Butterfly valves BVG, BVGF, BVA, BVAF, BVH, BVHS, BVHM

Technical Information · GB
3 Edition 09.12

- For gas, air, hot air and flue gas
- Low leakage rate and pressure loss
- High control accuracy
- BVG and BVA with reduced nominal diameters
- Butterfly valve can be mounted directly onto the actuator IC 20 or IC 40
- Suitable for intermittent operation
- BVGF, BVAF work clearance-free
- Low-maintenance operation
- EC type-tested and certified
- BVHM: FM approved
- BVG: certified pursuant to GOST-TR

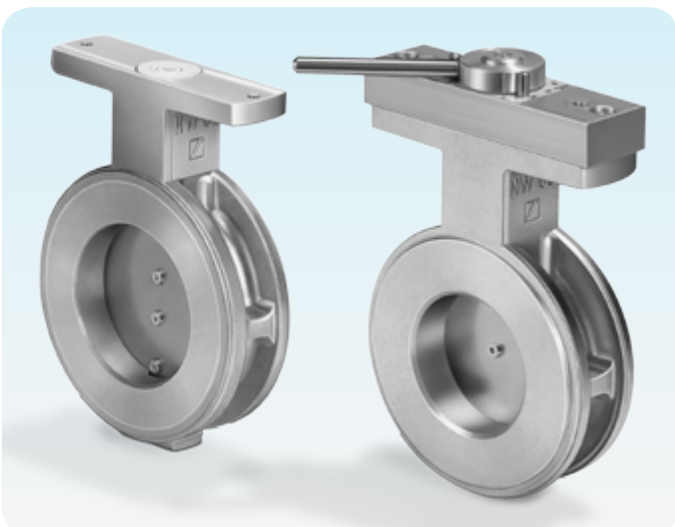
krom//schroder

Contents

1 Application

The butterfly valves are designed to adjust volumes of gas, cold and hot air and flue gas on various appliances and flue gas lines. They are designed for control ratios up to 1:10, and with the mounted actuator IC 20 or IC 40 they are suitable for regulating flow rates for modulating or stage-controlled combustion processes.

BVG, BVA

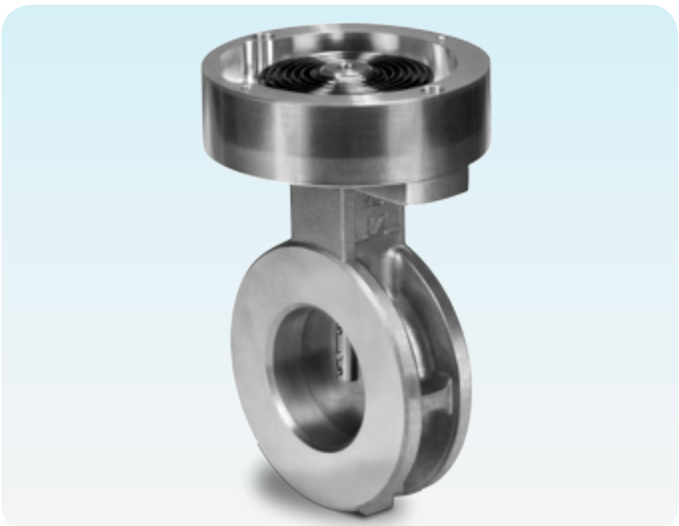


BVG for gas, BVA for air. These butterfly valves can be fitted with an adapter set with square shaft, free shaft end or manual adjustment, for instance.

Using the adapter set with manual adjustment, see page 31 (Accessories), flow rates can be set and fixed, for example to limit the high-fire rate on the burner. A scale indicates the set angle of opening.

Butterfly valves BVG, BVGF, BVA and BVAF with reduced nominal diameter (reduced by one or two nominal sizes) can be used to achieve higher control accuracy. This will mean that complex reducing fittings will no longer be required.

BVGF, BVAF



Butterfly valves BVGF and BVAF work clearance-free.

In case of change of direction, the butterfly valve adjusts to the setpoint without delay. The butterfly valve thus reaches the required position more quickly.

BVH

BVH, BVHM, BVHS for hot air and flue gas

The butterfly valve BVH is used for processes that require the very precise adjustment of the flow rate or low leakage. In conjunction with the stop bar, the valve disc ensures very low leakage rates.

Using a spiral spring which compensates for the play in combination with the actuator IC 40 it is possible to move the valve disc to the required angle with almost zero hysteresis.

BVHS

The butterfly valve BVHS with safety closing function, see page 10 (Function), is used with the actuator IC 40S in systems where it is important that in the event of a mains voltage failure the valve closes preventing air streaming into the furnace without being under control.

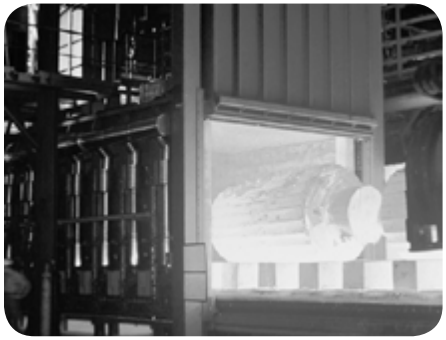
In order to maximize the service life of the butterfly valve, the safety closing function should be used only for the scheduled closing function and not for controlled shut-down or for intermittent switching of the burner.

BVHM

Well suited to intermittent operation due to the large number of operating cycles in conjunction with the solenoid actuator MB 7.

Butterfly valve with actuator

Roller hearth kiln in the ceramics industry



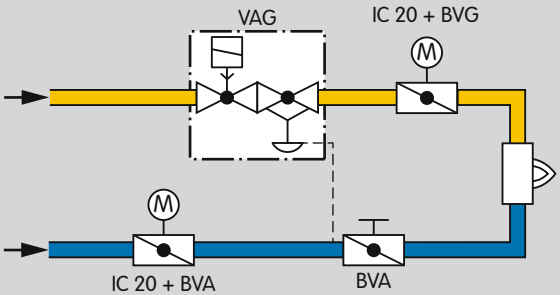
Forging furnace

1.1 Example of applications

1.1.1 BVG, BVGF, lambda correction

If the burner is to be operated with excess gas or air for reasons of the process operation, the butterfly valve BVG, BVGF can be used to correct the lambda value.

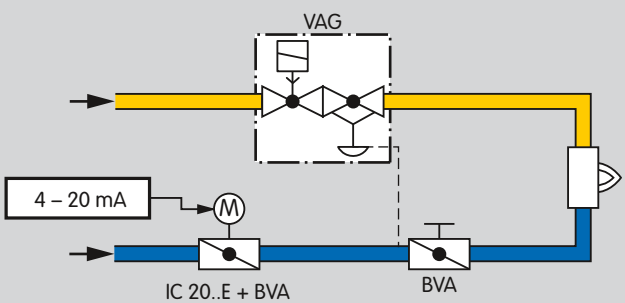
The butterfly valve with manual adjustment is used to adjust the high-fire rate.

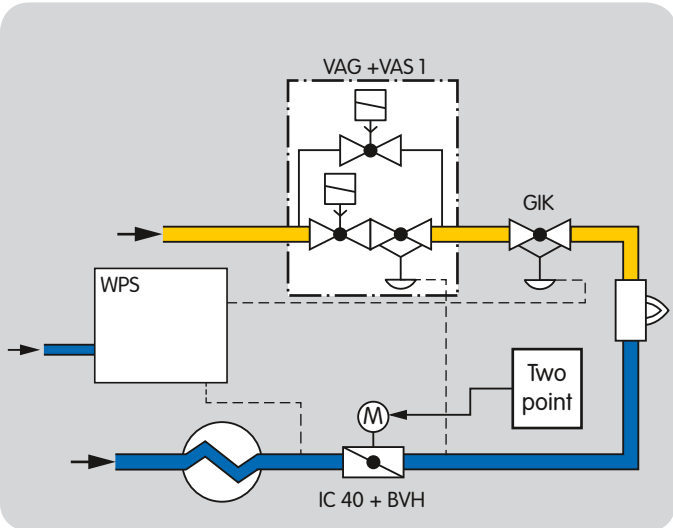


1.1.2 BVA, BVAF, adjusting the burner capacity

In pneumatic systems, the butterfly valve with mounted actuator IC 20..E determines the air volume for the required burner capacity.

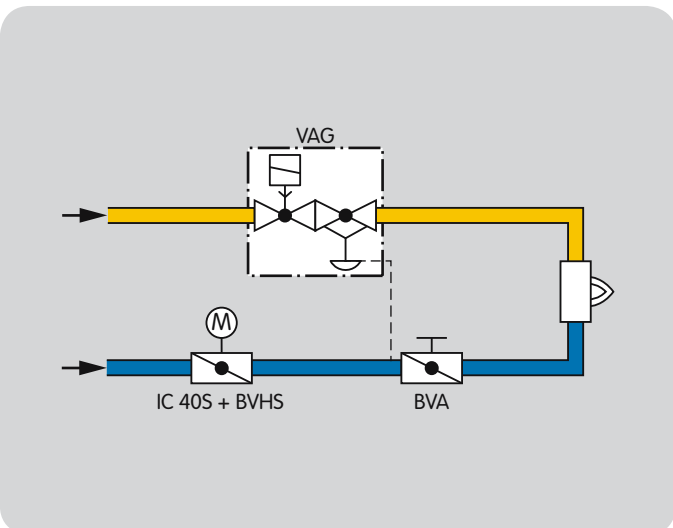
The butterfly valve with manual adjustment is used to adjust the high-fire rate.





1.1.3 BVH, hot air compensation

The butterfly valve BVH is used on burners that are operated with preheated combustion air at temperatures of up to 450°C (840°F). Hot air compensation, see page 40 (Glossary).

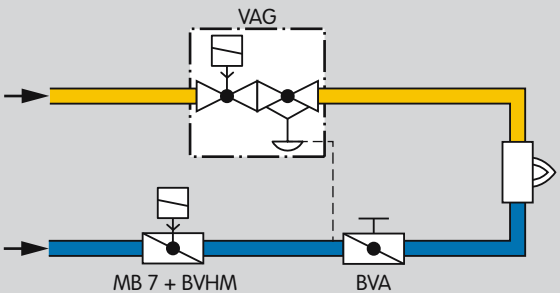


1.1.4 BVHS, safety closing function in the event of a mains voltage failure

The safety closing function ensures that in the event of a mains voltage failure air cannot stream into the furnace without being under control.

The BVHS is installed in the air circuit together with the actuator IC 40S.

The butterfly valve with manual adjustment is used to adjust the high-fire rate.



1.1.5 BVHM, large number of operating cycles for intermittent operation

The butterfly valve BVHM features flow adjustment for low-fire and high-fire rate. The valve stop ensures low leakage rates. With fitted solenoid actuator MB 7, the valve is suitable for intermittent operation.

2 Certification

EC type-tested and certified

pursuant to

– Gas Appliances Directive (2009/142/EC) in conjunction with EN 161.

BVHM

FM approved

Factory Mutual Research Class: 7400 Process Control Valves.

Designed for applications pursuant to NFPA 85 and NFPA 86.

www.approvalguide.com

Approval for Russia

BVG, BVA, BVH, BVHS, BVHM

Certified by Gosstandart pursuant to GOST-TR.
Approved by Rostekhnadzor (RTN).

Scan of the approval for Russia (RUS) – see www.docuthek.com ➔ Elster Kromschröder ➔ Kromschröder, LBE ➔ Products ➔ 03 Valves and butterfly valves ➔ Butterfly valves BVG, BVA, BVH ➔ Kind of document: Certificate ➔ BV... B00069 (nationales Zertifikat Russland) (RUS)

3 Function

BVG, BVGF, BVA, BVAF, BVH, BVHM, BVHS

The butterfly valves are designed on the basis of the free-flow principle (no deflection of the flow). They release a cross-section for the flowing medium, depending on a rotary movement between 0 and 90°.

The butterfly valves BVG, BVGF, BVA and BVAF are with valve disc clearance. BVH is equipped with a mechanical stop bar. The valve disc of the butterfly valves BVH, BVHS, BVHM features a twin disc and, together with the mechanical stop bar, ensures very low leakage.

BVG, BVGF, BVA, BVAF and BVH are specifically designed to fit the Elster Kromschröder actuators IC 20 and IC 40. The butterfly valves feature very easy action. Consequently, the actuator requires only a low torque.

BVHM is tailored to the Elster Kromschröder solenoid actuator MB 7.

BVG, BVA

Butterfly valves with reduced nominal diameter (reduced by up to two nominal sizes) can be used to achieve higher control accuracy. This will mean that expensive reducing fittings will no longer be required.

Various adapter sets with square shaft, free shaft end or lever are available as accessories, see page 31 (Accessories). Flow rates can be set and fixed using a lever, for example to limit the high-fire rate on the burner. A scale indicates the set angle of opening.

BVGF, BVAF

The spiral spring always pushes the valve disc in the direction of closing. Any clearance between the actuator and the valve disc is eliminated and the control command is executed without delay.

BVHM, BVHS

The butterfly valves BVHM, BVHS feature a safety closing function. They are used in systems where it is important that in the event of a mains voltage failure the valve closes preventing air streaming into the furnace without being under control.

A pre-tensioned spiral spring moves the valve disc against the mechanical stop of the butterfly valve in the event of a solenoid valve/motor defect, within the closing time.

The safety closing function of butterfly valve BVHS is possible only in conjunction with the actuator IC 40S.

4 Replacement possibilities for butterfly valves

4.1 DKG is to be replaced by BVG

Type			Type
DKG	Butterfly valve	Butterfly valve	BVG
25	DN 25		–
32	DN 32		–
40	DN 40	DN 65	40
50	DN 50	DN 65	50
65	DN 65	DN 65	65
80	DN 80	DN 65	80
100	DN 100	DN 65	100
125	DN 125	DN 65	125
150	DN 150	DN 65	150
/15-/125	Reduced to nominal diameter DN	Reduced to nominal diameter DN	/25-/125
T	T-product		
Z	For fitting between two DIN flanges	For fitting between two flanges to EN 1092	Z
W	For fitting between two ANSI flanges	For fitting between two ANSI flanges	W
03	p_U max. 300 mbar (4.35 psi)	p_U max. 500 mbar (7.25 psi)	05
H	With manual adjustment	Adapter set with manual adjustment	○
V	With square shaft	Adapter set with square shaft	○
F	With free shaft end	Adapter set with free shaft end	○
60	Temperature range 60°C (140°F)	Temperature range 60°C (140°F)	●
D	With disc clearance	With disc clearance	●
DKG 80Z03H60D	**Example**	**Example**	BVG 80Z05 + adapter set with manual adjustment

● *standard,* ○ *available*

4.2 DKL is to be replaced by BVA

Type			Type
DKL	Butterfly valve	Butterfly valve	BVA
25	DN 25		–
32	DN 32		–
40	DN 40	DN 40	40
50	DN 50	DN 50	50
65	DN 65	DN 65	65
80	DN 80	DN 80	80
100	DN 100	DN 100	100
125	DN 125	DN 125	125
150	DN 150	DN 150	150
/15-/125	Reduced to nominal diameter DN	Reduced to nominal diameter DN	/25-/125
T	T-product	–	–
Z	For fitting between two DIN flanges	For fitting between two flanges to EN 1092	Z
W	For fitting between two ANSI flanges	For fitting between two ANSI flanges	W
03	p_U max. = 300 mbar (4.35 psi)	p_U max. = 500 mbar (7.25 psi)	05
H	With manual adjustment	Adapter set with manual adjustment	○
V	With square shaft	Adapter set with square shaft	○
F	With free shaft end	Adapter set with free shaft end	○
100	Temperature range 100°C (210°F)	Temperature range 60°C (140°F)	●
D	With disc clearance	With disc clearance	●
DKL 40Z03F100D	**Example**	**Example**	BVA 40Z05 + adapter set with free shaft end

● *standard,* ○ *available*

4.3 K is to be replaced by BVHM

Type			Type
K	Valve	Butterfly valve for solenoid actuator MB 7	BVHM
40*	DN 40	DN 40	40
50	DN 50	DN 50	50
65	DN 65	DN 65	65
80	DN 80	DN 80	80
100	DN 100	DN 100	100
T	T-product		
Z	For fitting between two DIN flanges	For fitting between two flanges to EN 1092	Z
W	For fitting between two ANSI flanges	For fitting between two ANSI flanges	W
●	$p_{U\ max.}$ 130 mbar (1.89 psig)	$p_{U\ max.}$ 150 mbar (2.18 psig)	01
●	Temperature range 0 – 550°C (0 – 1020°F)	Temperature range 0 – 450°C (0 – 840°F)	●
A	With stop	With stop	A
K 80ZA	**Example**	**Example**	BVHM 80Z01A

**Nominal size DN 40 only with disc clearance*

● *standard,* ○ *available*

4.4 K is to be replaced by BVHS

Type			Type
K	Valve	Butterfly valve	BVHS
		Safety closing function**	S*
40*	DN 40	DN 40	40
50	DN 50	DN 50	50
65	DN 65	DN 65	65
80	DN 80	DN 80	80
100	DN 100	DN 100	100
T	T-product		
Z	For fitting between two DIN flanges	For fitting between two flanges to EN 1092	Z
W	For fitting between two ANSI flanges	For fitting between two ANSI flanges	W
●	p_U max. 130 mbar (1.89 psi)	p_U max. 150 mbar (2.18 psi)	01
●	Temperature range 0 – 550°C (0 – 1020°F)	Temperature range 0 – 450°C (0 – 840°F)	●
A	With stop	With stop	A
K 65ZA	**Example**	**Example**	BVHS 65Z01A

* *Nominal size DN 40 only with disc clearance*

** *Safety closing function only in conjunction with actuator IC 40S*

● *standard,* ○ *available*

4.5 DKR is to be replaced by BVH

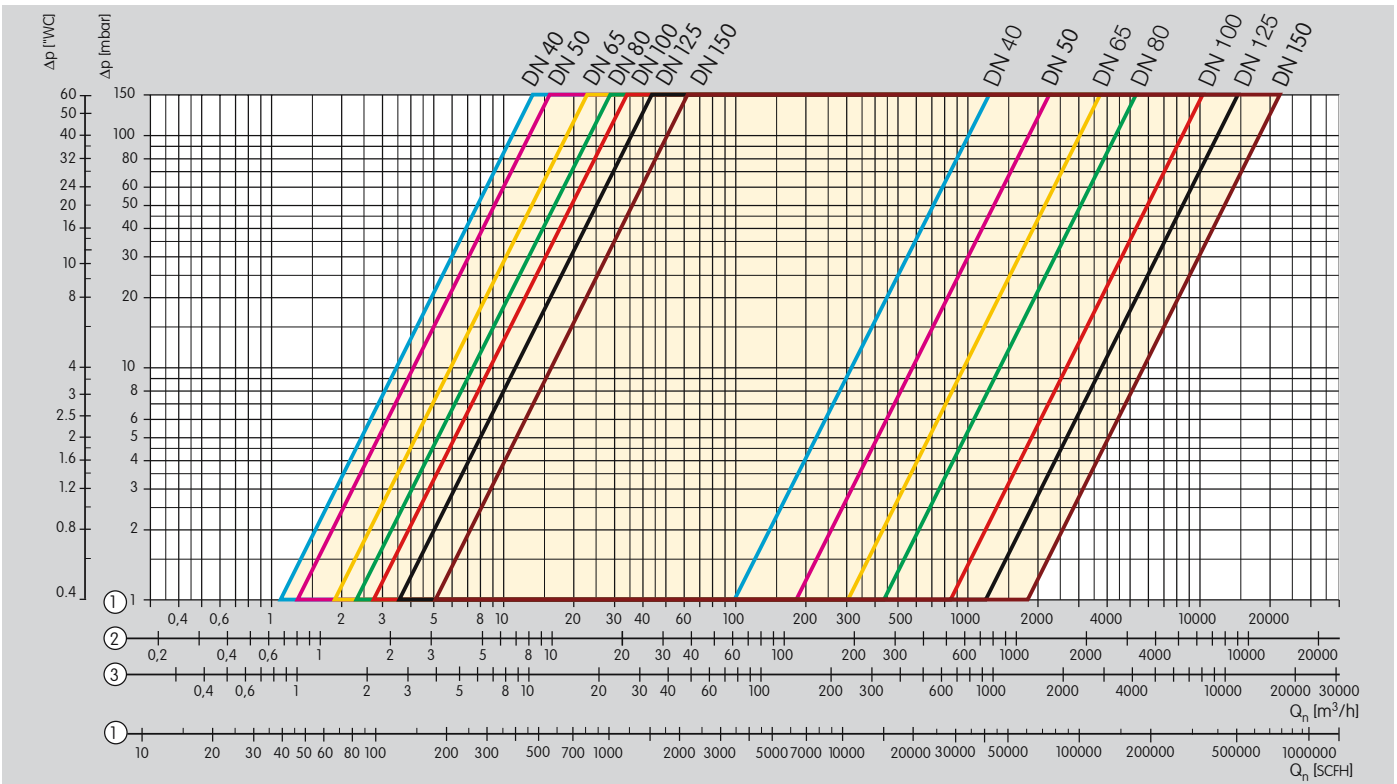
Type			Type
DKR	Butterfly valve	Butterfly valve	BVH
25	DN 25		–
32	DN 32		–
40	DN 40	DN 40	40
50	DN 50	DN 50	50
65	DN 65	DN 65	65
80	DN 80	DN 80	80
100	DN 100	DN 100	100
125	DN 125		–
150	DN 150		–
T			
Z	For fitting between two DIN flanges	For fitting between two flanges to EN 1092	Z
–	–	For fitting between two ANSI flanges	W
03	p_U max. 300 mbar (4.35 psi)	p_U max. 150 mbar (2.18 psi)	01
H	With manual adjustment	–	–
F	With free shaft end	–	–
100	Temperature range 100°C (210°F)		
450	Temperature range 450°C (840°F)	Temperature range 0 – 450°C (0 – 840°F)	●
650	Temperature range 650°C (1200°F)		
D	With disc clearance	With stop	A
DKR 65Z03F450D	**Example**	**Example**	BVH 65Z01A

● *standard,* ○ *available*

5 Flow rate

5.1 Flow rate curves for BVG, BVGF, BVA, BVAF

5.1.1 With full bore = nominal diameter



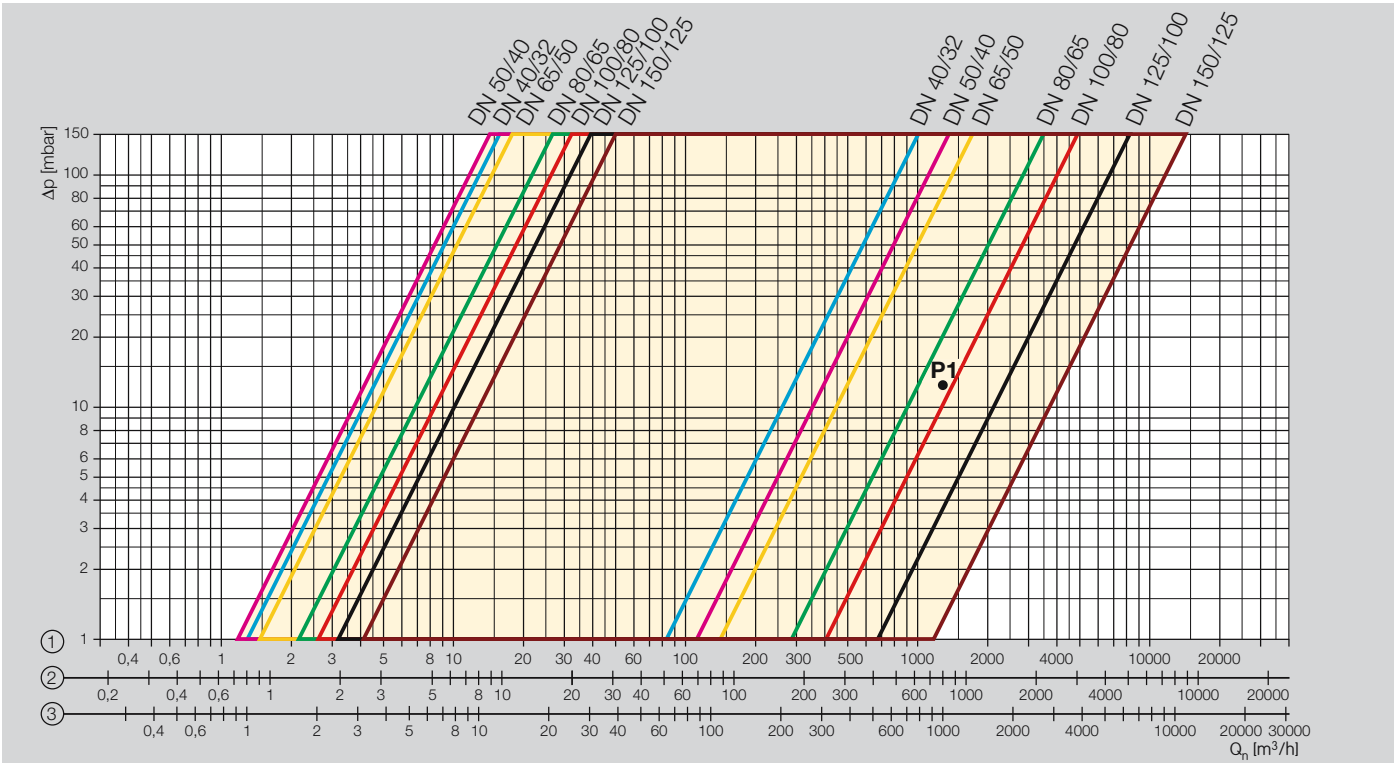
① = natural gas, dv = 0.62, ② = LPG, dv = 1.56,
③ = air, dv = 1.00

The characteristic curves are measured at 15°C (59°F) with a measurement set-up in accordance with the standard EN 13611/EN 161.

This involves measuring the pressure 5 × DN upstream and downstream of the unit under test. The pressure drop of the pipe is also measured but is not compensated for.

Left curve: leakage volume at a 0° opening angle.
Right curve: max. flow rate at a 90° opening angle.

5.1.2 With 1 x reduced bore



① = natural gas, dv = 0.62
② = LPG, dv = 1.56, ③ = air, dv = 1.00

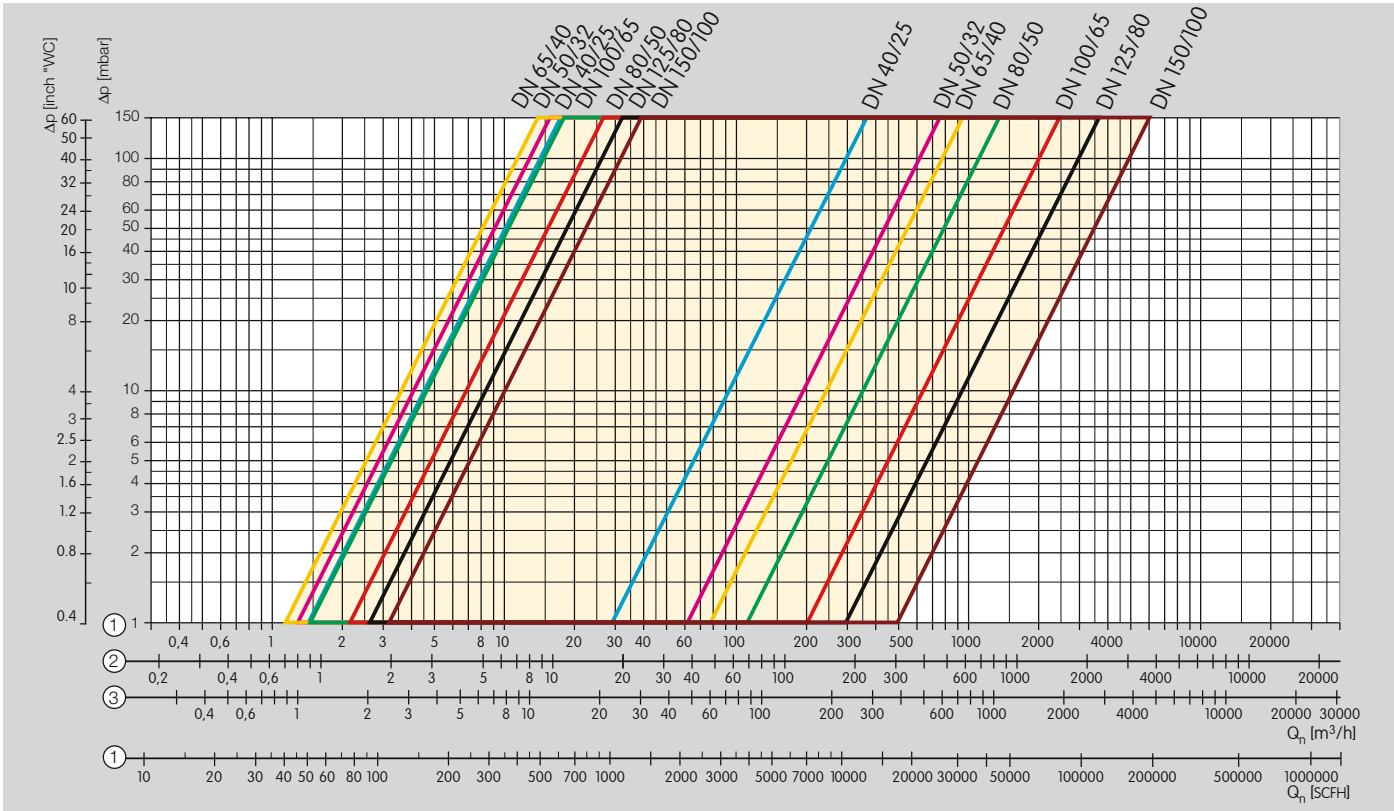
The characteristic curves are measured at 15°C (59°F) with a measurement set-up in accordance with the standard EN 13611/EN 161.

This involves measuring the pressure 5 × DN upstream and downstream of the unit under test. The pressure drop of the pipe is also measured but is not compensated for.

Left curve:
leakage volume at a 0° opening angle.

Right curve:
max. flow rate at a 90° opening angle.

5.1.3 With 2 × reduced bore



① = natural gas, dv = 0.62, ② = LPG, dv = 1.56,
③ = air, dv = 1.00

The characteristic curves are measured at 15°C (59°F) with a measurement set-up in accordance with the standard EN 13611/EN 161.

This involves measuring the pressure 5 × DN upstream and downstream of the unit under test. The pressure drop of the pipe is also measured but is not compensated for.

Left curve: leakage volume at a 0° opening angle.

Right curve: max. flow rate at a 90° opening angle.

5.1.4 k_V values

With full bore = nominal diameter

	Opening angle									
	0	10°	20°	30°	40°	50°	60°	70°	80°	90°
BVG/BVGF/BVA/BVAF 40	1.0	1.5	3.6	7.3	13	23	37	56	77	90
BVG/BVGF/BVA/BVAF 50	1.2	1.6	4.0	9.3	17	31	51	82	123	167
BVG/BVGF/BVA/BVAF 65	1.7	2.7	7.3	16	32	57	94	144	210	281
BVG/BVGF/BVA/BVAF 80	2.1	3.2	9.8	24	47	83	132	202	296	405
BVG/BVGF/BVA/BVAF 100	2.5	3.4	12	33	59	133	214	331	517	792
BVG/BVGF/BVA/BVAF 125	3.4	7.4	25	78	145	244	385	583	910	1132
BVG/BVGF/BVA/BVAF 150	4.7	13	58	132	229	369	583	882	1557	1696

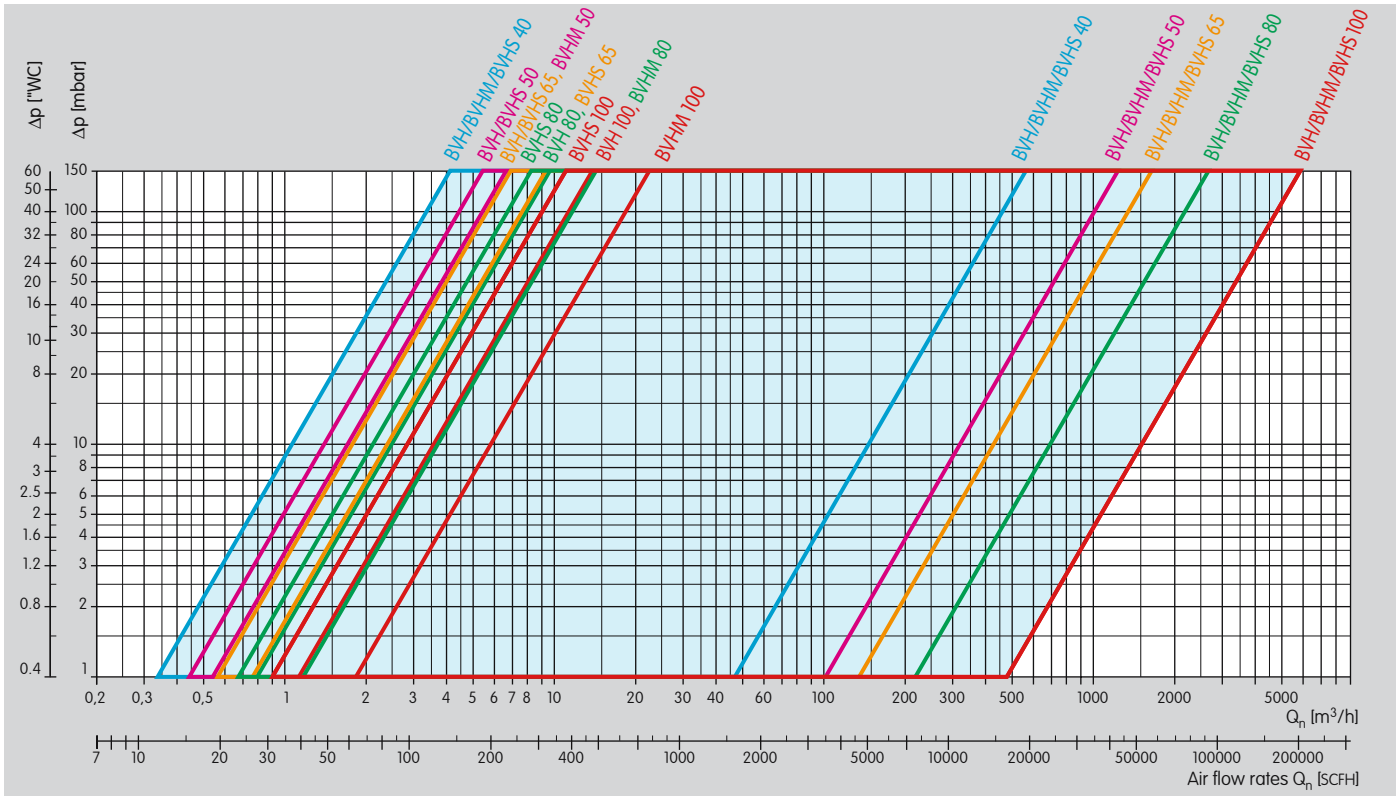
With 1 × reduced bore

BVG/BVGF/BVA/BVAF 40/32	1.2	1.4	2.8	5.4	9.5	16	27	41	57	63
BVG/BVGF/BVA/BVAF 50/40	1.1	1.5	3.2	7.1	13	21	34	52	73	90
BVG/BVGF/BVA/BVAF 65/50	1.3	1.6	4.3	9.5	17	29	46	68	97	120
BVG/BVGF/BVA/BVAF 80/65	2.0	2.4	7.0	16	31	55	89	132	185	243
BVG/BVGF/BVA/BVAF 100/80	2.4	3.3	9.8	23	49	88	140	203	275	335
BVG/BVGF/BVA/BVAF 125/100	2.9	5.2	17	48	103	173	262	364	478	561
BVG/BVGF/BVA/BVAF 150/125	3.8	6.6	25	89	180	288	422	586	771	940

With 2 × reduced bore

BVG/BVGF/BVA/BVAF 40/25	1.3	1.3	2.2	3.9	6.6	11	16	20	24	27
BVG/BVGF/BVA/BVAF 50/32	1.2	1.4	2.8	5.4	9.6	16	26	38	50	56
BVG/BVGF/BVA/BVAF 65/40	1.1	1.5	3.3	7.1	13	20	32	46	61	71
BVG/BVGF/BVA/BVAF 80/50	1.3	1.6	4.0	9.0	16	28	44	64	85	101
BVG/BVGF/BVA/BVAF 100/65	2.0	2.9	7.7	17	32	55	86	122	162	185
BVG/BVGF/BVA/BVAF 125/80	2.4	3.4	8.7	22	47	85	133	185	237	273
BVG/BVGF/BVA/BVAF 150/100	2.9	4.2	15	42	95	160	237	319	397	458

5.2 Flow rate curves for BVH, BVHM, BVHS



For air, dv = 1.00

The characteristic curves are measured at 15°C (59°F) with a measurement set-up in accordance with the standard EN 13611/EN 161.

The pressure is measured 5 × DN upstream and downstream of the unit under test. The pressure drop of the pipe is also measured but is not compensated for.

Left curve:
leakage volume at a 0° opening angle.

Right curve:
max. flow rate at a 90° opening angle.

5.2.1 k_V values

	Opening angle									
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
BVH 40	0.4	6.4	12	18	24	31	38	47	53	55
BVH 50	0.5	10	19	29	40	56	73	95	116	120
BVH 65	0.7	12	21	32	48	67	92	128	156	160
BVH 80	0.8	20	34	52	73	103	143	192	238	250
BVH 100	1.1	27	47	74	111	170	255	374	525	560
BVHM 40	0.4	6.4	12	18	24	31	38	47	53	55
BVHM 50	0.5	10	19	29	40	56	73	95	116	120
BVHM 65	0.7	12	21	32	48	67	92	128	156	160
BVHM 80	1.1	20	34	52	73	103	143	192	238	250
BVHM 100	2.1	27	47	74	111	170	255	374	525	560
BVHS 40	0.4	6.4	12	18	24	31	38	47	53	55
BVHS 50	0.5	10	19	29	40	56	73	95	116	120
BVHS 65	0.7	12	21	32	48	67	92	128	156	160
BVHS 80	0.8	20	34	52	73	103	143	192	238	250
BVHS 100	1.1	27	47	74	111	170	255	374	525	560

6 Selection

	40	50	65	80	100	125	150	/25 – /125	Z	W	01	05	A
BVG, BVGF	●	●	●	●	●	●	●	●	●	●		●	
BVA, BVAF	●	●	●	●	●	●	●	●	●	●		●	
BVH	●	●	●	●	●				●	●	●		●
BVHS	●	●	●	●	●				●	●	●		●
BVHM	●	●	●	●	●				●	●	●		●

● = *standard*, ○ = *available*

Example

BVA 50Z05

6.1 Type code

Code	Description
BVG	Butterfly valve for gas
BVGF	Clearance-free butterfly valve for gas
BVA	Butterfly valve for air
BVAF	Clearance-free butterfly valve for air
BVH	Butterfly valve for hot air and flue gas up to 450°C
BVHS	Butterfly valve for hot air and flue gas up to 450°C with safety closing function (only in conjunction with actuator IC 40S)
BVHM	Butterfly valve for hot air and flue gas up to 450°C (only in conjunction with solenoid actuator MB 7)
DN 40 – 150	Nominal diameter DN
DN /25 – 125	Reduced to nominal diameter DN
Z	For fitting between two flanges to EN 1092
W	For fitting between two ANSI flanges
	Max. inlet pressure $p_{u\ max.}$
01	150 mbar (2.18 psig)
05	500 mbar (7.25 psig)
A*	With stop bar

6.2 Determining the nominal size

6.2.1 Calculating the nominal size

(•) metric ( ) imperial

( ) BVG/BVGF (•) BVA/BVAF
( ) BVH/BVHS ( ) BVHM

Air	1.29	kg/m3
Flow rate Q (standard)	1000	m3/h
Outlet pressure p_d	30.0	mbar
$\Delta p_{min.}$	5.00	mbar
$\Delta p_{max.}$	40.0	mbar
Medium temperature	0	°C
Flow rate Q (operation)	935	m3/h

Product	Δp [mbar]	$Q_{min.}$ [m3/h]	a	∢ [°]	v [m/s]
BVA/BVAF 65	16.2	10.1	0.35	75	67
BVA/BVAF 80	7.8	11.3	0.21	67	49
BVA/BVAF 80/65	21.6	12.5	0.42	79	49
BVA/BVAF 100/80	11.4	13.5	0.28	66	29
BVA/BVAF 100/65	37.3	14.3	0.55	87	29
BVA/BVAF 125/80	17.1	14.4	0.36	69	19
BVA/BVAF 150/100	6.1	15.2	0.17	52	13

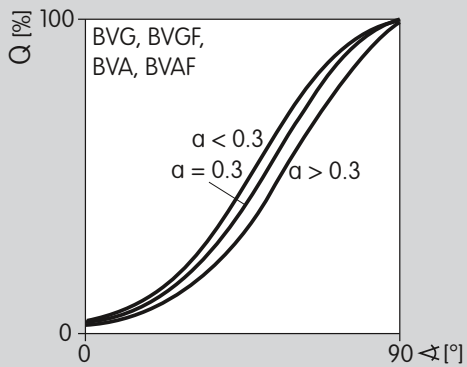
Δp = Pressure drop when valve fully opened (90°)
$Q_{min.}$ = Leakage rate when valve closed ($\Delta p = p_u = p_d + \Delta p_{90°}$)
a = Valve authority (recommended value: 0.3)
∢ = Opening angle at entered $\Delta p_{max.}$
v = Flow velocity

6.2.2 BVG, BVGF, BVA, BVAF

Δp on the butterfly valve is determined using the control characteristic a, see page 40 (Glossary) and the outlet pressure p_d for normal operation.

a = $\Delta p_{100\%}$/inlet pressure p_u

A control characteristic of a = 0.3 provides good control properties.



Example

We want to find $\Delta p_{100\%}$ in order to select the nominal size DN of the butterfly valve BVA for air to be used for modulating control of a gas burner:

Outlet pressure: p_d = 30 mbar
Air flow rate at standard conditions: Q_n = 1000 m³/h
Control characteristic: a = 0.3

$$\Delta p_{100\%} = \frac{a \times p_d}{1 - a}$$

$$\Delta p_{100\%} = \frac{0.3 \times 30 \text{ mbar}}{1 - 0.3} = 12.9 \text{ mbar} = 13 \text{ mbar}$$

The flow velocity in the pipes exercises a considerable influence on the pressure loss and the noise development. When designing the butterfly valve, it is recommended that the flow velocity of 30 m/s is not exceeded, see page 28 (Flow velocities in pipes).

A flow rate at standard conditions Q_n = 1000 m³/h results in a pipe of DN 100.

Select the required nominal size from the flow rate diagram on the basis of the desired flow rate Q_n and the calculated $\Delta p_{100\%}$.

Result

A butterfly valve with 1 × reduced bore is selected in order to obtain the pressure loss $\Delta p_{100\%}$ = 13 mbar that has been calculated taking into account the selected nominal size DN = 100.

DN ➔ BVA 100/80 – see **P1**, Flow rate, Flow rate curves for BVG, BVGF, BVA, BVAF on page 17 (With 1 x reduced bore).

6.2.3 BVH, BVHS, BVHM

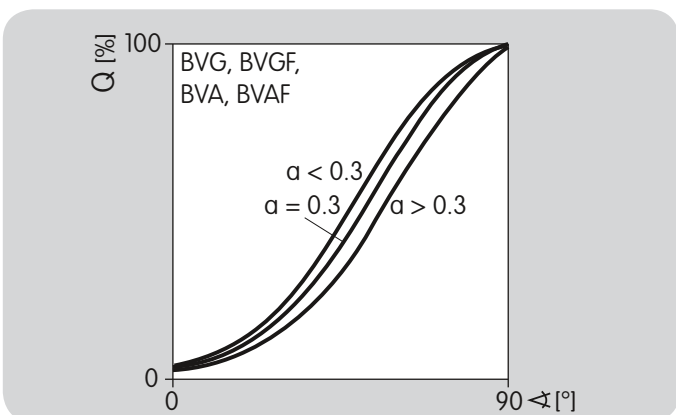
We want to find a butterfly valve BVH for staged control of a gas burner. In order to regulate accurately between loads, the opening angle for high-fire and low-fire rates is calculated using the k_V value.

Selecting the high-fire opening angle

Firstly, Δp_{HF} is determined using the control characteristic a, see page 40 (Glossary), and the outlet pressure $p_{d\,HF}$.

a = $\Delta p_{100\%}$/inlet pressure p_u

A control characteristic of a = 0.3 provides good control properties.



Example

Outlet pressure for high fire: $p_{d\,HF}$ = 30 mbar
Outlet pressure $p_{d\,HF\ absolute}$: 1.013 + 30 = 1.043 bar
High-fire flow rate at standard conditions: $Q_{n\,HF}$ = 430 m³/h
Density ρ_n for air: 1.29 kg/m³
Air temperature: 35°C (95°F)
Control characteristic: a = 0.3

$$\Delta p_{HF} = \frac{a \times p_{d\,HF}}{1 - a}$$

$$\Delta p_{HF} = \frac{0.3 \times 30\ \text{mbar}}{1 - 0.3} = 13\ \text{mbar} = 0.013\ \text{bar}$$

$$k_V = \frac{Q_n}{514} \cdot \sqrt{\rho_n \cdot T/(\Delta p_{HF} \cdot p_{d\,HF\ absolute})}$$

$$Q_n = \frac{k_V \cdot 514}{\sqrt{\rho_n \cdot T/(\Delta p_{HF} \cdot p_{d\,HF\ absolute})}}$$

$T_{absolute}$ = 35 + 273 K = 308 K

$$k_V = \frac{430}{514} \cdot \sqrt{\frac{1.293 \cdot 308}{0.013 \cdot 1.043}}$$

k_V = 144

Select the next largest k_V value in the k_V values table for the BVH, BVHS design, allowing for the maximum opening angle. An opening angle greater than 60° should be selected in order to achieve a wider control range.

For example, the selected k_V value for the butterfly valve BVH, DN 65 with 80° opening is ➔ k_V = 156 – see Flow rate, Flow rate curves for BVH, BVHM, BVHS on page 21 (kV values).

The ranges between the opening angles, which are listed in the k_V values table in 10° steps, can be considered as linear. After linear interpolation of the k_V values between 70° and 80°, the selected opening angle of the butterfly valve BVH for high fire is: k_V = 145 ➔ approx. 76°.

Then check the flow velocity: max. 30 m/s.

Selecting the low-fire opening angle

In a control range of 1:10, this results in a low-fire flow rate at standard conditions of: $Q_{n\,LF}$ = 43 m³/h/10 = 4.3 m³/h and an outlet pressure of $p_{d\,LF}$ = 30 mbar/10² = 0.3 mbar.

The inlet pressure p_u is the same for low-fire and high-fire rates.

$p_u = p_{d\,HF} + \Delta p_{HF}$ = 30 mbar + 13 mbar = 43 mbar,
inlet pressure $p_{u\,absolute}$: 1.013 bar + 0.043 bar = 1.056 bar.

Outlet pressure for low fire $p_{d\,LF}$ = 0.3 mbar,
outlet pressure $p_{d\,LF\,absolute}$: 1.013 bar + 0.0003 bar = 1.0133 bar.

Δp_{LF} for low fire:
$p_u - p_{d\,LF}$ = 43 mbar - 0.3 mbar = 42.7 mbar = 0.0427 bar.

$$k_V = \frac{Q_n}{514} \cdot \sqrt{\rho_n \cdot T/(\Delta p_{LF} \cdot p_{d\,LF\,absolute})}$$

$$k_V = \frac{43}{514} \cdot \sqrt{\frac{1.293 \cdot 308}{0.0427 \cdot 1.0133}}$$

$$k_V = 8.03$$

Select a similar k_V value in the k_V values table for the BVH, BVHS design. For a 10° opening angle, the selected k_V value is ➔ k_V = 12.

After linear interpolation of the k_V values between 0 and 10°, the selected opening angle of the butterfly valve BVH for low fire is: k_V = 8 ➔ approx. 6°.

The opening angle in the low-fire range should not be less than 2° in order to achieve good control properties.

Result

The opening angle for the butterfly valve BVH of DN 65 and control range 1:10 is 6° in the low-fire range and 76° in the high-fire range.

7 Project planning information

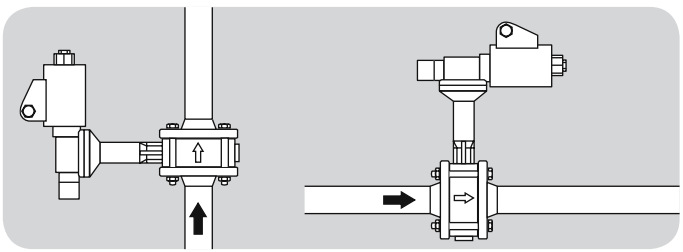
7.1 Installation

The butterfly valve must be installed in-between two flanges in accordance with EN 1092, PN 16.

The length of the inlet and outlet section should be 2 x DN.

When designing the pipe, it is recommended that a flow velocity of 30 m/s (5905 ft/min) is not exceeded, see page 28 (Flow velocities in pipes).

Installation position



The actuator must be installed in the vertical or horizontal position, not upside down. When built into a vertical pipe, dirt may accumulate on the stop bar, which may prevent the valve from closing properly. This is why we recommend selecting the direction of flow from bottom to top.

If pipe fittings (reducing fittings) are installed in the pipework, the additional pressure loss must be taken into account.

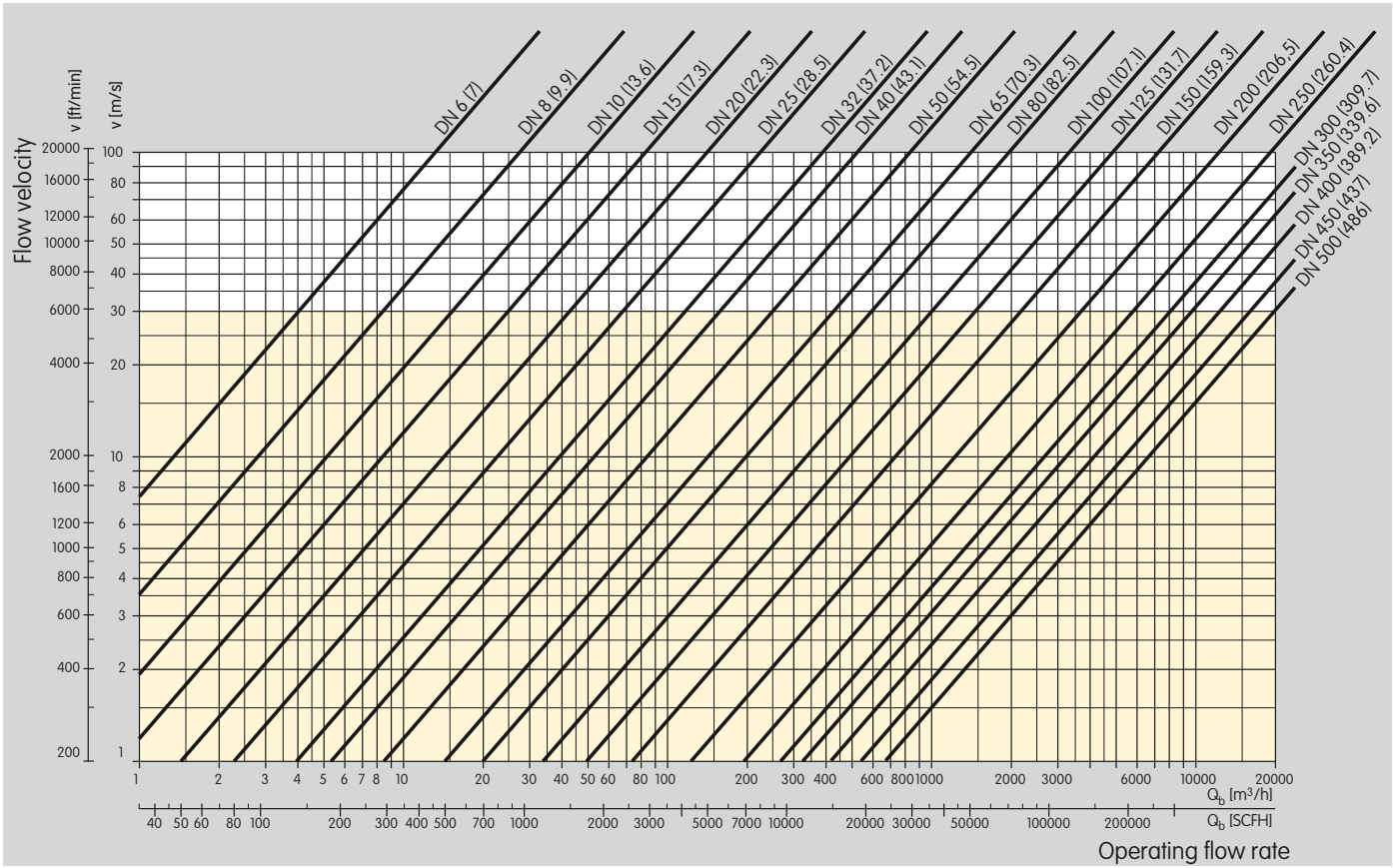
If the valve is used with hot air, the pipeline should be adequately insulated so as to reduce the ambient temperature – the flanges and the butterfly valves BVH, BVHS or BVHM must be kept free of insulating material. Install the butterfly valve in such a way that rising hot air does not circulate around the actuator.

Butterfly valves BVG, BVGF, BVA, BVAF and BVH and actuators IC 20 and IC 40 are supplied separately or assembled. Easy assembly with the actuator using 2 screws can be carried out either before or after installation of the butterfly valve in the pipework.

The butterfly valve BVHM and the solenoid actuator MB 7 are delivered separately. Easy assembly with the solenoid actuator using the installation set can be carried out either before or after installation of the butterfly valve in the pipework.

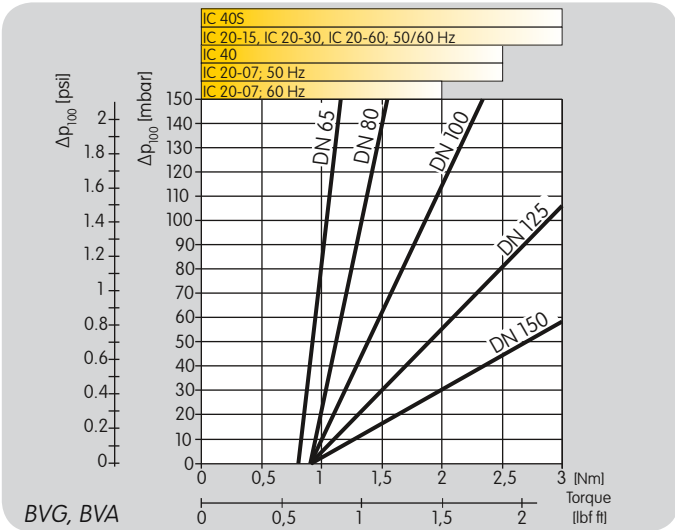
In conjunction with butterfly valves BVH, BVHS or BVHM for hot air, the actuators can be used in temperatures of up to 250°C (480°F), with additional heat deflectors they can be used in temperatures of up to 450°C (840°F).

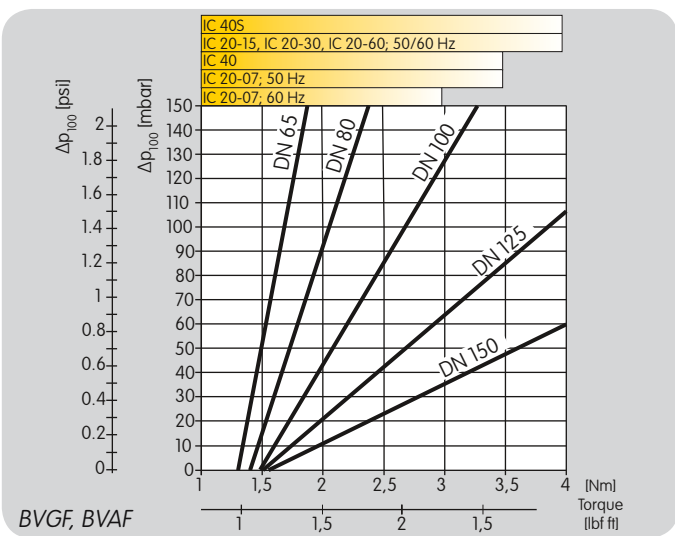
7.2 Flow velocities in pipes



It is recommended that flow velocities of 30 m/s (9505 ft/min) are not exceeded when using the valve on thermoprocessing equipment.

The details on the internal diameter correspond to the conventional dimensions for gas pipes as stipulated in the DIN standards DIN 2440 and DIN 2450. Different cross-sections will result in flow velocities that differ correspondingly.





7.3 Actuator selection

Butterfly valves BVG, BVGF, BVA, BVAF and BVH are controlled by actuator IC 20 or IC 40.

Butterfly valve BVHS is controlled by actuator IC 40S.

Butterfly valve BVHM is controlled by solenoid actuator MB 7.

7.3.1 IC 20, IC 40

The characteristic curves relate to the maximum torque produced by the flow rate. In general, maximum torque is reached at approx. 70°.

IC 20

The running time of the actuator per 90° depends on the required torque.

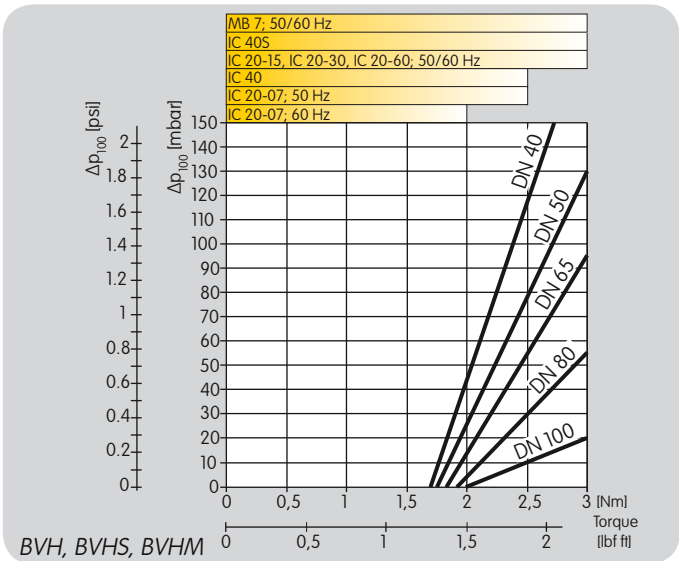
Example:

Any running time could be used for a butterfly valve BVG of nominal diameter DN 65.

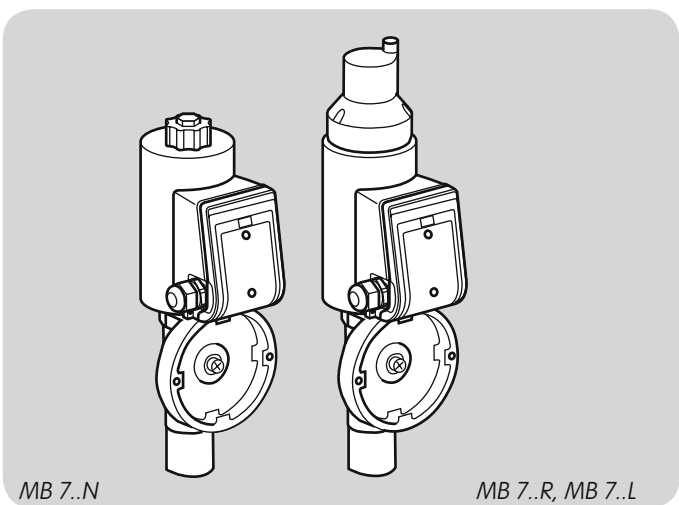
The running time is reduced by a factor of 0.83 at a frequency of 60 Hz on the actuator.

IC 40

Torque and running time are mutually independent on actuators IC 40 and IC 40S.



BVH, BVHS, BVHM



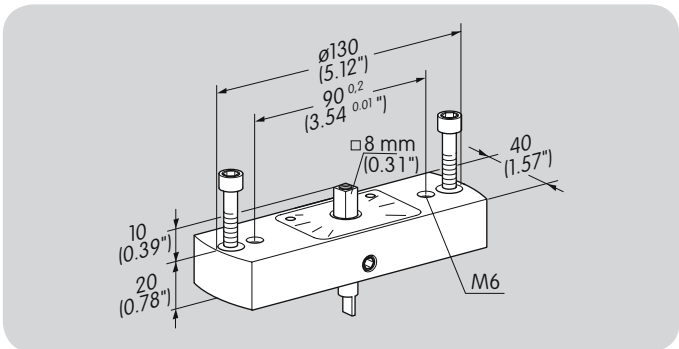
MB 7..N *MB 7..R, MB 7..L*

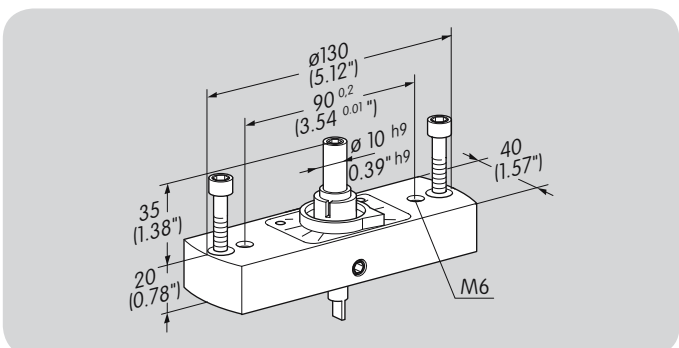
7.3.2 MB 7

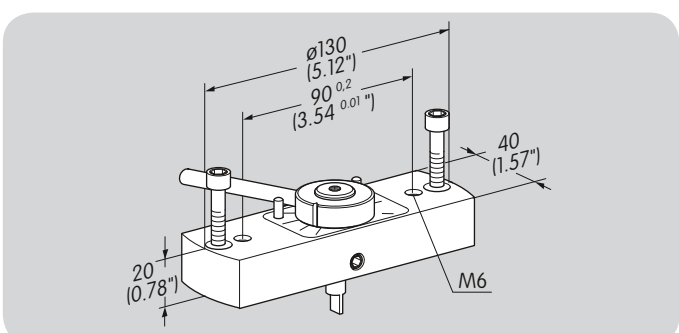
MB 7..N: quick opening: < 1 s,
quick closing: < 1 s,

MB 7..R: slow opening: 2 – 4 s,
slow closing: 2 – 4 s,

MB 7..L: slow opening: 2 – 4 s,
quick closing: < 1 s.







8 Accessories

8.1 For BVG, BVA

Adapter set with square shaft

This adapter set is required if the butterfly valve is mounted onto actuators other than IC. The actuator must have a square shaft end.

Adapter set	Order No.
Fitted	74921675
Enclosed	74921674

Adapter set with free shaft end

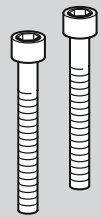
This adapter set is required if the butterfly valve is mounted onto actuators other than IC. The actuator must have a Ø 10 mm shaft end.

Adapter set	Order No.
Fitted	74921677
Enclosed	74921676

Adapter set with manual adjustment

This adapter set is required if the butterfly valve is to be opened and closed manually. The valve can be locked in position.

Adapter set	Order No.
Fitted	74921679
Enclosed	74921678

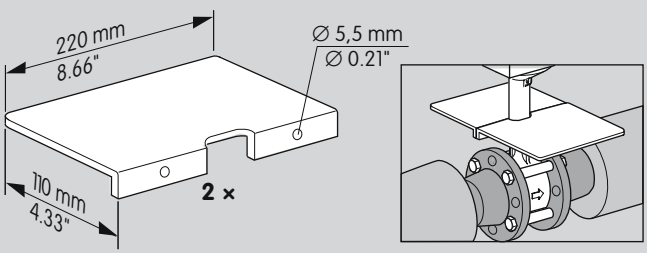


8.2 For BVG, BVGF, BVA, BVAF, BVH and BVHS

Fastening set

To attach an IC 20 or IC 40 to the butterfly valve. If the actuator and butterfly valve are pre-assembled, the fastening set will already be fitted; otherwise, it will be enclosed as an additional item.

Fastening set	Order No.
IC – BVA/BVG/BVH /E (fitted)	74921084
IC – BVA/BVG/BVH /B (enclosed)	74921082

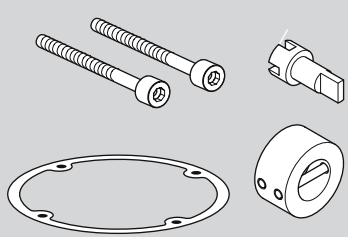


8.3 For BVH, BVHM and BVHS

Heat deflectors

Butterfly valves BVH, BVHM or BVHS for hot air can be used in temperatures of up to 250°C (480°F), with additional heat deflectors they can be used in temperatures of up to 450°C (840°F).

Order number: 74921670



8.4 For BVHM

Fastening set

This is required to attach the solenoid actuator MB 7 to the butterfly valve BVHM. The fastening set is delivered enclosed as an additional item.

Order number: 74922222

9 Technical data

BVG, BVGF, BVA, BVAF

Gas type:

BVG, BVGF: natural gas, town gas, LPG and other non-aggressive fuel gases.

BVGF: biologically produced methane (max. 0.1 %-by-vol. H_2S).

BVA, BVAF: air.

The gas must be dry in all conditions and must not contain condensate.

Housing material: AlSi,
valve disc: aluminium,
drive shaft: stainless steel,
seals: HNBR.

DN: 40 to 150,
reduction by 2 nominal sizes is possible.

Inlet pressure p_U: max. 500 mbar (7.25 psi).

Medium temperature: -20 to +60°C (-4 to +140°F),
Ambient temperature: -20 to +60°C (-4 to +140°F).

BVH, BVHM, BVHS

Gas type: air and flue gas.

DN: 40 to 100.

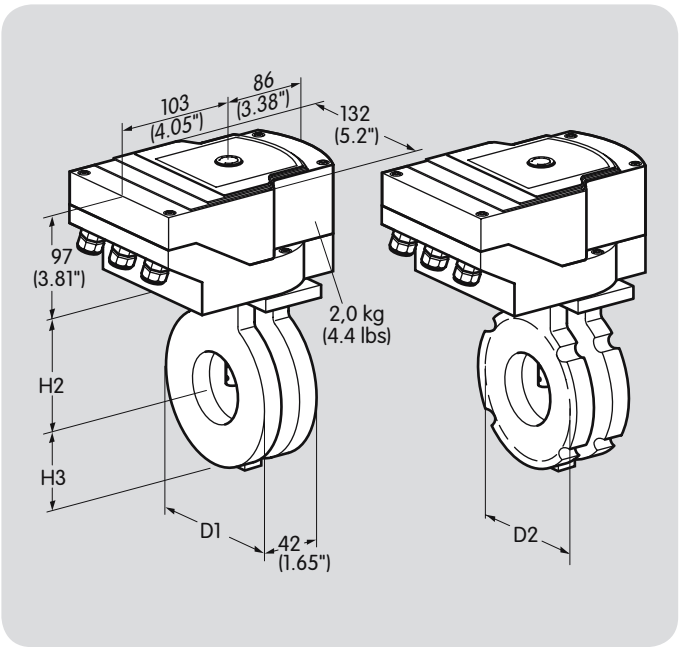
Housing material: GGG,
valve disc: stainless steel,
drive shaft: stainless steel.

Inlet pressure p_U: max. 150 mbar (2.16 psi).
Pressure differential between inlet pressure p_U and outlet pressure p_d: max. 150 mbar (2.16 psi).

Medium temperature: -20 to +450°C (-4 to +840°F),
Ambient temperature: -20 to +60°C (-4 to +140°F).

9.1 Dimensions BVG/BVA + IC 20/IC 40

Type	H2 mm (inch)	H3 mm (inch)	DIN D1 mm (inch)	ANSI D1 mm (inch)	ANSI D2 mm (inch)
BVG/BVA 40 + IC	96 (3.78)	52 (2.05)	92 (3.62)	92 (3.62)	85.7 (3.37)
BVG/BVA 50 + IC	100 (3.94)	59 (2.32)	107 (4.21)	107 (4.21)	105 (4.13)
BVG/BVA 65 + IC	108 (4.25)	69 (2.72)	127 (5)	127 (5)	124 (4.88)
BVG/BVA 80 + IC	115 (4.53)	76 (2.99)	142 (5.59)	142 (5.59)	137 (5.39)
BVG/BVA 100 + IC	125 (4.92)	86 (3.39)	162 (6.38)	162 (6.38)	–
BVG/BVA 125 + IC	138 (5.43)	101 (3.98)	192 (7.56)	192 (7.56)	–
BVG/BVA 150 + IC	150 (5.9)	114 (4.49)	218 (8.58)	218 (8.58)	–



With full bore = nominal diameter

Type	Weight kg (lbs)
BVG/BVA 40 + IC	2.7 (5.95)
BVG/BVA 50 + IC	2.8 (6.17)
BVG/BVA 65 + IC	3.0 (6.61)
BVG/BVA 80 + IC	3.2 (7.05)
BVG/BVA 100 + IC	3.3 (7.27)
BVG/BVA 125 + IC	3.6 (7.93)
BVG/BVA 150 + IC	3.9 (8.60)

9.1.1 With 1 × reduced bore

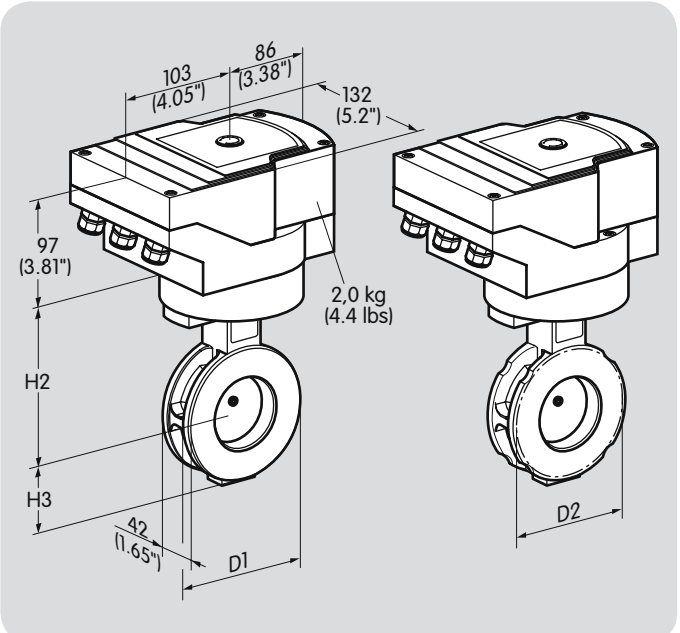
Type	Weight kg (lbs)
BVG/BVA 40/32 + IC	2.7 (5.95)
BVG/BVA 50/40 + IC	2.9 (6.39)
BVG/BVA 65/50 + IC	3.2 (7.05)
BVG/BVA 80/65 + IC	3.4 (7.49)
BVG/BVA 100/80 + IC	3.6 (7.93)
BVG/BVA 125/100 + IC	4.1 (9.04)
BVG/BVA 150/125 + IC	4.4 (9.70)

9.1.2 With 2 × reduced bore

Type	Weight kg (lbs)
BVG/BVA 40/25 + IC	2.8 (6.17)
BVG/BVA 50/32 + IC	3.0 (6.61)
BVG/BVA 65/40 + IC	3.2 (7.05)
BVG/BVA 80/50 + IC	3.5 (7.70)
BVG/BVA 100/65 + IC	3.8 (8.38)
BVG/BVA 125/80 + IC	4.4 (9.70)
BVG/BVA 150/100 + IC	4.9 (10.80)

9.2 Dimensions BVGF/BVAF + IC 20/IC 40

Type	H2 mm (inch)	H3 mm (inch)	DIN D1 mm (inch)	ANSI D1 mm (inch)	ANSI D2 mm (inch)
BVGF/BVAF 40 + IC	134 (5.28)	52 (2.05)	92 (3.62)	92 (3.62)	85.7 (3.37)
BVGF/BVAF 50 + IC	138 (5.43)	59 (2.32)	107 (4.21)	107 (4.21)	105 (4.13)
BVGF/BVAF 65 + IC	146 (5.74)	69 (2.72)	127 (5.00)	127 (5.00)	124 (4.88)
BVGF/BVAF 80 + IC	153 (6.02)	76 (2.99)	142 (5.59)	142 (5.59)	137 (5.39)
BVGF/BVAF 100 + IC	163 (6.41)	86 (3.39)	162 (6.38)	162 (6.38)	–
BVGF/BVAF 125 + IC	176 (6.93)	101 (3.98)	192 (7.56)	192 (7.56)	–
BVGF/BVAF 150 + IC	188 (7.40)	114 (4.49)	218 (8.58)	218 (8.58)	–



9.2.1 With full bore = nominal diameter

Type	Weight kg (lbs)
BVGF/BVAF 40 + IC	3.5 (7.70)
BVGF/BVAF 50 + IC	3.6 (7.93)
BVGF/BVAF 65 + IC	3.8 (8.38)
BVGF/BVAF 80 + IC	4.0 (8.82)
BVGF/BVAF 100 + IC	4.1 (9.04)
BVGF/BVAF 125 + IC	4.4 (9.70)
BVGF/BVAF 150 + IC	4.7 (10.36)

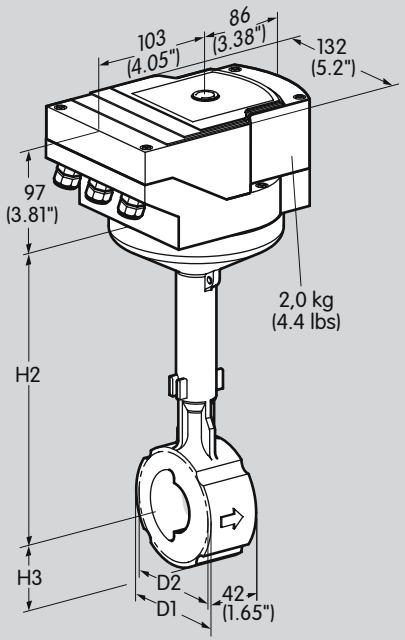
9.2.2 With 1 × reduced bore

Type	Weight kg (lbs)
BVGF/BVAF 40/32 + IC	3.5 (7.70)
BVGF/BVAF 50/40 + IC	3.7 (8.16)
BVGF/BVAF 65/50 + IC	4.0 (8.82)
BVGF/BVAF 80/65 + IC	4.1 (9.04)
BVGF/BVAF 100/80 + IC	4.4 (9.70)
BVGF/BVAF 125/100 + IC	4.9 (10.80)
BVGF/BVAF 150/125 + IC	5.2 (11.46)

9.2.3 With 2 × reduced bore

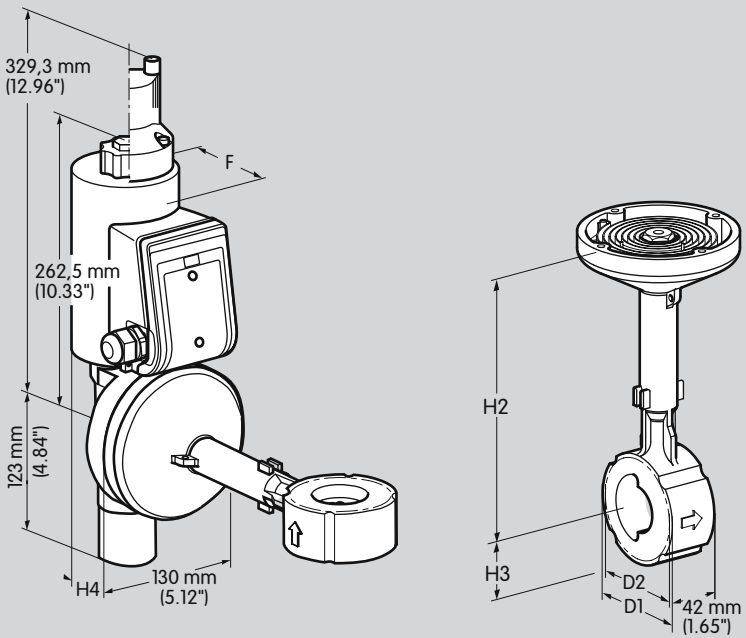
Type	Weight kg (lbs)
BVGF/BVAF 40/25 + IC	3.6 (7.93)
BVGF/BVAF 50/32 + IC	3.8 (8.38)
BVGF/BVAF 65/40 + IC	4.0 (8.82)
BVGF/BVAF 80/50 + IC	4.3 (9.48)
BVGF/BVAF 100/65 + IC	4.6 (10.14)
BVGF/BVAF 125/80 + IC	5.2 (11.46)
BVGF/BVAF 150/100 + IC	5.7 (12.57)

9.3 Dimensions BVH, BVHS + IC 20/IC 40



Type	H2 mm (inch)	H3 mm (inch)	DIN D1 mm (inch)	DIN D2 mm (inch)	ANSI D1 mm (inch)	ANSI D2 mm (inch)	Weight kg (lbs)
BVH/BVHS 40 + IC	234 (9.2)	46 (1.8)	92 (3.6)	–	92 (3.6)	85.7 (3.4)	5.4 (11.9)
BVH/BVHS 50 + IC	239 (9.4)	54 (2.1)	107 (4.2)	–	107 (4.2)	105 (4.1)	5.9 (13.0)
BVH/BVHS 65 + IC	243 (9.5)	64 (2.5)	127 (5.0)	–	127 (5.0)	124 (4.9)	6.8 (15.0)
BVH/BVHS 80 + IC	254 (10)	71 (2.8)	142 (5.6)	–	142 (5.6)	137 (5.4)	7.3 (16.1)
BVH/BVHS 100 + IC	265 (10.4)	88 (3.4)	175 (6.9)	162 (6.4)	175 (6.9)	–	8.5 (18.7)

9.4 Dimensions MB 7 + BVHM



Type	H2	H3	H4	DIN		ANSI		F	Weight
	mm (inch)	mm (inch)	mm (inch)	D1 mm (inch)	D2 mm (inch)	D1 mm (inch)	D2 mm (inch)	mm (inch)	kg (lbs)
BVHM 40 + MB 7	234 (9.21)	46 (1.81)	91.5 (3.58)	92 (3.6)	–	92 (3.6)	85.7 (3.37)	92 (3.62)	11.79 (26.00)
BVHM 50 + MB 7	239 (9.40)	54 (2.12)	91.5 (3.58)	107 (4.2)	–	107 (4.2)	105 (4.13)	92 (3.62)	12.17 (26.83)
BVHM 65 + MB 7	243 (9.56)	64 (2.51)	91.5 (3.58)	127 (5.0)	–	127 (5.0)	124 (4.88)	92 (3.62)	13.05 (28.77)
BVHM 80 + MB 7	254 (10.00)	71 (2.80)	91.5 (3.58)	142 (5.6)	–	142 (5.6)	137 (5.39)	92 (3.62)	13.59 (29.96)
BVHM 100 + MB 7	265 (10.43)	88 (3.46)	91.5 (4.33)	175 (6.9)	162 (6.4)	175 (6.9)	–	92 (3.62)	14.97 (33.00)

9.5 Conversion factors

SI unit ×	multiplier =	US unit
m^3/h	35.31	SCFH
bar	14.5	psi
mbar	0.0145	psi
mbar	0.39	"WC
mm	0.039	inch
kg	2.2	lbs
litres	0.26	gal
m/s	3.28	ft/s

US unit ×	multiplier =	SI unit
SCFH	0.0283	m^3/h
psi	0.0689	bar
psi	68.89	mbar
"WC	2.54	mbar
inch	25.4	mm
lbs	0.45	kg
gal	3.79	litres
ft/s	0.3048	m/s

$°C = (°F - 32) \times 5/9$

$°F = (°C \times 9/5) + 32$

10 Maintenance cycles

The butterfly valves BVG, BVGF, BVA, BVAF, BVH, BVHM and BVHS require little maintenance.

We recommend a function check once a year.

BVG, BVGF: check for external tightness once a year.

BVGF: if operated with biologically produced methane, a tightness test and function check must be carried out every six months.

11 Glossary

11.1 Control characteristic, valve authority

In order for the butterfly valve to be able to influence the flow rate, a proportion of the pressure loss Δp from the entire system has to be caused by the butterfly valve. Taking into consideration that the overall pressure loss Δp should be kept to a minimum, a valve authority a = 0.3 is recommended for the butterfly valve.

This means that of the overall pressure loss Δp there is a 30% drop on the fully open butterfly valve.

11.2 Interpolation (linear)

Mathematical production of interim values at equal distance to the adjacent value.

11.3 Hot air compensation

The volume of air increases with the addition of hot air. The oxygen content contained in the air reduces with every m^3. In order to maintain a constant oxygen content, additional air has to be added to the combustion gas.

11.4 Symbols in acc. with DIN EN 334/14382 and DVGWG 491

Comparison of the new and old symbols

Name of the variable	Old	New
Inlet pressure	p_e	p_u
Outlet pressure	p_a	p_d

Feedback

Finally, we are offering you the opportunity to assess this "Technical Information (TI)" and to give us your opinion, so that we can improve our documents further and suit them to your needs.

inter active

Clarity

- ○ Found information quickly
- ○ Searched for a long time
- ○ Didn't find information

  What is missing?
- ○ No answer

Comprehension

- ○ Coherent
- ○ Too complicated
- ○ No answer

Scope

- ○ Too little
- ○ Sufficient
- ○ Too wide
- ○ No answer

Use

- ☐ To get to know the product
- ☐ To choose a product
- ☐ Planning
- ☐ To look for information

Navigation

- ○ I can find my way around
- ○ I got "lost"
- ○ No answer

My scope of functions

- ○ Technical department
- ○ Sales
- ○ No answer

Remarks

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