

Name: Electronic gas volume converter
Type: MacBAT 5


Installation manual

Document issue: 1.1 / 02-2020






Applies to the following firmware:

Program series: S006.49



 **Implicitly read the manual, where all necessary information, also information regarding safety, are included. This is only a supporting document, includes only selected information, useful during device installation. Installation manual is only an annex to the main document.**

SAFETY

-  The converter is an intrinsically safe, explosion proof device and can be installed in 0,1 or 2 explosion zone of gases and vapors. Characteristics II 1G Ex ia IIB T4 Ga. Device installation in explosion hazard areas must comply with requirements of applicable regulations.
-  Minimum requirements regarding operating in the explosion hazard zone are indicated in Ordinance of the Minister of Economy of 8 July 2010 on minimum occupational health and safety requirements, related to potential explosive atmosphere at workplace (OJ No. 138, item 931).
-  IP rating declared by producer, IP66, shall be preserved while selecting diameter of cables inserted into glands, proper tightening of glands and arranging the gasket and tightening the housing cover.
-  Under certain extreme conditions plastic cover may conduct electrostatic charge capable of ignition. The product should not be installed at the place where environmental conditions are favorable to cumulate electrostatic charges. Clean the product only with wet cloth.
-  Implicitly read the manual. Manual along with information regarding safety and a template of EU conformity declaration is available on website [www.plummac.com](http://plummac.com) under following link: <http://plummac.com/project/macbat-5/>

link with QR code:



MECHANICAL INSTALLATION AND CONNECTION

First of all, the converter must be firmly attached to a solid element, considering provided external dimensions. For gas pipeline installation a dedicated mount bracket can be used to install the converter.

For installation the following tools are necessary:

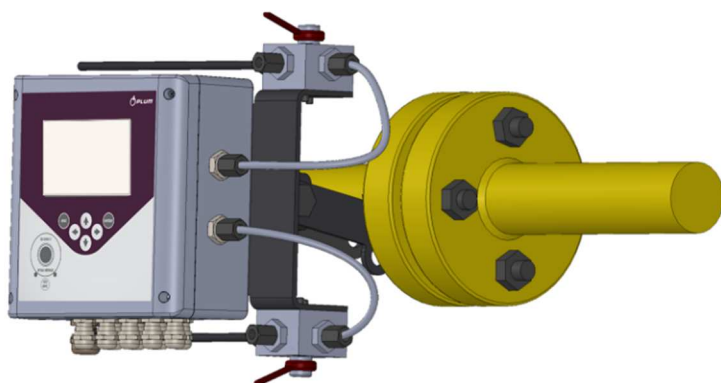
- Fork spanners 14, 17, 19, 22
- Philips screwdriver min. 100mm long
- Adjustable spanner, spacing 28



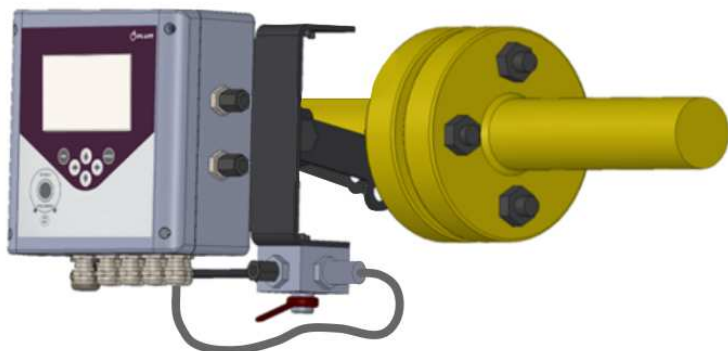
- Allen key no.4 min. 100mm long



- Ferrule crimper



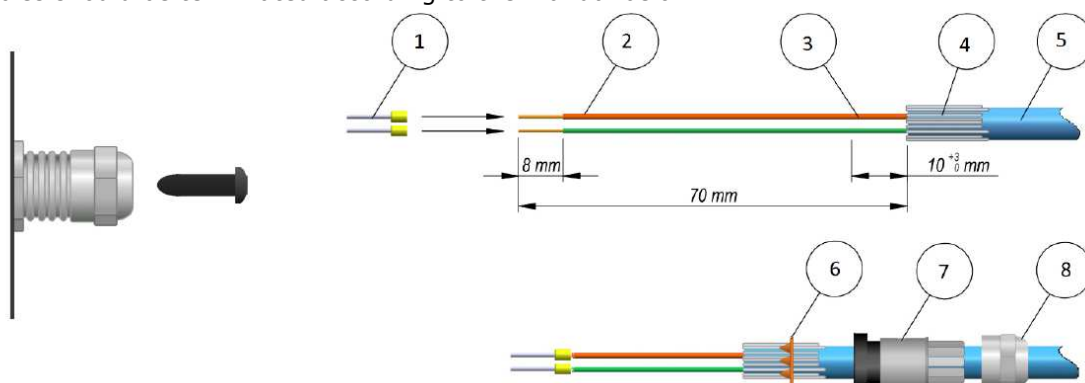
Depending on the type, connect internal pressure sensors with pulse cables or if converter is equipped with external pressure sensors, connect them directly to the gauge point. It is recommended to install device's pressure sensors behind the three-way valve, which cuts off gas flow to the converter. Temperature sensor should be placed in thermowell of gas pipeline.



Exemplary installation of the converter using dedicated flange mount bracket with external pressure sensor placed behind three-way valve and connected to the converter with a cable.

PREPARATION OF CABLES

Due to glands and splice connectors diameter multi-cored cables with cross section from $0,25\text{mm}^2$ to $0,75\text{mm}^2$ should be used. The cables should be terminated according to the manual below.



1 – ferrules, 2 – wires, 3 – foil, 4 – shield, 5 – cable, 6 – shaped gland ring, 7 – seal, 8 – gland nut.

Remove the bolt placed in gland. Prepare the cable in accordance with above illustration. After placing the ferrule crimp it with ferrule crimper. Insert shaped gland ring from point 6 onto rolled up cable shield (onto insulation) – to half of the length.

To connect the measuring cables they must be inserted into terminals chamber through correct glands. The glands are adjusted to ground pulse cable shields.

Cables and wires of intrinsically safe circuits must be placed separately to cables and wires of non-intrinsically safe circuits. Cables and wires of intrinsically safe circuits should be installed permanently and secured against mechanical damage.

DI digital inputs (LF, HF, signalization, NAMUR signalization):

Cables: LIYCY 2 x $0,25 - 0,5\text{ mm}^2$ or LIYCY 4 x $0,25 - 0,5\text{ mm}^2$.

Maximum length 10 m.

COM1 and COM2 ports, converter and internal modem powering, DO output.

Cables: LIYCY 2..10 x $0,50\text{ mm}^2$ – max 150 m, LIYCY 6..10 x $0,75\text{ mm}^2$ – max 200 m, or paired cables:

- LIYCY-P 2..5 x 2 x $0,34\text{ mm}^2$ – max 100 m
- LIYCY-P 2..5 x 2 x $0,50\text{ mm}^2$ – max 150 m
- LIYCY-P 2..5 x 2 x $0,75\text{ mm}^2$ – max 200 m.

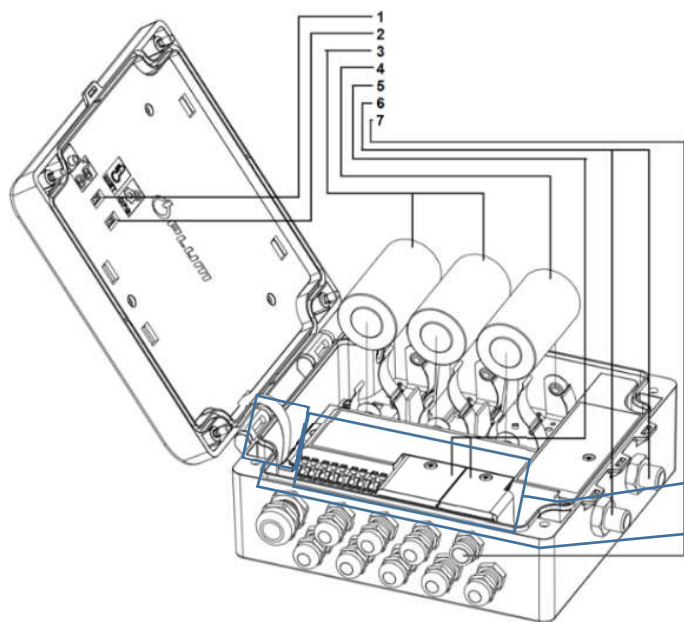
Number of wires required to connect:

- 2 wires to power the converter and internal modem – on-line operation mode
- 4 wires to power the converter and transmission on one RS485 channel
- 6 wires to power the converter and transmission on two RS485 channels
- 7-10 wires to power the converter, transmission, DO digital outputs

 **Tighten the nuts of all glands during installation. Producer does not provide the devices with gland nuts tightening, with seals guaranteeing declared IP protection level.**



DEVICE CONSTRUCTION



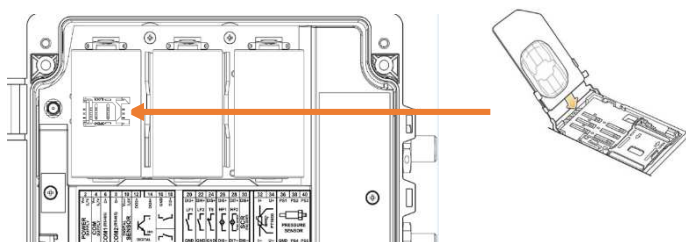
1. MET switch, hardware metrological blockade required by MID directive – **breaking the seal on this switch makes metrological properties attestation void!**
2. CFG switch, hardware programming blockade
3. Two additional batteries B2 and B3 for modem
4. Main battery B1 (converter)
5. Covers of measure input terminals
6. Internal pressure sensor
7. Internal FME socket for external GSM antenna

M12x1.5 diameter range 3-6,5 mm2 (spanner M17)

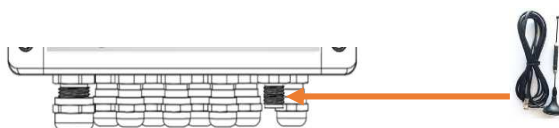
M16x1.5 diameter range 4-8 mm2 (spanner M18)

Attention! Glands must be implicitly blocked with spanner while tightening.

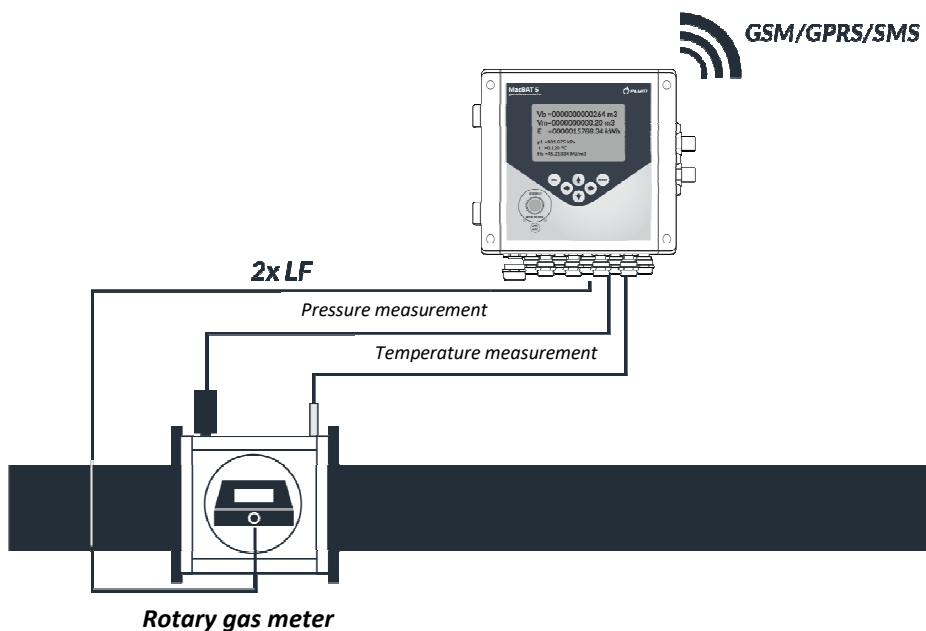
SIM CARD AND GSM ANTENNA INSTALLATION



If the converter is equipped with internal modem a SIM card of miniSIM size must be placed inside, under the battery marked as B3. In place of one gland there is FME antenna socket to connect external GSM antenna.

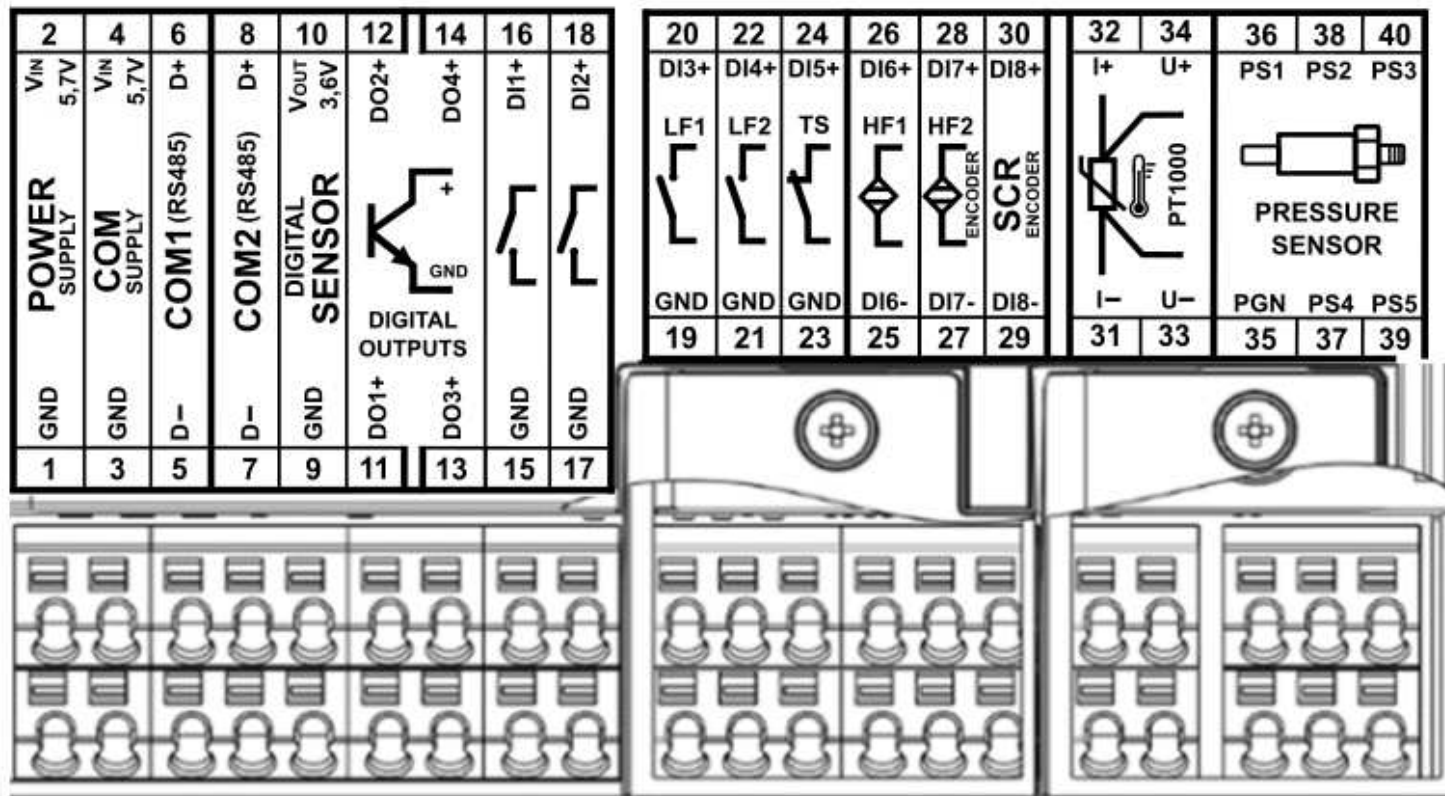


EXEMPLARY APPLICATION SCHEME



CABLES AND EXTERNAL CIRCUITS CONNECTION

Available converter terminals identification:

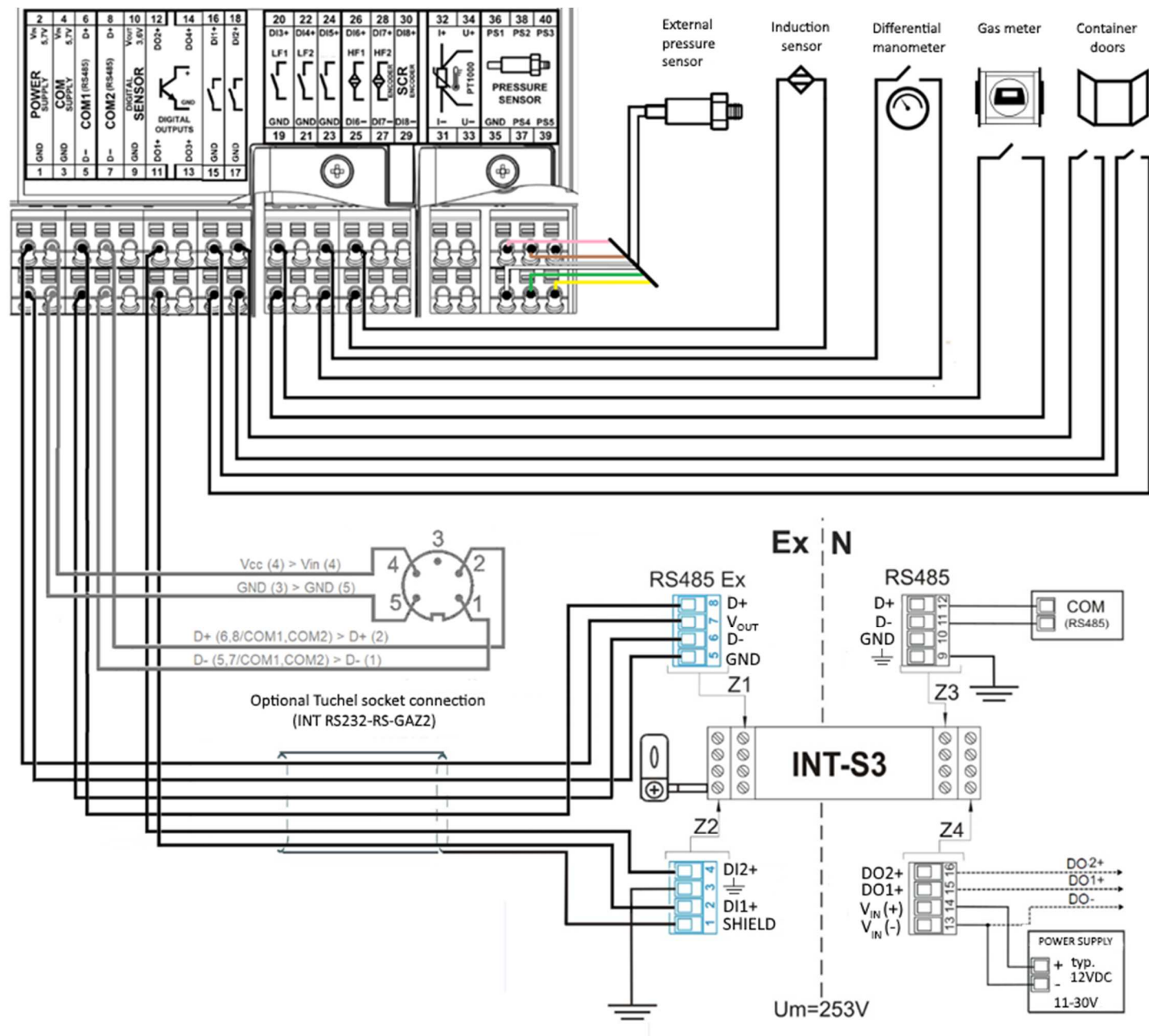


- 1-2 – external power supply terminals (POWER SUPPLY)
- 3-4 – external power supply of transmission circuits (COM SUPPLY)
- 5-8 – serial transmission ports terminals (COM1, COM2)
- 9-10 – power supply terminals of reserve pressure and temperature sensors (DIGITAL SENSOR) – unavailable option
- 11-14 – DO digital outputs terminals OC type (DIGITAL OUTPUTS DO1...DO4)
- 15-18 – digital input terminals (bistate signalization) (DIGITAL INPUTS DI1...DI2)
- 19-22 – digital input terminals (bistate signalization) shared with LF1 and LF2 pulse inputs (DI3...DI4)
- 23-24 – digital input terminals (bistate signalization) shared with TS control contact (DI5)
- 25-26 – digital input terminals (NAMUR signalization) shared with HF1 pulse input (DI6)
- 27-28 – digital input terminals (NAMUR signalization) shared with HF2 pulse input and NAMUR encoder (DI7)
- 29-30 – SCR Encoder input terminals (SCR ENCODER)
- 31-34 – basic CT6 temperature sensor terminals (PT1000, I+, I-, U+, U-)
- 35-40 – EPS external pressure sensor terminals (PRESSURE SENSOR, PS1...PS5, PGN)

To connect external circuits self-locking connectors are used. Stripped wires must be obligatorily terminated with 8mm long ferrule. After placing wire in the terminal it will be locked automatically in it.

Next page contains connection schematics of different circuits to the converter, such as: power and communication (INT-S3 interface), digital input circuits (signalizations), external pressure sensor, rotary gas meter.

CONNECTING INT-S3 INTERFACE AND EXTERNAL CIRCUITS



Ex RS485 port in INT-S3 can be connected with COM1 or COM2 in MacBAT 5.

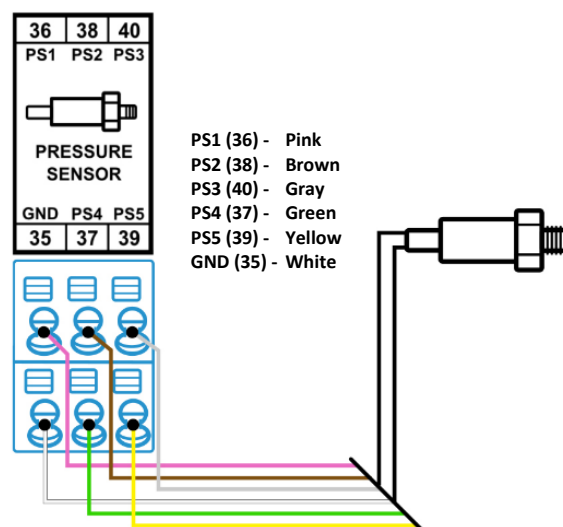
To provide transmission on second COM port and to power two additional digital outputs a second INT-S3 or INT-S3/N interface should be used – without using V_{OUT} (7) and GND (5) terminals.



Do not use INT-S3/**N** to power MacBAT5.



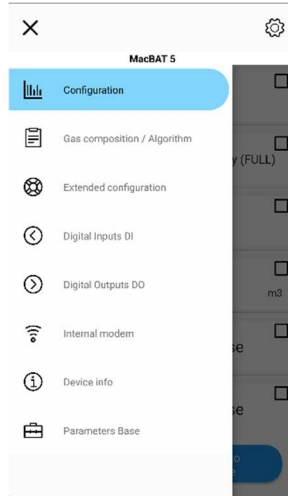
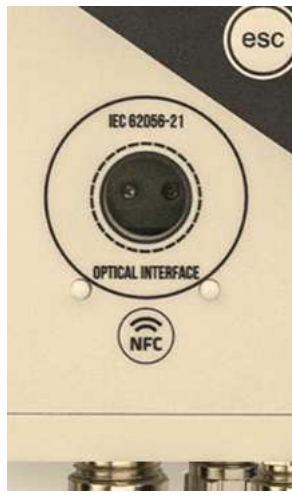
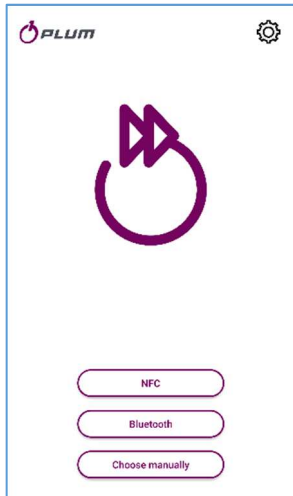
Do not use one INT-S3 interface to power two converters at the same time.



Implicitly follow the colors of pressure sensor wires. Sensors sold by PLUM have standardized insulation colors.

CONVERTER CONFIGURATION USING SMARTPHONE

To configure MacBAT 5 using smartphone use „**ConfIT! – volume converters**” application available free of charge via Google Play (next is a QR link to the application). Application enables connecting the device via Bluetooth (and OptoBTEx interface) or via NFC in smartphone. It requires that smartphone had Android 4.2 or higher installed.



Start the application on smartphone, select „NFC” connection option and apply smartphone (with its NFC antenna) to MacBAT5 device, to a place marked as “NFC”. ATTENTION – each smartphone have NFC antenna installed in a different place – please check it in smartphone’s manual.

Correctly established connection will effect in displaying reading bar and finally reading converter configuration parameters from the device.

Take away the smartphone.

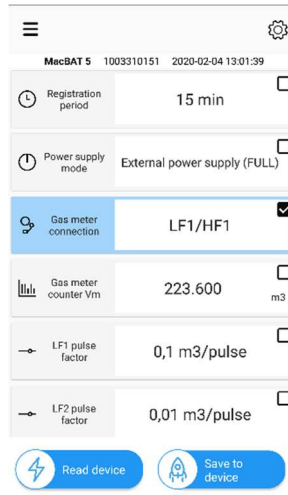
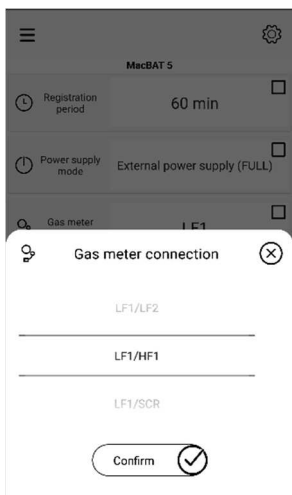
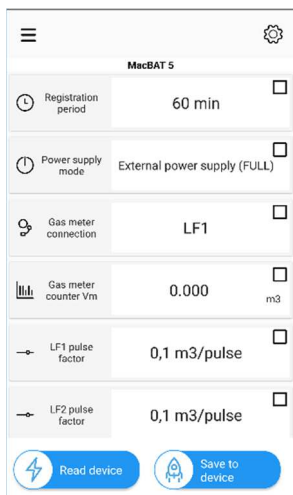
Application uses **401** account (Administrator) and **4096** password by default, to authorize modification of configuration. These data can be changed in application menu on the right, in “LOGIN” option.

Enter new configuration parameters values into individual settings categories (left application menu).

Select „Save to device” button and once again apply smartphone to MacBAT 5.

New configuration will be saved in the device, a relevant prompt shall confirm it.

Select „Read device” option and make sure that after another configuration reading all programmed parameters are set in the device.

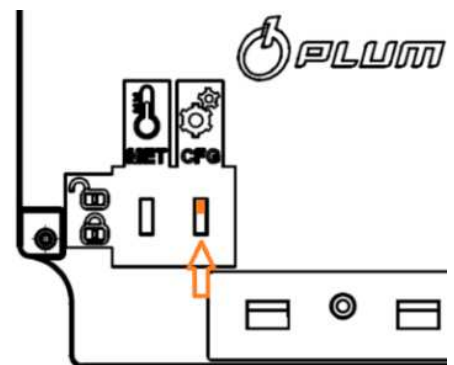


HANDLING THE CONVERTER AND CONFIGURATION USING KEYBOARD

The keyboard has 6 buttons: **enter** for entering the menu, accepting choices; **esc** for returning to parent menu or abandoning selected function; arrows $\leftarrow \rightarrow \uparrow \downarrow$ are navigation buttons through the menu. After selecting any parameter and pressing \rightarrow arrow „to the right” a short description shall appear. Converter’s main screen contains basic information on currently logged parameters.

Changing individual configuration parameters requires user authorization, which can be provided in two ways:

- Selecting appropriate user account (e.g. Account **Adm401** – Administrator, account 401) and entering password (**4096** by default with option to change it).
- Switching programming blockade inside the device housing, marked as CFG, to position of an open padlock disables user authorization request and allows full access to the device. This way is recommended during first configuration. After setting access passwords the converter should be set to locked padlock position, next it is suggested to seal it in order to avoid unauthorized access to the device.



All settings described below start from the main menu.

Configuration after device installation	
Date and time <i>enter -> Configuration -> Date and time</i> <i>enter -> Configuration -> Date and time -> Advanced</i>	<ul style="list-style-type: none"> date and time (DT) clock operating mode - automatic time adjustment summer/winter (AutoDST)
Data registration <i>enter->Data->Configuration->Basic</i>	<ul style="list-style-type: none"> registration period (Dtau) hour to start billing day (Billing Hour)
Power supply of device <i>enter->Configuration->Power source->External</i>	<ul style="list-style-type: none"> power source operating mode (EpwrSMode) (FULL – external powering, BATT – battery powering)
Gas meter settings <i>enter -> Measuring inputs -> Gas meter</i>	<ul style="list-style-type: none"> configuration of type of connection with gas meter (ConfImp) (e.g. LF1/HF1 – connection via pulse transmitters LF and HF from gas meter) gas meter pulse factor (e.g. LF1Factor) gas meter range (QmRMin / QmRMax) limits of flow (e.g. QmLMin)
Setting counter according to gas meter <i>enter -> Counters and flow -> Volume -> Current</i>	<ul style="list-style-type: none"> volume under measurement conditions – uncorrected (Vm)
Algorithm and gas composition <i>enter -> Gas and conversion -> Algorithm</i> <i>enter -> Gas and conversion -> Gas composition</i>	<ul style="list-style-type: none"> selecting algorithm to determine gas compressibility factor, e.g. SGERG-88 (ConfAlgZ) selecting the origin of components of simplified gas composition (Full.comp. – from full gas composition, Simpl. – from simplified gas composition) Full or Simplified gas composition
DI Digital inputs (signalizations) <i>enter -> Inputs / outputs -> Digital inputs / Digital outputs -> Configuration</i>	<ul style="list-style-type: none"> Selection of available inputs (ConfDI) (0-input unavailable, 1-input available) Inputs polarization (DIPol) (0-normally closed, 1-normally opened)
DO Digital outputs (OC type) <i>enter -> Inputs / outputs -> Digital outputs -> e.g. DO1</i>	<ul style="list-style-type: none"> Output operating mode DO (e.g. DO1Mode) (e.g. Events (S) – controlling the event-active closed (shorted)) Code of event controlling output DO (e.g. DO1Evt) (e.g. 52-Collective alarm A)
Data transmission (COM ports) <i>enter -> Configuration -> Transmission -> e.g. COM1</i>	<ul style="list-style-type: none"> COM port baud rate (e.g. COM1Bps) COM port address (e.g. COM1Adr)
Data transmission (internal modem) <i>enter->Configuration->Transmission->Modem->Configuration</i>	<ul style="list-style-type: none"> pin to SIM card (MPin) APN of SIM card (MOApn) Modem operating mode (MMode) (e.g. 3-Online mode with external power supply) Port number to operate in <i>Online mode with external power supply</i> (MOPort)
Passwords <i>enter -> Configuration -> Advanced -> All parameters</i> <i>passwords begins from parameter no.604 (fast search via "left arrow" ←)</i>	<ul style="list-style-type: none"> Administrator password – 401 account (Adm401Pwd) User password – 301 account (Cust301Pwd) User password to read data – 201 account (Rdr201Pwd)

POWERING FROM BATTERY

The device is powered with lithium-thionyl batteries with nominal voltage of +3,6V, size D, in compliance with IEC 60086-1.

Any works with the battery can be done only by trained personnel.

It is allowed to use only battery types provided below:



- LS 33600**, manufactured by Saft Specialty Battery Group
- EVE ER34615**, manufactured by Eve Energy CO., LTD.
(using this battery environmental temperature should be in range of: Ta= -25°C..+50°C)
- SL-2780**, manufactured by Tadiran Batteries GmbH

TECHNICAL SUPPORT

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