



# **DRIVER**

## **FOR ELECTRONIC EXPANSION VALVES**



## **USER MANUAL**

**CODE 144EVDRIVE0E08**

**Important**

Read these instructions carefully before installation and use and follow all recommendations regarding installation and for the electric connection; keep these instructions for future reference.

**The instrument must be disposed of according to local Standards regarding the collection of electric and electronic appliances.**



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# **EVDRIIVE01 USER MANUAL**

# 1 Generalities

## 1.1 Description

EVDRIVE01 is a stand-alone driver for electronic expansion valves.

The instrument has:

- 1 measurement input for pressure transducers 4-20 mA (evaporation probe)
- 1 measurement input for NTC probes (intake probe)
- 1 high voltage digital input (functioning consent)
- 2 low voltage digital inputs (functioning consent and state of the back-up battery charge)
- 1 power supply input coming from the back-up battery
- 1 digital output (relay), 3 A res. @ 250 VAC, for alarm output control
- 1 serial port with MODBUS communication protocol
- 1 serial port with INTRABUS communication protocol

The device can function only with the Alco Control valves belonging to the EXM, EXL, EX4, EX5, EX6, EX7, EX8 and EX9 ranges.

The device is in 4 modules DIN container. The user interface is made up from a custom display with 4 digits (with function icons) and 4 keys (set, up, down and escape).

Installation is envisioned in an electric control board on DIN guide

Using the EVC99P00X7XXX00 battery charger module (to be ordered separately) the device can be supported during valve closure in the absence of mains voltage.

Using the EVKEY programming key (to be ordered separately), it is also possible to upload and download configuration parameters.

Using a serial interface (to be ordered separately) it is finally possible to connect the device to the monitoring and supervision system of RICS plants (via TTL, with MODBUS communication protocol).

Even if the device is set-up to communicate with another device (a serial network with INTRABUS communication protocol), EVDRIVE01 is a stand-alone driver (i.e. can function alone, independently from the presence of other devices with which it could interact).

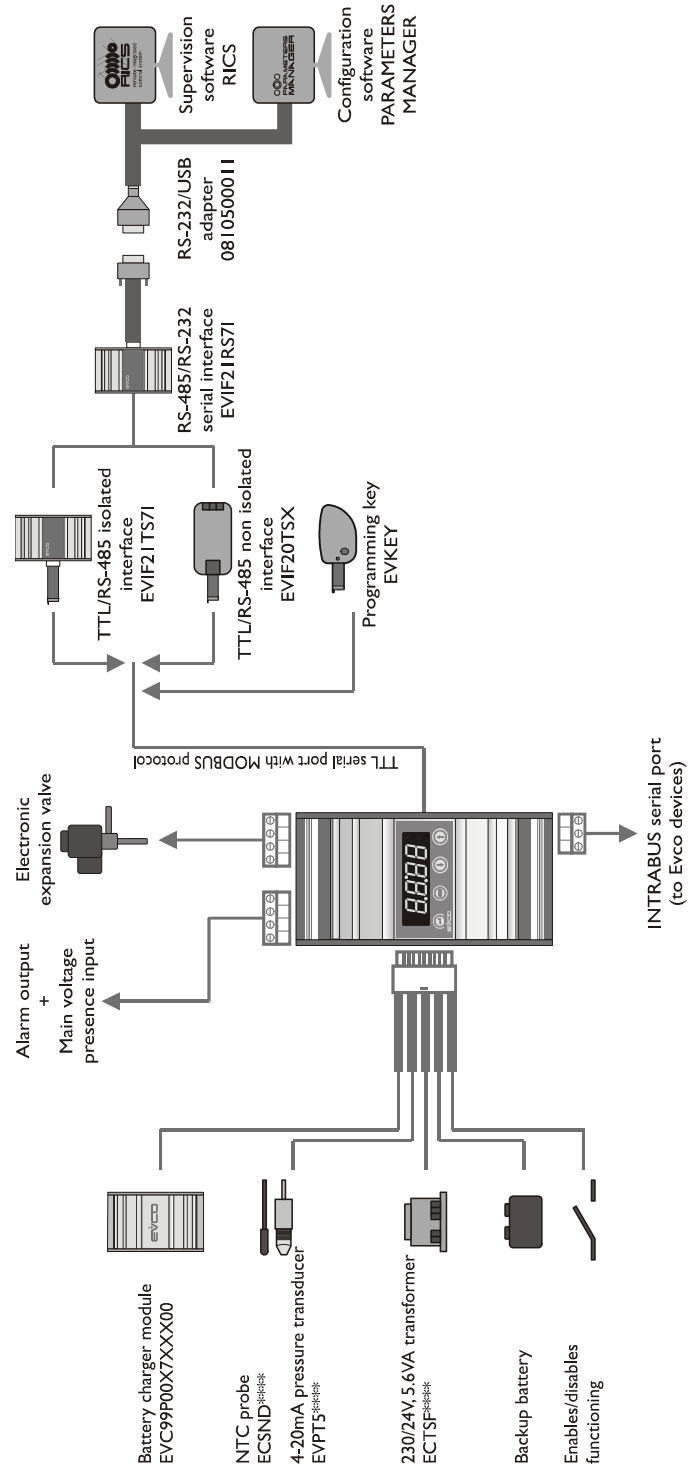
Among the many features, the following are also indicated:

- front panel protection rating IP40
- management of high over-heating and low over-heating alarms
- MOP function (Maximum Operating Pressure)
- LOP function (Lowest Operating Pressure).



## 2 Network components and accessories

### 2.1 Network components and accessories



## 3 Technical features

### 3.1 Connections

#### Power supply:

EVDRIVE01 is powered by an alternating current equal to 24 V. The maximum length of the power supply connection cables is 1 m. The EVDRIVE01 power supply is not isolated; therefore **it must be galvanically isolated from that of other devices.**

#### Connection of the analogue inputs:

EVDRIVE01 has two analogue inputs, one for NTC temperature probe and one for pressure transducer 4-20 mA. The pressure transducer can be powered via a 12 VDC unstabilised voltage, available on an instrument clamp. The maximum length of the analogue input connection cables is 3 m.

#### Connection of the digital inputs:

EVDRIVE01 has three digital inputs of which two low voltage (functioning consent and back-up battery charge state) non optoisolated and one in high voltage (functioning consent). The maximum length of the digital input connection cables is 3 m.

#### Connection of the digital outputs:

EVDRIVE01 has one digital output with electro-mechanical relay. The maximum length of the output connection cables is 10 m.

#### Connection of the electronic expansion valve:

The maximum length of the electronic expansion valve connection cables is 6 m.

#### IntraBus Connection:

EVDRIVE01 has an IntraBus serial port for connection to Evco appliances, which support the same communication protocol. The connection is made via a 3-way cable. The maximum length of the connection cables is 3 m. Even if the device is set-up to communicate with another device (a serial network with INTRABUS communication protocol), EVDRIVE01 is a stand-alone driver (i.e. can function alone, independently from the presence of other devices with which it could interact).

#### Recommendations for the electric connection

- do not operate on the terminal boards using electric or pneumatic screwdrivers
- if the instrument has been taken from an cold place to a hot one, the humidity could condense inside. Wait about one hour before applying power.
- make sure that the power supply voltage, frequency and operational electric power correspond to those of the local power supply
- disconnect the power supply before performing any type of maintenance
- do not use the instrument as a safety device
- for repairs and information regarding the instrument, contact the Evco sales network.

#### Precautions

The indications regarding the maximum lengths of the connections imply that a series of precautions are respected.

To prevent immunity problems, it is good practice to comply with the following indications:

- avoid places with antennas
- do not wire probe inputs with relay outputs; generally, prevent mixing low and high voltage signals
- do no wind cables around power components

To prevent safety problems, it is good practice to comply with the following indications:

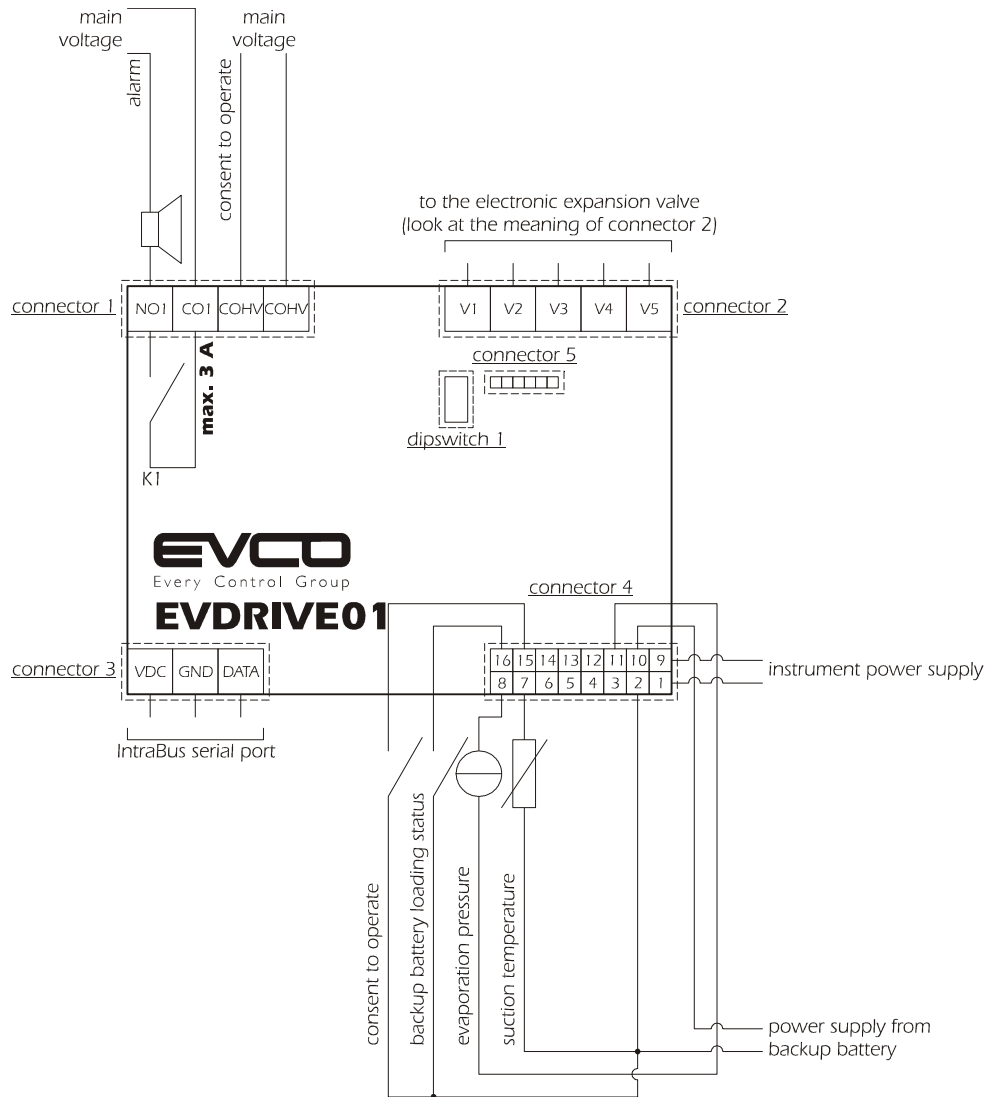
- avoid environments with relative humidity >90%
- avoid water
- avoid corrosive environments
- avoid explosive environments
- avoid environments with strong vibrations.

#### Arrangements

Make sure that the use conditions lie within the limits of use indicated in the technical features.

### 3.2 EVDRIIVE01 electric connection

Below find the EVDRIIVE01 connection layout with relative table regarding the meaning of inputs and outputs.



**Connector 1:** functioning consent relay output and digital input (high voltage).

| Code | Description                                       |
|------|---|
| NO1  | K1 relay normally open contact                    |
| CO1  | K1 common relay                                   |
| COHV | Functioning consent digital input (230 VAC ± 10%) |
| COHV | Functioning consent digital input (230 VAC ± 10%) |

**Connector 2:** electronic expansion valve.

| Code (Alco reference) | Description for EXM-246 / EXL-246 <sup>(1)</sup> valves  |
|-----------------------|--|
| V1                    | Shield   |
| V2 (2B)               | White wire   |
| V3 (2A)               | Orange wire  |
| V4 (1B)               | Blue wire  |
| V5 (1A)               | Yellow wire  |
| Code (Alco reference) | Description for EX4 / EX5 / EX6 / EX7 / EX8 / EX9 valves |
| V1                    | Shield   |
| V2 (2B)               | White wire   |
| V3 (2A)               | Black wire   |
| V4 (1B)               | Blue wire  |



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|         |            |
|---------|------------|
| V5 (1A) | Brown wire |
|---------|------------|

(1) The red wire and the brown wire are not used.

**Connector 3:** IntraBus serial port.

| Code | Description           |
|------|-----------------------|
| VDC  | Power supply (12 VDC) |
| GND  | Common                |
| DATA | Serial live           |

**The EVDRIVE01 power supply and that of the device connected to EVDRIVE01 via connector 3 must be galvanically isolated from each other.**

**Connector 4:** instrument power supply, back-up battery power supply, measurement inputs, digital inputs.

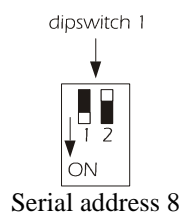
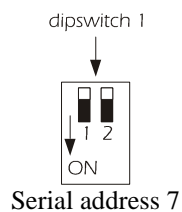
| Code | Description                                    |
|------|--|
| 1    | Instrument power supply (24 VAC)               |
| 2    | Common analogue and digital inputs             |
| 3    | Common analogue and digital inputs             |
| 4    | Common analogue and digital inputs             |
| 5    | Not used                                       |
| 6    | Not used                                       |
| 7    | Analogue input 2 (NTC temperature probe)       |
| 8    | Analogue input 1 (pressure transducer 4-20 mA) |
| 9    | Instrument power supply (24 VAC)               |
| 10   | Back-up battery power supply (12 VDC)          |
| 11   | Pressure transducer power supply (12 VDC)      |
| 12   | Not used                                       |
| 13   | Not used                                       |
| 14   | Not used                                       |
| 15   | Functioning consent digital input              |
| 16   | Back-up battery charge state digital input     |

**If the controller is supplied in direct current, one will not have to respect the polarity of the power supply voltage.**

**Protect the power supply with a fuse rated 2A-T 250 V; if the instrument is connected to a backup battery, protect pin 10 with a fuse rated 2A-T 250 V (both fuses must be UL listed or recognized).**

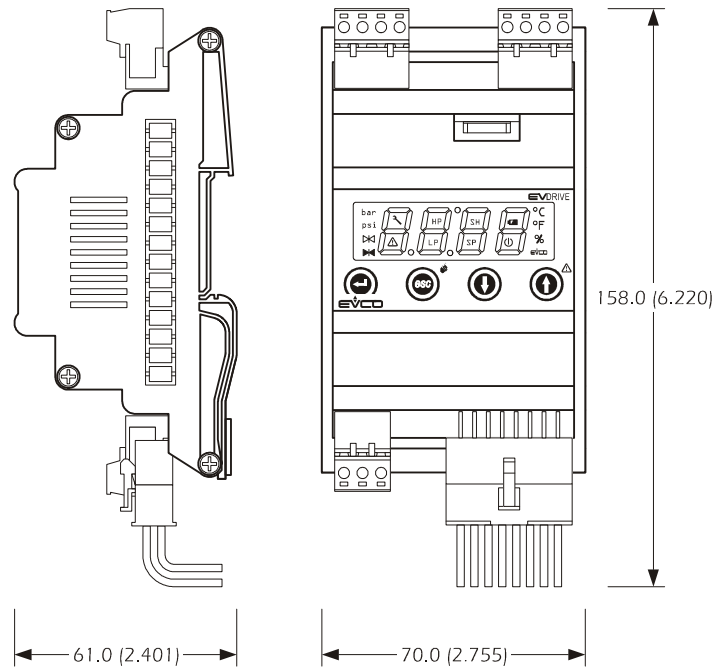
**Connector 5:** to the EVKEY programming key and the TTL / RS-485 interface.

**Dipswitch 1:** EVDRIVE01 address in INTRABUS serial network.



### 3.3 EVDRIVE01 dimensions and installation

The mechanical dimensions of EVDRIVE01 are given below; the measurements are expressed in mm (in).

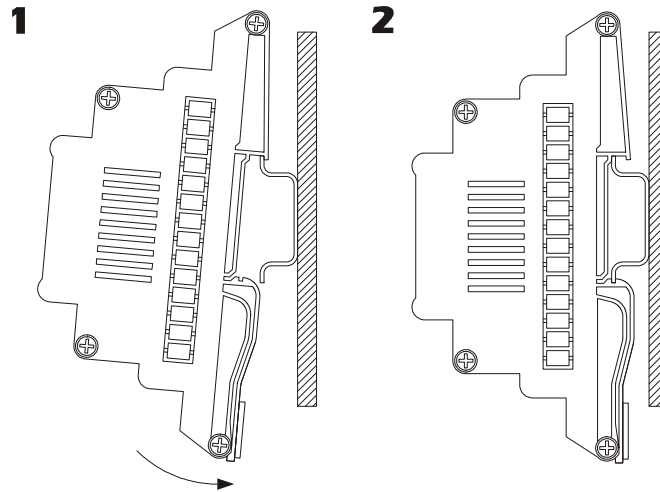


**Installation recommendations:**

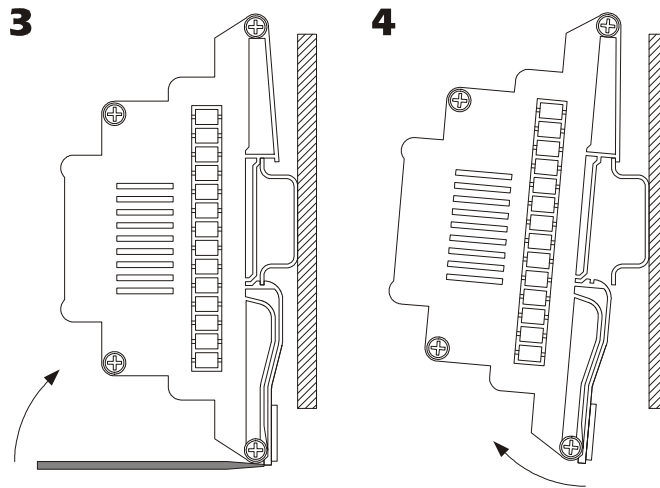
- make sure that the work conditions (temperature of use, humidity, etc.) lie within the limits indicated in the technical data
- do not install the instrument in proximity of heat sources (resistances, hot air pipes etc.) appliances with strong magnets (large diffusers etc.), places subject to direct sunlight, rain, humidity, excessive dust, mechanical vibrations or shocks
- in compliance with Safety Standards, the protection against any contact with the electric parts must be ensured via correct installation of the instrument. All parts that ensure protection must be fixed in a way such that they cannot be removed without the aid of a tool

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To install EVDRIIVE01, operate as indicated in the diagrams (points 1 and 2).



To remove EVDRIIVE01, use a screwdriver and operate as indicated in the diagrams (points 3 and 4).





### 3.4 General features

|   |   |
|---|---|
| Reference Standards regarding safety                  | EN60730-1   |
| Purpose of the device                                 | Electronic expansion valve driver   |
| Storage conditions                                    | -10T65 °C non-condensing R.H.<80%   |
| Functioning conditions                                | 0T40 °C non-condensing R.H.<80%   |
| Construction of control                               | Electronic control device to be incorporated; assumes the classification of the appliance with which it is integrated |
| Type of disconnection                                 | Reduced interruption (relay contacts)   |
| PTI of the insulating materials                       | >=250V  |
| Container   | Assembly on omega guide   |
| Type of actions and additional features               | 1C  |
| Pollution situation                                   | 2 or more   |
| Class of software                                     | A   |
| Period of the electric stress of the insulating parts | Long  |
| Front panel protection rating                         | IP40  |

### 3.5 Technical features

|   |                                       |
|---|---------------------------------------|
| Connection for low voltage signals  | Mini-Fit 16-way                       |
| Power connector   | Phoenix disconnectable terminal board |
|   | Cable section > 0.75mm <sup>2</sup>   |
| IntraBus serial port connection   | Phoenix disconnectable terminal board |
| Connection for the parameters key, TTL serial output for RS-485 module, interface for Flash programming | 6-way AMP micro-maTch                 |

| SPECIFICATIONS OF THE 16-WAY MINI-FIT CONNECTOR |   |   |
|---|---|---|
| SUPPLIER  | CONNECTOR CODE  | CONTACTS CODE   |
| Note:<br>use the appropriate tool for crimping  |  |  |
| CVILUX  | CP-01 116010 (V2)<br>CP-01 116020 (V0)  | CP-01 1000102 (AWG16÷24)  |
| SELECOM   | 6137R16WO (V2)  | 6137TR1 (AWG16÷20)<br>6137TR2 (AWG22÷26)  |
| JUSCOM  | 1090-557-162 (V2)   | 1150-156-012 (AWG18÷22)<br>1150-156-002 (AWG22÷26)                                    |
| CONEXCON  | 6740-1161 (V2)<br>6740-1160 (V0)  | 6744-2000 (AWG18÷22)  |
| MOLEX   | 39-01-2160 (V2)<br>39-01-2165 (V0)  | 39-00-0038 (AWG18÷24)<br>39-00-0046 (AWG22÷28)  |

### 3.6 Electric features

|  |  |   |
|--|--|---|
| Power supply                               | Voltage                                      | 24 VAC or 20... 36 VDC                        |
|  | Range  | ± 10 %  |
|  | Frequency                                    | 50/60Hz                                       |
|  | Maximum power absorbed                       | 30VA  |
|  | Supplied from a class 2 circuit.             |   |
|  | Rated impulse voltage                        | 330 V (related to the power supply)           |
|  | Overvoltage category                         | III   |
|  | Protection fuse                              | External                                      |
| Digital outputs                            | Number                                       | 1   |
|  | Type   | Electro-mechanical relays                     |
|  | Maximum contact current at 250VAC            | 3 A   |
|  | Number of manoeuvre cycles                   | 100.000                                       |
|  | Minimum interval between switch-overs        | 20s   |
|  | Type of micro switch interruption action     | 1C  |
|  | Insulation between the relay and low voltage | Reinforced                                    |
| Valve motor outputs                        | Number                                       | 1   |
|  | Type   | Step-by-step motor driver                     |
|  | Power supply                                 | Generated inside the module                   |
| Digital inputs in low voltage              | Number                                       | 2   |
|  | Type   | Potential-free contact                        |
|  | Current on the closing contact towards earth | 2mA   |
|  | Maximum closure resistance                   | 100Ω  |
|  | Detection time from OFF to ON                | 100ms   |
|  | Detection time from ON to OFF                | 100ms   |
| Digital inputs in high voltage             | Number                                       | 1   |
|  | Type   | Optoisolated                                  |
|  | Voltage range                                | 230 VAC ± 10 %                                |
|  | Min. detection time from OFF to ON           | 100ms   |
|  | Min. detection time from ON to OFF           | 100ms   |
| Analogue inputs for NTC probes             | Number                                       | 1   |
|  | Type   | NTC (10 KOhm ± 1 % @ 25 °C)                   |
|  | Suggested                                    | ECSNDX94ZASV                                  |
|  | NTC measurement range                        | -50°C ÷ 50°C in fluid<br>-50°C ÷ 105°C in air |
| Analogue inputs for pressure transducers   | Number                                       | 1   |
|  | Type   | Current                                       |
|  | Suggested                                    | EVPT530K00 or EVPT530K01                      |
|  | Current measurement range                    | 4-20 mA                                       |
|  | Power supply                                 | 8 ... 30 VDC                                  |
|  | Input resistance                             | < 200 Ohm                                     |
| Back-up battery power supply input back-up | Voltage                                      | 12 VDC  |
|  | Type of battery                              | lead, 12 V, 2 ...6 Ah                         |
|  | Battery charger                              | I max = 150 mA, V max = 13 V                  |
|  | Maximum power absorbed                       | 30VA  |
|  | Protection fuse                              | External                                      |
| Serial output (IntraBus)                   | Number                                       | 1   |
|  | Type   | EVCO serial live                              |
|  | Physical layer                               | 12VDC, GND, DATA                              |
|  | Baud rate                                    | 19.200 bit/s                                  |
|  | Phoenix disc.                                | connector                                     |

If EVDRIVE01 is supplied with DC voltage, it will not be possible detecting the lack of power supply. In this case parameter Pb01 must be set to 0 and the alarm PFir will not be shown; it will also not be required using the battery charger module EVC99P00X7XXX00 because no device will communicate EVDRIVE01 to close the valve. The high voltage digital output and the digital input have reinforced insulation with respect to the remaining I/O.

## 4 User interface

### 4.1 Display and keyboard

The built-in interface on the controller is made up from a 4 digit custom display (for displaying quantities), 4 keys (for surfing) and 16 icons (for immediate and intuitive representation).

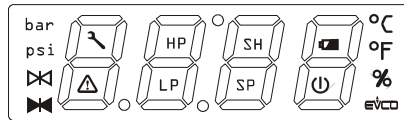







Main functions that can be activated using the keys:

| Key pressed                            | Function   |
|--|--|
| DOWN<br>during lamp test from power-on | Display version/firmware revision  |
| DOWN<br>for 2 seconds                  | Quantity temporary display   |
| SET/ENTER<br>for 2 seconds             | Display/ over-heating set-point modification<br>(PH30=0 disables the possibility for modification) |
| DOWN + UP<br>for 4 seconds             | Display/modify/reset parameters  |
| UP<br>for 2 seconds                    | Alarms display   |
| ESC<br>for 2 seconds                   | Display /modify % valve output n manual mode   |
| SET/ENTER + DOWN<br>for 2 seconds      | Block/Release keyboard   |

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Meaning of the icons:



| Icon   | Colour | Function   |
|--|--------|--|
| bar  | Green  | Identifies the unit of measurement selected. If on, it indicates that the pressure is expressed in bar   |
| psi  | Green  | Identifies the unit of measurement selected. If on, it indicates that the pressure is expressed in psi   |
| <br>valve closed      | Green  | Identifies the valve state (closing):<br>Off: the valve is closed or off or <5%<br>On: the valve is open at a value > 95 %<br>Flashing: the valve is working   |
| EVCO   | Amber  | Displayed only if available  |
| %  | Amber  | If on, it indicates that the % opening of the valve is being displayed   |
| °F   | Red    | Identifies the unit of measurement selected. If on, it indicates that the temperature is expressed in °F-°R  |
| °C   | Red    | Identifies the unit of measurement selected. If on, it indicates that the temperature is expressed in °C-°K  |
| <br>maintenance       | Red    | Identifies the request for maintenance. If on, the valve is operating in manual mode.  |
| <br>alarm             | Red    | Identifies the presence or not of alarms. Alarms are present if it is on, otherwise it remains off.  |
| HP<br>(MOP)  | Green  | It is active when the MOP function is activated (parameter PA50)<br>Off: function not active<br>On: MOP function active<br>Flashing: MOP alarm   |
| LP<br>(LOP)  | Green  | It is active when the LOP function is activated<br>Off: function not active<br>On: Low pressure alarm<br>Flashing: LOP alarm   |
| SH   | Green  | It is active when the SH function is activated<br>Off: function not active<br>On: function on (I am viewing the SH value)<br>Flashing: LSH, HSH alarm  |
| SP   | Green  | Identifies that a set-point is being displayed.<br>Flashing: the set-point is being modified.  |
| <br>Back-up battery | Green  | Battery state (DI2)<br>Off: Battery charged<br>On: Back-up battery being charged or back-up module disconnected  |
| <br>on/stand-by     | Red    | Identifies the state of the valve<br>Off: valve on (enabled)<br>On: valve off (disabled)<br>Flashing: valve in start-up  |
| central decimal point<br>higher  | Red    | Identifies the Intrabus / Modbus communication state<br><u>If Pr06 = 0 or 1</u><br>Off: No Intrabus / Modbus communication<br>On: Intrabus / Modbus communication error<br>Flashing: Intrabus / Modbus communication ok<br><u>If Pr06 = 2</u><br>Off: No Intrabus communication<br>On: Intrabus communication error<br>Flashing: Intrabus communication ok<br><u>If Pr06 = 3</u><br>Off: No Modbus communication |

|  |  |   |
|--|--|---|
|  |  | On: Modbus communication error<br>Flashing: Modbus communication ok |
|--|--|---|

## 4.2 Main page

The main screen changes according to the state of the valve: if the valve is not enabled (valve open and regulation deactivated) OFF is shown and the relative icon (stand-by) is on; if the valve is enabled (valve closed and regulation activated) the values selected by the PdIS parameter is selected (or an error label). The relative icon (stand-by) is off (an icon corresponds to the quantity displayed).

## 4.3 Temporary display of the quantities

Operate as indicated:

- press the DOWN key for 2 seconds: the SH label is displayed
- press the SET/ENTER key to display the over-heating value measured
- press the UP or DOWN key to change the default display according to the following table:

|      |  |
|------|--|
| SH   | Over-heating value measured                      |
| PrES | Pressure value measured                          |
| PErC | % valve opening                                  |
| TEMP | Temperature value measured                       |
| TSAT | Temperature value calculated (from the pressure) |
| SHSP | Over-heating set-point value                     |
| SEtP | Set of parameters currently selected             |

To exit the procedure:

- press SET or do not operate for 60 seconds or press UP or DOWN until the display shows the quantity established by the PdIS parameter or press the ESC key.

## 4.4 Setting the work set-point

Operate as indicated:

- make sure that the machine is on, that the keyboard is not blocked and that no procedure is in progress
- press the SET/ENTER key for 1 s: the display will show the current over-heating set-point
- press the UP or DOWN key within 15 s
- press SET/ENTER or do not operate for 15 s.

Using parameter PH30 it will be possible to block the possibility of modifying the set point; in his case, if you try to modify the set-point, LOC is shown for 2 s.

## 4.5 Setting the configuration parameters

This paragraph presents the menus found in the application. The main menu is divided into two levels (user and installer).

The installer level is protected by a password.

The range of values for those that can be set for the password is -99 / 999 (default = -19).

After 1 minute that no key is pressed, the password expires and must be set again.

To access the procedure, operate as indicated:

- make sure no procedure is in progress
- press the UP and DOWN key for 4 s the display will show a label.

To select a parameter:

- press the UP or DOWN key.

To modify a parameter:

- press the SET/ENTER key
- press the UP or DOWN key within 15 s
- press the SET/ENTER key or do not operate for 15 s.

To access the installer level:

- press the UP or DOWN key to select PA.
- press the SET/ENTER key



- press the UP key or the DOWN key within 15 s to set the password defined with the “PASS” parameter (default -19)
- press the SET/ENTER key or do not operate for 15 s
- press the UP and DOWN key for 4 s the display will show a label.

To exit the procedure:

- press the UP and DOWN key for 4 s or do not operate for 60 s.

**Cut off the power supply to the instrument after modification of the parameters.**

## 4.6 Restore the default value of the configuration parameters

Operate as indicated:

- make sure no procedure is in progress
- press the UP and DOWN key for 4 s the display will show a label
- press the UP or DOWN key to select PA
- press the SET/ENTER key
- press the UP or DOWN key within 15 s to set 743
- press the SET/ENTER key or do not operate for 15 s
- press the UP and DOWN key for 4 s the display will show dEF.
- press the SET/ENTER key
- press the UP or DOWN key within 15 s to set 149
- press the SET/ENTER key or do not operate for 15 s: the display will show flashing dEF for 4 seconds, after which the instrument will exit the procedure
- cut the instrument power supply off.

**Make sure that the default value of the parameters is appropriate.**

## 4.7 Main menu

It is possible to enter/display this menu holding the UP+DOWN keys down for 4 seconds.

The first variable displayed is rI00 (evaporation pressure); pressing SET/ENTER, the value is displayed. Using the UP or DOWN keys, scroll the list of VCM variables in reading only mode.

To exit the procedure: press UP+DOWN for 4 seconds or do not operate for 60 seconds or press the ESC key.

## 4.8 Copying the parameters set from an instrument to the EVKEY programming key (upload) and vice versa (download)

### 4.8.1 Preliminary considerations

The key allows to:

- copy the work set-point and the configuration parameters (successively called “parameters set”) from the instrument to the key (upload)
- copy the parameters set from the key to the instrument (download).

Copying the parameters set from the key to the instrument (download) is only allowed if the firmware of the instruments coincide.

The key can be used with powered and unpowered instruments. In the latter case a power supply unit must be used (available on request).

The power supply unit supports the copying operations of the parameters set, not the instrument functioning.

The parameters set copying operations request at maximum 10 s. If the signal is not given within this time that the operation has been completed successfully (i.e. the key LED stops emitting red light and emits green light again) the operation must be repeated.

### 4.8.2 Copying the parameters set from a powered instrument to the key (upload)

Operate as indicated:

- remove the instrument power supply
- connect the key to the instrument TTL serial port
- power the instrument: the key LED emits green light
- when the test inside the instrument display shows flashing “Cln”; the outputs are switched off

- hold the instrument SET/ENTER key for 4 s: the instrument display will show flashing “St”
- hold the instrument SET/ENTER key for 4 s: the key LED will emit red light and the parameters set will be copied from the instrument to the key. When copying has been performed, the instrument will restore normal functioning and the key LED will again emit green light
- disconnect the key.

To exit the procedure:

- do not operate for 60 s or disconnect the key when the LED of the latter emits green light and interrupt the instrument power supply.

### **4.8.3 Copying the parameters set from an unpowered instrument to the key (upload)**

Operate as indicated:

- connect the key to the instrument TTL serial port
- connect the pin of the power supply unit to the key
- connect the power supply unit plug to a socket: the key LED emits green light
- when the test inside the instrument display shows flashing “Cln”
- hold the instrument SET/ENTER key for 4 s: the instrument display will show flashing “St”
- hold the instrument SET/ENTER key for 4 s: “St” will stop flashing and remain on with a fixed light. The key LED will emit red light and the parameters set will be copied from the instrument to the key. When copying has been performed, the key LED will again emit green light
- disconnect the plug from the power supply unit
- disconnect the pin from the power supply unit
- disconnect the key.

To exit the procedure:

- do not operate for 60 s or disconnect the power supply unit plug when the key LED emits green light.

### **4.8.4 Copying the parameters set from the key to a powered instrument (download)**

Operate as indicated:

- remove the instrument power supply
- connect the key to the instrument TTL serial port
- power the instrument: the key LED emits green light
- when the test inside the instrument display shows flashing “Cln”
- hold the key button down for 1 s: the key LED will emit red light and the parameters set will be copied from the key to the instrument. When copying has ended, the instrument display will show “PrG”, the instrument restores normal functioning and the key LED will again emit green light
- press an instrument key to make “PrG” disappear
- disconnect the key.

To exit the procedure:

- do not operate for 60 s or disconnect the key when the LED of the latter emits green light and interrupt the instrument power supply.

### **4.8.5 Copying the parameters set from the key to an unpowered instrument (download)**

- connect the key to the instrument TTL serial port
- connect the pin of the power supply unit to the key
- connect the power supply unit plug to a socket: the key LED emits green light
- when the test inside the instrument display shows flashing “Cln”
- hold the key button down for 1 s: the key LED will emit red light and the parameters set will be copied from the key to the instrument. When copying has ended, the instrument display will show “PrG”, the key LED will again emit green light
- press an instrument key to make “PrG” disappear
- disconnect the plug from the power supply unit
- disconnect the pin from the power supply unit
- disconnect the key.

To exit the procedure:

- do not operate for 60 s or disconnect the power supply unit plug when the key LED emits green light.

## **4.9 Display of firmware identification**

On switch-on, during the lamp test phase, holding the DOWN key, the project identification is displayed for about 2 seconds. The information regarding the versions/revisions of the project is displayed in sequence. The procedure is exited automatically at the end of the lamp test.

## 5 List of parameters

Below find the list of all parameters managed by the application. A brief description, the range of acceptable values, unit of measurement, the default value and the menu in which it is found is supplied for every parameter. The menus are structured according to the following logic: user menu (UT) allows to modify the overheating set-point. Installer menu (IS) allows to modify all parameters; only if the installer menu is protected by a password.

| Code               | Parameter description                | Default | Min              | Max             | U.M.       | Menu | Notes   |
|--------------------|--------------------------------------|---------|------------------|-----------------|------------|------|---|
| FUNCTIONING MODE   |                                      |         |                  |                 |            |      |   |
| SEtP               | Functioning mode                     | 1       | 1                | 3               | -          | IS   | 1 = Parameters Set1<br>2 = Parameters Set2<br>3 = Parameters Set3 |
| SET1 (chiller)     |                                      |         |                  |                 |            |      |   |
| PC01               | Set Point Superheat Chiller          | 6       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | UT   | SP Over-heating SET1  |
| PC02               | Set Point Low Superheat Chiller      | 2       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | IS   |   |
| PC03               | SP Superheat Chiller High alarm      | 30      | 0.5 (1.0)        | 50.0<br>(90.0)  | K<br>(°R)  | IS   |   |
| PC04               | LOP Chiller Temperature              | -30     | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| PC05               | MOP Chiller Temperature              | 30      | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| PC06               | Valve opening duration from start-up | 5       | 1                | 30              | s          | IS   |   |
| PC07               | Valve opening % from start-up        | 50      | 10               | 100             | %          | IS   |   |
| SET2 (heat pump)   |                                      |         |                  |                 |            |      |   |
| PP01               | HP Set Point Superheat               | 6       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | UT   | SP Over-heating SET2  |
| PP02               | Set Point Superheat HP               | 2       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | IS   |   |
| PP03               | SP Superheat HP High alarm           | 30      | 0.5 (1.0)        | 50.0<br>(90.0)  | K<br>(°R)  | IS   |   |
| PP04               | LOP HP temperature                   | -30     | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| PP05               | MOP HP temperature                   | 30      | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| PP06               | Valve opening duration from start-up | 5       | 1                | 30              | s          | IS   |   |
| PP07               | Valve opening % from start-up        | 50      | 10               | 100             | %          | IS   |   |
| SET3 (defrost)     |                                      |         |                  |                 |            |      |   |
| Pd01               | Set Point Superheat Def              | 6       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | UT   | SP Over-heating SET3  |
| Pd02               | Set Point Low Superheat Def          | 2       | 0.5 (1.0)        | 30.0<br>(50.0)  | K<br>(°R)  | IS   |   |
| Pd03               | SP Superheat Def High alarm          | 30      | 0.5 (1.0)        | 50.0<br>(90.0)  | K<br>(°R)  | IS   |   |
| Pd04               | LOP temperature Def                  | -30     | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| Pd05               | MOP temperature Def                  | 30      | -40.0<br>(-40.0) | 40.0<br>(100.0) | °C<br>(°F) | IS   |   |
| Pd06               | Valve opening duration from start-up | 5       | 1                | 30              | s          | IS   |   |
| Pd07               | Valve opening % from start-up        | 50      | 10               | 100             | %          | IS   |   |
| PROTECTIONS ALARMS |                                      |         |                  |                 |            |      | Note: Parameters common to the various parameters                 |

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|                                  |   |     |              |              |           |    | SET  |
|----------------------------------|---|-----|--------------|--------------|-----------|----|--|
| PA01                             | Enable Intrabus communication alarm             | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = standard enabled  |
| PA02                             | Intrabus communication alarm delay T.           | 30  | 5            | 200          | s         | IS |  |
| PA10                             | Enable Low Superheat Alarm                      | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = enabled   |
| PA11                             | Low Superheat alarm hysteresis                  | 3   | 0.5 (1.0)    | 30.0 (50.0)  | K (°R)    | IS |  |
| PA12                             | Low Superheat alarm delay T.                    | 3   | 0            | 250          | min       | IS |  |
| PA20                             | Enable High Superheat Alarm                     | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = enabled   |
| PA21                             | High Superheat alarm hysteresis                 | 3   | 0.5 (1.0)    | 30.0 (50.0)  | K (°R)    | IS |  |
| PA22                             | High Superheat alarm delay T.                   | 3   | 0            | 250          | min       | IS |  |
| PA30                             | Enable Low Pressure Alarm                       | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = enabled   |
| PA31                             | SP Low Pressure alarm                           | 0   | -0.8 (-10.0) | 50.0 (700.0) | Bar (psi) | IS |  |
| PA32                             | Low Pressure alarm hysteresis                   | 0,3 | 0.1 (0.1)    | 1.0 (15.0)   | Bar (psi) | IS |  |
| PA33                             | Low Pressure alarm delay T.                     | 3   | 0            | 250          | min       | IS |  |
| PA40                             | Enable LOP Protection Alarm                     | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = enabled   |
| PA41                             | LOP alarm hysteresis                            | 3   | 0.1 (0.1)    | 15.0 (30.0)  | °C (°F)   | IS |  |
| PA42                             | LOP alarm delay T.                              | 3   | 0            | 250          | min       | IS |  |
| PA50                             | Enable MOP Protection Alarm                     | 0   | 0            | 1            | -         | IS | 0 =disabled<br>1 = enabled   |
| PA51                             | MOP alarm hysteresis                            | 3   | 0.1 (0.1)    | 15.0 (30.0)  | °C (°F)   | IS |  |
| PA52                             | MOP alarm delay T.                              | 3   | 0            | 250          | min       | IS |  |
| <b>DISPLAY</b>                   |   |     |              |              |           |    |  |
| PdIS                             | Value to show on the display                    | 0   | 0            | 6            | -         | IS | 0 = Over-heating value (K or R)<br>1 = Evap. pressure measured (bar/psi)<br>2 = % valve opening<br>3 = Intake temp. measured (°C/°F)<br>4 = Saturate gas (°C/°F) calculated (from P)<br>5 =SP overheating value<br>6 =SEtP selected parameters |
| <b>VALVE AND DRIVER ENABLING</b> |   |     |              |              |           |    |  |
| Pr02                             | Enables manual functioning of the valve         | 0   | 0            | 2            | -         | IS | 0 = No<br>1 = Yes, manual<br>2 = Debug   |
| Pr03                             | If in Manual func. mode, set the valve output % | 0   | 0            | 100          | %         | IS |  |
| Pr04                             | Enables valve forcing with probe error          | 0   | 0            | 1            | -         | IS | 0 = No<br>1 = Yes  |
| Pr05                             | % valve in case of probe error                  | 0   | 0            | 100          | %         | IS |  |
| Pr06                             | Enabling mode for valve                         | 0   | 0            | 3            | -         | IS | 0 = From digital input DI1   |

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|      |   |     |      |      |     |    |  |
|------|---|-----|------|------|-----|----|--|
|      | regulation  |     |      |      |     |    | 1 = From digital input DIHV<br>2 = From serial IntraBus<br>3 = From serial RS-485 (Modbus; via an external serial interface) |
| Prd0 | Step rate   | 10  | 1    | 200  | -   | IS | Step rate (ms) = Prd0 * 100  |
| Prd1 | % minimum opening   | 0   | 0    | Prd2 | %   | IS |  |
| Prd2 | % maximum opening   | 100 | Prd1 | 100  | %   | IS |  |
|      | <b>BACKUP</b>   |     |      |      |     |    |  |
| Pb01 | Back-up battery   | 0   | 0    | 1    | -   | IS | 0 = absent<br>1 = present  |
|      | <b>VARIOUS</b>  |     |      |      |     |    |  |
| PH01 | Enable alarm relay  | 0   | 0    | 2    | -   | IS | 0 = disabled<br>1 = enabled from any alarm<br>2 = enabled only for probes error  |
| PH02 | Relay logic alarm   | 0   | 0    | 1    | -   | IS | 0 = normally unexcited<br>1 = normally excited   |
| PH10 | Sets the D11 digital input logic                                  | 0   | 0    | 1    | -   | IS | 0: Normally open NO<br>1: Normally closed NC   |
| PH11 | Sets the D12 digital input logic                                  | 1   | 0    | 1    | -   | IS | 0: Normally open NO<br>1: Normally closed NC   |
| PH12 | Sets the DIHV digital input logic                                 | 0   | 0    | 1    | -   | IS | 0: Normally open NO<br>1: Normally closed NC   |
| PH20 | Sets the pressure unit of measurement:                            | 0   | 0    | 1    | -   | IS | 0: Bar<br>1: psi   |
| PH21 | Sets the temperature unit of measurement:                         | 0   | 0    | 1    | -   | IS | 0: °C<br>1: °F<br>Note K-R for over-heating  |
| PH22 | Sets the display of the Evco icon                                 | 1   | 0    | 1    | -   | IS | 0: NO<br>1: YES  |
| PH30 | Disables set-point modification from keyboard using SET/ENTER key | 0   | 0    | 1    | -   | IS | 0: block function disabled<br>1: block function enabled  |
| PSPI | Sets clock frequency of the SPI serial                            | 2   | 0    | 3    | Khz | IS | 0 = 3.9 Khz<br>1 = 8.9 Khz<br>2 = 15.6 Khz<br>3 = 17.8 Khz   |
|      | <b>SERIAL NETWORK (MODBUS)</b>                                    |     |      |      |     |    |  |
| Mod5 | Board Modbus Address  | 1   | 1    | 247  | n   | IS |  |
| Mod6 | Board communication Baud Rate                                     | 2   | 0    | 3    | n   | IS | 0 = 2400<br>1 = 4800<br>2 = 9600<br>3 = 19200  |
| Mod7 | ModBus Parity   | 2   | 0    | 2    | n   | IS | 0 = none<br>1 = Odd<br>2 = Even  |
| Mod8 | StopBit ModBus  | 0   | 0    | 1    | n   | IS | 0 = 1bit<br>1 = 2bit   |
|      | <b>PASSWORD</b>   |     |      |      |     |    |  |
| PASS | Installer level password  | -19 | -99  | 999  | n   | IS |  |

The following parameters are those managed by the VCM module  
After modification of the PI00, PI07 and/or PI08 parameter, the VCM module forces a reset.

| Code | Parameter description | Default | Min | Max | U.M. |  | Notes                |
|------|-----------------------|---------|-----|-----|------|--|----------------------|
| PI00 | Type of refrigerant   | 1       | 0   | 7   | -    |  | 0 = R22<br>1 = R134A |

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|      |   |   |   |   |   |  |   |
|------|---|---|---|---|---|--|---|
|      |   |   |   |   |   |  | 2 = R507<br>3 = R404A<br>4 = R407C<br>5 = R410A<br>6 = R124<br>7 = R744   |
| PI03 | Superheat control mode                          | 0 | 0 | 2 | - |  | 0 = Standard<br>1 = Slow<br>2 = Reserved  |
| PI07 | Type of valve                                   | 2 | 1 | 7 | - |  | 1 = EX4 Alco<br>2 = EX5 Alco<br>3 = EX6 Alco<br>4 = EX7 Alco<br>5 = EX8 Alco<br>6 = EX9 Alco<br>7 = EXM-246 or EXL-246  |
| PI08 | Type of pressure transducer (evaporation probe) | 0 | 0 | 3 | - |  | 0 = EVPT530K00 (4-20 mA, 0 ... 7 bar relative)<br>1 = PT4-18S (4-20 mA Alco, 0 ... 18 bar relative)<br>2 = EVPT530K01 (4-20 mA, 0 ... 30 bar relative)<br>3 = PT4-50S (4-20 mA Alco, 0 ... 50 bar relative) |
| PI09 | Reserved  |   |   |   |   |  |   |
| PI10 | Reserved  |   |   |   |   |  |   |
| PI11 | Reserved  |   |   |   |   |  |   |

The following parameters are however available in reading mode only, at user level.

| Code | Parameter description               |  | Min | Max | U.M.      |  | Notes  |
|------|-------------------------------------|--|-----|-----|-----------|--|--|
| rI00 | Evaporation pressure                |  |     |     | bar (psi) |  | From evaporation probe   |
| rI01 | Evaporation temperature             |  | -50 | 50  | °C        |  | From evaporation pressure (internal table)                             |
| rI02 | Intake temperature                  |  | -50 | 50  | °C        |  | From intake probe  |
| rI03 | Superheat Value                     |  | -50 | 50  | K         |  |  |
| rI04 | Valve opening percentage value      |  | 0   | 100 | %         |  |  |
| rI05 | Pressure probe error                |  | 0   | 2   | -         |  | 0 = correct functioning<br>1 = sensor short circuit<br>2 = sensor open |
| rI06 | Temperature probe error             |  | 0   | 2   | -         |  | 0 = correct functioning<br>1 = sensor short circuit<br>2 = sensor open |
| rI07 | Step-by-step motor error            |  | 0   | 1   | -         |  | 0 = correct functioning<br>1 = in error mode                           |
| rI08 | Unit alarms from VCM <sup>(1)</sup> |  | 0   | 7   | -         |  | Alarm bit state  |
| rI12 | Digital inputs state <sup>(2)</sup> |  | 0   | 2   | -         |  |  |
| rI15 | VCM module revisions                |  |     |     |           |  |  |

**Notes:**

(1) rI08:

| BIT    | 7 | 6 | 5 | 4 | 3 | 2           | 1         | 0         |
|--------|---|---|---|---|---|-------------|-----------|-----------|
| EGROUP | X | X | X | X | X | Motor error | SI2 error | SI1 error |

Example: alarm 7 is "Motor error + SI2 error + SI1 error"

(2) rI12:

| BIT   | 7 | 6 | 5 | 4 | 3 | 2 | 1         | 0         |
|-------|---|---|---|---|---|---|-----------|-----------|
| DIGIN | X | X | X | X | X | X | DI2 (VCM) | DI1 (VCM) |

## 6 Functioning

### 6.1 Preliminary considerations

The points that qualify an electronically-piloted thermostatic valve with respect to a mechanical thermostatic valve are the following:

- compatibility with every type of refrigerant (or however with many types of refrigerant)
- very large regulation range
- microprocessor regulation and therefore total flexibility.

The first two points constitute a noteworthy advantage for the producer of machines or plants because they simplify the logistics due to the consequent reduction of the codes and material to be managed and held in the warehouse. The extended regulation range also allows to guarantee excellent over-heating stability also in conditions (condensation pressure, evaporation pressure, over-heating value) distant from those of the project. mechanical thermostatic "works" well around the project nominal conditions: shifting from these conditions, the over-heating value changes and in some conditions becomes unstable. Because variability in the conditions of use is normal for cooling machines (consider an air-cooled chiller), the thermostatic cannot guarantee the constant over-heating value and often, in order to keep over-heating values acceptable also in day-to-day functioning it is forced to increase over-heating in greater functioning conditions at the expense of plant efficiency.

The microprocessor regulation is a formidable potential that opens the doors of any innovation in the strategy of regulation and use.

Some main features (and/or functionalities) of the electronic valves are: brief opening/closure times, high regulation resolution, shut/off functionality, continuous flow modulation, "correct" stress in the cooling circuit.

### 6.2 Enabling mode for valve regulation

If the valve is closed (disabled and regulation deactivated), the display will show OFF and the on/stand-by icon is on.

The valve can be opened (enabled and regulation activated) in one of the two following ways (selectable from parameter Pr06):

- from digital input (stand-alone functioning enabled from parameter Pr06=0 or 1): in this case, it can be enabled from optoisolated digital input (DIHV, Pr06=1) or from non-optoisolated digital input (DI1, Pr06=0). A typical application is the use of an optoisolated digital input (230VAC) connected in parallel to compressor (therefore the valve regulates when the compressor is on, otherwise it is off).
- from IntraBus serial (function enabled by parameter Pr06=2): in this case, it can be enabled via the IntraBus serial. A typical application is a chiller/heat pump that uses *c-pro* range controllers. This serial works with settings relative to fixed communication and allows the use of two valves at a maximum
- from ModBus serial (function enabled by parameter Pr06=3).

Whatever the enabling mode may be, there is a start-up procedure that keeps the valve open at a certain percentage (from parameter Px07, where x = C, P or d) for a certain period of time that can be set (from parameter Px06); the on/stand-by icon highlights the state. The display normally shows the quantity selected by the PdIS parameter + the icon that indicates the unit of measurement of the quantity displayed.

### 6.3 Manual functioning mode

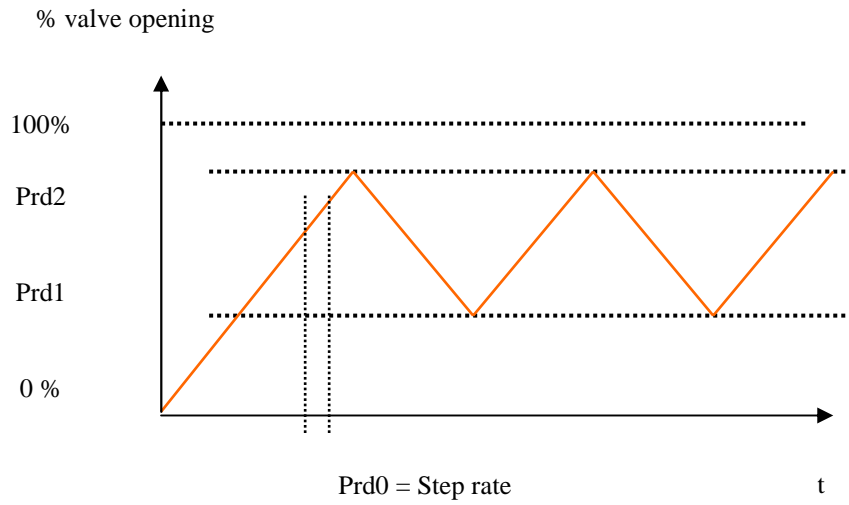
The program allows to set manual functioning for the valve. In this way, the over-heating algorithm is by-passed.

Manual functioning of the devices is useful when functional tests must be performed on the machine in order test the integrity and correct functioning. Therefore, using the local keyboard, it is possible to enable the manual function and set the valve output %; the same could be performed from the serial.

**For reasons of safety and to prevent possible damage, the valve must be On (enabled) in order to operate in manual mode.**

The maintenance icon switches on during manual functioning. Forcing is performed via relevant parameters Pr02, Pr03. In particular, with Pr02=0 the manual functioning is disabled. With Pr02=1 the manual functioning is enabled and Pr03 represents the % value that the valve output must assume. With Pr02=2 a particular manual command is enabled for inspections where the valve output assumes a trend as represented in the figure; for every Prd0\*100ms the valve output % is increased or decreased between a value minimum Prd1 and a maximum value Prd2.





It is possible to operate in manual mode during normal valve functioning; this allows to test the behaviour of the chiller where the valve has been inserted. Errors continue to be detected during this functioning. After a power cut, the valve starts to function in manual mode.

During manual functioning, by pressing the ESC key for about 2 seconds, the % value that the valve output must assume is displayed and set quickly.

## 6.4 Valve state

The valve can be in one of the following states (visible also from relevant icons).

| State    | Description                      | Icon                | Display     |
|----------|----------------------------------|---------------------|-------------|
| OFF      | Valve closed (mechanical stop)   | On/stand by         | OFF         |
| ON_START | Valve in start mode              | On/stand-by valve + | (PdIS)      |
| ON       | Valve is keeping the             | valve position      | (PdIS)      |
| ON       | Valve opening                    | valve position      | (PdIS)      |
| ON       | Valve closing                    | valve position      | (PdIS)      |
| ON-MAN   | Valve in manual mode             | maintenance         | (PdIS)      |
| OFF_ALL  | Valve closure following an alarm | alarm               | OFF (Blink) |
| ON_ALL   | Valve forced following an alarm  | alarm               | (PdIS)      |

The quantity established with the PdIS parameter is shown on the display.

## 6.5 Functioning mode (selection from the parameters set)

Three parameters set are envisioned to satisfy the regulation requirements of the more complex machines. Each parameters set includes the start-up parameters (time and opening value), the SH set-point, SH high/low alarm set, the LOP set and the MOP set.

The parameters set (or functioning mode) will be selected using the SEtP parameter. As an example, the three sets could represent the parameters for functioning as chiller or as heat pump or as defrost.

## 7 Diagnostics

The application can manage a series of alarms relative to the valve. On the basis of the various types of alarms, it is possible to configure any signalling delay.

The icon flashes when one or more alarms are active.

In order to display the various alarms, press the UP key from the main page for about 2 seconds; the first alarm present is displayed; using the UP or DOWN keys, scroll all of the alarms present. If there are no alarms, pressing the UP key for two seconds has no effect.

When the causes of the alarm have disappeared, the instrument will go back to normal functioning.

All of the digital inputs relative to the alarms (e.g.: battery charger input) are managed by an Alarms Logic parameter that has the following meaning:

- if set at NO, the inputs will be normally unexcited (open).
- if set at NC, the inputs will be normally excited (closed).

### 7.1 Probe alarms

In the case of a probe alarm, the VCM module closes the valve. The two parameters Pr04, Pr05 can be used to enable forcing of the valve (manual functioning) to a pre-defined value in order to allow temporary functioning.

### 7.2 Alarm relay

The program has the possibility of managing an alarm relay (parameter PH01). Via the relative parameter PH02 it is possible to establish the polarity (NO or NC) of the alarm output. With PH01=0 the relay is disabled; with PH01=1 the relay is enabled for all alarms envisioned (excluding the signalling only ones); with PH01=2 the relay is enabled only for the probe errors detected by the VCM module.

### 7.3 Alarms table

Below is a list of all alarms managed by the application. The order of presentation is the same as the order with which the alarms are presented when active.

| Code | Alarm description   | Consequence                  | Notes                  |
|------|---|------------------------------|------------------------|
| ESPI | Communication error with VCM controller   |                              | Fixed delay            |
| ECom | Intrabus communication error with main controller                               | The valve closes completely. | PA01, PA02             |
| EPr1 | Pressure transducer faulty or disconnected                                      | The valve closes completely  |                        |
| EPr2 | Temperature probe faulty or disconnected  | The valve closes completely  |                        |
| ALSm | Valve step-by-step motor error  |                              |                        |
| ALHS | High over-heating   | The SH LED flashes           | PA20, PA21, PA22       |
| ALLS | Low over-heating  | The SH LED flashes           | PA10, PA11, PA12       |
| ALLP | Low pressure  | The LP LED switches on       | PA30, PA31, PA32, PA33 |
| LOP  | LOP   | The LP LED flashes           | PA40, PA41, PA42       |
| MOP  | MOP   |                              | PA50, PA51, PA52       |
| PFIr | Problems with the electric mains (displayed only if back-up battery is present) |                              |                        |

## 8 Accessories

### 8.1 EVC99P00X7XXX0 battery charge module

If the back/up battery is present (Pb01 = 1) the valve can be closed following a mains voltage cut-off. A 12 VDC re/chargeable battery is used for this purpose along with the EVC99P00X7XXX0 module battery charger. The state of the battery charge can be monitored via digital input DI2 (the closed input indicates that the battery is charged; the open input indicates that the battery is charging or the input is not connected).

An icon on the display indicates the battery state.

There are two LEDs on the battery charger module: a green LED that indicates the presence of the power supply and a red LED that indicates that the battery is charging.

Power supply: 230 VAC.

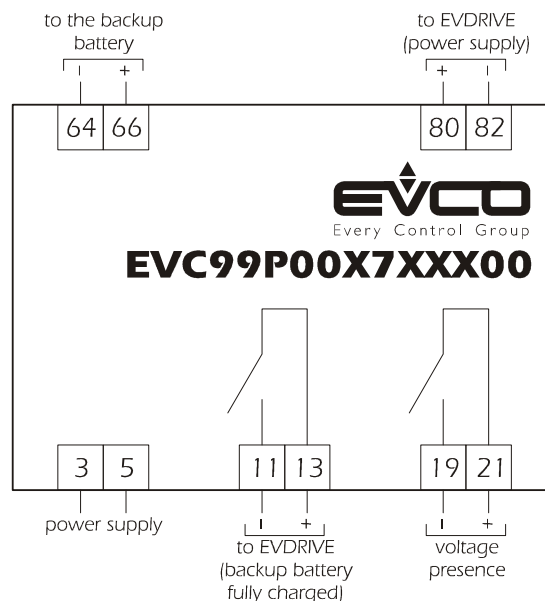
12 VDC, 7.5 Ah lead battery.

Contacts: BE optoisolator transistor.



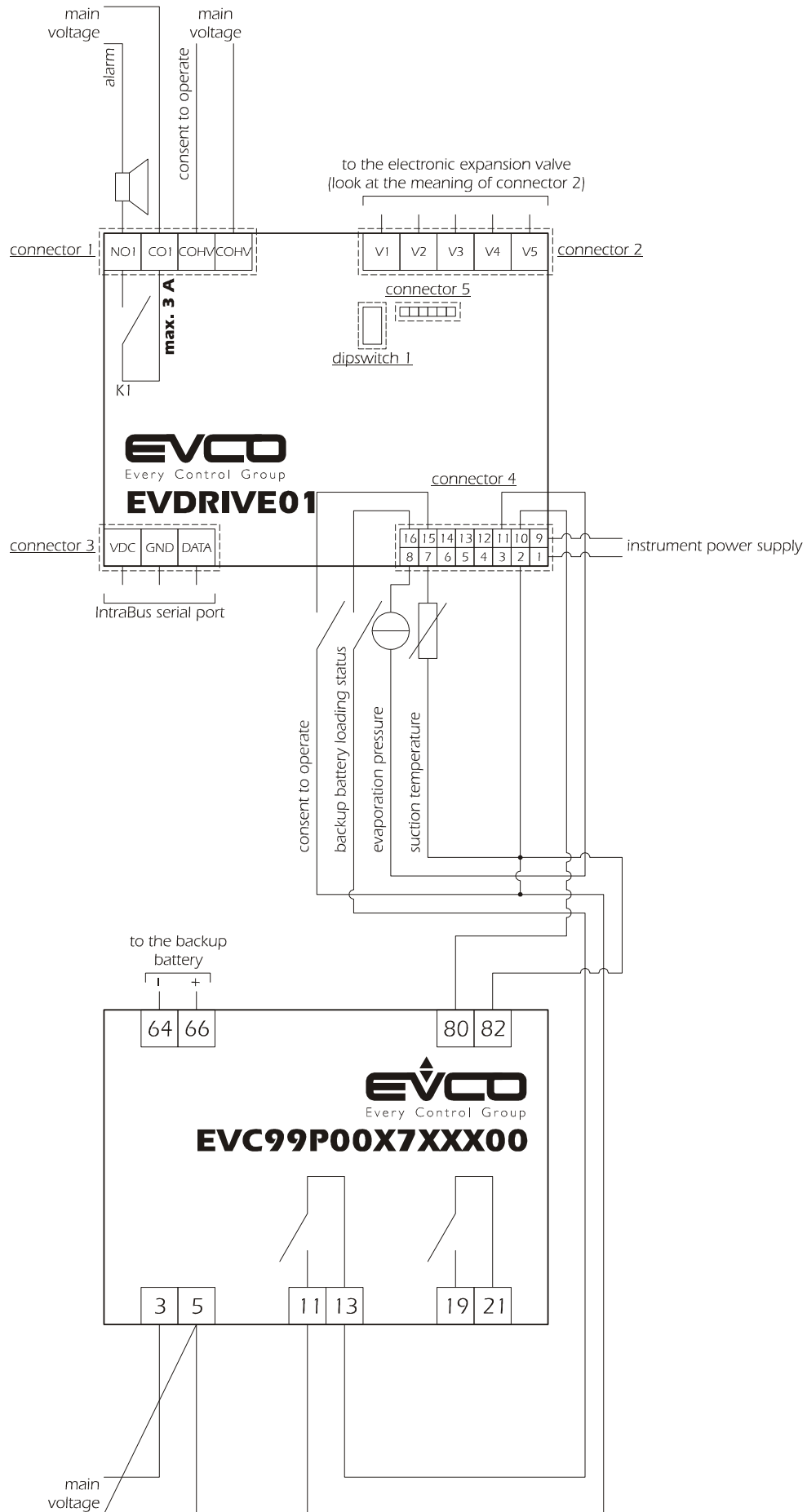
#### 8.1.1 EVC99P00X7XXX0 electric connection

The layout of the EVC99P00X7XXX0 connection is represented below.



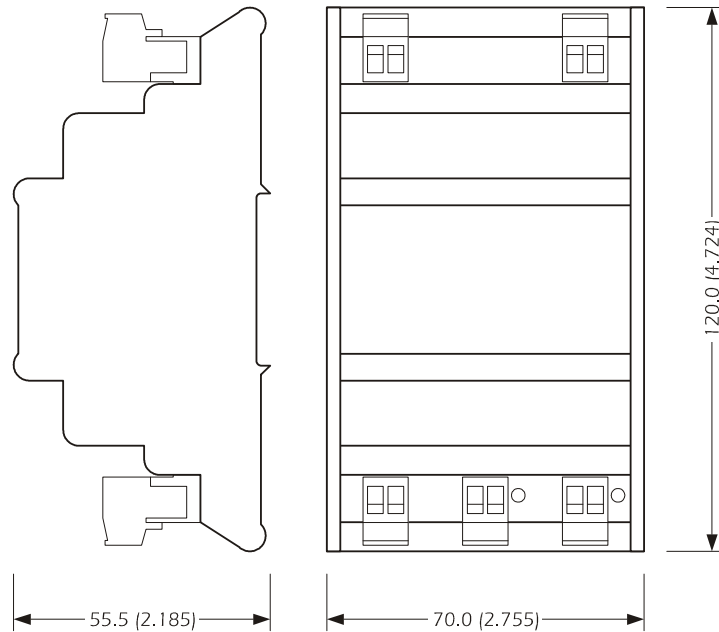
The layout of the EVC99P00X7XXX0 connection to EVDRIVE01 is represented below.

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### 8.1.2 EVC99P00X7XXX00 dimensions

The mechanical dimensions of EVC99P00X7XXX00 are given below; the measurements are expressed in mm (in).



#### Installation recommendations:

- make sure that the work conditions (temperature of use, humidity, etc.) lie within the limits indicated in the technical data
- do not install the instrument in proximity of heat sources (resistances, hot air pipes etc.) appliances with strong magnets (large diffusers etc.), places subject to direct sunlight, rain, humidity, excessive dust, mechanical vibrations or shocks
- in compliance with Safety Standards, the protection against any contact with the electric parts must be ensured via correct installation of the instrument. All parts that ensure protection must be fixed in a way such that they cannot be removed without the aid of a tool

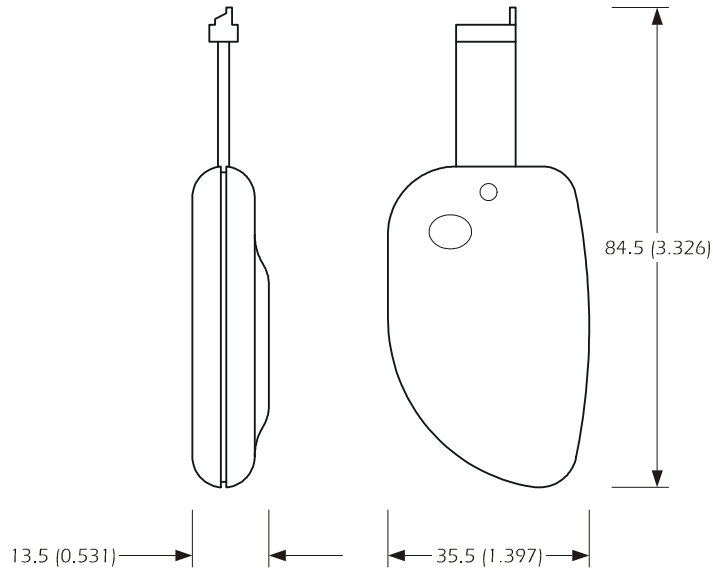
### 8.2 EVKEY programming key

The EVKEY programming key allows to download and upload configuration parameters (also with the controller unpowered. In this case the EVPS power supply unit must be used). EVKEY must be connected to the 6-way AMP micro-maTch (with reference to the wiring diagram given in paragraph 3.2, connector 5).



### 8.2.1 EVKEY dimensions

The mechanical dimensions of EVKEY are given below; the measurements are expressed in mm (in).



## 8.3 TTL / RS-485 serial interface

The TTL / RS-485 serial interfaces allow the conversion of signals from TTL to RS-485, for supervision with ModBus protocol.

These modules must be connected to the 6-way AMP micro-maTch (with reference to the wiring diagram given in paragraph 3.2, connector 5).

The insulated version (EVIF21TS7I) and non (EVIF20TSX) are available.

### 8.3.1 Non- isolated EVIF20TSX, TTL / RS-485 serial interface

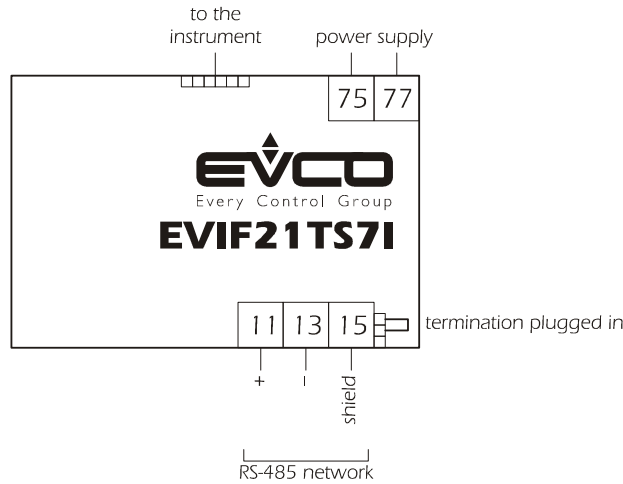


### 8.3.2 TTL / RS-485 serial interface isolated EVIF21TS7I



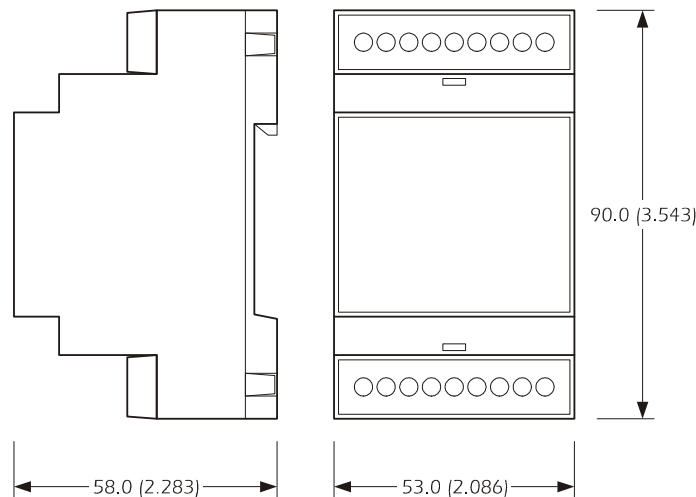
### 8.3.2.1 EVIF21TS7I electric connection

The layout of the EVIF21TS7I connection is represented below.



### 8.3.2.2 EVIF21TS7I dimensions

The mechanical dimensions of EVIF21TS7I are given below; the measurements are expressed in mm (in).



#### Installation recommendations:

- make sure that the work conditions (temperature of use, humidity, etc.) lie within the limits indicated in the technical data
- do not install the instrument in proximity of heat sources (resistances, hot air pipes etc.) appliances with strong magnets (large diffusers etc.), places subject to direct sunlight, rain, humidity, excessive dust, mechanical vibrations or shocks
- in compliance with Safety Standards, the protection against any contact with the electric parts must be ensured via correct installation of the instrument. All parts that ensure protection must be fixed in a way such that they cannot be removed without the aid of a tool



## **9 Communication with INTRABUS serial**

Even if the device is set-up to communicate with another device (a serial network with INTRABUS communication protocol), EVDRIVE01 is a stand-alone driver (i.e. can function alone, independently from the presence of other devices with which it could interact).

## 10 List of the ModBus variables

### 10.1 Introduction

This document describes the resources of the device that can be accessed via the serial port. The protocol is MODBUS RTU/JBUS.

### 10.2 List of devices

This document applies to :

| Device Name/Family | Notes |
|--------------------|-------|
| EVDRIIVE           |       |

### 10.3 Addressing conventions

Please note that according to MODBUS specs:

- the first register is called register 1
- register x must be read ad address x-1

According to JBUS:

- the first register is called register 0
- register x must be read ad address x

The JBUS convention has been used in this document, addresses are shown in hexadecimal with the leading symbol \$.

### 10.4 Implemented ModBus function codes

| Command                | Function Code | Notes                        |
|------------------------|---------------|------------------------------|
| READ HOLDING REGISTERS | \$03          | Maximum 95 registers at once |
| WRITE SINGLE REGISTER  | \$06          |                              |
| WRITE MULTIPLE HR      | \$10          | Maximum 95 registers at once |

## 10.5 Data exchange examples

### **Example 1:**

Reading Holding Register at address \$0601 (the SETP parameter, function modality). Note that according to MODBUS that is register 1538, while according to JBUS that is register 1537.

|    | Slave Address | Function Code | High Starting Address | Low Starting Address | High Quantity of Register | Low Quantity of Register | Low CRC | High CRC |
|----|---------------|---------------|-----------------------|----------------------|---------------------------|--------------------------|---------|----------|
| TX | \$F7          | \$03          | \$06                  | \$01                 | \$00                      | \$01                     | \$C1    | \$D4     |

|    | Slave Address | Function Code | Byte Count | High Register value | Low Register value | Low CRC | High CRC |  |
|----|---------------|---------------|------------|---------------------|--------------------|---------|----------|--|
| RX | \$F7          | \$03          | \$02       | \$00                | \$01               | \$B1    | \$91     |  |

the value is 1.

### **Example 2:**

Reading Holding Register at address \$FF08, representing the FW.ID field (FirmWare IDENTifier).

|    | Slave Address | Function Code | High Starting Address | Low Starting Address | High Quantity of Register | Low Quantity of Register | Low CRC | High CRC |
|----|---------------|---------------|-----------------------|----------------------|---------------------------|--------------------------|---------|----------|
| TX | \$F7          | \$03          | \$FF                  | \$08                 | \$00                      | \$01                     | \$21    | \$4A     |

|    | Slave Address | Function Code | Byte Count | High Register value | Low Register value | Low CRC | High CRC |  |
|----|---------------|---------------|------------|---------------------|--------------------|---------|----------|--|
| RX | \$F7          | \$03          | \$02       | \$01                | \$8D               | \$B1    | \$A4     |  |

The value is \$018D = 397

### **Example 3:**

Writing two Holding Registers starting at address \$0607 (parameters PC06 and PC07) with values 10 and 100.

|        | Slave Address | Function Code | High Starting Address | Low Starting Address | High Num HR | Low Num HR | Byte cnt | Data1 High | Data1 Low | Data2 High | Data2 Low | CRC High | CRC High |
|--------|---------------|---------------|-----------------------|----------------------|-------------|------------|----------|------------|-----------|------------|-----------|----------|----------|
| T<br>x | \$F7          | \$10          | \$06                  | \$07                 | \$00        | \$02       | \$04     | \$00       | \$0A      | \$00       | \$64      | \$A5     | \$8B     |

|        | Slave Address | Function Code | High Starting Address | Low Starting Address | High Num HR | Low Num HR | CRC High | CRC High |
|--------|---------------|---------------|-----------------------|----------------------|-------------|------------|----------|----------|
| R<br>x | \$F7          | \$10          | \$06                  | \$07                 | \$00        | \$02       | \$E4     | \$17     |

## 10.6 Holding register addresses table

| Description  | Index  | Access | Notes  |
|--|--------|--------|--|
| <b>PROBES</b>  |        |        |  |
| Suction pressure in mA                                 | \$0201 | R      | 2 decimal digits   |
| Coil out temperature                                   | \$0202 | R      | 1 decimal digit (*)  |
| Saturation temperature from suction pressure           | \$0203 | R      | 1 decimal digit (*)  |
| Suction pressure in Bar/psi                            | \$0204 | R      | 1 decimal digit (**)   |
| <b>DIGITAL OUTPUTS</b>                                 |        |        |  |
| Relay status   | \$0181 | R      | Bit0 = Alarm relay status  |
| <b>APPLICATION COMMANDS</b>                            |        |        |  |
| Load parameters in EV-KEY                              | \$0470 | W      | 1= store data in EV-KEY  |
| Enabling the valve at a distance                       | \$0500 | R/W    | 1= valve enabled<br>(only if Pr06 = 3)   |
| <b>CONTIGUOUS INFORMATIONS ABOUT INSTRUMENT STATUS</b> |        |        |  |
| Digital inputs/output                                  | \$0550 | R      | Bit0 = di 1<br>Bit1 = battery status<br>Bit2 = diHV<br>Bit3 = reserved<br>Bit4 = reserved<br>Bit8 = Alarm relay status |
| Suction pressure in mA                                 | \$0551 | R      | 2 decimal digits   |
| Coil out temperature                                   | \$0552 | R      | 1 decimal digit (*)  |
| Saturation temperature from suction pressure           | \$0553 | R      | 1 decimal digit (*)  |
| Suction pressure in Bar/psi                            | \$0554 | R      | 1 decimal digit (**)   |
| Superheat value [K]                                    | \$0555 | R      | 1 decimal digit  |
| Valve opening in %                                     | \$0556 | R      | 1 decimal digit  |
| Alarms   | \$0557 | R      | ( <sup>1</sup> )   |
| Flag status 1  | \$0558 | R      | ( <sup>2</sup> )   |
| Flag status 2 (MSB)<br>Valve status (LSB)              | \$0559 | R      | ( <sup>3</sup> )   |
| Mode configuration (SEtP parameter)                    | \$055A | R      |  |
| Superheat set point                                    | \$055B | R      |  |
| <b>VALVE STATUS</b>                                    |        |        |  |
| Valve status   | \$0502 |        | 0: off<br>1: starting<br>2: running<br>3: close (<5%)<br>4: open (>95%)  |

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|  | LOP temperature set point                   | \$0510 |  |  |
|--|---|--------|--|--|
|  | MOP temperature set point                   | \$0511 |  |  |
|  | Set point super heat                        | \$0512 |  |  |
|  | Length of valve initialization              | \$0513 |  |  |
|  | Percent opening during valve initialization | \$0514 |  |  |
|  | Set point low superheat alarm               | \$0515 |  |  |
|  | Set point high superheat alarm              | \$0516 |  |  |

- (\*) the measure unit depend on parameter PH21 (0:°C, 1:°F)
- (\*\*) the measure unit depend on parameter PH20 (0:Bar, 1:psi)

| Description          | Index  | Access | Notes         |
|----------------------|--------|--------|---------------|
| <b>PARAMETERS</b>    |        |        |               |
| Number of parameters | \$0600 | R      | 81 parameters |
| SEtP                 | \$0601 | R/W    |               |
| PC01                 | \$0602 | R/W    |               |
| PC02                 | \$0603 | R/W    |               |
| PC03                 | \$0604 | R/W    |               |
| PC04                 | \$0605 | R/W    |               |
| PC05                 | \$0606 | R/W    |               |
| PC06                 | \$0607 | R/W    |               |
| PC07                 | \$0608 | R/W    |               |
| PP01                 | \$0609 | R/W    |               |
| PP02                 | \$060A | R/W    |               |
| PP03                 | \$060B | R/W    |               |
| PP04                 | \$060C | R/W    |               |
| PP05                 | \$060D | R/W    |               |
| PP06                 | \$060E | R/W    |               |
| PP07                 | \$060F | R/W    |               |
| Pd01                 | \$0610 | R/W    |               |
| Pd02                 | \$0611 | R/W    |               |
| Pd03                 | \$0612 | R/W    |               |

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|      |        |     |  |
|------|--------|-----|--|
| Pd04 | \$0613 | R/W |  |
| Pd05 | \$0614 | R/W |  |
| Pd06 | \$0615 | R/W |  |
| Pd07 | \$0616 | R/W |  |
| PA01 | \$0617 | R/W |  |
| PA02 | \$0618 | R/W |  |
| PA10 | \$0619 | R/W |  |
| PA11 | \$061A | R/W |  |
| PA12 | \$061B | R/W |  |
| PA20 | \$061C | R/W |  |
| PA21 | \$061D | R/W |  |
| PA22 | \$061E | R/W |  |
| PA30 | \$061F | R/W |  |
| PA31 | \$0620 | R/W |  |
| PA32 | \$0621 | R/W |  |
| PA33 | \$0622 | R/W |  |
| PA40 | \$0623 | R/W |  |
| PA41 | \$0624 | R/W |  |
| PA42 | \$0625 | R/W |  |
| PA50 | \$0626 | R/W |  |
| PA51 | \$0627 | R/W |  |
| PA52 | \$0628 | R/W |  |
| PdIS | \$0629 | R/W |  |
| Pr02 | \$062A | R/W |  |
| Pr03 | \$062B | R/W |  |
| Pr04 | \$062C | R/W |  |
| Pr05 | \$062D | R/W |  |
| Pr06 | \$062E | R/W |  |
| Prd0 | \$062F | R/W |  |
| Prd1 | \$0630 | R/W |  |
| Prd2 | \$0631 | R/W |  |
| Pb01 | \$0632 | R/W |  |

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|          |        |     |                    |
|----------|--------|-----|--------------------|
| PH01     | \$0633 | R/W |                    |
| PH02     | \$0634 | R/W |                    |
| PH10     | \$0635 | R/W |                    |
| PH11     | \$0636 | R/W |                    |
| PH12     | \$0637 | R/W |                    |
| PH20     | \$0638 | R/W |                    |
| PH21     | \$0639 | R/W |                    |
| PH22     | \$063A | R/W |                    |
| PH30     | \$063B | R/W |                    |
| PSPI     | \$063C | R/W |                    |
| Mod1     | \$063D | R/W |                    |
| Mod2     | \$063E | R/W |                    |
| Mod3     | \$063F | R/W |                    |
| Mod4     | \$0640 | R/W |                    |
| Mod5     | \$0641 | R/W |                    |
| Mod6     | \$0642 | R/W |                    |
| Mod7     | \$0643 | R/W |                    |
| Mod8     | \$0644 | R/W |                    |
| PASS     | \$0645 | R/W |                    |
| PI00     | \$0646 | R/W |                    |
| PI03     | \$0647 | R/W |                    |
| PI07     | \$0648 | R/W |                    |
| PI08     | \$0649 | R/W |                    |
| PI09     | \$064A | R/W |                    |
| PI10     | \$064B | R/W |                    |
| PI11     | \$064C | R/W |                    |
| PI12     | \$064D | R/W |                    |
| PI13     | \$064E | R/W |                    |
| PI14     | \$064F | R/W |                    |
| PI15     | \$0650 | R/W |                    |
| Kbd lock | \$e053 | R   | 1= keyboard locked |

**INFO**

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|   |        |   |  |
|---|--------|---|--|
| Driver Identifier A: same as \$FF08 (397) | \$ff02 | R |  |
| Driver Identifier B: same as \$FF09       | \$ff03 | R |  |
| Firmware ID                               | \$ff08 | R |  |
| Firmware Variation/revision               | \$ff09 | R |  |

(<sup>1</sup>) **Alarms:** at address \$0557 :

| <b>Alarms</b>                | <b>Mask value</b> |                              |
|------------------------------|-------------------|------------------------------|
| Low superheat                | \$0001            |                              |
| High superheat               | \$0002            |                              |
| LOP                          | \$0004            |                              |
| MOP                          | \$0008            |                              |
| SPI communication error      | \$0010            |                              |
| Battery status               | \$0020            | 1: battery empty or charging |
| Low pressure                 | \$0040            |                              |
| Electrical net status        | \$0080            | 1: electrical net is active  |
| Pressure probe failure       | \$0100            |                              |
| Temperature probe failure    | \$0200            |                              |
| Motor failure                | \$0400            |                              |
| Intrabus communication error | \$0800            |                              |
| Storing error in EV-KEY      | \$1000            |                              |
| Cloning failure from EV-KEY  | \$2000            |                              |

(<sup>2</sup>) **Regulator flags (2):** at address \$0558:

| <b>Flag</b>                                    | <b>Mask value</b> |                 |
|--|-------------------|-----------------|
| Manual function activated                      | \$0001            |                 |
| Enabling input status                          | \$0002            |                 |
| Input HV                                       | \$0008            |                 |
| Manual function activated during probe failure | \$0010            |                 |
| Remote valve enabling                          | \$0020            |                 |
| On/Off status                                  | \$0040            | 0: Off<br>1: On |
| VCM module compatibility                       | \$0100            |                 |



(<sup>2</sup>) **Regulator flags (3)**: at address \$0559:

| <b>Flag</b>                     | <b>Mask value</b> |  |
|---------------------------------|-------------------|--|
| Power failure occurred          | \$0001            |  |
| Instrument configuration varied | \$0002            |  |
| No new info to read             | \$0010            |  |
| New info to read                | \$0020            |  |

**PAY ATTENTION:**

ALL THE ADDRESSES NOT MENTIONED EXPRESSLY IN THIS DOCUMENT MUST BE CONSIDERED RESERVED. **ALL THE ADDRESSES INDICATED AS RESERVED MUST NOT BE READ OR WRITTEN;** IF YOU DO NOT RESPECT THIS CONDITION, YOU COULD ALTER THE OPERATION OF THE INSTRUMENT.



## **EVDRIVE01 USER MANUAL**

EVDRIVE01 user manual.

Version 1.08 dated January 2011.

Code 144EVDRIVE0E08.

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## OFFICES

### Evco

Via Mezzaterra 6, 32036 Sedico Belluno ITALIA  
Tel. 0437-852468  
Fax 0437-83648  
info@evco.it  
www.evco.it

## OVERSEES BRANCHES

### Control France

155 Rue Roger Salengro, 92370 Chaville Paris FRANCE  
Tel. 0033-1-41159740  
Fax 0033-1-41159739  
control.france@wanadoo.fr

### Evco Latina

Larrea, 390 San Isidoro, 1609 Buenos Aires ARGENTINA  
Tel. 0054-11-47351031  
Fax 0054-11-47351031  
evcolatina@anykasrl.com.ar

### Evco Pacific

59 Premier Drive Campbellfield, 3061, Victoria Melbourne, AUSTRALIA  
Tel. 0061-3-9357-0788  
Fax 0061-3-9357-7638  
everycontrol@pacific.com.au

### Evco Russia

111141 Russia Moscow 2-oy Proezd Perova Polya 9  
Tel. 007-495-3055884  
Fax 007-495-3055884  
info@evco.ru

### Every Control do Brasil

Rua Marino Félix 256, 02515-030 Casa Verde São Paulo SÃO PAULO BRAZIL  
Tel. 0055-11-38588732  
Fax 0055-11-39659890  
info@everycontrol.com.br

### Every Control Norden

Cementvägen 8, 136 50 Haninge SWEDEN  
Tel. 0046-8-940470  
Fax 0046-8-6053148  
mail2@unilec.se

### Every Control Shangai

B 302, Yin Hai Building, 250 Cao Xi Road, 200235 Shangai CHINA  
Tel. 0086-21-64824650  
Fax 0086-21-64824649  
evcosh@online.sh.cn

### Every Control United Kingdom

Unit 19, Monument Business Park, OX44 7RW Chalgrove, Oxford, UNITED KINGDOM  
Tel. 0044-1865-400514  
Fax 0044-1865-400419  
info@everycontrol.co.uk