AVS Variable Frequency Pump Control Panel User Manual

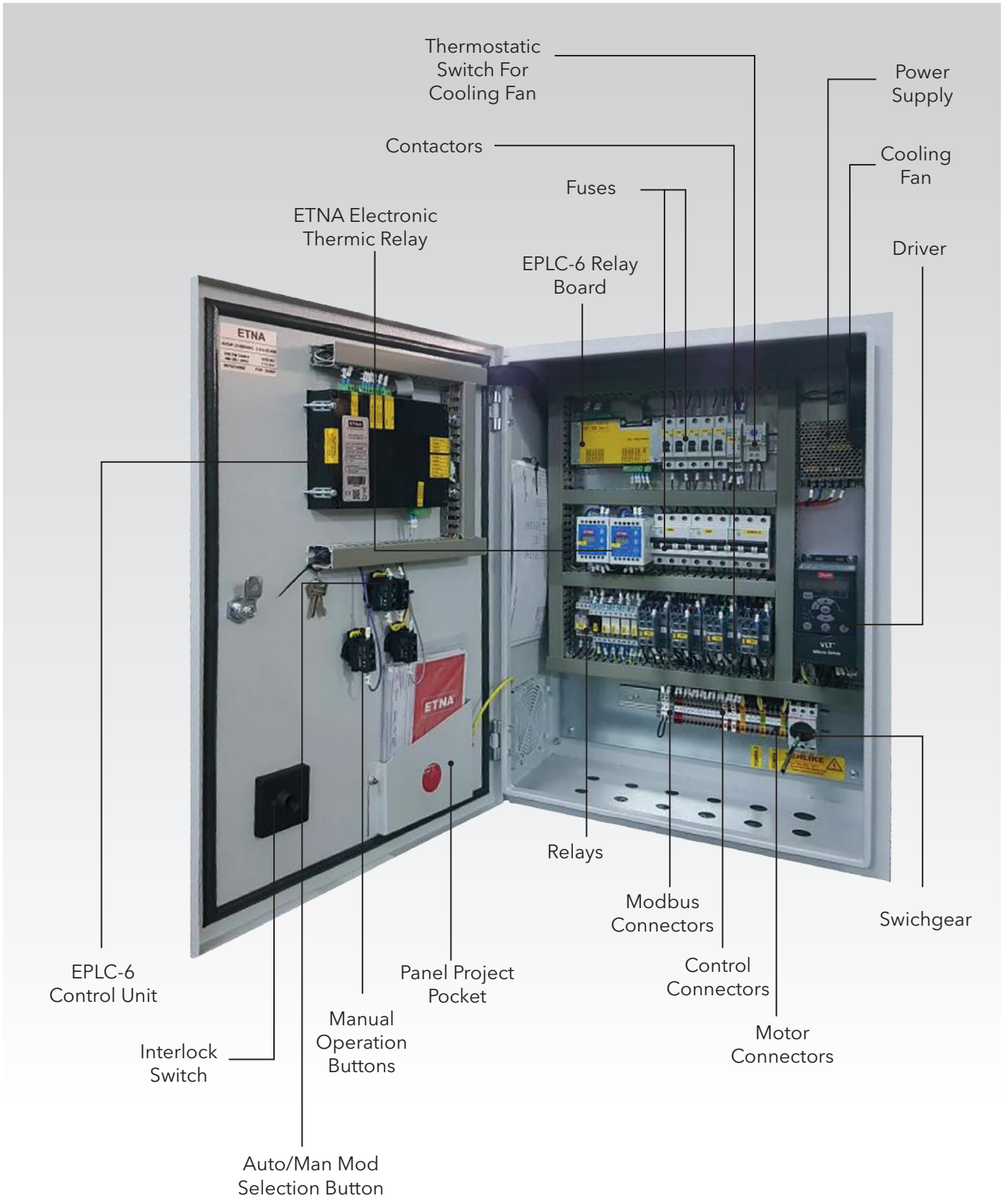
1. Product Information

AVS is a pump control panel having 4.3" TFT touch screen, uniquely designed high efficient variable speed control and relay board. The touch control panel is located on front casing while relay module is located inside. Other than these, Manual / Auto / Off Selection Button, Manual Control Buttons and Interlock Switch are available on front casing. AVS panel provides control and screen up to 6 pumps with the help of EPLC-6 control system, relays and switching components. System parameters can be changed on touch screen with user-friendly interface.

AVS Panel can be used on constant pressure booster or differential pressure circulation systems with the help of receiving data from an analog pressure sensor. The panel especially is recommended to use with frequency inverted pump applications. Apart from that, it is also possible to use the panel on constant cycle pump systems.

It is especially preferred in frequency controlled pump applications. It can also be used in fixed speed pump applications with pressure sensors.

Figure 1: AVS Panel



* The inside image of the panel may differ from the picture above.

Figure 2: AVS Panel Internal View

2. AVS Technical Specifications

- Epoxy coated DKP steel body
- Schneider switching instruments.
- Internal cooling with thermostatic control
- IP 54 protection class
- Manual / Autorun option
- Phase absence / unbalance /sequence protection by phase protection relay
- Thermal-magnetic motor protection
- Waterless run protection on booster applications by external floater connection
- Interlocking switch system
- 24V DC external power supply
- Remote control option via dry contact
- Possibility to send Run, Thermal Fault, General Fault data to Building Management System (BMS) for each pump individually
- Possibility to transfer system parameters to Building Management System (BMS) via MODBUSRS 485 data communication protocol (Please check next page for MODBUS Address Table)
- Possibility of control over automation system via Modbus RTU RS 485 communication protocol
- Enabling to control up to 6 cascade assembled pumps by 1 frequency inverter and uniquely designed controller with 4,3'' TFT touch screen
- Ability to view; number of pumps working, pump mode, driver frequency, set pressure, instant pressure, fault indications and date-time information.
- Preventing unauthorized access thanks to password protection support
- Possibility to change settings while system running
- Ability to view working hours of each pump
- Capability of collecting data with high precision using advanced pressure sensor calibration and off-set menu
- High pressure protection with adjustable value and duration
- Low pressure protection with adjustable value and duration against low water level and cavitation
- Optimum reaction time according to system needs with the help of adjustable pump on/off time
- Adjustable wake-up pressure
- Adjustable cyclic change over time
- Manual pump back up
- Booster and circulating mode selection
- Selection mode of with/without driver
- Adjustable PID reaction speed
- Adjustable driver switch off frequency value on frequency inverted systems
- Ability to run pumps with maximum speed via mains supply contactors in case driver in fault mode
- Ability to run pumps with maximum speed via mains supply contactors in case driver in fault mode preventing system blockage
- Adjustable maximum driver working frequency
- Adjustable minimum inverter working frequency
- Periodic maintenance reminder
- Turkish / English language option
- 100 events history logging capacity
- Real-time date / time information
- 12 V DC internal isolated 4-20 mA transmitter supply and 2 transmitter inputs

3. Menus

To reach device menus, tap the symbol on the main screen to reach the password screen. Once you enter your password, you can make any desired changes in the settings menu, either when the system is working or after halting it. Changes made to the system will not be saved unless the **SAVE** symbol on screen is tapped. Simply tap the relevant symbol for the sub-menu to reach it, and to return to a previous menu, simply tap the **BACK** symbol.

The up-down arrow symbol seen in menus is used to increase or decrease the value in the box to its left. Simply tap the up arrow icon to increase the value, and the down arrow icon to decrease it. When the symbol is pressed and held, the value will continually increase or decrease until the allowed limit. For 3-digit numbers, the relevant digit can be tapped to make changes.

3.1 Device Settings

All options about how the system works can be found in the "Device Settings" sub-menu that can be reached from the settings menu. Detailed information about the content and the effects of the "Device Settings" is listed below.

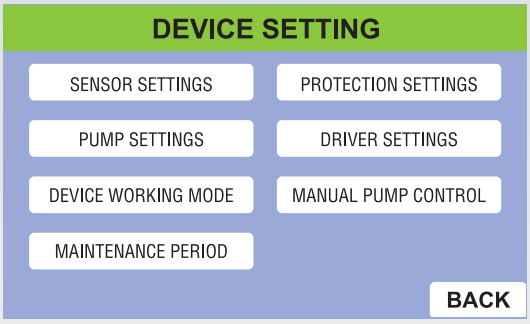


Figure 3: Device Settings Menu

3.1.1 Device Working Mode

Depending on the selection of booster pump and circulation in the Device Operation Menu, the EPLC-6 control unit can work in two different modes.

In booster pump mode, the EPLC-6 control unit compares a single data collected from the 4-20 mA pressure transmitter to the set value at which the device is desired to work.

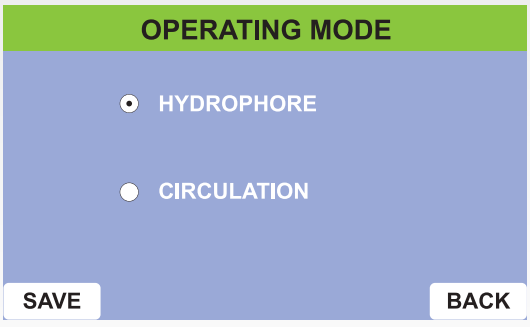


Figure 4: Device Operation Mode Selection Menu

If the pressure data collected from the transmitter is larger than the set value, the system stays in standby state. If the pressure data collected from the transmitter is smaller than the set value, the least used pumps are activated in order. If there is a driver in the system, the first pump is activated by the driver. In the event that a single pump cannot meet the demand; if there are other pumps, they are activated in order depending on the demand and work to bring the system's current pressure up to the set value. When demand decreases -or as the current pressure value surpasses the set value- the pump with the driver slows down and attempts to match the reference pressure value. The pumps are deactivated if they are no longer needed.

If in circulation mode, the EPLC-6 control unit first calculates the difference between two sets of data collected from the 4-20 mA pressure transmitters (transmitter1-transmitter2, where transmitter 1 is the value gathered from the transmitter at the entrance of the fixture and transmitter2 is from the transmitter at the exit of the fixture) and then compares this to the set differential pressure value at which the device is desired to work. When the system is run, if the difference between the values acquired from the transmitters is larger than the set value, the system keeps running with a single pump. If there is a driver in the system, it operates at minimum frequency. If the difference in pressure between transmitters is smaller than the set value, and if there is a driver in the system, the pump with the driver accelerates and attempts to match the reference differential pressure. If necessary, that is to say, if a single pump cannot meet the demand, the other pumps are activated in order and deactivated if the need is met. If the difference between the two transmitter values goes above the set value again (if the demand is met), a single pump is kept in operation. If there is a driver, it operates at minimum frequency.

PARAMETRE	BOOSTER	CIRCULATION
MINIMUM PRESSURE PROTECTION TIME	30 seconds	N/A
MAXIMUM PRESSURE PROTECTION TIME	10 seconds	10 seconds
SWITCH OFF TIME	30 seconds	30 seconds
SWITCH ON TIME	30 seconds	30 seconds
PERIODIC WORK	12 hours	12 hours
PUMP COUNT	3 pumps	3 pumps
WAKE UP PRESSURE	0,5 bar	0,2 bar
MAX. PRESSURE	12 bar	10 bar
DRIVER SWITCH OFF FREQ.	44 Hz	44 Hz
WAKEUP TIME	5 seconds	5 seconds
SLEEPING TIME	30 seconds	30 seconds
NUMBER OF REPEAT	5	0
MINIMUM PROTECTION PRESSURE	2 bar	0.1 bar
SENSOR SELECTION	SENSOR 1	SEN1-SEN2
SPARE PUMP	0	0
SPARE PUMP ON/OFF	0	0
DRIVER SELECTION	1	1
SET PRESSURE	8 bar	1 bar
SENSOR TYPE	16 bar	10 bar

Table 1. Panel Factory Settings

3.1.2 Pump Settings

Settings and changes such as adjusting and changing the number of active pumps in the system, the activation or deactivation periods of back-up pumps, cyclic change-over (periodic work) time, the wakeup differential pressure and the manual spare pump specification can be made from the "Pump Settings" menu.

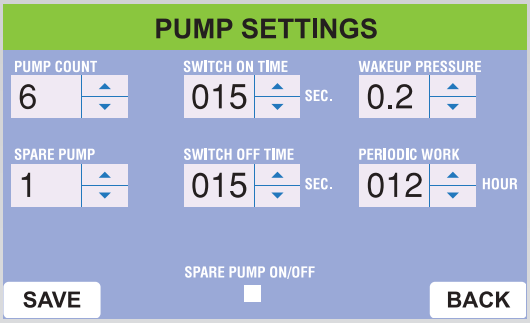


Figure 5: Pump Settings Menu

Pump Count: The number of pumps can be determined from the number of pumps field shown on the screenshot in Figure 5, by touching the ▲▼ icons. Pump number can be increased up to 6 pumps.

Switch On Time: For systems with multiple pumps (2-6 pumps), the pump activation period is the time required for other pumps to be activated in order after the 1st one, in case of need. In driver mode, if the driver has reached maximum frequency and the set value is higher than the current value, the activation period begins counting down in the background. If the set pressure value is not reached by the end of the activation period, a stand-by pump steps in. This process continues for all stand-by pumps until the current pressure value reaches the set pressure value.

In systems without a driver or in case of an error in the driver;

The activation period shortens by 10 times in booster pump mode. For example, if the activation period has been set to 30 seconds, it drops to 3 seconds.

The activation period gets multiplied in circulation mode. For example, if the activation period has been set to 30 seconds, it lengthens out to 60 seconds in systems without drivers or in case of driver errors. Factory setting is 30 seconds.

Switch Off Time: For systems with multiple pumps (2-6 pumps), the pump deactivation period counts down in the background when there are multiple active pumps and when the current pressure value is higher than the set value at the same time. If the current pressure value does not decrease below the set value by the end of the set deactivation period, pumps deactivate in order.

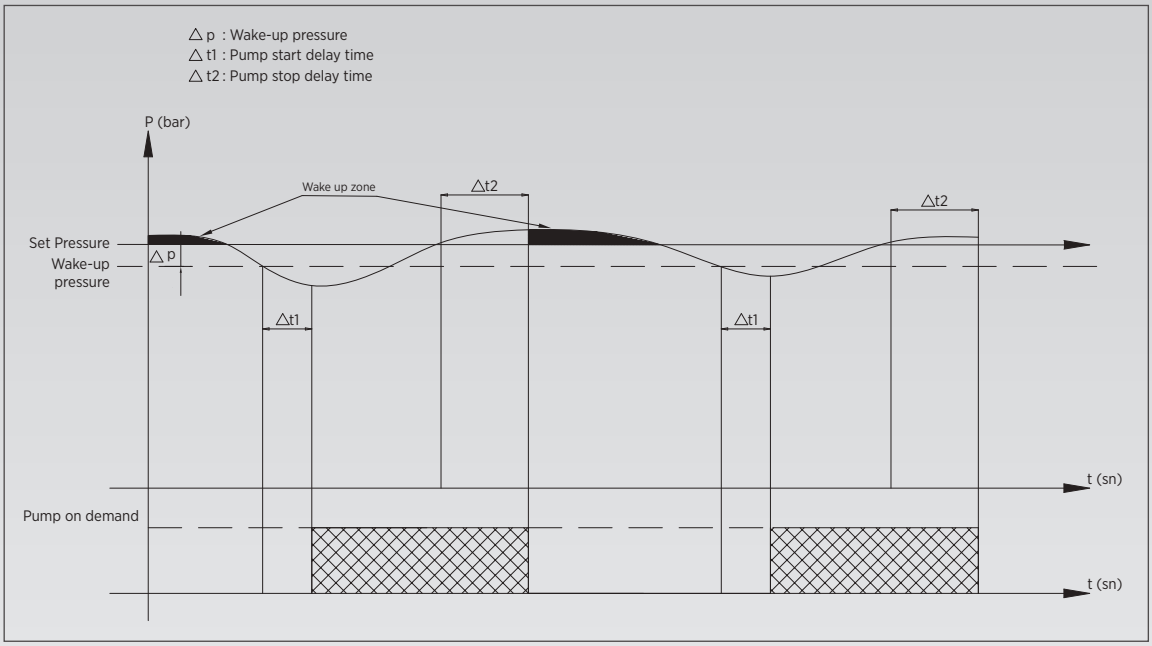
In systems without a driver, or in case of an error in the driver;

The deactivation period shortens by 10 in booster pump mode. For example, if the deactivation period has been set to be 30 seconds, it fixture is 0 but to 3 seconds.

The deactivation period gets multiplied by 2 in circulation mode. For example, if the deactivation period has been set to 30 seconds, it lengthens out to 60 seconds in systems without drivers or in case of driver errors. Factory setting is 30 seconds.

Wakeup Pressure: Wakeup pressure is the differential pressure between the set system pressure and the pressure value for pump activation.

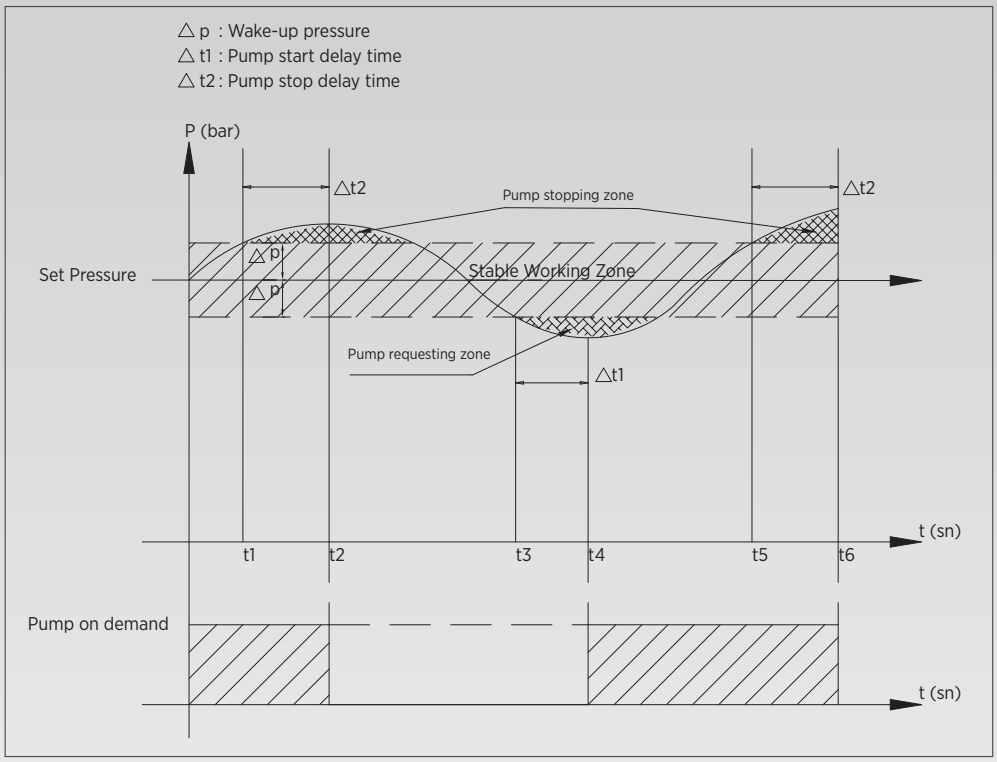
In booster pump mode, wakeup pressure is the differential pressure value at which the wakeup (pump activation) period starts counting, which is identified to prevent the system from continuously activating and deactivating and which can be adjusted as needed.



Graph 1: Pump ON / OFF vs. Wake-up Pressure on Constant Pressure Mode

For example, if the set pressure is 8 bars and wakeup pressure is 0.5 bars, a standby pump will activate after the current system pressure drops below 7.5 bars and the wakeup period is complete. The factory settings for booster pump mode has been set to 0.5 bars.

However, the concept of wakeup pressure differs in circulation mode. Since a single pump is always active in circulation systems, the wakeup pressure mentioned in the menu is a variable that only applies in systems without drivers, or with driver errors. 1. This variable, applied to the pumps activated after the first one, activates standby pumps after the activation period is completed and the current differential pressure is less than the set pressure for the fixture by the wakeup pressure. If the current differential pressure value is as high as the wakeup pressure value than the set value, the active pumps are deactivated after the deactivation period is complete. The factory settings for circulation mode has been set to 0.2 bars.



Graph 2: Pump ON / OFF vs. Wake-up Pressure on Circulation Mode

Cyclic Change-Over: The cyclic change-over (periodic work) is an algorithm developed to ensure the pumps to be working at the same capacity. The pump with the least working time in booster pump mode is activated as the first pump. In driver mode, no changes based on cyclic change-over periods are made on pumps in operation that work with a driver until the system is in sleep mode. On the next run, it operates with the least used pump being activated.

In circulation mode, when the systems starts, it first activates the least used pump. Once the designated cyclic change-over time is over, pumps are exchanged.

Back-up pump: If the user wants to manually deactivate any pump in the system, they need to select the relevant pump and, after activating the Back-up Pump On/Off selection, tap the **SAVE** symbol.

3.1.3 Sensor Settings

Settings such as set pressure, sensor calibration and sensor selection can be made from the "Sensor Settings" menu. NOTE: The sensor mentioned on the menu represents the pressure transmitter.

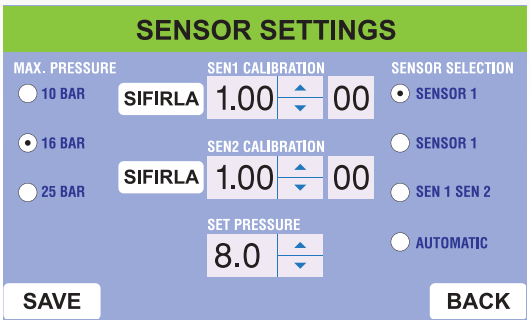


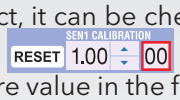
Figure 6: Sensor Settings Menu

Set Pressure: Set pressure is the pressure value at which the system is expected to work. In booster pump mode, it is associated with the value read off of pressure transmitters. In circulation mode, it is associated with the difference between the values read off of transmitter1 and transmitter2.

Maximum Pressure: Maximum pressure is the pressure value corresponding to the 20 mA maximum value on pressure transmitters. A standard selection between 10, 16 and 25 bars can be made on the screen.

Sensor Selection: Sensor1 is selected as the factory setting in booster pump mode. If the Sensor1 port belonging to the EPLC-6 is damaged, Sensor2 can be selected from the menu after the pressure transmitter is connected to the Sensor2 port. If a transmitter is connected to both ports and Automatic is selected, the system continues operating according to the value read off of Sensor2 without stopping when Sensor1 is damaged.

Sensor1- Sensor2 is selected as the factory setting in circulation mode. Sensor1 or Sensor2 cannot be selected alone in this mode. However, if Sensor2 is not connected or cannot be reached when Sensor1- Sensor2 is selected, the system will issue a warning and continue operating according to the Sensor1 value. If Sensor1 is not connected or cannot be reached, the system is blocked.

Sensor Calibration: Through the sensor calibration settings, any difference between the pressure value from transmitters and the actual pressure value of the fixture can be fixed. If the pressure value seen on the main screen is considered to be incorrect, it can be checked as follows; when the pressure value of the fixture is 0 but the value shown 

in the rightmost box is not 0, the RESET symbol can be tapped to set the pressure value in the fixture to 0. If the pressure of the fixture is not 0, the sensor maximum settings are selected correctly but the pressure value collected from the manometer is incorrect, the value in 

to the right of the RESET symbol can be increased or decreased at the rate of 20% to match the pressure value of the fixture and the pressure value shown on the main menu. This process can be done separately for each of the two sensors.

3.1.4 Protection Settings:

The maximum and minimum pressure values and the time period required for the activation of these protective pressure properties can be adjusted in the "Protection Settings" menu. As a result, the system is protected from working under damaging pressure conditions, cavitation or operating without water.

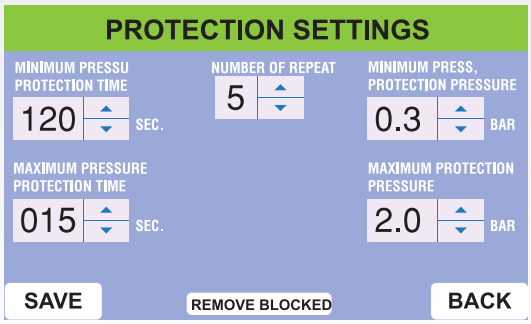


Figure 7: Protection Settings Menu

Maximum Protective Pressure: A maximum pressure is set through this parameter to protect the system from high pressure conditions. If system pressure is higher than the Maximum Protective Pressure throughout the set Maximum Protective Pressure Period, the system will enter high pressure protection mode and all operating pumps will halt. If the system pressure falls below the set value, the system will start operating again which means that the system will resume operating once the working conditions have been suitably met.

Maximum Protective Pressure Period: Maximum protective pressure period is the time period required for the activation of this protection if the current pressure value of the

system surpasses the maximum pressure value. All operating pumps halt during this period if the current pressure is larger than the maximum pressure.

Minimum Protective Pressure: The Minimum Protective Pressure parameter is used to protect the system from long-term low pressure, and to prevent damage to the system caused by cavitation or operating without water. If system pressure is lower than the Minimum Protective Pressure throughout the set Minimum Protective Pressure Period, the system will enter low pressure protection mode and all operating pumps will halt. If the minimum protective pressure value is 0, the protection will be disabled.

Minimum Protective Pressure Period: Minimum protective pressure period is the time period required for the activation of this protection if the current pressure value of the system is below the minimum pressure value. All operating pumps halt during this period if the current pressure is smaller than the minimum pressure.

Reboot Count: If the minimum protective pressure is activated in booster pump systems, the system is expected to reboot periodically. Reboot count is a function that allows the system to start operating again after a set waiting period following the halt caused by the minimum pressure protection. Reboot count can be set up to 5. The waiting period increases periodically after the low pressure protection kicks in. The 2 minute period of the 1st attempt is set to be 50 minutes for the 5th attempt. If the pressure does not rise after the set reboot count, the system gets blocked.

NOTE: If the reboot count is set at 0, the system gets blocked after the 1st low pressure error.

Unblock: If system intervention is requested without the full waiting time after the system enters low pressure protection mode and is blocked, the REMOVE BLOCKED symbol can be selected for a reset.

3.1.5 Driver Settings:

The Driver Settings menu allows changes to be made to the automatic PID settings, as well as the reaction speed and the driver frequency settings that are based on it. If the driver selection symbol seen in Figure 8 is active, the system works in driver mode.

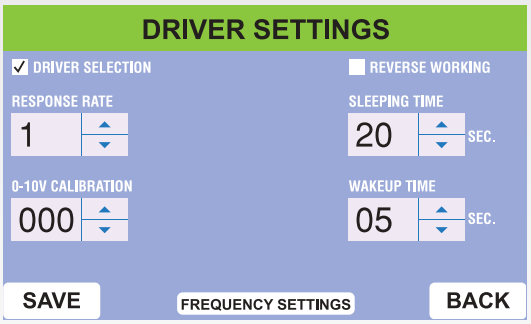


Figure 8: Driver Settings Menu

Reaction Speed: Reaction speed is a parameter that adjusts the variation in driver speed, or the reaction speed of the driver, depending on the difference between set pressure value and the current pressure value in driver mode. Reaction speed can be adjusted to 3 levels; In the 1st level, the reaction speed on the 1st level is slow and as the level is increased, the rotation speed in the reference speed relayed by EPLC-6 panel to the driver also increases. Therefore, the pump rotation speed that works with the driver also varies in proportion to the reaction speed.

Sleeping Period: Sleeping period is the condition when, in booster pump mode, the system's current pressure is higher than the set pressure and when pumps stand by ready to work, without working. In systems with drivers, if the system pressure is above the set value and if the driver frequency is lower than the deactivation frequency value and remains that way throughout the sleeping period, the system enters sleep mode.

Wakeup period: In booster pump mode, when the driver is active but the system pumps are inactive, the wakeup period is the time required to activate the pump operated by the driver in situations where system pressure is less than the set value by the wakeup pressure value.

3.1.5.1 Driver Frequency Settings:

The frequency values relayed as references by the EPLC-7 panels (max/min driver frequencies, driver deactivation frequency) can be adjusted in the Driver Frequency Settings.

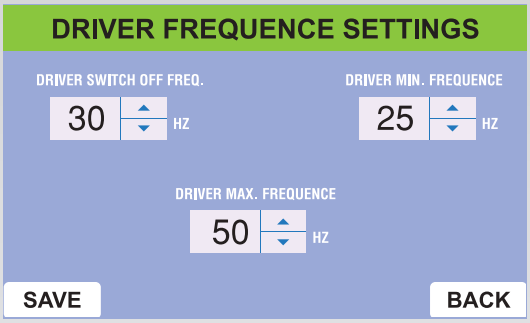


Figure 9: Driver Frequency Settings Menu

Maximum Frequency: Maximum frequency is the parameter determining the maximum frequency value the driver will operate on.

Minimum Frequency: Minimum frequency is the parameter determining the minimum frequency value the driver will operate on. The minimum value can be set to 25 Hz.

Driver Switch-off Frequency: This parameter is only valid when the driver is active and in booster pump mode, and can be used to adjust the frequency the driver will deactivate it. When the relationship between valve pressure with non-operating pumps and set pressure is evaluated, different operating values desired for pumps should be kept in mind and the driver deactivation frequency should be set accordingly. In other words, if the set values for active pumps in a system are increased, so should the driver deactivation frequency.

Parameters belonging to Danfoss FC-51 driver located in control panel are as follows;

3.1.6 Manual Pump Control:

Manual pump control is used to control the rotational direction of pumps while starting them up. With selections being made through the pump-specific symbols on screen, the driver or the network will keep the selected pump active for 3 seconds through the relevant contactors in singledriver multiple pump systems. In the meantime, the rotational direction and the direction specified on the pump should be checked to make sure they are the same. While checking for this issue, the automatic selection in Figure 10 should be manually changed and the select button on the front cover of the panel should be set to 0. The external start belonging to the panel must be set to passive.

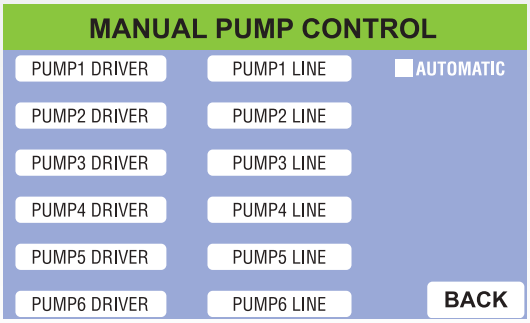


Figure 10: Manual Pump Control Menu

3.2 Maintenance Period:

Maintenance Period is an adjustment screen for the panel to remind the user of a future service and maintenance date after the system is put to use. The on/off selection in the upper leftmost corner of Figure 11 can be activated to select and set the month, day and time of the desired date. This period is synced with the real date and time on the panel.

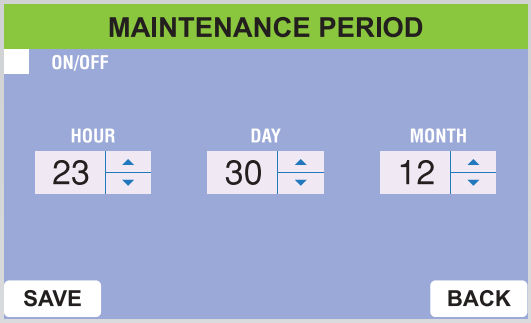


Figure 11: Maintenance Period Menu

3.3 General Settings

Settings that are not system specific such as the system mode, operating pressure and pump count can be adjusted in the General Settings menu. The error history can also be accessed from this menu.

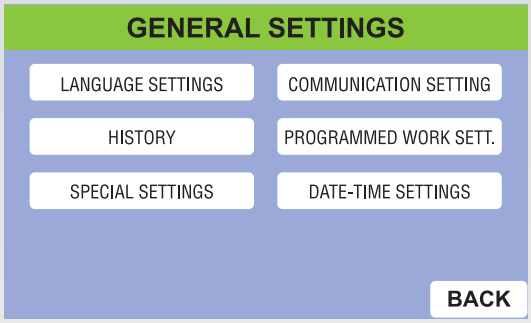


Figure 12: General Settings Screen

3.3.1 Language Settings:

A selection between Turkish and English can be made in the language settings menu.

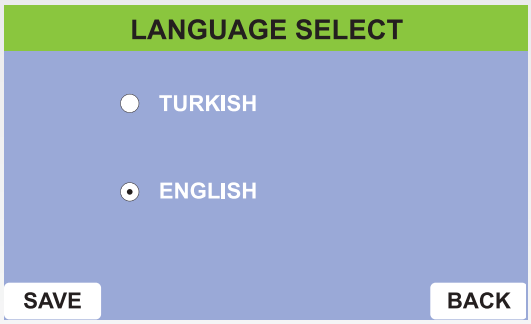


Figure 13: Language Selection Screen

3.3.2 Communication Settings:

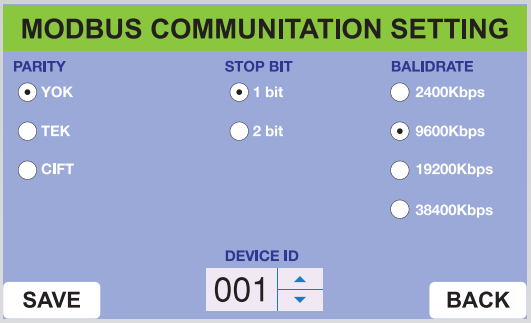


Figure 14: Modbus Communication Settings

PARITY, STOP BIT, BAUD RATE and DEVICE ID adjustments can be made in Modbus communication settings. If more than one device will be communicated with the same building automation system from the DEVICE ID setting, the device-specific ID number is determined from each panel connected to the system. The settings defined for the other features can be adjusted as can be seen in Figure 14. (YOK=NONE, TEK=ODD, CIFT=EVEN) Reading and writing can be performed via the Modbus RTU protocol. For versions 4 (V4) and higher (V5), the register table is shared below in Table 3. Using the Modbus 06 Write Single Register function, data can be written to the specified (W) addresses.

For the write function to operate on the (W) addresses specified in the table, the panel must be set to Stop mode. To switch the panel to Stop mode, the AUTO–MAN selector switch on the panel should be set to 0 (Stop) or Manual (MAN) position, or alternatively, the panel can be set to Stop mode via Modbus by sending the value 0 to address 40001 using the Write Single Register function. Once the panel is in Stop mode, the Write Single Register function can be used at the designated (W) addresses in the table. To restart the panel via Modbus, send the value 1 to address 40001.

Since the manual/automatic mode selection can be made both via Modbus and from the AUTO–MAN switch on the front cover of the panel, the last selected mode is always stored in memory while the panel is powered.

MEMORY ADDRESS	FUNCTION (R=Read, W=Write)	UNIT	CO EFFICIENT	VALUE RANGE	DESCRIPTION
40000	R	-	-	0 - 1	Service maintenance alarm (1- alarm, 0- no alarm)
40001	R / W	-	-	0 - 1	Panel start stop information (1- start mode, 0- stop mode)
40002	R	-	-	0 - 1	Blocking error (1- blocking, 0- no error)
40003	R	-	-	0 - 1	Phase error (1- phase error, 0- no error)
40004	R	-	-	0 - 1	No water (1- no water, 0- no error)
40005	R	-	-	0 - 1	Sensor 1 fault status (1- sensor failure, 0- no fault)
40006	R	-	-	0 - 1	SSensor 2 fault status (1- sensor failure, 0- no fault)
40007	R	-	-	0 - 1	High pressure error (1- high pressure error, 0- no error)
40008	R	-	-	0 - 1	Driver error (1- driver error, 0- no error)
40009	R	Seconds	-	0 - 65535	Low pressure countdown (Counts down the remaining time if there is a fault.)
40010	R	Hz	0.1	450 – 650	Driver frequency
40011	R	-	-	0 - 1	Operation mode (1-Circulation, 0- Booster)
40012	R	Bar	0.1	0 - 65535	Line pressure
40013	R / W	Bar	0.1	0 - 65535	Set pressure
40014	R	-	-	0 - 65535	Pump 1 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40015	R	-	-	0 - 65535	Pump 2 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40016	R	-	-	0 - 65535	Pump 3 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40017	R	-	-	0 - 65535	Pump 4 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40018	R	-	-	0 - 65535	Pump 5 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40019	R	-	-	0 - 65535	Pump 6 (11- Pump running, 22- Pump stops, 33- Spare Pump, 44- Thermal fault)
40020	R	-	-	0 - 65535	Number of pumps
40021	R	Minutes	6	0 - 65535	Pump 1 total operating time
40022	R	Minutes	6	0 - 65535	Pump 2 total operating time
40023	R	Minutes	6	0 - 65535	Pump 3 total operating time
40024	R	Minutes	6	0 - 65535	Pump 4 total operating time
40025	R	Minutes	6	0 - 65535	Pump 5 total operating time
40026	R	Minutes	6	0 - 65535	Pump 6 total operating time
40027	R	-	-	0 - 1	Low pressure error (1- low pressure error, 0- no error)
40028	R/W	-	-	0 - 1	Backup pump enable/disable (0 – disable, 1 – enable)
40029	R/W	-	1	0 - 6	Backup pump selection (0 – no backup pump, 1 – pump 1, 2 – pump 2, 3 – pump 3, 4 – pump 4, 5 – pump 5, 6 – pump 6)
40030	R/W	Second	1	0 - 255	Pump start delay (0 – 255)
40031	R/W	Second	1	0 - 255	Pump stop delay (0 – 255)
40032	R/W	Bar	0.1	0 - 20	Wake-up pressure (0 – 2.0)
40033	R/W	Time	1	0 - 255	Equal aging time (0 – 255)
40034	R/W	Second	1	0 - 255	Minimum pressure protection time (0 – 255)
40035	R/W	Bar	0.1	0 - 20	Minimum pressure protection value (0 – 2.0)
40036	R/W	Second	1	0 - 255	Maximum pressure protection time (0 – 255)
40037	R/W	Bar	0.1	20 - 250	Maximum pressure protection value (2.0 – 25.0)
40038	R/W	-	1	0 - 5	Retry count at minimum pressure (0, 1, 2, 3, 4, 5)
40039	R/W	-	1	1 - 3	Drive response speed (1, 2, 3)
40040	R/W	-	-	0 - 1	Drive selection (0 – drive disabled, 1 – drive enabled)
40041	R/W	Second	1	0 - 60	Sleep time (0 – 60)
40042	R/W	Second	1	0 - 60	Wake-up time (0 – 60)
40043	R/W	Hz	1	25 - 60	Drive cut-out frequency (25 – 60)
40044	R/W	Hz	1	25 - 50	Drive minimum frequency (25 – 50)
40045	R/W	Hz	1	25 - 60	Drive maximum frequency (25 – 60)

Table 2: AVS Panel Modbus Adress Table

3.3.3 Date and Time Settings:

The real date and time belonging to the device can be calibrated in the Date and Time Settings menu as shown in figure 16.

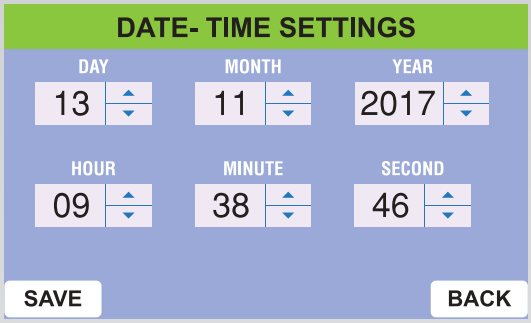


Figure 15: Date and Time Settings

3.3.4 History Records:

100 past event records with detailed information on the date, hour and error is shown in the Event Records section. The up and down arrows on the right side of the screen shown in Figure 16 can be moved to display all the errors in the event records.

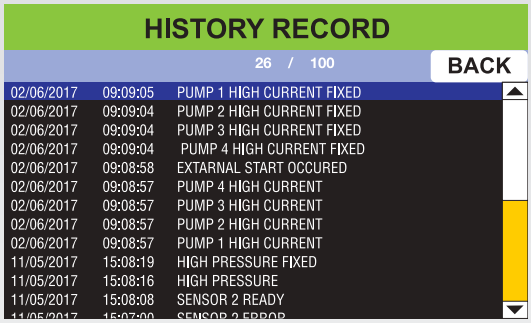


Figure 16: History Record Screen

3.4 General Information

Device version number, drivers for each pump, network and total operation times can be viewed from the General Information menu.

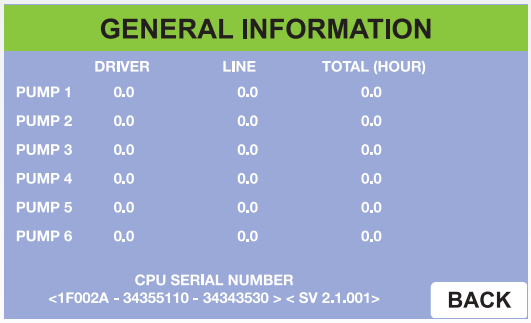
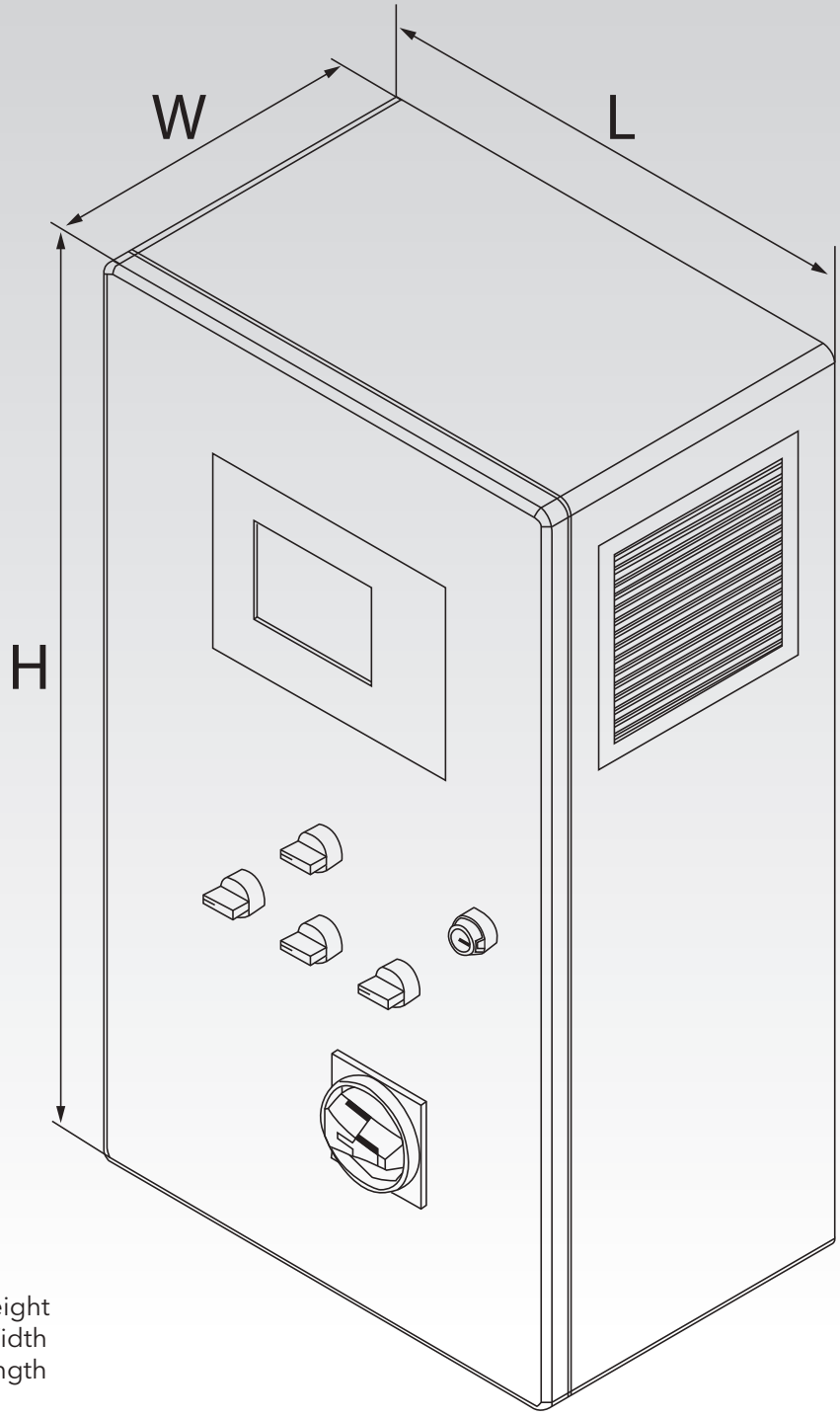


Figure 17: General Information Screen

4. Dimensions



H: Height
W: Width
L: Length

Figure 18: AVS Panel Dimensions

Motor Power		1 Pump Systems			2 Pump Systems			3 Pump Systems		
HP	KW	E (mm)	B (mm)	D (mm)	E (mm)	B (mm)	D (mm)	E (mm)	B (mm)	D (mm)
0,5	0,37	500	700	260	500	700	260	600	800	260
0,75	0,55	500	700	260	500	700	260	600	800	260
1	0,75	500	700	260	500	700	260	600	800	260
1,5	1,1	500	700	260	500	700	260	600	800	260
2	1,5	500	700	260	500	700	260	600	800	260
3	2,2	500	700	260	500	700	260	600	800	260
4	3	500	700	260	600	800	260	600	800	260
5,5	4	500	700	260	600	800	260	600	800	260
7,5	5,5	500	700	260	600	800	260	600	800	260
10	7,5	500	700	260	600	800	260	600	800	260
15	11	500	700	350	700	900	350	800	1000	350
20	15	500	700	350	700	900	350	800	1000	350
25	18,5	600	800	350	800	1000	350	1000	1200	350
30	22	600	800	350	800	1000	350	1000	1200	350

Motor Power		4 Pump Systems			5 Pump Systems			6 Pump Systems		
HP	KW	E (mm)	B (mm)	D (mm)	E (mm)	B (mm)	D (mm)	E (mm)	B (mm)	D (mm)
0,5	0,37	700	900	260	800	1000	350	800	1000	350
0,75	0,55	700	900	260	800	1000	350	800	1000	350
1	0,75	700	900	260	800	1000	350	800	1000	350
1,5	1,1	700	900	260	800	1000	350	800	1000	350
2	1,5	700	900	260	800	1000	350	800	1000	350
3	2,2	700	900	260	800	1000	350	800	1000	350
4	3	700	900	260	800	1000	350	800	1000	350
5,5	4	700	900	260	800	1000	350	800	1000	350
7,5	5,5	700	900	260	800	1000	350	800	1000	350
10	7,5	700	900	260	800	1000	350	800	1000	350
15	11	1000	1200	350	1000	1200	350	1200	1400	350
20	15	1000	1200	350	1200	1400	350	1200	1400	350
25	18,5	1000	1200	350	1200	1400	350	1200	1400	350
30	22	1000	1200	350	1200	1400	350	1400	1600	350

Table 3: AVS Panel Dimensions Table

5. Maintenance

General Information

Danger High Voltage:

WARNING: Please wait 5 minutes before any maintenance or after sales intervention to the capacitors be discharged.

Check List:

- Please be sure that there is no dust on cooling fun and ventilation system.
- Please be sure that ambient temperature is within the allowable range.
- Please be sure to cut the electricity before any intervention.
- Please consider pump and motor parameters always.
- Please get in contact with manufacturing company for more details.

Check History Record:

- It is possible to get information about working conditions on History Record.

6. Troubleshooting

WARNING: Please be sure to cut the electricity before any intervention.

Warnings and Faults:

In case there is an alarm or fault occurred, " icon starts to blink on the upper side of main screen. It is possible to view existing alarms and faults by touching that icon.

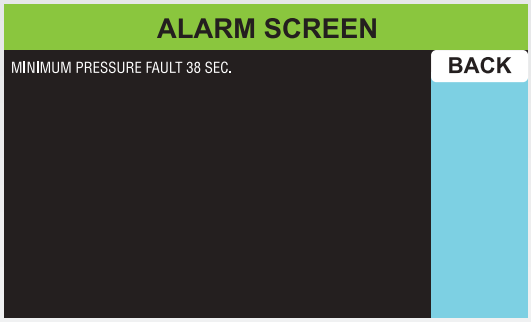


Figure 19. Alarm Screen

NO	FAULTS and ALARMS	POSSIBLE CAUSE	SOLUTION
1	**PANEL COULD NOT BE STARTED**	No 24 V DC signal on EPLC-6 board terminal number 1	• Check Manual-0-Automatic selector button. • Check if there is any start signal from BMS or "Remote Start" terminals are not short-circuited. • Check if there is any signal on RL3 relay. • Check cable connections.
2	**NO WATER**	No 24 V DC signal on EPLC-6 board terminal number 2	• Check if there is any water in the tank. • Check if the floater working properly. • Be sure there is signal on RL1 relay terminals. • Check cable connections.
3	**PHASE FAULT**	No 24 V DC signal on EPLC-6 board terminal number 3	• Check mains supply and voltage for each phase-neutral. • Check phase sequence. • Check phase protection relay. • Be sure there is signal on RL2 relay terminals. • Check cable connections.
4	**THERMAL PROTECTOR FAULT**	No 24 V DC signal on all EPLC-6 board terminal number 4,5,6,7,8,9	• Check the related thermal protection. • Check auxiliary contact of relay. • Check if the existing number of pumps is the same as set number of pumps on Settings menu. • Check cable connections.
5	**SENSOR 1 FAULT**	The sensor signal value connected to EPLC-6 panel number 35 terminal is less than a proper working sensor current (4mA).	• Check pressure transmitter. • Check pressure transmitter 4-20 mA signal with Ammeter. • Check pressure transmitter cable directions. • Check cable connections.
6	**SENSOR 2 FAULT**	The sensor signal value connected to EPLC-6 panel number 37 terminal is less than a proper working sensor current (4mA).	• Check pressure transmitter. • Check pressure transmitter 4-20 mA signal with Ammeter. • Check pressure transmitter cable directions. • Check cable connections.

NO	FAULTS and ALARMS	POSSIBLE CAUSE	SOLUTION
7	**MINIMUM PRESSURE FAULT**	System pressure value is less than "Minimum Pressure Protection Value" during "Minimum Pressure Protection Time"	• Check "Minimum Pressure Protection Value" parameter on Settings menu. • Check "Minimum Pressure Protection Time" parameter on Settings menu. • Check the difference between system pressure value on manometer and screen. • Be sure that transmitter maximum value is same as the value set on Settings menu • Check if suction line is blocked or there is any leakage on the system
8	**MAXIMUM PRESSURE FAULT**	SSystem pressure value is more than "Maximum Pressure Protection Value" during "Maximum Pressure Protection Time"	• Check "Maximum Pressure Protection Value" is in line with system hydraulic characteristics • Check "Minimum Pressure Protection Time" parameter on Settings menu. • Check the difference between system pressure value on manometer and screen, • Be sure that transmitter maximum value is same as the value set onSettings menu
9	**DRIVER FAULT**	No 24 V DC signal on EPLC-6 board terminal number 10.	• Check driver supply and fuse • Check the cable connection between driver fault terminal and EPLC 6 terminal number 10

Table 4. Panel Troubleshooting Table

7. 7. Frequency Converter (Danfoss iC2)

7.1. VFD Control Panel

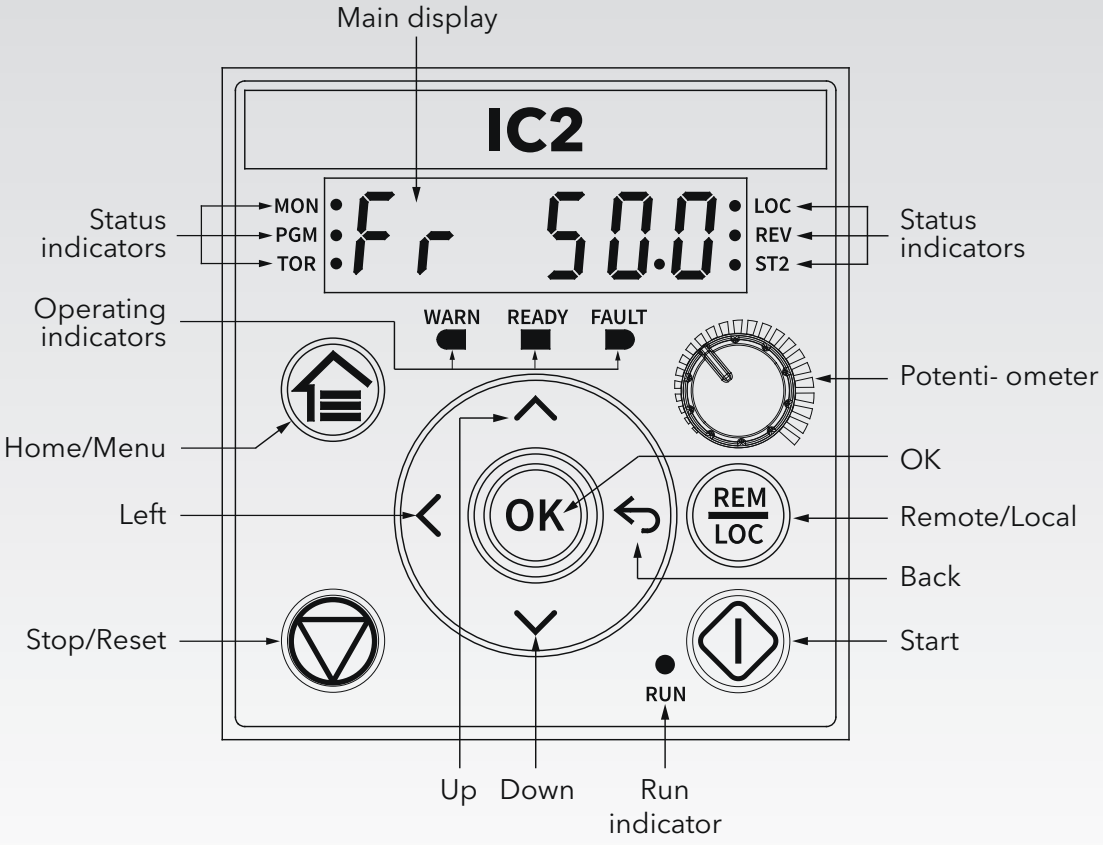


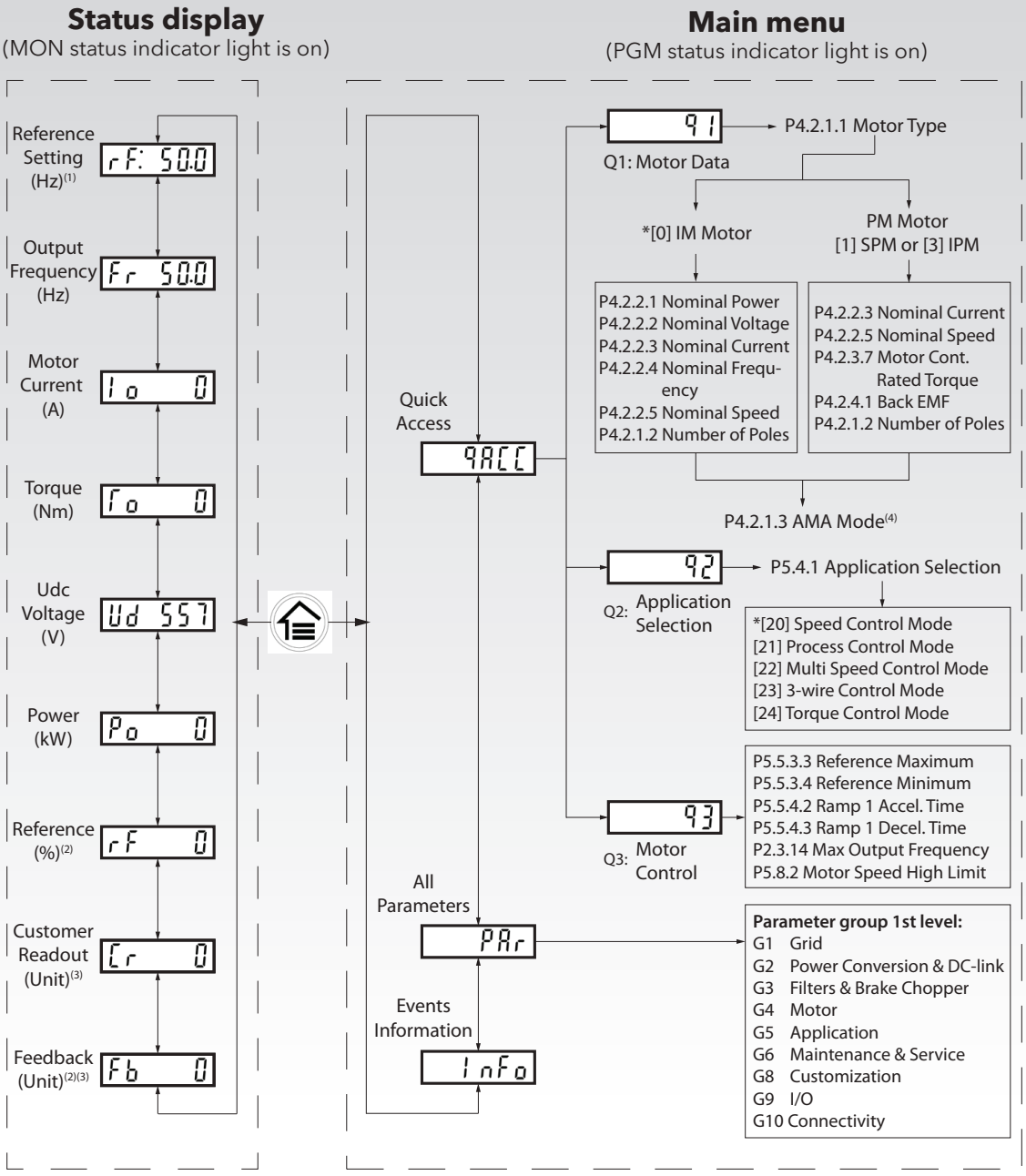
Figure 20. Driver Keypad Functions

No	Description	Indicators	Function	Set
1	Status indicators	MON (monitor):	On: The main display is showing the drive status.	X
		PGM (program):	On: The drive is in programming status.	
		TOR (torque):	On: The drive is in torque mode.	
2	Operating indicators	WARN:	Steadily lit when a warning occurs.	
		READY:	Steadily lit when the drive is ready.	
		FAULT:	Flashes when a fault occurs.	
3	Home/Menu button		Toggles between status view and main menu. Long press to access the shortcut menu for quickly reading and editing parameters.	
4	Left button		Moves the cursor 1 bit to the left.	
5	Stop/Reset button		Stops the drive in local mode. Resets the drive to clear a fault.	
6	Up button		Switches status/parameter group/parameter numbers, and tunes the parameter values.	
7	Down button		Switches status/parameter group/parameter numbers, and tunes the parameter values.	
8	Run indicator		On: The drive is in normal operation. Off: The drive has stopped. Flash: In the motor-stopping process; or the drive received a RUN command, but no frequency output.	
9	Start button		Starts the drive in local mode.	
10	Back button		Navigates to the previous step in the menu structure or cancels the setting during tuning parameter values.	
11	Remote/Local button		Toggles between the remote mode and local mode.	
12	OK button		Confirms the operation.	
13	Potentiometer		Changes the reference value when the reference value is selected as potentiometer.	
14	Status indicators	LOC (local):	On: The drive is in local mode.	
			Off: The drive is in remote mode.	X
		REV (reverse-ters):	On: The drive is in reverse direction.	
			Off: The drive is in forward direction.	X
		ST2 (setup 2):	On: Setup 2 enabled.	
			Off: Setup 2 disabled. Setup 1 enabled.	X

Table 5. Control panel descriptions

7.2. Operation with Control Panel

After the drive is powered up, press the Home/Menu button to toggle between status display and main menu. Use the Up/Down buttons to select items, and press the OK button to confirm selection.



(1) Local mode only.
(2) Remote mode only.
(3) The status is only shown when the corresponding function is enabled.
(4) For AMA execution, refer to chapter Automatic Motor Adaptation (AMA)

Figure 21. Operation with Control Panel

7.3. VFD Parameter Settings

If the device's parameter settings have been changed by unauthorized persons and therefore need to be reset to factory defaults, parameter P 6.6.8 must be set to 2 and confirmed, and the device's power must be turned off and then back on. Press the Stop/Reset button to reset the warning. This will restore the device's parameter settings to factory defaults. Subsequently, the parameters marked with an underscore must be configured.

Parameter No	Parameter Name	Parameter Descriptions
1.2.2	Grid Type	12= 380-440V/50 Hz (Default) - 112= 380-440V/60 Hz
4.2.2.1	Nominal power	As shown on nameplate.
4.2.2.2	Nominal voltage	As shown on nameplate.
4.2.2.3	Nominal current	As shown on nameplate.
4.2.2.4	Nominal frequency	As shown on nameplate.
4.2.2.5	**Nominal speed**	**As shown on nameplate.**
5.4.1	Application selection	20= Speed control mode
5.4.2	Operation mode	0= Speed open loop
5.4.3	**Motor control principle**	**0= U/f**
5.5.1.15	**[REM/LOC] Button**	**0= Disabled**
5.5.1.16	**[Stop/Reset] Button**	**7= Reset Only Enabled**
5.5.3.3	Reference maximum	50 Hz
5.5.3.4	**Reference minimum**	**25 Hz**
5.5.3.7	Reference 1 source	1= Analog input (T33)
5.5.4.2	Ramp 1 acceleration time	Set value according to real application.
5.5.4.3	Ramp 1 deceleration time	Set value according to real application.
5.6.1	**Start delay**	**1 s**
5.8.2	Motor speed high limit	65 Hz (50 Hz)
5.8.3	Motor speed low limit	0 Hz (25 Hz)
6.6.6	**Reset mode**	**5= Auto reset x 5**
6.6.8	Factory reset	2= Factory reset (except for communication settings.)
6.6.12	ECP (external operator panel) copy	0= No copy 1= All to ECP 2= All from ECP 3= Size indep. from ECP
9.4.1.2	Digital input DI1 (T13)	8= Start
9.4.1.4	Digital input DI/DO (T15)	1= Reset
9.4.3.1	**Function relay**	**2= Drive ready**
9.5.2.1	AI1 (T33) mode	1= Voltage mode
9.5.2.2	AI1 (T33) high voltage	10 V

Parameter No	Parameter Name	Parameter Descriptions
9.5.2.3	**AI1 (T33) low voltage**	**5 V**
10.1.1	FC Port protocol	0= FC 2= Modbus RTU
10.1.2	Address	1 (Default)
10.1.3	Baud rate	2= 9600 (Default) 3=19200 4=38400
10.1.4	Parity/Stop Bits	0= Even parity/1 stop bit (Default) 1= Odd parity/1 stop bit 2= No parity/1 stop bit 3= No parity/2 stop bits
10.1.5	Maximum Response Delay	0.100-10.000 sn
10.1.6	Minimum Response Delay	1-500 sn (Default= 0.010)

Table 6. Parameter settings

7.4. Terminal connections

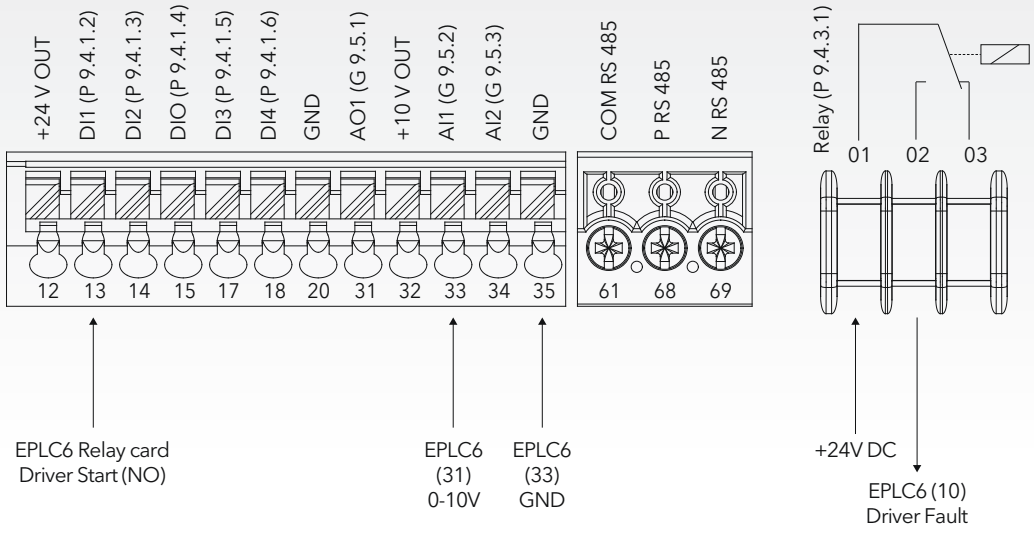


Figure 22. Terminal connections

7.5. iC2 Troubleshooting

No	Description	Warning	Fault	Trip	Cause
lock	Live Zero Error	X	X		Signal on terminal 33 or 34 is less than 50% of the value set in P 9.5.2.3 T33 Low Voltage, P 9.5.2.5 T33 Low Current, P 9.5.3.3 T34 Low Voltage, and P 9.5.3.5 T34 Low Current.
3	No Motor	X	X		No motor has been connected to the output of the drive.
4	Mains Phase Loss (1)	X	X	X	Missing phase on the supply side, or the voltage imbalance is too high. Check the supply voltage.
7	DC Over Voltage (1)	X	X		DC-link voltage exceeds the limit.
8	DC Under Voltage (1)	X	X		DC-link voltage drops below the voltage warning low limit.
9	Inverter Overloaded	X	X		More than 100% load for too long.
10	Motor ETR Overtemperature	X	X		Motor is too hot due to more than 100% load for too long.
11	Motor Thermistor Overtemperature	X	X		Thermistor or thermistor connection is disconnected, or the motor is too hot.
12	Torque Limit	X	X		Torque exceeds the value set in either P 5.10.1 Motor Torque Limit or P 5.10.2 Regenerative Torque Limit.
13	Over Current	X	X	X	Inverter peak current limit is exceeded. If this fault occurs on power-up, check whether power cables are mistakenly connected to the motor terminals.
14	Earth Fault	X	X	X	Discharge from output phases to ground.
16	Short Circuit		X	X	Short circuit in motor or on motor terminals.
17	Control Word Timeout	X	X		No communication to the drive.
18	Start Failed		X		May be caused by a blocked motor.
25	Brake Resistor Short		X	X	Brake resistor is short-circuited, thus the brake function is disconnected.
26	Brake Overload	X	X		The power transmitted to the brake resistor over the last 120 s exceeds the limit. Possible corrections: Decrease brake energy via lower speed or longer ramp time.
27	Brake IGBT/Brake chopper Short Circuited		X	X	Brake transistor is short-circuited, thus brake function is disconnected.
28	Brake Check		X	X	Brake resistor is not connected/working.
30	U phase loss		X	X	Motor phase U is missing. Check the phase.
31	V phase loss		X	X	Motor phase V is missing. Check the phase.
32	W phase loss		X	X	Motor phase W is missing. Check the phase.
36	Mains Failure	X	X		This warning/fault is only active if the supply voltage to the drive is less than the value set in P 2.3.7 Power Loss Controller Limit, and P 2.3.6 Power Loss Action is NOT set to [0] No Function.
38	Internal Fault		X	X	Contact the local supplier.
40	Overload T15	X			Check the load connected to terminal 15 or remove short-circuit connection.
46	Gate drive Voltage Fault		X	X	
47	24 V Supply Low	X	X	X	24 V DC may be overloaded.

No	Description	Warning	Fault	Trip	Cause
50	AMA calibration failed		X		A calibration error has occurred.
51	AMA check Unom and Inom		X		Wrong setting for motor voltage and/or motor current.
52	AMA low Inom		X		Motor current is too low. Check the settings.
53	AMA big motor		X		The power size of the motor is too large for the AMA to operate.
54	AMA small motor		X		The power size of the motor is too small for the AMA to operate.
55	AMA parameter range		X		The parameter values of the motor are outside of the acceptable range. AMA does not run.
56	AMA interrupt		X		The AMA is interrupted.
57	AMA timeout		X		
58	AMA internal		X		Contact the local supplier.
59	Current Limit	X	X		The drive is overloaded.
60	External Interlock		X		External interlock has been activated.
61	Feedback Error	X	X		
63	Mechanical Brake Low		X		Actual motor current has not exceeded release brake current within start delay time window.
69	Power Card Temp	X	X	X	The cutout temperature of the power card has exceeded the upper limit.
80	Drive Initialized		X		All parameter settings are initialized to default settings.
87	Auto DC brake	X			Occurs in IT mains when the drive coasts, and the DC voltage is higher than 830 V for 400 V units and 425 V for 200 V units. The motor consumes energy on the DC link. This function can be enabled/disabled in P 2.3.13 Auto DC Braking.
95	Lost load detected	X	X		
99	Locked Rotor		X		Rotor is blocked.
126	Motor Rotating		X		PM motor is rotating when AMA is performed.
127	Back EMF too High	X			The back EMF of PM motor is too high before starting.
Err. 89	Parameter read only				Parameters cannot be changed.
Err. 95	Not while running				Parameters can only be changed when the motor is stopped.
Err. 96	A wrong password was entered				Occurs when using a wrong password for changing a password-protected parameter.

Table 7. Warning and Fault Events Summary

NOTES

NOTES

NOTES

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Dudullu Organize Sanayi Bölgesi 2. Cadde No: 14
34775 Ümraniye- İstanbul / Turkey
Tel : +90 216 561 47 74 (Pbx) • Fax : +90 216 561 47 50
www.etna.com.tr/en • info@etna.com.tr

ETNA®

0850 455 38 62
customer service