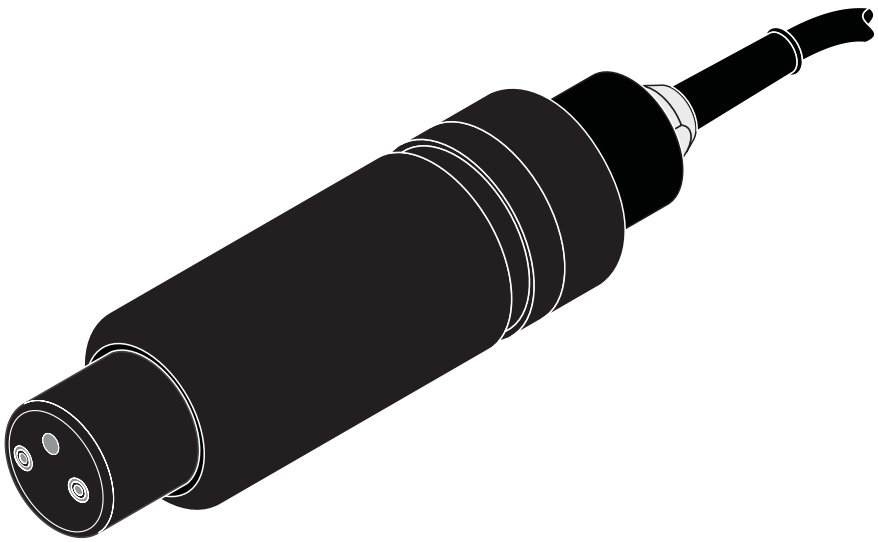
Operating manual

TetraCon® 700 SW



Conductivity measuring cell

Accuracy when going to press

The use of advanced technology and the high quality standard of our instruments are the result of continuous development. This may result in differences between this operating manual and your instrument. Also, we cannot guarantee that there are absolutely no errors in this manual. Therefore, we are sure you will understand that we cannot accept any legal claims resulting from the data, figures or descriptions.

1 Overview

1.1 Structure of the TetraCon® 700 SW conductivity measuring cell

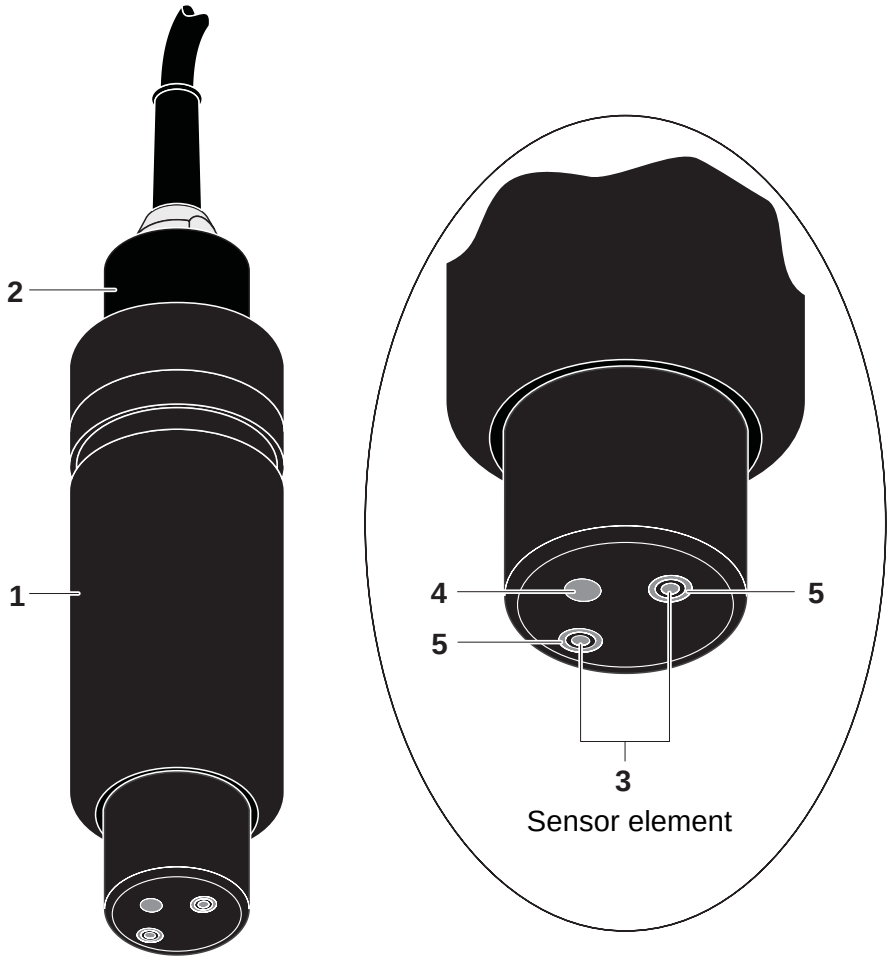


Fig. 1-1 Structure of the TetraCon® 700 SW conductivity measuring cell

1	Shaft
2	Closing head with protective ring
3	Voltage electrodes
4	Temperature sensor
5	Current electrodes (ring)

1.2 Recommended fields of application

The TetraCon® 700 SW conductivity measuring cell is suitable for stationary measurements in seawater, e.g. for aquaculture.

Characteristics

The principle of the measurement method makes it possible to avoid influences from primary or secondary polarization effects, which ensures a high degree of measuring accuracy.

The modern epoxy casting technique reduces the danger of breaking the conductivity measuring cell in rough industry use.

1.3 Instrument identification

Instrument identification

The instrument designation (end of name "-99" for SW model) is impressed on the plug end of the cable. The series number is engraved in the closing head. Have these designations ready in case of queries to the WTW service department.

2 Safety

2.1 General information on safety

These safety instructions contain all instructions that have to be followed for a safe operation of the TetraCon® 700 SW conductivity measuring cell. Before starting any work with the TetraCon® 700 SW, carefully read the safety instructions and strictly follow all protective measures mentioned.

Always store and make available these safety instructions together with the operating manual in the vicinity of the place of installation as possible.

General safety instructions

Safety instructions in this operating manual can be recognized by the warning symbol (triangle) in the left column. The signal word (e. g. "Caution") indicates the level of the danger:

Warning
indicates instructions that must be followed precisely in order to prevent serious dangers to persons.

Caution
indicates instructions that must be followed precisely in order to avoid slight injuries or damage to the instrument or the environment.

Other labels

Note
indicates notes that draw your attention to special features.

Note
indicates cross-references to other documents, e.g. operating manuals.

2.2 Authorized use

The authorized use of the TetraCon® 700 SW is stationary conductivity measurement.

The technical specifications according to chapter 8 TECHNICAL DATA must be observed. Only operation according to the instructions given in this operating manual is considered to be authorized.

Any other use is considered to be **unauthorized**. Unauthorized use invalidates any claims with regard to the guarantee.

2.3 General safety instructions

Function and operational safety

The conductivity measuring cell left the factory in a safe and secure technical condition.

The smooth functioning and operational safety of the conductivity measuring cell can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed during operation.

The smooth functioning and operational safety of the conductivity measuring cell can only be guaranteed under the environmental conditions that are specified in chapter 8 TECHNICAL DATA.

The specified temperature (chapter 8 TECHNICAL DATA) must be maintained during the application and transport of the conductivity measuring cell. Protect the conductivity measuring cell, particularly against frost or overheating.

Safe operation

If safe operation is no longer possible, the conductivity measuring cell must be taken out of operation and secured against inadvertent operation.

Safe operation is no longer possible if the conductivity measuring cell:

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer operates as described in this manual.

If you are in any doubt, contact the supplier of your conductivity measuring cell.

Obligations of the operator

The operator of the conductivity measuring cell must ensure that the following rules and regulations are followed when dealing with hazardous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations
- Safety data sheets of the chemical manufacturer.

3 Commissioning

3.1 Scope of delivery

- TetraCon® 700 SW
- The conductivity measuring cell is provided with protection caps
- Operating manual.

3.2 Installation

Connection to the measuring transmitter

The TetraCon® 700 SW connection cable has a cable plug to be connected to the Cond input socket of a measuring transmitter. It is connected to the terminal strip of measuring transmitters without a Cond input socket via the ADA/AMPH-LF adapter (see chapter 7 REPLACEMENT PARTS AND ACCESSORIES).

For detailed information please refer to the operating manual of the measuring transmitter.

4 Measuring / Operation

4.1 Measuring

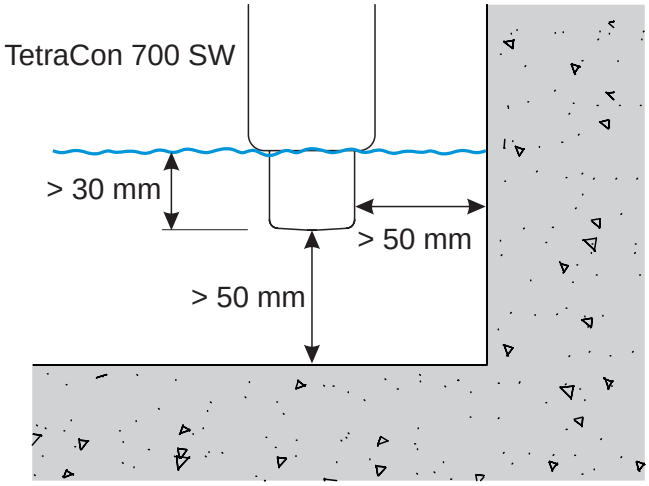
Warning
Contact with the sample can lead to danger to the user! Depending on the type of sample, suitable protective measures must be taken (protective clothing, protective goggles, etc.).

Minimum immersion depth

Observe the minimum immersion depth of the conductivity measuring cell (> 30 mm).

Spacing

Make sure the conductivity measuring cell is surrounded by a gap of at least 5 cm from the electrodes at the base and sides (boundary fields) when measuring.



Measuring at a narrow location

If the gap is less than that, the cell constant changes. This leads to inexact measurement results. Normally, measuring transmitters have a correction function that can compensate for this influence. This procedure determines a new cell constant for the system consisting of conductivity measuring cell + measuring environment. For more detailed information, refer to section 4.2 APPLICATION-DEPENDENT SETTINGS.

Note
Normally, the conductivity measuring cell does not age. Special measuring mediums (e.g. strong acids and bases, organic solvents) or temperatures that are too high may considerably reduce its lifetime or lead to damage. No warranty claims can be made for mechanical damage or any failure caused by these types of measuring mediums.

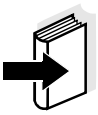
4.2 Application-dependent settings

The TetraCon® 700 SW conductivity measuring cell is long-term stable. It is immediately ready for authorized use.

Adapting the cell constant to the installation location

In the case of special installation conditions, it may be necessary to adapt the cell constant (due to the influence of the measuring environment, e.g. of boundary fields).

In chapter 6 WHAT TO DO IF... of this operating manual you will find the correct values to set for some products of the WTW accessory program that require a correction of the cell constant (if it is possible to give fixed values at all). If necessary, special installation recommendations for the TetraCon® 700 SW can be found in the accessory operating manual.



Note
Details on how to determine and set the cell constant can be taken from the operating manual of the measuring transmitter.

5 Maintenance, cleaning, disposal

5.1 Maintenance

The TetraCon® 700 SW conductivity measuring cell does not require maintenance.

5.2 Cleaning

Warning
Contact with the measuring solution or cleaning solution can endanger the user!Take protective measures suitable for the kind of measuring solution or cleaning solution (protective clothes, eye protectors etc.).

If the conductivity measuring cell is heavily contaminated, this can affect the measuring accuracy. Therefore, we recommend cleaning the conductivity measuring cell regularly according to visual checks. Especially before measuring low conductivity values, we recommend to clean the measuring cell thoroughly.

Cleaning

Contamination	Cleaning agents	Reaction time at room temperature
Water-soluble substances	Tap water	Any
Slurry and loosely adhering dirt or biological films	Soft brush, warm tapwater with detergent	Any
Fats and oils	– Warm water and household detergent – In the case of heavy contamination: Methylated spirits	– Any – Maximum of 5 minutes
Lime and hydroxide deposits	Acetic acid (10 %)	Any

5.3 Disposal

We recommend to dispose of the conductivity measuring cell as electronic waste.

6 What to do if...

Measurement delivers no or wrong measured values

Cause	Remedy
– Conductivity measuring cell not correctly connected	– Check connection to measuring transmitter
– Cable damaged	– Check cable. If it is defective, send conductivity measuring cell to WTW
– Measuring range exceeded	– Select larger measuring range or set automatic selection of the measuring range

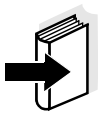
Measurement provides implausible measured values

Cause	Remedy
– Conductivity measuring cell is heavily contaminated	– Clean the conductivity measuring cell
– Boundary field not maintained	– The conductivity measuring cell must be surrounded by a gap of at least 5 cm at the base and sides when measuring at the electrodes. Otherwise, the cell constant will change (see section 4.1 MEASURING)
– Electrodes damaged	– Send the measuring cell to WTW
– System setting incorrect	– Correct the system setting
– Measuring range exceeded	– Make sure the correct sensor is being used for the application
– The measuring cell was installed in a flow-thru device and the boundary field is not sufficient	– Set the cell constant to the value of the installed state (if known) – If the cell constant of the measuring cell in the installed state is not known, adjust the measured value to the nominal value of a measuring solution (see operating manual of the measuring transmitter)

7 Replacement parts and accessories

Adapter

Model	Order no.
ADA/AMPH-LF	303 215



Note
Information on further accessories is given in the WTW catalog and in the Internet.

8 Technical data

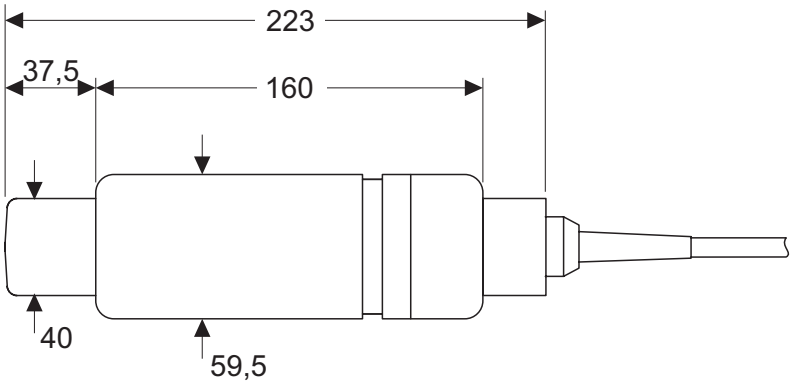
8.1 General features

Measuring range 10 µS/cm ... 1000 mS/cm at 0 °C ... + 50 °C

Measuring principle Four-electrodes measurement

Temperature sensor Integrated NTC 30 (30 kΩ / 25 °C)

Dimensions



Weight approx. 860 g (without sensor connection cable)

Material

Sensor head	PVC, epoxy (filling material)
Electrodes, housing of the temperature sensor	Graphite
Shaft	POM
Closing head	POM
Protection ring	POM
Cable screw joint	Titan Grade 2
Cable coating	PUR

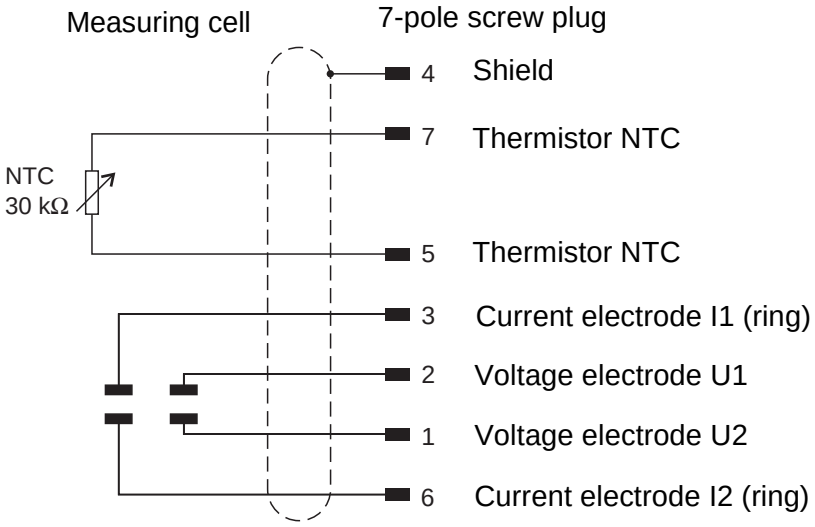
Connection cable	Length	15.0 m (special lengths on request)
	Diameter	8.8 mm
	Smallest allowed bend radius	Permanent bend:180 mm Short time bend:90 mm
	Connection	Screw plug, 7 poles (IP 65)
Guidelines and norms used	General safety	– EN 61010-1 – UL 3111-1 – CAN/CSA C22.2 No. 1010.1
Test certificates	UL, cUL	

8.2 Electrical data

Caution

All voltages must be protective low voltages or safety extra low voltages without hazard of contact according to E 61010-1 or UL 3111-1.

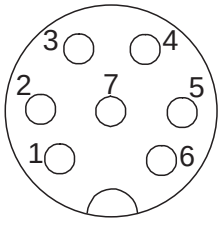
Wiring diagram



Pin assignment

Pin	Assign-ment	Wire color	Max. voltage	Max. current
1	U2	Yellow	---	---
2	U1	Gray	---	---
3	I1	Pink	1 V	5 mA
4	Shield	Transparent	---	---
5	NTC	Brown	3.5 V	0.15 mA
6	I2	Green	1 V	5 mA
7	NTC	White	3.5 V	0.15 mA

Plug from the front:



8.3 Measurement conditions

Temperature range

Measuring medium	0 °C ... + 50 °C
Storage/transport	- 5 °C ... + 65 °C (storage in air recommended)

Immersion depth min. 30 mm

Operating position Any

Approach flow not required

Pressure resistance Conductivity measuring cell including connection cable:

Max. admissible overpressure	10^6 Pa (10 bar)
Type of protection	IP 68 (106 Pa or 10 bar)

7-pole screw plug:

Type of protection	IP 65

The TetraCon® 700 SW meets the requirements according to article 3(3) of the directive, 97/23/EC ("pressure equipment directive").

8.4 Characteristics when delivered

Temperature measurement

Probe accuracy	± 0.2 K
Response time	t_{90} (90 % of the final value display after) < 60 s t_{95} (95 % of the final value display after) < 120 s

Cell constant

In free solution, i.e. bottom and side gap > 5 cm	K = 0.917 cm^{-1} ± 1.5 %