**▶blackline pro▶**
an OBL brand

# USE AND MAINTENANCE MANUAL

## CONTROL AND MANAGEMENT KIT FOR METERING PUMPS

**PRO**

**PRO UL**

$C\!E$

**English**

YEAR 2021.06

⚠️ **ATTENTION:**
Industrial machinery not intended for use by non-professional operators. These instructions are intended for qualified personnel.

**OBL**
**METERING PUMPS**

**IDEX**

| Doc. No. **UT-5601** | Rev. | **4** | Lang. | **EN** | 1st Issue 24/06/2020 |
|---|---|---|---|---|---|
| Prepared by | **A.A.** | | Checked by | **C.V.C.** | Replaced on |

# REVISION INDEX

| Chapters | Rev | Date | Rev | Date | Rev | Date | Rev | Date | Rev | Date |
|----------|-----|------|-----|------|-----|------|-----|------|-----|------|
| **Index** | 0 | 20/06/2018 | 1 | 05/10/2018 | 2 | 07/02/2019 | 3 | 24/06/2020 | 4 | 01/03/2021 |
| **0** | 0 | 20/06/2018 | | | 2 | 07/02/2019 | | | | |
| **1** | 0 | 20/06/2018 | | | 2 | 07/02/2019 | 3 | 24/06/2020 | | |
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| **6** | 0 | 20/06/2018 | | | | | 3 | 24/06/2020 | 4 | 01/03/2021 |
| **7** | 0 | 20/06/2018 | | | | | 3 | 24/06/2020 | | |
| **8** | 0 | 20/06/2018 | | | | | 3 | 24/06/2020 | | |

| Date | 24/06/2020 | | |
|------|-----------|---|---|
| **Signature** | | | |

# TABLE OF CONTENTS

# 0    INTRODUCTION

## 1  SCOPE OF THE USE AND MAINTENANCE MANUAL

This manual provides the user with general guidelines to use the product safely.

This User Manual is an integral part of the product and provides the following information about the product:

- technical specifications;
- a description of its operation and limits;
- instructions on how to use it under safe conditions;
- instructions on how to perform maintenance and repairs correctly and safely;
- technical support;
- instructions on waste disposal.

## 2  HOW TO READ THIS USER MANUAL

This manual is divided into chapters. Each one of them provides specific information.

### NUMBERING OF THE FIGURES

Each figure is numbered progressively.

### NUMBERING OF THE TABLES

Each table is numbered progressively.

The progressive number starts from 1 at every new paragraph.

### ABBREVIATIONS

Cap.   = Chapter
Par.   = Paragraph
Sec.   = Section
Page   = Page
Fig.   = Figure
Tab.   = Table

# 1   GENERAL INFORMATION

## 1   MANUFACTURER'S IDENTIFICATION DATA

| | |
|---|---|
| **MANUFACTURER** | OBL S.R.L. |
| **REGISTERED HEADQUARTERS AND ADMINISTRATIVE OFFICE** | Via Kennedy 12 - 20090 Segrate (MILAN) ITALY |
| **TELEPHONE NUMBER** | **0039 02 26 91 91** |
| **E-MAIL** | Obl.info@idexcorp.com |

## 2   CE MARKING

Every KIT-PRO product is identified with a CE label indicating its reference data, which are printed indelibly.



| | |
|---|---|
| 1=Product model | 6=Protection rating |
| 2=Power supply voltage | 7=Serial number |
| 3=Maximum current consumption | 8=Month and year of manufacture |
| 4=Power supply frequency | 9=Max power of the motor |
| 5=Maximum power consumption | |

# 3 UL MARKING

Every KIT-PRO UL product is identified with a UL label indicating its reference data, which are printed indelibly.



| 1=Product model | 4=NEMA type |
|---|---|
| 2=Product input data | 5=Manufacturing year and month |
| 3=Product output data | 6=Warnings |

# 4   DECLARATIONS

$$C \, \epsilon$$

## EU DECLARATION OF CONFORMITY (UT5604-0)
### (ANNEX IV, DIR. 2014/35/EU)
### THE MANUFACTURER

| COMPANY NAME | OBL SRL |
|---|---|
| ADDRESS | VIA KENNEDY 12, 20090 Segrate – MILAN - Italy |

## DECLARES THAT THE PRODUCT

| NAME | MODEL |
|---|---|
| KIT PRO | KIT PRO |

## COMPLIES WITH THE FOLLOWING EUROPEAN DIRECTIVES

**DIRECTIVE 2014/35/EU** of the European Parliament and Council, dated 26 February 2014, on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits

**DIRECTIVE 2014/30/EU** of the European Parliament and Council, dated 26 February 2014, on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)



## AND THAT THE FOLLOWING STANDARDS HAVE BEEN APPLIED
### (PARTS/ARTICLES OF HARMONISED STANDARDS)

| EN 61800-5-1 | Adjustable speed power drive systems - Part 5-1: Safety provisions - Electric, thermal, and energy safety |
|---|---|

DATE AND PLACE

*Segrate , 26/06/18*

SIGNATURE

## 5    UL CERTIFICATION

# CERTIFICATE OF COMPLIANCE

| | |
|---|---|
| **Certificate Number** | 20181226-E504591 |
| **Report Reference** | E504591-20181220 |
| **Issue Date** | 2018-DECEMBER-26 |

**Issued to:**  OBL srl
Via Kennedy 12
20090 Segrate MI ITALY

**This certificate confirms that representative samples of**  POWER CONVERSION EQUIPMENT

Enclosed type 4X – Power Conversion Equipment – Motor Drive Model KIT-PRO.

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

**Standard(s) for Safety:**  UL 61800-5-1, Adjustable Speed Electrical Power Drive Systems - Part 5-1: Safety Requirements - Electrical, Thermal and Energy and CSA C22.2 No. 274-17, Adjustable Speed Drives

**Additional Information:**  See the UL Online Certifications Directory at https://iq.ulprospector.com  for additional information.

This *Certificate of Compliance* does not provide authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program
UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

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# 6    TECHNICAL SUPPORT - INFORMATION

This product is guaranteed as stated in the general terms and conditions of sale. Should malfunctions or failures (included within the cases covered by the warranty) be detected during the warranty period, the Manufacturer will repair or replace the defective parts, prior to verification.SAFETY

# 2    SAFETY

## 1    GENERAL SAFETY WARNINGS

The Manufacturer has designed this product to make it as SAFE as possible.

Every OBL KIT PRO is a reliable, quality product, which undergoes careful end inspection to ensure proper operation and ascertain compliance with specified performance.

The Manufacturer of the machine must install the product and comply with all the regulations and safety standards in force in the country of installation.

Attention! When using mains-powered equipment, always follow basic safety precautions, including the following, to reduce damage to people and property:

Carefully read the instructions in this manual before installing/using the device.

Keep these instructions for future use.

## 2    USE RESTRICTIONS

The PRO KIT can be installed only and exclusively on the following pump models:

1. OBL's metering pumps of the Black Line series (M diaphragm version)
2. OBL's metering pumps of the Black Line series (R piston version)
3. OBL's metering pumps of the Black Line series (XRN version)

## 3    ELECTROMAGNETIC COMPATIBILITY

The user is the only responsible for solving problems related to electromagnetic compatibility once the finished product is completely produced. In some cases, the equipment needs to be earthed correctly, while in others a screen may be required. The manufacturer of the KIT PRO is available to help the user solve problems related to electromagnetic compatibility upon request.

# 4  SAFETY

- Carefully read this use and maintenance manual before starting, using, performing maintenance, or any other operation on the equipment.
- Strictly comply with the warnings contained in the manual, whether they indicate danger or caution.
- The operator must meet all the requirements for using this type of machine.
- Always wear personal protective equipment in compliance with the occupational safety regulations in force.
- Before proceeding with the installation, make sure that the area does not feature any dangerous condition. Make sure no foreign bodies have been left inside or on the machine.
- Start the machine start-up sequence following the instructions.
- Do not enter the machine's operating area while the machine is running.
- Do not introduce your hands or anything else near or inside the equipment live parts.
- Do not work in dark conditions. Use all the lights available, making sure they are efficient.
- Do not use the machine when under the influence of medicines or alcohol, as they may impact your capacity of moving and thinking.
- Stay concentrated and use caution before carrying out any operation.
- Always keep the work area clean.
- Warn the maintenance managers about any malfunction of parts or systems on board the machine.
- Do not wear loose clothing, but always accident-prevention clothing.

**<u>NOTE (for UL version)</u>: Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.**

**CSA: INTEGRAL SOLID STATE SHORT CIRCUIT PROTECTION DOES NOT PROVIDE BRANCH CIRCUIT PROTECTION. BRANCH CIRCUIT PROTECTION MUST BE PROVIDED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE, PART I.**

# 5    SAFETY PICTOGRAMS

The device is installed on OBL metering pumps. Pay attention to the safety pictograms on the pumps.

# 3    INSTALLATION

## 1     TRANSPORT AND HANDLING

The KIT-PRO / KIT-PRO UL can be handled manually as it weighs only 5 kg. Always transport the product inside its original packaging.

## 2     STORAGE CONDITIONS

If not used immediately, the KIT-PRO/KIT-PRO UL should be stored with suitable covers in a temperate, dry, clean, vibration-free and weatherproof environment. Protect from soil moisture by placing the unit on shelves or wooden pallets. If the temperature is below 0°C, ensure that it does not go lower than -10°C. If not specifically highlighted on the package, do not stack packaging, to prevent damage to the KIT-PRO and to avoid tipping over or falling that can create accidents. Ensure that access of unauthorized persons is not allowed in the storage location and that the floor or shelf can support the weight of the machinery or equipment stored. Take additional safety measures in the case of storage in extreme conditions, i.e. in sub-tropical or desert climates.

⚠ **Report special storage conditions in advance in order to provide for adequate packaging.**

⚠ **Check the dimensions and overall gross weight of the package before handling or lifting it.**

# 3    POSITIONING

The Black Line 2.0 M and R pumps can be installed on a KIT-PRO, as shown in Figure 1.
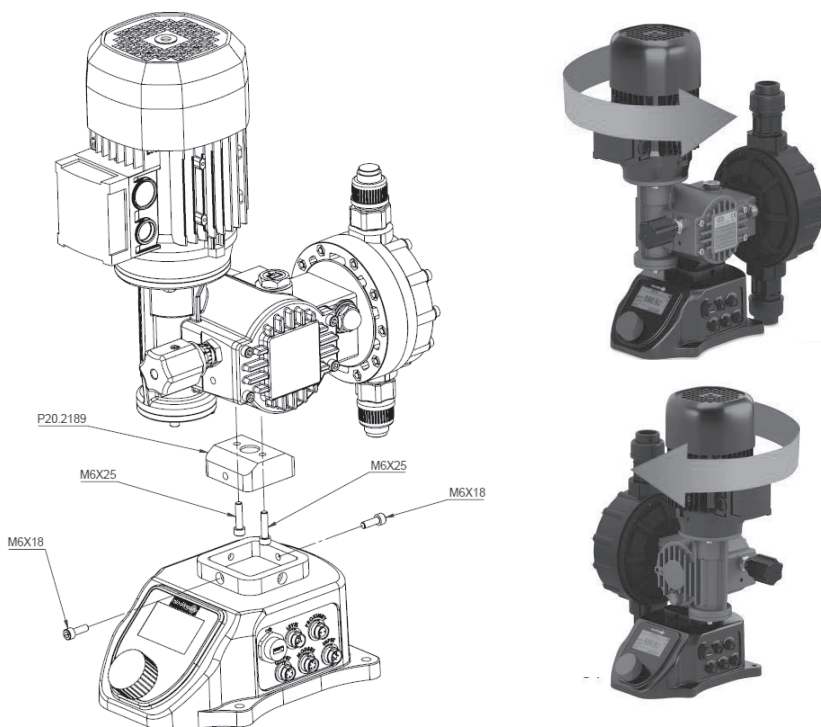


**Figure 1 Installation of the KIT**

Moreover, the orientation of **KIT-PRO / KIT-PRO UL** can be changed from 0 to 90° compared to the pump. To carry out this operation, you just have to:

1. unscrew the 2 screws (M6x18)
2. rotate the pump
3. tighten the 2 screws (M6x18)

# 4    ADJUSTMENTS

See chapter 5 "USE AND SOFTWARE".

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# 5   ASSEMBLY

The KIT PRO /KIT PRO UL can be supplied in two versions:

- Assembled on an OBL metering pump (Black Line series)
- The assembly kit can be assembled and installed on an OBL Black Line 2.0 metering pump (manufactured from May 2017 onwards)

The KIT PRO must be assembled on pumps not installed in a system. **Contact an OBL distributor in the event the OBL pump on which the KIT PRO is to be installed is already operating in a system**.

**The KIT PRO is suitable for all OBL metering pumps of the Black Line series with a standard motor (three-phase power supply 380V/230V/110V 50/60 Hz). Contact an OBL distributor in the event motors with different characteristics are installed.**

Follow the instructions below to assemble the KIT PRO on OBL's Black Line metering pumps:

1. Make sure the motor is not powered
2. Make sure that the OBL metering pump on which the KIT PRO is to be installed is not running.
3. Disassemble the base of the Black Line pump (pos. 117 in the BL2.0 M and R section drawings)
4. Mount connection P20.2189 (Figure 1) using the M6x25 screws.
5. Fasten the KIT PRO to the connection (Figure 1) using the provided M6x18 screws.
6. Disconnect any connection to the electric motor terminal box of the Black Line metering pump.
7. Connect the KIT PRO's output cable to the terminal box of the Black Line pump's motor, making sure that the connection is **delta (230 V)** like the picture on the side. Refer to the use and maintenance manual of the Black Line metering pump, chapter 2 paragraph 6, and chapter 8. In the following table please find the information regarding colour conductors associated to the interconnection of the motor and power supply. The device shall be connected using this information.
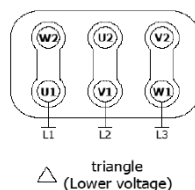
**Table 1 Motor and power supply interconnetions**

| CONNECTOR CABLE GLAND | CONDUCTOR FUNCTION | KIT-PRO CONDUCTOR COLOUR | KIT-PRO UL CONDUCTOR COLOUR |
|---|---|---|---|
| MOTOR | U | Blue or Grey | Red |
| | V | Brown | White |
| | W | Black | Black |
| | GROUND | Yellow/Green | Green |
| POWER | L | Black or brown | Black |
| | N | Blue | White |
| | GROUND | Yellow/Green | Green |

8. KIT-PRO must be fixed to a stable support by tightening the M8 screws into the Ø8.5 holes on the body (Figure 2).
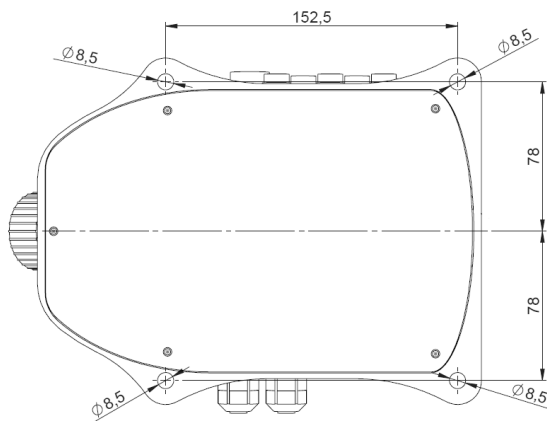


Figure 2 Fastening holes

9. **Before making electrical connections, make sure that the power mains voltage matches the information contained on the KIT PRO /KIT PRO UL data plate.**

# 6    ELECTRICAL CONNECTIONS

### 6.1 Power supply connection

The cable glands should be tightened so that seal rings keep the necessary pressure:

- to prevent transmission of mechanical stress on the motor terminals
- to ensure mechanical protection (IP degree) of the terminal box

**NOTE: Always make the earth connection using the appropriate earth wire on the main power cable.**

**NOTE: In the event of power outage or disconnection, let the screen switch off before reconnecting the power supply.**

**NOTE: For KIT-PRO UL cable glands should be tightened considering the following torques:**

1. **Panel I/O Cable Gland = in-lbs (N-m)= 79.6 (9)**
2. **Power Cable gland: in-lbs (N-m)= 97 (11)**

## 6.2 Signal connection

The KIT PRO has different signal connections, whose name are shown on the enclosure.

The KIT includes the relative connectors, which are provided with a 1-meter cable. The cables supplied feature 4 conductors featuring different colours. The function of the input cables changes depending on the hardware version. Please check the hardware operating on the controller in the menu settings→firmware info→version. The version of the hardware can be 0.1 or 0.2 (from the end of 2020). Table below **Errore. L'origine riferimento non è stata trovata.**shows the connectors needed.

Table 2 Connectors

| CONNECTOR | PIN FUNCTION | KIT-PRO CONDUCTOR COLOUR | KIT-PRO UL CONDUCTOR COLOUR |
|---|---|---|---|
| INPUT (HW 0.1) | Remote Start/Stop (contact) | Yellow | Red |
| | Pulses (contact) | Green | Green |
| | Ground (-) (common for all pins of input connector) | Brown | White |
| | 4-20 mA/0-10V analogue (+) (passive signal: power supply needed) | White | Black |
| INPUT (HW 0.2) | Remote Start/Stop | Yellow | Red |
| | Remote Ground | Green | Green |
| | 4-20 mA/0-10V/pulse (-) (passive signal: power supply needed) | Brown | White |
| | 4-20 mA/0-10V/pulse (+) (passive signal: power supply needed) | White | Black |
| MODBUS | A | Yellow | Red |
| | B | Green | Green |
| | Ground (-) | Brown | White |
| OUTPUT (HW 0.1) | 4-20 mA analog (+) (passive signal: power supply needed) | Yellow | Red |
| | 4-20 mA analog (-) (passive signal: power supply needed) | Brown | White |
| | Relays | Green | Green |
| | Relays | White | Black |
| OUTPUT (HW 0.2) | 4-20 mA analog (+) (active signal: no power supply needed) | Yellow | Red |
| | 4-20 mA analog (-) (active signal: no power supply needed) | Brown | White |
| | Relays | Green | Green |
| | Relays | White | Black |

| | Start | Green | Red |
|---|---|---|---|
| LEVEL | Stop | Yellow | Green |
| | Ground (common for all pins of level connector) | Brown | White |
| USB 2.0 HOST | VBUS | Suitable for the connection of a USB flash drive | Red |
| | D- | | Green |
| | D+ | | White |
| | Ground | | Black |
| Proximity | 0 V | Suitable for the connection of the supplied proximity sensor. | Red |
| | Proximity | | Green |

### 6.3 Connecting the stroke counter sensor (proximity)

The stroke counter sensor Figure 8 is provided with the KIT PRO.

To install it, you just have to:

1. Loosen the oil cap (pos. 119 of the section drawing)
2. Tighten the proximity sensor in the oil cap housing
3. Connect the proximity sensor to the electronics using the appropriate connector

**NOTE:** **The proximity sensor is supplied with a spacer. Use the spacer considering the recommendations hereinafter:**

1. **Install 1 spacer on the M versions with flowrate below 800 l/h models**
2. **Remove it from the R version with flowrate equal or lower than 300 l/h**
3. **Install 2 spacers in case of M and R series with maximum flowrate higher than 800 l/h and 300 l/h respectively. These are the models with 20 mm stroke length.**

**NOTE: Always make the connection using the appropriate connector. Do not use or connect other inductive sensors to the proximity connection. Make all the connections only when the pump is at a standstill.**
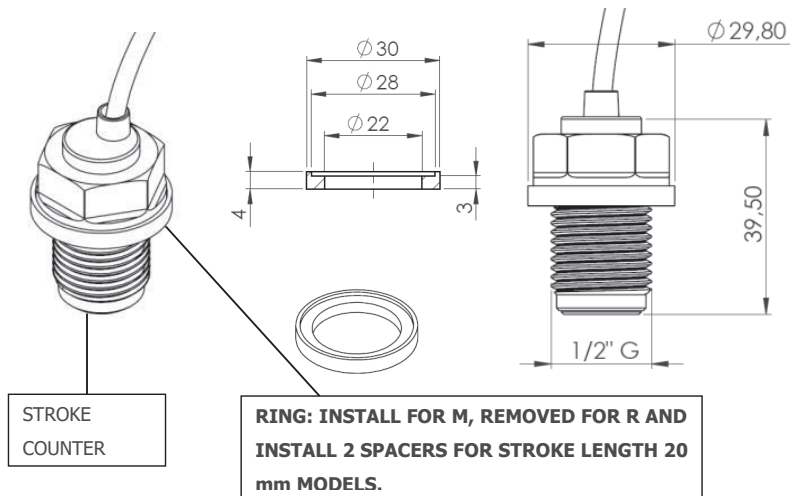
| STROKE COUNTER | RING: INSTALL FOR M, REMOVED FOR R AND INSTALL 2 SPACERS FOR STROKE LENGTH 20 mm MODELS. |

**Figura 3 Proximity and Spacer**

# 4    PRODUCT DESCRIPTION

## 1    OPERATING PRINCIPLE

The KIT PRO is a management and control system for OBL's Black Line metering pumps. The KIT PRO can adjust the flow rate, changing the number of revs of the pump's electric motor. The KIT PRO has different operating modes (cf. chapter 5) to manage the pump's flow rate.

The KIT PRO can receive an input alarm signal from the instruments installed on the metering system, such as the level sensors.

The KIT PRO is provided with a display from where you can see the pump's operating status and enter the flow rate parameters. The different operating statuses of the pumps have different colours:

- Operating mode colour (green, blue, azure, lilac): correct operation
- Yellow: incorrect yet not dangerous operation
- Red: incorrect operation and pump lock

The PRO KIT does not adjust the stroke of the metering pump (cf. Use and maintenance manual of the Line Black pump, chap. 10.2).

The KIT PRO adjusts the ratio between maximum and minimum flow rate provided, as it adds the possibility to vary the number of revs of the electric motor and adjust the pump's stroke. This way, the turndown ratio can be of 500:1.

**NOTE**: The system does not automatically record every adjustment. Therefore, the flow rate and volume indicated by the software may differ from those actually provided, unless a calibration procedure is carried out (Table ) with the new adjustment position.

## 2    MAIN COMPONENTS AND DIMENSIONS

As shown in the following figures, the KIT PRO consists of:

1. 1 enclosure containing the electronic control unit
2. 1 connection
3. 1 proximity sensor
4. 4 connectors with a 1-meter cable



Figure 4 Front view

ELECTRIC MOTOR SUPPLY
3-PHASE (3+PE WIRES)

230 V POWER SUPPLY
(2+PE WIRES)

232

247
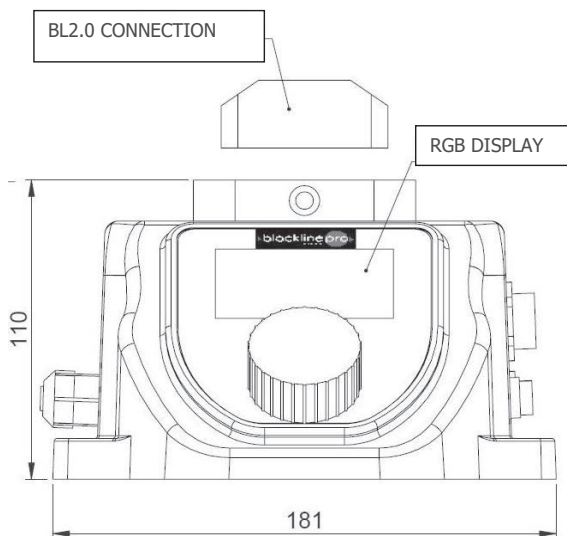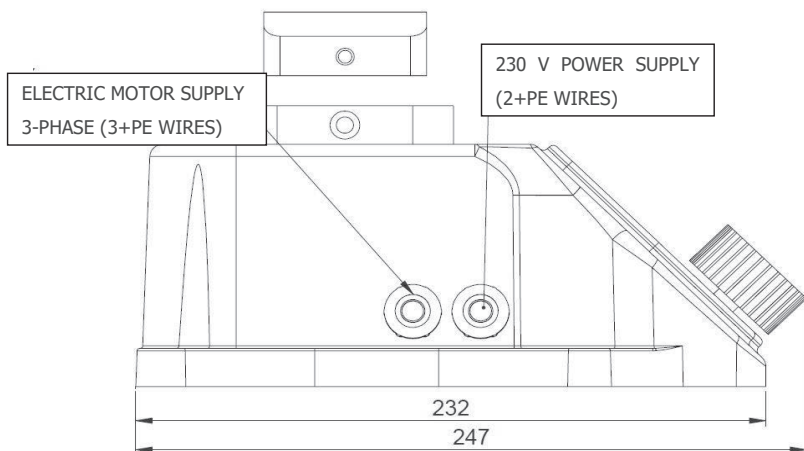
**Figure 5 Side view of the supply lines**

KNOB

BL2.0 CONNECTION

STROKE COUNTER SENSOR

LEVEL

PROXIMITY

OUTPUT

MODBUS

INPUT

INPUT CONNECTOR

USB CONNECTOR

MODBUS CONNECTOR

OUTPUT CONNECTOR

LEVEL CONNECTOR
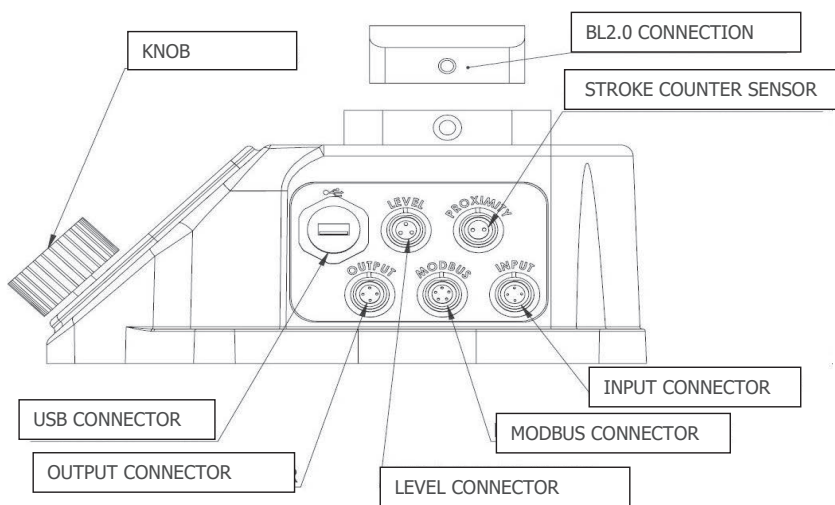
**Figure 6 Side view of the supply lines**

Figure 7 – Layout



STROKE COUNTER

**RING: INSTALL FOR M, REMOVED FOR R AND INSTALL 2 SPACERS FOR STROKE LENGTH 20 MM MODELS.**

Figure 8 stroke counter sensor and ring

# 3    ENVIRONMENTAL CONDITIONS

As for installation, the environmental conditions must match the possible use conditions of OBL's metering pumps, which can be combined with the KIT PRO.

This product shall be used in Pollution degree 2 Environment.

# 4    TECHNICAL DATA

The KIT PRO is suitable for all OBL's metering pumps of the Black Line series with a standard motor (three-phase power supply 230/380V 50 Hz). Contact an OBL distributor in the event motors with different characteristics are installed.

**Table 3- Technical data**

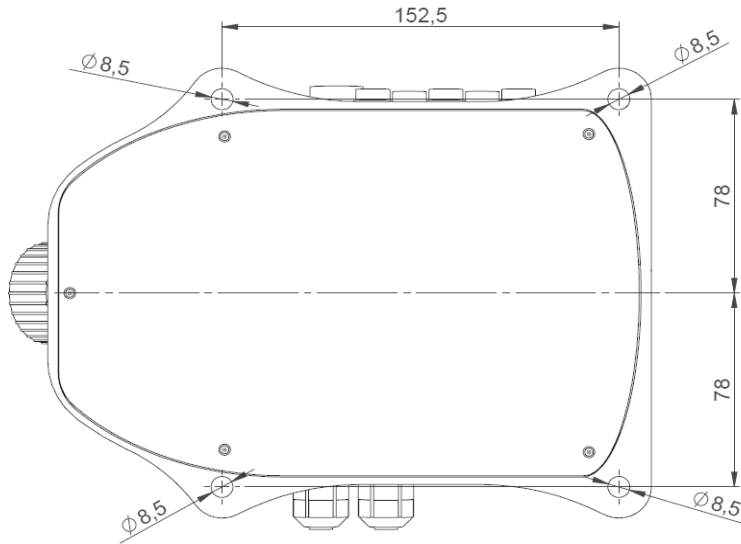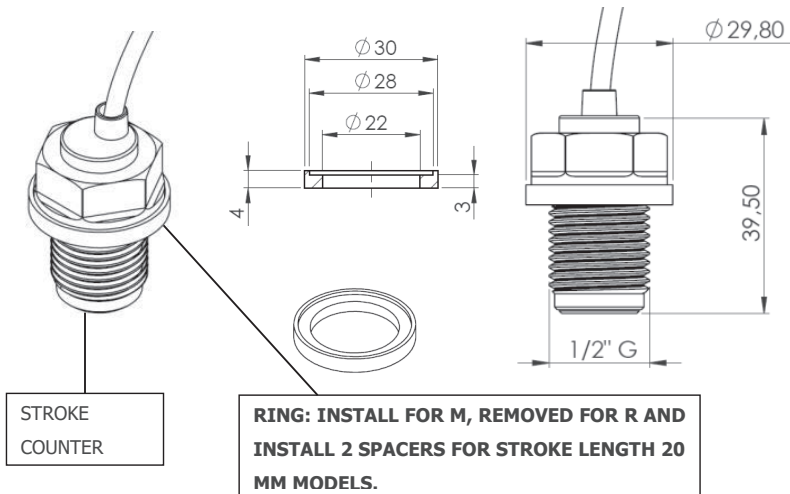| | | | M | R |
|---|---|---|---|---|
| **Mechanical data** | Max. flow rate (@ 1,5 bar) | | 1500 lt/hr | 1050 lt/hr |
| | Max pressure | | 12 bar | 40 bar |
| | Max. stroke frequency | | 155 strokes/min | 114 strokes/min |
| | Max. suction lift | | 1,5 m | 1,5 m |
| | Liquid temperature | | -10°C÷+40°C | -10°÷+90°C |
| | Max. weight | | 28 Kg | 26 Kg |
| | Accuracy | | +/- 3% | |
| | Linearity | | +/- 5% | +/- 3% |
| | Repeatability | | +/- 3% | |
| | Turndown ratio | | 500:1 | |
| | Sound pressure | | 70 dbA | |
| | Materials (actuator, casing, motor) | | Aluminum | |
| | Finishing (actuator, casing) | | Electrophoretic deposition (EPD) | |
| **Electrical data** | Max power consumption | | 1500W | |
| | Max motor power | | 750W | |
| | Max output current | | 3,3 A on 1,9 A off (0,2 s ON 50%) 3A (100%) | |
| | Max input current | | 4.2 A | |
| | Power Supply | | 110 V AC 230 V AC | |
| | Frequency | | 50/60 Hz | |
| | Operating temperature | | -10/40 °C   14/113 °F | |
| | Max inrush current | | 2,3A (110V) 5A (230V) | |
| | Enclosure class (actuator only) | | IP65 | |
| | Recommended fuse | | 6,3 x 32mm 8A | |
| **USB** | Type | | USB 2.0 HOST | |
| **Serial** | MODBUS RTU | | Half Duplex RS-485 | |
| **Input** | 4-20 mA | Max input Voltage /Control input | 14 V DC | |
| | | Impedance | 120 Ω | |
| | 0-10 V | Input Voltage /Control input passive | 10 V DC | |
| | | Impedance | 15 kΩ | |
| | Pulse (PNP) | Voltage Range High Level | Min 19V DC - Max 29 V DC | |
| | | Max resistance in pulse circuit | 15 KΩ | |
| | | Min pulse length | 10ms | |
| | Remote | Max load START/STOP digital input | 28 V DC | |
| | Level | Max load STOP digital input | 28 V DC | |

| | | Max load START digital input | 28 V DC |
|---|---|---|---|
| **Output (HW 0.1)** | 4-20 mA (passive) | Input Voltage /Control input | 48 V DC |
| | Relays | Max load | 24 V DC 3A |
| **Output (HW0.2)** | 4-20 mA (active) | Max Out Voltage | 21 V DC |
| | | Max impedance | 750 Ω |
| | Relays | Max load | 24 V DC 3A |

# 5    USE AND SOFTWARE

## 1  INTERFACE

The user interface consists of an encoder with a knob, which allows you to carry out two operations:

**Table 1 Interface**

| **ROTATION** | Turn the knob to move a selector switch to the required item. Moreover, you can increase or decrease the value of a selected item. |
|---|---|
| **CLICK** | Press the knob to confirm a selected value or access different items of the menu. |

## 2  ICONS

The icons used in the program and relative function are summarised in the following table:

**Table 5 Icons**

| ICON | FUNCTION |
|---|---|
| 🏠 | Main Menu |

| | | |
|---|---|---|
| | ‖ıı. | Statistics |
| | ⠿ | Settings |
| | ⇦ | Previous page |
| | ⏻ | Off |
| | ▶ | Start |
| | ■ | Stop |
| | ⚠ | Alarm |
| | ◙ | Manual adjustment value |
| | ♻ | Operating frequency |
| | ⊓Ո | Flow partialisation |
| | ☒ | Reset |
| | ⛓ | Modbus |

# 3 MENU

## 3.1 Home page



**Figure 9 Home page**

## 3.2 Operating modes

From the home page, click "operating modes" to select the operating mode you need. Each mode features an input screen (Figure 10Figure 11) and an operating screen (Figure 11).
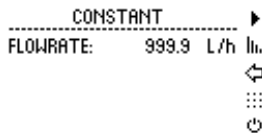


**Figure 10 Input**
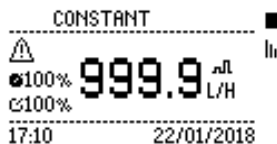


**Figure 11 Operating screen**

You can change the mode operating parameters or carry out operations by using the icons on the right side of every input screen:

1. Start: to start the set mode
2. Statistics (Figure 12): you can view:

    a. The volume provided and the partial resettable activation time (by clicking on the reset icon)

    b. The volume provided and the total non-resettable activation time



STATS
------------------------------------
PARTIAL VOL.    900.00 L
PARTIAL LIFE    00d00h00m

TOTAL VOL.      600.00 L
TOTAL LIFE      00d00h00m

**Figure 12 Statistics**

3. Back: to return to the previous menu
4. Settings: to open the setting menu
5. Off: to set the electronics in standby.

The operating modes available are shown in the following table:

**Table 6 Operating modes**

| Modes | Input parameters | Description |
|---|---|---|
| Constant | FLOW RATE | The pump runs at a constant flow rate |
| Batch | VOLUME<br>FLOW RATE<br>START (MANUAL OR EXTERNAL) | The pump doses the volume of liquid at the set flow rate. Upon manual start, the process is repeated once and then it stops. Upon external start, the pump waits for the signal to start based on the set parameters and waits for a signal to repeat the process again. |
| PPM | PPM<br>CONCENTRATION<br>PULSE/L (L/PULSE)<br>TIMEOUT | When the pump receives an external input signal sending pulses, it doses the liquid based on the liquid concentration value and ppm required at destination. The PULSE/L and L/PULSE parameters allow you to set the characteristics of the meter. The TIMEOUT parameter considers the maximum interval between two subsequent pulses. |
| Percentage | PERCENTAGE<br>CONCENTRATION<br>PULSE/L (L/PULSE)<br>TIMEOUT | When the pump receives an external input signal sending pulses, it doses the liquid based on the concentration value of the liquid and the concentration required at destination (Percentage). The PULSE/L and |

| | | |
|---|---|---|
| | | L/PULSE parameters allow you to set the characteristics of the meter. The TIMEOUT parameter considers the maximum interval between two subsequent pulses. |
| MLQ | MLQ<br>CONCENTRATION<br>PULSE/L (L/PULSE)<br>TIMEOUT | When the pump receives an external input signal sending pulses, it doses the liquid based on the concentration value of the liquid and millimetres per quintal (MLQ) required at destination. The PULSE/L and L/PULSE parameters allow you to set the characteristics of the meter. The TIMEOUT parameter considers the maximum interval between two subsequent pulses. |
| Pulse | MAXIMUM PULSE VALUE/M<br>MINIMUM PULSE VALUE/M<br>MAXIMUM FLOW RATE<br>MINIMUM FLOW RATE<br>TIMEOUT | When the pump receives a pulse input signal, it adjusts the flow rate based on the value of pulses per minute received between the maximum and minimum values. The TIMEOUT parameter considers the maximum interval between two subsequent pulses. |
| Analog mA | MA MAXIMUM VALUE (20 MA)<br>MA MINIMUM VALUE (4 MA)<br>MAXIMUM FLOW RATE<br>MINIMUM FLOW RATE<br>RANGE ALARM | The pump adjusts the flow rate based on an external analog signal and the maximum and minimum values set in the inputs. |
| Analog V | MAXIMUM V VALUE (10 V)<br>MINIMUM V VALUE (0 V)<br>MAXIMUM FLOW RATE<br>MINIMUM FLOW RATE<br>RANGE ALARM | The pump adjusts the flow rate based on an external analog signal and the maximum and minimum values set in the inputs. |
| Pause-work | FLOW RATE<br>OPERATING PERIOD (MIN)<br>PAUSE PERIOD (MIN) | The pump alternates pause periods with constant flow rate operation periods whose duration can be set. |

| Weekly | SET A PROGRAM:<br>• PROGRAM No.<br>• DURATION<br>• START TIME<br>• CONSTANT FLOW RATE<br>• VOLUME<br>• DAYS OF ACTIVITY | This menu allows you to set the data of each program (max 13 programs). You can set the constant flow rate or volume of constant flow rate to be transferred, transfer duration, start time, and days of activity.<br>We recommend not overlapping the programs. |
|  | ACTIVE PROGRAMS | This menu shows the active programs and allows you to activate or deactivate them. |

## 3.3 Partialisation

In the event that the required flow rate is 30% lower than the set flow rate during calibration, the pump starts the partlialisation stage. This stage consists in:

1. Work stage, in which the pump runs at 30%
2. Pause stage

The duration of these two stages are calculated by the firmware so as to obtain the flow rate required.

The minimum flow rate provided is 1% the maximum flow rate. The pump fails to start if this value is not reached.

## 3.4 Settings

The setting menu is shown in Figure 13 and allows you to open all the functions described in Table .
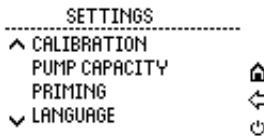


**Figure 13 Settings**

Table 7 Settings

| Modes | Input parameters | Description |
|---|---|---|
| Calibration | TEST DURATION<br>MOTOR POWER<br>MAXIMUM MOTOR PHASE CURRENT<br>MOTOR FREQUENCY | This mode allows you to test the pump's flow rate at the maximum frequency. The pump capacity screen appears at the end of the test. |

| | | Moreover, you can set the test pressure (for test purposes only). Moreover, you can set the motor phase current (depending on the power) so that the system can block the pump once this current value is exceeded (table 8:motor short-circuit alarm). The system saves the date of the last test performed. **NOTE: it is good practice to calibrate the pump every time process conditions change (pressure, manual adjustment value, etc.).** |
|---|---|---|
| Pump capacity | MAXIMUM FLOW RATE<br>TEST VOLUME<br>ADJUSTMENT<br>TEST PRESSURE<br>DATE OF THE LAST TEST PERFORMED | In this screen, you can enter the flow rate or volume obtained during calibration. The maximum flow rate set will never be exceeded in the operating modes. The adjustment value is displayed in the operating screen. |
| Priming | PRIMING TIME | Set the priming time and click start to start the priming function. Press stop to stop the priming function. |
| Languages | IT EN ES FR NL RU DE TU | Select language |
| Password | USER<br>ADMIN | Set the 4-digit password for each user (it blocks the parameter setting of the operating modes) or administrator (it blocks the access to settings). |
| DATE & CLOCK | DATE FORMAT (DD/MM/YY)<br>TIME FORMAT (24/12 H)<br>DATE<br>TIME | You can choose how you want to display the date and time. These data are added to the statistics report. |
| UNIT OF MEASUREMENT | Flow Rate L/h and Gal/h. | Even the volume measurement units are updated accordingly. |
| PROXIMITY | Alarm activation with red display. | The proximity sensor (supplied) verifies the correct operation of the pump. The firmware stops the pump if the number of strokes is equal to 0 |

| | | with active pump. An error is recorded in the report. The error can be reset in the alarm log. |
|---|---|---|
| FIRMWARE INFO | INFO<br>UPDATE FIRMARE<br>EXPORT PARAMETERS<br>IMPORT PARAMETERS<br>EXPORT LOG<br>DELETE LOG<br>RESTORE TO FACTORY SETTINGS | This screen allows you to interface with the USB port, through which you can update the software, import and export parameters, export and delete reports, check the software version, and restore the default settings of the system. Export the report before updating the software so as not to erase the log file from the system. |
| MODBUS | MODBUS (YES/NO)<br>BAUD RATE<br>ADDRESS | This setting allows you to control the pump in Modbus. |
| ANALOG OUTPUT | OUTPUT | Possibility to activate the output of a proportional analog signal at the operating frequency. |
| RELAY | OUTPUT (OFF / START/STOP / ALARM)<br>CONTACT (N.O. /N.C.) | This function allows you to use the relay with a N.O. or N.C. contact. The output signal indicates the pump's status (ON/OFF) or the presence of an alarm. |
| DISPLAY | MENU' LIGHT (ON/OFF)<br>WORKING COLOUR (GREEN, PINK, BLUE, AZURE)<br>CONTRAST (0-100%) | Display settings: backlight activation while browsing the menus, colour selection in operating modes, contrast. |
| LEVEL | STOP (YES/NO)<br>CONTACT (N.O./N.C.)<br>RED ALARM DISPLAY (YES/NO)<br>START (YES/NO)<br>CONTACT (N.O./N.C.) | Setting for starting or stopping the pump remotely (usually from a level sensor). You can also decide whether to activate the red display with the pump at a standstill. This setting uses the two pins on the level connector. |
| REMOTE START/STOP | START/STOP (YES/NO)<br>CONTACT (N.O./N.C.) | Setting for starting or stopping the pump remotely. One single pin is used in this case. The pump starts when the contact is closed and |

| | | blocks when the contact is open (or vice-versa, depending on the N.O. or N.C. contact). |
|---|---|---|
| OVERFLOW | ALARM (YES/NO) LIGHT ALARM (YES/NO) STOP OR WORK | In PPM, MLQ, and Percentage modes, you can activate an alarm (overflow) to block (STOP) or run (WORK) the pump if the flow rate calculation exceeds the flow rate set during the calibration stage. |

## 3.5  Alarm log

The alarm log contains all the triggered alarms. Select the reset icon to reset an alarm.

```
       ALARM REGISTER
----------------------------------
PR014 - 24/05/18 - 18:20
```

The alarms are summarised in Table .

**Table 8 Alarms**

| ALARM CODE | ALARM TYPE | DESCRIPTION | CAUSE | VISUAL FEEDBACK (SCREEN) |
|---|---|---|---|---|
| TOU01 | ELECTRONICS HARDWARE | TIMEOUT | Failed communication between two microcontrollers | FLASHING RED |
| CUR02 | ELECTRONICS HARDWARE | OVER CURRENT | The motor current exceeds the limit | |
| TEM03 | ELECTRONICS HARDWARE | OVER TEMPERATURE | The temperature exceeds the board limits. | |
| OVB04 | ELECTRONICS HARDWARE | OVER BUS | Voltage exceeds the sheet limits | |
| INR05 | ELECTRONICS HARDWARE | INRUSH | Inrush relays broken | |
| TRI06 | MOTOR HARDWARE | TRIP | Motor short circuit | |
| PRO07 | FUNCTIONAL | PROXIMITY | Motor or Pump block | |
| DFL08 | FIRMWARE | DATA FLASH | Data setting error | FLASHING |

| | | | | |
|---|---|---|---|---|
| EFL09 | FIRMWARE | EXT FLASH | Log write error and FW update error | YELLOW |
| RTC10 | ELECTRONICS HARDWARE | RTC | Clock error upon power-on (the clock is set to a non-admitted time). Flat battery. | |
| LOG11 | FIRMWARE | LOG | Error in recording the file log | |
| LVL12 | PROCESS | LEVEL | STOP input of the level sensor | FIXED RED |
| OVR13 | PROCESS | OVERFLOW | Overflow alarm | FIXED RED OR FIXED YELLOW |
| RMT14 | PROCESS | REMOTE STOP | Alarm resulting from remote stop | FIXED RED |
| AMA15 | PROCESS | ANALOG mA | Input current beyond the range set in the analog mA mode. | FIXED RED |
| AVA16 | PROCESS | ANALOG V | Input voltage beyond the range set in the analog V mode. | FIXED RED |
| UVG17 UVB18 | ELECTRONICS HARDWARE | | Power supply voltage too low. | |

## 3.6  Analog Mode Calibration Procedure

The scope of the following procedure is to calibrate analog output and input mA signal to let the pump recognize 4 mA and 20 mA. When the measured value by PRO KIT is quite different from the input value (at least 0,3 mA difference), this procedure will help the accuracy of 4-20 mA signal.

**Disable Analog Output**

The first operation to be accomplished is to disable analog mA output:

1) Go to the menu "settings→Analog output"
2) Set the analog output to "NO" clicking on it

---

**Figure 14**

**Loop installation**

To the signal, the items required are:

Analog input:

1) Power loop (max 14 Vdc voltage in parallel on the pins)
2) Multimeter to measure 4-20 mA

Analog output:

3) Power loop (max 48 Vdc)
4) Multimeter to measure 4-20 mA

The loop must be connected to PRO according to the cables table described in the manual.

The multimeter shall be connected in series to close the loop and measure current. Please refer to multimeter manual for connection specifications.

**Calibration**

To calibrate the analog signal the necessary operations are the followings:

1) Power up the loop for analog input signal.
2) Go to the menu "setting→calibration"
3) Click the handwheel for 10 sec until will appear 3 new fields
   a. Analog ma
   b. Analog V
   c. Analog Output
4) Click on analog input
5) A window with 2 values "4 mA" and "20 mA" will appear and a value on the bottom of the screen is proportional to the input current.
6) To calibrate 4 mA input signal:
   a. Set current input at 4 mA.
   b. Click on 4 mA (1100 as default)
   c. Change the value
   d. The value the bottom of the screen will change.
   e. Change the value close to 4 mA to reach the value at the bottom of the screen.
7) To calibrate 20 mA input signal:

---

a. Set current input to 20 mA.
b. Click on 20 mA (2300 as default)
c. Change the value
d. The value of current at the bottom of the screen will change.
e. Change the value close to 4 mA to reach the value at the bottom of the screen.
8) Click on the down arrow to memorize the calibrated value. (do not push the left arrow otherwise you have to calibrate 4 mA and 20 mA newly).
9) Confirm the selection and go back to the previous menu.
10) Click on analog output (if needed)



**Figure 15**

11) A window with 2 values "4 mA" and "20 mA" will appear.



**Figure 16**

12) To calibrate 4 mA signal:
   a. click on 4 mA (1100 in the picture above)
   b. change the value
   c. the value of current measured by the multimeter shall change
   d. Change the value until the multimeter will measure the desired 4 mA
13) To calibrate 20 mA signal:
   a. click on 20 mA (2300 in the picture above)
   b. change the value
   c. the value of current measured by the multimeter shall change
   d. Change the value until the multimeter will measure the desired 20 mA

14) Click on the down arrow to memorize the calibrated value. (do not push the left arrow otherwise you have to calibrate 4 mA and 20 mA newly).



**Figure 17**

15) Confirm the selection.

## 3.7 Modbus

**Table 9 Modbus Specification**

| MODBUS SPECIFICATION | |
|---|---|
| Serial interface | RS 485 half duplex |
| Protocol | MODBUS-RTU |
| Baud rate | 2400-4800-9600-19200-38400-57600-115200 bps |
| Start bit | 1 |
| Data lenght | 8 bit |
| Parity bit | N. A. |
| Stop bit | 1 |
| Cyclic Redundancy Check (CRC) | CRC-16 |
| ID slave address | 1 to 247 |
| Modbus paramerters registers | Da 40001 a 40058 |

| Modbus commands registers | Da 41001 a 41016 |
|---|---|
| Registers that can be read with 1 command | 58 |
| Registers that can be written with 1 command | 58 |
| Function Codes | 03 ( 03 hex ) – read holding register |
|  | 16 ( 10 hex ) – preset multiple holding register |
| Exclusion Codes | 01 ( 01 hex ) – illegal function |
|  | 02 ( 02 hex ) – illegal data value |
|  | 03 ( 03 hex ) – illegal data address |
|  | 07 ( 07 hex ) – NAK |

The user can activate MODBUS functionality in settings menu.
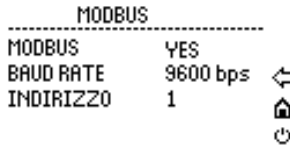


**Figure 18 Modbus settings**

In MODBUS window, the user can:

1. activate MODBUS (YES/NO)
2. set the baud rate (2400-4800-9600-19200-38400-57600-115200 bps ).
3. set the slave device address

When MODBUS is active, the user can locally do the following operations:

1. When the motor is ON
   a. To stop the pump (selecting STOP icon)
   b. To display statistics
2. When the motor is OFF:
   a. To navigate in the menu
   b. It is not possible to start up the motor. The user has to turn off MODBUS mode to start up the motor.

When MODBUS is active, an icon will appear on the right corner of all windows of the firmware.
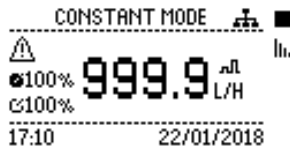


**Figure 19 Modbus operating mode**

**COMMUNICATION EXAMPLE**

Black Line PRO can communicate with a PLC using MODBUS interface.

Examples of communications are described hereinafter:

1. Read Holding Registers (Function Code 03)
   a. Request:

This command is requesting the content of holding registers 40024 to 40025 from the slave device with address 01.

```
01 03 0017 0002 740F
```

01:          Slave Address (01 hex)

03:          Function Code (Read holding registers)

0017:        The Data Address of the first register requested. (40024 - 40001 = 17 hex)

0002:        The total number of registers requested. (read 2 registers 40024 to 40025)

740F:        CRC (cyclic redundancy check) for error checking.

b. Response:

```
01 03 04 003C 003C 3A2E
```

01:          Slave Address (01 hex)

03:          Function Code (Read holding registers)

04:          The number of data bytes to follow (2 registers x 2 bytes each = 4 bytes)

003C:        The contents of register 40024

003C:        The contents of register 40025

3A2E:        The CRC (cyclic redundancy check).

2. Preset Multiple Registers (FC=16)

    a. Request

This command is writing the contents of two holding registers 41003 and 41004 to the slave device with address 01.

```
01 10 03EA 0002 04 0000 0000 6968
```

01:          The Slave Address (01 hex)

10:          The Function Code (Preset Multiple Registers)

03EA:        The Data Address of the first register. (41003 - 40001 = 03EA hex)

0002:        The number of registers to write

04:          The number of data bytes to follow (2 registers x 2 bytes each = 4 bytes)

0000:        The value to write to register 41003

0000:        The value to write to register 41004

6968:        The CRC (cyclic redundancy check) for error checking.

b. Response

```
01 10 03EA 0002 6078
```

01:          The Slave Address (01 hex)

10:          The Function Code (Preset Multiple Registers)

03EA:        The Data Address of the first register. (41003 - 40001 = 03EA hex)

0002:        The number of registers written.

6078:        The CRC (cyclic redundancy check) for error checking.

---

3. Read Holding Registers (FC=03) ERROR
    a. Request
        ▪ This command is requesting the content of analog output holding registers 40100 (register out of range) from the slave device with address
        ▪ `01 03 9CA3 0001 5A78`
    b. Response
        ▪ `01 83 02 C0F1`

        `01:`   The Slave Address (01 hex)

        `83:`   The Function Code (Preset Multiple Registers) with 1 to MSB

        `02:`   error code (illegal data address)

        `C0F1:`   The CRC (cyclic redundancy check) for error checking.

**MODBUS LIST**

The list of the registers and parameters that the user can write/read using Modbus is described in the following table:

**Table 10 Modbus list**

| Nr. Reg. | PAR. | TYPE MOTOR OFF | TYPE MOTOR ON | BYTE | Min value | Max value | Default | U.M. | Description |
|---|---|---|---|---|---|---|---|---|---|
| 40001 | M_TIME_S | W/R | R | 2 | 1 | 120 | 60 | s | Calibration time - calibration settings |
| 40002 | M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h or Gal/h)*10 | Max flowrate - pump capacity settings |
| 40003 | M_PERC | W/R | R | 2 | 1 | 100 | 50 | % | Adjustment % - pump capacity settings |
| 40004 | M_L_PULSE | W/R | R | 2 | 1 | 2000 | 200 | L/p or p/L | L/pulse o pulse/L |
| 40005 | | W/R | R | 2 | 0 | 5 | 1 | | Languages<br>Value 0= Italian<br>Value 1=English<br>Value 2=Spanish<br>Value 3=Dutch<br>Value 4=Russian<br>Value 5=French |
| 40006 | M_FDATE | W/R | R | 2 | 0 | 2 | 0 | | Date Format<br>Value 0=DD/MM/YY<br>Value 1=MM/DD/YY<br>Value 2=YY/MM/DD |
| 40007 | M_24H | W/R | R | 2 | 0 | 1 | 0 | | Time Format<br>Value 0=24h<br>Value 1=12 h |
| 40008 | M_UNIT_LH | W/R | R | 2 | 0 | 1 | 0 | | Unit of measure<br>Value 0=L/h<br>Value 1=Gal/h |
| 40009 | M_YES_NO | W/R | R | 2 | 0 | 1 | 1 | | Proximity red alarm<br>Value 0=No<br>Value 1=Yes |

| 40010 | M_YES_NO | R | R | 2 | 0 | 1 | 0 | | MODBUS activation<br>Value 0=No<br>Value 1=Yes |
|-------|----------|-----|---|---|---|-----|------|----|------------------|
| 40011 | M_YES_NO | W/R | R | 2 | 0 | 1 | 1 | | Analog output<br>Value 0=No<br>Value 1=Yes |
| 40012 | M_RELAY | W/R | R | 2 | 0 | 1 | 1 | | Relay output activation<br>Value 0=Off<br>Value 1=START/STOP<br>Value 2=Alarm |
| 40013 | M_COLOR | W/R | R | 2 | 1 | 5 | 2 | | Display color<br>Value 1=Display OFF<br>Value 2=Green<br>Value 3=Pink<br>Value 4=Light blue<br>Value 5=Blue |
| 40014 | M_PERC | W/R | R | 2 | 0 | 100 | 50 | % | Display contrast |
| 40015 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | Red alarm display level and remote control<br>Value 0=No<br>Value 1=Yes |
| 40016 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | Red alarm display overflow<br>Value 0=No<br>Value 1=Yes |
| 40017 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | START/STOP remote control alarm<br>Value 0=No<br>Value 1=Yes |
| 40018 | M_CONTACT | W/R | R | 2 | 0 | 1 | 0 | | Remote control contact<br>Value 0=NO<br>Value 1=NC |
| 40019 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | Red alarm display overflow<br>Value 0=No<br>Value 1=Yes |
| 40020 | M_STOP_WORK | W/R | R | 2 | 0 | 1 | 0 | | STOP/WORK overflow settings<br>Value 0=STOP<br>Value 1=WORK |
| 40021 | M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Flowrate constant mode |
| 40022 | M_VOLUME_INT | W/R | R | 2 | 1 | 65535 | 1000 | L o Gal | Volume batch mode |
| 40023 | M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Flowrate batch mode |
| 40024 | M_MINUTE | W/R | R | 2 | 1 | 255 | 60 | min | Working time pause-work mode |
| 40025 | M_MINUTE | W/R | R | 2 | 1 | 255 | 60 | min | Pausetime pause-work mode |
| 40026 | DIP_MIN | W/R | R | 2 | 5 | 20 | 20 | mA | High value current 4-20 mA analog mA |
| 40027 | DIP_MAX | W/R | R | 2 | 4 | 20 | 4 | mA | Low value current 4-20 mA analog |

| | | | | | | | | | mA |
|---|---|---|---|---|---|---|---|---|---|
| 40028 | DIP_MIN M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Max flowrate analog mA mode |
| 40029 | DIP_MAX M_FLOW | W/R | R | 2 | 0 | 9999 | 0 | (L/h o Gal/h)*10 | Min flowrate analog mA mode |
| 40030 | DIP_MIN | W/R | R | 2 | 1 | 10 | 10 | V | High value voltage 0-10 V analog V mode |
| 40031 | DIP_MAX | W/R | R | 2 | 0 | 10 | 0 | V | Low value voltage 0-10 V analog V mode |
| 40032 | DIP_MIN M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Max flowrate analog V mode |
| 40033 | DIP_MAX M_FLOW | W/R | R | 2 | 0 | 9999 | 0 | (L/h o Gal/h)*10 | Min flowrate analog V mode |
| 40034 | M_U16 | W/R | R | 2 | 1 | 65535 | 100 | PPM | PPM desired in the tank PPM mode |
| 40035 | M_PERC | W/R | R | 2 | 1 | 100 | 100 | % | Concentration dosed fluid PPM mode |
| 40036 | M_PERC | W/R | R | 2 | 1 | 100 | 100 | % | Concentration in the tank percentage mode |
| 40037 | M_PERC | W/R | R | 2 | 1 | 100 | 100 | % | Concentration dosed fluid percentage mode |
| 40038 | M_U16 | W/R | R | 2 | 1 | 1000 | 100 | MLQ | MLQ desired in the tank MLQ mode |
| 40039 | M_PERC | W/R | R | 2 | 1 | 100 | 100 | % | Concentration dosed fluid MLQ mode |
| 40040 | DIP_MIN M_P_M | W/R | R | 2 | 2 | 1000 | 2 | p/m | High value pules p/m pulse mode |
| 40041 | DIP_MAX M_P_M | W/R | R | 2 | 1 | 1000 | 1 | p/m | Low value pules p/m pulse mode |
| 40042 | DIP_MIN M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Max flowrate pulse mode |
| 40043 | DIP_MAX M_FLOW | W/R | R | 2 | 0 | 9999 | 0 | (L/h o Gal/h)*10 | Min flowrate pulse mode |
| 40044 | M_PRESSURE | W/R | R | 2 | 1 | 300 | 1 | Bar | Calibration pressure – calibration window |
| 40045 | M_TYPE_START | W/R | R | 2 | 0 | 1 | 0 | | Batch start Value 0=manual Value 1=external |
| 40046 | M_FLOW | W/R | R | 2 | 1 | 9999 | 600 | (L/h o Gal/h)*10 | Flowrate pause work mode |
| 40047 | M_CONTACT | W/R | R | 2 | 0 | 1 | 0 | | Contact output relay Value 0=NO Value 1=NC |
| 40048 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | Level START contact activation Value 0=No Value 1=Yes |
| 40049 | M_YES_NO | W/R | R | 2 | 0 | 1 | 0 | | Level STOP contact activation |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Value 0=No |
| | | | | | | | | | Value 1=Yes |
| 40050 | M_CONTACT | W/R | R | 2 | 0 | 1 | 0 | | Level START contact |
| | | | | | | | | | Value 0=NO |
| | | | | | | | | | Value 1=NC |
| 40051 | M_CONTACT | W/R | R | 2 | 0 | 1 | 0 | | Level STOP contact |
| | | | | | | | | | Value 0=NO |
| | | | | | | | | | Value 1=NC |
| 40052 | M_YES_NO | W/R | R | 2 | 0 | 1 | 1 | | Menù light |
| | | | | | | | | | Value 0=No |
| | | | | | | | | | Value 1=Si |
| 40053 | M_BAUD | R | R | 2 | 0 | 6 | 0 | | Baudrate MODBUS |
| | | | | | | | | | Value 0=2400 |
| | | | | | | | | | Value 1=4800 |
| | | | | | | | | | Value 2=Verde |
| | | | | | | | | | Value 3=Rosa |
| | | | | | | | | | Value 4=Azzurro |
| | | | | | | | | | Value 5=Blu |
| 40054 | M_TIME_S | W/R | R | 2 | 1 | 120 | 120 | s | Pulses time out in pulse mode, PPM mode, concentration mode e MLQ mode |
| 40055 | M_AMPERE | W/R | R | 2 | 10 | 35 | 20 | | Motor current calibration window |
| 40056 | M_50_60Hz | W/R | R | 2 | 0 | 1 | 0 | | 50/60 Hz |
| 40057 | M_LP_PL | W/R | R | 2 | 0 | 1 | 0 | | L/pulse pulse/L in PPM, MLQ e percentage modes |
| 40058 | M_U8 | R | R | 2 | 1 | 247 | 1 | | MODBUS ID |
| 41001 | OPERATING MODE | W/R | W/R | 2 | 1 | 10 | 1 | uint16 | Operating modes |
| | | | | | | | | | Value 1=Constant |
| | | | | | | | | | Value 2=Batch |
| | | | | | | | | | Value 3=Pause-work |
| | | | | | | | | | Value 4=Weekly |
| | | | | | | | | | Value 5=Analog mA |
| | | | | | | | | | Value 6=Analog V |
| | | | | | | | | | Value 7=PPM |
| | | | | | | | | | Value 8=Percentage |
| | | | | | | | | | Value 9=MLQ |
| | | | | | | | | | Value 10=Pulse |
| 41002 | START-STOP | W/R | W/R | 2 | 0 | 2 | 0 | uint16 | Starting motor |
| | | | | | | | | | Value 0=Stop |
| | | | | | | | | | Value 1=Start |
| | | | | | | | | | Value 2=Standby |
| 41003 | ALARMS | W/R | W/R | 4 | This value can be written only to 0 | | | uint3 | These registers inform the user about alarms according to the position of the bit |
| 41004 | | | | | | | | | BIT 0    "UVG17",//UNDER  BUS GO |
| | | | | | | | | | BIT 1    "UVB18",//UNDER  BUS GO |
| | | | | | | | | | BIT 2    "TOU01",//TIME OUT |

| | | | | | BIT 3 | "CUR02",//OVER CURRENT |
|---|---|---|---|---|---|---|
| | | | | | BIT 4 | "TEM03",//OVER TEMPERATURE |
| | | | | | BIT 5 | "OVB04",//OVER BUS |
| | | | | | BIT 6 | "INR05",//INRUSH |
| | | | | | BIT 7 | "TRI06",//TRIP |
| | | | | | BIT 8 | "PRO07",//PROXIMITY |
| | | | | | BIT 9 | "DFL08",//DATA FLASH |
| | | | | | BIT 10 | "EFL09",//EXT FLASH |
| | | | | | BIT 11 | "RTC10",//RTC |
| | | | | | BIT 12 | "LOG11",//LOG |
| | | | | | BIT 13 | "LVL12",//STOP LEVEL |
| | | | | | BIT 14 | "OVR13",//OVERFLOW |
| | | | | | BIT 15 | "RMT14",//REMOTE |
| | | | | | BIT 16 | "AMA15",//ANALOG mA |
| | | | | | BIT 17 | "AVA16",//ANALOG V |
| 41005 | PARTIAL LIFE | W/R | W/R | 4 | This value can be written only to 0 | minutes | Durata della vita parziale della pompa. Scrivendo a zero il registro si resetta questo valore nel firmware. |
| 41006 | | | | | | | |
| 41007 | PARTIAL VOLUME L | W/R | W/R | 4 | This value can be written only to 0 | L*100 | Volume parziale in litri erogato dalla pompa. Scrivendo a zero il registro si resetta questo valore nel firmware. |
| 41008 | | | | | | | |
| 41009 | PARTIAL VOLUME Gal | W/R | W/R | 4 | This value can be written only to 0 | Gal*100 | Volume parziale in galloni erogato dalla pompa. Scrivendo a zero il registro si resetta questo valore nel firmware. |
| 41010 | | | | | | | |
| 41011 | ADJUSTMENT | R | R | 2 | | | % | Adjustment |
| 41012 | MOTOR | R | R | 2 | | | % | Frequency % of the motor |
| 41013 | FLOW/VOL. | R | R | 4 | LSB | | float | Flowrate or volume displayed on the screen |
| 41014 | | | | | MSB | | | |
| 41015 | INFO | R | R | 4 | LSB | | float | Sec, mA, V, flowrate, input, p/m displayed on the screen |
| 41016 | | | | | MSB | | | |

# 6    MAINTENANCE

## 1    ROUTINE MAINTENANCE

Routine maintenance includes operations that are carried out based on the operator's common sense, without following a strict schedule.

⚠ HAZARD

Do not carry out routine maintenance operations on mains-powered equipment.

Routine maintenance operations carried out by the user:

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- Cleaning

Frequently clean the pump. Dirt and residues must not cover the adjustments or the interface screen.

## 2 TROUBLESHOOTING

To make a self-diagnosis of the product, see subchapter "Alarm log".

Contact the manufacturer if you detect defects and/or malfunctions that are not described in this manual.

# 7   ACCESSORIES AND SPARE PARTS

## 1   ASSISTANCE

Contact the manufacturer for any information relative to installation, use, and maintenance of the product.

For the sake of clarity, the client must always refer to this manual and the instructions listed.

## 2   SPARE PARTS

> **ALWAYS USE ORIGINAL SPARE PARTS.**
>
> **FOR ANY SPARE PART, CONTACT THE MANUFACTURER.**

The following spare parts are available for the KIT PRO:

**Table 11 Spare parts**

| Spare part kit code | Description | KIT component code | Description |
|---|---|---|---|
| KME60 | Connection cables (4 pieces) | KME60 | Connection cables (4 pieces) |
| KPRA08 | Proximity sensor | KPRA08 | Proximity sensor |
| KKPRO | Spare part kit for routine maintenance | P20.2189 | Pump connection |
| | | KMV150 | Knob |
| | | P20.2193 | Front label |

We do not recommend using non-original spare parts. If you decide to use them, all the Warranty terms and conditions, if still valid, will be void and null and the Manufacturer will not be held responsible for any damage to people and/or property.

# 8 ADDITIONAL INSTRUCTIONS

## 1 DECOMMISSIONING AND DISASSEMBLY

It is the user's responsibility to comply with the procedures and regulations in the countries of operation, regarding disposing of waste resulting from maintenance (consumption material) or the demolition of equipment.

"Waste" is intended as any substance or object which the holder has decided to or is required to discard. Waste is classified according to the origin, in "urban waste" and "special waste" and, according to harmfulness, in "hazardous waste" and "non-hazardous waste".

⚠ Maintenance or demolition pump waste are classified as "special waste" only if properly cleaned. Otherwise, they are to be considered "HAZARDOUS special waste".

⚠ "Special waste" and "urban waste", and especially "hazardous" and "non-hazardous" waste, must never be mixed."

Briefly summarising:

- "special waste" must not be disposed of as "urban waste"
- this waste must be collected separately using public or private collection systems required by local laws (in an approved collection centre)
- due to its use, this equipment may contain hazardous substances. Improper disposal can have adverse effects on human health and the environment.
- administrative sanctions exist in the case of improper disposal of or abuse of waste

⚠ Disposal of substances into sewers or abandoning waste in the environment is strictly prohibited. Contact your local waste disposal service to receive adequate and accurate information regarding disposal.

# NOTE

# NOTE

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