

Certified according to DIN ISO 9001

Short Form Manual



TRICOR

Coriolis Mass Flow Meter

About this manual

This short form manual contains all information required for a safe usage of the TRICOR coriolis mass flow meter.

Additionally it provides the information required for trained personnel to install and set up the meter.

For an optimized installation and the best setup, however, we recommend reading the full size manual

Additional to this manual the full size manual contains:

- Dimensional drawings for the mechanical installation
- Circuit diagrams for the electrical installation
- A complete description of the manual control including all submenus
- A description of the remote control via interface
- Chapters for maintenance, calibration and service
- The complete technical data

Manual-Revision: 001

Valid for:

SW main 2.0x and newer

SW display 2.0x and newer

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1 General Information

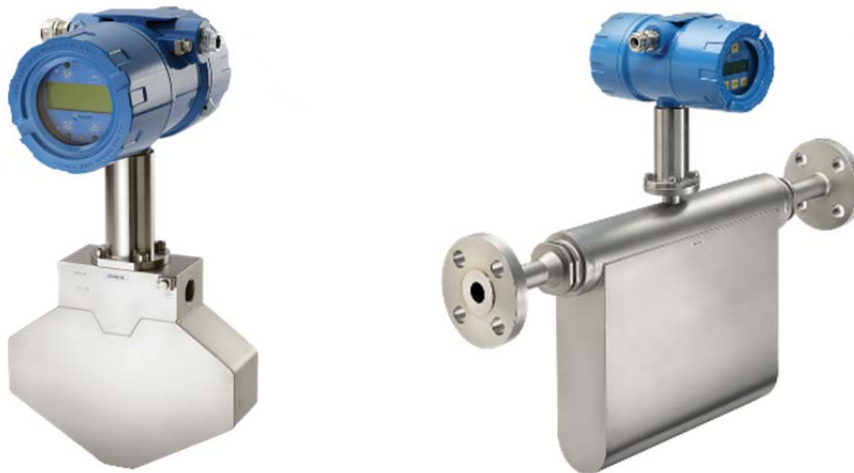
1.1 Features

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

- No 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 Tricor Mass Flow Meters are available as compact version with onsite 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.



Compact versions



Separate versions, wall mount (left) and panel mount (right)

1.2 Safety

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 capped 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.

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.

Special requirements for Ex installations

In hazardous locations the covers of the electronics of the compact or wall mount version must not be opened under any circumstances if the supply voltage is alive. For operating the keys the magnet must be used.

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.

The maximum values specified in the technical data must be observed at any time.

Warnings in this manual

NOTE:

Notes provide important information for the correct usage of the equipment. If the notes are not observed, a malfunction of the equipment is possible.

WARNING!

Warnings provide very important information for the correct usage of the equipment. Not observing the warnings may lead to danger for the equipment and to danger for health and life of the user

1.3 Ordering Codes and Accessories

For the ordering code and additional accessories refer to the full manual.

The shipment of a compact version consists of a TCMxxxx... with mounted electronics and the user's manual.

The shipment of a remote version consists of TCMxxxx...(without electronics), the electronics TCE80xx..., a connecting cable (with TCE80xx-E just fixed to the TCE) and the user's manual.

2 Installation

2.1 Mechanical Installation

Installation Guidelines

Coriolis mass flow meters measure the flow of a liquid or gas by vibrating the medium perpendicular to the flow direction and measuring the effect of the inertial force of the medium. Consequently for best performance the meter must be decoupled from external vibrations and the medium must be homogenous.

External vibration:

In case of (possible) external vibrations connect the meter mechanically rigidly to a non-vibrating point or – if this is not possible – connect it via vibration dampers.

The small meters (TCM0325 through TCM3100) can be mounted via optional mounting threads on the back side, all other meters must not be fixed directly, but via holders connected to the external tubing, as close as possible to the flanges of the meter.

In case of vibrating tubes a decoupling via flexible hoses might be recommended.

Piston pumps and other pumps producing a strongly pulsating flow should be decoupled hydraulically via longer pipes, flexible tubes or other measures.

Inhomogeneous media:

If a liquid might contain gas bubbles or solid particles, care must be taken that the gas bubbles or the solid particles will not remain in the meter.

If a pure liquid or a liquid with possible gas bubbles is to be measured, the meter should be installed horizontally with the meter showing downwards. This assures that gas bubbles will not accumulate in the measuring tubes. Meters with U- shaped tubes (TCM5500 and greater) can also be mounted vertically.

If a liquid might contain solid particles, the meter should be installed horizontally with the meter showing upwards. This assures that the solid particles will not accumulate in the measuring tubes. Meters with U- shaped tubes (TCM5500 and greater) can also be mounted vertically

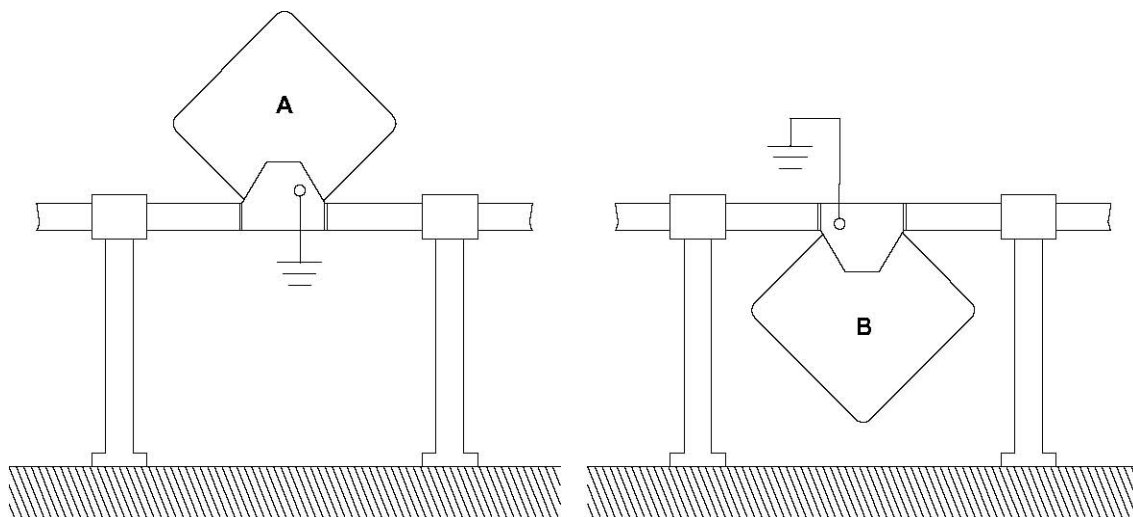
The TCM0325 through TCM3100 must not be mounted vertically, as according the diamond shaped tube geometry gas bubbles as well as solid particles would accumulate in the meter.

2 phase media with gas bubbles (like foam) or solid particles (like paints or slurry) can be measured without any problems, if the gas bubbles or solid particles are small compared to the tube diameter and evenly distributed. The mounting guidelines, nevertheless, must be observed.

Horizontal Installation

The horizontal installation is the recommended installation.

If the medium might contain solid particles, mount the meter as in position “A”, in all other cases as in position “B”.



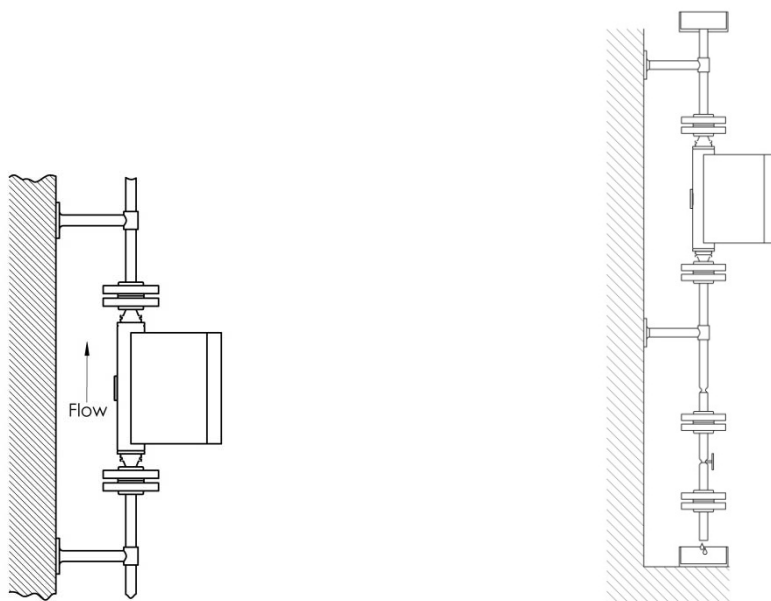
Vertical Installation

The diamond shaped TCM0325 through TCM3100 should not be mounted vertically at all.

All other meters can be mounted vertically. This would be the recommended position, if the medium might contain gas bubbles and solid particles.

It is recommended to mount the meter in an upstream position for avoiding that it runs empty during operation.

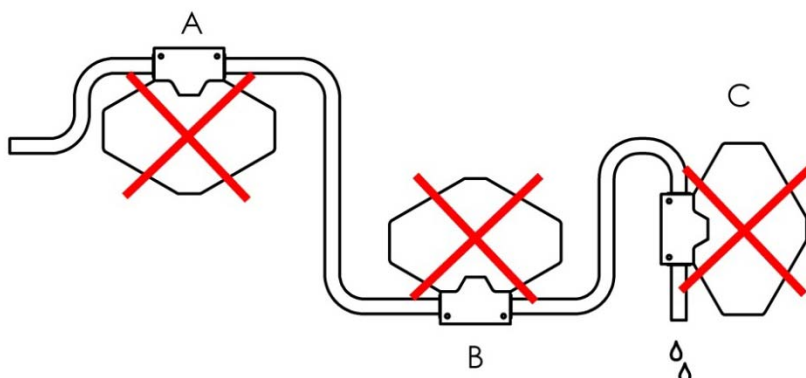
Mounting in a drop line is only allowed, if an orifice and the closing valve are located below the meter for making sure, that neither during operation nor after closing the valve the meter will run empty.



Critical Installations

The meters must not be mounted at the highest point of the tubing, if gas bubbles are to be expected (A), or at the lowest point, if solid particles are to be expected (B), as in both cases also the right orientation might not help.

Also the meters must not be mounted in a drop line near the open end (C), as in that case the meter might run empty.



Mechanical Installation of the electronics (remote versions)

For dimensional drawings for mounting the electronics refer to the complete manual.

2.2 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.

WARNING!

Never connect a 24V only version to the mains supply or vice versa!

The digital inputs and outputs are referred to GND and to the ground potential of the DC supply (= negative pole). The AC supply terminals are electrically isolated from all inputs and outputs.

The power supply input of the TCE is protected by a 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.

The ground potential GND is connected to protective ground via a 1kΩ resistor. The resistor withstands a voltage between GND and PE of up to 30V, but for proper operation this voltage should not be higher than 5V.

For connecting the TCE, 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.

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 TCE.

Connecting TCE and TCM

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

Feed the cable from the TCE into the cable gland of the TCM and connect the single wires as described below.

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

Close all openings properly and tighten the cable glands.

Power supply and I/O

The Ex versions in the Ex d housing have self-opening terminals. Push the cable end sleeves into the terminals. There is no tool required to connect the cables.

If cables without end sleeves are to be connected or if cables have to be removed, open the terminal by pressing a small screwdriver into the orange operator of the terminal.

All other versions have standard cage clamp terminals. Push a small screwdriver into the upper (smaller) opening of the terminal, feed the cable into the bigger opening and pull out the screwdriver.

Depending on the electronics version, the positions of the I/O terminals are different. The numbers and names, however, are the same for all versions.

I/O Terminals

1	+ I1	current loop 1 positive terminal
2	- I1	current loop 1 negative terminal
3	+ I2	current loop 2 positive terminal
4	- I2	current loop 2 negative terminal
5	F out	Frequency / pulse output
6	CTL OUT	Control output
7	CTL IN	Control input
8	GND	Ground (for pins 5 through 7)
20	COMMON	Common (for pins 21 and 22) (connected to PE with Ex versions)
21	- RS485	RS485 negative line
22	+RS485	RS485 positive line
31	FF-	Foundation fieldbus, negative rail
32	FF+	Foundation fieldbus, positive rail

24V DC Supply

50	+ 24 VDC	Positive supply voltage (24 VDC)
51	- 24 VDC	Supply ground
52	PE	Protective Ground

100 – 240V AC Supply

90	L	Life (AC voltage)
91	N	Neutral
52	PE	Protective Ground

Additionally up to 2 sliding switches can be found:

RS485 LOAD	enables / disables a 120 Ω terminating resistor for RS485
REL / CTL OUT	switches over between relay output and CTL OUT

24V DC Power Supply

The DC powered TCE requires a regulated DC power supply of 24V \pm 20%.

Connect the ground of your power supply to terminal 51 and the +24V to terminal 50.

100 to 240V AC Mains Supply

The AC versions of the TCE require a nominal power supply of 100 – 240V AC and operate over a range of 90 – 264V AC.

For the mains powered units a good connection of PE is mandatory. The cross section of the PE cable should be at least the cross section of the supply cable or 1mm², whichever is higher.

Connect the supply to terminal 91 (neutral) and 90 (life).

DC and AC supply

The TCE80xx-S-xBxx or TCE80xx-L-xBxx can be connected to a 24V DC and a mains supply simultaneously. The unit will operate properly as long as one of the 2 supplies is present.

Digital I/O ports

The frequency and control outputs are active push-pull outputs with an output resistance of 220Ω. They can be loaded to the positive supply or to ground. For a high output swing the load resistors R_{load} should not be lower than 1kΩ.

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

Analog outputs

The TCE8000 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.

For 24V minus 10% supply the maximum load resistance is 620Ω.

As the terminals are floating, the load resistor and the current meter can be placed in the positive or in the negative supply rail.

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

2.3 Ex Installation

WARNING!

In hazardous locations all installations must only be carried out by qualified personnel!
Switch off all power supplies before installing or uninstalling the unit in hazardous locations!
Never open any cover of the electronics in hazardous locations with any supply or I/O circuits alive!
The Ex d protection of the housing is void, if any of the cable glands is not closed properly!

NOTE

For use in hazardous locations the TCM as well as the TCE must be Ex versions!
The inputs and outputs of the TCE are not power limited and must not be used to drive intrinsically safe circuits

Locating the Compact Version

The TCM***_**-****-E*** -Ex is explosion proof with EX d for the electronics and Ex i for the meter.

Locating the Remote Version with TCE80**-E-****-Ex

The TCM***_**-****-****-Ex is intrinsically safe when driven by the corresponding TCE80xx-Ex.

The TCE80**-E-****-Ex is explosion proof "EX d". It contains the safety barriers for the TCM.

The TCE80**-E-****-Ex can be located inside and outside the hazardous area.

Locating the Remote Version with TCE80**-L-****-Ex

The TCM***_**-****-****-Ex is intrinsically safe when driven by the corresponding TCE80xx-Ex.

The TCE80**-L-****-Ex is not explosion proof and only provides the safety barriers for the TCM.

The TCE80**-L-****-Ex must be located outside the hazardous area.

Electrical connections

Power Supply and Grounding

For operation in hazardous areas a good connection of PE is mandatory. The cross section of the PE cable must be at least the cross section of the supply cable or 1mm², whichever is higher.

The supply terminals (50, 51 for 24V DC or 90, 91 for mains operation) are designed for a rated voltage of 250V AC.

WARNING!

Applying 250V AC to the DC supply terminals (50, 51) will not affect the Ex safety of the TCE or TCM, but will damage the supply circuit of the TCE!

The TCE80**-L-*B**-Ex can be connected to a 24V DC and a mains supply simultaneously. The unit will operate properly as long as one of the 2 supplies is present.

Digital Control Inputs and Outputs

The digital I/O terminals are designed for a rated voltage of 250V AC.

WARNING!

Applying 250V AC to the digital I/O terminals (5, 6, 7, 8) will not affect the Ex safety of the TCE or TCM, but will damage the I/O board of the TCE!

Analog Outputs

The analogue current output terminals are designed for a rated voltage of 30V AC.

The outputs are protected against wrong polarity. Voltages below 30V will not damage the outputs nor affect the Ex safety.

WARNING!

Applying more than 30V DC to any of the outputs will damage the TCE and destroy the protection of the TCM!

If more than 30V have been applied to any of the analog output pins, the unit must be returned to KEM for repair as the safety barrier might be destroyed!

3 Manual Operation

3.1 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 work normally flow and batch)

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 3.53.5):

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

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

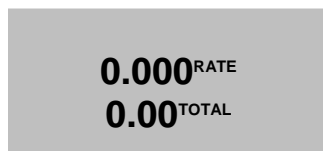
For entering the CONTROL menu press "P" for 3 seconds.

3.2 Power On Sequence and Principles of Manual Control

After power on the display shows for 2 seconds the type of the electronics, the sensor type and the SW versions.

In case no backup of the settings was made, a warning is displayed.

Now the TCE8000 switches to the measuring mode, displaying the default screen:



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

In manual control the TCE is menu driven and provides 2 operational modes, the "Measuring Mode" and the "Control 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 control mode the 3 pushbuttons below the display have varying functions. The actual function is indicated in the display, just above the pushbutton.

In the control menu all necessary settings can be made.

The control menu contains the 5 submenus "ZERO OFFSET", "DISPLAY", "SETUP", "I/O-TEST" and "SERVICE".

For protecting the unit against unintentional changes by unauthorized personnel, the menus "ZERO OFFSET", "SETUP" and "I/O-TEST" are protected by a user password and the menu "SERVICE" by a service password.

3.2.1 Using the magnet

In hazardous, wet and dusty areas the display cover must not be opened to operate the pushbuttons.

Beside every pushbutton there is a hall sensor which can be operated via the magnet attached to the housing.

For operating the keys hold the magnet to the glass.

The best positions for operating the keys are:

Key	position
P	right edge of the yellow area
Reset	left edge of the yellow area
Display	lower edge of the yellow area
Info	right edge of the yellow area



3.3 Setup guidelines

Ex work the Tricor mass flow meters come with a setup optimized for normal applications. In more than 90% of the applications no further optimization except a regular offset adjustment is required.

The different possibilities for optimizing the settings are described below.

Meter Mode

A coriolis mass flow meter measures the mass flow and the density and can calculate the volume flow.

For avoiding strange effects with the total values when changing the dimensions, the TCE8000 can be set up as a mass flow OR a volume flow meter.

When set up as mass flow meter, only mass and mass flow engineering units can be selected, when set up as volume flow meter, only volume and volume flow engineering units can be selected.

Offset Calibration

In contrast to a PD meter, a coriolis mass flow meter has no “natural” zero. At no flow the measured time shift is nearly zero, but not exactly. The offset calibration determines this offset and corrects the measured value correspondingly.

As the offset depends slightly upon the temperature, the density of the medium and the operating pressure, it is strongly recommended to make the offset procedure under working conditions, i.e. with the medium to be measured and at operating pressure and temperature.

Flow filter

The rough data of a mass flow meter are relative noisy. For having a stable reading a filtering of the calculated flow is required.

The filters in the TCE8000 are set via the time constant t . The time constant is the time the output needs after a jump from x to 0 to go to $x/e = x/2.72$. A higher time constant means more stable reading, but also a slower reaction to changing flows.

A rough relation between the time and the filtered flow value after a jump is

Elapsed time	Remaining error (% of the step)
$1 * t$	30
$2 * t$	10
$3 * t$	3
$4 * t$	1

A linear filter as it is realized in the TCE8000 electronics just delays the flow reading and consequently the total. Independent of the slope (fast or slow) of the rising and falling flow, the error of the internally calculated total and at the frequency output cancel out, if the flow rises from zero (or any other value) and later goes back to the starting value. For getting a correct total via the display or the frequency output, it is just necessary to wait long enough after the flow is switched off.

For best results the TCE8000 electronics provide 2 filters.

The FLOW FILTER filters the mass flow before calculating other parameters like volume flow, total or the frequency and current outputs. For normal applications a moderate filtering with $t = 1s$ is recommended.

The DISPLAY FILTER filters the flow display additionally to the FLOW FILTER. It does not affect any other parameter or any of the outputs. The default setting is $t = 1s$.

If the flow is fast changing or sometimes makes a jump and the outputs have to react as fast as possible, set FLOW FILTER to $t < 1s$. If nevertheless the flow display has to be stable for better readability, the DISPLAY FILTER can be increased.

Cutoff

As mentioned above, a mass flow meter has no natural zero and the rough data are noisy. Consequently with no flow a meter would indicate and give out continuously a small fluctuating flow.

The parameter CUTOFF is used to provide a clear zero. If the calculated and filtered flow is below cutoff, the meter indicates zero, the total values remain unchanged and the outputs show zero flow as well.

The value for CUTOFF must be above the noise floor in the given application and well below the minimum flow to be measured. As a good compromise the default value for CUTOFF is 0.5% of the full scale range of the meter.

Step response

Sometimes it is necessary to react fast to a fast changing flow, but also to have a stable output, if the flow is (mostly) constant. This cannot be achieved by adjusting the flow filter.

The parameter STEP RESPONSE provides a fast reaction at fast changing flow, also with a high filter constant.

If the difference between the measured flow and the filtered flow is smaller than the step response value, the flow filter remains active. If the difference is higher than step response, the filter is cleared and filled with the new value.

The recommended value for constant or slowly changing flow is 99% (the default value ex work). If the unit has to react to fast changing flow, the optimum value depends on the individual situation. For ON / OFF operation a value of half the ON flow is recommended.

If STEP RESPONSE is set too low, even small changes in flow or even the internal noise will activate the step response function and partially or all the time deactivate the filter, leading to noisy readings and noisy output signals.

Interaction of FLOW FILTER and CUTOFF

If the filter constant is set to a high value, the calculated flow is delayed compared to the actual flow. In ON-OFF operation this leads to the fact that it takes a long time until the calculated flow settles to the ON or OFF value. The total value remains correct if the unit measures long enough after the flow got switched off. If cutoff is set to a high value, the meters stops measuring too early and consequently the calculated total is too low. Also the number of pulses at the frequency output is too low. The error is systematic.

NOTE

In ON-OFF operation high values for the flow filter combined with high values for cutoff must be avoided! Jumps of the flow not going down to zero are not affected by cutoff.

Interaction of FLOW FILTER and STEP RESPONSE

As described above, a linear filter just delays the flow reading and consequently the total but does not alter the final total.

If the step response is activated, a nonlinear term is added to the filter. The indicated flow will follow more closely the total flow, but the remaining deviation depends on the values for the filter and for step response, but also on the slope of the flow change and on the size of a step.

If the flow changes slowly or a jump is smaller than step response, the step response function will not be activated and remains linear all the time, producing the normal delay.

If the flow changes fast and the step is higher than step response, the filter will be made faster, the indicated flow follows more closely the actual flow and the delay will be smaller.

In ON-OFF operation with a fast rising and slowly falling flow a systematic positive error is to be expected. If the rising is slow and the falling fast, the error will be negative.

NOTE:

If step response is used (e.g. for good reaction to fast changing flow), checking the accuracy for the given application is strongly recommended!

3.4 Measuring mode

Function of the keys

In the measuring mode all pushbuttons have a fixed function:

P	Opens the Control Menu if pressed for about 3 seconds
Reset	Resets the batch counter to zero, if the function "KEY RESET" is enabled
Display	Toggles the display between the 2 preselected settings.
Info	Opens the info menu and toggles between the different screens

3.5 Offset calibration

For best accuracy the Tricor 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 operating temperature.

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

NOTE:

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

Start the offset procedure as follows:

- Press "P" for about 3 seconds
- The display shows "ZERO OFFSET"
- Press "P"
- Change the indicated number with "up" to 2207 and confirm with "P"
- Press "SLOW" (recommended) or "FAST"
- The display shows "MAKE ZERO" for 10 to 30 s and counts down to "0"
- Confirm with "Info"

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

3.6 Control Mode

Function of the keys

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

P	Confirms the selection in a list or any kind of inputs
Reset	Performs the indicated function
Display	Performs the indicated function.
Info	Performs the indicated function. In most cases exits the current menu point without altering the original value

DISPLAY Menu

The following submenus are available:

FLOW DISPLAY:	Setting the flow units, the flow decimal point and a flow filter for the display.
TOTAL DISP:	Setting the total and batch units and the total and batch decimal point.
DENS DISP:	Setting the density units.
TEMP DISP:	Setting the temperature units.
DISP MODE:	Setting the content of the 2 display views and the display mode.

SETUP Menu (PW 2207)

In the SETUP menu all settings can be made to adapt the meter to the individual requirements.

The following submenus are available:

PARAMETER:

METER MODE	Selecting mass or volume meter mode
FLOW FILTER	Setting the filter time constant
CUT OFF	Setting the cutoff value
STEP RESP:	Adjusting the settings for fast changing flow
RESET KEY	Enable / disable the key "Reset"
FLOW-DIREC	Setting up the unit for reverse flow
K-FACTOR	Fine scaling the meter
FAULT TIME	Setting the error response time
LANGUAGE	Selecting the display language

IN/OUTPUTS:

FREQ OUT	Configuring the frequency output
CTRL OUT	Configuring the control output
ANALOG OUT	Configuring the analog output
CTRL IN	Configuring the control input
INTERFACE	Configuring the interface

DATA CONFIG:

SAVE DATA	Saving the actual settings as backup
RECALL DATA	recalling the last settings from the backup

RESET TOTAL:

Resets the total count to zero.

I/O-TEST Menu (PW 2207)

In the I/O-TEST menu all inputs and outputs can be tested.

The following submenus are available:

FREQ OUT	A freely settable frequency can be applied to the output
CTRL OUT	The output level can be set
ANALOG OUT	A freely settable current can be applied to the outputs
CTRL IN	The current level at the input is indicated

When the I/O-TEST menu is left, all outputs return to normal operation.

SERVICE Menu

In the SERVICE menu the original settings ex work can be reloaded and the unit can be calibrated.

For a description of the service menu refer to the complete manual.

4 Service

The TRICOR mass flow meters do not require regular maintenance.

For further information refer to the complete manual.

5 Listings

5.1 Warranty

KEM warrants material and production for a period of 12 months after installation and start up, max. 18 months from delivery date.

5.2 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 ¹ and Immunity ¹ .
	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 ²	Power Line Surge Immunity (Performance criterion B)
	IEC 61000-4-6 / 2009	Conducted RF Immunity (Performance criterion B)
	IEC 61000-4-11 / 2005 ²	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 ¹	
	AS/NZS 2064	Industrial, Scientific, and Medical Equipment: 1992
FCC EMC Compliance	Emissions comply with the Class A Limits of FCC Code of Federal Regulations 47, Part 15, Subpart B ¹ .	

¹ Compliance demonstrated using high-quality shielded interface cables

² 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	
ATEX	II 2G Ex d [ia] IIC T4 Gb II 2G Ex d [ia] IIB T4 Gb II (2)G [Ex ia Gb] IIC II (2)G [Ex ia Gb] IIB II 2G Ex ia IIC T4 Gb II 2G Ex ia IIB T4 Gb	TCE800*-E-****-Ex TCM0325 ... 7900-**-****-E***-Ex TCE801*-E-****-Ex TCM28k ... 65k-**-****-E***-Ex TCE800*-L-****-Ex TCE801*-L-****-Ex TCM0325 ... 7900 TCM28k, TCM65k

5.3 Technical Data

The critical data of the unit (medium pressure, operating temperature, supply voltage) are indicated on the letter plate of the unit and must be observed without exception. For the full data refer to the complete manual.

For dimensional drawings refer to the complete manual or to the datasheet.

5.4 WEEE and RoHS

The unit described herein is not subjected 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 off as domestic waste.

The unit described herein fully complies with the RoHS directive.

Contact

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