Operating Manual

Conductivity meter
Type M2436

ⅢMOSTEC

Warranty

Mostec warrants this product to be free of manufacturing defects for a 2-year period after the original date of purchase. Within this period, defective products will be repaired free of charge provided that the defect occurred during normal operation. This warranty does not cover damage to the product resulting from ordinary usage such as front panel scratches, broken control elements and corrosion, etc. The customer is responsible for shipping and packing charges for products returned under warranty to Mostec. Mostec warrants this product beyond the 2-year warranty period for an additional 2 years in case of long term damages due to improper manufacturing. Such damages as poorly soldered joints or other assembly problems are also covered by the warranty. Transportation damages are not covered by the warranty and should be referred to the respective delivery service.

Technical description

The M2436 conductivity meter is mounted in +/-180° turnable, water resistant, polypropylen case. Any commercially available conductivity cell's, K-factor 0.01, 0.1, 1.0 and 10.0, which cover a dynamic range from 0.01µS to 20mS full scale can be used. The cell is simply assembled to the desired measuring unit and directly attached to the M2436.

The conductivity meter is suitable for water, waste water or ultrapure water conditioning in continuous or batch-type operating modes, for liquid chromatography or for general chemical process monitoring.

Temperature coefficient of the cell is compensated either manually or automatically by a Pt-100 platinum probe within the range of 0°C to 130°C.

The 8x2 LCD character display shows the currently measured conductivity and the process temperature.

These values are available at two galvanic isolated outputs of 0...20mA or 4...20mA.
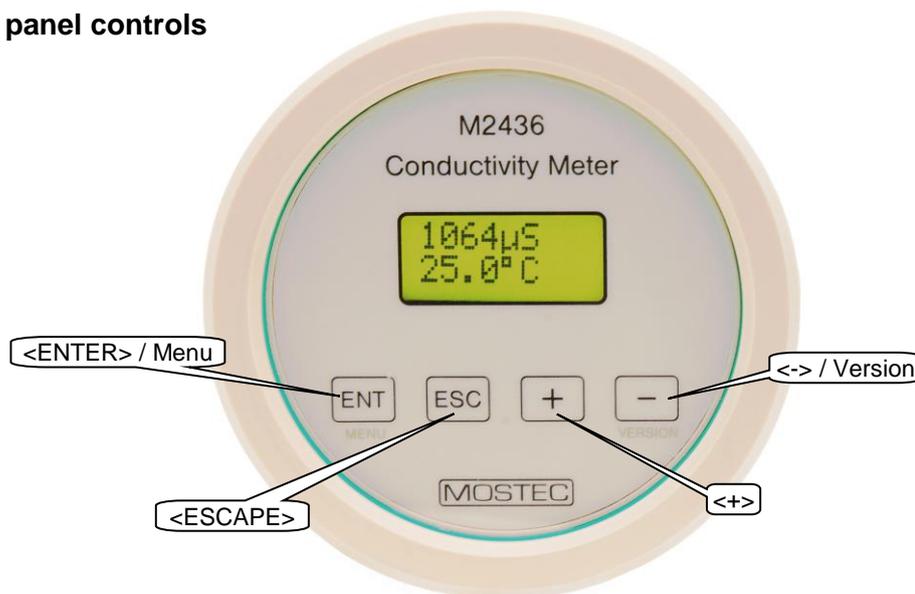
The M2436 is powered by either 24VAC or DC.

Optionally, all measuring ranges are externally selectable with digital control wires during the measurement process. Two isolated, free limit contacts are also optionally available to control valves or other control elements.

Supply lines and all other lines, either from or to the conductivity meter, are protected by internal noise filters against HF-noise. A cable of either 2m or 5m is used to connect the M2436si signals and power supply.

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** Note: This function is an option

A. Front panel controls

B. How to change the cell's K-factor

Manual setting of the cell's K-factor. Possible factors are C=0.01, C=0.1, 1.0 and C=10.0 for conductive cell's and C=ind for inductive cell's. The cell's K-factor has higher priority than the measurement range. Depending on the cell's K-factor, only corresponding measurement ranges are available. If the cell's K-factor has changed, the instrument will be set to the smallest possible measurement range automatically.

1. Push and hold the key ENT.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **K-factor** by the key + or −, then press ENT.
   ⇨ The display shows the actual value of the cell's K-factor.
3. Change the value for the cell's K-factor with the key + or −, then press ENT.
4. Press the key ESC twice.
   ⇨ the display shows the actual value.

C. How to change the measurement range by menu

Manual setting of the cell's K-factor. The cell's factor has a higher priority than the measurement range. Depending on the cell's K-factor, only corresponding measurement ranges are available. If the cell's K-factor has changed, the instrument will be set to the smallest possible measurement range automatically.

Available measurement ranges depending on the cell's K-factor:

C=10.0	C=1.0	C=0.1	C=0.01	C=ind
---	---	2µS	2µS	---
---	20µS	20µS	20µS	---
---	200µS	200µS	---	---
---	2mS	---	---	2mS
20mS	20mS	---	---	20mS
200mS	---	---	---	200mS
---	---	---	---	2S

1. Push and hold the key ENT.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. press ENT
   ⇨ The display shows the actual value of the measurement range.
3. Change the value for the measurement range with the key + or −, then press ENT.
4. Press the key ESC twice.
   ⇨ the display shows the actual value.

D. How to change the measurement range with externally control wires

Optionally, all measuring ranges are externally selectable with digital control wires during the measuring process.

The measurement range will be set by signals with external 24V supply and digital control wires. Depending on the cell's K-factor, only corresponding measurement ranges are available. If the selected cell's K-factor is not possible, the instrument indicates an error code (see chapter M, page 9). If no digital control wires are connected, the instrument select's the internal measurement range automatically.

Available measurement ranges set by external control wires:

red/blue	white/green	brown/green	white/yellow	Range kond.	Range ind.
GND	0V	0V	0V	intern	intern
GND	+24V	+24V	+24V	2uS	2mS
GND	0V	+24V	+24V	20uS	20mS
GND	+24V	0V	+24V	200uS	200mS
GND	0V	0V	+24V	2mS	2S
GND	+24V	+24V	0V	20mS	---
GND	0V	+24V	0V	200mS	---

Available measurement ranges depending on the cell's K-factor:

C=10.0	C=1.0	C=0.1	C=0.01	C=ind
---	---	2µS	2µS	---
---	20µS	20µS	20µS	---
---	200µS	200µS	---	---
---	2mS	---	---	2mS
20mS	20mS	---	---	20mS
200mS	---	---	---	200mS
---	---	---	---	2S

E. How to change the temperature compensation to Pt100

If the M2436 is set to Pt100 and the Pt100 sensor is not connected, damaged, or the temperature is higher than 135ºC, the processor internally uses a temperature value of 135ºC and the display value is flashing.
If the temperature is lower than -10°C, the processor internally uses a temperature value of -10ºC and the display value is flashing.

If a inductive cell is used and the temperature is higher than 125ºC, the instrument indicates an error code (see chapter M, page 9). Because no correct signals are possible at this high temperature.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Man/Auto** by the key `+` or `−`, then press `ENT`.
3. Change the value to **AUTO** with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

F. How to change the temperature compensation to manual

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Temp.Man** by the key `+` or `−`, then press `ENT`.
   ⇨ The display shows the actual value of the manual temperature.
3. Change the value for the temperature with the key `+` or `−`, then press `ENT`.
4. Change to menu **Man/Auto** by the key `+` or `−`, then press `ENT`.
3. Change the value to **MAN** with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC`.
   ⇨ the display shows the actual value.

G. How to change the temperature slope %/ºC

All liquids have a positive temperature coefficient, expressed in %/ºC conductivity change. The higher the temperature the lower the electrical resistance which is equal to higher siemens values. Water has a slope of about 2.25%/ºC. The temperature slope should be set in such a way, to display a constant conductivity value when the temperature only changes.

Example:
The conductivity is 15.5µS at a temperature of 20ºC. Now increase the temperature to 30ºC, without chemically changing the medium. The conductivity must still show 15.5µS. When the displayed conductivity value changes, the temperature slope requires readjustment.

Measuring the absolute conductivity at 25ºC:
You may switch off the temperature compensation by simply selecting slope 0.0%/ºC. The indicated values are now not temperature compensated.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Slope** by the key `+` or `−`, then press `ENT`.
   ⇨ The display shows the actual value of the temperature slope.
3. Change the value for the temperature slope with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC`.
   ⇨ the display shows the actual value.

H. How to change the cell correction factor

If the conductivity cell has a special K-factor outside of K=1.0, K=0.1 and K=0.01, the value can be adjusted with the cell correction factor.
Factory set value of K is 1.000. If you have to change this value, the calibration of the M2136 is maintained, but the displayed conductivity value is no longer the standard calibration.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **GAIN** by the key `+` or `−`, then press `ENT`.
   ⇨ The display shows the actual value of cell correction factor.
3. Change the value for the correction factor with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC`.
   ⇨ the display shows the actual value.

J. How to change the current output for conductivity

The current output relates to the selected measurement range and can be set in the range of 0…20mA.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Out-LW** by the key `+` or `−`, then press `ENT`.
3. Change **Zero** for the lower current value, or **GAIN** for the upper value by the key `+` or `−`, then press `ENT`.
4. Change the value for the current output with the key `+` or `−`, then press `ENT`.
5. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

In addition, the current span can be set in percent for the conductivity measurement.
Example: current span = 100.0% (standart), range = 0…2mS, current output = 4…20mA
   ⇨ 0…2mS = 4…20mA
new current span = 50.0%, range = 0…2mS, current output = 4…20mA
   ⇨ 0…1mS = 4…20mA

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Range LW** by the key `+` or `−`, then press `ENT`.
   ⇨ the display shows **End Val**, then press `ENT`.
3. Change the value for the current span output (10…100.0%) with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

K. How to change the signal current output for temperature

The current output relates to the measurement range of 0…130$°C$ and can be set in the range of 0…20mA.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Out-TEMP** by the key `+` or `−`, then press `ENT`.
3. Change **Zero** for the lower current value, or **GAIN** for the upper value by the key `+` or `−`, then press `ENT`.
4. Change the value for the current output with the key `+` or `−`, then press `ENT`.
5. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

In addition, the current span can be set for the temperature measurement.
Example: current span = 130.0$°C$ (standart), current output = 4…20mA
   ⇨ 0…130.0$°C$ = 4…20mA
   new current span = 100.0$°C$, current output = 4…20mA
   ⇨ 0…100.0$°C$ = 4…20mA

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **Range TP** by the key `+` or `−`, then press `ENT`.
   ⇨ the display shows **End Val**, then press `ENT`.
3. Change the value for the current span output (10…130$°C$) with the key `+` or `−`, then press `ENT`.
4. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

L. How to adjust the limit contacts

The instrument is available with 2 limit contacts. They can be set over the intire measurement range.
If the measurement range changes, the limit contacts for all other measurement ranges will be set
to the new value automatically.

⇨ E.g. the measurement range is set to 20.00 µS and the limit contact is set to 10.00 µS. If the measurement range changes to 200.0 µS, the limit contact will be set to 100.0 µS.

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Change to menu **SP1** for limit contact 1 or **SP2** for limit contact 2 by the key `+` or `−`,
   then press `ENT`. ⇨ the display shows the actual value.
3. Change the value for the limit contact with the key `+` or `−`, then press `ENT`.
4. Change to menu **HYS1** for limit contact 1 or **HYS2** for limit contact 2 by the key `+` or `−`,
   then press `ENT`. ⇨ the display shows the actual value.
5. Change the value for the hysteresis with the key `+` or `−`, then press `ENT`.
6. Change to menu **REL1** for limit contact 1 or **REL2** for limit contact 2 by the key `+` or `−`,
   then press. ⇨ the display shows the actual value.
7. Change the value for the switching method of the relays with the key `+` or `−`, then press `ENT`.
   "**nor**": Relays ON, when input > limit contact value (normally open)
   "**inv**": Relays ON, when input < limit contact value (normally closed)
8. Press the key `ESC` twice.
   ⇨ the display shows the actual value.

M. Menu protection with access code

The contents in the user menus can be protected from unintended access, using an access code. After activating the access code, menu values can be displayed but no longer modified. To modify setpoints and other parameters, the access code has to be set to the value 0. If the code has a value different from 0, writing to the user menu is suppressed. Call Mostec if the access code is lost or unavailable.

Set the access code:

1. Push and hold the key `ENT`.
   ⇨ The display is flashing between the actual value and **MENU**.
   ⇨ After 3 seconds, the display will show up the program menu **MENU**.
2. Now navigate to the **Code** menu item by the key `−`, then press `ENT`.
   a) *A code has already been entered:* The display shows **Code ON**. Enter now the valid access code with the keys `+` and `−` and confirm with the `ENT` key. If the code is wrong, the display shows **wrong!**. If the code is correct, the display shows **CODE OFF** and **0**. It the can be modified with the keys `+` and `−`,
   or in order to make changes to the user menu, set to **0**, then confirm with the `ENT` key.
   b) *No code has been entered:* The display shows **0**. A code can be entered with the keys `+` and `−`, then confirm with the `ENT` key. If you do not need the user menu protection, leave the value **0** unchanged and quit the menu with the `ESC` key. The entered code should be placed on a save place to have access to it long time periods later.

N. Error codes

Error codes with conductive cell and external range control:

With the external range control, the range can be set to a impossible range.

LCD Display:
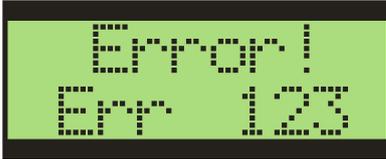
Reason:

- The range is too low for the corresponding programmed cell's K-factor.

→ current output conductivity = <4, (<0) mA

- The range is too high for the corresponding programmed cell's K-factor.

→ current output conductivity > 22mA

Select range between 20.00µS and 20.00mS

Error codes with inductive cell and external range control:

With the external range control, the range can be set to an impossible range. At a measured temperature higher than 125.0°C, no accurate measurement is possible anymore.

LCD Display:

Reason

- The range is not possible for the corresponding programmed cell's K-factor.

→ current output conductivity > 22mA

Select range with digital control wires!

Lower or cool down the medium temperature!

O. Technical Data

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Measuring ranges:	0...2.000µS (K = 0.1, K = 0.01) 0...20.00µS (K = 1.0, K = 0.1, K = 0.01) 0...200.00µS (K = 1.0, K = 0.1) 0...2.000mS (K = 1.0) 0...20.00mS (K = 1.0, K = 10.0) 0...200.0mS (K = 10.0)
Display:	8x2 character LCD display with grey characters and a yellow back light Viewing area: 36.0mm x16.00mm, character size: 2.945mm x 5.545mm
Working temperature range:	-5 to +45°C
Accuracy:	1.0%
Reproducibility:	<0.2%
Measuring amplitude:	70/150mV, conductive cell only
Step response:	Time between a conductivity change from 0% to 100% or reverse measured between 10% and 90% = 4 seconds
Input protection:	Virtual zero, protected by diodes
Temperature compensation:	Manual from 0 to 130°C Automatic by an external Pt-100-platinum sensor, 3-wire
Temperature slope:	0.00%/°C (without compensation) to 8.00%/°C. Selectable in all measuring ranges
Conductivity of water:	The self conductivity of ultrapure water is measured and temperature compensated
Reference temperature:	25°C
Cell connection:	The cell is directly assembled to the M2436 over a temperature restraining, +/-180° rotatable polyamide tube

Option current output:
  Max. load:
  Output impedance:
	2 x 0/4…20mA, galvanically isolated
	500Ω
	 >1MΩ typical

Device settings:	With push buttons, see operating manual
Options:	Measuring ranges, cells K-factor, temperature slope, current outputs
Power supply:	24VAC/DC
Power supply load:	1.5 to 2.5W at 24VDC
CE-conformity:	fulfilled
Connection cable::	PVC cable Length: 2m, 5m or other sizes on request
Thread:	¾" cylindrical gas, with O-Ring, adapters on request
Case:	Splash water proof, in polypropylen
Weight:	320g
Warranty:	2 years
Compatible cells:	type M8836s, M8836s10, M8836s01, M9836c1, others on request
Options:	-Customer specified functions -Customer specified cells -Other power supply/ output signal -2 limit contacts -Externally configurable measuring ranges

Terminal description standard version (without limit contacts and externally configurable measurement range):

Waterproof 5-pin connector St1:	1 = current output (-) for pin 2 and 3 (brown)
	2 = conductivity current output (+) (white)
	3 = temperature current output (+) (blue)
	4 = supply voltage: AC~/DC(-) (black)
	5 = supply voltage: AC~/DC(+) (grey)

Terminal description for version with 2 limit contacts and externally configurable measurement range:

Waterproof 8-pin connector St1:	1 = conductivity current output (+) (white)	5 = supply voltage: AC~/DC(+) (grey)
c.o. = change over	2 = current output (-) (brown)	6 = limit contact 1 c.o. (red)
n.o. = normally open	3 = limit contact 1 n.o. (green)	7 = temperature current output (+) (blue)
n.c. = normally closed	4 = supply voltage: AC~/DC(+) (yellow)	8 = limit contact 1 n.c. (pink)

Waterproof 8-pin connector St2:	1 = range configuration (GND) (white)	5 = n.c. (gray)
	2 = range configuration (+24V) (brown)	6 = limit contact 2 c.o. (red)
	3 = limit contact 2 n.o. (green)	7 = range configuration (+24V) (blue)
	4 = range configuration (+24V) (yellow)	8 = limit contact 2 n.c. (pink)

P. Dimensions (mm)

Side view

Bottom view
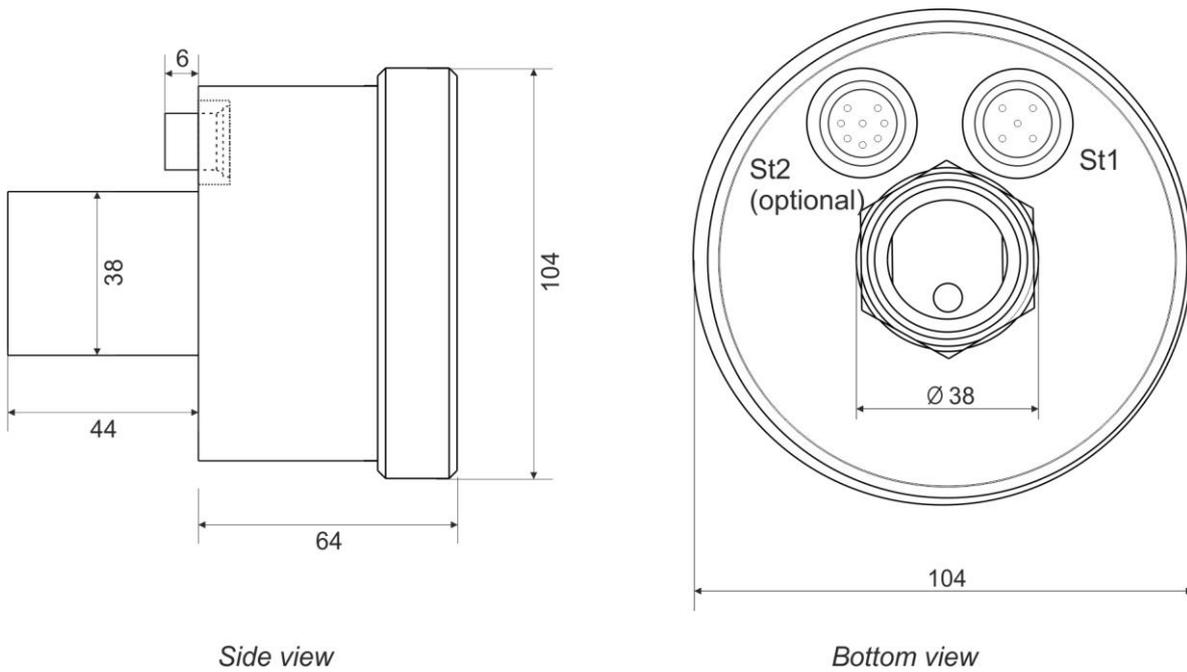
Q. Installation note

The operating position is generally unrestricted. The cell must always be completely immersed by the liquid and the minimum distance to the tube wall should be >10mm. Gas bubbles and solid matter deposits have to be avoided. Screw conductivity cell type M2436 with a torque of approx 3 Nm into the fitting. The O-Ring has to be placed to a plain surface area. For the M2436si, the torque is approx 15 Nm. The display of the M2436 & M2436si is ± 180° turnable.