Frese SIGMA Compact
Dynamic Balancing Valve

Description

The Frese SIGMA Compact is an externally adjustable dynamic balancing valve that provides simple, accurate and reliable flow limitation and isolation in heating and cooling systems.

Application

The Frese SIGMA Compact can be used in both heating and cooling systems for the effective distribution of flow in various sections of the system.

The Frese SIGMA Compact can be used instead of traditional double regulating valves and can be installed in both variable flow systems and constant flow systems.

Operation

The Frese SIGMA Compact can be set to the required position easily by using the scale, to limit the flow rate in certain parts of a system, eliminating overflows and the unnecessary wastage of energy. The internal differential pressure control function of the Frese SIGMA Compact ensures that the set flow rate is limited irrespective of differential pressure fluctuations in the system.

The hand wheel can be used to close the valve and to open it to the preset flow.

Features

- Easy adjustment of the flow using the clear preset scale on the valve
- Hand wheel provides an isolation function up to 10 bar differential pressure
- No minimum straight pipe lengths required before or after the valve
- Built-in P/T plugs for needle system
- Size range: DN50 to DN150
- Flow range: 2,480 to 195,000 l/h
- Maximum differential pressure: 800 kPa

Benefits

- Easy to size and select as only the flow rate is required
- Simplified system design with the number of balancing valves being reduced
- Removes the requirement for main circuit or branch balancing valves in the system
- Works as a flow limiter ensuring no overflows
- Easy to install and adjust on site
- Provides flexibility if the system is modified after the initial installation
- Simplifies the commissioning process and reduces commissioning time due to automatic balancing of the system
- High level comfort for the end-users as a result of the correct balance of the hydraulic system
- Reliable operation as a dynamic balancing valve automatically finds the hydraulic balance regardless of pressure fluctuations in the system

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Function

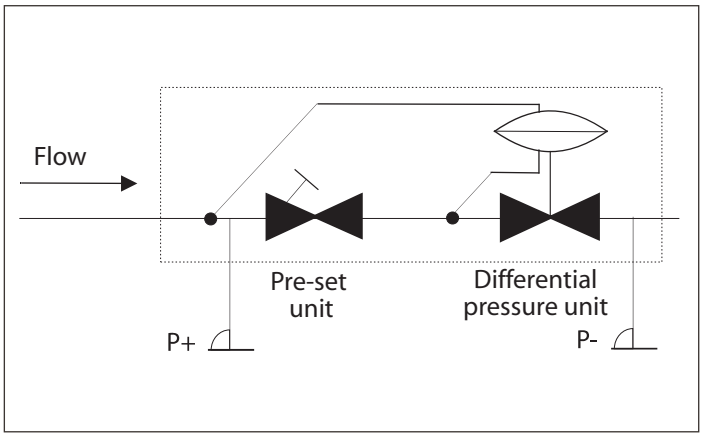
The Frese SIGMA Compact reacts to pressure fluctuations in a system in order to keep the differential pressure across the pre-set unit constant. By achieving this, a maximum flow limit is ensured in accordance with the design.

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)

Simplified Outline

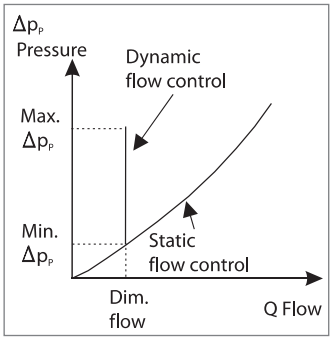


Flow Characteristic

The illustration shows how the flow in a Frese SIGMA Compact valve reacts in accordance to the pump pressure. For comparison we have added a typical flow characteristic for a static balancing valve.

The differential pressure function of the valve will work when the differential pressure provided by the pump is sufficient to meet the required minimum differential pressure (which is dependent upon the required flow rate).

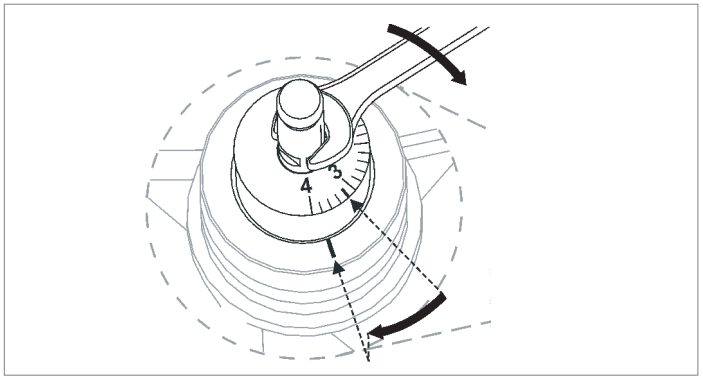
Once the minimum differential pressure is satisfied, the set flow rate is maintained regardless of any pressure fluctuations in the system.



Setting the Valve and mounting the hand wheel

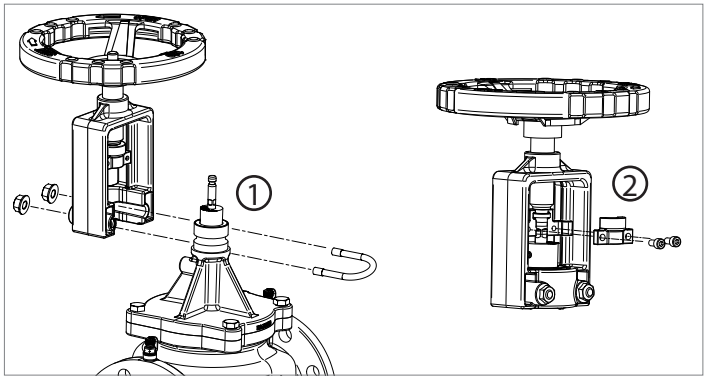
The Frese SIGMA Compact is easily set using the pre-setting scale.

The set point of the valve can be determined by using the flow graphs (page 8 to 13) or the Frese APP for the valve dimension in question.



After pre-setting of the flow, the hand wheel is mounted on the valve neck (1) and locked to the valve stem (2) .

To use the valve for isolation, turn the hand wheel clockwise to the fully closed position.



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Verification of Dynamic Systems

In general the flow rate in a system can be verified in two ways:

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

Direct flow rate verification

This 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

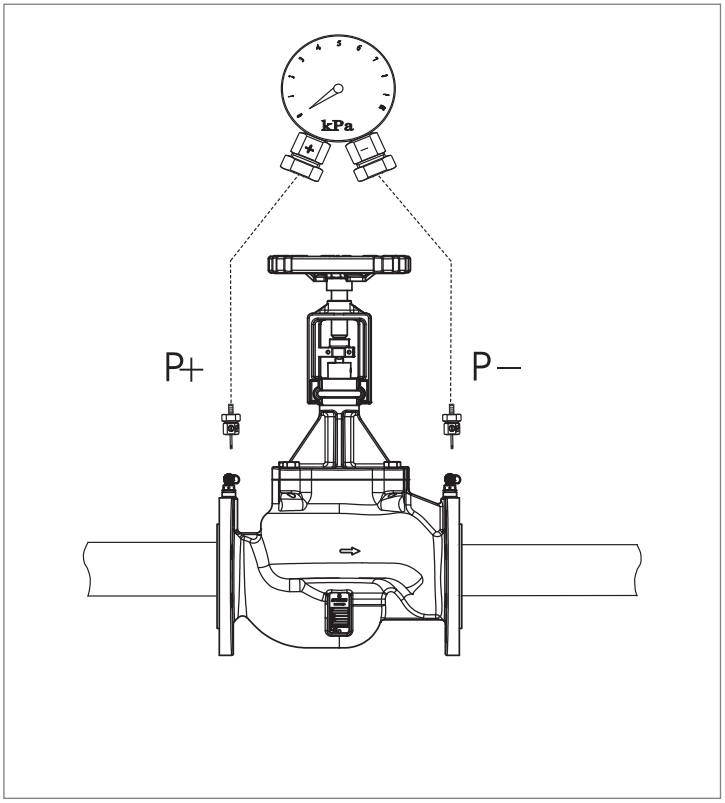
This is the main method of flow verification.

Once the design flow rate is known, the valve can be set using the flow graphs or Frese APP. Either of these tools will show the required set point and the required minimum differential pressure for the set flow rate.

The Frese SIGMA Compact valve contains a differential pressure regulator, to limit and maintain the design flow limited under fluctuating pressure conditions.

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 can be recorded according to the flow rate graphs provided.



Measurement of the differential pressure (Δp) across the valve

Measurement of the differential pressure (Δp) across the valve

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 required for that set point, the flow can be read from the graph.

If the measured differential pressure is below the minimum Δp required for that set point, the flow can be found by using the formulas below.

Flow Calculation

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

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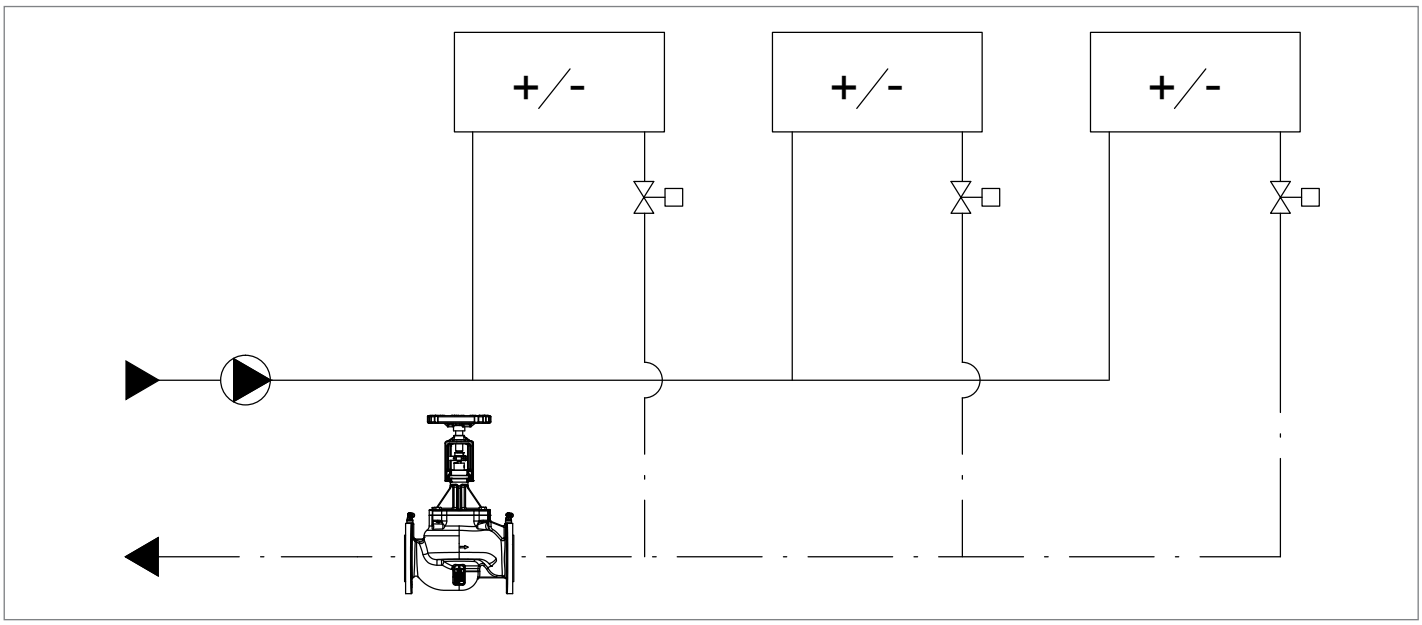
Application Diagrams

Frese SIGMA Compact installed in a circuit with heating or cooling coils

The system is easily balanced by adjusting the pump according to the required differential pressure across the dynamic balancing valve located at the furthest point from the pump, known as the critical valve (P+ - P-).

When the minimum required differential pressure is available at the critical valve, sufficient differential pressure will be available in the rest of the system and the system will be automatically balanced.



Flow rate example:

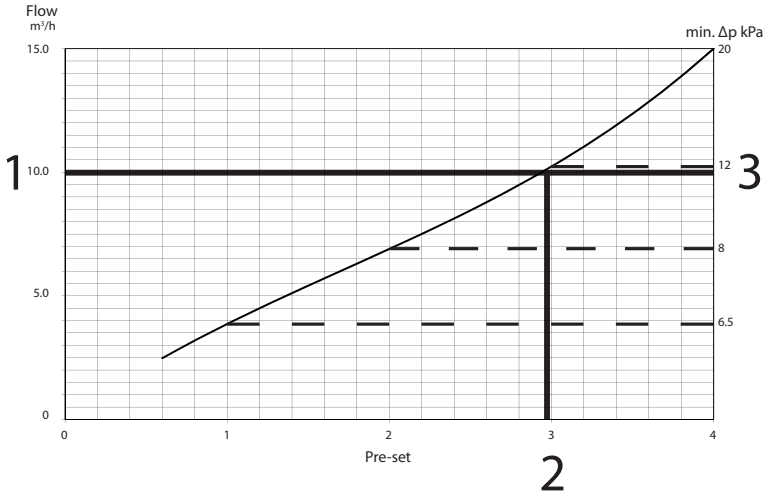
Frese SIGMA Compact DN50 Low

Required design flow rate 10 m^3/h - (2.78 l/s)

1. The required design flow rate is used as the point of reference for the overall rating of dynamic systems. (See the graph)

2. The pre-setting for the valve can be determined using the flow rate graph or the Frese APP.
Setting = 2.9

3. On the right axis, the minimum differential pressure required from the pump can be determined.
Minimum DP required approx. 12 kPa.



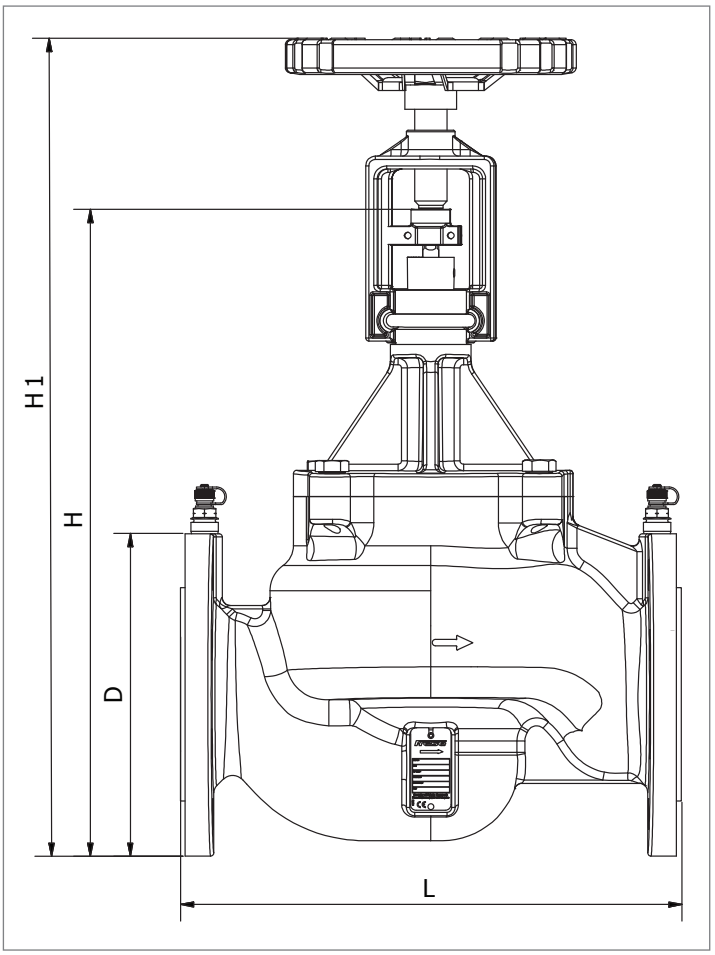
Frese SIGMA Compact
Dynamic Balancing Valve

Technical Data DN50 - DN80

Valve	
Valve housing:	GJL-250 PN16 GJS-400 PN25
DP controller:	Stainless steel
Spring:	Stainless steel
Diaphragm:	Reinforced EPDM
O-rings:	EPDM
Pressure class:	PN16/25
Flange connections:	ISO 7005-2 / EN 1092-2
Max. differential pressure:	800 kPa
Medium temperature range:	-10 ˚C to 120˚C
Hand wheel	Steel
Hand wheel spindle	Stainless steel
Yoke	Zinc alloy EN 1774

The pipe system shall be properly ventilated to avoid risk of air pockets. Glycolic mixtures up to 50% are applicable (both ethylene and propylene).

Recommendation: Water treatment to VDI 2035.



Dimension & Weight DN50-DN80

Valve Size		DN50	DN65	DN80
Dimensions (mm)	L	230	290	310
	H	367	384	413
	H1	480	497	526
	D	165	185	200
Weight (kg)	PN16	15.4	20.0	26.3
	PN25	15.2	20.4	28.3

Flow

Valve Size		DN50		DN65		DN80	
Type		LF	HF	LF	HF	LF	HF
Flow	l/h	2480 - 15000	3920 - 24000	4380 - 25000	5950 - 35000	5340 - 34000	7020 - 43000
	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

Frese SIGMA Compact
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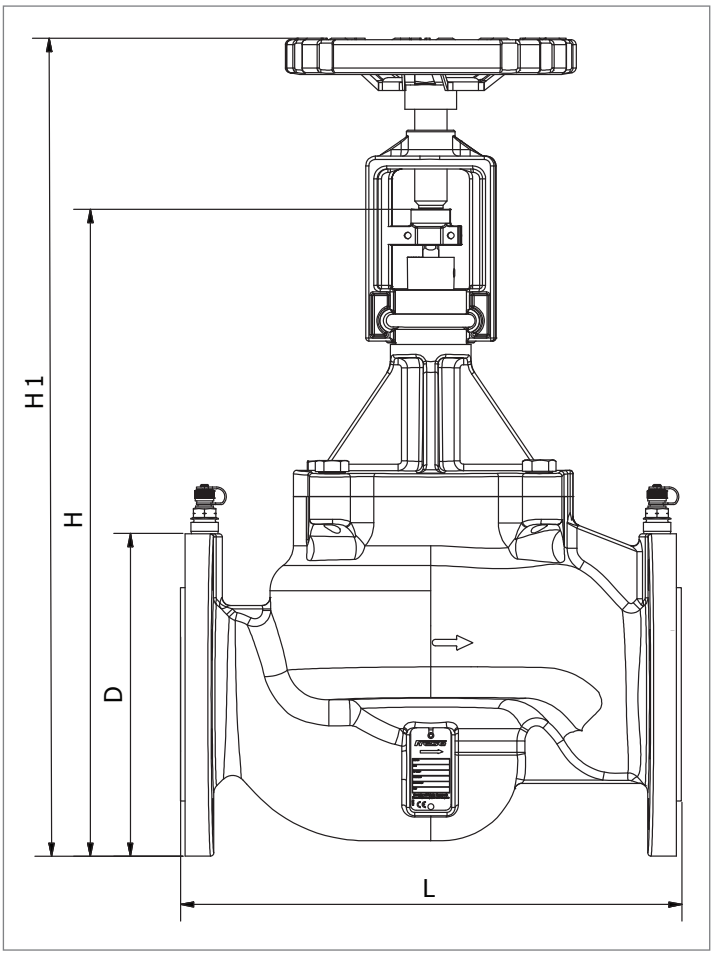
Technical Data DN100 - DN150

Valve

Valve housing DN100 & 150:	GJS-400 PN16/PN25
Valve housing DN125:	GJL-250 PN16 GJS-400 PN25
DP controller:	Stainless steel
Spring:	Stainless steel
Diaphragm:	Reinforced EPDM
O-rings:	EPDM
Pressure class:	PN16/25
Flange connections:	ISO 7005-2 / EN 1092-2
Max. differential pressure:	800 kPa
Medium temperature range	
DN100-DN125:	-10˚C to 120˚C
DN150:	-10˚C to 110˚C
Hand wheel	Steel
Hand wheel spindle	Stainless steel
Yoke	Zinc alloy EN 1774

The pipe system shall be properly ventilated to avoid risk of air pockets. Glycolic mixtures up to 50% are applicable (both ethylene and propylene).

Recommendation: Water treatment to VDI 2035.



Dimension & Weight DN100 - DN150

Valve Size		DN100	DN125	DN150
Dimensions	L	350	400	480
	H	566	608	676
	H1	714	761	782
	D	235	270	285
Weight (kg)	PN16	50.2	71.4	97.8
	PN25	50.2	71.4	97.8

Flow

Valve Size		DN100		DN125		DN150	
Type		Low	High	Low	High	Low	High
Flow	l/h	12100-68000	14800-90000	18500-110000	23000-135000	25600-148000	32000-195000
	l/s	2.917 - 19.444	3.750 - 25.000	5.139 - 30.556	6.389 - 37.500	7.111 - 41.110	8.889 - 54.168
	gpm	46.23-308.20	59.44-396.26	81.45-484.32	101.26-594.39	112.71-651.59	140.89-858.56

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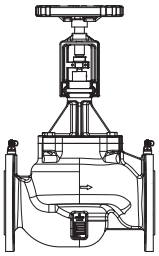
Product Programme

Frese SIGMA Compact							
		DN50	DN65	DN80	DN100	DN125	DN150
PN16		Low 53-2400 High 53-2410	Low 53-2401 High 53-2411	Low 53-2402 High 53-2412	Low 53-2403 High 53-2413	Low 53-2404 High 53-2414	Low 53-2405 High 53-2415
PN25		Low 53-2420 High 53-2430	Low 53-2421 High 53-2431	Low 53-2422 High 53-2432	Low 53-2423 High 53-2433	Low 53-2424 High 53-2434	Low 53-2425 High 53-2435

Frese SIGMA Compact
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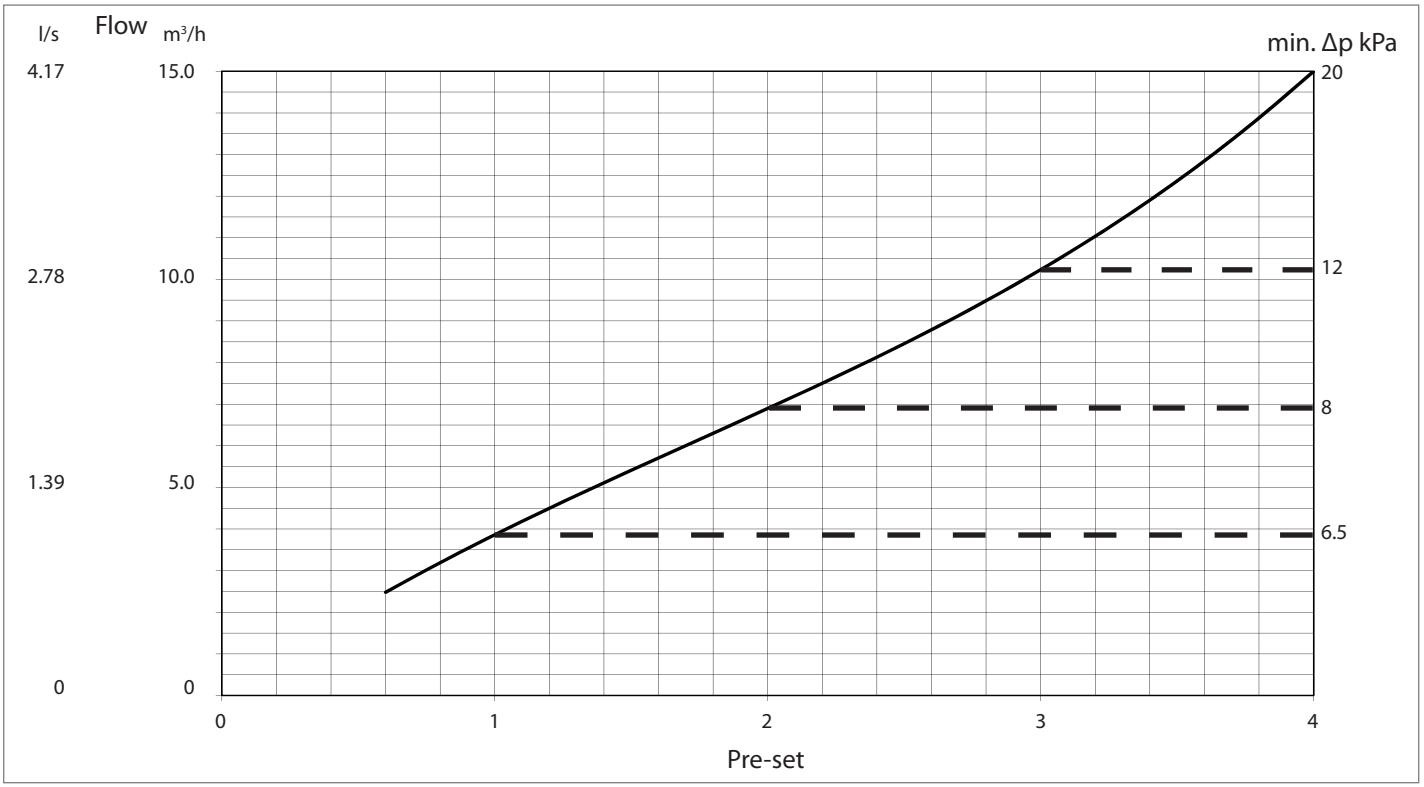
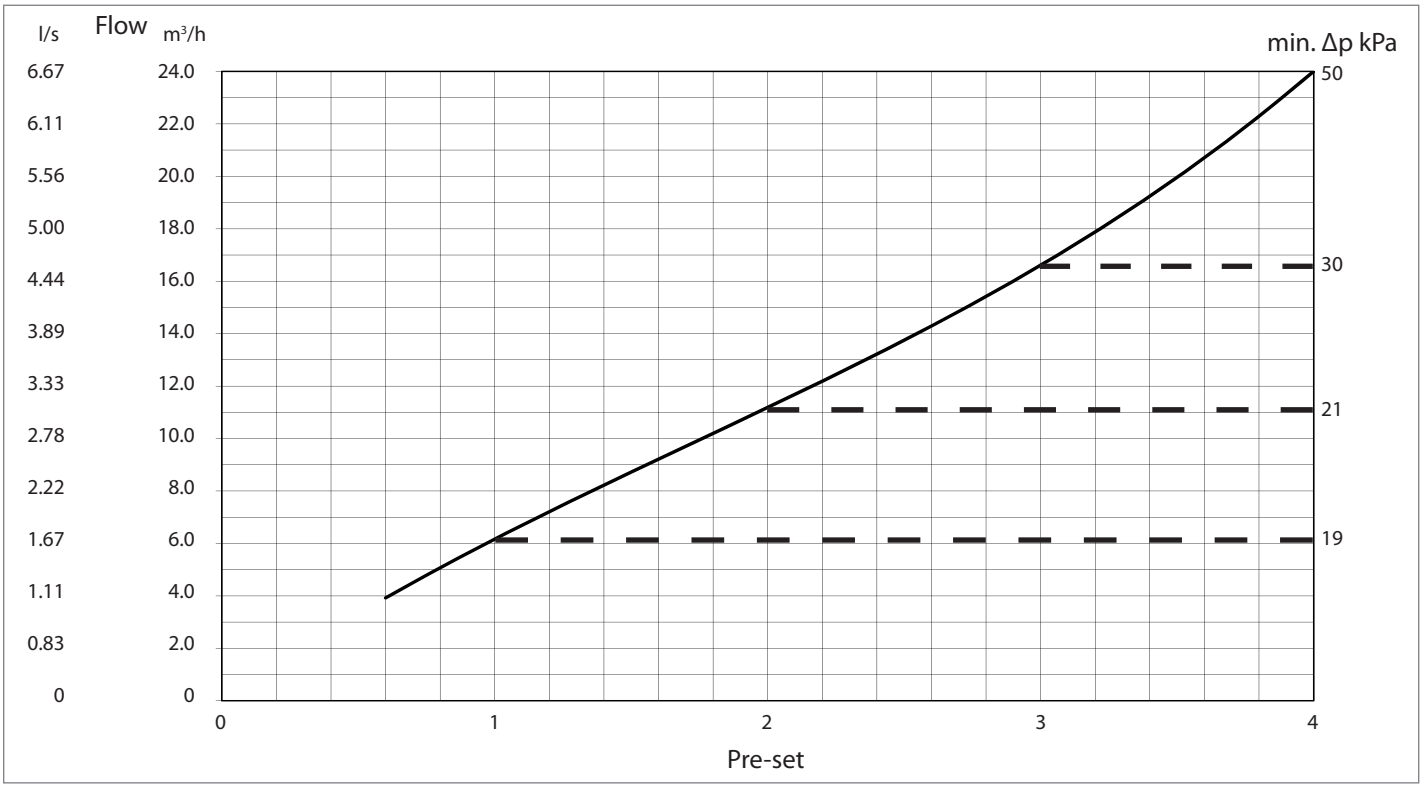
Frese SIGMA Compact Low Flow DN50



Frese SIGMA Compact High Flow DN50



Frese SIGMA Compact
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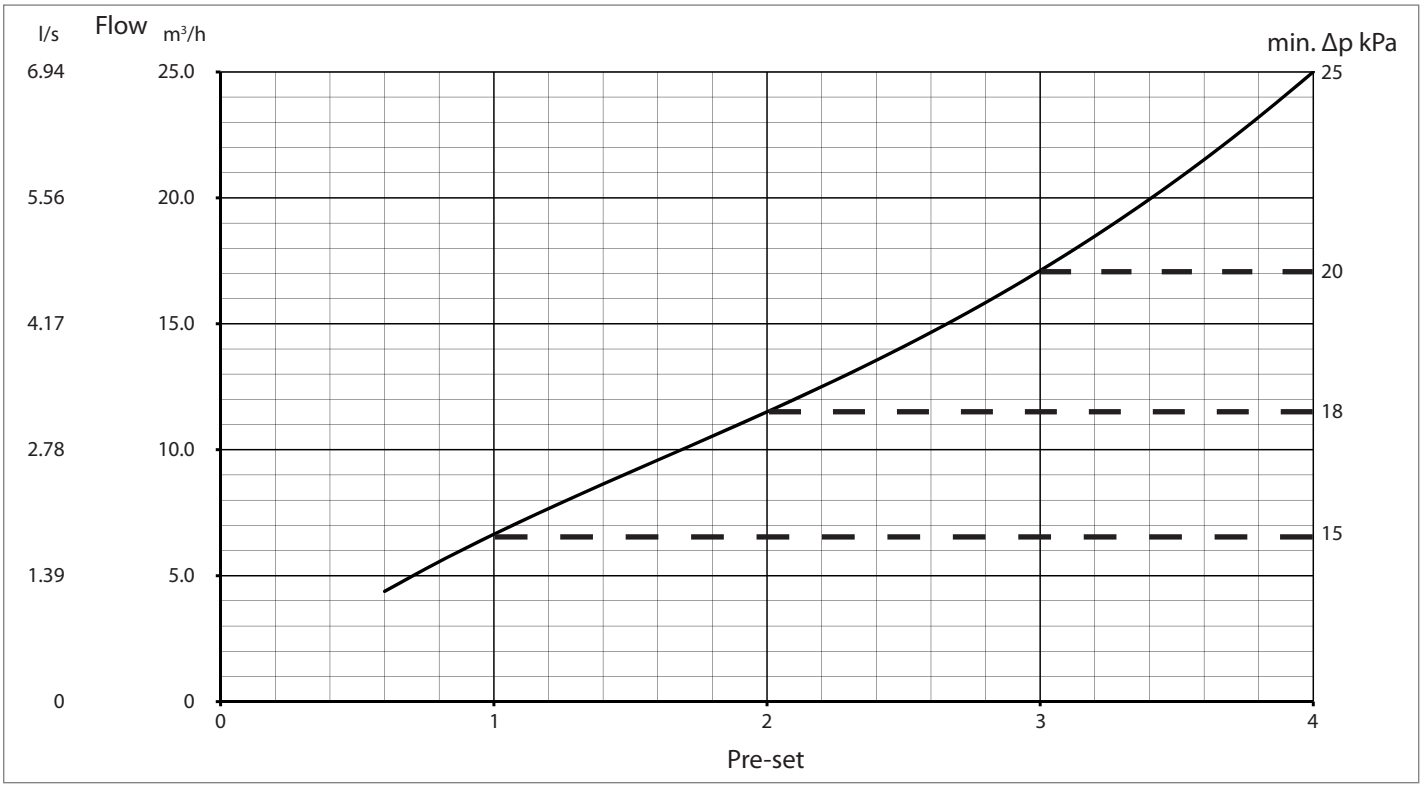
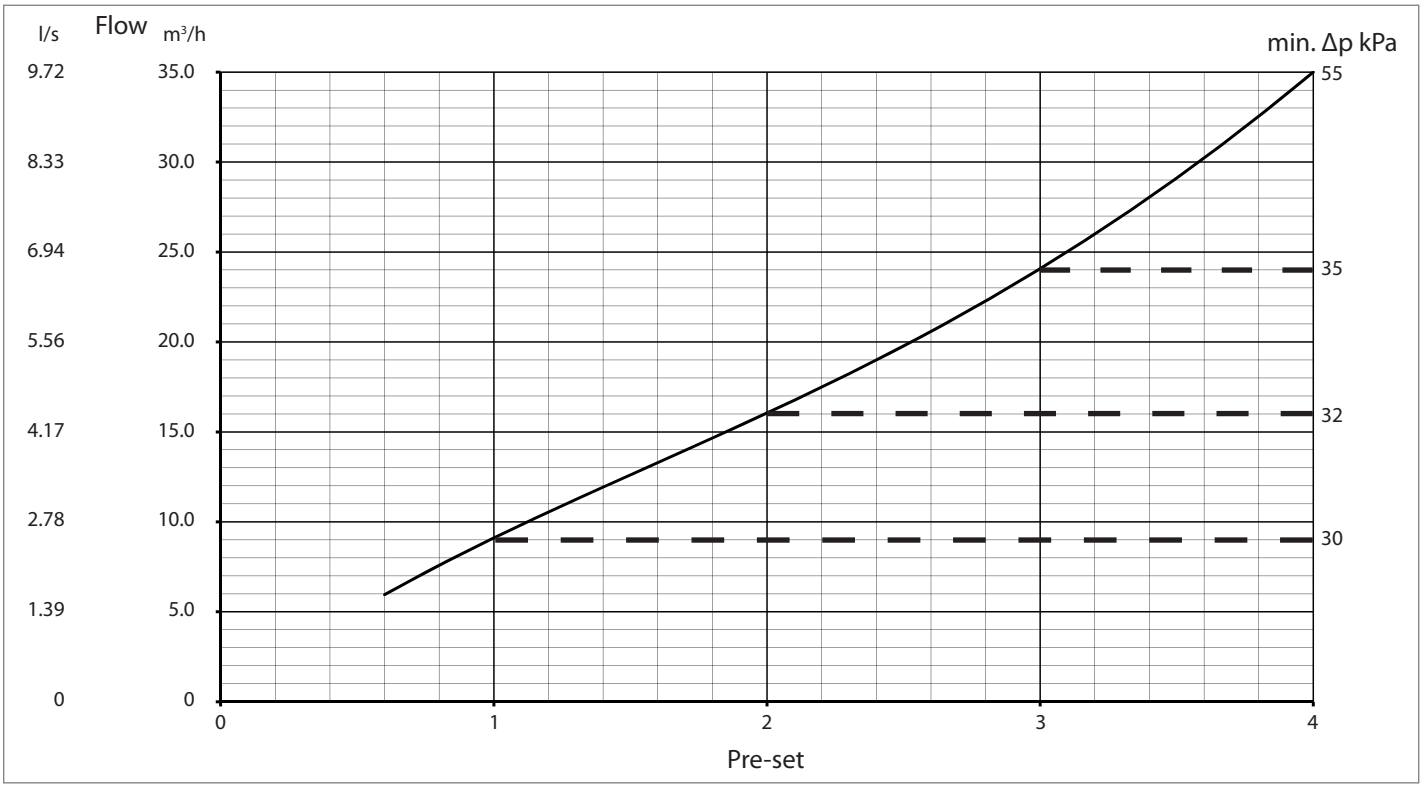
Frese SIGMA Compact Low Flow DN65



Frese SIGMA Compact High Flow DN65



Frese SIGMA Compact
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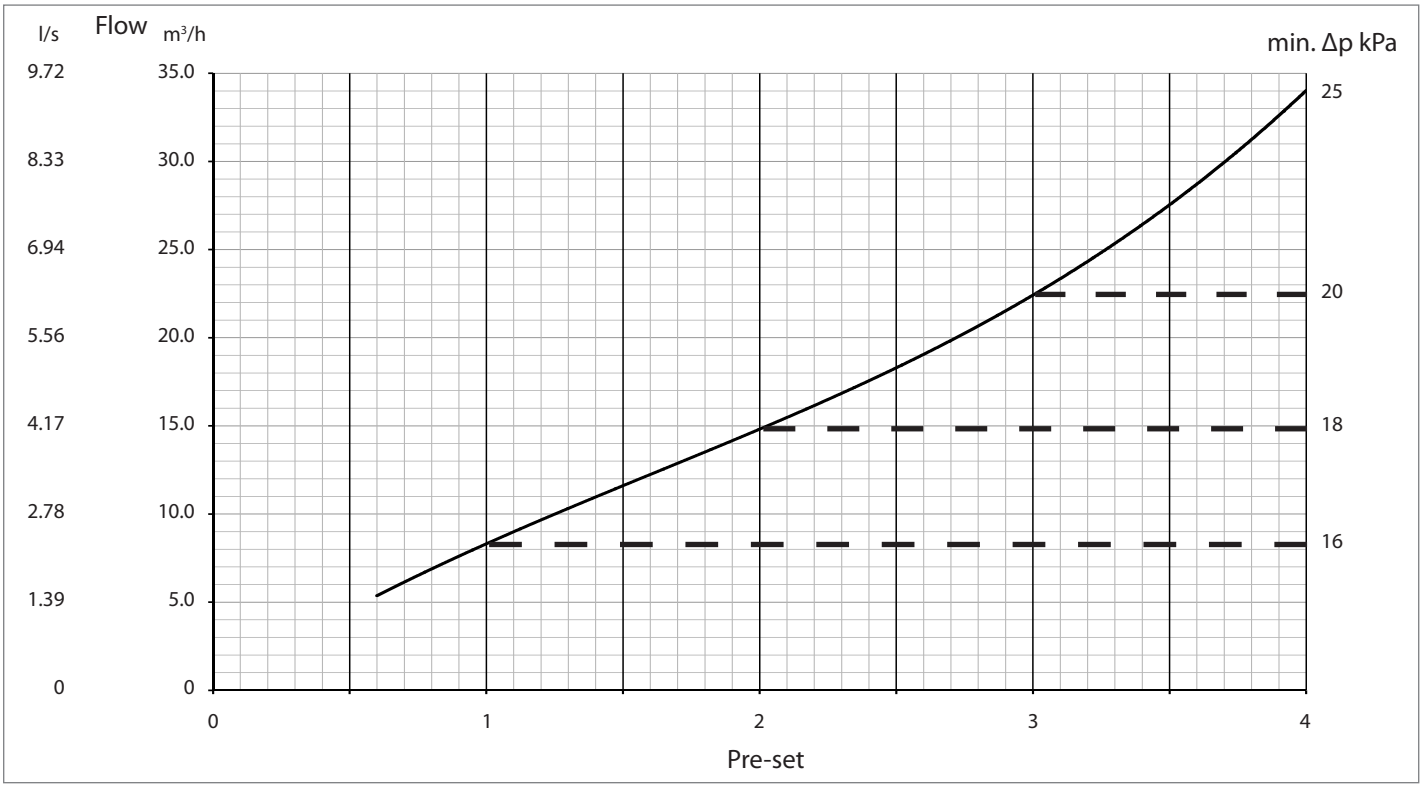
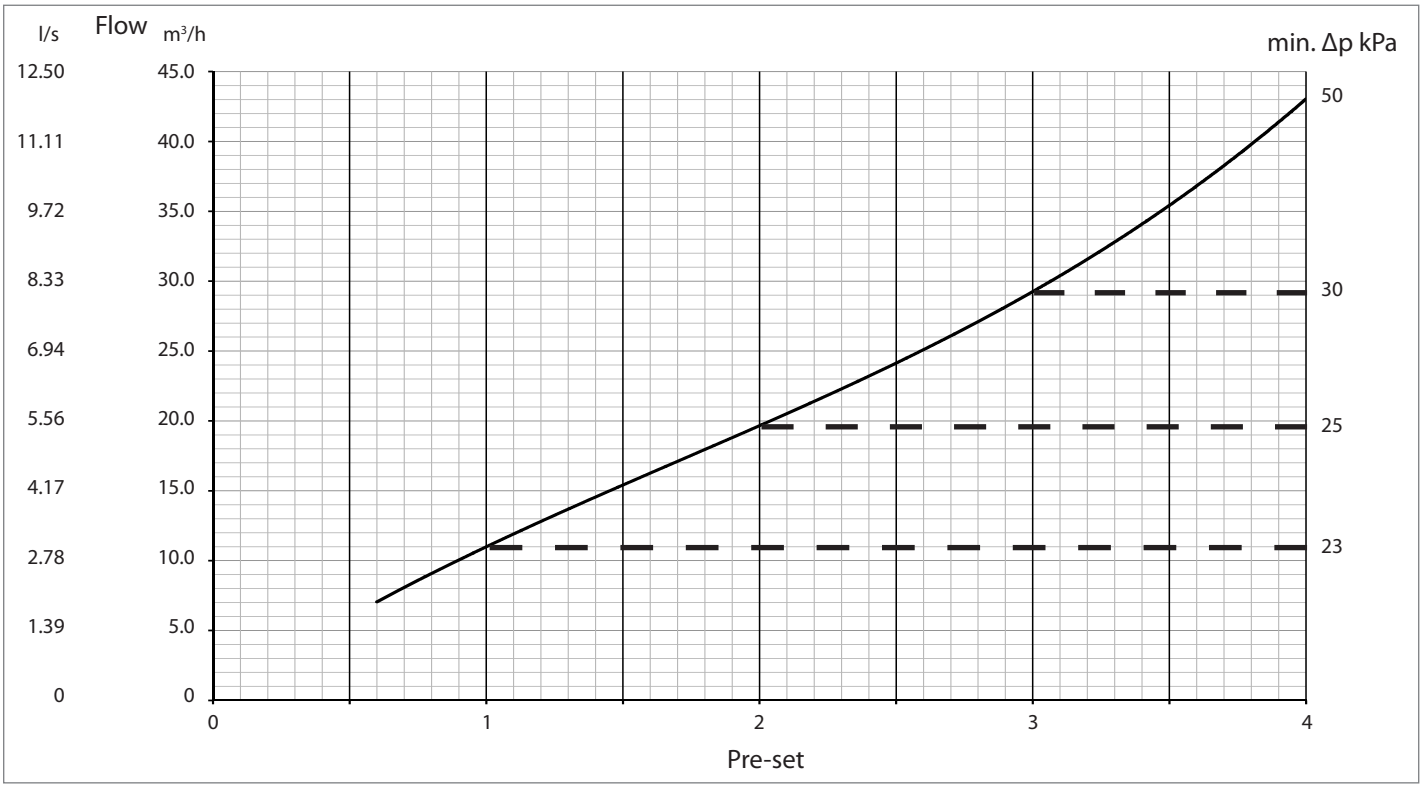
Frese SIGMA Compact Low Flow DN80

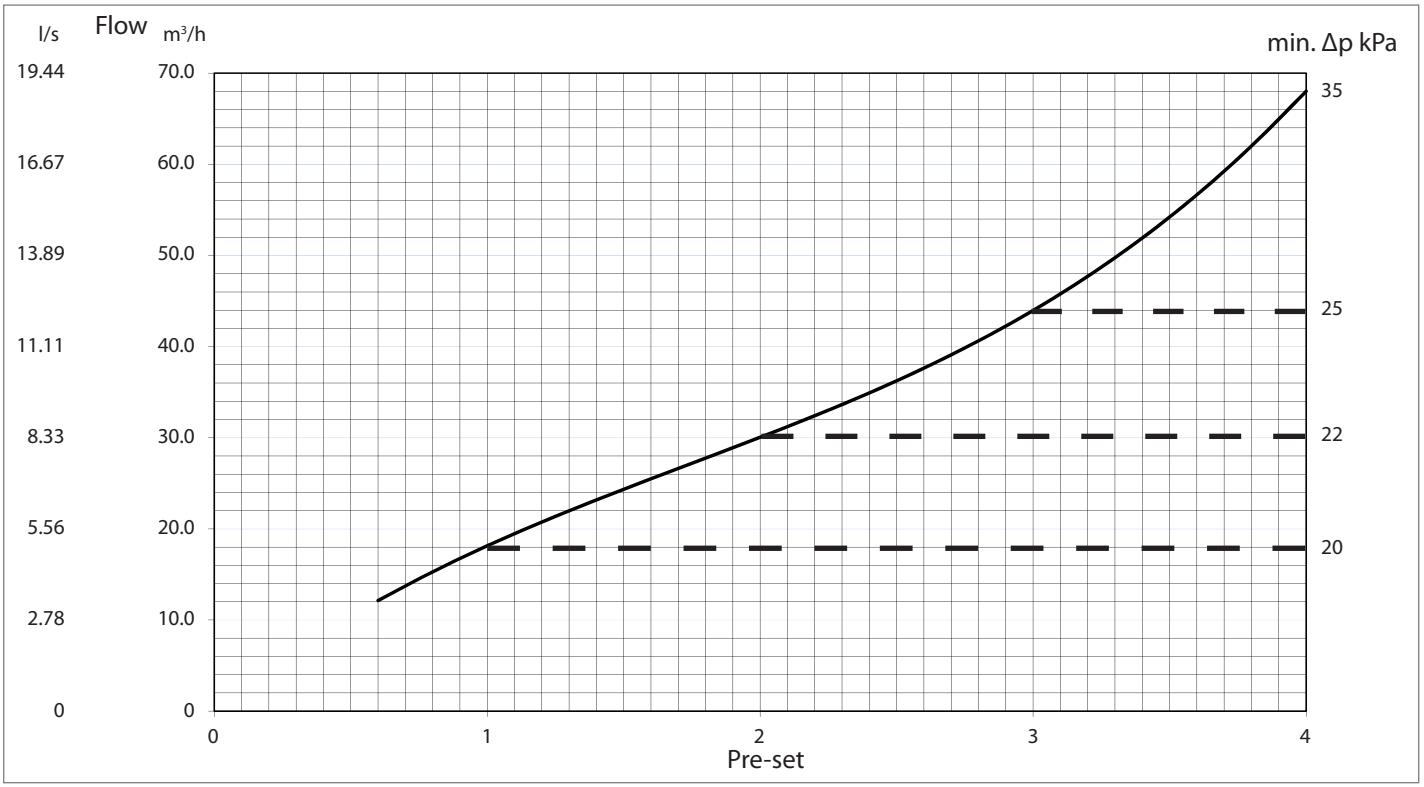


Frese SIGMA Compact High Flow DN80



Frese SIGMA Compact
Dynamic Balancing Valve

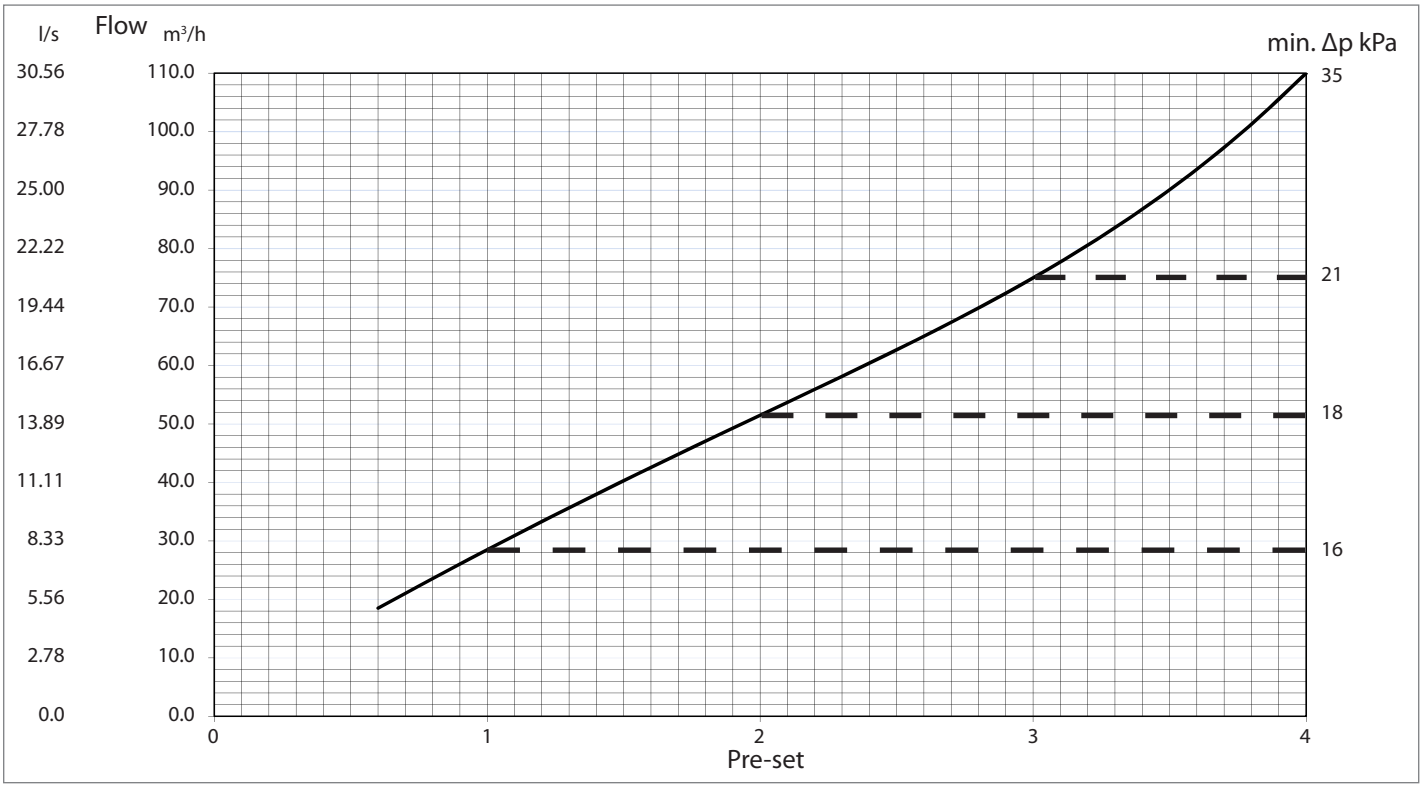
Frese SIGMA Compact Low Flow DN100



Frese SIGMA Compact High Flow DN100

Frese SIGMA Compact
Dynamic Balancing Valve

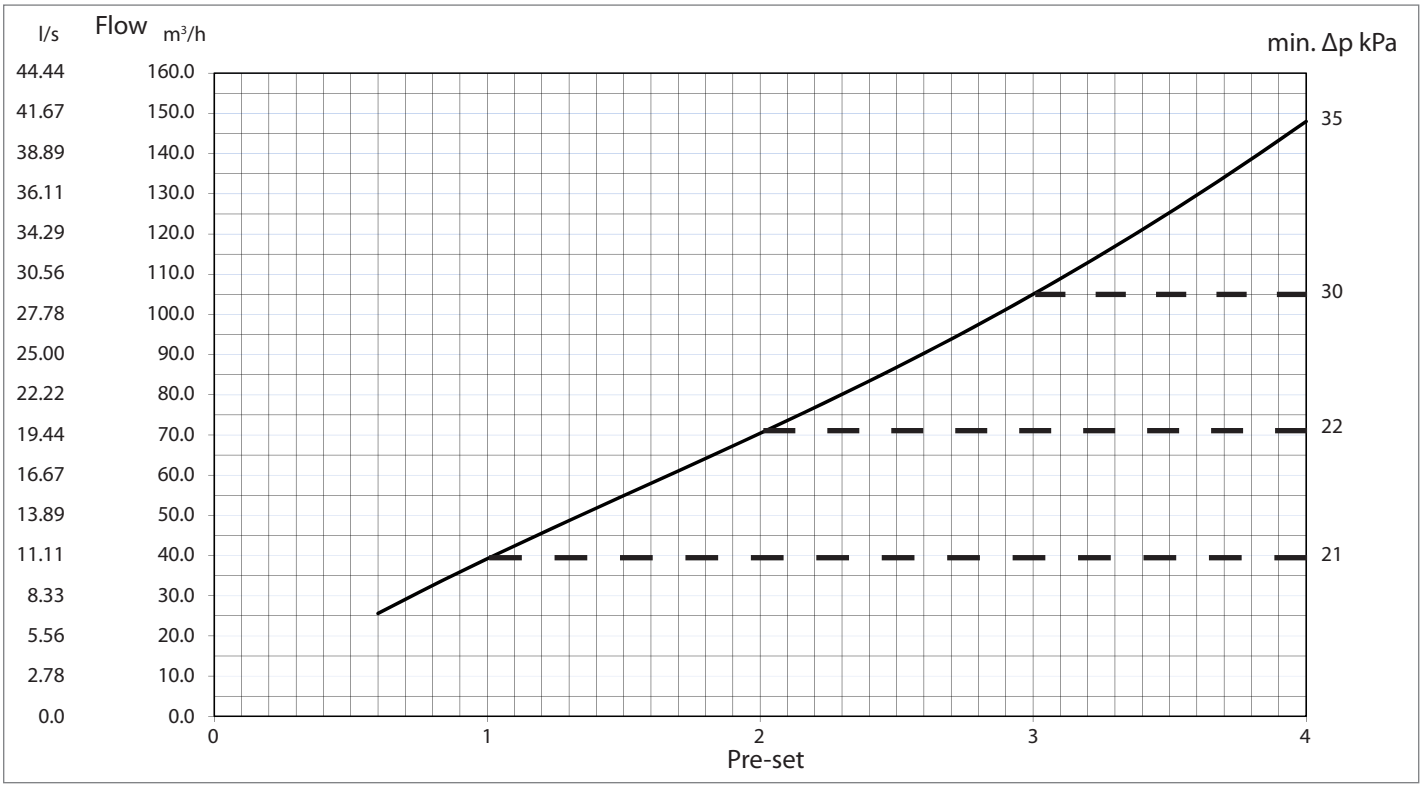
Frese SIGMA Compact Low Flow DN125



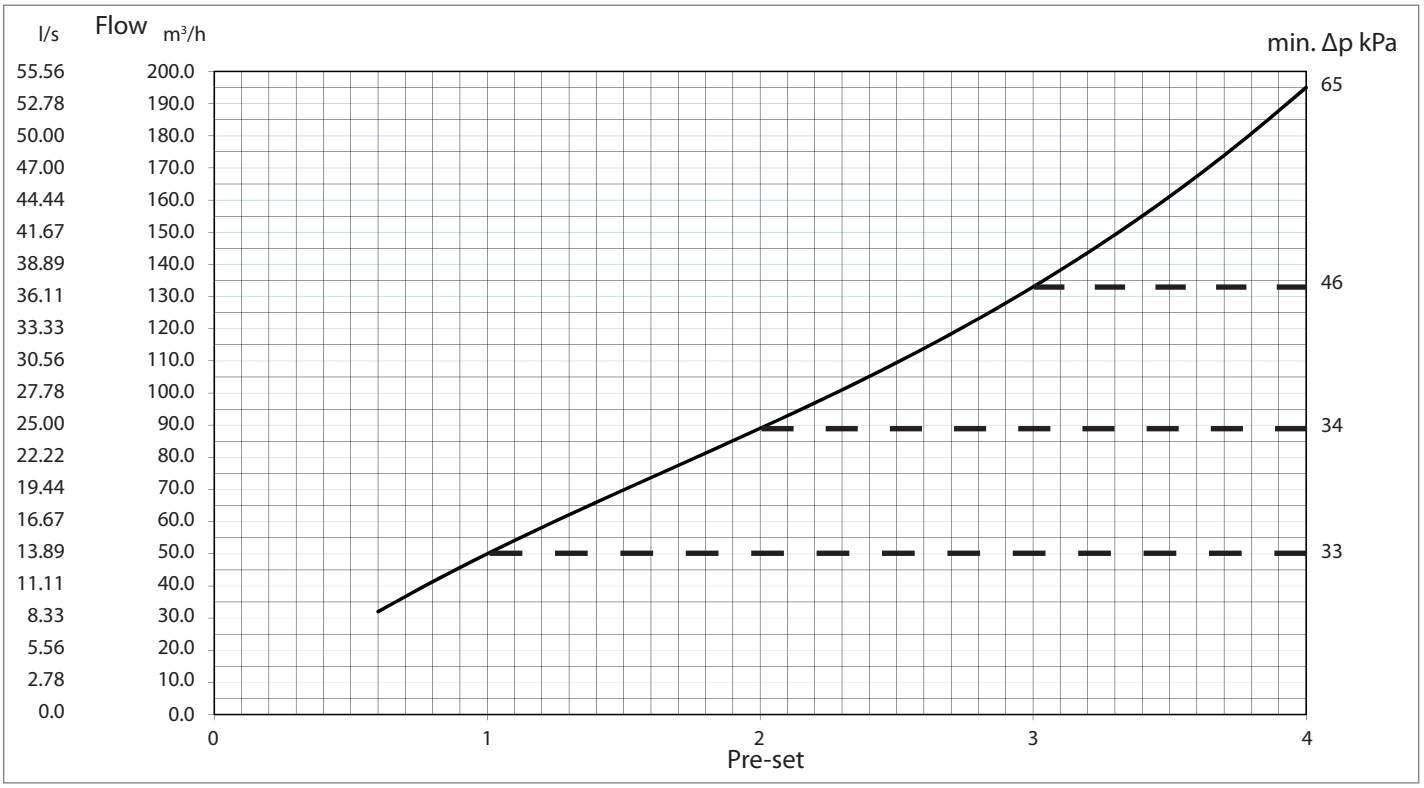
Frese SIGMA Compact High Flow DN125

Frese SIGMA Compact
Dynamic Balancing Valve

Frese SIGMA Compact Low Flow DN150



Frese SIGMA Compact High Flow DN150



Frese SIGMA Compact Dynamic Balancing Valve

Setting and Flow DN50-DN65-DN80

	SIGMA Compact DN50 LF			SIGMA Compact DN50 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	2.5	0.689	10.92	3.9	1.090	17.28
0.8	3.2	0.887	14.06	5.1	1.410	22.34
1.0	3.9	1.073	17.01	6.2	1.713	27.15
1.2	4.5	1.250	19.81	7.2	2.003	31.75
1.4	5.1	1.420	22.51	8.2	2.285	36.21
1.6	5.7	1.586	25.14	9.2	2.560	40.57
1.8	6.3	1.750	27.74	10.2	2.833	44.90
2.0	6.9	1.916	30.36	11.2	3.107	49.24
2.2	7.5	2.084	33.03	12.2	3.386	53.66
2.4	8.1	2.258	35.79	13.2	3.672	58.20
2.6	8.8	2.441	38.69	14.3	3.970	62.92
2.8	9.5	2.635	41.76	15.4	4.283	67.88
3.0	10.2	2.842	45.04	16.6	4.614	73.13
3.2	11.0	3.065	48.57	17.9	4.967	78.72
3.4	11.9	3.306	52.40	19.2	5.346	84.72
3.6	12.8	3.569	56.56	20.7	5.753	91.17
3.8	13.9	3.855	61.09	22.3	6.192	98.13
4.0	15.0	4.167	66.03	24.0	6.667	105.65

	SIGMA Compact DN65 LF			SIGMA Compact DN65 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	4.4	1.216	19.27	6.0	1.654	26.21
0.8	5.6	1.544	24.47	7.6	2.108	33.41
1.0	6.6	1.846	29.25	9.1	2.530	40.09
1.2	7.7	2.129	33.73	10.5	2.929	46.42
1.4	8.6	2.399	38.02	11.9	3.314	52.52
1.6	9.6	2.663	42.21	13.3	3.692	58.52
1.8	10.5	2.927	46.39	14.7	4.072	64.53
2.0	11.5	3.195	50.63	16.0	4.458	70.66
2.2	12.5	3.472	55.03	17.5	4.858	76.99
2.4	13.5	3.763	59.64	19.0	5.277	83.63
2.6	14.7	4.071	64.52	20.6	5.719	90.63
2.8	15.8	4.400	69.73	22.3	6.188	98.07
3.0	17.1	4.753	75.32	24.1	6.688	105.99
3.2	18.5	5.132	81.33	26.0	7.222	114.45
3.4	19.9	5.539	87.78	28.0	7.791	123.47
3.6	21.5	5.976	94.71	30.2	8.397	133.08
3.8	23.2	6.445	102.13	32.5	9.042	143.29
4.0	25.0	6.945	110.06	35.0	9.724	154.11

	SIGMA Compact DN80 LF			SIGMA Compact DN80 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	5.3	1.484	23.53	7.0	1.951	30.92
0.8	6.9	1.906	30.21	9.0	2.513	39.83
1.0	8.3	2.301	36.48	11.0	3.043	48.23
1.2	9.6	2.677	42.44	12.8	3.547	56.23
1.4	10.9	3.040	48.19	14.5	4.034	63.94
1.6	12.2	3.396	53.83	16.2	4.510	71.48
1.8	13.5	3.751	59.46	18.0	4.982	78.96
2.0	14.8	4.113	65.19	19.6	5.457	86.49
2.2	16.2	4.486	71.11	21.4	5.943	94.19
2.4	17.6	4.878	77.32	23.2	6.446	102.17
2.6	19.1	5.295	83.93	25.1	6.973	110.53
2.8	20.7	5.744	91.04	27.1	7.533	119.40
3.0	22.4	6.230	98.74	29.3	8.131	128.88
3.2	24.3	6.760	107.15	31.6	8.775	139.09
3.4	26.4	7.341	116.35	34.1	9.473	150.15
3.6	28.7	7.978	126.46	36.8	10.230	162.15
3.8	31.2	8.679	137.57	39.8	11.055	175.22
4.0	34.0	9.450	149.78	43.0	11.954	189.47

Frese SIGMA Compact Dynamic Balancing Valve

Setting and Flow DN100-DN125-DN150

	SIGMA Compact DN100 LF			SIGMA Compact DN100 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	12.1	3.369	53.41	14.8	4.100	64.99
0.8	15.3	4.247	67.32	18.9	5.246	83.15
1.0	18.1	5.040	79.88	22.6	6.276	99.48
1.2	20.8	5.764	91.36	26.0	7.216	114.37
1.4	23.2	6.439	102.06	29.1	8.090	128.22
1.6	25.5	7.083	112.26	32.1	8.924	141.44
1.8	27.8	7.713	122.24	35.1	9.743	154.42
2.0	30.0	8.347	132.30	38.1	10.572	167.57
2.2	32.4	9.004	142.71	41.2	11.438	181.29
2.4	34.9	9.701	153.75	44.5	12.364	195.97
2.6	37.6	10.456	165.73	48.2	13.377	212.03
2.8	40.6	11.288	178.91	52.2	14.501	229.85
3.0	44.0	12.214	193.59	56.7	15.763	249.84
3.2	47.7	13.253	210.05	61.9	17.186	272.41
3.4	51.9	14.422	228.58	67.7	18.798	297.94
3.6	56.7	15.739	249.46	74.2	20.622	326.85
3.8	62.0	17.222	272.98	81.7	22.684	359.54
4.0	68.0	18.891	299.41	90.0	25.009	396.40

	SIGMA Compact DN125 LF			SIGMA Compact DN125 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	18.5	5.139	81.45	23.0	6.389	101.26
0.8	23.6	6.543	103.71	29.9	8.312	131.74
1.0	28.5	7.917	125.48	36.5	10.139	160.70
1.2	33.3	9.255	146.69	42.8	11.878	188.26
1.4	38.0	10.558	167.35	48.7	13.539	214.59
1.6	42.6	11.830	187.50	54.5	15.134	239.88
1.8	47.1	13.075	207.24	60.0	16.680	264.38
2.0	51.5	14.305	226.74	65.5	18.194	288.38
2.2	55.9	15.534	246.21	70.9	19.697	312.20
2.4	60.4	16.778	265.94	76.4	21.213	336.23
2.6	65.0	18.059	286.24	82.0	22.767	360.86
2.8	69.8	19.402	307.51	87.8	24.389	386.57
3.0	75.0	20.833	330.20	94.0	26.111	413.86
3.2	80.6	22.385	354.80	100.7	27.966	443.26
3.4	86.7	24.092	381.86	108.0	29.991	475.36
3.6	93.6	25.994	412.01	116.0	32.226	510.79
3.8	101.3	28.133	445.91	125.0	34.714	550.22
4.0	110.0	30.555	484.29	135.0	37.500	594.37

	SIGMA Compact DN150 LF			SIGMA Compact DN150 HF		
Pre-set	Flow m³/h	Flow l/s	Flow gpm	Flow m³/h	Flow l/s	Flow gpm
0.6	25.6	7.111	112.71	32.0	8.889	140.89
0.8	32.6	9.049	143.42	41.3	11.480	181.96
1.0	39.2	10.889	172.59	50.0	13.889	220.14
1.2	45.6	12.660	200.66	58.2	16.162	256.16
1.4	51.8	14.389	228.06	66.0	18.341	290.70
1.6	58.0	16.100	255.18	73.7	20.468	324.42
1.8	64.1	17.815	282.37	81.3	22.583	357.94
2.0	70.4	19.555	309.95	89.0	24.723	391.86
2.2	76.8	21.337	338.20	96.9	26.922	426.71
2.4	83.4	23.177	367.36	105.2	29.214	463.04
2.6	90.3	25.088	397.65	113.9	31.630	501.33
2.8	97.5	27.081	429.24	123.1	34.198	542.04
3.0	105.0	29.166	462.28	133.0	36.945	585.59
3.2	112.9	31.348	496.87	143.6	39.897	632.37
3.4	121.1	33.632	533.07	155.1	43.076	682.75
3.6	129.7	36.021	570.94	167.4	46.502	737.05
3.8	138.7	38.515	610.46	180.7	50.194	795.57
4.0	148.0	41.110	651.59	195.0	54.168	858.56

Frese SIGMA Compact
Dynamic Balancing Valve

Specification Text - Frese SIGMA Dynamic Balancing Valve

The integrated differential pressure control and the flow setting shall be one combined unit

The flow setting control unit shall be pressure independent

The Dynamic Control Valve shall contain a combined flow setting and differential pressure control bonnet assembly

The valve housing shall be GJL-250 or GJS-400

The valve shall have a spring made of stainless steel, a Diaphragm made of Reinforced EPDM and O-rings made of EPDM

The valve shall have flange connections according to EN 1092

The valve shall have a maximum operating differential pressure of 800 kPa (8 Bar)

The valve shall have an external adjustable analogue step less presetting scale from minimum to maximum flow

P/T plugs shall be available

The valve shall be capable of closing against a maximum differential pressure of 800 kPa (8 bar) with a leakage rate at maximum 0,01% of max rated volumetric flow and comply to EN1349 Class IV

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