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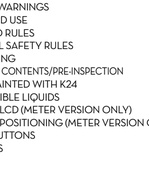
1 MACHINE AND MANUFACTURER IDENTIFICATION

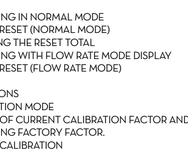
AVAILABLE MODELS:
- K24-UL M/F 1" NDT
- K24-UL M/F 1" BSP
- K24-UL M/F 1" NPT PULSER
- K24-UL M/F 1" BSP PULSER

MANUFACTURER: PIUSI S.p.A. , Via Pacinotti 16/A – z.i. Rangavino 46029 Suzzara - (MN) (Italy)

METER VERSION



PULSER VERSION



1.1 STANDARD USED FOR EVALUATION

UL 913 Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations, Eighth Edition, Revision date 2015-10-16

UL 61010-1 SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - PART 1: GENERAL REQUIREMENTS- Edition 3 - Revision Date 2016/04/29

Standard CSA C22.2 NO. 60079-0:15 EXPLOSIVE ATMOSPHERES – PART 0: EQUIPMENT – GENERAL REQUIREMENTS, THIRD Edition, UPDATE No. 1:April 2018

Standard CSA C22.2 NO. 60079-11:14 EXPLOSIVE ATMOSPHERES – PART 11: EQUIPMENT PROTECTION BY INTRINSIC SAFETY "I" - SECOND EDITION

CSA C22.2 NO. 61010-1-12 SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - PART 1: GENERAL REQUIREMENTS - THIRD EDITION, UPDATE NO. 1, JULY 2015, UPDATE NO. 2: APRIL 2016 SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - PART 1: GENERAL REQUIREMENTS - Edition 3 - Revision Date 2016/04/01

2 GENERAL WARNINGS

Important precautions To ensure operator safety and to protect the meter from potential damage, workers must be fully acquainted with this instruction manual before performing any operation.

Symbols used in the manual The following symbols will be used throughout the manual to highlight safety information and precautions of particular importance:

WARNING **WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury**

NOTICE **NOTICE is used to address pratices not related to personal injury**

Manual preservation This manual should be complete and legible throughout. It should remain available to end users and specialist installation and maintenance technicians for consultation at any time.

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WARNING **Installation, assembly and maintenance operations of the K24, must only be performed by personnel qualified to operate in HAZARDOUS LOCATIONS ZONE1.**
BEFORE PROCEEDING WITH THE REFUELLING OF THE AIRCRAFT, ENSURE THAT THE SYSTEM INTENDED FOR SUCH ACTION COMPLIES WITH THE REGULATIONS IN FORCE IN THE COUNTRY OF USE
Stop operation immediately if static sparking occurs or if you feel a shock. Do not use equipment until you identify and correct the problem.
Keep a working fire extinguisher in the work area.
Do not operate the unit when fatigued or under the influence of drugs or alcohol.
Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
Keep children and animals away from work area.
Comply with all applicable safety regulations.

3 SAFETY INSTRUCTIONS

3.1 SAFETY WARNINGS

WARNING **Mains - preliminary checks before installation**
You must avoid any contact between the electrical power supply and the fluid that needs to be FILTERED.

MAINTENANCE CONTROL
Before any checks or maintenance work are carried out, disconnect the power source.

FOR YOUR SAFETY, REVIEW THE MAJOR WARNINGS AND CAUTIONS BELOW BEFORE OPERATING YOUR METER
When metering flammable liquids, observe precautions against fire or explosion
When handling hazardous liquids, always follow the liquid manufacturer's safety precautions
Always dispose of used cleaning solvents in a safe manner according to the solvent manufacturer's instructions.
During meter removal, liquid may spill. Follow the liquid manufacturer's safety precautions to clean up minor spills
Do not blow compressed air through the meter
Do not allow liquids to dry inside the meter
Use only liquids permitted

3.2 INTENDED USE

WARNING **THE DETERMINATION OF THE AREAS (ZONES) IS TO BE CARRIED OUT BY THE USER**

INTENDED USE **Using the appliance for fluids other than those listed at paragraph "COMPATIBLE LIQUIDS" and for uses other than those described at the item "authorised use" is forbidden.**

FORBIDDEN USE

PLANT OPERATION RESTRICTIONS IT IS FORBIDDEN:
1 **To use the appliance in a construction configuration other than that contemplated by the manufacturer**
2 **To use the appliance with fixed guards tampered with or removed.**
3 **To integrate other systems and/or equipment not considered by the manufacturer in the executive project.**
4 **To connect the appliance up to energy sources other than those contemplated by the manufacturer**
5 **To use the commercial devices for purposes other than those indicated by the manufacturer.**
6 **Do not use in case of lightnings**

3.3 FIRST AID RULES

Contact with the product In the event of problems developing following EYE/SKIN CONTACT, INHALATION or INGESTION of the treated product, please refer to the SAFETY DATA SHEET of the fluid handled.

NOTICE Please refer to the safety data sheet for the product

SMOKING PROHIBITED When operating the dispensing system and in particular during refuelling, do not smoke and do not use open flame.

WARNING **When metering flammable liquids, observe precautions against fire or explosion**
When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
Do not submerge the meter

3.4 GENERAL SAFETY RULES

ESSENTIAL PROTECTIVE EQUIPMENT CHARACTERISTICS Wear protective equipment that is:
- suited to the operations that need to be performed;
- resistant to cleaning products.

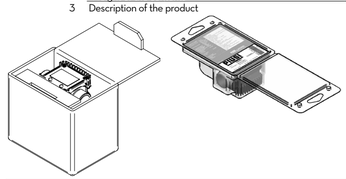
PERSONAL PROTECTIVE EQUIPMENT THAT MUST BE WORN
- Safety shoes;
- Close-fitting clothing;
- Protective gloves;
- Safety goggles;

OTHER DEVICES
- Instruction manual.

WARNING **If handling hazardous liquids, always follow the Liquid Manufacturer's Safety Precautions. Wear protective clothing such as goggles, gloves and respirator as instructed.**
When metering flammable liquids, observe precautions against fire or explosion. Do not meter in the presence of any source of ignition including running or hot engines, lighted cigarettes, or gas or electric heaters

3.5 PACKAGING

FOREWORD K24 is packed in a cardboard box or in a transparent blister with a label indicating the following data:
1 Contents of the package
2 Weight of the contents
3 Description of the product



3.6 PACKAGE CONTENTS/PRE-INSPECTION

NOTICE **In the event that one or more of the components described below are missing from inside the package, please contact Piusi S.p.A. technical support.**
Check that the data on the plate correspond to the desired specifications. In the event of any anomaly, contact the supplier immediately, indicating the nature of the defects. Do not use equipment which you suspect might not be safe.

4 BECOMING ACQUAINTED WITH K24

FOREWORD Electronic digital meter featuring a turbine measurement system, designed for precise measuring of low viscosity fluids.
K24 is a bi-directional meter with LCD display and calibration buttons. The body is made of aluminum (conductive) and designed for high flow 120 l/min. (32 GPM).

WARNING **Do not use K24 for purposes other than those intended.**

4.1 COMPATIBLE LIQUIDS

Turbine measurement system The turbine is placed inside a hole through the body of k24, fitted with M-f threaded inlet and outlet.

COMPATIBLE LIQUIDS The liquids compatible with k24 are at low viscosity, namely:
- **DIESEL** - **KEROSENE**
- **PETROL** - **PETROL ALCOHOL MIXED MAX 20% (E20)**
- **AVGAS 100/100LL** - **JET A / A1**
- **ASPEN 2 / 4**

WARNING **DO NOT USE WITH SUNDRIES LIQUIDS**

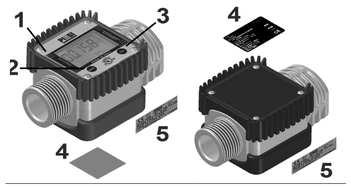
INTENDED USE **The K24 flow meter has been designed and made for the precise measurement of pumped liquids, including under high pressure. Use only the liquids listed under the item «Compatible liquids».**

UNINTENDED USE **Using the system for purposes other than those intended and indicated under "Intended use" is strictly forbidden.**
All other uses excepting those for which the litre counter was designed and described in this manual shall be deemed "MISUSE", and consequently Piusi S.p.A. disclaims all liability for any injury caused to persons of animals or damage to things or the system itself.

NOT COMPATIBLE LIQUIDS **The K24 flow meter IS NOT compatible with the following fluids :**
All fluids of group IIC , IC (definition like IEC60079-0)
Not suitable with explosive dust (IIIC)
All fluids not suitable with alluminum, PA (polyammide) , PBT (Polybutylene terephthalate).

Main components K24

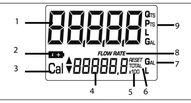
1	LCD display	3	CAL key
2	RESET key	4	Technical data plate
		5	Marking



4.2 DISPLAY LCD (METER VERSION ONLY)

FOREWORD The "LCD" of the METER features two numerical registers and various indications displayed to the user only when the applicable function so requires.

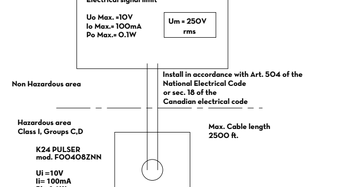
1	Partial register (5 figures with moving comma FROM 0.1 to 99999) indicating the volume dispensed since the reset button was last pressed	5	Indication of total multiplication factor (x10 / x100)
		6	Indication of type of total, (TOTAL / Reset TOTAL);
2	Indication of battery charge	7	Indication of unit of measurement of Totals: L=Litres Gal=Gallons
3	Indication of calibration mode	8	Indication of Flow Rate mode
4	Totals register (6 figures with moving comma FROM 0.1 to 999999), that can indicate two types of Total: 4.1. General Total that cannot be reset (TOTAL) 4.2. Resettable total (Reset TOTAL)	9	Indication of unit of measurement of Partial: Qts=Quarts Pts=Pints L=Litres Gal=Gallons



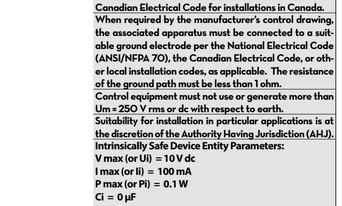
4.3 DISPLAY POSITIONING (METER VERSION ONLY)

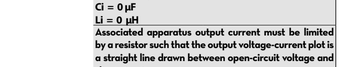
FOREWORD The square shape of the k24 body allows the card to be rotated in its housing, thus ensuring great versatility in positioning
This allows easy display readings in any position. The card housing is closed by a plastic cover sealed through a rubber protection acting as a gasket as well. This can be easily removed unscrewing the 4 screws that fix both the cover and the card (1).

NOTICE **While fixing the K24 card, make sure the battery contact cable is not placed above the circular housing of the bulb.**



PULSER VERSION
The Pulser version is a pulse emitter (reed bulb) which translates the magnetic field variations generated by TURBINE rotation into electric pulses to be sent to an external receiver to be connected.
The pulser does not need any independent electric power supply, as it is directly powered by the receiver connection. The issued pulse type is represented by a square wave generated by the voltage variation - see the following diagram:





MODEL	FLOW RATE FIELD		PULSER		Frequency Signal Max	Square Wave Duty Cycle
	l / min.	g / min	Pulse / liter (approximately)	Pulse / Gal (approximately)		
K24	5 - 120	1,3 - 31,7	100	379	200 Hz	70 - 90%

The electrical signal between K24 PULSER and the control unit device must be protected by intrinsically safe barrier. The electrical limits of signal are the follows :
Ui = 10 V - Ii = 100 mA - Pi = 0,1 W

4.4 PANEL CONTROL DRAWING

WARNING **Associated apparatus must be installed in accordance with its manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for installations in Canada.**
When required by the manufacturer's control drawing, the associated apparatus must be connected to a suitable ground electrode per the National Electrical Code (ANSI/NFPA 70), the Canadian Electrical Code, or other local installation codes, as applicable. The resistance of the ground path must be less than 1 ohm.
Control equipment must not use or generate more than Um = 250 V rms or dc with respect to earth.
Suitability for installation in particular applications is at the discretion of the Authority Having Jurisdiction (AHJ).
Intrinsically Safe Device Entity Parameters:
V max (or Ui) = 10 V dc
I max (or Ii) = 100 mA
P max (or Pi) = 0,1 W
Ci = 0 µF
Li = 0 µH
Associated apparatus output current must be limited by a resistor such that the output voltage-current plot is a straight line drawn between open-circuit voltage and short-circuit current.
The intrinsically safe device does not provide 500 V isolation with respect to earth. Associated apparatus used must be galvanically isolated or dual channel shunt zener diode barriers with linear outputs used channel to channel.
Associated apparatus may be in a Division 2 or Zone 2 location if so approved.

Selected associated apparatus must be third party listed as providing intrinsically safe circuits for the application, and have Voc or Vt not exceeding Vmax (or Uo not exceeding Ui), Isc or It not exceeding Imax (or Io not exceeding Ii), and the Po of the associated apparatus must be less than or equal to the Pmax or Pi of the intrinsically safe equipment, as shown in Table 1.
Capacitance and inductance of the field wiring from the intrinsically safe equipment to the associated apparatus shall be calculated and must be included in the system calculations as shown in Table 1. Cable capacitance, Ccable, plus intrinsically safe equipment capacitance, Ci, must be less than the marked capacitance, Ca (or Co), shown on any associated apparatus used. The same applies for inductance (Lcable, Li and La or Lo, respectively). Where the cable capacitance and inductance per foot are not known, the following values shall be used:
Ccable = 60 pF/ft., Lcable = 0.2 µH/ft.

TABLE 1:

I.S. Equipment		Associated Apparatus
V max (or Ui)	≥	Voc or Vt (or Uo)
I max (or Ii)	≥	Isc or It (or Io)
P max (or Pi)	≥	Po
Ci + Ccable	≤	Ca (or Co)
Li + Lcable	≤	La (or Lo)

Where multiple circuits extend from the same piece of intrinsically safe equipment to associated apparatus, they must be installed in separate cables or in one cable having suitable insulation. Refer to Article 504.30 (B) of the National Electrical Code (ANSI/NFPA 70) and Instrument Society of America Recommended Practice ISA RP12.06 for installing intrinsically safe equipment.
Associated apparatus must not be used in combination unless permitted by the associated apparatus certification.

4.5 USERS BUTTONS

FOREWORD The METER features two buttons (RESET and CAL) which individually perform two main functions and, together, other secondary functions.

MAIN FUNCTIONS PERFORMED
- for the RESET key, resetting the partial register and Reset Total
- for the CAL key, entering instrument calibration mode

SECONDARY FUNCTIONS Used together, the two keys permit entering configuration mode where the desired unit of measurement can be set.

LEGEND **CALIBRATE MEANS PERFORMING ACTIONS ON THE METER KEYS. BELOW IS THE LEGEND OF THE SYMBOLS USED TO DESCRIBE THE ACTIONS TO BE PERFORMED**

SHORT PRESSURE OF CAL KEY	**LONG PRESSURE OF CAL KEY**	**SHORT PRESSURE OF RESET KEY**	**LONG PRESSURE OF RESET KEY**

5 OPERATING MODES

OPERATING MODES The user can choose between two different operating modes:
The meter features a non-volatile memory for storing the dispensing data, even in the event of a complete power break for long periods.
The measurement electronics and the LCD display are fitted in the top part of the K24 which remains isolated from the fluid-bath measurement chamber and sealed from the outside by means of a cover.

1 - Normal Mode Normal Mode: Mode with display of Partial and Total dispensed quantities

2 - Flow rate Mode Flow Rate Mode: Mode with display of Flow Rate, as well as Partial dispensed quantity.

6 INSTALLATION

WARNING **Installation, assembly and maintenance operations of the K24 , must only be performed by personnel qualified to operate in HAZARDOUS LOCATIONS.**
K24 features a threaded, perpendicular inlet and outlet (1" NPT or BSP male and female that can be combined together). It has been designed to be easily installed in any position: fixed in-line or mobile on a dispensing nozzle. In order to improve the life of the turbine, it is recommended to fit a strainer before the meter itself
For installations on system, position meter so that the battery housing can be easily reached.

CONNECTIONS
To protect against the leakage, make sure all threads are sealed with two or three turns of thread tape or a sealing compound compatible with the liquid being metered
Make sure the thread tape or sealing compound does interfere with flow
Make sure there are no leaks in the connections.
To seal leaks, remove and inspect the meter and replace the thread tape or sealant. Refer to the Troubleshooting Section
To minimize static electricity build up,use only static conductive hose R<1M•m when metering flammable fluids, and keep the fill nozzle in contact with the container being filled during the filling process.
All parts of our system must be incontinuity and grounded.
DO NOT exceed 145 psi - 10 bar line pressure.
DO NOT install additional foot valve or check valve without a pressure relief valve; otherwise the meter may rapture.

PULSER CONNECTIONS
K24 PULSER version suitable only for fixed installation
The electrical signal between K24 PULSER and the control unit device must be protected by intrinsically safe barrier.
The electrical limits of signal are the follows :
Ui = 10 V
Ii = 100 mA
Pi = 0,1 W
The barier must be properly connected to an earth grounded.
Improper installation of this meter and barier could result in death or serious injury.

7 DAILY USE

FOREWORD The only operations that need to be done for daily use are partial and/or resettable total register resetting. The user should use only the dispensing system of K24. Occasionally the meter may need to be configured or calibrated. To do so, please refer to the relevant chapters.

Below are the two typical normal operation displays. One display page shows the partial and reset total registers. The other shows the partial and general total. Switchover from resettable total to general total display is automatic and tied to phases and times that are in factory set and cannot be changed.

NOTICE **6 digits are available for Totals, plus two icons x 10 / x100. The increment sequence is the following:**
0.0 → 99999.9 → 999999 → 100000 x 10 → 999999 x 10 →100000 x 100 → 999999 x 100

7.1 DISPENSING IN NORMAL MODE

FOREWORD Normal mode is the standard dispensing. While the count is made, the partial and resettable total are displayed at the same time (reset total).

NOTICE **Should one of the keys be accidentally pressed during dispensing, this will have no effect.**

stand by A few seconds after dispensing has ended, on the lower register, the display switches from resettable total to general total: the word reset above the word total disappears, and the reset total is replaced by the general total. This situation is called standby and remains stable until the user operates the k24 again.

7.1.1 PARTIAL RESET (NORMAL MODE)

The partial register can be reset by pressing the reset key when the meter is in standby, meaning when the display screen shows the word "TOTAL".

After pressing the reset key, during reset, the display screen first of all shows all the lit-up digits and then all the digits that are not lit up.

At the end of the process, a display page is first of all shown with the reset partial and the reset total

and, after a few moments, the reset total is replaced by the non resettableTotal.

7.1.2 RESETTING THE RESET TOTAL

The reset total resetting operation can only be performed after resetting the partial register. The reset total can in fact be reset by pressing the reset key at length while the display screen shows reset total as on the following display page:

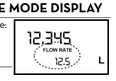
Schematically, the steps to be taken are:
1 Wait for the display to show normal standby display page (with total only displayed)
2 Press the reset key quickly
3 The meter starts to reset the partial

4 While the display page showing the reset total is displayed Press the reset key again for at least 1 second

5 The display screen again shows all the segments of the display followed by all the switched-off segments and finally shows the display page where the reset Reset Total is shown.

7.2 DISPENSING WITH FLOW RATE MODE DISPLAY

It is possible to dispense fluids, displaying at the same time:
1 the dispensed partial
2 the Flow Rate in [Partial Unit / minute] as shown on the following display page:

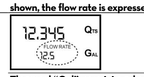


Procedure for entering this mode:
1 wait for the Remote Display to go to Standby, meaning the display screen shows Total only
2 quickly press the CAL key.
3 Start dispensing

The flow rate is updated every 0.7 seconds. Consequently, the display could be relatively unstable at lower flow rates. The higher the flow rate, the more stable the displayed value.

NOTICE

The flow rate is measured with reference to the unit of measurement of the Partial. For this reason, in case of the unit of measurement of the Partial and Totel being different, as in the example shown below, it should be remembered that the indicated flow rate relates to the unit of measurement of the partial. In the example shown, the flow rate is expressed in Qts/min.



The word "Gal" remaining alongside the flow rate refers to the register of the Totals (Reset or NON Reset) which are again displayed when exiting from the flow rate reading mode.

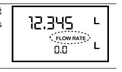
To return to "Normal" mode, press the CAL key again. If one of the two keys RESET or CAL is accidentally pressed during the count, this will have no effect.

NOTICE

Even though in this mode they are not displayed, both the Reset Total and the General Total (Total) increase. Their value can be checked after dispensing has terminated, returning to "Normal" mode, by quickly pressing CAL.

7.2.1 PARTIAL RESET (FLOW RATE MODE)

To reset the Partial Register, finish dispensing and wait for the Remote Display to show a Flow Rate of O.O as indicated in the illustration



then quickly press RESET

8 CALIBRATION

When operating close to extreme use or flow rate conditions (close to minimum or maximum acceptable values), an on-the-spot calibration may be required to suit the real conditions in which the K24 is required to operate.

8.1 DEFINITIONS

CALIBRATION FACTOR OR "K FACTOR" FACTORY K FACTOR

Multiplication factor applied by the system to the electrical pulses received, to transform these into measured fluid units.

Factory-set default factor. It is equal to 1.000. This calibration factor ensures utmost precision in the following operating conditions:

Fluid **Diesel**
Temperature: **20°C - 68°F**
Flow rate: **50 lit/min (13 GPM)**

Even after any changes have been made by the user, the factory k factor can be restored by means of a simple procedure.

USER K FACTOR:

Customized calibration factor, meaning modified by calibration.

8.2 CALIBRATION MODE

Why calibrate?
1 Display the currently used calibration factor:
2 Return to factory calibration (Factory K Factor) after a previous calibration by the user
3 Change the calibration factor using one of the two previously indicated procedures

FOREWORD **Two procedures are available for changing the Calibration Factor:**
1 In-Field Calibration, performed by means of a dispensing operation
2 Direct Calibration, performed by directly changing the calibration factor

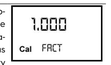
In calibration mode, the partial and total dispensed quantities indicated on the display screen take on different meanings according to the calibration procedure phase. In calibration mode, the K24 cannot be used for normal dispensing operations. In "Calibration" mode, the totals are not increased

NOTICE

The K24 features a non-volatile memory that keeps the data concerning calibration and total dispensed quantity stored for an indefinite time, even in the case of a long power break; after changing the batteries, calibration need not be repeated.

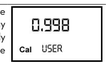
8.2.1 DISPLAY OF CURRENT CALIBRATION FACTOR AND RESTORING FACTORY FACTOR.

By pressing the CAL key while the appliance is in Standby, the display page appears showing the current calibration factor used. If no calibration has ever been performed, or the factory setting has been restored after previous calibrations, the following display page will appear:



The word "Fact" abbreviation for "factory" shows that the factory calibration factor is being used

If, on the other hand, calibrations have been made by the user, the display page will appear showing the currently used calibration factor (in our example 0,998) .



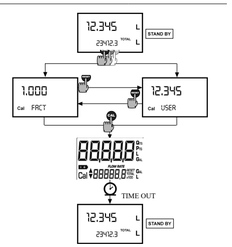
The word "user" indicates a calibration factor set by the user is being used..

The flow chart alongside shows the switchover logic from one display page to another

In this condition, the Reset key permits switching from User factor to Factory factor.

To confirm the choice of calibration factor, quickly press CAL while "User" or "Fact" are displayed.

After the restart cycle, the K24 uses the calibration factor that has just been confirmed



NOTICE

When the Factory Factor is confirmed, the old User factor is deleted from the memory

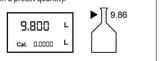
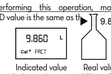
8.2.2 IN FIELD CALIBRATION

FOREWORD This procedure calls for the fluid to be dispensed into a graduated sample container in real operating conditions (flow rate, viscosity, etc.) requiring maximum precision.

For correct K24 calibration, it is most important to:

1 When the Factory Factor is confirmed, the old User factor is deleted from the memory
2 use a precise Sample Container with a capacity of not less than 5 litres, featuring an accurate graduated indicator.
3 ensure calibration dispensing is done at a constant flow rate equivalent to that of normal use, until the container is full;
4 Not reduce the flow rate to reach the graduated area of the container during the final dispensing stage (the correct method during the final stages of sample container filling consists in making short top-ups at normal operation flow rate);
5 after dispensing, wait a few minutes to make sure any air bubbles are eliminated from the sample container, only read the Real value at the end of this stage, during which the level in the container could drop.
6 Carefully follow the procedure indicated below.

8.2.2.1 IN-FIELD CALIBRATION PROCEDURE

ACTION		DISPLAY
1	NONE Meter in Standby	12.345 L 1345 TOTAL L
2	**LONG CAL key keying** The Meter enters calibration mode, shows «CAL» and displays the calibration factor in use instead of partial. The words "Fact" and "USER" indicate which of the two factors (factory or user) is currently in use. Important: This factor is that which the instrument also uses for field calibration measurement operations	1.000 L Cal FACT (USER) L
3	**LONG RESET key keying** The Meter shows "CAL" and the partial at zero. The Meter is ready to perform in-field calibration.	0.000 L Cal FIELD
4	**DISPENSING INTO SAMPLE CONTAINER** Without pressing any key, start dispensing into the sample container  Dispensing can be interrupted and started again at will. Continue dispensing until the level of the fluid in the sample container has reached the graduated area. There is no need to reach a preset quantity. 	9.800 L Cal FIELD
5	**SHORT RESET key keying** The Meter is informed that the calibration dispensing operation is finished. Make sure dispensing is correctly finished before performing this operation. To calibrate the Meter, the value indicated by the partial totaliser (example 9.800) must be forced to the real value marked on the graduated sample container. In the bottom left part of the display an arrow appears (upwards and downwards), that shows the direction (increase or decrease) of the value change displayed when the following operations 6 or 7 are performed.	9.800 L Cal▲ FIELD
6	**SHORT RESET key keying** The arrow changes direction. The operation can be repeated to alternate the direction of the arrow.	9.800 L Cal▼ FIELD
7	**SHORT/LONG CAL key keying** The indicated value changes in the direction indicated by the arrow - one unit for every short CAL key keying - continually if the CAL key is kept pressed. The speed increase rises by keeping the key pressed. If the desired value is exceeded, repeat the operations from point (6).	9.860 L Cal▲ FIELD
8	**LONG RESET key keying** The Meter is informed that the calibration procedure is finished. Before performing this operation, make sure the INDICATED value is the same as the  The Meter calculates the new USER K FACTOR ; this calculation could require a few seconds, depending on the correction to be made ATTENTION: If this operation is performed after action (5), without changing the indicated value, the USER K FACTOR would be the same as the FACTORY K FACTOR, thus it is ignored.	- - - - - L Cal END
9	**NO OPERATION** At the end of the calculation, the new USER K FACTOR is shown for a few seconds, after which the restart cycle is repeated to finally achieve standby condition. **IMPORTANT: From now on, the indicated factor will become the calibration factor used by the Meter and will continue to remain such even after a battery change**	1.015 L Cal END
10	NO OPERATION The Meter stores the new work calibration factor and is ready to begin dispensing, using the USER K FACTOR that has just been calculated..	0.000 L Cal 1345 TOTAL L

8.2.3 DIRECT MODIFICATION OF K FACTOR

If normal Meter operation shows a mean percentage error, this can be corrected by applying to the currently used calibration factor a correction of the same percentage. In this case, the percentage correction of the USER K FACTOR must be calculated by the operator in the following way

New cal. Factor = Old Cal Factor * (100 - E%/100)

Example:
Error percentage found: E% - 0.9 %
CURRENT calibration factor: 1.000
New USER K FACTOR: 1.000 * [(100 – (- 0.9))/100] = 1.000 * [(100 + 0.9)/100] = 1.009

If the Meter indicates less than the real dispensed value (negative error) the new calibration factor must be higher than the old one as shown in the example. The opposite applies if the Meter shows more than the real dispensed value (positive error).

ACTION		DISPLAY
1	**NONE** METER in Standby.	12.345 L 1345 TOTAL L
2	**LONG CAL KEY KEYING** Meter enters calibration mode, shows "CAL" and displays the calibration factor being used instead of the partial. The words "Fact" and "User" indicate which of the two factors (factory or user) is currently being used.	1.000 Cal FACT (USER)
3	**LONG RESET KEY KEYING** The Meter shows "CAL" and the zero partial total. Meter is ready to perform in-field calibration by dispensing - see previous paragraph.	1.000 L Cal FIELD
4	**LONG RESET KEY KEYING** We now go on to Direct change of the calibration factor. the word "Direct" appears together with the Currently Used calibration factor. In the bottom left part of the display, an arrow appears (upwards or downwards) defining the direction (increase or decrease) of change of the displayed value when subsequent operations 5 or 6 are performed.	1.000 L Cal▲ DIRECT
5	**SHORT RESET KEY KEYING** Changes the direction of the arrow. The operation can be repeated to alternate the direction of the arrow.	1.000 Cal▼ DIRECT
6	**SHORT/LONG CAL KEY KEYING** The indicated value changes in the direction indicated by the arrow - one unit for every short CAL key keying - continually if the CAL key is kept pressed. The speed increase rises by keeping the key pressed. If the desired value is exceeded, repeat the operations from point (5).	1.003 L Cal▲ DIRECT
7	**LONG RESET KEY KEYING** The Meter is informed that the calibration procedure is finished. Before performing this operation, make sure the INDICATED value is the same as the	- - - - - L Cal END
8	**NO OPERATION** At the end of the calculation, the new USER K FACTOR is shown for a few seconds, after which the restart cycle is repeated to finally achieve standby condition. ***IMPORTANT: From now on, the indicated factor will become the calibration factor used by the Meter and will continue to remain such even after a battery change***	1.003 L Cal END
9	**NO OPERATION** The Meter stores the new work calibration factor and is ready to begin dispensing, using the USER K FACTOR that has just been changed.	0.000 L 1345 TOTAL L

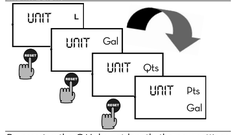
9 METER CONFIGURATION

The METER feature a menu with which the user can select the main measurement unit, Quarts (Qts), Pints (Pts), Litres (Lit), Gallons (Gal); The combination of the unit of measurement of the Partial register and that of the Totals is predefined according to the following table:

Combination no.	Unit of Measurement Partial Register	Unit of Measurement Totals Register
1	Litres (L)	Litres (L)
2	Gallons (Gal)	Gallons (Gal)
3	Quarts (Qts)	Gallons (Gal)
4	Pints (Pts)	Gallons (Gal)

To choose between the 4 available combinations:

1 Wait for the METER to go to Standby
2 Then press the CAL and RESET keys together. Keep these pressed until the word "UNIT" appears on the screen together with the unit of measurement set at that time (in this example Litres / Litres)
3 Every short press of the RESET key, the various combinations of the units of measurements are scrolled as shown below.



4 By pressing the CAL key at length, the new settings will be stored, the METER will pass through the start cycle and will then be ready to dispense in the set units.

NOTICE

The Reset Total and Total registers will be automatically changed to the new unit of measurement.
NO new calibration is required after changing the Unit of Measurement.

10 MAINTENANCE

BATTERY REPLACEMENT Use only Piusi Battery code *18021

WARNING

To reduce risk of ignition of a flammable or explosive atmosphere do not use Volt meter or smiliar powered tools during the live maintenance.

WARNING

The warranty and the safety of the product is insured only with the use of battery Piusi code *18021 PIUSI S.p.A. DENIES LIABILITY FOR DAMAGES CAUSED BY THE USE OF BATTERIES NOT SUITABLE.
K24 should be installed in a position allowing the batteries to be replaced without removing it from the system.

BATTERIES **Check the batteries and terminals at least every year to ensure proper operation. It is strongly recommended that terminals be cleaned annually**

K24 features two low-battery alarm levels:

1 

When the battery charge falls below the first level on the LCD, the fixed battery symbol appears. In this condition, K24 continues to operate correctly, but the fixed icon warns the user that it is ADVISABLE to change the batteries.

2 

If K24 operation continues without changing the batteries, the second battery alarm level will be reached which will prevent operation. In this condition the battery icon starts to flash and is the only one to remain visible on the LCD.

WARNING

During meter removal, liquid may spill. Follow the liquid manifacturer's safety precautions for clean up of minor spills.

TO REMOVE BATTERY

1 **Ensure all liquid is drained from the meter. This could include draining the hose, meter, nozzle or pipe**
2 **Wear protective clothing as necessary, loosen both ends of the meter. Use a wrench only on the meter's flat metal surfaces**
3 **If the meter is not immediately installed again, cap the hose end or pipe to prevent spills**
To reduce the risk of ignition of a flammable or explosive atmosphere, batteries must only be changed in a non-hazardous location
To prevent ignition of flammable or combustibile atmospheres, disconnect power before servicing

To change the batteries, with reference to the exploded diagram positions, proceed as follows

1 Press RESET to update all the totals
2 Loosen the 4 fixing screws of the lower cover
3 Remove the old batteries and disconnect the plug
4 Place the new batteries in the same position as the old ones (sure to put the battery in the correct way)
5 Close the cover again, by positioning the rubber protection as a gasket
6 K24 will switch on automatically and normal operation can be resumed

The K24 will display the same Reset Total, the same Total and the same Partial indicated before the batteries were changed. After changing the batteries, the meter does not need calibrating again.

CLEANING Only one operation is necessary to clean the K24. After removing k24 from the plant where it was built in, any residual elements can be removed by washing or mechanically-handling. If this operation does not restore a smooth rotation of the turbine, it will have to be replaced.

WARNING

Do not discard the old batteries in the environment. Refer to local disposal regulations.
Do not use compressed air onto the turbine in order to avoid its damage because of an excessive rotation

TO STORE **Follow the liquid manifacturer's instructions for the disposal of contaminated cleaning solvents**

K24 FRONT FACE REPLACEMENT

1  **Carefully remove the screws from the corners of the front panel, and then carefully lift the front cover up away from the main body of the meter.**

2  **Carefully remove the screws from the corners of the front panel, and then carefully lift the front cover up away from the main body of the meter.**

3 **When the new panel is fitted make sure the power adapter is fitted correctly with the location pin in the correct way**

4  **Carefully refit the display panel back onto the main body making sure the wire is tucked into the corner and replace the screws**

11 MALFUNCTIONS (EN60079-19)

Problem	Possible cause	Remedial Action
LCD: no indication	Bad battery contact	Check battery contacts
Not enough measurement precision	Wrong K FACTOR	With reference to paragraph H, check the K FACTOR
	The meter works below minimum acceptable flow rate.	Increase the flow rate until an acceptable flow rate range has been achieved
Reduced or zero flow rate	TURBINE blocked	Clean the TURBINE
The meter does not count, but the flow rate is correct	Incorrect installation of gears after cleaning	Repeat the reassembly procedure
	Possible electronic card problems	Contact your dealer
K24 is switched of	Battery discharged or installed in the wrong way	Check battery charge and/or check the battery position

12 DISPOSAL

Foreword If the system needs to be disposed, the parts which make it up must be delivered to companies that specialize in the recycling and disposal of industrial waste and, in particular:

Disposing of packing materials The packaging consists of biodegradable cardboard which can be delivered to companies for normal recycling of cellulose.

Metal Parts Disposal Metal parts, whether paint-finished or in stainless steel, can be consigned to scrap metal collectors.

Disposal of electric and electronic components These must be disposed of by companies that specialize in the disposal of electronic components, in accordance with the indications of directive 2012/19/CE (see text of directive below).

Information regarding the environment for clients residing within the European Union European Directive 2012/19/EC requires that all equipment marked with this symbol on the product and/or packaging not be disposed of together with non-differentiated urban waste. The symbol indicates that this product must not be disposed of together with normal household waste. It is the responsibility of the owner to dispose of these products as well as other electric or electronic equipment by means of the specific refuse collection structures indicated by the government or the local governing authorities.
Disposing of RAEE equipment as household wastes is strictly forbidden. Such wastes must be disposed of separately.
Any hazardous substances in the electrical and electronic appliances and/or the misuse of such appliances can have potentially serious consequences for the environment and human health.
In case of the unlawful disposal of said wastes, fines will be applicable as defined by the laws in force.

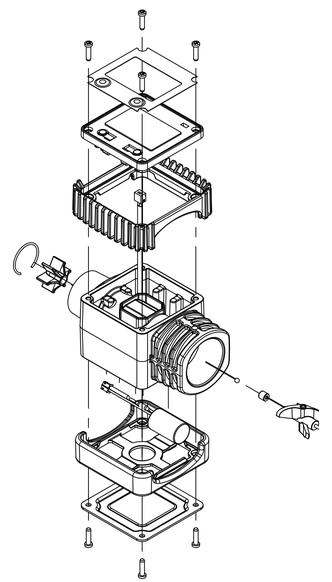
Miscellaneous parts disposal Other components, such as pipes, rubber gaskets, plastic parts and wires, must be disposed of by companies specialising in the disposal of industrial waste.

13 TECHNICAL DATA

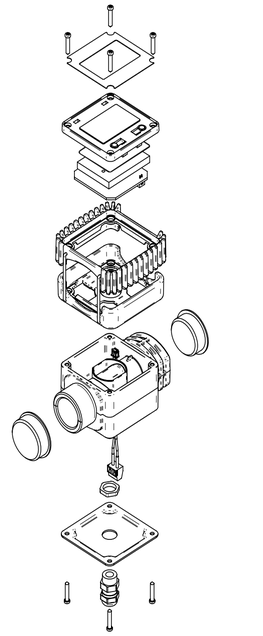
Measurement system		TURBINE	
Resolution (nominal)		0.010 lit/pulse	0.006 gall./pulse
Flow Rate (Range)		7 - 120 (Lit/min)	2 / 32 (gal/min)
Operating pressure (Max)		10 (Bar)	145 (psi)
Bursting pressure (Min)		100 (Bar)	1450 (psi)
Storage temperature (Range)		-20 - + 70 (°C)	-4 / 158 (°F)
Storage humidity (Max)		95 (% RU)	
AMBIENT Operating temperature (Range)	**METER VERSION**	- 10 / + 50 (°C)	+14 / 122 (°F)
	PULSER VERSION	- 10 / + 40 (°C)	+14 / 104 (°F)
FLUID Operating temperature (Range)	**METER VERSION**	- 10 / + 50 (°C)	+14 / 122 (°F)
	PULSER VERSION	- 10 / + 40 (°C)	+14 / 104 (°F)
Flow resistance		0.30 Bar at 100 lit/min. 4.35 psi at 26.41 gal/min	
Permissible Viscosity (Range)		2 - 5.35 cSt/ pulse	
Accuracy		+/- 1% after calibration within 10-90 (litres/min) 2,65-23,8 (gallons/min) range	
Reproducibility (Typical)		+/- 0,3 (%)	
Screen		Liquid crystals LCD. Featuring: - 5-figure partial - 6-figure Reset Total plus x10 / x100 - 6-figure non reset Total plus x10 / x100	
Power Supply		Lithium battery PIUSI code *18021	
Battery life		24 months	
Weight		0.4 Kg (included batteries)	
Protection		IP65	
Pulser Data		Ui = 10 V Ii = 100 mA Pi = 0.1 W	

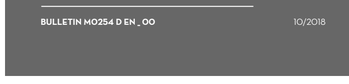
14 EXPLODED VIEWS AND OVERALL DIMENSIONS

METER VERSION



PULSER VERSION





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