

Certified according to DIN ISO 9001

# Manual



C-Flow KCM & KCE 8000

#### SW-Version

Main: V1.0

Display: V1.0

Handbuch-Revision: 1.0

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# **1 GENERAL INFORMATION**

# 1.1 Features

The C-Flow Mass Flow Meters based on the Coriolis principle show many advantages compared to other flow meter principles:

- Now moving parts
- High accuracy
- Simultaneous measuring of mass flow, density and temperature
- Calculation of volume flow as well as mass and volume total
- Flushable

The C-Flow Mass Flow Meters are available as compact version with on site display and as meter with remote display for wall or panel mount.

All versions are available as standard version as well as Ex certified for hazardous locations.

The meters provide the following features:

- A graphic display
- Menu driven control with soft keys for easy operation also without manual
- 2 freely programmable 4-20 mA outputs
- 1 freely programmable frequency output
- 1 control input and 1 control output
- RS485 interface

As an option are available

- HART interface
- Foundation Fieldbus interface



Fig. 1: Compact version



Fig. 2: Separate versions, wall mount (left) and panel mount (right)

# 1.2 Safety

#### 1.2.1 General Safety

All statements regarding safety of operation and technical data in this manual will only apply when the unit is operated correctly in accordance with this manual.

The data for Ingress Protection will only apply when all connectors are caped properly with the corresponding counterpart with the same or better IP rating. Cable glands must be populated with cables with the specified diameter and closed properly. The display cover must be closed.

During operation all openings of the housing must be closed unless otherwise noted in this manual.

All connections to the load and to the supply must be made with shielded cables unless otherwise noted in this manual. This unit must be grounded.

This unit must be supplied by a safety approved power supply with outputs which comply with Safety Extra Low Voltage (SELV).

As a protection against fire in the positive supply a fuse with a current rating not higher than the current carrying capacity of the cable used is required.

Before installing the flow meter and transmitter the user is responsible to ensure that all wetted parts are compatible with the fluid or gas to be measured.

The user has to adhere to the instructions for installing electrical devices and corresponding instructions.

The devices described in this manual may only be connected and operated by authorized and qualified personnel.

#### 1.2.2 Special requirements for Ex installations

In hazardous locations the rear cover of the KCE must not be opened under any circumstances if the supply voltage is alive.

The analogue and digital I/O signals are not specified for driving Ex i circuits.

When using long cables make sure that the maximum inductances and capacitances for the respective voltage or gas group are not exceeded.

# **1.3 Ordering Codes and Accessories**

#### 1.3.1 Ordering Code





Please ask KEM or your nearest dealer for the possible combinations and the best solution for your application

#### 1.3.2 Accessories

Ordering Code Description

Connecting Cable KCM ⇔ KCE80xx.SG

### 1.4 Measuring Principle KCM

Two parallel flow tubes inside the KCM flow meter are vibrating at their resonant frequency in opposite direction. Any mass flow passing through the tubes will delay the vibration at the incoming side and accelerate the vibration at the outgoing side. This causes a small time delay between both ends of the tube. This time delay is measured and used to calculate the mass flow through the tubes.

By measuring the resonant frequency of the tubes the mass of the medium and - given a constant volume inside the tubes - the specific gravity of the medium can be calculated.

As both effects are temperature dependent, the temperature is measured via a precise sensor for correcting the temperature effects of flow and density measurement.

As a consequence a coriolis mass flow meter measures directly mass flow, density and temperature of the medium. Knowing the mass flow and the density, also the volume flow can be calculated.

Cycle of deformation (simplified):

Rotation and deformation of two parallel tubes by the coriolis force Fc.



Fig. 3: Flections of the tubes with and without flow

# **2 GETTING STARTED**

# 2.1 Unpacking

Verify that you have received the following items:

When you ordered a compact version:

- KCMxxx.CF... with mounted electronics
- User's manual

When you ordered a remote version

- KCMxxx.C... (without electronics)
- KCE80xx....
- Connecting cable (with KCE80xx-WG just fixed to the KCE)
- User's manual

### 2.2 **Operating Elements**

2.2.1 KCE80xx-WG and compact version



#### Fig. 4: Operating Elements of KCE80xx.WG and compact version

- 1 = LED "OK", flashes green when there is no error
- 2 = LED "ERR", flashes red when an error occurs
- 3 = Display
- 4 = Pushbutton "P", activates / selects the different menus and confirms the settings
- 5 = Pushbutton "Reset", normal: resets the totalizer, SETUP: softkey
- 6 = Pushbutton "Display", normal: toggles the display, SETUP: softkey
- 7 = Pushbutton "E", normal: selects the error menu, SETUP: softkey
- 8 = Front cover
- 9 = Set screw for front cover (varying position)
- 10 = Cable gland for power supply and signal I/O
- 11 = Caped thread 1/2" NPT for second cable gland
- 12 = Screw for protective ground
- 13 = rear cover
- 14 = Set screw for rear cover (varying position)

Wall mount version only:

- 15 = Cable to the meter KCMnnnn, length as ordered (standard 3m)
- 16 = Wall mounting bracket

#### 2.2.2 KCE80xx.SG



Fig. 5: Operating Elements of KCE80xx.SG

- 1 = LED "OK", flashes green when there is no error
- 2 = LED "ERR", flashes red when an error occurs
- 3 = Display
- 4 = Pushbutton "P", activates / selects the different menus and confirms the settings
- 5 = Pushbutton "Reset", normal: resets the totalizer, SETUP: softkey
- 6 = Pushbutton "Display", normal: toggles the display, SETUP: softkey
- 7 = Pushbutton "E", normal: selects the error menu, SETUP: softkey
- 8 = Removable panel holder left
- 9 = Removable panel holder right
- 10 = Connector to the meter, D-Sub 9, female
- 11 = Screw type connector for power supply and I/O signals

#### 2.2.3 KCMxxxx.1... (remote version)



#### Fig. 6: Operating Elements KCM

- 1 = Locking screw for screw type terminals
- 2 = Cable gland for cable to the KCE
- 3 = Fluid input, flange / thread as ordered
- 4 = Fluid output, flange / thread as ordered
- 5 = Screw for protective ground (KCM0300 through 3000 only)
- 6 = M6 mounting threads (back side, option, KCM0300 through 3000 only)

# 2.3 Pin Assignments

#### 2.3.1 Compact or wall mount version



#### Fig. 7: Electrical terminals KCE80xx-WG and compact version

- 1 = Terminal block for I/O signals
- 2 = Terminal block for interface (RS485)
- 3 = Switch for terminating resistor for the RS485 interface
- 4 = Terminal block power supply

#### **KCE Terminal connections**

1	+  1	current loop 1 positive terminal
2	- 11	current loop 1 negative terminal
3	+ 12	current loop 2 positive terminal
4	- 12	current loop 2 negative terminal
5	F out	Frequency / pulse output
6	STAT OUT	Status output
7	CTL IN	Control input
8	GND	Ground (for pins 5 through 7)
20	COMMON	Common (for pins 21 and 22)
21	- RS485	RS485 negative line
22	+RS485	RS485 positive line
50	+ 24 VDC	Positive supply voltage (24 VDC)
51	- 24 VDC	Supply ground
52	PE	Protective Ground

#### 2.3.2 Panel mount version



Fig. 8: Electrical terminals KCE80xx-SG

#### **KCE** Terminal connections

1	+ 11	current loop 1 positive terminal
2	- 11	current loop 1 negative terminal
3	+ 12	current loop 2 positive terminal
4	- 12	current loop 2 negative terminal
5	F out	Frequency / pulse output
6	STAT OUT	Status output
7	CTL IN	Control input
8	GND	Ground (for pins 5 through 7)
20	COMMON	Common (for pins 21 and 22)
21		
	- KS485	RS485 negative line
22	- RS485 +RS485	RS485 negative line RS485 positive line
22	- RS485 +RS485	RS485 negative line RS485 positive line
22 50	- RS485 +RS485 + 24 VDC	RS485 negative line RS485 positive line Positive supply voltage (24 VDC)
22 50 51	- RS485 +RS485 + 24 VDC - 24 VDC	RS485 negative line RS485 positive line Positive supply voltage (24 VDC) Supply ground
22 50 51 52	- RS485 +RS485 + 24 VDC - 24 VDC PE	RS485 negative line RS485 positive line Positive supply voltage (24 VDC) Supply ground Protective Ground

### 2.4 Quick start

#### WARNING:

As for safety and accuracy reasons many precautions must be taken, read chapter 3 carefully before installing the unit!

In case the unit has only to be operated without flow for testing or learning purpose, the following connections have to be made (see chapter 3.2):

- Connect the 24V supply
- Connect the KCE to the KCM (only required with the remote version)
- The frequency and analogue outputs as well as the interface may be connected as well, if those features are required

#### WARNING:

If the unit is connected to a bigger system, for your personal safety connect the protective ground as well!

#### 2.4.1 First Operation

Make sure that all mechanical and electrical connections are made properly.

Switch on the power supply. The LED "OK" will flash green.

After the power up sequence the display shows the preselected values (ex factory normally flow and total)

Switch on the flow. The value indicated in the display should be positive.

In case of an error the LED "ERR" will flash red.

As soon as the unit has reached the operating temperature, make the zero point calibration (see chapter 4.4.16):

- Switch off the flow
- Wait until the flow is zero
- Start the zero point calibration in the SETUP menu
- Switch on the flow again

The display can be altered by pressing the key "Display".

The error code can be viewed by pressing the key "E" for 3 seconds.

If the function is activated, the TOTAL reading can be reset to zero by pressing the key "Reset".

For entering the SETUP menu press "P" for 3 seconds.

#### 2.4.2 SETUP Menu

In the SETUP menu all configurations can be made. This includes configuration of the analogue and digital outputs, customizing the display and other settings.

The menu itself is self explaining, the function of the softkeys (5, 6, 7) is indicated in the display above the pushbutton.

For entering the SETUP menu press the pushbutton "P" (4) for 3 seconds.

Change the indicated number "2206" with the softkey "up" (6) to "2207" and confirm with "P" (4).

Select the desired submenu with the softkeys and confirm with "P" (4).

Every setting must be confirmed with "P" (4) for storing the setting or with "E" for exiting without storing.

For finishing the SETUP menu press "E" (7) in the main level.

# **3 INSTALLATION**

# 3.1 Mechanical

In accordance with this manual the user should select the installation position which fits the application best. To ensure the highest degree of accuracy and repeatability, care should be taken to affix the C-Flow products in a stable process site and minimize the amount of vibration in the installation environment

#### 3.1.1 Horizontal Installation

When the KCM is installed horizontally the exact position depends on the measuring medium. The KCM housing should point upward (A) when the fluid contains solids. This will help avoid deposits in the measuring tube. The KCM housing should point downward (B) when the fluid contains gas or air bubbles. This will help avoid falsified measurements due to gas bubbles.



Fig. 9: Recommended Horizontal Installation

#### 3.1.2 Vertical Installation

- A vertical installation should only be selected, if
- a) the medium contains no deposits.
- b) gas or air bubbles are not expected.

When the KCM is installed vertically the flow direction should be upward. Please consider that the KCM will not run empty in this position due to the geometric construction of the measuring tubes.



Important notes on vertical installation

When the system is stopped gas or air bubbles may accumulate at the highest point of the tubes. Due to the tube geometry the measuring tubes do not vent automatically in vertical installation position. Gas bubbles may also accumulate at the highest point of the tubes when the mass flow is very low. Generally, gas bubbles will lead to undefined measuring results due to the big density difference.

#### 3.1.3 Installation in a Drop Line

This installation requires a pipe reduction or orifice with a smaller cross section than the KCM to ensure the KCM cannot drain during the measuring process.



Fig. 10: Installation in a Drop Line

#### 3.1.4 Critical Installations

Installations which may lead to an inclusion of air or gas bubbles should be avoided as the might falsify

the measuring results considerably. Therefore installations at the highest point of the system (A) or close upstream of a free discharge (B) are not recommendable.



#### Fig. 11: Critical Installations

#### 3.1.5 Mechanical Installation of the electronics (-WG and -SG version)

KCE80xx-WG

The wall mount unit is to be mounted on the wall with 2 screws with 5mm diameter, about 40mm apart. For exact dimensions refer to chapter 7.3.3

#### KCE80xx-SG

The housing requires an opening in the panel of 92mm x 92mm.

Remove the fixing screws from the housing by moving the end of the screws downwards (left side) and upwards (right side).

Put the KCE80xx-SG into the opening and refix the fixing screws.

Tighten the fixing screws until the unit is fixed properly.

### 3.2 Electrical installation

Make sure that the unit is properly mounted and the process input and output are connected before making the electrical connections.

This unit must be grounded.

The KCE requires a regulated DC power supply of 24V ±20%.

The digital inputs and outputs are referred to the ground potential of the supply (= negative pole). Ex work this ground is connected to protective ground. In case the supply potential must be separated from protective ground, please contact KEM

For connecting the KCE, shielded cables must be used. The shield should be connected to the case. If in bigger systems the shield must not present a DC connection for avoiding high ground loop currents, make the ground connection of the shield via a capacitor of e. g. 100nF.

Make sure that the flow meter is grounded.

#### WARNING

Improper grounding and shielding may lead to bad EMC behavior or danger to your health!

#### NOTE

Make sure that all cable and wires are connected and fixed properly before applying power to the KCE.

#### 3.2.1 Connecting KCE and KCM

With the remote version the KCE and KCM must be connected before making the other electrical installations. If no KCM is connected to the KCE, the KCE will only show an error message after power on.

Put the D-Sub connector of the cable to the connector "sensor" on the back side of the housing (panel mount version only)

Open the junction box of the KCM.

Feed the cable from the KCE into the cable gland of the KCM and connect the single conductors as described in tab. Tab. 1.

Terminal	Signal	Color
1	Driver +	Grey
2	Driver -	Pink
3	Sensor A +	Blue
4	Sensor A -	Red
5	Sensor B +	White
6	Sensor B -	Brown
7	Pt1000 +	Green
8	Pt1000 -	Yellow
PE	Protective ground	Yellow / green

Adjust the position of the cable in the cable glands and close the cable gland.

#### Tab. 1: Connections KCMxxxx.0

Close the top cover of the junction box and fix it with the screw.

#### 3.2.2 Electrical Installation of Wall Mount and Compact Version

Connect the KCM to the KCE (see chapter 3.2.1, remote version only)

Open the safety screw at the top cover of the unit with the provided Allen key.

Remove the display cover of the KCE by turning it counter clockwise.

Pull out the display

Prepare the cable for installation:

- Separate the single conductors for about 12 cm
- Strip the end and cover it with a cable end sleeve
- Connect a 7 cm long stranded wire to the shield

Feed the cable through the cable gland.

Connect the shield to the PE screw.

Open the individual terminals by pressing a small screw driver into the small, upper hole of the terminal, feed in the conductor end and pull out the screw driver.

For the right connections refer to chapter 3.2.4 to 3.2.6.

Adjust the position of the cable in the cable gland in that way that the single conductors remain short but tension free and fix the cable in the cable gland.

Put in the display again. The display can be put in at 4 orientations separated by 90°.

Perform – if necessary – a function test and make the necessary settings (see chapter 4.3).

Close the display cover.

Fasten the safety screw if necessary.

#### 3.2.3 Panel Mount Version

Connect the KCM to the KCE (see chapter 3.2.1)

Prepare the cable for installation:

- Separate the single conductors as required
- Strip the end and cover it with a cable end sleeve
- Connect a stranded wire to the shield

Connect the shield to the PE terminal.

Connect the individual cables to the screw type terminals as required.

For the right connections refer to chapter 3.2.4 to 3.2.6.

Perform – if necessary – a function test and make the necessary settings (see chapter 4.3).

#### 3.2.4 Power Supply and Grounding

The KCE requires a regulated DC power supply of 24V ±20%.

The power supply input of the KCE is protected by a 315mA fuse. As a protection against fire in case of a short in the supply cable, the output of the power supply must be equipped with a fuse with a rating not higher than the current carrying capacity of the cable used.

For connecting the KCE 8000 use shielded cables. If several cables are used, each cable should be shielded properly.

Connect the ground of your power supply to terminal 51 and the +24V to terminal 50. (See Fig. 12)



Protective Ground

#### Fig. 12: Wiring diagram for power connections

Terminal	Description
50	Positive supply Voltage, 24V ±20%, referred to pin 51
51	Ground potential for supply voltage
52	Protective ground

The ground terminals 8, 20 and 51 are internally connected together.

#### NOTE:

In standard configuration terminal 51 (ground) and 52 (protective ground) are internally connected. In case of a potential difference in your system a high equalizing current will flow.

For disconnecting the internal ground from protective ground please contact KEM.



#### 3.2.5 Connecting the control inputs and outputs

#### Fig. 13: Wiring diagram for digital I/O connections

Terminal	Description
5	Frequency output, active, referred to pin 8
6	Status output, active, referred to pin 8
7	Control input, active high, referred to pin 8
8	Ground potential for digital I/O- pins.

The frequency and control outputs are active push-pull outputs with an output resistance of 220 $\Omega$ . They can be loaded to the positive supply or to ground. For a high output swing the load resistors R<sub>load</sub> should not be lower than 1k $\Omega$ .

In case of a load resistor to ground the output voltages are:

Vhigh = V<sub>supply</sub> \*  $R_{load}$  / (220 $\Omega$  +  $R_{load}$ )

 $V_{low} < 1V$ 

In case of a load resistor to the positive supply the output voltages are:

Vhigh > Vsupply - 1V

Vlow = Vsupply - Vsupply \* R<sub>load</sub> / (220Ω + R<sub>load</sub>)

The control input requires a high voltage of minimum 6.5V and a minimum input current of 0.1mA.

The ground terminals 8, 20 and 51 are internally connected together.

NOTE:

In standard configuration terminal 8 (ground) and 52 (protective ground) are internally connected. In case of a potential difference in your system a high equalizing current will flow.

#### 3.2.6 Connecting the analogue outputs

The KCE8000 provides 2 independent passive 4-20mA current loops CURRENT 1 and CURRENT 2.

The current loops are isolated from each other and from the power supply.

For operation an external supply of 8 to 30V (nominal 24V) is required.

The minimum voltage between terminal 1 and 2 or 3 and 4 respectively is 8V.

The minimum load resistance is  $0\Omega$ , the maximum is determined by the supply voltage.

At a given supply voltage the maximum load resistance can be calculated as:

 $R_{load}(max) = (V_{supply} - 8V) / 22mA$ 

For 24V minus 10% supply this gives a maximum value of  $620\Omega$ .

With a given load resistance, the minimum supply voltage can be calculated as:

 $V_{supply}(min) = 8V + R_{load} * 22mA$ 



Fig. 14: Wiring diagram for 4-20mA current loop

Terminal	Description
1	Positive terminal of the passive 4-20mA loop 1
2	Negative terminal of the passive 4-20mA loop 1
3	Positive terminal of the passive 4-20mA loop 2
4	Negative terminal of the passive 4-20mA loop 2

As the terminals are floating, the load resistor and the current meter can be placed in the positive or in the negative supply rail (see Fig. 14, right or left circuit).

Connect the shield of the cables to protective ground (terminal 52).

### 3.3 Ex Installation

#### WARNING

In hazardous locations all installations must only by carried out by qualified personnel! Switch off all power supplies before installing or uninstalling the unit in hazardous locations!

#### 3.3.1 Compact Version

The KCMxxx.CF.xxx-Ex is explosion proof with EX d in the back side chamber, Ex e in the terminal chamber and Ex i for the display and the meter.

The inputs and outputs are not power limited and must not be used to drive intrinsically save circuits

WARNING

Never open the back side cover in hazardous locations with any supply or I/O circuits alive!

#### 3.3.2 Remote Version with KCE80xx-WG

NOTE

For use in hazardous locations the KCM as well as the KCE must be Ex versions!

The KCMxxx.-Ex is intrinsically safe when driven by the corresponding KCE80xx-Ex. The KCE80xx-WG is explosion proof with EX d in the back side chamber, Ex e in the terminal chamber and Ex i for the display and the meter.

The inputs and outputs of the KCE are not power limited and must not be used to drive intrinsically save circuits

The KCE80xx-WG-Ex can be located inside and outside the hazardous area.

#### WARNING

Never open the back side cover of the KCE80xx-WG-Ex in hazardous locations with any supply or I/O circuits alive!

#### 3.3.3 Remote Version with KCE80xx-SG

#### NOTE

For use in hazardous locations the KCM as well as the KCE must be Ex versions!

The KCMxxx.-Ex is intrinsically safe when driven by the corresponding KCE80xx-Ex. The KCE80xx-SG is not explosion proof and only provides the intrinsically safe connections to the KCM.

The inputs and outputs of the KCE are not power limited and must not be used to drive intrinsically save circuits

The KCE80xx-SG-Ex must be located outside the hazardous area.

# **4 MANUAL OPERATION**

# 4.1 Power On Sequence and Principles of Manual Control

The power up sequence gives the following information, each for about 2 second:



This gives the type of electronics. At the time being the types KCE8000 (low power) and KCE8010 (high power) are available.

SENSOR SIZE KCM0300

This gives the sensor size. At the time being Sensors from KCM0300 (300kg/h max.) to KCM60k (60,000kg/h max.) are available

SW MAIN Revision: V1.01

This indicates the SW version of the main processor.

SW DISPLAY Revision: V1.05

This indicates the SW version of the display processor.



If changes to the settings were made before the last power down and not saved to the backup EEPROM, the following message appears:

***	WARNING	***
THERE	IS NO RAM B	ACKUP
LOOK I	NTO YOUR M	ANUAL
PRESS	SENT TO CON	ITINUE

If no key is pressed the warning will disappear automatically after 10 seconds.

For further information refer to chapter 4.4.19.

Now the KCE8000 switches to the measuring mode, displaying the default screen:

0.000<sup>rate</sup> 0.00<sup>total</sup>

The green LED "OK" flashes with a 1 second period. In case of an error the red LED "ERR" flashes.

In manual control the KCE is menu driven and provides 2 operational modes, the "Measuring Mode" and the "Setup Mode".

In the measuring mode the display shows the preselected measured values and all 4 pushbuttons have the function printed on them. The switch over between the different measuring displays and the error display can be made at any time without interrupting the measurements.

In the setup mode the 3 pushbuttons below the display have varying functions. The actual function is indicated in the display, just above the pushbutton.

In the setup menu all necessary settings can be made.

For protecting the unit against unintentional changes by unauthorized personnel, the setup menu is password protected.





Fig. 15: Operating scheme of the Measuring Mode

# 4.2 Measuring mode

#### 4.2.1 Function of the keys

In the measuring mode all pushbuttons have a fixed function:

Р	Opens the Setup Menu if pressed for about 3 seconds
Reset	Resets the totalizer to zero, if the function "KEY RESET" is enabled
Display	Toggles the display between the 2 preselected settings.
E	Opens the error menu

#### 4.2.2 Display selection

The KCE provides 2 presettable displays. Ex work display 1 shows the flow and the total value, display 2 shows density and temperature.

For changing from on display to the other just press the pushbutton "Display".

For changing the content of the 2 displays refer to chapter 4.4.17

#### 4.2.3 Resetting the total value

For easy batching in local operation the KCE provides the possibility to reset the total value by pressing the pushbutton "Reset".

For protecting the unit against unintentional resetting of the total value, this function can be disabled.

Ex work the function is disabled.

For changing the setting refer to chapter 0.

#### 4.2.4 Error Menu

For easy debugging in case of a malfunction of the system, the KCE provides a 2 level error menu.

For entering the menu press the pushbutton "E" for about 3 seconds.

The display shows "NO ERROR" or one or more of the following error messages:

Code	Error
1	Amplitude sensor A is out of range (too high or too low)
2	Amplitude sensor B is out of range (too high or too low)
3	Measured time delay is too high
4	Offset adjust procedure is in progress
5	Driver current is not stable
6	Temperature sensor is out of range. Typically indicated if the line is broken or has a short
7	Oscillating frequency too low
8	Oscillating frequency too high
9	Driver current too low

#### Tab. 2: Error Codes

Press "E" a second time for getting 8 internal operating parameters:

Code	Value
SA	Sensor voltage A in mV
SB	Sensor voltage B in mV
DR	Driver current in mA
PT	Measured Temperature in °C
FRE	Oscillating frequency in Hz
DEN	Density
OFF	Actual offset value
RUN	Actual time shift

#### Tab. 3: List of service parameters

By pressing "E" you can toggle between those 2 displays.

For returning to the normal operation press "Display".

# 4.3 Offset calibration

For best accuracy the C-Flow needs an in situ offset calibration. This calibration zeroes out the ambient effects and increases the measuring accuracy at low flow.

The offset calibration must be carried out with the medium to be measured and should be carried out at a temperature and pressure as close to the normal operation as possible.

#### Proceed as follows:

Operate the unit for a while under normal operating conditions for making sure that the actual temperature of the unit equals the normal operation temperature.

Switch off the flow. For best results use a valve in front and one behind the KCM. If the valves are not close to the KCM and / or only one valve is used, wait long enough for being sure that there is no more flow through the KCM.

#### NOTE:

If there is a residual flow through the KCM or the KCM is exposed to mechanical shocks during the offset procedure, the resulting value will be wrong.

Start the offset procedure as follows (see also chapter 4.4.16):

- Press "P" for about 3 seconds
- Change the indicated number with "up" to 2207 and confirm with "P"
- Press "DOWN" until the display shows "ZERO-POINT"
- Press "P"
- Press "SLOW" (recommended) or "FAST"
- The display shows "MAKE ZERO" for 10 to 30 s and counts down to "0"
- Confirm with "E"
- Press "E" a second time for returning to the measuring menu

The offset procedure takes about 10 s (fast) or 25 - 30 s (slow). During the procedure the red LED will flash.

For an automatic offset calibration initiated by the central control unit, the control input can be configured as "initiate offset". In that case the KCE starts an offset procedure each time a high level is applied to the input.

For configuring the input refer to chapter 4.4.22.

# 4.4 Setup Mode

In the setup mode the KCE can be adapted to the individual application. As unintentional changes of the settings might cause problems, the setup mode is password protected.

To enter the setup mode proceed as follows:

Press "P" for about 3 seconds

The display shows:

ENTER USER\_CODE 2206 LEFT DOWN EXIT

Change the indicated number with "up" to 2207 and confirm with "P"

The display shows:

SLECT PROG POINT FLOW-UNITS UP DOWN EXIT

With the keys "UP" and "DOWN" you can scroll through the main list.

Select the desired submenu and confirm with "P".

#### 4.4.1 Function of the keys

In the setup menu some pushbuttons have changing functions, indicated in the display above the pushbutton:

Reset Performs the indicated function

Display Performs the indicated function.

E Exits the current menu point without altering the original value Exits the setup menu when pressed in the main list
# 4.4.2 Setup Menu structure

The setup menu contains several submenus with selection lists and numerical entries. A part of this structure is shown in Fig. 16.



Fig. 16: Menu structure in the Setup Mode

- Selection List Scroll through the list with "up" and "down". Accept the selection with "P" or quit without changing the setting with "E"
- 2. Shifting the decimal Point Shift the decimal point with "left". Accept the selection with "P" or quit without changing the setting with "E"

# 3. Numerical Input

Shift the cursor to the right with "right" and increase the number with "up". If the curser is set to the decimal point, "up" will shift it to the right (i.e. increase the indicated value by a factor of 10). Accept the selection with "P" or quit without changing the setting with "E"

- Submenu Scroll through the list with "up" and "down". Enter the selected level with "P" or exit with "E"
- 5. Menu chain

Make the settings as indicated in the display. Accept the settings with "P" or skip it with "E". Both "P" and "E" will lead you to the next point in the chain.

# 4.4.3 List of submenus

This list gives an overview over the addressable submenus. For further information refer to the corresponding chapters.

# FLOW UNITS:

Determines the engineering units used to display flow rate.

# FLOW-DP:

Determines the decimal place used in the flow rate display.

#### FLOW-FILTER:

Used to dampen the display. Bigger numbers result in a smoother, less noisy flow display.

#### TOTAL-UNITS:

Determines the engineering units used in the flow total display.

#### TOTAL-DP:

Determines the decimal place used in the flow total display.

#### **DENS-UNITS:**

Determines the engineering units used in the density display.

#### TEMP-UNITS:

Determines the engineering units used in the temperature display.

#### KEY-RESET:

When this function is turned on, user can reset the flow totalizer by pressing the "Reset" button.

# FLOW-DIREC:

Defines the positive flow direction of the meter.

### FREQ-OUT:

Configures the frequency output. The output port can be set to a frequency proportional to the flow or to pulses per mass or volume.

#### CURRENT-1:

Configures the 4-20mA output number 1.

### CURRENT-2:

Configures the 4-20mA output number 2.

### ZERO-POINT:

Performs the offset calibration procedure

#### **DISPLAY:**

Sets up the appearance of the display as well as the state of the backlight..

# FAULT TIME:

Determines how long to display a fault signal and how quickly the unit should respond to a fault.

#### SAVE DATA:

Saves the current settings of the unit to the backup EEPROM.

# **RESTORE DAT:**

This restores factory settings. DO NOT USE WITHOUT CONSULTING FACTORY.

# I/O-TEST:

Unit can simulate flow conditions by giving signals on the frequency, Current 1, Current 2, Status Out and RS485 outputs.

### CTL-INPUT:

Determines the function of the control input.

#### INTERFACE:

Selects the active interface.

#### 4.4.4 FLOW-UNITS

In the submenu "FLOW-UNITS" the engineering units used for the flow display and the internal calculations can be set.



#### NOTE:

After changing the engineering units for the display, check the settings for the analogue output and the frequency output as this change might influence the settings!

The following engineering units can be selected:

Flow-Unit	Description	Unit Type
KG/M	Kilograms/minute	mass
LB/M	Pounds/minute	mass
OZ/M	Dry Ounces/minute	mass
T/M	Metric Tons/minute	mass
ST/M	Stones/minute	mass
G/H	Grams/hour	mass
KG/H	Kilograms/hour	mass
LB/H	Pounds/hour	mass
OZ/H	Dry Ounces/hour	mass
T/H	Metric Tons/hour	mass
ST/H	Stones/hour	mass
G/D	Grams/day	mass
KG/D	Kilograms/day	mass
LB/D	Pounds/day	mass
OZ/D	Dry Ounces/day	mass
T/D	Metric Tons/day	mass
ST/D	Stones/day	mass
CC/S	Cubic cm. /second	volume
L/S	Litres/second	volume
USGAL/S	US gallons/second	volume
LOZ/S	Fluid Ounces/second	volume
EGAL/S	English gallons/second	volume
BBL/S	English Barrels/second	volume
CC/M	Cubic cm. /minute	volume
Flow-Unit	Description	Unit Type
L/M	Litres/minute	volume
USGAL/M	US gallons/minute	volume
LOZ/M	Fluid Ounces/minute	volume
EGAL/M	English gallons/minute	volume
BBL/M	English Barrels/minute	volume
CC/H	Cubic cm. /hour	volume
L/H	Litres/hour	volume
UGAL/H	US gallons/hour	volume
LOZ/H	Fluid Ounces/hour	volume
EGAL/H	English gallons/hour	volume

BBL/H	English Barrels/hour	volume
CC/D	Cubic cm. /day	volume
L/D	Litres/day	volume
UGAL/D	US gallons/day	volume
LOZ/D	Fluid Ounces/day	volume
EGAL/D	English gallons/day	volume
BBL/D	English Barrels/day	volume
G/S	Grams/second	mass
KG/S	Kilograms/second	mass
LB/S	Pounds/second	mass
OZ/S	Dry Ounces/second	mass
T/S	Metric Tons/second	mass
ST/S	Stones/second	mass
G/M	Grams/minute	mass

Use the keys "UP" and "DOWN" to select the desired engineering units and confirm with "P" or skip with "E".

# 4.4.5 FLOW-DP:

In the submenu "FLOW-DP" the number of decimal places used for the flow display can be set.



Use the key "LEFT" to select the desired number of decimal places and confirm with "P" or skip with "E".

# 4.4.6 FLOW-FILTER

In the submenu "FLOW-Filter the damping of the flow display can be set. Larger numbers cause slower and steadier display results. Allowable values for the filter range from 1 to 100,000. The default is 100 (light filtering).



Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

### 4.4.7 TOTAL-UNITS

In the submenu "TOTAL-UNITS" the engineering units used for the total display and can be set.

SLECT PROG POINT TOTAL-UNITS UP DOWN EXIT
P→
SLECT TOTAL UNITS
KILO
UP DOWN EXIT

The following engineering units can be selected:

<u>Total-Unit</u>	Description	<u>Unit Type</u>
KILO	Kilogram	mass
POUNDS	Pounds	mass
OUNCES	Dry Ounces	mass
TONS	Metric Tons	mass
STONES	Stones	mass
CC	Cubic Centimetres	volume
LITER	Litres	volume
US-GAL	U.S. Gallons	volume
L-OUNC	Fluid Ounces	volume
UK-GAL	English Gallons	volume
UK-BBL	English Barrel	volume
GRAMS	Grams	mass

Choose the keys "UP" and "DOWN" to select the desired engineering units and confirm with "P" or skip with "E".

#### 4.4.8 TOTAL-DP

In the submenu "FLOW-DP" the number of decimal places used for the flow display can be set.



Use the key "LEFT" to select the desired number of decimal places and confirm with "P" or skip with "E".

# 4.4.9 DENS-UNITS

In the submenu "DENS-UNITS" the engineering units used for the density display and can be set.



The following engineering units can be selected:

Density-Unit	<b>Description</b>
KG/L	Kilograms/Liter
LB/FT3	Pounds/cu. foot
LB/GAL	Pounds/US Gal.
G/CC	Grams/cu. cm.
G/L	Grams/liter

Use the keys "UP" and "DOWN" to select the desired engineering units and confirm with "P" or skip with "E".

#### 4.4.10 TEMP-UNITS

In the submenu "TEMP-UNITS" the engineering units used for the temperature display can be set.



As engineering units "°C" and "F" can be selected:

Use the keys "UP" and "DOWN" to select the desired engineering units and confirm with "P" or skip with "E".

### 4.4.11 KEY-RESET

In the submenu "KEY-RESET" can be set, if in the measuring mode the key "Reset" resets the total value or not.



The setting "KEY RES.OFF" disables, the setting "KEY RES.ON" enables the reset key.

Use the keys "UP" and "DOWN" to select the mode and confirm with "P" or skip with "E".

#### 4.4.12 FLOW-DIREC

In the submenu "FLOW-DIREC" the sign of flow for the display and the frequency output can be set.



If "FORWARD" is selected, a flow through the sensor in direction of the arrow will give a positive value for flow in the display.

If "REVERSE" is selected, a flow through the sensor in direction of the arrow will give a negative value for flow in the display.

NOTE

With a flow below zero, there will be no frequency or pulses at the frequency output.

Use the keys "UP" and "DOWN" to select the desired mode and confirm with "P" or skip with "E".

# 4.4.13 FREQ-OUT

In the submenu "FREQ-OUT" the mode of operation of the frequency output can be set.



In the mode "Frequency" the output produces a frequency proportional to the actual flow. The allowable output frequency goes from 1 Hz to 10 kHz.

In the mode "Pulse" the output produces a pulse every time the internal total counter increased by the set mass or volume. The maximum output frequency in this mode is about 15 pulses per second

Use the keys "UP" and "DOWN" to select the desired mode and confirm with "P" or skip with "E".

#### NOTE

The dimension used for FREQ-OUT is the same as used for the Display.

#### FREQUENCY PROGRAMMING

For the frequency mode the following settings have to be made:



**FULL SCALE FOR F-OUT** - is the flow rate that should equate to the maximum output frequency to be specified below. The default is the maximum flow rate of the specific KCM flow meter matched to the control, but any other setting is possible as well.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

MAX FREQ AT FULL SCALE 01000.0 HZ RIGHT UP EXIT

**MAX FREQ. AT FULLSCALE** – is the output frequency generated at "FULL SCALE FOR F-OUT". The maximum allowable setting is 10000Hz. The default is 1000 Hz.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".



**FREQUENCY FILTER** – is an internal filter for smoothing the output frequency. Reasonable numbers for the filter are from 10 to 10000. A zero value will not be accepted. Default is 100 (light filtering).

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

FREQUENCY SAMPLE 110.000 STEPS RIGHT UP EXIT

**FREQUENZ SAMPLE** – is a second filter for the output frequency. Reasonable values are from 100 to 950. A zero value or a value greater than 999 will not be accepted. Default is 110 (light sampling).

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

FREQUENCY STEP		
040.000 STEPS		
RIGHT	UP	EXIT

**FREQUENZ STEP** – is a special parameter to speed up the reaction of the KCE to fast changes of flow. If the change in output frequency compared to the previous measurement would be grater than the selected Frequency Step, the KCE recognizes this as a flow step and modifies the filter parameter for s short period for reacting faster to this change. Reasonable values are 5% to 10% of the max flow frequency representation for FREQUENZ STEP. The default value is 40 HZ.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

The KCE will return to "FREQ-OUT" in the main list.

### CYCLE OUT PROGRAMMING:



VALUE FOR CYCLE – sets the mass or volume quantity giving one output pulse.

For an optimum adaption to slow input stages, the KCE does not give out pulses with fixed pulse lengths but produces pulses with a duty cycle of about 50%. For getting 1 pulse per kg set CYCLE to 0.5 kg and the KCE will produce pulses and pauses each 0.5 kg long.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

#### 4.4.14 CURRENT 1

In the submenu "CURRENT 1" the mode of operation of current loop 1 can be set.

The current loop 1 can give out the actual flow, the density, the temperature, the total value and a constant 4mA current.



#### NOTE

The mode "TOTAL" can only be selected, if the control input is used for reset total. (Refer to chapter 4.4.22)

#### NOTE:

As the mode "4mA" does not give out any measured value, it only makes sense for testing purpose.

Use the keys "UP" and "DOWN" to set the desired value and confirm with "P" or skip with "E".

The following parameters apply for all operational modes of the current loop.

VALUE AT 20 mA **24.999 кд/м** RIGHT UP EXIT **VALUE AT 20 mA** – is the flow rate that should equate to 20 mA output current. The default is the maximum flow rate of the specific KCM flow meter matched to the control, but any other setting is possible as well.

Default for DENSITY is 3.00 g/cc. Default for temperature is 40 degrees C.

NOTE

There is no VALUE AT 20 mA variable for the 4 MA OUT function.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

OFFSET CURRENT 1 004.0 mA RIGHT UP EXIT

**OFFSET CURRENT 1** – is the current given out when the measured value is zero. Default setting is 4.00 mA. Offset value must be greater than 2 mA for loop power considerations.

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

FILTER CURRENT 1 100.000 STEPS RIGHT UP EXIT

**FILTER CURRENT 1** - is an internal filter for smoothing the output current. Reasonable numbers for the filter are from 10 to 10000. A zero value will not be accepted. Default is 100 (light filtering).

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

The KCE will return to "CURRENT 1" in the main list.

# 4.4.15 CURRENT 2

Same function as CURRENT 1 but for 4-20mA output 2.

As the current loop 2 is the current loop with the HART modem, the mode "4mA" can be used, if the HART communication is required, but no analogue value should be given out.

For the settings refer to chapter 4.4.14:

### 4.4.16 ZERO-POINT

In the submenu "ZERO-POINT" the zero calibration procedure can be started.

The offset procedure is critical for proper operation. During the offset procedure (about 10 seconds for "fast" or 30 seconds for "slow") the measured flow gets averaged and the result will be defined as new zero value.

#### NOTE

Flow MUST be "zero" and meter MUST be filled with the liquid to be measured.



Use the keys "SLOW" and "FAST" to start the desired zero procedure or skip with "E".



While the offset is in progress MAKE ZERO will display along with a counter counting down to zero. The status LED on the front panel will blink RED until the procedure is completed.

* END OF ZERO-POINT *			
PRESS E TO	RETURI	N	
OLD ZERO:	0.105	μS	
NEW ZERO:	0.113	μS	

END OF ZERO-POINT will appear when the procedure is complete.

Press "E" to return. The screen will indicate READY as the new offset is loaded and then return to the main list.

#### 4.4.17 DISPLAY

In the submenu "DISPLAY" the content of the display can be set and the backlight can be switched on or off.

The measured values rate, total, density and temperature as well as the actual output frequency and the actual currents at current output 1 and 2 can be displayed.



Use the keys "UP" and "DOWN" to select setting the display mode or the backlight and confirm with "P" or skip with "E".

#### Setting the display mode:



Use the keys "UP" and "DOWN" to select the display to be configured and confirm with "P" or skip with "E".

ACTUAL DISPLAY MODE !
LINE1: RATE
LINE2: TOTAL
EXIT

Start changing with "P" or skip with "E".

SELECT LINE MODE		
2-LINES		
UP	DOWN	EXIT

Use the keys "UP" and "DOWN" to select the number of lines and confirm with "P" or skip with "E".

SELECT LINE 1		
RATE		
UP	DOWN	EXIT

Use the keys "UP" and "DOWN" to select the desired value and confirm with "P" or skip with "E".

In case a 2 line display was selected, the display shows:

SELECT LINE 2 TOTAL UP DOWN EXIT

Use the keys "UP" and "DOWN" to select the desired value and confirm with "P" or skip with "E".

The display returns to



Use the keys "UP" and "DOWN" to select the other display and confirm with "P" or skip with "E".

### Switching on and off the backlight:



Use the key "UP" to toggle the backlight status and confirm with "P" or skip with "E".

# 4.4.18 FAULT TIME

In the submenu "FAULT TIME" the on and off delay time of the error LED can be set.

FAULT ON DELAY TIME defines, how long a fault must be present until the red error LED will light up and the error flag on the interface will be set. FAULT OFF DELAY TIME defines, how long the error LED and the error flag will remain active after the fault has disappeared.

Allowable delay values range from 0 to 10,000 seconds. The default is 2.7 seconds for both variables.



Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

FAULT OFF DELAY TIME		
2.7000 SECONDS		
RIGHT	UP	EXIT

Use the keys "RIGHT" and "UP" to set the desired value and confirm with "P" or skip with "E".

#### 4.4.19 SAVE DATA

In the submenu "SAVE DATA" all setting can be stored in the non- volatile EEPROM memory for backup purpose.



Start the procedure with "START" or skip with "EXIT".

After "START" the display will show



And then return to the main list

NOTE

If changes are made in the SETUP menu without making SAVE DATA, every time at power on the following warning will be displayed for 10 seconds:



# 4.4.20 RESTORE DAT

In the submenu "RESTOR DAT" all setting can be restored from the non- volatile EEPROM memory.

This function gives the possibility to undo all settings made since the last execution of "SAVE DATA".



Start the procedure with "START" or skip with "EXIT".

After "START" the display will show



And after a few seconds

And then return to the main list

# 4.4.21 I/O TEST

In the submenu "I/O-TEST" the analogue and digital outputs can be tested.



Use the keys "UP" and "DOWN" to select the desired output and confirm with "P" or skip with "E".

Testing the frequency output



Use the keys "RIGHT" and "UP" to set the desired frequency and confirm with "P" or skip with "E".

Allowed frequencies are 1 to 10,000 Hz



Press "YES" to set a new frequency or EXIT to finish.

#### Testing the current output 1 or 2



Use the keys "RIGHT" and "UP" to set the desired current and confirm with "P" or skip with "E".

Allowed currents are 2 to 20 mA.



Press YES to set a new current or EXIT to finish.

**NOTE** Status Out and RS232/485 tests are not implemented at this time.

### 4.4.22 CTL-INPUT

In the submenu "CTL-INPUT" the function of the control input can be set.

With "OFFSET" selected the KCE performs an offset procedure each time a high level is applied to the control input.

With "RESET TOTAL" selected the KCE resets the internal total to zero each time a high level is applied to the control input.



Use the keys "UP" and "DOWN" to select the desired input mode and confirm with "P" or skip with "E".

#### 4.4.23 INTERFACE

In the submenu "INTERFACE" the interface for remote control can be selected.

The standard unit provides RS485 only and no selection is possible.

With the corresponding options implemented, HART or Foundation Fieldbus can be selected as alternatives.



Use the keys "UP" and "DOWN" to set the desired interface and confirm with "P" or skip with "E".

# **5 REMOTE OPERATION**

# 5.1 RS485

# 5.2 **HART**

# 5.3 Foundation Fieldbus

Tbd.

# 6 SERVICE AND MAINTENANCE

# 6.1 Maintenance

The sensors of the KCM series as well as the electronics of the KCE8000 series do not require regular maintenance.

In case of abrasive or sedimenting media however it is recommended to return the measuring system to KEM after 8,000 hours of operation for re-calibration and pressure test. This interval may be shorter when the medium is extremely abrasive or sedimenting.

For best performance we recommend checking the calibration every 5 years, in harsh environments even more frequent.

If for the specific application an obligatory calibration is required, refer to the corresponding national regulations for the necessary calibration intervals.

# 6.2 Trouble shooting

In case the C-Flow does not work properly, first check the following items:

# No display, no LED lighting

All cables properly connected?

- → Connect the missing cables Power supply switched on?
- Switch on the power supply
   Display positioned properly (compact and wall mount only)?
- → Remove the display and reset it properly Internal fuse of the KCE blown?
- → For checking and changing the fuses refer to chapter 0.

# Output frequency too high or unstable

Most probably EMC problems

Shield and ground properly connected?

→ Connect shield properly. If necessary, try additional means of grounding and shielding

# 6.3 Service

The KCE and KCM do not contain any user serviceable parts except the fuses.

In case of malfunction, please contact your nearest dealer or directly KEM. For the addresses see chapter 7.5.

# 6.4 Changing the fuses

The non Ex versions of the KCE contain a fuse in the 24V power supply. In case this fuse has blown it can be replaced by qualified personnel.

# WARNING

The Ex versions of the KCE8000 series contain several internal fuses for protecting the intrinsically safe parts (display and KCM) against too high voltage and power. Those fuses are critical parts and must not be exchanged except by KED or by service personnel authorized by KEM.

If the fuses are replaced by third persons, the Ex certification for the unit will be void!

### 6.4.1 Changing the fuse with the KCE80xx-SG

Switch off the power supply.

Remove the 4 screws in the back panel and pull out the back panel carefully.

Below the ribbon cable connector you find the following fuse in the fuse holder:

Littelfuse NANO 2 375mA slow blow, ordering code 0452.375

NOTE

For your own safety replace the fuse only by the same type and rating.

Replace the fuse and reclose the unit.

### 6.4.2 Changing the fuse with the KCE80xx-WG and compact version

Switch off the power supply.

Open the safety screw at the top cover of the unit with the provided Allen key.

Remove the display cover of the KCE by turning it counter clockwise.

Pull out the display

Remove the 3 screws in the PCB and pull it out carefully.

Below the ribbon cable connector you find the following fuse in the fuse holder:

Littelfuse NANO 2 375mA slow blow, ordering code 0452.375

NOTE

For your own safety replace the fuse only by the same type and rating.

Replace the fuse and reclose the unit.

# 7 LISTINGS

# 7.1 Warranty

KEM warrants material and production for a period of 18 months after installation and start up, max. 24 months from delivery date.

# 7.2 Certifications and compliances

Category	Standards or description		
EC Declaration of Conformity - EMC	Meets intent of Directive 2004 / 108 / EEC for Electromagnetic Compatibility. Compliance is given to the following specifications as listed in the Official Journal of the European Communities:		
	EN 61326 / 2006	EMC requirements for Class A electrical equipment for measurement, control and laboratory use, including Class A radiated and Conducted Emissions <sup>1</sup> and Immunity <sup>1</sup> .	
	IEC 61000-4-2 /2009	Electrostatic Discharge Immunity (Performance criterion B)	
	IEC 61000-4-3 / 2008	Radiated RF Electromagnetic Field Immunity (Performance criterion B)	
	IEC 61000-4-4 / A1-2009	Electrical Fast Transient / Burst Immunity (Performance criterion B)	
	IEC 61000-4-5 / 2007 <sup>2</sup>	Power Line Surge Immunity (Performance criterion B)	
	IEC 61000-4-6 / 2009	Conducted RF Immunity (Performance criterion B)	
	IEC 61000-4-11 / 2005 <sup>2</sup>	Voltage Dips and Interruptions Immunity (Performance criterion B)	
Australia / New Zealand Declaration of Conformity- EMC	Complies with the Radiocommunications Act and demonstrated per EMC Emission standard <sup>1</sup>		
	AS/NZS 2064	Industrial, Scientific, and Medical Equipment: 1992	
FCC EMC Compliance	Emissions comply with the Clas A Limits of FCC Code of Federal Regulations 47, Part 15, Subpart B <sup>1</sup> .		

<sup>1</sup>Compliance demonstrated using high-quality shielded interface cables

<sup>2</sup>Applies only to units with AC mains supply instead of or additional to the SELV supply

.

Category	Standards or description	
EC Declaration of Conformity – Low Voltage	Compliance is given to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 2006/95/EEC	
	EN 61010-1 / 2002	Safety requirements for electrical equipment for measurement control and laboratory use.
U.S. Nationally Recognized Testing Laboratory Listing	UL 61010-1 / 2004	Standard for electrical measuring and test equipment.
Canadian Certification	CAN/CSA C22.2 no. 61010-1-4 / 2008	Safety requirements for electrical equipment for measurement, control, and laboratory use.
Additional Compliance	IEC61010-1 / 2002	Safety requirements for electrical equipment for measurement, control, and laboratory use.
Equipment Type	Test and measuring	
Safety Class	Class 1 (as defined in IEC 61010-1, Annex H) – grounded product	

# 7.3 Technical Data

# 7.3.1 Technical Data KCM Transducer

	KCM0300	KCM0600	KCM1500	KCM3000	KCM6000	KCM20k	KCM60k
Max. flow (kg/h)	300	600	1500	3000	6000	20 000	60 000
Min. flow (kg/h)	3	6	15	30	60	200	600
Max. flow (lb/min)	11.03	22.06	55.15	110.29	220.59	735.29	2205.88
Min. flow (lb/min)	0.11	0.22	0.55	1.10	2.21	7.35	22.06
Basic Accuracy (% of flow reading)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Zero Stability (% of full sclae)	0.02	0.02	0.01	0.01	0.01	0.02	0.02
Zero Drift (% f.s. per °C)	0.002	0.002	0.001	0.001	0.001	0.002	0.002
Repeatability (% of flow)	0.2	0.2	0.1	0.1	0.1	0.2	0.2
Density measuring range (kg/m³)	0 - 4500 kg/m³						
Density accuracy (kg/m <sup>3</sup> )	±0.002 kg/ltr.						
Temperature accuracy		±1°C ±0.5% of reading					

	KCM0300	KCM0600	KCM1500	KCM3000	KCM6000	KCM20k	KCM60k	
Process and Ambient								
Process connections	adapto	female thread 1/2"fanges EN1092, ANSI B1adaptors for flanges, diary and tri-clampDIN2512						
Max. pressure		200 bar				40 bar		
Max. pressure (Option)		350 bar						
Pressure Drop at max. flow H <sub>2</sub> 0		see dia	agramm					
Operating Density range		500 - 2500 kg/m³						
Process temperature	-40 +125°C				-40 +180°C			
Ambient temperture		-20 +70°C				-20 +60°C		
Storage temperature	-40 +70°C							

Electr. connections remote	screw type terminals								
Electr. connections compact.		none (internally connected to the electronics)							
Ingress Protection		IP67 IP65							
General									
Tube arrangement	2 serial	2 parallel	2 serial	2 parallel	2 parallel	2 parallel	2 parallel		
Tube inner diameter	4mm	4mm	8mm	8mm	12mm	18mm	34mm		
Tube material	stainless steel DIN 1.4571 ss 1.4404 / 1.4571								
Housing material		stainless steel DIN 1.4571 cast iron							
Dimensions		see drawings							

# 7.3.2 Technical Data KCE 5000 Transmitter

General	
Display:	Grafic, 132 x 32 dot
Supply votage:	24 VDC, ± 20%
Programming:	via front keyboard
Interface:	RS 485, option HART or Foundation Fieldbus
EMC:	according to EN 50 081-2 and EN 50 082-2
Power consumption:	max. 4 W
Exd housing:	
Dimensions:	see drawing
Connections:	internal screw type terminals ½" female NPT cable gland
Material:	aluminium diecast
Protection class	IP 68
Weight:	approx. 2 kg
Temperature:	operating:- 20 up to 50°C storage and transport: -20 up to 70°C
Panel-mounted housing:	
Dimensions:	96 x 96 x 100mm (h * w * d)
Connections:	rear screw type terminals
Material:	Noryl
Protection class:	front: IP 60, rear: IP 30
Weight:	approx. 500g
Temperature:	operation: 0 to 50°C storage and transport: -20 up to 70°C

Analog Outputs	
Two current outputs:	4-20 mA passive, two-wire, isolated
Resolution:	14 bit
Linearity:	± 0.05% of full scale
Temperature drift:	0.05% per 10K
Load:	< 620 Ώ (at 24V supply)
Output value:	flow rate, job total, density or temperature
Pulse Output	
Frequency range:	0.5 -10,000 Hz
Output signal:	active push pull output of flow rate and / or cycle output
Digital I/O	
Status output type	push pull
Low / high level	1V / 23V @ 24Vsupply, 10k $\Omega$ load
Allowed load current	20mA max.
Output signal	Programmable
Control input type	Active high
Threashold voltage	6.5V
Input current	0.1mA @ 6.5V, 0.2mA @ 24V Vin
Input signal	Programmable

# 7.3.3 Dimensional Drawings (mm)

## KCM 0300 to KCM 3000



Туре	а	b	С	d	е	f
KCM 0300	214	182	160	15	19	110
KCM 0600	214	182	160	15	19	87
KCM 1500	350	280	258	18	21	140
KCM 3000	350	280	258	18	21	140

# KCM 6000 to KCM 60K





Туре	а	b	С	f	g	flange ends
KCM 6000	400	465	173	65	113	DN 25 PN 40, ANSI 1" 150/300 lb
KCM 20K	500	506	206	65	113	DN 50 PN 40, ANSI 2" 150/300 lb
KCM 40K	600	592	290	77	137	DN 80 PN 40, ANSI 3" 150/300 lb
KCM 60K	600	592	290	77	137	DN 80 PN 40, ANSI 3" 150/300 lb



# KCM with wall-mounted housing

Туре	а	b	С	d	е	F
KCM 0300	214	182	160	15	19	110
KCM 0600	214	182	160	15	19	87
KCM 1500	350	280	258	18	21	140
KCM 3000	350	280	258	18	21	140

# Panel-mounted housing





# 7.4 WEEE and RoHS

The unit described herein is not subject to the WEEE directive and the corresponding national laws.

At the end of life forward the unit to a specialized recycling company and do not dispose it of f as domestic waste.

The unit described herein fully complies with the RoHS directive.

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# 7.7 Adresses

Main office

KEM Küppers Elektromechanik GmbH Liebigstraße 2 D-85757 Karlsfeld Germany

tel +49 81 31 5 93 91 - 0 info@kem-kueppers.com www.kem-kueppers.com

Please see our website for worldwide contacts



#### CONTACT WORLDWIDE

**KEM –. Headquarter** Liebigstraße 2 D-85757 Karlsfeld T. +49 8131 5 93 91-4 F: +49 8131 9 26 04 info@kem-kueppers.com

#### Denmark

E.Eberhardt ApS Bygstubben 6 DK-2950 Vedbaek T. +45 45 89 33 66 info@eeberhardt.dk

#### China

KEM China Rm. 2429, JinYuan Office Building No.36 CN-BeiYuan Road, Beijing 100012 T. +86 10 52 00 37 38 shaw@kem-kueppers.com

#### Finland

Wexon Oy Juhanilantie 4 FI-01740 Vantaa T. +358 9 29 01 40 wexon@wexon.com

#### United Kingdom

KEM Küppers UK 2 Highfield Drive, Ickenham Uxbridge UB10 8AL England T. +44 1895 23 35 52 hans.rader@kem-kueppers.co.uk

Hong Kong Area Asia Technology and Instrument Ltd. Unit 5, 9/F., Free Trade Centre 49 Tsun Yip Street, Kwun Tong HK-Kowloon T. +85 227 16 55 56 ati@ati.com.hk

#### Italy Ingg. Vigo e Cova SAS Piazzale Segrino 6/a I-20159 Milano T. +39 02 668 82 02 vigo.cova@vigocova.com

#### KEM – Office West

Im Langen Hahn 44 D-58515 Lüdenscheid T. +49 2351 9 78 80 F: +49 2351 9 78 83 1 kem-west@kem-kueppers.com

Norway Flow Treknikk as Olav Brunborgsc. 27, Postboks 244 N-1377 Billingstad T. +47 66 77 54 00 mail@flow.no

Poland Newtech Engineering Ul. Sowinskiego 3 PL- 4-100 Gliwice T. +48 32 237 61 98 newtech@newtech.com.pl

Portugal Contimetra Departmento Industria R. Braamcamp 88-40 Dt0 P-1269-020 Lisboa T. ++351 213 86 05 00 contimetra@contimetra.com

# Russia

Michael Dueck Industrievertretungen und Vertrieb St-Vither-Str. 12 D-50171 Kerpen T. +49 2237 67 91 88 info@m-dueck.de

Sweden Petronic AB SE-590 93 Gunnebobruk T. +46 490 25 85 00 info@pentronic.se KEM – Office South

Dahlienweg 35 D-73765 Neuhausen T. +49 7158 98 56 82 F: +49 7158 98 56 83 kem-sued@kem-kueppers.com

#### Singapore

Polyquip Engineering Pte Ltd Blk 20 Woodlands Link # 08-12 SGP-738733 Singapur -T. +65 67 53 79 97 sales@polyqip.com.sg

**Slovakia** Bibus SK, s.r.o. Priemyselná 4

SK-949-01 Nitra T. +421 377 41 25 25 gyenes@bibus.sk

Spain

Ortrat S.L. Calle La Sofora 13+15 ES-28020 Madrid T. +349 1 57 91 60 6 ortrat@ortrat.es

Taiwan

Yuden Electric Co.,Ltd. Taiwan Headquarter 5F, No. 121, Li De ST, JHONGHE TAIPEI COUNTY 235, Taiwan ROC T. +886 2 82 21 29 58 sales@yuden.com.tw

United States of America

AW-LAKE Company Electronics for Instrumentation 8809 Industrial Dr. Franksville , WI 53126, USA T. +1 262 88 49 80 0 sales@aw-lake-com

www.kem-kueppers.com

KEM Küppers Elektromechanik GmbH | Liebigsraße 2 | D-85757 Karlsfeld | tel +49 8131 5 93 91 - 0 | fax +49 8131 9 26 04

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