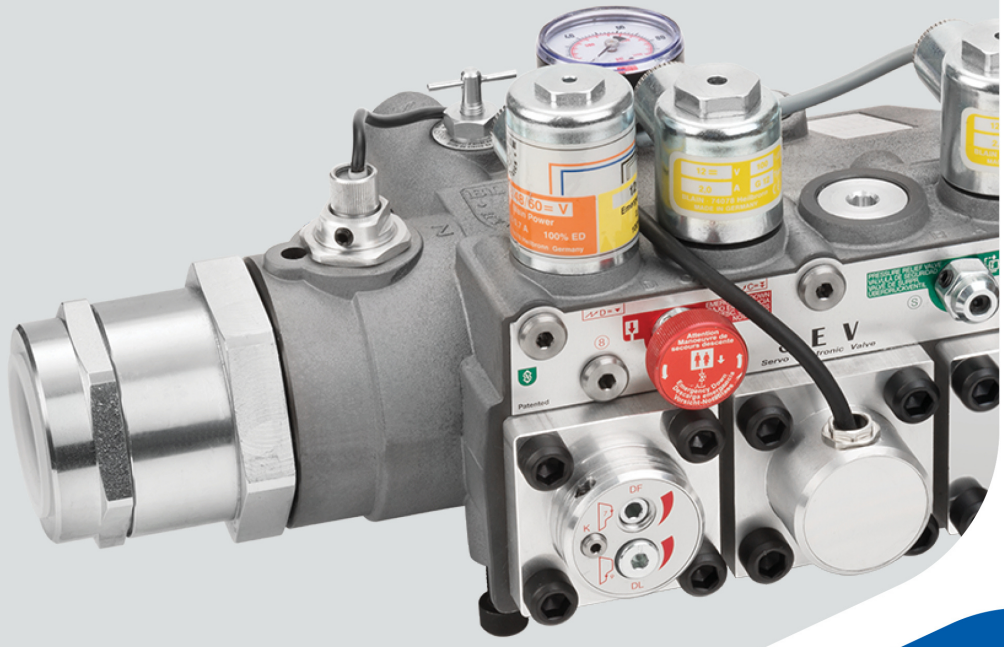
BLAIN

SMART VALVES SERIES FOR HYDRAULIC ELEVATORS

Excellence in Simplicity and Performance



Smart

SEV Servo Electronic Valve

MANUAL

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1. GENERAL INFORMATION

1.1 Safety precautions & general warnings

Installation, operation and servicing of the **SEV** should only be performed by qualified personnel. Before installing the SEV package, the "**Quick Start Guide**" should be read, understood, and all safety precautions mentioned in these documents and warnings must be followed. The **SEV** must be installed according to the descriptions in this technical manual and in accordance with the local elevator safety codes and directives.

Figure 1: New Smart Servo Electronic Valve SEV 07 with p-T sensor and new electronic card

1.2 Product introduction

The SEV package consists of:

1) SEV valve,
2) Electronic card,
3) User Manual.

Figure 2: Older version of electronic valve SEV05 without p-T sensor and new electronic card

The valve: The smart servo electronic valve has been integrated with a pressure and temperature sensor alongside a flow meter. The existing design has been further improved by removing some adjustments to simplify and quicken the set-up process. Integration of pressure and temperature sensors enable excellent ride quality by providing real time compensation to pressure and temperature variations.

The smart electronic card: The onboard web server and Wi-Fi on the electronic card allows users to connect with the card using any smart device (phone, tablet, laptop or PC). Setting up the system, making changes or observing travel graphs of the elevator are possible via Wi-Fi connectivity. The platform is system independent and can be accessed using any standard web browser independent of the operating system of the device used for interacting with the card. Since the complete system is platform independent, there is no need to download and install any app or software. The embedded software on electronic card stores all the settings, information and travel logs. The step-by-step set up guide and multilingual interface software in SI and Imperial units make inputting and monitoring information very easy and accessible.

Warranty information

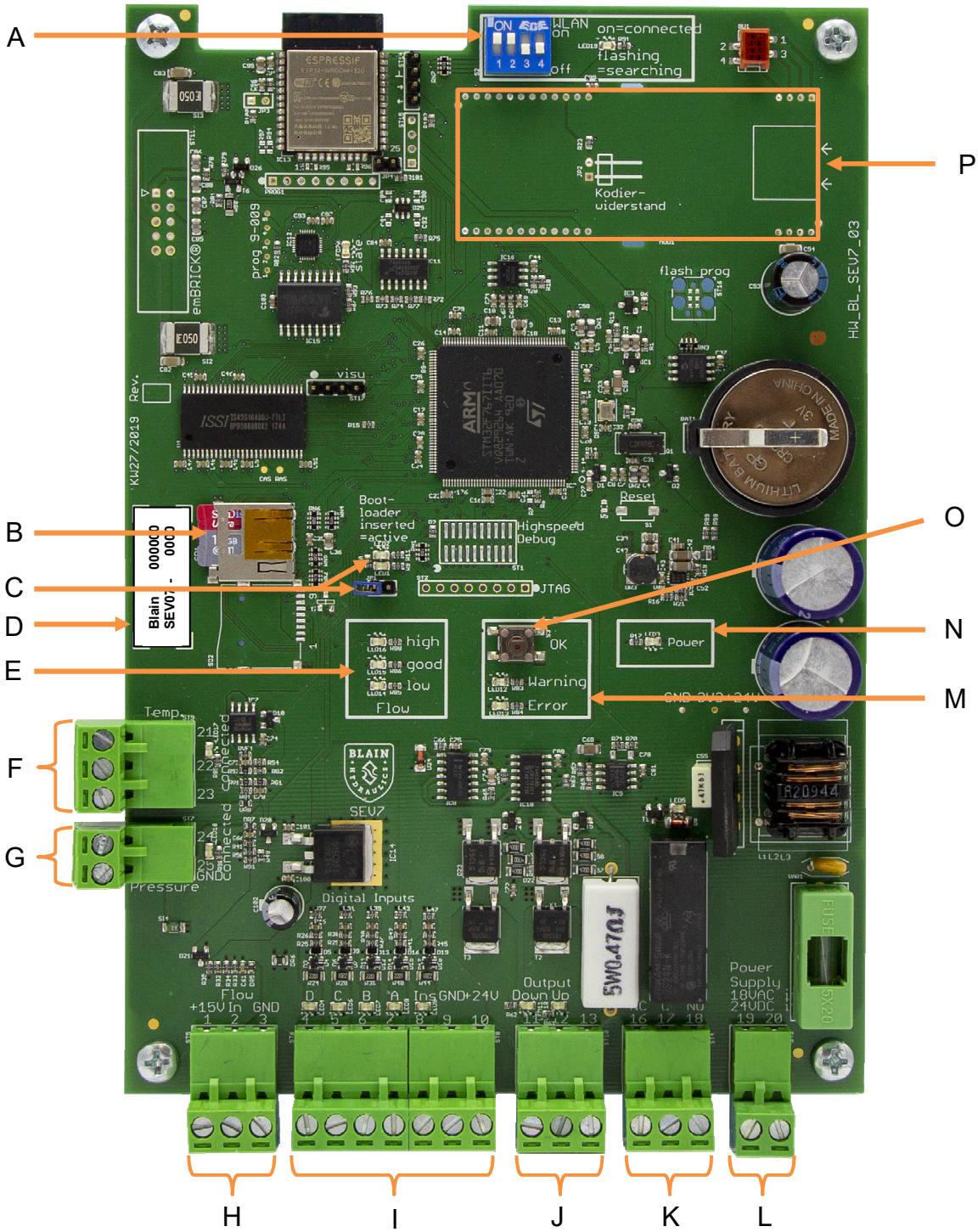
Blain's SEV User Manual is provided for qualified personnel, who are competent in installing, adjusting and servicing of hydraulic elevators. Blain Hydraulics assumes no liability for any personal injury, property damage, losses or claims arising from in appropriate use of its product or incompetence of the installer.

Warranty expires, if:

- Components or spare parts different than the original ones are installed.
- Elevator system or **SEV** is installed or serviced by unqualified personnel.
- **SEV** package is installed in any location without applying the elevator safety codes (EN81-20/50, ASME 17.1 or the existing local code).

2. THE SEV CARD

2.1 Overview



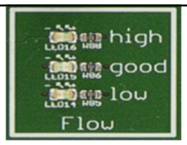
A	Mode switch	**I**	Input signals
B	Memory card slot	**J**	Output signals
C	Jumper for data upload	**K**	Error relay
D	Type plate	**L**	Power supply 24 V DC / 18 V AC
E	Flow sensor adjustment feedback	**M**	Error LED (red) / warning LED (orange)
F	Temperature sensor connection	**N**	Power LED (green)
G	Pressure sensor connection	**O**	Quit / confirm button
H	Flow sensor connection	**P**	Slot for additional interface PCB

2.2 LED Diagnostics

BOOT LOADER LEDs

Normal state:
- Jumper non-bridged, green and red LED will light up alternately.

Update state:
- Jumper bridged, update when powering SEV card in bridged mode. If an update is being processed, the green LED will flash rapidly until the update is finished.



FLOW LEDs

They indicate if the sensor has been adjusted properly. If the adjustment is set higher or lower than the range, the corresponding LEDs will light up to signal, that the sensor has to be readjusted.

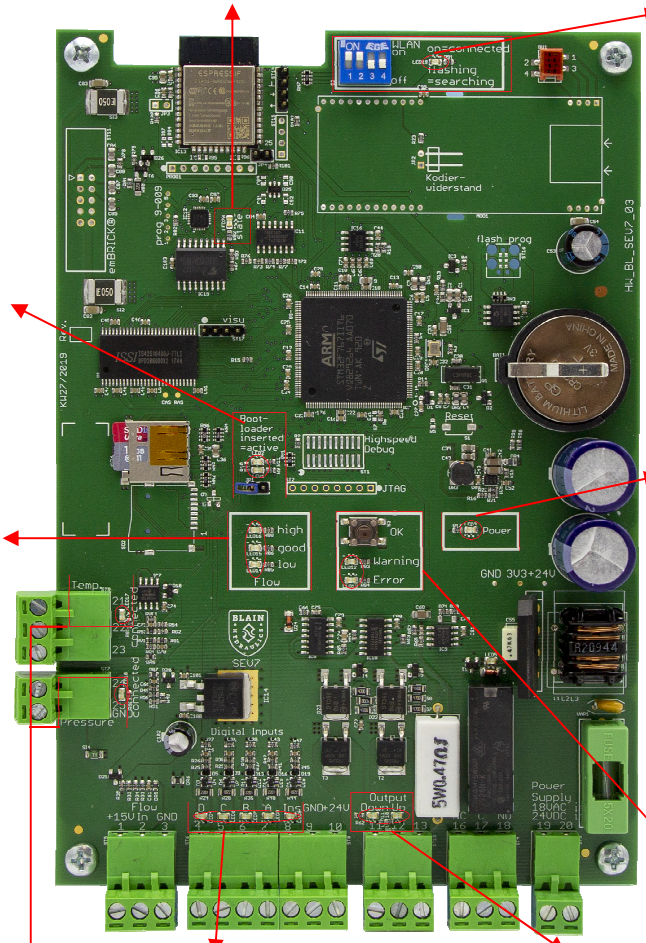
SENSOR LEDs

(SEV07 only)

These will glow green if the pressure-temperature sensor is connected properly.

STATE LED

The orange state LED flashes slowly. Any other behaviour is related to communication problems and reflects a defect.



INPUT AND OUTPUT SIGNAL LEDs

D (red), **C** (red), **B** (green), **A** (green) and **Ins** (yellow) are reflecting the input signals into the electronic card.

Down (red) and **Up** (green) are the corresponding output signals and indicate the travel direction.

SWITCH LED

When switch "1" is set to „ON", the LED flashes slowly. As soon as a Wi-Fi connection to a smart device is established, the LED lights up continuously.

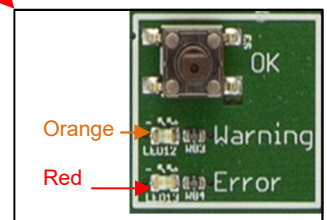
Switch "2" is used to select the SEV valve version.

"ON" = SEV 07

"OFF" = SEV 05

POWER LED

The green power LED will continuously glow as long as the electronic card is supplied with power.



DIAGNOSTIC LEDs

The orange "Warning" LED lights up in case of an unexpected behaviour. If there is a major fault interfering with the normal operation of the valve like the flow sensor or a coil being defect, the red "Error" LED will light up and prevent the SEV from functioning until the error has been fixed and reset by pressing the "OK" button.

3. THE SEV VALVE

The smart Servo Electronic Valve (SEV) is controlled by closed loop digital electronics, providing consistent travel characteristics elevators irrespective of load and oil temperature variations. An electronic card regulates the performance of the car via proportional solenoid valves. The elevator operation can be monitored, recorded and adjusted by a smart device using Wi-Fi connectivity. Additional intermediate speed for maintenance runs can also be programmed.

SEV 05

SEV 07

Electronic card

SEV valves include the following essential features:

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

Technical data		**1" SEV**	**1½" SEV**	**2" SEV**	**2½" SEV**
Flow range	l/min (US gpm)	40-180 (10-48)	Up to 430 (up to 114)	Up to 580 (up to 153)	Up to 1100 (up to 291)
Pressure range	bar (psi)	9-70 (130-1000)			8-60 (116-855)
Burst pressure	bar (psi)	400 (5800)			300 (4350)
Pressure loss (static)	bar (psi)	≈ 2 – 3 bar (29 – 44 psi) depending on flow and valve port size			
Weight	kg (lbs)	10 (22)			24,5 (54)
Oil viscosity		22-75 cSt. at 40°C (104°F)			
Max. oil temperature		14°-61°C (57°-142°F) for oil VG46; 200 cSt – 20 cSt.			
Optimal oil temperature		25°-50°C (77°-122°F) for oil VG46; 100 cSt – 30 cSt.			
Ambient temp range		0°-70°C (32°-158°F)			
Insulation class, AC and DC		IP 68			
Coils AC	[24V / 1.8A], [42V / 1.0A], [110V / 0.43A], [230V / 0.18A]				
Coils DC	[12V / 2.0A], [24V / 1.1A], [42V / 0.5A], [48V / 0.6A], [80V / 0.3A], [110V / 0.25A], [196V / 0.14A]				
Elec. card input	24V DC / 18V AC				
Elec. card weight	0.5kg (1.1lbs)				

Up travel Up to 1.0 m/s (197 fpm). 1 Full Speed, 1 Leveling Speed, 1 Inspection speed.

Down travel Up to 1.0 m/s (197 fpm). 1 Full Speed, 1 Leveling Speed, 1 Inspection speed.

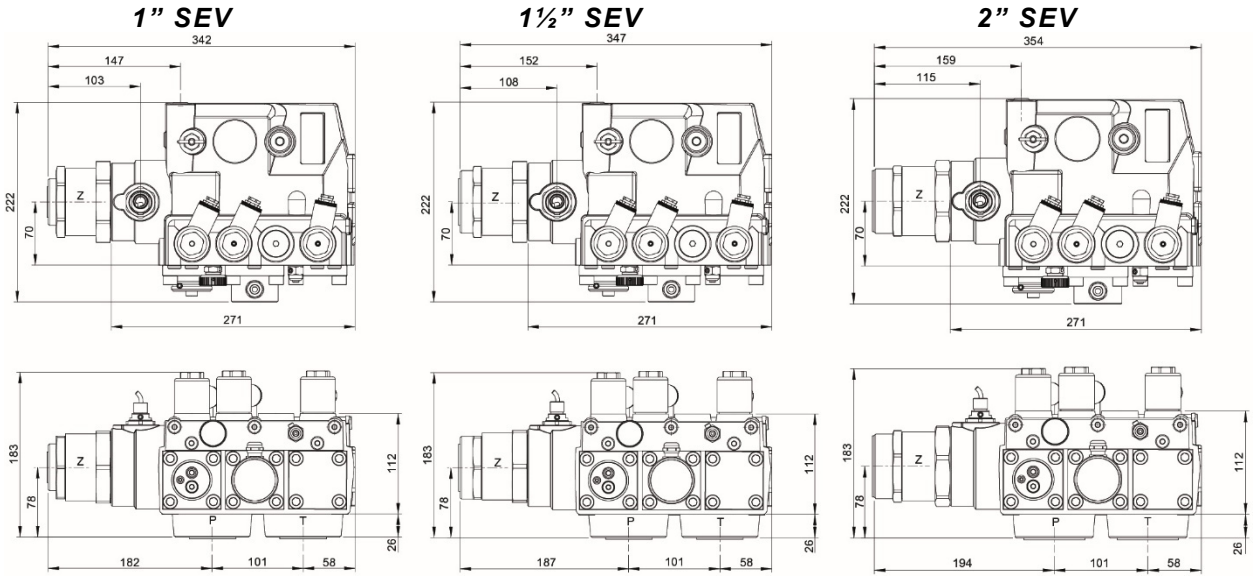
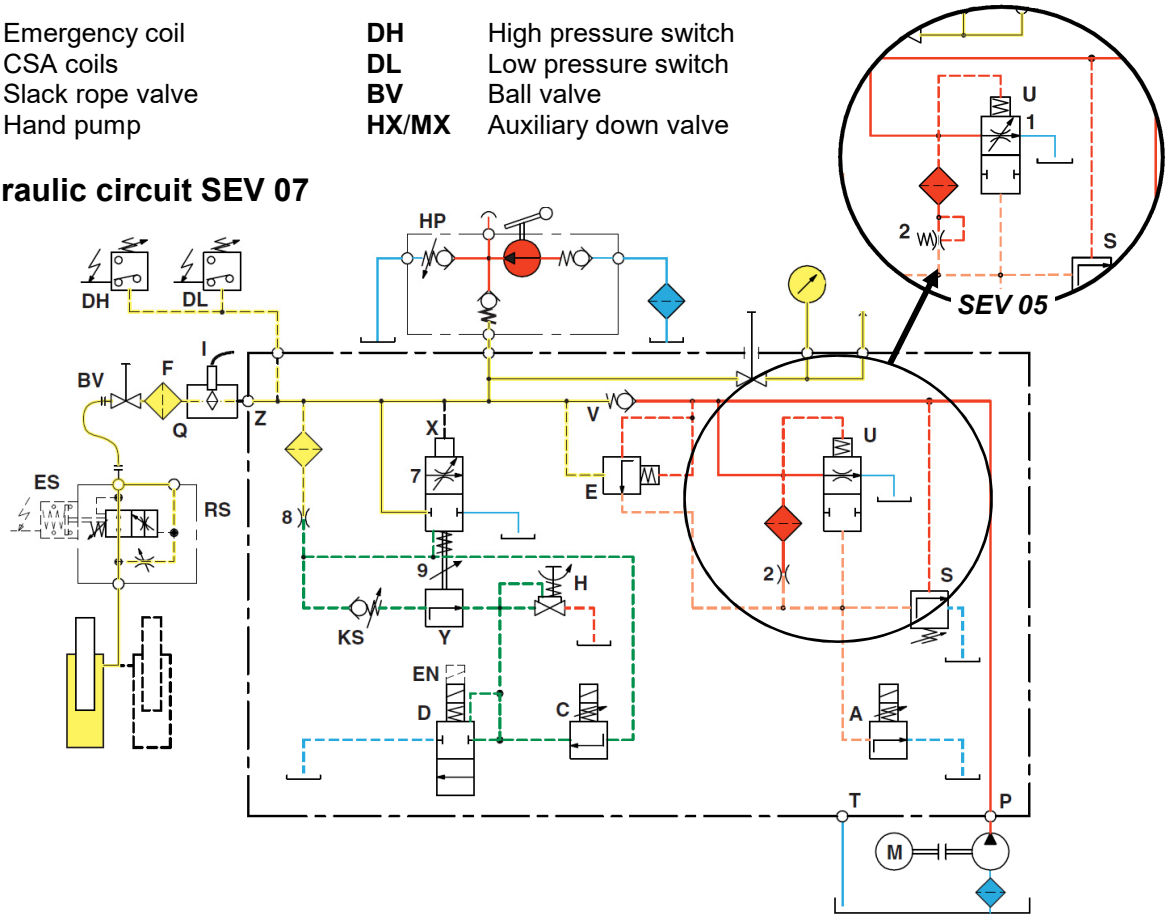


Figure 3: SEV valve dimensions

Optional Equipment

EN	Emergency coil	**DH**	High pressure switch
CSA	CSA coils	**DL**	Low pressure switch
KS	Slack rope valve	**BV**	Ball valve
HP	Hand pump	**HX/MX**	Auxiliary down valve

3.1 Hydraulic circuit SEV 07



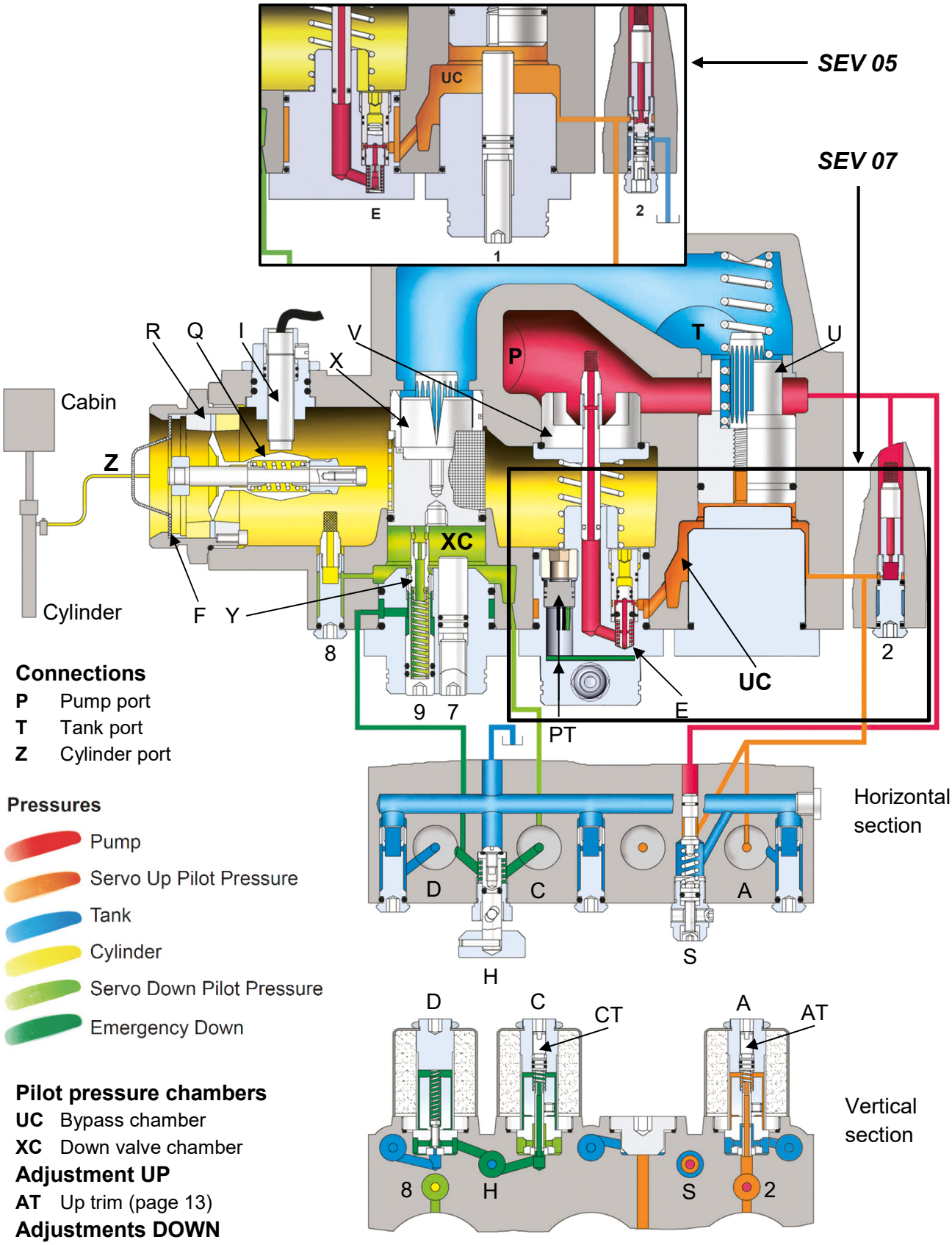
Control Elements

A	Solenoid UP control
C	Solenoid Down control
D	Solenoid Down start/stop
H	Manual lowering
S	Pressure relief valve
U	Bypass valve
X	Down valve
V	Check valve
Y	Down leveling valve

Down adjustments

7	Full speed limitation
9	Manual lowering speed

3.2 Cut section SEV 07



Connections

P Pump port
T Tank port
Z Cylinder port

Pressures

Pump
Servo Up Pilot Pressure
Tank
Cylinder
Servo Down Pilot Pressure
Emergency Down

Pilot pressure chambers

UC Bypass chamber
XC Down valve chamber

Adjustment UP

AT Up trim (page 13)

Adjustments DOWN

CT Down trim (page 13)
7 Full speed limitation
9 Manual lowering speed

Control elements

A	Solenoid Up control	**pT**	Pressure-temp.-sensor	**V**	Check valve
C	Solenoid Down control	**Q**	Flow meter	**X**	Down valve
D	Solenoid Down start/stop	**R**	Flow ring	**Y**	Manual lowering valve
E	Early start valve	**S**	Pressure relief valve	**2**	Pilot orifice Up
H	Manual lowering	**U**	Bypass valve	**8**	Pilot orifice Down
I	Flow sensor				

3.3 Valve operation

UP operation

1. With an **Up** signal, the pump-motor is energized and the electronic card´s **Up** program starts simultaneously. Oil flows through orifice **2** into the bypass pilot chamber **UC**.
2. Coil **A** is energized and solenoid **A** (normally open) partially closes, reducing the volume of pilot oil flowing out from the bypass pilot chamber.
3. The bypass valve **U** begins to close as pressure increases in the bypass pilot chamber. As the bypass valve **U** is closing, the check valve **V** is opening while a steadily increasing volume of oil is flowing into the cylinder displacing the flow meter **Q**.
4. The inductive flow sensor **I**, measures the increasing displacement of the flow meter. This value is compared in the card with the target flow, which prescribes the acceleration, full speed, deceleration and levelling speed of the car. Correction of the flow rate is made by varying the power to coil **A** from the card, controlling the position of the bypass valve through pilot pressure in chamber **UC**.
5. The comparison and correction of the flow continue throughout the complete **Up** operation of the elevator.

DOWN operation

(Caution! Coil D is directly connected to the elevator´s controller, not to the SEV card!)

1. With a **Down** signal, coil **D** is energized, solenoid **D** (normally closed) opens and the electronic card´s **Down** program starts simultaneously.
2. Coil **C** is energized from the card and solenoid **C** (normally closed) partially opens. Oil escapes from the down valve pilot chamber **XC** through solenoid **D** (fully open) back to the tank, while oil passes through fixed orifice **8** from the cylinder into the down valve pilot chamber **XC**.
3. The down valve **X** begins to open as pressure decreases in the down valve pilot chamber **XC**. As the down valve opens, a steadily increasing volume of oil flows from the elevator´s cylinder into the tank, displacing the flow meter **Q**.
4. The inductive sensor **I** measures the increasing displacement of the flow meter. This value is being compared by the card with the set value of the target flow.
5. Correction of the flow rate is made by varying the power to coil **C** from the card, controlling the position of the down valve through pilot pressure in chamber **XC**.
6. The comparison and correction of the flow continue throughout the complete **DOWN** operation of the elevator.

INSPECTION Speed

Besides full speed and levelling speed, an optional inspection speed is available by the SEV system. Up and down inspection speeds can be independently adjusted between 0.05 m/s and 0.30 m/s.

3.4 Initial Operations

Valves are already adjusted and tested. Check electrical operation before changing valve settings. Test that the correct coil is energized by using metal parts to feel magnetic pull. Once system is installed correctly, it is ready for operation.

UP travel

Once an **UP** call has been made, it will take a few seconds before the elevator starts moving since the pilot chamber **UC** is being filled with oil.

- Adjustment **1** – Bypass

With no load in the car, disconnect the SEV card (no power to coil **A**) and turn on the pump-motor. Turn adjustment **1** 'in' until the car barely moves, then turn 'out' so the car stands. Turn 'out' another half a turn.

- Pressure relief valve **S**:

Turning it 'In' (clockwise) produces a higher, 'out' (c-clockwise) a lower maximum pressure setting. After turning out, open manual lowering **H** for an instant to release pressure inside the valve.
Important: When testing the pressure relief valve, do not close ball valve sharply.

- **KS** Slack rope valve:

Coils **C** and **D** must be de-energized! The **KS** is adjusted with a 3 mm Allen key. Turning the screw **K** 'in' results in a higher pressure setting and 'out' in a lower pressure setting. To adjust, turn **K** all the way 'in', then turn **K** 'out' until the empty car just begins to descend, then turn out another half a turn to ensure that with cold oil the empty car can be lowered as required.

When an up call is given, the car may delay a few seconds whilst the pilot pressure chamber **UC** fills with oil.

DOWN

- Adjustment **7** – Maximum speed limitation

Limit the down fast speed in case of wrongly entered technical data being programmed into the card to avoid a possible overspeed of the car. For fine tuning, as the elevator reaches the full speed, no. **7** can be turned in until the vibration of the down valve is felt, then turn no. **7** half a turn out.

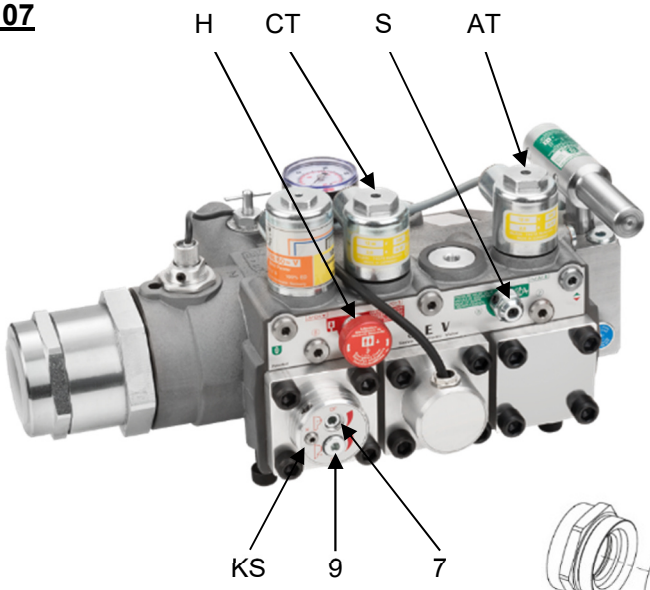
- Adjustment **9** - Emergency Down Speed

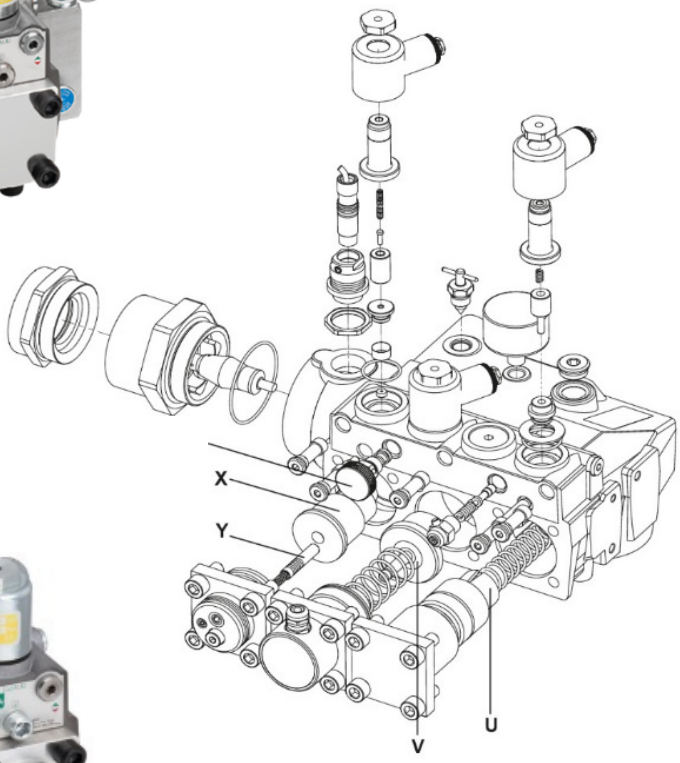
With no load in the car, turn no. **9** in until it is 5 mm away from the flange face. Open the manual lowering **H**. Turn no. **9** out until the speed of 3 cm/s (6 ft/m) is reached. The elevator travels at the speed of adjustment No 9 as the manual lowering knob is opened or when coil **D** is energized. Levelling speed should be between 5 – 7 cm/s (10 – 14 ft/min).

Adjustment **9** is the lowest speed to be controlled by the electronic card. Therefore it should be adjusted lower than the levelling speed.

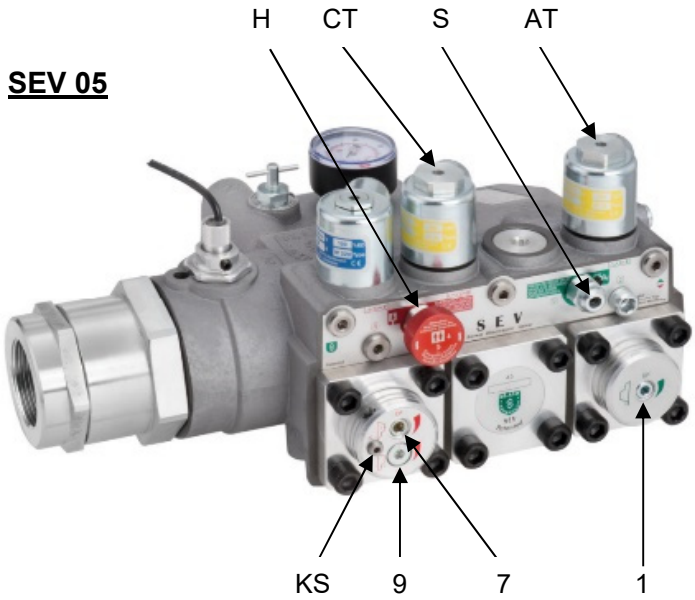
3.5 SEV adjustments and explosion drawing

SEV 07





SEV 05



Adjustments

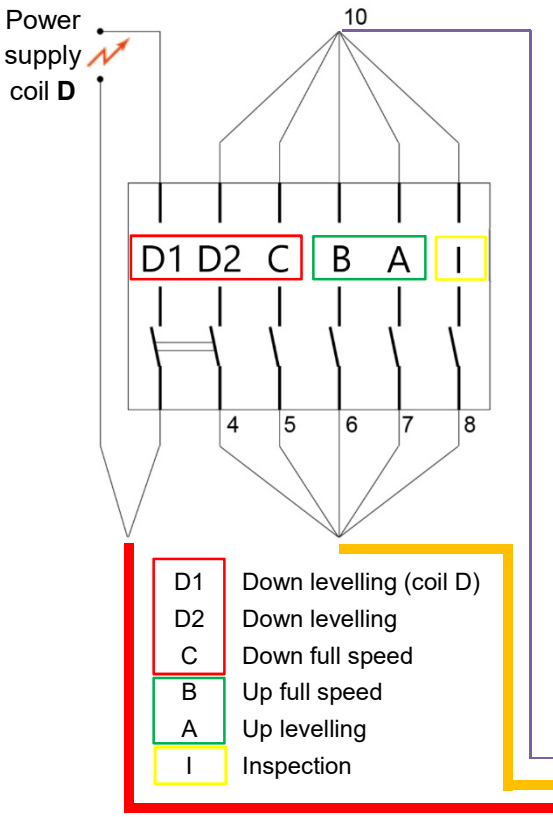
CT	Trim solenoid **C**
S	Pressure relief valve
AT	Trim solenoid **A**
KS	Slack rope valve (optional)
9	Manual lowering speed
7	Maximum speed limitation
1	Bypass adjustment

Highlighted valve parts

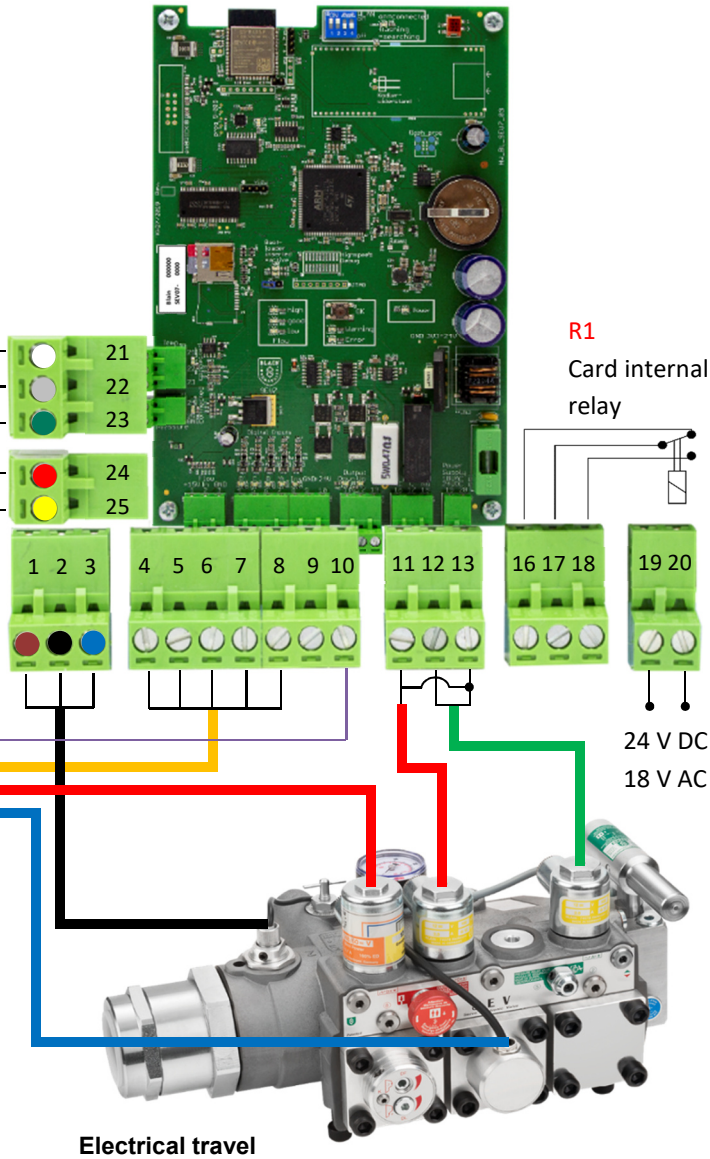
H	Manual lowering
X	Down valve
Y	Down levelling valve
V	Check valve
U	Bypass valve

4. ELECTRICAL INSTALLATION

Lift Controller



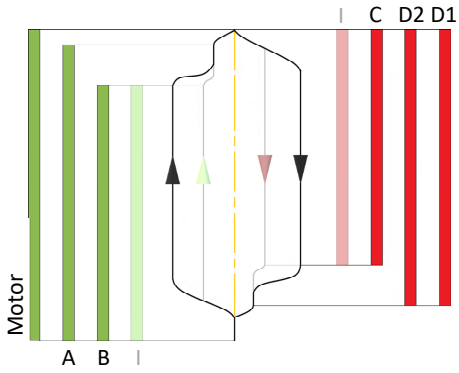
SEV card



PIN	Explanation
1	Flow sensor - power supply (brown)
2	Flow sensor - sensor signal (black)
3	Flow sensor - neutral (blue)
4	Input signal "D" Down start/stop
5	Input signal "C" Down control
6	Input signal "B" Up full speed
7	Input signal "A" Up control
8	Input signal "I" inspection
9	Optional ext. power supply for signaling
10	Int. power supply for signaling
11	Output signal "C" Down
12	Output signal "A" Up
13	Output signal neutral for Up and Down
16	Error relay NC – closed if OK – open if fault
17	Error relay COM
18	Error relay NO – open if OK – closed if fault
19	Supply voltage ground
20	Supply voltage live 18V AC / 24V DC
21	Temperature sensor C (white wire)
22	Temperature sensor B (grey wire)
23	Temperature sensor A (green wire)
24	Pressure sensor power 24 V (red wire)
25	Pressure sensor signal (yellow wire)

Electrical travel

Sequence	UP	DOWN
Normal travel:	Motor+A+B	D1+D2+C
Inspection:	Motor+A+B+I	D1+D2+C+I
Slow speed:	Motor+A	D1+D2



5. CONTROL VALVE INSTALLATION

Check the following:

1. The flow on the data plate of the valve complies with the flow rate of the pump (±10 %).
2. The minimum and maximum static pressures on the valve data plate is in accordance with those of the elevator.
3. The electrical supply to the **SEV** card is 24V DC or 18V AC and 50VA.
4. The star – delta timer is to be set between 0.3s and 0.4s
5. The flow ring **R**, bypass valve **U** and down valve **X** have been chosen correctly according to the selection charts in section 11.
6. On standby the value of the flow sensor must be adjusted between 4.8mA and 5.3mA (see section 6.).

Installation of the SEV Valve onto the Power Unit

For a compact and time saving installation as well as easier servicing and protection of the flow meter, cylinder connection **Z** of the **SEV** is fitted with the Blain ball valve G1“, G1.5“, G2“or G2.5“.

Installation of the SEV Card into the Controller

The **SEV** Card can be connected with any standard type hydraulic elevator controller. The power to coils **A** and **C** is supplied from the card. Power to coil **D** is directly provided by the main controller. Page 11 shows the detailed wiring diagram for connecting the **SEV** card to the elevator controller.

Installation of Deceleration Switches in the Elevator Shaft

Slow-down (deceleration) and stop switches should be set according to the following recommendations

Recommended switch positions and levelling speeds

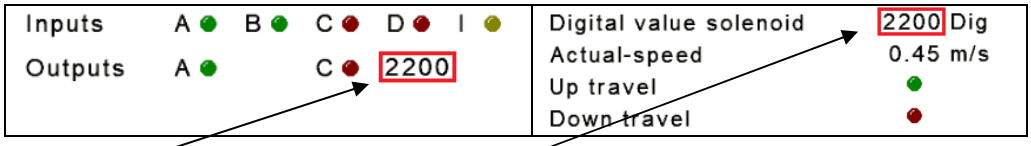
Metric				Imperial			
Travel speed	Decel. switch before floor	Levelling speed	Stop switch before floor	Travel speed	Decel. switch before floor	Levelling speed	Stop switch before floor
m/s	cm	m/s	cm	fpm	in	fpm	in
0.3	25	0.06	1.0	60	10	12	0.4
0.4	45	0.06	1.0	80	17	12	0.4
0.5	60	0.06	1.0	100	24	12	0.4
0.6	75	0.06	1.0	120	30	12	0.4
0.7	95	0.07	1.5	140	37	14	0.6
0.8	110	0.07	1.5	160	43	14	0.6
0.9	130	0.08	2.0	180	51	16	0.8
1.0	145	0.08	2.0	200	57	16	0.8

Depending on customers priorities, for travelling time or stopping accuracy, the recommended values for levelling speeds may be modified, i.e. for faster floor to floor times; faster levelling speeds, for more accurate floor stops; slower levelling speeds.

6. FLOW SENSOR AND SOLENOID ADJUSTMENTS

6.1 Adjustment of solenoids

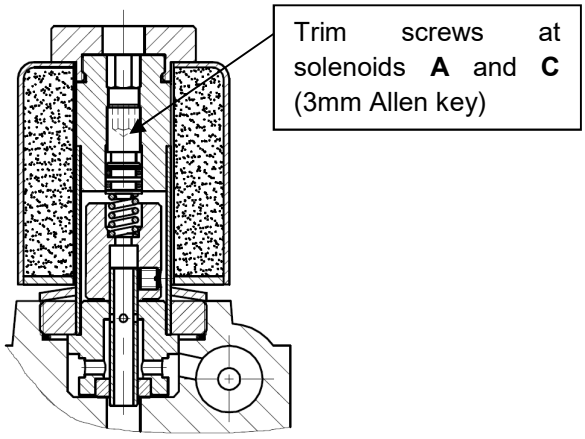
The adjustment of the solenoid power level is necessary, if parts of the solenoids have been changed during servicing. Solenoid power level has to be adjusted to ensure the valves best possible performance and to produce a quick and smooth initial movement of the car away from the floor. The travel direction is shown by the color of the LEDs. Green LEDs are referring to Up direction while red LEDs are used for Down direction.



Within the "**MAIN MENU**" and the "**Status**", the digital value of the **UP** solenoid (**A**) or **DOWN** solenoid (**C**) during an **UP** or **DOWN** travel is displayed. Depending on travel direction, the **green** LED for output signal **A** (**Up**) or **red** LED for output signal **C** (**Down**) will be illuminated.

As basic setting, the adjustment screw is turned out all the way out and then turned in for 3.5 turns. For finetuning the adjustment screw should be turned slightly "in" or "out" in order to increase or decrease its digital value.

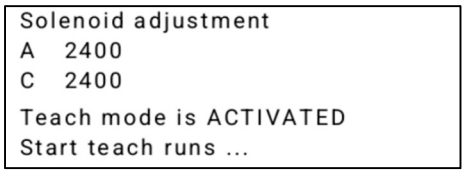
If the elevator runs at a constant speed, i.e. at full speed or slow speed, this digital value should ideally be around 2100 ± 200. To alter the value, turn the trim screw in or out.

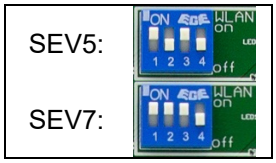


If possible, the adjustment should be made during slow speed, as there is more time for adjusting between 2 floors. The starting value for acceleration is 2400. Since the SEV card always starts with this value in the standard setting, the solenoid valve adjustment should ensure a quick and soft start.

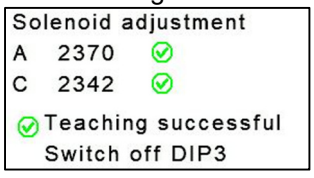
Alternatively, after the basic setting, you can also activate the self-learning (teach mode) for optimal setting of the solenoid valves. To do this, switch on the DIP3. Then the activation is displayed as follows.

Attention! Teach runs have to be executed under no load condition!

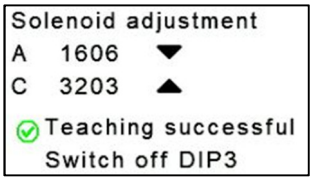




Now start the empty lift and let it run until the display for a successful learning run appears. The numbers for the currently determined optimal starting value appear behind the two solenoid valves **A** and **C**. This should be in the range of 2400 ± 300.



If there are green ticks ✓ behind the numbers, then the starting values are within the allowed range. If black arrows appear, then the setting of the solenoid valve is too high or too low. If the value is too high, then turn the adjustment screw ¼ turn counterclockwise and if the value is too low, turn it in the opposite direction accordingly. Depending on the deviation from 2400 and the gain, you still have to readjust 1/8 turn to get within the permissible range.



6.2 Solenoid valve correction when fully loaded

After the adjustment of the solenoid valves for the **unloaded** condition has been successfully completed, a correction for the **loaded** condition may be necessary under certain circumstances.
Under "Settings" -> "Valve settings" -> "Solenoid valve settings", the starting behavior at nominal load can be corrected using the *correction value* parameter.
If having a delayed take off, the *correction value* should be increased, e.g. from 100% to 110%. If, on the other hand, the take-off occurs with a jerk, the correction value should be reduced.

6.3 Solenoid valve adjustment for relevelling

With the relevelling it is possible to set its starting behavior under "Settings" -> "Valve settings" -> "Solenoid valve settings" using the "*Relevelling*" parameter. The solenoid valve setting for the relevelling can assume values from 1 (delayed but gently) to 10 (rapid but with a jerky take off). The default value is set to 4.

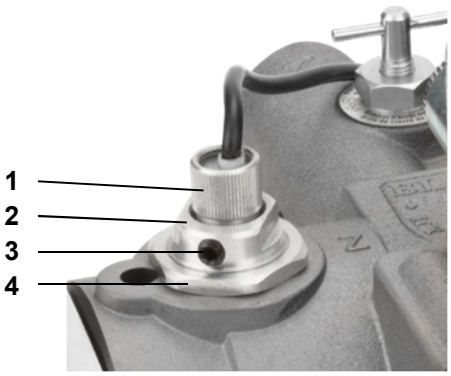
6.4 Adjustment of flow sensor

Attention!

Flow sensor is already factory adjusted. Readjusting is only necessary when replacing sensors.

Vertical sensor adjustment

If the sensor value [mA] under static condition is not set between 4.8 and 5.3 mA, close the ball valve and open manual lowering to drop the valve pressure, loosen up the lock screw of the sensor and turn the knurled sensor-head in or out until the value is between 4.8 and 5.3 mA. Re-tighten the lock screw.
Attention: Adjusting the sensor value below 4.5 mA may cause the sensor to press against the flow meter!



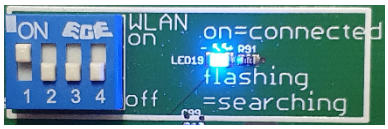
1 Sensor head
2 Sensor bushing [19 mm (3/4”) spanner]
3 Sensor lock screw (3mm Allen key)
4 Bushing lock nut [32 mm (1 1/4”) spanner]

Radial sensor adjustment

For radial adjustment of the sensor loosen the bushing lock nut (**4**), without turning the sensor bushing (**2**). Operate the elevator to run **Up** and **Down** at leveling speed. Measure the speed with stop watch or tachometer. Levelling speeds for both directions should have the same value. If Down leveling speed is slower than Up leveling speed, rotate the bushing (**2**) clockwise by 15° and re-measure the leveling speeds. If Down leveling speed is faster than Up leveling speed, rotate the bushing (**2**) counter-clockwise by 15° and re-measure the leveling speeds.
Repeat the process of rotating the bushing in clockwise or anti-clockwise as required to set the Up and Down leveling speeds to be practically the same. Re-tighten the bushing lock nut once the setup is finished.

7. WI-FI CONNECTIVITY & SECURITY

The SEV card is delivered, as shown in the picture to the right.



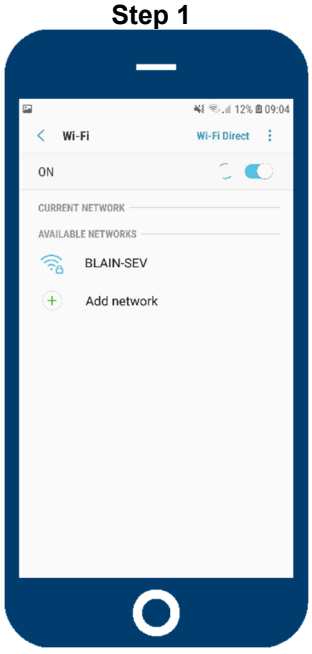
Switch 1 – The Wi-Fi switch in **ON** position allows communication with the electronic card using a smart phone. The on-board Wi-Fi access point is available for accepting connections.
Switch 2 – The **OFF** position enables the electronic card to be used for SEV-05 valves. The **ON** position is to be used when using SEV-07 valves with pressure and temperature sensors.
Switch 3 – "ON": Teach mode for solenoid adjustment is activated
Switch 4 – not in use

Because the software for communicating with the card resides on the card itself and is browser-based, no additional software installation is required on your smart device. This allows the use of any smart device regardless of the operating system or software architecture. It is recommended to use **Mozilla Firefox for Android or Safari for iOS** as web browser.

To connect with the SEV card using your smart device, ensure the **switch 1** to be in **ON** position. The **Blue LED** will flash during the process of establishing a Wi-Fi connection. Once a stable connection is established, the **LED** would stop flashing and remain **ON**.

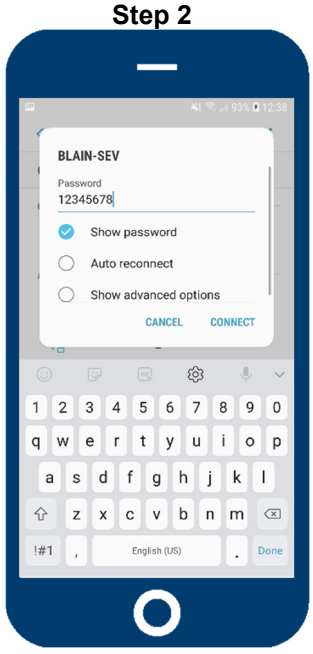
*In order to safeguard unauthorized access to the electronic card, the Wi-Fi should be switched **OFF** on completion of setup / configuration / monitoring.*

Step 1



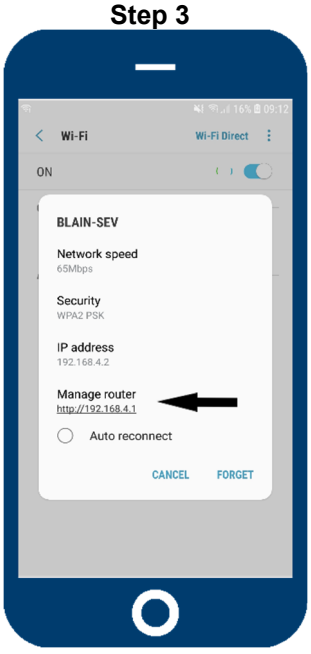
Identify and connect with the BLAIN-SEV Wi-Fi from your smart device.

Step 2



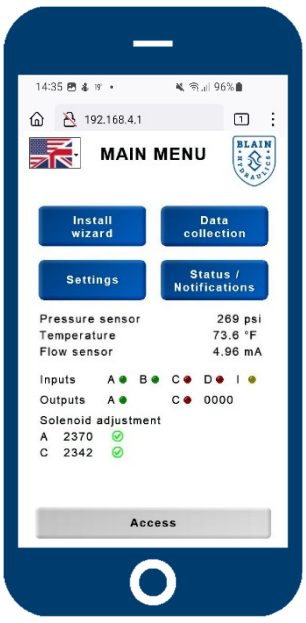
Provide the password to get connected. The default **password** is **12345678**.

Step 3



Once connected, tap on the Wi-Fi to get into the configuration. Tap on "Manage router" to access the SEV card with your preferred browser (Firefox recommended).
Alternatively open your preferred browser and provide the **IP address 192.168.4.1** in the navigation bar.

Step 4



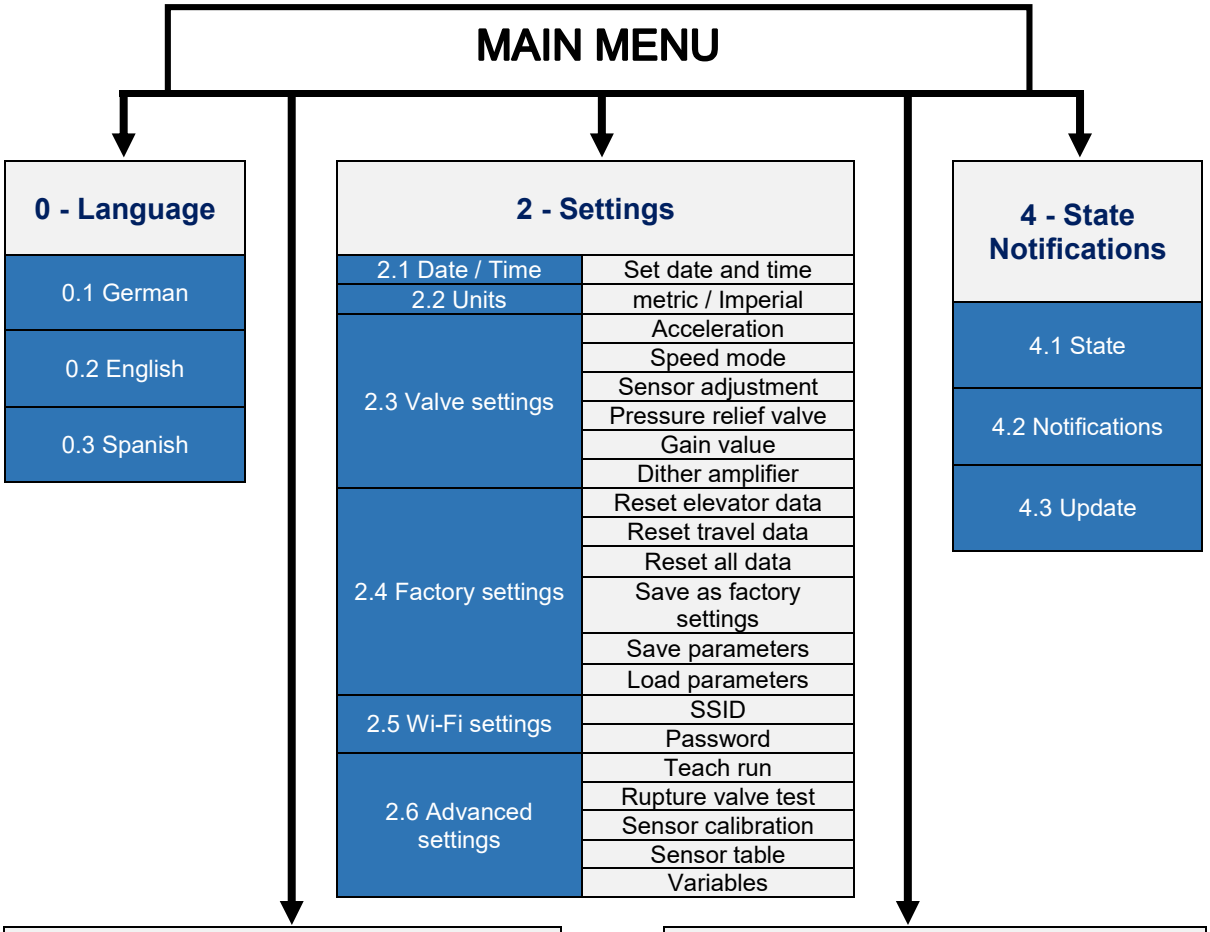
Once the authentication is completed, a loading screen will appear

Once loading is complete, the MAIN MENU can be seen.

During the time the smart device is connected with the SEV card, no internet connectivity or other network connections are possible.

Password:	12345678
IP address:	192.168.4.1

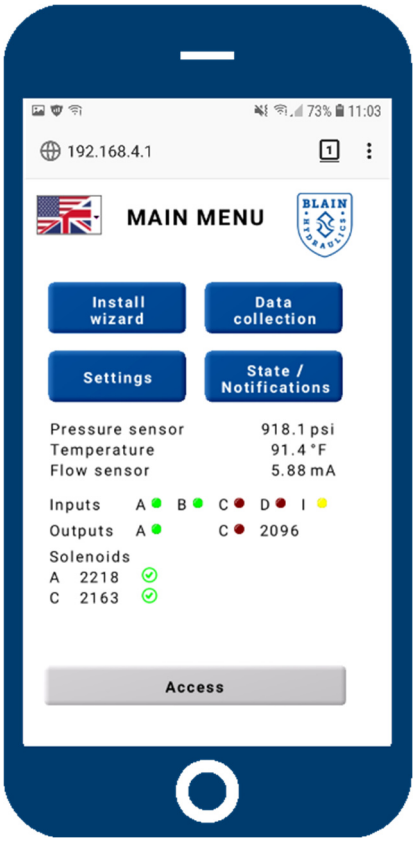
8. OPERATION VIA SMART DEVICE



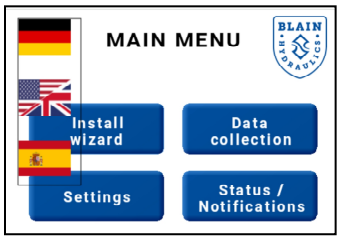
1 - Install wizard	
1.1 Welcome screen	Introduction
1.2 Cylinder data	Transmission
	No. of cylinders
	Piston type / diameters
1.3 Pump data	Performance
	Efficiency
1.4 Weight & pressure	Empty cabin
	Payload
	Min. pressure
	Max. pressure
1.5 Up travel data	Speed
	Acceleration
	Soft stop
1.6 Down travel data	Speed
	Acceleration
1.7 Inspection travel data	Up speed
	Down speed
1.8 Final screen	Final information

3 - Data collection	
3.1 Device ID	ID
3.2 Elevator data	Cylinder data
	Pump data
	Weight
	Pressure
3.3 Travel data	Up travel
	Down travel
	Inspection travel
3.4 Logbook	Last runs
	Reset counters
3.5 Trouble shooting	General error
	Error Up travel
	Error Down travel

8.1 Main menu



The language of the software can be changed by pressing the country flag symbol in the upper left corner.



Once the desired language has been selected, enter the date, time and preferred unit system in the "**Settings**" menu. To return to the **"MAIN MENU"** from any point in the submenu, use the **" MAIN MENU " button**.

The "**Install wizard**" is being used to assist during valve setup and serves as a step by step guide to help users entering the complete and correct necessary elevator data.

The "**Data collection**" gives an overview about all entered data to make changes if necessary and it gives access to the "**Logbook**" and the "**Trouble shooting**" sections.

In the "**Settings**" menu you can change units, valve and Wi-Fi settings or reset settings to factory settings if desired.

The "**State/notifications**" shows the status of the system and allows for possible updates.

The "**Access**" button gives the user the possibility to enter and change passwords necessary for accessing the features of the software. Only with correct access changes can be made.

Furthermore the "**MAIN MENU**" acts as the first tool for analyzing and setting up the valve. Values for pressure, temperature and flow are displayed. In case of no readings the connections need to be rechecked or the sensors changed. LEDs for input and output give feedback for diagnostics. While traveling constantly in full speed or levelling speed in Up or Down direction, the highlighted digital value should stay in the range of 2100 ± 200. The green check marks should show up behind the digital values of the solenoids giving feedback of the correct starting values.

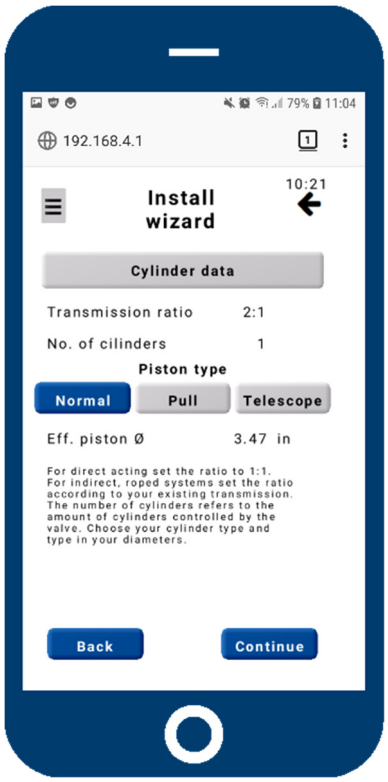
The following section of this installation manual describes how to set up and service the valve with the help of the software. The most important points of navigating the menu will be covered and the sub menus **"Install wizard", "Data collection", "Settings" and "State / Notifications"** will be explained in detail.

Please note: Changing data is only allowed when correct access codes are being input!
The standard level 1 code is 1111 and can be changed by the user by pressing the access button.

8.2 Install Wizard

The installation wizard only needs to be used when a new SEV card is taken from storage. In the case of a new installation or spare parts delivery directly from the factory, the data has already been entered and the wizard does not need to be used. The **"Data collection"** submenu should be used to check the existing data.

> *Before the installation wizard is started it is highly recommended that all technical data of the lift is readily available and that the input unit is correctly selected. The choice for unit's selection between Metric and Imperial can be made from the "**Settings**" menu > units from the home screen.*

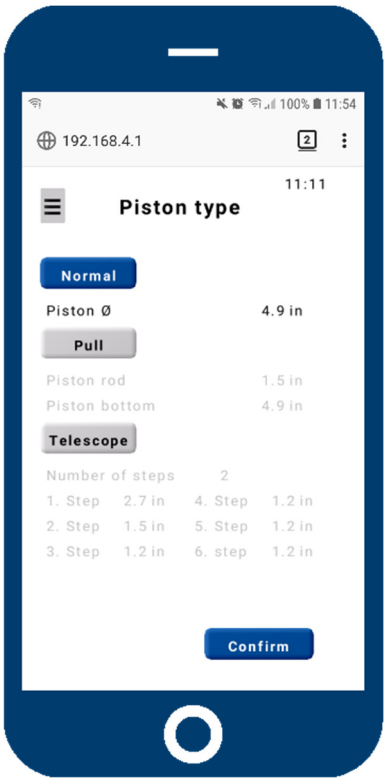


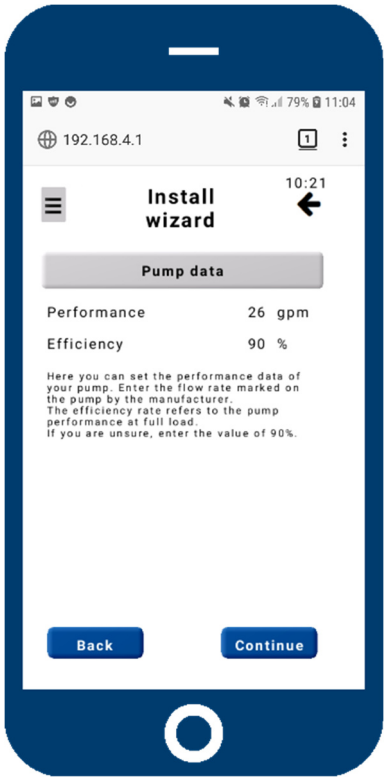
←Left

After starting the install wizard and reading the welcome screen, you are asked to enter the necessary cylinder data. Pressing the buttons for the different piston types will bring up a dialogue field (screen on the right), where the desired values can be entered. To change transmission ratio or number of cylinders, tap on the corresponding values.
The effective piston diameter is calculated depending on the entered data. Changing its value will override all other data.

Right→

Select a piston type and enter its diameters by tapping on the values. Use the confirm button on the bottom right to get back to the screen on the left.



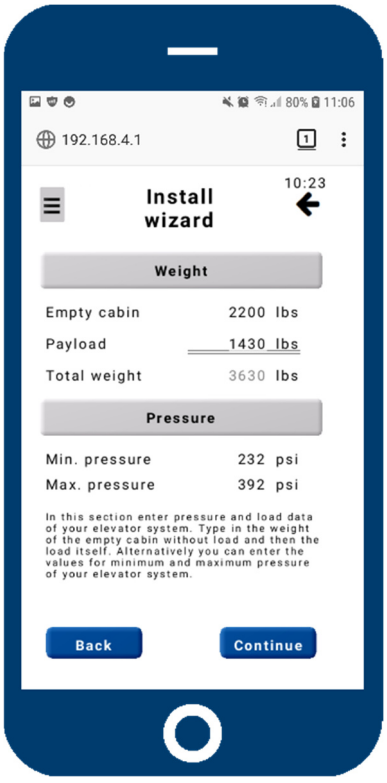


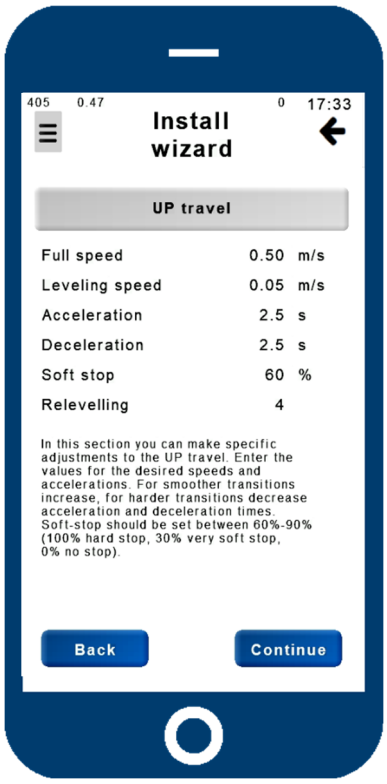
←Left

Enter the pump performance data provided by the manufacturer. Due to changes in load and oil viscosity the pump will not always deliver its full flow. Furthermore some flow is needed by the SEV to regulate and provide constant speed and travel time. 90 % efficiency is an approximated value.

Right→

Provide the static weight of your elevator system and the pay load data. Alternatively the values for minimum and maximum pressure can be entered. Please note, that entering the weight automatically calculates the pressure and vice versa.

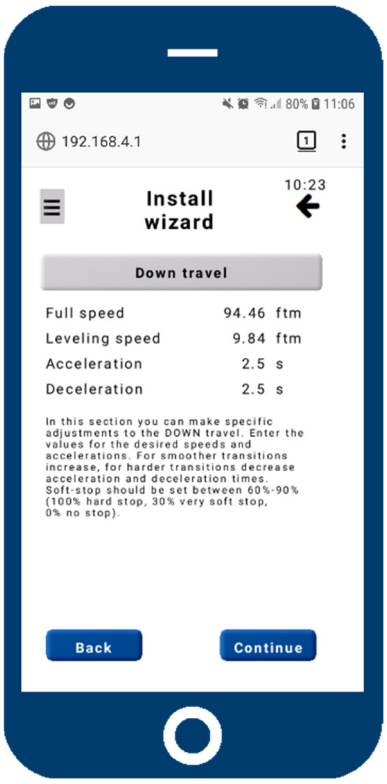


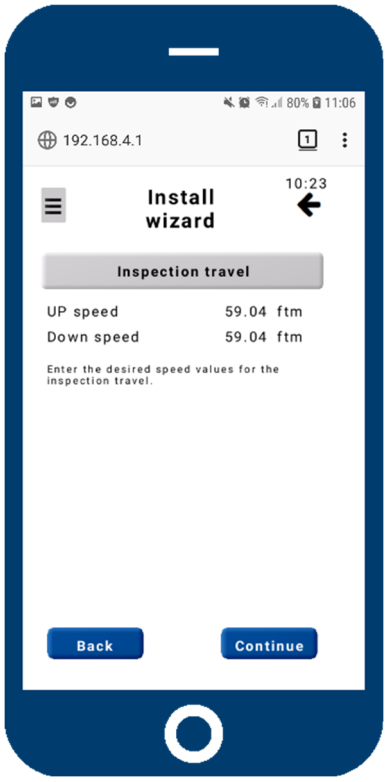


←Left and Right→

Enter your desired speeds, acceleration and deceleration times of the **Up** travel as well as the **Down** travel.

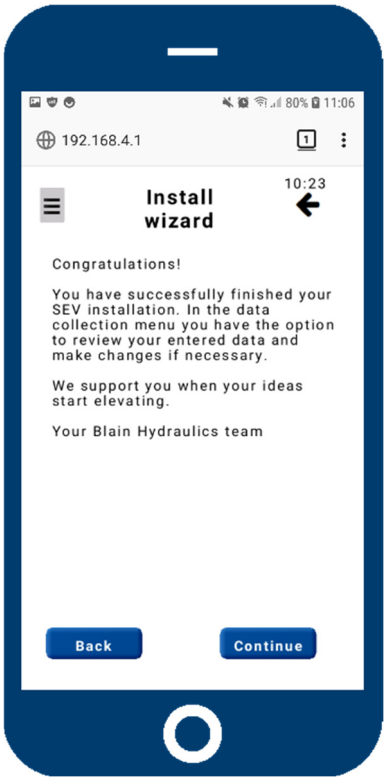
Your full speed in **Up** direction is already being calculated based on the entered piston and pump data. Speed in **Down** direction is limited to 196,85ftm (1m/s). Values shown in imperial units are displayed after being converted from Metric system and therefore vary slightly from the actual value. **Soft stop** controls the final stop into the landing zone in **Up** direction. Making it too soft (choosing a smaller value) may cause the elevator to continue traveling and surpassing the floor level. The **relevelling** can be set between 1 (delayed but gently) and 10 (rapid but with a jerky take off). Standard value is 4.





←Left

The inspection travel speed for Up and for Down direction can be set here. The speed can be used for inspections or short floor distances. Press continue to proceed further.

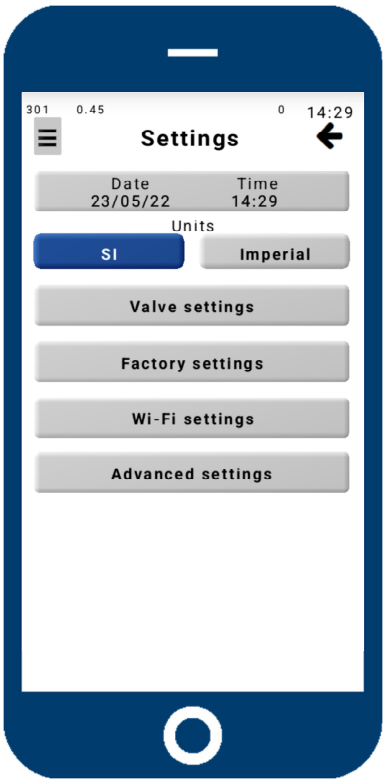


Right→

Once you reach the final screen, the install wizard ends, confirming that the entered data has been saved successfully on the electronic card. In order to review and change all entered data, you can run the install wizard again or check the "**Data collection**".

8.3 Settings

8.3.1 Date, time, units and valve settings



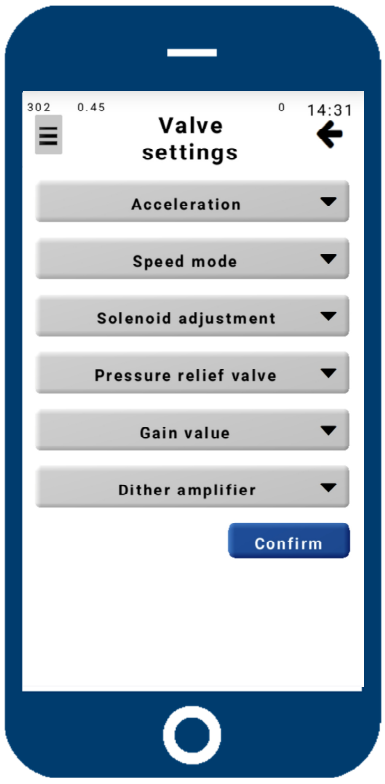
←Left

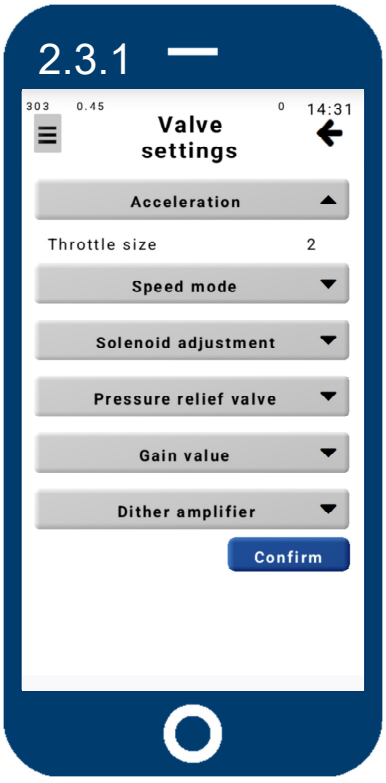
Within the settings you can change the date and time, set the units between metric and Imperial and access the "**Settings**" sub menus

Right→

This section gives you the option to improve your travel quality in case of setup problems or wrongly chosen insert sizes. The gain value can be used to even out the problems caused by wrong insert size selection. The dither amplifier is used to get rid of vibrations experienced while travelling.

Warning: Adjustments for Gain and Dither should only be done once Blain Hydraulics tech support has been consulted. Speed mode can be either set to Constant Speed Mode or Energy Saving Mode. The pressure relief valve allows a setup while receiving live feed from the pressure sensor within the system.



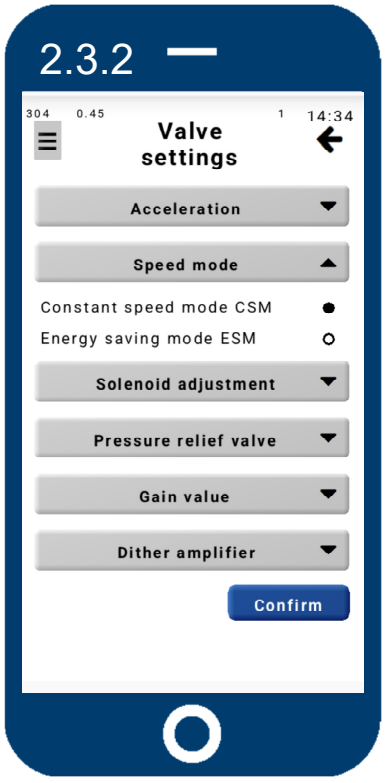


←Left

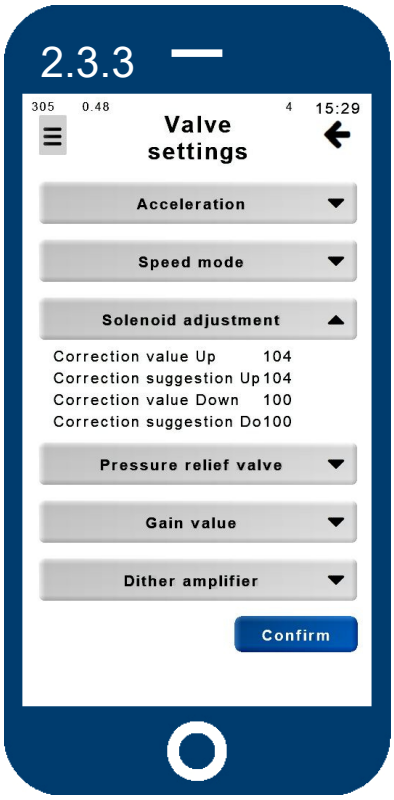
The acceleration can only be adjusted via Wi-Fi on the SEV07. Size 2 is installed as standard. Size 1 is used for lower pressures; for larger ones, size 3. Compare this value with the built-in throttle and adjust if necessary. Value has no meaning for SEV05.

Right→

Usually, speed is controlled by following a constant target value (speed mode CSM). The energy saving mode (ESM) can be used to optimally use the pump flow rate. In this case the target speed is adjusted to the current speed for each travel. Speed is depending on the load. The flow rate of the pump changes, which leads to different floor to floor travel times. To ensure that the slow speed times remain the same, the deceleration phase is varied accordingly.

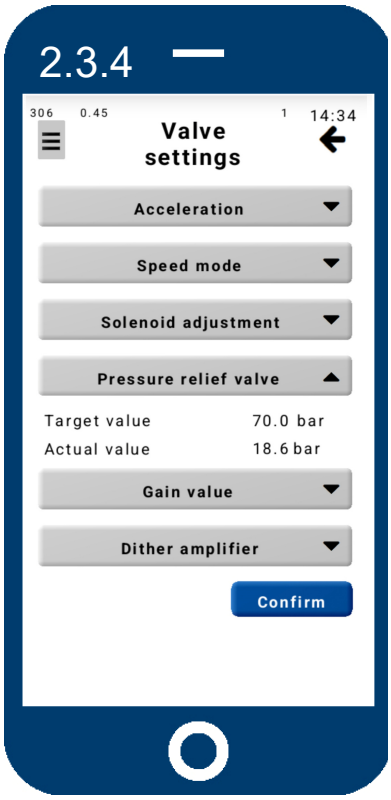


8.3.2 Solenoid adjustments



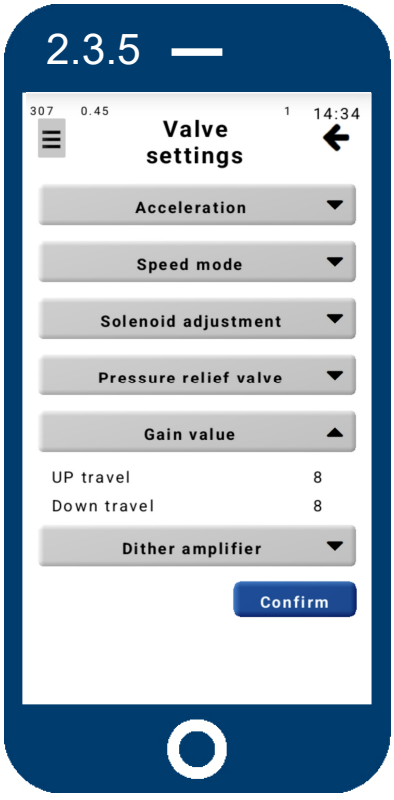
←Left

If parts of the solenoid valve "A" or "C" are replaced (pre-setting: complete out and 3 turns in) or the solenoid valve setting is changed, a *teachrun* with an **empty** cabin must first be carried out (see 8.3.5). Then the correction for the approach in the **loaded** state takes place. If the approach takes too long (increase in the coil value), the **correction value** (only SEV7) must be reduced; if it is too hard be increased accordingly. The calculation of the correct correction value is displayed as a suggestion and should be adopted with the correction value. Depending on the deviation from the ideal value, the correction is made 2-3 times.



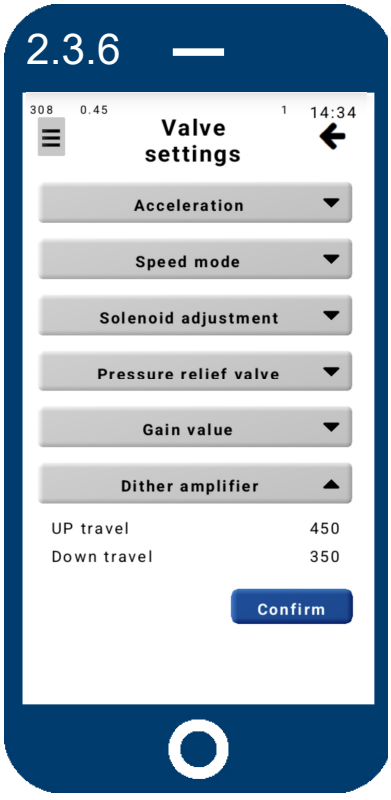
Right→

The setpoint for the pressure relief valve is calculated from the maximum pressure entered and multiplied by factor 1.4. The current actual value (SEV07 only) can be used for setting.



←Left

The **gain factor** is used for better control and to equalize the input sizes. A larger value shortens the response time of the valve (Caution! Vibrations if the value is too large). A decrease dampens the responses from the valve.
The default value is 8.



Right→

The **dither value** from the controller prevents the solenoid valve from sticking when the control value changes. Decreasing it reduces this responsiveness; an increase can lead to vibrations.
The default values are shown.

8.3.3 Factory and Wi-Fi settings

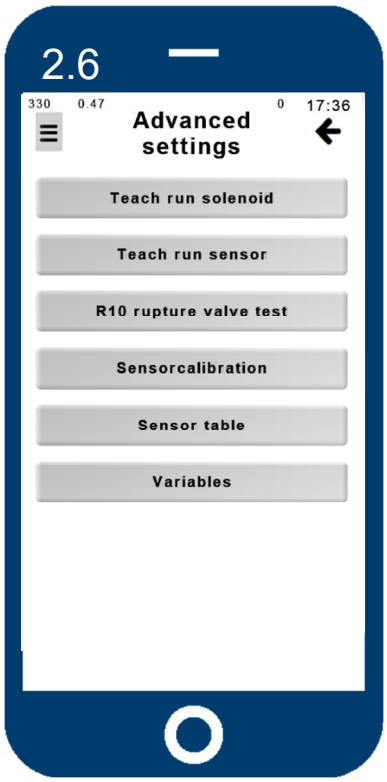
←Left

From this menu you can reset different data you previously entered and reset everything to factory settings. The factory settings are set by the customers themselves or Blain Hydraulics according to customer data. Additionally settings can be uploaded to and downloaded from the SD card.

Right→

The Wi-Fi settings allow modification of the SSID and its corresponding password. The current Wi-Fi version is shown as well.

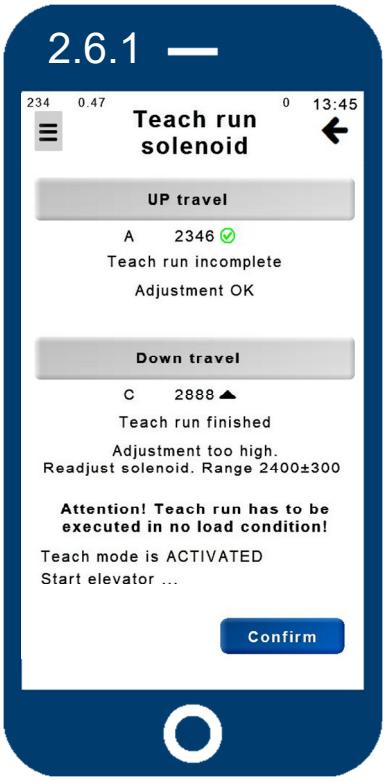
8.3.4 Advanced settings



←Left

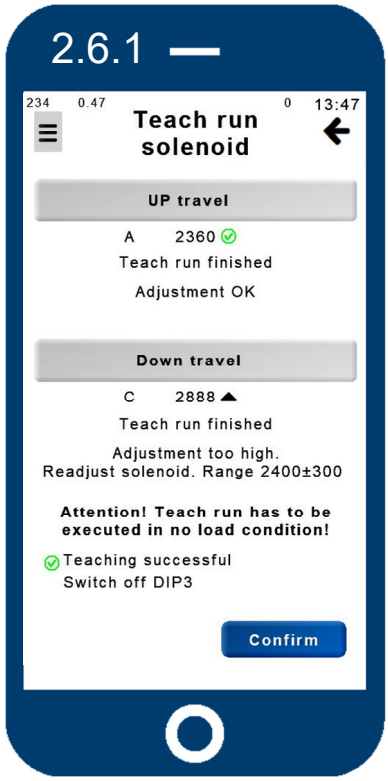
The "**advanced settings**" menu allows to carry out teach runs for the solenoid as well as for the sensor and rupture valve tests. Changing sensible sensor values and variables is reserved for Blain Hydraulics technicians.

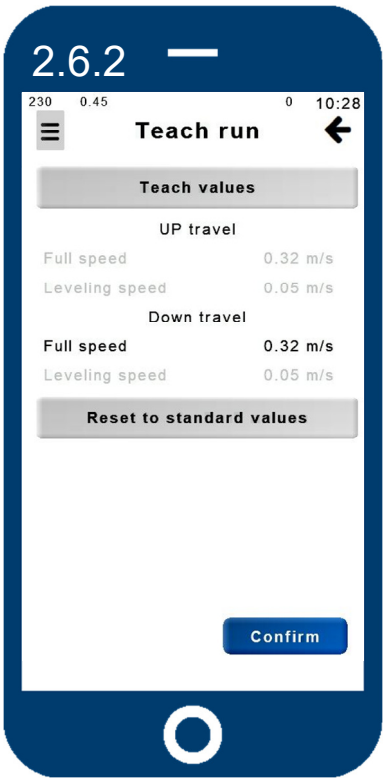
8.3.5 Teachrun for solenoid and speed calibration



←*Left and Right*→

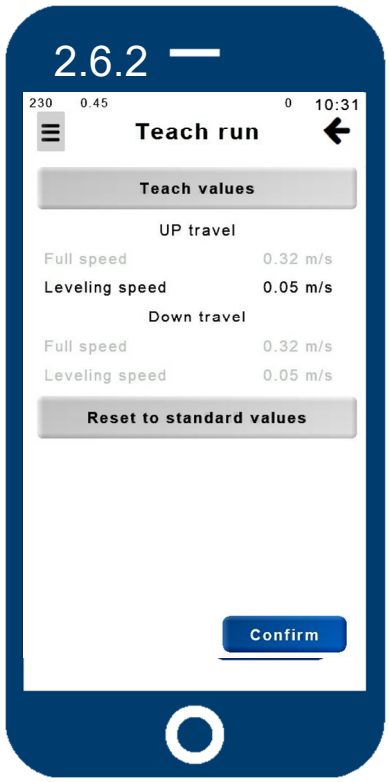
To carry out the teach run, the DIP3 switch must be switched "ON". The teach run of the solenoid valve is used to correct imprecise manual settings on the solenoid valve. During the self-learning phase, the system will start up frequently in succession until it has found the appropriate starting value. If the value has been determined and is in the range of 2400±300, then the teach run has ended successfully. If the journey is aborted during the learning phase, the message "teach run incomplete" appears. If the value is outside the permissible range, the solenoid valve must be readjusted and the teach run carried out again, even if the “teaching successful” message appears.





←Left and Right→

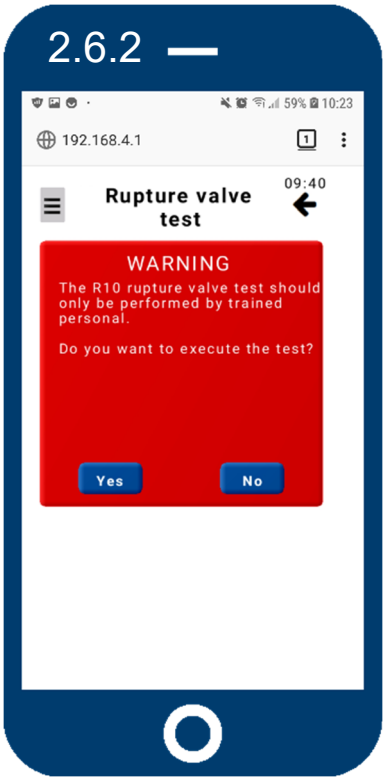
To calibrate full speed, the elevator must run at full speed and reach a constant speed. To calibrate the slow speed, the elevator may only start at slow speed (relevelling). To do this, only give a slow speed signal or, alternatively, disconnect terminal 6 (up) or terminal 5 (down) from the card and give a full speed signal. In this case, the card only receives a slow speed signal. If the elevator runs at the same speed, the run can be interrupted and the slow speed calibrated. Once finished reconnect the terminal(s).



The **"Teach run"** menu is used for fine adjustment of the main speeds (full speed and/or slow speed), if they do not match the target values. Only the speed of the last trip in the direction traveled can be edited, all others have a gray background. A teach run may become necessary if the sensor, the electronic card or the flow meter have been changed. The new data is immediately adopted in the sensor table!

If you enter the wrong data without running again, enter the data correctly or reset to standard values!

8.3.6 Rupture valve test

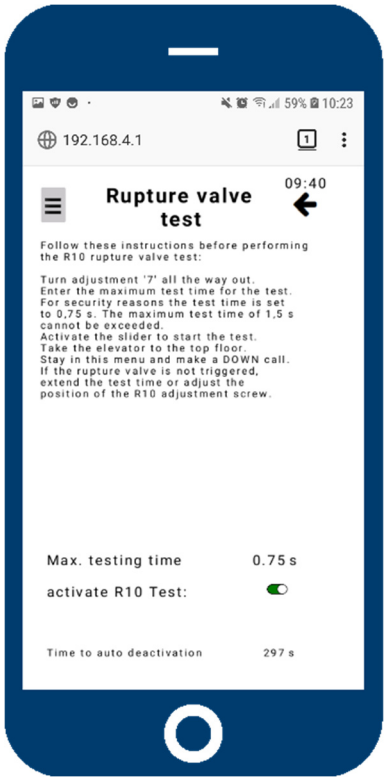


←Left

Before the "**rupture valve test**" is carried out, a warning is shown. After the warning perception there is a short briefing before the screen on the right appears. **This test should only be performed by qualified personnel (code:4646)!**

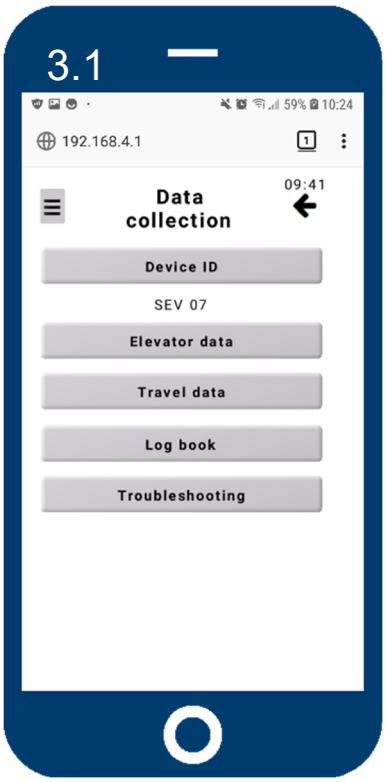
Right→

Follow the instructions on screen to test your rupture valve. The default setting of the testing time is set to 0.75 s for security reasons. After the test time limit is reached, the control valve will decelerate the elevator. If test time is too short for the rupture valve to be activated, the time can be increased. Once the slider is triggered, the test can be carried out within the next 300 s. The test will be disabled when leaving this screen.



8.4 Data collection

8.4.1 Elevator data

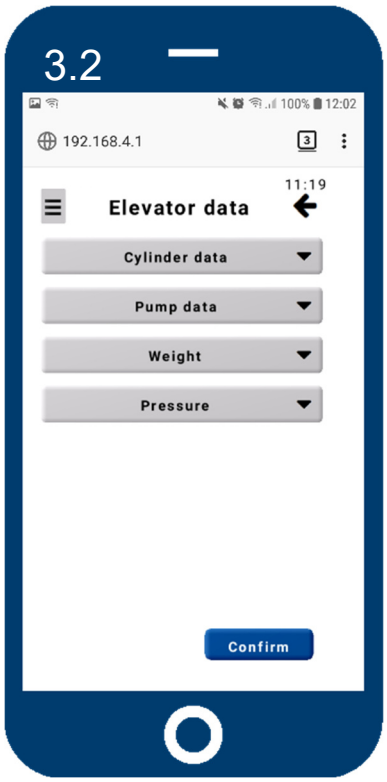


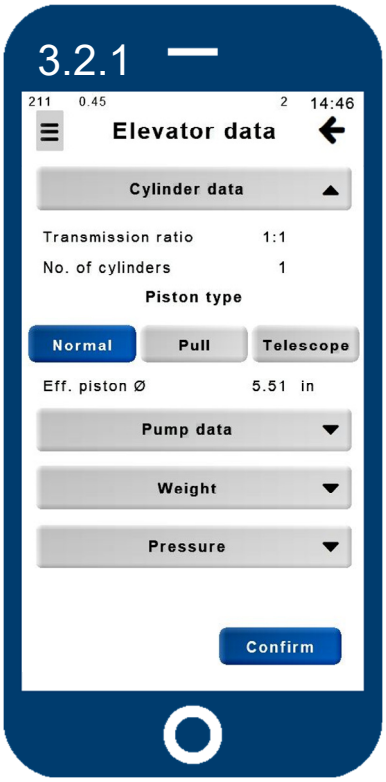
←Left

The "**Data collection**" sub menu provides an overview of the existing data stored on the card. Data can be entered here when selecting "**Elevator data**" or "**Travel data**". In addition there is access to the "**Log book**" as well as the "**Trouble shooting**". The "**Logbook**" provides an overview of travel logs with the option of looking at its travel graph. "**Troubleshooting**" offers help on most common errors.

Right→

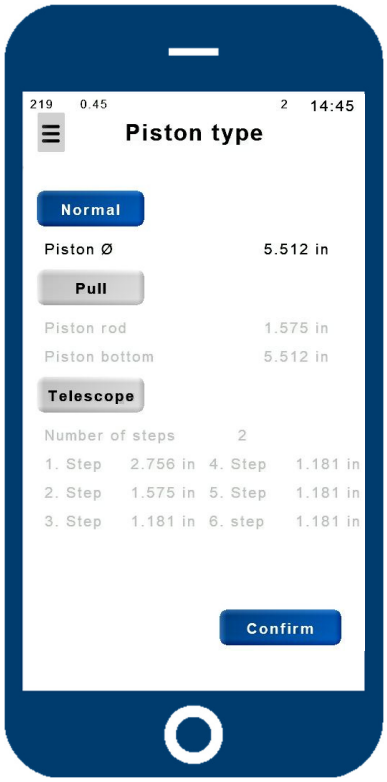
Within the "**Elevator data**" menu section you can check the data for your piston, pump, weight and pressures and change them if desired.





←Left

In addition to the number of cylinders and the transmission ratio, the piston type and its respective diameter can be set in the **"Cylinder data"** menu.
The effective piston diameter calculated from these 3 data can be edited if required.

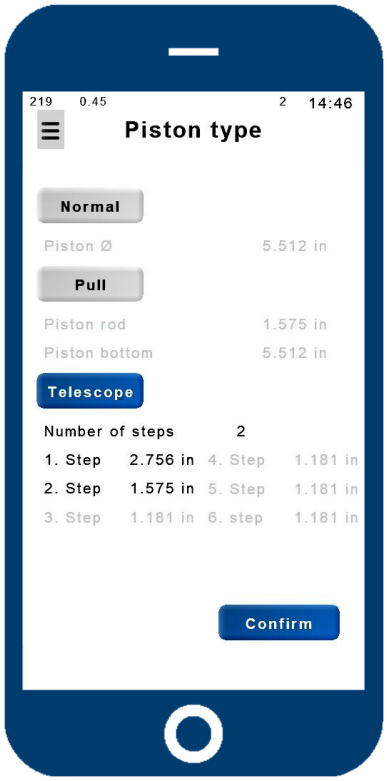


Right→

The piston diameter of the push type piston is entered under the Normal piston type.

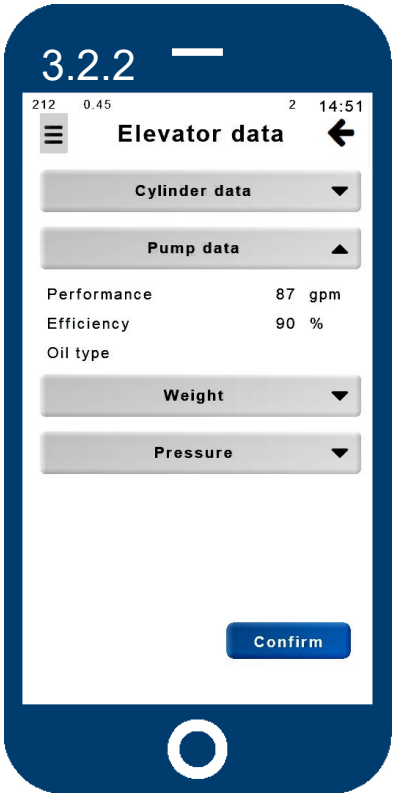
←Left

When using a pull type piston, the two relevant diameters must be entered here.

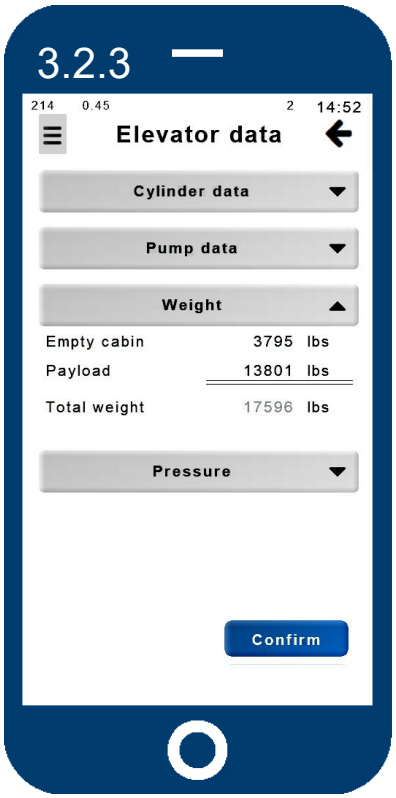


Right→

In the case of using a telescopic piston system, the number of stages must first be entered before the diameter of each stage can be edited.

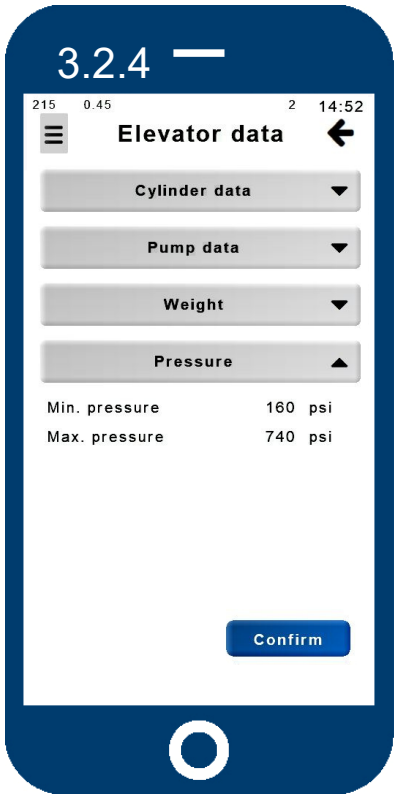


←Left
Enter the pump parameters according to the manufacturer's specifications. The flow rate of the pump is reduced by load and high oil temperature (change of oil viscosity). This is determined by the efficiency. In addition, a certain oil flow in circulation is required for the flow regulation of the SEV valve. Based on experience, the value should therefore be set to 90%.



←Left
If the data for the empty weight and the payload are entered, the pressure is calculated automatically in the next step.

Right→
Alternatively, you can also enter the pressures and the weights will be calculated.



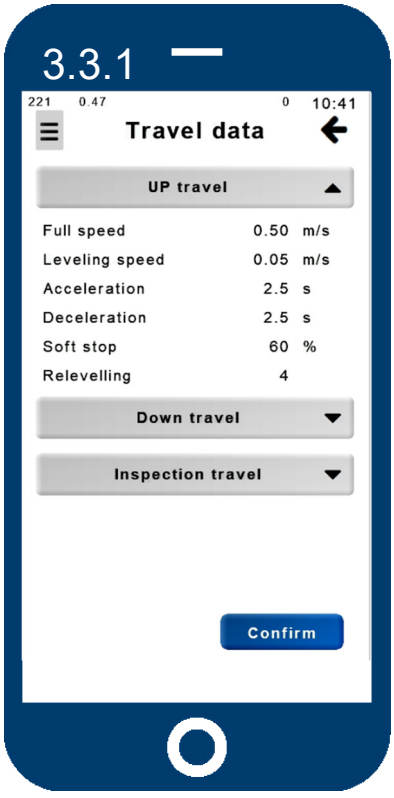
8.4.2 Travel data

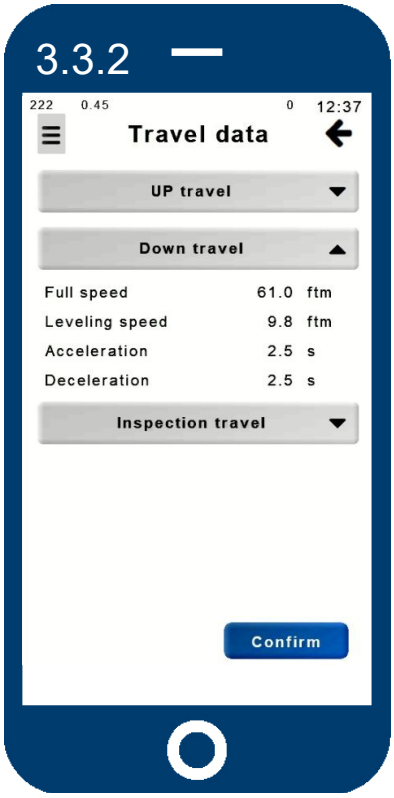
←Left

In the **"Travel data"** menu, the travel parameters for the up and down as well as inspection travel can be viewed and set separately.

Right→

In addition to the setting of the speeds for full and slow travel, a value for the **soft stop** can also be entered. 100% indicates the same deceleration as when transitioning from full speed to slow speed. 0%, on the other hand, refers to no deceleration (too soft) until the motor is being turned off. The **relevelling** can be set between 1 (delayed but gently) and 10 (rapid but with a jerky take off). Standard value is 4.





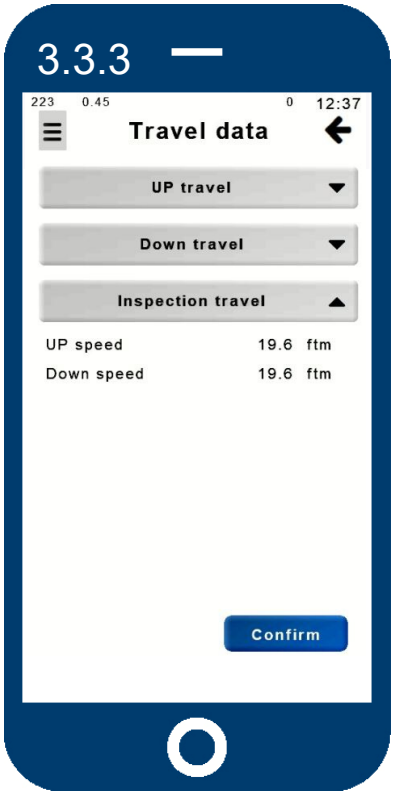
←Left

For the down travel the parameters for the speeds, accelerations and decelerations can be viewed or changed.

.

Right→

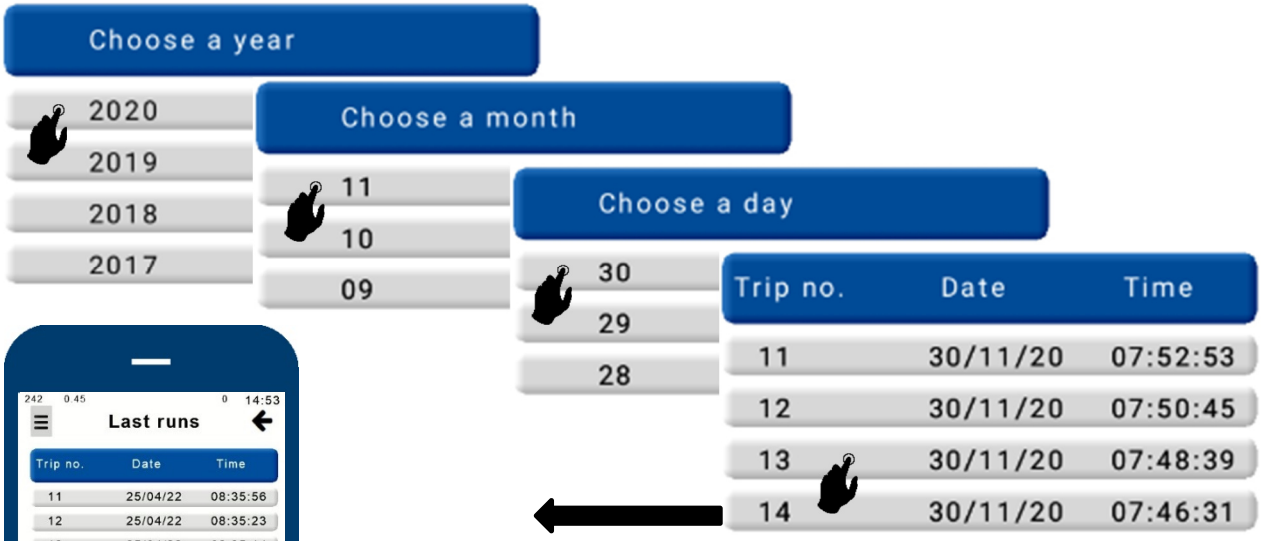
The inspection speeds can be viewed or changed in this area. These speeds can be used for short stops or as a 3rd speed option.



8.4.3 Log book

The "log book" provides information about the last saved trips. Each trip can be identified by its date and time. Additionally, the travel diagrams can be called up by pressing on the individual run. The symbols + and - are used to navigate between the pages. Various views enable the analysis of ride characteristics and valve settings.

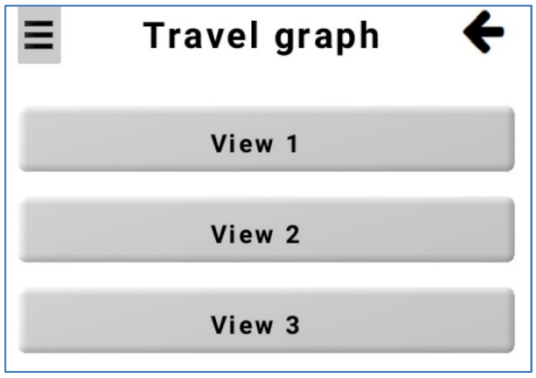
Monitoring is beneficial for quick and easy diagnose and identification of errors for technical support.



By selecting the year, month and day, you get to the “last runs” overview for this day. The last trip is always listed at the top and the first at the bottom.

If more than 10 runs are saved on this day, the symbols for scrolling appear at the bottom. With Top you get to the last trip of the day, which is trip no. 1.

Choosing a date will provide a travel overview. When selected its travel graphs can be analyzed. There are three different views to choose from. Each view will display different channels for analyzing.



View 1 is the most common one to analyze the travel characteristics of the elevator. The actual and target speed values for Up and Down directions as well as the solenoid power level and the acceleration values are displayed. Examples are given below.

View 2 gives a more detailed look into values of the PID controller and will be used mainly by Blain Hydraulics technical support for system diagnostics.

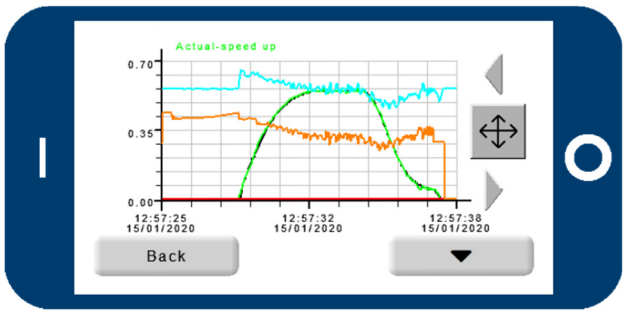
View 3 shows the pressure and temperature changes during the travel. Each view has the same basic layout and buttons to fulfil the same functions.

1	Chosen channel
2	Scale of chosen channel
3	Back to view selection
4	Move to the left
5	Swap between move and zoom function
6	Move to the right
7	Change channel

Depending on the selected channel (**1**), the scaling (**2**) adapts automatically. Y-axis values depend on the measurement system selected in the "**Settings**" menu and can be shifted using the icons. Pressing the "Back" button (**3**) results in a return to the view selection. When the crosshair icon  (5) is displayed, the x-axis can be shifted using the left (4) and right (6) arrow icons.

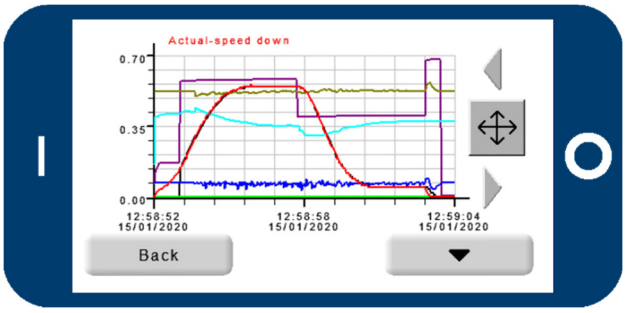
By pressing the crosshair icon  , the arrow icons change into lens icons to make use of the zoom function (zoom in  and zoom out ) and the lens  replaces the crosshair.

The button  (**5**) allows to switch between different channels in each selected view. The color of the travel graph indicates the travel direction (green – up direction; red – down direction).



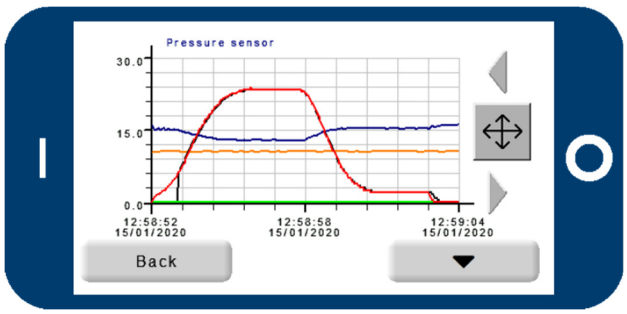
View 1 – (e.g. Up travel)

- Target trace
- Actual speed value Up
- Actual speed value Down
- Solenoid digital value
- Actual acceleration value



View 2 – (e.g. Down travel)

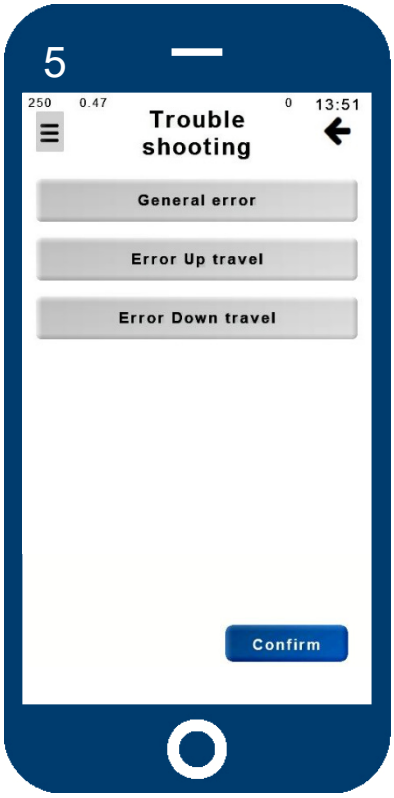
- Target trace
- Actual speed value Up
- Actual speed value Down
- Status
- Proportional term
- Integral term
- Derivative term



View 3 – (e.g. Down travel)

- Target trace
- Actual speed value Up
- Actual speed value Down
- Pressure
- Temperature

8.4.4 Trouble shooting

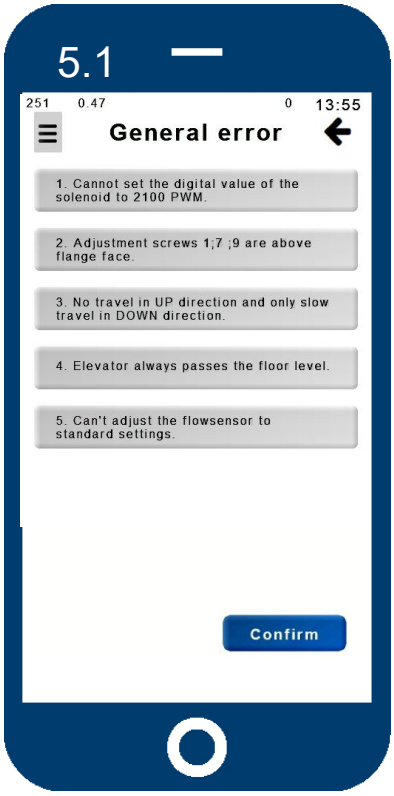


←Left

In the "Troubleshooting" section, information is provided about the most common problems encountered while or before traveling in either direction.

Right→

In terms of errors, there are different symptoms, which can occur on the elevator system caused by the control valve. If you click on the button describing the symptoms, a new window appears with possible causes and suggested solutions.



General errors

Problem	Cause	Recommended
1. Cannot set the digital value of the solenoids **A** or **C** to 2100 PWM.	Spring of solenoid **A** and/or **C** is missing.	Insert spring.
	Needles of the solenoids **'A'** and **'C'** are swapped.	Insert the correct needles for **A** and **C**
2. No travel in UP direction and only slow travel in DOWN direction.	Error notification on the card: sensor faulty.	Clear error and quit notification.
	No input signal to the SEV card.	Check the main controller signaling.
	Simultaneous Up and DOWN signal input on SEV card.	Check signal input and only give a signal for one direction.
3. Elevator always passes the floor level.	Elevator is travelling faster than set speed. Sensor is not correctly adjusted.	Adjust sensor correctly. Look at sensor adjustment in SEV manual.
4. Can't adjust the flow sensor to standard settings.	Sensor is faulty.	Change sensor.
	Broken spring in the flowmeter.	Change flow meter.
5. Pressure-temperature sensor not functioning or no reading on main menu.	Connection problem.	Check connection and signal input to SEV card. Change sensor if necessary.
	Sensor defect.	Flip switch Nr. 2 on SEV card to use SEV valve without p-T sensor. Change sensor (middle flange).

I. **Valves are already adjusted and tested.** Check all electrical connections and correct coil supply before changing valve settings.
II. Make sure all parts are properly mounted after servicing the valve.

Up direction travel

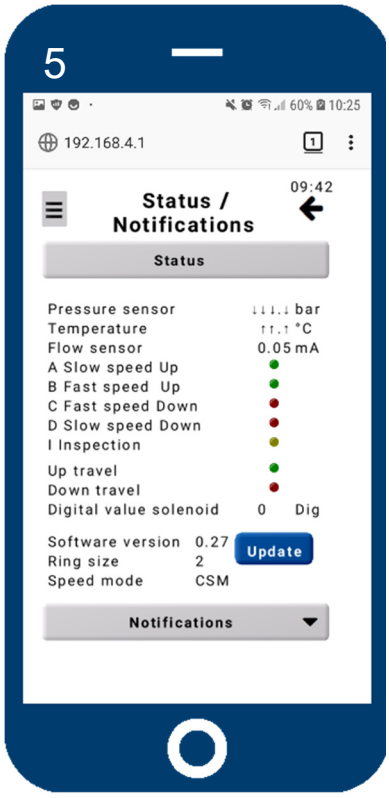
Problem	Cause	Recommended
1. No UP start. Elevator remains at floor level.	Coil **'A'** not energized, voltage too low.	Lift coil to check magnetic force.
	Insufficient voltage supplied to SEV card.	Supplied Voltage to SEV card has to be 24 V DC.
	Spring preload of solenoid **'A'** not properly adjusted.	Run elevator with leveling speed in UP direction and set digital value of solenoid **'A'** to 2100.
	Solenoid **'A':** tube not screwed down tight.	Tighten solenoid **'A'** tube.
	Bypass flow guide **'U'** is too large.	Insert smaller bypass flow guide (flow chart).
	Pressure relief valve **'S'** is set too low.	Set relief valve higher (turn in).
	Pump running in the wrong direction.	Check motor direction, install pump correctly.
	The pump connection flange is leaking.	Seal the pump connection.
	The pump is undersized, worn or cracked.	Select bigger pump or change pump.
2. UP start is too hard.	Short delay valve is not closing.	Change short delay valve.
	Bypass flow guide **'U'** too small.	Insert larger bypass flow guide.
	O-Ring **'UO'** on bypass flow guide **'U'** is leaking.	Change O-Ring → look at SEV spare parts list.
	Star/delta motor switch period too long.	0.2 – 0.3 sec. switch time is sufficient.
	Excessive friction on the guide rails or in the cylinder head.	Cannot be eliminated through valve adjustment.
3. No deceleration into leveling speed.	O-Ring **'UO'** on bypass flow guide **'U'** is leaking.	Change O-Ring → look at SEV spare parts list.
	Deceleration time target value too high.	Set lower value for deceleration time (2.5 s)
4. Deceleration into leveling speed, but overtravel of floor level.	Deceleration time target value too high.	Set lower value for the deceleration time (2.5 s)
	Leveling speed target value too high.	Set lower value for the leveling speed.
	Deceleration signal received too late.	Change shaft switch position.
	Sudden and hard elevator stop caused by too soft setting of soft stop.	Increase setting for soft stop to make stop harder (standard: 60%).
	Target value cannot be reached, <u>because:</u> - pressure loss in the system is too big - dynamic pressure drops below 12 bar	<u>Possibilities:</u> - Use next larger insert size - Increase pressure and weight - Reduce friction in the system - Adjust deceleration time (longer) - Change position of deceleration switch
5. Vibration during the whole travel.	Bypass flow guide **'U'** is too large.	Choose smaller insert size if gain <6.
	Gain is too big (>11).	Decrease gain.
6. Vibrations during parts of the travel.	Control parameters are not optimal.	Decrease gain and respectively change P-and D- portion (slope).
7. Slow reaction of controlled variable.	Bypass flow guide **'U'** too small.	Use next larger insert size, if gain >11.
	Gain is too small.	Increase gain (not < 6).

Down direction travel

Problem	Cause	Recommended
1. No DOWN start.	Coil **'D'** not energized, voltage too low.	Lift coil to check magnetic force.
	Insufficient voltage supplied to SEV card.	Voltage supplied to SEV card is 24 V DC.
	O-Ring **'UO'** of down valve **'X'** leaking.	Change O-Ring → SEV spare parts list.
2. No full speed.	No input signal to the SEV card for full down speed.	Check input signals on SEV card (LEDs).
	Adjustment **'7'** closed too far.	Turn out adjustment **'7'.**
	Elevator is travelling faster than set speed. Sensor is not correctly adjusted.	Adjust sensor properly. Look at sensor adjustment in SEV manual.
3. Deceleration into leveling speed. Elevator travels through floor level.	Filter of deceleration nozzle contaminated or nozzle damaged.	Clean filter or change deceleration nozzle.
	Down leveling speed is too fast.	Turn in adjustment **'9'** to about 0.05 m/s leveling speed.
4. No deceleration into leveling speed. Elevator travels through floor level.	Inner O-Ring **'FO'** in flange **'7F'** is leaking.	Change O-Ring → SEV spare parts list.
5. Elevator sinks due to inner leakage	Solenoid **'D':** tube not screwed down tight.	Tighten solenoid **'D'** tube.
	Solenoid **'D':** needle **'DN'** and seat **'DS'** contaminated or damaged.	Clean or change needle and seat.
	O-Ring **'XO'** of down valve **'X'** leaking.	Change O-Ring → SEV spare parts list.
	O-Ring **'VO'** of check valve **'V'** leaking.	Change O-Ring → SEV spare parts list.
	O-Ring **'WO'** of check valve **'V'** leaking.	Change O-Ring → SEV spare parts list.
	Inner O-Ring **'FO'** in flange **'4F'** leaking.	Change O-Ring → SEV spare parts list.
	O-Ring **'HO'** of manual lowering **'H'** leaking.	Change O-Ring **'HO'** or change manual lowering.
	Short delay valve **'E'** is leaking.	Change short delay valve.
6. Deviation of target trend line during deceleration/ bandwidth too big.	Down valve flow guide **'X'** too small.	Use next larger insert size, if gain >11.
	Gain is set too low.	Increase gain if gain <6.
	Seat housing dimension is not correct.	Change seat housing.
7. Vibrations during the whole travel.	Down valve flow guide **'X'** too large.	Choose smaller insert size if gain <6.
	Gain is too big.	Decrease gain (not >11).
8. No leveling when using the manual lowering.	Adjustment **9** closed too far.	Turn out Nr. **9** to about 0.05 m/s leveling speed when using the manual lowering.
	Pressure setting of **'KS'** too high.	Turn out adjustment **'KS'.**
	Spring **9F** in adjustment **9** broken or down leveling valve **Y** blocked.	Check and clean tappet and spring, change faulty parts.
9. Leveling speed too fast when.	Solenoid **'C':** tube not screwed down tight.	Tighten solenoid **'C'** tube.
	Adjustment **'9'** opened too far.	Turn in adjustment **'9'** to about 0.05 m/s leveling speed.

[#]: To check for energized solenoid coils, remove 19mm hex nut. By lifting the coil, the noticeable magnetic force of an energized coil can be checked and the travel function of the elevator manipulated.

8.5 Status, Meldungen und Update

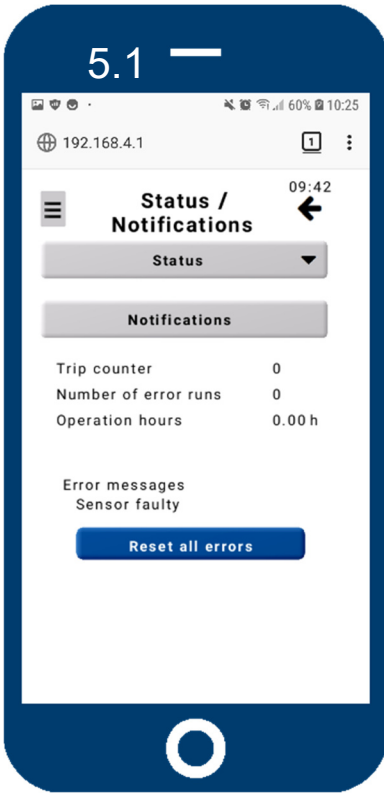


←Left

The current status of the valve is shown here with the help of various data, such as sensor values for pressure and temperature, as well as the input (A, B, C, D, I) and output signals (Up and Down) are displayed. Furthermore information on the software version, the flow ring size and the speed mode can be found. With the update button, new firmware can be loaded from the micro SD card.

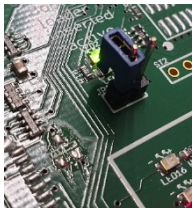
Right→

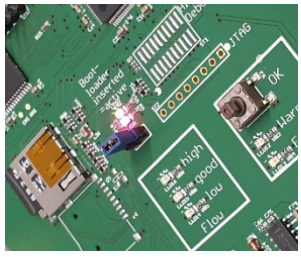
The notifications inform about number of runs, error runs and operation hours as well as existing errors. „Reset all errors“ deletes the messages once resolved.



To perform an update, a micro SD card with a new software version is required. During the update, the green LED of the boot loader flashes very quickly. The process usually takes approxemitly 30 seconds. As soon as the process is complete, the green and red Boot Loader LEDs are flashing slowly alternately. There are two options for performing updates:

1. Update via power supply
   a. Disconnect the SEV card from the power supply.
   b. Put a jumper on the two exposed pins of the boot loader.
   c. Insert the micro SD card into the card slot.
   d. Reconnect the power supply to the SEV card.
   e. Wait for the update to finish.
   f. Remove the bridge from the two pins.
   g. Connect your device to the SEV card.





2. Update via menu button
   a. Insert the micro SD card into the card slot.
   b. Connect to the WLAN of the SEV card and call up the menu.
   c. Go to Status / Messages and press the "Update" button. 

   d. Enter the password level 1 (if not changed: 1111) and confirm your entry.
   e. Wait for the update to finish.

9. ERROR RELAIS

Card Internal Relay R1 - Evacuation of passengers

Important

If there is a major fault interfering with the normal operation of the SEV card when travelling between floors, power supply to coil **A** or **C** will automatically be interrupted.

During Up travel the motor and during Down travel coil **D** (Down start/stop) remain energised unless the SEV relay **R1** signals otherwise.

*When a major fault occurs the relay **R1** on the **SEV** card switches to send and error signal to the main controller. The terminals **18**, **19** and **20** are used for error signal wiring. When **R1** relay switches, then the following emergency functions should initiate:*

- *Motor-pump combination will be switched off*
- *Coil **D** is energised to lower the car at levelling speed to the next lower floor*
- *Elevator is taken out of service and emergency service is being notified*

The following faults are signalled by illuminating the red **Error** LED. At the same time, the notifications section in the software menu will show the nature of the fault as follows:

Major Faults

1. Coil defect	Coil **A** or **C** disconnected or short circuited.	**Elevator stops. Relay R1 switches over.**
2. Sensor defect	Sensor disconnected, damaged or wrongly adjusted.	

After the fault has been corrected, errors 1-2 must be cancelled by pressing **OK** button on SEV Card and erased from the notifications menu.

Minor Faults

3 Supply Voltage	Power supply to the card is less than 17 V DC. Elevator operation continues at inspection speed.	**Elevator continues to operate. Relay R1 does not switch.**
4 Sensor feedback	The value of the sensor does not change within 8 seconds of the start signal.	
5 Sensor overflow	The value of the sensor exceeds its defined maximum value.	
6 Leveling too long	Duration of up or down levelling phase is excessively long.	
7 Overtravel	Elevator surpasses the floor level.	

Errors 3-7 do not have influence on the operation of the elevator. As long as the power supply to the SEV card is maintained, errors will be saved and the orange LED will remain illuminated. The error indication can be cancelled one after the other in reversed order of occurrence (last error first) by pressing **OK** button on the SEV card or by erasing the error messages within the “notifications” menu.

10. SELECTION CHARTS – VALVE INSERTS

Data required when ordering:

- Pump data
- Static pressure empty car
- Static pressure with full load
- Up speed
- Down speed
- Voltage for coils
- options

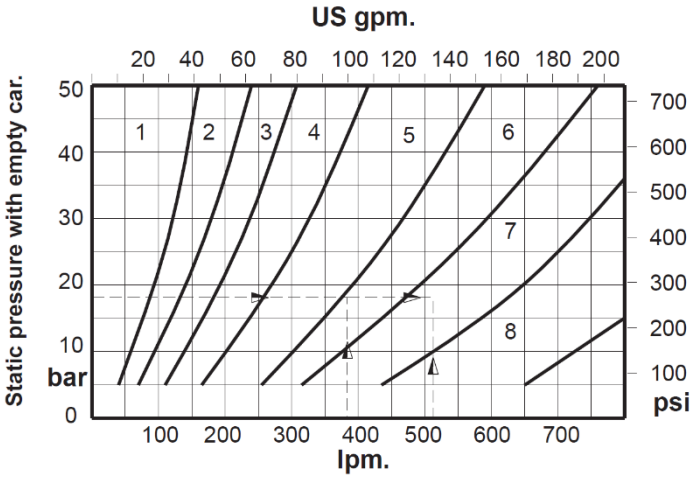
Additional for adjustment:

- Cylinder data

Flow ring R selection

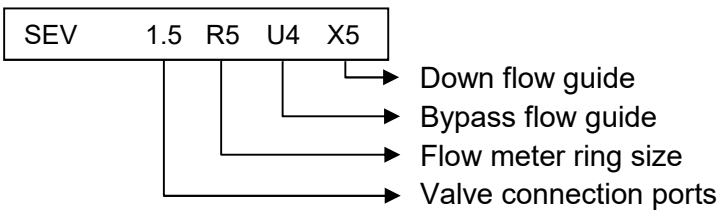
l/min	US gpm	Ring size	P, T, Z ports
40 – 75	10 – 20	R1	1” G
76 – 110	21 – 29	R2	1” G
111 – 180	30 – 47	R3	1” G
181 – 270	47 – 70	R4	1.5” G
271 – 430	71 – 112	R5	1.5” G
431 – 580	112 – 151	R6	2” G
581 – 1200	152 - 312	R7	2.5” G
Overlap	Flow rates outside the specified range from -20% to +10% are acceptable		

Flow Guide Selection Charts for Up and Down direction

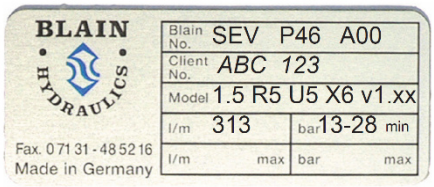


Example	
Up direction	**Down direction**
flow: 380 l/min (99 gpm)	flow: 510 l/min (133 gpm)
Static Empty Car Pressure. 18 bar (260 psi)	
Selected Bypass Valve **U**, ring size 5	Selected Down Valve **X**, ring size 6
* Overlap for valve sizes should not exceed 15%.	

Valve data plate



Example



Available options

EN – Emergency Power Coil: Battery lowering in case of power failure. (D coil double wound)
KS – Slack Rope Valve: Prevents excessive slack rope condition in 2:1 systems.
HP – Hand Pump: To raise car manually.
DH – Pressure Switches: Signals hydraulic pressure above the normal operating pressure.
DL – Pressure Switches: Signals hydraulic pressure below the normal operating pressure.

11. FLOW – PRESSURE CHART (METRIC & IMPERIAL)

Ram Ø • Area • Speed • Flow

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

Ram Ø • Area • Load • Pressure

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

in² = 6,45 cm² | 1 in = 25,4 mm | 1 m/s = 197 ft/min | 1 Imp. gpm = 4,55 l/min | 1 US gmp = 3,79 l/min | 1 kg = 2,2 lbs | 1 bar = 14,5 psi

Ram Ø • Area • Speed • Flow

ft/min		10	20	30	40	50	60	70	80	90	100	110	120	140	160	180	200
Ø inch	in²	US gpm															
1.4	1.5	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	11.2	12.8	14.4	16.0
1.6	2.0	1.0	2.1	3.1	4.2	5.2	6.3	7.3	8.4	9.4	10.5	11.5	12.5	14.6	16.7	18.8	20.9
1.8	2.5	1.3	2.6	4.0	5.3	6.6	7.9	9.3	10.6	11.9	13.2	14.6	15.9	18.5	21.2	23.8	26.5
2.0	3.1	1.6	3.3	4.9	6.5	8.2	9.8	11.4	13.1	14.7	16.3	18.0	19.6	22.9	26.1	29.4	32.7
2.2	3.8	2.0	4.0	5.9	7.9	9.9	11.9	13.8	15.8	17.8	19.8	21.7	23.7	27.7	31.6	35.6	39.5
2½	4.9	2.6	5.1	7.7	10.2	12.8	15.3	17.9	20.4	23.0	25.5	28.1	30.6	35.7	40.8	45.9	51.0
2.6	5.3	2.8	5.5	8.3	11.0	13.8	16.6	19.3	22.1	24.8	27.6	30.4	33.1	38.6	44.2	49.7	55.2
2¾	5.9	3.1	6.2	9.3	12.4	15.4	18.5	21.6	24.7	27.8	30.9	34.0	37.1	43.2	49.4	55.6	61.8
3.0	7.1	3.7	7.3	11.0	14.7	18.4	22.0	25.7	29.4	33.1	36.7	40.4	44.1	51.4	58.8	66.1	73.5
3.2	8.0	4.2	8.4	12.5	16.7	20.9	25.1	29.3	33.4	37.6	41.8	46.0	50.2	58.5	66.9	75.3	83.6
3½	9.6	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	70.0	80.0	90.0	100.0
3.6	10.2	5.3	10.6	15.9	21.2	26.5	31.7	37.0	42.3	47.6	52.9	58.2	63.5	74.1	84.7	95.2	105.8
3.8	11.3	5.9	11.8	17.7	23.6	29.5	35.4	41.3	47.2	53.1	59.0	64.9	70.7	82.5	94.3	106.1	117.9
4.0	12.6	6.5	13.1	19.6	26.1	32.7	39.2	45.7	52.3	58.8	65.3	71.9	78.4	91.5	104.5	117.6	130.7
4.2	13.9	7.2	14.4	21.6	28.8	36.0	43.2	50.4	57.6	64.8	72.0	79.2	86.4	100.8	115.2	129.6	144.0
4⅜	15.0	7.8	15.6	23.4	31.3	39.1	46.9	54.7	62.5	70.3	78.1	86.0	93.8	109.4	125.0	140.7	156.3
4½	15.9	8.3	16.5	24.8	33.1	41.3	49.6	57.9	66.1	74.4	82.7	90.9	99.2	115.8	132.3	148.8	165.4
4.8	18.1	9.4	18.8	28.2	37.6	47.0	56.4	65.8	75.3	84.7	94.1	103.5	112.9	131.7	150.5	169.3	188.1
5.0	19.6	10.2	20.4	30.6	40.8	51.0	61.2	71.5	81.7	91.9	102.1	112.3	122.5	142.9	163.3	183.7	204.1
5⅛	23.2	12.1	24.1	36.2	48.3	60.4	72.4	84.5	96.6	108.6	120.7	132.8	144.9	169.0	193.1	217.3	241.4
5½	23.8	12.4	24.7	37.1	49.4	61.8	74.1	86.5	98.8	111.2	123.5	135.9	148.2	172.9	197.6	222.3	247.0
6.0	28.3	14.7	29.4	44.1	58.8	73.5	88.2	102.9	117.6	132.3	147.0	161.7	176.4	205.8	235.2	264.6	294.0
6½	33.2	17.3	34.5	51.8	69.0	86.3	103.5	120.8	138.0	155.3	172.5	189.8	207.0	241.5	276.0	310.5	345.0
6.8	36.3	18.9	37.8	56.6	75.5	94.4	113.3	132.2	151.0	169.9	188.8	207.7	226.6	264.3	302.1	339.8	377.6
7.0	38.5	20.0	40.0	60.0	80.0	100.0	120.0	140.0	160.1	180.1	200.1	220.1	240.1	280.1	320.1	360.1	400.1
7½	44.2	23.0	45.9	68.9	91.9	114.8	137.8	160.8	183.7	206.7	229.7	252.6	275.6	331.5	367.5	413.4	459.3
8.0	50.3	26.1	52.3	78.4	104.5	130.7	156.8	182.9	209.0	235.2	261.3	287.4	313.6	365.8	418.1	470.4	522.6
8½	56.7	29.5	59.0	88.5	118.0	147.5	177.0	206.5	236.0	265.5	295.0	324.5	354.0	413.0	472.0	531.0	590.0
8.8	60.8	31.6	63.2	94.9	126.5	158.1	189.7	221.3	252.9	284.6	316.2	347.8	379.4	442.7	505.9	569.1	632.4
9½	70.9	36.8	73.7	110.5	147.4	184.2	221.1	257.9	294.8	331.6	368.5	405.3	442.2	515.9	589.6	663.3	737.0
10⅝	88.7	46.1	92.2	138.3	184.4	230.5	276.6	322.6	368.7	414.8	460.9	507.0	553.1	645.3	737.5	829.7	921.9
11.2	98.5	51.2	102.4	153.6	204.9	256.1	307.3	358.5	409.7	460.9	512.2	563.4	614.6	717.0	819.5	921.9	1024.3
12.0	113.1	58.8	117.6	176.4	235.2	294.0	352.8	411.6	470.4	529.1	587.9	646.7	705.5	823.1	940.7	1058.3	1175.9

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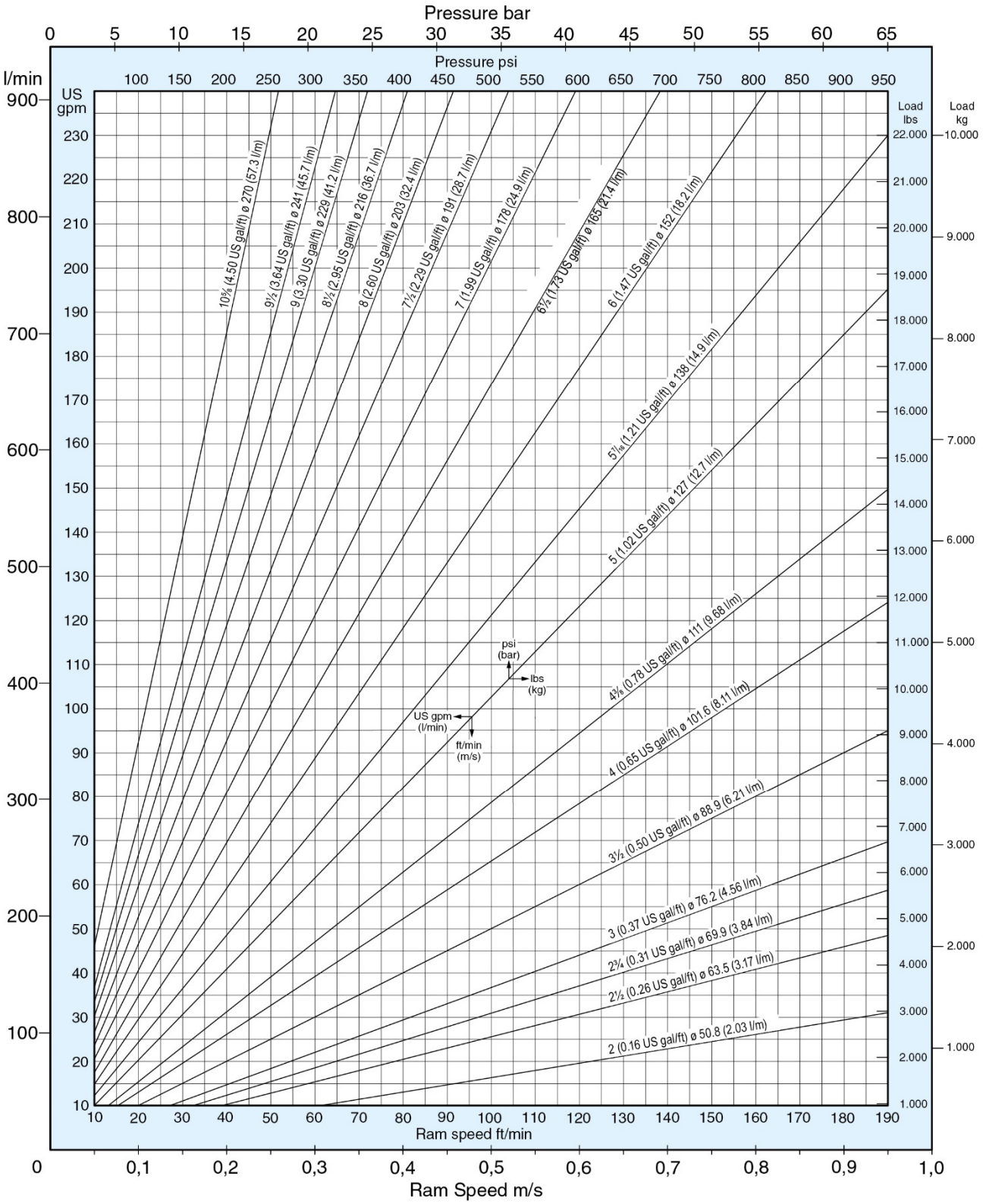
Ram Ø • Area • Load • Pressure

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

in² = 6,45 cm² | 1 in = 25,4 mm | 1 m/s = 197 ft/min | 1 Imp. gpm = 4,55 l/min | 1 US gmp = 3,79 l/min | 1 kg = 2,2 lbs | 1 bar = 14,5 psi


Pressure bar
Pressure psi
l/min
US gpm
Load lbs
Load kg
10¾ (4.50 US gal/ft) ø 270 (57.3 l/m)
9½ (3.64 US gal/ft) ø 241 (45.7 l/m)
9 (3.30 US gal/ft) ø 229 (41.2 l/m)
8½ (2.95 US gal/ft) ø 216 (36.7 l/m)
8 (2.60 US gal/ft) ø 203 (32.4 l/m)
7½ (2.29 US gal/ft) ø 191 (28.7 l/m)
7 (1.99 US gal/ft) ø 178 (24.9 l/m)
6¾ (1.73 US gal/ft) ø 165 (21.4 l/m)
6 (1.47 US gal/ft) ø 152 (18.2 l/m)
5⅜ (1.21 US gal/ft) ø 138 (14.9 l/m)
5 (1.02 US gal/ft) ø 127 (12.7 l/m)
4⅜ (0.78 US gal/ft) ø 111 (9.68 l/m)
4 (0.65 US gal/ft) ø 101.6 (8.11 l/m)
3½ (0.50 US gal/ft) ø 88.9 (6.21 l/m)
3 (0.37 US gal/ft) ø 76.2 (4.56 l/m)
2¾ (0.31 US gal/ft) ø 69.9 (3.84 l/m)
2½ (0.26 US gal/ft) ø 63.5 (3.17 l/m)
2 (0.16 US gal/ft) ø 50.8 (2.03 l/m)
psi (bar)
lbs (kg)
US gpm (l/min)
ft/min (m/s)
Ram speed ft/min
Ram Speed m/s

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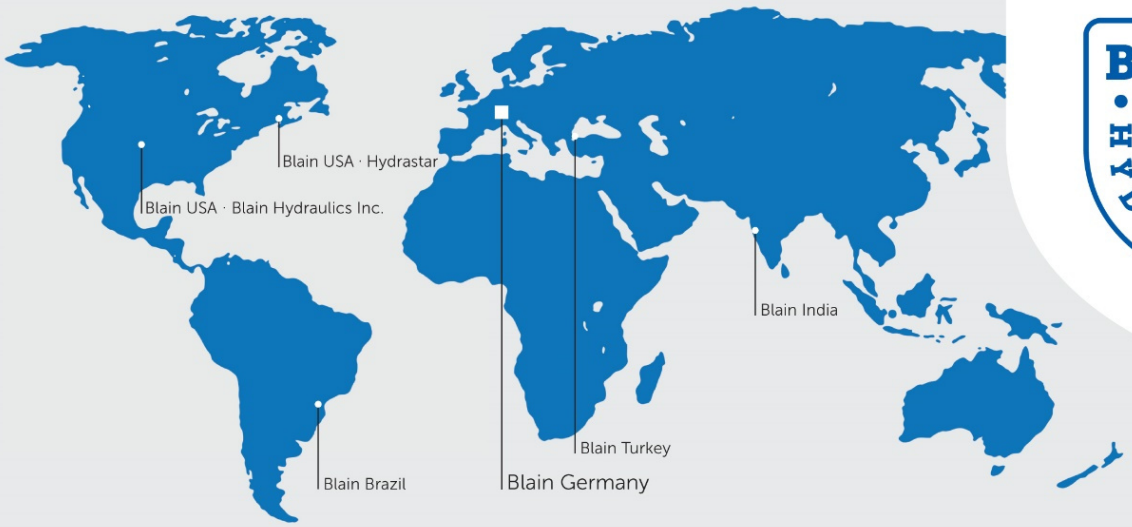

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BLAIN HYDRAULICS

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