Pump Control System for Infinitely Variable Speed Control

BOA-Systronic

Type Series Booklet

KSB

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Type Series Booklet BOA-Systronic

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Pump Control System

Automation system

BOA-Systronic

Main applications

Optimised, energy-efficient operation of:

- Room heating and air-conditioning systems (air/water systems)
- Heating, ventilation and air-conditioning applications using:
  - Air heating registers, air cooling registers
  - Convectors, door air curtains
  - Underfloor heating systems, concrete core activation systems
  - Static heating surfaces
  - Wall and ceiling heating systems
- Suitable for connection to all types of heat generators, local and district heating networks

Fluids handled

- Cold, hot and heating water to VDI 2035 with a max. glycol content of 40 % (DN 20) or 50 % (DN 25 – DN 200)

Operating data

Operating properties

Characteristic		Value
Flow rate	Q	0.5 m³/h to 185 m³/h[1)]
Fluid temperature	t	DN 20: +5 °C to +110 °C > DN 20: -10 °C to +120 °C[2)]
Operating pressure	p	DN 20: 4 bar > DN 20: 16 bar
Process connection		DN 20: Rp 1" DN 25-200: flange

Designation

Example: BOA-Systronic DN 50

Key to the designation

Code	Description
BOA-Systronic	Type series
DN 50	Nominal system diameter

Design details

Design

- Ready-to-connect control unit with parameters pre-set at the factory, plus two maintenance-free, electrically actuated control valves with threaded ends (DN 20) or flanged ends (DN 25 - DN 200) and a shut-off and measurement globe valve (DN 25 - DN 200).
- The input signal for the control unit is the power signal (mixing valve signal) provided by the higher-level closed-loop/open-loop control system; signal types 0-10 VDC or 3-point 230 VAC can be connected to the control unit.
- The control unit converts the power signal received into energy-optimised control signals for both control valves (0-10 VDC) and into the energy-optimised discharge head setpoint (0-10 VDC) for the circulator pump. The signals are output simultaneously.
- Status indication via "equipment-on" lamp.

Operating modes

Automatic operation

- Under part-load conditions, the consumer installations are operated both with an increased temperature differential (between supply and return) and reduced flow rate. Volume flow is controlled by the two control valves such that the circulator pump is provided with the optimum water volume to be handled at all times. The consumer circuit is operated with variable volume flow rates while the mixing principle is retained. Depending on the input signal, the control unit automatically determines energy-optimised setpoints for both control valves and the circulator pump and outputs them simultaneously so that the consumer circuit is operated in a hydraulically and energetically optimised manner. The optimised flow rate in the consumer circuit also enables the hydraulically and energetically optimised operation of pumps installed in the primary circuits of heating networks.
  As the consumer circuit is operated with an increased temperature differential, the return temperature is reduced to the same extent as the supply temperature is increased. In combination with condensing boilers, primary energy can thus be saved without any additional

1) Higher flow rates on request
2) Up to +130 °C for short periods

effort.

The savings are achieved by volume flow control combined with the optimised flow rate setpoint provided to the pump, irrespective of the pump technology used. All control functions needed for the operation and required function of the system are performed by a suitable higher-level closed-loop/open-loop control system.

Stand-by operation

- The circulator pump is operated at the discharge head determined for the design point. The control valve in the mixing line is fully opened so that mixing is performed by the main control valve (in supply or return) only. The consumer installations are provided with the flow rate determined for the design point, irrespective of the actual load situation. To this end, a voltage signal (max. 24 V) (terminal pair Lz+/Lz-) is applied to the control unit.
  Typical application:
  if consumer installations are at risk of freezing when operated with an increased temperature differential under part-load conditions.

Manual operation

- Both control valves and the circulator pump can be operated manually from a laptop computer, using the commissioning software.
  Typical application:
  testing the correct connection/function of the components, e.g. during commissioning.

Emergency operation

- The control valves and the circulator pump can be adjusted manually on site.
  Typical application:
  component failure (electrical defect).

Automation

BOA-Systronic can be used with any closed-loop/open-loop control system capable of providing the power signal for controlling the control valve (mixing valve signal). The Systrobox control unit can receive and process an analog 0-10 VDC signal or 230 VAC 3-point signal without requiring any additional hardware.

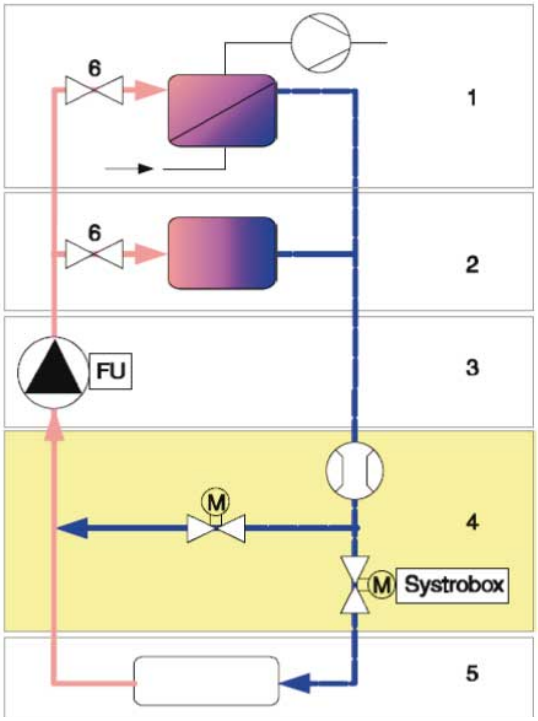
All data points of the control unit are readable/writable and can be transmitted via the RS485 interface to a connected, pre-configured BACnet/IP gateway (see accessories), from where they can be integrated into a Modbus, BACnet/IP or Siemens S5/S7 network for further processing.

Connections

- General fault message (volt-free contact)

Configuration and function

Configuration



Schematic of heating/cooling circuits

1	Consumer	2	Consumer
3	Variable speed pump	4	BOA-Systronic
5	Heat/cold generator	6	Balancing device

Heat distribution

- Single-pipe systems
- Two-pipe systems

Heat/cold generation

- Standard boilers
- Condensing boilers
- Low-temperature boilers
- Local heating networks
- District heating networks
- Heat pumps
- Refrigerators

Function

The load-dependent optimisation of flow rates as well as knowledge about the system curve (measured during commissioning) enable energy and cost optimised operation of the circulator pump. No excessive pump heads are generated, and flow noises are minimised or eliminated altogether. The circulator pump receives the discharge head setpoint as a 0-10 VDC signal. The variable speed system of the circulator pump converts the discharge head setpoint into the respective differential pressure. Differential pressure control of the pump is maintained, i.e. when adjustments are made by room temperature control devices (e.g. thermostatic valves), the circulator pump will shift its operating point in addition to and independently from BOA-Systronic along the set pump characteristic curve (pump control).

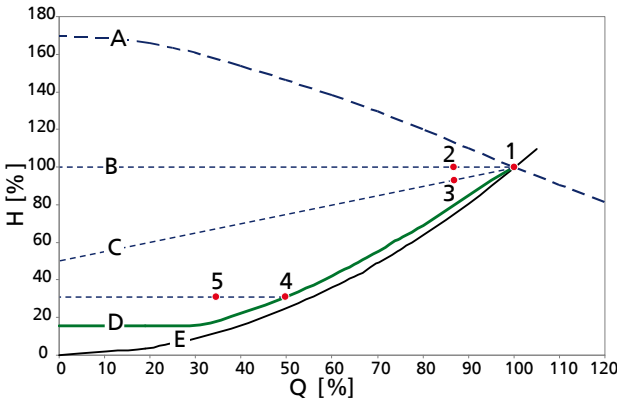
Variable speed pumps with a 0-10 VDC control input (for differential pressure setpoint) can be used in conjunction with BOA-Systronic. If necessary, the pump may have to be

equipped with a communication module (see technical product literature of pump).

- Riotronic-Eco 25-60 BMS with integrated 0-10 VDC interface
- Rio-Eco/Rio-Eco Z in combination with communication modules ("Ext.Off" communication module with 0-10 VDC interface is included in the scope of supply of BOA-Systronic DN 25 - DN 125)
- Glanded pumps combined with PumpDrive variable speed system

Example: Operating point of a BOA-Systronic-controlled circulator pump (annual average)

At an average external temperature of approx. 9 °C (annual average) the consumer circuit requires only about 25 % of the (design) thermal output it is rated for (without the influence of room temperature control). This output (point 4 in diagram below) is provided at 50 % of the design volume flow and at increased supply temperature (heating) or at reduced supply temperature (cooling). The circulator pump needs to generate only a quarter of the discharge head and requires only an eighth of the power at design point (affinity laws). Under the influence of room temperature control, the pump's operating point additionally shifts towards lower outputs/power along the pump characteristic curve (point 5 in diagram below).



A	Characteristic curve of fixed speed pump	B	Constant-pressure control of circulator pump: pump characteristic curve Δp = constant
C	Proportional-pressure control of circulator pump: pump characteristic curve Δp = variable	D	System control curve BOA-Systronic
E	System curve		

1	Operating point of variable speed circulator pump without influence of room temperature control (design point)	2	Operating point of variable speed circulator pump with constant-pressure control Δp = constant and influence of room temperature control, without BOA-Systronic, example
3	Operating point of variable speed circulator pump with proportional-pressure control Δp = variable and influence of room temperature control, without BOA-Systronic, example	4	Operating point (annual average) of variable speed circulator pump controlled by BOA-Systronic without influence of room temperature control, example
5	Operating point (annual average) of variable speed circulator pump controlled by BOA-Systronic with influence of room temperature control, example		

Temperatures

The supply temperature is increased by the higher-level closed-loop/open-loop control system.

Materials

Overview of materials available for control ball valve (BOA-Systronic DN 20 only)

Component	Material
Body	Forged nickel-plated brass body
Obturator	Stainless steel
Sealing element	PTFE
Stem	Stainless steel
Stem seal	EPDM
Control orifice	TEFZEL

Overview of materials available for control valves DN 25 - DN 200

Component	Material
Body	Lamellar graphite cast iron (EN-GJL-250)
Obturator	Control valve plug, grey cast iron/ EPDM
Stem	Stainless steel, min. 13 % Cr
Stem nut	Galvanised steel
Sealing element	PTFE
Profile joint	Elastomer EPDM
O-ring	NBR elastomer
Bearing bush	Steel/PTFE
Actuating bush	Galvanised steel
Top flange	Steel
Actuator Housing Bracket Cover	 Aluminium Aluminium Plastic

Overview of materials available for measurement and shut-off valves DN 25 - DN 200

Component	Material
Body	Lamellar graphite cast iron (EN-GJL-250)
Obturator	Control valve plug, grey cast iron/ EPDM
Stem	Stainless steel, min. 13 % Cr
Stem nut	Galvanised steel
Sealing element	PTFE
Retaining ring	DN 20 to 150: plastic; DN 200: galv. steel
Cap	Plastic, glass-fibre reinforced, impact-resistant
Insulating cap	Plastic
Travel stop	Galvanised steel
Locking device	Galvanised steel
Plug	Plastic
Handwheel	Aluminium, die-cast DN 15 - DN 25: plastic, glass-fibre reinforced DN 200: grey cast iron
Sensor	PEEK

Product benefits

- The pump's operating costs are reduced by up to 70 % owing to energy-optimised flow rates and discharge heads, irrespective of the pump technology used
- Fuel costs are reduced owing to reduced return temperatures
- Added comfort as flow noises are eliminated and pump heads are minimised
- Lower commissioning costs as water flow rates in the main supply/return section of the consumer circuit are automatically adjusted (hydraulic balancing), the system curve is automatically measured and stored, and the control valves are automatically calibrated
- Control unit parameters are set at the factory, depending on the nominal size
- Easy and fast selection, no need to calculate the $K_v$values of the control valves
- Tried-and-tested system components for standard control systems
- Future-proof investment owing to forward-looking systems approach
- Optimised globe valve selection

Selection information

The required nominal size of the BOA-Systronic system depends on the flow rate determined at design point (see table). If the "parallel shift of heating curve" option is applied, the flow rate will already be reduced by 25 % at design point.

Flow rate based selection of BOA-Systronic

Min. flow rate (design point)	Max. flow rate (design point)	Nominal size of BOA-Systronic system	Mat. No.
[m³/h]	[m³/h]		
0.5	1.5	DN 20	48014003
1.0	2.7	DN 25	48014089
2.3	4.2	DN 32	48014090
3.6	6.7	DN 40	48014091
5.7	10.6	DN 50	48014092
9.8	15.1	DN 65	48014093
13.7	22.7	DN 80	48014094
20.3	37.8	DN 100	48014095
31.8	51.0	DN 125	48014096
45.0	95.0	DN 150	48013731
80.0	200.0	DN 200	48013732

Example:
All data apply to design point. Thermal output of consumer circuit: 300 kW

Option A:
Design point is retained: From the data specified, a flow rate (at design point) of Q = 12.9 m³/h is calculated.
Read off from table: nominal size of BOA-Systronic system = DN 65

Option B: Design point is reduced by 25 %. From the data specified, a flow rate (at design point) of Q = 12.9 m³/h is calculated. Parallel shifting of the heating curve (increase in supply temperature) enables a 25 % reduction in flow rate: Q_P = 9.7 m³/h.
Read off from table: nominal size of BOA-Systronic system = DN 50

The above limits apply to flow velocities of approx. 1.5 m/s in the piping. The K_v values of the control valves need not be calculated. The control valves are calibrated automatically during commissioning.

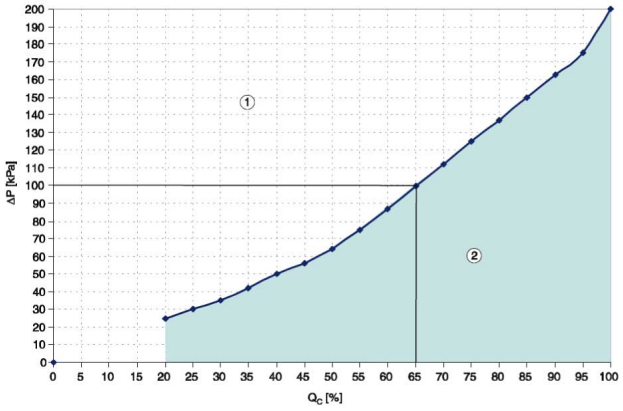
Economic efficiency

If BOA-Systronic is used in conjunction with refrigerators as energy generators (Carnot processes), the system's economic efficiency will depend on whether the additional power required by the refrigerator exceeds the energy savings to be achieved by the circulator pump (and the energy savings to be achieved by any pumps installed in the primary circuits of larger installations).

For pump differential pressures Δp ≥ 200 kPa (design point) the use of BOA-Systronic is always economically efficient.

For pump differential pressures Δp < 200 kPa (design point) economic efficiency depends on the cooling capacity (see diagram).

Pump differential pressure



Cooling capacity

Pump differential pressures

①	where use of BOA-Systronic is economically efficient	②	where use of BOA-Systronic is not economically efficient

Area ①:
BOA-Systronic is economically efficient in combination with pumps whose differential pressures (design point) are located in this area, because the amount of pump energy saved exceeds the additional work done by the compressor to provide the increased temperature differential.

Area ②:
BOA-Systronic is not economically efficient in combination with pumps whose differential pressures (design point) are located in this area, because the extra energy required by the compressor of the refrigerator exceeds the pump energy to be saved.

Example:
The discharge head at design point is 100 kPa (= 10 m) (horizontal line in diagram). For cooling capacities < 65 % BOA-Systronic is economically efficient as the pump saves more energy than is additionally absorbed by the refrigerator. For cooling capacities > 65 % BOA-Systronic is not economically efficient as the pump saves less energy than is additionally absorbed by the refrigerator.

Savings potentials

The energy costs of the circulator pump can be reduced by up to 70 %. The same energy cost savings can be achieved by pumps installed in the primary circuits of larger installations. The table indicates average savings potentials of a BOA-Systronic-controlled circulator pump.

Costs saved (in €/year)

BOA-Systronic	Volume flow rate	Energy costs saved	
		Rio-Eco	Etaline
	[m³/h]	€/year	
DN 20	0,5 - 1,5	30 - 60	
DN 25	1,0 - 2,7	50 - 80	
DN 32	2,3 - 4,2	70 - 140	100 - 170
DN 40	3,6 - 6,7	100 - 200	120 - 220
DN 50	5,7 - 10,6	180 - 330	200 - 320
DN 65	9,5 - 15	300 - 400	300 - 500
DN 80	14 - 23	380 - 800	450 - 800
DN 100	20 - 38	500 - 1200	600 - 1200
DN 125	32 - 53		800 - 1600
DN 150	45 - 95		1200 - 3400
DN 200	80 - 185		2500 - 8000

Parameters:
Operating time/year: 6500 hours, cost of electricity: 0.18 €/kWh, pump head: 4 - 12 m

The reduced return temperature improves the efficiency of condensing boilers, opening up additional savings potential:

Costs saved by reduced return temperature

Heat requirement of building	Energy costs saved
[kW]	€/year
50 - 100	55 - 110
101 - 200	110 - 220
201 - 300	220 - 330
301 - 400	330 - 440
401 - 500	440 - 560
501 - 600	560 - 660
601 - 700	660 - 780
701 - 800	780 - 880
801 - 900	880 - 1000
901 - 1000	1000 - 1100
1001 - 1100	1100 - 1300
1101 - 1200	1300 - 1400

Parameters:
Full-load operating hours: 2100 hours/year, calorific value: 10.6 kWh/m³, fuel costs (gas) 0.80 €/m³, heating temperature: 70/50 °C

Planning information

- The only data required for selecting a BOA-Systronic system is the flow rate or thermal output of the consumer circuit at design point. The process of selecting the control valve(s) is eliminated. Selection and simulation software can be downloaded free of charge from www.ksb.com.
- BOA-Systronic can optionally be operated with a reduced design point (75 % of rated flow). As a result, the required nominal size of the BOA-Systronic system and the rated discharge head of the circulator pump are reduced, so that often smaller nominal sizes of BOA-Systronic and a less powerful pump can be used.
- If BOA-Systronic is to be integrated in higher-level automation systems via the optional BACnet IP gateway, pre-configuration of the gateway will have to be coordinated with the measuring and control equipment consultant (clarification of network/Ethernet IP configuration and BACnet parameters).
- If BOA-Systronic is used in combination with pressurised manifolds, this differential pressure must be compensated by increasing the valve authority accordingly (using the BOA-Systronic commissioning software). This may be necessary in applications such as local or district heating systems where additional pumps are installed in the primary circuits.
- A BOA-Systronic commissioning checklist of the measures to be carried out during commissioning of the system can be downloaded from www.ksb.com.

Technical data

Nominal sizes of system components

Nominal size of BOA-Systronic system	Nom. size of main control valve in supply/return	Nom. size of main control valve in mixing line	Nom. size of measuring/shut-off globe valve (return)
DN 20	DN 20	DN 15	-
DN 25	DN 25	DN 25	DN 25
DN 32	DN 32	DN 25	DN 32
DN 40	DN 40	DN 25	DN 40
DN 50	DN 50	DN 32	DN 50
DN 65	DN 65	DN 40	DN 65
DN 80	DN 80	DN 50	DN 80

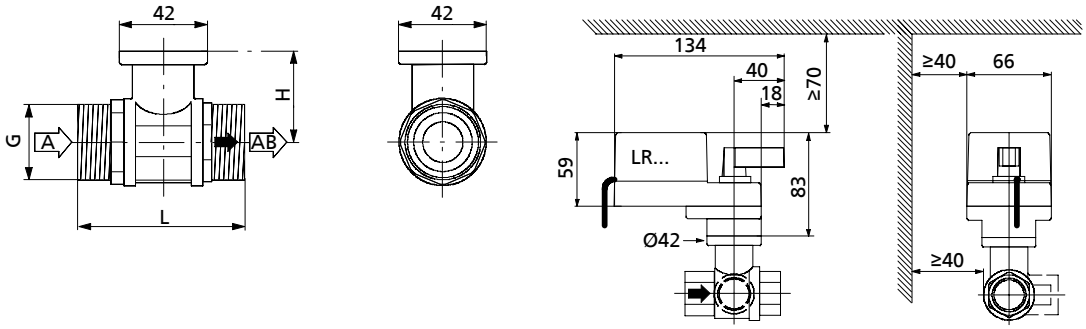
Nominal size of BOA-Systronic system	Nom. size of main control valve in supply/return	Nom. size of main control valve in mixing line	Nom. size of measuring/shut-off globe valve (return)
DN 100	DN 100	DN 65	DN 100
DN 125	DN 125	DN 80	DN 125
DN 150	DN 150	DN 100	DN 150
DN 200	DN 200	DN 125	DN 200

Technical data: Systrobox control unit

Parameter	Value
Systrobox power supply	24 VAC ±10 %/50 Hz, 5 A, cosφ > 0.8
Function range	21.6 - 26.4 VAC
Inputs	1x 0 - 10 VDC, R_i = 260 kΩ
	1x 3-point 230 VAC
	1x 4 - 20 mA, R_i = 120 Ω
Outputs	3 × 0/2 - 10 VDC/max. 10 mA
	3 × 24 VAC/max. 3 A
	1 × 24 VDC/max. 0.2 A
	1 × relay contact 0.5 A/max. 10 W
Communication	1 × RS485 (terminal)
	1 × RS485 (RJ45)
Cable connection	Clamped connection
Enclosure	IP 54 as per EN 60529
Safety class	II as per EN 60730
Interference immunity	As per EN 61000-6-1 and -2
RFI emission	As per EN 61000-6-3 and -4
Electromagnetic compatibility	89/336/EEC
EC directive on low-voltage equipment	73/23/EEC
Contamination level	2
Power consumption	Systrobox : 2 W BOA-Systronic DN 20: 15 VA BOA-Systronic DN 25 - 50: 22 VA BOA-Systronic DN 25 - 80: 52 VA BOA-Systronic DN 100 - 200: 85 VA
Operating temperature	0 ℃ to +50 ℃
Operating mode	Continuous operation
Transport/storage temperature	-20 ℃ to +70 ℃
Resistance to heat and fire	Category D (glow-wire test)
Test temperature, ball impact test	Housing 75 °C Terminals 100 °C
Software	Class A
Weight (Systrobox control unit only)	Approx. 0.2 kg
Dimensions (H x W x D)	130 mm × 130 mm × 80 mm
Mounting	As required
Device type	1.C

Dimensions

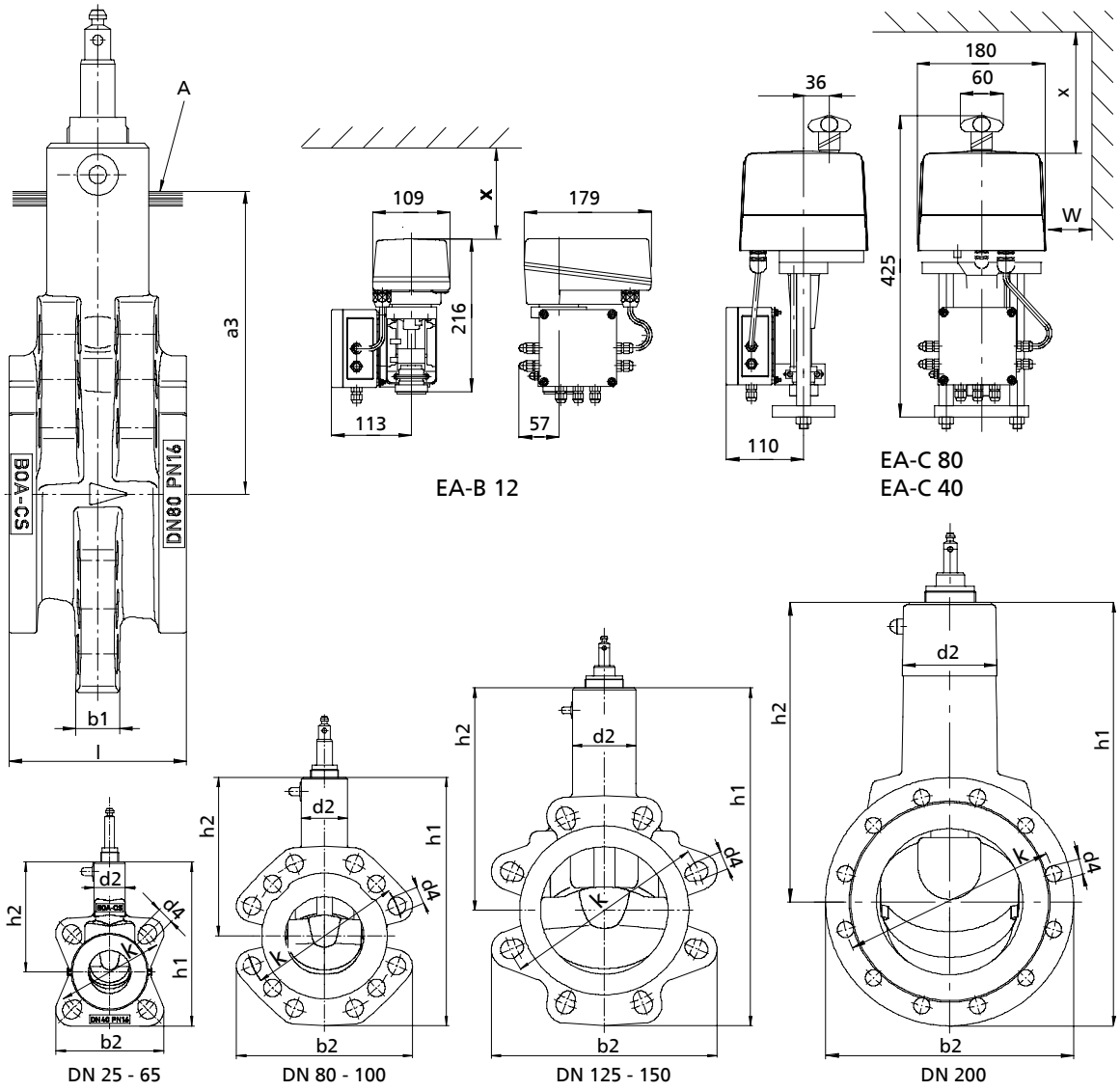
Control ball valves (BOA-Systronic DN 20 only)



Dimensions in mm

DN	L	H	Connection	[kg]
15	74	44	G 1	0.6
20	85.5	46	G 1	0.8

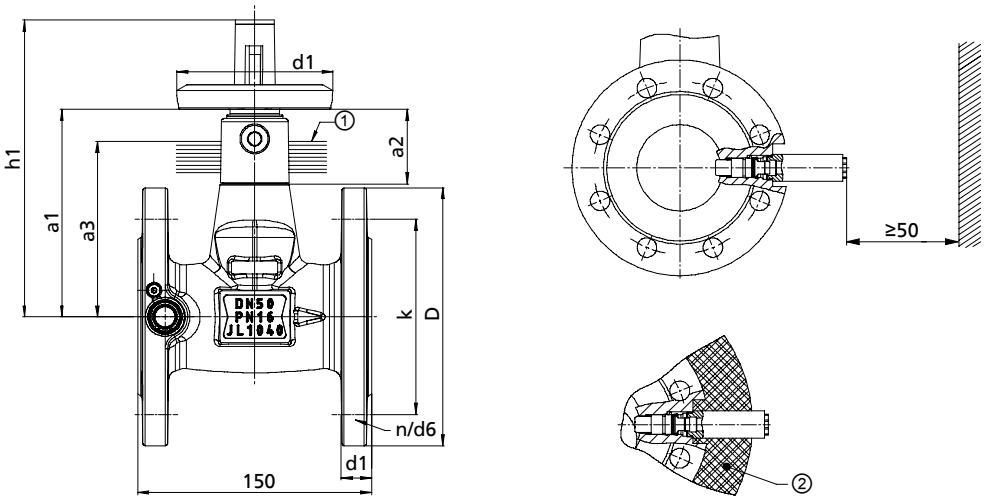
Control valves (BOA-Systronic DN 25 - DN 200)



Dimensions in mm

DN						PN 6		PN 10		PN 16						[kg]	
	l	h1	h2	d2	a3	k	n x d4	k	n x d4	k	n x d4	b1	b2	x	w	EA-B12	EA-C80 EA-C40
25	25	129	87	30	72.5	75	4 x 11	85	4 x 14	85	4 x 14	13	85	100	100	2.8	-
32	32	163	112	32	85	90	4 x 14	100	4 x 18	100	4 x 18	16	103	100	100	3.5	-
40	40	166	112	32	95	100	4 x 14	110	4 x 18	110	4 x 18	16	110	100	100	4.0	-
50	50	186	126	40	107.5	110	4 x 14	125	4 x 18	125	4 x 18	20	120	150	110	5.1	--
65	65	233	166	44	125	130	4 x 14	145	4 x 18	145	4 x 18	24	135	150	120	-	13.5
80	80	254	162	47	140	150	4 x 18	160	8 x 18	160	8 x 18	20	180	150	140	-	16.5
100	100	303	200	58	160	170	4 x 18	180	8 x 18	180	8 x 18	20	203	150	150	-	19.5
125	125	365	248	75	175	200	8 x 18	210	8 x 18	210	8 x 18	23	230	150	170	-	23.5
150	150	397	261	75	192.5	225	8 x 18	240	8 x 22	240	8 x 22	23	266	150	170	-	29.5
200	230	575	405	120	220	280	8 x 18	295	8 x 22	295	12 x 22	30	340	150	170	-	76.5

Measurement and shut-off valve (BOA-Systronic DN 25 - DN 200)



DN 15 - 200

① Insulation boundary
② Insulation

Dimensions in mm

BOA-Control IMS												Insulation thickness [mm]/Extension set[3]				
DN	l	h1	d1	d2≈	a1	a2	D	k	n x d4	b	[kg]	0-10	11-20	21-30	31-40	41-50
15	115	156	80	35	105	46	95	75	4 x 130	14	2,3	Set A[4]	Set A	Set A	Set A	Set B
20	120	156	80	35	105	46	105	75	4 x 130	16	2,7	Set A[3]	Set A	Set A	Set A	Set B
25	125	156	80	35	105	46	115	75	4 x 130	16	3,0	Set A[3]	Set A	Set A	Set B	Set B
32	130	179	100	35	122	46	140	90	4 x 130	18	4,8	Set A	Set A[3]	Set A	Set B	Set B
40	140	179	100	35	122	46	150	100	4 x 130	18	5,5	Set A	Set A[3]	Set A	Set B	Set B
50	150	189	100	43	131	46	165	110	4 x 130	20	6,9	Set A	Set A	Set A[3]	Set B	Set B
65	170	252	125	47	174	66	185	130	4 x 130	20	10,0	Set A	Set A	Set A	Set B[3]	Set B
80	180	252	160	52	185	76	200	150	8 x 170	22	12,5	Set A	Set A	Set A	Set B[3]	Set B
100	190	298	160	63	215	73	220	170	8 x 170	24	17,1	Set A	Set A	Set A	Set B	Set B[3]
125	200	373	200	85	270	115	250	200	8 x 220	26	26,5	Set A	Set A	Set B	Set B	Set B[3]
150	210	386	250	85	282	113	285	225	8 x 340	26	31,0	Set A	Set A	Set B	Set B	Set B[3]
200	230	693	315	136	434	174	340	280	12 x 340	30	71,0	Set A	Set B	Set B	Set B	Set B[3]

BACnet data points

Data points for write/read access

Description	Unit
Control signal of discharge head setpoint for pump in automatic operation	[0-100 %]
Control signal for main control valve in automatic operation	[0-100 %]
Control signal for mixing control valve in automatic operation	[0-100 %]
Input of automatic/manual operating mode with feedback monitoring	-
Input of discharge head setpoint for pump, manual operation	[0-100 %]
Input of control signal for main control valve, manual operation	[0-100 %]
Input of control signal for mixing control valve, manual operation	[0-100 %]
Ventilation controller input (0 = automatic mode, 1 = stand-by mode)	[V]
Measured flow rate	[mA]
Control signal from higher-level closed-loop/open-loop control system	[0-100 %]

3) The size of the extension sets depends on the nominal size and the insulation thickness Set A = 50 mm, Set B = 85 mm, Set C = 115 mm
4) Insulation in accordance with the German heating systems regulations

Description	Unit
Calculated flow rate	[m³/h]
Status of general fault message relay (On/Off)	-
Communication status (monitoring of BOA-Systronic interfaces)	-

Actual-position feedback can be obtained from both control valve actuators as a 2-10 VDC signal.

In the event of a Systrobox fault the volt-free general fault message relay contact (NC) is activated. If no fault is detected the contact is closed (broken wire detection).
The following faults can be detected:

- Failure of operating software
- CPU failure
- Interruption of 24 VAC power supply
- Short circuit of control outputs
- Faulty initialisation

For integration of the pump in automation systems refer to the product literature of the relevant pump.

Scope of supply

BOA-Systronic DN 20

- 1 control valve DN 15, complete with electric actuator
- 1 control valve DN 20, complete with electric actuator and mounted Systrobox control unit
- 1 operating manual

BOA-Systronic DN 25 - DN 125

- 2 control valves complete, with electric actuator and mounted Systrobox control unit
- 1 measurement and shut-off globe valve
- 1 communication module Ext.Off for Rio-Eco high-efficiency pump
- 1 operating manual

BOA-Systronic DN 150 - DN 200

- 2 control valves, complete, with electric actuator and mounted Systrobox control unit
- 1 measurement and shut-off globe valve
- 1 operating manual
- The commissioning software is available free of charge in our product catalogue on the Internet at http://shop.ksb.com/docs/DE/DE/ES000494.

Accessories

	Designation	Mat. No.	[kg]
	Parameterisation kit Comprises USB-Nano-485 interface converter, connection cable and commissioning tool for interface converter on CD-ROM	48014073	0,3
	USB Nano 485 interface converter for connecting a laptop computer with USB interface to the RS485 interface of the Systrobox control unit	48014071	0,1
	RS485 connection cable (2-wire) to RJ45 for connecting the interface converter to the RJ45 socket of the Systrobox control unit	48014070	0,1
	Flow meter For optional, once-only volume flow measurement during commissioning, in order to optimally adapt BOA-Systronic to the site system. The flow meter is connected to the Systrobox control unit and powered (24 VDC) via the pre-configured 4-core cable supplied.	48013496	0,2
	BACnet (IP) gateway[5)] 100 data points, pre-configured, for connection of up to two BOA-Systronic systems When ordering please specify "For use with BOA-Systronic"	46002246	0,4

5) Integration of the BOA-Systronic control system in BACnet systems implemented by Lua driver via the RS485 interface; integrated Lua interpreter for direct read and write access to all devices in the BACnet network; on-site commissioning required, no additional configuration software required. Configuration exclusively via EDE files.

	Designation	Mat. No.	[kg]
	BACnet (IP) gateway[5)] 100 data points, pre-configured, for connection of up to four BOA-Systronic systems When ordering please specify "For use with BOA-Systronic"	01318429	0,4
	Sub-D plug for connecting the RS485 2-wire data cable to the serial RS485 interface of the BACnet (IP) gateway	01315496	0,1
	Transformer AC 400V / 230V / 24V 50 VA	01058592	1
	Transformer AC 400V / 230V / 24V 100 VA	01147693	1,974
	Transformer AC 400V / 230V / 24V 250 VA	01147694	6,77

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