BLAIN VALUES

V-0

V-1

V-10

V-100

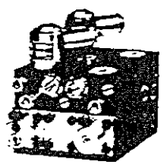
EV 0 thru EV 10

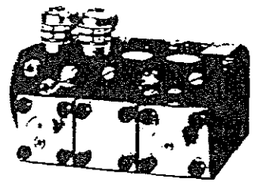
Elevator Control Valves

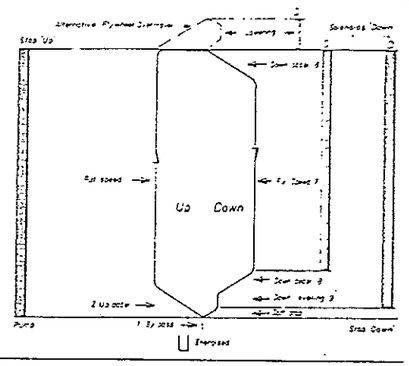
HADRAULICS

TYPES

EV 0 ¾" 1½" & 2"



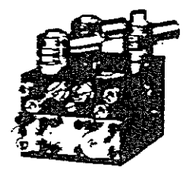


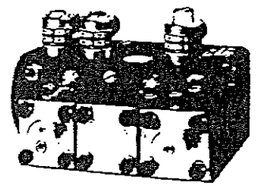


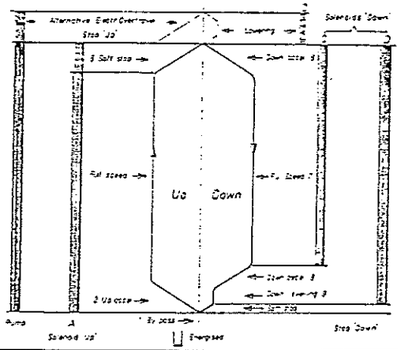
Up Up to 0.16 m/s (32 fpm). 1 Up Speed.
Up Start is smooth and adjustable.
Up Stop is by de-energising the pump-motor.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

EV 1



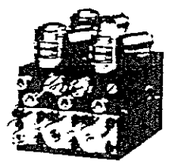


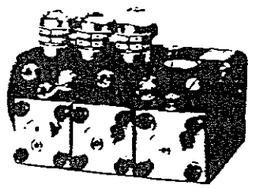


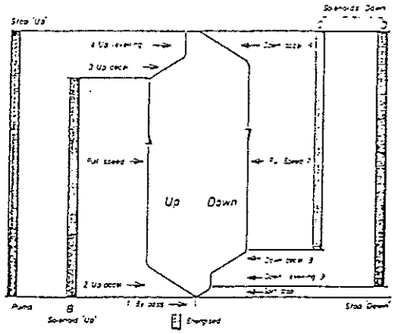
Up Up to 0.16 m/s (32 fpm). 1 Up Speed.
Up to 0.4 m/s (80 fpm) by overtravelling and levelling back down.
Up Start is smooth and adjustable.
Up Stop is smooth and exact through valve operation whereby the pump must run approx. ½ sec. longer through a time relay.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

EV 10



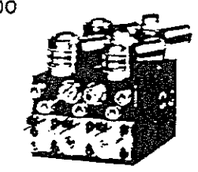


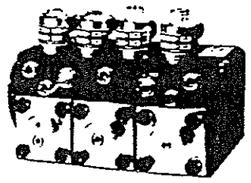


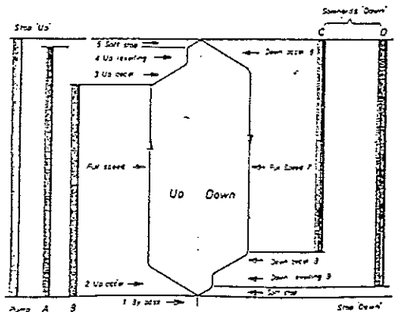
Up Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
Up Start and Slow Down are smooth and adjustable.
Up Levelling speed is adjustable.
Up Stop is by de-energising the pump-motor.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

EV 100







Up Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'up' functions are smooth and adjustable.
Up Levelling speed is adjustable.
Up Stop is smooth and exact through valve operation whereby the pump must run approx. ½ sec. longer through a time relay.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.

EV Parts List

Pos.	No.	Item
	1F	Flange – By Pass
	FO	O-Ring – Flange
	1E	Adjustment – By Pass
	EO	O-Ring – Adjustment
	U	By Pass Valve
	UO	O-Ring – By Pass Valve
	UF	Spring – By Pass
	UD	Noise Suppressor
2	2	Adjustment – Up Accel.
3	*3	Adjustment – Up Decel.
	4F	Flange – Check Valve
	FO	O-Ring – Flange
	4E	Adjustment – Up Levelling
	EO	O-Ring – Adjustment
4	W	Up-Levelling Valve
	WO	O-Ring – Up-Levelling Valve
	V	Check Valve
	VO	Seat – Check Valve
	VF	Spring – Check Valve
5	*3	Adjustment – Up Stop
6	*3	Adjustment – Down Accel.
	7F	Flange – Down Valve
	FO	O-Ring – Flange
	7E	Adjustment – Down Valve
	EO	O-Ring – Adjustment
7	X	Down Valve
	UO	O-Ring – Down Valve
	XO	Seat – Down Valve
	F	Filter
	UD	Noise Suppressor
8	8	Adjustment – Down Decel.
	4E	Adjustment – Down Levelling
	EO	O-Ring – Adjustment
9	9F	Spring – Down Valve
	Y	Down-Levelling Valve

*Several parts occur more then once in different positions of the valve.

Pos.	No.	Item
H	H	Manual Lowering
	HO	Seal – Manual Lowering
S	SE	Adjustment – Relief Valve
	SM	Head – Relief Valve
	SZ	Nipple – RV Spring
	SO	O-Ring – Nipple
	SF	Spring – Relief Valve
	SK	Ball – Relief Valve
	SS	Piston – Relief Valve
A & B	MM	Nut – Solenoid
	AD	Collar – Solenoid
	M	Coil – Solenoid
	AR	Tube – Solenoid 'Up'
	MO	O-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
	DR	Tube – Solenoid
	MO	O-Ring – Solenoid
	DN	Needle – 'Down'
	DF	Spring – Solenoid 'Down'
	DK	Core – Solenoid
	DH	Seat Housing – 'Down'
	DS	Seat – Solenoid 'Down'

1) 1½" and 2" Valve-Housings are different only in their port thread sizes.

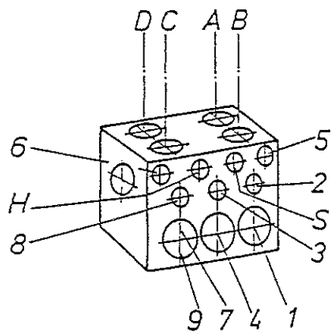
2) Positions 3, 5, 6, 8, H, S, A, B, C and D are the same in all EV Valves.

3) For Pos. 1, 2, 4, 7 and 9 please state the valve size, ¾" or 1¼".

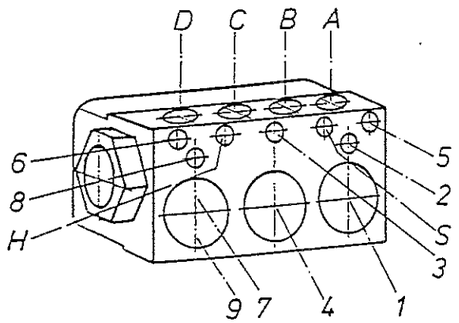
4) For No. U, V and X, the Valve 'Insert' size should be stated e.g. /04 or /4 (as on name plate). Alternatively the pump flow and the minimum operating pressure should be given.

Valve Types	Elements Omitted
EV 0	A, B, W, 3, 4 & 5
EV 1	B, W, 3 & 4
EV 10	A & 5
EV 100	as shown

EV Housings



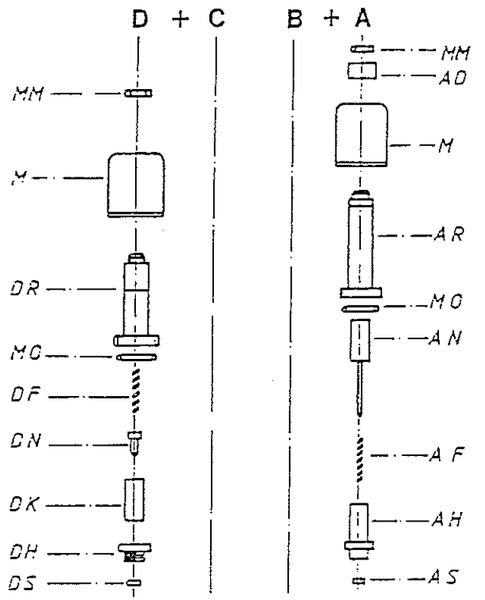
3/4" EV



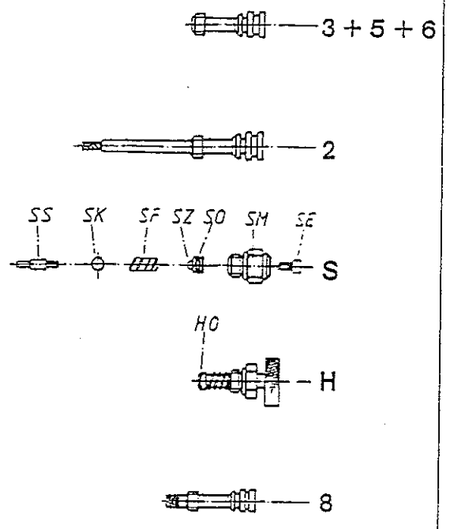
1 1/2" + 2" EV

EV Parts List

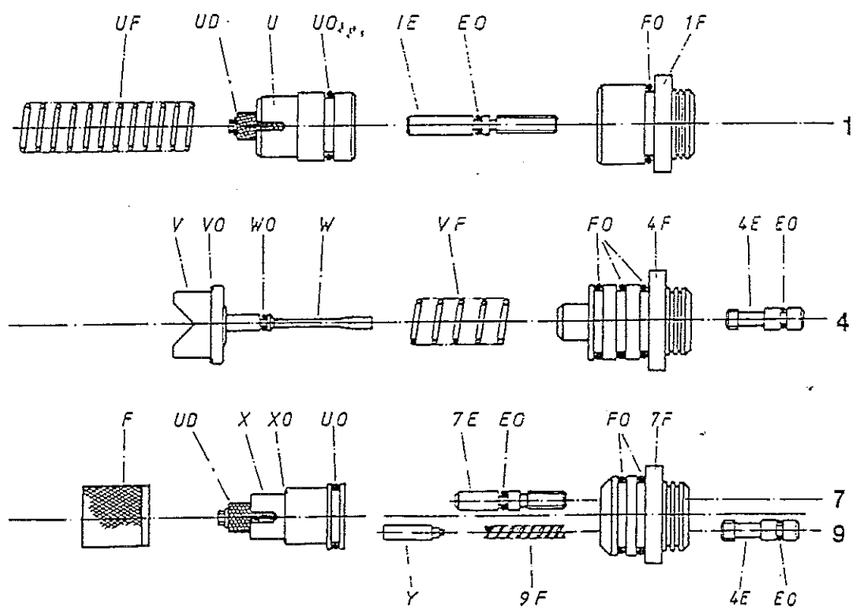
Solenoid Valves



Adjustments

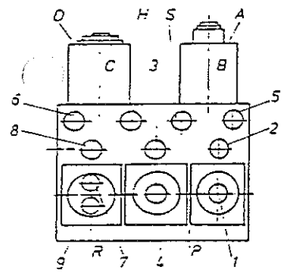


Flow Valves



Sectional Views

¾" EV



Adjustments 'Up'

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

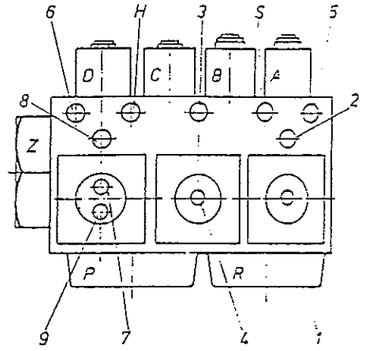
Adjustments 'Down'

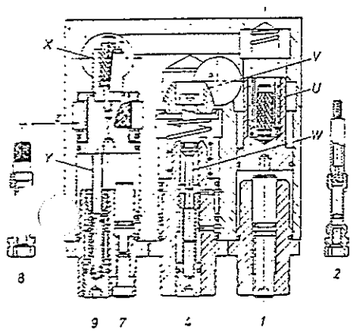
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

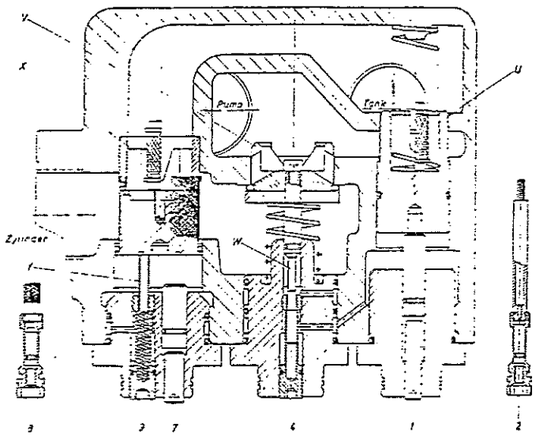
Control Elements

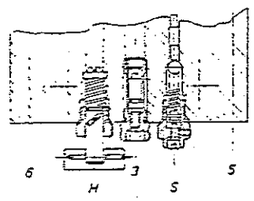
A Solenoid (Up Stop)
B Solenoid (Up Deceleration)
C Solenoid (Down Deceleration)
D Solenoid (Down Stop)
H Manual Lowering
S Relief Valve
U By Pass Valve
V Check Valve
W Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

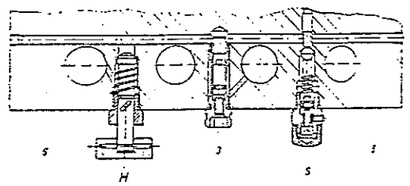
1½" & 2" EV

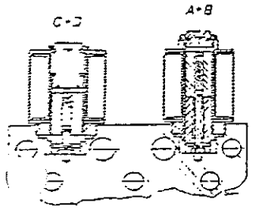


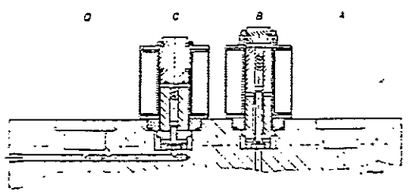










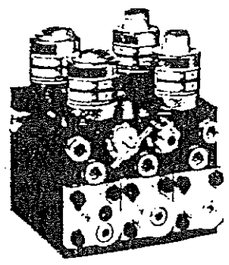


BÖLLINGER HÖFE
D-7100 HEILBRONN
GERMANY

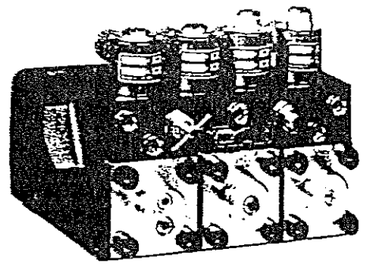
BLAIN HYDRAULICS

TELEX 07 28 347
TELEFON (0 71 31) 2 10 16

The BLAIN Control Valves EV 0, EV 1, EV 10 and EV 100 present a complete selection of elevator valves to match differing requirements of Oil Hydraulic Elevators from slow speed installations to high performance passenger service. Easy to install, EV's are smooth, reliable and precise in operation throughout extreme load and temperature variations.



¾"-EV



1½" & 2"-EV

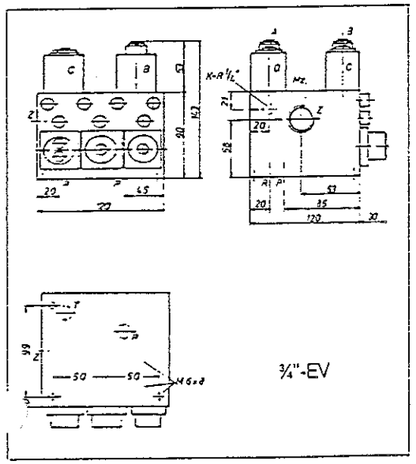
Description

Available port sizes are ¾", 1½" and 2 pipe connection, depending on flow. All EV's start on less than minimum load and can be used for 'direct' or 'star-delta' starting. According to customers information, valves are factory adjusted ready for operation and are very simple to readjust if so desired. The patented 'up levelling' system combined with compensated pilot control insure stability of elevator operation and accuracy of stopping independent of temperature variations up to 70 °C.

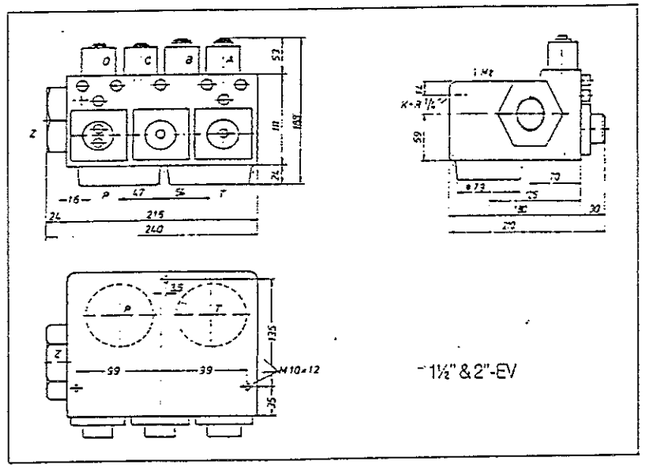
BLAIN valves are machined and finished to highest quality standards. They include the following features essential to efficient installation and trouble free service:

Simple Responsive Adjustment
Temperature and Pressure Compensation
Solenoid Connecting Cables
Pressure Gauge and Shut Off Cock
Self Closing Manual Lowering
Self Cleaning Pilot Line Filters
Self Cleaning Main Line Filter (Z–T)
Built-in Turbulence Suppressors
70° Rockwell Hardened Bore Surfaces
100 % Continuous Duty Solenoids

Technical Data:		¾"	1½"	2"
Flow	l/min.	10–125 (2.6–33 USgpm)	30–450 (8–120 USgpm)	30–750 (8–200 USgpm)
Operating pressure	bar	10–100 (150–1500 psi)	5–100 (75–1500 psi)	5–100 (75–1500 psi)
Burst Pressure P	bar	450 (6600 psi)	350 (5000 psi)	350 (5000 psi)
Burst Pressure Z	bar	650 (8000 psi)	530 (7800 psi)	530 (7800 psi)
Pressure Drop P–Z	bar	3 (45 psi)	1 (15 psi)	1.8 (26 psi)
Weight	kg	5 (11 lbs)	11 (24 lbs)	11 (24 lbs)
Solenoid volts ~	ac	110 v/0.3 amp, 220 v/0.15 amp.		
Solenoid volts =	dc	24 v/0.8 amp, 42 v/0.5 amp, 48 v/0.4 amp, 110 v/0.2 amp, 180 v/0.11 amp.		
Oil Viscocity	°E	2.4 – 4 °C at 50 °C (15 – 35 cSt at 120 °F)		



¾"-EV



1½" & 2"-EV

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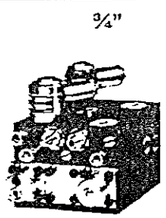
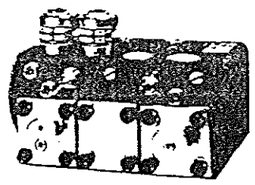
D-7100 HEILBRONN
GERMANY

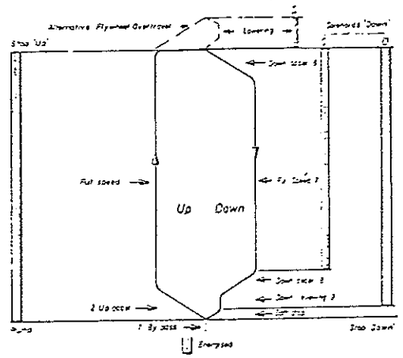
BLAIN Hydraulics

TELEX 07 28 347
TELEFON (0 71 31) 2 10 16

:V 0



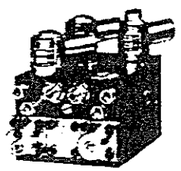


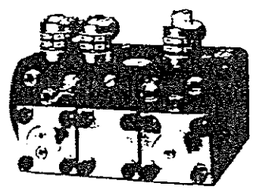


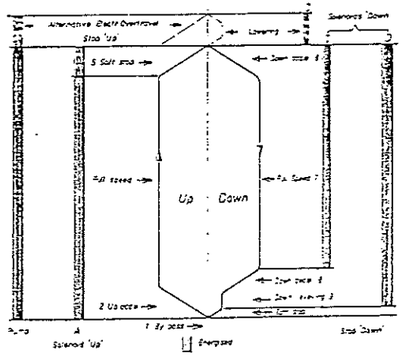
Up Up to 0.16 m/s (32 fpm). 1 Up Speed.
Up Start is smooth and adjustable.
Up Stop is by de-energising the pump-motor.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

:V 1







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Up to 0.4 m/s (80 fpm) by overtravelling and levelling back down.
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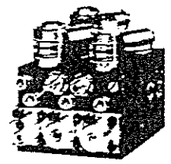
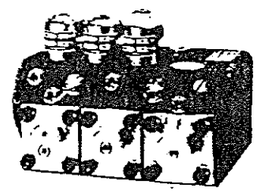
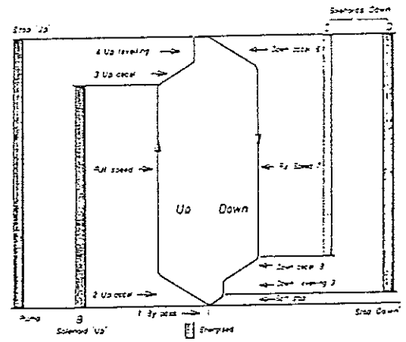
Up Stop is smooth and exact through valve operation whereby the pump must run approx. ½ sec. longer through a time relay.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

:V 10



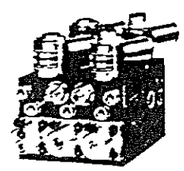


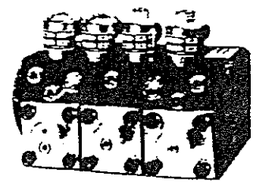


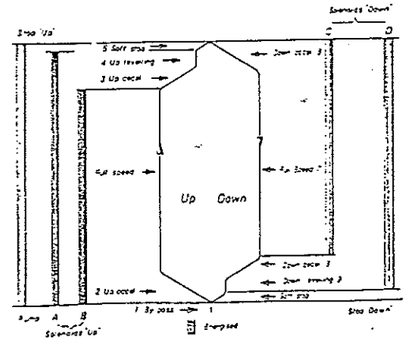
Up Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
Up Start and Slow Down are smooth and adjustable.
Up Levelling speed is adjustable.
Up Stop is by de-energising the pump-motor.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

:V 100







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All 'up' functions are smooth and adjustable.
Up Levelling speed is adjustable.
Up Stop is smooth and exact through valve operation whereby the pump must run approx. ½ sec. longer through a time relay.

Down Up to 1.0 m/s (200 fpm). 1 Full Speed and 1 Levelling Speed.
All 'down' functions are smooth and adjustable.

Valves are already fully adjusted. Check electrical operation before changing valve settings.
To check that the correct solenoid is energised, remove nut and raise solenoid slightly.
Nominal Settings: Adjustments 1 and 4 approx. level with flange faces. Up to two turns in either direction may then be necessary.
Adjustments 2, 3 and 5 all the way 'in', then two turns 'out'. One final turn in either direction may be necessary.

---

1. **By Pass:** When the pump is started, the unloaded car should remain stationary at the floor for a period of 1 to 2 seconds before starting upwards. The length of this delay is according to the setting of adjustment **1.** 'In' (clockwise) shortens the delay, 'out' lengthens the delay.

2. **Up Acceleration:** With the pump running, the car will accelerate according to the setting of adjustment **2.** 'In' (clockwise) provides a softer acceleration, 'out' a quicker acceleration.

Up Stop: The pump-motor is de-energised. There is no adjustment.

Alternative Up Stop with Over-travel: The motor is de-energised at floor level. Through the flywheel-action of the pump-motor drive the car will travel to just above floor level. In overtravelling the floor, 'down levelling' solenoid **D** is energised, lowering the car smoothly back down to floor level where **D** is de-energised.

EV 0

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1. **By Pass:** When the pump is started and solenoid **A** energised, the unloaded car should remain stationary at the floor for a period of 1 to 2 seconds before starting upwards. The length of this delay is according to the setting of adjustment **1.** 'In', shortens the delay, 'out' lengthens the delay.

2. **Up Acceleration:** With the pump running and solenoid **A** energised as in **1**, the car will accelerate according to the setting of adjustment **2.** 'In' (clockwise) provides a softer acceleration, 'out' a quicker acceleration.

5. **Up Stop:** At floor level, solenoid **A** is de-energised. Through a time relay the pump should run approx. ½ second longer to allow the car to stop smoothly by valve operation according to the setting of adjustment **5.** 'In' (clockwise) provides a softer stop, 'out' a quicker stop.

Alternative Up Stop: At relatively higher speeds the car, will travel to just above floor level. In overtravelling the floor, down levelling solenoid **D** is energised, lowering the car smoothly back down to floor level where **D** is de-energised.

EV 1

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1. **By Pass:** When the pump is started and solenoid **B** energised, the unloaded car should remain stationary at the floor for a period of 1 to 2 seconds before starting upwards. The length of this delay is according to the setting of adjustment **1.** 'In' (clockwise) shortens the delay, 'out' lengthens the delay.

2. **Up Acceleration:** With the pump running and solenoid **B** energised as in 1., the car will accelerate according to the setting of adjustment **2.** 'In' (clockwise) provides a softer acceleration, 'out' a quicker acceleration.

3. **Up Deceleration:** When solenoid **B** is de-energised, the car will decelerate according to the setting of adjustment **3.** 'In' (clockwise) provides a softer deceleration, 'out' a quicker deceleration.

4. **Up Levelling:** With solenoid **B** de-energised as in **3**, the car will proceed at its levelling speed according to the setting of adjustment **4.** 'In' (clockwise) provides a slower, 'out' a faster up levelling.

EV 10

Up Stop: The pump-motor is de-energised. There is no adjustment.

---

1. **By Pass:** When the pump is started, and solenoids **A** and **B** energised, the unloaded car should remain stationary at the floor for a period of 1 to 2 seconds before starting upwards. The length of this delay is according to the setting of adjustment **1.** 'In' (clockwise) shortens the delay, 'out' lengthens the delay.

2. **Up Acceleration:** With the pump running and solenoids **A** and **B** energised as in 1., the car will accelerate according to the setting of adjustment **2.** 'In' (clockwise) provides a softer acceleration, 'out' a quicker acceleration.

3. **Up Deceleration:** When solenoid **B** is de-energised, whilst solenoid **A** remains energised, the car will decelerate according to the setting of adjustment **3.** 'In' (clockwise) provides a softer deceleration, 'out' a quicker deceleration.

4. **Up Levelling:** With solenoid **A** energised and solenoid **B** de-energised as in 3., the car will proceed at its levelling speed according to the setting of adjustment **4.** 'In' (clockwise) provides a slower, 'out' a faster up levelling.

EV 100

5. **Up Stop:** At floor level, solenoid **A** is de-energised with solenoid **B** remaining de-energised. Through a

Valves are already fully adjusted. Check electrical operation before changing valve settings.
To check that the correct solenoid is energised, remove nut and raise solenoid slightly.
Nominal Settings: Adjustments 7 and 9 approx. level with flange face. Two turns in either direction may then be necessary.
Adjustments 6 and 8 turn all the way 'in', then two turns 'out'. One final turn in either direction may be necessary.

6. **Down Acceleration:** When solenoids **C** and **D** are energised, the car will accelerate downwards according to the setting of adjustment 6. 'In' (clockwise) provides a softer down acceleration, 'out' a quicker acceleration.

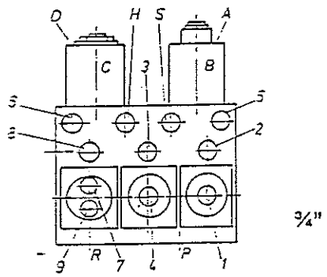
7. **Down Speed:** With solenoids **C** and **D** energised as in 6 above, the full down speed of the car is according to the setting of adjustment 7. 'In' (clockwise) provides a slower down speed, 'out' a faster down speed.

8. **Down Deceleration:** When solenoid **C** is de-energised whilst solenoid **D** remains energised, the car will decelerate according to the setting of adjustment 8. 'In' (clockwise) provides a softer deceleration, 'out' a quicker deceleration.

9. **Down Levelling:** With solenoid **C** de-energised and solenoid **D** energised as in 8 above, the car will proceed at its down levelling speed according to the setting of adjustment 9. 'In' (clockwise) provides a slower, 'out' a faster down levelling speed.

   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.

Positions of Adjustments



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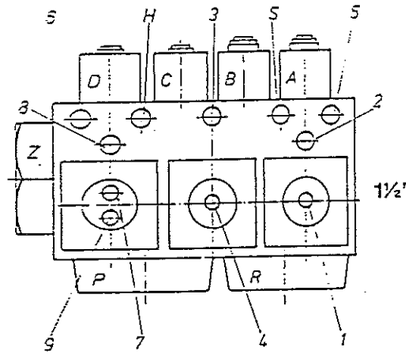


1½" & 2"

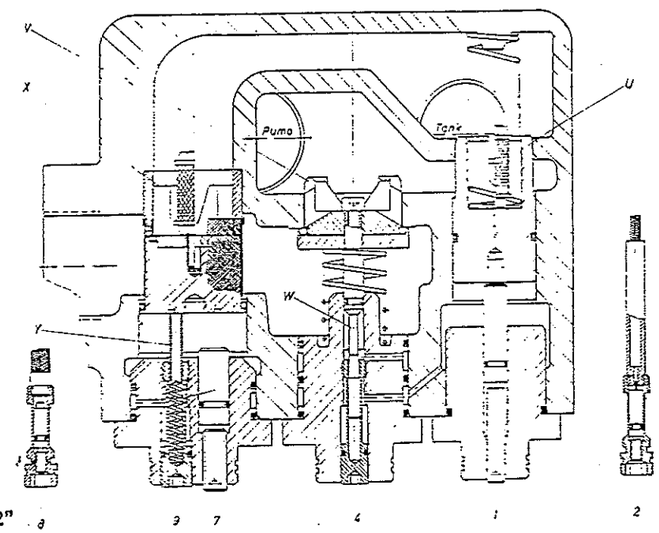
Adjustments 'Up'
1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments 'Down'
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

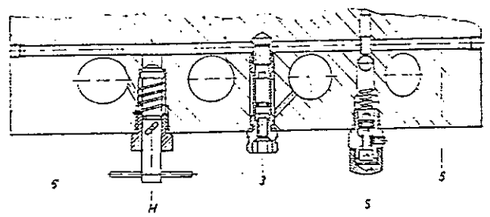
Control Elements
A Solenoid (Up Stop)
B Solenoid (Up Deceleration)
C Solenoid (Down Deceleration)
D Solenoid (Down Stop)
H Manual Lowering
S Relief Valve
U By Pass Valve
V Check Valve
W Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

Valve Types	Elements Omitted
EV 0	A, B, W, 3, 4 & 5
EV 1	B, W, 3 & 4
EV 10	A & 5

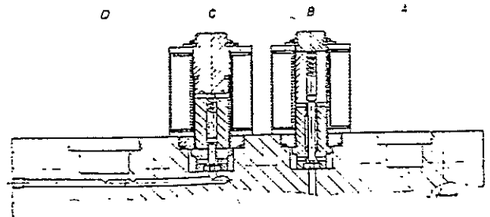
Blain EV 100 Sectional Drawing



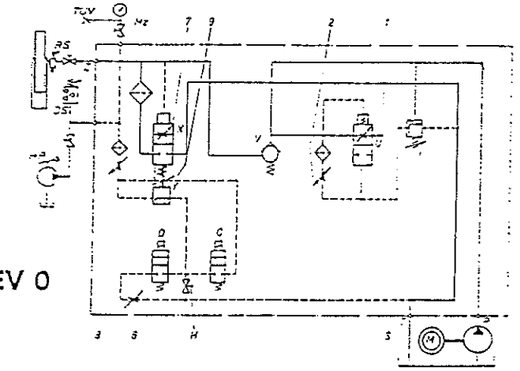
Horizontal Section



Vertical Section



EV 0



Control Elements

- **C** Solenoid (Down Deceleration)
- **D** Solenoid (Down Stop)
- **H** Manual Lowering
- **S** Relief Valve
- **U** By Pass Valve
- **V** Check Valve
- **X** Full Speed Valve (Down)
- **Y** Levelling Valve (Down)

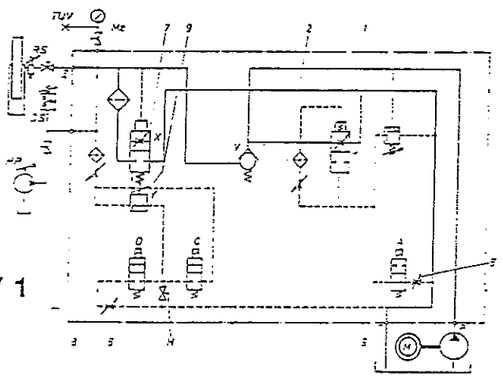
Separate Equipment:
- **RS** Pit Safety valve
- **HP** Hand Pump
- **DS** Pressure Switch

Adjustments 'Up'
1. By Pass
2. Up Acceleration

Adjustments 'Down'
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

Solenoid Valves:
C & D close when de-energise

EV 1



Control Elements

- **A** Solenoid (Up Stop)
- **C** Solenoid (Down Deceleration)
- **D** Solenoid (Down Stop)
- **H** Manual Lowering
- **S** Relief Valve
- **U** By Pass Valve
- **V** Check Valve
- **X** Full Speed Valve (Down)
- **Y** Levelling Valve (Down)

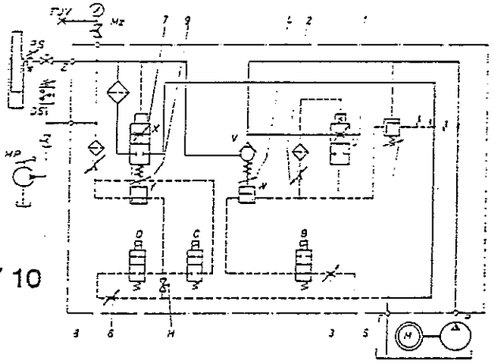
Separate Equipment:
- **RS** Pit Safety valve
- **HP** Hand Pump
- **DS** Pressure Switch

Adjustments 'Up'
1. By Pass
2. Up Acceleration
5. Up Stop

Adjustments 'Down'
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

Solenoid Valves:
A opens when de-energised
C & D close when de-energise

EV 10



Control Elements

- **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** Levelling Valve (Up)
- **X** Full Speed Valve (Down)
- **Y** Levelling Valve (Down)

Separate Equipment:
- **RS** Pit Safety valve
- **HP** Hand Pump
- **DS** Pressure Switch

Adjustments 'Up'
1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed

Adjustments 'Down'
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

Solenoid Valves:
B opens when de-energised
C & D close when de-energise

EV 100

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** Levelling Valve (Up)
- **X** Full Speed Valve (Down)
- **Y** Levelling Valve (Down)

Separate Equipment:
- **RS** Pit Safety valve
- **HP** Hand Pump

Adjustments 'Up'
1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments 'Down'
6. Down Acceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

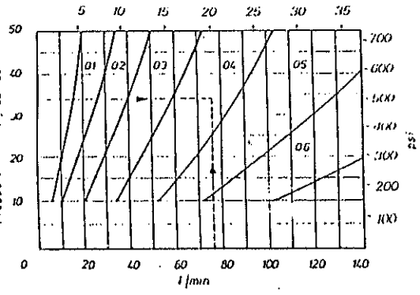
Solenoid Valves:
A & B open when de-energised
C & D close when de-energise

Ø mm	50		60	65	70	75	80	85	90	95	100	105	110	115	1	25	130	135	140	145	150	155	160	165	170	175	180	18	90	210	220	Ø
cm²	19,6	2	28,3	33,2	38,5	44,2	50,3	56,7	63,6	70,9	78,5	86,6	95,0	103,9	1	123	133	143	154	165	177	189	201	214	227	241	255	28	314	346	380	cm²
m/sec.	l/min																															m/sec.
0,05	5,9	7,1	8,4	9,9	11,5	13,2	15,0	17,0	19,0	21,2	23,5	25,9	28,5	31,1	33,9	37	40	43	46	50	53	57	60	64	68	72	76	85	94	104	114	0,05
0,10	11,8	14,2	16,9	19,9	23,1	26,5	30,1	34,0	38,1	42,5	47,1	51,9	57,0	62,3	67,8	74	80	86	92	99	106	113	121	128	136	144	153	170	189	208	228	0,10
0,15	17,6	21,3	25,4	29,8	34,6	39,7	45,2	51,0	57,2	63,8	70,6	77,9	85,5	93,5	101,7	110	119	129	139	149	159	170	181	192	204	216	229	255	283	312	342	0,15
0,20	23,5	28,4	33,9	39,8	46,2	53,0	60,3	68,0	76,3	85,0	94,2	103,9	114,0	124,6	135,7	147	159	172	185	198	212	226	241	257	272	289	305	340	377	416	456	0,20
0,25	29,4	35,5	42,4	49,8	57,7	66,3	75,4	85,0	95,4	106,3	117,7	129,9	142,5	155,8	169,6	184	199	215	231	248	265	283	302	321	341	361	382	425	471	520	570	0,25
0,30	35,2	42,6	50,9	59,7	69,3	79,5	90,5	102,0	114,4	127,6	141,3	155,8	171,0	187,0	203,5	221	239	258	277	297	318	340	362	385	409	433	458	510	566	624	684	0,30
0,35	41,1	49,7	59,4	69,7	80,8	92,8	105,6	119,0	133,5	148,8	164,8	181,8	199,5	218,1	237,5	258	279	301	323	347	371	398	422	449	477	505	534	595	660	727	798	0,35
0,40	47,0	56,8	67,9	79,6	92,4	106,0	120,7	136,0	152,6	170,1	188,4	207,8	228,0	249,3	271,4	294	318	343	369	396	424	453	483	513	545	577	611	680	754	831	912	0,40
0,45	52,9	63,9	76,4	89,6	103,9	119,3	135,8	153,0	171,7	191,4	211,9	233,8	256,5	280,5	305,3	331	358	386	416	446	477	509	543	577	613	649	687	765	848	935	1.026	0,45
0,50	58,8	71,1	84,9	99,6	115,5	132,6	150,9	170,0	190,8	212,7	235,5	259,8	285,0	311,7	339,3	368	398	429	462	495	530	566	603	641	681	722	764	851	943	1.039	1.140	0,50
0,55	64,6	78,2	93,3	109,5	127,0	145,8	165,9	187,1	209,8	233,9	259,0	285,7	313,5	342,8	373,2	405	438	472	508	545	583	623	664	706	749	794	840	936	1.037	1.143	1.254	0,55
0,60	70,5	85,3	101,8	119,5	138,6	159,1	181,0	204,1	228,9	255,2	282,6	311,7	342,0	374,0	407,1	442	478	515	554	594	636	679	724	770	817	866	916	1.021	1.131	1.247	1.368	0,60
0,70	82,3	99,5	118,8	139,4	161,7	185,6	211,2	238,1	267,1	297,7	329,7	363,7	399,0	436,3	475,0	515	557	601	646	693	742	793	845	898	953	1.010	1.069	1.191	1.320	1.454	1.596	0,70
0,80	94,0	113,7	135,8	159,3	184,8	212,1	241,4	272,1	305,2	340,3	376,8	415,6	456,0	498,7	542,8	588	637	687	739	792	848	905	965	1.026	1.090	1.154	1.222	1.361	1.508	1.662	1.824	0,80
0,90	105,8	127,9	152,8	179,2	207,9	238,6	271,6	306,1	343,4	382,8	423,9	467,6	513,0	561,0	610,7	663	717	773	831	892	954	1.019	1.086	1.155	1.226	1.299	1.374	1.531	1.697	1.870	2.052	0,90
1,00	117,6	142,2	169,8	199,2	231,0	265,2	301,8	340,2	381,6	425,4	471,0	519,6	570,0	623,4	678,6	736	796	859	923	991	1060	1.132	1.207	1.283	1.362	1.443	1.527	1.701	1.885	2.078	2.280	1,00

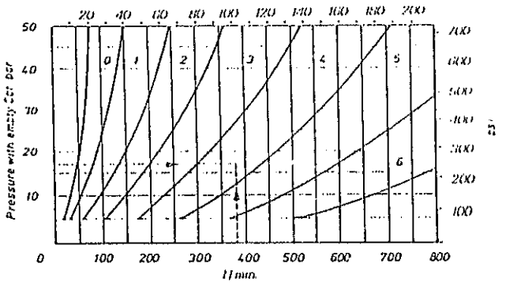
kp	bar																															kp
500	25,5	21,0	17,6	15,0	12,9	11,3	9,9	8,8	7,8	7,0	6,3	5,7	5,2	4,8	4,4	4,0	3,7	3,4	3,2	3,0	2,8	2,6	2,4	2,3	2,2	2,0	1,9	1,7	1,5	1,44	1,31	500
750	38,2	31,8	26,5	22,6	19,4	16,9	14,9	13,2	11,7	10,5	9,5	8,6	7,8	7,2	6,6	6,1	5,6	5,2	4,8	4,6	4,2	3,9	3,7	3,5	3,3	3,1	2,8	2,6	2,3	2,16	1,97	750
1000	51,0	42,1	35,3	30,1	25,9	22,6	19,8	17,6	15,7	14,1	12,7	11,5	10,5	9,6	8,8	8,1	7,5	6,9	6,4	6,0	5,6	5,2	4,9	4,6	4,4	4,1	3,9	3,5	3,1	2,88	2,63	1000
1500	76,5	63,2	53,0	45,1	38,9	33,9	29,8	26,4	23,6	21,1	19,1	17,3	15,7	14,4	13,2	12,2	11,3	10,4	9,7	9,0	8,4	7,9	7,4	7,0	6,6	6,2	5,8	5,2	4,7	4,33	3,94	1500
2000	102,0	84,3	70,6	60,2	51,9	45,2	39,7	35,2	31,4	28,2	25,4	23,0	21,0	19,2	17,6	16,2	15,0	13,9	12,9	12,1	11,3	10,5	9,9	9,3	8,8	8,3	7,8	7,0	6,3	5,77	5,26	2000
2500	127,5	105,4	88,3	75,3	64,9	56,5	49,7	44,0	39,3	35,2	31,8	28,8	26,3	24,0	22,1	20,3	18,8	17,4	16,2	15,1	14,1	13,2	12,4	11,6	11,0	10,3	9,8	8,8	7,9	7,21	6,57	2500
3000	153,0	126,5	106,0	90,3	77,9	67,8	59,6	52,9	47,1	42,3	38,2	34,6	31,5	28,8	26,5	24,4	22,6	20,9	19,4	18,1	16,9	15,8	14,9	14,0	13,2	12,4	11,7	10,5	9,5	8,66	7,89	3000
3500	178,5	147,6	123,6	105,4	90,9	79,1	69,5	61,7	55,0	49,3	44,5	40,4	36,8	33,6	30,9	28,5	26,3	24,4	22,7	21,1	19,8	18,5	17,4	16,3	15,4	14,5	13,7	12,3	11,1	10,10	9,20	3500
4000	204,0	168,7	141,3	120,4	103,8	90,4	79,5	70,5	62,8	56,4	50,9	46,1	42,1	38,4	35,3	32,5	30,1	27,9	25,9	24,2	22,6	21,1	19,8	18,7	17,6	16,6	15,7	14,1	12,7	11,54	10,52	4000
4500	229,5	189,0	159,0	135,5	116,8	101,8	89,4	79,3	70,7	63,4	57,3	51,9	47,3	43,3	39,7	36,6	33,9	31,4	29,2	27,2	25,4	23,8	22,3	21,0	19,8	18,7	17,6	15,8	14,3	12,99	11,83	4500
5000	255,1	210,9	176,6	150,6	129,8	113,1	99,4	88,1	78,6	70,5	63,6	57,7	52,6	48,1	44,2	40,7	37,6	34,9	32,4	30,2	28,2	26,4	24,8	23,3	22,0	20,7	19,6	17,6	15,9	14,43	13,15	5000
6000	306,1	253,1	212,0	180,7	155,8	135,7	119,2	105,8	94,3	84,6	76,4	69,2	63,1	57,7	53,0	48,8	45,2	41,9	38,9	36,3	33,9	31,7	29,8	28,0	26,4	24,9	23,5	21,1	19,0	17,32	15,78	6000
7000	357,1	295,3	247,3	210,8	181,8	158,3	139,1	123,4	110,0	98,7	89,1	80,8	73,6	67,3	61,8	57,0	52,7	48,9	45,4	42,3	39,6	37,0	34,8	32,7	30,8	29,1	27,5	24,6	22,2	20,20	18,41	7000
8000	408,1	337,5	282,6	240,9	207,7	180,9	159,0	141,0	125,7	112,8	101,9	92,3	84,2	76,9	70,7	65,1	60,2	55,9	51,9	48,4	45,2	42,3	39,7	37,4	35,2	33,2	31,4	28,2	25,4	23,09	21,04	8000
9000	459,1	379,7	318,0	271,0	233,7	203,6	178,9	158,7	141,5	126,9	114,6	103,9	94,7	86,6	79,5	73,3	67,8	62,8	58,4	54,5	50,9	47,6	44,7	42,0	39,6	37,4	35,3	31,7	28,6	25,98	23,67	9000
10000	510,2	421,9	353,3	301,2	259,7	226,2	198,8	176,3	157,2	141,0	127,3	115,4	105,2	96,2	88,4	81,4	75,3	69,8	64,9	60,5	55,5	52,9	49,7	46,7	44,0	41,5	39,2	35,2	31,8	28,86	26,30	10000

$\frac{m^2}{,45}$ = in² m/sec x 197 = ft/min l/min x 0,22 = Imp. gals $\frac{mm}{25,4}$ = inches l/min x 0,26 = US. gals kp x 2,2 = lbs bar x 14,7 =

Flow Guide Sizes for 3/4" Valves
USgpm



Flow Guide Sizes for 1½" and 2" Valves
USgpm



When ordering valves please state:

			or	
1. Control Valve Type				
2. Pipe Connection Size				
3. Pump Delivery	l/m	(USgpm)		
4. Car Speed	m/s	(fps)		
5. Stat. Pressure Empty Car	bar	(psi)		
6. Stat. Pressure Loaded Car	bar	(psi)		
7. Solenoid Voltage	volts			

BLA
HYDRAU

BLAIN HYDRAULICS

INSTRUCTION MANUAL

GENERAL APPLICATIONS
OPERATION, MAINTENANCE
AND TROUBLESHOOTING

Operation

Upwards

Up Acceleration: As the 'up' command is given, solenoids A and B are energised and close. The pump starts, initially delivering oil into the pump chamber and through the bypass valve U back to tank. Pilot pressure flows through up-acceleration adjustment 2 into the bypass valve chamber forcing the bypass valve to close. As The pump pressure builds up due to the bypass valve closing and exceeds the ram pressure acting on the opposite side of the check valve V, the check valve opens and oil flows to the cylinder producing up acceleration.

Up Full Speed: When the bypass valve U is completely closed, the full output from the pump flows to the cylinder producing maximum up speed.

Up Slow Down: Approaching floor level, a switch in the hatch is actuated causing solenoid B to be de-energised and to open. Pilot pressure escapes from the bypass valve chamber through the up slow speed valve W, through solenoid B and slow down adjuster 3 back to tank. The bypass spring forces the bypass valve U open against the reduced pressure behind the valve allowing an increasing amount of oil from the pump to flow directly to tank and resulting in the slow down of the car.

Up Levelling: As less oil flows to the cylinder, check valve V closes until the control edge of the up levelling valve W partially covers the orifice of the up levelling adjuster 4. Pilot pressure can now only escape from the bypass chamber at a rate relative to the amount the orifice is open which is itself determined by the position of the check valve. Since pilot pressure continues to enter the bypass chamber through adjuster 2, a hydraulic balance occurs between the position of the check valve and that of the bypass valve, producing a stable up levelling.

Up Stop: At floor level, solenoid A is de-energised allowing pilot pressure to escape from the bypass valve chamber directly back to tank through adjuster 5 resulting in the bypass valve moving to its fully open position and causing the total output from the pump to be bypassed to tank. The car then comes to a halt.

Downwards

Downwards Acceleration: As the 'down' command is given, solenoids C and D are energised and open. Pilot pressure escapes out of the down valve chamber through solenoids C and D, through adjustment 6 and back to tank. Pressure in the down valve chamber falls allowing pressure on the cylinder side of the valve to force the down valve open. The car accelerates downwards.

Down Full Speed: The distance the down spool opens is limited by adjuster 7 which determines the full down speed of the car.

Down Slow Down: Approaching the floor level, a switch in the hatch is actuated by the car causing solenoid C to de-energise and close. Since the slow speed valve Y is closed there is no escape for the pilot oil from the down chamber X, either through solenoid C or through the channel leading to solenoid D. Pilot oil continually entering the chamber through adjuster 8 causes the down spool to start closing producing a slow down of the car.

Down Levelling: As the control edge of the down slow speed valve Y uncovers the orifice of the down slow speed adjuster, pilot oil again escapes from the down valve chamber back to tank, this time through the orifice and solenoid D. At a given position of the down valve X which governs the position of valve Y, the amount of pilot oil escaping through the orifice of Y strikes a balance with the amount of oil entering through adjuster 8. Further closing of the down valve is prevented and a stabilised down levelling results.

Down Stop: When the floor level is reached, a switch in the hatch is operated by the car, de-energising solenoid D which closes and prevents any further pilot oil escaping from the down valve chamber. Pilot pressure entering through adjuster 8 causes the down valve to close completely, bringing the car to a halt.

Relief Valve: Excessive pump pressure acting on the pilot relief valve S moves the piston against its spring, opening the valve. Pilot pressure escapes out of the by pass valve chamber allowing the bypass valve U to open and releasing the full output of oil from the pump to tank.

Manual Lowering: By opening valve H pilot pressure is released from behind the down spool through the slow speed valve Y allowing the car to lower.

Re-Adjustments

It should be noted, that in the up direction, any change made to the up start 2 (pilot input) will effect adjustments 3, 4 and 5 (pilot outputs). Therefore, 2 should be satisfactory before other up-adjustments are made: Similarly in down direction, down transition 8 should be satisfactory before other down-adjustments are made.

Re-Adjustments "Up"

1. By-Pass: With the electrical supply to solenoids A and B disconnected and the pump running, the car (unloaded) should not move. Screw in (clockwise) on 1 until the car barely moves, then back out one full turn. The car will stop. The valve is now sized to the output of the pump.

2. Up Start: With the pump running and solenoids A and B energised, the car will accelerate according to the setting of adjustment 2. 'In' (clockwise) provides a softer acceleration, 'out' a quicker acceleration.

3. Up Slow Down: With solenoid A energised and solenoid B de-energised, the car will decelerate according to the setting of adjustment 3. 'In' (clockwise) provides a softer deceleration, 'out' a quicker deceleration.

4. Up Levelling: With solenoid A energised and solenoid B de-energised as in 3 above, the car will proceed at its levelling speed according to the setting of adjustment 4. 'In' (clockwise) provides a slower up levelling, 'out' a faster speed.

5. Up Stop: With both solenoids A and B de-energised, the car will stop according to the setting of adjustment 5. 'In' (clockwise) provides a softer stop, 'out' a quicker stop.

   Note: The pump should run for about 1/2 sec. after solenoid A is de-energised to a allow the car to stop gently by valve control.

Re-Adjustments "Down"

6. Down Start: With solenoids C and D energised, the car will accelerate downwards according to the setting of adjustment 6. 'In' (clockwise) provides a softer down acceleration, 'out' a quicker acceleration.

7. Down Speed: The full down speed of the car is according to the setting of adjustment 7. 'In' (clockwise) provides a slower down speed, 'out' a faster down speed.

8. Down Slow Down: With solenoid C de-energised and solenoid D energised, the car will decelerate according to the setting of adjustment 8. 'In' provides a softer deceleration, 'out' a quicker deceleration.

9. Down Levelling: With solenoid C de-energised and solenoid D energised as in 8 above, the car will proceed at its down levelling speed according to the setting of adjustment 9. 'In' (clockwise) provides a slower down levelling, 'out' a faster down levelling speed.

10. Down Stop: With solenoids C and D de-energised, the car will stop according to the setting of adjustment 8 and no further adjustment will be required.

H Manual Lowering: Provides the means of lowering the car at levelling speed in an emergency, for example due to an electrical failure. Out (anticlockwise) opens the down levelling valve Y.

S Relief Valve: Relief pressure is increased by turning 'in' (clockwise) on adjustment S and decreased by turning 'out'.

B L A I N. EV Control Valves

Trouble Shooting

Note I Valves are fully adjusted at the factory. Check electrical operation before Changing valve settings.

Note II For checking electrical operation at the valve, remove the nuts (18 mm) from the top of the appropriate Solenoid. Then with the elevator running, the energising and de-energising of the Solenoids can be felt by lifting the Solenoid a few millimeters.

U P T R A V E L

Problem	Possible cause	Recommended
No 'Up Start' (Elevator remains at floor)	A) Solenoid 'A' not energised or voltage too low. B) Solenoid Valve 'A' not closing fully possibly due to particle.	See Note II at top of page. Turn Adjustment '5' all the way 'in'. If the elevator now starts upwards, the cause is A) or B).
	C) Adjustment '2' (Up Acceleration is turned too far 'in'.	Turn fully 'in', then two turns 'out'.
	D) Adjustment '1' is too far back. Not enough pilot pressure (minimum 5 bar)	With the Pump running, turn Adjustment '1' 'in' until the elevator barely moves upwards, then out one complete turn.
	E) The Pump is running in the wrong direction. F) The Pump is damaged. G) The Pump Connection Flange is leaking excessively.	It may be necessary to remove the return line to estimate if the correct amount of oil is being put out by the Pump.
	H) The Relief Valve is set too low.	Increase the pressure setting by turning 'in'.
	I) The Valve size is not suited to the Pump delivery (By-Pass Valve too large).	Valve size and intended flow is stamped on Nameplate in 'Type'-field.
'Up Start' but no full speed	J) See F) and G) above	------
	K) Solenoid 'B' (Deceleration) not energised or voltage too low. L) Solenoid Valve 'B' not closing properly possibly due to particle.	See Note II at top of page. Turn restriction '3' all the way 'in'. If the elevator now travels with fullspeed, the cause is 'K' or 'L'.
Elevator doesn't decelerate into up-levelling (continues at full speed)	M) Solenoid 'B' (Up Deceleration) does not de-energise in time.	See Note II at top of page
	N) Adjustment '3' (Up Deceleration) not far enough open.	Can be turned fully out.
	O) Adjustment '2' (Up Acceleration) too wide open	Normally 1 1/2 to 2 turns open from fully closed position.
	P) Up Levelling speed too fast (Adjustment 4)	Adjust to between 4 and 6 cm/sec.
Slow Down from up full speed but no 'Up'-levelling	Q) See 'H' above	------
	R) Up Levelling speed Adjustment '4' too far 'in'.	Between being level with the Flange and two turns further out is a normal setting.
	S) Solenoid 'A' (Up Stop) not energised (Possible Solenoid 'A' and 'B' reversed).	See Note II at top of page. Solenoid 'A' must be energised.

Problem	Possible cause	Recommended
Elevator travels passed the upper floor level	T) Solenoid 'A' (Up Stop) is de-energised too late.	See Note II at top of page 1.
	U) Adjustment '5' (Soft Stop) not far enough open.	Can be turned fully out.
	V) Up Levelling (4) is too far out (too fast).	Adjust to between 4 and 6 cm/sec.
	W) Adjustment '1' (By-Pass) not far enough open and Pump flow doesn't completely by-pass.	Test two turns further out.

D O W N T R A V E L

Problem	Possible cause	Recommended
No Down Start (Elevator remains at floor)	a) Solenoid 'D' not energised or voltage too low.	See Note II at top of page 1
	b) Adjustment '6' (Down Acceleration) not far enough open	Can be turned fully out.
	c) Adjustment '8' (Down Deceleration) too wide open.	Caution. Turn 'in' in steps of 1/2 turns only. If turned in too far, the elevator will not slow down!
Down Start but no Full Speed	d) Solenoid 'C' not energised or voltage too low.	See Note II at top of page 1.
	e) Adjustment '7' (full Speed Down) not far enough open.	Test two turns further out.
Down full Speed but no Down Levelling	f) Solenoid 'D' not energised (Possibly Solenoids 'C' and 'D' reversed).	See Note II at top of page 1
	g) Adjustment '9' (Down Levelling Speed) not far enough open. h) Spring in adjustment '9' broken.	Between being level with the Flange and two turns further out is a normal setting.
Elevator travels through the lower floor	i) Adjustment '8' (Down Deceleration) not far enough open	open 1/2 turn
	j) Down Levelling Speed too fast (Adjustment 9)	Adjust to between 4 cm and 6 cm/sec.
Leakage (Elevator sinks away from floor)	k) Solenoid Valve 'D' leaking	Change needle and seat.
	l) Check Valve leaking	Change seat and spindle O-rings.
	m) Down Valve leaking	Change seat O-ring.
	n) Manual Lowering leaking	Change seat O-ring.
	o) Other Valve or Hand Pump in System leaking	If possible, remove return lines to check for leaks.
	p) Contraction of Oil during cooling down.	This may become a problem when Oil temperatures have gone above approx. 35° C. Can be prevented by installing cooling.

BLAIN HYDRAULICS

BLAIN HYDRAULICS

REGULAR GRADE OILS FOR HYDRAULIC ELEVATOR SERVICE

Manufacturer	Oil	Viscosity (SSU) @ 100° F	Viscosity (SSU) @ 210° F	Viscosity Index	Pour Point (° F)	Gravity (API °)
Amoco	Nonpareil Medium	155-160	43	100	+10	32.4
	Industrial Oil 15	150-155	43	95	−25	30.4
Arco	Ideal S-150	150	43	100	15	33.0
	Duro S-150	150	43	98	10	32.0
BP	Energol TH-C32H8 (Sinturlite Supreme 150)	160	44.2	100	+10	32.5
Chevron	OC Turbine Oil 9	155	43	93	−15	31.0
Citgo	Pacemaker T-15	150-160	43	95	−30	31.0
	Pacemaker 15	150-160	43	95	−30	31.0
Conoco	Dectol R & O 15	155	44	100	−20	32.0
Exxon	Teresstic 43	147	43.5	110	+15	32.4
	Nuto 43	150	43.6	108	−10	32.2
Gulf	Gulfcrest 44	147.5	43.7	113	+ 5	32.7
	Harmony 44	150.2	43.5	106	+10	31.8
Houghton	Hydrodrive MIH Light	145-155	43.0	—	—	—
Mobil	DTE 797	145-155	43.5	102	+20	31.0
	DTE Light	145-155	43.4	95	+20	31.0
Shell	Turbo Oil 27	157	43.6	98	+10	31.9
	Tellus 27	150	42.7	98	+10	30.6
Sun	Sunvis 916	150-160	—	95	−20	31.0-33.0
Texaco	Regal AR & O	153	43.8	97	−30	—
	Rando A	158	44	100	−20	31.0
Union	Unax Turbine Oil XD150	150	43.0	100	−20	—
	Unax RX 150	145-155	42.5-45.5	100	−15	—

ANTIWEAR OILS FOR HYDRAULIC ELEVATOR SERVICE

Amoco	Rykon Industrial 15	150-160	44	125	−30	30.6
Arco	Duro AW S-150	160	44	100	−20	31.5
BP	Energol HLP-C32 (Duro AW 16)	162.8	44.2	102	−25	31.4
Chevron	E. P. Hydraulic 9	150	44	95	−25	30.6
Citgo	Pacemaker XD-15	150-160	43	95	−30	29.0
Conoco	Super Hydraulic 15	155	44	100	−20	31.0
Exxon	Nuto H 44	159	43.6	95	−35	29.8
Gulf	Harmony 43 AW	149.7	43.5	106	+10	31.6
Houghton	Hydro-Drive HP 150	150	43	95	+15	—
Mobil	DTE 24	145-160	44	95	+20	31.0
Shell	Tellus 927	160	45	110	−25	31.0
Sun	Sunvis 816	150-160	—	100	−20	31.33
Texaco	Rando HDA	159	44	99	−25	28.9
Union	Unax AW 150	150	43	100	−30	—

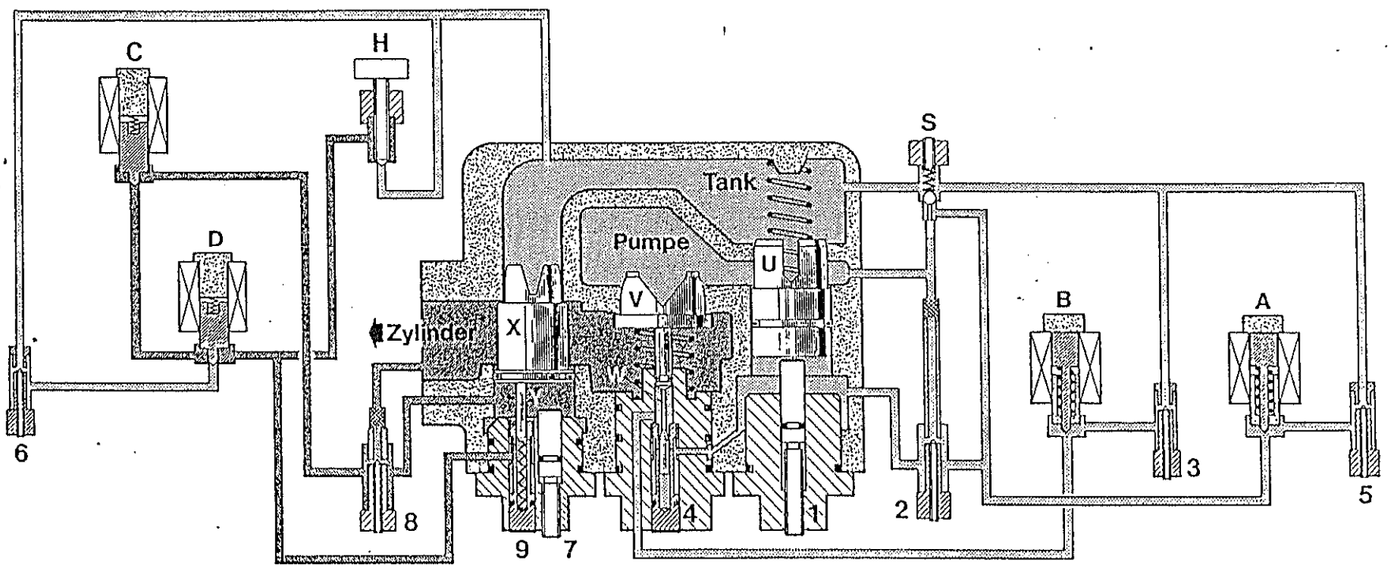
Footnotes:
1. All oils on this list are approximately 150 SSU @ 100°F with 90+ VI. In general, this type oil has provided the best overall system performance. More viscous grades of the same oils may also be used. Do NOT use less viscous oils.
2. Where high oil temperatures are expected or when operating near the pressure-viscosity limits of the pump, a more viscous oil should be used.

CAUTION

Blain seals and O-rings are designed for use with any of the above specified grades (or equal) hydro oil.

DO NOT DEVIATE

BLAIN HYDRAULICS	Hydraulic flow scheme Situation: Rest position	E\. .00



Regarding Up Travel:

When de-energised, the solenoids A and B are opened by a spring. The pilot oil chamber behind the bypass valve U is unpressurised. The bypass valve U is kept open because of the spring pressing against adjuster 1. A range of different piston inserts exists for the bypass valve U which will be chosen according to feed flow and pressure in correspondence with the diagrams "Insert sizes". By turning adjuster 1 the orifice - and thus the passage diameter - of the bypass valve U can be adjusted. Being a passive element the check valve V is closed by means of a spring. Only fluid coming from the pump chamber to the cylinder chamber can pass it.

Regarding Down Travel:

When de-energised, the solenoids C and D are closed by a spring. The pressure built up in the pilot oil chamber behind the down valve, coming from cylinder chamber, keeps the down valve piston in closing position.

Adjustments "Up"

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments "Down"

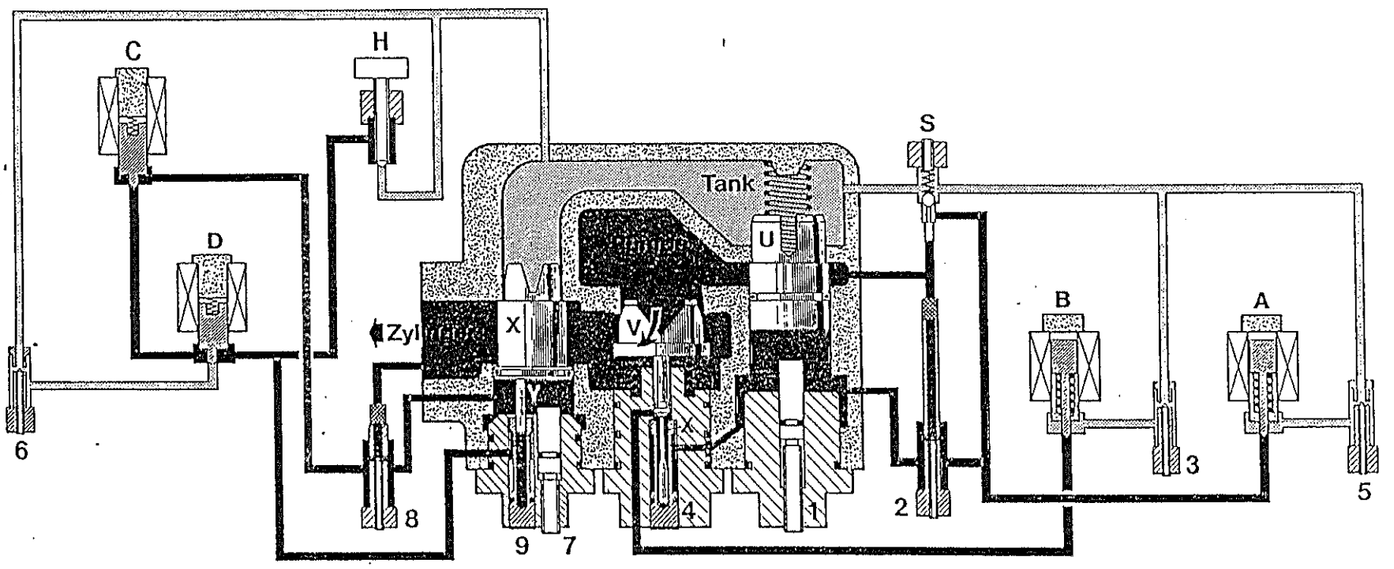
6. Down Deceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

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 Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

Datum: 19.5.81 Gezeichnet: Geprüft:	**Elevator Control Valve** Blain Hydraulics GmbH · Böllinger Höfe · 7100 Heilbronn · Tel. 07131/21016	Zeichnungs-Nr. D 6.10200

BLAIN HYDRAULICS	Hydraulic flow scheme Situation: Up travel (main speed)	E 00



Up Acceleration:

When the "up" command is given, solenoids A and B are energized and close. Simultaneously pump and motor start. The pump conveys oil through the bypass valve U by means of the low pilot pressure pre-set by adjustor 1 back to the tank. The pilot pressure is built up by adjuster 2 in the pilot cylinder of bypass valve U. The bypass valve U closes softly against the spring. Due to this closing procedure the pump pressure exceeds the pressure of the elevator ram and opens the check valve V. More and more oil is flowing to the elevator ram, producing up acceleration of the car.

Up Travel (main speed): - see illustration -

When the bypass valve U is completely closed, the full output from the pump flows to the cylinder producing maximum up speed of elevator car.

Relief Valve:

The pump pressure is limited by a relief valve S in the pilot conduit of the bypass valve U. The relief valve opens against a spring when the adjusted maximum pressure is obtained and connects the pilot cylinder of bypass valve U to the tank. The bypass valve opens and the entire feed flow of the pump flows back to the tank.

Adjustments "Up"

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments "Down"

6. Down Deceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

Control Elements:

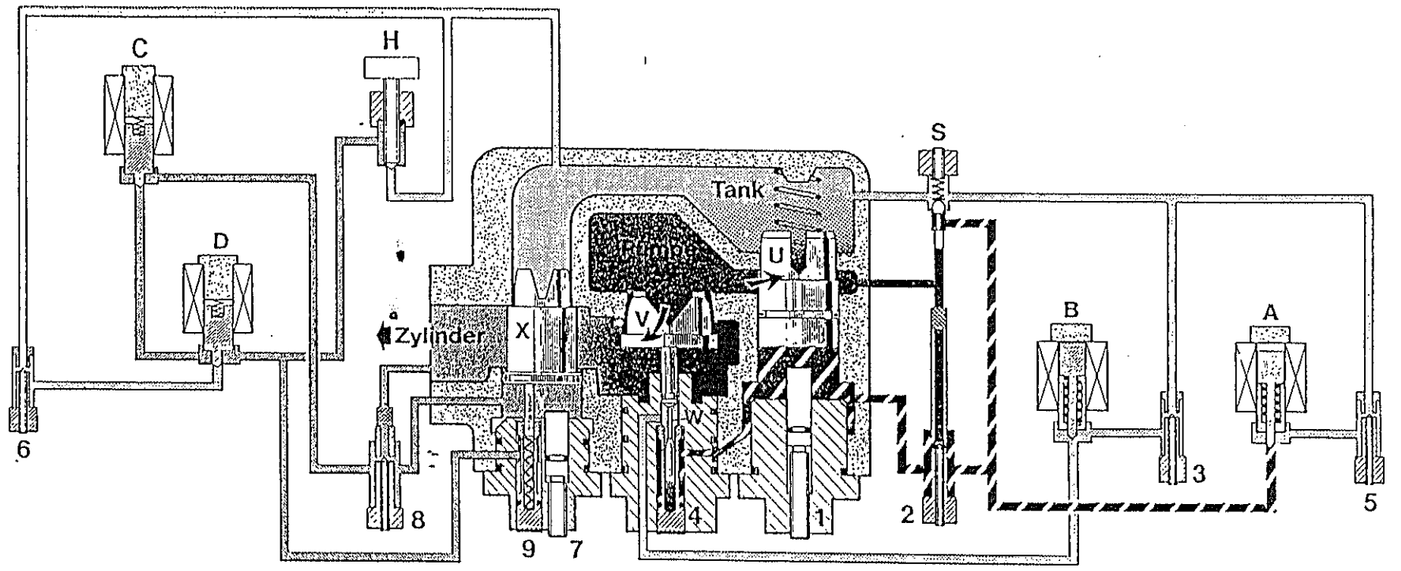
A Solenoid (Up Stop)
B Solenoid (Up Deceleration)
C Solenoid (Down Deceleration)
D Solenoid (Down Stop)
H Manual Lowering
S Relief Valve
U By Pass Valve
V Check Valve
W Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

Datum: 19.5.81 Gezeichnet: Geprüft:	Elevator Control Valve Blain Hydraulics GmbH · Böllinger Höfe · 7100 Heilbronn · Tel. 07131/21018	Zeichnungs-Nr. D 6.10201

BLAIN HYDRAULICS

Hydraulic flow scheme
Situation: Up levelling (creep speed)

EV 100



Up Deceleration:

Approaching floor level, a switch in the hatch is actuated causing solenoid B to be de-energised and to open. Pilot pressure escapes from the bypass valve chamber through the up levelling valve W, through solenoid B and levelling adjuster 3 back to tank. The bypass spring forces the bypass valve U open against the reduced pressure behind the valve allowing an increasing amount of oil from the pump to flow directly to tank and resulting in the slow down of the car.

Up Levelling (creep speed): - see illustration -

As less oil flows to the cylinder, check valve V closes until the control edge of the up levelling valve W partially covers the orifice of the up levelling adjuster 4. Pilot pressure can now only escape from the bypass chamber at a rate relative to the amount the orifice is open which is itself determined by the position of the check valve. Since pilot pressure continues to enter the bypass chamber through adjuster 2, a hydraulic balance occurs between the position of the check valve and that of the bypass valve, producing a stable up levelling.

Up Stop:

At floor level, solenoid A is de-energised through a switch in the hatch allowing pilot pressure to escape from the bypass valve chamber directly back to tank through adjuster 5 resulting in the bypass valve moving to its fully open position and causing the total output from the pump to be bypassed to tank. The car then comes to a halt.

Adjustments "Up"

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments "Down"

6. Down Deceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

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 Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

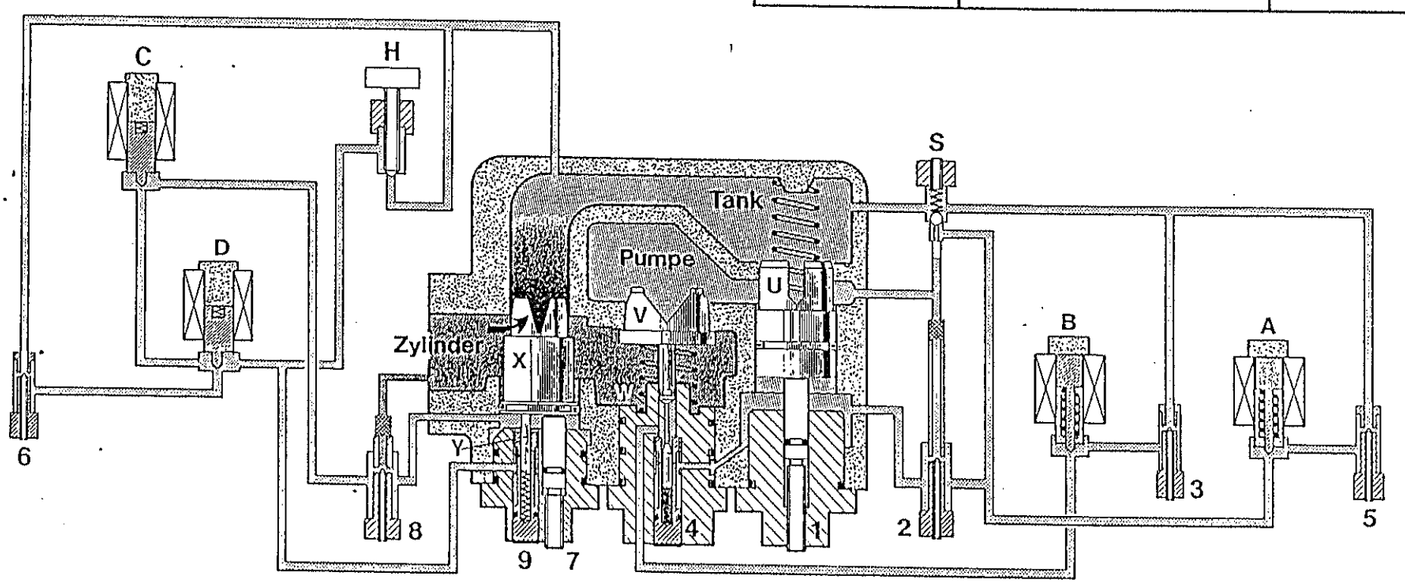
Datum: 19.5.81
Gezeichnet:
Geprüft:

Elevator Control Valve

Blain Hydraulics GmbH · Böllinger Höfe · 7100 Heilbronn · Tel. 07131/21016

Zeichnungs-Nr.
D 6.10202

BLAIN HYDRAULICS	Hydraulic flow scheme Situation: Down travel (main speed)	EV 00



Down Acceleration:

As the "down" command is given, solenoids C and D are energised and open. Pilot pressure escapes out of the down valve chamber through solenoids C and D, through adjuster 6 and back to tank. Pressure in the down valve chamber falls allowing pressure on the cylinder side of the valve to force the down valve open. The car accelerates downwards.

Down Travel (main speed): - see illustration -

The distance the down valve X opens is limited by adjuster 7 which determines the down speed of the car.

Adjustments "Up"

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments "Down"

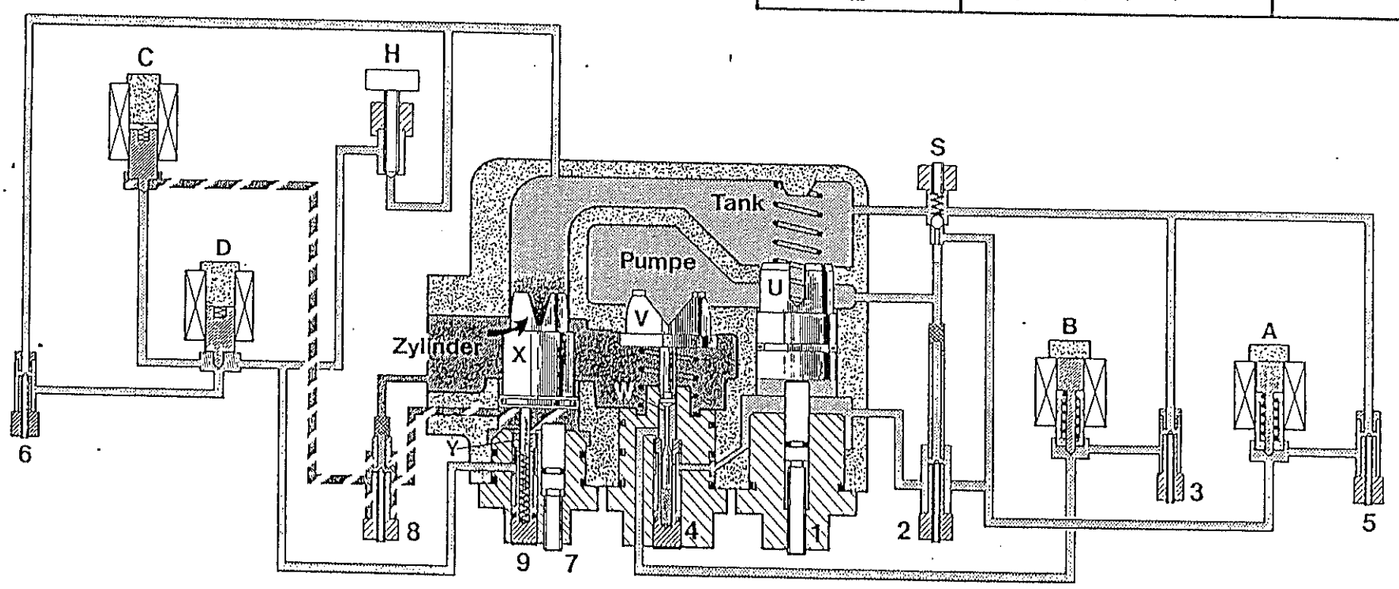
6. Down Deceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

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 Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

Datum: 19.5.81 Gezeichnet: Geprüft:	Elevator Control Valve Blain Hydraulics GmbH · Döllinger Höfe · 7100 Heilbronn · Tel. 07131/21016	Zeichnungs-Nr. D 6.10203

BLAIN HYDRAULICS	Hydraulic flow scheme Situation: Down levelling (creep speed)	E 100



Down Deceleration:

Approaching the floor level, a switch in the hatch is actuated by the car causing solenoid C to be de-energized and to close. The escape of the oil flowing through adjuster 8 into the pilot cylinder of down valve X is prevented by the closed down levelling valve Y and the only now closed solenoid C. The pressure in the pilot cylinder is built up in dependance of adjuster 8. The down valve closes partially producing a slow down of the elevator car.

Down Levelling (creep speed): - see illustration -

Reaching the pre-set position of down levelling valve Y, adjuster 9 opens - thus preventing further closing of down valve X and resulting in a stabilized down levelling.

Down Stop:

When the floor level is reached, a switch in the hatch is actuated, de-energizing and closing solenoid D. The oil pressure in the pilot cylinder of the down valve builds up by adjuster 8. The down valve closes damped, thus giving the car a soft stop.

Manual Lowering (emergency lowering):

Lowering at pre-set levelling speed. After opening the manual lowering valve H the pilot oil flows from the down valve chamber through the down levelling valve Y to the tank. The down valve X opens as far as the adjustment of the down levelling valve allows and the car lowers at a slow rate.

Adjustments "Up"

1. By Pass
2. Up Acceleration
3. Up Deceleration
4. Up Levelling Speed
5. Up Stop

Adjustments "Down"

6. Down Deceleration
7. Down Full Speed
8. Down Deceleration
9. Down Levelling Speed

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 Levelling Valve (Up)
X Full Speed Valve (Down)
Y Levelling Valve (Down)

Datum: 19.5.81 Gezeichnet: Geprüft:	Elevator Control Valve Blain Hydraulics GmbH · Böllinger Höfe · 7100 Heilbronn · Tel. 07131/21018	Zeichnungs-Nr. D 6.10204

Trouble Shooting

Note I, Valves are fully adjusted at the factory. Check electrical operation before Changing valve settings.

Note II For checking electrical operation at the valve, remove the nuts (18 mm) from the top of the appropriate Solenoid. Then with the elevator running, the energising and de-energising of the Solenoids can be felt by lifting the Solenoid a few millimeters.

U P T R A V E L

Problem	Possible cause	Recommended
No 'Up Start' (Elevator remains at floor)	A) Solenoid 'A' not energised or voltage too low. B) Solenoid Valve 'A' not closing fully possibly due to particle.	See Note II at top of page. Turn Adjustment '5' all the way 'in'. If the elevator now starts upwards, the cause is A) or B).
	C) Adjustment '2' (Up Acceler-ation is turned too far 'in'.	Turn fully 'in', then two turns 'out'.
	D) Adjustment '1' is too far back. Not enough pilot pressure (minimum 5 bar)	With the Pump running, turn Adjustment '1' 'in' until the elevator barely moves upwards, then out one complete turn.
	E) The Pump is running in the wrong direction. F) The Pump is damaged. G) The Pump Connection Flange is leaking excessively.	It may be necessary to remove the return line to estimate if the correct amount of oil is being put out by the Pump.
	H) The Relief Valve is set too low.	Increase the pressure setting by turning 'in'.
	I) The Valve size is not suited to the Pump delivery (By-Pass Valve too large).	Valve size and intended flow is stamped on Nameplate in 'Type'-field.
'Up Start' but no full speed	J) See F) and G) above	------
	K) Solenoid 'B' (Deceleration) not energised or voltage too low. L) Solenoid Valve 'B' not closing properly possibly due to particle.	See Note II at top of page. Turn restriction '3' all the way 'in'. If the elevator now travels with fullspeed, the cause is 'K' or 'L'.
Elevator doesn't decelerate into up-levelling (continues at full speed)	M) Solenoid 'B' (Up Deceleration) does not de-energise in time.	See Note II at top of page
	N) Adjustment '3' (Up Deceler-ation) not far enough open.	Can be turned fully out.
	O) Adjustment '2' (Up Acceler-ation) too wide open	Normally 1 1/2 to 2 turns open from fully closed position.
	P) Up Levelling speed too fast (Adjustment 4)	Adjust to between 4 and 6 cm/sec
Slow Down from up full speed but no 'Up'-levelling	Q) See 'H' above	------
	R) Up Levelling speed Adjustment '4' too far 'in'.	Between being level with the Flange and two turns further out is a normal setting.
	S) Solenoid 'A' (Up Stop) not energised (Possible Solenoid 'A' and 'B' reversed).	See Note II at top of page. Solenoid 'A' must be energised.

Problem	Possible cause	Recommended
Elevator travels passed the upper floor level	T) Solenoid 'A' (Up Stop) is de-energised too late.	See Note II at top of page 1.
	U) Adjustment '5' (Soft Stop) not far enough open.	Can be turned fully out.
	V) Up Levelling (4) is too far out (too fast).	Adjust to between 4 and 6 cm/sec.
	W) Adjustment '1' (By-Pass) not far enough open and Pump flow doesn't completely by-pass.	Test two turns further out.

D O W N T R A V E L

Problem	Possible cause	Recommended
No Down Start (Elevator remains at floor)	a) Solenoid 'D' not energised or voltage too low.	See Note II at top of page 1
	b) Adjustment '6' (Down Acceler-ation) not far enough open	Can be turned fully out.
	c) Adjustment '8' (Down Deceler-ation) too wide open.	Caution. Turn 'in' in steps of 1/2 turns only. If turned in too far, the elevator will not slow down!
Down Start but no Full Speed	d) Solenoid 'C' not energised or voltage too low.	See Note II at top of page 1.
	e) Adjustment '7' (full Speed Down) not far enough open.	Test two turns further out.
Down full Speed but no Down Levelling	f) Solenoid 'D' not energised (Possibly Solenoids 'C' and 'D' reversed).	See Note II at top of page 1
	g) Adjustment '9' (Down Levell-ing Speed) not far enough open. h) Spring in adjustment '9' broken.	Between being level with the Flange and two turns further out is a normal setting.
Elevator travels through the lower floor	i) Adjustment '8' (Down Deceler-ation) not far enough open	open 1/2 turn
	j) Down Levelling Speed too fast (Adjustment 9)	Adjust to between 4 cm and 6 cm/sec.
Leakage (Elevator sinks away from floor)	k) Solenoid Valve 'D' leaking	Change needle and seat.
	l) Check Valve leaking	Change seat and spindle O-rings.
	m) Down Valve leaking	Change seat O-ring.
	n) Manual Lowering leaking	Change seat O-ring.
	o) Other Valve or Hand Pump in System leaking	If possible, remove return lines to check for leaks.
	p) Contraction of Oil during cooling down.	This may become a problem when Oil temperatures have gone above approx. 35° C. Can be prevented by installing cooling.

- IF THE CAR DOES NOT MOVE:

(1) CHECK THE HOISTWAY SWITCHES FOR PROPER SETTING.

(2) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE UP LEVELING SPEED COIL.

C. .TALLS IN UP LEVELING

(a) ENSURE THAT THE HIGH SPEED COIL AND THE UP LEVELING COIL ARE WIRED IN PROPER SEQUENCE.

(b) CHECK FOR PROPER VOLTAGE AT THE UP LEVELING COIL.

(c) EXAMINE THE UP FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(d) EXAMINE THE UP LEVELING SPOOL FOR FREEDOM OF MOVEMENT.

(e) EXAMINE THE BYPASS PISTON RING FOR EVIDENCE OF DAMAGE OR WEAR.

(f) CHECK THE RELIEF VALVE FOR PROPER SETTING. REFER TO SECTION (1) (d).

FINAL STOP TOO ROUGH

(a) TURN THE UP STOP ADJUSTOR IN FOR A SMOOTHER STOP.

(b) ENSURE THAT THE PUMP CONTINUES TO RUN FOR AT LEAST ONE SECOND AFTER THE CAR COMES TO REST.

DOWN SECTION

CAR WILL NOT LOWER

(a) ENSURE THAT ALL GATE VALVES AND TANK SHUT OFF VALVES ARE OPEN.

(b) CHECK FOR PROPER VOLTAGE AT THE DOWN LEVELING COIL.

TURN THE DOWN ACCELERATION ADJUSTOR OUT.

(c) ECK THE DOWN LEVELING SOLENOID OPERATOR FOR REEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(d) EXAMINE THE DOWN PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

DOWN ACCELERATION TOO SLOW

(a) TURN THE DOWN ACCELERATION ADJUSTOR OUT FOR A FASTER DOWN START.

(b) CHECK JACK PACKING AND GUIDE SHOES.

DOWN ACCELERATION TOO ROUGH

(a) TURN THE DOWN ACCELERATION ADJUSTOR IN FOR A SMOOTHER START.

(b) CHECK JACK PACKING.

(c) BLEED AIR FROM JACK.

CAR COMES DOWN IN LEVELING SPEED ONLY.

(a) CHECK FOR PROPER VOLTAGE AT THE HIGH SPEED COIL.

(b) TURN THE DOWN SPEED ADJUSTOR SLOWLY OUT.

MAIN DOWN SPEED TOO SLOW

(a) ENSURE THAT ALL GATE VALVES AND TANK SHUT OFF VALVES ARE FULLY OPEN.

(b) TURN THE DOWN ACCELERATION ADJUSTOR OUT.

TURN THE DOWN SPEED ADJUSTOR SLOWLY OUT.

CONT

(d) EXAMINE THE DOWN PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

(e) CHECK FOR LINE RESTRICTION.

(f) CHECK THE FLOW CAPACITY OF THE SUPPLY AND RETURN LINE PIPING.

(14) CAR OVERSHOOTS FLOOR OR DOWN TRANSITION TOO SLOW

(a) TURN THE DOWN TRANSITION ADJUSTOR IN FOR A FASTER TRANSITION.

(b) CHECK THE HIGH SPEED SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(c) CHECK THE DOWN FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(d) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE HIGH SPEED COIL.

(e) CHECK HOISTWAY SWITCHES FOR PROPER SETTING.

(15) NO DOWN LEVELING SPEED

(a) TURN THE DOWN ACCELERATION ADJUSTOR OUT.

(b) ENSURE THAT THE HIGH SPEED AND DOWN LEVELING COILS ARE WIRED IN PROPER SEQUENCE.

(c) OPEN THE MANUAL LOWERING VALVE. IF THE CAR LOWERS:

(1) CHECK FOR PROPER VOLTAGE AT THE DOWN LEVELING COIL.

(2) CHECK THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(16) DOWN STOP INACCURATE OR CAR SLIDES THROUGH THE FLOOR

(a) CHECK THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT AND EVIDENCE OF FOREIGN MATERIAL.

(b) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE DOWN LEVELING COIL.

(c) CHECK HOISTWAY SWITCHES FOR PROPER SETTING.

(17) CAR WILL NOT HOLD FLOOR LEVEL

(a) ENSURE THAT THE MANUAL LOWERING VALVE IS FULLY CLOSED.

(b) TURN THE DOWN ACCELERATION ADJUSTOR FULLY IN TO STOP.

- IF THIS STOPS THE DOWN LEAK:

(1) EXAMINE THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT AND EVIDENCE OF FOREIGN MATERIAL.

- IF THE CAR CONTINUES TO LEAK DOWN: LAND THE CAR, REMOVE THE MAIN CLOSURE AND:

(2) EXAMINE THE DOWN VALVE SEAT AND THE CHECK VALVE SEAT FOR EVIDENCE OF DAMAGE.

(3) EXAMINE THE DOWN VALVE SEAL FOR EVIDENCE OF DAMAGE.

(4) EXAMINE THE CHECK VALVE SEAL FOR EVIDENCE OF DAMAGE.

(5) EXAMINE THE EXTERNAL SEAL RINGS ON BOTH THE DOWN VALVE SEAT AND THE CHECK VALVE SEAT.

(6) INSPECT THE INTERNAL "U" CUP SEALS ON BOTH THE UP LEVEL AND DOWN LEVEL ADJUSTORS FOR EVIDENCE OF DAMAGE.

CANTON ELEVATOR

HC-220 H.E. VALVE INFORMATION

READ THIS INFORMATION CAREFULLY BEFORE INSTALLING EQUIPMENT

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FORWARD

THE INFORMATION CONTAINED IN THE TROUBLE SHOOTING SECTION OF THIS MANUAL HAS BEEN DEVELOPED BY HYDRAULIC ENGINEERING, INC. IT IS INTENDED FOR USE BY CUSTOMERS SKILLED IN THE INSTALLATION AND SERVICE OF HYDRAULIC ELEVATOR SYSTEMS. THE INFORMATION CONTAINED HEREIN IS SUBJECT TO CHANGE. WHILE EVERY EFFORT HAS BEEN MADE TO ELIMINATE ERRORS, HYDRAULIC ENGINEERING DISCLAIMS LIABILITY ARISING FROM MISINTERPRETATION.

BEFORE DISASSEMBLING ANY SECTION OF THE VALVE, MAKE SURE THAT ELECTRICAL POWER HAS BEEN DISCONNECTED, AND THAT ALL PRESSURE HAS BEEN RELIEVED FROM THE SYSTEM.

HC-220 TROUBLE SHOOTING GUIDE

UP SECTION

(1) PUMP RUNS - CAR WILL NOT MOVE

(a) MAKE SURE THAT ALL GATE VALVES IN THE SYSTEM ARE OPEN.

(b) CHECK FOR PROPER VOLTAGE AT THE UP LEVELING COIL.

(c) IF THE CAR IS IN THE PIT:

(1) ENSURE THAT THE MANUAL LOWERING VALVE IS CLOSED.

(2) ENSURE THAT THE MAIN DOWN VALVE IS NOT IN THE OPEN POSITION BY TURNING THE DOWN ADJUSTOR FULLY IN TO STOP.

(d) TURN THE RELIEF ADJUSTOR FULLY IN TO STOP.

NOTE: IF TURNING THE RELIEF ADJUSTOR IN RESULTS IN CAR MOVEMENT, BE SURE THAT THE RELIEF VALVE IS PROPERLY SET WITH A PRESSURE GAUGE.

(e) CHECK THE UP FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(f) TURN THE UP STOP ADJUSTOR IN TO STOP. IF THIS RESULTS IN CAR MOVEMENT:

(1) EXAMINE THE UP LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(2) EXAMINE THE UP LEVELING SPOOL. CHECK FOR FREEDOM OF MOVEMENT. CHECK THE BLEED PORT THROUGH THE SPOOL FOR OBSTRUCTION.

(2) UP SPEED TOO SLOW OR CAR WILL ATTAIN LEVELING SPEED ONLY

(a) ENSURE THAT THE RELIEF VALVE IS PROPERLY SET. REFER TO SECTION (1) (d).

(b) CHECK BELTS AND PULLEYS ON PUMP AND MOTOR IF APPLICABLE.

(c) TURN THE UP STOP ADJUSTOR FULLY IN TO STOP. IF THIS RESULTS IN CAR MOVEMENT:

(1) EXAMINE THE UP LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(2) CHECK THE UP LEVELING SPOOL FOR FREEDOM OF MOVEMENT. CHECK THE BLEED PORT THROUGH THE SPOOL FOR EVIDENCE OF OBSTRUCTION.

(d) TURN THE UP TRANSITION ADJUSTOR FULLY IN TO STOP. IF THIS RESULTS IN CAR MOVEMENT:

(1) CHECK THE HIGH SPEED SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

CONT

(2) CHECK THE HIGH SPEED SPOOL FOR FREEDOM OF MOVEMENT. CHECK THE BLEED PORT THROUGH THE SPOOL FOR EVIDENCE OF OBSTRUCTION.

NOTE: THIS PROCEDURE SHOULD BE USED TO ISOLATE THIS PARTICULAR PROBLEM ONLY. TURNING THE UP TRANSITION ADJUSTOR FULLY IN WILL CAUSE THE CAR TO HAVE NO SLOW-DOWN IN UP TRAVEL. IF FULL SPEED IS ATTAINED, POWER SHOULD BE IMMEDIATELY DISCONNECTED. WHENEVER POSSIBLE, THIS PROCEDURE SHOULD BE MADE BETWEEN INTERMEDIATE FLOORS.

(e) CHECK THE UP FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(f) EXAMINE THE BYPASS PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

(3) UP ACCELERATION TOO SLOW

(a) TURN THE UP ACCELERATION ADJUSTOR OUT FOR A FASTER START.

(b) CHECK THE UP FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(c) CHECK THE BYPASS PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

(d) CHECK THE RELIEF VALVE FOR PROPER SETTING. REFER TO SECTION (1) (d).

(4) UP ACCELERATION TO ABRUPT

(a) TURN THE UP ACCELERATION ADJUSTOR IN FOR A SMOOTHER UP START.

(b) CHECK THE BYPASS SIZING ADJUSTMENT. REFER TO ADJ PROCEDURES.

(c) CHECK JACK PACKING, GUIDE SHOES AND RAIL ALIGNMENT.

(5) CAR OVERSHOOTS FLOOR

(a) TURN THE UP TRANSITION ADJUSTOR OUT FOR A FASTER TRANSITION.

(b) INSPECT THE HIGH SPEED SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(c) CHECK HOISTWAY SWITCHES FOR PROPER SETTING.

(d) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE HIGH SPEED COIL.

(e) CHECK THE HIGH SPEED SPOOL FOR FREEDOM OF MOVEMENT. CHECK THE BLEED PORT THROUGH THE SPOOL FOR EVIDENCE OF OBSTRUCTION.

NOTE: IF THE UP TRANSITION COMPENSATION HAS BEEN SET (MP AND LC ADJUSTMENTS), PROCEED TO (f) AND (g) BELOW. REFER TO THE ADJUSTMENT PROCEDURES FOR PROPER ADJUSTMENT OF MINIMUM PRESSURE (MP) AND LOAD COMPENSATOR (LC) ADJUSTMENTS.

(f) IF THE CAR OVERSHOOTS IN AN EMPTY CAR CONDITION, ADJUST THE MINIMUM PRESSURE ADJUSTOR SLOWLY IN.

(g) IF THE CAR OVERSHOOTS ONLY WITH A LOAD, ADJUST THE LOAD COMPENSATOR SLOWLY IN.

(6) CAR LEVELS OR SLIDES PAST FLOOR

(a) DISCONNECT THE UP LEVELING COIL AND REGISTER A CALL.

- IF THIS RESULTS IN CAR MOVEMENT:

(1) TURN THE UP STOP ADJUSTOR OUT.

(2) CHECK THE BYPASS SIZING ADJUSTMENT FOR PROPER SETTING. REFER TO ADJUSTMENT PROCEDURES.

(3) CHECK THE UP LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(4) CHECK THE UP LEVELING SPOOL FOR FREEDOM OF MOVEMENT. CHECK THE BLEED PORT THROUGH THE SPOOL FOR OBSTRUCTION.

CONT

- IF THE CAR DOES NOT MOVE:

(1) CHECK THE HOISTWAY SWITCHES FOR PROPER SETTING.

(2) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE UP LEVELING SPEED COIL.

(7) CAR STALLS IN UP LEVELING

(a) ENSURE THAT THE HIGH SPEED COIL AND THE UP LEVELING COIL ARE WIRED IN PROPER SEQUENCE.

(b) CHECK FOR PROPER VOLTAGE AT THE UP LEVELING COIL.

(c) EXAMINE THE UP FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(d) EXAMINE THE UP LEVELING SPOOL FOR FREEDOM OF MOVEMENT.

(e) EXAMINE THE BYPASS PISTON RING FOR EVIDENCE OF DAMAGE OR WEAR.

(f) CHECK THE RELIEF VALVE FOR PROPER SETTING. REFER TO SECTION (1) (d).

(8) FINAL STOP TOO ROUGH

(a) TURN THE UP STOP ADJUSTOR IN FOR A SMOOTHER STOP.

(b) ENSURE THAT THE PUMP CONTINUES TO RUN FOR AT LEAST ONE SECOND AFTER THE CAR COMES TO REST.

DOWN SECTION

(9) CAR WILL NOT LOWER

(a) ENSURE THAT ALL GATE VALVES AND TANK SHUT OFF VALVES ARE OPEN.

(b) CHECK FOR PROPER VOLTAGE AT THE DOWN LEVELING COIL.

(c) TURN THE DOWN ACCELERATION ADJUSTOR OUT.

(d) CHECK THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(e) EXAMINE THE DOWN PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

(10) DOWN ACCELERATION TOO SLOW

(a) TURN THE DOWN ACCELERATION ADJUSTOR OUT FOR A FASTER DOWN START.

(b) CHECK JACK PACKING AND GUIDE SHOES.

(11) DOWN ACCELERATION TOO ROUGH

(a) TURN THE DOWN ACCELERATION ADJUSTOR IN FOR A SMOOTHER START.

(b) CHECK JACK PACKING.

(c) BLEED AIR FROM JACK.

(12) CAR COMES DOWN IN LEVELING SPEED ONLY.

(a) CHECK FOR PROPER VOLTAGE AT THE HIGH SPEED COIL.

(b) TURN THE DOWN SPEED ADJUSTOR SLOWLY OUT.

(13) MAIN DOWN SPEED TOO SLOW

(a) ENSURE THAT ALL GATE VALVES AND TANK SHUT OFF VALVES ARE FULLY OPEN.

(b) TURN THE DOWN ACCELERATION ADJUSTOR OUT.

(c) TURN THE DOWN SPEED ADJUSTOR SLOWLY OUT.

CONT

(d) EXAMINE THE DOWN PISTON RING FOR EVIDENCE OF WEAR OR DAMAGE.

(e) CHECK FOR LINE RESTRICTION.

(f) CHECK THE FLOW CAPACITY OF THE SUPPLY AND RETURN LINE PIPING.

(14) CAR OVERSHOOTS FLOOR OR DOWN TRANSITION TOO SLOW

(a) TURN THE DOWN TRANSITION ADJUSTOR IN FOR A FASTER TRANSITION.

(b) CHECK THE HIGH SPEED SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(c) CHECK THE DOWN FILTER FOR EVIDENCE OF RESTRICTION OR OBSTRUCTION.

(d) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE HIGH SPEED COIL.

(e) CHECK HOISTWAY SWITCHES FOR PROPER SETTING.

(15) NO DOWN LEVELING SPEED

(a) TURN THE DOWN ACCELERATION ADJUSTOR OUT.

(b) ENSURE THAT THE HIGH SPEED AND DOWN LEVELING COILS ARE WIRED IN PROPER SEQUENCE.

(c) OPEN THE MANUAL LOWERING VALVE. IF THE CAR LOWERS:

(1) CHECK FOR PROPER VOLTAGE AT THE DOWN LEVELING COIL.

(2) CHECK THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT OR EVIDENCE OF FOREIGN MATERIAL.

(16) DOWN STOP INACCURATE OR CAR SLIDES THROUGH THE FLOOR

(a) CHECK THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT AND EVIDENCE OF FOREIGN MATERIAL.

(b) ENSURE THAT THERE IS NO ELECTRICAL DELAY IN DE-ENERGIZING THE DOWN LEVELING COIL.

(c) CHECK HOISTWAY SWITCHES FOR PROPER SETTING.

(17) CAR WILL NOT HOLD FLOOR LEVEL

(a) ENSURE THAT THE MANUAL LOWERING VALVE IS FULLY CLOSED.

(b) TURN THE DOWN ACCELERATION ADJUSTOR FULLY IN TO STOP.

- IF THIS STOPS THE DOWN LEAK:

(1) EXAMINE THE DOWN LEVELING SOLENOID OPERATOR FOR FREEDOM OF MOVEMENT AND EVIDENCE OF FOREIGN MATERIAL.

- IF THE CAR CONTINUES TO LEAK DOWN: LAND THE CAR, REMOVE THE MAIN CLOSURE AND:

(2) EXAMINE THE DOWN VALVE SEAT AND THE CHECK VALVE SEAT FOR EVIDENCE OF DAMAGE.

(3) EXAMINE THE DOWN VALVE SEAL FOR EVIDENCE OF DAMAGE.

(4) EXAMINE THE CHECK VALVE SEAL FOR EVIDENCE OF DAMAGE.

(5) EXAMINE THE EXTERNAL SEAL RINGS ON BOTH THE DOWN VALVE SEAT AND THE CHECK VALVE SEAT.

(6) INSPECT THE INTERNAL "U" CUP SEALS ON BOTH THE UP LEVEL AND DOWN LEVEL ADJUSTORS FOR EVIDENCE OF DAMAGE.

CANTON ELEVATOR

HC-220 H.E. VALVE INFORMATION

READ THIS INFORMATION CAREFULLY BEFORE INSTALLING EQUIPMENT

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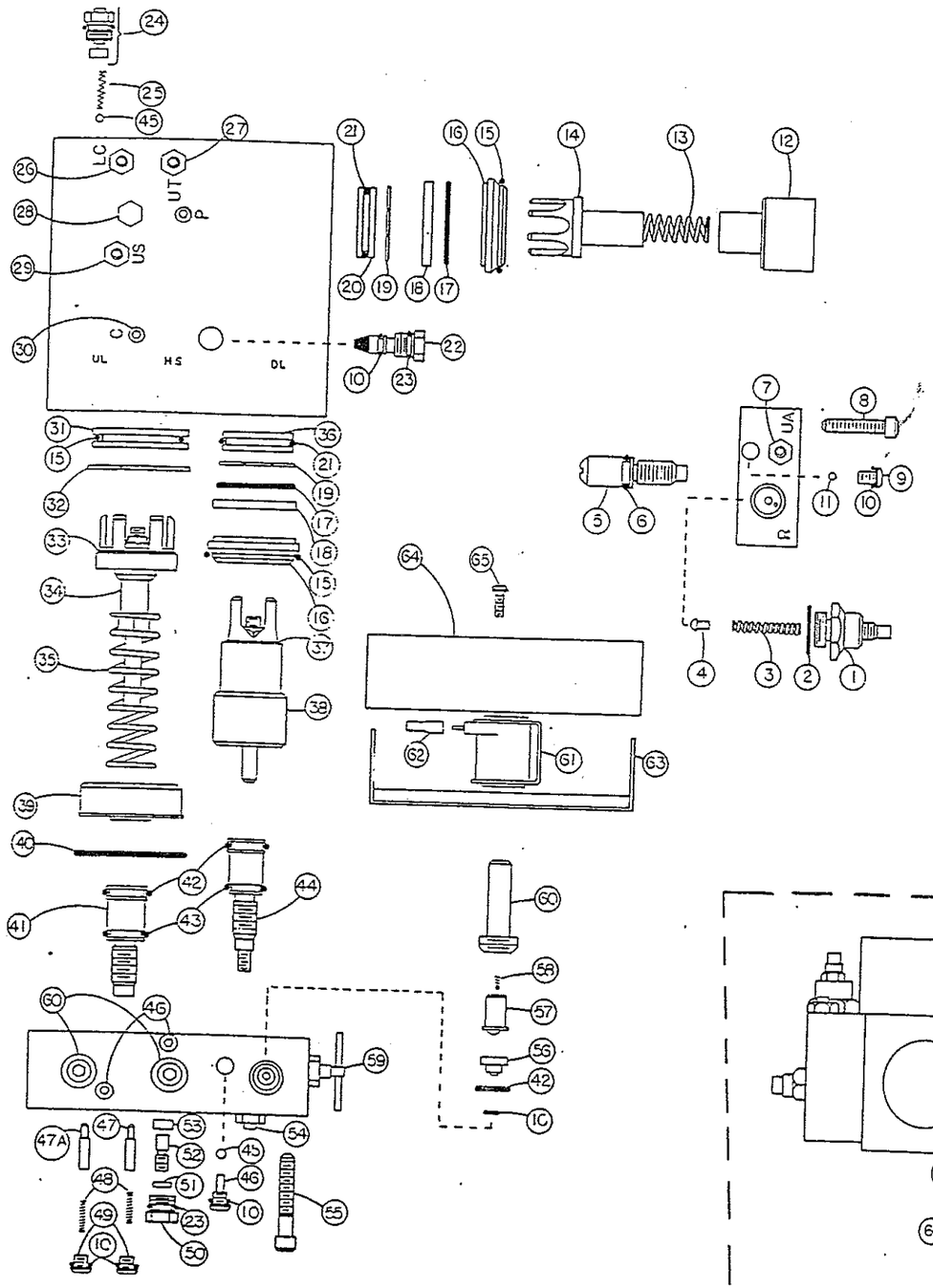
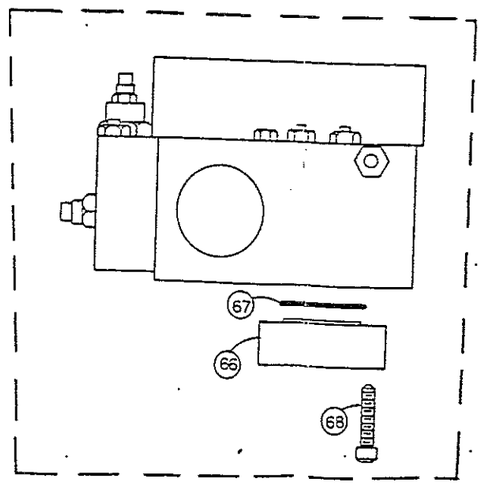




ITEM NO.	IDENTIFICATION	PART NO.
1	RELIEF CARTRIDGE ASSEMBLY	EV-022
2	SEAL RING	2-020
3	RELIEF VALVE SPRING	EV-022-3
4	RELIEF POPPIT	EV-022-4
5	BYPASS ADJUSTOR ASSEMBLY	EV-021
6	SEAL RING	2-111
7*	UA ADJUSTOR ASSEMBLY	EV-007
8	5/16-18 x 1-1/2" SOCKET HEAD CAP SCREW	EV-028
9	1/4-28 x 3/8" SOCKET BUTTON HEAD SCREW	EV-044A
10	SEAL RING	2-010
11	CHECK BALL (.156" DIA.)	EV-036
12	BYPASS VALVE PISTON	EV-020-1
13	BYPASS VALVE SPRING	EV-020-3
14	BYPASS VALVE GUIDE	EV-020-2
15	SEAL RING	2-133
16	SEAL RETAINER	EV-017
17	PISTON SEAL ENERGIZER	2-130
18	PISTON SEAL RING	EV-018
19	SNAP RING	EV-016
20	BYPASS VALVE SEAT	EV-019
21	SEAL RING	2-125
22	DOWN FILTER ASSEMBLY	EV-023
23	SEAL RING	2-012
24*	MP ADJUSTOR ASSEMBLY	EV-0078
25	MINIMUM PRESSURE SPRING	EV-048
26*	LC ADJUSTOR ASSEMBLY	EV-007A
27*	UT ADJUSTOR ASSEMBLY	EV-007
28	UP FILTER ASSEMBLY	EV-023
29*	US ADJUSTOR ASSEMBLY	EV-007
30	1/8" PIPE PLUG	EV-033
31	CHECK VALVE SEAT	EV-011
32	SNAP RING	EV-012
33	SEAL RING	2-126
34	CHECK VALVE ASSEMBLY	EV-010
35	CHECK VALVE SPRING	EV-013
36	DOWN VALVE SEAT	EV-015
37	SEAL RING	2-119
38	DOWN VALVE ASSEMBLY	EV-014
39	CHECK SPRING RETAINER	EV-009
40	SEAL RING	2-139
41	UP LEVEL SPEED ADJUSTOR ASSEMBLY	EV-004
42	SEAL RING	2-114
43	SEAL RING	2-113
44	DOWN/DOWN LEVEL SPEED ADJUSTOR ASSEMBLY	EV-005
45	CHECK BALL (.187" DIA.)	EV-039
46	CHECK BALL RETAINING SCREW	EV-035
47	HIGH SPEED SPOOL	EV-034
47A	UP LEVELING SPOOL	EV-034
48	SPOOL SPRING	EV-042
49	1/4-28 x 1/4" SOCKET BUTTON HEAD SCREW	EV-044
50	ADJUSTOR CARTRIDGE	EV-007-1
51	ADJUSTOR SEAL	EV-007-2
52	ADJUSTOR SCREW	EV-007-3
53	ADJUSTOR SLEEVE	EV-007-4
54*	DA ADJUSTOR ASSEMBLY	EV-007
55	5/16-18 x 2" SOCKET HEAD CAP SCREW	EV-027
56	SOLENOID SEAT	EV-003
57	BALL CAGE ASSEMBLY	EV-001
58	SOLENOID SPRING	EV-001-2
59	MANUAL LOWERING VALVE ASSEMBLY	EV-008
60	SOLENOID TUBE	EV-002
61	COIL - REFER TO COIL SELECTION CHART	
62	WIRE TERMINAL	EV-049
63	COIL BASE PLATE	EV-040
64	COIL COVER	EV-041
65	10-32 x 5/8" SOCKET BUTTON HEAD SCREW	EV-050
66	FLANGE (2" NPT)	EV-051
67	SEAL RING	2-134
68	5/16-18 x 1-1/4" SOCKET HEAD CAP SCREW	EV-053

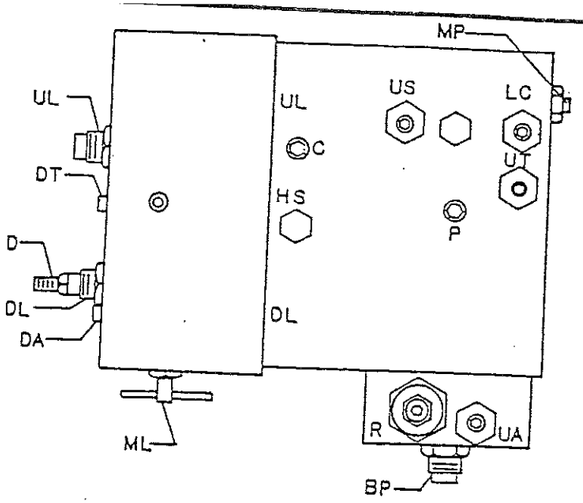
* REFER TO ITEMS 50 - 53 FOR COMPONENT BREAKDOWN

CANTON ELEVATOR

HC-220 H.E. VALVE INFORMATION

PARTS IDENTIFICATION

IS907 4-29-93



SOLENOID COIL OPERATING SEQUENCE

FOR FULL UP SPEED TRAVEL: ENERGIZE BOTH THE UP LEVELING SOLENOID COIL (UL) AND THE HIGH SPEED SOLENOID COIL (HS).

FOR UP LEVELING SPEED TRAVEL: ENERGIZE THE UP LEVELING SOLENOID COIL (UL) ONLY.

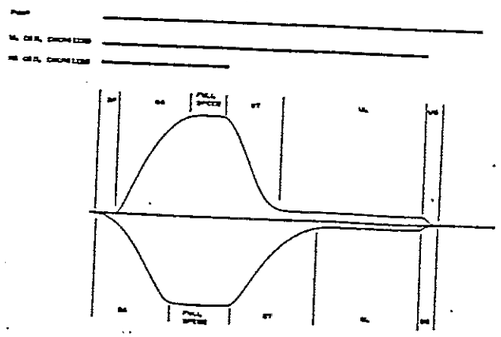
FOR FULL DOWN SPEED TRAVEL: ENERGIZE BOTH THE DOWN LEVELING SOLENOID COIL (DL) AND THE HIGH SPEED SOLENOID COIL (HS).

FOR DOWN LEVELING SPEED TRAVEL: ENERGIZE THE DOWN LEVELING SOLENOID COIL (DL) ONLY.

THE HC-220 CONTROL VALVE UTILIZES THREE SOLENOID COILS:

HS	HIGH SPEED SOLENOID
UL	UP LEVEL SPEED SOLENOID
DL	DOWN LEVEL SPEED SOLENOID

FOR FULL UP SPEED	ENERGIZE BOTH THE UP LEVEL SPEED COIL AND THE HIGH SPEED COIL.
FOR UP LEVEL SPEED	ENERGIZE THE UP LEVEL SPEED COIL ONLY.
FOR FULL DOWN SPEED	ENERGIZE BOTH THE DOWN LEVEL SPEED COIL AND THE HIGH SPEED COIL.
FOR DOWN LEVEL SPEED	ENERGIZE THE DOWN LEVEL SPEED COIL ONLY.



ADJUSTMENT FUNCTIONS

BP — BYPASS ADJUSTOR: GOVERNS THE MAXIMUM AMOUNT OF FLUID THAT CAN BE BYPASSED AT MINIMUM PRESSURE.

UA — UP ACCELERATION ADJUSTOR: CONTROLS THE RATE OF ACCELERATION TO FULL UP SPEED. TURN UA IN (CW) FOR A SLOWER ACCELERATION. TURN UA OUT (CCW) FOR A FASTER ACCELERATION.

UL — UP LEVELING ADJUSTOR: CONTROLS THE UP LEVELING SPEED. TURN UL IN (CW) FOR A SLOWER LEVELING SPEED. TURN UL OUT (CCW) FOR A FASTER LEVELING SPEED.

UT — UP TRANSITION ADJUSTOR: CONTROLS THE RATE OF DECELERATION FROM FULL UP SPEED TO UP LEVELING SPEED. TURN UT IN (CW) FOR A SHORTER LEVELING DISTANCE. TURN UT OUT (CCW) FOR A LONGER LEVELING DISTANCE.

US — UP STOP ADJUSTOR: CONTROLS THE FINAL STOP IN UP TRAVEL. TURN US OUT (CCW) FOR A MORE POSITIVE STOP. TURN US IN (CW) FOR A SMOOTHER STOP.

MP — MINIMUM PRESSURE ADJUSTOR: GOVERNS THE MINIMUM PRESSURE AT WHICH THE LOAD COMPENSATOR BECOMES EFFECTIVE.

LC — LOAD COMPENSATOR: REGULATES THE UP TRANSITION RATE UNDER LOAD CONDITIONS.

R — RELIEF ADJUSTOR: GOVERNS THE PRESSURE AT WHICH THE RELIEF VALVE WILL ACTUATE. TURN THE R ADJUSTOR IN (CW) TO INCREASE THE RELIEF SETTING. TURN THE ADJUSTOR OUT (CCW) TO LOWER THE RELIEF SETTING

DL — DOWN LEVELING SPEED ADJUSTOR: CONTROLS THE DOWN LEVELING SPEED. TURN DL OUT (CCW) FOR A FASTER LEVELING SPEED. TURN DL IN (CW) FOR A SLOWER LEVELING SPEED.

D — DOWN SPEED ADJUSTOR: CONTROLS THE FULL DOWN SPEED. TURN D OUT (CCW) FOR A FASTER DOWN SPEED. TURN D IN (CW) FOR A SLOWER DOWN SPEED.

DT — DOWN TRANSITION ADJUSTOR: CONTROLS THE RATE OF DECELERATION FROM FULL DOWN SPEED TO DOWN LEVELING SPEED. TURN DT IN (CW) FOR A LONGER LEVELING DISTANCE. TURN DT OUT (CCW) FOR A SHORTER LEVELING DISTANCE.

DA — DOWN ACCELERATION ADJUSTOR: CONTROLS THE RATE OF ACCELERATION TO FULL DOWN SPEED. TURN DA IN (CW) FOR A SLOWER ACCELERATION. TURN DA OUT (CCW) FOR A FASTER ACCELERATION.

ML — MANUAL LOWERING ADJUSTOR: LOWERS THE CAR IN LEVELING SPEED MANUALLY.

HC 220 ADJUSTMENT PROCEDURE

- MAKE SURE THAT ALL SEAL NUTS (ADJUSTOR CARTRIDGES) ARE TIGHT.
- WHEN INSTRUCTED TO TURN AN ADJUSTOR "IN", THE ADJUSTMENT IS ALWAYS CLOCKWISE (CW). WHEN INSTRUCTED TO TURN AN ADJUSTOR "OUT", THE ADJUSTMENT IS ALWAYS COUNTERCLOCKWISE (CCW).
- MAKE ALL ADJUSTMENTS WITH NO LOAD ON THE CAR EXCEPT AS NOTED.
- WHEN DISCONNECTING A COIL, ALWAYS DISCONNECT THE COIL ELECTRICALLY.

INITIAL ADJUSTMENT SETTINGS

UP SECTION

BP	OUT (CCW) TO STOP
UA	IN (CW) TO STOP
UL	APPROXIMATELY THREE THREADS ABOVE THE JAM NUT
UT	OUT (CCW) TO STOP
US	OUT (CCW) TO STOP
MP	IN (CW) TO STOP
LC	OUT (CCW TO STOP

DOWN SECTION

D	APPROXIMATELY TWO THREADS ABOVE THE JAM NUT
DL	APPROXIMATELY THREE THREADS ABOVE THE JAM NUT
DA	OUT (CCW) TO STOP
DT	IN (CW) TO STOP
ML	IN (CW) TO STOP

UP TRAVEL ADJUSTMENT

1. BP — DISCONNECT THE UL COIL AND START THE PUMP. TURN THE BP ADJUSTOR IN (CW) UNTIL THE CAR BEGINS TO MOVE, THEN BACK OUT (CCW) UNTIL THE CAR STALLS. TURN THE BP ADJUSTOR OUT (CCW) AN ADDITIONAL 1/4 TURN.

2. UA — RECONNECT THE UL COIL AND REGISTER A CALL. TURN UA OUT (CCW) TO ATTAIN FULL UP SPEED WITHIN 24" - 36".

3. UL — DISCONNECT THE HIGH SPEED COIL AND REGISTER A CALL. TURN UL OUT (CCW) TO ATTAIN 10 - 12 FEET PER MINUTE LEVELING SPEED. RETURN THE CAR TO FLOOR LEVEL AND RECONNECT THE HIGH SPEED COIL.

4. UT — REGISTER A CALL AND ADJUST UT IN (CW) SO THAT THE CAR SLOWS TO APPROXIMATELY 4" - 6" OF STABILIZED UP LEVELING.

NOTE: A MINOR READJUSTMENT OF UL MAY BE NECESSARY AFTER SETTING UP TRANSITION.

*5. MP — REGISTER A CALL AND TIME A FULL FLOOR RUN. TURN MP OUT (CCW) UNTIL A REDUCTION OF APPROXIMATELY ONE SECOND IN FLIGHT TIME IS ACHIEVED.

*6. LC — TURN THE LOAD COMPENSATOR IN (CW) TO STOP, THEN BACK OUT (CCW) 3-1/2 TURNS. APPLY LOAD TO THE CAR AND REGISTER A CALL. ADJUST LC OUT (CCW) UNTIL THE FLIGHT TIME EQUALS THAT OF THE UNLOADED CAR.

*NOTE: THE ADJUSTMENT OF MP AND LC ALLOW THE CAR TO TRANSITION AND LEVEL IN TO THE FLOOR FOR THE SAME LENGTH OF TIME REGARDLESS OF LOAD CONDITION, THUS ELIMINATING "STRECHED-OUT" LEVELING UNDER FULL OR PARTIAL LOAD CONDITIONS. IF NO LOAD IS AVAILABLE DURING THIS ADJUSTMENT PHASE, LC MUST BE TURNED IN (CW) TO STOP. WITH LC TURNED FULLY IN, THE CAR WILL LEVEL IN TO THE FLOOR AS DO CONVENTIONAL VALVES WITH RESPECT TO LOAD.

7. US — WITH US IN ITS PRESENT POSITION, THE CAR SHOULD STOP APPROXIMATELY 1/4" - 3/8" BELOW FLOOR LEVEL. DISCONNECT THE UL COIL AND REGISTER A CALL. TURN US IN (CW) UNTIL THE CAR JUST BEGINS TO MOVE, THEN BACK OUT (CCW) UNTIL THE CAR STALLS. RETURN THE CAR TO FLOOR LEVEL AND RECONNECT THE UL COIL. REGISTER A CALL AND ADJUST US IN (CW) TO BRING THE CAR TO FLOOR LEVEL. THE PUMP SHOULD BE TIMED TO RUN FOR APPROXIMATELY ONE SECOND AFTER REACHING THE FLOOR.

8. R — THE RELIEF VALVE HAS BEEN FACTORY SET AT 500 P.S.I. INSTALL A PRESSURE GUAGE AT "P" PORT AND RECORD THE SYSTEM PRESSURE WITH A FULL LOAD ON THE CAR. SET THE RELIEF VALVE IN ACCORDANCE WITH LOCAL CODES, BUT NOT IN EXCESS OF 25% ABOVE MAXIMUM WORKING PRESSURE.

DOWN TRAVEL ADJUSTMENT

1. DA — TURN DA IN (CW) TO STOP AND REGISTER A CALL. TURN DA OUT (CCW) UNTIL THE CAR BEGINS TO MOVE AWAY FROM THE FLOOR, THEN OUT (CCW) AN ADDITIONAL 1/4 TURN.

2. DL — DISCONNECT THE HIGH SPEED COIL AND REGISTER A CALL. TURN DL OUT (CCW) TO ATTAIN 6 - 9 FEET PER MINUTE LEVELING SPEED.

3. D — RECONNECT THE HIGH SPEED COIL AND RETURN THE CAR TO THE UPPER LANDING. REGISTER A CALL AND TURN THE DOWN ADJUSTOR OUT (CCW) TO ATTAIN FULL DOWN SPEED.

4. DT — REGISTER A CALL AND TURN DT OUT (CCW) TO ATTAIN APPROXIMATELY 4" - 6" OF STABILIZED DOWN LEVELING.

NOTE: A MINOR READJUSTMENT OF DL MAY BE NECESSARY AFTER SETTING DOWN TRANSITION.

OPERATIONAL DATA

MINIMUM OPERATING PRESSURE	30 p.s.i.
MAXIMUM OPERATING PRESSURE	1000 p.s.i.
FLOW CAPACITY (REFER TO FLOW CHART)	220 g.p.m.(MAXIMUM)
PRESSURE DROP ACROSS CHECK VALVE	13 p.s.i. - 25 p.s.i.
MINIMUM OPERATING TEMPERATURE	70° F
MAXIMUM OPERATING TEMPERATURE	150° F
THREE SOLENOID COIL OPERATION	
OPTIONAL UP TRANSITION COMPENSATION ADJUSTMENT	

COIL DATA

VOLTS	HZ	PART NO.
110	60	032
208/230	60	032A
110	DC	032A

CANTON ELEVATOR

HC-220. H.E. VALVE INFORMATION

READ THIS INFORMATION CAREFULLY BEFORE INSTALLING EQUIPMENT

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