

Liquid level gauges for steam applications



Liquid level gauges

Choosing the right gauge

The determining factor for choosing a gauge is on the one hand the medium, and on the other hand the pressure and temperature range within which the gauge is to be used. It is on these factors that the design, construction materials and finally the price of the gauge depend.

Basically, Klinger liquid level gauges can be used for every medium encountered in practice; our range of construction materials varies from low temperature steels to high-tensile heat-resistant steel.

Level gauges for steam and hot water

Robustly made, safe against glass breakage

Steam boilers are more frequently shut down and started up than other pressure vessels. This puts extreme demands on the glass and the gauge. The glass must withstand the thermal stresses which arise, the gauge body must therefore be stable and rigid. Our gauge bodies are designed to meet the needs of the glass: the glass lies between sealing and cushion gaskets and except for the sight area is completely enclosed by metal. This is one of the prerequisites for the safety of our gauges in service: even if a glass breaks, it remains wedged in the glass housing. Glass splinters cannot be blown out.

Up to 32 bar:

Reflex gauges

On steam boilers where the pressure does not exceed 32 bar, reflex gauges are the best and most economical solution.

Up to 120 bar:

Transparent, mica-protected gauges

Our transparent gauges are offered for the pressure range up to 120 bar. Transparent gauges on steam boilers are provided with an illuminator to ensure perfect visual indication.

Up to 180 bar:

Bi-colour gauges

We have developed bi-colour level gauges for steam pressures up to 180 bar. This insures the clearest indication possible. Such gauges are used exclusively on steam boilers.

Level gauges for media in the processing industry

The service conditions in the process industries (oil refineries, petro-chemical and also chemical plant) are completely different to those in steam generating plant.

Reflex gauges

In the process industry too, the reflex gauge gives the clearest indication regardless of whether the medium is clear or coloured water.

Transparent gauges

If the medium is dirty, viscous or aggressive, flat transparent glasses guarantee better indication since the glass surface can be protected by mica shields against serious attack by the medium.

Temperature range

-196°C to +400°C

Level gauges in the process industries are mainly exposed to nonvarying service conditions: extremely high pressures at low temperatures or low pressure at high temperatures.

Low temperature applications

When working with media under cryogenic conditions it should be ensured that metallic materials display the necessary impact strength. Glass, which is brittle even at room temperature, does not change its properties at low temperatures.

No impairment of vision due to icing

Ice which forms on the gauge glass can make observation difficult. For such cases we offer anti-frost blocks which

ensure complete readability of the level even in low temperature applications. Gauges fitted with this accessory must of course be well insulated to suit the ambient temperature.

Ancillary heating systems

If the medium tends to become viscous or solidifies when the temperature falls, the deposits formed on the glass can make it impossible to read the level. For such cases we supply ancillary heating systems for the gauge and shut-off fittings. The medium is thereby maintained in the liquid state and good visibility is ensured.

Explosion proof illuminators

With coloured media indication is unexceptionable. If the medium is clear water and a transparent gauge is used, an illuminator must be provided to ensure clear indication of the level. We supply illuminators to class IP 65 E Ex d II cT 6.

Liquid level gauges

Operating principle reflex gauges

Reflex gauge

Applications:

Steam: up to 32 bar saturated steam

Indication

Very clear

Steam-Vapour space – silver white

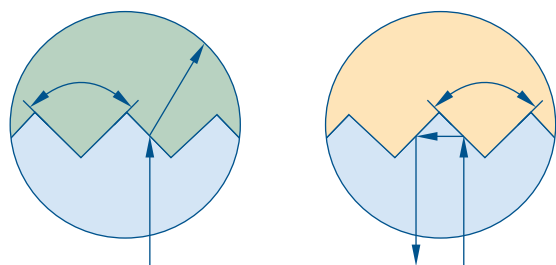
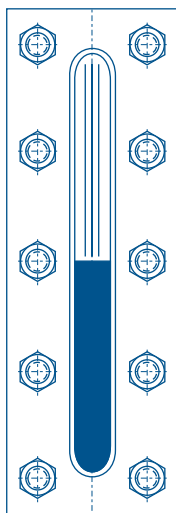
Water-Liquid space – dark

The principle of the reflex glass is based on the difference in the refractive indices of liquid and gas or, in particular, of water and steam. The liquid column is contained within the recess of the centre-piece behind the gauge glass which is clamped within the gauge body.

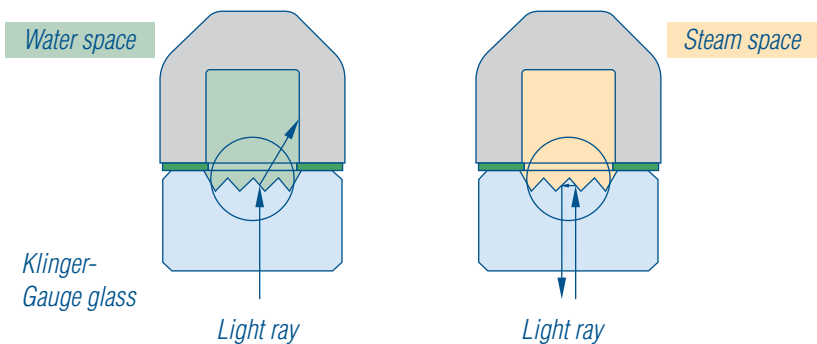
If a ray of light encounters the surface of one of the 45 °C slanted grooves in the gas or steam space it is reflected to the opposite surface of the groove and from there totally reflected – back into the direction of observation. The steam or gas space therefore appears silver-white.

The gauge glass – a KLINGER reflex glass – has prismatic right angled grooves on the side facing the water and steam spaces. Light rays entering from outside the gauge are either absorbed or reflected depending upon whether they enter the water or steam space.

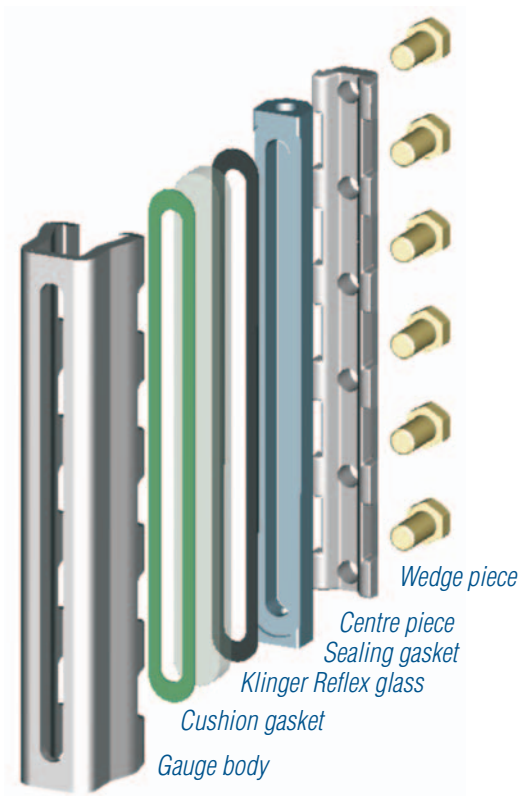
The advantage of the reflex gauge lies in its clear, unambiguous readability. This system makes false readings of the liquid level impossible and thereby eliminates dangers which could arise in this connexion.



Gauge body



The light ray which encounters the surface of a groove in the liquid space is almost totally absorbed. The liquid behind the reflex glass therefore appears black.





Liquid level gauges

Operating principle bi-colour gauges

Bi-colour gauges

Applications:

For steam services up to 180 bar (+355,5°C); in principle it is a transparent gauge, but with a wedge-shaped centrepiece. For direct observation the gauge is provided with an illuminator containing red and green filters.

Indication:

Water space – green
Steam space – red

Operating principle of bi-colour gauges

The bi-colour level gauge is in principle a transparent gauge in which the centrepiece has a wedge-shaped section. This design makes bi-colour indication possible. Two colour-filters are mounted right in front of the light source of the illuminator – one red and one green. When seen from the front, the red colour filter must always be on the left.

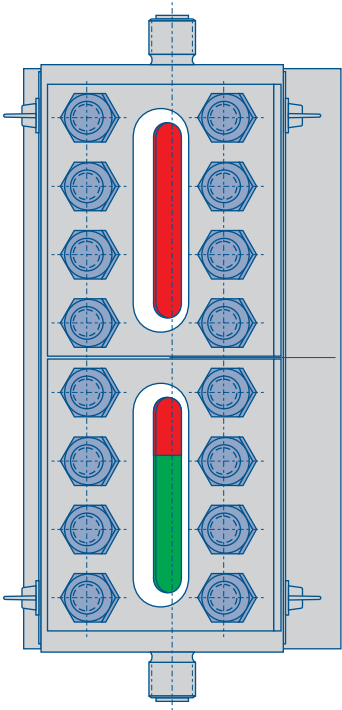
The optical separation of the steam and water spaces is in this case also based on the differential refraction of light in steam and water.

The bi-colour indication is produced as follows: If the red light ray enters the water it is deflected sideways and absorbed. If it enters the steam space it passes trough unhindered and appears in the indication as red. Light rays which pass trough the green filter are absorbed in the steam space but pass unhindered through the water space: the liquid column is therefore indicated as green. Bi-colour level gauges were developed specially for high-pressure steam boilers and condensate accumulators.

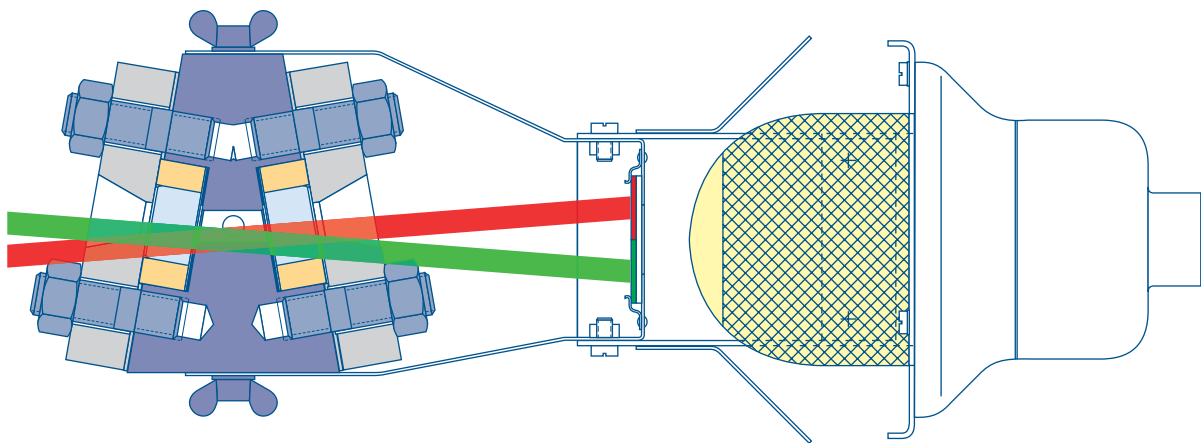
Bi-colour gauges are not installed with on inclination. If the gauge is mounted in an elevated position the liquid level may be reflected down to the observation platform by means of a system of mirrors (max. sight length approx. 780 mm).

For illuminators, class IP65 EEx d II Ct6, we use 15W-bulbs.

Red/green indication can of course be transmitted by TV to a distant observation stand.



Direct observation
red/green

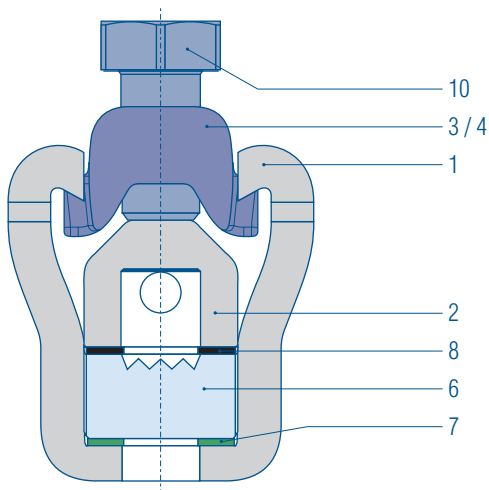


Liquid level gauges

Steam application

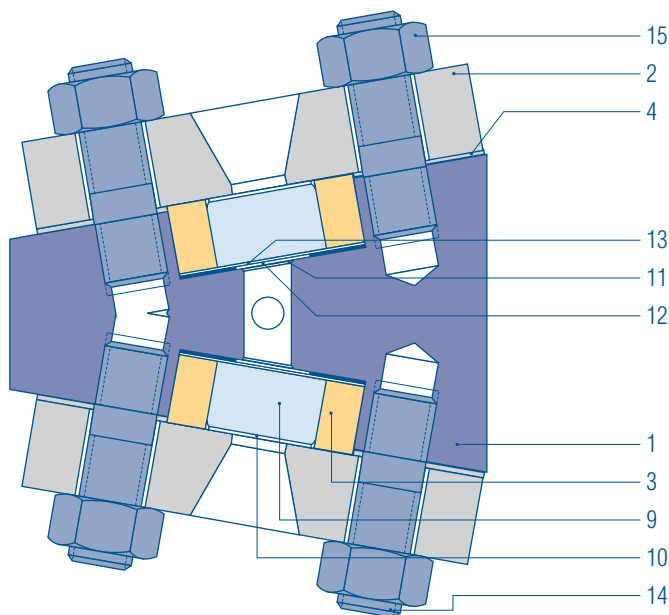
Part lists and materials

K



Pos.	Part	Materials
		FS/H
1	Gauge cover	Ck 35
2	Centre piece	C22.8
3	Wedge piece	C22.8
4	Clamp	C22.8
6	Reflex glass	Borosilicate glass
7	Cushion joint	K-Sil
8	Sealing joint	Graphite
10	Hexagon-headed screw	5.6

KTA



Pos.	Part	Materials
		FS/H
1	Centre piece	Ck 45 N
2	Cover plate	Ck 45 N
3	Glass holder	1.0570
4	Spacer strip	1.4401
8	Glass protector	Mica ¹⁾
9	Transparent glass	Borosilicate glass
10	Cushion joint	Graphite
11	Sealing joint	Graphite
12	Mica shield	stained A quality
13	Protective gasket	Graphite
14	Stud bolt	1.7709
15	Hexagon nut	1.7258

¹⁾ not shown on drawing



Reflex level gauges

Steam application

K Nominal pressure: PN 40, 32 bar
PN 40 236°C saturated steam
32 bar with gauge cock D
236 °C Construction to KLINGER
saturated steam material code FS/H
Gauge glass:
Klinger Reflex glass A
Material Borosilicate

Connexion gauge body – gauge cock

Rotatable (360°)
End tubes o.D. 16 mm
The seal is made by a stuffing box in the gauge cock and a joint ring on the gauge.

Connexion construction

End connexion with D gauge cocks (see illustration). Safety ball in the upper and lower shut off fitting.

Vessel connexion by flange or male thread available to all recognized standards.

Weight: Gauges cocks with DN 20 flanges approx. 7,3 kg.

Torque for gauge bolts 60 Nm, cold.

For gauge body and gauge cock part lists, dimensions of glasses and material specifications see pages 5, 8 and 11.

Suggested order specification Reflex level gauge PN 40

KLINGER material code FS/H

Gauge glass Borosilicate
thermally prestressed

Connexion gauge body – gauge cock
rotatable

Shut-off fittings gauge cocks

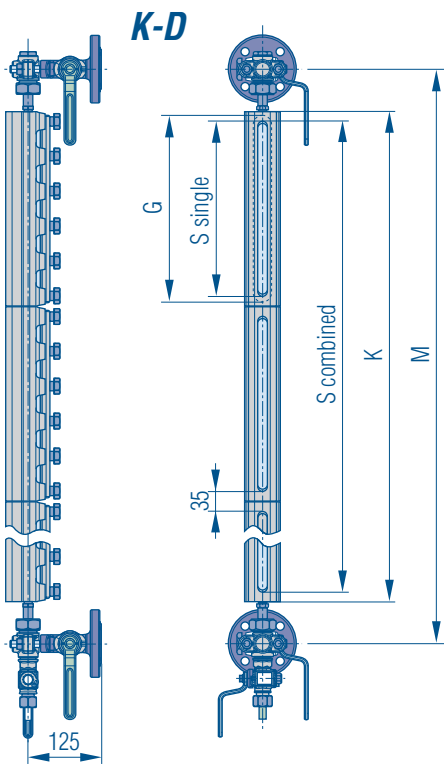
With safety balls

Ordering example:

K-D, 2 x VI, FS/H

DN 20 / PN 40

M= 615 mm



Overall and connexion dimensions (mm)

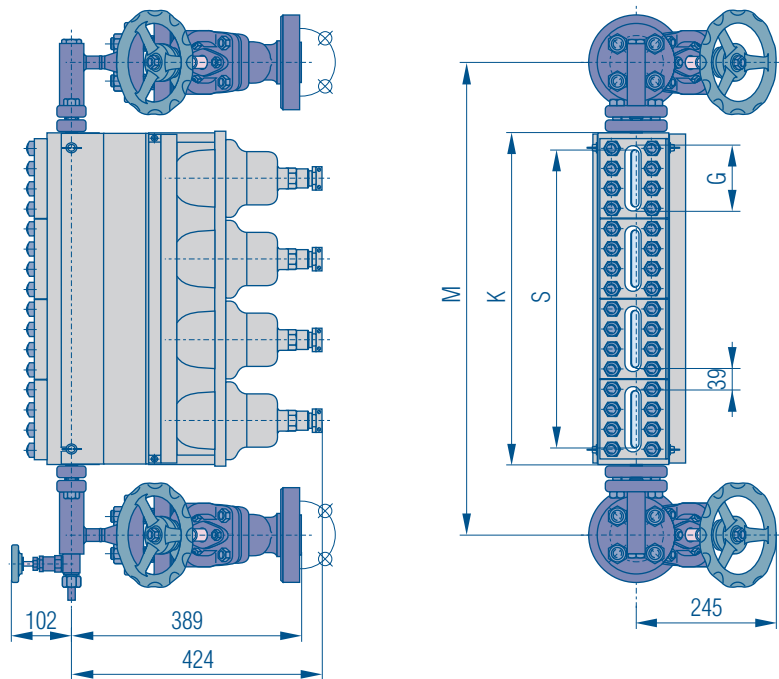
Gauge size	Centre-to-centre distance M min	Body length K	Sight length S	Glass length G	Approx. weight of gauge (kg)
III	265	177	143	165	4,30
IV	290	202	168	190	5,00
V	320	232	198	220	5,50
VI	350	262	228	250	6,70
VII	380	292	258	280	6,90
VIII	420	332	298	320	7,80
IX	440	352	318	340	8,50
2 x IV	495	406	373	190	10,00
2 x V	555	466	433	220	11,00
2 x VI	615	526	493	250	13,40
2 x VII	675	586	553	280	13,80
2 x VIII	755	666	633	320	15,60
2 x IX	795	706	673	340	17,00
3 x VI	880	790	758	250	20,10
3 x VII	970	880	848	280	20,70
3 x VIII	1090	1000	968	320	23,40
3 x IX	1150	1060	1028	340	25,50
4 x VII	1265	1174	1143	280	27,60
4 x VIII	1425	1334	1303	320	31,20
4 x IX	1505	1414	1383	340	34,00
5 x VII	1560	1468	1438	280	34,50
6 x VI	1675	1582	1553	250	40,20
5 x VIII	1760	1668	1638	320	39,00
5 x IX	1860	1768	1738	340	42,50
7 x VI	1940	1846	1818	250	46,90
6 x VIII	2095	2002	1973	320	46,80
6 x IX	2215	2122	2093	340	51,00
7 x VIII	2430	2336	2308	320	54,60
7 x IX	2570	2476	2448	340	59,50

The maximum centre-to-centre distance $M_{max}=M_{min}+129$

High pressure bi-colour gauges

Steam application

KTA-DVK 2



Nominal pressure:
PN 315, 180 bar
355,5°C saturated steam
with gauge valve DVK 2
Construction to KLINGER
material code FS/H
Gauge glass:
Klinger Transparent glass TA 28
material Borosilicate
Mica shield TA 28
Illuminator IP 65
with red/green indication
for direct observation or by mirrors,
and for TV transmission

KTA
PN 315
180 bar
355,5°C
saturated steam

Overall and connexion dimensions (mm)

Gauge size	Centre-to-centre distance M min	Body length K	Sight length S	Glass length G	Approx. weight of gauge (kg)
2 x I	423	290	233	113	24
3 x I	559	426	369	113	36
4 x I	695	562	505	113	48
5 x I	831	698	641	113	60
6 x I	967	834	777	113	72

The maximum centre-to-centre distance $M_{max}=M_{min}+116$

Connexion gauge body – gauge valve

Rotatable (360°)
Connecting piece with flanges. Seal between gauge and connecting piece: joint ring.

Connexion construction

End connexion with gauge valves DVK 2 (see illustration). Safety ball in the upper and lower shut-off fitting.
Vessel connexion with flanges or male thread available to all recognized standards.
Weight: Gauge valve set with DN 25 flanges approx 44 kg.
Torque for gauge bolts 150 Nm, cold 120 Nm under working conditions.

For gauge body and gauge valve part lists, dimensions of glasses and material specifications see pages 5, 8, 9 and 12.

Suggested order specification
Bi-colour level gauge PN 315
red/green indication
KLINGER material code FS/H
Gauge glass Borosilicate
thermally prestressed
Connexion gauge body – shut off fittings rotatable
Shut-off fittings gauge valves with safety balls

Ordering example:
KTA-DVK 2, 3 x I, FS/H
DN 25 / PN 315
M= 600 mm

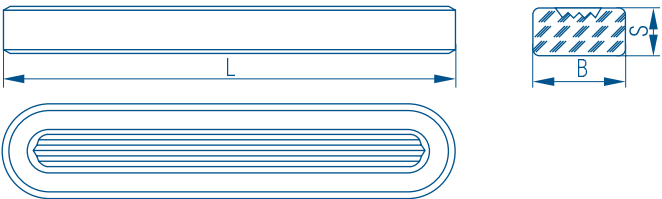


Reflex and transparent gauge glasses

Technical data

Reflex glasses

Reflex glasses A, B, H



Overall dimension (mm)

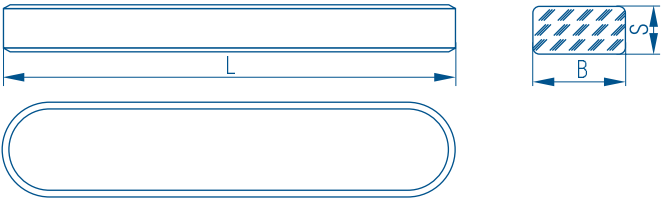
Size	Type A			Weight g/piece	Type B			Weight g/piece	Type H			Weight g/piece
	L	B	S		L	B	S		L	B	S	
0	-	-	-	-	95	34	17	110	-	-	-	-
I	115	30	17	118	115	34	17	132	115	34	22	176
II	140	30	17	146	140	34	17	162	140	34	22	214
III	165	30	17	176	165	34	17	195	165	34	22	254
IV	190	30	17	200	190	34	17	228	190	34	22	294
V	220	30	17	237	220	34	17	264	220	34	22	344
VI	250	30	17	265	250	34	17	301	250	34	22	392
VII	280	30	17	303	280	34	17	338	280	34	22	445
VIII	320	30	17	334	320	34	17	387	320	34	22	503
IX	340	30	17	359	340	34	17	410	340	34	22	536
X	-	-	-	-	370	34	17	461	-	-	-	-

KLINGER gauges glasses Applicational range reflex glasses	Type A 1)		Type B 1)		Type H 1)	
	bar	°C	bar	°C	bar	°C
For media with no significant glass attack, e.g. oils, hydrocarbons	400	120	265	120	300	120
	150	400	180	400	200	400
	0–10	430	0–10	430	0–10	430
For media with significant glass attack, e.g. saturated steam, HPHW, alkalis	35	243	35	243	42 ²⁾	253

1) Glass types to OeNORM M 7354 or DIN 7081. 2) For steam pressures above 35 bar we recommend the use of transparent glasses with mica shields.

Transparent glasses

Transparent glasses A, B, H, TA 28



Overall dimension (mm)

Size	Type A			Weight g/piece	Type B			Weight g/piece	Type H			Weight g/piece	Type TA 28			Weight g/piece
	L	B	S		L	B	S		L	B	S		L	B	S	
0	-	-	-	-	95	34	17	110	-	-	-	-	-	-	-	-
I	115	30	17	118	115	34	17	132	115	34	22	176	113	27,6	16,8	114
II	140	30	17	146	140	34	17	162	140	34	22	214	-	-	-	-
III	165	30	17	176	165	34	17	195	165	34	22	254	163	27,6	16,8	168
IV	190	30	17	200	190	34	17	228	190	34	22	294	188	27,6	16,8	194
V	220	30	17	237	220	34	17	264	220	34	22	344	218	27,6	16,8	226
VI	250	30	17	265	250	34	17	301	250	34	22	392	248	27,6	16,8	258
VII	280	30	17	303	280	34	17	338	280	34	22	445	278	27,6	16,8	290
VIII	320	30	17	334	320	34	17	387	320	34	22	503	318	27,6	16,8	334
IX	340	30	17	359	340	34	17	410	340	34	22	536	338	27,6	16,8	356
X	-	-	-	-	370	34	17	461	-	-	-	-	-	-	-	-

KLINGER gauges glasses Applicational range transparent glasses	Type A 1)		Type B 1)		Type H		Type TA 28 4)	
	bar	°C	bar	°C	bar	°C	bar	°C
For media with no significant glass attack, e.g. oils, hydrocarbons	240	120	290	120	340	120	-	-
	160	400	200	400	230	400	-	-
	0–10	430	0–10	430	0–10	430	-	-
For media with significant glass attack, e.g. saturated steam, HPHW, alkalis	2)		2)		2)		3)	
	35	243	35	243	42	253	120	324
	70	300	85	300	85	300	180	356

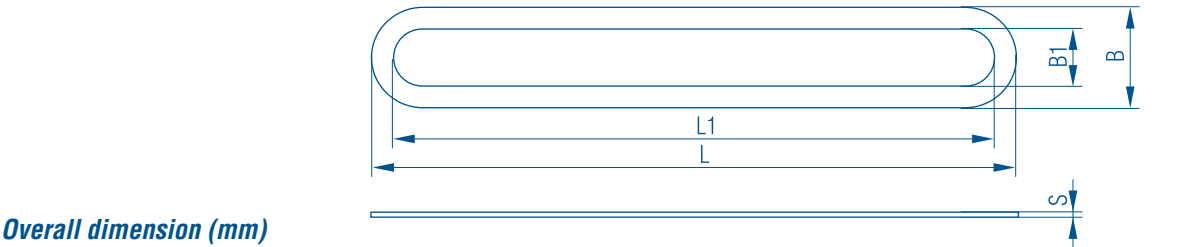
1) Glass types to OeNORM M 7354 or DIN 7081.
2) For steam pressures above 35 bar we recommend the use of transparent glasses with mica shields.
3) For steam pressures above 120 bar only TA 28 glasses, size I, may be used.
4) TA glasses may only be used with mica shields.

Sealing and cushion gasket & mica shields

for reflex and transparent gauge glasses

Sealing gasket, cushion gasket made from asbestos-free material

Sealings



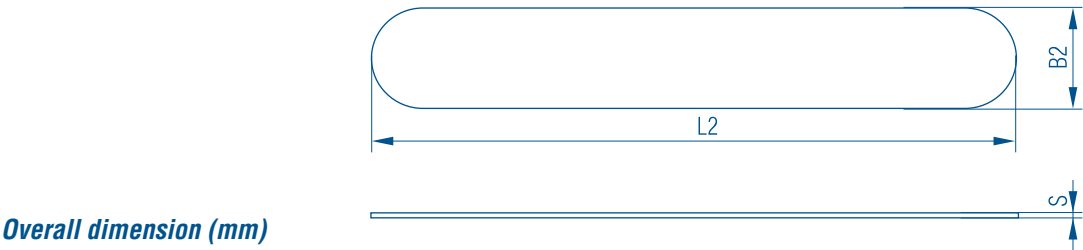
Overall dimension (mm)

Size	Type A				Type B/H				Sealing gasket and protective gasket 1) TA 28				Cushion gasket 2) TA 28			
	L	L1	B	B1	L	L1	B	B1	L	L1	B	B1	L	L1	B	B1
0	95	70	30	15	95	70	34	15	-	-	-	-	-	-	-	-
I	115	90	30	15	115	90	34	15	133	97	47	19	112	97	27	17
II	140	115	30	15	140	115	34	15	-	-	-	-	-	-	-	-
III	165	140	30	15	165	140	34	15	183	147	47	19	162	147	27	17
IV	190	165	30	15	190	165	34	15	208	172	47	19	187	172	27	17
V	220	195	30	15	220	195	34	15	238	202	47	19	217	202	27	17
VI	250	225	30	15	250	225	34	15	268	232	47	19	247	232	27	17
VII	280	255	30	15	280	255	34	15	298	262	47	19	277	262	27	17
VIII	320	295	30	15	320	295	34	15	338	302	47	19	317	302	27	17
IX	340	315	30	15	340	315	34	15	358	322	47	19	337	322	27	17

Sealing and cushion gasket s=1,5 mm 1) Protective gasket s=0,5 mm 2) Cushion gasket s=0,5 mm

Mica shields

Mica shields



Overall dimension (mm)

Size	Type A		Type B/H		Type TA 28	
	L2	B2	L2	B2	L2	B2
0	95	30	95	34	-	-
I	115	30	115	34	133	47 ¹⁾
II	140	30	140	34	-	-
III	165	30	165	34	183	47 ²⁾
IV	190	30	190	34	208	47 ²⁾
V	220	30	220	34	238	47 ²⁾
VI	250	30	250	34	268	47 ²⁾
VII	280	30	280	34	298	47 ²⁾
VIII	320	30	320	34	338	47 ²⁾
IX	340	30	340	34	358	47 ²⁾

s=0,15–0,20 s=0,15–0,20 ¹⁾ s=0,60 ²⁾ s=0,30–0,40

Material

A and B micas: stained first quality
TA 28 micas: stained A quality

KEL-F shields

Size like mica shields
Type B/H standard thickness = 1 mm



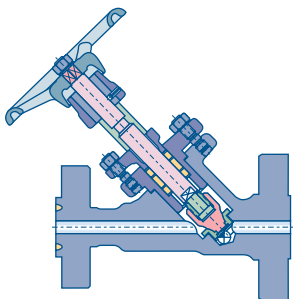
Liquid level gauges

Shut-off fittings

DVK 2 Shut-off fittings gauge valve DVK-2

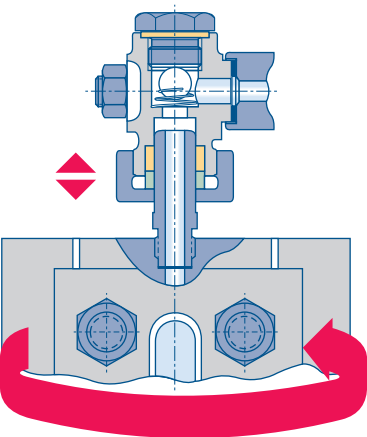
Shut-off fittings for high pressures and high temperatures. The piston material is high-alloy, hardened steel. The connection to the gauge is made by a connecting piece with two flanges.

Standard version with safety ball in the two connecting pieces. Standard operation by handwheel, special version with chain-wheel operation. Quick open/shut operation is not possible with DVK 2 gauge valves.

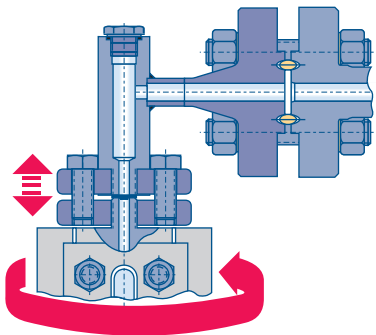


Connexion gauge body – shut-off fitting

Steam application



Male thread with two oval flanges and gasket, positive connection. When oval flanges are loosened the gauge body may be rotated through 360°.



End-tubes contained in and sealed by gland ring. The connexion is not positive, the gauge body may be easily rotated through 360°.

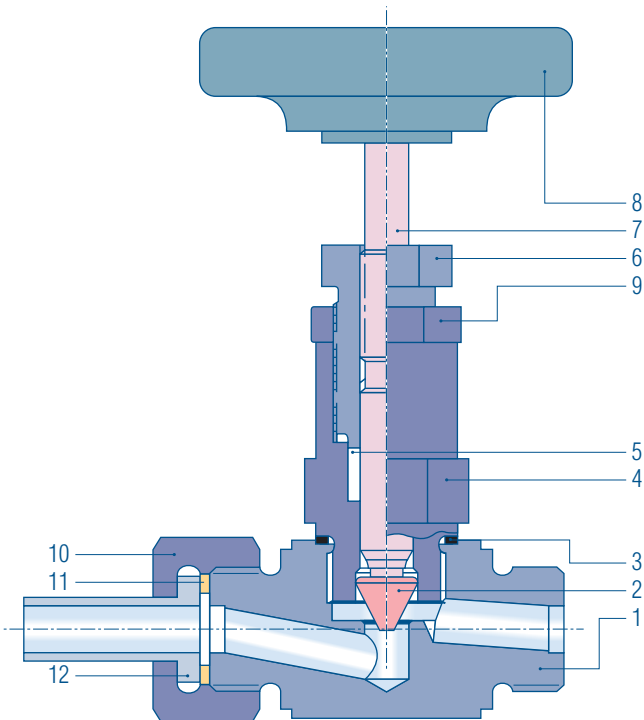
NV/ASP Drain valve

PN 400

Nominal pressure PN 400
Construction to KLINGER
material code M/H

Size DIN 8
Overall length: Klinger standard
Connection: R1/2"
Temperature: -40 °C to + 400 °C
Drain valve for gauge valve DVK-2

Pos.	Part	Material
1	Body	1.4571
2	Valve cone	1.4122
3	Sealing ring	2.4055 (Ni)
4	Head piece	1.4571
5	Stuffing box	Graphite
6	Stuffing box nut	1.4401
7	Spindle	1.4404
8	Handwheel	Synthetic
9	Nut	1.4401
10	Screw coupling	A2
11	Sealing	K-Sil
12	Drain pipe	1.0402

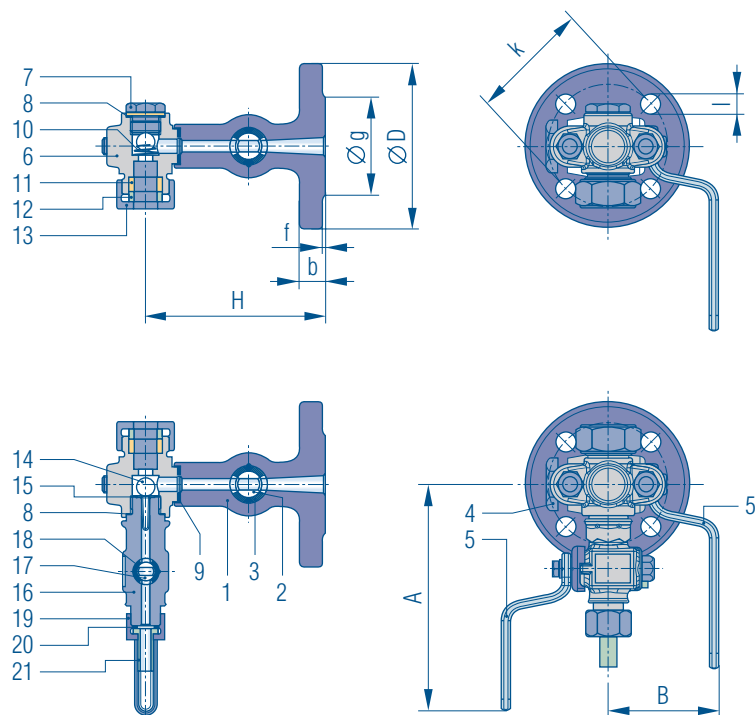


Shut-off fittings

Gauge cocks

Nominal pressure:
PN 63, ANSI 400
Construction to KLINGER
material code FS/H, M/H
Shut-off fitting for:
Gauges K

D
PN 63
ANSI 400



Overall and connexion dimensions (mm)

Flange connexion	H	A	B	D	b	g	f	Drilled			Approx. kg
								No. of holes	l	k	
DN 20 PN 40	124	142	78	105	18	58	2	4	14	75	7,30
DN 25 PN 40	124	142	78	115	18	68	2	4	14	85	7,70
3/4" ANSI 300	123	142	78	117,5	16	43	1,6	4	19	82,6	7,70
1" ANSI 300	124	142	78	124	17,5	50,8	1,6	4	19	88,9	8,20

Pos.	Part	Materials	
		FS/H	M/H
1	Gauge cock body	A105	F316L
2	Cock plug AB 18	AISI316	AISI316
3	Packing sleeve AB 18	Graphite	Graphite
4	Tightening nut	A105	AISI316
5	Handle	Fe37B-Nylon	Fe37B-Nylon
6	Stuffing-box body	A105 N	F316L
7	Plug	A105 N	AISI316
8	Gasket	Softnickel	Softnickel
9	Gasket	K-SIL	K-SIL
10	Pressure spring	AISI301	AISI301
11	Gland ring	Graphite	Graphite
12	Thrust ring	A105	A105
13	Union nut	A105	A105
14	Ball	AISI301	AISI301
15	Pressure spring	AISI301	AISI301
16	Drain cock body	A105	F316L
17	Plug AB 12	AISI316	AISI316
18	Packing sleeve Ab12	Graphite	Graphite
19	Union nut	A105	A105
20	Gasket	K-SIL	K-SIL
21	End tube	AISI316	AISI316

Connexions

Vessel connexions:

Standard flange dimensions, as shown in the table

Male screw connections with pipe thread to DIN 2999-R1/2" or R3/4"

Connexion gauge body – gauge cock

The connection to the gauge is formed by K end-tubes (16 mm o.D.) which are rotatably held within the gauge cock stuffing box.

The gauge cocks are provided with safety balls in the upper and lower gauge cocks.

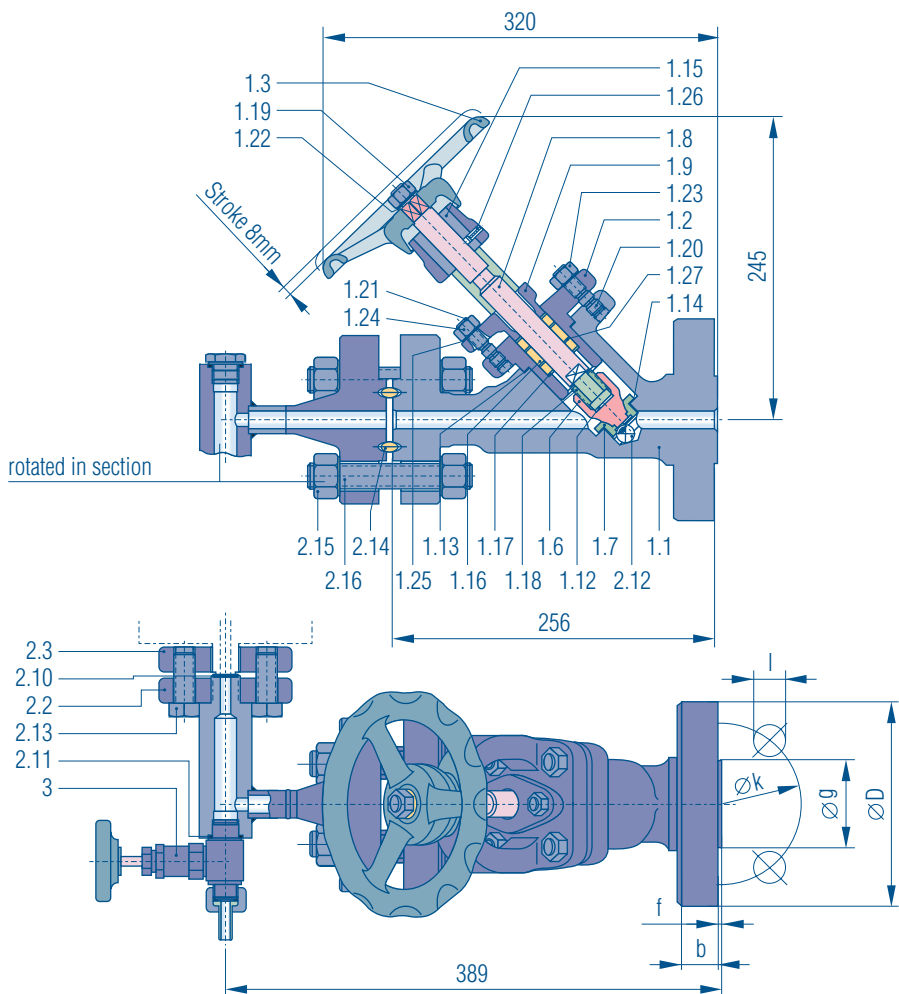
The lower gauge cock is provided with an ABL 12 drain cock.



Shut-off fittings

Gauge valve

DVK 2 Nominal pressure:
PN 315, PN 250, PN 160
Construction to KLINGER
material code FS/H
Shut-off fittings for:
Gauges T 85,
TA 120, KTA



Overall and connexion dimensions (mm)

Flange connexion	D	b	g	f	Drilled			Approx. kg
					No. of holes	l	k	
DN 25 PN 160	140	24	68	2	4	18	100	18
DN 25 PN 250	150	28	68	2	4	22	105	18
DN 25 PN 315	160	34	68	2	4	22	115	18

Connexion gauge body – gauge cock

Connexion to the gauge is made by connecting pieces with two flanges. The NV/ASP drain valve is screwed into the lower connecting piece. The gauge valves are fitted with safety balls as standard.

Pos.	Part	Material FS/H
1.1	Body	C22.8
1.2	Bonnet	C22.8
1.3	Handwheel	GG-20
1.6	Piston	4528 V
1.7	Seating ring	1.4571
1.8	Spindle	1.4104
1.9	Gland retainer	GGG-40
1.12	Shim washer	90MnV8
1.13	Gasket	Softnickel
1.14	Gasket	Softnickel
1.15	Threaded bush	Sint C11
1.16	Stuffing-box ring	Graphite
1.17	Bottoming ring	St 12.03 / FeCu 10 Ni 8p
1.18	Split nut	St 60 / FeCu 10 Ni 8p
1.19	Hexagon nut	5
1.20	Stud bolt	2CrMoV511

Pos.	Part	Material FS/H
1.21	Stud bolt	Ck35
1.22	Serrated lock washer	Spring steel
1.23	Hexagon nut	24CrMo5
1.24	Hexagon nut	C35
1.25	Belleville wassher	50CrV4
1.26	Tension pin	Spring steel
2.1	Connecting piece	C22.8
2.2	Oval flange Ø17	St 42
2.3	Oval flange M16	St 42
2.8	Plug	9SMn28K
2.10	Gasket	Softnickel
2.11	Gasket	Softnickel
2.12	Ball	1.4034
2.13	Hexagon-headed screw	8.8
2.14	Gasket	Soft iron
2.15	Nut	C35
2.16	Stud bolt	Ck 35
3	Drain valve	

Liquid level gauges

Accessories

Illuminators for KLINGER bi-colour gauges

Safety class IP 65

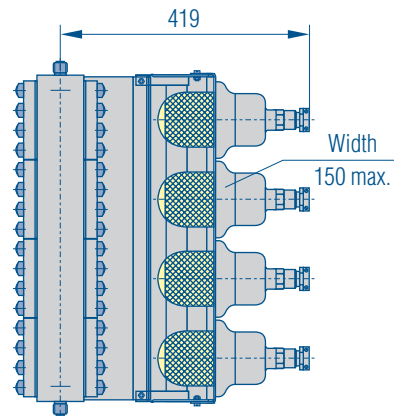
EEx dII CT6, 230 V 50 Hz, 15 W with
red / green indication.

Lamp bulb with screwed base E 27.

Suitable for outdoor service.

Special voltage on request.

Illuminators



More items contained in our program

Liquid level gauges for process applications

- Reflex level gauges R100 for 100 bar
- Reflex level gauges R160 for 160 bar
- Reflex level gauges R250 for 250 bar
- Reflex level gauges UOR for 63 bar
- Transparent level gauges T50 for 50 bar
- Transparent level gauges T100 for 100 bar
- Transparent level gauges T160 for 160 bar
- Transparent level gauges T250 for 250 bar
- Transparent level gauges UOT for 63 bar

Liquid level gauges for steam applications

- Reflex level gauges R100-D for 22 bar, 216 °C
- Transparent level gauges T85 for 85 bar, 298 °C
- Transparent level gauges T120 for 120 bar, 323 °C

Shut-off fittings liquid level gauges

- Gauge cocks type DG made of FS/H, M/H and M
- Gauge valve type RAV 946/947 and 956/957 made of FS/H, M/H and M

KLINGER material code

FS/H: Carbon steel C22.8 (without copper alloy parts)

M/H: stainless steel 1.4401-AISI

316 (parts which don't meet with the medium
are made of carbon steel)

M: Stainless steel 1.4401-AISI 316 (all parts made
of stainless steel)

Detailed information you can find at
www.klinger.kfc.at



Liquid level gauges

Pressure-Temperature-Table, Pressure rating

Pressure-Temperature-Table for saturated steam

Pressure bar	Satur- ated steam °C	Pressure bar	Satur- ated steam °C
0,01	6,6	8,5	172,1
0,015	12,7	9,0	174,5
0,02	17,1	9,5	176,8
0,025	20,7	10	179,0
0,03	23,7	11	183,2
0,04	28,6	12	187,1
0,05	32,5	13	190,7
0,06	35,8	14	194,1
0,08	41,1	15	197,4
0,10	45,4	16	200,4
0,12	49,0	17	203,4
0,15	53,6	18	206,2
0,20	59,7	19	208,8
0,25	64,6	20	211,4
0,30	68,7	22	216,2
0,35	72,3	24	220,8
0,40	75,4	26	225,0
0,50	80,9	28	229,0
0,60	85,5	30	232,8
0,70	89,5	32	236,4
0,80	93,0	34	239,8
0,90	96,2	36	243,1
1,0	99,1	38	246,2
1,1	101,8	40	249,2
1,2	104,2	42	252,1
1,3	106,6	44	254,9
1,4	108,7	46	257,6
1,5	110,8	48	260,2
1,6	112,7	50	262,7
1,8	116,3	55	268,7
2,0	119,6	60	274,3
2,2	122,6	65	279,6
2,4	125,5	70	284,5
2,6	128,1	75	289,2
2,8	130,5	80	293,6
3,0	132,9	85	297,9
3,2	135,1	90	301,9
3,4	137,2	95	305,8
3,6	139,2	100	309,5
3,8	141,1	110	316,5
4,0	142,9	120	323,1
4,5	147,2	130	329,3
5,0	151,1	140	335,0
5,5	154,7	150	340,5
6,0	158,1	160	345,7
6,5	161,2	180	355,4
7,0	164,2	200	364,2
7,5	167,0	224	372,0
8,0	169,6	225	374,0

Pressure rating

Pres- sure rating	Material of pipe-line parts					Permissible working pressure in pipe-line in bar for temperature °C					
	Flanges valves				Bolt to DIN 2507 sheet 2 ¹⁰⁾	³⁾ 20 (120)	200	250	300	350	400
	Cast iron with laminar graphite ¹¹⁾	Cast iron with spheroidal graphite ¹¹⁾	Cast steel	Steel							
6	GG-20	GGG-38	-	St 37-2	4 D	6*)	-	-	-	-	-
10	GG-20	GGG-38	GS-45	St 37-2	4 D	10 ⁴⁾	-	-	-	-	-
16	GG-20	GGG-38	GS-45	St 37-2	4 D	16 ⁴⁾	-	-	-	-	-
	-	-	GS-C 25	C 22N	C 35	16	14	13	11	10	8
25	-	GGG-38	GS-45.5	C 22 N	4 D ¹²⁾	25 ⁴⁾	-	-	-	-	-
	-	-	GS-C 25	C 22 N	C 35	25	20	18	16	16	13
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	25	22	20	17	16	13
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55			25	22	20	19
40	-	-	GS-45.5	C 22 N	4 D ¹²⁾	40	32	28	24	-	-
	-	-	GS-C 25	C 22 N	C 35	40	-	-	-	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	40	35	32	28	24	21
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55			40	35	31	30
63	-	-	GS-C 25	C 22 N	C 35	63	36	29	24	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	63	50	45	40	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	63	-	-	-	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	63	50	45	40	36	32
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55			63	56	50	47
100	-	-	GS-C 25	C 22 N	C 35	100	80	70	60	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	100	-	-	-	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	100	80	70	60	56	50
160	-	-	GS-C 25	C 22 N	C 45	160	130	112	96	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	160	-	-	-	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	160	130	112	96	90	80
250	-	-	GS-C 25	C 22 N	C 45	250	200	175	150	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	250	-	-	-	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	250	200	175	150	140	125
315	-	-	GS-C 25	C 22 N	C 45	315	250	225	192	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	315	-	-	-	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	315	250	225	192	180	160
400	-	-	GS-C 25	C 22 N	C 45	400	320	280	240	-	-
	-	-	GS-22 Mo 4	15 Mo 3	24 CrMo 5	400	-	-	-	-	-
	-	-	GS-17 CrMo 55	13 CrMo 44	24 CrMoV 55	400	320	280	240	225	200

³⁾ The permissible working pressure at 20°C may be applied in the case of ferrous materials in the temperature range from -10 to 120°C.

⁴⁾ Stress limitations: up to 120°C: for liquids provided the product of the inside diameter in mm and the working pressure in N/m² does not exceed the following values: 72.000 for St 00 and St 33, 100.000 for St 37, for compressed air and non hazardous gases to 100 N/cm². Up to 180°C: for saturated steam up to 100 N/cm²; for gas pipe-lines see also DIN 2470, DIN 2460 and DIN 2461.

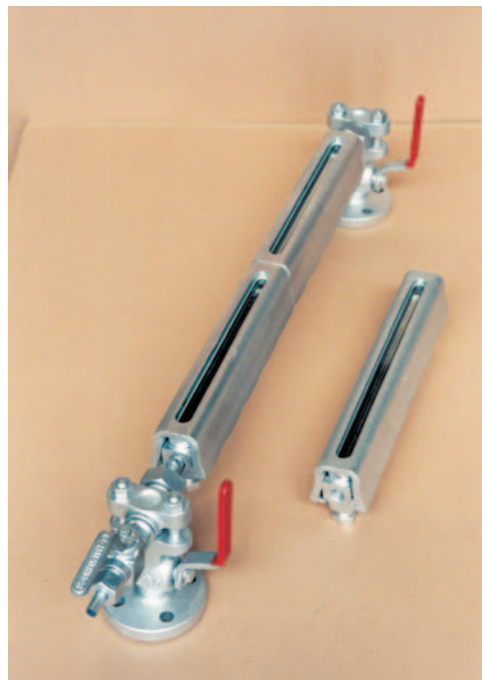
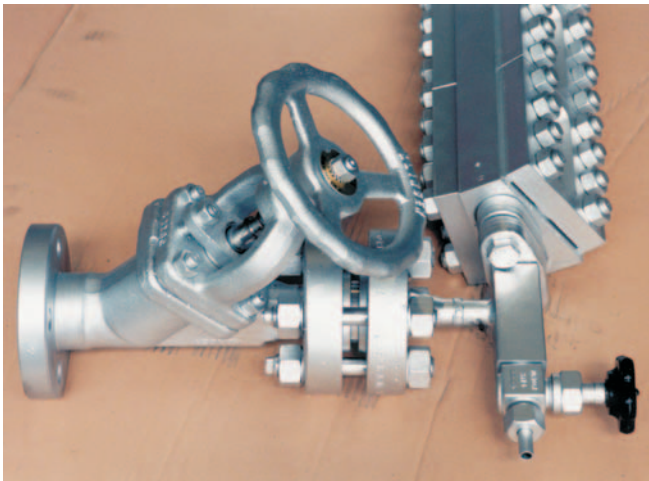
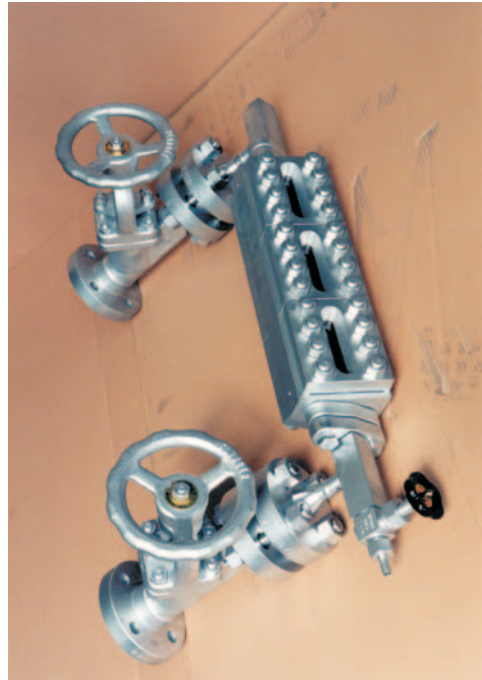
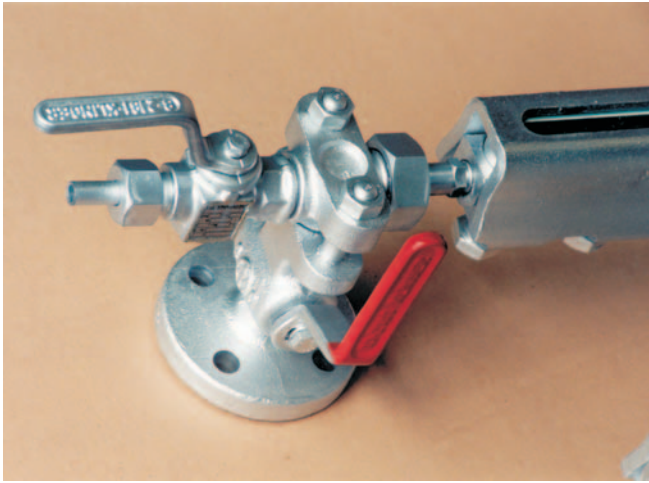
¹⁰⁾ The strength value of the bolts is listed with a temperature 15°C lower than the working temperature.

¹¹⁾ With cast iron gate valve the permissible working pressures shown in the dimensional standards (e.g. DIN 3201) apply.

¹²⁾ Only with soft gaskets; bolts C35 metal gaskets or composite metal/soft gaskets.

*) Permissible working pressure for valves is same as at 200°C if GG-20 ans 5 D bolts are used.

Liquid level gauges



References

- | | |
|----------------|---------------|
| ■ ABB | ■ Lenzing |
| ■ Bayer | ■ Lurgi |
| ■ BP | ■ Mobil |
| ■ Ciba | ■ MOL |
| ■ Dow Chemical | ■ Neste OY |
| ■ ESSO | ■ Norsk Nydro |
| ■ FW Vienna | ■ OMV |
| ■ Hoechst | ■ Sasol |
| ■ JGC | ■ Shell |
| ■ Koszience | ■ Slovnaft |
| ■ Kvaerner | ■ Solvay |



KLINGER product range

Product range

Ballostar®KHA

*3piece ball valve made of
grey cast iron, steel and stainless
cast steel*

Ballostar®KHI

*2piece ball valve made of
grey cast iron, steel and stainless
cast steel*

KLINGER Monoball®

*One-piece ball valve made of
steel and stainless cast steel*

KLINGER Ball-o-top

Brass ball valves

Piston valves KVN

*made of grey cast iron, nodular cast
iron, steel and stainless cast steel*

KLINGERMATIC®

*Actuator for piston valves and ball
valves*

Liquid level gauges

*for steam boiler and process
application*

Reflex and transparent gauges

Circular sight-glasses

AB cocks

*Packing-sleeve cocks and pressure-
gauge cocks in brass, steel and
stainless steel*

Key role

Link

Innovation

Navigation

Growth

Efficiency

Routine

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