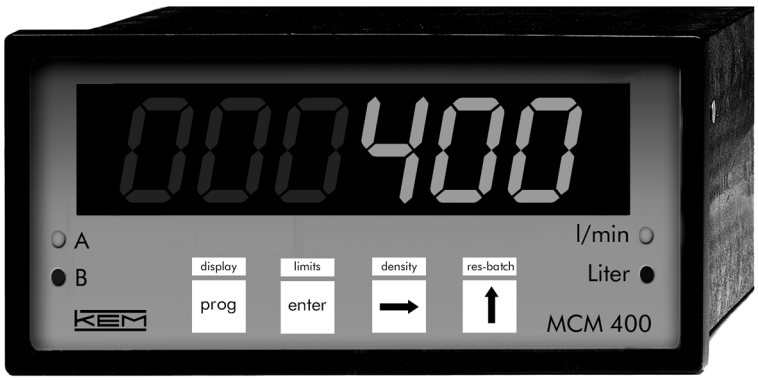
MCM 400
User's Manual

As of version: EL04.99



Küppers Elektromechanik GmbH
Quality system certified to DIN EN ISO 9001

Contents

Features and Application

The MCM 400 is a microprocessor-based readout and evaluation unit for measuring values available as a frequency. In addition to a 6-digit LED display (7 segments, digit height 20mm), the MCM has a frequency measuring channel, 0.4Hz–10kHz, and two relay switch outputs. Frontsided LED's inform the operator on the status of the switch output and the operation mode of the display. Three control inputs serve processing. Operation and parameter settings are effected via foil touch keyboard.

Options

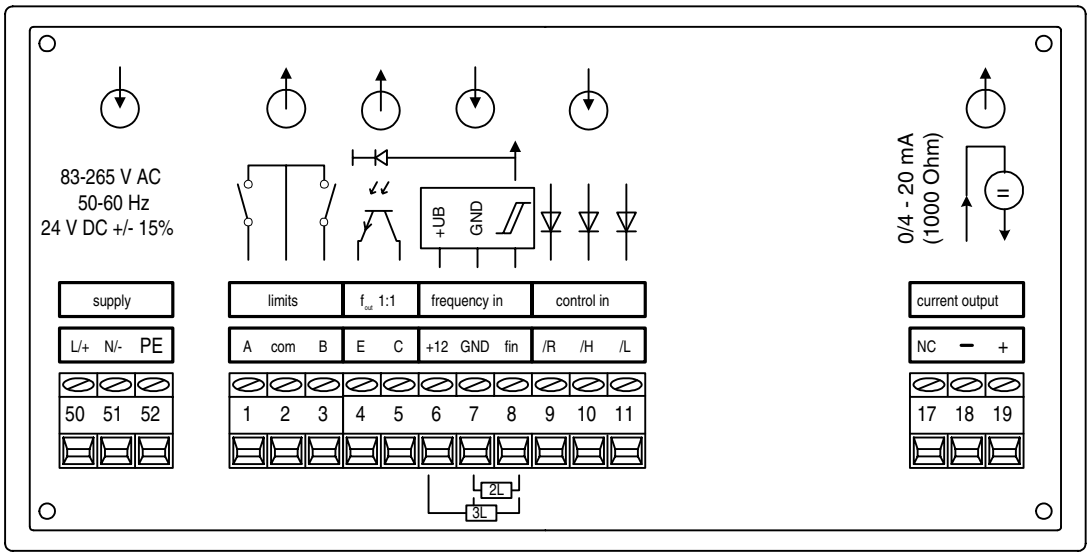
- 10-point-linearisation of the frequency measuring input
- Analogue output, galvanically free (0/4-20mA), resolution 12 bit
- Power supply 24VDC, 230VAC, 115VAC
- Wall mounting housing IP 54

Special features of the MCM 400 are excellent readability of measuring and operation values, fast response time, high accuracy as well as simple and safe programming of all parameters.
Typical applications can be found in the monitoring of real-time values or control of batch processes.

Technical Data

housing protection	front: IP50 DIN 40050 (option S), IP54 DIN 40050 (option W) rear: IP30 as per DIN 40050 (option S), IP54 DIN 40050 (option W)
connections	power supply: screw terminals 0.14 up to 1.5mm² in- and outputs: screw terminals 0.14 up to 1.5mm²
housing dimensions (option S)	DIN panel mounted 144 x 72mm, depth: 83mm
housing dimensions (option W)	wall mounted: w = 165mm, h = 155mm, d = 94mm with 4 cable sleeves PG13.5 (wire-size 5 to 12mm)
permissible ambient temperature	0 up to +45°C
weight	approx. 500g
supply voltage	24VDC, 115VAC, 230VAC/50 Hz power consumption: 5VA
pickup supply	12VDC/50 mA
frequency inputs	measuring accuracy: 0.02%, response time ≥ 20ms current switch level: NAMUR DIN 19234 voltage switch level: Ul < 6V, Uh > 9V, Umax = 30V
frequency measuring range	0.4Hz up to 10kHz (with $t_{on/off}$ > 40 µs)
control inputs	/reset /hold /limit-wait (delay time): active at Ul < 3 V (tmin = 50ms) vs. GND
analogue output	galvanically separated, resolution 12bit, response time ≥ 20ms current (0/4 to 20mA), load: 1,000Ω linearity: 0.05 % of full scale temperature drift: 0.05% per 10K residual ripple: 0.05% of full scale
switch outputs	2 potential free relay contacts, programmable contact load: 30 V/50mA, low-inductive switch hysteresis adjustable from 0 to 9.9% of measuring value
frequency outputs 1:1	galvanically free: open collector 30V/50mA
display	6 digits, bright shining red LED display, digit height 20mm programmable flashing for limits
indicators	2 LEDs for limit status (lefthand front)
flow rate unit	stickers are supplied for the righthand LEDs to indicate the programmed flow rate unit
data memory	EEPROM for at least 10 years

Layout of Terminals – Connections



Supply

no.	*description*
50	L (+) supply voltage
51	N (-) supply voltage
52	PE protected earth

Limits

no.	*description*
1	operational contact A
2	Common operational contact A and B
3	operational contact A

fout 1:1

no.	*description*
4	f 1:1 frequency output, emitter
5	f 1:1 frequency output, collector

Frequency input

no.	*description*
6	+12V/50mA external, pickup supply
7	GND, external, pickup supply
8	fin channel A measurement

Control inputs

no.	*description*
9	/reset counter (vs. GND)
10	/hold (vs. GND)
11	/limit start delay (vs. GND)

Current output

no.	*description*
17	n. c.
18	I– current output (0/4 to 20mA)
19	I+ current output (0/4 to 20mA)

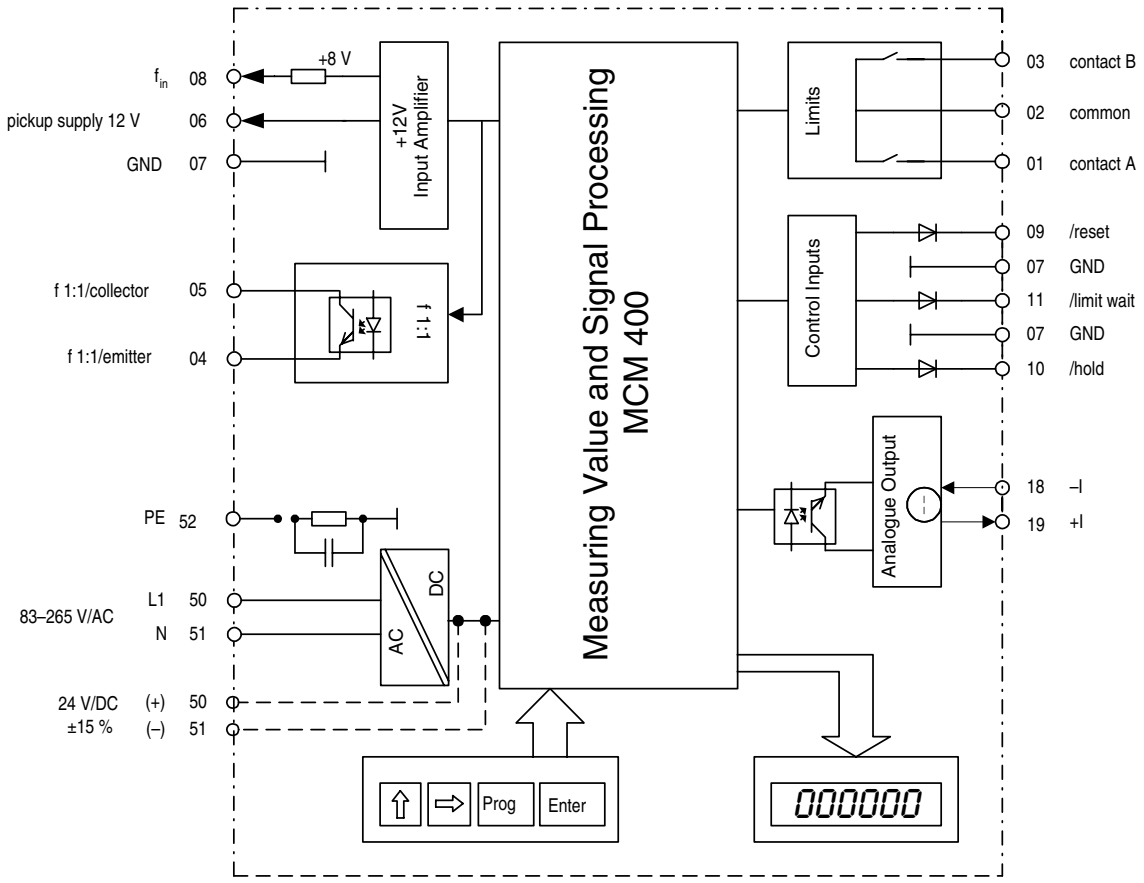
Notes on Installation

Connect metal housing with PE.
Built-in devices have to be installed in a metal housing connected with protected earth.
Observe a low impedance connection of PE and a measurement of the PE resistor according to VDE 0701. Also observe a sufficient shielding for the employed cabinet.

Keep distance.
Keep current-carrying cables at least 30cm away from the MCM 400. Only shall indicated terminals and contacts be used for power supply. Keep mobiles, ISM-units or switching inductivities like engines or solenoid valves at least 2 metres away from the digital measuring and control electronics. Avoid sources of electrostatic charges in the closer environment of the MCM 400. Operators should also consider appropriate clothing and wear of shoes with discharging ability.

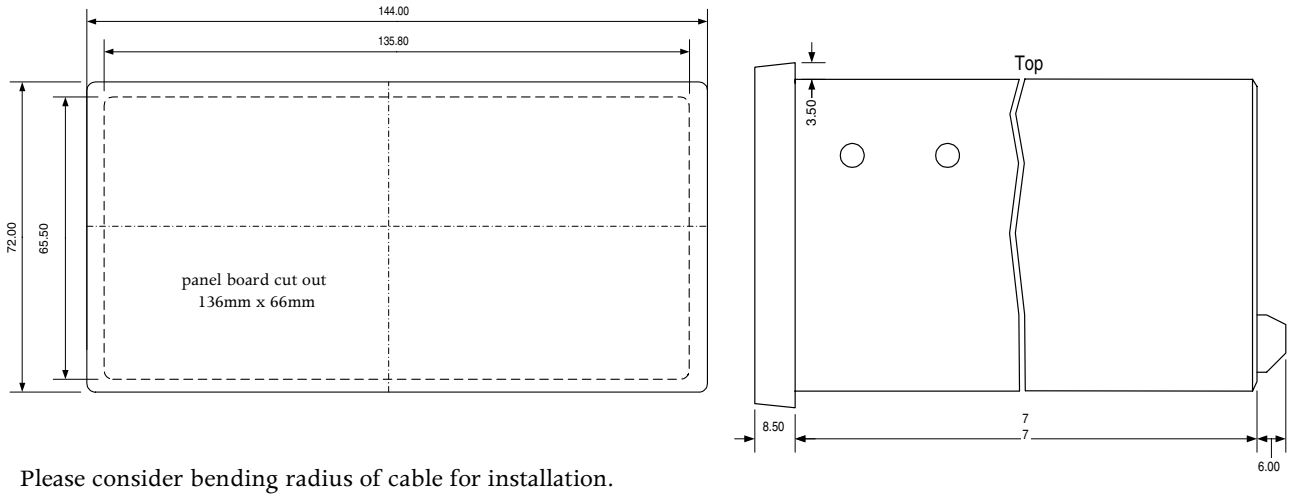
Avoid parallel arrangement of current-carrying cables.

Data Flow Chart



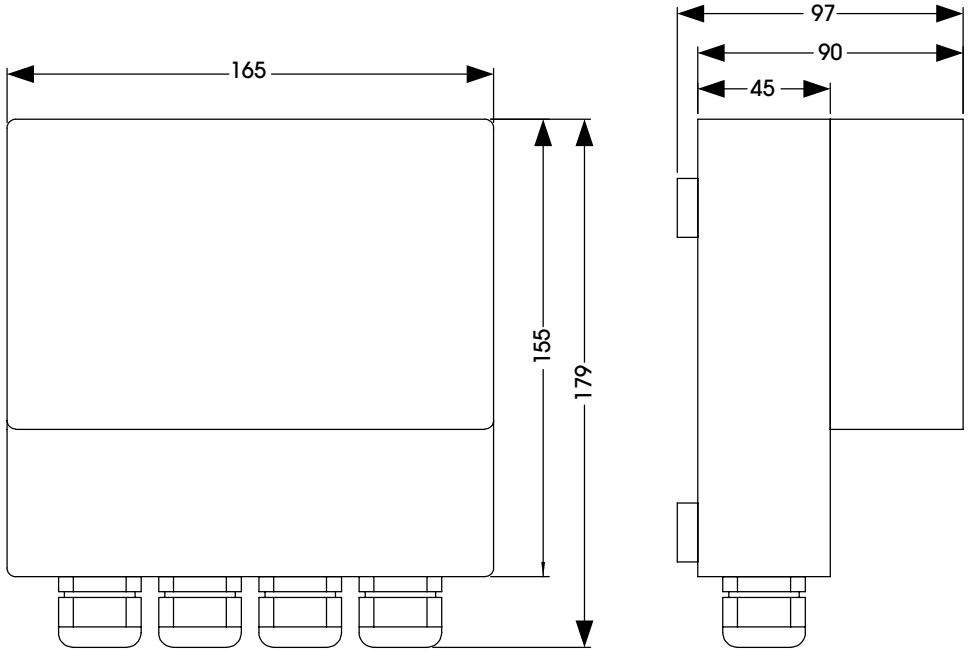
Drawing Panel Mounting(mm)

For dimensioning panel board cut out.



Please consider bending radius of cable for installation.
Avoid parallel cable runs of power and measuring lines.

Drawing Wall Mounting (mm)



Avoid parallel cable runs of power and measuring lines.

Ordering Information

MCM 400 – xxx – x x x x – xx

Software code
00–99 = standard software

not used

Linearisation
1 = with linearisation
0 = without Linearisation

Analogue output
A = with analogue output
0 = without analogue output

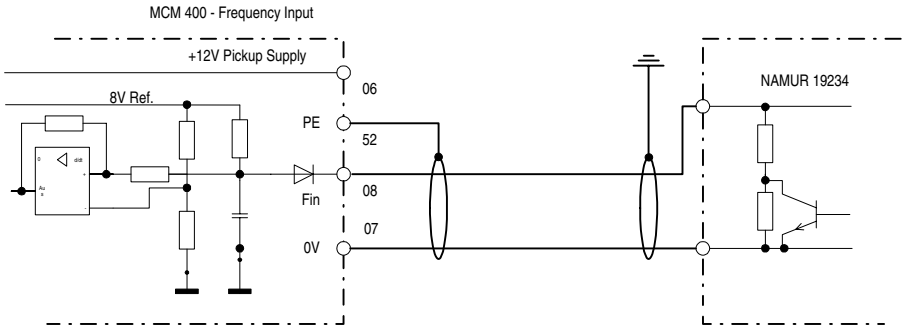
Housing
S = panel mounted
W = wall mounted

Supply voltage
024 = 24VDC controlled
230 = 115–265 V 50–60 Hz/AC

Inputs and Outputs

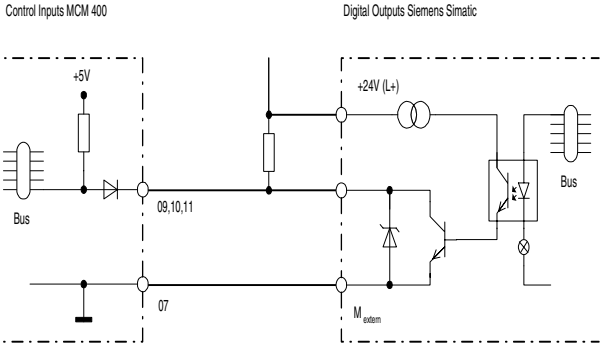
Frequency input

The versatile frequency input stage of the MCM 400 allows to operate sensors with NAMUR output or any output in compliance with the level limits (cf. technical data). The pickups may be powered via terminal 6 with a voltage of +12V, max. 50mA.



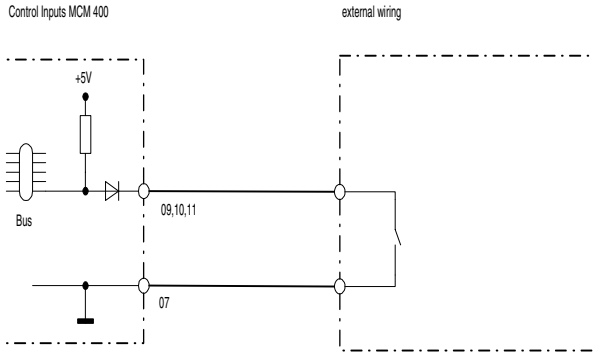
Control inputs

These inputs have identical input wirings (/reset, /hold and /limit-wait).



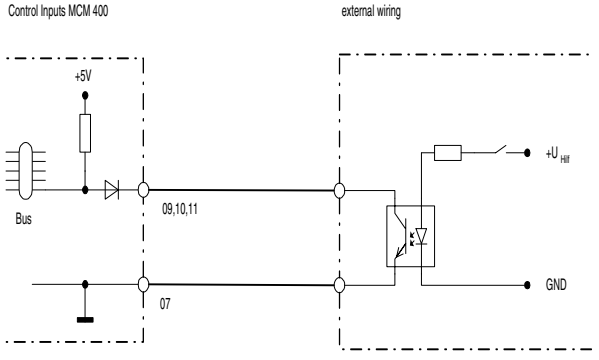
Control input /reset

This input serves to reset the standardised totaliser of the MCM 400 to 0000.



Control input /hold

The optional analogue output will hold its current value as long as this connection is active. Moreover, the totaliser of the MCM will hold its current count.

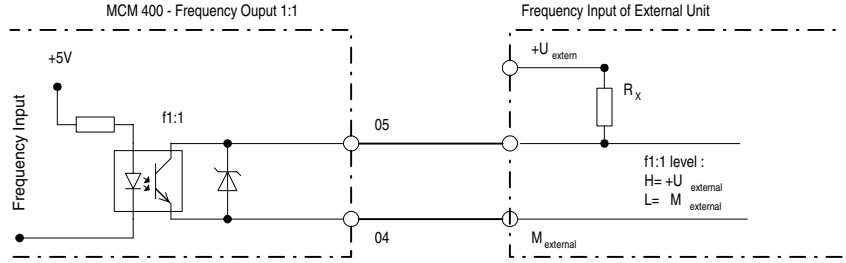


Control input /limit wait (delay time)

Using this input you may delay the response of the limits A and B by an adjustable time interval (see parameter P-1.2). This is useful in order to prevent the evaluation of a start up period of the system.
In case this input is not connected the limits will respond as soon as the programmed values are reached.

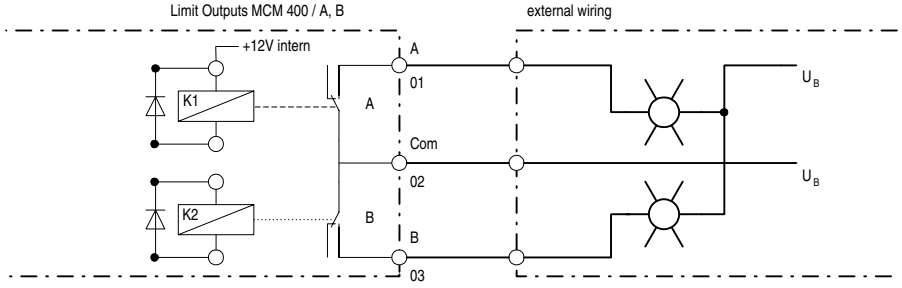
Frequency output f 1:1

This output provides the input frequency galvanically free via open collector and allows for further evaluation of the unprocessed frequency by additional units. Using external resistor networks, levels of all kinds may be realised.



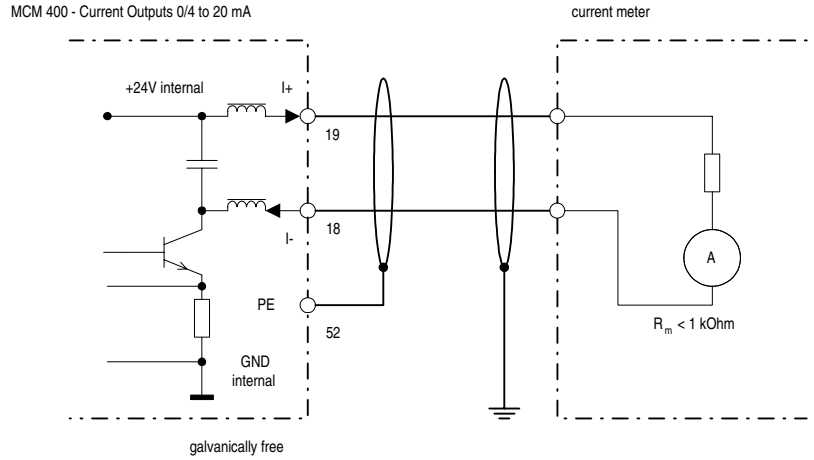
Limit outputs

The output of both limits A and B is an operational relay contact at terminals 1 and 3 respectively as well as terminal 2 common. The mode of operation is programmable.



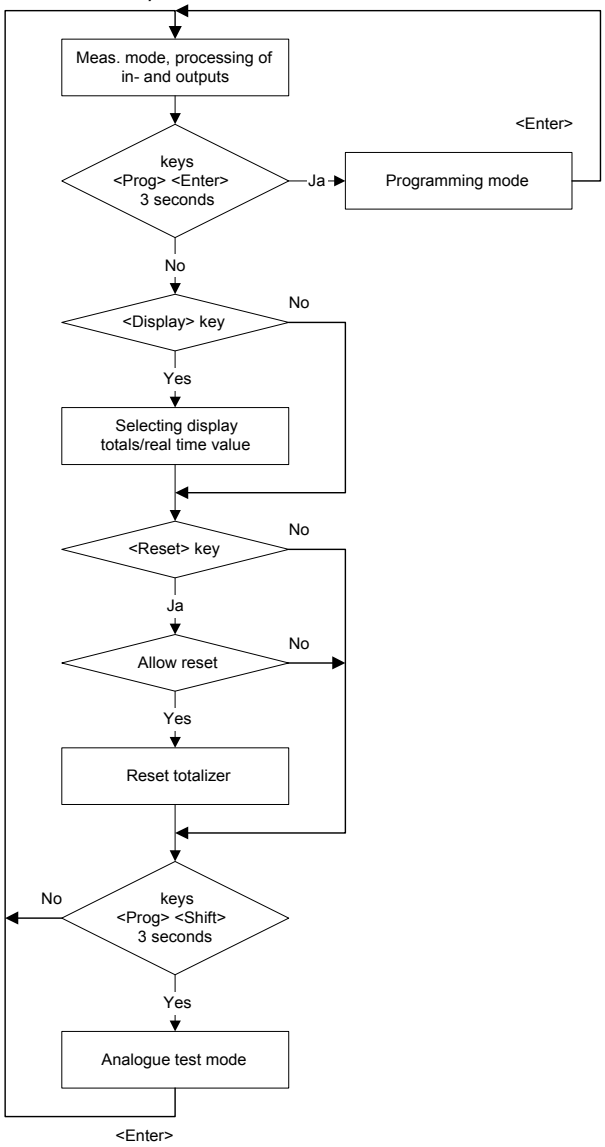
Analogue output 0/4–20mA

The optional analogue output is freely scaleable (assignment of real-time values of the frequency measuring input).



Programme Scheme

shift = ⇨-key



General

In the measuring mode the MCM will check several key combinations and the software runs through the respective routines.

Programming

To start programming simultaneously press PROG and ENTER for approx. 3 seconds.
The current display is faded out and all outputs take a neutral status. The display shows the first programming level P00. The further process is described on the following pages.

Display selection

Press display to select the indication of totals or the real-time value.

Reset of the Totaliser

When the total reset via keyboard is programmed, the totaliser can be reset via res.-batch to 000000 in the measuring mode.

Analogue out check

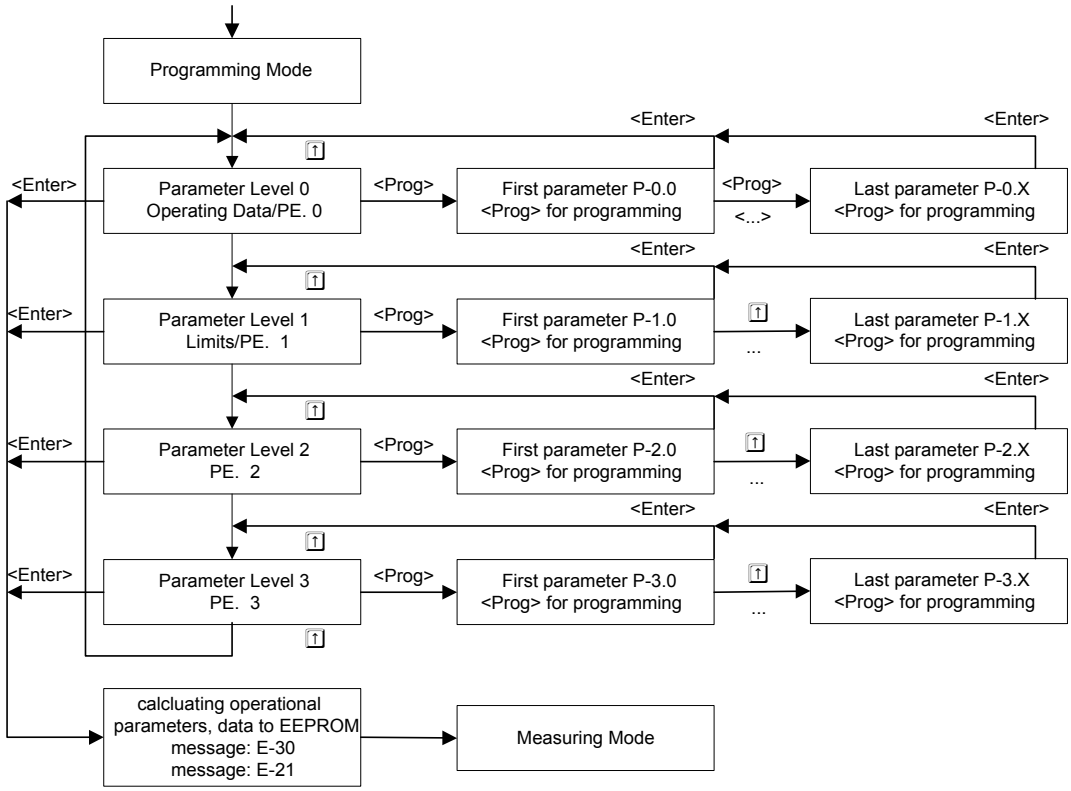
This functions is used to check the performance of the analogue output. 4 presets of current values can be sent to the analogue output via the keyboard.

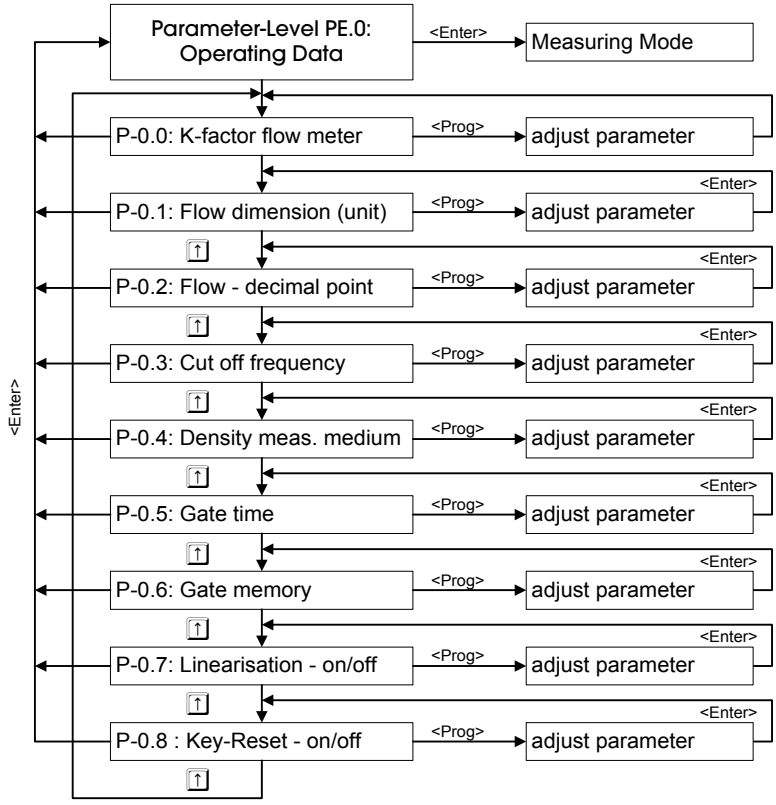
Display Messages

The following messages may appear in the display during the measuring mode or after programming:

Message	*Description*
E-00	erase of EEPROM/data memory
E-01	parameter error in EEPROM -> proceed with ENTER
E-02	exceeding display, value cannot be indicated with 6 digits
E-03	n. c.
E-04	setting defaults to MPU-RAM
E-20	copying data to MPU-RAM
E-21	calculating operational parameters
E-30	writing data in EEPROM
E-50	programming not allowed

Programming Summary

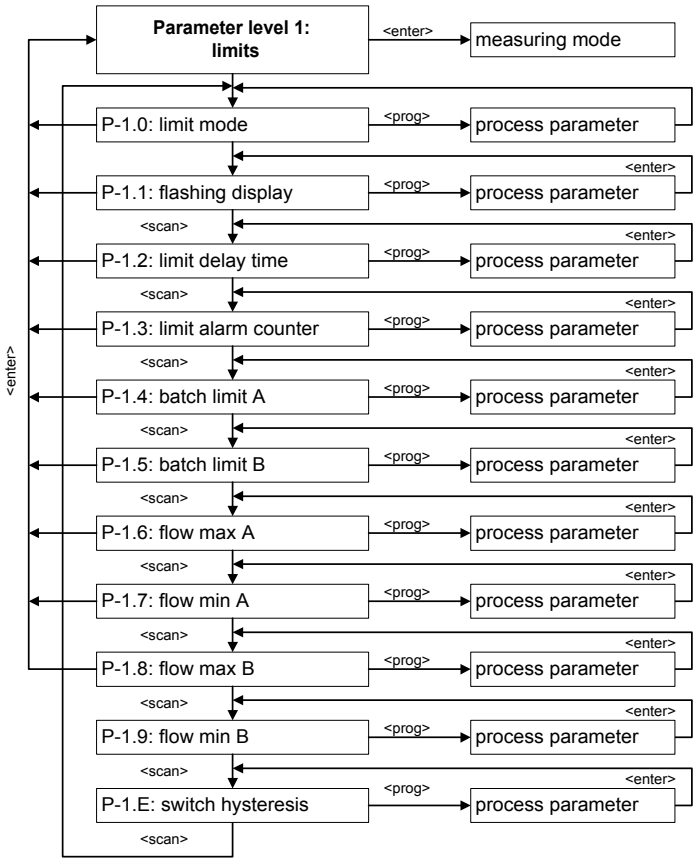




Parameter level PE.0

Basic adjustments for the flow meter and measuring mode like decimal point, flow unit, gate time and so on. A detailed description can be found on the following pages.

P-0.4 (density) is only available when a mass-related unit was programmed (see P-0.1).



Parameter level 1

Programming the two limits of the MCM. Adjusting operation mode of the switch contacts, limit values and hysteresis for the switch processes.

The limits are programmable in accordance with the limit mode.
P-1.0 to P-1.3 are always available.

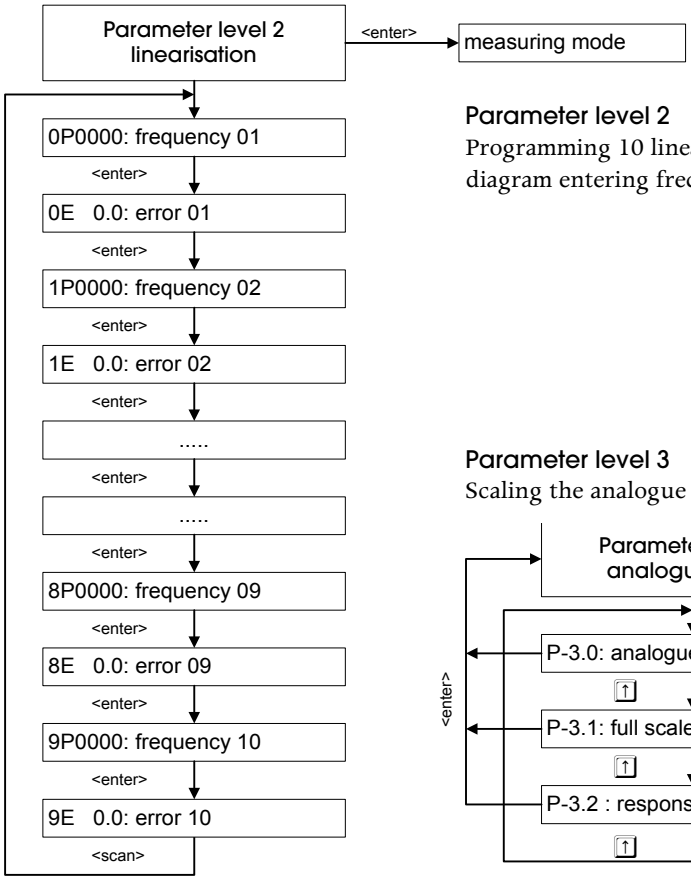
Limit mode 0: no limits
Parameters P-1.1 to P-1.9 not available.

Limit mode 1: batch limits
P-1.4 to P-1.5 available, P-1.6 to P-1.E not available.

Limit mode 2: flow limits
P-1.6 to P-1.E available.

Limit mode 3: flow limits min/max
P-1.6, P1.9 to P-1.E available.

<scan> = ↑-key



Parameter level 2

Programming 10 linearisation points from the calibration diagram entering frequency and error (option).

Parameter level 3

Scaling the analogue output (option).

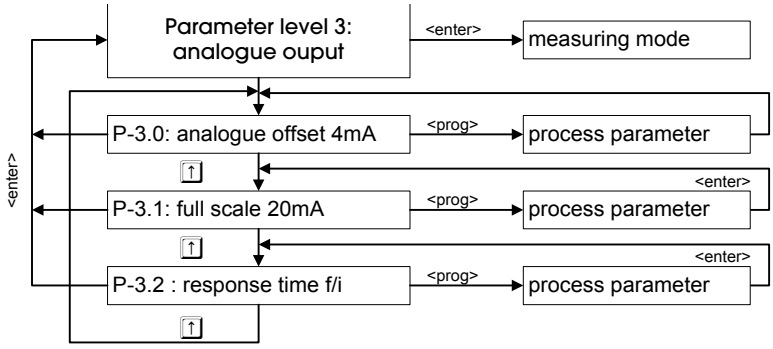


Table of Parameters

The table below shows all parameters with their adjustable range and the respective defaults. A detailed description can be found on the following pages.

Parameter	Description	Range	Default
PE 0	*Parameter level 0/Operational data*		
P-0.0	K-factor flow meter	0.010–999999 pulses/ltr	40000 pulses/ltr
P-0.1	Flow rate unit	0–14 (see table page 16)	2 (ltr/min)
P-0.2	Flow decimal point	0000–0.000	00.00 (2 digits)
P-0.3	f-cut (cut off frequency)	0.4–100.0Hz	5.0Hz
P-0.4	Density of the measuring medium	0.010–9999 kg/m^3	1000 kg/m^3
P-0.5	Gate time	0.507–3.042 s	1.014 s
P-0.6	not in use	–	–
P-0.7	Linearisation on/off	0 = off, 1 = on	0 (off)
P-0.8	Key reset on/off	0 = off, 1 = on	0 (off)
PE 1	*Parameter level 1/Limits*		
P-1.0	Limit mode	0=off 1=batch limit 2=flow limit 3=flow limit min/max	0 (off)
P-1.1	Flashing display	0 = off, 1 = on	0 (off)
P-1.2	Limit wait time (delay time)	0.507–3.042sec	3.042sec
P-1.3	Limit alarm counter	0–20	0
P-1.4	Batch limit A	0.01–9999.99	100.00 Litres
P-1.5	Batch limit B	0.0–9999.99 (Flow-Dim)	100.00 Litres
P-1.6	Flow max A	depending on flow decimal point	100.00 ltr/min
P-1.7	Flow min A	depending on flow decimal point	10.00 ltr/min
P-1.8	Flow max B	depending on flow decimal point	100.00 ltr/min
P-1.9	Flow min B	depending on flow decimal point	10.00 ltr/min
P-1.E	Switch hysteresis A and B	0.1–9.9%	0.1%
PE 2	*Parameter level 2/Linearisation*		
	Linearisation		
	10 frequencies in Hz	0–9999Hz	0Hz
	10 errors in %	0.0 up to ±9.9%	0%
PE 3	*Parameter level 3/Analogue output*		
P-3.0	Analogue offset	0 = 0mA, 1 = 4mA	0 (= 0mA)
P-3.1	Analogue full scale	0.001–999999 (Flow dim)	1000 ltr/min
P-3.2	Response time	0 = fast, 1 = slow	1 (slow)

Invalid programming

When entering invalid values or values which are not included in the respective range, the last value will re-appear in the display after pressing ENTER and you may repeat programming.

Restoring defaults

Simultaneously press PROG, ENTER and ⊡
Connect power supply
When the message E - 04 appears in the display, all defaults are restored as listed in the above table.

Start Up

After powering up the MCM 400 will show the software version.

EL04.99

All outputs are in a neutral status (operational contacts of the limit relays are open, analogue output at 0mA). The MCM is reading the parameters in the EEPROM which is indicated by the following message:

E. 20

Afterwards all operational parameters are calculated

E. 21

Finally, the MCM will automatically go into the measuring mode. The display will show the current value in accordance with the selected display mode.

Measuring Mode

The measuring mode allows for indicating either real-time values or totals. Please note, in the measuring mode the keys take the functions as labelled on top of them, i. e. the PROG key changes to DISPLAY key.
Press DISPLAY to select the desired display mode. Your selection is indicated by two LED's located on the right-hand front. The LEDs may be marked using the stickers supplied with the MCM.
The way of indication (decimal point, flow rate unit etc.) depends on the adjustments in parameter level 0.

Real-time Value

The current real-time value of the frequency input is indicated in accordance with the adjusted flow rate unit and decimal point. The calculation is based on the currently measured frequency and the K-factor of the flow meter. The calculation is upgraded every 0.5sec corresponding to approx. 2Hz. The internal upgrading and the resultant response time of the analogue output and the limits depends on the parameters »gate time« (P-0.5).

Totals

The MCM 400 is equipped with a totaliser (batch counter) which will add the pulses of the flow meter standardised in a technical unit (P-0.1 = Flow rate unit). The totaliser allows for detection of total flow rates over a long period. The decimal point position depends on the flow rate unit. The MCM will automatically display as many digits as possible.

EXAMPLE: Flow rate unit = m^3/h, the consumption is displayed with 3 digits in m^3: 12,345m^3

If the measuring value exceeds the display range, it will be assigned accordingly (e. g. 1234.567m^3 will be display as 1234.56m^3). In case the measuring value is too high to be displayed by fading out digits, it will be displayed using exponential notation (e. g. 1234567.89m^3 will be displayed 1.23E06).

In the measuring mode the totaliser may be reset via the RES.-BATCH key, if the key reset was allowed during programming (P-0.8: 1 = ON). Alternatively, the totaliser may be reset via the control input /reset (terminal 9).

Limit Status

The status of the limit switch contacts is indicated by two LED's located on the left-hand frontside.
With active limits the related LED will turn on, i. e. the limit switch contact is closed. A further possibility to indicate active limits is the flashing of the display by adjusting parameter P-1.1 accordingly.

Programming

Start the programming mode

To start the parameter programming simultaneously press PROG and ENTER for approx. 3 seconds.
The measuring mode will be interrupted and all outputs take a neutral status. The first parameter level (PE) appears in the display:

PE.0... ↑ ... PE.3

PE means parameter level. 0 to 3 number the levels available (depending on options included).

ENTER to return to measuring mode (cf. programming scheme page 10).
↑ to go through the parameters.
PROG to select the first parameter of the present level.

P-0.0 . ↑ ... P-0.8

P means parameter. The first number indicates the parameter level while the second number refers to the parameter itself.

ENTER to return to the parameter level (cf. programming scheme page 10).
↑ to go through the parameters.
PROG to programme a parameter.

After pressing PROG the display will show the current value of the selected parameter. It may be adjusted by entering either numericals or selecting from presets.

Entering numerical parameters

When a numerical parameter appears in the display the up right-hand digit will flash asking you to enter a value
→ to select the decimal position. The present position is flashing.
↑ to enter a value. Each pressing will increase the value by 1 (0..9).
→ to select the next decimal position.
ENTER to save parameter

Afterwards the parameter number will appear in the display again.
↑ to select the next parameter followed by PROG to programme the parameter.
ENTER to quit.

Selecting from presets

For some parameters there are only presets to select from. The parameters concerned and their respective presets are shown in the table below.
↑ to go through the presets.
ENTER to save.

Prog.-Code	*Parameter function/Description*	*Presets/Range*
P-0.1	flow rate unit	0–15 (see tables page 16)
P-0.2	flow decimal point	0000.–0.000
P-0.5	gate time	507–3042 (ms) adjustable in steps of 507 ms
P-0.7	linearisation	0 = off, 1 = on
P-0.8	key-reset	0 = off, 1 = on
P-1.0	Limit-Mode	0 = limits off, 1 = batch limits, 2 = flow limits, 3=flow limits min/max
P-1.1	flashing display for limits	0 = off, 1 = on
P-1.2	limit wait time	104–3120 (ms) adjustable in steps of 104 ms
P-3.0	offset analogue output	0 = 0 mA, 1 = 4 mA
P-3.2	response time analogue output	0 = fast, 1 = slow

Parameter Level 0 – Adjusting Operational Parameters

P-0.0: K-factor of the flow meter

Each flow meter is supplied with a calibration record indicating the mean K-factor. This factor defines the no. of pulses per volume unit (litres) over the entire measuring range of the flow meter. The linearity error of the mean K-factor over the entire measuring range is also shown in the calibration record.
In addition to the mean K-factor and error, the calibration record does also include K-factors and errors at certain flow rates. With constant flow rates you may reach a higher accuracy by selecting the K-factor which is the closest to the flow rate in your application.

EXAMPLE: (mean) K-factor as per calibration record = 5432.64 pulses/ltr.

Enter the number for each position via the ↑ and → key. The decimal point may be moved via the PROG key. Press ENTER to save.

P-0.1: Flow rate unit

Select the unit in which the flow rate shall be indicated. Your selection will also apply for the limits and analogue output. The unit itself does not appear in the display.

EXAMPLE: Flow rate unit = 2 (ltr/min), real-time values are indicated in ltr/min, analogue full scale value and limits correspond to ltr/min or litres (batch), totals are indicated in litres.

Preset	0	1	2	3	4	5	6	7	8
Unit	cm^3/min	cm^3/s	ltr/min	ltr/h	m^3/min	m^3/h	gal/min	gal/h	UPM
Operation	↑	↑	↑	↑	↑	↑	↑	↑	↑

Preset	9	10	11	12	13	14	15
Unit	g/min	g/s	kg/min	kg/h	lb/min	lb/h	Nm^3/h
Operation	↑	↑	↑	↑	↑	↑	↑

P-0.2: Flow decimal point

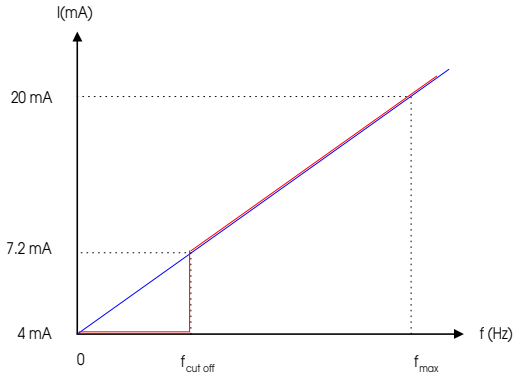
Applies for the real-time values. The adjustment of the decimal point determines the number of decimal digits. For totals, the MCM will calculate the best decimal point position in accordance with the measured value.

Preset	0000.	000.0	00.00	0.000
Meaning	1/1	1/10	1/100	1/1000
Operation	↑	↑	↑	↑

EXAMPLE: The flow rate is to be indicated in ltr/min with two decimal digits.
Select preset 2 for flow rate unit (P-0.1) and 00.00 for decimal point (P-0.2).

P-0.3: Cut off frequency

When the flow rate bypasses the minimum flow range of the flow meter, the output frequency will be outside the linear range of the meter. The frequency corresponding to the minimum flow range (see calibration record) is called »cut off frequency«. The analogue output, display and limits will not work below this frequency. The analogue output takes its offset value, the real-time values are display 0000 and the limits are out of operation.
The decimal point position for the cut off frequency is fixed to 000.0Hz. Press ↑ to programme the value for each digit. Press → to move and ENTER to save.



P-0.4: Density (specific gravity of the measuring medium)

In case a mass-related unit was selected for the flow rate (P-0.1), you may enter the density of the measuring medium in kg/m³ and the MCM will calculate the measuring values considering the K-factor and density.
The decimal point may be moved via the PROG key.
Please note, when a volumetric unit (e. g. ltr/min) was selected for the flow rate, the MCM will skip the density programming.

P-0.5: Gate time

The parameters »gate time« and »gate memory« enable you to adapt the temporary transmission behaviour between frequency and analogue output to your requirements.
After the gate time has passed, the MCM calculates an average frequency for the measuring interval thereby calming signal fluctuations.

Periodic disturbances, e. g. pressure fluctuations, will be included in the displayed values, if the gate time is too short. You may avoid this by choosing an appropriate interval.

EXAMPLE: flow variations with a period of 0.5 seconds require a gate time of ≥ 0.5 seconds.

You may select intervals from 507msec to 3549msec in steps of 507 msec via the ↑ key. Save your selection with ENTER.

Preset	507	1014	1521	2028	2535	3042
Unit	msec	msec	msec	msec	msec	msec
Operation	↑	↑	↑	↑	↑	↑

P-0.6: not in use

P-0.7: Linearisation on/off

This parameter can be used to either activate or deactivate the 10-point-linearisation of the MCM 400 for real-time values and the analogue output. With active linearisation the MCM will correct the measuring frequency according to the programmed error and frequency figures. The programming of these figures is performed in parameter level 2 (see page 19).

Preset	0	1
Status	off	on
Operation	↑	↑

P-0.8 Key reset of the totaliser

In addition to resetting totals via the control input /reset, the totaliser can also be reset via the key RES.-BATCH The key reset will be available, if this parameter is set to 1. Please note, the reset function via key is only available for totals.

Preset	0	1
Status	off	on
Operation	↑	↑

Completion of a parameter level

After adjusting the last parameter save with ENTER. The display shows the current parameter no. (*P-0.8*).

↑ to go through the parameters again.
ENTER to quit

After pressing ENTER MCM goes back to parameter level

↑ to select the next parameter level.
ENTER to quit programming. All data will be saved and the MCM will automatically go into the measuring mode.

Parameter Level 1 – Programming the Switch Outputs

P-1.0: Limit mode

The two switch outputs may be related to the totals (batch limit) or real-time values (flow limit).
Active limits are indicated by the two left-hand front LED's. You may select the desired mode via the ↑ key.

Limits off: both switch outputs A and B are off.

Batch limit: The switch outputs A and B will be activated on reaching counts as adjusted for parameter *P-1.3* or *P-1.4* respectively.

Flow range limit: The switch outputs A and B will monitor the real-time value within a programmable range adjustable with parameters *P-1.6*/*P-1.5* and *P-1.8*/*P-1.7*.

Flow limit min/max: Switch output A monitors the max value programmed under P-1.6
Switch output B monitors the min value programmed under P-1.9

Preset	0	1	2	3
Limit mode	off	batch limit	flow range limit	flow limit min/max
Operation	↑	↑	↑	↑

P-1.1: Flashing display with active limits

In addition to have active limits indicated by the front LED's, you may also adjust the display to flash on reach of the limits A or B.

Preset	0	1
Flashing	off	on
Operation	↑	↑

P-1.2: Limit wait time (delay time)

This parameter prevents the limits from reacting too early, e. g. when starting up a system. The allowable adjustment ranges from 507msec to 3042msec and can be selected in steps of 507msec. The adjusted delay time applies for both limits and is to be activated via the external contact »control input /limit wait«. With active wait time the limits are put in a neutral state until the response time has passed.

Preset	507	1014	1521	2028	...	3042
Unit	msec	msec	msec	msec	...	msec
Operation	↑	↑	↑	↑	↑	↑

P-1.3: Limit alarm counter

This parameter can be used to ignore sporadically appearing limit alarms by programming a minimum number of alarms necessary to activate the limits. You may adjust this parameter in a range of 0 to 20 alarms. When 0 is programmed the limits will be activated withou delay.

P-1.4: Batch-Limit A (limit mode 1)

Enter the standardised count on which the switch output A is to be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment). You may enter values with max. 2 decimal digits.

P-1.5: Batch-Limit B (limit mode 1)

Enter the standardised count on which the switch output A is to be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment). You may enter values with max. 2 decimal digits.

P-1.6: Flow-Max A (limit mode 2 and 3)

If the flow rate exceeds the value programmed here, the switch output A will be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment).
The number of decimal digits corresponds to the flow decimal point adjustment P-0.2 (Flow-DP).
Save your adjustment with ENTER.

P-1.7: Flow-Min A (limit mode 2)

If the flow rate bypasses the value programmed here, the switch output A will be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment).
The number of decimal digits corresponds to the flow decimal point adjustment P-0.2 (Flow-DP).
Save your adjustment with ENTER.

P-1.8: Flow-Max B (limit mode 2)

If the flow rate exceeds the value programmed here, the switch output B will be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment).
The number of decimal digits corresponds to the flow decimal point adjustment P-0.2 (Flow-DP).
Save your adjustment with ENTER.

P-1.9: Flow-Min B (limit mode 2 and 3)

If the flow rate bypasses the value programmed here, the switch output B will be activated (the MCM takes over the unit in accordance with the flow rate unit adjustment).
The number of decimal digits corresponds to the flow decimal point adjustment P-0.2 (Flow-DP).
Save your adjustment with ENTER.

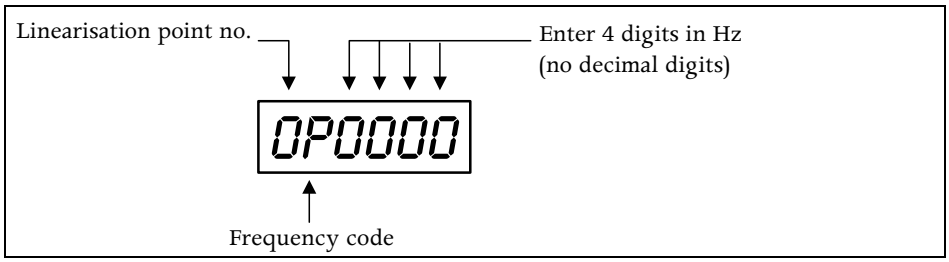
P-1.E: Hysteresis (for limit mode 2 or 3)

The hysteresis of both switch outputs A and B is to be entered as percentage of the limit. When the output is active, the limit has to exceeded or bypassed by this percentage before the output takes a neutral status again. The percentage may be entered as accurate as 0.1%.

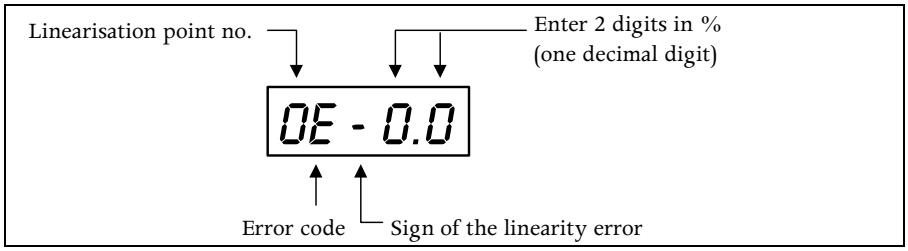
Parameter Level 2 – Linearisation

The mean K-factor of the flow meter defines a pulse rate per volume unit, which contains an error over the complete measuring range. The linearisation allows to compensate for this error by entering 10 linearisation points over the measuring range, i. e. 10 frequencies with their respective errors. This will enable you to reduce the measuring error to the repeatability which is usually ±0.1% for KEM flow meters.

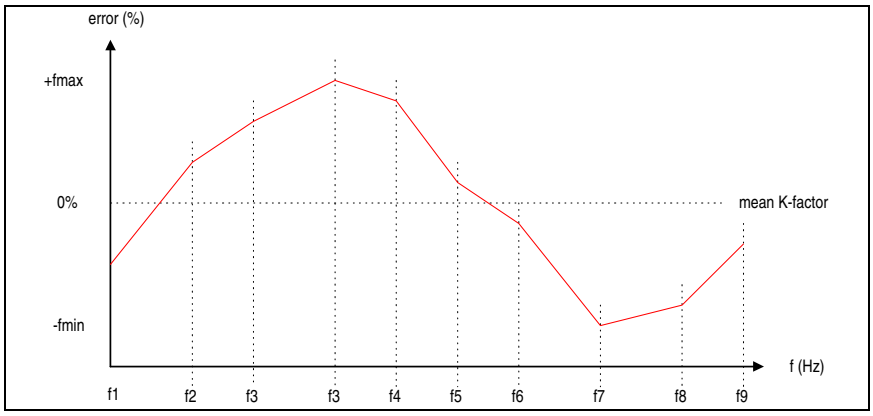
Having selected parameter level 2 press PROG to start programming the first frequency:



The programming starts off with the first frequency (=0). You may enter the frequency figures using the ↑ and → key. Frequencies are to be entered as integer numbers in Hz. The figures can be found in the calibration record of the flow meter. On completion of this parameter, you are requested to enter the respective linearity error. The display shows the following:



The linearisation point no. is automatically maintained. Use PROG to select the sign of the error, either + or –. Enter the linearity error with one decimal digit in 1/10% via ↑ and →.
On completion the MCM will automatically go back to the frequency display for programming the next frequency. This process will repeat until a frequency has been programmed as 0 or when 10 linearisation points have been completed (last linearisation point no. is 9). After saving the last error the MCM goes back to the parameter level.



Calibration Diagram

Figures for frequencies and errors can be taken from the table of the calibration record.

Parameter Level 3 – Programming the Analogue Output

With the optional analogue output the MCM 400 may generate a potential free current signal of 0/4 to 20 mA which is in proportion with the real-time value. 3 parameters have to be adjusted:

P-3.0: Analogue offset

You may select between an absolute offset of 0mA or a shifted offset of 4mA.
Save with ENTER.

Preset	0	1
Offset	0 mA	4 mA
Operation	↑	↑

P-3.1: Analogue full scale

Enter the real-time value which shall correspond to 20mA (unit in accordance with adjustment for P-0.1). In order to reach a max. accuracy, you may move the decimal point via the PROG key to the desired digit independent of the programmed decimal point (P-0.2). Save with ENTER.

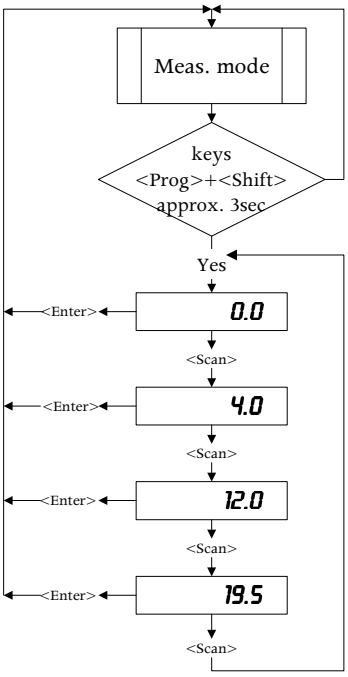
P-3.2: Response time of the analogue output

The FAU can convert the measuring frequency into an analogue signal based on the incoming frequency (fast) or based on the "calmed" frequency (slow). The calmed frequency is calculated in accordance with the adjustments for »gate time« P-0.5.

Preset	0	1
Response time	fast	slow
Operation	↑	↑

Save with enter ENTER.

Analogue Out Check



Starting the Test Programme

Simultaneously press PROG and → for approx. 3sec. The MCM 400 will leave the measuring mode and run the test programme to check the analogue output. This process is indicated by both LED's on the right-hand frontside which will take turns flashing.

The output may be checked with respect to performance and linearity. 4 fixed output values are available. Press ↑ to select the presets.

Pressing ENTER will stop the test programme and re-start the measuring mode.

PLEASE NOTE:
During the test mode the limit are neutral. Incoming measuring signals (pickup frequencies) are not processed.