



## SEMPPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE OPERATING INSTRUCTIONS

Before installation these instructions must be fully read and understood

### Series

VSE/VSR Full lift and normal safety relief valve.  
VSE 1 open spring bonnet  
VSR 1 open spring bonnet and adjusting ring  
VSE 2 closed spring bonnet  
VSR 2 closed spring bonnet and adjusting ring  
VSE 4 closed spring bonnet, weight-loaded

### Orifice letters

SKB (Sempell): A - Z  
SKB (API): EA - TA

### Design

According to TO.271.01./271.02. and  
TO.272.01./271.02.

- Spring-loaded (cylindrical compression spring)
- Weight-loaded
- Roller bearing up 8 kN spring force
- Cooling spacer for medium temperatures  $\geq 400^{\circ}\text{C}$

### Attachment

- Pneumatic measuring device A 143 for adjusting the set pressure at operating pressure

For the application of a pneumatic actuator A 160 see corresponding operating instruction VCIOM-02239.

*Observe design data on the tagplate!*

### ATTENTION

*This operating instruction does not specify the extent of delivery. It is valid for several sizes, designs, accessories and additional devices. It contents generally exceeds the contractual determined extent of delivery.*

### 1 DANGER AND WARNING INDICATIONS

The construction of the Sempell safety valves corresponds to the latest state of engineering and the valid safety regulations. Nevertheless, improper use or improper installation can cause risks for the personnel or can lead to restrictions in regard of the operational safety. Therefore, the Sempell GmbH recommends the operator of the safety valves to take appropriate measures and make sure that the present operating instructions are read and understood by the assigned personnel.

### APPLICATION LIMITS

*It is only allowed to use the valves according to the details of these operating instructions and according to the parameters and application cases agreed in the delivery contract (see nameplate). The application of the valve has to take place adequate to the medium tolerances of the used materials.*

### WARNINGS FOR THE OPERATING AND MAINTENANCE PERSONNEL

*Before commissioning and maintenance works familiarise yourself with the legal accident prevention regulations, the local safety instructions and this operating instruction and observe them.*

*Use the safety valve and its individual parts and accessories only for the purpose intended by us.*

### Please observe the following points besides the notes given in the text:

- Danger of burning at safety valves and with the connected pipes while operating under increased temperature.
- Disassembly of the safety valve only in case of pressureless plant and after cooling down.
- Protection against risks caused by evaporation also in case of pressureless system; for information please contact the safety inspector concerned.
- After assembly check all sealing points in regard of tightness.
- In case of adjustment make changes at pressure screw and adjusting ring only with clearly reduced pressure to avoid unintended response.
- Carry ear protection during adjustment, if necessary.
- Danger of burning by discharge of small amounts of possibly hot medium in case of safety valves with open spring bonnet (VSE 1, VSR 1).
- Danger of injury while discharging at disconnected discharge line.
- Extreme vibrations can lead to inadmissible increase of operating pressure with the possibly destruction of the safety valve or to the destruction of the balanced bellows with unintentional escape of medium.

### Exclusion of liability

Sempell GmbH cannot be held liable in case of improper maintenance and adjustment of a Sempell safety valve, use of inadmissible spare parts or utilities and in case of a temporary or permanent connection of equipment with the safety valve which is not approved by us.

# SEPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

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### 2 DESCRIPTION

Spring-loaded full lift safety relief valves are direct acting safety valves for protection of pressure tanks against inadmissible excess-pressure.

A cylindrical compression spring creates the closing force on the valve disc against the opening pressure of the medium below the valve disc. At normal operating conditions the valve seat is held tight.

By changing the spring compression it is possible to change the set pressure. In case of exceeding set pressure, the pressure of the medium prevails and the safety valve opens.

With full lift characteristic the safety valve opens rapidly at full lift and discharges the total mass flow necessary to prevent a further pressure increase.

With normal characteristic the safety valve reaches the lift necessary for the mass flow to be discharged after response within a pressure increase of maximum 10%.

After a defined pressure decrease, the safety valve closes again.

By means of the lifting lever at the cap the safety valve can be opened by hand with a set pressure of 85% at least.

The safety valves are type tested and comply with the requirements of the standards and regulations.

*Use within areas exposed to danger of explosion*

The safety valves underwent a hazard analysis according to code 94/9/EC with the following result:

- The safety valves do not have a potential ignition source. ATEX 94/9/EC is not applicable to these valves.
- The valves safety may be used in the EX range
- Electrical / pneumatically accessories have to undergo a separate assessment of conformity according to ATEX.
- The surface temperature does not depend from the valve itself but from the operational conditions. Observe while installing.

### 3 OPERATION

#### 3.1 Warning indications for the operation

*Observe safety regulations!*

#### ATTENTION

*Unstable behaviour of safety valves such as chattering or vibrating can destroy the valve seat, the safety valve or the pipe and thus causing the failure of the safety function or the shutdown of the plant. Therefore, observe regulations and empirical notes regarding design and dimensioning, fitting and installation.*

#### ATTENTION

*Safety valves with weight loading, Series VSE 4, are blocked for the transport. Before commissioning remove blocking stem and mount gag plug (17) with gasket (40).*

- Design and dimensioning: do not use larger safety valves than necessary! In case of back pressure use safety valves with bellows.
- Fitting and installation: lay supply line as short as possible. Use as few bends as possible.
- Keep supply line free from vibrations. Absorb or avoid pressure surges and waves, e. g. caused by pumps or other valves.
- Drain the discharge line and the valve body at their lowest point. Condensate can impair the function of the safety valve.
- Protect lines and valve against freezing.

# SEPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

SKB-DIN	Max. weight [kg] without accessories about	SKB-API	Max. weight [lbs] without accessories about
A	19	EA	42
B	19	FA	42
C	21		
D	35	GA	77
E	70	HA	155
F - G	80	JA	175
H	90	KA	200
J - K	110	LA	245
L	150	MA-NA	310
M	170		
N	200	PA	440
P	250	QA	555
Q	270		
R	300	RA	665
S	300	TA	665
T	380		
U	410		
V	460		
W	530		
X	1260		
Y	1600		
Z	1870		

### 3.2 Storage rules

To preclude damages during loading and unloading, move the valve with suitable lifting gears. Handwheels and other driving elements are unsuitable as impact points. The transport shall preferably take place by cable or transport pallet.

At delivery provide the outsides of all ferritic parts of the safety valve except the welding edges with a coat of paint.

The insides of the body are protected by a watery corrosion preservative that has a long-term effect because of the film formative active agents.

All connection inlets are closed by corresponding caps.

In this state the safety valve can be stored in closed, dust-free and dry rooms lying on a pallet without difficulties. Time of storage about six months. Storage of more than six months asks for disassembly and visual check of the inner parts of the safety valve. A weather-protected outside storage is not allowed.

#### For spare parts out of elastic material

(O-rings, scraper rings, rod and piston gaskets) additionally apply:

**Temperature:** the temperature of the storage shall be between 0°C and 25°C since otherwise a hardening of the material and so a shortening of durability will follow. Shield heating elements and lines in heated storeroom so that no direct heat irradiation arises. The distance between the heat source and the stocks has to be 1 m at least.

**Moisture:** to prevent the formation of condensate, avoid moist storerooms. A relative humidity of below 65% is at best.

**Lighting:** the products of elastic materials are to protect from direct sun light and from strong artificial light with a high ultraviolet part. Therefore supply the windows of the storerooms with a red or orange (in no case blue) paint.

**Ozone:** protect products of elastic materials from ozone (formation of cracks and embrittlement). The storeroom may not contain ozone generating systems (fluorescing sources of light, mercury vapour lamps, electric motors, etc.).

**Oxygen:** protect products out of elastic materials from draught by storage in airtight tanks. Oxygen causes cracking and embrittlement.

If these requirements are guaranteed for products out of elastic materials, the storage time is about 5 years.

#### For spare parts out of steel

Store the parts in closed, dust-free and dry rooms so that damages do not occur.

Especially the following protection measures apply:

Disc (4): wax coat of the gasket, net coat

Guide bush (6): protection by net coat

# SEPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 3.3 Installation instructions

#### NOTE

Clean pipes before installing safety valves as otherwise the valve seats can be damaged by foreign bodies when discharging!

Remove transport protection just before installation.

Check plant identification and details on the nameplate.

#### 3.3.1 Installation

The installation zone must be easily accessible for maintenance works. Required free space above the safety valve see section Dimensions. In case of large safety valves provide for additional space for lifting gears, at least 500 mm.

Position of installation vertical, inlet from below. Do not brace valve body when fastening; if necessary compensate bearing of the supporting brackets.

Lay line in such a way that neither static or dynamic forces nor forces caused by thermal expansion may be transferred to the valve body.

#### PLEASE NOTE

Stresses at the valve body may lead to leaking at the valve seat!

#### 3.3.2 Inlet line

If possible arrange safety valve directly at the nozzle of the tank to be protected. Otherwise lay inlet line between tapping point and safety valve as short and as poor in resistance as possible.

In no case the inlet line diameter must be smaller than the inlet nominal size at the safety valve.

The pressure loss in the inlet line must not exceed 3% of the set pressure at the greatest possible discharge quantity.

Check inlet line in regard of pressure vibrations according to FBR 153 as far as possible.

#### ATTENTION

A pressure loss higher than the closing pressure difference may lead to an unstable, uncontrollable behaviour of the safety valve; chattering or vibrating may destroy the valve seat, the safety valve or the line and thus lead to failure of the safety function or to the shutdown of the plant!

For discharge of condensate in case of gases and vapours, the inlet line must have a slope to the tapping point of 15 degrees at least.

#### ATTENTION

Condensate at the inlet of the safety valve changes the functional behaviour and may lead to an inadmissible pressure increase. Danger of explosion!

In case of liquids with temperatures higher than the ambient temperature, the inlet line must be assembled with slope to the safety valve, or designed as a siphon-type bend in front of the safety valve. Thereby, a heat transmission to the safety valve is avoided which could impair the tightness at the valve seat.

#### 3.3.3 Exhaust line

In no case the exhaust line diameter must be smaller than the outlet nominal size at the safety valve.

Back pressures in the exhaust line are admissible up to 15% of the set pressure and for safety valves with compensating piston (SN 144) up to 50% of the set pressure, in case there are no other restrictions, e. g. with respect to the strength of the body connection flange.

#### ATTENTION

Higher back pressures may lead to an unstable, uncontrollable behaviour of the safety valve; chattering or vibrating may destroy the valve seat, the safety valve or the line and thus lead to failure of the safety function or to shutdown of the plant!

At the deepest point the exhaust line must be equipped with a drain which is large enough to enable the discharge of minor leaks, e. g. in case of untight valve seat. Particularly in the open air exhaust line, valve body and drain must be protected against icing and freezing, e. g. by (electrical) trace heating; merely insulating is not sufficient!

Do not exchange the drain connection G 1/4" at the valve body for the lock screw (44) at orifice letters A40 and B40. Removing the lock screw (44) may change the function of the safety valve!

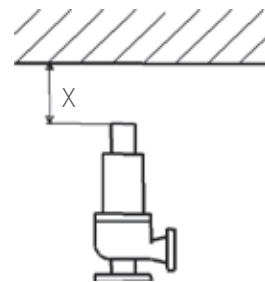
#### ATTENTION

An icy, frozen or clogged exhaust line leads to the failure of the safety function! Danger of explosion in case of excess-pressure!

#### CAUTION

In case of several safety valves with one common exhaust line, take special safety precautions for disassembling of only one safety valve to exclude danger in case of unintended discharge of other safety valves!

Recommendation! Sound isolate exhaust line and/or provide the same with silencer; in doing so, regard allowable back pressure!



#### DIMENSIONS

SKB	Overhead dimension X
A - G	300 mm
EA - JA	12"
H - R	700 mm
KA - RA	26"
S - Z	900 mm
TA	36"

# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 3.3.4 Insulating

In case of hot medium insulate inlet line and valve body. In case of gases and vapours insulate inlet line and valve body very carefully to avoid condensation.

#### ATTENTION

*Condensate at the inlet of the safety valve changes the functional behaviour and may lead to an inadmissible pressure increase; danger of explosion!*

The spring bonnet and a possibly mounted cooling spacer shall not be insulated as with heated spring the set pressure decreases.

### 3.4 Pressure test

The response of the safety valve must be prevented.

Either flange off the safety valve and close the supply line with a blind flange or block the valve. In case of welded-in safety valve a pressure test insert can be used.

#### ATTENTION

*In case of a blocked safety valve the test pressure can amount up to 1.5 fold of the set pressure without consultation with Sempell.*

Turn in the blocking screw instead of the gag plug (17) and tighten it securely by hand so that the disc (4) is blocked in closed position. In case of design with supplementary loading (SN 111) screw off electric solenoid including cooling spacer and replace it against a cap (13) with blocking screw SN 100.

#### ATTENTION

*After the pressure test, restore and check the ready-to-operate state!*

### 3.5 Commissioning

#### ATTENTION

*At safety valves with weight load, Series VSE 4, remove blocking screw before commissioning and assemble gag plug (17) with gasket (40).*

The safety valve is delivered ready to operate. The set pressure is adjusted at works and secured against unauthorized adjustments by lead seal. Higher medium temperatures can lower the set point at approx. 1% per 100°C and ask for a readjustment under operating conditions. Standard values see table in section "Adjustment of the set pressure".

### 3.6 Operational test

Function and reliability of the safety valves are proved by the type test. Therefore operational tests are generally not carried out in the plant. This is only usual for steam boiler safety valves.

### 3.7 Discharge test

- Apply ear plugs.
- Slowly increase operating pressure in the plant until the safety valve has fully opened.
- Lower operating pressure until the safety valve closes.

In case of several discharge tests with hot steam allow intermediate cooling down of the safety valve as caused by heating of the spring a slight decrease of the set pressure is possible.

#### ATTENTION

*When discharging, some leaking medium may escape at the open bonnet (8) in case of safety valves Series VSE 1 / VSR 1. Danger of scalding by hot steam!*

### 3.8 Adjustment of the set pressure

#### ATTENTION

*A change of the lead sealed spring adjustment must only take place in the presence of the competent inspector.*

The adjustment of the set pressure takes place on the test stand. If the set pressure is adjusted in the plant, the pneumatic measuring device A 143 should be applied as by means of this device the set pressure can be adjusted without increasing the operating pressure.

#### ATTENTION

*Adjusting only with lowered pressure. At operating pressure working on the tightening screw (11) may lead to unintended response of the safety valve. When discharging, some leaking medium may escape at the spindle guide of the tightening screw (11). Danger of scalding by hot steam!*

Remove lead seal. Unscrew cap (13). Loosen lock nut (28). For working at the tightening screw (11) secure spindle (7) e. g. with a pin against rotation as otherwise the valve seat may be damaged.

Tighten tightening screw (11) (turn right):

set pressure higher

loosen tightening screw (11) (turn left):

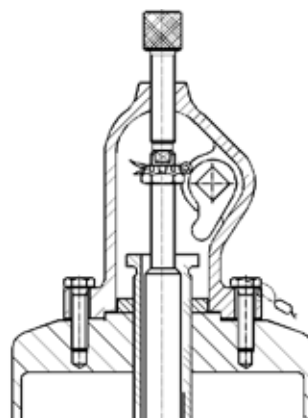
set pressure lower

After the adjustment secure tightening screw (11) with lock nut (28). Mount cap (13) and lead seal.

Standard values for the change of the set pressure in % for a quarter turn of the tightening screw (11):

Orifice letter SKB	Changes in %
AIV EAIV	10
AI-III, B, C EAI-III, FA	7
D-H GA-KA	4
J-M LA-NA	3
N-R PA-RA	1.5
S-W TA	1
X-Z	0.5

Precision of the set pressure adjustment: ± 3%



# SEPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 3.9 FUNCTIONAL DIFFERENCES

	VSE 1 Standard	VSE 1 with compensating piston SN 144	VSR 1 (with adjusting ring) Standard	VSR 1 with compensating piston SN144
Opening pressure difference	+5%	+3%	+3%	+3%
Closing pressure difference	-10%	-10%	-8%	-6%

	VSE 2 Standard	VSE 2 with valve seat for liquids SN 123	VSR 2 (with adjusting ring) Standard	VSR 2 with valve seat seat for liquids SN 123
Opening pressure difference	+5%	+10%	+3%	+10%
Closing pressure difference	-10%	-20%	-8%	-10%

For set pressures below 3 bar the closing pressure difference may be up to 0.3 bar.

#### Changing the closing pressure difference for VSR 1 and VSR 2

After removing the lock screw (44), the closing pressure difference can be changed by means of the adjusting ring (14). The sum of opening and closing pressure difference remains approximately the same.

For adjusting, put screwdriver through the opening and adjust adjusting ring (14) groove by groove. Its graduation equals about 0.2 mm of vertical adjustment.  
Screw adjusting ring (14) up = closing pressure difference lowers. Turn in and tighten lock screw (44) again.

#### ATTENTION

Remove lock screw (44) only with lowered pressure. At operating pressure adjusting the adjusting ring (14) may lead to unintended response of the safety valve. When discharging the safety valve or in case of untight valve seat, medium may escape out of the opened adjusting bore. Danger of scalding by hot media, e. g. steam!

### 3.10 TROUBLE SHOOTING

Malfunction	Cause	Remedies
Safety valve opens at different pressures.	<ol style="list-style-type: none"> <li>1. Condensate in the inlet line.</li> <li>2. Pressure change by superimposed vibration.</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve insulation of line. Observe drain and slope.</li> <li>2. Suppress vibrations at the safety valve.</li> </ol>
Safety valve opens and closes in rapid succession.	<ol style="list-style-type: none"> <li>1. Pressure loss in the inlet line is greater than the closing pressure difference.</li> <li>2. Discharge quantity is too small because the subsequent flow is too small.</li> <li>3. Admissible back pressure is exceeded in the exhaust line.</li> <li>4. Dynamic pressure drop in the inlet line, especially in case of liquids.</li> </ol>	<ol style="list-style-type: none"> <li>1. For VSR enlarge closing pressure difference. Otherwise reduce flow resistance of the inlet line: expand, shorten or remove constrictions. Fast remedy: decrease lift (as far as allowed), therefore diminish outflow.</li> <li>2. Install smaller safety valve or adjust discharge quantity.</li> <li>3. Decrease flow resistance of the exhaust line: e.g. by expanding or shortening the line.</li> <li>4. Provide safety valve with a vibration damper.</li> </ol>
Closing pressure differences are too great.	<ol style="list-style-type: none"> <li>1. Saturated steam with high moisture. Adjusting ring (14) of VSR is not adjusted correctly.</li> </ol>	<ol style="list-style-type: none"> <li>1. For VSR change closing pressure difference.</li> </ol>
Safety valve stays open after discharge test.	<ol style="list-style-type: none"> <li>1. Foreign bodies between seat zone (3) and disc (4).</li> </ol>	<ol style="list-style-type: none"> <li>1. Repeat discharge test or blow off foreign bodies by lifting the lever (36). Otherwise disassemble valve.</li> </ol>
Safety valve fails to close tightly.	<ol style="list-style-type: none"> <li>1. Valve seat damaged.</li> <li>2. Difference between operating and set pressure is too small.</li> <li>3. Body forming by line forces.</li> <li>4. No slope of the inlet line in case of hot liquids.</li> </ol>	<ol style="list-style-type: none"> <li>1. Disassemble valve. Rework valve seat and disc (4).</li> <li>2. Enlarge difference or mount supplementary loading.</li> <li>3. Lay line elastically.</li> <li>4. Assemble inlet line with slope to the safety valve or lay siphon-type bend.</li> </ol>

# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

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### 4 INSPECTION AND MAINTENANCE WORKS

Determine inspection intervals depending on frequency of response and operating conditions. Keep certificates about performed works at the safety valve.

Before commissioning again drain safety valve.

#### While controlling

- Check valve for tightness. In doing so, take care of the following indications: whistling noises, medium at the bonnet, medium at the drain nozzle or in the exhaust line.

#### Inspection

- Check each sealing. Replace if leaky.
- Check seat faces.
- Smooth valve seat and disc (4) with fine lapping paste. If necessary, replace disc (4).
- Equalize guide areas of the spindle (7); when doing so, do not apply material removing machine works.

#### At larger intervals, e.g. each 3 years

- Completely disassemble safety valve.
- Clean and check valve parts.
- Smooth valve seat and disc (4) with fine lapping paste. If necessary, replace disc (4). In case of rework observe functionally important outlines at the valve seat.
- Replace spring (10) when damaged by corrosion or temperature and readjust set pressure.
- Equalize guide areas of the spindle (7); when doing so, do not apply material removing machine works.
- Lubricate roller bearing (48) and tightening screw (11).
- Treat ball (18), sliding guides not in contact with the medium, fits, gaskets and threads with an assembling lubricant.

#### ATTENTION

*Do not treat valve seats, metallic sealing surfaces and sliding guides in contact with the medium.*

#### ATTENTION

*For oxygen application all parts in contact with the medium must be free from oil and grease. Danger of explosion!*

### 5 DISASSEMBLY

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#### 5.1 Danger and warning indications

*Take work order and wait until the installation is switched free.*

*Check if the valve is pressureless and cooled down.*

*Residual medium may escape when opening and disassembling the valve; also at pressureless plant further evaporations are possible.*

*Before disassembly switch off electrical supply, loosen plug or disconnect cable.*

*Loosen nuts (9.1) only when the spring (10) is released as the studs (9) cannot absorb the initial stress in the spring (10).*

#### 5.2 Instructions for disassembly

- First dismount supplementary loading. Disassemble position indicator only if necessary.
- For works at lifting nuts (12) or tightening screw (11) secure the spindle (7) e. g. with a pin against torsion as otherwise the valve seat can be damaged.

#### 5.3 Tools

- fixed spanner 10 - 80 mm
- socket wrench 17 mm
- screwdriver 8 mm
- retaining ring pliers for outer rings
- flatnose pliers
- side cutting pliers
- hammer
- punch Ø 2,5; 3; 4 mm
- seal wire
- lead seal
- lead-sealing pliers
- vernier calliper
- lapping wheel
- washer for M10, M16, M24

In case of very great safety valves (SKB X, Y and Z) it is possible that there are other parts or parts arrangements than described in this operating instruction because of special design conditions. Please observe special, order specific assembly drawing.

#### 5.4 Operating materials

##### 5.4.1 Lubricating the removable valve components

To lubricate the removable or detachable valve components during assembly, use the greases specified in Table A. Removable or detachable valve components are all screw connections, especially pressure-retaining screw connections, and other components within the distribution of forces. All removable or detachable valve components are lubricated with the same grease if they are lubricated in the assembly process.

The operating temperature of the valve is definitive for selecting the grease to be applied for the removable valve components (cf. Table A).

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## OPERATING INSTRUCTIONS

**TABLE A: Greases for lubricating the removable valve components**

Design temperature of the valve $T_B$	Grease
$T_B < 400^\circ\text{C}$	Molykote® BR 2 Plus <sup>[1]</sup>
$400^\circ\text{C} \leq T_B < 700^\circ\text{C}$	Molykote® P 37 <sup>[1]</sup>

<sup>[1]</sup> Before applying the grease, ensure that the surfaces are metallically blank (free of oil, grease, etc.) and free of dirt particles.

The greases specified in Table A are manufactured and/or supplied by the following manufacturers and/or suppliers:

Grease:	Manufacturer / Supplier:
Molykote® BR 2 Plus	Dow Corning GmbH Wiesbaden Rheingastr. 34, 65201 Wiesbaden
Molykote® P 37	Dow Corning GmbH Wiesbaden Rheingastr. 34, 65201 Wiesbaden

### 5.4.2 Lapping abrasives

It is necessary to use special lapping abrasives that contain finely distributed hardened particles for lapping seat surfaces on body and disk seats. The lapping abrasive specified in Table B is recommended by Sempell:

**TABLE B: Lapping abrasives, suitable for the finishing of valve seats**

Lapping abrasive:	Manufacturer / Supplier:
TETRABOR®	ESK Ceramics GmbH & Co. KG
Boron carbide [F 100 - F 1200]	Max - Schaidhauf-Str. 35, 87437 Kempten - Germany
Lapping abrasive for disc out of material 1.4980: Diamond suspension 2 - 30 µm.	Mikrodiamant GmbH, Ostfildern

### 5.4.3 Further operating materials

Further required operating materials and their usage are specified in Table C and are manufactured and/or supplied by the following manufacturers and/or suppliers:

**TABLE C: Further operating materials**

Usage	Type	Manufacturer / Supplier
Degreasing agent	Isopropylalkohol [2-Propanol]	
Assembly lubricant (colloidal graphite) for parts in contact with the medium	DAG® 156	Acheson Industries, Dornstadt
O-ring grease	Molykote® 55	Dow Corning GmbH Wiesbaden Rheingastr. 34, 65201 Wiesbaden

### ATTENTION

For oxygen application all parts in contact with the medium must be free from oil and grease.  
Danger of explosion.



# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 5.5 Dismantling the safety valve

To remove or disassemble a possibly mounted pneumatic actuator A160 see operating instruction MA.270.07.xxxx E.

Remove lead seal. Dismount cap (13). Remove split pin (29) and lifting nuts (12) or loosen and remove checked lifting nuts (12). Measure and record distance between upper edge of spindle (7) and tightening screw (11). Loosen lock nut (28) and release spring (10) by means of tightening screw (11).

Loosen nuts (9.1) and lift off bonnet (8). Remove spring (10), cooling spacer (15) (if installed), gasket (26), spindle (7) and guide bush (6). In case of VSR 1 and VSR 2 do not change position of the adjusting ring (14); mark, if necessary. Remove disc (4) and ball (18); at orifice letter SKB: D - W drive out dowel pin (19). The guide piston (5) will not be disassembled. Dismount cap (13) with lever (36) only if necessary.

### 6 ASSEMBLY

For SKB D - W: fasten disc (4) and ball (18) by means of dowel pin (19) to the spindle (7).

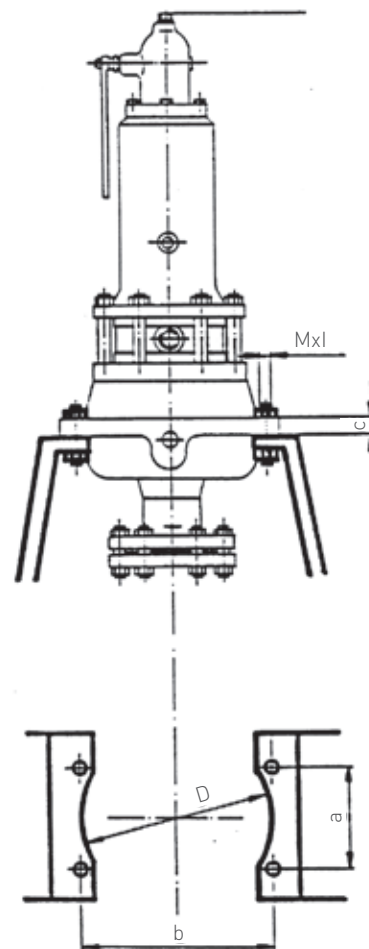
Insert guide bush (6); for VSR 1 and VSR 2 observe marked position of the adjusting ring (14). Insert disc (4), ball (18) and spindle (7). Put over cover (16) possibly with slide ring (43). According to design put on cooling spacer (15), split ring (20), stop bush (21), distance bush (22), pressure bush (23), spring stop (24), spring (10), spring plate (25) and roller bearing (48).

Put on bonnet (8) and screw tight with hexagonal nuts (9.1). Prestress spring (10) by means of tightening screw (11) onto the same dimension as measured before disassembling; thus the same set pressure as before. Secure tightening screw (11) with lock nut (28). Screw on two lifting nuts (12) at the upper end of the spindle (7) and secure them or screw on lifting nuts (12) and tighten with split pin (29).

Mount cap (13) and lead seal. Check easy motion and function of the lever (36) with fork (31). If available, mount supplementary loading.

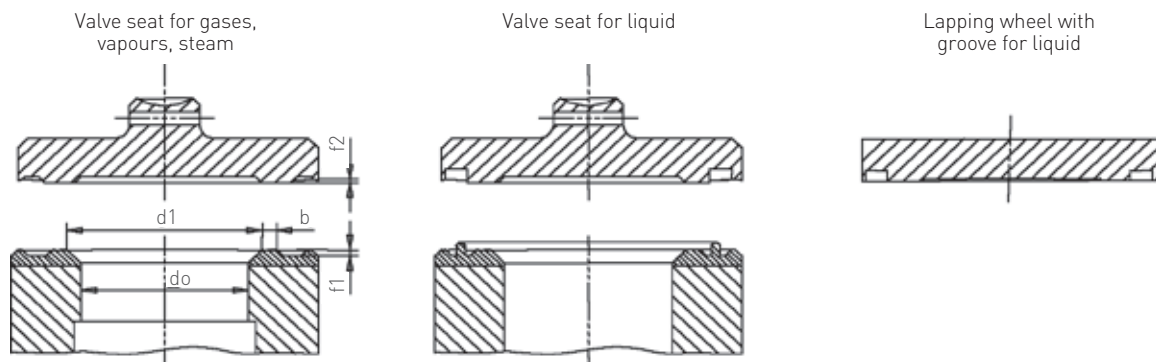
### 7 DIMENSIONS FOR MOUNTING BRACKET

Orifice letter SKB			Dimensions in mm					
Sempell	API	Group	a	b	c	D	Thread	
A	EA	III - IV	106	152	10	160	M12 x 65	
B	FA	III	106	152	10	160	M12 x 65	
		IV	104	194	10	180	M12 x 65	
C		III	106	152	10	160	M12 x 65	
		IV	104	194	10	180	M12 x 65	
D	GA	I	98	140	10	150	M8 x 55	
		II	106	152	10	160	M12 x 65	
		III - IV	104	194	10	180	M12 x 65	
E	HA	I	98	140	10	150	M8 x 65	
		II	106	152	10	160	M12 x 65	
		III - IV	104	194	10	180	M12 x 65	
F		I	126	180	12	190	M12 x 65	
		I - IV	138	196	15	200	M16 x 80	
G	JA	I - II	138	196	15	210	M16 x 80	
		III - IV	138	196	15	210	M16 x 80	
H	KA	I - II	160	230	15	250	M16 x 80	
		III - IV	160	230	15	250	M16 x 80	
J		I - III	184	262	15	290	M16 x 80	
		IV	184	262	15	290	M16 x 80	
K	LA	I - IV	192	274	15	300	M16 x 80	
L	MA, NA	I - IV	200	286	15	310	M16 x 80	
M		I - IV	230	328	15	370	M16 x 80	
N	PA	I - III	242	344	20	380	M20 x 100	
P		I - III	288	410	20	460	M20 x 100	
Q	QA	I - III	288	410	20	460	M20 x 100	
R	RA	I - III	288	426	20	480	M20 x 100	
S	TA	I	350	350	25	430	M20 x 135	
T		I	400	400	30	480	M20 x 135	
U		I	450	450	30	530	M20 x 140	
V		I	550	550	30	680	M20 x 140	
W		I	640	640	30	780	M20 x 140	
X		I	720	720	60	900	M24 x 180	
Y		I	860	860	60	1050	M24 x 180	
Z		I	950	950	60	1140	M24 x 180	



# SEPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS



### 8 FUNCTIONALLY IMPORTANT OUTLINES AT THE VALVE SEAT

Orifice letter SKB			Functionally important outlines in mm						
Sempell	API	Group	do	d1	b	b	f1	f2 <sup>[1]</sup>	f2 <sup>[2]</sup>
			H8	- 0,1	min.	max.	- 0,3	- 0,1	- 0,1
A	-	IV	13	14.4	1.05	1.20	0.5	0.4	1.1
A	EA	I - III	18	19.9	1.30	1.45	0.5	0.4	1.1
B-C	FA	I - IV	18	19.9	1.30	1.45	0.5	0.4	1.1
D-E	GA-HA	I - IV	24.5	27.1	1.20	1.35	1.0	0.6	1.1
F	-	I - IV	28	30.9	1.30	1.45	1.0	0.6	1.1
G	JA	I - IV	33	36.4	1.30	1.45	1.0	0.8	1.6
H	KA	I - IV	38	41.9	1.55	1.70	1.0	0.8	1.6
J	-	I - IV	44	48.5	1.25	1.45	1.0	1.0	1.6
K	LA	I - IV	51	56.2	1.40	1.60	1.0	1.0	1.6
L	MA-NA	I - IV	59	65.0	1.50	1.70	1.0	1.3	2.1
M	-	I - IV	69	76.0	1.50	1.70	1.0	1.3	2.1
N	PA	I - III	80	88.1	1.45	1.75	1.5	1.6	2.1
P	QA	I - III	93	102.4	1.30	1.60	1.5	1.6	2.1
Q	-	I - III	107	117.7	1.35	1.65	1.5	1.9	2.6
R	RA	I - III	126	138.6	1.40	1.70	1.5	1.9	2.6
SPZ	TA	I	[3]	[3]	[3]	[3]	[3]	[3]	[3]

1. For gases, vapours and liquids
2. For steam
3. From orifice letter S on request

# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

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### 9 METHODS TO PRODUCE SUPERFINISHED SEALING SURFACES

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#### ATTENTION

*Lapping is a precision operation and must be carried out by trained personnel. Various operating areas ask for various operating methods.*

#### 9.1 Lapping area production

##### 9.1.1 Disc

Parts with flat seats are normally machine lapped.

#### Procedure:

Allow boron carbide lapping emulsion (a mixture of grade 800 lapping powder and lapping oil) to drip onto the constantly rotating lapping machine wheel. Load the items to be lapped into a suitable locator that is set eccentrically to the table. The lapping operation takes 15 to 20 minutes depending on the quality of the prepared sealing surface. Afterwards the parts will be polished. In case of parts made of material 1.4980 the parts will additionally be polished on a tin plate with a diamond suspension; grain size 2 - 3. A sight control and a test with an interference glass follow to check whether the surface is plane and not convex or concave.

##### 9.1.2 Valve seat

The preferred method is hand operated machine lapping in case the valve seat is installed in the body (screwed in, welded in or in another connection). Thereby it is important that the required force is constantly and steadily transferred through a spring.

#### Procedure:

Grinding and/or lapping foils of different grain sizes are pasted onto a plain carrier wheel of the machine. The prepared seating areas with 3.2 Ra roughness are alternately lapped with grain sizes of 200-600-1000. After lapping with 200 grain size, there should be no visible tool marks. The change takes place at intervals of about 1 minute. Lapping is carried out with oscillating movements. Finally the seating area is cleaned and visually inspected.

#### 9.2 Lapping area site

As a rule, there is no lapping machine available so only a manual method or the method described in section 9.1.2 can be used.

##### 9.2.1 Disc

Depending upon their size, lap the parts on glass plates or discs or rings made of grey cast iron. Lapping abrasive: Tetra Bor lapping paste (grade 120 to 1200).

#### Procedure:

Up to a size of about 200 mm diameters lap the parts on the plates. In case of greater diameters, use the part to be lapped as a pad and move the discs or rings. Thinly distribute the lapping abrasive on one side and up a grain size > 400 additionally sprinkle it with oil drops. Oscillatingly move the valve part or the lapping wheel with constant hand pressure. This operation takes several minutes. Remove the paste with a cold cleaning and repeat the procedure using progressively finer lapping paste. Finally a sight control follows. Up to a size of approx. 200 mm diameter lap the discs with a mobile manual lapping machine according to section 9.1.2.

##### 9.2.2 Valve seat

Procedure see section 9.1.2.

#### ATTENTION

*Check body seats regularly to verify that the seat surfaces are still rectangular to the body center. If this is not the case, restore squareness by using a flat grinding machine.*

### 10 DECLARATION TO EC-DIRECTIVE

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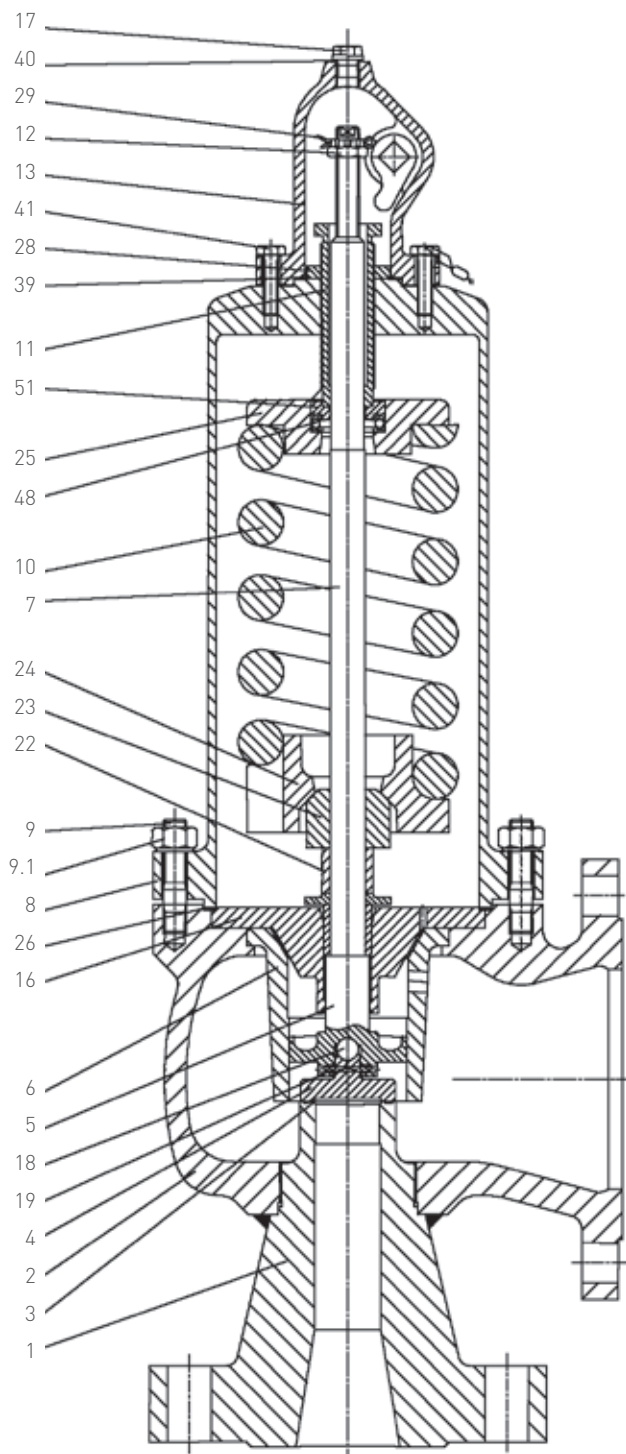
The declaration of conformity can be found in the documentation.

# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 11 PART LIST AND ASSEMBLY DRAWINGS VSE 1 AND VSR 1

VSR 1, SKB J - R, WITH ADJUSTING RING



### PARTS LIST

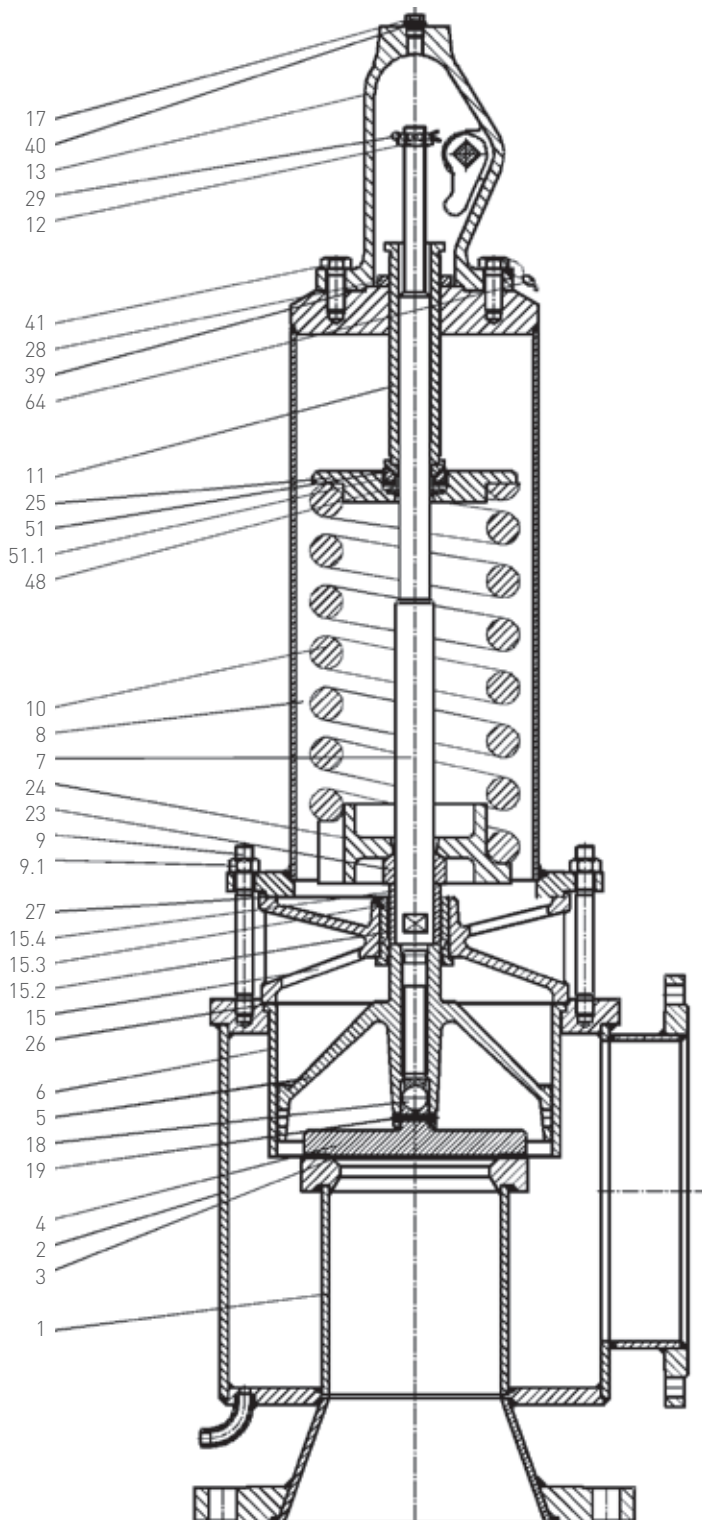
Part	Name
1	Inlet nozzle
2	Body
3	Seat zone
4•	Disc
5	Guide piston
6	Guide bush
7	Spindle
8	Bonnet
9	Stud
9.1	Nut
10	Spring
11	Tightening screw
12	Lifting nut
13	Cap
14	Adjusting ring
15	Cooling spacer
16	Cover
17	Gag plug
18•	Ball
19•	Dowel pin
22	Distance bush
23	Pressure bush
24	Spring stop
25	Spring plate
26•	Gasket
28	Nut
29	Split pin
30	Bush
31	Fork
32	Square shaft
36	Lever
37	Washer
38	Hexagon nut
41	Cap screw
43	Slide ring (for SN 144)
44	Lock screw
45	Gasket
47	Circlip
48	Roller bearing
51	Pressure plate
51.1	Bearing bush
54	Guard ring
55	Baffle plate

• Recommended spare parts

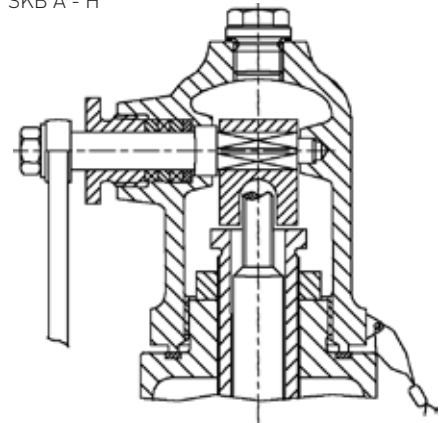
# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

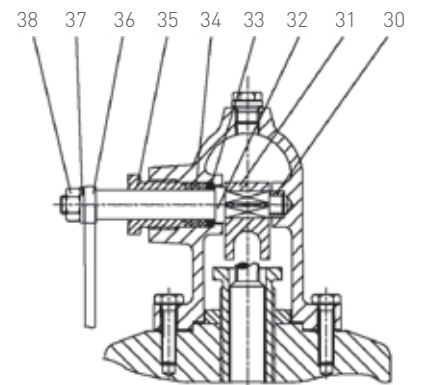
VSE 1, SKB S - Z



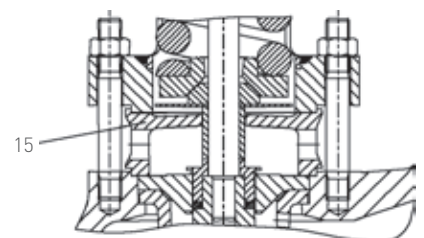
SCREWED CAP  
SKB A - H



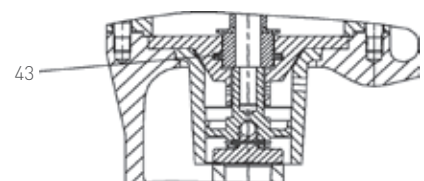
FLANGED CAP  
SKB J - Z



ACCESSORY 110 COOLING SPACER  
as spring protection at operating  
temperatures between 400°C and - 90°C



ACCESSORY 144 COMPENSATING PISTON

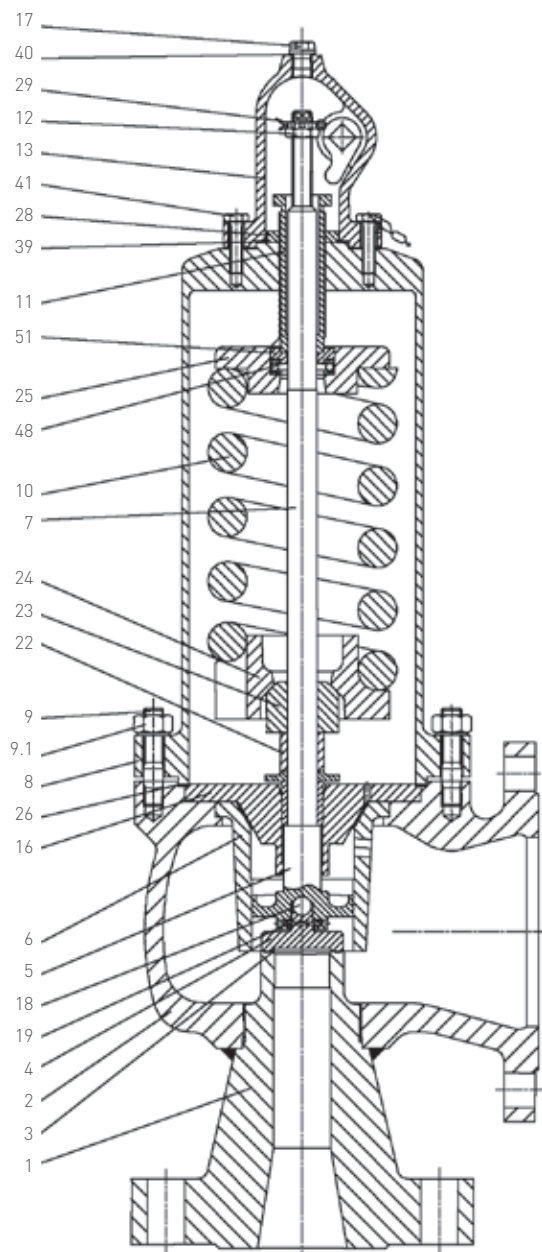


# SEMPELL SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE

## OPERATING INSTRUCTIONS

### 12 PART LIST AND ASSEMBLY DRAWINGS VSE 2 AND VSR 2

VSE 2, SKB J - R



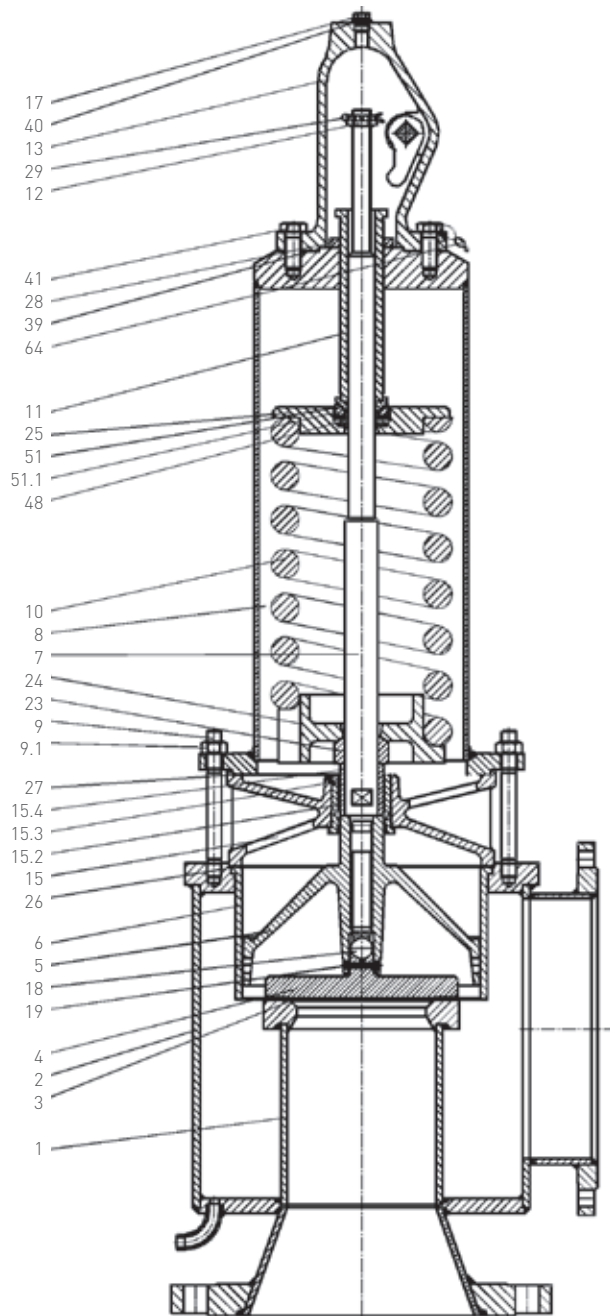
### PARTS LIST

Part	Name
1	Inlet nozzle
2	Body
3	Seat zone
4 •	Disc
5	Guide piston
6	Guide bush
7	Spindle
7.1	Screw bolt
8	Bonnet
9	Stud
9.1	Nut
10	Spring
11	Tightening screw
12	Lifting nut
13	Cap
14	Adjusting ring
15	Cooling spacer
16	Cover
17	Gag plug
18 •	Ball
19 •	Dowel pin
22	Distance bush
23	Pressure bush
24	Spring stop
25	Spring plate
26 •	Gasket
28	Lock nut
29	Split ring
30	Bush
31	Fork
32	Square shaft
33	Bottom ring
34	Packing
35	Gland
36	Lever
37	Washer
38	Hexagon nut
39	Gasket
40	Gasket
41	Cap screw
44	Lock screw
45	Gasket
48	Roller bearing

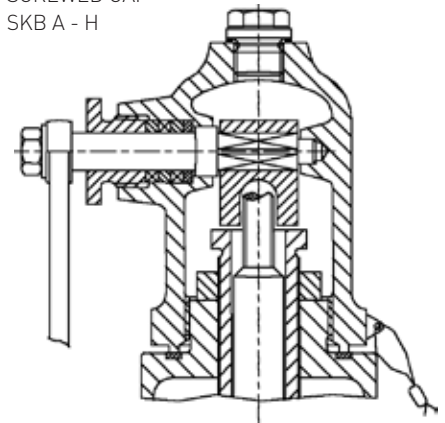
• Recommended spare parts

**SEMPELL** SERIES VSE/VSR FULL LIFT AND NORMAL SAFETY RELIEF VALVE  
OPERATING INSTRUCTIONS

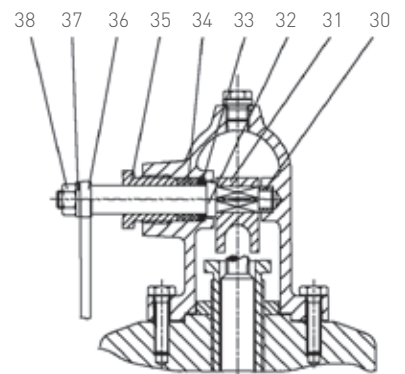
VSE 2, SKB S - Z



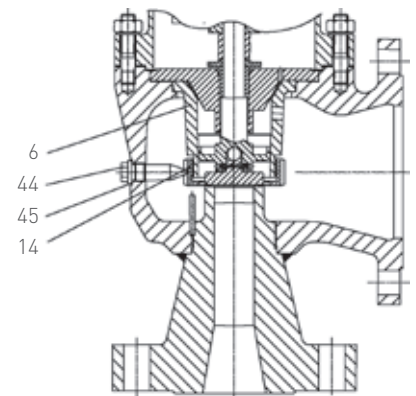
SCREWED CAP  
SKB A - H



FLANGED CAP  
SKB J - Z



VSR 2 WITH ADJUSTING RING (TO SKB S)



ACCESSORY 110 COOLING SPACER  
as spring protection at operating temperatures  
between 400°C and - 90°C

