Operating Instructions
EcoControl LM

Conductivity Measuring Instrument

GB

13.28 µS   23.4°C
Min: 15.00 µS   *

Contents

Important safety information

➤ Please read the operating instructions carefully and completely prior to working with the instrument.

➤ Ensure that the operating instructions are always available to all users.

➤ Always pass the EcoControl LM on to a third party together with these operating instructions.

Intended use

The EcoControl LM in combination with a suitable conductivity probe is intended for measuring the conductivity in aqueous media. The instrument is intended for industrial usage.

➤ Always adhere to the performance limits stated in the "Technical data" section.

To ensure correct and intended usage, the instructions and especially the "Important safety information" section have to be read and understood.

The instrument is not used as intended if

• it is used in application areas which are not stated in these instructions.

• it is used in operational conditions which deviate from the ones described in these instructions.

Staff qualifications

Assembly, calibration and commissioning require fundamental electrical knowledge as well as knowledge of the respective technical terms. Assembly, calibration and commissioning should therefore only be carried out by a specialist or by an authorised individual supervised by a specialist.

A specialist is someone who due to his/her technical training, know-how and experience as well as knowledge of relevant regulations can assess assigned tasks, recognise potential hazards and ensure appropriate safety measures. A specialist should always adhere to relevant technical regulations.

Warning notices in these instructions

The warning notices in these instructions warn the user about potential dangers to individuals and property resulting from incorrect handling of the instrument. Warning notices are structured as follows:

SIGNAL WORD!

Description of type or source of the danger

Description of the consequences resulting from non-observance

➤ Preventive measures. Always follow these preventive measures.

"**DANGER**" indicates an immediate hazardous situation which, if not avoided, will result in death or serious injury.

"**WARNING**" indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

"**CAUTION**" indicates a potentially hazardous situation which, if not avoided, would result in minor or moderate injuries or property damage.

"**Note**" indicates important information. If this information is not observed, it may result in an undesirable result or state.

Further documents

EcoControl LM is a plant component. Therefore, always observe the documentation of the plant manufacturer.

Pay particular attention to

General instructions

- Adhere to national health and safety regulations as well as environmental protection regulations in the country of use and at the installation site.

- Do not modify or tamper with the instrument.

- Quick, repeated switching on/off of the instrument should be avoided. Wait at least 5 seconds before switching the main switch on and off.

- Do not carry out any actions at the instrument which are not described in these instructions; failure to adhere to these instructions will negatively affect any warranty claims that you make thereafter.

- Adhere to national and local regulations during installation and commissioning.

Installation

- Always completely disconnect the relevant plant part before installing the instrument or connecting/disconnecting it to/from the power supply. Secure the plant against reconnection.

- EcoControl LM requires an interference free and stable power supply and must be earthed. If necessary, use a mains filter to protect EcoControl LM against interference voltages caused, e.g., by solenoid valves or large motors. Never lay connecting cables parallel to power cables and keep cables to sensors as short as possible.

- Only connect the instrument to the mains voltage specified on the rating plate.

- Always observe technical data and ambient parameters.

Operation

- Ensure that the maximum electrical load capacity of the relay outputs and the total power rating are never exceeded.

- Immediately switch off EcoControl LM and contact service staff if malfunctioning occurs (e. g. display failure). The warranty will be void if you tamper with or attempt to repair EcoControl LM. Repairs must be carried out by authorised service staff.

- After a protective circuit (e.g. a fuse) has been tripped, always attempt to eliminate the cause of malfunctioning (e.g. replace a defective motor valve) before reactivating the protective circuit. Frequent triggering is always due to an error which, in certain circumstances, may also cause damage to EcoControl LM.

Cleaning

- Only use a dry, lint-free cloth for cleaning.

De-installation

- Prior to de-installing a defective instrument, always write down a description of the error (failure effect). It is only possible to repair a defective instrument (irrespective of the warranty period) if it is de-installed and returned to us with a description of the error.

Disposal

- Dispose of the instrument in accordance with national regulations.

Scope of delivery

1x EcoControl LM conductivity measuring instrument

1x lithium battery, installed

1x operating instructions

Performance specifications

Use EcoControl LM in combination with a suitable conductivity probe to determine conductivity in aqueous media.

- Connection of various conductivity probes via input of the cell constant as well as the possible connection of a temperature sensor.

- Two independently programmable limit value contacts are available for various monitoring and control tasks. Additionaly one alarm output is present.

- The measuring result can be transferred via the 0/4-20 mA interface or the serial RS232 interface.

- RS232 interface:
  Measuring results can be printed out or displayed on a PC. Between 20 (minimum) and 10,000 (maximum) measuring values with time and date can be saved by the instrument. Measuring values can be read via the PC with the aid of the "EcoControl" PC program.

Operating features and connections
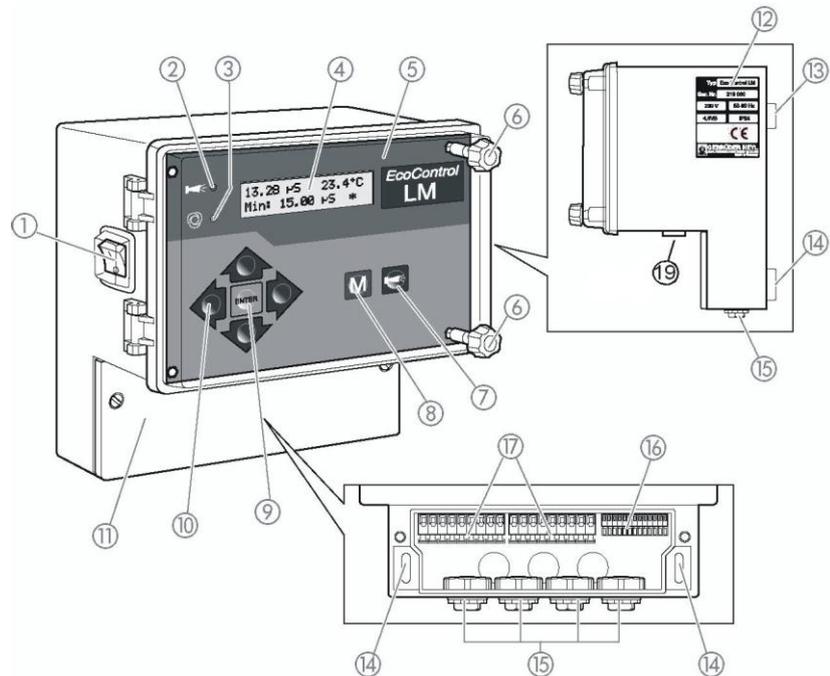
① I/O switch (backlit)

② LED "Alarm"

③ LED "Status"

④ Display

⑤ Housing cover

⑥ Housing cover screws

⑦ "Alarm" key

⑧ "M" key (menu)

⑨ "ENTER" key

⑩ Arrow keys

⑪ Terminal box cover

⑫ Rating plate

⑬ Eyelet for instrument attachment

⑭ Elongated holes for instrument attachment

⑮ Cable sleeves

⑯ Terminals for measuring data inputs and outputs

⑰ Terminals for power supply and consumers

⑱ pH/Redox only

⑲ Interface connection

Position of the fuses
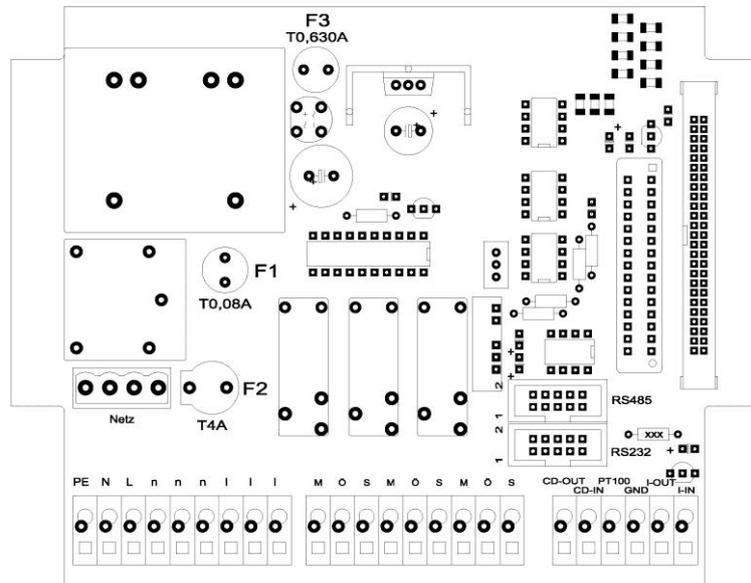
	Art. no.
F1: Fuse T0.08A	31596
F2: Fuse T4A (glass fuse 20 x 5)	31666
F3: Fuse T0.630A	31618

Interfaces:

RS485, sub D 10 pole

RS232, sub D 10 pole

Installation

Prior to installation

Risks resulting from incorrect installation!
EcoControl LM is protected against splash water and dust. High-pressure water and excessive dust will damage the instrument.

➤ Install EcoControl LM at a location where it is protected against high-pressure water, dust and aggressive substances – e. g. in a switch cabinet or on a suitable wall.
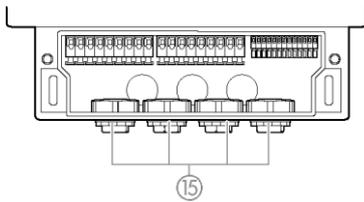
➤ Use a screwdriver to loosen the screws of the terminal box cover.

➤ Remove the Terminal box cover ⑪.
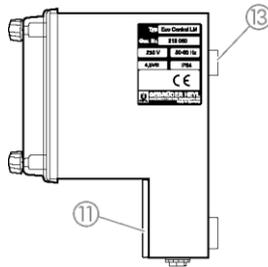
EcoControl LM attachment

➤ Use the supplied screws to attach the instrument at a suitable position in the switch cabinet or on a wall.

➤ Hook the Eyelet for instrument attachment ⑬ onto the screw.

➤ Use screws to fix EcoControl LM via the Elongated holes for instrument attachment ⑭ .

Connecting the power supply and devices
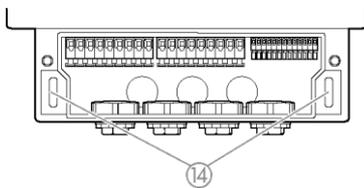
CAUTION!

Risk of electric shocks during installation!
If the power supply is not disconnected prior to installation, it may result in physical injuries, destruction of the product or damage to plant parts.

➤ Disconnect the relevant plant parts before installing EcoControl LM.

➤ Only use tested cables with sufficient cross-sections for the connections.

CAUTION!

⚠

Risk of damages caused by electromagnetic fields!

If EcoControl LM or the connecting cables are installed parallel to power cables or in close proximity to electromagnetic fields, the instrument may be damaged or measurements may be erroneous.

➤ Always install connecting cables and power cables separately.

➤ Always earth the instrument.

➤ Protect EcoControl LM against interference voltages – e. g. via a mains filter.

➤ Shield the instrument against strong electromagnetic fields.

➤ Refer to the rating plate for the appropriate power supply.

➤ Connect the power supply to terminals 1–3.

The following devices can be connected to EcoControl LM:

• Various consumers, e.g. pumps, motors or solenoid valves (terminals 4–18)

• Sensors (terminals 19–22)

• Output devices (terminals 23, 24)

➤ Refer to the following table for the terminal block identification:

Terminals	Meaning
PE / N / L (1–3)	EcoControl LM power supply
n / l (4–9)	Consumer power supply
MIN (10–12)	Relay output: Switches if the value falls below the set minimum limit value.
MAX (13–15)	Relay output: Switches if the set maximum limit value is exceeded.
AL (16–18)	Relay output: Switches if the set limit value for the alarm is achieved.
19 and 20	Conductivity measuring probe (only for EcoControl LM)
21 and 22	Temperature sensor PT100 connection
23 and 24	0/4 – 20 mA signal output

A connection example is shown below:
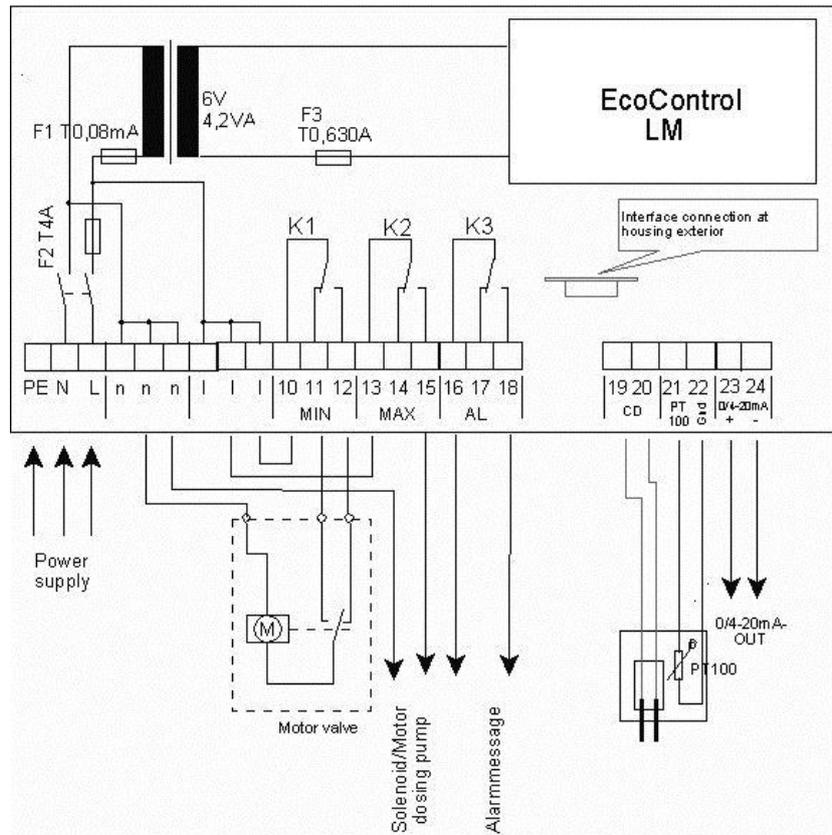
After installation
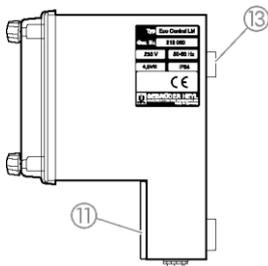
➤ Replace the Terminal box cover ⑪.

➤ Tighten the screws at the Terminal box cover ⑪.
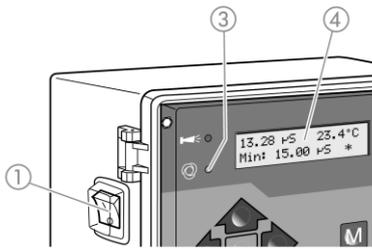
Commissioning

Switch EcoControl LM on/off

➤ To switch on the instrument, flick the I/O switch ① to "I".
The I/O switch ① is backlit. The LED "Status" ③ illuminates green.
The operating display subsequently appears on the main Display
④.

➤ To switch off the instrument, flick the I/O switch ① to "O".
The main Display ④ is switched off. The LED "Status" ③ extinguishes.

Operating system

Housing cover

To operate the instrument, fold down the Housing cover ⑤ as follows:

➤ Slightly turn the Housing cover screws ⑥ anti-clockwise.

➤ Fold down the Housing cover ⑤.

Call menu

➤ Press the "M" key ⑧.
The basic menu appears.

Select menu

The following menus can be selected in the basic menu:

Menu	Functions
Service	Request and change current EcoControl LM settings and statuses. Access is **not** password protected.
Information	Display current settings from the "Basic program" menu. Access is **not** password protected.
Basic program	Change settings or define values, enter plant data and parameters. The menu is password protected.

➤ Press the arrow keys ⬆ or ⬇ to select the desired menu. Continue to press the keys to scroll up or down.
The selected menu is displayed in capital letters in the first line of the display.

➤ Press the "ENTER" key ⑨.
The selected menu opens. The menu item appears in the first line in capital letters.

Navigate to the desired menu item or input area

➤ Press the arrow keys ↑ or ↓ to select a menu item. Continue to press the keys to scroll up or down.

➤ Press the "ENTER" key ⑨.
The menu item displayed in the second line is selected and now appears in capital letters in the first line. The submenu or the input area is displayed.

Return to the higher order menu level

➤ Press the "M" key ⑧.
The higher order menu level is displayed.

Enter/Change values

Only in the "Basic program" and in some menu items in the "Service" menu is it possible to enter or change values. Active menu items are indicated via a tick, inactive menu items via a minus sign.

➤ Change to the desired input area as described in the previous section.
The first or active digit of the value you can change flashes.

➤ Press the ↓ key to reduce this value or the ↑ key to increase this value.
The changed value is displayed.

➤ Press the ← or the → key to move to the previous or next digit respectively and to reduce or increase the value as desired.

➤ Press the "ENTER" key ⑨ to confirm the displayed value.
The value is saved.

Exit menu

➤ Press the "M" key ⑧ several times to access the basic menu or to go to the operating display.

Note:

If a button is **not** pressed for 2 minutes, the instrument automatically exits the menu and the operating display appears.

Closing the housing cover

To protect the instrument, always close the Housing cover ⑤ as follows:

➤ Shut the Housing cover ⑤.

➤ Hold the Housing cover ⑤ closed.

➤ Slightly turn the Housing cover screws ⑥ clockwise.

Menu tree "Service"

SERVICE	Enter →	CALIBRATE CD
Calibrate CD	← M	Cal. CON Zero
		Target value
		Cal. START
		Factor 1.00
		Cal. Reset

SERVICE	Enter →	CALIBRATE °C
Calibrate °C	← M	Ent.target temp
		Cal. START
		Cal. Reset

SERVICE	Enter →	OPERATING INFO	Enter →	CALIBRATION
Operating info	← M	Calibration	← M	Last calibr.

LAST CALIBR.
on: 21.11.06
at: 13:48
CON zero: 0.0000uS
Factor: 1.000000

OPERATING INFO	Enter →	OPER. HRS. 256h
Operating hours	← M	Reset? (Enter)

SERVICE	Enter →	TIME DATE
Time Date	← M	12:03 10.12.06
		automatic ✔

SERVICE	Enter →	DIAGNOSIS	Enter →	OUTPUT
Diagnosis	← M	Output	← M	Output Min
				Output Max
				Output Alarm
				Output mA

SERVICE	Enter →	ERROR HISTORY
Error history	← M	display
		delete

SERVICE	Enter →	MAINTENANCE
Maintenance	← M	in 80 days
		Reset? (Enter)

SERVICE	Enter →	SOFTWARE STATUS
Software status	← M	87M002 15.05.06

Menu tree "Basic Program"

```
┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ ENTER PASSWORD      │
│ Enter password      │ ◄────── │ Password     000    │
└─────────────────────┘    M    └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ CELL CONSTANT       │
│ Cell constant       │ ◄────── │ C=     1.00/cm      │
└─────────────────────┘    M    └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ LIMIT VALUE MIN     │
│ Limit value min     │ ◄────── │          10 µS/cm   │
└─────────────────────┘    M    └─────────────────────┘

              ┌─────────────────────┐  Enter  ┌─────────────────────┐
              │ LIMIT VALUE MIN     │ ──────► │ HYSTERESIS          │
              │ Hysteresis          │ ◄────── │              5%     │
              └─────────────────────┘    M    └─────────────────────┘

              ┌─────────────────────┐  Enter  ┌─────────────────────┐
              │ LIMIT VALUE MIN     │ ──────► │ Function            │
              │ Function            │ ◄────── │ Permanent           │
              └─────────────────────┘    M    ├─────────────────────┤
                                             │ Impulse       -     │
                                             ├─────────────────────┤
                                             │ Intervall     -     │
                                             ├─────────────────────┤
                                             │ En. delay    1s     │
                                             ├─────────────────────┤
                                             │ Drop out delay      │
                                             ├─────────────────────┤
                                             │ mm:ss       00:05   │
                                             └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ LIMIT VALUE MAX     │
│ Limit value max     │ ◄────── │        1000 µS/cm   │
└─────────────────────┘    M    └─────────────────────┘

              ┌─────────────────────┐  Enter  ┌─────────────────────┐
              │ LIMIT VALUE MAX     │ ──────► │ HYSTERESIS          │
              │ Hysteresis          │ ◄────── │              5%     │
              └─────────────────────┘    M    └─────────────────────┘

              ┌─────────────────────┐  Enter  ┌─────────────────────┐
              │ LIMIT VALUE MAX     │ ──────► │ Function            │
              │ Function            │ ◄────── │ Permanent           │
              └─────────────────────┘    M    ├─────────────────────┤
                                             │ IImpulse      -     │
                                             ├─────────────────────┤
                                             │ IInterval     -     │
                                             ├─────────────────────┤
                                             │ Two-point     -     │
                                             ├─────────────────────┤
                                             │ En. delay    1s     │
                                             ├─────────────────────┤
                                             │ Drop out delay.     │
                                             ├─────────────────────┤
                                             │ mm:ss       00:05   │
                                             └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ CONTROL AREA        │
│ Control area        │ ◄────── │              20%    │
└─────────────────────┘    M    ├─────────────────────┤
                               │ Alarm    -          │
                               └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ TEMP. COMPENS       │
│ Temp. compens.      │ ◄────── │ automat.    -       │
└─────────────────────┘    M    ├─────────────────────┤
                               │ manual      ✔       │
                               ├─────────────────────┤
                               │ Factor     2.0      │
                               ├─────────────────────┤
                               │ Temp.:    25°C      │
                               ├─────────────────────┤
                               │ Alarm Min   2°C     │
                               ├─────────────────────┤
                               │ Alarm Max  50°C     │
                               └─────────────────────┘

┌─────────────────────┐  Enter  ┌─────────────────────┐
│ BASIC PROGRAM       │ ──────► │ ALARM               │
│ Alarm               │ ◄────── │ Impulse 1s    -     │
└─────────────────────┘    M    ├─────────────────────┤
                               │ Permanent           │
┌─────────────────────┐        ├─────────────────────┤
│ BASIC PROGRAM       │        │ Delay      2s       │
│ Functions           │        └─────────────────────┘
└─────────────────────┘
```

```
┌─────────────────────────┐
│ BASIC PROGRAM           │
├─────────────────────────┤
│ Alarm                   │
└─────────────────────────┘
         ⬇ ⬆
┌─────────────────────────┐  Enter  ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
│ BASIC PROGRAM           │ ──────→ │ FUNCTIONS               │ ──────→ │ FCT. 0/4-20mA           │
├─────────────────────────┤         ├─────────────────────────┤         ├─────────────────────────┤
│ Functions               │ ←────── │ Fct. 0/4-20mA           │ ←────── │ 0-20mA          ✓       │
└─────────────────────────┘    M    └─────────────────────────┘    M    ├─────────────────────────┤
                                              ⬇ ⬆                        │ 4-20mA          -       │
                                                                         ├─────────────────────────┤
                                                                         │ 0/4mA:      0uS/cm      │
                                                                         ├─────────────────────────┤
                                                                         │ 20mA:    1000uS/cm      │
                                                                         └─────────────────────────┘

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ FUNCTIONS               │ ──────→ │ BUFFER                  │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Buffer                  │ ←────── │ ON             -        │
                                       └─────────────────────────┘    M    ├─────────────────────────┤
                                              ⬇ ⬆                          │ Interval      20m       │
                                                                           ├─────────────────────────┤
                                                                           │ Max. data     500       │
                                                                           ├─────────────────────────┤
                                                                           │ delete                  │
                                                                           └─────────────────────────┘

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ FUNCTIONS               │ ──────→ │ SER. INTERFACE          │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Ser. interface          │ ←────── │ Printer    -            │
                                       └─────────────────────────┘    M    ├─────────────────────────┤
                                                                           │ Interval     10m        │
                                                                           ├─────────────────────────┤
                                                                           │ Modem   -               │
                                                                           └─────────────────────────┘
```

```
┌─────────────────────────┐  Enter  ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
│ BASIC PROGRAM           │ ──────→ │ EXTRAS                  │ ──────→ │ LANGUAGE                │
├─────────────────────────┤         ├─────────────────────────┤         ├─────────────────────────┤
│ Extras                  │ ←────── │ Language                │ ←────── │ German          ✓       │
└─────────────────────────┘    M    └─────────────────────────┘    M    ├─────────────────────────┤
                                              ⬇ ⬆                        │ English         -       │
                                                                         ├─────────────────────────┤
                                                                         │ French          -       │
                                                                         ├─────────────────────────┤
                                                                         │ Italian         -       │
                                                                         ├─────────────────────────┤
                                                                         │ Polish          -       │
                                                                         └─────────────────────────┘

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ EXTRAS                  │ ──────→ │ PASSWORD                │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Password                │ ←────── │ NEW:    000             │
                                       └─────────────────────────┘    M    └─────────────────────────┘
                                              ⬇ ⬆

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ EXTRAS                  │ ──────→ │ SERAL NO.               │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Serial no.              │ ←────── │       abcxyz            │
                                       └─────────────────────────┘    M    └─────────────────────────┘
                                              ⬇ ⬆

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ EXTRAS                  │ ──────→ │ MAINTENANCE             │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Maintenance in-         │ ←────── │ Days:         100       │
                                       └─────────────────────────┘    M    ├─────────────────────────┤
                                              ⬇ ⬆                          │ Alarm         -         │
                                                                           └─────────────────────────┘

                                       ┌─────────────────────────┐  Enter  ┌─────────────────────────┐
                                       │ EXTRAS                  │ ──────→ │ RELEASE                 │
                                       ├─────────────────────────┤         ├─────────────────────────┤
                                       │ Release                 │ ←────── │ none            ✓       │
                                       └─────────────────────────┘    M    ├─────────────────────────┤
                                                                           │ passive         -       │
                                                                           ├─────────────────────────┤
                                                                           │ active          -       │
                                                                           └─────────────────────────┘
```

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Calibration of the conductivity probe

After installing EcoControl LM, the conductivity probe and the temperature sensor must be calibrated.

The most precise measurements are achieved via two-point calibration. To achieve this, calibrate

- the zero point
- and the target value

of the conductivity probe.

Zero point calibration

Measuring error (offset) caused, e.g., by a temperature drift in the measuring system can be counterbalanced via zero point calibration. If zero point calibration is not carried out, the measuring results will be less exact.

➤ Ensure that the probe with the final cable length has been connected, but is completely dry and not wetted with the measuring medium.

```
Calibration CD

Cal. CON Zero
```

➤ Select the menu items "Service" > "Calibrate CD" > "Cal. CON Zero". Zero point calibration starts.

Zero point calibration finishes automatically. EcoControl LM corrects the measuring error by forming the difference.

➤ Subsequently execute target value calibration.

Target value calibration

Measuring errors which are caused by a soiled probe can be corrected via target value calibration. Target value calibration is particularly suitable if there are high accuracy requirements in a limited measuring range. Furthermore, this method allows you to carry out measurements whose cell constant is unknown with a probe.

Depending on the application, the target value can be calibrated in three different ways:

- Calibration without temperature compensation
- Calibration with temperature compensation for constant medium temperature
- Calibration with temperature compensation for variable medium temperature.

Calibration without temperature compensation

Carry out calibration without temperature compensation when the temperature of the medium is approx. 15 C and remains constant.

To achieve this, the correction factor determined from a comparison measurement and the display has to be entered manually.

Correction factor = measured conductivity/displayed conductivity

➤ Enter the correction factor evaluated as described above under "Service" > "Calibration CD" > "Factor".
The entered correction factor is immediately operative.

Set temperature coefficient
(see chapter "Operation / Enter val-
ues in the basic programm / Set the
temp.erature compensation)

```
TEMP. COMPENS.
manual              ✔
```

```
TEMP. COMPENS.
Temp.        20°C
```

```
TEMP. COMPENS.
automat.            ✔
```

```
TEMP. COMPENS.
Factor     1.90%/°C
```

Start target value calibration
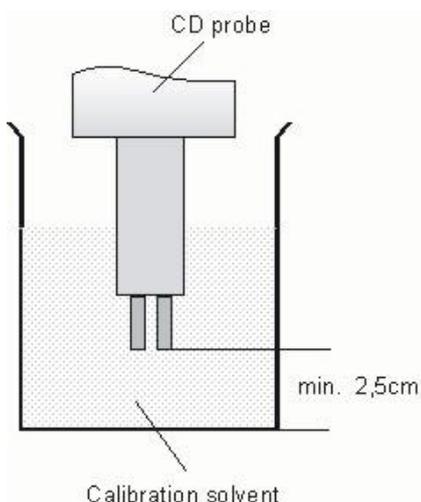
Calibration with temperature compensation for constant medium temperature

If a **probe without temperature sensor** is used, the temperature of the medium has to be entered. Proceed as follows:

➤ Select and confirm the "manual" option in the "Basic Program" > "Temp. compens." menu.

➤ Enter the temperature of the calibration solvent under "Basic Program" > "Temp. compens." > "Temp.".

If a **probe with temperature sensor** is used, enter a fixed factor as the temperature coefficient. Proceed as follows:

➤ Select and confirm the "automat" option in the "Basic Program" > "Temp. compens." menu.

➤ Enter 1.90%/°C as the temperature coefficient under "Basic Program" > "Temp. compens" > "Factor".

➤ Enter the conductivity of the calibration solvent at 25 °C under "Service" > "Calibration CD" > "Target value".
If the conductivity of the calibration solvent deviates by more than ±50% from this target value during target value calibration, the calibration process is terminated and "Error" appears on the LC display.

CAUTION!

Risk of incorrect measured values

If calibration is not carried out or an unsuitable calibration solvent is used, it will result in incorrect measured values.

➤ Always calibrate with a calibration solvent in accordance with DIN EN 27888.

CD probe

min. 2,5cm

Calibration solvent

➤ Dip the measuring probe into the calibration solvent as shown left.

➤ After inserting a probe with temperature sensor, wait approx. 2 minutes before starting calibration, thus ensuring that the probe has the same temperature as the solvent.

➤ Select and confirm "Service" > "Calibration CD" > "Cal. START".
Target value calibration starts.

Calibration finishes automatically. EcoControl LM corrects the measuring error by forming a correction factor.

The calibration is registered with the time and date.

Calibration with temperature compensation for variable medium temperature

If the temperature of the medium is unknown, it is possible to connect a separate temperature sensor PT100. With automatic temperature compensation it may also be wise to carry out calibration of the temperature measurement (e.g. for longer lengths of the sensor lead). The conductivity probe then has to be calibrated as follows:

```
CALIBRATE °C

Ent. target temp.
```

➤ Enter the target temperature under "Service" > "Calibrate °C" > "Ent. target temp.".

```
CALIBRATE      °C

Start
```

➤ Select and confirm "Service" > "Calibrate °C" > "Cal. START". Calibration starts.

The instrument executes calibration. (Rotating dash at the end of the second line).

```
CALIBRATE      °C

          OK!
```

Please ensure that the entered input-target-temperature does not deviate by more than ± 5°C from the sensor temperature. The error message "ERROR 4" appears for larger deviations. This error message also appears for an unavailable sensor or an open circuit/short circuit.

Reset calibration to standard values

To cancel incorrect calibration, either repeat the calibration process, as described in the previous section, or reset calibration as follows:

```
CALIBRATE °C

Cal. Reset
```

➤ Select and confirm "Service" > "Calibrate °C" > "Cal. Reset". Calibration is reset to the standard value. Your measuring system is not calibrated! The calibration reset is registered with the time and date.

Display or reset operating hours

EcoControl LM records the operating hours. To display the operating hours:

```
OPER. HRS.     1256 h

 Reset? (Enter)
```

➤ Select and confirm "Service" > "Oper. info" > "Operating hours".
The current reading of the operating hours meter is displayed.

To reset the operating hours meter to zero:

➤ Select and confirm "Service" > "Oper. info" > "Operating hours" > "Reset? (Enter)".
The operating hours meter is reset to zero.

Display and set the time and date

EcoControl LM has an integrated clock, which continues to run even when the instrument is switched off – as long as the battery is not flat. To set the time, proceed as follows:

```
┌─────────────────────────────┐
│ TIME        DATE            │
│                             │
│  11:55      31.12.07        │
│                             │
└─────────────────────────────┘
```

➤ Select and confirm "Service" > "Time Date" > "hh:mm dd.mm.yy".
  The current time and date are displayed.

➤ To alter the time and date, press the "ENTER" key ⑨.
  Use the arrow keys to select and change each digit of the time and date.

➤ To save the time and date, press the "ENTER" key ⑨.

To set the clock automatically for summertime and wintertime:

```
┌─────────────────────────────┐
│ TIME        DATE            │
│                             │
│ automatic    ✔              │
│                             │
└─────────────────────────────┘
```

➤ Select and confirm "Service" > "Time Date" > "hh:mm dd.mm.yy" > "automatic".
  If a tick appears, the clock is automatically set for summertime and wintertime; if a dash appears, the clock is not automatically set for summertime and wintertime.

➤ Use the cursor keys ⬆⬇ and "ENTER" to change the setting

Operation

Key functions

Key	Function
ENTER	• Acknowledge input • Trigger functions
Arrow keys	• Menu navigation • Input of numerical values and programming data
M	• Call menu • Call higher order menu (back)
Alarm	• Switch off alarm signal (the fault display can only be deleted once the fault has been eliminated)

Display

The operating display appears after switching on the instrument. If an error occurs, the display switches to the respective error message. Furthermore, the display shows the menu and enables programming of EcoControl LM.

The display has two lines each with max. 16 characters.

Operating display

```
163.0µS 23.2°C
12:03 08.01.07
```

Line 1 displays the current measured conductivity in µS/cm and the liquid temperature in °C.

Line 2 alternates between the status messages of the limit values/limit value contacts and other measured values. The display is updated every 5 seconds.

Error messages

If errors occur at EcoControl LM, a respective error message appears on the Display ④.

Note:

In addition to the displayed error messages, the red LED "Alarm ② illuminates or flashes.

Error messages alternate with the operating display. Each error is stored in the error history (see „Display or delete the error history ").

Power failure

```
Power failure

8:36    17.06.06
```

When switching on EcoControl LM after a power failure, the following message appears: "Power failure". After switching on or after voltage recovery, EcoControl LM starts in the basic state.

➤ Check the plant for possible negative results due to the power failure.

All the saved values, e.g. calibration values, are not lost, even during a power failure. The integrated clock is battery backed and continues to run.

To acknowledge the error display:

➤ Press the "Alarm" key ⑪

Control area

➤ The following displays only appear if the alarm for the control area has been activated.

```
Control area

exceeded
```

The conductivity is outside the programmed tolerance range. Depending on the actual programming, the relay K3 "AL" is switched in addition to the display.

To acknowledge the error display:

➤ Press the "Alarm" key ⑪

Minimum temperature

```
Temperature min.

12:45 24.12.06
```

The programmed minimum permissible temperature has not been achieved. Depending on the actual programming, the relay K3 "AL" is switched in addition to the display.

To acknowledge the error display:

➤ Press the "Alarm" key ⑪

Maximum temperature

```
Temperature max.

12:45 24.12.06
```

The programmed maximum permissible temperature has been exceeded. Depending on the actual programming, the relay K3 "AL" is switched in addition to the display.

To acknowledge the error display:

➤ Press the "Alarm" key ⑪

Calibration error

```
Calibration CD

Error X      (M)
```

If the calibration procedure is incorrectly, the device creates a error message from error 1 to error 3:

Error 1: Zero offset calibration, > check cable and probe

Error 2: Desired value calibration, > check probe/calibration solvent

Error 3: Temperature calibration, > check cable and probe

To acknowledge the error display:

➤ Press the "M" key (Menu)

Enter/Alter values in the "Basic program" menu

EcoControl LM can be configured in the "Basic program" menu. Enter the password to switch to the "Basic program" menu.

Enter password

The password is a 3-digit password between "000" and "999". It is factory set to "000".

```
ENTER PASSWORD

Password   000
```

➤ Select and confirm "BASIC PROGRAM" > "Enter Password". "Password 000" appears on the display.

➤ Enter the password and confirm it via the "ENTER" key ⑨. Once the correct password has been entered, the Basic program menu opens. "BASIC PROGRAM" appears on the display. If an incorrect password is entered, the "INFORMATION" menu opens. It is possible to read but not alter all the parameters in the "INFORMATION" menu.

Change cell constant

```
CELL CONSTANT

C=        1.00/cm
```

➤ Select and confirm "BASIC PROGRAM" > "CELL CONSTANT". The current cell constant appears on the display.

To alter this cell constant:

➤ Press the "ENTER" key ⑨.

➤ Enter the cell constant of your conductivity probe (range 0.01-9.99) and confirm it.

Define lower limit value and function if the limit value is not achieved

Define the lower (minimum) limit value and its switching hysteresis in the "LIMIT VALUE MIN" menu and program the function which is to occur if the value falls below the lower limit value. If the value falls below the lower limit value, it appears after "MIN:" in the bottom line of the display and the relay K1 "MIN" reacts according to the programmed switching function.

First define the lower limit value as follows:

```
LIMIT VALUE MIN

            10µS/cm
```

➤ Select and confirm "Basic Program" > "Limit value min". The current lower limit value appears on the display.

To alter this value:

➤ Press the "ENTER" key ⑨.

➤ Enter the desired lower limit value and confirm it.

Note:

The lower limit value must be less than the upper limit value.

Now define the hysteresis:

```
HYSTERESIS

              5%
```

➤ Select and confirm "BASIC PROGRAM" > "Limit value min" > "Hysteresis". The current hysteresis appears on the display.

To alter this hysteresis:

➤ Press the "ENTER" key ⑨.

➤ Enter the desired hysteresis in % and confirm it.

Now program the switching function which is to occur if the value falls below the lower limit value:

Note:

The neutral position of the relay is the same for the de-energized EcoControl LM and when the lower limit value is achieved: Contact between the terminals: 10 and 11.

➤ Select and confirm "BASIC PROGRAM" > "Limit value Min" > "Function".
The "FUNCTION" menu appears on the display. It includes the following menu items:

```
FUNCTION

Permanent        ✔
```
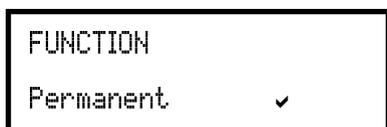
• "Permanent":
If the value falls below the lower limit value, the relay K1 "MIN" is permanently switched (contact between the terminals: 10 and 12). The relay drops out again if the lower limit value plus the set hysteresis is exceeded.

Example:

Lower limit value = 100 µS/cm
Relay drop out at 5% hysteresis = 105 µS/cm

```
FUNCTION

Impulse          ✔
```
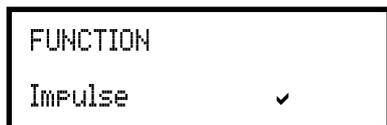
• „Impulse":
If the value falls below the lower limit value, the relay K1 "MIN" switches for a time period set under "mm:ss" (see below). The relay K1 "MIN" remains switched for this set time period – even if the lower limit value is then achieved.

```
FUNCTION

Interval         ✔
```
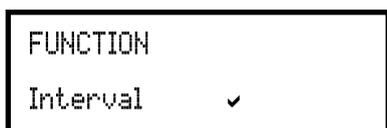
• "Interval":
If the value falls below the lower limit value, the relay K1 "MIN" switches at the time interval set under "mm:ss" (see below). The pulse duty factor is 1:1, i.e. the switch-on time and switch-off time are identical.

```
FUNCTION

En.delay.        1s
```
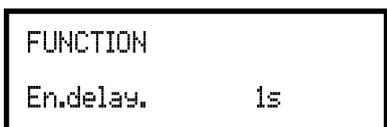
• „En.delay." (Energised delay):
If the value falls below the lower limit value, the relay K1 "MIN" switches after the delay period set here (0 to 99 s). If the limit value is exceeded during this delay period, the relay K1 "MIN" remains idle.

```
FUNCTION

Drop-out delay.
```
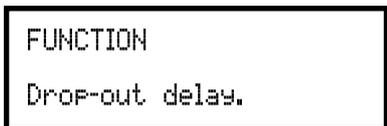
• "Drop-out delay" (Drop-out delay):
If the lower limit value is exceeded, the relay K1 "MIN" drops out after the delay period set here (0 to 99 s). If the value falls below the limit value during this delay period, the relay K1 "MIN" remains switched.

```
FUNCTION

 mm:ss           00:05
```
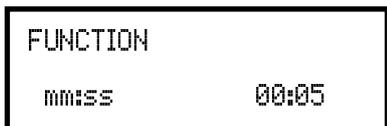
• „mm:ss" (Time):
Time for which the functions "Impulse" and "Interval" are switched (00:00 to 99:99).

➤ Select and confirm the desired function ("Permanent", "Impulse" or "Interval") in the "FUNCTION" menu.
The activated function is indicated by a tick, inactive functions via a minus sign.

➤ Enter the desired times in the functions "En.delay.", "Drop-out delay" and "mm:ss" and confirm them.

Define the upper limit value and function if the limit value is exceeded

Define the upper (maximum) limit value and its switching hysteresis in the "LIMIT VALUE MAX" menu and program the function which is to occur if the upper limit value is exceeded. If the upper limit value is exceeded, it appears after "Max:" in the top line of the display and the relay K2 "MAX" reacts according to the programmed switching function.

First define the upper limit value as follows:

➤ Select and confirm "Basic Program" > "Limit value max".
The current upper limit value appears on the display.

```
LIMIT VALUE MAX

           1000µS/cm
```

To alter this value:

➤ Press the "ENTER" key ⑨.

➤ Enter the desired upper limit value and confirm it.

Note:

The upper limit value must be greater than the lower limit value, but smaller than the measuring range.

Now define the hysteresis as follows:
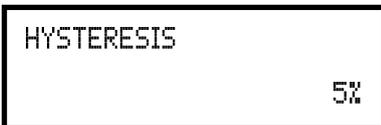
➤ Select and confirm "Basic Program" > "Limit value max" > "Hysteresis".
The current hysteresis appears on the display.

```
HYSTERESIS

                5%
```

To alter this hysteresis:

➤ Press the "ENTER" key ⑨.

➤ Enter the desired hysteresis in % and confirm it.

Now program the switching function which is to occur if the upper limit value is exceeded:

Note:

The neutral position of the relay is the same for a de-energized EcoControl LM and when the upper limit value is exceeded: Contact at terminals: 13 and 14.

➤ Select and confirm "Basic Program" > "Limit value Max" > "Function".
The "FUNCTION" menu appears on the display. It includes the following menu items:
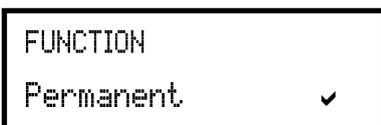
● "Permanent":
If the upper limit value is exceeded, the relay K2 "MAX" switches permanently (contact at terminals: 13 und 15). The relay drops out again if the value falls below the upper limit value less the set hysteresis.

```
FUNCTION

Permanent        ✔
```

Example:

Upper limit value = 1000 µS/cm
Relay drop out at 5 % hysteresis = 950 µS/cm

```
FUNCTION

Impulse          ✔
```

- "Impulse":
  If the upper limit value is exceeded, the relay K2 "MAX" switches for a time period set under "mm:ss" (see below). The relay K2 "MAX" remains switched for this set time period – even if the upper limit value is no longer exceeded.

```
FUNCTION

Interval         ✔
```

- "Interval":
  If the upper limit value is exceeded, the relay K2 "MAX" switches at the time interval set under "mm:ss" (see below). The impulse duty factor is 1:1, i.e. the switch-on time and switch-off time are identical.

```
FUNCTION

Two-point        ✔
```

- "Two-point": (Two-point controller function)
  If the upper limit value is exceeded, the relay K2 "MAX" switches. This drops out again when the value falls below the lower limit value.
  Any programmed energy and drop-out delays are also operative, i.e. the energy delay of the upper limit value and the drop-out delay of the lower limit value.

```
FUNCTION

En.delay       1s
```

- "En.delay." (Energy delay):
  If the upper limit value is exceeded, the relay K2 "MAX" switches after the delay period set here (0 to 99 s). If the value falls below the limit value during this delay period, the relay K2 "MAX" remains idle.

```
FUNCTION

Drop-out delay    1s
```

- "Drop-out delay" (Drop-out delay):
  If the value falls below the upper limit value, the relay K2 "MAX" drops out after the delay period set here (0 to 99 s). If the limit value is exceeded during this delay period, the relay K2 "MAX" is switched.

```
FUNCTION

 mm:ss         00:05
```

- „mm:ss" (Time):
  Time for which the functions "Impulse" and "Interval" are switched (00:00 to 99:99).

➤ Select and confirm the desired function ("Permanent", "Impulse" or "Two-point") in the "FUNCTION" menu.
  The activated function is indicated by a tick, inactive functions via a minus sign.

➤ Enter the desired times in the functions "En.delay.", "Drop-out delay" and "mm:ss" and confirm them.

Define a control area

It is possible to define a control area. This is the tolerance range in which the value can fall below the lower limit value or exceed the upper limit value before an error message appears on the display.

It is also possible to define whether the alarm should sound if the value falls below or exceeds the control area.

```
Control area

exceeded
```

If the value falls below or exceeds the control area, the error message "Control area not achieved" or "Control area exceeded" alternates with the operating display.

Example:

Upper limit value = 1000 µS/cm
Lower limit value = 100 µS/cm

Control area = 20%
The error message appears at 1200 µS/cm (upper limit value + 20%) and at 80 µS/cm (lower limit value – 20%).

Define the control area first:

WARNING!

Risk of personal injuries and damage to property!
If the control area is set to "0%", EcoControl LM will not trigger an alarm – not even if "Alarm" has been checked!

➤ Set the control area to at least "1%"!

```
Control area

            20%
```
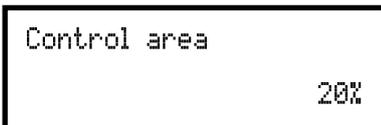
➤ Select and confirm "Basic program" > "Control area".
  The current control area appears on the display.

To alter this value:

➤ Press the "ENTER" key ⑨.

➤ Enter the desired control area in % and confirm it.

Subsequently activate/deactivate the alarm:

```
Control area

Alarm            ✔
```
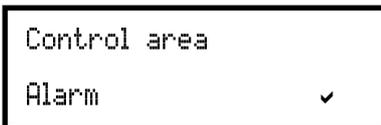
➤ Select and confirm "Basic program" > "Control area" > "Alarm".
  If a tick appears after "Alarm" on the display, the alarm is activated; if a minus sign appears after "Alarm" on the display, the alarm is not activated.

➤ Press the "ENTER" key ⑨.

➤ Select and confirm the alarm status.

Set the temperature compensation

The temperature compensation ensures that the correct conductivity is measured even if the temperature of the medium changes.
In the "TEMP. COMPENS." menu define:

- whether temperature compensation is to occur automatically or manually,

- which temperature coefficient is to be used for temperature compensation,

- at which temperatures the alarm is to be triggered,

- which alarm signal is to be output.

Set automatic / manual temperature compensation

➤ If the temperature sensor PT100 has been connected to connection "PT100" (terminals 21 and 22) of EcoControl LM, select and confirm "Basic program" > "Temp. compens." > "automat." (automatic temperature compensation);
  if a temperature sensor has not been connected to the connection "PT100", select and confirm "Basic program" > "Temp. compens." > "manual" (manual temperature compensation).

Enter the temperature - coefficient

```
Temp. compens.

Factor      2.0
```
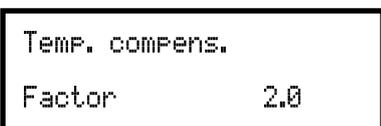
➤ Select and confirm "Basic program" > "Temp. compens" > "Factor".

➤ If "automat." has been selected above, enter the factor for the temperature coefficient of the medium to be measured (the tem-

perature coefficient of natural water is approx. 2%/°C);
if "manual" has been selected above, no entry is required.

Calculate the temperature coefficient

Determine the temperature coefficient for media with unknown temperature coefficients (e. g. pure water) via a reference measurement as follows:

➤ Enter "1.0" as the factor under "Basic program" > "Temp. compens" > "Factor".

```
Temp. compens.

Factor          1.0
```

➤ Measure the conductivity and the temperature of the medium at temperature T1.

➤ Measure the conductivity and the temperature of the same medium at temperature T2.

➤ Calculate the factor with the following formula:

$$\text{Faktor} = \frac{\left(\dfrac{\text{Leitfähigkeit (T1)}}{\text{Leitfähigkeit (T2)}}\right) - 1}{T1 - T2}$$

Enter the temperature

➤ Enter the calculated factor under "Basic program" > "Temp. compens" > "Factor" and confirm it.

➤ Select and confirm "Basic program" > "Temp. compens" > "Temp".

```
Temp. compens.

Temp.          24°C
```

➤ If "manual" has been selected above, enter the temperature of the medium;
if "automat." has been selected above, no entry is required.

Enter the temperature for the insufficient temperature alarm

➤ Under "Basic program" > "Temp. compens." > "Alarm Min" enter and confirm the temperature at which the alarm is to be triggered if this temperature is not achieved.
If this temperature is not achieved, the error message "Temperature Min." appears on the display and a fault message is output at output AL.

```
Temp. compens.

Alarm Min       10°C
```

Note:

If "0°C" has been entered here, the temperature is not monitored. An alarm will not sound even if the temperature of the medium decreases rapidly.

Enter the temperature fort he excess temperature alarm

➤ Under "Basic program" > "Temp. compens." > "Alarm Max" enter and confirm the temperature at which the alarm is to be triggered if this temperature is exceeded.
If this temperature is exceeded, the error message "Temperature Max." appears on the display and a fault message is output at output AL.

```
Temp. compens.

Alarm Max       40°C
```

Note:

If "0°C" has been entered here, the temperature is not monitored. An alarm will not sound even if the temperature of the medium increases rapidly.

Configure the alarm signal

It is possible to choose between two signals as the alarm message:

• Continuous contact or

• One second impulse.

Furthermore, it is possible to enter a time by which the alarm signal is to be delayed.

Note:

The neutral position of the relay K3 "AL" is the same for the de-energized EcoControl LM and when the alarm has been triggered: Contact between the terminals: 16 and 17.

➤ Select and confirm "Basic Program" > "Temp. compens" > "Alarm".
The "ALARM" menu appears on the display. It includes the following menu items:

```
ALARM

Permanent       ✔
```
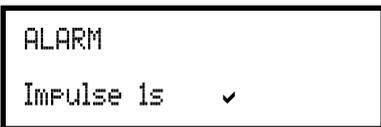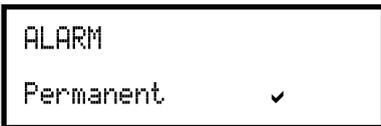
- "Permanent":
  If the alarm is triggered, the relay K3 "AL" switches permanently once the delay period (see below) has elapsed (contact between the terminals: 16 and 17). The relay drops out again as soon as the cause of the alarm has been eliminated or the "Alarm" key ⑦ is pressed.

```
ALARM

Impulse 1s      ✔
```

- "Impulse 1s":
  If the alarm is triggered, the relay K3 "AL" switches once for 1 second once the delay period (see below) has elapsed (contact between the terminals: 16 and 17). The relay drops out again after one second.

```
ALARM

Delay      10s
```

- "Delay":
  If the alarm is triggered, the relay K3 "AL" switches once the entered delay period has elapsed. If the cause of the alarm is eliminated during this delay period, the alarm is not triggered.

➤ Select and confirm the desired function ("Permanent" or "Impulse 1s") in the "ALARM" menu.
The activated function is indicated by a tick, the inactive function via a minus sign.

➤ Enter and confirm the desired delay period under "Delay".

Configure the 0/4-to-20 mA interface

The 0/4-to-20 mA interface is suitable, e. g., for connecting a printer. To adapt the output signal to your printer, configure the transmission-ratio spread as well as the lower and upper limit.

➤ Select and confirm "Basic Program" > "Functions" > "0/4-20mA".
The "FCT.0/4-20mA" menu appears. It includes the following menu items:

```
FCT.0/4-20mA

0-20 mA         ✔
```
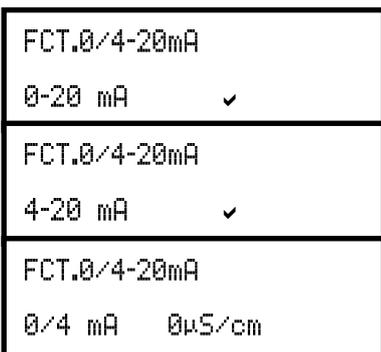
- "0-20 mA":
  If the menu item is activated, the interface supplies 0 to 20 mA.

```
FCT.0/4-20mA

4-20 mA         ✔
```

- "4-20 mA":
  If the menu item is activated, the interface supplies 4 to 20 mA.

```
FCT.0/4-20mA

0/4 mA    0µS/cm
```

- "0/4 mA":
  Value of the smallest conductivity to be output (usually 0 µS/cm).

```
FCT.0/4-20mA

20 mA      1000µS/cm
```

- "20 mA":
  Value of the maximum conductivity to be output.

➤ Select and confirm the desired transmission-ratio spread ("0-20 mA" or "4-20 mA") in the "FCT.0/4-20mA" menu.
  The activated transmission-ratio spread is indicated by a tick, the inactive transmission-ratio spread via a minus sign.

➤ Enter and confirm the desired conductivities under "0/4 mA" and under "20 mA".

  Notes:

  Observe the actual measuring conditions when setting the limits. A large transmission-ratio spread is not more exact than the measuring system allows.
  The maximum load of 500 Ω should not be exceeded!

Configure the integrated ring buffer

EcoControl LM has a ring buffer in which up to 10,000 measured values can be saved with time and date. The oldest values are overwritten by the new ones if the ring buffer is full.

➤ Select and confirm "Basic Program" > "Functions" > "Buffer".
  The "Buffer" menu appears. It includes the following menu items:

```
BUFFER

On         ✔
```

- "On":
  Ringer buffer status: If a minus sign appears, EcoControl LM will not save any measured values; if a tick appears, EcoControl LM will save the currently measured conductivity [µS/cm] and temperature [°C] with time and date – at the interval defined as follows.

```
BUFFER

Interval    20m
```

- "Interval":
  Interval in minutes during which a measured value is saved. The interval can be set between 1 and 99 minutes.

```
BUFFER

Max data    500
```

- "Max. data.":
  Number of measured values which are saved. The minimum number is 20, the maximum number 10,000.

```
BUFFER

delete
```

- „Delete":
  Menu item for deleting the integrated ring buffer.

➤ Select and confirm the desired status in the "Buffer" > "On" menu.
  The activated buffer is indicated by a tick, the inactive buffer via a minus sign.

➤ Enter and confirm the desired interval in which a data record is to be saved under "Buffer" > "Interval" .

➤ Enter the number of measured values to be saved under "Buffer" > "Max. data".

To delete the ring buffer:

➤ Select and confirm "Buffer" > "Delete".
  "RESET? (Enter)" appears on the display.

➤ Press the "ENTER" key ⑨.
The ring buffer is deleted.

Configure the serial interface

The measured values saved in the ring buffer can be read with a PC program via the serial interface. The serial interface is designed for a Baud rate of 19200 and 1 stop bit and has no parity.

Note:

To ensure data can be transferred via the serial interface, the serial interface must be released as described under "Release/Block the serial interface ".

➤ Select and confirm "Basic Program" > "Functions" > "Ser. interface".
The "SER. INTERFACE" menu appears. It includes the following menu items:

```
SER. INTERFACE

Printer        ✔
```

• "Printer":
Status of the printer funktion. If the printer function is activated, the measured results are output at a serial protocol printer – at the interval defined as follows.

```
SER. INTERFACE

Interval    10m
```

• "Interval":
Interval in minutes during which printing occurs. The interval can be set between 1 and 99 minutes.

```
SER.INTERFACE

PC in/out      ✔
```

• "PC in/out":
Configuration of the serial interface for communication with a connection program (e. g. hyper terminal). If this option is activated, the serial interface transfers the current measured conductivity once per second.
This option is used for diagnosis and for recording the special behaviour for test purposes.

```
SER.INTERFACE

Modem          ✔
```

• "Modem":
Configuration of the serial interface for communication with a PC via modem or null modem cable. If this option is activated, the measuring results are output at the PC as soon as the PC program "EcoControl" requests it at the PC.

Alter the language on the display

The EcoControl LM can display menu texts, error messages, etc. in five languages. Further languages are possible on request.

```
LANGUAGE

German    ✔
```

➤ Select and confirm "Basic Program" > "Extras" > "Language".
The "LANGUAGE" menu appears. It includes the following languages:
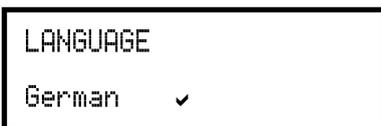
• German
• English
• French
• Italian
• Polish
• Further languages on request

➤ Select and confirm the desired language.
The activated language is indicated by a tick, the inactive languages by a minus sign. The menu texts, error messages, etc. then appear in the selected language.

Alter the password

It is possible to alter the three-digit password which has to be entered to change to the "Basic program".

➤ Select and confirm "Basic program" > "Extras" > "Password".
The current password appears. The password is factory set to "000".

```
PASSWORD

NEW:          000
```

To alter the password:

➤ Press the "ENTER" key ⑨.

➤ Enter and confirm the three digits of the new password.
The password is altered.

Display the serial number

EcoControl LM has a serial number. This serial number is required to read data via the serial interface with the aid of a communication program at a PC.

Note:

The serial number is located on the Rating plate ⑫ after the "Instrument no.".

```
SERIAL NO.
        205505
```

➤ Select and confirm "Basic program" > "Extras" > "Serial no.".
The serial number appears.

Define the maintenance interval

It is possible to set a maintenance interval for the conductivity probe.

➤ Select and confirm "Basic program" > "Extras" > "Maintenance interval".
The current maintenance interval appears.

```
MAINTENANCE INTERV.

Days:         120
```

To alter this interval:

➤ Press the "ENTER" key ⑨.

➤ Enter and confirm the desired maintenance interval in days (0 to 999).
The maintenance interval is altered. Once the maintenance interval has elapsed the message "Maintenance required!" appears on the display.

Note:

If the maintenance interval is set to "000", monitoring does not occur.

➤ Select "Basic program" > "Extras" > "Maintenance interval". > "Alarm".
If there is a tick after "Alarm" an alarm signal is output as soon as the maintenance interval has elapsed; if there is a minus sign after "Alarm", an alarm signal is not output.

➤ Press the "ENTER" key ⑨ to alter the alarm status.

Once maintenance has been completed, reset the interval to the selected value via the menu item Reset (Enter). Also see chapter "Maitenance and Care / Reset maintenance interval".

Release/Block the serial interface

The integrated serial interface can be blocked or released.

Note*:*

To ensure data can be transferred via the serial interface, the interface has to be configured accordingly, as described under*:*
„Release/Block the serial interface ".

➤ Select and confirm "Basic Program" > "Extras" > "Release".
The "RELEASE" menu appears. It includes the following menu items:

```
RELEASE
none        ✔
```

- "none":
The serial interface is blocked. It is neither possible to read data nor program via a PC.

```
RELEASE
passive        ✔
```

- "passive":
The serial interface is only released for reading data with the PC program "EcoControl".

```
RELEASE
active        ✔
```

- "active":
The serial interface is released for reading measured values of EcoControl LM.
If the measured values of EcoControl LM are to be read via a PC, the serial interface has to be configured for communication with a modem or PC via a null modem cable (see "Configure the serial interface "). The PC program "EcoControl" is required for this task.

Reset all factory settings (Reset)

CAUTION!

⚠

Risk of data loss!

If all the settings are reset to the factory settings, all the entered values are deleted – e. g. also calibration. The instrument is subsequently not ready for operation.

➤ Only reset the factory settings if absolutely necessary.

To reset the basic factory settings:
➤ Switch EcoControl LM on while pressing the arrow key ⬇.
All the settings are deleted and reset to the factory settings.

Read measuring data via the PC program "EcoControl"

The following settings in section "Configure the serial interface" or "Release/Block the serial interface" must be carried out as follows:

"Modem":
Configuration of the serial interface for communication with a modem or a PC via a null modem cable.

"Passive":
The serial interface is only released for reading data with the PC program "EcoControl".

or

"active":
The serial interface is released for reading measured values of Eco-Control LM and for deleting.

➤ Connect the PC via the RS232 interface directly to the EcoControl controller or via a modem (remote transfer).

➤ Start the "EcoControl" software at the PC.

➤ Enter the EcoControl LM instrument number in the "Serial number" field.

➤ Click on "read".
The "Save as" window opens.

➤ Select the folder and the file name under which the read data is to be saved and click on "OK".
The software reads the data from EcoControl LM and saves it as a csv worksheet. The csv worksheet can be opened and edited with a spreadsheet program.

Troubleshooting

Should problems or questions arise while operating EcoControl LM which are not described in these operating instructions and/or cannot be solved, please contact our technical hotline.

Tel.: +49 (0)5121 7609-51

Fax: +49 (0)5121 7609-44

E-Mail: info@heyl.de

Try to identify the problem as accurately as possible and record the actions and conditions under which it occurred. This will enable us to offer you swift effective assistance.

Create diagnoses

It is possible to display the switching statuses of the three relays which switch the connections of consumer. Furthermore, the relays can be manipulated for test purposes – e. g. for commissioning.

To display the switching statuses:

➤ Select and confirm "Service" > "Diagnosis" > "Output".

➤ Select and confirm the relay whose switching status is to be displayed.

- "Output min":
  Corresponds to relay K1 "MIN" (terminals 10, 11, 12),

- "Output max":
  Corresponds to relay K2 "MAX" (terminals 13, 14, 15),

- "Output alarm":
  Corresponds to relay K3 "AL" (terminals 16, 17, 18),

- "Output mA":
  Corresponds to terminals 19 and 20.
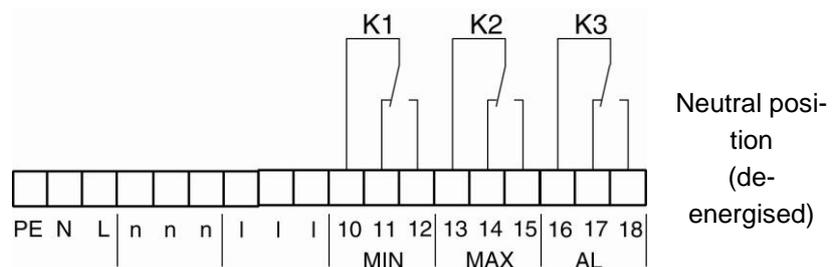
The switching status of the selected relay is displayed:

- "off": the selected relay is not active,

- "on": the selected relay is active,

- "10.0 mA": the current applied at the output (terminals 19 and 20)

Risk of personal injuries and damage to plant parts!

DANGER!

If the relays which switch the connections for consumer ⑯ are manipulated, it will trigger the corresponding reactions of the connected plant. This may result in personal injuries or damage to plant parts.

➤ Always make sure that people are not at risk and downstream plant parts cannot be damaged before manipulating the relays.

➤ Press one of the arrow keys ⬇ or ⬆.
The switching status of the selected switch changes and is shown on the display.

To alter the current at the output (terminals 19 and 20):

➤ Press on the arrow keys ⬇ or ⬆ several times.
The current is reduced or increased by 5 mA.

Display or delete the error history

The error history is a list of the error messages or statuses which have occurred during current operation. The error history is not lost after a power failure. Errors are registered with the time and date – if the clock battery provides sufficient power. The number of error messages can be exported or read, but not the actual error history.

To display the error history:

```
Power failure
06:56 16.12.06
```

➤ Select and confirm "Service" > "Error history" > "Display".
The last error message is displayed.

➤ Press the arrow key ⬇ to display older error messages.

To delete the error history:

The error messages stored in the error history can be deleted and recording restarted as follows:

➤ Select and confirm "Service" > "Error history" > "Delete".
All the stored error messages are deleted.

Display number and date of the software

The number and date of the Eco-Control LM software can be retrieved as follows:

```
SOFTWARE STATUS
87M002 15.08.06
```

➤ Select and confirm "Service" > "Software status".
The number and date of the software are displayed.

Maintenance and Care

Replacing the battery

The EcoControl LM battery powers the integrated clock to ensure the clock does not have to be reset after power failure. The battery has a service life of approx. 5 years.

If the error messages are saved without the time and date in the "Service" > "Error history" > "Display" menu after power failure, the battery is flat.

Note:

A "CR 2032" lithium battery is required.

Replace the battery approx. every 5 years as follows:

DANGER!

Risk of electric shock!
Working at the open instrument can result in electric shocks, i.e. there is a danger of death.

➤ Always completely disconnect the instrument from the mains before replacing the battery.

➤ Open the housing cover.
➤ Use a 7 mm or 5 mm hexagon socket screw key to loosen the four screws that hold the display board in place.
➤ Carefully remove the display board without pulling the connected cables and turn the display board around.
➤ Remove the battery from its holder, always observe correct battery polarity.
➤ Insert a new battery that is identical to the old one.
➤ Re-insert the display board into the housing and carefully tighten the four screws.
➤ Close the housing cover.
➤ Dispose of the old battery in accordance with national regulations.
➤ Set the time and date (see "Commissionig / Display and set the time and date").

Display maintenance interval

A maintenance interval can be programmed, as described on chapter "Operation / Define maintenance interval" , e.g., to receive a reminder about immanent maintenance tasks or probe calibration. If a maintenance interval has been programmed, the remaining days of the current interval can be displayed as follows:

➤ Select and confirm "Service" > "Maintenance".
The remaining days of the maintenance interval are displayed.

```
MAINTENANCE

in   120   days
```
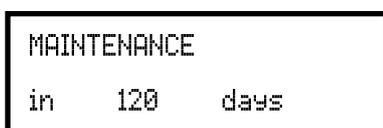
Reset the maintenance interval

If a maintenance interval has been programmed, the fault message "Maintenance required!" is output at output AL once the maintenance interval has elapsed.

➤ Carry out the required maintenance work.

```
MAINTENANCE

Reset
```

➤ Acknowledge the fault message "Maintenance required!", by selecting and confirming "Service" > "Maintenance" > "Reset". "OK!" appears on the display. The fault message is cancelled. The interval restarts.

Note:

If a maintenance interval has not been set, "Maintenance not active!" appears.

Disassembly

CAUTION!

Risk of injuries when disassembling live parts!

If the power supply is not disconnected prior to disassembly, it may result in physical injuries, destruction of the product or damage to plant parts.

➤ Always disconnect the relevant plant parts before disassembling EcoControl LM.
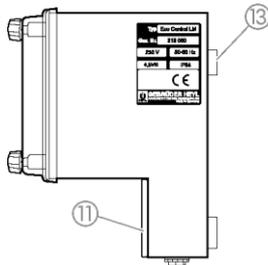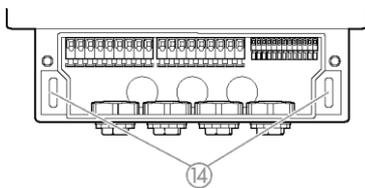
➤ Loosen the screws at the Terminal box cover ⑪.

➤ Remove the Terminal box cover ⑪.

➤ Disconnect all the connected cables.

➤ Remove the two screws from the Elongated holes for instrument attachment ⑭.

➤ Remove EcoControl LM from the Eyelet for instrument attachment ⑬.

➤ Screw the Terminal box cover ⑪ back on.

Accessories

Conductive conductivity probes without temperature sensor

Type	Cell const. [1/cm]	Max. temp. [°C]	Meas. range [µS/cm]	Order no.
SO 1	0.1	40	1 - 2.000	310001
SO 5	0.5	40	5 - 10.000	310003
SO 10	1	40	10 - 20.000	310014
SOE 0	0.01	130	0.1 - 200	310005
SOE 1	0.1	130	1 - 2.000	310002
SOE 5	0.5	130	5 - 10.000	310004
SOE 50	5	80	100 - 10.0000	310050
SEI 1	0.1	40	1 - 2.000	310101
SEI 5	0.5	40	5 - 10.000	310103
SD 10	1	40	10 - 20.000	310013

Conductive conductivity probes with temperature sensor PT100

Type	Cell const. [1/cm]	Max. temp. [°C]	Meas. range [µS/cm]	Order no.
ST 1/PT100	0.1	40	1 - 2.000	310120
ST 5/PT100	0.5	40	5 - 10.000	310121
ST 10/PT100	1	40	10 - 20.000	310123
STE 0/PT100	0.01	130	0.1 - 200	310110
STE 1/PT100	0.1	130	1 - 2.000	310125
STE 5/PT100	0.5	130	5 - 10.000	310126
STE 50/PT100	5	80	100 - 100.000	310129
SEI 1/PT100	0.1	40	1 - 2.000	310130
SEI 5/PT100	0.5	40	5 - 10.000	310131

Please refer to our delivery programme for an up-to-date overview of available accessories.

Technical data

Power supply:	24 V AC, 115 V AC or 230 V AC ±10% 50 - 60 Hz Fuse T4A
Power consumption without exterior load:	Max. 6 VA
Type of protection:	IP54
Degree of protection:	I
Conformity:	EN 61000-6-2, EN 61000-6-4, EN 61010-1
Ambient temperature:	5 – 45 °C
EcoControl dimensions	W x H x D = 166 x 155 x 115 mm
Weight:	Approx. 0.8 kg

Measuring range

Cell constant	Measuring range	Type of probe
0,01 cm^{-1}	0,1 - 200 µS/cm	SOE 0, STE 0-PT100
0,1 cm^{-1}	1 - 2000 µS/cm	SO 1, SOE 1, ST 1-PT100, STE 1-PT100, SEI 1(-PT100)
0,5 cm^{-1}	5 - 10000 µS/cm	SO 5, SOE 5, ST 5-PT100, STE 5-PT100, SEI 5 (-PT100)
1,0 cm^{-1}	10 - 20000 µS/cm	SO 10, ST 10-PT100, SD 10
5,0 cm^{-1}	100 - 100000 µS/cm	SOE 50, STE 50-PT100

Display accuracy:	± 2 digit or ± 5% from end of the measuring range, depending on the probe being used
Resolution:	0.001 µS/cm to 0.1 mS/cm depending on the measuring range
Automatic or manual temperature compensation, temperature coefficient 0 – 9.99 %/°C	
Temperature display:	0.0 to 99.9 °C ± 0.5
Current interface:	0/4 - 20 mA, max. load 500 Ω, galvanically isolated
RS232 interface	19200 baud, 1 stop bit, no parity

Conformity Declaration

EC Conformity Declaration

CE

for the following product

EcoControl LM
Measuring Instrument for Conductivity and TDS and Controller for Cooling Circuits

We hereby confirm that the above product confirms to the principal health and safety regulations laid down in the EC Directives 2004/108/EG and 2006/95/EG.
This declaration applies to all units produced in accordance with the attached manufacturing documents which are a constituent part of this declaration.

The product was assessed with reference to the following standards:

EN 61000-6-4: Electromagnetic compatibility, Generic emission standard
EN 61000-6-2: Electromagnetic compatibility, Generic immunity standard
EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use

This declaration is made on behalf of

GEBRÜDER HEYL
Analysentechnik GmbH & Co. KG
Orleansstraße 75b
31135 Hildesheim

by

Jörg-Tilman Heyl
General Manager

Hildesheim, 28/11/2012

Gebrüder Heyl

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