AQC-D3

Measuring cell

Installation and operating instructions

Declaration of conformity

GB EC Declaration of Conformity

We, Grundfos, declare under our sole responsibility that the products AquaCell AQC-D3 and the preassembled systems, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

— Low Voltage Directive (2006/95/EC)*.
Standard used: EN 61010-1: 2001 (second edition).

— EMC Directive (2004/108/EC).
Standards used: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Only for products with operating voltage > 50 VAC or > 75 VDC.

DE EG-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte AquaCell AQC-D3 und die vormontierten Systeme, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EG-Mitgliedstaaten übereinstimmen:

— Niederspannungsrichtlinie (2006/95/EG)*.
Norm, die verwendet wurde: EN 61010-1: 2001 (zweite Ausgabe).

— EMV-Richtlinie (2004/108/EG).
Normen, die verwendet wurden: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Nur für Produkte mit Betriebsspannungen > 50 VAC bzw. > 75 VDC.

ES Declaración CE de Conformidad

Nosotros, Grundfos, declaramos bajo nuestra única responsabilidad que los productos AquaCell AQC-D3 y los sistemas premontados a los cuales se refiere esta declaración son conformes con las Directivas del Consejo relativas a la aproximación de las legislaciones de los Estados Miembros de la CE sobre

— Directiva de Baja Tensión (2006/95/CE)*.
Norma aplicada: EN 61010-1: 2001 (segunda edición).

— Directiva EMC (2004/108/CE).
Normas aplicadas: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Sólo para productos con tensión de funcionamiento > 50 VAC o > 75 VDC.

FR Déclaration de Conformité CE

Nous, Grundfos, déclarons sous notre seule responsabilité que les produits AquaCell AQC-D3 ainsi que les systèmes préassemblés auxquels se réfère cette déclaration sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives à

— Directive Basse Tension (2006/95/CE)*.
Norme utilisée : EN 61010-1: 2001 (deuxième édition).

— Directive Compatibilité Electromagnétique CEM (2004/108/CE).
Normes utilisées : EN 61326-1 : 2006, EN 61000-3-2 : 2006 + A1 : 2009 + A2 : 2009, EN 61000-3-3 : 2008.

* Convient uniquement aux produits avec tension de service > 50 VAC ou > 75 VDC.

IT Dichiarazione di Conformità CE

Noi, Grundfos, dichiariamo sotto la nostra esclusiva responsabilità che i prodotti AquaCell AQC-D3 e dei sistemi preassemblati ai quali questa dichiarazione si riferisce sono conformi alle Direttive del Consiglio concernente il ravvicinamento delle legislazioni degli Stati membri CE relative a

— Direttiva Bassa Tensione (2006/95/CE)*.
Norma applicata: EN 61010-1: 2001 (seconda edizione).

— Direttiva EMC (2004/108/CE).
Norme applicate: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Solo per prodotti con tensione di alimentazione > 50 VAC o > 75 VDC.

NL EC overeenkomstigheidsverklaring

Wij, Grundfos, verklaren geheel onder eigen verantwoordelijkheid dat de produkten AquaCell AQC-D3 en de voorgeassembleerde systemen waarop deze verklaring betrekking heeft in overeenstemming zijn met de Richtlijnen van de Raad inzake de onderlinge aanpassing van de wetgevingen van de Lid-Staten betreffende

— Laagspannings Richtlijn (2006/95/EC)*.
Gebruikte norm: EN 61010-1: 2001 (tweede editie).

— EMC Richtlijn (2004/108/EC).
Gebruikte normen: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Alleen voor producten met bedrijfspanning > 50 VAC of > 75 VDC.

PL Deklaracja zgodności WE

My, Grundfos, oświadczamy z pełną odpowiedzialnością, że nasze wyroby AquaCell AQC-D3 i kompaktowe uklady pomiarowe, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich WE:

— Dyrektywa Niskonapięciowa (LVD) (2006/95/WE)*.
Zastosowana norma: EN 61010-1: 2001 (drugie wydanie).

— Dyrektywa EMC (2004/108/WE).
Zastosowane normy: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Dotyczy produktów o napięciu zasilania > 50 VAC lub > 75 VDC.

PT Declaração de Conformidade CE

Nós, Grundfos, declaramos sob nossa única responsabilidade que os produtos AquaCell AQC-D3 e os sistemas pré-montados aos quais se refere esta declaração estão em conformidade com as Directivas do Conselho das Comunidades Europeias relativas à aproximação das legislações dos Estados Membros respeitantes à

— Directiva Baixa Tensão (2006/95/CE)*.
Norma utilizada: EN 61010-1: 2001 (segunda edição).

— Directiva EMC (compatibilidade electromagnética) (2004/108/CE).
Normas utilizadas: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Apenas para produtos com tensão de funcionamento > 50 VCA ou > 75 VCC.

RU Декларация о соответствии EC

Мы, компания Grundfos, со всей ответственностью заявляем, что изделия AquaCell AQC-D3 и предварительно смонтированных систем, к которым и относится данная декларация, отвечают требованиям следующих указаний Совета EC об унификации законодательных предписаний стран-членов EC:

— Низковольтное оборудование (2006/95/EC)*.
Применявшийся стандарт: EN 61010-1: 2001 (второе издание).

— Электромагнитная совместимость (2004/108/EC).
Применявшиеся стандарты: EN 61326-1: 2006,
EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Только для изделий с рабочим напряжением > 50 В AC или > 75 В DC.

TR EC uygunluk bildirgesi

Biz, Grundfos, olarak, bu beyanda belirtilen AquaCell AQC-D3 ve önceden birleştirilmiş sistem ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

— Düşük Voltaj Yönetmeliği (2006/95/EC)*.
Kullanılan standart: EN 61010-1: 2001 (ikinci baskı).

— EMC Diretifi (2004/108/EC).
Kullanılan standartlar: EN 61326-1: 2006, EN 61000-3-2: 2006 + A1: 2009 + A2: 2009, EN 61000-3-3: 2008.

* Çalışma voltajı yalnızca > 50 VAC veya > 75 VDC değerinde olan ürünler için.

Pfinztal, 1st August 2011

Ulrich Stemick
Technical Director
Grundfos Water Treatment GmbH
Reetzstr. 85, D-76327 Pfinztal, Germany

Person authorised to compile technical file and
empowered to sign the EC declaration of conformity.

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Warning

These complete installation and operating instructions are also available on www.Grundfosalldos.com.

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury!

Caution ***If these safety instructions are not observed, it may result in malfunction or damage to the equipment!***

Note ***Notes or instructions that make the job easier and ensure safe operation.***

2. Installation data

Note ***Please fill in the data below after start-up. It will help you and your Grundfos service partner to make subsequent adjustments to the installation.***

Owner:

Grundfos customer number:

Order number:

Product number:

Product serial number:

Put into service on:

Location of product:

Used for:

3. Installation sketch

4. Unit description / preassembled systems

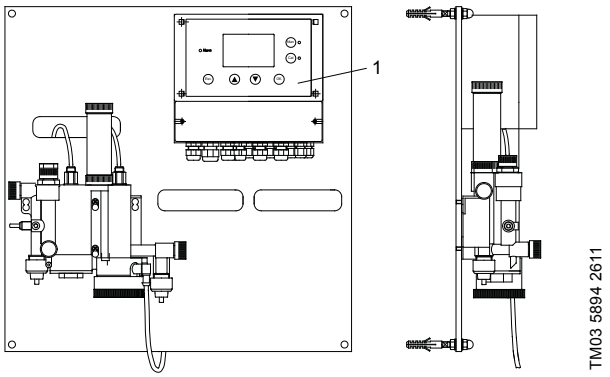


Fig. 1 AQC-D3 potentiostatic measuring cell with Conex® DIA / DIS measuring amplifier

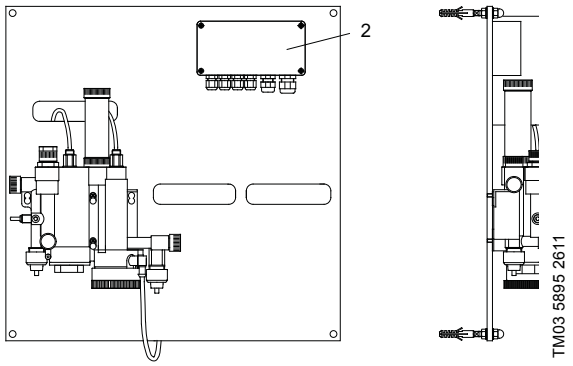


Fig. 2 AQC-D3 potentiostatic measuring cell with sensor interface

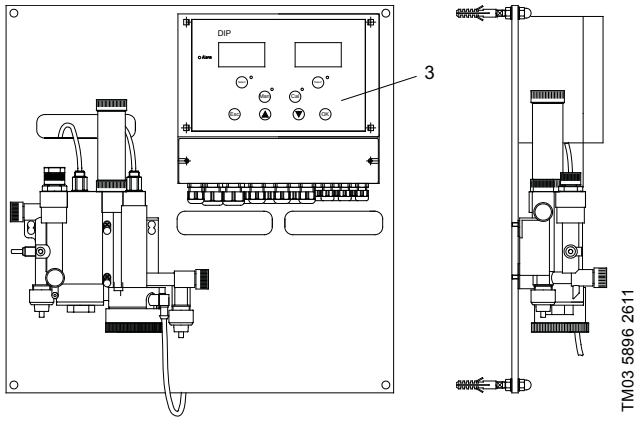
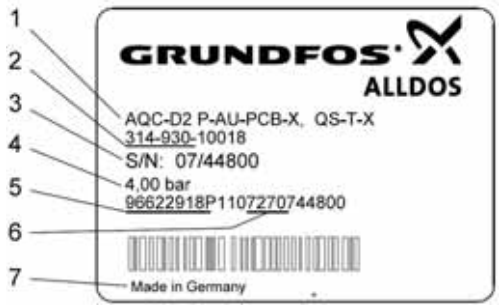


Fig. 3 AQC-D3 potentiostatic measuring cell with DIP measuring amplifier

1	Conex DIA-1, Conex DIA-2, Conex DIA-2Q, Conex DIS-D measuring amplifier
2	Sensor interface for Conex DIA-1, Conex DIA-2, Conex DIA-2Q, cabinet-mounted device
3	DIP measuring amplifier

5. Identification

5.1 Nameplate, AquaCell



TM03 8992 2211

Pos.	Description
1	Type designation
2	Model
3	Serial number
4	Maximum pressure [bar]
5	Product number
6	Year and week code
7	Country of origin

Fig. 4 Nameplate, AquaCell

5.2 Type key, AquaCell

Type key example		**AQC**	**-D1,**	**P**	**AU-PCB-RCB,**	**QS**	**-T,**	**G**
Model								
AQC	AquaCell							
Application								
D1	Pressure-proof, with cleaning motor (Cl_2, ClO_2, O_3)							
D2	Pressure-proof, with hydromechanical cleaning (Cl_2, ClO_2, O_3)							
D3	Pressureless, with hydromechanical cleaning (Cl_2, ClO_2, O_3)							
Pressure-loading valve								
P	With pressure-loading valve							
X	Without pressure-loading valve							
Electrodes								
AU	Gold							
PT	Platinum							
PCB	pH, ceramic diaphragm, with buffer solution							
PCX	pH, ceramic diaphragm, without buffer solution							
PTB	pH, PTFE diaphragm, with buffer solution							
PTX	pH, PTFE diaphragm, without buffer solution							
PKB	pH, KCl filling, with buffer solution							
PKX	pH, KCl filling, without buffer solution							
PGB	pH, gel filling, with buffer solution							
PGX	pH, gel filling, without buffer solution							
RCB	Redox, ceramic diaphragm, with buffer solution							
RCX	Redox, ceramic diaphragm, without buffer solution							
RTB	Redox, PTFE diaphragm, with buffer solution							
RTX	Redox, PTFE diaphragm, without buffer solution							
RRB	Redox, without reference system, with buffer solution							
RRX	Redox, without reference system, without buffer solution							
X	No electrode							
Flow sensor								
QS	Flow sensor							
X	No flow sensor							
Temperature sensor								
T	With Pt100							
Power supply								
G	1 x 230/240 V, 50/60 Hz							
H	1 x 115/120 V, 50/60 Hz							
I	24 VDC							
X	No power supply							

5.3 Type key, preassembled system

Example:	DIA	-1	-A	D1	P	-AU	-PCB	-QS	-T	W	-G

Units for measurement and control

DIA-1	Dosing Instrumentation Advanced with 1 input
DIA-2	Dosing Instrumentation Advanced with 2 inputs
DIA-2Q	Dosing Instrumentation Advanced with 1 input + flow measurement
DIP	Dosing Instrumentation Pool
DIS-PR	Dosing Instrumentation Standard for pH/redox measurement
DIS-D	Dosing Instrumentation Standard for Cl_2 / ClO_2 / O_3

Assembly

A	Preassembled

Cell type

D1	Pressure-proof, with cleaning motor
D2	Pressure-proof, with hydromechanical cleaning
D3	Pressureless, with hydromechanical cleaning
D4	Pressureless, with cleaning motor, for total chlorine
D5	Pressureless, with cleaning motor, for free chlorine
P/R	pH or redox only
F	Fluoride only
PA/HP	Peracetic acid or hydrogen peroxide only

Pressure-loading valve

P	With pressure-loading valve
X	Without pressure-loading valve

Electrodes for disinfection

AU	Gold
PT	Platinum
X	No disinfection measurement

Other electrodes

PCB	pH, ceramic diaphragm, with buffer solution
PCX	pH, ceramic diaphragm, without buffer solution
PTB	pH, PTFE diaphragm, with buffer solution
PTX	pH, PTFE diaphragm, without buffer solution
PKB	pH, KCl filling, with buffer solution
PKX	pH, KCl filling, without buffer solution
PGB	pH, gel filling, with buffer solution
PGX	pH, gel filling, without buffer solution
RCB	Redox, ceramic diaphragm, with buffer solution
RCX	Redox, ceramic diaphragm, without buffer solution
RTB	Redox, PTFE diaphragm, with buffer solution
RTX	Redox, PTFE diaphragm, without buffer solution
RRB	Redox, without reference system, with buffer solution
RRX	Redox, without reference system, without buffer solution
F	Fluoride
PA	Peracetic acid
HP	Hydrogen peroxide
X	No electrode

Flow sensor

QS	Flow sensor integrated
X	No flow sensor

Temperature sensor

T	With Pt100
X	No temperature sensor

Mounting

W	Wall-mounted
P	Panel-mounted

Power supply

G	1 x 230 V, 50/60 Hz
H	1 x 120 V, 50/60 Hz
I	24 VDC

6. Unit description / holders for electrodes and sensors

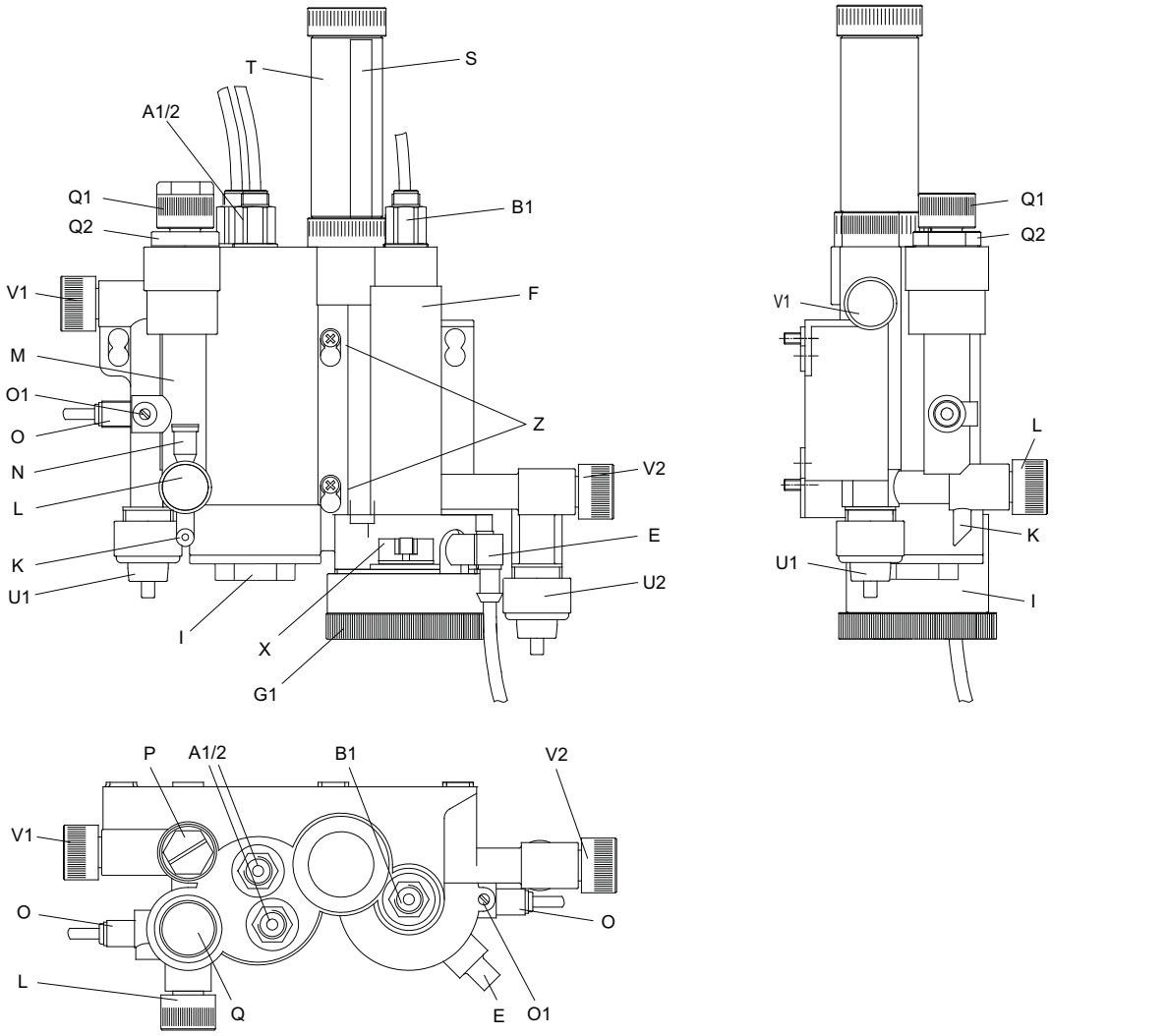


Fig. 5 AQC-D3 potentiostatic measuring cell (unpressurised, hydromechanical)

Pos.	Component
A	Holders for pH single-rod electrode and redox electrode (optional)
A1/2	pH single-rod electrode and redox electrode (optional)
B	Holder for reference electrode
B1	Reference electrode (Cl_2, ClO_2, O_3)
E	Plug for measuring electrode
F	Flow armature
G1	Slide
I	Bottom of measuring chamber
K	Sample water extraction device with extraction spindle
L	Bleeding spindle
M	Measuring tube
N	Float body
O	Water sensor (optional)
O1	Screw
P	Filter cartridge
Q	Sample water regulating device
Q1	Adjusting spindle
Q2	Spindle inset
S	Ascending pipe
T	Housing cylinder
U1	Connection for sample water inlet
U2	Connection for sample water outlet
V1	Shut-off spindle for sample water inlet

Pos.	Component
V2	Shut-off spindle for sample water outlet
X	Cleaning wing
Z	Holes for fastening screws

These positions that are described later on in the document are not shown in the diagram:

Pos.	Component
D	Measuring electrode (Cl_2, ClO_2, O_3) with integrated Pt100
H	Screwed part with slide, inlet chamber, cleaning wing and measuring electrode
P1	Filter for screw cap
P2	Filter strainer
P3	Filter receptacle
W	Inlet chamber
W1	O-rings of the inlet chamber

7. General information

This manual contains all important information for users of the AquaCell AQC-D3 and the preassembled systems:

- technical data
- instructions for start-up, use and maintenance
- safety information.

Should you require further information, or should problems occur which are not handled in sufficient depth in this manual, please contact Grundfos. We will enjoy supporting you with our comprehensive know-how in the fields of measurement and control as well as water treatment.

We always welcome any suggestions on how to optimise our installation and operating instructions to satisfy our customers.

7.1 Guarantee

A guarantee claim in the sense of our general conditions of sale and delivery can only be recognised if these requirements are complied with:

- The device has been used according to the information in this manual.
- The device has not been dismantled or incorrectly handled in any manner.
- Repairs have only been carried out by authorised personnel.
- Only original parts have been used during repairs.
- Only components approved by Grundfos are used in the complete plant.

Typical parts subject to wear are excluded from the guarantee, for instance a gaskets, magnetic stirrer, reference electrode and pH redox single-rod electrodes

8. Applications

The AQC-D3 potentiostatic measuring cell is used for measuring the concentration of chlorine (Cl_2) in the pH-range 4.5 to 8.5, chlorine dioxide (ClO_2) or ozone (O_3). By means of the suitable single-rod electrodes, it can also measure the pH value and redox potential in plants for treating swimming-pool water and drinking water.

The preassembled systems measure and control the following, depending on the measuring amplifier and controller installed:

- Preassembled system with Conex® DIA-1 measuring amplifier and controller:
  - Measurement: free chlorine (Cl_2), as an option with pH compensation, chlorine dioxide (ClO_2), ozone (O_3), pH, temperature.
  - Control: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3).
- Preassembled system with Conex® DIA-2 measuring amplifier and controller:
  - Measurement: free chlorine (Cl_2), as an option with pH compensation, chlorine dioxide (ClO_2), ozone (O_3), pH, temperature.
  - Control: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3), pH.
- Preassembled system with Conex® DIA-2Q measuring amplifier and controller:
  - Measurement: free chlorine (Cl_2), as an option with pH compensation, chlorine dioxide (ClO_2), ozone (O_3), pH, temperature.
  - Control: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3), pH, redox potential.
- Preassembled system with Conex® DIS-D measuring amplifier and controller:
  - Measurement: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3).
  - Control: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3).
- Preassembled system with DIP measuring amplifier and controller:
  - Measurement: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3), pH, redox potential, temperature.
  - Control: chlorine (Cl_2), chlorine dioxide (ClO_2), ozone (O_3), pH.

9. Safety information

9.1 Obligations of the owner

The owner of the plant is responsible for

- compliance with country-specific safety regulations
- training of operating personnel
- provision of prescribed protective gear
- implementation of regular maintenance.

9.2 Avoidance of danger

Warning

Do not dismantle the device components!

Cleaning, maintenance and repairs must only be carried out by authorised personnel!

Warning

Other applications than those described in section 8. Applications are considered as non-approved and are not permissible. Grundfos cannot be held liable for any damage resulting from incorrect use.

Derivates of chlorine isocyanic acid cannot be measured or controlled. Grundfos cannot be held liable for damage or consequential damage regarding this.

10. Technical data

10.1 General data

- AQC-D3: hydromechanically driven unpressurised flow armature with open outlet for sample water.
- Measuring parameters:
  – free chlorine, chlorine dioxide, ozone
  – optional: pH value, redox potential, temperature (for compensation of pH, Cl_2, ClO_2, O_3).
- Sample water:
  – min. conductivity: 50 µS/cm
  – temperature: 0 to 50 °C
  – pH value (only measuring parameter Cl_2: pH 4.5 - 8.5)
  – inlet pressure: max. 4 bar, min. 0.3 bar
  – counter-pressure: p_{amb} (open outflow)
  – pressure difference: max. 0.3 bar.
- Permissible ambient temperature: 0 to 50 °C.
- Permissible storage temperature:
  – –20 to +65 °C
  – Electrodes: –10 to +30 °C.

Caution ***Observe the installation and operating instructions of the electrodes!***

- Permissible humidity: max. 90 % relative humidity (no condensation).
- Sample water flow rate: min. 20; max. 60 l/h.
- Materials of parts that come into contact with the media: PMMA, PVC, steel, PTFE, EPDM.
- Electrode materials: Glass, metal, noble metal, PPO (polyphenylene oxide), PA 6.6.
- Connections:
  – inlet: for PVC tube 6/12 or PVC pipe 12 x 1.2
  – outlet: for PVC tube 6/12 or PVC pipe 12 x 1.2.

Measuring parameters: chlorine, chlorine dioxide and ozone

- Measuring ranges: Dependent on measuring amplifier. See section *10.3.1 Measuring range for measuring parameters Cl_2, ClO_2, O_3, pH, Redox*.
- Sensitivity: < 20 ppb.
- Accuracy: < ± 5 % of full-scale value.
- Repeatability: < ± 4 %.
- Response time: t_{90} < 60 s.

10.2 Versions

- Power supply:
  – 230/240 V (50/60 Hz) (standard)
  – 115-120 V (50/60 Hz)
  – 24 VDC.
- Equipment / options:
  – electrode (gold) (standard) (for free chlorine, chlorine dioxide, ozone)
  – electrode (platinum)
  – redox single-rod electrode
  – redox electrode (with DIP)
  – pH single-rod electrode.

10.2.1 AquaCell AQC-D3 potentiostatic measuring cell

- Cables:
  – cable for reference electrode, pH or redox single-rod electrode, 3 m, with free cable end
  – cable for measuring electrode, 3 m, with free cable end.
- Options
  – water sensor with cable, 3 m.

10.2.2 Preassembled systems

- Cables
  – cable for reference electrode, pH or redox single-rod electrode, 1 m, preconnected
  – cable for measuring electrode, 1 m, preconnected.
- Options:
  – water sensor with cable, 1 m.

Product numbers of the spare parts and optional accessories, see section *16. Spare parts and accessories*.

10.3 Measuring ranges

10.3.1 Measuring range for measuring parameters Cl_2, ClO_2, O_3, pH, Redox

Preassembled system with Conex DIA

Cl_2 [mg/l]	ClO_2 [mg/l]	O_3 [mg/l]	pH	Redox (ORP) [mV]
0.00-0.50	0.00-0.50	0.00-0.50	0.00-14.00	–1500-+1500
0.00-1.00	0.00-1.00	0.00-1.00	2.00-12.00	0-1000
0.00-2.00	0.00-2.00	0.00-2.00	5.00-9.00	
0.00-5.00	0.00-5.00	0.00-5.00		
0.0-10.0	0.0-10.0			
0.0-20.0				
freely selectable between				
0.0-50.0	0.0-50.0	0.00-5.00	0.00-14.00	–1500-+1500

Preassembled system with Conex DIS-D

Cl_2 [mg/l]	ClO_2 [mg/l]	O_3 [mg/l]
0.00-2.00	0.00-2.00	0.00-2.00
0.00-20.00	0.00-20.00	0.00-20.00*

* Effective measuring range: 0.00-5.00

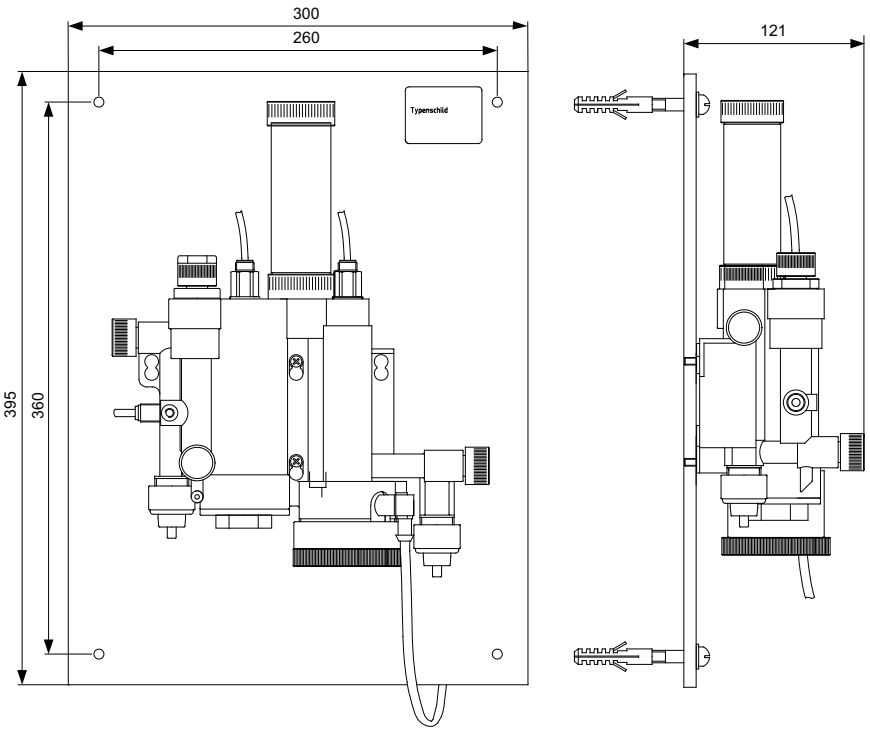
Preassembled system with DIP

Cl_2 [mg/l]	ClO_2 [mg/l]	O_3 [mg/l]	pH	Redox (ORP) [mV]
0.00-0.50	0.00-0.50	0.00-0.50	0.00-14.00	–1500-+1500
0.00-1.00	0.00-1.00	0.00-1.00	2.00-12.00	0-1000
0.00-2.00	0.00-2.00	0.00-2.00	5.00-9.00	
0.00-5.00	0.00-5.00	0.00-5.00		
0.0-10.0	0.0-50.0			
0.0-30.0				
freely selectable between				
0.0-30.0	0.0-50.0	0.00-5.00	0.00-14.00	–1500-+1500

10.3.2 Measuring range for temperature (not with Conex DIS-D)

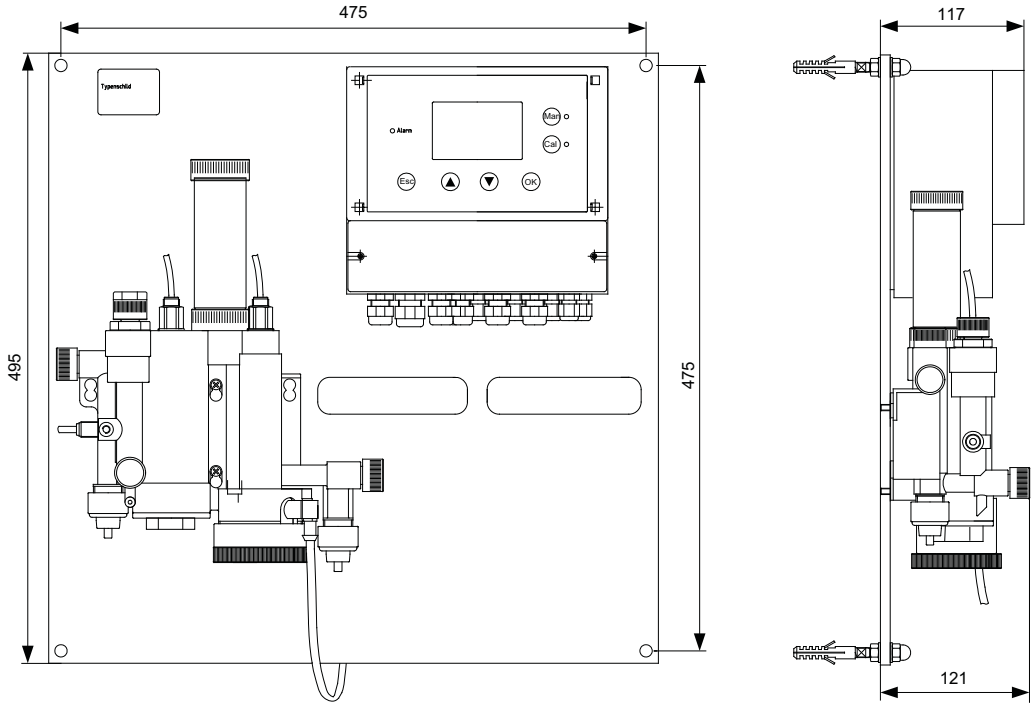
°C	°F
0 to +50	32 to 122
0 to +100	32 to 212
–5 to +120	23 to 248

10.4 Dimensional sketches / drilling diagram



TM03 5898 2411

Fig. 6 Drilling diagram for AQC-D3 measuring cell



TM03 5899 2411

Fig. 7 Drilling diagram for preassembled systems. Example with Conex DIA (wall-mounted unit)

11. Installation

11.1 Transport and storage

Transport unit carefully, do not throw, store in dry conditions between –20 and +65 °C.

Caution ***Store electrodes between –10 and +30 °C. Keep protective caps moist with 3-molar potassium chloride solution.***

11.2 Unpacking

Caution ***Do not allow any foreign bodies to enter!***

- Check scope of delivery.
- Assemble as soon as possible following unpacking.

11.3 Installation requirements

Caution ***Non-observance may result in damage or errors in measurement!***

- The location must be vibration-free, dry, dust-free and free of corrosive, pungent fumes or aggressive solvents.
- For safety reasons, the customer should install an earth leakage circuit breaker for the measuring amplifier.
- Maximum permissible cable length:
  - – Individual devices for AQC-D3 measuring cells: between measuring cell and measuring amplifier or sensor interface: 3 m.
  - – Preassembled systems with Conex DIS, DIA or DIP as wall-mounted unit: completely prewired.
  - – Preassembled systems with Conex DIA as control cabinet unit: Distance between measuring amplifier and sensor interface ≤ 100 m.
- Ensure a continuous supply of sample water.
- Install the measuring cell so that the line length of the sample water feed is as short as possible in order to reduce the delay time of the flow armature.
- Retain the permissible inlet pressure and counter-pressure of the sample water.
  - – Fit a pressure booster pump or pressure reducer, if necessary.

11.4 Mounting

The flow armature is fastened to the mounting plate from factory.

Caution ***The measuring cell breaks when the screws are tightened! Do not tighten the screws; only screw them in without tightening them!***

Caution ***The potentiostatic measuring cell or preassembled system must be mounted vertically!***

Individual device for AQC-D3 measuring cells

1. Drill four dowel holes with a diameter of 10 mm and min. 60 mm deep. See section *10.4 Dimensional sketches / drilling diagram*.
2. Mount the measuring cell and the mounting plate on the wall using the mounting material provided.

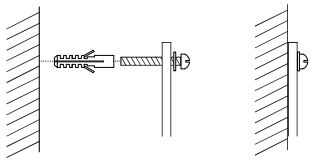


Fig. 8 Mounting of AQC-D3 measuring cell

Preassembled systems

1. Drill four dowel holes with a diameter of 10 mm and min. 60 mm deep. See section *10.4 Dimensional sketches / drilling diagram*.
2. Mount the preassembled system and the mounting plate on the wall using the mounting material provided. Distance between the mounting plate and the wall: min. 20 mm.

Caution ***Do not pinch the cable! Always observe the mounting sequence below.***

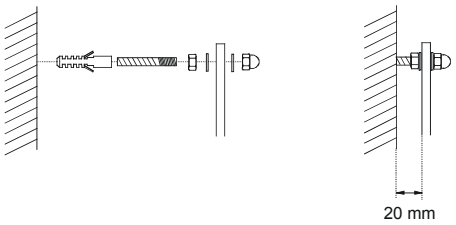


Fig. 9 Mounting sequence for preassembled systems

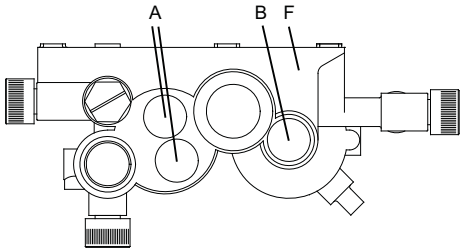
12. Start-up

12.1 Installation of electrodes and sensors

12.1.1 Reference electrode, pH and redox single-rod electrodes

1. Unscrew the screw plugs of the holders (A, B) used for the flow armature (F).
2. Remove the moisture retention caps of the electrodes or single-rod electrodes (A1, A2, B1) used, and keep them for possible electrode removal.
3. Screw in the electrodes or single-rod electrodes (A1, A2, B1) used by hand into the holders (A or B).

Caution ***Observe the installation and operating instructions of the electrodes!***



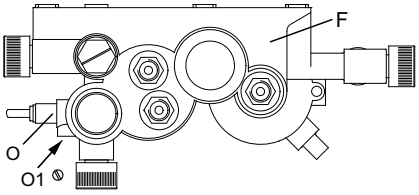
TM03 5858 2611

Fig. 10 Holders for electrodes

12.1.2 Water sensor

Note ***The water sensor (O) is optional.***
The holder for the water sensor is on the float body.

1. Screw the water sensor (O) into the appropriate holder of the measuring cell, and secure it using the screw.
2. Slacken the screw (O1), insert the water sensor as far as it will go (O), and gently tighten the screw.



TM03 5859 1106

Fig. 11 Holder for water sensor

12.1.3 Temperature sensor

Note ***The Pt100 temperature sensor is integrated into the measuring electrode (D).***

12.2 Water connections

Caution ***Only tighten the union nut by hand. Do not use any tools!***

Caution ***Observe the local pressure! The permissible primary water pressure is 0.3 to 3.0 bar. Fit a pressure booster pump, if necessary. Check the tightness of the measuring cell.***

Caution ***To avoid a siphon effect: Let the sample water outlet (U2) point downwards. There must be no counter-pressure (open outflow)!***

1. Close the shut-off spindle for sample water inlet (V1) and outlet (V2).
2. Connect the sample water inlet and outlet to the connections for the sample water inlet (U1) and outlet (U2).

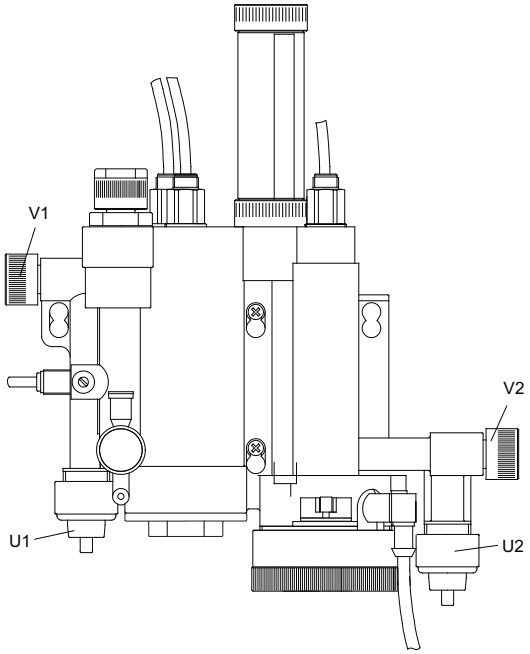


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Fig. 12 Water connections

12.3 Floater stopper

The measuring cell is supplied with a built-in floater stopper. If the sample water flow rate is increased, the float body (N) will therefore not move outside of the detection range of the water sensor (O). See the figure in section *12.3.1 Removing the floater stopper*. An alarm is not triggered, and the control output remains active.

The advantage of this is that in the event of frequent peaks in the sample water flow rate, the alarm is not continuously triggered, and the control output remains active.

Warning

If the sample water flow rate is set too high or is increased temporarily, no alarm is triggered and the control output remains active!

If the sample water flow rate is set too high or is increased temporarily, there is a risk that the sample water will overflow at the overflow mechanism. In this state, no alarm is triggered, and the control output remains active!

If the detection range of increased sample water flow rate is to be activated, the floater stopper must be removed. When the floater stopper is removed, an alarm is triggered, and the control output is disabled each time the sample water flow rate is increased.

12.3.1 Removing the floater stopper

1. Close the water supply to the measuring cell.

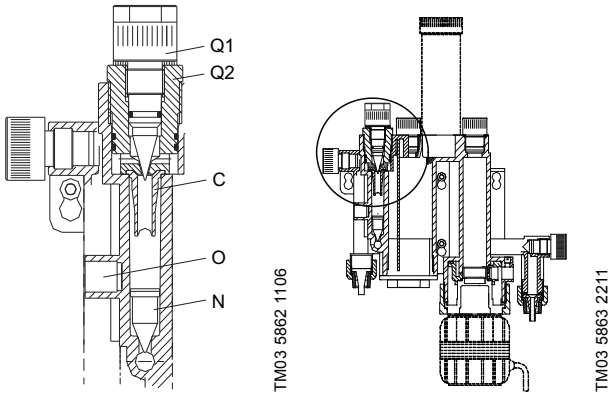

Fig. 13 Floater stopper

2. Unscrew the adjusting spindle (Q1) from the spindle inset (Q2).
3. Unscrew the spindle inset (Q2) from the fitting.

Fig. 14 Removing the floater stopper - part 1

4. Remove the floater stopper (C) from the fitting (for instance using a pair of tweezers).

Fig. 15 Removing the floater stopper - part 2

5. Screw the spindle inset (Q2) into the fitting with a maximum torque of 2 Nm.
6. Screw the adjusting spindle (Q1) into the spindle inset (Q2).
7. Open the water supply to the measuring cell, and set the desired water flow rate with the adjusting spindle (Q1).

12.4 Preparing the electrode cable for connection to the measuring amplifier

Note ***The preassembled systems are prewired.***

Warning

The electrical connection should be carried out by qualified personnel!

Observe the local safety regulations!

Protect the cable connections and plugs against corrosion and humidity.

Cables for single-rod electrodes or electrodes (A1, A2, B1)

1. Cut the electrode cables to the desired length + approximately 80 mm for the connections.
2. Remove 80 mm of the outer insulation.
3. Disentangle the braided screen until you reach the next part of the insulation, and twist it to form a wire.
4. Strip the braided screen (for instance using a shrink tube), and fit a wire end ferrule.
5. Remove the black (conductive) sheath of the insulated electrode wire until you reach the insulation.
6. Fit a wire end ferrule to the electrode wire.

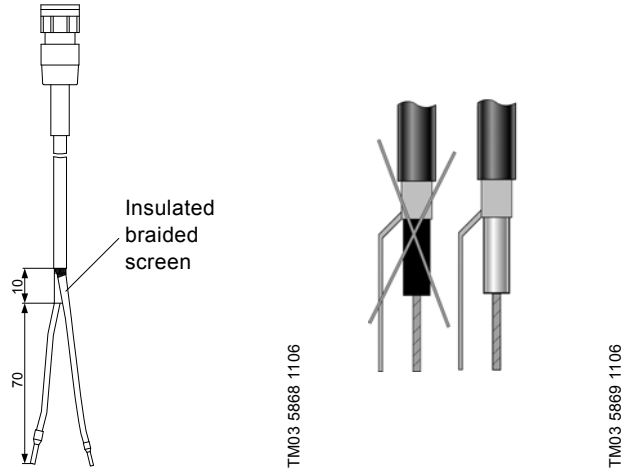

Fig. 16 Cable for single-rod electrode or electrodes (A1, A2, B1)

Cable from measuring electrode (D)

1. Cut the electrode cables to the desired length + approximately 105 mm for the connections.
2. Remove 105 mm of the outer insulation.
3. Disentangle the braided screen until you reach the next part of the insulation.
4. Cut the enclosed braided screen to 65 mm, isolate it (for instance using a shrink tube), and fit a wire end ferrule. Then remove the rest of the screen until you reach the insulation.
5. Cut the brown and white insulated wire of the measuring electrode and counter-electrode to 65 mm, and fit wire end ferrules.
6. Fit wire end ferrules to the blue and black insulated wires of the temperature sensor.

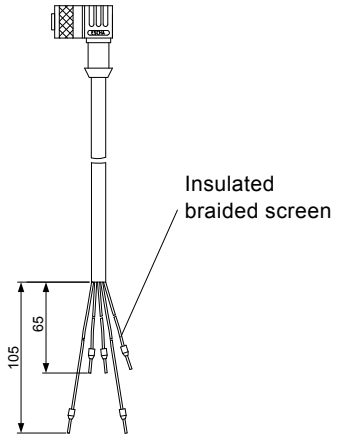

Fig. 17 Cable from measuring electrode (D)

Pin	Component
Pin 1 brown	Measuring electrode M
Pin 2 white	Counter-electrode G/C
Pin 3 blue	Pt100 temperature sensor
Pin 4 black	Pt100 temperature sensor

12.5 Electrical connections

Warning

The electrical connection should be carried out by qualified personnel!

Before connecting the supply cables, check that the supply voltage specified on the type plate corresponds to the local conditions!

Before connecting the supply cables, switch off the electricity supply!

Observe the local safety regulations!

Protect the cable connections and plugs against corrosion and humidity.

Connect an earth leakage circuit breaker in front of the measuring amplifier.

Preassembled systems

The preassembled systems are prewired.

1. Connect an earth leakage circuit breaker in front of the measuring amplifier.
2. Connect the electricity supply to the measuring amplifier.

Caution ***Observe the installation and operating instructions of the measuring amplifier!***

AQC-D3 measuring cell

Note ***The cables are not preconnected. See section 12.4 Preparing the electrode cable for connection to the measuring amplifier.***

Caution ***Observe the installation and operating instructions of the measuring amplifier!***

1. Connect electrodes to the corresponding terminals of the measuring amplifier.
2. Connect measuring electrodes (D) to the corresponding terminals of the measuring amplifier. Fit the screen according to the installation and operating instructions of the measuring instrument.

Caution ***The temperature sensor cannot be used with Conex DIS-D. Place the cables of the temperature sensor so that no short-circuit can occur!***

3. Connect the water sensor to the corresponding terminals of the measuring amplifier.
4. Connect an earth leakage circuit breaker in front of the measuring amplifier.
5. Connect the electricity supply to the measuring amplifier.

Caution ***Before connecting the supply cables, check that the supply voltage specified on the nameplate corresponds to the local conditions! Observe the installation and operating instructions of the measuring amplifier!***

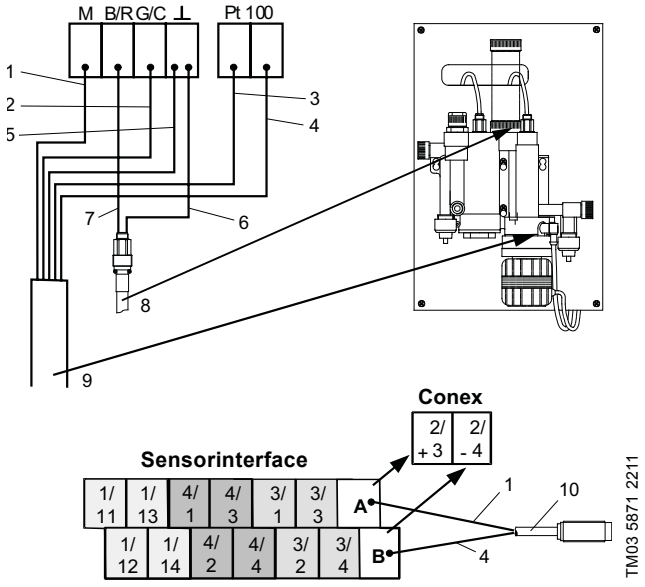

Fig. 18 Conex DIA-1 / DIA-2 / DIA-2Q for mounting in a control panel

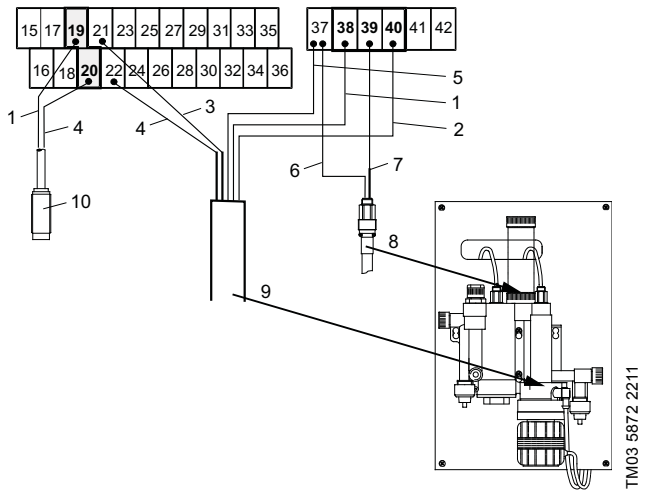

Fig. 19 Conex DIA-1 / DIA-2 / DIA-2Q for wall mounting

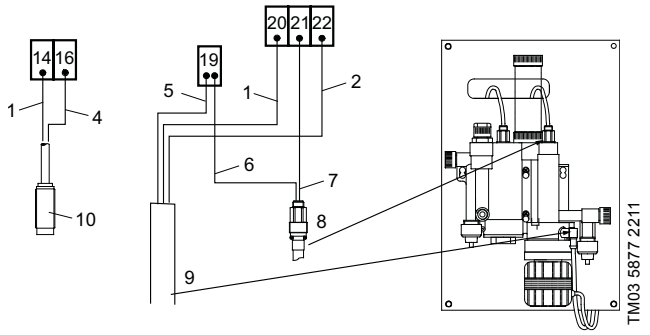

Fig. 20 Conex DIS-D

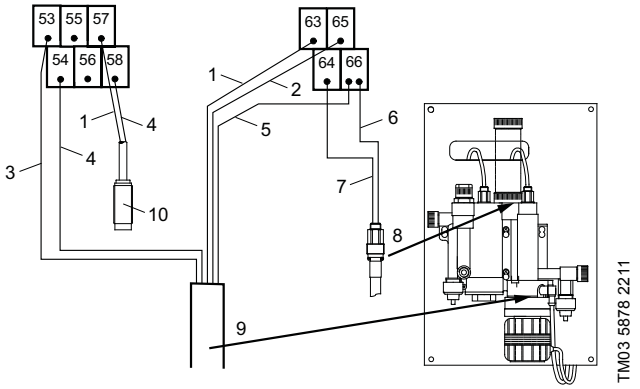

Fig. 21 DIP

Pos.	Component
1	Brown
2	White
3	Black
4	Blue
5	Screen
6	Outer conductor (screen)
7	Inner conductor
8	Reference electrode
9	Measuring electrode
	Counter-electrode
	Pt100 temperature sensor (not with Conex DIS-C)
10	Water sensor

12.6 Checks prior to start-up

- Check the tightness of the whole system.
- Check the electrical connections.

12.7 Switching on

Caution ***Observe the installation and operating instructions of the measuring amplifier and device controlled!***

Caution ***At first start-up or after a long-term stop: Let the system run for at least two hours to avoid faulty measurements and calibration!***

1. Close the bleeding spindle (L).
2. Open the shut-off spindle for sample water outlet (V2) 2-3 turns.
3. Gradually open the shut-off spindle for sample water inlet (V2) 2-3 turns.
   – Avoid turbulent flow!
4. Check that the cleaning wing (X) rotates.
   – Try, if necessary, to briefly increase the quantity of sample water with the adjusting spindle (Q1) in order to move the cleaning wing (X).
   – If the cleaning wing (X) still does not rotate, check and correct its position, if necessary. See section *14. Maintenance*.
5. Switch on the measuring amplifier.
6. Only switch on the device controlled after the first calibration, if necessary.

12.7.1 Setting the quantity of sample water

- Set the quantity of sample water with the adjustment spindle (Q1) so that a small amount of sample water runs through the ascending pipe (S) in the housing cylinder (T). (In order for the water sensor to work, the float body must be at the height of the water sensor.)

12.8 Calibrating the parameters Cl_2, ClO_2, O_3

Caution ***At first start-up or after long-term stop: Let the system run for at least two hours to avoid faulty measurements and calibration!***

Due to the electro-chemical behaviour of the measuring cell, no zero-point adjustment is necessary. Only the rate of rise (sensitivity) must be adjusted during calibration.

Caution ***During the calibration: Keep the pH value, sample water flow rate and water temperature constant.***

- Check the calibration after 24 hours, and repeat, if necessary!

12.8.1 Photometrical measurement

1. Open the bleeding spindle (L), and let the water run for a few seconds.
2. Take a water sample, and close the bleeding spindle (L).
3. Determine the concentration of the measuring parameter photometrically, for instance using the Grundfos DIT hand photometer.

Caution ***Observe the installation and operating instructions of the photometer!***

12.8.2 Calibration example based on chlorine measurement with pH compensation (not with Conex DIS-D)

Caution ***Observe the installation and operating instructions of the measuring amplifier!***

- If not done yet: Define the basic settings for the measuring amplifier.

Note ***When carrying out a chlorine measurement with pH compensation, the pH value must be calibrated first, since the pH value is used when calibrating the chlorine value!***

Calibrating the pH value

- DIP: Select the right-hand display for pH with the Select button.
- Conex DIA and DIP: Use the CAL button to select the calibration function CAL. The LED illuminates.

1. Fill buffer solution 1 from the supply bottle into a clean vessel.
2. Immerse the combination electrode into the buffer solution.
3. If necessary, enter the code number for Cal (or full) authorisation.
4. Change to the menu "calibration" with the OK button.
5. Select the measured variable "pH", and confirm with OK.
   – Selection possibilities: "cal. meas. value" (= measured value), "cal result" and "cal cycle" (= count-down function which triggers the alarm "Calibrate sensor" after a selectable time interval of 1-100 days).

6. Select the line "cal. meas. value" with UP/DOWN.

pH
cal. meas. value
cal result
cal cycle

7. Select one of the defined buffer solutions ("GRUNDFOS", "DIN/NIST", the optional setting "others"), and press OK.
   – The menu "temperature" is then selected automatically.

buffer
GRUNDFOS
DIN/NIST
others

8. Enter the temperature of the buffer solutions.
9. Press OK to automatically jump to the menu "buffer value 1".
10. "GRUNDFOS" or "DIN/NIST" buffer solutions: Select one of the three available buffer values.

buffer value 1
4.01 pH
7.00 pH
9.18 pH

Buffer 1

Once the buffer values have been read by the measuring amplifier, the temperature of the sample water and the measured signal are automatically read.

1. Then discard the buffer solution.
   – Do **not** return the buffer solution to the supply bottle!
2. Press OK to automatically jump to the menu "buffer value 2".

Buffer 2

1. Select one of the two other buffer values.
2. Press OK to automatically read the measured signal of buffer value 2, and compare it with the buffer values.
   – The calibration result is then displayed: sensor gradient + asymmetry potential.

CALDATA pH
slope
- 60.17 mV / pH
asymmetry pot.
19 mV

3. Then discard the buffer solution.
4. Go back to the menu "calibration" with ESC.

Then calibrate the chlorine value!

Calibrating the parameters chlorine, chlorine dioxide and ozone

- DIP: Select the left-hand display for chlorine with the Select button.

1. Select the calibration function with the CAL button. The LED illuminates.
2. Press OK to select the menu "calibration".
3. Select "chlorine", and confirm with OK.

chlorine
cal. meas. value
cal result
cal cycle

4. Enter the reference value (for instance the value measured photometrically using DIT).
   – The measured signal is then read in automatically and compared with the reference value.
   – The calibration result is then displayed: sensor gradient.

CALDATA chlorine
slope
34.67 µA / ppm

Reading calibration data in the diagnostics menu "Service"

- Select "Service" in the MAIN MENU with UP/DOWN, and press OK (on both displays with DIP).
  – The data of the last 10 calibrations can be read.

12.8.3 Calibrating the parameters chlorine, chlorine dioxide or ozone with Conex DIS-D

1. Press the CAL selector, and select the calibration menu.
   – The CAL LED next to the CAL selector illuminates.
   – To prevent overdosing, the controllers must be switched off, and the actuators closed.
   – When the calibration function has been selected with the CAL button, the measured-value display shows the current measured value.
2. Use UP/DOWN to select the photometrically or analytically determined reference value (for instance the value measured photometrically using DIT).
3. Start the calibration with OK.
   – The sensor data are then read in by an automatic read function, and the calibration carried out.
   – The gradient (sensitivity) of the sensor is calculated.
   – The calibration result is displayed immediately after the calibration.
   – The sensor gradient is displayed in µA/ppm.

Calibration result

- The result of the current (last) calibration can be displayed in the code menu at any time:
  – Code 51: display of calibrated gradient in µA/ppm.

Error message when reading in the current signal of the sensor system

- The alarm LED flashes.
- The code flashes.

13: Gradient error.

The alarm is triggered if the plausibility check establishes an upward or a downward violation of the following gradient ranges depending on the selected measuring cell:

Measuring cell	Lower limit	Upper limit
AQC-D3	2.5 µA/ppm	70.0 µA/ppm

- Press OK to acknowledge the error message and to return to the display level.
  – The calibration data are then imported.

Note

The instrument is operating in emergency mode! Eliminate the fault, see section 13.5 Fault finding chart, and calibrate again!

13. Operation

13.1 Function

Various oxidation agents are used for the disinfection of swimming-pool water and drinking water, for instance chlorine (Cl_2), chlorine dioxide (ClO_2) and ozone (O_3).

It is necessary to measure the concentration of the oxidation agent and to regulate its dosing for various reasons:

- The disinfection effect is too weak at too low concentrations.
- Too high concentrations have consequences:
  - danger to health
  - unpleasant odour and taste
  - corrosion damage
  - increased operating costs.

The AQC-D3 potentiostatic measuring cell is used for measuring the concentration of chlorine (Cl_2), chlorine dioxide (ClO_2) or ozone (O_3) and is equipped with additional holders for pH single-rod electrodes and redox single-rod electrodes, and also for a water sensor and an integrated Pt100 temperature sensor.

The preassembled system with Conex DIA, Conex DIS and DIP are used when the values of decontamination agents, pH and redox-potential have to be determined and controlled.

The basic element of the preassembled systems is the AQC-D3 potentiostatic measuring cell.

13.1.1 Functional principle of measurement

- Sample water is taken at a representative position and passed to the measuring cell via an integral filter.
  - The water flow rate can be adjusted on the measuring cell.
  - A water sensor (optional), for example, serves to trigger an alarm or to switch off the control function if there is a sample water deficiency.
  - The agent to be determined (Cl_2, ClO_2 or O_3) is measured at the noble-metal electrode.
- The material to be determined generates an electric current:
  - in the µA range
  - proportional to the concentration of the parameters Cl_2, ClO_2 and O_3.
  - The measuring cell is controlled by a potentiostat integrated into the measuring amplifier
  - A constant voltage is applied to the measuring electrode. An exactly defined potential of the working electrode is retained by means of the third electrode (reference electrode). This results in a linear response for the measuring cell as well as a stable zero point for the measurement.
- The Conex or DIP measuring amplifiers and controllers
  - amplify the current
  - calculate it using the calibration parameters
  - display the concentration as a digital value
  - control a gas dosing unit or a dosing pump as the device controlled.

13.1.2 Electrode cleaning

The measuring electrode and the counter-electrode are continuously cleaned of deposits by a cleaning wing which has a gentle, yet effective action.

- This ensures uniform sensitivity for the measuring cell over a long period.
- The cleaning wing is driven hydraulically.

13.1.3 Influence of temperature

The current generated on the electrodes depends on the temperature of the sample water.

- The measured value increases by approx. 4 % per 1 °C increase.
- Temperature variations can be compensated for by the measuring amplifier if the temperature compensation function is activated.
  - The temperature can be measured using a Pt100 temperature sensor integrated into the measuring electrode.
  - The temperature measuring signals are transferred to the measuring amplifier and calculated using the electrode signals.

13.1.4 Influence of the pH value on the chlorine measurement

Free, active chlorine is considered as the total of molecular chlorine gas (Cl_2), hypochlorous acid (HOCl) and hypochlorite anions (OCl-). Dissolved chlorine gas in molecular form practically does not exist at the application-dependent pH values (pH 4.5 to 8.5), but is subject to hydrolysis in the presence of water according to the equation

$$Cl_2 + H_2O \leftrightharpoons HOCl + HCl$$

The resulting hypochlorous acid is the actually effective compound for disinfection of the water. The dissociation of acid to anions is primarily according to an equilibrium dependent on the pH value according to the equation

$$HOCl + H_2O \leftrightharpoons H_3O+ + OCl-$$

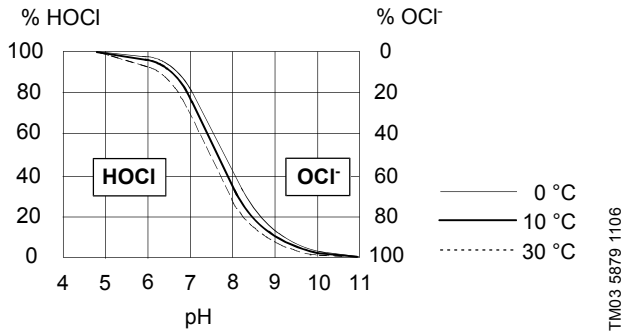

Fig. 22 HOCl-OCl diagram

The potentiostatic measuring cell for chlorine primarily only determines the portion of hypochlorous acid that is relevant for disinfection.

Since the dependence on the pH value is particularly large in the actually relevant range between pH 7 and pH 8.5, this dependence must be compensated for in the measuring amplifier if the pH value varies considerably. The pH value must therefore also be measured, and the pH compensation function must be activated on the measuring amplifier.

13.2 Operation

13.2.1 Switching on

See section *12.7 Switching on*.

13.2.2 Operating state

Caution ***Observe the installation and operating instructions of the measuring amplifier and the device controlled (for instance a gas dosing unit or dosing pump)!***

- The operation of the measuring cell in the operating state can be taken from the installation and operating instructions of the relevant measuring amplifier.

Caution ***The measuring cell may be damaged if the reference electrode B1 is not connected, and the electricity supply is switched on!***

13.2.3 Adjusting / setting the quantity of sample water

- Set the quantity of sample water with the adjustment spindle (Q1) so that a small amount of water runs through the ascending pipe (S) in the housing cylinder (T).
- When using a water sensor (O, optional): In order for the water sensor (O) to work, the float body (N) must be at the height of the water sensor (O).

Caution ***Measuring cell with floater stopper (default upon delivery): If the sample water flow rate is set too high or is increased temporarily, no alarm is triggered, and the control output remains active! If the sample water flow rate is set too high or is increased temporarily, there is a risk that the sample water will overflow at the overflow mechanism. In this state, no alarm is triggered, and the control output remains active!***

Caution ***Measuring cell without floater stopper (see section 12.3.1 Removing the floater stopper): If the sample water flow rate is too high, the float body (N) will move outside of the detection range of the water sensor (O). In this state, an alarm is triggered via the connected measuring amplifier, and the control output is switched off, if necessary. The flow rate is set correctly if the float body (N) is at the height of the water sensor (O).***

Note ***By increasing the sample water flow rate, the delay time of the flow armature can be reduced.***

13.3 Switching off

Caution ***To avoid a dosing error, the device controlled (for instance a gas dosing unit or dosing pump) must be switched off each time the measuring system is switched off. Observe the installation and operating instructions of the measuring amplifier and device controlled!***

13.3.1 Short-term stop (up to one week)

1. Close and/or switch off the device controlled (for instance a gas dosing unit or dosing pump).
2. Wait until the display of the measuring amplifier is at zero.
3. Switch off the measuring amplifier.
4. Close the connection to the sample water inlet (U1) and outlet (U2).

Caution ***To protect the electrodes, do not drain the water! Make sure that the water level in the flow fitting F is sufficiently high for the reference electrode B1 to be immersed at least 2 cm during device stop.***

13.3.2 Long-term stop

1. Close and/or switch off the device controlled (for instance a gas dosing unit or dosing pump).
2. Wait until the display of the measuring amplifier is at zero.
3. Switch off the electricity supply to the measuring amplifier.
4. Close the connection to the sample water inlet (U1) and outlet (U2).
5. Open the bleeding spindle (L) and deaeration spindle (J), and drain water.
6. Remove the reference electrode (B1), fit thread protective caps, and clean the electrode.
7. Remove the pH (A1) and redox single-rod measuring chains (A2), if necessary. Fit thread protective caps, and clean the electrodes.
8. Fit protective caps on the electrodes. The protective caps must be filled with 3-molar potassium chloride solution.

Caution ***Observe the installation and operating instructions of the electrodes!***

9. Store electrodes with protective caps in a dry place. If they are stored for an extended period of time, add a 3-molar potassium chloride solution, if necessary.
10. Carefully unscrew the screwed part (H), and empty it of water, if any.

Caution ***Carefully remove the screwed part (H)! The cleaning wing (X) and inlet chamber (W) are loose on the measuring electrode (D) and may fall out!***

11. Before starting up again, and if it is very dirty, clean the whole flow armature (F). See section *14. Maintenance*.

13.4 Switching on again

Caution ***Observe the installation and operating instructions of the measuring amplifier and device controlled (for instance a gas dosing unit or dosing pump)!***

13.4.1 After short-term stop

Note ***Fill the measuring cell with water.***

1. Open the connection to the sample water outlet (U2).
2. Open the connection to the sample water inlet (U1).
3. Check the quantity of sample water.
4. Switch on the measuring amplifier.

Caution ***Let the system run for at least two hours to avoid faulty measurements and calibrations!***

5. Take a photometrical measurement.
6. Recalibrate, if necessary. See section *12.8 Calibrating the parameters Cl_2, ClO_2, O_3*.
7. Switch on the device controlled (for instance a gas dosing unit or dosing pump), if necessary.

13.4.2 After long-term stop / inspection

If the measuring cell has been switched off for a long period of time or has been emptied, for instance for inspection, is it necessary to start up the measuring cell as if it was the first start-up. See section *12.6 Checks prior to start-up* and *12.7 Switching on*.

13.5 Fault finding chart

Caution **_Observe the installation and operating instructions of the measuring amplifier and controller!_**

Fault	Cause	Remedy
1. No display. No electricity supply to the measuring cell.	a) A disinfection or oxidation agent is missing in sample water.	Check the concentration by making a reference measurement. Check the dosing units, and activate dosing. Check the settings of the measuring amplifier.
	b) The electrode cable connection is interrupted.	Remake the connection. Replace damaged cables.
	c) No or too low sample water flow rate.	Clean the filter, check the flow rate, and check the sample water inlet pressure.
	d) The measuring electrodes are faulty.	Replace the measuring electrode.
	e) The measuring electrodes are contaminated or made passive by deposits.	Dismantle, clean or replace the measuring electrode.
2. The measured value is lower than the reference measurement.	a) The measuring electrodes are faulty.	Replace the measuring electrode.
	b) The measuring electrodes are contaminated or made passive by deposits.	Remove, clean or replace the measuring electrode.
	c) The temperature has fallen since the calibration.	Recalibrate. Activate the automatic temperature compensation, where applicable.
	d) The system has run too short time prior to calibration.	Let the system run for at least two hours, and recalibrate.
	e) Unsuitable chlorination agent.	Only use chlorine solutions such as chloric gas, sodium hypchlorite and chlorinated lime. Do not use organic products such as trichlorine isocyanic acid, as these cannot be measured if this procedure is used.
	f) Incorrect photometric reference measurement during calibration.	Check the reference measurement, and take another measurement. Repeat the calibration.
	g) The pH value for the chlorine measurement has risen since the calibration.	Keep the pH value constant. Recalibrate. Activate the pH value compensation.
	h) The quantity of sample water is set too low.	Check and set the quantity of sample water. Check the filter, and clean it, if necessary.
	i) The cleaning wing is blocked.	Fit the cleaning wing correctly.
3. The measured value is higher than the reference measurement.	a) The temperature has risen since the calibration.	Recalibrate. Activate the automatic temperature compensation.
	b) The pH value for the chlorine measurement has fallen since the calibration.	Keep the pH value constant. Recalibrate. Activate the pH value compensation, where applicable.
	c) Interference by other oxidation agents in the sample water.	Analyse the sample water. Check the chemicals used.
4. The measured value is unstable.	a) Interferences on the signal lines.	Check the screen and the connections to the amplifier.
	b) The reference electrode diaphragm is blocked.	Clean the diaphragm (on the side at the bottom of the reference electrode) using diluted hydrochloric acid (10 %). Replace the reference electrode, if necessary.
	c) The measuring electrode is contaminated or faulty.	Clean the measuring electrode using a diluted abrasive cleaning agent. Replace the measuring electrode, if necessary.
	d) The filter is contaminated, and the quantity of sample water is therefore too low.	Check the filter, and clean it, if necessary.
	e) Siphon effect at the sample water outlet.	Ensure a flow of sample water with no counter-pressure.

14. Maintenance

14.1 Intervals for cleaning and maintenance

Caution ***Prior to maintenance work: Switch off the system as described in section 13.3 Switching off!***

- Clean the filter
  - – if high contamination is evident, or if the pressure drops considerably.
- Clean the whole flow armature
  - – if high (visible) contamination is evident.
  - – if faults occur.
  - – before starting up again after a prolonged stoppage.
- Replace the electrodes.
  - – Grundfos recommends that you replace the reference electrode and, if necessary, the redox or pH single-rod electrode after 12 months.
  - – The measuring electrode is wear-resistant and does not have to be replaced on a regular basis.

14.2 Cleaning and replacing the filter

- Required tools and aids:
  - – water
  - – soft brush.

1. Close the connection to the sample water inlet (U1) and outlet (U2).
2. Unscrew the filter cartridge (P).
3. Unscrew the plastic screw thread (P1) at the upper end of the filter cartridge (P), using a screwdriver or coin, if necessary.
4. Remove the filter strainer (P2) from the filter receptacle (P3), and clean it under running water. Use a soft brush, if necessary.
5. If damaged: Replace the filter strainer (P2).
6. Re-assemble the filter cartridge (P) in reverse order.
7. Check the tightness of the filter cartridge (P).

Note ***After cleaning, check the sample water flow rate, and adjust it, if necessary.***

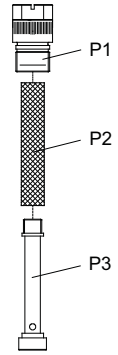

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Fig. 23 Filter

14.3 Cleaning the flow armature

14.3.1 Removing the measuring cell

Caution ***The measuring cell must only be removed by authorised personnel.***

1. Close the water inlet, and switch off the measuring cell.
   - – Close the shut-off spindles of the sample water inlet (V1) and outlet (V2).
   - – Close and/or switch off the device controlled (for instance a gas dosing unit or dosing pump).
   - – Wait until the display of the measuring amplifier is at zero.
   - – Switch off the electricity supply to the measuring amplifier.
2. Empty the measuring cell.
   - – Open the bleeding spindle (L) and deaeration spindle (J), and drain the water.
   - – Unscrew the connections to the sample water inlet (U1) and outlet (U2).
3. Remove the electrodes and sensors.
   - – If a water sensor is fitted: Unscrew the screw (O1) on the water sensor (O), and remove the sensor.
   - – Unscrew the plug for the measuring electrode (E), and remove the electrode.
   - – Remove the reference electrode (B1). Fit thread protective caps, and clean the electrode.
   - – Remove the pH (A1) and redox electrodes (A2), if necessary. Fit thread protective caps, and clean the electrodes.
   - – Fit protective caps on the electrodes. The protective caps must be filled with 3-molar potassium chloride solution.

Caution ***Observe the installation and operating instructions of the electrodes!***

- – Store electrodes with protective caps in a dry place.

Note ***Carefully remove the screwed part (H)! The cleaning wing (X) and inlet chamber (W) are loose on the measuring electrode (D) and may fall out! Keep O-rings!***

4. Unscrew the measuring electrode.
   - – Unscrew the screwed part (H) from the flow armature (F) with the slide (G1), and remove them carefully.
   - – Keep O-rings (W1).
   - – Remove the cleaning wing (X) and inlet chamber (W).
5. Remove the flow armature.
   - – Slacken the screws of the flow armature (do not unscrew completely), press the flow armature upwards, and remove it from the mounting plate.

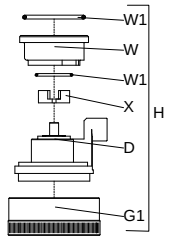

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Fig. 24 Exploded view of screwed part

14.3.2 Dismantling the measuring cell

1. Remove the housing cylinder and ascending pipe.
   – Remove the housing cylinder (T), and dismantle it.
   – Remove the ascending pipe (S).
2. Remove the sample water regulating device and float body.
   – Remove the valve insert (Q2) and adjusting spindle (Q1), and separate them.
   – Remove the float body (N).
3. Remove the filter.
   – Unscrew the filter cartridge (P).
   – Slacken the screw cap for the filter (P1) at the upper end of the filter cartridge (P).
   – Remove the filter strainer (P2) from the filter receptacle (P3).
4. Remove the calibration cup and evacuation spindle.
   – Remove the calibration cup (I) and evacuation spindle (J), and separate them.
5. Remove the shut-off spindles and the bleeding spindle.
   – Unscrew the shut-off spindles of the sample water inlet (V1) and outlet (V2) and the bleeding spindle (L).

14.3.3 Cleaning the measuring cell

- Required tools and aids:
  – soap suds, possibly diluted hydrochloric acid (5-10 %), water
  – abrasive domestic cleaning agent (for instance ATA, VIM).
  – The flow armature (F) can be cleaned with conventional soap suds.
  – If high contamination or furring is evident, clean the dismantled flow armature (F) briefly with diluted hydrochloric acid (max. 5-10 %).

Warning

Observe the safety regulations when using hydrochloric acid! When cleaning with hydrochloric acid it is absolutely necessary to wear safety goggles.

Caution ***Before using other detergents, check the chemical resistance of the materials, as they may destroy some components.***

Caution ***Do not clean electrodes, filters, float bodies or other metal parts using hydrochloric acid.***

1. Clean the metal surfaces of the measuring electrode (D) and the float body (N) with an abrasive domestic cleaning agent if there are deposits.
2. Clean the filter strainer (P2) under running water. Use a soft brush, if necessary.
3. Carefully clean all plastic parts with soap suds.
4. Use hydrochloric acid (5-10 %) for deposits.
5. Carefully rinse all parts with clean water.
6. Replace any damaged parts.

14.4 Assembling the measuring cell

Caution ***Only tighten screw parts by hand; do not use tools! Risk of leaking! Ensure that all O-rings are fitted correctly!***

- Re-assemble the measuring cell in reverse order.
  – Screw in the shut-off spindles of the sample water inlet (V1) and outlet (V2) and the bleeding spindle (L).
  – Assemble and screw in the calibration cup (I) and evacuation spindle (J).
  – Assemble and screw in the filter cartridge (P).
  – Insert the float body (N) with the sharp end facing downwards into the measuring tube (M).
  – Tightly screw in the valve (Q2), and screw in the adjusting spindle (Q1).
  – Fit the ascending pipe (S). Screw in the housing cylinder (T).

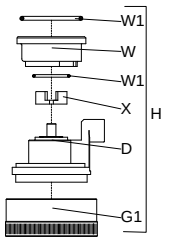

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Fig. 25 Exploded view of screwed part / inlet chamber

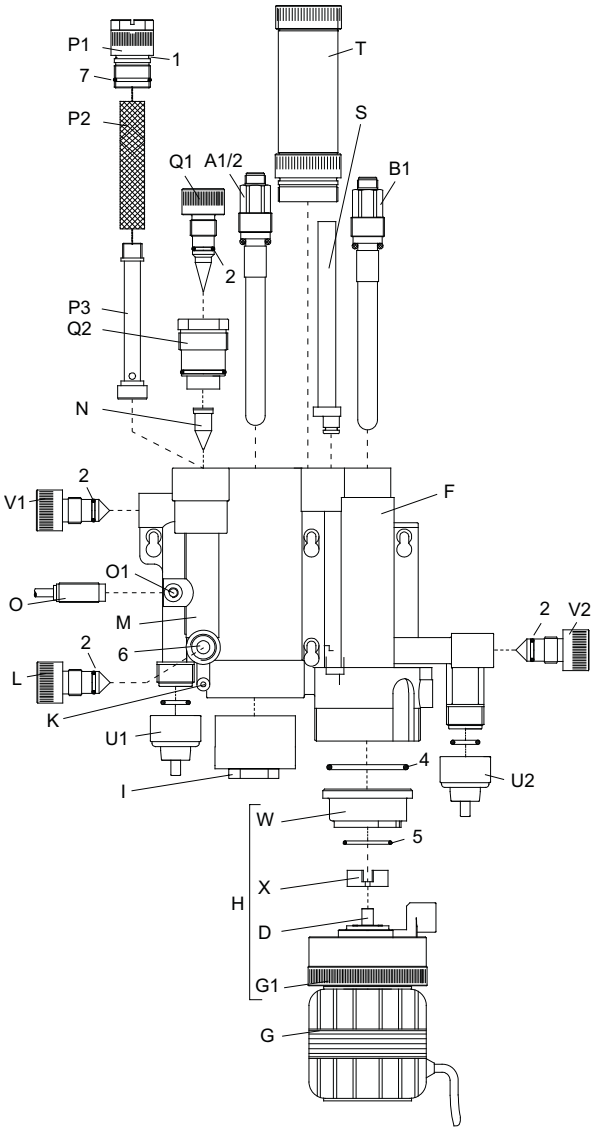

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Fig. 26 Exploded view of AQC-D3

15. Starting up the measuring cell

See section *12. Start-up*.

16. Spare parts and accessories

16.1 Electrodes, sensors and cables

Product number	Component
96609182 (321-252)	Cable for reference electrode, pH or redox single-rod electrode, 1 m
96609183 (321-250)	Cable for reference electrode, pH or redox single-rod electrode, 3 m
96609184 (321-140)	Cable for measuring electrode, 1 m
96609185 (321-141)	Cable for measuring electrode, 3 m
96609172 (45.10212-1)	Water sensor with cable, 1 m
96609173 (45.10212)	Water sensor with cable, 3 m
96609174 (314-605)	Reference electrode
96609175 (553-1561)	Measuring electrode, gold
96609176 (553-1562)	Measuring electrode, platinum
96609158 (312-100)	Single-rod measuring cell pH (standard)
96609162 (313-100)	Single-rod measuring cell redox (standard)
96622944 (313-105)	Redox electrode (in combination with DIP only)
96622950 (553-1563)	Cleaning wing

16.2 Other parts

Product number	Component		
96609171 (553-1529)	Spare parts set		
	Pos.	Designation	Quantity
	1	O-ring 20 x 2	1
	2	O-ring 10 x 2	4
	3	O-ring 50 x 2	1
	4	O-ring 45 x 3	1
	5	O-ring 26 x 2	1
	6	O-ring 8.3 x 2.4	1
	7	O-ring 7 x 2.5	1
96624812 (553-1593)	Screw plug with O-ring for holder A (pH or redox single-rod measuring electrode)		
91834713 (12.4568)	Filter strainer (P2)		

17. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use appropriate waste collection services.
2. If this is not possible, contact the nearest Grundfos or Grundfos company or service workshop.

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