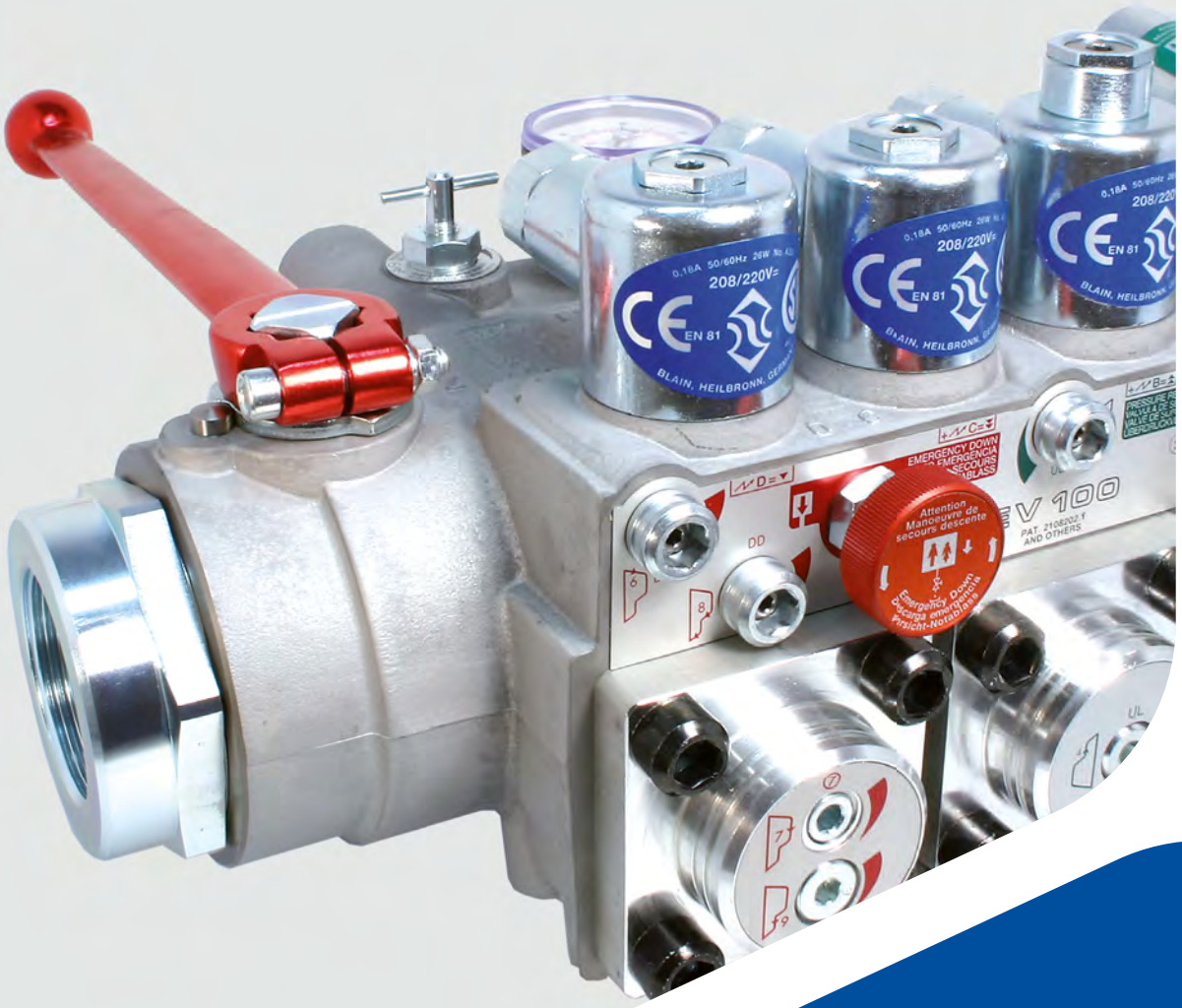
BLAIN VALVES FOR HYDRAULIC ELEVATORS

Excellence in Simplicity and Performance



SERVICE MANUAL

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Service Manual

Elevator Valve EV & KV

! Caution

Only qualified elevator mechanics are permitted to install and adjust elevator control valves and controllers.

Every Blain control valve is subjected to strong quality standards, from production, adjustment and testing, to final shipment.

This manual will provide assistance whenever servicing is required. If necessary, please contact our technical department, stating the valve number, which is engraved into the EV casting above the nameplate, as well as other related technical data.

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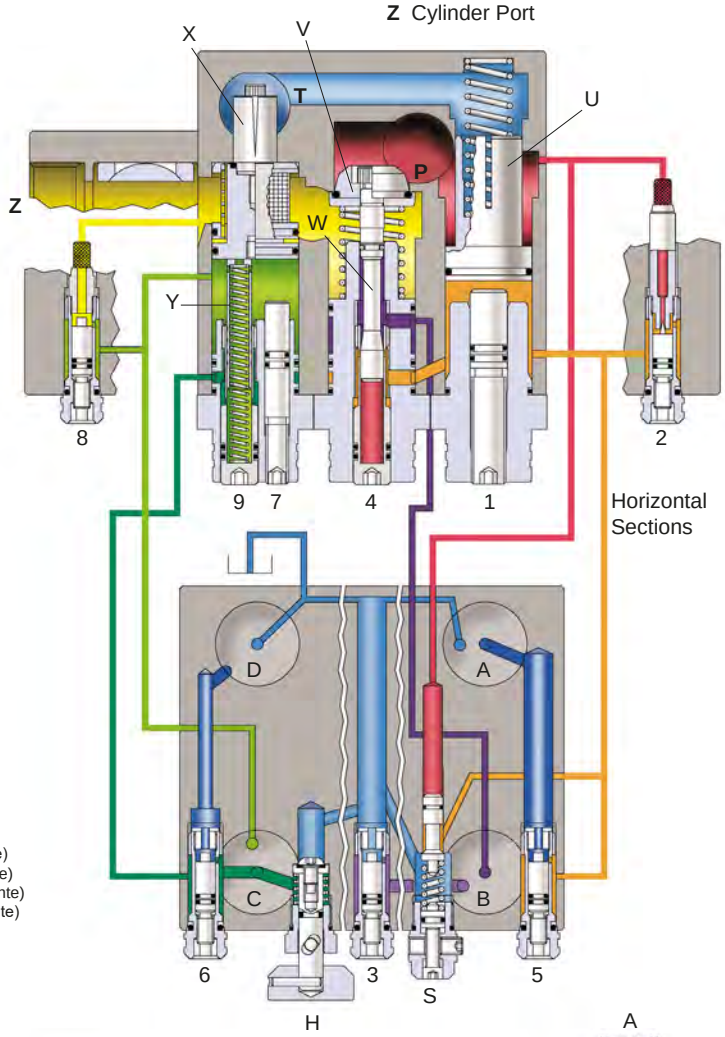
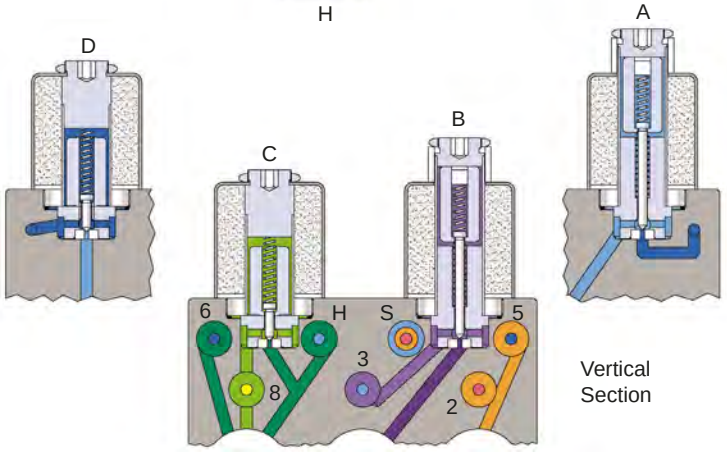
EN ISO 9001

Elevator Valve - EV 100 3/4”
for Home Lifts

P Pump Port
T Tank Port
Z Cylinder Port



Horizontal Sections



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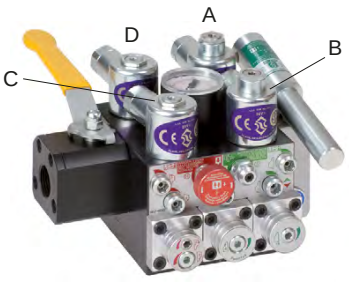

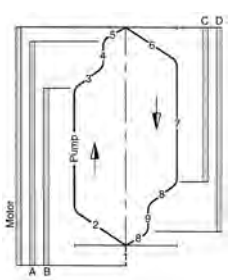

Control Elements
A Solenoid (UP Stop)
B Solenoid (UP Deceleration)
C Solenoid (Down Deceleration)
D Solenoid (Down Stop)
H Manual Lowering
S Relief Valve
U By Pass Valve
V Check Valve
W Leveling Valve (Up)
X Full Speed Valve (Down)
Y Leveling Valve (Down)

Adjustments UP
1 By Pass
2 Up Acceleration
3 Up Deceleration
4 Up Leveling Speed
5 Up Stop

Adjustments DOWN
6 Down Acceleration
7 Down Full Speed
8 Down Deceleration
9 Down Leveling Speed

Pressure
Pumpe
Bypass Valve
Up Leveling
Tank
Cylinder
Down Valve
Down Leveling

Steuerelemente
A Magnetventil (Halt oben)
B Magnetventil (Abbremsen auf)
C Magnetventil (Abbremsen unten)
D Magnetventil (Halt unten)
H Notablassventil
S Überdruckventil
U Umlaufkolben
V Rückschlagventil
W Schleichfahrtventil (auf)
X Senkkolben
Y Schleichfahrtventil (ab)

Einstellungen AUF
1 Umlaufeinstellung
2 Anfahrdrossel
3 Abbremsdrossel
4 Schleichfahrteinstellung
5 Haltedrossel

Einstellungen AB
6 Anfahrtdrossel
7 Senkfahrteinstellung
8 Abbremsdrossel
9 Schleichfahrteinstellung

Druck
Pumpe
Umlaufkolben
Schleichfahrt (Auf)
Tank
Zylinder
Senkkolben
Schleichfahrt (Ab)

Eléments de commande
A Electro-vanne ‘arrêt’ (en fin de montée)
B Electro-vanne ‘ralentissement’ (montée)
C Electro-vanne ‘ralentissement’ (descente)
D Electro-vanne ‘arrêt’ (en fin de descente)
H Descente de secour (homme mort)
S Valve de sécurité
U By-pass
V Clapet anti-retour
W Soupape montée petite vitesse
X Soupape descente
Y Soupape descente petite vitesse

Réglages MONTÉE
1 By-pass
2 Etrangleur de démarrage
3 Etrangleur de ralentissement
4 Réglage de petite vitesse
5 Etrangleur d’arrêt

Réglages DESCENTE
6 Etrangleur de démarrage
7 Réglage de grande vitesse
8 Etrangleur de ralentissement
9 Réglage de petite vitesse

Pression
Pompe
By-pass
Montée petit vitesse
Cuve
Vérin
Soupape descente
Descente petite vitesse

Elementos de mando
A Válv. magnética ‘parada’ (arriba)
B Válv. magnética ‘frenado’ (subida)
C Válv. magnética ‘frenado’ (bajada)
D Válv. magnética ‘parada’ (abajo)
H Válv. parada de urgencia (manual)
S Válv. de seguridad
U Válv. de desviación
V Válv. de retención
W Válv. de subida lentísima
X Válv. de bajada
Y Válv. de bajada lentísima

Ajustes SUBIDA
1 Desviación
2 Arranque
3 Frenado
4 Recorrido lentísimo
5 Parada

Ajustes BAJADA
6 Arranque
7 Recorrido en bajada
8 Frenado
9 Recorrido lentísimo

Presión
Bomba
Válvula de desviación
Subida lentísima
Tanque
Cylindro
Válvula de bajada
Bajada lentísima

EN ISO 9001

Elevator Valve
EV 100 1½”, 2”, 2½”

P Pump Port
T Tank Port
Z Cylinder Port

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B Solenoid (UP Deceleration)
C Solenoid (Down Deceleration)
D Solenoid (Down Stop)
H Manual Lowering
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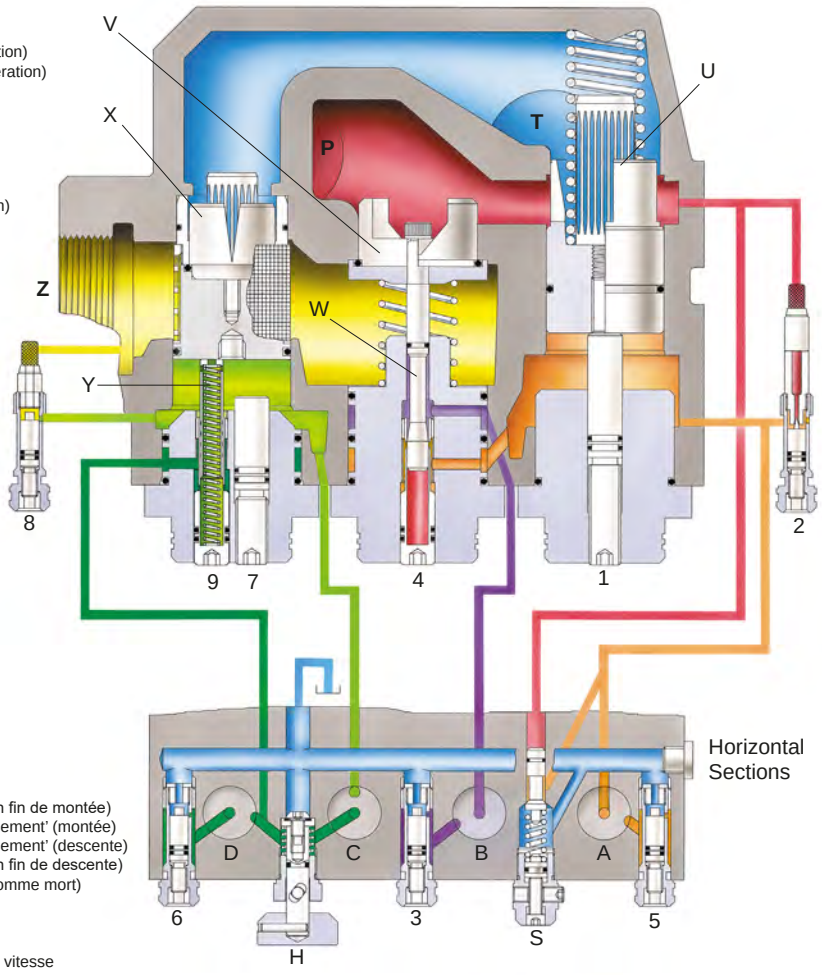
U By Pass Valve
V Check Valve
W Leveling Valve (Up)
X Full Speed Valve (Down)
Y Leveling Valve (Down)

Adjustments UP
1 By Pass
2 Up Acceleration
3 Up Deceleration
4 Up Leveling Speed
5 Up Stop

Adjustments DOWN
6 Down Acceleration
7 Down Full Speed
8 Down Deceleration
9 Down Leveling Speed

Pressure
Pumpe
Bypass Valve
Up Leveling
Tank
Cylinder
Down Valve
Down Leveling



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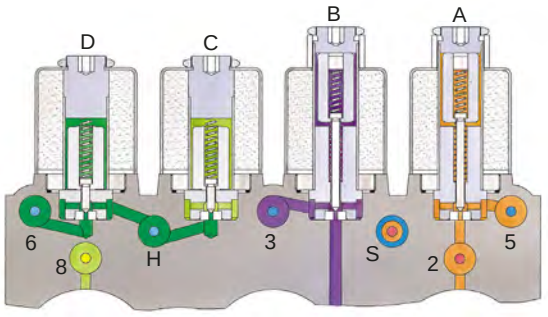

Vertical Section

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A Electro-vanne ‘arrêt’ (en fin de montée)
B Electro-vanne ‘ralentissement’ (montée)
C Electro-vanne ‘ralentissement’ (descente)
D Electro-vanne ‘arrêt’ (en fin de descente)
H Descente de secour (homme mort)
S Valve de sécurité
U By-pass
V Clapet anti-retour
W Soupape montée petite vitesse
X Soupape descente
Y Soupape descente petite vitesse

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2 Etrangleur de démarrage
3 Etrangleur de ralentissement
4 Réglage de petite vitesse
5 Etrangleur d’arrêt

Réglages DESCENTE
6 Etrangleur de démarrage
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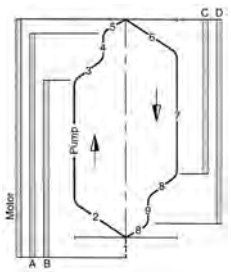
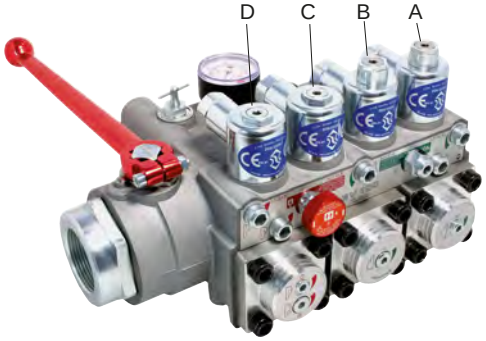
Pression
Pompe
By-pass
Montée petit vitesse
Cuve
Vérin
Soupape descente
Descente petite vitesse





Steuerelemente
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Einstellungen AB
6 Anfahrtdrossel
7 Senkfahrteinstellung
8 Abbremsdrossel
9 Schleichfahrteinstellung

Druck
Pumpe
Umlaufkolben
Schleichfahrt (Auf)
Tank
Zylinder
Senkkolben
Schleichfahrt (Ab)

Elementos de mando
A Válv. magnética ‘parada’ (arriba)
B Válv. magnética ‘frenado’ (subida)
C Válv. magnética ‘frenado’ (bajada)
D Válv. magnética ‘parada’ (abajo)
H Válv. parada de urgencia (manual)
S Válv. de seguridad
U Válv. de desviación
V Válv. de retención
W Válv. de subida lentísima
X Válv. de bajada
Y Válv. de bajada lentísima

Ajustes SUBIDA
1 Desviación
2 Arranque
3 Frenado
4 Recorrido lentísimo
5 Parada

Ajustes BAJADA
6 Arranque
7 Recorrido en bajada
8 Frenado
9 Recorrido lentísimo

Presión
Bomba
Válvula de desviación
Subida lentísima
Tanque
Cilindro
Válvula de bajada
Bajada lentísima

EN ISO 9001

Quick adjustment procedure

Solenoid Coils

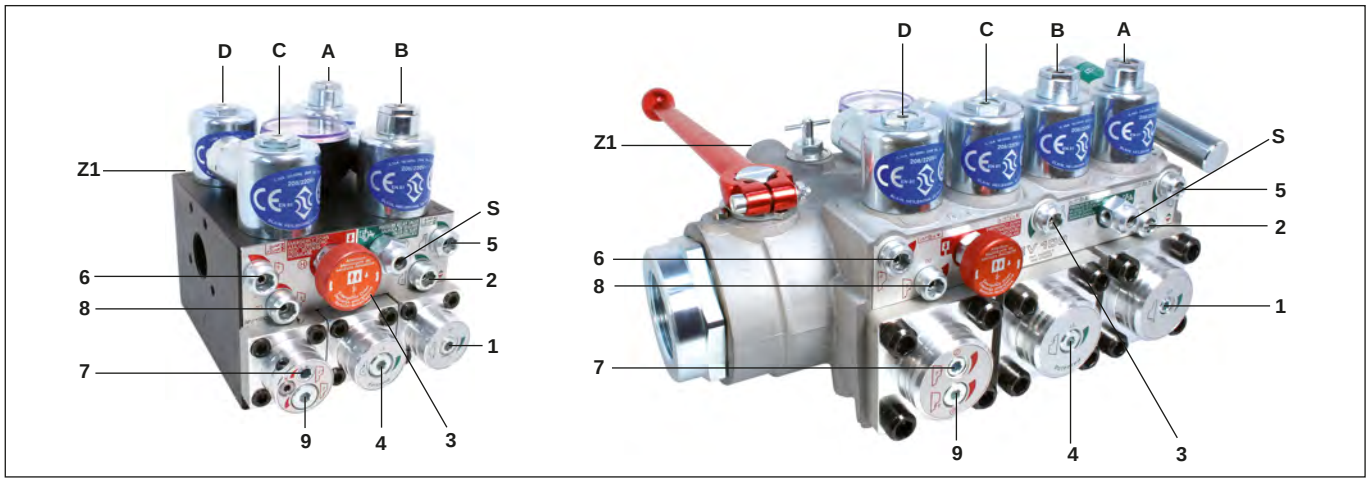
During adjustment of the EV 100 valve, instead of making a full floor to floor travel to check operation, much time can be saved by removing the securing nuts of the coil and switching to deceleration or to acceleration by lifting or replacing the appropriate coil by hand, allowing several adjustment corrections during one car travel between floors.

Caution: Once removed from the solenoid tube, the energised coil will begin to overheat after about 10 s.
If necessary, to slow the rate of heating, place an 14 or 17 mm socket key or similar steel rod as core thru the coil.
Do not lay an energised coil to one side, otherwise it may overheat unnoticed.

If the coil becomes too hot to hold, it must be replaced, back over the solenoid tube and any further adjustment carried out with the elevator making normal floor to floor runs.

Car not visible from Machineroom

If the car cannot be seen during adjustment of the valve, the acceleration and deceleration times can be heard from the change of the turbulent noise within the valve as the speed of the car changes. With no load in the car, the duration of the speed changes should be about 2.5 seconds. This applies to adjustments 2, 3, 6 and 8.



Up Travel (empty car)

PRE-SETTINGS		EV 100 ¾"	EV 100 1½" - EV 100 2½"	
Adjustment No. **1**	level with flange face			5 mm Socket key
Adjustment No. **2**	all the way 'in'	then 1.5 turns 'out'	then 2 turns 'out'	3 mm Socket key
Adjustment No. **3**	all the way 'in'	then 1.5 turns 'out'	then 2.5 turns 'out'	3 mm Socket key
Adjustment No. **4**	level with flange face			5 mm Socket key
Adjustment No. **5**	all the way 'in'	then 1.5 turns 'out'	then 2.5 turns 'out'	3 mm Socket key
Adjustment No. **S**	all the way 'in'	then 1.5 turns 'out'	then 1.5 turns 'out'	3 mm Socket key

1. Pilot Pressure Setting
Disconnect coil **A**. Energise Motor (pump).
If the car does not move, turn No. **1** 'in' until the car begins to move, turn No. **1** 'out' until the car stops, then back out again ½ turn.
The car remains standing still.
DO NOT UP-LEVEL WITH THIS ADJUSTMENT! Between full and empty car, levelling speed differences would be extreme.

2. Up Acceleration
Reconnect coil **A**. Start Motor and energise coil **A** and **B** (normal 'up' call).
Observe the up acceleration. If it is too quick, turn No. **2** 'in' ½ turn. If it is too long, turn No. **2** 'out' ½ turn.
Repeat until acceleration is satisfactory. Acceleration time should be about 2.5 s.

3. Up Deceleration
With coil **B** still disconnected. Energise motor and coil **A** (normal 'up-level' call).
The car will travel upwards at levelling speed. Turn No. **3** 'in' until the car starts to up level faster, then turn No. **3** 'out' until the original levelling speed is observed. Reconnect coil **B** and place a normal up call.
Observe the deceleration of the car. If it is too long, turn No. **3** 'out' ¼ turn; if it is too short, turn No. **3** 'in' ¼ turn.
Repeat until deceleration is satisfactory. Deceleration time should be about 2.5 s.

Quick adjustment procedure

4. Up Levelling
Disconnect coil **B**. Energise Motor and coil **A** (normal 'up-level' call).
With adjustment No. **4** level with the face of the flange the car will up level. If the levelling speed is too fast, turn No. **4** 'in' until the speed is as required. If the speed is too slow, turn No. **4** 'out'. Recommended speed 6 cm/s.

5. Up Soft Stop
Disconnect coil **A**. Energise Motor.
The car should not move. Turn No. **5** 'in' until the car starts upwards then turn No. **5** 'out' until the car stops.
Reconnect coil **A**. Energise Pump-Motor and **A**. The car will travel upwards at levelling speed.
Lift **A** coil by hand briefly and observe the stopping of the car. If the stop is too hard turn No. **5** 'in' ¼ turn.
If the stop is too soft, turn No. **5** 'out', ¼ turn. Repeat until the stop is satisfactory.

S Pressure Relief Valve
Turn **S** screw 'out' until about 2 mm of the screw head is showing. Close the ball valve in the cylinder line and open the manual lowering **H** to lower valve pressure down to zero. Place an up call, energising motor and coils **A** and **B**. The relief pressure will show on the pressure gauge.
To increase the relief valve setting, turn **S** 'in'.
To decrease the relief valve setting, turn **S** 'out', then open the manual lowering for ½ second with the pump still running to release locked-in pressure, before observing the pressure gauge reading.

PRE-SETTINGS		**EV 100 ¾"**	**EV 100 1½" - EV 100 2½"**	
Adjustment No. **7**	3 mm under the flange face			5 mm Socket key
Adjustment No. **8**	all the way 'in'	then 1 turns 'out'	then 1.5 turns 'out'	3 mm Socket key
Adjustment No. **9**	level with flange face			5 mm Socket key
Adjustment No. **6**	all the way 'in'	then 1.5 turns 'out'	then 1.5 turns 'out'	3 mm Socket key

7. Down Full Speed
Place down call (coils **C** and **D** energised).
Observe full down speed. Turn No. **7** 'in' for slower, 'out' for faster speed.

8. Down Deceleration
Place down call (coils **C** and **D** energised).
As the car approaches full speed, remove coil **D** by hand briefly from the solenoid and observe the deceleration of the car.
If the deceleration is too long, turn No. **8** 'out' ¼ turn; if it is too short, turn No. **8** 'in' ¼ turn.
Caution. Never close adjustment & completely(in). This will cause damage to the car.
Repeat until deceleration is satisfactory. Deceleration time should be about 2.5 secs.

9. Down Levelling Speed
Disconnect coil **C**. Place down call (**D** energised).
Observe down levelling speed. Turn No. **9** 'in' for slower, 'out' for a fast down levelling speed.
Recommended speed 6 cm/s.
Note: The manually operated down speed is 6cm/s.

6. Down Acceleration
Turn No. **6** all the way 'in'. Place down call (coils **C** and **D** energised).
The car will not move. Turn No. **6** 'out' slowly until the car accelerates downwards.
If the acceleration is too long, turn No. **6** 'out' ¼ turn. If it is too short, turn No. **6** 'in' ¼ turn.
Acceleration time should be about 2.5 s.

H Emergency Lowering
The manually operated emergency down speed and the **D** coil operated down levelling speed are the same.

Down Stop
When solenoid **D** is de-energised with solenoid **C** remaining de-energised, the car will stop according to the setting of adjustment 8 and no further adjustment will be required.

KS Slack Rope Valve
The KS is adjusted with a 3 mm Socket Key by turning the screw **K** 'in' for higher pressure and 'out' for lower pressure. With **K** turned all the way 'in', then half a turn back out, the unloaded car should descend when the **D** solenoid alone is energised. Should the car not descend, **K** must be backed off until the car just begins to descend, then backed off a further half turn to ensure that with cold oil, the car can be lowered as required.

Switch Distances

Recommended distances between leveling and stop switches

Elevator Speed mtrs/sec.	Switch Distance approx. cm	Elevator Speed ft/min.	Switch Distance approx. inches
0,10	5	20	2
0,15	10	30	4
0,20	15	40	6
0,25	18	50	7
0,30	25	60	9
0,35	30	70	12
0,40	40	80	16
0,45	46	90	18
0,50	50	100	20
0,55	58	110	23
0,60	70	120	28
0,70	80	140	31
0,80	95	160	36
0,90	105	180	41
1,00	120	200	48

With no load in the car, the deceleration time should be 2 to 2.5 secs. from full speed to levelling speed.
The levelling time should be 1 to 2 secs.

Accurate landing can be affected by different factors as follows:

a. If the levelling speed is fast i.e. 0,1 m/sec (20 ft/min), landing will not be as accurate as when the levelling speed is slower i.e. 0,05 m/sec (10 ft/min).

b. If the soft stop adjustment ‘5’ is set too soft, stopping will be less accurate as when ‘5’ is set for a quicker stop.

c. Particularly when the mechanic can not see the operation of the elevator car, it is possible that the elevator has not finished decelerating from fast speed before reaching the floor. In other words, the elevator has not slowed down to its correct levelling speed before the stop switch is actuated.
Usually, the levelling operation can be observed through the crack in the car doors. Alternatively, in the machine room, the turbulent noise within the valve during levelling can be heard and should last 1 to 2 secs. following 2 to 2,5 secs. deceleration time with no load in the car.

d. A difference in landing accuracy between the elevator being loaded and unloaded, can be due to the car under load, leaning to one side by several millimeters causing an alteration in the operating position of the stop switch by some centimetres.

EV 100 Trouble Shooting (2018)

UP Travel

EN ISO 9001

Problem	Possible cause	Recommended
No Up-Start (Elevator remains at floor)	Test: Turn adjustment **5** all the way in. If the elevator now starts upwards the problem is at solenoid **A**.	
	Solenoid **A:** not energised or voltage too low.	See Ⓐ below.
	Solenoid **A:** tube not screwed down tight.	Tighten Solenoid **A** tube.
	Solenoid **A:** Dirt or damage between needle **AN** and seat **AS**.	Clean or change needle and seat.
	Adjustment **2** not far enough open.	Turn out adjustment **2**.
	Adjustment **1** too far back (open). Not enough pilot pressure.	Turn in adjustment **1** with the pump running.
	Pressure relief valve **S** is set too low.	Set relief valve higher. (turn in)
	Adjustment **8** turned in too far (car sits on the buffer).	Turn out adjustment **8**.
	Bypass flow guide **U** is too large.	Insert smaller bypass flow guide (see flow guide charts at EV catalogue).
	Pump running in the wrong direction.	Check motor direction and install the pump correctly.
	The pump connection flange is leaking excessively.	Seal the pump connection.
	The pump is undersize, worn or crack in the housing.	Select bigger pump or replace pump.
	Test: If by turning adjustment **1** with the pump running the pressure does not rise above 5 bar, even with a smaller bypass valve inserted, the problem should be sought at the pump.	
Up-Start, but no Full Speed	Test: Turn adjustment **3** all the way in. If the elevator now travels upwards at full speed the problem is at solenoid **B**.	
	Solenoid **B** not energised or voltage too low.	See Ⓐ below.
	Solenoid **B** tube not screwed down tight.	Tighten Solenoid **B** tube.
	Solenoid **B**: Dirt or damage between needle **AN** and seat **AS**.	Clean or change needle and seat.
	The pump connection flange is leaking excessively.	Seal the pump connection.
	The pump is undersize or worn.	Select bigger pump or replace pump.
Up-Start too hard	Adjustment **1** turned in too far.	Turn out adjustment **1**.
	Adjustment **2** turned out too far.	Turn in adjustment **2**.
	Bypass flow guide **U** too small (slots too narrow).	Change to flow guide with wider slots.
	O-Ring **UO** on Bypass Valve **U** is leaking.	Change O-Ring ⟶ see EV Spare Parts List.
	Star to Delta motor switch period is too long.	0.2-0.3 sec. is sufficient.
	Excessive friction on the guide rails or in the cylinder head.	Can not be eliminated thru valve adjustment.
No deceleration into levelling speed	Solenoid **B** does not de-energise.	Lift coil to check magnetic pull. See Ⓐ below. Slow down switch possibly set to high (late).
	Adjustment **3** turned in too far.	Turn out adjustment **3**. Turn in adjustment **2**.
	O-Ring **UO** on Bypass Valve **U** is leaking.	Change O-Ring → see EV Spare Parts List.
Levelling too fast	Adjustment **4** too far screwed out.	Turn in adjustment **4** to about 0.05 m/s levelling speed.
Deceleration into levelling speed but overtravel of floor level	Solenoid **A** is de-energised too late.	Lift coil to check pull. See Ⓐ below. Switch position in the shaft.
	Adjustment **5** turned in too far.	Turn out adjustment **5**.
	Adjustment **1** turned in too far.	Turn out adjustment **1**.
	Up levelling speed too high.	Turn in adjustment **4** to about 0.05 m/s levelling speed.
Bypass-pressure not adjustable	Restriction on the return line.	Remove restriction; enlarge return line.
	Bypass flow guide **U** too small (slots too narrow).	Change to flow guide with wider slots.
Elevator stops before reaching the floor (no levelling)	Solenoid **A** and **B** reversed.	Swap solenoid **A** and **B**. See Ⓐ below.
	Up levelling speed too slow.	Turn out adjustment **4.**
	Middle O-Ring **FO** of flange **4F** is leaking.	Change O-Ring → see EV Spare Parts List.

Valves are already adjusted and tested. Check electrical operation before changing valve settings. Test that the correct solenoid is energised, by removing nut and raising solenoid slightly to feel pull.

Ⓐ For checking the operation of the solenoids, remove the top nuts. By lifting the coils a few millimetres, the magnetic pull of the coil can be felt. For testing, the operation of the elevator car can also be controlled by lifting and replacing the coil.

If the coil gets too hot, the coil has to be mounted onto the solenoid and the following adjustments have to be carried out on normal travels from floor to floor.

Standard settings: Adjustments **1** approx. level with flange face. Adjustment **4** 1mm above flange face (chamfer of adjustment screw is visible). Up to two turns in either direction may then be necessary. Adjustments **2**, **3** & **5** all the way in (clockwise) then for EV ¾": adjustments **2** & **3** 1.75 turns out (c-clockwise) and adjustment **5** 1.25 turns out (c-clockwise), for EV 1 ½" – 2 ½": adjustments **3** & **5** two and half turns out (c-clockwise), adjustment **2** two turns out. Small final adjustments may be necessary.

EV 100 Trouble Shooting (2018)

DOWN Travel

Problem	Possible cause	Recommended
No Down Start	Solenoid **D** not energised or voltage too low.	Lift coil to check magnetic pull. See Ⓐ below.
	Adjustment **6** turned in too far.	Turn out adjustment **6**.
	Adjustment **8** turned out too far.	Turn in adjustment **8** cautiously. **Attention:** Danger of travelling through.
	O-Ring **UO** on Down Valve **X** is leaking.	Change O-Ring → see EV Spare Parts List.
No full speed	Solenoid **C** not energised or voltage too low.	Lift coil to check magnetic pull. See Ⓐ below.
	Adjustment **7** turned in too far.	Turn out adjustment **7**.
	Down Valve flow guide **X** too small.	Check insert size (see flow guide charts page 6)
	Filter on solenoid **D** contaminated.	Clean filter.
No down levelling. Elevator stops before floor level	Solenoid **C** and **D** reversed.	Lift coil to check magnetic pull. See Ⓐ below.
	Adjustment **9** turned in too far.	Turn out adjustment **9** to about 0.05 m/s levelling speed.
	Spring **9F** in adjustment **9** is broken or down levelling valve **Y** is blocked.	Replace the spring or clean the down levelling valve.
	Pressure setting of **KS** too high.	Turn adjustment **KS** out.
No decelleration into levelling speed. Elevator travels though floor level	Adjustment **8** turned in too far. Filter of adjustment 8 blocked or adjustment 8 is damaged.	Turn out adjustment **8** about ½ turn, clean the filter or replace adjustment **8** .
	Adjustment **9** turned out too far.	Turn in adjustment **9** to about 0.05 m/s levelling speed.
	Solenoid valve **C** contaminated	Clean or change needle and seat.
	Inner O-Ring **FO** on flange **7F** is leaking.	Change O-Ring → see EV Spare Parts List.
Elevator sinks quickly	Solenoid **D** tube not screwed down tight.	Tighten Solenoid **D** tube.
	Adjustment **8** turned in too far.	Turn out adjustment **8** about ½ turn.
	Damage on down valve **X** or check valve **V**.	Check parts and change them if necessary.
Elevator sinks slowly due to inner leakage (Relevelling)	For possible down leakage points, see technical documentation "System Leakage".	Replace one seal at a time and test before proceeding to the next point of possible leakage, if still necessary.
	Solenoid **D** contaminated or damaged.	Clean solenoid **D** or replace neddle **DN** and seat **DS**.
	O-Ring **XO** of Down Valve **X** is leaking.	Change O-Ring → see EV Spare Parts List. When Down Valve is compensated, replace Down Valve.
	O-Ring **VO** of Check Valve **V** is leaking.	Change Check Valve → see EV Spare Parts List.
	O-Ring **WO** of Check Valve **V** is leaking.	Change O-Ring → see EV Spare Parts List.
	Inner O-Ring **FO** on flange **4F** is leaking.	Change O-Ring → see EV Spare Parts List.
	O-Ring **HO** of Manual Lowering **H** is leaking.	Replace Manual Lowering.
Elevator sinks due to inner leakage of auxiliary equipment	**HP**: Handpump is leaking.	Seal the hand pump.
	HX/MX: Adjustment **8M** turned in too far.	Turn out adjustment **8M**.
	HX/MX: Down valve **9M** is leaking. Dirt or damage between the needle **DN** and seat **DS**.	Clean or change needle and seat.
	HX/MX: O-Ring **XO** of Down Valve **YM** is leaking.	Change O-Ring → see EV Spare Parts List.
	HX/MX: Manual Lowering is leaking (HX/MX).	Replace Manual Lowering.
	Contraction of oil during cooling especially from 35°C or above.	Consider oil cooler if hot oil is a problem.
	Micro Drive **MD**, Door Lock Valve **L10** or **L20** are leaking.	When possible isolate and check.

Valves are already adjusted and tested. Check electrical operation before changing valve settings. Test that the correct solenoid is energised, by removing nut and raising solenoid slightly to feel pull.

Ⓐ For checking the operation of the solenoids, remove the top nuts. By lifting the coils a few millimetres, the magnetic pull of the coil can be felt. For testing, the operation of the elevator car can also be controlled by lifting and replacing the coil.

If the coil gets too hot, the coil has to be mounted onto the solenoid and the following adjustments have to be carried out on normal travels from floor to floor.

Standard settings: Adjustments **7** & **9** approx. level with flange faces. Up to two turns in either direction may then be necessary. Adjustments **6** & **8** all the way in (clockwise) then for EV ¾", adjustment **8** one turn and adjustment **6** two turns out (c-clockwise), for EV 1 ½" – 2 ½", adjustment **8** 1.5 turns and adjustment **6** 2.5 turns out (c-clockwise). Small final adjustments may be necessary.

EV System Leakage
(re-levelling)

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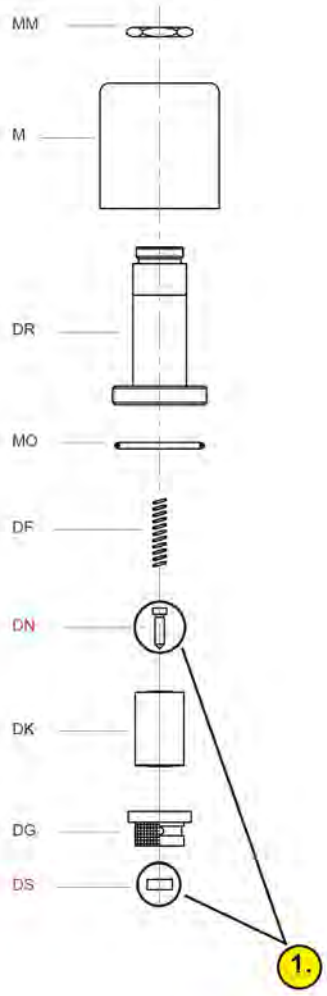
Solenoid Valves

D



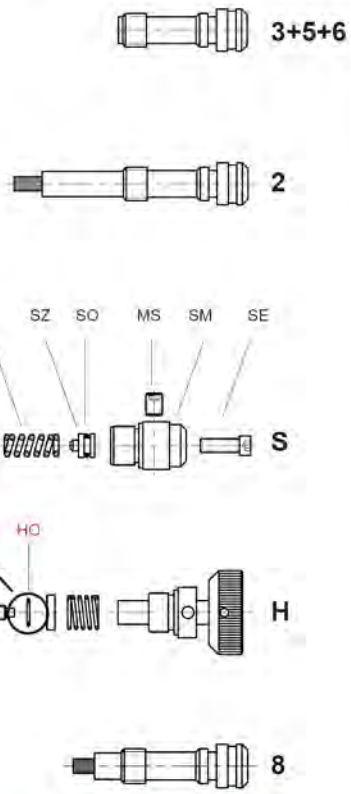
0-Ring-Size			
No.	¾"	1 ½"	2½"
FO	26x2P	47x2.5P	58x3P *
EO	9x2P	9x2P	9x2P
UO	26x2V	39.34x2.62V	58x3V
WO	5.28x1.78V	5.28x1.78V	5.28x1.78V
VO	23x2.5V	42x3V	60x3V **
7O	5.28x1.78P	9x2P	9x2P
XO	13x2V	30x3V	47x3V
HO	5.28x1.78V	5.28x1.78V	5.28x1.78V
SO	5.28x1.78P	5.28x1.78P	5.28x1.78P
MO	26x2P	26x2P	26x2P

* FO by 4F 2½" is 67x2.5P

** 90 Shore

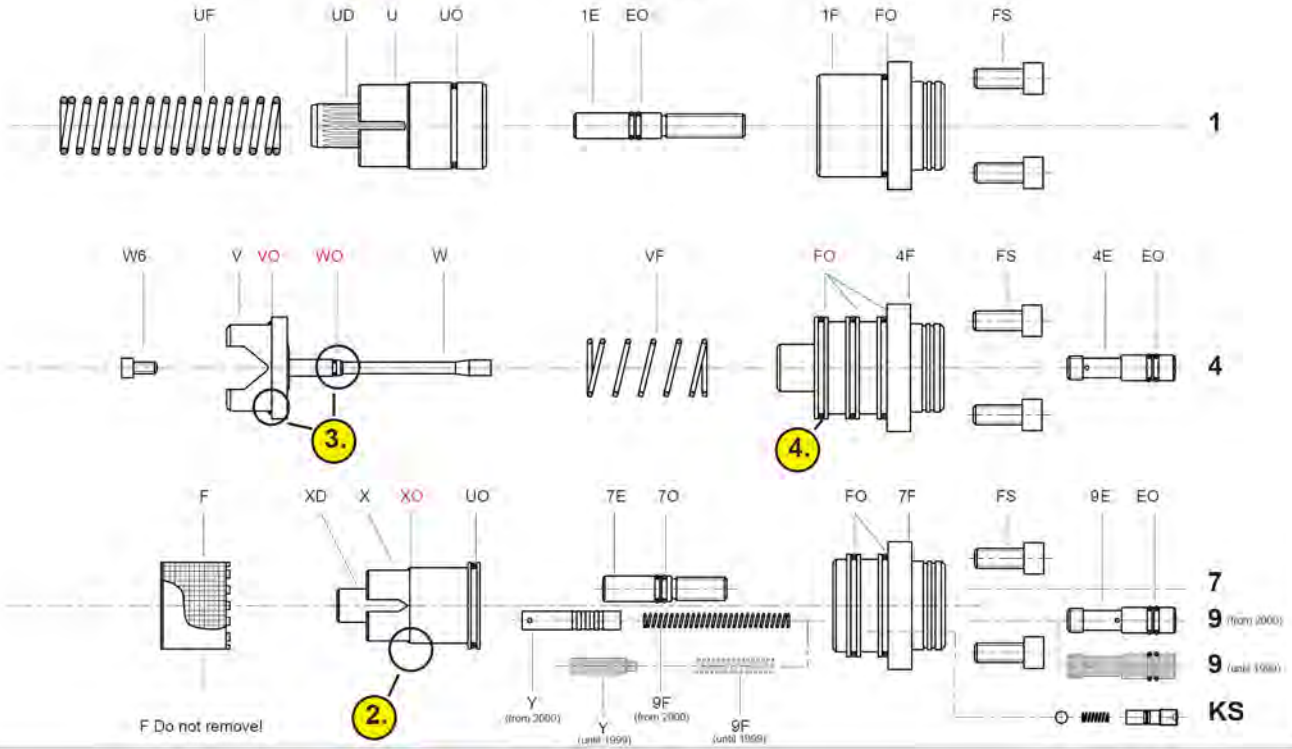
O-Ring: V=FKM-Viton
P=NBR-Perbunan

Adjustments



Replace possible leaking parts (DS & DN, XO, VO & WO, FO and HO) in the order of probabilities 1 - 5.
Replace part 1 and check if the valve is leakproof now.
Replace part 2 only if the valve is still leaking, etc.

Flow Valves



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EV Spare Parts List

Pos.	No.	Item
1	FS	Lock Screw - Flange
	FO	O-Ring - Flange
	1F	Flange - By Pass
	EO	0-Ring - Adjustment
	1E	Adjustment - By Pass
	UO	0-Ring - By Pass Valve
	U	By Pass Valve
	UD	Noise Suppressor
	UF	Spring - By Pass
2	2	Adjustment - Up Acceleration
3	3	Adjustment - Up Deceleration
4	EO	0-Ring - Adjustment
	4E	Adjustment - Up Levelling
	4F	Flange - Check Valve
	FO	0-Ring - Flange
	VF	Spring - Check Valve
	W	Up-Levelling Valve
	WO	0-Ring - Up Levelling Valve
	VO	Seal - Check Valve
	V	Check Valve
	W6	Screw - Check Valve
5	3	Adjustment - Up Stop
6	3	Adjustment - Down Acceleration
7	7F	Flange - Down Valve
	FO	0-Ring - Flange
	7O	0-Ring - Adjustment
	7E	Adjustment - Down Valve
	UO	0-Ring - Down Valve
	XO	Seal - Down Valve
	X	Down Valve
	XD	Noise Suppressor
	F	Main Filter
8	8	Adjustment - Down Deceleration
9	9E	Adjustment - Down Levelling
	EO	0-Ring - Adjustment
	9F	Spring - Down Valve
	Y	Down Levelling Valve
H	H	Manual Lowering - Self Closing
	HO	Seal - Manual Lowering
S	SE	Adjustment - Screw
	SM	Hexagonal
	MS	Grub Screw
	SO	0-Ring - Nipple
	SZ	Nipple
	SF	Spring
	SK	Piston
A+B	MM	Nut - Solenoid
	AD	Collar - Solenoid
	M	Coil - Solenoid (indicate voltage)
	AR	Tube - Solenoid 'Up'
	MO	0-Ring - Solenoid
	AN	Needle - 'Up'
	AF	Spring - Solenoid 'Up'
	AH	Seat Housing - 'Up'
	AS	Seat - Solenoid Up'
C+D	MM	Nut - Solenoid
	M	Coil - Solenoid (indicate voltage)
	DR	Tube - Solenoid 'Down'
	MO	0-Ring - Solenoid
	DF	Spring - Solenoid 'Down'
	DN	Needle - 'Down'
	DK	Core - Solenoid
	DG	Seat Housing with Screen-'Down'
	FD	Filter Solenoid
	DS	Seat - Solenoid 'Down'

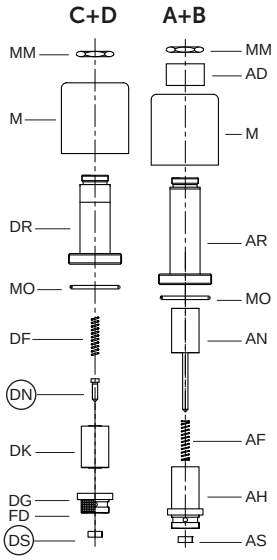
Some parts occur more than once in different positions of the valve.

O-Ring-Size			
No.	¾"	1 ½"	2 ½"
FO	26x2P	47x2.5P	58x3P *
EO	9x2P	9x2P	9x2P
UO	26x2V	39.34x2.62V	58x3V
WO	5.28x1.78V	5.28x1.78V	5.28x1.78V
VO	23x2,5V	42x3V	60x3V **
7O	5.28x1.78P	9x2P	9x2P
XO	13x2V	30x3V	47x3V
HO	5.28x1.78V	5.28x1.78V	5.28x1.78V
SO	5.28x1.78P	5.28x1.78P	5.28x1.78P
MO	26x2P	26x2P	26x2P

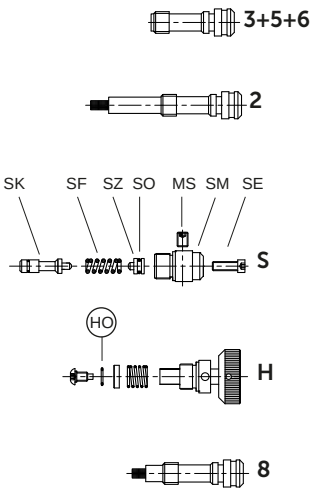
* FO by 4F 2½" is 67x2.5P
** 90 Shore

O-ring: V = FKM - Viton
P = NBR - Perbunan

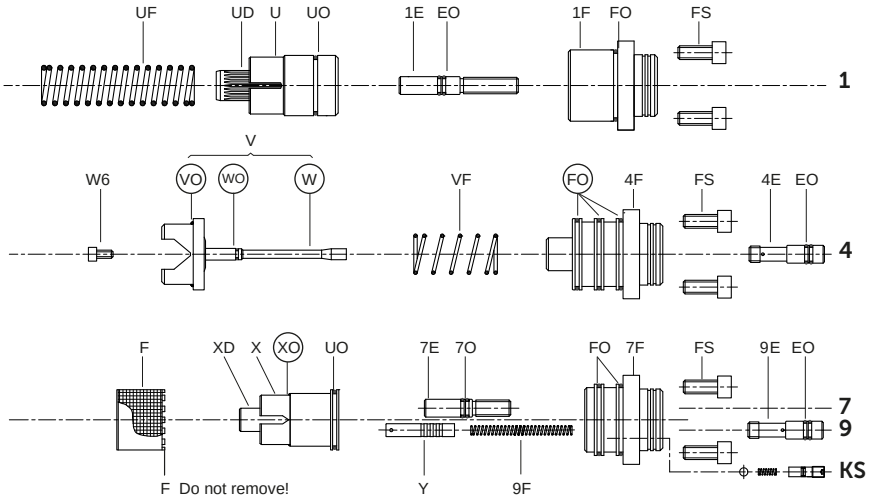
Solenoid Valves



Adjustments

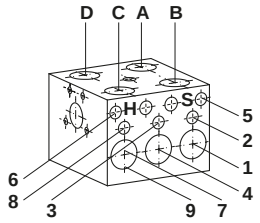


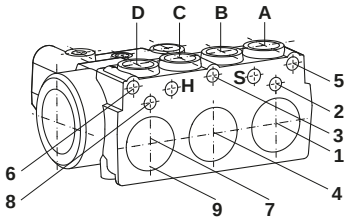
Flow Valves

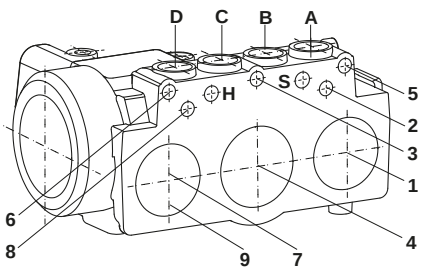


In case of down leakage, replace and test in the following order: (DS) & (DN), (XO), (VO), (WO), (FO) + (HO).

Taper threads: Do not exceed 8 turns of piping into the valve connections.

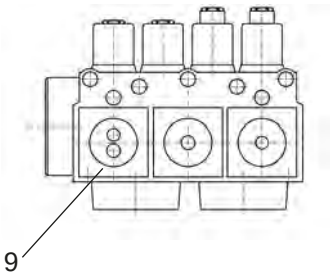






To order EV: Size (inch), valve type, state pump flow, empty car pressure (or flow guide size) and solenoid voltage.
Example order: 2"EV100, 380l/min, 18bar (empty), 110 AC or 2"EV100/4/110AC

Down Levelling
Adjustment 9
Replacement

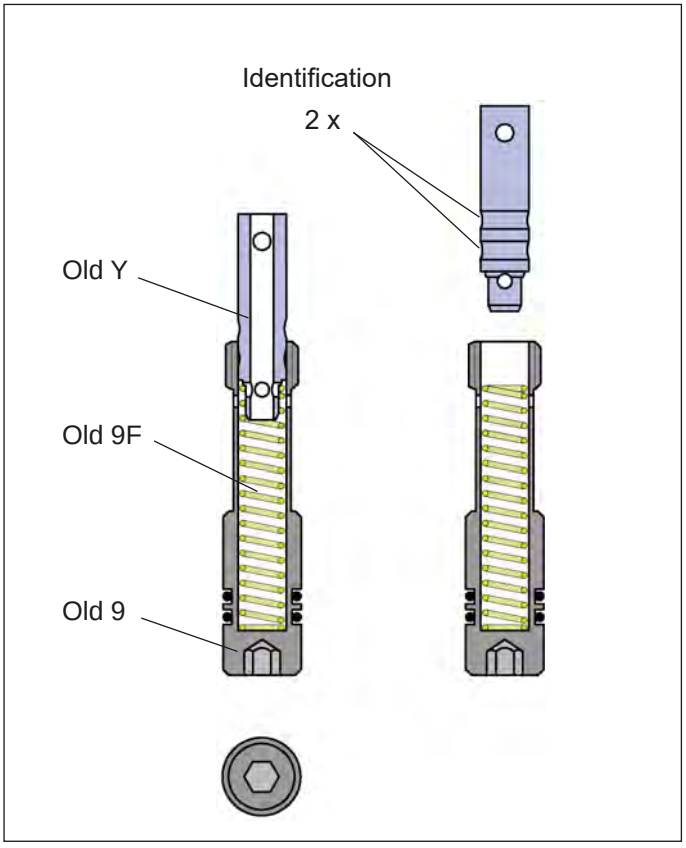


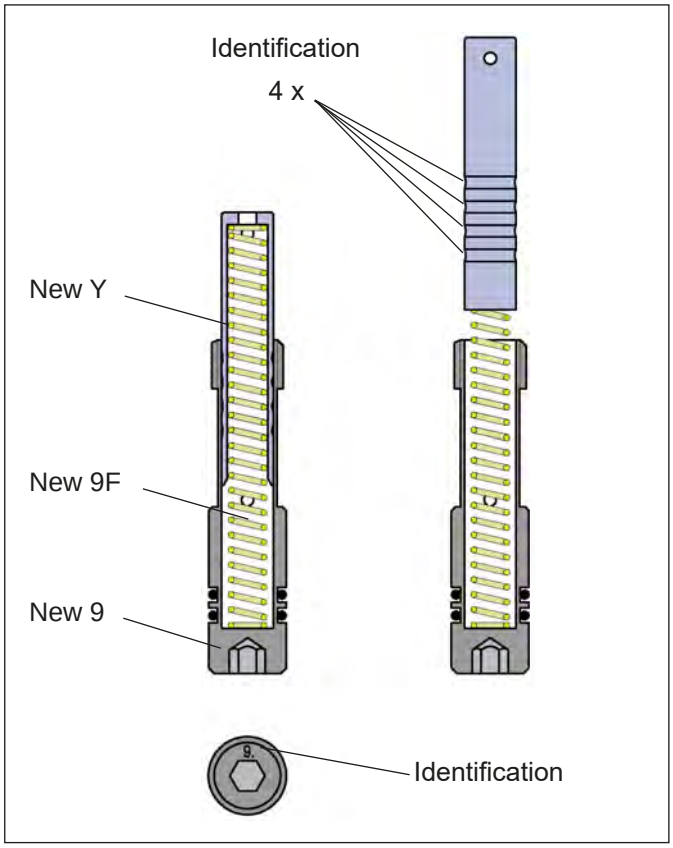
Old Type

1971 - 1999
Replacement not necessary
if operation is normal

New Type

from Jan. 2000





Advantages of new type

- Smoother deceleration
- Higher mechanical closing force
- Longer spring life
- Easier assembly

In the past, a small number of the original springs No. 9F have broken. Beginning January 2000, the design of the down levelling adjustment was modified to take a stronger spring.
The complete new adjustment is interchangeable with the original adjustment 9.
A broken spring 9 would cause the down levelling speed to be slower. No danger to passengers would arise as a consequence.

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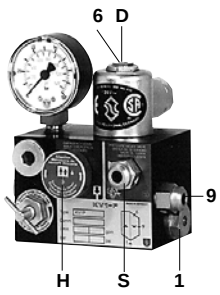
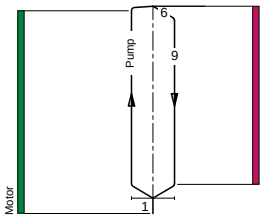
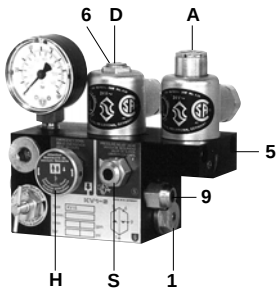
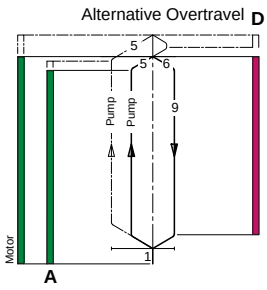
Residential Elevator Valves KV









Control Elements

A Solenoid Up
D Solenoid Down
F Main Filter
H Manual Lowering
L Gauge Shut Off Cock
U Bypass Valve
V Check Valve
Y Down Levelling Valve

Adjustments

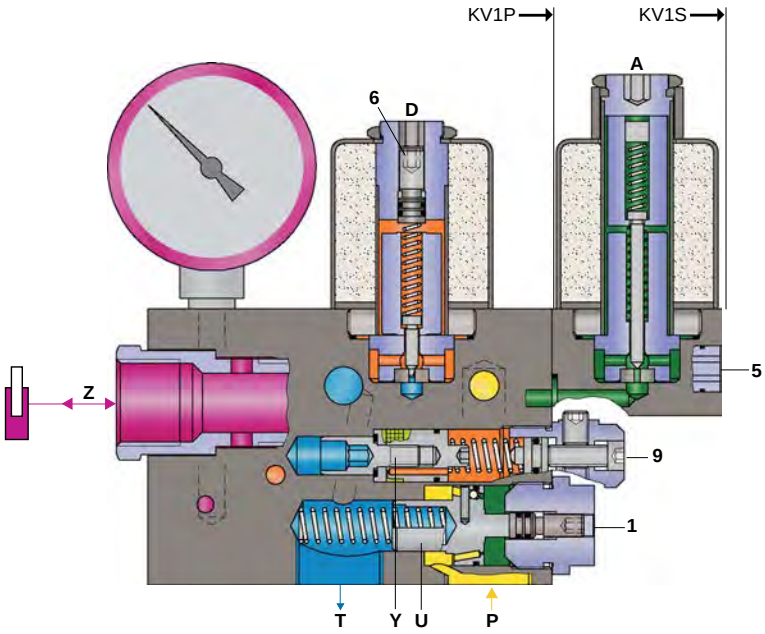
1 Bypass
5 Up Soft Stop
6 Down Acceleration
9 Down Speed
S Relief Valve

Connections

P Pump
T Tank
Z Cylinder

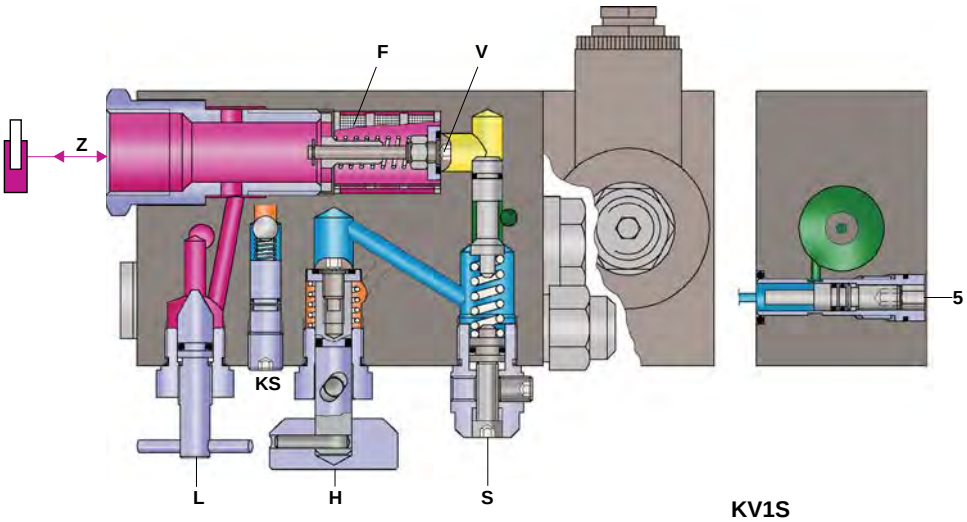
Options

BV Ball Valve
HP Hand Pump
KS Slack Rope Valve
DH High Pressure Switch
DL Low Pressure Switch
RS Pipe Rupture Valve
ES Pipe Rupture Valve Switch

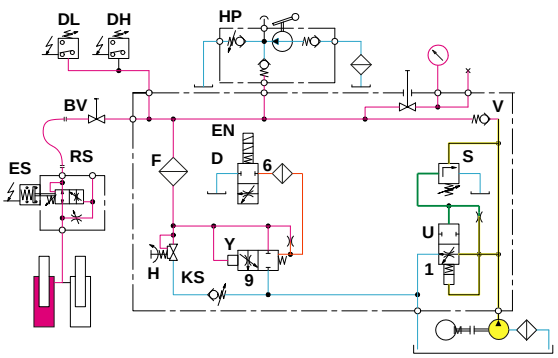


Pressures

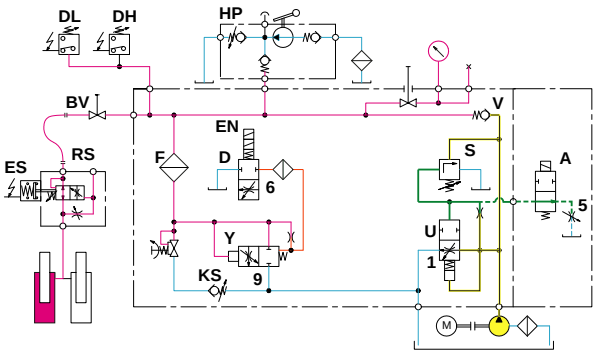
Pump
Pilot Up
Tank
Cylinder
Pilot Down



KV1P



KV1S



KV Elevator Control Valve Trouble Shooting (2018)

UP Travel

EN ISO 9001

Problem	Possible cause	Recommended
No Up-Start (Elevator remains at floor).	Test for KV1S and KV2S: Turn adjustment **5** all the way in, if the elevator now starts upwards the problem is at solenoid **A**.	
	Solenoid **A** not energised or voltage too low.	See Ⓐ below.
	Solenoid **A** tube not screwed down tight.	Tighten Solenoid **A** tube.
	Solenoid valve **A:** Dirt or damage between needle and seat.	Clean or change needle and seat.
	Orifice in bypass valve blocked.	Clean or change bypass valve **U**.
	Adjustment **1** too far back (open). Not enough pilot pressure (minimum 5 bar) or bypass flow guide too large (slots too wide). see*	With the pump running, turn adjustment **1** in, or if already too far in, insert smaller bypass flow guide (see the diagram in KV literature).
	Pressure relief valve **S** is set too low.	Set relief valve higher. Preadjustment all the way in and then 1½ turn out.
	Down valve **7** or **9** are open due to contamination in their orifices. (Especially if the elevator settles back on the buffers. Solenoid **D** is leaking.	Clean or replace down valves **7** (KV2 only) and **9**. Clean solenoid **D**.
	Pump running in the wrong direction.	Check motor direction and install the pump correctly.
	The pump connection flange is leaking excessively.	Seal the pump connection.
	The pump is undersize, worn or crack in the housing.	Select a bigger pump or replace the pump.
	Bypass flow guide too large.	Replace with smaller size.
	* Test: If by turning adjustment **1** with the pump running the pressure does not rise above 5 bar, even with a smaller bypass valve inserted, the problem should be sought at the pump.	
Up-Start too hard.	Adjustment **1** turned in too far.	Turn out adjustment **1**.
	Bypass flow guide **U** too small (slots too narrow).	Change to flow guide with wider slots.
	Star to delta motor switch period is too long.	0.2-0.3 sec. is sufficient.
	O-ring **UO** on the bypass valve **U** is leaking.	Change O-Ring → see KV Spare Parts List.
	Excessive friction on the guide rails or in the cylinder head.	Can not be eliminated through valve adjustment.
Elevator slows down but over travels the floor level.	Solenoid **A** (Up-stop) is de-energised too late.	See Ⓐ below.
	Adjustment **5** (Soft Stop) not far enough open (KV1S and KV2S).	Open further out.
	Adjustment **1** Bypass not far enough open and pump flow does not completely by-pass.	Open adjustment **1** two turns further out.
Relief-Valve not adjustable to lower value.	Adjustment **1** too far in.	Open adjustment **1** further out.
	½" pipe thread connection in return line **T** should not exceed 14 mm.	With tape threads, 4-6 threads of engagement is sufficient.
Elevator doesn't reach full speed.	Bypass piston doesn´t close. Piston orifice is dirty **and** adjustment **1** turned in too far.	Clean the dirt / foreign particles in the by-pass piston orifice or change the piston and turn adjustment **1** out.

Valves are already adjusted and tested. Check electrical operation before changing valve settings. Test that the correct solenoid is energised, by removing nut and raising solenoid slightly to feel pull.

Ⓐ For checking the operation of the solenoids, remove the top nuts. By lifting the coils a few millimetres, the magnetic pull of the coil can be felt. For testing, the operation of the elevator car can also be controlled by lifting and replacing the coil.

If the coil gets too hot, the coil has to be mounted onto the solenoid and the following adjustments have to be carried out on normal travels from floor to floor.

Standard settings: Adjustment **1** level with flange faces. Adjustment **5** (KV1S & KV2S) level with flange faces.

KV Elevator Control Valve Trouble Shooting (2018)

Down Travel

Problem	Possible cause	Recommended
No Down Start (Elevator remains at floor).	Solenoid **D** not energised or voltage too low.	Lift coil to check magnetic pull. See Ⓐ below.
	Adjustment **6** turned in too far.	Turn out adjustment **6**.
	O-ring **YO** on down valve, leaking.	Replace O-ring **YO**.
KV2 only: Down start but no full speed	Solenoid **C** not energised or voltage too low.	Lift coil to check magnetic pull. See Ⓐ below.
	Adjustment **7** (Full speed down) turned in too far.	Turn out adjustment **7**.
	Down piston too small.	Insert the next size higher.
	Filter on Solenoid **D** contaminated.	Clean filter.
KV2 only: Down full speed but no down levelling.	Solenoids **C** and **D** reversed.	See Ⓐ below. Swap solenoid **C** and **D**.
	Adjustment **9** (Down levelling speed) turned in too far.	Turn out adjustment **9**.
	Solenoid **C** contaminated	Clean or change needle & seat.
	Solenoid **C** does not de-energise.	Check voltage on Solenoid **C**.
Only with KV2: Braking is too hard & stop is too soft. (The elevator travels below floor level).	Down piston **7** (Ø 0.2mm orifice; brass) & slow piston **9** (Ø 0.4mm orifice; steel) are reversed.	Swap piston **7** & **9**.
Elevator travels through floor level.	Down levelling speed **9** too fast.	Adjust to 0.05 m/s.
	Solenoid **D** is leaking.	Clean solenoid **D**; turn seat upside down or replace needle & seat.
	Orifice in down flow guide **X** or down levelling flow guide **Y** is blocked or contaminated.	Replace piston.
Leakage (Elevator sinks).	Leak at **N6, S6, XO, VO, WO** or **HO**.	Replace and test in sequence.
	Other valves (ex. handpump) in the system, leaking.	Where possible, isolate and check.
	Contraction of oil during cooling, especially from 35°C or above.	Consider oil cooler to keep oil temperatures down.
	Solenoid **D** tube not screwed down tight.	Tighten Solenoid **D** tube.

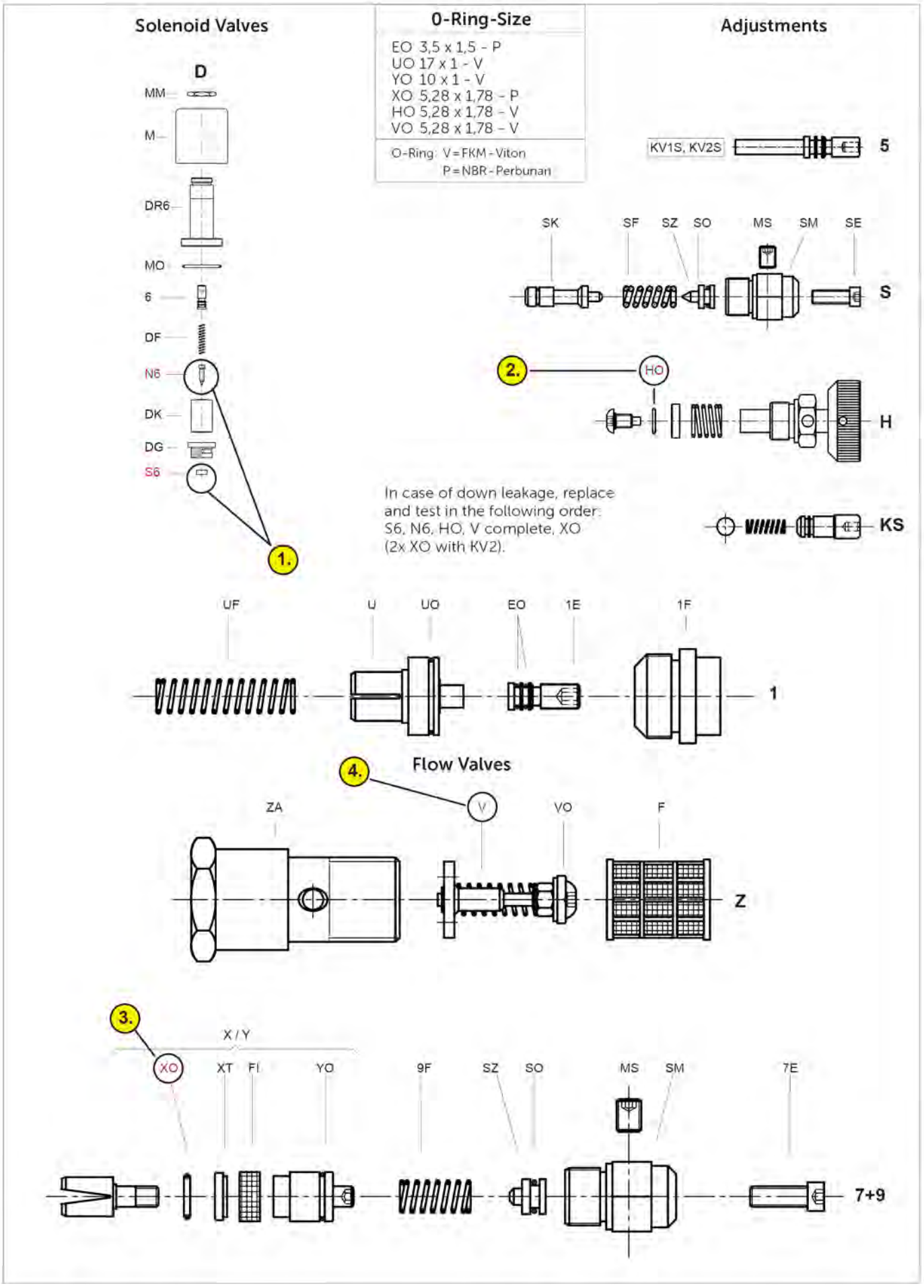
Valves are already adjusted and tested. Check electrical operation before changing valve settings. Test that the correct solenoid is energised, by removing nut and raising solenoid slightly to feel pull.

Ⓐ For checking the operation of the solenoids, remove the top nuts. By lifting the coils a few millimetres, the magnetic pull of the coil can be felt. For testing, the operation of the elevator car can also be controlled by lifting and replacing the coil.

If the coil gets too hot, the coil has to be mounted onto the solenoid and the following adjustments have to be carried out on normal travels from floor to floor.

Standard settings: Adjustments **7 & 9**, screw heads level with the hexagon heads.

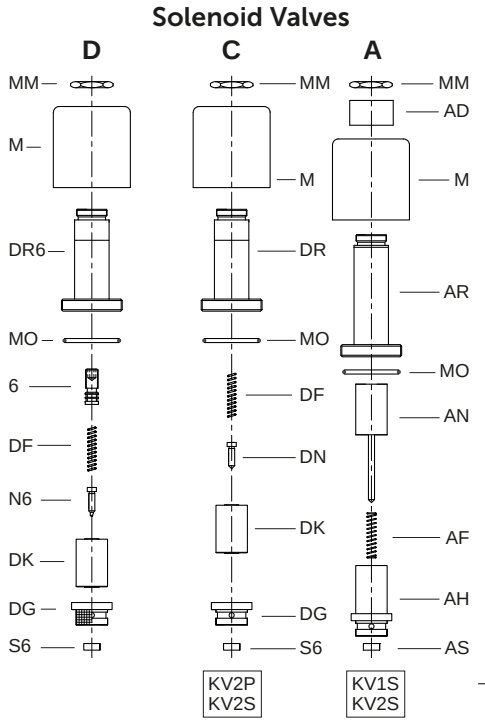
KV System Leakage
(re-levelling)

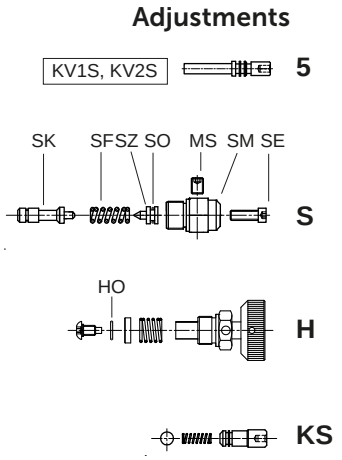


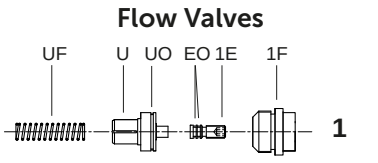
EN ISO 9001

KV Spare Parts List

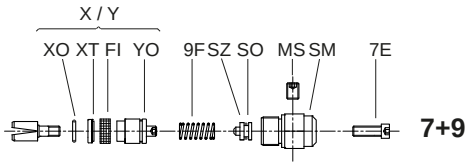
Pos.	No.	Item
1	1F	Flange - Bypass
	1E	Adjustment - Bypass
	EO	0-Ring - Adjustment (3,5x1,5 - P)
	U	Flow Guide - Bypass
	UO	0-Ring - Bypass (17x1 - V)
	UF	Spring - Bypass
5	5	Adjustment - Up Stop
6	6	Adjustment - Down Acceleration
7+9	7E	Adjustment - Down Valve
	9F	Spring - Down Valve
	YO	0-Ring - Flow Guide (10x1 - V)
	XO	Seal - Flow Guide (5.28x1.78 - V)
	XT	0-Ring Disc
	FI	Filter - Down Valve
	X	Down Flow Guide (Brass)
	Y	Down Levelling Flow Guide (Steel) - KV2
	Y	Down Flow Guide (Steel) - KV1
S	SE	Adjustment Screw - Relief Valve
	SM	Hexagonal - Relief Valve
	MS	Locking Screw
	SO	0-Ring - Nipple
	SZ	Nipple - Relief Valve
	SF	Spring - Relief Valve
	SK	Piston - Relief Valve
H	H	Manual Lowering - Self Closing
	HO	Seal - Man. Lowering (0-Ring 5.28x1.78 - V)
HA	HA	Adjustable Manual Lowering
KS	KS	Slack Rope Valve
A	MM	Nut Solenoid
	AD	Collar Solenoid
	M	Coil Solenoid (indicate voltage)
	AR	Tube Solenoid 'Up'
	MO	0-Ring Solenoid
	AN	Needle Solenoid 'Up'
	AF	Spring Solenoid 'Up'
	AH	Seat Housing 'Up'
	AS	Seat Solenoid 'Up'
C+D	M	Coil Solenoid (indicate voltage)
C	DR	Tube - Solenoid 'Down', w/o adj. 6
D	DR6	Tube Solenoid 'Down', with adj. 6
	MO	0-Ring Solenoid
	DF	Spring Solenoid 'Down'
C	DN	Needle Solenoid 'Down'
D	N6	Needle Solenoid 'Down' (Nipple)
C	HN	Needle Solenoid 'Down'
	DK	Core Solenoid 'Down'
	DG	Seat Housing 'Down'(Solen.D with screen)
C	S6	Seat Solenoid 'Down'
C	CO	0-Ring Seat Housing
Z	ZA	Cylinder Thread Connection
	V	Check Valve
	VO	0-Ring Check Valve (5,28x1,78 - V)
	F	Main Filter
L	L	Gauge Shut Off Cock

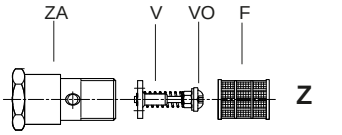


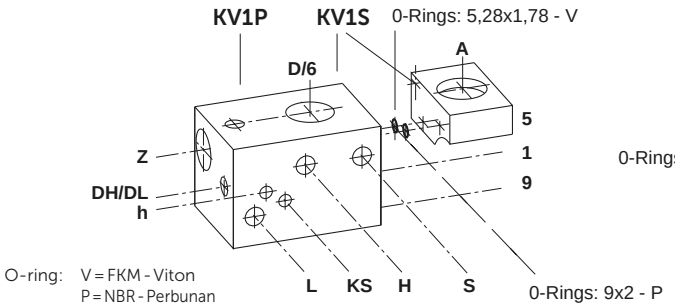


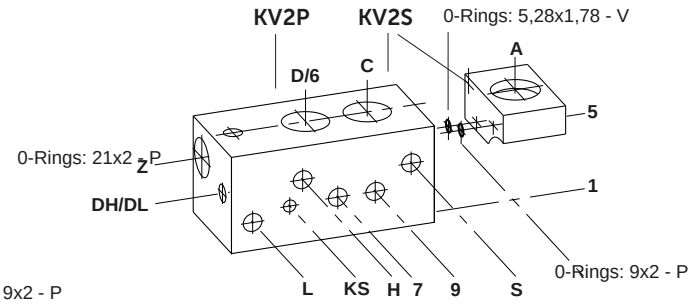


In case of down leakage, replace and test in the following order: S6, N6, HO, V complete, XO, (2x XO with KV2).









Slack Rope Valve `KS´

EN ISO 9001

Purpose

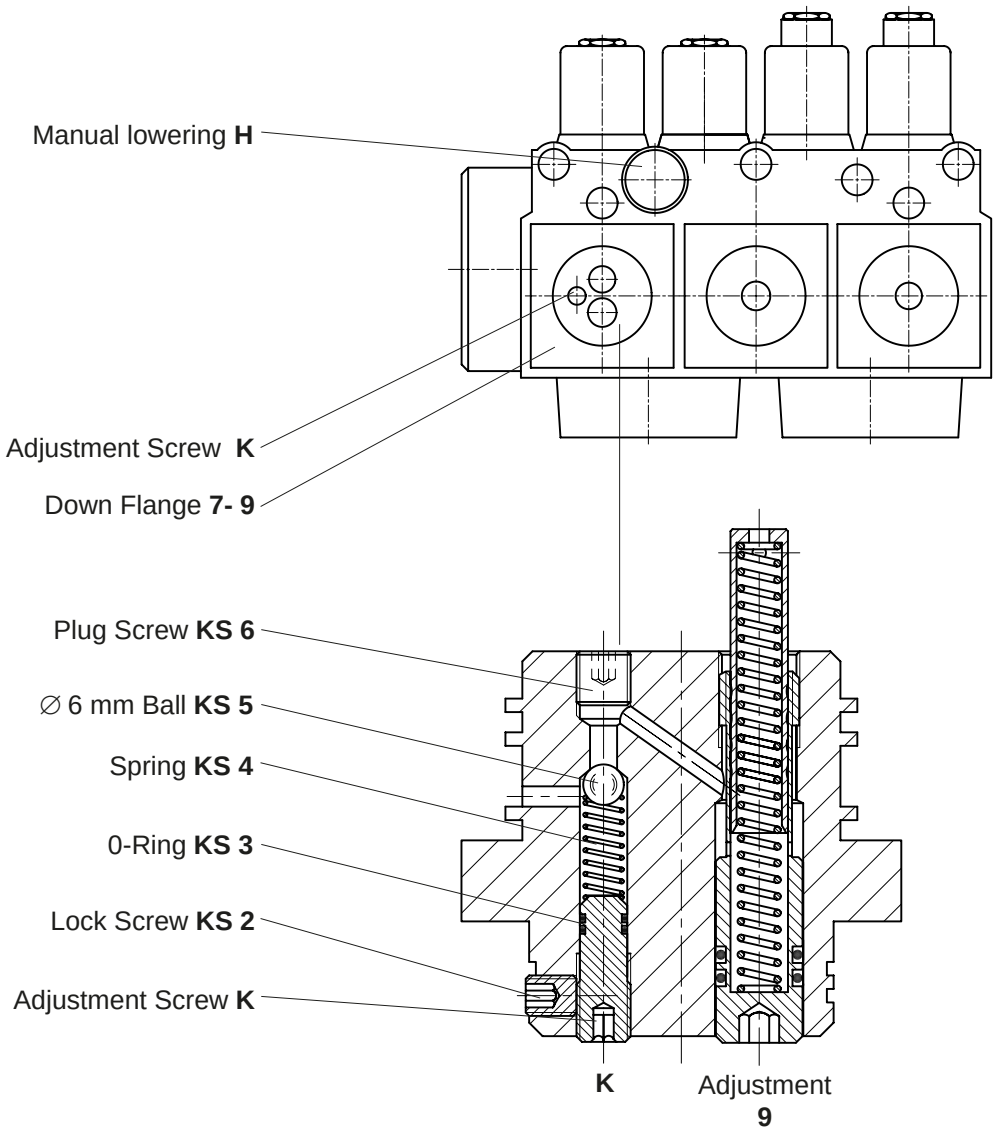
In the case of the operation of the safeties in a 1:2 hydraulic lift system where the weight of the car is no longer carried by the ropes, the electrical supply to the elevator should automatically be switched off. As the ram comes to a stop, usually after about 60 cm, a limited slack rope condition will occur. The **KS** Slack Rope Valve avoids the ram being lowered by the opening of the manual lowering valve which would otherwise cause additional slack rope. The **KS** Slack Rope Valve prevents the pressure holding up the ram from being evacuated through the manual lowering valve.

Function

The **KS** valve is adjusted to a pressure just above the pressure produced by the weight of the ram. When under normal operating conditions, the weight of the car acts upon the ram through the 1:2 roping, the resulting pressure is sufficient to open the poppet of the **KS** valve when the manual lowering **H** is opened, allowing the car to descend as required. When however the`safeties´ have operated and only the weight of the ram and sheave block are acting upon the hydraulic system, the resulting pressure is too low to open the **KS** valve. The ram and sheave block can not be lowered.

Adjustment

The **KS** is adjusted with a 3 mm Socket Key by turning the screw **K** `in´ for higher pressure and `out´ for lower pressure. With **K** turned all the way `in´, then half a turn back out, the unloaded car should descend when the **D** solenoid alone is energised. Should the car not descend, **K** must be backed off until the car just begins to descend, then backed off a further half turn to ensure that with cold oil, the car can be lowered as required.



Overheating of Power Units - System Leakage

Oil temperatures above 55 °C (130° F) should be avoided, otherwise the efficiency of the pump drops considerably and its life is reduced. Aging of the oil is also accelerated.

Possible causes of overheating:

1. Up levelling too long due to the levelling speed being too slow or the slow down switch being set too low.
2. Machine room ventilation inadequate.
3. The frequency of operation is too high for the normal rate of heat dissipation.

Temporary solution:

As a temporary measure to avoid overheating of the oil resulting in the shut down of the elevator, the down speed can be slowed to reduce frequency of operation until a permanent solution is installed.

Cooling systems

a. If the degree of overheating is not excessive and it takes for example two to three hours for the oil temperature to rise from 20° to 55°C (70° to 130° F), it may be sufficient to improve air circulation around the power unit, for example through the installation of a 0.05 to 0.10 kW ventilator extracting air out of the machine room or through a fan of similar power, blowing air over the power unit.

b. Should the above be inadequate, depending on the size of the elevator, it will be necessary to install a 10-50 l/min. (3 - 13 gpm) pump to circulate the hot oil through an air cooled radiator of about 0.1 to 0.2 fan kW. It is also essential that there is sufficient extraction of warm air out of the machine room or that the cooler is out side of the machine room, for example in the elevator shaft. The effective cooling power of an air cooled radiator should not to be confused with the power of the fan drive which normally need only be 0.1 or 0.2 kW. Normally, the effective cooling power of a cooler need only be approximately ¼ of the main hydraulic elevator motor, in the case of submersible drives.

Cooling systems for the above purpose should be switched into operation when the oil reaches 30° - 35°C (85° - 95° F).

System leakage (re-levelling)

The aim of manufacturers of hydraulic elevator control valves is to produce valves with zero leakage. Due to fine contamination in the oil perfect sealing between valve parts may not always be achieved, leading to a slow down leak of the elevator car.

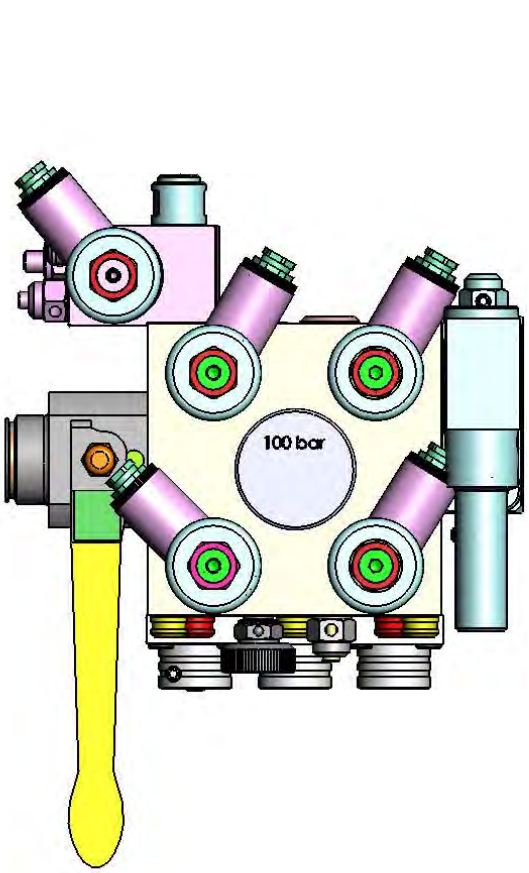
It would become unnecessarily expensive to strive for perfect sealing in every valve in operation. Therefore, because code requirements assure a safe relevelling system whether descent of the car is caused by valve leakage or through the cooling of the oil in the cylinder pressure system, a minor leakage of the control valve can be tolerated.

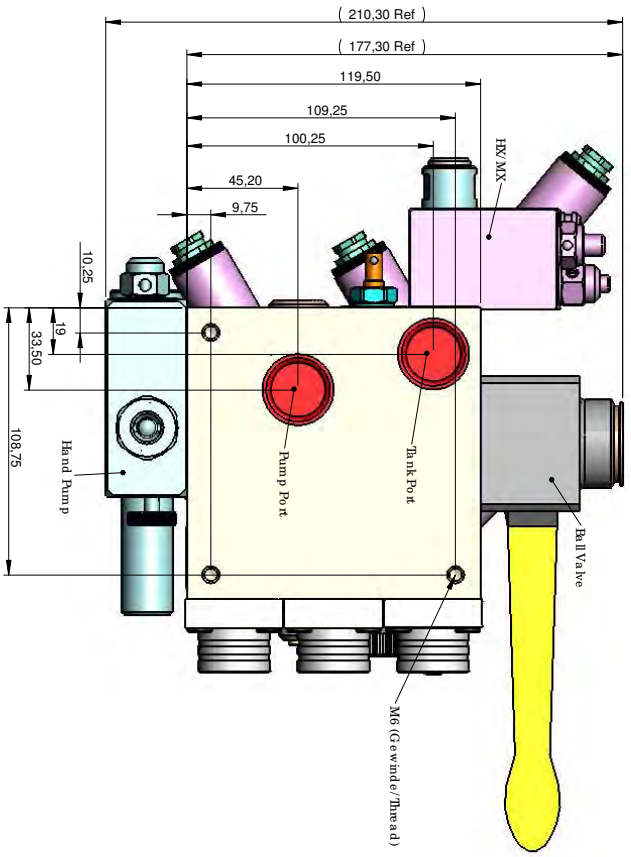
1. The European Code EN 81-2 require: that the loaded elevator does not leak downwards by more than 10 mm (3/8“) in 10 minutes. This is the standard used to determine if a valve should be serviced for leakage.
2. For practical reasons, a quicker method for judging valve leakage is to close the ball valve in the cylinder line and observe the gauge showing pressure in the cylinder chamber of the valve. If this pressure falls to zero in less than 20 secs, it may be necessary to service the valve, depending on the diameter of the main ram and sensitivity of the customer.
3. Down sinking giving the impression of leakage can be due to cooling of the oil.

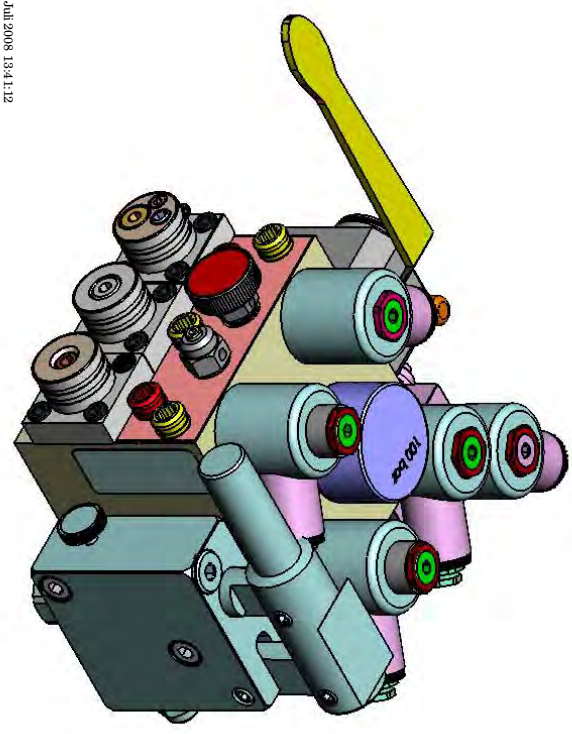
When the elevator is at rest and the temperature of the oil falls, contraction of the oil in the cylinder and piping causes the car to sink. This sinking is very slow but overnight without relevelling could amount to as much as half a meter, depending on the temperature drop of the oil and the volume of oil in the cylinder system. The elevator relevelling system, operating normally however, keeps the car at floor level.

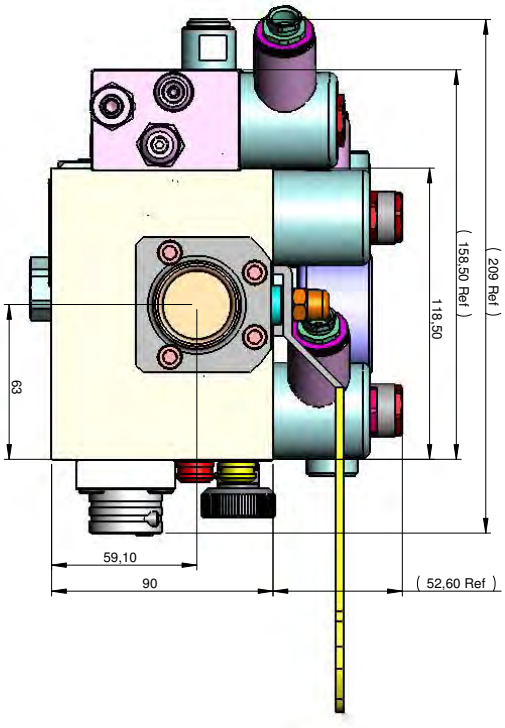
4. In the case of Blain EV valves, see page 10 EV and 16 KV indicating where valve down leakage can occur.

EN ISO 9001









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		c							
		d							
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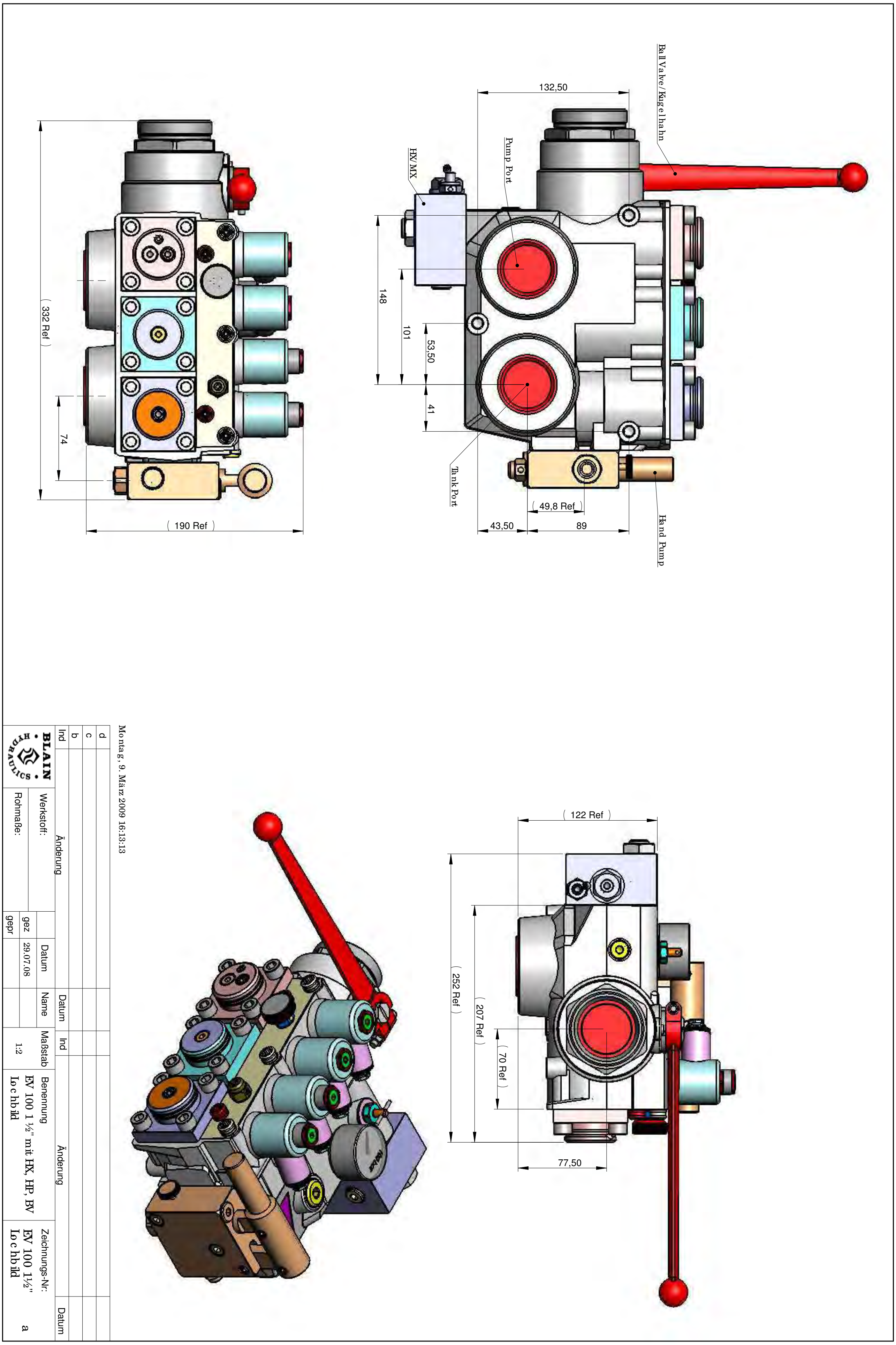
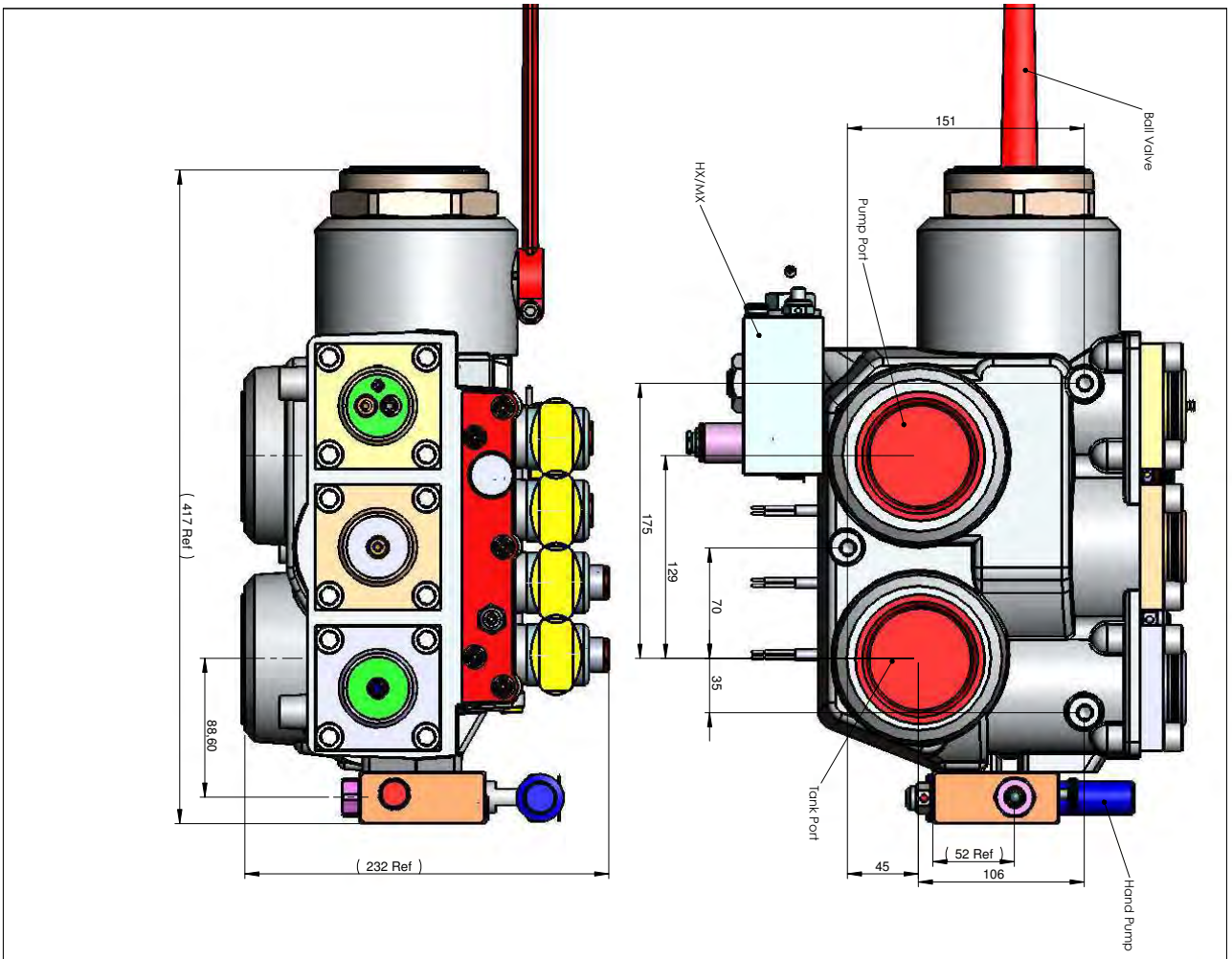
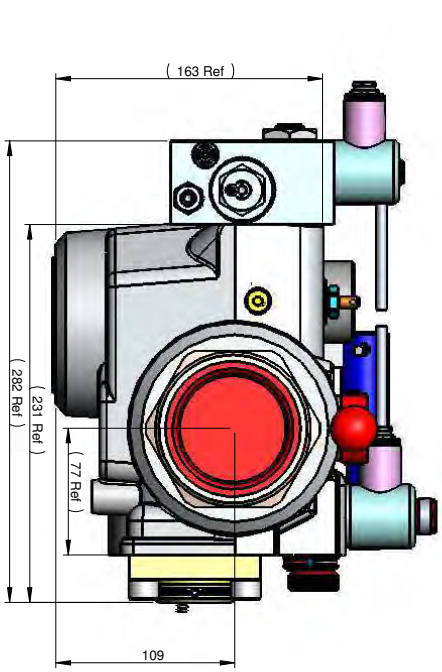
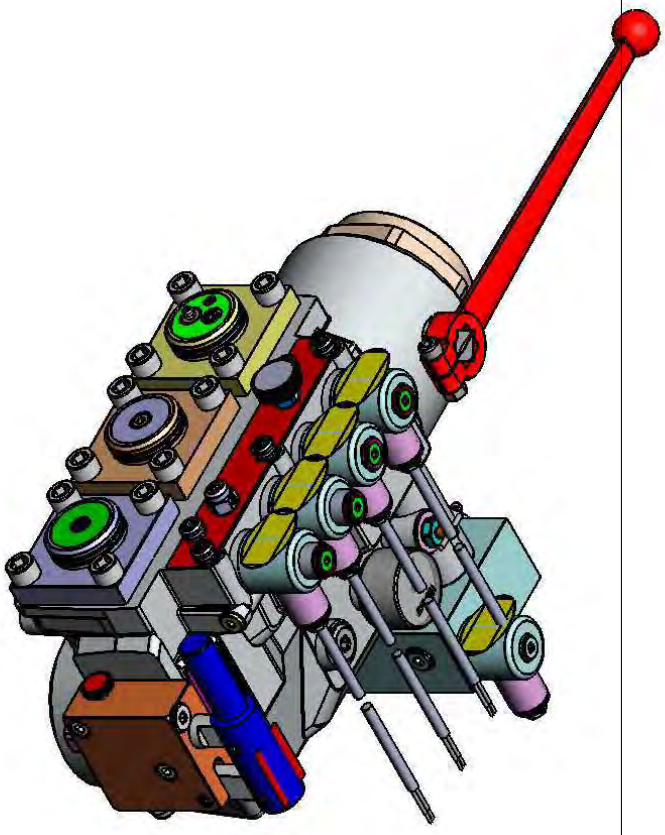
		gepr							
									Datum


132,50
Ball Valve / Kugelhahn
Pump Port
HX/MX
148
101
53,50
41
Tank Port
49,8 Ref
43,50
89
Hand Pump
332 Ref
74
190 Ref
122 Ref
252 Ref
207 Ref
70 Ref
77,50
Montag, 9. März 2009 16:13:13
d
c
b
Ind
Änderung
Datum
Name
Ind
Datum
BLAIN HYDRAULICS
Werkstoff:
Rohmaße:
gez
gepr
29.07.08
Maßstab
1:2
Benennung
EV 100 1 ½" mit HX, HP, BV
Lochbild
Zeichnungs-Nr:
EV 100 1½"
Lochbild
a

EN ISO 9001







Rohmaße:	Werkstoff:	Änderung	Ind	Datum	Name	Maßstab	Benennung	Änderung	Datum
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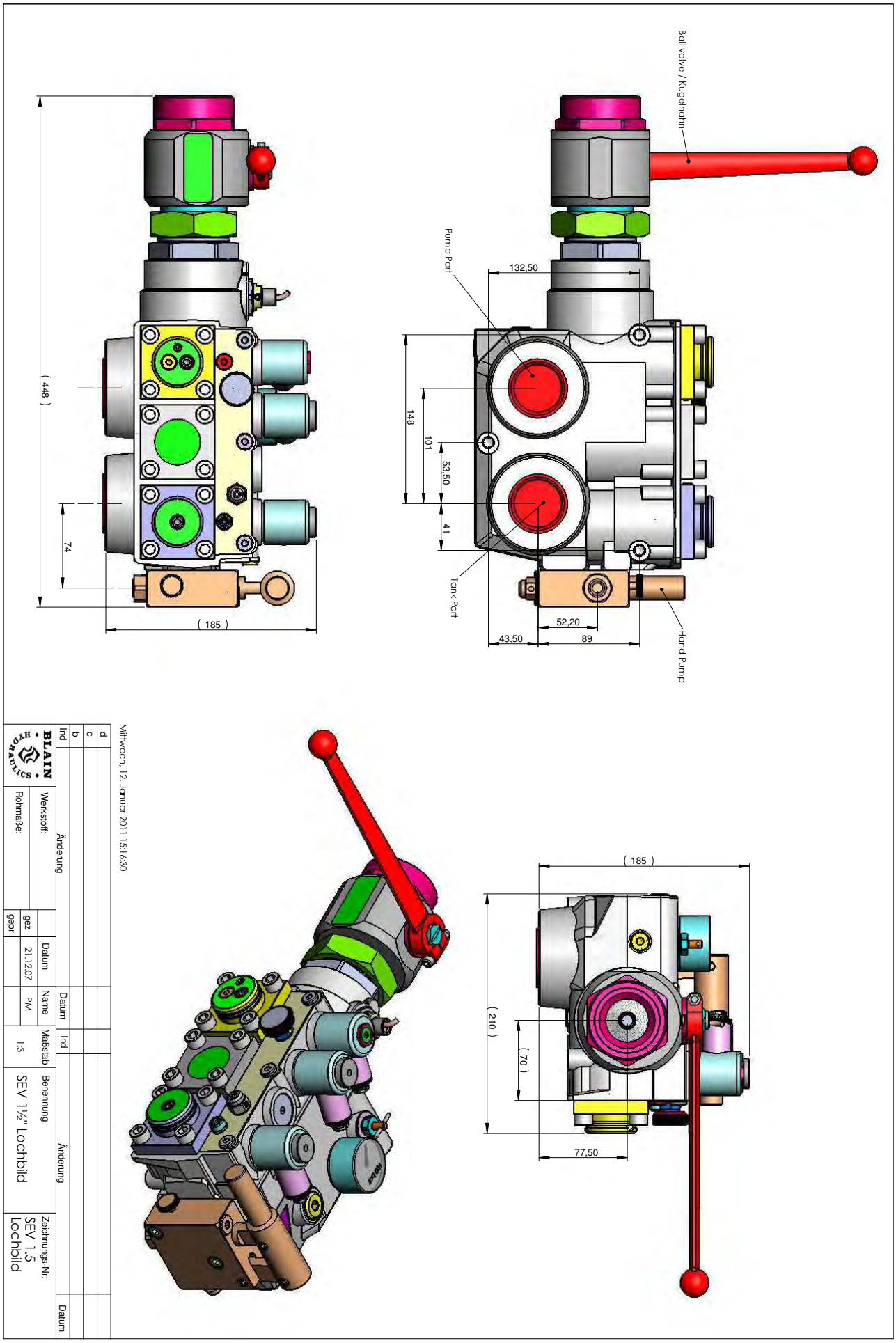
			c						
			d						
gepr	gez			06.04.10	JG				
							Zeichnungs-Nr:		
							EV 100 2 1/2" a		

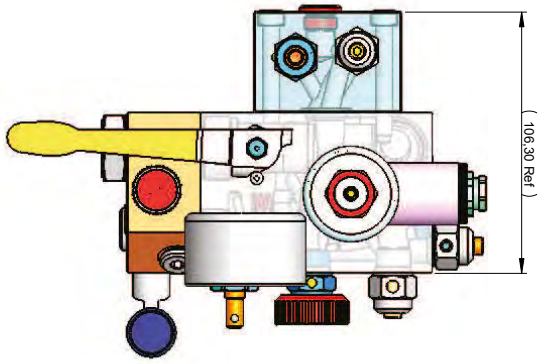
Dienstag, 6. April 2010 17:36:22

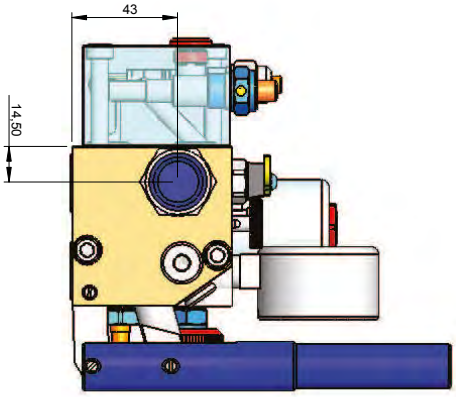
Ungefähres Gewicht in Gramm : 24337.79

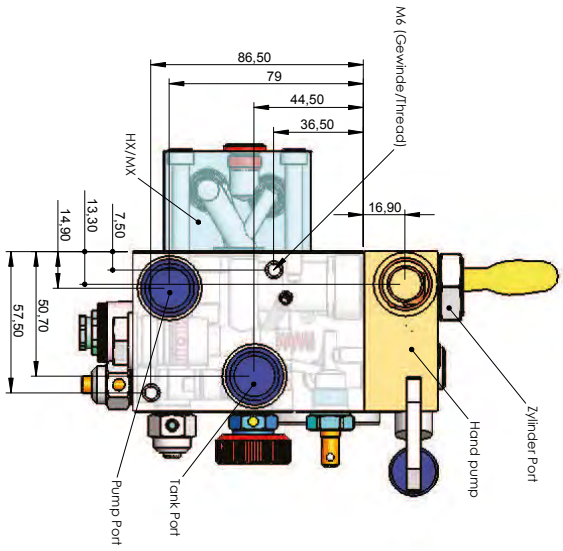
EN ISO 9001

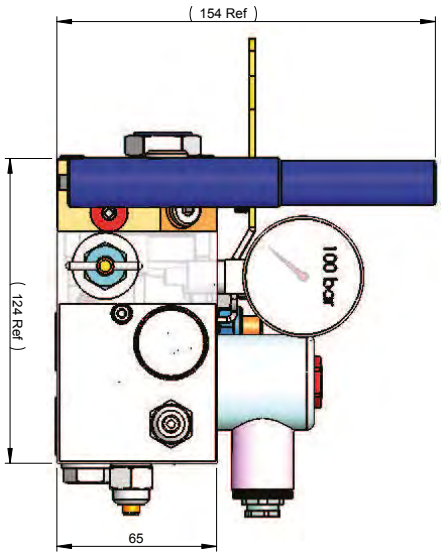

Ball valve / Kugelhahn
Pump Port
Tank Port
Hand Pump
132,50
148
101
53,50
41
52,20
43,50
89
(448)
74
(185)
(185)
(210)
(70)
77,50
Mittwoch, 12. Januar 2011 15:16:30
BLAIN HYDRAULICS
Rohmaße:
Werkstoff:
Änderung
Ind
Datum
Name
Maßstab
1:3
Benennung
SEV 1½" Lochbild
Zeichnungs-Nr:
SEV 1.5
Lochbild
gez
21.12.07
PM
gepr

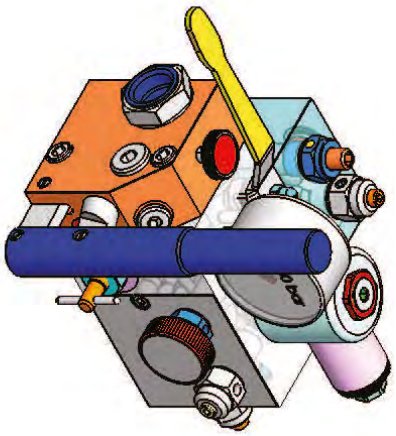
EN ISO 9001











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								c	
								b	
								Ind	Änderung
								Datum	
								Name	
								Ind	
								Datum	Änderung
gepr	gez	28.07.08							

Rohmaße:

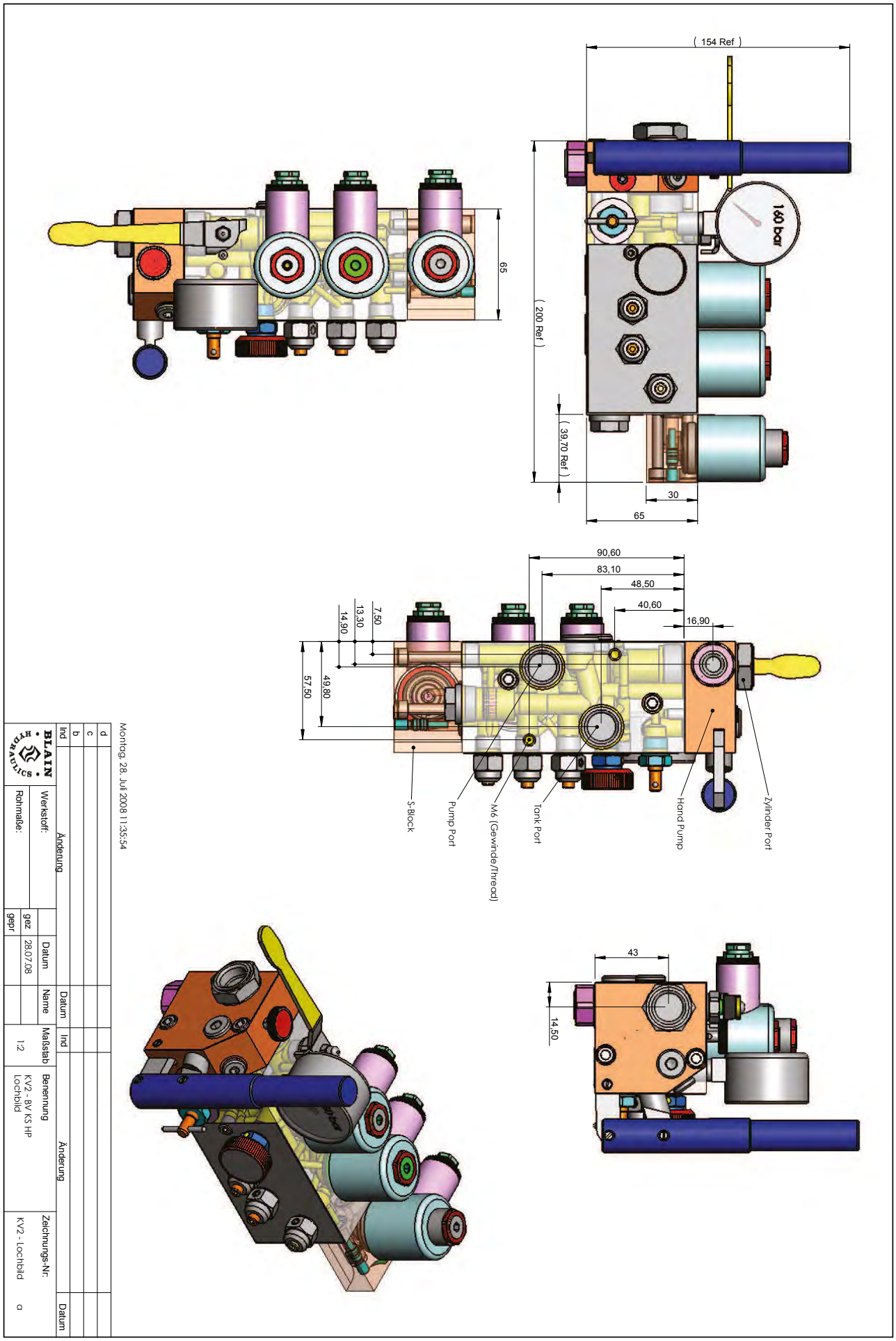
Werkstoff:

BLAIN HYDRAULICS

Maßstab: 1:2

Benennung: KV1P mit BV, HP, HX, KS Lochbild

Zeichnungs-Nr.: KV1P-Lochbild a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160 bar
(200 Ref)
(39,70 Ref)
30
65
65
90,60
83,10
48,50
40,60
16,90
14,90
13,30
7,50
57,50
49,80
S-Block
Pump Port
M6 (Gewinde/Thread)
Tank Port
Hand Pump
Zylinder Port
43
14,50
Montag, 28. Juli 2008 11:35:54
BLAIN HYDRAULICS
Rohmaße:
Werkstoff:
Maßstab 1:2
Benennung KV2 - BV KS HP Lochbild
Zeichnungs-Nr. KV2 - Lochbild a
Änderung
Ind
Datum
Name
gez 28.07.08
gepr
a
b
c
d

EN ISO 9001

Bypass Flowguide / Umlaufkolben Einsatzgröße :- U 01, 02, 03, 04, 05, 06, 07
Downvalve Flowguide / Senkkolben Einsatzgröße :- X 1-2, 3-4, 5-6, 7

BLAIN HYDRAULICS	Werkstoff:		Maßstab	Benennung:	Zeichnungs-Nr.:
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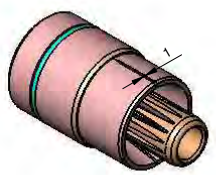
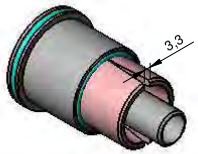
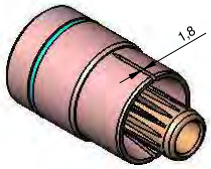
		gepr.			



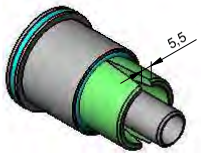
U 0

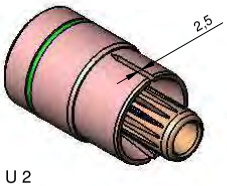


Senkkolben / Down Flowguide X- 0



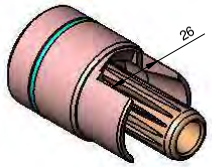
U 1





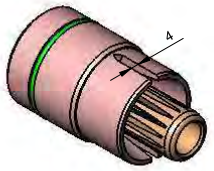
U 2

Senkkolben / Down Flowguide X 1-2

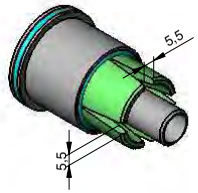


U 7

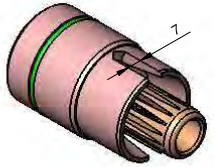
Senkkolben / Down Flowguide X 7



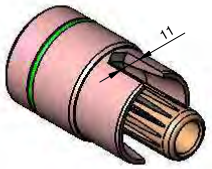
U 3



Senkkolben / Down Flowguide X 3-4

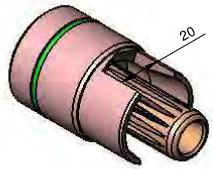


U 4



U 5

Senkkolben / Down Flowguide X 5-6



U 6

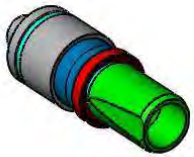
Bypass Flowguide / Umlaufkolben Einsatzgröße :- U 0,1, 2, 3, 4, 5, 6, 7

Downvalve Flowguide / Senkkolben Einsatzgröße :- X 0, 1-2, 3-4, 5-6, 7

Montag, 6. September 2010 11:46:01

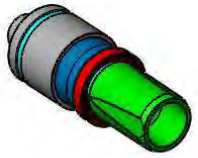
d								
c								
b								
Ind	Änderung			Datum	Ind	Änderung		Datum
BLAIN HYDRAULICS	Werkstoff:		Datum	Name	Maßstab	Benennung		Zeichnungs-Nr:
	Rohmaße:	gez	03.09.10	PM	1:2	EV 1½-2" Flow Guides EV 1½-2" Einsatzgroße		EV 1.5-2-U-X
		gepr						

U 10

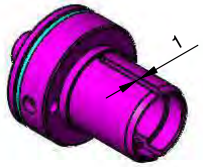


Y 10

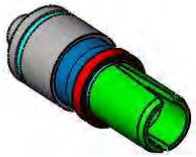
U 20



Y 20

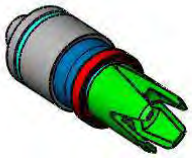


U 40

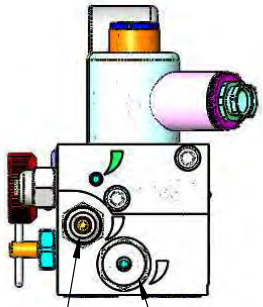


Y 40

U 80

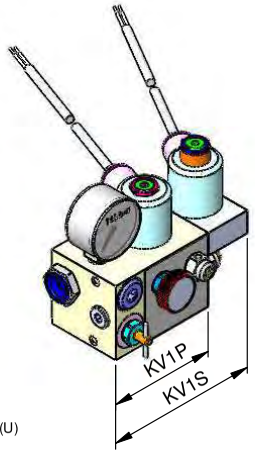


Y 80



Down Flowguide (Y)
open flange using
spanner 17

Bypass Flowguide (U)
Open flange using
spanner 19



Bypass Flowguide / Umlaufkolben Einsatzgröße :- U 10, 20, 40, 80
Downvalve Flowguide / Senkkolben Einsatzgröße :- Y 10, 20, 40, 80

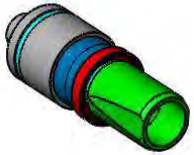
Freitag, 26. November 2010 11:15:33

Applicable for KV1P & KV1S

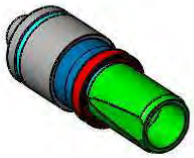
d	d	00.00.00	g	g	00.00.00
c	c	00.00.00	f	f	00.00.00
b	b	00.00.00	e	e	00.00.00
Ind	Änderung	Datum	Ind	Änderung	Datum

BLAIN HYDRAULICS	Werkstoff:		Datum	Name	Maßstab	Benennung:	Zeichnungs-Nr.:
	Rohmaße:	gez	06.09.10	PM	1:1	KV1 Flowguides KV1 Einsatzgrösse	KV1-U-Y
		gepr.					

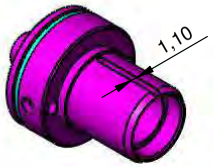
U 10



X 10
Adj. / Ein. - 7

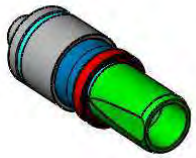


Y 10
Adj. / Ein. - 9

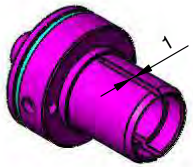


U 20

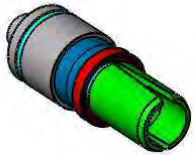
X 20
Adj. / Ein. - 7



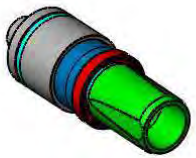
Y 10
Adj. / Ein. - 9



U 40

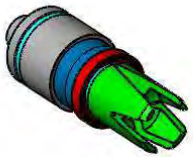


X 40
Adj. / Ein. - 7

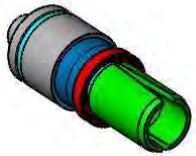


Y 20
Adj. / Ein. - 9

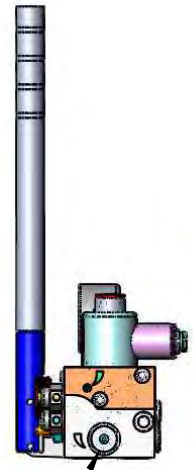
U 80



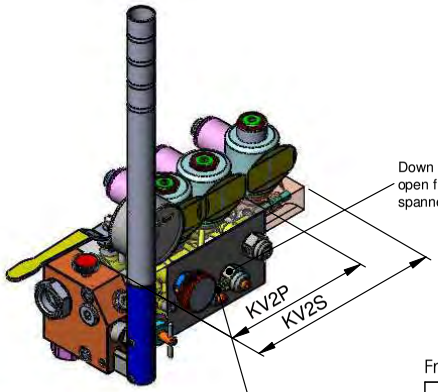
X 80
Adj. / Ein. - 7



Y 40
Adj. / Ein. - 9



Bypass Flowguide (U)
Open flange using
spanner 19



Bypass Flowguide / Umlaufkolben Einsatzgröße :- U 10, 20, 40, 80

Downvalve Flowguide (Adjustment 7)/ Senkkolben Einsatzgröße (Ein.7) :- X10, 20, 40, 80..... (Brass / Messing)

Downvalve Flowguide (Adjustment 9)/ Senkkolben Einsatzgröße (Ein.9) :- Y10, 20, 40

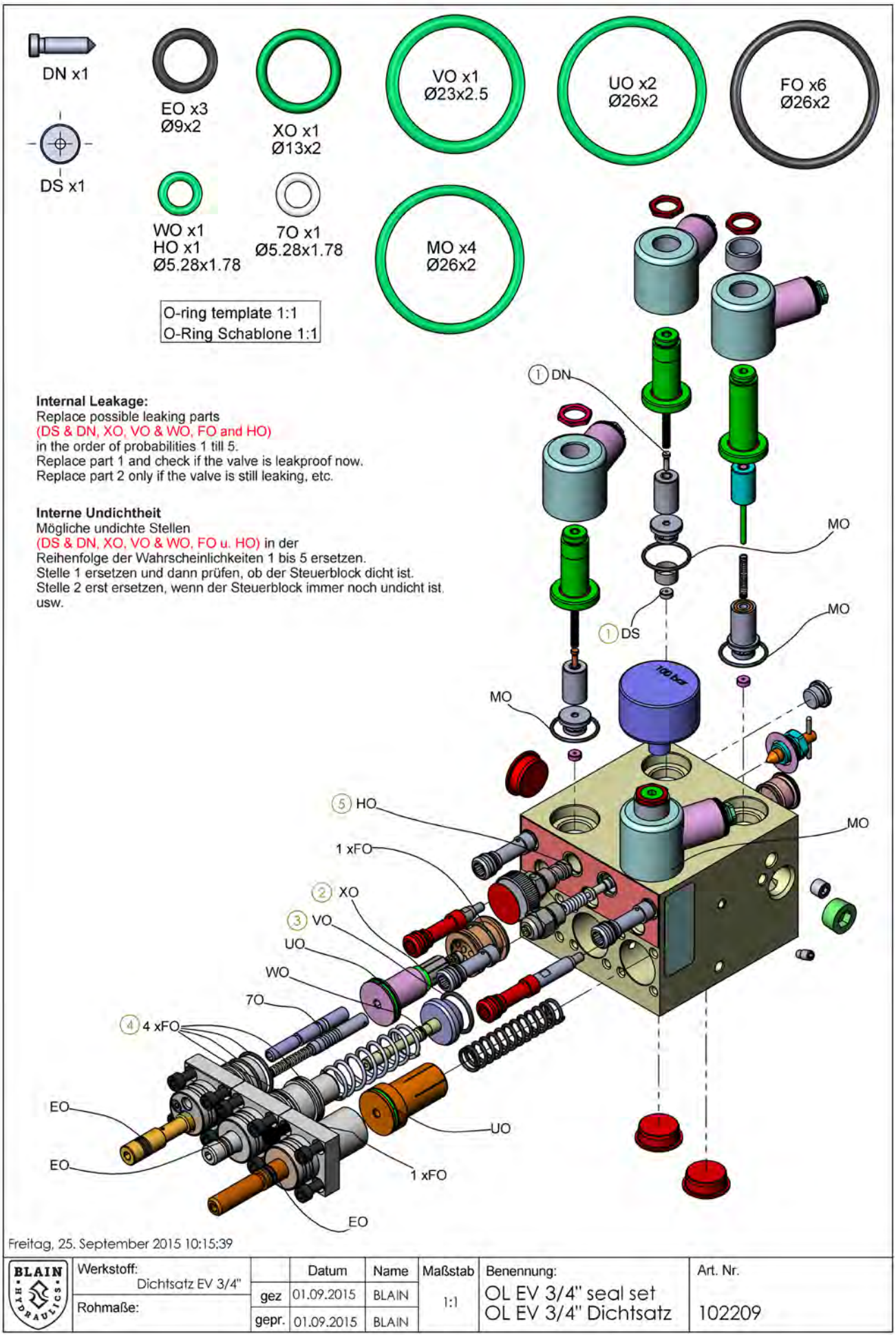
Applicable for KV2P & KV2S

Freitag, 26. November 2010 11:33:42

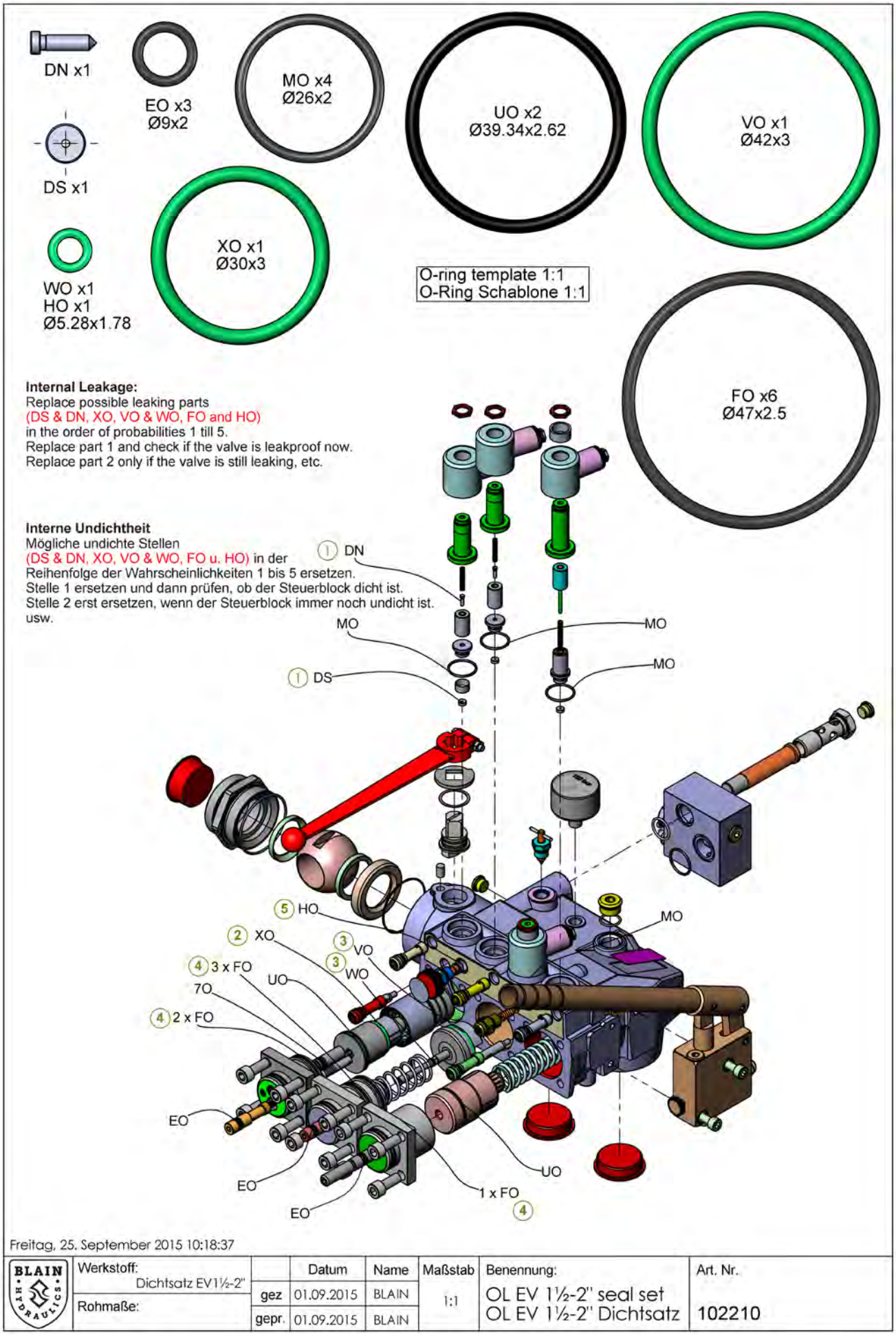
d	d	00.00.00	g	g	00.00.00
c	c	00.00.00	f	f	00.00.00
b	b	00.00.00	e	e	00.00.00
Ind	Änderung	Datum	Ind	Änderung	Datum

BLAIN HYDRAULICS	Werkstoff:		Datum	Name	Maßstab	Benennung:	Zeichnungs-Nr.:
	Rohmaße:	gez	06.09.10	PM	1:1	KV2 Flowguides KV2 Einsatzgrösse	KV2-U-Y
		gepr.					

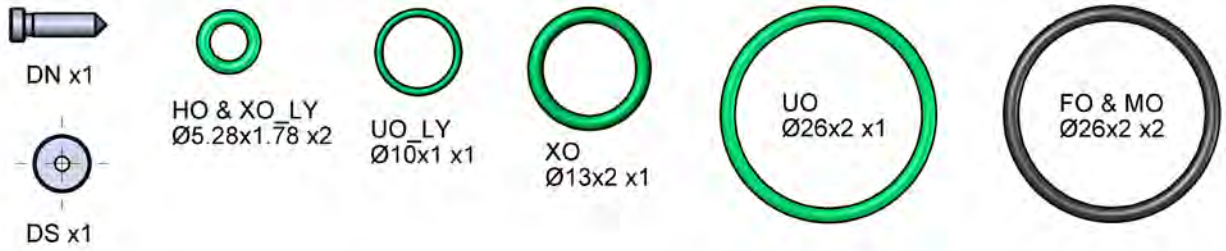
EN ISO 9001


DN x1
DS x1
EO x3
Ø9x2
XO x1
Ø13x2
VO x1
Ø23x2.5
UO x2
Ø26x2
FO x6
Ø26x2
WO x1
HO x1
Ø5.28x1.78
7O x1
Ø5.28x1.78
MO x4
Ø26x2
O-ring template 1:1
O-Ring Schablone 1:1
Internal Leakage:
Replace possible leaking parts
(DS & DN, XO, VO & WO, FO and HO)
in the order of probabilities 1 till 5.
Replace part 1 and check if the valve is leakproof now.
Replace part 2 only if the valve is still leaking, etc.
Interne Undichtheit
Mögliche undichte Stellen
(DS & DN, XO, VO & WO, FO u. HO) in der
Reihenfolge der Wahrscheinlichkeiten 1 bis 5 ersetzen.
Stelle 1 ersetzen und dann prüfen, ob der Steuerblock dicht ist.
Stelle 2 erst ersetzen, wenn der Steuerblock immer noch undicht ist.
usw.
1 DN
MO
MO
1 DS
MO
MO
5 HO
1 xFO
2 XO
3 VO
UO
WO
7O
4 4 xFO
EO
EO
UO
1 xFO
EO
Freitag, 25. September 2015 10:15:39
BLAIN HYDRAULICS
Werkstoff: Dichtsatz EV 3/4"
Rohmaße:
Datum
Name
Maßstab
Benennung:
gez 01.09.2015 BLAIN
gepr. 01.09.2015 BLAIN
1:1
OL EV 3/4" seal set
OL EV 3/4" Dichtsatz
Art. Nr.
102209

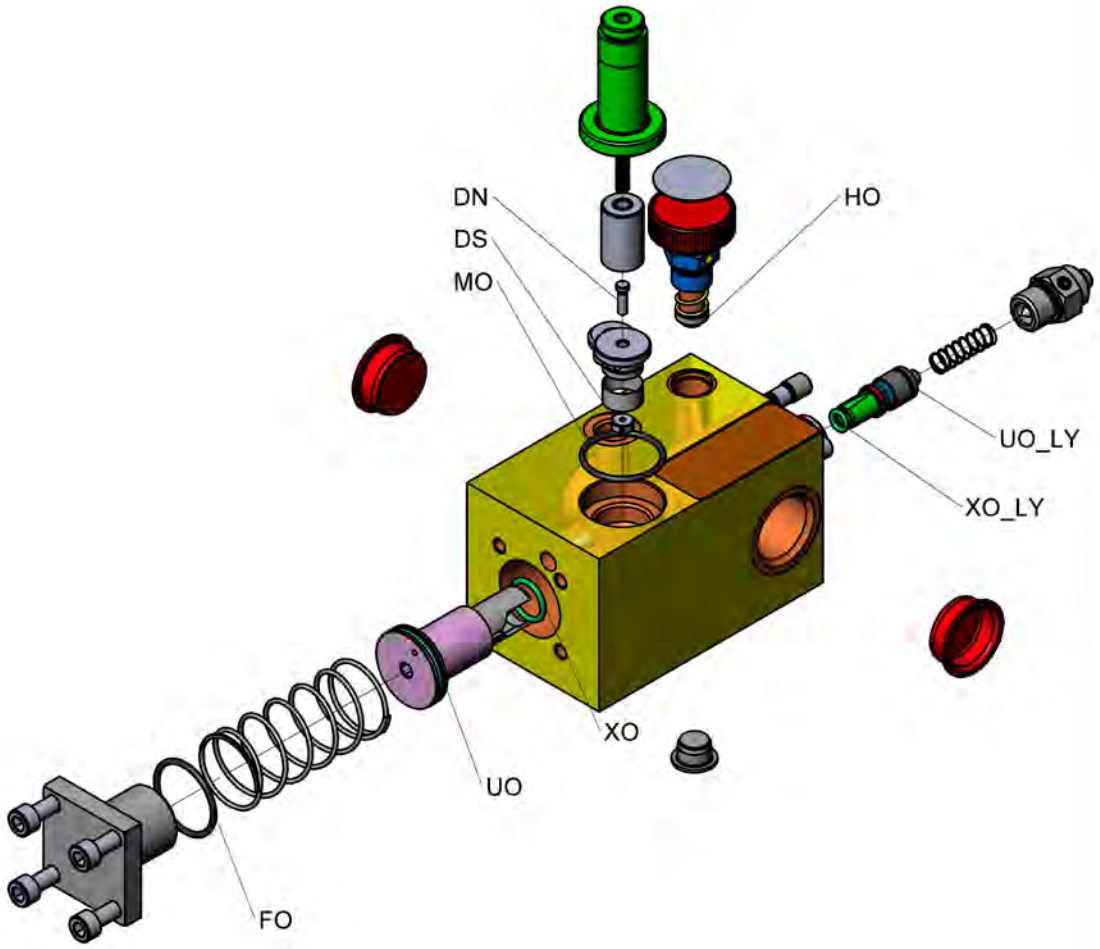
EN ISO 9001


DN x1
EO x3
Ø9x2
MO x4
Ø26x2
UO x2
Ø39.34x2.62
VO x1
Ø42x3
DS x1
XO x1
Ø30x3
WO x1
HO x1
Ø5.28x1.78
O-ring template 1:1
O-Ring Schablone 1:1
FO x6
Ø47x2.5
Internal Leakage:
Replace possible leaking parts
(DS & DN, XO, VO & WO, FO and HO)
in the order of probabilities 1 till 5.
Replace part 1 and check if the valve is leakproof now.
Replace part 2 only if the valve is still leaking, etc.
Interne Undichtheit
Mögliche undichte Stellen
(DS & DN, XO, VO & WO, FO u. HO) in der
Reihenfolge der Wahrscheinlichkeiten 1 bis 5 ersetzen.
Stelle 1 ersetzen und dann prüfen, ob der Steuerblock dicht ist.
Stelle 2 erst ersetzen, wenn der Steuerblock immer noch undicht ist.
usw.
1 DN
MO
MO
MO
1 DS
5 HO
2 XO
3 VO
3 WO
4 3 x FO
UO
7O
4 2 x FO
EO
EO
EO
UO
1 x FO
4
Freitag, 25. September 2015 10:18:37
BLAIN HYDRAULICS
Werkstoff:
Dichtsatz EV1½-2"
Rohmaße:
Datum
Name
gez
01.09.2015
BLAIN
gepr.
01.09.2015
BLAIN
Maßstab
1:1
Benennung:
OL EV 1½-2" seal set
OL EV 1½-2" Dichtsatz
Art. Nr.
102210

EN ISO 9001

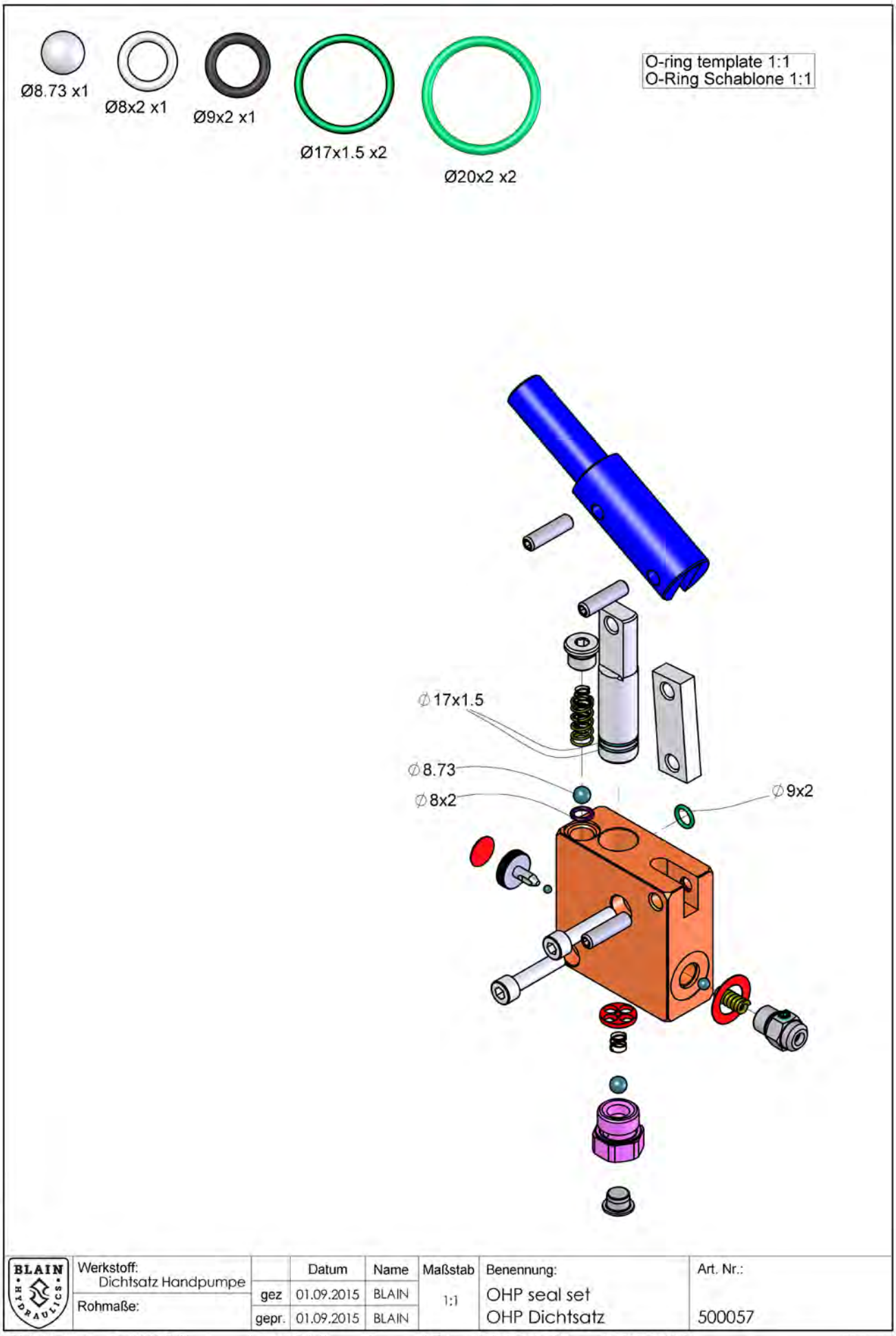


O-ring template 1:1
O-Ring Schablone 1:1



BLAIN HYDRAULICS	Werkstoff: Dichtsatz L10 ¾		Datum	Name	Maßstab	Benennung:	Art. Nr.:
	Rohmaße:	gez	01.09.2015	BLAIN	1:1	OL10 ¾ seal set OL10 ¾ Dichtsatz	500059
		gepr.	01.09.2015	BLAIN			

EN ISO 9001



BLAIN HYDRAULICS	Werkstoff: Dichtsatz Handpumpe		Datum	Name	Maßstab	Benennung:	Art. Nr.:
	Rohmaße:	gez	01.09.2015	BLAIN	1:1	OHP seal set OHP Dichtsatz	500057
		gepr.	01.09.2015	BLAIN			

EN ISO 9001

Flow - Pressure Tables (metric)

Ram Ø • Area • Speed • Flow

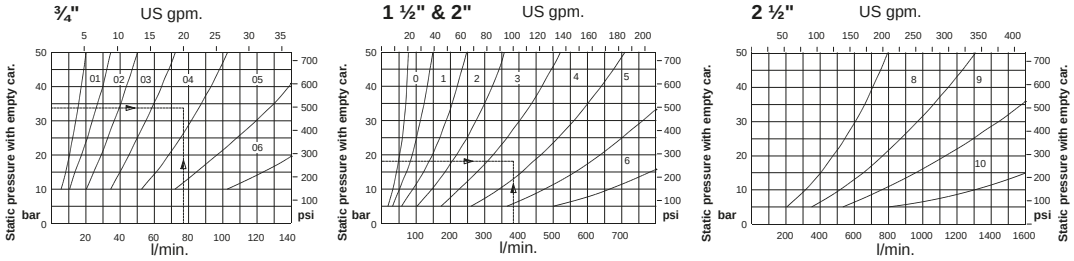
m/s		0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.70	0.80	0.90	1.00
Ø mm	cm²	l/min															
35	9.6	2.9	5.8	8.7	11.5	14	17	20	23	26	29	32	35	40	46	52	58
40	12.6	3.8	7.5	11.3	15.1	19	23	26	30	34	38	41	45	53	60	68	75
45	15.9	4.8	9.5	14.3	19.1	24	29	33	38	43	48	52	57	67	76	86	95
50	19.6	5.9	11.8	17.7	23.6	29	35	41	47	53	59	65	71	82	94	106	118
55	23.8	7.1	14.3	21.4	28.5	36	43	50	57	64	71	78	86	100	114	128	143
60	28.3	8.5	17.0	25.4	33.9	42	51	59	68	76	85	93	102	119	136	153	170
65	33.2	10.0	19.9	29.9	39.8	50	60	70	80	90	100	110	119	139	159	179	199
70	38.5	11.5	23.1	34.6	46.2	58	69	81	92	104	115	127	139	162	185	208	231
75	44.2	13.3	26.5	39.8	53.0	66	80	93	106	119	133	146	159	186	212	239	265
80	50.3	15.1	30.2	45.2	60.3	75	90	106	121	136	151	166	181	211	241	271	302
85	56.7	17.0	34.0	51.1	68.1	85	102	119	136	153	170	187	204	238	272	306	340
90	63.6	19.1	38.2	57.3	76.3	95	115	134	153	172	191	210	229	267	305	344	382
95	70.9	21.3	42.5	63.8	85.1	106	128	149	170	191	213	234	255	298	340	383	425
100	78.5	23.6	47.1	70.7	94.2	118	141	165	188	212	236	259	283	330	377	424	471
105	86.6	26.0	52.0	77.9	103.9	130	156	182	208	234	260	286	312	364	416	468	520
110	95.0	28.5	57.0	85.5	114.0	143	171	200	228	257	285	314	342	399	456	513	570
115	103.9	31.2	62.3	93.5	124.6	156	187	218	249	280	312	343	374	436	499	561	623
120	113.1	33.9	67.9	101.8	135.7	170	204	238	271	305	339	373	407	475	543	611	679
125	122.7	36.8	73.6	110.4	147.3	184	221	258	295	331	368	405	442	515	589	663	736
130	132.7	39.8	79.6	119.5	159.3	199	239	279	319	358	398	438	478	557	637	717	796
140	153.9	46.2	92.4	138.5	184.7	231	277	323	369	416	462	508	554	647	739	831	924
150	176.7	53.0	106.0	159.0	212.1	265	318	371	424	477	530	583	636	742	848	954	1060
160	201.1	60.3	120.6	181.0	241.3	302	362	422	483	543	603	664	724	844	965	1086	1206
170	227.0	68.1	136.2	204.3	272.4	340	409	477	545	613	681	749	817	953	1090	1226	1362
180	254.5	76.3	152.7	229.0	305.4	382	458	534	611	687	763	840	916	1069	1221	1374	1527
190	283.5	85.1	170.1	255.2	340.2	425	510	595	680	766	851	936	1021	1191	1361	1531	1701
200	314.2	94.2	188.5	282.7	377.0	471	565	660	754	848	942	1037	1131	1319	1508	1696	1885
210	346.4	103.9	207.8	311.7	415.6	520	623	727	831	935	1039	1143	1247	1455	1663	1870	2078
220	380.1	114.0	228.1	342.1	456.2	570	684	798	912	1026	1140	1254	1368	1597	1825	2053	2281
240	452.4	135.7	271.4	407.2	542.9	679	814	950	1086	1221	1357	1493	1629	1900	2171	2443	2714
260	530.9	159.3	318.6	477.8	637.1	796	956	1115	1274	1434	1593	1752	1911	2230	2548	2867	3186
280	615.8	184.7	369.5	554.2	738.9	924	1108	1293	1478	1663	1847	2032	2217	2586	2956	3325	3695
300	706.9	212.1	424.1	636.2	848.2	1060	1272	1484	1696	1909	2121	2333	2545	2969	3393	3817	4241

Ram Ø • Area • Load • Pressure

kg		500	750	1000	1500	2000	2500	3000	3500	4000	4500	5000	6000	7000	8000	9000	10000
Ø mm	cm²	bar															
35	9.6	51	76	102	153	204	255	306	357	408	459	510	612	714	816	918	1020
40	12.6	39	59	78	117	156	195	234	273	312	351	390	468	546	625	703	781
45	15.9	31	46	62	93	123	154	185	216	247	278	308	370	432	493	555	617
50	19.6	25	38	50	75	100	125	150	175	200	225	250	300	350	400	450	500
55	23.8	21	31	41	62	83	103	124	145	165	186	206	248	289	330	372	413
60	28.3	17	26	35	52	69	87	104	121	139	156	173	208	243	278	312	347
65	33.2	15	22	30	44	59	74	89	103	118	133	148	177	207	237	266	296
70	38.5	13	19	26	38	51	64	76	89	102	115	127	153	178	204	229	255
75	44.2	11	17	22	33	44	56	67	78	89	100	111	133	155	178	200	222
80	50.3	9.8	15	20	29	39	49	59	68	78	88	98	117	137	156	176	195
85	56.7	8.6	13	17	26	35	43	52	61	69	78	86	104	121	138	156	173
90	63.6	7.7	12	15	23	31	39	46	54	62	69	77	93	108	123	139	154
95	70.9	6.9	10	14	21	28	35	42	48	55	62	69	83	97	111	125	138
100	78.5	6.2	9.4	13	19	25	31	38	44	50	56	62	75	87	100	112	125
105	86.6	5.7	8.5	11	17	23	28	34	40	45	51	57	68	79	91	102	113
110	95.0	5.2	7.7	10	16	21	26	31	36	41	47	52	62	72	83	93	103
115	103.9	4.7	7.1	9.4	14	19	24	28	33	38	43	47	57	66	76	85	94
120	113.1	4.3	6.5	8.7	13	17	22	26	30	35	39	43	52	61	69	78	87
125	122.7	4.0	6.0	8.0	12	16	20	24	28	32	36	40	48	56	64	72	80
130	132.7	3.7	5.5	7.4	11	15	19	22	26	30	33	37	44	52	59	67	74
140	153.9	3.2	4.8	6.4	9.6	13	16	19	22	26	29	32	38	45	51	57	64
150	176.7	2.8	4.2	5.6	8.3	11	14	17	19	22	25	28	33	39	44	50	56
160	201.1	2.4	3.7	4.9	7.3	9.8	12	15	17	20	22	24	29	34	39	44	49
170	227.0	2.2	3.2	4.3	6.5	8.6	11	13	15	17	19	22	26	30	35	39	43
180	254.5	1.9	2.9	3.9	5.8	7.7	9.6	12	14	15	17	19	23	27	31	35	39
190	283.5	1.7	2.6	3.5	5.2	6.9	8.6	10	12	14	16	17	21	24	28	31	35
200	314.2	1.6	2.3	3.1	4.7	6.2	7.8	9.4	11	13	14	16	19	22	25	28	31
210	346.4	1.4	2.1	2.8	4.2	5.7	7.1	8.5	9.9	11	13	14	17	20	23	26	28
220	380.1	1.3	1.9	2.6	3.9	5.2	6.5	7.7	9.0	10.3	12	13	16	18	21	23	26
240	452.4	1.1	1.6	2.2	3.3	4.3	5.4	6.5	7.6	8.7	9.8	11	13	15	17	20	22
260	530.9	0.9	1.4	1.8	2.8	3.7	4.6	5.5	6.5	7.4	8.3	9.2	11	13	15	17	19
280	615.8	0.8	1.2	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	9.6	11	13	14	16
300	706.9	0.7	1.0	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.2	6.9	8.3	9.7	11	13	14

in² = 6,45 cm² | 1 in = 25,4 mm | 1 m/s = 197 ft/min | 1 Imp. gpm = 4,55 l/min | 1 US gmp = 3,79 l/min | 1 kg = 2,2 lbs | 1 bar = 14,7 psi

Flow Guide Selection Charts



EN ISO 9001

Flow - Pressure Tables (US gpm/psi)

Ram Ø • Area • Speed • Flow

ft/min		10	20	30	40	50	60	70	80	90	100	110	120	140	160	180	200
Ø inch	in²	US gpm															
1.4	1.5	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	11.2	12.8	14.4	16.0
1.6	2.0	1.0	2.1	3.1	4.2	5.2	6.3	7.3	8.4	9.4	10.5	11.5	12.5	14.6	16.7	18.8	20.9
1.8	2.5	1.3	2.6	4.0	5.3	6.6	7.9	9.3	10.6	11.9	13.2	14.6	15.9	18.5	21.2	23.8	26.5
2.0	3.1	1.6	3.3	4.9	6.5	8.2	9.8	11.4	13.1	14.7	16.3	18.0	19.6	22.9	26.1	29.4	32.7
2.2	3.8	2.0	4.0	5.9	7.9	9.9	11.9	13.8	15.8	17.8	19.8	21.7	23.7	27.7	31.6	35.6	39.5
2½	4.9	2.6	5.1	7.7	10.2	12.8	15.3	17.9	20.4	23.0	25.5	28.1	30.6	35.7	40.8	45.9	51.0
2.6	5.3	2.8	5.5	8.3	11.0	13.8	16.6	19.3	22.1	24.8	27.6	30.4	33.1	38.6	44.2	49.7	55.2
2¾	5.9	3.1	6.2	9.3	12.4	15.4	18.5	21.6	24.7	27.8	30.9	34.0	37.1	43.2	49.4	55.6	61.8
3.0	7.1	3.7	7.3	11.0	14.7	18.4	22.0	25.7	29.4	33.1	36.7	40.4	44.1	51.4	58.8	66.1	73.5
3.2	8.0	4.2	8.4	12.5	16.7	20.9	25.1	29.3	33.4	37.6	41.8	46.0	50.2	58.5	66.9	75.3	83.6
3½	9.6	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	70.0	80.0	90.0	100.0
3.6	10.2	5.3	10.6	15.9	21.2	26.5	31.7	37.0	42.3	47.6	52.9	58.2	63.5	74.1	84.7	95.2	105.8
3.8	11.3	5.9	11.8	17.7	23.6	29.5	35.4	41.3	47.2	53.1	59.0	64.9	70.7	82.5	94.3	106.1	117.9
4.0	12.6	6.5	13.1	19.6	26.1	32.7	39.2	45.7	52.3	58.8	65.3	71.9	78.4	91.5	104.5	117.6	130.7
4.2	13.9	7.2	14.4	21.6	28.8	36.0	43.2	50.4	57.6	64.8	72.0	79.2	86.4	100.8	115.2	129.6	144.0
4⅜	15.0	7.8	15.6	23.4	31.3	39.1	46.9	54.7	62.5	70.3	78.1	86.0	93.8	109.4	125.0	140.7	156.3
4½	15.9	8.3	16.5	24.8	33.1	41.3	49.6	57.9	66.1	74.4	82.7	90.9	99.2	115.8	132.3	148.8	165.4
4.8	18.1	9.4	18.8	28.2	37.6	47.0	56.4	65.8	75.3	84.7	94.1	103.5	112.9	131.7	150.5	169.3	188.1
5.0	19.6	10.2	20.4	30.6	40.8	51.0	61.2	71.5	81.7	91.9	102.1	112.3	122.5	142.9	163.3	183.7	204.1
5⅞	23.2	12.1	24.1	36.2	48.3	60.4	72.4	84.5	96.6	108.6	120.7	132.8	144.9	169.0	193.1	217.3	241.4
5½	23.8	12.4	24.7	37.1	49.4	61.8	74.1	86.5	98.8	111.2	123.5	135.9	148.2	172.9	197.6	222.3	247.0
6.0	28.3	14.7	29.4	44.1	58.8	73.5	88.2	102.9	117.6	132.3	147.0	161.7	176.4	205.8	235.2	264.6	294.0
6½	33.2	17.3	34.5	51.8	69.0	86.3	103.5	120.8	138.0	155.3	172.5	189.8	207.0	241.5	276.0	310.5	345.0
6.8	36.3	18.9	37.8	56.6	75.5	94.4	113.3	132.2	151.0	169.9	188.8	207.7	226.6	264.3	302.1	339.8	377.6
7.0	38.5	20.0	40.0	60.0	80.0	100.0	120.0	140.0	160.1	180.1	200.1	220.1	240.1	280.1	320.1	360.1	400.1
7½	44.2	23.0	45.9	68.9	91.9	114.8	137.8	160.8	183.7	206.7	229.7	252.6	275.6	331.5	367.5	413.4	459.3
8.0	50.3	26.1	52.3	78.4	104.5	130.7	156.8	182.9	209.0	235.2	261.3	287.4	313.6	365.8	418.1	470.4	522.6
8½	56.7	29.5	59.0	88.5	118.0	147.5	177.0	206.5	236.0	265.5	295.0	324.5	354.0	413.0	472.0	531.0	590.0
8.8	60.8	31.6	63.2	94.9	126.5	158.1	189.7	221.3	252.9	284.6	316.2	347.8	379.4	442.7	505.9	569.1	632.4
9½	70.9	36.8	73.7	110.5	147.4	184.2	221.1	257.9	294.8	331.6	368.5	405.3	442.2	515.9	589.6	663.3	737.0
10⅝	88.7	46.1	92.2	138.3	184.4	230.5	276.6	322.6	368.7	414.8	460.9	507.0	553.1	645.3	737.5	829.7	921.9
11.2	98.5	51.2	102.4	153.6	204.9	256.1	307.3	358.5	409.7	460.9	512.2	563.4	614.6	717.0	819.5	921.9	1024.3
12.0	113.1	58.8	117.6	176.4	235.2	294.0	352.8	411.6	470.4	529.1	587.9	646.7	705.5	823.1	940.7	1058.3	1175.9

Ram Ø • Area • Load • Pressure

lbs		1100	1650	2200	3300	4400	5500	6600	7700	8800	10000	11000	13200	15400	17600	19800	22000
Ø inch	in²	psi															
1.4	1.5	714.6	1071.9	1429.1	2143.7	2858.3	3572.9	4287.4	5002.0	5716.6	6496.1	7145.7	8574.9	10004.0	11433.2	12862.3	14291.5
1.6	2.0	547.1	820.6	1094.2	1641.3	2188.4	2735.5	3282.6	3829.7	4376.8	4973.6	5471.0	6565.1	7659.3	8753.5	9847.7	10941.9
1.8	2.5	432.3	648.4	864.5	1296.8	1729.1	2161.4	2593.6	3025.9	3458.2	3929.8	4322.7	5187.3	6051.8	6916.4	7780.9	8645.5
2.0	3.1	350.1	525.2	700.3	1050.4	1400.6	1750.7	2100.8	2451.0	2801.1	3183.1	3501.4	4201.7	4902.0	5602.3	6302.5	7002.8
2.2	3.8	289.4	434.1	578.7	868.1	1157.5	1446.9	1736.2	2025.6	2315.0	2630.7	2893.7	3472.5	4051.2	4630.0	5208.7	5787.5
2½	4.9	224.1	336.1	448.2	672.3	896.4	1020.5	1344.5	1568.6	1792.7	2037.2	2240.9	2689.1	3137.3	3585.4	4033.6	4481.8
2.6	5.3	207.2	310.8	414.4	621.6	828.7	1035.9	1243.1	1450.3	1657.5	1883.5	2071.8	2486.2	2900.6	3314.9	3729.3	4143.7
2¾	5.9	185.2	277.8	370.4	555.6	740.8	926.0	1111.2	1296.4	1481.6	1683.6	1852.0	2222.4	2592.8	2963.2	3333.6	3704.0
3.0	7.1	155.6	233.4	311.2	466.9	622.5	778.1	933.7	1089.3	1244.9	1414.7	1556.2	1867.4	2178.7	2489.9	2801.1	3112.4
3.2	8.0	136.8	205.2	273.5	410.3	547.1	683.9	820.6	957.4	1094.2	1243.4	1367.7	1641.3	1914.8	2188.4	2461.9	2735.5
3½	9.6	114.3	171.5	228.7	343.0	457.3	571.7	686.0	800.3	914.7	1039.4	1143.3	1372.0	1600.6	1829.3	2058.0	2286.6
3.6	10.2	108.1	162.1	216.1	324.2	432.3	540.3	648.4	756.5	864.5	982.4	1080.7	1296.8	1513.0	1729.1	1945.2	2161.4
3.8	11.3	97.0	145.5	194.0	291.0	388.0	485.0	582.0	678.9	775.9	881.7	969.9	1163.9	1357.9	1551.9	1745.9	1939.8
4.0	12.6	87.5	131.3	175.1	262.6	350.1	437.7	525.2	612.7	700.3	795.8	875.4	1050.4	1225.5	1400.6	1575.6	1750.7
4.2	13.9	79.4	119.1	158.8	238.2	317.6	397.0	476.4	555.8	635.2	721.8	794.0	952.8	1111.6	1270.4	1429.1	1587.9
4⅜	15.0	73.2	109.8	146.3	219.5	292.7	365.9	439.0	512.2	585.4	665.2	731.7	878.1	1024.4	1170.8	1317.1	1463.4
4½	15.9	69.2	103.7	138.3	207.5	276.7	345.8	415.0	484.1	553.3	628.8	691.6	830.0	968.3	1106.6	1244.9	1383.3
4.8	18.1	60.8	91.2	121.6	182.4	243.2	303.9	364.7	425.5	486.3	552.6	607.9	729.5	851.0	972.6	1094.2	1215.8
5.0	19.6	56.0	84.0	112.0	168.1	224.1	280.1	336.1	392.2	448.2	509.3	560.2	672.3	784.3	896.4	1008.4	1120.5
5⅞	23.2	47.4	71.1	94.7	142.1	189.5	236.9	284.2	331.6	379.0	430.6	473.7	568.4	663.2	757.9	852.7	947.4
5½	23.8	46.3	69.4	92.6	138.9	185.2	231.5	277.8	324.1	370.4	420.9	463.0	555.6	648.2	740.8	833.4	926.0
6.0	28.3	38.9	58.4	77.8	116.7	155.6	194.5	233.4	272.3	311.2	353.7	389.0	466.9	544.7	622.5	700.3	778.1
6½	33.2	33.1	49.7	66.3	99.4	132.6	165.7	198.9	232.0	265.2	301.4	331.5	397.8	464.1	530.4	596.7	663.0
6.8	36.3	30.3	45.4	60.6	90.9	121.2	151.4	181.7	212.0	242.3	275.4	302.9	363.5	424.0	484.6	545.2	605.8
7.0	38.5	28.6	42.9	57.2	85.7	114.3	142.9	171.5	200.1	228.7	259.8	285.8	343.0	400.2	457.3	514.5	571.7
7½	44.2	24.9	37.3	49.8	74.7	99.6	124.5	149.4	174.3	199.2	226.4	249.0	298.8	348.6	398.4	448.2	498.0
8.0	50.3	21.9	32.8	43.8	65.7	87.5	109.4	131.3	153.2	175.1	198.9	218.8	262.6	306.4	350.1	393.9	437.7
8½	56.7	19.4	29.1	38.8	58.2	77.5	96.9	116.3	135.7	155.1	176.2	193.8	232.6	271.4	310.2	348.9	387.7
8.8	60.8	18.1	27.1	36.2	54.3	72.3	90.4	108.5	126.6	144.7	164.4	180.9	217.0	253.2	289.4	325.5	361.7
9½	70.9	15.5	23.3	31.0	46.6	62.1	77.6	93.1	108.6	124.1	141.1	155.2	186.2	217.3	248.3	279.3	310.4
10⅝	88.7	12.4	18.6	24.8	37.2	49.6	62.0	74.4	86.8	99.3	112.8	124.1	148.9	173.7	198.5	223.3	248.1
11.2	98.5	11.2	16.7	22.3	33.5	44.7	55.8	67.0	78.2	89.3	101.5	111.7	134.0	156.3	178.6	201.0	223.3
12.0	113.1	9.7	14.6	19.5	29.2	38.9	48.6	58.4	68.1	77.8	88.4	97.3	116.7	136.2	155.6	175.1	194.5

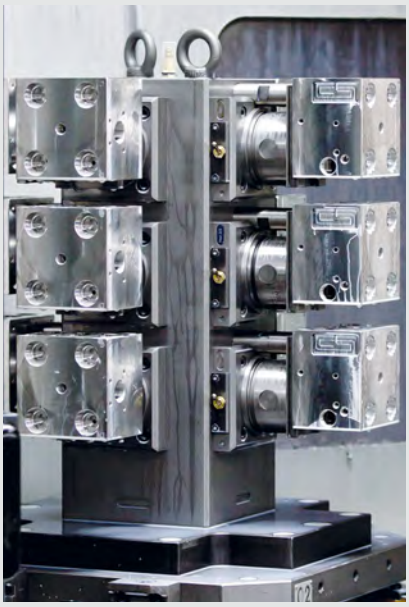
in² = 6,45 cm² | 1 in = 25,4 mm | 1 m/s = 197 ft/min | 1 Imp. gpm = 4,55 l/min | 1 US gmp = 3,79 l/min | 1 kg = 2,2 lbs | 1 bar = 14,7 psi

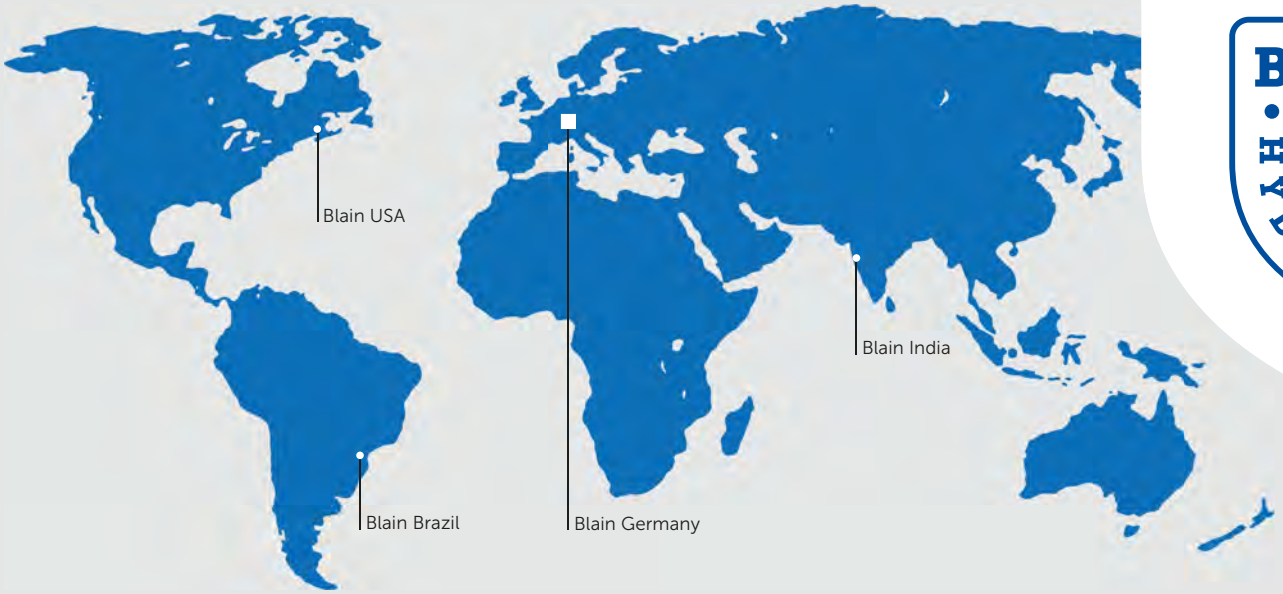
EN ISO 9001

Notes

EN ISO 9001

Notes





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