EV40-F

User Manual

Software Version R1.12A

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1 GENERAL INFORMATION

1.1 SAFETY PRECAUTIONS & GENERAL WARNINGS

Installation, operation and servicing of the **EV40** system should be performed by qualified personnel. Before installing an **EV40-F** system, **Technical Manuals** of the YASKAWA inverters (GA700/ L1000H) and this **EV40-F User Manual** should be read, understood, and all safety precautions mentioned in those documents and warnings must be followed. The **EV40-F** system must be installed according to the descriptions in line with the Technical Manuals and the local codes.

Figure 1: The EV40-F system components

1.2 PRODUCT INTRODUCTION

The EV40-F package consists of (see Annexure 2);

1) **EV40** valve
2) Yaskawa drive (L1000H or GA700)
3) **Pro-Hydro** interface card
4) Temperature & pressure sensors
5) Line filter (only with L1000H)
6) EV40-F User Manual

⚠	***The EV40-F system comes with GA700 or L1000H YASKAWA drives. Users should consult Yaskawa's respective Technical Manuals whenever a referring is made.***

⚠

Verify receipt of the correct valve and drive type by checking the information on the nameplates. Selection and application of the EV40-F system remains as the responsibility of elevator manufacturer or end user. *(For L1000H type drives, drives are marked as CIMR-L##V# Up to 7.5kW and above 7.5kW; CIMR-L##A# is for standard models and CIMR-L##F# is for models in compliance with IEC/EN 61508 SIL3)*

kW size	CIMR- Series			CIPR- Series
	L1000H	Line Filter (separate)		GA700 (line filter included in the housing)
3	LC4V00**07**BAA-0011	FS23639-15-07		GA70C4000**9**BBAA-BA
4	LC4V00**09**BAA-0011			GA70C400**12**BBAA-BA
5.5	LC4V00**15**FAA-0011	FS23639-30-07		GA70C400**18**BBAA-BA
7.5	LC4F00**18B**AC-9120	FB-40025A		GA70C400**23**BBAA-BA
11	LC4F00**24B**AC-9120	FB-40044A		GA70C400**31**BBAA-BA
15	LC4F00**31B**AC-9120			GA70C400**38**BBAA-BA
18,5	LC4F00**39**BAC-9120			GA70C400**44**BBAA-BA
22	LC4F00**45**BAC-9120	FB-40060A		GA70C400**60**BBAA-BA
30	LC4F00**60**BAC-9120			GA70C400**75**BBAA-BA
37	LC4F00**75**BAC-9120	FB-40105A		GA70C400**89**BBAA-BA
45	LC4F00**91**BAC-9120			GA70C40**103**BBAA-BA
55	LC4F0**112**CAC-9120	FB-40170A		GA70C40**140**BBAA-BA
75	LC4F0**150C**AC-9120			GA70C4**168**BBAA-BA

EV40 valve has been designed to use **GA700 and L1000H Yaskawa** drives (inverters) for the up travel, whereas the down travel is managed mechanically. Functionality of **EV40** valve is tested and necessary adjustments are done in the factory.

The **EV40-F** system can be installed either on a new or an existing power unit without necessitating to change the power unit.

	***With a worn-out pump the contracted car speed may not be reached. Leakage from the worn-out pump may become excessive with loaded car or/and warm oil therefore, increasing motor speed may not provide higher flow rate. In such a case, replacement of the pump is necessary.***

The **Pro-Hydro** interface card contains sophisticated, specially designed hydraulic elevator software to provide highest level of ride quality regardless of the changes in load and oil temperature. YASKAWA GA700 or L1000H drives are utilized at heavy duty mode for motors up to 75kW (100HP) power size. The **Pro-Hydro** card allows user to connect via **Wi-Fi** and set-up the system, make changes and perform diagnostics.

The **EV40-F** system has been designed to offer not only an energy-efficient but also an economically effective solution. It provides better ride quality, saves energy and diminishes the inrush current. 4 different travel speeds are possible as shown in ***Table 1***.

Speed	Explanation	Setting Range
Nominal speed	Nominal travel speed	0.05 to 1.00 m/s
Inspection speed	Used during inspection	0.05 to 0.30 m/s
Leveling speed	Used for approaching to the floor	0.01 to 0.15 m/s
Re-levelling speed	Used for re-levelling	0.01 to 0.15 m/s

Table 1: Speeds used by EV40-F

1.3 WARANTY INFORMATION

The Yaskawa GA700, L1000H, A1000, V1000 Technical Manuals, Quick Start Guides and Blain's EV40-F User Manual should be referred by qualified personnel, who are competent in installing, adjusting and servicing of hydraulic elevators. Blain Hydraulics assumes no liability for any personal injury, property damage, losses or claims arising from in appropriate use of the EV40-F product or incompetence of the installer. Technical Manuals can be downloaded from https://www.yaskawa.eu.com/en/service/download-center .

Warranty expires, if:

- components or spare parts that are different than the original ones are installed
- the elevator system or the EV40-F system is installed or serviced by unqualified personnel
- the EV40-F system is installed in any location without applying the elevators safety codes (EN81-20/50, ASME 17.1 or the existing local code).

2 VALVE SETTINGS AND HYDRAULIC LAYOUT

EV40 valve is a modified version of **EV** series Blain valves and therefore it can be easily utilized by people who have some experience with the **EV** valves. As shown in *Figure 2*, apart from the pressure relief valve, all up-direction adjustments and up solenoids were cancelled. This is because of the fact that flow control in up direction is performed by the **Pro-Hydro** card & **Yaskawa** drive. Adjustments in down direction however, are the same as in the **EV100** valve as shown in the hydraulic layout.

¾" EV40 *1½" EV40* *2½" EV40*

Figure 2: EV40 valve sizes

EV40 valves include the following essential features:

Simple responsive down adjustment
Temperature and pressure compensations
Built-in turbulence suppressors
Pressure gauge and shut-off cock
Self-closing manual lowering
Self-cleaning pilot line filters
Self-cleaning main line filter (Z-T)
70HRc hardened bore surfaces
100% continuous duty solenoid coils

Technical data		**¾" EV40**	**1½-2" EV40**	**2½" EV40**
Flow range	l/min (USgpm)	10-125 (2-33)	30-800 (8-212)	500-1530 (130-405)
Pressure range	bar (psi)	8-70 (73-1015)	8-70 (44-1015)	8-68 (44-986)
Burst Pressure Z	bar (psi)	575 (8340)	505 (7324)	340 (4931)
Pressure Drop P–Z	bar (psi)	6 (88) at 125 lpm	4 (58) at 800 lpm	4 (58) at 1530 lpm
Weight	kg (lbs)	5 (11)	10 (22)	14 (31)
Oil Viscosity		25-75 cSt. at 40°C (104°F)		
Max. Oil Temperature		55°C (131°F)		
Insulation Class, AC and DC		IP 68		
Coils AC	24 V/1.8 A, 42 V/1.0 A, 110 V/0.43 A, 230 V/0.18 A, 50/60 Hz			
Coils DC	12 V/2.0 A, 24 V/1.1 A, 42 V/0.5 A, 48 V/0.6 A, 80 V/0.3 A, 110 V/0.25 A, 196 V/0.14 A			

Up travel Up to 1.0m/s (197 fpm). Nominal, levelling and inspection speeds. Up start, speeds, transition times and up stop are adjusted by drive parameters.

Down travel Up to 1.0m/s (197 fpm). Nominal and levelling speeds. All down functions are smooth and adjustable.

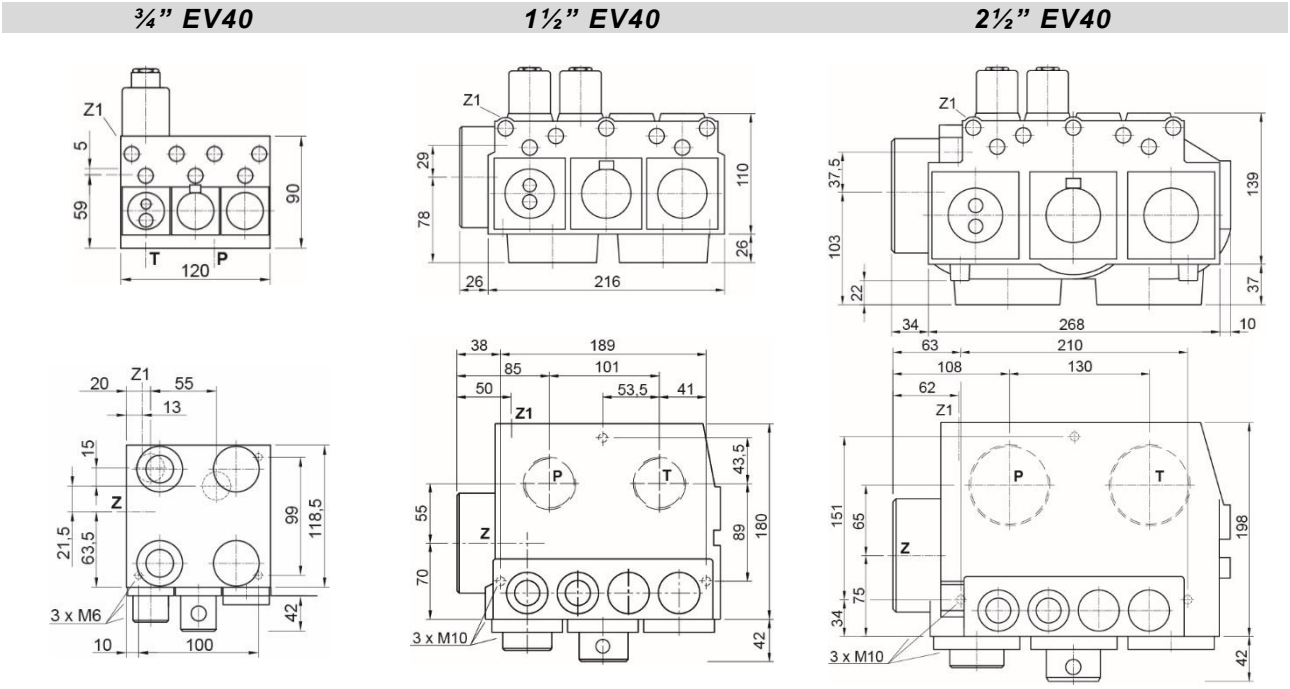


Figure 3: EV40 valve dimensions

Optional Equipment

EN	Emergency power solenoid	DH	High pressure switch
CSA	CSA solenoids	DL	Low pressure switch
KS	Slack rope valve	CX	Pressure compensated down
BV	Main shut-off valve	HP	Hand pump
HX/MX	Auxiliary down		

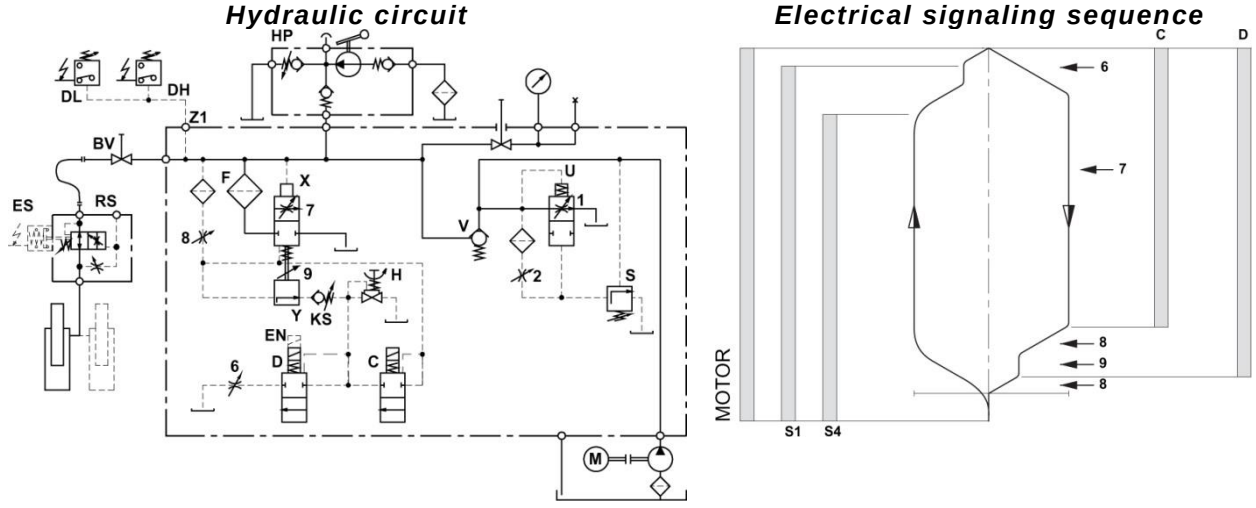


Figure 4: Hydraulic circuit and electrical signaling sequence

Control Elements				DOWN Adjustments	
C	Solenoid (Down decel.)	U	By-pass valve	6	Down acceleration
D	Solenoid (Down stop)	V	Check valve	7	Down full speed
H	Manual lowering	X	Full speed valve (Down)	8	Down deceleration
S	Relief valve	Y	Leveling valve (Down)	9	Down leveling speed
		F	Filter		

	***WARNING: Only qualified personnel should adjust or service the EV40 valve. Unauthorized manipulation may result in injury, loss of life or damage to equipment. Prior to servicing of internal parts, ensure that electrical power connection is switched off and residual pressure in the valve is reduced to zero.*** **Valves are already tested for functionality. Check electrical operation before changing drive settings. Refer to the EV40-F manual for necessary parameter settings.**

2.1 PRESSURE RELIEF VALVE ADJUSTMENTS

S Relief Valve: In (clockwise) produces a higher, out (c-clockwise) a lower maximum pressure setting. After turning out, open manual lowering **H** for an instant.

Important: When testing relief valve, do not close ball valve sharply

2.2 DOWN TRAVEL ADJUSTMENTS

Valves are already adjusted according to available data.

Check electrical operation before changing valve settings. To check the operation of the coils, remove hexagon nut (19 mm). By lifting the coil, the noticeable magnetic force of a live coil can be felt.

Nominal Settings: Adjustments **7** & **9** level with flange faces, then turn out adj. **9** for ½ a turn.
Turn in adj. **6** & **8** completely, then:
for **EV ¾":** turn out adj. **6** for 2 ½ turns and turn out adj. **8** for 1 turn.
for **EV 1 ½" – 2 ½":** turn adj. **6** for 2 to 2 ½ turns out and adj. **8** for 1 ½ turns out.

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

7. Down Speed: With coils **C** and **D** energized 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' (c-clockwise) a faster down speed.

8. Down Deceleration: When coil **C** is de-energized whilst coil **D** remains energized, the car will decelerate according to the setting of adjustment **8**. 'In' (clockwise) provides a softer deceleration, 'out' (c-clockwise) a quicker deceleration. **Attention: Do not turn adjustment 8 all the way in! Closing adjustment 8 completely (clockwise) may cause the car to fall on the buffers.**

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

Down Stop: When coil **D** is de-energized with coil **C** remaining de-energized, the car will stop according to the setting of adjustment **8.** No further adjustment is required.

KS Slack Rope Valve: Coils **C** and **D** must be de-energized! The **KS** is adjusted with a 3 mm Allan Key. Turn the screw **K** 'in' for a higher pressure setting and 'out' for a lower pressure setting. With **K** turned all the way 'in', then half a turn back out, the unloaded car should descend when Manual Lowering **H** is opened. 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.

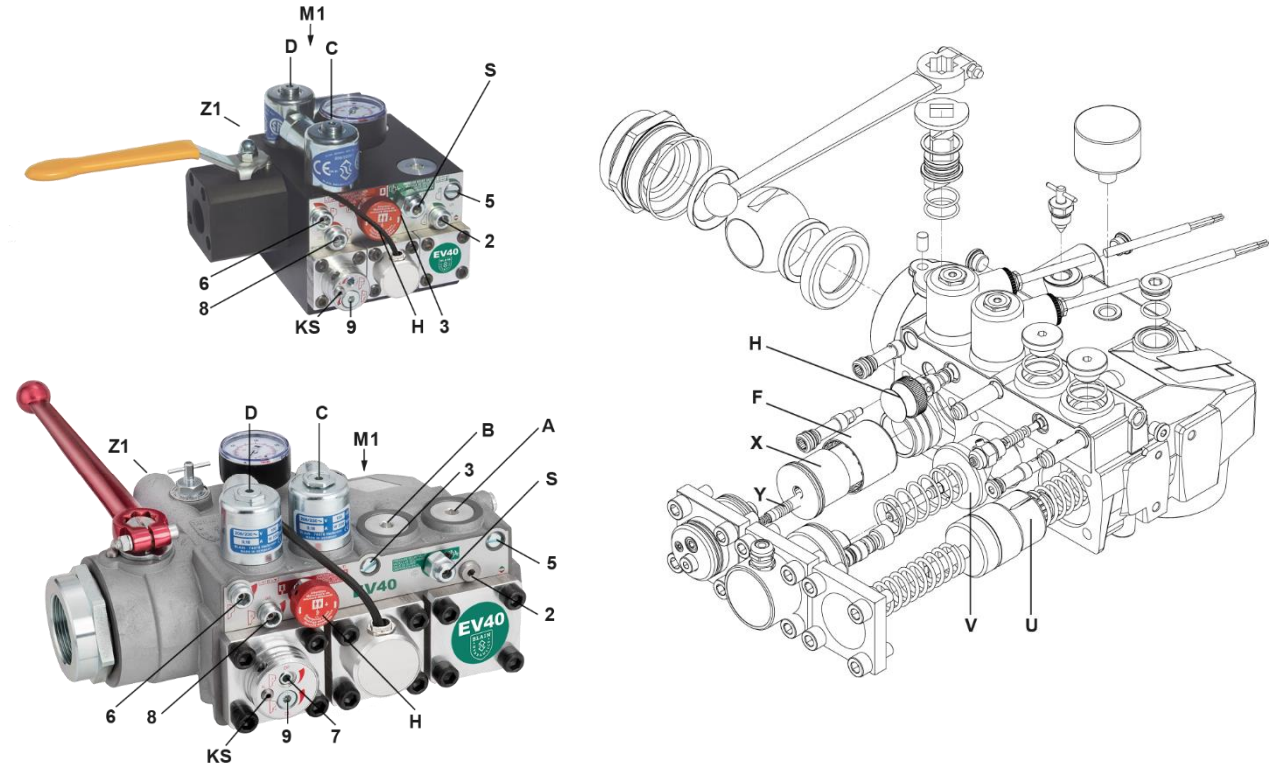


Figure 5: EV40 adjustments and explosion drawing

Control Elements		**DOWN Adjustments**
C Solenoid (Down Deceleration)	U By Pass Valve	6 Down Acceleration
D Solenoid (Down Stop)	V Check Valve	7 Down Full Speed
H Manual Lowering	X Full Speed Valve (Down)	8 Down Deceleration
S Relief Valve	Y Leveling Valve (Down)	9 Down Leveling Speed
	F Filter	

Connections	
Z1	¼" Pressure switch connection
M1	½" Test pressure gauge connection

EV4 Spare Parts List

EV4

Pos.	No.	Item
1	FS	Lock Screw - Flange
	FO	O-Ring - Flange
	1F4	Flange - By Pass
	UO	0-Ring - By Pass Valve
	U4	By Pass Valve
	UD	Noise Suppressor
	UF1	Spring - By Pass
	UF2	Spring - By Pass
	US	Dead Stop
2	2	Fixed orifice
3	3	Plug
4	4F4	Flange - Check Valve
	FO	0-Ring - Flange
	VF	Spring - Check Valve
	VO	Seal - Check Valve
	V	Check Valve
	W	Up-Levelling Valve
	WO	0-Ring - Up Levelling Valve
	VO	Seal - Check Valve
	W6	Screw - Check Valve
5	3	Plug
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	EO	0-Ring - Adjustment
	9E	Adjustment - Down Levelling
	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
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'

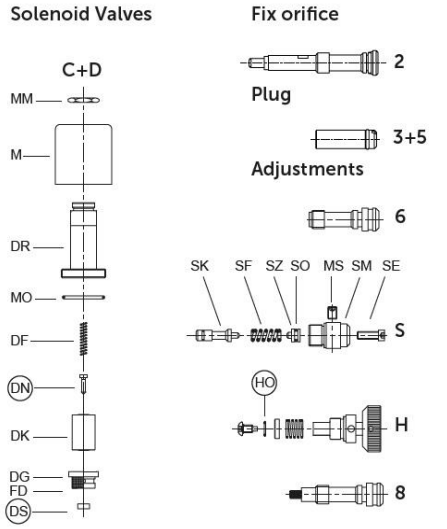
Some parts occur more than once in different positions of the valve.

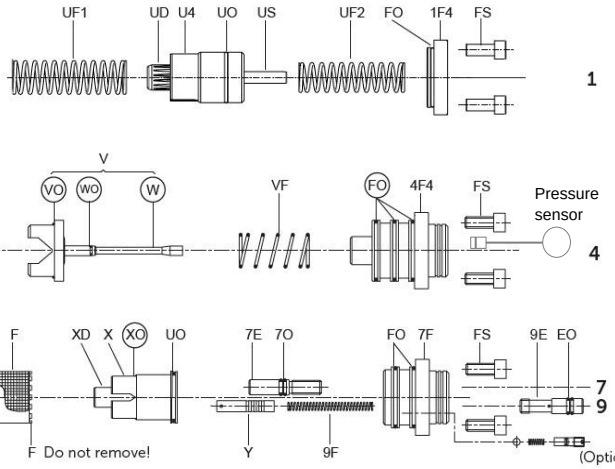
O-Ring-Size			
No.	¾"	1½"	2½"
FO	26x2P	47x2.5P	58x3P *
EO	9x2P	9x2P	9x2P
UO	26x2V	39.34x2.62V	58x3V
WO	5.28x1.78V	5.28x1.78V	5.28x1.78V
VO	23x2,5V	42x3V	60x3V **
7O	5.28x1.78P	9x2P	9x2P
XO	13x2V	30x3V	47x3V
HO	5.28x1.78V	5.28x1.78V	5.28x1.78V
SO	5.28x1.78P	5.28x1.78P	5.28x1.78P
MO	26x2P	26x2P	26x2P

* FO by 4F 2 ½" is 67x2.5P
** 90 Shore

Anillos: V = FKM - Viton
P = NBR - Perbunan

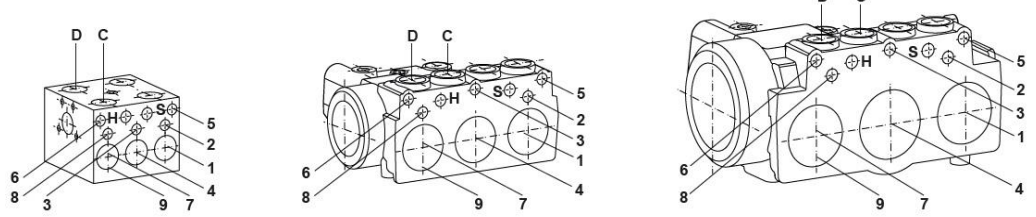
US is only for EV4 1 ½" and above sizes!



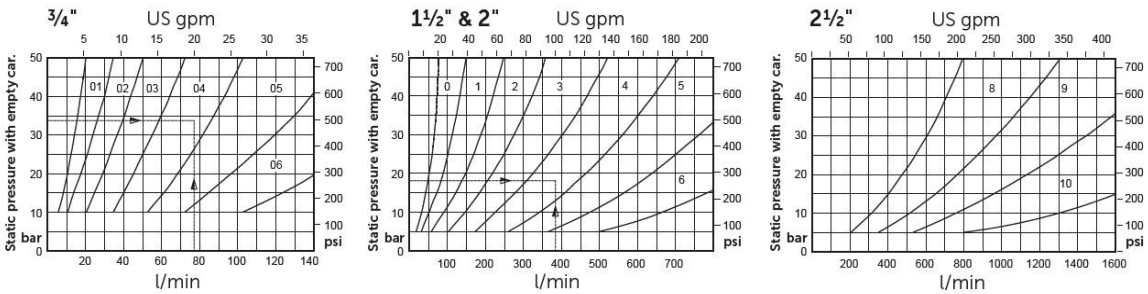


In case of internal leakage, replace and test in the following order: (DS) & (DN), (XO), (VO), (WO), (FO) + (HO).

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



Flow Guide Selection Charts



To order EV4: Size (inch), state pump flow, empty car pressure (or flow guide size) and coil voltage.
Example order: 1½"EV4, 380l/min, 18bar (empty), 110AC or 1½"EV4/4/110AC

3 ELECTRICAL INSTALLATION

	**Do not examine, connect, or disconnect wiring on an energized drive.** ***All drive connections should be carried out according to the instructions in the Technical Manuals of Yaskawa drives by qualified personnel. Technical Manuals can be downloaded from*** https://www.yaskawa.eu.com/en/service/download-center.

3.1 MAIN AND CONTROL CIRCUIT WIRING

A standard connection diagram of GA700 drive is given in Figure 7.

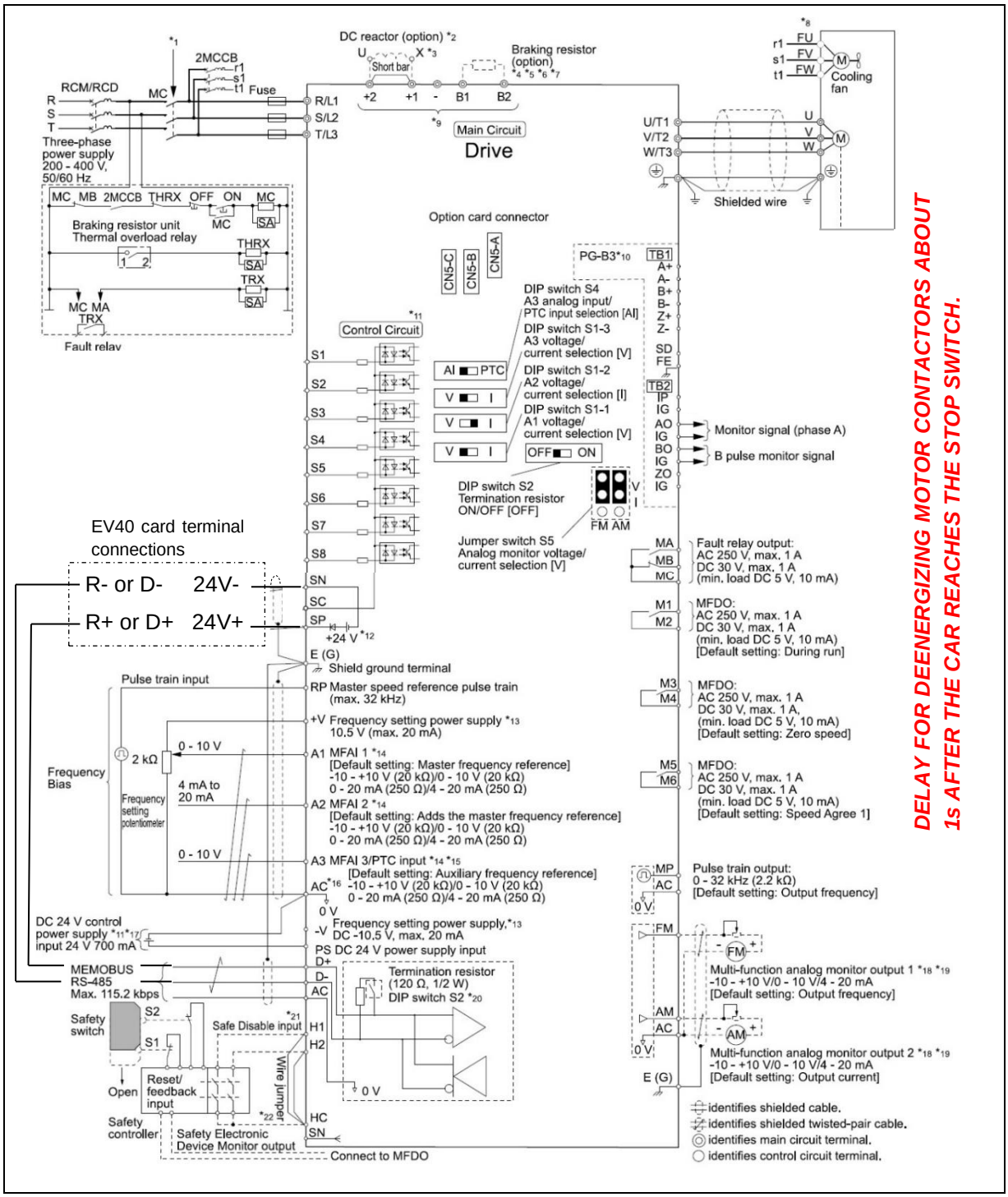


Figure 7: Wiring of GA700 drive

Figure 8 shows electrical connection diagram of L1000H drive.

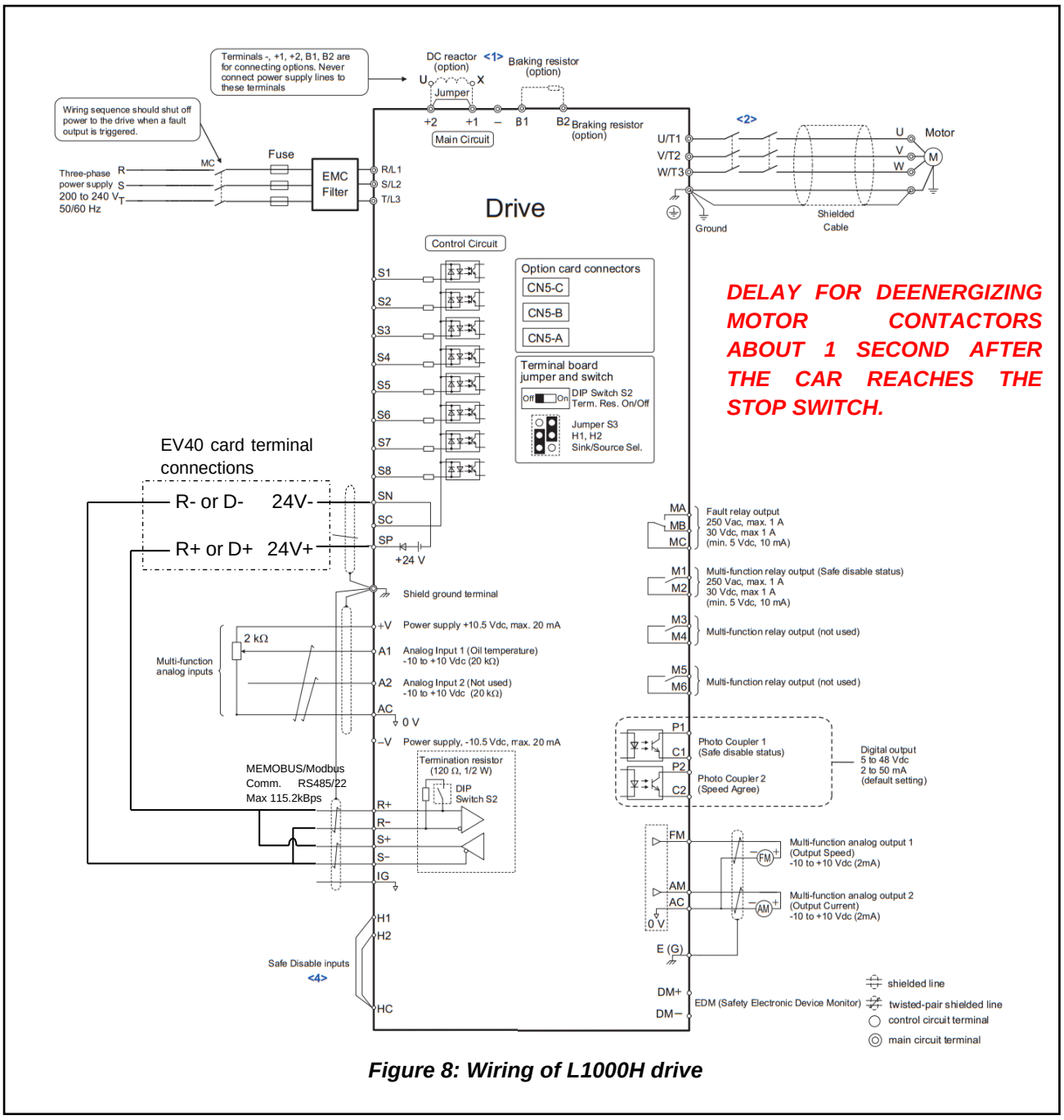


Figure 8: Wiring of L1000H drive

	***Before installing the EV40 valve make sure that motor and drive sizes match. When a smaller size drive (inverter) is used targeted up-speed may not be reached.***

3.2 TECHNICAL PROPERTIES OF PRO-HYDRO INTERFACE CARD

Technical properties of the Pro-Hydro interface card are given in Table 2.

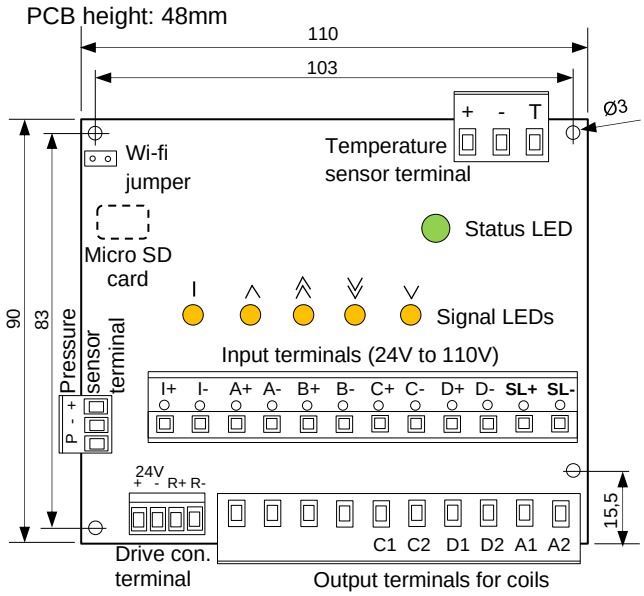


Figure 9: Pro-Hydro interface card

Pro-Hydro interface card	
Power supply	24V DC
Power consumption	3W
Ambient temperature range	15°C – 45°C
Protection class	IP00
Mounting leg length - min	30mm
Input terminal voltage range	24V to 110V
Temperature sensor	
Output signal	Digital
Supply voltage	3.3V
Pressure sensor	
Output signal	4-20mA
Supply voltage	24Vdc

Table 2: Properties of the Pro-Hydro card.

Pro-Hydro card is delivered with a Micro SD card. If the card is taken out the EV40-F system may not function.
There is 45V to 230V voltage range available for Pro-Hydro card as an option.

3.3 PRO-HYDRO INSTALLATION STEPS (SEE FIGURE 10)

1) Connect the mains power to the drive (to L1, L2 L3 terminals) - see Section 3.3.1.
2) Connect the motor output from the drive to the motor contactor in the lift controller with a shielded cable.
3) Connect the motor contactor to the electrical junction box on the power unit with a shielded cable (Pay attention to motor connection. Star→Delta switching is not necessary) – see Section 3.3.3.
4) Perform **Pro-Hydro** wiring to the **EV40** valve on power unit: Temperature & pressure sensors and output coils (C1, C2, D1, D2, A1 and A2) are connected to the **Pro-Hydro** card - see Section 3.3.4.
5) Connect **Pro-Hydro** to the Yaskawa drive - see Section 3.3.5.
6) Perform **Pro-Hydro** connection to the lift controller: Signaling coil connections (I, A, B, C, D, SL) are done as shown in Figure 10 - see Section 3.3.6.
7) When required connect **M3-M4** and **M5-M6** to the lift controller for pressure feedbacks.

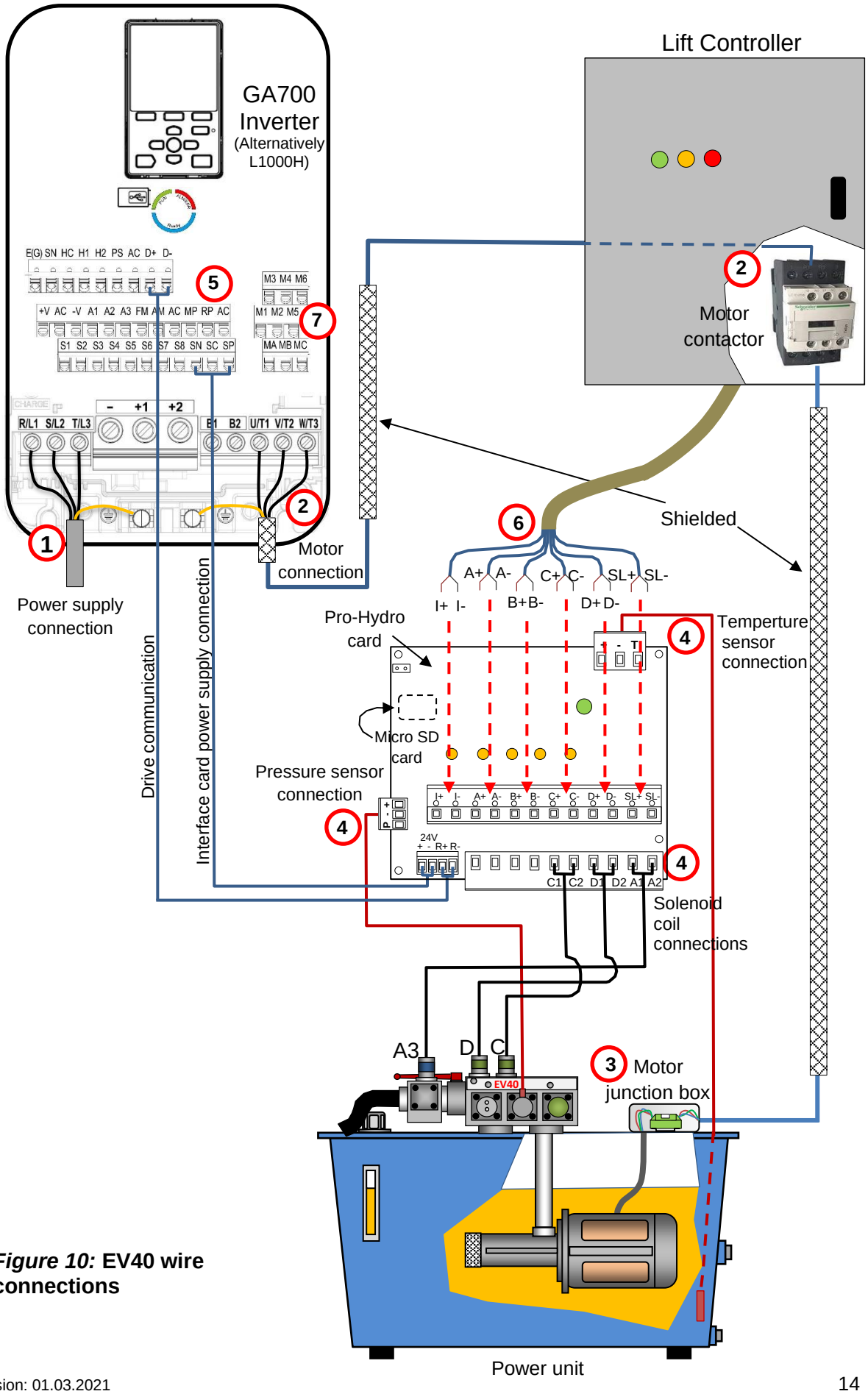
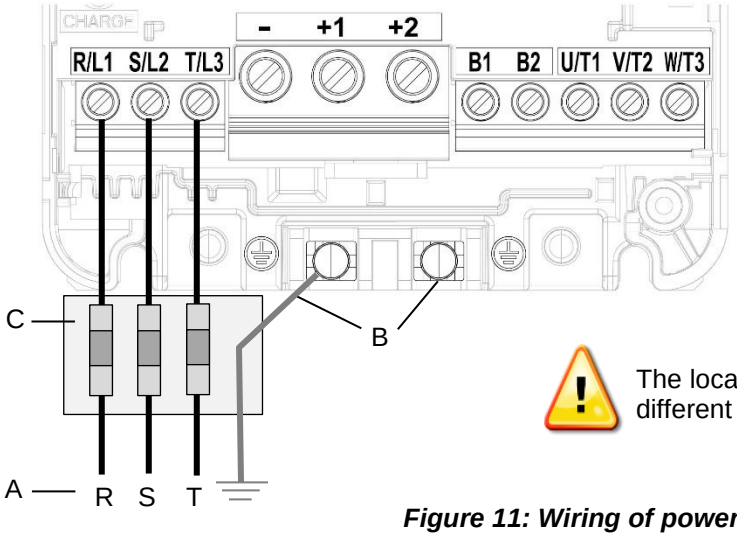


Figure 10: **EV40 wire connections**

3.3.1 CONNECTION OF THE MAIN POWER SUPPLY: Perform wire connections between the power supply and the drive as shown in Figure 11. Follow GA700/L1000H Yaskawa technical manuals as reference.



A- R/S/T input power supply
B- Ground connections
C- Input protection (Fuses or circuit breakers)

The location of terminals can be different for different drive models.

Figure 11: Wiring of power supply

3.3.2 CONNECTION OF THE MOTOR OUTPUTS TO THE MOTOR CONTACTOR: Use a shielded cable and connect the shield to the ground. Connect motor outputs (U/T1, V/T2, W/T3) from the drive to the motor contactor in the lift controller as shown in Figure 12.

3.3.3 CONNECTION OF THE MOTOR CONTACTOR TO THE ELECTRICAL JUNCTION BOX: Use a shielded cable and connect the shield to the ground. The motor connection is shown in Figure 12 for a 6-lead delta connection. Before connecting the motor to the junction box check motor name plate for correct type of connection.

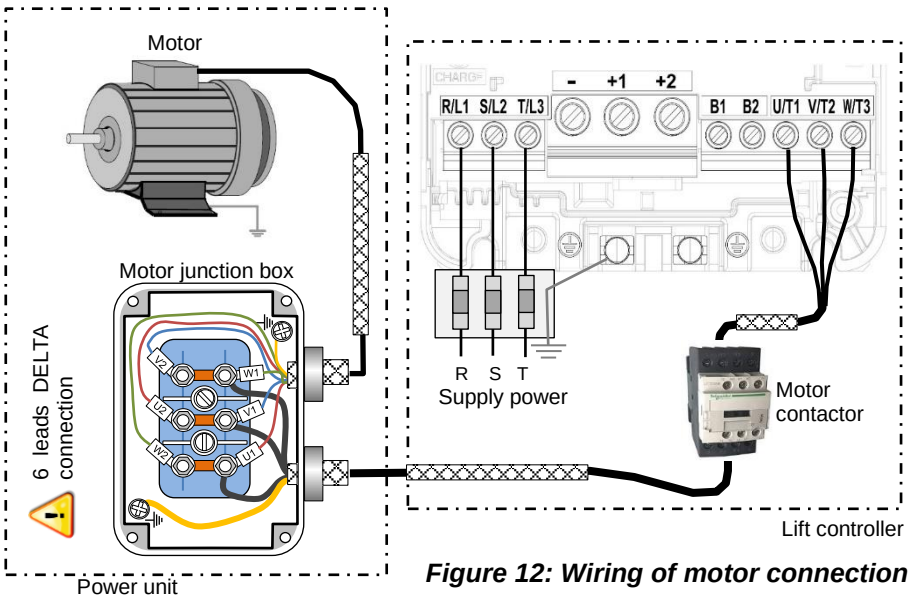


Figure 12: Wiring of motor connection

Terminals	Connection
R/L1, S/L2, T/L3	Power supply connection
U/T1, V/T2, W/T3	Motor connection
Ground	Grounding

	When contactor-less solution is used, install the inverter in a IP54 cabinet according to electrical safety circuits described in the YASKAWA installation manuals of A1000 and GA700 drives.

3.3.4 CONNECT THE PRO-HYDRO CARD TO THE POWER UNIT

3.3.4.1 Temperature sensor wiring: The top right terminals (Figure 13) are used for the temperature sensor. Temperature sensor should be dipped in the tank below the oil level and should not be in contact with any equipment and the walls of the tank.

	Temperature sensor connection	
	Terminals	Cable color
Power (+)	3.3V DC	Braun
Ground (-)	GND	White (Black)
Signal (T)	Dig. Signal	Green

3.3.4.2 Pressure sensor wiring: The down-left terminals (Figure 13) are used for the pressure sensor.

	Pressure sensor connection	
	Terminals	Cable color
Power (+)	+24VDC	Red
*Ground (-)	If exist	Black or Blue
Signal (P)	4-20mA	Yellow

3.3.4.3 Solenoid coil wiring: The coils on the EV40 valve are connected to the lower terminals as shown in Figure 13.

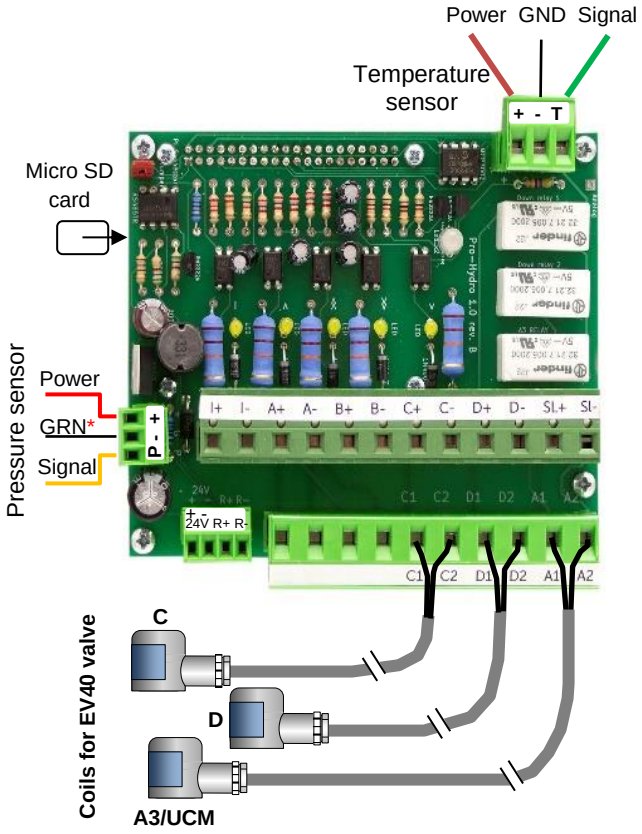


Figure 13: Pro-Hydro card wiring

If DC coils are used, connection should be done with correct polarity. C1, D1 and A1 have positive, whereas C2, D2 and A2 have negative polarity. **A1** and **A2** connections are for the **UCM** (unintended car movement-A3) coil according to EN81-20/50. It may not be required for all applications. For grounding of the Pro-Hydro-card and high voltage coils use the side connections on the PCB.

3.3.5 CONNECT THE PRO-HYDRO CARD TO THE DRIVE

Wiring is slightly different with GA700 and L1000H drives.

	WARNING: When L1000H drives with* CIMR-*LC4V## type is used, 24V DC supply power should be provided externally. Polarity of the external supply power should be cared otherwise the Pro-Hydro card can be damaged.

3.3.5.1 *Connect the Pro-Hydro card to GA700 Yaskawa drive*

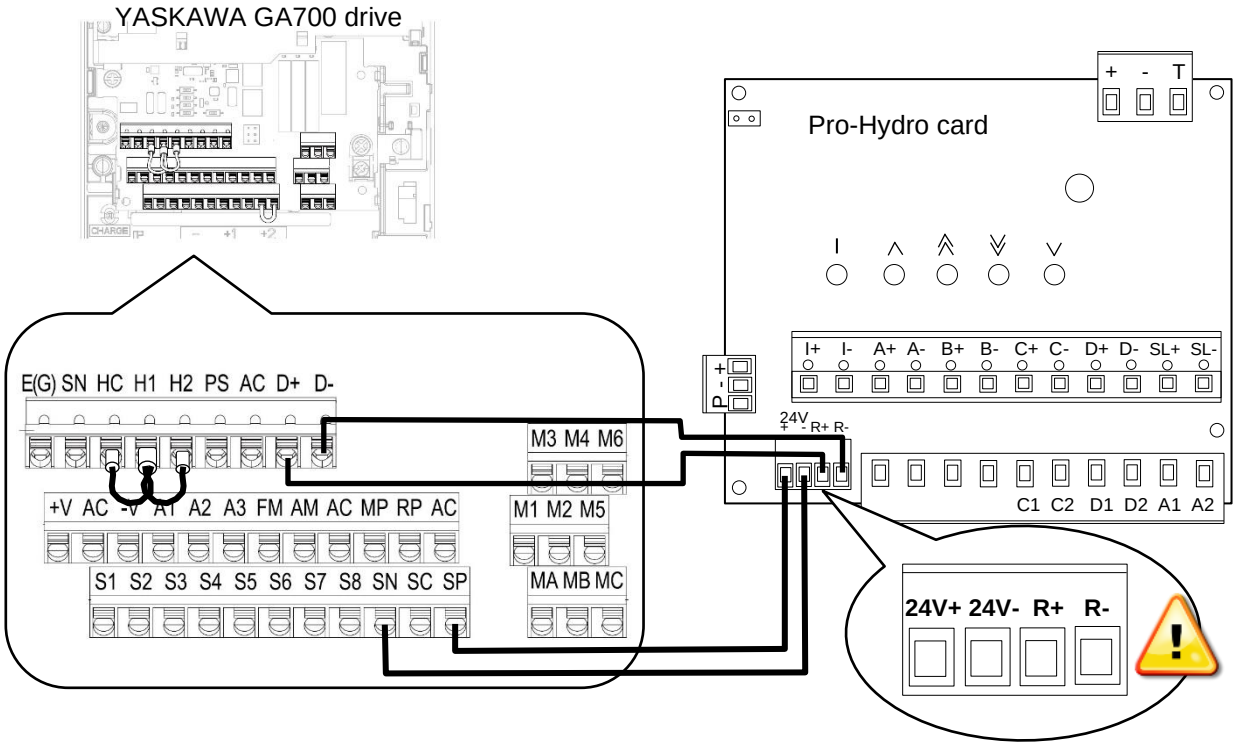


Figure 14: Wiring of GA700 drive to the Pro-Hydro card

STEPS TO FOLLOW

1- The drive is delivered with bridge connections between **SC-SP** and **HC-H1-H2.**
REMOVE the bridge between **SC** and **SP**.
KEEP the bridges amongst **HC-H1-H2** unless safe disable input (SIL3 contactor-less solution) is used.

2- Do following connections between **GA700** drive and the **Pro-Hydro** card as shown in the below Table, see Figure 14.

Drive terminal	Pro-Hydro terminal
SP ◄⟷►	24V+
SN ◄⟷►	24V-
D+ ◄⟷►	R+
D- ◄⟷►	R-

⚠	***WARNING: Incorrect wiring will damage both the drive and the Pro-Hydro card.***

3.3.5.2 Connect the Pro-Hydro card to L1000H Yaskawa drive

STEPS TO FOLLOW

1- The drive is delivered with bridge connections between **SC-SP** and **HC-H1-H2**.
REMOVE the bridge between **SC** and **SP**.
KEEP the bridges amongst **HC-H1-H2** unless safe disable input (SIL3 contactor-less solution) is used.

2- Do following connections between **L1000H** YASKAWA drive and the **Pro-Hydro** card, see Figure 15.

Drive terminal		Pro-Hydro terminal
SP	⟷	24V+
SN	⟷	24V-
R+ & S+	⟷	R+
R- & S-	⟷	R-

WARNING: Incorrect connection will damage both the drive and the Pro-Hydro card

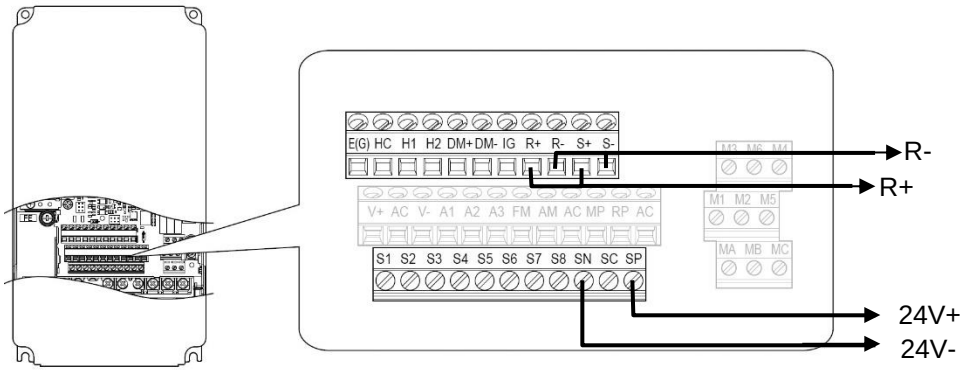


Figure 15: Wiring of L1000H (CIMR-LC4F## type) to the Pro-Hydro card

3.3.6 CONNECT THE PRO-HYDRO CARD TO THE LIFT CONTROLLER

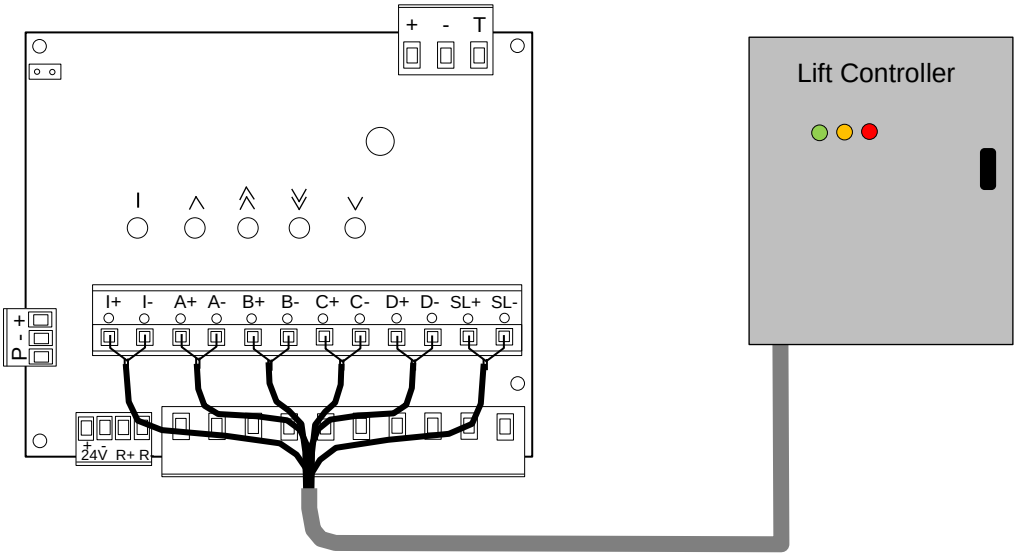


Figure 16: Wiring of the Pro-Hydro card to the lift controller

STEPS TO FOLLOW

1- Check output voltage of the lift controller for the Pro-Hydro card. Output voltage from the lift controller should match with coil voltage on the EV40 valve.
2- Check if the output voltages are AC or DC. When it is a DC voltage pay attention to polarity during wiring.
3- The Pro-Hydro board accepts input voltages between **24V** to **110V** (AC or DC). When the voltage from the lift controller is higher than **110V** contact Blain Hydraulics for a special card.
4- SL+/SL- are connected in case an A3/UCM valve is used. Inspection (I+/I-) or/and SL+/SL- signals from the lift controller may have a lower voltage than **24V**. In this case use a relay circuitry to decrease the input voltage to the required level.
5- See below table and Figure 16 for wiring.

SIGNALING SEQUENCES	UP			DOWN			
Travels	**A** (A+/A-)	**B** (B+/B-)	**I** (I+/I-)	**D** (D+/D-)	**C** (C+/C-)	**SL** SL+/SL-	**I** (I+/I-)
Normal run (accel. & full speed)	on	on	off	on	on	on	off
Deceleration to levelling speed	on	off	off	on	off	on	off
Stop at floor	off(1)	off	off	off	off	off	off
Re-levelling	on	off	off	on	off	on	off
Inspection run	on	off	on	on	off	on	on
Input signal voltage should match with the coil voltage and be between 24V – 110V							
(1) To have a soft stop motor should run about 1 second longer after A signal is removed							

3.4 DRIVE PREPARATION

Perform followings to prepare the drive for the **EV40-F** system.

3.4.1 ENABLING INTERNAL EMC FILTER

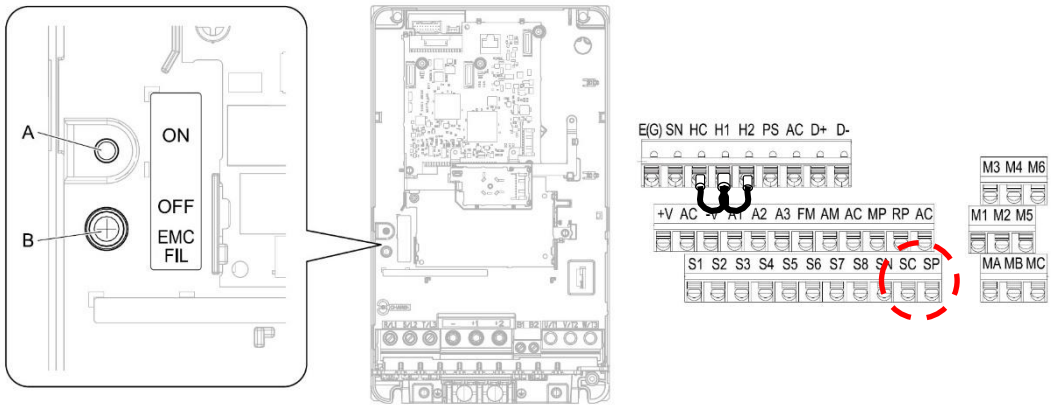


Figure 17: Enabling inbuilt EMC filter and terminal bridges.

Move the switch screw from position **B** to position **A** (in the hole) to turn ON the inbuilt EMC filter. If the EMC filter switch screw is lost, refer to GA700 Technical Manual pp.251 to find out the type of correct replacement screw (See Figure 17).

	***WARNING: Electrical Shock Hazard. Make sure that the power to the drive is OFF and the CHARGE LED light is OFF before moving the EMC filter screw. Failure to obey could cause death or serious injury. Refer to GA700 YASKAWA Technical manual.***

3.4.2 CHECKING TERMINAL BRIDGES: MAKE SURE THAT THE CONNECTION BRIDGE BETWEEN TERMINAL SP & SC IS REMOVED AND THE CONNECTION BRIDGES AMONGST HC-H1-H2 REMAINS INTACT (SEE FIGURE 17).

3.4.3 INITIAL DRIVE SETTINGS: AFTER COMPLETING ALL WIRING CORRECTLY POWER THE DRIVE AND DO THE FOLLOWINGS: -

- Make sure that **A1-01** (Access level selection) is set to **2** (Advance level)
- Verify **H5-01** (Modbus communication address) is set to "**1F**"
- Change **H5-02** (Communication speed) to "**8**" (115.2kbps)
- Power the drive off and on again to activate the setting (wait 3 minutes before repowering). This will allow the **Pro-Hydro** card to communicate with the drive
- Verify that 10 seconds after re-powering the drive the diagnostic LED on the **Pro-Hydro** card starts blinking green at 1 second intervals – See Section 5 when LED blinks RED.

3.5 CONNECTING YOUR DEVICE TO THE PRO-HYDRO CARD

System setup is done by using a mobile phone through a web-base interface, which can be accessed via inbuilt Wi-Fi hotspot.

3.5.1 SWITCHING WI-FI ON AND OFF

There is a **Wi-Fi** jumper placed on the top-left corner of the Pro-Hydro card (See Figure 18).
Wi-Fi is **DISABLED** when the jumper is connecting the two pins.
Wi-Fi is **ENABLED** when the two pins are not connected.

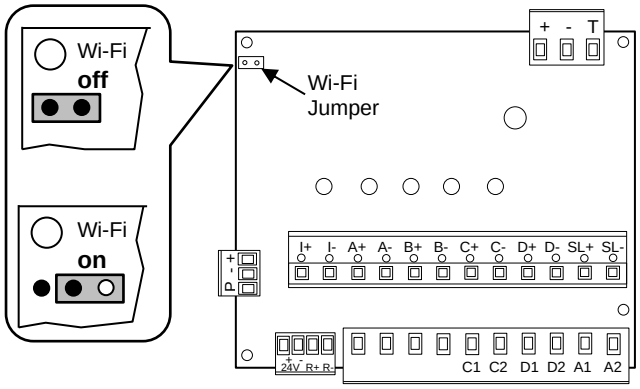


Figure 18: Wi-Fi connection

	***WARNING: Do not leave the Wi-Fi enabled in case of unauthorized access.***

3.5.2 WEB INTERFACE

To connect your device (mobile phone) to the Pro-Hydro card use following name of Wi-Fi network (SSID) and password:

Wi-Fi network (SSID)	Pro-Hydro
Password	Pro-Hydro

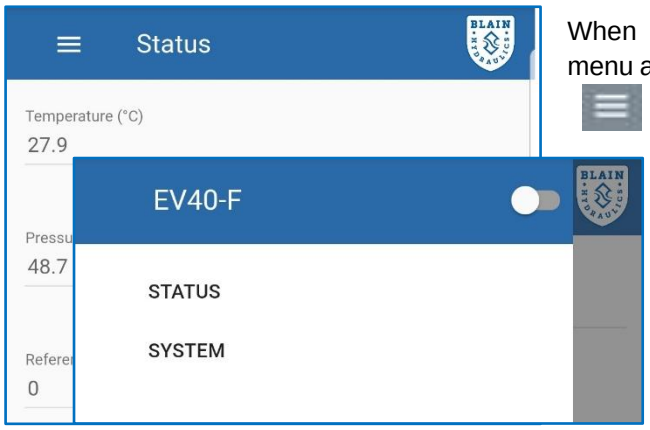
or alternatively you can scan the left-hand QR code on the drive. Type http://172.27.1.1 in the address bar of your browser or scan the right-hand QR code on the drive.

WARNING: On some mobile devices, the 3G/4G cellular network connection must be disabled before going to the URL.

4 ACCESSING PRO-HYDRO CARD

After enabling **Wi-Fi** connection between the **Pro-Hydro** card and a smart phone, system settings can be done using the menus below.

4.1 MAIN MENU

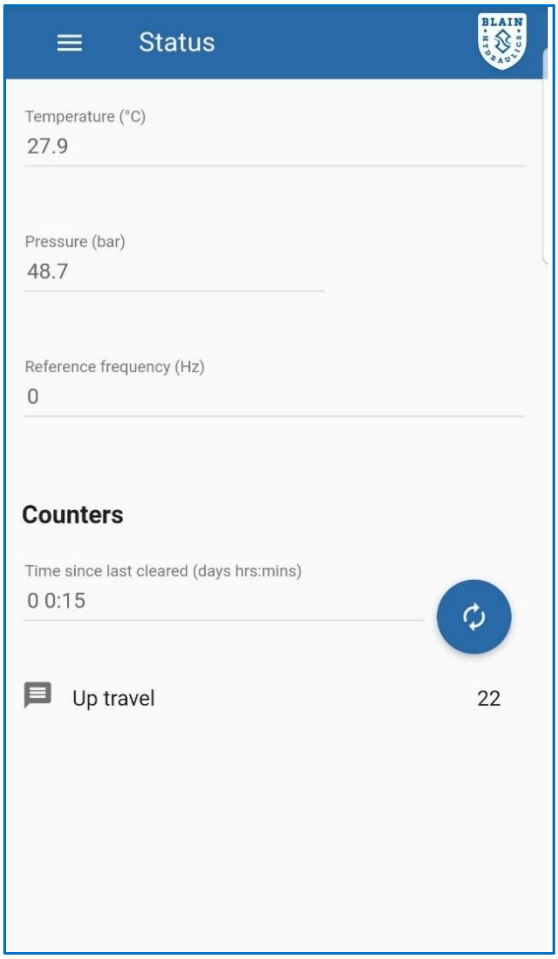


When **Wi-Fi** connection is done successfully, STATUS menu appears on the smart phone. Use the top-left indicator to open the main menu.

The Main menu allows the user to access **STATUS** and **SYSTEM** sub-menus without needing a password. A switch on the top-right corner is used for lift data entries.

Figure 19: Main menu

4.1.1 STATUS



The **STATUS** screen shows the current state of the system. Status menu consists of the followings:

Temperature, Pressure & Output Frequency: Oil temperature, system pressure readings and output frequency of the drive are shown in the upper part.

Counters: It shows the actual time of travels. It can be reset by pressing the button on the right.

Fault indications: Warnings and errors are shown at the bottom part of **STATUS**. Keys to the fault messages are given below:

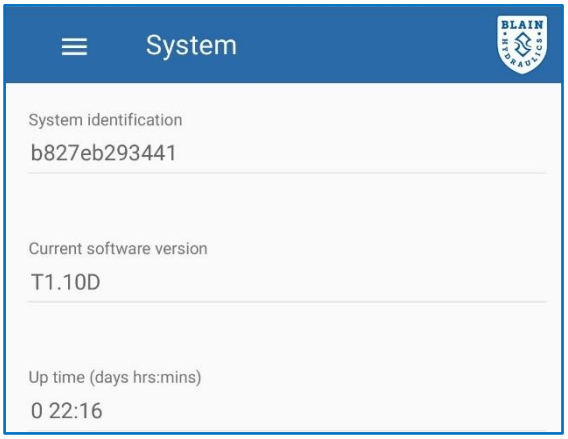
Messages: General status information, no further action is needed.

Warnings: Indicates problematic situations that may need further investigation.

Errors: Errors that prevent lift from normal operation. Errors need to be corrected to run the lift. See section **5** for the most common error messages and remedies.

Use the top-left indicator to swap amongst menus.

Figure 20: Status menu



4.1.2 SYSTEM

Information about the system identification, current software version and up-travel time are shown here. Language and unit selections can also be done in the system menu (see Section 4.3). The system menu also allows the user to upload a pre-defined lift configuration or updated firmware, at a higher access level, see Section 4.12.

Figure 21: System menu

4.2 ACCESSING SETUP MENUS

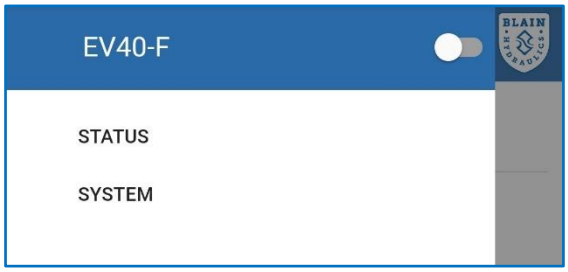
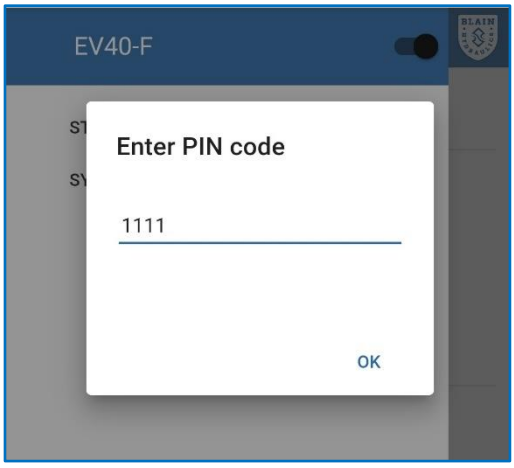
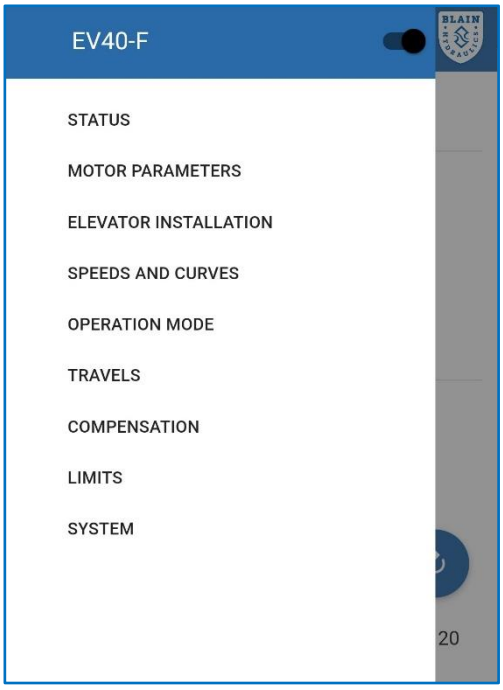


Figure 22: Accessing setup menus





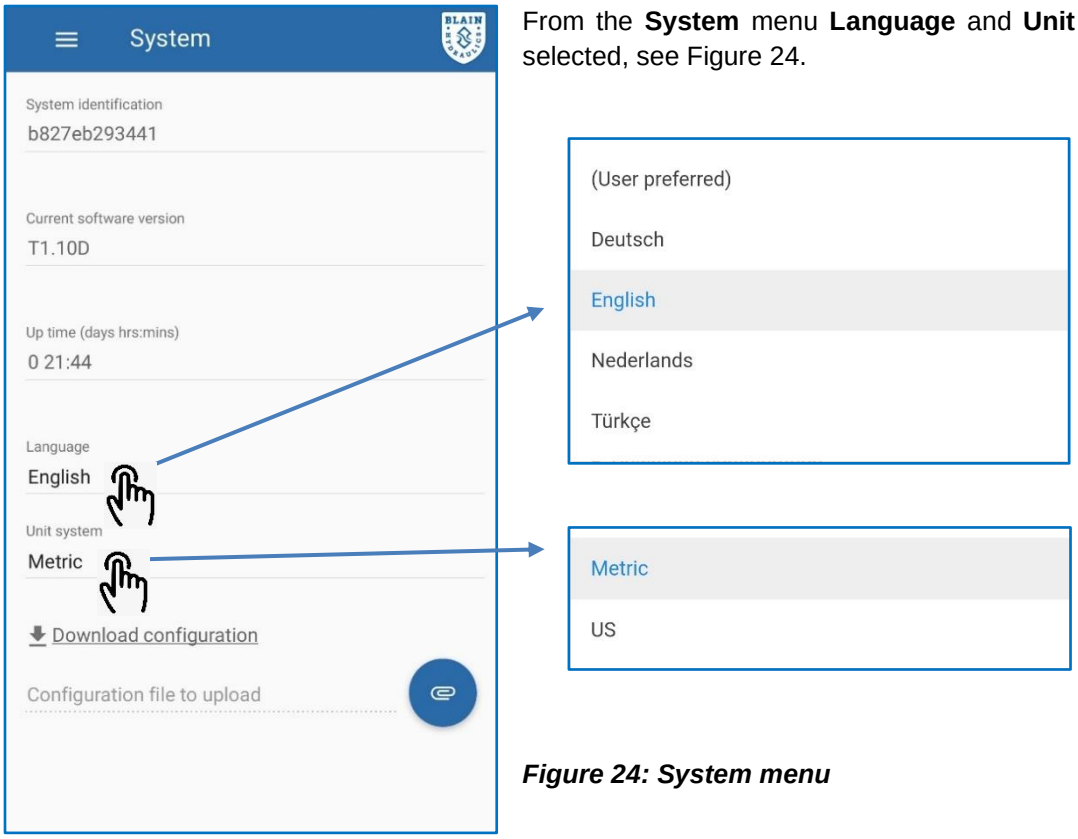
To access setup menus, turn the switch on at the top-left corner. A new screen will appear to input access password. Enter the user access code **1111** and press "**OK**" to access setup menus.

After entering the access code, setup sub-menus appear, as shown in Figure 23. One can now surf amongst the menus to enter data. Use the top-left indicator to swap amongst menus.

Figure 23: Setup sub-menus

4.3 LANGUAGE AND UNIT SETTINGS

After accessing the setup level necessary settings can be done using the menus below.



From the **System** menu **Language** and **Unit system** can be selected, see Figure 24.

Figure 24: System menu

4.4 MOTOR PARAMETERS

Motor parameters must be set before the elevator can run. Obtain correct motor parameters from the motor name plate or from the technical data sheets of the lift.

Motor voltage: Must be covered by the drive operation range.
Motor base frequency: This is the frequency that motor is designed for.
Motor rated power: This needs to be input in kW
Motor nominal current: The rated current of the motor in Ampere.
Motor rated speed: It is input in rotation per minute (rpm). 2 pole 50Hz and 60Hz motors give around 2800 and 3400rpm respectively whereas, 4 pole motors give halve of those.

Press SAVE button to save entries. A message will appear that the parameters have been saved.

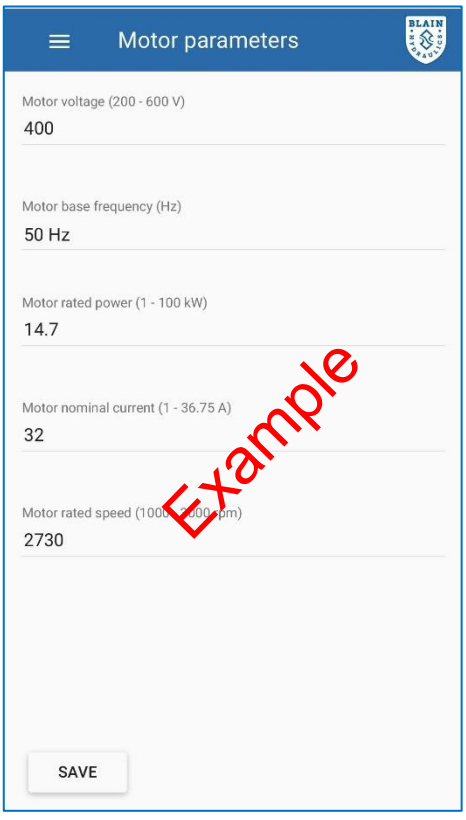


Figure 25: Motor parameters

4.5 ELEVATOR INSTALLATION

WARNING: Elevator parameters must be set before the elevator can run.

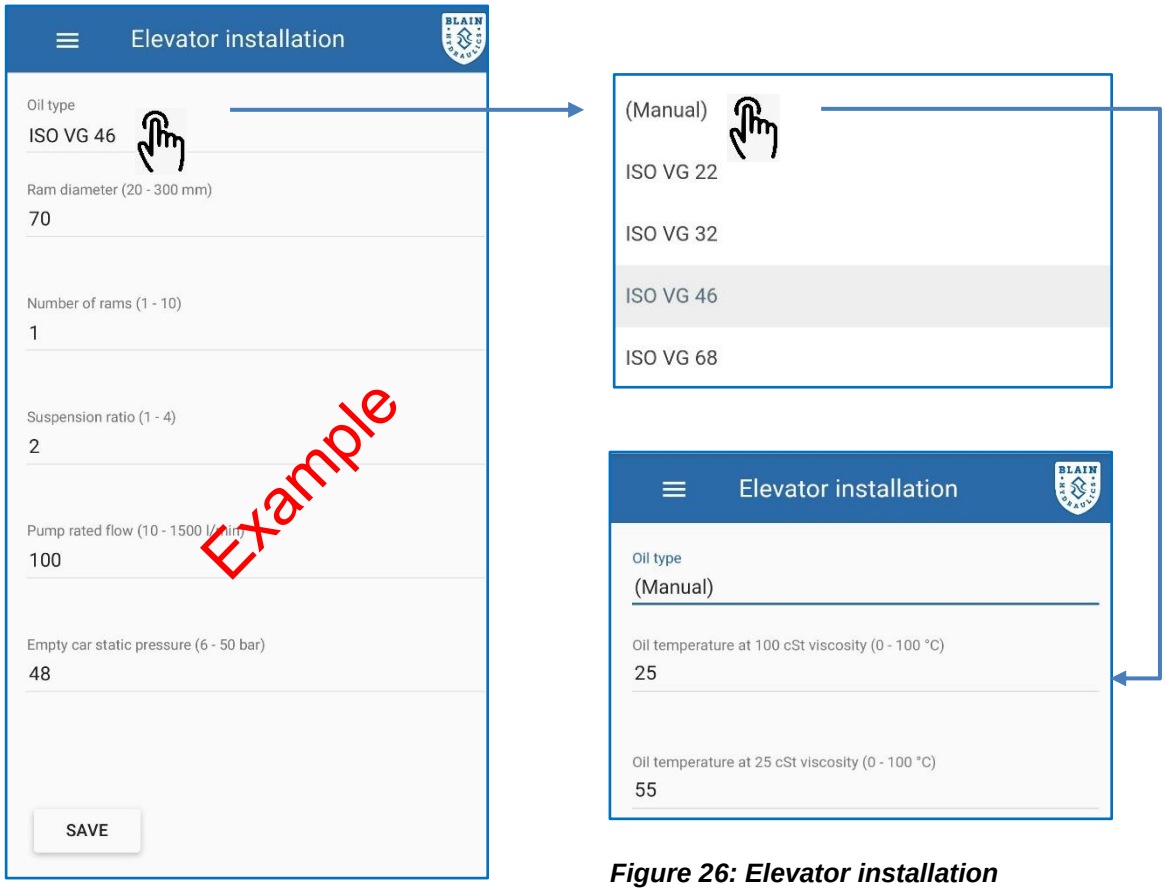


Figure 26: Elevator installation

Oil type indicates the oil kind that is used in the hydraulic tank. By default, ISO VG46 is selected. When oil type is different, selection of the oil type can be done from the pull-down menu (see Figure 26). Using a special oil is also possible by choosing the "**Manual**" option. In this case, parameters for the special oil should be typed in (Oil temperature at 100cSt viscosity and Oil temperature at 25cSt viscosity).

Ram diameter is the diameter of the ram or rams used in hydraulic cylinders. In case of a telescopic cylinder, the effective ram diameter should be typed in. Formulation for calculating the effective ram diameter is shown below: -

Number of telescopic stages: n
Ram diameter (1st stage) : D1
Ram diameter (2nd stage) : D2
Ram diameter (n th stage) : Dn

$$\text{Effective ram diameter} = \sqrt{\frac{D1^2 + D2^2 + \cdots + Dn^2}{n}}$$

Number of cylinders indicates the number of cylinders that are used to lift the car.

Suspension ratio indicates the ratio of the car speed to the ram speed. Type in 1 for direct (1:1) applications and 2 for indirect (2:1) applications.

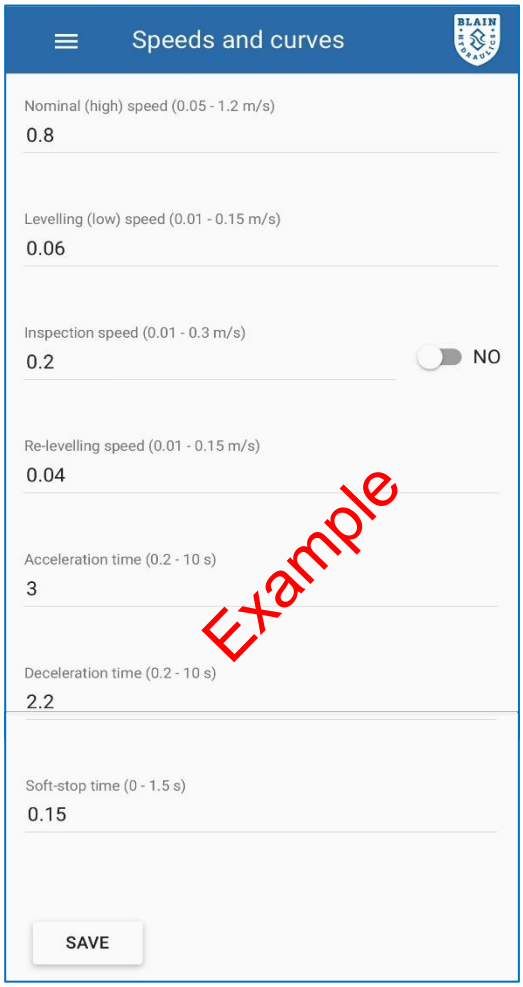
Pump flow rate is the rated pump flow as specified on the name-plate of the power unit.

Empty car static pressure is the pressure that the system manometer shows with empty car. It can also be determined from the pressure reading on the status page while the elevator is empty. Read the pressure when the lift car is at the bottom floor and subtract 3 bar.

After inputting data press SAVE to save the parameters. A message will appear that the parameters have been successfully stored.

4.6 SPEEDS AND CURVES

WARNING: *The speeds and curves parameters must be set before the elevator can run.*



Nominal speed is the contracted elevator speed.
Levelling speed is the slow speed for approaching the stop switch at floor level.
Inspection speed is used during installation and inspection of the elevator. Depending on the signal input to I+/I-, the inspection travel can be activated in NO (Normally open) or NC (Normally Closed) modes. NO: I+/I- doesn't contain voltage or wires are not connected (LED on the card is **off**). NC: I+/I- contains voltage (LED on the card is **on**).
Acceleration time is the time necessary to accelerate the car to nominal speed.
Deceleration time is the time necessary to decelerate the car from nominal to levelling speed.
Soft stop time is the time necessary to decelerate from levelling speed to zero. When there is no contactor delay time provided by the lift controller, then Soft-stop time should be set to zero.
Re-levelling speed is the speed set for re-levelling.

After inputting data press SAVE to save the parameters. A message will appear that the parameters have been successfully stored.

Figure 27: Speed & Curves

4.7 TEST TRAVELS

	***WARNING: Make sure that no one is in the lift during test travels.***

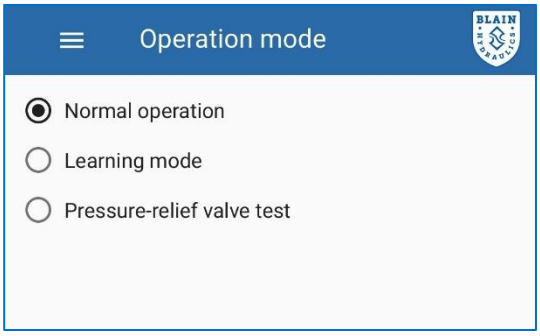
When all parameters are set and safeties are tested, a test drive can be carried out:

1. Let the elevator move one floor upwards. Check acceleration, deceleration and levelling times and then send it one floor downwards.
   The control valve is set at the factory. In case the downward travel doesn't go smoothly, see Section 2.2 to adjust the control valve. Alternatively, check Section 5.2.2 "Down Travel Trouble shooting".

2. Repeat up and down test travels approximately 4-5 times to make sure that there is no air in the hydraulic system. When necessary relieve air in the cylinder.

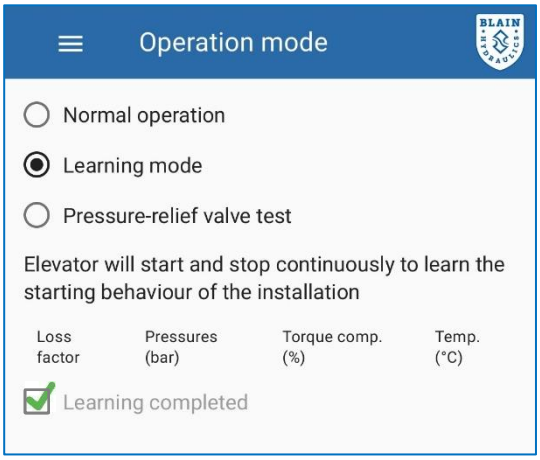
To optimize further the smoothness of upwards travel, proceed to the Section 4.8, the "Learning mode".

4.8 OPERATION MODE



Normal operation

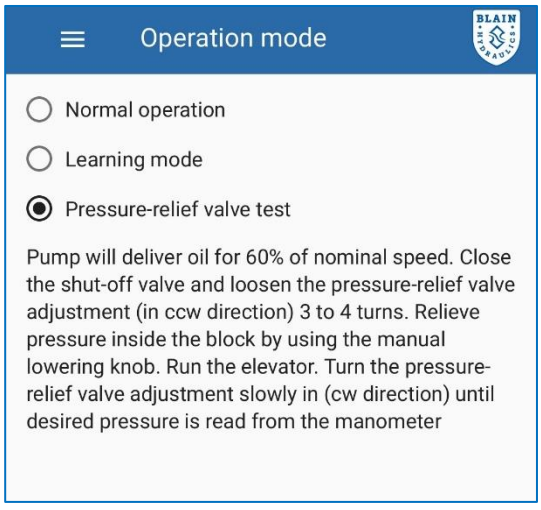
The elevator runs at **Normal operation** mode, which is the default selection.



Learning mode

"Learning mode" updates the system about conditions of the physical installation and the pump performance. Learning operation should be done after the elevator installation is completed. Before performing "Learning mode" operation let the elevator make a few normal travels at nominal speed. Be sure that the oil temperature is above 22°C (72°F). Below 22°C (72°F) the learning mode button is disabled however, manual adjustment is possible.

Make sure that the lift controller is able to make a normal run without interruption. The software will start and stop the lift car several times during learning. After a few short travels, runs will stop and software will show "**Learning completed**" (a check sign in the box). It will switch to **Normal operation** automatically.
When the run is interrupted, mode will return to "Normal operation". In this case the app shows "**learning drive NOT completed successfully**".



Pressure relief valve test

Select this to adjust the pressure relief valve. The software will generate 60% of the nominal speed in an upwards run. Close the shut-off valve and loosen the pressure relief valve adjustment in ccw direction 3 to 4 turns. Open the manual lowering to relieve pressure inside the valve. Run the elevator. Turn the pressure relief valve adjustment slowly in (cw direction) until desired pressure is read from the manometer. When the run is stopped or interrupted, mode will return to "Normal operation".

Figure 28: Operation mode

4.9 TRAVELS

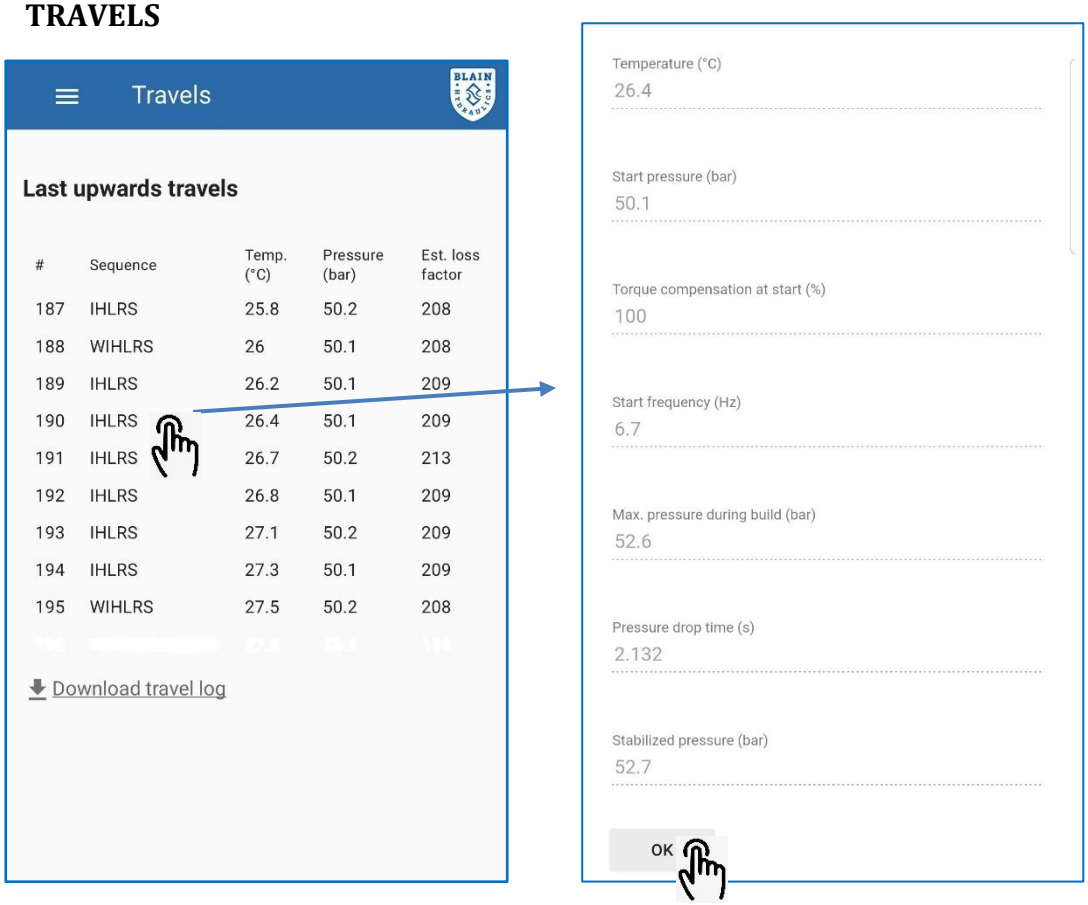
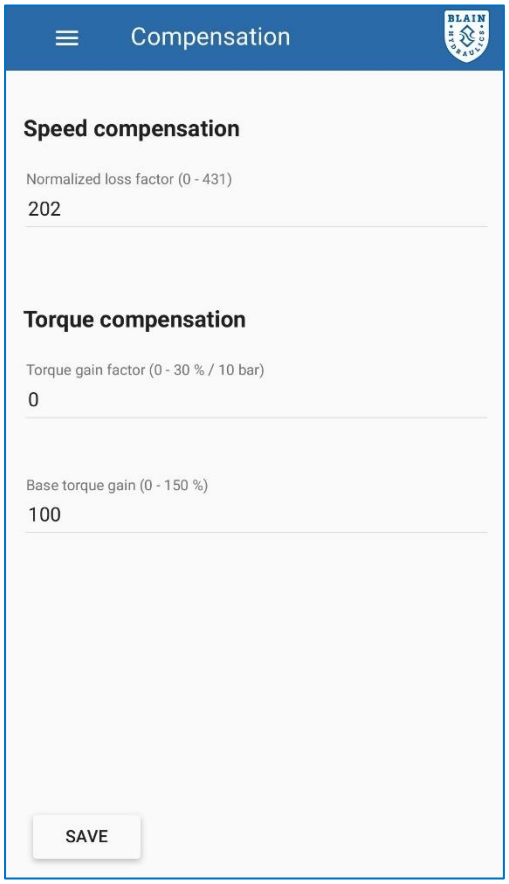


Figure 29: Travels menu

This screen shows the latest upward rides. The last run is displayed on the bottom line. By clicking on a ride line additional information about the ride is shown in a pop-up. Using the "**Download travel log**" link it is possible to download the travel log details in CSV format for off-line analysis. An explanation for the short-codes for travels is given below.

#	Indicates the sequence of the ride. Rides are numbered as the system is started first and this value contains the rides sequence number.	
Sequence	Indicates the ride event sequence. Every character represents a specific state during a ride.	
	W	Indicates waiting for high signal. After the low input signal comes up, the system waits a specific time for the high signal to come up. This is to differentiate between a re-levelling action and a normal upwards travel.
	I	Indicates the initial build-up phase. After low and high signals come up, the system builds up the pressure to make the elevator take-off.
	H	Indicates acceleration to high speed.
	L	Indicates deceleration to low (or levelling) speed.
	S	Indicates a stop. Should always be at the end of the sequence.
	R	Indicates travel at levelling speed.
	This means that an IHLRS or WIHLRS are normal upwards travels, WLS sequences are normal re-levels. Any up-travel sequence without R (such as IHLS) means, that the car decelerated directly to the stop without reaching levelling. Any other sequence indicates an abnormal sequence of events because of unexpected signal drops, etc.	
Temp. (°C)	Indicates the temperature at the start of the ride.	
Pressure (bar)	Indicates the start pressure during the ride and is an indication of the load.	
Est. loss factor	Is the estimated speed loss factor (see the Compensation menu)	

4.10 COMPENSATION



The meaning of the compensation parameters is described below. When necessary, check and adjust the appropriate values:

- **Normalized loss factor** is used for speed compensation. It determines the frequency increase per bar for a normalized thickness of the oil. It is advisable to increase the value if the levelling speed is too low. Increments of 10 may be necessary especially with high loads. Decrease the value accordingly if the levelling speed is too high.
- **Torque gain factor** gives the number of gain per 10 bar added to the adjusted value at the base torque gain. Adjusted value must be 0 when base torque gain is 100%.
- **Base torque gain** Influences the amount of current the drive provides at low frequencies. Normally this value should be 100%. For more details, see information section at the end of the page.

Press SAVE to save the parameters. A message will appear that the parameters have been successfully stored.

Figure 30: Compensation menu

Additional Information on compensation

Hydraulic lift installations controlled via inverters faces some difficulties:

a) Pump losses vary depending on oil viscosity (oil temperature) and load in the car (pressure). Viscosity characteristics of oil vary by the type of oil used in the installation. Speed compensation is needed to attain the same ride characteristics irrespective of the elevator load and oil temperature.
b) A drive/inverter makes it possible to vary the speed of the motor/pump combination. However, comfort is also related to the torque applied at varying speeds. This means that additional torque compensation is needed to get sufficient torque at low speeds.
c) In some cases, default values for compensation may not be appropriate which is indicated by the following problems:

- The nominal and mostly the levelling speed do not match with the actual speeds.
- The take-off during the build-up phase is bumpy.

d) **Speed compensation** is needed depending on the pump quality. Good pumps normally require less compensation (a lower amount of speed compensation). Incorrect speed compensation may result in improper speeds, especially at higher loads.
e) **Torque compensation** is needed depending on the inverter type. Assumed that speed compensation is correct, the following situations indicate that a change to the torque compensation is needed: -

- Torque compensation may be too low if the elevator doesn't start moving during the pressure build-up phase, but during the acceleration phase. This results in jumpy starts, especially at higher loads.
- Torque compensation may be too low if the cabin is wobbly when running at levelling speed and with heavy load.
- Torque compensation may be too high if the cabin resonates at levelling speed.

4.11 LIMITS

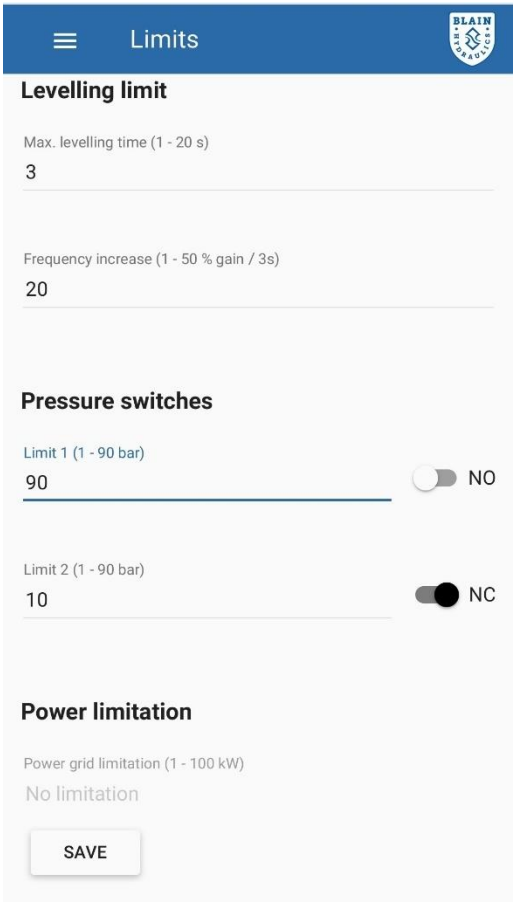


Figure 31: Limits menu

Check and adjust the appropriate values:

Levelling limit determines the time for maximum levelling travel. When **Levelling limit** is exceeded, motor frequency percentage increases in the next 3 seconds up to the value defined by "**Frequency increase**" (section 6.3.2).

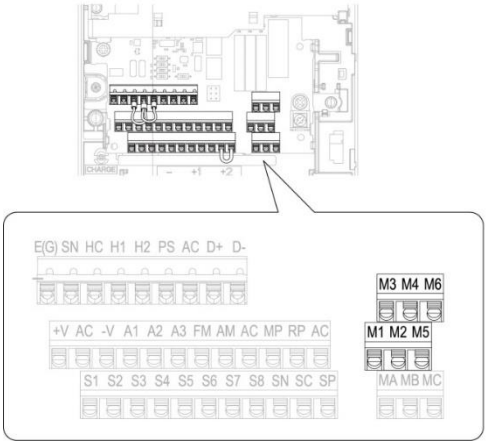
Pressure switches allow user to signal the lift controller when pressure limits are exceeded. **Limit 1** and **Limit 2** can be used for those purposes between 1bar to 90bar.
NO/NC indicates whether the switches are normally open (NO) or normally closed (NC). With the **NO**-switch the over- pressure and with the **NC**-switch the under-pressure conditions can be detected. For L1000H and GA700 drives M3-M4 and M5-M6 terminals are used for pressure switching.

In case the switches are not used, leave their values to 90bar and normally open (NO). In this way switch activation is prevented.

Power limitation is used when there is supply power limitation. When used, the **EV40-F** system will determine the nominal speed according to the available supply power from the grid – see Section 6.3.1. Number of power limitations occurred is also listed in the status menu.

After setting the parameters, press to SAVE activate them.

Additional information



The limits page contains advanced settings which may or may not be used. It contains settings for the following features:

1- Alarm signalling.
2- Power grid limitation.

1. Alarm signalling

The system has the option to signal overload, overpressure and low-pressure situations via outputs from the drive. This can be used to close or open a circuit, for example to activate an audible signal in the cabin when an overload occurs. The outputs are present as M3-M4 and M5-M6 on the drive terminals and can be configured as normally open or normally closed.

Note that the allowed voltage and current for the outputs are restricted to 30 VDC / 250 VAC / 1 A. See the inverter technical manual for more details.

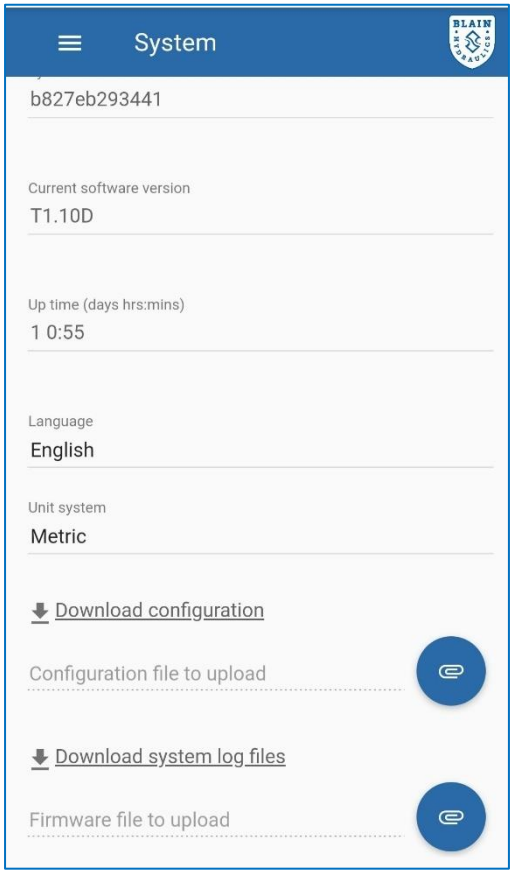
2. Power grid limitation – see Section 6.3.1.

In case of installations where the power grid connection has insufficient capacity to operate the maximum power drawn by the drive, it is possible to limit the power drawn from the grid by decreasing the nominal speed. The system is able to calculate the expected power by the drive during the build-up phase and can decrease the speed in order to satisfy the available supply power condition, if needed.

Note that this calculation is approximate. Although the system tries to keep the drawn power below the limit, the actual drawn power may fluctuate because of the logic in the drive itself.

When power limitation is used, elevator speed will be less than the nominal speed. This would normally cause longer levelling time. However, travel times have been programmed so levelling times remain the same.

4.12 SYSTEM

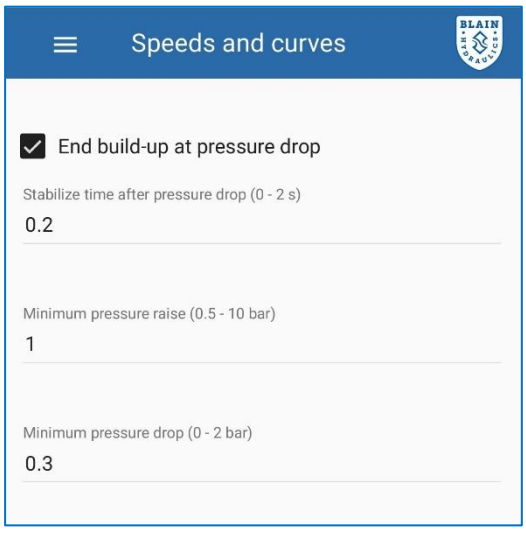


The system page shows information about system identification, software version and the total up-time. Furthermore, it allows to the download of the system logs or configuration parameters for analysis.

***NOTE:** It is only possible to upload a pre-defined configuration or firmware when the advanced mode password is given in the status field.*

Figure 32: System menu

4.13 ADVANCE SETTINGS



When the elevator has a double, wavy or uncomfortable start some of the internal parameters might be fine-tuned. In order to do that, input the access password for the technician level.

4252 (see section 4.1).

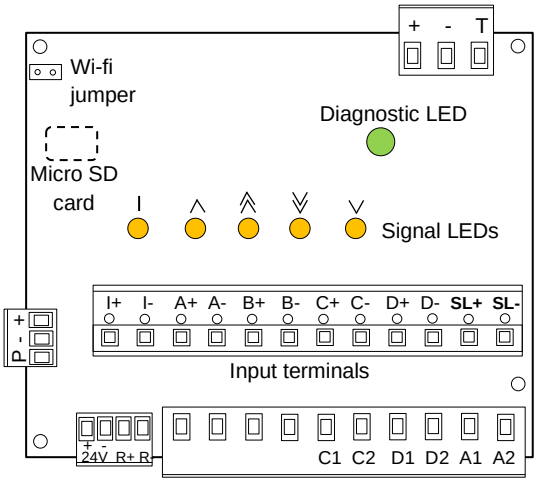
If the start is too hard you may increase "**Minimum pressure rise**" parameter to 1.2 bar and "**Minimum pressure drop**" to 0.4bar and see the affect.

If the start is wobbly decrease the above parameters slightly.

	***WARNING: Do not play with other parameters, you may spoil the ride quality.***

5 DIAGNOSTICS & TROUBLESHOOTING

5.1 DIAGNOSTICS



Pro-Hydro card includes 5 yellow signal LEDs and a diagnostic LED. The yellow LEDs light up when corresponding input signals are received. The Diagnostic LED changes its color and blinking pattern according to the failure status. This is given in below table.

Figure 33: Diagnostics LEDs.

Diagnostic LED color	Blinking pattern	Diagnostics
Green	Slow (1x per second)	Elevator idle, no hardware problems
	Fast (4x per second)	Elevator moving, no hardware problems
Green + Red	3 blinks then pause, one or more blinks are red	The red blink indicates problem. First blink: Communication Second blink: Temperature sensor Third blink: Pressure sensor Ex. Green-Red-Green indicates temperature sensor failure
Red	Continuously	Fatal error
Not lit		Fatal hardware problem

5.2 TROUBLESHOOTING

5.2.1 UP DIRECTION TRAVEL

Problem	Possible cause	Corrective action
Connection to the EV40 card is not happening	Somehow IP address is not received	Switch to airplane mode and back. Forget the pro-hydro network and reconnect. Assign yourself a static IP address. Take different addresses for laptop or phone. Suggestions: 172.27.1.100 or -.101
Pro-Hydro card connected, but the status LED is not blinking at all	Initial drive settings are not done	Do initial drive settings and restart the drive (see Section 3.4.3)
Pro-Hydro status LED is blinking red & green	Sensors or communication wiring was not properly done (see Section 5.1)	Check wiring (sections 3.3.4 and 3.3.5)

Invalid pressure from sensor	Faulty wire connections	Check wire connections and make sure that connection is correct.
	Measure the voltage between + and G pole. This must be about 24 V DC.	If measurements do not match change the sensor.
	Measure the output current from P. It should be between 4 to 20mA. 4mA is zero pressure. Alternatively measure voltage between G and P pole while the sensor is connected. The voltage must be at least 1VDC (for 1bar) and at maximum 5VDC (for 90bar).	
Drive display: Default temperature taken, temperature sensor does not provide readings	Faulty wire connections	Check wire connections and make sure that connection is correct.
	Measure the voltage between + and G pole of the temperature sensor. This must be about 3.3VDC.	If measurements do not match change the sensor
	Measure the voltage between G and T pole of the temperature sensor. This must be about 3.3VDC.	
Drive display: Communication read/write failure or Misc. communication failure	Communication with the inverter is problematic	Check wiring between the inverter and the Pro-Hydro card
Drive display: CRC error in communication	H5 parameters are not correctly set or the inverter was not re-powered after settings.	Check if H5 parameters are correctly set according to values mentioned at Section 3.4.3. Remember to re-power the inverter after settings.
Drive display: CE serial communication or CE MEMOBUS/Modbus communication error	Power or data connection to the Pro-Hydro card is problematic. Micro SD card is not inserted or corrupted.	Check the connections, see Section 3.3.5. Check Micro SD card, when necessary replace it.
No up start Drive display: STo (Safe Torque OFF), Green and Blue LEDs blink on the drive	HC/H1/H2 bridge on the drive has broken	Provide a bridge between HC/H1/H2 or make correct wiring for Safe Disable function.
Erratic starts or low full or levelling speed or no levelling speed	Pressure or temperature readings are not correct or speed or torque compensation is too high.	Check sensor connections or repeat Learning (see pg.26)
No start	No input is received from the lift controller or DC input signal polarizations are wrong.	Check the LEDs on the Pro-Hydro card to observe input signals to correct the error.
Elevator increases its speed during levelling	Leveling time is longer than 3 seconds. See Section6.3.2.	Increase deceleration time to shorten the leveling time to about 1.5s.
Elevator stops hard without levelling	Elevator reaches the floor at a higher speed than expected (without a “R” in travel sequence).	Decrease deceleration time or change the switch distance in the shaft.
Elevator starts late and jerky	Torque or speed compensation may be too low	Increase base torque gain and loss factor and/or repeat learning.
Car resonates at levelling speed	Torque compensation may be too high	Decrease base torque gain.
Car is wobbly at levelling with high load	Torque compensation may be too low	Increase base torque gain.
The counter in status menu shows too high value for “Minimum pressure taken”	Empty car static pressure input may be wrong	Correct the input in “Elevator Installation” menu.

The car has double start	Internal set-up parameters for minimum pressure rise are not correct.	Increase minimum pressure rise (see section 4.13)
Counter in status menu shows too high value for "Temperature read disturbance"	Power cable in the controller system are not shielded, ground connection is not done properly or temperature sensor wiring is too close to high voltage line.	Use shielded cable and apart temperature sensor wiring away from high voltage line.
At low pressures start is hard & run is uncomfortable.	"Empty car static pressure" (Installation menu) is too high.	Input "Empty car static pressure" as shown in Section 4.5.

5.2.2 DOWN DIRECTION TRAVEL

Problem	Possible cause	Corrective action
No Down Start	Coil **D** not energised or voltage too low.	Lift coil to check magnetic pull.
	Adjustment **6** is closed too far.	Turn out adjustment **6**.
	Adjustment **8** is opened too far.	Turn in adjustment **8** cautiously. Attention: Danger of traveling through!
	O-Ring **UO** on Down Valve **X** is leaking.	Change O-Ring →see EV Spare Parts List.
	Filter on solenoid **D** contaminated.	Check filter, clean if necessary.
No full speed	Coil **C** not energised or voltage too low.	Lift coil to check magnetic pull.
	Adjustment **7** (full speed) closed too far.	Turn out adjustment **7**.
	Down valve flow guide **X** too small (slots too narrow).	Insert larger down valve flow guide (see 'flow guide charts' on EV-datasheet).
	Filter on solenoid **D** contaminated.	Check filter, clean if necessary.
No down leveling. Elevator stops before floor level	Coil **C** and **D** reversed.	Swap coil **C** and **D**. Lift coil to check magnetic pull.
	Adjustment **9** turned in to far.	Turn out adjustment **9** to about 0.05 m/s levelling speed.
	Spring **9F** in adjustment **9** is broken or down levelling	Clean the down levelling valve or change the spring.
	Pressure setting of **KS** too high.	Turn out adjustment **KS**.
Deceleration into levelling speed. Elevator travels through floor level	Adjustment **8** closed too far. Filter of adjustment **8** contaminated or adjustment **8** is damaged.	Turn out adjustment **8** about ½ turn, clean the filter or change adjustment **8**.
	Down levelling speed is too fast.	Turn in adjustment **9** until the lift stops level with the floor or to about 0.05 m/s(recommendation).
No deceleration into levelling speed. Elevator travels though floor level	Solenoid **C**: needle **DN** and seat **DS** contaminated or damaged.	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 slowly due to inner leakage (Re-leveling)	**For possible down leakage points, see "Technical Documentation System Leakage".**	
	Solenoid **D**: needle **DN** and seat **DS** contaminated or damaged	Clean or change needle and seat.
	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** in flange **4F** is leaking.	Change O-Ring → see EV spare parts list.

	O-Ring **HO** of manual lowering **H** is leaking.	Change O-Ring **HO** or change manual lowering
Elevator sinks quickly	Solenoid **D** tube not screwed down tight.	Tighten solenoid **D** tube.
	Adjustment **8** is closed 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 due to inner leakage of auxiliary equipment	**HP:** Hand pump 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 down valve, 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.	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.

6 ANNEXURE 1

6.1 TRAVEL CHARACTERISTICS

6.1.1 NOMINAL SPEED TRAVEL

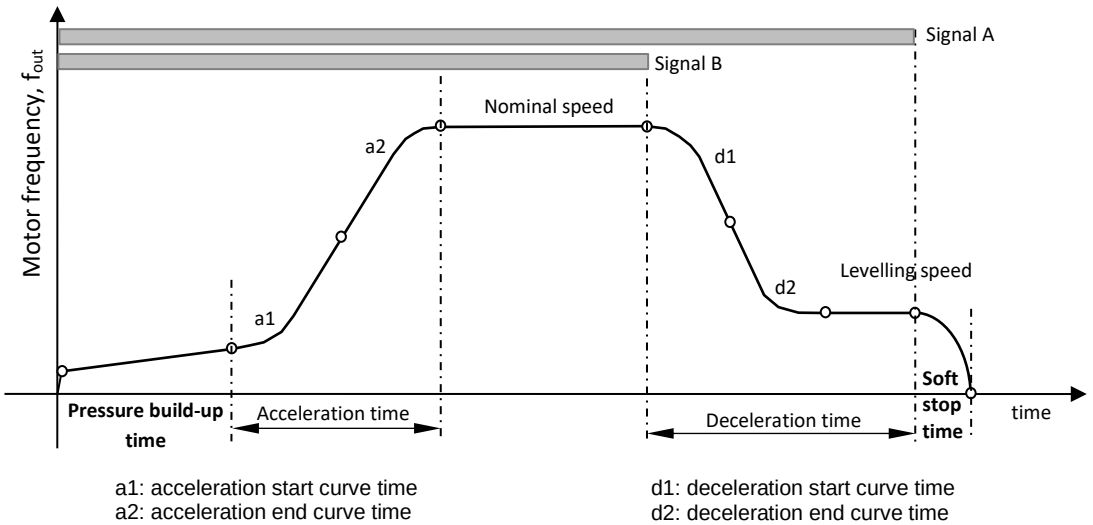


Figure 34: Target parameters

A nominal speed travel goes through following phases;

1- **The Pressure build-up phase**: In this phase the elevator starts moving in a smooth and comfortable way. Pressure in the system is built-up slowly until the elevator takes off. This phase is initiated by receiving both up signals **A** and **B**.

2- **The Acceleration phase**: Standard target curves in Yaskawa drive are used to accelerate the elevator to the nominal speed. The time taken for this phase is the acceleration time.
3- **The deceleration phase:** This phase is initiated by removing the **B** signal. The elevator decelerates into the leveling speed. The time taken for this phase is the deceleration time.
4- **Soft stop**: Initiated by removing the **A** signal. The car is decelerated to the floor stop level smoothly and accurately. In order to have the soft stop, the main contactor is delayed about 1 second after the **A** signal is removed.

6.1.2 RE-LEVELLING TRAVEL

Re-levelling may be needed when stopping accuracy is not met or the system has a leakage problem. Only **A** signal is given for re-levelling. The system slopes up to the re-levelling speed and travels at that speed until **A** signal is dropped. There is no soft stop. The speed is immediately set to 0. The characteristics of the ride is shown in Figure 32a.

6.1.3 INSPECTION TRAVEL

Inspection travel is done at a speed not higher than 0.30 m/s (59fpm). It is normally set to 0.20m/s (39fpm) for convenience. In order to travel at inspection speed, **A** & **B** signals and the inspection signal "**I**" are given. During the travel the inspection LED is lit. The inspection travel has no build up phase therefore the elevator starts acceleration immediately. There is no deceleration or soft stop. The end speed is the inspection speed (see Figure 32b).

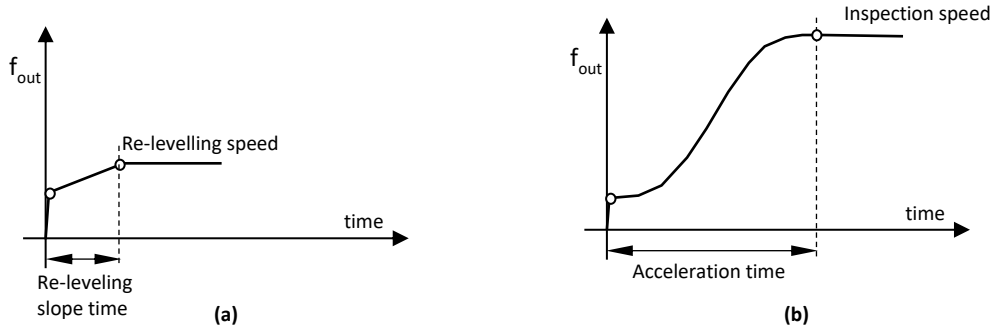


Figure 35: Re-levelling and inspection travels

6.2 TRAVEL PROCEDURE

The Upward Run Signal (**A**) and/or the Speed Selection Signal (**B**) are given to the drive to perform a travel. When only **A** signal is given the elevator travels at re-leveling speed. On the other hand, when **A** and **B** signals are given, the drive accelerates the elevator to the nominal speed. As **B** (speed selection signal) is removed, the elevator decelerates to the leveling speed. The drive then continues on traveling at leveling speed until **A** signal is removed. After the removal of **A** signal, motor contactors should be delayed approximately 1 second until the soft stop procedure is executed. The drive signaling sequence is shown in *Figure 36*.

According to the signal combination speed selections are shown below.

	RUN Signal	Speed Selection Signal
Nominal speed	A	B
Inspection speed	A	B + I
Re-leveling speed	A	-

Table 2: Signaling the drive for different elevator travels

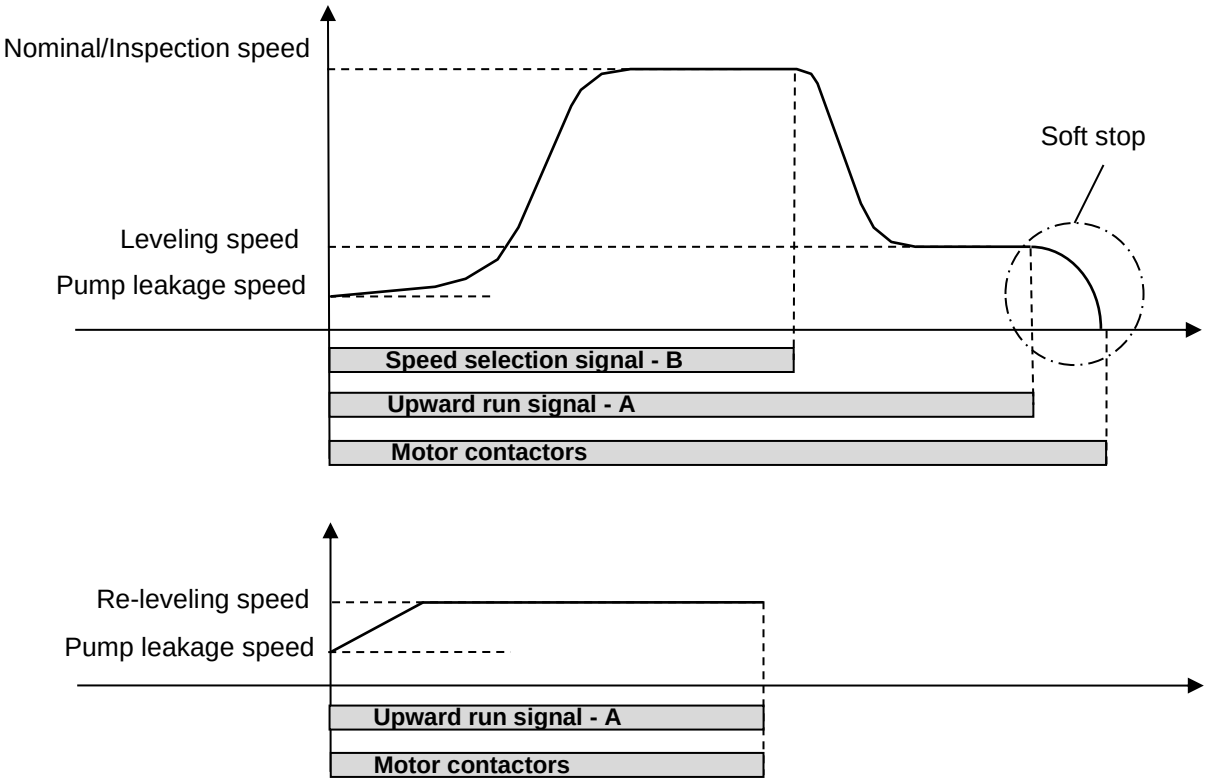


Figure 36: Signaling the drive for different travels

6.3 SPECIAL FUNCTIONS

6.3.1 DECELERATION TIME COMPENSATION

In case the drive runs with a slower speed than the nominal speed, removal of upward run signal is delayed by $\mathbf{t_x}$ seconds in order to ensure the shortest possible travel time and good ride quality (*Figure 37*). t_x time is calculated by the Pro-Hydro system automatically.

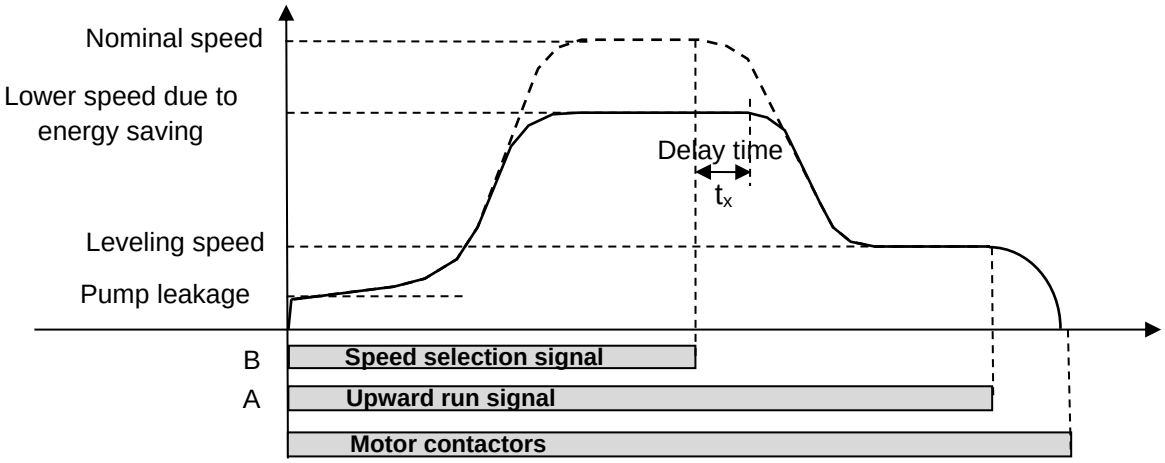


Figure 37: Deceleration compensation to have constant leveling time

6.3.2 LEVELING SPEED CONTROL

In case of wrong set up or having a low performance power unit, the pump might not generate enough positive flow during leveling travel. In such a case, the car could never reach the next floor or it may take a very long time. To allow recovery, after a certain waiting time (Max. levelling time) the drive starts to increase the motor speed (Frequency increase) automatically until the stop switch is reached (Frequency increase is the percentage increase of the leveling speed frequency for the next 3s travel).

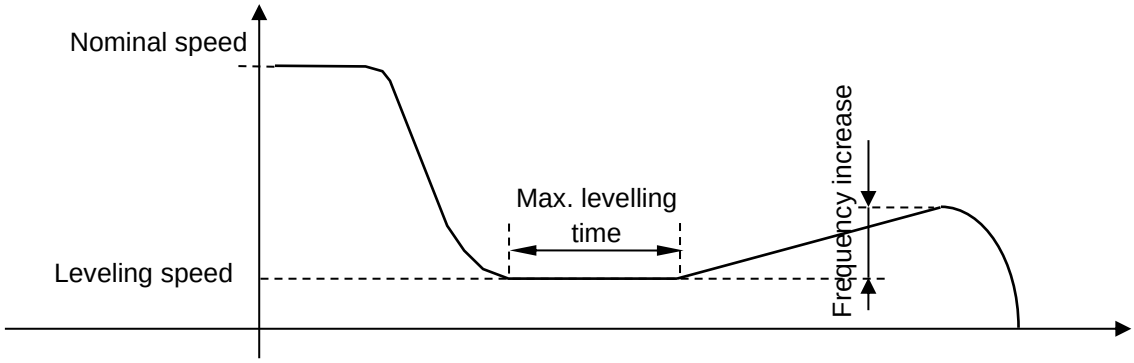


Figure 38: Leveling recovery function

From the Travel menu levelling times can be obtained by clicking on travels (see section 3.7.3).

6.4 ENERGY SAVING MODE

In order to lower the energy consumption or when supply power limitation exists, via the “Power limitation” setting from the “Limits” menu elevator speed can be changed according to load in the car. This means that the elevator will have the maximum nominal speed when it is empty or lightly loaded and the lowest when it is fully loaded. In this way energy efficiency of the elevator system is increased.

6.5 MISCELLANEOUS FUNCTIONS

6.5.1 DRIVE ACCESS LEVEL (A1-01)

By default, the user accesses to “**Customer level**” (A1-01=3), where only necessary parameters are listed. Unless necessary the user should stay in customer level for a quick and trouble-free set-up. To swap into “**Advance level**” set **A1-01** to **2**.

Parameter name	Setting	Access level
A1-01	2	Advance
	3	Customer

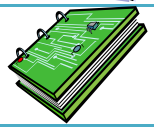
6.5.2 COPY FUNCTION (O3-01)

When drive parameters will be transferred to another drive the keypad (LED operator) can be used for this purpose.

Parameter	Setting	Effect
o3-01	0	COPY SELECT (no function)
	1	DRIVE →KEYPAD All parameters are copied from the drive to the keypad.
	2	KEYPAD → DRIVE All parameters are copied from the keypad to the drive.
	3	KEYPAD<-->DRIVE Parameter settings in the drive are compared to those in the keypad.

To enable Copy Function Selection set **o3-02** to **1**, for disabling set **o3-02** to **0**.

7 ANNEXURE 3 – EV40-F PACKAGE DETAILS

Product	Details
EV40 valve (comes with an integrated pressure sensor)	
Yaskawa L1000H or GA700 drives	
Pro-Hydro interface card	
Temperature sensor	
Yaskawa line filter (delivered with L1000H drives only)	
Yaskawa AC Reactor	Optional
Quick start manual	
EV40-F user manual	

Note: Pictures depicted are for reference only. Actual product may vary.

8 ANNEXURE 4 – POWER UNIT DESIGN

In case of vibration in the car:

In some applications vibration in the car might be experienced, particularly at low frequencies. This cannot be predicted precisely as it depends on the structural design of the elevator system & the shaft. In such a case try to eliminate the sources for structure borne noises (eliminating metal to metal bridging, placing the tank on rubber legs, etc.) and for fluid borne noises (using a meter-long hose at the ends of the pipe line). Using expansion chambers (silencers) may not remedy the problem. Vibrations in the car are mainly related with pump leakage & pulsation, motor performance at low frequencies, pressure, natural frequency of the elevator system and hydraulic layout.

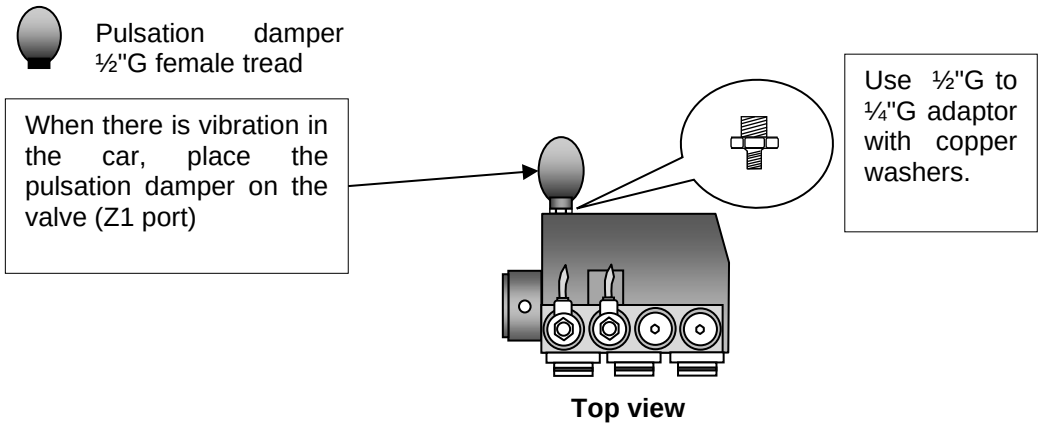
An easy solution to the problem is to connect a small pulsation damper to the power unit.

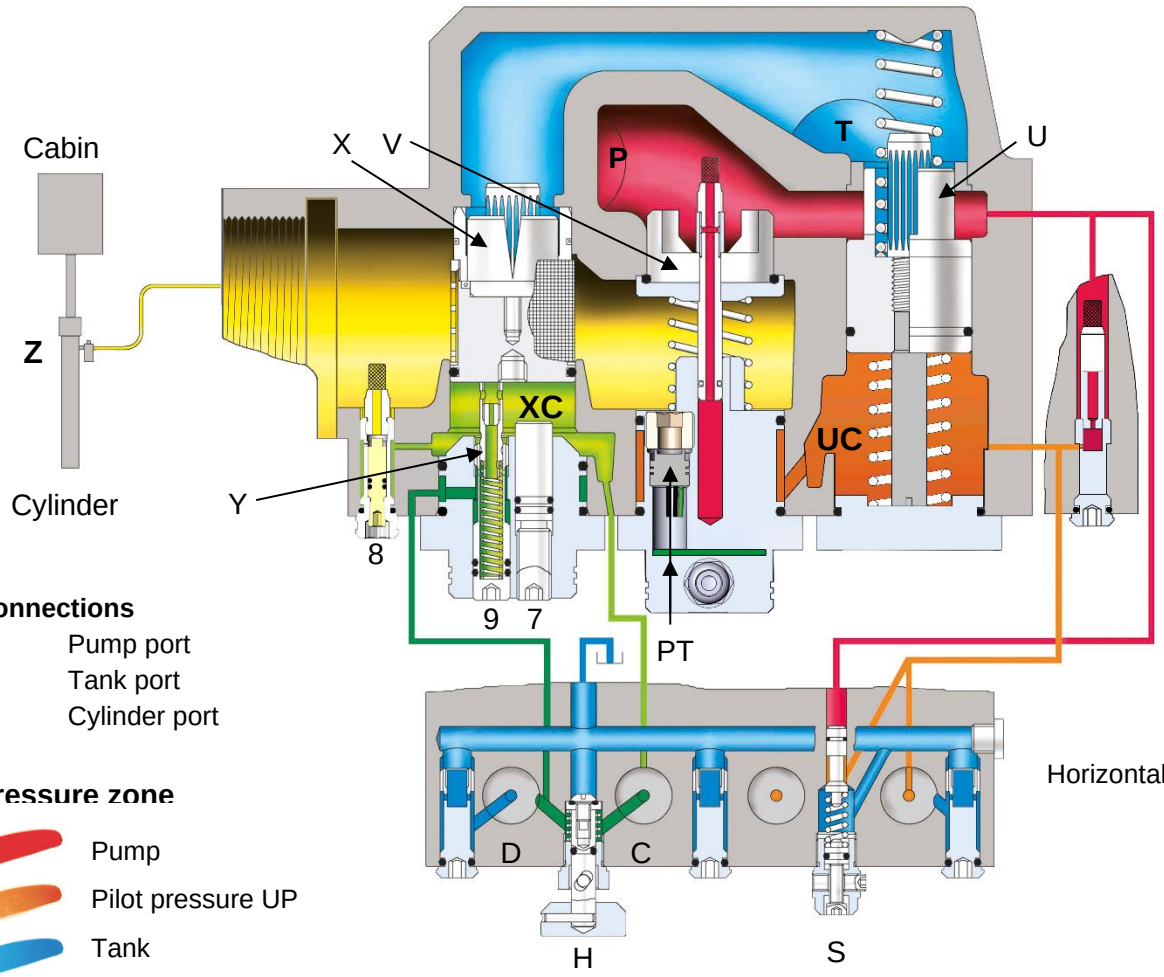
Blain Hydraulics approves the use of pulsation dampers by “Hydac” with 0.075 or 0.16 liter volume. Refilling pressure could be chosen about 65% to70% of the minimum static pressure.

A pulsation damper can be connected to the EV40 valve via Z1 port by using a **½"G** to **¼"G** adaptor, which is delivered with the damper.

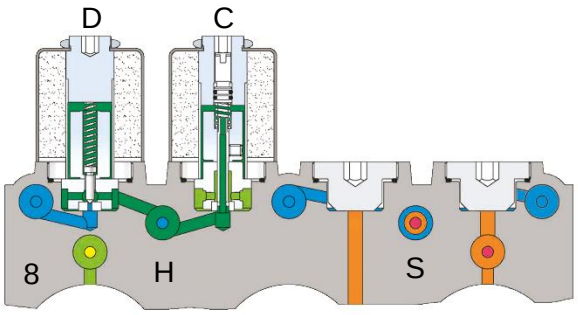
If some vibration is felt at start or at low frequencies and cannot be eliminated with the connection of a gas damper (Z1 port on the EV40 valve) the cause might come from the pump leakage or poor motor performance at low frequencies.

If auditable noise at full contracted travel speed is higher than the pump manufacturer’s specification (after eliminating all sources of noise) change the pump bearing or the pump with a silent one (follow pump manufacturer’s recommendations).





Horizontal cut



Vertical cut

Connections

P	Pump port
T	Tank port
Z	Cylinder port

Pressure zone

- Pump
- Pilot pressure UP
- Tank
- Cylinder
- Pilot pressure DOWN
- Emergency Down

Pilot pressure chambers

UC	Bypass chamber
XC	Down valve chamber

Adjustment "DOWN"

7	Full speed limitation
9	Manual lowering speed

Notes:

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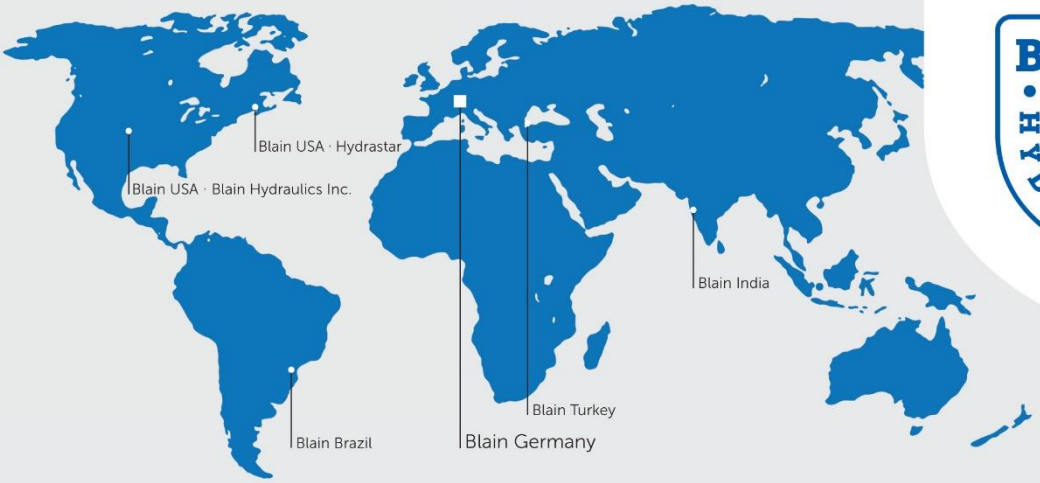

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