Main-Index

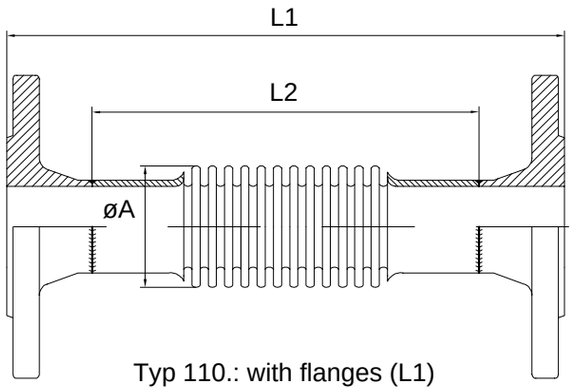
back to startpage

All measurements and weights are approximate figures.
Illustrations are not bindig. Alteration rights reserved.

Index Group 1

Strainer, Compensators

Steel compensator for pumps,
PN 16, without protective jacket and guiding tube
for absorption of all kinds of oscillations
for heat transfer oil installations up to 350°C
with flanges acc. to DIN 2633 (type 110 3..)
or with weld-on ends (type 111 3..)
(for temperatures over 300°C: C 22-flanges are necessary, please specify when ordering!)
Bellow made of 1.4541



Typ 110.: with flanges (L1)
Typ 111.: weld-on ends (L2)

Order text:
Steel compensator for pumps PN 16, DN . .
with flanges / weld-on ends
List-No. 11 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	14	13	11	10	bar

DN	List-No. type with:		Max. perm. oscillation by:		Bellow diameter	Imm. lenght (mm) L1	L2	Weight kg	
	flanges	weld-on ends	20°C	300°C	∅A	type 110	type 111	type 110	type 111
15	110 300	111 300	0,5	0,4	36	245	175	1,4	0,3
20	110 301	111 301	0,5	0,4	36	251	175	2,3	0,4
25	110 302	111 302	0,7	0,5	42	261	185	2,6	0,5
32	110 303	111 303	1,1	0,8	50	265	185	3,8	0,6
40	110.304	111 304	1,1	0,8	60	274	190	4,2	0,7
50	110 305	111 305	1,0	0,7	75	295	205	5,8	0,8
65	110 306	111 306	1,0	0,7	90	320	230	7,3	1,3
80	110 308	111 308	0,9	0,6	110	330	230	9,1	1,8
100	110 310	111 310	0,9	0,6	133	334	230	11,4	2,2
125	110 312	111 312	0,7	0,5	157	380	270	15,9	3,3
150	110 315	111 315	0,7	0,5	190	380	270	19,8	4,3
200	110 320	111 320	0,7	0,5	250	425	300	30,0	8,0
250	110 325	111 325	0,7	0,5	300	440	300	40,9	9,7

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

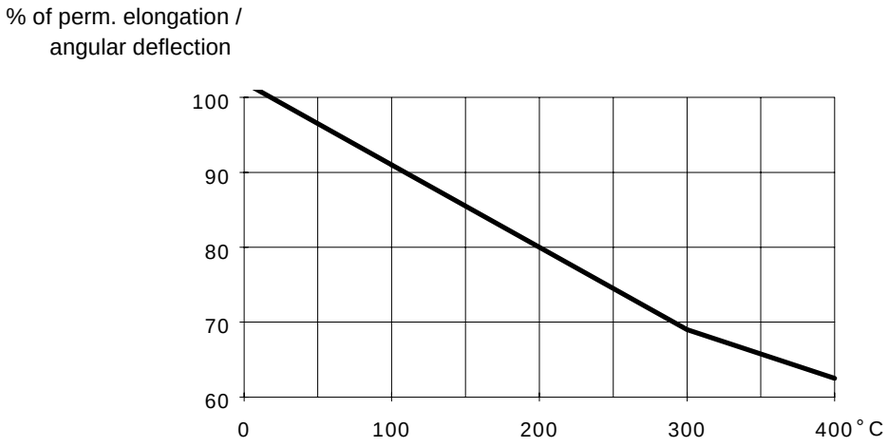
Steel compensator for pumps,
PN 16,

Data for axial, angular and lateral load:

DN	Perm. elongation axial +/- mm	Perm. ang. deflection angular +/- °	Perm. axle misalignment lateral +/- mm
15	12,0	30	5
20	12,0	30	5
25	15,0	30	8
32	15,0	30	12
40	15,0	30	12
50	22,5	25	11
65	22,5	25	11
80	22,5	20	10
100	22,5	20	10
125	22,5	12	8
150	32,5	12	8
200	35,0	12	8
250	35,0	12	8

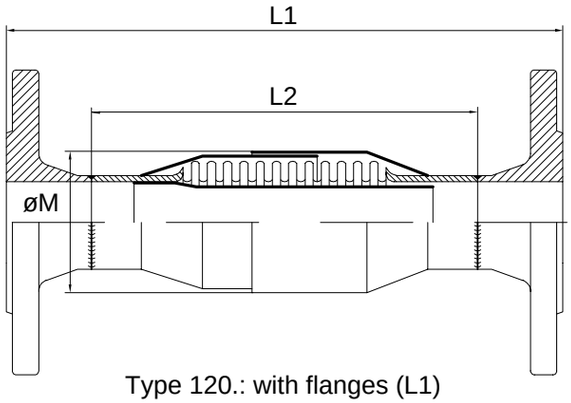
Data are valid for a *single* load and nominal temperature. If several kinds of load occur simultaneously, reduce data (further information on request).

For higher temperatures the data have to be reduced acc. to diagramm 1
(for instance: for 300°C down to about 68%)



open printversion

Steel compensator for pipe conduits,
PN 16, with protective jacket and guiding tube
for absorption of axial extensions
for heat transfer oil installations up to 350°C
with flanges acc. to DIN 2633 (type 120 3..)
or with weld-on ends (type 121 3..)
(for temperatures over 300°C: C 22-flanges are necessary, please specify when ordering!)
Bellow made of 1.4541



Type 120.: with flanges (L1)
Type 121.: with weld-on ends (L2)

Order text:
Steel compensator for pipe conduits PN 16, DN . .
with flanges / weld-on ends
List-No. 12 . . .

Max. operating pressure:

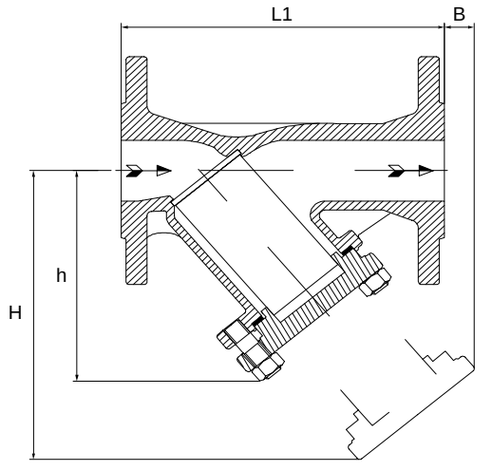
by:	120	200	250	300	350	°C
PN 16	16	14	13	11	10	bar

DN	List-No. type with:		Max. perm. extension by:		Jacket diameter	Imm. lenght (mm) L1	L2	Weight kg	
	flanges	weld-on ends	20°C	300°C	∅M	type 120	type 121	type 120	type 121
15	120 300	121 300	24	17	44	245	175	1,6	0,4
20	120 301	121 301	24	17	44	251	175	2,6	0,5
25	120 302	121 302	30	22	50	261	185	2,9	0,7
32	120 303	121 303	30	22	57	265	185	4,2	0,8
40	120.304	121 304	30	22	68	274	190	4,7	0,9
50	120 305	121 305	45	32	85	310	220	6,6	1,6
65	120 306	121 306	45	32	100	330	240	8,3	2,2
80	120 308	121 308	45	32	120	340	240	11,5	4,1
100	120 310	121 310	45	32	145	359	255	15,9	6,6
125	120 312	121 312	45	32	175	390	280	22,4	9,8
150	120 315	121 315	65	46	200	425	315	31,8	16,3
200	120 320	121 320	70	49	273	479	355	48,3	26,3
250	120 325	121 325	70	49	324	495	355	61,4	30,2

open printversion

Strainer with flange connection
GGG 40.3, PN 16

Strainer with flange connection,
for water, steam and heat transfer oil
Filter screen: made of alloy steel wire,
if desired with supporting basket
(from DN 200 onwards standard equipment)
and/or fein screen (mesh size 0,25 mm)
Body: GGG 40.3, PN 16
Flanges acc. to DIN 2533



Order text:
Strainer GGG 40.3, PN 16, DN . .
filter screen made of alloy steel,
Flanges acc. to DIN
List-No. 150 4 . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	List-No.	Weight	Immersion lenght	Height opened		Measure	Screen	Wire gauge x mesh size
		kg	L	h	H	B	∅ x height	
15	150 400	3,5	130	90	135	10	23 x 57	0,5 x 1
20	150 401	4	150	100	150	10	28 x 69	0,5 x 1
25	150 402	5,5	160	115	180	25	36 x 83	0,5 x 1
32	150 403	7	180	125	205	35	42 x 99	0,5 x 1
40	150.404	9	200	150	235	45	50 x 115	0,5 x 1
50	150 405	12	230	160	250	45	61,5 x 120	0,5 x 1
65	150 406	16	290	180	285	25	78,5 x 135	0,63x1,25
80	150 408	21	310	215	330	40	89,5 x 150	0,63x1,25
100	150 410	28	350	235	365	55	109,5 x 170	1,0 x 1,6
125	150 412	41	400	275	425	65	137,5 x 200	1,0 x 1,6
150	150 415	58	480	305	480	50	160 x 225	1,0 x 1,6
200	150 420	115	600	390	610	80	210 x 285	1,0 x 1,6

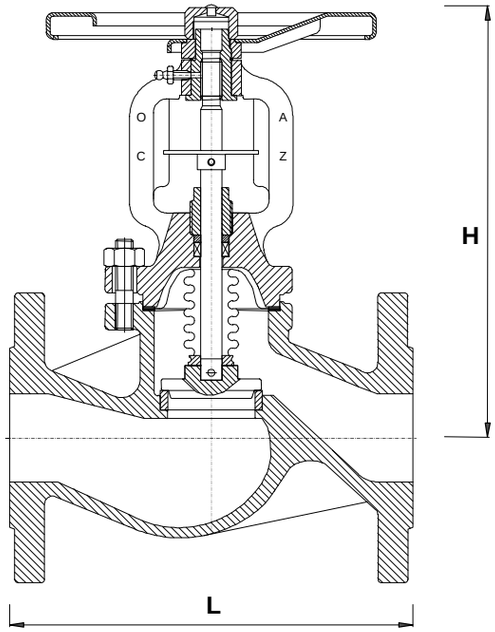
open printversion

Index Group 2

Manual operated valves

Manual operated stop valve in two way form with VA-bellow sealing, PN 16, GGG-40.3

Valve body: GGG-40.3, two way form**,**
for water, steam and heat transfer oil
Pressure range: PN 16,
Flanges acc. to DIN,
Sealing: VA-bellow,
and safety stuffing box,
Internal parts: stainless steel



Order text:
Manual operated stop valve PN 16, DN . .
in two way form with VA-bellow sealing,
List-No. 246 4 . .a

Max. operating pressure:

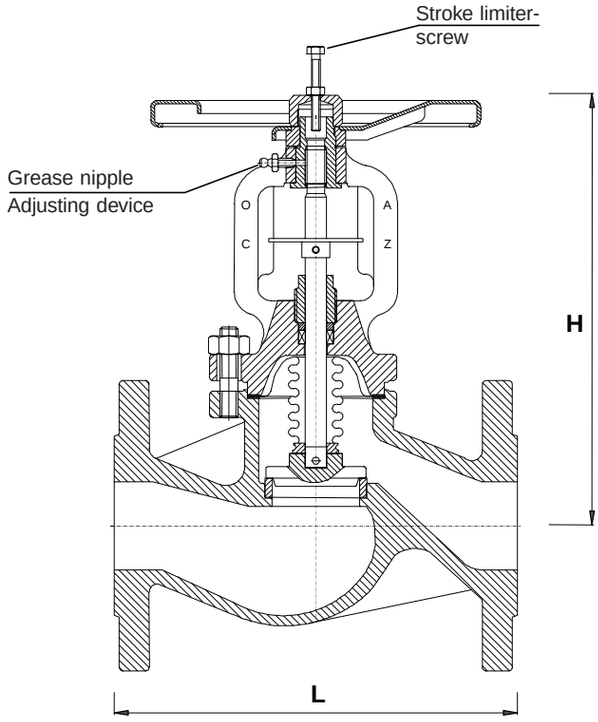
by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	List-No.	Kvs m³/h	Stroke mm	Weight kg	Immersion lenght L	Height H	Hand wheel Ø
15	246 400a	4,7	6	3,7	130	191	126
20	246 401a	7,4	6	4,4	150	191	126
25	246 402a	11,2	8	5,1	160	197	126
32	246 403a	18,3	8	7,5	180	200	126
40	246 404a	29,3	13	8,8	200	218	150
50	246 405a	44,2	13	12,2	230	220	150
65	246 406a	73,2	16	16,1	290	238	175
80	246 408a	112,2	20	21,4	310	257	175
100	246 410a	173,0	25	33,0	350	340	225
125	246 412a	288,0	32	51,0	400	360	300
150	246 415a	410,0	40	69,0	480	390	300
200	246 420a	725,0	50	105,0	600	530	400

open printversion

Manual operated control valve in two way form with VA-bellow sealing, PN 16, GGG-40.3

Valve body: GGG-40.3, two way form**,**
for water, steam and heat transfer oil
Pressure range: PN 16,
Flanges acc. to DIN,
Sealing: VA-bellow,
and safety stuffing box,
Internal parts: stainless steel



Order text:
Manual operated control valve PN 16, DN . .
in two way form with VA-bellow sealing,
List-No. 256 4 . .a

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	List-No.	Kvs m³/h	Stroke mm	Weight kg	Immersion lenght L	Height H	Limitation screw	Handwheel Ø
15	256 400a	4,7	6	3,7	130	191	M8x55	126
20	256 401a	7,4	6	4,4	150	191	M8x55	126
25	256 402a	11,2	8	5,1	160	197	M8x55	126
32	256 403a	18,3	8	7,5	180	200	M8x55	126
40	256 404a	29,3	13	8,8	200	218	M8x55	150
50	256 405a	44,2	13	12,2	230	220	M8x55	150
65	256 406a	73,2	16	16,1	290	238	M8x55	175
80	256 408a	112,2	20	21,4	310	257	M8x55	175
100	256 410a	173,0	25	33,0	350	340	M12x70	225
125	256 412a	288,0	32	51,0	400	360	M12x80	300
150	256 415a	410,0	40	69,0	480	390	M12x80	300
200	256 420a	725,0	50	105,0	600	530	M12x100	400

open printversion

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted ,
see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
alternatively: weld-on ends (on request)
Sealing: VA-bellow, double wall,
and safety stuffing box,
Internal parts: stainless steel, replaceable seat rings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% K_{VS}

Actuator:
Manual operated

Accessories, special types**:**
Reduced kvs-values (on request)
Weld-on ends (on request)

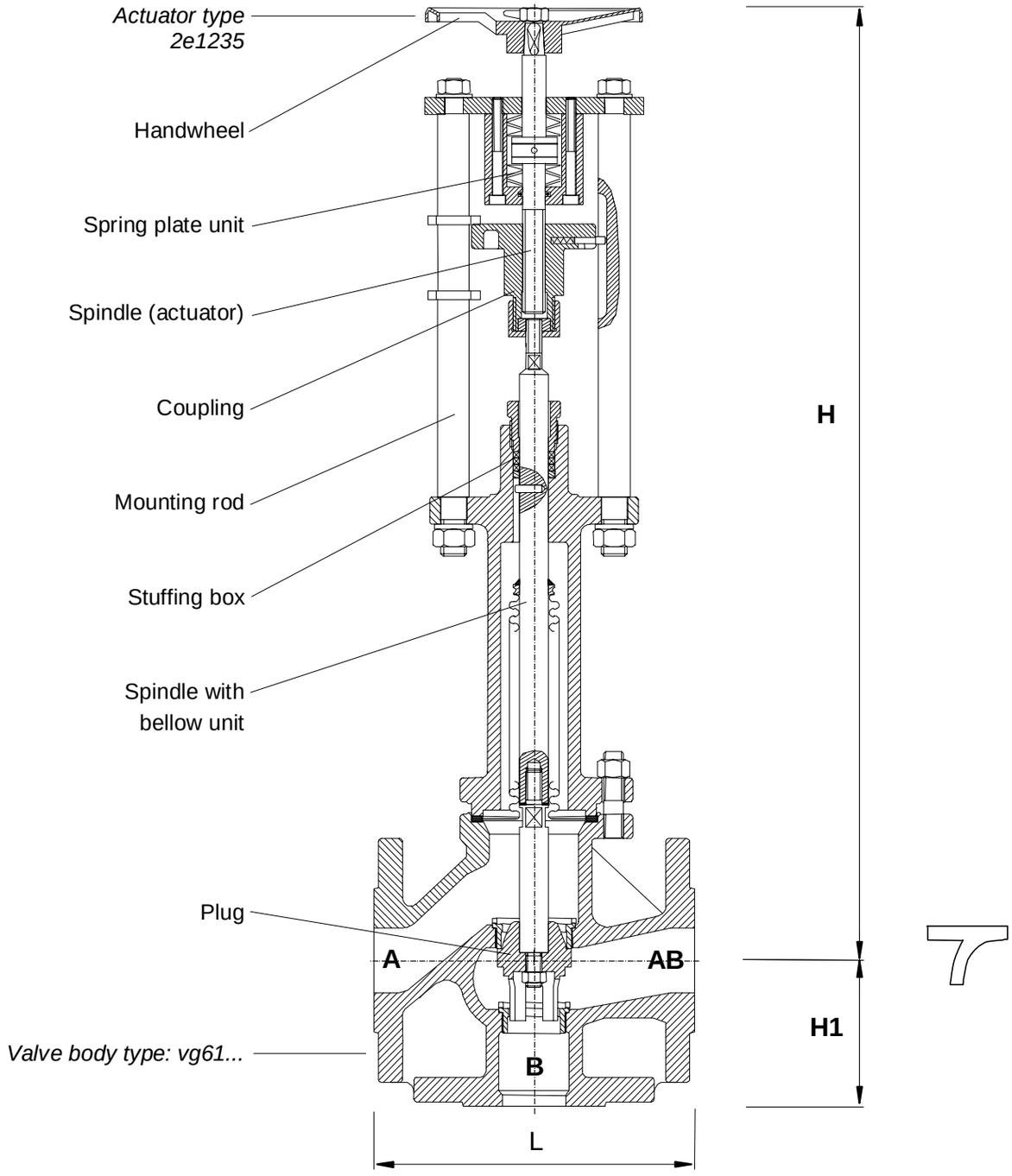
Order text:
Manual operated control valve PN . ., DN . .
in three way form with VA-bellow sealing,
List-No. 2661 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List-No.**		**Kvs**	**Stroke**
	PN 16	PN 25	m³/h	mm
20	2661 401	2661 501	6,3	20
25	2661 402	2661 502	10	20
32	2661 403	2661 503	16	20
40	2661 404	2661 504	25	20
50	2661 405	2661 505	40	20
65	2661 406	2661 506	63	30
80	2661 408	2661 508	100	30
100	2661 410	2661 510	160	30

open printversion



DN	20	25	32	40	50	65	80	100
Height H	605	599	605	611	613	743	744	751
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	13	14	17	18	21	38	42	56

open printversion

Index Group 3

Pneumatic control valves

Body: GGG-40.3, two way form**,**
for water and steam,
Pressure range: PN 16, PN 25,
Flanges acc. to DIN,
Spindle sealing: spring loaded PTFE-V-ring unit,
for media temperatures up to 250°C
alternatively: graphite-packing
Internal parts: stainless steel
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes" (optional "spring opens")
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
Positioner (see page 390 5 and 390 8)
Electro.-pneum. transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)

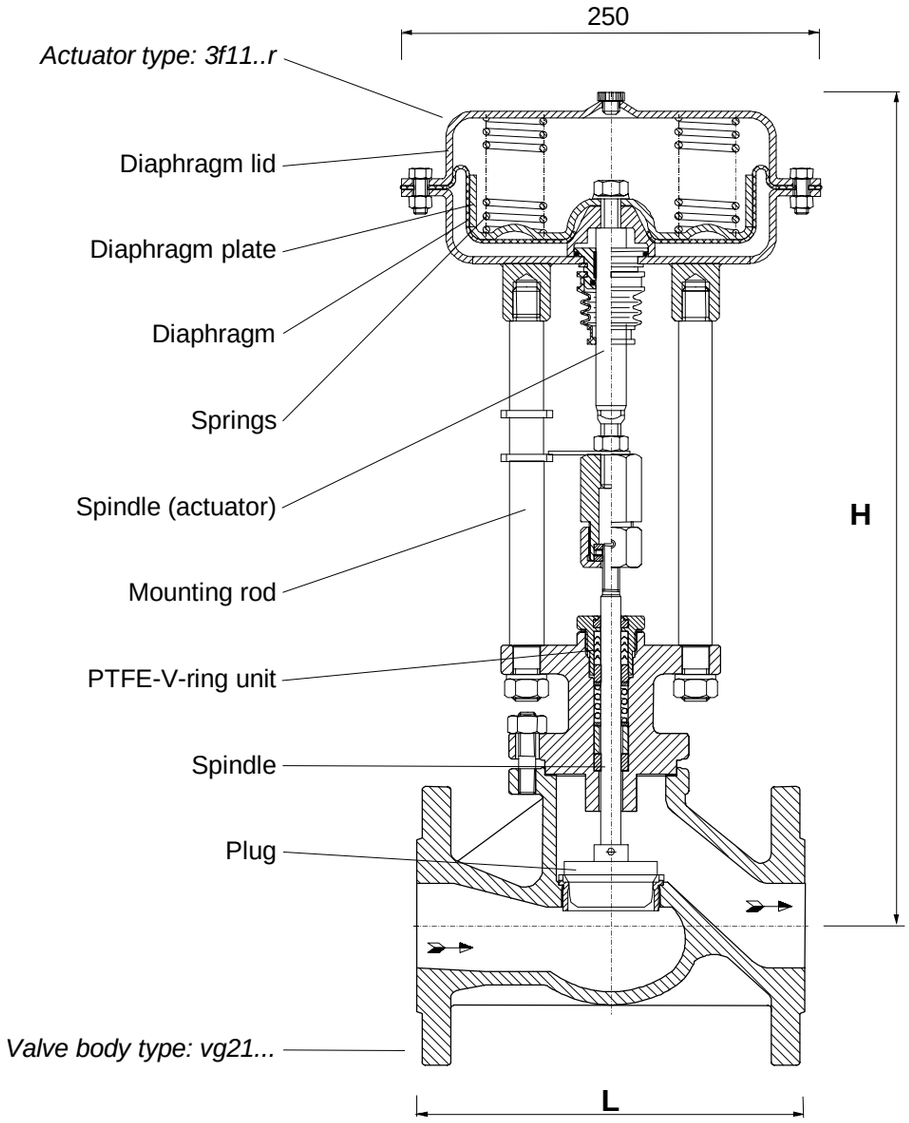
Order text:
Pneum. control valve PN . ., DN . .,
in two way form with PTFE-V-ring unit,
spring closes / spring opens straight-way
control signal . . . - . . . bar, List No. 321 . . .

Max. operating pressure:

by:	120	200	250	°C
PN 16	16	13	13	bar
PN 25	25	20	18	bar

DN	**List No.**		**Kvs**	**Stroke**	**Closing pressure** (bar) for control signal...		
	PN 16	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	321 400.	321 500.	4	20	16,2	25,0	
20	321 401.	321 501.	6,3	20	13,3	25,0	
25	321 402.	321 502.	10	20	11,1	25,0	
32	321 403.	321 503.	16	20	6,3	22,8	25,0
40	321 404.	321 504.	25	20	3,6	14,4	25,0
50	321 405.	321 505.	40	20	1,9	8,9	20,7
65	321 406.	321 506.	63	30	0,6	4,8	11,9
80	321 408.	321 508.	100	30		3,0	7,7
100	321 410.	321 510.	160	30		1,7	4,7

open printversion



DN	15	20	25	32	40	50	65	80	100
Height H	460	474	468	474	480	482	525	526	533
Immersion lenght L	130	150	160	180	200	230	290	310	350
Weight kg	16	17	18	20	21	23	36	40	50

open printversion

Body: GGG-40.3, three way form**,**
for water and steam, as mixing valve,
(diverting purposes restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
alternatively: graphite-packing
Internal parts: stainless steel
Flow characteristic: linear
Leakage: acc. to VDI/VDE 2174

Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes" (optionally "spring opens")
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3bar, ...d: 6bar

Accessories, special types**:**
Positioner (see page 390 5 and 390 8)
Electro.-pneum. transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)

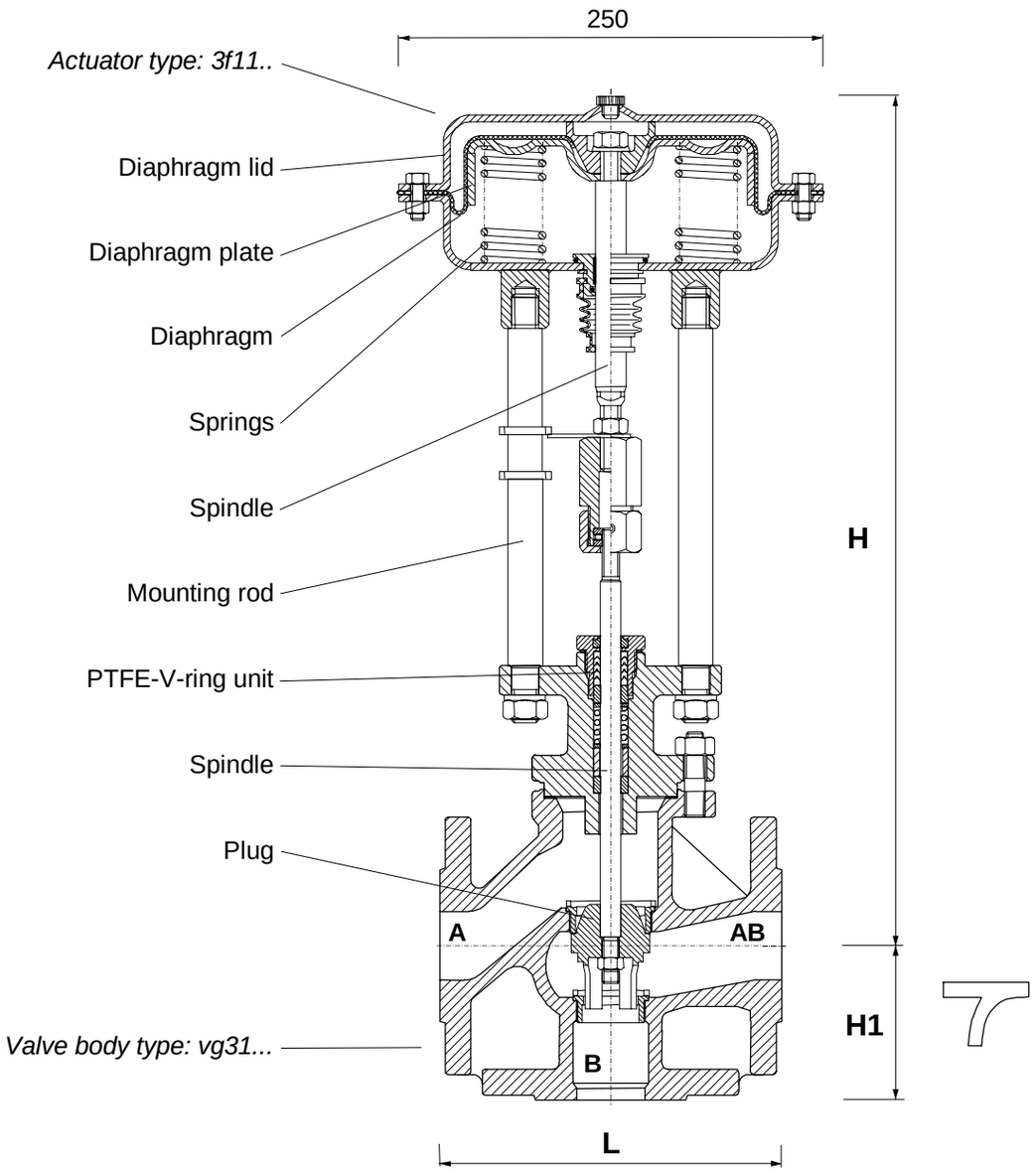
Order text:
Pneum. control valve PN . ., DN . .,
in three way form with PTFE-V-ring unit,
spring closes / spring opens straight-way
control signal . . . - . . . bar, List No. 331 . . .

Max. operating pressure:

by:	120	200	250	°C
PN 16	16	13	13	bar
PN 25	25	20	18	bar

DN	**List No.** PN 16	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal: 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
20	331 401.	331 501.	6,3	20	13,3	25,0	
25	331 402.	331 502.	10	20	11,1	25,0	
32	331 403.	331 503.	16	20	6,3	22,8	25,0
40	331 404.	331 504.	25	20	3,6	14,4	25,0
50	331 405.	331 505.	40	20	1,9	8,9	20,7
65	331 406.	331 506.	63	30	0,6	4,8	11,9
80	331 408.	331 508.	100	30		3,0	7,7
100	331 410.	331 510.	160	30		1,7	4,7

open printversion



DN	20	25	32	40	50	65	80	100
Height H	474	468	474	480	482	525	526	533
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	18	19	22	23	26	41	45	59

open printversion

Body: GGG-40.3, two way form**,**
for heat transfer oil
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
Sealing: VA-bellow double wall
and safety stuffing box,
Internal parts: Niro,
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes" (optionally "spring opens")
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
Positioner (see page 390 5 and 390 8)
Electro.-pneum. transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)

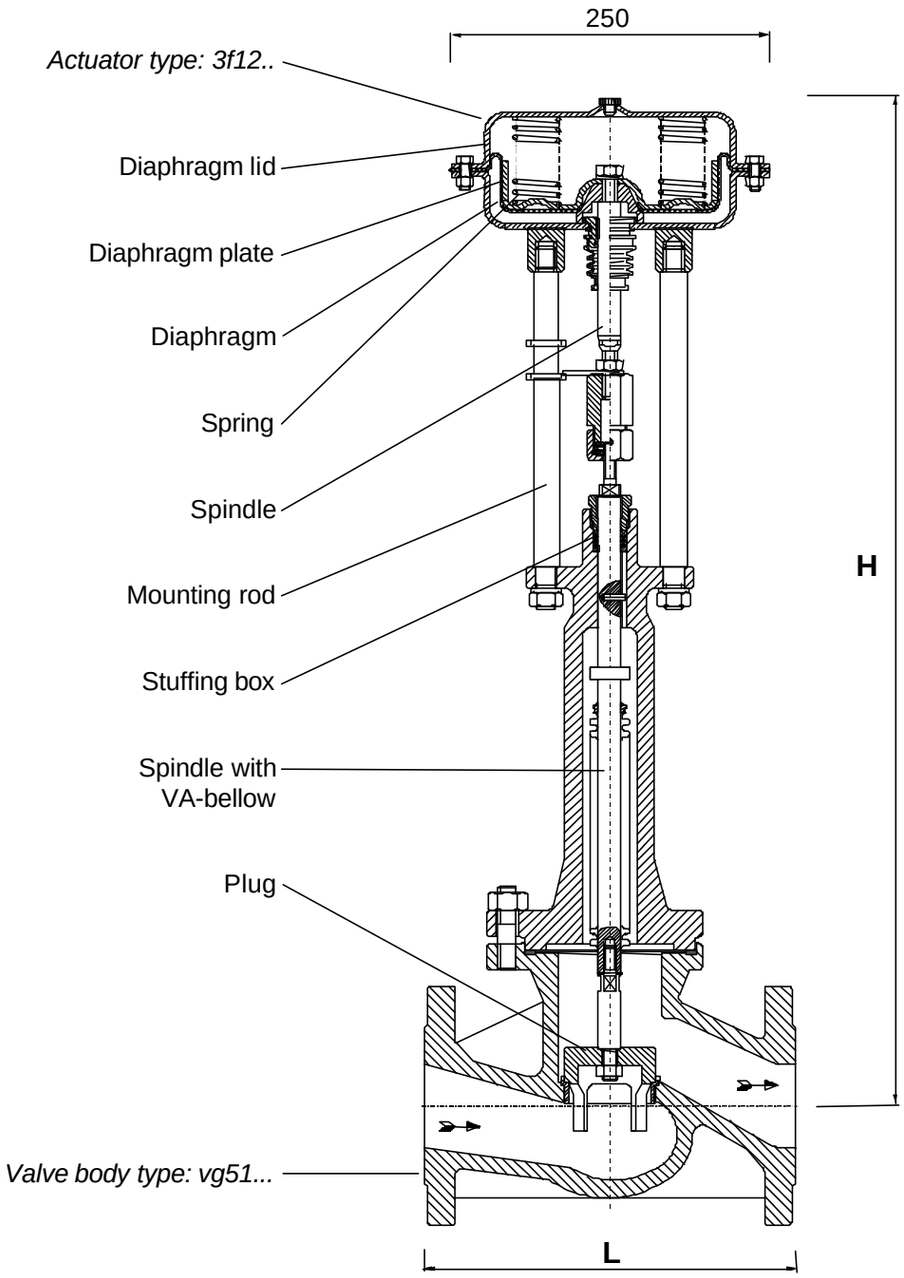
Order text:
Pneum. control valve PN . ., DN . .,
in two way form with VA-bellow sealing,
spring closes / spring opens straight-way
control signal . . . - . . . bar, List No. 351 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List No.** PN 16	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal: 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	351 400.	351 500.	4	20	16,2	25,0	
20	351 401.	351 501.	6,3	20	13,3	25,0	
25	351 402.	351 502.	10	20	11,1	25,0	
32	351 403.	351 503.	16	20	6,3	22,8	25,0
40	351 404.	351 504.	25	20	3,6	14,4	25,0
50	351 405.	351 505.	40	20	1,9	8,9	20,7
65	351 406.	351 506.	63	30	0,6	4,8	11,9
80	351 408.	351 508.	100	30		3,0	7,7
100	351 410.	351 510.	160	30		1,7	4,7

open printversion



DN	15	20	25	32	40	50	65	80	100
Height H	633	647	641	647	653	655	785	786	793
Immersion lenght L	130	150	160	180	200	230	290	310	350
Weight kg	17	18	19	21	22	24	39	43	53

open printversion

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
alternatively: weld-on ends (on request)
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, replaceable seatrings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% K_{VS}

Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes" (optionally "spring opens")
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3bar, ...d: 6bar

Accessories, special types**:**
Positioner (see page 390 5 and 390 8)
Electro.-pneum. Transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)
Distributing valve plug (on request)
Weld-on ends (on request)

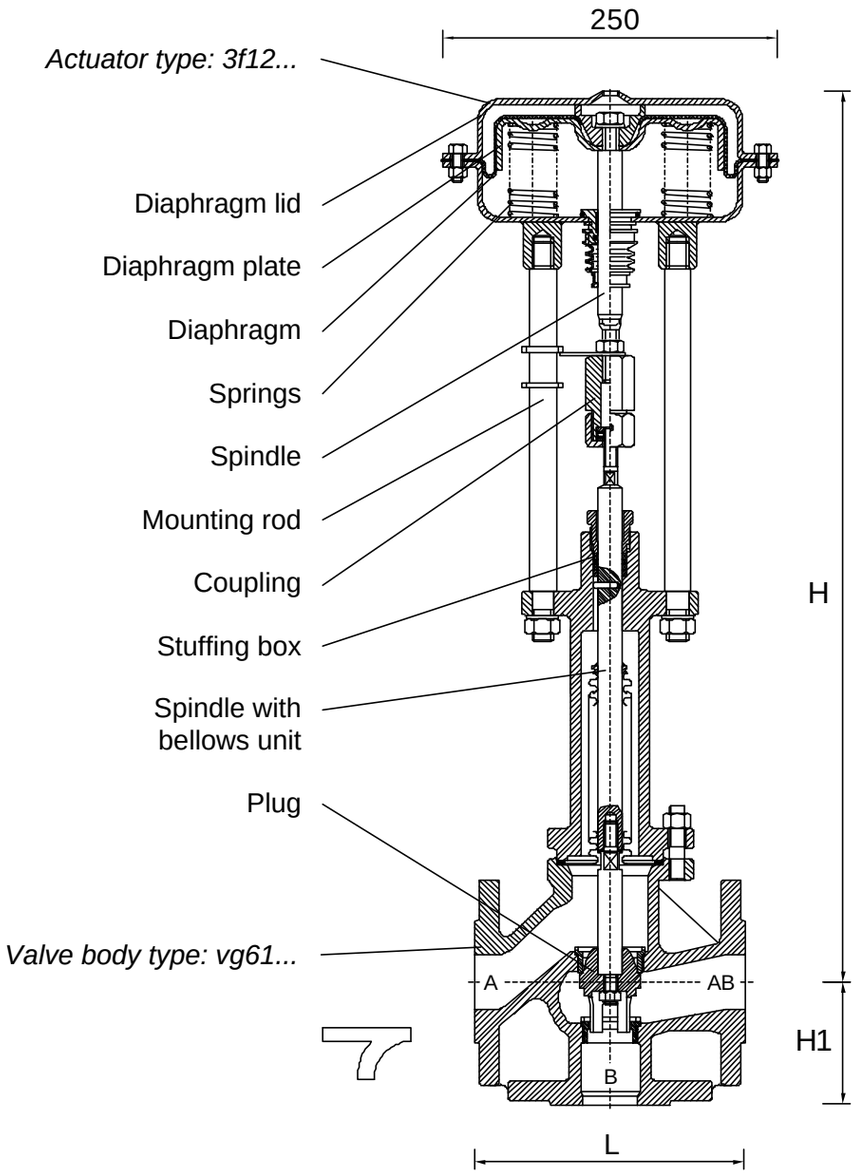
Order text:
Pneum. control valve PN . ., DN . .,
in three way form with VA-bellow sealing,
spring closes / spring opens straight-way
control signal . . . - . . . bar, List No. 361 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List No.** PN 16	PN 25	**kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal: 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
20	361 401.	361 501.	6,3	20	13,3	25,0	
25	361 402.	361 502.	10	20	11,1	25,0	
32	361 403.	361 503.	16	20	6,3	22,8	
40	361 404.	361 504.	25	20	3,6	14,4	25,0
50	361 405.	361 505.	40	20	1,9	8,9	20,7
65	361 406.	361 506.	63	30	0,6	4,8	11,9
80	361 408.	361 508.	100	30		3,0	7,7
100	361 410.	361 510.	160	30		1,7	4,7

open printversion



DN	20	25	32	40	50	65	80	100
Height H	647	641	647	653	655	785	786	793
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	19	20	23	24	27	44	48	62

open printversion

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, screwed seat rings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% K_{VS}

Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes" (optionally "spring opens")
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3bar, ...d: 6bar

Special design:
weld-on ends similar to DIN 3239,

Accessories, special types**:**
Positioner (see page 390 8)
Electro.-pneum. Transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)
Verteilventil- Kegel (auf Anfrage)
Distributing valve plug (on request)

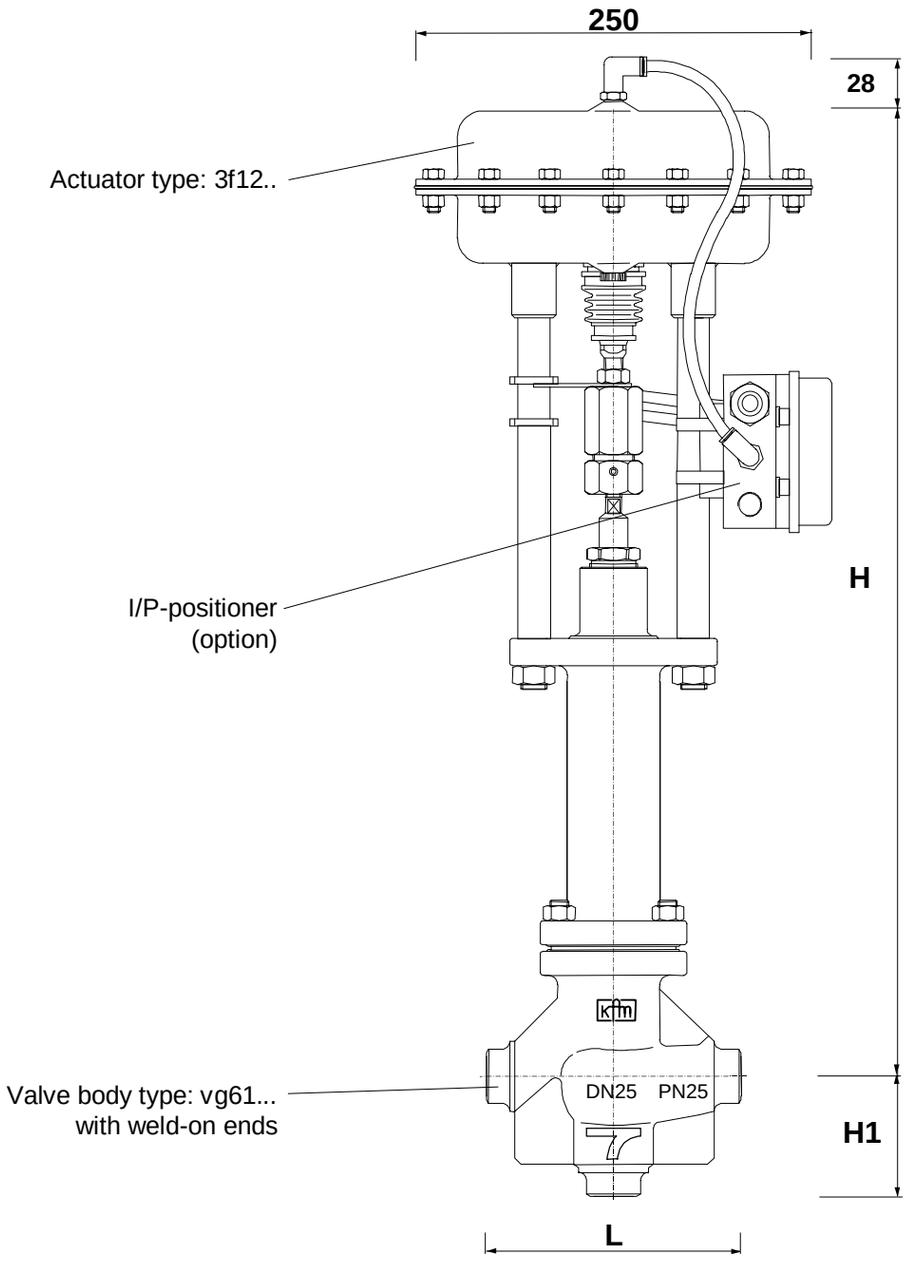
Order text:
Pneum. control valve PN . ., DN . . ,
in three way form with VA-bellow sealing,
spring closes / spring opens straight-way
control signal . . . - . . . bar,
List-No. 361 . . . / fs

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List-No.** PN 16	PN 25	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
20	361 401. / fs	361 501. / fs	6,3	20	13,3	25,0	
25	361 402. / fs	361 502. / fs	10	20	11,1	25,0	
32	361 403. / fs	361 503. / fs	16	20	6,3	22,8	
40	361 404. / fs	361 504. / fs	25	20	3,6	14,4	25,0
50	361 405. / fs	361 505. / fs	40	20	1,9	8,9	20,7
65	361 406. / fs	361 506. / fs	63	30	0,6	4,8	11,9
80	361 408. / fs	361 508. / fs	100	30		3,0	7,7
100	361 410. / fs	361 510. / fs	160	30		1,7	4,7

open printversion



DN	20	25	32	40	50	65	80	100
Height H	647	641	647	653	655	785	786	793
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	18	19	22	23	26	42	46	60

open printversion

Body: bronze,
for water up to 150°C,
Thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron,
optionally of brass / bronze
Pressure range: PN 16,
Sealing: O-ring with PTFE-scraper ring,
Internal parts: stainless steel and brass,
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

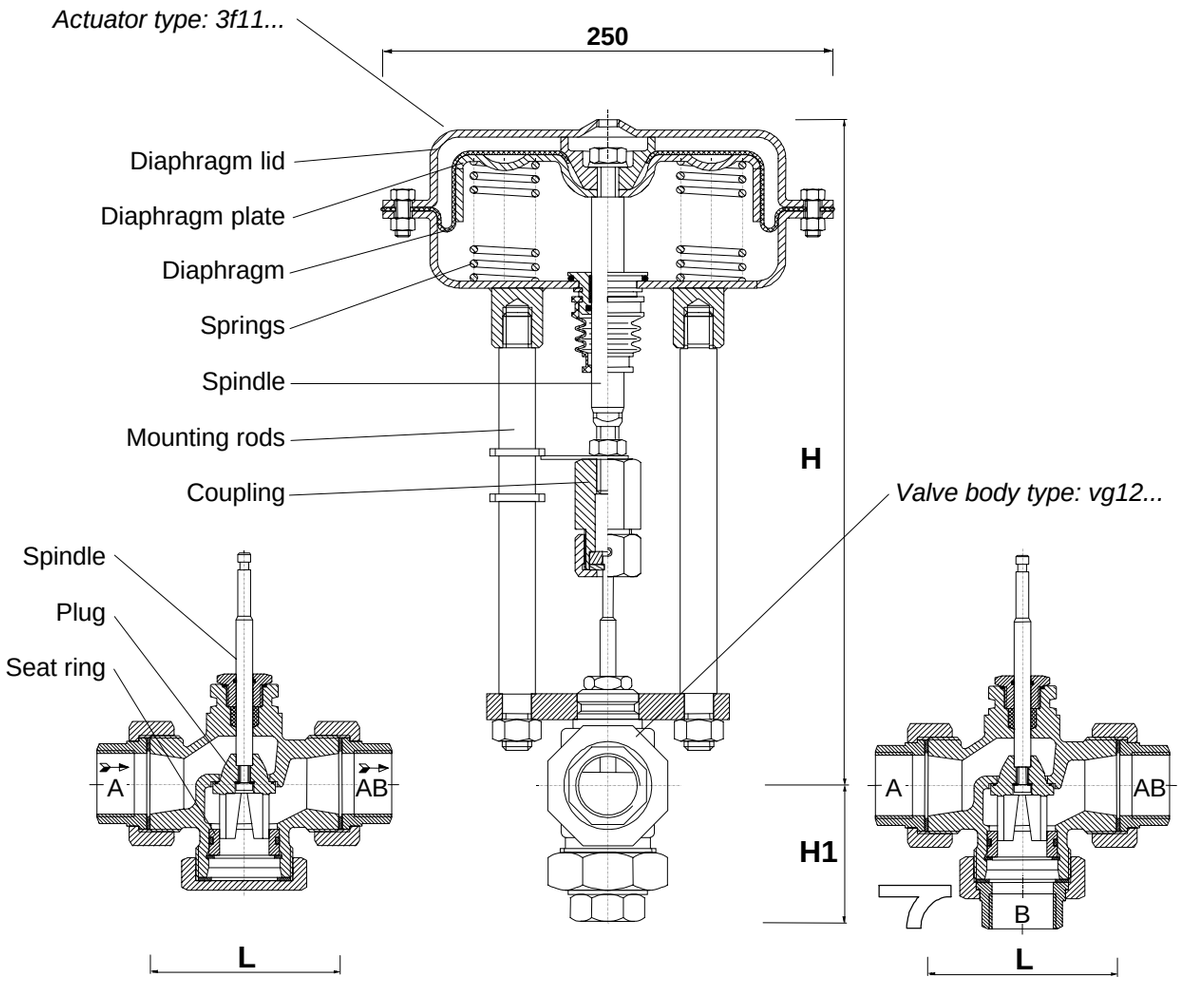
Actuator: diaphragm area: 250 cm², ∅ = 250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
“Spring closes“ (optionally „spring opens“)
Air connection: G 1/4",
Operating pressure: standard type: 1,6 bar,
another types: ...c: 3bar,

Accessories, special types**:**
Positioner (see page 390 5 and 390 8)
Electro.-pneum. transformer (see page 3903)
Limit switch (see page 39e)
Another kvs- values (on request)

Order text:
Pneumatic control valve of bronze PN 16, DN . .
in two / three way form with O-ring sealing,
spring closes / spring opens straight-way
control signal . . . - . . . bar, List No. 38 0 . . .

DN	List-No. three way	List-No. two way	Kvs m³/h	Stroke mm	Closing pressure (bar) for control signal: 0,4...1,2bar: standard	1,0...2,0bar: type ...c
1/2"	4803 100.	4802 100.	3	18	16,0	
3/4"	4803 101.	4802 101.	6,3	18	13,3	16,0
1"	4803 102.	4802 102.	10	18	11,1	16,0
1 1/4"	4803 103.	4802 103.	16	18	6,3	16,0
1 1/2"	4803 104.	4802 104.	25	18	3,6	14,4

open printversion



Two way form

Three way form

DN	1/2“	3/4“	1“	1 1/4"	1 1/2"
Height H	356	354	355	354	354
Stud lenght H1	44	44	45	47	52
Immersion lenght L	64	80	90	110	120
Weight kg	10,2	10,6	10,9	11,7	12,0

open printversion

Function:

The pneumatic positioner drives the plug of the control valve in position which depend on the input signal. The input signal can be adapted to the valve travel with various measuring springs and/or various levers for valve travel. Possible ranges are: 0,2...1,0 bar and for split-range operation 0,2...0,6 bar und 0,6...1,0 bar.
The valve plug position is transmited to the positioner with a lever. The minimum and the maximum of the input signal correspond to the end positions of the valve plug.
The positioner controls and changes the output pressure connected to the pneumatic actuator and causes valve positon changes, according to the input signal.

Technical data:

Input signal:	0,2...1,0 bar, 0,2...0,6 bar and 0,6...1,0 bar
Supply air:	1,4...6 bar (dry and free of any oil and dust)
Signal pressure:	0...supply air pressure
Charakteristic:	linear
Operating direction:	reversible
Max. ambient temperature:	-20°C...70°C
Air connection:	G 1/4"
Protection class	IP 54
Weight:	0,9 kg

Order text:

Pneumatic positioner, input signal . . . - . . . bar,
supply air max. 6 bar, attached to the pneumatic control valve 3 . .
List-No.: 390 540

open printversion

Samson type

Eckardt type

Function:

The electropneumatic positioner drives the plug of the control valve in position which depend on the input signal. The input signal can be adapted to the valve travel with various measuring springs and/or various levers for valve travel. Possible ranges are: 4...20 mA and for split-range operation 4...12 mA and 12...20 mA.
The valve plug position is transmited to the positioner with a lever. The minimum and the maximum of the input signal correspond to the end positions of the valve plug.
The positioner controls and changes the output pressure connected to the pneumatic actuator and causes valve positon changes, according to the input signal.

Technical data:

Input signal:	4...20 mA, 4...12 mA, 12...20 mA	
Supply air:	1,4...6 bar (dry and free of any oil and dust)	
Signal pressure:	0...supply air pressure	
Charakteristic:	linear	
Operating direction:	reversible, adjusted: direct (input increasing / output increasing)	
Air connection:	G 1/4"	
Type	a) Samson	b) Eckardt
Max. ambient temperature:	-20°C...70°C	-20°C...80°C
Protection class	IP 54	IP 65
Weight:	1,2 kg	1,7 kg
Explosion protection:	EEx ia IIC T6 (option)	EEx ia IIC T6 (standard)

Type list:	**List –No.**
Samson standard type:	390 841
Samson ex- version:	390 842
Eckardt type:	390 846x

alternative:
adjusted for operating direction invers (increasing / decreasing):
Type suffix: … i

open printversion

Solenoid valve

Material:	Brass
Nominal diameter	DN 2 mm
Air connection:	R 1/4" female thread on both sides
Voltage:	230V 50/60 Hz, alternatively: 115V 50/60 Hz, 24V =
Ambient temperature:	max. + 55°C

Two way form (2/2-ways)

Closed when de-energized

Operating pressure:	0...16 bar
Weight:	0,5 kg
Electrical connection:	cable plug with flat terminals
List-No.:	393 100

Open when de-energized

Operating pressure:	0...12 bar
Weight:	0,5 kg
Electrical connection:	cable plug with flat terminals
List-No.:	393 100 s

Closed when de-energized, Ex-version for hazardous locations

Type:	EEx ed IIC T4
Operating pressure:	0...7 bar
Weight:	0,8 kg
Electrical connection::	with terminal housing IP 65
List-No.:	393 110

Three way form (3/2-ways)

Service port A relieved, when de-energized

Operating pressure:	0...10 bar
Weight:	0,8 kg
Electrical connection:	cable plug with flat terminals
List-No.:	393 300

Service port A relieved, when de-energized, Ex-version for hazardous location

Type:	EEx ed IIC T4
Operating pressure:	0...6 bar
Weight:	0,8 kg
Electrical connection::	with terminal housing IP 65
List-No.:	393 310

open printversion

Throttling valve

Material:	brass
Connection:	R 1/4" female thread on both sides
Weight:	0,1 kg
List-No.:	394 800

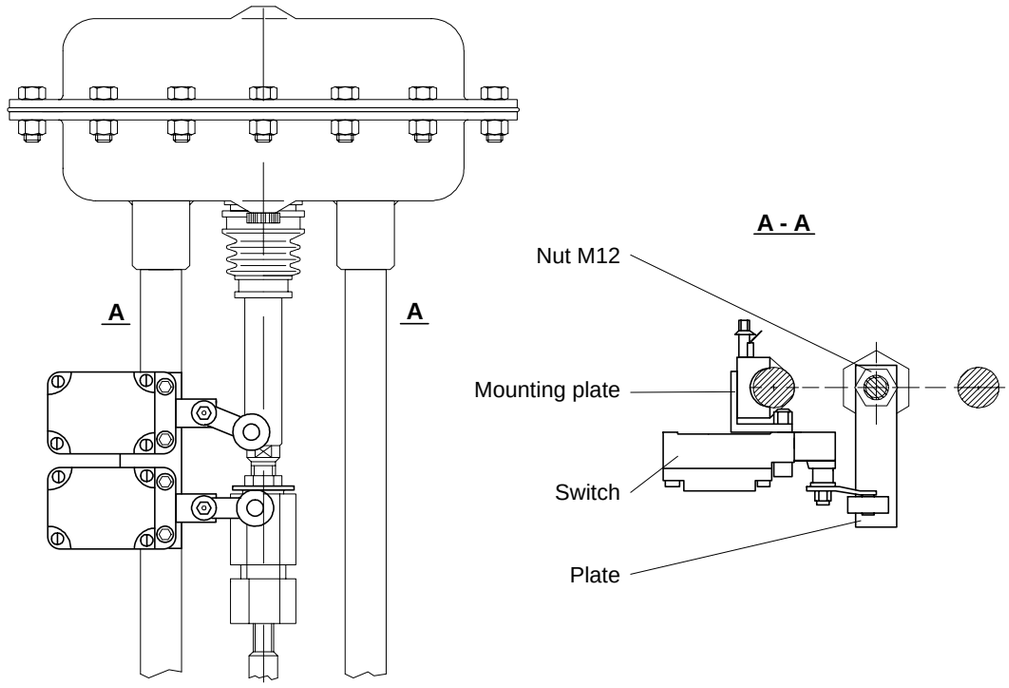
Maintenance unit

Line pressure:	max. 10 bar
Operating pressure:	adjustable 10...80 % of line pressure
Weight:	0,5 kg
Connection:	R 1/4" female thread on both sides

- with manometer for operating pressure 0...2,5 bar
List-No.: 394 150

- with manometer for operating pressure 0...6 bar
List-No.: 394 151

Pneumatic actuators type 3f1... can be equipped with an additional limit switch for valve position "up" and/or "down".



Limit switch: aluminium - die casting,

Jump-contact: 1 opener / 1 closing contact

Switch power: 6A / 400V AC-11

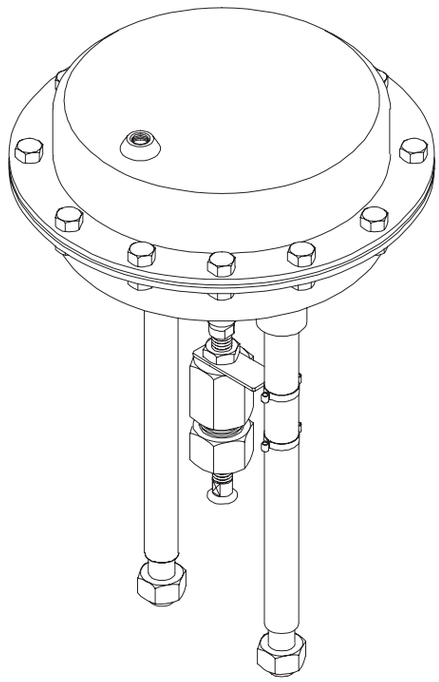
Protection class: IP 65

Summary of types:	**List-No.**
1 add. upper limit switch for valve position "up"	39eo
1 add. lower limit switch for valve position "down"	39eu
add. 1 upper and 1 lower limit switch	39ev

open printversion

Pneumatic actuator for valves

Control pressure:	max. 6 bar
Thread connection:	G1/4"
Diameter:	250 mm
Diaphragm area:	250 cm²
Stroke:	15, 20, 30, 35, 40 mm
Spindle sealing:	O-ring, maintenance free
Operating mode:	Standard: Spring moves spindle upwards (reversible)
alternatively:	Spring moves spindle downwards
Rods distance:	100 mm
Weight:	9 kg
Connection to valve spindle:	with coupling ring 20 x10 mm with thread M10 or M12
Max. ambient temperature:	-20...110° C



Accessories, special types**:**
Limit switch (see page 39e)
Manual operating device (see page 39h)
Electro.-pneumatic Transformer (see page 3903)
Pneumatic positioner (see page 390 5)
Electro-pneumatic positioner (see page 390 8)

Order text:
Pneumatic actuator, Spring moves spindle upwards/downwards,
control signal . . . - . . . bar for Stroke . . . mm,
mounting rod size . . ., List-No. 3f1 . . .

Stroke	**Spring range (bar)**		
mm	0,4...1,2	1,0...2,0	2,0...4,0
15	x	x	x
20	x	x	x
30	x	x	x
35		x	x
40		x	x

Summary of types:

3f1 **x** **x** **x** **x**

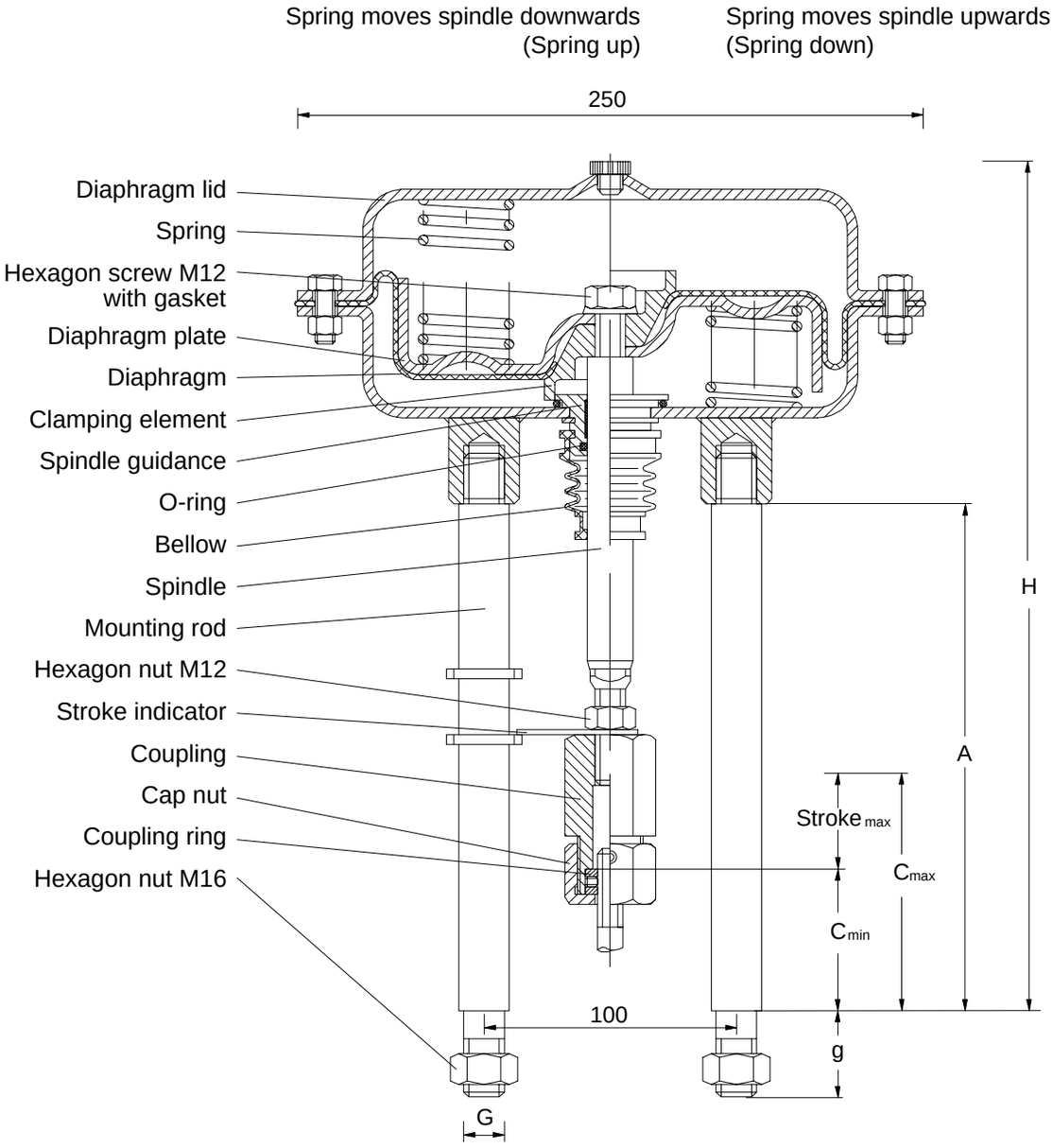
Mounting rod size
0 = 200 mm
1 = 180 mm
2 = 237 mm

Spring range
b = 0,4...1,2 bar
c = 1,0...2,0 bar
d = 2,0...4,0 bar

Stroke
1 = 15 mm
2 = 20 mm
3 = 30 mm
4 = 35 mm
5 = 40 mm

Reverse operating mode
r = Spring moves spindle downwards

open printversion



Rod lenght A (mm)	Cmin mm	Cmax mm	H mm	G mm	g mm
180	29	65	315	M12	24
200	49	85	335	M16	32
237	86	122	341	M16	32

Another mounting rod lenghts on request.

open printversion

Index Group 4

Electric control vlaves

Body: GGG-40.3, two way form**,**
for water and steam,
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
Spindle sealing: spring loaded PTFE-V-ring unit,
for media temperatures up to 250°C
alternatively: graphite-packing
Internal parts: stainless steel
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 2000 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)

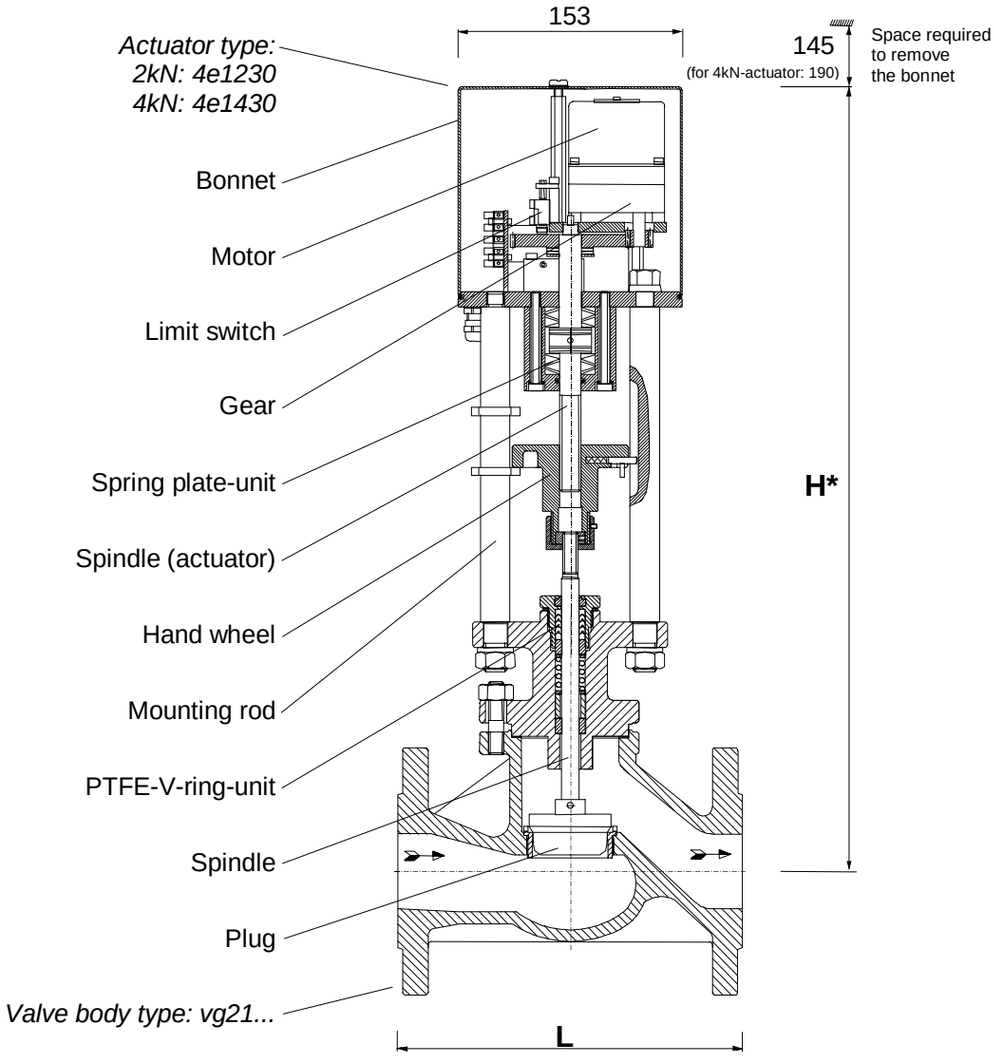
Order text:
Motor control valve PN . ., DN . .
in two way form with PTFE-V-ring unit,
Power supply . . ., List-No. 421 . . .

Max. operating pressure:

by:	120	200	250	°C
PN 16	16	13	13	bar
PN 25	25	20	18	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. speed**	**Closing pressure** (bar)	
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N
15	421 400	421 500	4	20	66	25,0	
20	421 401	421 501	6,3	20	66	25,0	
25	421 402	421 502	10	20	66	25,0	
32	421 403	421 503	16	20	66	17,3	25,0
40	421 404	421 504	25	20	66	10,8	25,0
50	421 405	421 505	40	20	66	6,6	16,0
65	421 406	421 506	63	30	100	3,4	9,1
80	421 408	421 508	100	30	100	2,0	5,8
100	421 410	421 510	160	30	100	1,1	3,5

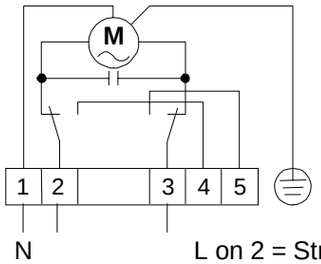
open printversion



DN	15	20	25	32	40	50	65	80	100
Height H *	491	505	499	505	511	513	556	557	564
Immersion lenght L	130	150	160	180	200	230	290	310	350
Weight kg	13	14	15	17	18	20	33	37	47

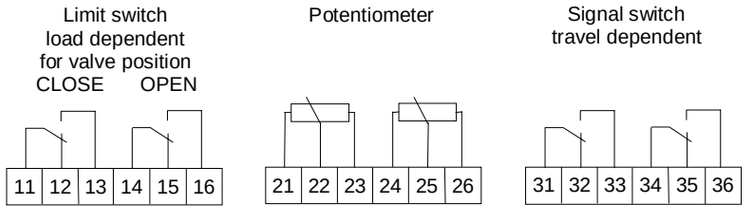
* = add. 45mm for 4 kN-actuator

Electrical wiring:



L on 2 = Straightway closes
L on 3 = Straightway opens

Accessories (optional)**:**



open printversion

Body: GGG-40.3, three way form**,**
for water and steam, as mixing valve,
(diverted purpose restricted,
see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
alternatively: graphite-packing
Internal parts: stainless steel
Flow characteristic: linear
Leakage: acc. to VDI/VDE 2174

Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 2000 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)

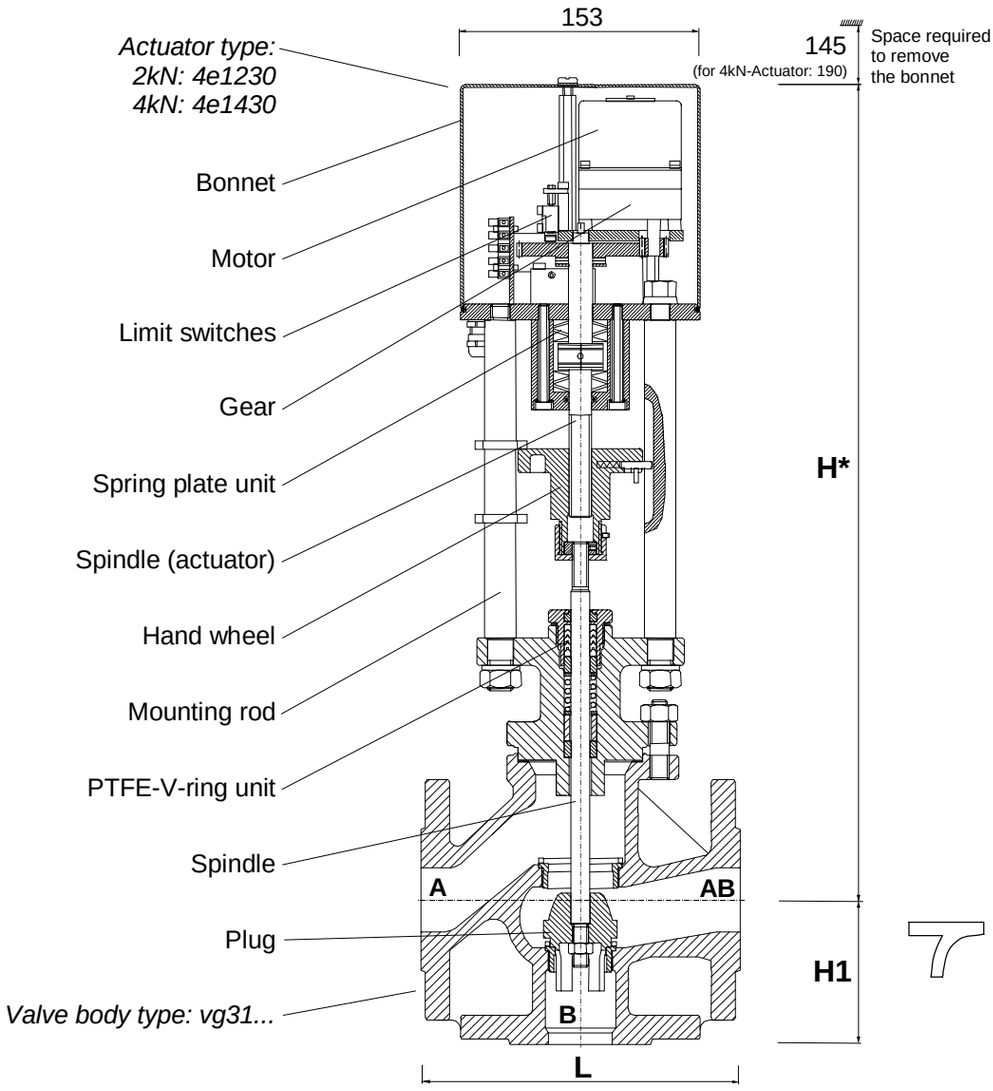
Order text:
Motor control valve PN . ., DN . .
in three way form with PTFE-V-ring unit,
Power supply . . ., List-No. 431 . . .

Max. operating pressure:

by:	120	200	250	°C
PN 16	16	13	13	bar
PN 25	25	20	18	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. speed**	**Closing pressure** (bar)	
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N
20	431 401	431 501	6,3	20	66	25,0	
25	431 402	431 502	10	20	66	25,0	
32	431 403	431 503	16	20	66	17,3	25,0
40	431 404	431 504	25	20	66	10,8	25,0
50	431 405	431 505	40	20	66	6,6	16,0
65	431 406	431 506	63	30	100	3,4	9,1
80	431 408	431 508	100	30	100	2,0	5,8
100	431 410	431 510	160	30	100	1,1	3,5

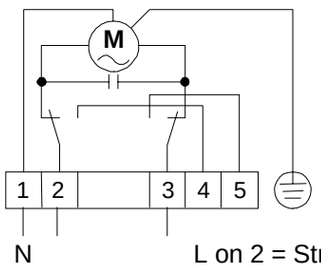
open printversion



DN	20	25	32	40	50	65	80	100
Height H *	505	499	505	511	513	556	557	564
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	15	16	19	20	23	38	42	56

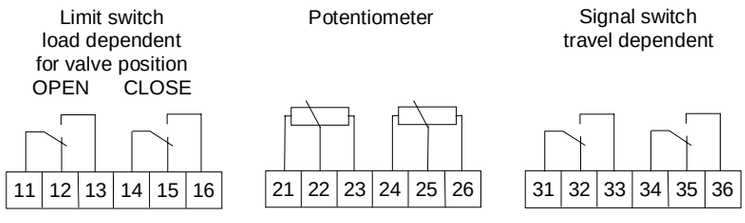
* = add. 45mm for 4kN-actuator

Electrical wiring:



L on 2 = Straightway opens
L on 3 = Straightway closes

Accessories (optional)**:**



open printversion

Body: GGG-40.3, two way form**,**
for heat transfer oil
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
Sealing: VA-bellow double wall
and safety stuffing box,
Internal parts: Niro,
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 2000 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)

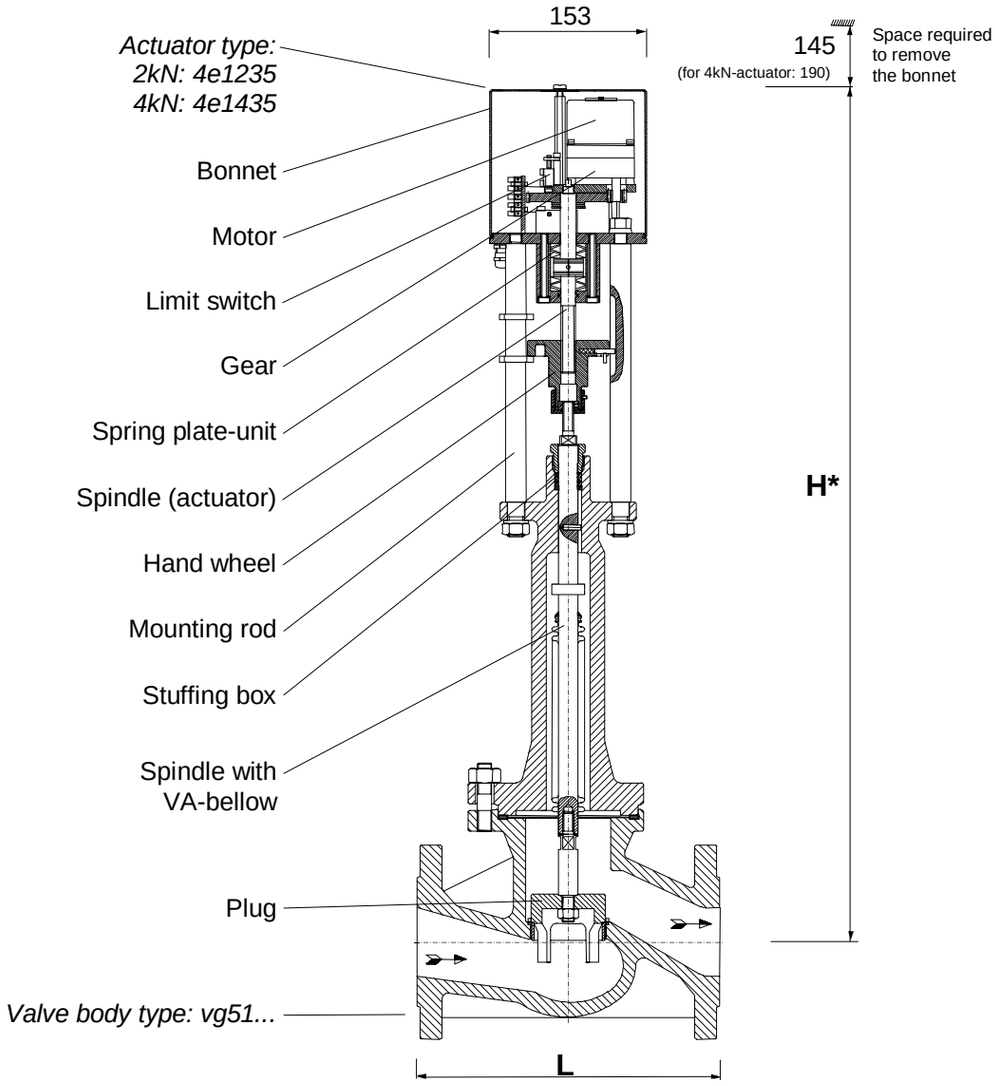
Order text:
Motor control valve PN . ., DN . .
in two way form with VA-bellow sealing,
Power supply . . ., List-No. 451 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List No.**		**Kvs**	**Stroke**	**Pos. speed**	**Closing pressure** (bar)	
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N
15	451 400	451 500	4	20	66	25,0	
20	451 401	451 501	6,3	20	66	25,0	
25	451 402	451 502	10	20	66	25,0	
32	451 403	451 503	16	20	66	17,3	25,0
40	451 404	451 504	25	20	66	10,8	25,0
50	451 405	451 505	40	20	66	6,6	16,0
65	451 406	451 506	63	30	100	3,4	9,1
80	451 408	451 508	100	30	100	2,0	5,8
100	451 410	451 510	160	30	100	1,1	3,5

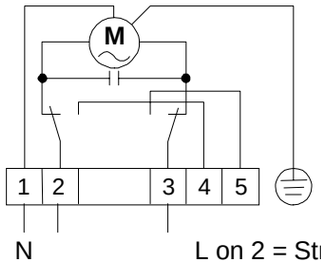
open printversion



DN	15	20	25	32	40	50	65	80	100
Height H *	491	505	499	505	511	513	556	557	564
Immersion lenght L	130	150	160	180	200	230	290	310	350
Weight kg	13	14	15	17	18	20	33	37	47

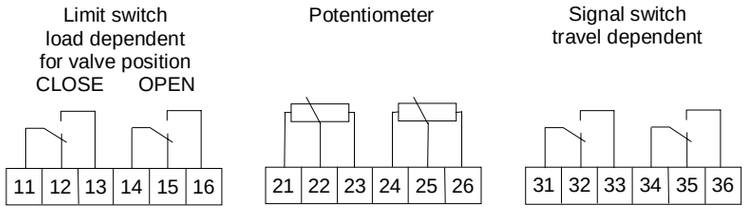
* = add. 45mm for 4 kN-actuator

Electrical wiring:



L on 2 = Straightway closes
L on 3 = Straightway opens

Accessories (optional)**:**



open printversion

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
alternatively: weld-on ends (on request)
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, screwed seat rings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% K_{VS}

Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 2000 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)
Weld-on ends (on request)

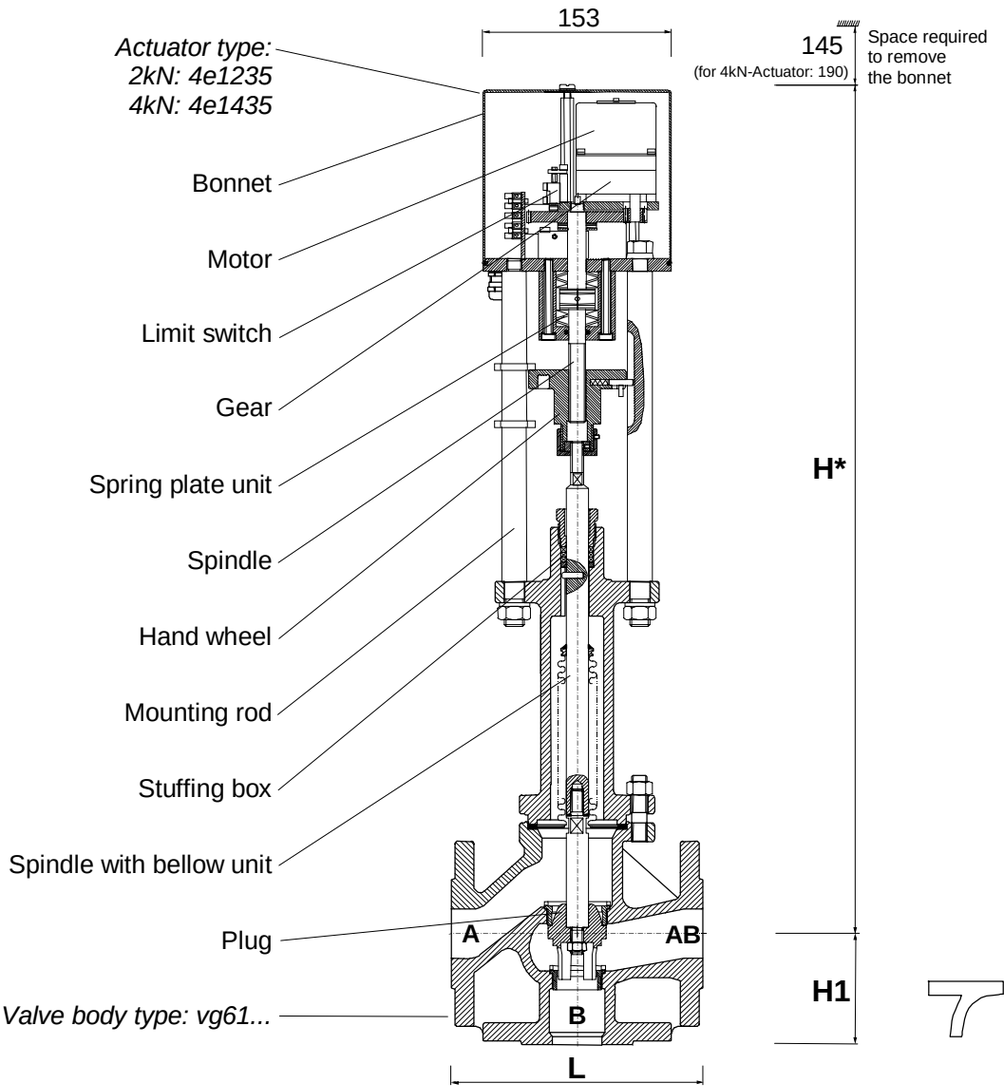
Order text:
Motor control valve PN . ., DN . .
in three way form with VA-bellow sealing,
Power supply . . ., List-No. 461 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. speed**	**Closing pressure** (bar)	
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N
20	461 401	461 501	6,3	20	66	25,0	
25	461 402	461 502	10	20	66	25,0	
32	461 403	461 503	16	20	66	17,3	25,0
40	461 404	461 504	25	20	66	10,8	25,0
50	461 405	461 505	40	20	66	6,6	16,0
65	461 406	461 506	63	30	100	3,4	9,1
80	461 408	461 508	100	30	100	2,0	5,8
100	461 410	461 510	160	30	100	1,1	3,5

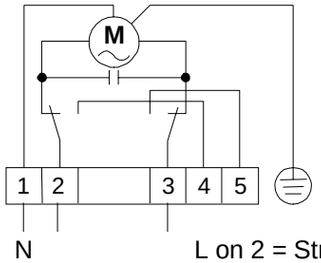
open printversion



DN	20	25	32	40	50	65	80	100
Height H *	675	669	675	681	683	813	814	821
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	16	17	20	21	24	41	45	59

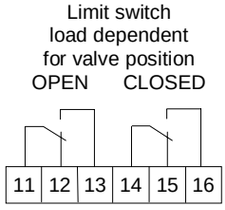
* = add. 45mm for 4kN actuator

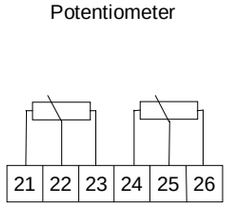
Electrical wiring:

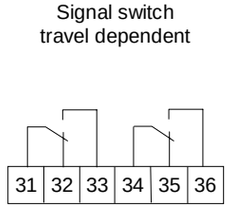


L on 2 = Straightway opens
L on 3 = Straightway closes

Accessories (optional)**:**







open printversion

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, screwed seat rings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 2000 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Special design:
weld-on ends similar to DIN 3239,

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)
Distributing valve plug (on request)

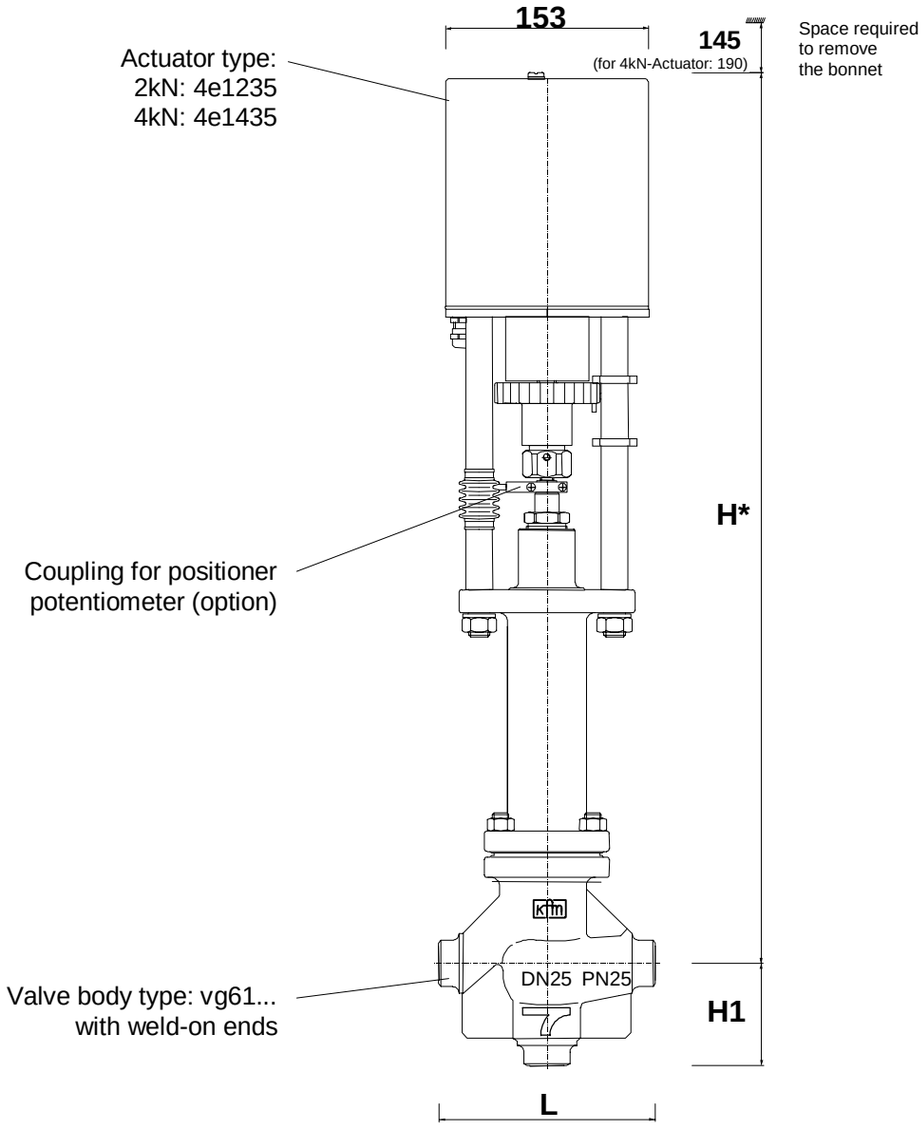
Order text:
Motor control valve PN . ., DN . :
in three way form with VA-bellow sealing,
Power supply . . ., List-No. 461 . . . / fs

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. speed**	**Closing pressure** (bar)	
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N
20	461 401 / fs	461 501 / fs	6,3	20	66	25,0	
25	461 402 / fs	461 502 / fs	10	20	66	25,0	
32	461 403 / fs	461 503 / fs	16	20	66	17,3	25,0
40	461 404 / fs	461 504 / fs	25	20	66	10,8	25,0
50	461 405 / fs	461 505 / fs	40	20	66	6,6	16,0
65	461 406 / fs	461 506 / fs	63	30	100	3,4	9,1
80	461 408 / fs	461 508 / fs	100	30	100	2,0	5,8
100	461 410 / fs	461 510 / fs	160	30	100	1,1	3,5

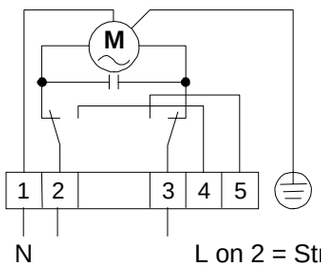
open printversion



DN	20	25	32	40	50	65	80	100
Height H *	675	669	675	681	683	813	814	821
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	15	16	19	20	23	39	43	57

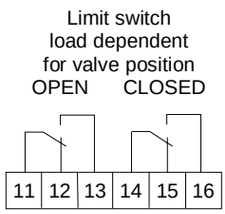
* = add. 45mm for 4kN actuator or actuator with integrated positioner

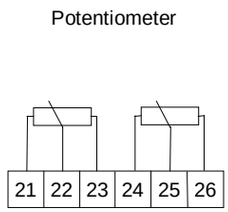
Electrical wiring:

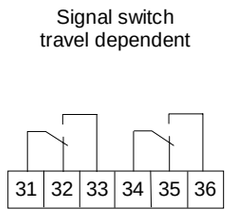


L on 2 = Straightway opens
L on 3 = Straightway closes

Accessories (option)**:**







open printversion

Body: bronze,
for water up to 150°C,
Thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron,
optionally of brass / bronze
Pressure range: PN 16,
Sealing: O-ring with PTFE-scraper ring,
Internal parts: stainless steel and brass,
Flow characteristic: equal percentage
Leakage: acc. to VDI/VDE 2174

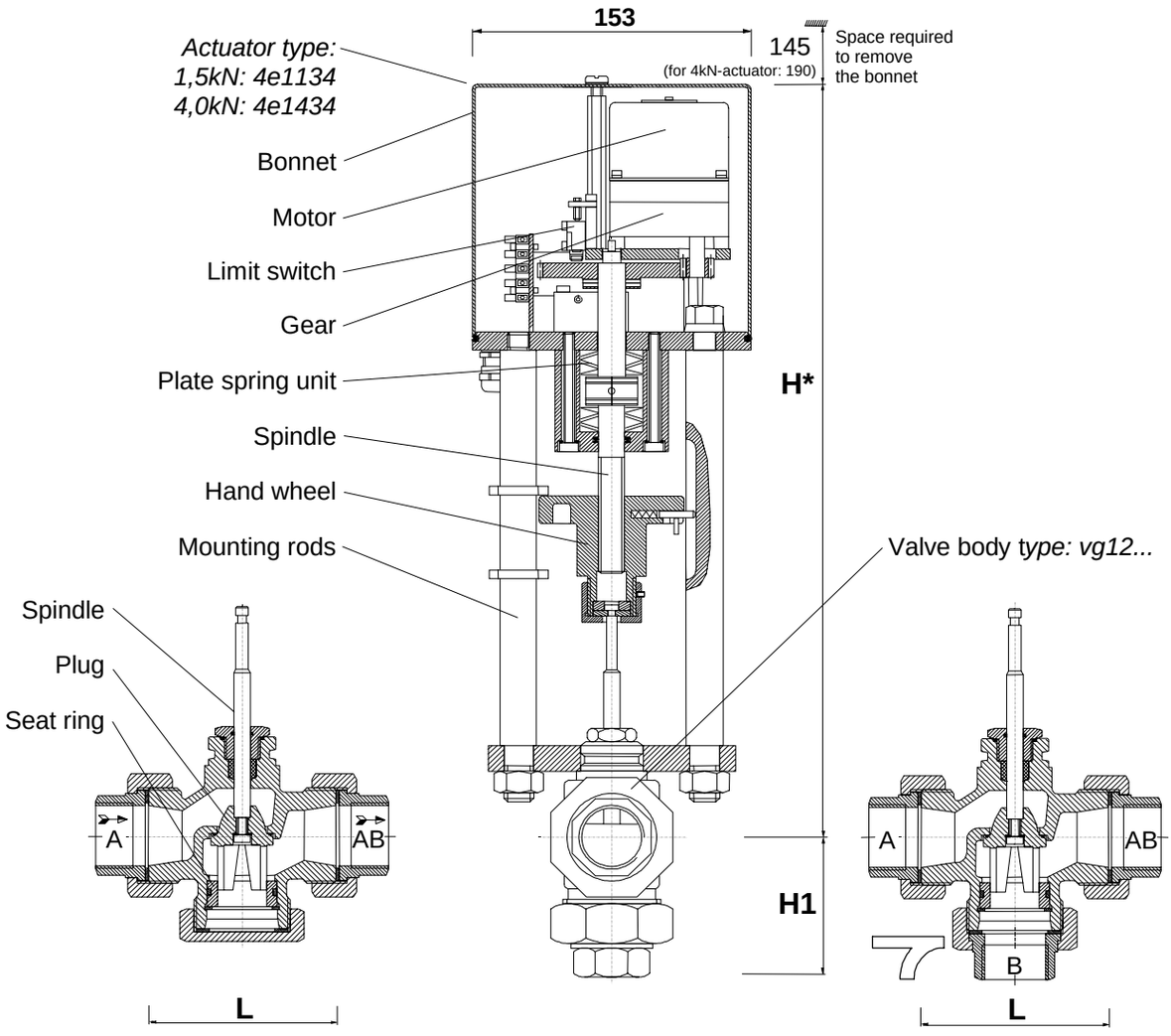
Actuator: with integrated manual emergency
and load dependent limit switches
Thrust: 1500 N
Power input: 10 VA
alternatively: 4000 N / 20 VA (appendix ..c)
Power supply: 230V /50...60Hz
other voltages on request
Protection class: IP65

Accessories, special types**:**
Add. signal switches (see page 49e, 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Other voltages (on request)
Other positioning speed (on request)
Reduced kvs-values (on request)

Order text:
Motor control valve of bronze PN 16, DN . .
in two / three way form with O-ring sealing,
Power supply . . ., List-No. 48 0 . . .

DN	List-No.		Kvs	Stroke	Pos. speed	Closing pressure (bar)	
	three way	two way	m³/h	mm	sec	1500N	4000N
1/2"	4803 100.	4802 100.	3	18	60	16,0	
3/4"	4803 101.	4802 101.	6,3	18	60	16,0	
1"	4803 102.	4802 102.	10	18	60	16,0	
1 1/4"	4803 103.	4802 103.	16	18	60	11,8	16,0
1 1/2"	4803 104.	4802 104.	25	18	60	7,2	16,0

open printversion



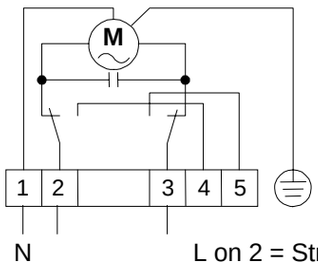
Two way form

Three way form

DN	1/2“	3/4“	1“	1 1/4"	1 1/2"
Height H *	386	384	385	384	384
Stud lenght H1	44	44	45	47	52
Immersion lenght L	64	80	90	110	120
Weight kg	7,2	7,6	7,9	8,7	9,0

* = add. 45mm for 4kN-Actuator

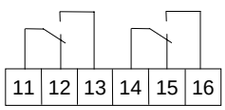
Electrical wiring:



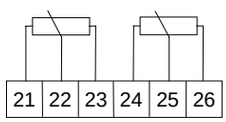
L on 2 = Straightway opens
L on 3 = Straightway closes

Accessories (option)**:**

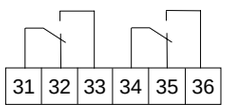
Limit switch
load dependent
for valve position
OPEN CLOSE



Potentiometer

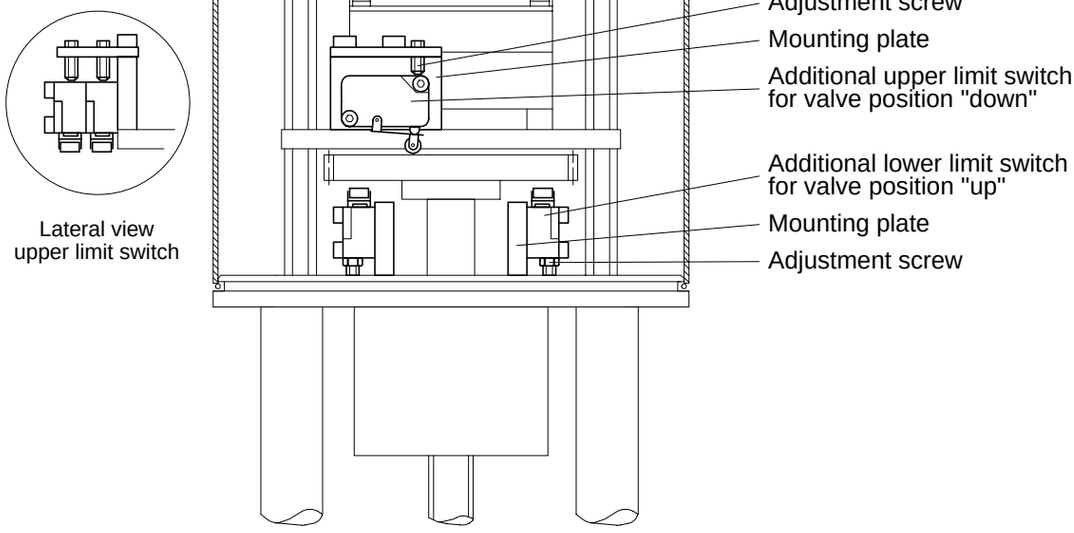


Signal switch
travel dependent



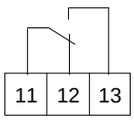
open printversion

Electric actuators type 4e... can be equipped with an additional load dependent limit switch for valve positon "up" and/or "down". The zero-potential change over switches have a contact rating of 250V / 2A (ohmic load).

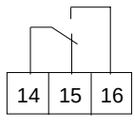


Lateral view
upper limit switch

Additional terminals:



Upper switch for valve position "down"



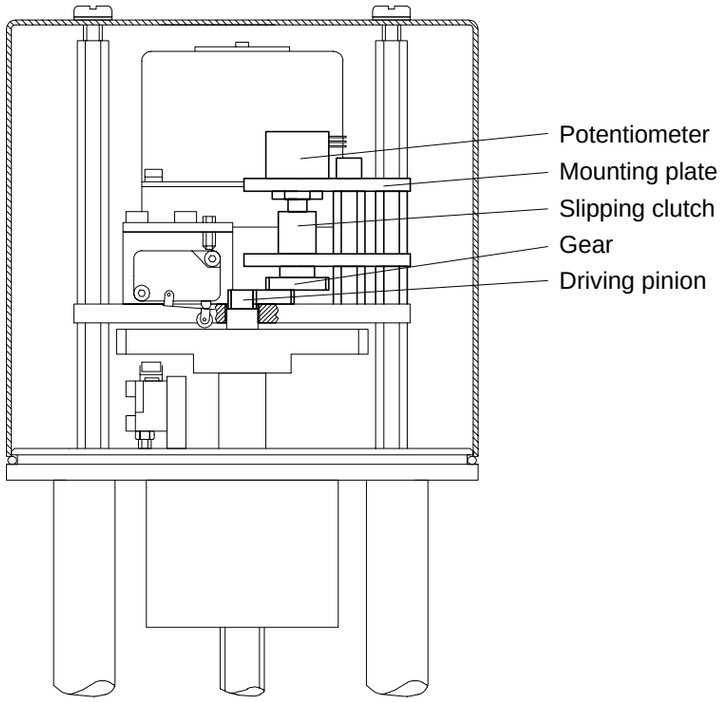
Lower switch for valve position "up"

Summary of types:	**List-No.**
1 add. upper limit switch for valve position "down"	49eo
1 add. lower limit switch for valve position "up"	49eu
1 upper and 1 lower additional limit switch	49ev

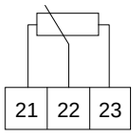
open printversion

Electric actuators type 4e... can be equipped with a potentiometer for position feedback.

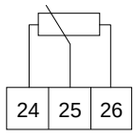
The potentiometer is connected to the actuator by a slipping clutch. This effects an auto-addjustment after each manual operation and prevents damages by exceeding of the end position.



Additional terminals:



Potentiometer 1



Potentiometer 2

Summary of types:

49f x x x

x = 2: Double potentiometer (2x100 Ohm only)

x = 1:
1 100 Ohm *
2 200 Ohm
5 500 Ohm
0 1000 Ohm

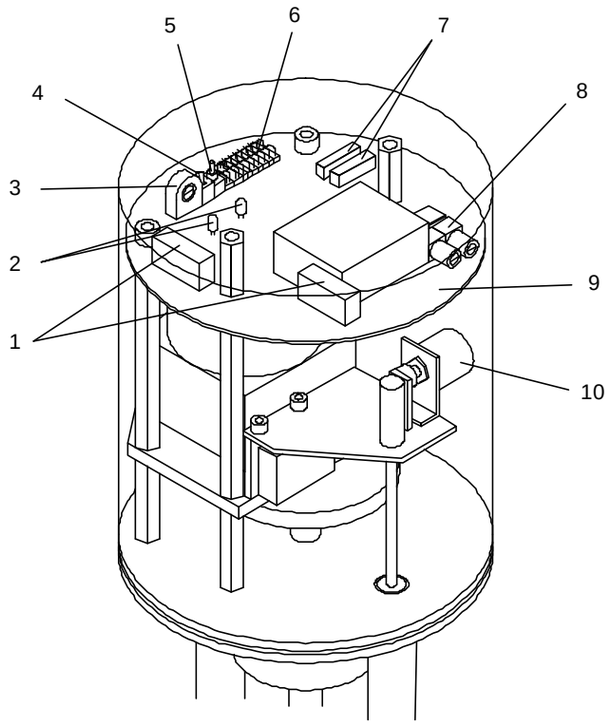
x = 1:
1 Stroke 15 mm
2 Stroke 20 mm
3 Stroke 30/35 mm

* default value: standard potentiometer 100 Ohm

open printversion

This accessory is used for the actuation of electric actuators type 4e1 with current or voltage signals of 0/4...20 mA or 0...10 V. It is integrated in actuators and consists of positioner on circuit board and feedback potentiometer.
The height of 2000N-actuators (control valves) with integrated positioner: add. 45 mm.

1 Relays for motor operation
2 LED´s for Relays function
3 Potentiometer for sensitivity of response
4 Switch "Manual / Automatic"
5 Key for manual function
6 Switches for input signal
7 Potentiometer for adjustment of feedback potentiometer
8 Fuses
9 Circuit board
10 Feedback potentiometer



Method of operation:
The positioner compares permanent the control signal (signal input) to the signal of feedback potentiometer (control valve position). It activates Relay 1 or Relay 2, if the control valve position doesn't correspond to the control signal (0...100% control signal = 0...100% valve stroke), this way the actuator moves the valve spindle until the desired position is reached. Control characteristic is proportional.

Versions:

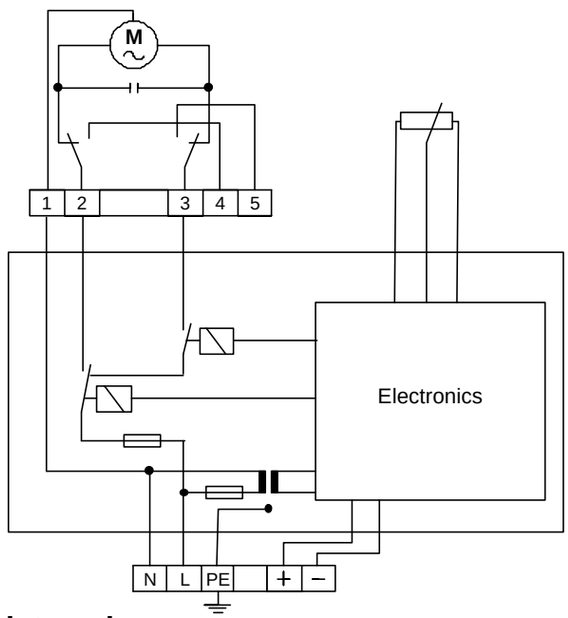
49sr x x x

x (3rd): = 230V 50/60Hz; 1 = 115V 50/60Hz; 2 = 24V 50/60Hz

x (2nd): 1 = for 15 mm Stroke; 2 = for 20 mm Stroke; 3 = for 30/35 mm Stroke; 4 = for 40 mm Stroke

x (1st): 2 = for 2000N-Actuator; 4 = for 4000N-Actuator

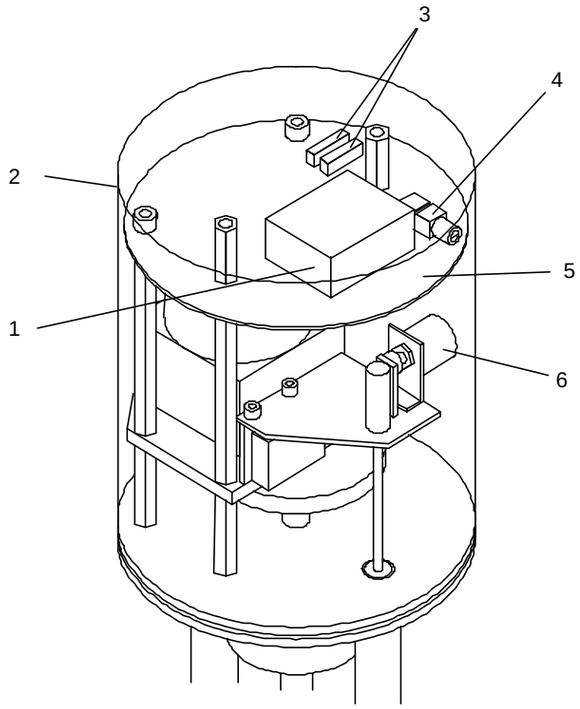
Function and connection:



open printversion

This accessory is used for the position indication of electric actuators type 4e1 with current or voltage signals of 0/4...20 mA or 0...10 V. It is integrated in actuators and consists of electronic position indicator on circuit board and feedback potentiometer.
The height of 2000N-actuators (control valves) with integrated positioner: add. 45 mm.

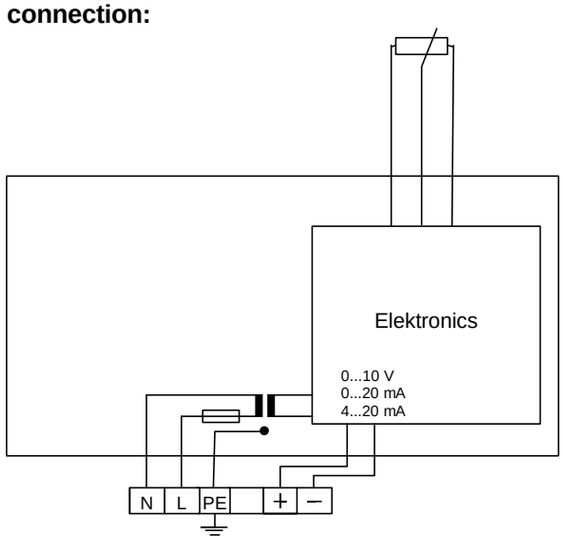
1 Transformer
2 Bonnet
3 Potentiometer for adjustment of feedback potentiometer
4 Fuse
5 Circuit board
6 Feedback potentiometer



Method of operation:

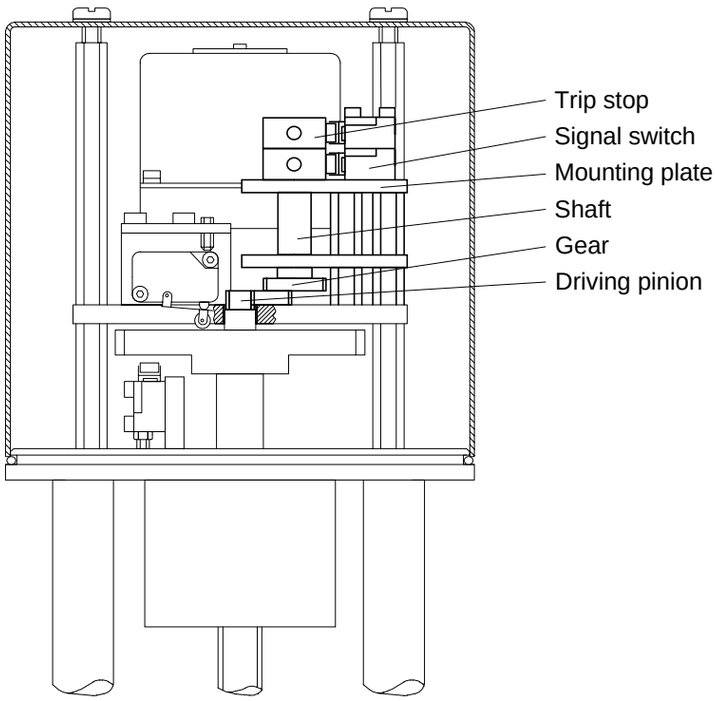
The indicator registers position of the control valve thruogh the signal of feedback potentiometer and convert it into standard output signal 0/4...20 mA or 0...10 V.

Function and connection:

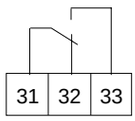


open printversion

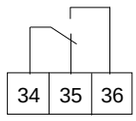
Electric actuators type 4e... can be equipped with 1 or 2 additional travel dependent switches.
The zero-potential change over switches have a contact rating of 250V / 2A (ohmic load).



Additional terminals:



Signal switch 1



Signal switch 2

Summary of types:

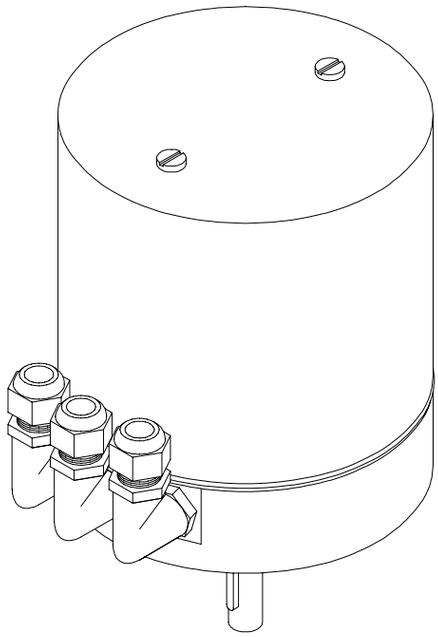
49w **x** **x**

2 2 travel dependent signal switches

1 Stroke 15 mm
2 Stroke 20 mm
3 Stroke 30/35 mm

open printversion

Electric rotary actuator for butterfly valves

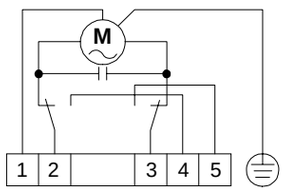


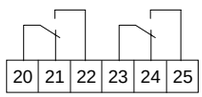
Steering:	3-point step controller
Motor voltage:	230V / 50...60Hz
alternatively:	115V / 50...60Hz (option 49u1) 24V / 50...60Hz (option 49u2)
Torque:	20 Nm
Power input:	10 VA
Operating time:	47 s by 50 Hz and rotation angle of 105° (40 s by 50 Hz and rotation angle of 90°)
Driving shaft:	∅12x50 mm with parallel key 4x20 mm acc. to DIN 6885 form A
Protection class:	IP 65
Cable inlet:	3 x PG 11
Limit pos. switching:	1 changeover switch for each limit position, travel dependent, ratings 250V / 2A
Equipment:	2 travel dependent signal switches for rotation angle of 105° 2 potentiometers 0...200 Ohm for rotation angle of 105°
Max. ambient temperature:	-15...60° C
Weight:	5,5 kg

Order text:

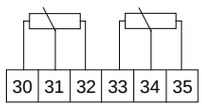
Electric rotary actuator for butterfly valves,
torque 20 Nm, operating time 47 s by rotation angle of 105°,
with 2 travel dependent signal switches and
2 potentiometers 0...200 Ohm for rotation angle of 105°,
voltage . . ., List-No. 4d124b

Electrical connection:



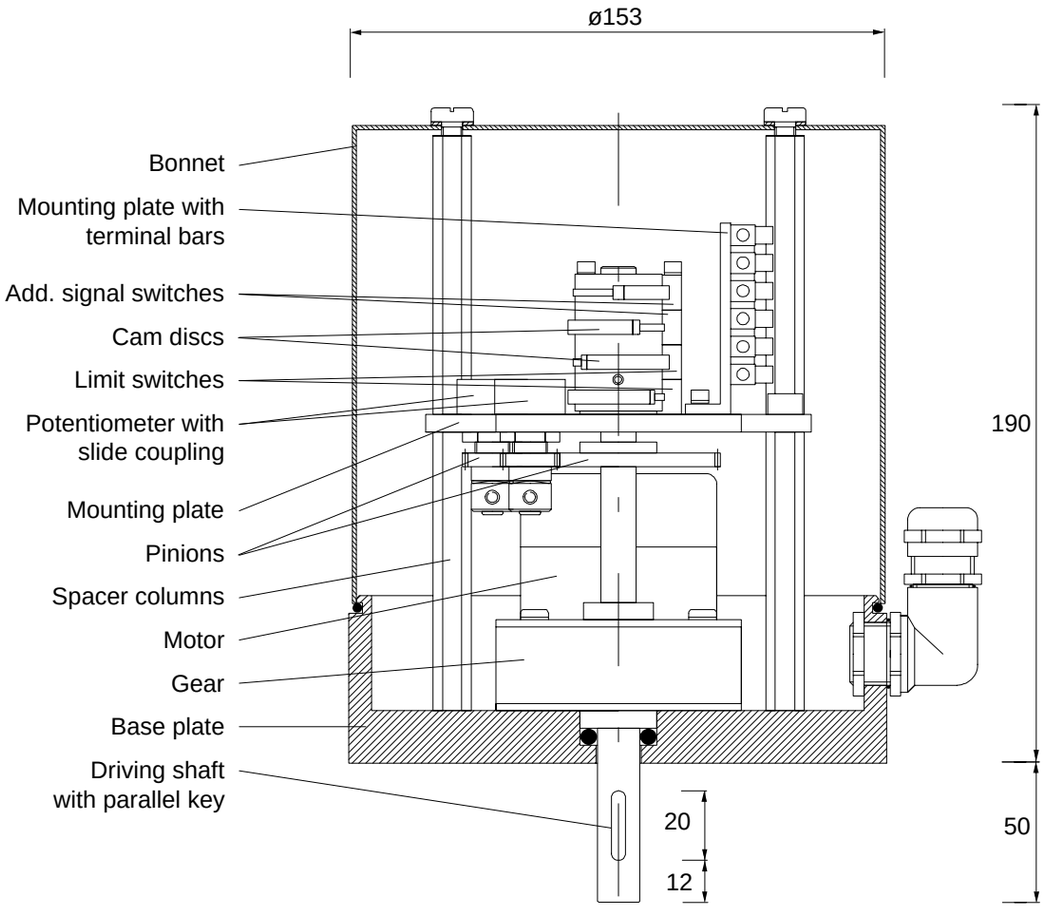


add. signal switches
travel dependent

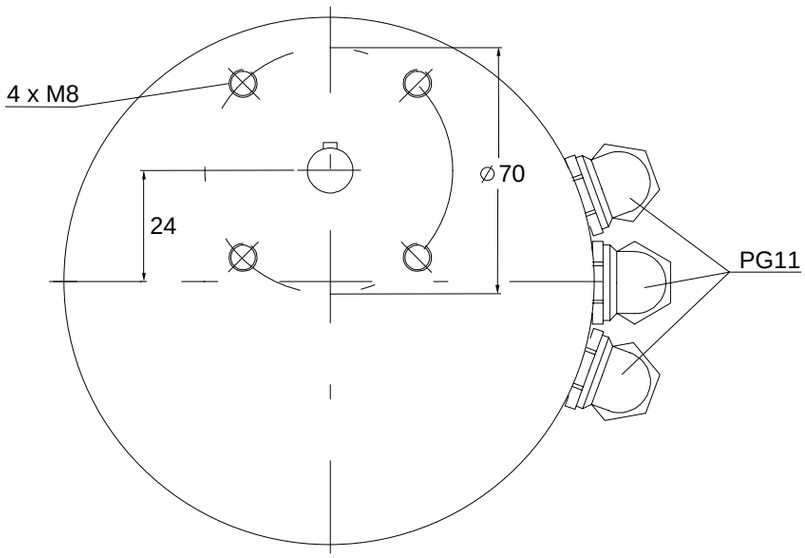


add. potentiometer

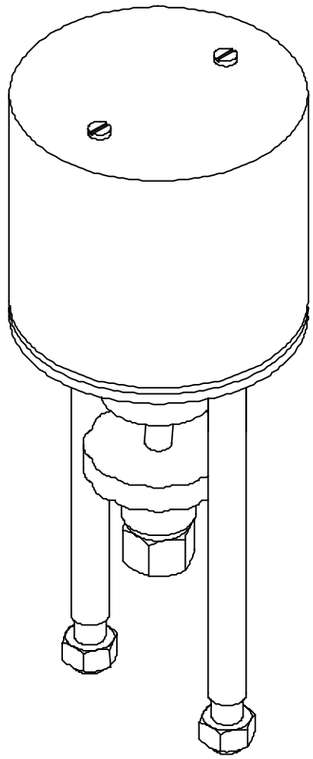
open printversion



View from the bottom side:



open printversion



Electric actuator for valves
with integrated manual emergency

Controlling device:	3-point step controller
Power supply:	230V / 50...60Hz
alternatively:	115V / 50...60Hz (option 49u1)
	24V / 50...60Hz (option 49u2)
	24V DC (option 49u8)
Thrust:	2000 N
	Power input: 10 VA
alternatively:	4000 N / 20 VA
Positioning time:	3,3 s/mm
alternatively:	2,2 s/mm (option 49t12)
Stroke:	41 mm
Protection class:	IP 65
Limit switches:	1 changeover switch for each limit position, load dependent, ratings: 250V / 2A
Mounting position:	any, avoid hanging position (damaging by effluent media possible)

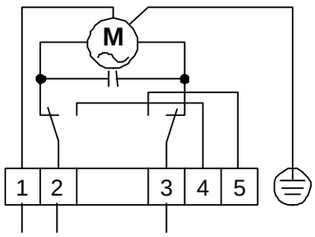
Max. ambient temperature: -15...60° C

Accessories, special designs:
Add. load dependent signal switches (see page 49e)
Add. travel dependent signal switches (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)

Order text:
Electric actuator, thrust . . ., power supply . . .,
pos. time . . ., mounting rod size . . .,
List-No. 4e1 . . .

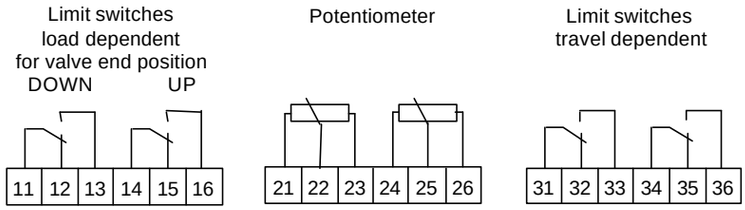
List-No.	Thrust N	Mounting rod size	Pos.time s/mm	Weight kg
4e1134	1500	4	3,3	6
4e1230	2000	0	3,3	6
4e1231	2000	1	3,3	6
4e1232	2000	2	3,3	6
4e1235	2000	5	3,3	6
4e1430	4000	0	3,3	7
4e1431	4000	1	3,3	7
4e1432	4000	2	3,3	7
4e1435	4000	5	3,3	7

Electrical wiring:

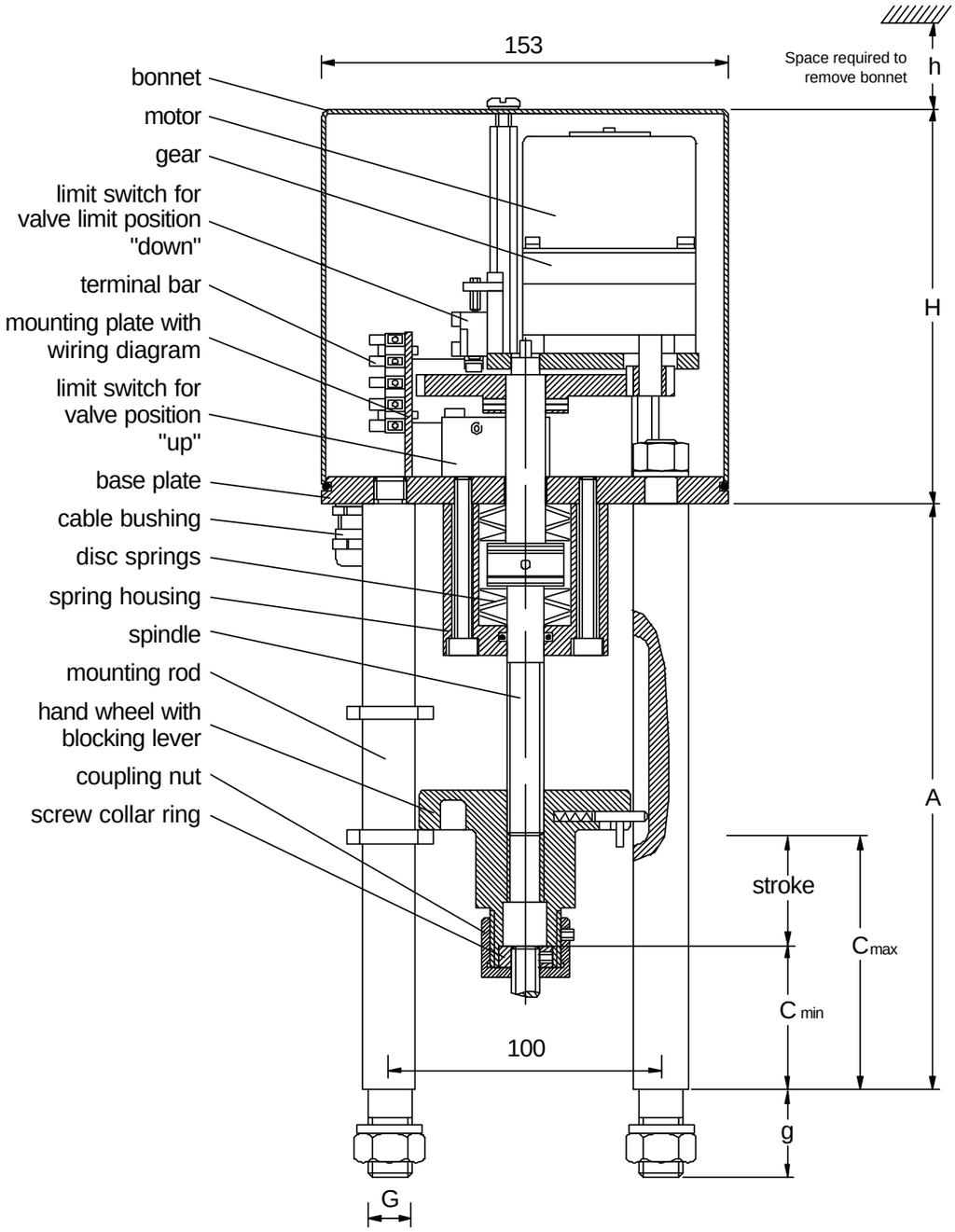


L on 2 = stroke downwards
L on 3 = stroke upwards

Accessories (option)**:**



open printversion



Type	Thrust N	A mm	Cmin mm	Cmax mm	H mm	h mm	G mm	g mm
4e1134	1500	195	40	81	146	145	M12	24
4e1231	2000	218	63	104	146	145	M16	32
4e1232	2000	231	76	117	146	145	M16	32
4e1235	2000	250	95	136	146	145	M16	32
4e1431	4000	218	63	104	191	190	M16	32
4e1432	4000	231	76	117	191	190	M16	32
4e1435	4000	250	95	136	191	190	M16	32

open printversion

Motor control valve in three way form with VA bellow sealing with emergency close-function, PN 16 / 25, GGG-40.3

Body: GGG-40.3, three way form**,**
for heat transfer oil, as mixing valve,
(diverted purpose restricted),
(see page 038 990)
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
alternatively: weld-on ends (on request)
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, screwed seat rings,
Flow characteristic: linear
Positioning ratio: 50:1
Leakage: < 0,01% K_{VS}

Electro-hydraulic actuator: with emergency close function
(straightway A-AB closed by power failure)
and integrated manual emergency

Thrust:	ca. 2800 N
Power input:	DN 20...50: 15 VA,
	DN 65...100: 24 VA
Power supply:	230V/50...60Hz
Emergency close time:	DN 20...50: 10 s,
	DN 65...100: 14 s
Protection class:	IP54

Accessories, special designs:
Add. two signal switches (59e)
Feedback potentiometer (59f)
Reduced kvs-values (on request)
Weld-on ends (on request)

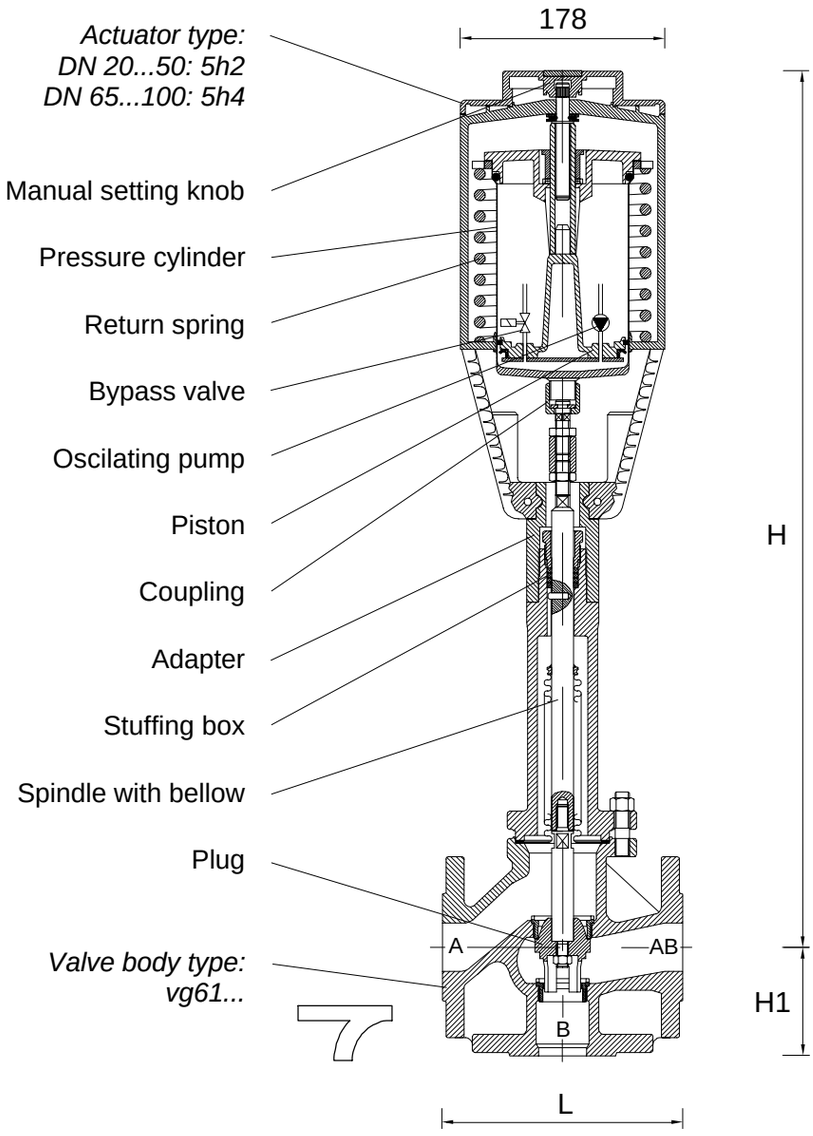
Order text:
Electro-hydraulic control valve PN . ., DN . .
in three way form with VA-bellow sealing,
and emergency close function, List-No. 561 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

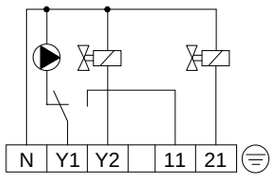
DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Pos. speed sec	Closing pressure bar
20	561 401	561 501	6,3	20	120	25,0
25	561 402	561 502	10	20	120	25,0
32	561 403	561 503	16	20	120	25,0
40	561 404	561 504	25	20	120	16,5
50	561 405	561 505	40	20	120	10,3
65	561 406	561 506	63	30	100	5,7
80	561 408	561 508	100	30	100	3,7
100	561 410	561 510	160	30	100	2,0

open printversion



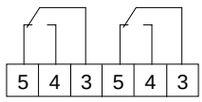
DN	20	25	32	40	50	65	80	100
Height H	725	719	725	731	733	863	864	871
Stud lenght H1	70	75	80	90	100	120	130	150
Immersion lenght L	150	160	180	200	230	290	310	350
Weight kg	18,5	19,5	22,5	23,5	26,5	45,0	49,0	64,0

Electrical wiring:

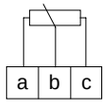


N/Y1 = Straightway opens
N/Y2 = Straightway closes
N/21 = Emergency close funktion
(closes straightway by power failure)

Accessoires (optional)**:**



add. signal switch
travel dependent



potentiometer

open printversion

Index Group 6

Other Valves

Safety equipement: acc. to DIN 4754
for shut off or discharge by emergency
and simultaneous disconnection of burner
through electrical signal contact.
Operating through release cord (supplied by customer)

Body: GGG-40.3, two way form,
for heat transfer oil,
Pressure range: PN 16,
Flanges acc. to DIN,
Sealing: VA-bellow,
and safety stuffing box,
Internal parts: stainless steel,

Switch: die cast metal enclosed,
Spring contact: 1x opening / 1x closing,
Opening contact forcibly actuated
Contact rating: 6A / 400V AC-11
Protection class: IP 65

Order text emergency stop valve:
Emergency stop valve PN 16, DN . .
List-No. 640 40 . s

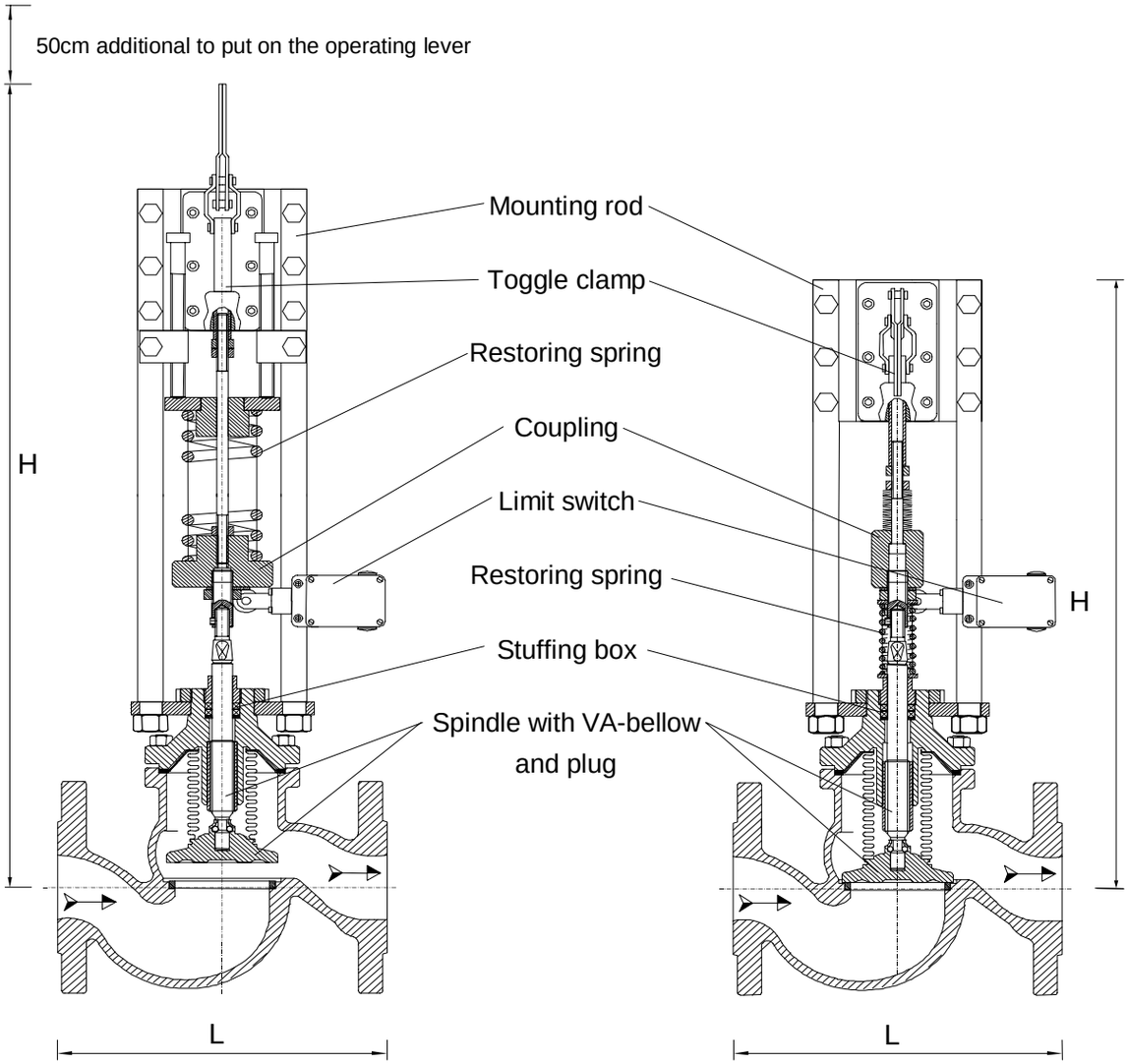
Order text emergency outlet valve:
Emergency outlet valve PN 16, DN . .
List-No. 640 40 . o

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	**List-No.** stop valve	**List-No.** outlet valve	**Kvs** m³/h
25	640 402s	640 402o	10,5
32	640 403s	640 403o	17,7
40	640 404s	640 404o	31,4
50	640 405s	640 405o	45,0
65	640 406s	640 406o	87,0

open printversion



Emergency stop valve
Shown in operating state

Emergency outlet valve
Shown in operating state

DN	List-No.		Immersion lenght	Height		Weight	
	stop valve	outlet valve		type s *	type o	type s *	type o
			mm	mm		kg	
25	640 402s	640 402o	160	745	460	18	16
32	640 403s	640 403o	180	755	470	21	19
40	640 404s	640 404o	200	770	485	22	20
50	640 405s	640 405o	230	770	485	25	23
65	640 406s	640 406o	290	790	505	32	30

***** add. ca. 50 cm to put on the operating lever

open printversion

Body: GGG-40.3, two way form**,**
for heat transfer oil,
Pressure range: PN 16, PN 25
Flanges acc. to DIN,
alternatively: weld-on ends (on request)
Sealing: VA-bellow double wall,
and safety stuffing box,
Internal parts: stainless steel, screwed seat rings,
Flow characteristic: linear
Positioning ratio: 50:1

Function:
The valve opens the straightway against outside spring
when the differential pressure on the valve plug is rising.
Response pressure: adjustable 1...6 bar with an adjusting key.

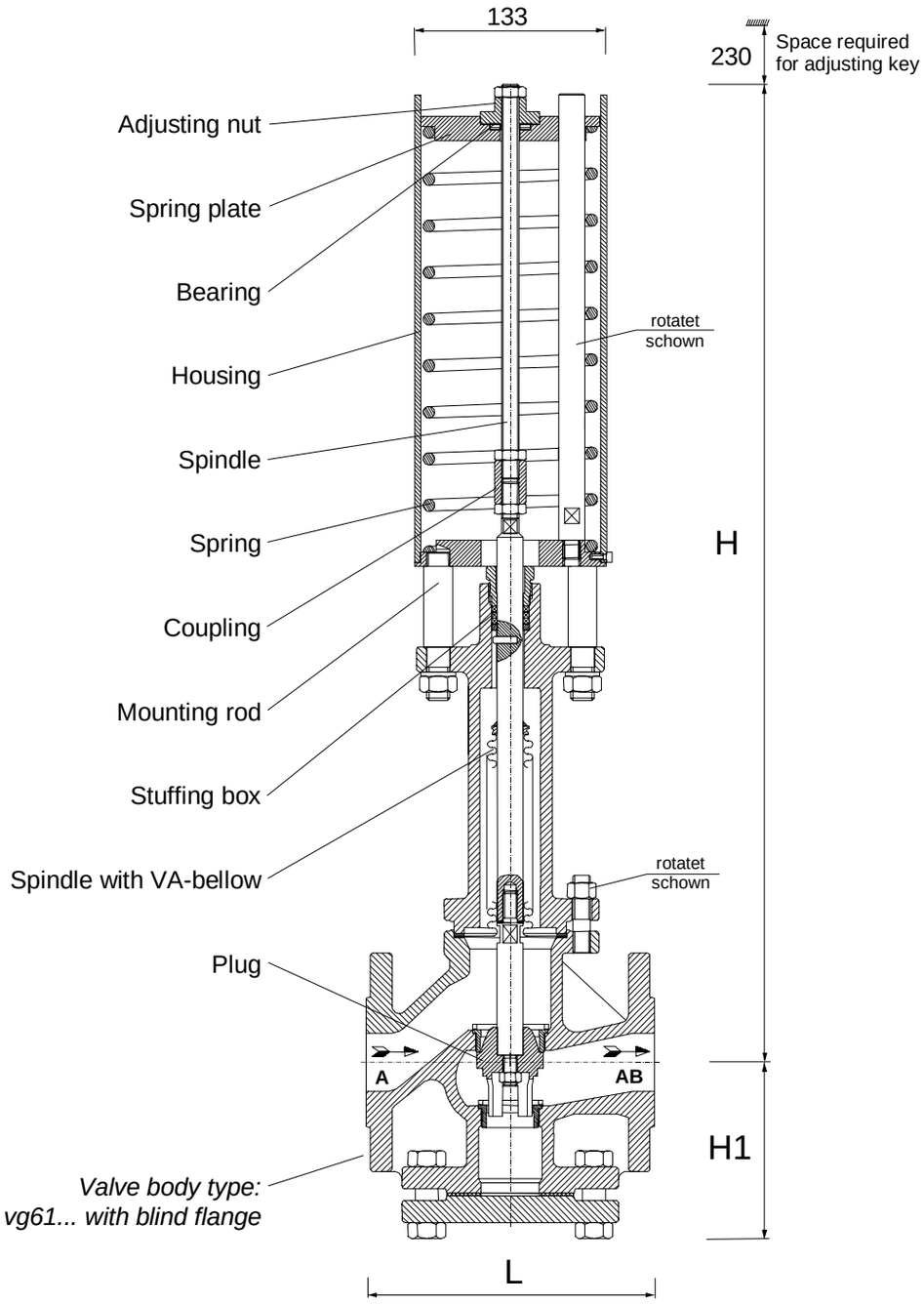
Order text:
Overflow valve PN . ., DN . .
with VA-bellow sealing, List-No. 661 . . .

Max. operating pressure:

by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar
PN 25	25	20	18	16	15	bar

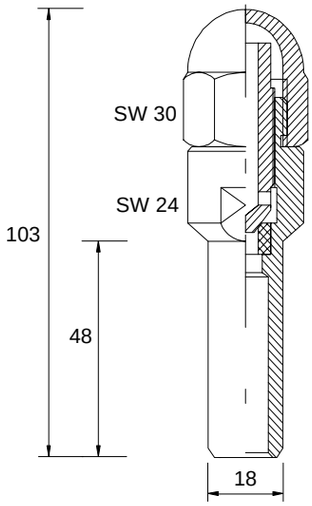
DN	**List-No.**		**Kvs**	**Stroke**
	PN 16	PN 25	m³/h	mm
25	661 402	661 502	10	20
32	661 403	661 503	16	20
40	661 404	661 504	25	20
50	661 405	661 505	40	20
65	661 406	661 506	63	30
80	661 408	661 508	100	30

open printversion

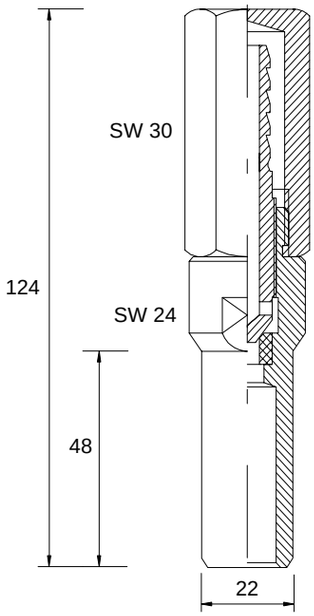


DN	25	32	40	50	65	80
Height H	655	660	665	670	950	995
Stud lenght H1	105	110	120	135	155	170
Immersion lenght L	160	180	200	230	290	310
Weight kg	20	23	25	28	50	55

open printversion



691 511



691 522

Technical data:

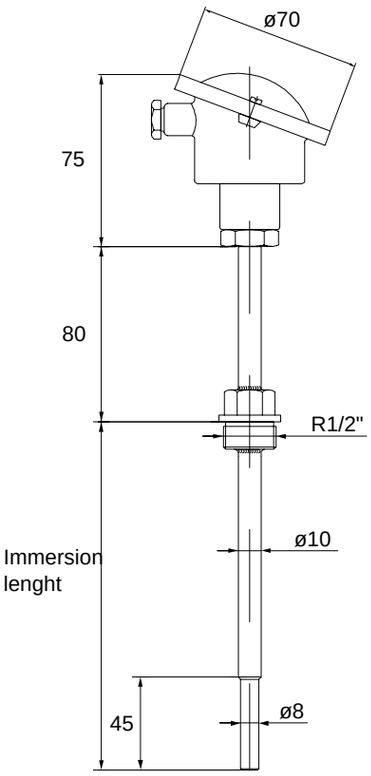
Housing:	RSt37-2
Seat and plug:	stainless steel
Pressure range:	PN 25
Connection:	weld-on ends
Nominal diameter:	DN 10, DN 15
Operation:	square shaft, SW 11
Locking cap:	steel, galvanized, SW 30
Weight:	0,3 kg (69151.) 0,4 kg (69152.)

Types:	**List-No.**
without tube nozzle:	
DN 10	**691 511**
DN 15	**691 512**
with tube nozzle:	
DN 10	**691 521**
DN 15	**691 522**

open printversion

Resistance thermometer for liquid media with terminal head form B

713 4.. E



Screw-in resistance thermometer with terminal head, measuring jaw poured in, vibration-safe,
alternatively: changeable (type suffix ..a)

Technical Data:

Sensor:

Terminal head:	form B, DIN 43 729
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Neck tube:	10 x 80 mm
Connection:	R 1/2"
Material:	V4A
Immersion lenght:	160 mm, 250 mm, 400 mm, other lenghts on request

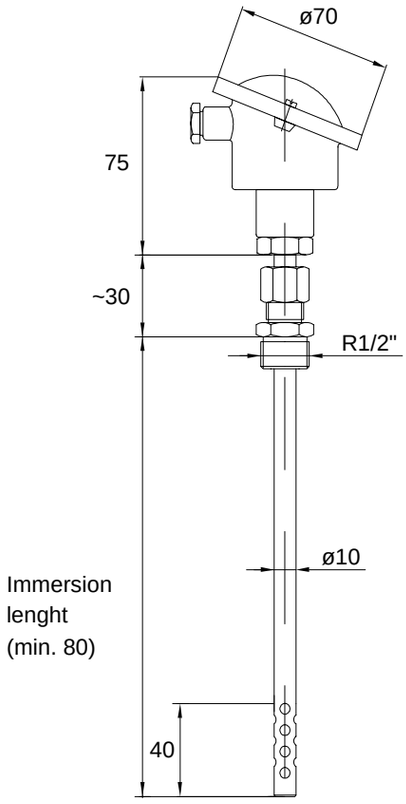
Transit times (water 0,4m/s):	t_{05} *in s*	t_{09} *in s*
Measuring jaw poured in	12	40
Measuring jaw changeable	15	50

Immersion lenght:	**List-No.:**	
mm	*1 x Pt100 DIN*	*2 x Pt100 DIN*
160	713 411	713 421
250	713 4125	713 4225
400	713 414	713 424

Order text:

Resistance thermometer .. x Pt100 DIN,
with terminal head form B, immersion lenght ... mm,
measuring jaw poured in / changeable
List.-No. 713 4...

open printversion



Resistance thermometer with terminal head and slidable screw joint, measuring jaw poured in, vibration-safe.

Technical Data:

Sensor:

Terminal head:	form B, DIN 43 729
Max. ambient temperature:	100°C
Max. media temperature:	400°C
alternatively:	600°C (type suffix t)
Connection:	R 1/2"
Material:	V4A
Immersion lenght:	250 mm, 400 mm, with borings on lenght 40 mm, other lenghts on request

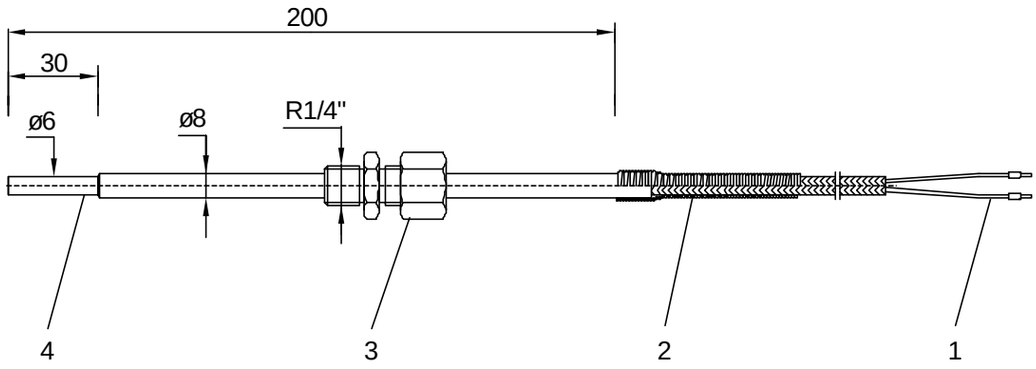
Transit times (air 1m/s):	t_{05} *in s*	t_{09} *in s*
	50	150

Immersion lenght:	**List-No.:**	
mm	*1 x Pt100 DIN*	*2 x Pt100 DIN*
250	713 5125	713 5225
400	713 514	713 524

Order text:

Resistance thermometer .. x Pt100 DIN,
with terminal head form B, immersion lenght ... mm,
for media temperature up to 400°C / 600°C,
tube with borings, List.-No. 713 5...

open printversion



1. Cable terminal
2. Protective spring
3. Screw joint
4. Protective tube

Resistance thermometer, 2-wire-type with slidable screw joint and 3 m fixed measuring cable with alloy steel schielding and protective spring, wires with cable terminals.

Technical Data:

Measuring jaw:	1 x Pt100 DIN, poured in, vibration safe
Transmit times (air 1 m/s):	t_{05} = 50 s t_{09} = 150 s
Protective tube:	VA, 200 x 8 mm / measuring tip 30 x 6 mm
Cable:	3 m
Protective spring:	VA, 40 mm
Screw joint:	R 1/4"

Order text:

Resistance thermometer 1 x PT100 DIN
with slidable screw joint R 1/4",
3 m fixed measuring cable,
tube VA, 200 x 8 mm / 30 x 6 mm,
List-No.: 714 400-S

open printversion

INDEX
1
2
3
4
5
6
7
8
9
0

Measuring trancducer for overpressure,
with DMS-measuring system

Body:	chrome-nickel-steel
Range:	see type summary
max. statistical compressive load:	acc. to pressure range (see type summary)
Media contacting internal parts:	stainless steel
Pressure connection:	G 1/2" A
Current output:	0...20 mA 3-wire circuit (Li.-No. "...g") or 4...20 mA 2-wire circuit (Li.-No. "...i")
Linearity:	+/- 0,5 %
Hysteresis:	0,3 %
Supply voltage:	15...30 VDC
Electr. connection:	Instrument socket
Protection class:	IP65
Permited operating temp.:	0...60°C
Permited media temp.:	0...85°C
Weight:	0,4 kg

Type summary:

765 x x x x

2 = Outside threading G 1/2"

0 = linear output

g = output 0...20 mA, 3-wire connection
i = output 4...20 mA, 2-wire connection

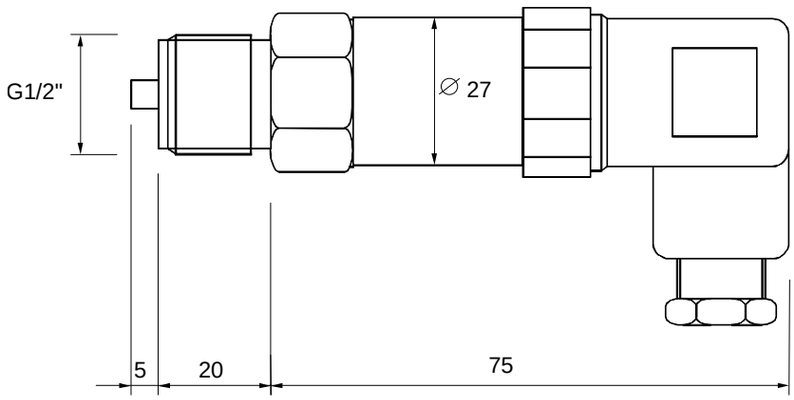
0 = Range	0,6	bar	max. stat. operating pressure	2 bar
1 = Range	1,0	bar	max. stat. operating pressure	2 bar
2 = Range	1,6	bar	max. stat. operating pressure	3 bar
3 = Range	2,5	bar	max. stat. operating pressure	5 bar
4 = Range	4,0	bar	max. stat. operating pressure	8 bar
5 = Range	6,0	bar	max. stat. operating pressure	12 bar
6 = Range	10,0	bar	max. stat. operating pressure	20 bar
7 = Range	16,0	bar	max. stat. operating pressure	32 bar
8 = Range	25,0	bar	max. stat. operating pressure	50 bar
9 = Range	40,0	bar	max. stat. operating pressure	80 bar

Order text:

pressure transmitter with DMS-measuring system, class 0.5
Range ... bar, output signal ... mA,
List-No.: 765 ...

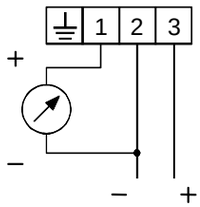
open printversion

Dimensions:



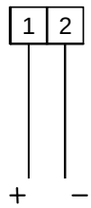
Electrical wiring:

3-wire connection (0...20 mA)



24VDC
from separate
power supply

2- wire connection (4...20 mA)



15...30VDC
from measuring device

open printversion

General description:

Compact unit in the 96 x 96 mm switch panel format for operating and fault messages in control and monitoring systems.

Faults are displayed by red LEDs on the front panel, operations are displayed by green LEDs. (Optional colours can be supplied).

Operating and fault displays are triggered by contact inputs and have a mere display function. As an option, fault displays can also select the acoustic warning contact K2 (without interlocking function).

In addition, fault messages entail an internal, automatically interlocking alarm circuit.

The button releasing the alarm locking situation is mounted on the front panel, together with a lamp-test button. One further optional button can be provided.

The legend film is behind the front film and can be accessed following the removal of the front frame. Legends can either be produced by the supplier according to instructions, or by the user on a laser printer or copier.

Types:

821 0016	16 operation displays
821 0808	8 malfunction warnings, 8 operation displays
821 1006	10 malfunction warnings, 6 operation displays
821 1600	16 malfunction warnings

Additional devices:

821 902	relay K3 in user defined function
821 910	additional relay (K4)
821 9si	Interbus - S - interface

open printversion

Functions:
Operating displays have a mere display function. Their display is by green LEDs (optional colours can be supplied).

Fault displays have either a mere display function or can, if required, activate relay K2 (without interlocking). They are displayed by red LEDs.

Fault messages are grouped as a multi-input fault warning message. When a fault has occurred on one of these inputs, the acoustic warning relay is energized, the attendant red LED flashes. Once the *Reset button* on the front is actuated, the acoustic warning relay is reset, i. e. it drops out again. The fault warning LED now has steady light. *Following* the remedy of the malfunction, the fault warning LED extinguishes automatically.

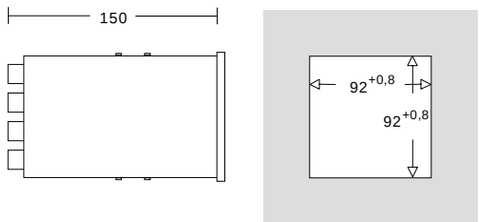
If one fault is followed by another, the acoustic warning relay energizes again, the LED of the new fault input flashes (new value message).

The button "LED test" is intended for a light diode function check.

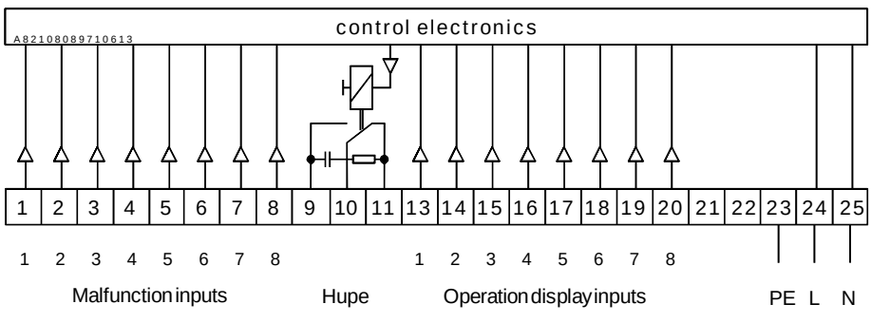
Technical Data:

Inputs :	230 V, 48...62 Hz
max input current :	2 mA
Supply voltage :	230 V, ca. 3,5 VA
Relay outputs :	230 V / max. 2 A
Type of protection acc. DIN 40050 :	IP 54 (terminals IP 20)
Permissible ambient temperature :	0...60°C
Nominal temperature :	20°C
Service position :	optional
Permissible relative humidity :	75 % average annual value (group F DIN 40040), without dew formation

Installation dimensions:



Connecting diagram:
(Example: 821 0808, depending on sub type there may be some additional details or some details are missing ; valid for each version is the wiring diagram on its casing only.)



open printversion

Function extensions:

Digital cummunication:

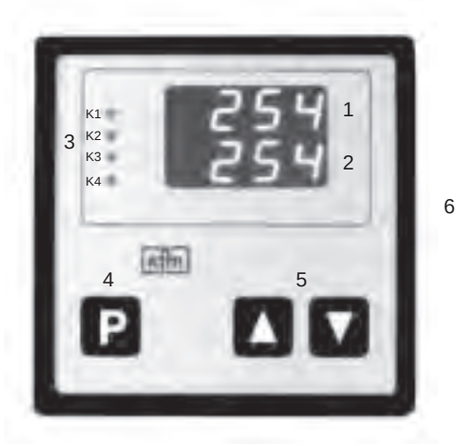
Additional equipments:

– see Page 2 –

Page 2

Additional equipments:

1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



DIN-certificate: TR (TW) 949 97

Brief description:

KFM 92 is a microprozessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation.

An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:

	suffix (*)
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logik output	..L

function extensions

	suffix (*)
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:

	(*)
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
Interbus S interface	(99) si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.'

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

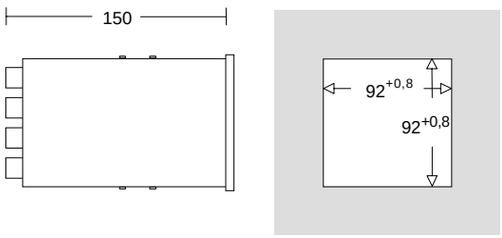
up to 8 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

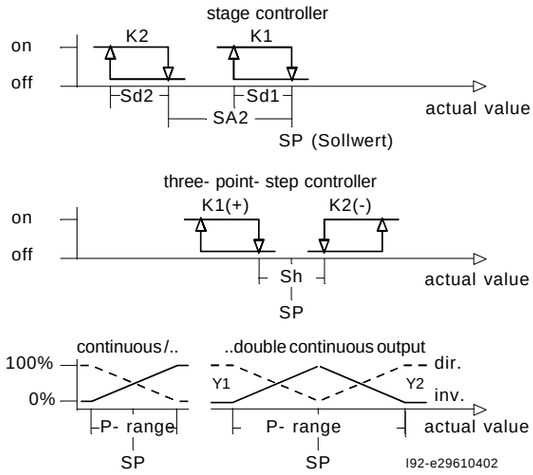
open printversion

Characteristics:
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
(parameters depending on sub type:)
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

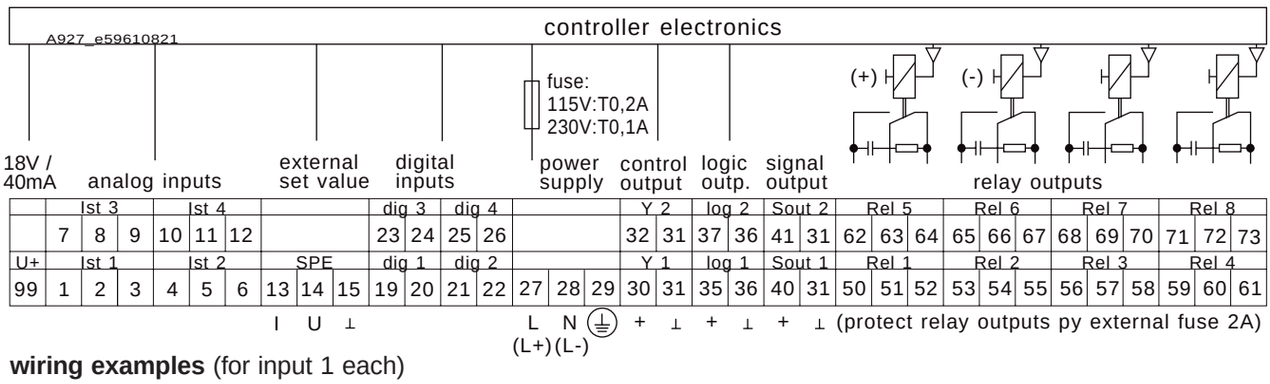
Installation dimensions:
(not valid for integrated version)



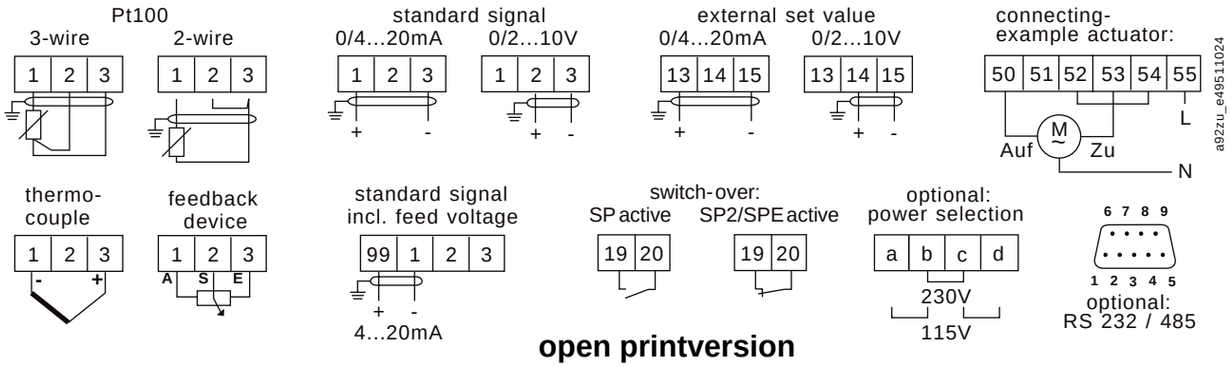


Other data:
Housing for panel mounting 96 x 96 mm
(or integrated version)
Power supply: 230V or 115 V +/- 10 %, 48...62Hz
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KUF to DIN 40050
Relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 50081-2 and EN 50082-2

Wiring diagram:
(Example, depending on sub type some details can be missed valid for each delivered controller is the wiring diagram on its casing only)



wiring examples (for input 1 each)



open printversion

1 Digital display actual value (depending on type)
2 Digital display setpoint
3 Key for setpoint and parameter mode
4 Setpoint adjustment
5 Parameter mode lock switch (back face)

5

General:

The units in 96 x 96 panel mounting format are based on the KFM 92 industrial control unit series and allow external setting of one to three setpoints or continuous control outputs and up to 4 three-level signals. Upper and lower limits can be assigned to the setting ranges.

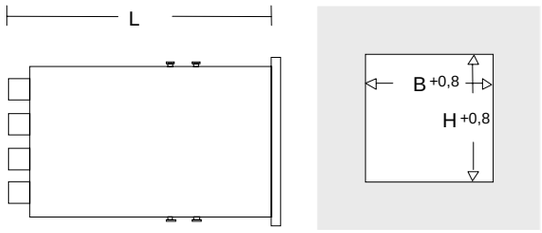
The unit has a dual display. In operating mode, the target value or control output is displayed in the lower row. The upper row can optionally be used for the remote display of the actual value.

Accessories from the KFM 92 product range are available as an option.

Types:	*Type*
Setpoint generator	9293.
Setpoint generator with actual value remote display (Pt100 / standardised signal)	9293.0 / e
Actuator (three-point step)	9297.
Actuator (continuous)	9298.
Actuator (continuous, 2 outputs)	9299.

See data sheet 9200 for device variants and accessories

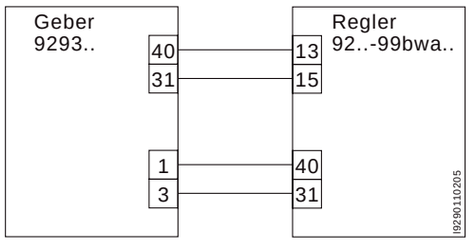
Assembly dimensions:



Form 96x96: L= 150mm, W= 92mm H=92mm
Form 72x144: L= 170mm, W=168mm H=139mm

Wiring:

Example:Connections between **remote control unit** 92930e and **controller** 92..-99bwa-ogx-..)

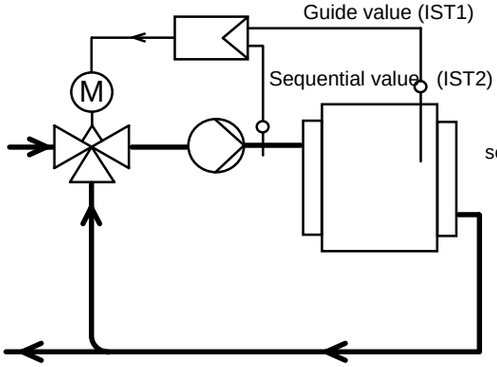


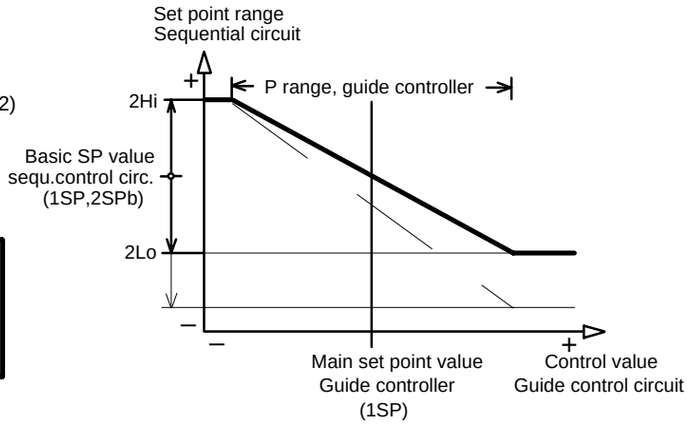
open printversion

Function:

For cascade controllers, the basic unit of the standard version serves as a sequential controller, acting on the control output. The function extension consists of an additional guide control circuit with its own measu-ring input, the output of which acts on the set point value of the sequential controller. A deviation between set point and actual value of the guide control circuit (e.g. product temperature) increases or decreases the basic set point value of the sequential control circuit (e.g. supply temperature or combustion chamber temperature) within an adjustable range.

In the basic version 991k, only the set point value for the guide control circuit is set. It also serves as basic set point value for the sequential circuit. In version 991kb the possible change of the set point value is limited by the adjusted minimum and maximum absolute values. In version 991ku the guide controller set point value and sequential controller basic set point value are set independently from each other.





Control behaviour, equipment:

Sequential controller:	as desired, depending on the selected basic version
Guide controller:	PI (PID), with especially modified integral action

Versions:	**List No.:**
Standard version	991k..
Standard version, with limitable sequential setpoint value range	991kb.
separate set point values	991ku..

Addition for measuring input of guide controller, if different from sequential controller:

Pt100 DIN, 0...400°C	..0
Pt100 DIN, 0...100°C	..1
Thermal element NiCr-Ni (Typ K)0...1200°C	..n
Thermal element Fe-CuNi (Typ J)0... 900°C	..f
Thermal element PtRh-Pt (Typ S)0...1700°C	..p
Reostatic teletransmitter 0...100/1000Ω	..w
Standard signal 0(4)...20mA, 0(2)...10V	..e

open printversion

Characteristic features of cascade controller

Input IST1 (Terminal 1-3) = Guide value
Input IST2 (Terminal 4-6) = Sequential value

Set point value setting:

1SP Guide controller set point value, also basic set point value for sequential controller (except for type 991ku)

2SP Display: current sequential controller set point value = total of basic set point value and guide controller influence

Parameter level 1 (supplement):		*Factory setting:*	*Notes:*
CH	Channel selection of guide controller / sequential controller = CH1 / CH2		
FUE	Only for optimization, in CH2: guide controller influence An/AuS (ON/OFF)	An	___
2SPb	Basic set point value for sequential controller (only for type 99ku)	0	___

Parameter level 2 (supplement):			
2Lo / 2HI	admissible maximum difference of the sequential controller set point value	-50/50	___
2FLo / 2FHI	minimum / maximum limit of sequential controller set point value #/#= controller range	#/#	___

Configuration level (supplement):			
1 ib	Integration range of the guide controller: 0...100% of the proportional band	*100*	___

Commissioning

Prior to optimizing the control behaviour, correct the factory set set point value range limitations of the sequential circuit, if necessary. The admissible range of the sequential circuit set point value is dependent upon various factors (e.g. maximum heating surface temperature, design of the heating surfaces, etc.) and should be individually set for each machine system. The values "2Lo" for the bottom and "2Hi" for the upper limit are set in parameter level 2 as a *difference* to the basic set point (also refer to the function diagram). The factory setting for thermostats is -50K / +50 K, for controllers with signal input 0.0. In version 991kb is to adjust additional an upper and lower absolute limit value.

Once the sequential control circuit limit values are set, optimize the sequential control circuit *without* influence on the guide control circuit. For this purpose, switch off the guide controller function (parameter level 2: CH2, FUE AUS). Now undertake the standard optimization of the control parameters.

Subsequently, switch on the guide controller function again and optimize the parameter for the guide control circuit, taking into consideration that the guide control circuit often reacts more sluggish than the sequential circuit. Therefore, it can usually be operated as proportional action controller *without* integral action (value for I at 0.0) or with a relatively long integral action time (several minutes). As an option, the integration range may be limited with parameter ib.

Deviating rection to error messages:

At Err 1 the guide controller element does not function,
the sequential controller element continues to operate as standard controller with the set set point value.

At Err 2 the configurated safety circuit reacts (Factory setting: relay off or control signal on 0)

open printversion

Function:

Enter a series of set point values and allocated times in the parameter level, which are invoked in succession after a program start has been triggered. The controller operates in standard operation on the basis of the set basic set point value prior to a start and following a program sequence.

Enter the programs as steps with consecutive numbers, always consisting of a target set point value SP.. and the attendant time t.. If a direct switch-over (*jump*) to the next set point value is desired, t.. is set to ”0”. If a value of >0 is set for t.., the change to the attendant target set point value takes place within this time in form of a *Ramp.* If a set point value is to be kept unchanged for a specific amount of time, set the subsequent SP.. to the same value, the attendant time t.. serves as *holding time* .

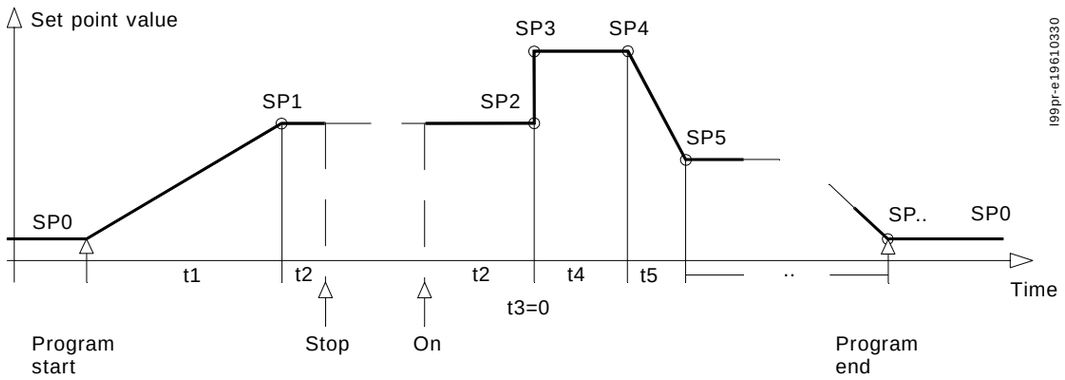
If fewer steps are required in the individual program than preset unter Pr-S, they can be suppressed by setting a set point value as above and a time of ”0”.

integrated set point monitoring:

Constant monitoring takes place during the program sequence, to check whether the actual value follows the current set point value. The program sequence is stopped as soon and as long as the difference set as admissible is exceeded:

With a *ramp*, the further increase or decrease of the set point value is stopped. With *holding times* the specified time increases accordingly. With a *jump* the next time segment does not start till afterwards.

Program sequence (example)



Versions:

	List No.:
1 program, max. 20 steps	991p1
4 programs, max. 20 steps	991p4
8 programs, max. 10 steps	991p8

open printversion

Special features of the program controllers:

Operation (supplement):

The *bottom display* continuously shows the current (ramp) set point value influence SP..
(Factory setting, other displays can be configurated)

Actuate the P key *(continuous):*

only when the program is running:

SP.. Display of the current (ramp) set point value influence SP..

only when program is OFF:

SP 0 Basic set point value, display and adjustment possibility via the ▲...▼ keys

P-nr Display of the current program No.,
.. only when program is OFF: program selection via the ▲...▼ keys

Pro Display of the current operating condition:
..
AN: program is running
Stop: program has stopped
AUS: program has been completed or aborted, basic set point value is active

Switch-over possibilities from the displayed operating condition by means of the ▲ key (continuous):
AN: start program or continue stopped program
Stop: stop the running program and continue at this point later
AUS: abort running program and continue with the basic set point value (SP0)

Note:The "ON" function may also be triggered by briefly closing the control input (sensor or wiping contact).

press the P key again*: return to operating condition.*

Parameter level 2 (supplement):

		Factory setting:
Pr-S	Select the number of program steps/time segments *uniformly* for *all* programs, 1...10/20, depending on the design	10/20
P-nr	Select the program number (1...4/8, depending on the design)	
t'.1	Enter the holding or ramp time (0.0...999.9 min), in which the subsequent (target) program set point value SP.1 is to be reached.	
SP.1	Enter the 1st (target) program set point value (see program example)	0
t..,SP..	Continuously enter times and set point values for further program steps by actuating the P key.	
	Return to the operating condition after the last setting. Next program: invoke parameter level 2 again.	

Configuration level (supplement):

d SP	Set point value monitoring: admissible deviation between set point and actual value (K or value)	5.0

open printversion

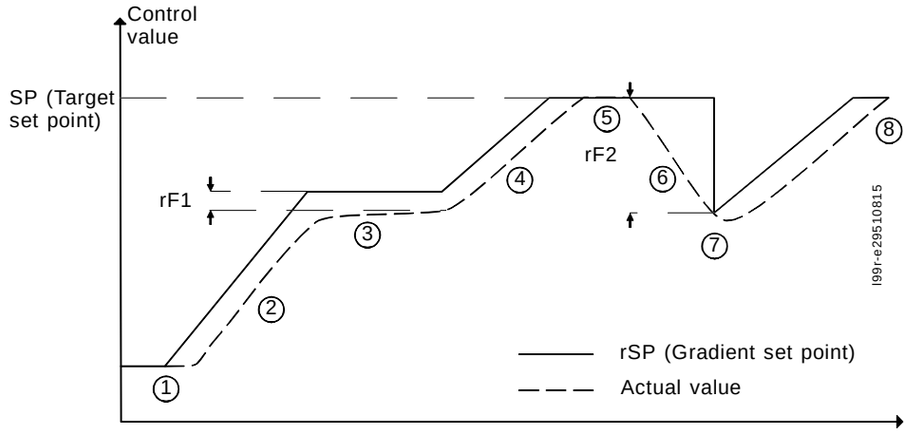
Function:

The set point value ”SP” set at the controller serves as the target set point value. Once the controller has been switched on, the starting point of the ramp set point value ”rSP” is set to the available actual value. Subsequently, the default set point value increases or decreases by the set gradient.

A synchronously running monitoring function causes the ramp set point value to be stopped as soon and as long as the actual value does not follow the default set point value at the set max. distance ("rF1").

The additional function "ramp set point value" switches off as soon as the target set point value is reached, however, it remains in readiness and starts again each time the set point value setting is changed or when the actual value is changed by more than the admissible difference ("rF2").

Operating phases of the ramp function (example)



1. Ramp set point value is set to actual value
2. Set point value increases at set gradient
3. Set point value does not continue to increase as the actual value does not follow
4. Set point value increases again, as actual value has dropped below the max. difference "rF1"
5. Actual value has reached the target set point value, ramp function is switched off
6. Possible malfunction: actual value drops by more than the admissible "rF2"
7. Ramp function is activated, ramp set point value is set to momentary actual value
8. Target set point value is reached again, ramp function is switched off.

List No.: 991r.

Operation:

Parameter level 2 (supplement):

Gr Increase (gradient) of the ramp set point value in K (or value) per minute (0.0...100.0) (Setting 0.0 = ramp function switched off), factory setting: 0.0

dSPL Additional possibility when display is switched over: "r SP" => display of momentary ramp set point value

Configuration level (supplement):

rF1 "Waiting window": maximum deviation of the ramp set point value from the actual value, as stopping influence on the set point change. Factory setting : 2.0

rF2 "Start window": minimum deviation of actual value / standard set point value for renewed start of the ramp function. Factory setting: 10.0

open printversion

Function:

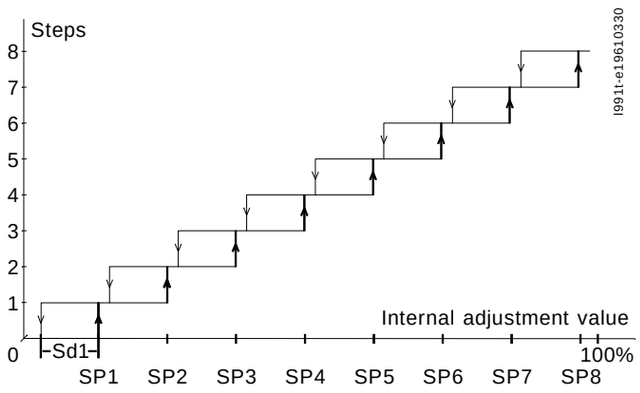
Completion of a continuous PID controller with subsequently arranged switching steps, optionally installed in the controller or in external accessory units. In principle, the operation, handling and optimization of the continuous controller remain unchanged, However, the continuous control signal is not led to the outside but immediately converted internally to an appropriate number of switched on relay switching steps, based on the actuating variable 0...100%.

In the factory setting, the switching points of the steps are evenly distributed throughout the entire adjustment range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

All relays are potential free change over contacts, a spark quenching unit is installed for the normally open contacts. Relays which are not needed may be switched off through switch point >100%. Recommended supplement for heater controls: accessory equipment 99ax to display the return flow temperature.

The first step may be configured as switching output if desired. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Example of 8 steps



Versions:	**List No.:**
Internal controller switching steps: (maximum 8 (92..) or 6 (94../ 95..) steps)	991t..
Switching steps in external accessory units: (4,6 or 8 each, max 20 steps total) comprising of:	
- Controller connection for accessory units	91tw
- Accessory unit:	
for switchboard installation 96x96mm	991tz2..
for switchboard installation 72x144mm	991tz4..
as 19"- insert	991tz5..
for standard rail installation	991tz6..
Option:	
First step cycling, relay version	..t
ditto, logical output	..tL

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Special features of step controllers

Factory setting

Configuration level (supplement):

tE	Switch-on delay per step 1...60sec	5sec
SP..	Switch-on points for step 1...8, based on output 0...100% (or deactivation with setting 101%)	see table
Sd..	Switching differences %	see table

optional:

rel	Switching behaviour of first step: St (normal step) / CY" (cycling*)	St
cy"	Cycle for cycle behaviour (2...120 sec)	20 sec

Settings SP.., Sd..
in %, based on internal control signal 0...100%

	SP1	**SP2**	**SP3**	**SP4**	**SP5**	**SP6**	**SP7**	**SP8**	**Sd..**
for switching behaviour St= normal									
3 Steps	34	66	97						31
4 Steps	27	50	74	97					24
5 Steps	21	40	59	78	97				18
6 Steps	17	33	49	65	81	97			14
7 Steps	16	30	43	57	70	84	97		11
8 Steps	13	25	37	49	61	73	85	97	10
for switching behaviour CY= step1 cycling									
3 Steps		34	66						0.1
4 Steps		27	50	74					0.1
5 Steps		21	40	59	78				0.1
6 Steps		17	33	49	65	81			0.1
7 Steps		16	30	43	57	70	84		0.1
8 Steps		13	25	37	49	61	73	85	0.1

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Method of operation:

The functional extension for continuous PID controllers consists of a following electrical output for the operation of motors, control valves or other electrical actuators. The operation, control and optimisation of the continuous controller remain, in principle, unchanged.

The continuous control signal is converted via the relay outputs K1 (open) and K2 (closed) directly into a corresponding setting of the connected actuator (see the controller data sheet for the circuit diagram). At the same time, the usual continuous output is omitted (with the exception of Type 991uy).

In addition to the two additional relays, the necessary supplementary item, 99axr, the input for the position feed back, is also supplied. A feedback potentiometer for indication of the position must be present on the actuator that is being driven.

The expansion to version 2 consists of an additional input and an output for a second actuator, whose position is compared with the first and made to follow it.

The functional extension for a three-step controller allows a second actuator to be operated in parallel. The position is continuously compared with that of the first actuator, and made to follow it. In addition to the two additional relays, the two necessary items of supplementary equipment, 99axr, inputs for the position feed back, are also supplied. Feedback potentiometers for indication of the position must be present at both the actuators that are being driven.

Models:	**List no.:**
Position controller instead of continuous output	991u
Position controller in addition to continuous output	991uy
Double position controllers instead of continuous output	991u2
Position controller for continuous heating/cooling controller (9281.):	
- instead of 1st output (heating output)	991uh
- instead of 2nd output (cooling output)	991uk
Second (relay) position output for switching controllers	991uww

Operation (extension):

Parameter level:		Factory setting
SA..	Dead band relay no. to guidance signal (as a % of the regulating distance)	0.0
Sd..	Switching difference relay no. (as a % of the regulating distance)	0.5

Configuration level:

FG. A..E Remote comparison, see data sheet 99axr or reverse side

open printversion

Accessory equipment, series 9.. additional analog inputs

Controllers of series 9.. may be equipped with up to 4 analog inputs per unit in addition to the measuring inputs available as standard. They may be used to display additional measuring values or as reference value for installed additional contacts.

The display is continuously switched over to additional inputs by actuating the ▲ key. In addition, the bottom display shows the brief designation of the attendant measuring input. The display automatically switches back to the standard operating condition 5 seconds after the last key was pressed. Furthermore, input 2 may be configured as a second display in addition to the controller actual value.

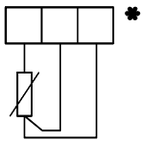
For temperature sensor inputs, °C or °F may be selected as display unit, for standard signal inputs, a scaling between -999 and +4000 may be infinitely set..

Measuring input:	**List-No.:**	**Measuring/display range**
Resistance thermometer:		
Pt100 DIN	99ax	0...400 °C (0...100,0 °C)* (0....600 °C)*
Thermal elements:		
NiCrNi (Typ K)	99axn	0...1200 °C
FeCuNi (Typ J)	99axf	0...900 °C
PtRhPt (Typ S)	99axp	0..1700 °C
Standard signal:		
0(4)...20 mA or 0(2)...10 VDC	99axe	adjustable
4...20 mA incl voltage supply	99axi	adjustable
Rheostatic teletransmitter:		
0...100 to 0...1000 Ω	99axw	0...100.0 %

*(Alternative range, according to the order data)

Order text: Accessory equipment:
additional analog input for .....
Range: .....
Li-No.: 99a ..

additional connection terminals:

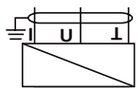


***Terminal No. according to number of existing, or required analog inputs:

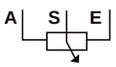
second input: terminal 4/5/6
third input: terminal 7/8/9
fourth input: terminal 10/11/12

alternative:

thermocouple



standard signal



feedback device

I99axe9610412

open printversion

INDEX
1
2
3
4
5
6
7
8
9
0

Additional function for calculating the *difference* between two actual values. (Differential value = actual value 1.. – actual value 2..).
The calculated difference is displayed and made available both as a controlled variable and a reference for additional contacts or signal outputs (CH 0 / Ist0).

All controllers of the KFM 92 – 94 type series can be operated with this additional function as a differential value controller. Depending on the type, existing measuring inputs are accessed; the delivery scope includes an additional measuring input, if necessary.

Versions:		**Del.-No.**
	Incl. additional measuring input	**99ax.d**
Order text:	Optional equipment: Additional analogue input for ___*, range: 0..._____°C, including function for calculation of the difference X1-X2 for display and further measured value processing List No.: 99ax*_d (*possible measuring inputs and list end no. as analogue inputs, sheet 99ax)	
	For 2 *existing* measuring inputs	**99ax.dx**
Order text:	Optional equipment: Function for calculation of the difference X1-X2 from 2 actual values of existing measuring inputs, for display and further measured value processing List No.: 99axdx_ _** (**assigned measuring inputs in plain text added, Example: ..99axdx12 = difference between measuring input 1 and 2)	

Operation (special features)**:**

Operating status:

The top display indicates the *temperature difference* between actual value measuring input 1 and actual value measuring input 2. In addition, it is also possible to display the actual values of measuring input 1 and 2 in succession by pressing the ▲ - key.

Settings:

The differential value is displayed in the parameter levels, in as much as it is relevant for settings and displays, additionally as channel (CH) 0:

Parameter level 2:

0bLo/0bHi Range beginning / end for calculated difference

(if the difference goes under / exceeds the range limits: Error message Err0)

0nSt In as much as this function is provided: Setting the number of places after the decimal point of the differential value display

Supplement to error messages:

open printversion

On devices with an additional measurement input (input 2), this supplementary equipment permits a maximum or minimum selection from the inputs 1 or 2. The values indicated by the two inputs are continuously compared, and only that input with the larger (or smaller) value is used as the regulating magnitude.

Ordering text: Supplementary equipment:
Minimum-maximum selection between 2 measurement inputs
Li. – no. 99ax1ma

Additional information for the operating instructions:

In the normal operating mode, the *upper* display indicates the **active** actual value.
The *lower* display remains empty, or, according to the version and the setting, indicates the (active) set value or the manipulated variable.

If the ▲ - button is pressed the *upper* display shows the value for input 1 and
the *lower* display shows the value for input 2.

Different reactions to error messages:

An error in one of the two measurement inputs is indicated by an “Err” in the display.

By pressing the ▲ - button it is possible to determine whether the error occurred at input 1, input 2, or at both inputs.

Options to series 9..
Analog input for position feedback

Used in conjunction with controllers with three-point step output, this option allows position indication of the accessed actuator equipped with a feedback potentiometer.

A program for convenient automatic adaptation of the display 0...100% to the electrical values of the respectively available feedback potentiometer in the configuration level, is included:

Operation:
After checking or correcting the floating time "Y" actuate the P-key, possible several times,
until **"FG A"** appears in the display.
Start compensation by *pressing the P-key for a prolonged time (longer than 5 sec.),*
until a flashing **"0"** appears in the bottom display.
(*Press the P-key briefly to skip compensation.)*
Relay 2 ("-") switches ON, actuator moves to starting/closed position,
Relay 2 switches OFF, **"0"** changes to steady display

After checking the mechanically correct position, acknowledge the default value 0% with the P-key,
"**FG E**" appearing in the top display for final value compensation,
a flashing **"100"** appears in the bottom display
Relay 1 ("+") switches ON, actuator moves to end/open position,
Relay 1 switches OFF, "**100**" changes to steady display

After checking the mechanically correct position, confirm the default value 100% with the P-key
(subsequently, the system switches to the next configuration)

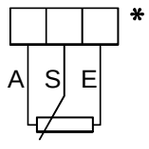
The program also checks whether the output has really caused an alteration of the position of the actuator and the potentiometer:
If identical values are measured at the start and the end, the error message "Err 300" appears.

Measuring input:	**List No.:**	**Measuring/display range**
Teletransmitter 0...100 to 0...1000 Ω	99axr	0...100.0 %

Order text:

Option:
Additional analog input 0-100...1000 Ω
for position feedback, display 0...100 %
List No. 99axr

Additional connecting terminal:



* Terminal No. per number of existing and/or required inputs:

1st analog input: Terminal 1/2/3
2nd analog input: Terminal 4/5/6
3rd analog input: Terminal 7/8/9
4th analog input: Terminal 10/11/12

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

additional device for standard signal input: alteration rate limitation

The adjustment *d* helps to avoid overshoots due to violent corrective actions, f.e.in steam contol circuits.

The additional adjustment *db* allows to restrict this influence to a part of the input range.

Order text: Additional device:
input signal alteration rate limitation
List No. 99azd*

Adjustment:
(in supplement to configuration level):

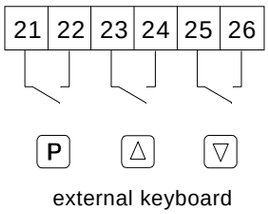
***d"** permissible speed of corrective action, % per second
(no function: adjust 0.0)
factory setting: 0.0

***db** influenced part (%) of input range
(no range restriction: adjust 100)
factory setting: 100

* = no. of measuring input

KFM-controllers of the series 92-95 can be equipped with terminals for external keyboards. For this purpose please use potential-free change-over switches, e.g. push buttons. The internal keys have priority.

Additional terminals:



external keyboard

Remarks: *To avoid cross interference use shielded cable only for the low voltage signal leads, the shelding must be earthed one-sided.*

Avoid to cross with load wires

INDEX
1
2
3
4
5
6
7
8
9
0

This function expansion makes it possible to switch over control units of series 92/93/94/95 from the internal equipment set point value to an externally specified set point value, as desired.

The analog input for processing the external set point value signal is identified on the connection terminals with the designation SPE, as well as the optional connection type of voltage (U) or direct current (I).

The voltage or current range may be configured to 0 or 2...10 V or 0 or 4...20 mA. Furthermore, the set point range allocated to the signal range is freely adjustable. The function of the value is selectable by menu as absolute (abs) adding (add) or subtracting (sub).

Depending on type, switch-over from the internal to the external set point value takes place through a binary control input (potential free normally open contact), alternative: voltage 5V...24V (type extension ..u") or is to select by menu adjustment in the set point level (F-SP: choice SP = intern or SPE = extern setpoint. (type extension "..u")

In the operating level, the incoming external set point value signal is displayed under the designation “SPE” after the set point value “SP”, once the P key is actuated again. In addition, it can be recognized whether this is currently effective, depending on the switch setting: The respective active value SP or SPE appears in the normal display, the inactive value only flashing.

Providing the set point value in the operating level is displayed in the bottom display, this display automatically switches over to the external set point value, i.e. as soon as it has been activated it displays the current effective set point value.

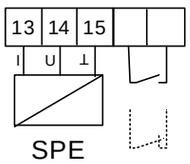
Types	**List No.**
Control input for potential free normally open contact	99bwa
Control input 0V / 5...24V	99bwau
to activate with menu function	99bwam

Order text:

Accessory equipment:
Function expansion for external set point value
with additional analog input 0/4...20mA o. 0/2...10V
control input.. / to activate.. List No.....

Additional connection terminals:

Li.No. 99bwa + 99bwam
Potential free normally open contact



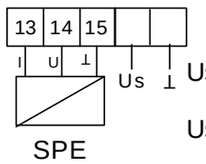
I=0/4-20mA
U=0/2-10V

*

internal setpoint is active*

external setpoint is active*
(*=only 99bwa)

Li.No. 99bwau
Switch-over with external voltage Us



I=0/4-20mA
U=0/2-10V

*

Us = 0V : internal setpoint is active

Us = 5...24V : external setpoint is active

I9awizE9610222

* Terminal No. depending on the number of available or required inputs:

1. binary input: terminal 19 (+Us) / 20 (⊥)
2. binary input: terminal 21 (+Us) / 22 (⊥)

open printversion

Accessory equipment 9..
additional set point value permitting switch-over

This function expansion for control units of series 92/93/94/95 makes it possible to enter one or several additional set point values in the operating level as an optional alternative to the main set point value SP.

Switch-over from the main set point value to a different set point value takes place through the allocated binary control input (potential free normally open contact, alternative: voltage 5V..24V (type addition "_u")). Only one contact may be switched at a time.

Providing the set point value in the operating level is displayed in the bottom display, this display automatically switches over to the external set point value, i.e. as soon as it has been activated it displays the current effective set point value.

In the operating level, the additional set point value is displayed and set under the designation “SP2” / ”SP3” for example, after the main set point value “SP”, once the P key is actuated again. In addition, it can be recognized which set point value is currently effective: The respective active value SP or SP_ appears in the normal display, the inactive value only flashing.

Order text:

Accessory equipment:
Function expansion for switching over
to additional set point values incl.
attendant binary control inputs
Li.-No. 99bwz_*: Control input for potential free normally open contact
Li.-No. 99bwz_*u: Control input 0V / 5...24V
* = Number of additional set point values

Additional connection terminals:

Li.No.99bwz_
Potential free normally open contact

*

Main setpoint is active

additional setp. is active

Li.No.99bwz_u
Switch-over with external voltage Us

*

Us = 0V : Main setpoint is active

Us = 5...24V : additional setp. is active

I99awiz9610222

* Terminal No. depending on the number of available or required inputs:

1. binary input (SP2): terminal 19 (+Us) / 20 (⊥)
2. binary input (SP3): terminal 21 (+Us) / 22 (⊥)
3. binary input (SP4): terminal 23 (+Us) / 24 (⊥)
4. binary input (SP5): terminal 25 (+Us) / 26 (⊥)

open printversion

The control function can be stopped with an external contact via a digital input.

Execution:	**List No.**
Control stop, manual function active	99bxh
for switching controllers:	
Control stop, all relays off	99bx70
Control stop, relay K2 actuated	99bx72
for permanently activated controllers:	
Control stop, corrective signal *0%*	99bx80
Control stop, corrective signal stop	99bx82
Control stop, manual function active	99bx80h
for ramp setpoint controllers:	
additional: setpoint ramp reset	-r
for additional switching contacts:	
Automatic function contact 1-4 stop, concerning relays off	99bxf1
Automatic function contact 2-4 stop, concerning relays off	99bxf2

Other executions upon request

Function:

Standard execution:
Open contact: Normal control function
Contact closed: Stopped control function

Alternative: reverse operation -u

Connection:

Refer to the wiring diagram contained in the general controller description Pg. 9200..

Note: Use a screened cable with earthing at one end for the signal lines to avoid stray pick-up, avoid close proximity to power lines.

open printversion

Special function:
Limitation of a continuous action control output

Description:

The control output of continuous action controllers can be limited to a settable value by way of a binary input or a relay linkage.

The desired maximum value of the control variable is set in the configuration level as parameter **Yhi**.

Versions:	**List No.**
Limitation by way of binary output	99bybb
Limitation by linking an auxiliary contact K1. The switching point is set as usual for K1; all standard function and allocation selection possibilities of the auxiliary contact are retained.	99bybf

By allocation of another measuring input it is also possible to trigger the limitation by conditions outside the control circuit (return temperature, other measuring value).

Alternative in each case: reverse action	.....u

open printversion

additional device for continous controllers: speed limitation of corrective action

This alternation helps to avoid overshoots due to violent corrective actions, f.e.in steam contol circuits.

Order text: Additional device:
speed limitation of corrective action
List No. 99byd

Adjustment:
(in supplement to configuration level):

tY permissible speed of corrective action, % per second
(no function: adjust 0.0)

factory setting: 0.0 %/sec

open printversion

In the *double* continuous controllers of the 9… series, this additional equipment is used to select, according to the setting, either the largest (maximum selection) or the smallest (minimum selection) of the two internal actuating signals, and to make it available at only *one* output present in hardware as a 0/4…20 mA signal.

Ordering text:

Additional equipment for continuous controllers:
Selection function for maximum or minimum selection of the internal actuating signal of a double continuous controller and connection to the position output.
List no.: 99bym

Operation:

Configuration levels (extension):

		Factory setting:	*Notes:*
1out	Position output characteristic curve control loop 1 direct / inverse "di / in"	in	
2out	Position output characteristic curve control loop 2 direct / inverse "di / in"	in	
out	Position output signal "0-20 / 4-20" mA	4-20	-------
out	Operation of the "Lo / Hi" selection	Lo	-------

INDEX
1
2
3
4
5
6
7
8
9
0

open printversion

The control loop selection facility consists of an additional binary input in order to activate one or the other of two control loops.

According to the state of the binary input, the first (binary input unconnected) or the second (binary input bridged) control loop is activated. The output of the inactive control loop is set to 0%.

Further options (available on request):

- The signal selection function also includes an additional input for an external actuating signal.
- Additional minimum / maximum – selection switching

Ordering text: Supplementary equipment:
Signal selection function for continuous 2-channel controllers
Li.-no. 99byu2

Operation (extension):

Display of the actual value:

Temporary indication in the lower display by pressing the ▲ button,
permanent display can be configured in parameter level 2

Configuration levels (extension):		Factory setting
out	Min.- / Max. selection function (Lo / Hi)	Lo

open printversion

INDEX

Additional switching contacts are avaiable type dependent, up to 8 relays per controller.

1. Adjustments on *parameter* level, seperately per each contact:

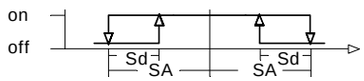
SP.. **S**witching **p**oint for independent additional contacts with own set value (type dependent).
SA.. **S**witching interval for following additional contacts, given as range (**a**bsolute value) above or below the set value of the controller.
(SA or SP alternatively, depending on the selected control function)

Sd.. **S**witching **d**ifference (hysteresis), dead zone between activating and deactivating switching function. (To the deactivating switching point it is necessary to take an adequate deviation (concerning the adjusted switching point) into account)

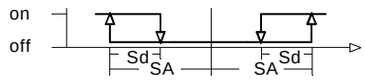
2. Selectable **switching functions** on *configuration* level, seperately per each contact:
(type dependent**)**

a) *following* contacts:

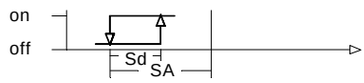
LC A Switching point on both sides of the set value (**L**imit **c**omparator). Relay drops out in case of rising deviation (**A**us)



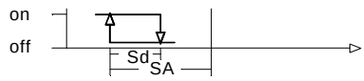
LC E Switching point on both sides of the set value (**L**imit **c**omparator). Relay cuts in in case of rising deviation (**E**in)



Su A Switching point below the set value. Relay drops out in case of decr. act. value (**A**us)



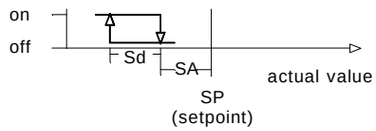
Su E Switching point below the set value. Relay cuts in in case of decr. actual value (**E**in)



So A Switching point above the set value. Relay drops out in case of rising act. value (**A**us)

So E Switching point above the set value. Relay cuts in in case of rising actual value (**E**in)

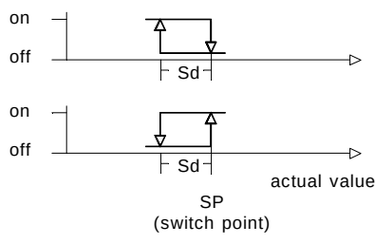
St A Heating stage below the set value. Relay drops out in case of rising act. value (**A**us)



b) *independent* contacts :

US A Relay drops out in case of rising actual value (**A**us)

US E Relay cuts in in case of rising actual value(**E**in)



3. further adjustments on configuration level:

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH.. assigned measuring input/ actual value (**ch**annel) no. .. for independent contacts or assigned control loop for following contacts

SI E "Safety" shut down (in case of measuring line fault): Relay **on**
SI A "Safety" shut down (in case of measuring line fault): Relay **off**

open printversion

Additional contact with special function: switchable common output for 2 control channels

INDEX

1
2
3
4
5
6
7
8
9
0

Additional device (only) for dual controller type 927030..

In devaition to the normal device (1 output for each control loop) there is only one output for both control loops.

Depending on the switching state of the additional contact (relay 3) the control channel 1 or the control channel 2 is connected to the output.

additional contact switched off: control channel 1 is connected to the output
additional contact switched on: control channel 2 is connected to the output

Besides the switching state of the additional contact (relay 3) the LED 3 gives the additional information of the active control channel.

The adjustments and the other functions of the additional contact are equal to the normal device.

Type:	**List - No.**
1 common output, switchable to control loop 1 or 2	99f1u
option: the setpoint of the 1st control channel(1 SP) can be adjusted at the configuration-level (for this setpoint the setpoint limitations 1 Lo/Hi are dropped)	99f1u2

open printversion

Optional equipment:
Auxiliary control circuit with limiting function

The limiting function consists of an additional control circuit with its own measuring input and its own settings (CH2), intervening in the output of the main control circuit. The function mode (min. or max. limitation, effective direction) can be set per menu.

Function:

In the case of 3-point step controllers the relay of one control direction (depending on the presetting) is locked and the relay of the other control direction is activated in increments as soon as the set limit value is exceeded or undergone. This causes the current position of the actuator to be maintained or adjusted so that the limit value is maintained.

In the case of continuous action controllers the larger or smaller current control signal, depending on the presetting, is selected from the two control circuits and switched to the output. In this way the control signal of the auxiliary control circuit is given priority as soon as the set limit value is no longer maintained.

Versions:	**List No.:**
Optional equipment for 3-point step controllers auxiliary control circuit with limiting function incl. additional input Pt100* (0..400°C)	99g7
Optional equipment for continuous action controllers auxiliary control circuit with limiting function incl. additional input Pt100* (0..400°C)	99g8

* alternatively other measuring inputs (type accessories such as main type Pg. 92)

Operation (supplement):

Actual value display:

Short-term display in the bottom display by actuating the ▲-key,
continuous display in the parameter level 2 can be configured

Setpoint value setting:

Actuate the P-key until "**2SP**" appears,
set the desired value using the arrow keys.

Parameter level1 :

After calling up the parameter level select **CH 2**.
Call up and set the parameters in succession as for CH1.
*Attention:: Do not change the setting of parameter **CH 1** for the main control circuit!*

Configuration level:		*Factory setting*
2out	effective auxiliary control circuit direction direct / inverse (di / in)	in
out	min. / max. limiting function (Lo / Hi)	Lo

open printversion

This function expansion is designed to transmit actual values, set point values, additional correcting variables, etc. as standard signals from series 92/93/94/95 control units to display units, PLC or IPC.

The current or voltage range can be configured at 0...20mA, 4...20 mA, 0 ...10V or 2...10 V.
The signal range can be set as minimum and maximum value.

Designs:	**Type**
Output signal 0/4...20mA	99og.
Output signal 0/2...10 V	99ok.
As alternative:	
Actual value	x
2 actual values	xx
Set point value	....w
Actual value + set point value	....xw
dc decoupled (isolated), suffix:	.....t

Additional designs available upon request

Order text:

Accessory equipment:
1(2) analog signal output(s) ...(mA,V)
for ... (value) and ...-(value)
Adjustable range
Li. No. 99o.....

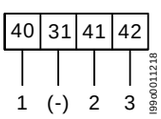
Operation:

Parameter level 2 (supplement):		*Factory setting*
(1)S Lo	Beginning of range setting (display value)	*(same as controller)*
(1)S Hi	End of range setting (display value)	*(same as controller)*

Configuration level (supplement):

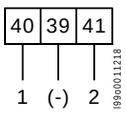
Sout **Sou1(2)**	Assignment of information signal (value): Ist1 = Act.1/ Ist2 = Act.2/ Setp. = SP/ control output =Y	*Ist 1*
Sout **Sou1(2)**	Selection of information signal (type): 0-20 / 4-20 mA or 0-10 / 2-10 V	*4-20*

Additional connecting terminals:



1 = Signal output 1
2 = Signal output 2
3 = Signal output 3
(-) = common reference potential

isolated design:



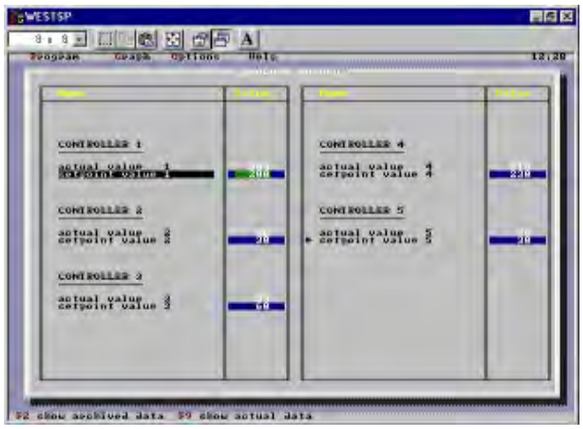
1 = Signal output 1
2 = Signal output 2
(-) = common reference potential

* only available according to type

open printversion

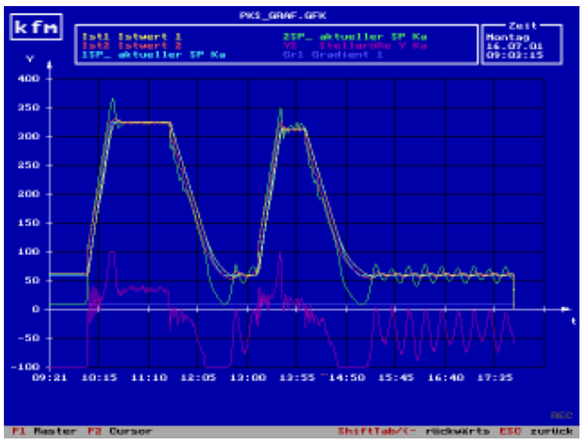
The basic version of the KFM – PCS interface software offers three different functional areas, which can be optionally and independently used. All are distinguished by simple handling. Optionally the software can be adapted to the customer requirements.

1. Summary Display of all Controllers



On starting, the program automatically searches for the connected controllers, and the summary display appears.
Actual and set values are displayed, together with other equipment dependent values. Also the display of status and error messages is possible. Some of the displayed settings can be changed and these have immediate effect in the controllers.

2. Graphical Display (Line Recorder)



The data arriving from each controller can be displayed as a separate, continuous diagram. Recordings made previously can also be recalled and displayed.

3. Automatic Data Recording (Logger)

The actual and set values, along with other values if chosen, can be automatically and continuously stored in a file. This file can be displayed as a graph, or may be used by other programs. The recording rate can be adjusted, as well as the number of recorded files that are archived before the oldest is overwritten.

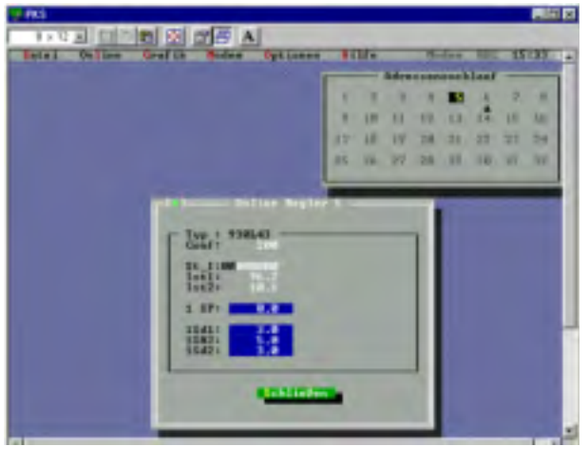
4. Customer-Specific Options

A wide range of other additional equipment is available, including parameterisation and configuration of the individual controllers, set value programs with direct editing facilities, and pre-calculated graphical display for each controller.

Order designation:	**Li. – no.**
KFM - PCS Interface Software	99pcs1

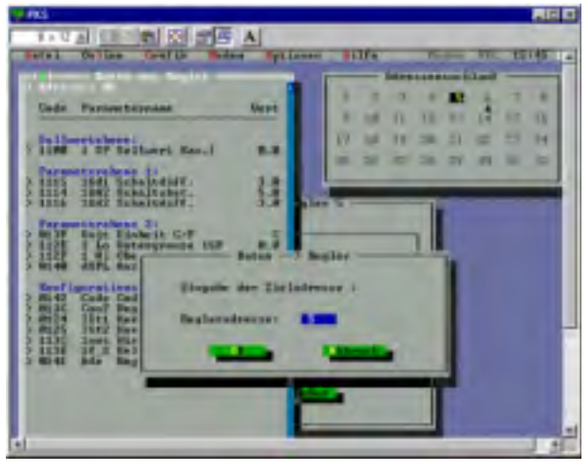
open printversion

The interface software KFM – PKS offers four different function areas, which can be optionally and independently used. The software is distinguished by simple handling.



1. Online remote operation

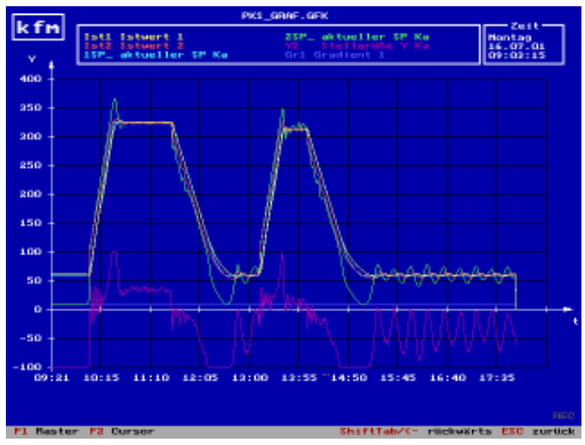
On starting, the program automatically searches for any connected controllers. A window then appears, displaying the actual value, set value and parameters of the first controller found. All settings are displayed can be changed; changes have immediate effect in the controller. If more than one controller is connected (RS485 only), the required controller can be selected via a menu.



2. Data transfer

Optionally also the complete parameter block of the selected controller can be read out, edited, displayed as a table and printed out under DOS.

It is also possible to save the complete parameter setting as a file. Equally, parameter sets that have already been saved can be loaded into the controller.



3. Graphical Display (Line Recorder)

The data arriving from the controller can be displayed as a continuous diagram. Recordings made previously can also be recalled and displayed.

4. Data Recording (Logger)

Up to six types of data arriving from the controller can be stored continuously in a file. This file can later either be recalled and displayed as a graph, or can be used by other programs.

Order designation:	**Li. – no.**
KFM - PKS Interface Software	99pks1

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

General information:

Series interfaces enable digital communication with computers or higher ranking control systems. An RS 232 interface permits connection of one controller per computer interface. The RS485 interfaces enable the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level).

Technical data:

Interface:	RS232	RS485
Connection:	series, asynchronous 2 wire (+GND)	series, asynchronous 2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Dead-end feeder length:	15m	2m
Max. number of controllers:	1	31
Transfer rate:	9600 Bit / s	9600 Bit / s

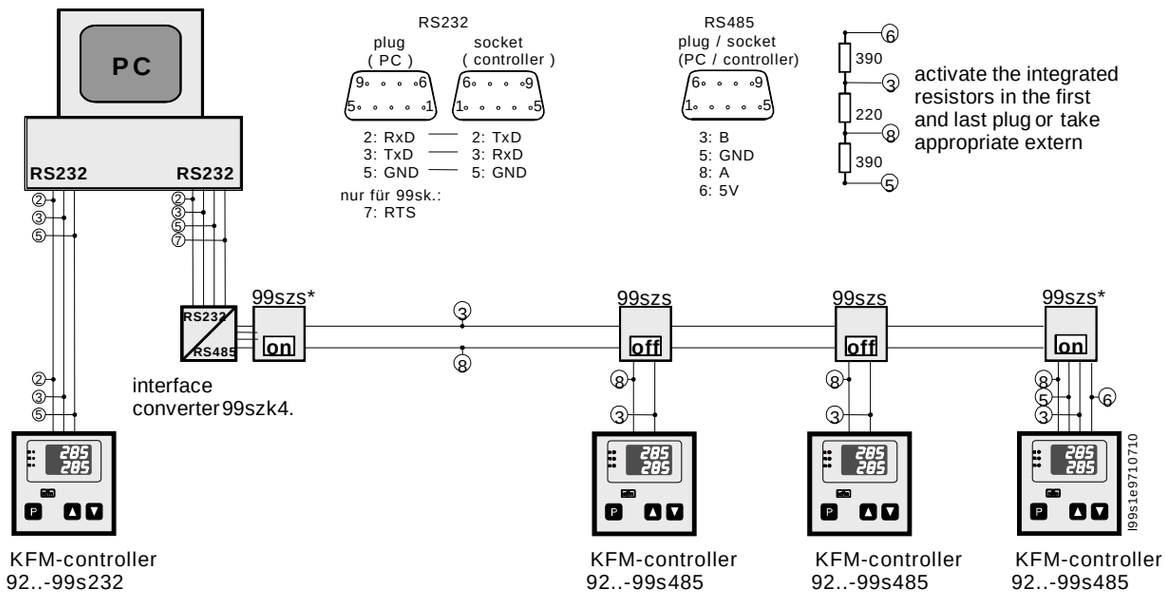
Hardware prerequisites:

IBM XT, AT or compatible PC, SPS etc.
RS232: series interface RS 232 (COM 1, COM..)
RS485: ser. interface RS485, alternative: RS232 with interface converter RS232/RS485 (KFM 99szk4)

Connection lines:

Use screened lines to connect the interfaces (e.g. KFM 99szl.). Place the screening on the controller earthing terminal. Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate extern resistors.

Wiring example



open printversion

The series field bus system INTERBUS-S offers an optimum solution to minimize wiring. The input and output assembly groups, e.g. of a PLC become unnecessary, instead all INTERBUS-S subscribers are directly activated by an INTERBUS-S controller card in the PLC. A bus cable is connected from subscriber to subscrib and the entire communication of the individual control units takes place via this bus line.

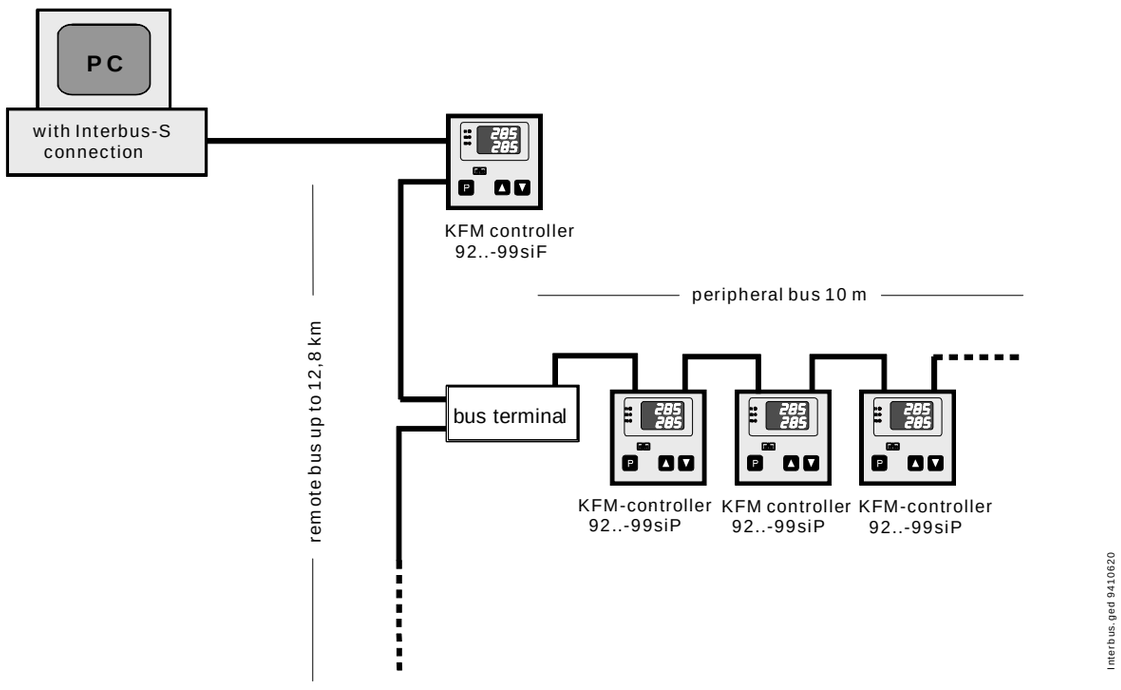
INTERBUS-S interfaces in KFM controller replace the wiring of external analog signals (external set point values, actual value, set point value outputs, etc.). Up to 8 values or parameters can be cyclically read and described via the INTERBUS-S. The bus connection is available in two versions. In both versions, the bus connection is isolated from the controller potential.

1. INTERBUS-S peripheral connection
A peripheral bus subscriber is used wherever the spatial distance to the next subscriber is limited to less than 10 m (e.g. switch cabinet). The connection to the higher ranking remote bus is undertaken with a so-called bus terminal. The physical connection on the controller takes place via a 15 pole D-SUB plug or 15 pole D-SUB-socket.

2. INTERBUS-S remote bus connection
The remote bus subscriber is always used when large distances must be bridged. For the remote bus, the physical connection at the controller takes place via a 9 pole D-SUB plug or 9 pole D-SUB socket.

Technical data:

Protocol:	INTERBUS-S (cyclical data exchange)
Max. expansion:	10m (peripheral bus) / 12.8 km (remote bus)
Interface:	TTL (peripheral bus) / RS 485(remote bus)
Data protection:	CRC 16
Max. number of I/O points:	4096
Telegram format:	Total frame message
Access procedure:	Master-Slave
Typical cycle time:	1024 I/O points in 3.7 ms reading and writing
Baud rate:	500 kBaud



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

The PROFIBUS serial fieldbus system helps to minimise the amount of cabling. Input and output modules, suc as a PLC, become unnecessary. Instead of this, a bus cable is connected from one device to the next, and the entire communication between the individual control devices takes place over this bus line. All the PROFIBUS devices are addressed directly by the PROFIBUS controller card in the PLC or in the master computer.

In KFM controllers, the PROFIBUS interface replaces the cabling of external analogue signals (external set value inputs, actual values, set value outputs etc.).

TYPE 99spd: PROFIBUS-DP slave connection
The Profibus DP connection is implemented in accordance with EN 50170. The controller is connected directly to the bus line via a 9-pin D-SUB socket.

Technical data:

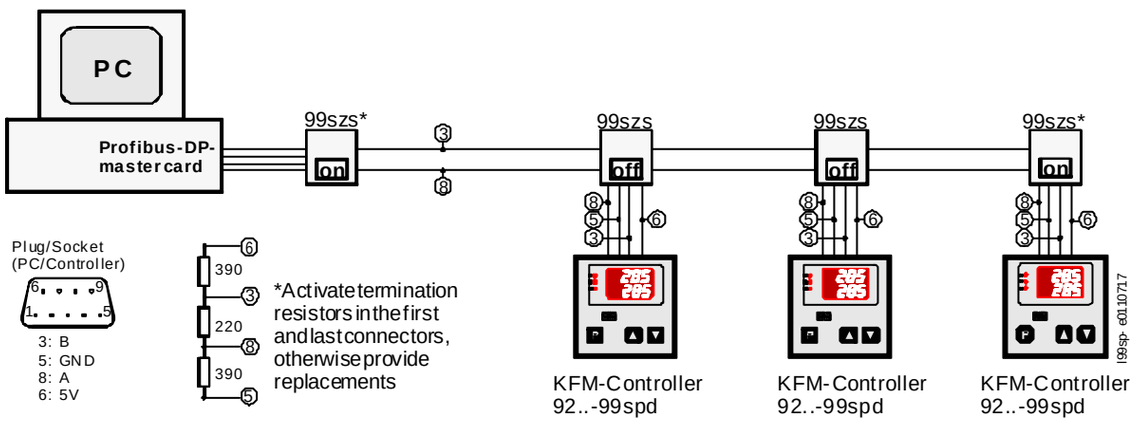
Protocol:	PROFIBUS-DP
Topology:	Linear bus with bus connections at each end
Interface:	RS 485
Addressing:	0...126 (can be set in the controller using a menu)
Max. number of devices:	32 per segment, can be increased to 127 with a repeater
Data format:	Modules for fixed or floating point data transmission
Baud rate:	Automatic baud rate detection up to max. 12 Mbaud

For other data, see the GSD file in the appendix

Pin-out of the 9-pin connector:

Pin no	Identification	Description
3	RxD / TxD-P	Receive/send data plus
4	CNTR-P	RTS control signal for optical fibres
5	DGND	Data reference potential for termination resistors
6	VP	5 V supply for termination resistors
8	RxD / TxD-N	Receive/send data minus

Wiring example:



open printversion

Operating instructions

Parts lists

Installation:

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.

Observe the ambient temperature limits (-20...+110°C), if necessary, for higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Pneumatic connection:

The control pressure has to be regulated by means of a reducing unit.
For protection of aktuators, the reducing unit should be combined with filter unit.

The pneumatic supply tube has to be connected to the free thread connection G 1/4" on the pressure side of the actuator. The thread connection on the oposite spring side of the actuator is protected with the sealing cap. The vent hole in the cap must stay free.

By operating mode "spring closes", the pneumatic connections are situated by three way valves on the upper side of the actuator, by two way valves on the lower side of the actuator.
By operating mode "spring opens" is this reverse.

The right mounting side for pneumatic connection can be controlled with stroke indicator:
position without air supply up: pneumatic connection up,
position without air supply down: pneumatic connection down

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Undertake maintenance on the drive in accordance with the corresponding information in the separate operating manual.

open printversion

Disassembly of actuator:

- Move actuator with actuating pressure into the middle of the stroke
- Loosen headless setscrew in the cap nut (21)
- Secure coupling (20) position (width across flats 32), unscrew** cap nut (21)
- Unscrew nut (23)
- Remove actuator from valve
- Let off actuating pressure

Assembly of actuator:

- Position actuator onto valve, tighten nut (23)
- Move actuator into middle of stroke with actuating pressure
- Secure coupling (20) position (width across flats 32)
- Tighten cap nut (21) and headless setscrew
- Move valve into end positions, if necessary, and adjust clamping rings towards position indicator (17)

** ***Note:*** *Ensure that the position of coupling (20), indicating plate (19) and fastening nut (18) is not altered, otherwise the starting point of the actuator will require resetting.*

Setting the starting point

Ensure that the actuator is readily assembled on the valve before setting.
Release lock nut (18) (see fig. 1) on the actuator spindle (16) and screw slightly in the direction of the actuator. Temporarily remove the indicating plate (19) located beneath.

Set the desired starting pressure for the actuator on the control air reducing unit. If the access is performed via a positioner, set it to the maximum actuating pressure by the appropriate input signal.

Screw coupling (20) onto the actuator spindle (16) until the valve spindle is just in the CLOSED position or starts moving in the OPEN direction.

If the coupling cannot be adjusted sufficiently on the drive spindle, first of all adjust the coupling ring (22) by approx. 5 mm. It is accessible after the cap nut (21) has been screwed off the coupling (20) and can be turned slightly up or down on the spindle.

First of all loosen the headless setscrews of the position securing element on the coupling ring and cap nut. After completing the measure, ensure that all parts are restored to their original status.

Subsequently, reattach indicating plate (19), secure with lock nut (18) and restore to the normal operating status on the pressure reducing unit or positioner.

Exchanging the diaphragms

- Dismantle actuator from valve - as described above
- Unscrew coupling (20) and nut (18) from the drive spindle (16)
- Remove nuts and screws (5) and diaphragm lid (1)

Attention: *All actuators contain two long screws. Ensure that these screws are loosened last and uniformly on both sides to reduce the spring pretension / preloading.*
Non-observance of this information entails risk of injury !

- Remove springs (2) and spindle-diaphragm-diaphragm plate unit
- Secure spindle (16) position (width over flats 13) and screw off screw (4) together with retaining ring
- Remove clamping element (3) and diaphragm (8), insert new diaphragm (8) and clamping element (3)
- Replace retaining ring, insert screw (4) and tighten against the spindle (16)
- Insert springs (2) and spindle-diaphragm-diaphragm plate unit, ensuring at the same time that the springs are correctly positioned in the diaphragm plate (6) and the diaphragm is aligned in relation to the screw holes
- Put diaphragm lid (1) in place and align, insert screws (5) commencing with the two long screws and tighten in a cross pattern with the nuts
- Screw coupling (20) and nut (18) onto the actuator spindle (16), insert indicating plate (19)
- Mount actuator onto valve - as described above
- Set the starting point - as described above

open printversion

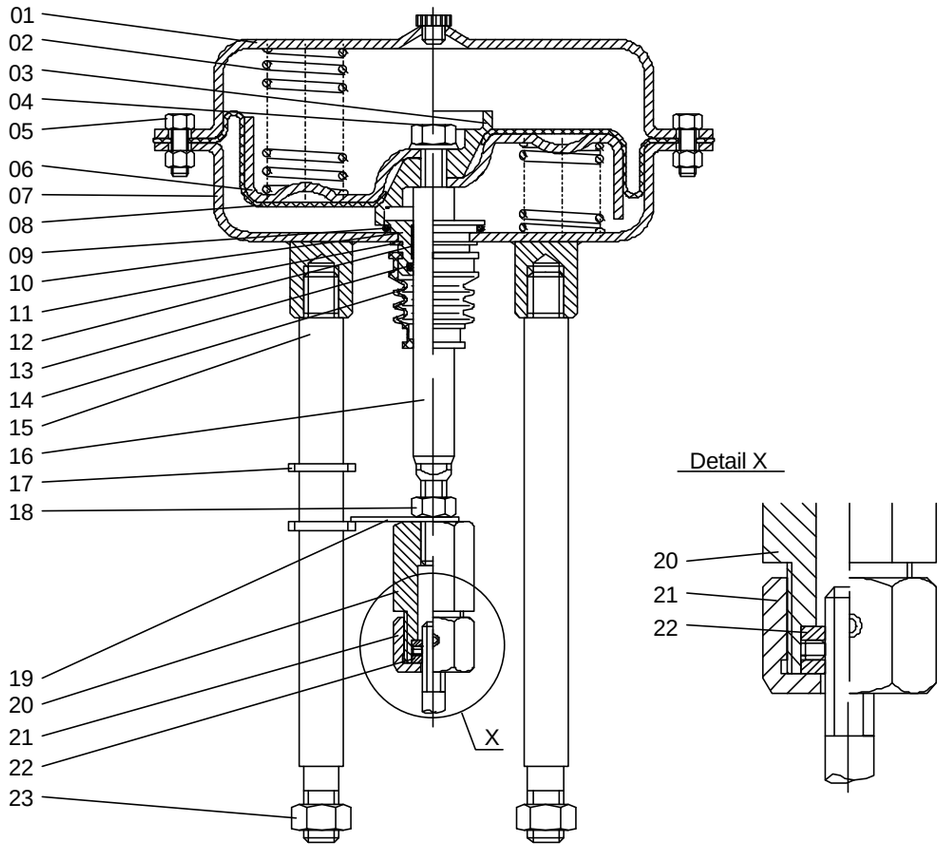


Fig. 1

No.	Designation	Part-No.
01	Diaphragm lid	f5h
02	Spring	f5f ***
03	Clamping element	f3ks
04	Screw M12 with retaining ring	e8av1230+f8ds12
05	Screw M8 with Nut	f8av0825+f8mv08
06	Diaphragm plate	f5mt
07	Diaphragm housing	f5b
08	Diaphragm	f5m
09	O-ring	f5o38x4
10	Spindle guidance	f3sd
11	Seeger-ring	f5sr31
12	Guiding tape	f9fb
13	O-ring	f5o18x3
14	Bellow	f5gf
15	Mounting rod	f3s200
16	Spindle	f3s12
17	Stroke indikators	e5ak
18	Nut M12	f8mv12f
19	Indicating plate	f3ab
20	Coupling	f3k60
21	Cap nut	f3um3/4
22	Coupling ring with headless setscrew	e3sr10 ****
23	Nut M16 with spring ring	e8mv16+e8fv16

*** = Stroke and control pressure dependent
**** = Only for valve spindle with thread M10

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.
Observe the ambient temperature limits (-20...+60°C), if necessary, provide a drive heater at lower temperatures, and for higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Electrical connection:

Check supply voltage according to the rating plate, loosen screws on the motor hood and remove hood

Route signal and control lines separately from high-voltage lines, if necessary, run in screened cables. Insert cables (1.5 mm²) through a wringing nipple or cable screw connection.

Perform electrical connection with the supply voltage switched off according to the connection diagram (observe VDE and EVU regulations).

In the event of deviations, the connection diagram in the motor hood has precedence

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Undertake maintenance on the drive in accordance with the corresponding information in the separate operating manual.

Attention:

- *Adjustment of and work at the actuator may only be done by skilled labour*
- *Disconnect the mains connection before removing the cover*
- *Observe local instructions and terminal diagram*

Electrical connection:

The signal and control lines must be laid separately from the mains lines.
The signal lines must be encased in a shielded cable.
The cable cross-section must be laid out according to the actuator otput and the necessary cable lenght.

- Check the mains voltage according to the name plate
- Disconnect the mains connection
- Loosen the cover screws and remove the bonnet
- Insert the cable into the conduit fitting PG11
- Connect the wires according to the circuit diagram
  In case of discrepances the circuit diagramm in the bonnet has priority
- *Pay attention to the direction of operation: (*view for the direction of operation: fig. 3)
  voltage on the terminals 1/2 rotates the driving shaft to the right (clockwise)
  voltage on the terminals 1/3 rotates the driving shaft to the left (counterclockwise)
- Reinstall the bonnet and tighten the screws

Adjustment of the limit switches (fig. 1)**:**

The limit position switching is caused by effect of the cam discs N1 and N2 to the travel switches S1 and S2.
For the clockwise direction of operation: S1;
For the counterclockwise direction of operation: S2.
The switch points are continuously adjustable.

Adjustment:
The actuator has to switch off prior to the mechanical limit stop of the valve to avoid gear damages

- Loosen both screws of the cam disc on the respective height
- Move the actuator electrically into the desired position
- Switch off motor
- Twist cam disc until limit switch switches
- Retighten the screws of cam disc
- Drive actuator into both end positions to check the adjustment, readjust if necessary

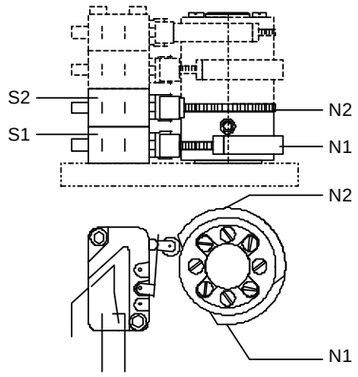


Fig. 1

Adjustment of the additional signal switches (fig. 2)**:**

- As described for the limit switches
  switch S3
  switch S4

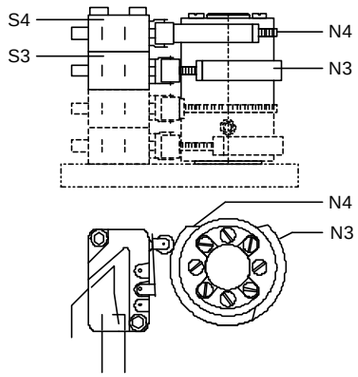


Fig. 2

Adjustment of the feedback potentiometers

The end positon of the potentiometers are automatically adjusted by slide couppling.
For this it is necessary to drive the actuator electrically in *both* end positions by commissioning (max rotation angle 105°).

open printversion

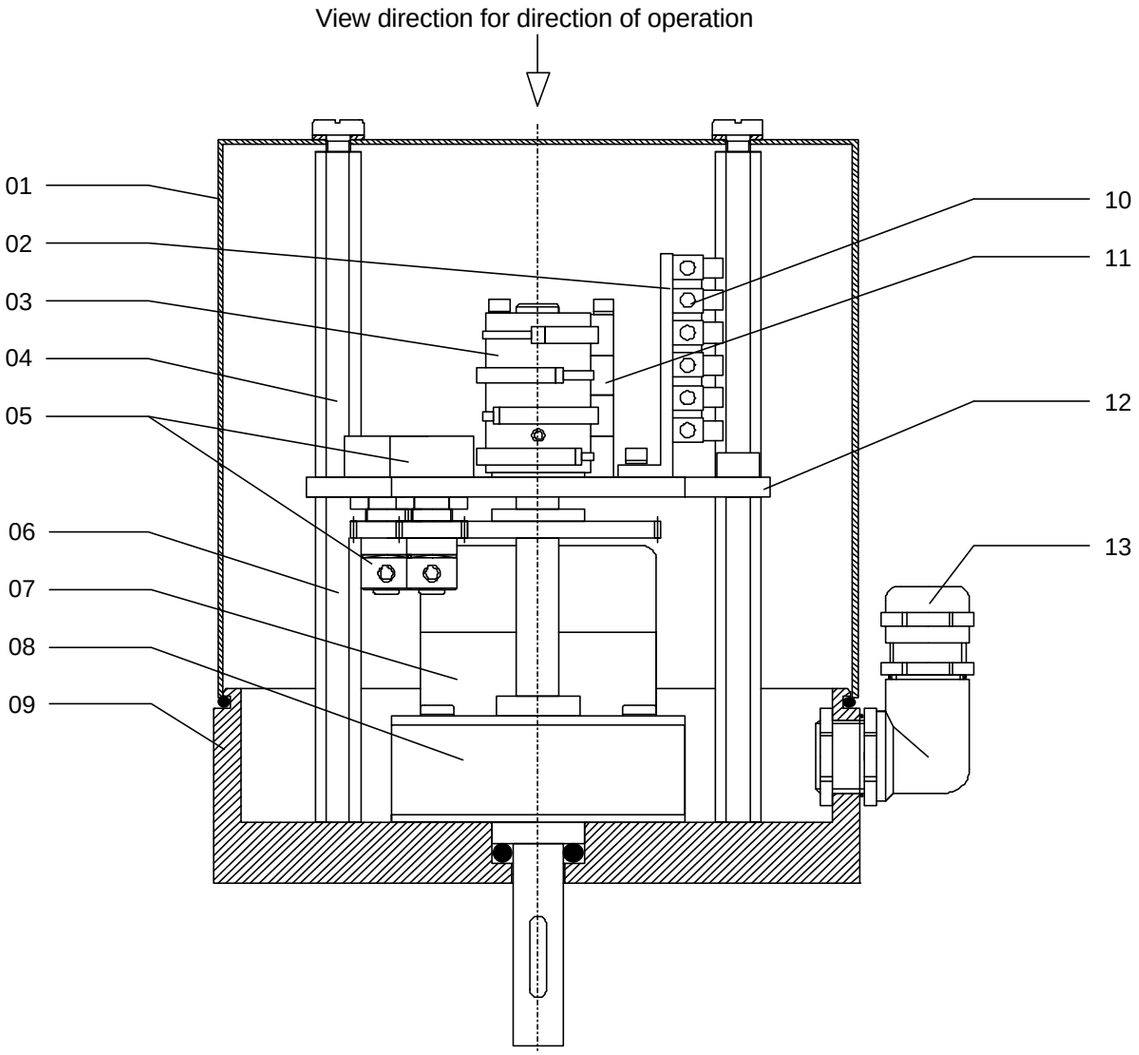


Bild 3

No.	Designation	Part-No.
01	Bonnet	e3h136
02	Terminal plate	d3hb
03	Cam block	dhn
04	Spacer column	d5d0680l
05	Potentiometer complete with pinion and slide coupling	dhp2
06	Spacer column	d5d0680
07	Motor 230V / 50/60Hz with capacitor ***	dhm220
08	Gear complete with pinion, O-ring and parallel key***	dhg1000
09	Base plate	d3gp
10	Terminal bars	e6k12
11	Switches	e5wsr
12	Mounting plate	d3zp
13	Conduit fitting PG11	dhkv

*** = only for standard actuator: voltage 230V / 50/60Hz, operating time 40s by rotation angle of 90°

open printversion

Attention:

- Adjustment of and work at the actuator may only be done by skilled labour
- Disconnect supply before removing the cover
- Observe local instructions and terminal diagram

Actuator disassembly:

- disconnect supply
- loosen fixing screw (21) (see Fig.1)
- unscrew coupling nut (19)
- unscrew nuts (18)
- take off actuator from valve connection

Actuator assembly:

- lift actuator onto valve connection and secure nuts (18) (see Fig.1)
- tighten (19) coupling nut and fixing screw (21)
- connect lines acc.to wiring diagram
- if necessary, move actuator in both limit positions and adjust stroke indikators (17) on mounting rod

Maintenance: the spindle has to be kept cleen and lubricated, if necessary, lubricate the spindle with molykote including grease

Limit switches adjustment:

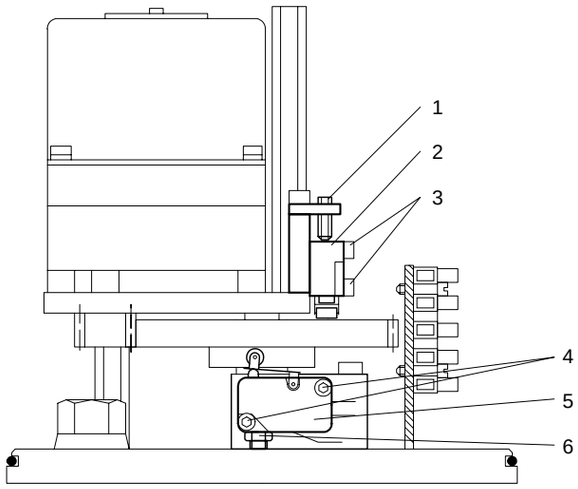


Fig. 2

Upper limit switch:

- turn adjustment screw (1) (see Fig.2) anticlockwise abuot three rotations
- loosen slight hexagon socket head cap screw (3), push switch (2) upwards
- switch on the control voltage on terminal "2" (see wiring connection), and drive the valve electrically into the end position "down" until the motor blocks (another motor sound, the switch doesn't turn off)
- switch off the control voltage
- turn adjustment screw (1) clockwise until the switch (2) turns off plus 1 1/4 rotations
- tighten slight hexagon socket head cap screw (3)
- controll adjustment (drive the valve electrically once more into the end position "down")

Lower limit switch:

- turn adjustment hexagon screw (6) (see Fig.2) clockwise abuot three rotations
- loosen slight hexagon socket head cap screw (4), push switch (5) downwards
- switch on the control voltage on terminal "3" (see wiring connection), and drive the valve electrically into the end position "up" until the motor blocks (another motor sound, the switch doesn't turn off)
- switch off the control voltage
- turn adjustment hexagon screw (6) anticlockwise until the switch (5) turns off plus 1 1/4 rotations
- tighten slight hexagon socket head cap screw (4)
- controll adjustment (drive the valve electrically once more into the end position "up")

open printversion

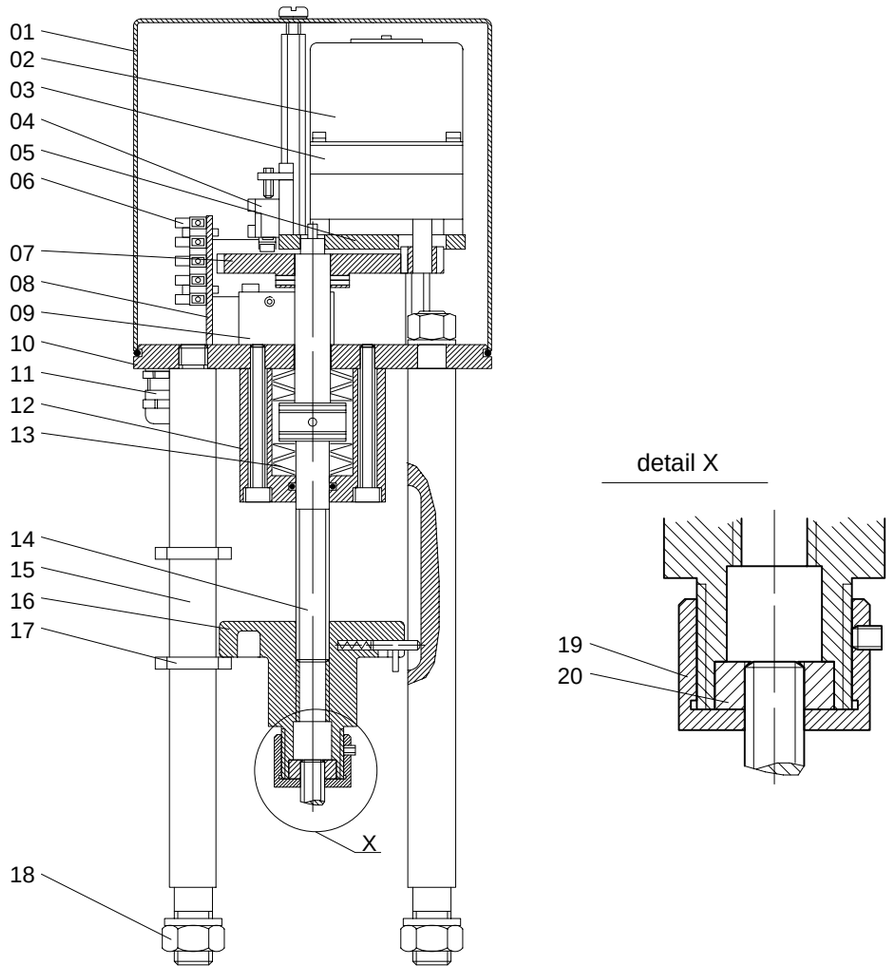


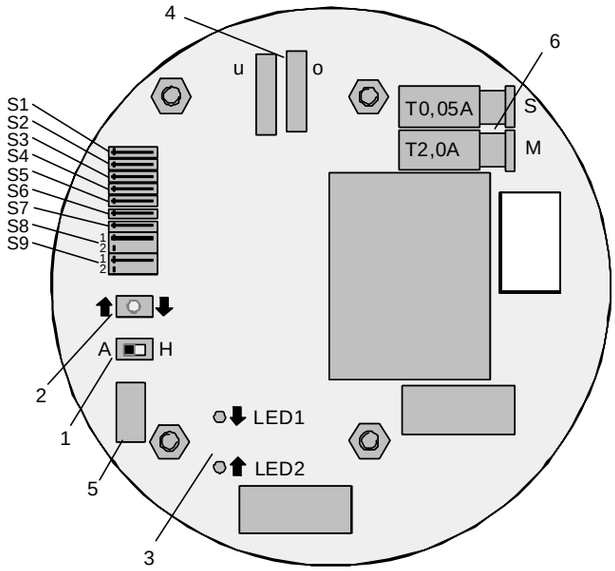
Fig.1

No.	Designation	Part-No.
01	Bonnet: 2kN / 4kN	e3h136 / e3h180
02	Motor 230V / 50/60Hz: 2kN / 4kN***	e2m220 / e2m220.4
02a	Capacitor: 2kN / 4kN	e2k033 / e2k068
03	Gear: pos. speed 3,3s/mm / pos. speed 2,2s/mm	e2g1875 / e2g1250
04	Limit switch for spindle position "down"	eheo
05	Mounting plate for motor	e3zp
06	Terminal bar	e6k12
07	Gear wheel	e3zr75
08	Mounting plate with wiring diagram	e3hb
09	Limit switch for spindle position "up"	eheu
10	Base plate	e3gp
11	Screw-type cable bushing PG11	e1kv11
12	Spring housing	e3fg
13	Set of disc springs	e5ft355+e5fs335
14	Spindle	e3s
15	Mounting rod***	e3s... / e3s...n
16	Hand wheel with blocking lever	ehhr
17	Stroke indicator	e5ak
18	Hexagonal nut M16	e8mv16
19	Coupling nut	e5vk
20	Screw collar ring***	e3sr...

*** = only for standard actuator: voltage 230V / 50/60Hz, mounting rods lenght 218mm, valve spindle M10

open printversion

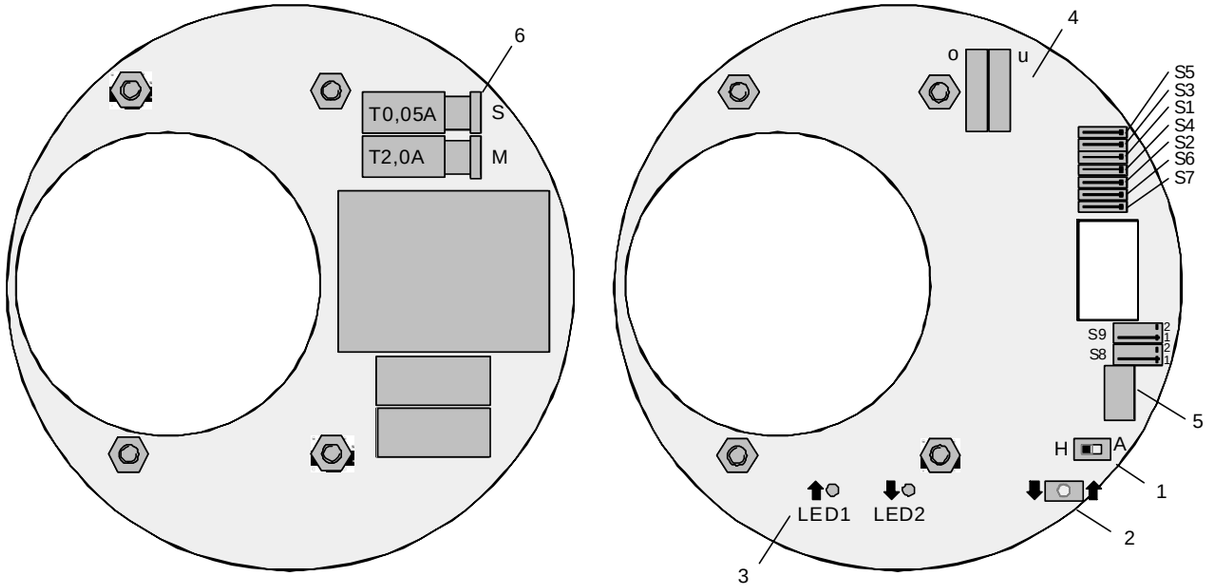
Version for 2000N-actuator:



1) Switch manual/auto:
   A - auto
   H - manual
2) Manual control:
   ↓ - down
   ↑ - up
3) Funktion indication LEDs:
   LED1 - ↓ - down
   LED2 - ↑ - up
4) Adjustment potentiometer:
   o – upper end position
   u - lower end position
5) Potentiometer Xsh
6) Fuses:
   S – for electronics
   M – for relays

S.) Switches
   (see table)

Version for 4000N-actuator:



Positions of switches S1- S9 (preadjusted):

Signal	S1	S2	S3	S4	S6	S9
0...20mA	open	open	open	open	open	position 1
4...20mA	open	closed	open	open	open	position 2
0...10mA	closed	open	open	open	open	position 1
10...20mA	closed	open	open	closed	open	position 1
4...12mA	closed	open	closed	open	open	position 2
12...20mA	closed	open	closed	closed	open	position 2
0...10V	open	open	open	open	closed	open

Operating direction	S8 (Two-way-valve)	S8 (3-way-valve)
direct (by min. signal is the straightway closed)	position 2	position 1
inverse (by max. signal is the straightway closed)	position 1	position 2

open printversion

Electrical connection:

- Check supply power acc. to name plate
- Loosen bonnet screws and remove bonnet
- Lay signal and control lines separate from the power curret lines or use shildes cables
- Insert cable (1,5mm²) into twist clamp or conduit fitting
- Connect wires acc. to diagram with power supply switched off
  (observe local instructions and terminal diagram)

Manual operation:

- Turn switch (1) to position "H"
- Drive the valve with the key into desired position, the mating LED will shine
- Turn switch (1) back to position "A", if necessary

Adjustment modification / inspection:

The actuator is delivered ready for operation, an adjustment of positioner is normally not necessary. Improper modification can couse defective actuator function.

Input signal range / operating direction: with switches S.. (see the tabel).

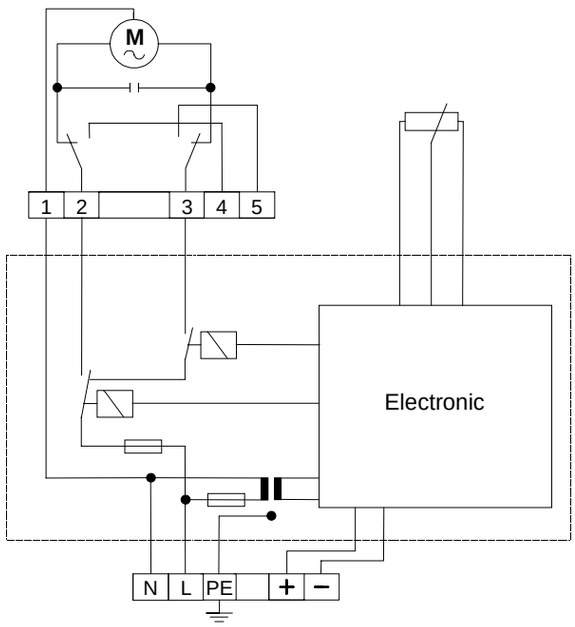
Sensitivity of response: potentiometer Xsh
Right hand turn:lower sensivity; Left hand turn:higher sensivity

Adjustment of end positions *(potentiometer Xsh should be turned in the middle position):*

- Adjust input signal for OPEN-position (two-way-valve) or CLOSED-position (three-way-valve) The valve drives to the upper end position, LED 2 shines. If not, correct adjustment with potentiometer "o" (end position switch should release and LED 2 should shine)
- Modify input signal at about 1% in direction down, correct adjustment with potentiometer "o" until LED 2 go out
- Adjust input signal for CLOSED-position (two-way-valve) or OPEN-position (three-way-valve) The valve drives to the lower end position, LED 1 shines. If not, correct adjustment with potentiometer "u" (end position switch should release and LED 1 should shine)
- Modify input signal at about 1% in direction up, correct adjustment with potentiometer "u" until LED 1 go out

Check the start and end adjustments again and modify, if necessary

Function and connection:



open printversion

Installation:

The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel.
Provide suitable measures to absorb possible tensile and pressure forces.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

For operating from a distance, a release cord (supplied by customer) should be fastened on the toggle clamp lever

Operation:

Emergency stop valves:

Operation readiness:	push the toggle clamp lever up past dead center to open the straightway of the valve and to pretension the actuating spring.
Emergency stop:	the actuating spring will close the straightway of the valve when the toggle clamp lever will be moved back past dead center with the release cord.

Emergency outlet valves:

Operation readiness:	push the toggle clamp lever down past dead center to close the straightway of the valve and to pretension the actuating spring.
Emergency outlet:	the actuating spring will open the straightway of the valve when the toggle clamp lever will be moved back past dead center with the release cord.

Attention! *The lengthening lever must be removed from the toggle clamp lever after the valve was prepared for operation readiness (injury danger by emergency function release).*

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Occasionally lubricate the slide guide on the toggle clamp.

open printversion

Installation:

The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel.
Provide suitable measures to absorb possible tensile and pressure forces.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Function:

The overflow valve is a two way valve with spring load.
The spindle sealing is a double wall VA-bellow and safety stuffing box.
The valve plug is a regulating plug type with linear flow characteristic. Hereby, a sudden pressure fall is prevented when the valve responds.

The valve opens the straightway against outside spring when the differential pressure on the valve plug is rising. The response pressure is adjustable in 1...6 bar range. The preloading of the spring can be changed with the adjusting key and the adjusted response pressure is schown on the scale.

The adjusted overflow pressure is not an absolute value, it is a differential pressure between inlet and outlet of the valve.

Operation:

The necessary overflow pressure can be adjusted with changing of the position of the upper spring plate. For this, an adjusting key is delivered. The value of the adjusted overflow pressure is schown on the scale in range of 1...6 bar. Right hand turning of the key causes rising of response pressure, left hand turning causes falling of response pressure

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Occasionally lubricate the bearing, the adjusting nut and the thread spindle.

1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)

DIN-certificate: TR (TW) 949 97

Brief description:

KFM 92 is a microprozessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation.

An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logik output	..L

function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
Interbus S interface	(99) si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.'

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 8 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Operating status:

The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)

The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.

(optional: switch on and off using separate ⟲ - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)

The *lower diplay* shows „H *“ and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ⟲ - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates „-Ad-“.
Cancel: P - key >5 sec again

open printversion

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position „**U**“ = unlocked
(Lock access after the adjustments: Switch position to „L“ = locked).

After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.

*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter „Optimization“)	25,0	___
***I**	integral action time Tn (min) (ref. to chapter „Optimization“)	7,0	___
***d**	rate time Tv (min) (ref. to chapter „Optimization“)	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - ke**y,**
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

***** = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position „u“)

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: „-Ad-“,
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

open printversion

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position „**U**“ (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to „L“= locked)

Hold down the P - key and press the ▲ - ke**y,**
hold down both keys for more than 5 sec. until the display changes

CodE 0 — Enter the code number (password) ▼...▲ (1...9999), factory setting: **1**
move on to next input: *briefly* press P - ke**y**

Cod 1 — Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)

ConF 702 — Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.

ISt 1 0.0 — Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: „rtd / Iu“	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator „6...600“ (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: „2...120“ (sec.)	*20 sec.*
***out**	adjusting kind of output signal „0...20/ 4...20(mA)/ 0...10/ 2..10(V)”	*4...20 mA*
***out**	adjusting output characteristics direct / inverted „di / in“	*in*
	(for 2 output signals:“in in / in di / di in / di di“)	
***td**	for 2 output signals: deadpoint between output 1 and 2 „0...10%“	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal „0..20/4..20(mA)/0..10/2..10(V)“	*4...20 mA*
Sou*	adjusting kind of information signal „Ist/Soll..“ (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:“rel1 / rel2 / AUS“ (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: „0...100“ (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: „SiE/SiA“(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

***** = In case of multiple measuring inputs or control loops: relay- or channel number

open printversion

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

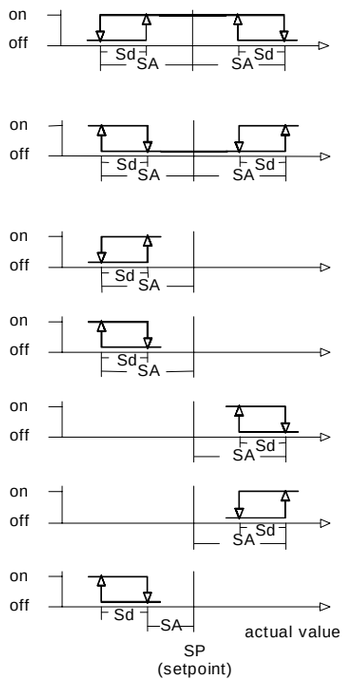
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

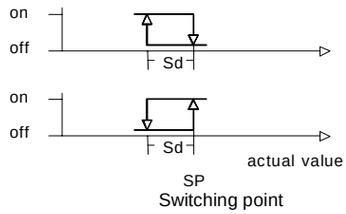
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

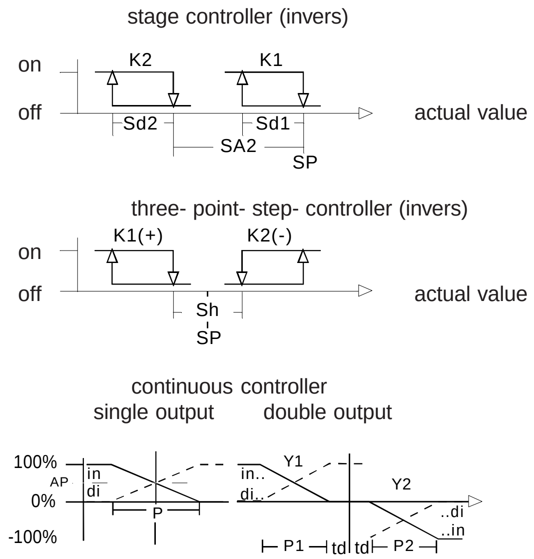
Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP.(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

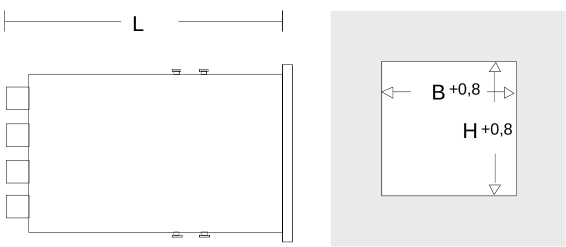
open printversion

Characteristics:
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
(parameters depending on sub type:)
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K



Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

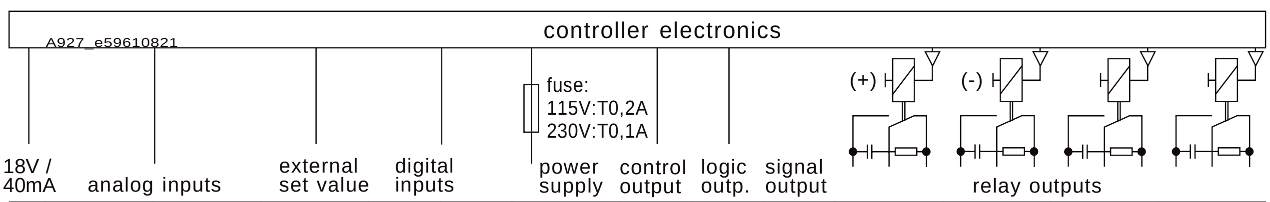
Installation dimensions:



Form 96x96: L= 150mm, B= 92mm H=92mm
Form 72x144: L= 170mm, B=168mm H=139mm

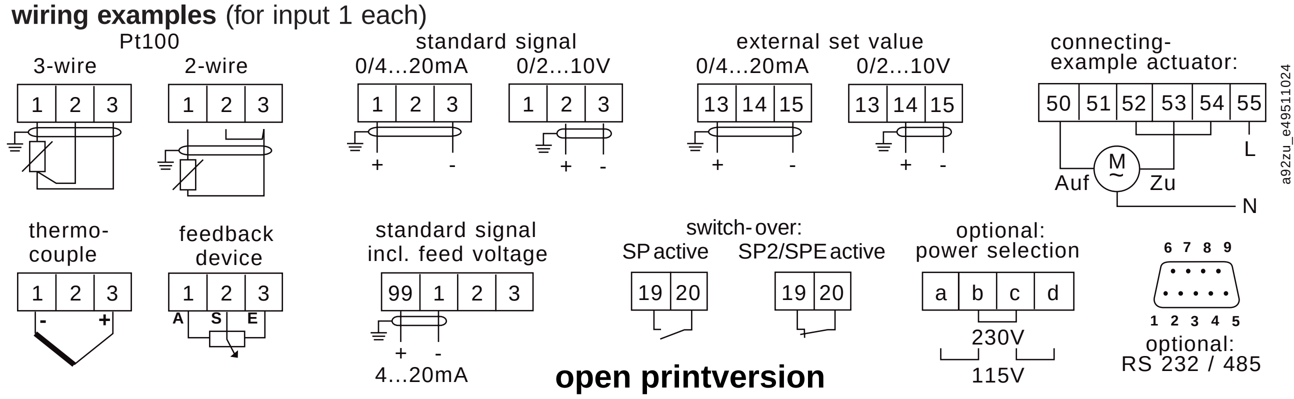
Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 230VAC +/- 10 %, 48...62Hz
alternative 115 VAC, 48 VAC, 24 VAC, 24 VDC
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KUF to DIN 40050
Relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 50081-2 and EN 50082-2

Wiring diagram:
(Example, depending on sub type some details can be missed
valid for each delivered controller is the wiring diagram on its casing only)

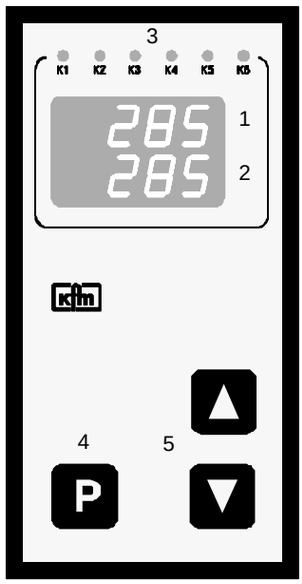


	Ist 3			Ist 4						dig 3		dig 4					Y 2		log 2		Sout 2		Rel 5			Rel 6			Rel 7			Rel 8		
	7	8	9	10	11	12				23	24	25	26				32	31	37	36	41	31	62	63	64	65	66	67	68	69	70	71	72	73
U+	Ist 1			Ist 2			SPE			dig 1		dig 2					Y 1		log 1		Sout 1		Rel 1			Rel 2			Rel 3			Rel 4		
99	1	2	3	4	5	6	13	14	15	19	20	21	22	27	28	29	30	31	35	36	40	31	50	51	52	53	54	55	56	57	58	59	60	61
							I	U	⊥					L (L+)	N (L-)	⏚	+	⊥	+	⊥	+	⊥	(protect relay outputs py external fuse 2A)											

wiring examples (for input 1 each)



open printversion



1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)

Brief description:

KFM 94 is a microprozessor based industry controller series in panel mounting- format 72 x 144 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 6 relays, several digital and analog out- and inputs and other additional devices.

Types: *(depending on configuration*):*	*type:*
indicator	9401.
one stage controller	9410.
two stage controller	9420.
heating / cooling controller	9430.
positioner / follow-up controller	9440.
two- point- PID controller	9450.
three- point- PID controller	9460.
three- point- step controller	9470.
continuous controller	9480.
continuous controller, 2 outputs	9481.
Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: (continuous) logic output	..L
function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t
Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
Interbus S interface	(99) si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.'
...

Inputs:

max. 4 measuring inputs, acc. to sub-type:	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.

Display of function:

Hold down the P-key for more than 5 sec to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).

Measuring line monitoring:

Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 6 relays with potential free change over switch, as control outputs or as additional contacts, capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

open printversion

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:

The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key**,**
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)

The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.

(optional: switch on and off using separate ⟲ - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)

The *lower diplay* shows „H *“ and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ⟲ - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates „-Ad-“.
Cancel: P - key >5 sec again

open printversion

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position „**U**“ = unlocked
(Lock access after the adjustments: Switch position to „L“ = locked).

After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.

*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter „Optimization“)	25,0	___
***I**	integral action time Tn (min) (ref. to chapter „Optimization“)	7,0	___
***d**	rate time Tv (min) (ref. to chapter „Optimization“)	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - ke**y,**
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

***** = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

INDEX

1
2
3
4
5
6
7
8
9
0

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position „u“)

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: „-Ad-“,
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position „**U**“ (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to „L“= locked)

Hold down the P - key and press the ▲ - ke**y,**
hold down both keys for more than 5 sec. until the display changes

Enter the code number (password) ▼...▲ (1...9999), factory setting: **1**
move on to next input: *briefly* press P - ke**y**

Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)

Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.

Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: „rtd / Iu“	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator „6...600“ (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: „2...120“ (sec.)	*20 sec.*
***out**	adjusting kind of output signal „0...20/ 4...20(mA)/ 0...10/ 2..10(V)”	*4...20 mA*
***out**	adjusting output characteristics direct / inverted „di / in“	*in*
	(for 2 output signals:“in in / in di / di in / di di“)	
***td**	for 2 output signals: deadpoint between output 1 and 2 „0...10%“	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal „0..20/4..20(mA)/0..10/2..10(V)“	*4...20 mA*
Sou*	adjusting kind of information signal „Ist/Soll..“ (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:“rel1 / rel2 / AUS“ (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: „0...100“ (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: „SiE/SiA“(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

***** = In case of multiple measuring inputs or control loops: relay- or channel number

open printversion

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

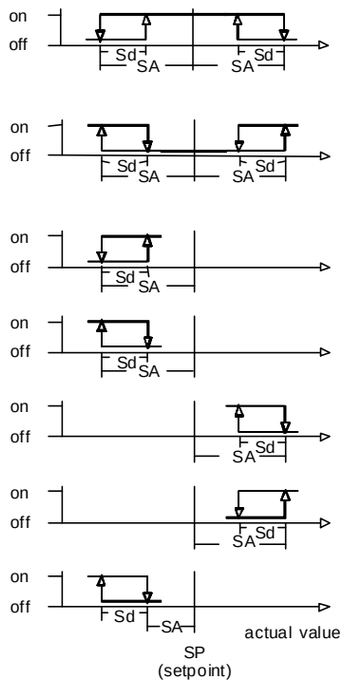
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

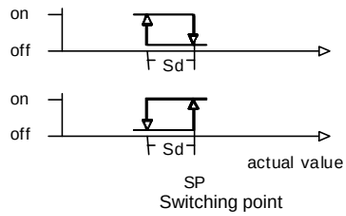
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

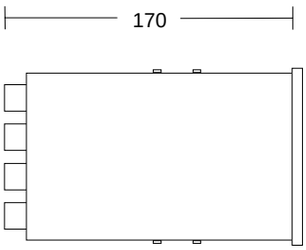
"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

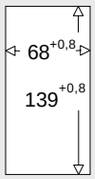
open printversion

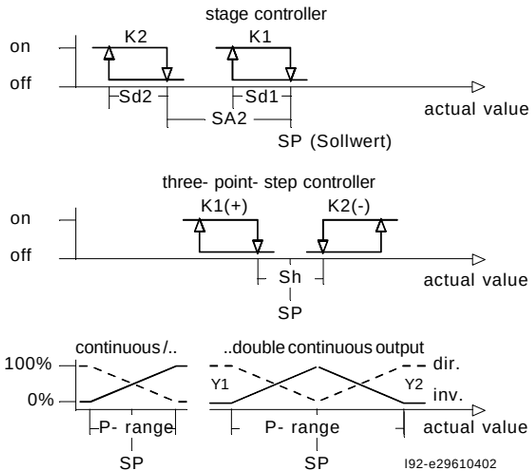
Characteristics:
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
(parameters depending on sub type:)
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

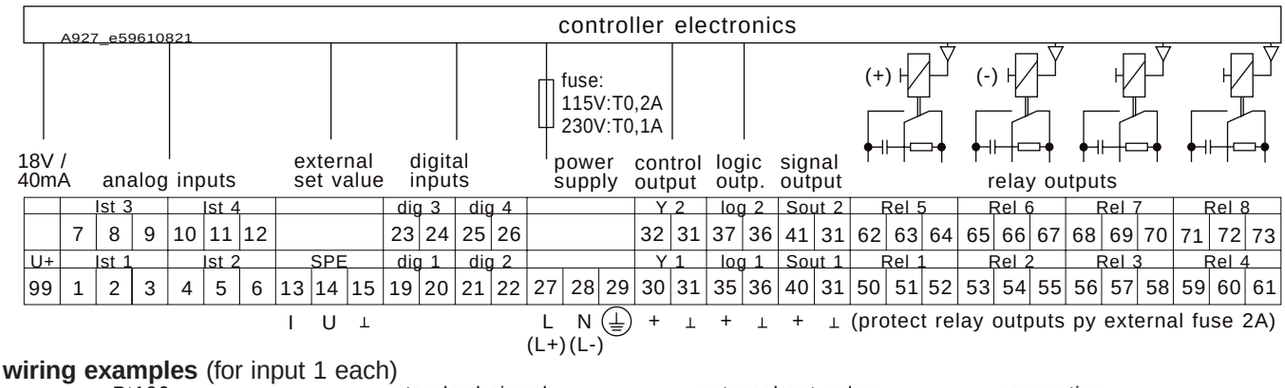




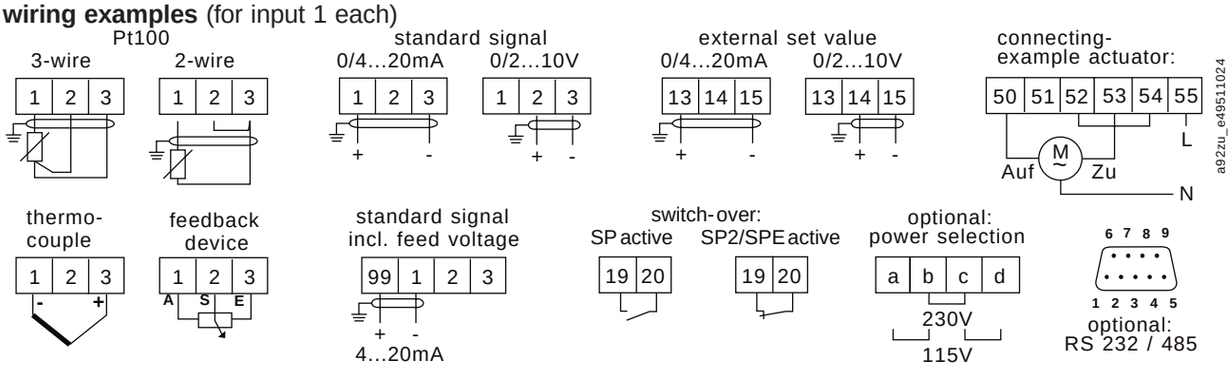


Other data:
Housing for panel mounting 96 x 96 mm
Power supply: 230V or 115 V +/- 10 %, 48...62Hz
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KUF to DIN 40050
Relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 50081-2 and EN 50082-2

Wiring diagram:
(Example, depending on sub type some details can be missed valid for each delivered controller is the wiring diagram on its casing only)



wiring examples (for input 1 each)



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

General information:

Series interfaces enable digital communication with computers or higher ranking control systems. An RS 232 interface permits connection of one controller per computer interface. The RS485 interfaces enable the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level).

Technical data:

Interface:	RS232	RS485
Connection:	series, asynchronous	series, asynchronous
	2 wire (+GND)	2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Dead-end feeder length:	15m	2m
Max. number of controllers:	1	31
Transfer rate:	9600 Bit / s	9600 Bit / s

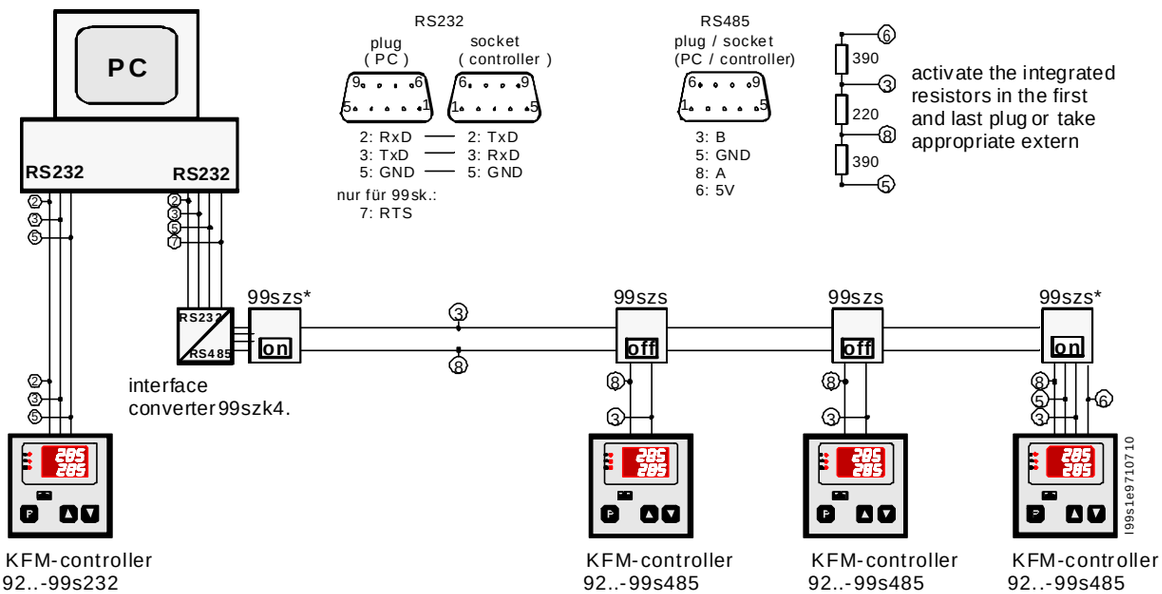
Hardware prerequisites:

IBM XT, AT or compatible PC, SPS etc.
RS232: series interface RS 232 (COM 1, COM..)
RS485: ser. interface RS485, alternative: RS232 with interface converter RS232/RS485 (KFM 99szk4)

Connection lines:

Use screened lines to connect the interfaces (e.g. KFM 99szl.). Place the screening on the controller earthing terminal. Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate extern resistors.

Wiring example



open printversion

Transmission protocol:

Data is transmitted according to the KFM log 2.0 which is laid out in line with the ISO 1745.

Data format:

Each field of the data frame comprises a start bit, the 7 bit ASCII value,
a parity bit for even parity and a stop bit.
Transmission rate: 9600 Bit/s (other interface configurations can be supplied).

Data frame (telegram) :

The data frame commences and ends with a control character (see table) and comprises of 2 bytes for the controller address (ADR) and 4 bytes for the parameter code (code) as well as up to 6 bytes for the number value, i.e.: number value on the left from the decimal point: up to 4 bytes; 1 byte for the decimal point, number value on the right of the decimal point: 1 byte.
1 byte = 1 digit or letter or control character = 1 ASCII value

Data integrity:

The data frames for parameter transmission are safeguarded with a "BCC" sign, i.e.the transmitted data is supplemented by a check sum consisting of the logic linking (EXOR) of all transmitted characters between STX (excl.) and ETX (incl.).
The controller acknowledges a successful transmission with "ACK". A faulty transmission is confirmed by "NAK".

Examples: The computer requests data

EOT	ADR	ADR	Code	Code	Code	Code	ENQ

the controller response:

STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX	BCC

The computer sends data. To this effect, the controller must operational, because the simultaneous entry of data via interface and controller keyboard is inadmissible.

EOT	ADR	ADR	STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX

controllers response to a successful transmission: ACK

controllers response to a faulty transmission: NAK

Control characters:

control characters	value(HEX)	meaning
STX	02	start of text
ETX	03	end of text
EOT	04	end of transmission
ENQ	05	enquire
ACK	06	acknowledge
NAK	15	not acknowledge
=	3D	value allocation

Permitted characters for code and value:

ASCII-code	value (HEX)	description	ASCII-Zeichen	value(HEX)	description
"0"	30	zero	"9"	39	nine
"1"	31	one	"A"	41	ten (code)
"2"	32	two	"B"	42	eleven (code)
"3"	33	three	"C"	43	twelve (code)
"4"	34	four	"D"	44	thirteen (code)
"5"	35	five	"E"	45	fourteen (code)
"6"	36	six	"F"	46	fifteen (code)
"7"	37	seven	"."	2E	dec.point (value)
"8"	38	eight	"-"	2D	minus sign(val.)

open printversion

1.) parameter codes that can only be **sent** by the controller: (online= controller continues normal operation)

CODE (HEX)	Parameter*	Symbol	value range
014D	guide controller on/off	FUE	0=off,1=on
1001..05	status- / control byte 1..5	-	
1010..15	actual value 1..6	IST1	
1020..24	controller output Y 1..5	Y(1)..5	
102A	active controller output (99g8..)	Y	
1030..34	active set point value chan. 1..5	(1..5SP)	
	active program set point value	(SP)	-
	ramp set point value	rSP	-
	actual program step	-	-
1050	difference actual value 1 / 2	FUE	0=off,1=on
1051	average actual value 1 / 2	FUE	0=off,1=on
3002	actual program step	SP..	

Contents of the statusbytes:

statusbyte 1*: :

0	0	Err6	Err5	Err4	Err3	Err2	Err1

Err1 ... Err6 = 0: no malfunction at the measuring input 1 ... 6,
Err1 ... Err6 = 1: malfunction at the measuring input 1 ... 6

statusbyte 2*:

			bin.inp. 5	bin.inp. 4	bin.inp. 3	bin.inp. 2	bin.inp. 1

Bit = 0: input bit is not set
Bit = 1: input bit is set

statusbyte 5*:

rel. 8	rel. 7	rel. 6	rel. 5	rel. 4	rel. 3	rel. 2	rel. 1

Bit = 0: output bit is not set
Bit = 1: output bit is set

2.) parameter codes that can be **sent or received** by the controller (online):

(The parameter code is exemplary for channel 1. For example: 1100 = int. setpoint value 1.
For the other channels change the number at the second place to the true channel number,
for example 1200 = int. set point value channel 2).

CODE (HEX)	Parameter*	Symbol	value range
1100	(internal) set point value channel 1	(1)SP	Lo...Hi
1101	second set point value channel 1	(1)SP2	Lo...Hi
1103..06	proportional band XP1..4 channel 1	(1)P(1)..4	0.0...999.9
1107..0A	integral action time Tn1..4 channel 1	(1)I(1)..4	0.0...999.9
110B..0E	derivative time Tv1..4 channel 1	(1)d(1)..4	0.0..99.9/0.00..99.99
110F	neutral zone Xsh channel 1	(1)Sh	0.05...1,0
1113..14	switching interval 1..2 channel 1	(1)SA1..2	0...range (bLo/Hi)
1115..16	switching difference 1..2 channel 1	(1)Sd1..2	0... range (bLo/Hi)
111C	switch-over SP/SPE (99bwam)	SP-F	0 = SP, 1 = SPE
2000..07	switching interval addit.contact 1..8	SA1..8	0.0... range
2008..0F	switching diff. addit.contact 1..8	Sd1..8	0.1... range
4101..14	1. .. 20. program setpoint value	SP.1 .. 20	Lo...Hi
3101..14	1. .. 20. attendant time	H' 1.. 20	0...6000
3001	actual program status	Pro	0=off,1=on,2=stop

* available depending on type and design

open printversion

Offline parameter:

In opposite to the online parameters the offline parameters can not be transmitted while the controller continues normal operation. So the controller has to be stopped by sending "FE = 7708" (the display shows "ConF"). After the transmission the controller has to be switched-over to the normal operating mode by sending "FF = 7708".

(The parameter code is exemplary for channel 1. For example: 113A = travel time of actuator channel 1. For the other channels change the number at the second place to the true channel number, for example 123A = travel time of actuator channel 2).

CODE (HEX)	parameter*	symbol	Value range
010C..11	min. value range input 1..6	1..6bLo	-999...bHi
0112..17	max. value range input 1..6	1..6bHi	blo...4000
0118..1d	decimal point input 1..6	1..6nst	0...2
011E..23	type of measuring input 1..6	Ain1..6	0...11
0124..29	correction actual value 1..6	Ist1..6	-5%...+5% of range
012A..2C	min. value range signal input	(1..3)SLo	-999...SHi
0130..32	max. value range signal input	(1..3)SHi	SLo...4000
0136..38	signal output 0/4...20mA	Sou(t/1..3)	0=0-20,1=4-20
013C	type of controller	ConF	
013D	cyclus time	Cy"	2...120
013F	display unit °C / °F	Unit	0=°C, 1=°F
0140	lower display indication	dSPL	0=off,1=SP, 2=rSP, 3=Y,4=°C,5=°F,6=bar, 7=%,8=Ist1,9=Ist2...
0141	controller address	Adr	1...255
0142	code number	Cod1	0...9999
0147	allowed deviation	d.SP	0.1...200.0
0148	number of program cycles	P-CY	0...20
0149	number of program steps	P-S	0...20
014E	wait time for input signal reception	t"	1...100
112B	meas. input for control loop 1	On1	1...6
112C	second meas. input	Ain	1...6
112D	function of the ext. setpoint	SPE	2=AbS,3=Add,4=Sub
112E	low limit set point value	(1) Lo	range (bLo/Hi)
112F	high limit set point value	(1) Hi	range (bLo/Hi)
1132..33	gradient 1..2	Gr1..2	0...100
1134..35	waiting window value 1..2	rF1..2	0.1...999.9
1137	output signal at act. val=setp.	(1)YAP	YLO...YHi
1138	low limit control output	(1)YLo	0...YHi
1139	high. limit control output	(1)YHi	YLo...100
113A	travel time of actuator channel 1	(1) Y"	6...600
113B	type of output signal 0 / 4-20mA	(1)out	0=0-20,1=4-20
113C	output direction di / in	(1)out	0=in(in),1=(in)di 2=diin,3=didi
113D	dead range	(1)td	0.0...10.0
113E	output reaction at meas.fault(relais)	(1)Y_S	0=off,1=K1,2=K2
113F	output reaction at meas.fault(Y)	(1)Y_S	YLo...YHi (continuous)
1140	integration range limit chan.1	(1) ib	0...100
1148	switch-over control val. on / off	YH	0=off,1=on
1149	external control value	YH	0...100
114E	switch-over SPE / YE	YE	0=SPE,1=YE
2010..17	function selection additional contact 1...8	rEL1..8	0=LCA...8=USE...
2018..1F	input selection additional contact 1...8	rEL1..8	Ist1...6, 11=1Y...
2020..27	channel selection additional contact 1...8	rEL1..8	1..4=(1)..4SP,11=rSP..
2028..2F	condition relay1...8 for measuring line default	rEL1..8	0=off,1=on

* available depending on type and design

open printversion

programming example in “C” (extract):

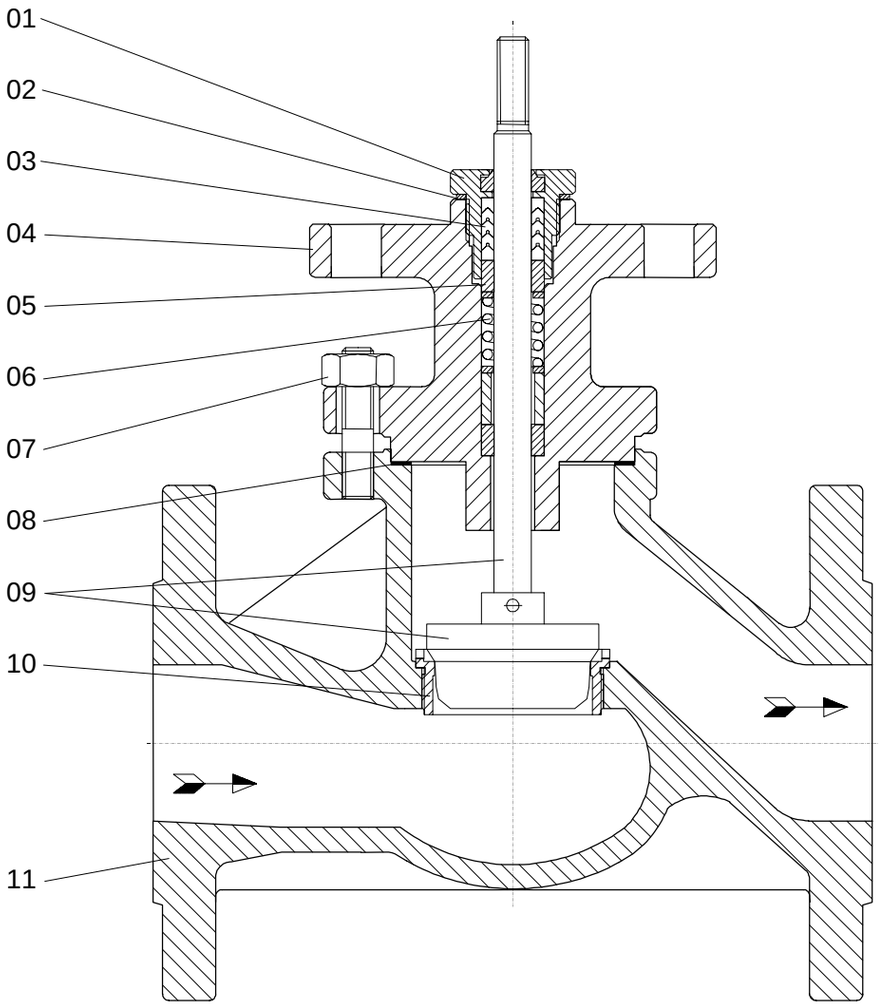
```
void send_data_frame( void)
{
int i;
char antwort=' ', z_buff[80];
unsigned char bcc;

printf( "\n\ndata ----> controller");
for ( i=0; i<=strlen( Ist); i++ )                    // send data - frame
    {
    if ( i==0 )
        {
        sende_byte( 0x04);                           // send 'EOT'
        sende_byte( adresse[0]);                     // send 1. adress-byte
        sende_byte( adresse[1]);                     // send 2. adress-byte
        sende_byte( 0x02);                           // send 'STX'
        sende_byte( code[0]);                        // send 1. code-byte
        bcc=code[0];
        sende_byte( code[1]);                        // send 2. code-byte
        bcc = bcc^code[1];
        sende_byte( code[2]);                        // send 3. code-byte
        bcc = bcc^code[2];
        sende_byte( code[3]);                        // send 4. code-byte
        bcc = bcc^code[3];
        sende_byte( EQL);                            // send '='
        bcc = bcc^EQL;
        }
    sende_byte( Ist[i]);                             // send data
    bcc = bcc^Ist[i];
    }//for
sende_byte( 0x03);                                   // send 'ETX'
bcc = bcc^0x03;
sende_byte( bcc & 0x00ff);                           // send BCC-byte

for ( i=1; i<=400; i++ )
    {
    if ( (inportb ( com+LSR) & 0x01) ) antwort=inportb( com+RBR);
    if ( antwort==NAK ) { printf( "\nOut of Range !"); break;}
    if ( antwort==ACK ) { printf( "\nOK !"); break; }
    delay( 1);
    }//for
if ( i==401 ) printf( "\nNo response !");
};
```

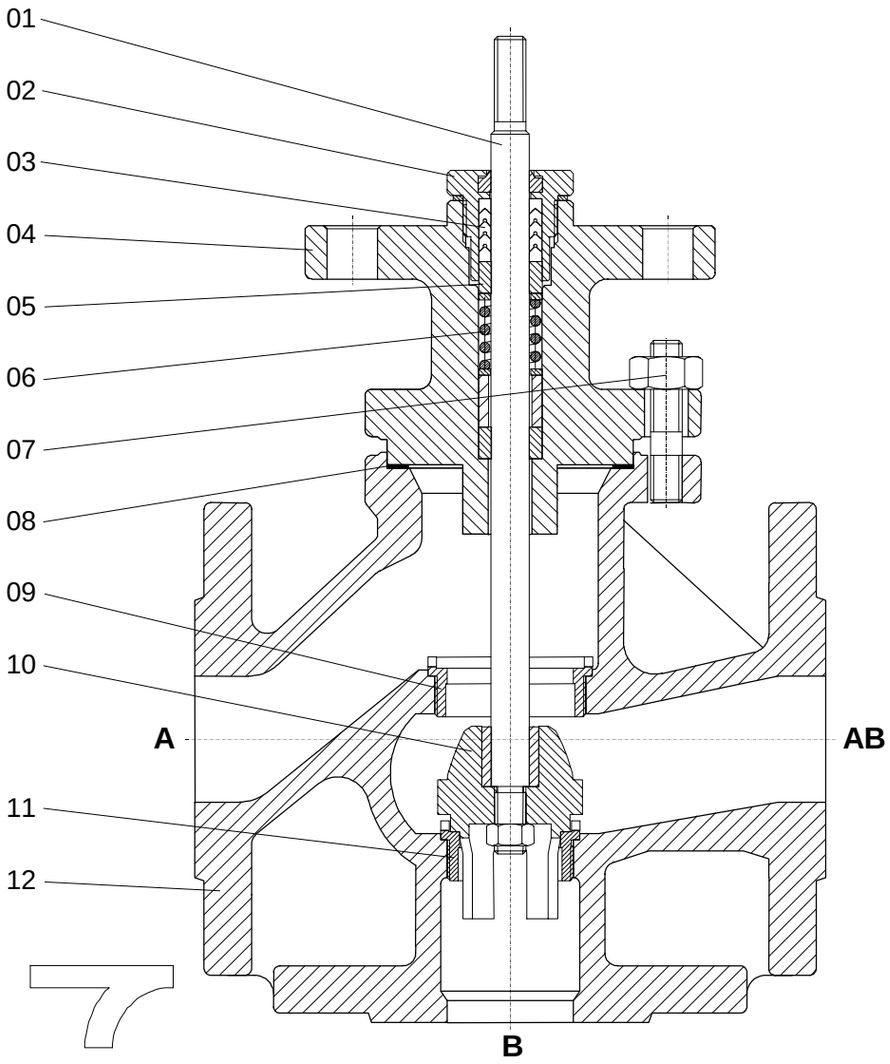
INDEX

1
2
3
4
5
6
7
8
9
0



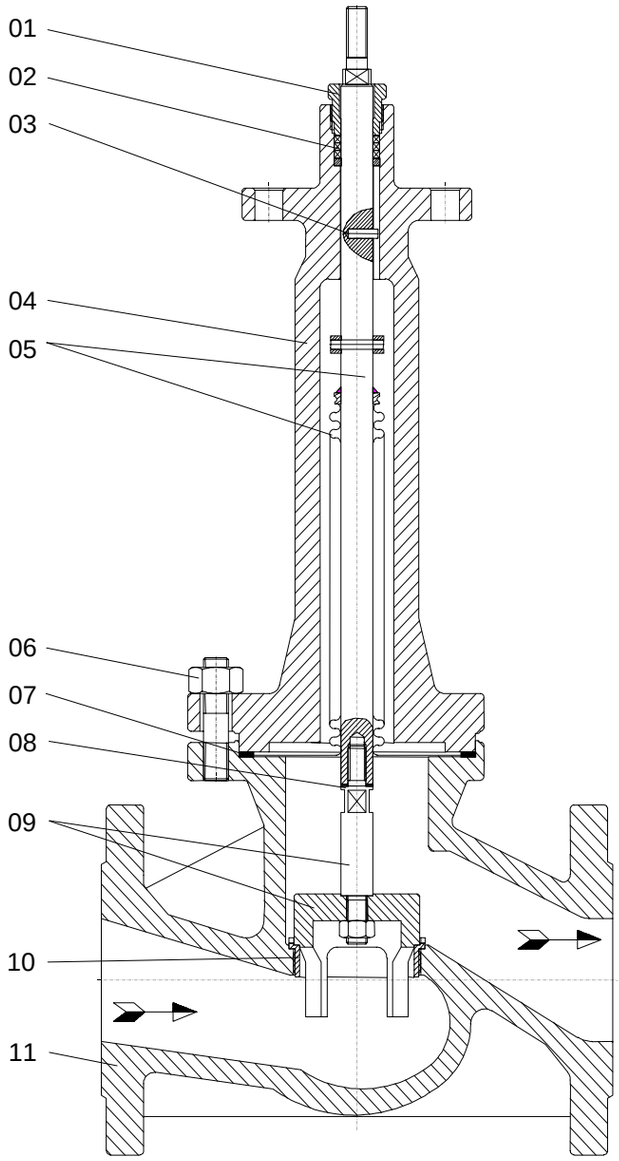
No.	Designation	Part-No.
01	Screw joint with scaper	6a21dv..
02	Gasket	6a21sd..
03	V-rings	6a21dm
04	Mounting bonnet	6a21vd..
05	Guiding bush	6a21gb
06	Spring	6a21f
07	Studs with hexagon nuts	6a21ss..
08	Gasket	6a21dd..
09	Plug with spindle	6a21ks..
10	Seat ring	6a21s..
11	Valve body	6a21vg..

open printversion



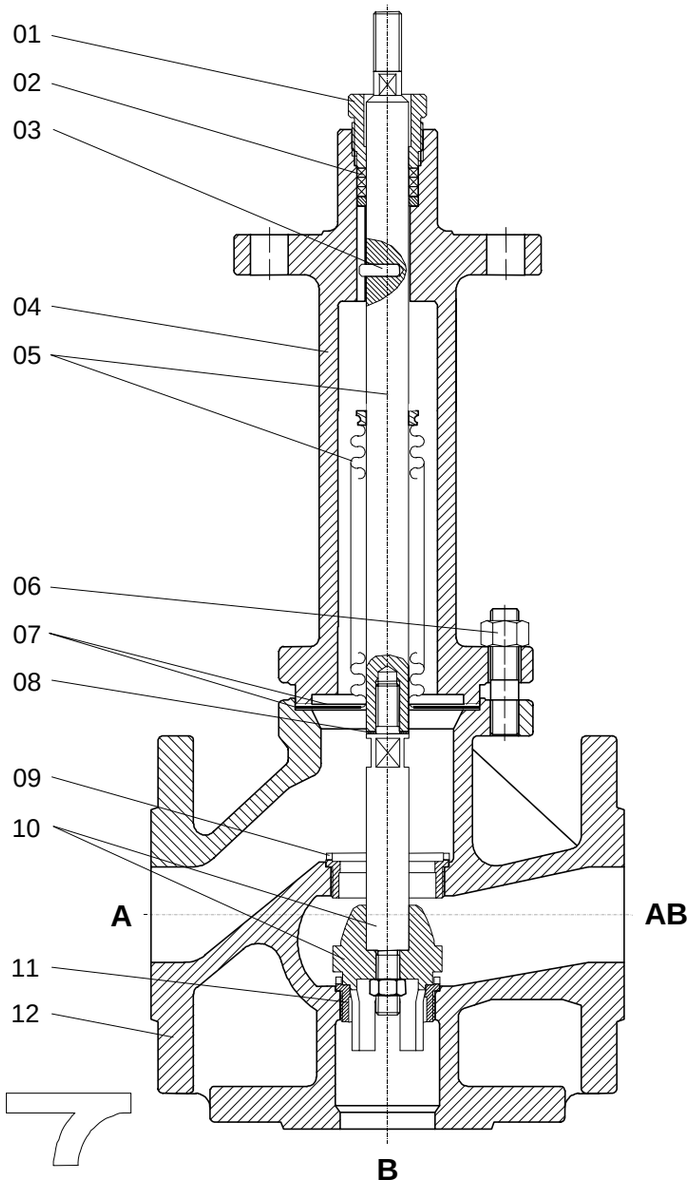
No.	Designation	Part-No.
01	Spindle	6a31s..
02	Screw joint with scaper	6a31dv..
03	V-rings	6a31dm
04	Mounting bonnet	6a31vd..
05	Guiding bush	6a31gb
06	Spring	6a31f
07	Studs with hexagon nuts	6a31ss..
08	Gasket	6a31dd..
09	Upper seat ring	6a31so..
10	Plug	6a31k..
11	Lower seat ring	6a31su..
12	Valve body	6a31vg..

open printversion



No.	Designation	Part-No.
01	Screw joint	6a51sv
02	Safety stuffing box	6a51st
03	Pin	6a51vss
04	Mounting bonnet	6a51vd..
05	Spindle with bellow	6a51sf..
06	Studs with hexagon nuts	6a51ss..
07	Gasket	6a51dd..
08	Lock washer	6a51ssc
09	Lower spindle with plug	6a51ks..
10	Seat ring	6a51s..
11	Valve body	6a51vg..

open printversion



No.•	Designation•	Part-No.•
01•	Screw joint	6a61sv
02	Safety stuffing box	6a61st
03	Pin	6a61vss
04	Mounting bonnet	6a61vd..
05	Spindle with bellow	6a61sf..
06	Studs with hexagon nuts	6a61ss..
07	Gasket	6a61dd..
08	Lock washer	6a61ssc
09	Upper seat ring	6a61so..
10	Lower spindle with plug	6a61ks
11	Lower seat ring	6a61su..
12	Valve body	6a61vg..

open printversion