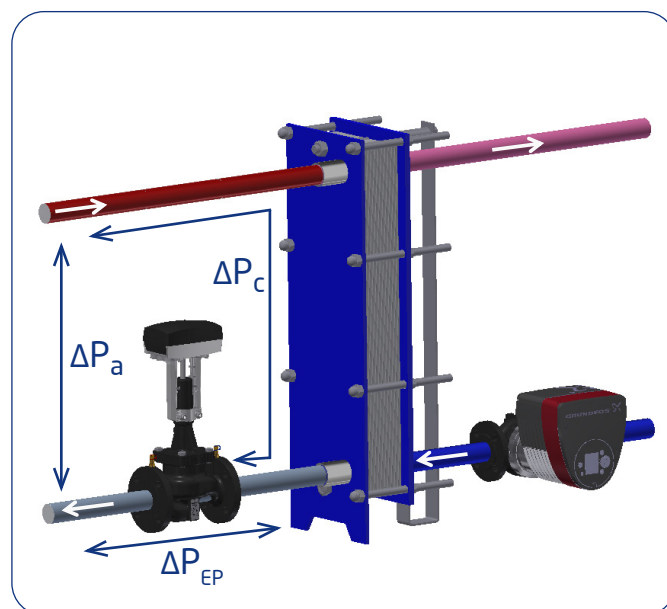
A district heating substation should be sized for a building's central heating system.

The substation uses a heat exchanger. The flow through the heat exchanger must be controlled by means of a motorized valve in order to achieve the required water temperature on the secondary system side.

Frese OPTIMA Compact EP is chosen for the application.

The valve must be sized for the following conditions:

- The heat exchanger must provide 750 kW
- The supply water temperature on the primary system side is 130°C
- The return water temperature on the primary system side is 70°C
- The differential pressure available on the primary system side is $\Delta P_a = 900 \text{ kPa}$ (9 bar)
- The pressure loss in all the pipes, heat exchanger and other components of the substation except for the control valve (Frese OPTIMA Compact EP) is $\Delta P_c = 50 \text{ kPa}$ (0.5 bar)



Frese OPTIMA Compact EP DN50-DN80

Frese OPTIMA Compact EP sizing example (continued...)

The required flow through Frese OPTIMA Compact EP is:

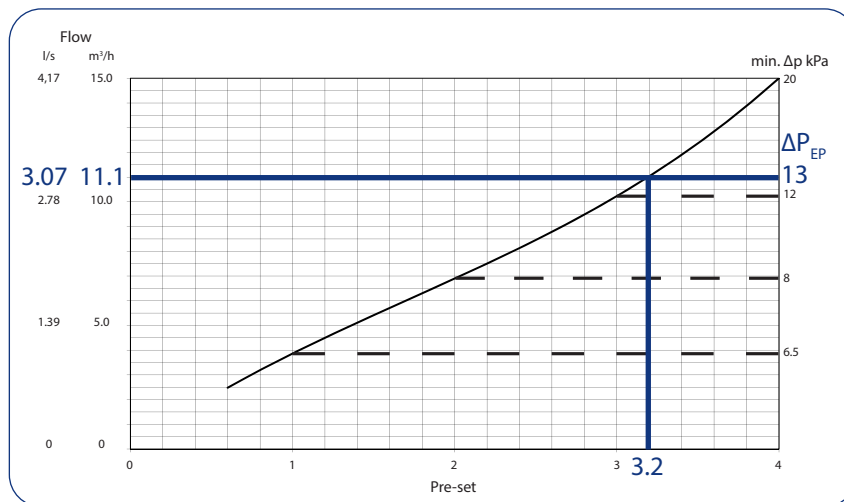
$$Q = \frac{E \text{ [kW]}}{c_p \text{ [kJ/(kg K)]} * \rho \text{ [kg/dm}^3\text{]} * \Delta T \text{ [K]}}$$

c_p – water heat capacity, kJ/(kg K)
 ρ – water density, kg/dm³
 ΔT – supply and return water temperature difference, K
 E – heat exchanger capacity, kW

$$Q = \frac{750 \text{ kW}}{4.20 \text{ [kJ/(kg K)]} * 0.970 \text{ [kg/dm}^3\text{]} * (130-70) \text{ K}} = 3.07 \text{ dm}^3/\text{s} = 11,100 \text{ l/h}$$

The required Frese OPTIMA Compact EP should be selected based on the graphs.

In this case the Frese OPTIMA Compact EP DN50 LF meets the specification.



The selected Frese OPTIMA Compact EP DN50 LF requires $\Delta P_{EP} = 13 \text{ kPa}$ of differential pressure and should be set to position 3.2 to provide the sizing flow.

The total required pressure loss in the substation is:

$$\Delta P_c + \Delta P_{EP} = 50 \text{ kPa} + 13 \text{ kPa} = 63 \text{ kPa}$$

It is lower than the available differential pressure in the substation: $\Delta P_a = 900 \text{ kPa}$.

The greatest differential pressure that Frese OPTIMA Compact EP could be subjected to in the substation during sizing conditions is:

$$\Delta P_{max} = \Delta P_a - \Delta P_c = 900 \text{ kPa} - 50 \text{ kPa} = 850 \text{ kPa}$$

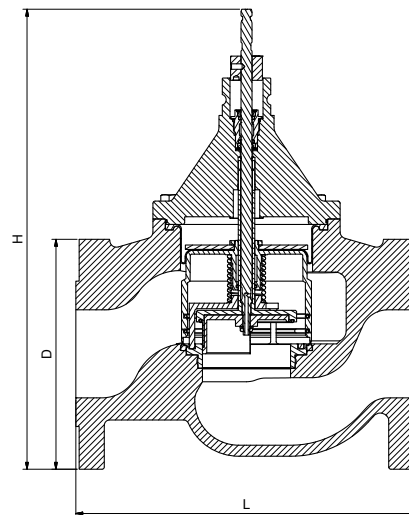
Since Frese OPTIMA Compact EP can operate at a differential pressure of 1200 kPa (12 bar) and the greatest differential pressure in the district heating system is 900 kPa, the valve can be used in the substation.

No additional differential pressure control valve is required in the substation as the integrated in Frese OPTIMA Compact EP differential pressure controller will compensate for any pressure fluctuations in the district heating system.

Frese OPTIMA Compact EP DN50-DN80

Technical data

Valve housing DN50-DN65:	GJL-250 PN16 GJS-400 PN25
Valve housing DN80:	GJS-400 PN16/PN25
DP controller:	Stainless steel
Spring:	Stainless steel
Diaphragm:	Reinforced EPDM
O-rings:	EPDM
Pressure class:	PN16/25
Stroke:	20 mm
Flange connections:	ISO 7005-2 / EN 1092-2
Max. differential pressure:	1200 kPa
Medium temperature:	-20°C to 150°C
When used at temperatures below 0°C, a stem heater must be used, to prevent ice on the spindle	



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 Recommendation: Water treatment to VDI 2035.

Dimension & Weight

Dim.		DN50	DN65	DN80
		ISO	ISO	ISO
Dimensions mm	L	230	290	310
	H	367	384	413
	D	165	185	200
Weight kg	PN16	14.5	18.9	27.3
	PN25	14.1	19.2	27.5

Flow

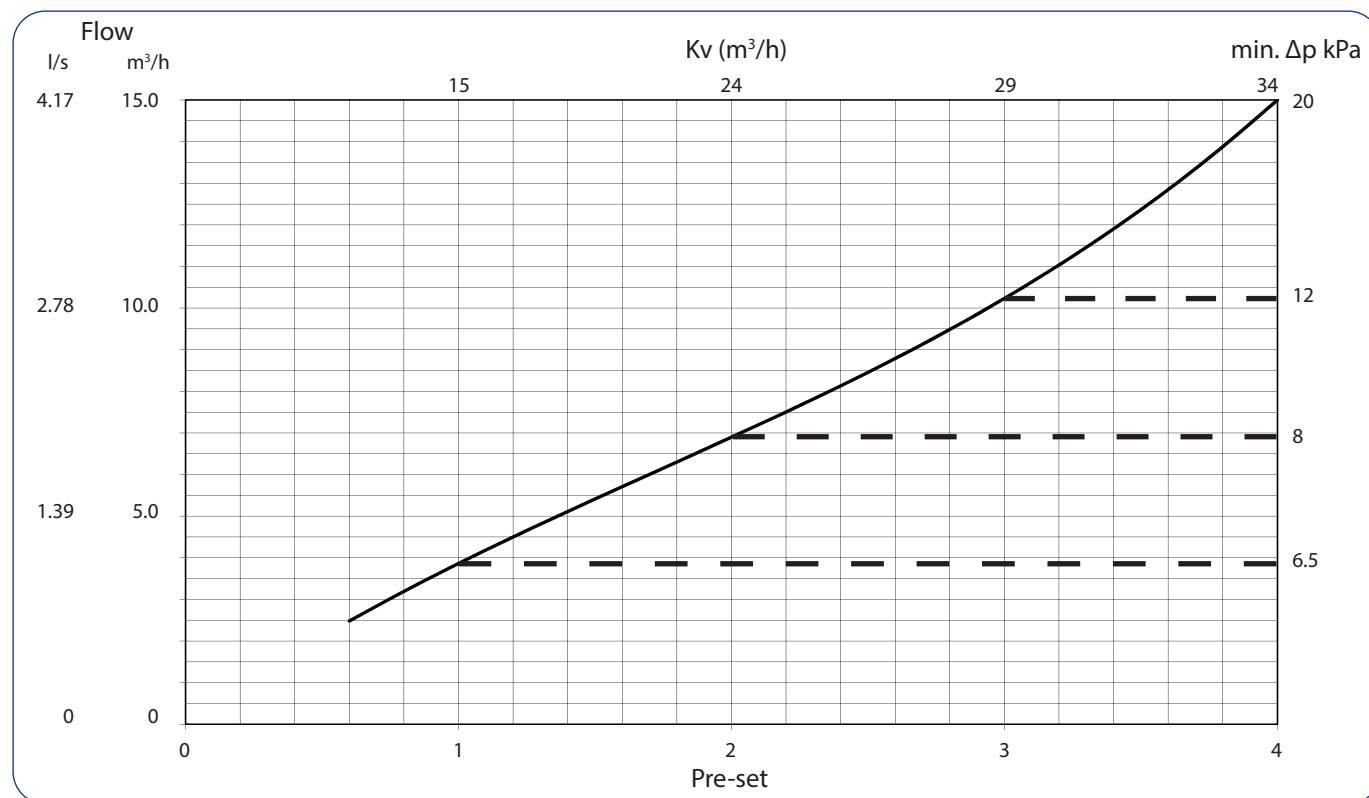
Dim.		DN50		DN65		DN80	
Type		LF	HF	LF	HF	LF	HF
Flow	m³/h	2.48 - 15.00	3.92 - 24.00	4.38 - 25.00	5.95 - 35.00	5.34 - 34.00	7.02 - 43.00
	l/s	0.689 - 4.167	1.089 - 6.667	1.216 - 6.945	1.654 - 9.724	1.484 - 9.450	1.951 - 11.954
	gpm	10.92 - 66.03	17.28 - 105.65	19.27 - 110.06	26.21 - 154.11	25.53 - 149.78	30.92 - 189.47

Product programme

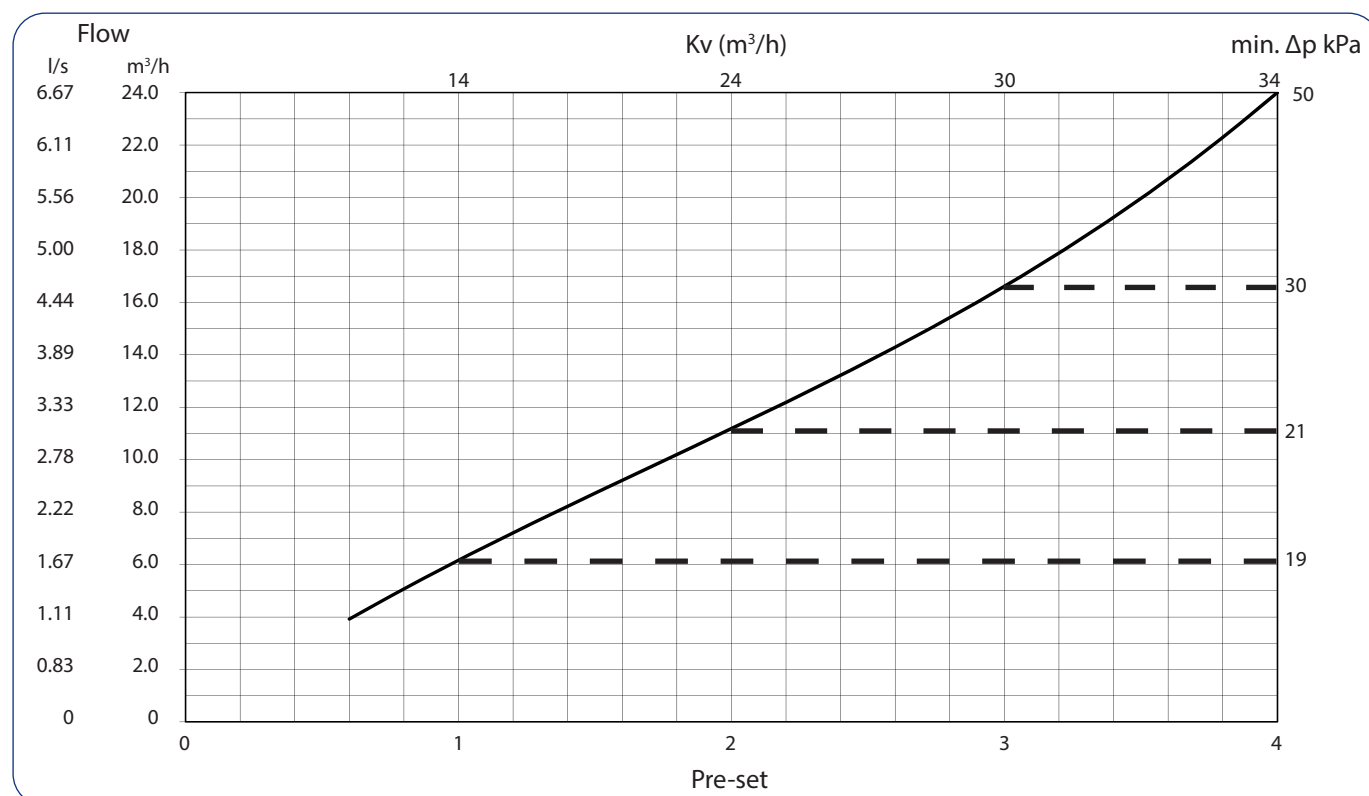
Dim.	Type	Flow m³/h	PN16	PN25
DN50	Low flow	2.48 - 15.00	53-8000	53-8020
	High flow	3.92 - 24.00	53-8010	53-8030
DN65	Low flow	4.38 - 25.00	53-8001	53-8021
	High flow	5.95 - 35.00	53-8011	53-8031
DN80	Low flow	5.34 - 34.00	53-8002	53-8022
	High flow	7.02 - 43.00	53-8012	53-8032

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Frese OPTIMA Compact EP • Low Flow DN50

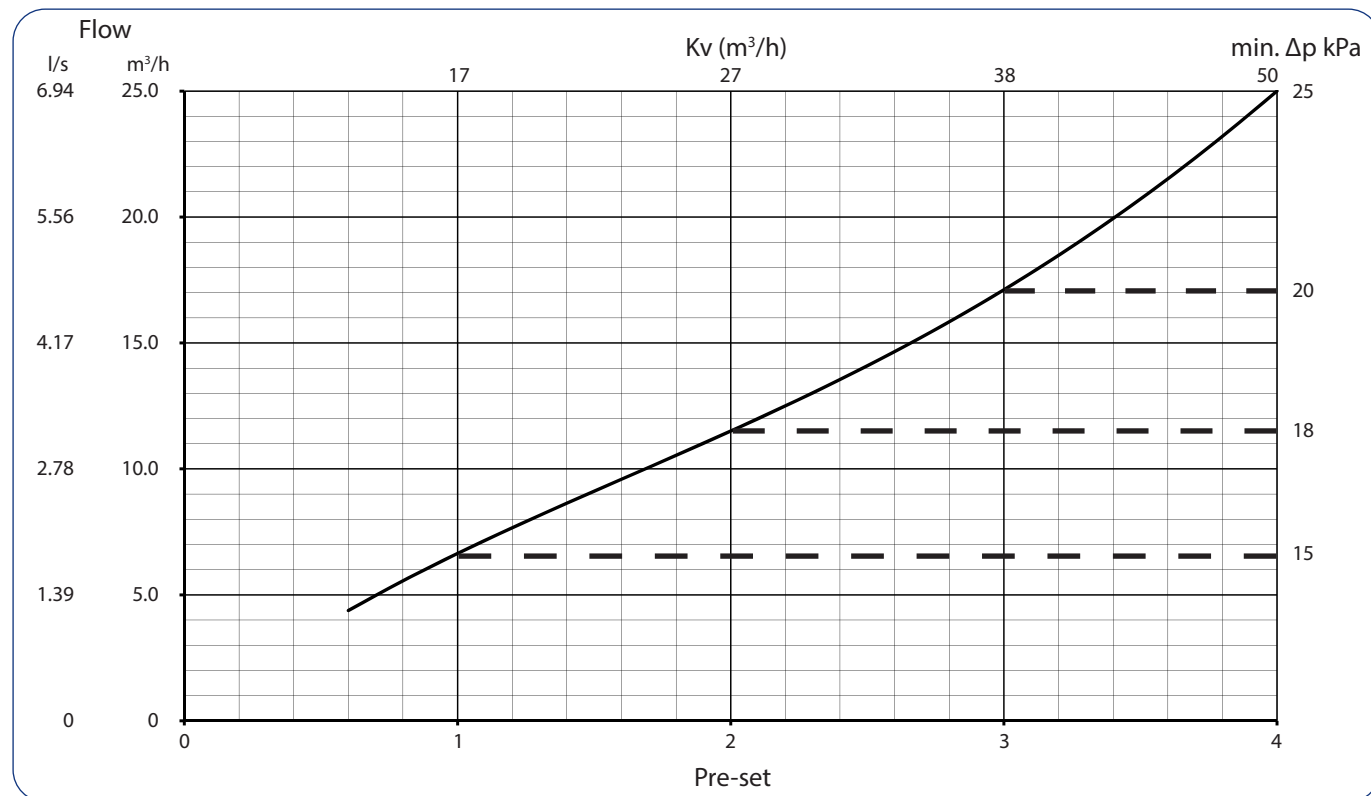


Frese OPTIMA Compact EP • High Flow DN50

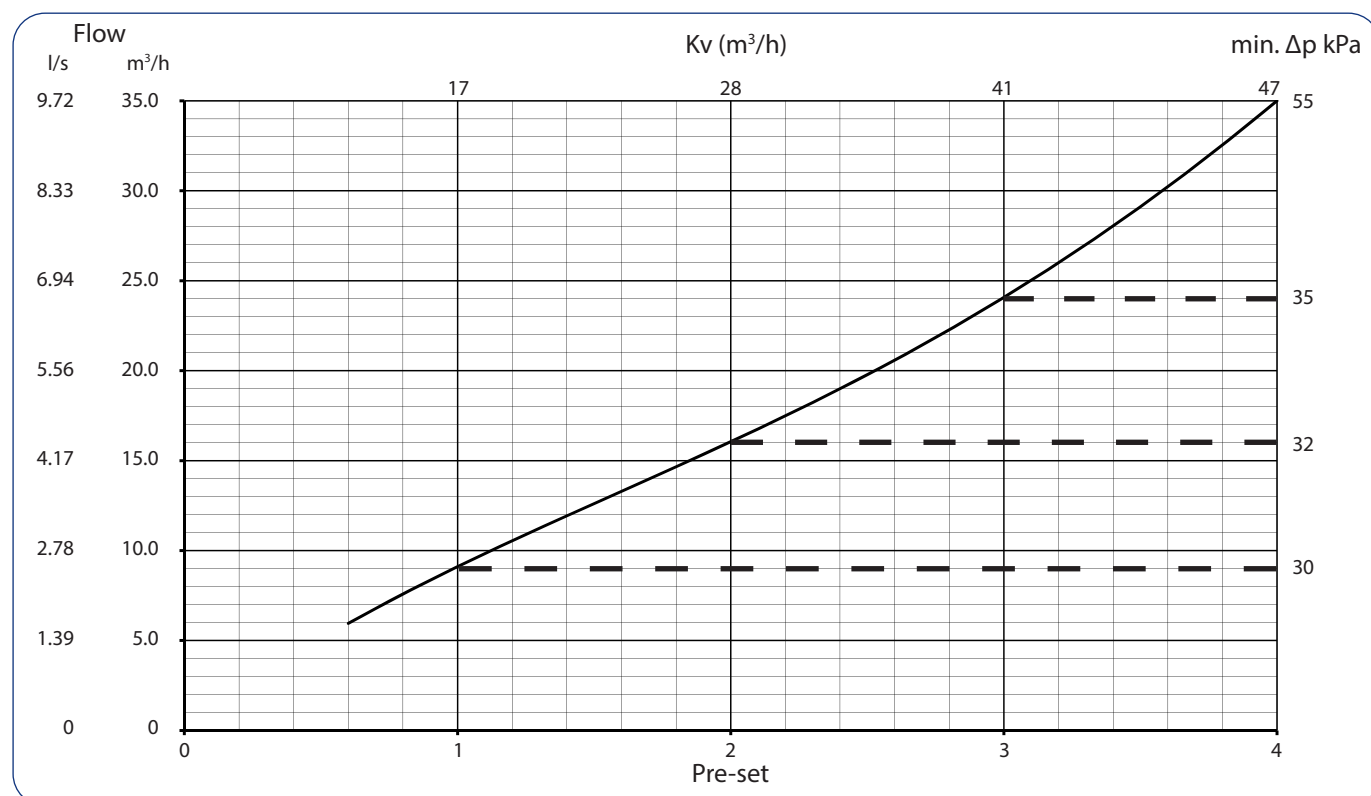


Frese OPTIMA Compact EP DN50-DN80

Frese OPTIMA Compact EP • Low Flow DN65

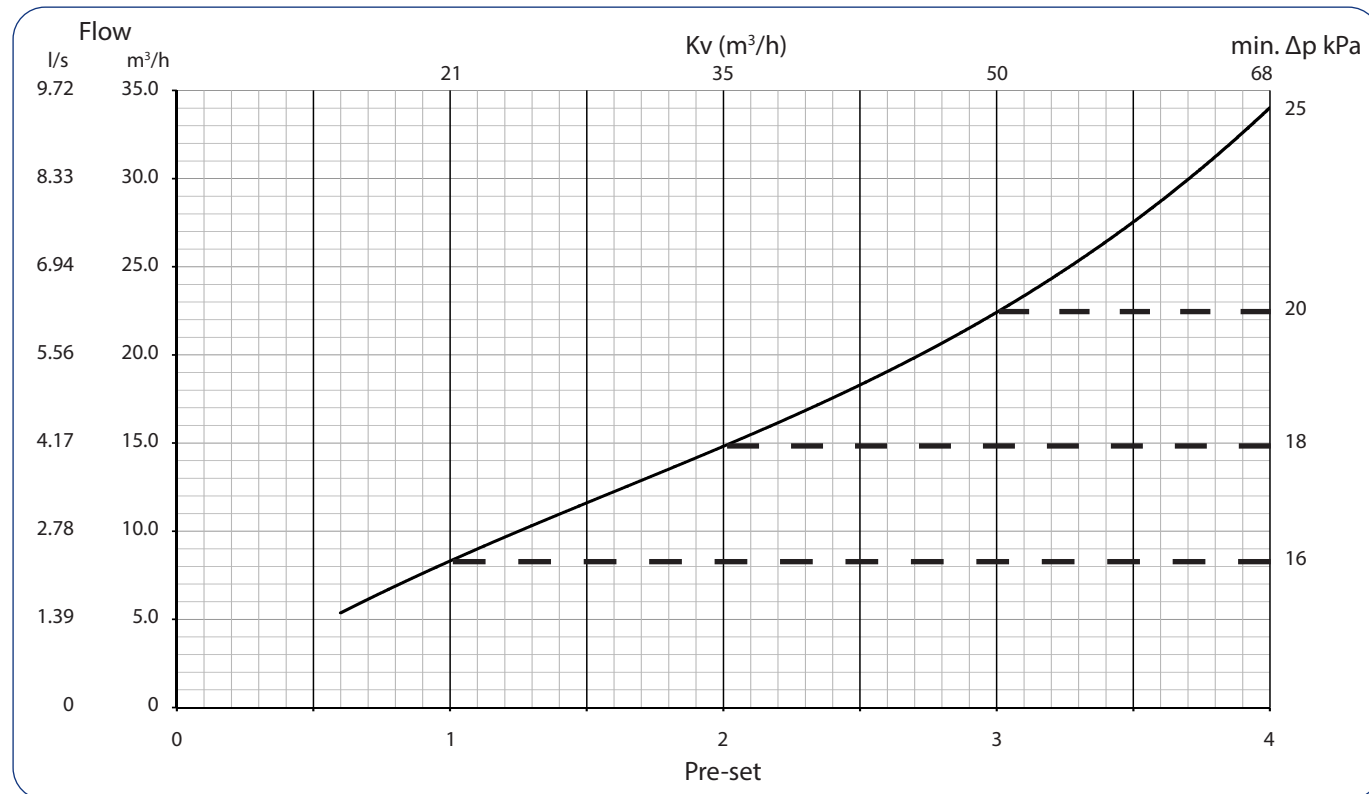


Frese OPTIMA Compact EP • High Flow DN65

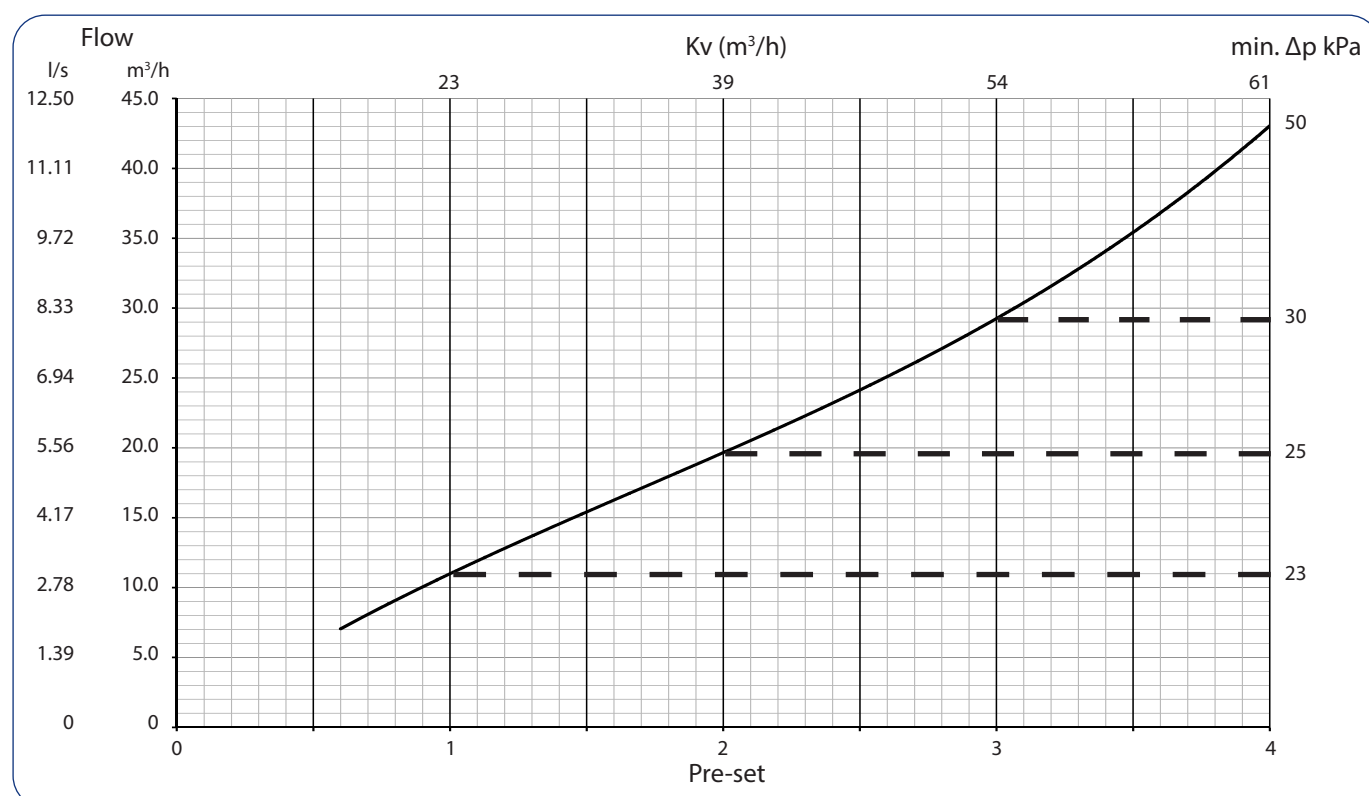


Frese OPTIMA Compact EP DN50-DN80

Frese OPTIMA Compact EP · Low Flow DN80



Frese OPTIMA Compact EP · High Flow DN80



Frese OPTIMA Compact EP DN50-DN80

Setting and Flow · Low Flow

Dim.	DN50			DN65			DN80		
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
0.6	2.5	0.689	10.92	4.4	1.216	19.27	5.3	1.484	23.53
0.8	3.2	0.887	14.06	5.6	1.544	24.47	6.9	1.906	30.21
1.0	3.9	1.073	17.01	6.6	1.846	29.25	8.3	2.301	36.48
1.2	4.5	1.250	19.81	7.7	2.129	33.73	9.6	2.677	42.44
1.4	5.1	1.420	22.51	8.6	2.399	38.02	10.9	3.040	48.19
1.6	5.7	1.586	25.14	9.6	2.663	42.21	12.2	3.396	53.83
1.8	6.3	1.750	27.74	10.5	2.927	46.39	13.5	3.751	59.46
2.0	6.9	1.916	30.36	11.5	3.195	50.63	14.8	4.113	65.19
2.2	7.5	2.084	33.03	12.5	3.472	55.03	16.2	4.486	71.11
2.4	8.1	2.258	35.79	13.5	3.763	59.64	17.6	4.878	77.32
2.6	8.8	2.441	38.69	14.7	4.071	64.52	19.1	5.295	83.93
2.8	9.5	2.635	41.76	15.8	4.400	69.73	20.7	5.744	91.04
3.0	10.2	2.842	45.04	17.1	4.753	75.32	22.4	6.230	98.74
3.2	11.0	3.065	48.57	18.5	5.132	81.33	24.3	6.760	107.15
3.4	11.9	3.306	52.40	19.9	5.539	87.78	26.4	7.341	116.35
3.6	12.8	3.569	56.56	21.5	5.976	94.71	28.7	7.978	126.46
3.8	13.9	3.855	61.09	23.2	6.445	102.13	31.2	8.679	137.57
4.0	15.0	4.167	66.03	25.0	6.945	110.06	34.0	9.450	149.78

Setting and Flow · High Flow

Dim.	DN50			DN65			DN80		
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
0.6	3.9	1.090	17.28	6.0	1.654	26.21	7.0	1.951	30.92
0.8	5.1	1.410	22.34	7.6	2.108	33.41	9.0	2.513	39.83
1.0	6.2	1.713	27.15	9.1	2.530	40.09	11.0	3.043	48.23
1.2	7.2	2.003	31.75	10.5	2.929	46.42	12.8	3.547	56.23
1.4	8.2	2.285	36.21	11.9	3.314	52.52	14.5	4.034	63.94
1.6	9.2	2.560	40.57	13.3	3.692	58.52	16.2	4.510	71.48
1.8	10.2	2.833	44.90	14.7	4.072	64.53	18.0	4.982	78.96
2.0	11.2	3.107	49.24	16.0	4.458	70.66	19.6	5.457	86.49
2.2	12.2	3.386	53.66	17.5	4.858	76.99	21.4	5.943	94.19
2.4	13.2	3.672	58.20	19.0	5.277	83.63	23.2	6.446	102.17
2.6	14.3	3.970	62.92	20.6	5.719	90.63	25.1	6.973	110.53
2.8	15.4	4.283	67.88	22.3	6.188	98.07	27.1	7.533	119.40
3.0	16.6	4.614	73.13	24.1	6.688	105.99	29.3	8.131	128.88
3.2	17.9	4.967	78.72	26.0	7.222	114.45	31.6	8.775	139.09
3.4	19.2	5.346	84.72	28.0	7.791	123.47	34.1	9.473	150.15
3.6	20.7	5.753	91.17	30.2	8.397	133.08	36.8	10.230	162.15
3.8	22.3	6.192	98.13	32.5	9.042	143.29	39.8	11.055	175.22
4.0	24.0	6.667	105.65	35.0	9.724	154.11	43.0	11.954	189.47

Documentation formula

[illegible]

Pump type	Regulation mode	Set point
Installation		
Signature		Date

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