VEGA 3
Multi-stream Modular Flow Computer

CE (Ex) *IECEx*

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

FC-M Flow Computer Main

FC-E Flow Computer Extension

- 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.

A toolkit software is available for system diagnostic in on-line mode (via Ethernet) or off-line (via Usb PenDrive).

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.
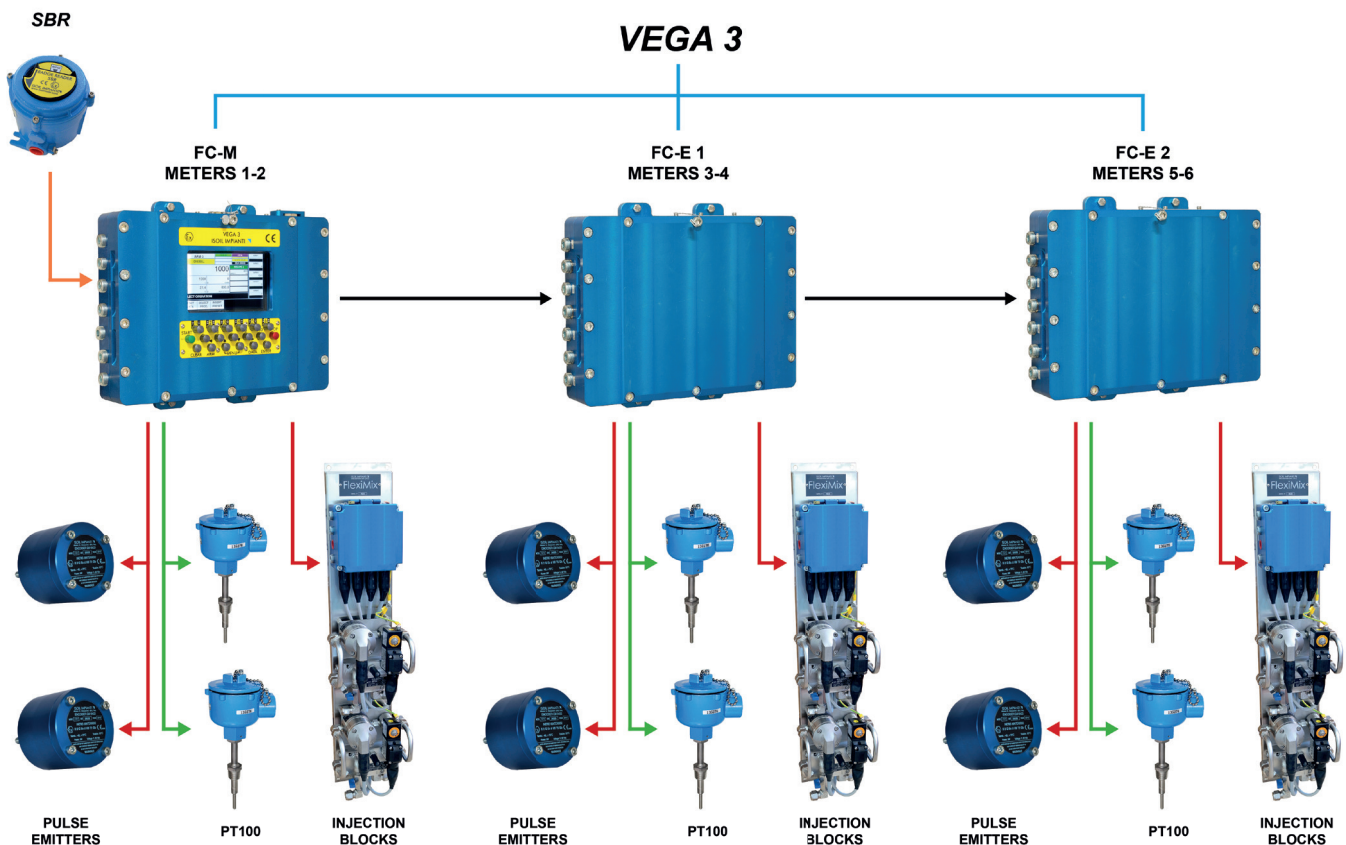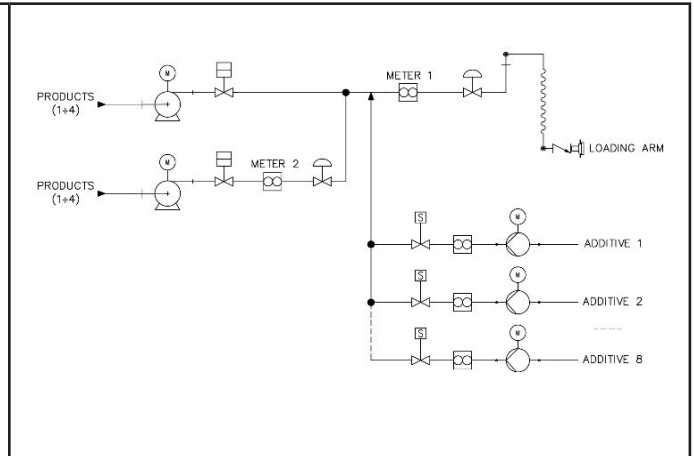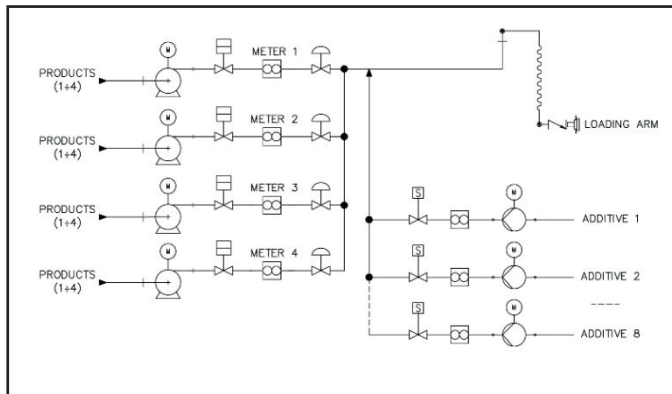
Applications and examples

- Tank-truck, tank-trains, ships loading and unloading
- Pipelines

- In line blending and additives injection
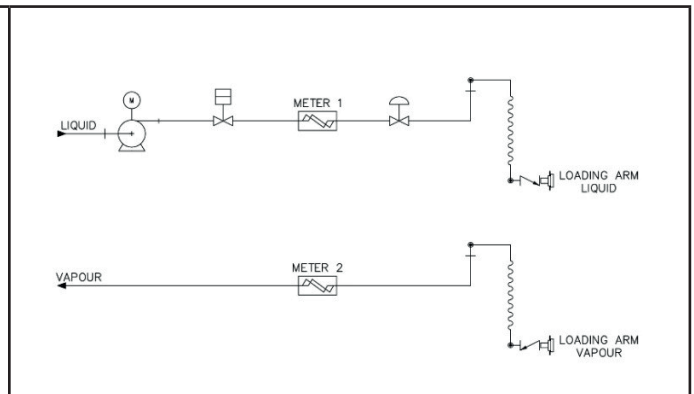- LPG liquid and vapour differential measurement
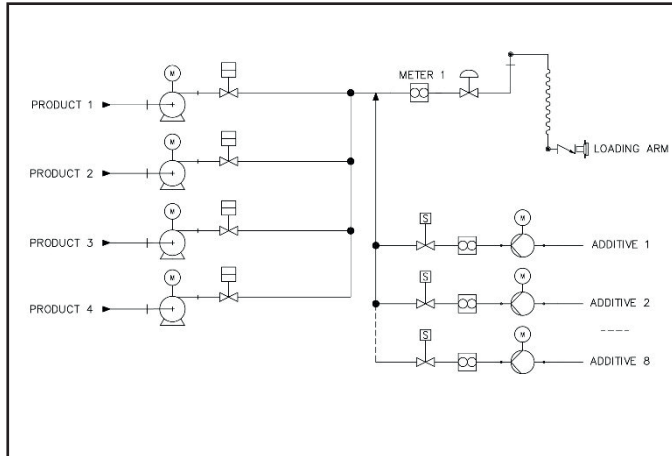
Single meter (1÷4 products)

Side stream blending (2 meters)

Ratio blending (2÷4 meters)

Differential measurement (LPG liquid and vapour)

Hardware characteristics

FC-M and FC-E

- Ex-d explosion proof ATEX-IECEx approved
- n° 14 ½" NPT and n°2 ¾" NPT cable entries
- Serial communication ports: n° 2 EIA-RS485/RS232,
- n°2 EIA-RS485/RS422, n° 2 CAN bus channels
- Modular electronics:
  - carrier board (scheda base)
  - AC/DC or DC/DC power supply board
  - n°4 slots for optional boards

- 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)

Functional characteristics

- Multilingual user interface with clear messages (Italian, English)
- Adaptability to many different automation and configuration modes
- Setting of measurement unit (one customized measurement unit can be set)
- Top/bottom loading management for tank trucks
- User identification management via badge reader
- The TAS system allows to display messages and to remotely manage outputs
- Quantity acquisition from various interfaces (pulses, CAN bus, ModBus RTU) and from different meter types (positive displacement, turbine, Coriolis…)
- Product temperature reading via 3/4 wires PT100 thermoresistance
- Density and pressure acquisition Acquisizione densità e pressione attraverso diverse interfacce (parametri condizioni base, input 4÷20mA o ModBus RTU)
- Temperature compensation with API/ASTM tables for compensated volume and weight
- Alarm management
- Freeware Diagnostic Toolkit (GUI for Windows XP, 7 e 10) with the following features:

  - online use via FTP Ethernet
  - offline use via USB key
  - management of parameters configuration
  - management of software updates

- Interlock management (pre-set list and customizable fields)
- Valves management (one/two stage valves, digital or 4÷20mA analogic valves)
- Management of automatic top-up functions
- Management of interlocks, product selection and vapour recovery valves
- Management of pumps and in-line pressure
- Back pressure management to avoid flash phenomena
- In line blending management of up to n° 4 meters at the same time and up to n° 8 additive injections per measuring system/loding arm
- Local mode (stand alone) or remote mode (host controlled) via ModBus (TCP or RTU) protocol
- Direct management of printing with configurable report
- Drop-down menu with detailed descriptions
- Tools for hardware diagnostics, meters and injection blocks calibration (additive injection meters)
- Tools for data analysis and export

  - analysis and download of transaction data and of parameters modifications
  - badge file management (white list)

Functions

Measurement unit	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).
Quantity acquisition	• 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 trasmission, 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.
Temperature acquisition	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.
Density acquisition	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.
Pressure acquisition	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.
Temperature and pressure compensation (optional)	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.
Volume to mass/ mass to volume conversion	Calculation is made with: • observed density if available • gross standard volume (GSV) and density at standard conditions (VEGA3 with compensation function only).
Meter calibration	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).
Badge management	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).
Transactions data repository	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
- Close the preset in order to supply the exact amount of preset product

- Open selecting, block and vapour recovery valves and start pump and preset flow control valves according to the timing set in the pertaining parameters
- Close the compartment and hose valves and stop the pump 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

- 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/disenabling 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.

Additives 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.

Technical Features

ENVIRONMENTAL CHARACTERISTICS

Ambient Working Temperature:	-40 ÷ +55°C (-40÷131°F) For temperatures lower than -25°C VEGA 3 must be constantly powered
Ambient Storage Temperature:	-40 °C a +55°C
Humidity:	5 a 95 % without condensation

CASING PROTECTION

|	
ATEX-IECEX:	II 2G Ex db IIB T6 Gb INERIS 15ATEX0037X Approval – INE 15.0042X
Enclosure protection:	IP66 (according IEC 60529), outdoor use

MECHANICAL CHARACTERISTICS

Enclosure Material:	Anodized Aluminium
Display (FC-M):	LED backlighted LCD colour display; 800x480 pixel
Keyboard:	n°19 solid state digits (10 numeric and 9 function digits)
Weight:	15 kg
Cable Entries:	n° 14 holes ½" NPT n° 2 holes ¾" NPT

ELECTRICAL CHARACTERISTICS

Power supply:	AC version: 115÷230 VAC - 48 W max DC version: 24 VDC - 48 W max	
Internal battery: Pulse emitter:	2x6 Vdc 1150 mAh (optional) 12 Vdc 100 mA	
Counting Inputs:	n° 2 two channels 90° ± 30° phased inputs, fmax 5kHz 0°, fmax 5kHz - NPN o 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 frequence 5 kHz, duty cycle 50%	
Inputs for PT100 A Class:	n° 2 inputs for platinum temperature probe IEC751, DIN 43760 (0,00385Ω/°C)	
	• temperature range:	-50 ÷ +250 °C
	• resolution:	0.025 °C min. (10.000 points)
	• deviation (all gain):	±0.125 °C max. (500ppm max.)
	• refresh time:	min. 500 ms.
Analog Inputs:	n° 4 4÷20 mA analog outputs (optional)	
	• input resistance	25 Ohm
	• resolution:	2 µA min. (10.000 points)
	• deviation (all gain):	±10 µA max. (600ppm max.)
	• refresh time:	min. 500 ms.
Analog Outputs::	n° 4 uscite analogiche 4÷20 mA (optional)	
	• max load resistance:	25 Ohm
	• resolution:	4µA min. (5.000 points)
	• deviation (all gain):	± 20 µA max. (1000 ppm max.)
	• refresh time:	50 ms.

Digital power outputs::	n° 12 of which: • n° 8 rmechanical relays (all versions) • n° 4 VAC solid state relays (VAC voltage powered versions) • n° 4 VDC olid 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 pulse emitter Channel 2 for IC-E Injection Controller Extension Power supply: 12 VDC 250 mA max.

Dimensions

N.2 HOLES 3/4" NPT

N.4 HOLES Ø8.5 FOR WALL MOUNTING

N.7 HOLES 1/2" NPT
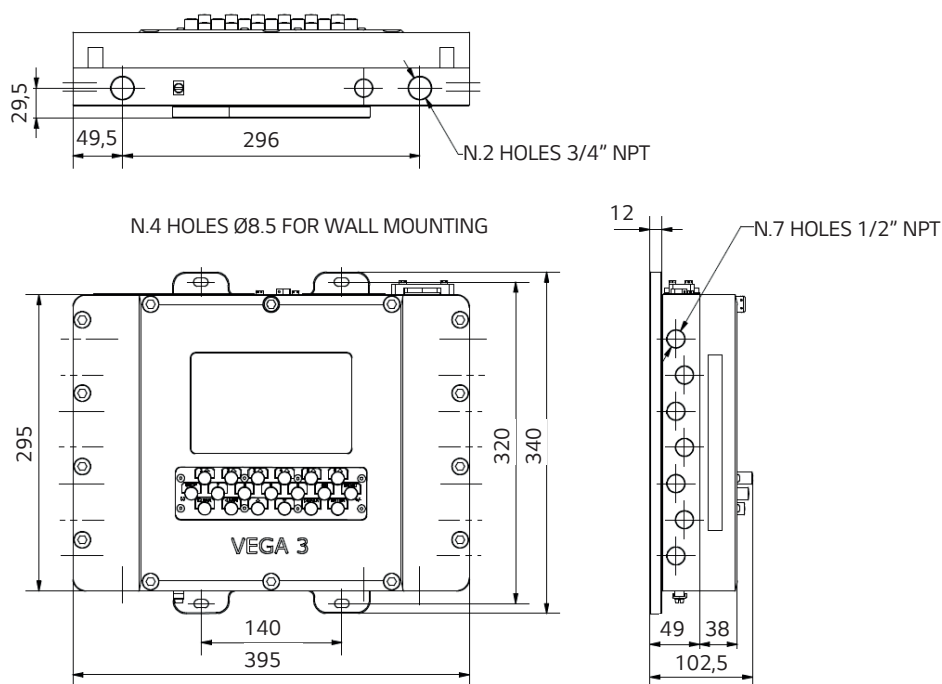
VEGA 3

Ordering Code

VEGA 3 Flow Computer	FC-	X	-	X	X	-	X	X	X	X

Main module with display and keyboard	M
Extension Module	E

Power supply 115÷230 Vac	1
Power supply 24 Vdc	2

No internal battery	0
Internal battery	1

No 2PTC board	0
2PTC board (n.2 input PT100)	1

No 4IN board	0
4AIN board (n.4 analog 4÷20 mA inputs)	1

No 4AOUT board	0
4AOUT board (n.4 analog 4÷20 mA outputs)	1

None	0