

CEM-190

CEM-196

(Complete with GSM/GPRS – UMTS – LTE module)

Controls and commands an engine driven irrigation pump. It includes water pressure transmitter with digital pressure gauge. Enables manual adjustment of the engine rpm and stopping if a fault occurs.



USER'S MANUAL



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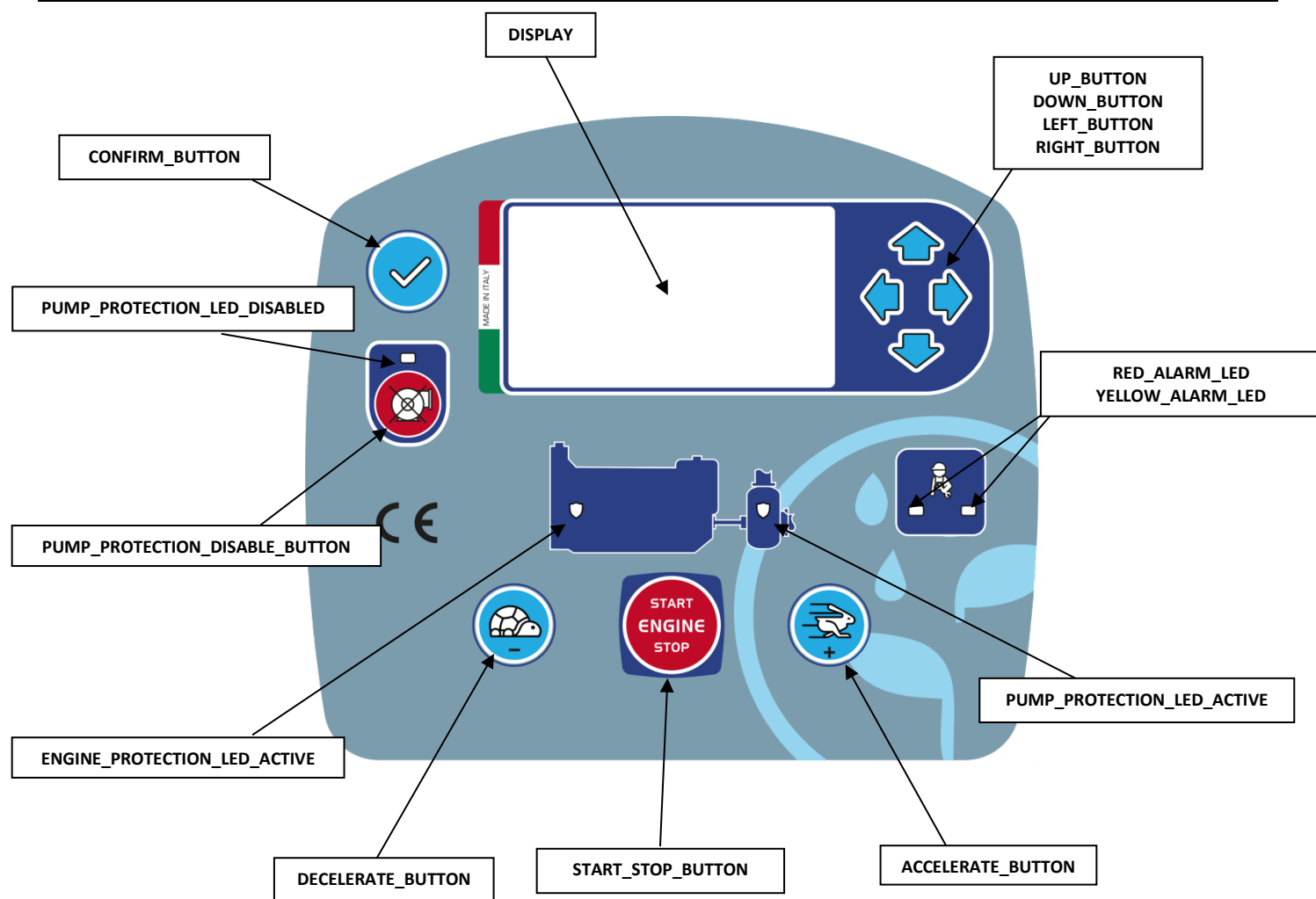
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Handwriting practice area with 30 horizontal lines.

CHRONOLOGY OF MANUAL REVISIONS			
Date	Revision	Description	Page
18/02/2022	1.00	First release	

INSTRUCTIONS IN BRIEF



CONFIRM_BUTTON

Confirms the action.

PUMP_PROTECTION_LED_DISABLED

It flashes when pump protections are disabled

PUMP_PROTECTION_DISABLE_BUTTON

Press until LED starts to flash to disable pump protections. To re-enable, press again until the LED turns off.

ENGINE_PROTECTION_LED_ACTIVE

ON if engine protections are active.

DECELERATE_BUTTON, ACCELERATE_BUTTON

Decelerates/accelerates the engine. When the control unit is on, the buttons are always active, even when the engine is not running.

START_STOP_BUTTON

If the control unit is switched off, press the button for at least one second; the control unit will switch on, performing an LED test and checking for any faults.

Starts/stops the engine when the control unit is on.

PUMP_PROTECTION_LED_ACTIVE

ON if engine protections are active.

RED_ALARM_LED

It flashes if a fault has stopped the engine.

YELLOW_ALARM_LED

It flashes if there is a warning fault that does not stop the engine.

UP_BUTTON, DOWN_BUTTON, LEFT_BUTTON, RIGHT_BUTTON

Press the arrows to browse display menus.

Acknowledging the general alarm.

GENERAL DESCRIPTION

The control unit allows starting and stopping an engine-driven irrigation pump. It can manage a linear actuator used to vary the diesel engine's rpm. With each rpm variation there is a variation in irrigation pressure.

The operator accelerates or decelerates the engine manually by pressing the buttons on the front of the control unit. All diesel engine and pump protections are managed.

The CEM-196 model manages the remote control with modem via app or SMS text message.

If necessary, pump protections can be disabled temporarily by simply operating the button on the front panel. It is also possible to set an operation timer that stops the pump when the time expires.

Functions can be managed easily thanks to the messages displayed. Pop-up messages highlight statuses in progress, showing any times about to expire or indicating which buttons to press; they also display, in text form, any triggered faults or pre-alarms that could stop the engine.

TYPES

The following table summarises the differences between the various models available:

TYPE	MODEM 4G
CEM-190	NO
CEM-196	YES

PROTECTIONS

The control unit protects the pump by stopping the engine if a fault occurs.

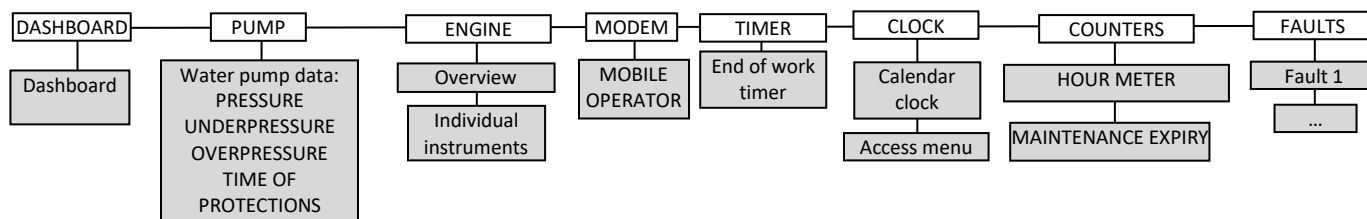
List of engine protections or alarms	List of pump protections
• Low oil pressure (from contact and/or transmitter) • Engine overtemperature (from contact and/or transmitter) • Alternator belt breakage • Fuel reserve • No fuel (from contact and/or transmitter) • Low fuel pressure • Low coolant level • Battery voltage low • Battery voltage high • Fault available A1 • Fault available A2 • Underspeed (disabled at the factory) • Overspeed (disabled at the factory) • Emergency button	• Pump water low pressure • Pump water high pressure • Maximum pump water pressure • Pump water transmitter fault

INSTRUMENTS

The control unit has a backlit 240 x 128 dot graphic display. It displays instruments and provides access to parameter setting.

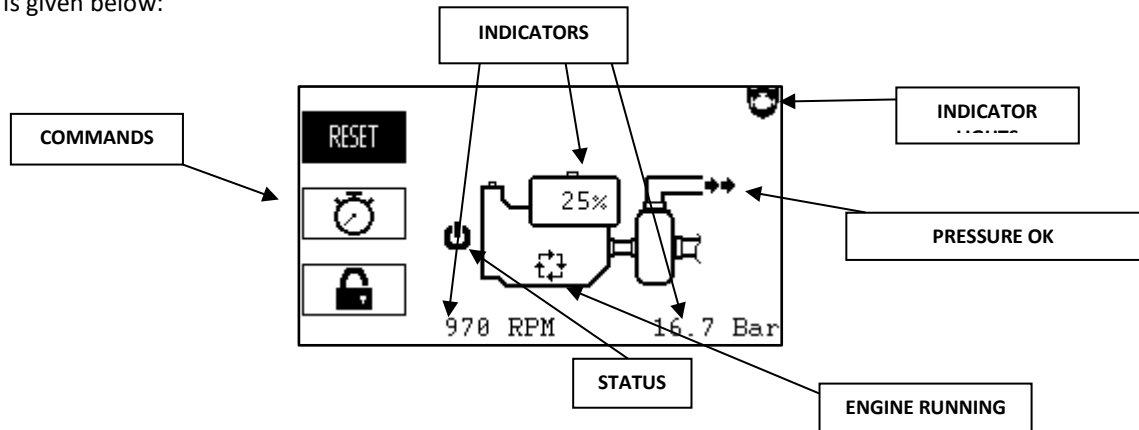
NAVIGATING ACROSS INSTRUMENTS

The instruments displayed on the control unit are divided into pages, each with a uniform group of instruments; to move from one page to another, use the RIGHT_BUTTON and LEFT_BUTTON; to move within the pages, use the UP_BUTTON and DOWN_BUTTON.



MAIN DASHBOARD

This is the most important instrument. It lets you provide commands and check the general status of the pump.
An example is given below:



COMMANDS

The selected command is highlighted; to move from one command to the other, use the UP_BUTTON and DOWN_BUTTON and the CONFIRM_BUTTON to execute the command. Available commands (if all enabled) are:

Symbol	Name	BRIEFLY
RESET	RESET	Restores the control unit; see section on restoring.
	STOP TIMER	Sets up the stop timer
	LOCK/UNLOCK	Sets LOCK MODE
	SPOTLIGHT COMMAND	Controls the SPOTLIGHT function-output. To enable, see setting DEVICE > LIGHT CONTROL

INDICATORS

They display the machine's primary data:

- ENGINE RPM
- PUMP BAR
- FUEL TANK

STATUSES

Symbol	Meaning
	STOP TIMER
	Function-input CALL enabled
	START by function-input FLOAT START / FLOAT STOP
	Manual START
	STOP by function-input FLOW SWITCH
	LOCK by function-input LOCK
	LOCK by LOCK MODE
	Remote start by SMS text or app

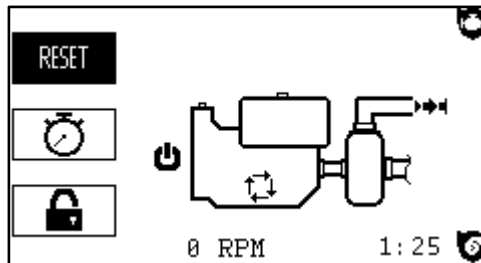
INDICATOR LIGHTS

Up to 10 indicator lights can be displayed simultaneously:

Symbol	Meaning
	TIMER ACTIVE
	ENGINE PROTECTIONS ACTIVE
	PUMP PROTECTIONS ACTIVE
	COOLING
	GLOW PLUGS
	FAULT CAUSES STOP

	FAULT ONLY WARNING
	MAINTENANCE EXPIRED
	FILTER WASH IN PROGRESS
	DECELERATION IN PROGRESS
	FUNCTION-OUTPUT LIGHT ACTIVE

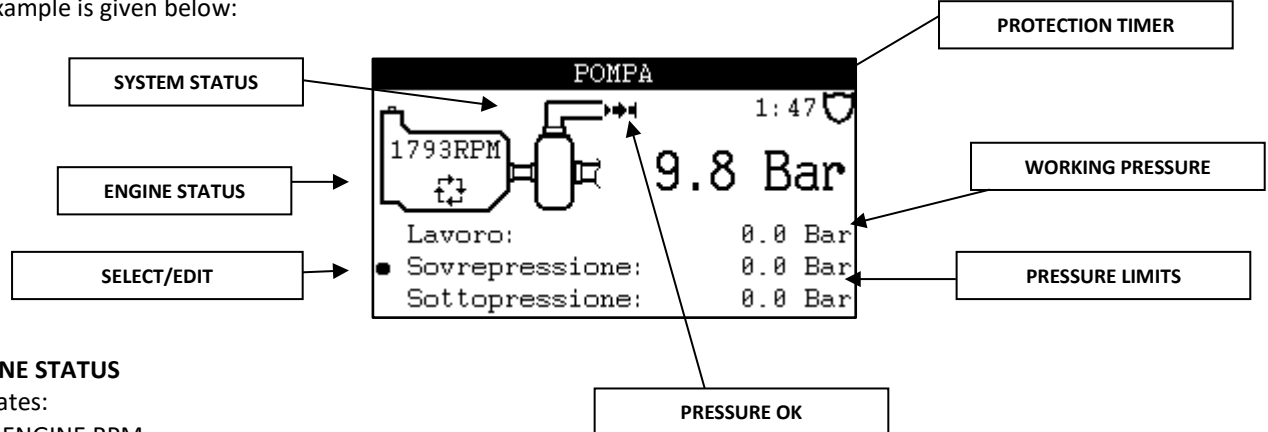
If $IRRIGATION > PUMP \text{ PROTECTION SENSOR} = PUMP \text{ PRESSURE SWITCH}$, the instrument shows the time to pump protection activation, not the pump pressure value.



DASHBOARD PUMP

This instrument displays the status of the water pump and allows changing the water pump underpressure and overpressure values. If $IRRIGATION > PUMP \text{ PROTECTION SENSOR} = PUMP \text{ PRESSURE SWITCH}$, the instrument is disabled.

An example is given below:



ENGINE STATUS

Indicates:

- ENGINE RPM
- ENGINE RUNNING

PROTECTION TIMER

Indicates time to activation of pump protections.

WORKING PRESSURE

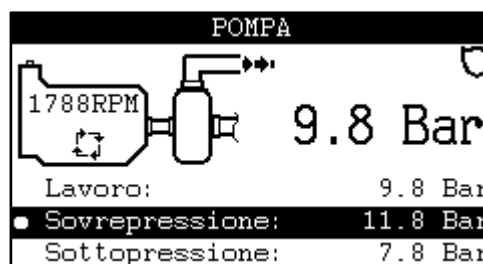
Indicates the pump's operating pressure – WORKING PRESSURE.

PRESSURE LIMITS

Indicates, once acquired, the pump's underpressure and overpressure values.

SELECT/EDIT

Used to select the parameter you want to edit: OVERPRESSURE or UNDERPRESSURE; to move, press UP_BUTTON or DOWN_BUTTON. To enter edit mode and change the value, press the CONFIRM_BUTTON when the desired parameter is selected:

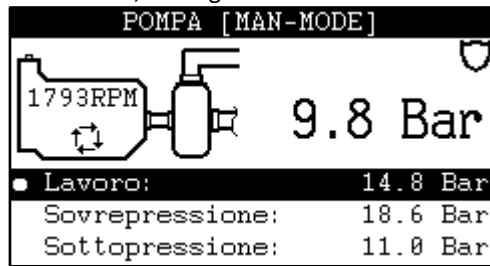


PARAMETER EDIT MODE

When the item is in edit mode, use the UP_BUTTON and DOWN_BUTTON to change the value and the CONFIRM_BUTTON to confirm the new setting and return to display mode. After 1' of inactivity in edit mode, the unit will return to display mode automatically without changing the value.

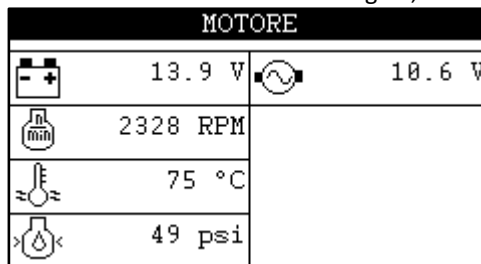
MANUALLY CAPTURED PROTECTIONS

When the parameter IRRIGATION > PROTECTION TYPE is MANUAL ACQUISITION, there is also the option to change the working pressure. The variation is made when you exit the edit mode. The new setting is stored in the non-volatile memory; this means it will remain even if the battery is disconnected from the control unit. If the pump protections are active, they are deactivated and then activated again after 8 seconds, setting the new limit values.



DASHBOARD ENGINE

The first instrument of the group provides all the values for the diesel engine, as in the example below:



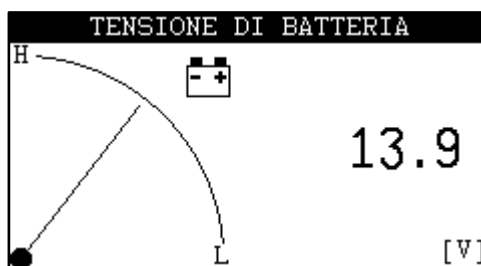
Engine instruments are displayed individually or an overview is given:

Symbol	Parameter	Control Unit	UM
	BATTERY VOLTAGE	Voltmeter	V
	RPM	Alternator/Pickup	RPM
	TEMPERATURE	Sensor	°C/°F
	OIL PRESSURE	Sensor	BAR/kPa/psi
	FUEL LEVEL	In Float switch	%
	ALTERNATOR CHARGE	Alternator	V

INDIVIDUAL INSTRUMENTS

Each engine value – pressures, temperatures, voltages, fuel, etc. – can be displayed in more detailed form.

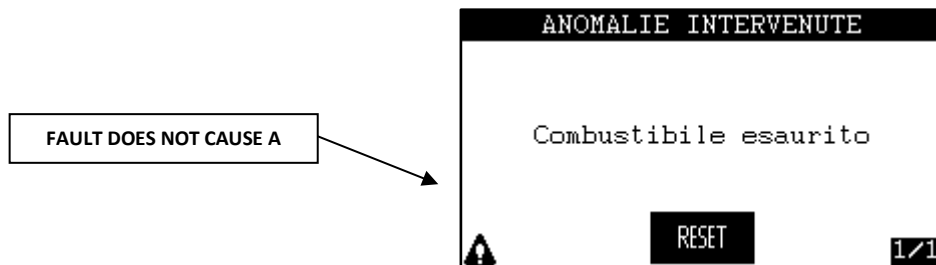
Example: battery voltage:



DASHBOARD FAULT

Use the UP_BUTTON and DOWN_BUTTON to select the displayed fault:

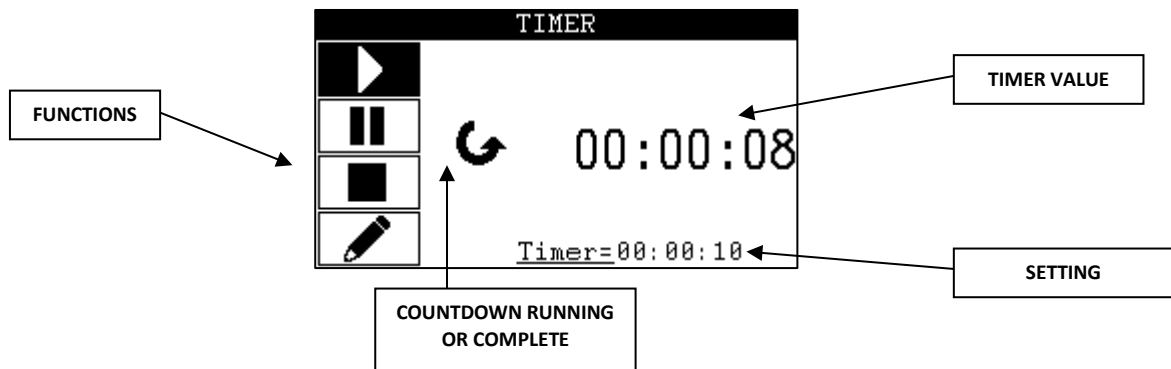




Pressing the CONFIRM_BUTTON will restore the device; press the Restore Button (virtual) on the display.

DASHBOARD TIMER

The timer is used to operate the pump for a preset time (if necessary), up to a maximum of 96 hours. At the end, the pump is stopped and the message Stop at work end by timer. is displayed.



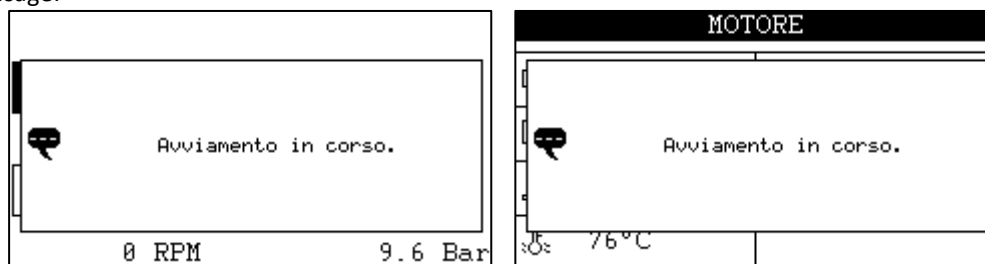
Use the UP_BUTTON and DOWN_BUTTON to change the selection of the function and the CONFIRM_BUTTON to confirm the selection:

Symbol	Meaning
	START: starts the countdown
	PAUSE: pauses the countdown
	STOP: interrupts the countdown and restores the value
	EDIT: edits the setting

DASHBOARD MESSAGES

In some cases, a message window can appear on top of the instruments. There are multiple types of messages and they are sequentially displayed every 5 seconds. Pressing the UP_BUTTON, DOWN_BUTTON, RIGHT_BUTTON or LEFT_BUTTON scrolls the sequence, at the end of which it cancels the window.

Example of message:



OPERATION

START_STOP_BUTTON

Used to:

- **Switch on the control unit.** If the control unit is switched off, press the button for at least one second; the control unit will switch on, performing an LED test and checking for any faults.
- **Start the pump.** If there are no faults which stop it, the engine driven pump will start at idling speed. If, on the other hand, there are faults which result in stoppage, the start-up will not occur.
- **Stop the pump.** If the engine driven pump is running, press the button for at least one second. The control unit will activate the linear actuator, reducing the RPM until the engine reaches minimum speed, and then will stop the engine.

ACCELERATE_BUTTON and DECELERATE_BUTTON

The ACCELERATE_BUTTON and DECELERATE_BUTTON are used to accelerate and decelerate the engine manually. When the control unit is on, the buttons are always active, even when the engine is not running.

UP_BUTTON, DOWN_BUTTON, LEFT_BUTTON and RIGHT_BUTTON

Used to browse display menus. They silence the alarm.

START/STOP

The pump can be started in any one of the following ways:

- By pressing the START_BUTTON.
- When the logic of the function-inputs FLOAT STOP / FLOAT START starts, see section START AND STOP FLOAT SWITCHES
- When function-input CALL is activated
- Remotely, with SMS command or with app

Any one of the following stops the pump:

- Pressing the STOP_BUTTON:
The engine is decelerated and then stopped.
- A stop-causing fault:
The engine is decelerated and/or cooled (if so required by the fault that caused the stop) and stopped.
- The TIMER, when the set operation time elapses:
The engine is decelerated, cooled (if enabled) and stopped.
- When the logic of the function-inputs FLOAT STOP / FLOAT START stops
- Upon deactivation of the function-input CALL
- When LOCK mode is set
- When the function-input FLOW SWITCH activates after the engine has been running for 2 minutes.
- When the function-input LOCK is active
- Remotely, with SMS command or with app

DECELERATION

If a linear actuator is installed and a stop occurs, the control unit decelerates automatically and stops the engine when the rpm remains unchanged for 5 consecutive seconds. There are some fault-generated stops that do not contemplate a deceleration.

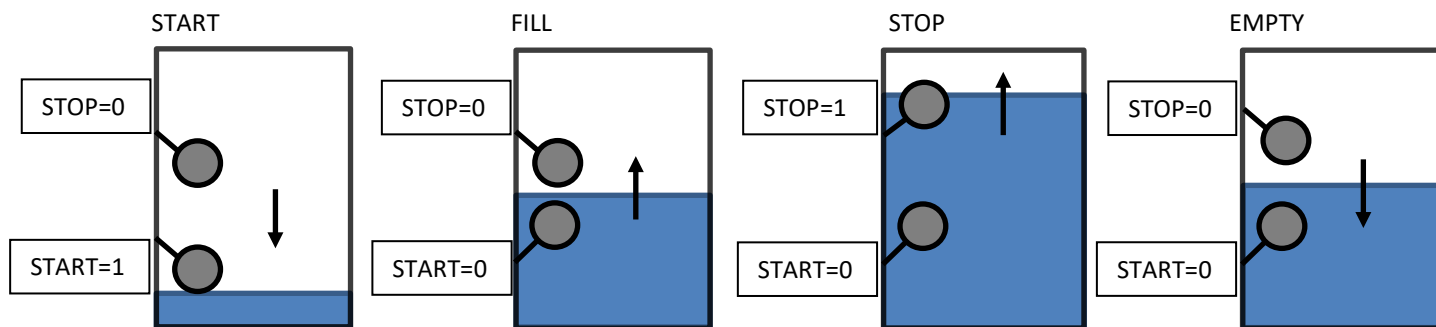
COOLING

During automatic stops or fault-generated stops (where contemplated) the engine is cooled while running for a set time after deceleration.

START AND STOP FLOAT SWITCHES

Use of the function-inputs FLOAT STOP / FLOAT START provides adequate tank filling operation:

- When the function-input FLOAT START is activated (if the function-input FLOAT STOP is not active), the engine is started: START stage.
- The engine is kept running even if the function-input FLOAT START deactivates; FILLING stage.
- The engine is stopped when the function-input FLOAT STOP activates: STOP stage.
- If, after the stop, the function-input FLOAT STOP deactivates, the engine is not started: EMPTYING stage.
- If during the FILLING stage the engine is stopped, the process is interrupted; the engine will be restarted when the function-input FLOAT START re-activates: EMPTYING stage.



The emptying stage can be managed by inverting the position of the float switches.

MANUAL IRRIGATION

The control unit does not adjust the working pressure automatically. The operator has to start the engine and accelerate or decelerate it until the desired working pressure is reached. If the tubes of the irrigation system are long, we recommend disabling the pump protections temporarily with the specific button until water flows out of the nozzle; you can then re-enable the pump protections. Read the section PUMP PROTECTIONS.

Typically, when the irrigation system finishes its work, the pump is stopped due to a low water pressure fault if the discharge valve opens or due to high water pressure if the outlet valve closes.

ENGINE PROTECTIONS

ACTIVATION

Engine protections are enabled 20 seconds after the end of the start-up impulse and disabled when the motor is stopped. When the protections are active, the ENGINE_PROTECTIONS_ACTIVE_LED lights up.

PROTECTIONS

Faults of the engine protection probes are indicated by the RED_ALARM_LED (lights up if fault causes engine stop) and YELLOW_ALARM_LED (lights up if fault does not cause a stop).

See list of engine faults, activation column. ENGINE PROTECTIONS ACTIVE.

PUMP PROTECTIONS

ENABLING

If IRRIGATION > PUMP PROTECTION SENSOR = WATER PRESSURE TRANSM. is set, the pump protections enable with the engine running after a time equal to IRRIGATION > PROTECTION ACTIVATION TIME > MINIMUM (factory set at 2) consecutive minutes, during which the following two conditions are verified:

- The water pressure remains stable; there are no oscillations greater than 2 BAR
- The water pressure is greater than the value of IRRIGATION > MINIMUM PRESSURE.

If IRRIGATION > PUMP PROTECTION SENSOR = PUMP PRESSURE SWITCH is set, the pump protections enable with the engine running after a time equal to IRRIGATION > PROTECTION ACTIVATION TIME > MINIMUM (factory set at 2) consecutive minutes, during which the function-input PUMP PRESSURE SWITCH did not activate.

In any case, the pump protections enable with the engine running after a time IRRIGATION > PROTECTION ACTIVATION TIME > MAXIMUM minutes (factory set at 10).

When the protections are active, the PUMP_PROTECTIONS_ACTIVE_LED lights up.

Pump protections deactivate at the start of the engine stopping procedure.

If the pump protections are active and the DECELERATE_BUTTON or ACCELERATE_BUTTON is pressed, the protections are deactivated for 8 seconds.

PUMP PROTECTION DISABLE BUTTON

To disable the pump protections, press the PUMP_PROTECTIONS_DISABLE button for at least 3 consecutive seconds with the engine running; the PUMP_PROTECTIONS_DISABLED_LED will flash to confirm they have been disabled. All controls except fault "Water pump maximum pressure" and "Engine temperature transmitter disconnected", will be disabled.

Pressing the button again or stopping the pump will cancel the disable command.

WATER PRESSURE TRANSM.

When the pump is controlled by the WATER PRESSURE TRANSM. , all the protections use the pressure value readings as the baseline.

Water pump maximum pressure

If the water pressure reading from the transmitter exceeds the threshold of IRRIGATION > MAXIMUM PRESSURE, the control unit activates the fault “Water pump maximum pressure” and stops the pump at once. This control is always active.

MINIMUM PRESSURE

If the working pressure is less than or equal to IRRIGATION > MINIMUM PRESSURE (factory set at 0.2), activation of the protections triggers the fault “Water pump underpressure” and the engine is stopped.

Water pump pressure transmitter fault

If the pressure transmitter (TPA) is disconnected or breaks, the fault “Water pump pressure transmitter fault” is triggered.

If the fault appears when the engine is started, it will stop the engine after 2 seconds.

If the fault appears before starting the engine, it will stop the engine 1 minute after the engine is started.

OVERPRESSURE AND UNDERPRESSURE

With pump protections active, if the pump pressure exceeds the OVERPRESSURE value, the fault “Water pump overpressure” is triggered; likewise, if the pressure drops below the UNDERPRESSURE value, the fault “Water pump underpressure” is activated. Both faults stop the engine.

UNDERPRESSURE and OVERPRESSURE values are established in two different ways depending on how the parameter IRRIGATION > PROTECTION TYPE is set.

AUTOMATIC ACQUISITION (factory setting)

When pump protections are activated, the unit takes the water pressure as the WORKING PRESSURE.

If the working pressure is greater than or equal to 4 bar:

- $\text{OVERPRESSURE} = \text{WORKING PRESSURE} + [\text{HIGHER OVERPRESSURE DIFFERENTIAL}]$ (factory set at 2 bar)
- $\text{UNDERPRESSURE} = \text{WORKING PRESSURE} - [\text{HIGHER UNDERPRESSURE DIFFERENTIAL}]$ (factory set at 2 bar)

If the working pressure is less than 4 bar:

- $\text{OVERPRESSURE} = \text{WORKING PRESSURE} + [\text{LOWER OVERPRESSURE DIFFERENTIAL}]$ (factory set at 1 bar)
- $\text{UNDERPRESSURE} = \text{WORKING PRESSURE} - [\text{LOWER UNDERPRESSURE DIFFERENTIAL}]$ (factory set at 1 bar)

Where:

[HIGHER UNDERPRESSURE DIFFERENTIAL] is the parameter

IRRIGATION > PUMP WATER UNDERPRESSURE > UPPER DIFFERENTIAL

[LOWER UNDERPRESSURE DIFFERENTIAL] is the parameter

IRRIGATION > PUMP WATER UNDERPRESSURE > LOWER DIFFERENTIAL

[LOWER OVERPRESSURE DIFFERENTIAL] is the parameter

IRRIGATION > PUMP WATER OVERPRESSURE > LOWER DIFFERENTIAL

[HIGHER OVERPRESSURE DIFFERENTIAL] is the parameter

IRRIGATION > PUMP WATER OVERPRESSURE > UPPER DIFFERENTIAL

If the WORKING PRESSURE is lower than the UNDERPRESSURE DIFFERENTIAL value (whether LOWER or HIGHER), the UNDERPRESSURE value is set to the value of IRRIGATION > MINIMUM PRESSURE.

Water underpressure and overpressure thresholds can be changed manually at any time; see PUMP INSTRUMENT.

MANUAL ACQUISITION

This type of protection can be enabled when the pump is started automatically upon closing of the remote start contact (float switch, pressure switch, generic contact, etc.) and the linear actuator is disabled. The engine rpm must be pre-set by mechanically operating the engine accelerator. The operator must set the WORKING PRESSURE on the control unit; see PUMP INSTRUMENT. This value is stored in a non-volatile memory and is therefore maintained even if the control unit battery is disconnected.

- $\text{OVERPRESSURE} = \text{WORKING PRESSURE} + [\text{OVERPRESSURE PERCENTAGE}]$ (factory set at 26%)
- $\text{UNDERPRESSURE} = \text{WORKING PRESSURE} - [\text{UNDERPRESSURE PERCENTAGE}]$ (factory set at 26%)

Where

[OVERPRESSURE PERCENTAGE] is the parameter

IRRIGATION > PUMP WATER OVERPRESSURE > DIFFERENTIAL

[UNDERPRESSURE PERCENTAGE] is the parameter

IRRIGATION > PUMP WATER UNDERPRESSURE > DIFFERENTIAL

PUMP PRESSURE SWITCH

When the pump is controlled by PUMP PRESSURE SWITCH, all the protections use the function-input PUMP PRESSURE SWITCH as the baseline; it is therefore necessary to connect a pressure switch to an adequately programmed input.

Upon activation of the function-input PUMP PRESSURE SWITCH and once the time IRRIGATION > PUMP PRESSURE SWITCH DELAY has elapsed, if the pump protections are active, the fault “Water pump underpressure” will occur.

FILTER WASHING

When the function-input FILTER WASH is active, the UNDERPRESSURE value changes and is equal to IRRIGATION > FILTER WASH > PRESSURE. When the function-input deactivates, the UNDERPRESSURE value returns to the previous value.

If the function FILTER WASH (IRRIGATION > FILTER WASH > FUNCTION) is disabled, the function-input is not active.

RESET

The device is reset via the RESET command in the main DASHBOARD. The following operations are carried out:

- Active faults restored
- Engine protection timer restored.
- Pump protection timer restored.
- Stop TIMER restored if it stopped the control unit.
- Stop from function-input FLOW SWITCH restored.

EMERGENCY STOP

This is available in all operating modes. It is possible to install (hook mount) one or more buttons. Stopping is immediate, without engine deceleration; it activates the general alarm and **EMERGENCY STOP** is displayed.



Do not use the emergency button in combination with a stopping system that is not energized while running.

MODEM COMMANDS (CEM-196)

The control unit incorporates a telephone modem that is able to manage SMS text messages or communicate via the Elcos Smart Control app.

The following are possible:

- Start or stop the pump.
- Disable or enable pump protection.
- Set the minutes of operation.
- Verify the pump status.
- Be notified if the pump is in alarm status.
- Reset faults.

When using the system with SMS text messaging, at least one telephone number must be set in the control unit's phone book; this will be used to send fault notifications. If the IOT system is used instead, the mobile network operator's APN must be set in the control unit.

PROCEDURE TO DISABLE THE PIN

After purchasing a SIM Card from a mobile operator, regardless of the contract the customer has chosen, the PIN must be disabled. To do so, insert the SIM card into a normal mobile phone for personal use; turn on the phone and enter the PIN provided by the operator. Look through the mobile phone's menu to find the procedure to deactivate the PIN. Follow the deactivation procedure, so that when the SIM card is turned on again in the future, the PIN will not be requested. Turn off the cellphone and extract the SIM Card. Make sure the control unit is off and then insert the SIM card in the slot.

COMMISSIONING

To make sure the area surrounding the control unit is covered by signal, check the icon on the display. Place the antenna vertically using its magnetic support and at the point of maximum signal strength.

SMS

The SMS notification and SMS command mechanism is active if MODEM > SMS > FUNCTION = INCLUDED.

FAULT NOTIFICATION

When a fault occurs, if operation with SMS has been enabled, the control unit will sequentially send the text message (only once) to all the telephone numbers stored in the phone book.

START AND STOP NOTIFICATION CALENDAR

If MODEM > SMS > TEXT MSG START AND STOP = INCLUDED, as soon as the engine starts up or stops, the control unit will sequentially send a notification message (only once) to all the telephone numbers stored in the phone book.

END OF WORK NOTIFICATION

When MODEM > SMS > TEXT MSG AT END OF WORK = INCLUDED, the system will sequentially send a text message (only once) notifying the stop effected by the flow switch or stop timer to all the numbers stored in the phone book.

SMS COMMANDS

The following is the list of commands that can be sent to the control unit:

Numerical code	Text code	Description
001	STATUS1	PUMP status request: MOTOR PUMP is RUNNING. Hour meter =00:24 NO FAULTS PRESSURE =10.0 Bar PUMP PROTECTIONS INCLUDED UNDERPRESSURE =8.0 Bar OVERPRESSURE =12.0 Bar TIMER=00:01.31
002	STATUS2	ENGINE values status request: MOTOR PUMP is RUNNING. FUEL =100% ENGINE PRESSURE =8.9 Bar ENGINE TEMPERATURE =91°C RPM=0 BATTERY =12.9V
005	STOP	Stops the pump.
008	START	Starts the pump
010	PROT OFF	Disables the pump protections
011	PROT ON	Enables the pump protections
007	RESET	Resets the device
040	FUEL ON	Enables the FUEL FAULT
041	FUEL OFF	Disables the FUEL FAULT
500#[minutes]	TIMER#[minutes]	Sets the minutes of operation on the timer, maximum 1440min (1day). Do not add spaces before or after the minutes.
1#[number]	T1#[number]	The telephone number of field <i>[number]</i> will be stored in the assigned phone book position, overwriting the current number (add the country code before the number). Do not add spaces before or after the number. To cancel a number, send the field <i>[number]</i> made up of only spaces.
2#[number]	T2#[number]	
3#[number]	T3#[number]	
4#[number]	T4#[number]	
5#[number]	T5#[number]	
101	TT1	The telephone number that sent the message will be stored in the assigned phone book position, overwriting the current number.
102	TT2	
103	TT3	
104	TT4	
105	TT5	
10#[apn of mobile operator]	APN#[apn of mobile operator]	Saves the mobile network operator's APN in the control unit. Do not add spaces before or after the APN.
200	ECHO NUM	Answers with the list of telephone numbers stored in the phone book and the APN stored in the control unit. Contacts: T1#+393245566741 T2#---- T3#+393245566741 T4#---- T5#+393487763267
300	ECHO APN	Answers with the list of the APN.

When MODEM > SMS > TEXT MESSAGE FROM ALL = INCLUDED, the commands sent to the control unit will be accepted by all cellphones; otherwise, only by the phones stored in the control unit.

FUEL FAULT

Fault "FUEL FAULT" depends on any change in the fuel level in the motor pump tank when the engine is stopped. The control enables after receiving SMS command "040" or "FUEL ON" and disables by sending SMS "041" or "FUEL OFF". The control disables when battery power is disconnected.

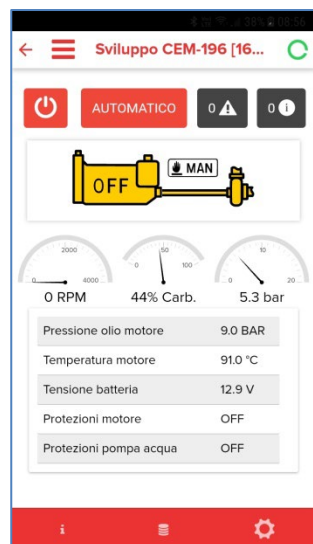
The fault control, if enabled, activates 5 minutes after the engine is turned off and in that instant, the fuel level reference value is captured. A negative variation generates the fault: when the level is between 100% and 80%, the variation has to be 10%; when the level is between 79% and 1%, the variation has to be 5%. The fault is delayed by 5 seconds and is stored. The reference value and related variation are updated when the fault is restored, the control is activated or the tank is topped up.

An additional SMS "OFF state" is sent when the operator sets the control unit in LOCK MODE.

APP

Management via the app is active if MODEM > IOT > FUNCTION = INCLUDED

From the main app screen you can START/STOP and view the main values:



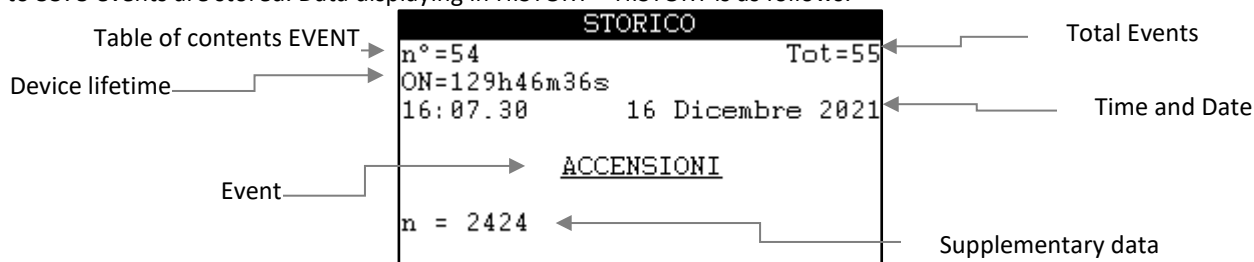
The following pages are also available:

- **FAULTS:** Displays current faults and lets you reset the device
- **FUEL:** (Access level: “manufacturer”) Makes it possible to set fault thresholds and activate the FUEL FAULT.
- **CLOCK SETTINGS:** Used to set the clock, date and stop timer.
- **WATER PUMP:** Used to manage fault thresholds and disable pump protections.
- **SETTINGS:** (Access level: “manufacturer”) Various settings.

For additional information, refer to the “Elcos Smart Control” app documentation.

EVENT LOG

Up to 5375 events are stored. Data displaying in HISTORY > HISTORY is as follows:



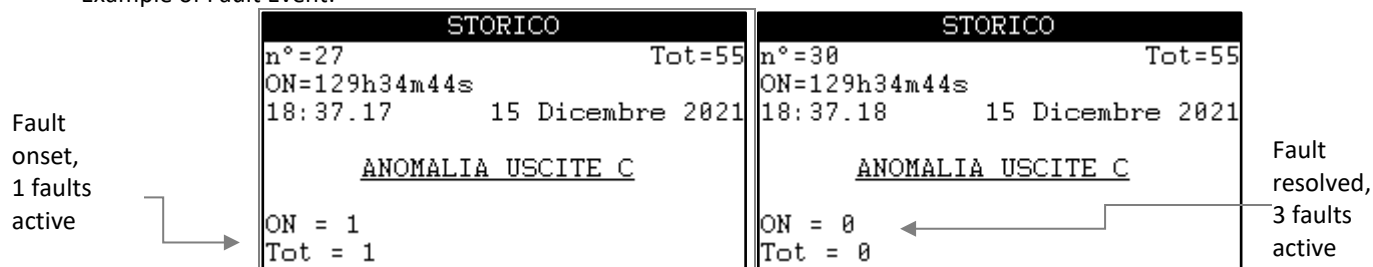
The event with the greatest number indicates the last event that occurred, 1 is the first. If no events are stored, the display shows HISTORY EMPTY.

The events are:

EVENT	DATUM 1	DATUM 2	SAVING
FAULT	1 Onset	NUMBER OF ACTIVE FAULTS	At fault onset/resolution.
	0 Resolved		
MANUAL START REQUEST START REQUEST BY CALL FLOAT START REQUEST REMOTE START REQUEST	1 ACTIVATED	---	On presentation of request
	0 DEACTIVATED		
TIMER STOP REQUEST FLOW SWITCH STOP REQ. LOCK MODE STOP REQ. LOCK STOP REQUEST REMOTE STOP REQUEST	1 ACTIVATED	---	On presentation of request
	0 DEACTIVATED		
SWITCH-ONS	Total number of start-ups	---	Upon start-up of device
ENGINE STARTED	HOURS (TOTAL)	MINUTES (TOTAL)	As soon as an engine running is detected, stores the total engine running time.
ENGINE STOPPED	HOURS (PARTIAL)	MINUTES (PARTIAL)	As soon as an engine stop is detected, stores the partial start time.
BATTERY VOLTAGE	BATTERY	---	Every day On start-up With engine running each hour
FUEL LEVEL	%	---	Every day On start-up With engine running each hour
ENGINE PROTECTIONS	1 ACTIVATED	---	On activation/deactivation of engine protections
	0 DEACTIVATED		
PUMP PROTECTIONS	1 ACTIVATED	1 DISABLED	On activation/deactivation of pump protections
	0 DEACTIVATED	0 ENABLED	On disable/enable of pump

			protections
WATER PRESSURE	BAR	---	With engine running every 15 minutes
MOTOR RPM	RPM	---	With engine running every 15 minutes
ENGINE TEMPERATURE	°C	---	With engine running every 15 minutes
OIL PRESSURE	BAR	---	With engine running every 15 minutes
PRESSURE LIMITS	UNDERPRESSURE BAR	OVERPRESSURE BAR	On activation of pump protections
WORKING PRESSURE	BAR	---	On activation of pump protections
LOW CONSUMPTION	1 Input	---	When in and out of POWER SAVING mode.
	0 Output		
DELETE HISTORY	---	---	A delete has occurred in the event log.

Example of Fault Event:



UP_BUTTON and DOWN_BUTTON modify the event index. To exit CONFIRM_BUTTON

POWER SAVING

With the engine stopped, the control unit goes into power saving mode after a certain period of inactivity. The parameters can be customised; see DEVICE > STAND-BY.

Under power saving mode, the modem is off; this means you will not be able to manage the control unit remotely. The function-input STANDBY BLOCK inhibits the POWER SAVING input when it is activated.

WAKE UP

To wake the device from power saving, hold the START_STOP_BUTTON down for some time.

You can also exit power saving via two inputs:

- IN BLACK/GREEN
- IN ORANGE/BROWN

The device can be programmed to wake up from power saving when the input is closed to ground or open. Wake-up is independent of the function-input or fault associated with the input.

INSTALLATION

STOPPING SYSTEMS

Stopping can be achieved in two ways:

- With the solenoid valve or electromagnet energized when the engine is running and de-energized when the engine is stopped (default setting).
- With the electromagnet de-energized when engine is running and energized when it is stopped, remaining in this condition for the entire ENGINE > STOP > STOP TIME after engine not running has been detected.

If after ENGINE > STOP > FAILURE TO STOP – factory setting 120 seconds from receipt of the stop command – the control still detects the engine running signal, the “Failure of engine to stop” trips.

GLOW PLUGS

Activation of the GLOW PLUGS output is adjustable — from a minimum of 0 seconds (command off) to a maximum of 60 seconds. Once activation of the PREHEATING has been completed, the engine start-up procedure begins. POST-HEATING can also be managed, i.e. maintaining output live for a set amount of time, even after the engine has been started: see ENGINE > GLOW PLUGS

GENERAL ALARM

The GENERAL ALARM signal can be obtained by installing a signalling device at the specific output. It can be programmed (menu IN-OUT > GENERAL ALARM > DURATION) so that it is always on or remains on for a specific amount of time. It trips whenever the control unit detects a fault. Pressing one of the arrows silences the alarm.

IMMINENT START

Every automatic start-up is preceded by the intermittent activation of the general alarm output for 8 seconds; then, 3 seconds later, the start-up cycle begins. If a buzzer is connected to this output, the operator is notified that start-up is imminent. This function can be bypassed.

(IN-OUT > GENERAL ALARM > DURATION > IMMINENT START)

ENGINE RUNNING DETECTION

Engine running is detected by the voltage and by the frequency of the battery charger alternator (permanent or pre-excitation magnets). Once detected, the starter motor switches off.

MAINTENANCE

To make maintenance to the engine unit as easy as possible, three scheduled maintenance programs – MAINTENANCE – can be set up. When the event occurs, a fault is activated that indicates that the programmed expiry has been reached; these signals cannot be cancelled in the same way as other faults, but must be restored individually.

Programmed expiries can be associated with:

- RUNNING HOURS: system's run time (hours).
- MOTOR HOURS: engine's run time (hours).
- CALENDAR: calendar day.

The message displayed can be personalised.

START-UP

Always as a way to ease maintenance management, the date the system was commissioned can be included under the item:

MAINTENANCE > START-UP

This date is displayed in the section DATA > RETENTION under the settings menus.

PROGRAMMABLE INPUTS

Some digital inputs are fully programmable for activation parameters regarding DELAY TIME and the ACTIVATION LEVELS (active CLOSED or active OPEN); the inputs recognise closing towards the negative pole (ground) The inputs can be addressed to a FUNCTION-INPUT or associated with a FAULT. In the second case, also the TEXT DISPLAYED, ACTIVATION TIME, and STORAGE can be programmed.

If several inputs are associated to a FUNCTION-INPUT, the latter will be active when at least one input is active.

Table of FUNCTION-INPUTS that can be associated:

FUNCTION	DESCRIPTION
"_""_"	No association
PUMP PRESSURE SWITCH	Pressure switch for the water pump; see pump protections
CALL	Starts the pump; see START/STOP
FLOW SWITCH	Flow switch for the irrigation tubing; see START/STOP

FLOAT START	Float switch piloting the start-up; see START/STOP
FLOAT STOP,	Float switch piloting the stop; see START/STOP
FILTER WASH	Indicates filter washing in progress; see pump protections
LOCK	Locking; see START/STOP
FUEL PRESSURE SWITCH	Fuel pressure switch
STANDBY BLOCK	Inhibits the POWER SAVING input

The table of programmable inputs is given below.

Wire colour
IN ORANGE/BROWN
IN ARANCIO/VIOLA
IN PURPLE
IN BLACK/GREEN
BLACK/BLUE INPUT

PROGRAMMABLE OUTPUTS

FUNCTION-OUTPUTS and FAULTS can be associated with each programmable output. The output is activated (the corresponding relay is closed) when the FUNCTION-OUTPUT or associated FAULT is active.

If several FUNCTION-OUTPUTS or FAULTS are associated with an output, the output will be active when at least one function-output or fault is active.

The table of FUNCTION-OUTPUTS that can be associated is given below.

FUNCTION	Description
"----	No association.
LIGHT	Used to pilot the spotlight.
ENGINE RUNNING	Activates the output and signals that the engine is actually running.
ENGINE DELAYED RUNNING	Indicates, if output is activated, that the engine is actually running and 20 seconds have elapsed (this time cannot be programmed).
STOP WITH ELECTROMAGNET	Management of the engine stop command excited during stopping phase is associated to the output.
STOP IN PROGRESS	Indicates that the control unit is running the stopping procedure. Restores with the engine stopped or with a failed stop condition.
FAULT RESET	Enables the output for 1 second when the operator uses the front buttons to reset the faults.

The table of programmable outputs is given below.

Wire colour
WHITE/BLUE WIRE
YELLOW/BLUE WIRE
YELLOW/WHITE WIRE

FAULTS

FAULT	SOURCE	ACTIVATION	MEMORY	STOP	WITH DECELERATION	WITH COOLING	Occurs when:
----	-	-	-	-	-	-	Unlinked fault
LOW OIL PRESSURE < Low engine oil pressure >	CONTACT OIL PRESSURE SWITCH	ENGINE PROTECTIONS ACTIVE	YES	YES	NO	NO	The oil pressure is lower than the pressure switch threshold and its contact is closed to ground.
OIL PRESSURE SWITCH FAULT < Oil pressure switch fault >		WITH ENGINE STOPPED	YES	YES	NO	NO	The contact is open with engine stopped (the function can be disabled); this allows checking the integrity of the connection.
ENGINE OVERTEMPERATURE < Engine overtemperature by thermostat >	CONTACT THERMOSTAT	ALWAYS ACTIVE	YES	YES	YES	YES	The temperature is higher than the thermostat threshold and its contact is closed to ground.
OVERTEMPERATURE WARNING < Engine overtemperature warning >	TEMPERATURE TRANSMITTER	ALWAYS ACTIVE	YES	PRG	YES	YES	The temperature has exceeded the set threshold.
TEMPERATURE TX INTERRUPTED < Engine temperature transmitter disconnected >		ALWAYS ACTIVE	NO	NO	-	-	The temperature transmitter is interrupted or malfunctioning.
INCORRECT TEMP. TABLE < Incorrect temp. transmitter calibration table >	-	ALWAYS ACTIVE	YES	NO	-	-	The CUSTOM engine temperature transmitter calibration table is incorrect.
LOW OIL PRESS. WARN. < Low oil pressure warning >	LOW OIL PRESSURE TRANSMITTER	ENGINE PROTECTIONS ACTIVE	NO	PRG	NO	NO	The oil pressure is lower than the set cut-in time threshold.
PRESSURE TX INTERRUPTED < Oil pressure transmitter disconnected >		ALWAYS ACTIVE	NO	NO	-	-	The engine pressure transmitter is interrupted or malfunctioning.
INCORRECT PRESSURE TABLE < Incorrect pressure transmitter calibration table >	-	ALWAYS ACTIVE	YES	NO	-	-	The CUSTOM oil pressure transmitter calibration table is incorrect.
LOW FUEL PRESSURE < Low fuel pressure >	FUEL PRESSURE SWITCH	ENGINE PROTECTIONS ACTIVE	YES	YES	NO	NO	The fuel pressure is lower than the pressure switch threshold and the contact is closed to ground (function-input FUEL PRESSURE SWITCH)
FUEL FLOAT TRANSM. FAULT < Fuel float connection disconnected >	FUEL FLOAT	ALWAYS ACTIVE	NO	NO	-	-	The fuel level transmitter is interrupted.
FUEL RESERVE < Fuel reserve >		ALWAYS ACTIVE	NO	NO	-	-	The fuel level is lower than the set threshold. Resets when the level rises above 2% of the threshold.
FUEL FINISHED < Fuel finished >		ALWAYS ACTIVE	YES	PRG	YES	YES	Two simultaneous operations: -The fuel level is lower than the set threshold for the programmed range. -The ORANGE input (FUEL FLOAT SWITCH) is closed to ground.
INCORRECT FLOAT TABLE < Incorrect fuel float calibration table >	-	ALWAYS ACTIVE	YES	NO	-	-	The CUSTOM fuel float calibration table is incorrect.
COOLANT LEVEL < Low coolant level >	RADIATOR LEVEL	ALWAYS ACTIVE	YES	YES	YES	NO	The coolant has dropped below the minimum level.
ALTERNATOR FAULT < Charging alternator fault >	ALTERNATOR	ENGINE PROTECTIONS ACTIVE	YES	PRG	YES	YES	The alternator is not charging the battery or problem in the electrical system.
EMERGENCY < Emergency engine stop >	EMERGENCY BUTTON	ALWAYS ACTIVE	YES	YES	NO	NO	The emergency button is pressed.

ORANGE/BROWN INPUT FAULT PURPLE/ORANGE WIRE PURPLE INPUT FAULT BLACK/GREEN INPUT FAULT FAULT IN BLACK/BLUE	CORRESPONDING INPUT	PRG	PRG	PRG	PRG	PRG	See PROGRAMMABLE INPUTS.
BATTERY UNDERVOLTAGE < Battery undervoltage >	BATTERY	ALWAYS ACTIVE	YES	PRG	YES	YES	The battery voltage is lower than the set threshold for the programmed time.
BATTERY OVERVOLTAGE <Battery overvoltage>		ALWAYS ACTIVE	YES	PRG	YES	YES	The battery voltage is higher than the set threshold for the time programmed.
FAILURE TO STOP < Failure of engine to stop >	SOLENOID VALVE OR ELECTROMAGNET	STOPPING PROCEDURE TERMINATED	YES	YES	-	-	Engine running is detected after the stopping system remained activated for the time ENGINE > STOP > FAILURE TO STOP
UNDERSPEED < Engine underspeed >	ALTERNATOR "W"	WHEN THRESHOLD REACHED	YES	PRG	NO	NO	The engine speed is lower than the set threshold.
OVERSPEED < Engine overspeed >		ALWAYS ACTIVE	YES	PRG	NO	NO	The engine speed is higher than the set threshold.
MAINTENANCE 1 MAINTENANCE 2 MAINTENANCE 3	SETTINGS	ALWAYS ACTIVE	YES	NO	-	-	See settings
KEYBOARD ERRO < Keyboard error >	-	IGNITION	YES	NO	-	-	Buttons were pressed in the ignition phase.
NON-VOLATILE MEMORY ERROR < Non-volatile memory error >	-	ALWAYS ACTIVE	YES	NO	-	-	The non-volatile memory has a fault. To restore the error, switch the control unit off and on.
FAILURE TO START < Failure of engine to start >	-	STARTING PROCEDURE TERMINATED	YES	YES	NO	NO	The engine did not start up: -After a manual start-up -After a number of automatic start-up attempts equal to ENGINE > START > START ATTEMPTS
PUMP WATER UNDERPRESSURE < Water pump underpressure >	TPA-200	PUMP PROTECTIONS ACTIVE	YES	YES	YES	YES	See section PUMP PROTECTIONS.
PUMP WATER OVERPRESSURE < Water pump overpressure >		PUMP PROTECTIONS ACTIVE	YES	YES	YES	YES	
PUMP WATER MAX PRESSURE < Water pump maximum pressure >		ALWAYS ACTIVE	YES	YES	NO	NO	
PUMP WATER PRESS. TX FAULT < Water pump pressure transmitter fault >		ALWAYS ACTIVE	NO	YES	YES	NO	The values read by the transmitter are not consistent with the specifications. The transmitter could be disconnected or malfunctioning. See section PUMP PROTECTIONS.
PUMP PRESS. UNDERPRESSURE < Underpressure by pump pressure switch >	PUMP PRESSURE SWITCH	PUMP PROTECTIONS ACTIVE	YES	YES	YES	YES	See section PUMP PROTECTIONS.
NON-VOLATILE MEMORY ERROR < Non-volatile memory error >	-	ALWAYS ACTIVE	YES	NO	-	-	Fault in the device's non-volatile memory.
YELLOW/BLUE WIRE FAULT YELLOW/WHITE WIRE FAULT < Yellow / Blue wire output anomaly > < Yellow / Blue wire output anomaly >	OUTPUTS	ALWAYS ACTIVE	NO	NO	-	-	There is an overload or short-circuit problem on the corresponding output
NO SIM CARD < NO SIM CARD >	MODEM OPTION	ACTIVE MODEM	YES	NO	-	-	No SIM card in the control unit.
SIM CARD WITH ACTIVE PIN < SIM CARD with pin active >		ACTIVE MODEM	YES	NO	-	-	SIM card PIN was not deactivated.
NO NUMBER IN CONTACTS < No telephone number in contacts >		ACTIVE SMS MESSAGES	YES	NO	-	-	No telephone number in the phone book for SMS text messaging
NO APN < No APN entered >		ACTIVE IOT	YES	NO	-	-	No APN set up for app connectivity.

GENERIC MODEM ERROR < Generic MODEM error >		ACTIVE MODEM	YES	NO	-	-	A generic modem error has occurred. The Modem instrument can provide more detailed information.
FUEL FAULT < Fuel fault >		ACTIVE MODEM and SENT COMMAND	YES	YES	NO	-	See description for FUEL FAULT.

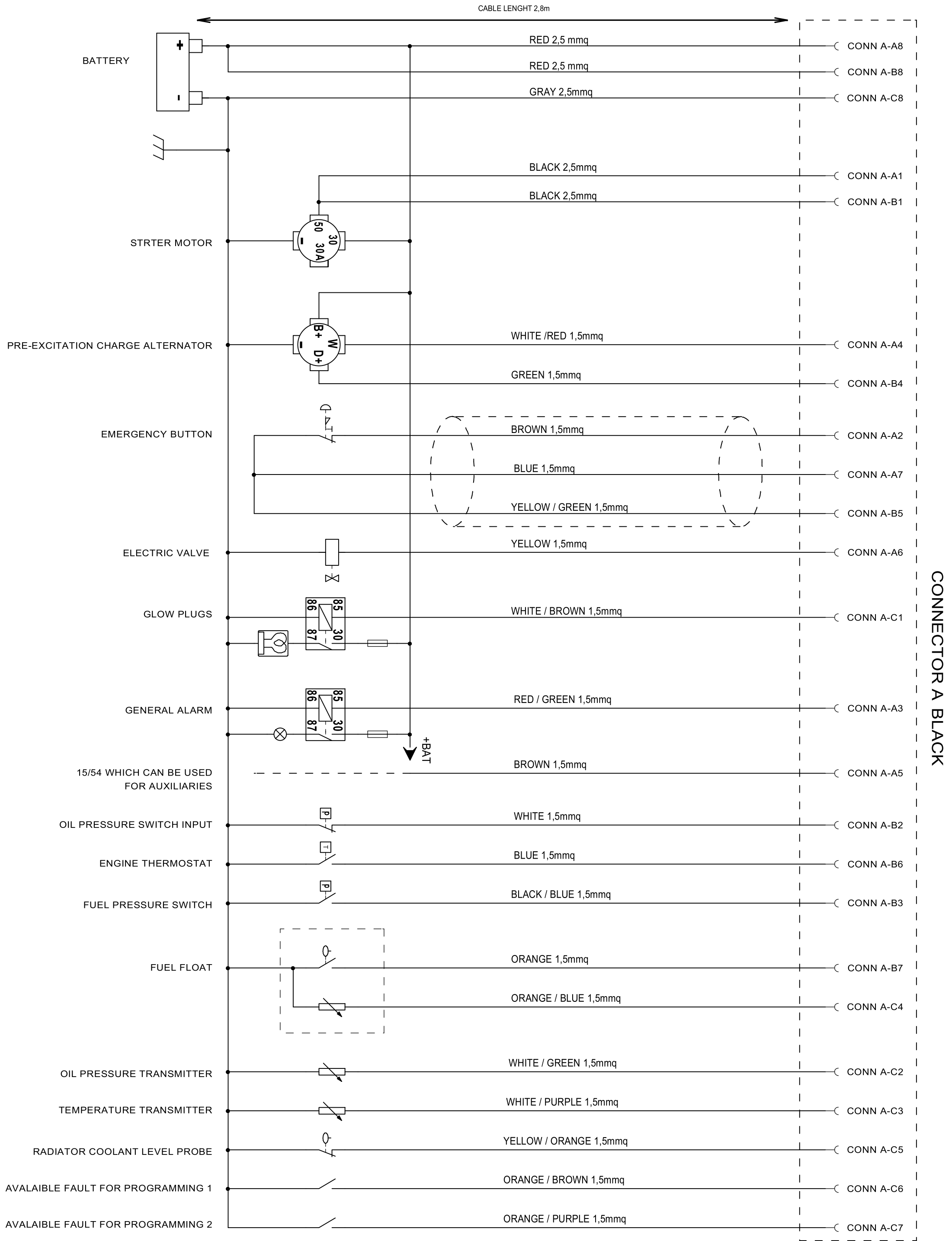
SERIAL PORTS

The control unit includes USB 2.0 port. It is detected as VCP (Virtual COM Port) and can be connected to a PC to:

- Transfer settings using SW ZW-SMART
- Update the control unit's FW using SW ZW-UPG
- Querying with protocol MOD Bus RTU

WIRING DIAGRAM

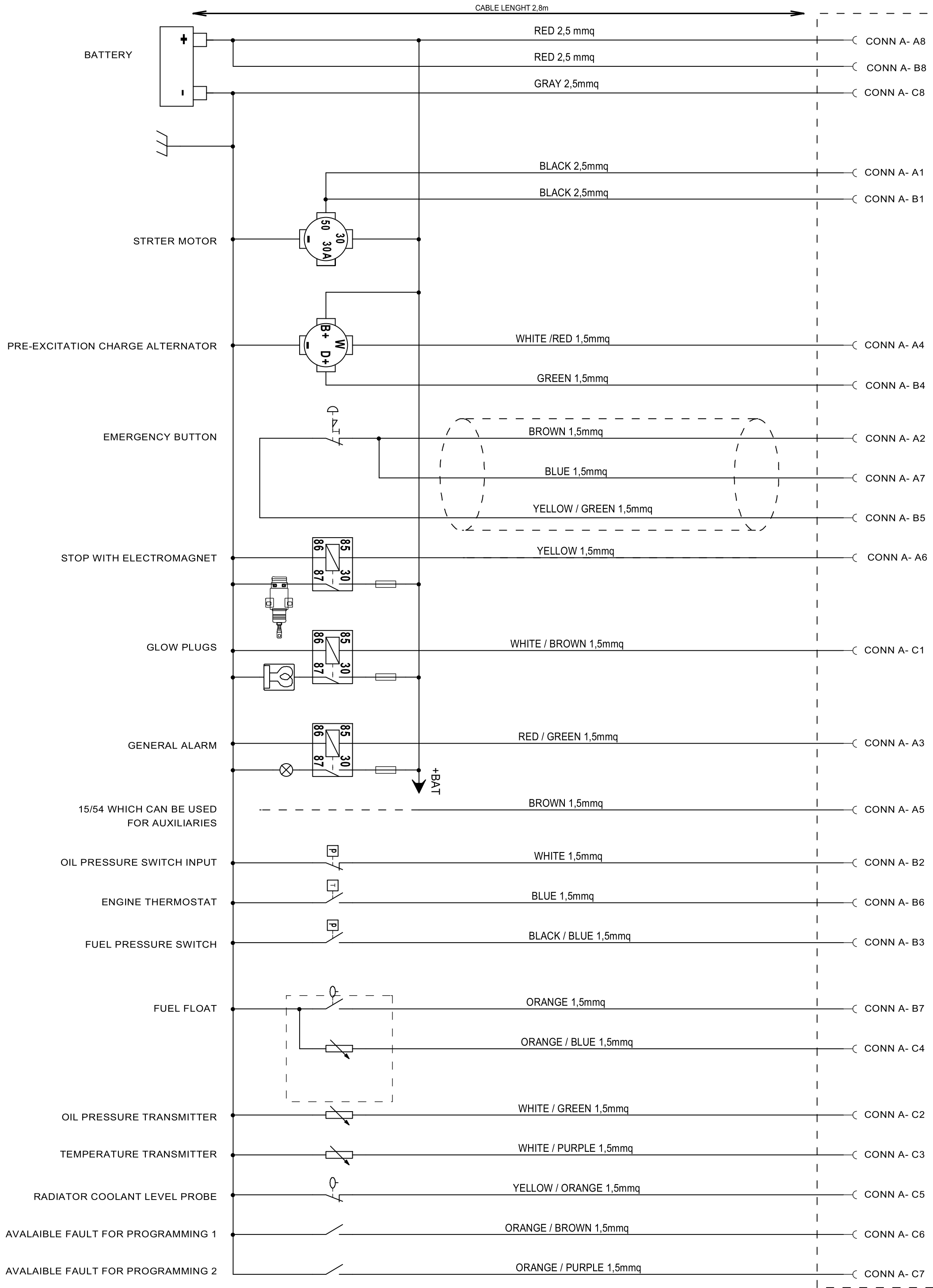
WIRING DIAGRAM STOP SOLENOID VALVE



Basic scheme subject to change without notice.

WIRING DIAGRAM

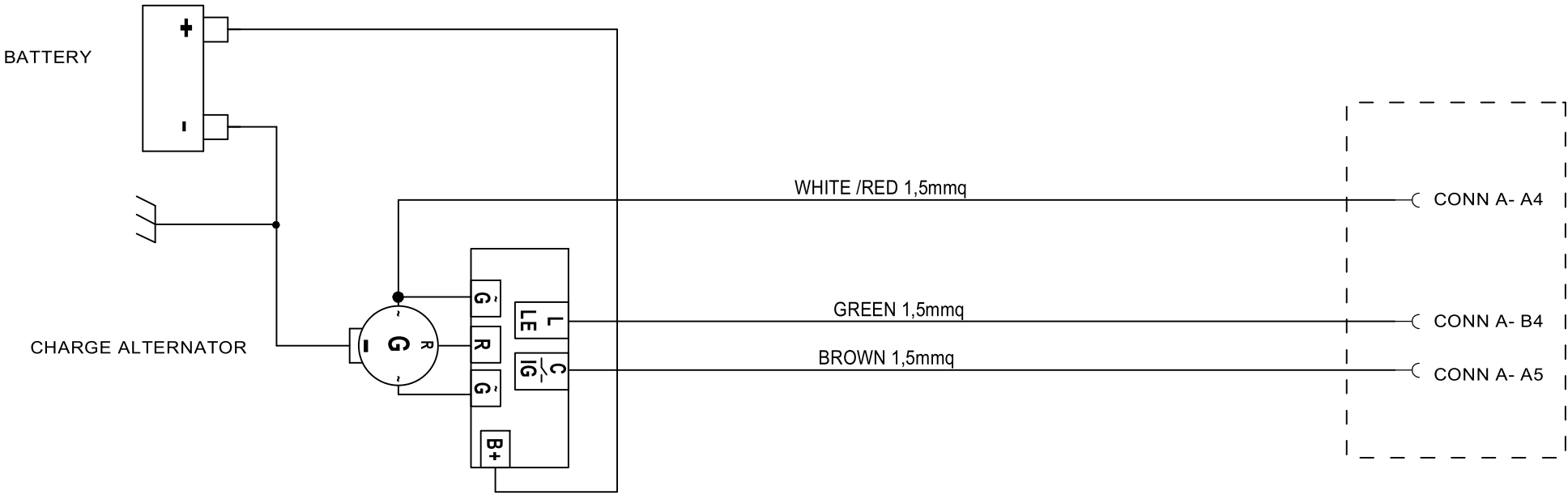
WIRING DIAGRAM WITH STOP ELECTRO-MAGNET



BLACK "A" CONNECTOR

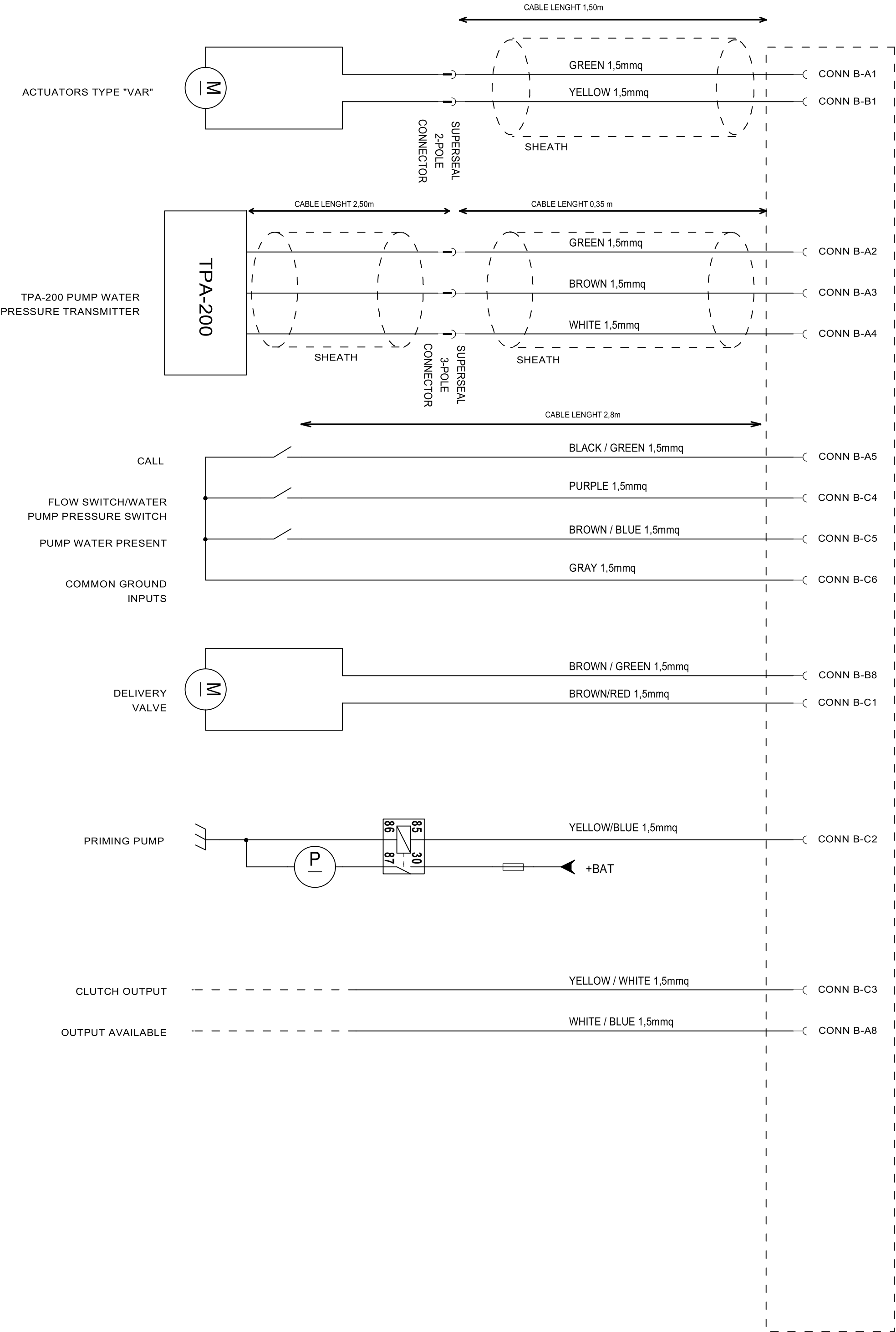
WIRING DIAGRAM

DIAGRAM WITH PERMANENT MAGNETS CHARGE ALTERNATOR



BLACK "A" CONNECTOR

WIRING DIAGRAM



GRAY "B" CONNECTOR

SETTINGS

To access settings (the pump must be stopped), go to the <<PROG>> instrument (CLOCK instrument, then press UP_BUTTON), and then hold down the CONFIRM_BUTTON until OK! is displayed. During settings, the PUMP_PROTECTIONS_DISABLED_LED emits two quick flashes.



To move between the menus, use the UP_BUTTON, DOWN_BUTTON, LEFT_BUTTON, RIGHT_BUTTON and select the parameter to be displayed or modified with the RIGHT_BUTTON.

After period of time in settings without any activity, the control unit returns to the operating mode on its own. To exit settings, go to the start menu and hold down the CONFIRM_BUTTON until OK! appears:

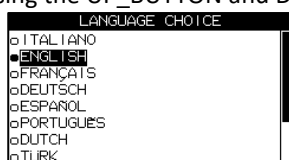


SETTING TYPES

There are multiple types of settings available:

MULTIPLE CHOICE

This allows one parameter to be selected from many, for example the language. The set parameter is the one with the black dot next to it; the selection can be changed using the UP_BUTTON and DOWN_BUTTON.



To confirm the parameter, press the CONFIRM_BUTTON until OK is displayed.



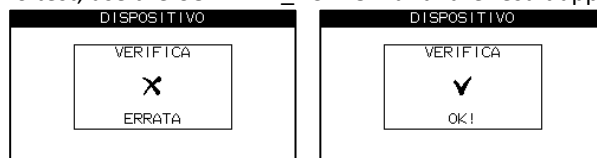
To exit settings, press the LEFT_BUTTON or CONFIRM_BUTTON.

PASSWORD

Access to some menus, or setting of some parameters, requires the entry of a numerical password:



Enter one digit at a time; use the LEFT_BUTTON and RIGHT_BUTTON to move the cursor, and the UP_BUTTON and DOWN_BUTTON to change the digit. To test, use the CONFIRM_BUTTON until the result appears:



It is possible to change the password in the same manner; the existing password must be entered first.



To exit settings, press the PUMP_PROTECTIONS_DISABLE_BUTTON.

CLOCK/CALENDAR

The current time and date are displayed:

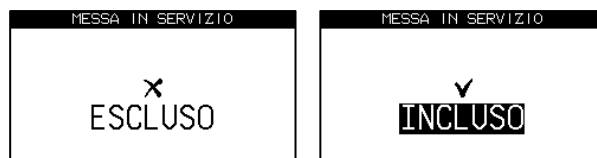


The value shown can be changed using the UP_BUTTON or DOWN_BUTTON. To change selection, use the RIGHT_BUTTON or the LEFT_BUTTON. To exit settings, press the PUMP_PROTECTIONS_DISABLE_BUTTON. It does not require confirmation. The time is retained by the control unit even when it is not powered, thanks to an internal battery.

If the internal battery is not installed, the following date and time will appear on start-up: 1/01/2020, 00:00.00.

EXCLUSION

A parameter can be enabled or disabled; use the UP_BUTTON or DOWN_BUTTON to change the setting. If the parameter is modified, the text is highlighted.



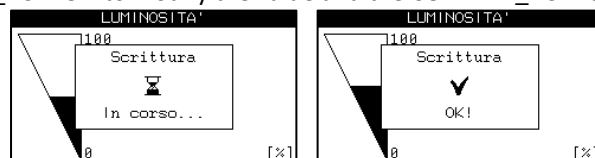
To set it, press the CONFIRM_BUTTON until OK is displayed. To exit programming, press the LEFT_BUTTON or PUMP_PROTECTIONS_DISABLE_BUTTON.

VALUE

The settings screen displays the value of the parameter in the centre (highlighted if modified), the unit of measurement at the bottom right, and the details and quantitative indication of the value on the left:



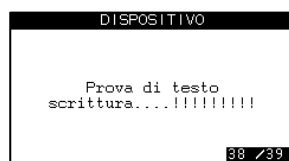
Use the UP_BUTTON or DOWN_BUTTON to modify the value and the CONFIRM_BUTTON to confirm the value:



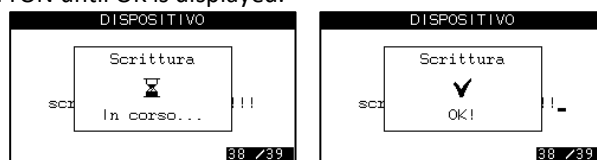
To exit programming, press the LEFT_BUTTON or PUMP_PROTECTIONS_DISABLE_BUTTON. Normally, the set value takes effect only after OK! is displayed. In some settings, the value is modified instantly and retained only if confirmed: an example of this is the LCD contrast setting.

TEXT STRING SETTINGS

The text to be modified is displayed at the centre, and the available number of characters at the bottom right. The cursor indicates the character being edited. Use the LEFT_BUTTON and RIGHT_BUTTON to move the cursor, and the UP_BUTTON and DOWN_BUTTON to change the character.



To set it, press the CONFIRM_BUTTON until OK is displayed.



To exit programming, press the LEFT_BUTTON or PUMP_PROTECTIONS_DISABLE_BUTTON.

TABLE SETTINGS

In some cases table values must be set, for example for the fuel float sensor. The values are represented in two columns:

LIVELLO COMBUSTIBILE		
0	%	---
10	%	---
20	%	---
30	%	---
40	%	---
50	%	---
60	%	---
70	%	---

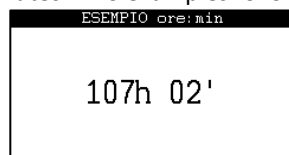
The element being modified is highlighted and flashes. Use the RIGHT_BUTTON to increase the value and the LEFT_BUTTON to decrease it; once the value has been modified, two dots are displayed beside it. To set the entire table, press the CONFIRM_BUTTON until OK is displayed:



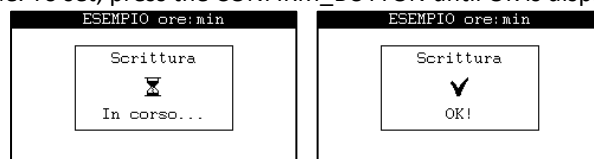
To exit programming, press the LEFT_BUTTON or PUMP_PROTECTIONS_DISABLE_BUTTON.

TIME

Times can be modified in the format hours/minutes. Two examples follow:

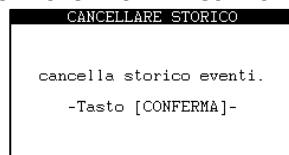


Use the LEFT_BUTTON and RIGHT_BUTTON to move the selection (flashing value with cursor), the UP_BUTTON and DOWN_BUTTON to change the value. To set, press the CONFIRM_BUTTON until OK is displayed:



CONFIRM ACTION

Some settings require confirmation; for example FACTORY SETTINGS RESET or DELETE LOG action:



To confirm, press the CONFIRM_BUTTON until OK is displayed:



SPECIAL CASES

There are some special types of settings (for example, rpm calibration); please see the instructions on the display.

SETTINGS SW

Using the ZW-SMART Software, the control unit can be programmed over the USB Virtual Com Port.

PARAMETER SETTINGS

LANGUAGE CHOICE

Parameter	Factory settings	Range	Notes
LANGUAGE	ITALIANO	ITALIANO	Resetting the language overwrites programmable fault text and maintenance operation text with the default language value. A CUSTOM language cannot be selected unless the messages have been programmed with the ZW-SMART software.
		ENGLISH	
		FRANÇAIS	
		DEUTSCH	
		ESPAÑOL	
		PORTUGUÊS	
		DUTCH	
		CUSTOM	

DATA

Page	Description	Example
RELEASE HW	Device's main ID.	RELEASE HW HW Code: _____40332627 Board: _____0.01 Assembly: _____0.01
RELEASE MODEM	Modem card ID.	RELEASE MODEM HW Code: _____40332629 Board: _____0.01 Assembly: _____0.01
RELEASE FW	Device's FW ID.	RELEASE FW FW Code: _____0x4023 Boot: _____1-00 App: _____0-06
INFO	Device information	INFO s.n.: _____1 Type: _____Model--- Mat: _____Matr.---
PRODUCTION	Production information	PRODUZIONE Coll: _____00/2000 Time: _____48:00 Box: _____00
DEVICE	Device life information	DISPOSITIVO Time: _____123h52'57s Switch ON: _____2255
RETENTION	System operation information	RETENTION Ore Totali: _____3:01 Avviamenti: _____21 Mancati avv.: _____7 Avvio: _____00/00/2000
APP	App connection information	APP s.n.: _____0001641900000001 Code: _____16419 Type: _____CEH-190

CALENDAR CLOCK

Parameter	Variable	Factory settings	Range	Notes
CALENDAR CLOCK	DATE AND TIME	...		Clock/calendar settings.
	FORMAT	ANALOGUE	ANALOGUE	
			DIGITAL	

BATTERY				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" – "9999"	Entering the correct password allows the parameters to be changed.
CHANGE PASSWORD		"0000"	"0000" – "9999"	Change the password for access to the menu.
BATTERY VOLTMETER		INCLUDED	INCLUDED	Displays the starting battery voltage measured between the RED and GREY wires. If disabled, faults "FAULT - BATTERY UNDERVOLTAGE" and "Battery overvoltage" are not active.
			EXCLUDED	
BATTERY VOLTAGE		12 V	12 V	Nominal battery voltage; by setting a new value, the thresholds and delays of BATTERY UNDERVOLTAGE, BATTERY OVERVOLTAGE and ENGINE > ALTERNATOR CHARGE > ALTERNATOR D+ > ENGINE RUNNING D+ are reset to the default values.
			24 V	
BATTERY UNDERVOLTAGE	FAULT	INCLUDED	INCLUDED	See fault.
			EXCLUDED	
	THRESHOLD	11 V [12 V] 22 V [24 V]	8 ÷ 14 V [12 V] 16 ÷ 28 V [24 V]	
	DELAY	2 sec	1 ÷ 5 sec	
	STOP	WITHOUT STOP	WITHOUT STOP WITH STOP	
BATTERY OVERVOLTAGE	FAULT	INCLUDED	INCLUDED	See fault.
			EXCLUDED	
	THRESHOLD	16 V [12 V] 32 V [24 V]	12 ÷ 18 V [12 V] 24 ÷ 36 V [24 V]	
	DELAY	2 sec	1 ÷ 5 sec	
	STOP	WITHOUT STOP	WITHOUT STOP WITH STOP	

ENGINE								
Parameter	Variable		Factory settings	Range	Notes			
ENTER PASSWORD			“0000”	“0000” – “9999”	Entering the correct password allows the parameters to be changed.			
CHANGE PASSWORD			“0000”	“0000” – “9999”	Change the password for access to the menu.			
RPM VARIATION			INCLUDED	INCLUDED	If enabled, it manages rpm variations. If disabled:			
				EXCLUDED	- it does not manage deceleration and cooling. - it does not manage the speed actuator outputs			
STOP	STOP SYSTEM		ENERGIZED IN RUN. MODE	ENERGIZED IN RUN. MODE	Fuel supply system.			
				ENERGIZED IN STOP MODE				
	STOP TIME		20 sec	0 ÷ 60 sec	Stopping system activation time with engine at a standstill.			
	FAILURE TO STOP		120 sec	0 ÷ 120 sec	See STOPPING FAILURE fault.			
START	START TIME		5 sec	5 ÷ 25 sec	Starter motor activation time.			
	PAUSE TIME		5 sec	5 ÷ 10 sec	Pause between start-up attempts.			
	START ATTEMPTS		4	1 ÷ 15	See START-UP FAILURE fault			
GLOW PLUGS	PREHEATING		0 sec	0 ÷ 60 sec	Activated before start-up. 0 sec, pre-heating off. Too long a time can damage the glow plugs.			
	POST-HEATING		0 sec	0 ÷ 60 sec	Enabled throughout engine start-up and for the set time. 0 sec, post-heating off.			
COOLING TIME			0sec	0 ÷ 600 sec	Cooling time prior to automatic stop.			
OIL PRESSURE CHECK			BEFORE STARTING	ENGINE RUNNING	The OIL PRESSURE SWITCH FAULT is disabled and the LOW OIL PRESSURE fault is enabled.			
				BEFORE STARTING	The OIL PRESSURE SWITCH and LOW OIL PRESSURE faults are both enabled.			
RADIATOR LEVEL PROBE			NORMAL OPERATION	NORMAL OPERATION	If there is no liquid, the probe switches off the ground signal.			
				REVERSE OPERATION	If there is no liquid, the probe switches on the ground signal.			
ENGINE TEMPERATURE	FUNCTION		EXCLUDED	EXCLUDED	Enables or disables the instrument and its function.			
				INCLUDED				
	TYPE		TTAO/402	See list “ENGINE TRANSDUCERS”	Transmitters already entered.			
				TABLE		25 °C	----	Custom interpolation table which associates the resistance values with the temperature values. Associate at least two values. The fault
						50 °C	----	
70 °C	----							

		80 °C	----		TEMPERATURE TABLE ERROR will be generated if only one value, or else non-monotonic values, are entered.
		85 °C	----		
		90 °C	----		
		95 °C	----		
		100 °C	----		
		120 °C	----		
		130 °C	----		
	OVERTEMPERA TURE WARNING	FAULT	EXCLUDED	EXCLUDED	See fault.
				INCLUDED	
		THRESHOLD	100 °C	90–140 °C	
		STOP	WITHOUT STOP	WITH STOP WITHOUT STOP	
OIL PRESSURE	FUNCTION		EXCLUDED	EXCLUDED	Enables or disables the instrument and its function.
				INCLUDED	
	TYPE		TPO/403	See list “ENGINE TRANSDUCERS”	Transmitters already entered.
	TABLE	0 bar	----	0 ÷ 380 ohm	Custom interpolation table which associates the resistance values with the pressure values. Associate at least two values. The fault PRESSURE TABLE ERROR will be generated if only one value, or else non-monotonic values, are entered.
		1 bar	----		
		2 bar	----		
		3 bar	----		
		4 bar	----		
		5 bar	----		
		6 bar	----		
		7 bar	----		
		8 bar	----		
		9 bar	----		
	LOW OIL PRESS. WARN.	FAULT	EXCLUDED	INCLUDED	See fault.
				EXCLUDED	
		THRESHOLD	0.5 bar	0 ÷ 6.0 bar	
		DELAY	1 sec	1 ÷ 5 sec	
		STOP	WITHOUT STOP	WITH STOP WITHOUT STOP	
FUEL LEVEL	FUNCTION		INCLUDED	EXCLUDED	Enables or disables the instrument and its function.
				INCLUDED	
	TYPE		VEGLIA	See list “ENGINE TRANSDUCERS”	Transmitters already entered.
	TABLE	0 %	----	0 ÷ 380 ohm	Custom interpolation table which associates the resistance values with the fuel percentage values. Associate at least two values. The fault FLOAT TABLE ERROR will be generated if only one value, or else non-monotonic values, are entered.
		10 %	----		
		20 %	----		
		30 %	----		
		40 %	----		
		50 %	----		
		60 %	----		
		70 %	----		
		80 %	----		
		90 %	----		
		100 %	----		
	FUEL RESERVE	THRESHOLD	10 %	0–100%	NO FUEL fault parameters from level.
	FUEL FINISHED	FAULT	EXCLUDED	INCLUDED	
				EXCLUDED	
		THRESHOLD	1 %	0–100%	
		DELAY	3 sec	0 ÷ 60 sec	NO FUEL fault (level or input) stops or not.
		STOP	WITH STOP	WITH STOP WITHOUT STOP	
ALTERNATOR CHARGE	FAULT	STOP	WITHOUT STOP	WITH STOP	Stop enabled or not in the event of fault
				WITHOUT STOP	
	ALTERNAT OR D+	FUNCTION	INCLUDED	INCLUDED	Includes full management of D+: -fault -engine running
				EXCLUDED	
		THRESHOLD	7 V [12 V] 14 V [24 V]	3 - 24 [V]	Assessment threshold
		FAULT	INCLUDED	INCLUDED	Includes D+ in the charging ALTERNATOR FAULT assessment.
				EXCLUDED	
		ENGINE RUNNING D+	INCLUDED	INCLUDED	Includes D+ in the engine running assessment.
				EXCLUDED	
		PRE-EXCITATION	INCLUDED	INCLUDED	Enables alternator pre-excitation.
				EXCLUDED	
	ALTERNAT OR W	FUNCTION	INCLUDED	INCLUDED	Includes full management of W.
				EXCLUDED	

		FAULT	INCLUDED	INCLUDED	Includes W in the charging alternator fault assessment.
				EXCLUDED	
		ENGINE RUNNING W	INCLUDED	INCLUDED	Includes W in the engine running assessment and in the RPM displayed.
				EXCLUDED	
		CALIBRATION	----	600 ÷ 5000 RPM	Performs RPM calibration. Provides access to parameter after entering the ENGINE password.
ENGINE RUNNING RP		THRESHOLD	600 RPM	300 ÷ 4000 RPM	Engine running assessment threshold.
UNDERSPEED		FUNCTION	EXCLUDED	INCLUDED	UNDERSPEED fault settings
				EXCLUDED	
		THRESHOLD	0 RPM	0 ÷ 4000 RPM	
		STOP	WITHOUT STOP	WITH STOP	
				WITHOUT STOP	
OVERSPEED		FUNCTION	EXCLUDED	INCLUDED	OVERSPEED fault settings
				EXCLUDED	
		THRESHOLD	4000 RPM	0 ÷ 4000 RPM	
		STOP	WITHOUT STOP	WITH STOP	
				WITHOUT STOP	
MAXIMUM SPEED		THRESHOLD	4000 RPM	0 ÷ 4000 RPM	The maximum RPM value that the engine can reach. When the engine reaches this value, the control unit does not allow the engine rpm to increase any further.
BROWN CABLE			15/54	15/54	Activates during engine start-up.
				ALWAYS ACTIVE	Always active; it turns off only with the control unit in power saving mode.

ENGINE TRANSDUCERS

The control unit has already recorded some values of temperature, pressure and fuel float.

Temperature transmitter tables already entered in the control unit										
TYPE	25°C	50°C	70°C	80°C	85°C	90°C	95°C	100°C	120°C	130°C
TTAO/402	896 ohm	365 ohm	196 ohm	145 ohm	127 ohm	110 ohm	97 ohm	85 ohm	53 ohm	30 ohm
VDO/120	544 ohm	197 ohm	97 ohm	70 ohm	60 ohm	51 ohm	44 ohm	38 ohm	22 ohm	17 ohm
VDO/150	909 ohm	324 ohm	157 ohm	113 ohm	97 ohm	83 ohm	72 ohm	62 ohm	37 ohm	29 ohm
BERU	4036 ohm	1259 ohm	560 ohm	387 ohm	324 ohm	273 ohm	231 ohm	196 ohm	106 ohm	80 ohm
VEGLIA		708 ohm	399 ohm	245 ohm	210 ohm	175 ohm	153 ohm	130 ohm	75 ohm	59 ohm
JCB/1707	503 ohm	200 ohm	105 ohm	78 ohm	67 ohm	59 ohm	51 ohm	45 ohm		9
LOMBARDINI	927 ohm	322 ohm	155 ohm	112 ohm	96 ohm	83 ohm	71 ohm	62 ohm	36 ohm	29 ohm
F16173	2130 ohm	834 ohm	435 ohm	323 ohm	280 ohm	243 ohm	213 ohm	186 ohm	114 ohm	91 ohm
VSG40028	1896 ohm	813 ohm	387 ohm	275 ohm	234 ohm	199 ohm	171 ohm	145 ohm	80 ohm	64 ohm
DUTG	1232 ohm	579 ohm	294 ohm	159 ohm	142 ohm	126 ohm	109 ohm	92 ohm	56 ohm	35 ohm
DAEWOOD	446 ohm	153 ohm	73 ohm	52 ohm	44 ohm	38 ohm	32 ohm	28 ohm	16 ohm	12 ohm
CUSTOM	-	-	-	-	-	-	-	-	-	-

Pressure transmitter tables already entered in the control unit										
TYPE	0BAR	1BAR	2BAR	3BAR	4BAR	5BAR	6BAR	7BAR	8BAR	9BAR
TPO/403	270 ohm	251 ohm	203 ohm	157 ohm	114 ohm	79 ohm	47 ohm	32 ohm	23 ohm	1 ohm
VDO	10 ohm		50 ohm		85 ohm		119 ohm		152 ohm	
VDO 29/10	9 ohm	38 ohm	57 ohm	77 ohm	99 ohm	114 ohm	134 ohm	149 ohm	164 ohm	180 ohm
LOMBARDINI	10 ohm	31 ohm	52 ohm	71 ohm	90 ohm	107 ohm	124 ohm	140 ohm	156 ohm	170 ohm
[10-180] ohm	10 ohm	27 ohm	44 ohm	61 ohm	78 ohm	95 ohm	112 ohm	129 ohm	146 ohm	163 ohm
[240-33.5] ohm	240 ohm	219 ohm	199 ohm	178 ohm	157 ohm	137 ohm	116 ohm	95 ohm	75 ohm	54 ohm
DD6E	7 ohm	39 ohm	72 ohm	104 ohm	132 ohm	159 ohm	187 ohm	215 ohm	242 ohm	270 ohm
VSG40030	259 ohm	215 ohm	172 ohm	139 ohm	106 ohm	83 ohm	60 ohm	46 ohm	32 ohm	21 ohm
CUSTOM	-	-	-	-	-	-	-	-	-	-

Fuel float tables already entered in the control unit		
TYPE	0%	100%
VEGLIA	300 ohm	0 ohm
VDO	10 ohm	181 ohm
DATCON	240 ohm	37 ohm
[10-180] ohm	10 ohm	180 ohm
[240-33.5] ohm	240 ohm	34 ohm
DUMP	5 ohm	90 ohm
EUROSWITCH	3 ohm	184 ohm
CUSTOM	-	-

IRRIGATION				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" – "9999"	Entering the correct password allows the parameters to be changed.
CHANGE PASSWORD		"0000"	"0000" – "9999"	Change the password for access to the menu.
PUMP PROTECTION SENSOR		WATER PRESSURE TRANSM.t	WATER PRESSURE TRANSM. PUMP PRESSURE SWITCH	See PUMP PROTECTIONS
PUMP PRESSURE SWITCH DELAY		5 sec	0 ÷ 9999 sec	Cut-in time of the pump pressure switch
PROTECTION ACTIVATION TIME	MINIMUM	2min	0 to 30 min	See PUMP PROTECTIONS
	MAXIMUM	10min	0 to 30 min	
PROTECTION TYPE		AUTOMATIC ACQUISITION	AUTOMATIC ACQUISITION MANUAL ACQUISITION	Enabled if RPM VARIATION = EXCLUDED
PUMP WATER UNDERPRESSURE	FUNCTION	INCLUDED	INCLUDED EXCLUDED	The fault 'pump water pressure low' can be disabled.
	DELAY	5 sec	0 ÷ 9999 sec	Intervention time
	UPPER DIFFERENTIAL	2 BAR	0,1 ÷ 3,0 BAR	Enabled if PROTECTION TYPE = AUTOMATIC ACQUISITION o ENGINE > RPM VARIATION = INCLUDED
	LOWER DIFFERENTIAL	1.0 BAR	0,1 ÷ 3,0 BAR	
	DIFFERENTIAL	26 %	0–99%	Enabled if PROTECTION TYPE = MANUAL ACQUISITION and ENGINE > RPM VARIATION = EXCLUDED
PUMP OVERPRESSURE WATER	FUNCTION	INCLUDED	INCLUDED EXCLUDED	The fault 'pump water pressure high' can be disabled.
	DELAY	5 sec	0 ÷ 9999 sec	Intervention time
	UPPER DIFFERENTIAL	2 BAR	0,1 ÷ 3,0 BAR	Enabled if PROTECTION TYPE = AUTOMATIC ACQUISITION o ENGINE > RPM VARIATION = INCLUDED
	LOWER DIFFERENTIAL	1.0 BAR	0,1 ÷ 3,0 BAR	
	DIFFERENTIAL	26 %	0–99%	Enabled if PROTECTION TYPE = MANUAL ACQUISITION and ENGINE > RPM VARIATION = EXCLUDED
MAXIMUM PRESSURE		25.0 BAR	1,0 ÷ 25,0 BAR	See PUMP PROTECTIONS
MINIMUM PRESSURE		0.2 BAR	0 ÷ 1,0 BAR	See PUMP PROTECTIONS
FILTER WASH	FUNCTION	EXCLUDED	INCLUDED EXCLUDED	See PUMP PROTECTIONS
	PRESSURE	1 BAR	0.2 ÷ 21.0 bar	

MODEM				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" – "9999"	Entering the correct password gives access to the rest of the menu.
CHANGE PASSWORD		"0000"	"0000" – "9999"	Change the password for access to the menu.
MODEM	FUNCTION	INCLUDED	INCLUDED	This parameter is enabled in CEM-196 control units. As a general rule, if the modem module is not installed, it is not possible to enable this function.
			EXCLUDED	
IOT	FUNCTION	EXCLUDED	INCLUDED EXCLUDED	If enabled, the control unit can interact with the app.
	APN	" "	" " ÷ 'z'	APN of the mobile operator, required for app connectivity.
SMS	FUNCTION	INCLUDED	INCLUDED EXCLUDED	If enabled, the control unit can manage SMS text messaging.
	TEXT MESSAGE FROM ALL	INCLUDED	INCLUDED	The control unit will accept SMS commands from all telephone numbers.
			EXCLUDED	The control unit will only accept SMS commands from telephone numbers saved in the directory
	TEXT MSG AT END OF WORK	INCLUDED	INCLUDED EXCLUDED	If enabled, it sends SMS text notifying end of work.
	TEXT MSG START AND STOP	INCLUDED	INCLUDED EXCLUDED	If enabled, it sends SMS text notifying start/stop.
	FUEL FAULT	INCLUDED	INCLUDED EXCLUDED	If enabled, it manages the fuel fault.

	TELEPHONE 1 TELEPHONE 2 TELEPHONE 3 TELEPHONE 4 TELEPHONE 5	“ “	‘ ’ ÷ ‘g’	Telephone numbers to which text messages will be sent with the GSM modem.
--	---	-----	-----------	---

IN-OUT				
Parameter	Factory settings	Range	Notes	
ENTER PASSWORD	“0000”	“0000” – “9999”	Entering the correct password gives access to the rest of the menu.	
CHANGE PASSWORD	“0000”	“0000” – “9999”	Change the password for access to the menu.	
PROGRAMMABLE INPUTS			Menu	
PROGRAMMABLE OUTPUTS			Menu	
GENERAL ALARM	IMMINENT START	INCLUDED	INCLUDED	See GENERAL ALARM
			EXCLUDED	
	DURATION	9999 sec	0 ÷ 9999 sec	See GENERAL ALARM The value 9999 sec indicates operation with no time limit

PROGRAMMABLE INPUTS				
Parameter	Variable	Factory settings	Range	Notes
TYPE	See the table below		FAULT FUNCTION	Identifies whether the input is associated to a function or fault.
FUNCTION (visible if TYPE = FUNCTION)	See the table below		See the full list of functions-input.	Identifies the function associated to the input.
CLOSING DELAY	See the table below		0 ÷ 9999 sec	Delay occurring upon activation.
OPENING DELAY	See the table below		0 ÷ 9999 sec	Delay occurring upon deactivation.
INTERVENTION	See the table below		CLOSED OPEN	The input is active if it is open or closed to common.
STOP (visible if TYPE = FAULT)	See the table below		WITH STOP WITHOUT STOP	Programming enabled if TYPE TYPE = FAULT Sets the moment of activation, storing, the type of alarm and the text for the fault.
DECELERATION (visible if TYPE = FAULT)	See the table below		WITH DECELERATION WITHOUT DECELERATION	
COOLING (visible if TYPE = FAULT)	See the table below		WITH COOLINGt WITHOUT COOLING	
ACTIVATION (visible if TYPE = FAULT)	See the table below		ALWAYS ACTIVE ACTIVE RUNNING	
MEMORY (visible if TYPE = FAULT)	See the table below		NOT STORED STORED	
FAULT TEXT (visible if TYPE = FAULT)	ORANGE/BROWN INPUT FAULT PURPLE/ORANGE WIRE PURPLE INPUT FAULT BLACK/GREEN INPUT FAULT FAULT IN BLACK/BLUE		‘0’ ÷ ‘9’, ‘ ’, ‘A’ ÷ ‘Z’	
				When the language is changed, the text is reset to the default value.

The factory settings for the inputs are the following:

PROGRAMMABLE INPUTS	TYPE	INPUT SETTINGS							
		CLOSING DELAY	OPENING DELAY	INTERVENTION	STOP	DECELERATION	COOLING	ACTIVATION	MEMORY
IN ORANGE/BROWN	FAULT	5	1	CLOSED	NO	-	-	RUNNING	NO
IN ARANCIO/VIOLA	FAULT	2	2	CLOSED	YES	YES	NO	RUNNING	YES
IN PURPLE	PUMP PRESSURE SWITCH	1	1	CLOSED	-	-	-	-	-
IN BLACK/GREEN	CALL	1	1	CLOSED	-	-	-	-	-
BLACK/BLUE INPUT	FUEL PRESSURE SWITCH	1	1	CLOSED	-	-	-	-	-

PROGRAMMABLE OUTPUTS				
Parameter	Factory settings	Range	Notes	
OUTPUT FUNCTIONS	"----	"----	See PROGRAMMABLE OUTPUTS	
		WHITE/BLUE WIRE		
		YELLOW/BLUE WIRE		
		YELLOW/WHITE WIRE		
FAULTS	"----	"----		
		WHITE/BLUE WIRE		
		YELLOW/BLUE WIRE		
		YELLOW/WHITE WIRE		

For the list of functions, refer to the section PROGRAMMABLE OUTPUTS; for the list of faults, refer to the section FAULTS.

Programming default values are as follows:

Parameter	DEFAULT
All	----

SERIAL PORTS				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" - "9999"	Entering the correct password gives access to the rest of the menu.
CHANGE PASSWORD		"0000"	"0000" - "9999"	Change the password for access to the menu.
USB-VCP	VCP ADDRESS	1	1 ÷ 32	Address of the control unit with MOD Bus RTU Slave protocol.
	PROTOCOL	MOD BUS	MOD BUS	Data exchange protocol The CLI protocol is active during regular operation whereas in settings mode, MOD BUS is always active .
			CLI	
RS-485	ADDRESS	1	1 ÷ 32	Communication parameters
	BAUDRATE	9600	1200 ÷ 115200	
	SETUP RESET	E,8,1	E,8,1	
			N,8,1	
			O,8,1	

DEVICE					
Parameter	Variable		Settings setting	Range	Notes
ENTER PASSWORD			“0000”	“0000” - “9999”	Entering the correct password gives access to the rest of the menu.
CHANGE PASSWORD			“0000”	“0000” - “9999”	Change the password for access to the menu.
STAND-BY	FUNCTION		INCLUDED	INCLUDED	Enables or disables the unit’s power saving mode or Stand-By.
				EXCLUDED	
	STAND-BY INPUT TIME		30 sec	1 ÷ 1800 sec	This is how long the unit takes to time out to power saving Stand-By mode and turn off.
	STANDBY IF INPUT FAULT		INCLUDED	INCLUDED	If enabled, the control unit goes into power saving mode even if a fault is present.
				EXCLUDED	
	WAKE UP	IN BLACK/GREEN	DEACTIVATED	DEACTIVATED	See section POWER SAVING.
				OPEN	
				CLOSED	
	IN	DEACTIVATED	DEACTIVATED		

		ORANGE/BROWN		OPEN	
				CLOSED	
DISPLAY	LCD CONTRAST		50 %	0–100%	Display contrast
	BRIGHTNESS		50 %	0–100%	Display brightness
SETUP RESET					Restore the default settings.
HOUR METER			0	0h 0' – 1193046h 59'	Engine run time
FAILED STARTS			0	0 ÷ 65535	Number of failed starts
STARTS			0	0 ÷ 65535	Number of engine start-ups
LIGHT CONTROL			EXCLUDED	INCLUDED	Enables or disables the spotlight command in the main dashboard.
				EXCLUDED	
UNIT OF MEASUREMEN	TEMPERATURE	°C	°C	Unit of measurement displayed for the TEMPERATURE measurement instruments.	
			°F		
	PRESSURE	bar	bar	Unit of measurement displayed for the PRESSURE measurement instruments.	
			kPa		
			psi		

HISTORY				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" - "9999"	Entering the correct password gives access to the rest of the menu.
CHANGE PASSWORD		"0000"	"0000" - "9999"	Change the password for access to the menu.
HISTORY				Display of event log, always accessible.
DELETE HISTORY				Delete the contents of the log, password access.

MAINTENANCE				
Parameter	Variable	Factory settings	Range	Notes
ENTER PASSWORD		"0000"	"0000" - "9999"	Entering the correct password gives access to the rest of the menu.
CHANGE PASSWORD		"0000"	"0000" - "9999"	Change the password for access to the menu.
MAINTENANCE 1 MAINTENANCE 2 MAINTENANCE 3	MODE	DEACTIVATED	DEACTIVATED	See maintenance.
			MOTOR HOURS	
			RUNNING HOURS	
			CALENDAR	
	EXPIRY	...	DATE MOTOR HOURS RUNNING HOURS Depending on the mode.	Indicates the data regarding the next scheduled maintenance expiry.
	MAINTENANCE TEXT	MAINTENANCE 1 MAINTENANCE 2 MAINTENANCE 3	'0' ÷ '9', ' ' , 'A' ÷ 'Z'	Text displayed When the language is changed, the text is reset to the default value.
RESET				Resets the expired maintenance.
START-UP		...	CLOCK/CALENDAR	System commissioning date.

REPLACING THE CONTROL UNIT

Before replacing the control unit, we advise you to transfer all the technical settings to a personal computer and save them in an archive file. This operation can be performed using the ZW-SMART software, which can be requested from Elcos or downloaded from the website www.elcos.it.

TECHNICAL SPECIFICATIONS						
Power supply						
Suitable for batteries			12Vdc		24Vdc	
Operating range	Identifier	Terminal	Colour	8–48Vdc		
	+BATT	CONN A-A8 CONN A-B8	RED			
	-BATT	CONN A-C8	GREY			
Absorption with engine not running *1)			CEM-190	130mA @ 12Vdc	90mA @ 24Vdc	
			CEM-196	145mA @ 12Vdc	100mA @ 24Vdc	
Absorption in Stand-By *1)			Approx. 12mA		Approx. 10mA	
Voltage dip on battery power supply			From 10Vdc to 0Vdc for 150ms			
STATIC-type closed outputs on +BATT tipo STATICO						
Identifier	Terminal		Colour		Maximum load	
GLOW PLUGS	CONN A-C1		WHITE/BROWN		0.5 A	
GENERAL ALARM	CONN A-A3		RED/GREEN		0.5 A	
15/54	CONN A-A5		BROWN		0.5 A	
Programmable	CONN B-C2		YELLOW/BLUE		0.5 A	
Programmable	CONN B-C3		YELLOW/WHITE		0.5 A	
Programmable	CONN B-A8		WHITE/BLUE		0.5 A	
VAR	CONN B-A1; CONN B-B1		GREEN and YELLOW		3 A	
RELAY-type closed outputs on E-POWER						
Identifier	Terminal		Colour		Maximum load	
STOP	CONN A-A6		YELLOW		3A (2A@65°C)	
RELAY-type closed outputs on +BATT						
Identifier	Terminal		Colour		Maximum load	
STARTING	CONN A-A1; CONN A-B1 (Use both)		BLACK		20 A @12V	10 A @24V
Analogue Inputs						
Identifier	Terminal	Colour	Input	Accuracy	Measurement range	
FUEL FLOAT	CONN A-C4	ORANGE/BLUE	0–380 Ω	±2% *1)	0–100%	
ENGINE TEMPERATURE TX	CONN A-C3	WHITE/PURPLE	0–3200 Ω	±2% *1)	0–140 °C	
OIL PRESSURE TX	CONN A-C2	YELLOW/ORANGE	0–380 Ω	±2% *1)	0.0 ÷ 9.0BAR	
Frequency outputs						
Identifier	Terminal	Colour	A/C voltage		Measurement range	
ALTERNATOR W	CONN A-A4	WHITE/RED	0.75 ÷ 65 Vac		50–2000 Hz	
Voltage inputs						
Identifier	Terminal	Colour	Measurement range			
ALTERNATOR D+	CONN A-B3	GREEN	0.5 ÷ 30 Vdc			
Digital inputs (closed to negative)						
Identifier	Terminal	Colour	Threshold H	Threshold L	Max. current supplied	
OIL PRESSURE SWITCH	CONN A-B2	WHITE	> 2V	≤ 0.8V	3.3 mA @ 48 V	
ENGINE THERMOSTAT	CONN A-B6	BLUE				
FLOAT SWITCH CONTACT	CONN A-B7	ORANGE				
Programmable (def. FAULT)	CONN A-C6	ORANGE/BROWN				
Programmable (def. FAULT)	CONN A-C7	ORANGE/PURPLE				
Programmable (def. CALL)	CONN B-A5	BLACK/GREEN				
Programmable (def. PUMP PRESSURE SWITCH)	CONN B-C4	PURPLE				
Programmable (def. FUEL PRESSURE SWITCH)	CONN B-C5	BLACK/BLUE				
Emergency button						
Identifier	Terminal	Colour	Characteristics			
E-V_BATT	CONN A-A2	BROWN	Battery positive			
E-POWER	CONN A-A7	BLUE	STOP output supply			
E-IN	CONN A-B5	YELLOW/GREEN	Digital input			
			Threshold H		Threshold L	Max. absorbed current
			> 2V		≤ 2V	4 mA @ 48 V
Lines of communication						
USB 2.0 (USB-B connector)	Inside control unit		Not isolated. Maximum cable length 3 m.			
Environmental conditions						
Operating temperature			-20–60 °C			
Storage temperature			-20–60 °C			
Relative humidity			≤ 80%			
Protection class						
IP			IP 54			
Container						
Weight			1.25 Kg			
Dimensions (LxHxD)			Only container: 172x157x134mm With fastening brackets: 202.2x172x134mm			
Wiring length			2.0 m			
Material			PC-ABS V0 and front panel in metal			
Water pressure transmitter						
Identifier	Terminal	Colour	Characteristics			
TPA-GROUND	CONN B-A2	GREEN	GROUND			
TPA-POWER	CONN B-A3	BROWN	+5v			
TPA-IN	CONN B-A4	WHITE	Voltage input [0 ÷ 5] VDC			

*1) approximate value

WARNING

It only controls and commands a diesel-engine driven irrigation pump. Commands the stop if a fault to probe-controlled parts occurs. It is also designed for installation on board the machine.

Warning: Compliance with the following recommendations is obligatory



- Always make connections following the wiring diagram provided in the manual.
- All works performed on the unit must be carried out with the engine off and with starter motor terminal 50 disconnected.
- Check the consumption of the connected devices is in line with the described technical specifications.
- The installation must always guarantee adequate dissipation of heat.
- Always install the device at a lower position than any other devices that produce or dissipate heat.
- Handle and connect without exposing the electronic circuit board to mechanical strain.
- Do not let cuttings of copper conductors or other metal residues drop onto the control unit.
- Never disconnect the battery terminals while the engine is running.
- Strictly avoid using a battery charger for emergency start-up; this could damage the control unit.
- To safeguard persons and equipment, always disconnect the electrical system terminals from the battery poles before connecting an external battery charger.

Device sensitive to electrostatic discharge

Do not open the container unless precautions to avoid electrostatic discharges have been taken.



This control unit is not suitable for operation under the following conditions:



- Where the room temperatures exceeds the limits specified in the technical data sheet.
- Where abrupt shifts in temperature and air pressure produce exceptional condensation.
- Where there is high pollution caused by dust, fumes, vapour, salts and corrosive or radioactive particles.
- There is high radiation of heat due to direct sunlight, ovens or the like.
- You suspect the presence of mould or pests.
- There is a danger of fire or explosion.
- Strong shocks or vibrations can be transmitted to the control unit.

Electromagnetic Compatibility

This control unit works correctly only if it is installed in systems that comply with regulations governing CE marking; in fact, it complies with the immunity requirements given in EN61326-1, but this does not rule out the possibility that malfunctions could occur in extreme cases that may arise in particular situations.

The installer is responsible for checking that the level of perturbation does not exceed that specified in standards.

Operation and maintenance

We recommend the following maintenance on a weekly basis:



- checking the signals;
- checking the battery status;
- checking the wires are connected firmly and the condition of the terminals.

IN THE ABSENCE OF OUR WRITTEN DECLARATION ATTESTING TO THE CONTRARY, THIS UNIT IS NOT SUITABLE FOR USE AS A CRITICAL COMPONENT IN EQUIPMENT OR SYSTEMS VITAL TO THE LIFE OF PEOPLE AND OTHER LIVING THINGS.

INFORMATION FOR ORDERING

Type	Item Code
CEM-190	00210736
CEM-196	00210737

STANDARD ACCESSORIES

Type	Item Code
CEM-190 ENGINE PRE-WIRED FEMALE CONNECTOR	70804452
PREWIRED FEMALE CONNECTOR CEM-190 TPA-200	70804453
CABLE FOR TPA-200 CEM-190	40500262
TPA-200 PUMP WATER PRESSURE TRANSMITTER	70500255
REDUCING NIPPLE F1/4" GAS – M3/8" GAS	70190241
ZANCHE CEP/CEM KIT	40804362
MAGNETIC ANTENNA WITH 3m cable (ONLY FOR CEM-196)	70070187
SUPERSEAL 2-POLE CONNECTOR KIT	40804602

ACCESSORIES AVAILABLE ON REQUEST

Type		Item Code
AST-015/00	Rod electrode, including accessories	40241012
E-25	Screw electrodes, including accessories	40190115
VAR-140 12V	Linear actuators	00571543
VAR-144 24V	Linear actuators	00571551
CRU-1901	Base assembly support	40493385
ZW-SMART	Programming software	00070212

DOCUMENTATION ON REQUEST

Downloadable from the website www.elcos.it/



List of MOD Bus CEM-196 addresses

CONFORMITY
CE