CLA-VAL **D22**

Electronic Valve Controller

User Manual

Reduce your waste - Sort your rubbish

Table of Contents

1 INTRODUCTION

1.1 PRECAUTIONS BEFORE STARTING

: Before usage, make sure that the latest software version is installed on your device. You can download the latest software from: www.cla-val.ch.

: This equipment must be handled with precaution. CLA-VAL electronic products are robust and designed to work under field environmental conditions, but high shocks and strong mechanical constraints can damage the equipment and/or alter its functionality.

1.2 TROUBLESHOOTING

1.2.1 NOTHING ON THE DISPLAY

1. Check if there is a proper power supply applied to the electronic valve controller. A clean 12 VDC to 24 VDC continuous voltage must be provided to one of the "**V+**" connections in the junction terminal (grounded to the "**V-**").
2. Check that the screen is not in standby mode by clicking on one of the five navigation buttons. If the screen switches on, you can unlock the screen by clicking two seconds on the "**Home/Ok**" button.

1.2.2 AN INPUT OR VARIABLE IS DISPLAYED IN RED, ORANGE OR BLUE

See the colour coding convention used on the electronic valve controller for the inputs, outputs and variables in chapter 3.1.

1.2.3 ISSUE WITH THE BEHAVIOUR OF THE VALVAPPS™

Refer to the technical datasheet related to your ***ValvApps***™, and especially the block diagram and the logic scheme explaining its behaviour.

For any remaining issue, please contact CLA-VAL.

1.3 GENERAL DISCLAIMER

In accordance with our policy of continuous development and improvement, CLA-VAL reserves the right to modify or improve its products at any time without prior notice. CLA-VAL assumes no liability or responsibility for any errors or omissions in the content of this document.

1.4 ENVIRONMENTAL PROTECTION

Help to preserve and protect the environment. Recycle used equipment and accessories.

1.5 TYPOGRAPHY

Throughout this manual, the following typographical conventions and symbols have been adopted to help readability:

a. "**Bold":** Menu, command, tab and button.

b. ***BOLD ITALIC***: Important information.

c. (1): Number of the reference marks on image.

d. **www.cla-val.ch:** Web-site address.

e.  : Some tips.

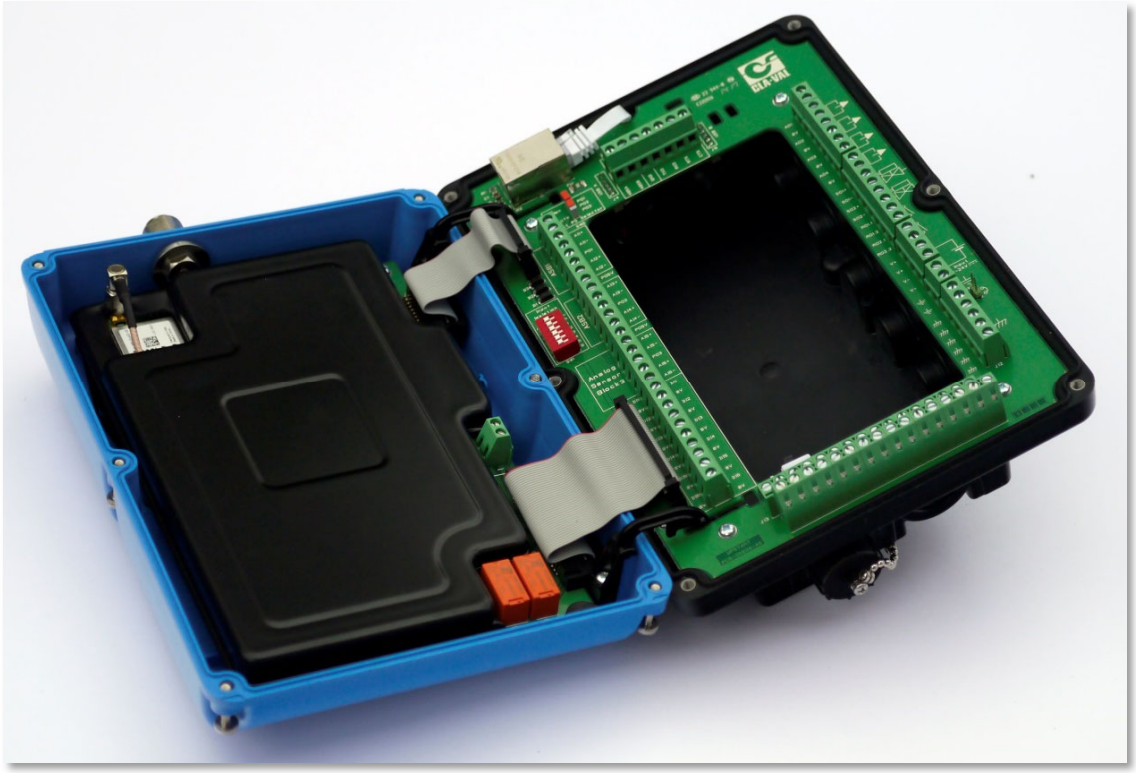
f. : Warning!

2 ELECTRICAL & MECHANICAL DETAILS

2.1 TECHNICAL CHARACTERISTICS

Enclosure	
Material	Flame retardant PC/ABS plastic
Connections	M16/M20 IP-68 Cable Glands IP-68 USB Type A IP-68 RJ45 Ethernet Port
Dimensions	227 mm (8.94") H x 160 mm (6.3") W x 95 mm (3.74") D
Protection	IP68 (1 month under 2 meters)
Mounting Bracket	Stainless steel
Power Requirements	
Voltage Input	12 VDC to 24 VDC
Power Consumption	1.9 W in stand-by, 3 W nominal when regulating (up to 30 W peak consumptions)
Protection	32 VDC over-voltage protection Reverse voltage protection
Inputs (Screw Connection I/O terminal)	
Analog (AI1 to AI6)	6 (six) 4-20 mA inputs (max. voltage = 32 VDC)
Digital (DI1 to DI6)	6 (six) dry contacts inputs (max. voltage = 5 VDC @ 0.1 A, max. frequency = 100 Hz)
Units	Configurable
Decimal point	1 (“0”) to 4 (“0.000”) significant digits
Signal filter	Cumulative filter configurable 1% to 99%, or disabled
Totalizer	Configurable input and units
Outputs (Screw Connection I/O terminal)	
Analog (AO1 to AO4)	4 (four) 4-20 mA outputs (10-bit resolution, impedance = 500 Ω)
Solenoid (SO1 and SO2)	2 (two) solid state relay (24 VDC @ 0.5 A - binary or proportional)
Relay (RO1 and RO2)	2 (two) mechanical relay (max. voltage 24 VDC or 240 VAC, max. current 2 A)
PID Control Parameters	
Proportional Band	0% to 100% (adjustable in 1% increments - independently for opening and closing)
Dead Band	Adjustable from 0 to full-scale of set-point signal
Cycle Time	0 s to 60 s (adjustable in increments of 1 s)
Integral Band	0 s to 60 s (adjustable in increments of 1 s)
Derivative Band	0 s to 60 s (adjustable in increments of 1 s)
Loop Zoning	Up to 4 zones
PID Loops	Up to 4
Display & Navigation	
Display	4.3" color display (272 x 480, 24-bit)
Navigation	5 (five) mechanical push buttons
Communication	
Interfaces	Ethernet, 2G / 3G / 4G (GPRS, LTE-M, NB-IoT), RS-232 & RS-485, USB
Protocols	Modbus RTU, Modbus TCP, VNC, FTP
Logging	
Process	Manual and Automatic
Memory	Internal memory, SD card (4 GB default), Export to USB, Export to FTP server
Logging speed	1 minute
Format	CSV file (proprietary format)
Temperature Range	
Working Temperature	-10°C to +80°C
Storage Temperature	-30°C to +85°C

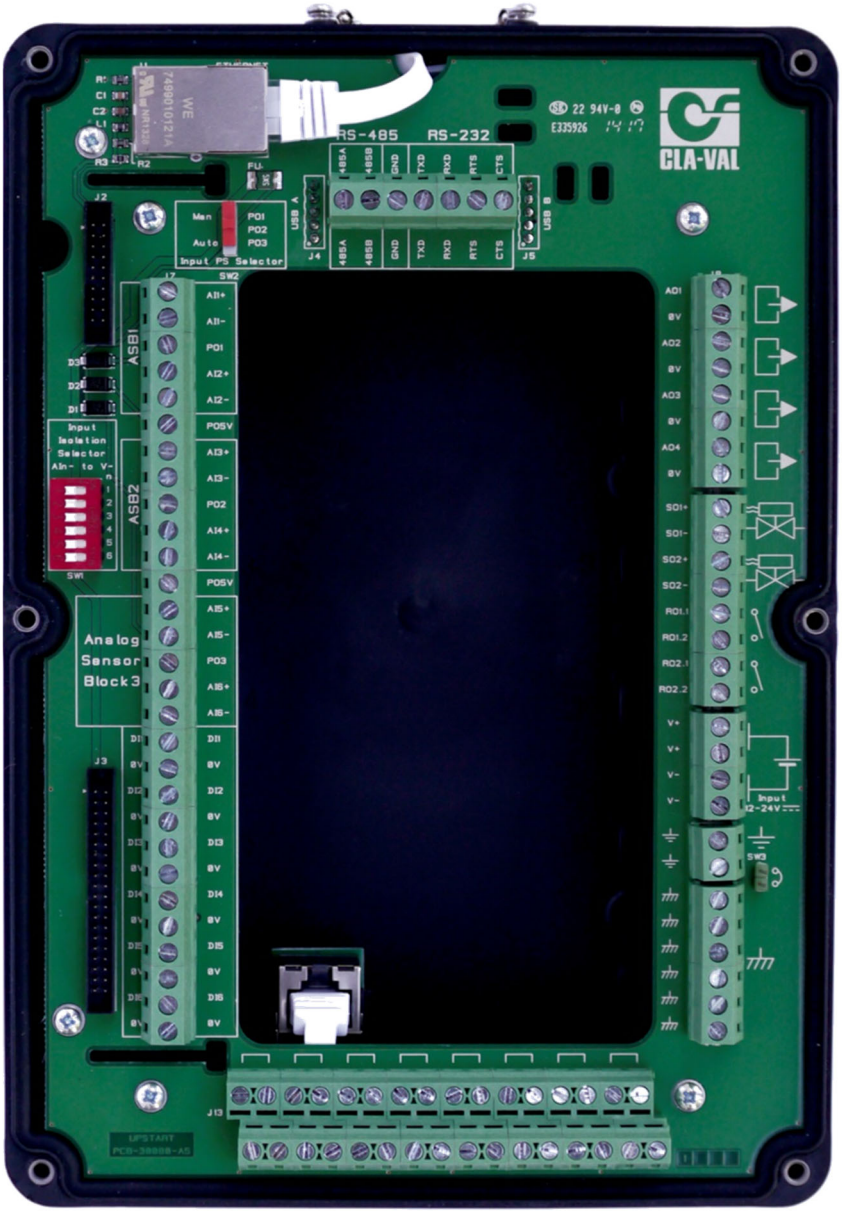
2.2 MECHANICAL DETAILS



The product is composed of two separable sub-parts:

- **Cover:** this part contains the main electronic board implementing all the control electronics of the electronic valve controller.
- **Junction board:** this part contains the connection blocks for the power supply, inputs and outputs.

2.2.1 JUNCTION BOARD INTERNAL CONNECTIONS

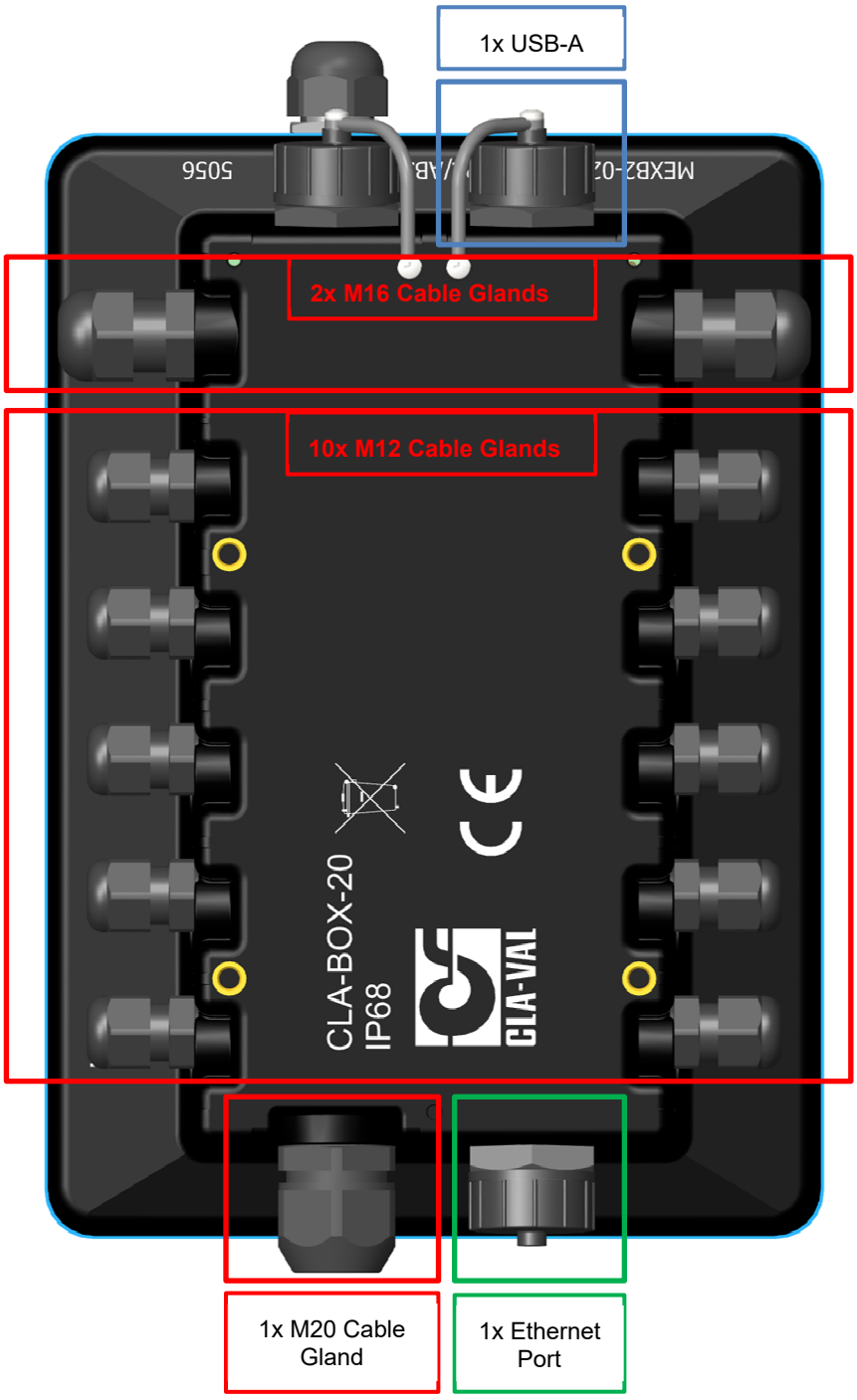


2.2.2 JUNCTION BOX CABLE GLANDS / SIZES / LOCATIONS

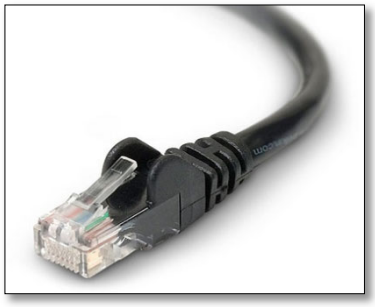
To ensure IP68 protection, the junction box is interfaced via cable glands (optionally Souriau™ connectors).

A) Multi-Conductor Cable Size / Wire Gauge. **Note:** To preserve IP68, the following must be respected.

- M12 Multi-Conductor Cable Size Range: 3 mm - 6 mm (0.12" - 0.26").
- M16 Multi-Conductor Cable Size Range: 5 mm - 10 mm (0.20" - 0.39").
- M20 Multi-Conductor Cable Size Range: 6 mm - 12 mm (0.24" - 0.47").



B) Ethernet



In the Ethernet port, it is possible to connect RJ-45 Ethernet cables, just like those shown in the photo on the left side.

C) USB-A

The USB-A slot gives the possibility to connect standard USB Flash Drives (shown in the photo on the right side).

2.2.3 COVER PART

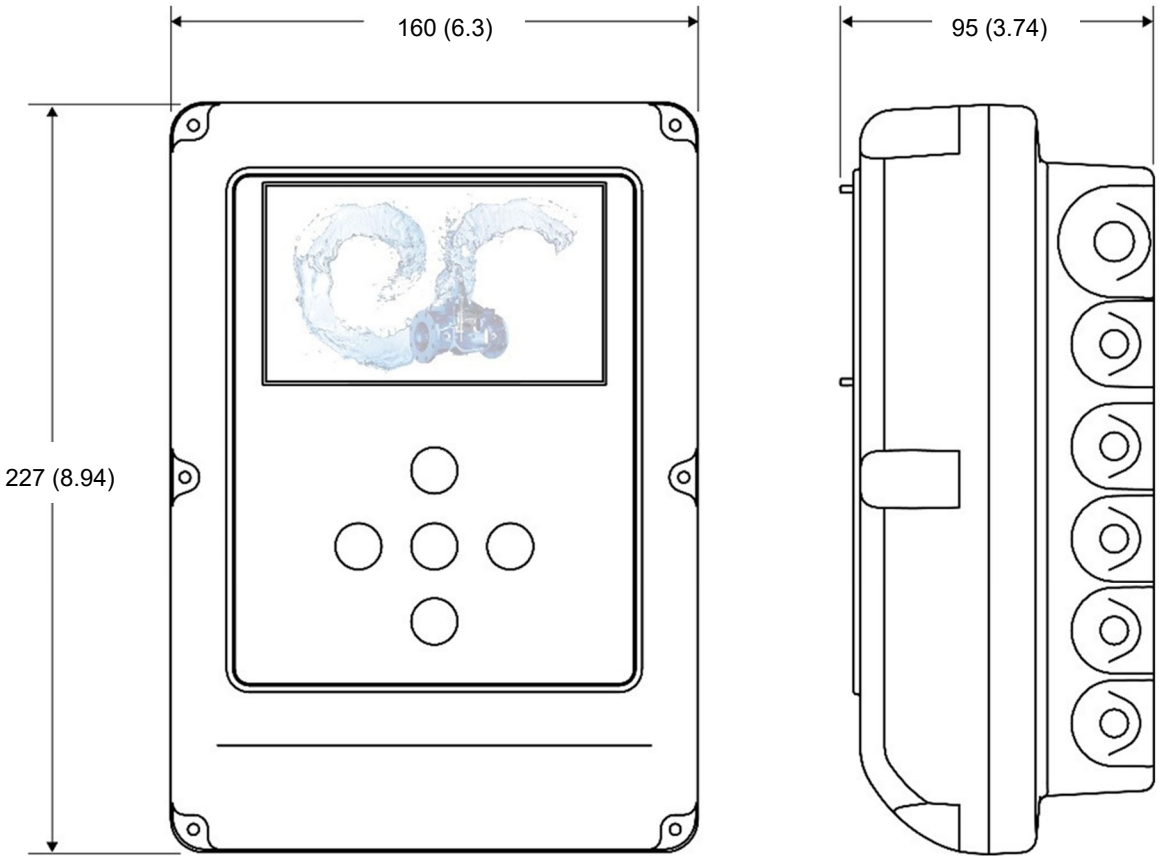
The cover part is physically separable from the junction board. This part of the product contains all the control electronics of the electronic valve controller. The cover should not be opened and is not intended to be accessed by the user, except for memory or SIM card access.

2.3 PHYSICAL MOUNTING

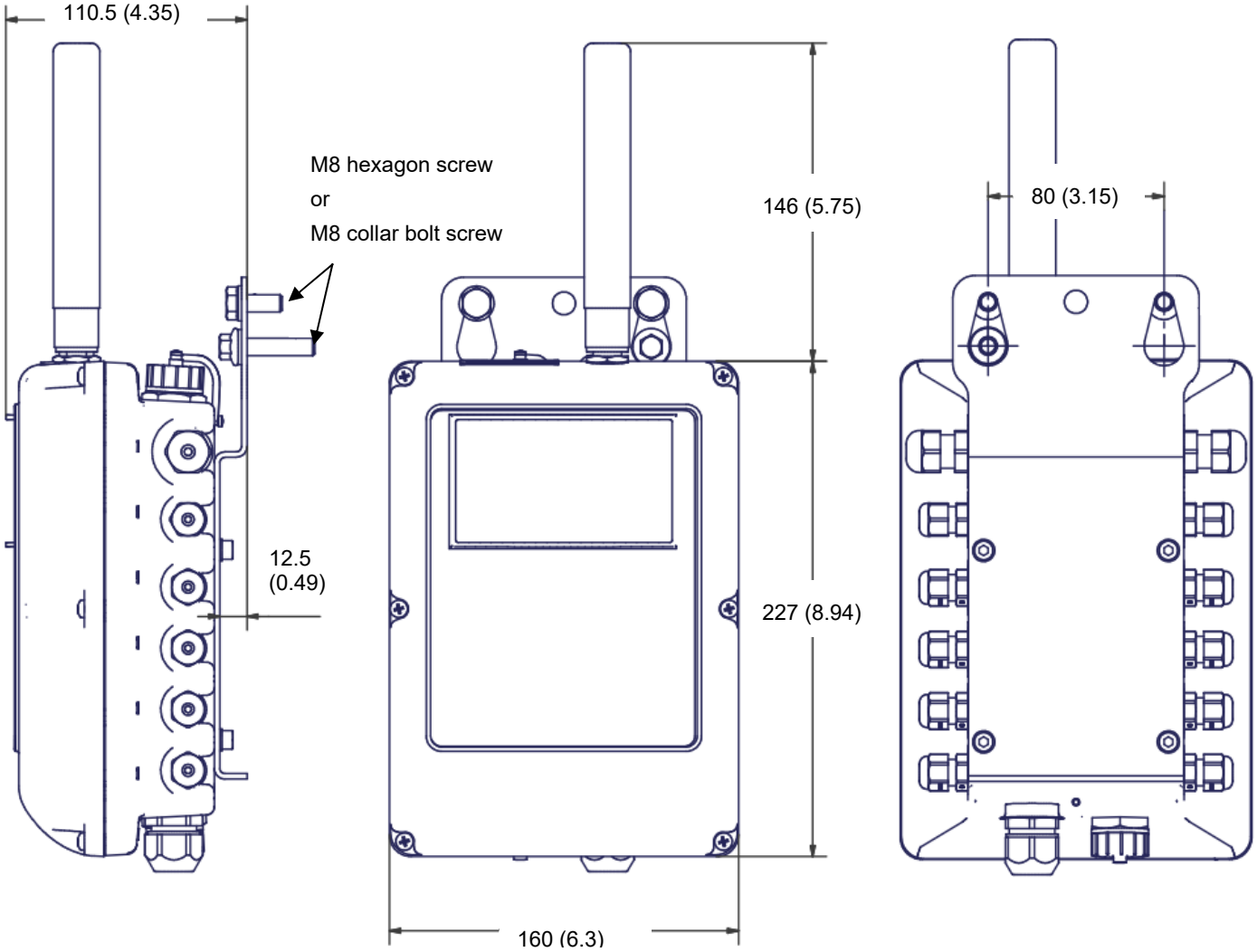
2.3.1 OVERALL DIMENSIONS

For all drawings below, units are in millimeters (inches).

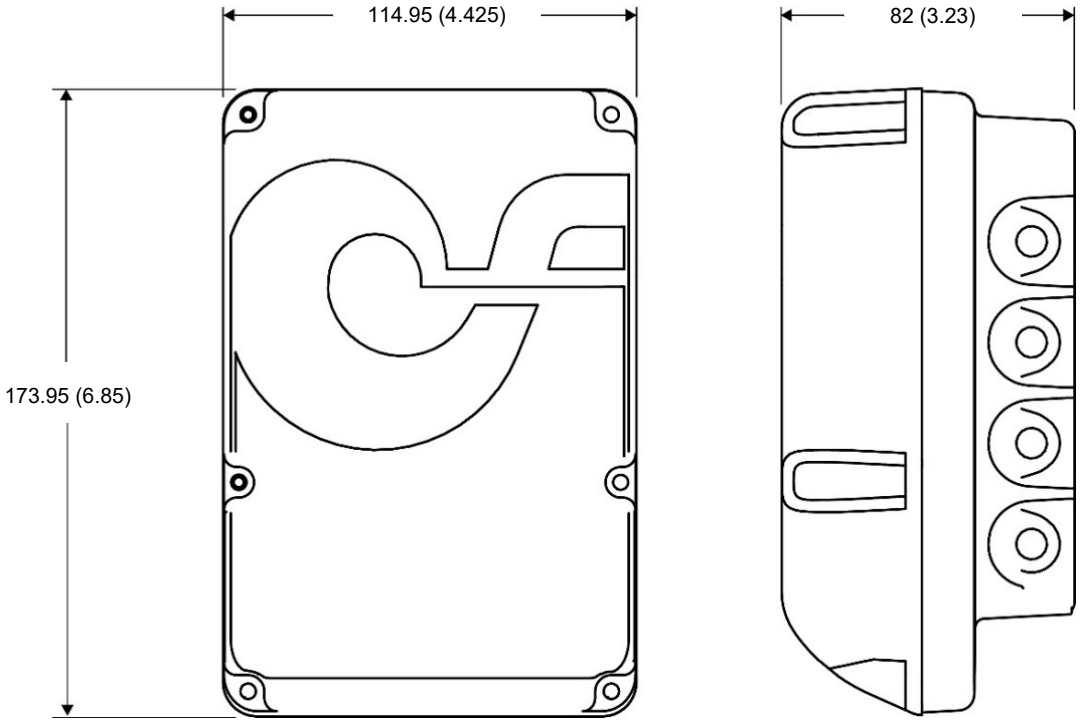
- Control box.



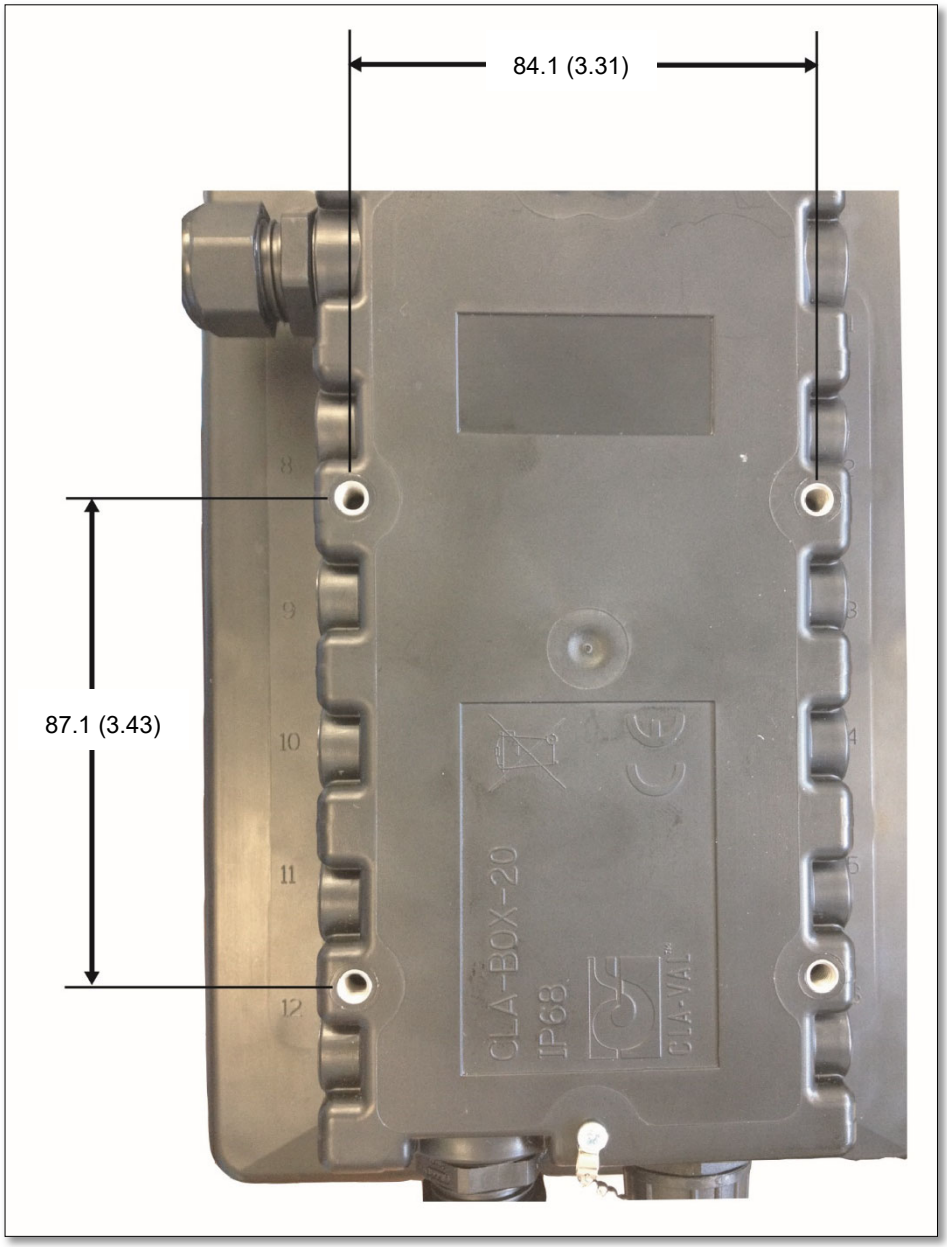
- With antenna and wall-mounting bracket.



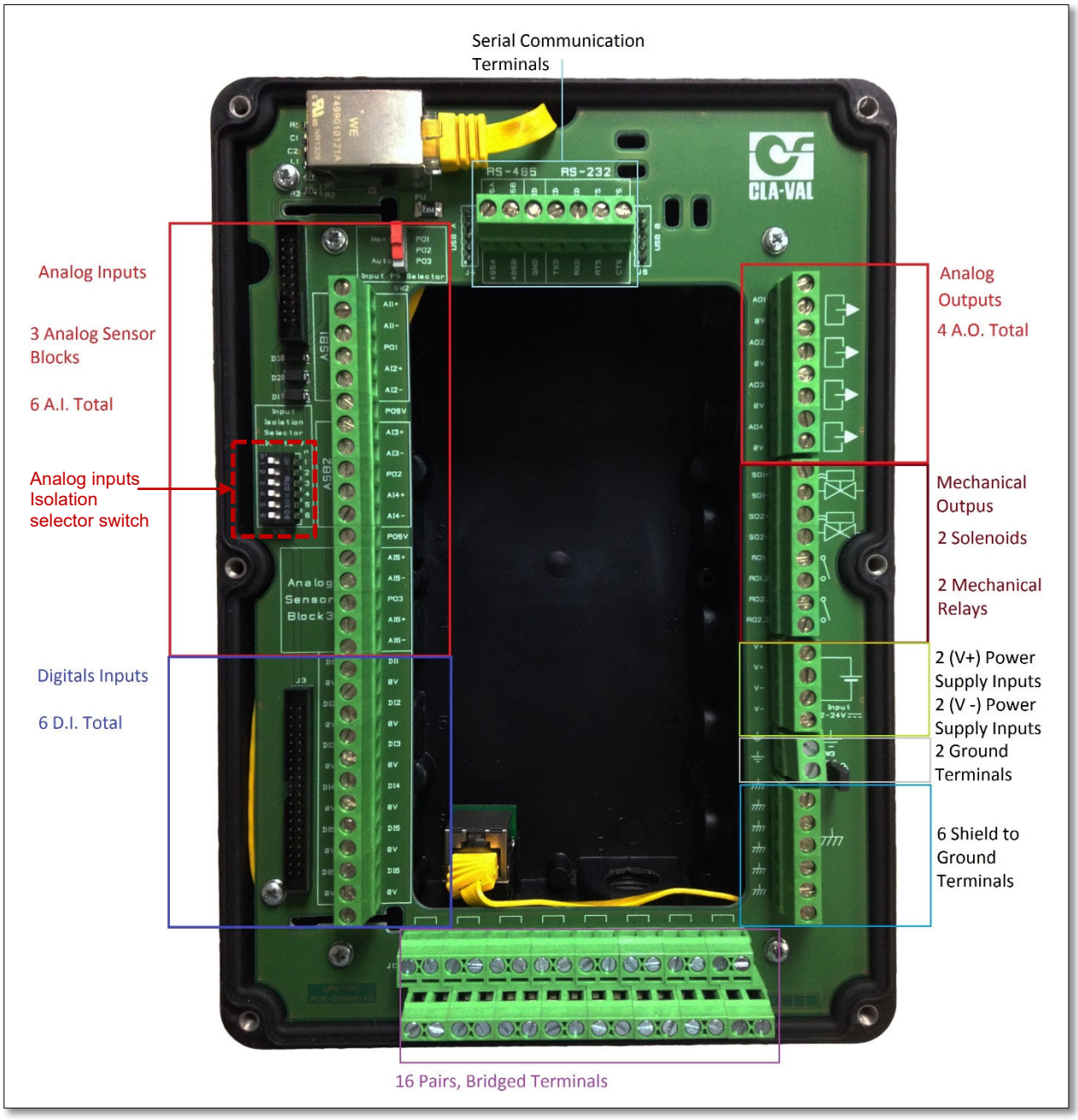
- Cla-Box 10 (accessory box - U1 option).



2.3.2 BOLT PATTERN

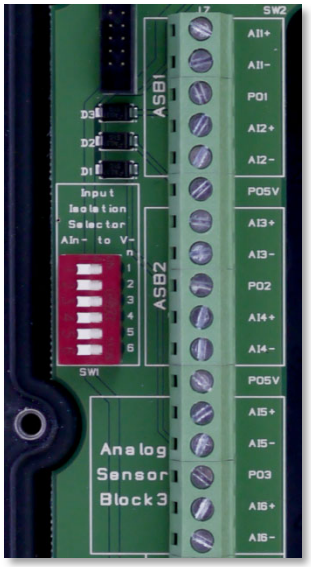


2.4 HARDWARE INPUTS/OUTPUTS (I/O)



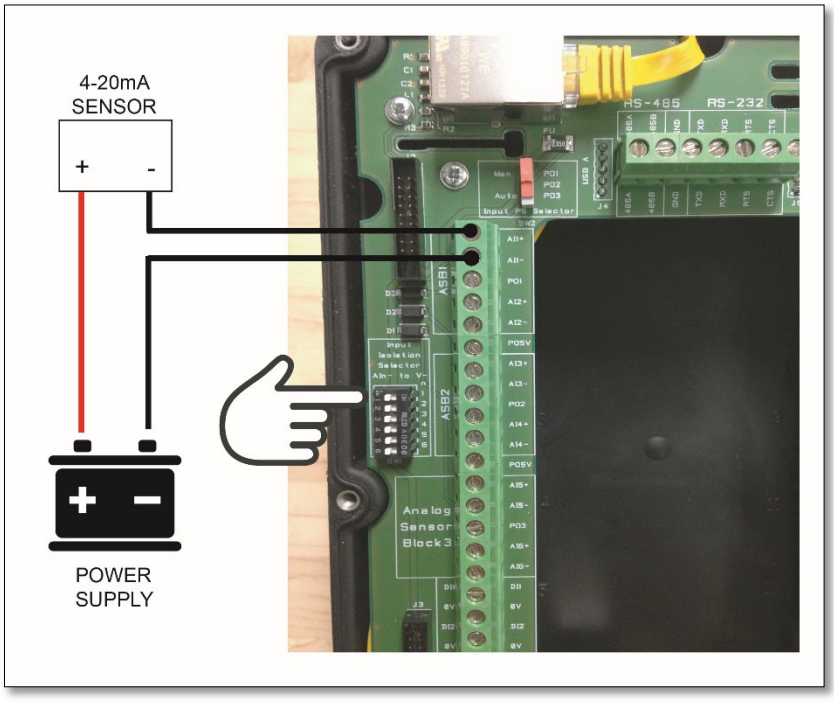
- Inputs:
  - Six Analog Inputs (AI).
  - Six Digital Inputs (DI).
- Outputs:
  - Four Analog Outputs (AO).
  - Four Mechanical Outputs: 2x Solenoid Outputs, 2x Contact Closures (mechanical relays).

2.5 WIRING ANALOG INPUTS FOR 4-20 MA SENSORS



2.5.1 2-WIRE 4-20 MA SENSOR (LOOP POWER)

2.5.1.1 2-wire (Externally Powered)

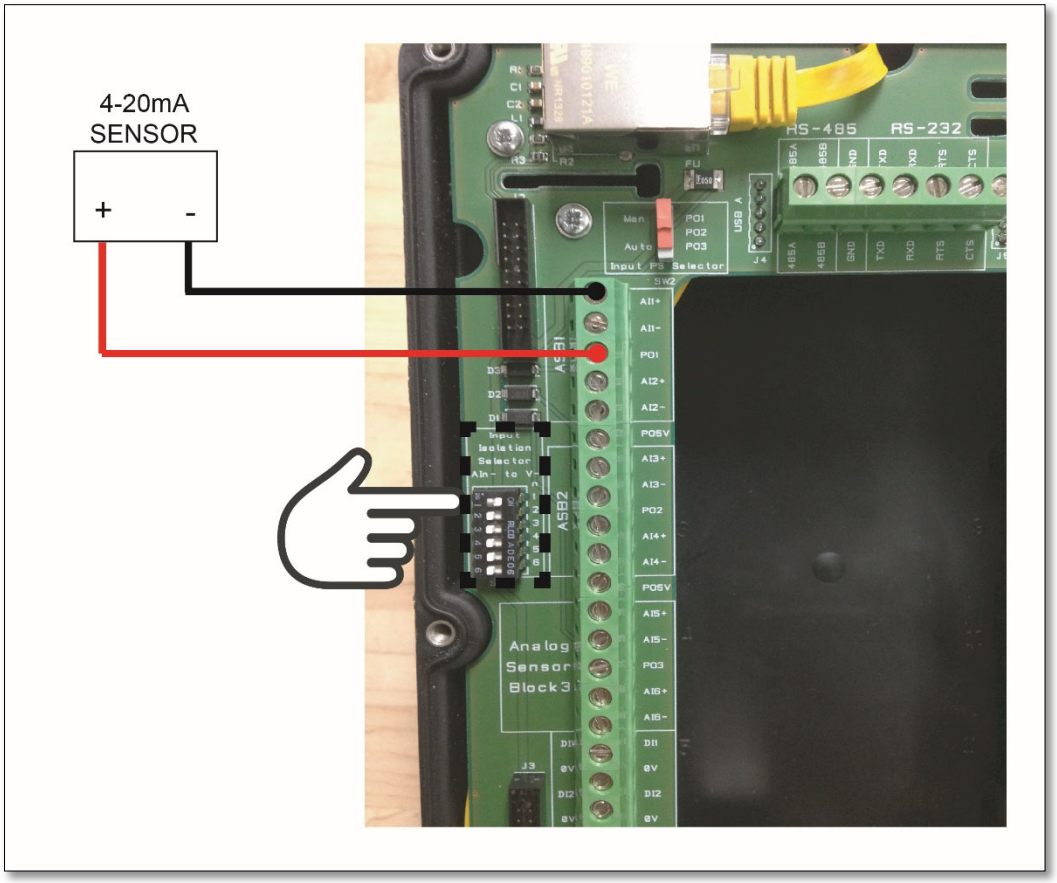


For isolated 2-wire signals, the power supply, sensor and electronic valve controller make a continuous loop, allowing the current to be measured by the electronic valve controller.

⚠ For isolated signals, ensure that the "Isolation Selector Switch" is set to the ***LEFT*** or "**OFF**".

Examples: Mag Meter

2.5.1.2 2-wire (Internally Powered)



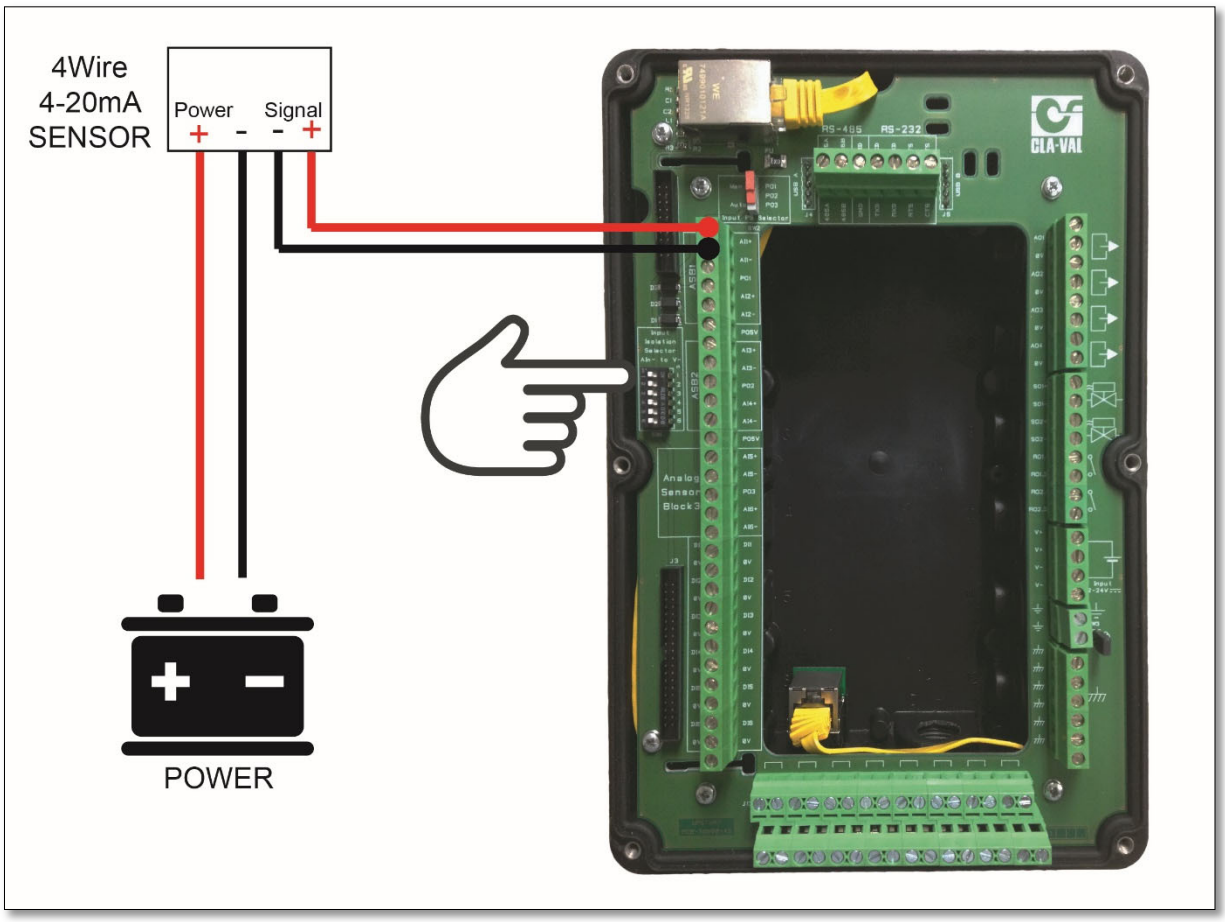
For non-isolated signals, the electronic valve controller provides the power for the sensor and makes a continuous loop, allowing the current to energize the sensor and then be measured by the electronic valve controller.

⚠ For non-isolated signals, ensure that the "Isolation Selector Switch" is set to the ***RIGHT*** or "***ON***".

Examples: e-FlowMeter, pressure transducer.

2.5.2 4-WIRE 4-20 mA SENSOR

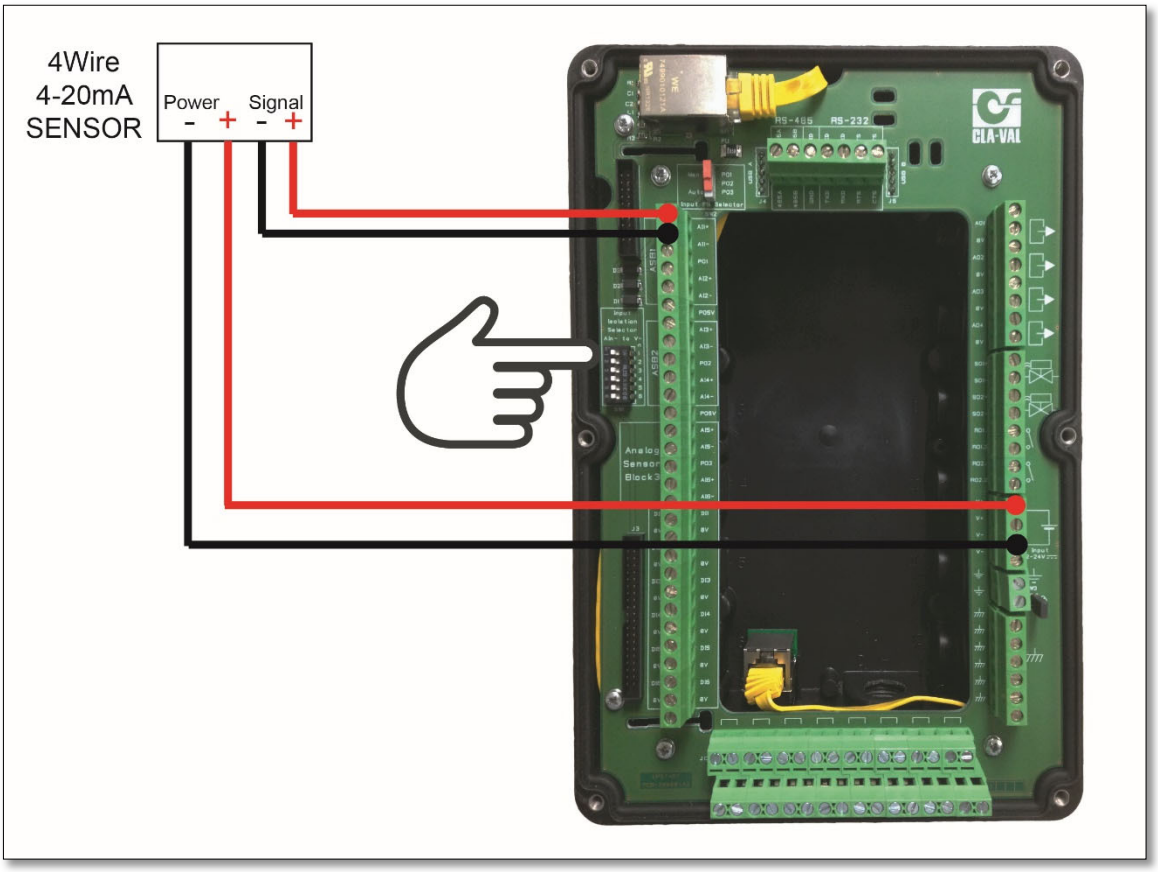
2.5.2.1 4-wire (Externally Powered)



For 4-wire signals, the sensor is externally powered usually using 2 wires. The two signal wires coming from the sensor are then measured by the electronic valve controller in the analog input section of the terminal board.

⚠ For 4-wire signals, ensure that the "Isolation Selector Switch" is set to the ***LEFT*** or "***OFF***".

2.5.2.2 4-wire (Internally Powered)



For 4-wire internally powered signals, the sensor is powered directly from the main electronic valve controller power supply terminals. The two signal wires coming from the sensor are then measured by the electronic valve controller in the analog input section of the terminal board.

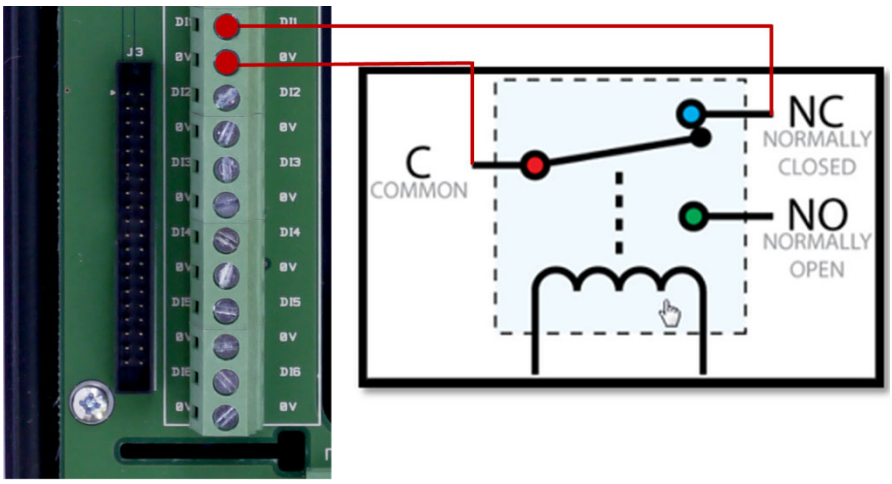
⚠ For isolated signals, ensure that the "Isolation Selector Switch" is set to the ***LEFT*** or "**OFF**".

2.6 WIRING DIGITAL INPUTS

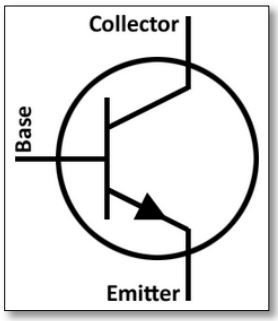
2.6.1 MECHANICAL RELAY

A mechanical relay can be used as a digital input because the state is either open (1) or closed (0). Depending on how the input is configured, action can be taken when this mechanical switch closes or opens.

Typical application: position/limit/proximity/level switch.



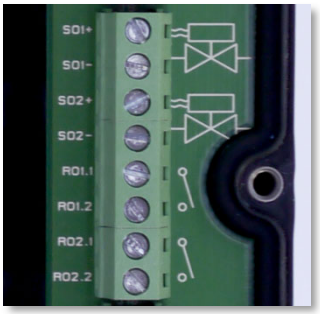
2.6.2 NPN TRANSISTOR



An NPN transistor can be used as a digital input because the state is either open (V+) or closed (V-). Depending on how the input is configured, action can be taken when this NPN transistor switches state.

Typical applications: digital pulse output from flow meter or register counter.

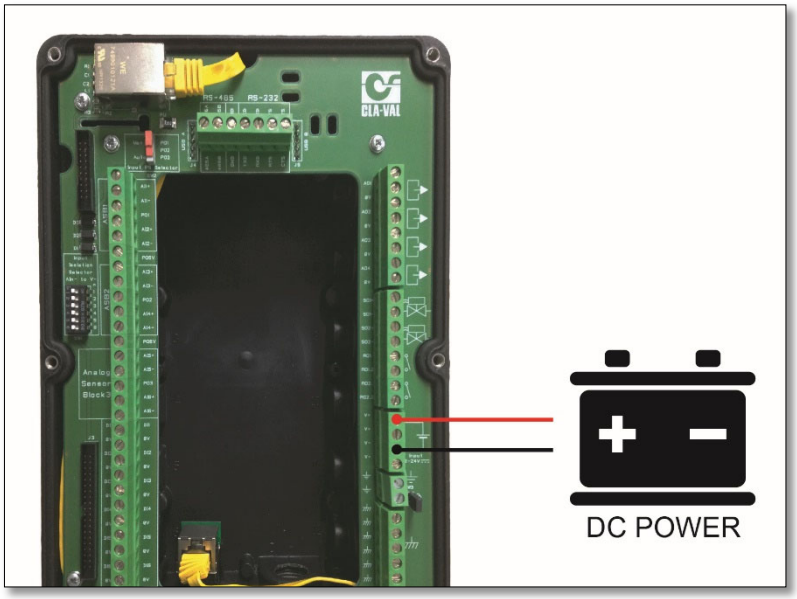
2.7 OUTPUTS SOLENOIDS



2.8 POWER SUPPLY

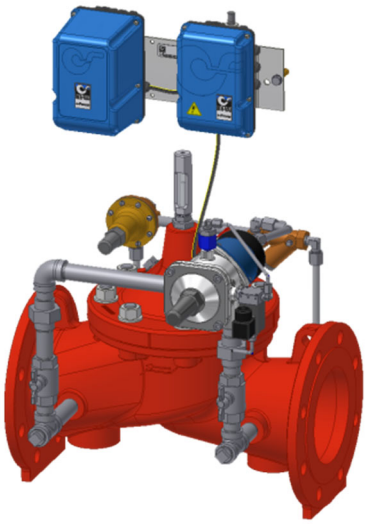
2.8.1 DC INPUT POWER

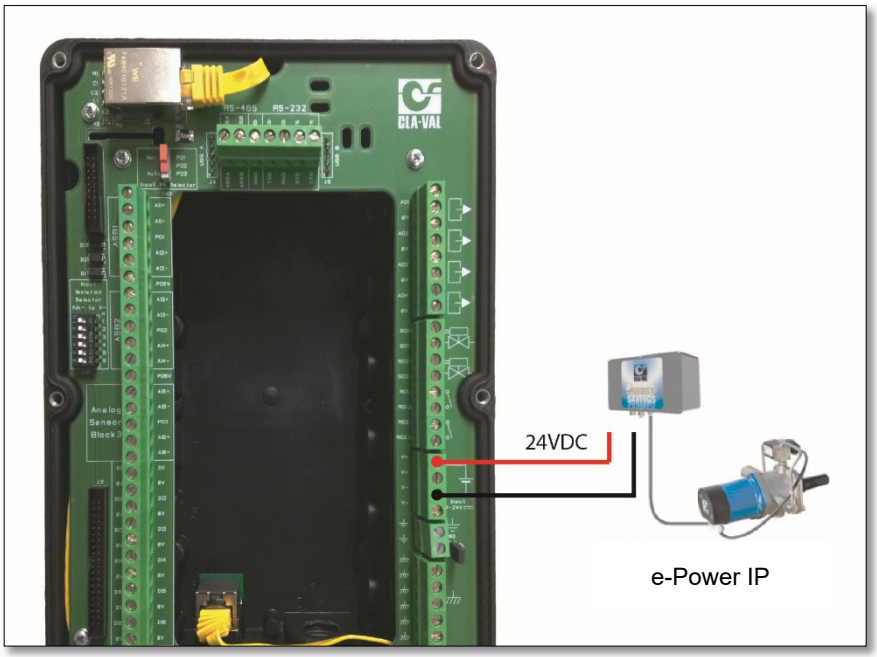
The electronic valve controller requires a continuous voltage of 12-24 VDC. The electronic valve controller consumes typically 0.9 W in standby mode and 3 W in usage; its peak power consumption can go up to 30 W.



2.8.2 AUTONOMOUS POWER SUPPLY

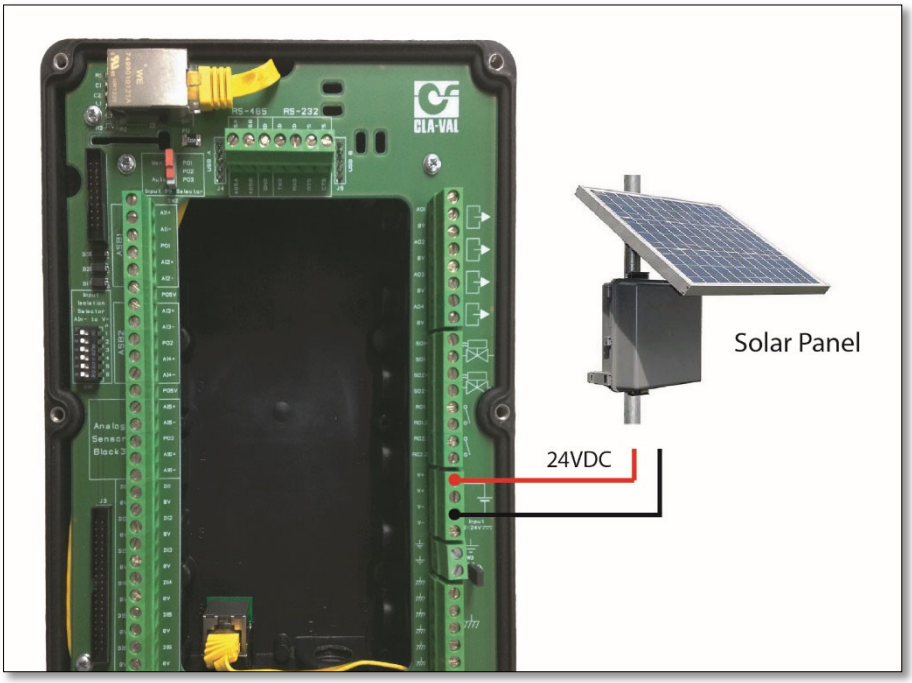
The **CLA-VAL e-Power IP** power supply is the ideal compact power generator for the electronic valve controller to get a completely autonomous valve.





2.8.3 ALTERNATIVE POWER SUPPLIES

2.8.3.1 Solar Panel



2.9 WIRING TROUBLESHOOTING

Check the wiring connections first. The large majority of electronics problems arise from mistakes in the wiring.

Use the continuity function of the meter to check and make sure that A connects to B.

If mistakes are made during the wiring, for example AI2 was wired in place of AI1, their positions can be rearranged by using the Input configuration menus instead of re-wiring all of the inputs.

3 NAVIGATION

3.1 COLOR CONVENTION

Values are usually displayed in black; however, input values can sometimes be displayed in different colours, depending on the status of the associated input:

- **Black:** normal status. The value displayed is what is measured on the input.
- **Red:** loss of signal. The associated input has no signal arriving.
- **Orange:** loss of signal, the system overrides the value.
- **Blue:** local override. The value has been manually overridden locally and the signal at the input is not taken into account.
- **Grey:** remote signal.

3.2 BASIC BUTTON FUNCTIONALITY

3.2.1 BUTTON DESCRIPTIONS

-  - Home/Ok.
-  - Left/Input.
-  - Right/Output.
-  - Up/Valve configuration.
-  - Down/Settings.

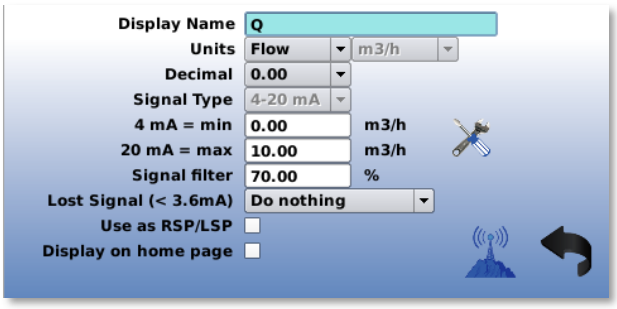
Other icons in this manual:

-  - Short click (less than 1 second).
-  - Long click (more than 1 second).

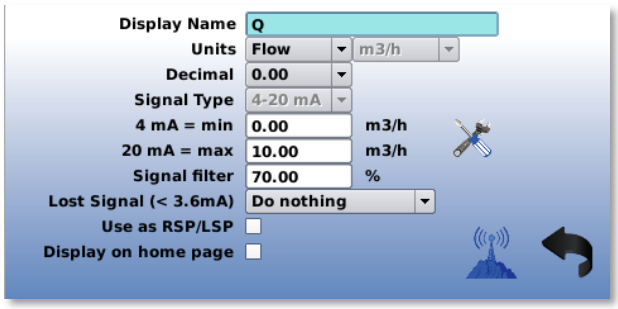
3.2.2 SHORT CLICK - LESS THAN 1 SECONDS

-  Is "**Ok**" or "**Select**" when used as a  (short click).
-  - When used as a  , the cursor moves to the left.
-  - When used as a  , the cursor moves to the right.

-  - When used as a  , the cursor moves up.

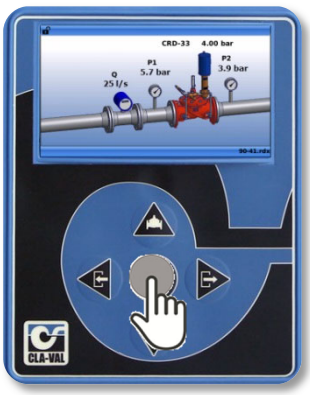


-  - When used as a  , the cursor moves down.

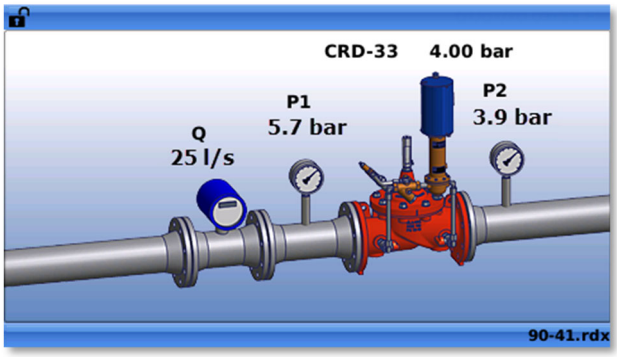


3.2.3 EXTENDED CLICK - MORE THAN 3 SECONDS ("HOME/OK" BUTTON ONLY)

From the home screen,  on "**Home/Ok**" will put the electronic valve controller into sleep mode.



From any other location, a on the "**Home/Ok**" button returns to the home screen.



3.3 INFORMATION SCREENS

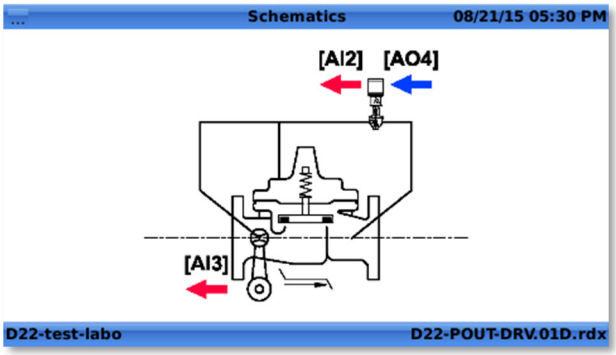
The information screens appear after a on one of the side buttons.

3.3.1 SCREENS DESCRIPTION

3.3.1.1 "Schematics"

1. "**Short Click**": View Valve Information (from home screen).

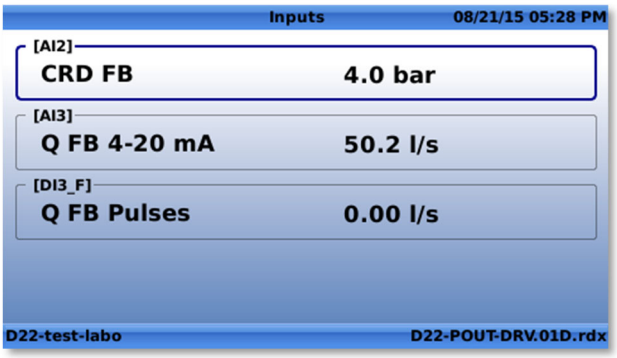
From the home screen, on the button navigates to the "**Valve Information**" screen.



3.3.1.2 "Inputs"

1. "**Short Click**": View Input Information (from home screen).

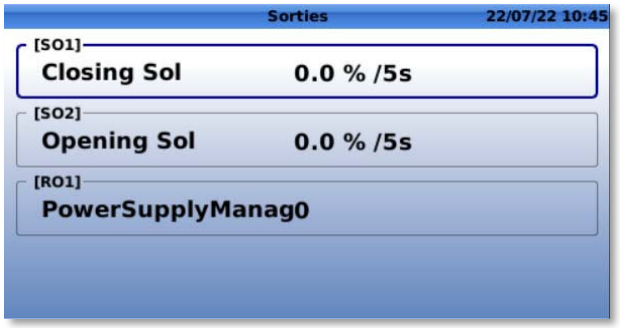
From the home screen, a  on the  navigates to the "**Inputs**" screen.



3.3.1.3 "Output"

1. "**Short Click**": View Output Information (from home screen).

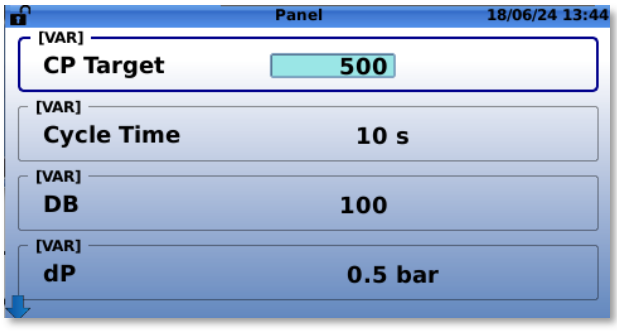
From the home screen, a  on the  navigates to the "**Outputs**" screen.



3.3.1.4 "Display Panel"

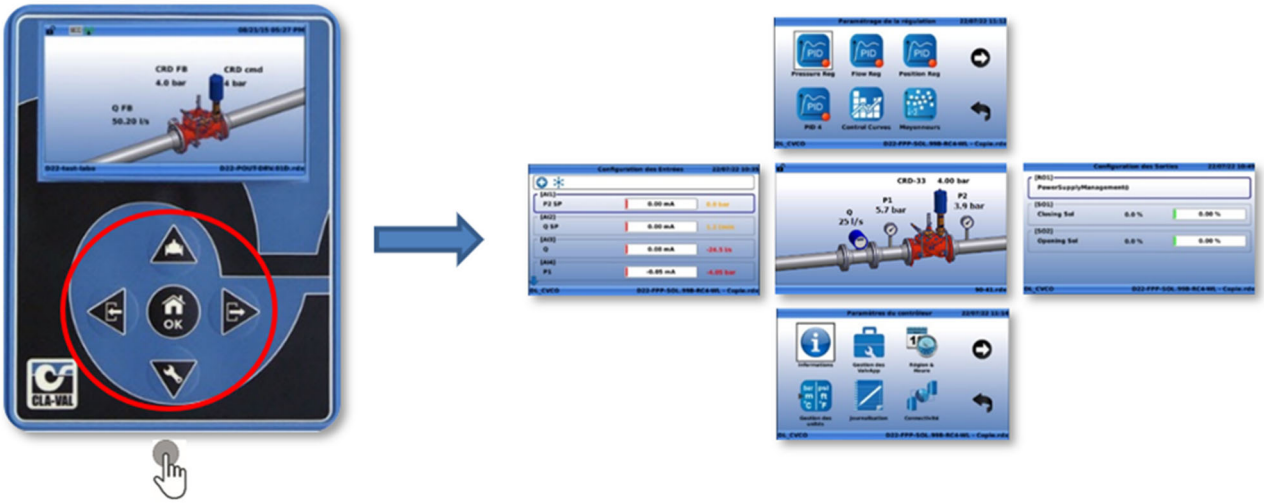
1. **"Short Click":** View variables Information (from home screen).

From the home screen, a  on the  navigates to the "**Outputs**" screen.



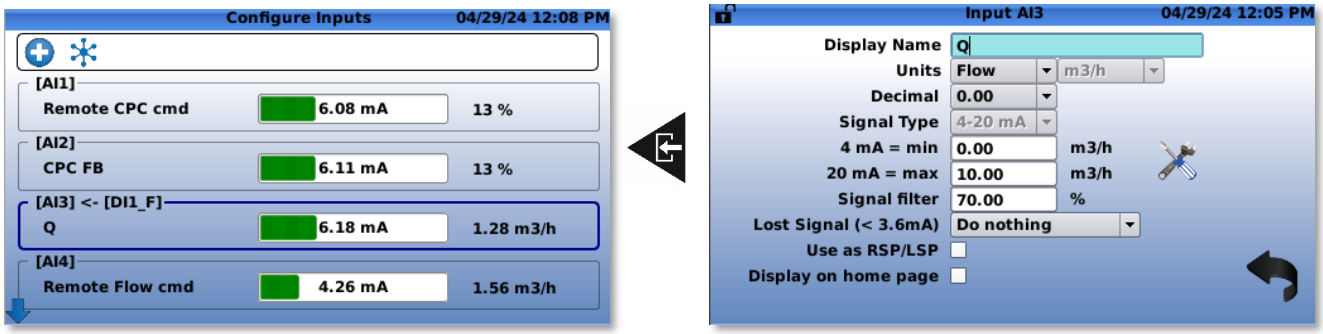
3.4 CONFIGURATION TABS

The configuration screens appear after an on the side buttons.



3.4.1 "CONFIGURE INPUTS" MENU

1. "**long click**" on .
2. Select the input.
3. "**short click**" on .



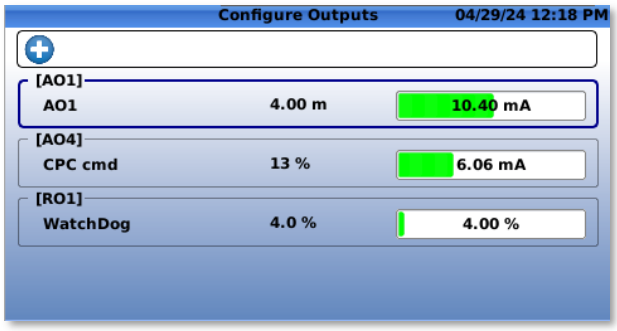
Analog Input Field Descriptions:

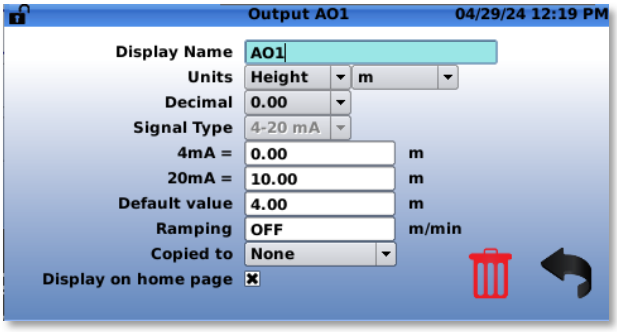
- **"Display Name":** Use this field to choose a unique name for each input.
- **"Units":** Choose from the available units of:
  - (gpm) - Gallon per minute [flow].
  - (mgd) - Mega Gallons per day [flow].
  - (cfm) - Cubic Feet per minute [flow].
  - (cfs) - Cubic feet per second [flow].
  - (l/min) - Liter per minute [flow].
  - (l/s) - Liter per second [flow].
  - (m3/h) - Cubic meters per hour [flow].
  - (Ml/d) - Mega liters per day [flow].

  - (Imp gpm) - Imperial Gallons per minute [flow].
  - (bar) - Bar [pressure].
  - (kPa) - Kilopascals [pressure].
  - (Mhd) - Mega Hectares per day [flow].
  - (psi) - Pounds per square inch [pressure].
  - (m) - Meters of water [pressure].
  - (in) - Inches of water [pressure].
  - (ft) - Feet of water [pressure].
  - (%) - Percentage [unit-less].
  - (h) - Hours [time].
  - (min) - Minutes [time].
  - (s) - Seconds [time].
  - (gal) - Gallons [volume].
  - (mg) - Mega gallons [volume].
  - (cf) - Cubic feet [volume].
  - (l) - Liters [volume].
  - (m3) - Cubic meters [volume].
  - (Ml) - Mega liters [volume].
  - (mA) - Milliamps [electrical flow].
  - (Volt) - Volts [electrical potential].
- **"Decimal":** Select from available decimal places:
  - 0
  - 0.0
  - 0.00
- **"Signal Type":** Select from available signal types:
  - 4-20 mA.
- **"4mA = min":** Set the value of the input at 4 mA; usually this will correspond to a value of 0.
- **"20mA = max":** Set the value of the input at 20 mA; this should correspond to the maximum measured value.
- **"Signal Filter":** Select a filter length between 1% and 99%. This is a cumulative filter, where the value corresponds to the weight of the previous sample. The higher the value, the higher the filtering effect. A 0% value will inactivate the filter.
- **"Lost Signal (< 3.6 mA)":** This menu designates which action the controller will take in the event that a signal falls below 3.6 mA, usually when there is a power outage or when the 4-20 mA loop has been broken.
  - **"Default Value"**: This option allows the user to input a value to be inserted when the 4-20mA input signal has been lost.
  - **"Keep Value"**: This option allows the user to specify that the last input value received by the controller will be the value that is used once the signal is lost.
  - **"Do nothing"** This option will specify that no action is taken by the controller when an input signal is lost.
- **"Use as RSP/LSP":** When this box is checked, the input is treated as an RSP/LSP - Remote Set Point / Local Set
- **"Display on home page":** While the box is checked this input is displayed on the home screen.

3.4.2 "CONFIGURE OUTPUTS" MENU

1.  **"long click"** on  .
2. Select the input.
3.  **"short click"** on  .





Solenoid Output Field Descriptions:

- **"Display Name":** Use this field to choose a unique name for each output.
- **"Type":**
  - **"PWM":** (Pulse Width Modulation): this is the industry trade name for the management of pulses sent to the opening/closing solenoids.
  - **"Digital 1/0":** Specifies that the output is either open or closed for the time specified in the boxes below.
  - **"Dry contact (1/0)":** Impulsion while there is a state change.
- **"Cycle Time":** The amount of time for one complete cycle of action for the opening/closing solenoid.
- **"Default Value":** The default active time of the solenoid during the cycle.
- **"Display on home page":** While the box is checked this input is displayed on the home screen.

Analog Output Field Descriptions:

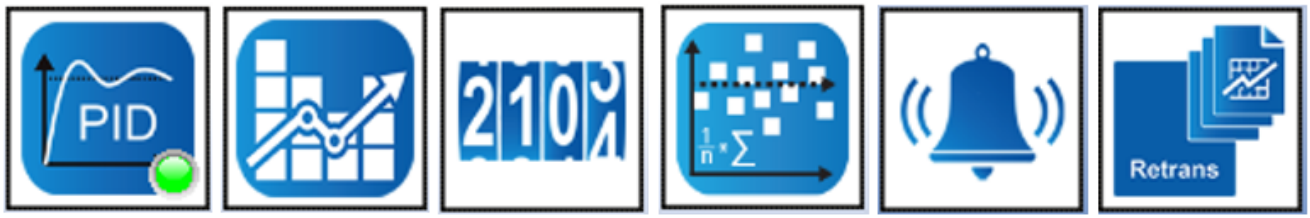
- **"Display Name":** Use this field to choose a unique name for each input.
- **"Units":** Choose from the available units of:
  - (gpm) - Gallon per minute [flow].
  - (mgd) - Mega Gallons per day [flow].
  - (cfm) - Cubic Feet per minute [flow].
  - (cfs) - Cubic feet per second [flow].
  - (l/min) - Liter per minute [flow].
  - (l/s) - Liter per second [flow].
  - (m3/h) - Cubic meters per hour [flow].
  - (Ml/d) - Mega liters per day [flow].
  - (Imp gpm) - Imperial Gallons per minute [flow].
  - (bar) - Bar [pressure].
  - (kPa) - Kilopascals [pressure].
  - (Mhd) - Mega Hectares per day [flow].
  - (psi) - Pounds per square inch [pressure].
  - (m) - Meters of water [pressure].
  - (in) - Inches of water [pressure].
  - (ft) - Feet of water [pressure].

- (%) - Percentage [unit-less].
- (h) - Hours [time].
- (min) - Minutes [time].
- (s) - Seconds [time].
- (gal) - Gallons [volume].
- (mg) - Mega gallons [volume].
- (cf) - Cubic feet [volume].
- (l) - Liters [volume].
- (m3) - Cubic meters [volume].
- (Ml) - Mega liters [volume].
- (mA) - Milliamps [electrical flow].
- (Volt) - Volts [electrical potential].

- "**Decimal":** Select from available decimal places:
  - 0
  - 0.0
  - 0.00
- "**Signal Type":** Select from available signal types (to be updated to include more signal types in the future):
  - 4-20 mA.
- "**4mA =":** Set the value of the input at 4 mA; usually this will correspond to a value of 0.
- "**20mA =":** Set the value of the input at 20 mA; this should correspond to the maximum measured value.
- "**Default Value":** When the 4-20 mA loop is broken, this is the value that is used.
- "**Ramping":** Ramping speed to reach the value.

3.4.3 "VALVE CONFIGURATION" MENU

The "**Valve Configuration**" screen includes the regulation blocks related to the loaded ***ValvApps***™. Regulation blocks can be of the following types:



- **"PID" (Proportional-Integral-Derivative):**

  The "**PID**" regulation maintains the valve at a configured set-point. Up to four (4) "**PID**" regulation loops can be programmed, each of them offering local or remote set-point capability. Real-time chart view helps to visualize valve response and fine tune the electronic valve controller accordingly. Perfect valve control is achieved by CLA-VAL features such as programmable set-point ramping to prevent hydraulic shocks.

- **"Control Curve":**

  The "**Control Curve**" offers an easy way to create a relationship between 2 system variables. Using graphical functions, the user draws the "**Control Curve**" relationship linking pressure, flow, level and/or time directly on the electronic valve controller screen. Up to four (4) "**Control Curves**" can be profiled allowing specific adaptation such as seasonal adjustment.

- **"Totalizer":**

  The "**Totalizer**" offers the possibility to measure and track the total amount of the fluid which passes through the valve. It is possible to configure and use up to 4 "**Totalizers**".

- **"Averagers":**

  The "**Averager**" is an algorithm used to calculate the average value of a set of data points or measurements. It offers the possibility to calculate the average per minute, hourly or weekly. It is possible to use up to 4 "Averagers".

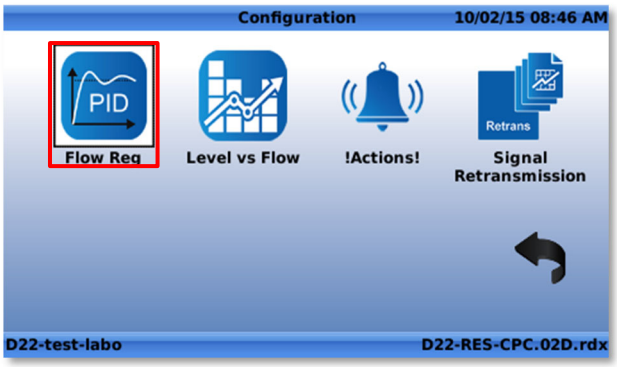
- **"!Actions!":**

  Used to take action (or alarms) when a programmable condition is met by forcing an output (relay, solenoid, 4-20 mA). The closing relay can be used to send an alarm to a supervision system. Up to four (4) "**!Actions!**" can be programmed including appropriate hysteresis or dead band configuration.

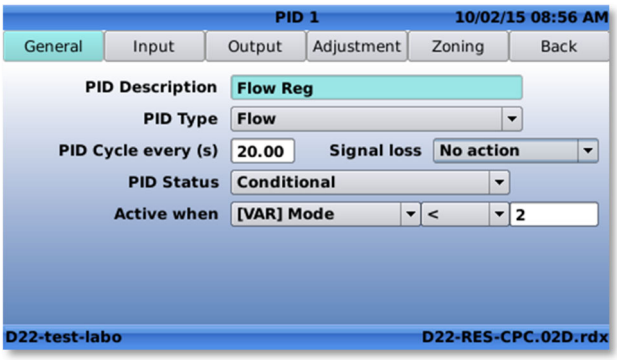
- **"Signal Retransmission":**

  Used to retransmit any input signal, variable, or calculation to a supervision system. Up to four (4) input signals, such as pressure, flow, or level can be redirected through the 4-20 mA outputs. Pulses received from a flow meter are converted into a 4-20 mA signal and retransmitted.

3.4.3.1 Valve Configuration - "PID" Menu

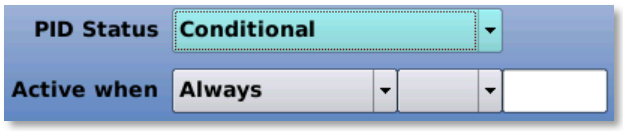


3.4.3.1.1 "General" Tab



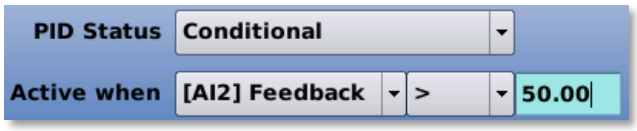
Field Description:

- **"PID Description":** Use this field to choose a unique name for each PID loop.
- **"PID Type":** Designate what type of control is being used.
  - **"Flow":** Control using flow SetPoint and Feedback.
  - **"Pressure":** Control using pressure SetPoint and Feedback.
  - **"Level":** Control using level SetPoint and Feedback.
  - **"%":** Control using percentage open (position of the valve) SetPoint and Feedback.
  - **"Analog":** Control using flow SetPoint and Feedback.
- **"PID Cycle every (s)":** This field designates how often the calculation will be done to determine the appropriate action to be taken with the output.
- **"Signal loss":** This field designates what action the controller will take when there is a loss of signal on the Remote Set Point (RSP). The options are:
  - **"No Action"**.
  - **"Open 100%":** Open valve 100%.
  - **"Close 100%":** Close valve 100%.
  - **"Lock Position":** Maintain valve in current position.
- **"PID Status":** The user may configure a PID loop, but not activate it until the appropriate time. The choices are:
  - **"On"**: The regulator is always active.
  - **"Off"**: The regulator is not active.
  - **"Conditional":** When the **"Conditional"** option is chosen, an additional field appears and prompts the user to specify when the PID should be active. The following field is shown:

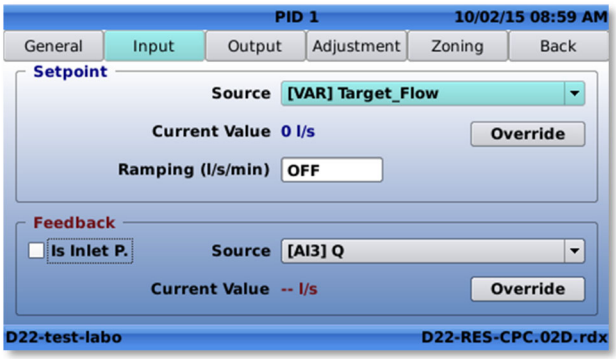


The PID loop can be configured to be active - Always, or when one of the inputs meets a certain condition. In this case, use the pull down menu that is defaulted to "Always" to select the appropriate input, then use the pull down menu to the right to select an operator, such as the "**Greater than**" sign (>), then specify a value.

Example: The following PID loop has been set to be conditional active, only when the Feedback [AI2] is greater than 50.00 l/s.



3.4.3.1.2 "Input" Tab

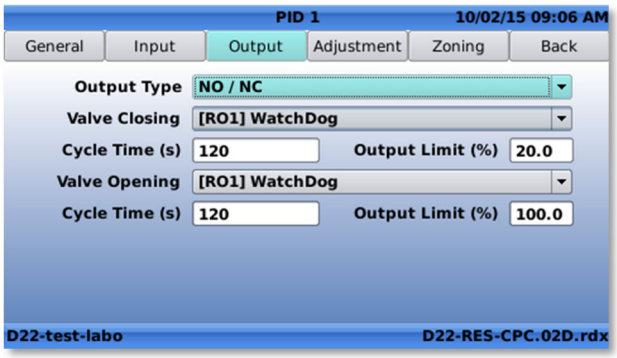


Field Description:

- **Setpoint Section:**
  - "**Source":** Designates which compatible input or variable is to be used as the Setpoint for the PID loop.
  - "**Current Value":** Shows the ***live*** current value of that input.
  - "**Override":** Allows the user to input an override value from this menu rather than having to go back to the input information or input configuration screens - this can be helpful when commissioning a system for the first time.
  - "**Ramping (l/s/min)":** Gradually variating the value when the set point changes rapidly [either by "**Remote Set Point**" Changes or "**Local Set Point**" (override) changes].
- **Feedback Section:**
  - "**Source":** Designates which input is to be used as the feedback for the PID loop.
  - "**Current Value":** Shows the ***live*** current value of that input.
  - "**Override":** Allows the user to input an override value from this menu rather than having to go back to the input information or input configuration screens - this can be helpful when commissioning a system for the first time.

3.4.3.1.3 "Output" Tab

Allows to configure the output on which the regulation is done.

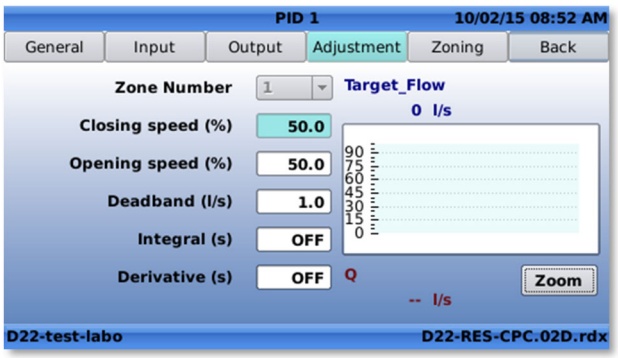


Field Description:

- "**Output Type":** Designates what type of output is used. Pick in the dropdown menu from the following:
  - "**NC/NC":** NC = Normally Closed (Closing Sol / Opening Sol).
  - "**NO/NO":** NO = Normally Open (Closing Sol / Opening Sol).
  - "**NO/NC":** Normally Open (Closing Sol) / Normally Closed (Opening Sol).
  - "**Linear 4-20mA":** Will vary the Analog Output (4-20 mA) according to the PID loop.
  - "**Linear -> VAR":** Will vary the internal variable according to the PID loop.
- "**Valve Closing":** Designates which of the solenoid outputs [SO1] or [SO2] will be used to close the valve.
- "**Cycle Time (s)":** Designates the total cycle of action for the "**Valve Closing**" solenoid:
  - "**Output limit (%)":** Designates valve closing limit.
- "**Valve Opening":** Designates which of the solenoid outputs [SO1] or [SO2] will be used to open the valve:
  - "**Output limit (%)":** Designates valve opening limit.
- "**Cycle Time (s)":** Designates the total cycle of action for the "**Valve Closing**" solenoid.

3.4.3.1.4 "Adjustment" Tab

The **"Adjustment"** tab offers the possibility to configure the regulator coefficients and some other parameters of the PID.



Field Description:

- **"Zone Number":** Designates which PID loop is being adjusted; at any time, up to 4 PID loops may be used.
- **"Closing Speed (%)":** Designates how quickly the valve will be able to close. 1% is the slowest possible, 99% is the fastest possible.

  Note: Actual time to close will depend on the hydraulic conditions.
- **"Opening Speed (%)":** Designates how quickly the valve will be able to open. 1% is the slowest possible, 99% is the fastest possible.

  Note: Actual time to open will depend on the hydraulic conditions.
- **"Deadband (l/s)":** Designates where the controller will take no action because it is close to the SetPoint.

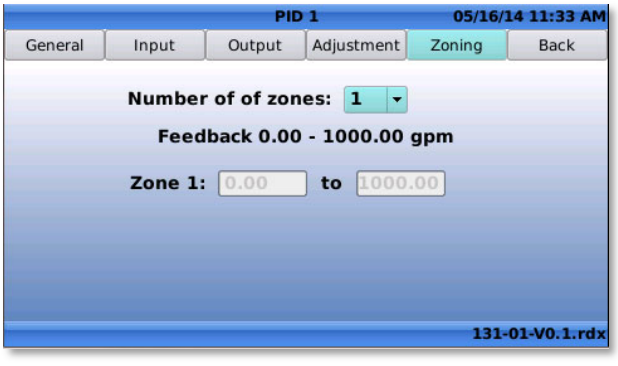
  Example: If the setpoint is 50 l/s and the deadband is set at 2 l/s, then the controller will take no action on the feedback value from 48 l/s to 52 l/s
- **"Integral (s)":** This value is used for fine tuning of very sensitive systems.

  It is not recommended that this be used without contacting CLA-VAL Technical Support!
- **"Derivative (s)":** This value is used for fine tuning of very sensitive systems.

  It is not recommended that this be used without contacting CLA-VAL Technical Support!

3.4.3.1.5 "Zoning" Tab

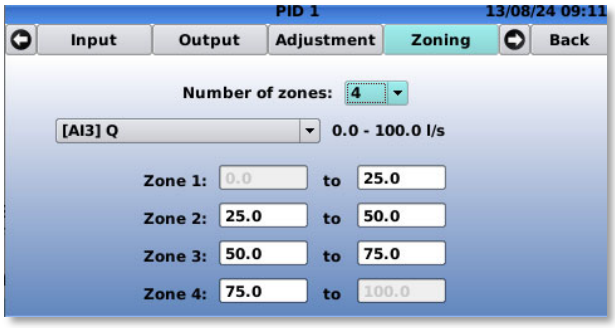
This tab allows the creation of up to four distinct regulation zones based on a specified input or variable. Each zone can be configured with different opening and closing speeds, as well as variable deadbands. It is important to note that the regulator coefficients remain constant from one zone to another.



Field Description:

- "**Number of zones":** Designates how many PID zones are to be created (max 4).

Note: When multiple PID loops are created, the active region for each is designated by an equal division of the total feedback range, see example below:

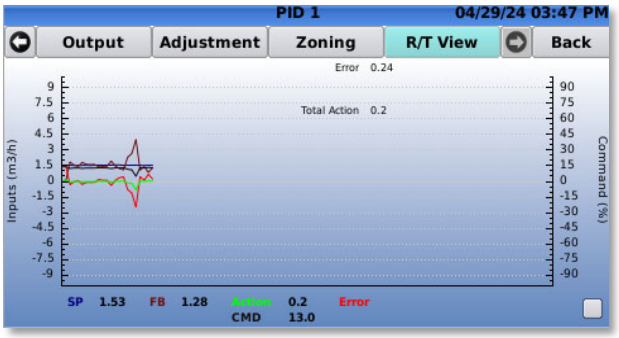


The active region for zones 1, 2, 3 and 4 are each one quarter of the total feedback range. These values can be specified by changing the values in each zone, according to the needs of the user.

- "**Zone 1**": designates the top of the range for zone 1 (bottom range is bounded by the low level of the feedback scale).
- "**Zone 2**": designates the bottom and top range for zone 2.
- "**Zone 3**": designates the bottom and top range for zone 3.
- "**Zone 4**": designates the bottom range for zone 4 (top of the range is bounded by the high level of the feedback scale).

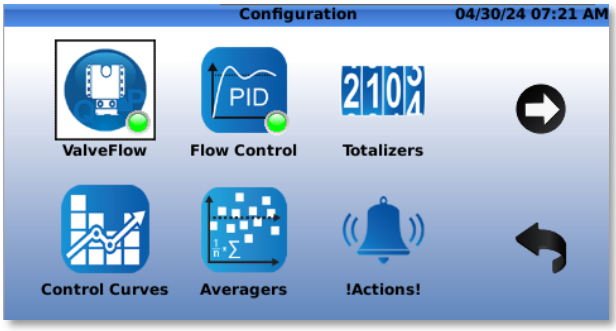
3.4.3.1.6 "R/T View" Tab

The "**R/T View**" tab provides a real-time graphical representation of the regulation process. It offers valuable insights into the system's performance by displaying real-time information on setpoints, feedback on commands, and ongoing actions. Users can monitor and analyse the regulation process efficiently, enabling them to make informed decisions and adjustments as needed. With the "**R/T View**" tab, users can gain a comprehensive understanding of the system's behaviour and performance dynamics, enhancing overall control and efficiency.



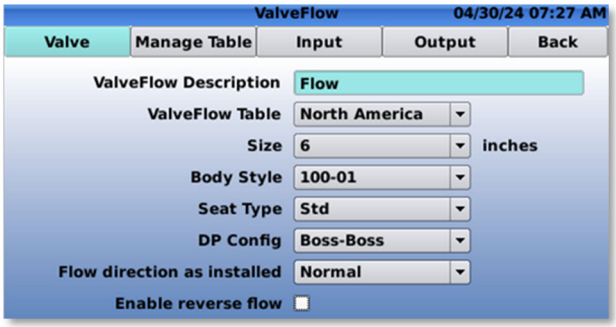
3.4.3.2 Valve Configuration - "ValveFlow" Menu

ValveFlow is a feature designed to calculate the flow rate passing through a valve, given the upstream and downstream pressures, as well as the valve opening. By utilizing this feature, it is possible to accurately determine the flow rate within a pipeline system, enabling precise control and optimization of fluid dynamics.



3.4.3.2.1 "Valve" Tab

In this tab it is possible to choose the valve type and its parameters and some other parameters see the “Field Description” below.

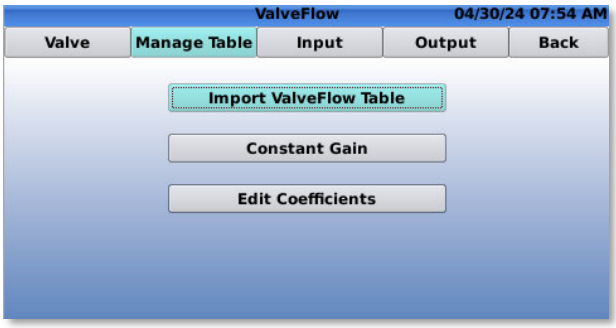


Field Description:

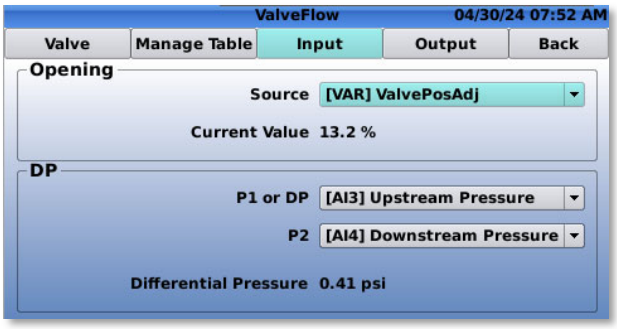
- **"ValveFlow description":** Designates the name of the ValveFlow.
- **"ValveFlow Table":** Designate the table to be used.
- **"Size":** Designate the size of the valve that is being used. Options are different depending on the “ValveFlow table that is being used.
- **"Body Style":** Designate the body style of the valve. Options are:
- **"Seat Type":** Designate the type of seat of the valve. Options are:
- **"DP Config":** Designate the location of the pressure transducers. Options are:
  - Boss-Boss - Pressure transducers located on the valve.
  - Pipe - Pressure transducers located on the pipe.
- **"Flow direction as installed"**: Designate the flow direction.
  - Normal - Flow goes in the same direction as indicated on the valve.
  - Reverse - Flow goes in the reverse direction as indicated on the valve.

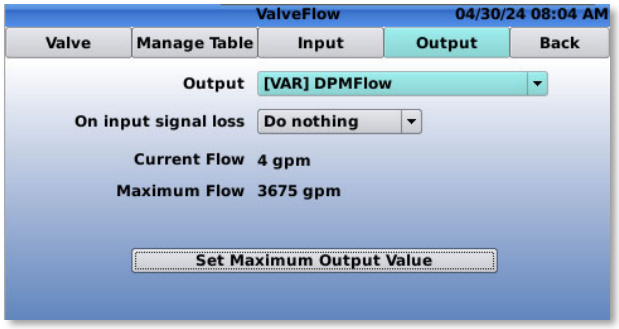
3.4.3.2.2 "Manage Table" Tab

In this tab it is possible to import a new table which can be used to calculate the flow according to the needs of the user.



3.4.3.2.3 "Input" Tab

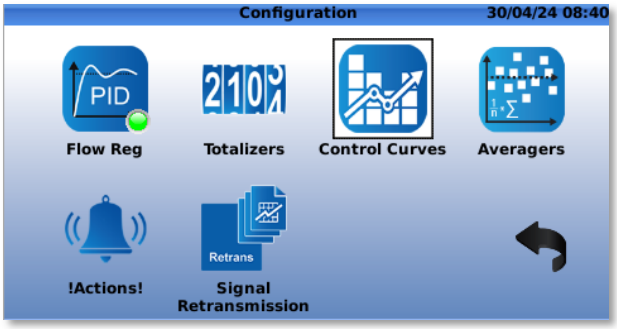


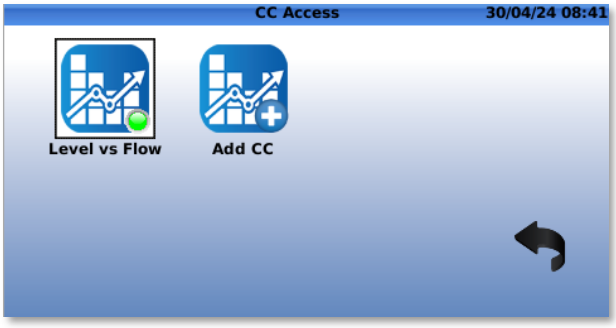


The "**Input**" tab offers the possibility to define the inputs which will be used for the flow calculations.

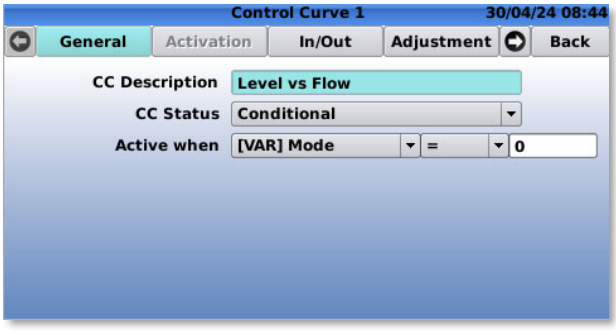
The "**Output**" tab offers the possibility to specify the variable in which the calculated flow will be stored and also it is possible to define the maximum flow which can be calculated.

3.4.3.3 Valve Configuration - "Control Curve" Menu





3.4.3.3.1 "General" Tab



Field Description:

- **"CC Description":** Designate a name for the custom control curve.
- **"CC Status":** Designate whether the control curve is active.
  - **"On":** The control curve is active.
  - **"Off":** The control curve is inactive.
  - **"Calendar":** The control curve is activated according to calendar rules, which are defined in the **"Activation"** tab.
  - **"Period":** The control curve is activated according to précised period, the period is defined in the **"Activation"** tab.
  - **"Conditional":** Condition based on an input or variable, as defined in the **"Active when"** field.
- **"Active when":** Designate the rule for the conditional activation.

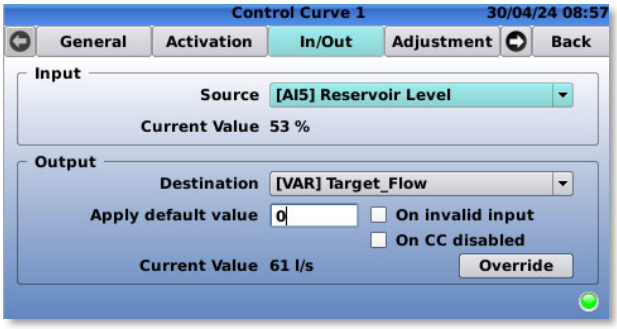
3.4.3.3.2 "Activation" Tab (only for Calendar & Periodic Activation)

This tab is used only when the activation of the control curve is made on calendar or periodic bases. It is possible to choose between varying activation options.

Field Description:

- **"Day of the week":** Designate which day(s) of the week the custom control curve is active.
- **"Month of the year":** Designate for which months the days selected are considered.
- **"Period":** Designate the period during which the CC is active.

3.4.3.3.3 "In/Out" Tab



Field Description:

"Input" Section:

- **"Source":** Designate the input flow signal location.

"Output" Section:

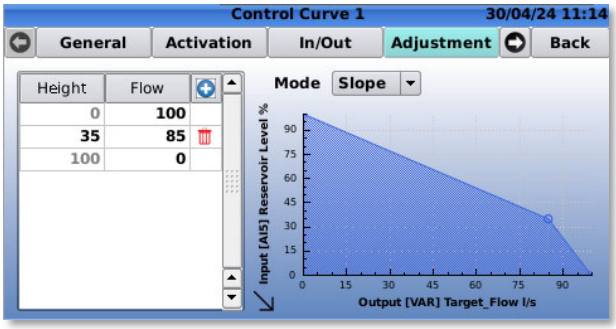
- **"Destination":** Designate the analogue output location for the motorized control.
- **"Apply default value"**: Define a default value to the output in case of an invalid entry or when the CC is not active.
- **"Override":** Override the output in **"Designation"** with a custom value.

3.4.3.3.4 "Adjustment" Tab

The following tab is used to configure the control curve. In this tab it is possible to add or remove points, as well as change the transition mode between points (slope or step). Additionally, the modifications made can be observed in graphical form.

The arrow located at the bottom-left corner indicates the direction in which the graph should be read:

1. Standard: the input is on the X-axis (in this case, Target Flow) and the output on the Y-axis (in this case, Reservoir/Tank Level).
2. Reverse: the input is on the Y-axis (in this case, Reservoir/Tank Level) and the output on the X-axis (in this case, Target Flow).



The graph on the right describes the relationship between the reservoir level and the flow setpoint, indicating that as the reservoir level increases, the flow rate decreases. From the above graph, it is evident that this is a reverse control curve.

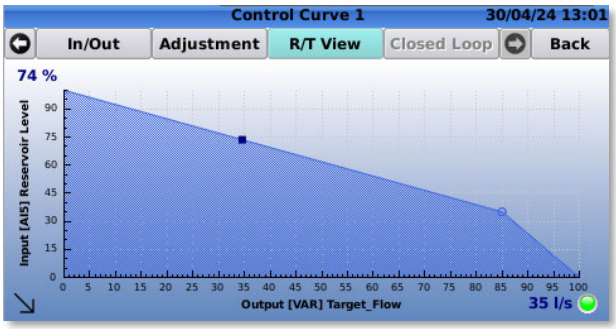
The control curve can be completely customised from the "**Adjustment**" tab.

Using , , , , it is possible to navigate between each of the points on the table. The currently selected point is filled in red, while other points are not filled.

- "**Edit a point**": To edit a point you need to be positioned on the point to be changed and the click on (Home/OK). The selected point becomes red and the value can be modified.
- "**Add new point**": To add a new point you need to click (Home/OK) on the (+) and then insert the desired value.
- "**Delete a point":** To erase a point you should click on the red bin next to the desired value.

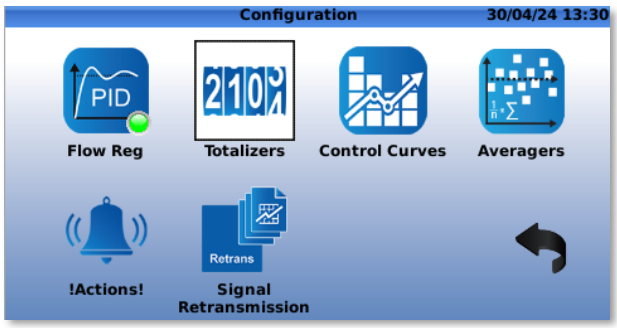
3.4.3.3.5 "R/T View" Tab

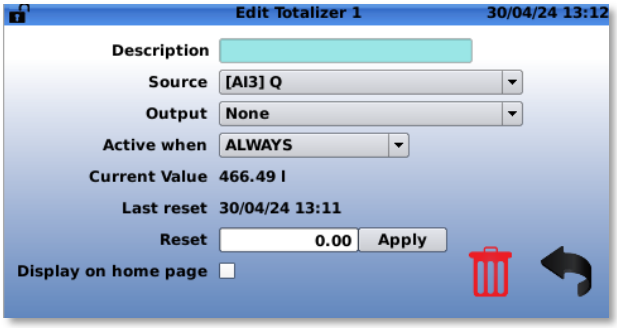
This tab offers the possibility to observe real-time variations in the control curve. The green button in the bottom-right corner indicates that the control curve is active, allowing users to monitor changes dynamically as they occur.



3.4.3.4 Valve Configuration - "Totalizer" Menu

This tab gives the possibility to create and configure a totalizer.



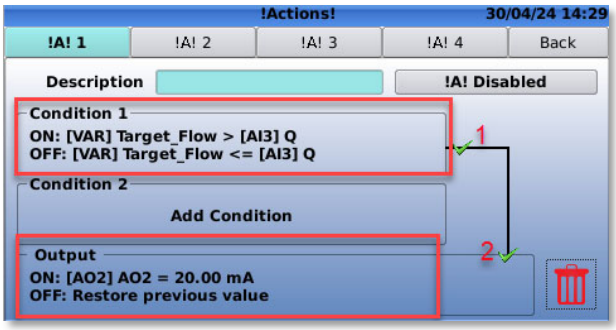


Field Description:

- **"Description":** Designates the name and the description of the totalizer count.
- **"Source":** Designates which input should be used as the source for the totalizer count.
- **"Output":** Designates where the total should be sent after it is calculated.
- **"Active when":** Designates when the totalizer should be active.
  - **"Always":** The totalizer will always be on.
  - **"[Aix, Dix, Var]":** Conditional based on input or variable.
- **"Reset":** Offers the possibility to reset the totalizer to 0 or to a given value.
- **"Display on home page":** By checking the box it is possible to show the totalizer on the home page.

3.4.3.5 Valve Configuration - "Actions" Menu

In this tab it is possible to create and configure alarms which give the possibility to force an output or variable in function of an input value, variable or time.



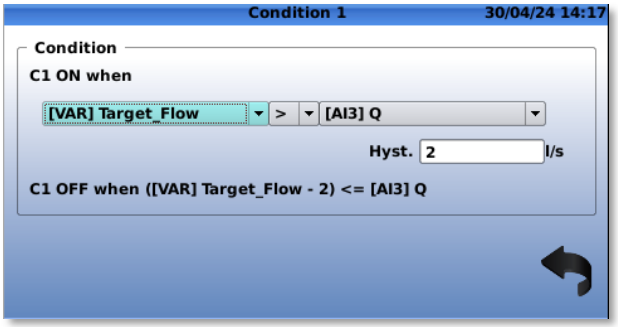
Field Description:

- **"Description":** Use this field to choose a unique name for each action.
- **"!A! Enabled":** Designates that this action is enabled or disabled.

To configure an action, follow the steps below:

1. Click OK on the "**Condition 1**" to configure the condition.

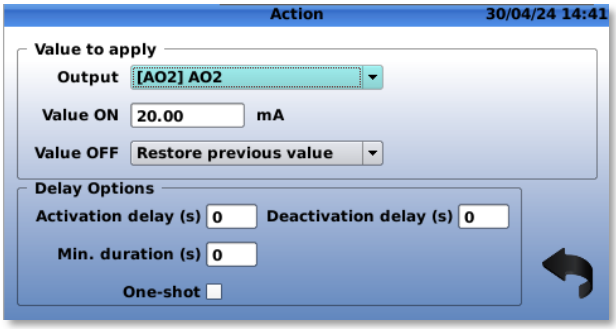
In the "**Condition**" menu, configure the condition when and how to apply the action.



Field Description:

- "**C1ON when**": Conditional field that designates when this action is active, according to the value and operator used.
- "**Hysteresis**": Set up a hysteresis.

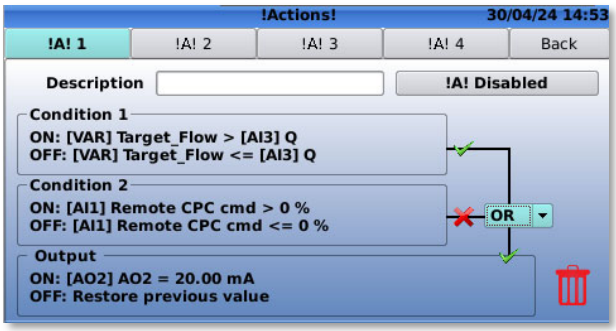
Go back to the "**Actions**" menu and then click OK on the "**Output**" to configure in which output the action will affect.



Field Description:

- "**Output**": Designates on which of the outputs to act.
- "**Value ON**": Designates the value to apply to the selected output.
- "**Default**": Designates the default value of that action - which will be applied while the action is in the "OFF" state.
- "**Delay Options**": Offers the possibility to apply the action with a delay.

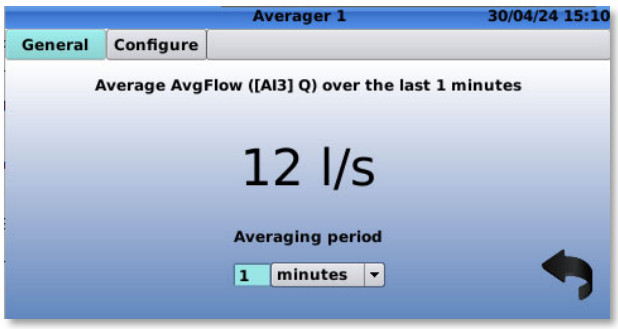
It is possible to configure two conditions and utilize a logical operator such as "**AND**" or "**OR**" to activate the action.

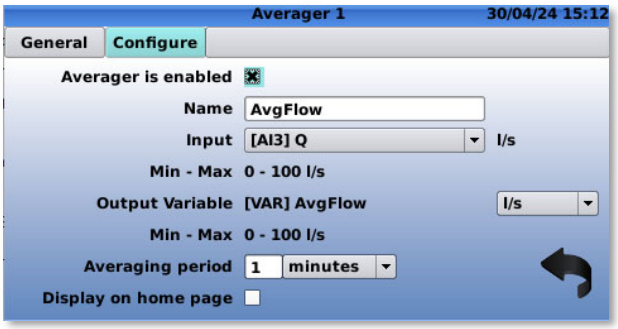


The ✓ icon is displayed when a condition is filled, and the ✗ when it is not filled.

3.4.3.6 Valve Configuration - "Averagers" Menu

The "**Averagers**" tool allows the user to calculate and display the average value over an input or variable. This tool offers the possibility to stock the average value of a given input or variable into a new variable.





3.4.3.6.1 "General" Tab

In this tab it is possible to view the real-time value of this average and also choose the time interval over which the average is calculated.

3.4.3.6.2 "Configure" Tab

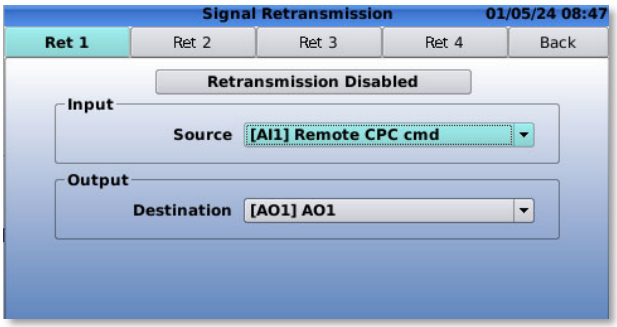
This tab allows to configure the averaging. Details of the fields are as follows.

Field Description:

- "**Name**": Designates the name of the variable which will contain the calculated average.
- "**Input**": Designates the input on which the average will be calculated.
- "**Output Variable**": Shows the variable which will contain the calculated average and its unity.
- "**Averaging period**": Offers the possibility to choose the time interval over which the average will be calculated.
- "**Display on home page**": By checking the box the average variable will be displayed on the home screen.

3.4.3.7 Valve Configuration - "Signal Retransmission" Menu

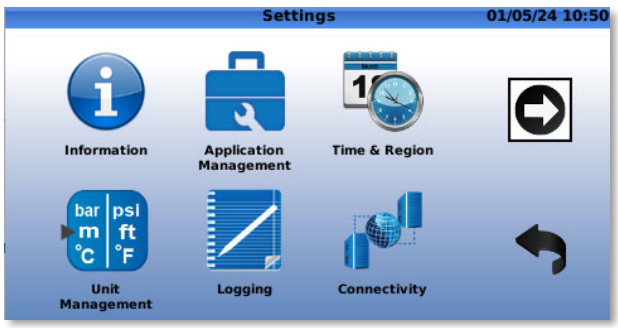
The "**Signal Retransmission**" tool allows the redirection of an input signal or a variable signal to an output.

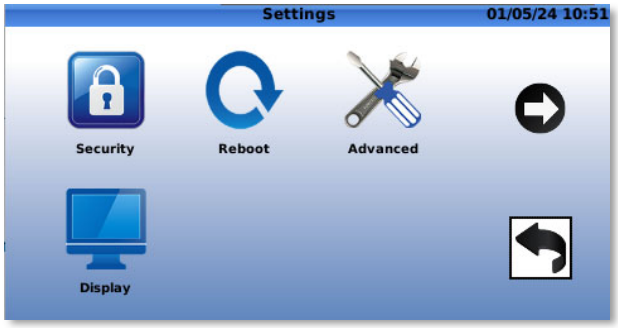


Field Description:

- "**Retransmission Disabled**": Designates if the retransmission is enabled or disabled.
- "**Source**": Designates the analogue input or the variable from which the signal will be retransmitted.
- "**Destination**": Designates the analogue output on which the signal will be retransmitted.

3.4.4 "SETTINGS" MENU





3.4.4.1 "Information" Page

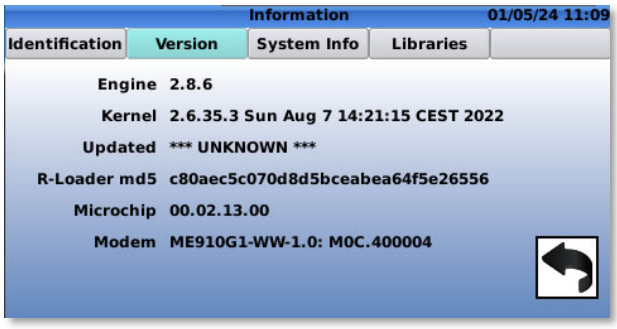
3.4.4.1.1 "Identification" Tab

Device identification information with "**S/N (IMEI)**" the serial number of the device, and "**SIM (ICCID)**" the SIM card identification number.

Field Description:

- "**S/N (IMEI)":** the serial number of the device.
- "**HostName":** Use this field to assign a host name to the device. The default host name of the device is of the form *D22-serial number.*
- "**Contact":** Use this field to enter an email valid email address for the use of the ***Link2Valves***™ data visualisation web interface.
- "**Location":** Use this field to enter the location of the device.
- "**Order ID":** Use this field to enter the Order ID.

3.4.4.1.2 "Version" Tab

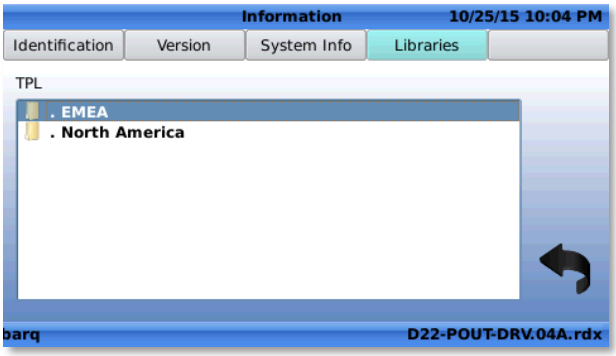


This page shows information about the version of the operating software installed on the device, updates and modem version.

3.4.4.1.3 "System Info" Tab

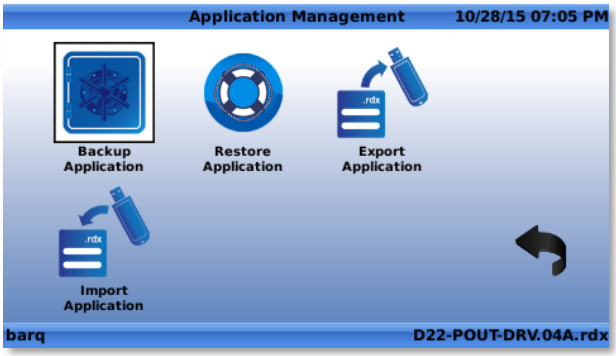
This page shows information about various system settings, such as Uptime or RAM usage.

3.4.4.1.4 "Libraries" Tab



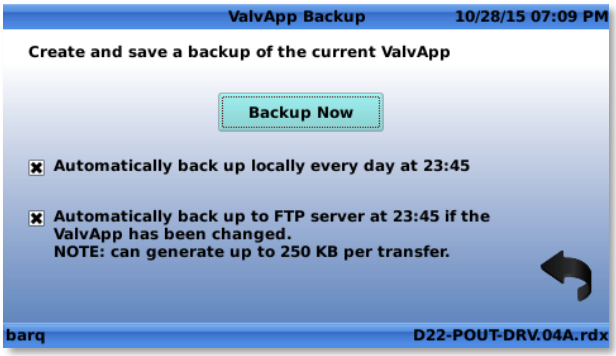
This tab contains the libraries of the standard ***ValvApps***™.

3.4.4.2 "Application Management" Page



3.4.4.2.1 "Backup Application"

When the "**Backup Application**"  icon is selected, the following dialog boxes appear:

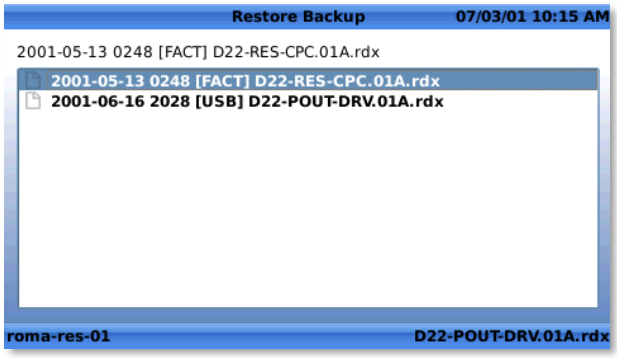


- **"Backup Now":** Click on this button to manually back up the application.
- **"Automatically back up locally every day at 23:45":** Check (resp. un-check) the box to activate (resp. deactivate) an automatic backup of the current ***ValvApps***™ stored locally in the machine daily.
- **"Automatically back up to FTP server at 23:45 if the ValvApps has been changed":** Check (resp. un-check) the box to activate (resp. deactivate) an automatic backup of the current ***ValvApps***™ stored to the configured FTP server. This back up will happen only if the ***ValvApps***™ has been modified.

⚠ This function can generate important data transfer (up to 250 kB) depending on the application.

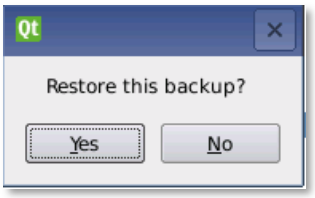
3.4.4.2.2 "Restore Application"

When the "**Restore Application**" icon is selected, the following screen appears, showing the available ***ValvApps***™ that can be restored:



: In the directory screen, click the button to enter a folder, and the button to navigate to the parent directory.

Select the appropriate file to restore, then click OK. The following dialog box will appear to confirm your choice:



Select "**Yes**" to restore to the chosen backup file. Select "**No**" to cancel the backup.

From the "**Restore Backup**" Screen, click the button to return to the previous menu.

: A Long click on the OK button returns to the main menu and cancel out of the menu.

3.4.4.2.3 "Export Application"

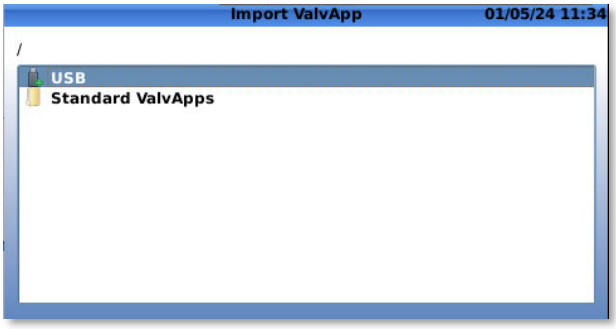
To use the functionality of the "**Export Application**" function, ensure that either a USB stick is inserted into the USB-A Slot of the D22 Electronic Controller, and/or an FTP server is setup in the device. When the "**Export Application**" icon is selected, the following screen appears:

The USB option gives the possibility to export the application to the directory of the connected USB stick, the FTP option enables the user to export the application to an FTP server.

3.4.4.2.4 "Import Application"

To use the functionality of the "**Import Application**" function, ensure that a USB Flash drive or is inserted into the USB-A slot of the Electronic Controller, and/or an FTP server is setup in the device.

When the "**Import Application**" icon is selected, the following screen appears to show the directory of the USB drive inserted into the electronic controller and the library of the Standard ***ValvApps***™.



: In the directory screen, use the buttons , to navigate into different repertoires and find the desired ***ValvApps***™

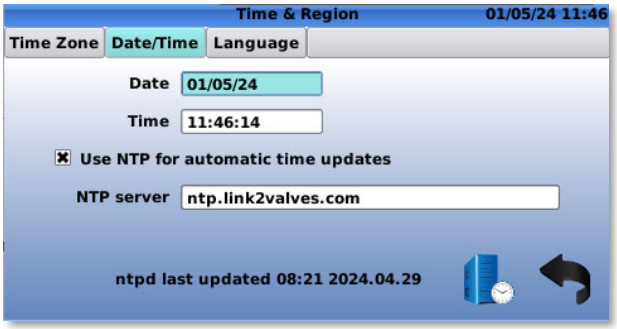
Click the button to load the selected file.

3.4.4.3 "Time & Region" Page

3.4.4.3.1 "Time Zone" Tab

In this tab is possible to choose the time zone, the country, the region and it is also possible to choose to automatically adjust for the daylight-saving time.

3.4.4.3.2 "Data and Time" Tab



Offers the possibility to manually set the date and the time or to automatically do it by taking the updates from the NTP.

To perform an automatic update, simply click on the following icon.  .

3.4.4.3.3 "Language" Tab

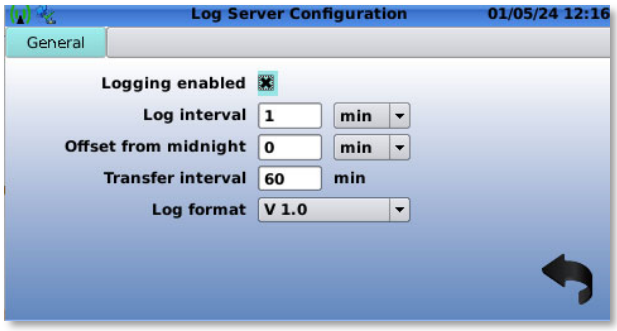
In this tab, the user can choose the date and time format and change the language of the device.

3.4.4.4 "Logging" Page

3.4.4.4.1 "Configuration"

⚠ ***It is recommended to not change the logging parameters without assistance of an official CLA-VAL representative.***

Select the icon  to enter the "**Log Server Configuration**" menu.



- "**Logging enabled":** Check (resp. un-check) the box to activate (resp. deactivate) the logging of data.
- "**Log interval":** Defines the frequency at which data are saved in the internal memory of the device.

  ⚠ Interval of less than a minute can result to a rapidly overload of the memory.

  To activate the fast logging, you need to contact CLA-VAL.
- "**Transfer interval":** Defines the frequency at which saved data are transferred to the server that has been configured in the device.
- "**Log format":** Designates which format to use for the log files.
  - "**V1.0":** Complete log format for devices with an R-Engine software version 1.7 or higher.
  - "**Legacy":** Allows to generate log files compatible with log files of devices with R-Engine software version lower than 1.7.

  ⚠ An interval of less than one minute can quickly lead to memory overload.

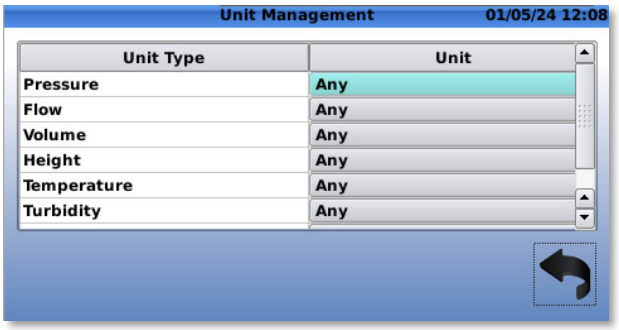
3.4.4.4.2 "Export"

Select the icon to export log files to a USB drive or FTP server.

Choose from one of the options and then click on to finalize the exporting of the logs.

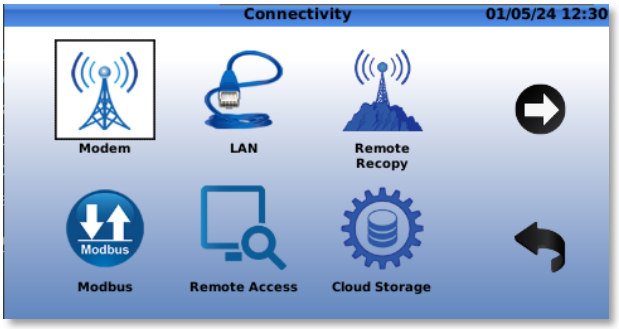
3.4.4.5 "Unit Management" Page

In this page, it is possible to choose the units for the parameters used in the controller.



3.4.4.6 "Connectivity" Page

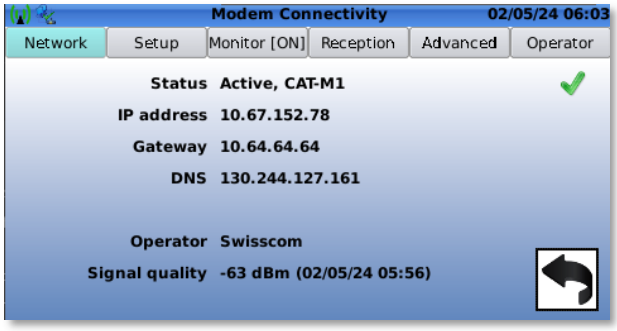
This page contains multiple menus for the configuration of different communication protocols.



3.4.4.6.1 "Modem Connectivity" Page

To use the cellular network functionality, ensure that a valid SIM card is inserted in the cover part of the Electronic Controller (see section §2.2.3 of this manual).

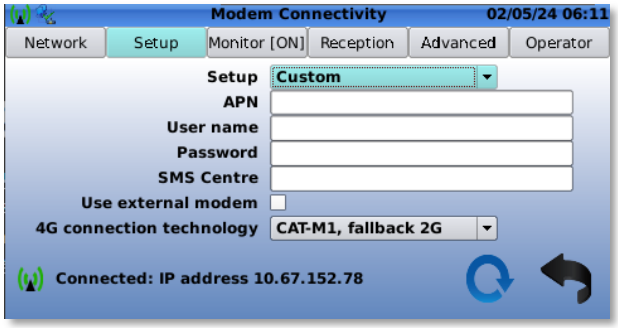
When "**Modem**" icon is selected, the following screen appears:



- "**Network**" tab: Provides general information about the cellular network connectivity.

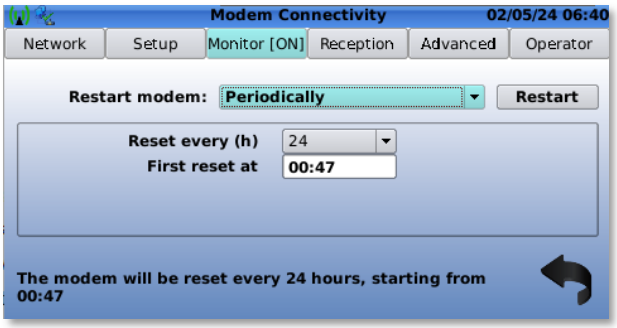
: The icon is displayed if the device is connected, and the icon when the device is not connected.

- "**Setup**" tab:



  - "**Setup ":** Allows the user to choose between CLA-VAL (if a CLA-VAL Sim card is used) or Custom if other Sim cards are used, then the other fields must be filled with the right information provided by the network operator.
  - "**4G connection technology":** Offers the possibility to choose between numerous options of communication (4G CAT-M1 or NB-Iot) depending on the coverage constraints, geographical situation of the device, and the user's preferences.
  - "**Refresh ":** With a click on the 'Refresh' button, the modem will automatically reboot and reconnect to the network. This process ensures that the modem establishes a fresh connection to the network, which can help resolve connectivity issues or update network settings. Please note that during the reboot process, the modem may temporarily lose connectivity, so it is advisable to perform this action during a time when network interruption is acceptable.

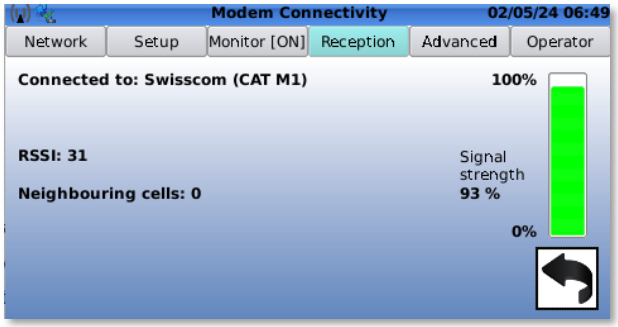
- "**Monitor [ON]**" tab: In this tab, it is possible to choose when resetting the modem automatically.



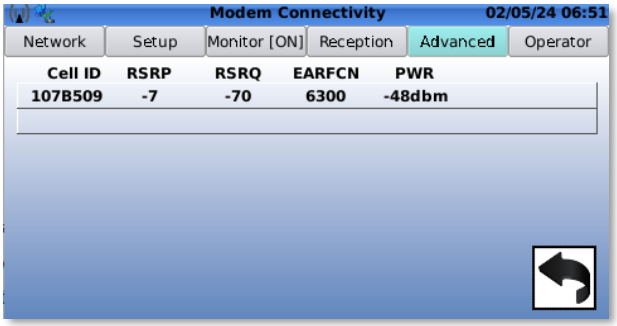
  - "**Never":** The modem will not restart.
  - "**Connection to target lost":** Designate a known IP address "**Ping Target**" to target for the modem to check at a regular interval defined in "**Interval (min.)**" if the communication failed. After a number of unsuccessful tries defined in "**Retry Count**", the communication is considered lost, and the modem restarts.
  - "**Periodically":** Reboot the communication modem periodically as defined in "**Reset every (h)**" starting at the time set in "**First reset at**".

⚠ Ensure that the target is a valid IP address that is constantly active. Use the "**Test**" button to check if the connection to the target can be established.

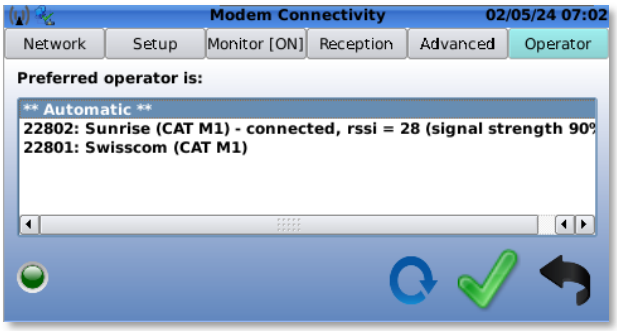
- "**Reception**" tab: This tab provides information regarding the network and its signal quality.



- "**Advanced**" tab: This tab provides advanced information regarding the cellular network connectivity.

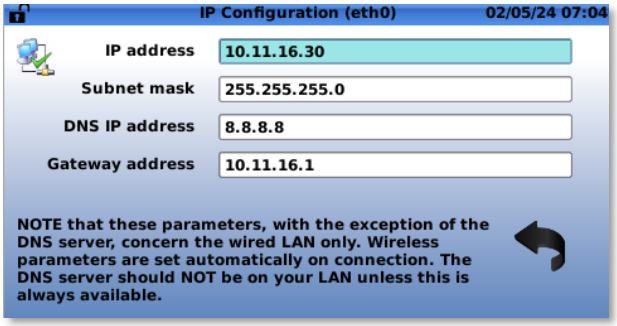


- "**Operator**": This tab provides a list of operators available on the area where the device is located. It is possible to choose the automatic mode which selects the best operator by default or select the one preferred.



3.4.4.6.2 "LAN"

When "**LAN**"  icon is selected, the screen "**IP Configuration (eth0)**" appears:

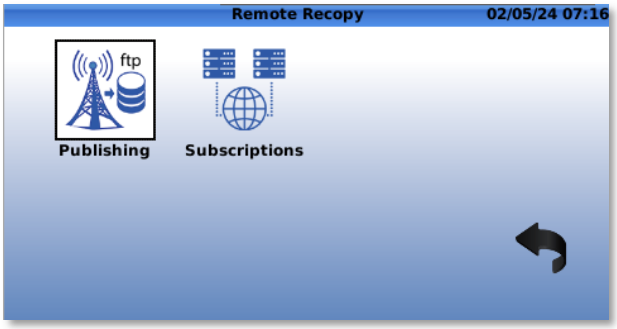


This "**LAN**" window offers the possibility to configure the device to be connected to a local area network.

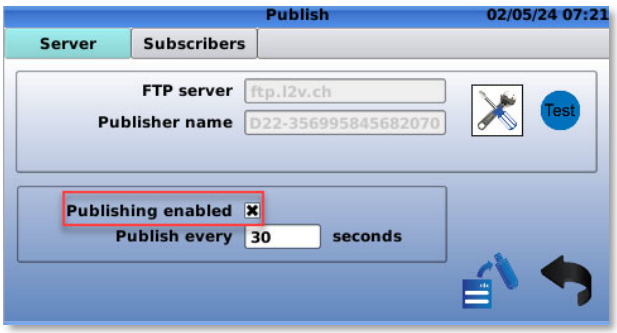
3.4.4.6.3 "Remote Recopy" page

The "**Remote Recopy**" option allows the user to set up a p*eering* functionality, for multiple electronic controllers to communicate together remotely (remote access to inputs, outputs and internal variables).

With a click on "**Remote Recopy**"  icon, the following screen appears:



1. In the "**Publish**" menu a check on the "**Publishing enable**" button allows the remote recopy on the configured FTP server.



The "**FTP server**" field is then automatically filled with the FTP server set in the device. The FTP server access settings can be changed by pressing the icon.

2. Click the Test icon to check the connection to the FTP server. A "Server access status" confirms a successful connection to the server, while a indicates a failed connection.

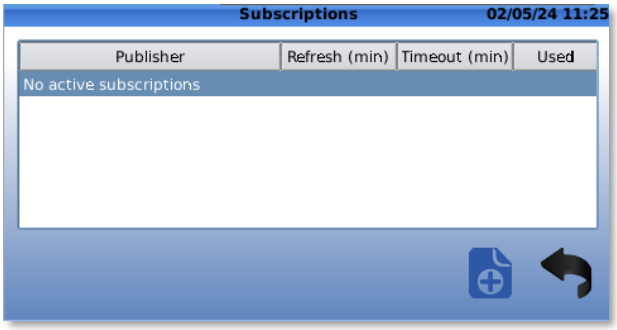
   In this case, please check the FTP server parameters and connectivity.

3. Enter the publishing frequency in the "**Publish every**" field (minimum 5 seconds).

   : 15 minutes to 60 minutes is probably a good data transfer frequency for most of hydraulic applications.

   : High frequency of data transfers may result in high costs from the operator.

4. Once the publishing is set and validated, export the configuration on a USB stick by clicking the icon.
5. For each of the devices that need to access the publishing device inputs, outputs or remote variables, click the "**Remote Recopy**" > "**Subscriptions**" icon.



Click on the icon to add a subscriber and then insert the USB stick with the publishing device configuration (see step d.). Then import the right file with the icon.

6. Click the Test icon to check the connection to the FTP server. A  "Server access status" confirms a successful connection to the server, while a  indicates a failed connection.
7. Enter the connection frequency in the "**Refresh time**" field (minimum 5 seconds), and the time to disable tentative connections in case of a connection failure in the "**Timeout**" field.

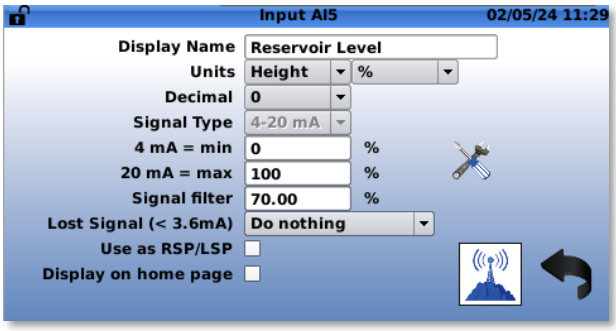
 : 15 minutes to 60 minutes is probably a good data transfer frequency for most of hydraulic applications.

 : The connection frequency of the subscribers should be smaller or equal to the publishing frequency of the publisher.

 High frequency of data transfers may result in high costs from the operator.

8. Go in the input configuration screen to affect a remote value of the "**Publisher**" to one of the inputs of the "**Subscriber**".

Long click  on the  from the home screen and select the input to be affected to a remote value. Then click  .



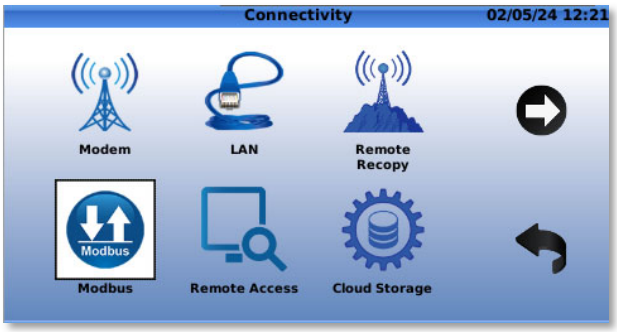
9. Click on the  icon and enable the "**Remote recopy enabled**" check box.

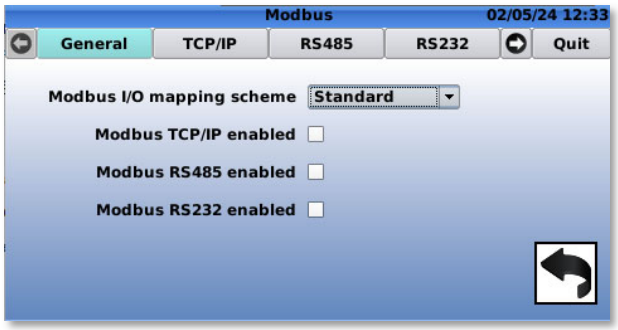
Choose the "**Publisher**" and the "**Source value**" to be peered to.

 : Only compatible signals of the "**Publisher**" will be shown in the "**Source value**".

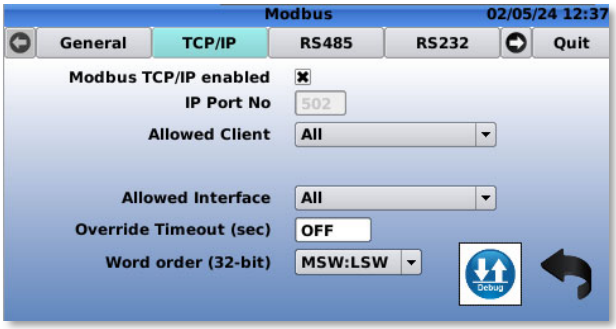
3.4.4.6.4 "Modbus"

Enter in the "**Modbus**" menu by clicking on the "**Modbus**"  icon. (à choix : TCP/IP, RS-485, RS-232).

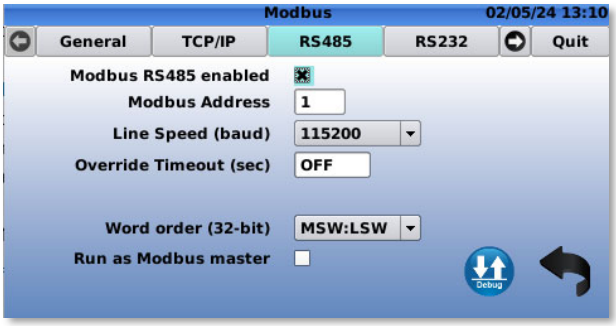




- "**General**" tab: The "**General**" tab contains dialogs to enable/disable various types of Modbus communication, as well as the button to choose the mapping scheme.
- "**TCP/IP**" tab: This tab offers the possibility to configure the Modbus TCP/IP.

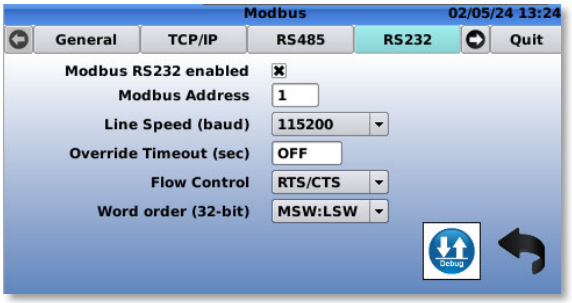


  - "**Allowed Clients**" offers three options: Allow all the clients, allow clients within a specified IP range or allow only a single client.
  - "**Allowed interface**": This button allows to choose the allowed interfaces.
  - "**Override Timeout**": Allows to choose duration of an override via Modbus.
  - "**Word order**": Allows to choose the data representation.
  - "**Debug icon**": Allows to monitor the trace of the Modbus communication, it is also possible to save these logs on an USB-stick.
- "**RS485**" tab: Offers options for the configuration of the Modbus RS485 which is commonly used for slightly long distances and for multi-point communication.

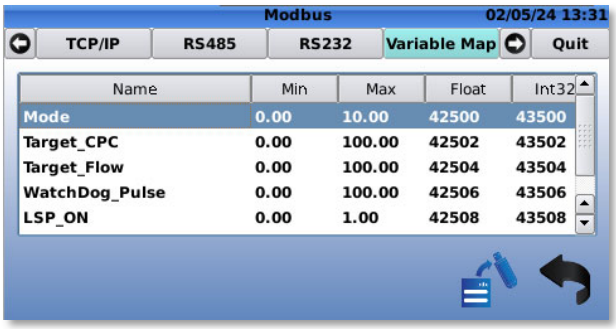


  - "**Line Speed**": Offers flexibility by allowing selection from a range of baud rates, depending on the implementation.
  - "**Run as Modbus master**": If checked, allows the controller to operate as the Modbus master.

- "**RS232**" tab: Offers options for the configuration of the Modbus RS232 which is used for short distance communication between two devices.

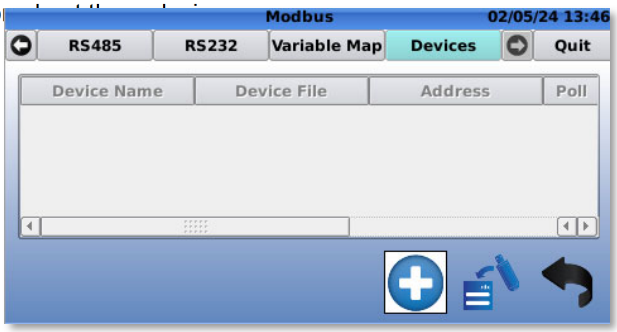


  - "**Flow Control**": Allows to choose how the data is transmitted between the two devices connected. RTS (request to send) and CTS (clear to send).
- "**Variable Map**" tab: Contains the addresses of the variables. The variables are specific to each valve app and can be modified via Modbus like all other I/Os.



The addresses may vary depending on which mapping scheme is chosen.

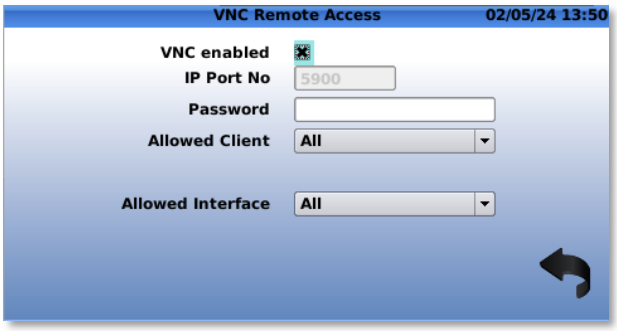
- "**Devices**" tab: Enables the addition of devices communicating with the controller via Modbus, displaying comprehensive informatio



See Chapter 5 «Appendix: Modbus Interface» for more details on how to interface to the Electronic Valve Controller via Modbus.

3.4.4.6.5 "Remote Access"

Enable the remote access to the device via VNC by checking the "**VNC enabled**" check box:



- The remote access can be protected with a password.
- The number of allowed users can be limited.
- Can limit the allowed interfaces.

⚠ Required software: the recommended software to access Electronic Controller Remote display is ***VNC Viewer***™ from ***Tight VNC***® (http://www.tightvnc.com).

To set a connection via ***VNC Viewer***™, follow the steps hereunder:

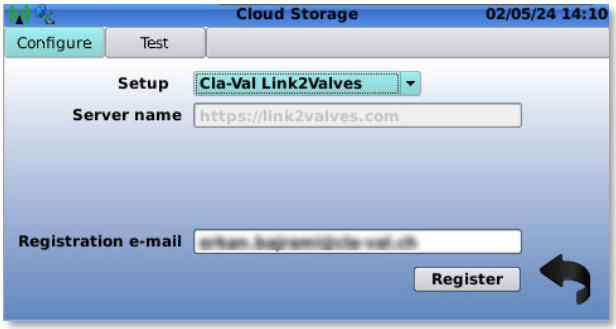
1. Set the IP address on the computer to 10.11.16.1, Subnetmask 255.255.255.0 of the interface.

: In a ***Windows***® environment, for a wired LAN this is usually accessed via the *Control Panel* > *Network and Internet* > *Network connections* > *Local Area Connections* > *Local Area Connection.*

2. Get the IP address of the Electronic Controller (see chapter 3.4.4.6.2 section 2 of this manual) **From the Home Screen, go to device configuration (Long click down) > Next screen > Reboot**.

3.4.4.6.6 "Cloud Storage – Link2Valves"

- "**Configure**" tab.

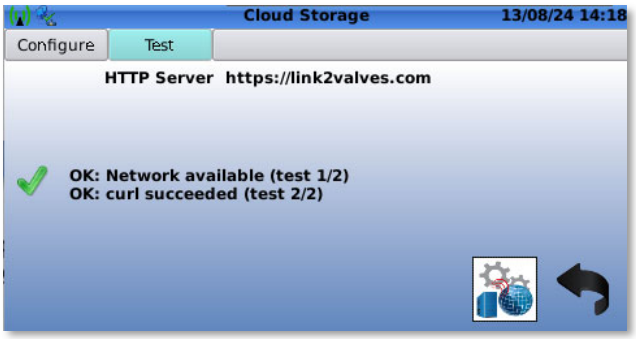


To connect to the Cla-Val web server and view data on Link2Valves.com, select the Cla-Val Link2Valves option. Then, register using your email address. For more details, refer to Chapter 4.3.3 (insert link).

: If a connection to the CLA-VAL servers is desired, only a valid registration e-mail address is necessary.

- "**Test**" tab.

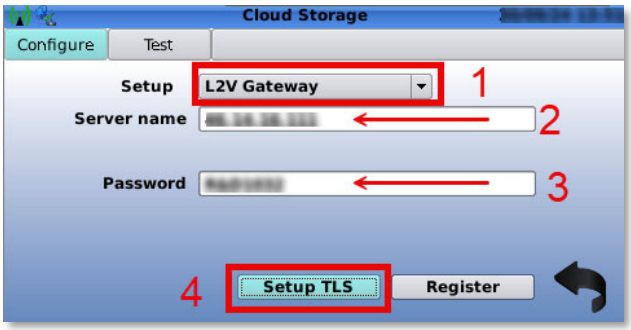
This tab offers the possibility to check the connection to the servers.



Go to the "**Test**" tab to check the connection to the Link2Valves. Click on the  icon to run the test again.

3.4.4.6.7 "Cloud Storage - Link2Valves Gateway"

To connect to the Link2Valves Gateway, select the "**L2V Gateway**" option. Then, enter the server's name or address and the password.



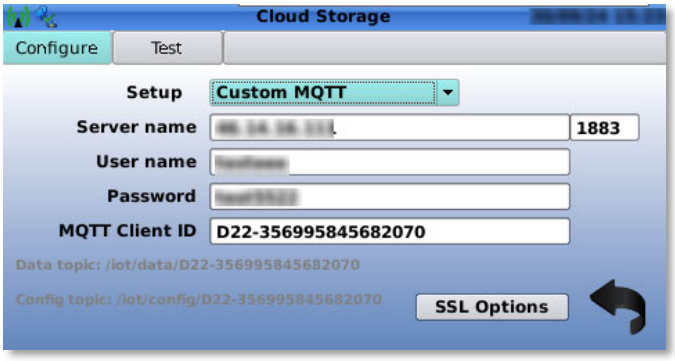
Next, by clicking on "**Setup TLS**", you can either download the certificate or import it using a USB key.

Once this is validated, go to the "**Configure**" tab and click on "**Register**" button

⚠ To use the L2V Gateway, the user needs to install in his environment an application dedicated to the L2V Gateway.

3.4.4.6.8 "Cloud Storage - MQTT"

To use MQTT as the communication protocol, select the "**Custom MQTT**" option. In the configuration process, the server's name, username, and password must be provided by the user. The MQTT Client ID for D22 devices follows the format D22-imei of the device. Note that the default port is 1883, unless otherwise specified. The data and configurations are sent to the topics indicated in faded text.



After entering all the information, click on "**SSL Options**" to either download the certificate or import it using a USB key.

When using MQTT, it is possible to adjust various parameters remotely, such as the recording interval or data transmission interval. Control curves can also be modified, with the option to add or edit points on the control curve, and it is possible to change the values of variables. Below are some examples on how to make these modifications via MQTT.

- Modifying the Control Curve via MQTT

```
{
  "profileChanges":[
    {
      "curveId":3, //Here enter the CC number
      "profile":[

        {
          "X":4,  // The X and Y represents the points on the curve
          "Y":2.5
        },
        {
          "X":8,
          "Y":2.5
        },
        {
          "X":12,
          "Y":6
        },
        {
          "X":15,
          "Y":12
        },
        {
          "X":18,
          "Y":14
        },
        {
          "X":20,
          "Y":14.9
        }
      ]
    }
  ]
}
```

- Modifying the logging parameters via MQTT

```
{
 "logging":{
          "interval":60,       // Data logging interval in seconds
          "transfer": 1440      // Log Transfer interval in minutes
             }}
```

- Modifying the variables values via MQTT

```
   "settingChanges":[
      {
         "name":"P_SP",  // Enter here the name of the variable
         "value":12.0    // Enter here the desired value
            },
      {
         "name":"Pos_SP",
         "value":75.0
            },
      {
         "name":"Q_SP",
         "value":2.0
      }
         ]
      }
```

3.4.4.6.9 "Wireless"

The following menu facilitates configuring the controller to establish a Wi-Fi connection, enabling communication with a computer and allowing the use of VNC even when not connected to the local network.

- "**WiFi AP name**": Designates the name of the device while it is being searched for connection.
- "**WPA key**": Designates the password, if configured, to restrict access solely to users with knowledge of the password.
- "**IP address**": Is set by default to 10.255.255.1.

3.4.4.6.10 "Display"

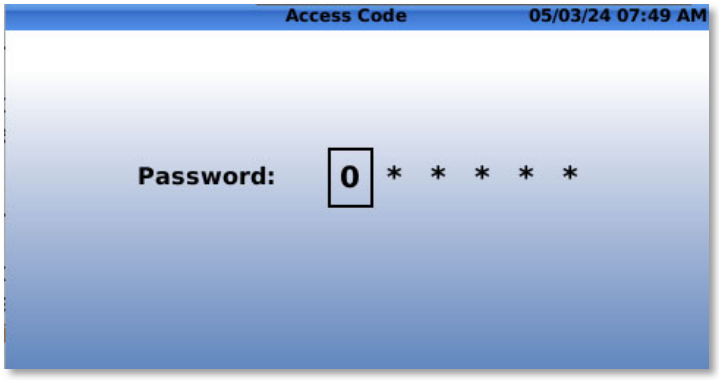
This menu provides options for adjusting the display brightness and setting a timer for automatic shutdown.

"**Brightness**": The brightness button allows the user to customize the brightness level between 1% to 100%.

"**Shutdown**": The shutdown button enables the user to set a specific duration after which the display will automatically shut down, helping to conserve power and enhance energy efficiency. If the timer is set to 0, then the display will always stay on. Otherwise, if the timer is set to a specific time, then the display will turn off after the specified number of minutes.

3.4.4.6.11 "Security"

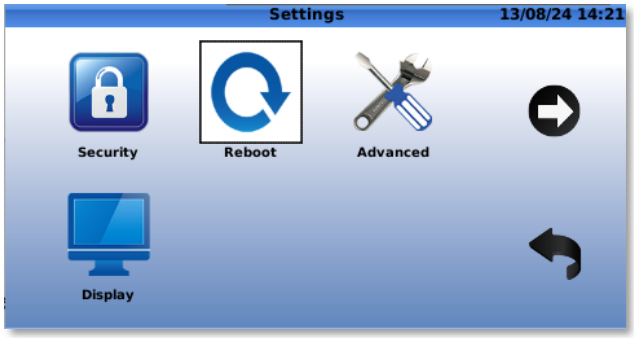
In the security page it is possible to protect the device with a password, restricting access to only those who know the password. The password protects the access to settings (long click down) and the access to the valve configuration (long click up).

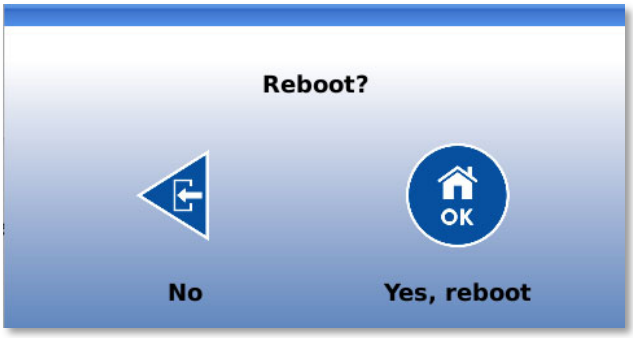


The password takes effect after performing a reboot. The device remains unlocked after entering the password. The password reactivates after 20 minutes of inactivity.

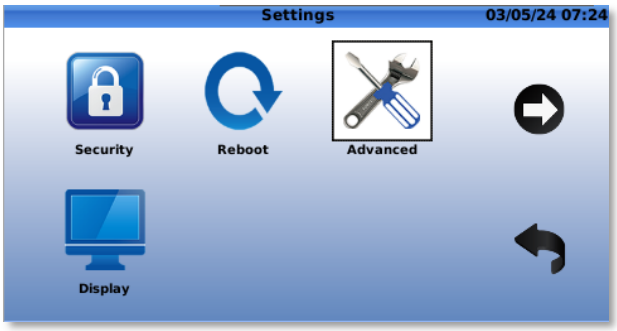
3.4.4.6.12 "Reboot"

Use this button  to reboot the electronic controller whenever necessary. Once the system reboots, it will take approximately 45 to120 seconds to restart.

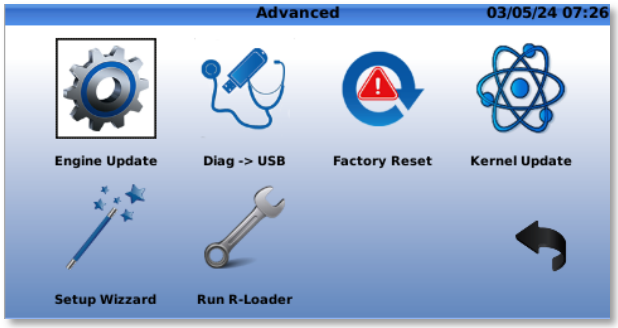


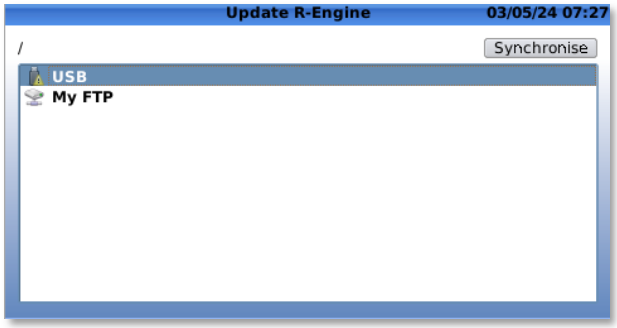


3.4.4.6.13 "Advanced" Settings Page

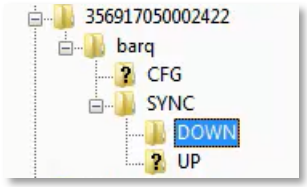


3.4.4.6.13.1 **"Engine Update"**





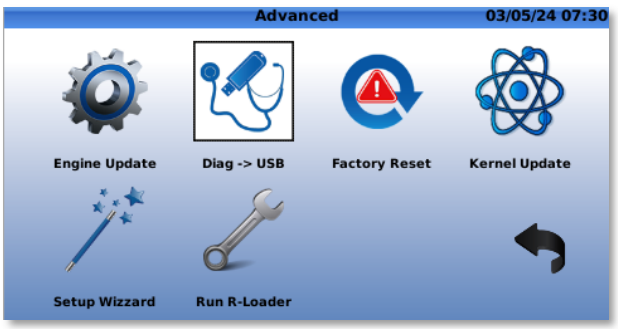
- **USB:** Click the button to update from a USB Flash drive. If a USB Flash drive is inserted into the USB slot, then the Electronic Controller will show the contents of the drive. Navigate to the selected **.tar* file and click OK.
- **My FTP:** If a server has been setup for connectivity, the update can be made from that server. Navigate to the selected **.tar* file and click OK.
  The Engine needs to be located on the FTP server configured in the Electronic Controller in the "***SYNC\DOWN***" folder



: An R-Engine update requires a **.tar* file.

3.4.4.6.13.2 **"Diag -> USB"**

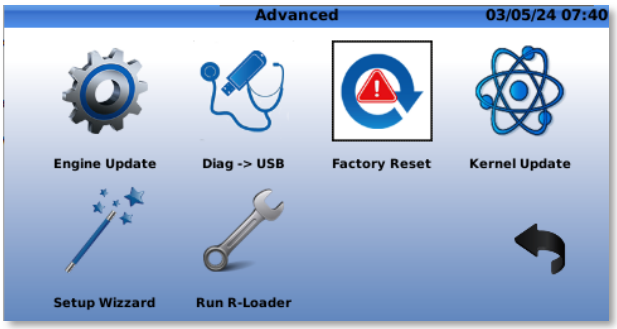
This allows to export the diagnostic file of the electronic controller. The diagnostic file cannot be used directly by the user, and is usually requested by CLA-VAL for support purposes.



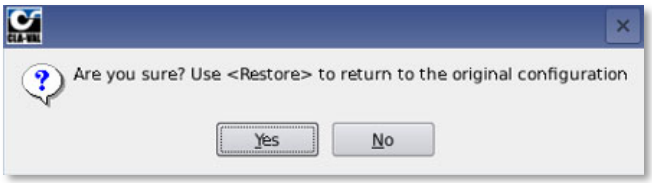
- **USB:** Click the button to export the diagnostic file to a USB Flash drive.
- **My FTP:** If a server has been setup for connectivity, the file can be exported to that server.

While navigating, click on the to come back to the precedent level.

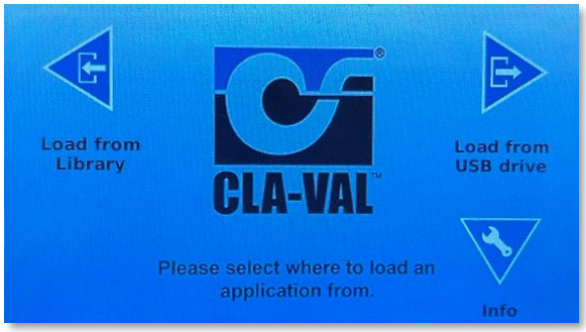
3.4.4.6.13.3 **"Factory Reset"**



When clicking on the  icon, the following dialog box will appear to confirm or cancel the factory reset:



- After a factory reset, the following screen will appear to prompt the next choice:

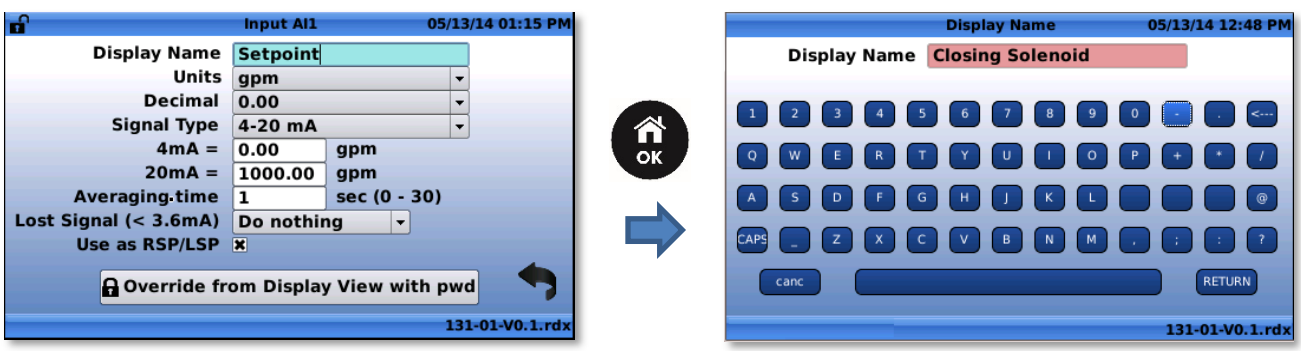


- Click the  button to load a ***ValvApps™*** from the internal library. Once inside the library, select and load the desired ***ValvApps™.***
- Click the  button to load a ***ValvApps™*** from an attached USB Flash Drive. Select and load the desired ***ValvApps™.***

The electronic controller will restart, and the application will be loaded upon startup of the system.

3.5 IN-MENU "NAVIGATION"

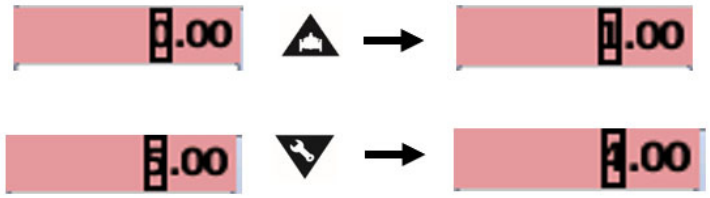
3.5.1 KEYBOARD FUNCTIONALITY



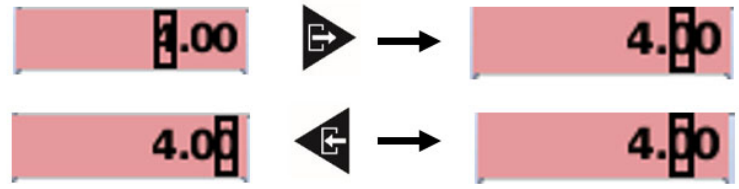
- Letter Selection - use arrow keys to navigate to letters and then press OK to select each letter.
- Deleting text - navigate to <--- button and press OK to delete letters.
- Capital Letter (CAPS) Selection - select CAPS and press OK. The CAPS button will become red - CAPS. Now all of the text in the window will come in *ALL CAPITAL LETTERS*.
- Accept text - navigate to the RETURN button and press OK to accept the text. Alternately, long hold (more than 2 seconds) on OK will also accept the text.
- Cancel text changes - navigate to canc button and press OK to cancel text changes.

3.5.2 NUMERAL SELECTION

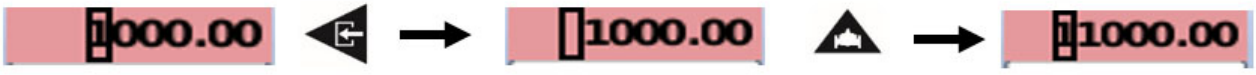
- Press OK to enter the numeral selection field.
- Use ▲ and ▼ to increase and decrease the selected numeral.



- Use ◀ and ▶ to move the cursor to the left and right, respectively.

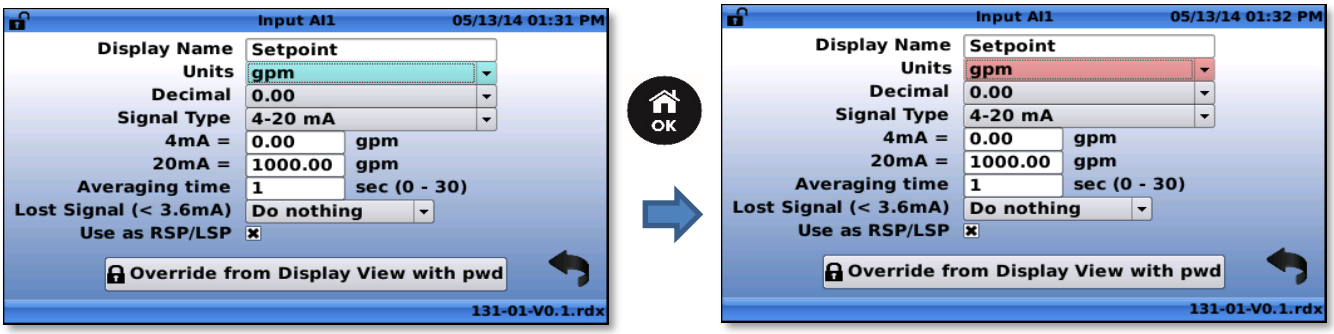


- To add digits to the left of the current maximum use the ◀ to move the cursor to the left.



- To accept changes, select OK to return to exit field.

3.5.3 DROP-DOWN MENU



- Use and to navigate up and down the options in the drop-down menu.

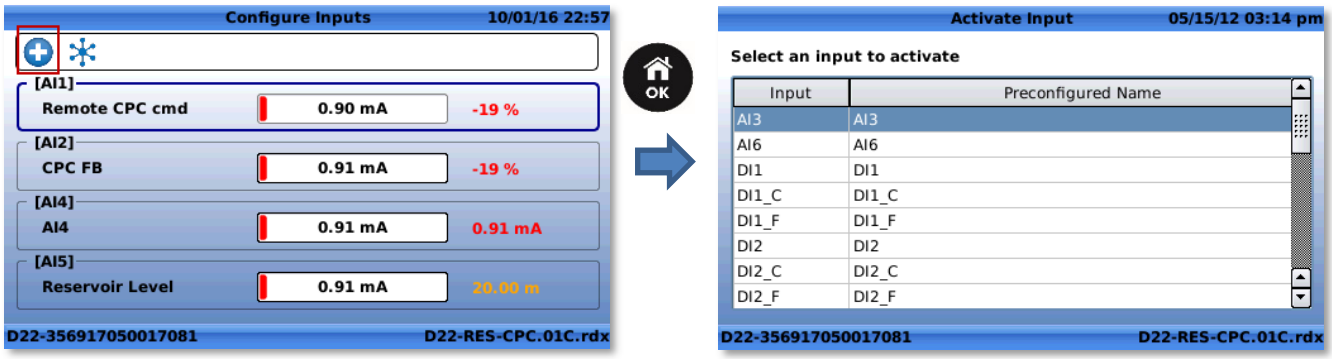
- Short click OK to accept the selection.
- Long click OK will escape to Home Screen and cancel any selections.

4 SPECIFIC FEATURES

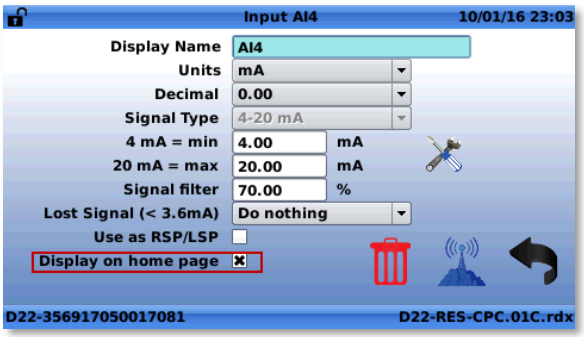
4.1 ADD INPUTS MANUALLY

It is possible to add inputs even if they are not initially introduced to ***ValvApps™***. This is advantageous when additional sensors need to be added.

To manually add an input, perform a long click-left, then click on the button "+" as shown in the following figure, and select the desired input. Finally, click OK. The input will then appear on the list of inputs.



To display an input on the home screen, perform a long-left click, then in the list of inputs, click on the desired input and check the box as shown in the following figure. To remove a manually added input, click on the red trash icon.

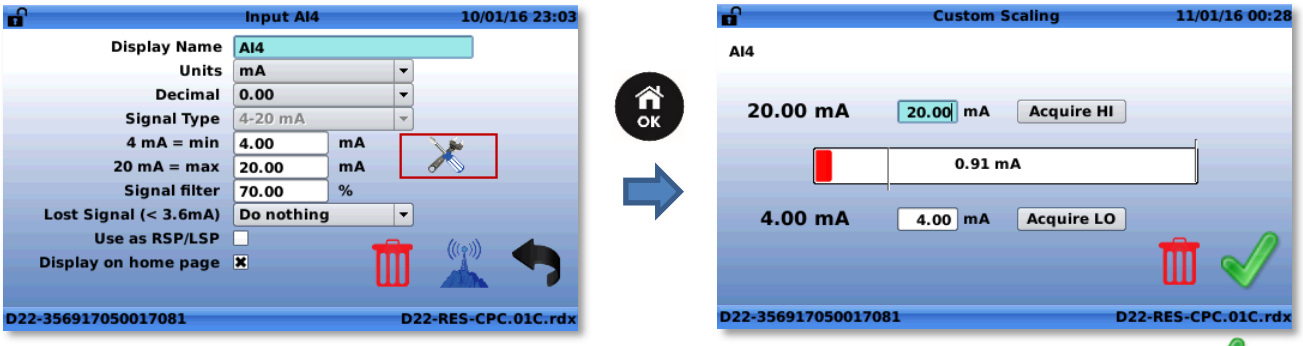


4.2 CUSTOM SCALING

This feature is useful to re-scale signals of 4-20 mA sensors when the practical application range is reduced (say for instance 6-16 mA).

To custom scale an input, go to the "**Configure Inputs**" screen:

Long click left > *Left* on input to be custom scaled.

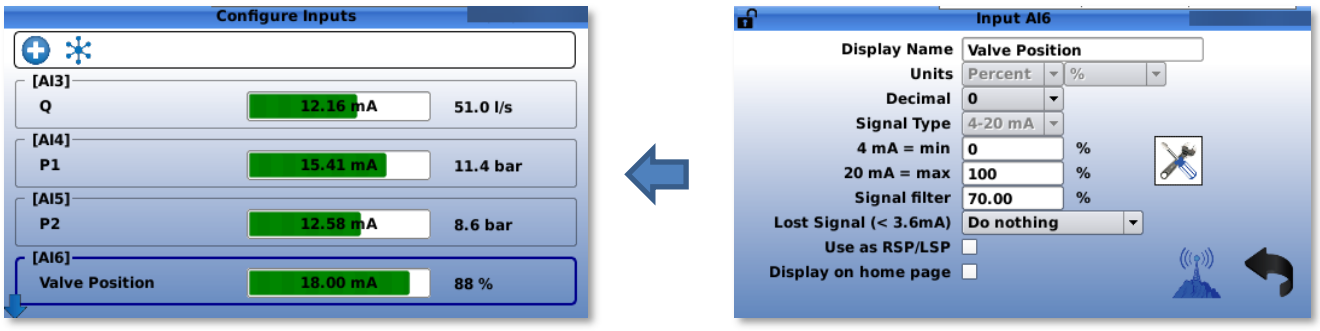


Push "***Acquire Lo***" to set the minimum value and "***Acquire HI***" to set the maximum value and validate it with the ✓. Note that the sensor can also have a reversed range, i.e. minimum physical value for 20 mA and maximum physical value for 4 mA.

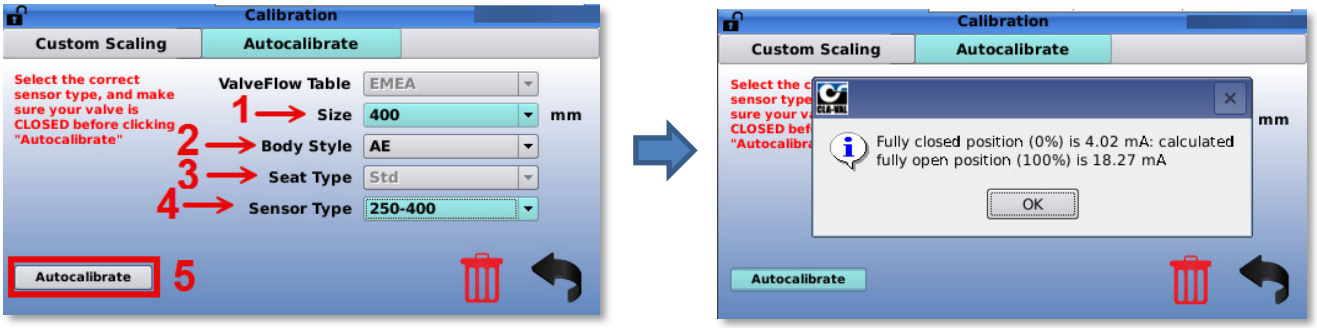
4.3 E-LIFT AUTOCALIBRATION

The Autocalibration feature for e-Lift enables the use of full-range sensors and streamlines the calibration process for precise and efficient operation.

To initiate the autocalibration procedure, from the home screen, perform a long press on the left button. Select the input channel to which the e-Lift is connected, then enter the configuration menu by pressing left again and then click on the tools icon.



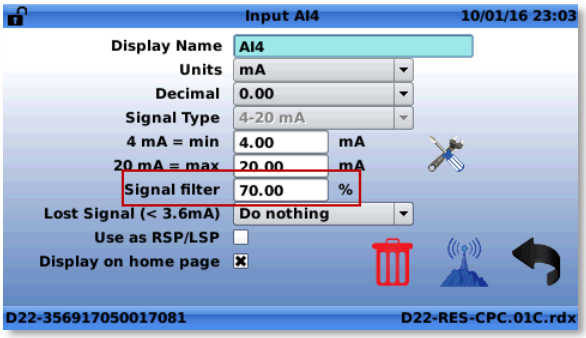
Navigate to the Autocalibrate tab and input the relevant valve specifications. Select the appropriate sensor type based on the valve dimensions: for valves up to DN200, select 32-200; for valves up to DN400, select 250-400; for valves up to DN600, select Tytan; and for valves greater than DN600, select e-Lift-34 for Tytan. Ensure the valve is fully closed, then initiate the calibration process by clicking the Autocalibrate button.



4.4 INPUT FILTERING

Signal filtering can be implemented for the analogue inputs of the electronic controller to reduce the noise coming from the sensors and stabilize the signal. The filter can be adjusted in the "**Configure Inputs**" screen:

Long click left > *Left* on the selected input.



The value can be set from 1% (light) to 99% (strong) or disabled. The default value is set at 70%, which is usually a good filtering for most of the application.

This default value of 70% should not be changed, unless required!

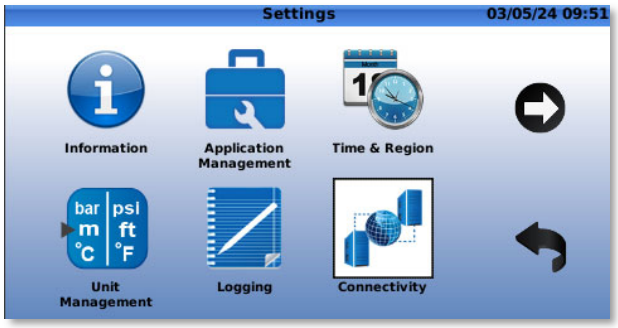
4.5 REMOTE CONFIGURATION

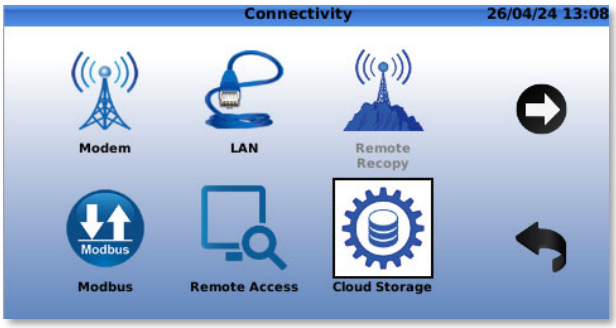
Remote editing and modification of control curves, set-points, and variables are possible through the CLA-VAL Link2Valves web platform. This capability proves invaluable when adjustments to the operational mode or regulation profile characteristics are required, eliminating the need to dispatch a technician to the field. For example, transitioning from fixed pressure regulation to automatic pressure vs. flow regulation profile, or gradually adjusting the PRV outlet pressure set point until reaching the network's optimal point, are all achievable remotely.

To use this functionality, the electronic controller needs to be connected to the internet (either via the cellular network or via Ethernet) and registered in the CLA-VAL ***Link2Valves*** platform for a user with Administrator rights (contact CLA-VAL for more details).

4.5.1 REGISTER THE ELECTRONIC CONTROLLER ON LINK2VALVES

Long click down > "**Connectivity**" > "**Cloud Storage**"





1. Enter "**Cla-Val Link2Valves**" in "**Setup**".
2. Enter the e-mail address in "**Registration e-mail**".
3. Click on "**Register**" and wait for process to complete.

4.5.2 CONNECT TO LINK2VALVES

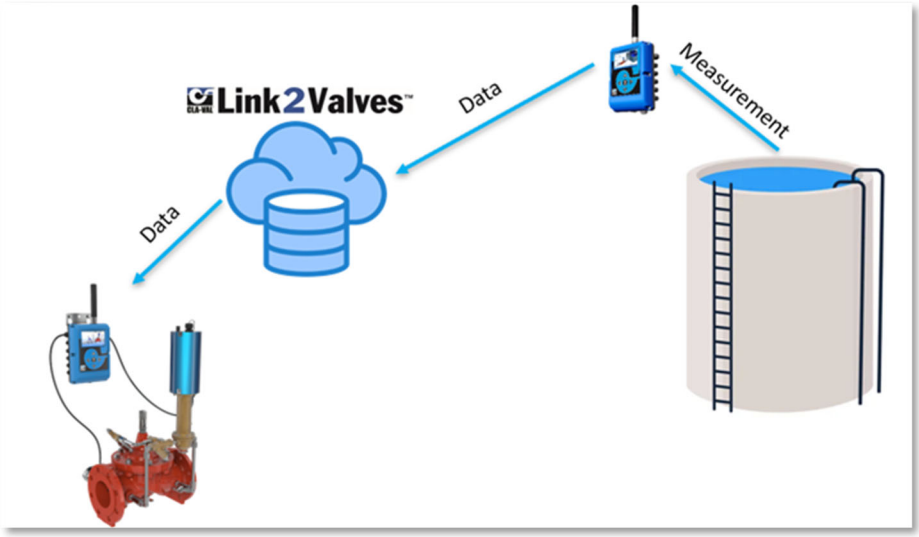
If already registered in ***Link2Valves***, connect to www.link2valves.com and log in.

If not registered, click on the automatic email received from *no-reply@link2valves.com* (check your spam box if not in your inbox) and enter a password in the website. Ask CLA-VAL to get administrator rights.

See the Link2Valves User Guide for more details on how to use the functionality of Link2Valves.

4.6 HTTPS PEERING VIA L2V

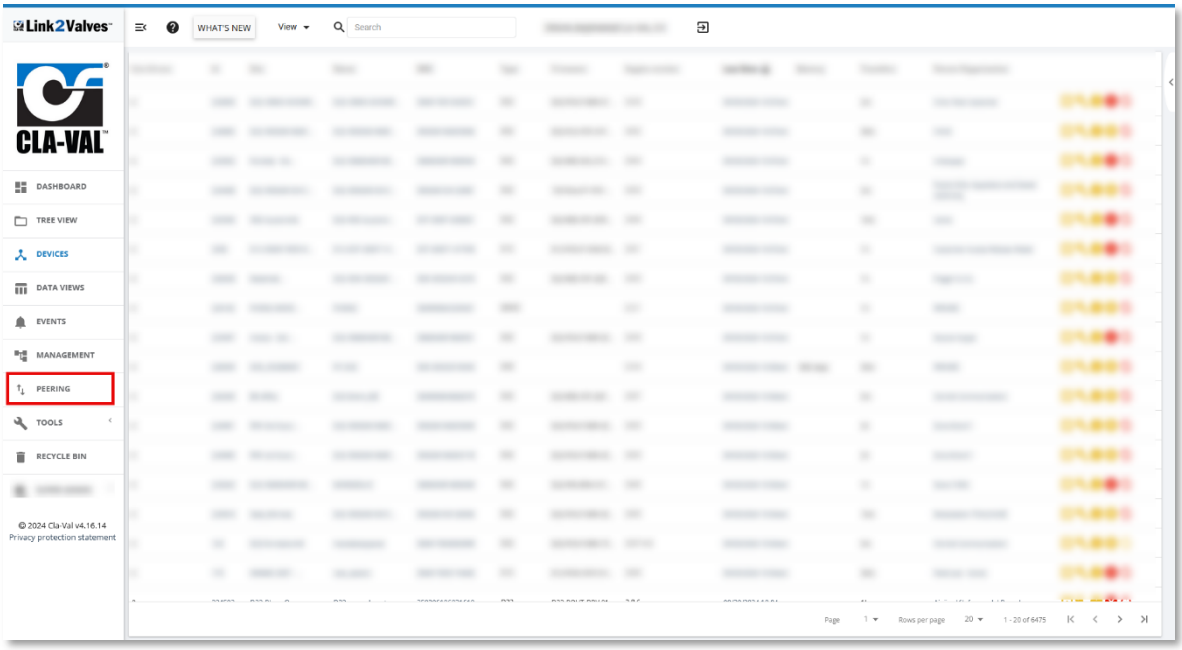
The HTTPS Peering feature allows the connection of two or more D22 devices to communicate and exchange information with each other. This functionality is particularly useful in scenarios where measurements are taken far from the valve, such as when the tank is located at a distance. In such cases, the D22 placed near the tank measures the level, and then sends this value to the D22 controlling the valve. Based on these values, the controller will activate the actuator to achieve the desired setpoint.



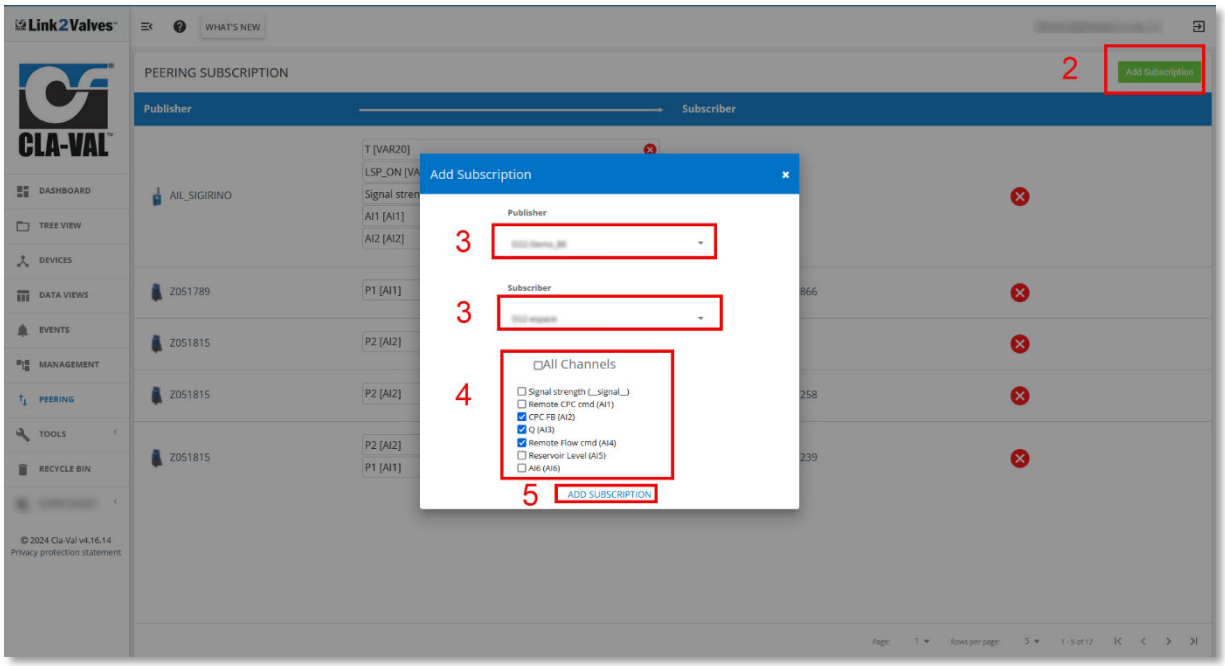
To use this feature, it is necessary for the devices intended to communicate to be connected through the Link2Valves.

The first step is to configure the Peering feature on L2V. To do this:"

1. From the main page of Link2Valves, click on the "**Peering**" section.



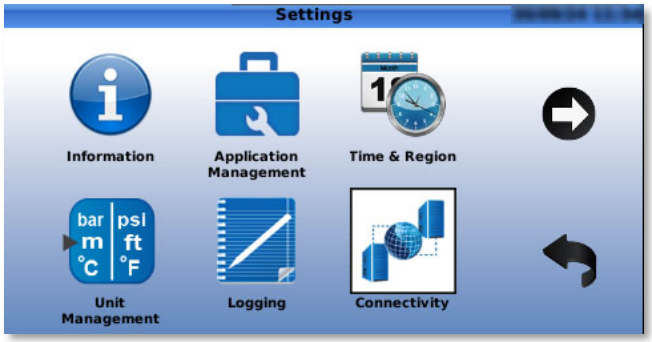
2. Click on "**Add a Subscription**" to create a new communication link between two devices.
3. Select the device that will publish the data and the device that will receive the data.
4. Choose the inputs you want to transmit to the other device. For the publisher, it is also possible to publish its outputs.
5. Finally click on the button "**Add Subscription**".

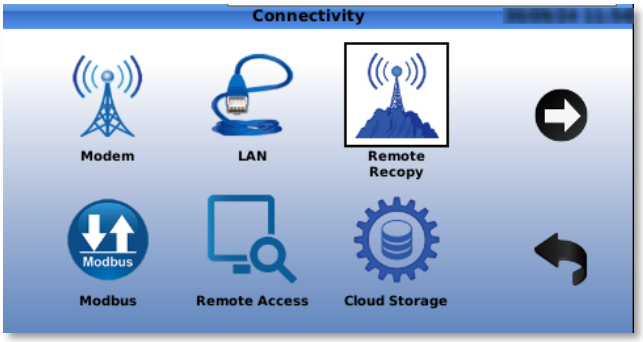


After configuring the HTTPS Peering on Link2Valves, the next step is to configure the D22s to communicate between them.

To configure the Peering feature on the D22, follow these steps:

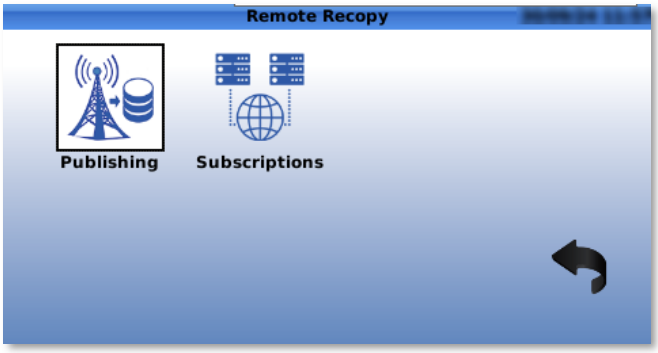
1. From the Home Screen, perform a long click down to access to the settings of the D22.
2. Enter the **Connectivity** menu and navigate to the **Remote Recopy** menu.

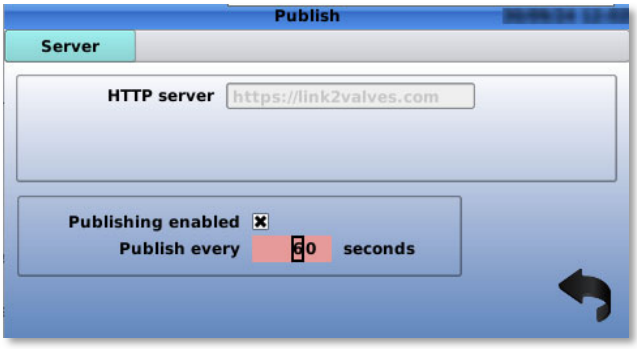




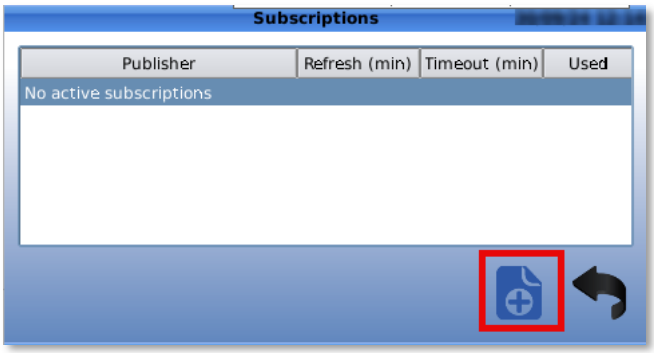
3. In the **Publisher** menu, configure the device that will publish its data. Enable publishing and choose the interval of publishing.

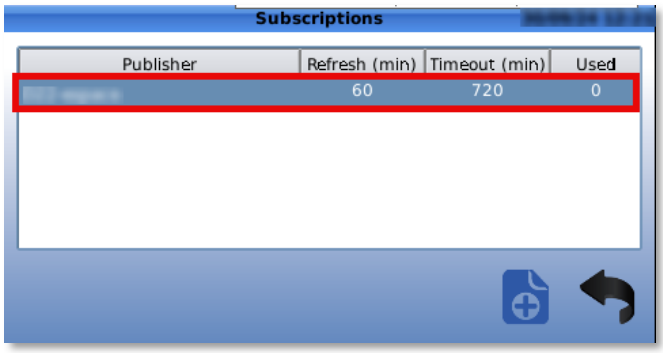
⚠ Please remind that higher frequency of publishing consumes more data bandwidth.



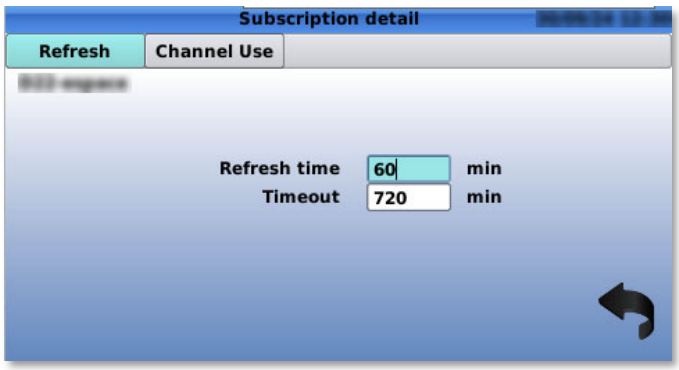


4. In the **Subscriber** menu, configure the device that will receive the data.
   a. Click on the following button to search for publishers, then click and enter on the publisher menu from which the data will be subscribed.

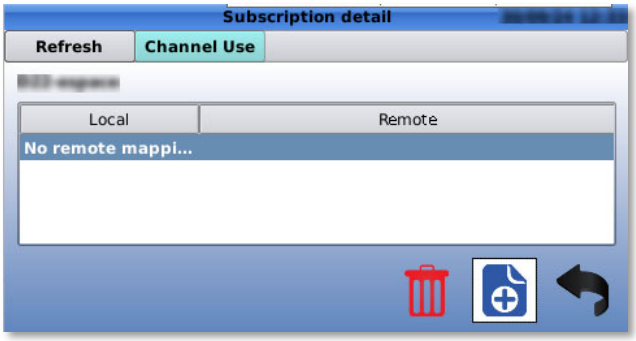


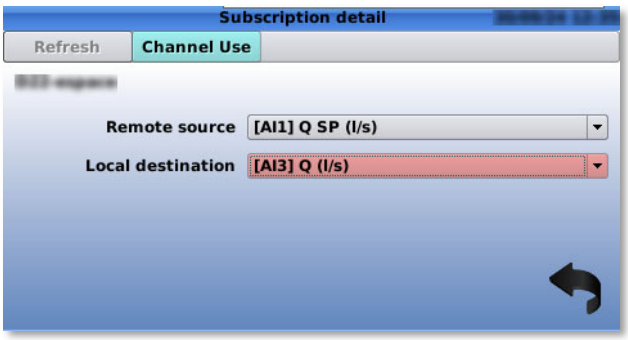


   b. After selecting the publisher, choose the data refresh interval and set the timeout duration in case no data is available.



   c. Click on the "**Channel Use**" tab and then click on the button to add the channels you want to subscribe to.





By completing these steps, the D22 devices will be able to communicate effectively via the HTTPS Peering.

5 APPENDIX: MODBUS INTERFACE

5.1 MODBUS PROTOCOL

Supports Modbus TCP/IP and Modbus RTU simultaneously, as a server (slave) only.

- Modbus RTU: Requires UID (Modbus address, 1-255) and baudrate.
- Modbus TCP/IP: Requires allowed client IP address range (for access control) and IP port number (default 502).

5.2 STANDARD MODBUS INTERFACE

All the data accessible via Modbus requests is mapped into a table within the address space (addresses 00000 to 43999). The supported function codes are as follows:

- 01 - Read Coils
- 02 - Read Discrete Inputs
- 03 - Read Holding Registers
- 04 - Read Input Registers
- 06 - Write Singel Register
- 16 - Write Multiple Registers

All the physical inputs and outputs are mapped and accessible via a Modbus request. The mapping is done by considering numerous factors, such as the function code, data property and data type. The table accommodates different data formats based on the specific request and purpose.

Below, the mapping of the physical inputs and outputs is explained in detail. For a clearer explanation, the schema is divided into multiple sections, sometimes based on the function code and in other cases based on the data type.

5.2.1 DISCRETE INPUT CONTACTS

Function Code 01 - Read Coils: Is used to only read data from coils, which typically represent discrete outputs (in our case Solenoid output and Relay output).

The coil outputs registers can be read in the address range from 00000 to 09999 (in our case, we only use the first 4 addresses). Each address stores a single bit which can be "1 for ON or 0 for OFF".

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps (- : not used)													
							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discrete Output Contacts	01: Read Coils	00000	Read-Only	Bit	SO1	Physical Output State (On / Off)	SO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		00001	Read-Only	Bit	SO2		SO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		00002	Read-Only	Bit	RO1		RO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		00003	Read-Only	Bit	RO2		RO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		00004 - 09999	Read-Only			Not used	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

5.2.2 DISCRETE INPUT CONTACTS

Function Code 02 - Read Discrete Inputs: Is used to read data from discrete inputs, representing binary inputs (1 or 0).

The registers containing this data span the address range from 10000 to 19999 (only the first 6 addresses are used). The data inside these addresses is a single bit, varying between '1' for ON and '0' for OFF.

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps (- : not used)													
							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discrete Input Contacts	02: Read Discrete Inputs	10000	Read-Only	Bit	DI1	Physical Input State (On / Off)	DI1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10001	Read-Only	Bit	DI2		DI2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10002	Read-Only	Bit	DI3		DI3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10003	Read-Only	Bit	DI4		DI4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10004	Read-Only	Bit	DI5		DI5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10005	Read-Only	Bit	DI6		DI6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		10006 - 19999	Read-Only			Not used	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

5.2.3 ANALOG INPUT REGISTERS

Function Code 04 - Read Input Register: It is employed to Read-Only data.

The mapping table for the analog input registers spans the address range from 30000 to 39999. (Only the first 36 addresses are used). Each input analog register holds a (IEEE Float, high-order word:low-order word).

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps (- : not used) 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Analog Input Registers	04: Read Input Register	30000	Read-Only	IEEE Float	AI1	Physical Input value	high-order word
		30001					low-order word
		30002	Read-Only	IEEE Float	AI2		high-order word
		30003					low-order word
		30004	Read-Only	IEEE Float	AI3		high-order word
		30005					low-order word
		30006	Read-Only	IEEE Float	AI4		high-order word
		30007					low-order word
		30008	Read-Only	IEEE Float	AI5		high-order word
		30009					low-order word
		30010	Read-Only	IEEE Float	AI6		high-order word
		30011					low-order word
		30012	Read-Only	IEEE Float	DI1_C		high-order word
		30013					low-order word
		30014	Read-Only	IEEE Float	DI2_C		high-order word
		30015					low-order word
		30016	Read-Only	IEEE Float	DI3_C		high-order word
		30017					low-order word
		30018	Read-Only	IEEE Float	DI4_C		high-order word
		30019					low-order word
		30020	Read-Only	IEEE Float	DI5_C		high-order word
		30021					low-order word
		30022	Read-Only	IEEE Float	DI6_C		high-order word
		30023					low-order word
		30024	Read-Only	IEEE Float	DI1_F		high-order word
		30025					low-order word
		30026	Read-Only	IEEE Float	DI2_F		high-order word
		30027					low-order word
		30028	Read-Only	IEEE Float	DI3_F		high-order word
		30029					low-order word
		30030	Read-Only	IEEE Float	DI4_F		high-order word
		30031					low-order word
		30032	Read-Only	IEEE Float	DI5_F		high-order word
		30033					low-order word
		30034	Read-Only	IEEE Float	DI6_F		high-order word
		30035					low-order word
		30036 - 39999	Read-Only			Not used	- - - - - - - - - - - - - - - -

Input values are expressed as natural units, so that if a 4-20 mA analog input is configured as flow, where 4 mA = 0 l/s and 20 mA = 200 l/s, for an input value of 12 mA the client will read 100.

Note that input values are supplied after filtering, scaling and special handling. So, reading the value of an 4-20 mA input which has no signal (defined as input < 3.6 mA) may return:

- An out-of-range value.
- The last-known good value.
- A default value.

Depending on the configuration of the input. An input/output with a local override applied will return the override value, ***not*** the current physical value.

5.2.4 HOLDING REGISTERS

Function Code 03 - Read Holding Register: It is designed for reading data from the holding registers.

Function Code 06 - Write Single Register: It is used for writing in a single register.

Function Code 16 - Write Multiple Registers: It is designed for writing multiple registers.

The three function codes above can be used on holding registers, the holding registers span the address range from 40000 to 43999. Below it will be explained separately according to the information and the data type of the holding registers.

In the table below, details regarding the holding registers between addresses 40000 and 40999 are displayed. The first 19 addresses are used. Each address stores 1 byte of data.

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps														
							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Holding Registers	03: Read Holding Registers 06: Write Single Registers 16: Write Multiple Registers	40000	Read-Only	Word	Multi	Analog Input Out of Range Status	AI1	AI2	AI3	AI4	AI5	AI6	-	-	-	-	-	-	-	-	-	-
		40001	Read-Only	Word	Multi	Digital Counter Input Out of Range Status	DI1_C	DI2_C	DI3_C	DI4_C	DI5_C	DI6_C	-	-	-	-	-	-	-	-	-	-
		40002	Read-Only	Word	Multi	Digital Frequency Input Out of Range Status	DI1_F	DI2_F	DI3_F	DI4_F	DI5_F	DI6_F	-	-	-	-	-	-	-	-	-	-
		40003	Read-Only	Word	Multi	Analog Input Local Override Status	AI1	AI2	AI3	AI4	AI5	AI6	-	-	-	-	-	-	-	-	-	-
		40004	Read-Only	Word	Multi	Digital Input Local Override Status	DI1	DI2	DI3	DI4	DI5	DI6	-	-	-	-	-	-	-	-	-	-
		40005	Read-Only	Word	Multi	Digital Counter Input Local Override Status	DI1_C	DI2_C	DI3_C	DI4_C	DI5_C	DI6_C	-	-	-	-	-	-	-	-	-	-
		40006	Read-Only	Word	Multi	Digital Frequency Input Local Override Status	DI1_F	DI2_F	DI3_F	DI4_F	DI5_F	DI6_F	-	-	-	-	-	-	-	-	-	-
		40007	Read-Write	Word	Multi	Analog Input Modbus Override Active Bit	AI1	AI2	AI3	AI4	AI5	AI6	-	-	-	-	-	-	-	-	-	-
		40008	Read-Write	Word	Multi	Digital Input Modbus Override Active Bit	DI1	DI2	DI3	DI4	DI5	DI6	-	-	-	-	-	-	-	-	-	-
		40009	Read-Write	Word	Multi	Digital Counter Input Modbus Override Active Bit	DI1_C	DI2_C	DI3_C	DI4_C	DI5_C	DI6_C	-	-	-	-	-	-	-	-	-	-
		40010	Read-Write	Word	Multi	Digital Frequency Input Modbus Override Active Bit	DI1_F	DI2_F	DI3_F	DI4_F	DI5_F	DI6_F	-	-	-	-	-	-	-	-	-	-
		40011	Read-Only	Word	Multi	Analog Output Local Override Status	AO1	AO2	AO3	AO4	-	-	-	-	-	-	-	-	-	-	-	-
		40012	Read-Only	Word	Multi	Digital Output Local Override Status	SO1	SO2	RO1	RO2	-	-	-	-	-	-	-	-	-	-	-	-
		40013	Read-Only	Word	Multi	Analog Output Alarm Active Status	AO1	AO2	AO3	AO4	-	-	-	-	-	-	-	-	-	-	-	-
		40014	Read-Only	Word	Multi	Digital Output Alarm Active Status	SO1	SO2	RO1	RO2	-	-	-	-	-	-	-	-	-	-	-	-
		40015	Read-Only	Word	Multi	Analog Output Recopy Active Status	AO1	AO2	AO3	AO4	-	-	-	-	-	-	-	-	-	-	-	-
		40016	Read-Only	Word	Multi	Digital Output Recopy Active Status	SO1	SO2	RO1	RO2	-	-	-	-	-	-	-	-	-	-	-	-
		40017	Read-Write	Word	Multi	Analog Output Modbus override active bit	AO1	AO2	AO3	AO4	-	-	-	-	-	-	-	-	-	-	-	-
		40018	Read-Write	Word	Multi	Digital Output Modbus override active bit	SO1	SO2	RO1	RO2	-	-	-	-	-	-	-	-	-	-	-	-
		40019 - 40999	Read-Only			Not used	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The Holding Registers mapped between addresses 40000 to 40002 are Read-Only registers and contain information about the range status of the analog and digital inputs. They are used to check if any of the input values are out of range.

The Holding Registers between 40003 to 40006 are Read-Only registers and contain information about the override status of the analog and digital inputs. Are used to check if any input is being overridden.

The Holding Registers between 40007 to 40010 are Read-Write registers which contain information about the active bit. **Note:** "To enable the override on an input/output, it is essential to set the correct value for the active bit".

To enable forcing on the analog inputs AIx, the value of Holding Register 40007 must be set to one of the specific values corresponding to the input that needs to be forced:

- Enable forcing for AI1 then the value of the HR 40007 must be set on 1
- Enable forcing for AI2 then the value of the HR 40007 must be set on 2
- Enable forcing for AI3 then the value of the HR 40007 must be set on 4
- Enable forcing for AI4 then the value of the HR 40007 must be set on 8
- Enable forcing for AI5 then the value of the HR 40007 must be set on 16
- Enable forcing for AI6 then the value of the HR 40007 must be set on 32

To disable any override the value of the HR 40007 must be set on 0

To enable the override on multiple inputs simultaneously, the value of HR 40007 must be equal to the sum of the digits used to activate forcing on a single input. For example:

- AI1 & AI2 then the value of the HR 40007 must be set on 3
- AI3 & AI5 then the value of the HR 40007 must be set on 20
- AI5 & AI6 then the value of the HR 40007 must be set on 48 ect.

The same logic is followed to enable the forcing on other analog and digital input/outputs.

Note: that an override will have no effect if:

- The write operation is incomplete (Typically Enable forcing is off).
- The supplied value is out of the permitted range.
- A local override, an alarm, or a recopy is active.

- If a modbus override is applied and subsequently a local override, an alarm or a recopy become active, the modbus override is removed.

Note also: That the values read may not reflect those used in, for example, a PID block. For example, AI1 is used as the setpoint for a PID the user may override it locally: alternatively, he may choose to override the setpoint value in the PID parameters. In this latter case the value of AI1 no longer reflects the setpoint value.

The following section of the table details the mapping of the holding registers between addresses 41000 and 41999, in these holding registers it is possible to read and write the logical state of digital inputs and outputs.

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps													
							0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Holding Registers	03: Read Holding Registers 06: Write Single Registers 16: Write Multiple Registers	41000	Read-Write	Word	DI1	Logical Input State (On / Off)	DI1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41001	Read-Write	Word	DI2		DI2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41002	Read-Write	Word	DI3		DI3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41003	Read-Write	Word	DI4		DI4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41004	Read-Write	Word	DI5		DI5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41005	Read-Write	Word	DI6		DI6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41006	Read-Write	Word	SO1	Logical Output State (On / Off)	SO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41007	Read-Write	Word	SO2		SO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41008	Read-Write	Word	RO1		RO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41009	Read-Write	Word	RO2		RO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		41010 - 41999	Read-Only			Not used	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

In the addresses between 42000 and 42499, you can find the holding registers containing the logical values of the inputs and outputs. These holding registers allow both reading and writing of IEEE floats, high-order word: low-order word.

To avoid any confusion, the difference between logical value and physical value lies in their representation and interpretation:

1. Logical value - In this case, represents the value displayed or manipulated in the system.
2. Physical value - Refers to the value measured by the sensor.

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Holding Registers	03: Read Holding Registers 06: Write Single Registers 16: Write Multiple Registers	42000	Read-Write	IEEE Float	AI1	Logical Analog Inputs Value	high-order word
		42001					low-order word
		42002	Read-Write	IEEE Float	AI2		high-order word
		42003					low-order word
		42004	Read-Write	IEEE Float	AI3		high-order word
		42005					low-order word
		42006	Read-Write	IEEE Float	AI4		high-order word
		42007					low-order word
		42008	Read-Write	IEEE Float	AI5		high-order word
		42009					low-order word
		42010	Read-Write	IEEE Float	AI6		high-order word
		42011					low-order word
		42012	Read-Write	IEEE Float	DI1_C	Logical Digital Counter Inputs Value	high-order word
		42013					low-order word
		42014	Read-Write	IEEE Float	DI2_C		high-order word
		42015					low-order word
		42016	Read-Write	IEEE Float	DI3_C		high-order word
		42017					low-order word
		42018	Read-Write	IEEE Float	DI4_C		high-order word
		42019					low-order word
		42020	Read-Write	IEEE Float	DI5_C		high-order word
		42021					low-order word
		42022	Read-Write	IEEE Float	DI6_C		high-order word
		42023					low-order word
		42024	Read-Write	IEEE Float	DI1_F	Logical Digital Frequency Inputs Valu	high-order word
		42025					low-order word
		42026	Read-Write	IEEE Float	DI2_F		high-order word
		42027					low-order word
		42028	Read-Write	IEEE Float	DI3_F		high-order word
		42029					low-order word
		42030	Read-Write	IEEE Float	DI4_F		high-order word
		42031					low-order word
		42032	Read-Write	IEEE Float	DI5_F		high-order word
		42033					low-order word
		42034	Read-Write	IEEE Float	DI6_F		high-order word
		42035					low-order word
		42036	Read-Write	IEEE Float	AO1	Logical Analog Outputs Value	high-order word
		42037					low-order word
		42038	Read-Write	IEEE Float	AO2		high-order word
		42039					low-order word
		42040	Read-Write	IEEE Float	AO3		high-order word
		42041					low-order word
		42042	Read-Write	IEEE Float	AO4		high-order word
		42043					low-order word
		42044	Read-Write	IEEE Float	SO1	Logical Output Value (PWM value 0-	high-order word
		42045					low-order word
		42046	Read-Write	IEEE Float	SO2		high-order word
		42047					low-order word
		42048	Read-Write	IEEE Float	RO1		high-order word
		42049					low-order word
		42050	Read-Write	IEEE Float	RO2		high-order word
		42051					low-order word
		42052	Read-Only	IEEE Float	Vbatt	Battery level	high-order word
		42053					low-order word
		42054 - 42499	Read-Only			Not used	- - - - - - - - - - - - - - - -

The table below details the registers located at addresses 43000 to 43499. The only difference between this table and the previous one lies in the type of data. The holding registers of this table contain integer data, whereas in the previous one they contained floating-point data.

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Holding Registers	03: Read Holding Registers 06: Write Single Registers 16: Write Multiple Registers	43000	Read-Write	INT 32	AI1	Logical Analog Inputs Value	high-order word
		43001					low-order word
		43002	Read-Write	INT 32	AI2		high-order word
		43003					low-order word
		43004	Read-Write	INT 32	AI3		high-order word
		43005					low-order word
		43006	Read-Write	INT 32	AI4		high-order word
		43007					low-order word
		43008	Read-Write	INT 32	AI5		high-order word
		43009					low-order word
		43010	Read-Write	INT 32	AI6		high-order word
		43011					low-order word
		43012	Read-Write	INT 32	DI1_C	Logical Digital Counter Inputs Value	high-order word
		43013					low-order word
		43014	Read-Write	INT 32	DI2_C		high-order word
		43015					low-order word
		43016	Read-Write	INT 32	DI3_C		high-order word
		43017					low-order word
		43018	Read-Write	INT 32	DI4_C		high-order word
		43019					low-order word
		43020	Read-Write	INT 32	DI5_C		high-order word
		43021					low-order word
		43022	Read-Write	INT 32	DI6_C		high-order word
		43023					low-order word
		43024	Read-Write	INT 32	DI1_F	Logical Digital Frequency Inputs Value	high-order word
		43025					low-order word
		43026	Read-Write	INT 32	DI2_F		high-order word
		43027					low-order word
		43028	Read-Write	INT 32	DI3_F		high-order word
		43029					low-order word
		43030	Read-Write	INT 32	DI4_F		high-order word
		43031					low-order word
		43032	Read-Write	INT 32	DI5_F		high-order word
		43033					low-order word
		43034	Read-Write	INT 32	DI6_F		high-order word
		43035					low-order word
		43036	Read-Write	INT 32	AO1	Logical Analog Outputs Value	high-order word
		43037					low-order word
		43038	Read-Write	INT 32	AO2		high-order word
		43039					low-order word
		43040	Read-Write	INT 32	AO3		high-order word
		43041					low-order word
		43042	Read-Write	INT 32	AO4		high-order word
		43043					low-order word
		43044	Read-Write	INT 32	SO1	Logical Output Value (PWM value 0-100)	high-order word
		43045					low-order word
		43046	Read-Write	INT 32	SO2		high-order word
		43047					low-order word
		43048	Read-Write	INT 32	RO1		high-order word
		43049					low-order word
		43050	Read-Write	INT 32	RO2		high-order word
		43051					low-order word
		43052	Read-Only	IEEE Float	Vbatt	Battery level	high-order word
		43053					low-order word
		43054 - 43499	Read-Only			Not used	- - - - - - - - - - - - - - - -

In summary, the range of a 32-bit floating-point number (float) is much wider than that of a 32-bit integer (int), allowing floats to represent a broader range of values, including fractions and very large numbers. However, integers provide precise representations for whole numbers.

This last table details the mapping of the system variables int two types of data (INT 32 and IEEE Float).

	Function code	Address	Data Property	Data Type	I/O	Information	Bit maps 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Holding Register	03: Read Holding Registers 06: Write Single Registers 16: Write Multiple Registers	42500	Read-Write	IEEE Float	VAR 1	Internal Variable	high-order word
		42501					low-order word
		42502	Read-Write	IEEE Float	VAR 2		high-order word
		42503					low-order word
		...	Read-Write	IEEE Float	...		high-order word
		...					low-order word
		42998	Read-Write	IEEE Float	VAR N		high-order word
		42999					low-order word
		43500	Read-Write	INT 32	VAR 1	Internal Variable	high-order word
		43501					low-order word
		43502	Read-Write	INT 32	VAR 2		high-order word
		43503					low-order word
		...	Read-Write	INT 32	...		high-order word
		...					low-order word
		43998	Read-Write	INT 32	VAR N		high-order word
		43999					low-order word

The full mapping schema can be downloaded here: Download Standard Modbus table.

6 APPENDIX: MODBUS INTERFACE FOR VARIOUS SLAVE SENSORS

6.1 CLA-VAL e-DRIVE-34 ACTUATOR

The e-Drive-34 actuator is fully interfaced to the electronic valve controller via its Modbus RS-485 interface, connected to the e-Drive-34 Souriau circular connector.

IMPORTANT: this feature requires the e-Drive-34 actuator to be loaded with firmware version 4.03 or higher!

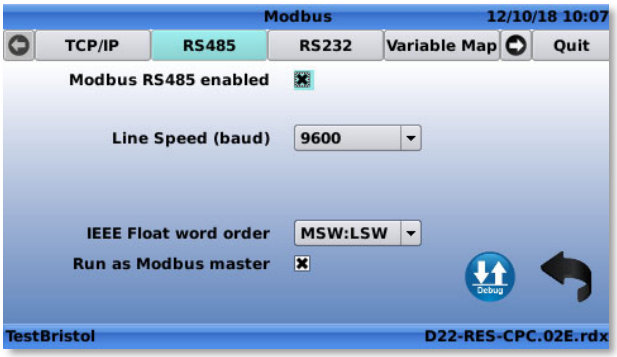
6.1.1 INTERFACING AN e-DRIVE-34 ACTUATOR TO THE ELECTRONIC VALVE CONTROLLER

1. Turn off the electronic valve controller.
2. Connect the circular plug cable on the e-Drive-34 and the electronic valve controller.
   a. According this wiring table.

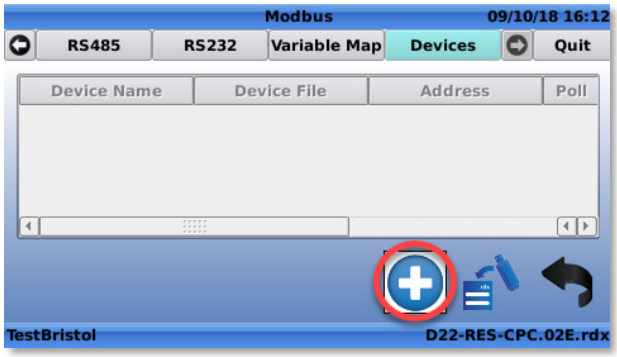
Circular plug cable	Designation	D22	e-Drive-34
1	24V	V+	A
2	0V	V-	B
3	GND	RS-485 GND	C
4	485A	RS-485 485A	D
5	485B	RS-485 485B	E
6	Libre	-	F

3. Turn on the electronic valve controller.
4. Go into "**Settings**" (long click down) > "**Connectivity**" > "**Modbus**".

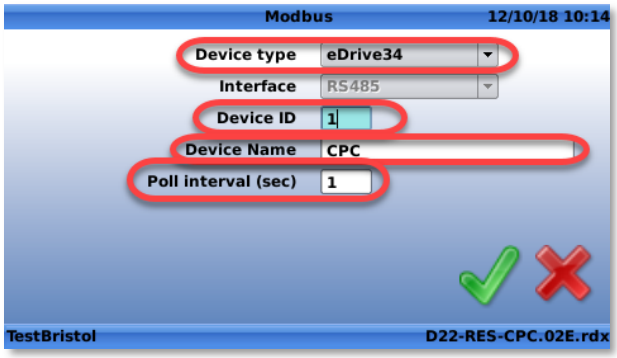
5. In the "**RS-485**" tab.
   a. Enable the checkbox to allow **Modbus RS-485** connection.
   b. Set "**Line Speed**" at "**9600**" baud.
   c. Set "**IEEE float word order**" to "**MSW:LSW**".
   d. Check the checkbox to "**run as Modbus master**".



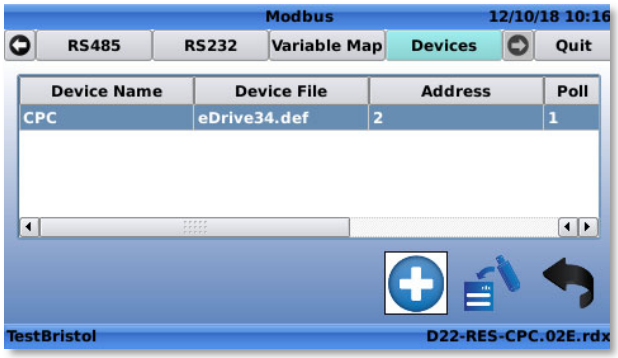
6. In the "**Devices**" tab (right click to reach the tab).
   a. Click on the "**+**" button.



7. Create the Modbus device.
   a. Set "**Device type**" to "**eDrive34**".
   b. "**Device ID**" to the slave address of the e-Drive-34 (default: 1).
   c. Give a name to the device.
   d. Set the "**Poll interval**" (default: 1 second).
   e. Click on "✓" to add/create the device.

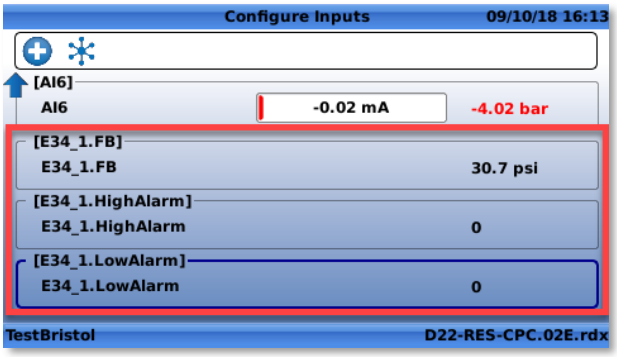


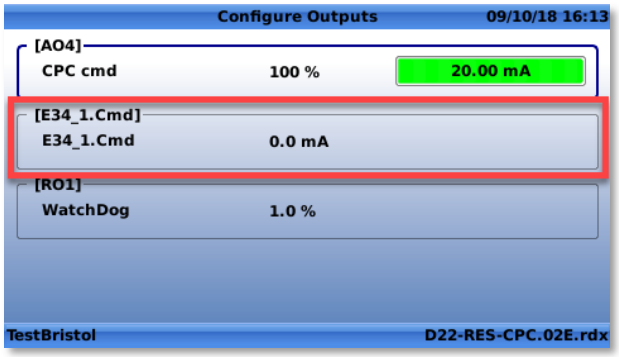
f. The e-Drive-34 is created and now controllable via Modbus.



Once the actuator is interfaced to the electronic valve controller advanced controller, the following e-Drive-34 signals are available:

- Inputs:
  - <*name_of_device*>.FB -> Feedback
  - <*name_of_device*>.HighAlarm -> HighAlarm
  - <*name_of_device*>.LowAlarm -> LowAlarm
- Output:
  - <*name_of_device*>.Cmd -> Command



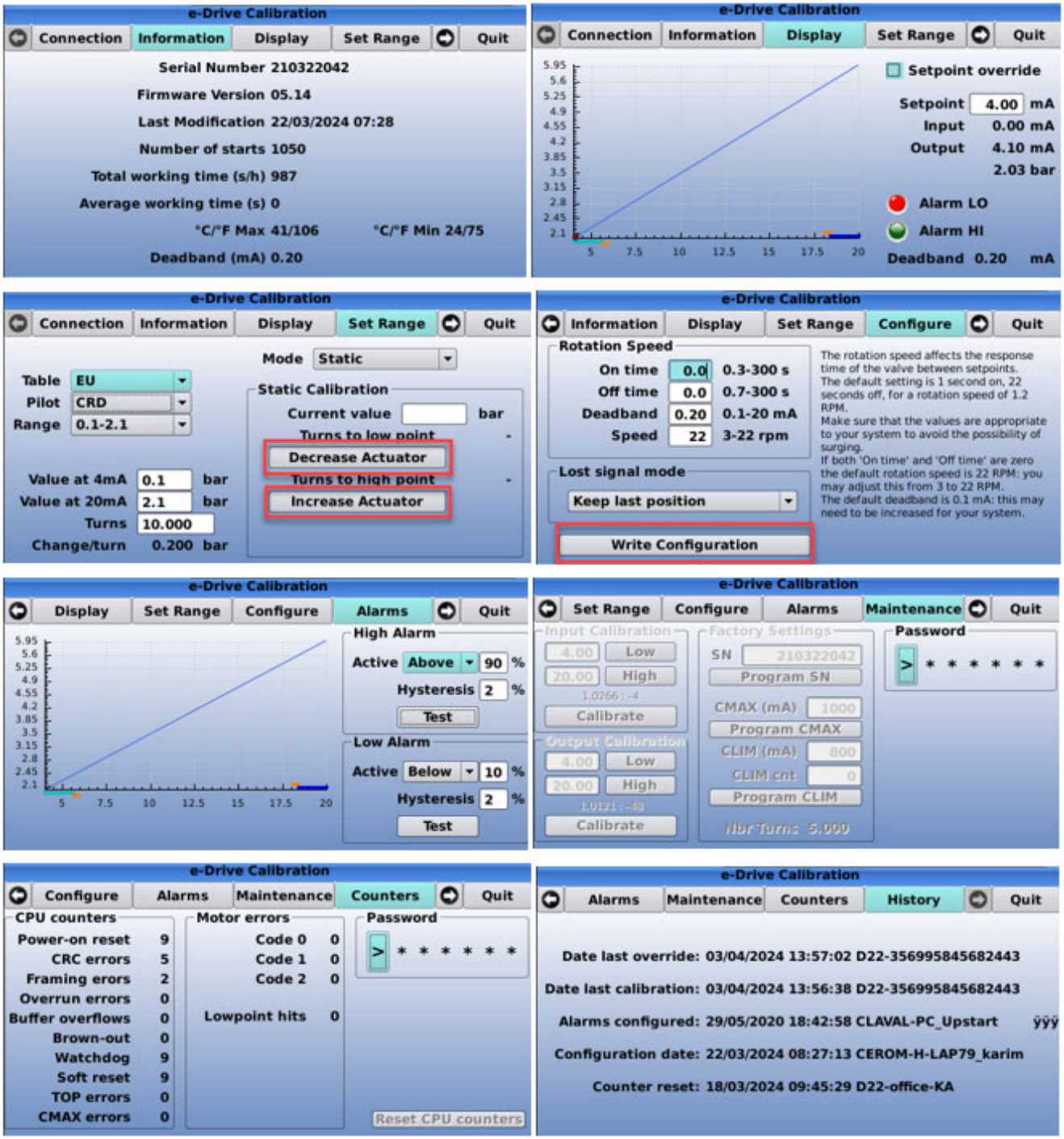


All the inputs/outputs can be used into followings electronic valve controller regulation blocks:

- PID
- Control Curve
- Input recopy
- Signal retransmission
- Actions

6.1.2 CALIBRATE AN e-DRIVE-34 ACTUATOR FROM THE ELECTRONIC VALVE CONTROLLER

It is also possible to calibrate the e-Drive-34 with a D22 controller (via its Modbus RS-485 interface), preventing the need of a computer in the field. The electronic valve controller graphical interface replicates the e-Drive-34 PC software information/commands, with an improved user experience (context-sensitive assistance). To navigate to the e-Drive-34 user interface:
(Long click up) "**Configuration**" > "**eDrive34**".



How to access the menu:

Once the e-Drive-34 is interfaced (see chapter 6.1.1), click on the "**eDrive34**" icon into "**Configuration**" menu (Long click up).

1. By default, the "**Modbus slave address**" of an e-Drive-34 actuator is set to 1.
2. It is possible to connect up to five e-Drive-34 to an electronic valve controller, by setting a different Modbus slave address for each actuator, before connecting them at the same time.
3. When changing settings, the button "**Write calibration**" appears. Click on this button to save changes.
4. The "**Maintenance**" tab is protected by password, providing access only to advanced users, and avoiding unwanted misusage. Please contact your CLA-VAL representative if the password is requested.

6.2 SENSOR INTERFACE DEFINITION FILE

The sensor interface definition file is used to describe a sensor and its values. The file contains a description for the values available from the sensor (Modbus address, unit, range of the value, etc.). This chapter explains how to create a description file for a specific sensor.

All the values described in the sensor interface definition file can be used into the following electronic valve controller regulation blocks:

- PID
- Control Curve
- Input recopy
- Signal retransmission
- Actions

The sensor interface definition file (.def) is composed of the following section:

1. .ID — This section defines a sensor type.
2. .Channels — This section defines the channels provided by the sensor.
3. .ReadRequest X — This section(s) defines Modbus read request(s). X is the id of the request.
4. .WriteRequest X — This section(s) defines Modbus write request(s).

This is an example of the definition file (edrive34.def) for the CLA-VAL e-Drive-34:

```
# EDrive34 difinition file
.ID
Equipment=eDrive34,E34,rs485
.Channels
Cmd=2
FB=0,4,0,0,100
LowAlarm=1
HighAlarm=1
.ReadRequest 1
registers=4,23,5
Cmd=0,int16,moto,raw,40,200
FB=2,int16,moto,raw,40,200
LowAlarm=3,int16,moto,cooked
HighAlarm=4,int16,moto,cooked
.WriteRequest 1
registers=16,23,2
Cmd=0,int16,moto,raw,40,200
```

 : The "#" character is used to add comment into the file.

 **: No empty line are accepted in the .def file.**

6.2.1 ".ID" SECTION

This .ID section defines the sensor type. The section contains only one line beginning with "Equipment", followed by the sensor type name, the base name, and the interface to use.

```
Equipment=<equipment type name>,<base name>,<interface>
```

- <equipment type name> is informational
- <base name> indicates the base name affected to object and channels
- <interface> = rs485/tcpip/both

 : tcpip & both are not yet implemented in version 2.3.1

6.2.2 ".CHANNELS" SECTION

This .Channels section defines the channels of the sensor. The section contains one line for each channel beginning with the channel base name, followed by the channel type, unit type, unit code, minimum value, and maximum value.

```
<channel name>=<type>,<unittype>,<unitcode>,<min>,<max>
```

- <type> = Code of the channel type
- <unittype> = Code of the unit type (optional)
- <unitcode> = Code of the unit (optional)
- <min> = Minimum acceptable value, natural units (optional)
- <max> = Maximum acceptable value, natural units (optional)

The following tables describe the various codes:

Channel Type	Code
Analog Input	0
Digital Input	1
Analog Output	2
Digital Output	3

Unit Type	Unit Type Code	Unit	Unit Code
Analog	0	mA	0
Analog	0	V	1
Flow	1	gpm	0
Flow	1	mgd	1
Flow	1	cfm	2
Flow	1	cfs	3
Flow	1	l/m	4
Flow	1	l/s	5
Flow	1	m3/h	6
Flow	1	Ml/d	7
Flow	1	UK gpm	8
Pressure	2	bar	0
Pressure	2	kPa	1
Pressure	2	Mhd	2
Pressure	2	psi	3
Height	3	m	0
Height	3	in	1
Height	3	ft	2
Height	3	%	3

Unit Type	Unit Type Code	Unit	Unit Code
Percent	4		
Time	5		
Volume	6	g	0
Volume	6	mg	1
Volume	6	cf	2
Volume	6	l	3
Volume	6	m3	4
Volume	6	Ml	5
Volume	6	UK g	6
No Unit	7		
PH	8	PH	0
Free Rad	9	Cl	0
Temperature	10	deg C	0
Temperature	10	deg F	1
Turbidity	11	FNU	0
Turbidity	11	NTU	1
Turbidity	11	FAU	2

6.2.3 ".READREQUEST" SECTION

This ".ReadRequest" section defines the Modbus read request of the sensor. The section contains one line for registers to read, and one line for each channel to assign to the register(s). It is possible to have several ".ReadRequest"; e.g.: ".ReadRequest 1", ".ReadRequest 2", etc.

```
registers=<function code>,<register address>,<read count>
```

- <function code> = Modbus function code to use
- <register address> = Address of 1st register to read
- <read count> = Number of 16-bit registers to read

```
<channel name>=<offset>,<type>,<format>,<state>{[,<scale>]}|{,<min>,<max>}
```

- <offset> = Register offset in reply
- <type> = int16/int32/float
- <format> = moto/intel (applies only to int32 and float)
  - Moto: Big-endian, most significant bit/word.
  - Intel: Little-endian, least significant bit/word.
- <state> = cooked/raw
  - cooked: There is an optional scaling factor <scale>. For instance, if vbatt is provided as mV * 10, there is a scaling factor of 0.01 to get the value in volts. If not supplied, <scale> is 1
  - raw: Then min/max for the raw data values must be supplied so that the Electronic Valve Controller can calculate gain+offset to get from the raw value to the physical min/max defined for the channel

6.2.4 ".WRITEREQUEST" SECTION

This ".WriteRequest" section defines the Modbus write request of the sensor. The section contains one line for registers to read, and one line for each channel to assign it to a register. It's possible to have several ".WriteRequest"; e.g.: ".WriteRequest 1", ".WriteRequest 2", etc.

The description of a ".WriteRequest" is exactly the same than the ".ReadRequest".

6.3 ADDING SENSOR INTO THE ELECTRONIC VALVE CONTROLLER

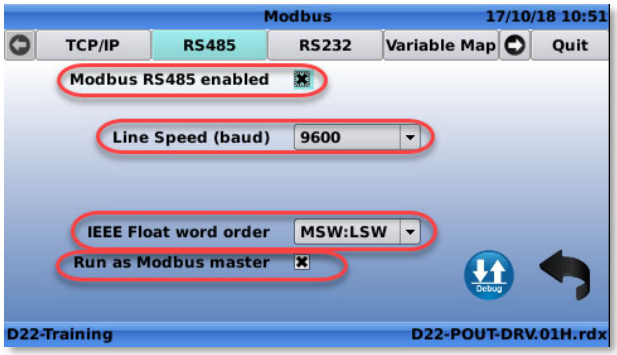
This chapter explains how to add a custom sensor, described by a sensor interface definition file (.def), into a electronic valve controller.

1. Create a sensor interface definition file, according the process describes in chapter 6.2.
   a. For this example we'll use a D22 like a sensor and read two values: AI1 (IN) and AO1 (OUT) as input channel type, this is the description file:

```
.ID
Equipment=D22,D22,rs485
.Channels
IN=0,4,0,0,100
OUT=0,4,0,0,100
.ReadRequest 1
registers=3,42001,2
IN=0,float,moto,cooked
.ReadRequest 2
registers=3,42201,2
OUT=0,float,moto,cooked
```

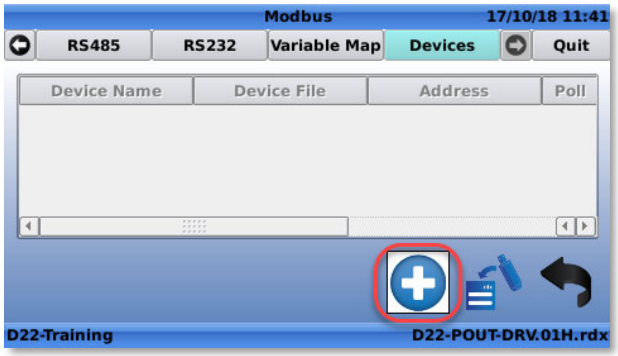
2. Save this file with the .def extension, ex: D22_test.def.
3. Copy this file into a USB key.
4. Plug the USB key into the electronic valve controller.
5. On electronic valve controller, go into "**Settings**" (long click down) > "**Connectivity**" > "**Modbus**".

a. On the "**RS485**" tab.
   i. Check the checkbox "**Modbus RS485 enabled**".
   ii. Set "**Line Speed**", ***is mandatory to set the same value on the Modbus Master and Modbus slave***.
   iii. Set "**IEEE Float word order",** MSW:LSW for D22.
   iv. Check the checkbox "**Run as Modbus master**".

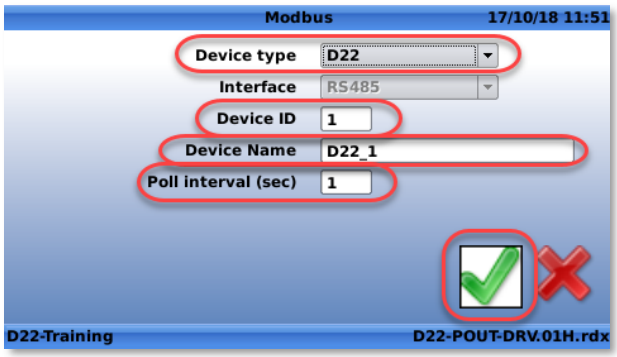


b. On the "**Devices**" tab, on the far right.
   i. Click on the button to import file.

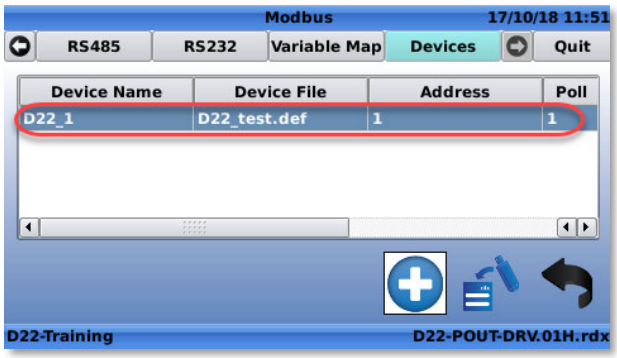
   ii. Browser into USB key to reach the definition file and click "**Ok**".
   iii. Click on the "**+**" button to add the new sensor.



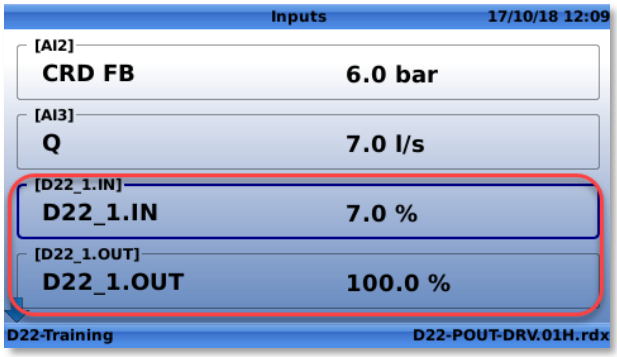
iv. Select the "**Device type**" sensor, defined into the sensor interface definition file.
v. Set the "**Device sensor ID**".
vi. Set the Device sensor Name.
vii. Set the "**Poll Interval**".
viii. Click on the " " to validate the addition of the device sensor.



ix. The sensor is correctly added.



6. Go back to "**Main screen**" with long click "**OK**".
7. Go into "**Inputs**" menu with short click left.
8. The two read values have been added.



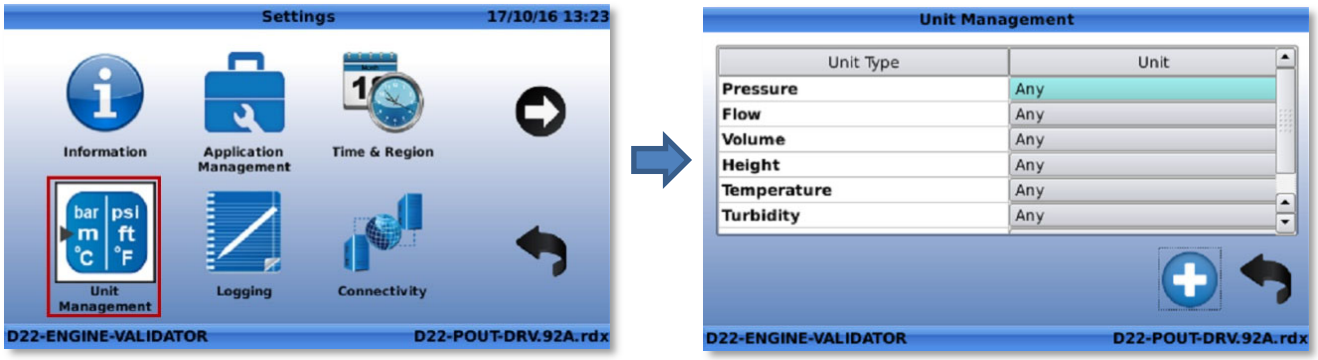
7 APPENDIX: ENGINE UPDATE INFORMATION

7.1 SINCE RELEASE 1.8.4 (17.10.2016)

7.1.1 CENTRALIZED UNIT CONFIGURATION

It is now possible to configure all the Inputs/Outputs and internal variables units of the D12 & D22 from a single menu, preventing inconsistencies and mistakes in conversions when configuring the units independently.

The Centralized Unit Configuration can be accessed from the "**Settings**" screen: *Long click Down* > *"***Unit Management***"*.



The user can select a unit to be applied for a type of physical value, and all the values will throughout the device menus will then be automatically changed.

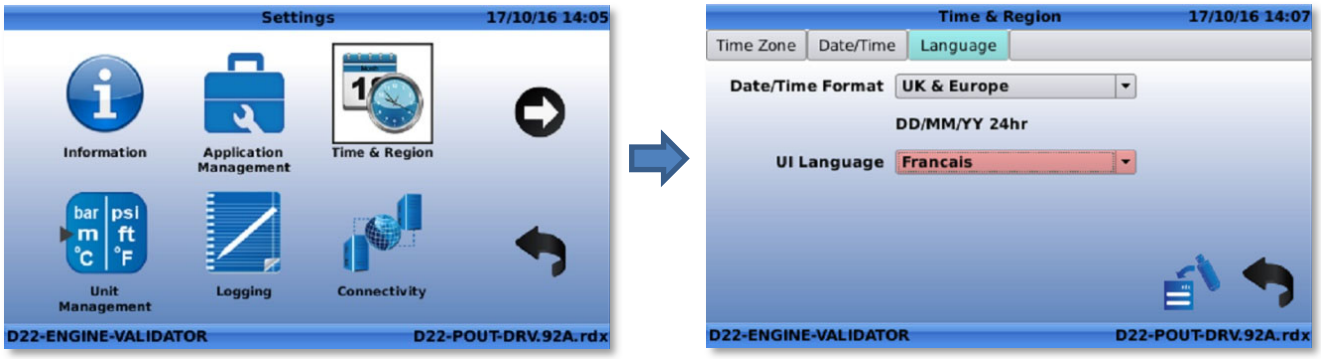
By selecting "**Any**", the user can still manually change the units independently.

7.1.2 LATCHING SOLENOID SUPPORT

The D22/VC-22D now offers the capability to control Latching Solenoids via its SO1 and SO2 outputs. The Solenoid output type can be set in the "**Output Configuration**" screen (*Long click Right*).

7.1.3 LANGUAGE SUPPORT: FRENCH

Starting with R-Engine 1.8.4, French language display has been added for the D22. To select the language, go in the "**Settings**" screen: *Long click Down* > "**Time & Region**" > "**Language**" tab. A reboot of the device is needed to apply the changes.



Note: The texts and images specific to a ValvApps will not be changed; only the texts relevant to the R-Engine will be translated.

7.2 SINCE RELEASE 1.9.0 (06.06.2017)

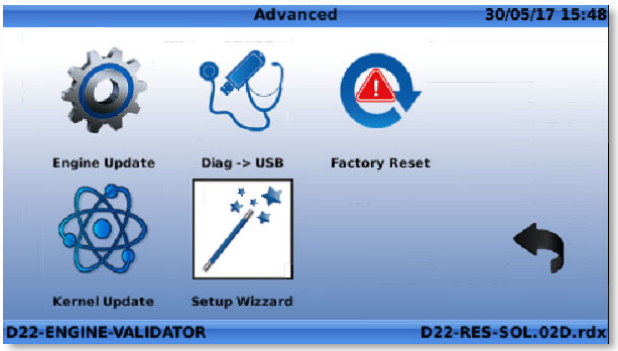
7.2.1 CONFIGURATION WIZARD

In order to ease the D22/VC-22D and D12/VC-12 device commissioning, a new tool has been implemented to go through the device start-up process step-by-step and configure the devices with the minimum information needed to get the system running.

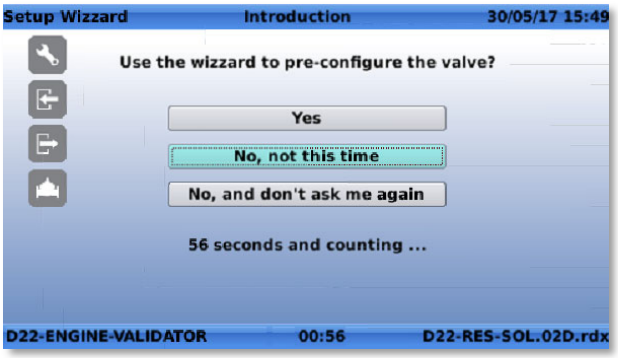
This feature, called the "**Setup Wizzard**", avoids having to navigate in the menus at the time of the commissioning, preventing confusion, especially for people who are not very familiar with the CLA-VAL controllers.

Here are a few screenshots showing the steps of the "**Wizzard**" for a given ValvApps (D22-RES-SOL.02 - reservoir level control with solenoids).

Note that the "**Setup Wizzard**" will automatically show up the first time the unit is switched on. It can also be directly accessed/launched from the "**Advanced**" menu (*Long Click Down > Advanced*).

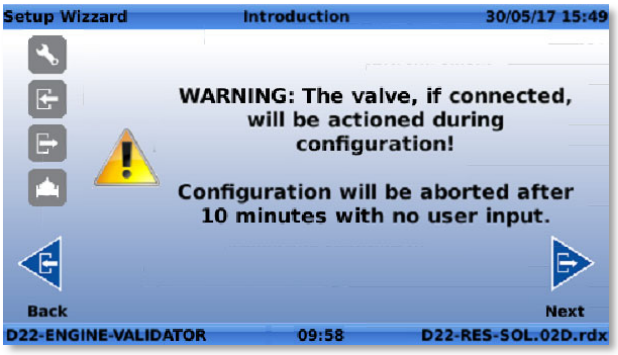


When the "**Setup Wizzard**" is launched, the user has 1 minute to react before it deactivates and the unit gets back to normal use.



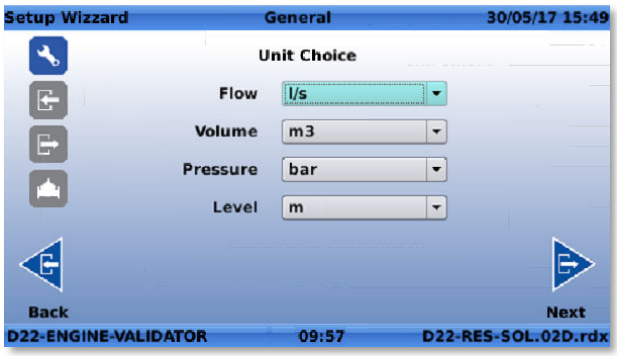
Selecting "**No, not this time**" will exit the "**Setup Wizzard**", but the latter will be launched again automatically after the next unit reboot.

Selecting "**No, and don't ask me again**" will exit the "**Setup Wizzard**", and it will not show up again, unless manually launched.

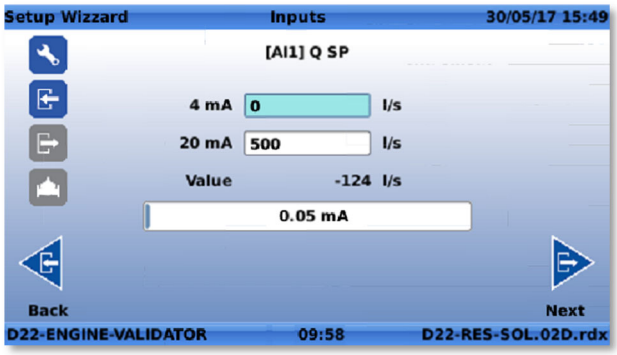


1. General configuration - Region, Time and Language.

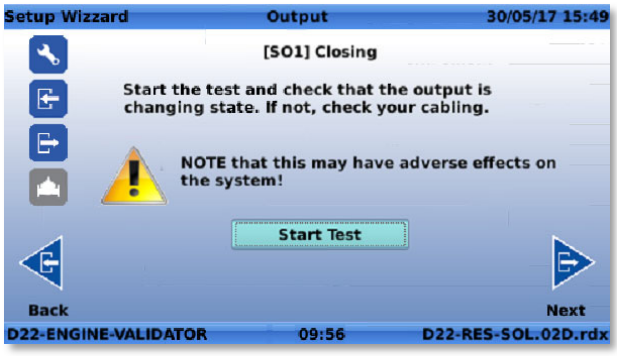
2. General configuration - Units.



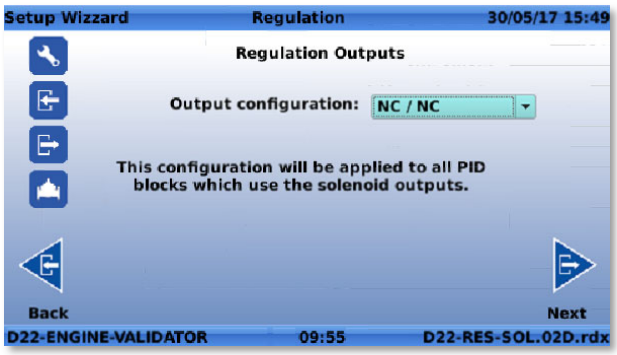
3. Inputs configuration.

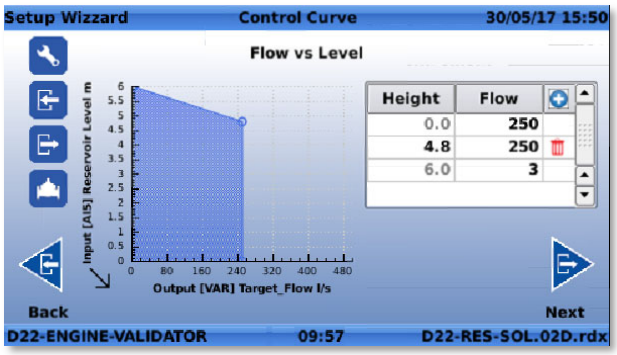


4. Outputs configuration.

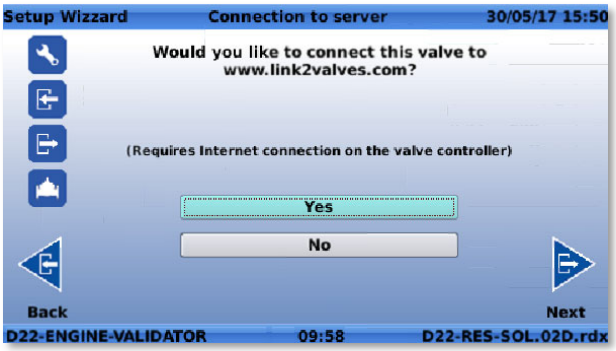


5. Regulation details (if needed).





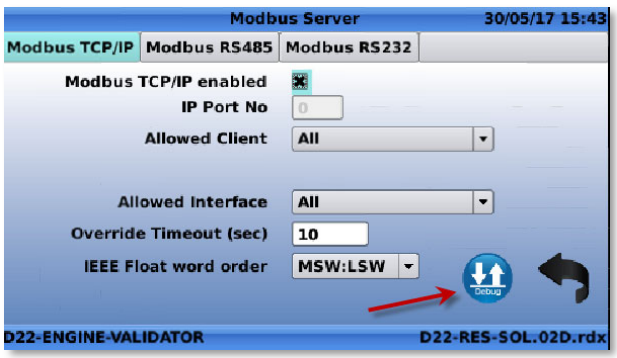
6. Communications configuration.



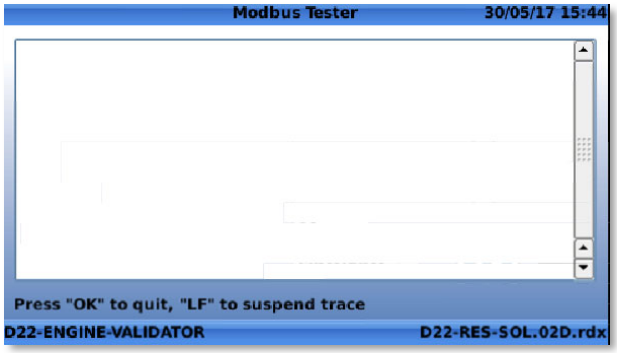
7.2.2 MODBUS OVERRIDE VIA UI / MODBUS DEBUGGER

This new feature has been implemented in order to help supporting/troubleshooting customers having issues connecting the D22/VC-22D to their system via Modbus.

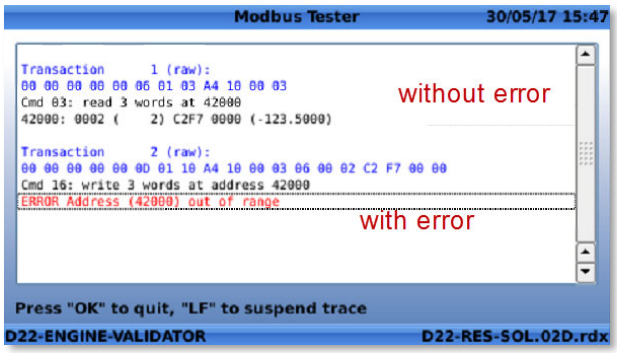
The Modbus debugger can be accessed from the Modbus connectivity menu (*Long Click Down* > *Connectivity* > *Modbus*).



Before any frame is sent to the D22/VC-22D:

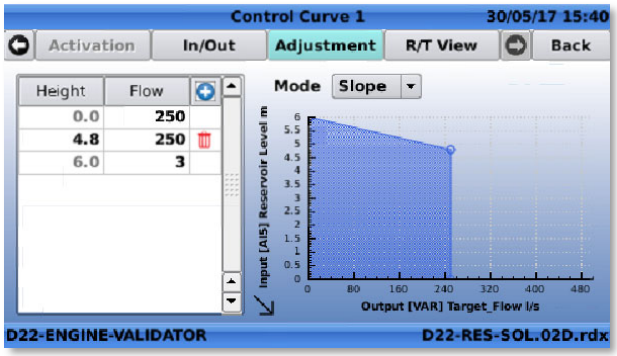


After 2 frames:



7.2.2.1 Control Curve Navigation Improvement

The navigation for setting/modifying the control curve has been improved by putting the point coordinates on the left, making the navigation more logical.



7.2.2.2 Automatic Output Conversion

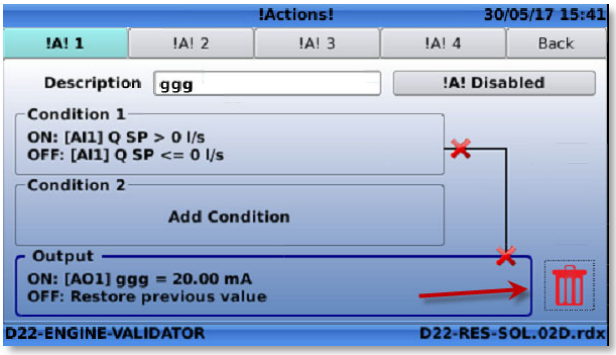
Following up the centralized "**Unit Management**" feature included in the previous R-Engine version, the values are now automatically and immediately converted when changing the unit the in the Configuration Screen (*Long Click Left* > *Left* for inputs, or *Long Click Right* > *Right* for outputs).

7.2.2.3 DP Metering

The DP metering feature (flow estimation as a function of the differential pressure and valve position) has now been implemented for CLA-VAL Europe valves and can be integrated in new CLA-VAL Europe ValvApps if needed.

7.2.2.4 Remove "!Actions!"

It is now possible to remove actions (*Long Click Up > !ACTIONS!*).



7.2.3 BUG FIXES

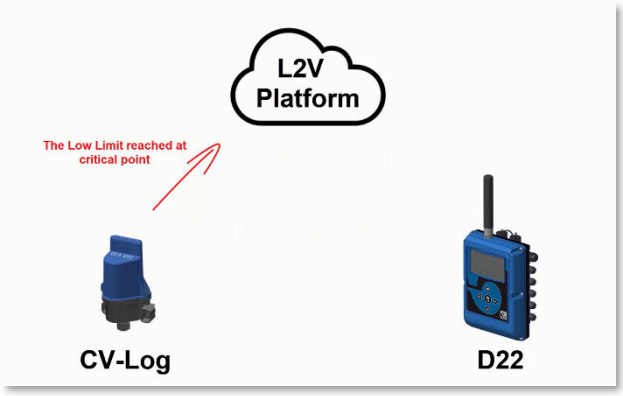
- ValvApps are backed-up automatically via HTTPS (previously only via FTP).
- When Internal Variables unit is set to "**Time**", and format set to seconds, display "**s**" and not "**HHMM**".

- PID: 100% setting blocked on D12.
- In **"Action"** Menu: Avoid D22 freezing when quickly changing tabs.
- LSP min/max Pressure settable within full range (0.11 → 0.10, 2.09 → 2.1)
- Log data / ValvApps backup saved on SD card
- Add capability to remove inputs added on-the-fly
- Correct 'ACTION' output status when using an input added on the fly in condition, or when enabling a new output with an 'ACTION'

7.3 SINCE RELEASE 2.0.1 (19.02.2018)

7.3.1 CLOSED LOOP CRITICAL POINT PRESSURE MANAGEMENT

This feature allows connecting a remote CV-Log logger located at a critical point and correcting the regulation profile of the D12 or D22 controller when over or under-pressure alerts are sent by the logger. A video explaining how the system works, and how to set it up is available here:
http://share.cla-val.ch/public.php?service=files&t=b83fc0a6d7dfc4650b21a59804731ec3



7.3.2 INTEGRAL AND DERIVATIVE PARAMETERS FOR PID

Up to now, the PID regulation only took into consideration the proportional factor (P), which is sufficient for most of the applications. However, in some applications it might be difficult to reach proper regulation, for instance when a very precise control is needed for a very small reservoir, which requires the usage of Integral and Derivative factors (I and D) of the PID. Therefore, integral and derivative factors of the PID control loop have been added back.

7.3.3 DP METERING ON D12

The DP Metering feature, allowing calculating flow with differential pressure and valve position sensor has been added to the D12 controller. Note that this feature needs to be added/declared in the ValvApps in order to be used, thus please specify at the time of ordering if needed.

7.3.3.1 Input Calibration Menu

The input calibration menu (red screen), which was not working properly has been corrected.

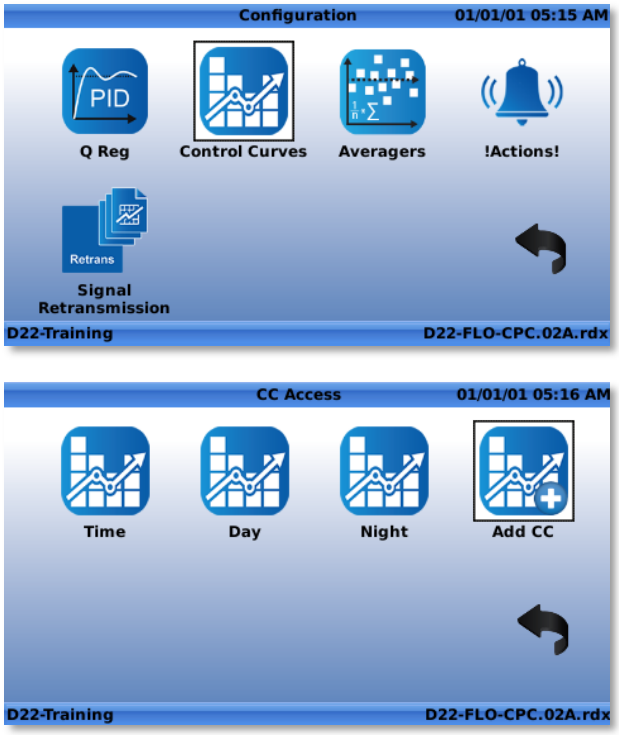
7.3.3.2 DPM - Add Custom Table

It is possible to add a custom table for the DPM calculation to tweak calculation in order to better match reference flowmeter measurements.

7.4 SINCE RELEASE 2.1.0 (20.03.2018)

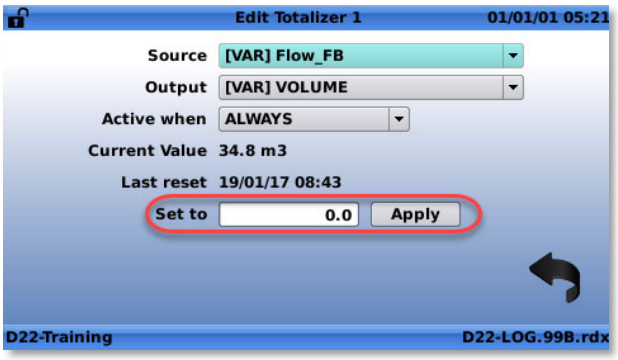
7.4.1 POSSIBILITY TO ADD CONTROL CURVE ON THE FLY

This feature re-organizes the control curves into a menu and allows creating up 8 Control Curves manually “on-the-fly”.



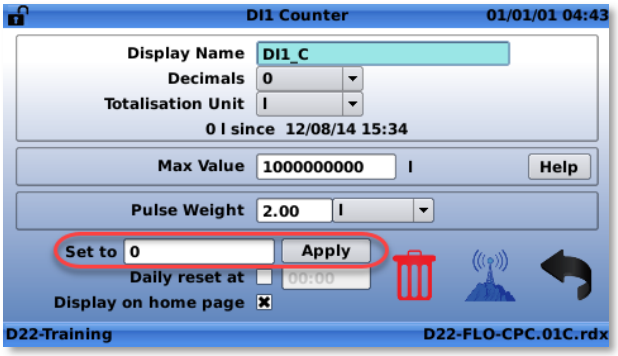
7.4.2 INITIAL VALUE FOR TOTALIZER FUNCTION

It is now possible to set a starting value for the totalizer feature.



7.4.3 INITIAL VALUE FOR A COUNTER DIGITAL INPUT

This feature allows setting a starting value for a counter digital input of the type "DI_C".



7.4.4 MODBUS - INTEGER VALUES TABLE AND ADDRESSING

A new Modbus table has been created for supervision systems not supporting decimal values, and thus requiring integer numbers for the inputs and outputs values.

The integer Modbus table, starting at the Modbus address 44000, provides inputs and outputs values into integer format according the decimal precision, as shown hereafter:

I/O	Value displayed on D22	Decimal parameter	Read on Integer Modbus
AI1 (Q Set Point)	582	0	582
AI1 (Q Set Point)	582.3	0.0	5823
AI1 (Q Set Point)	582.31	0.00	58231

In addition, some Supervision Systems set the command in the 1st digit of the Modbus address.

For example: Sending 42000 to execute the command "4" at the address "2000", which was not supported by the D22 up to now. To comply with such systems, the R-Engine version 2.1.0 now has the capability to be configured to "ignore" the first digit of the Modbus address (called "modulo" or address "shift").

7.4.4.1 Closed Loop Critical Point Pressure Management

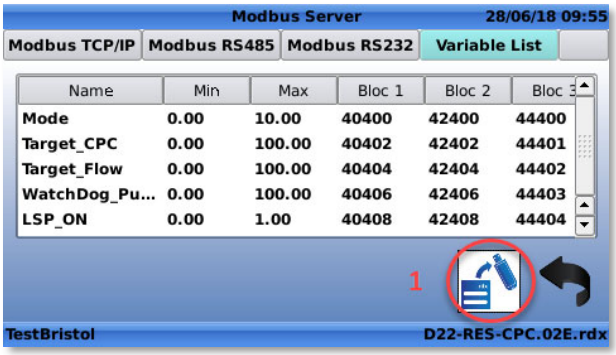
The alarm recovery algorithm has been improved to optimize the usage.

7.5 SINCE RELEASE 2.2.0 (03.07.2018)

7.5.1 INTERNAL VARIABLE AVAILABLE INTO MODBUS TALE

It is now possible to read/write via Modbus all the internal variables available in the display panel (Short Click Down).

The list of all available variables can be found in a new tab "**Variable List**" in the Modbus Menu.



The list of variables with their information (min/max range, and Modbus register address) can be exported to a USB stick by pressing the export to USB icon (1).

7.5.2 BUG CORRECTION

The following bug resolution has been implemented in the R-Engine version 2.2.0.

7.5.2.1 ValvApps Remote Backup (Communication)

When remote backup of the ValvApps to FTP server (or Link2Valves server) is enabled, it was possible that the PID process got corrupted during the backup process (only when a PID command was changed during the process). This issue has now been resolved.

7.6 SINCE RELEASE 2.3.1 (26.10.2018)

7.6.1 E-DRIVE-34 FULL INTEGRATION (VIA MODBUS)

The e-Drive-34 actuator is now fully interfaced to the D22 controller via its Modbus RS-485 interface, connected to the e-Drive-34 SOURIAU circular connector.

IMPORTANT: this feature requires the e-Drive-34 actuator to be loaded with firmware version 4.03 or higher!

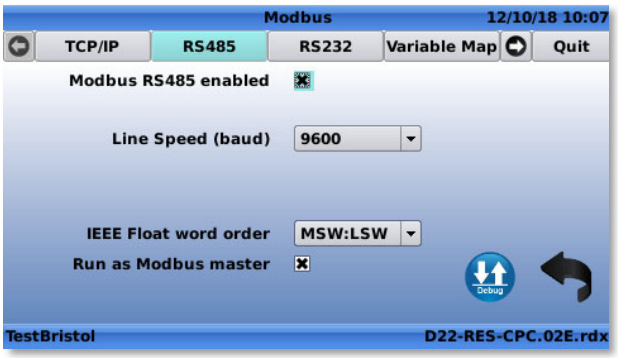
7.6.1.1 Signal Interface

Interfacing an e-Drive-34 actuator to the D22:

1. Turn off the D22.
2. Connect the circular plug cable on the e-Drive-34 and D22.
   a. According this wiring table:

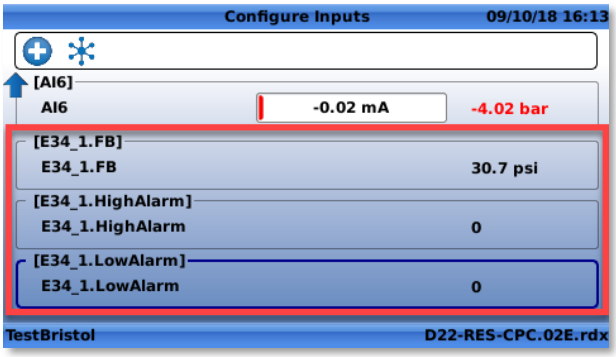
Circular plug cable	Designation	D22	e-Drive-34
1	24V	V+	A
2	0V	V-	B
3	GND	RS-485 GND	C
4	485A	RS-485 485A	D
5	485B	RS-485 485B	E
6	Libre	-	F

3. Turn on the D22.
4. Go into "**Settings**" (long click down) > "**Connectivity**" > "**Modbus**".
5. In the "**RS-485**" tab.
   a. Enable the checkbox to allow **Modbus RS-485** connection.
   b. Set "**Line Speed**" at "**9600**" baud.
   c. Set "**IEEE float word order**" to "**MSW:LSW**".
   d. Check the checkbox to "**Run as Modbus master**".

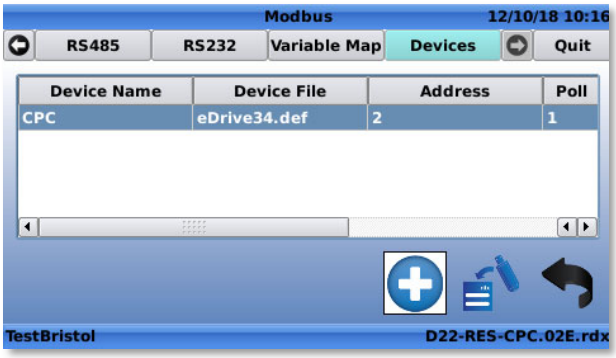


6. In the "**Devices**" tab (right click to reach the tab).
   a. Click on the "**+**" button.

7. Create the Modbus device
   a. Set "**Device type**" to "**eDrive34**".
   b. "**Device ID**" to the slave address of the e-Drive-34 (default: 1).
   c. Give a name to the device.
   d. Set the "**Poll interval**" (default: 1 second).
   e. Click on the "**green checkmark**" to add/create the device.

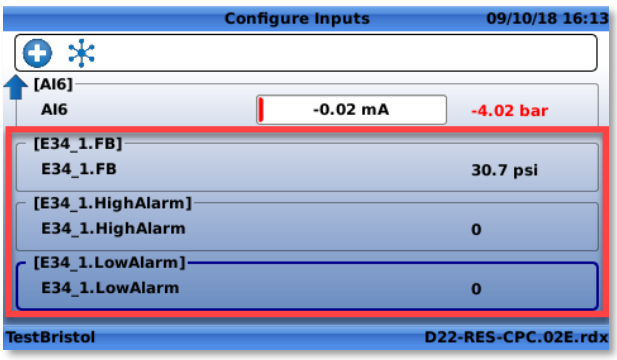


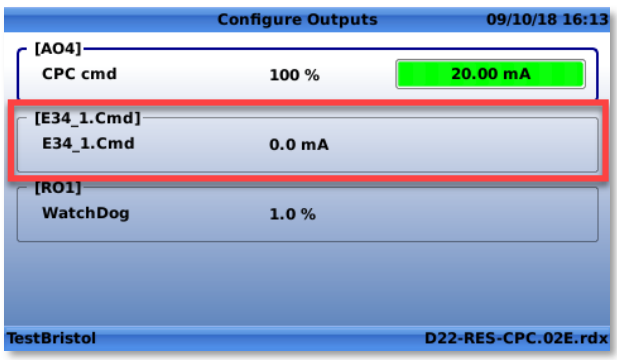
   f. The e-Drive-34 is created and now controllable via Modbus.



Once the actuator is interfaced to the D22 advanced controller, the following e-Drive-34 signals are available:

- Inputs:
  - <*name_of_device*>.FB -> Feedback
  - <*name_of_device*>.HighAlarm -> HighAlarm
  - <*name_of_device*>.LowAlarm -> LowAlarm
- Output:
  - <*name_of_device*>.Cmd -> Command



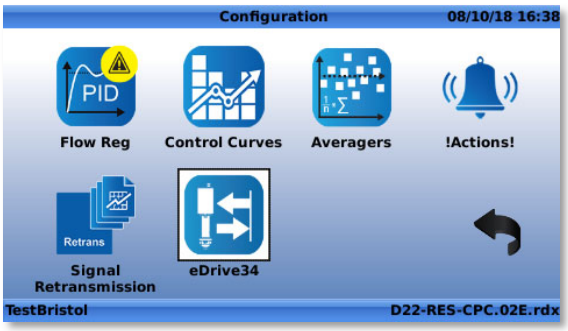


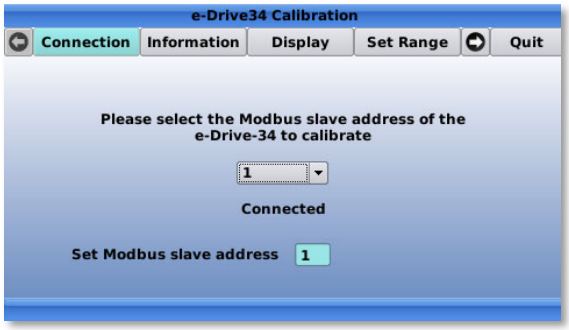
All the inputs/outputs can be used into followings D22 regulation blocks:

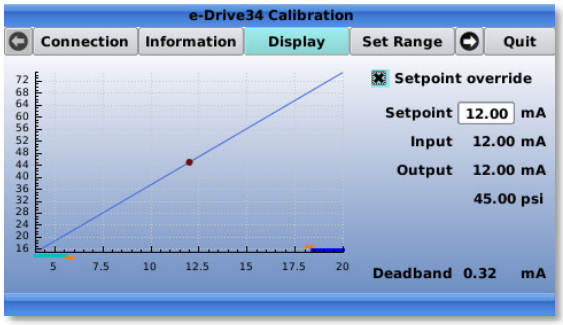
- PID
- Control Curve
- Input recopy
- Signal retransmission
- Actions

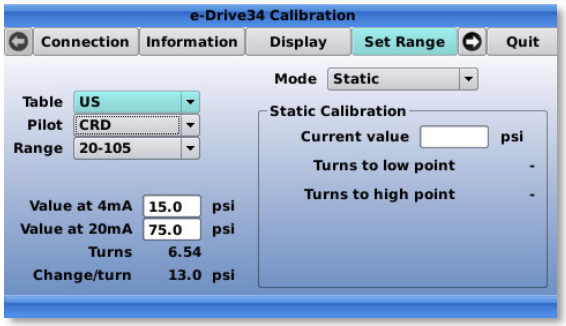
7.6.2 CALIBRATION

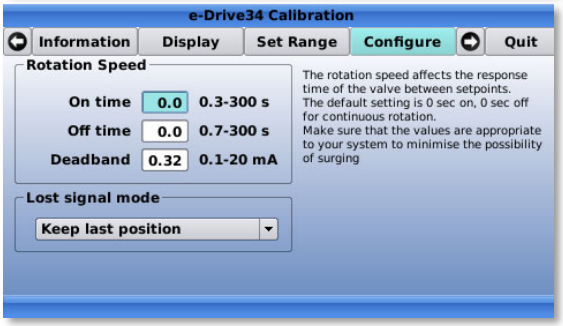
It is now also possible to calibrate the e-Drive-34 with a D22 controller (via its Modbus RS-485 interface), preventing the need of a computer in the field. The D22 graphical interface replicates the e-Drive-34 PC software information/commands, with an improved user experience (context-esensitive assistance). To navigate to the e-Drive-34 user interface: *(Long click up)* "**Configuration**" > "**eDrive34**".

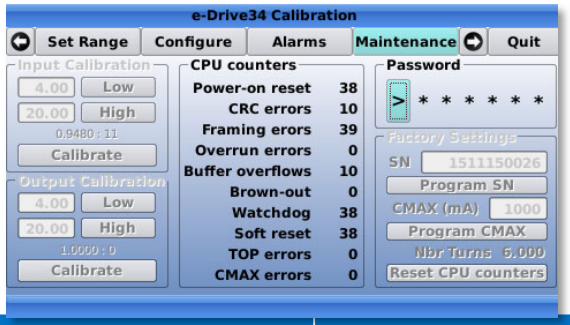


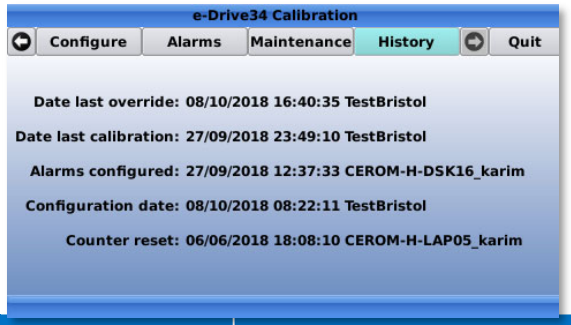












How to access the menu:

Once the e-Drive-34 is interfaced (see paragraph 7.6.1.1), click on the "**eDrive34**" icon into "**Configuration**" menu (Long click up)

1. By default, the "**Modbus slave address**" of an e-Drive-34 actuator is set to 1.
2. It is possible to connect up to five e-Drive-34 to a D22, by setting a different Modbus slave address for each actuator, before connecting them at the same time.
3. When changing settings, the button "**Write calibration**" appears. Click on this button to save changes.
4. The "**Maintenance**" tab is protected by password (252825), providing access only to advanced users, and avoiding unwanted misusage.

7.6.3 INTERFACE FOR GENERIC MODBUS SENSORS

In addition, the new R-Engine 2.3.1 software also allows the capability to interface any Modbus RS-485 sensor to the D22 advanced controller.

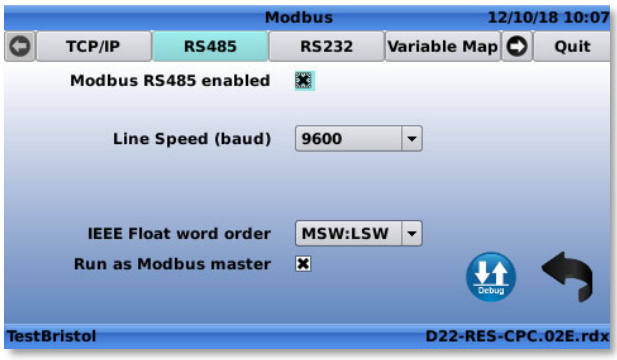
All the values of the sensor can be used into followings regulation blocks:

- PID
- Control Curve
- Input recopy
- Signal retransmission
- Actions

Refer to the D22 User Manual for more information on how to create a sensor interface definition file in the D22.

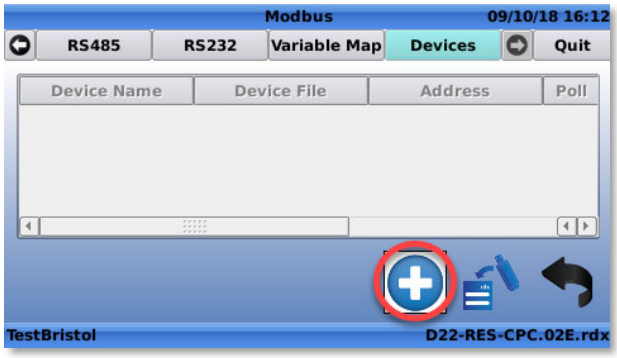
Interfacing a Modbus RS-485 Sensor to the D22:

1. Turn off the D22.
2. Connect the sensor and D22.
3. Turn on the D22.
4. Go into "**Settings**" (long click down) > "**Connectivity**" > "**Modbus**".
5. In the "**RS485**" tab.
   a. Check the checkbox to enable "**Modbus RS485**"
   b. Set "**Line Speed**" at "**9600**" baud
   c. Set "**IEEE Float word order**" to "**MSW:LSW**"
   d. Check the checkbox to "**Run as Modbus master**"

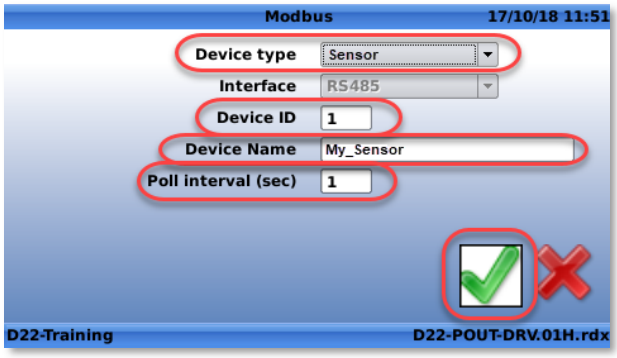


6. In the "**Devices**" tab (right click to reach the tab).
   a. Click on the button to import file.

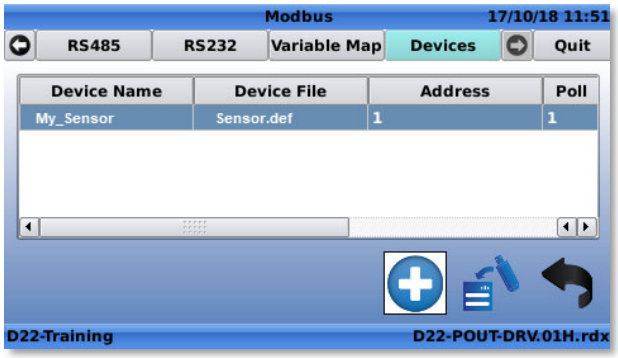
   b. Browser into USB key to reach the sensor interface definition file and click "**Ok**".
   c. Click on the "**+**" button to add the new sensor.
7. In the "**Devices**" tab (right click to reach the tab).
   a. Click on the "**+**" button.



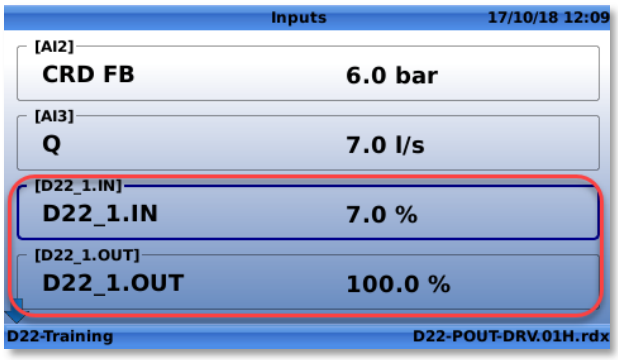
8. In the window to create the Modbus device.
   a. Set **"Device type"** on the name of the sensor (given by the sensor interface definition file).
   b. Set **"Device ID"** to the slave address of the sensor.
   c. Give a name to the device.
   d. Set the **"Poll Interval"**, by default 1 second.
   e. And finally click on  to add/create the device.



f. The e-Drive34 is created and now controllable by Modbus.



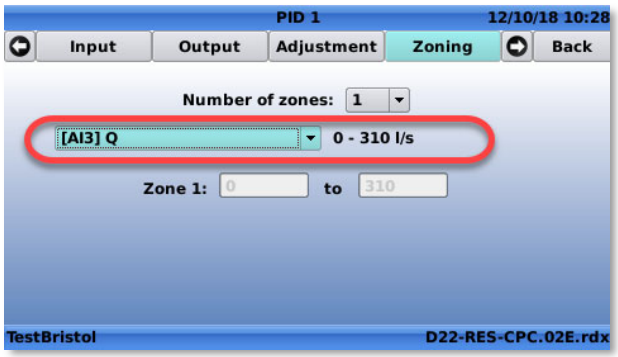
g. These inputs/outputs will can be configured as a normal input/output. Example of a specific D22 sensor interface definition file.



7.6.4 PID

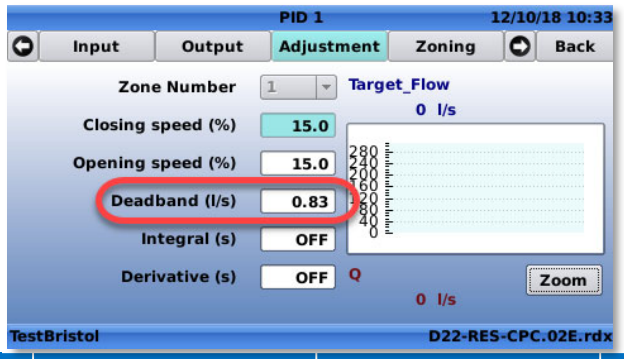
7.6.4.1 Multi-Zone Tuning

It is now possible to select any input, or internal variable, to create a mutli-zone for a PID.



7.6.4.2 Increase Deadband Decimal

The new R-Engine 2.3.1 allows better resolution of up to 2 digits.



7.6.4.3 Logfile Date-Time Format

The date-time format for the "**TIME**" column in the *.CSV log file is exported according the date-time format set into the D22.
See hereafter examples:

Date-Time "UK & Europe":

	TIME (LE)	TIME	R
7	1534158949	13.08.2018 13:15	
8	1534158889	13.08.2018 13:14	
9	1534158785	13.08.2018 13:13	
10	1534158725	13.08.2018 13:12	
11	1534158665	13.08.2018 13:11	
12	1534158605	13.08.2018 13:10	

Date-Time "USA":

		MAXI
6	TIME (LE)	TIME
7	1534159009	08/13/2018 01:16:49 PM
8	1534158949	08/13/2018 01:15:49 PM
9	1534158889	08/13/2018 01:14:49 PM
10	1534158785	08/13/2018 01:13:05 PM
11	1534158725	08/13/2018 01:12:05 PM
12	1534158665	08/13/2018 01:11:05 PM

7.6.4.4 Communication Data Consumption Optimization

Some improvements to reduce the overall data consumption of the communicating devices has been implemented.

7.6.4.5 Wizzard Tool

It is now possible to configure into the "**Wizzard**" input setting a default action in case of signal loss.

7.6.5 BUG CORRECTION

The following bug resolution has been implemented in the R-Engine version 2.3.1.

7.6.5.1 The Use of the «@» Character

In the last version of R-Engine software version, a bug was introduced preventing the use of «@» character in the contact field (in the "**Information**" menu and in the "**Wizzard**"). This is now corrected.

7.7 SINCE RELEASE 2.4.0 (08.02.2019)

7.7.1 WIFI COMMUNICATION CAPABILITY

The D22 / D12 & D11 controllers now implement a WiFi interface via a dongle connected on a USB port, allowing a more easy and robust VNC connection than BlueTooth on a computer or tablet.

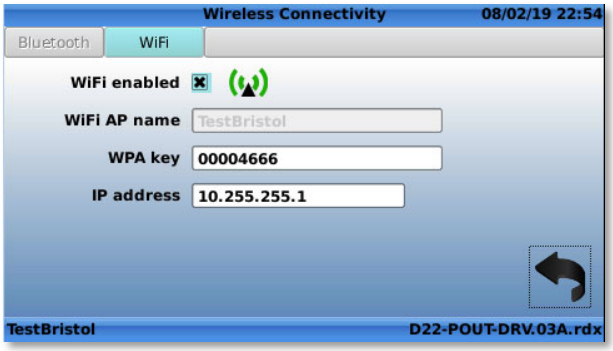
The WiFi USB dongle CVEU part number is MEX-CB-LM007.

IMPORTANT: this feature requires a dongle WiFi LM007-1051 (on the right in the picture below) or Netgear N300 (on the left in the picture below). Other dongles might not be compatible!

7.7.1.1 Setting up the WiFi Interface on the D22 Controller

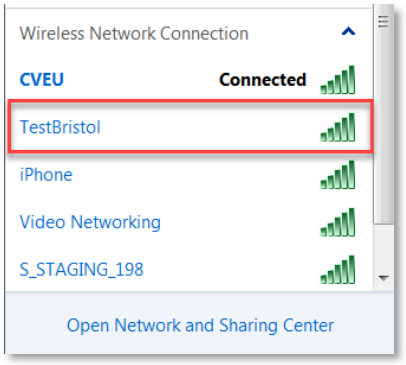
1. Connect the WiFi dongle on a USB port.

2. Navigate to "**Settings**" (long click down) > "**Connectivity**" > "**Next**" page > "**Wireless**".
3. In the "**WiFi**" tab.
   a. Enable the checkbox to allow **WiFi** connection.
   b. "**WiFi AP name**" is set as the *Device Name*.
   c. Set "**WPA key**" if needed. By default the key is *0000* followed by the 4 last IMEI digits.
   d. "**IP address**" is set to *10.255.255.1* by default. There is no need to change it.

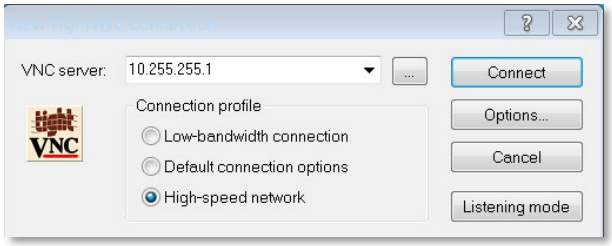


4. Exit the screen by clicking on the black arrow.
   a. Click "**OK**" on the pop-up message.

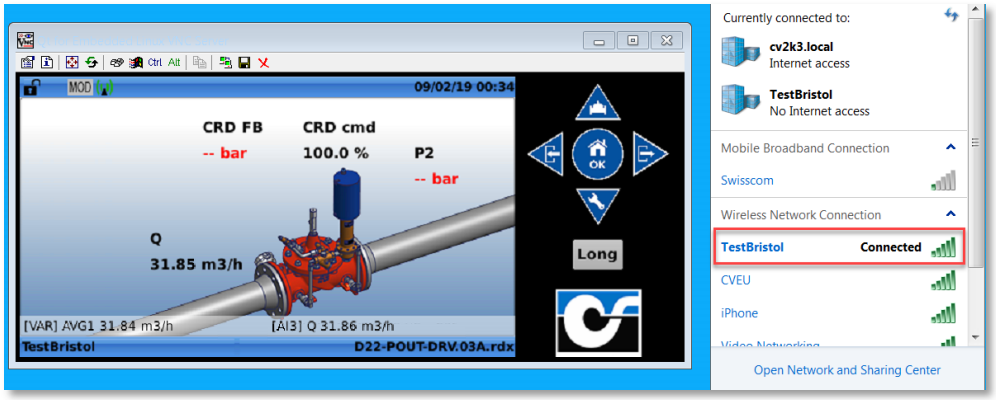
5. On your laptop, check the "**Wireless network**" and select the D22 device to connect to.



a. When the Wireless is connected, WPA is asked (password). Enter the "**WPA Key**" used in step 3c.
b. Open a "**VNC**" software and write the IP address used in step 3d (*10.255.255.1*), click "**Connect**".



c. Use the VNC to navigate.



7.7.1.2 Setting up the WiFi Interface on the D11 & D12 Controllers

In the D11 and D12 controllers, the WiFi is activated by default and is therefore immediately available, provided a WiFi dongle is present.

To interface to the controller via WiFi, follow the same procedure as in step 5 of the D22 interface.

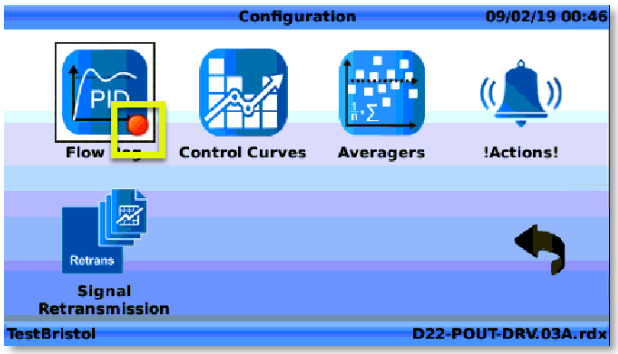
Note:

The password (WPA Key) is displayed on the OLED display for 10 minutes when switching on the device.

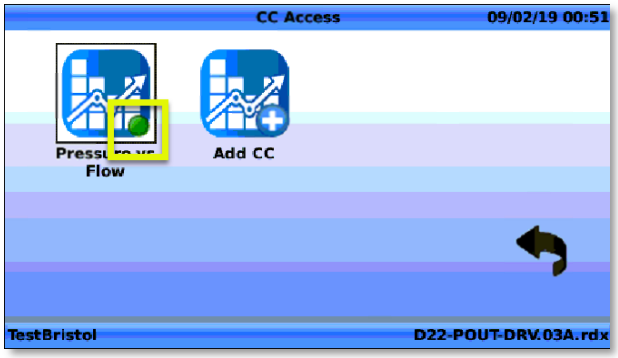
7.7.2 PID & CC STATUS ICON

The new R-Engine 2.4.0 software also shows the status of the PIDs and Control Curves directly on the icons of the configuration screen.

- **Red:** PID / CC is not active.



- **Green:** PID / CC is active



7.7.2.1 Improve Data Transfer Security via HTTPS

Starting with R-Engine version 2.4.0, the D12 and D22 controllers are forced to use the latest standard TLS security protocol version 1.2, when communicating via HTTPS (i.e. with Link2Valves).

7.7.2.2 Password Reactivation

For devices where a password protection is set, when entering the password the device would remain unlocked unless the password was manually reactivated. A timer has now been added, and the controller will automatically lock back after 20 minutes of inactivity.

7.7.3 BUG CORRECTION

Here is a list of the main bugs resolved in the R-Engine version 2.4.0.

7.7.3.1 Quick Navigation (Right/Left) User Interface Crash (R-UI)

In some cases, when navigating quickly in the control curve menu, the controller could reboot or get blocked. This should be now resolved.

7.7.3.2 Special Characters In APN Settings

In the last version of the R-Engine software, a bug was introduced preventing the use of "@" and some other special characters the APN settings. This is now corrected.

7.7.3.3 Inverted Solenoid Command in French Interface

The translation in French inverted the Solenoid command in the PID Output tab. This is now corrected.

7.7.3.4 Time Zone & Linux Epoch Wrong in AreaS without Daylight Saving

The Linux Epoch information in the CSV log file was wrong for countries that do not use daylight saving. This is now corrected.

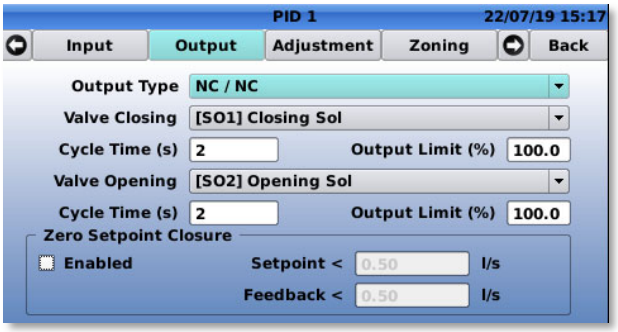
7.8 SINCE RELEASE 2.5.0 (06.08.2019)

7.8.1 ZERO SET POINT CLOSURE (ONLY D22)

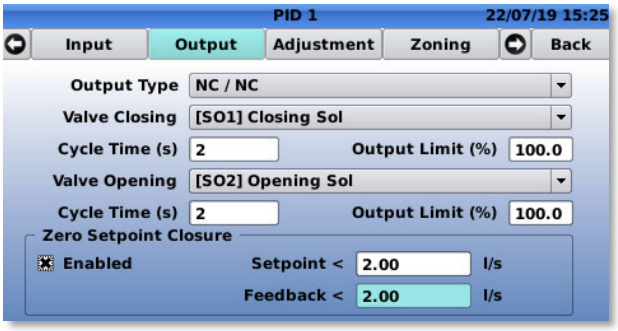
In step by step applications (solenoid command), a setting can be adjusted on solenoid closure to force the valve fully close, whenever the valve position is within the deadband of closure.

7.8.1.1 Features Menu

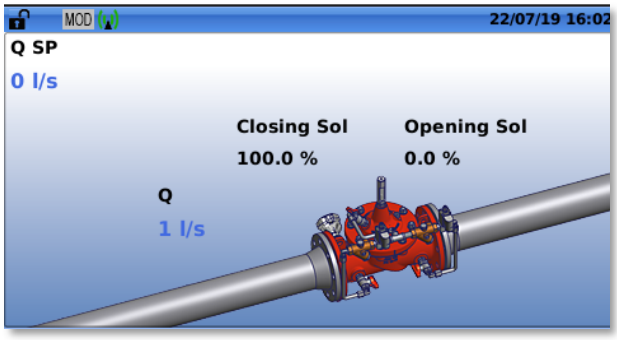
1. Go into the "**PID**" (long click up) > "**Output**" tab.



2. Enable the checkbox "**Zero Setpoint Closure**" to allow the setting of "**Setpoint**" and "**Feedback**".
3. Adjust "**Setpoint**" and "**Feedback**" values to activate the feature.



When both values are reached, the "**Zero Setpoint Closure**" provides on "**Closing solenoid**" 100% activation to close fully the valve.



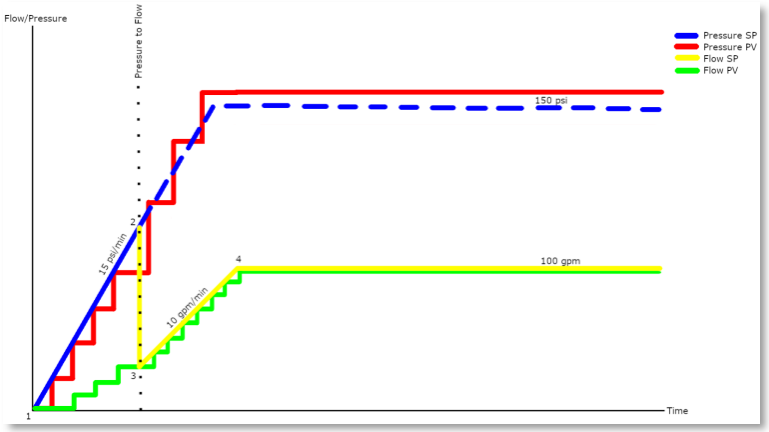
7.8.2 PID BUMPLESS TRANSFER WITH MULTI PID (ONLY D22)

When using multiple PID regulation, a progression Ramp from the starting point to the setpoint can be used when switching between the 2 PID processes, instead of jumping directly to the new setpoint.

Here an example of PID control before R-Engine update and after with PID Bumpless implemented.

Switch reaction between 2 PID control before R-Engine update

Switch reaction between 2 PID control after R-Engine update



7.8.3 MODIFY THE VALVAPPS NAME WHEN REGULATION IS MODIFIED

A number is added at the end of the ValvApps name when the configuration parameters are changed into the device. This feature helps identifying easily the modifications made by a user in the regulation configuration.

In addition, when the ValvApps is saved on a USB key, the name of the device is now added to the ValvApps name, avoiding to erase previously saved versions of the same ValvApps.

The name of a ValvApps is changed if some modifications are made. The list of modifications is as follows:

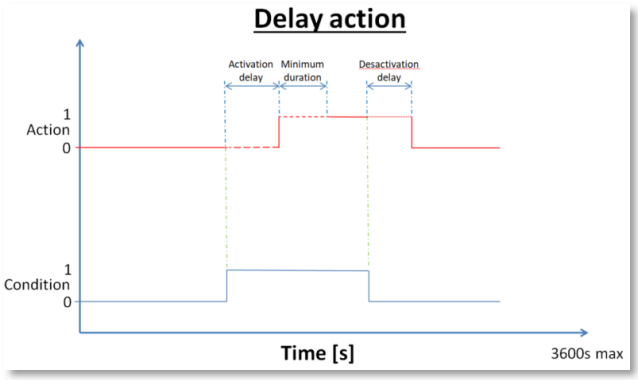
- addition/deletion/modification of an action
- addition/deletion/modification conditions for a CC
- addition/deletion/modification of conditions for a PID
- addition/deletion/modification input or output
- addition/deletion/modification average
- addition/deletion/modification retransmission
- addition/deletion/modification recopy
- modification VAR
- modification DPM
- modification log

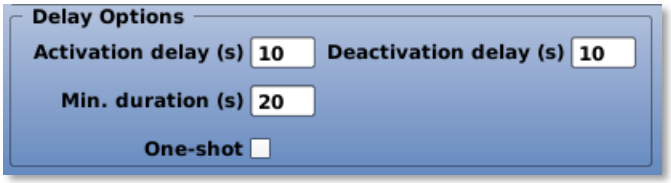
When a modification as listed above is made, the ValvApps name is renamed as per the following example: ***D22-POUT-DRV.95B.rdx*** will be renamed after modification to ***D22-POUT-DRV.95B.REV000.rdx.***

7.8.4 DELAY OPTION IN "ACTION" MENU

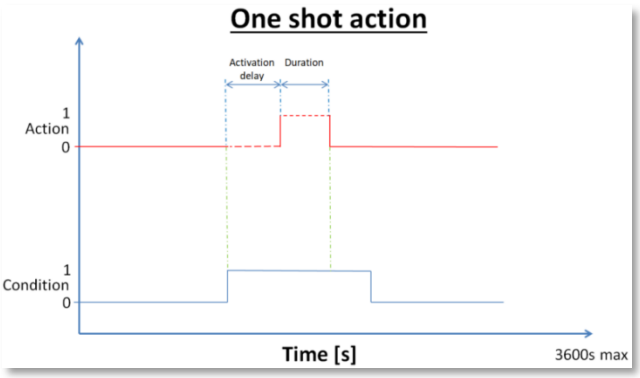
This option provides the capability to add a delay prior to activating an action. When the condition is true, a time delay will be applied before the corresponding action becomes effective. Useful when you use flow condition for example. Some activation options have also been added and can be combined with the action delay (minimum activation / one shot).

Function Activation / Deactivation Delay & Minimum Duration





Function one shot

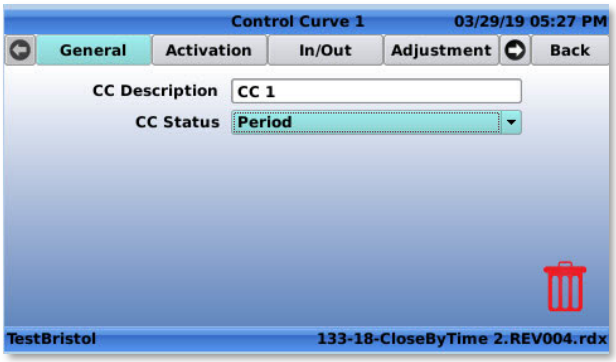


7.8.5 EXTENSION OF CONTROL CURVES ACTIVATION BASE ON A TIME PERIOD CONDITION

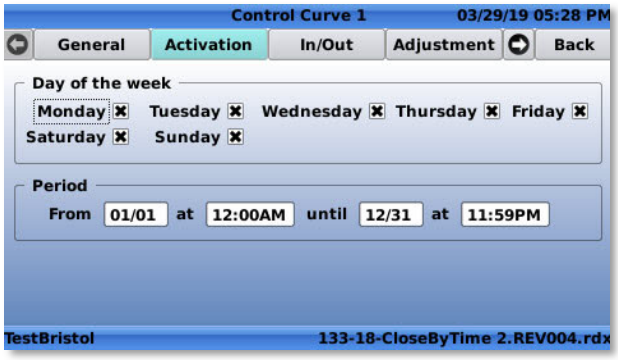
In addition to the existing enabling conditions for a CC, a period is now added to define date & time of activation and deactivation.

Here is an example of the period configuration:

Period Activation



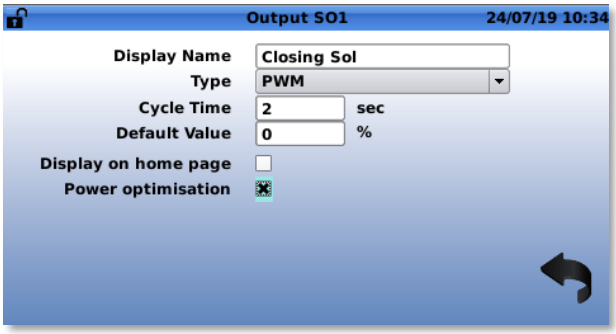
Period Selection



7.8.6 "OPTICON": SOLENOID OUTPUT POWER CONSUMPTION OPTIMIZATION (D22 ONLY)

This feature minimizes the power consumption on the solenoid output of the D22, thus decreasing the temperature of the solenoid, which minimizes the risk of blocking in hard water conditions.

The function work in digital or PWM (no necessary in latching type).



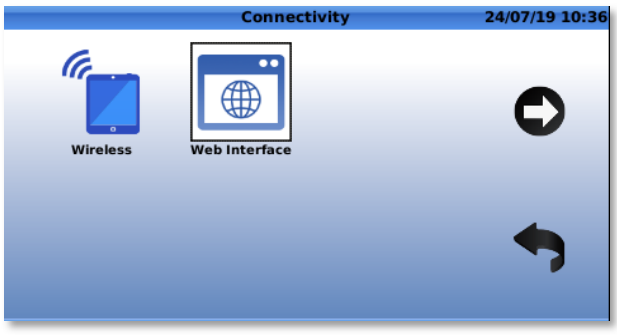
7.8.7 IMPORT AND/OR EXPORT FILES VIA THE WEB INTERFACE

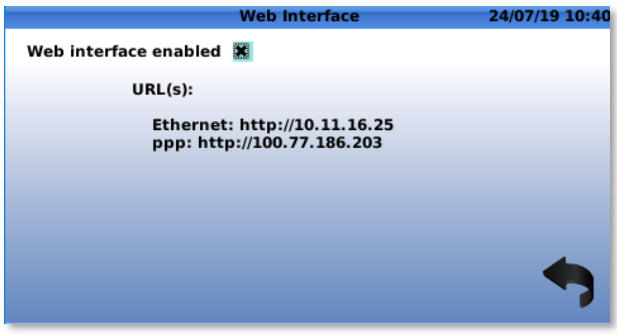
After the WiFi interface implementation in version 2.4.0, this feature provides the capability to upload/download files to/from a device via WiFi connection.

Please note Browser compatible & tested are: Mozilla Firefox / Chrome / Edge

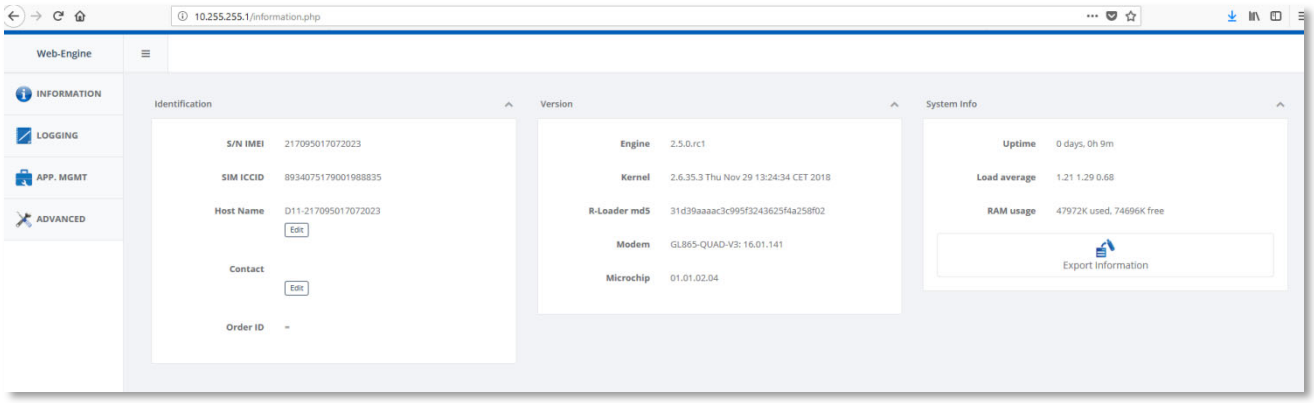
On D11 & D12, the "**Web interface**" is activated by default and IP address connection is http://10.255.255.1/

On D22, you should activate "**Web interface**" into menu "**Connectivity**", second page.





Check the IP address into "**Web Interface**" then establish connection with your Browser.



7.8.8 MODBUS NEW DATA MODEL (NEW TABLE)

Table Modbus are completely reviewed to provide simpler interface with SCADA request. The old Modbus table is called "**Cla-Val table**" and the new table is called "**Standard table**". By default, after an update R-Engine will keep the table used before the update. In other words, if you update with the version 2.5.0, R-Engine will keep the "**Cla-Val table**" activated, thus ensuring the existing connection with the SCADA system.

You will have the ability to select which table you want into "**Modbus**" menu. The biggest change between two tables are: to which address the value is stored and the introduction of the concepts of physical value and logical value.

The complete table is into the “Modbus_tables.xlsx” file attached to the “What’s new (06.08.19)” email (this email).

Here is a small example of overriding AO3:

CLA-VAL table:

To override the value of AI3 initially requires two or three write operations:

- Write the desired value to registers 42007 and 42008 (using either two single-word writes or a single 2-word write operation)
- Write 1 to address 42006 to apply the value in the holding register

Standard table:

To override the value of AI3 initially requires two or three write operations:

- Set bit 2 of address 40017 to 1 to apply the value in the holding register
- Write the desired value to registers 42040 and 42041 (using either two single-word writes or a single 2-word write operation)

Note:

- Due to the concepts of physical value and logical value, it is imperative to first activate the override and then assign the desired value to the correct register address.
- In the interval between the activation of the override and the assignment of the value, the taken override value will be the actual value of the logical value.
- The physical value registers will always contain the measured value on the input or output even if no sensor is connected (bit Out of Range at 1)
- The logical value registers will be the same of the physical value registers except if a local override is applied or if the input is used like a RSP/LSP in LSP mode.

7.8.8.1 Force Devices to Use TLS 1.2 and Certificates

Security improvements between device & server Link2Valves have been implemented.

7.8.9 BUG CORRECTION

The following bug resolution has been implemented in the R-Engine version 2.5.0.

7.8.9.1 Log Export on USB Broken

This bug was introduced into version R-Engine 2.4.0. Fixed into this version.

7.8.9.2 R-UI Crash After Modem Busy Error

Some improvements to not reboot after R-Ui crash with Modem busy error have been implemented.

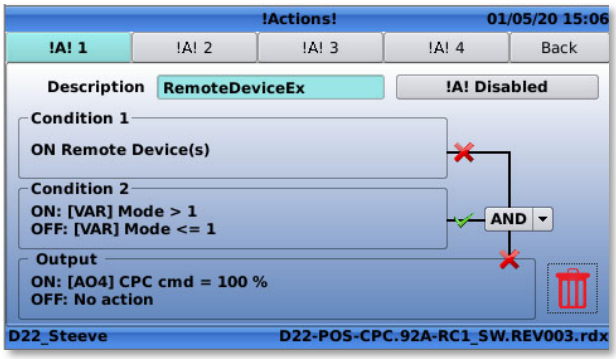
7.9 SINCE RELEASE 2.6.0 (04.05.2020)

7.9.1 POSSIBILITY TO USE CV-LOG ALERTS IN ACTION (ONLY D22)

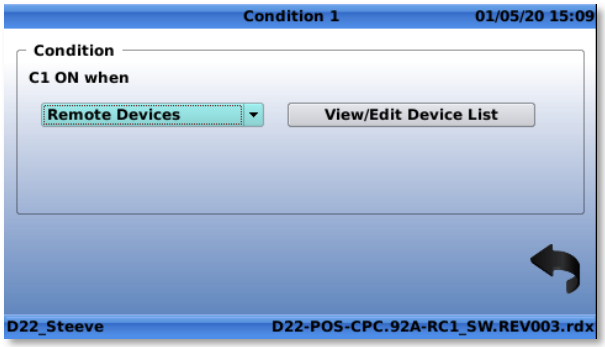
This feature allows you to perform an action on the D22 when a high or low alarm is sent from a CV-LOG to Link2Valves.

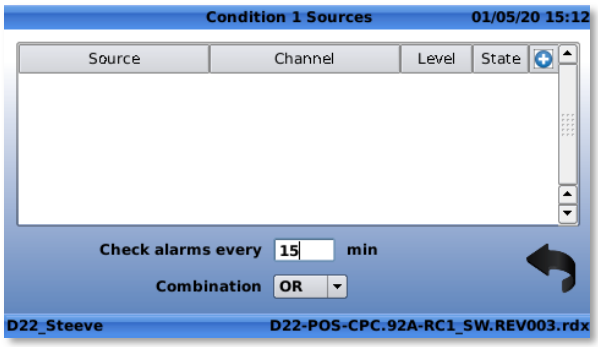
The D22 needs to be in the same Link2Valves organization as the CV-LOG, or in a parent organization (above the one where the CV-LOG is located).

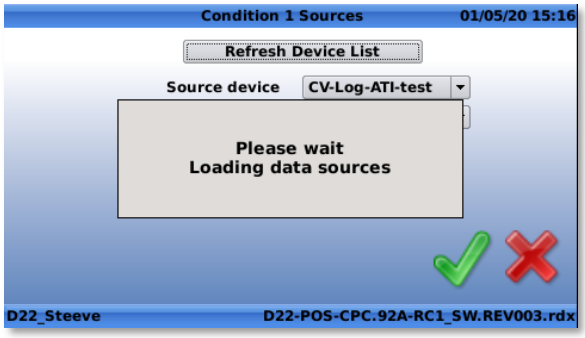
1. Go into the "**!ACTION!**" (long click up) > "**!A! 1**".



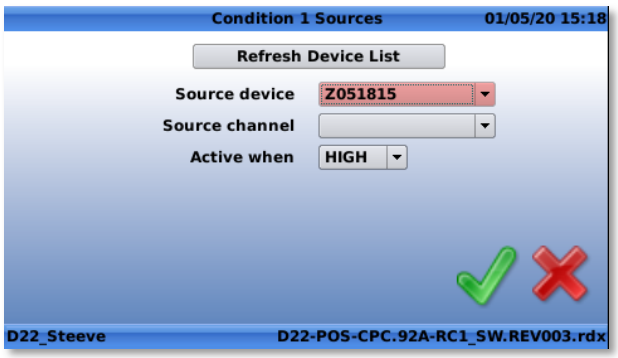
2. Go into the "**Condition 1**" to configure it. And select "**Remote Devices**" at the bottom of the list.
3. Select and click on the "**View/Edit Device List**" button.
4. Select and click on the  button then on the "**Refresh Device List**" button to refresh the available CV-Log. Wait until the end of the refresh.

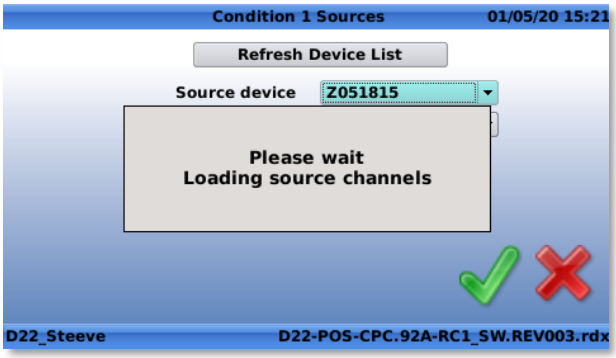




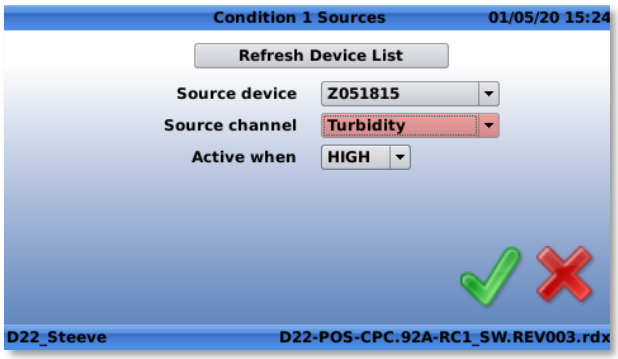


5. It is now possible to select the "**Source device**", that will be the desired CV-Log. When selected, click "**OK**", that will update the list of the channel available for the selected CV-Log.





6. Select the "**Source channel**" of the selected CV-Log.



7. It is mandatory to select when the condition will be active with the "**Active when**" choice.

Two options:

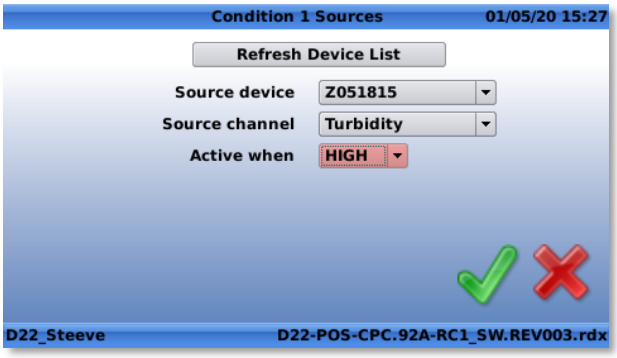
- **HIGH:** When the CV-Log will be in a high alarm state
- **LOW:** When the CV-Log will be in a low alarm state

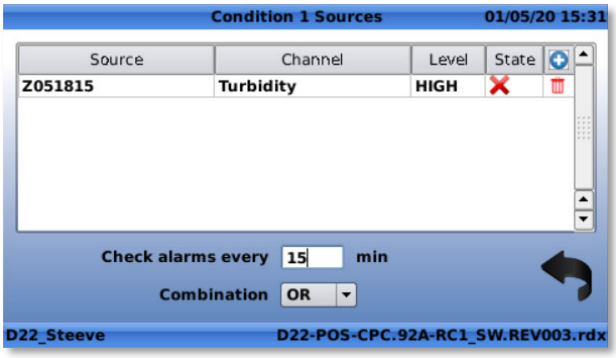
8. When everything is set, click on the " ". That will subscribe the D22 to the selected CV-Log channel. And put it into the following tab.

You can manage the different CV-Log Source/Channel from this tab. You can also configure the interval of the alarm check (minimum possible is 10 minutes) with the input "**Check alarms every**". And decide the combination rule for all the alarm received by the CV-Log's with the box choice "**Combination**".

Two options:

- **OR:** Condition active if at least one CV-Log is in alarm state.
- **AND:** Condition active only if all the CV-Log are in alarm state.





7.9.1.1 Log Files Are no Longer Deleted During an Engine Update

The most recent log files (10 Mb ≈ 260 days of data logged) are kept in the internal flash, and no longer deleted after an engine update.

7.9.1.2 Backup Into SD and SD Stockage Improvement

The memories usage, storage and backup has been improved. It is important to know that there are 2 types of memory used: flash memory and SD card.

The flash memory allows you to save all the system configuration and some of the log files.

As for the SD card, it is intended to regularly backup the ValvApps, log files and trace logs (a useful system file used for support if necessary).

The ValvApps, log files and trace logs will be backed-up at each startup and every day at midnight on the SD card. The 10Mb most recent files will be kept on the flash memory, used if an extraction is performed by the user, and the rest will be backed-up into the SD card as follows:

- **ValvApps:** into folder RDX/
- **Log files:** into folder LOG/
- **Trace logs:** into folder TRACE/

The different files are stored into a sub-folder, function of the month and year. See the following example:

/SD/LOG/2020-05/D22-Training-2020-05-04_0800.csv.zip

This makes it easier and faster to navigate through the files.

7.10 SINCE RELEASE 2.8.0 (30.03.2021)

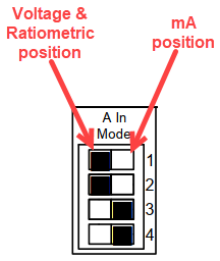
7.10.1 COMPATIBILITY WITH E-LIFT-35 ON THE D12

The D12 is now able to measure signals coming from 0-5 V or 0-10 V sensors (in addition to the already available Ratiometric & 4-20 mA signals). This is especially interesting for connecting the new e-Lift-35 position transmitter to the D12 in 0-10 V mode for a lower power consumption.

IMPORTANT: To use the 0-10 V mode, the D12 needs a resistor in series for a good accuracy. This resistor is provided / included with the e-Lift-35 package. For more detail, please contact CLA-VAL.

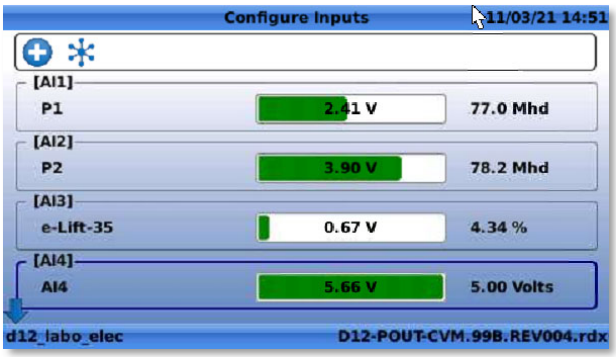
The D12 internal switches must be positioned as following:

- ***Left for Voltage & Ratiometric sensors***
- ***Right for 4-20 mA sensors***

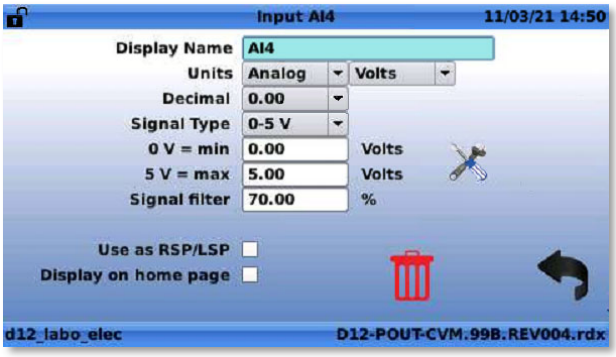


In the software interface:

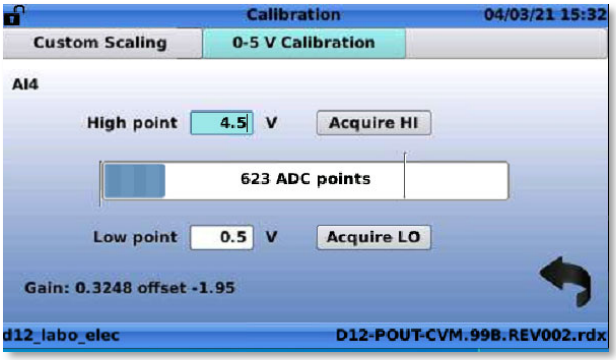
1. Go into the "**CONFIGURE INPUTS!**" (long click left) > "**AI**".



2. Select the correct input and click the left button (short).



3. Signal Type allows choosing between 4 type of sensor signals:
   - 4-20 mA
   - Ratio metric
   - 0-5 V
   - 0-10 V
4. The "**Tool icon**" allows custom scaling & calibration for sensors of type 0-5 V, 0-10 V, or 4-20 mA.



5. For Ratio metric sensors, only the low point needs to be calibrated through the "**Tool icon**".

7.10.1.1 Custom APN for 4G Communications

Up to now, using a custom SIM card (custom APN and password) was not possible with the new 4G communication. This has now been implemented.

7.10.1.2 WiFi Access Point - Limited Number of Characters

The D12/D22 devices do not support long WiFi network names, therefore a limitation to 31 characters has been implemented for WiFi connections.

7.10.1.3 Special Character "@"

"@" can now be used in the "**Connectivity**" menu (email) and in "**Wizzard**" menu. Up to now, this character was only available in the information / contact.

7.10.1.4 DPM EMEA

Updated DP Metering new table, based on most recent lab measurements.

7.11 SINCE RELEASE 2.8.2 (11.03.2022)

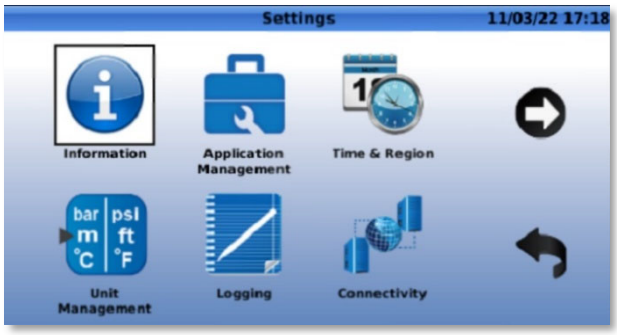
7.11.1 SET LOGGING TIME PRECISELY ON THE D22 & D12

The logging menu now allows setting the logging time precisely, using the "**Offset from midnight**" configuration input. When this setting is 0, the logging cycle starts at midnight, logging once every "Log interval" period. With other offset values, the cycle will start sometime after midnight; for example, a value of 5 min will make the logging cycle start at 00:05.

This feature synchronizes the logging times across devices, which can be useful to compare their data more easily.

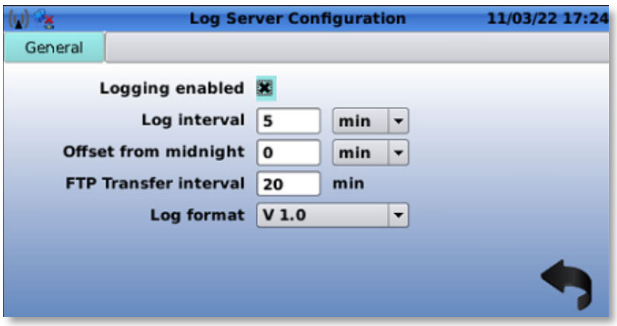
To configure this setting through the interface:

1. Go into "**Settings**" (long click down).



2. Select the "**Logging**" icon then click "**OK**".

3. Select the "**Configuration**" icon then click "**OK**".



In the example above, with "**Offset from midnight**" set to 0 (the default value), data points will be recorded every 5 minutes from midnight:

- 00h00
- 00h05
- 00h10
- Etc...

7.11.1.1 Fix for SD Card Read / Write Problems

In some cases where read or write access on SD card was not possible, an issue appeared making the device continually reboot. With this update, the procedure has changed to allow devices to boot properly even when the SD card is not accessible.

7.11.1.2 Remote Control Curve Modification Refused when one CC is Off

The D12/D22 devices refused Link2Valves' remote configuration updates when multiple CC were programmed and one of them was set to "**OFF**". With this update, this issue is fixed; CCs can now be configured remotely from Link2Valves with activation set to OFF.

7.12 SINCE RELEASE 2.8.3 (01.10.2022)

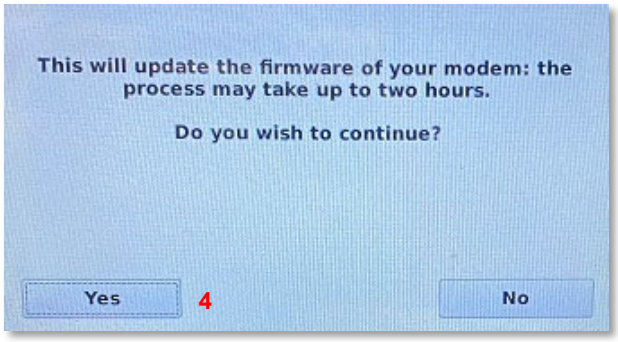
7.12.1 ALLOW UPDATE FW TELIT ME910 MODEM 4G FOR D22

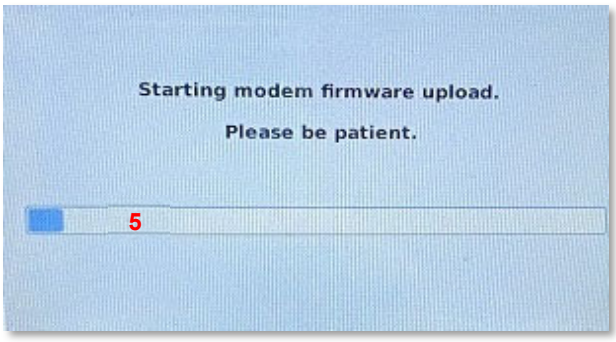
A bug has been identified on the Telit ME910 4G Modem that prevents proper data communication on the AT+T network in the USA., a script that can be loaded on a USB key is available, allowing to update the Telit ME910 modem firmware and resolving the issue. The update process takes approximately 2x 50 min, and Telit is working on the next release to update the model faster (date of next release unknown).

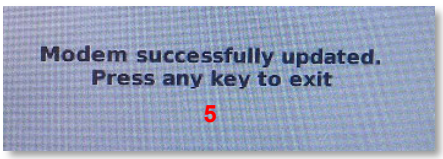
This issue only affects **communicating** devices **in the USA**, communicating **through AT+T**.

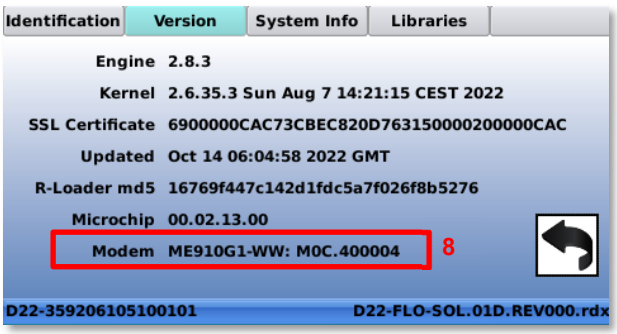
Here is a step-by-step approach to proceed with the update:

1. Load the script on a USB key
2. Switch the D22/VC-22D off and connect the USB key
3. Switch the D22/VC-22D on and follow
4. Select "**Yes**" to confirm the firmware update
5. A progression bar will show you when the update is finish.
6. Switch the D22/VC-22D off and on
7. Once the D22/VC-22D completely start up press “long down”, select information then version.
8. The new modem version is: **ME910G1-WW: M0C.400004**



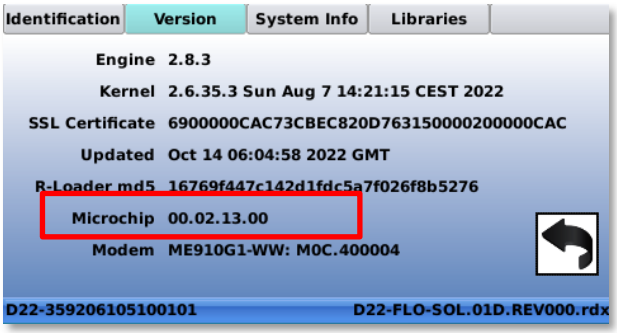






7.12.2 UPDATE MICROCHIP (PIC18F86K22 VS. PIC18F87K22)

Due to stock delivery issues, a new microcontroller version was installed on D22/VC-22D devices. The new engine 2.8.3 will automatically update it to version 00.02.13.00



7.12.3 IMPROVED SECURITY

Following a requestion from the customer Veolia (France), a few system functions have been reviewed and modified for an improved data security (strcopy, strcat, …).

The version of LFTP (sophisticated file transfer program) has also been updated to 4.9.2

7.12.4 REMOVE "R-ACCESS" USER NAME FROM TEST REPORT

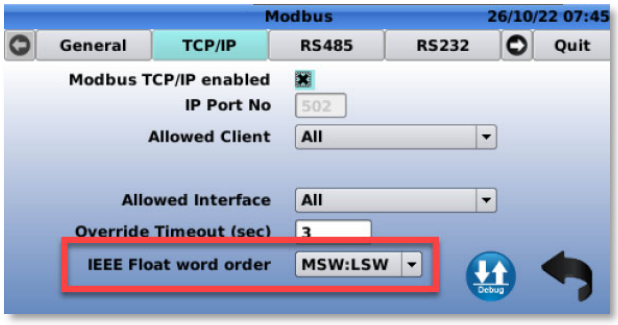
The report of the test bench showed the password of the device. Due to security improvement, we removed the password on the test report automatically generated by the test bench.

7.12.5 MODBUS TCP/IP MENU CLARIFICATION

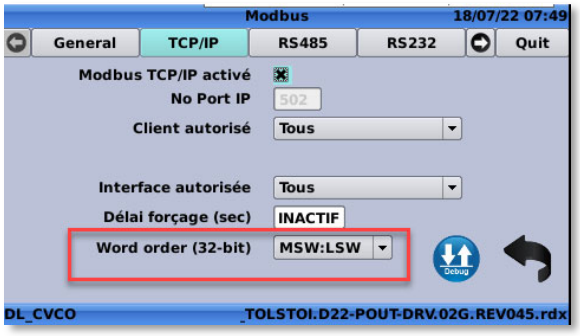
The text in the Modbus TCP/IP menu has been modified for reasons of misunderstanding. The text changed from "***IEEE Float word order***" into "***Word order 32bits for Modus***".

As a reminder, only words of 32-bit values are concerned by MSW:LSW **(Most significant word : Least significant Word)** order.

Engine 2.8.2 text:



Engine 2.8.3 new text:

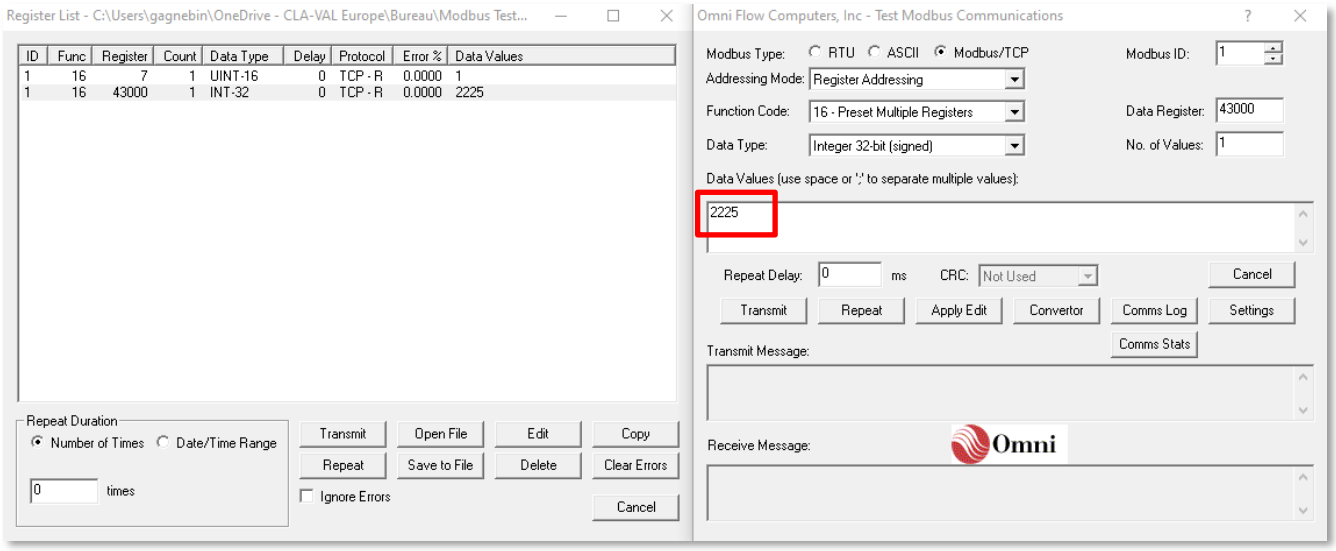


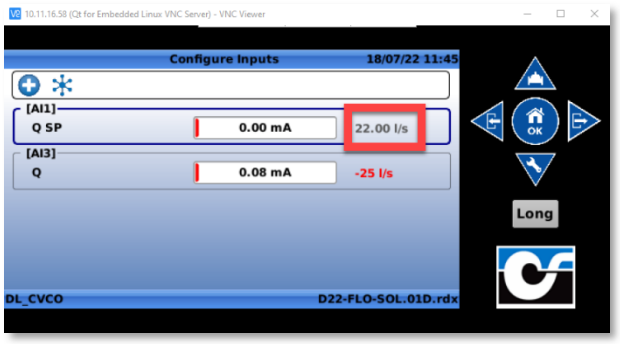
7.12.6 MODBUS OVERRIDE VALUE

When a value was sent through Modbus, the 2 last digits wasn't kept and was rounded to the closest integer number.

Previous Engine (2.8.2) example:

Writing 2225 on 32-ibt integer should give a value of 22.25 but was rounded to 22.00 l/s.

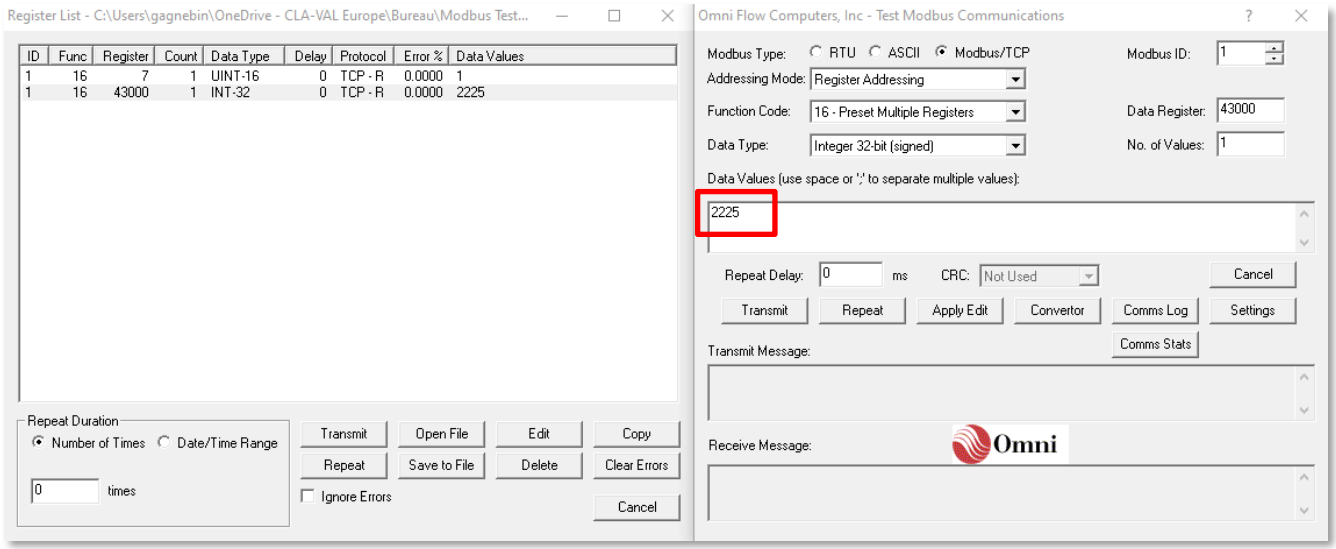


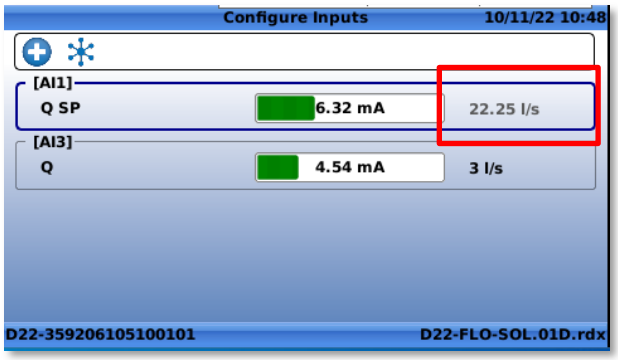


Now the 2 last digits are kept

Engine 2.8.3 example:

Writing 2225 on 32-ibt integer will show up 22.25 l/s





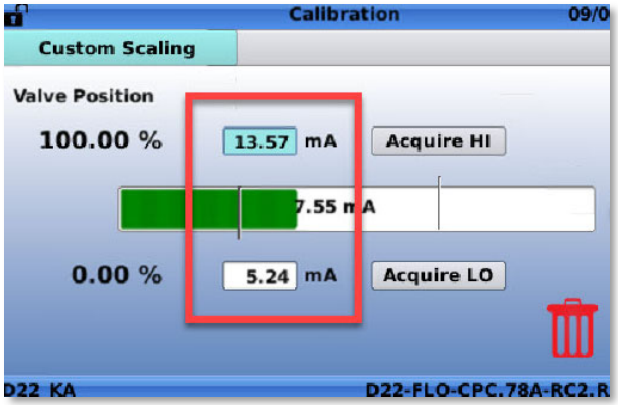
7.12.7 BUG CORRECTIONS

7.12.7.1 Infinite Retres Downloading Remote R-Engine Update

There was a bug when downloading a new R-Engine version via L2V, making the device to get stuck in an infinite restart loop. This is now resolved.

7.12.7.2 Custom Scaling Doesn't Show Decimal Value after Validation

The decimal value of a custom scaling was lost after a reboot of the device. Now, if "***Acquire Hi***" or "***Acquire Lo***" is saved on custom scaling with a decimal value, it now keeps the decimal value even after rebooting:



7.12.7.3 ValveFlow Calculation with Decimal Value for D12

An optimization of the decimal conversion in the ValveFlow (DPM) calculation has been implemented for the D12 (already implemented on D22 with engine 2.8.2).

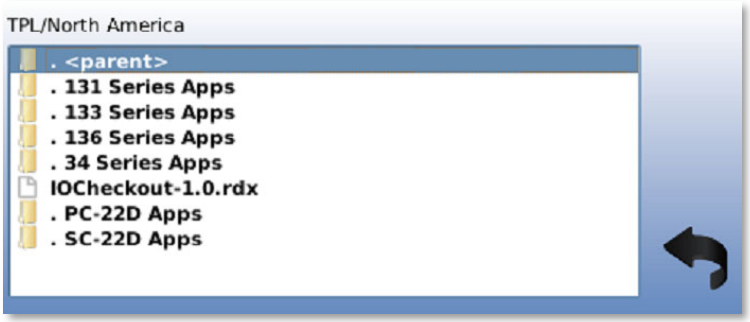
7.13 SINCE RELEASE 2.8.4 (17.02.2023)

7.13.1 ALLOW NEGATIVE FLOW VALUE

Some flowmeters have the capability to provide measure reverse flows in addition to straight flows. It is now possible to configure a flow input with a 4-20 mA range including negative values.

7.13.2 LIBRARIES UPDATE

Updated the North American Standard ValvApps library with a new hierarchy folder.

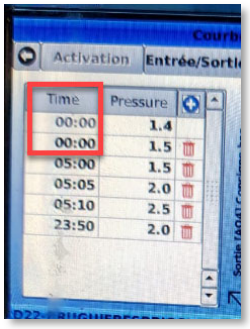


Updated the latest North American DPM table.

7.13.3 BUG CORRECTIONS

7.13.3.1 Multiple Control Curve Points at the Same Time

It was possible to mistakenly create Control Curve points with the same time, creating control issues. This has now been corrected.



7.13.3.2 Reboot After Removing a Control Curve Point

In some cases, the device could reboot after the modifications of a Control Curve (seen with ValvApps D22-RES-CPC.05E). This issue is now resolved.

7.13.3.3 Bad Formatting of .csv fileS BY d12/d22 with Engine 2.8.3

The Engine 2.8.3 created bad .csv log files by adding extra "battery charge" columns. This problem is now corrected.

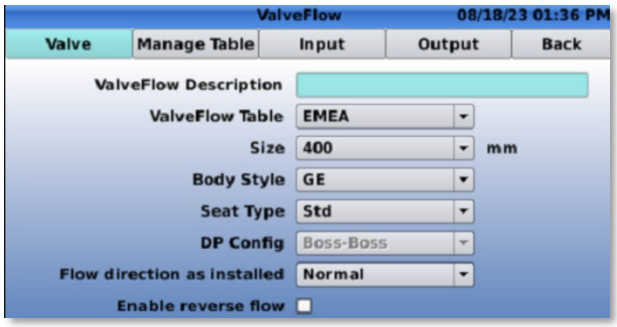
7.14 SINCE RELEASE 2.8.5 (17.08.2023)

7.14.1 MAIN IMPROVEMENTS

7.14.1.1 ValveFlow Improvements (Before DP Metering)

The ValveFlow function has been upgraded with new features, as per the hereafter list.

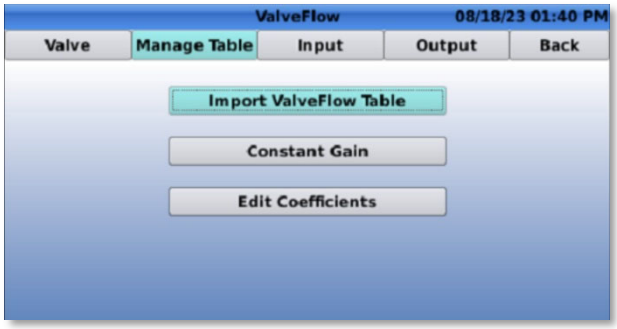
7.14.1.1.1 Valve



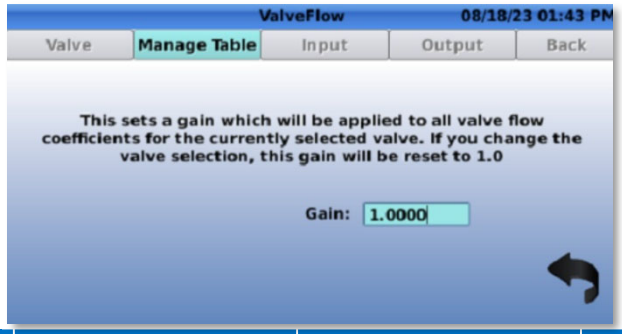
Flow Direction as Installed: Choose ***Normal*** if the flow through the valve is direct. Select ***Reverse*** if you are using ValveFlow for reverse flow only.

Enable Reverse Flow: This function allows reading reverse flows when selected. To check if the ValveFlow table includes the Size & Body you have selected, please contact CVEU.

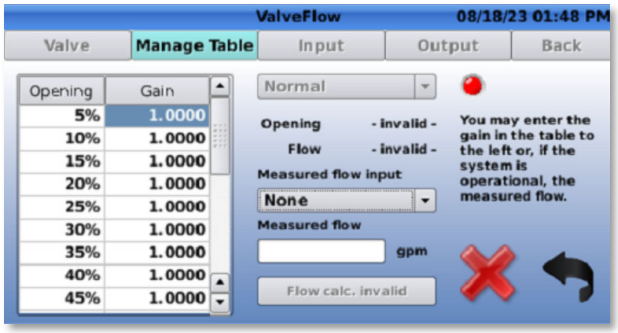
7.14.1.1.2 Manage Table



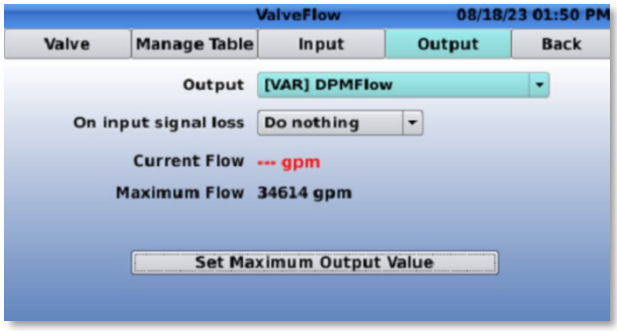
- **Import ValveFlow Table**: A custom ValveFlow table saved from another Valve or generated from new measurements can now be imported.
- **Constant Gain**: A constant gain can be applied to the ValveFlow table to adjust the calculated values.



- **Edit Coefficients**: Customize the gain applied to the ValveFlow calculation. This can be done in steps of 5%. Manual input is available on the left table. If a Flowmeter is connected to D22 for comparison, automatic calculation can be enabled by selecting the flow input for comparison.



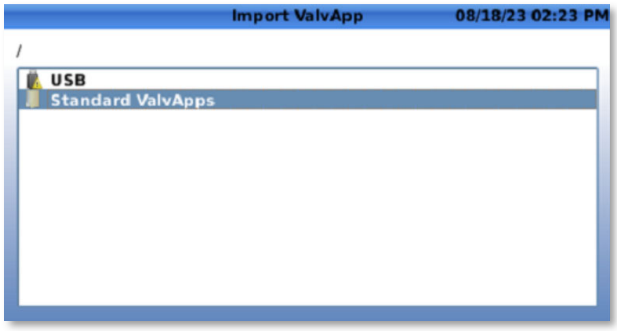
7.14.1.1.3 Output

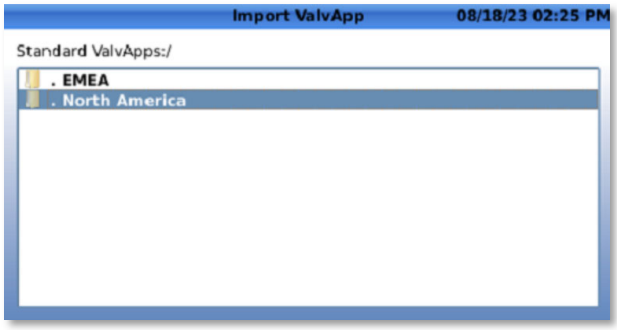


- **On Input Signal Loss**: If an input signal used ValveFlow is lost (P1, P2, or Position), the user can select the default behavior of the D22 to be either do nothing or apply a default value.

7.14.1.2 Load Standard ValvApps without Factory Reset

You can now upload a new ValvApp directly from the settings menu under ***Application Management*** > ***Import ValvApp***.

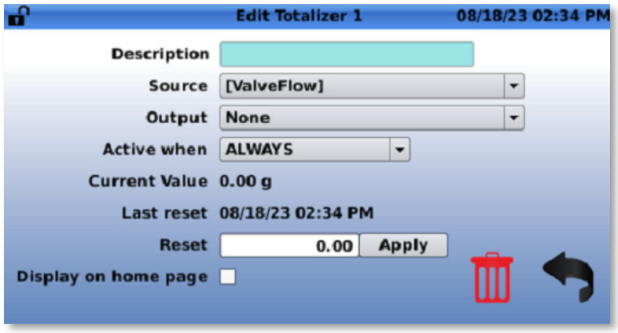




Choose the appropriate folder for your region (EMEA for Europe & Middle East / North America for the US).

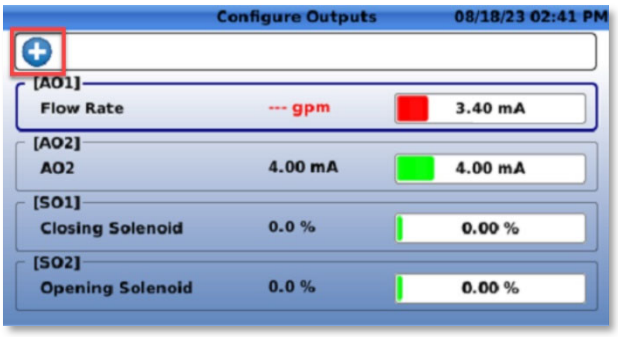
7.14.1.3 Add Totalizer via the Configuration Menu

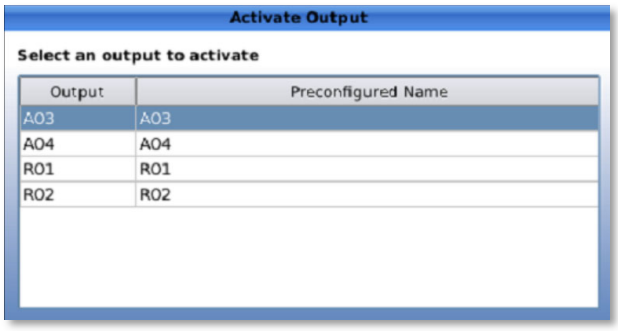
The totalizer functionality is now always available without the need for a specific ValvApps. In the **Valve** Menu (accessible by holding the 'up' button from the home screen), a Totalizer can be added on the fly (up to 4 totalizers are possible).



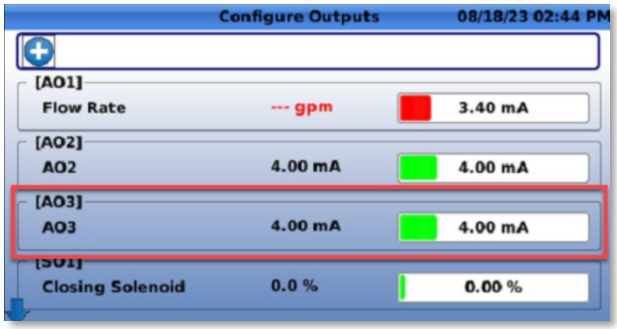
7.14.1.4 Add New Outputs on the Fly

From the home screen menu, holding the right button gives access to the configuration menu. Outputs not defined by default in the ValvApps can now be added. Select the  icon and then click "**OK**" to see the available outputs.





After selecting the desired output, it will appear in "**Configure Outputs**", where you can proceed with further configuration (units, range, etc.) and use it for actions or other options.



7.14.2 BUG CORRECTIONS

7.14.2.1 Prevent Register if e-Mail Field is Invalid

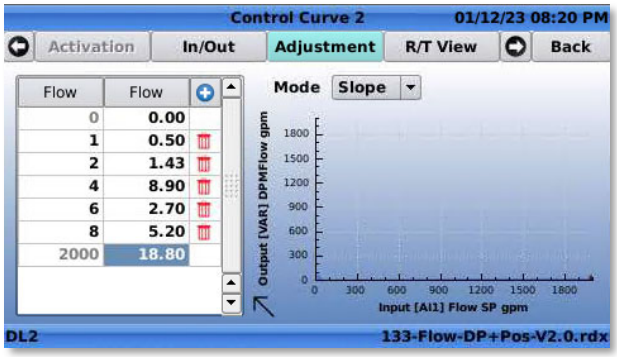
A popup message will appear if the email is not valid or not provided.

7.14.2.2 GSM Signal Strength Measures Stuck at 0 (D12 only)

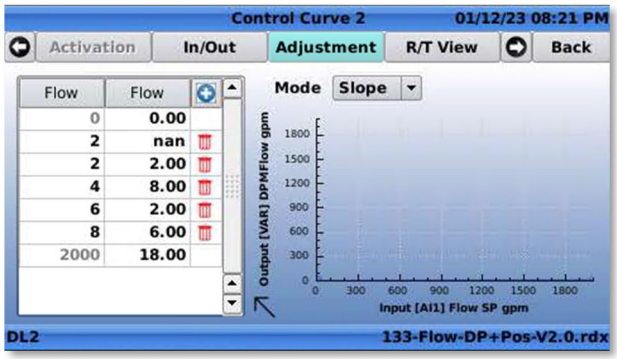
In the log files sent by the D12, the modem receives irregular characters in the operator's name, in addition to losing the ability to measure GSM strength. Version 2.8.5 fixes this issue and restores GSM strength measurements.

7.14.2.3 Control Curves Round Output to Whole Number when Using 2 Decimals

A bug can appear in previous versions of the R-Engine, when adding a control curve using a Variable output with 2-decimal precision:



Leaving and going back to the Control Curve menu would display a ***nan*** value, or decimals would be lost.



Version 2.8.5 fixes this issue and maintains the original precision.

7.14.2.4 Fix for Slow Network FTP Communication

It has been noticed that some networks can be slower, causing issues with FTP communications. Version 2.8.5 corrects these issues this by improving timeout controls.

7.15 SINCE RELEASE 2.8.6 (25.04.24)

7.15.1 NEW FEATURES

7.15.1.1 Modbus Log-to-Disc

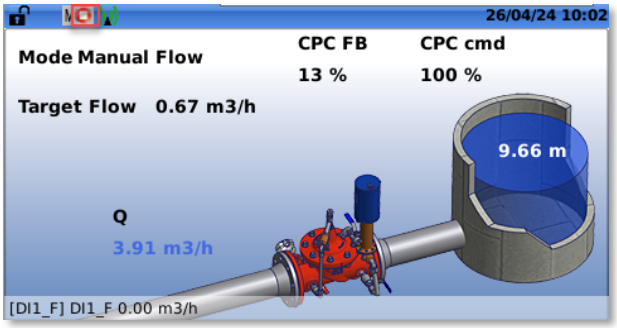
This feature allows users to easily save and access Modbus debugging logs on external devices. It provides a more efficient way to troubleshoot Modbus issues. It eliminates the inconvenience of navigating and troubleshooting Modbus on the controller's screen. Additionally, users can continue navigating on the controller while the debugging logs are being saved in the background.

When clicking on any Modbus debug button (TCP/IP, RS485, or RS 232), if a USB stick is connected to the D22, the following message will appear:

If the debugging tab is closed, then a pop-up message will appear which asks if the logging on the USB key should continue.

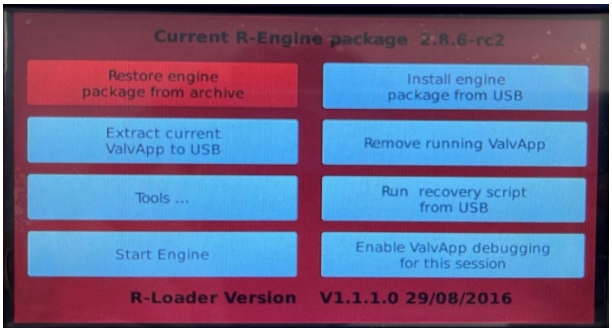
By choosing "**Yes**", the logging to the USB stick will continue until it is disabled, USB stick is full, USB stick is removed or the D22 is rebooted.

The logged data will be displayed in the same format like on the Debug window of the D22 controller. While the logging into the USB stick is active, the Modbus icon on the home page header will show a little red icon:



7.15.1.2 R-loader Access from Advanced Settings Menu

R-loader serves as an advanced troubleshooting tool. It can be accessed during the controller startup by holding down both side buttons. With this new version, users will have the possibility to access this tool directly from the advanced settings menu.



The usage of the R-Loader might change factory parameters. It is strongly recommended to ask assistance from the factory when using this feature.

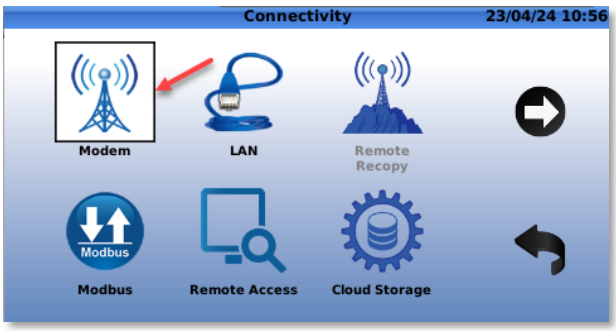
7.15.2 IMPROVEMENTS

7.15.2.1 Cellular Network

The cellular network window has been updgraded with new features, and its icon name has changed.

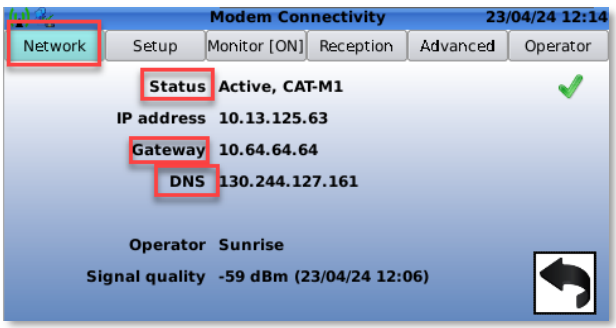
7.15.2.1.1 Icon Name

The icon name passed from “GPRS/GSM” to “Modem”.



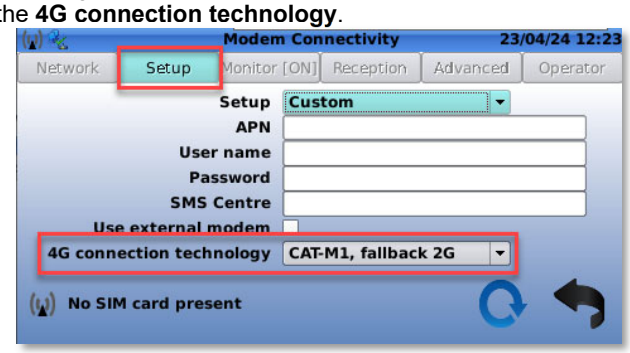
7.15.2.1.2 Network

The following image shows the modifications that have been made on the Network tab inside the Modem:



7.15.2.1.3 Setup

The tab name “GPRS Setup” has changed to “Setup”. In addition to this modification, an additional option has been added to the tab which allows to choose the **4G connection technology**.

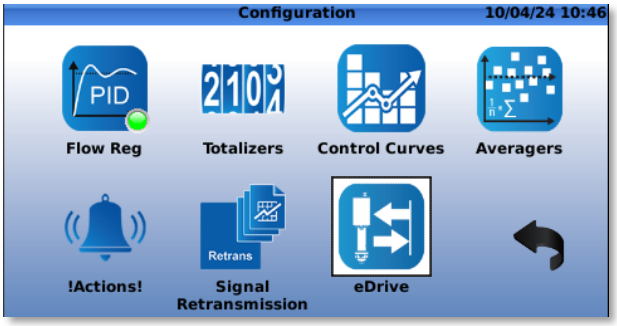


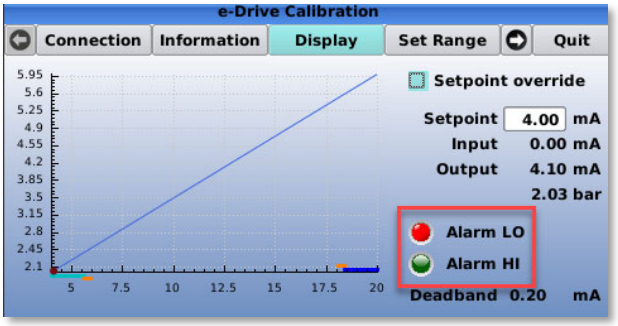
4G connection technology: Offers the possibility to choose between numerous options of communication depending on the coverage constraints, and the geographical situation of the device.

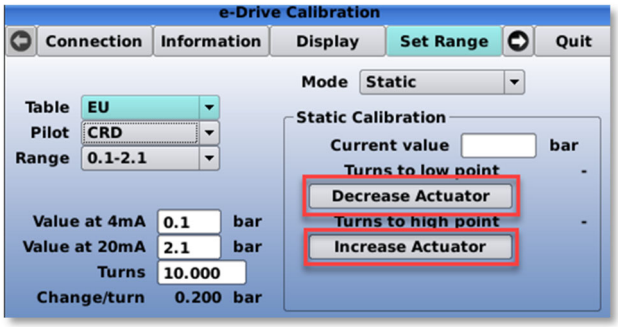
7.15.2.2 E-Drive Menu

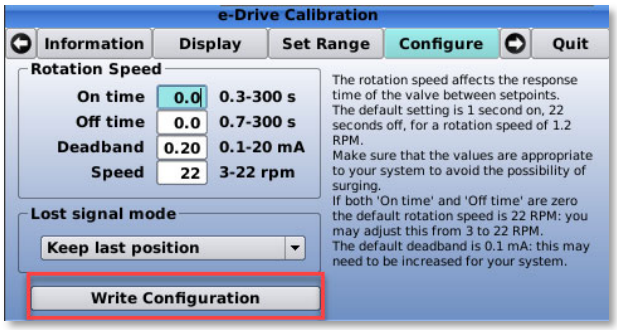
The navigation for setting up and calibrating an E-Drive has been enhanced by adding additional buttons on certain tabs.

This improvement allows for smoother calibration processes and more efficient adjustments.



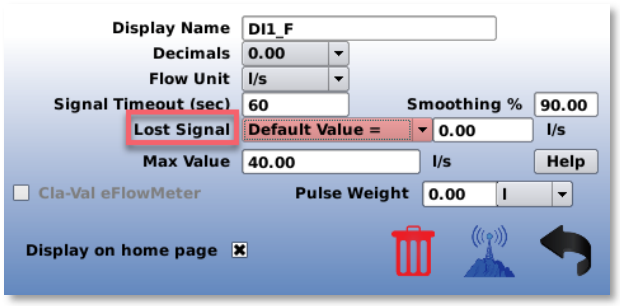






7.15.2.3 Options for Handling Signal Losses on DI_F

This enhancement provides users with the option to select a value in the event of no signal on a digital frequency input, offering greater flexibility and control.



It is possible to choose a default value, to keep the existing value or do nothing in case there is a lost signal on this type of input.

7.15.3 BUG FIXES

- The issue where control curve modifications made on L2V weren't applying to the controller was resolved. With this version, adjustments can be made on L2V and applied to the controller without problem.
- No need to restart the device after switching between the Modbus tables.
- In the ValvApps that include ValFlow (DPMetering) the PID will continue to control the valve in case of no signal on certain inputs.