INSTRUCTION MANUAL

C3630

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2-wire E.C. transmitter

DIN RAIL

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1.0 General

This manual applies to the C3630 digital 2-wire transmitter DIN RAIL housing.

It explains the purpose of the equipment, describes the components of the system and the procedures for installing, operating and calibrating the equipment. Some maintenance suggestions are also provided.

2.0 Functional description

This transmitter, when connected to the E.C. cell provides a digital readout of the conductivity of aqueous solutions.

The transmitter will perform manual or automatic temperature compensation to correct conductivity readings for temperature related variations. Temperature information is displayed by pushing button "2" marked "TEMP".

Measuring scales, operating frequency and decimal point are selectable.

The transmitter provides an isolated 4/20 mA output, proportional to the conductivity value which is suitable for data acquisition systems, recorders, controllers or other input devices that require a 4/20 mA input.

The front panel contains trimmer pots for zero and cell constant adjustment. Zero is adjusted by trimmer "3" marked "zero" and cell constant is adjusted by trimmer "4" marked "sens".

3.0 Physical Description

The transmitter enclosure is designed for DIN rail mounting.

It consists of a plastic case with front panel that is coated by a polycarbonate membrane (fig. 1, page 12), to ensure maximum anti-corrosion characteristics.

For field applications mounting in a splash proof or weather resistance box is suggested.

Figure 3 describes the physical details and dimensional characteristics.

Connections to power supply, loads, recorder, RTD, electrodes and probe are installed on to the terminal block connector.

4.0 Specifications

Display	: LCD
Input	: 2-electrode E.C. cell 4-electrode E.C. cell RTD Pt100 2 or 3 wire
Output	: 4/20 mA isolated
Scales	: 0/200.0 µS - 0/2000 µS - 0/20.00 mS -10.0/120.0 °C
Temperature compensation	: manual or automatic
Temperature compensation coefficient	: 0/4.0 %/°C adjustable
Temperature compensation reference	: 20 °C
Zero	: adjustable +/- 15%
Slope	: adjustable 86/112% narrow range adjustable 0/160% wide range
Operating temperature	: 0/50 °C
Operating humidity	: 95% without condensation
Power supply	: 10/30 VDC
Isolation	: 500 Volt input to output
Terminal block	: detachable
Nett. Weight	: 200 g
Dimensions	: 105x95x58mm (6 modules)
Mounting	: DIN Rail mountable

5.0 Physical installation

The transmitter must be installed into an enclosure for outdoor or indoor use and may be located close to the measuring point or some distance away in a control area.

The transmitter's housing is designed for DIN Rail mounting.

The conductivity cell must be mounted properly if the system is to operate accurately and efficiently.

It must meet the following requirements:

- the sample in the cell must be representative of the whole solution.
- the solution must circulate continuously through the cell.
- the flow velocity in the cell must not be so high as to cause cavitation.
- the position and orientation of the cell must not trap air-bubbles near the electrode area.
- sediments must not accumulate within the electrode area.
- in all dip cell installations the water must be continuously agitated.

Keep away the cable from power wires on the overall length.

This cable must not be interrupted on overall length. If interruption is necessary, the extension cable must be fastened to the high insulation terminal strip.

The cell's cable must be protected by a sheath and not installed near power cables.

Interrupting cables must be avoided or carried out using high insulation terminals.

6.0 Electrical installation

The electrical installation consists of (fig. 2, page 13):

- connecting the power supply to the transmitter.
- connecting the cell or the probe to the transmitter.
- connecting the temperature sensor.

All connections within the transmitter are made on the terminal block.

6.1 Connecting the power (fig. 2, page 13)

- connect dc power "+" to terminal "1"marked "+".
- connect the terminal marked "-"to terminal "+" of the load.
- connect dc power "-" to terminal "-" of the load.

The unit is protected against eventual inverted connections.

Warnings

Verify the supply Voltage prior to connection to the transmitter.

6.2 Connecting the 2-electrodes cell (probe)

Cell cabling is a critical part of the whole system.

- use the original cable on overall length between sensor and input terminals if the transmitter.

- avoid interruption on the cable. If interruption is necessary the extension cable must be fastened
  to the high insulation terminal strip.

- keep the cable away from power wires on the overall length.

- connect the cell cable to the terminals "10 - 13" marked "CO - CI".

6.3 Connecting the 4-electrode cell

This special cell must be connected to terminals "10 - 11 - 12 - 13".
See the specific instruction manual for this E.C. sensor.

6.4 Connecting the temperature sensor

The model C3630 features automatic temperature compensation carried out by means of a RTD Pt100. The temperature sensor has to be installed in the same solution being measured, close to the E.C. cell in-line or in the tank.

ATTENTION:

In order to activate the ATC function, prior to connecting the RTD Pt100 between terminal "4 - 5 - 6" marked "T1 - T2 - T3", it is necessary to remove the jumpers from terminals "3 - 4" and "5 - 6".

These jumpers must be reinstalled when operating the transmitter in manual temperature mode.

The RTD connection as above described will also provide a digital display of temperature values.

The sample temperature value is displayed by pushing the key pad "2" marked "TEMP" on the front panel.
The temperature readout will not disrupt the measuring functions of the transmitter.

7.0 **System check**

Before connecting the system to the power supply:

- check that all connections are installed correctly.
- check that all cables are properly fastened to prevent strain on the connections.
- check that all terminal-strip connections are mechanically and electrically solid.

8.0 Operating the system

8.1 Pre-operation check

The system's control and indicators are all located on the front panel (fig. 1, page 12).

The transmitter LCD will be displayed to indicate that the unit is on.

Push the key pad "2" to check the sample temperature (if RTD Pt100 is connected), or the manual temperature value (RTD Pt100 not connected and jumpers installed).

Push the button "S1" and adjust the temperature coefficient value on the display by means of the trimmer "R33" marked "TC". (fig. 2). (Standard value is 2.0%/°C.

Scales selection

Select the scale as per following table by the dip-switches S2 marked A and S3 marked B:

Scales	Switch S2	Switch S3
200.0 µS	off	off
2000 µS	on	off
20.00 mS	off	on

Frequency selection

Select the frequency as per following table by the dip-switch S4 marked M and S5 marked H:

Frequency	Switch S4	Switch S5
low	off	off
medium	on	off
high	off	on

Select low frequency for 200.0 µS scale.
Select medium frequency for 2000 µS scale.
Select high frequency for 20.00 mS scale.

Decimal point selection

Select the decimal point as per following table by the dip-switch S6 marked 1, S7 marked 2 and S8 marked 3:

Decimal point	Switch S6		Switch S7	Switch S8
xxxx	off	off	off	
x.xxx	on	off	off	
xx.xx	off	on	off	
xxx.x	off	off	on	

The circuit boards of the unit are pre-adjusted at the factory. If sensors and probes have been installed correctly as previously described, the system should operate correctly requiring only the K cell calibration.

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WARNING: Improper wiring connections that result in damage to the transmitter are not covered under warranty.

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8.2 Electrical calibration (fig. 2, page 13)

The following procedures can be used to verify that the system is operating satisfactorily, and it can be repeated periodically to check that the transmitter is maintain electrical calibration:

- connect a conductivity simulator to terminals "10 - 13".
- simulate conductivity values over the entire scale.
- adjust "zero" and "slope" with the trimmers located on the front panel (fig. 1, page 12).

For the customer's convenience it follows the equivalence table between the Electric resistance (Ohm) and the Conductivity (Siemens) according to the relation:

$$1\ \text{Siemens} = \frac{1}{1\ \text{Ohm}}$$

R ohm	1 Mohm	: 100 Kohm	: 10 Kohm	: 1 Kohm	: 100 ohm	: 10 ohm
C Siemens	1 microS	: 10 microS	: 100 microS	: 1.000 microS	: 10 mS	: 100 mS

9.0 **Normal operation**

As solution passes the installed E.C. cell, the transmitter will indicate the appropriate conductivity value. The display will indicate instantly the conductivity value of the solution currently being measured.

9.1 Manual temperature compensation

The manual temperature compensation is available when the RTD Pt100 is not installed.

- install the jumpers between "3 - 4" and "5 - 6".
- push the key pad "2" on the front panel (fig. 1) and adjust the trimmer "R5" marked "T MAN" (fig.2) to indicate the desired temperature value on the display.

9.2 Cell constant adaptation

If the cell constant value is not exactly K = 1.00 (see the value marked on the cell) the instrument must be calibrated in order to adapt the instrument to the cell. The calibration is obtained by means of S.C.S. (Standard Conductivity Solution), adjusting the sensitivity trimmer marked "sens". If necessary adjust the coarse sensitivity trimmer "R24" marked "sens coa".

9.3 Chemical calibration of the conductivity

When the cell constant is unknown or is to be checked, it is suggested the following calibration procedure by means of Conductivity Standard Solution:

- prepare a standard KCL solution (see table on this page)
- operate the instrument as for when measuring non Temperature -compensated.
- immerse the cell into solution and adjust the fine sensitivity trimmer or the coarse sensitivity trimmer if necessary.
- the accuracy of the calibration depends on the purity of the water and the purity of the dissolved salt.

Standard Conductivity Solutions

Tables

KCL concentration		1N		0.1 N	0.01 N
temperature °C	0	65.410	7.150	776	
	5	74.140	8.220	896	
	10	83.190	9.330	1.020	
	15	92.520	10.480	1.147	
	16	94.410	10.720	1.173	
	17	96.310	10.950	1.199	
	18	98.220	11.190	1.225	
	19	100.140	11.430	1.251	
	20	102.070	11.670	1.278	
	21	104.000	11.910	1.305	
	22	105.940	12.150	1.332	
	23	107.890	12.390	1.359	
	24	109.840	12.640	1.386	
	25	111.800	12.880	1.413	
	26	113.770	13.130	*	
	27	115.740	13.370	*	
	28	*	13.620	*	
	29	*	13.870	*	
	30	*	14.120	*	

KCL normal solution:
Prepare by dissolving 74.59 gms. of research grade potassium chloride in 1 litre of distilled water.

Values in microSiemens (micromhos/cm).
Low conductivity standard solutions are not steady.

10.0 Preventive maintenance

10.1 Transmitter

Quality components have been used to ensure a high level of reliability. Frequency of maintenance or re-calibration is variable based on each particular application.

As with any electronic device, the mechanical components, such as potentiometers and connectors, are the most probable sources of potential problems.

- check for damage of the electrolyte capacitors if the transmitter is exposed to temperatures above 60 °C.
- check for damage in all the electronic components if the transmitter is subjected to excessive voltage or powers surges .
- check for damage of the electronic and mechanical components if the transmitter is dropped.
- repeat the pre-operation check periodically to ensure proper operation.
- check that all the connections are free from moisture and contamination such as rust and corrosion.

WARNING:

Disconnect the power supply to the monitor before performing the following procedures:

- Inspect the printed circuit boards for dirt and corrosion; clean as necessary and blow dry.
- tighten all the terminal-board connections and mounting hardware.
- replace the front panel circuit board or the base circuit board.

10.2 Sensor

Coatings on the conductivity cells measuring surface can effect operation. Solutions which are high alkaline content and or solutions which contain slurries, oils, grease etc., will require cleaning and inspection of the cell's measuring surface.

11.0 Troubleshooting guide

Symptoms	Probable cause	Remedy
LCD not displayed transmitter reading	Power source problem; incorrect power wiring	Check power supply check wiring
Display reading too high/low	Cell failure; transmitter not calibrated	Clean sensor Calibrate with S.C.S.
Display reading does not change	Cell damage; short circuit	Sensor replacement check cable
Slope will not adjust	Cell damage; open temp. circuit	Sensor replacement check ATC sensor/jumpers

Digital E.C. transmitter

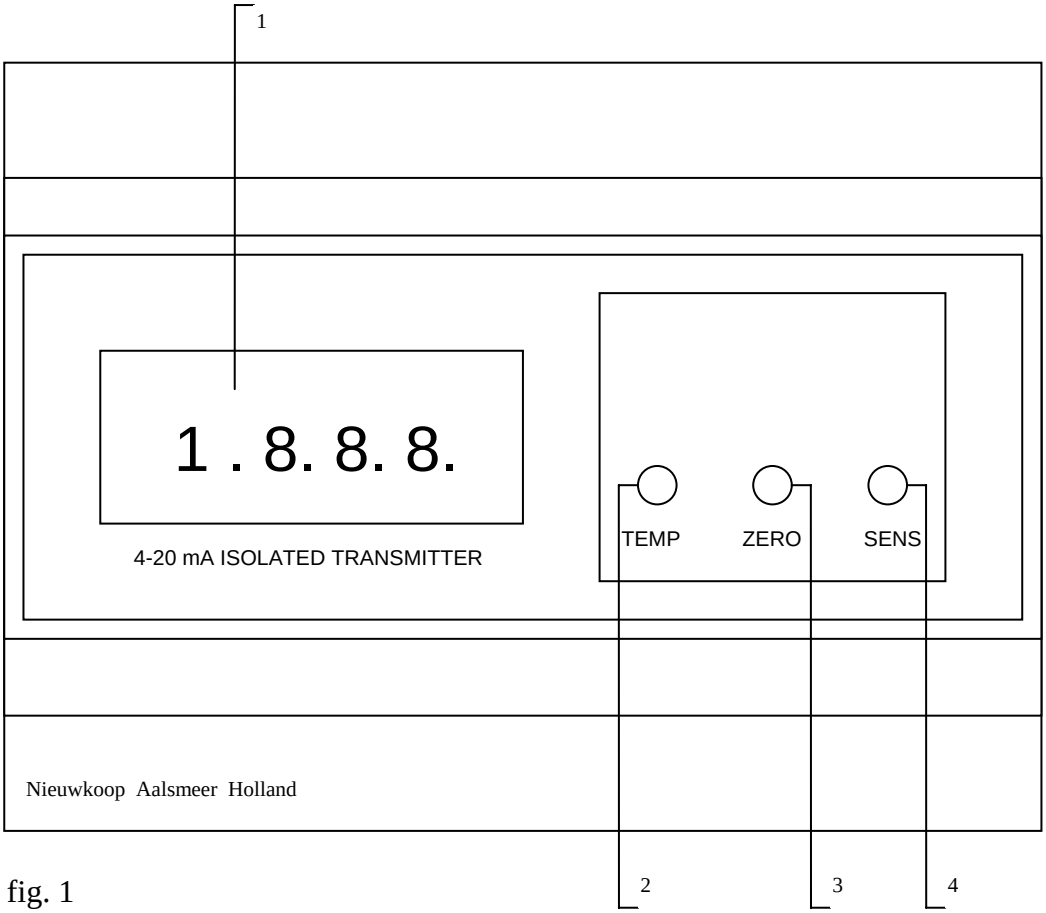


fig. 1

1. Display
2. Temperature display actuator
3. Zero calibration
4. Slope calibration

C3630 Connections

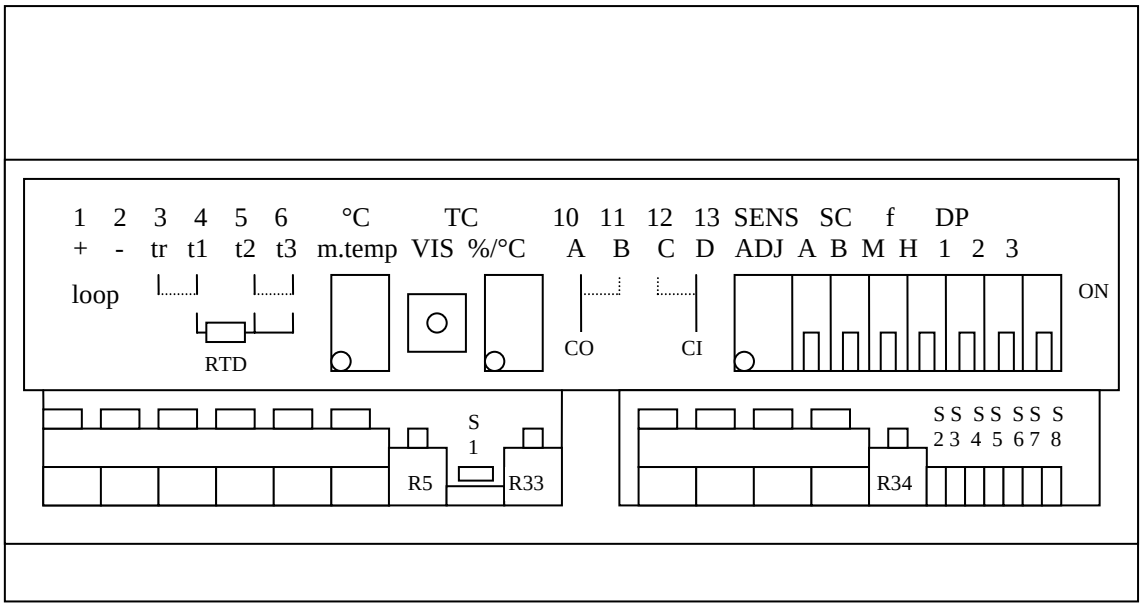
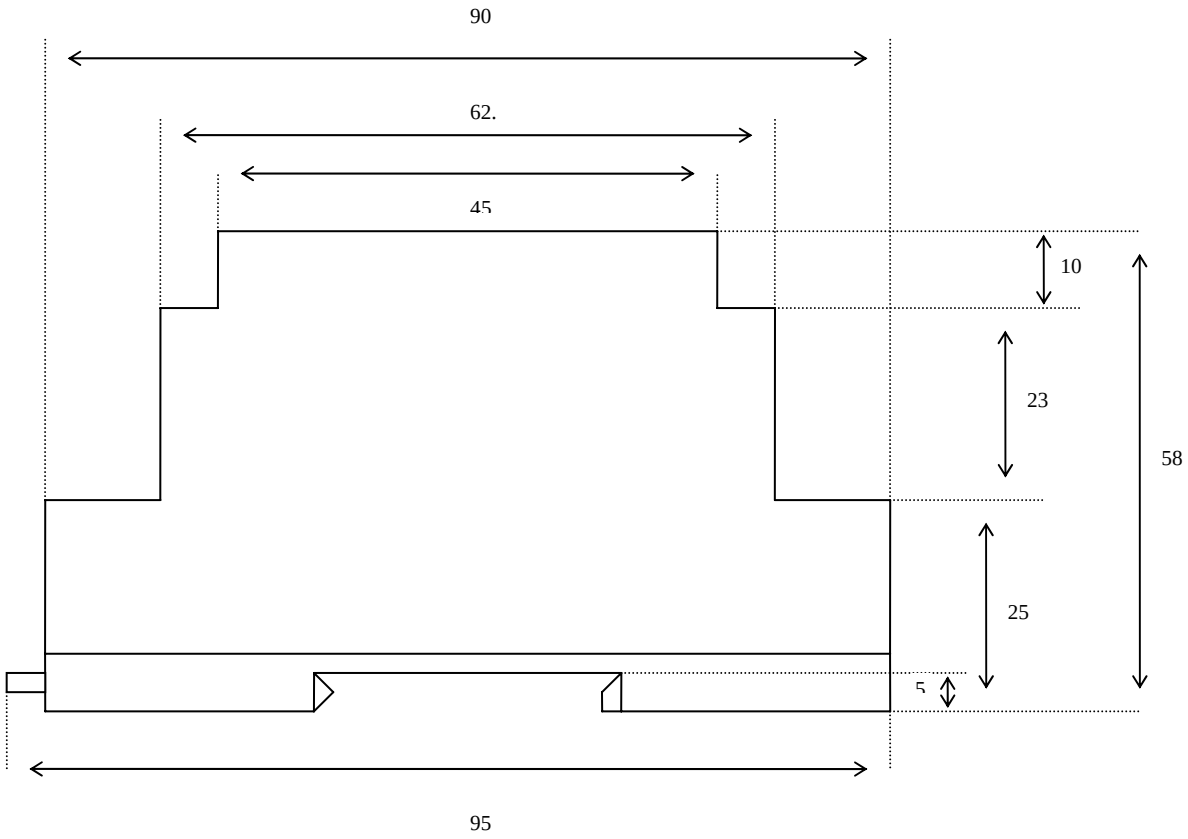


fig. 2

1.	Loop supply (+ input)
2.	Loop supply (- input)
3. 4.	Manual temperature compensation jumper
5. 6.	Manual temperature compensation jumper
4. 5. 6.	RTD Pt100 input (A.T.C.)
10. 13.	2-electrode cell input
10. 11. 12. 13.	4-electrode cell input

R5	Manual temperature control
R33	Temperature coefficient control
R34	Coarse sensitivity adjustment

S1	Temperature coefficient visualisation
S2	2000µS scale switch
S3	20mS scale switch
S4	Medium frequency switch
S5	High frequency switch
S6	Decimal point x.xxx switch
S7	Decimal point xx.xx switch
S8	Decimal point xxx.x switch



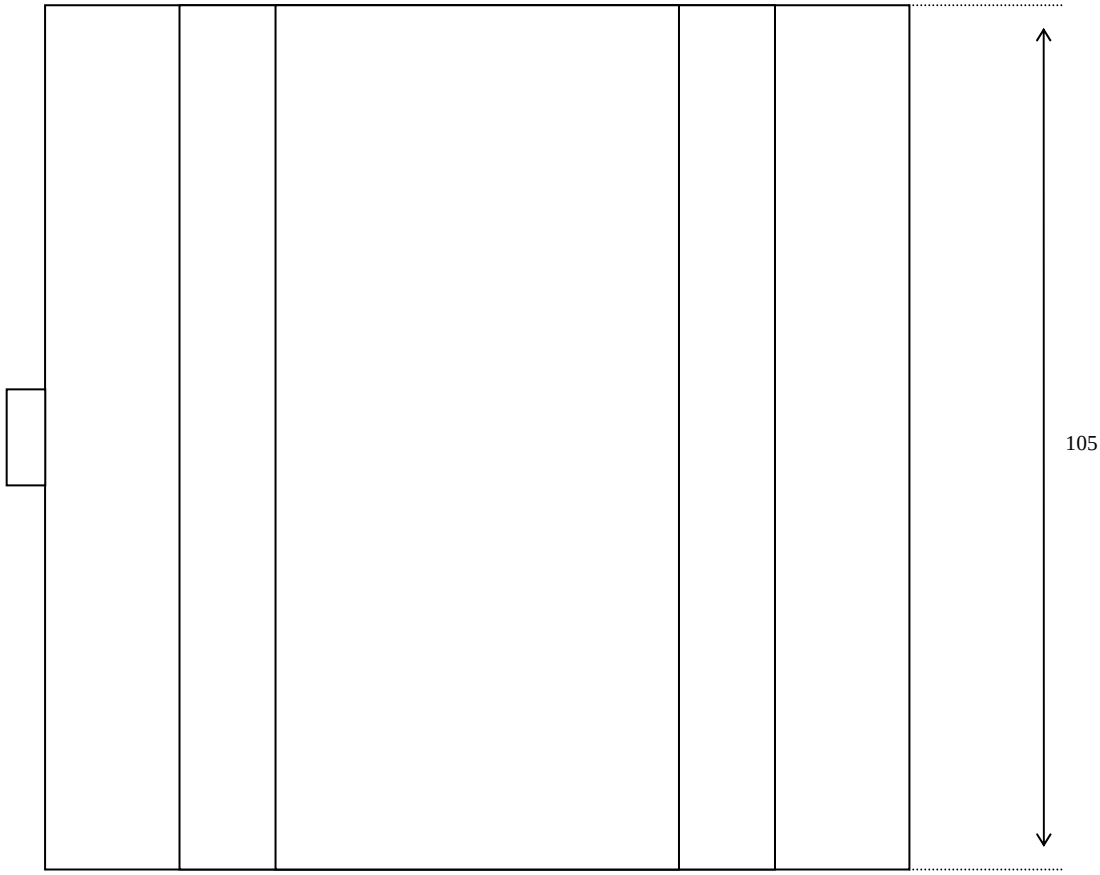


fig. 3

Connections Examples