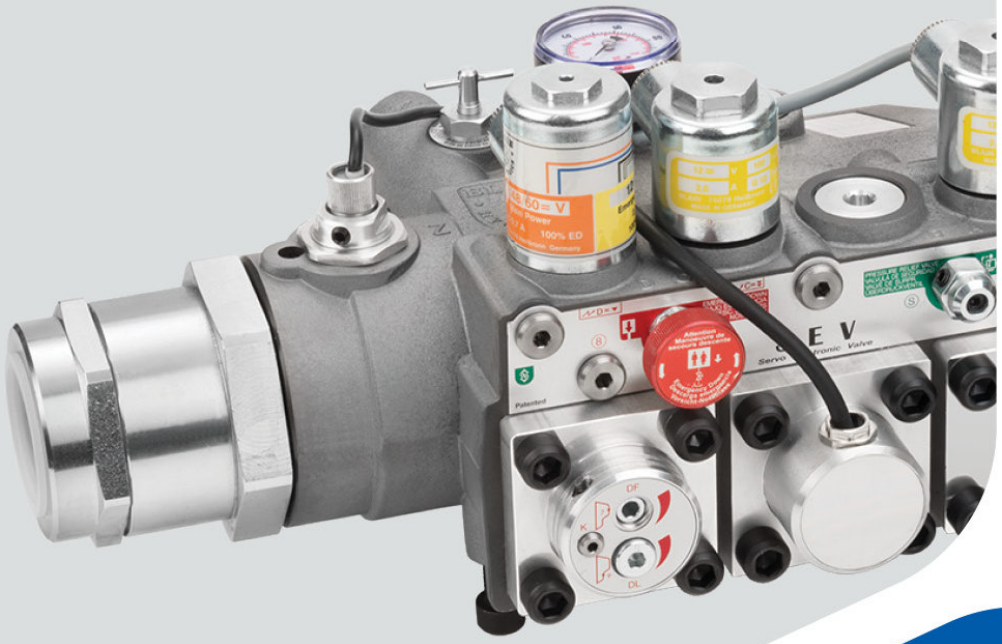
# BLAIN

## SMART VALVES SERIES FOR HYDRAULIC ELEVATORS

*Excellence in Simplicity and Performance*



# SEV-07 USER MANUAL

Smart

SEV Servo Electronic Valve

www.blain.de

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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 re-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: Smart Servo Electronic Valve SEV 07 with pressure and temperature sensor and electronic card SEV 07*

Figure 2: *Older version of electronic valve SEV05 without pressure and temperature sensor and electronic card SEV 07*

## 1.2 Product introduction

The SEV package consists of:

1) SEV valve,
2) Electronic card SEV 07,

The SEV user manual may be included.

**The valve**: The smart **s**ervo **e**lectronic **v**alve (SEV) 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**

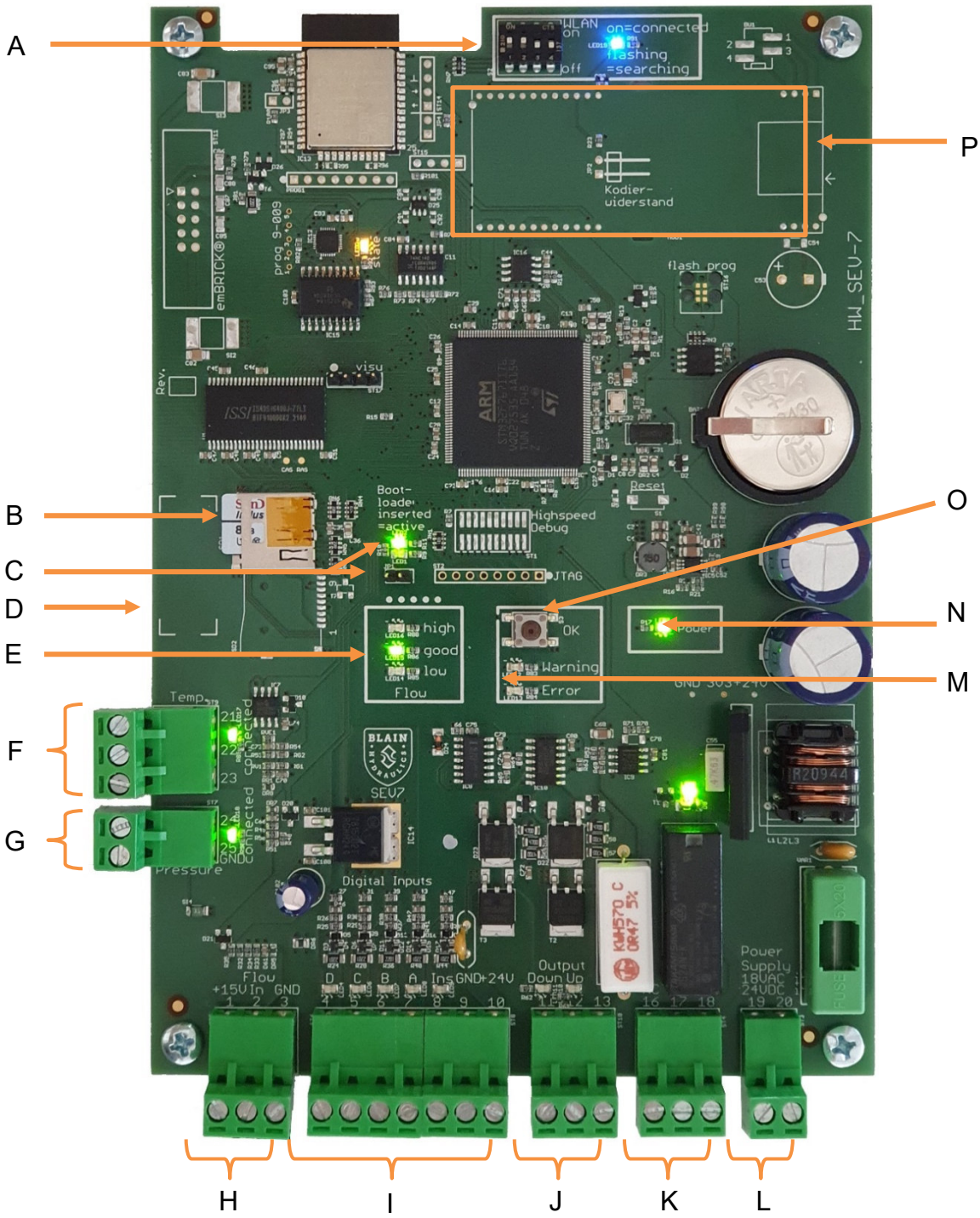
Blain's SEV User Manual is provided for qualified personnel, who are competent in installing, adjusting and servicing of hydraulic elevators. Blain Hydraulics assumes no liability for any personal injury, property damage, losses or claims arising from in appropriate use of its product or incompetence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

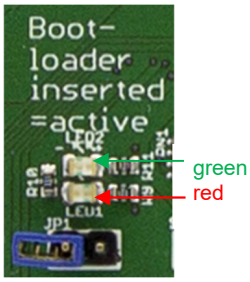
# 2. THE SEV CARD

## 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 |

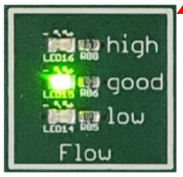
## 2.2 LED Diagnostics



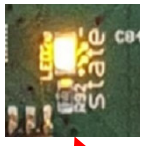

**BOOT LOADER LEDs**

Normal state
(Jumper non-bridged)
Green and red LED will light up alternately.

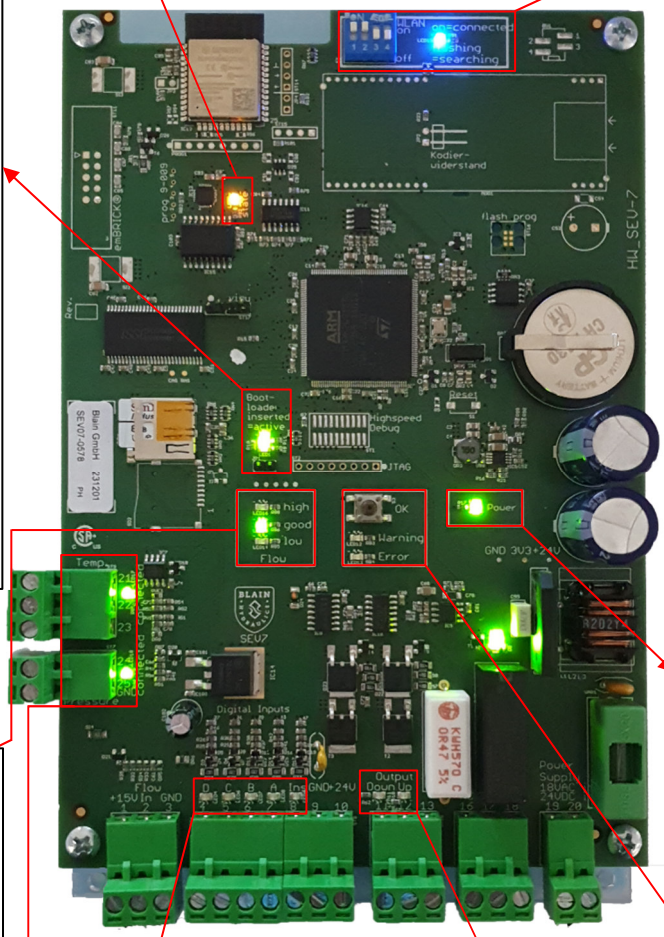
Update state
(Jumper is bridged)
Update when powering SEV card in bridged mode. If an update is being processed, the green LED will flash rapidly until the update is finished.



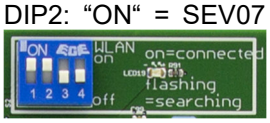

**FLOW LEDs**
They indicate if the flow sensor has been adjusted properly. If the adjustment is set too high or too low, the corresponding orange LED will light up. The sensor has to be readjusted.
If the sensor is set within the permissible range, the green LED lights up.



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

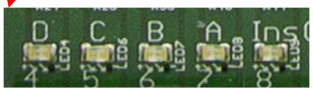


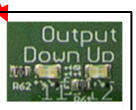
**SWITCH LED**
When switch "1" is set to „ON", the LED flashes slowly. As soon as a Wi-Fi connection to a smart device is established, the LED lights up continuously.
Switch "2" is used to select the SEV valve version.
DIP2: "ON" = SEV07




DIP2: "OFF" = SEV05

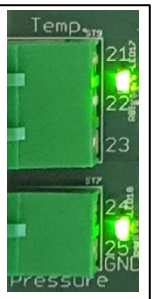
**POWER LED**
The green power LED will continuously glow as long as the electronic card is supplied with power.

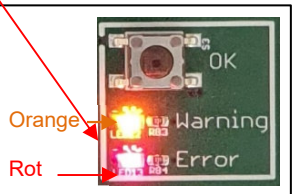



**INPUT AND OUTPUT SIGNAL LEDs**
**D** (red), **C** (red), **B** (green), **A** (green) and **Ins** (orange) are reflecting the input signals into the electronic card.
**Down** (red) and **Up** (green) are the corresponding output signals and indicate the travel direction.

**SENSOR LEDs**
(SEV07 only)
These will glow green if the pressure & temperature sensors are connected properly.



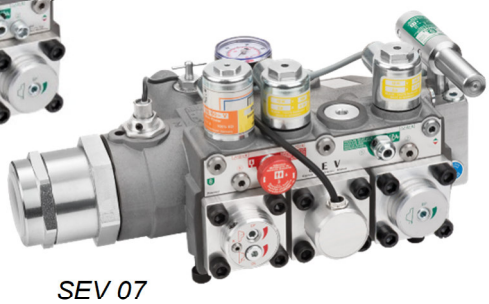




**DIAGNOSTIC LEDs**
The orange "Warning" LED lights up in case of an unexpected behaviour.
If there is a major fault interfering with the normal operation of the valve like the flow sensor or a coil being defect, the red "Error" LED will light up and prevent the SEV from functioning until the error has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

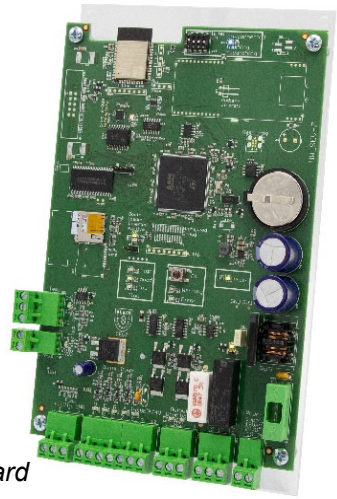
# 3. THE SEV VALVE

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*



*SEV card*

<u>SEV valves include the following essential features:</u>

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) | | | | |

Three different speeds can be adjusted in the up direction and down direction.

- Full (fast) speed (0.05 – 1.00 m/s)
- Leveling speed (0.03 – 0.15 m/s)
- Inspection speed (0.05 – 0.30 m/s).

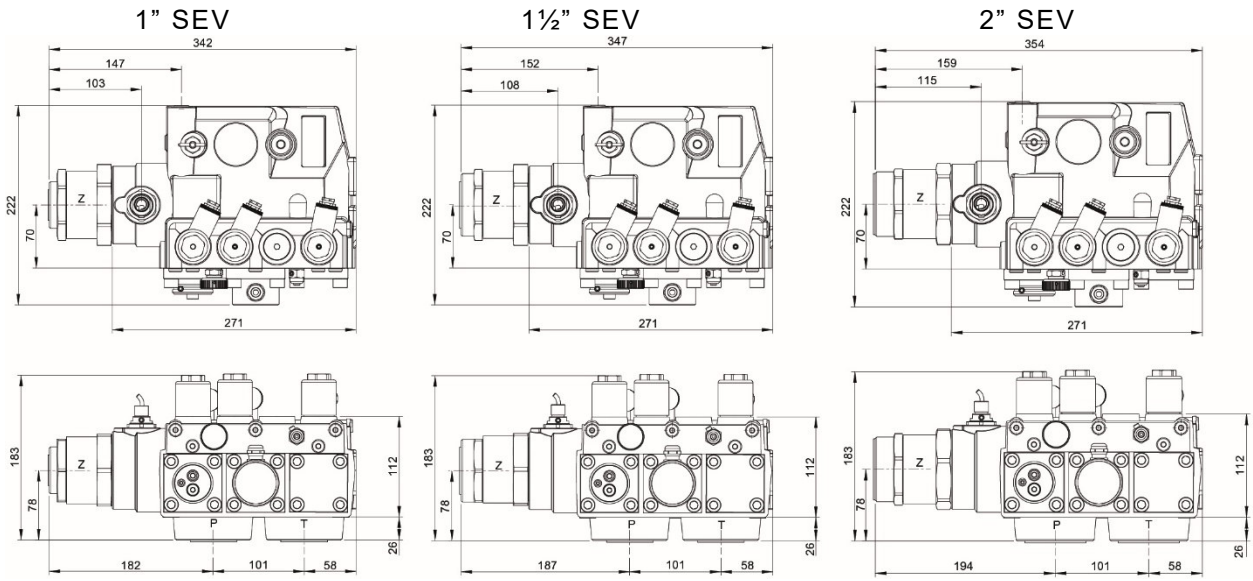
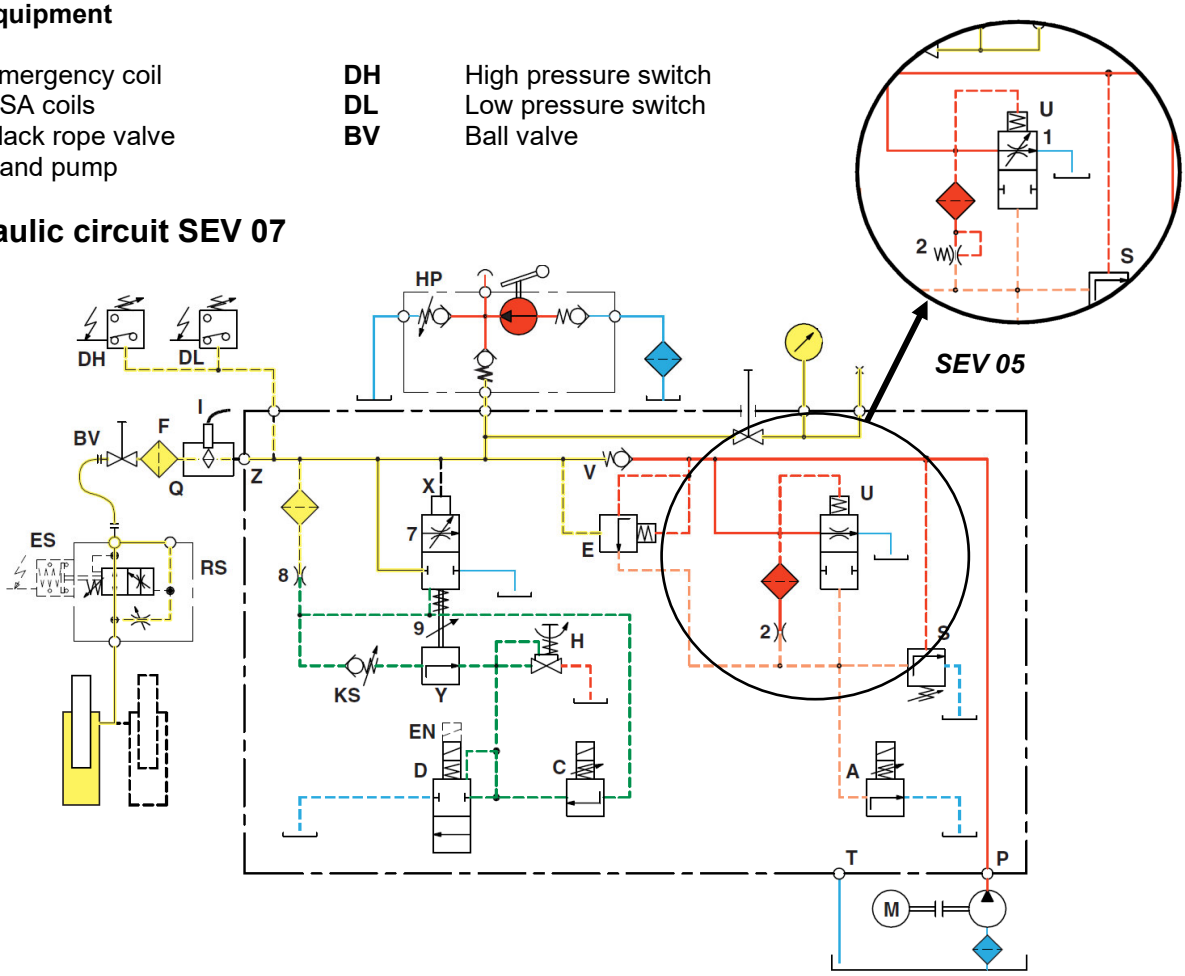



*Figure 3: SEV valve dimensions*

**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 | | |

## 3.1 Hydraulic circuit SEV 07



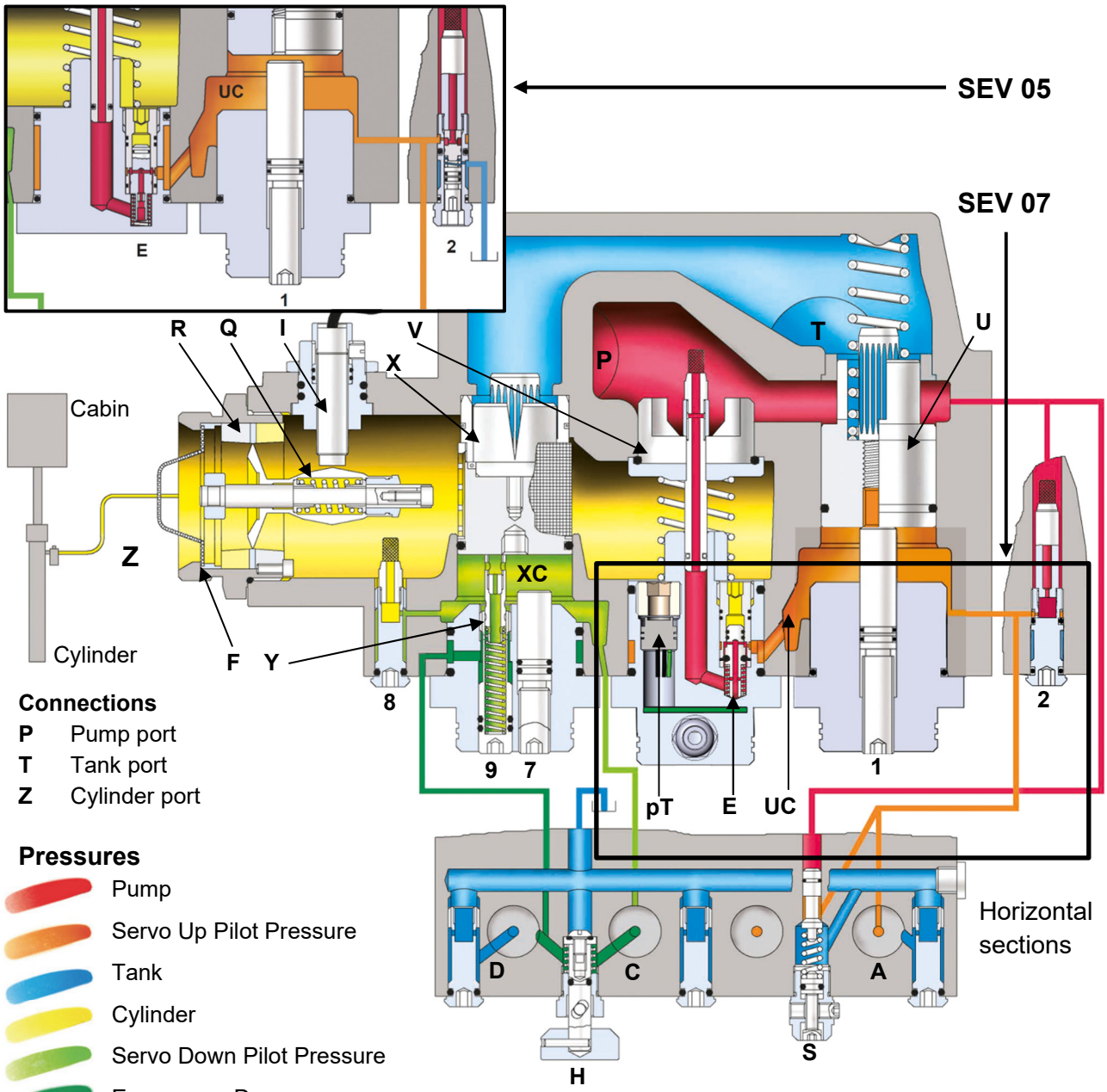

**Control Elements**

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

**Down adjustments**

| | |
|---|---|
| **7** | Full speed limitation |
| **9** | Manual lowering speed |

## 3.2 Cut section SEV 07




**Connections**

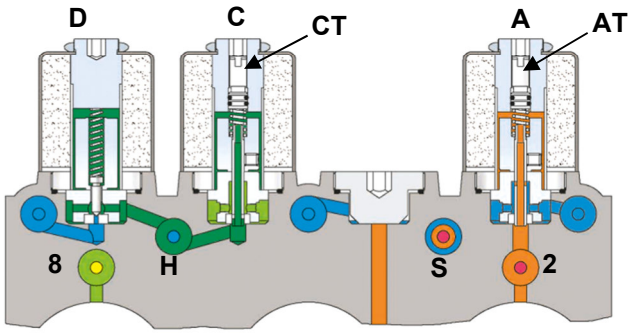
- **P** Pump port
- **T** Tank port
- **Z** Cylinder port

**Pressures**

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




Horizontal sections




Vertical section

**Pilot pressure chambers**

- **UC** Bypass chamber
- **XC** Down valve chamber

**Adjustment UP**

- **1** Bypass
- **AT** Up trim (page 15)

**Adjustments DOWN**

- **CT** Down trim (page 15)
- **7** Full speed limitation
- **9** Manual lowering speed

**Control elements**

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

## 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**

If the elevator is not moving for a long time, it may take several seconds after up command before the elevator starts moving, because the pilot chamber **UC** must first be filled with oil. From the second trip onwards, this start-up time is significantly reduced by the early start valve **E** (manual, chapter 3.2).

- Adjustment **1** – Check Bypass pressure / bypass time and adjust if necessary

Only start the setting when the cabin is unloaded. Disconnect PIN 10 on the SEV card so that no input signal is sent to the card. The elevator must not move when the motor is running. To adjust, screw in (CW) setting **1** until the elevator moves and then (with the motor running) turn out (CCW) setting **1** until the elevator stops. Then turn out setting **1** another half turn and reconnect PIN 10.

- Pressure relief valve **S**

With the closed ball valve and running motor, the maximum pressure set on the pressure relief valve S can be read on the pressure gauge. Turning adjustment **S** '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 with running motor**.

**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.
The highest speed that can be controlled by the SEV card is defined by setting **7**. Therefore, the setting in the SEV card for the full speed should always be slower than setting **7** of the SEV valve.

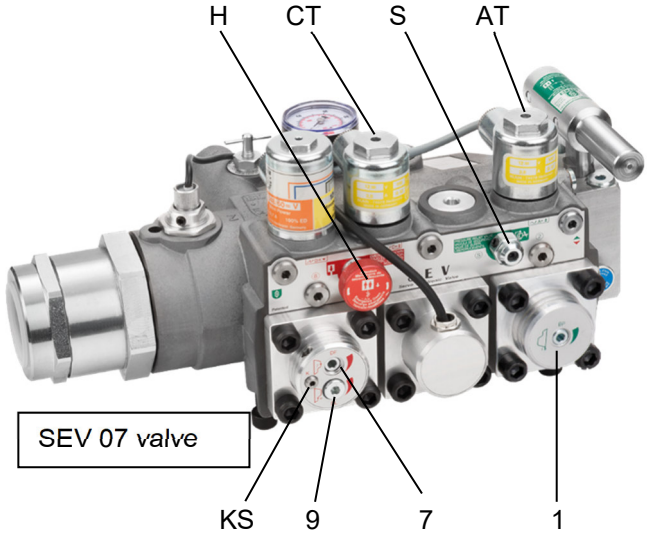
- Adjustment **9** - Emergency Down Speed

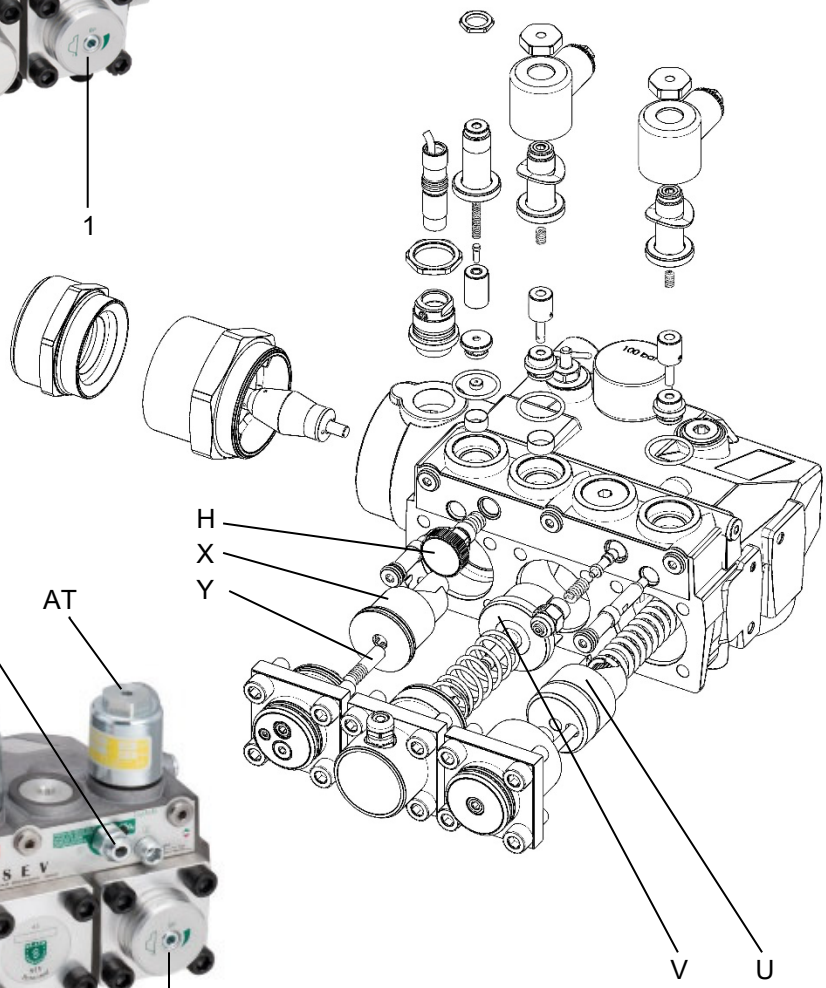
With the cabin unloaded, open the emergency lowering **H** and check the speed. Alternatively, this can also be done with PIN 10 of the SEV card disconnected and a travel command in the down direction. The speed should be a maximum of 3cm/s. If the speed is faster, setting 9 must be turned in (CW) further - then check again.
The lowest speed that can be controlled by the SEV card is defined by setting 9. The programmed slow speed should therefore always be above this and be approx. 5 - 7cm/s.

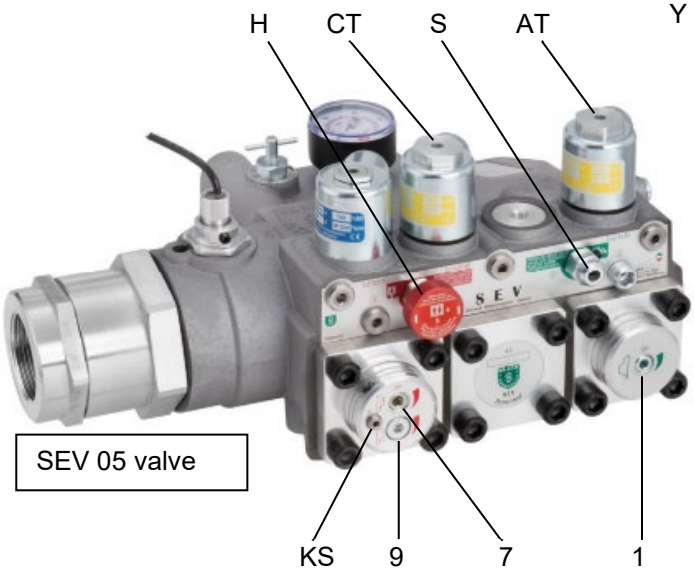
- **KS** - Slack rope valve

To adjust the slack rope prevention **KS**, no drive command must be present! **KS** is adjusted using a 3mm Allen key. Turning in (CW) the adjusting screw **K** results in a higher pressure and turning out (CCW) it results in a lower pressure. To adjust **KS**, turn **K** all the way "in". Then, with the emergency lowering open or the coil D activated, turn out (CCW) the adjusting screw **K** until the empty cabin begins to move downwards. Then turn out (CCW) another half turn to ensure that the cabin can be lowered even when the oil is cold.

## 3.5 SEV adjustments and explosion drawing




**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 |

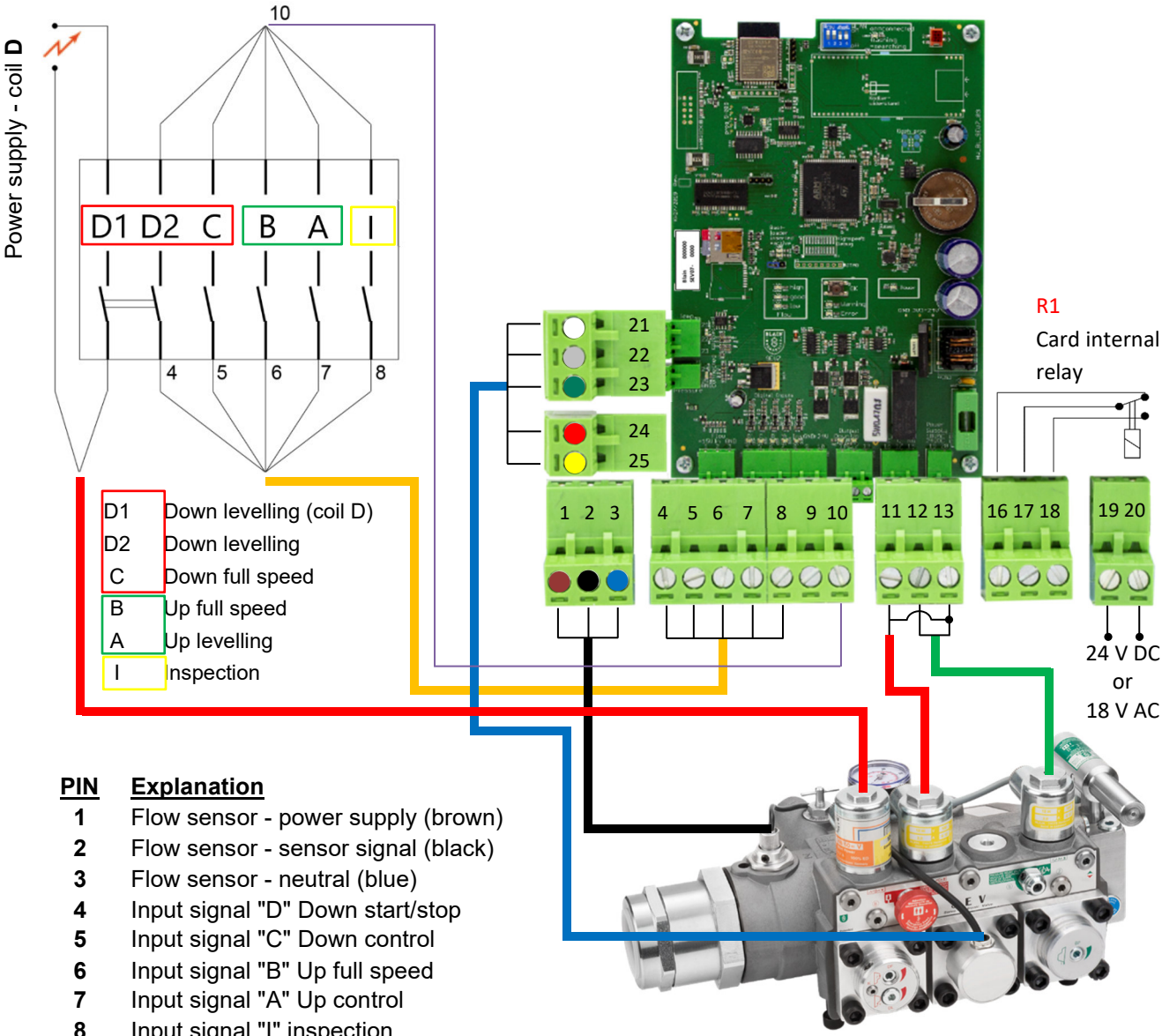
**Highlighted valve parts**

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

# 4. ELECTRICAL INSTALLATION

## Lift Controller

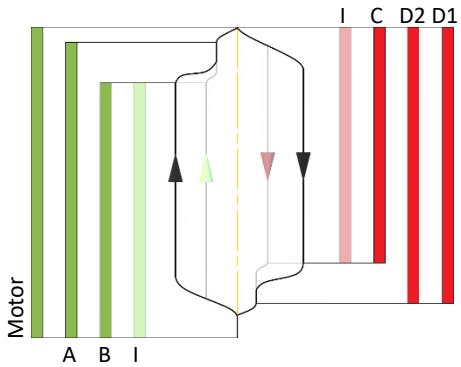
## SEV card




| 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 (input signals)**

| Speeds | UP | DOWN |
|---|---|---|
| Normal speed | 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 chapter 9.
6. On standby the value of the flow sensor must be adjusted between 4.8mA and 5.3mA (see chapter 7.2).

**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 optionally equipped 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 of 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. Chapter 4 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.

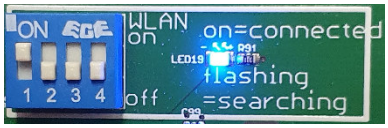
**Recommended switch positions and levelling speeds**

| 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. WI-FI CONNECTIVITY & WEB SERVER START

The SEV card is delivered with default DIP switch adjustment, as shown in the picture on the right.




**Switch 1** The Wi-Fi switch in **ON** position allows communication with the SEV 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 is activated, **OFF**: Teach mode is deactivated.

**Switch 4** not in use.

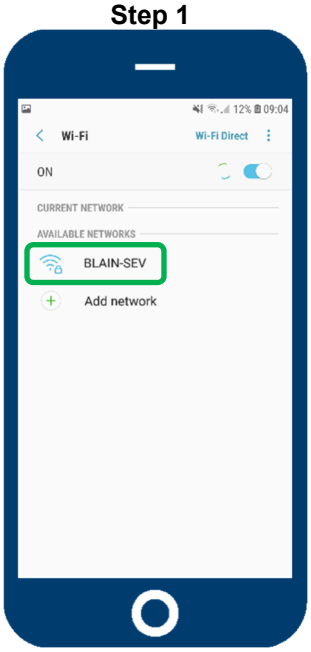
Because the software for communicating with the card resides on the card itself and is browser-based, no additional software installation is required on your smart device. This allows the use of any smart device regardless of the operating system or software architecture. It is recommended to use **Mozilla 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 (DIP 1 is **OFF**) on completion of setup / configuration / monitoring.*

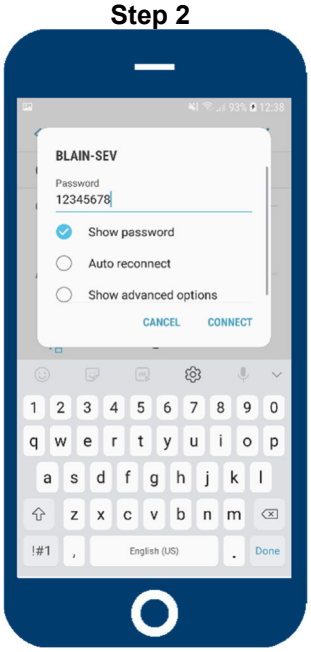
The first two steps are used to establish a WLAN connection to the SEV card. In the third step, the SEV card's web server is called. In the last step, the masks are transferred and displayed.

**Step 1**



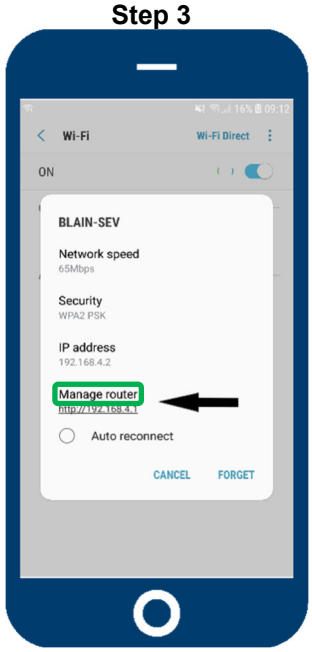

Identify and connect with your smart device the Wi-Fi SSID “BLAIN-SEV “ or with the serial number of the SEV valve (e.g. T123456).

**Step 2**




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

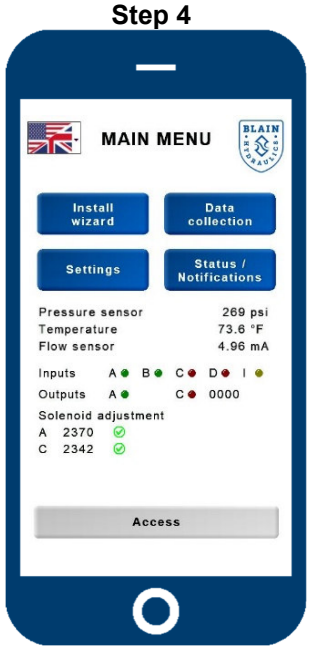
**Step 3**



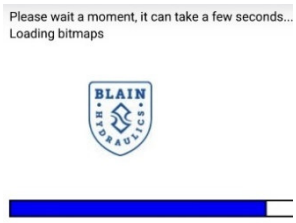

Once connected, tap on the Wi-Fi to get into the configuration or click on adjustments symbol ⚙. Tap on “Manage router” to access the SEV card with your preferred browser (Firefox recommended).

Alternatively, if the *Manage Router* option is not present (e.g. with iPhone), open your preferred browser and enter the IP address **192.168.4.1** in the navigation bar.

**Step 4**




Once the authentication is completed, this 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.*
> *Due to special security settings on the iPhone, establishing a Wi-Fi connection can take a very long time.*

| | |
|---|---|
| Default password: | 12345678 |
| IP address: | 192.168.4.1 |

# 7. OPERATION VIA SMART DEVICE

## MAIN MENU

### 0 - Language

- 0.1 German
- 0.2 English
- 0.3 Spanish

### 2 - Settings

| | |
|---|---|
| 2.1 Date / Time | Set date and time |
| 2.2 Units | Metric / Imperial |
| 2.3 Valve settings | Pressure range setting |
| | Speed mode |
| | Smooth Take-off (loaded) |
| | Pressure relief valve |
| | Gain value |
| | Dither amplifier |
| 2.4 Factory settings | Reset elevator data |
| | Reset travel data |
| | Reset all data |
| | Save as factory settings |
| | Save parameters on SD |
| | Load parameters from SD |
| 2.5 Wi-Fi settings | SSID |
| | Password |
| 2.6 Advanced settings | Teach run solenoid |
| | Teach run sensor |
| | Rupture valve test |
| | Sensor calibration |
| | Sensor table |
| | Variables |

### 4 - State Notifications

- 4.1 State
- 4.2 Notifications
  - Reset counters
  - Reset errors
- 4.3 Defect sensors
- 4.3 Update

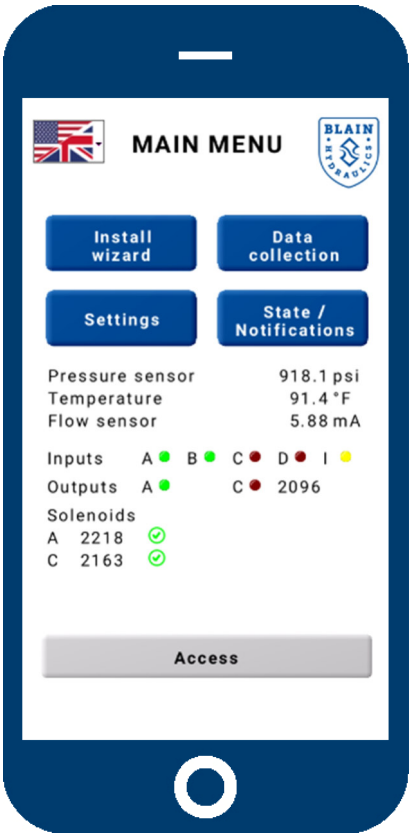
### 1 - Install wizard

| | |
|---|---|
| 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 | Speeds |
| | Accelerations |
| | Soft stop |
| | Relevelling |
| 1.6 Down travel data | Speeds |
| | Accelerations |
| 1.7 Inspection travel data | Up speed |
| | Down speed |
| 1.8 Final screen | Final information |

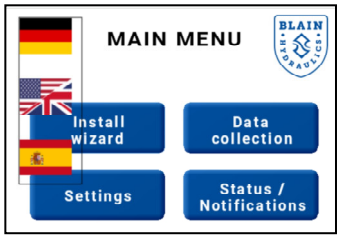
### 3 - Data collection

| | |
|---|---|
| 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 |
| | Recording |
| 3.4 Logbook | Saved travel graphs |
| 3.5 Trouble shooting | General error |
| | Error Up travel |
| | Error Down travel |

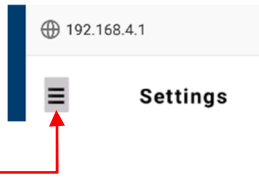
## 7.1 Main menu




**Language selection:** 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 used to assist during valve setup and serves as a step-by-step guide to help users entering the elevator data correctly.

The "**Data collection**" gives an overview about all input data. If necessary, allows changes and gives access to the "**Logbook**" and the "**Trouble shooting**".

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 allows user to enter and change passwords to access features of the software.

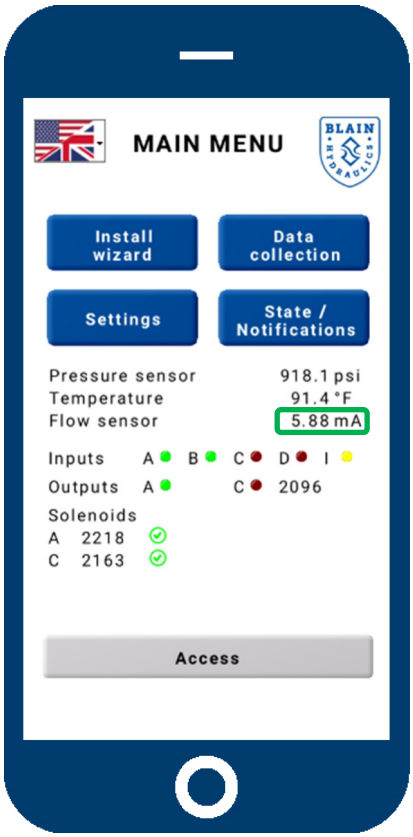
Furthermore the "**MAIN MENU**" acts as the first tool for analyzing and setting up the valve. Values for pressure, temperature and flow sensor are displayed. In case of no readings the connections need to be rechecked. The combined pressure and temperature sensor is already calibrated at the factory with an associated circuit board. They are installed together as a pair. Hence new calibration is not necessary. In case anyone of this is damaged, it has to be replaced with a new pair of sensor and circuit board. 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 **A** & **C** giving feedback of the correct starting values.

The following section of this User 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.

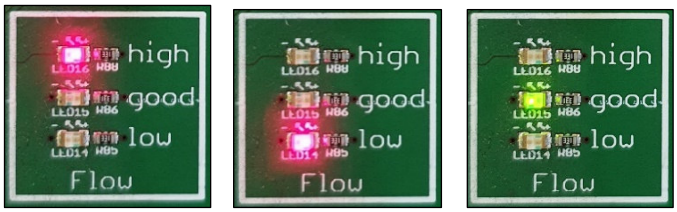
> *Changing data is only possible when correct access codes are being input!*
> *The standard **Level 1** code is **1111** and can be changed by the user by pressing the access button.*
> *Values highlighted in grey cannot be edited.*

## 7.2 Adjustment of flow sensor

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




The current sensor value from the flow sensor is displayed on the home page in the main menu on the smartphone.
If the elevator is on the floor, the value should be between 4.8mA and 5.3mA. If the value is outside this range, it must be adjusted.
The sensor setting can be read directly on the controller card at any time, even without a smartphone connection, and should always be done on the floor.




too high (>5.3mA) | too low (<4.8mA) | Set correctly

In addition to the value for the flow sensor, the SEV-7 also displays the two values for pressure and temperature. The SEV-05 displays arrows for the pressure and temperature sensors.

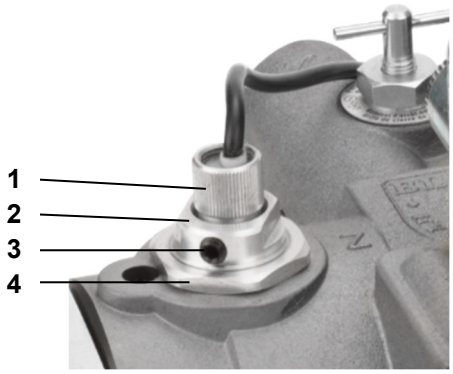
### Vertical sensor adjustment

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! Changing the settings under pressure can lead to deformation or even damage.

### 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 stopwatch 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**) counterclockwise by 15° and re-measure the leveling speeds.
Repeat the process of rotating the bushing in clockwise or anticlockwise 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.



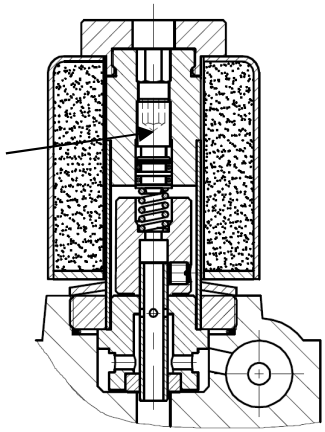

**1** Sensor head
**2** Sensor bushing [19 mm (3/4”) spanner]
**3** Sensor lock screw (3mm Allen key)
**4** Bushing lock nut [32 mm (1 1/4”) spanner]

## 7.3 Adjustment of solenoids with hand

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.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Inputs | A ● | B ● | C ● | D ● | I ● | Digital value solenoid | 2200 Dig |
| Outputs | A ● | | C ● | 2200 | | Actual-speed | 0.45 m/s |
| | | | | | | Up travel | ● |
| | | | | | | Down travel | ● |

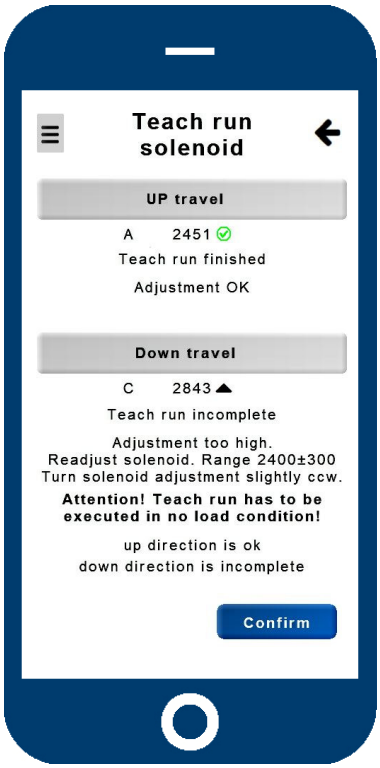
*Display of the digital value in the "Main menu" or in "Status/Notifications"*




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" 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 ± 300. 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.
With the SEV-05 control block, the digital starting value for accelerating to full speed is always 2400. Therefore, the setting on the solenoid valves must be made so that a quick but smooth start is achieved.

## 7.4 Adjustment of solenoids with teach mode (only for SEV-7)

Attention! Teach runs have to be executed under no load condition! The solenoid valves are already set at the factory and only need to be readjusted after a replacement.




In order to achieve optimum starting behavior with the SEV-7, the current solenoid valve setting can be determined using the teach run mode. This is activated by switching on DIP3. The activation is displayed in red in the main menu as follows:

Teach mode is ACTIVATED

*DIP3 for teach run mode*

If the elevator is not working properly or if parts have been replaced, you should start with the default setting. To do this, completely unscrew (CCW) the adjustment screw from the solenoid valve and then screw it back in (CW) 3 turns.

Now start the **unloaded** elevator from the lowest to the highest floor level. The elevator starts and pauses the journey until it has found the optimal setting and then travels to the target floor without interruption.

In the menu under "Settings" -> "Advanced settings" -> "Teach run – solenoid" the message "Teach run finished" appears. If there are green check marks behind the numbers ✓, then the determined starting value is within the permissible range of 2400 ± 300 (see example on the left).

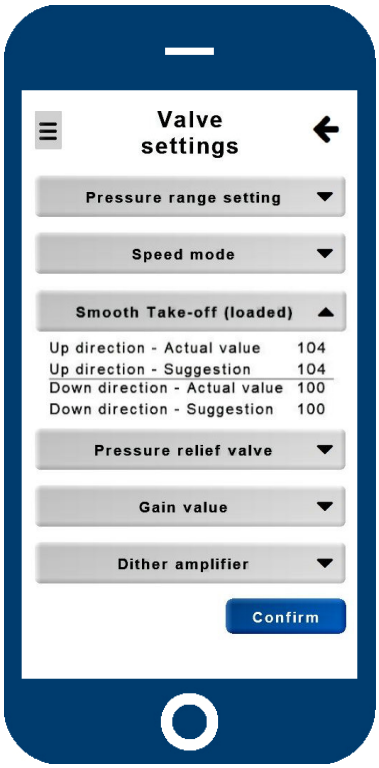
Otherwise, if black arrows appear, then the setting of the solenoid valve is too high ▲ or too low ▼. If the value is too high, unscrew the adjusting screw ¼ turn anticlockwise; if the value is too low, turn it in the opposite direction. Depending on the deviation from the permissible range (2400 ± 300), readjust by another 1/8 turn and carry out a learning run again.

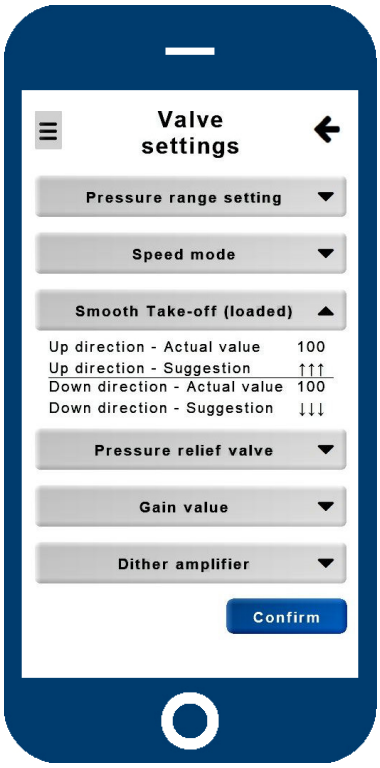
When the learning run is finished, this message appears on the home page in the main menu:

✓ Teaching successful
Switch off DIP3

## 7.5 Take-off smoothness adjustment with fully loaded car (only SEV7)

To assure take-off smoothness at every load in the car (after the adjustment of the solenoid valves for the **unloaded** condition has been successfully completed), a solenoid power correction for the **loaded** condition may be necessary under certain circumstances.
Before carrying out a journey with a load, make sure that DIP3 is no longer switched on for the learning journey.
Under "Settings" -> "Valve settings" -> "Smooth Take-off (loaded)", the starting behaviour at rated load can be corrected to have smoother start by using the suggested parameters.
If having a delayed take off, the actual value should be increased, e.g. from 100% to 104%. If, on the other hand, the take-off occurs with a jerk, the value should be reduced. This starting value can vary depending on the direction of travel.



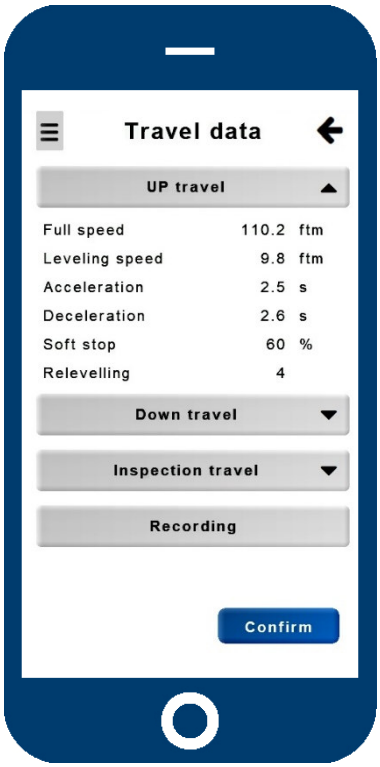




## 7.6 Solenoid valve adjustment for relevelling

Relevelling behaviour (soft start vs delay time) can be adjusted under "Data collection" -> "Travel data" -> "UP travel" using the "*Relevelling*" parameter.

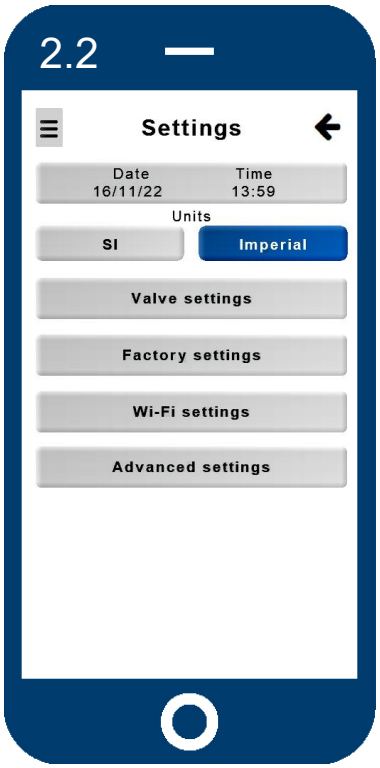
Setting can be done between 1 (delayed but gently) to 10 (rapid but with a jerky take off).

The default value is set to 4.



## 7.7 Settings

### 7.7.1 Date, time, units and valve settings

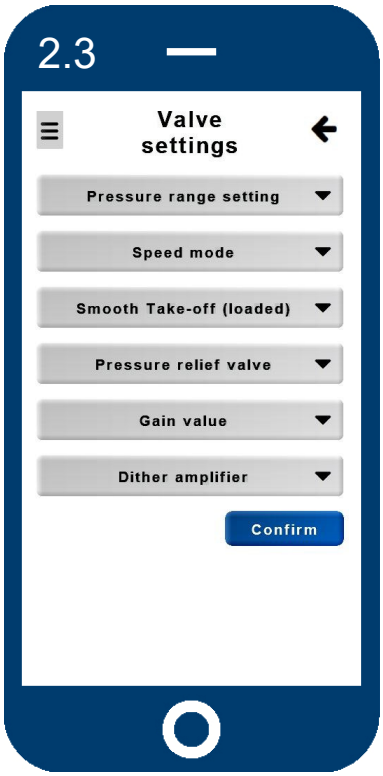


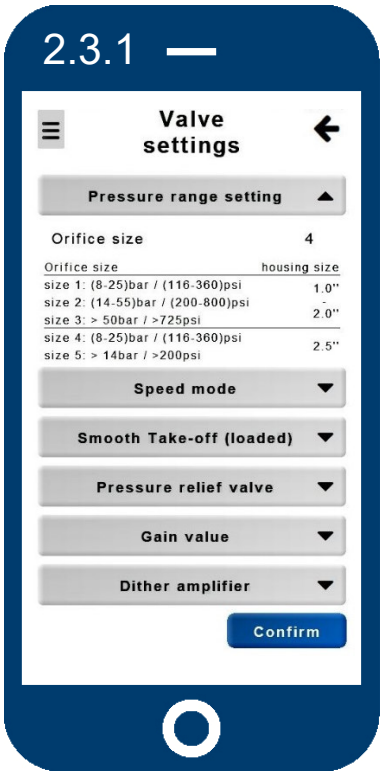

***←Left***

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

***Right→***

**Valve settings** give 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.

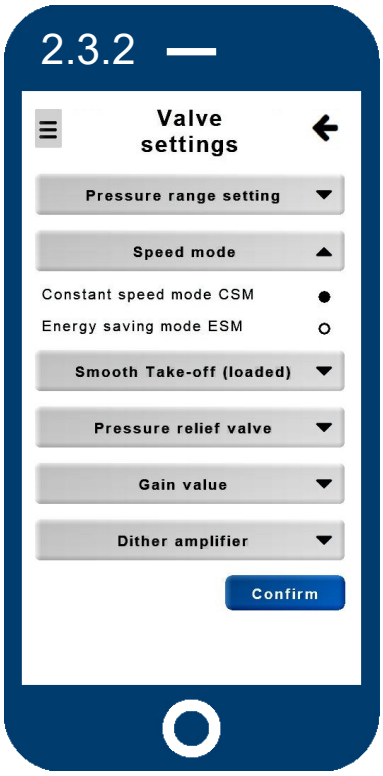



***←Left***

The "Pressure range" allows setting of the correct orifice size that was installed in the SEV valve. Size 2 or 5 used as default. All other sizes are used for low- and high-pressure ranges respectively. "Pressure range" can only be adjusted via a smart device. Compare this value with the built-in orifice and adjust if necessary (used only for SEV-07). If the size does not match the housing, this error message appears:

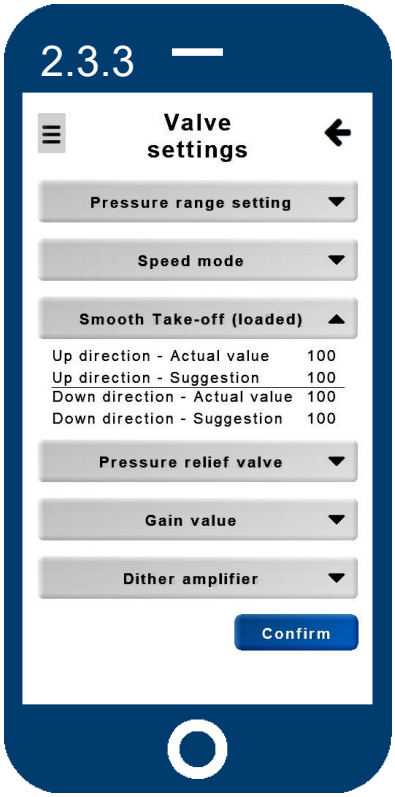
Orifice size does not match the housing size! Correct and confirm again.




***Right→***

Constant Speed Mode (CSM), which uses fixed target speed, is set as default. The Energy Saving Mode (ESM) allows optimal use of pump flow rate for target speed selection according to the load in the car. In this case the target speed is automatically set for each travel. With variant target speed to ensure a constant levelling time, deceleration phase is varied accordingly.

### 7.7.2 Solenoid adjustments

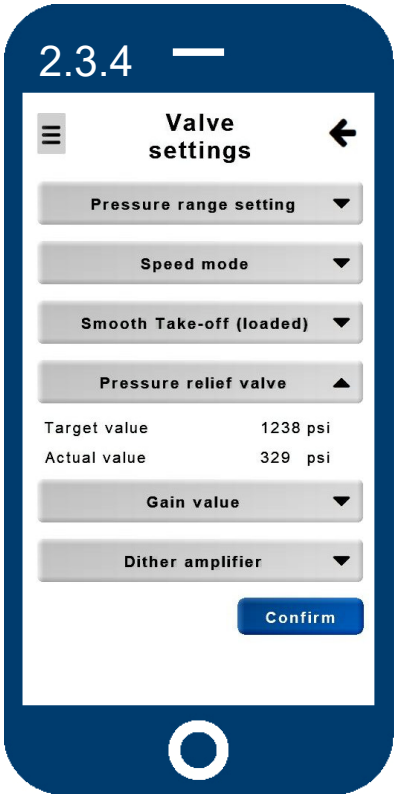


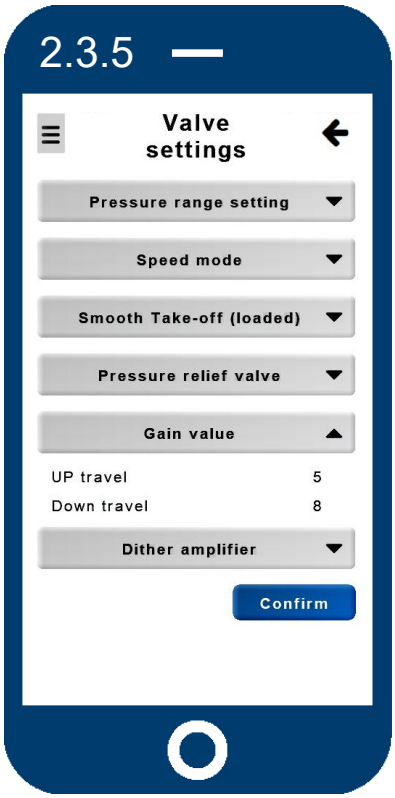

***←Left***

If parts of the solenoids "**A**" or "**C**" are replaced (pre-setting: complete out and 3 turns in) or the solenoid valve setting is changed, a *teach run* with an **empty** cabin must first be carried out (see chapter 7.4). Then "**Smooth Take-off**" for soft start up with **loaded car** takes place. If start up takes too long time, the "**actual value"** (only SEV-07) must be reduced; if it is too hard it should be increased. Suggested corrections are displayed and should be used. 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. This calculated value is displayed here for comparison with the actual value. Only with SEV7 is the current actual pressure value displayed and can be used to adjust the pressure relief valve.



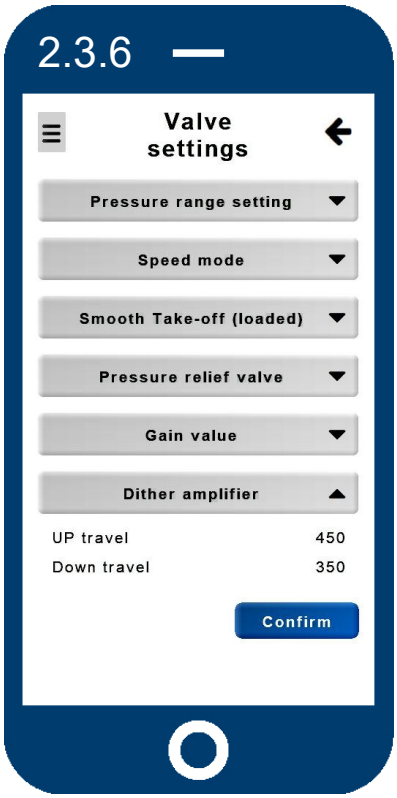




***←Left***

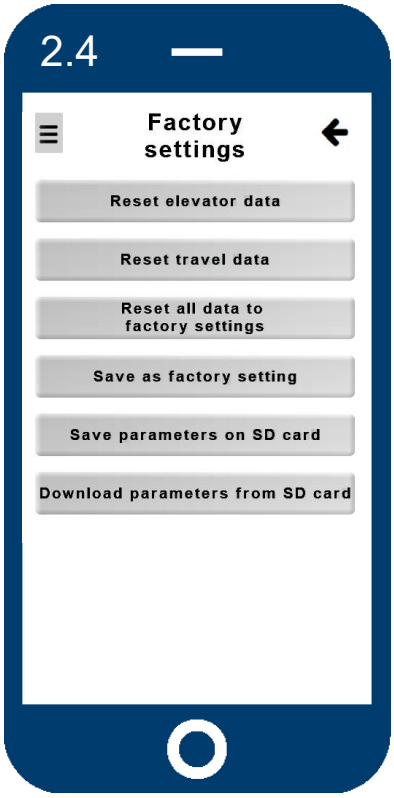
The "**Gain value"** is used for improving control performance. Too high gain values can cause vibrations conversely, too low values can generate sluggish response from the SEV valve. Default value is 8.

***Right→***

The "**Dither amplifier"** prevents the solenoid valve from sticking. Decreasing it reduces this responsiveness; an increase can led to vibrations. The default values are shown on the right.



### 7.7.3 Factory and Wi-Fi settings

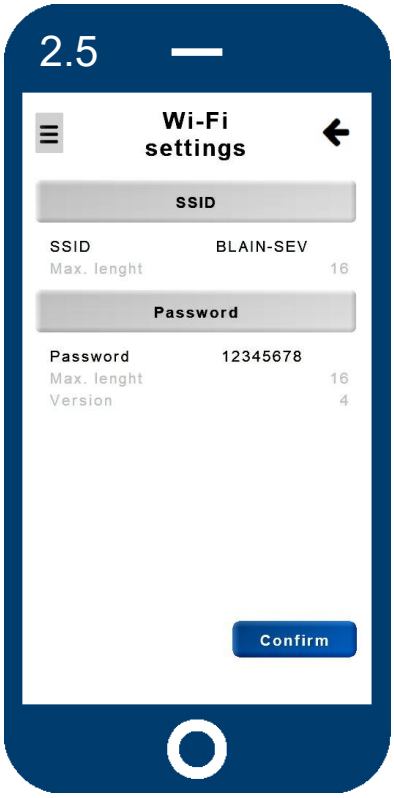



***←Left***

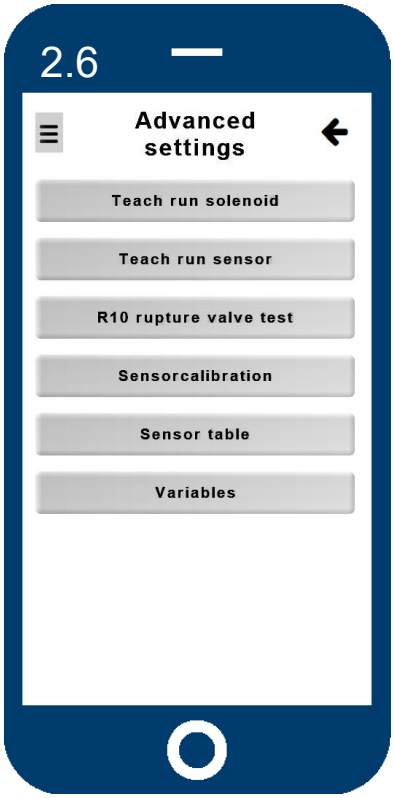
From this menu you can reset different data you previously entered and reset everything to factory settings. The factory settings are set by the customers themselves or Blain Hydraulics according to customer data. Additionally, settings can be uploaded to and downloaded from the SD card.

***Right→***

The SSID and Wi-Fi password can be modified to suit the customer's requirements using the **Wi-Fi settings**. The SSID corresponds to the serial number of the SEV block when delivered from the factory. For replacement cards, the SSID can also be *BLAIN-SEV* (see example). The current Wi-Fi version is also displayed.




### 7.7.4 Advanced settings

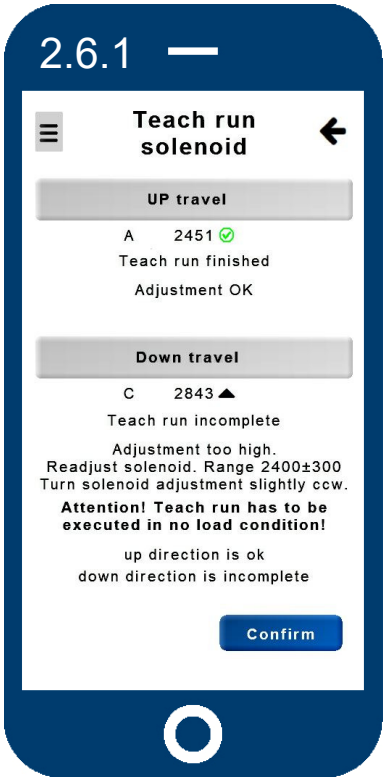



***←Left***

The "**Advanced settings**" menu allows to carry out teach runs to optimize solenoid power levels as well as for the sensor and rupture valve tests.

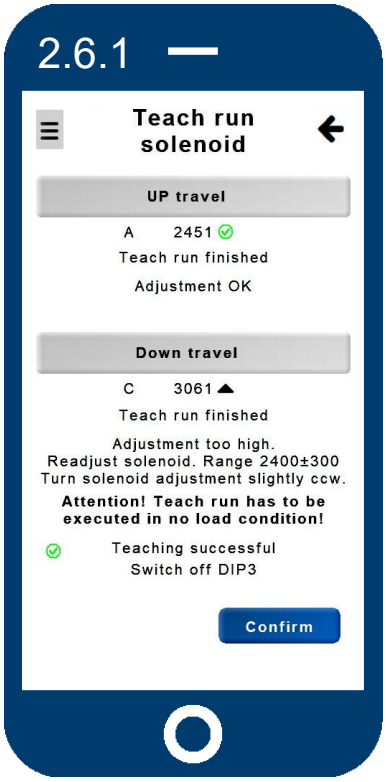
Changing parameters in the "Sensor calibration", "Sensor table" and "Variables" sections is reserved for Blain Hydraulics only.

### 7.7.5 Teach run solenoid – adjusting take-off



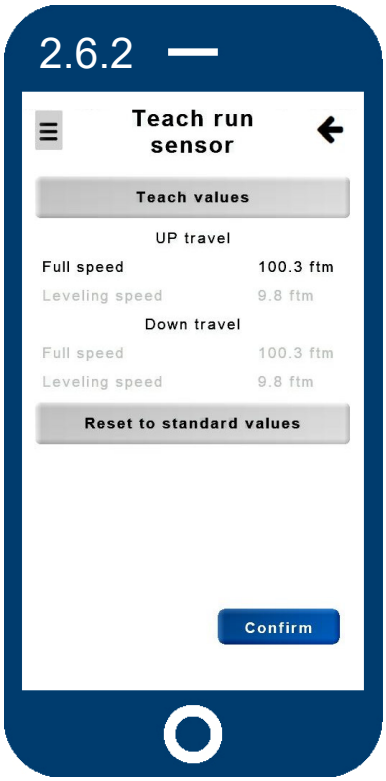

***←Left and Right→***

To perform a **teach run for solenoids**, the DIP3 switch must be set to "ON".
The teach run for solenoids is used to correct inaccurate manual settings on the solenoid valve. During the teach run phase, the system will start and stop repeatedly until it has found the appropriate starting value for a gentle start. If the value has been determined and is in the range of 2400±300, then the teach run has ended successfully.
When the teach run is aborted during the learning phase, the message "teach run incomplete" appears (see example on the right). If the value is outside the permissible range, this is indicated by black arrows. The solenoid valve must be adjusted and the learning run carried out again. In the example shown, the solenoid valve for the lowering direction (CT) is set too high and must be unscrewed (e.g. ¼ turn CCW).



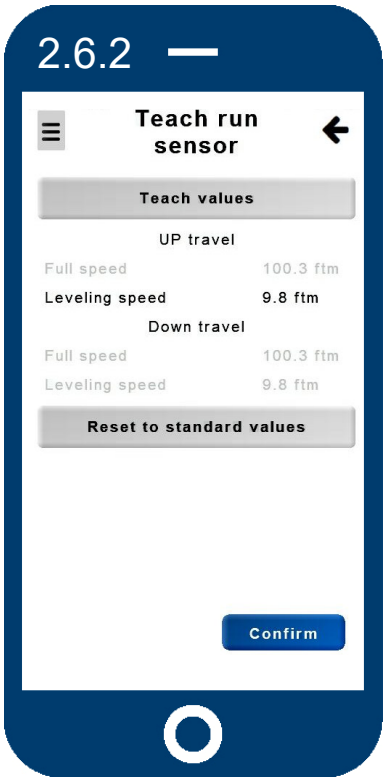

### 7.7.6 Teach run speed – adjusting sensor table

The **"Teach run - sensor"** menu is used if the actual cabin speed does not match the actual speed displayed on the SEV card. A teach run may become necessary if the flow sensor, the electronic card or the flow meter have been changed. Only the speed of the last trip in the direction traveled can be edited, all others have a gray background. The changed speed data is immediately transferred to the sensor table after pressing the "Confirm" button!
**If you make an incorrect entry, enter the data correctly without driving again or reset to the default values!**

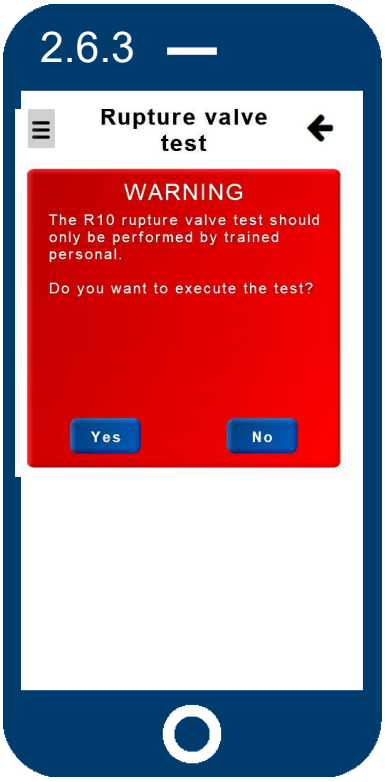



***←Left and Right→***

To **calibrate** full **speed(s)**, the elevator must travel at full speed travel and reach a constant speed. To calibrate the slow speed, the elevator must travel at slow speed (levelling) only. In order to travel with slow speed, disconnect terminal 6 for up direction or terminal 5 for down direction from the card and give full speed signal (card receives slow speed signal only).
Setting 9 (emergency lowering speed) on the SEV valve must not be faster than the slow lowering speed, otherwise incorrect calibration will occur.
If the elevator is travelling at a speed other than the target speed, enter the measured speed in the highlighted line (not greyed out) and press the "Confirm" button. Then reconnect the terminal(s).



### 7.7.7 Rupture valve test



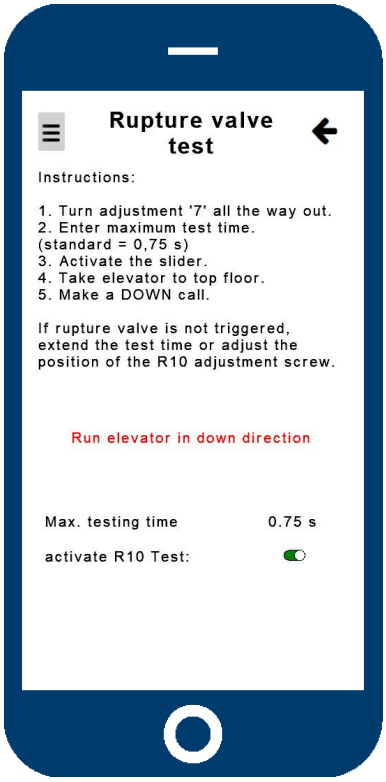

***←Left***

Before the "**rupture valve test**" is carried out, a warning is shown.

**This test should only be performed by qualified personnel (code: 4646)!**

***Right→***

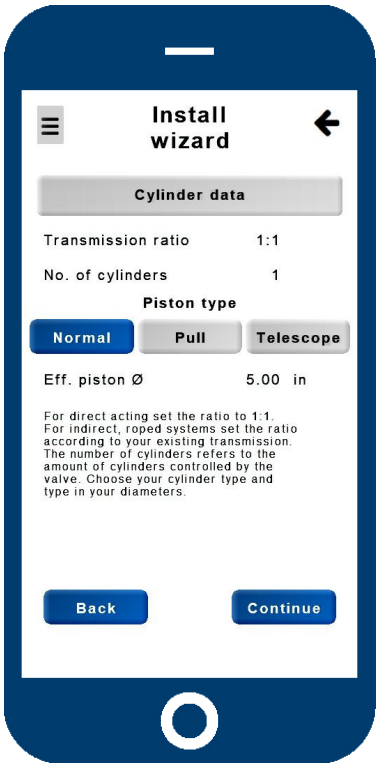
Follow the instructions on the screen to test the rupture valve. The default setting of the testing-time is set to 0.75s for safety reasons. After the testing-time limit is reached, the control valve will slow down the elevator. If test time is too short for the rupture valve to be activated, the time 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.




### 7.7.8 Install Wizard

The installation wizard only needs to be used when a new SEV card is taken from storage or all data has been reset to default. 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 starting the installation wizard, it is highly recommended that all technical data of the lift is readily available and that the input unit is correctly selected. The selection of the unit can be set between metric and imperial in the main menu in the "**Settings**" section.*



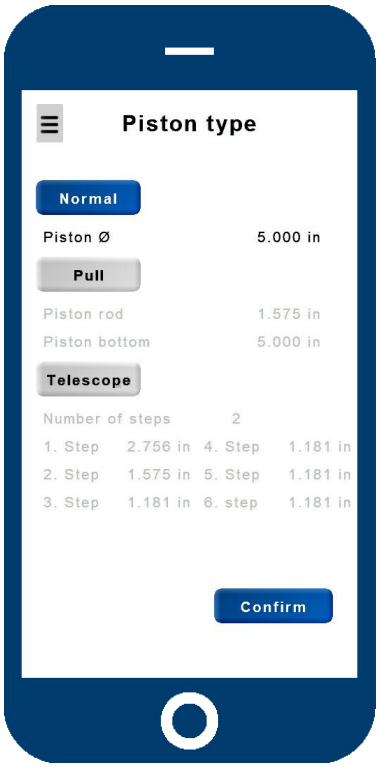

***←Left***

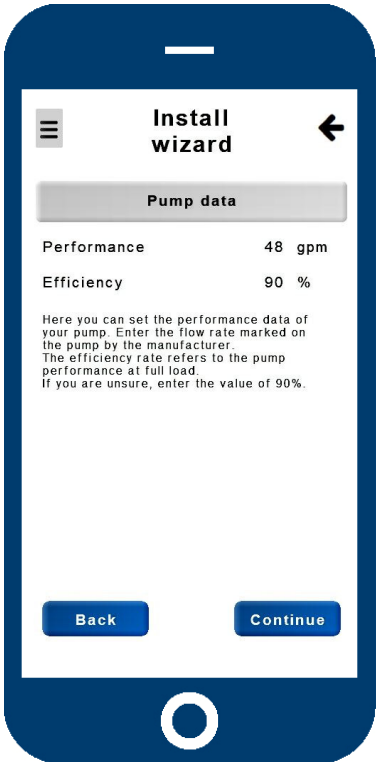
After starting the install wizard and reading the welcome screen, you are asked to enter the necessary cylinder data. Pressing the buttons for the different piston types will bring up a dialogue field (screen on the right), where the desired values can be entered. To change transmission ratio or number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

The effective piston diameter is calculated from the cylinder data and piston data. Changing its value will override all other data.

***Right→***

Select a piston type and enter the ram diameter(s) by tapping on the value(s). Use the "Confirm" button at the bottom right, to get back to the previous screen and press "Back" button. As shown on the left.



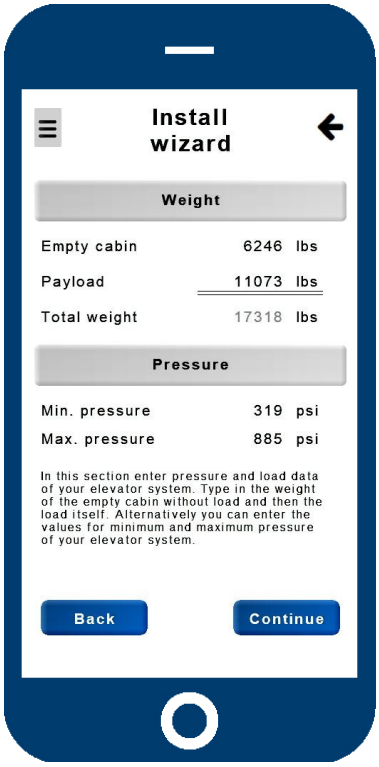


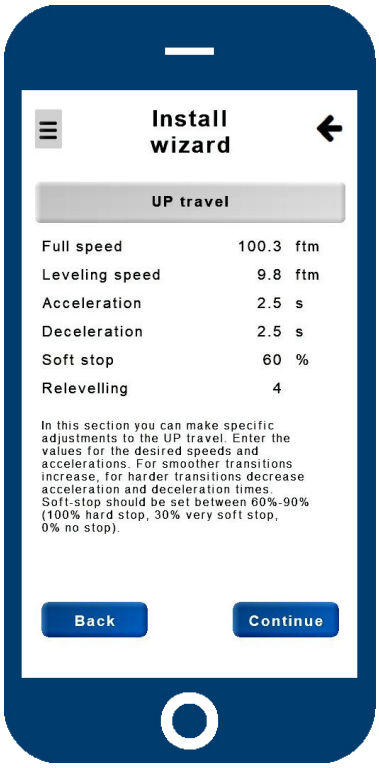

***←Left***

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.
Therefore, 90 % efficiency is taken as approximate efficiency value.

***Right→***

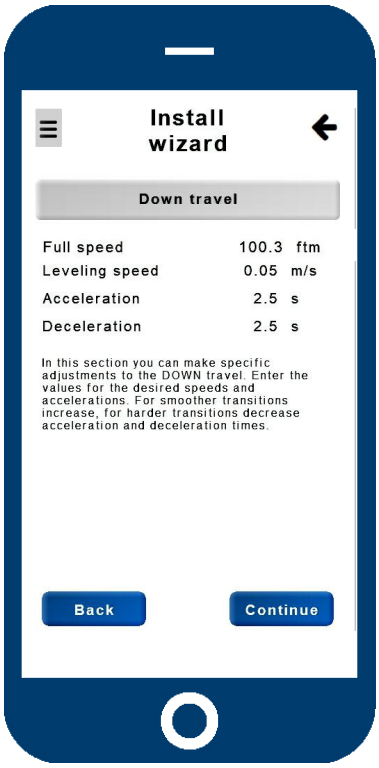
Provide static weight of your elevator system and pay load data. Alternatively, values for minimum and maximum pressures can be entered. Note, that entering the weight automatically calculates the pressure and vice versa.

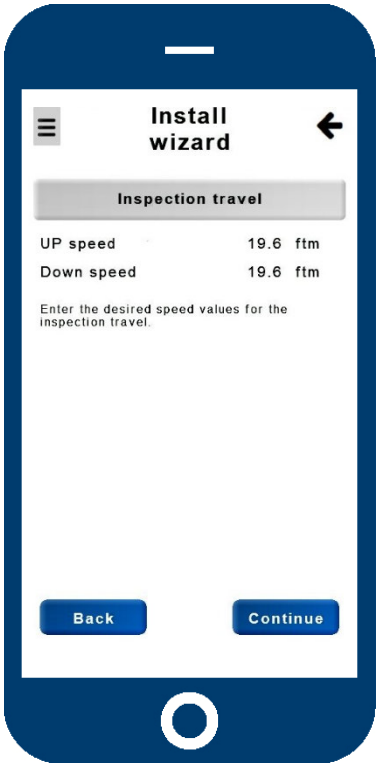



***←Left and Right→***

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.
The full speed is limited to 1m/s (196,85fpm) in both directions. If arrows appear, the speed is too fast and must be reduced.
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 overshooting the floor level. Default value is 60%.
The **relevelling** can be set between 1 (delayed but gently) and 10 (rapid but jerky take off).
Default value is 4.



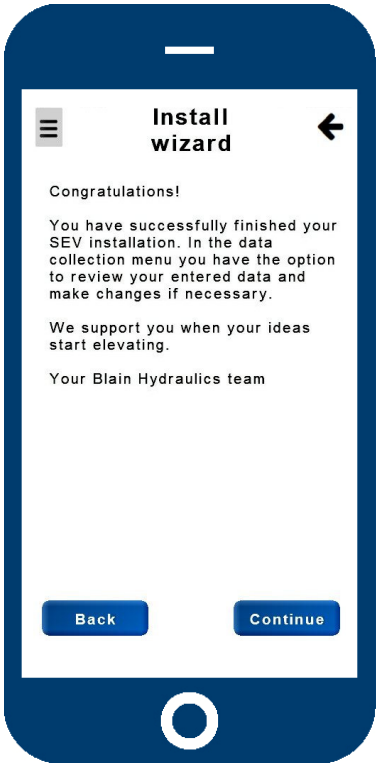



***←Left***

The inspection speeds for up and down direction can be set separately, but must never exceed the speed for full speed. The inspection speed can also be used as a reduced speed, for example when the distances between floors are quite short, such as half floors.
Press "Continue" to finish the wizard.

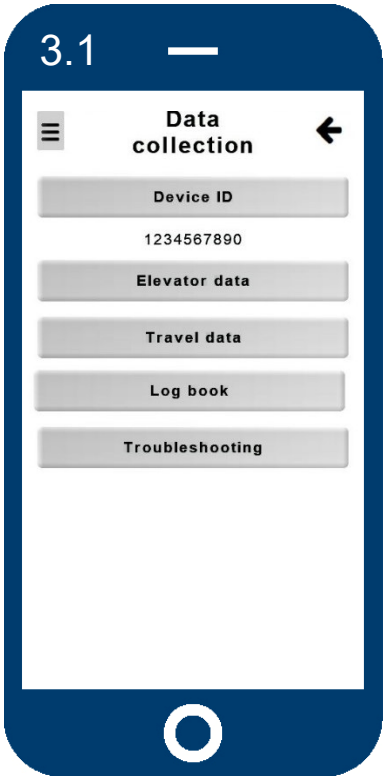
***Right→***

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




## 7.8 Data collection

### 7.8.1 Elevator data

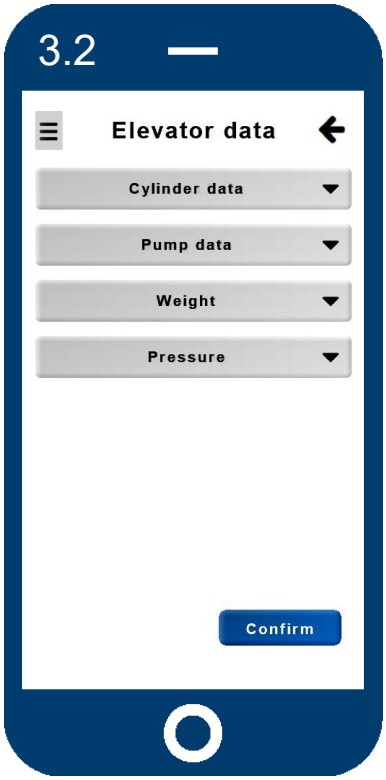


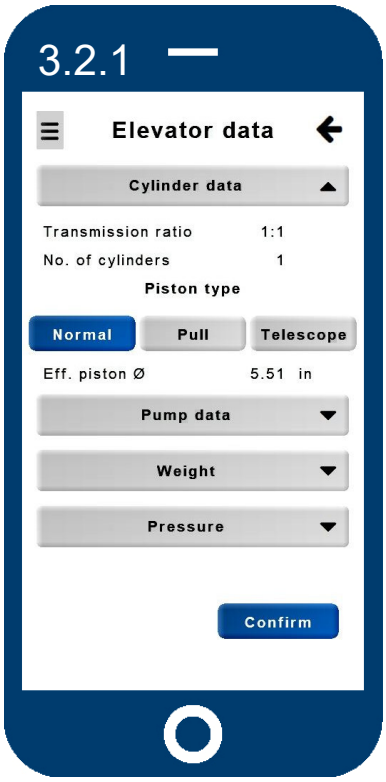

***←Left***

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 "**Logbook**" as well as the "**Trouble shooting**". The "**Logbook**" provides an overview of travel logs and travel graphs. "**Troubleshooting**" offers help on most common errors.

***Right→***

Within the "**Elevator data**" menu section one can check the data for piston, pump, weight and pressures, and change them if necessary. This is usually only done once during setup.





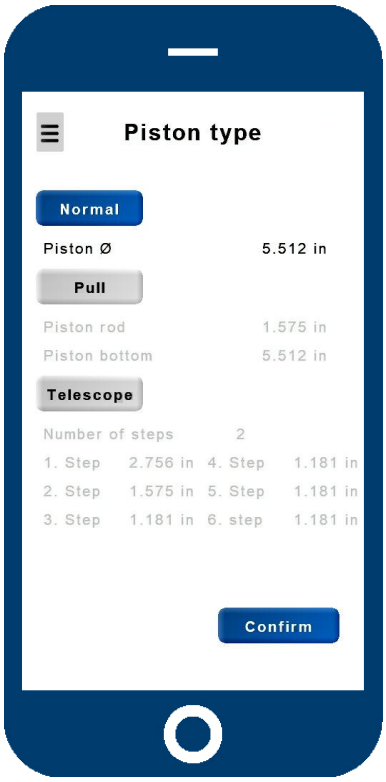

***←Left***

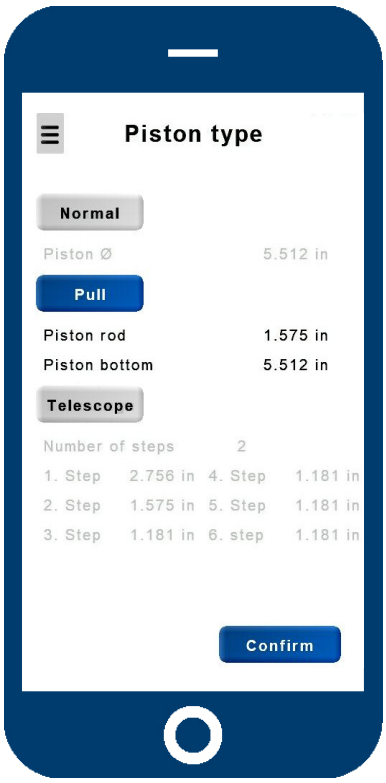
In the elevator data section, you can select the number of cylinders and the transmission ratio as well as the cylinder type.
Depending on the elevator system, you can choose between a standard piston (normal), pull piston or a telescopic cylinder. After selecting the cylinder type, enter its respective diameter.

The effective piston diameter is calculated from these 3 data.
**Attention!** This is used to control the elevator and should only be edited in urgent cases!

***Right→***

The piston diameter of the standard cylinder (push cylinder) is entered under “Normal”.



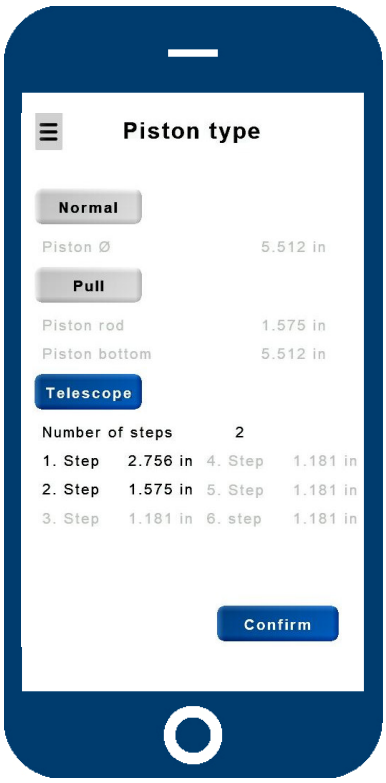



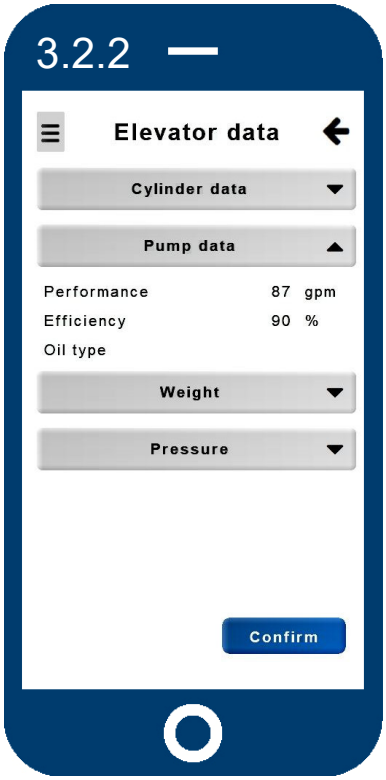

***←Left***

When using a pull piston, the two relevant diameters must be entered.
The piston rod must always be smaller than the piston bottom.
If an incorrect entry is made, the pump data, pressures and travel parameters must be checked again after a correction!

***Right→***

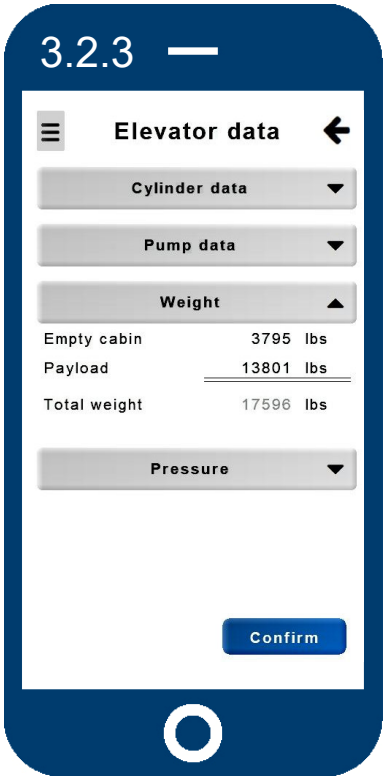
In the case of using a telescopic cylinder, the number of stages must first be entered before the ram diameter of each stage can be edited.






***←Left***

Enter the pump parameters according to the manufacturer's specifications. Flow rate of the pump reduces by increasing load and oil temperature, which changes pump efficiency. Since a certain amount of oil flow is required for flow regulation of the SEV valve, 90% is set for pump efficiency.

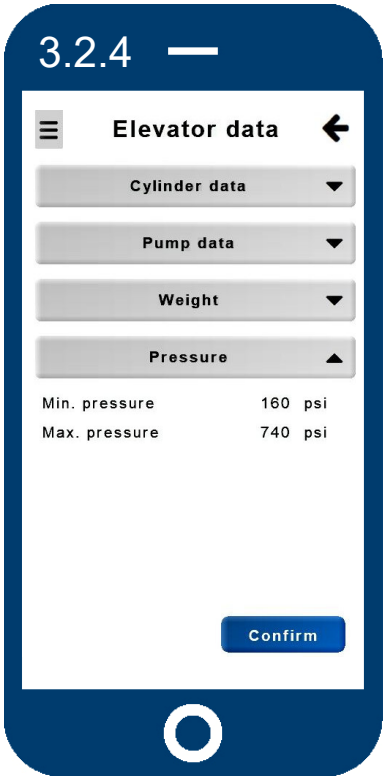



***←Left***

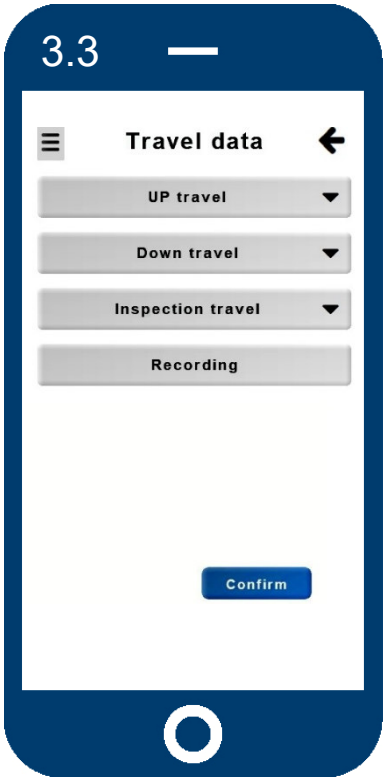
If the data for the empty system weight (frame with empty cabin, ram, pulleys etc.) and the payload are entered, the pressure min and pressure max are calculated automatically in the next step.

***Right→***

Alternatively, the pressures can be entered to calculate the corresponding weights.



### 7.8.2 Travel data



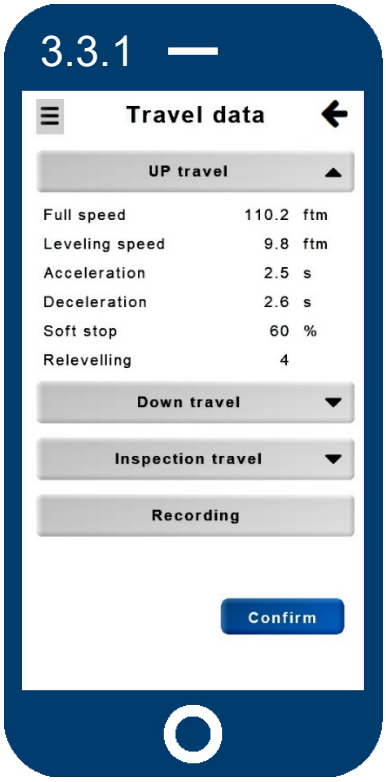

***←Left***

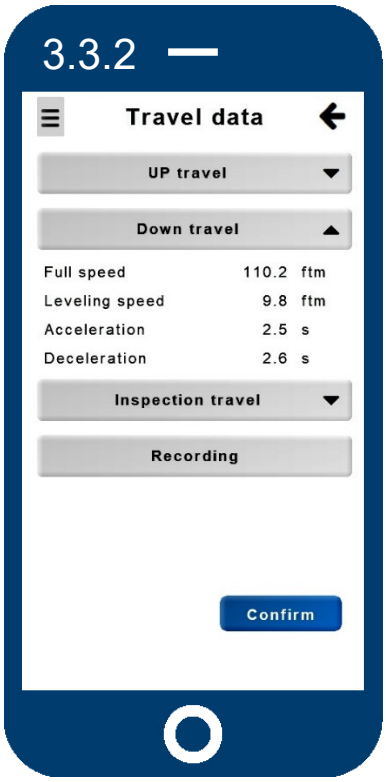
In the **"Travel data"** menu, the travel parameters for the up and down as well as inspection travel can be viewed and set separately.

***Right→***

In addition to the setting of the full and slow speeds, a value for the **soft stop** can also be entered for the up direction. 100% means the same deceleration as the change from full speed to levelling speed. 0%, on the other hand, means no braking (too gentle) until the motor is switched off.

The **relevelling** can be set between 1 (delayed but gently) and 10 (rapid but a jerky take-off). Standard value is 4.



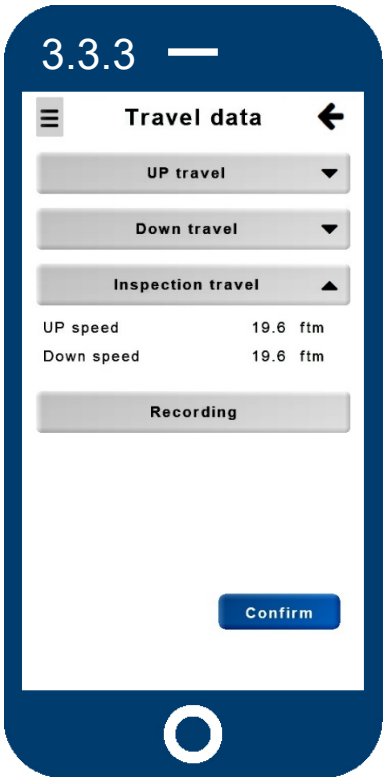




***←Left***

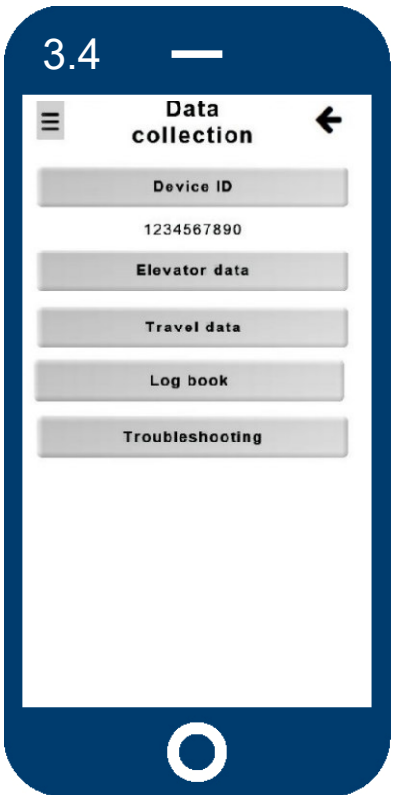
For the down travel the parameters for the speeds, accelerations and decelerations can be viewed or changed.

***Right→***

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

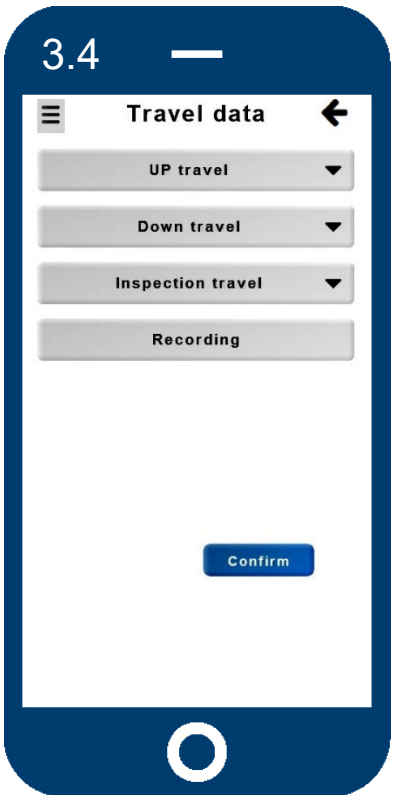


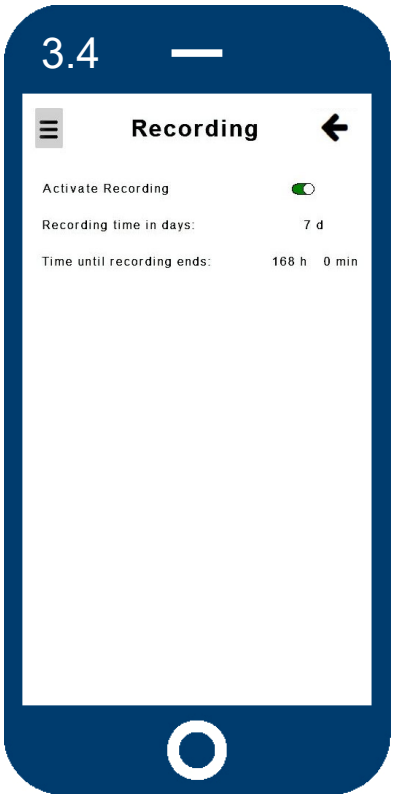
### 7.8.3 Enable Recording




The setting for activating the storage of travel graphs recording can be found here:
-> “Data collection” -> “Travel data” -> “Recording”

If storage is activated, all travel graphs saved on the micro-SD card can then be viewed in the menu:
-> “Data collection” -> “Logbook” (see manual, chapter 7.8.4).



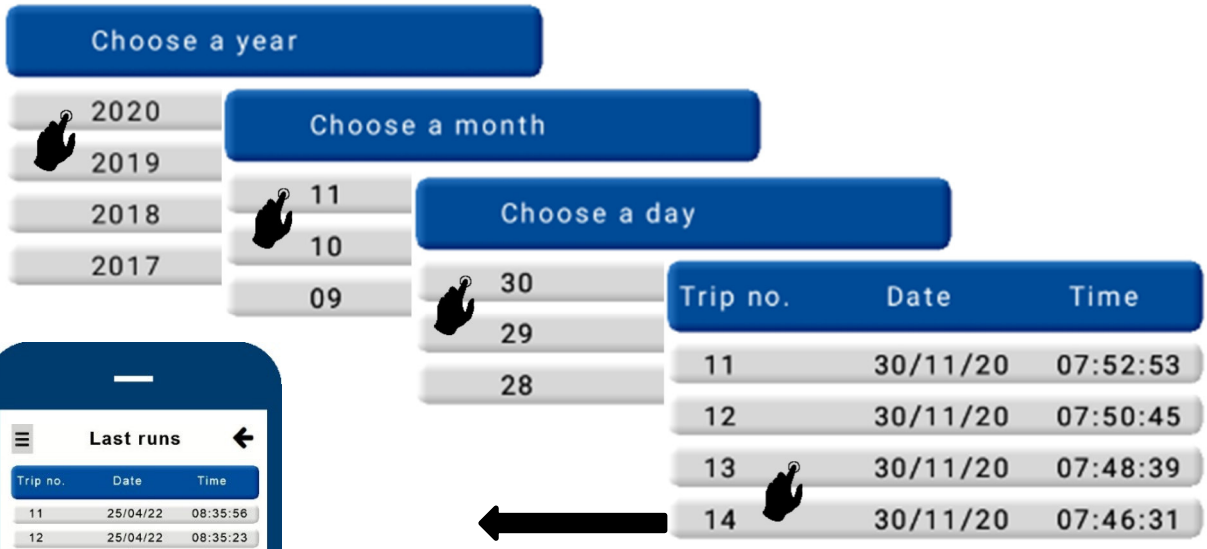




***←Left***
In the “**Recording**” menu, you can activate the recording of all trips by tapping the slider and deactivate it again at any time.
The recording duration can be set between 1 and 31 days. The remaining time is displayed.

***Right→***
The recording ends automatically after the set period has expired or when the slider is actively switched off.

### 7.8.4 Logbook

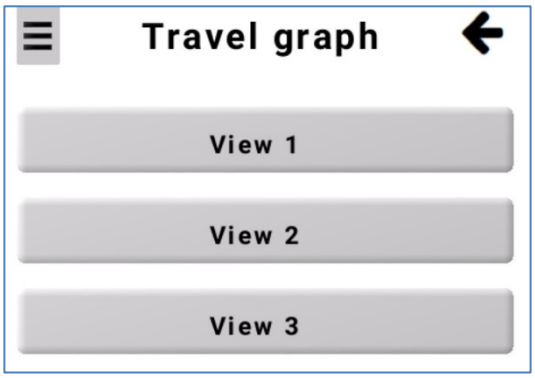
All saved trips can be found under "Data collection" -> "Logbook". There are three different views available for analyzing driving characteristics and valve settings. They help to quickly and easily diagnose any malfunctions and troubleshoot more quickly.



Each trip can be identified by the date and time it was saved. After selecting the year, month and day, you will be taken to the trip overview for the selected day. The last trip is always listed at the beginning and the first at the end.

If more than 10 trips are saved for that day, symbols for browsing appear at the bottom. You can use the symbols + and - to navigate back and forth between the individual pages. You can use Top to get to the last trip of the day, which has trip number 1.

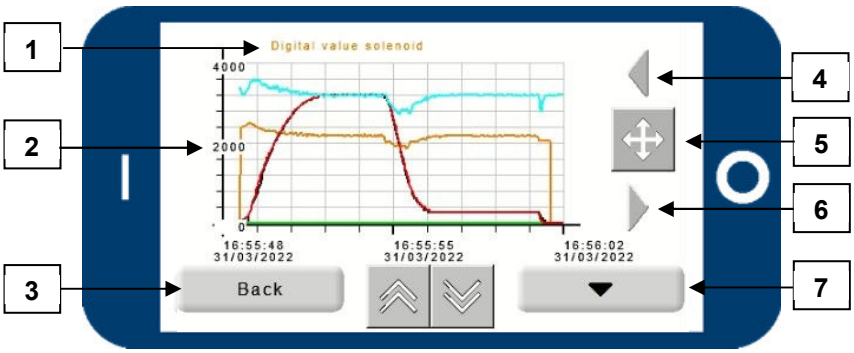
Once the desired trip has been selected, three different views with different channels are available for analysis, which are explained in more detail on the next page.




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

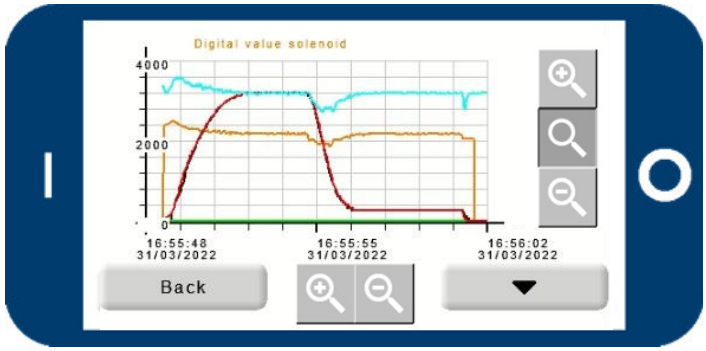
**View 2** gives a more detailed look into values of the PID controller and will be used mainly by Blain Hydraulics technical support for system diagnostics.

**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 Chanel |
| 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) adjusts automatically. The values of the y-axis depend on the measurement system selected in the “Settings” menu item. Pressing the “Back” button (3) takes you back to the view selection. When the crosshair symbol (5) is displayed, the x-axis can be moved using the arrow symbols on the left (4) and right (6). The arrows are used to move the selected and zoomed channel along the y-axis.



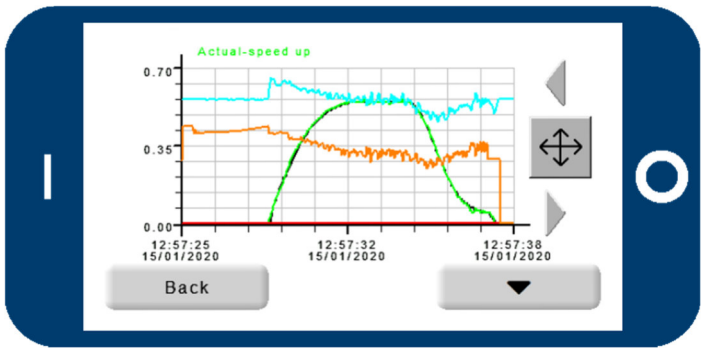

By pressing the crosshair symbol , the view changes from the sliding function to a zoom function and the magnifying glass symbol appears. Using the magnifying glasses and , the x and/or y axes can be zoomed in or out.

The button (**5**) allows to switch between different channels in each selected view.

The color of the actual speed in the travel graph indicates the travel direction (green – up direction; red – down direction).

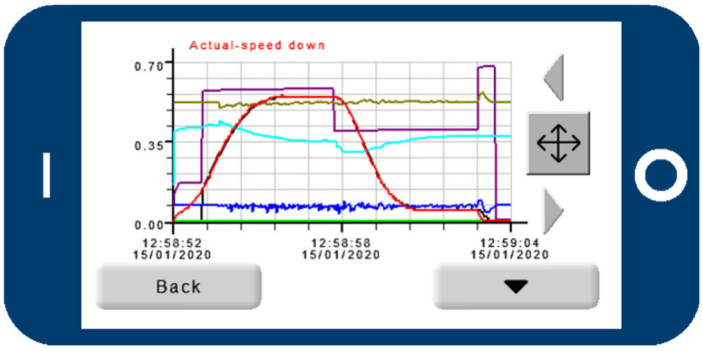
***View 1 – (example for up travel)***

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



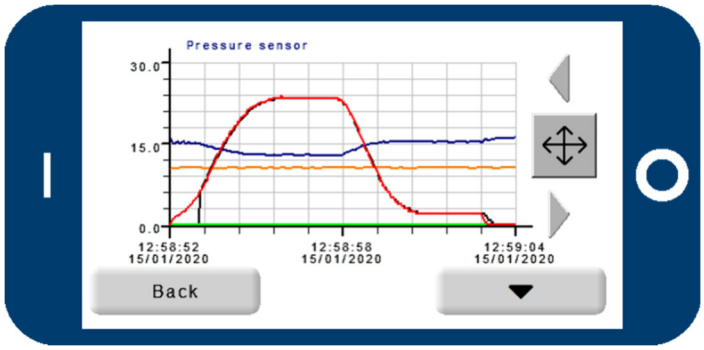

***View 2 – (example for down travel)***

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

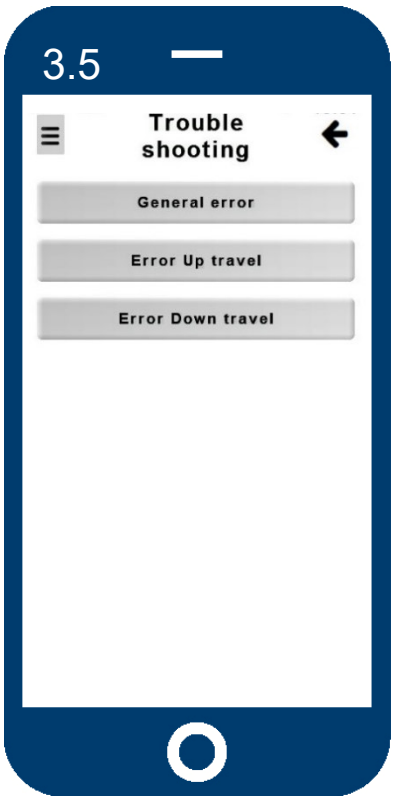



***View 3 – (example for down travel)***

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

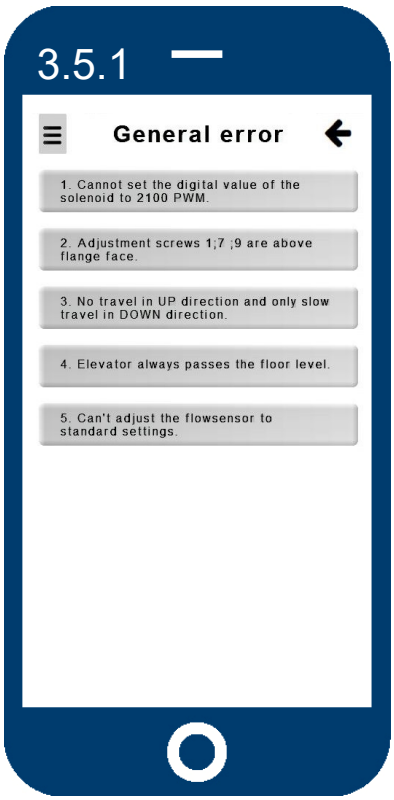


### 7.8.5 Trouble shooting




***←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.




## Troubleshooting – 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- and/or temperature sensor not functioning or no reading on main menu. | Connection problem. | Check connection and signal input to SEV card. |
| | Sensor(s) defect. | The elevator can still be used, but the rides are a bit rough.<br>Replace the sensor. |

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><br>- pressure loss in the system is too big<br>- dynamic pressure drops below 12 bar | <u>Possibilities:</u><br>- Use next larger insert size<br>- Increase pressure and weight<br>- Reduce friction in the system<br>- Adjust deceleration time (longer)<br>- 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). |

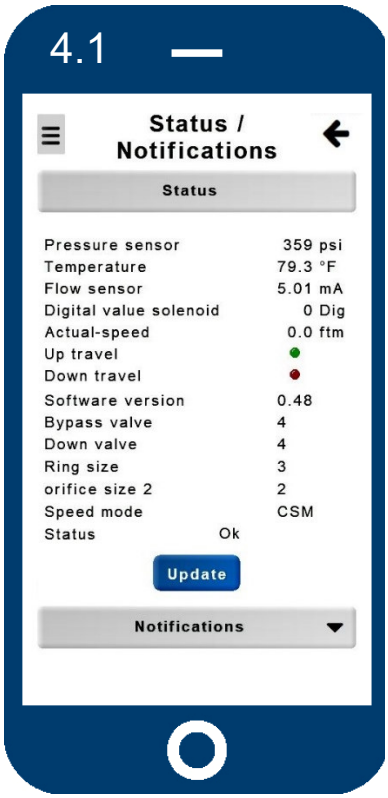
## Down direction travel

| 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. | Outer 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. |

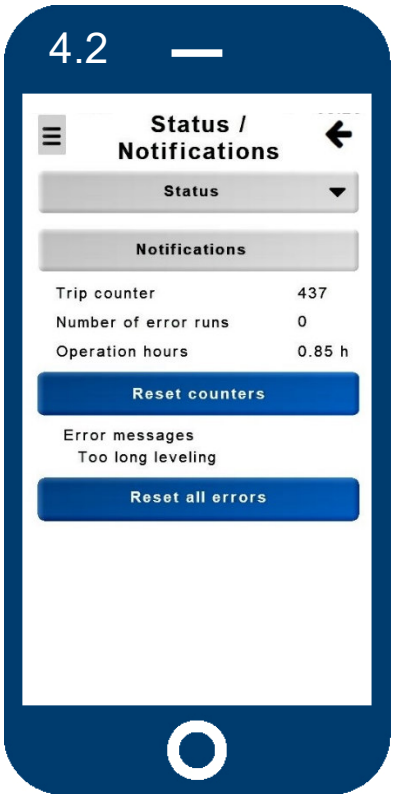
[#]: To check for energized solenoid coils, remove 19mm hex nut. By lifting the coil, the noticeable magnetic force of an energized coil can be checked and the travel function of the elevator manipulated.

## 7.9 Status, Notifications und Update

### 7.9.1 Status and Notifications

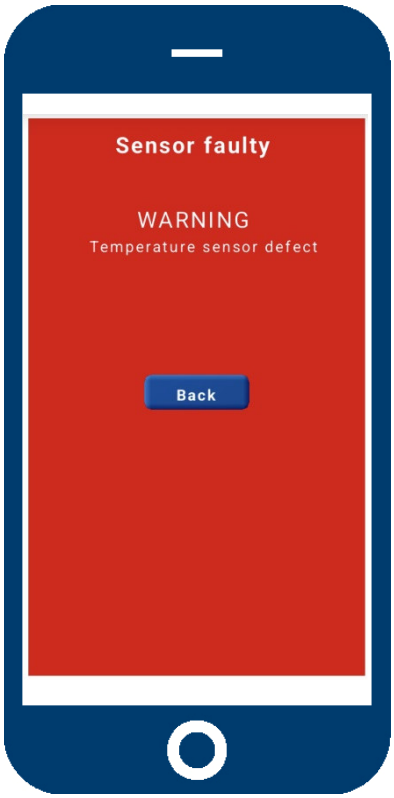


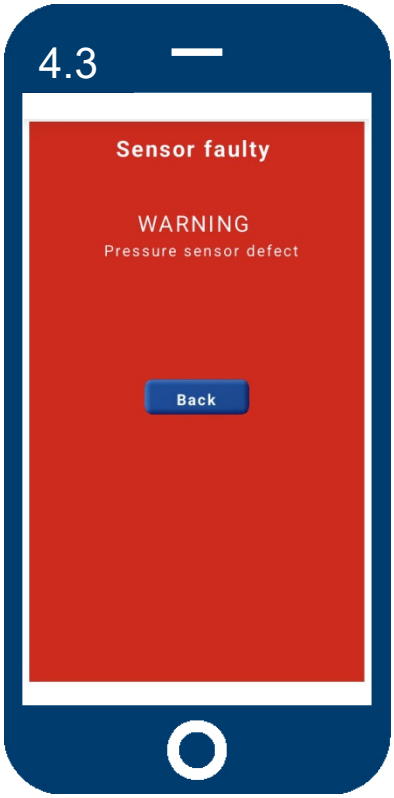

***←Left***
The current status of the valve is displayed here. Various data, such as sensor values for pressure and temperature (SEV7 only), as well as the input signals (A, B, C, D, I) and output signals (lift and descent) are displayed. Information of the software version, the measuring ring size and the speed mode can be found. Using the update button, new firmware can be loaded from the micro-SD card onto the SEV 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.

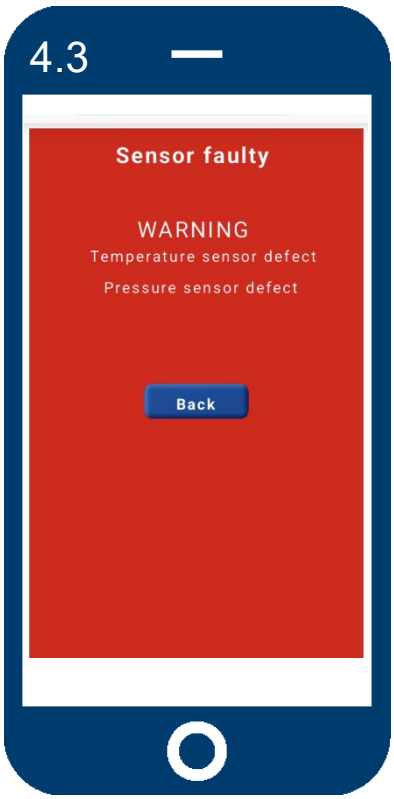
If a sensor fails (even if there is no connection to the sensor), a message appears on the smart phone. Additionally, this is also indicated via a flashing code on the error LED and warning LED on the SEV card.



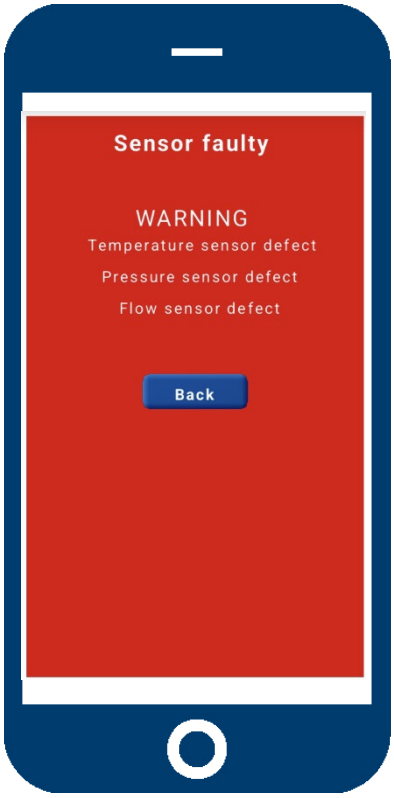




If the pressure sensor is defective, the error LED and the warning LED flash approx. once per second.

If the temperature sensor is defective, the error LED flashes; the warning LED is off.




If the pressure and temperature sensor are defective, the Error LED and the Warning LED flash very quickly (approx. 2 times second).




If the flow sensor is defective, the connection is faulty or screwed in too deeply, the error message “Flow sensor defective” appears. The Error LED and the Warning LED both light up permanently. If one of the other two sensors is also defective, this flashing code will be ignored.

### 7.9.2 Emergency program with defect sensors

If the flow sensor is defective and cannot be fixed by pressing the OK button on the SEV card, the SEV card will not allow **any** movement. The D coil is only activated in the down direction by the lift controller and a slow lowering movement is carried out. This can be adjusted using setting 9 and should ideally be set to 3cm/s. A lower speed can significantly slow down a quick evacuation in an emergency or make it impossible. A higher speed can affect the SEV's slow speed control.

If, however, only the pressure and/or temperature sensors are defective or not right connected, the control system allows driving by assuming standard values at the expense of reduced driving quality. The values for a defective temperature sensor are displayed with arrows pointing upwards; those for a defective pressure sensor are displayed with arrows pointing downwards (see example on the right).

| | |
|---|---|
| Pressure sensor | ↓↓↓.↓ bar |
| Temperature | ↑↑.↑ °C |
| Flow sensor | 5.05 mA |

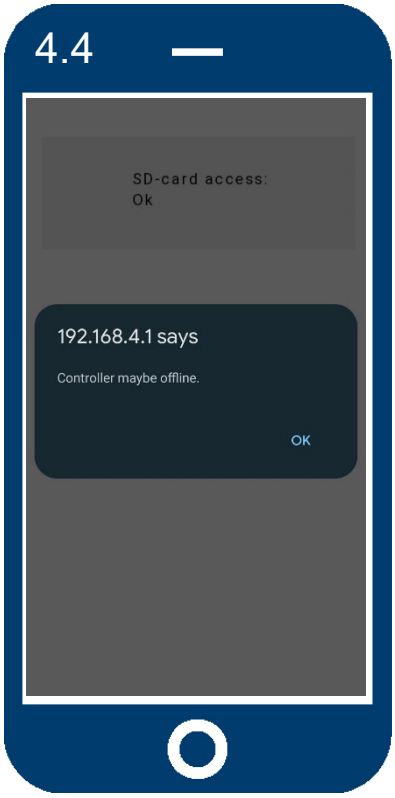
If the temperature sensor is defective, the control is based on the assumption that the oil has a temperature of 79°F (26°C). If the pressure sensor is defective, a load of 25% is assumed.

### 7.9.3 Firmware update

To perform a firmware update, a functioning micro-SD card is required, which contains the new software version and the "webhome" folder required for the connection. If necessary, use a new micro-SD card (maximum 32GB) with the files and insert it into the slot. To recognize the new micro-SD card, the supply voltage of the SEV card must be briefly disconnected for approx. 3 seconds. Depending on the software change, all parameters are reset to default values. It is therefore recommended to save the current parameters of the SEV card to the micro-SD card before the update.

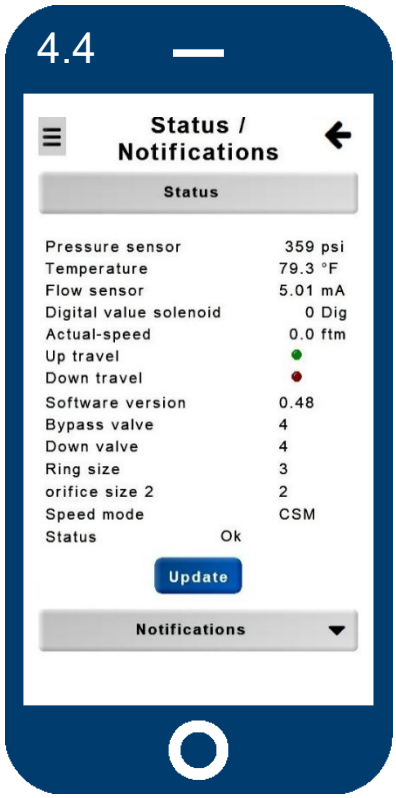
After the Wi-Fi connection has been established, open the web server in the browser (192.168.4.1) and wait until the menu is displayed after the blue loading bar.

Set the access authorization to level 2. To do this, go to "Access authorizations" in the main menu -> enter password" 4646 and confirm. Now save the current parameters of the SEV card to the micro-SD card. This is done under "Settings" -> "Factory settings" -> "**Save** parameters **to** SD card"; save with "Continue".

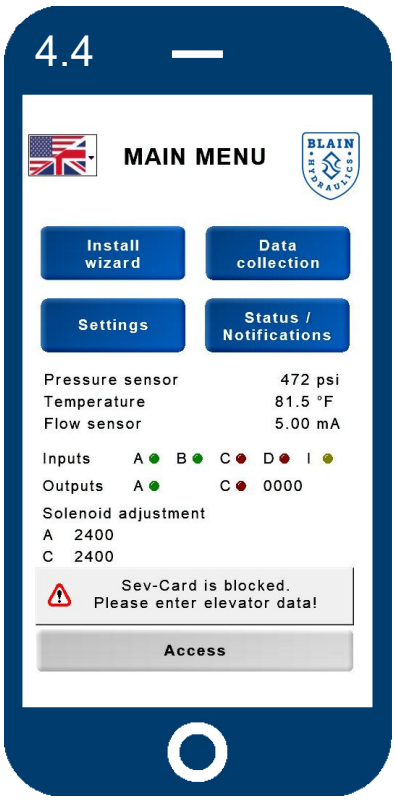



To start the update, press the **Update** button in the "Status Messages" area. The yellow State LED will now start to flash quickly. When the transfer begins, the green Bootloader LED (next to the Micro SD card) will also flash very quickly. The update will be complete after about 30 seconds. As soon as the process is complete, the green and red Boot Loader LEDs will light up alternately once per second.

Acknowledge the error message now displayed on the SEV page in the browser on your mobile phone and close the browser.



The firmware update may reset the SSID. This will disconnect the connection to the SEV card. The cell phone must be re-registered in the SEV card's WLAN (SSID name: Blain-SEV) and the web server (192.168.4.1) must be called up in the browser.

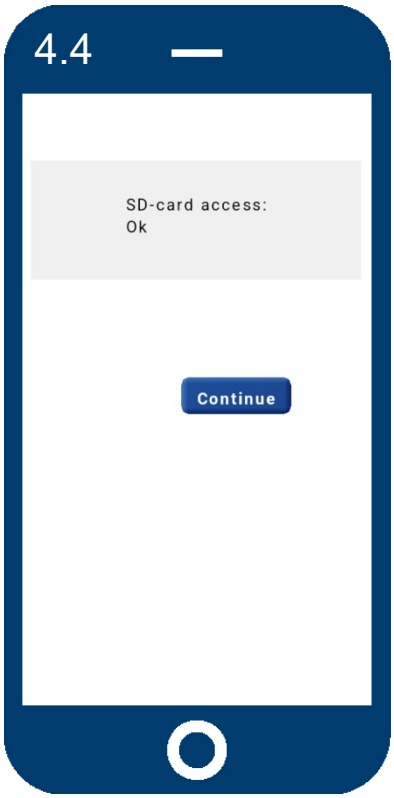



Depending on the scope of the software update, the left display (SEV card is blocked) may appear in the main menu. If the card is blocked, no control is carried out until the elevator data has been checked and changed if necessary. Existing input signals are indicated by the input LEDs on the card lighting up.

The new software version of the SEV card is now displayed in the section "Status Notifications".

Set the access level in *Access* to level 2. To do this, go to the main menu and select “Access” -> “enter Password” and enter 4646 and confirm. Then transfer the saved parameters from the micro-SD card to the SEV card (under Settings -> Factory settings -> **Download** parameters **from** SD card).

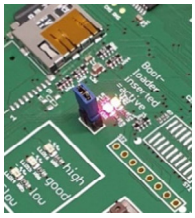
Loading the parameters changes the SSID name of the SEV card again and thus disconnects the WLAN connection. The image is "frozen". In this case, close the website, re-establish the WLAN connection and call up the web server in the browser (192.168.4.1).




If the message appears SD-card access: Ok, acknowledge it with continue and go to the main menu on the 3 bars.

Alternative variant: A software update can also be carried out using a jumper.

To do this, the parameters of the SEV card must first be saved to the micro-SD card (see above). The software update is started by disconnecting the SEV card from the power supply and placing a jumper on the two free pins of the boot loader. The power supply of the SEV card is then reconnected and the update starts automatically. After about 30 seconds, the update is finished and the boot loader LEDs flash normally again. Remove the jumper from the two pins.



After re-establishing a connection between the smartphone and the SEV card, the parameters must then be transferred **from** the **micro-SD** card back **to** the **SEV** card as described above.

# 8. 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 energized 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 energized 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 signaled 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.<br>Relay R1 switches over.** |
| **2. Sensor defect** | Flow sensor disconnected, damaged or wrongly adjusted (<4.2mA). | |

After the fault has been corrected, errors 1-2 must be cancelled by pressing **OK** button on SEV Card or erased from the notification 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.<br>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.

# 9. 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

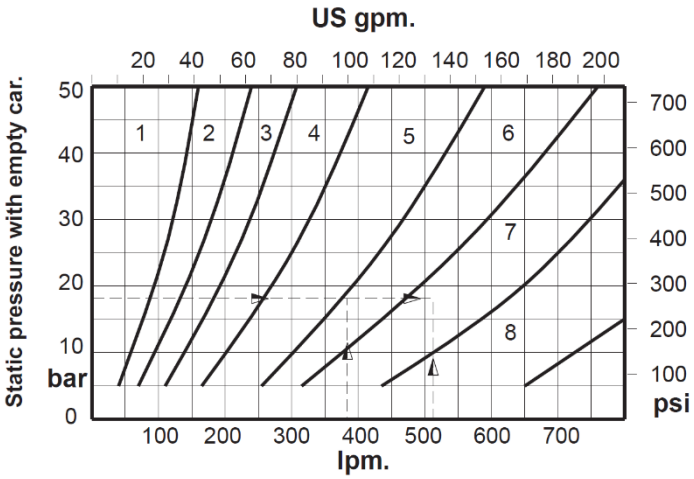
Additional for adjustment:

- 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 | The ring size installed in the control valve must match the ring size stored in the software!<br><br>* Range limit for ring size 6:<br>454 l/min (129 GPM) at 8 bar (116 psi) minimum pressure linear to 580 l/min (153 GPM] at 15 bar (217 psi) minimum pressure | | |

## 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 flow guide sizes should not exceed 15%. | |

## Valve data plate

| Model | 2” | R5 | U4 | X5 |
|---|---|---|---|---|

- X5 → Down flow guide
- U4 → Bypass flow guide
- R5 → Ring size of the flow meter
- 2” → Valve connection ports

## 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.

# 10. 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 |
| 5 7/16 | 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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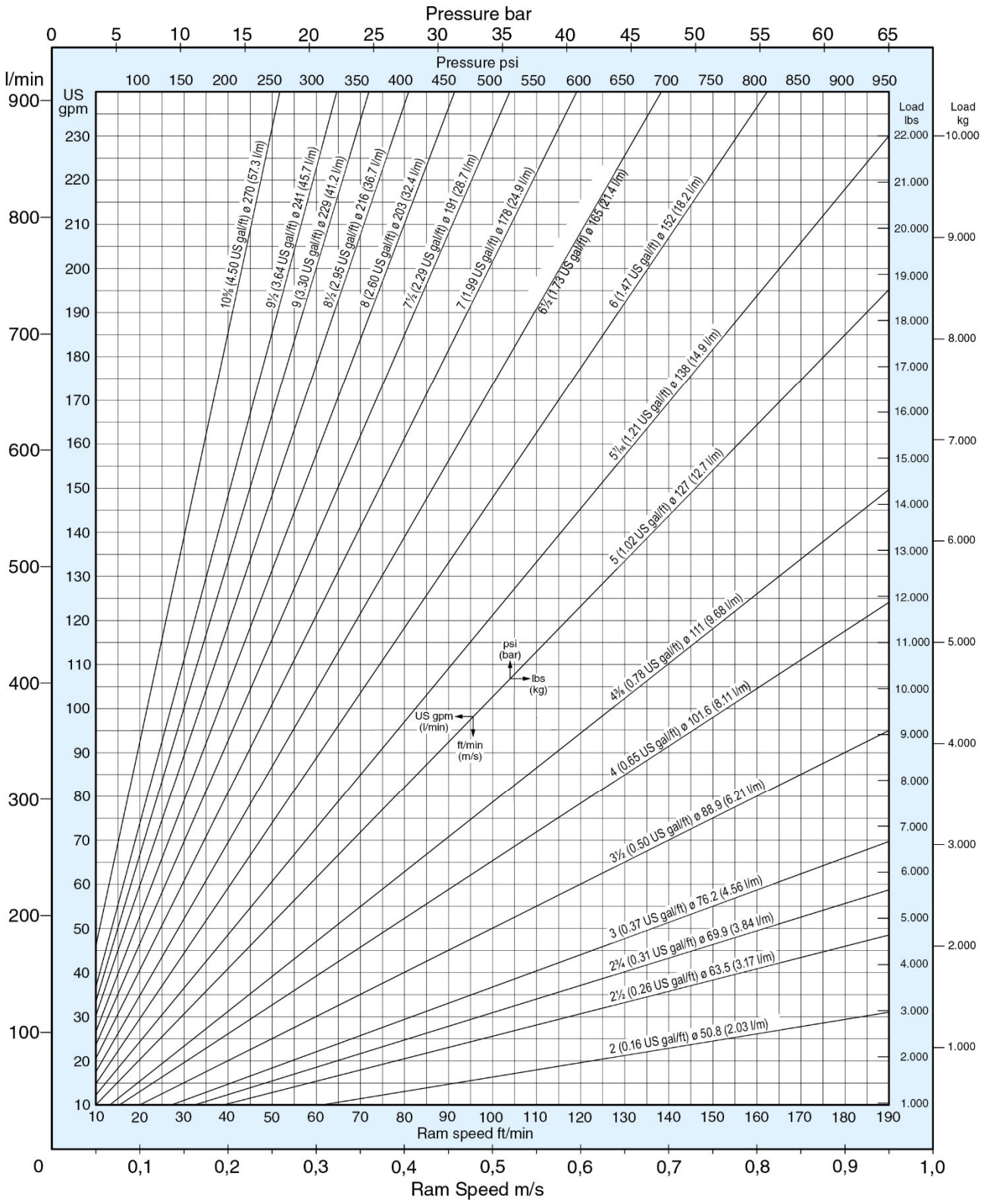
## Ram Ø • Area • Load • Pressure

| 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
0 5 10 15 20 25 30 35 40 45 50 55 60 65
Pressure psi
100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950
l/min
900 800 700 600 500 400 300 200 100
US gpm
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
Load lbs
22.000 21.000 20.000 19.000 18.000 17.000 16.000 15.000 14.000 13.000 12.000 11.000 10.000 9.000 8.000 7.000 6.000 5.000 4.000 3.000 2.000 1.000
Load kg
10.000 9.000 8.000 7.000 6.000 5.000 4.000 3.000 2.000 1.000
10% (4.50 US gal/ft) ø 270 (57.3 l/m)
9¼ (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)
6½ (1.73 US gal/ft) ø 165 (21.4 l/m)
6 (1.47 US gal/ft) ø 152 (18.2 l/m)
5¼ (1.21 US gal/ft) ø 138 (14.9 l/m)
5 (1.02 US gal/ft) ø 127 (12.7 l/m)
4⅞ (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)
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
Ram speed ft/min
0 0,1 0,2 0,3 0,4 0,5 0,6 0,7 0,8 0,9 1,0
Ram Speed m/s

# 11. QUICK START GUIDE

All SEV cards and SEV valves are factory-set with customer data. Checks can be carried out at any time. Changes only in case of problems or replacement of the corresponding component.

## Step 1: Hardware check before putting into service

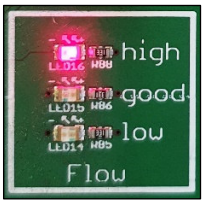
a) Is the wiring between the SEV card, SEV valve, SEV sensors and controller correct (see User Manual, chapter 4)?
b) Are there any error messages on the SEV card (User Manual chapter 2.2 and 7.9.1)? If there are errors, the LEDs light up depending on the error level. Once all errors have been corrected, clear the errors with the OK button.

## Step 2: Software check - Wi-Fi connection to the SEV card (no internet required)

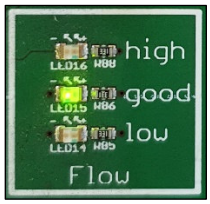
a) Establish a Wi-Fi connection between the SEV card and smartphone. For this switch on DIP1 (blue LED flashes) and connect device to the card's SSID. If the connection is successful, the blue LED lights up continuously (User Manual, chapter 6).
b) Start the web server from the micro-SD card. This is done by entering the IP address **192.168.4.1** in the browser.
c) The blue loading bar appears when loading the SEV menu (User Manual, chapter 6).

## Step 3: Check flow sensor setting

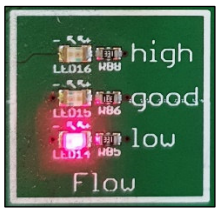
The SEV flow sensor must be set to "good" between "high" and "low". This is shown on the SEV card by the LEDs (User Manual, chapter 2.2 and 6.4).




too high (>5.3mA)




set correctly




too low (<4.8mA)

sensor defect: <4.3mA

The radial setting of the sensor (Chapter 7.2) should only be changed if the flow meter has been changed. If there are large speed deviations between the set target value and the actual speed after the change, a speed learning run must also be carried out.
When changing the sensor, in most cases only a horizontal adjustment needs to be made.

## Step 4: Adjust bypass pressure

Terminals 6 and 7 have to be disconnected from the SEV card (User Manual, chapter 4). Start the motor with empty cabin. Turn in adjustment **1** until the elevator starts moving and then turn it back out (with the motor running) until the elevator stops. From this setting turn out the adjustment **1** about half a turn (with hot oil 1 turn) and reconnect terminals 6 and 7.

As an alternative to disconnecting PIN 6 and 7, the adjustment screw from the pressure relief valve can be unscrewed flush with the nut surface. After setting the by-pass pressure, the adjustment screw should be brought back to the set position. See also here: www.blain.de ->Service -> Troubleshooting.

## Step 5: Check/adjust emergency lowering speed

a) Run the **empty** cabin to an upper floor and switch off the re-levelling function of the elevator controller.
b) When the emergency lowering is open, turn setting No. 9 out until the elevator descends at a speed of 0.02-0.03 m/s (not faster) otherwise, unregulated ride at slow speed may happen.

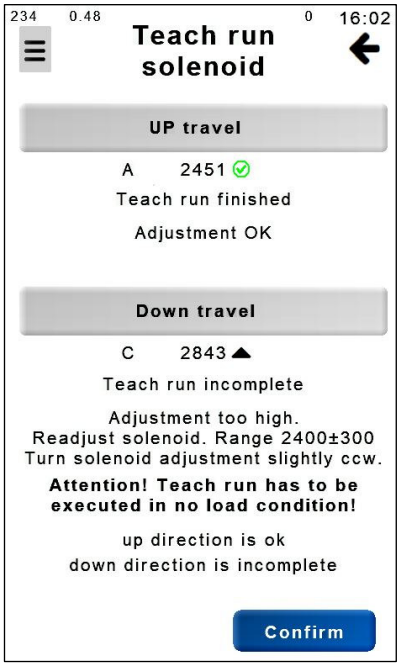
## Step 6: Check SEV card data

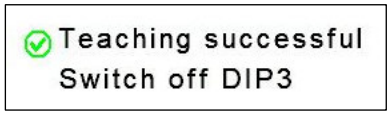
a) Compare all elevator data on the SEV card with the data of the existing elevator (User Manual, chapter 7.8.1).
b) Compare the calculated ring size on the SEV card with what is installed in the SEV valve by checking the name plate on the SEV valve. (See User Manual, chapter 9).

## Step 7: Check the solenoid valve setting/perform a teach run (only for SEV-07 valve)

a) Take the elevator to the bottom floor with an **empty** car.
b) Switch on DIP3 to activate the teach run and check the values (“settings” -> “advanced settings” -> “Teach run solenoid”; chapter 7.4 and 7.7.5).

c) Initial solenoid adjustment: Place an Allen key, size 3, on the top of the solenoid. Screw all the way out and 3 turns in (User Manual, chapter 7.4 and 7.7.2).
d) Switch off travel time monitoring from the elevator controller.
e) Give an up command to the top floor.
f) The SEV card will start and stop the elevator until the actual start value is found for the up solenoid and runs the elevator without another break into to floor level.
g) To set the down solenoid valve **C;** adjust No. 9 one and a half turn below the flange-level, No. 7 one turn above the flange-level and give a down command to the lowest floor.
h) If the teach run is incomplete or the value is outside the permissible range, this is displayed with arrows. If the value is too high ▲, the solenoid must be readjusted (1/8 to 1/4 turn) counterclockwise; if it is too low ▼, it must be readjusted clockwise.
i) After the correct range setting ✓ and a successful teach run message (see information), switch off DIP3.



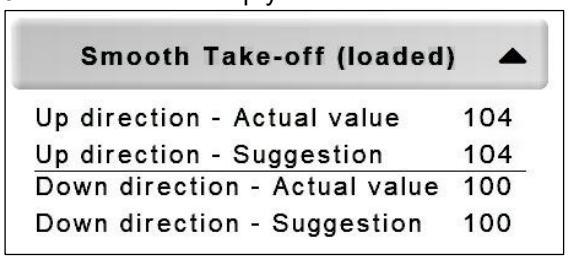



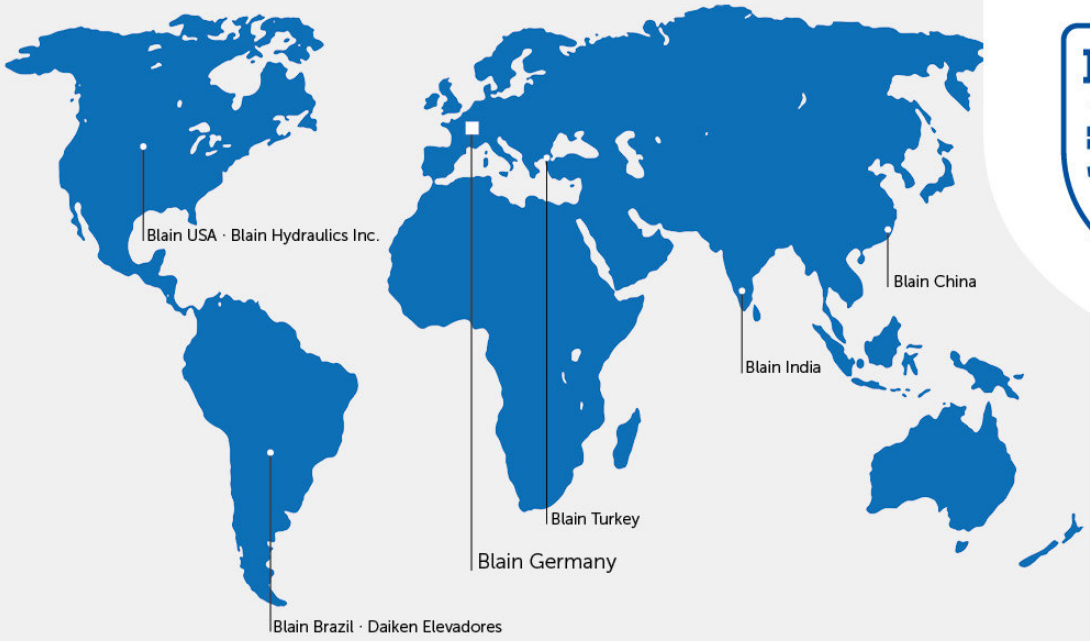

## Step 8: Check/adjust maximum speed limit

a) Run the **empty** cabin to an upper floor.
b) Run the cabin from the top floor level to the bottom floor. As soon as the fast speed is reached, turn adjustment No. 7 in (cw) until you feel vibration on the adjustment screw. Then ½ turn out (ccw).

## Step 9: Check/correct solenoid valve settings for **A** and **C** at rated load (only for SEV-07 valve)

a) Important! Check if DIP3 is switched off. Otherwise step 6 “teach run with empty cabin” has to be done again!
b) Run the lift up and down one floor with the rated load and accept the proposed correction value (User Manual, chapter 7.5; “Settings” -> “Valve settings” -> “Smooth Take-off [loaded]”).
c) Carry out step a) possibly 2-3 times, until the suggestion only changes by 1 and there is a quick, but soft start with rated load.







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# BLAIN HYDRAULICS

*Designer and Manufacturer of the highest quality control valves & safety components for hydraulic elevators*