



VEGA3

Electronic counter for multi-streams

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VEGA3 is a calculator-indicating device to be used in measuring systems for liquids other than water (MID MI-005) approved by the Notified Body LNE (France) with the Evaluation Certificate n. LNE-29970.

Metrological characteristics

- Multiple stream management: up to 6 measuring systems / loading arms
- Multiple meters management:
 - up to 12 meters in total
 - up to 4 meters per measuring system / loading arm
- Multiple products management:
 - up to 16 products in total
 - up to 4 products per meter
- Measuring system-loading arm configuration:
 - single meter
 - sequential blending
 - ratio blending (up to 4 meters)
 - side stream blending (up to 4 meters)
 - differential (2 meters)
- Security:
 - Weight and Measure Switch seal
 - Up to 8 user accounts
 - Log parameters modification function
 - Continuous self-diagnosis
- Approved for interruptible and non-interruptible measuring systems according to MID European Directive
- Software certification with the following extensions (Welmec Guide 7.2):
 - Extension S (Software separation):
the metrological part of the software is separated from the automation one;
 - Extension L (Long term data storage):
delivery data (100.000 deliveries) are saved and stored in a structure with MID criteria. Data can also be downloaded via serial line or directly consulted on the display thanks to a specific tool.
 - Extension T (Legally relevant data transmission): delivery data can be sent to a printer (ISOIL printer ST500-M) via serial line with legally relevant protocol.



FC-M Flow Computer Main



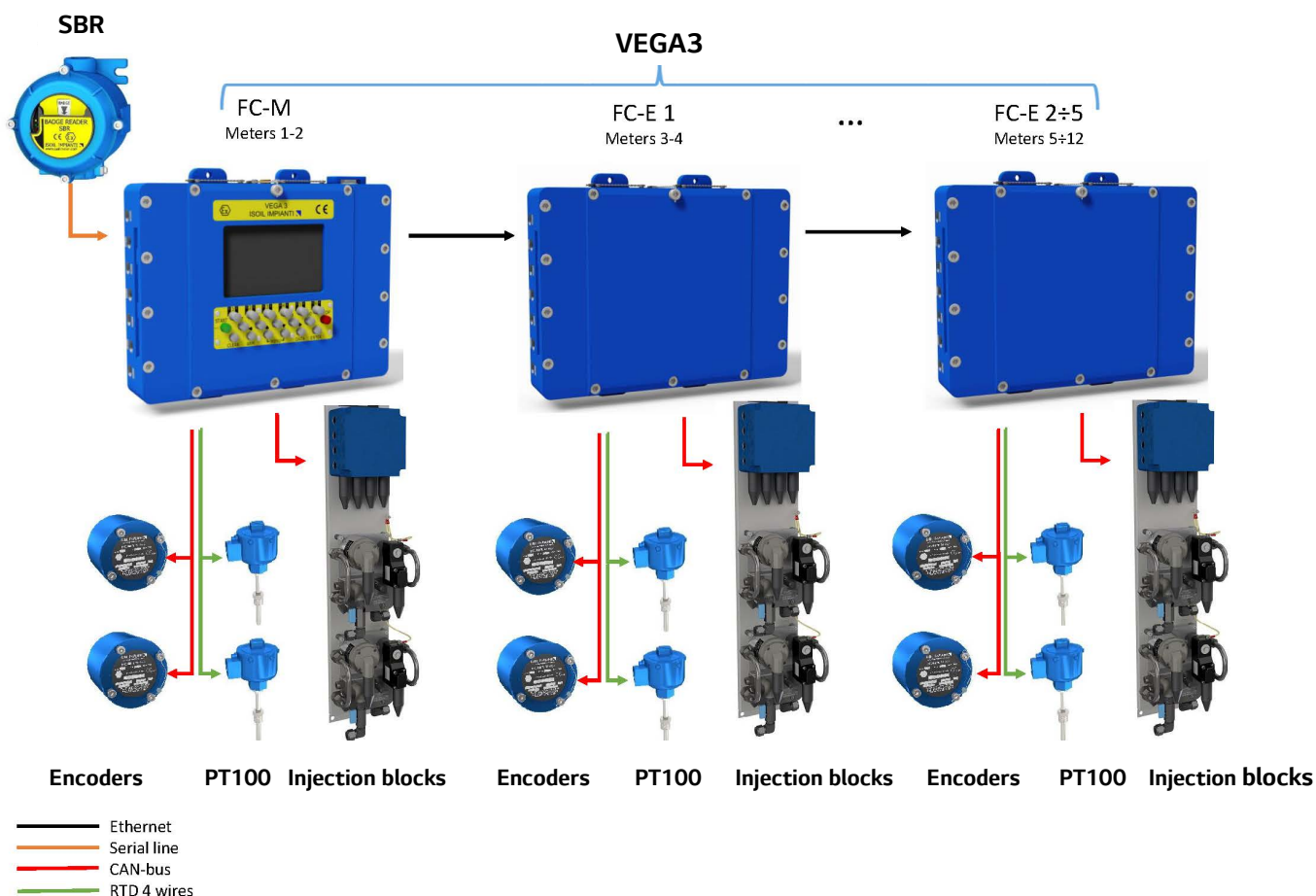
FC-E Flow Computer Extension

Modular architecture

VEGA3 is a flexible, modular and cost-effective system adaptable to different configurations and installation requirements. It is composed of one main module (FC-M) and up to 5 extension modules (FC-E).

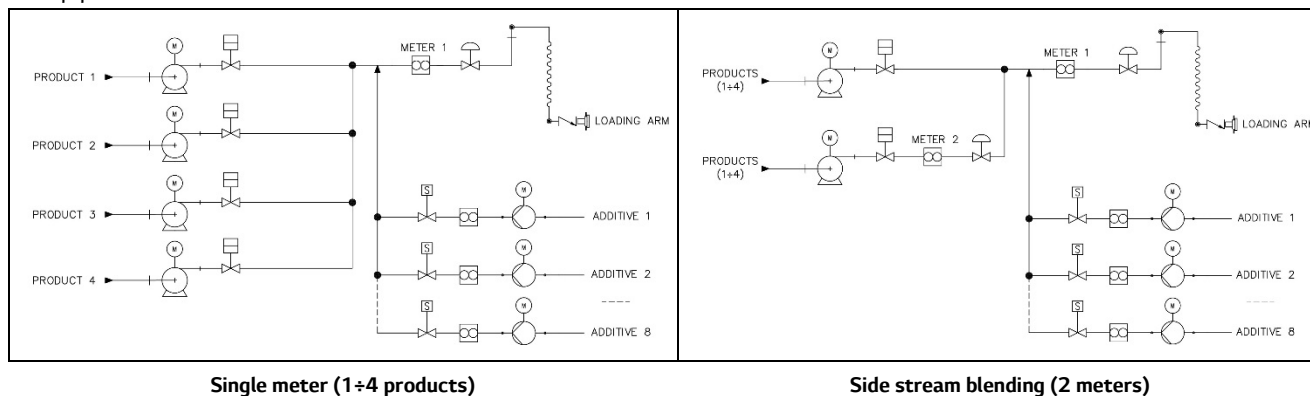
The FC-M is the main module with HMI. It is provided with display and keyboard.

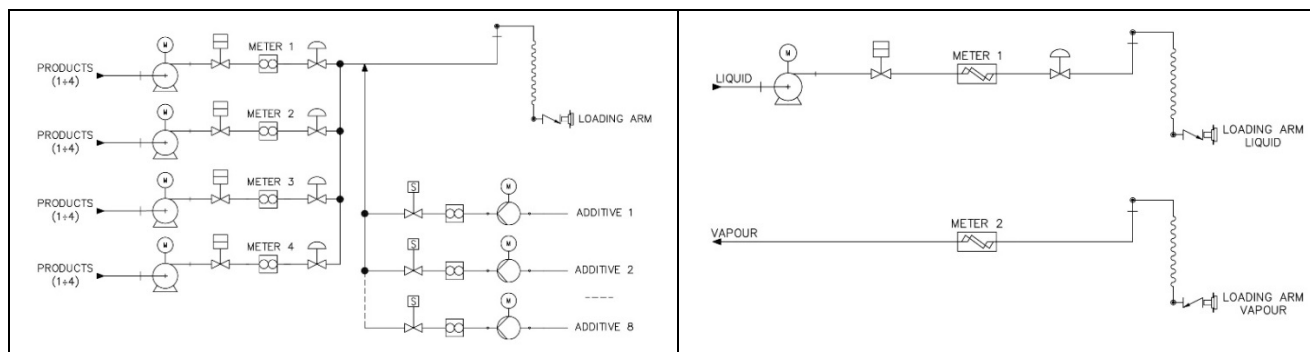
The FC-Es are the optional modules (up to 5) which can be connected to the FC-M via daisy-chain Ethernet connection.



Applications and examples

- tank-truck, tanks-trains, ships loading and unloading
- in line blending and additives injection
- pipe lines
- LPG liquid and vapour differential measurement





Ratio blending (2÷4 meters)

Differential measurement (LPG liquid and vapour meters)

Hardware characteristics

FC-M

- Backlight LED colour display with automatic heating device for low temperature
- Numeric and multi-function membrane keyboard
- Ethernet port 100BASE-TX (ModBus TCP and FTP support)
- High speed USB port (pen drive support)

FC-E

- Ex-d explosion proof ATEX-IECEX approved
- High wiring and cable entries capacity:
 - n° 14 ½" NPT and n°2 ¾" NPT
- Serial communication ports: n° 2 EIA-RS485/RS232, n°2 EIA-RS485/RS422, n° 2 CAN bus channels
- n°2 dual channel pulses inputs
- n°16 programmable digital inputs
- n°4 programmable solid state relays
- n°8 programmable free contact relays
- n°4 programmable digital outputs (PPG Programmable Pulses Generator capability)
- Modular electronic:
 - carrier board (base board)
 - AC/DC or DC/DC power supply board
 - n°4 slots for optional boards.

Options

- Internal back-up battery
- 2PTC board (n°2 PT100 inputs) Product temperature acquisition
- 4AIN board (n°4 4÷20mA inputs) Product density or pressure acquisition
- 4AOUT board (n°4 4÷20mA outputs) Flow control valve, flowrate or temperature data transmission.

Functional characteristics

- Drop-down menu with detailed descriptions
- User interface with clear messages
- Delivery controlled by PRESET or by START/STOP
- Clear messages for alarms and incorrect operations
- Adaptability to many different automation and configuration modes
- Management of identification codes from the keyboard (driver, customer, order number...)
- Management of up to 8 products with the same meter thanks to independent identification labels, meter factor, density, etc.
- Error curve dynamic correction
- Management of up to 6 compartments
- Management of up to 3 hoses
- Management of preset valves (on/off, 2 stages and multistep valves)
- Setting of measurement unit (one customized measurement unit can be set)
- Temperature compensation with API/ASTM tables for compensated volume and weight
- Product temperature reading via 3/4 wires PT100 thermoresistance
- Direct management of printing with configurable reports
- Diagnostic applications
- 6 emergency functions of which 3 can be configured.

Functions

<u>Measurement unit</u>	Preset and calculations in: • litres, gallons (US, UK), cubic meters, cubic centimeters, barrels (volume) • grams, kilograms, pounds, tons (mass) • measurement unit / min, measurement unit /hour or measurement unit /second (flow rate) • °C or °F (temperature).
<u>Quantity acquisition</u>	• Via dual pulses emitters thanks to continuous monitoring and error indicating alarms according to OIML R117, ISO 6551 level B, and to API chapter 5.5 level B. • Connection to ISOIL EM6422 via protected CanBus protocol in order to improve safety of data transmission, immunity against tampering and to enhance the self-diagnosis functions. • Acquisition of measured data from an external device (e.g Coriolis flow meter mod. Promass by E+H) via serial line (ModBus RTU) and configuration of: slave address, registers number and data type.
<u>Temperature acquisition</u>	Temperature can be acquired from a PT100 probe connected to VEGA3 or via serial line (ModBus RTU) with a temperature transmitter. During delivery VEGA3 calculates the weighted product's average temperature.
<u>Density acquisition</u>	Density can be acquired via a 4÷20 mA input or via serial line (ModBus RTU). Density in kg/m³, kg/ dm³ or °API. Base density (standard conditions) or observed density (ambient temperature). During delivery VEGA3 calculates the weighted product's average density.
<u>Pressure acquisition</u>	Pressure can be acquired via a 4÷20 mA input or via serial line (ModBus RTU). Relative pressure in psig, barg or Kpag. During delivery VEGA3 calculates the weighted product's average pressure and equilibrium pressure.
<u>Temperature and pressure compensation (optional)</u>	This function enables to compensate for temperature and pressure variation from reference conditions: base temperature (typically at 15°C/ 20°C and 60°F) and base or equilibrium pressure. VEGA3 calculates the temperature compensated volume (GST) for: • Petrochemical products using API chapter 11.1 tables (2004 edition and 2007 addendum) or BRAZIL table. • NGL and LPG products using API chapter 11.2.4 tables (2007 edition). • Ethanol product using OIML R22 and NBR5992 tables. • other generic products by using the ALPHA cubic expansion coefficient. VEGA3 calculates the temperature and pressure compensated volume (GSV) for: • Petrochemical products using API chapter 11.1 tables (2004 edition and 2007 addendum) or BRAZIL table. • NGL and LPG products using API chapter 11.2.4 tables (2007 edition) for temperature compensation (CTL) and API chapter 11.2.2 (1986 edition) for pressure compensation (CPL). API chapter 11.2.5 tables is used for vapour pressure calculation.
<u>Volume to mass/ mass to volume conversion</u>	Calculation is made with: • observed density if available • gross standard volume (GSV) and density at standard conditions (VEGA3 with compensation function only).

<u>Meter calibration</u>	For each meter VEGA3 allows setting of: • k-factor (pulses/measurement unit, meter factor) • correction curve (up to 5 couples of flow rate/correction for error correction in the entire flow rate range) • meter factor (average calibration factor) for each measured product (up to 4 products/blends).
<u>Badge management</u>	If interfaced via serial line to SBR badge reader, VEGA3 identifies badge code and it can: • transmit it to TAS • validate it remotely from TAS • validate it locally (from a "white list" badges file, up to n°1000 badge codes are supported).
<u>Transaction data repository</u>	Transactions data are automatically stored in binary and CSV (Comma Separated Value) formats files on FIFO mass memories. Repositories can be consulted locally thanks to a graphical tool on the menu. VEGA3 also integrates an FTP server that allows to access to transactions files (read only mode) via FTP clients.

Operations

Delivery management

When in local mode VEGA 3 can manage product delivery according to the enabled functions and perform the following operations:

- select product and set the preset
- check interlocks and signals
- start product delivery from keyboard or external button
- open selecting, block and vapour recovery valves and start pump and preset flow control valves according to the timing set in the pertaining parameters
- manage loading by means of control valves and additive injection solenoid. During this phase the VEGA3 does not only count product but it also carries out flow rate, temperature and automation controls
- close the preset in order to supply the exact amount of preset product
- close the compartment and hose valves and stop the pump according to the timing set in the pertaining parameters
- store data and print delivery reports.

When in remote mode the VEGA3 operates as an intelligent terminal controlled by a TAS (Terminal Automation System) and once initialized it works independently controlling product delivery by means of the devices it is connected to.

The system can control the following functions:

- identification of driver and loading consent
- delivery start and stop, operating sequence selection, reset of quantity and density updating
- enabling/disabling measuring system/loading arm
- alarm reset
- data acquisition (status)
- preliminary and final data summary
- download of product delivery data.

Remote control is achieved though ModBus TCP RTU protocol via Ethernet or serial line connection.

Valves

VEGA 3 can manage different valve types:

- Two stages: two stages valve allows supply of the preset quantity by controlling the two solenoid valves (one for Low flow and one for High flow). Flow rate values can be pre-set by acting mechanically on the valve while the VEGA3 manages low flow stage at the beginning of product delivery, high flow stage and low flow at the end of product delivery in order to avoid *splash* phenomena and the formation of foam. The duration of the different phases can be set in the specific parameters. Moreover the automatic final adjustment function can be used: if required, the preset ends with a series of short valve openings until the exact preset value is reached.
- Multistep (digital valve): this valve not only allows managing of the initial and final low flow stage, but it also allows for dynamic regulation of flow rate at pre-set value by acting on the solenoid valves (one N.O and one N.C). This regulates the position of the valve diaphragm.
This valve has a default high flow rate value and two lower high flow rate values that can be controlled by two digital inputs. High flow rate can alternatively be set from the TAS.
- Analog valve (4÷20 mA): by the 4÷20mA signal VEGA3 is able to drive any valve with suitable hydraulic characteristics. Delivery phases and flow rate values are managed as for the digital valve.

Report printing

VEGA3 can print reports that can be configured with a set of specific parameters through serial protocol.

The ISOIL printing system managed is ST500-M (MID approved). This system allows up to a maximum of n°16 VEGA3 to be connected in multi-point by RS422 or RS485 serial line.

The ST500-M collects data from each VEGA3 and prints them on an 80 columns printer while data frame is checked by CRC16.

Moreover the VEGA 3 can print reports on a network printer via Ethernet connection (not legally relevant).

Inputs and outputs configuration

The VEGA3 firmware allows maximum flexibility to fit the needs of different devices and field signals.

Each digital input can be programmed defining:

- predefined list of interlocks and signals
- generic interlock with programmable labels
- layer management (system, measuring system/ loading arm, meter, product/additive)
- input logic (not inverted/ inverted).

Each digital output can be programmed defining:

- predefined list of signals
- layer management (system, measuring system/ loading arm, meter, product/additive)
- input logic (not inverted/ inverted).

Pulses output can be additionally programmed to represents factorizable measured quantities.

4÷20 mA inputs

The 4÷20mA inputs can be configured to:

- receive actual product density. It's possible to select two types of data to be represented in the input: density at base temperature condition and density at observed condition.
- receive observed pressure.

4÷20 mA outputs

The 4÷20mA outputs can be configured to:

- send the observed or average product's temperature
- send the observed or average flow rate
- drive analog valves.

Blending management

VEGA3 measuring system – loading arm can be configured according following blending options:

- sequential blending: up to n°4 components can be delivered sequentially
- side-stream blending: n°2 components are delivered simultaneously
Main meter measures the blend of products and selected secondary meter measures the secondary product. Main components data are calculated by the difference.
- ratio blending: n°2 components are delivered simultaneously. Each component is measured by the selected meter and blend data are calculated by the sum of components data.

It's possible to define up to n°4 blends composition per each measuring system – loading arm, via parameters configuration or via TAS configuration message.

Additive injection management

VEGA3 manages an in-line additives injection by the optional linking with IC-E (Injection Controller Extension).

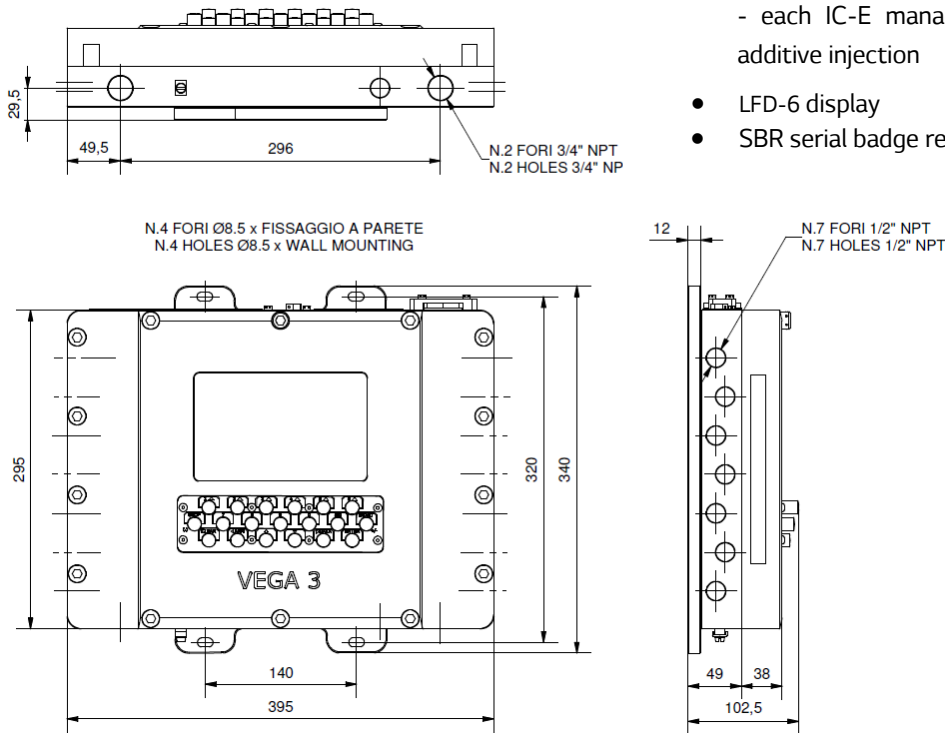
Each measuring system – loading arm can handle up to n°8 I.B. (Injection Blocks), with the limits of up to n°8 Injection Blocks handled by the same module FC-M/FC-E.

It's possible to define up to n°4 recipes composition per each measuring system – loading arm via parameters configuration or via TAS configuration message.

Each recipe allows defining up to n°4 additives to be injected simultaneously, and the cleaning line quantity.

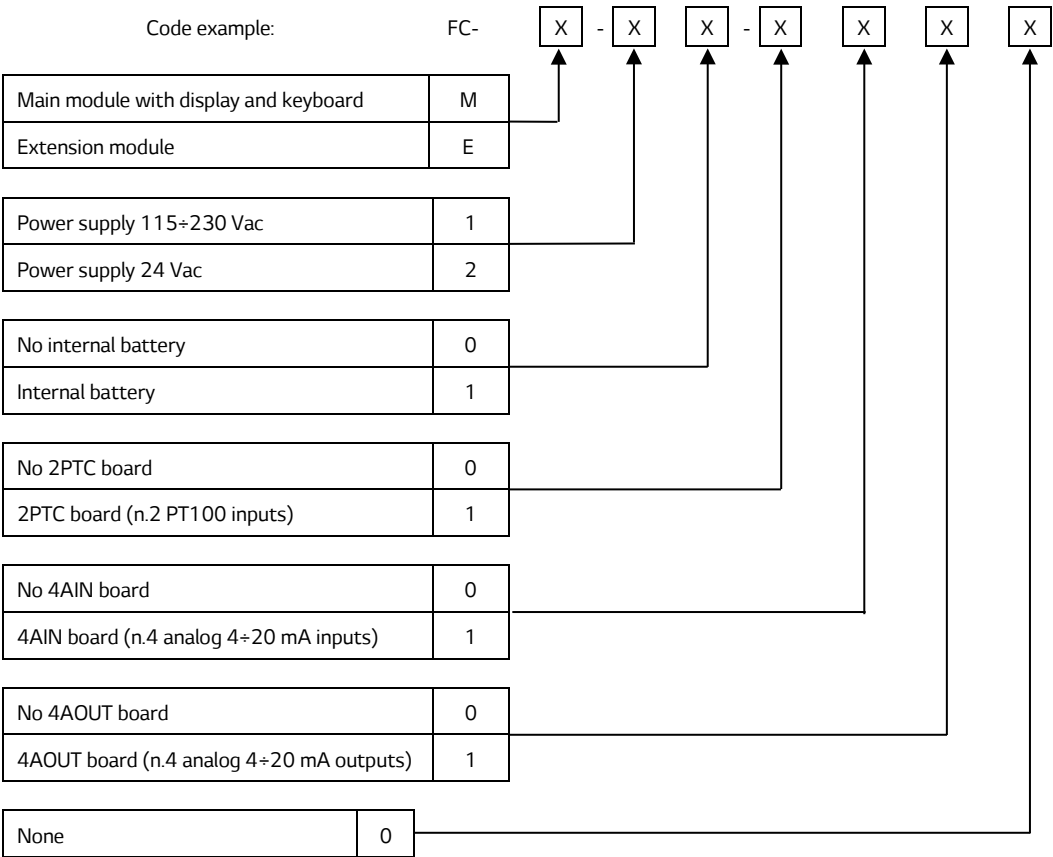
Dimensions

Dimensions in mm



Accessories

- EM6422 pulse emitter
- ST500-M legally relevant printer
- A class PT100 thermoresistance
- IC-E Injection controller extension (up to n.2)
 - linkable via CAN bus channel to each FC-M/E
 - each IC-E manages up to 4 IB2 for inline additive injection
- LFD-6 display
- SBR serial badge reader



Technical data

Environmental features

Operating temperature:	-40 ÷ +55°C (-40÷131°F) <i>For temperatures lower than -25°C VEGA 3 must be constantly powered</i>
Storage temperature:	-40 ÷ +55°C (-40÷131°F)
Humidity:	5 ÷ 95% without condensation

Construction

Casing:	anodized aluminium
Display (FC-M only):	LED backlighted LCD colour display; 800x480 pixel
Keyboard:	solid state keyboard with 10 numeric and 9 function digits
Cable entries:	n°14 ½"NPT holes and n° 2 ¾" NPT holes
Weight:	15 kg

Electrical characteristics

Power supply: - Internal battery: - Pulses emitter:	115÷230 Vac 48 W max	24 Vdc 48 W max
	2x6 Vdc 1150 mAh (optional)	
	12 Vdc 100 mA	
Ingresso di conteggio:	n° 2 two channels 90° ± 30° phased inputs, fmax 5kHz NPN or PNP open collector	
Digital inputs:	n° 16 NPN open collector inputs	
Digital outputs:	n° 4 open drain outputs: - max. voltage 30 V- - max. current 250 mA per output - on-off function - PPG (Programmable Pulses Generator) max freq. 5 kHz, duty cycle 50%	
Inputs for PT100 A Class:	n° 2 inputs for platinum temperature probe - IEC751, DIN 43760 (0,00385 Ω/°C) - temperature range: -50 ÷ +250 °C - resolution: 0.025 °C min. (10.000 p) - deviation (all gain): ±0.125 °C max. (500ppm max.) - refresh time: min. 500 ms.	
Analog inputs:	n° 4 4÷20 mA analog inputs (optional) - input resistance: 25 Ohm - resolution: 2 µA min. (10.000 actual points) - deviation (all gain): ±10 µA max. (600ppm max.) - refresh time: min. 500 ms.	
Analog outputs:	n° 4 4÷20 mA analog outputs (optional) - max load resistance: 500 Ohm - resolution: 4µA min. (5.000 actual points) - deviation (all gain): ± 20 µA max. (1000 ppm max.) - refresh time: 50 ms.	
Digital power outputs:	n°12 of which: - n°8 mechanical relays (all versions) - n°4 Vac solid state relays (Vac voltage powered versions) - n°4 Vdc solid state relays (Vdc voltage powered versions)	
Serial communication lines:	n°2 EIA RS232/RS485 switchable n°2 EIA RS485/RS422 switchable	
Ethernet and USB port (FC-M only):	n°1 Ethernet 100BASE-TX (RJ45) n°1 HiSpeed USB port (Type A)	
CAN bus:	n°2 channels: channel 1 for EM6422 and channel 2 for IC-E Injection Controller Extension Power supply: 12 Vdc 250 mA max.	
ATEX-IECEX protection:	II 2G Ex d IIB T6 Gb INERIS 15ATEX0037X approval – INE 15.0042X	
Enclosure protection:	IP66	

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