 elevation technology ab Box 66, Fabriksgatan 13 SE-342 21 ALVESTA, Sweden	Hydroelite 3G-1 <b>Function description Ver.2</b> Drive and Control system	Technical Documentation <b>T 100 38 EN</b>	
		INSTALLATION	2008-05-06
		BB/PF/LaK	Side 1

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# 1 System description

HydroElite is an integrated control and drive system for hydraulic lifts. All the decentralised functions in the system, on lift car and at landings, communicate via a common data bus, CANbus.

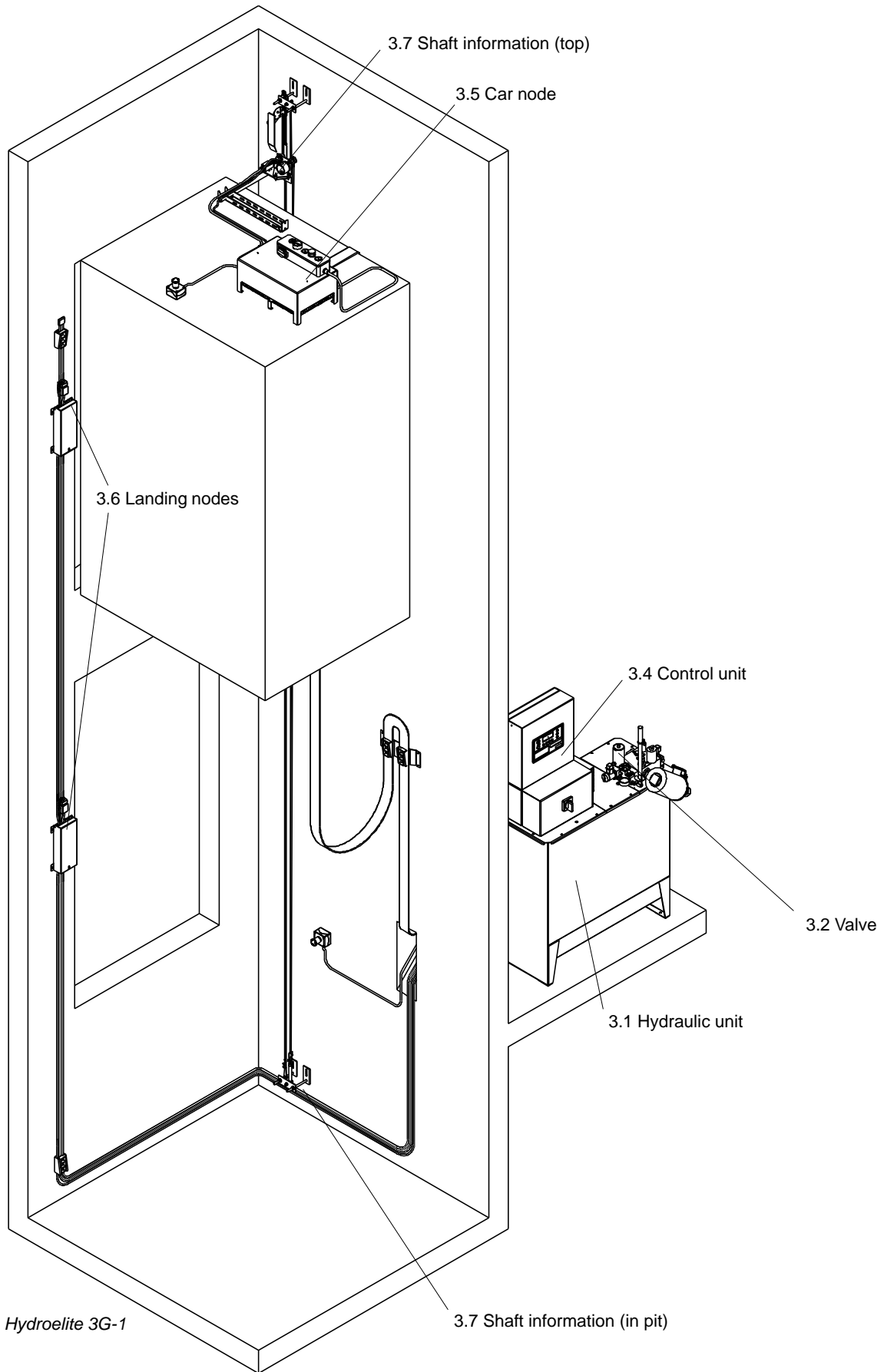


Fig. 1.1 Hydroelite 3G-1

## 1.1 Hydraulic system

The power unit (Fig 1.1 pos. 3.1) consists of an electric motor and a pump in oil-drained performance, for minimum noise level.

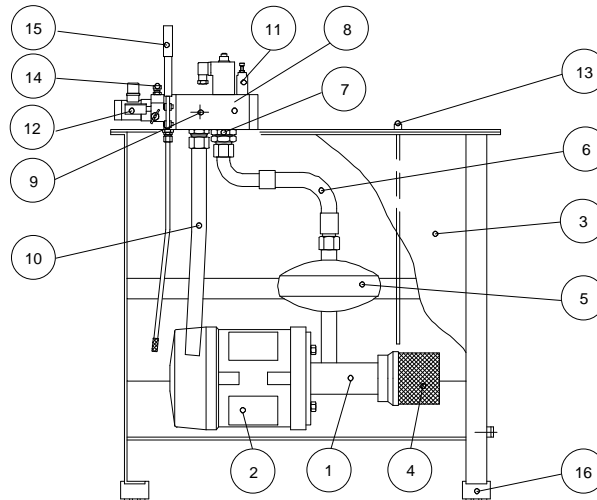
The valve system Dynahyd-S1 (Fig 1.1 pos. 3.2) is a electronic regulated hydraulic system, that uses a specially designed servo valve for precise regulation of the oil flow, which enables direct approach to floor without any creeping. The valve system is completely self-learning and requires no manual settings.

The Dynahyd valve is controlled by Hydroelite control node, that contains a control board, a safety board, motor contacts and a soft starter for reducing the start power.

The pump and motor are placed below the oil level in the power unit.

### 1.1.1 Function

(see Fig 1.2)



**Fig. 1.2** Power unit with valve system Dynahyd-S1

The screw pump(1), direct connected to the motor(2), sucks oil from the tank(3) through the filter(4). Then the pump sends oil through the pulsation damper(5), the hydraulic hose(6), the check valve(7), the valve system(8), the shut-off valve with filter(9), the hydraulic hose and finally through the rupture valve to the jack.

At down travel the oil is led back to the tank through the outlet tube (10).

The pump and lift are protected against overload at up travel by the pressure relief valve VS(11).

The pressure gauge(12), which is provided with a shut-off valve and a test connection, is conneted to the valve system to supervise the working pressure.

The oil level can be controlled by an oil dip stick(13). The oil is protected against over-heating by a thermoswitch in the tank, which prevents that the motor starts when the temperature exceeds 70°C. The motor is also protected against over-heating by thermistors.

The valve system is equipped with a special emergency lowering valve VSMA(14) at indirect acting lift. VSMA maintains a minimum pressure at emergency lowering so that slack rope will not arise.

The hand pump(15) is provided with a pressure relief valve.

The hydraulic unit is placed on vibration absorbers made of rubber(16).

## 1.2 Control system

### 1.2.1 Control node

see fig 1.1 (pos 3.4)

The control node contains following components:

- Main switch with motor protection,
- Soft starter for the motor,
- Printed circuit board with integrated electronics for regulation of the valve system, traffic control and communication between car and floors
- Digital display with push buttons for commissioning and diagnostics (see 3.4)
- Battery and charging board

The control node manages inputs and outputs in the machine room and supervises the safety circuit that is connected there. A recall handle for inspection travel can be attached to the control node.

The control node also supervises the other nodes including their safety circuit and also processes their in- and outsignals.

The lift main program runs at the control node.

### 1.2.2 Car node

see fig 1.1 (pos 3.5)

The car node manages all occurring inputs and outputs in the car and supervises the car safety circuit. A recall handle for inspection travel is attached to the car node.

### 1.2.3 Floor nodes

see fig 1.1 (pos 3.6)

There are one floor node per door. The floor nodes manage all occurring inputs and outputs with the floors and supervise landing door safety circuits.

### 1.2.4 Shaft information

see fig 1.1 (pos 3.7)

The shaft information contains an absolute encoder which senses the position and the speed of the car. The inductive encoder, placed on car roof, senses when the elevator is within a floor zone. Both of these encoders supervise each other.

## 2 Valve system Dynahyd

### 2.1 Function description at travel

see fig. 2.1

#### 2.1.1 *Up travel*

##### 2.1.1.1 Motor start

When the motor starts, the valves VR and VB opens so that all the oil is pumped through the valve VB back to the tank.

##### 2.1.1.2 Acceleration up to full speed

The servo valve closes the valve VB slowly which leads the pressure in front of the VB to increase. When a sufficiently high pressure has obtained, the valve VRP opens and the lift starts to accelerate. With that a gradual less and less part of the oil is led back to the tank. The lift achieves full speed when the valve VB has closed completely.

##### 2.1.1.3 Deceleration from full speed

The Dynahyd drive control unit calculates the required deceleration distance for the actual speed and initiates the start point of the deceleration. At this point the servo valve starts to open the valve VB slowly, which leads the lift to decelerate.

##### 2.1.1.4 Final stop

The lift enter the landing with direct approach and the motor is deenergized. The check valve VRP closes and prevents the lift to lower below the landing. The check valve VR closes as well.

#### 2.1.2 *Down travel*

##### 2.1.2.1 Acceleration up to full speed

The servo valve closes the valve VB and the solenoid valve VMD is deenergized, which leads the valve VRP to open. The servo valve controls the acceleration up to full speed by opening the valve VB slowly.

##### 2.1.2.2 Deceleration from full speed

The Dynahyd drive control unit calculates the required deceleration distance for the actual speed and initiates the start point of the deceleration. The servo valve starts to close the valve VB slowly, which leads the lift to decelerate.

##### 2.1.2.3 Final stop

Just before the moment the lift reaches the landing the solenoid valve VMD is deenergized. This leads the check valve VRP to close and the lift stops gently at the landing. With VRP closed, the lift is prevented from lower at landing.

#### 2.1.3 Pressure relief valve VS

When the pressure exceeds the set maximum value, the valve VS opens. This leads the valve VB to open and all the oil from the pump is led back to the tank.

#### 2.1.4 Manual emergency lowering valve VSMA

The valve VSMA is operated by its push button, which cause that oil is led back from the jack to the tank. If the pressure in the jack drops below the set minimum pressure, no further oil is led to the tank. The minimum pressure is set so that no slack rope occurs on a 2:1- or 4:2-installation.

#### 2.1.5 Electric emergency lowering (option)

As an option the emergency lowering valve can be provided with a coil, which makes it possible to electrically operate the valve.

2.2 View of Dynahyd-S1 valve system

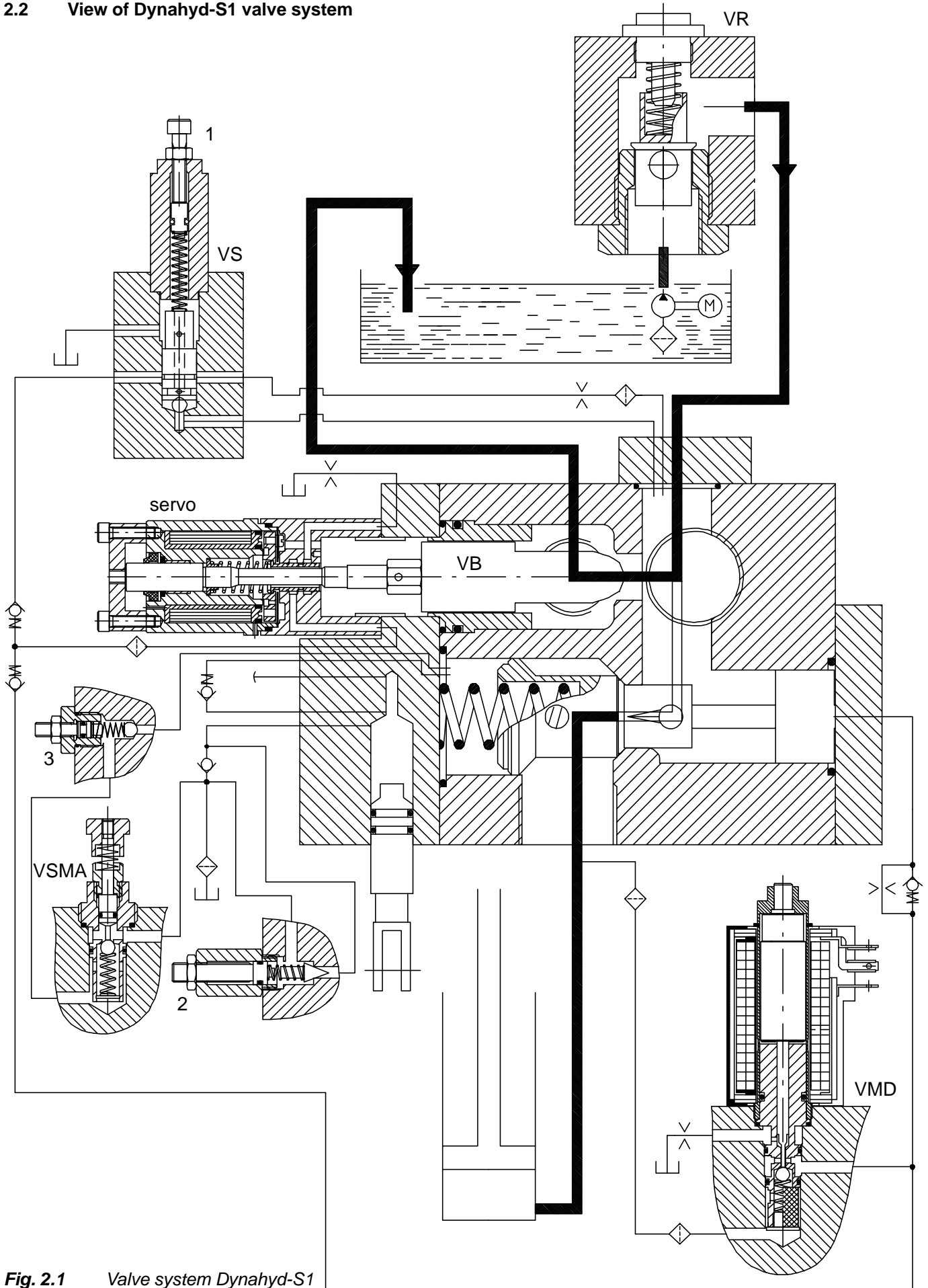


Fig. 2.1 Valve system Dynahyd-S1

2.3 Hydraulic flow diagram

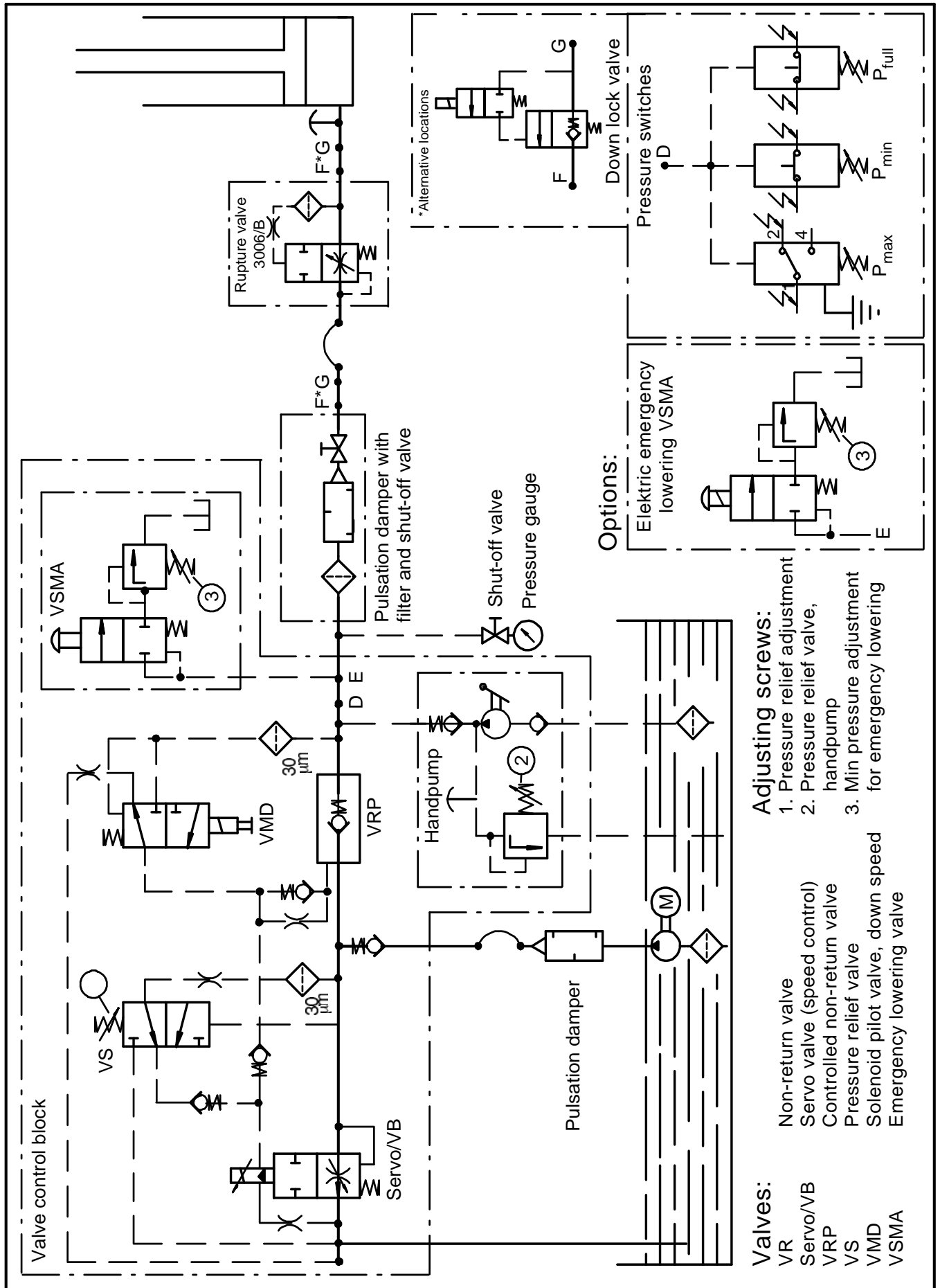
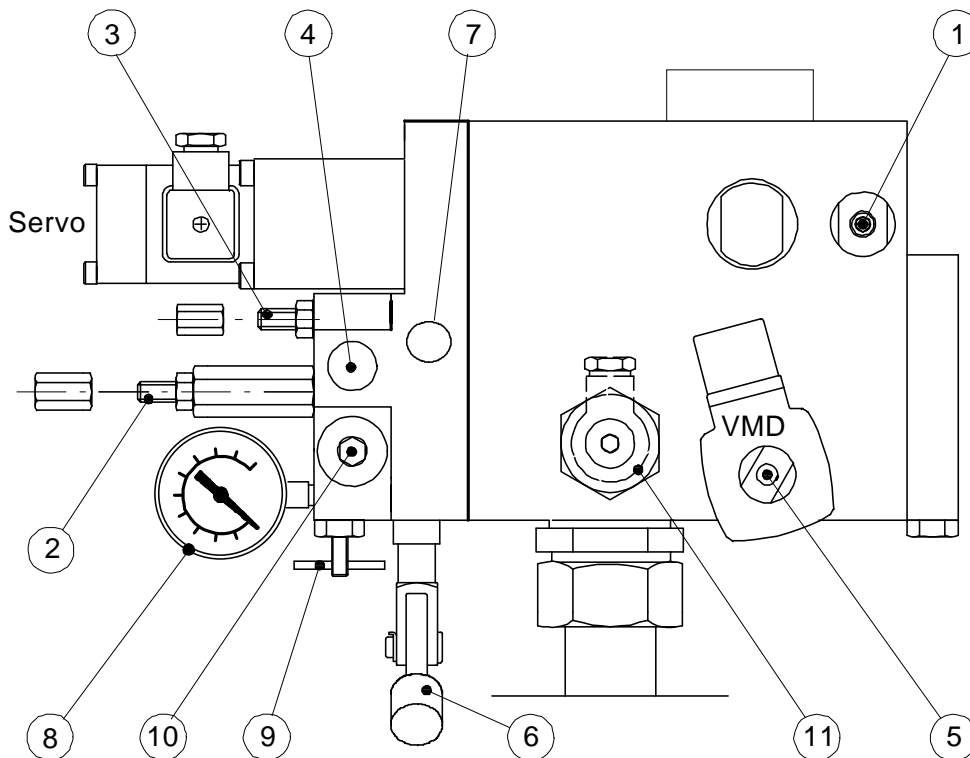


Fig. 3.1 Hydraulic flow diagram Dynahyd-S1

## 2.4 Adjusting screws and pressure switches



**Fig. 4.1** Valve system Dynahyd-S1

### 2.4.1 Adjusting screws

#### **Adjustment of Pressure relief valve (1)**

- Screw in the screw for higher pressure.

#### **Adjustment of Hand pump pressure relief valve (2)**

- Screw in the screw for higher pressure.

#### **Adjustment of min pressure for emergency lowering (3)**

- Screw in the screw for higher pressure.

### 2.4.2 Manual emergency lowering

#### **Manual emergency lowering (4)**

- The min pressure is adjusted by adjusting screw (3) to prevent from slack rope.

#### **Manual lowering (5)**

**NOTE:** Manual lowering is used only if a pressure-less system is wanted.

### 2.4.3 Handpump

#### **Handpump (6)**

- Set max pressure by adjusting screw (2).

#### **Luftningsskruv för handpumpen (7)**

- Screw out the adjusting screw some turns for bleeding.

### 2.4.4 Pressure gauge

#### **Pressure gauge (8)**

#### **Shut-off valve for pressure gauge (9)**

- Screw out the adjusting screw for setting the pressure gauge in operation.

#### **Connection for test pressure gauge G ½ (10)**

### 2.4.5 Pressure switches

**Max. pressure switch (std), Min. pressure switch (option), Full load pressure switch (Low hysteresis) (option) (11)**

### 3 Control system

#### 3.1 Function description

##### 3.1.1 Travel start

A request of making a travel can come from the call button, the recall handle or be internal. When the door/s are closed a check control begins before start. This check is divided up into two stages and one starting phase.

**Stage 1:** The safety circuit is checked up to closed car door (P670:1, resp. 2), and also the contacts that have the same position both in idle mode and during travel.

Then a command is sent to the travel relay on car roof (K609). The travel relay extends the safety circuit by locking contacts on car and landing door back to the control node. It also feeds eventually retracting ramp / pawl device magnets with voltage.

When the circuit is closed the relays K204 and K206 are activated.

**Stage 2:** The other contacts are checked, which now have another positions after that the travel relay is affected, ex. pawl device and supervised photocell.

##### Starting phase:

**Up travel:** The contactor (K1) is activated. Then a start signal, that activates the thyristors, is sent to the softstarter board. When a signal, that indicates that the motor is active, comes from the softstarter board the servo begins to be energized and the travel starts.

**Down travel:** The servo is energized. After an acknowledgement the servo is activated, the down valve VMD is activated and the travel starts.

##### 3.1.2 Travel

During travel the safety circuit, other contacts and speed are supervised continuously. An interrupt of the speed signal for longer than 0,5 s cancels the travel.

##### 3.1.3 Finish of travel

The deceleration distance for the actual speed is calculated by the control system and decides the starting point for the deceleration. When the speed is 0.0 m/s, the travel is broken.

When the lift is in deceleration mode and within floor zone the relays K607 and K608 on the car node can be activated. These are used to overbridge the door contacts of the safety circuit. Then the door can begin to open shortly before the lift is stopped.

##### 3.1.4 Doors

A door opening is activated either at the finish of a travel or by pressing the button at the same floor as the lift is located.

At door opening on the main side the relay K604 is activated, and at opposite side the relay K600. The door is in the opening phase until the limit switch interrupts the feed to the relay or if the door run time runs out. Then the door stands full opened for a time that depends on which function that opens the door (destination, call, or photocell).

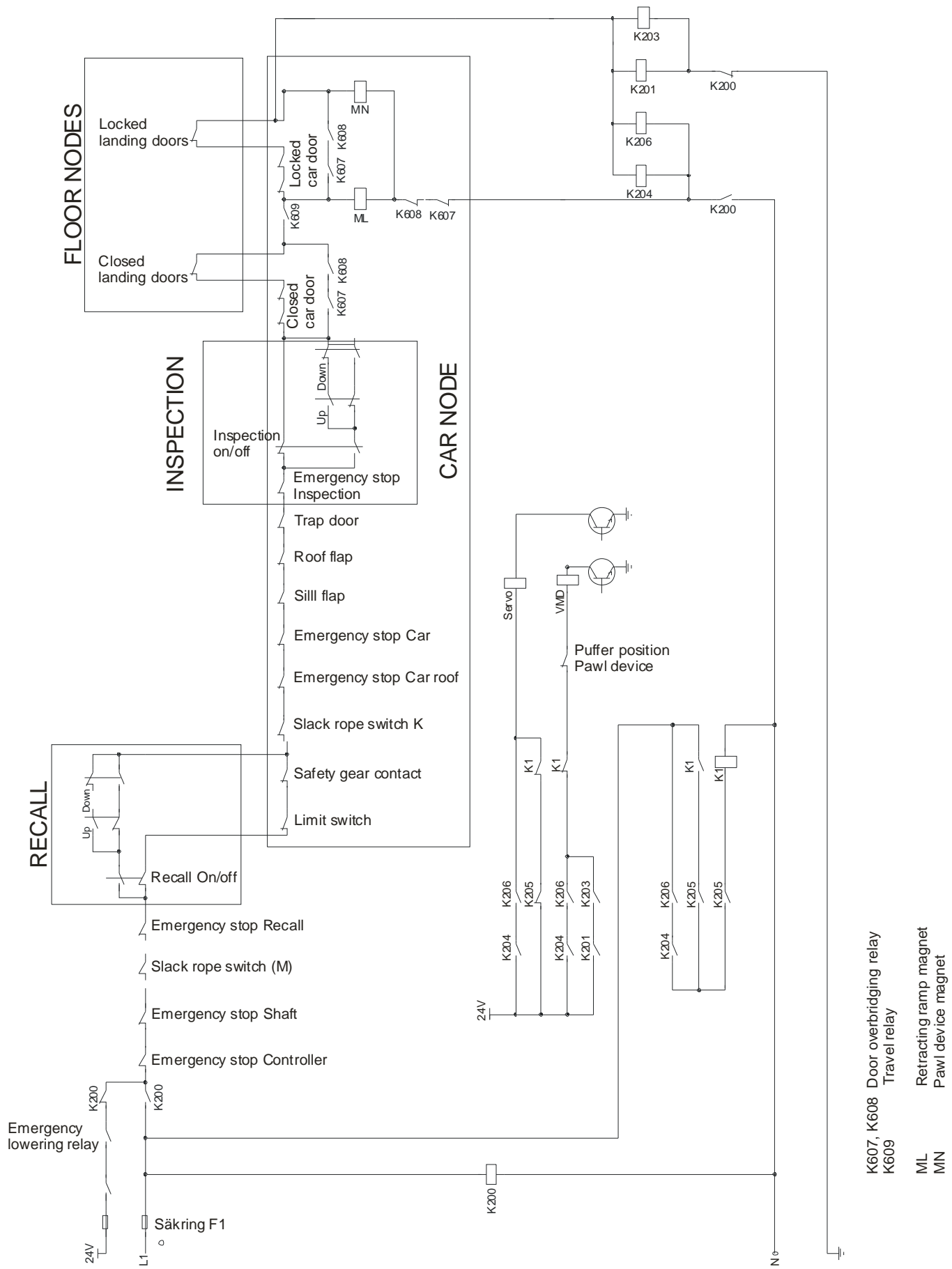
At closing of the main side door the relay K605 is activated, and at opposite door the relay K601. The door is in the closing phase until the closing contact of the safety circuit (P670:1 resp. 2) becomes closed.

##### 3.1.5 Actions of Error

**Total blocking error:** At major errors where it assesses that the control of the lift is out of control (for example speed signal error), the lift becomes blocked. No new travels are accepted until a manual reset of the control system is done.

**Blocking releveling to bottom floor:** At major errors, but with the assess that the lift can perform down travels, the lift is parked at bottom floor. Then no new travel calls are accepted until a manual reset of the system is done.

3.2 Safety circuit Diagram



### 3.3 Electric diagrams and Connection tables

For each commission there are electric diagrams and connection tables that describe all electric connections.

The electric diagrams are divided up to sub groups: Emergency equipment, Power feed, Safety circuit, Travel control, Control system, Door control, Supplement and Installation.

Connection tables are available in two versions both for internal and external connection.

For internal connection there are connection tables for Power unit, Car roof panel, Floor nodes, Travelling cables, Extra stop button in shaft, Control unit and also order specific material.

For external connection there are connection tables for Control unit (Control node), Car roof panel (Car node), Floor nodes (in shaft) and also order specific material.

#### 3.3.1 Electric diagrams

##### 3.3.1.1 S411 Emergency equipment

ex: emergency signal, emergency light, alarm forwarding, alarm telephone (ex: Safeline), emergency telephone, emergency signal buttons, alarm acknowledgement, GSM-line, loudspeaker, Intercom, etc.

##### 3.3.1.2 S412 Power feed

ex: Voltage, group control, wall socket, transformer, lighting, etc.

##### 3.3.1.3 S413 Safety circuit

ex: Direkt control/Indirect acting, door type and number of doors, pawl device, final limit switch, stop button, inspection door, door opener, etc.

##### 3.3.1.4 S414 Travel control

ex: pawl device, limit switch, safety circuit, extra run button, etc

##### 3.3.1.5 S415 Styrssystem

ex: full collective/down collective/direct/pickup, group control, floor indicator, arrival signal, etc.

##### 3.3.1.6 S416 Tableaux

ex: button type, floor indicator, lamps, indications, arrival signal, control system, etc

##### 3.3.1.7 S417 Door control

ex: door type, photocell, door opener, door reversal, retracting ramp, roof flap, safety sill, etc.

##### 3.3.1.8 S418 Supplement

ex: external material

##### 3.3.1.9 S419 Supplement

ex: external material

##### 3.3.1.10 S420 Installation

Installation drive/Recall handle

Installation diagram depending on for example: door type automatic door/swing door

#### 3.3.2 Connection tables external connection

##### 3.3.2.1 Power feed connection

Order specific - Connected by lift erector

##### 3.3.2.2 Control unit

Order specific - Connected by lift erector

##### 3.3.2.3 Car roof unit

Order specific - Connected by lift erector

##### 3.3.2.4 Floor nodes

Order specific - Connected by lift erector

##### 3.3.2.5 ev. Door machinery

Order specific - Connected by lift erector

##### 3.3.2.6 ev. Order specific material

Order specific - Connected by lift erector

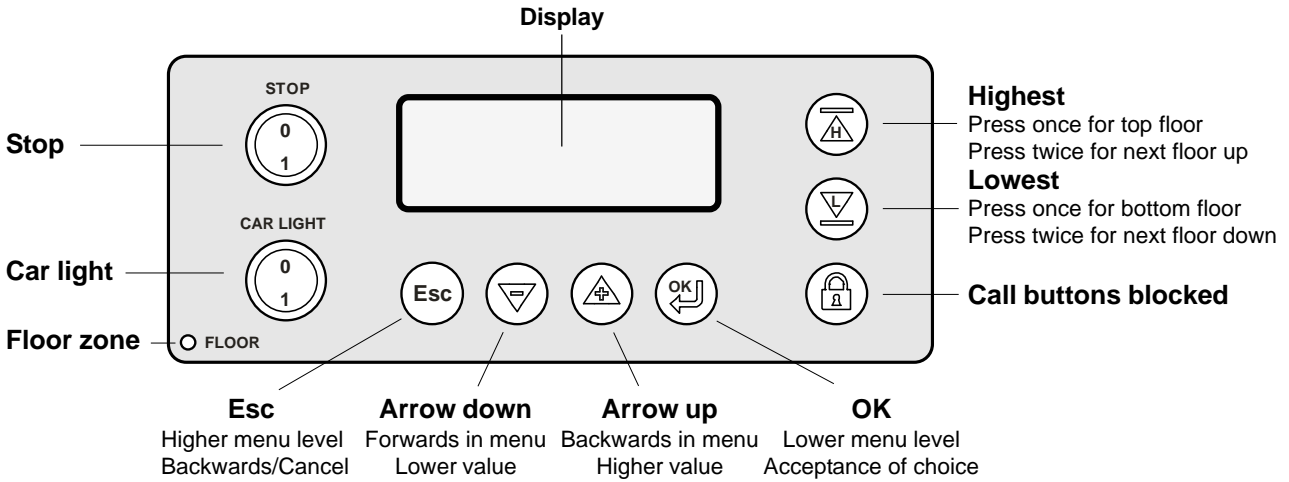
#### 3.3.3 PM Lift erector

Installation and connection of existing material

Order specific - Connected by lift erector

### 3.4 Control panel

In front of the Hydroelite control node there is a control panel with display. Complete description of the control node and its display function are described in instruction **T 100 37 Control node menu**.



**Fig. 3.1** Control panel

#### LIFT CAR

- Stop - switch that gives/recalls stop command to lift car
- Car light - switch that lights/unlights the car light
- Floor - Yellow LED that lights when lift car is within floor zone
- Highest - Button to make travel command upwards; press once for travel to top floor, and twice for travel to next floor in up-direction
- Lowest - Button to make travel command downwards; press once for travel to bottom floor, and twice for travel to next floor in down-direction
- Call buttons blocked - Button to block /unblock calls

#### DISPLAY

- Esc - Button to step to higher menu level, and for step backwards or cancelling menu choices
- Arrow down - Button to step forwards within menu level, and decrease digits/values at parameter adjustments
- Arrow up - Button to step backwards within menu level, and increase digits/values at parameter adjustments
- OK - Button to step to lower menu level, and for accept new parameter adjustments.

#### 3.4.1 Menu commands (available without password)

When the lift is commissioned the following menu commands are available:

Show	1	Commands	2
Statistics	1.1	Car destination	2.1
System log	1.2	Floor calls	2.2
Error log	1.2.1	Door open/close	2.3
Warning log	1.2.2	Reset	2.4
Information log	1.2.3	Extra	2.5
Total log	1.2.4	Store	2.6
Info all errors	1.2.5	Alarm	2.7
PC printouts	1.3	Advanced	2.8
Commission info	1.4		
Safety circuit	1.5	<b>Log in</b>	<b>3</b>
Door	1.6		
Traffic control	1.7		
Drive	1.8		

If other parameters have to be changed you can receive a password (PIN-code) after an agreement with Hydroware.

All the menu commands are described in instruction T100 37 Control node menu.