This product is discontinued!

EK260

Volume Conversion Device EK260

Operating Manual and Installation Instructions

Operating Manual:	73017115	SW Version:	from V2.54
Issued:	24.02.2010(q)	Edition:	

Contents

I   Safety instructions

☞   *The connections of the EK260 are freely accessible during setting up. Therefore, make sure that no electrostatic discharge (ESD) can occur in order to avoid damage to the components. The person carrying out the installation can, for example, discharge himself/herself by touching the potential equalisation line.*

☞   *To avoid erroneous operation and problems, the operating manual must be read before putting the EK260 into operation.*

The EK260 Volume Conversion Device(Volume Conversion Device) is suitable for applications in Ex Zone 1 for gases in the temperature class T4 (ignition temperature > 135°C, e.g. natural gas) according to VDE 0170. (see Appendix A-2)

In this application it is essential to take note of the following information:

☞   *Follow the regulations in the relevant standards, in particular DIN EN 60079-14 (VDE 0165 Part 1) and DIN EN 50014.*

☞   *Make sure that the limits quoted in the certificate of conformance (see Appendix A-2) for the devices to be connected are not exceeded.*

☞   *The housing of the EK260 must be earthed directly to a potential equalisation strip. A terminal screw is provided for this on the left housing wall.*

II Items supplied and accessories

Items supplied:

The items supplied with the EK260 include:

  a) EK260 Volume Conversion Device

  b) Dispatch list

  c) Configuration data sheet

  d) Operating Manual

  e) 3 blind insertion seals for gland-type cable entries

  f) Lead sleeves for sealing the pressure connection.

Ordering information and accessories	Order no.
• EK260 Volume Conversion Device, complete	83 462 140
• EBL 50 Thermowell, complete with M10 x 1 weld-in sleeve	73 012 634
• EBL 67 Thermowell, complete with M10 x 1 weld-in sleeve	73 014 456
• EBL 160 Thermowell, complete with G 3/4" weld-in sleeve and sealing ring	73 012 100
• EBL 250 Thermowell, complete with G 3/4" weld-in sleeve and sealing ring	73 012 100
• Three-way test tap	73 008 403
• Shut-off ball valve with Ermeto 6L test connection	73 016 166
• Minimess test connection	73 016 167
• Operating manual, German	73 016 960
• Operating manual, English	73 017 115
• Operating manual, French	73 017 218
• Plug-in terminal, 2-pole black	04 130 407
• Calibration covering cap	73 016 879
• Battery module, 13 Ah	73 015 774

1 Brief description

The EK260 Volume Conversion Device is used for the conversion of the gas volume measured at line conditions by a gas meter into the base conditions and into the appropriate energy.

The pressure and temperature are measured for the determination of the line conditions. The inverted compressibility factor ratio (K-value) can alternatively be calculated according to S-GERG 88 or AGA-NX19 or it can be entered as a constant. The volume is converted into energy using the adjustable calorific value.

The integral recording device contains meter readings and maxima from the last 15 months and the consumption profile of the last 9 months for a measurement period of 60 minutes.

Power supply:

- Battery operation with a service life depending on operating mode $\geq$ 5 years.
- Optional double battery life is possible by connection of an additional battery pack.
- Battery replacement possible without loss of data and without violation of calibration seals.
- Data retention without battery supply due to internal EEPROM.
- Connection for external power supply unit.

Operator interface:

- Alphanumeric display with two lines of 16 characters.
- A display list freely assignable by the user.
- Programming via keypad possible.
- Calibration switch (separately sealed in the device).
- Calibration logbook according to PTB-A 50.7 for changing values relevant to calibration without the calibration lock.
- Two user locks (supplier's and customer's locks) with numerical codes.
- Access rights for each individual value can be set separately via interface (with appropriate rights).

Counter / signal inputs:

- 3 inputs for reed contacts or transistor switches, programmable as pulse or signal inputs.
- Connection provided for an Elster GmbH C1 Encoder Counter for digital transmission of genuine counter readings (also in battery mode).
- Maximum counting frequency 2 Hz (adjustable).
- Pulse value for each input separately adjustable, also non-decade.
- Various counters for Vb and Vm and for each input (main counter, original counter, disturbance volumes, totaliser, adj. counter, measurement period counter, day counter).
- Each input can be separately sealed and secured under official calibration.

Pulse / signal outputs:

- 4 programmable transistor outputs, each freely programmable as alarm / warning output, pulse output, signal output for limit monitoring.
- Each output can be separately sealed and secured under official calibration.

Data interface:

- Optical interface according to IEC 62056-21 (replaces IEC 61107 and EN61107).
- Permanently wired serial interface (RS232 or RS485).
- MODBUS protocol via the permanently wired serial interface.
- Automatic setting of the clock by remote data transmission with a modem connected.
- Sending short messages by SMS.
- Programmable standard output data records for process data ("three-minute values").

Pressure and temperature sensors:

- Pressure sensor type CT30 integrated in device,or external mounted.
- Pt500 temperature sensor, variable length.

Mechanical details / housing:

- Suitable for wall mounting and meter installation (with mounting bracket).
- Mounting + device installation without breaking the calibration seals.
- Ambient temperature range: -25°C...+55°C
  Extended temperature range with restricted functions possible.

Approvals:

- Approval by calibration authorities
  - as Volume Conversion Device acc. MID-Directive 2004/22/EG,
  - as flow recording device acc. PTB-A50.7,
  - as high flow display device acc. PTB-A50.7.
- Ex approval for use in Ex Zone 1 according to EEx ib IIC T4.

Monitoring functions

- Monitoring of signalling inputs.
- Monitoring of any values with respect to programmable limits.
- All monitoring can trigger appropriate reactions such as for example, entries in the status register, logbook or archives or signalling via outputs.

Archives

- Counter readings and maxima from the last 15 months for Vb and Vm.
- Mean values, maxima and minima from the last 15 months for pressure and temperature as well as partially for the inverted compressibility factor ratio and conversion factor.
- Measurement period values (consumption profile) from the last 9 months for Vb, Vm, p, T, K and C for a measurement period of 60 minutes. The measurement period can be set in the range from 1 to 60 minutes.
- Automatic changeover to daylight saving time can be set.
- Event logbook with 500 entries for events such as for example status changes, signalling inputs, limit violations.
- Changes logbook ("audit trail") with entry of the last 200 changes to settings (parameterising steps).
- PTB logbook (optional) with 50 entries for changing fixed values which are normally subject to the calibration lock. All changes of this type are recorded.

2 Operation

2.1 Front panel

The following are positioned on the front panel for operation:

- Two-line alphanumeric display with 16 characters per line.
- Six keys for the display and entry of values.
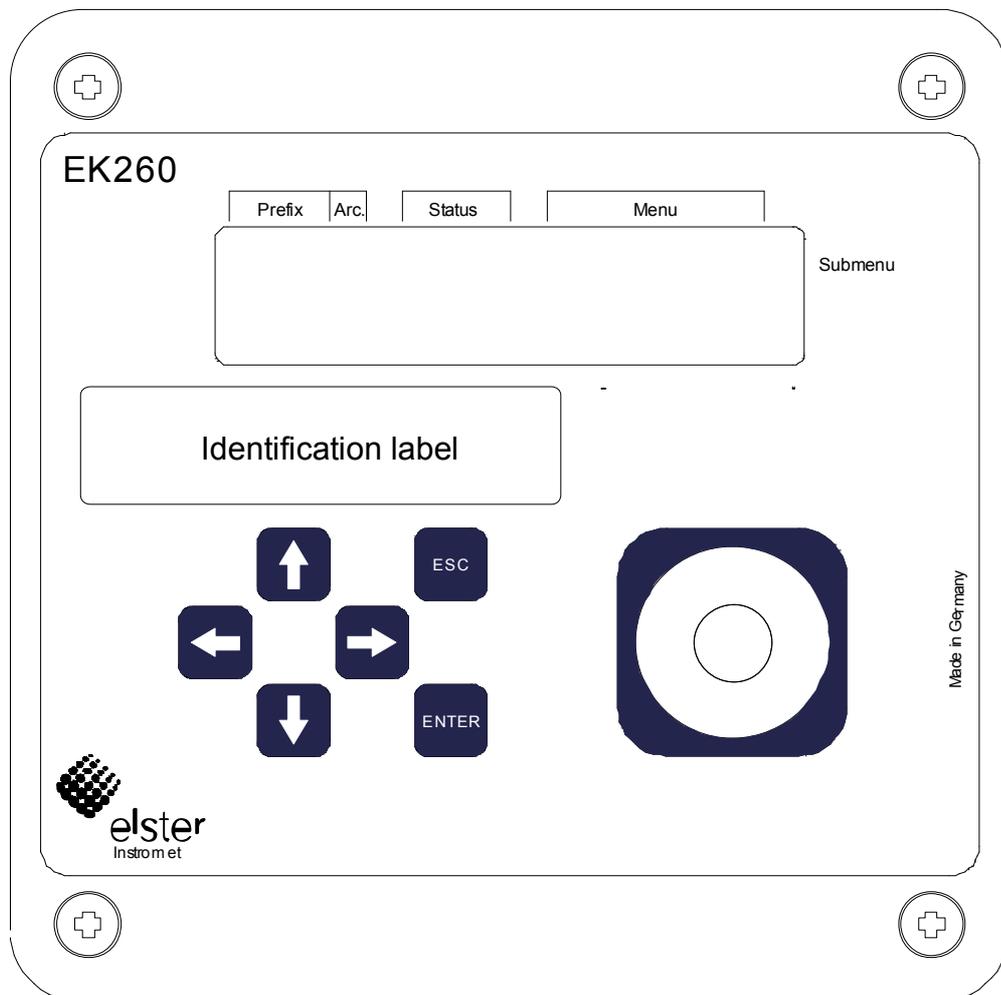
2.2 Display

Basic display structure (with an example):

Prefix	Archive	Device status		Menu				
m a x ↑		**A W B**	**V b**					**→**
V b A		**1 2 3 4 5 6 7 . 8**					**m 3**	

Submenu

Both lines in the display are subdivided into fields which are described below.

2.2.1 Line 1 = Labels

The first line is subdivided into five fields of which four are labelled on the front panel:

1. Prefix (Type of computation)

The type of computation identifies so-called "initial values" (also termed "capture values"). These are values which have been formed over a time period (e.g. the adjustable measurement period or one month). Labels:

- max   Maximum   – highest value within the time range
- min   Minimum   – lowest value within the time range
- Δ   Change   – volume within the time range
- ∅   Mean   – mean within the time range

2. Archive

If an arrow points upwards to the label "Archive", then the displayed value is an archived value. This was frozen at a defined point in time and cannot be changed.

3. Device status

Here a maximum of three of the most important items of status information are continually shown.

A <u>flashing character</u> signifies that the relevant state is still present and the relevant message is present in the momentary status.

A <u>non-flashing character</u> signifies that the relevant state is past, but the message in the status register has not yet been cleared.

Meaning of the letters:

- A   "Alarm"
    At least one status message has occurred which has resulted in disturbance volumes being counted.
    Basically, all messages with numbers in the range "1" and "2" represent alarms (e.g. "Alarm limits for pressure or temperature violated" → 3.7).
    Alarm messages are copied into the status register and are retained here, even after rectification of the cause of the error, until they are manually cleared.
- W   "Warning"
    At least one status message has occurred which is valid as a warning.
    Basically, all messages with numbers in the range "3" to "8" represent warnings (e.g. "Warning limits for pressure or temperature violated" or "Error on output" → 3.7).
    Warning messages are copied into the status register and are retained here, even after rectification of the cause of the error, until they are manually cleared.

- B   "Batteries flat"
  The remaining battery service life is less than 3 months.
  This display corresponds to the status message "*Batt. low*" ($\rightarrow$ Page 52).
- L[1]   "Calibration logbook full"
  The calibration logbook is full; some parameters can now only be changed with the calibration lock open. ($\rightarrow$ *PLogB*, page 45)
  This display corresponds to the status message "PLogB full", ($\rightarrow$ page 52).
  ☞   *If the calibration lock is opened with the calibration logbook full, it can only be closed again after clearing the calibration logbook.*
- P   "Programming mode"
  The programming lock (calibration lock) is open.
  This display corresponds to the status message "*Cal.lock o.*" ($\rightarrow$ Page 52).
- M   "Measurement error"
  The connected gas meter encoder does not supply a fault-free counter reading.
  A flashing "M" corresponds to the status message "Coder fault" ($\rightarrow$ Page 52).
- o   "online"
  A data transfer via the optical or permanently wired interface is running. In each case the other interface cannot then be used.
  This display corresponds to the status message "*online*" ($\rightarrow$ Page 52).

4. Menu

Here is displayed to which list according to Chapter 3 the currently displayed value belongs. In submenus (indicated by an arrow to the left, see below) its name is displayed which is identical to the abbreviated designation of the entry point.

5. Submenu

- $\rightarrow$ Arrow to the right
  indicates that the displayed value is the entry point of a submenu. This can be called with the key [ENTER].
- $\leftarrow$ Arrow to the left
  indicates that you are located in a submenu which can be quit with the key [ESC]. On pressing [ESC] you are returned to the entry point of the submenu.

2.2.2 Line 2 = Value with name and unit

In the second line the name, value and (when available) the unit of the data are always shown.

Uncalibrated values are identified for the user with an asterisk ("∗") after the abbreviated designation.

For use outside of applications subject to calibration, the device can also be obtained without the identification of uncalibrated values.

Example of uncalibrated values:

V	b	A	∗	1	2	3	4	5	6	7	.	8		m	3

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[1]If the device has a calibration logbook.

Example of calibrated values:

| V | b | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | . | 8 | | m | 3 |

2.3 Keypad

Key(s)	Designation	Effect
↓	Down cursor key	• **Downwards movement** within the list: From the first value in the list movement is in the direction of the last value or from the last value <u>directly</u> to the first one.
↑	Up cursor key	• **Upwards movement** within the list: From the last value in the list movement is in the direction of the first value or from the first value <u>directly</u> to the last one.
→	Pfeil rechts	• **Movement to the right** to a different list: From the first list movement is in the direction of the last list or from the **last** list <u>directly</u> to the first one. With similar lists (e.g.: Vb and Vm) skipping occurs to the appropriate value, otherwise to the first value. • **Switchover to the second part of the value** for values displayed on two lines: - Counter readings **divided** into pre- and post-decimal places. - Date and time (together one value) divided.
←	Left cursor key	• **Movement to the left** to a different list: From the last list movement is in the direction of the first list or from the first list <u>directly</u> to the last one. With similar **lists** (e.g.: Vb and Vm) skipping occurs to the appropriate value, otherwise to the first value in the adjacent list.
ENTER	Enter	Depends on the value displayed (Data class, → 2.3.1) • **Activate the entry mode.** • **Open the submenu.** • **Update measurement** (by pressing twice).
ESC	Escape	• **Return from a submenu** to the entry point in the higher level main menu. • **Cancel entry** (the value remains unchanged).
← + ↑	Home / Clear	• **Skips to first value in the list** • **Updates a value** in the entry mode
← + →	Help	• **Displays the address** (reference code) of the value
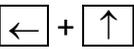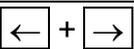
In the entry mode the keys change their functions, see Chapter 2.3.1.

2.3.1 Changing values

The methods of entering and changing values differ depending on the value. These are therefore subdivided into so-called "data classes" (abbreviation: "DC"). Values in the same data class are treated identically during entry. A prerequisite for an entry is that the lock assigned to the value is open.

The following data classes (DC) are present in the EK260:

DC	Type	Entry, change using <ENTER>
1	Display test	No change possible.
2	Function	Triggers the function by entering "1".
3	Constant	No change possible.
4	Measurement	The value is updated by pressing <ENTER>. <u>twice</u>.
5	Status	Abbreviated text for the status messages can be called with <ENTER>.
6	Initialisable value	After <ENTER> value initialisation (standard setting) by pressing the key combination <CLR> = $\boxed{\leftarrow}$ + $\boxed{\uparrow}$.
7	Discrete value	After <ENTER> value change by selection from a list of possible values with the keys $\boxed{\uparrow}$ and $\boxed{\downarrow}$. Value initialisation is possible with $\boxed{\leftarrow}$ + $\boxed{\uparrow}$.
8	Permanent value	After <ENTER>, setting to any value within the valid range is possible. Selection of each individual character to be changed with $\leftarrow$ and $\rightarrow$ and changing with $\boxed{\uparrow}$ und $\boxed{\downarrow}$. Value initialisation is possible with $\boxed{\leftarrow}$ + $\boxed{\uparrow}$.
9	Archive heading	Branching to the appropriate archive.
11	Combination	Similar to "Permanent value" (see above) but masked entry, i.e. only the character currently being edited is visible, all others are masked out by a minus sign. With a <u>closed lock</u> it is opened on entering the correct combination. With an <u>open</u> lock, the combination is changed by the entry.
12	Counters	As "Permanent value" (see above.).
15	Computation counter	No change possible.
16	Initial value	No change possible, sometimes branching to a submenu.
17	Archive value	No change possible.
19	Status register	Abbreviated text for the status messages can be called with <ENTER>. Initialisation is possible with the menu command Clr.
20	Flag	No change possible.
21	Constant value with 0	As "Permanent value" (DC = 8, see above), but the entry of "0" is always possible independent of the specified limits.

If a value is accommodated in a submenu, it <u>cannot</u> be changed independent of its data class by the keypad, since the key <ENTER> is then used for branching into the submenu.

2.3.2 Entering sources

At a number of points the entry of a "source" is required for parameterisation (e.g. *SC.Qb* in the volume at base conditions list, *SC.O1* in the output list).

The address of the desired value is entered as the source. It can be found in the tables at the beginning of each list (Chapter 3.1 ff.). In comparison to the addresses shown there however, the following supplements must be given:

- Completion of leading zeroes so that a total of four numbers exist in front of the colon.
- If the address includes no underscore "_", then "_0" should be appended.

Example 1:
Source: 2:300   (Address of the volume at base conditions *Vb*, see table in 3.1)
Enter: **000**2:300**_0**   (Supplements printed in bold)

Example 2:
Source: 6:310_1   (Address of the temperature *T*, see table in 3.4)
Enter: **000**6:310_1   (Supplements printed in bold)

2.3.3 Entry errors

Entry error messages are displayed after invalid entries via the keypad.

Display: **----x---**   where x = Error code according to the following table

Code	Description
1	The archive is empty, no values are available yet.
2	The archive value cannot be read. The archive has possibly just been opened by the interface for reading out.
4	Parameter cannot be changed (constant).
5	No authorisation for changing the value. To change the value the appropriate lock must be opened.
6	Invalid value: The entered value is outside the permissible limits.
7	Incorrect combination: The entered combination (numerical code) is incorrect and the lock is not opened.
11	Entry not possible due to special setting or configuration, for example: - The entry of *Vm* and *VmD* in the encoder mode (Md.I1 = 5) is not possible. - Md.I1 cannot be set to "5" with devices without encoder capability. - The calorific value can only be changed in the Gas analysis list; not in the Energy list.
12	The entry of this source (address) is not permitted. For the output source *SC.O2*, e.g. for output mode "8", the addresses of Qb, Qm, p and T are permissible, but no counter readings, etc.
13	The function can only by executed after the time ($\rightarrow$ **Fehler! Verweisquelle konnte nicht gefunden werden.**, *Time*) has been set (initialised) to its start value with the key combinations $\boxed{\leftarrow}$ + $\boxed{\uparrow}$.
14	Gas analysis parameters for AGA-NX-19 do not match. Example: For "H gas" (calorific value *Ho.b* over 11.055) the density ratio dr must not exceed the maximum value of 0.691. ($\rightarrow$ 3.5)
20	Value for the application-specific display is not defined. The value to be displayed can be defined by the user by entering the address. No value is displayed because this has not yet occurred.

2.4 Access rights

The EK260 differentiates between four access parties and the calibration logbook. Each access party has a lock and a corresponding code. The locks have the order of priority

Calibration lock – Manufacturer's lock[1] – Supplier's lock – Customer's lock.

The access rights apply both for keypad inputs as well as for accesses via the optical or electrical (permanently wired) interface. If the lock is locked, all attempts to set values are answered with an appropriate error message (see Chap. 2.3.3).

Also the reading of values via the interfaces is only possible, for reasons of data protection, when at least one of the locks is open.

Normally, in addition to the access rights assigned to each individual value, values can also be changed by the access parties with higher priority. A value, which for example has "S" ("Supplier") as access rights, can also be changed by calibration officials and a value subject to the customer's lock can also be changed by suppliers.

Each party with write access for a value can also change the access rights (write and read access for each party) for this value via the interface. The rights of parties with higher priority can also be changed.

Therefore, it is possible for the specifications to deviate from the access rights specified in the lists in the operating instructions.

2.4.1 Calibration lock

The calibration lock is used for securing parameters subject to calibration regulations. This includes all values which affect the volume counting.

The calibration lock is implemented as a pushbutton located within the EK260 housing below the circuit board cover panel. It can be secured with an adhesive seal ($\rightarrow$ 5.9.1)

The factory default settings protected under calibration regulations are each identified with "C" in the lists in the functional description.

Depending on the applications, values, which are not included as inputs subject to calibration regulations, can be placed under the user lock via the WinPADS parameterisation software, for example to be able to use them as signalling inputs.

The calibration lock is opened by pressing the pushbutton (the symbol "P" flashes in the display) and is closed again when it is pressed again (symbol "P" goes out). Closure is also possible by deleting the value "St.PL" ($\rightarrow$ 3.9) via the keypad or interface. With the aid of the "WinPADS" parameterisation software a time in minutes can also set after which the calibration lock automatically closes.

In particular for applications not subject to the German calibration regulations, the level of protection for all parameters can be changed on request. For example, parameters which are as standard subject to the calibration lock can also be protected with the supplier's lock or with the calibration logbook[2].

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[1] The manufacturer's lock is reserved for Elster and is not described here.
[2] If the device has a calibration logbook.

2.4.2 Calibration logbook The calibration logbook is activated by default, but can also be deactivated optionally. The corresponding menu items ($\rightarrow$ 3.7) remain visible in the display. The affected parameters are then subject to the calibration lock.

With the aid of the "Calibration logbook" according to PTB-A 50.7 ($\rightarrow$ *PLogB, page 45*) some parameters relevant to calibration regulations can be changed also with the calibration lock closed. Prerequisites for this are:

- The calibration lock (see below) must be open.
- At least three entries must be available in the calibration logbook.

The affected factory default settings (e.g. cp value, measurement period) are identified in the lists in Chapter **Fehler! Verweisquelle konnte nicht gefunden werden.**. with the access right "PL". By changing the access rights as described in 2.4, further parameters may be affected or the affected parameters may only be subject to the calibration lock.

For each change of a parameter with "PL" rights with the calibration lock closed, two data rows are entered, one with the value before the change and one with the value afterwards.

If the calibration logbook is full, it can be cleared with the calibration lock open using the command *ClrPL* ($\rightarrow$ page 47).

☞   If the calibration lock is opened with the calibration logbook full, it can only be closed again after clearing the calibration logbook.

2.4.3 Supplier's lock and customer's lock

The supplier's and customer's locks are used for securing all data which is <u>not</u> subject to calibration regulations, but which should also not be changed without authorisation.

The factory default settings which are write-protected under the supplier or customer locks are each identified with "S" or "K" in the lists in the functional description ($\rightarrow$ 3). All values which are shown with a minus symbol "-" cannot be changed, because they represent, for example, measurements or constants.

The locks can be opened by entering a code (the "combination") under *Cod.S* or *Cod.C* and closed by entering "0" for *St.SL* or *St.CL* ($\rightarrow$ page 59). With the aid of the parameterisation software "WinPADS" a time in minutes can also be set for each lock under the addresses 1:174 ... 4:174 after which it automatically closes.

2.5 Formation of the list structure

The data display in the EK260 is structured in a tabular form. The individual columns in the table each contain associated values.

Values identified with U and Arc are submenus or archives which you can view by entering <ENTER> and leaving again with <ESC>. They each have, subordinate to the main menu, a dedicated list structure, which is written in the corresponding list ($\rightarrow$ 3).

The archives are subdivided into a number of data rows (also termed "data records"). All values in the same data row are saved ("archived") at the same point in time.

The maximum number of data rows and the number of values in a data row depends on the relevant archive. Within an archive the number of values and their meaning are the same for each data row.

Switching to another archive data row occurs with the keys $\boxed{\uparrow}$ (for "younger" data rows) and $\boxed{\downarrow}$ (for "older" data rows). After the last data row, the first follows again and vice versa.

Switching to another value within a data row occurs with the keys $\boxed{\rightarrow}$ and $\boxed{\leftarrow}$. After the last value, the first follows again and vice versa.

A summary of the standard main menu (list structure) is shown on the following pages. By changing the value *Menu* (see page 94), a minimum main menu can be selected.

Volume at base conditions	Actual volume	Pressure	Temperature
Std.V.	**Act.V.**	**Press.**	**Temp.**

To "User" ↔

To "Conv." ↔

Volume at base conditions		Actual volume		Pressure	Temperature
↔	Vb Vol. at base cond.	↔	Vm Actual volume	↔ p Pressure	↔ T Temperature	↔
	Qb Flow at base cond.	↔	Qm Actual flow	p.LW Lower warn. limit	T.LW Lower warn. limit
	VbD Disturbance quant.	↔	VmD Disturbance quant.	p.UW Upper warn. limit	T.UW Upper warn. limit
	VbT Total quantity	↔	VmT Total quantity	pMin Lower alarm limit	TMin Lower alarm limit
	VbA Adjustable counter	↔	VmA Adjustable counter	pMax Upper alarm limit	TMax Upper alarm limit
	SC.Qb Source monitoring	↔	SC.Q Source monitoring	MRL.p Meas. range bottom	MRL.T Meas. range bottom
	QbUW Upper warn. limit	↔	QmUW Upper warn. limit	MRU.p Meas. range top	MRU.T Meas. range top
	QbLW Lower warn. limit	↔	QmLW Lower warn. limit	p.F Substitute value	T.F Substitute value
	VbMP Δ Meas. per. counter	↔	VmMP Δ Meas. per. counter	Pb Pressure at base conditions	Tb Temp. at base conditions
	VbMP max S Month's maximum	↔	VmMP max S Month's maximum	Md.p Pressure mode	Md.T Temperature mode
	VbDy Δ Daily counter	↔	VmDy Δ Daily counter	Typ.p Press. sensor type	Typ.T Temp. sensor type
	VbDy max S Month's maximum	↔	VmDy max S Month's maximum	SNp Sensor serial no.	SNT Sensor serial no.
				Eq1p Equ. coefficient 1	Eq1T Equ. coefficient 1
				Eq2p Equ. coefficient 2	Eq2T Equ. coefficient 2
				Eq3p Equ. coefficient 3	Eq3T Equ. coefficient 3
				p1Adj Adjustment val. 1	T1Adj Adjustment val. 1
				p2Adj Adjustment val. 2	T2Adj Adjustment val. 2
				Prog Accept adjust.	Prog Accept adjust.
				p.Amb Air press. fixed val.	T.Mes Temp. meas.
				p.Mes Pressure meas.	T.MP ∅ Meas. period mean
				p.Abs Abs.pressure meas.	T.Mon max S Month's maximum
				p.MP ∅ Meas. period mean	T.Mon min S Month's minimum
				p.Mon max S Month's maximum	
				p.Mon min S Month's minimum	

Conversion	Archive	Status + Logbook	System

To "Temp." ↔

Conv.		**Archiv**		**Status**		**System**	

↔

Conv.
C
Conversion factor
K
Gas law dev. factor
Ho.b
Calorific value
CO2
Carbon dioxide content
H2 / N2
(depends on Md.K)
Rhob / dr
(depends on Md.K)
K.F
K substitute value
Md.K
K mode

Archiv	
ArMo1	Arc
Month archive 1	
ArMo2	Arc
Month archive 2	
ArMP	Arc
Meas. per. archive	
MPer	
Meas. period	
MP.Re	
Rem. time mea. p.	
FrMP	
ArMP frozen	

Status	
SReg	S
Status register	
Stat	S
Momentary status	
Clr	
Clear S. Reg	
Logb.	Arc
Logbook	
AudTr	Arc
Audit Trail	
PlogB	Arc
Calibration Logb.	
ClrPL	
clear Cal. Logb.	

System
Time
Date and time
MdTim
Daylight saving: y / n
MCyc
Meas. cycle time
OCyc
Operating cycle time
Disp
Disp. switch-off time
Aut.V
Disp. changeover time
SNo
Serial number
Ta.Rg
Ambient temp.
Vers
Software version
Chk
Software checksum

To "Serv." ↔

Service	Inputs	Outputs	
Serv.	**Inputs**	**Outp.**	

↔		↔		↔		↔
Bat.R Remaining bat. life		Vo only in Encoder mode Orig. counter Input 1		Md.O1 Mode for Output 1		
Bat.C Battery capacity		cp.I1 Cp value Input 1		SC.O1 Source Output 1		
St.SL Supplier's lock		Md.I1 Mode for Input 1		cp.O1 cp value Output 1		
Cod.S Supplier's code		V1 Adj. counter Input 1		SpO1 Status pointer O1		
St.CL Customer's lock		q.max (only for encoder mode)		Md.O2 Mode for Output 2		
Cod.C Customer's code		cp.I2 Cp value Input 2		SC.O2 Source Output 2		
St.PL Calibration lock		Md.I2 Mode for Input 2		cp.O2 cp value Output 2		
Contr Display contrast		V2 Adj. counter Input 2		SpO2 Status pointer O2		
Adj.T Clock adjust. factor		St.I2 Status on Input 2		Aj1O2 HF adjust factor 1		
Sel.p Select. press. sensor		MdMI2 Mode monitorino I2		Aj2O2 HF adjust factor 2		
Save Save all data		SC.I2 Source monitoring I2		f1.O2 Freq. for Aj1.O2		
Clr.A Clear archives		L1.I2 Limit 1 for I2		f2.O2 Freq. for Aj2.O2		
Clr.V Clear counters		L2.I2 Limit 2 for I2		Md.O3 Mode for Output 3		
Clr.X Initialise device		SpI2 Stat. pointer mon. I2		SC.O3 Source Output 3		
Bin.T Temp. raw value		St.I3 Status on Input 3		cp.O3 cp value Output 3		
Bin.p Pressure raw value		MdMI3 Mode monitoring I3		SpO3 Status pointer O3		
Addr User display address		SC.I3 Source monitoring I3		Md.O4 Mode for Output 4		
… User display		L1.I3 Limit 1 für I3		SC.O4 Source Output 4		
WRp Repair counter W		SpI3 Stat. pointer mon. I3		cp.O4 cp value Output 4		
VbRp Repair counter Vb		SNM Serial no. gas meter		SpO4 Status pointer O4		
VmRp Repair counter Vm						
Rep. Revision mode						
ArCal $\quad$ Arc Frozen values						
Frz Freeze						
- Display test						

Interfaces	Energy	User list
Ser.IO	**Energ.**	**User**

To "Outp." ↔

To "Std.V." ↔

Interfaces Ser.IO	Energy Energ.	User list User
↔ Md.S2 Mode, Interface 2	↔ W Energy	↔ VbT Vb total
DF.S2 Data format, Interface 2	P Power	VmT Vm total
Bd.S2 Baud rate, Interface 2	WD Disturbance quantity	p Pressure
TypS2 RS-232 / RS-485	WT Total quantity	T Temperature
Num.T No. of rings bef. answrg.	WA Adjustable counter	K Gas law dev. factor
M.INI Initialise modem	Ho,b Calorific value	C Conversion factor
PrLog S Printer log	SC.W Source monitoring	SReg Status register
CSync S Clock set by rem. trans.	P.UW Upper warning limit	VbMP max Month's maximum Vb
GSM.N GSM network	P.LW Lower warning limit	Date Of month's max. Vb
GSM.L Reception field strength	WMP Δ Meas. per. counter	Time Of month's max. Vb
StM Modem status (GSM)	WMP max S Month's maximum	Qb Flow at base cond.
P.Sta Response to PIN code	WDy Δ Daily counter	Qm Actual flow
PIN PIN code	WDy max S Month's maximum	Menu Display menu
Resp1 Response to Message 1		
ANT2 Response to Message 2		
SEND Send message		
Bd.S1 Baud rate, Interface 1		
CW1.S Call window 1 start		
CW1.E Call window 1 end		
CW2.S / M.CW1 (depends on setting)		
CW2.E / M.onl (depends on setting)		

3 Functional description

The data display is structured in tabular form (list structure) ($\rightarrow$ 2.5). The individual columns in the table each contain associated values. The following functional description is orientated to this list structure.

Here, the following abbreviations are used:

- AD   Abbreviated designation
                Designation of the value in the display
- Access   Write access
                Indicates which lock must be opened to change the value ($\rightarrow$ 2.4.1, 2.4.3):
                - C   = Calibration lock
                - PL[1] = Calibration logbook (PTB logbook, $\rightarrow$ page 45)
                - M   = Manufacturer's lock
                - S   = Supplier's lock
                - K   = Customer's lock
                If the letter is located in brackets, the value can only be changed via the interface and not via the keypad.
- Address Address of the value.
                This is required especially for data transmission via the serial interface. The address can be displayed by pressing the keys $\boxed{\leftarrow}$ + $\boxed{\rightarrow}$ simultaneously.
- DC   Data class
                The data class shows, amongst other properties, whether and how the value can be changed. ($\rightarrow$ 2.3.1)

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[1] If the device does not have a calibration logbook, then the affected values are subject to the calibration lock.

3.1 Standard Volume (Volume at base conditions) list

AD	Designation / value	Unit	Access	Address	DC
Vb	Volume at base conditions	m3	PL	2:300	12
Qb	Flow at base conditions	m3/h	-	2:310	4
VbD	Vb disturbed	m3	S	2:301	12
VbT	Vb total	m3	-	2:302	15
VbA	Vb adjustable	m3	S	2:303	12
SC.Qb	Source for warning Qb	-	S	7:154	8
QbUW	Upper warning limit Qb	m3/h	K	7:158	8
QbLW	Lower warning limit Qb	m3/h	K	7:150	8
VbMP Δ	Measurement period counter Vb	m3	-	1:160	16
VbMP max	Max. meas. per. count. Vb current month	m3	-	3:160	16
VbDy Δ	Daily counter Vb	m3	-	2:160	16
VbDy max	Max. daily count. Vb current month	m3	-	4:160	16

Vb   **Volume at base conditions**
The Volume at base conditions computed from the measured "actual volume" is summed here provided no alarm is present.
"Alarm" means "any message with the number "1" or "2" ($\rightarrow$ 3.7).
$Vb = Vm \cdot C$ where Vm = Actual volume ($\rightarrow$ 3.2)
                                    C   = Conversion factor ($\rightarrow$ 3.5)

Qb   **Flow at base conditions**
Momentary flow at base conditions (standard flow rate).
$Qb = Qm \cdot C$ with Qm = Actual flow ($\rightarrow$ page 26)
                                      C   = Conversion factor ($\rightarrow$ page 38)
The measurement inaccuracy of Qb is maximum 2% to 11% depending on the boundary conditions quoted for Qm ($\rightarrow$ page 26).
In the alarm state Qb is computed with the substitute values of the disturbed measurements.

VbD   **Vb disturbed**
Here the volume at base conditions is summed while ever an alarm is present, i.e. a message with the number "1" or "2" is located in any momentary status ($\rightarrow$ 3.7).
In the alarm state the volume at base conditions is computed with the substitute values of the disturbed quantities. ($\rightarrow$ 3.3: *p.F*, 3.4: *T.F*)

VbT   **Vb total**
Here the sum of *Vb* + *VbD* is always displayed. Entries for *Vb* or *VbD* therefore also have an effect here. No entry for *VbT* itself can be carried out.

VbA   **Vb adjustable**
Here, as with *VbT*, the total quantity, i.e. disturbed and undisturbed volumes, are counted. In contrast to *VbT*, *VbA* can however be changed manually.
The counter is typically used for tests.

SC.Qb Source for Warning Qb
QbUW Upper warning limit Qb
QbLW Lower warning limit Qb

Using these three values, the flow at base conditions can be monitored in various ways. When the value to be monitored exceeds the upper limit *QbUW* or falls below the lower limit *QbLW*, the message "Vb Warn Lim." is entered in *St.2* ($\rightarrow$ page 51).

Various actions can in turn be programmed for this message, such as for example, entry of the change of status in the logbook ($\rightarrow$ 3.7) or activation of a signalling output ($\rightarrow$ 3.11).

With *SC.Qb* you can set which value is to be monitored.

SC.Qb	Value to be monitored
0002:310_0	*Qb* Flow at base conditions
0001:160_0	VbMP Δ Meas. period counter Vb
0002:160_0	*VbDy* Δ Daily counter Vb

For further details on entering a source for *SC.Qb*: See Chap. 2.3.2.

VbMP Δ Measurement period counter Vb

VbMP Δ is restarted at "0" at the beginning of each measurement period ($\rightarrow$ 3.6) and indicates the progress of *VbT* (see above). The measurement period *MPer* can be set in the archive list ($\rightarrow$ 3.6).

At the end of each measurement period *VbMP* Δ is saved in the measurement period archive ($\rightarrow$ 3.6).

VbMP Δ can be monitored by appropriate programming of *SC.Qb* and *QbUW* (see above) in order, for example, to issue a warning signal to a special-contract customer when a limit is exceeded.

VbMP max   Max. measurement period counter Vb in current month

By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

The maxima of the last 15 months can be interrogated in the month archive 1 ($\rightarrow$ 3.6).

VbDy Δ Daily counter Vb

VbDy Δ is restarted with "0" at the start of each day and indicates the progress of *VbT* (see above). As standard, the start of day is set to 06:00 hrs. and can be changed with the calibration lock open via the serial interfaces under the address "2:141".

VbDy max   Max. daily counter Vb in current month

By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

The maxima of the last 15 months can be interrogated in the month archive 1 ($\rightarrow$ 3.6).

3.2 Actual volume (volume at measurement conditions) list

AD	Designation / value	Unit	Access	Address	DC
Vm	Actual volume	m3	PL	4:300	12
Qm	Actual flow rate	m3/h	-	4:310	4
VmD	Vm disturbed	m3	S	4:301	12
VmT	Vm total	m3	-	4:302	15
VmA	Vm adjustable	m3	S	4:303	12
SC.Q	Source for Warning Q	-	S	8:154	8
QmUW	Upper warning limit Qm	m3/h	K	8:158	8
QmLW	Lower warning limit Qm	m3/h	K	8:150	8
VmMP Δ	Measurement period counter Vm	m3	-	8:160	16
VmMP max	Max. meas. per. count. Vm current month	m3	-	10:160	16
VmDy Δ	Daily counter Vm	m3	-	9:160	16
VmDy max	Max. daily count. Vm current month	m3	-	11:160	16

Vm   Actual volume

The volume *V1* ($\rightarrow$ 3.10) measured on the input is summed here provided no alarm is present.

"Alarm" means "any message with the number "1" or "2" ($\rightarrow$ 3.7).

The entry of Vm is not possible in the encoder mode (Md.I1 = 5). An attempt to make an entry leads to entry error "11" ($\rightarrow$ 2.3.3)

In the encoder mode, to bring Vm to the gas meter reading and to clear VmD, Md.I1 ($\rightarrow$ 3.10) can first be set to "0" and then set again to "5".

Qm   Actual flow rate

Momentary actual flow (actual flow rate).

The measurement inaccuracy of the displayed actual flow rate depends on whether a pulse transmitter or an encoder is connected:

With a connected pulse transmitter:

With a pulse interval of a maximum of 15 minutes (at least four pulses per hour) and *cp.I1* $\leq$ 1 ($\rightarrow$ page 64) the measurement uncertainty of *Qm* is maximum 1%. With a pulse interval of more than 15 minutes *Qm* = "0" is displayed. After a change of the gas flow the accurate value can only be shown once the gas meter has sent at least two pulses.

With a connected encoder:

If the counter reading changes every 2 seconds or quicker, the measurement uncertainty of *Qm* is maximum 1%.

With counter reading changes every 200 seconds or quicker the measurement uncertainty is maximum 10%. It can be reduced down to 2% at *MCyc* = 4 seconds by reducing the measuring cycle *MCyc* ($\rightarrow$ page 56).

If the encoder counter reading does not change for longer than 200 seconds, *Qm* = "0" is displayed.

VmD   Vm disturbed

Here the actual volume is summed while ever an alarm is present, i.e. a message with the number "1" or "2" is located in any momentary status ($\rightarrow$ 3.7).

The entry of VmD is not possible in the encoder mode (Md.I1 = 5). An attempt to make an entry leads to entry error "11" ($\rightarrow$ 2.3.3)

In the encoder mode, to clear VmD and to bring Vm to the gas meter reading, Md.I1 ($\rightarrow$ 3.10) can first be set to "0" and then set again to "5".

VmT   Vm total

Here the sum of *Vm + VmD* is always displayed. Entries for *Vm* or *VmD* therefore also have an effect here. No entry for *VmT* itself can be carried out.

With the connection of an encoder (*Md.I1* = 5, $\rightarrow$ 3.10), VmT corresponds with two exceptions to the original counter Vo ($\rightarrow$ 3.10) and so also to the gas meter reading:

− When the gas meter runs backwards, VmT stops and only continues synchronously with the gas meter again when the meter has a higher reading than before it started to run backwards.

− VmT always has 9 pre-decimal and 4 post-decimal places, whereas the encoder always has 8 significant places and has between 6 and 9 pre-decimal places depending on the cp value of the gas meter. With a cp value of "1" VmT has one pre-decimal place more which is incremented with each overflow of the gas meter.

VmA   Vm adjustable

Here, as with *VmT*, the total quantity, i.e. disturbed and undisturbed volumes are counted. In contrast to *VmT*, *VmA* can however be changed manually.

This counter is typically set to the same reading as the gas meter in order to be able to easily detect deviations by comparison of the two counter readings.

SC.Q   Source for Warning Q
QmUW Upper warning limit Qm
QmLW Lower warning limit Qm

Using these three values, the actual flow can be monitored in various ways. When the value to be monitored exceeds the upper limit *Qm.UW* or falls below the lower limit *Qm.LW*, the message "Vm Warn Lim." is entered in *St.4* ($\rightarrow$ page 51).

Various actions can in turn be programmed for this message, such as for example, entry of the change of status in the logbook ($\rightarrow$ 3.6) or activation of a signalling output ($\rightarrow$ 3.11).

With *SC.Q* you can set which value is to be monitored.

SC.Q	Value to be monitored
0004:310_0	*Qm* Actual flow rate
0008:160_0	VmMP Δ Measurement period counter Vm
0009:160_0	*VmDy Δ* Daily counter Vm

For further details on entering a source for *SC.Q*: See Chap.2.3.2.

VmMP Δ Measurement period counter Vm

VmMP Δ is restarted with "0" at the beginning of each measurement period ($\rightarrow$ 3.6) and indicates the progress of *VmT* (see above). The measurement period *MPer* can be set in the archive list ($\rightarrow$ 3.6).

At the end of each measurement period *VmMP Δ* is saved in the measurement period archive ($\rightarrow$ 3.6).

VmMP Δ can be monitored by appropriate programming of *SC.Qb* and *QbUW* (see above) in order, for example, to issue a warning signal to a special-contract customer when a limit is exceeded.

VmMP max   Max. measurement period counter Vm in current month

By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

The maxima of the last 15 months can be interrogated in the monthly archive 1 ($\rightarrow$ 3.6).

VmDy Δ Daily counter Vm

VmDy Δ is restarted with "0" at the beginning of each day and indicates the progress of *VmT* (see above). As standard, the start of day is set to 06:00 hrs. and can be changed if required via the serial interfaces under the address "2:141".

VmDy max   Max. daily counter Vm in current month

By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

The maxima of the last 15 months can be interrogated in the month archive 1 ($\rightarrow$ 3.6).

3.3 Pressure list

AD	Designation / value	Unit	Access	Address	DC
p	Pressure	bar	-	7:310_1	4
p.LW	Lower warning limit pressure	bar	S	10:150	8
p.UW	Upper warning limit pressure	bar	S	10:158	8
pMin	Lower alarm limit pressure	bar	C	7:3A8_1	8
pMax	Upper alarm limit pressure	bar	C	7:3A0_1	8
MRL.p	Pressure meas. range lower limit	bar	C	6:224_1	8
MRU.p	Pressure meas. range upper limit	bar	C	6:225_1	8
p.F	Pressure substitute value	bar	S	7:311_1	8
pb	Pressure at base conditions	bar	C	7:312_1	8
Md.p	Pressure mode	-	C	7:317	7
Typ.p	Pressure sensor type	-	C	6:223	8
SNp	Serial no. of pressure sensor	-	C	6:222	8
Eq1p	Coefficient 1 of pressure equation	-	C	6:280	8
Eq2p	Coefficient 2 of pressure equation	-	C	6:281	8
Eq3p	Coefficient 3 of pressure equation	-	C	6:282	8
p1Adj	Adjustment value 1 for pressure	bar	C	6:260_1	8
p2Adj	Adjustment value 2 for pressure	bar	C	6:261_1	8
Prog	Accept pressure adjustment	-	C	6:259	2
p.Amb	Air pressure fixed value	bar	C	6:212_1	8
p.Mes	Pressure meas.	bar	-	6:211_1	4
p.Abs	Absolute pressure measurement	bar	-	6:210_1	4
p.MP Ø	Measurement period mean pressure	bar	-	19:160	16
p.Mon max	Month's maximum pressure	bar	-	21:160	16
p.Mon min	Month's minimum pressure	bar	-	22:160	16

p   **Press.**

p is the pressure which is used for computing the conversion factor ($\rightarrow$ 3.5) and hence the volume at base conditions ($\rightarrow$ 3.1).

In disturbance-free operation the measurement *p.Abs* (see below) is used: *p* = p.Abs.

With a relevant disturbance (alarm), the substitute value *p.F* (see below) is used: *p* = *p.F*. In addition, disturbance quantities are then counted ($\rightarrow$ 3.1, 3.2) and the message "p Alarm Lim." displayed ( ). Relevant disturbances are:

– *p.Abs* is located outside of the set limits *pMin* and *pMax* (see below).

– With a connected encoder (Md.I1 = 5, $\rightarrow$ 3.10) no actual volume can be measured for more than 20 seconds. Since the gas flow variation is not known for the time period and therefore no gas quantities can be assigned to the measured values of pressure and temperature, the correction occurs as disturbance quantities with substitute values for pressure and temperature. ($\rightarrow$ 4.5)

p.LW   Lower warning limit pressure
p.UW   Upper warning limit pressure

These values are used for monitoring the gas pressure p: When p exceeds the upper limit *p.UW* or falls below the lower limit *p.LW*, the message "p Warn Lim." is entered in *St.7*. ($\rightarrow$page 51)

Various actions can in turn be programmed for this message, such as for example, entry of the change of status in the logbook ($\rightarrow$ 3.6) or activation of a signalling output ($\rightarrow$ 3.11).

pMin   Lower alarm limit pressure
pMax   Upper alarm limit pressure

The validity of the measured pressure *p.Abs* (see below) is checked based on these alarm limits. This monitoring does <u>not</u> occur when *pMin = pMax*.

If *p.Abs* is located within the alarm limits, it is used as p (see below) for correction: p = p.Abs.

If *p.Abs* is located outside the alarm limits, the substitute value *p.F* (see below) is used: p = p.F. In addition, disturbance quantities are counted in this case ($\rightarrow$ 3.1, 3.2) and the message "p Alarm Lim." is displayed. ($\rightarrow$ page 48)

MRL.p   Pressure meas. range lower limit
MRU.p   Pressure meas. range upper limit

These details of the measurement range are used to identify the pressure sensor. They have no effect on the measurements.

p.F   Pressure substitute value

If the measured pressure *p.Abs* is outside the alarm limits *pMin* and *pMax* (see below), *p.F* is used as pressure p for correction. p = p.F.

pb   Pressure at base conditions

The pressure at base conditions is used for computing the conversion factor ($\rightarrow$ 3.5) and hence the volume at base conditions.

Md.p   Pressure mode

With *Md.p* = "1" the measured pressure *p.Abs* (see below) is used for correction, provided it does not violate the alarm limits.

With *Md.p* = "0" the fixed value (substitute value) *p.F* is always used for correction. No disturbance quantities are counted.

☞   *Please only enter "1" or "0" for Md.T. Depending on the system, further values which cannot be used here are presented after pressing <ENTER>.*

Typ.p   Pressure sensor type

Here the designation of the pressure sensor is displayed which was selected in the service list with *Sel.p*. ($\rightarrow$ 3.9).

SNp   Serial no. of pressure sensor

Identification of the pressure sensor associated with the EK260.

Eq1p **Coefficient 1 of pressure equation**
Eq2p **Coefficient 2 of pressure equation**
Eq3p **Coefficient 3 of pressure equation**

The coefficients of the quadratic equation for calculating the pressure *p.Mes* from the raw pressure value *Bin.p* ($\rightarrow$ 3.9):

$$p.Mes = Eq1p + Eq2p \cdot Bin.p + Eq3p \cdot Bin.p^2$$

To adjust the pressure measurement circuit, the three coefficients of the quadratic equation can either be found by the EK260 itself after entry of *Prog* (see below) or calculated and entered by the user.

The latter occurs based on three values for *Bin.p* and the corresp. set values.

The EK260 itself assumes a linear characteristic and after the entry of *Prog* (see below) only determines the coefficients *Eq1p* and *Eq2p*. The third coefficient *Eq3p* remains unchanged. The standard value for *Eq3p* is "0".

p1Adj **Adjustment value 1 for pressure**
p2Adj **Adjustment value 2 for pressure**
Prog **Accept pressure adjustment**

These values are used for the adjustment of the pressure measurement circuit, i.e. for the internal computation of the equation coefficients for the pressure (see above).

The adjustment takes place in three steps:

1. Apply measurement pressure 1 (= reference value 1) to the pressure sensor and enter as *p1Adj*.

2. Apply measurement pressure 2 (= reference value 2) to the pressure sensor and enter as *p2Adj*.

3. Enter *Prog* = "1" so that the EK260 calculates the equation coefficients.

After applying the measurement pressure, you should either wait about one minute each time before entering the adjustment or press <ENTER> number of times during the display of the pressure measurement *p.Mes* (see below) until the displayed value is stable.

Approx. $0.4 \cdot pMax$ and approx. $0.9 \cdot pMax$ should be selected as adjustment values.

p.Amb **Air pressure fixed value**
p.Mes **Pressure measurement**
p.Abs **Absolute pressure measurement**

p.Abs is the sum of *p.Amb* and *p.Mes*: *p.Abs* = *p.Amb* + *p.Mes*.

"0" should be entered when using an absolute pressure sentors and the ambient pressure when using a gauge pressure sensor.

p.Mes is the absolute or gauge pressure depending on the pressure sensor.

If the measured pressure *p.Abs* is within the alarm limits *pMin* and *pMax* (see above), then it is used as the pressure *p* for correction: *p* = *p.Abs*.

p.MP Ø **Measurement period mean pressure**

p.MP Ø is the averaged value of all pressure measurements within the current measurement period.

At the end of each measurement period *p.MP Ø* is saved in the measurement period archive ($\rightarrow$ 3.6).

p.Mon max   Month's maximum pressure
p.Mon min   Month's minimum pressure

p.Mon max is the highest, *p.Mon min* the lowest of all pressure measurements within the current month.

By entering <ENTER> you can branch to the relevant submenu where the corresponding time stamp is displayed.

The maxima and minima of the last 15 months can be interrogated in the monthly archive 2 ($\rightarrow$ 3.6).

3.4 Temperature list

AD	Designation / value	Unit	Access	Address	DC
T	Temperature	°C	-	6:310_1	4
T.LW	Lower warning limit temperature	°C	S	9:150	8
T.UW	Upper warning limit temperature	°C	S	9:158	8
TMin	Lower alarm limit temperature	°C	C	6:3A8_1	8
TMax	Upper alarm limit temperature	°C	C	6:3A0_1	8
MRL.T	Temperature meas. range lower limit	°C	C	5:224_1	8
MRU.T	Temperature meas. range upper limit	°C	C	5:225_1	8
T.F	Temperature substitute value	°C	S	6:311_1	8
Tb	Temperature at base conditions	K	C	6:312	8
Md.T	Temperature mode	-	C	6:317	7
Typ.T	Temp. sensor type	-	C	5:223	8
SNT	Serial number of temperature sensor	-	C	5:222	8
Eq1T	Coefficient 1 of temperature equation	-	C	5:280	8
Eq2T	Coefficient 2 of temperature equation	-	C	5:281	8
Eq3T	Coefficient 3 of temperature equation	-	C	5:282	8
T1Adj	Adjustment value 1 for temperature	°C	C	5:260_1	8
T2Adj	Adjustment value 2 for temperature	°C	C	5:261_1	8
Prog	Accept temperature adjustment	-	C	5:259	2
T.Mes	Temperature measurement	°C	-	5:210_1	4
T.MP Ø	Measurement period mean temperature	°C	-	15:160	16
T.Mon max	Month's maximum temperature	°C	-	17:160	16
T.Mon min	Month's minimum temperature	°C	-	18:160	16

(Legends: see page 23)

T   Temperature

T is the temperature which is used for computing the conversion factor ($\rightarrow$ 3.5) and hence the volume at base conditions ($\rightarrow$ 3.1).

In disturbance-free operation the measurement *T.Mes* (see below) is used: *T = T.Mes*.

With a relevant disturbance (alarm), the substitute value *T.F* (see below) is used: *T = T.F*.

In addition, disturbance quantities are then counted ($\rightarrow$ 3.1, 3.2) and the message "T Alarm Lim." displayed ($\rightarrow$ page 48). Relevant disturbances are:

− *T.Mes* is located outside of the set alarm limits *TMin* and *TMax* (see below).

− With a connected encoder (Md.I1 = 5, $\rightarrow$ 3.10) no actual volume can be measured for more than 20 seconds. Since the gas flow variation is not known for the time period and therefore no gas quantities can be assigned to the measured values of pressure and temperature, the conversion occurs as disturbance quantities with substitute values for pressure and temperature. ($\rightarrow$ 4.5)

T.LW   Lower warning limit temperature
T.UW   Upper warning limit temperature

These values are used for monitoring the gas temperature T: When T exceeds the upper limit $T.UW$ or falls below the lower limit $T.LW$, the message "T Warn Lim." is entered ($\rightarrow$ page 51).

Various actions can in turn be programmed for this message, such as for example, entry of the change of status in the logbook ($\rightarrow$ 3.7) or activation of a signalling output ($\rightarrow$ 3.11).

TMin   Lower alarm limit temperature
TMax   Upper alarm limit temperature

The validity of the measured temperature $T.Mes$ (see below) is checked, based on these alarm limits. This monitoring does <u>not</u> occur when TMin = TMax.

If $T.Mes$ is located within the alarm limits, it is used as T (see below) for conversion: $T = T.Mes$.

If $T.Mes$ is located outside the alarm limits, the substitute value $T.F$ (see below) is used: $T = T.F$. In addition, disturbance quantities are then counted ($\rightarrow$ 3.1, 3.2) and the message "T Alarm Lim." displayed ($\rightarrow$ page 48).

MRL.T Temperature meas. range lower limit
MRU.T Temperature meas. range upper limit

These details of the measurement range are used to identify the temperature sensor. They have no effect on the measurements.

T.F   Temperature substitute value

If the measured temperature $T.Mes$ is outside the alarm limits $TMin$ and $TMax$ (see below), $T.F$ is used as temperature T for conversion. $T = T.F$.

Tb   Temperature at base conditions

The temperature at base conditions is used for computing the conversion factor ($\rightarrow$ 3.5) and hence the volume at base conditions.

Md.T   Temperature mode

With $Md.T$ = "1" the measured temperature $T.Mes$ (see below) is used for conversion, provided it does not violate the alarm limits.

With $Md.T$ = "0" the fixed value (substitute value) $T.F$ is always used for conversion. No disturbance quantities are counted.

☞   *Please only enter "1" or "0" for Md.T. Depending on the system, further values which cannot be used here are presented after pressing <ENTER>.*

Typ.T   Temperature sensor type
SNT   Serial number of temperature sensor

Identification of the temperature sensor associated with the EK260.

Eq1T **Coefficient 1 of temperature equation**
Eq2T **Coefficient 2 of temperature equation**
Eq3T **Coefficient 3 of temperature equation**

The coefficients of the quadratic equation for calculating the temperature *T.Mes* from the raw temperature value *Bin.T* ($\rightarrow$ 3.9):

$$T.Mes = Eq1T + Eq2T \cdot Bin.T + Eq3T \cdot Bin.T^2$$

To adjust the temperature measurement circuit, the three coefficients of the quadratic equation can either be found by the EK260 itself after entry of *Prog* (see below) or calculated and entered by the user.

The latter occurs based on three values for *Bin.T* and the corresp. set values.

The EK260 itself assumes a linear characteristic and after the entry of *Prog* (see below) only determines the coefficients *Eq1T* and *Eq2T*. The third coefficient *Eq3p* remains unchanged. The standard value for *Eq3T* is $6.411 \cdot 10^{-8}$.

T1Adj **Adjustment value 1 for temperature**
T2Adj **Adjustment value 2 for temperature**
Prog **Accept temperature adjustment**

These values are used for the adjustment of the temperature measurement circuit, i.e. for the internal computation of the equation coefficients for the temperature (see above).

The adjustment takes place in three steps:

1. Apply measurement temperature 1 (= reference value 1) on the temperature sensor and enter as *T1Adj*.

2. Apply measurement temperature 2 (= reference value 2) on the temperature sensor and enter as *T2Adj*.

3. Enter *Prog* = "1" so that the EK260 calculates the equation coefficients.

After applying the measurement temperature, you should either wait about one minute each time before entering the adjustment or press <ENTER> a number of times during the display of the temperature measurement *T.Mes* (see below) until the displayed value is stable.

To optimise the accuracy, the adjustment values should be located as close as possible to the measurement range limits *MRL.T* and *MRU.T* (e.g. -10°C and +60°C).

T.Mes **Temperature measurement**

If the measured temperature *T.Mes* is within the alarm limits *TMin* and *TMax* (see below), then it is used as the temperature *T* (see above) for conversion. *T = T.Mes*.

T.MP Ø **Measurement period mean temperature**

T.MP is the averaged value of all temperature measurements within the current measurement period.

At the end of each measurement period *T.MP Ø* is saved in the measurement period archive ($\rightarrow$ 3.6).

T.Mon max   Month's maximum temperature
T.Mon min   Month's minimum temperature

> *T.Mon max* is the highest, *T.Mon min* the lowest of all temperature measurements within the current month.
>
> By entering <ENTER> you can branch to the relevant submenu where the corresponding time stamp is displayed.
>
> The maxima and minima of the last 15 months can be interrogated in the monthly archive 2 ($\rightarrow$ 3.6).

3.5 Volume corrector list

Which values are displayed in this list depends on the set K-value and the computation mode *Md.K* (see below):

a) Computation according to S-Gerg-88 (Md.K = 1)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
K	Inverted compressibility factor ratio	-	-	8:310	4
pbX	Pressure at base conditions for gas analysis	bar	S	7:314_1	8
TbX	Temperature at base cond. for gas analysis	°C	S	6:314_1	8
Ho.b	Calorific value	kWh/m3	S	10:312_1	8
CO2	Carbon dioxide content	%	S	11:311	8
H2	Hydrogen content	%	S	12:311	8
Rhob	Density gas at base conditions	kg/m3	S	13:312_1	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

b) Computation according to AGA-NX19 (Md.K = 2)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
K	Inverted compressibility factor ratio	-	-	8:310	4
pbX	Pressure at base conditions for gas analysis	bar	S	7:314_1	8
TbX	Temperature at base cond. for gas analysis	°C	S	6:314_1	8
Ho.b	Calorific value	kWh/m3	S	10:311_1	8
CO2	Carbon dioxide content	%	S	11:311	8
N2	Nitrogen content	%	S	14:311	8
dr	Density ratio	-	S	15:311	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

c) Computation according to AGA-8 Gross Characterisation Method 1 (Md.K = 3)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
K	Inverted compressibility factor ratio	-	-	8:310	4
pbX	Pressure at base cond. for gas analysis	bar	S	7:314_1	8
TbX	Temperature at base cond. for gas analysis	°C	S	6:314_1	8
Ho.b	Calorific value	kWh/m3	S	10:314_1	8
CO2	Carbon dioxide content	%	S	11:314	8
dr	Density ratio	-	S	15:314	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

d) Computation according to AGA-8 Gross Characterisation Method 2 (Md.K = 4)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
K	Inverted compressibility factor ratio	-	-	8:310	4
CO2	Carbon dioxide content	%	S	11:314	8
N2	Stickstoff-Anteil	%	S	14:314	8
dr	Density ratio	-	S	15:314	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

e) Computation according to AGA-NX19 following Herning & Wolowsky (Md.K = 5)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
K	Inverted compressibility factor ratio	-	-	8:310	4
CO2	Carbon dioxide content	%	S	11:314	8
N2	Nitrogen content	%	S	14:314	8
dr	Density ratio	-	S	15:314	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

f) Constant K value (Md.K = 0)

AD	Designation / value	Unit	Access	Address	DC
C	Conversion factor	-	-	5:310	4
Ho.b	Calorific value	kWh/m3	S	10:311_1	8
K.F	K-value substitute value	-	S	8:311	8
Md.K	K-value mode	-	PL	8:317	7

The rated operating conditions applying to the various conversion methods are described in Chapter 4.1.

C   Conversion factor

The conversion factor is calculated according to the following formula:

$$C = \frac{1}{K} \cdot \frac{p}{pb} \cdot \frac{Tb}{T}$$

(p, pb: $\rightarrow$ 3.3, T, Tb $\rightarrow$ 3.4, K: see below)

K   Inverted compressibility factor ratio (K-value)

The inverted compressibility factor ratio is used for computing the conversion factor (see above). It is calculated according to the following formula:

$$K = \frac{Z}{Z_b}$$

where Z = compressibility factor and Z_b = compressibility factor at reference conditions.

The computation of Z and Zb occurs according to S-Gerg-88 or AGA-NX19 depending on the setting of Md.K. The gas analysis values *Ho.b*, *CO2*, *H2* and *Rhob* (Md.K = 1) or N2 and dr (Md.K = 2) need to be included in the entries for this (see below).

If the K-value mode *Md.K* (see below) is set to "fixed value" (= "0"), *K* is not computed, but the substitute value *K.F* (see below) is used instead.

pbX   Pressure at base conditions for the gas analysis

TbX   Temperature at base conditions for the gas analysis

The standard states described by *pbX* and *TbX* apply to the entry of the gas analysis *Ho.b, CO2 ... dv* (see below). In contrast to this the conversion factor *C* (see above and the volume at base conditions *Vb* ($\rightarrow$ 3.1) are calculated according to pb and *Tb* ($\rightarrow$ 0 and 3.4).

With each change of *pb* or *Tb, pbX* resp. *TbX* is automatically set to the same value. For different values *pbX* or *TbX* must be entered after *pb* resp. *Tb*.

Ho.b   Calorific value

CO2   Carbon dioxide content

H2   Hydrogen content   (only for *Md.K* = 1)

Rhob   Density gas at base conditions (only for *Md.K* = 1)

N2   Nitrogen content   (only for *Md.K* = 2)

dr   Density ratio   (only for *Md.K* = 2)

Depending on the set K-value mode *Md.K*, these gas analysis values must be entered so that the inverted compressibility factor ratio *K* can be correctly computed.

For calculations according to S-Gerg-88 (*Md.K* = 1) and/or AGA-NX19 (*Md.K* = 2) the valid ranges are:

Ho.b	6.0	...13.0	kWh/m^3
CO2	0.0	...30.0	Mol-%
H2	0.0	...10.0	Mol-%
Rhob	0.71	...1.16	kg/m^3
N2	0.0	...30.0	Mol-%
dr	0.554	...0.900	for "L gas" (*Ho.b* $\leq$ 11.055)
	0.554	...0.691	for "H gas" (*Ho.b* > 11.055)

☞   *Furthermore, the following limits must be ensured by the gas supplier:*

Methane	CH_4	*50 - 100 %*	*Propane*	C_3H_8	*0 - 5 %*
Nitrogen	N_2	*0 - 50 %*	*Butane*	C_4H_{10}	*0 - 1 %*
Ethane	C_2H_6	*0 - 20 %*	*Pentane*	C_5H_{12}	*0 – 0.5 %*

K.F   K-value substitute value

If the K-value mode *Md.K* (see below) is set to "fixed value" (= "0"), the constant substitute value *K.F* is used instead of the calculated inverted compressibility factor ratio *K* for the computation of the conversion factor *C* (see above).

Md.K   K-value mode

With *Md.K* you can set whether the conversion factor *C* ($\rightarrow$ 3.5) and hence the volume at base conditions *Vb* ($\rightarrow$ 3.1) are determined with the calculated K-value or with the constant K-value, *K.F*:

Md.K = "0": The fixed value (substitute value) *K.F* is used.

Md.K = "1": The K-value is calculated according to S-Gerg-88.

Md.K = "2": The K-value is calculated according to AGA-NX19.

Md.K = "3": The K-value is calculated according to the AGA-8 Gross characterisation method 1.

Md.K = "4": The K-value is calculated according to the AGA-8 Gross characterisation method 2.

Md.K = "5": The K-value is calculated according to AGA-NX19 following Herning & Wolowsky.

3.6 Archive list

AD	Designation / value	Unit	Access	Address	DC
ArMo1	Monthly archive 1	-	-	1:A30	8
ArMo2	Monthly archive 2	-	-	2:A30	8
ArMP	Measurement period archive	-	-	3:A30	8
MPer	Measurement period	Minutes	PL	4:150	8
MP.Re	Remaining time of measurement period	Minutes	-	4:15A	15
FrMP	Freeze measurement period	-	S	3:A50	2

(Legends: see page 23)

ArMo1 Monthly archive 1

Entry point for the first monthly archive in which counter readings and consumption maxima from the last 15 months are saved.

The day boundary (= month boundary) "06:00 hrs." can be changed via the serial interfaces under the address 2:141.

Each archive data row has the following entries:

$\leftrightarrow$ To "Check"	ABNo Block number	Time Storage time	Vb Volume at base cond.	VbT Totaliser Vb	VbMP max Month's maximum	Time Time-point VbMP max	Stat Status for VbMP max	$\leftrightarrow$

$\leftrightarrow$	VbDy max Month's maximum	Time Time-point VbDy max	Stat Status for VbDy max	Vm Actual volume	VmT Totaliser Vm	VmMP max Month's maximum	Time Time-point VmMP max	$\leftrightarrow$

$\leftrightarrow$	Stat Status for VmMP max	VmDy max Month's maximum	Time Time-point VmDy max	Stat Status for VmDy max	St.2 Status 2 (incl. Vb)	St.4 Status 4 (incl. Vm)	Check Checksum	$\leftrightarrow$ To "ABNo"

ArMo2 Monthly archive 2

Entry point for the second monthly archive in which maxima, minima and some mean values for Qb, Qm, p, T from the last 15 months are saved.

The day boundary (= month boundary) "06:00 hrs." can be changed via the serial interfaces under the address "2:141".

Each archive data row has the following entries:

ABNo	Time
Block number	Storage time

Qb max	Time	Stat	Qb min	Time	Stat
Month's maximum	Time-point Qb max	Status for Qb max	Month's minimum	Time-point Qb min	Status for Qb min

Qm max	Time	Stat	Qm min	Time	Stat
Month's maximum	Time-point Qm max	Status for Qm max	Month's minimum	Time-point Qm min	Status for Qm min

p.Mon Ø	p.Mon max	Time	Stat	p.Mon min	Time	Stat
Pressure mean	Month's maximum	Time-point p max	Status for p max	Month's minimum	Time-point p min	Status for p min

T.Mon Ø	T.Mon max	Time	Stat	T.Mon min	Time	Stat
Temperature mean	Month's maximum	Time-point T max	Status for T max	Month's minimum	Time-point T min	Status for T min

K.Mon Ø	C.Mon Ø	St.7	St.6	St.8	St.5	Check
K-value mean	C factor mean	Status 7 (incl. p)	Status 6 (incl. T)	Status 8 (incl. K)	Status 5 (incl. C)	Checksum

ArMP Measurement period archive

Entry point for the measurement period archive where counter readings and measurements are archived in the cycle of the measurement period *MPer*. The archive has approx. 7000 data rows, corresponding to a memory depth of about 9 months for a measurement period of 60 minutes.

Each archive data row has the following entries:

ABNo	Time	Vb	Δ Vb	VbT	Δ VbT	Vm
Block number	Storage time	Volume at base cond.	Counter increment	Totaliser Vb	Counter increment	Actual volume

Δ Vm	VmT	Δ VmT	p.MP Ø	T.MP Ø	K.MP Ø	C.MP Ø
Counter increment	Totaliser Vm	Counter increment	Pressure mean	Temperature mean	K-value mean	C factor mean

St.2	St.4	St.7	St.6	StSy	Ev	Check
Status 2 (incl. Vb)	Status 4 (incl. Vm)	Status 7 (incl. p)	Status 6 (incl. T)	System status	Trigger event	Checksum

The totalizer increments in comparison to the corresponding previous entry are identified with a "Δ". They are only shown in the display and are not read out over the interface.

Normally, the flow (consumption) within a measurement period is involved here. This does not occur when an archive row has been entered due to a special event (e.g. setting of the clock or of a counter, appearance of an important status message). Then the segment "Δ" and the abbreviated designation flash for the displayed counter increment in order to make the user aware of this special feature.

With the supplier's lock open, it is possible to set which counters and associated counter increments are saved in this archive using the "WinPADS" parameterisation software. The change is recorded in the PTB logbook. The archives are deleted when the counters are changed:

Meaning	Address	Standard setting	
		Value	Meaning
1st counter in the archive	3:0C00	2:0300	Vb
2nd counter in the archive	3:0C01	2:0302	VbT
3rd counter in the archive	3:0C02	4:0300	Vm
4th counter in the archive	3:0C03	4:0302	VmT

MPer **Measurement period**

With the measurement period that can be set here, all values related to the measurement period are formed. These are: *VbMP* Δ ($\rightarrow$ 3.1), *VmMP* Δ ($\rightarrow$ 3.2), *p.MP* Ø ($\rightarrow$ 3.3) , *T.MP* Ø ($\rightarrow$ 3.4) as well as values present in the measurement period archive *ArMP* (see above).

MPer must be an integer multiple of the operating cycle *OCyc* ($\rightarrow$ 56) so that the measurement period values (e.g. VbMP Δ, VbDy Δ , p.MP $\varnothing$, T.MP $\varnothing$) can be concluded at the correct points in time.

With the default setting for *OCyc* the following values for *MPer* are practicable and usual: 5, 10, 15, 20, 30 or 60 minutes.

MP.Re **Remaining time of measurement period**

Display of remaining time for the current measurement period for the user's information. The output is given right-justified in minutes.

FrMP **Measurement period archive, freeze**

A data row can be saved in the measurement period archive *ArMP* (see above) with this function. Based on the "trigger event" *Er* which is also saved, it can be seen in the data row whether it was saved automatically due to the expired measurement period or by triggering of *FrMP*.

3.6.1 Device numbers and channel numbers for WinView and WinLIS

The contents of the archives described here are suitable for processing with the WinLIS and WinVIEW evaluation programs. The data is allocated there to so-called "device numbers" (DS-100 numbers). Within each "device number" the so-called "channel number", indicating the type of data, is located at the fifth position from the right (ten thousands position).

Channel number	Value	
1	Vb	Volume at base conditions (undisturbed)
2	VbT	Total volume at base conditions
3	Vm	Actual volume (undisturbed)
4	VmT	For pulse counting: Total actual volume
	Vo	In the encoder mode: Actual reading of the encoder counter
5	C	Conversion factor
6	T	Gas temperature
7	p	Gas pressure
8	K	K-value

Examples:
- Device number: 1438004 $\Rightarrow$ Channel number = 3 $\Rightarrow$ Vm (Actual volume undisturbed)
- Device number: 1479321 $\Rightarrow$ Channel number = 7 $\Rightarrow$ p (Gas pressure)

3.6.2 Find function for checking the archive entries

The measurement period archive comprises many thousands of entries. The device has a Find function for archive entries in order to be able to display single values from this quantity of data for checking purposes. Values can be sought in the following columns:

- Block number
- Date and time
- Counter readings

The search takes place initially by selecting the desired column (block number, date/time or counter reading) in any archive row. Once the "ENTER" key has been pressed, the value to be found in this column can be entered. After termination of the entry with <ENTER>, the display skips to the archive row with the entered value. If it is not present, the display skips to the entry which is closest to the one sought.

3.7 Status list

AD	Designation / value	Unit	Access	Address	DC
SReg	Status register, total	-	-	1:101	19
Stat	Momentary register, total	-	-	1:100	5
Clr	Clear status register	-	S	4:130	2
Logb.	Logbook	-	-	4:A30	8
AudTr	Audit Trail	-	-	5:A30	8
PLogB	Calibration logbook (PTB logbook)	-	-	9:A30	8
ClrPL	Clear calibration logbook	-	C	9:A52	2

<div align="right">(Legends: see page 23)</div>

SReg   Status register, total
Stat   Momentary register, total

The EK260 supplies two types of status information: Momentary status (also known as "status") and the status register.

- Messages in the momentary status point to current statuses such as for example, errors that are present. When the condition is no longer present, the corresponding message in the momentary status disappears. Manual deletion is not possible. Alarms, warnings and reports (i.e. messages with numbers in the range from "1" to "16") are displayed in the momentary statuses.

- In the status register all messages since the last manual clearing are collected. Here, you can also see what has happened, for example, since the last station inspection. The messages can be cleared in this list with the command "Clr".

Only alarms and warnings (i.e. messages with numbers in the range from "1" to "8") are displayed in status registers. Reports are not entered because they identify states which are not problematical or may even be intended (e.g. "Daylight saving time", "Calibration lock open" or "Data transfer running").

SReg and *Stat* initially show all existing messages as numbers.

They can be recalled individually as short text by pressing <ENTER>: First, the most important message (with the lowest number) is displayed. You can switch to the next or previous message with the keys $\rightarrow$ and $\leftarrow$ respectively.

An overview of the possible messages and their meanings is given in Chapter ($\rightarrow$ 3.7.1 page 47).

The display also shows the short text
- in the upper row to the right of the associated status register name and
- in the lower row to the left of the message number (prefixed with "#").

You need the status register name and the message name, for example for entering a "status pointer" for the outputs (*SpO1*, *SpO2*, etc. $\rightarrow$ 3.11, page 70).

All the status messages are list in Chapter 3.7.1 (from page 47 onwards).

Deleting messages:

After entering <ENTER> the messages in *SReg* (not in *Stat*) can be cleared (acknowledged) singly by pressing the key combination $\boxed{\leftarrow}$ + $\boxed{\uparrow}$. With the command *Clr* (see below) all messages in "*SReg*" can be cleared simultaneously.

Clr   Clear status register

This enables you to clear all the status register contents, i.e. "*SReg*" and its complete submenu: After calling by ENTER, an "0" is positioned right-justified in the display. The function is triggered, i.e. all status registers are cleared, after switching to "1" (with ↑) and terminating with ENTER.

If the alarm or warning states are however still present, they are again directly entered as messages.

The messages in *SReg* can also be cleared singly: see above under *SReg*.

Logb.   Logbook (event logbook)

Entry addresses for the logbook in which the last 500 status changes are archived.

Each archive data row has the following entries:

↔	ABNo	Time	Ev	Check	↔
To "Check"	Block number	Storage time-point	Trigger event	Checksum	To "ABNo"

AudTr   Audit trail (changes logbook)

Entry addresses for the changes logbook (audit trail) in which the last 200 settings changes (parameterisations) are archived.

Each archive data row has the following entries:

↔	ABNo	Time	Addr	a	n	↔
To "Check"	Block number	Storage time-point	Address of changed value	Old value	New value	

↔	St.PL	St.ML	St.SL	St.CL	Check	↔
	Calibration lock	Manufacturer's lock	Supplier's lock	Customer's lock	Checksum	To "ABNo"

PLogB Calibration logbook (PTB logbook)

With the aid of the "Calibration logbook" according to PTB-A 50.7 some parameters relevant to calibration regulations can be changed also with the calibration lock closed. Prerequisites for this are:

- The supplier's lock (see below) must be open.
- At least three free entries must be available in the calibration logbook.

The affected parameters (e.g. cp value, measurement period) are identified with the access right "PL" in the lists in this chapter. If the calibration logbook is deactivated (see Chapter 0), then the affected parameters are subject to the calibration lock.

For each change of such a parameter with the calibration lock closed a data row is in each case entered with the value before and after the change. Additionally, an entry is always made on opening and closing the calibration lock.

The calibration logbook has 50 data rows. Since the first data row always logs the closure of the calibration lock and the last data row is always kept free for opening the calibration lock, a maximum of 48 parameter changes can be entered. With a logbook which is fully written up the status message "PLogb full" is displayed in the system status (→ page 52) and "L" (→ page 11) flashes in the display field "Status". The calibration logbook can be cleared with the calibration lock open using the command *ClrPL* (see below).

☞   *If the calibration lock is opened with the calibration logbook full, it can only be*

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closed again after clearing the calibration logbook.

☞ *If the calibration logbook is deactivated, then the affected values are subject to the calibration lock.*

The data rows of the calibration logbook have the following entries:

↔	ABNo	Time	Add	a	n	↔
to "Check"	Block number	Storage time	Addr. of changed value	Old value	New value	

↔	St.PL	St.ML	St.SL	St.CL	Check	↔
	Calibration lock	Manufacturer's lock	Supplier's lock	Customer's lock	Checksum	To "ABNo"

ClrPL   Clear calibration logbook
> This allows for all entries in the calibration logbook PlogB (see above) to be deleted:
> After call-up using <ENTER>, a "0" is displayed on the far right of the display. The function is triggered (all entries are deleted) by switching to "1" (using ↑) and confirming with <ENTER>.

3.7.1 List of status messages

	Message	in status		AD	Description
Alarm[1]	1	StSy	SRSy	Restart	Restart of the device
	1	St.5	SR.5	C-fact. err.	Conversion factor cannot be computed
	1	St.6	SR.6	T Alarm Lim.	Alarm limits for temperature violated
	1	St.7	SR.7	p Alarm Lim.	Alarm limits for pressure violated
	1	St.8	SR.8	K-val. error	Compressibility cannot be computed
	1	St.9	SR.9	Z-fact. err.	Compressibility factor cannot be computed
	2	St.1	SR.1	I1 Alarm	Alarm on Input I1
	2	St.5	SR.5	T Inp. Error	No usable input value for temperature
	2	St.6	SR.6	p Inp. error	No usable input values for pressure
Warning[2]	3	StSy	SRSy	Data restore	Data has been restored
	4	St.1	SR.1	Outp.1 Error	Error on Output 1
	4	St.2	SR.2	Outp.2 error	Error on Output 2
	4	St.3	SR.3	Outp.3 error	Error on Output 3
	4	St.4	SR.4	Outp.4 error	Error on Output 4
	5	St.2	SR.2	I2 Pulse cmp	Error during pulse comparison on Input 2
	6	St.1	SR.1	W Warn Lim.	Warning limits for power violated
	6	St.2	SR.2	Vb Warn Lim.	Warning limits for flow at base cond. violated
	6	St.4	SR.4	Vm Warn Lim.	Warning limits for actual flow violated
	6	St.6	SR.6	T Warn Lim.	Warning limits for temperature violated
	6	St.7	SR.7	p Warn Lim.	Warning limits for pressure violated
	7	StSy	SRSy	Soft. error	Software error
	8	StSy	SRSy	Sett. error	Setting error
	8	St.2	SR.2	I2 Warn.sig.	Warning signal on Input I2
	8	St.3	SR.3	I3 Warn.sig.	Warning signal on Input I3
Report[3]	9	StSy		Batt. low	Battery service life below limit
	10	StSy	.	Repair mode	Repair mode switched on
	11	StSy	.	Clock n. set	Clock not set
	11	St.1	.	Encoder err.	Encoder error
	12	StSy	.	PLogb full	Calibration logbook full
	13	StSy	.	online	Data transmission running
	13	St.2	.	I2 Rep.sig.	Report signal on Input I2
	13	St.3		I3 Rep.sig.	Report signal on Input I3
	14	StSy		Remote clock	Remote clock setting started
	14	St.1		Cal.lock o.	Calibration lock open
	14	St.2		Man.lock o.	Manufacturer's lock is open

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[1]   Alarm: Instead of the act. measurement, the substitute value is used; quantities are counted in the disturbance volume counter.

[2]   Warning: The message is held in the status register until manually deleted.

[3]   Report: The message is not kept in the status register.

Message	in status		AD	Description
14	St.3		Supp.lock o.	Supplier's lock is open
14	St.4		Cust.lock o.	Customer's lock is open
15	StSy		Batt. operat	Battery operation
15	St.1		Call Win.1+	Extended Call acceptance time window 1
16	StSy		Dayl.Sav.Tim	The displayed time is daylight saving time
16	St.1		Call Win.1	Call acceptance time window 1 is active
16	St.2		Call Win.2	Call acceptance time window 2 is active

Restart   Restart of the device   Message 1 in StSy

The device was started without usable data. Counter readings and archives are empty, the clock has not been set.

C-fact. err.   Conversion factor cannot be computed   Message 1 in St.5

The conversion factor C ($\to$ 3.5) cannot be computed because the temperature T ($\to$ 3.4) is outside the range -100°C to +100°C or no usable inverted compressibility factor ratio K ($\to$ 3.5) is available (cf. message "1" in "St.8"). Possibly the temperature sensor is not connected correctly or the substitute value for the inverted compressibility factor ratio $K.F$ ($\to$ 3.5) has the value "0".

The conversion factor is set to "0" and disturbance quantities for Vb are counted in VbD ($\to$ 3.1).

With the correct device setting, this message does not occur, because, for example, when an alarm limit, TMin or TMax ($\to$ 3.4), is exceeded, the temperature substitute value $T.F$ is used.

T Alarm Lim.   Alarm limits for temperature violated   Message 1 in St.6

The measured gas temperature $T.Mes$ is located outside of the set alarm limits TMin, TMax ($\to$ 3.4).

While ever this message is present in St.6, the substitute temperature $T.F$ ($\to$ 3.4) is used for volume conversion and disturbance quantities are counted for Vb and Vm ($\to$ 3.1, 3.2).

The alarm limits can be changed with the calibration lock open. If they are set to the same value, they are ignored, i.e. they cannot cause any alarm messages nor disturbance quantities.

p Alarm Lim.   Alarm limits for pressure violated   Message 1 in St.7

The measured gas pressure $p.Abs$ is located outside of the set alarm limits $pMin$, $pMax$ ($\to$ 3.3).

While ever this message is present in $St.7$, the substitute pressure $p.F$ ($\to$ 3.3) is used for volume conversion and disturbance quantities are counted for Vb and Vm ($\to$ 3.1, 3.2).

The alarm limits can be changed with the calibration lock open. If they are set to the same value, they are ignored, i.e. they cannot cause any alarm messages nor disturbance quantities.

K-val. error   Compressibility cannot be computed   Message 1 in St.8

The inverted compressibility factor ratio K ($\to$ 3.5) cannot be computed because no valid compressibility factor could be determined. (see below: "Z-fact. err.")

While ever this problem exists, the substitute value $K.F$ is used for the inverted compressibility factor ratio and disturbance quantities are counted for Vb and Vm ($\to$ 3.1, 3.2).

Z-fact. err.   Compressibility factor cannot be computed   Message 1 in St.9

At least one of the gas analysis values Ho.b, CO2, H2, Rhob ($\rightarrow$ 3.5) is located outside of the permissible range.

While ever this problem exists, the last valid value for each of the affected gas analysis values is used and disturbance quantities are counted for *Vb* and *Vm* ($\rightarrow$ 3.1, 3.2). If a valid value has not yet been able to be calculated (because the gas analysis has not till now been correct), the compressibility factor is set to "0". Consequently therefore, also no inverted compressibility factor ratio can be computed. (See above: Message "1" in St.8).

I1 Alarm   Alarm on Input I1   Message 2   in St.1

With a connected encoder (*Md.I1* = 5, $\rightarrow$ 3.10) no actual volume could be measured for more than 20 seconds ($\rightarrow$ 4.5). Possible causes are, for example, a cable breakage or low batteries in the EK260.

In this case the substitute values p.F ($\rightarrow$ 3.3) and T.F ($\rightarrow$ 3.4) are used for volume conversion and disturbance quantities are counted for Vb and Vm ($\rightarrow$ 3.1, 3.2).

T Inp. Error   No usable input value for temperature   Message 2 in St.5

The signal, Bin.T ($\rightarrow$ 3.9), measured on the temperature input is outside the valid range. The sensor may not be correctly connected.

In this case the substitute temperature *T.F* ($\rightarrow$ 3.4) is used for volume conversion and disturbance quantities are counted for *Vb* and *Vm* ($\rightarrow$ 3.1, 3.2).

p Inp. error   No usable input values for pressure   Message 2 in St.6

The signal, Bin.p ($\rightarrow$ 3.9), measured on the pressure input is outside the valid range. The sensor may not be correctly connected.

In this case the substitute pressure *p.F* ($\rightarrow$ 3.3) is used for volume conversion and disturbance quantities are counted for *Vb* and *Vm* ($\rightarrow$ 3.1, 3.2).

Data restore   Data has been restored   Message 3 in StSy

The device was temporarily without any power supply. Possibly during battery replacement, the battery was removed before the new one was connected. Data has been retrieved from the non-volatile memory (EEPROM).

The retrieved counter readings and the clock values are possibly out of date:

If a manual data backup was carried out with the command "Save" before the voltage failure($\rightarrow$ 3.9), the counter readings and time correspond to the state at the time of the data backup.

Without manual data backup, the counter readings and time are retrieved with the state at the end of the last day before the voltage failure.

Outp.1 Error   Error on Output 1   Message 4 in St.1
Outp.2 Error   Error on Output 2   Message 4 in St.2
Outp.3 Error   Error on Output 3   Message 4 in St.3
Outp.4 Error   Error on Output 4   Message 4 in St.4

The volume pulses to be passed through an output are temporarily saved in a pulse buffer. The buffer can accommodate 65535 pulses. If the volume to be output is continuously greater than that which can be output in the form of pulses, the pulse buffer continually fills and will eventually reach its maximum state. If then further pulses arrive, these can no longer be temporarily saved and are lost. The pulse buffer remains at its maximum state in this case. Any loss of pulses is indicated by message "4".

If the pulse buffer drops below the level of 65000 pulses, the message is cleared again.

To rectify the cause of this problem, the cp value of the output ($\rightarrow$ 3.11 Output list) can be reduced or the output frequency (address 1:617) increased with an AS-200 Readout Device or the WinPADS Parameterisation Software.
With a change of the output cp value, the corresponding input buffer is cleared.

I2 Pulse cmp   Error during pulse comparison on Input 2   Message 5 in St.2

Input 2 (I2) can be parameterised for monitoring as a pulse or signal input. When used as a pulse input, the pulses arriving on I2 can, for example, be compared with those on Input 1. If the deviation is too great, this message is displayed.

Settings for the pulse comparison can be made with *MdMI2, SC.I2, L1.I2, L2.I2* und *SpI2*. Further explanation for this: $\rightarrow$ 3.10.

W Warn Lim.   Warning limits for power violated   Message 6 in St.1

The measured power *P* or an amount of energy (e.g. *WMP*) is located below the set warning limits *P.UW, P.LW* ($\rightarrow$ 3.13).

With *SC.W* you can set whether the momentary load *P* or the energy amount *WMP* of the started measurement period is monitored. Further explanation: $\rightarrow$ 3.13: S.W

Vb Warn Lim.   Warning limits for flow at base conditions violatedMessage 6 in St.2

The measured flow at base conditions *Qb* is located outside of the set warning limits QbUW, QbLW ($\rightarrow$ 3.1).

With *SC.Qb* you can set whether the momentary flow *Qb* or the volume at base conditions *VbMP* of the started measurement period is monitored. Further explanation: $\rightarrow$ 3.1: SC.Qb

Vm Warn Lim. Warning limits for actual flow violated   Message 6 in St.4

The measured actual flow *Qm* is located outside of the set warning limits Qm.UW, Qm.LW ($\rightarrow$ 3.2).

With *SC.Q* you can set whether the momentary flow *Qm* or the volume at base conditions *VbMP* of the started measurement period is monitored. Further explanation: $\rightarrow$ 3.2: SC.Q

T Warn Lim.   Warning limits for temperature violated   Message 6 in St.6

The measured temperature *T.Mes* is located outside of the set warning limits T.LW, *T.UW* ($\rightarrow$ 3.4).

p Warn Lim.   Warning limits for pressure violated   Message 6 in St.7

The measured gas pressure *p.Mes* is located outside of the set warning limits p.LW, *p.UW* ($\rightarrow$ 3.3).

Soft. error   Software error   Message 7 in StSy

This message is used for diagnosis at the factory. If it occurs during operation, contact Elster GmbH or your local representative.

Sett. error   Setting error   Message 8 in StSy

On account of the programming that has been carried out, an unusable combination of settings arose, e.g. a value which cannot be processed in a certain mode.

Detailed information can be called up with special read-out programs via the serial interface under the address 1:1FA. However, they are coded and can only be interpreted by Elster GmbH.

I2 Warn.sig.   Warning signal on Input I2   Message 8 in St.2

Input 2 (I2) can be parameterised for monitoring as a pulse or signal input . When set as signalling input, this message is displayed while ever an active signal is present, i.e. the terminals are connected through a low resistance. For connection of a contact for tamper detection, the warning input can also be set such that message "8" is displayed here while ever an inactive signal is present, i.e. the terminals are open.

Settings for the message input can be made with MdMI2, SC.I2, L1.I2, L2.I2 und *SpI2*. Further explanation for this: $\rightarrow$ 3.10.

I3 Warn.sig.   Warning signal on Input I3   **Message 8 in St.3**

This message is displayed, for example, while ever an active signal is present, i.e. the terminals are connected through a low resistance. For connection of a contact for tamper detection, the warning input can also be set such that this message is displayed while ever an inactive signal is present, i.e. the terminals are open.

Settings for the message input can be made with MdMI3, SC.I3, L1.I3, L2.I3 and *SpI3*. Further explanation for this: → 3.10.

Batt. low   Battery service life below limit   **Message 9   in StSy**

The calculated remaining battery service life *Bat.R* (→ Chapter 3.9) has fallen below the set limit.

The limit can be changed via the serial interface under the address 2:4A1. The standard setting is 3 months.

So long as this message is displayed, the "B" in the display field "Status" flashes (Chapter 2.2.1).

Repair mode   Repair mode switched on   **Message 10   in StSy**

The device is in the repair mode. This is switched on and off with *Rep.* (→ 3.9).

Clock n. set   Clock not set   **Message 11   in StSy**

The running accuracy of the internal clock has been optimised in the factory by frequency measurement and a corresponding setting of the adjustment factor *Adj.T* (→ 3.9). The error message indicates that this has not yet been carried out.

Encoder err.   Error in the encoder data   **Message 11 in St.1**

At the last interrogation (in the last measurement cycle) the connected gas meter encoder supplied no data or faulty data. If the encoder does not send any fault-free counter reading within 20 seconds, the message "I1 Alarm" (→ page 48) is also produced and disturbance counting is switched on. If a measurement cycle *MCyc* (→ page 56) of 20 seconds is set, in the case of a fault the messages "Encoder err." and "I1-Alarm" appear simultaneously.

As long as the messages "Encoder err." is active, the "M" also flashes in the field "Status" of the display (→ page 11).

PLogb full   Calibration logbook full   **Message 12   in StSy**

The calibration logbook is full. Without the calibration lock a change of the parameters identified with the access "PL" is only possible again when the content of the calibration logbook is cleared (→ *ClrPL*, page 47). The calibration lock can only be closed again after clearing the calibration logbook.

online   Data transmission running   **Message 13   in StSy**

Data is currently being transmitted via one of the two serial interfaces (optical or permanently wired).

The data transfer cannot take place over both interfaces simultaneously.

While ever this message is displayed, the "o" in the display field "Status" flashes (→ Chapter 2.2.1).

I2 Rep.sig.   Report signal on Input I2   **Message 13 in St.2**

Input 2 (I2) can, for example, be used as a time-synchronous input. As long as the input receives an active signal (i.e. the terminals are connected through low resistance), this message is displayed.

Settings for the message input can be made with MdMI2, SC.I2, L1.I2, L2.I2 und *SpI2*. Further explanation for this: → 3.10.

I3 Rep.sig.   **Report signal on Input 3**   **Message 13 in St.3**

Input 3 (I3) can, for example, be used as a time-synchronous input. While ever the input is receiving an active signal (i.e. terminals connected through low resistance), this message is displayed.

Settings for the message input can be made with MdMI3, SC.I3, L1.I3, L2.I3 and *SpI3*. Further explanation for this: → 3.10.

With special parameterisation for the connection an FE230 Function Expansion, this message means "Data transmission running via FE230".

Remote clock Remote clock setting started   **Message 14 in StSy**

This message is entered when the EK260 starts to set its clock by remote transmission. It is deleted again when it has been successfully concluded.

If this message remains entered longer than a few minutes, the function "Automatic setting of clock by remote transmission" is activated, but could not be executed. Possible causes of this may be, for example:

- A modem which is ready for operation is not connected.
- A modem is connected with which "clock setting by remote data transmission" is not possible. The function is only guaranteed with the devices FE260 or EM260 which can be obtained from Elster GmbH and each of which has an integrated modem.
- An interface mode *Md.S2* (→ 3.12) is set, with which the function is not possible. *Md.S2* must be set to "3" or "6".
- The telephone number *TNoCS* (→ 3.12.2) for the time service is not correct.
- On calling the time service, it was engaged for a long period.
- The deviation of the device clock from the clock of the time service is greater than *DevCS* (→ 3.12.2).

Further details on the function "Automatic setting of the clock by remote transmission" → 3.12.2 .

Cal.lock o.   **Calibration lock open**   **Message 14 in St.1**
Man.lock o.   **Manufacturer's lock is open**   **Message 14 in St.2**
Supp.lock o.   **Supplier's lock is open**   **Message 14 in St.3**
Cust.lock o.   **Customer's lock is open**   **Message 14 in St.4**

For protection against unauthorised parameterisation or reading out via a serial interface, the EK260 has a total of four locks in the following order of priority: Calibration, manufacturer's, supplier's and customer's locks.

The **calibration lock** can be opened and closed using a sealable pushbutton which is located inside the device (→ 5.9.1). Closure is also possible by deleting the value "*St.PL*" (→ 3.9) via the keypad or interface.

While ever this message is displayed in *St.1*, the "P" in the display field "Status" flashes (→ 2.2.1).

The **manufacturer's lock** is normally only opened for special applications by Elster GmbH staff and includes access for changing all values not subject to official calibration. It can only be opened and closed via a serial interface with an AS-200 Readout Device or the WinPADS Parameterisation Software.

The **supplier's lock** is normally used by gas suppliers. It gives access for changing various values which are not subject to official calibration. The relevant values are identified in the lists (→ 3) with an "S".

The supplier's lock can be opened and closed with "Cod.S" and "St.SL" (→ 3.9).

The **customer's lock** is normally used by gas customers. It gives access for changing some values which are not subject to official calibration. The relevant values are identified in the lists ($\rightarrow$ 3) with a "K".

The customer's lock can be opened and closed with "Cod.C" and "St.CL" ($\rightarrow$ 3.9) .

Batt. operat   Battery operation   Message 15 in StSy

This message is always displayed when the device is being supplied by its internal battery, i.e. not by an external power supply.

Call Win.1+   Extended call acceptance time window 1   Message 15 in St.1

This message is needed for the operation of an FE230 Function Expansion to switch on the FE230 power supply via an output terminal set as a status output.

The message largely corresponds to message *Call Win.1* (see below). If a data transmission is still running at the end of Call acceptance window 1, the message *Call Win.1+* remains however entered until the data transmission has finished.

Dayl.Sav.Tim   The displayed time is daylight saving time   Message 16 in StSy

In the system list ($\rightarrow$ 3.8) you can set under *MdTim* whether the EK260 carries out automatic daylight saving switchover or not.

Call Win.1   Call acceptance time window 1 is active   Message 16 in St.1
Call Win.2   Call acceptance time window 2 is active   Message 16 in St.2

The EK260 provides two time windows within which a modem connected to the serial interface accepts calls for data interrogation. Outside of these time windows calls are ignored, so that, for example, a person located in the station can be called via a telephone connected to the same telephone line.

The message indicates that the time window 1 ($\rightarrow$ 3.12 Interface list) programmed with *CW1.S* and *CW1.E* (Call Win.1) or with *CW2.S* and *CW2.E* (Call Win.2) is active, i.e. the EK260 accepts calls.

3.7.2 Status register addresses

To read out the status information via the interface or to accept it into the user list ($\rightarrow$ page 94), its addresses are needed (cf. table on page 47):

AD *	Description	Address		AD *	Description	Address
Stat	Total momentary status	1:100		SReg	Total status register	1:101
StSy	System momentary status	2:100		SRSy	System status register	2:101
St.1	Momentary status 1	1:110		SR.1	Status register 1	1:111
St.2	Momentary status 2	2:110		SR.2	Status register 2	2:111
St.3	Momentary status 3	3:110		SR.3	Status register 3	3:111
St.4	Momentary status 4	4:110		SR.4	Status register 4	4:111
St.5	Momentary status 5	5:110		SR.5	Status register 5	5:111
St.6	Momentary status 6	6:110		SR.6	Status register 6	6:111
St.7	Momentary status 7	7:110		SR.7	Status register 7	7:111
St.8	Momentary status 8	8:110		SR.8	Status register 8	8:111
St.9	Momentary status 9	9:110		SR.9	Status register 9	9:111

* "AD" = Abbreviated designation (Designation of the value in the display)

3.8 System list

AD	Designation / value	Unit	Access	Address	DC
Time	Date and time	-	S	1:400	12
MdTim	Daylight saving: yes / no	-	S	1:407	7
MCyc	Measurement cycle time	Seconds	C	1:1F0	8
OCyc	Operating cycle time	Seconds	S	1:1F1	8
Disp	Time before display switches off	Minutes	S	2:1A0	8
Aut.V	Time to changeover to standard display	Minutes	C	1:1A0	8
SNo	Serial number	-	C	1:180	8
Ta.Rg	Ambient temperature range	-	C	3:424	8
Vers	Software version number	-	-	2:190	3
Chk	Software checksum	-	-	2:191	4

(Legends: see page 23)

Time   Date and time

The date and time are displayed separately. When moving to the right within the list structure, the date is displayed after the time. When moving to the left, only the time is displayed.

After pressing <ENTER> for entry (set clock), the date and time are displayed together (initially without seconds). The input mark (cursor) is located on the right-hand display position, then after pressing → again, the complete value is moved to the left so that the seconds can also be changed.

The time is updated in synchronism with the operating cycle *OCyc* (see below) or after key operation.

MdTim Daylight saving: yes / no

"0" = Automatic changeover between summer and winter time OFF.

"1" = Automatic changeover between summer and winter time:
Summer time begins on the last Sunday in March at 2:00 hrs. and ends on the last Sunday in October at 2:00 hrs. The EK260 time is corrected automatically when the switchover is activated.

"2" = Switchover at set times
The start and finish of daylight saving is set under the addresses 1:4A0 and 1:4A8. The times must be set each year.

MCyc   Measurement cycle time

Measurements (e.g. pressure, temperature), computed values (e.g. K-value, conversion factor) and counter readings are updated on this cycle.

To ensure all functions, *MCyc* must only be set to integer factors of 60 seconds, e.g. 5, 10, 15, 20, 30 or 60 seconds. In addition *MCyc* must be an integer factor of *OCyc* (see below). Entries of values not satisfying these conditions are, where possible, corrected automatically. If the EK260 does not find any suitable value during the correction attempt, it rejects the entry with error message "6". ($\rightarrow$ 2.3.3)

In applications subject to official calibration *MCyc* must be less than or equal to 20 seconds.

The standard setting is 20 seconds.

With settings less than 20 seconds the battery service life is reduced. ($\rightarrow$ B-2 Batteries
)

OCyc   Operating cycle time

The time and all values which relate to a time interval (e.g. measurement period, 1 day, 1 month) are updated on this cycle. The latter includes in particular all values for which a type of computation is displayed ($\rightarrow$ 2.2.1), e.g. VbMP Δ, VbDy Δ, p.MP $\varnothing$, T.MP $\varnothing$.

OCyc must only be set to values which are integer factors or multiples of 60 seconds and which are also integer multiples of *MCyc* (see above). Entries of other values are, where possible, corrected automatically. If the EK260 does not find any suitable value during the correction attempt, it rejects the entry with error message "6". ($\rightarrow$ 2.3.3)

In addition, *OCyc* must be an integer factor of the measurement period *MPer* ($\rightarrow$ 3.6) so that the measurement period values (e.g. VbMP Δ, VbDy Δ, p.MP $\varnothing$, T.MP $\varnothing$) can be concluded at the correct points in time.

The standard setting is 300 seconds (= 5 minutes).

With settings less than 300 seconds the battery service life is reduced. ($\rightarrow$ B-2 Batteries
)

Disp   Time before display switches off

In order to conserve the batteries the display switches off after key operation once the set time has expired.

The setting "0" signifies that the display is always switched on.

With settings of "0" or greater than 10 minutes, the battery service life is reduced.

Aut.V   Time to changeover to standard display

The display automatically changes over to the standard display once the time set here has expired without any key operation.

The setting "0" signifies that the display is not switched over. In applications subject to official calibration this setting is not however permissible.

The standard setting is 1 minute.

The number of the display column, to the first value of which switching takes place, can be set via the interface under address "1:1F2". The standard setting is "1", i.e. switching takes place to the volume at base conditions column ($\rightarrow$ 3.1) with the first value *Vb*.

SNo   Serial number
The serial number of the Volume Conversion Device (same number as on the identification label).

Ta.Rg Ambient temperature range
The permissible ambient temperature for the EK260 in operation subject to calibration regulations.

Vers   Software version number
Chk   Software checksum
Version number and checksum provide clear identification of the software implemented in the EK260.

3.9 Service list

AD	Designation / value	Unit	Access	Address	DC
Bat.R	Remaining battery service life	Months	-	2:404	15
Bat.C	Battery capacity	Ah	S	1:1F3	8
St.SL	Supplier's lock: Status / close	-	S	3:170	7
Cod.S	Supplier's combination, enter / change	-	S	3:171	11
St.CL	Customer's lock: Status / close	-	K	4:170	7
Cod.C	Customer's combination, enter / change	-	K	4:171	11
St.PL	Calibration lock: Status / close	-	K	1:170	7
Contr	Display contrast	-	S	1:1F6	8
Adj.T	Clock adjustment factor	-	C	1:452	8
Sel.p	Pressure sensor selection	-	C	6:239	7
Save	Save all data	-	S	1:131	2
Clr.A	Clear measurement archive	-	PL	1:8FD	8
Clr.V	Clear counters (incl. archive)	-	C	2:130	2
Clr.X	Initialise device	-	C	1:130	2
Bin.T	Temperature binary value	-	-	5:227	4
Bin.p	Pressure binary value	-	-	6:227	4
Addr	Address for user display	-	S	14:1C2	8
...	User display (value under address "Addr"	...	...	...	...
WRp	Repair counter W	kWh	S	1:305	12
VbRp	Repair counter Vb	m3	S	2:305	12
VmRp	Repair counter Vm	m3	S	4:305	12
Rep.	Repair mode on / off	-	C	1:173	7
ArCal	Frozen values	-	-	6:A30	8
Frz	Freeze	-	S	6:A50	2
-	Display test	-	-	1:1F7	1

(Legends: see page 23)

Bat.R **Remaining battery service life**

The calculation of the remaining battery service life occurs in dependence of the consumed capacity (which is measured) and a consumption expected for the future (which gives the remaining battery service life). Therefore, for applications with high current consumption the remaining battery service life may reduce quicker than stated by the figure for the remaining service life!

If *Bat.R* is less than 3 months and the Volume Conversion Device runs in the battery mode, "Batt. low" ($\rightarrow$ page 52) is displayed in the system status and "B" flashes in the display status field ($\rightarrow$ 2.2.1).

Recalculation of the remaining battery service life is carried out automatically after the entry of a new battery capacity *Bat.C* (see below).

The settings of the measurement cycle MCyc ($\rightarrow$ 3.8), operating cycle OCyc ($\rightarrow$ 3.8), input mode Md.I1 ($\rightarrow$ 3.10) and display switch-off Disp ($\rightarrow$ 3.8) are taken into account during the computation of the remaining battery service life. Future operating conditions, e.g. changing the settings, duration of readouts or frequency of key operations cannot be foreseen however and therefore lead to a corresponding uncertainty for the displayed remaining battery service life. For data readouts, a mean future duration of 15 minutes per month is estimated.

To increase the service life four batteries instead of two can be used. In this case double the value (e.g. 26.0 Ah) must be entered for Bat.C (see below) after inserting the batteries.

Bat.C **Battery capacity**

Here, the original capacity and <u>not</u> the residual capacity of the batteries last used is displayed.

After a battery replacement the capacity of the battery used must be entered here so that recalculation of the remaining battery service life is initiated.

The capacity to be entered need not necessarily correspond to the typical capacity quoted by the battery manufacturer. Apart from these details, the capacity depends on the application conditions such as ambient temperature and the device current consumption. In view of this and as a precaution, the minimum and not the typical value should be used. When used in ambient temperatures between –10°C and +50°C, the value to be entered is normally about 80% of the capacity quoted by the manufacturer.

Since two batteries are connected in series in each case, the capacity of <u>one</u> battery must be entered per battery pack (= 2 batteries) used.

With the use of battery packs obtainable from Elster GmbH with two size "D" cells, the value 13.0 Ah should be entered for *Bat.C* and 26.0 Ah when 4 cells are used.

St.SL	**Supplier's lock**	**(status / close)**
Cod.S	**Supplier's combination**	**(enter / change)**
St.CL	**Customer's lock**	**(status / close)**
Cod.C	**Customer's combination**	**(enter / change)**

Basic principle of operation of lock and combination: → 2.4, page 16.

<u>Open</u> lock:

To open the supplier's or customer's lock, the correct combination code must be entered under *Cod.S* or *Cod.C.* The factory setting for *Cod.S* and *Cod.C* is in each case the code "0".

Example: Opening the supplier's lock:

1. Bring *Cod.S* into the display ⇒ "--------" is displayed instead of a value.
2. Press <ENTER> ⇒ "0" flashes as the first figure.
3. Set the first figure of the combination code with the keys ↓ and ↑ .
4. Select and set the next figures with the key → .
5. Press <ENTER>.
6. Check: "1" ("1" = open) is displayed under *St.SL*.

The individual characters of the combination code are in hexadecimal notation, i.e. they take on values from 0 to 9 and from A to F. "A" follows "9" and "F" is followed again by "0", i.e. the key ↑ changes "9" to "A" and "F" to "0".

Leading zeroes do not need to be entered, e.g. "123" can be entered instead of "000001123".

Close lock:
Closing the supplier's or customer's lock occurs by entering "0" for *St.SL* or *St.CL*.

Example: Closing the supplier's lock:
1. Bring *St.SL* into the display.
2. Press <ENTER> ⇒ The value begins to flash.
3. Press the key ⬇ ⇒ "0" is displayed.
4. Press <ENTER>.
5. Check: "0" ("0" = closed) is displayed under *St.SL*.

Change combination:
To change the code the new code is entered with the lock open. The procedure is identical to "Open lock" (see above).
For the case where a user has forgotten his combination *Cod.S* or *Cod.C*, they can be read out via the interfaces with the calibration lock open. (Calibration lock: see 2.4.1.

St.PL Calibration lock (status / close)
Basic principle of operation of the calibration lock: → 2.4.1.
Opening the calibration lock: Only with the sealed pushbutton (→ 5.9.1).
Closing the calibration lock: Either by pressing the pushbutton again or by clearing *St.PL* via the interface or keypad (← + ↑ in the entry mode, → 2.3.1, Data Class 6).

Contr Display contrast
Setting the contrast of the display. Changes only become effective after confirmation of entry with <ENTER>. Valid range: 0 bis 255.

Adj.T Clock adjustment factor
Adj.T is the deviation of the running accuracy of the clock at room temperature in per mil ($\cdot 10^{-3}$). The EK260 uses *Adj.T* to optimise the running accuracy of the clock.
The adjustment of the clock is carried out in the factory.
Provided no value has been entered for *Adj.T*, the EK260 displays the message ("Clock n. set") in the system status in the status *Stat*. (→ page 52).

Sel.p Pressure sensor selection
With this value the EK260 is informed of which pressure sensor is installed:
0 = No pressure sensor
2: CT30
On changing this value the designation of the pressure sensor *Typ.p* (→ 3.3) is appropriately changed automatically.

Save Save all data
This function should be executed before any battery replacement in order to save the counter readings, date and time in the non-volatile memory (EEPROM).
Save must be set to "1" to execute data backup.

Clr.A **Clear measurement archive**

All measurement archives (month, day and measurement period archives, not, for example, logbooks) are deleted. This function is particularly practicable after the measuring point of the EK260 is changed.

In order that the archives are not unintentionally deleted, the following safety mechanism is integrated: To clear the archives the EK260 serial number (found on the name-plate of the device) must be entered.

Clr.V **Clear counters (incl. archive)**

All the counter readings and archives are cleared.

Clr.X **Initialise device**

All data (counter readings, archives and settings) are cleared.

The following safety mechanism was included so that this function cannot be carried out with the calibration lock open: Clr.X can only by executed after the clock ($\rightarrow$ 3.8, Time) has been set (initialised) to its start value with the key combinations $\boxed{\leftarrow}$ + $\boxed{\uparrow}$. Otherwise, an attempt to execute Clr.X causes the error message "13" to appear on the display.

Bin.T **Temperature binary value**

Bin.p **Pressure binary value**

These are the raw values measured directly on the respective input and which are converted to the corresponding measurement quantities with the adjustments made ($\rightarrow$ 3.3, 3.4).

Addr **Address for user display**

... **User display (value under the address "Addr")**

Under *Addr* the address of any value can be entered in order to read it in the display item situated there (here respresented by "...").

As set at the factory, this is assigned to the internal error register (address 1:01FA_1).

WRp **Repair counter W**

VbRp **Repair counter Vb**

VmRp **Repair counter Vm**

Rep. **Repair mode on / off**

The revision mode is switched by entering "1" for *Rep.* In the repair mode all counters located in the actual volume, volume at base conditions and energy lists are stopped and all measured quantities are counted in *VmRp*, *VbRp* and *WRp*.

By entering "0" for *Rep.* the repair mode is switched off again and therefore switched back into the normal operating mode.

ArCal Frozen values

Frz Freeze

ArCal is the entry address for the calibration archive which contains the two last manually frozen data rows with measurements. Freezing is carried out with *Frz*. The calibration archive is especially intended for operating point checks.

Each archive data row has the following entries, whereby the abbreviated designations generally flash for counter increments ("Δ..."):

$\leftrightarrow$

To "Check"

ABNo	Time	Vb	Δ Vb	Vm	Δ Vm
Block number	Storage time-point	Volume at base cond.	Counter increment	Actual volume	Counter increment

$\leftrightarrow$

$\leftrightarrow$

VbRp	Δ VbRp	VmRp	Δ VmRp	p	T
Repair counter	Counter increment	Repair counter	Counter increment	Press.	Temperature

$\leftrightarrow$

$\leftrightarrow$

K	C	Qb	Qm	Check
Gas law dev. factor	Conversion factor	Flow at base conditions	Actual flow	Checksum

$\leftrightarrow$

To "ABNo"

- Display test

The display flashes to test all segments.

3.10 Input list

AD	Designation / value		Unit	Access	Address	DC
Vo	Original encoder counter reading (only in encoder mode)		m3	-	1:202	15
cp.I1	cp value	for Input 1	1/m3	PL	1:253	8
Md.I1	Mode	for Input 1	-	PL	1:207	7
V1	Volume	on Input 1	m3	S	1:203	12
q.max	Maximum flow (only in encoder mode)		m3/h	PL	1:23C	8
cp.I2	cp value	for Input 2	1/m3	S	2:253	8
Md.I2	Mode	for Input 2	-	S	2:207	7
V2	Volume	on Input 2	m3	S	2:203	12
St.I2	Status	on Input 2	-	-	2:228	4
MdMI2	Mode	for monitoring Input 2	-	S	11:157	7
SC.I2	Source	for monitoring Input 2	-	S	11:154	8
L1.I2	Limit 1	for monitoring Input 2	-	S	11:150	8
L2.I2	Limit 2	for monitoring Input 2	-	S	11:158	8
SpI2	Status pointer	for monitoring Input 2	-	S	11:153	8
St.I3	Status	on Input 3	-	-	3:228	4
MdMI3	Mode	for monitoring Input 3	-	S	12:157	7
SC.I3	Source	for monitoring Input 3	-	S	12:154	8
L1.I3	Limit 1	for monitoring Input 3	-	S	12:150	8
SpI3	Status pointer	for monitoring Input 3	-	S	12:153	8
SNM	Serial number of gas meter		-	S	1:222	8

Vo   Original encoder counter reading or total volume on Input 1

This value is only displayed in the encoder mode (Md.I1 = 5).

Vo is the "origin counter" of the EK260, i.e. all the increments in the actual and volume at base conditions are derived from this.

In principle Vo <u>cannot</u> be changed by entry.

Vo is formed differently depending on the setting of Md.I1 (see above).

Md.I1 = 1 (Input I1 is the pulse input):

The pulses arriving on Input 1 (terminal "DE1") are converted into volumes with the cp value cp.I1 and summed in Vo.

Md.I1 = 5 (Input I1 is the encoder input):

Vo is a copy of the gas meter reading (original counter). The EK260 interrogates the counter reading from the encoder counter each measurement period. An encoder should be connected just like a pulse transmitter on Input 1 (terminal "DE1") of the EK260.

cp.I1   cp value Input 1

Pulse constant (parameter of the connected gas meter) for conversion of the pulses counted on Input 1 into the volume counters *Vo* and *V1* (see below); the increase in volume is directly accepted into the total actual volume *VmT* ($\rightarrow$ 3.2).

cp.I1 indicates how many pulses correspond to the volume of 1 m^3.

If Input 1 is set as an encoder input (Md.I1 = 5, see below), cp.I1 has no significance.

Md.I1   Mode for input 1

The operating mode of Input 1 (I1) can be defined here:

> 0: Switched off (input has no function).
> 1: Pulse counting
> 5: Encoder input

(The values "2" and "3" can also be entered here, but they are not meaningful.)

If the EK260 is connected to the pulse output (reed contact) of a counter, Md.I1 should be set to "1".

With the connection of a gas meter with encoder ($\rightarrow$ 4.5) Md.I1 should be set to "5". With an EK260 without encoder capability "5" cannot be set. An attempt to make an entry leads to entry error "11". ($\rightarrow$ 2.3.3)

With an encoder connected *V* can be set to the gas meter reading and *VmD* cleared by entering "0" and then "5" again.

If a connected gas meter with encoder is to be replaced by a new one, *Md.I1* should be set to "0" <u>before</u> making the connection and set to "5" again <u>afterwards</u>. (Further details are given in $\rightarrow$ 4.5).

When using an encoder in the battery mode, the expected battery service life is reduced significantly compared with the use of an LF pulse transmitter. In order to obtain a longer battery service life, two battery packs (4 batteries) can be used in this case. ($\rightarrow$ 3.9: Bat.R and Bat.C)

V1   Adjustable volume counter on Input 1

The volume counted on Input 1 is summed in V1. V1 counts independent of the alarm conditions. The progress therefore corresponds to that of VmT and VmA ($\rightarrow$ 3.2). V1 is an "adjustable counter" like VmA, i.e. it is subject to the supplier's lock and can therefore be set to any reading without opening the calibration lock.

V1 is the gas volume measured on Input 1. The increase in volume is directly accepted into the total actual volume VmT ($\rightarrow$ 3.2).

q.max   Maximum flow (only in encoder mode)

This value is only displayed and used in the encoder mode (*Md.I1* = 5).

q.max is used for plausibility monitoring of the counter readings supplied by the encoder: If the flow *Qm* ($\rightarrow$ page 26), calculated through the change of counter reading, exceeds the set value for *q.max*, the last counter reading is discarded and then the next one is used for further quantity counting. (In this way no quantities are lost.)

If q.max = 0 is set, the plausibility monitoring is switched off.

cp.I2   **cp value Input 2**

If Input 2 is set as a counting input (*Md.I2* = 1, see below), the pulse constant must be entered here which is used for the conversion of the pulses to the volume *V2* (see below).

cp.I2 is not subject to the calibration lock because it has no influence on *Vm* or *Vb*.

Input 2 can only be used for pulse comparison with Input 1 (→ *MdMI2,* see below)*.*

If Input 2 is set as a status input (*Md.I2* = 2, see below), *cp.I2* has no significance.

Md.I2   **Mode for input 2**

The application of Input 2 (I2) can be defined here.

    0: Switched off (input is not used).

    1: Counting input.

    2: Status input.

When the input is used as a counting input, the EK260 can, for example, be parameterised such that it carries out a pulse comparison of Inputs 1 and 2 and signals impermissibly large deviations.

With the setting "status input" the EK260 can, for example, signal attempts at tampering on a pulse transmitter of the gas meter, provided the meter also supports this.

After setting *Md.I2* the function on Input 2 is more specifically defined with *MdMI2* (see below).

V2   **Adjustable volume counter on Input 2**

With the setting *Md.I2* = "1" (see below) *V2* is the gas volume measured on Input 2. *V2* is not directly included in the computation of the actual or volume at base conditions. However, with appropriate setting of *MdMI2* (see below), it can be compared with *V1* (see above) in order to signal impermissibly large deviations.

St.I2   **Status on Input 2**

If *Md.I2* = "2" (see above), the status of Input 2 is displayed here:

St.I2 = 0:   Input signal is inactive (no signalling).

St.I2 = 1:   Input signal is active (signalling).

MdMI2   Mode for monitoring I2
SC.I2   Source for monitoring I2
L1.I2   Limit 1 I2
L1.I2   Limit 2 I2
SpI2   Status pointer for monitoring I2

☞   *For MdMI2 only enter one of the values described here: "2", "3", "5" or "17". Depending on the system and after entering <ENTER>, other values are offered which are however not meaningfully applicable here.*

Depending on the application of Input 2 as counting or status input (see above: *Md.I2*), the following functions can be realised by setting these values:

If Input 2 is a counting input, the function "pulse comparison" can be set.

If Input 2 is a status input, the functions "active warning input", "inactive warning input", "active reporting input", "inactive reporting input" and "time-synchronous input" can be set.

"Warning input" signifies that the status message "I2 Warn.sig." ($\rightarrow$ page 51) is affected directly by the input status.

"Report input" signifies that the status message "I2 Rep.sig." ($\rightarrow$ page 52) is affected directly by the input status.

"Active": A signal arises when the input terminals are short-circuited (switch to switching point "on", $\rightarrow$ B-4).

"Inactive": A signal arises when the input terminals are parted (switch to switching point "off", $\rightarrow$ B-4).

Programming takes place according to the following table. (For further details on entering a source for *SC.I2*: See Chap.2.3.2).

a) I2 is a <u>counting input</u> (*Md.I2* = "1")

- Pulse comparison on Inputs 1 and 2

Value	Setting	Comment
Md.I2	1	Input mode "counting input"
MdMI2	17	Monitoring mode "pulse comparison"
SC.I2	01:226_0 = "PulI1"	Address of pulse counter for Input 1
L1.I2	4	Maximum number of disturbance pulses
L2.I2	1000	Pulse windows per disturbance pulse
SpI2	0.05_02:1.1 = I2 Pulse cmp↑	Pointer to message "5" in status 2

With this setting the pulses counted on Inputs 1 and 2 are compared:
If the pulse counters on Input 1 and Input 2 differ by more than 4 pulses (= *L2.I2*) in 4000 pulses (= *L1.I2 · L2.I2*), the message "I2 Pulse cmp" is displayed in the status *Stat*.

b) I2 is a <u>status input</u> (*Md.I2* = "2")

- Input 2 is an <u>active</u> warning input (input for warning signal):

Value	Setting	Comment
Md.I2	2	Input mode "status input"
MdMI2	2	Monitoring mode: "Signal when SC.I2 ≥ L1.I2"
SC.I2	02:228_0 = "St.I2"	Status on Input 2
L1.I2	1	Comparative value
L2.I2	-	(Not used here)
SpI2	0.05_02:1.1 = I2 Warn.sig.↑	Pointer to message "8" in status 2 (warning)

- Input 2 is an <u>inactive</u> warning input (e.g. tamper detection):

Value	Setting	Comment
Md.I2	2	Input mode "status input"
MdMI2	3	Monitoring mode: "Signal when SC.I2 < L1.I2"
SC.I2	02:228_0 = "St.I2"	Status on Input 2
L1.I2	1	Comparative value
G2.I2	-	(Not used here)
SpI2	0.05_02:1.1 = I2 Warn.sig.↑	Pointer to message "8" in status 2 (warning)

- Input 2 is an active <u>reporting</u> input (input for report signal):

Value	Setting	Comment
Md.I2	2	Input mode "status input"
MdMI2	2	Monitoring mode: "Signal when SC.I2 ≥ L1.I2"
SC.I2	02:228_0 = "St.I2"	Status on Input 2
L1.I2	1	Comparative value
L2.I2	-	(Not used here)
SpI2	0.05_02:1.1 = I2 Rep.sig.↑	Pointer to message "13" in status 2 (report)

- Input 2 is an inactive <u>reporting</u> input (input for report signal):

Value	Setting	Comment
Md.I2	2	Input mode "status input"
MdMI2	3	Monitoring mode: "Signal when SC.I2 < L1.I2"
SC.I2	02:228_0 = "St.I2"	Status on Input 2
L1.I2	1	Comparative value
L2.I2	-	(Not used here)
SpI2	0.05_02:1.1 = I2 Rep.sig.↑	Pointer to message "13" in status 2 (report)

- Input 2 is time-synchronised input:

Value	Setting	Comment
Md.I2	2	Input mode "status input"
MdMI2	5	Monitoring mode: "Time-synchronised input"
SC.I2	02:228_0 = "St.I2"	Status on Input 2
L1.I2	1	Comparative value
L2.I2	-	(Not used here)
SpI2	0.13_02:1.1 = I2 Rep.sig.↑	Pointer to message "13" in status 2 (report)

Time synchronisation can occur under the following conditions:
- There must be a pulse on the input within one minute before or after a full hour. The deciding factor is the time in the EK230.
- Only one synchronisation per hour can occur.

St.I3   Status on Input 3

Here the status of Input 3 is displayed which is used as status input:

St.I3 = 0:   Input signal is inactive
(terminals open or voltage > 3V)

St.I3 = 1:   Input signal is active
(terminals connected through low resistance or voltage < 0.8V)

MdMI3   **Mode for monitoring I3**
SC.I3   **Source for monitoring I3**
L1.I3   **Limit 1 I3**
SpI3   **Status pointer for monitoring I3**

    By setting these values the following functions can be realised for Input 3 (Input 3 is only used as status input).

    (For further details on entering a source for *SC.I3*: See Chap.2.3.2.

- Input 3 is an <u>active</u> warning input (input for warning signal):

Value	Setting	Comment
MdMI3	2	Monitoring mode: "Signal when SC.I3 $\geq$ L1.I3"
SC.I3	03:228_0 = "St.I3"	Status on Input 3
L1.I3	1	Comparative value
SpI3	0.05_02:1.1 = I3 Warn.sig.↑	Pointer to message "8" in status 3

- Input 3 is an <u>inactive</u> warning input (e.g. tamper detection):

Value	Setting	Comment
MdMI3	3	Monitoring mode: "Signal when SC.I3 < L1.I3"
SC.I3	03:228_0 = "St.I3"	Status on Input 3
L1.I3	1	Comparative value
SpI3	0.05_02:1.1 = I3 Warn.sig.↑	Pointer to message "8" in status 3

- Input 3 is an active reporting input (input for report signal):

Value	Setting	Comment
MdMI3	2	Monitoring mode: "Signal when SC.I3 $\geq$ L1.I3"
SC.I3	03:228_0 = "St.I3"	Status on Input 3
L1.I3	1	Comparative value
SpI3	0.05_02:1.1 = I3 Rep.sig.↑	Pointer to message "13" in status 3 (report)

    This setting is also established by loading a special parameter file for the connection of an FE230 Function Expansion.

- Input 3 is an inactive reporting input (input for report signal):

Value	Setting	Comment
MdMI3	3	Monitoring mode: "Signal when SC.I3 < L1.I3"
SC.I3	03:228_0 = "St.I3"	Status on Input 3
L1.I3	1	Comparative value
SpI3	0.05_02:1.1 = I3 Rep.sig.↑	Pointer to message "13" in status 3 (report)

- Input 3 is time-synchronised input:

Value	Setting	Comment
MdMI3	5	Monitoring mode: "Time-synchronised input"
SC.I3	03:228_0 = "St.I3"	Status on Input 3
L1.I3	1	Comparative value
SpI3	0.13_02:1.1 = I3 Rep.sig.↑	Pointer to message "13" in status 3 (report)

For time synchronisation: see "Input 2 is the time-synchronous input" on page 68).

SNM   Serial number of gas meter

The serial number of the gas meter connected to the counting input I1.

3.11 Output list

AD	Designation / value		Unit	Access	Address	DC
Md.*O1*	Mode	for Output 1	-	S	1:605	7
SC.O1	Source.	"	-	S	1:606	8
cp.O1	cp value	"	1/m3	S	1:611	8
SpO1	Status pointer	"	-	S	1:607	8
Md.*O2*	Mode	for Output 2	-	S	2:605	7
SC.O2	Source.	"	-	S	2:606	8
cp.O2	cp value	"	1/m3	S	2:611	8
SpO2	Status pointer	"	-	S	2:607	8
Aj1O2	HF adjust. factor 1	"	(see [1])	S	2:622	8
Aj2O2	HF adjust. factor 2	"	(see [2])	S	2:623	8
f1.O2	Frequency for Aj1O2	"	Hz	S	2:624	8
f2.O2	Frequency for Aj2O2	"	Hz	S	2:625	8
Md.O3	Mode	for Output 3	-	S	3:605	7
SC.O3	Source	"	-	S	3:606	8
cp.O3	cp value	"	1/m3	S	3:611	8
SpO3	Status pointer	"	-	S	3:607	8
Md.O4	Mode	for Output 4	-	S	4:605	7
SC.O4	Source	"	-	S	4:606	8
cp.O4	cp value	"	1/m3	S	4:611	8
SpO4	Status pointer	"	-	S	4:607	8

(Legends: see page 23)

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[1] The unit for the HF adjustment values is the same as the unit for the corresponding quantity defined with *SC.O2*:

[2] The unit for the HF adjustment values is the same as the unit for the corresponding quantity defined with *SC.O2*:

The function of the outputs can be set with the values described here. The ex-works standard setting is:

- Output 1: Pulse output *VbT* (total volume at base conditions), 1 pulse per m^3;
  changes to the settings possible with open supplier's lock.

- Output 2: Pulse output *VmT* (total actual volume), 1 pulse per m^3;
  changes to the settings possible with open supplier's lock.

- Output 3: Status output alarm or warning, logic active;
  Changes to the settings only possible with open supplier's lock.

- Output 4: No function assigned.

With the aid of the WinPADS Parameterisation Software the access rights ($\rightarrow$ 2.4) mentioned here can be changed for each output with an appropriately open lock. In this respect there are the following alternatives:

- Changes to the settings only possible subject to the calibration lock.

- Changes to the settings possible subject to the supplier's and calibration locks.

- Changes to the settings possible subject to the customer's, supplier's and calibration locks.

Md.O1 ... Md.O4   Mode for Outputs 1...4

The four signal outputs of the EK260 can be set for various functions. The basic function is defined with the mode *Md.A...* Depending on this, the source (*SC.A...,* see below), the cp value (*cp.A...,* see below) or the status pointer (*SpA...*, see below) must also be parameterised, where necessary, for the relevant output.

In the following table, apart from the setting possibilities for *Md.A...* it is shown for each setting whether *SC.A...*, *cp.A...* or *SpA...* must be parameterised.

Md.A..	Meaning	To program:		
		SC.A...	*cp.A...*	*SpA...*
0	Output switched off (transistor blocking, "switch open")	-	-	-
1	Volume pulse output	Yes	Yes	-
2	Status output, logic active (signalling active ⇒ output switched on)	-	-	Yes
3	Time-synchronised output	Yes	-	-
4	Output switched on (transistor conducting, "switch closed")	-	-	-
5	Volume pulse output, logic inactive	Yes	Yes	-
6	Status output, logic inactive (signalling active ⇒ output switched off)	-	-	Yes
8	HF output*	Yes	-	-
9	Event output, logic active (signalling active => output switched on	-	-	Yes
10	Event output, logic inactive (signalling active => output switched off	-	-	Yes
99	Continuous pulse (for test purposes)	-	-	-

(*)   Mode "8" only functions with Output 2 (DA2) and with an external power supply. The adjustment occurs with *Aj1O2*, *Aj2O2*, *f1.O2* and *f2.O2.* (see below)

SC.O1 ... SC.O4   Source for Outputs 1...4

These values are only of significance if the mode *Md.A...* of the same output is set to "1" (volume pulse output), "3" (time-synchronised output) or "8" (HF output).

If the error message "12" appears when attempting to make an entry, the address cannot be used with the set mode (*Md.A...*, see above).

For further details on entering a source: See Chap. 2.3.2.

Depending on *Md.A...*, the following settings for *SC.A* are practicable:

- for mode "1" or "5" (volume pulse output)

SC.A...	Meaning
0002:300_0	Vb Volume at base conditions, undisturbed
0002:301_0	VbD Volume at base conditions, disturbance quantity
0002:302_0	VbT Volume at base conditions, total quantity (undisturbed + disturbed)
0004:300_0	Vm Actual volume, undisturbed
0004:301_0	VmD Actual volume, disturbed
0004:302_0	VmT Volume at base conditions, total quantity (undisturbed + disturbed)

The period duration and pulse duration can be set individually for each output via the serial interface under the addresses "1:617" to "4:617" (period duration) or "1:618" to "4:618" (pulse duration) as a multiple of 125 ms. The period duration must always be greater than the pulse duration.

- for mode "3" or "7" (time-synchronised output)

By programming *SC.A...* according to the following table, you can set at which time points a time-synchronised pulse is output:

SC.A...	Pulse is output
0001:143_0	At the beginning of each month at 0 hrs.
0002:143_0	At the beginning of each month at 6 hrs[1].
0001:142_0	At the beginning of each day at 0 hrs.
0002:142_0	At the beginning of each day at 6 hrs[1].
0001:403_0	At the beginning of each hour
0001:402_0	At the beginning of each minute [2]
0004:156_0	At the beginning of each measurement period *MPer* ($\rightarrow$ 3.6)

The pulse duration can be set individually for each output via the serial interfaces under the addresses "1:618" to "4:618" as a multiple of 125 ms.

- for mode "8" (HF output, only for Output 2)

SC.A...	Output "DA2" corresponds to
0002:310_0	Flow at base conditions *Qb*
0004:310_0	Actual flow *Qm*
0001:310_0	Power *P*
0007:310_1	Pressure *p*
0006:310_1	Temperature *T*

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[1] The day boundary "06:00 hrs." can be set via the serial interfaces (address 2:141).

[2] The output of a time-synchronous pulse each minute is only possible if the operating cycle OCyc ($\rightarrow$ page 56) is set to "60" or lower, whereby however the battery service life reduces slightly.

cp.O1 ... cp.O4   cp value for Outputs 1...4

If the output is programmed as a volume pulse output (*Md.A...= 1*), the increase in volume is converted with *cp.A...* into the number of pulses to be output. The conversion takes place according to the formula:

$$i = V \cdot cp.A...$$

where   i: Number of output pulses

V: Volume increase which is to be output as a pulse.

cp.A... therefore states how many pulses are to be output for 1 m^3.

If a mode other than "1" is set, *cp.A...* has no significance. This also applies to the setting "time-synchronised output" (see above), although then *cp.A...* is displayed dependently of *SC.A...* with a time unit.

With a change of the output cp value, the corresponding input buffer is cleared. (cf. Messages "Error on Output1" to "Error on Output4", page 49).

SpO1 ... SpO4   **Status pointer for Outputs 1...4**

The status pointers *SpO1 ... SpO4* are used to set which status messages an output parameterised as status or event output represents.

The <u>display</u> of the status pointer occurs as a short text according to Chapter 3.7 with a following arrow pointing upwards "↑" (e.g. "I3 Warn.sig."). Here, the symbol "↑" indicates that the "signal arrives".

For <u>entry</u> a special numerical display is implemented (e.g. "*08_03:1.1*"), because a text entry on the device would only be possible with a great deal of effort.

If the output is programmed as status or event output "with <u>active</u> logic" (*Md.A...= 2 or 9*), then *SpA...* sets with which status messages of the momentary status → (3.7) the output is to be switched <u>on</u>. If none of the selected messages is present, the output remains switched off.

If the output is programmed as status output "with <u>inactive</u> logic" (*Md.A...= 6 or 10*), then *SpA...* sets with which status messages of the momentary status the output is to be switched <u>off</u>. If none of the selected messages is present, the output remains switched on (!).

In contrast to the status output, an event output automatically returns to its basic state after a programmable time. This time can be set with the WinPADS parameterisation software.

There are two basic ways of selecting status messages with *SpA...*:

 - Selection of a single message.
 - Selection of a message group.

Example of a "message group":

"Messages 1 to 8" signify that the output is switched while ever one or more of the messages with the number "1" to "8" is present in the momentary status.

"Message groups" always start with the message "1" ("any of the messages 1 to ..."). It is not possible, for example, to select the messages "3 to 5".

All the possible settings for *SpA...* are described in the following. Here, "mm" signifies the message, i.e. one of the messages "1" to "16" can be selected with "mm".

a) A message in a status St.1 to St.9

SpA... = „mm_0s:1.1"
  where   s = 1 to 9 for *St.1* to *St.9*

<u>Example:</u>
"0.08_03:1.1" means: Message 8 in status *St.3K* ("*I3 Warn.sig."* → page 52)

b) A message in the system status *StSy*

SpA... = "mm_02:2.1"

<u>Example:</u>
"0.03_02:2.1" signifies: Message 3 in system status *StSy (*"Data restore" → page 49).

c) A message in the overall status *Stat*

Since *Stat* combines the messages of all statuses, this setting means that the output is switched while ever the message "mm" is present in any of the statuses *StSy or St.1* to *St.9.*

SpA... = "mm_01:2.1"

Example:
"0.08_01:2.1" signifies: Message 8 in any status *StSy or St.1* to *St.9.*

(After the entry the following is displayed: "*Message 8↑*".)

d) Message group in a status *St.1* to *St.9*

SpA... = "1.mm_0s:1.1"
  where   s = 1 to 9 for *St.1* to *St.9*

Example:
"1.06_04:1.1" means: Any of the messages 1 to 6 in the status *St.4.*

(After the entry the following is displayed: "*St.4:M1-6↑*".)

e) Message group in the system status *StSy*

SpA... = "1.mm_02:2.1"

<u>Example:</u>
"1.03_02:2.1" signifies: Any of the messages 1 to 3 in the system status *StSy.*

(After the entry the following is displayed: "*StSy:M1-3↑*".*)*

f) Message group in the total status *Stat*

The output is switched while ever one of the messages 1 to mm is present in any of the statuses *StSy or St.1* to *St.9.*

SpA... = "1.mm_01:2.1"

<u>Example:</u>
"1.08_01:2.1" signifies: Any of the messages 1 to 2 in any status *StSy or St.1* to *St.9*, i.e. any alarm or any warning.

(After the entry the following is displayed: "*Stat:M1-8↑*".*)*

Aj1O2 HF adjustment factor 1 for Output 2
Aj2O2 HF adjustment factor 2 for Output 2
f1.O2 Frequency for *Aj1O2* for Output 2
f2.O2 Frequency for *Aj2O2* for Output 2

With an external power supply of the EK260 Output 2 (DA2) can be used as an HF output by setting *Md.O2* = "8". The output frequency is then proportional to a quantity, e.g. flow, pressure or temperature.

The maximum output frequency is 1000 Hz. With the connection of an FE260 Function Expansion the adjustment should however be made such that no frequency above 500 Hz is output.

These four values are used to adjust the HF output, whereby the adjustment points are freely selectable. It is recommended that the adjustment is at the salient points of the quantity to be output (e.g. Qmin and Qmax).

The unit for the HF adjustment values *Aj1O2* and *Aj2O2* is the same as the unit for the corresponding quantity defined with *SC.O2* - it is therefore automatically changed over appropriately when *SC.O2* changes.

If a frequency outside of the range selected with f1.O2 and f2.O2 is to be output, then error message "Outp.1 Error" appears in the status (→ page 49).

3.11.1 Parameterising the HF output

! The HF output only functions with an external power supply !

Adjustment steps	Example with adjustment	
1. "Source": Address of the quantity to which the output frequency should correspond.	Output frequency proportional to the flow at base conditions Qb.	*SC.O2* = 0002:310_0
2. Lower adjustment value	Minimum flow Qb min = 0 m³/h	*Aj1O2* = 0
3. Output frequency which corresponds to the lower adjustment value "0 m³/h"	0 Hz at 0 m³/h	*f1.O2* = 0
4. Upper adjustment value	Maximum flow Qb max = 1800 m³/h	*Aj2O2* = 1800
5. Output frequency which corresponds to the upper adjustment value "1800 m³/h"	500 Hz (at 1800 m³/h)	*f2.O2* = 500

3.11.2 Brief summary of output parameterisation

⬩ **Volume pulse output**.. *Md.A..* = 1 or 5
    ➜ Selection of the volume counter:
       - Vb   Volume at base conditions, undisturbed ...... *SC.A...* = 0002:300_0
       - VbD   Volume at base conditions, disturbance quantity   *SC.A...*   =
   0002:301_0
       - VbT   Volume at base conditions, total quantity..... *SC.A...* = 0002:302_0
       - Vm   Actual volume, undisturbed .... *SC.A...* = 0004:300_0
       - VmD Actual volume, disturbed............................... *SC.A...* = 0004:301_0
       - VmT Actual volume, total quantity........................ *SC.A...* = 0004:302_0
   Setting of the cp value .... *cp.A...* = **...**

⬩ **Status output, logic active or inactive**................................ *Md.A..* = 2 or 6
⬩ or **event output, logic active or inactive** .... Md.A = 9 or 10
   ' Selection of status message(s):
   - A message in a status *St.1* to *St.9* .... *SpA...* = 0.mm_0s:1.1 *
   - A message in the system status *StSy*.............................. *SpA...* = 0.mm_02:2.1 *
   - A message in the total status *Stat*.................................. *SpA...* = 0.mm_01:2.1 *
   - Message group in a status *St.1* to *St.9*........................... *SpA...* = 1.mm_0s:1.1 *
   - Message group in the system status *StSy* .... *SpA...* = 1.mm_02:2.1 *
   - Message group in the total status *Stat*............................. *SpA...* = 1.mm_01:2.1 *

⬩ **Time-synchronised output, logic active or inactive** .... *Md.A..* = 3 or 7
   'Setting of the time-point:
   - At the start of each month at 0 hrs. .... *SC.A...* = 0001:143_0
   - At the start of each month at 6 hrs. .... *SC.A...* = 0002:143_0
   - At the start of each day at 0 hrs....................................... *SC.A...* = 0001:142_0
   - At the start of each day at 6 hrs....................................... *SC.A...* = 0002:142_0
   - At the beginning of each hour.. *SC.A...* = 0001:403_0
   - At the beginning of each minute. .... *SC.A...* = 0001:402_0
   - At the beginning of each measurement period.................*SC.A...* = 0004:156_0

⬩ **HF output (only possible for Output 2)** .... *Md.O2* = 8
   Adjustment..*Aj1O2, Aj2O2, f1.O2, f2.O2* See Chap. 3.11.1.

⬩ **Continuous pulse (for test)**.. *Md.A..* = 99

⬩ **Output switched on**... *Md.A..* = 4

⬩ **Output switched off**.. *Md.A..* = 0

                * ***mm** = Message (1...16), **s** = Status number (1...9 for St.1 ... St.9)*

3.12 Interface list

The values displayed in this list depend on the set interface mode Md.S2 (see below):

a) All modes except "Modbus" (Md.S2 ≠ 13):

AD	Designation / value	Unit	Access	Address	DC
Md.S2	Mode, Interface 2	-	S	2:705	7
DF.S2	Data format, Interface 2	-	S	2:707	7
Bd.S2	Baud rate, Interface 2	Bd	S	2:708	7
TypS2	Type, Interface 2	-	S	2:70A	7
Num.T	Number of ringing tones before accepting call.	-	S	2:720	8
M.INI	Initialise modem	-	S	2:728	2
PrLog	Printer log	-	-	2:7E6	8
CSync	Automatic setting of the clock by rem. data transfer	-	-	2:7D4	8
GSM.N	GSM network	-	-	2:775	4
GSM.L	Reception level	-	-	2:777	4
StM	Modem status (GSM)	-	-	2:77C_1	4
P.Sta	Response to PIN code	-	-	2:77A	20
PIN	PIN code	-	S	2:772	11
Resp1	Response to Short Message 1	-	-	2:742	20
Resp2	Response to Short Message 2	-	-	2:74A	20
SEND	Send short message (SMS)	-	S	2:734	2
Bd.S1	Baud rate, Interface 1	Bd	S	1:709	7
CW1.S	Call acceptance window 1, start	-	S	5:150	8
CW1.E	Call acceptance window 1, end	-	S	5:158	8
CW2.S M.CW1	Call acceptance window 2, start - or: Status message "Call acceptance window 1"	-	S	6:150	8
CW2.E M.onl	Call acceptance window 2, end - or: Status message "FE230 online"	-	S	6:158	8

b) Mode "Modbus" (Md.S2 = 13):

AD	Designation / value	Unit	Access	Address	DC
Md.S2	Mode, Interface 2	-	S	2:705	7
DF.S2	Data format, Interface 2	-	S	2:707	7
Bd.S2	Baud rate, Interface 2	Bd	S	2:708	7
TypS2	Type, Interface 2	-	S	2:70A	7
Modb	Modbus parameter	-	(C)	1:1C1	8
Bd.S1	Baud rate, Interface 1	Bd	S	1:709	7
CW1.S	Call Window 1, start	-	S	5:150	8
CW1.E	Call Window 1, end	-	S	5:158	8
CW2.S	Call Window 2, start	-	S	6:150	8
CW2.E	Call Window 2, end	-	S	6:158	8

(Legends: see page 23)

Connection of a device to Interface 2 (permanently wired interface): → 5.6

Md.S2 Mode, Interface 2

This value informs the EK260 which device is connected to the internal (permanently wired) interface and how it is to be controlled.

All the modes which can be set are described here. You can quickly find the setting suitable for your application in Chapter 4.7.

Md.S2 =

1 "With control line"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
No	Yes	Yes	Yes

Suitable for direct connection to a PC

2 "Modem" (no GSM modem)

Modem control	RS-232 control lines	Battery operation	Baud rate selection
Yes	Yes	Yes	No

Suitable for the connection of a commercially available modem.

For GSM modems Mode 2 can also be used, but Mode 7 is more suitable (see below), because then monitoring of the link to the GSM network also occurs.

Num.T (see below) is effective.

3 "Modem with responses"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
Yes	No	No	No

The EK260 controls the modem over the data lines via "responses". The activation of the responses occurs with the modem command "ATQ0V1".

Particularly suitable for the connection of an FE260 Function Expansion with modem.

Num.T (see below) is effective.

5 "Without control lines"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
No	No	No	Yes

The baud-rate selection can be bypassed in this mode in that the values under the addresses 02:708 (*Bd.S2*) and 02:709 are set to the same value. The ex-works setting is 02:708 = 02:709 = 19200 Bd.

Suitable for the connection of the following devices:

- Modem with automatic call acceptance, e.g. in or on an FE260.
- Another device (not a modem) with RS232 or RS485 interface for data interrogation connected to an FE260.

Num.T (see below) is <u>not</u> effective.

Md.S2 =

6 "Modem with responses, battery mode"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
Yes	No	Yes	No

In the mode Md.S2 = 6 the EK260 handles, as with Md.S2 = 3 (see above), the modem control over the data lines via "responses". The modem is <u>not</u> parameterised for automatic call acceptance.

Num.T (see below) is effective.

7 "GSM modem"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
Yes	Yes	Yes	No

Suitable for the connection of a commercially available GSM modem.

This mode largely corresponds to Mode 2 (see above), but checks the EK260 daily shortly after midnight for whether the modem is still ("logged in") with the GSM network and, if required, establishes the connection.

Num.T (see below) is effective.

9 "Without control lines, battery mode

Modem control	RS232 control lines	Battery operation	Baud rate selection
No	No	Yes	Yes

Md.S2 = 9 corresponds to Md.S2 = 5, but can in contrast also be used in battery mode.

The device current requirement is in this mode increased not just during the actual communication that occurs, but rather during the whole call time window. The time window should therefore be restricted as far as possible.

10 "Printer protocol"

Modem control	RS-232 control lines	Battery operation	Baud rate selection
No	No	Yes	No

Suitable for the connection of a printer with serial interface RS-232/V.24 or RS-485.

Only two lines need to be connected: TD (TxD) and Gnd for RS-232/V.24 or T+ and T- for RS-485.

Further details → 3.12.1

Md.S2 =

13 "Modbus"

Modem control	RS232 control lines	Battery operation	Baud rate selection
No	Yes	Yes	No

In the mode Md.S2 = 13 the modbus protocol is available via the permanently wired interface. Further explanation → 3.12.3, page 89.

15 "GSM modem without control lines with call acceptance"

Modem control	RS232 control lines	Battery operation	Baud rate selection
No	No	No	Yes

Md.S2 = 15 corresponds to Md.S2 = 5 (see above), but also makes available the GSM network parameters such as Reception Level and Network Operator.

Suitable for connection of following devices:

- GSM-Modem with automatic call acceptance without control lines.

However, Mode 3 (see above) is recommended for a GSM modem in or on an FE260.

17 " GSM modem with control lines with call acceptance"

Modem control	RS232 control lines	Battery operation	Baud rate selection
No	Yes	Yes	Yes

Md.S2 = 17 corresponds to Md.S2 = 1 (see above), but also makes available the GSM network parameters such as Reception Level and Network Operator.

19 " GSM modem without control lines, call acceptance, battery mode"

Modem control	RS232 control lines	Battery operation	Baud rate selection
No	No	Yes	Yes

Md.S2 = 19 corresponds to Md.S2 = 9 (see above), but also makes available the GSM network parameters such as Reception Level and Network Operator.

Suitable for connection to an FE230.

Md.S2 = "3" and Md.S2 = "5" only function when the value "1:1FB" = "1" which can be called via the interface is set (standard setting). The means that the EK260 with external supply remains continually active to monitor the interface. With "1:1FB = 0" the current consumption with an external power supply can be reduced for special applications (not for battery operation).

DF.S2 Data format, Interface 2

Here the number of data bits, parity bit usage and number of stop bits are set for the data interchange between the EK260 and a device (e.g. a modem) connected to the interface terminals.

For this there are three possible settings:

- "0" = 7e1 = 7 data bits, even parity, 1 stop bit
- "1" = 7o1 = 7 data bits, odd parity, 1 stop bit
- "2" = 8n1 = 8 data bits, no parity, 1 stop bit

"0" (7e1) is the basic setting which is described in the applicable IEC 62056-21 interface standard.

Bd.S2 Baud rate, Interface 2

Here, the initial baud rate (speed) for the data transmission between the EK260 and a device connected to the interface terminals can be set.

Possible settings: 300, 600, 1200, 2400, 4800, 9600, 19200

With the application of the baud rate selection the baud rate is generally set according to (DIN) EN 61107 to "300". It is then only used briefly for initiating the data interchange. The actual baud rate for transferring the useful data is automatically increased to 19200 Bd.

With a modem connected (i.e. when Md.S2 is set to "2" or "3") <u>no</u> automatic baud rate selection occurs. Bd.S2 should then be set to "19200".

TypS2 Type, Interface 2

The interface type can be set here:

"1" = RS-232 (e.g. for connecting a commercially available modem)

"2" = RS-485 (e.g. for connecting an "FE260" function expansion)

In the setting "2" (RS-485) two separate wires must be connected each for transmitted and received data (four-wire connection → 5.6.5).

Modb Modbus parameters

Here the submenu for the Modbus parameters is called with <ENTER> (→ 3.12.3, page 89).

Num.T Number of ringing tones before answering

With some settings for Md.S2 (see above) you can specify here how many ringing tones the EK260 allows before it accepts the call ("before answering").

The entry of values in the range from 1 to 12 is accepted. Depending on the type of modem, the function is only guaranteed with additional restrictions. (Refer to the operating instructions for the connected modem and to Chaps. 5.6 and 5.6.5.)

When using a GSM modem, Num.T must be set to 1 ringing tone.

M.INI Initialise modem

With this command you can initialise a connected modem when you, for example, are connecting an unparameterised modem or when the modem has lost its settings.

In particular when connecting a new modem, it must be ensured that a suitable initialisation string is available under the address "2:721" of the EK260. This can then be loaded using the "WinPADS" parameterisation software.

(Connection of a modem: → 5.6)

PrLog Printer log

Entry point into the submenu "Printer log".

The printer log is used for the cyclical output of formatted data to a printer with a serial interface conforming to RS-232 and which is connected to the internal interface (Interface 2).

After entry into the submenu with <ENTER>, settings of the printer log can be made, such as for example, when a data row is output.

CSync Automatic setting of the clock by rem. data transmission

Entry point into the submenu for setting the function "Automatic setting of the clock by remote data transmission" → 3.12.2

GSM.N GSM network
GSM.L Reception level

When using a mobile radio modem and with a suitable setting of *Md.S2* (see above), information regarding the mobile radio network can be recalled here once the EK260 has logged in.

The information is automatically updated each night at 0:00 and after a failure of the external power supply. If required, an update can be carried out by pressing the key combination <ENTER> during the display of *GSM.L*.

StM GSM modem log-in status

☞ *This value is only valid when using a GSM modem.*

This value shows in which network the GSM modem is logged in:

Logged out	The GSM modem is currently not logged in. Possible causes: Call window off, no SIM card inserted, SIM PIN not entered.
Own network	The GSM modem is logged into its own network.
Searching...	The GSM modem is currently logging into a network.
Denied	The GSM modem log-in has been denied.
Third party	The modem is logged into a third party network ("roaming").
no command	The modem command for reading out the modem status has not been parameterised. If this text is displayed with a connected GSM modem, the EK260 has not been correctly parameterised.

P.Sta Response to PIN code
PIN PIN code

☞ *These values are only valid when using a GSM modem.*

Under *PIN* the "Personal Identification Number" of the SIM card is entered in order to be able to use it.

The status with regard to the PIN can be seen under *P.Sta*.

Message	Meaning
PIN NEW	The PIN has not yet been entered.
PIN READY	The SIM card is used without a PIN.
PIN OK	The PIN has been entered correctly, the SIM card is ready for operation.
PIN ERROR	The PIN has been entered incorrectly.

Resp1 Response to Short Message 1
Resp2 Response to Short Message 2
Send   Send short message

☞   *These values are only valid when using a GSM modem.*

The EK260 is able to send a short message by SMS, e.g. to a mobile telephone, on the occurrence of definable events. In this respect the message content, recipient and trigger events can be set with the WinPADS parameterisation program.

The defined short message can be immediately sent by entering "1" for *SEND*.

Bd.S1 Baud rate, Interface 1

Here, the baud rate (speed) for the data transmission between the EK260 and a device connected to the optical interface can be set.

The standard setting is 9600 Bd. If problems occur with the data transmission, then this is probably due to the readout lead. Then set Bd.S1 to 4800 Bd (to give a slower data transmission).

Depending on the system, Bd.S1 can also be set to 19200 Bd. With this setting, the data transmission does not function correctly. Therefore, avoid using this setting.

CW1.S Call acceptance window 1, start
CW1.E Call acceptance window 1, end
CW2.S Call acceptance window 2, start   - or:
M.CW1 Status message "Call acceptance window 1"
CW2.E Call acceptance window 2, end   - or:
M.onl   Status message "Data transmission running via FE230"

With these values two different time windows can be set within which a data transmission is possible each day via the internal permanently wired interface. The EK260 does not respond outside of this time window. With the "WinPADS" parameterisation software the repeat cycle of the time windows can be set to "daily", "weekly" or "monthly".

In order to always enable the data transmission irrespective of the time windows, the value "0" can be written to both of the so-called "Pointers to the time windows" (addresses 2:722 and 2:723).

The EK260 compares the two time windows with the running time of day on a rhythm with the operating cycle, *OCyc*, ($\rightarrow$ 3.8). If, for example, with a standard operating cycle of 5 minutes, the start of a time window is at 6:53 hrs., then it is first activated at 6:55 hrs.

For the connection of an FE230 Function Expansion there are special parameter files available which can be installed with the "WinPADS" parameterisation program and also loaded into the device with it. In this case the two display points *CW2.S* and *CW2.E* are changed to *M.CW1* and *M.onl*:

M.An1 is the number of the message "Call Win.1" ($\rightarrow$ page 54), *M.onl* is the number of the message "online" ($\rightarrow$ page 52). The EK260 needs this information for the control of the FE230. *M.CW1* and *M.onl* must not be changed.

3.12.1 Printer log

AD	Designation / value	Unit	Access	Address	DC
PrCyc	Printer log cyclical	Minutes	S	13:150	8
daily	Printer log daily	-	S	3:141_1	8
StPrL	Status pointer for printer line	-	S	2:7E2	8
PL.V1	Printer log 3rd column	-	S	3:1CA	7
PL.V2	Printer log 4th column	-	S	4:1CA	7
Print	Command: Output printer row	-	S	2:7E5	2

(Legends: see page 23)

You can reach this submenu by pressing <ENTER> during the display of *PrLog* (→ 3.12). All the values present here only work as described if *Md.S2* = "10" is set (→ page 79 et seq.).

Example of a log printout:

```
EK260
                                                    11.09.2002
                                        SNM:     000000000002
                                        CuNo:    000000000001
                                        SNo:     000221308888

 Date   Time      Vb          Vm           Qb     Qm      T       P       K       Z
Stat
 11.09. 10:05    204856     9273564      31.3   31.0   11.56 1.006 1.0004 0.9351      0
 11.09. 10:10    204857     9273565      31.4   31.1   11.57 1.006 1.0004 0.9351      0
 11.09. 10:15    204860     9273568      37.5   37.2   11.65 1.006 1.0004 0.9351    13.
 11.09. 10:20    204863     9273571      31.4   31.1   11.64 1.006 1.0004 0.9351    13.
 11.09. 10:25    204864     9273572      32.1   31.8   11.56 1.006 1.0004 0.9351    13.
*11.09. 10:36    204870     9273578      31.6   31.3   14.00 1.006 1.0004 0.9351     2.
 11.09. 10:30    204870     9273578      31.3   31.0   14.00 1.007 1.0004 0.9352     2.
 11.09. 10:35    204870     9273578      31.4   31.1   14.00 1.007 1.0004 0.9352     2.
 11.09. 10:40    204870     9273578      32.7   32.4   14.00 1.007 1.0004 0.9352     2.
*11.09. 10:43    204872     9273581      37.8   37.5   11.50 1.007 1.0004 0.9352      0
 11.09. 10:45    204875     9273583      31.3   31.0   11.70 1.007 1.0004 0.9352      0
 11.09. 10:50    204878     9273586      32.1   31.8   11.64 1.008 1.0004 0.9353      0
 11.09. 10:55    204881     9273589      31.3   31.0   11.79 1.008 1.0004 0.9353      0
 11.09. 11:00    204883     9273591      31.4   31.1   11.53 1.007 1.0004 0.9352      0
!11.09. 11:01    204883     9273591      31.4   31.1   11.53 1.007 1.0004 0.9352      0
 11.09. 11:05    204885     9273593      30.5   30.2   11.63 1.007 1.0004 0.9352      0
```

At the left margin of each line (directly before the date) symbols are, where applicable, displayed which indicate special features:

! The printout of the line has been initiated by a change of status.

* The printout of the line has been initiated by a keypad command.

If a number of messages are present in the status Stat (cf. Chap. 3.7), then in the "Stat" status column only the most important message (the lowest message number) is output in each case.

PrCyc   Printer log cyclical

One data line is printed out in each case on this cycle.

PrCyc must be an integer multiple of the operating cycle *OCyc* ($\rightarrow$ 3.8) or "0". With PrCyc = "0" only the setting "daily" (see below) for the daily printer output is effective.

With the default setting for *OCyc* the following values for *PrCyc* are practicable and usual: 0, 5, 10, 15, 20, 30 or 60 minutes.

Cyclical transmission is deactivated by default; to activate it, use the WinPADS parameterisation software to change the value: 13:157 from "0" to "21".

daily   Printer log daily

Time at which a data line is printed out each day. Only "full" hours (minutes = 0) are permissible.

If a cyclical and a daily printout occur at the same point in time, only one line is printed out. "daily" cannot be switched off separately, i.e. it is always effective with Md.S2 = 10.

StPrL   Status pointer for printer line

This sets which status changes initiate the printout of a line prefixed by "!". The following entries are practicable:

1.02_01:2.0 ..... Any message "1" or "2" arises or goes
(i.e. an alarm message arises or goes)
1.08_01:2.0 ..... Any message "1" or "8" arises or goes
(i.e. an alarm or a warning message arises or goes)

PL.V1   Printer log 3rd column
PL.V2   Printer log 4th column

Here you can choose which counter readings are printed out in columns 3 and 4 of the lines. Choose from the following list:

0002:300_1...... Vb   Volume at base conditions, undisturbed
0004:300_1...... Vm   Actual volume, undisturbed
0002:302_1...... VbT   Total volume at base conditions
0004:302_1...... VmT   Actual volume (total)
0004:303_1...... VmA   Actual volume, adjustable
0001:202_1...... Vo   Original counter on Input 1
0002:202_1...... VmT.2   Totaliser on Input 2

Due to the system, other entries are also possible here, but not practicable.

Basically, only counter readings without post-decimal places can be printed out.

Print   Command: Output printer line

Entering "1" causes the immediate printout of a line with an asterisk "*" prefix.

3.12.2 Automatic setting of the clock by remote data transmission

AD	Designation / value	Unit	Access	Address	DC
MdCSy	Mode for clock setting by rem. data transmission	-	S	14:157	7
TimCS	Time for clock setting by rem. data transmission	-	S	14:150	8
ScCSy	Source for time of clock sync. via rem. data transmission	-	S	14:154	8
TNoCS	Telephone no. for time synchronisation	-	(S)	2:7D0	8
DevCS	Limit for time synchronisation	Minutes	S	2:7D1	8
DF.CS	Data format for time synchronisation	-	S	2:7D5	7
Sync	Command: Time synchronisation	-	(S)	2:7D3	2

(Legends: see page 23)

The EK260 can be set using these values such that it regularly calls a telephone time service by means of a connected modem and sets its clock.

☞ *The automatic setting of the clock by remote data transmission is only guaranteed with the devices FE260 or EM260 which can be obtained from Elster GmbH and each of which has an integrated modem. When using a* <u>GSM</u> *modem this function is basically* <u>not</u> *possible.*

As supplied ex-works, this function is switched off. To switch it on, *MdCSy* (see below) must be set to "6" and to "0" to switch it off again.

If the function is active, the EK260 sets the message "Remote clock" in the system status *StSy* ($\rightarrow$ 53) with each call and deletes it again thereafter. If the clock setting does not function (e.g. because the telephone number is not correct or no modem ready for operation is connected), the message "14" is retained until the beginning of the cycle in which the next time for setting the clock is located.

Example: The clock is to be set monthly on the 2nd day at 23:00. On 2.5.2003 at 23:00 the message "14" is entered into the system status. If the setting of the clock does <u>not</u> function on 2.5.2003 at 23:00, it is only deleted on 1.6.2003 at 0:00 hrs.

Requirements for this function:

- A modem ready for operation must be connected to the EK260.
- The EK260 must be set to an interface mode Md.S2 ($\rightarrow$ 3.12) in which it controls the modem, i.e. Md.S2 = 3 or 6. The function is not possible in all other modes, even when a modem is connected.
- To activate the function, *DevCS* (see below) must be set $\neq$ "0" and the address 14:0157 set to "6".

☞ *If you use the function "Automatic setting of the clock by remote data transmission", take the following points into consideration:*

  - In the battery mode each data transfer costs additional battery capacity. If you are using the function in the battery mode, you should therefore prefer larger cycles (*ScCSy*, see below).

- With each setting of the clock an entry is made into the measurement period archive (→ 3.6). The memory duration is then reduced and the data transfer time extended. With daily setting of the clock you lose, for example, about 4% of the memory duration and the data transfer takes about 4% longer. For this reason also, you should prefer to use larger cycles if possible (→ *ScCSy*, see below).

- If you use this function with a number of devices, they should be set if possible to different time-points so that they do not all attempt to call the time service at the simultaneously.

MdCSy **Mode for clock setting by rem. data transmission**

To activate (switch on) the function " Automatic setting of the clock by remote data transmission" *MdCSy* = "6" must be set and *MdCSy* = "0" must be set to switch off.

TimCS **Time-point for setting the clock by remote data transmission**
ScCSy **Cycle for setting the clock by remote data transmission**

Both of these values are used to set at which recurring time-points the cyclical setting of the clock occurs.

First, you set the cycle with *ScCSy* (monthly, weekly or daily), then you set the recurring time-point with *TimCS*.

ScCSy =	⇒ Cycle	⇒ Format for *TimCS* *
0001:140_3	daily	hh:mm
0001:140_4	weekly	WW,hh:mm:ss
0001:140_5	monthly	DD,hh:mm:ss

* WW = weekday (So, Mo, Tu, ...); DD = Day in the month (01, 02, ... 31);
  hh = hour; mm = minutes; ss = seconds

TNoCS **Telephone number for setting the clock by remote data transmission**

Telephone number of the telephone time service. As standard, the telephone number of the time service of the PTB standards institute in Germany is entered here.

DevCS **Max. deviation for setting the clock**

Maximum deviation between the device clock and the clock of the telephone time service. The clock is not set if the deviation is greater.

If this value is set to "0", the function "Automatic setting of the clock by remote data transmission" is switched off, but message "14" is still generated in the system status as set with TimCS and *ScCSy*.

DF.CS **Data format for setting the clock by remote data transmission**

Setting of data bits, parity and stop bits specially and exclusively for the data transmissions for the setting of the clock by remote data transmission. Significance of the possible settings "0", "1" and "2": see *DF.S2* (Chap. 3.12)

The setting must conform to that used by the time service which is called up with *TNoCS* (see above). The standard setting is "2" (8 data bits, no parity, 1 stop bit).

Sync **Command: Set the clock by remote data transmission**

Entering "1" causes the immediate setting of the clock by remote data transmission.

3.12.3 Modbus parameters

AD	Designation / value	Unit	Access	Address	DC
MBDir	Data direction	-	S	2:7B0	7
MBTrM	Transmission mode	-	S	2:7B1	7
MBAdr	Device address ("slave" address)	-	S	2:7B2	8

(Legends: see page 23)

In the mode Md.S2 = 13 the Modbus protocol is available via the permanently wired interface. Values can be read and changed and the measurement period archive can be read out.

The functions "Read holding registers" (3), "Read Input Registers" (4), "Preset Single Register" (6) and "Preset Multiple Registers" (16) of the protocol are implemented. Reading out via the Modbus is described in separate documents from Elster GmbH.

External power supply is required for the EK260 for the Modbus communication and at least one readout time window must be open. In the interface list "Ser.IO" ($\rightarrow$ **3.12**) Md.S2 must be set to "13" and DF.S2 to "0" or "1" depending on the set transmission mode MBTrM.

MBDir   Data direction

    0 = The most significant word in the first register (H word first).

    1 = The least significant word in the first register (L word first) affects only values with binary formats).

MBTrM   Transmission mode

    0 = ASCII mode – The content of each register is transmitted as four ASCII coded hexadecimal figures. DF.S2 must be set to "0".

    1 = RTU mode – The content of each register is transmitted as two bytes. DF.S2 must be set to "2".

    2 = RTU-TCP mode – transmission as in RTU mode with additional information for Modbus TCP protocol

MBAdr   Device address ("slave" address)

    Address of the EK260 for the Modbus communication.

    Value range from 1 to 247 (0 = "Broadcast").

The following settings for the desired Modbus addresses and the associated LIS-200 addresses of the EK260 as well as the data formats can only be changed using the WinPADS parameterisation software:

MAd1 … MAd40   Addresses for MODBUS Registers 1 to 40

    There are 40 Modbus registers available for reading and writing values. Three values must be set for the definition of each Modbus register: The Modbus register address, *MAd...*, the corresponding LIS-200 address *LAd...* (EK260 address) and the Modbus data format code *Fmt...*.

    The Modbus register addresses can take on values from 1 to 65536.

Fmt1 … Fmt40   Data format for Modbus Registers 1 to 40
   The data format code for each register according to the table (see below). For details please request the separate document from Elster GmbH.

Code	Format	No. of registers				
a) Binary formats:						
3	Number	1	Value			
4	Number	2	MS word	LS word		
			Upper part	Lower part		
32	Exponential	2	MS word			LS word
			Bit 31	Bit 30…23	Bit 22…16	Bit 15...0
			Sign	Exponent	Mantissa upper part	Mantissa lower part
9	Counter	3	MS word	...	LS word	
			Predec. point upper part	Predec. point lower part	Decimal places	
b) Decimal formats:						
17	BCD counter *	4	MS word	...	...	LS word
			Predec. places			Decimal places
	BCD time stamp *	4	MS word	...	...	LS word
			CCYY **	MMDD **	hhmm **	ss00 **
16	BCD no.	3	MS word	...	LS word	
			12 digits			
12	BCD time	1	hhmm **			

 * Counter or time stamp, depending on allocated LIS-200 address (see below)
 ** CC = century, YY = year, MM = month, DD = day, hh = hour, mm = minutes, ss = seconds

LAd1 … LAd40   LIS-200 addresses for Modbus Registers 1 to 40

Not all the device information can be read via Modbus, but rather only important values such as counter readings and measurements. The list below shows the standard setting. ("Reg." = Modbus register, "AD" = Abbreviated designation)

Reg.	AD	Designation / value	Format code	Unit	Lis-200 address
1	Bat.R	Remaining battery service life	3	months	2:404
2	Stat	Momentary register, total	3		1:100
3	VmT	Vm total, decimal places	3	10^{-4} m^3	4:302_2
4	VbT	Vb total, decimal places	3	10^{-4} m^3	2:302_2
5	WT	W total, decimal places	3	10^{-4} kWh	1:302_2
101	VmT	Vm total, predecimal places	4	m^3	4:302_1
103	VbT	Vb total, predecimal places	4	m^3	2:302_1
105	WT	W total, predecimal places	4	kWh	1:302_1
301	pb	Pressure at base conditions	32	bar	7:312_1
303	Tb	Temperature at base conditions	32	°C	6:312_1
305	p.Abs	Absolute pressure measurement	32	bar	6:210_1
307	p.Mes	Pressure measurement	32	bar	6:211_1
309	T.Mes	Temperature measurement	32	°C	5:210_1
311	C	Conversion factor	32		5:310
313	K	Inverted compressibility factor ratio	32		8:310
315	p.F	Pressure substitute value	32	bar	7:311_1
317	T.F	Temperature substitute value in °C	32	°C	6:311_1
319	N2	Nitrogen content	32	%	14:314
321	H2	Hydrogen content	32	%	12:314
323	CO2	Carbon dioxide content	32	%	11:314
325	Rhob	Density gas at base conditions	32	kg/m^3	13:314_1
327	Qm	Actual flow rate	32	m^3/h	4:310
329	Qb	Flow at base conditions	32	m^3/h	2:310
331	P	Power	32	kW	1:310
333	Ho.b	Calorific value	32	kWh/m^3	10:314_1
335	dr	Density ratio	32		15:314
337	pbX	Pres. at base cond. for gas analysis pres.	32	bar	7:3140_1
339	TbX	Standard temp. for gas analysis in °C.	32	°C	6:3140_1
501	VmT	Vm total	9	m^3	4:302
504	VbT	Vb total	9	m^3	2:302
507	WT	W, total	9	kWh	1:302
801	VmT	Vm total	17	10^{-4} m^3	4:302
805	VbT	Vb total	17	10^{-4} m^3	2:302
809	WT	W, total	17	10^{-4} kWh	1:302
813	Time	Date and time	17		1:400
817	SNo	Device number (serial number)	16		1:180
820	DayB	Day boundary	12		2:141_1

Example of Modbus parameterisation:

In order to read the 9 predecimal places of the actual total volume counter under Modbus address "101" and the current gas temperature in °C under Modbus address "309", the parameters must be set as follows with the aid of the "WinPADS" parameterisation software via the optical interface:

```
W1   01:08C0.0   (101)
W1   01:08C1.0   (0004:0302_1)
W1   01:08C2.0   (4)
W1   02:08C0.0   (309)
W1   02:08C1.0   (0005:0210_1)
W1   02:08C2.0   (32)
```

3.13 Energy list

AD	Designation / value	Unit	Access	Address	DC
W	Energy	kWh	S	1:300	12
P	Power	kW	-	1:310	4
WD	W, disturbance quantity	kWh	S	1:301	12
WT	W, total	kWh	-	1:302	15
WA	W, adjustable	kWh	S	1:303	12
Ho.b	Calorific value	kWh/m3	S	10:312_1	8
SC.W	Source for warning W or P	-	S	15:154	8
P.UW	Upper warning limit for P	kW	K	15:158	8
P.LW	Lower warning limit for P	kW	K	15:150	8
WMP Δ	Measurement period counter W	kWh	-	27:160	16
WMP max	Max. meas. per. count. W current month	kWh	-	29:160	16
WDy Δ	Daily counter W	kWh	-	28:160	16
WDy max	Max. daily count. W current month	kWh	-	30:160	16

(Legends: see page 23)

W   **Energy**

The energy is calculated according to the following formula from the volume at base conditions and the entered calorific value:

$W = Vb \cdot Ho.b$ where   Vb   = Volume at base conditions ($\rightarrow$ 3.1)

Ho.b = Calorific value ($\rightarrow$ 3.5)

Energy is summed in the counter *W* as long as no alarm is present.

An alarm is present when any message "1" or "2" is urgent ($\rightarrow$ 3.7).

P   **Power**

Momentary power (energy per hour). $P = Qb \cdot Ho.b$

WD   **W, disturbance quantity**

Here the energy is summed while ever an alarm is present, i.e. a message "1" or "2" is located in any momentary status ($\rightarrow$ 3.7).

WT   **W, total**

Here the sum of *W*+ *WD* is always displayed. Entries for *W* or *WD* therefore also have an effect here. No entry for *WT* itself can be carried out.

WA   W adjustable counter

Here, as with *WT*, the total quantity, i.e. disturbed and undisturbed volumes, are counted. In contrast to *WT*, *WA* can however be changed manually.

The counter is typically used for tests.

Ho.b   Calorific value

The calorific value is used for calculating the energy. Please note that it may differ under some circumstances from the calorific value of the gas analysis in the volume conversion list ($\rightarrow$ **3.5**, page 36) when pbX differs from pb or TbX differs from Tb.

Entry of the calorific value in the energy list is not permitted. (Entry error message "6" is displayed.) Only change the calorific value in the volume conversion list ($\rightarrow$ 3.5, page 36).

SC.W   Source for warning W
P.UW   Upper warning limit W
P.LW   Lower warning limit W

Using these three values, the determined energy or power can be monitored in various ways. When the value to be monitored exceeds the upper limit *QbUW* or falls below the lower limit *QbLW*, the message "W Warn Lim.Various actions can in turn be programmed for this message, such as for example, entry of the change of status in the logbook ($\rightarrow$ 3.7) or activation of a signalling output ($\rightarrow$ 3.11).

With *SC.W* you can set which value is to be monitored.

SC.W	Value to be monitored	
0001:310_0	P	Power
0027:160_0	*WMP* Δ	Meas. period counter W
0028:160_0	*WDy* Δ	Daily counter W

For further details on entering a source for *SC.Qb*: See Chap.2.3.2.

WMP Δ Meas. period counter W

WMP Δ is restarted at "0" at the beginning of each measurement period ($\rightarrow$ 3.6) and indicates the progress of *WT* (see above). The measurement period MPer can be set in the archive list ($\rightarrow$ 3.6).

At the end of each measurement period *WMP* Δ is saved in the measurement period archive ($\rightarrow$ 3.6).

WMP Δ can be monitored by appropriate programming of *SC.Qb* and *QbUW* (see above) in order, for example, to issue a warning signal to a special-contract customer when a limit is exceeded.

WMP max   Max. measurement period counter W in current month

By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

The maxima of the last 15 months can be interrogated in monthly archive 1 ($\rightarrow$ 3.6), if it has been appropriately parameterised.

WDy Δ Daily counter W

WDy Δ is restarted with "0" at the beginning of each day and indicates the progress of *WT* (see above). As standard, the start of day is set to 06:00 hrs. and can be changed with the calibration lock open via the serial interfaces under the address "2:141".

WDy max   Max. daily counter W in current month

> By entering <ENTER> you can branch to the submenu where the time stamp of the maximum is displayed.

> The maxima of the last 15 months can be interrogated in monthly archive 1 ($\rightarrow$ 3.6), if it has been appropriately parameterised.

3.14 User list

AD	Designation / value	Unit	Access	Address	DC
VbT	Vb total	m3	-	2:302	15
VmT	Vm total	m3	-	4:302	15
p	Pressure	bar	-	7:310_1	4
T	Temperature	°C	-	6:310_1	4
K	Inverted compressibility factor ratio	-	-	8:310	4
C	Conversion factor	-	-	5:310	4
SReg	Status register, total	-	S	1:101	19
VbMP	Month's max. Vb	m3	-	3:161	16
Date	Date of month's max. Vb	-	-	3:165_1	16
Time	Time of month's max. Vb	-	-	3:165_2	16
Qb	Flow at base conditions	m3/h	-	2:310	4
Qm	Actual flow rate	m3/h	-	4:310	4
Menu	Selection for display menu	-	L	1:1A1	7

(Legends: see page 23)

With exception of the last value, this list is application-specific, i.e. the user can himself set which values in this list are displayed. Ex-works, these are the above-mentioned values which are also all displayed in another list and described in the corresponding chapters.

Since the status register *SReg* in this list is not assigned to any submenu, it can be directly cleared here in contrast to the status list ($\rightarrow$ 3.7).

The setting of the values to be displayed occurs by using the parameterisation software "WinPADS".

With *Menu* the complete display structure of the EK260 can be switched between "complete" and "simple".

Menu =	Meaning
1	Complete display structure
2	Only "*User*" column
3	Complete display structure without the "Energy" column

Menu = 1 corresponds to the standard setting which is described in this manual.

With the setting *Menu* = 2, the display is limited to the column "User" described here. All other columns cannot be called.

4 Applications

4.1 Rated operating conditions for the various conversion methods

In determining the actual permissible measurement range for the pressure and temperature of the gas, apart from the technical possibilities offered by the connected measurement sensor, the conversion method must also to be considered. The alarm limits Tmin, Tmax, pmin and pmax can lie outside of the measurement range and differ by up to 5% (for pressure) or 1°C (for temperature) from the measurement range limits. In this way testing of the device at the measurement range limits for temperature and pressure is simplified.

On reaching or exceeding the alarm limits, an alarm is triggered and counting takes place in the disturbance quantity counters.

The following correction methods are available for certain applications:

Fixed value K=1 (Md.K = 0, see Chapter 3.5)

This fixed value can be used when the gas shows only slight deviations (up to 0.25%) from the ideal gas behaviour. For natural gases and their mixtures, i.e. gas mixtures, which have a high methane content, this applies at temperatures above -10°C up to an absolute pressure of 1.5 bar or an overpressure of 0.5 bar.

The pressure range can be extended to 2.0 bar absolute pressure or 1.0 bar overpressure if the temperature is always higher than

-        +5 °C for gases with $H_{o,b}$ < 11.5 kWh/m³

-        +12 °C for gases with $H_{o,b} \geq$ 11.5 kWh/m³

Wider pressure and temperature ranges can be set for the gas composition present at a measuring point if compliance with the error limit is proven by calculations. This also applies to other fuel gases (e.g. town gas). For the calculations the conditions given in the following section apply.

Fixed value K≠1 (Md.K = 0, see Chapter 3.5)

Fixed values for K, which differ from 1, may be suitable for measuring points, the absolute pressure of which always lies below 11 bar and for which the gas pressure and the gas temperature only vary within known limits. The fixed value must be calculated using one of the following methods:

- S-Gerg 88 after testing the reliability of the method (see below)

- AGA8-DC92 according to ISO 12213 Part 2 /1/

Through a calculation using the same method, it must be proven that the K-values only deviate by at the most 0.25% from this fixed value in the permissible measurement range (i.e. with compliance to the pressure and temperature limits). The principles of the calculation and the calculated results at the limits of the measurement range must be recorded in the operational and rating data book, page "Proof of measures implemented". The alarm limits p_{min}, p_{max}, T_{min} and T_{max} must be set according to the measurement range (see above).

S-Gerg 88 (Md.K = 1, see Chapter 3.5)

This method is suitable for natural gases and their mixtures

1.) at temperatures between -10°C and +60°C and for absolute pressures up to 26 bar

2.) at temperatures between -10°C and +60°C, also at absolute pressures above 26 bar, when the following conditions are fulfilled

- The amount of substance of the propane x_{C3} [in mol%] must lie within the limits given by the following equation in relationship to the amount of substance of the ethane x_{C2} [in mol%].

$$0.3 \cdot x_{C2} - 1.0 \quad < \quad x_{C3} \quad < \quad 0.3 \cdot x_{C2} + 1.0 \qquad (1)$$

- The sum of the amounts of substance of n-butane, isobutane and higher hydrocarbons x_{C4} [in mol%] must lie within the limits given by the following equation in relationship to the amount of substance of the ethane x_{C2} [in mol%].

$$0.1 \cdot x_{C2} - 0.3 \quad < \quad x_{C4+} \quad < \quad 0.1 \cdot x_{C2} + 0.3 \qquad (2)$$

3.) For other gas compositions (e.g. processed biogas), temperature ranges and pressure ranges, when it is proven through comparative calculations using the method AGA8-DC92 for the expected pressure and temperature ranges, which are safeguarded by alarms, as well as the present gas composition, that no deviations of more than 0.1% occur.

The principles of the calculation and the calculation results at the limits of the measurement range must be recorded in the operational and rating data book, page "Proof of measures implemented", unless the calculation method S-Gerg 88 is generally accepted for the present application due to a national regulation.

AGA8 Gross characterisation method 1 und 2 (Md.K = 3 and 4, see Chapter 3.5)

This method is suitable for temperatures between 0°C and 55°C for gas mixtures, whose relative density lies between 0.554 and 0.87, whose calorific value is between 5.2 kWh/m³ and 12.5 kWh/m³ and whose components comprise the following amounts of substances [in mol-%]:

CH_4	N_2	CO_2	C_2H_6	C_3H_8	C_4H_{10}	C_5H_{12}	C_{6+}	He	H_2	CO	H_2O	H_2S
≥ 45	≤ 50	≤ 30	≤ 10	≤ 4	≤ 1	≤ 0.3	≤ 0.2	≤ 0.2	≤ 10	≤ 3	≤ 0.05	≤ 0.02

C_4H_{10}: Sum of n-butane and i-butane;

C_5H_{12}: Sum of n-pentane and i-pentane;

C_{6+}: Sum of all hydrocarbons with at least 6 carbon atoms

AGA-NX19 and AGA-NX19 according to Herning and Wolowsky (Md.K = 2 and 5, see Chapter 3.5)

This method is suitable for applications for which it has been shown by a comparative calculation with the reference method AGA8-DC92 or (in its application range) S-Gerg 88 that no deviations of more than 0.1% occur.

4.2 Application as high flow display device

The EK260 possesses an integral high flow display function with nationally certificated type approval. Permissible values are:

- the maximum <u>volume at base conditions</u> flow <u>per measurement period</u> within one month
  VbMP max,
- the maximum <u>volume at base conditions</u> flow <u>per day</u> within one month *VbDy max,*
- the maximum <u>actual volume</u> flow <u>per measurement period</u> within one month
  VmMP max,
- the maximum <u>actual volume</u> flow <u>per day</u> within one month *VmDy max.*

These **maxima of the last 15 months** can be saved in the monthly archive 1 (*ArMo1*). The content of this archive can be called under the "Archive list" ($\rightarrow$ Chapter 3.6, page 40).

The **arising maxima of the current month** can also be checked:

- *VbMP max* and *VbDy max* in the "Standard Volume (Volume at base conditions) list" (Chapter 3.1, page 24),
- *VmMP max* and *VmDy max* in the "Actual volume (volume at measurement conditions) list" (Chapter 3.2, page 26),

At the end of each month the "arising maxima" of the month just finished are written to the latest data record of monthly archive 1. Along with this, the oldest data record is then deleted so that monthly archive 1 always includes exactly 15 months.

The "end of the month" can be defined, i.e. it occurs on the first day of each month at an adjustable time. As standard, this **month boundary** (**= day boundary**) is set to "06:00 hrs." and can be called up via the serial interfaces under the address "2:141" and changed with the supplier's lock open, if entries are still free in the calibration logbook ($\rightarrow$ page 45). Any full hour of the day (0 to 23 hrs.) can be set.

As standard, the **measurement period** *MPer* is set to "60 minutes" and can be recalled in the "Archive list" (Chapter 3.6, page 40) and changed with the calibration lock open. Practical and normal values are 5, 10, 15, 20, 30 or 60 minutes.

If the time is changed by more than 1% of the measurement period, then the affected measurement period is marked as having suffered a fault. In the display, measurement values which are faulty for one reason or another are marked with a blinking short description.

4.3 Application as flow recording device

The EK260 possesses an integral flow recording function with nationally certificated type approval. In the measurement period archive ($\rightarrow$ Chapter 3.6) the counter readings *Vb* and *Vm* used for billing are included as well as their increments ΔVb and ΔVm. The increments always refer to the previous archive row.

The device is equipped with the following functions for checking the billing data "on site":

- Display and read-out of all data relevant to billing.
- Additional display of the counter increments (consumption values) in the measurement period archive ($\rightarrow$ 3.6, "ArMP").
- With invalid consumption values the abbreviated designation flashes incl. "Δ". (Further details are given in $\rightarrow$ 3.6, "ArMP").
- Find function for checking the archive entries ($\rightarrow$ 3.6.2).
- Display of the set measurement period *MPer* and the remaining time in the current measurement period *MP.Re* ($\rightarrow$ 3.6).
- Labelling of uncalibrated values[1] by an asterisk after the abbreviated designation.
- Checking each individual archive row using a checksum ("CRC").
  If a data error has occurred in an archive row, each value affected flashes in the display.

4.4 Connection of a counter with LF pulse transmitter

Ex-works the maximum counting frequency of the EK260 Volume Conversion Device is parameterised to 2 Hz. Reparameterising to a maximum of 10 Hz is possible by trained specialist personnel with the calibration lock open. Changes to the input frequency must be noted in the operational and rating data book on the page "Proof of measures carried out".

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[1] For use outside of applications subject to calibration, the device can also be obtained without the identification of uncalibrated values

4.5 Connecting a meter with encoder

From program version 2.00 onwards the EK260 is also available in a version which enables an encoder totalizer to be connected to read the actual gas meter counter reading and to be used as the input for actual volume.

After each activation by the connected device (e.g. EK260), an encoder totalizer integrated into the gas meter sends the absolute counter reading precisely in the representation as it is read off the mechanical totalizer, i.e. the "actual meter reading". The connection between the Volume Conversion Device and the encoder totalizer is made with just two wires which act simultaneously as the power supply for the encoder and as data lines.

Compared to conventional pulse transmission, this procedure offers a number of advantages, e.g.:

- No loss of actual volume due to temporary disturbances.
- When using a modem on the EK260, the counter reading of the gas meter (actual counter) can be read remotely.

With the connection of an encoder totalizer, Md.I1 ($\rightarrow$ 3.10) should be set to "5". A copy of the cyclically read gas meter counter reading can then be called into the EK260 display as the actual counter Vo ($\rightarrow$ 3.10). The reading of the counter and saving as *Vo* occurs with the measuring cycle *MCyc* ($\rightarrow$ 3.8), i.e. normally every 20 seconds.

The progress of *Vo* is used as the input quantity for computing all the actual and volume at base conditionss ($\rightarrow$ 3.2, 3.1).

Also, if with disturbances (e.g. cable breakage or low batteries in the EK260) no data transmission is possible over a longer time period and so no actual volume can be acquired, no quantities are lost, because the EK260 immediately reads the present gas meter reading once the disturbance is rectified. However, since no assignment to the various measured values of pressure and temperature can be made for the period of the disturbance, these quantities are converted to volume at base conditionss with substitute values and counted as disturbance quantities.

With a connected encoder no entries can be made for *Vm* and *VmD* ($\rightarrow$ 3.2). By changing *Md.I1* ($\rightarrow$ 3.10) to "0" and then setting it to "5" again, *Vm* can be set to the gas meter reading and *VmD* cleared.

If a connected gas meter with encoder is to be replaced by a new one, *Md.I1* ($\rightarrow$ 3.10) should be set to "0" before making the connection and set to "5" again afterwards. If this is not carried out, the EK260 does not know that a new meter has been connected and interprets the change of meter reading incorrectly either as reverse running or as an increase in volume on the meter:

If the new meter reading is lower (reverse running), the EK260 waits until the reading of the old gas meter has been reached before it continues to count Vm and Vb.

If the new meter reading is higher, the EK260 sees an increase in volume (not actually present) which it adds to Vm and, converted, to Vb.

Further information on the interface and the compatibility conditions can be found in the Internet at the address www.elster-instromet.com.

4.6 Application in areas subject to explosion hazards

4.6.1 Applications in Zone 1

The EK260 is suitable for applications in Ex Zone 1 for gases in the temperature class T4 (ignition temperature > 135°C, e.g. natural gas). (Certificate of conformance: → Appendix A-2)

With applications in Zone 1 connected devices must not exceed the conditions and limits quoted in the certificate of conformance (→ A-2). Furthermore, all safety information (→ Chapter I) must be followed.

4.6.2 Applications in Zone 2

The device may also be used in Zone 2 under all conditions which enable application in Zone 1 (→ 4.6).

Furthermore, the device may be used according to DIN EN 60079-14 (VDE 0165 Part 1), Section 5.2.3 c) in Zone 2 for gases of temperature class T1 (e.g. natural gas) if the installation is implemented according to DIN EN 60079-14 (VDE 0165 Part 1) and the operating conditions quoted in these instructions are fulfilled.

In particular they are:

- Ambient temperature according to Chapter B-1.
- Batteries according to Chapter B-2.
- Correct wiring, in particular no active outputs switching one against the other.
- Voltage of an external power supply according to Chapter B-3 has a maximum of 9.9 V (manufacturer's rating of the connected device).
- Switching of the digital inputs DE1...DE3 according to Chapter B-3 only with reed contacts, transistor switches or encoder interface.
- Switching voltage of the device connected to the outputs DA1..DA4 with a maximum of 30 V according to Chapter B-5 (manufacturer's rating of the connected devices).
- Only connect devices which conform to the RS-232 or RS-485 standard to the electrical serial interface according to Chapter B-7.
- Unused cable glands must be closed off according to DIN EN 60079-14 (VDE 0165 Part 1), Section 14.3.2 with plugs or suitable screw caps.
- Installation, cables and lines according to DIN EN 60079-14 (VDE 0165 Part 1), in particular Sections 9, 12.1, 12.2 and 14.3.

4.7 Applications for Interface 2

Depending on the application, Interface 2 must be parameterised as described here. For each setting, pay attention to the appropriate information under Chapter 3.12, *Md.S2* (page 79), particularly with regard to the EK260 power supply.

4.7.1 Modem with control signals (standard modem)

☞ *For connection see Chap. 5.6, page 113).*

A commercially available modem is connected to the EK260.

Settings under the interface list (→ **3.12**, page 78):

- *Md.S2* = 2   if a GSM modem is not involved
           or 7   if a GSM modem is involved.
- *TypS2* = 1   RS232
- *Bd.S2* = 19200   19200 Bd (without using the baud rate selection)
- *Num.T* = 2...9   if a GSM modem is not involved
           or 1   if a GSM modem is involved.
- *PIN*   = ...   This must be entered for a GSM modem with activated PIN.

4.7.2 Modem without control signals

☞   For this application the EK260 needs external power supply.

☞   For connection see Chap. **5.6.2**, page 114).

A modem with RS232 interface is connected to the EK260; RS232 control lines such as "Ring", "DCD" etc. are not connected.

Settings under the interface list (→ **3.12**, page 78):

- *Md.S2* = 3   Modem control through the EK260 via the data lines; no automatic call acceptance by the modem
           or 5   automatic call acceptance by the modem; no modem control by the EK260
           or 15   GSM modem automatic call acceptance; no modem control by the EK260.
- *TypS2* = 1   RS232
- *Bd.S2* = 19200 *   19200 Bd (without using the baud rate selection)
- *Num.T* = 2...9   only with *Md.S2* = 3 and if a GSM modem is <u>not</u> involved
           or 1   only with *Md.S2* = 3 and if a GSM modem is involved.
- *PIN*   = ...   only with *Md.S2* = 3 and if a GSM modem with activated PIN is involved.

* Normally, modems do not carry out any baud-rate selection so that with Md.S2 = "5" and "15" the values under the addresses 02:708 (Bd.S2) and 02:709 must be the same.
For the special case of a modem with baud-rate selection the starting baud rate (e.g. 300 Bd) must be set under Bd.S2 (address 02:708) and the baud-rate identification (e.g. 19200 Bd) under the address 02:709.
The ex-works setting is: 02:708 = 19200 Bd and 02:709 = 19200 Bd.

4.7.3 FE260 Function Expansion with modem

☞ For connection see Chap. 5.6.5, page 115.

The FE260 is a mains-powered function expansion incl. Ex isolation and supply for the EK260. It has alternatively an integral modem or a connection for a commercially available modem.

Settings under the interface list ($\rightarrow$ **3.12**, page 78):

- *Md.S2* = 3   Modem control through the EK260 via the data lines; no automatic call acceptance by the modem

    or 5   automatic call acceptance by the modem; no modem control by the EK260

    or 15   GSM modem automatic call acceptance; no modem control by the EK260.

- *TypS2* = 2   RS485
- *Bd.S2* = 19200   19200 Bd (without using the baud rate selection)
- *Num.T* = 2...9   only with *Md.S2* = 3 and if a GSM modem is <u>not</u> involved

    or 1   only with *Md.S2* = 3 and if a GSM modem is involved.

- *PIN* = ...   only with *Md.S2* = 3 and if a GSM modem with activated PIN is involved.

4.7.4 FE260 Function Expansion without modem

☞ *For connection see Chap. 5.6.5, page 115.*

The FE260 is a mains-powered function expansion incl. Ex isolation and supply for the EK260. It has alternatively an integral modem or a connection for a device with serial interface.

Settings under the interface list ($\rightarrow$ **3.12**, page 78):

- *Md.S2* = 5   Operation without control lines and without modem control
- *TypS2* = 2   RS485
- *Bd.S2* = 19200   19200 Bd (without using the baud rate selection)

4.7.5 FE230 Function Expansion with modem

☞ For connection see Chap.5.6.6, page 115.

The FE230 is a battery-powered function expansion with integral modem.

For this application an extended device parameterisation via the optical interface is necessary. For this task there are special parameter files available which can be installed with the "WinPADS" parameterisation program and also loaded into the device with it.

Settings under the interface list ($\rightarrow$ 3.12, page 78):

- *Md.S2* = 19   Mode for FE230
- *TypS2* = 2   RS485
- *Bd.S2* = 19200   19200 Bd (without using baud rate selection)

! After the parameterisation process for the FE230 the settings in the interface list, particularly for the readout time window, must be carried out ($\rightarrow$ 3.12), because the batter service life of the FE230 strongly depends on this !

4.7.6 Printer on the EK260 or on an FE260

Further information on using a printer: $\rightarrow$ 3.12, *DProt* and 3.12.1.

☞ *Connection of a printer directly to the EK260: See Chap. 5.6.3, page 114.*

☞ *Connection of a printer to an FE260: See Chap. 5.6.5, page 115 .*

Settings under the interface list ($\rightarrow$ 3.12, page 78):

- *Md.S2* = 10   Printer protocol
- *TypS2* = 1   RS232, if the printer is connected to the EK260.
  - or 2   RS232, if the printer is connected to an FE260.
- *Bd.S2* = ...   as the baud rate of the printer, e.g.:
  - 19200   19200 Bd
- *DF.S2* = ...   According to the printer data format:
  - 0   7e1 (7 data bits, even parity, 1 stop bit)
  - or 1   7o1 (7 data bits, odd parity, 1 stop bit)
  - or 2   8n1 (8 data bits, no parity, 1 stop bit)

4.7.7 Other device with RS232 interface (e.g. PC)

☞ *For connection see Chap. 5.6.4, page 115).*

Settings under the interface list ($\rightarrow$ 3.12, page 78):

- *Md.S2* = 1   Operation with control line
- *TypS2* = 1   RS232
- *Bd.S2* = 19200 *   19200 Bd   without using baud rate selection [1]
  - oder   300   300 Bd   with using baud rate selection
    - (procedure as for the optical interface) [2]
- *DF.S2* = ...   Data format accord. to the connected device ($\rightarrow$ *DF.S2*, page 82).

4.7.8 Modbus protocol

☞ *For this application the EK260 needs external power supply.*

☞ *For connection see Chap. 5.6.4, page 115).*

Settings under the interface list ($\rightarrow$ 3.12, page 78):

- Md.S2 = 13   Modbus protocol
- *TypS2* = 1   RS232
  - or 2   RS485, depending on connected device
- *Bd.S2* = 19200   19200 Bd, or other baud rate accord. to connected device
- *DF.S2* = ...   Data format accord. to the connected device ($\rightarrow$ *DF.S2*, page 82)

---

[1] If the connected device does not carry out any baud rate selection, the values must be the same under the addresses 02:708 (Bd.S2) and 02:709. The factory setting is: 02:708 = 19200 Bd and 02:709 = 19200 Bd.

[2] The set baud rate is only used briefly for introducing and terminating the data traffic. The actual baud rate for transferring the useful data is increased automatically to 19200 Bd within the scope of the protocol.

4.7.9 Sending short messages by SMS.

☞ *It is not possible to send short messages with an FE230*.

If a modem (except FE230) is connected to Interface 2, then with definable events the EK260 can send a brief message by a short message (Short Message Service in the GSM mobile radio network). To do this, a large number of settings are needed which cannot be made by means of the keypad on the device, but instead with the aid of the "WinPADS" parameterisation software.

The settings which can be made include the event which triggers the message, one or two recipients and any eight volume corrector values as the message content.

With *SEND* ($\rightarrow$ page 84) you can send the defined message also with the keypad.

Various protocols / delivery modes are used for SMS transmission.
- Text SMS: works with AT command + CMGS, only with GSM modems, also in other countries.
- EMI/UCP and TAP (D1): also work with non-GSM modems, but only in Germany.

4.7.10 Standard output data records for process data ("three-minute values")

Process data can be synchronously temporarily stored in short cycles (e.g. 3 minutes) and interrogated over the interface. To output these data records the mode "Data readout"" in "Mode C" according to IEC 62056-21[1] is used.

In order to obtain practicable values, buffer storage of the process data has to be activated. In this respect
  - the value "21" is written to the address "13:0157.0" via the interface and
  - the operating cycle *OCyc* ($\rightarrow$ 56) is set to an integer divisor of 3 minutes.

Through these measures the battery service life of the EK260 is slightly reduced. The expected remaining service life is displayed under *Bat.R* ($\rightarrow$ page 58).

Output of the data records
The data records are labelled on recalling with the addresses 1:01CD ... 15:01CD. (Other addresses are used to set the content, see above.)
In the factory setting the following data are output:

---

[1] IEC 62056-21: formerly IEC 1107 or EN 61107

No.	Address	Assignment	Meaning	Example
1.	1:01CD	1:0180	EK260 serial number	1:1CD.10(4102758)
2.	2:01CD	1:0400	Time stamp	2:1CD.12(2007-02-26,13:24:35)
3.	3:01CD	2:0300	Volume at base conditions	3:1CD.12(12340*m3)
4.	4:01CD	2:0301	Volume at base conditions, disturbed	4:1CD.12(0*m3)
5.	5:01CD	4:0300	Actual volume	5:1CD.12(134560*m3)
6.	6:01CD	4:0301	Actual volume, disturbed	6:1CD.12(0*m3)
7.	7:01CD	5:0310	Conversion factor	7:1CD.11(0.89531)
8.	8:01CD	7:0310_1	Gas pressure	8:1CD.11(0.98862* bar)
9.	9:01CD	6:0310_1	Gas temperature	9:1CD.11(24.32*°C)
10.	10:01CD	8:0310	Inverted compressibility factor ratio	10:1CD.11(1.00068)
11.	11:01CD	2:0310	Flow at base conditions	11:1CD.11(32.23*m3|h)
12.	12:01CD	4:0310	Actual flow	12:1CD.11(36*m3|h)
13.	13:01CD	2:0110	Status 2 (incl. Vb)	13:1CD.13(0)
14.	14:01CD	4:0110	Status 4 (incl. Vm)	14:1CD.13(0)
15.	15:01CD	2:0100	System status	15:1CD.13(13)(15)

Setting the data record content

You can freely set the content of the process data with the aid of the "WinPADS" parameterisation software". The addresses 1:01CF ... 15:01CF are used for setting values.

Archiving the data records

For tracing (e.g. after a mains failure) the last 200 process data records can be saved in Archive 10. Archiving starts once the buffer storage of the process data has been activated (see above).

5 Installation and maintenance

The EK260 is suitable for wall mounting and for installation on a gas meter. The holes for wall mounting become accessible after opening the housing cover. For installation on a meter a mounting bracket is required.

The drilling dimensions can be taken from the adjacent illustration.

The installation and first test can occur without the presence of a calibration official, because all relevant areas are secured by adhesive labels.

5.1 Installation procedure

The following steps must be carried out to install the device:

1. Mounting of the EK260 on the gas meter, on a bracket or on the wall.

2. Connection of the pulse transmitter or encoder, pressure line (perform tightness test) and insertion of the temperature sensor in the thermowell.

3. If required, connection of the following equipment to the power supply input, serial interface or pulse/signal outputs.

☞ *If the EK260 is used in a hazardous area (Zone 1), then only intrinsically safe electrical circuits of certificated "associated operating equipment" must be connected. Their certificated electrical data must conform to the requirements stated in the certificate of conformance for the EK260.*

4. With unused union screw joints the insertion seal must be replaced by one of the enclosed blind insertion seals.

5. Sealing of the device by the weights and measures office or test station according to the seal layout.

6. Close the housing.

☞ *When closing the housing, make sure that no cables are pinched.*

7. Open the shut-off valve (two-way or three-way valve) between the gas meter pressure sensor port and the pressure sensor of the volume conversion device.

☞ *Open the shut-off valve slowly to avoid pressure surges.*

☞ *Insofar as the volume conversion device has not been commissioned by a calibration authority, we recommend comparing the displayed pressure in the Pressure menu p.Mes (Chapter 0) with the value of a pressure gauge (may be present) directly upstream or downstream of the gas meter in the system. If applicable, note that the pressure gauge displays relative pressure, that is, atmospheric pressure (approx. 1 bar) must be added. This check allows you to ensure that the shut-off valve is open and that the volume conversion device is using the operating pressure for conversion.*

5.2 Three-way valve

A three-way valve is normally installed when the pressure sensor is fitted in order to be able to test the pressure sensor while it is installed or to replace defective sensors without having to shut off the entire gas line every time. The three-way valve available from ELSTER is configured as follows:

Testing at operating pressure

Operating position

Test connection

Testing with external pressure

from meter

Shut-off in 45° position

to VCD

Operating pressure: 100 bar
Housing: steel, galvanized
Ball: hard chromium-plated
Seal: polyamide
ID No.:   73008403

Lead-sealing bores with union nut and switching lever
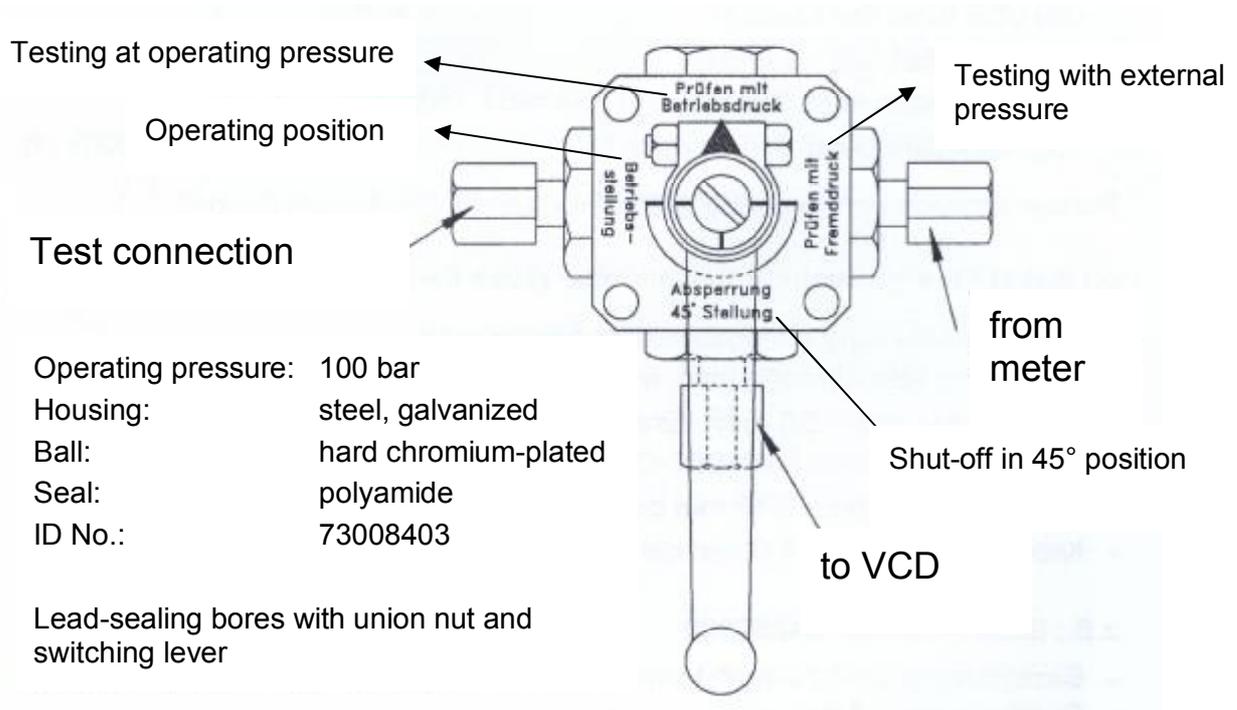
Explanation:

"from meter"   from gas meter "p-connection"; on the meter inlet side for diaphragm gas meters;

"to VCD"   to the connector on the pressure sensor of the volume conversion device;

"Test connection"   point for reading the test pressure or for applying external pressure to the volume conversion device.

When installing the three-way valve, make sure that the position of the control lever is checked with the corresponding flows, since the lever can be removed and may be installed in the wrong position!

5.3 Mounting

5.3.1 Wall mounting

Four holes are provided in the housing for wall mounting:
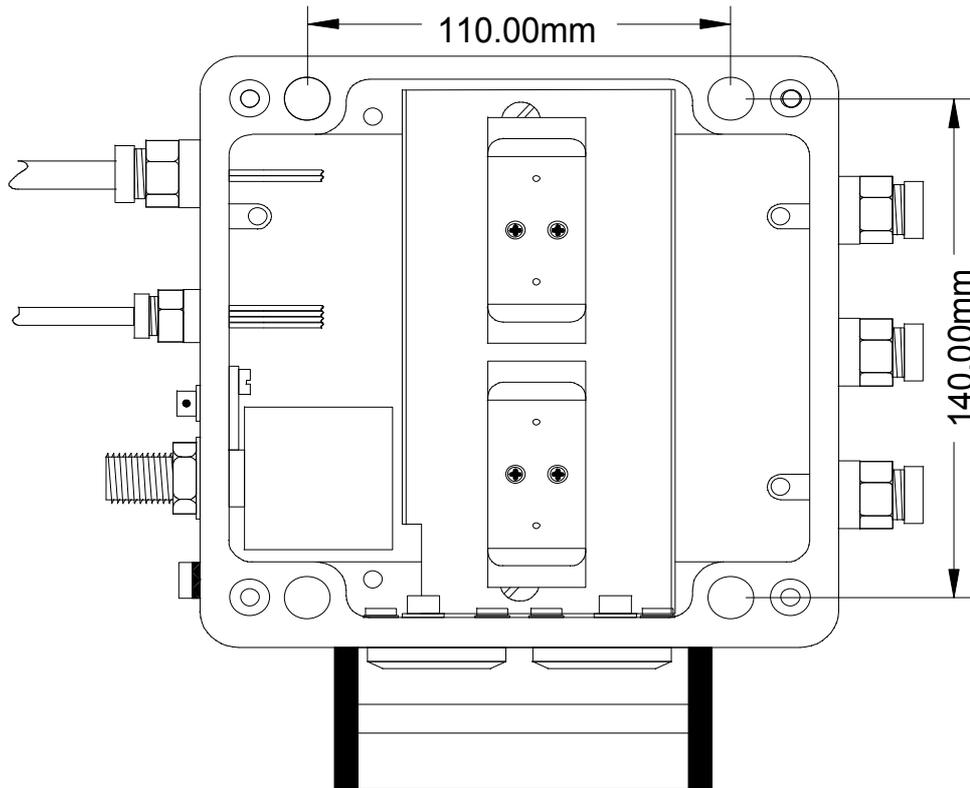
Fig. 1: Drilling template for wall mounting

For a selection of suitable mounting screws: see Fig. 2
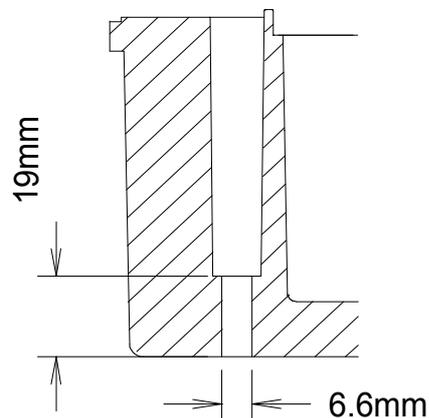
Fig. 2: Cross-section of the mounting holes.

5.3.2 Meter superstructure

Montage EK260 auf Zählwerkskopf S1
Installation EK260 on Meter Head S1

Dreiwege-Kugelhahn
three way tap

(2)

2x Zylinderschraube M5x40
2x machine screws M5x40

(2)

(1)

2x Flachmutter M5
2x flat nuts M5

2x Zylinderschraube M5x10
2x machine screws M5x10

(3)

2x Zylinderschraube M5x10
2x machine screws M5x10

(4)

Zählwerkskopf S1
Meter Head S1

2x Vierkantmutter M5
2x square nuts M5

(4)

Abdeckkappe
cover plate

(5)

2x Zylinderschrauben M5x40
2x machine screws M5x40

4x Zylinderschrauben M5x10
4x machine screws M5x10

4x Flachmuttern M5
2x flat nuts M5

2x Vierkantmuttern M5
2x square nuts M5

Fig. 3: Mounting the EK260 on an "S1" meter head.

5.4 Cable connection and earthing

The EK260 housing must always be earthed in order to divert high energy and high voltage electromagnetic interference. An M6 screw is provided for this on the left-hand side of the housing.

The earthing must be low resistance. The best conditions are obtained when a direct connection is provided to the local potential equalisation strip through a cable which is as short and as thick (at least 4mm²) as possible.

All permanently connected cables have a screen which must be earthed <u>at both ends</u> to prevent interference due to high frequency electromagnetic fields. The screen must be connected <u>all round, complete and flat</u>. The EK260 has special EMC cable glands for this purpose.

With correct connection of the cable screens and correct laying of the cables effects due to circulation should not be expected. If, however, interference due to earthing points with potential differences occur, potential equalisation lines can be laid in parallel to the cables. These should then be connected as close as possible to the cable screen connection points.

Additional requirements are placed on the earthing of conducting screens between Ex areas and non-Ex areas. The relevant installation requirements, e.g. EN 60079-14, must be followed.

5.5 Terminal layout

Connection of the individual cables is made to the corresponding terminals on the circuit board in the housing cover. When positioning the cables, make sure that no cables are pinched as the cover is closed.
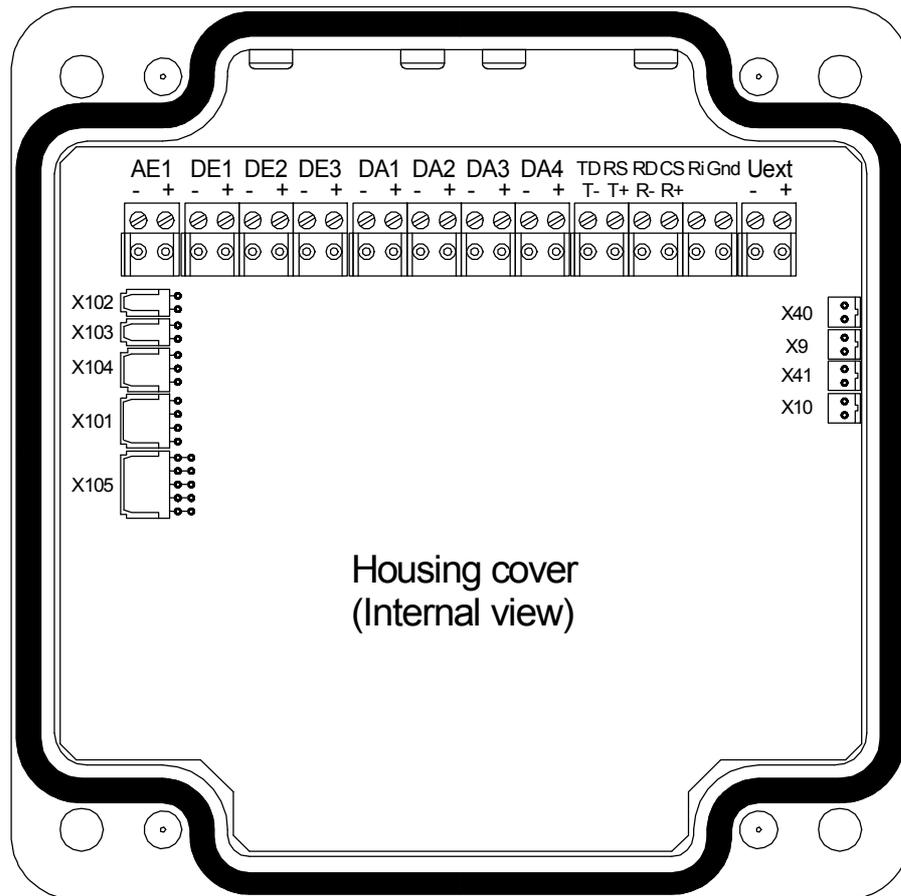
Fig. 4: Terminal layout

Inputs:	
AE1	(Not used, provided for future expansion)
DE1	Digital Input 1 for pulse transmitter or encoder
DE2	Digital Input 2
DE3	Digital Input 3

Outputs:	
DA1	Digital Output 1
DA2	Digital Output 2
DA3	Digital Output 3
DA4	Digital Output 4

Serial Interface:

	Type RS-232 *	Type RS-485 *
TD / T-	Transmitted data (output)	Transmitted data -
RS / T+	Control output	Transmitted data +
RD / R-	Received data (input)	Received data -
CS / R+	Control input	Received data +
Ri	Ring signal input	---
Gnd	Signal ground	---

External power supply:

Uext	External power supply

Pressure and temperature sensors:

X102	Temperature sensor Pt500, two-wire
X103 + X102	Temperature sensor Pt500, three-wire
X104	Pressure sensor CT30 (three-wire)
X101	Not used
X105	(Not used, provided for future expansion)

Batteries:

X9, X40	Battery Pack 1
X10, X41	Battery Pack 2

* The type for the permanently connected serial interface can be set via the keypad or the optical interface. (→ 3.12: *TypS2*)

5.6 Connection of the serial interface

5.6.1 Modem with control signals

Connection diagram:

EK260	Colour*		Pin*	Modem
TD / T-	gn	→	3	TxD
RS / T+	ye	→	4	DTR
RD / R-	br	←	2	RxD
CS / R+	wh	←	1	DCD
Ri	pk	←	9	Ring
Gnd	gr		5	Gnd

AE1 + (open)

− Capaci-tor ** 1 µF ("105...")   (not with EM260)

(Screw)
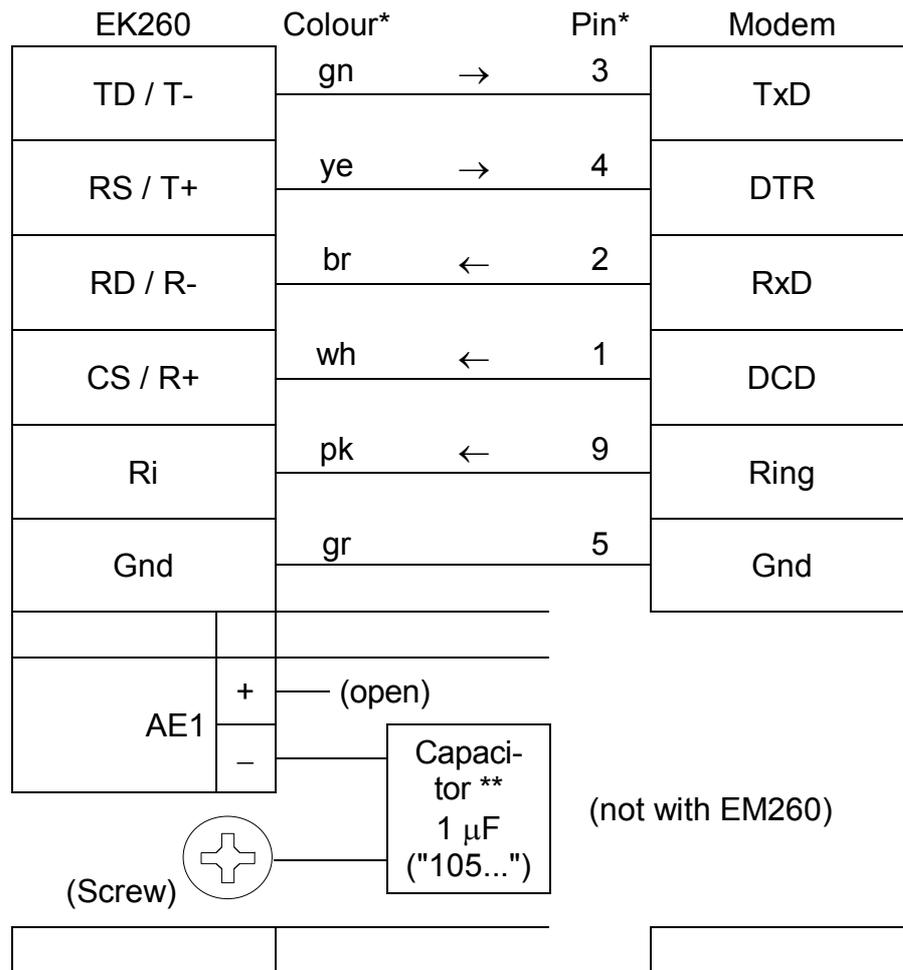
* Pin numbers of the DSUB-9 plug and wire colours when using a ready-made cable obtainable from Elster GmbH, e.g. Order No. 73016923 (2 m) or 73017268 (10 m).

** A capacitor with a capacity of 1 µF (labelled "105...") is enclosed with the EK260 in the accessories bag. When using a commercially available modem, it should be connected as shown to prevent possible interference due to the modem.
Screw Capacitor Terminal

When using the modem "EM260" from Elster GmbH no capacitor is required.

One capacitor lead is connected to the terminal "AE-" and the other lead is clamped under the screw located on the left(??). Cut off any protruding wires so that no undesired short circuits arise.
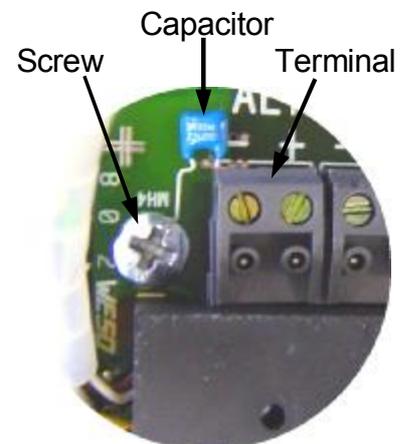
! The capacitor must not be connected with applications in Ex Zone 1.

5.6.2 Modem without control signals

! For this application the EK260 needs an external power supply !

Connection diagram:

EK260		Modem
TD / T-	→	TxD
RS / T+	— (open)	
RD / R-	←	RxD
CS / R+	— (open)	
Ri	— (open)	
Gnd		Gnd
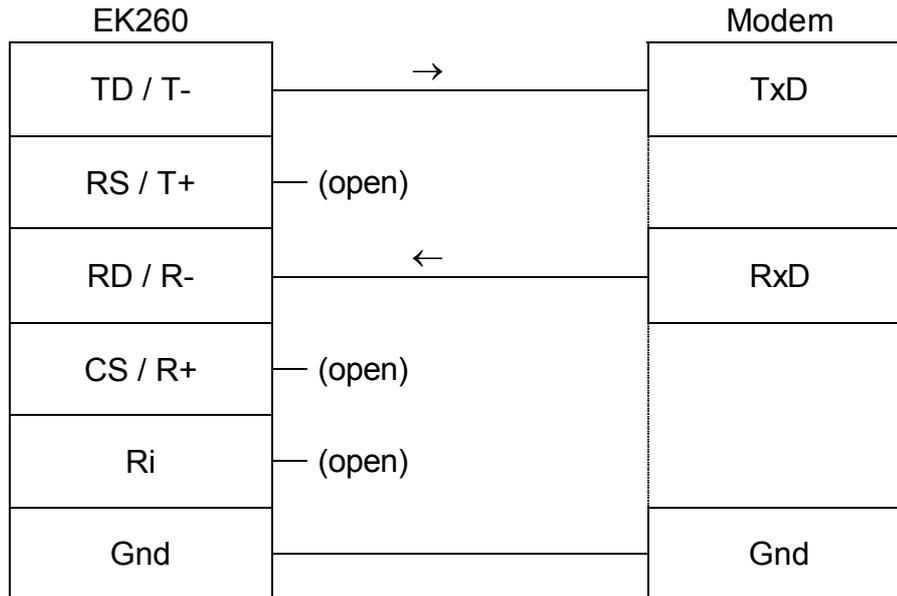
5.6.3 Printer

Connection diagram:

EK260		Printer
TD / T-	→	Data input
RS / T+	— (open)	
RD / R-	— (open)	
CS / R+	— (open)	
Ri	— (open)	
Gnd		Gnd
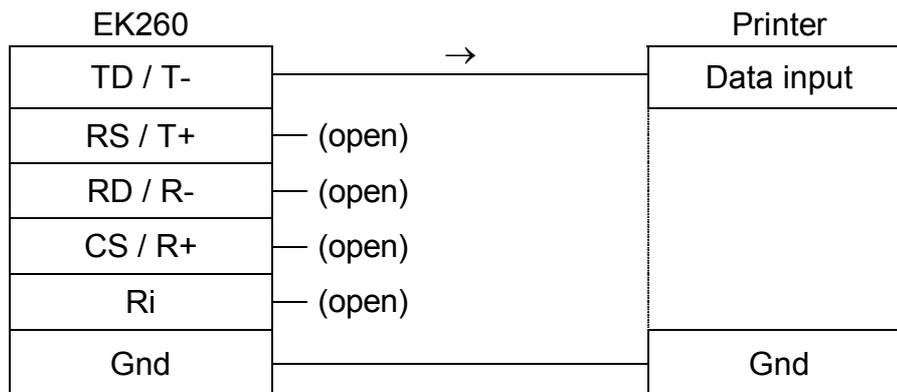
5.6.4 Other devices with RS-232 interface

Connection diagram:

EK260		Connected device (RS-232)
TD / T-	$\rightarrow$	RxD
RS / T+	$\rightarrow$	DSR or CTS
RD / R-	$\leftarrow$	TxD
CS / R+	$\leftarrow$	DTR or RTS[1]
Ri		
Gnd		Gnd
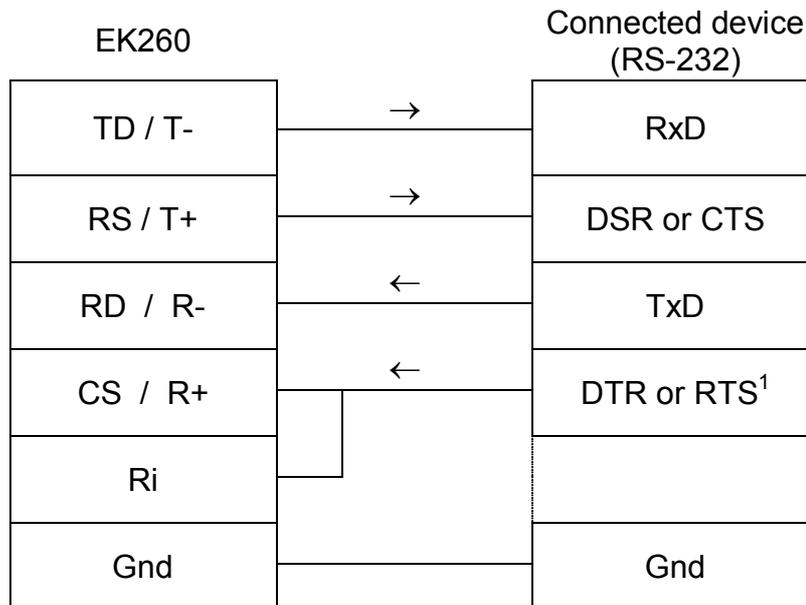
5.6.5 FE260 Function Expansion (optionally with modem)

! *For this application the EK260 also needs the external power supply through the FE260, i.e. the Uext+ and - terminals must be connected (see below). No data transmission can take place during a power failure.*

Connection diagram:

EK260		FE260
TD / T-	$\rightarrow$	T-
RS / T+	$\rightarrow$	T+
RD / R-	$\leftarrow$	R-
CS / R+	$\leftarrow$	R+
Ri	(open)	
Gnd	(open)	
Uext + -		U + -

---
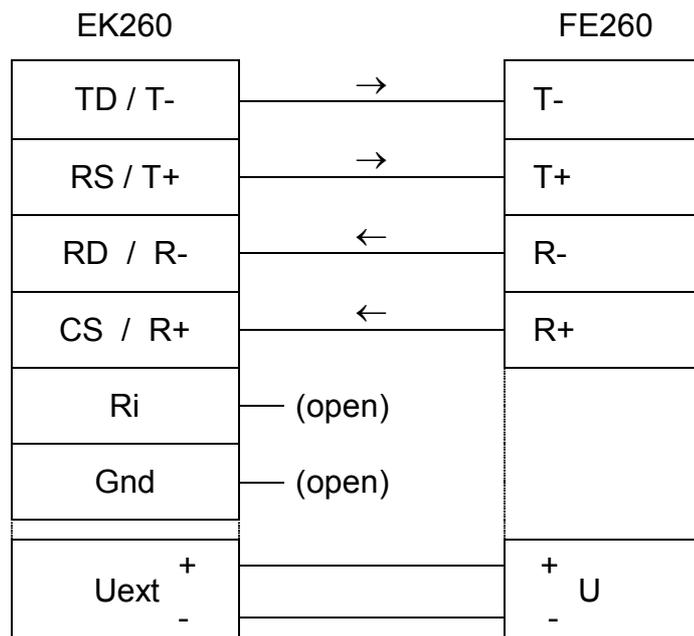
[1] The connected device must switch the signal used to active before the start of the communication and inactive again after the communication has terminated.

5.6.6 FE230 Function Expansion

Connection diagram:

EK260		FE230
T+	→ grey	T+
T-	→ pink	T-
R+	← green	R+
R-	← yellow	R-

DE3 +	← blue	+ DE3
DE3 -	← red	- DE3

DA4 +	→ white	+ DA4
DA4 -	→ brown	- DA4
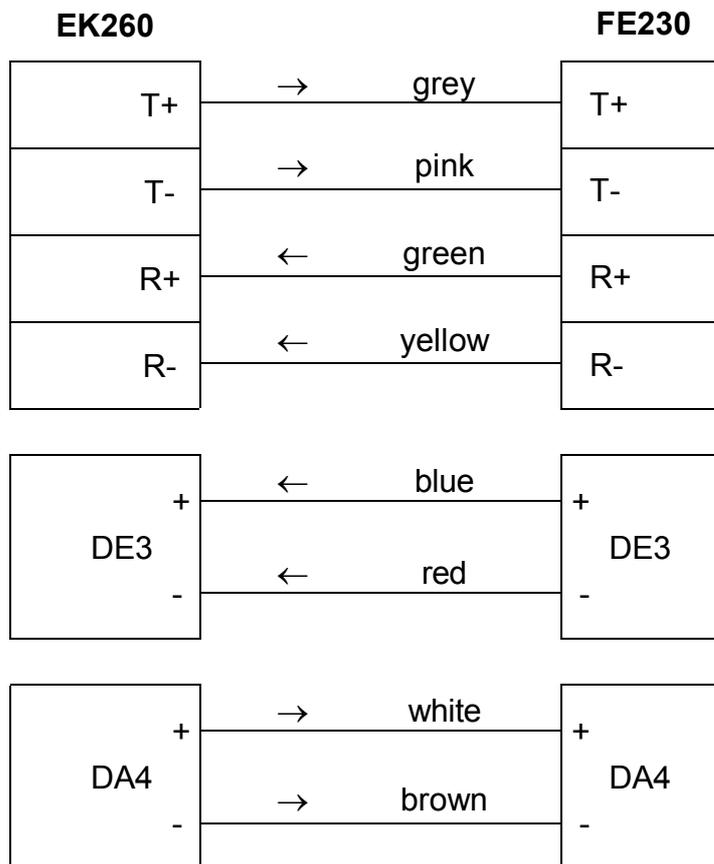
5.7 Connection of a low-frequency pulse transmitter (reed contacts)

The gas meter pulse transmitter must always be connected to terminal "DE1".

A pulse transmitter must always be connected to the terminal "DE1". In addition, a second pulse transmitter can be connected to terminal "DE2", e.g. for a pulse comparison (→ page 66). Any polarity can be chosen. Connection diagram:

When using the lead available from Elster GmbH with the order no. 73017093 (about 70 cm long), the following wires should be connected:
Terminal DE1: Brown and white
Terminal DE2: Yellow and green

Pulse transmitter 1	+ / -	DE1
Pulse transmitter 2 (on request)	+ / -	DE2
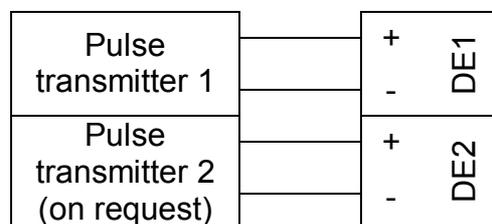
5.7.1 Pulse transmitter type "E10"

If the connected gas meter is fitted with a type "E10" pulse transmitter with a higher pulse frequency, then the adjustable threshold frequency of the EK260 must be increased. To do so, you need a PC on which the "WinPADS" parameterisation software is installed and an infrared readout adapter.

Please proceed as follows to adjust the threshold frequency:
- Attach the readout adapter to the computer and the EK260.
- Open "WinPADS-EK" (WinPADS for EK200 series).
- Click on the "User" tab.
- Enter the addresses "1:0232" and "1:0233" in the "Address" column in separate white fields.
- Enter the value "2" in the "Value" column for 1:0232, and the value "1" for 1:0233.[1]
- Click on "Set values".

The values are subject to the "calibration logbook" access rights, that is, they can also be changed with the calibration lock and supplier lock open if entries are still available in the calibration logbook. (→ *PLogB*, page 45)

5.8 Connection of an encoder

Connection diagram:

Connection of an
Elster GmbH gas meter
with encoder to the Ek260

Plug on gas meter (encoder)
View from outside onto the plug

Terminal "DE1"
in EK260
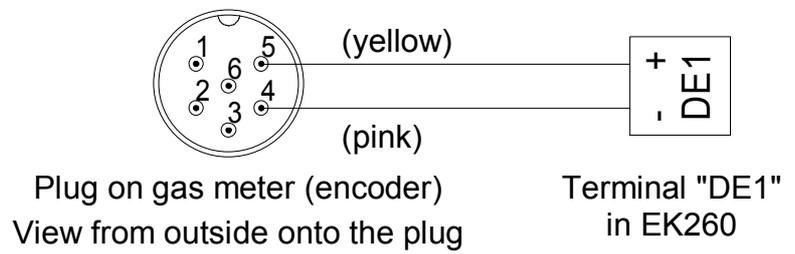
The connection schematic applies to the encoder versions "C-1" and "S1". With the version "S1" the polarity must be observed, i.e. "DE1+" must be connected to Pin 5 and "DE1-" to Pin 4 of the encoder. With the version "C-1" the polarity does not matter.

Procedure:

---

[1] The minimum period duration is entered under 1:0232, and the minimum pulse duration under 1:0233. The values are always multiples of 62.5 milliseconds.

- Before starting the connection work, set *Md.I1* ($\rightarrow$ 3.10, page 63) to "0". This also applies when a meter is replaced. (Further details $\rightarrow$ 4.5, page 99)
  To be able to change *Md.I1* the calibration lock ($\rightarrow$ page **Fehler! Textmarke nicht definiert.**) or, if entries are still available in the calibration logbook ($\rightarrow$ page 45), the supplier lock must be open ("P" flashes, $\rightarrow$ 2.4.1).

- Make the connection as shown in the above connection diagram.
  Here it does not matter to which of the two shown pins of the encoder plug "+" and "-" are connected.
  When using the lead available from Elster GmbH with the order no. 73017093 (about 70 cm long), the pink (-) and (+) yellow cores must be connected (polarity not important):

- Set *Md.I1* ($\rightarrow$ 3.10) to "5" with the calibration lock open.

- Check the display of Vo ($\rightarrow$ 3.10): After 20 seconds at the latest after entering "5" for *Md.I1* the EK260 displays the gas meter reading as *Vo*.

5.9 Seals

1. Setting the parameters

- To change values subject to calibration regulations (e.g. cp value), the adhesive labels on the calibration lock in the device must be opened up and the button pressed (status "P" flashes in the display).

2. Closing and securing the calibration lock

- Once all values subject to calibration regulations have been changed, the calibration lock is closed by pressing the button (status "P" goes out) and the access opening is sealed with an adhesive label.

3. Securing the circuit board

- The circuit board is provided with a plastic cover to protect it from tampering. One of the two fixing screws of this cover must be provided with an adhesive label.

4. Securing the inputs/outputs

- When used in applications subject to official calibration, the terminals relevant to official regulations (e.g. counting inputs) must be secured against tampering by calibration covering caps. Sealing is provided by an adhesive label on the screw of the covering cap.

- See Chap. 5.9.1 for seal layout.

5.9.1 Seal layout of basic device

a) Housing cover (internal view)

Sealing points for securing the PCB cover

Sealing points for securing the calibration switch

PCB cover

Terminal covers

Sealing points for securing the terminal covers for the inputs and outputs
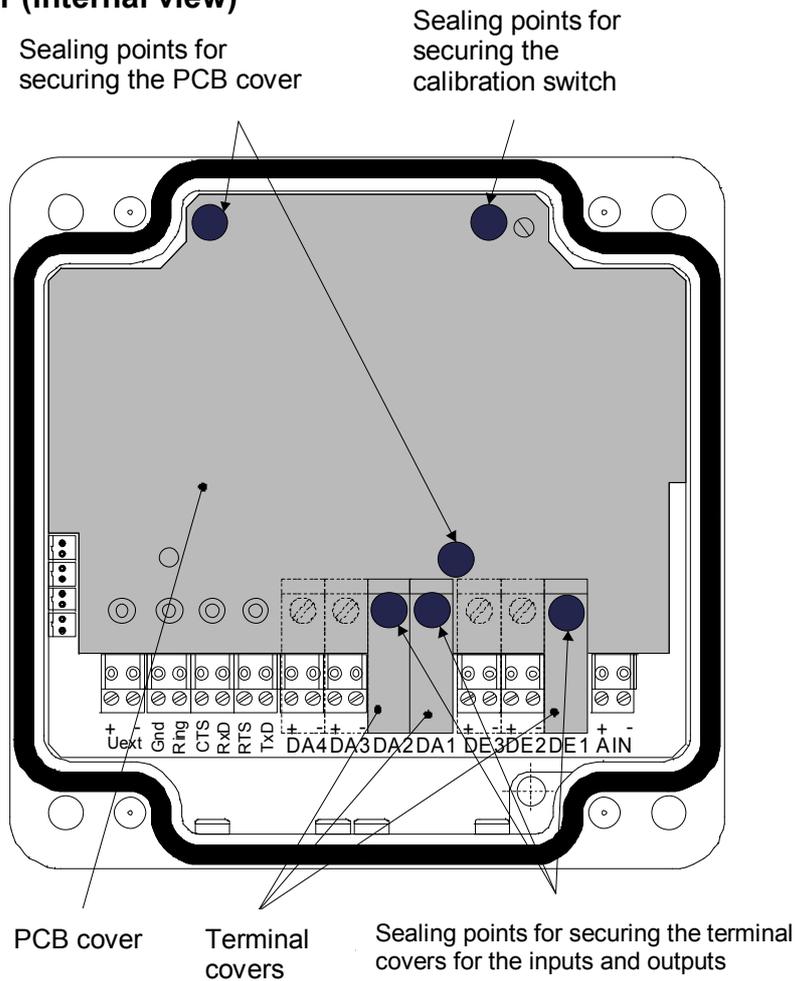
b) Housing cover (front view), standard seals

EK260

Prefix | Arc | Status | Menu

Submenu

Identification label

Possible sealing point for securing the identification label.

ESC

ENTER

elster
Instromet

Made in Germany

---
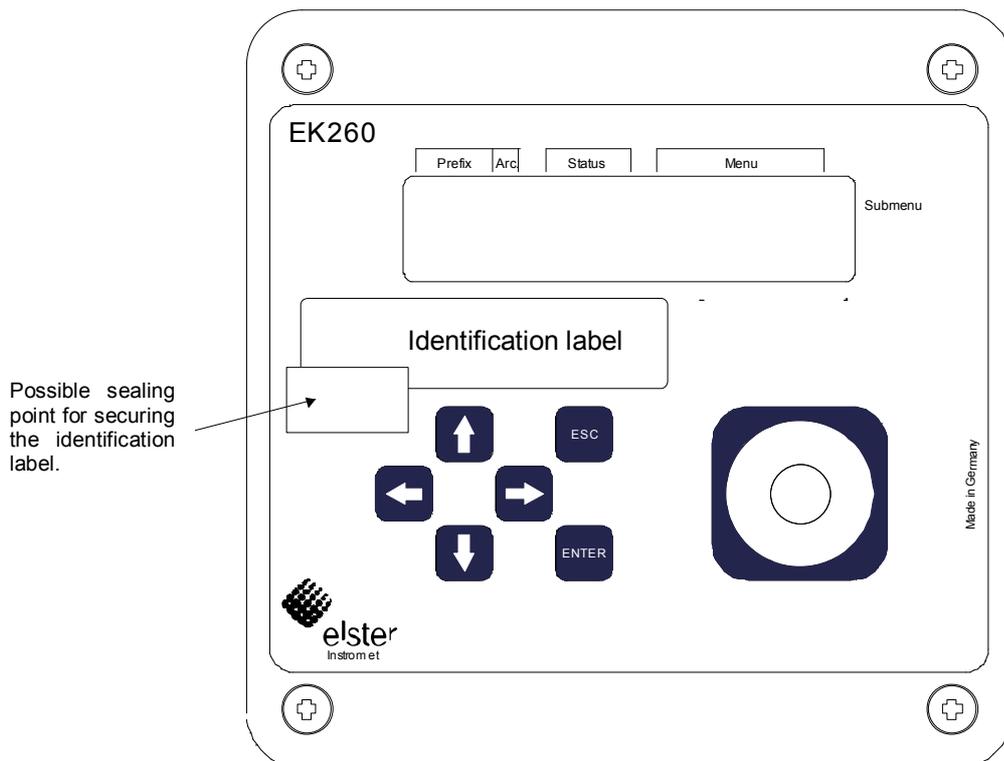
c) Housing cover (front view), cover sealing using wire seal (optional user sealing)

Capstan headed screws for wire seal for securing the device

Wire seal

EK260

| Prefix | Arc. | Status | Menu |

Submenu

Identification label

Possible sealing point for securing the identification label.

ESC

ENTER

elster
Instromet

Made in Germany
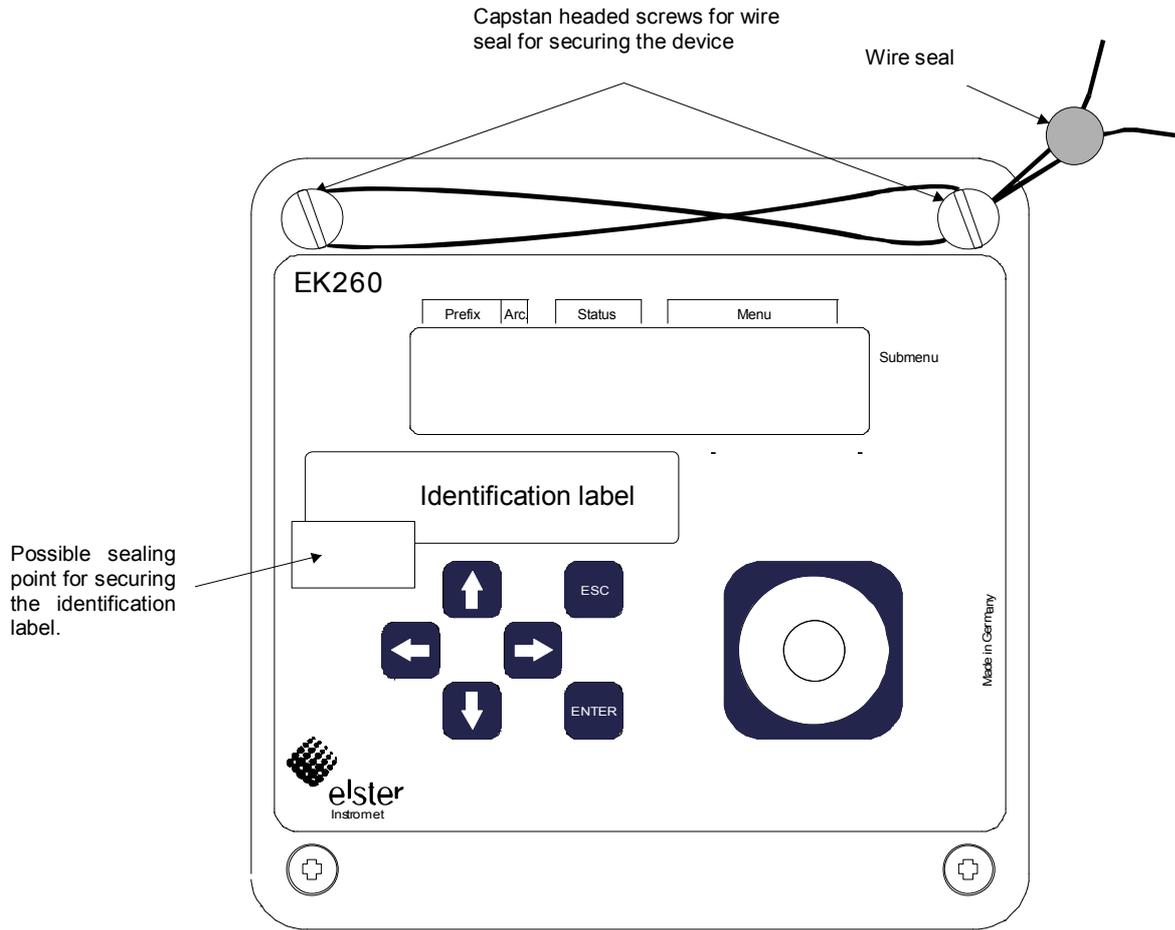
5.9.2 Seal layout of temperature sensor

The sealing of the temperature sensor is generally carried with wire seals.

In this section the sealing methods used by Elster GmbH for the standard temperature sensors are illustrated as examples. Other variants of seals are possible depending on the combination of temperature sensor and thermowell.

a) Temperature sensor of variable length + standard thermowell

Sealing sleeve

Cable glant for fixing the temperature

Capstan headed screw

Thermowell

Wire seal

Temperature sensor
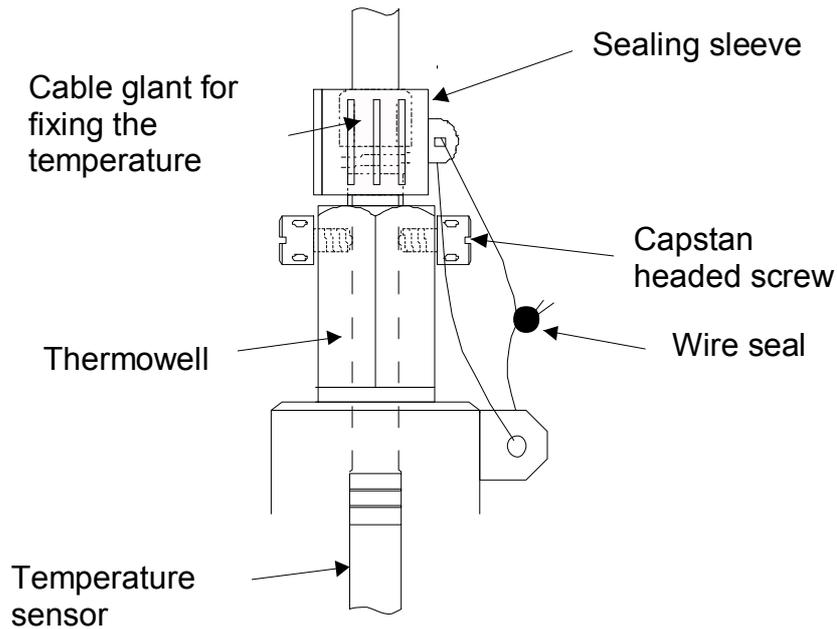
b) Temperature sensor of variable length + older Elster thermowells

Sealing sleeve

Sealing adapter

Wire seal

Capstan headed screw

Thermowell

Wire seal

Temperature sensor
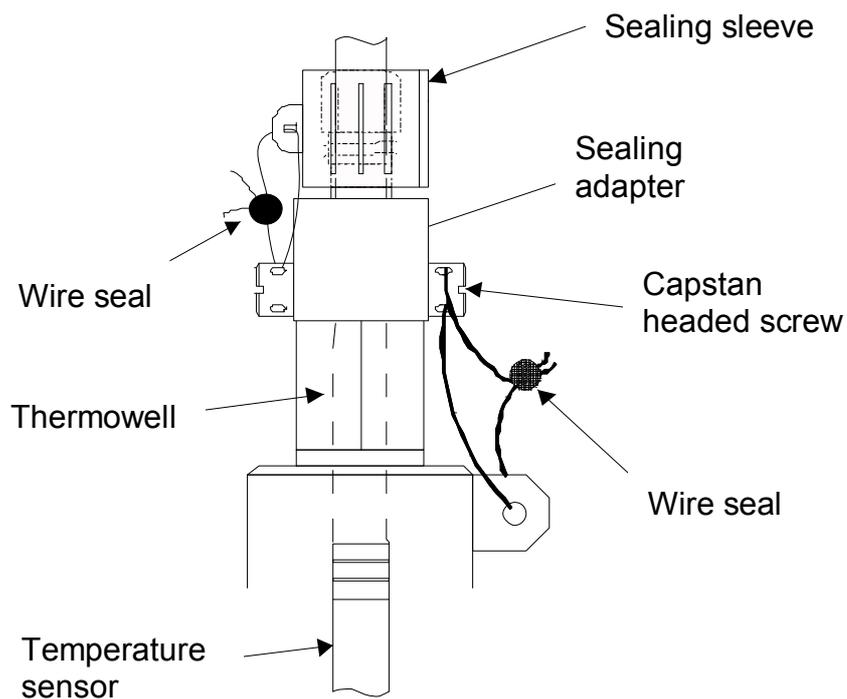
5.9.3 Sealing layout of pressure sensor

The sealing points shown in the sealing layouts are to be secured with sealing labels

a) Internal fitting

Wire seal

Sealing sleeve

Volume Conversion Device

Pressure connector

Pressure sensor

b) External fitting

Sealing point for securing the identification label

Wire seal

Sealing sleeve

Pressure connector

Type   identification as sticker or lasered.

Connecting cable

Pressure sensor
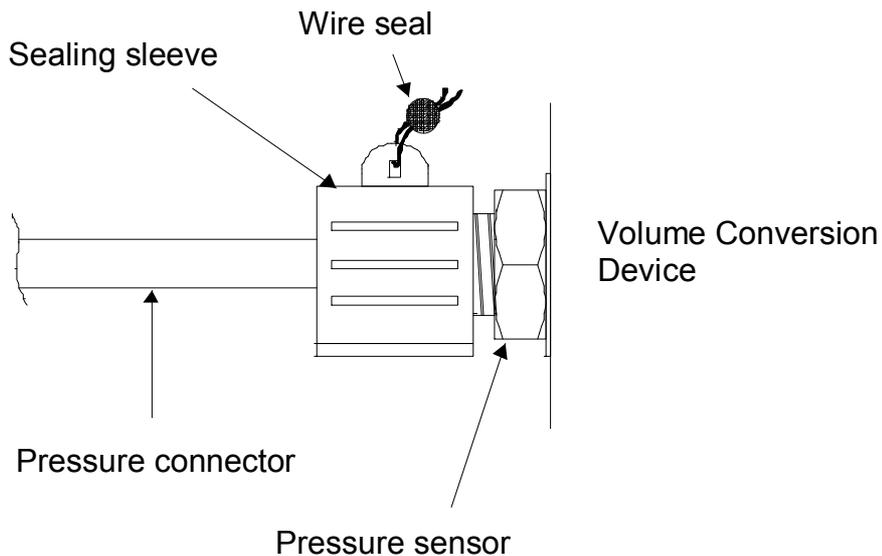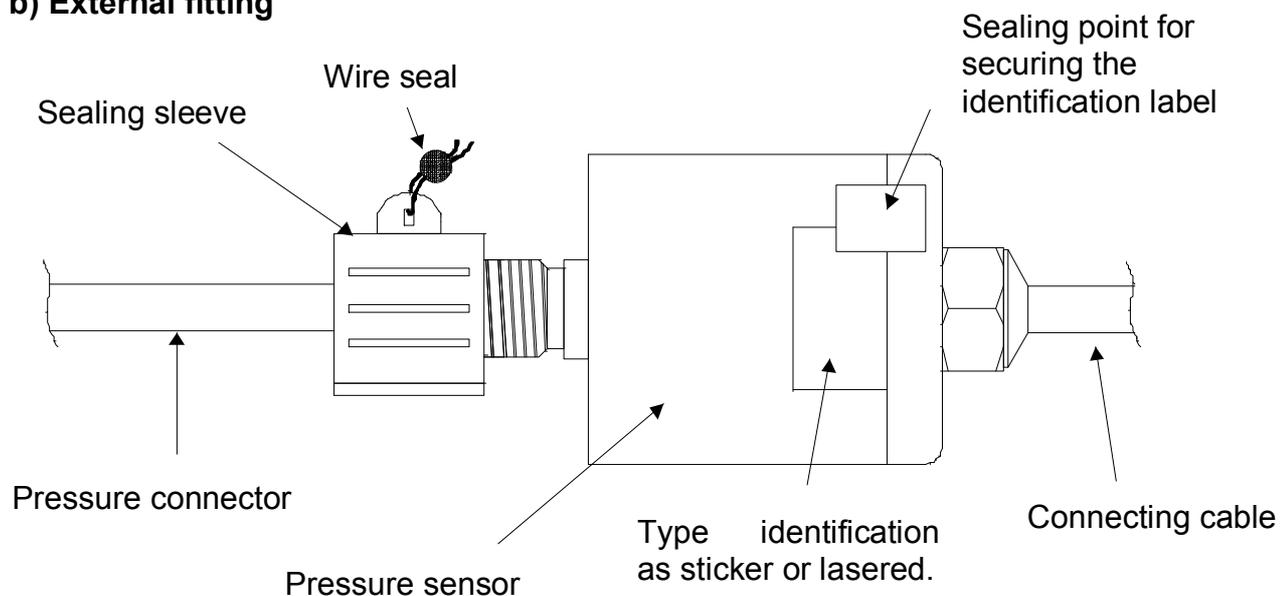
5.10 Battery replacement

During operation a check must be made from time to time of whether the battery needs to be replaced. The battery warning "B" in the "Status" field of the display ($\rightarrow$ **2.2.1**) is used for this as well as the remaining battery life in the service list ($\rightarrow$ 3.9: Bat.R).

☞ *The displayed remaining service life applies to the specified standard operating application ($\rightarrow$ B-2). The remaining service life is reduced correspondingly quicker due to changes of the measurement cycle, reading of the values or continuous active display.*

☞ *The battery life with two batteries in the standard operating mode ($\rightarrow$B-2) is at leas 5 years. The battery life may be reduced in other operating modes. Further details are given in $\rightarrow$ 3.9: Bat.R and Bat.C*

☞ *Battery replacement can be carried out without the presence of a calibration official, because the housing itself is not sealed.*

☞ *During battery replacement at least two batteries should always remain connected. Before the old batteries are removed, the new batteries must be connected. A total of four plugs are provided for this.*

☞ *EK260 measurements may be lost due to careless procedures. All adjusted parameters as well as date, time and counter readings are saved hourly in a non-volatile memory (EEPROM) and recalled automatically when required.*

☞ *As an additional backup, all data should be saved in the non-volatile memory (EEPROM) directly before battery replacement ($\rightarrow$ 3.9, "Save"). If, due to an operating fault during battery replacement, data is lost, the EK260 automatically recalls the data from the time it was previously saved.*

☞ *Therefore, replacement should only be carried out by Elster GmbH Service or by specially trained personnel.*

Carrying out the battery replacement:

1. Save the data as a precautionary measure ($\rightarrow$ 3.9: *Save*).

2. Open up the housing cover and swivel it downwards. The batteries are then accessible in the bottom part of the housing.

3. Check the type and order number of the new batteries.

☞ Tip: Mark the <u>old</u> batteries, e.g. with a felt-tip pen or sticker <u>before</u> you start the battery replacement. This avoids any later confusion.

4. At least one battery pack (two batteries) must always be connected to the two upper or the two lower plugs. If this is not the case, archives may be deleted, volume pulses may be lost during the battery replacement and the clock may be slow after battery replacement.

5. Insert the new batteries and connect to the free plugs in parallel to the old battery pack (both are electrically isolated). The plugs are polarised against incorrect connection.

6. Pull off the old batteries from the plugs and remove.

7. Reclose the device (make sure that the cable is not pinched).

8. The initial capacity must be re-entered under "Service" - "Battery capacity" ($\rightarrow$ 3.9: *BAT.C*) (this is essential even with the same capacity value)!
With the use of battery packs obtainable from Elster GmbH with two size "D" cells, the value 13.0 Ah should be entered for *Bat.C* and 26.0 Ah when 4 cells are used.

9. Check the operating life calculated by the EK260: For *Bat.R* ($\rightarrow$ 3.9) at least 60 months must be displayed. If this is not the case, carry out the step 8 again.

10. End of the battery replacement.

A   Approvals

A.1   EC Declaration of Conformance

Declaration of Conformity
Konformitätserklärung

elster

	MID	**ATEX**
Product / *Produkt*	Volume conversion device / Zustands-Mengenumwerter	
Type, Model / *Typ, Ausführung*	**EK260**	
Product marking / *Produkt-Kennzeichnung*	$C\epsilon$ M.... 0102 DE-08-MI002-PTB001	$C\epsilon$ 0044 (Ex) II 2 G EEx ib IIC T4
EC-Directives / *EG-Richtlinien*	2004/22/EC, 89/336/EEC 2004/22/EG, 89/336/EWG	94/9/EC 94/9/EG
Standards / *Normen*	EN12405-1:2005+A1, EN61326:1997+A1, OIML D11 Edition 2004 (E)	EN50014:1997+A1+A2, EN50020:2002
EC Type-Examination / *EG-Baumusterprüfung*	Notified Body 0102 Physikalisch Technische Bundesanstalt (PTB) D-38116 Braunschweig	Notified Body 0032 and 0044 (legal succession) TÜV NORD CERT GmbH D-30519 Hannover
Surveillance Procedure / *Überwachungsverfahren*	Notified Body 0102 2004/22/EC Annex D 2004/22/EG Anhang D	Notified Body 0044 94/9/EC Annex IV+VII 94/9/EG Anhang IV+VII

We declare as manufacturer:

Products labelled accordingly meet the requirements of the listed directives and standards. They correspond to the tested type samples. The production is subject to the stated surveillance procedure.
If alterations are made to the product or it is modified, this declaration becomes void with immediate effect.

Wir erklären als Hersteller:

Die entsprechend gekennzeichneten Produkte erfüllen die Anforderungen der aufgeführten Richtlinien und Normen. Sie stimmen mit dem geprüften Baumuster überein. Die Herstellung unterliegt den genannten Überwachungsverfahren.

Bei Umbau des Produkts oder Änderungen am Produkt verliert diese Erklärung mit sofortiger Wirkung ihre Gültigkeit.

08.07.2009

Division Director Electronics Industrial
Division Director Electronics Industrial

Head of Development Electronic Systems
Leiter Entwicklung Elektronik-Systeme

Elster GmbH, Postfach 1880, D – 55252 Mainz-Kastel; Steinern Straße 19-21

A.2 Approval for Ex Zone 1

TÜV CERT

Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

(2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) EC-Type Examination Certificate Number

TÜV 00 ATEX 1598

(4) Equipment: Electronic volume corrector type EK260

(5) Manufacturer: Elster Produktion GmbH

(6) Address: Steinernstraße 19-21

D – 55252 Mainz-Kastel

(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The TÜV Hannover/Sachsen-Anhalt e.V., TÜV CERT-Certification Body, notified body number N^r 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 00 PX 13900.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997   EN 50 020: 1994

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type examination certificate relates only to the design and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.

(12) The marking of the equipment or protective system must include the following:

II 2 G   EEx ib IIC T4

TÜV Hannover/Sachsen-Anhalt e.V.   Hannover, 2000-09-13
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

TÜV NORD

Head of the
Certification Body

This certificate may only be reproduced without any change, schedule included.
Excerpts or changes shall be allowed by the TÜV Hannover/Sachsen-Anhalt e.V.

page 1/2

(13) **SCHEDULE**

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 00 ATEX 1598**

(15) Description of equipment

The electronic volume corrector type EK260 is an explosion-proof electronic device that meets the requirements of category 2 (zone 1). The device determines and displays the basic volume of a gas volume, that is measured by an external gas meter under service conditions, using the state variables pressure and temperature.
For the measurement of the pressure an internal sensor is used. The temperature sensor is permanently fixed with the device.
For the supply of the device two batteries in series connection or an external intrinsically safe power supply can be used.
Optional it is possible to use further two batteries in order to obtain a longer life of the batteries.

The permissible ambient and gas temperature range is –30°C to 60°C.

Electrical data

Supply .... 4 pcs. lithium batteries type LS 33600, company Saft
(internal battery) $U = 7,2$ V, modified accumulator pack of the manufacturer

Signal circuits............................... in type of protection "Intrinsic Safety" EEx ia/ib IIC
(terminals Uext + -;   only for the connection to certified intrinsically safe
TD RS T- T+, RD CS R- R+;   circuits with the following maximum values:
DA1 ... DA4)
$$U_i \leq 10 \text{ V}$$
$$\Sigma I_i \leq 100 \text{ mA}$$
$$\Sigma P_i \leq 0,5 \text{ W}$$
The effective internal inductance and capacitance are negligibly small.

Digital inputs .... in type of protection "Intrinsic Safety" EEx ia/ib IIC
(terminals DE1 to DE4)   only for the connection to reed contacts with a cable length up to 50 m

(16) Test documents are listed in the test report No.: 00 PX 13900.

(17) Special conditions for safe use

(18) Essential Health and Safety Requirements

no additional ones

Translation

1. SUPPLEMENT to

EC TYPE-EXAMINATION CERTIFICATE No. TÜV 00 ATEX 1598

of the company: Elster Produktion GmbH
Steinemstraße 19-21
D – 55252 Mainz-Kastel

In the future, the electronic volume corrector EK260 may also be manufactured according to the test documents listed in the test report.

The amendments concern the CPU board internal design and therefor the electrical data.

All other data apply unchanged for this 1. Supplement.

Electrical data

Supply .... 2 resp. 4 pcs. lithium batteries type LS 33600, company Saft
(internal battery) $U = 7,2$ V, modified accumulator pack of the manufacturer

Signal circuits............................. in type of protection "Intrinsic Safety"   EEx ib IIC
(terminals Uext + -;   only for the connection to certified intrinsically safe
TD RS T- T+, RD CS R- R+;   circuits with the following maximum values:
DA1 ... DA4) $U_i = 10$ V
$\Sigma I_i = 100$ mA
$\Sigma P_i = 0,5$ W
The effective internal inductance and capacitance are negligibly small.

CPU board version 1.3

Digital inputs .... in type of protection "Intrinsic Safety"   EEx ib IIC
(terminals DE1 to DE4)   only for the connection to reed contacts with a cable length up to 50 m

CPU board version 2.3
Digital input............................... in type of protection "Intrinsic Safety"   EEx ib IIC
(terminal DE1)   Maximum values:
$U_o = 10$ V
$I_o = 13$ mA
$P_o = 32$ mW
characteristic line: linear
max. permissible outer capacitance: $C_o = 2,94$ µF
max. permissible outer inductance: $L_o = 90$ mH

page 1/2

1. Supplement to EC Type-Examination Certificate No. TÜV 00 ATEX 1598

Digital input .... (terminal DE2)	in type of protection "Intrinsic Safety" EEx ib IIC Maximum values: U_o = 10 V I_o = 11 mA P_o = 28 mW characteristic line: linear max. permissible outer capacitance: C_o = 2,94 µF max. permissible outer inductance: L_o = 90 mH
Digital inputs .... (terminals DE3 and DE4)	in type of protection "Intrinsic Safety" EEx ib IIC only for the connection to reed contacts with a cable length up to 50 m

(16) Test documents are listed in the test report N° 01 PX 06610.

(17) Special conditions for safe use

(18) Essential Health and Safety Requirements

no additional ones

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hannover, 2001-05-17

Strobel

Head of the
Certification Body

RA 00 04-00

TÜV NORD

Translation

2. SUPPLEMENT to

EC-TYPE EXAMINATION CERTIFICATE No. TÜV 00 ATEX 1598

Equipment:	**Electronic Volume Corrector type EK260**
Manufacturer:	Elster-Instromet Production GmbH
Address:	Steinern Straße 19-21
	D-55252 Mainz Kastel
Formerly	ELSTER GmbH

In the future, the Electronic Volume Corrector type EK260 may also be manufactured and operated according to the documents listed in the test report.

The amendments concern the internal design.

The electrical data and all further information apply unchanged fort his supplement.

The equipment inclusive these amendments meet I the requirements of the following standards:

EN 50014:1997+ A1+A2   EN 50020:2002

The test documents are listed in the test report N° 06 YEX 552672-b.

TÜV NORD CERT GmbH & Co. KG   Hannover, 2006-01-18
Am TÜV 1
D-30519 Hannover
Tel.: +49 (0) 511 986-1455
Fax: +49 (0) 511 986-1590

Head of the
Certification Bo

page 1/1

Elster GmbH

B   Technical data

B-1   General data (mechanical, terminals, ambient conditions)

Housing/construction	Wall-mounted housing (horizontally); aluminium cast alloy G AI SI 12 / DIN 1775; with cable glands
Dimensions (W x H x T)	Approx. 200 x 200 x 102 mm (with cable glands and profile strips)
Weight	Approx. 2.8 kg
Cable connection	Clamp terminals; 0.5 ... 1.5 mm² with flexible cable fit core-end sleeves
Screen	Connect cable screen to the cable gland
Protection	IP 65 according to EN60529

Ambient conditions accord. to	MID Directive:
Ambient temperature	-25°C ... +55 °C
Humidity conditions	condensation
Point of use	open

Mechanical ambient conditions accord. to MID Directive:

Class	M2

Electromagnetic ambient conditions accord. to MID Directive:

Class	E2

B-2   Batteries

Batteries	2 lithium batteries; 3.6V; size D normal rated capacity: 16.5 Ah Usable capacity for EK260: 13.0 Ah Order no.: 73015774
	2 additional lithium batteries optional for double service life Order no.: 73015774

The min. service life of five years is guaranteed with two batteries for the following **standard operating mode**:

Measurement cycle	20 s
Operating cycle	300 s (5 minutes)
Mode Input 1	1 (pulse input)
Display active	1 hour per month
Interface active	15 minutes per month
Ambient temperature	T_A = -10...+50 °C

B-3 External power supply

Designation	Uext
Cable termination	Plug-in terminals; 0.5 ... 1.5 mm²
	With flexible cable use core-end sleeves.
Screening	Connect cable screen to the cable gland.

Nominal data:

Supply voltage:	$U = 9.0\,V \pm 10\%$
Supply current:	$I \leq 40\,mA$

B-4 Pulse, status and encoder inputs

Three digital inputs with common ground (minus pole) for reed contacts, transistor switches or encoder interface (only Input "DE1").

Each input can be parameterised and sealed separately.

Designation   DE1... DE3

Nominal data

☞   *For data which is not mentioned here, the limits in the certificate of conformance must be observed when using the EK260 in Ex Zone 1.*

a) Application as LF pulse or signal input ($Md.I1, Md.I2, Md.I3 \neq 5$):

Open-circuit voltage	$U_0 \approx 5.0\,V$	
Internal resistance	$R_i \approx 1\,M\Omega$	
Short-circuit current	$I_s \approx 5\,\mu A$	
Switching level "on":	$R_e \leq 100\,k\Omega$ or	$U_e < 0.8\,V$
Switching level "off"	$R_a \geq 2\,M\Omega$ or	$U_a \geq 3.0\,V$
Pulse duration	$t_e \geq 62.5\,ms$	
Space duration	$t_a \geq 62.5\,ms$	
Counting frequency	$f \leq 2\,Hz$ (see chapter 4.4)	

b) Use of Input 1 (terminal "DE1") as encoder input (*Md.I1* = 5):

Open-circuit voltage	$U_0 \approx 8\,V$	(7...9 V)
Internal resistance	$R_i \approx 820\,\Omega$	
Short-circuit current	$I_s \approx 8\,mA$	(6...10 mA)
Switching level "on":	$I_e \leq 1.2\,mA$	
Switching level "off"	$I_a \geq 2.1\,mA$	
Baud rate	2400 Bd	
Data format	7 data bits, even parity, 1 stop bit ("7e1")	
Flow measurement uncertainty	$E_Q \leq 10\%$ [1]	

---

[1] If the meter reading supplied by the encoder does not change for 200 s, Qm is set to "0" (e.g. at 1.8 m3/h for counters with one decimal place). With meter reading changes at intervals of less than 20 s the measurement is more accurate.

B-5 Signal and pulse outputs

Four transistor outputs with common ground (minus pole).

In the "Pulse output" mode (*Md.A...* = 1, → 3.11) the quantity pulses determined for a measurement cycle are output as pulse packets and are therefore not suitable for open or closed loop control purposes. A frequency proportional to flow can only be output on the output DA2 after setting Md.O2 = 8. (→ 3.11)

Each output can be parameterised and sealed separately.

Designation   DA1... DA4

Nominal data:

☞   *For data which is not mentioned here, the limits in the certificate of conformance must be observed when using the EK260 in Ex Zone 1.*

Maximum switching voltage   30 V DC
Maximum switching current   100 mA DC
Maximum voltage drop   1 V
Maximum residual current   0.001 mA

a) Application as LF pulse or time-synchronous output (*Md.A...* = 1 or 3):
Pulse duration   Min. 125 ms, adjustable on a pitch of 125 ms
Space duration   Min. 125 ms, adjustable on a pitch of 125 ms
Output frequency   Max. 4 Hz, adjustable

b) Application as HF output (only Output 2 "DA2", *Md.O2* = 8):
Output frequency   Max. 1000 Hz, adjustable

Schematic circuit diagram:

B-6   Optical serial interface

Optical interface according to (DIN) IEC 62056-21; bit-serial, asynchronous data transmission according to ISO 1177, half duplex.

Support of **Data transmission mode "C"** (= Data read-out, programming and manufacturer-specific applications with automatic change of the baud rate).

Baud rate	300 Bd (initial baud rate); automatic up to 9600 Bd.
Format	1 start, 7 data, 1 parity (even) and 1 stop bit.
Connection	Optical read-out head on device front panel (automatic positioning / fixing by magnet).

B-7   Electrical serial interface (internal)

RS-232 or RS-485 interface (selectable) for connecting, for example, a modem.

B-8   Pressure sensor

The pressure sensor can be implemented either as an internal or external variant.

Connection:

Pressure connection: Ermeto M12 x 1.5 male thread

Usable length approx. 10 mm

Installation information:

When connecting the pressure line to the pressure sensor, attention must be paid to the pipe diameter to avoid damage and leaks on the gland connection. In particular the parting point on the pipe should be checked for burrs or flaring, which cause an increase in the outside diameter of the pipe (see following drawing of the Ermeto connection on the pressure sensor).

Cross-section of pressure sensor connection
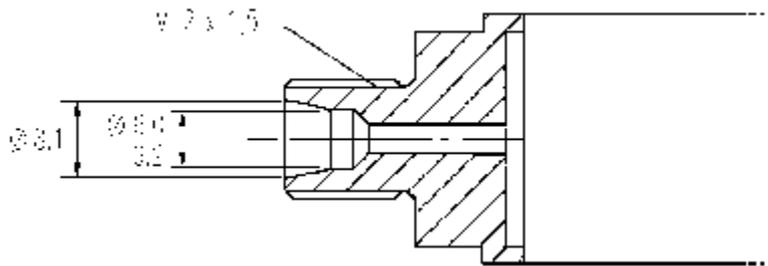
Pressure sensor measurement ranges

Measurement range	Max. admissible overload
0,7 ... 2 bar abs.	18 bar abs.
0,8 ... 5 bar abs.	25 bar abs.
1,4 ... 7 bar abs.	25 bar abs.
2 ... 10 bar abs.	40 bar abs.
2,4 ... 12 bar abs.	40 bar abs.
4 ... 20 bar abs.	40 bar abs.
6 ... 30 bar abs.	60 bar abs.
8 ... 40 bar abs.	60 bar abs.
14 ... 70 bar abs.	105 bar abs.
16 ... 80 bar abs.	105 bar abs.

B-9   Temperature sensor

Type: Pt500 according to DIN EN 60751
Measurement range: -10°C ... +60°C
Measurement uncertainty: $\leq \pm$ 0.1% of measurement
Mounting: Insertion into sensor receptacle with variable length

B-10 Measurement uncertainty

The error limits quoted in the MID and in (DIN) EN 12405 are maintained.

Depending on the ambient temperature and the pressure measurement range, detailed data is available on request.

C Index