BA 232C/07/en/07.03
No. 51504299

CUM 740
Transmitter for Turbidity and Solids Contents

Operating Instructions

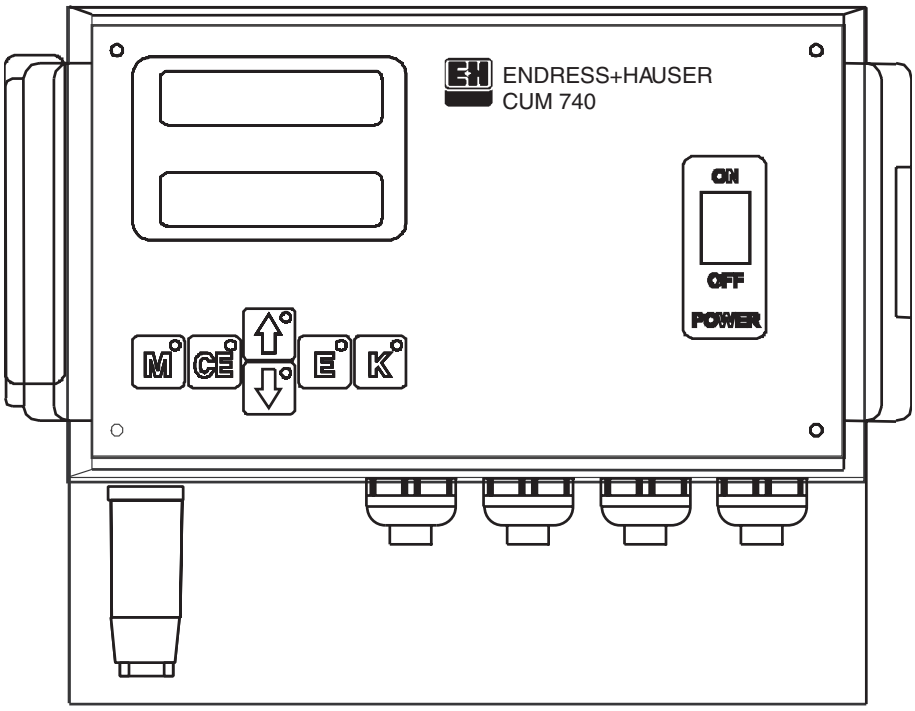









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Table of contents

1. Safety Information / Sicherheitshinweise / Informations de securité

GB

- Only authorized personnel is allowed to carry out installation, putting into operation, handling, maintenance and repairs applying the relevant safety rules for mechanical engineering and electrical engineering especially norm EN 292.

NOTE: Improper handling may cause personal injury or material damage!

- The declaration of conformity is only with reference to the measuring transformer and not its assembly.

D

- Installation, Inbetriebnahme, Handhabung, Wartung und Reparatur darf nur von autorisiertem Fachpersonal ausgeführt werden. Anzuwenden sind hierbei die einschlägigen Sicherheitsrichtlinien für Maschinenbau und Elektrotechnik, insbesondere die Norm EN 292.

ACHTUNG: Durch unsachgemäße Handhabung können Personen- und Sachschäden entstehen!

- Die Konformitätserklärung bezieht sich nur auf den Meßumformer und nicht auf dessen Montage.

F

- Installation, mise en service, manipulations, entretien et réparation doivent être effectues que par des techniciens qualifiés. Les instructions de sécurité machines et électrotechniques doivent être appliquées, et tout particulièrement la norme EN 292.

ATTENTION: Des manipulations inappropriées peuvent entraîner des dommages matériels et corporels!

- Le déclaration de conformité se réfère seulement au systéme de mesure et non à son montage.

2. General information

2.1 Assembly instructions

- The measuring location must allow a representative measurement.

- We recommend to equip the system with an additional protective roof against direct weather factors (e.g. deposition of snow).

- Holding devices must ensure that the weight of the device (approx. 5 kg) can be picked up without vibrations.

- Install the system at a location which can be easily accessed in order to avoid danger to operating personnel (e.g. at putting into operation, maintenance and cleaning).

- The probe must be made easily accessible as well.

- The construction of the device must be secured with 1A.

- Any cable connections have to be laid in a manner that prevents mechanical damages and disturbances by other cables.

- The load capacity of the probe cable is maximally designed for the probe with probe weight and screen grid.

- The probes are measuring technical devices. Please note that the measuring windows cannot be damaged, e.g. at the built-in version by weld beads in the pipeline.

2.2 Functions

NOTE: For a correct functioning of the device please proceed according to the operation instructions

- In the annex of this manual there is a blank which can be used to fill in by hand all parameters specific to measuring location (important e.g. in case of loss of data).

- All adjusted parameters are battery-buffered. The battery-life is approx. 5 years.

- In the terminal cabinet, there are all fuses of the measuring transformer (refer to item 9., “terminal assignments“)

- Note that generally for all probe types strong scrapers and heavy contamination of the measuring windows may impair the measuring ability.

- **ATTENTION!**
  Start the device only when the probe plug is connected and screwed!
  Plugging in or out of the probe only when the device is off!

2.3 Maintenance instructions

Every four weeks:

Cleaning of the probe:

Remove rough deposits at the cable with a cloth.
Clean the soiled probe with a brush and soap-suds.
ATTENTION: Fact is that the measured value may be impaired by heavy scratches or damages at the measuring windows.

The cleaning cycle may be extended depending on application (experience)

Yearly jobs:

General function test:

Electronics:
Check probe calibration.
(Battery buffer: Durability of the battery = 5 years)

Tighten cable terminals and control their position.

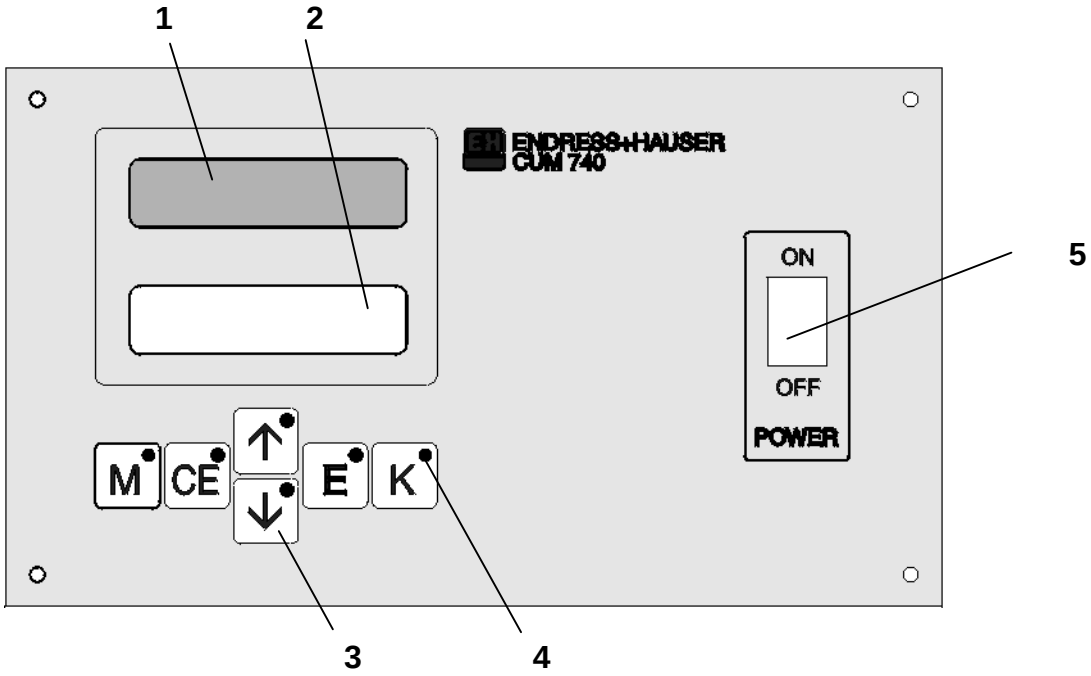
3. General description

The CUM 740 is controlled by a 16-bit-microcontroller and allows the following functions:

- Detection and processing of measured values
- Special menu-driven routine with an alphanumeric display
- Monitoring of the system and probes
- Storage and control of user parameters

All user parameters such as measuring range, alarms, cleaning intervals and adjustment of output signals are fed in a menu-driven routine and stored in a battery-buffered memory.
The 6 position keypad is used to enter program parameters and to move horizontally and vertically in the menus on the display. During the measurement cycle, the numeric results are shown on an LCD-display and at the same time on an LED-display which can be read from a longer distance.
LEDs are integrated in the keypad to show different states of the system, control and outputs

4. Front view of control panel



1 = LED-Display

2 = LCD-Display

3 = Keys for operation:

M - for the main routine "MEASUREMENT"
CE - for backwards movements in the submenu
⇧ - for backwards movement in the main menu
- to increase numeric values in the submenu
⇩ - for forward movement in the main menu
- for decrease of numeric values in the submenu
E - to confirm main menu items
- to confirm numeric values and parameters
- to change the display during the measurement
R - for adjuasting the calibration factor

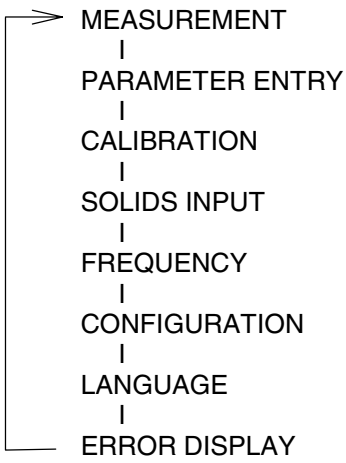
4 = Control LEDs:

LED 1 (M)	Alarm A
LED 2 (CE)	Alarm B
LED 3 (⇧)	Range exceeded
LED 4 (⇩)	Below range
LED 5 (E)	Call in error display
LED 6 (R)	Operation cleaning program

5 = Power switch

5. Programming

The main menu includes the following titles always shown in capital letters:



After the instrument is powered on, it switches automatically into the measuring state. By pressing the "M" key you get the main routine MEASUREMENT (same from almost any main routine or sub routine). If the measurement program is not automatically started after switch on (e.g. if the system has not been configured yet), press the "M" key before turn on and until the word MEASUREMENT is shown on the LCD display.

General:

a) Vertical movement in the main menu is done by the arrow keys '⇧' and '⇩'.
To enter a main item press the "E" key.

'⇩' forward movement in the main menu
'⇧' backward movement in the main menu
'E' enter main routine, continue in each submenu
'M' move to the start of the main menu (routine MEASUREMENT).

b) Horizontal backward and forward movement at each selected submenu by using the "E" and "CE" keys.

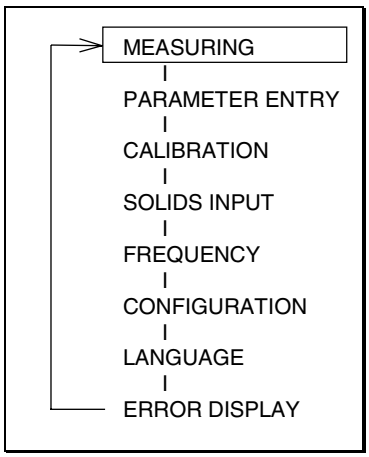
'E' forward movement at the submenu
'CE' backward movement at the submenu

c) Within a subroutine, numerical values can be increased and decreased by continuously pressing keys '⇧' and '⇩'. The selection is accepted by pressing the "E" key.

'⇧' numerical value increase
'⇩' numerical value decrease
'E' accept value and store it

d) **Code no.** to get into the submenus: Enter the number "**91**".

5.1 Routine MEASUREMENT / Main Menu



---------- MEASUREMENT
I
Measured value (mg/l, g/l, FTU, NTU, %, ppm)
I
Analog output (mA)
I
Frequency (Hz)

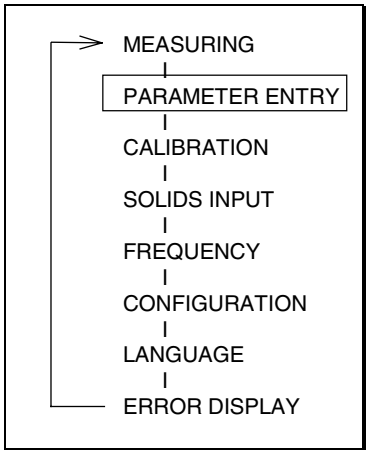
Function:
Detection, evaluation and display of the probe signal,
of the anaolg current and the probe frequency as well as
setting the alarm switches

Operation:
By once pressing the key “E“ the display for the physical measured value is switched to the corresponding analog output signal (current) By pressing the key “E“ twice the measured probe frequency or 505 Hz appear as error display on the LCD display, as well as the corresponding measured value on the LED display.
Return into the main menu with the key “M“.

Pressing the “K“ key allows the adjustment of the calibration factor (see 5.6, “configuration“).

‘**E**’ selection of display measured value or display analog output and frequency
‘**K**’ adjust calibration factor
‘**M**’ return to main menu

5.2 Routine PARAMETER ENTRY



---------- PARAMETER ENTRY
I
Measurement range - start (g/l, FTU, NTU, %, ppm)
I
Measurement range - end (g/l, FTU, NTU, %, ppm)
I
Alarm A (g/l, FTU, NTU, %, ppm)
I
Alarm B (g/l, FTU, NTU, %, ppm)
I
Damping (s)
I
Cleaning interval (min)
I
Cleaning period (s)

Function:
- Measuring range - start and end:
  Selectable concentration range within a calibration curve, the analog output (signal current 0-20 mA or 4-20 mA) being assigned in linear manner.
  The display (LED and LCD) only indicate values which are higher than half of the measuring ranges at the start and smaller than double the ranges at the end.
  Range start and end values are the same for setting the alarms.

- Alarm values Alarm A and Alarm B:
  Concentration-threshold values for alarm relays. The switch hysteresis is ± 2 % each.

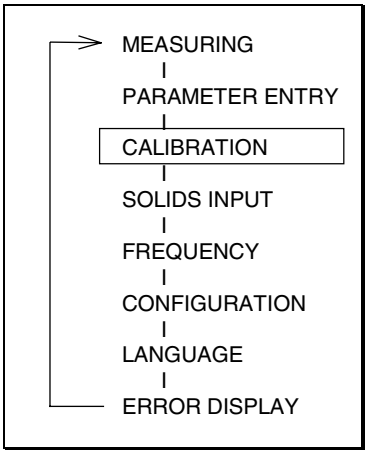
- Response Time (Damping) (1 - 600 s):
  The response time sets the time interval period in seconds, by which the probe average signal (corresponding to the concentration value) can be arithmetically determined. The probe signal is measured every 0.5 s. The selected value is valid for the actual measurement as well as the calibration of the probe (see section 5.3).

- Cleaning interval (1 – 720 min):
  Selection of a time interval (in minutes) for a special cleaning routine (if selected).

- Cleaning period (1 – 600 s):
  Time period of the probe cleaning process in seconds.
  ("Connection of solenoid valve" see annex)

Operation:
Movement through the submenu and selection of numerical values refer to item 5.b) and 5.c) "General".

5.3 Routine CALIBRATION



---------- CALIBRATION
I
Input of code number (91)
I
Number of measuring points (n)
I
Measuring points 1...n (Hz)

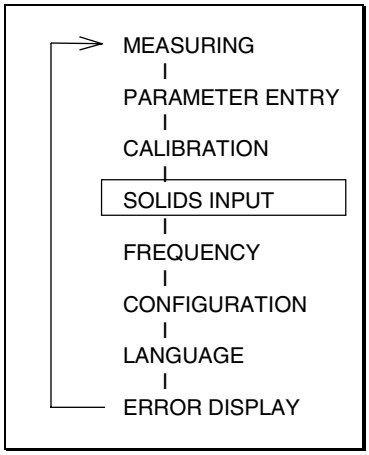
Function:
For calibration the probe signals (measuring points 1...n) which are measured by media of comparison with known concentration are detected and stored in any order.
Before delivery theCUM740 is calibrated at the factory (refer to item 5.6 CONFIGURATION, factory adjustment). A calibration specific to application is necessary, as far as "standards" (e.g. formazine) for turbidity is not worked with.

For calibration we generally recommend to set the damping to 2 seconds.

Operation:
- Code number:
  Two-digit number. If it is incorrect, the submenu will be left and the main menu routine MEASUREMENT will be returned to.
- Number of measuring points:
  Number of media points for comparison to be used for calibration (min. 2, max. 8).
- Measuring points:
  Display of every measuring point number and the detected probe signal (response time / damping please refer section 5.2, "parameter entry"). Storing of measured value by pressing the key "E". (Attention: the previous measured value of this measuring point number is overwritten.) Return one measuring point by "CE". Press the key "M" to return into the main menu.

Attention: Please use for zero-calibration (clear water) a black vessel (bucket 10 ltr.).
Please cover bucket during calibration to avoid artificial light.

5.4 Routine SOLIDS INPUT



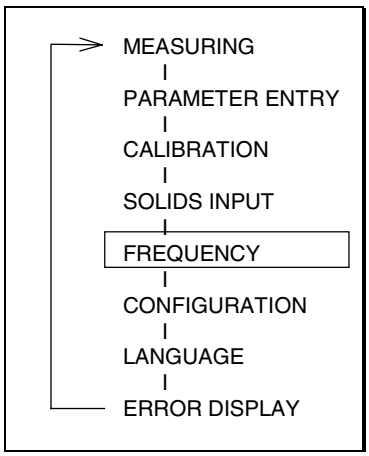
---------- SOLIDS INPUT
I
Input of code number (91)
I
Measuring point 1...n (mg/l, g/l, FTU, NTU, %, ppm)

Function:
In this submenu concentration values of the media (known or subsequently detected in the lab) corresponding to the detected probe signals from routine 5.3 “calibration“ (for the measuring points 1...n) are entered and stored.

Operation:
For movement in the submenu and selection of numerical values, please refer to section 5.b) and c).

At the end return to the main menu with key “M“.
Setting the 3. digit: Additional to key ‘⇧‘ or ‘⇩‘press key ‘E’.

5.5 Routine FREQUENCY

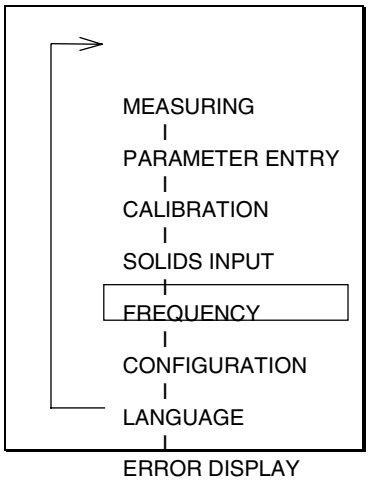


---------- FREQUENCY
I
Input of code number (91)
I
Frequency 1...n (in Hz)

Function:
At frequency input, the probe signals (see 5.3 “calibration“) detected for the measuring points 1...n, can be examined and manually changed if necessary.

Operation:
Movement in the submenu and selection of numeric values refer to section 5.b) and c) “General“.
At the end return to the main menu with key “M“.

5.6 Routine CONFIGURATION



---------- CONFIGURATION
I
Input of code number (91)
I
Probe type
I
Factory adjustment
I
Unit of measure (ppm, mg/l, g/l, FTU, NTU, %)
I
Calibration Factor (± 25 %)
I
Analog output (0-20 mA, 4-20 mA)
I
Alarm A (NC or NO - rest current or operating current)
I
Alarm B (NC or NO - rest current or operating current)
I
Error contact (NC or NO - rest current or operating current)

Function:

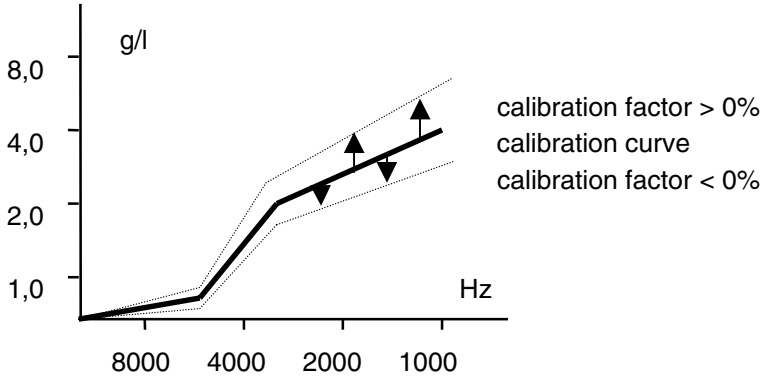
- Code number: Two-digit number. If it is incorrect, the submenu will be left and the main menu routine MEASUREMENT will be displayed.

- Probe type:
  Select type of used measurement probe. At present the following standard probes are available:
  - CUS 65-A/, -B/, -C/, -D/, -E
  - CUS 61 / 62 / 63 / 64
  - free parameters (without probetype-monitoring and detection of pollution)

  further probes according to table on page 19 chapter 8

- Factory adjustment:
  By pressing both arrow keys at the same time standard parameters are read in (corresponding to the selected probe type). Please find a table about these standard parameters in the annex of this manual.
  Attention: By entering the factory adjustment the previous stored values are overwritten.
  If a calibration specific to media is requested, press the key “E“ and proceed as described under item 6, “putting into operation“.

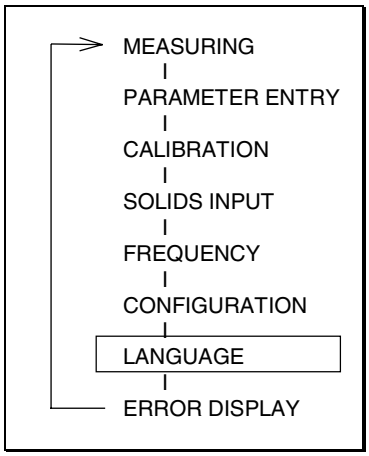
- Unit of measure: Select the physical units to measure the concentration. Allowable units are dependent on each type of probe selected.
- Calibration factor: Linear adaptation factor of the calibration curve at low movements of the medium being measured. Input limits: ± 25% (is set on 0% when factory adjustment is selected).



- Analog output: Select if the defined concentration measuring range (refer to 5.2 “parameter entry“) is to be displayed in a linear manner on a current range of 0-20 mA or 4-20 mA. (Corresponding to the range start is either 0 mA or 4 mA but the end is always 20 mA.)
- Alarm A and B, contact error:
  Select the function of the corresponding relays for NO or NC contact.

Operation:
For movement in the submenu and selection of numerical values, please refer to section 5.b) and c) “General“. At the end return to the main menu with key “M“.

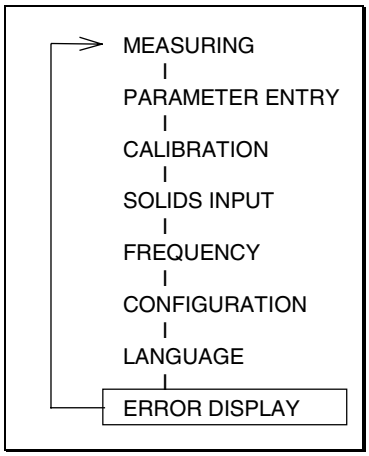
5.7 Routine LANGUAGE



---------- LANGUAGE
I
German - English - French - Swedish
- Norwegian - Dutch - Danish - Spanish
(if requested Japanese, Italian, Polish, Finnish)

Operation:
Select the change to a language with keys ‘⇧‘ and ‘⇩‘ and press the “E“ key to store.
Return to main menu with key “M“.

5.8 Routine ERROR DISPLAY



---------- ERROR DISPLAY
I
Error report

Function:

Error messages MTF software Rev. 4.6:

0 = too high concentration
2 = wrong type of probe
3 = no probe signal
4 = no probe signal / probe contaminated
5 = test calibration

Error text brief description:

0 = too high concentration — is displayed if the specified measuring range end (refer to PARAMETER ENTRY 5.2) is exceeded by more than two times.

2 = wrong type of probe — is displayed if the probe connected does not correspond with the selected type (refer to CONFIGURATION 5.2). (“Free parameters“ without probe type monitoring and dirt detection).

3 = no probe signal — is displayed if the measuring transformer does not receive a frequency signal from the probe (e.g. cable breakthrough). Error 3 results in a frequency display of 0 Hz independent from ouput “disturbance“.

4 = no probe signal / probe contaminated
is displayed, if the measuring transformer receives no frequency signal from the probe and additionally receives a status message (e.g. contaminated probe window / does not apply to the thick sludge probe type CUS 64 / CUS 65-E). Error 4 results in a frequency display of 505 Hz independent from the output “disturbance.“

5 = test calibration — is displayed if the calibration frequencies lie closer to each other than 15 Hz (e.g. if the saved calibration frequencies were overwritten by mistake).

Error message at “free parameters“:
- C - measuring range exceeded
- no probe signal
- test calibration

The signal output “error“ is only set after a cause of error has been existing for at least 10 s.

Operation:
The error messages can one after another be called up with “E“ and called back with “CE“.
After the last message you will be asked to return into the main menu by pressing the key “M“.

Causes for disturbances in the system can be found at the measuring probe , the measuring transformer, the cable distance between both units as well as in the range of mains supply. If in a first putting into operation all application questions are clarified and there are still some disturbances, or disturbances suddenly appear in a so far duly functionning measurement, you have the possibility to send the defective unit to our following address(see back page of these Operating Instructions).

6. Putting into operation

A pre-programmed and adjusted amplifier starts the measuring cycle automatically after being switched on, a manual setup is not necessary.

The probes **CUS 63 and CUS 65-D** are delivered with a pre-calibration of **0 - 100 FTU**. Please check if the data in routine “FREQUENCY“ is identical to the data of the calibration sheet of probes. If the data is not identical, please enter the data of the calibration sheet for probes at the routine “FREQUENCY“ .

The probes **CUS 61 / 62 / 64 und CUS 65-A/, -B/, -C/, -E** are pre-calibrated at the factory with SiO_2 .

A calibration specific to the application is normally necessary.

Note: The probes **CUS 64 und CUS 65-E cannot be set up or calibrated in clear water area**. The probe is designed for applications in thick sludge. Representative values can only be expected, if the lowest calibration point lies at a sludge concentration > 1%. (0.8 % are possible depending on sludge nature.)

You obtain calibration values close to practice by assigning the raw signal of the probe (frequency) to the solids determination of the laboratory over a defined period of time (1 week). To perform this under process conditions, the probe has to be mounted at the pipe.

Often a calibration specific to the medium is carried out by the customer (e.g. with activated sludge of a wastewater treatment plant). Please refer to the following example:

6.1 Calibration

6.1.1 2-point-calibration: (usually sufficient)

In most cases it is enough to work with a two point calibration, alltough the measurement converter CUM 740 allows to save up to 8 calibration points.
The two point calibration happens with tap water (1.measurement point) and with the sludge of the respective application (2.measurement point).
In order to carry out the two point calibration in the menu point „Calibration“ the amount of the measurement points have to be set on 2.
The probe which is to be calibrated will be dipped into a dark covered up bucket filled with tap water and the frequency is saved with the enter key. (This is not effective for the back-scattered probes CUS 64 and CUS 65-E).
As described the probe is to be installed with the respective application (e.g. aeration basin, sludge pipe) and the measured frequency saved again with the enter key .

It is to observe, that the measurement value is stabil.

Hereupon the sludge of the application of a representative specimen (1Ltr.) is pulled and the solid content is determined in the laboratory.
Through the menu point „place“, for the first measurement point, the concentration 0 e.g. g/l (PPM, mgl/l, %) is put in and for the second measurement point the result of the laboratory predestination from the sludge specimen (e.g. g/l PPM, mgl/l, %).
Should there be immediatly little deviations to the compared measurements of the laboratory, they can be simply eliminated through the „calibration factor“ (key K).
This means a displacement of the calibration curve of + 25 % or - 25 %.

6.1.2 Multipoint calibration

Example putting into operation TS-measurement with CUS 65-A:

Setup procedure: For a 4-point calibration you will need about 5 liters of activated sludge and 4 black buckets. The minimum bucket volume for calibration is 2 liters. The first bucket contains clear water for the zero point. The second contains a diluted sludge 1:1 (1 liter sludge and 1liter water).The third contains the original sludge. For the fourth bucket which contains a thickened original sludge you should wait some time until you see the seperation of water and sludge. Carefully pour out the water because the bucket should contain a thicker sludge than normal. To do this you will need about 3 liters of sludge.

After the probe calibration the concentration values will be analyzed in the lab.

Important: **During calibration the sludge must be stirred continuously with the probe in order to obtain a proportionate distribution of concentration.**

Start programming: Press and hold key “M“ during powerup test and until the display shows “MEASUREMENT“.

Note: If the probe signals change too slow on the display, please check at “PARAMETER“ the response time and enter a smaller value. For calibration a damping of 2 seconds is generally recommended.

	MEASUREMENT	
1. Press ⇧ 3x, display shows	CONFIGURATION	press key E.
	Code No.:	⇧/⇩ 91, press key E.
	Type of probe	⇧/⇩ CUS 65-A, press key E.
	Unit of measure	⇧/⇩ g/l, press key E.
	Alarm A	⇧/⇩ operating- or rest current, (make or break), then E.
	Alarm B	⇧/⇩ operating- or rest current, (make or break), then E.
	Error contact	⇧/⇩ operating- or rest current, (make or break), then E.
	-> M	press key M.
	MEASUREMENT	
2. Press ⇧ 2x, display shows	CALIBRATION	press key E.
	Code No.:	⇧/⇩ 91, press key E.
	No. of points?	⇧/⇩ 4 (2 - 8), press key E.

Place probe in bucket 1 and stir, frequency with clear water ~ 4000 Hz.

1. Value	if zero stable, press key “E“.

Place probe in bucket 2 and stir, frequency with diluted sludge ~3150 Hz.

2. Value	if value stable, press key “E“.

Place probe in bucket 3 and stir, frequency with original sludge ~ 2210 Hz.

3. Value	if value stable, press key “E“.

Place probe in bucket 4 and stir, frequency with thicker sludge ~ 1980 Hz.

4. Value	if value stable, press key “E“.

	-> M	press key M.
	MEASUREMENT	
3. Press ⇩3x, display shows	SOLIDS INPUT	press key E.
	Code No.:	⇧/⇩ 91, press key E.
	1. Value x.xx g/l	⇧/⇩ 0.00 zero-value, press E 0.00 g/l
	2. Value x.xx g/l	⇧/⇩ 1. lab-value, press E e.g. 3.5 g/l
	3. Value x.xx g/l	⇧/⇩ 2. lab-value, press E e.g. 6.3 g/l
	4. Value x.xx g/l	⇧/⇩ 3. lab-value, press E e.g. 8.5 g/l
	-> M	press key M.
	MEASUREMENT	
4. Press ⇩ 1x, display shows	PARAMETER ENTRY	press key E.
	Range start x.xx g/l	⇧/⇩ Value, press key E.
	Range end x.xx g/l	⇧/⇩ Value, press key E.

Alarm A x.xx g/l	⇧/⇩	Value, then press E. switch value e.g. 5.6 g/l
Alarm B x.xx g/l	⇧/⇩	Value, then press E. switch value e.g. 8.5 g/l
Damping x s	⇧/⇩	1 - 600 s, press key E. e.g. 5
Cleaning interval xxx min	⇧/⇩	1 - 720, press key E. Relay-interval time
Cleaning period xxx s	⇧/⇩	1 - 600, press key E. Relay-active time
-> M		press key M.
MEASUREMENT		press key E.

MTF - Display normal

5.88
Meas. value 5.88 g/l

During the measurement cycle the actual current output can be shown by pressing key ‘E’ once.

16.6
Analog output 16.6 mA

During the measurement cycle the actual probe frequency and the value belonging to it can be displayed by pressing the key ‘E’ twice.

5.88
Frequency 2323 Hz

7. Inputs and Outputs

7.1 Control inputs (+24V)

- 24 V DC „IN“ (terminals 24/25): Freezing of the measurement (The measurement is interrupted and the currently displayed value is “frozen“.)

For control of 24 V DC „IN“ you can use U_a (+24V, terminal 26).

Attention: Therefore terminal 27 (0V) has to be connected with terminal 24 (0V).

7.2 Signal outputs (switch contacts)

- “Alarm A“: Actuates exceeding or below limit value
- “Alarm B“: Actuates exceeding or below limit value
- “Hold”: Measurement interruption, values on hold
- “Error”: Error display at operation menu
- “Cleaning”: Switch contact for probe cleaning

The switch contacts are designed for DC 30 V / 1 A or AC 230 V / 2 A.

7.3 Analog output (I-1)

0/4 mA = Measurement range - start
20 mA = Measurement range - end (see 5.2, “Parameter entry“/function)

Configuration of analog output (see 5.6, “Configuration“ / analog output)

Note: Resistance max. 500 Ω

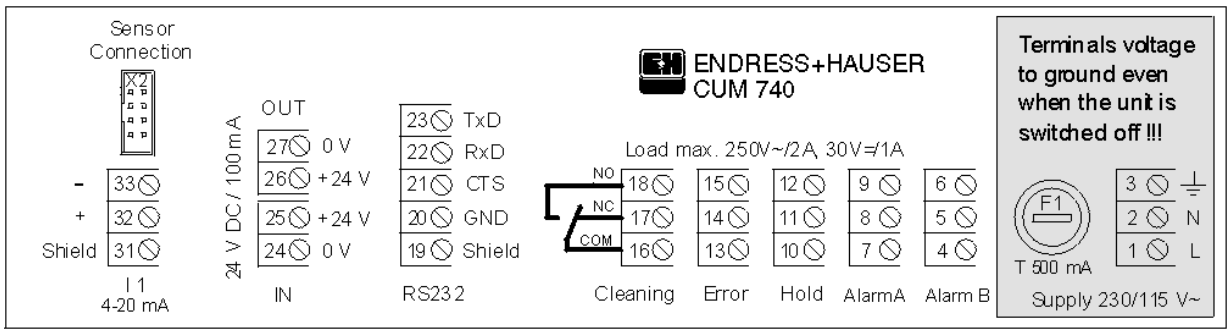
8. Adjustment ranges of concentration

The measuring range (item PARAMETER ENTRY) can be defined within the following limits, dependent on which probe type and what kind of physical unit have been selected at item CONFIGURATION:

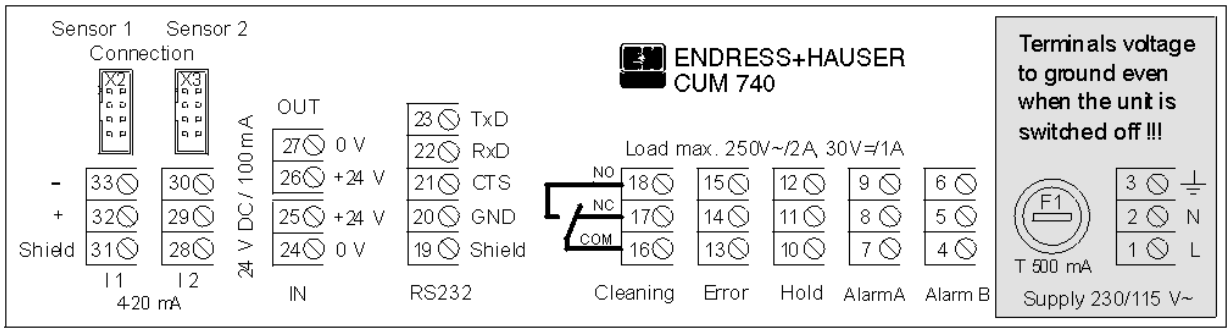
Type of probe	mg/l, ppm	g/l	FTU	%
1. CUS 61 / 65-A (SAM / SAD)	100 - 100 000	0.1 - 100		0.01 - 10
2. CUS 62 / 65-C (SAV)		0.3 - 400		0.03 - 40
3. CUS 63 / 65-D (SSN)	1 - 5000		0.5 - 1000	
4. CUS 64 / 65-E (SRH)		1.0 - 1000		0.1 - 100
5. CUS 65-B (SAH)		0.3 - 400		0.03 - 40
6. fr. Par.	0.1 - 10000	0.1 - 1000	0.02 - 5000	0.01 – 100

9. Terminal assignments:

Connection of 1 sensor:



Connection of 2 sensors:

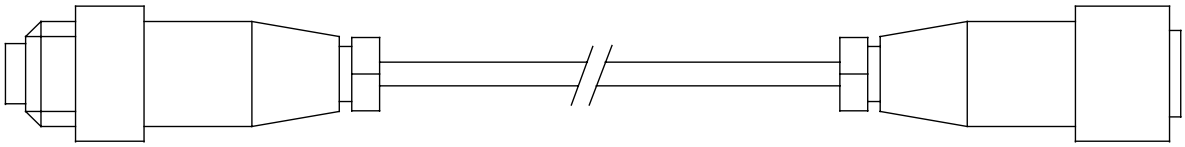


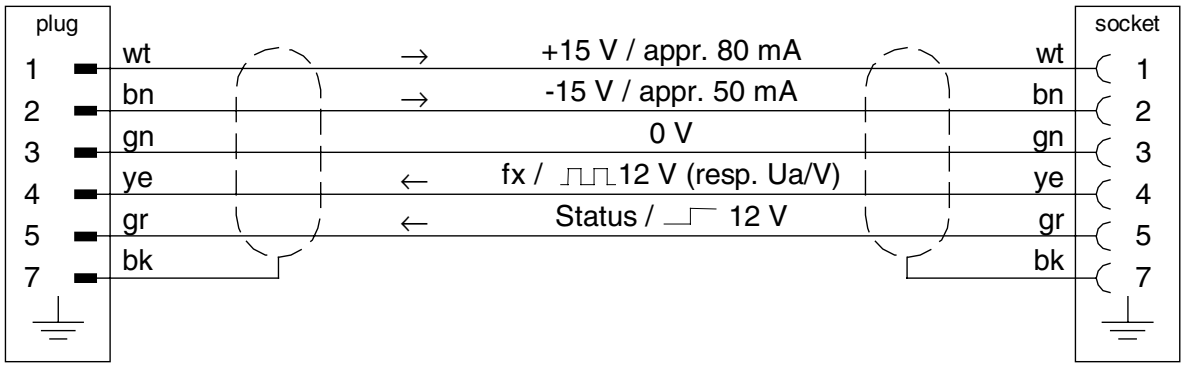
10. Pin connection of probe plug, -socket and extension cable:

cable plug, 7-poles, IP 67

Control cable, flexible
≤ 50 m: 5 x 0.25
≤ 100 m : 5 x 0.5
>100 m : 5 x 1

cable socket, 7-poles, IP 67





11. Serial Interface CUM 740 (Option):

Cable assignment:

RS 232-0 on CUM 740				COM 1 / 2 at the PC		
terminal	**SUB-D 9 poles**	**Function**		**Function**	**SUB-D 9 poles**	**SUB-D 25 poles**
23	3	TxD0	- - - - - - - - - -	RxD	2	3
22	2	RxD0	- - - - - - - - - -	TxD	3	2
21	8	CTS0	- - - - - - - - - -	RTS	7	4
				CTS	8	5
20	5	GND	- - - - - - - - - -	GND	5	7

Software protocol: **9600, N, 8, 1**

Output format: **ASCII**

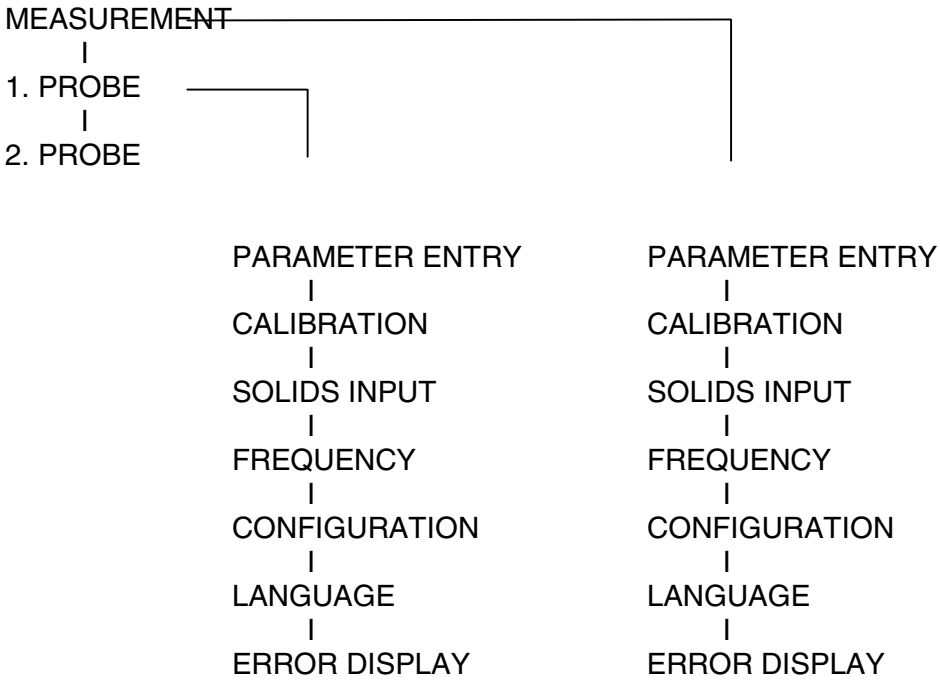
The output of the results (measured value + measuring unit + CR) is effected continuously during the automatic measurement in second intervals. A configuration of the interface on CUM 740-side is not necessary.

12. Special version „2 sensors“

12.1 Menu (special version „2 sensors“)

Function and construction of the menu points are – disregarding unimportant exceptions – identical with the 1-sensor version. All memory values (configuration of probe as type, measuring unit etc. , calibration curve, measuring range, cleaning interval, calibration factor) however, are created twice. Therefore, the adequate sensor must first be chosen before each entry.

In the middle of the LED-line, it is indicated which data set (of the first or the 2nd sensor) is currently selected.



12.2 Probe types (special version „2 sensors“)

To enable the device to be operated with one probe only, the virtual type “no probe“ was additionally included. When this is selected no indication appears on the corresponding probe channel, neither the limit value nor the current output will be affected nor an error message will be put out.

12.3 Alarm values (special version „2 sensors“)

Exactly one alarm value with corresponding relay output (Alarm A or Alarm B) is assigned to each probe.

12.4 Error messages, error output (special version „2 sensors“)

The output “error“ is set as soon as one error message from at least one probe comes up within a certain time-span. The causes of error can be viewed in detail for each probe in the respective sub-menu “READ ERROR“.

The output “error“ is set back when none of the connected probes outputs an error message.

12.5 Calibration factor (special version „2 sensors“)

Each probe has an own calibration factor. It can either be put in via the menu “CONFIGURATION“ , or it can be called up or changed during the running measurement by pressing the key “K“ (press once: sensor 1, twice: sensor 2). In the middle of the LED line it is indicated which correction factor of the 1st or 2nd probe is being selected.

12.6 Cleaning of the probe (special version „2 sensors“)

Cleaning interval and –duration can be parametered separately for each probe. The hold-output is activated as long as the cleaning is active in at least one of the probes.

During the cleaning the measuring signal is frozen at the corresponding probe.

12.7 Current ouputs (special version „2 sensors“)

Current output „I-1“ is assigned to the 1st probe, current output „I-2“ to the 2nd.

12.8 Measured value output via serial interface (special version „2 sensors“)

The measured values are put out by each probe in second-intervals as ASCII-string at the RS-232 interface (9600, N, 8, 1) (as long as the probe type “no probe“ has not been configured) .

Each measured value is marked from which probe (“1:“ or “2:“) it comes from.

12.9 Measured value indication via LED special version „2 sensors“)

In automatic measuring operation, the measured value of the probe is indicated of which the main menu (that means 1st or 2nd PROBE – PARAMETER ENTRY, CALIBRATING,...) was called up last.

13. Technical Data

13.1 General information

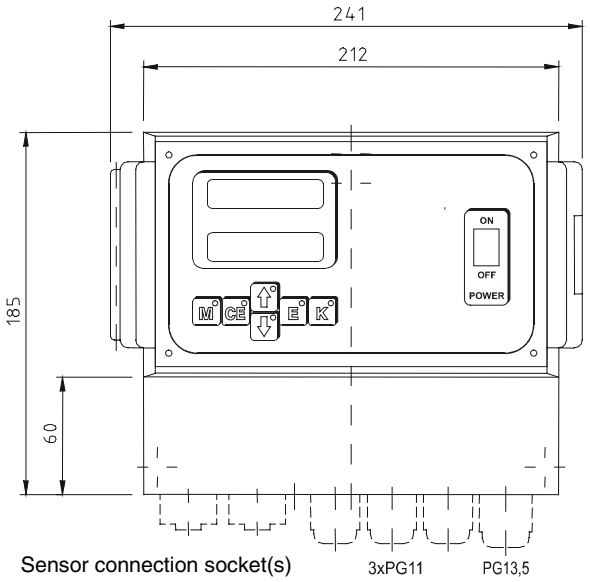
Measuring principle:	Multi-beam pulsed-light, infra-red light with 880 nm wave length
Measuring range:	dependent on the measuring probe connected
Power supply:	115 - 230 V /, 50 / 60 Hz 24 V / AC-DC (optional)
Power consumption:	max. 25 VA
Measuring accuracy:	≤ ± 1%
Repeatability:	0.5 %
Analog output:	standard signal 0 - 20 mA or 4 - 20 mA galvanically separated
Permissible load:	max. 500 Ω
Relay outputs:	2 alarm contacts free chosable 1 relay contact for probe cleaning 1 relay contact for error report 1 relay contact for hold
Switching capacity:	DC 30 V / 1 A AC 230 V / 2 A
Serial interface: 11	RS 232 (optional)

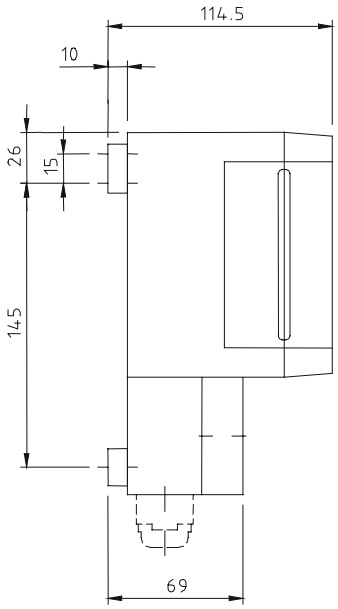
13.2 Electronics unit

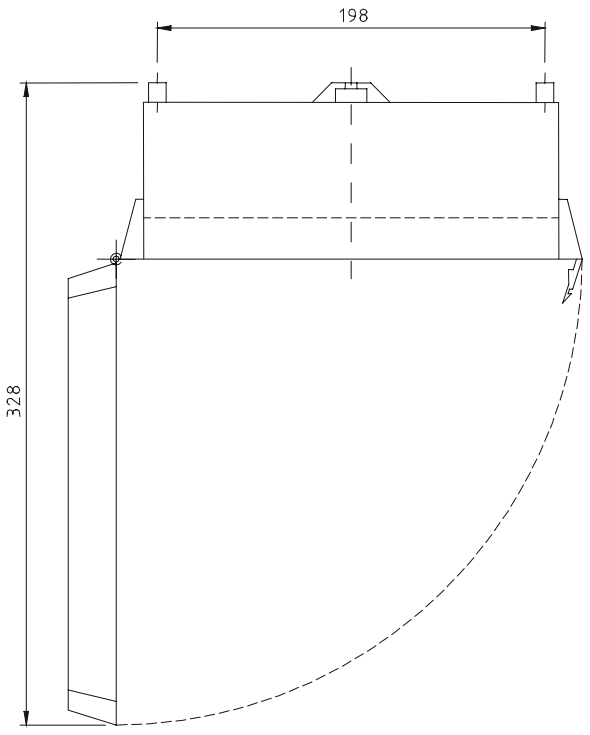
Ambient temperature:	-20...+60°C
Programming:	Menu-driven, microprocessor controlled
Displays:	LED display (14 mm) for actual measured value, 2-line LC display (5 mm) for programming measured value in FTU, NTU, g/l, mg/l, % and ppm
Keypad:	Dust- and water-proof foil keypad with 6 keys for menu control
Signal transmission:	max. 200 m from the sensor to the transformer
Connections:	Connector IP 67 between probe and transformer, ouputs on terminals
Version:	Field enclosure IP 65 / NEMA 4X
Weight:	3.5 kg

13.3 Dimensions

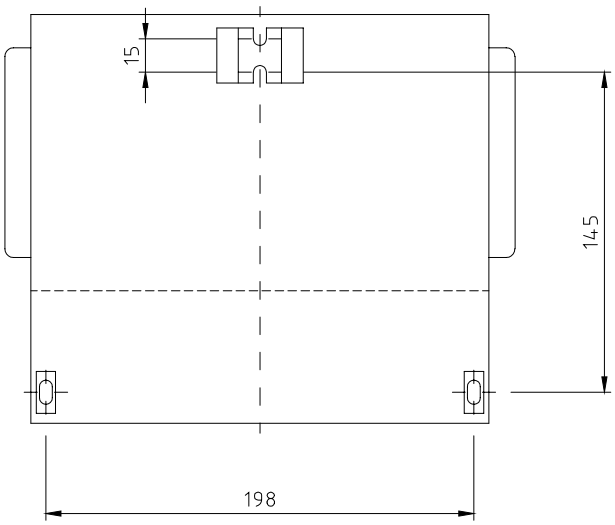
13.3.1 Field enclosure







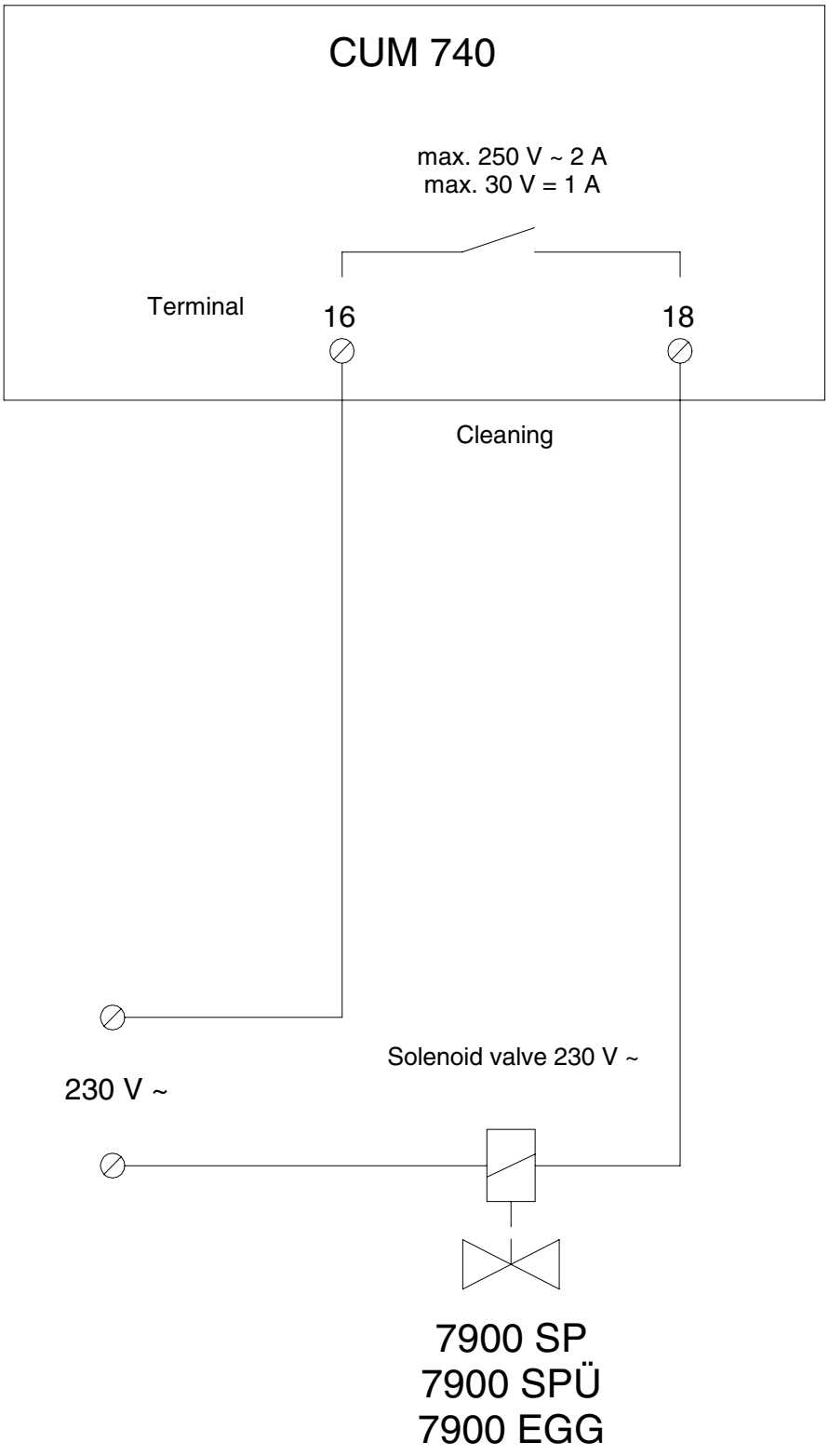
Back view:



Annex

Contents:

Drive system for solenoid valves for cleaning



Measuring procedure - Applications

Measuring procedure	Physical Unit	Ranges	Type of probe	Typical application
Scattering light	mg/l ppm FTU NTU	2 ... 1000 FTU, NTU 2 ... 1000 mg/l (depends on media)	SSN	Treatment plant outlet, River water Process water, filtrate
Absorption light	g/l % mg/l ppm	0 ... 40 g/l NS* 0 ... 20 g/l PS*	SAH	Primary sludge Return activated sludge
		0 ... 12 g/l NS* 0 ... 6 g/l PS*	SAM	Centrifugate, Screened water, Sludge level, Activated sludge,
		0 ... 50 g/l NS* 0 ... 30 g/l PS*	SAV	Primary sludge, Digested sludge, Thickened sludge
Back scattering light	g/l %	10 ... 150 g/l NS*	SRH / SRM	Inlet centrifuge / press Thickened sludge Primary sludge, digested sludge

* NS = Normal activated sludge
* PS = Primary- or mixed sludge

MTF- Factory settings (standard parameters) see 5.6 „configuration“

Please note: By entering the factory setting, all previous stored values will be overwritten. The correction factor is set to 0%.

Type of probe	CUS61/65-A	CUS65-C	CUS63/65-D	CUS64/65-E	CUS65-B	Free param.
Measuring unit	g/l	%	FTU	%	g/l	%
Analog output	4...20 mA	4...20 mA	4...20 mA	4...20 mA	4...20 mA	4...20 mA
Contacts	oper. current	oper. current	oper. current	oper. current	oper. current	oper. current
No. calibr. points	6	8	8	5	5	4
Frequency 1 [Hz]	4100	6500	6600	4050	3400	8000
Frequency 2 [Hz]	3520	6000	5920	3700	3250	6000
Frequency 3 [Hz]	3250	5750	5320	3200	3200	4000
Frequency 4 [Hz]	2950	5470	4920	2800	2900	2000
Frequency 5 [Hz]	2650	5150	4620	2200	2200	-
Frequency 6 [Hz]	2370	4900	4320	-	-	-
Frequency 7 [Hz]	-	4650	4020	-	-	-
Frequency 8 [Hz]	-	4400	3600	-	-	-
Concentration 1	0.0	0.0	0.5	1.0	0.0	1.0
Concentration 2	2.0	1.0	5	2.0	3.0	3.0
Concentration 3	3.0	2.0	20	4.0	5.0	10.0
Concentration 4	4.0	3.0	50	6.0	10.0	30.0
Concentration 5	5.0	4.0	100	8.0	20.0	-
Concentration 6	6.0	5.0	200	-	-	-
Concentration 7	-	6.0	400	-	-	-
Concentration 8	-	7.0	1000	-	-	-
Range start	0.0	0.0	0.0	1.0	0.0	1.0
Range end	10.0	10.0	1000	10.0	20.0	30.0
Alarm A	10.0	10.0	200	10.0	10.0	10.0
Alarm B	10.0	10.0	400	10.0	20.0	10.0
Damping [s]	20	20	20	20	20	20
Clean. interv. [min]	0	0	0	0	0	0
Clean. dur. [s]	1	1	1	1	1	1
normal operating ranges are within the frequency stroke of:	4000 Hz - 1000 Hz	6500 Hz - 4000 Hz	6600 Hz - 3600 Hz	4100 Hz - 1000 Hz	3500 Hz - 1000 Hz	-

Troubleshooting guide

Attention: Before exchanging the fuses disconnect the device from the mains!
Start the device only with inserted and screwed probe plug!
Plug in or out the probe plug only when the device is off!

Causes of error :

Causes for errors in the system may be found at the measuring probe, the measuring transformer, the cable section between both units and in the field of mains supply.

First steps:

1. Localize errors, if probe or measuring electronic defective, by exchange of components (if available)

2. Test probe frequency by twice pressing the ENTER key in the “measurement-mode” (frequency indication on LC-display) – see error messages (0 Hz, or 505 Hz), 5.8

3. Test power supply and fuse (F1).

For further support in troubleshooting please refer to your sales organisation responsible (see back page of these Operating Instructions for addresses).

Error messages

The signal output “error” is only set when a cause of error exists for at least 10 seconds without interruption.
Over-concentration is displayed when the predetermined range end is exceeded more than twice
Wrong type of probe is shown when the connected probe does not correspond to the selected type.
No probe signal is shown when the measuring transformer does not receive a frequency signal from the probe (e.g. cable breakthrough) This error results in a frequency display of 0 Hz independently from the output “error”.
No probe signal / probe soiled is shown when the measuring transformer does not receive a frequency signal from the probe and in addition receives a status message (e.g. soiled probe windows / does not apply for the thick sludge probes CUS 64 / 65-E). Independent from the output “error” the error results in a frequency display of 505 Hz.
Test calibration is displayed when the calibration frequencies are closer than 15 Hz from each other (e.g. when the saved calibration frequencies were overwritten by mistake).

Error diagnosis

Problem / error		**Symptom**	**Possible cause**	**Measure**
1	no function	no display, mains switch is not on	mains supply ⇨ mains fuse ⇨ mains switch defective ⇨	test feed test fuse in connection case return to manufacturer or order spare part
2	device loses programming after it has been stopped	random values in the memories	buffer-battery of the CPU is empty (lasts about 5 years), possibly EMV error.	return to manufacturer or order spare part
3	creeping display up to the real measured value	actualization of the display too sluggish	damping time too long	change damping time accordingly under “parameter entry”
4	no concentration measurement	no display of any measured value, frequency display “505 Hz” or “0Hz”	probe electronics defective ⇨ measuring window soiled ⇨	 return to manufacturer clean measuring window
5	no continuous output current	current output varying at stable probe frequency	current output defective possible EMV error	return to manufacturer
6	output signals are not set	correspondent output relay does not actuate despite LED-display	relay contact pasted, because efficiency of the relay exceeded; relay defective	Return to manufacturer

CUM 740 - parameters

Serial-Number: _____

Sensor - 1, No.: _____ Sensor - 2, see next page

Software-Version: PO - _____

1. Configuration

Type of probe	Factory settings ☐ yes ☐ no	Measurement unit	Calibration factor

Analog output	Alarm A	Alarm B	Error contact

2. Frequency [Hz] →

3. Solids input →

[ ]

Unit

1. _____	**2.** _____	
3. _____	**4.** _____	**5.** _____
6. _____	**7.** _____	**8.** _____

4. Parameter entry

Range start	Range end	Alarm A	Alarm B

Damping	Cleaning interval	Cleaning duration

5. Remarks: _____

CUM 740 - parameters

Serial-Number: _____

Sensor - 2, No.: _____ Sensor - 1, see previous page

Software-Version: PO - _____

1. Configuration

Type of probe	Factory settings ☐ yes ☐ no	Measurement unit	Calibration factor

Analog output	Alarm A	Alarm B	Error contact

2. Frequency [Hz] →

3. Solids input →

[ ]

Unit

1. _____	**2.** _____	
3. _____	**4.** _____	**5.** _____
6. _____	**7.** _____	**8.** _____

4. Parameter entry

Range start	Range end	Alarm A	Alarm B

Damping	Cleaning interval	Cleaning duration

6. Remarks: _____

Accessories

Sensors

TurbiMax W CUS 61
Turbidity and solids content sensor for medium concentrations
Technical Information TI 228C/07/en, Order No.: 51504289

TurbiMax W CUS 62
Turbidity and solids content sensor for high concentrations
Technical Information TI 229C/07/en, Order No.: 51504291

TurbiMax W CUS 63
Turbidity and solids content sensor for low concentrations
Technical Information TI 230C/07/en, Order No.: 51504293

TurbiMax W CUS 64
Turbidity and solids content sensor for highest concentrations
Technical Information TI 231C/07/en, Order No.: 51504295

TurbiMax W CUS 65
Turbidity and solids content sensor for low to highest concentrations
Technical Information TI 370C/07/en, Order No.: 51512873

Attachment

Immersion pipe
Immersion pipe for sensor immersion in basins. Material: stainless steel 1.4404 (AISI 316L) (pipe), stainless steel 1.4571 (AISI 316Ti) (fitting).

Wall attachment for immersion pipe
Wall attachment for immersion pipe attachment to basins or channels.
Material: stainless steel 1.4301 (AISI 304)
Order No.: 51503581

Counter plate
Counter plate to fix the immersion pipe attachment. Material: stainless steel 1.4301 (AISI 304).
Order No.: 51512992

Assemblies

Installation assembly
CleanFit CUA 451
Retractable assembly with ball valve for pipe installation
Material: stainless steel 1.4404 (AISI 316L)
Technical Information TI 369C/07/en, Order No. 51512836

Connection accessories

Extension cable

Extension cable, length 10 m, shielded, with SXP plug and SXK coupling. Ingress protection IP 67.
Order No.: 51503633

Plugs

SXP plug, 7-pole
Order No.: 51504027
SXK coupling, 7-pole
Order No.: 51504025

Junction box

Junction box for extension of cable connection between sensor and instrument. Sensor cable input SXB socket, cable output Pg 11 cable gland. Material: Makrolon®. Ingress protection IP 67.
Order No.: 51503632

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Austria
❑ Endress+Hauser Ges.m.b.H.
Wien
Tel. ++43 (1) 88056-0, Fax (1) 88056-35

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Belorgsintez
Minsk
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❑ Endress+Hauser Moscow Office
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Yugoslavia
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Casablanca
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Lagos
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Tunis
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