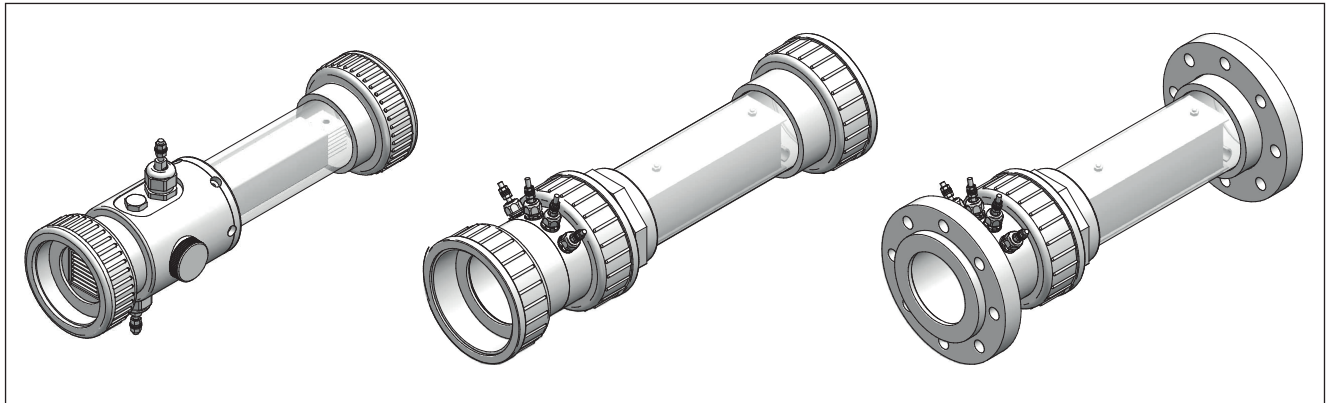


TECHNOSTAR 2000 ST, AT, AT-F

Flow-through chlorine electrolysis (chlorine electrolysis system in inline operation) with a capacity of 80 ... 2x250 g/h



EN

01

Operating instructions

Read this operating manual before using the equipment.

To be retained for future reference.

Key data of the delivered product (Enter after installation)		
TECHNOSTAR	Part number	91210 ____
	Serial number	91 _____
	Type	____ 2000 ST-80 (2 cells)
		____ 2000 ST-120 (3 cells)
		____ 2000 ST-160 (4 cells)
		____ 2000 AT-250 (1 cell)
		____ 2000 AT-2x250 (2 cells)
Electrolytic cell(s)	Part number	91 _____
	Serial number(s)	1 91 _____
		2 91 _____
		3 91 _____
		4 91 _____
Date of delivery		____ / ____ / 20____
Order		

General

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Area of responsibility	Person / deputy	Address	Telephone / mobile
Operating company of the system			
Operating the system			
Service and maintenance of the system			
Supplier / manufacturer of the system			
Electrics			
Medical emergency			

General

1 General

1.1 Introduction

This operating manual provides significant assistance in ensuring the successful and safe running of the TECHNOSTAR flow-through chlorine electrolysis system, subsequently referred to as “the system”.

The operating manual contains important information which enable the safe, correct and economical operation of the system. Compliance with the specifications of the operating manual help you to avoid dangers, minimise repair costs, reduce down time and increase the reliability and service life of the system.

The operating manual for the Technostar 2000 AT, 2000 ST and 2000 PT must always be available where the system is located and it has to be read and used by every person who is assigned to working on the system. This includes:

- the assembly
- the servicing and repair work
- the servicing (maintenance and care)
- the transport

1.2 References to intellectual property rights

This operating manual must be treated confidentially. Only authorised persons should have access to it. It may only be given to third parties with the written consent of the manufacturer.

All documents are protected in the sense of the copyright law. It is forbidden to forward on and copy the documents, even in part, as well as to use and communicate their contents, insofar as this is not expressly conceded in writing.

Violations are punishable and incur an obligatory payment of damages. The manufacturer retains all commercial property rights.

1.3 Details for the operator

This operating manual is a key part of the TECHNOSTAR flow-through chlorine electrolysis system. The operator ensures that the service personnel learn these guidelines.

The operating manual is to be supplemented by the operator regarding the operating instructions due to national regulations for Health and Safety at Work and Environmental Protection, including the information on the responsibilities of supervision and obligations to report for the observance of operational specifics, e.g. concerning labour organisations, operational sequences and appointed personnel.

Besides the operating manual and the obligatory regulations for Health and Safety at Work applicable in the country of use as well as in the place of use, the recognised specialist technical regulations for safe and professional work must also be observed.

The operating company of the TECHNOSTAR flow-through chlorine electrolysis system may not perform any alterations, extensions or conversions to the TECHNOSTAR system which could impair safety, without the consent of the manufacturer.

This also applies to the installation and setup of safety devices.

Any spare parts used must comply with the manufacturer's technical specifications. This is always guaranteed in the case of original spare parts.

Only employ trained or instructed personnel. Clearly specify the responsibilities of the personnel for operating, servicing and repairing the system.

1.4 Instruction and training course assistance

As a contractor/operator you are obligated to inform and/or instruct the operating personnel about existing provisions of law and accident prevention regulations as well as about existing safety regulations at the plant. In doing so the different technical qualifications have to be taken into account.

The operating personnel must have understood the training and it must be ensured that the training is adhered to.

Only in this way can you ensure that your personnel work in a safety conscious and risk aware manner. This should be controlled on a regular basis. As the contractor/operator you should therefore obtain confirmation of each of the employee's attendance in writing.

On the following pages you will find examples of the training course topics, as well as a main form to copy for the confirmation of attendance.

Should the operating personnel require further training after the system has been handed over to the operating company, please contact the manufacturer to make the necessary arrangements.

1.5 Example of training course topics

For safety

- Accident prevention regulations
- General legal provisions
- General safety precautions
- Action to be taken in an emergency
- Safety precautions for operating
- Operating the safety equipment on the TECHNOSTAR flow-through chlorine electrolysis systems
- Definition of symbols and signs

To operate

- How to operate the controls
- Explanation of the operating system for the operating personnel
- Special experience in handling the TECHNOSTAR flow-through chlorine electrolysis systems
- Elimination of operational disturbances

For maintenance and service instructions

- Cleaning the system
- Exchange of replacement parts

Confirmation of the training instruction

Topic of the training instruction:

Date:

Training instructor:

Training instructor s signature:

No.	Surname, forename	Signature
1		
2		
3		
4		
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21		

General

2 Safety

2.1 General

The TECHNOSTAR flow-through chlorine electrolysis systems, subsequently referred to as the systems have been constructed in accordance with the state-of-the-art and recognised safety-related rules.

Nevertheless, use of the system can still pose dangers for the user or a third person and cause damage to the system and other property if it is:

- Operated by untrained or un-instructed personnel.
- Not deployed in accordance with its intended use.
- Is subject to incorrect maintenance and servicing.

2.2 Use in accordance with regulations

The TECHNOSTAR flow-through chlorine electrolysis systems are designed exclusively to generate hypochlorous acid from the salt (NaCl solution) released in the swimming pool water. The salt content of the pool water usually amounts to a minimum of 0.35 %.

Irrespective of the natural salt content of the chlorides in the water for swimming and wading pools, a minimum of 1.7 kg of salt (sodium chloride) must be added to the water used for the "in situ" production of the biocidal active agent "hypochlorous acid" for every kg of chlorine to be produced as a precursor. In accordance with the biocide ordinance, as of 01.09.2015, the member states of the European Union may only use precursor for biocidal active agents produced "in situ" and which are used as disinfectants. These precursors must satisfy the quality requirements made of these substances by DIN EN and be sourced from a manufacturer or supplier which is listed in accordance with article 95 of the biocide ordinance. Please ask your salt supplier to confirm conformity with the biocide ordinance (certificate).

The quantity of sodium chloride (NaCl) to be added in accordance with the biocide ordinance is calculated from the actual chlorine production, which can be determined either via the measuring and control technology (free chlorine; Y value) or the stand time of the electrodes, or using the ampere hour counter on the system. The salt can be added to the bathing water well in advance.

Biocidal active agent:

active chlorine generated from sodium chloride by electrolysis:

EC-no. mixture;

CAS no. not applicable

Precursors:

Sodium chlorite:

EC-no. 231-598-3;

CAS-no. 7647-15-5;

Special salt for the electrolytic cell

DIN EN 16401 and 14805

The TECHNOSTAR flow-through chlorine electrolysis systems may only be operated with accessories authorised for the purpose by the manufacturer.

Another or a further use is considered as not being in compliance with the intended use. The operating company of the system is liable for all damage resulting from such use. This equally applies to any modifications made to the system.

Observance of the directions described in this operating manual and in the supplied product's documentation concerning safety, how to operate, repair/service the system is also an integral part of its correct employment.

Comply with the specifications of the section Technical data and the original documentation of any supplied products.

2.3 Details of signs and symbols

The following terms and/or signs are used in this operating manual for references to safety and particularly important information:



DANGER!

Refers to imminent danger. Failure to follow this instruction may lead to death or extremely serious injuries.



WARNING

Refers to a potentially hazardous situation. Failure to follow this instruction may lead to death or severe injury.



CAUTION!

Refers to a potentially hazardous situation. Failure to follow this instruction may lead to minor injury or damage to property.



ATTENTION!

Failure to follow these safety instructions may endanger the machine and its functions.



PLEASE NOTE

This refers to additional information to facilitate operation and ensure the smooth running of the equipment.

All WARNINGS have to be precisely adhered to!

Observe the safety directions specified in each case and conduct yourself in a particularly careful manner in these cases! Pass on all safety instructions to other users, too!

Beside the instructions stated in this operating manual all the general valid regulations for safety and the prevention of accidents have to be respected!

Comply with all instructions to ensure intended use of the system. Pass on all instructions to other users.

The instructions and symbols directly mounted on the system have to be adhered to, for example warning signs, operating signs, direction of rotation arrows, component markings, etc.

The instructions and symbols directly mounted on the system must not be removed and have to be kept completely legible!

2.4 Residual risk

Even if all safety regulations have been adhered to residual risks still remain when operating the system.

All the people who work on the system have to be aware of these residual risks and obey the instructions, which are there to prevent these residual risks leading to accidents or damages.



DANGER!

Electric shock when working on live components!

Only certified electricians may carry out work on the electrical fittings.

2.5 Safety tips for the operating personnel

The system may only be used if it is in a technically perfect condition as well as only if it is used for its intended purpose, safely whilst being aware of the dangers and observing this operating manual! All disturbances and in particular those that can jeopardise the safety have to be immediately eliminated!

Each person who is assigned to the installation, start-up, operation and maintenance of the system has to have fully read and understood

this operating manual before commencing work in particular the section Safety. Once the work has begun it is too late. This applies more so for personnel who are only occasionally employed on the system.

The operating manual must be accessible at all times at the system.

No liability is assumed for damages and accidents caused due to non-compliance of the operating manual.

Observe the relevant regulations for accident prevention as well as the other general recognised technical safety and occupational health regulations.

The responsibilities for the various activities in the areas of operation, maintenance and servicing must be clearly defined and adhered to. This is the only way to avoid incorrect handling, in particular in dangerous situations.

The operating company is responsible for ensuring that the operating and maintenance personnel wear personal protective equipment when using acid during the acidification of the electrolytic cell. This includes in particular protective face cover, rubber or plastic boots, protective gloves and a protective apron.

If changes appear in the way the system operates that are relevant to safety or if disturbances arise, the system must be stopped immediately and the incidence has to be reported to the responsible place/authority!

Keep the first aid kit (first aid box, eye wash bottles, etc.) within easy reach!

The location and operation of fire extinguishers has to be made known and the ways to report a fire and for fire fighting have to be observed.

The instructions for service work in the section Maintenance and Servicing have to be observed without fail during inspections, maintenance and repairs on the system and the safety devices!

Work on the flow-through chlorine electrolysis system may only be performed by reliable personnel. The legal minimum age must be observed!

Only use trained or instructed personnel!

Personnel to be trained, taught, instructed or those placed in an apprenticeship may only work on the system whilst under the constant supervision of an experienced person!

2.6 Safety instructions for operating the system

2.6.1 General

When performing work that affects the

- Operation
- Refitting
- Inspection
- Maintenance
- Repair work,

it is imperative that you comply with the activation and shutdown procedures established in this operating manual and the servicing instructions.

The system may only be started if it is assembled and ready to operate.

The system may only be operated if all the guards and safety devices are present and fully functional, e.g. detachable guards!

The system has to be checked at least once every shift for externally recognisable damage, in particular screws, seals and loose parts. If

there are changes (including that of the operational behaviour) report this immediately to a responsible specialist.

When there is a malfunction immediately stop and secure the system. The disturbances are to be eliminated by specialists who are trained to do so.

2.6.2 Safety instructions for servicing

Inform the operating personnel before starting special and servicing work. There must be a designated supervisor.

The default periods, or those given in the operating manual, for repeat checks/inspections have to be observed.

The appropriate tools have to be used for carrying out service and repair work tasks.

The system's main switch must be at position 0 for maintenance, repair and service work. A warning sign has to be attached that prohibits the circuit switching and refers to the work on the system.

In order to avoid electric shocks do not open any electrical components or casings and covers.

Do not touch any damaged, sharp or, in particular, live parts.

Regularly check cables, hose connections and in particular mobile parts for damages and if necessary replace.

Regularly inspect seals on the electrical casings and if necessary replace.

Tighten up loose bolt connections again during maintenance and repair work! If required, tighten the screws with a torque wrench provided for this.

If it is necessary to disassemble safety devices during maintenance or repairs, the assembly and inspection of the safety devices has to be carried out immediately after the maintenance and repair work is completed!

Do not use any aggressive or cleaning agents containing solvents. Use cleaning cloths without fibres.

Only use mild water-based cleaning agents. Observe the manufacturer's instructions. Do not use any organic solvents, as there is a risk of fire and explosion!

Ensure for a secure and environmentally friendly disposal of operating materials and auxiliary substances as well as of replacement parts!

2.7 Electricity

Work may only be carried out on the electrical fittings by an electrician or instructed personnel under the direction and supervision of an electrician in accordance with the electro-technical regulations!



PLEASE NOTE

Only use original fuses with the prescribed amperage!



DANGER!

Never carry out work on live parts!

Isolate/disconnect components that are to be inspected, serviced or repaired. Secure disconnected/isolated equipment from being unintentionally or automatically switched on again (secure fuses, block disconnectors, etc.). First check that the disconnected/isolated components are de-energised, then earth and short circuit and also disconnect/isolate neighbouring components that may possibly still be live.

If it is necessary to carry out work on live components (only in exceptional cases!) an additional person must be called in, who can activate

Safety

the EMERGENCY-OFF button in case of an emergency or the main switch. Only use isolated-voltage tools.

Regularly check the cable for damages and replace if necessary.

2.8 Corrosion

A concentration of chloride ions (Cl-) in swimming pool water which significantly exceeds the limit value of the German drinking water ordinance (*Trinkwasserverordnung*) can result in corrosion of the components of the swimming pool, the swimming pool technology or the building.



CAUTION!

All materials used or to be used must be resistant against salt and sea water (see DIN 50930 part 4). Stainless steel parts must be drawn from material class 4 (or better) 5.

All metal parts used in swimming pools must be earthed and connected to a potential compensation bar (compare VDE 0100 Part 702).

2.9 Brine tank, brine supply

A brine supply can optionally be installed in the pool circulation to ensure automatic salt supply.



PLEASE NOTE

The brine tank and the brine supply must comply with the specifications of the relevant German water resources legislation (*Wasserhaushaltsgesetz §19*).

2.9 Information signs at the system

The following information signs are mounted:



Earth wire connection!

This marking is affixed next to the earth screw.

The earth wire connection is a procedure that earths a dangerous contact voltage in case of an error.

The earthing equipment conductor carries out the protective earthing procedure. The protective earthing conductor "PE" (in Germany with a green/yellow insulation case) is the conductor used for protective measures during indirect contact to connect metallic parts with

- Other bodies
- Foreign conductive parts
- Earth wires, earthing conductors and grounded, active parts

3. Before commissioning



CAUTION!

Use the correct operating manual. Check that you have the correct operating manual against the specification on the type plate on the control unit.

3.1 Infrastructure requirements

TECHNOSTAR	2000 ST 80 – 160, AT-250, AT-250 F	2000 AT 2x250, AT-2x250 F
Voltage supply	230 V, 1 ~, 50/60 Hz	400 V, 3 ~, 50/60 Hz
Compressed air	-	
Water	-	
Waste water	-	
Disposal	-	
Cooling/heat	15 ... 35 °C ambient temperature	
Supply air	-	
Exhaust air	-	
Space requirements	~2 m ²	~3 m ²
Wall requirements	~1 m ²	~1.5 m ²
Surface load	-	
Base	-	
Soundproofing	-	

Tab. 3.1: Infrastructure

3.2 Transport

The TECHNOSTAR system is pre-assembled, tested and packed by the manufacturer. Check the system and the accessories upon delivery for damage caused by damaged packaging.

Report transport damage to the carrier, the insurance company and the manufacturer immediately. Check the entire delivery for completeness on the basis of the enclosed delivery note. Consult the provisions of the manufacturer's sales and delivery terms. The customer is responsible for the transport of the system. The manufacturer is not liable for any warranty claims following transport damage.



CAUTION!

Inappropriate Transport! Possible damage to property! The packed system may be damaged if it is incorrectly loaded, falls or slips! Avoid hard impacts when setting down! The selected means of transport has to be suitable for the respective tare weight! Observe the indications of weight in the section Technical Data! Make sure that the packed system does not slip during transport!



WARNING

Transport the packed system with lifting tools! Suspended loads can cause serious injury or death! Do not stop or work under floating loads! Only use technically perfect lifting accessories with sufficient carrying capacity! The load is always well balanced and never transport it higher than is absolutely necessary!



PLEASE NOTE

Perform a visual check (electrical inspection if necessary) of the electrode package in the electrolytic cell for a short circuit before installing an electrolytic cell in the pipe line.

The electrode plates in the electrode package could have loosened from their brackets during transport / the bracket of the electrode plates could have suffered damage. Check the electrolytic cell before installation. Report any transport damage and do not commission the electrolytic cell.

3.3. Scope of delivery

- Control unit (control cabinet)
- 1 ... 4 electrolytic cells (depending on model)
- 1 ... 4 electrolytic cell cables
- Installation material for fixing the control unit to the wall
- Operating instructions
- Circuit diagram of the control unit
- 2 ... 8 adhesion parts screw connections (depending on model)
- 1 ... 4 seals (depending on model)
- Temperature control / temperature sensor (depending on model)
- Flow control (optional)

3.4 Commissioning procedure

The manufacturer recommends the following steps for successful commissioning of the device:

- Read the operating manual
- Install the system (section 6)
- Configuration in accordance with local regulations
- Commissioning (section 8)
- Fill salt (section 8)
- Start production (Chapter 8)
- Adjustment to the surroundings / installation

3.5 Planning and design

All the requirements placed on the swimming pool technology and operation (water chemistry) resulting from flow-through chlorine electrolysis are summarised in the manufacturer's design/planning/installation instructions.



PLEASE NOTE

Operating a flow-through chlorine electrolysis system subjects the swimming pool technology to special requirements. Ask the manufacturer for details before installation if necessary.

4. Function

4.1 General

The Technostar flow-through chlorine electrolysis system generates the disinfectant "hypochlorous acid" (HClO) required for disinfection of the swimming pool water from the salt dissolved in the water (NaCl solution). It is the same hypochlorous acid which is produced by the mixture of the familiar chlorine products for the disinfection of swimming and wading pool water.

Electrolysis releases elementary chlorine (Cl_2) and hydrogen (H_2) from the salt dissolved in the water (NaCl solution). The chlorine reacts with the water immediately, producing hypochlorous acid (HClO).

Impurities in the water, bacteria, viruses, microbes and algae are destroyed oxidatively by the hypochlorous acid.

The effect of chlorine in water depends on the pH value of the water. The pH value (pH 0 ... 14) is a measure of the acid or alkali reaction of a watery solution:

pH < 7 acid watery solution (e.g. vinegar)

pH = 7 neutral watery solution or pure water

pH > 7 alkaline (base) watery solution (e.g. soap)

The optimum pH value for the effectiveness of chlorine in swimming and wading pool water is pH 7.0 ... 7.4.

The small amount of hydrogen gas which develops during electrolysis escapes over the water surface.

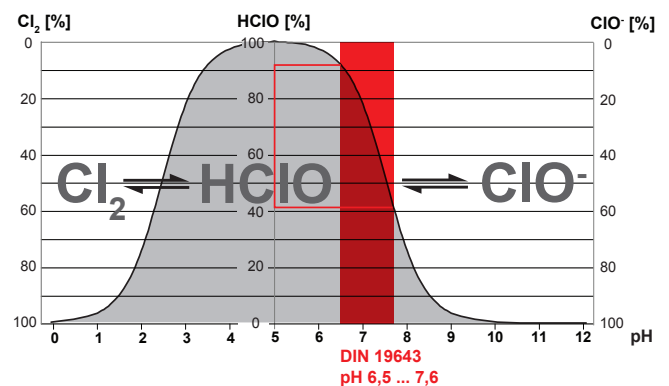
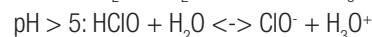
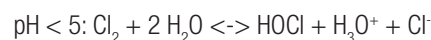


Fig. 4.1: Dissociation curve chlorine in water



4.2 Technical realisation

This electro-chemical process is performed in a flow-through chlorine electrolysis cell. This is installed in a bypass of a swimming pool supply water pipe.

The pool water containing salt is guided through the electrolytic cell which is open at both sides. The electrolysis current means that chlorine first develops at the anode of the electrolytic cell as part of an electrochemical process and then through disproportionation (Redox reaction, in which an element is simultaneously oxidised and reduced) hypochlorous acid develops. This produces the disinfection effect in the water. Electro-chemical hydrogen develops at the cathode, which reaches the swimming pool through the recycled circuit and leaks out into the swimming pool hall via the water surface area.

Function

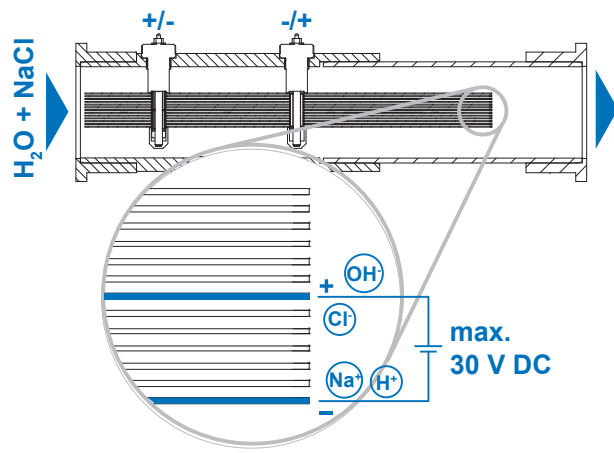
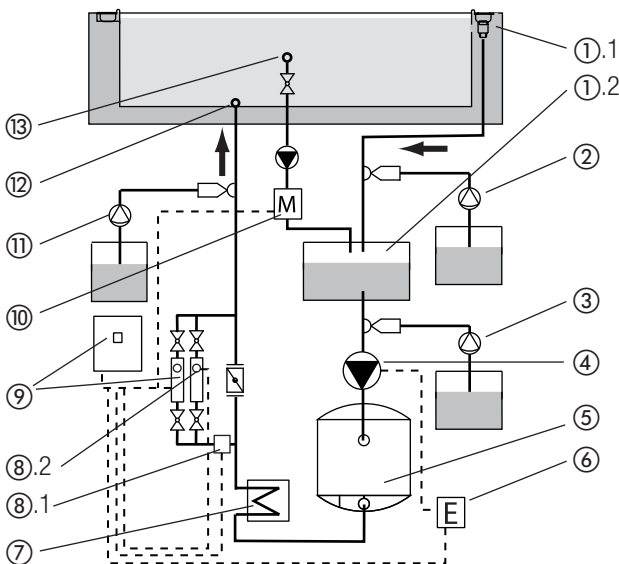


Fig. 4.2: The structure of an electrolytic cell

The formation of a dangerous explosive atmosphere from exceeding the lower explosion limit in areas can be excluded through a correct implementation of the procedure as per the present level of awareness.

The TECHNOSTAR flow-through chlorine electrolysis system is integrated in the piping of the swimming pool circulation.



①.1	Pool removal	
①.2	Splash water tank	
②	Salt dissolution station/brine metering	Optional
③	Flocculant dosing	
④	Circulation pump	
⑤	Filter	
⑥	Filter/timer	
⑦	Heater	
⑧.1	Flow control	Optional
⑧.2	Temperature control per electrolytic cell	Optional
⑨	TECHNOSTAR flow-through chlorine electrolysis system with 1, 2, 3 or 4 electrolytic cells	
⑩	Measuring & control equipment	
⑪	pH value control	
⑫	Pool recirculation	
⑬	Sample water extraction	

Fig. 4.3 and tab 4.1: Pool water circuit (see section 9)



PLEASE NOTE

The salt content of the pool water must be a minimum of 0,35% and under normal circumstances, should be between 0.4 ... 0.5 %. Higher salt contents are possible following consultation with and approval from the manufacturer.



Caution!

Comply with the local regulations when designing the treatment installation. For example, in some countries, the flow speed is reduced in the filter for salt water.

The latest TECHNOSTAR flow-through chlorine electrolysis systems are self-cleaning systems. Your electrolytic cells do not require cleaning / acidification in regular intervals. Automatic polarity reversal on the electrode cleans away deposits. A long interval between each polarity reversal will guarantee a long service life of the electrolytic cells. We also recommend manual acidification of the electrolytic cells with every maintenance of the swimming pool.

The TECHNOSTAR 2000 ST system is operated with two, three or four electrolytic cells in parallel in a water circuit; this is actuated from a control cabinet with a controller input.

The TECHNOSTAR 2000 AT system is operated with one or two electrolytic cells in parallel in a water circuit and actuated from a control cabinet with a controller input (two controller inputs with the models TECHNOSTAR 2000 AT-2x250).

4.3 Function

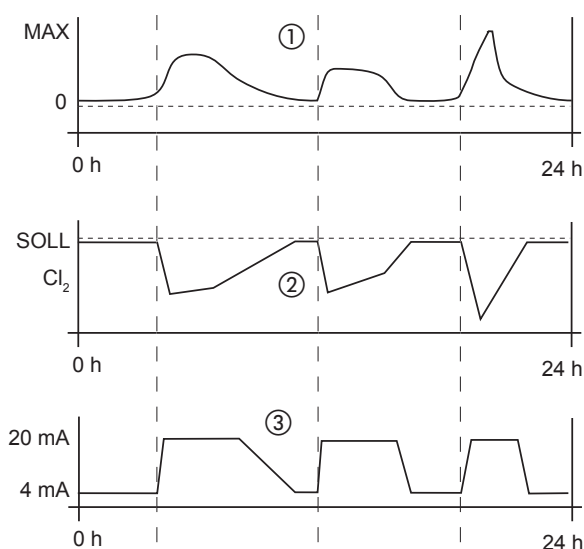
The on-site measurement and control technology recognises whether the setpoint for free chlorine set in the controller (preferably a PI controller) for the sample water has been undercut and issues a control signal. The TECHNOSTAR flow-through chlorine electrolysis systems require a constant analogue signal of 4 – 20 mA with the models TECHNOSTAR 2000 AT-2x250).

The 4 – 20 mA analogue signal from the controller for the free chlorine controls the voltage at the electrolytic cell. The control performs this until the desired amount of electricity flows through the electrolytic cells, between 0 – max. 40 A (see Tab. 4.2). The control restricts from an electrolysis voltage of 28 V DC.

TECHNOSTAR	Cells	Disinfectant capacity	Max. output current	Part no.
2000 ST	2	2x 40 g = 80 g Cl/h	12 A	91210100
	3	3x 40 g = 120 g Cl/h	16 A	91210101
	4	4x 40 g = 160 g Cl/h	20 A	91210102
2000 AT-250	1	250 g Cl/h	40 A	91210400 91210410
2000 AT-2x250	2	2x250 g Cl/h	2x 40 A	91210460 91210470

Tab. 4.2: TECHNOSTAR product versions

If the proportion of free chlorine in the sample water increases, the measurement and control technology registers this and reduces the control signal. A falling signal value reduces the output of the TECHNOSTAR flow-through chlorine electrolysis system and reduces the disinfectant capacity proportionally.



Tab. 4.3: Connection between the water content ① in the pool, the measured value of the free chlorine ② and the disinfectant capacity or the controller actuation of the TECHNOSTAR system ③.

As soon as the quantity of free chlorine in the sample water has reached the prescribed setpoint, the control signal of the measurement and control technology falls to 4 mA. The system stops the electrolysis and the production of hypochlorous acid.

Flow control and temperature control

An optional flow control for all electrolytic cells and a temperature control per electrolytic cell constantly monitor the water flow and the temperature in the electrolytic cell. This ensures that production ceases in the electrolytic cell and does not generate heat upon interruption of the water flow.

The temperature control is located directly on the electrolytic cell and in immediate proximity to the titanium plate. Fit the flow control in front of the electrolytic cell in the pipe line.

Following notification from a flow control or a temperature control, the control interrupts production and begins immediately after the end of the notification.

The manufacturer is not liable for damage suffered by the system or the entire installation resulting from operation of the system in an impermissible temperature range or with an impermissible through-flow.

5. Technical data

The control units of the TECHNOSTAR have been produced in a number of models. The operating manual describes the current model. Please contact the manufacturer should you require an operating manual for one of the following predecessor models:

TECHNOSTAR	Year of manufacture	Superseded predecessor model	Dimensions HxWxD [mm]
2000 PT	< 2010	Green, amperemeter, LEDs Steel cabinet	470 x 800 x 400
2000 ST	< 2010	Green or grey, amperemeter, LEDs, steel cabinet	600 x 600 x 210
	2010	Grey, key panel, steel cabinet	500 x 500 x 250
	2010	Green, key panel, plastic	380 x 400 x 200
	2011	Grey, key panel, steel cabinet	600 x 600 x 250
	< 2020	Grey, key panel, steel cabinet	800 x 600 x 250

2000 AT	< 2010	Green or grey, 1/2 amperemeter, LEDs, steel cabinet	600 x 600 x 210
	2010	Grey, key panel, steel cabinet	500 x 500 x 250
	2010	Green, key panel, plastic	380 x 400 x 200
	2011	Grey, key panel, steel cabinet	500 x 500 x 250
	< 2020	Grey, key panel, steel cabinet	800 x 600 x 250
4000 AT	< 2011	Green or grey, amperemeter, LEDs, steel cabinet	2200 x 850 x 400
4000 AX	< 2011	Green or grey, amperemeter, LEDs, steel cabinet	2200 x 850 x 400
2000 AX-500	< 2013	Grey, key panel, steel cabinet	1000 x 800 x 400
2000 AX-250	< 2016	Grey, key panel, steel cabinet	800 x 600 x 250
2000 AX- 2x250	< 2016	Grey, key panel, steel cabinet	1200 x 1200 x 400

Tab. 5.1: Superseded predecessor model of the TECHNOSTAR control units

5.1 Control units

TECHNOSTAR 2000	ST-80	ST-120	ST-160	AT-250	AT-2x250
Power supply	230 V AC, 50/60 Hz				400 V, 3~, 50/60 Hz
Power supply fuse	1x 10 A			1x 16 A	3x 16 A
Nominal current	1.5 A	2.0 A	2.4 A	5.8 A	12 A
Rated output	400 VA	500 VA	600 VA	1400 VA	2400 VA
Electrolytic cells	2	3	4	1	2x1
Control signal / analogue input 4 ... 20 mA	1				2
Electrolysis voltage	Max. 28 V DC				
Max electrolysis current	12 A	16 A	20 A	40 A	2x 40 A
Self-cleaning	Automatic polarity reversal				
Protection class	IP54				
Housing	Actively-ventilated steel cabinet				
Control box	EATON easy-E4				
Display	Colour display, 320 x 240 Pixel, resistive touch				
Manual control	0 ... 100 %				
release input	yes				
Alarm relay	yes				
Operating signal	yes				
Internal connections	Series terminals				
External connections	Cable terminals				
Ambient temperature	10 ... 40 °C				
Dimensions (HxWxD)	825 x 635 x 250 mm				1200 x 1200 x 400 mm
Weight	~ 60 kg				~ 100 kg

Tab. 5.2: Technical data TECHNOSTAR control unit

Technical data

5.1.1 Dimensioned drawings

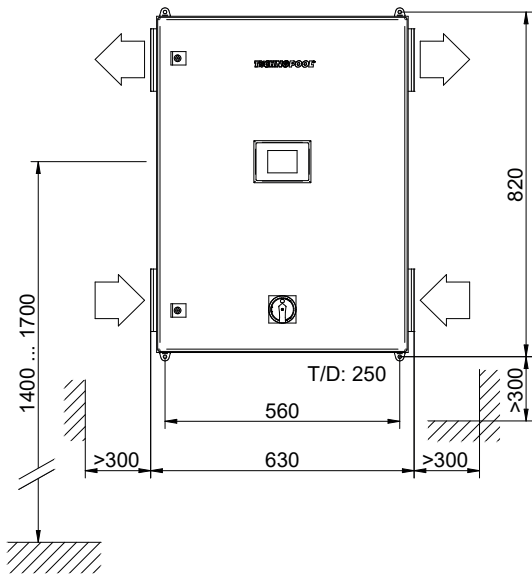


Fig. 5.1: TECHNOSTAR 2000 ST and 2000 AT-250, dimensions in mm

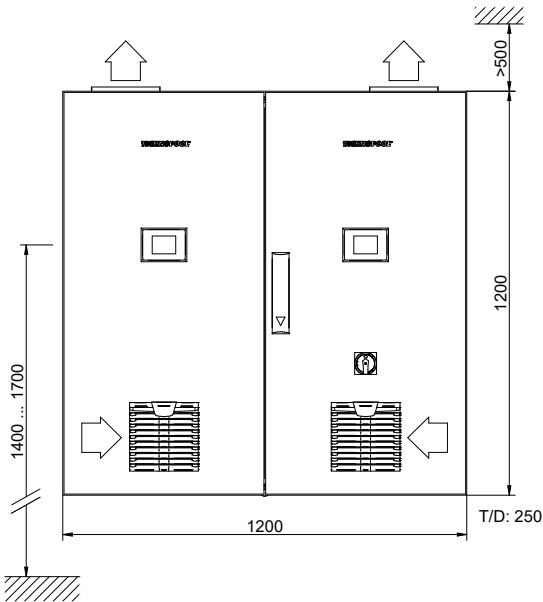


Fig. 5.2: TECHNOSTAR 2000 AT-2x250, dimensions in mm

5.2 Electrolytic cells

TECHNOSTAR	ST	AT	AT-F
Working temperature	15 ... 40 °C		
Nominal width	DN 50	DN 100	
Diameter	Ø 63 mm	Ø 110 mm	
Installation dimension	335 mm	555 mm	
Casing material	PVC		
Weight	~ 2 kg	~ 6 kg	~ 7 kg
Self-cleaning	Automatic polarity reversal		
Electrolysis plate material	Coated titanium		
Salt content	< 0.35 % NaCl salt, dissolved in water		
Flow speed	Minimum speed for expelling the gas produced, max. 1.5 m/s		
Connection control unit	2x M5	4x M6	
Piping connection	Threaded connection with union nut and screw-in part for adhesion		Flange
	DN50	DN100	DN100
	Ø 63 mm	Ø 110 mm	Ø 110 mm

Tab. 5.3: Technical data electrolytic cells

5.2.1 Dimensioned drawings

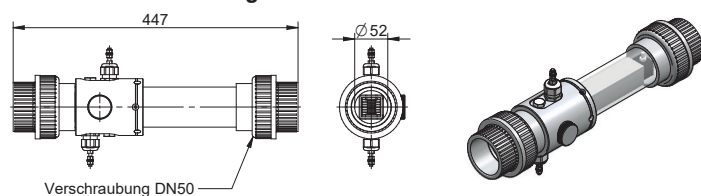


Fig. 5.4: TECHNOSTAR 2000 ST flow-through chlorine electrolysis cell

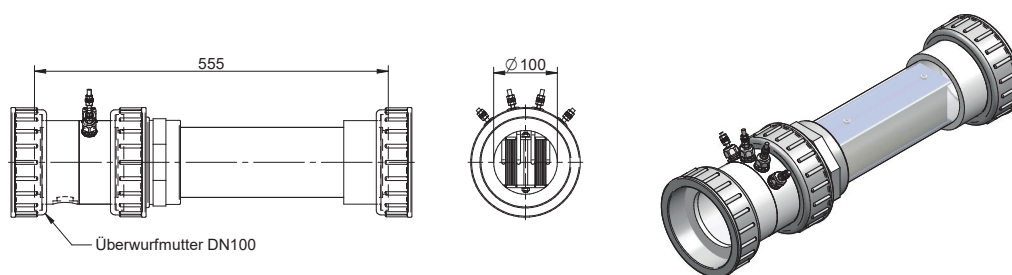


Fig. 5.5: TECHNOSTAR 2000 AT flow-through chlorine electrolysis cell

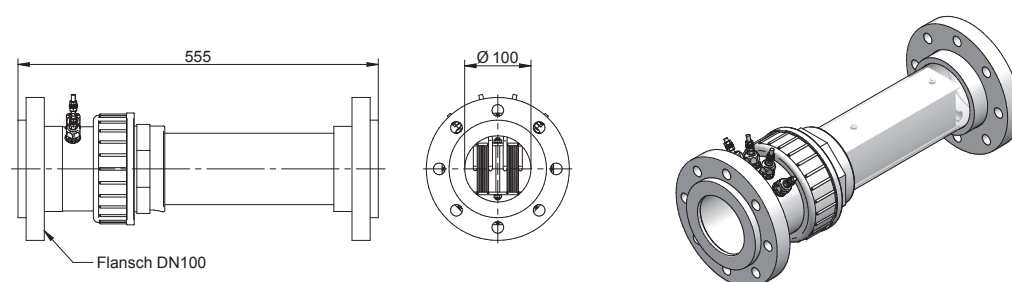


Fig. 5.6: TECHNOSTAR 2000 AT flow-through chlorine electrolysis cell with flange

Compatibility of the control unit and the electrolytic cells

The latest 2000 ST control unit is downwardly compatible with all 2000 ST, 2000 PT and Aquastar 200 control units.

The latest 2000 AT-250 control unit is downwardly compatible with all 2000 AX and Aquastar 400 control units.

Aquastar 400 control units cannot be operated with 2000 AX electrolytic cells.

Type 2000 AT control units constructed in 2010 and 2011 can be operated with either 2000 AT or 2000 AX electrolytic cells.

Type 2000 AT control units older than 2010 can be operated with either 2000 AT or 2000 AX electrolytic cells if fitted with a conversion set.

Technical data

5.3 Electrode cables

TECHNOSTAR	2000 ST	2000 AT
Cable	2 (per electrolytic cell)	4 (per electrolytic cell)
Length	2 m	5 m
Cross section	4 mm ²	10 mm ²
Coating	PVC	
Connection control unit	Wire end sleeve	Wire
Electrolytic cell connection	Ring tongue, insulated	
Load	approx. 5 – 6 A (each cable and cell)	approx. 20 A (each cable and cell)
	< 30 V DC	

Tab. 5.4: Technical data electrode cable between the control unit and the electrolytic cells.

The strengths of the series terminal strip up to max. 16 mm² at 2000 ST and 35 mm² at 2000 AT (from 09/2020) for the electrode cable in the control unit are to be taken into account. If required, terminals for larger cable cross-sections should be requested in advance.

Cable 4x single wires between the control cabinet and electrolytic cell 2000 AT					
Cable length	up to 4 m	4 – 10 m	> 10 – 16 m	> 16 – 25 m	> 25 – 35 m
Cross section	4 mm ²	*10 mm ²	16 mm ²	25 mm ²	35 mm ²

*Cross-section of the standard cable

Tab. 5.5: Minimum cross-sections for electrode cable 2000 AT

Cable 2x single wires between the control cabinet and electrolytic cell 2000 ST			
Cable length	up to 14 m	> 14 – 21 m	> 21 – 35 m
Cross section	*4 mm ²	6 mm ²	10 mm ²

*Cross-section of the standard cable

Tab. 5.6: Minimum cross-sections for electrode cable 2000 ST



DANGER!

The electrolytic cell may only be connected with the original electrode cable. The electrode cables must not be changed. Danger of fire from overheating of the cable or the cable contacts. Should you have alternative cable lengths, consult the manufacturer.

5.4 Further accessories

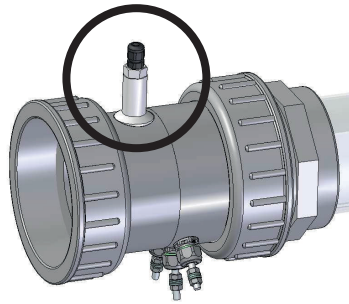


Fig. 5.9: Temperature control fitted

Temperature monitoring	
Part number	41100124
Connection	G 3/4 male
Materials	PVDF / titanium
switching point	45 °C ±3 °C
Hysteresis	2 °C
Display	Green: Temperature OK Red: Temperature exceeded
Output	Optocoupler, max. 60 V / 25 mA N.C. (normally closed), opener
Voltage supply	24 V DC ± 10 %
Suction connection	5 m, 2x 0.5 mm ²

Tab. 5.7: Technical data temperature control in the electrolytic cell (optional).

Flow control	
Part number	91930010
Voltage supply	24 V DC ± 20 %
Current consumption:	< 80 mA
Output	Relay changeover contact N.C. (normally closed), opener
Switching voltage	max. 250 V AC / 60 V DC
Switching current	max. 4 A AC / 4 A DC
Switching capacity	max. 1000 VA / 60 W
Ambient temperature	-20 ... +70 °C
Detection range	1 ... 150 cm/s
Temperature range	-20 ... +80 °C
Standby time	~12 s
Activation time	~2 s
Deactivation time	~2 s
Pressure resistance	60 bar
Sensor material	bronze EBZ 2.0966
Casing material	PBT
Protection class	IP67
Connection	5 m, 5x 0.5 mm ²

Tab. 5.8: Technical data flow control in the pipe line (optional).

6. Installation

6.1 General instructions

- Always use suitable tools for the assembly and installation of plastic connecting parts!
- Only apply the appropriate amount of force!
- Plastic parts (in particular parts made of PVC) screw on and off better if the thread is coated with silicone lubricant beforehand.
- Use the housing brackets to fix the TECHNOSTAR system to the wall-mounted housing.

6.2 Installation location

The installation / assembly site is determined by size measurement with the operator or his representative, the plant engineer as well as the planner. Subsequently this site is examined to see if there are any negative influences that could endanger the functioning of the system. Should such influences exist then a possible solution is drawn up with the operator to eliminate these influences.



PLEASE NOTE

Select the installation location in such a way that the power elements of the control unit experience sufficient cooling. The radiating heat from equipment and heat exchangers has to be shielded, so that the system can sufficiently expel its sensible heat. Comply with the maximum permitted ambient temperature of c. +40 °C (see Technical data).



PLEASE NOTE

If the temperature at the scheduled installation site reaches approx. +40 °C or higher, then additional cooling has to be provided. This cooling can for example be created by a supply of the cooler external air. Select the system's setting up site so that it can be accessed by the operating and maintenance personnel.



PLEASE NOTE

Do not set up the system in a flood risk area. If there is no other setting up site available then other suitable preventative measures are to be discussed (raised base, wall mounting, etc.).

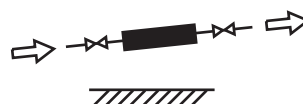
6.3 Hydraulic connection

The electrolytic cell is installed in the supply water pipe after the filter, parallel to the heater and in front of the pH value corrector injection nozzle (see graphic on the next page).

The installation of shut-off valves / slide gates in front and behind the electrolytic cell and the ability to let water out of the electrolytic cell facilitate the change of the electrolytic cell.



When in operation, the electrolytic cell must constantly be completely full with water to prevent the presence of air bubbles in the electrolytic cell through installation or the gas emissions during operation. Therefore, ensure a slight incline in the direction of flow when installing the piping.



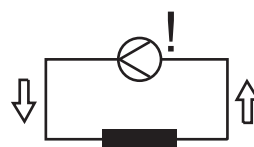
The structure of an electrolytic cell

All electrolytic cells consist of a housing which needs to be screwed into the piping, attached with adhesive or flange-mounted. The titanium package is installed in the housing with the electrolysis plates.



You can hire empty electrolytic cell housings from the manufacturer to facilitate the installation of the piping.

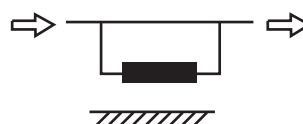
Flow-through chlorine electrolysis systems may not be operated without circulation.



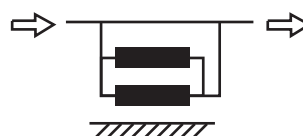
The flow rate in the electrolytic cell must amount to 1 ... 1.5 m/s.

Technostar 2000 ST electrolytic cell = 2 ... 3 m³/h, Technostar 2000 AT electrolytic cell = 18 ... 27 m³/h

The electrolytic cell(s) is (are) installed in the bypass of the circulation.

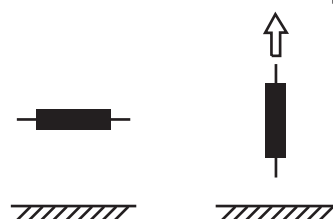


Multiple electrolytic cells are fitted in accordance with the Tichelmann circuitry principle and thus receive equal flow.



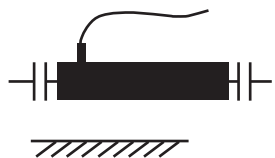
Comply with the maximum flow rate with all installations.

The electrolytic cell can be installed level or perpendicularly (with the direction of flow from bottom to top).



2000 ST electrolytic cells are optional and 2000 AT electrolytic cells are always fitted with a temperature control. When installing the electrolytic cell, apply the temperature control to its side.

Installation



Floor

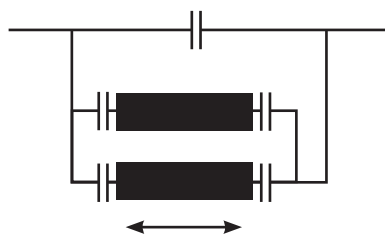
The installation of a flow control is optional and should always be installed in front of the electrolytic cells and not behind them. A stop valve must not be installed between the flow control and the electrolytic cells.

To avoid turbulence in the electrolytic cell, reduce the flow by engaging the stop valve / slide behind the electrolytic cell.



Wall (plan view)

When installing the piping, note that plastic expands with heat and can exert pressure on the electrolytic cell. This places a strain on the electrolytic cell and impedes its change and maintenance. The ideal installation involves the use of expansion bends with an angle greater than 90° or a good arrangement of screw connections / flanges in the pipe line.



In summary

- Always fit the flow-through chlorine electrolysis cell in the bypass of the supply water pipe.
- Fit the bypass beneath the supply water pipe for better de-gassing of the flow-through chlorine electrolysis cells.
- Fit a stop valve parallel to the bypass and in front of / behind every flow-through chlorine electrolysis cell.
- When installing multiple flow-through chlorine electrolysis cells, ensure there is a continuous flow.
- Use the stop valve behind the cell and in the direction of flow to achieve a choke effect to prevent turbulence when throttling in a flow-through chlorine electrolysis cell.
- Install the flow control in the pipe line in the direction of flow in front of the flow-through chlorine electrolysis cells
- Fit the flow-through chlorine electrolysis cell without mechanical stress.
- Fit a discharge in the bypass to discharge water to enable the removal of the flow-through chlorine electrolysis cell.

Perform installation in accordance with the layout examples in fig. 6.1 or 6.2. The exact layout must be adapted to the available dimensions.



Info!

Install more than two electrolytic cells in accordance with the Tichelmann system (see fig. 6.2). With this installation the flowing water divides itself almost equally on the individual cells. Ensure that the supply water pipe is able to

supply the required amount of water to ensure the minimum through-flow.

Layout examples

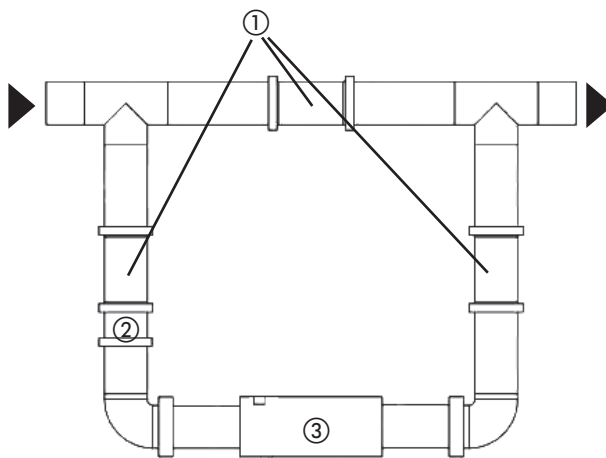


Fig. 6.1: Layout example with a flow-through chlorine electrolysis cell
① stop valve, ② flow control, ③ flow-through chlorine electrolysis cell

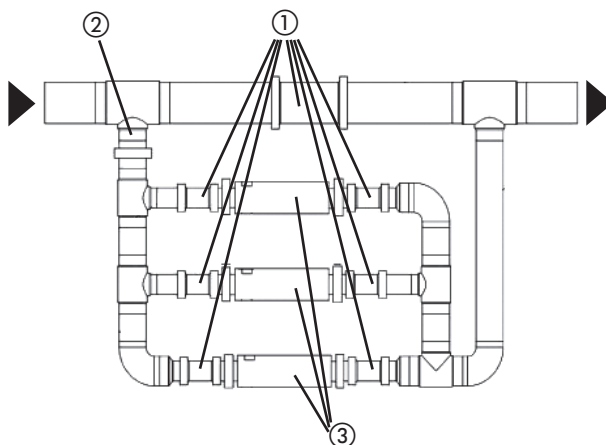


Fig. 6.2: Layout example with 3 flow-through chlorine electrolysis cells arranged in accordance with Tichelmann circuitry, ① stop valve, ② flow control, ③ flow-through chlorine electrolytic cell

Installing the electrolytic cell 2000 ST

The 2 contact pins ① for connecting the electrolytic cell cable to the electrolytic cell are tightened with a specified torque on the factory side. They may not be turned or loosened to tighten the cable.

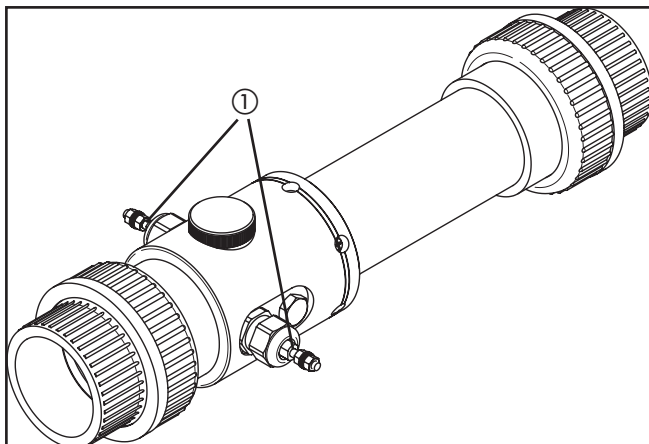


Fig. 6.3: 2000 ST electrolytic cell contact pins



PLEASE NOTE

Turning or loosening the contact pins on the electrolytic cell 2000 ST means that it is no longer possible to guarantee its function. Do not use the flats of the contact pins when fixing the electrolytic cell cable.

Proceed as follows with the installation:

1. Fit the electrolytic cell in the pipe line and tighten the screw connections (DN50).
2. Remove the cover cap from the electrolytic cell and slide it onto the cable.
3. Remove the nut, clamping ring and washer on the contact pin.
4. Fix the connecting cable with cable eyes.
5. Return the nut, clamping ring and washer to the contact pin.
6. Counter both nuts against each other.
7. Slide the cover caps over the contact pin.
8. Slowly flood the electrolytic cell and check the screw connections (DN50) for leak-tightness.

Installation

6.4 Electrical connection

The system's electrical connection to the mains has to correspond to the local regulations and may only be carried out by specialists. It must be designed in accordance with the connected power.

Voltage supply

The voltage supply is to be realised in accordance with the connection values specified by the manufacturer (see section 5 Technical data).



CAUTION!

Influence exerted on the control can falsify measurement and control values! Do not lay the signal cable parallel to the high voltage or mains lines! Lay the supply and signal lines in separated circuits! Make line junctions at a 90° angles! Use shielded cables for signal lines!



The control voltage guard on

ATTENTION!

cabinet may only be opened when not under voltage. The voltage supply must be switched off and against unintended activation when performing work on the control cabinet.



ATTENTION!

Comply with the specifications of the control unit circuit diagram! The circuit diagram accompanying the control unit is binding. It records all up-to-date adjustments and additions.

6.5 Terminal plan

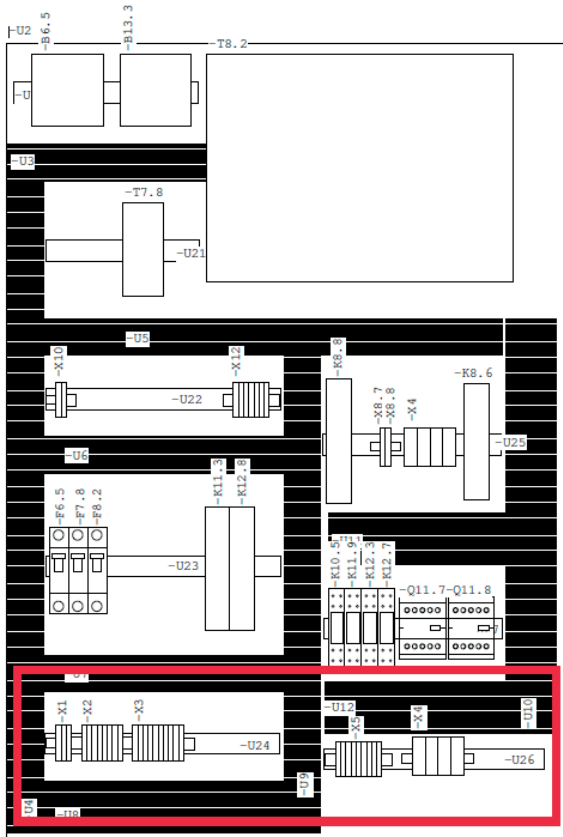


Fig. 6.4: Position of the terminal strips

Terminal	Cable	Function
1	L	Voltage supply
2	N	
3	PE	

Tab. 6.1: Terminal strip -X1 voltage supply control cabinet

Terminal	Cable	Function	Note
1	WH	Temperature monitoring Art.no. 41100124	Install separately from the high-voltage current
2	BN		
3	YE / BK		
4	GN / BU		
5	1	Flow control Art.no. 91930010	
6	3		
7	5		
8	4		

Tab. 6.2: Terminal strip -X2 sensors (temperature and flow)

Terminal	Function	Note
1	+ 24 V DC	release input Digital input, closed = operation released
2	Signal	
3	PE	
4	Contact Q3	Operating signal Relay output, closer (N.O.) Open = system does not produce Closed = system produces Max. 230 V AC, 5 A, galvanically isolated
5		
6	Contact Q4	Fault reporting Relay output, opener (N.C.) Closed = no fault Open = System fault Max. 230 V AC, 5 A, galvanically isolated
7		
8	PE	
9	+	External setpoint Analogue input, 4 ... 20 mA, Use an insulated cable
10	-	
11	PE	

Tab. 6.3: Terminal strip -X3 external

Terminal	Function	Note
1	+ mA	Analogue output For the actuation of further control cabinets; not galvanically separated from the analogue input
2	- mA	
3	PE	
4	Contact	Flow sensor output signal Signal transfer from the sensor to further control cabinets. If the main control cabinet is switched off, the flow signal for the other cabinets is no longer on, i.e. the other cabinets will indicate a "flow" fault.
5	Contact	
6	PE	
7	Contact	release input Signal transfer of the acknowledgement signal to further control cabinets. If the "main control cabinet" is switched off, the acknowledgement signal for the subsequent cabinets will no longer be pending.
8	Contact	
9	PE	

Tab. 6.5: Terminal strip X5 signal transfer (in accordance with SN 91930000615)

If a joint 4–20mA control signal for multiple control cabinets is to be used, the wiring is performed as follows.

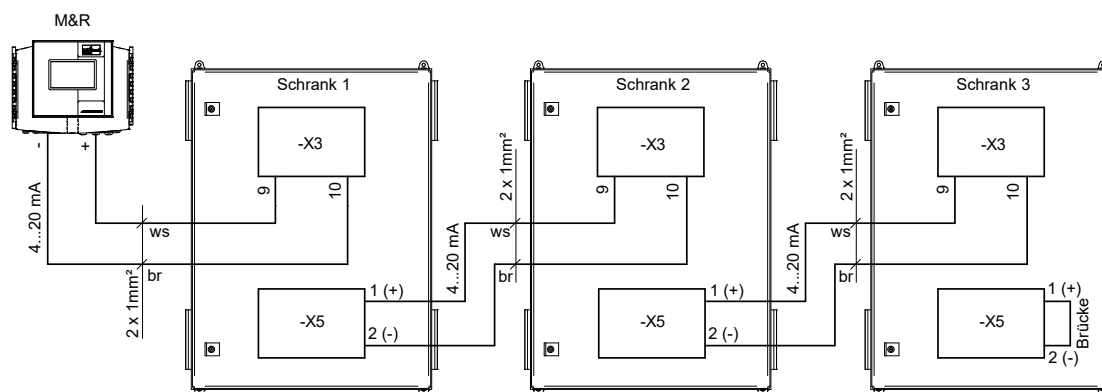


Fig. 6.5 Connection example series connection for control signal

If a joint external acknowledgement contact for multiple control cabinets is to be used, the wiring is performed as follows.

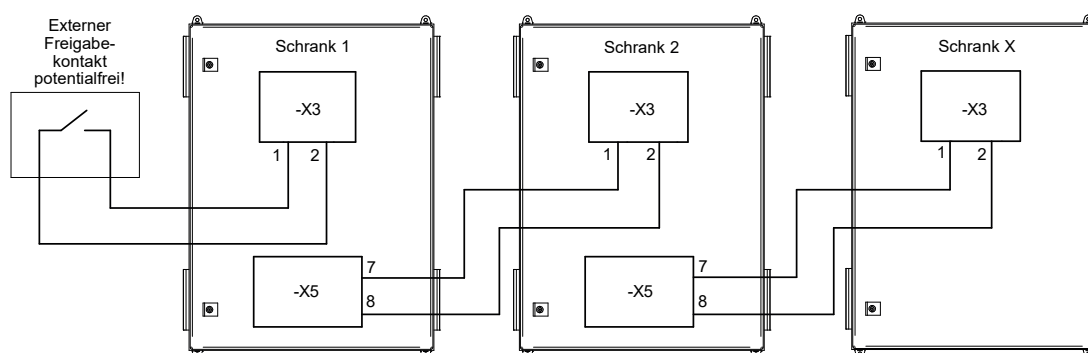


Fig. 6.5a Connection example external release for multiple cabinets (in accordance with SN 91930000615)

6.6 Connecting the electrolytic cells

The electrolytic cells can only be connected to the control unit via the electrode cable provided by the manufacturer.

The cable can be extended between the control unit and the electrode cable. Comply with the minimum cross sections (see section 5).



DANGER!

The electrolytic cell may only be connected with the original electrode cable. The electrode cables must not be changed. Danger of fire from overheating of the cable or the cable contacts.

TECHNOSTAR 2000 AT flow-through chlorine electrolysis cell



CAUTION!

Do not mix up the contacts (poles) of the electrolytic cell when connecting the electrode cable. Connecting the cable incorrectly will result in destruction of the electrolytic cell!

The TECHNOSTAR 2000 AT is a self-cleaning system. All electrolysis plates in the titanium package of the electrolytic cell are made of titanium and can be used both as cathodes (minus pole) or anodes (plus pole). This is used to effect self-cleaning of the electrolytic cell through automatic polarity reversal.

The electrolytic cell is made up of two titanium packages. To prevent mixing up the contacts, the connection poles on the electrolytic cell are marked as follows:

Titanium packages in the electrolytic cell	Connection pole	Marking
Package 1	Plus	"1+"
Package 1	Minus	"1-"
Package 2	Minus	"2-"
Package 2	Plus	"2+"

Tab. 6.6: Connection pole for the TECHNOSTAR 2000 AT electrolytic cell

Control unit terminal strip -X4	Electrolytic cell
Terminal	Marking
8	"1+"
6	"1-"
5	"2-"
7	"2+"

Tab. 6.7: Connection TECHNOSTAR 2000 AT control unit with electrolytic cell (as of SN 91930000623)

To check the connection: There must be no measurable DC voltage between poles 1+ and 2+ and 1- and 2-.

Installation

TECHNOSTAR 2000 ST flow-through chlorine electrolysis cell

These installations are also self-cleaning systems. The TECHNOSTAR 2000 ST is fitted with two electrolytic cells as standard and can be upgraded by the addition of up to two further electrolytic cells (total of 4).

The electrolysis cells are attached parallel to the electrical connection. Thus an even distribution of power is ensured to the individual electrolysis cells.

Control unit Terminal strip -X4		Electrolytic cells				Pole
Terminal		Cell 1	Cell 2	Cell 3	Cell 4	
5		x				Plus
6			x			
7				x		
8					x	
9		x				Minus
10			x			
11				x		
12					x	

Tab. 6.8: Connection TECHNOSTAR 2000 ST control unit with electrolytic cells

6.6 Protective switch

Description	Function
-F6.1	Fault current switch complete cabinet
-F6.5	Ventilation
-F7.8	Control voltage control cabinet
-F8.2	Voltage supply electrolytic cell(s)

Tab. 6.9: Fuses in the control unit



Fig. 6.7: l.t.r -F6.1, -F6.5, -F7.8 and -F8.2 protective switch

6.7 Connecting the temperature control

The A/N 41100124 temperature control is a fixed part of the 2000 AT electrolytic cell and optional with the 2000 ST. It is available in two versions, one with a fixed cable (old version) and one with a plug connection (new version). It is connected in accordance with the following connection diagram.

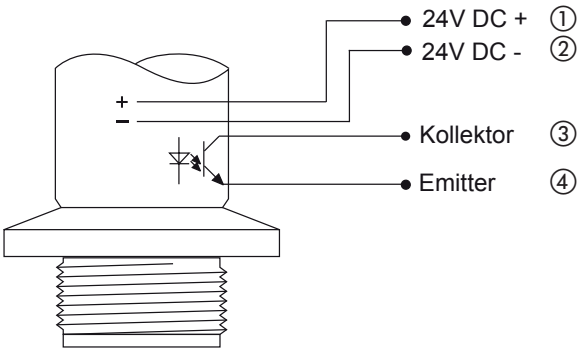


Fig. 6.8: Connections for a temperature control for installation in the electrolytic cell

Temperature control with fixed cable:

Connection		No.	Cable	Control unit Terminal strip -X2
Operating voltage	24 V DC +	①	WH (white)	1
	24 V DC -	②	BN (brown)	2
Optocoupler	Collector	③	YE (yellow)	3
	Emitter	④	GN (green)	4

Temperature control with plug and loose cable:

Connection		No.	Pin in plug	Cable	Control unit Terminal strip -X2
Operating voltage	24 V DC +	①	2	WH (white)	1
	24 V DC -	②	1	BN (brown)	2
Optocoupler	Collector	③	Ground	BK (black)	3
	Emitter	④	3	BU (blue)	4

Connection of multiple electrolytic cells in series. If a temperature control opens the contact, the entire circuit will open.

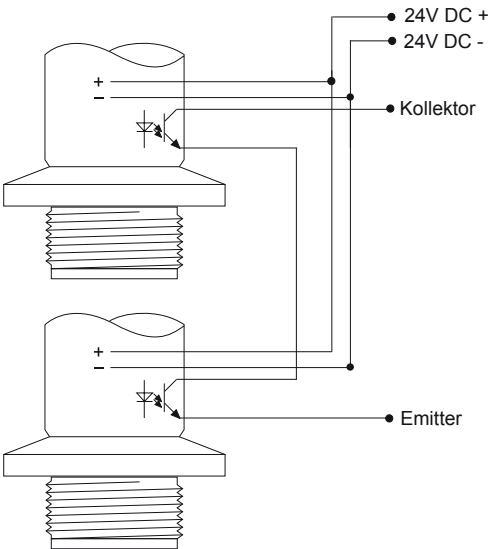
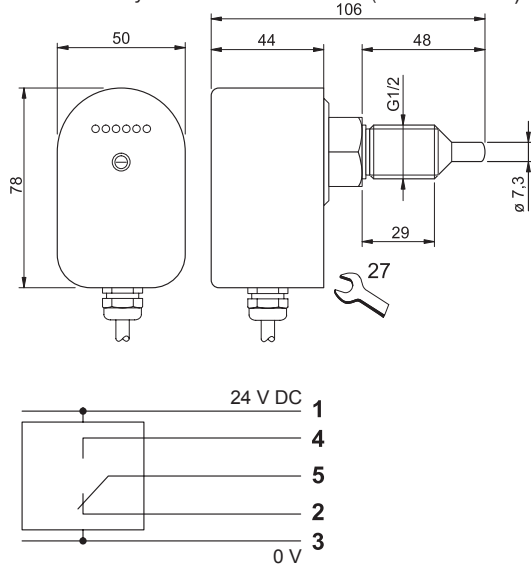


Fig. 6.9: Connection plan for two or more temperature controls

6.8. Connecting the flow control

It is necessary to install a flow control (A/N 91930010).



Connection		Cable	Control unit Terminal strip -X2
Supply voltage for the sensor	24 V DC +	1	5
	24 V DC -	3	6
Relay (potential-free)		5	7
		4	8

Fig. 6.10: Dimensioned drawing and circuit diagram flow control for installation in the pipe line

A joint flow control can be connected in series for connection to multiple control cabinets as follows:

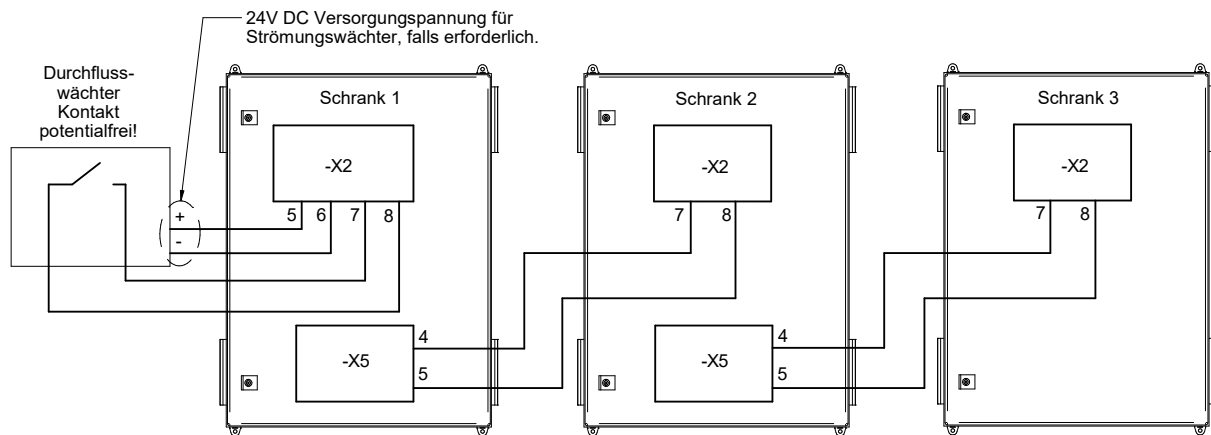
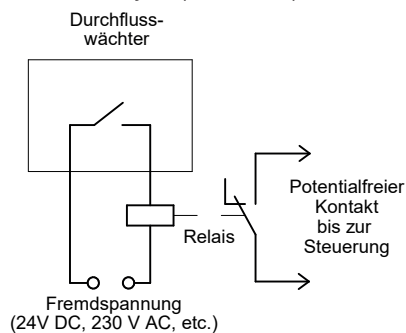


Fig. 6.11: Connection example series connection for a flow control (from SN 91930000614)

If a flow control is to be used that does not provide a potential-free contact, a relay for potential separation must be installed.



Operation

7. Operation



Info!

Read the operating manual before commissioning the system. Only the careful compliance with the specifications of this operating manual will guarantee smooth and accident-free operation of this system and its long service life.

The system may only be operated by those persons who

- Have read and understand this operating manual
- Have been trained in the operation of the system,
- Are familiar with the safety equipment and
- Have been informed of the residual dangers.

7.1 Operating and display elements

The control of the TECHNOSTAR 2000 ST, 2000 AT systems are fitted with an operating and display unit (see fig. 5.1). This is easy to operate via the touch panel and easy menu navigation.

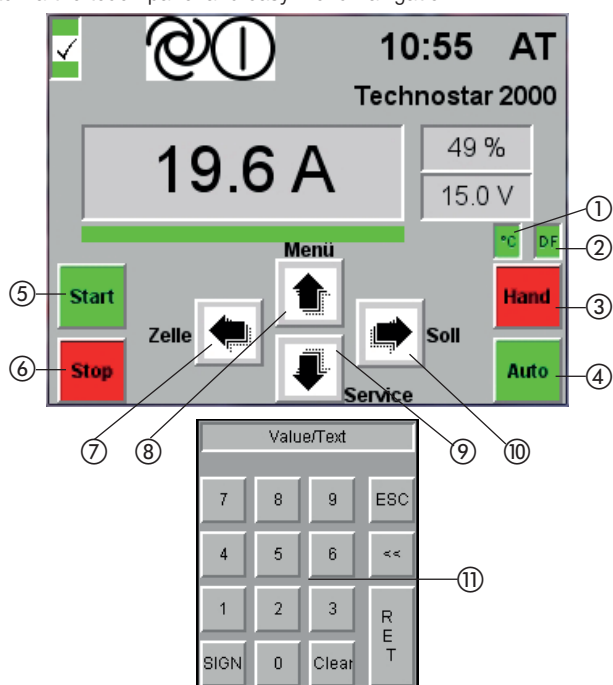


Fig. 7.1: Display and control elements in the control unit of the 2000 AT and ST.

Functional icons

	Colour	Function
①	green	The temperature in the electrolytic cell is "OK"
	red	The temperature in the electrolytic cell is too high
②	green	The flow in the electrolytic cell is "OK"
	red	No flow in the electrolytic cell
③ "Manual"		Activates manual mode ("Hand")
④ "Auto"		Activates automatic operation ("Auto"). Control via an external 4 – 20 mA signal.
⑤ "Start"		Starts the system. The system approaches the pre-set setpoint (manual or automatic).
⑥ "Stop"		Stops the system The system switches to standby mode.
⑦ „Cell“		Accesses the "Cell" menu. Displays the current parameters of the cells e.g. current, voltage and polarisation.
⑧ „Menu“		Accesses the "Menu" menu

⑨ "Service"		Accesses the "Service" menu. Code entry required.
⑩ „Setpoint“		Accesses the "Setpoint" menu Displays the manual or automatically pre-set setpoints.
⑪ „Keyboard“		The entry keyboard is displayed automatically upon actuation of an entry field.

Symbols in the main display

Symbol	Function
	Operating state "Off"
	Operating state "On", system produces
	Operating state "Pause with polarity reversal phase"
	External release "On"
	External release "Off"
	Operating mode "Hand" activated
	Operating mode "Automatic" activated
	Timer for operating mode "Hand"
	Temperature sensor notifies fault (flashes)
	Flow control notifies fault (flashes)
	Error in the 4 - 20 mA signal (flashes)

Symbols in the sub-menu

Symbol	Function
	Backlight display
	Lighting ON
	Lighting OFF
	Polarity direction 1 in the electrolytic cell
	Polarity direction 2 in the electrolytic cell
	User recognition in manual mode
	Service access

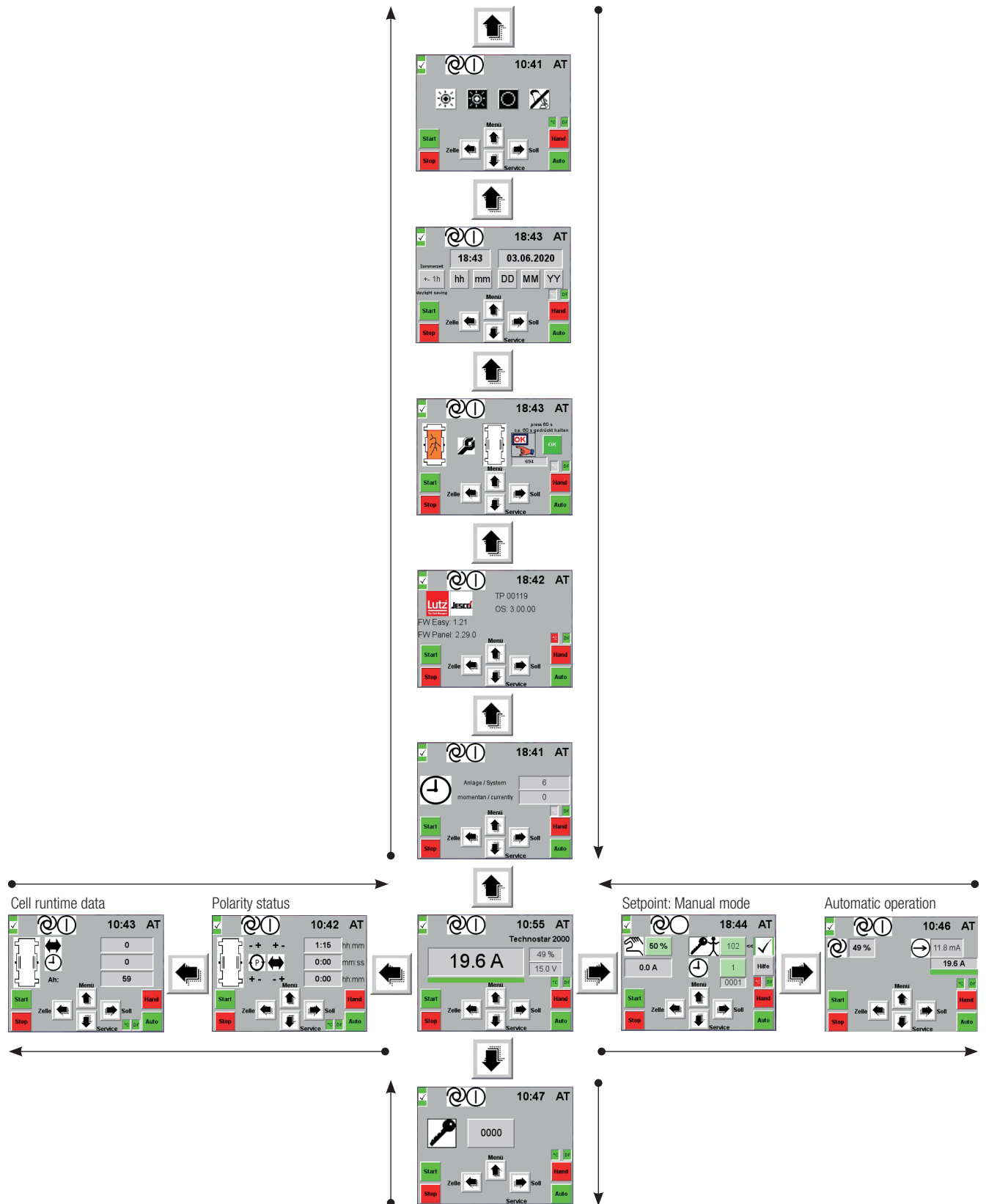
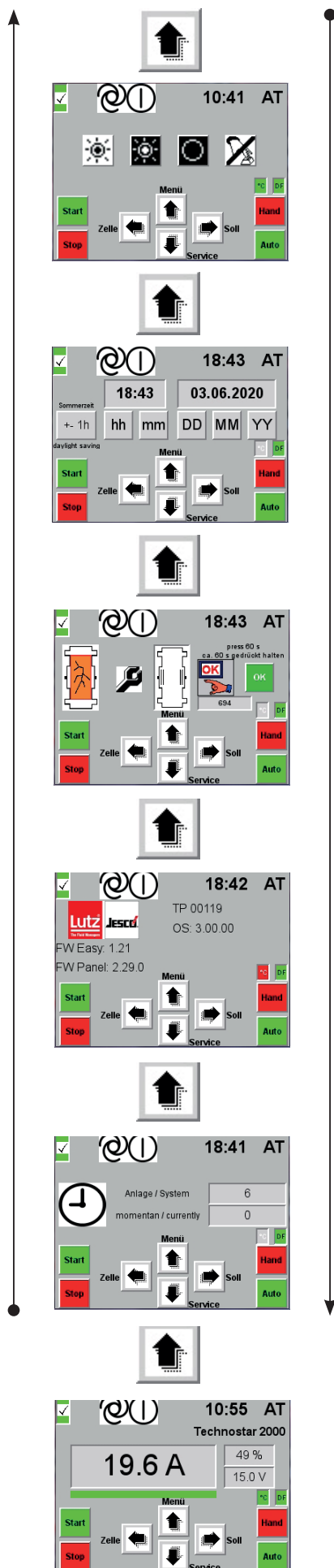


Abb. 5.2: Main screen and sub-menus

Operation



7.2 Menu “Menu”

Back to the main menu

Backlight display/keyboard lock

- The two buttons on the left-hand side switch the backlight on and off.
- The second button from right switches the complete display off (back on upon contact).
- The right-hand button locks the buttons (follow the instructions on the screen to unlock).

Set the date and time:

- Set the date and time by actuating the respective buttons.
- The “+/- 1h” button switches between summer and winter time.
-
-
-

Reset Ah consumption

Reset the ampere hours counter after replacing the electrolytic cell

- Hold the OK button depressed for 60 s to reset the Ah hours.

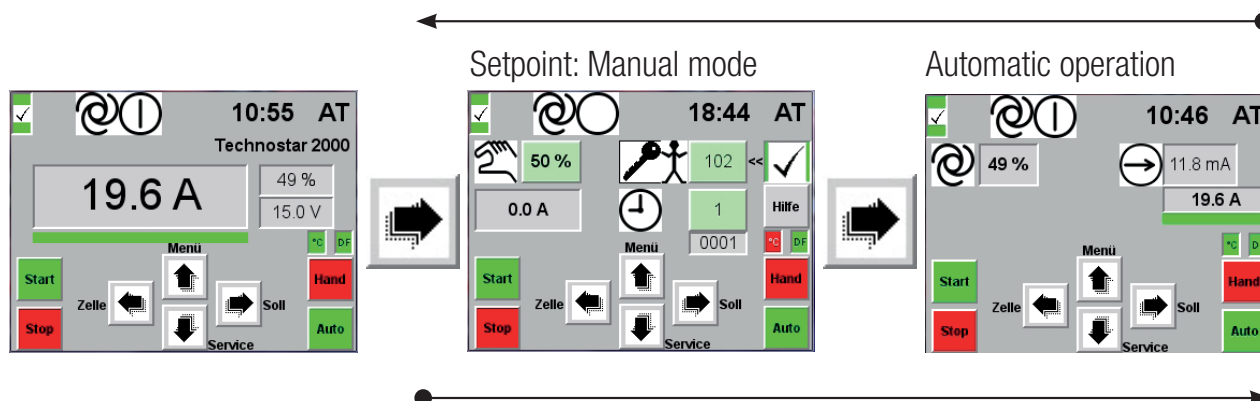
Display the device data

- Model
- Software and firmware version

Display operating hours

- Operating hours of the electrolytic cell
- Operating hours of the control unit

7.3 Menu “Setpoint”



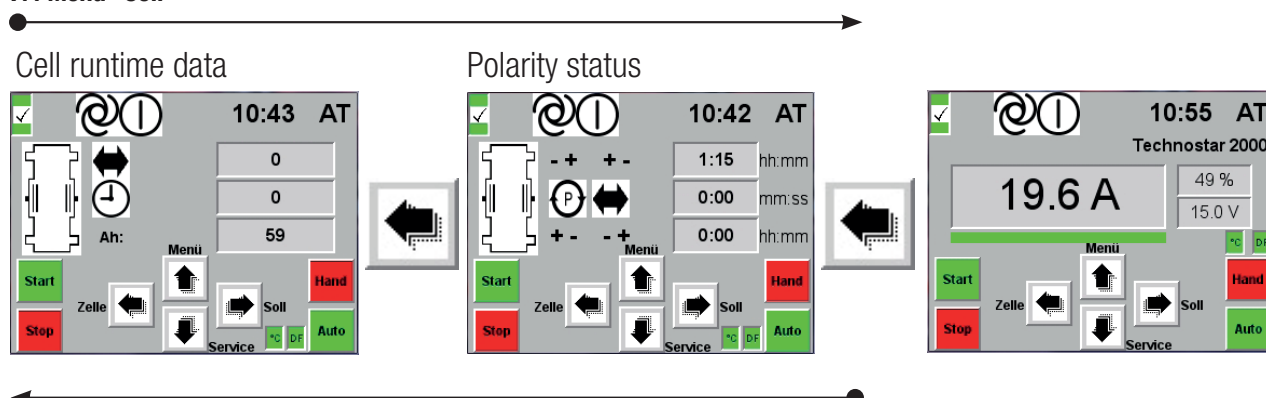
Manual mode settings

- The system is in automatic operation.
- Press the green button on the right-hand side next to the man
- Enter code for user 2 (see “Service”)
- Confirm with the RET button
- Press the green button on the right-hand side next to the clock
- Set the timer length in minutes
- Confirm with the RET button
- Press the green button on the right-hand side next to the hand and enter the setpoint
- Confirm with the RET button
- Switch the system to “manual” by actuating the corresponding button
- Starting/stopping the system via the Start and Stop buttons
- The main view shows the remaining time.
- The switch to automatic operation is performed after the end of the time.

Display automatic operation

- System output in %
- Electrolysis voltage
- Electrolysis current

7.4 Menu “Cell”



Electrolytic cell consumption

- Number of polarity reversals
- Number of operating hours of the electrolytic cell
- Ampere hours counter

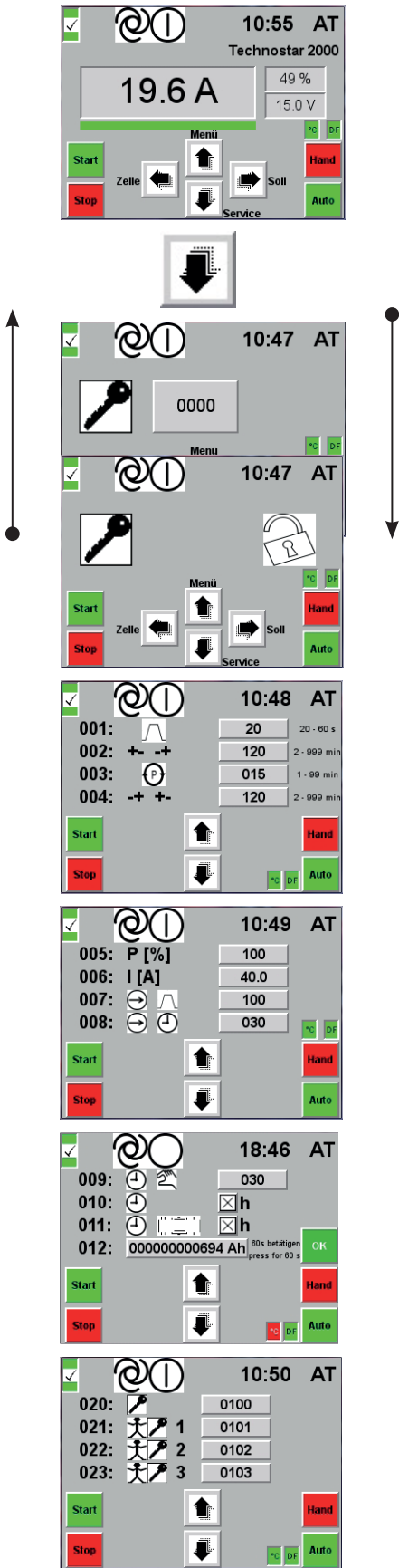
Self-cleaning

- hh:mm, remaining duration of the polarity reversal, counts forwards
- hh:mm, remaining duration of the pause, counts forwards

Commissioning

- hh:mm, remaining duration of the polarity reversal, counts forwards

The phase is highlighted which is currently active.



7.5 “Service” menu

The commissioning parameters can be set in the service menu. It is first necessary to enter a code.

Enter the service code

- Actuate field “0000”
- Enter code (see table)
- Confirm with RET
- The lock appears after the correct entry
- Display of the first four parameters with the “arrow down” button
- Processing the parameters by actuating the respective button
- Display the next four parameters with the “arrow down” button

Configuring a parameter

- The value can be entered after actuating the respective parameter button.
- Confirm with RET
- Display of the next four parameters with the “arrow down” button.
- End with the “Stop” button

Service details of the sub-menu

Abb.	Function	Presettings				
		ST-80	ST-120	ST-160	AT-250	AT-2x250
001	Soft start in seconds	20				
002	Production time +++ in minutes	120				
003	Pause time in minutes	15				
004	Production time -++ in minutes	120				
005	Restriction of the power output in %	100				
006	Power output in amperes	12	16	20	40	2x40
007	Monitoring input signal > as x %	100				
008	Monitoring time for deactivation in minutes	30				
009	Maximum time for manual mode in minutes	30				
010	Reset the device hour meter					
011	Reset electrolytic cell hour meter					
012	Adjusting the Ah meter					
020	Service code	100				
021	Password user 1 for manual mode	101				
022	Password user 2 for manual mode	102				
023	Password user 3 for manual mode	103				

8. Commissioning

8.1 Conditions for operating

- Make sure that the measurement and control system is working and that it has been calibrated correctly. Only then can the „Technostar“ system build up the required disinfection store.
- Check the displayed measured values of the measuring and control systems regularly with measurements taken manually.
- Make sure that the filter system is turned on. Water has to flow through the electrolysis cell.



Info!

The flow rate in the electrolysis cell is set during the start-up. The flap in the clean water line is provided with a marking in this position. After every change of an electrolysis cell the flap has to be set back to this marking. The flaps in front or behind the electrolysis cell(s) have to always be completely open for normal operations.



Info!

Commissioning is performed by the plant engineer possibly working in collaboration with the manufacturer and the operating company. The personnel receive training on site on how to work the system:

8.2 Commissioning sequence

- Set the swimming pool's pH value to a value between 7.0 and 7.4.

The amount of salt required depends on the amount of water in the swimming pool. Begin by adding 4 kg of salt per 1 m³ water. This corresponds to a salt content of 0.4 % (see also Calculating the Salt Content under 5.5 Operating).

- Fill your swimming pool with normal tap water if possible. Other types of water should be examined by a hygiene institute or your specialist for its applicability.



Info!

Water with iron content in particular is not suitable or it has to be treated first before being used with the electrolysis system. Water with phosphate content is, for example, a good fertile platform for algae.

- Stop the filter system, the counter current system and other devices before adding the salt granules. You thereby prevent the salt crystals from going through the floor drain, the gutter or skimmer and ending up in the piping and the filter basin.
- Distribute the required amount of salt as evenly as possible in the pool.

If all the salt is poured in one go it will have difficulty in dissolving as saturated brine forms around the mounds of salt. As water containing salt is heavier than fresh water the concentration of salt is significantly higher at the bottom than it is in the upper levels.

When using pre-prepared brine the filter system can be switched on directly.

- After the salt has dissolved or the required amount of brine has been put into the pool, switch the filter system to mixing the salt with the water.



Info!

The mixing is important!

- Set the measurement and control technology into operation and set the prescribed setpoints.
- Set the pH value to a value between 7.0 and 7.4.



PLEASE NOTE

Failure to set the pH value to the prescribed range can result in calcium precipitation in the electrolytic cell(s).

- After the measurement and control technology has been set into operation and everything is well mixed, switch on the system with the main switch.
- After a while measure the content of hypochlorous acid.

The hypochlorous acid formed from the salt is measured with DPD-1 test tablets or appropriate electronic measuring devices. It is measured in mg (milligram) per litre. The minimum content should not fall below 0.3 mg. The upper limit value should not exceed 1.0 mg under the normal operating conditions of open-air swimming pools. Comply with the values specified in DIN 19643.



Info! Private sector:

If you use a pool stabiliser (isocyanuric acid) or if you have put in organic chlorine (long term chlorine) for disinfecting before using a salt water system, then the measured value must be higher. In these cases check the content of stabiliser in the pool water, in order to determine the correct balance. If the value is too high let some of the pool water out and replenish it with fresh water or replace all of the water. The stabiliser accumulates in the pool water and can only be reduced by diluting it.

- After switching the salt water system on for the first time measure the disinfection content of the hypochlorous acid at short intervals with the DPD-1 method.
- Measure at least 2 to 3 times a day. The disinfection content of the hypochlorous acid rises slowly.

The increase of the disinfection content is determined by:

- The respective capacity of the electrolysis system
- The size of the pool
- The current salt content
- The temperature of the water
- Check the pH value of the water.

The pH value is the key value for the swimming pool water. It determines the effectiveness of the disinfection procedure.



Info!

The pH value must lie in the range 7.0 - 7.4. As the pH value rises the disinfection capacity steadily decreases until it is ineffective.

8.3 Operating the system

- Make sure that the requirements for operating and the steps for the set-up have been carried out.
- Now switch on the TECHNOSTAR system at the main switch on the control.

If the control signal from the measurement and control technology lies between 4 and 20 mA, the system starts to produce the hypochlorous acid in accordance with the requested output.



Info!

Please take the electricity outputs at 100% drive from the

Maintenance and servicing

Technical Data. The system's power output is now controlled directly by the measurement and control technology.

Check the salt content of the pool on a regular basis (min. 0.4 ‰). Thus preventing a deficiency in salt.

If the salt content of the pool water is controlled by a conductivity measurement and control system, then the salt content of the pool water must be subject to regular manual checks. If necessary, it is to be re-calibrated with this value.

If the brine is not automatically re-fed then the amount of salt missing has to be refilled by hand. The salt should be evenly distributed in the pool so that it dissolves quickly (see also 5.4 Start-up)

Calculating the salt content

A salt content of 0.4‰ corresponds to a quantity of 4 kg of salt in every m³ of pool water.

If for example, you measure a salt content of 0.25 ‰ = 2.5 kg of salt / m³, you are missing exactly 0.15 percentage points for the previous salt concentration of 0.4 ‰.

This corresponds to a missing 1.5 kg of salt per m³ water.

In order to attain the desired salt content of 0.4 ‰, you must add 1.5 kg of salt per m³ of pool water.

Visual check of the electrolytic cells:

Carry out a visual inspection of the electrolysis cell(s) at regular intervals.



Info!

A white deposit on the titanium plates of the electrolytic cell indicates calcium or gypsum deposits.

If these deposits are located only at the end of the titanium plates (light white film) and if the system has only recently been commissioned, the production time (until the next polarity reversal) set on the system should be shortened. If deposits are not visible, extend the production time successively to effect a significant increase in the service life of the electrolytic cells.



Caution! Changing the timing!

Can cause the system to malfunction! Only authorised and qualified technicians are allowed to override the system's timing. If necessary, contact the manufacturer or an authorised service partner.

8.4 Calibrating the measurement and control technology

The automatic conductivity measurement of the on-site measurement and control technology or the manual measurement performed by the operating company controls the brine provision to the bathing water.

An insufficient salt content in the water shortens the service life of the electrolytic cell considerably. To avoid low concentrations, perform regular measurements and calibrate the measuring technology.

9. Maintenance and servicing

9.1 General

The section Maintenance and servicing covers the areas of care and visual inspections by the operating personnel as well as cleaning, maintenance and repair by specially trained servicing personnel.

The instructions described in this section are to be taken as minimum recommendations. Extensions could be necessary depending on the operating conditions, in order to obtain the functional quality of the system.



Danger! Live system parts!

*When touched can cause to fatal injuries or death!
The system must be switched off at the main switch before performing any maintenance work and secured against unintended reactivation. Only qualified technical personnel are permitted to carry out work on the system's electrical fittings!*

In order to prevent material and consequential damages to the system, maintain an orderly dismantling and assembly of the components.

The following therefore applies in principle for all extension and dismantling work:

- Marking the parts in their shared identity.
- Marking and noting the installation position and location.
- Dismantle, clean and store component groups separately.

After the repair work the following applies in principle:

- Check that all bolted connections are tight.
- Examine the tightness of all the pipe interconnections and connections.

9.2 Care and inspection

All system parts require careful regular maintenance (see section 10).

It is the operating personnel's task to inspect the system's accessible work areas on a daily basis. All rubbish and/or contamination as far as it is accessible, should be removed and damages should be reported to the maintenance personnel.

- Always inspect the system therefore at the start of a shift.
- Clean badly soiled areas daily.
- Wipe soiled housing surfaces and control elements only with a damp cloth to clean (nothing more).
- When selecting a cleaning agent please ensure that none of the surfaces, keyboards, plastic parts or seals are aggressively affected.

All water based industrial cleaning agents can be freely used.

Carry out the following work in the intervals indicated. Please note that the intervals indicated only represent guideline values. In the long term the times depend on the running time of the system and the surrounding conditions.

Component	Work to be done	Interval
Light diodes	Check for function	daily
Fan in control	check that it functions smoothly	daily

9.3 Maintenance

The Technostar systems are manufactured to the highest quality standard and have a long service life. Nonetheless some parts are subject to operational wear and tear (e.g. the titanium plates, automatic circuit breakers, fuses, hydraulic gate, etc.). Therefore regular visual inspections and inspections with technical measurements are necessary to ensure a long-term service.



Info!

Maintenance work and work to prevent the need for repairs have to be carried out in accordance with the specifications of the corresponding national regulations and standards.



Info!

Liability claims are invalid if they arise from non-compliance of the maintenance instructions and intervals!

Bi-annual maintenance

Checking the following parameters against the values at the time of the installation

- Water temperature
- Flow speed
- pH value
- pH reducer chemical and dosing quantity
- Flocculant chemical and dosing quantity
- Settings (setpoint, PID parameters) of the controller for free chlorine, which controls the system.
- Ambient temperature

Checking the chlorine values in the operating log. Given greater deviation, adapt the system configuration in accordance with the operating manual as required.

Check the cable of the electrolytic cell for

- Kinking
- Moisture
- Thermal overload of the contact points
- Contact points for stability and surface corrosion
 - In the control unit
 - In the extension terminal box
 - On the electrolytic cell
- Change in length or cross-section after installation

Measuring the voltage (max. 30 V DC) on the control cabinet on the electrolytic cell. Improvement of the connection with a voltage decrease over 2.0 V DC.

Check the information texts

- Operating manual present, complete and up-to-date
- Circuit diagram of the control unit present complete and matches the current installation

Check the electrolytic cell for

- Mechanically stress-free installation
- Alignment in the direction of flow
- Direction with temperature control upwards
- Corrosion of the current contacts
- Leak-tightness
- Crystal development outside
 - At adhesion points
 - At current contacts
 - At screw connections/flanges
- Viewing glass soiling from inside

Maintenance and servicing

- Deformation of the titanium package, plane parallelism of the plates
- Vibrations or movements of the titanium package during flow
- Soiling from foreign bodies on the titanium package
- Extreme soiling (limescale or gypsum) between the plates of the titanium package.

If necessary, remove the electrolytic cell, clean and fix the individual components and install the electrolytic cells in accordance with the specifications of the operating manual. When installing the electrolytic cell, use new O-rings or flat gaskets (depending on the model).

Clean the outside surface of the electrolytic cell.

Check the control unit (control cabinet) when switched on for

- Space in front of the ventilation slots (supply and exhaust air)
- The function of the buttons and the illumination of the control
- The function of the temperature switching relay for the ventilator
- Moisture on the outside of the housing
- Inside temperature
- Noticeable 50 Hz humming from components, consult with the manufacturer if necessary.
- Compare with the displayed voltage and the displayed current of the electrolysis with a manual measurement.
- Function of the flow control (interruption of the flow)
- Function of the temperature control (interruption of the voltage supply of the temperature control)
- Function of the fault current circuit breaker

When deactivated for

- Stability of all components
- Fixed contact of all cable connections
- Corrosion of contacts and components
- Thermal overload of contacts and components
- Cleanliness of ventilation filter and ventilator
- Sealing bands
 - In the door
 - On the cable inputs
- Moisture inside
- Function of the protective earth on the housing

Then read out the system parameters at the time of the maintenance

- Operating hours
- Operating hours
- Ampere hours
- Polarity reversal units



Info!

The maintenance does not comprise or describe the change of the titanium package as a wear part. The change must be performed independently of the maintenance following a significant decrease in system output (in accordance with instructions in the operating manual) and is dependent on system operation.

The decrease in output becomes noticeable 1-2 weeks beforehand through a constant increase in the control size for free chlorine. This permits consolidation of maintenance and the replacement of the titanium package.

To prevent system outage, we recommend keeping a titanium package, a sealing set for the electrical connection of the titanium package and a set of seals (O-ring or flat gasket depending on the model).

9.4 Replacing the TECHNOSTAR 2000 AT electrolytic cell.

9.4.1 Dismantling the electrolysis cell

Only the replacement of one electrolysis cell is described. The procedure for further cells is respectively the same. Fig. 9.1 shows a system with three electrolytic cells of the Technostar 2000 AT system



Danger! Live system parts!

Can cause fatal injuries! The system has to be switched off at the main switch before any work is carried out and secured against being unintentionally switched on again! Set up a warning sign: "ATTENTION! Do not switch on! Work is currently being carried out on the system!"

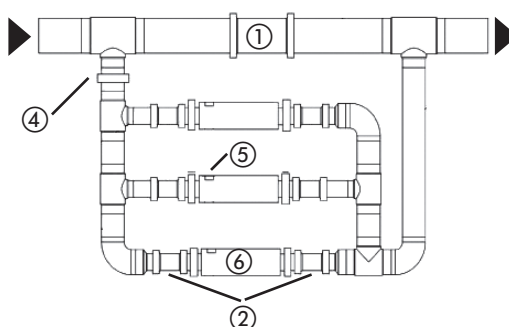


Fig. 9.1: Layout example with three TECHNOSTAR 2000 AT cells

- ① and ② stop valve
- ④ flow control
- ⑤ temperature control (optional, depending on the model)
- ⑥ TECHNOSTAR 2000 AT cell (DN 100, D 110 mm)

The numbers in brackets indicate the position numbers in Fig. 9.1.

- Open the stop valve of the supply water pipe ①.
- Close the stop valve in front of ② and behind the electrolytic cells.
- Remove the connecting cable; mark it if necessary.
- Working with caution, remove the temperature control.
- Working carefully, first remove the temperature control connecting cable from the connector plug. Unscrew the temperature control anti-clockwise.



Info!

The temperature control is not water-tight in the area of the connector plug.

When replacing the electrolytic cell, cover the sensors arranged underneath the cell to avoid the penetration of water. Water penetration destroys the sensor. Water on the plug causes leakage current and destroys the contacts.

Place the connecting cable to one side so that it does not come into contact with the water.

Now loosen the threaded connections to the left and right of the electrolysis cell.



Caution! Residual water in the electrolysis cell!

Can lead to slippery floors with consequential injuries and damages to the parts located underneath the electrolysis cell! Collect the residual water from the electrolysis cell in a suitable container!

Remove the dripping water from the floor if necessary!

- Loosen and remove the screw connections of the electrolytic cell.
- Next carefully take the electrolysis cell out without tilting it.



Info!

If the electrolysis cell is tilted as it is removed, the O-rings of the external threaded connections may be damaged! Check the O-rings after taking the electrolysis cell out. Immediately replace any damaged O-rings!

9.4.2 Returning the electrolytic cell

- Check that the O-rings on the external threaded connections are intact before installing the new electrolysis cell. Replace the O-rings if necessary.
- Lubricate the O-rings with silicone grease before installing. The silicone grease keeps the O-rings supple and facilitates the installation.
- Comply with the direction of flow of the electrolytic cell (sticker on the cell housing). Slide the new electrolysis cell between the external threaded connections without tilting it and tighten them with both of the lock nuts.

The electrolytic cell is to be fitted without any mechanical stress.



Info!

The electrolytic cell is to be positioned so that the temperature control is above and the connection pins of the power supply are at the bottom (fig. 9.2)!

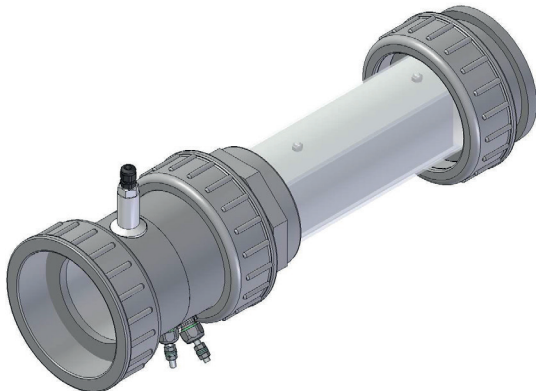


Fig. 9.2: Positioning the electrolytic cell 2000 AT with the temperature control above

- Now tighten the union nuts at the right and left
- Then fit the temperature control. Grease the thread of the sensor with silicone grease.
- Proceeding with caution, screw the temperature control vertically into the cell housing to its fullest extent (O-ring). Make sure that the thread does not suffer damage.



Info!

Should the thread suffer damage and it is no longer possible to screw the temperature control up to the O-ring, you can cut down the thread in the electrolytic cell. Use a G3/4" thread cutter. Then screw in the temperature control as described.

If you do not possess a suitable fine cutter, but have a reserve cell: install the reserve cell and send the defective electrolytic cell to the manufacturer for repair.



Caution!

Contact between the connector plug and water results in corrosion and malfunctions of the connector plug. Always fit the connector plug without contact to water.

- Connect the temperature control with the connecting cable. Ensure that the contacts of the connector plug do not come into contact with water.
- Now insert the cable into the plug of the sensor. The cable can only be fitted in a single direction. The plug is fitted with a lock.
- Open the stop valves (2) and (3) in the bypass again.
- Check the electrolytic cell for leaks. Tighten the screw connections if necessary.
- Then close the stop valve in the supply water pipe and replace it in accordance with the marking.
- Remove the warning sign on the control cabinet and turn the system back on at the main switch.

2000 AT electrical connection

Fit the electrolytic cell connecting cable in accordance with the marking. Counter the screw connection of the connecting cable.



Caution!

High force impact on threaded pins during countering of the connecting cable can result in shearing of the threaded pin from the titanium sheet.

Do not exert any force on the threaded pin when tightening the counter nuts.

Check the correct polarity of the connecting cable using a multimeter set to direct voltage (DC) and a measuring range over 30 volts.

- The DC voltage must be no more than 30 V between poles 1+ and 1-.
- The DC voltage must be no more than 30 V between poles 2+ and 2-.
- There must be no measurable voltage between poles 1+ and 2+ as well as 1- and 2-.



Caution!

Incorrect polarity damages the electrolytic cell. Turn the system off immediately at the main switch and attach the connection cable correctly!

Maintenance and servicing

9.5 Replacing the TECHNOSTAR 2000 ST electrolytic cell

Replace the electrolytic cell of the Technostar 2000 ST as described below.



PLEASE NOTE

Turning or loosening the contact pins on the electrolytic cell 2000 ST means that it is no longer possible to guarantee its function. Do not use the flats of the contact pins when fixing the electrolytic cell cable.

9.5.1 Dismantling the electrolysis cell



Danger!

Live system parts can cause fatal injuries! The system has to be switched off at the main switch before any work is carried out and secured against being unintentionally switched on again! Set up a warning sign: ATTENTION! Do not switch on! Work is currently being carried out on the system!

See section 6.3

- Turn off the system at the main switch and secure it against unintended reactivation.
- Set up a warning sign!

The numbers in brackets indicate the position numbers in Figure 69.1.

- Open up the stop valve of the clean water line (1).
- Close the stop valves in front (2) and behind (3) the electrolysis cells.
- Remove the electrolytic cell connecting cable.
- Now loosen the threaded connections to the left and right of the electrolysis cell.



Caution!

Residual water left in the electrolytic cell can lead to slippery floors with consequential injuries and damage to the parts located underneath the electrolytic cell! Collect the residual water from the electrolysis cell in a suitable container!

Remove the dripping water from the floor if necessary!

- Loosen the electrolysis cell's threaded connections completely.
- Next carefully take the electrolysis cell out without tilting it.



Info!

If the electrolysis cell is tilted as it is removed, the O-rings of the external threaded connections may be damaged! Check the O-rings after taking the electrolysis cell out. Immediately replace any damaged O-rings!

9.5.2 Returning the electrolytic cell

- Check that the O-rings on the external threaded connections are intact before installing the new electrolysis cell. Replace the O-rings if necessary.
- Lubricate the O-rings with silicone grease before installing. The silicone grease keeps the O-rings supple and facilitates the installation.
- Comply with the direction of flow (label on the cell housing). Slide the new electrolytic cell between the external screw connections without tilting it and fix it with the two union nuts.
- Now tighten the locknuts by hand to the right and left.
- The electrolytic cell is to be fitted without any mechanical stress.
- Fix the connecting cable of the electrolytic cell.
- Open the stop valve in the bypass.
- Close the stop valve up to the markings in the clean water line.
- Remove the warning sign on the control and switch on the system with the main switch.
- Check the system for leakages and remedy any found.

10. Care instructions for the electrolytic cells

The electrodes in the electrolysis cell are wearing parts; their service life depends greatly on the respective installation. The surface of the titanium electrode is coated with a mixed oxide. This coating is a prerequisite for the electrolysis cell's smooth operational running. The service life of the coating depends on various factors that can be significantly affected by the user.

10.1 Salt content of the swimming pool water

An insufficient salt content changes the chemical reactions on the titanium electrodes and causes the coating to decompose more quickly.

For this reason, the salt content should not fall below the stipulated minimum level of 0.35%. The salt content is given in a specific framework for all devices. The device's output depends on the salt content. With a lower salt content the output is also lower. Therefore the running time and/or the power output are increased to compensate. This reduces the service life.

10.2 Higher metal content of the water (iron, manganese)

A higher metal content in the water can for example arise with untreated spring water. This type of water is not suitable for the electrolysis system. The filling water must be treated accordingly beforehand in accordance with the recommendations of the German drinking water ordinance (*Trinkwasserverordnung*).

10.3 pH value of the swimming pool water

The pH value must not fall below pH 6.5 or rise above pH 7.6. Optimal values lie between pH 7.0 and 7.4.

10.4 Acid content during cleaning



Warning! Use of diluted hydrochloric acid!

*Can cause chemical burns to the skin and eye injuries!
Wear protective gloves, protective goggles and protective clothing before working with the diluted hydrochloric acid! When mixing the hydrochloric acid with the water, first pour water in a suitable container and then add the acid into the water. Never pour water into acid!*

Use diluted hydrochloric acid to clean the electrolytic cell. When using for example 31 % technical hydrochloric acid, it must be diluted to a ratio of 1: 5 with water.

Attention: First fill the water, then the hydrochloric acid!

A hydrochloric acid content of over 10 % slowly destroys the titanium plates and the coating. Commercial hydrochloric acid has a content of 31 % - 35 %.

After the cleaning process the cell has to be thoroughly rinsed out with water.

10.5 Do not use any hard/metal objects

Do not use any hard or metallic items to clean the electrodes. If you do the surface of the titanium electrode can be destroyed.

10.6 Limescale deposits in the cell

Heavy calcium deposits on the electrodes as well as the bridging between the electrodes shortens the service life of the titanium plates.

10.7 Only operate the electrolytic cell with direct voltage

The electrolytic cell may only be connected to the intended control. Operating the electrolysis cell in an alternating voltage destroys the titanium coating and leads to premature wear (loss).

Disposal

11. Shutdown and disposal

11.1 Decommissioning

If the flow-through chlorine electrolysis system has been out of service for more than a week, take the following precautions:

- Let the water out of the electrolytic cell
- Switch off the main switch of the control unit.
- Apply protection against unauthorised activation of the system.
- Protect the system against frost and heat.

11.2 Environmental Protection



Caution! Hydrochloric acid!

Can contaminate the floor or end up in the drains! Comply with all legal obligations pertaining to waste disposal and correct use/disposal when performing all acidification work on and with the system. Store, transport, collect and dispose of acid in suitable containers! Follow the safety data sheet!

11.2 Acid and waste containing acid



Info!

Acids and waste contains acid pose a high risk of danger for the environment. Therefore they are disposed of by specialist companies. Supply these internal company waste disposals to be passed on to the specialist companies. Read and observe the safety data sheets of the respective manufacturer as well as the operating instructions of the operator when handling acids and waste containing acid.



Info!

After the requisite prior treatment, the hydrochloric acid must be transported to and disposed in a certified hazardous waste incinerator; this procedure must comply with the specifications of the hazardous waste regulations. Waste code number: The allocation of waste code numbers has to be conducted industry specific and process specific, in accordance with to the EAK regulation.

11.3 Final decommissioning

If the flow-through chlorine electrolysis system is to be decommissioned, comply with the applicable laws and regulations pertaining to disposal.

Certainly it is wise to check which materials can be recycled and then do so.

12. Spare parts and accessories

Wearing parts	Part no.
Electrolytic cell 2000 ST	91930020
Electrolytic cell 2000 AT, flange connection	91930228
electrolytic cell 2000 AT	91930220
Spare parts	Part no.
Control unit 2000 ST	91930100
Control unit 2000 AT-250	91930213
Control unit 2000 AT-2x250	91930230
Cable 2000 ST (2x 2 m, ø4 mm ²)	TP00063
Protective cap cable 2000 ST	39057
Seal 2000 ST, O-ring, DN50	80088
Seal 2000 AT-G, O-ring, DN100	91930208
Seal 2000 AT-F, flat seal, DN100	88723
Screw-in part 2000 ST, PVC, DN50, for adhesion	22460
Screw-in part 2000 AT-G, PVC, DN100, for adhesion	97853
Flange bushing 2000 AT-F, PVC, DN100, for adhesion	88722
Flange 2000 AT, PP, DN100	88134
Accessories	
Screw M18x90 (DIN 100 flange)	83659
Nut M18 (DIN 100 flange)	83662
Washer ø18 (DIN 100 flange)	84166
Flow control Bronze, 24 V DC, L 46 mm, G 1/2 exterior	91930010
Temperature control PVDF/Monel, +45 °C switching range, G 3/4 a	41100124
Temperature control bungs, G 3/4 a	36105
Housing 2000 AT For installation and test runs of the piping and circulation	TP00108

13. Troubleshooting

Type of fault	Possible cause	Corrective measures
Flow meter display	Defect of the flow meter.	Check the sensor.
	No water flow.	Check the flaps in the bypass.
Display Temperature sensor.	Temperature control defective.	replace sensor.
	Temperature control has triggered.	display „red“ is automatically reset; remove triggering errors (water flow too low).
	other errors.	inform customer service:
half output despite 100 % requirement with MSR-technology.	titanium in the electrolysis cell is used up; the breakdown of the titanium quits.	Inform customer services; the electrolytic cell will need to be changed soon.
No output.	Cable loose.	Check cable and fasten.
	Automatic circuit breaker tripped.	Reactivate the automatic circuit breaker; contact the customer services if it repeats.
	Cell is worn.	Install new cells.
	External release not issued	Check the building automation.
Heavy limescale deposits in the cell.	Polarity reversal not active.	Observe the polarity reversal and check with a voltage meter.
	Shorten the polarity reversal time.	Working in the service menu, adjust the polarity reversal times. inform customer services.

The pool diary

[illegible][illegible]

Handover record

Handover record

This handover record serves to familiarise the customer with the surroundings. Please plan sufficient time to discuss or demonstrate the individual items on the record with the customer. Then the checkboxes are ticked off.

Customer name:

Location:

Street:

Tel.:

System installed:

Measuring and control equipment:

Installation by company:

Staff name:

Date of installation:

Date of handover:

The points which concern the customer

The following points are subject to extensive on-site explanation. After the handover, the customer must be able to explain what he has learnt and work independently to operate the system.

Demonstration of

- ☐ Control unit
- ☐ Control / MiniPLC
- ☐ Automatic circuit breakers
- ☐ Electrolytic cell connection
- ☐ Electrolytic cell structure
- ☐ Bypass gate valves
- ☐ Optimal water flow
- ☐ Cleaning the electrolytic cell

Further points for discussion

- ☐ System running time
- ☐ Filter system running time
- ☐ Salt content and capacity
- ☐ Connection pH / free chlorine
- ☐ Measure the free chlorine
- ☐ Measure the salt content
- ☐ Salt consumption / refill
- ☐ Calculate the salt addition
- ☐ Water chemistry / effects of water and salt
- ☐ Limescale and gypsum deposits / carbonate hardness
- ☐ Calculate the bound chlorine
- ☐ before adding salt / filter off
- ☐ Danger of corrosion
- ☐ Winter operation / high season operation

pH value measurement and control

Setting the pH value in the water, setpoint / actual value

- ☐ pH reducer (minus) / pH raiser (plus)
- ☐ Setting the quantity of pH agent dosing pump
- ☐ Treatment pH measuring electrode
- ☐ Calibration pH measuring electrode
- ☐ pH buffer solutions
- ☐ Carbonate hardness pH value buffering
- ☐ Injection nozzle
- ☐ Container, canister, suction lance

Free chlorine measurement and control

- ☐ Setting the free chlorine value in the water, setpoint / actual value
- ☐ Legal limit values
- ☐ pH and temperature-dependence
- ☐ Functioning chlorine measuring cell
- ☐ Treatment chlorine measuring cell
- ☐ Calibration chlorine measuring cell
- ☐ Measuring the photometer

[] Redox measurement and control

Value ranges

- ☐ pH and temperature-dependence
- ☐ Functioning Redox measuring chain
- ☐ Treatment Redox measuring chain
- ☐ Calibration Redox measuring chain

Measured values in the water upon handover

pH value -

Free chlorine	mg/L	
Bound chlorine	mg/L	
Stabiliser	mg/L	
Hardness	° dH	
Salt	%	

Comments:

.....
.....
.....
.....

Customer signature:

Customer advisor signature:

Date:

Location:



EU-Konformitätserklärung

Der Unterzeichnete Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, bestätigt, dass die nachfolgend bezeichneten Geräte in der von uns in Verkehr gebrachten Ausführung die Anforderungen der harmonisierten EU-Richtlinien, EU-Sicherheitsstandards und produktspezifischen Standards erfüllen. Bei einer nicht mit uns abgestimmten Änderung der Geräte verliert diese Erklärung ihre Gültigkeit.

(EN) EU Certificate of Conformity

The undersigned Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, hereby certifies that, when leaving our factory, the units indicated below are in accordance with the harmonised EU guidelines, EU standards of safety and product specific standards. This certificate becomes void if the units are modified without our approval.

(FR) Certificat de conformité aux directives européennes

Le constructeur, soussigné: Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, déclare qu'à la sortie de ses usines le matériel neuf désigné ci-dessous était conforme aux prescriptions des directives européennes énoncées ci-après et conforme aux règles de sécurité et autres règles qui lui sont applicables dans le cadre de l'Union européenne. Toute modification portée sur ce produit sans l'accord express de Jesco supprime la validité de ce certificat.

(ES) Declaración de conformidad de la UE

El que subscribe Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, declara que la presente mercancía, objeto de la presente declaración, cumple con todas las normas de la UE, en lo que a normas técnicas, de homologación y de seguridad se refiere, En caso de realizar cualquier modificación en la presente mercancía sin nuestra previa autorización, esta declaración pierde su validez.

(NL) EU-overeenstemmingsverklaring

Ondergetekende Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, bevestigt, dat het volgende genoemde apparaat in de door ons in de handel gebrachte uitvoering voldoet aan de eis van, en in overeenstemming is met de EU-richtlijnen, de EU-veiligheidsstandaard en de voor het product specifieke standaard. Bij een niet met ons afgestemde verandering aan het apparaat verliest deze verklaring haar geldigheid.

(HU) EG (EK)– Egyezőségi nyilatkozat

A Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark ezúton kijelenti, hogy a szóban forgó termék annak tervezése és szerkezeti módja, valamint forgalomba hozott kivitele alapján a vonatkozó alapvető biztonságtechnikai és egészségügyi követelményeknek és az alábbi felsorolt EG –irányelveknek minden szempontból megfelel. A terméken engedélyünk nélkül végrehajtott módosítások következtében jelen nyilatkozat érvényét veszíti.

(PT) Certificado de conformidade da UE

Os abaixo mencionados Lutz-Jesco GmbH, Am Bostelberge 19, 30900 Wedemark, por este meio certificam que ao sair da fábrica o aparelho abaixo mencionado está de acordo com as directrizes harmonizadas da UE, padrões de segurança e de produtos específicos. Este certificado ficará nulo se a unidade for modificada sem a nossa aprovação.

Bezeichnung des Gerätes: **Durchfluss-Chlorelektrolyse Anlage**
Description of the unit: **Flow-through Chlorine Electrolysis Unit**
Désignation du matériel:
Descripción de la mercancía:
Omschrijving van het apparaat:
A termék megnevezése:
Designação do aparelho:

Typ / Type / Tipo / Típusjelölés:

Technostar 2000 ST
Technostar 2000 AT
Technostar 2000 AX
Technostar 4000 AT
Technostar 4000 AX
Technostar 4000 AX+

EU-Richtlinie / EU directives/
Directives européennes / Normativa UE /
EU-richtlijnen / Vonatkozó EG-irányelvek /
Directrizes da UE
2006/42/EG
2006/42/EG
2004/108/EG

Harmonisierte Normen / harmonized
standards / Normes harmonisées /
Estándares acordemente / Toegepaste normeringen /
Hatályos normák / Normas harmonizadas
EN 55022 : 2006
EN 55024:1998 +A1:2001 +A2:2003
EN 61000-3-2 : 2005
EN 61000-3-3 : 2005
EN 61000-4-2 : 12.01
EN 61000-4-3 : 12.06
EN 61000-4-4 : 07.05
EN 61000-4-5 : 12.01
EN 61000-4-6 : 12.01
EN 61000-4-8 : 1993

i.V. Dipl. Ing. Klaus Albert
Lutz-Jesco, Wedemark, 01.01.2008

Technische Leitung / Technical Departement Manager / Direction technique /
Dirección Técnica / Hoofd technische dienst / Műszaki irodavezető / Director Técnico

CE-TECHNOSTAR-V02

