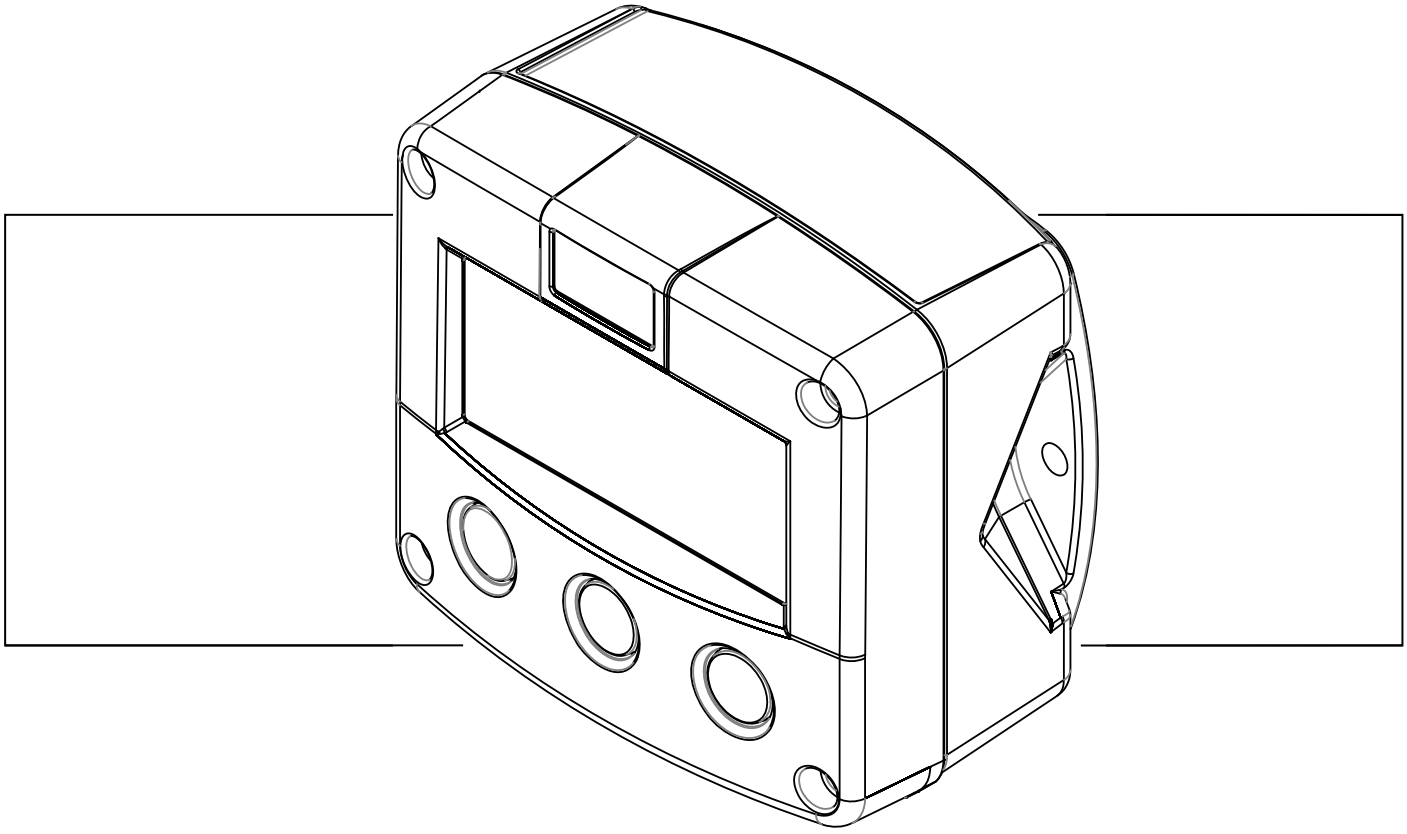
DOG-4/-6 electronic option
G0/H0/I0/K0/L0

FLOW RATE INDICATOR/TOTALISER



Signal input flowmeter: pulse

Signal outputs: 4-20 mA ref. flow rate and pulse ref. volume quantity

Options: Modbus communication

CE

SAFETY INSTRUCTIONS

▪ *Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.*

▪ *LIFE SUPPORT APPLICATIONS: The flow rate/totaliser is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.*

▪ *Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.*

▪ *This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).*

SAFETY RULES AND PRECAUTIONARY MEASURES

▪ The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
▪ Modifications of the flow rate/totaliser implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
▪ Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
▪ Check the mains voltage and information on the manufacturer's plate before installing the unit.
▪ Check all connections, settings and technical specifications of the various peripheral devices with the flow rate/totaliser supplied.
▪ Open the casing only if all leads are free of potential.
▪ Never touch the electronic components (ESD sensitivity).
▪ If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
▪ The local labor and safety laws and regulations must be adhered to.

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:
- The daily use of the unit is described in chapter 2 "Operational". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This operation manual describes the standard unit as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the flow rate/totaliser is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:


Caution !

A "**caution**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the flow rate/totaliser or connected instruments.


Note !

A "**note**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

Manufactured and sold by:

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CONTENTS MANUAL

The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

1. INTRODUCTION

1.1. General notice

This operating manual provides assistance and instructions to clients of Kobold Messring GmbH for the installation and configuration of the flow rate/totaliser when used in combination with a type DOG-… oscillation flowmeter.

This operating manual is a supplement to existing documents, such as the data sheet and the operating manual for the DOG-… oscillation flow meter.

This document is subject to change due to technical improvements. This version replaces all previous versions of the document.

1.2 Device description

The flow rate/totaliser is a microcontroller-operated display device for the volume flow and total volume flow of gases. Figure 1 shows a typical application of the flow rate indicator/totaliser.

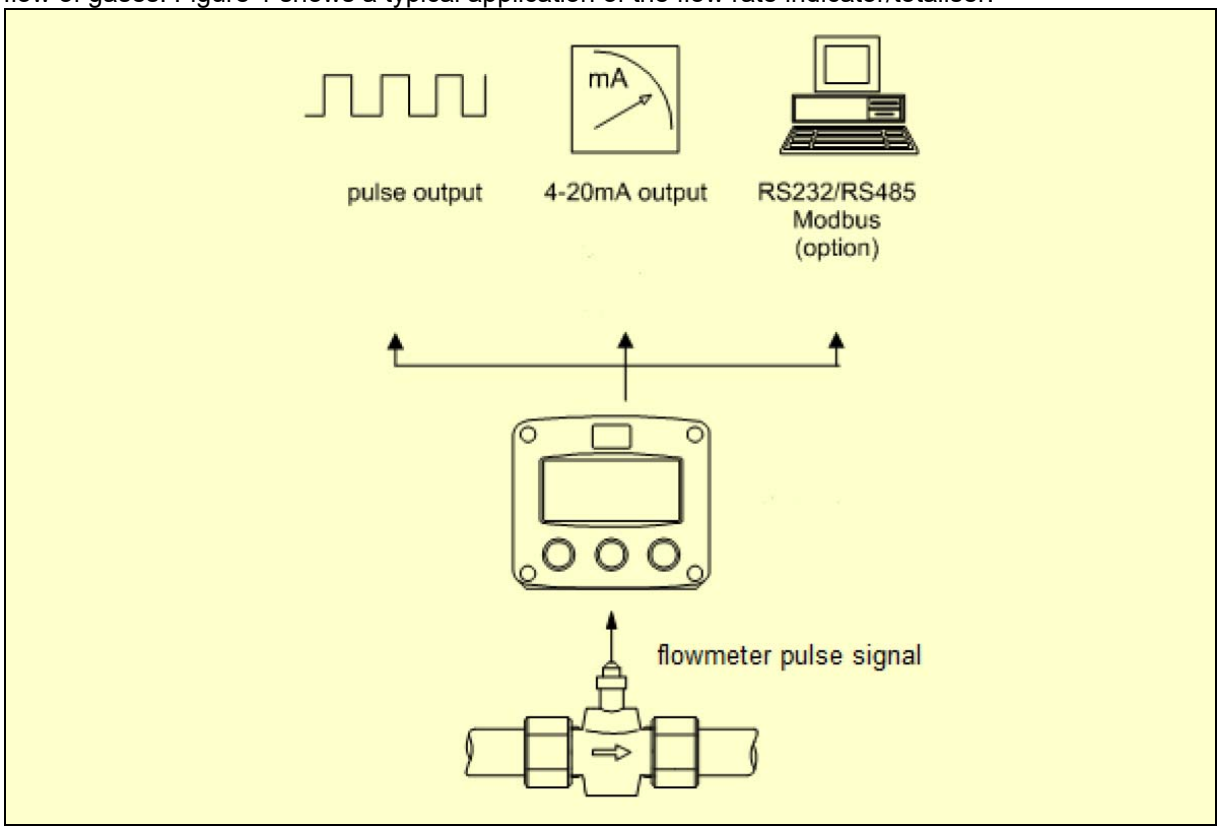


Fig. 1: Typical application for the flow rate indicator/totaliser

The flow rate/totaliser is installed together with, and pre-wired to, a DOG-… transmitter in a control box. A connector rail with all required inputs and outputs is provided for the user. The rail's connection layout is displayed on the switch box's safety cover. Electric wiring must be done in accordance with the wiring diagram following in chapter 4.

The flow computer is preconfigured by the factory. The table containing the factory settings can be found in annexure D.

The measuring range and the K-factor are pre-set according to client requirements. Linearization is switched off. The linearization settings should not be altered.

The analogue output (4-20 mA) is also factory-calibrated. Please do not change the settings in menu points 75 and 76, as the calibration points will otherwise be altered.

The pulse output is scaled according to volume quantity (for example, one pulse every 12 m^3). The factory setting is one pulse per m^3. The pulse duration can be adjusted between 0.0078 and 2 seconds. The standard setting is 0.0156 seconds.

2. OPERATIONAL

2.1. General

Caution !

▪ *The flow rate/totaliser may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
▪ *Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.*

This chapter describes the daily use of the flow rate/totaliser. This instruction is meant for users / operators.

2.2. CONTROL PANEL

The following keys are available:

Fig. 2: Control Panel.

Functions of the keys

This key is used to program and save new values or settings.
It is also used to gain access to SETUP-level; please read chapter 3.

This key is used to SELECT accumulated total.
The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.

Press this key twice to CLEAR the value for total.
The arrow-key ▶ is used to select a digit after PROG has been pressed or to configure the unit; please read chapter 3.

2.3. OPERATOR INFORMATION AND FUNCTIONS

In general, the flow rate/totaliser will always act at Operator level. The information displayed is dependent upon the SETUP-settings. All pulses generated by the connected flowmeter are measured by the flow rate/totaliser in the background, whichever screen refresh rate setting is chosen. After pressing a key, the display will be updated very quickly during a 30 second period, after which it will slow-down again. All information displayed is corrected by using the linearization table as stored in the flow rate/totaliser.

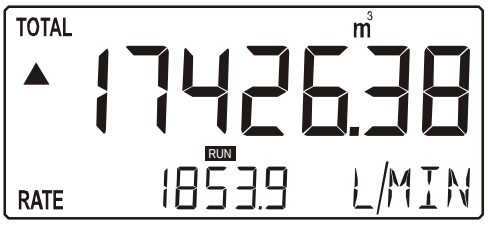


Fig. 3: Example of display information during process.

For the Operator, the following functions are available:

- **Display flow rate / total or flow rate**
  This is the main display information of the flow rate totaliser. After selecting any other information, it will always return to this main display automatically.
  Total is displayed on the upper-line of the display and flow rate on the bottom line.
  It is possible to display flow rate only with the large 17mm digits; in this instance press the SELECT-key to read the total.
  When "-------" is shown, then the flow rate value is too high to be displayed. The arrows ⬍ indicate the increase/decrease of the flow rate trend.

- **Clear total**
  The value for total can be re-initialized. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid re-initialization at this stage, press another key than CLEAR or wait for 20 seconds.
  Re-initialization of total DOES NOT influence the accumulated total.

- **Display accumulated total**
  When the SELECT-key is pressed, total and accumulated total are displayed. The accumulated total cannot be re-initialized. The value will count up to 99,999,999,999. The unit and number of decimals are displayed according to the configuration settings for total.

- **Alarm 01-03**
  When "alarm" is displayed, please consult Appendix B: problem solving.

3. CONFIGURATION

3.1. INTRODUCTION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.

Caution !

▪ Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
▪ The flow rate/totaliser may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
▪ Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.
▪ Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

3.2. PROGRAMMING SETUP-LEVEL

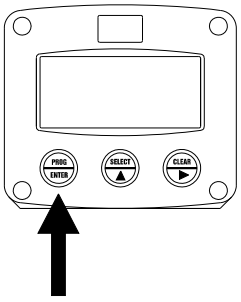
3.2.1. GENERAL

Configuration of the flow rate/totaliser is done at SETUP-level. SETUP-level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows ⬍ will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically. SETUP can be reached at all times while the flow rate/totaliser remains fully operational.

Note !

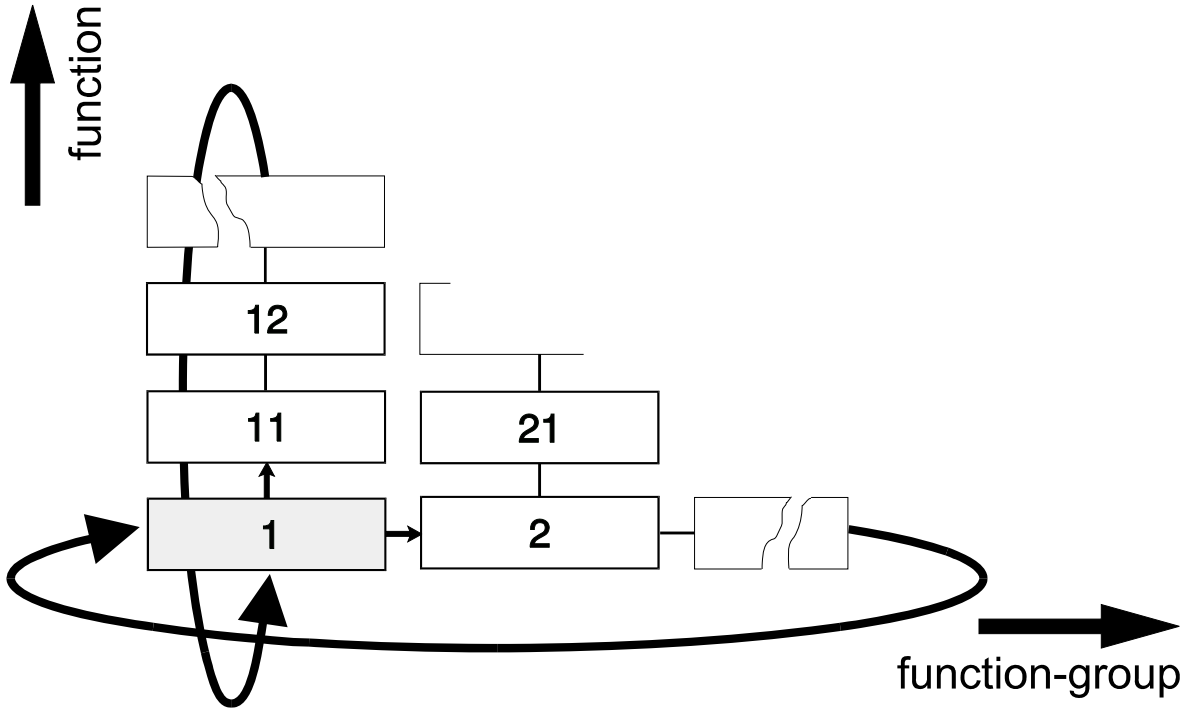
***Note:** A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.*

To enter SETUP-level:



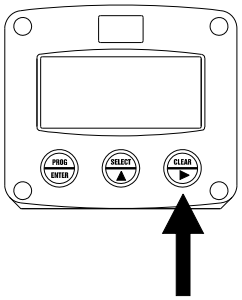
Press PROG/ENTER for 7 seconds

Matrix structure SETUP-level:

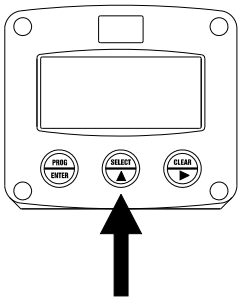


SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function:
SETUP is divided into several function groups and functions.



Select function-group with CLEAR ▶

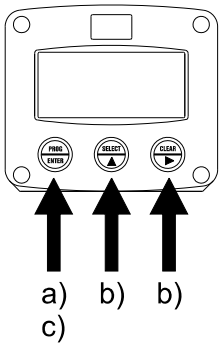


Select function with SELECT ▲

Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.

After selecting a sub-function, the next main function is selected by scrolling through all "active" sub-functions (e.g. 1▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▲, 31 etc.).

To change or select a value:



a) press PROG ENTER briefly; **PROGRAM** will start flash

b) select or enter value with SELECT and / or CLEAR

c) press PROG ENTER to confirm the value / selection.

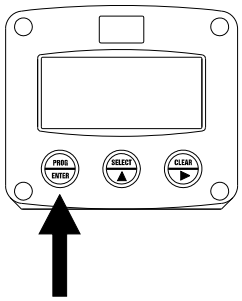
To change a value, use ▸ to select the digits and ▲ to increase that value.
To select a setting, both ▲ and ▸ can be used.
If the new value is invalid, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming.

When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.

Note !

Note: *alterations will only be set after ENTER has been pressed!*

To return to OPERATOR-level:



Press PROG ENTER for 3 seconds

In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically.

3.2.2. OVERVIEW FUNCTIONS SETUP LEVEL

SETUP FUNCTIONS AND VARIABLES			
1	**TOTAL**		
	11	UNIT	L - m3 - kg - lb - GAL - USGAL - bbl - no unit
	12	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	13	K-FACTOR:	0.000010 - 9,999,999
	14	DECIMALS K-FACTOR	0 - 6
2	**FLOWRATE**		
	21	UNIT	mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P
	22	TIME UNIT	sec - min - hour - day
	23	DECIMALS	0 - 1 - 2 - 3 (Ref: displayed value)
	24	K-FACTOR	0.000010 - 9,999,999
	25	DECIMALS K-FACTOR	0 - 6
	26	CALCULATION	per 1 - 255 pulses
	27	CUT-OFF	0.1 - 999.9 seconds
3	**DISPLAY**		
	31	FUNCTION	total - flow rate
4	**POWER MANAGEMENT**		
	41	LCD UPDATE	fast - 1 sec - 3 sec - 15 sec - 30 sec - off
	42	BATTERY MODE	operational - shelf
5	**FLOWMETER**		
	51	SIGNAL	npn - npn_lp - reed - reed_lp - pnp - pnp_lp - namur - coil_hi - coil_lo - act_8.1 - act_12 - act_24
6	**LINEARISATION**		
	61	FREQ. / M-FACTOR 1	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	62	FREQ. / M-FACTOR 2	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	63	FREQ. / M-FACTOR 3	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	..	..	……..
	6F	FREQ. / M-FACTOR 15	0.1 – 9,999.9 Hz / 0.000001 – 9.999999
	6G	LINEARISATION	enable / disable
	6H	DECIMALS FREQUENCY	00000 - 1111.1 - 222.22 - 33.333
7	**ANALOG**		
	71	OUTPUT	disable - enable
	72	4mA / 0V	0000.000 - 9,999,999
	73	20mA / 10V	0000.000 - 9,999,999
	74	CUT-OFF	0.0 - 9.9%
	75	CALIBRATE LOW	default - calibrate - calibrate set
	76	CALIBRATE HIGH	default - calibrate - calibrate set
	77	FILTER	01 - 99
8	**IMPULSE**		
	81	PERIOD TIME	0 - 250
	82	IMPULSE PER	X,XXX,XXX quantity
9	**COMMUNICATION**		
	91	SPEED / BAUDRATE	1200 - 2400 - 4800 - 9600
	92	ADDRESS	1 - 255
	93	MODE	rtu - off
A	**OTHERS**		
	A1	TYPE / MODEL	flow rate/totaliser
	A2	SOFTWARE VERSION	-
	A3	SERIAL NO.	-
	A4	PASS CODE	0000 - 9999
	A5	TAGNUMBER	0000000 - 9999999

3.2.3. EXPLANATION OF SETUP-FUNCTIONS

1 - TOTAL	
MEASUREMENT UNIT **11**	SETUP - 11 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected: L - m3 - kg - lb. - GAL - USGAL - bbl - _ (no unit). Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.
DECIMALS **12**	The decimal point determines for total, accumulated total and pulse output the number of digits following the decimal point. The following can be selected: 0000000 - 111111.1 - 22222.22 - 3333.333
K-FACTOR **13**	With the K-factor, the flowmeter pulse signals are converted to a quantity. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 11), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be. **Example 1:** **Calculating the K-factor.** *Let us assume that the flowmeter generates 2.4813 pulses per liter and the selected unit is "cubic meters / m3". A cubic meter consists of 1000 parts of one liter which implies 2,481.3 pulses per m3. So, the K-factor is 2,481.3. Enter for SETUP - 13: "2481300" and for* SETUP *- 14 - decimals K-factor "3".* **Example 2:** **Calculating the K-factor.** *Let us assume that the flowmeter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for* SETUP *- 13: "6523100" and for* SETUP *- 14 decimals K-factor "6".*
DECIMALS K-FACTOR **14**	This setting determines the number of decimals for the K-factor entered. (SETUP 13). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this setting influences the accuracy of the K-factor indirectly. (i.e. the position of the decimal point and thus the value given) This setting has NO influence on the displayed number of digits for total (SETUP 12)!

2 – FLOW RATE	
The settings for total and flow rate are entirely separate. In this way, different units of measurement can be used for each e.g. cubic meters for total and liters for flow rate. The display update time for flow rate is one second or more. ***Note:*** *these settings also influence the analog output.*	
MEASUREMENT UNIT **21**	SETUP - 21 determines the measurement unit for flow rate. The following units can be selected: mL - L - m3 - mg - g - kg - ton - GAL - bbl - lb - cf - REV - no unit - scf - Nm3 - NL - P. Alteration of the measurement unit will have consequences for operator and SETUP-level values. Please note that the K-factor has to be adapted as well; the calculation is not done automatically.
TIME UNIT **22**	The flow rate can be calculated per second (SEC), minute (MIN), hour (HR) or day (DAY).
DECIMALS **23**	This setting determines for flow rate the number of digits following the decimal point. The following can be selected: 00000 - 1111.1 - 2222.22 - 3333.333
K-FACTOR **24**	With the K-factor, the flowmeter pulse signals are converted to a flow rate. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 21), for example per liter. The more accurate the K-factor, the more accurate the functioning of the system will be. For examples read SETUP 13.
DECIMALS K-FACTOR **25**	This setting determines the number of decimals for the K-factor (SETUP 24). The following can be selected: 0 - 1 - 2 - 3 - 4 - 5 - 6 Please note that this SETUP - influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flow rate" (SETUP 23)!
CALCULATION **26**	The flow rate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flow rate will be. The maximum value is 255 pulses. ***Note:*** *this setting does influence the update time for the analog output directly (maximum update 10 times a second). If the output response is too slow, decrease the number of pulses.* ***Note:*** *the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications).* ***Note:*** *for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow.* ***Note:*** *for high frequency application (above 1kHz) do program a value of 50 or more pulses.*
CUT-OFF TIME **27**	With this setting, you determine a minimum flow requirement thresh-hold, if during this time less than XXX-pulses (SETUP 26) is generated, the flow rate will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).


Note !

3 - DISPLAY	
FUNCTION **31**	The large 17mm digits can be set to display total or flow rate. When "total" is selected, both total and flow rate are displayed simultaneously. When "flow rate" is selected, only flow rate will be displayed with it's measuring unit while total will be displayed after pressing SELECT.

4 - POWER MANAGEMENT	
LCD NEW **41**	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display update, it is **strongly advised** to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signals will be generated in the normal way. The following can be selected: Fast - 1 sec - 3 sec - 15 sec - 30 sec - off. ***Note:*** *after a button has been pressed by the operator - the display refresh rate will always switch to FAST for 30 seconds. When "OFF" is selected, the display will be switched off after 30 seconds and will be switched on as soon as a button has been pressed.*
BATTERY-MODE **42**	The unit has two modes: operational or shelf. After "shelf" has been selected, the unit can be stored for several years; it will not count pulses, the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the unit again, press the SELECT-key twice.

Note !

Note !

5 - FLOWMETER				
SIGNAL 51	The flow rate/totaliser is able to handle several types of input signal. The type of flowmeter pickup / signal is selected with SETUP 51. ***Note:*** *The selections "active pulse" offers a detection level of 50% of the supply voltage.*			
TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / mV	REMARK
NPN	NPN input	100K pull-up	6 kHz	(open collector)
NPN - LP	NPN input with low pass filter	100K pull-up	2.2 kHz	(open collector) less sensitive
REED	Reed-switch input	1M pull-up	1.2 kHz	
REED - LP	Reed-switch input with low pass filter	1M pull-up	120 Hz	Less sensitive
PNP	PNP input	100K pull-down	6 kHz	
PNP - LP	PNP input with low pass filter	100K pull-down	700 Hz	Less sensitive
NAMUR	Namur input	820 Ohm pull-down	4 kHz	External power required
COIL HI	High sensitive sine-wave (coil) input	-	20mVp-p	Sensitive for disturbance!
COIL LO	Low sensitive sine-wave (coil) input	-	90mVp-p	Normal sensitivity
ACT_8.1	Active pulse input 8.1 VDC	3K9	10KHz	External power required
ACT_12	Active pulse input 12 VDC	4K	10KHz	External power required
ACT_24	Active pulse input 24 VDC	3K	10KHz	External power required

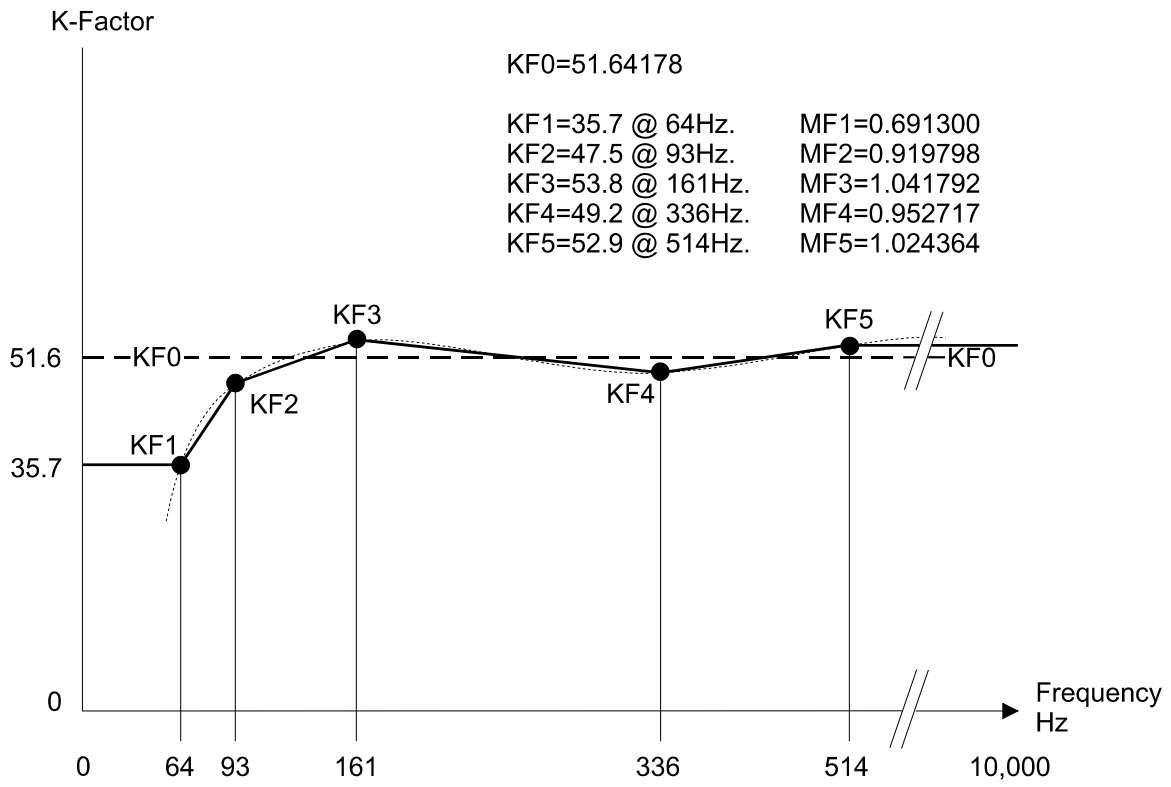
6 - LINEARISATION

The linearization function is available to approach the real flow curve better as with the general K-factor (KF0) entered with setup 14 and 24. This to obtain a more accurate flow rate, total and accumulated total as well as the analog and pulse output at any flowmeter frequency.
A maximum of 15 linearization-positions can be entered while the interpolation will calculate any other position in-between.

For each linearization position, the frequency and a Meter Factor (MF) must be entered.
The Meter Factor for each frequency is calculated with following formula:

$$\text{Meter-Factor} = \frac{\text{K-Factor at flow rate X}}{\text{KF0}}$$

The lowest frequency and MF you enter will be valid from 0Hz. The highest frequency and MF will be valid till 10KHz. It is advised to enter the frequencies in increasing order, however it is not necessary. Please have a look at following example to understand the method of linearization:



FREQUENCY / M-FACTOR 61 TO 6F	The frequency is displayed at the bottom line of the display. The maximum frequency is 9,999.9 Hz. With value 0.0Hz, the M-Factor is disabled. (Please read Setup function 6H - decimals frequency) The M-Factor is displayed at the top-line of the display. The minimum value to be entered is 0.000001 and the maximum value is 9.999999. *Please note that this value has always six decimals while the "dot" is not displayed.* Most M-factors will be around 1.000000 like 0.945354 or 1.132573.
DISABLE / ENABLE 6G	With this setup function, you can easily enable / disable the linearization function.
DECIMALS FREQUENCY 6H	For the frequency, following decimal positions can be selected: 00000 - 1111.1 - 222.22 - 33.333

Note !

7 - ANALOG OUTPUT

A linear analog 4-20 mA signal is generated according to the flow rate with a 10 bits resolution. The settings for flow rate (SETUP - 2) influence the analog output directly.
The relationship between rate and analog output is set with the following functions:

DISABLE / ENABLE 71	The analog output can be disabled. In case of a passive analog output type AP, 3.5 mA will be generated if a power supply is available but the output is disabled.
MINIMUM FLOW RATE 72	Enter here the flow rate at which the output should generate the minimum signal (4 mA) - in most applications at flow rate "zero". The number of decimals displayed depends upon SETUP 23. The time and measuring units (L/min for example) depend upon SETUP 21 and 22 but are not displayed.
MAXIMUM FLOW RATE 73	Enter here the flow rate at which the output should generate the maximum signal (20 mA) - in most applications at maximum flow. The number of decimals displayed depends upon SETUP 23. The time and measuring units (L/min for example) depend upon SETUP 21 and 22 but cannot be displayed.
CUT-OFF 74	To ignore leakage of the flow for example, a low flow cut-off can be set as a percentage of the full range of 16 mA. When the flow is less than the required rate, the current will be the minimum signal (4 mA). **Examples:**

4MA (SETUP 72)	20MA (SETUP 73)	CUT-OFF (SETUP 74)	REQUIRED RATE	OUTPUT
0 L/min	100 L/min	2%	(100-0)*2% = 2.0 L/min	4+(16*2%) = 4.32mA
20 L/min	800 L/min	3.5%	(800-20)*3.5%= 27.3 L/min	4+(16*3.5%)=4.56mA

TUNE MIN / 4MA 75	The initial minimum analog output value is 4 mA. However, this value might differ slightly due to external influences such as temperature for example. The 4 mA value can be tuned precisely with this setting. ▪ *Before tuning the signal, be sure that the analog signal is not being used for any application!* After pressing PROG, the current will be about 4 mA. The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value. Remark: the analog output value can be programmed “up-side-down” if desired, so 20mA at minimum flow rate for example!
TUNE MAX / 20MA 76	The initial maximum analog output value is 20 mA. However, this value might differ slightly due to external influences such as temperature for example. The 20mA value can be tuned precisely with this setting. ▪ *Before tuning the signal, be sure that the analog signal is not being used for any application!* After pressing PROG, the current will be about 20mA. The current can be increased / decreased with the arrow-keys and is directly active. Press ENTER to store the new value. Remark: the analog output value can be programmed “up-side-down” if desired, so 4mA at maximum flow rate for example!

Caution !

Caution !

Continued next page >>>

7 - ANALOG OUTPUT (CONTINUED)				
FILTER **77**	This function is used to stabilize the analog output signal. The output value is updated every 0.1 second. With the help of this digital filter a more stable but less precise reading can be obtained. The filter principal is based on three input values: the filter level (01-99), the last analog output value and the last average value. The higher the filter level, the longer the response time on a value change will be. Below, several filter levels with their response times are indicated:			
FILTER VALUE	RESPONSE TIME ON STEP CHANGE OF ANALOG VALUE. TIME IN SECONDS			
	50% INFLUENCE	75% INFLUENCE	90% INFLUENCE	99% INFLUENCE
01	filter disabled	filter disabled	filter disabled	filter disabled
02	0.1 second	0.2 second	0.4 second	0.7 second
03	0.2 second	0.4 second	0.6 second	1.2 seconds
05	0.4 second	0.7 second	1.1 seconds	2.1 seconds
10	0.7 second	1.4 seconds	2.2 seconds	4.4 seconds
20	1.4 seconds	2.8 seconds	4.5 seconds	9.0 seconds
30	2.1 seconds	4 seconds	7 seconds	14 seconds
50	3.5 seconds	7 seconds	11 seconds	23 seconds
75	5.2 seconds	10 seconds	17 seconds	34 seconds
99	6.9 seconds	14 seconds	23 seconds	45 seconds

8 - PULSE OUTPUT

One transistor or mechanic relay output is available as scaled pulse output according to the accumulated total.

PERIOD TIME PULSE OUTPUT 81

The period time determines the time that the transistor or relay will be switched; in other words the pulse length. The minimum time between the pulses is as long as the selected period time.
One period is approx. 7.8 msec. If the value selected is “zero”, the pulse output is disabled. The maximum value is 255 periods.
Note: *If the frequency should go out of range - when the flow rate increases for example - an internal buffer will be used to "store the missed pulses": As soon as the flow rate reduces again, the buffer will be "emptied".*
It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within it's range.
If a mechanic relay is used for the pulse output, it is recommended to reduce the max. output frequency to 0.5Hz, else the life time will be reduced significantly.

NUMBER OF PERIODS	PERIOD TIME	MAX. FREQUENCY
0	disabled	disabled
1	0,0078 seconds	64 Hz.
2	0,0156 seconds	32 Hz.
3	0,0234 seconds	21 Hz.
64	0,5000 seconds	1 Hz.
255	1,9922 seconds	0.25 Hz.

PULSE PER 82

According to the measurement unit settings for total, a pulse will be generated every X-quantity. Enter this quantity here while taking the displayed decimal position and measuring unit into account.
Example: Calculating the time between two pulses.

Settings for a pulse per = 10
This means that after each 10 m^3, one pulse will be generated, if m^3 is set for total.

Settings for a total K-factor = 27000
This is number of pulses per unit volume.

With **input pulse signal** of 150 Hz, it takes 1800 s until a pulse is generated.

$$time = \frac{(a\ pulse\ per) \cdot (K\_factor)}{frequency} = \frac{(10\ m^3) \cdot (2700/m^3)}{150\ Hz} = 1800\ sec = 30\ min$$

9 - COMMUNICATION (OPTIONAL)	
The functions described below deal with hardware that is not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation.	
BAUDRATE **91**	For external control, the following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud
BUS ADDRESS **92**	For communication purposes, a unique identity can be attributed to every flow rate/totaliser. This address can vary from 1-255.
MODE **93**	The communication protocol is Modbus RTU. Select OFF, to disable this communication function.

A - OTHERS	
TYPE OF MODEL **A1**	For support and maintenance it is important to have information about the characteristics of the flow rate/totaliser. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
VERSION SOFTWARE **A2**	For support and maintenance it is important to have information about the characteristics of the flow rate/totaliser. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
SERIAL NUMBER **A3**	For support and maintenance it is important to have information about the characteristics of the flow rate/totaliser. Your supplier will ask for this information in the case of a serious breakdown or to assess the suitability of your model for upgrade considerations.
PASS CODE **A4**	All SETUP-values can be pass code protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
TAGNUMBER **A5**	For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.

4. INSTALLATION

Caution !

4.1 GENERAL DIRECTIONS

- Take careful notice of the "Safety rules, instructions and precautionary measures" at the front of this manual.
- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The flow computer may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.
- Install the measuring sensor near the transducer (max.100m cable length, depending on the electrical interference zone).
- The measuring cable must be laid well away from strong sources of electrical interference and not parallel to power cables.
- The measuring cable of several DOG-… must not be laid over long distances next to one another or bundled together.
- The DOG-4A transducer must be installed outside of the Ex-zone.
- Lay the electrical cabling according to the following wiring diagram.
- Each transducer is matched specifically to the respective measuring sensor and must not be swapped over.
- The pipelines and the flange housing must be grounded.

4.2 MEASURING CABLE IN EX AREAS

An Ölflex EP (without shield) or Ölflex EBCY (with shield) may be used as measuring cable between the sensor and transmitter. Alternatively, a cable with comparable properties may be used.

Ölflex EB Li=0.65 mH/km Cisy=110 nF/km

Ölflex EBCY Li=0.65 mH/km Cisy=135 nF/km Ciasy=185 NF/km

The length of the cable may not exceed 100m. The maximum permitted cable inductance is Limax=65µH and the maximum capacitance Cimax=32nF.

4.3 ELECTRONIC OPTIONS G0/H0

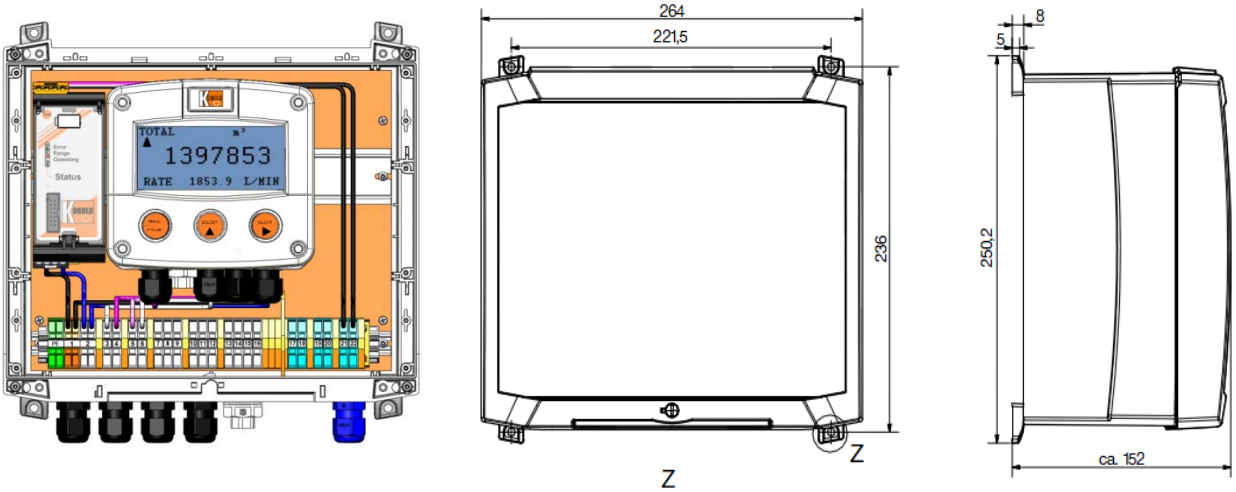


FIG. 5: ELECTRONIC OPTIONS G0/H0 WITH DIMENSIONS

4.3.1. TERMINAL CONNECTORS

The following terminal connectors are available:

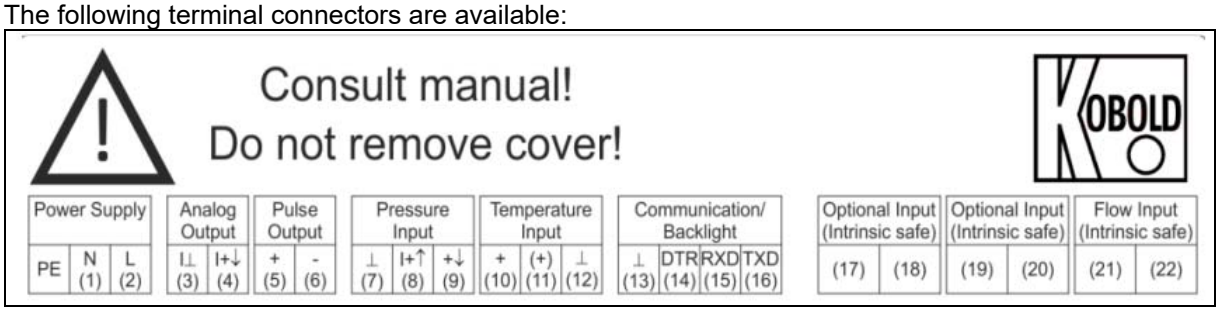
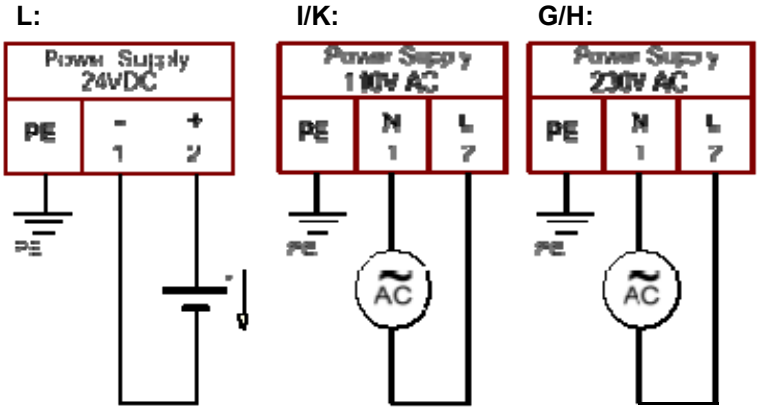


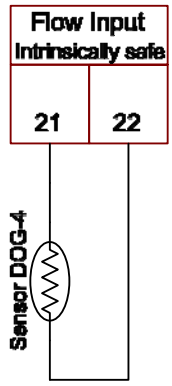
Fig. 6: Overview terminal connectors for electronic options G0/H0

Terminal PE – 1 – 2 (power supply)



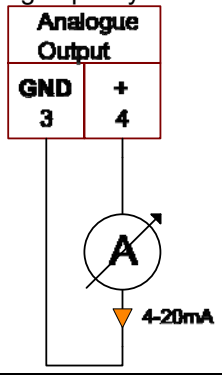
Terminal 21 – 22: Connection to the measuring sensor

Use terminal connectors 21 and 22 to connect the transmitter and the flow computer with the measuring sensor. The polarity of the sensor is not relevant.



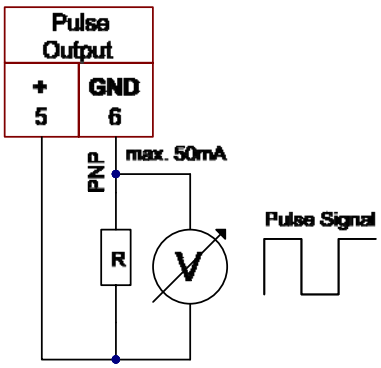
Terminal 3 – 4 (analog output signal proportional to the flow rate)

When the output is disabled, a 3.5mA signal will be generated on these terminals.
Max. driving capacity 1000Ω @ 24VDC.



Terminal 5 – 6 (scaled pulse output according to linearised total)

Setup 8 (par. 3.2.3.) determines the pulse output function. The maximum pulse frequency of this output is 60Hz. Max. driving capacity 50mA @ 24V per output.



Terminal 7 – 8 – 9 (input for pressure sensor)

Not connected. This input is used only with Flow Computer (options M0/N0).

Terminal 10 – 11 – 12 (input for temperature sensor)

Not connected. This input is used only with Flow Computer (options M0/N0).

Terminal 13 – 14 – 15 – 16: MODBUS communication

The following MODBUS types are available:

Type CH: Communication RS485 2-wire / Protocol MODBUS RTU **(optional)**
Type CB: Communication RS232 / Protocol MODBUS RTU **(on request)**

Full serial communications and computer control in accordance with RS485 (length of cable max. 1200 meters) or RS232 (length of cable max. 15 meters) is possible.

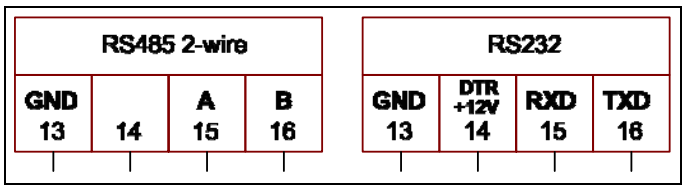


Fig.7: Overview terminal connectors for Modbus communication

When using the RS232 communication option, terminal 14 is used for supplying the interface. Please connect the DTR (or the RTS) signal of the interface to this terminal and set it active (+12V). If no active signal is available, it is possible to connect a separate supply between terminals 13 and 14 with a voltage between 8V and 24V.

Read the Modbus communication protocol and Appendix C.

5. MAINTENANCE

5.1. GENERAL DIRECTIONS


Caution !

- *Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The flow rate/totaliser may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.*

The flow rate/totaliser does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the user's responsibility to take all precautions to dehumidify the internal atmosphere of the flow rate/totaliser in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.

Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the polyester coating.

5.2. REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

APPENDIX A: TECHNICAL SPECIFICATION OF FLOW INDICTAOR

GENERAL

Display	
Type	High intensity reflective numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17 mm (0.67") and eleven 8 mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.

Operating temperature	
Operational	-25°C...+60°C

Power supply	
	G/H: 230 V_{AC} ±10% I/K:110 V_{AC} ±10% L: 24 V_{DC} ±20%

Data protection	
	EEPROM backup of all setting. Backup of running totals every minute. Data retention at least 10 years.
Pass code	Configuration settings can be pass code protected.

INPUTS

Flowmeter	
	Coil/sine wave (minimum 20mVp-p or 80mVp-p - sensitivity selectable), NPN/PNP, open collector, reed-switch, Namur, active pulse signals 8 - 12 and 24V.
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Linearisation	15 positions with interpolation function; Meter-Factor 0.000001 - 9.999999 versus Frequency 0.001 Hz - 9,999 Hz.

OUTPUTS

Analog output	
Function	transmitting linearised flow rate.
Accuracy	10 bit. Error < 0.05% - update 10 times a second. Software function to calibrate the 4.00mA and 20.00mA levels precisely within set-up.
Load	max. 1 kOhm
	Active 4-20mA output

Transistor output(s)	
Pulse output	Max. frequency 60Hz. Pulse length user definable between 7,8msec up to 2 seconds.
Function	One pulse output - transmitting linearised accumulated total.
	Active 24V DC transistor output; max. 50mA per output

Communication option	
Functions	reading display information, reading / writing all settings.
Protocol	Modbus RTU
Speed	1200 - 2400 - 4800 - 9600 baud
Addressing	maximum 255 addresses.
Interface	RS485 2-wire (optional) RS232 (on request)

OPERATIONAL

Operator functions	
Displayed functions	• linearised total and/or flow rate. • linearised total and linearised accumulated total. • total can be reset to zero by pressing the CLEAR-key twice.

Total	
Digits	7 digits.
Units	L, m3, GAL, USGAL, KG, lb, bbl, no unit.
Decimals	0 - 1 - 2 or 3.
Note	total can be reset to zero.

Accumulated total	
Digits	11 digits.
Units / decimals	according to selection for total.
Note	accumulated total cannot be reset to zero

Flow rate	
Digits	7 digits.
Units	mL, L, m3, Gallons, KG, Ton, lb, bl, cf, RND, ft3, scf, Nm3, Nl, igal - no units.
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

APPENDIX B: PROBLEM SOLVING

In this appendix, several problems are included that can occur when the flow rate/totaliser is going to be installed or while it is in operation.

Flowmeter does not generate pulses:
Check:
- Signal selection SETUP - 51,
- Flowmeter, wiring and connection of terminal connectors,

Flowmeter generates "too many pulses":
Check:
- Settings for total and Flow rate: SETUP 11-14 and 21-27,
- Type of signal selected with actual signal generated - SETUP - 51,

Analog output does not function properly:
Check:
- SETUP 71 - is the function enabled?
- SETUP 72 / 73: are the flow-levels programmed correctly?
- connection of the external power-supply according to the specification.

Pulse output does not function:
Check:
- SETUP 81 - impulse width; is the external device able to recognize the selected pulse width and frequency?
- SETUP 82 - pulse per “x” quantity; is the value programmed reasonable and will the maximum output be under 20Hz?

Flow rate displays "0 / zero" while there is flow (total is counting):
Check:
- SETUP 22 / 25: are the K-factor and time unit correct?
- SETUP 26 / 27: The unit has to count the number of pulses according to SETUP 26 within the time according to SETUP 27. Make sure that 27 is set to 10.0 seconds for example : the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 26.

The pass code is unknown:
If the pass code is not 1234, there is only one possibility left: call your supplier.

ALARM
When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the 5-digit error code. The codes are:

0001: irrecoverable display-data error: data on the display might be corrupted.
0002: irrecoverable data-storage error: the programming cycle might have gone wrong: check programmed values.
0003: error 1 and error 2 occurred simultaneously

If the alarm occurs more often or stays active for a longer time, please contact your supplier.

APPENDIX C: COMMUNICATION VARIABLES

Remarks:

- Below, an overview of the flow rate/totaliser specific variables; other common variables are described in the standard table.
- All numbers are decimal numbers, unless otherwise noted.
- The following variables of the standard table (var00-var30) are not valid for this product and will be responded with value 1: var00, 03-05, 07,08, 16-22, 24, 26-29.

CONFIGURATION VARIABLES flow rate/totaliser - SETUP-LEVEL:				
VAR	**DESCRIPTION**	**BYTES**	**VALUE**	**REMARKS**
TOTAL				
32 (20h)	unit	1	0=L 1=m3 2=kg 3=lb 4=gal 5=usgal 6=bbl 7=none	
33 (21h)	decimals	1	0…3	
34 (22h)	K-factor	3	1....9.999.999	K-f 0000001 - K-f 0000009 is allowed when decs < 6! (VAR37)
37 (25h)	decimals K-factor	1	0…6	
FLOW RATE				
48 (30h)	unit	1	0=mL 1=L 2=m3 3=mg 4=g 5=kg 6=ton 7=gal 8=bbl 9=lb 10=cf 11=rev (revolutions for RPM) 12=none 13=scf 14=NM3 15=NL 16=p	
49 (31h)	time unit	1	0=sec 1=min 2=hour 3=day	
50 (32h)	decimals	1	0…3	
51 (33h)	K-factor	3	1....9.999.999	K-f 0000001 - K-f 0000009 is allowed when decs < 6! (VAR54)
54 (36h)	decimals K-factor	1	0…6	
55 (37h)	number of pulses	1	1..255	
56 (38h)	cut-off time	2	1 .. 9999	steps of 100ms

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
DISPLAY				
64 (40h)	display function	1	0=total 1=flow rate	
68 (44h)	set flow rate monitor	1	0=operator level 1=SETUP level	
POWERMANAGEMENT				
80 (50h)	LCD update time	1	0=fast 1=1sec 2=3sec 3=15sec 4=30sec 5=off	
81 (51h)	power-mode battery	1	0=operational 1=shelf	
FLOWMETER				
96 (60h)	flowmeter signal	1	0=npn 1=npn-lp 2=reed 3=reed LP 4=pnp 5=pnp-lp 6=namur 7=coil hi 8=coil lo	
LINEARISATION				
1024 (400h)	linearization table entry	6	m=0..9999999 / f=0..99999	**INDEXED** 3 bytes m-factor MS-part 3 bytes freq. LS-part. | m | m | m | f | f | f | MSB……..….LSB
1038 (40Eh)	linearization on/off	1	0=disable 1=enable	
1039 (40Fh)	Decimals	1	0, 1, 2, 3	Number of decimals
ANALOG OUTPUT				
112 (70h)	analog output	1	0=disable 1=enable	
113 (71h)	minimum rate	3	0..9999999	unit, time, decimals acc. var48-50
116 (74h)	maximum rate	3	0..9999999	unit, time, decimals acc. var48-50
119 (77h)	cut off percentage	1	0..99	steps of 0.1%
120 (78h)	tune minimum rate	2	0..9999	
122 (7Ah)	tune maximum rate	2	0..9999	
99 (63h)	filter	1	0….99	
PULSE OUTPUT				
128 (80h)	impulse width	1	0=off 1=short 2=long	
129 (81h)	pulse per X quantity	3	1..9999999	unit, decimals acc. var32 -33

VAR	DESCRIPTION	BYTES	VALUE	REMARKS
OTHERS				
168 (A8h)	pass code	2	xxxx	read only!
170 AAh	tagnumber	3	0..9999999	Other vars: see standard table

OTHER flow rate/totaliser VARIABLES FOR COMMUNICATION

TOTAL - variable number 566 (236h) – 6 bytes

Read total: The value of total read using RS communications might differ from the value that appears on the display. This is due to the fact that the display can only display up to seven digits (for example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a "total" of 12345678 and a "total decimals" of 2).

Write total: total can only be cleared. This means writing a value different from 0 will result in the reply of an error message. Only writing 6 bytes of zeros to total will be accepted.

ACCUMULATED TOTAL - variable number 560 (230h) – 6 bytes

Read acc. total: A difference between the read value and the display value, as explained for "Read total", might appear here too.

Write acc. total: Not possible.

When reading or writing total or accumulated total it should be noted that the used values are given including the decimals. This means that a read/write to one of these variables should be accompanied with a read/write to the variable that holds the number of decimals for this variable:

Example: read var. 566 for total:
Read var. 33 for total decimals and calculate the real value of total by multiplying total with $10^{-(\text{total decimals})}$

FLOW RATE - variable number 572 (23Ch) – 4 bytes

Read flow rate: The value difference as mentioned with total/acc. total might appear here too.

Write flow rate: Not possible.

APPENDIX D: FACTORY SETTINGS FOR FLOW INDICATOR

MENU SETTINGS		FUNCTIONS	FACTORY DEFAULT SETTINGS
1	**TOTAL**		
	11	UNIT	m3
	12	DECIMALS	111111,1
	13	K-FACTOR	$K-Faktor = \frac{540000\left[\frac{Pulses}{h}\right]}{full\ scale\ flow\ value\left[\frac{m^3}{h}\right]}$ (enter with one decimal, according to 25)
	14	DECIMALS K-FACTOR	1
2	**FLOWRATE**		
	21	UNIT	m3
	22	TIME UNIT	hr
	23	DECIMALS	22222,22
	24	K-FACTOR	$K-Faktor = \frac{540000\left[\frac{Pulses}{h}\right]}{full\ scale\ flow\ value\left[\frac{m^3}{h}\right]}$ (enter with one decimal, according to 25)
	25	DECIMALS K-FACTOR	1
	26	CALCULATION	10
	27	CUT-OFF	30,0
3	**DISPLAY**		
	31	FUNCTION	total
4	**POWER MANAGEMENT**		
	41	LCD UPDATE	1 (sec)
	42	BATTERY MODE	operate
5	**FLOWMETER**		
	51	SIGNAL	PNP LP
6	**LINIARISATION**		
	61	FREQ. / M-FACTOR 1	0,0 Hz / 10000000
	62	FREQ. / M-FACTOR 2	0,0 Hz / 10000000
	63	FREQ. / M-FACTOR 3	0,0 Hz / 10000000
	64	FREQ. / M-FACTOR 4	0,0 Hz / 10000000
	..	..	……..
	6F	FREQ. / M-FACTOR 15	0,0 Hz / 10000000
	6G	LINEARISATION	disable
	6H	DECIMALS FREQUENCY	111111,1

7	**ANALOG**		
	71	OUTPUT	enable
	72	4mA / 0V	0000000
	73	20mA / 10V	Full scale flowrate value (Units dependent upon SETUP 21 and 22)
	74	CUT-OFF	1,0
	75	CALIBRATE LOW	0296 ± 1
	76	CALIBRATE HIGH	5395 ± 1
	77	FILTER	01
8	**IMPULSE**		
	81	PERIOD TIME	002 (pulse width 15.6ms)
	82	IMPULSE PER	000001,0 (i.e. pulse per m3)
9	**COMMUNICATION**		
	91	SPEED / BAUDRATE	2400
	92	ADDRESS	1
	93	MODE	OFF
A	**OTHERS**		
	A1	TYPE / MODEL	F112-P
	A2	SOFTWARE VERSION	TT:MM:JJ
	A3	SERIAL NO.	XXXXXXX
	A4	PASS CODE	0000
	A5	TAGNUMBER	0000000

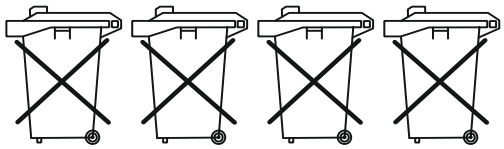
6. DISPOSAL

Note!

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

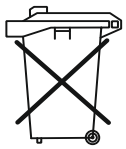
Batteries

Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:



1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment



7. EU DECLARATION OF CONFORMANCE

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

DOG-… electronic option G0/H0/I0/K0/L0 (Flow controller)

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU	**EMC Directive**
2014/35/EU	**Low Voltage Directive**
2011/65/EU	**RoHS** (category 9)

Also, the following standards are fulfilled:

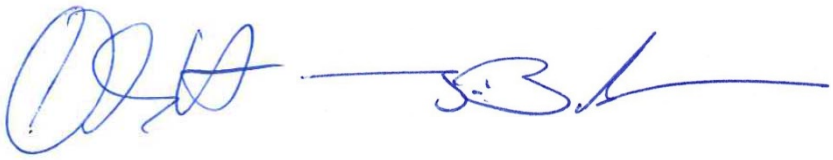
EN 61000-6-2:2005 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-3:2007/A1:2011 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

EN 61010-1:2010/A1:2019 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances



Hofheim, 22 Feb. 2024

H. Volz
General Manager

Joseph Burke
Compliance Manager

8. UK DECLARATION OF CONFORMITY

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

DOG-… electronic option G0/H0/I0/K0/L0 (Flow controller)

to which this declaration relates is in conformity with the following UK directives stated below:

S.I. 2016/1101	**Electrical Equipment (Safety) Regulations 2016**
S.I. 2012/3032	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Also, the following standards are fulfilled:

BS EN 61000-6-2:2005 Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments

BS EN 61000-6-3:2007/A1:2011 Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments

BS EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

BS EN 61010-1:2010+A1:2019
Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements

BS EN IEC 63000:2018
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Hofheim, 06 March 2024

H. Volz
General Manager

J. Burke
Compliance Manager