

redox

CONSTANT CORROSION CONTROL



eleXion

redoX Manual

Reaction vessel installation instructions

Contents

1. Overview.....	2
2. Area of application	3
3. System identification.....	4
4. General safety information.	6
5. General operating conditions.	7
6. Glycol	7
7. Reaction tank selection.	8
8. RedoX dimensional drawings.	9
9. Installation.....	14
9.1 Schematic principle	14
9.2 Schematic principle drawings.....	15
9.3 Maintenance clearance	17
9.4 Mounting the redoX reaction vessel.	17
9.5 Valve kit installation.....	18
9.6 Commissioning.....	22
10. BMS connectivity.....	23
10.1 Flow measurement	23
10.2 Filter.....	23
10.3 Anode.....	23
10.4 Complete compliance skid- viSion monitoring	24
11. Visual displays.	25
11.1 Understanding the mA meter/anode output display.	25
11.2 Understanding the Pressure gauges.	26
12. Maintenance.	27
12.1 Safety note	27
12.2 Isolating the unit.	27
12.3 Accessing the anodes & filter.	27
12.4 Inspecting the anode.....	28
12.5 Replacing the anodes.....	29
12.6 Cleaning the filter	30
12.7 Flushing the vessel body	30
12.8 Cleaning the vessel.	30
12.9 Replacing the automatic balancing valve cartridge	31
12.10 Accessing the pressure gauges and mA meter	32
12.11 Replacing the pressure gauges	32
12.12 Replacing the mA meter	32
12.13 Replacing the AAV	33
13. Monitoring / testing.....	33
14. FAQ / Troubleshooting	34
15. Maintenance log:	35
16. Sound Engineering Practice (SEP) Statement:	36

1. Overview.

Chemical free water treatment systems from eleXion have been specially designed to combat corrosion in modern sealed systems.

Achieving compliance with VDI 2035, VDI 6044, BSRIA BG29 & BG50 by targeting the three key elements of corrosion:

- pH
- dissolved oxygen
- Electrical conductivity

Chemical free water treatment and VDI 2035 is the preferred method of water treatment for the vast majority of HVAC manufacturers.

redoX from eleXion provides constant corrosion control by implementing electrochemical technology, in the form of the UK's most advanced electrochemical reaction vessel.

Next generation, technical advancements in electrochemistry ensure both heating and chilled systems remain compliant with known chemical free guidance.

Electrochemical reaction vessels (redoX) are installed onto the system to provide corrosion control in place of chemical dosing.

System water circulates through the reaction chamber where dissolved oxygen is constantly removed.

Dissolved oxygen is removed electrochemically by the process known as “Electrically induced oxygen reduction”. The byproduct of this reaction helps to elevate the pH of the system water to the correct levels, where they are constantly maintained.

The elevated pH of the system water helps contribute towards system passivation by the formation of a strong oxide layer on metal surfaces found in modern mixed metal installations.

Elevating the pH of the water also neutralises acids and contributes to a reduction in water hardness, therefore reducing electrical conductivity of the circulating water.

redoX offers constant corrosion control by eliminating the known contributing elements which are essential for corrosion to take place within a system (high levels of dissolved oxygen & low pH ranges).

redoX consists of three zone technology, with the zones being separated by the internal air separation/dirt disbursement plate and the large surface area filter.

The large surface area filter basket uses a reusable stainless steel filter bag. The stainless steel filter bags have a long service life and can be fully removed for cleaning purposes.

Differential pressure gauges indicate when the filter needs to be cleaned.

The electrical current of the anodes and the effectiveness of the reaction vessel are registered by the mA meter. The mA meter provides a visual condition of the anodes without having to remove the anodes for inspection.

redoX has been designed as a truly all in one device, taking the place of vacuum degassers, air separators, dosing pots, automatic dosing units, chemical dosing and side stream filters.

When utilised on a system which has been well designed, installed, commissioned & maintained, redoX will help contribute towards tolerable levels of dissolved oxygen within a system, and the formation of strong naturally occurring oxide layers, therefore preventing corrosion.

redoX reaction vessels have been designed to operate on certain system volumes where the oxygen ingress has been estimated. Systems which are known to suffer with high levels of oxygen ingress, have had historic corrosion issues as a result of oxygen ingress or where the system volume and ingress level is unknown, eleXion advises using either a larger redoX vessel to combat this or use multiple redoX reaction vessels.

The volumes and flow rates given against each model are an estimate only.

2. Area of application

The redoX reaction vessel has been designed for use in closed loop heating, chilled & condenser circuits.

Constant corrosion control is achieved within the closed loop systems as a result of electrochemical protection, oxygen is constantly removed and pH levels are maintained, preventing corrosion.

Electrochemical reaction vessels have been widely used across Europe for more than 50 years to provide corrosion control without the use of chemical additives.

The redoX system takes the place of chemical dosing as redoX reaction vessels create an environment where corrosion damage is highly unlikely.

The redoX reaction vessel should be strictly utilised on systems which do not consist of chemical inhibitors.

The system helps maintain a corrosion free environment, whilst removing deposits and corrosion debris from previously fouled systems.

New systems should be designed to be as oxygen tight as possible, utilising state of the art materials to achieve minimal oxygen entry through diffusion.

On existing systems which are not “closed” in terms of corrosion, the redoX reaction vessel can significantly improve system water quality by removing dissolved oxygen from the system water which has entered through diffusion as a result of poorly selected materials (non barrier plastic/hoses etc).

On systems which are not “closed” in terms of corrosion the redoX reaction vessel should be situated as near as possible to the known source of oxygen entry.

When installing existing systems which have previously been chemically dosed, eleXion recommends that the concentration of chemical within the system water is diluted before bringing on the redoX system.

If installed on a heavily dosed system, an increased maintenance schedule of the redoX vessel will be required until the concentration of chemical additives has been reduced to tolerable levels.

eleXion recommends that system water is kept between 10 -200 uS/cm on well designed “closed” systems and between 10-50 uS/cm on systems which are not deemed “atmospherically closed” as a result of non-barrier plastic etc &/or contain aluminium components.

If the redoX unit is installed on systems that have been filled with extremely hard water, expect to find calcium residue (lime scale and lime sludge) at the base of the vessel and surface of the anodes. As there is an increase in the system’s pH, calcium carbonate dissolved within the water will reach an equilibrium causing deposits to be formed.

As a result, a reduction in total hardness is to be expected within the system water as the pH rises above 9.

redoX vessels which have been heavily fouled as a result of lime scale formation or used on systems which have been previously dosed can be cleaned using a diluted natural acid, e.g. citric acid.

3. System identification.

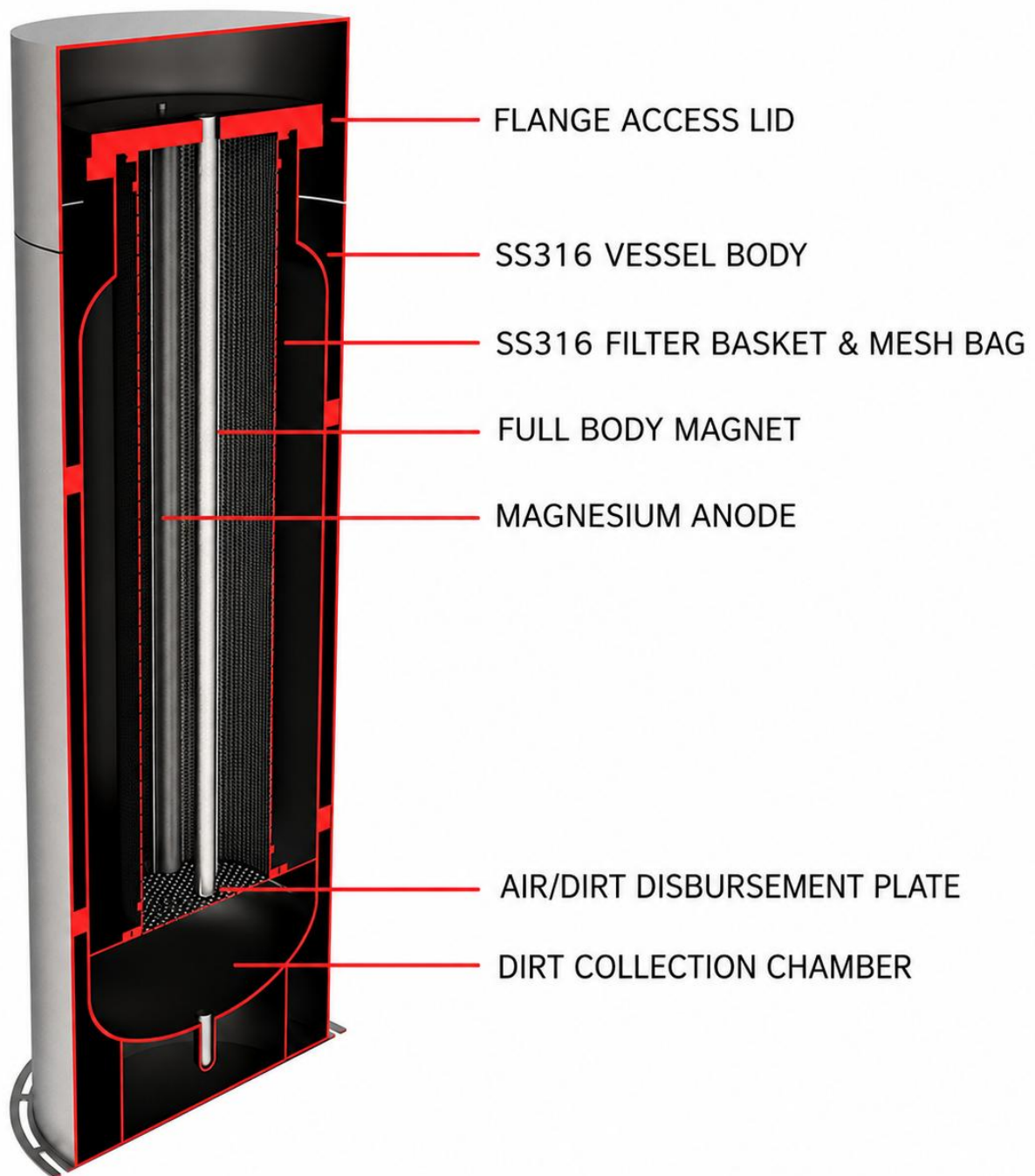
redoX 10-100

External



redoX 10-100

Internal



4. General safety information.

The redoX reaction tanks should only be installed, commissioned and operated in accordance with this instruction manual and should only be operated by suitably trained personnel.

Each redoX reaction tank is manufactured from high grade 316 stainless steel.

To ensure maximum performance and reliability only original supplied anodes, valves & accessories should be used when operating the redoX reaction tank.

The redoX vessel has been manufactured to withstand pressures of up to 10 bar, designed to withstand temperatures of up to 95 degrees. For systems that operate at higher pressures or temperatures than those stated, eleXion can provide made to order units up to 24 bar at medium water temperatures.

The units should never be exposed to higher temperatures or pressures than listed in the below technical data.

All units are pressure tested at the factory to ensure they are compliant with the information in this manual.

Directive PED2014/68/EU Sound engineering practice procedures are strictly adhered to.

eleXion products are manufactured in facilities which hold ISO 9001:2015, ISO 14001:2015 & ISO 45001:2018 accreditation.

redoX tanks are not designed to be used in water which is used for human consumption, with them being widely used in closed loop applications.

redoX reaction tanks should only be installed on a solid, stable and level platform, capable of supporting the weight of the unit when in operation.

Any modifications to the units or improper use will invalidate the warranty immediately. The manufacturer also assumes no liability for damages caused by incorrect use or installation.

redoX reaction vessels can be operated under high temperatures and pressures, precautions should be taken when handling or servicing the unit.

Onsite risk assessments should be completed and appropriate PPE should be worn before working on any eleXion system.

redoX reaction vessels consist of a high powered magnet, handle with caution as the force of the magnet could potentially cause personal harm as a result of being attracted to metal surface. People with medical issues such as having a pacemaker fitted should not handle the unit. Keep mobile phones etc away from the magnet to prevent damage.

Before any maintenance is carried out, the redoX reaction tank must be hydraulically isolated from the main system using the isolation valve kit supplied. If the temperature of the vessel is hot, the vessel should be allowed to cool to a safe temperature before handling or draining the vessel. Once drained, confirmation that the system is no longer at pressure should be witnessed via the inbuilt pressure gauges before attempting to open the vessel lid. Once confirmed opening of the vessel should be undertaken with caution, failure to comply with the above may result in personal harm.

The eleXion system must not be operated in potentially explosive atmospheres or close to an open flame source, it should also be installed in a suitably ventilated area.

If any damage or faults are found prior to or after installation, the unit must be taken out of service until such repairs can be made to the unit. The manufacturer assumes no responsibility for any damage caused by the continued use of the unit once any damage has been noted.

Personal injury and property damage resulting from the failure to comply with these instructions are not covered by the Product Liability. The manufacturer assumes no liability for any other damage caused by the failure to comply with these instructions.

Please read these instructions carefully before using the device. For your own safety and others, it is essential to follow the safety instructions in this instruction manual.

You must always adhere to the relevant local safety regulations. It is the installers' responsibility to comply with the local regulations that apply to them and to keep up to date with the latest regulations.

The reaction tank is only suitable for the treatment of system water for technical applications in closed loop systems, the treated circulating water is not suitable for human consumption.

No chemicals or highly concentrated detergents should be used in the system.

If the reaction vessel is operated in systems which have been filled with hard water, have previously been chemically dosed or are heavily fouled, then it is recommended that the maintenance frequency of the reaction tank is increased to suit site conditions.

Heavily fouled vessels may need cleaning with a weak natural acid cleaner that has been diluted such as citric acid.

5. General operating conditions.

The redoX reaction tank is designed to be used in a chemical free installation, the use of chemical agents can prevent the correct function of the redoX tank and therefore should not be used.

It is recommended that the tank is rinsed once a year with clean water, ideally using demineralised water.

6. Glycol

VDI 2035 and other known chemical free guidance does not cover the use of glycol.

eleXion endorses the use of more environmentally friendly and technically minded applications where the risk of freezing is a risk.

Technical based solutions such as trace heating, increased insulation, BMS control &/or pump kick when the external temperature falls below 5 °C, should ideally be utilised in place of glycol dosing.

In the event it is a necessity that glycol is to be added to a system then eleXion would recommend that a non toxic, environmentally friendly glycol is added to the system.

Typically, food grade ethylene glycol or equivalent, that is free from any additional inhibitors should be used.

The incumbent water treatment contractor shall ensure that the glycol is compliant with the above statement and perform an onsite test to ensure no dramatic increase in the system water electrical conductivity value or reduction of the pH value.

The water treatment contractor should test the system water regularly to ensure the glycol concentration remains at the required levels as degradation of glycol is known to cause a reduction in the system water's pH.

If Glycol is a requirement for the system installation, eleXion would also recommend looking at plate separation, preventing large volumes of glycol being used, protecting only the components that are exposed to the potential of freezing.

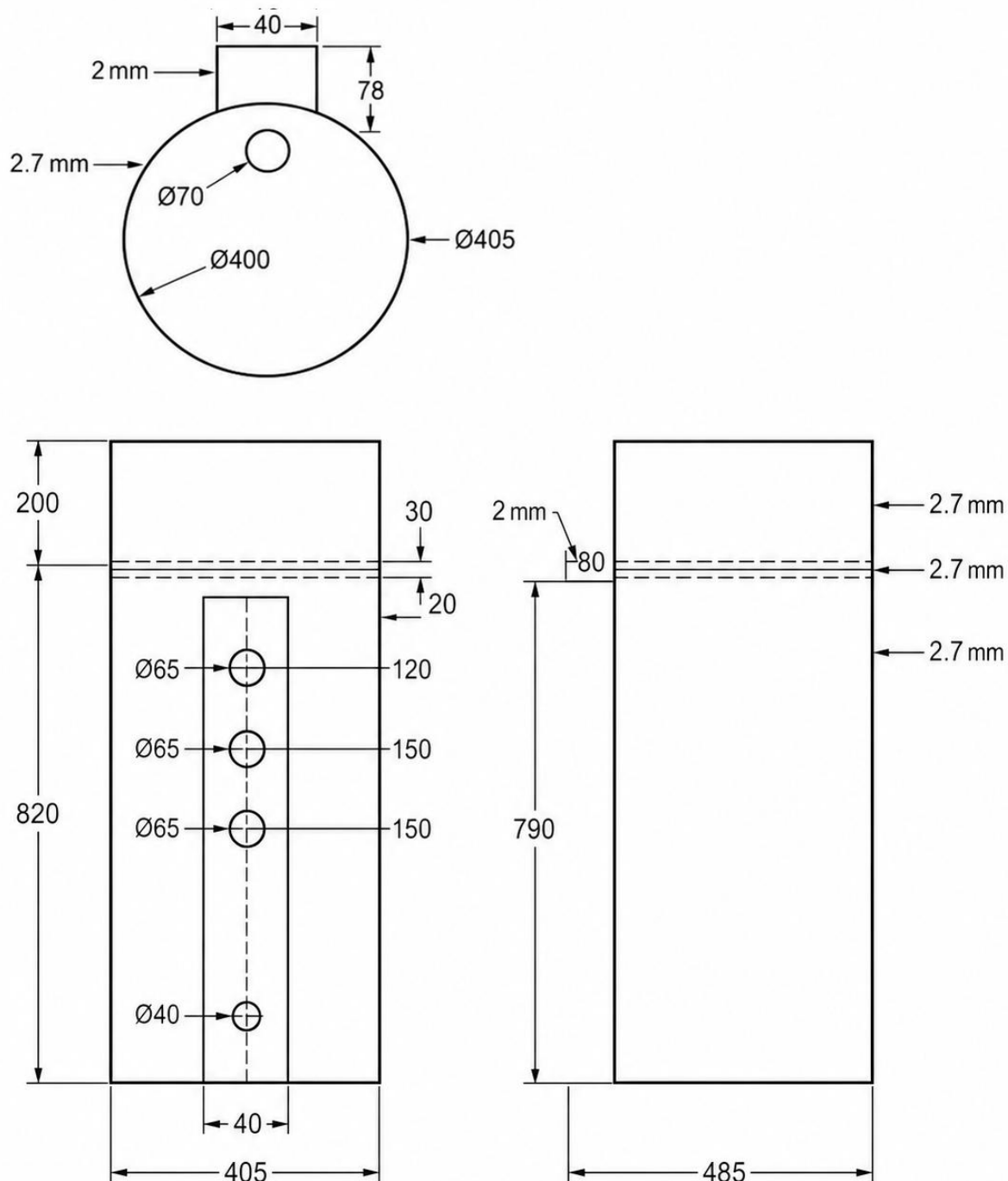
7. Reaction tank selection.

redoX model	10	20	40	70	100
Dimensions					
Tank height (mm)	1020	1100	1230	1400	1400
Tank width (mm)	405.40				655
Tank width with gauge housing (mm)	485.40				735
Weight empty (kg)	115	125	135	155	TBC
Vessel information					
Design code	PED 2014/68/EU				
Wet side material	316 SS				
External jacket material	304 SS				
Tank finish	Pickled & passivated				
Insulation	20 mm foam				
Test pressure (bar)	10			16	
Maximum operating pressure (bar)	6			10	
	UP TO 24 BAR AVAILABLE ON REQUEST				
Maximum operating temperature (°C)	95				
Effective capacity (Litres)	75	85	95	110	292
Connection sizes					
Air vent	½"				
*Inlet/outlet side stream model	¾"	1"		1 ¼"	
Drain	¾"				
Pressure gauge connection - 2no.	½"				
Anode access	Removable top flange with M16 wing nuts				
* Full flow or Side stream valve kit supplied – System hydraulic connection dependent					
Operating information					
Circulating water volume only / Buffer vessel volume not included					
Maximum system volume heating (Litres)	10,000	20,000	40,000	70,000	100,000
Maximum system volume cooling (Litres)	5,000	15,000	30,000	50,000	75,000
Recommended flow rate side stream (lpm)	5	10	20	45	80
Anode Structure	High purity				
Anode type	Exposed				
Anode maintenance meter	mA 50				
Magnet (mm) - 1200 gauss neodymium	600 x 20			800 x 20	
Pressure gauges (bar) - 2no.	12				16
Filter basket	SS 316 perforated tube				
Filter basket dimensions (mm)	200 x 670	200 x 670	200 x 870	200 x 870	300 x 870
Filter bag options (micron) - SS 316	1 / 5 / 25 / 38				
Effective filter area (m2)	0.50	0.50	0.60	0.60	0.96

8. RedoX dimensional drawings.

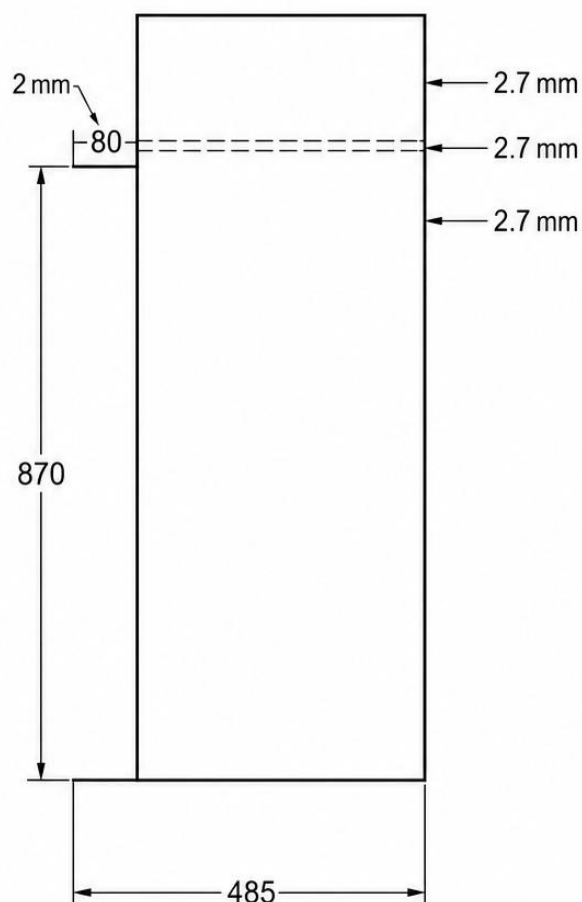
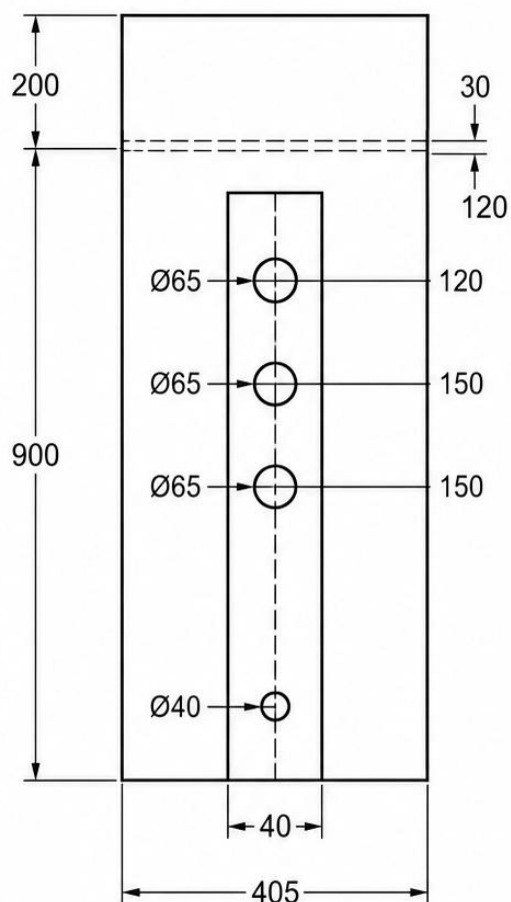
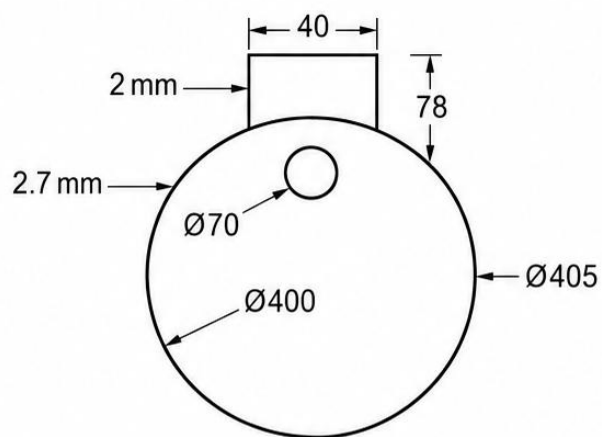
redoX 10

Dimensions



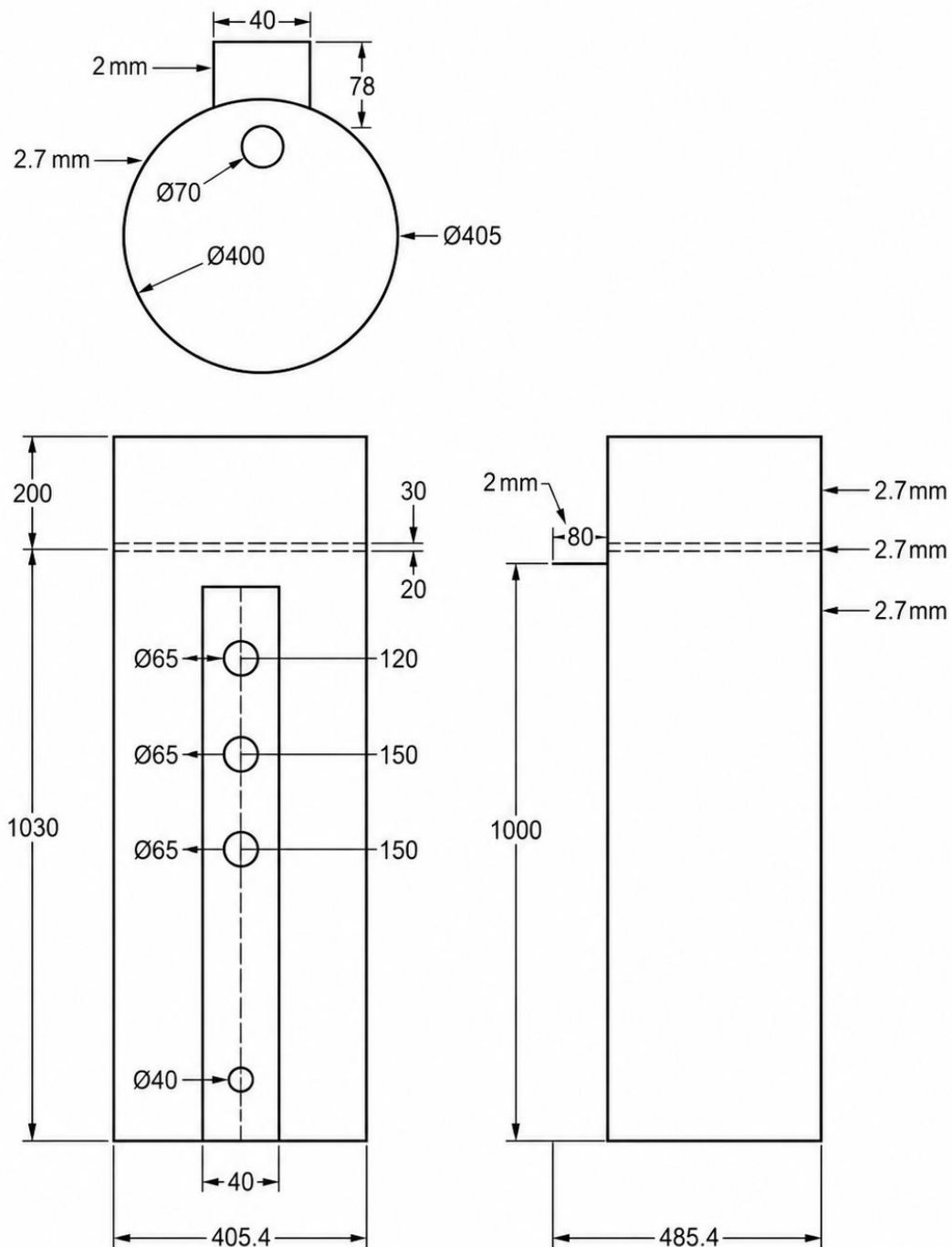
redoX 20

Dimensions



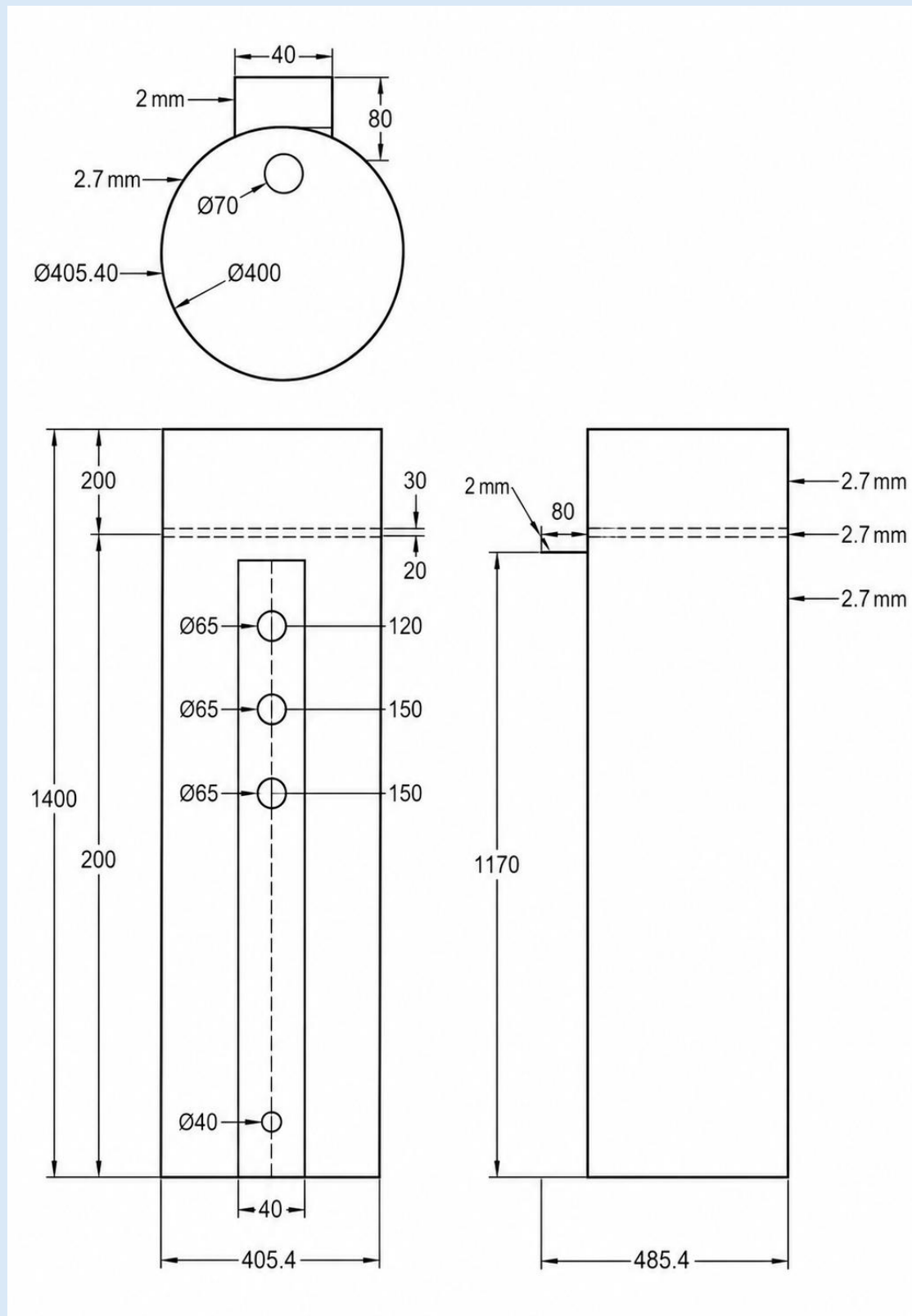
redoX 40

Dimensions



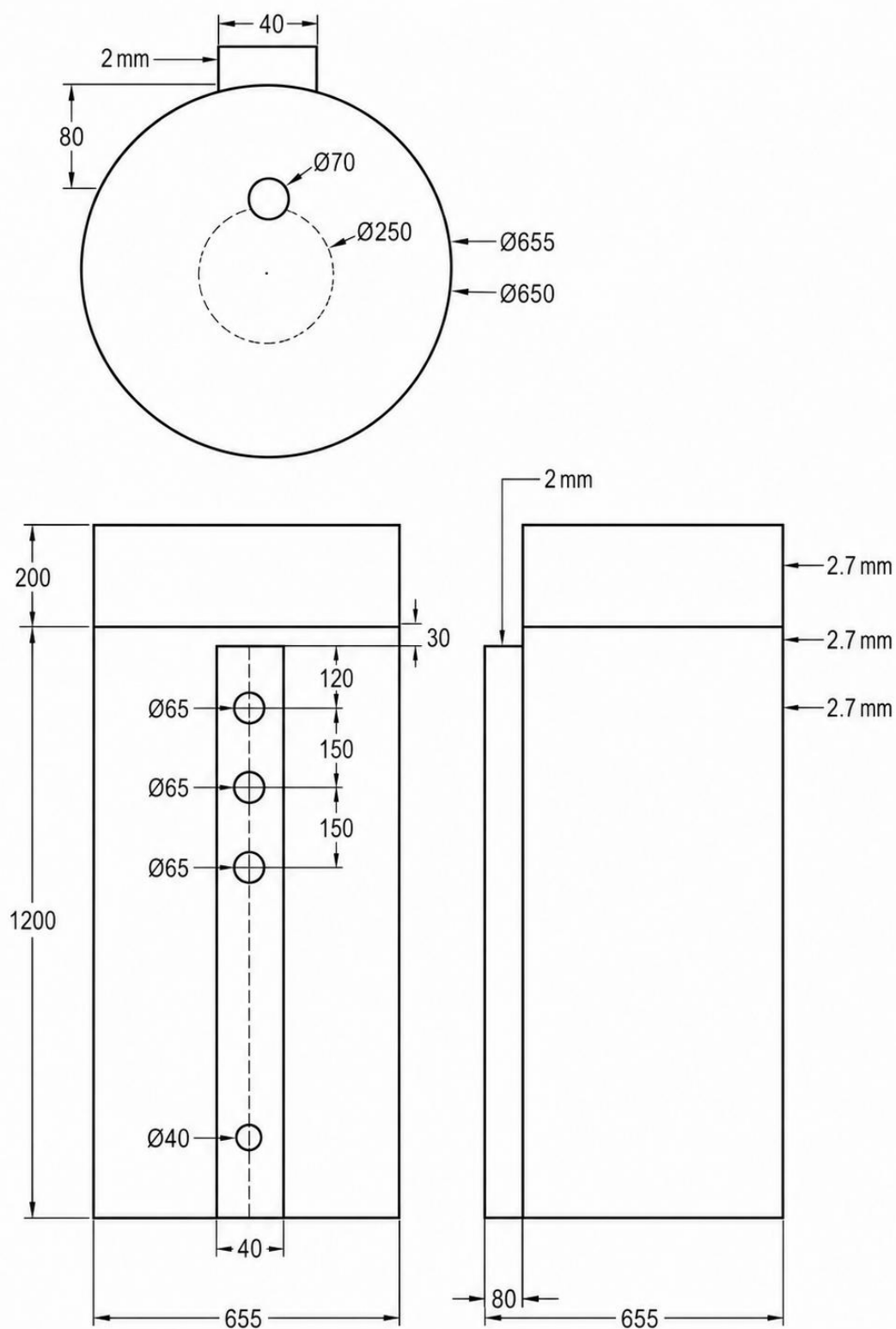
redoX 70

Dimensions



redoX 100

Dimensions



9. Installation.

9.1 Schematic principle

redoX reaction vessels simply require flow from the system to operate.

Flow can be generated via onsite pumps, which are already in the initial system design.

This type of installation simply requires the installer to “Tee” in before and after the pump, or find suitable connection points where flow can be generated across the flow/return line.

Alternatively on retrofit projects where side stream filtration and/or chemical dosing pots have been installed, the redoX can be installed in place of these types of units, utilising the existing pipe work.

These types of devices are typically installed with “Tee” points either side of the system pumps, allowing simple integration of the redoX reaction vessel.

Side stream filters & chemical dosing points can be installed across the flow and return of systems, this can cause a slight increase of the return temperature back to the main network. The flow rate through the reaction tank is minimal and shouldn't have a detrimental effect on system efficiency if installed across the flow and return pipe work. This stipulation typically only applies to systems utilising condensing boilers.

Alternatively, the redoX reaction vessel can be installed utilising its own circulation pump. This allows for flexible installation as the vessel can be piped into any available connections on existing systems, with new systems being able to provide two points with a minimum 500 mm spacing.

The reaction tank can be installed on the flow or return of the system.

Typically, more dissolved gases are found at locations where the system operates at its lowest temperature.

If there are known areas of oxygen ingress within the system then the redoX is ideally installed as close as possible to the source of oxygen ingress.

If the system has multiple areas of concern as a result of oxygen ingress, then the reaction vessel is ideally suited on the return line back to the main plant equipment.

eleXion's preferred installation method is on the return back to the plantroom utilising its own pump, as it is likely there will be more dissolved oxygen present.

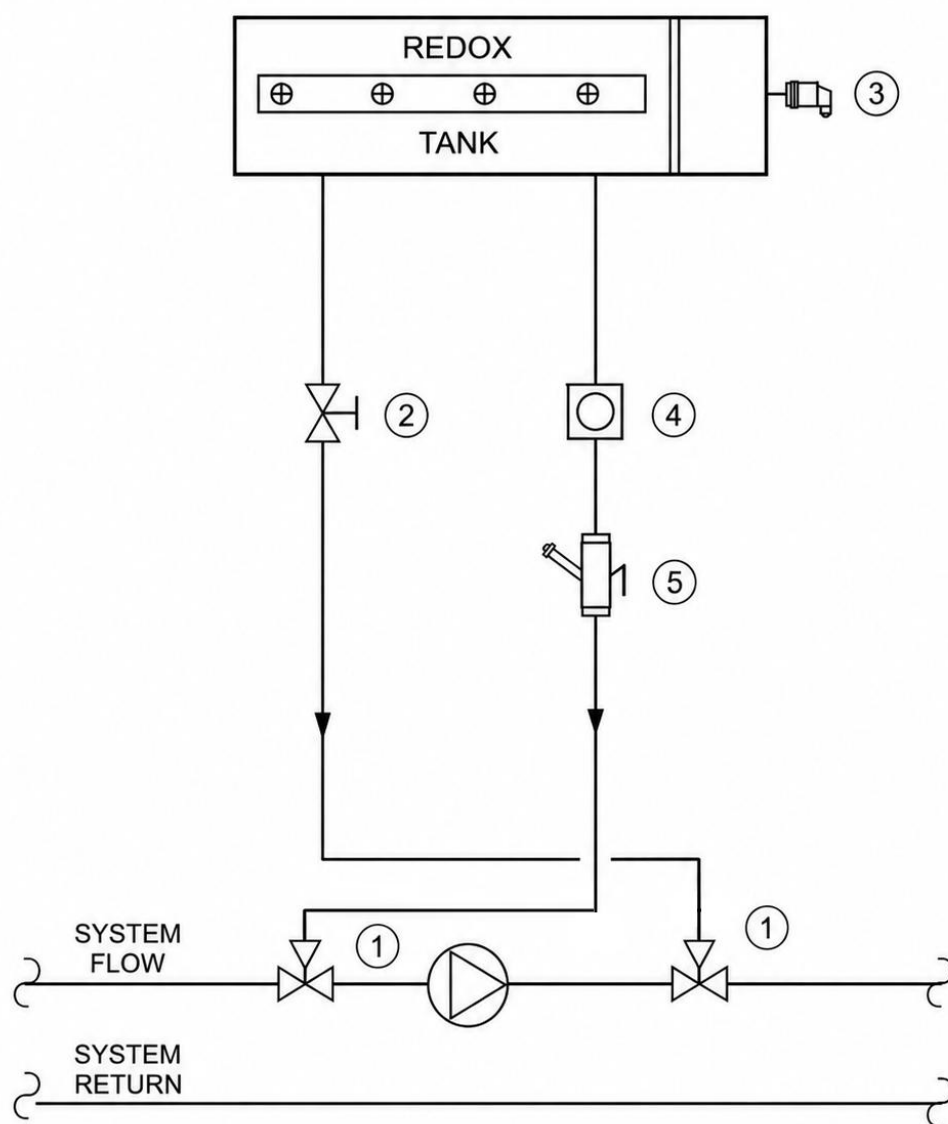
Installing on the flow line has the benefit of being able to remove microbubbles from the system water.

The redoX reaction vessel can also be installed directly into buffer vessels, whether they are used as large low loss header, 3 pipe buffers or simply for additional system volume.

9.2 Schematic principle drawings.

redoX installation principle

Utilising system pumps

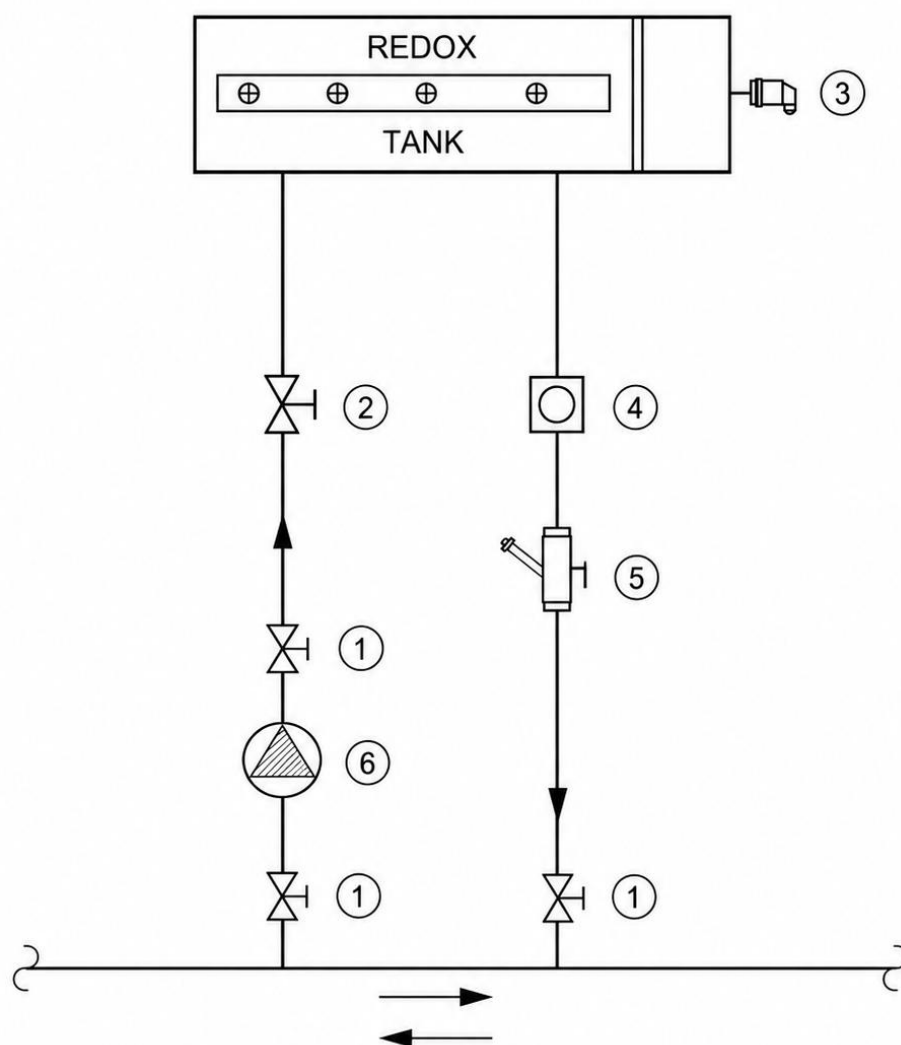


KEY

- ① CLIENT IV's NOT SUPPLIED
- ② FLUSHING BY-PASS
- ③ AUTO AIR VENT
- ④ MECHANICAL WATER METER
- ⑤ PRESET FLOW REGULATOR BALL VALVE

redoX installation principle

Utilising designated pump



KEY

500mm MINIMUM DISTANCE
BETWEEN CONNECTIONS.

EITHER PRIMARY FLOW OR
RETURN PIPEWORK.

PRIMARY RETURN PREFERABLE
ON HIGH TEMPERATURE SYSTEM.

- ① CLIENT IV's NOT SUPPLIED
- ② FLUSHING BY-PASS
- ③ AUTO AIR VENT
- ④ MECHANICAL WATER METER
- ⑤ PRESET FLOW REGULATOR BALL VALVE
- ⑥ CIRCULATING PUMP

9.3 Maintenance clearance

The recommended clearances are as follows:

redoX model	10	20	40	70	100
Clearances					
*Above vessel height	650 mm		800 mm		
In front of vessel	400 mm				
Either side of the vessel	400 mm				
Behind vessel	300 mm				

*If access above the reaction vessel is limited then it is possible to move the reaction vessel out of position during service visits. The redoX valve kit includes removable unions for this purpose allowing the installer to gain access to the internal chamber and remove the anodes/filter. eleXion would recommend the redoX vessel is installed on a small skid plate so that a trolley could be placed underneath and moved into an appropriate area for maintenance.

9.4 Mounting the redoX reaction vessel.

The redoX reaction vessel is supplied with a multi hole fixing ring for flexibility when mounting onsite.

The ring ensures there are ample fixing points available for the installer to securely mount the vessel no matter the surface in which they are utilising.

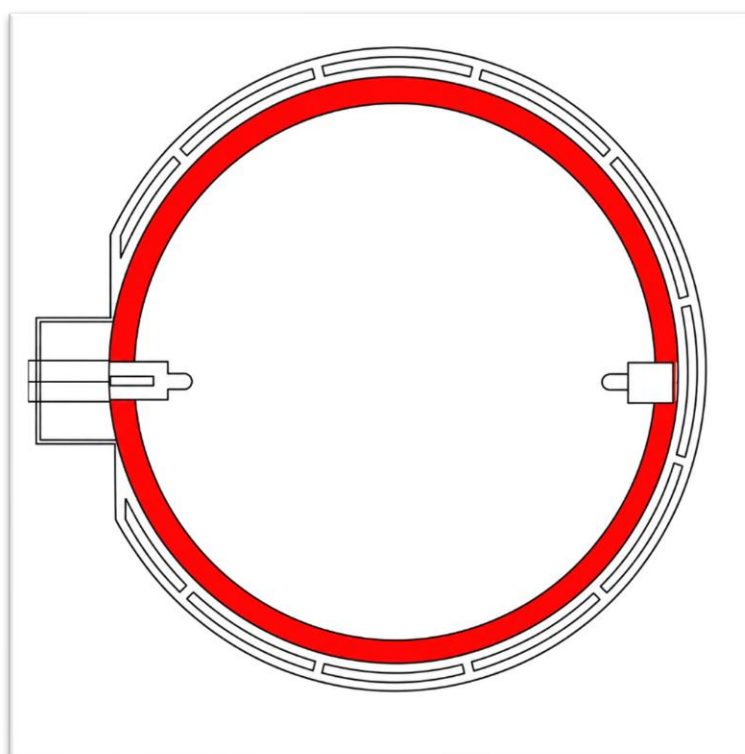
eleXion recommends that a minimum of four fixings are used, however depending on the installation environment and surface additional fixings may be required.

The installer must install the vessel on a suitable platform (direct to the floor/plinth/frame etc) which is capable of taking the weight of the vessel when full.

The platform must be sturdy and level to prevent the vessel from moving.

The installer will need to use appropriate fixings depending on the surface in which they plan to mount the vessel.

The vessel must be level and secured firmly to the floor.



9.5 Valve kit installation

redoX reaction tanks have been designed to provide absolute flexibility for site installation.

The inlet and outlet connections are located at the back of the vessel.

The inlet connection is located toward the bottom of the unit and the outlet is located towards the top of the unit.

The supplied valve kit consists of angled union valves which are to be fitted into the reaction vessel, these angled union valves allow for the pipework connecting the redoX to the system to be in any orientation to suit installation preference.

The valve kit can be fitted in any orientation to suit site installation conditions.

Only the valve kit supplied with each redoX model should be used, no alterations to the valve kit installation are permitted.

The installer must follow the valve kit arrangement diagram (found on the following pages) for the relevant model which they are installing.

The valve kit consists of all items needed to install the redoX reaction vessel.

The kit comes with a preset automatic balancing valve, designed to ensure the maximum flow rate of each model is not exceeded. The ABV self regulates depending on supplied flow rate from the system. No additional balancing valve or PICV is required.

The installer must provide a suitable jointing method to suit their preference.

eleXion permits the use of LOCTITE 55 or PTFE tape (or similar), for use on threaded fittings.

It is a requirement that the male threads of each item are “roughened or scratched” before applying the sealing thread.

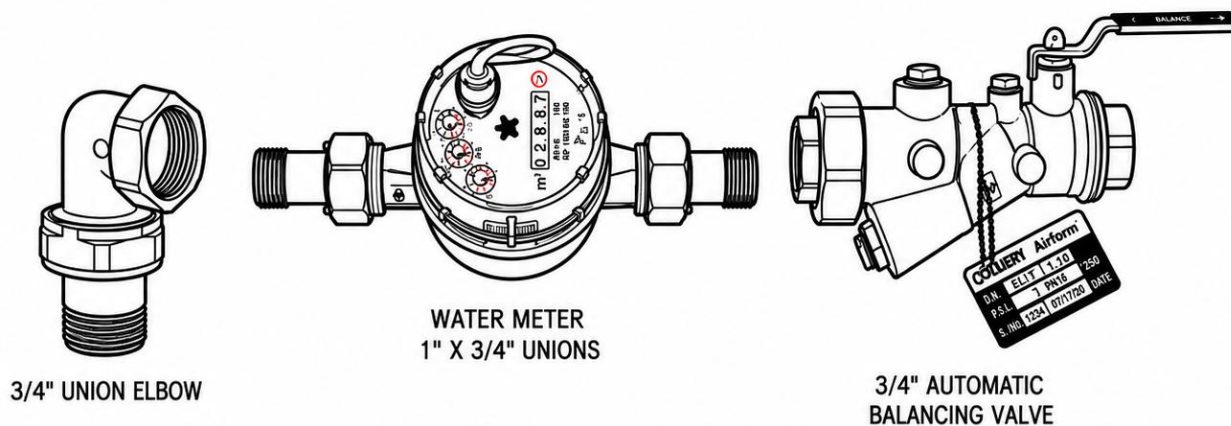
Alternatively sealing compounds are permitted for use such as LOCTITE 557 or Rapid blue gel (or similar).

Before applying the selected sealing method, please refer to the selected product manufacturer’s instructions to ensure that the product is suitable for use and you are familiar with the necessary steps in making a watertight seal.

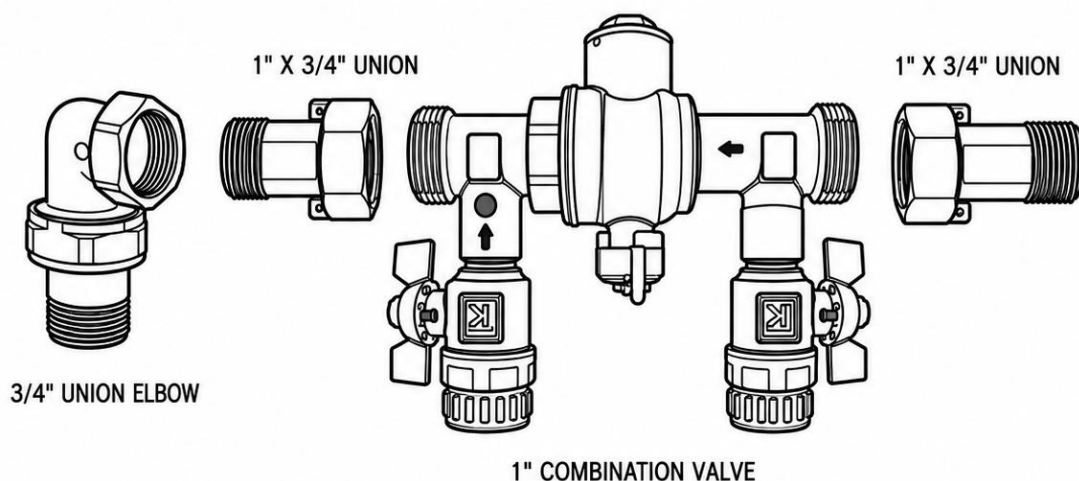
Any leak to the installed valve kit is the responsibility of the installer and will not be covered under the product guarantee, unless an item is faulty through manufacturing issues.

Redox 10

OUTLET VALVE KIT ARRANGEMENT



INLET VALVE KIT ARRANGEMENT



Supplied Valves & accessories

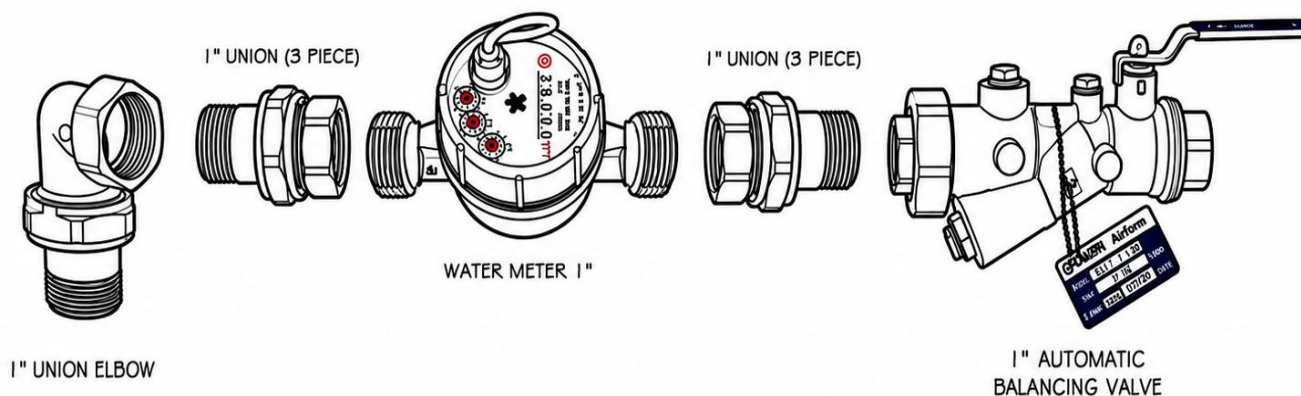
Item description	Part number	Size	Quantity
AAV	EXL15-1.0-110	1/2"	1
Inlet/outlet union elbows	1520034	3/4"	2
Combination/flushing bypass valve (LK521 Multifil)	091480	1"	1
Combination valve union	15440100	1" x 3/4"	2
Automatic balancing valve (121 valve - Caleffi)	121151 M30	3/4"	1
Water meter (USF- Altecnic)	GG-L31ASC02B051	3/4"	1
Drain valve	IT0930034B	3/4"	1
*Pump	60231351	DAB Evoplus 40/180 M	1
**Pump control module (on/off & run/fault output)	60152884	--	1

* Pump only required if not using pump found in existing system design, with redox requiring its own individual circulation pump to create flow (see schematic "installation with separate pump").

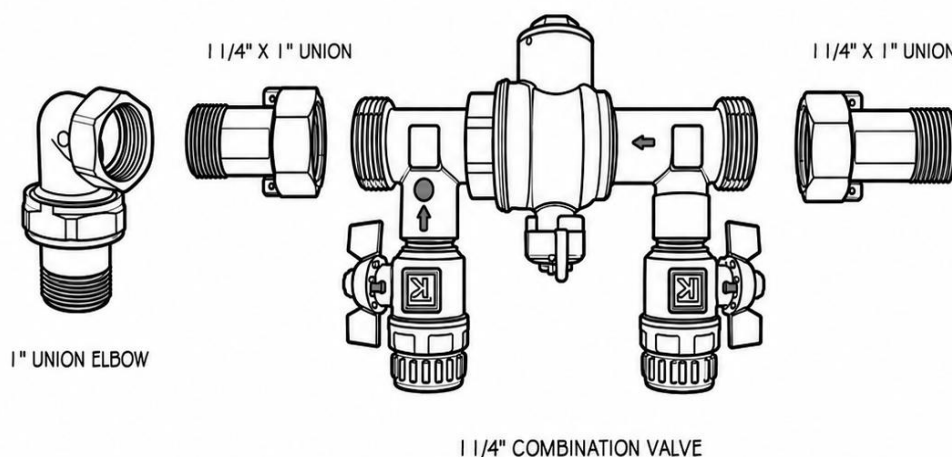
** Pump control module only required if separate pump is required and site requires external on/off run demands (inputs) with run and fault signals (outputs).

Redox 20 & 40

OUTLET VALVE KIT ARRANGEMENT



INLET VALVE KIT ARRANGEMENT



Supplied Valves & accessories

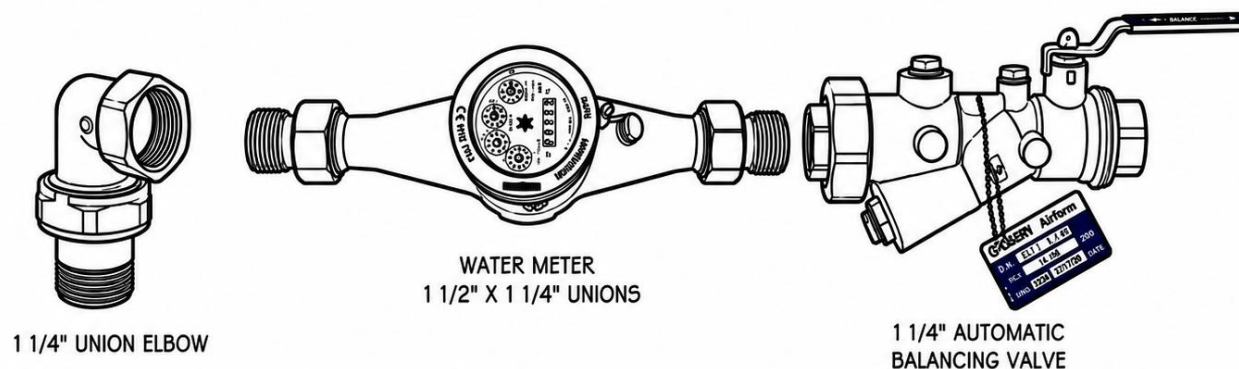
Item description	Part number	Size	Quantity
AAV	EXL15-1.0-110	1/2"	1
Inlet/outlet union elbows	IT1520100	1"	2
Combination/flushing bypass valve (LK521 Multifil)	091481	1 1/4"	1
Combination valve union	IT1540114	1 1/4" x 1"	2
Automatic balancing valve (121 valve - Caleffi)	121161 M60	1"	1
Water meter (USF- Altecnic)	GG-L31ASC02B051	3/4"	1
Water meter 3 piece union	IT1510100	1"	2
Drain valve	IT0930034B	3/4"	1
*Pump	60220931	DAB Evoplus 60/180 M (20) DAB Evoplus 80/180 M (40)	1
**Pump control module (on/off & run/fault output)	60152884	--	1

* Pump only required if not using pump found in existing system design, with redox requiring its own individual circulation pump to create flow (see schematic "installation with separate pump").

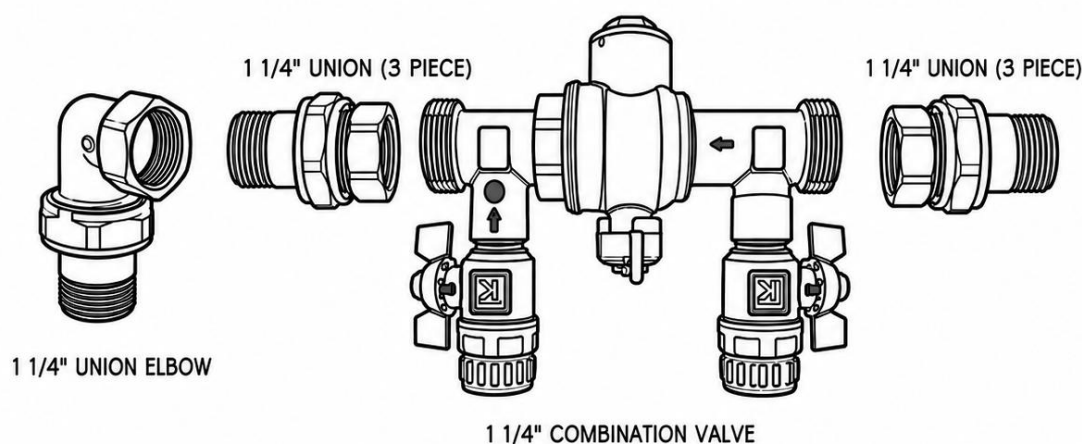
** Pump control module only required if separate pump is required and site requires external on/off run demands (inputs) with run and fault signals (outputs).

redoX 70 & 100

OUTLET VALVE KIT ARRANGEMENT



INLET VALVE KIT ARRANGEMENT



Supplied Valves & accessories

Item description	Part number	Size	Quantity
AAV	EXL15-1.0-110	1/2"	1
Inlet/outlet union elbows	IT1520114	1 1/4"	2
Combination/flushing bypass valve (LK521 Multifil)	091481	1 1/4"	1
Combination valve union	IT1510114	1 1/4"	2
Automatic balancing valve (121 valve - Caleffi)	121171 2M5	1 1/4"	1
Water meter (GMDM-1)	-	1 1/4"	1
Drain valve	IT0930034B	3/4"	1
*Pump	60150949	DAB Evoplus 110/220.32M	1
**Pump control module (on/off & run/fault output)	60152884	--	1

* Pump only required if not using pump found in existing system design, with redox requiring its own individual circulation pump to create flow (see schematic "installation with separate pump").

** Pump control module only required if separate pump is required and site requires external on/off run demands (inputs) with run and fault signals (outputs).

9.6 Commissioning

Once installed the unit can be commissioned.

- ✓ Ensure the reaction tank is fixed to a suitable base and the correct fixings have been used.
- ✓ Ensure enough space has been left for maintenance requirements.
- ✓ Ensure the reaction vessel has been hydraulically connected to the system correctly, following examples given within the manual.
- ✓ Ensure the valve kit has been installed correctly and the flow from the system enters the reaction vessel at the bottom connection and then exits the vessel at the top connection.
- ✓ Slowly start to fill and vent the unit, by opening the isolation valve located on the inlet of the reaction vessel (combination valve).
- ✓ Once fully vented, check for leaks.
- ✓ Check the mA meter is reading, showing current.
- ✓ Check the pressure gauges are reading the correct system pressure.
- ✓ Open the outlet isolation valve.
- ✓ Operate the proprietary pump or system pump to generate flow through the unit.
- ✓ Time the water meter for 1 minute, ensuring the flow rate through the unit is correct and in line with the details found within the data table. One revolution of the 0.01 dial (circled blue) represents 10 litres passed. Alternatively record the dial clock reading (circled green) and then record the volume passed after 1 minute, the difference equates to total litres per minute.
- ✓ Complete the paperwork, record the anode output (mA reading), record the water meter consumption and take a water sample.



10. BMS connectivity.

There are multiple options for monitoring the redoX reaction vessel and system water quality, utilising our state of the art viSion monitoring system.

viSion monitoring can be supplied as a separate unit or part of a combined package where it is directly mounted to redoX “complete compliance” skids.

10.1 Flow measurement

As standard redoX reaction vessels are supplied with a pulsed water meter which detects flow through the vessel. This can be recorded via the BMS directly or via viSion monitoring.

10.2 Filter

The differential pressure can be monitored across the redoX reaction vessel by the fitting of 2 x 4-20 mA transducers. The transducers can be fitted directly to the BMS or via the viSion monitoring unit.

10.3 Anode

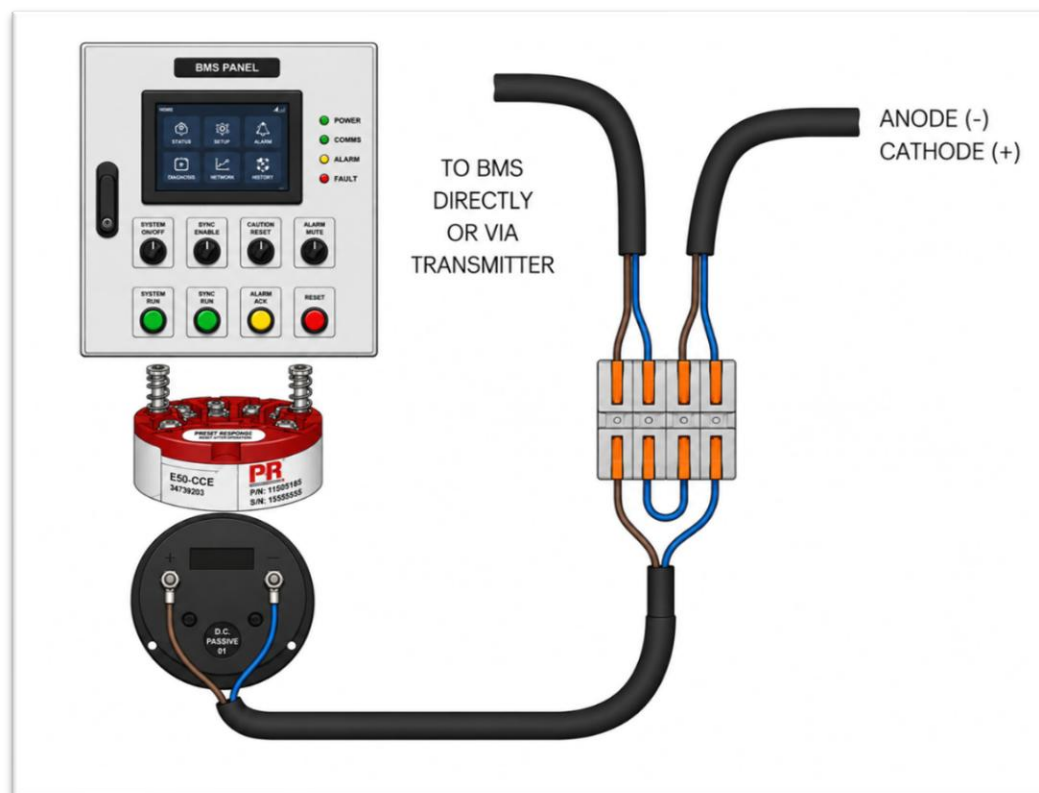
The anode performance can be monitored directly via the BMS.

A signal of 0-100 mA will be generated via the anode when in use, the BMS should record a scale of 0-100% to interpret the anode performance.

The front mA display meter and BMS must be installed in series to get an accurate reading for the anode, installing in parallel will only give 50% of the value.

Alternatively, the redoX reaction vessel can be supplied with a transmitter.

The transmitter must be installed in series with the front mA display meter, then the 4-20mA output can be connected to the BMS.



10.4 Complete compliance skid- viSion monitoring

Complete compliance skids consist of a pre plumbed redoX reaction vessel which has been mounted to a stainless-steel skid plate.

Skids can be fully customisable to suit project requirements, including remote monitoring of the system water quality in real time alongside performance of the reaction vessel.

When utilising viSion monitoring and sensor manifold, the following parameters can be checked:

- ✓ Flow rate through redoX
- ✓ Filter (via pressure transducer)
- ✓ Anode performance
- ✓ IoniX filling station water meter
- ✓ IoniX filling station high electrical conductivity alarm
- ✓ pH
- ✓ Dissolved oxygen
- ✓ Electrical conductivity
- ✓ Corrosion rate
- ✓ Temperature
- ✓ System pressure



11. Visual displays.

11.1 Understanding the mA meter/anode output display.

redoX reaction vessels are fitted with a mA meter which gives a visual indication on how the anode is performing and potential requirements for servicing/replacement.

The galvanic cell produces a small DC current as a result of the difference in potential from the two dissimilar metals which are used in the construction of the galvanic cell.

This current is recorded via the mA meter display.

The current within the vessel varies depending on system conditions, as the system self regulates and compensates due to fluctuating conditions within the system as it operates. It is normal for the gauge to display higher and lower readings throughout the year.



When a system is first filled it is normal for the mA meter to display maximum output. It is highly likely that the reading within the system will be far above this reading potentially up to 300 mA.

During normal operation if the system has elevated levels of dissolved oxygen, through oxygen ingress then the gauge will read a maximum output reading, the anode is working hard to rectify the conditions within the system.

Impurities &/or high levels of conductivity can also be a factor in the increased output of the current. Ideally the mA meter should not display a maximum reading at all times, the anode current should start to reduce. If after one year of operation, the anode meter displays maximum output at all times, an investigation into system sizing and areas of oxygen ingress needs to be instigated. The system is potentially undersized and a second vessel may need to be fitted to combat the oxygen ingress the system is experiencing.



Under normal operation the mA meter will display a reduced output reading.

This reduction is what we expect to see as the levels of dissolved oxygen and impurities improve as the system operates.

The anode output self regulates depending on system conditions, a reduction in output doesn't mean the anode is less effective and needs replacing, it is simply having to work at a reduced rate due to an improvement in the system conditions.

If the mA meter displays the same output value all year, the gauge may be faulty. The meter can be tested by disconnecting the lead at the anode connection on the lid; the gauge should drop to zero. Alternatively, a 1.5 V AA battery can also be used and the meter should read maximum.



The mA meter displays zero current, the anodes need to be checked.

Remove the anodes and inspect, the anodes may have become coated and require cleaning or the anodes may have come to the end of their service life and need to be replaced.

If the anodes are in a good condition and the mA meter still displays zero, the system may be free of dissolved oxygen. To test simply partially drain the reaction vessel allowing oxygen to enter the vessel, the current should increase.

During prolonged periods where the reaction vessel is not in use (shut down periods), it is possible for the mA meter to read zero, there is no flow through the vessel, once the system operates the mA meter should start to rise.

If the current doesn't increase the mA meter may be faulty, please test the meter using a 1.5v AA battery.

If in doubt replace the anodes to ensure the system remains at maximum efficiency.

11.2 Understanding the Pressure gauges.

The redoX reaction vessels are fitted with two pressure gauges, designed to display the pressure differential across the internal filter.

The top pressure gauge indicates the pressure at the outlet of the filter.



The bottom pressure gauge indicates the pressure at the inlet of the filter.



A visible 0.5 bar pressure differential across the two meters indicates the internal filter needs cleaning.

The pressure gauges give an indication that the tank has been successfully isolated from the system during servicing. Only once the pressure gauges both read zero, can the vessel be opened and the system maintenance performed. Failure to confirm that the system has been successfully isolated and fully drained could result in personal harm &/or damage to property.

12. Maintenance.

12.1 Safety note

Please complete a risk assessment before attempting to maintain the redoX reaction vessel. The system is subject to high pressures and temperatures.

The vessel should be given sufficient time to cool down to a safe operating temperature before attempting to handle the internal components.

Some of the vessel components are heavy and may require two engineers to safely handle these items.

12.2 Isolating the unit.

Each redoX reaction vessel is supplied with isolation valves to isolate the vessel and the supplied accessories from the system.

Before attempting to open the reaction vessel lid, the vessel must be isolated from the main system.

Isolate the vessel via closing the combination valve (centre handle), located on the supply line to the redoX vessel. When in operation the handle is in line with the direction of the pipeline and when closed the handle goes against the pipeline direction.

The outlet isolation valve is located on the automatic balancing valve.

Once successfully isolated the water meter should no longer spin.

Remove the magnet from the lid, store safely. **CAUTION high powered magnet!**

Attach a hose to the ¾" base drain and drain the vessel into a suitable drain or container.

The pressure gauges should now indicate zero bar pressure within the vessel.

Allow the vessel to be fully drained before attempting to open the vessel lid, removing the AAV may assist with draining the vessel. **Only attempt to remove the AAV once sufficient water has been drained from the vessel.**

When no more water is expelled from the hose the vessel has been successfully drained.

12.3 Accessing the anodes & filter.

On completion of draining the vessel, the anodes and internal filter can be accessed.

Remove the outer cover lid.

The anode(s) need to be disconnected from the anode mA meter. Disconnect them by removing the blue spade connector from the anode connection located on the lid.

The internal vessel lid can now be removed by undoing the six eyebolts using a suitable tool.

The lid needs to be lifted upwards, the air vent pipe can be used as a handle, redoX 100 vessels have a designated handle for removing the lid.

Caution the lid can be heavy, it is advisable that the lid on the redoX 70 & 100 is removed by two engineers.

12.4 Inspecting the anode

With the lid removed the anodes can be visually inspected.

The anode will likely be covered in residue, either black iron deposits or a white/yellow crust, this is normal.

The life span of the anodes is 2-5 years. For optimal performance replace every two years.

From new the anodes are 33mm in diameter.

eleXion recommends replacing the anode when the anode reaches a diameter of 10mm or if the anode is unlikely to be active before the next service visit.



To clean the anode(s), the anode needs to be removed from the lid.

The anode is fixed to the anode connection socket via an 8mm threaded stud.

The anode connection socket must be held using a spanner.

If the anode connection socket is allowed to move, the lid could potentially leak as the securing gasket has been disturbed.

The anode is only hand tightened into the anode connection socket, if the anode has become too tight to remove by hand, use a set of pipe grips on the anode surface to assist in removing.

Never attempt to remove the anode by holding the threaded stud with a pair of grips, this could cause the threaded stud to dislodge from the anode body.

The anode is supported at the base of the dry magnet pipe by a supporting cradle. The cradle can be removed in the event the anodes become stuck.

Use an Allen key to disconnect the cradle from the dry pocket pipe.

With the anode removed it can now be cleaned.

To clean the anode the surface of the anode needs scraping with a suitable tool.

eleXion recommends using the following tools: drill attachment cleaning wheel, grinder with light abrasive disk, wire brush or similar.

Precautions should be taken as dust like particles will be removed from the surface of the anode.

Appropriate PPE is recommended.

12.5 Replacing the anodes

When reinstating or replacing the anode(s) it is important that the anode(s) do not touch the anode cradle.

The anode cradle consists of an insulated shoulder washer, designed to ensure the anode does not make contact with the metal parts of the cradle. The anode must be inserted back through this insulation washer, if damaged or missing it must be replaced.

The anode must be screwed into the anode connection socket by hand only.

The anode only needs to be hand tight.

Ensure the anode connection socket is supported by using a spanner, if the seal on the anode connection socket is damaged or worn it must be replaced to ensure a watertight seal.

If the anode connecting socket needs replacing, it is critical that the bolt used to secure the anode connection socket to the lid is fitted with the insulating sleeve, designed to cover the threads of the bolt as it passes through the lid. If the bolt directly touches the metal lid the mA meter will not read and the reaction vessel will not function.

Upon cleaning the filter, the lid can be refitted to the vessel, the anode connecting wire will need to be reconnected to the anode via the blue spade connector.

Once the reaction vessel has been repressurised check the anode meter display is showing current.

12.6 Cleaning the filter

The filter basket can be removed by lifting the basket upwards out of the vessel body.

The basket is secured tightly by a retaining “O” ring, it may require slight manipulation to remove.

redoX 100 units have handles to assist in removing the basket.

With the filter basket removed it is now possible to clean the filter.

eleXion recommends the use of clean running water and a light brush only to clean the filter bag.

If the bag is heavily contaminated it can be removed by unscrewing the jubilee clip which has been sewn into the bag.

In the event the bag is damaged it must be replaced.

Once cleaned/replaced reinstate the bag and filter element into the vessel.

Ensure the basket fits inside the locating ring found at the base of the vessel, the locating ring sits around the air and disbursement plate.

The filter should fit flush with the lid, failure to secure correctly will result in the lid not sitting correctly and leakage.



12.7 Flushing the vessel body

For the most part the tank should be cleaned of any debris located in the base of the tank as it is drained.

Once drained visually check the vessel to see if any debris remains.

If required flush the vessel body with a bucket of clean water or using a hose.

12.8 Cleaning the vessel.

If the vessel wall is coated and highly contaminated with lime scale residue, or the system has been installed on heavily contaminated systems, or systems that have been heavily dosed, the walls of the vessel can be cleaned using a natural acid cleaner such as citric acid.

After cleaning the vessel, it should be neutralised and heavily rinsed before being brought back online.

Before commencing the deep clean ensure a risk assessment has been completed and the appropriate PPE is available.

12.9 Replacing the automatic balancing valve cartridge

It is possible to replace the polymer cartridge found within the automatic balancing valve.

If the water meter is not registering any flow round the system and the external pumps have been checked it is possible that the cartridge has become faulty or blocked.

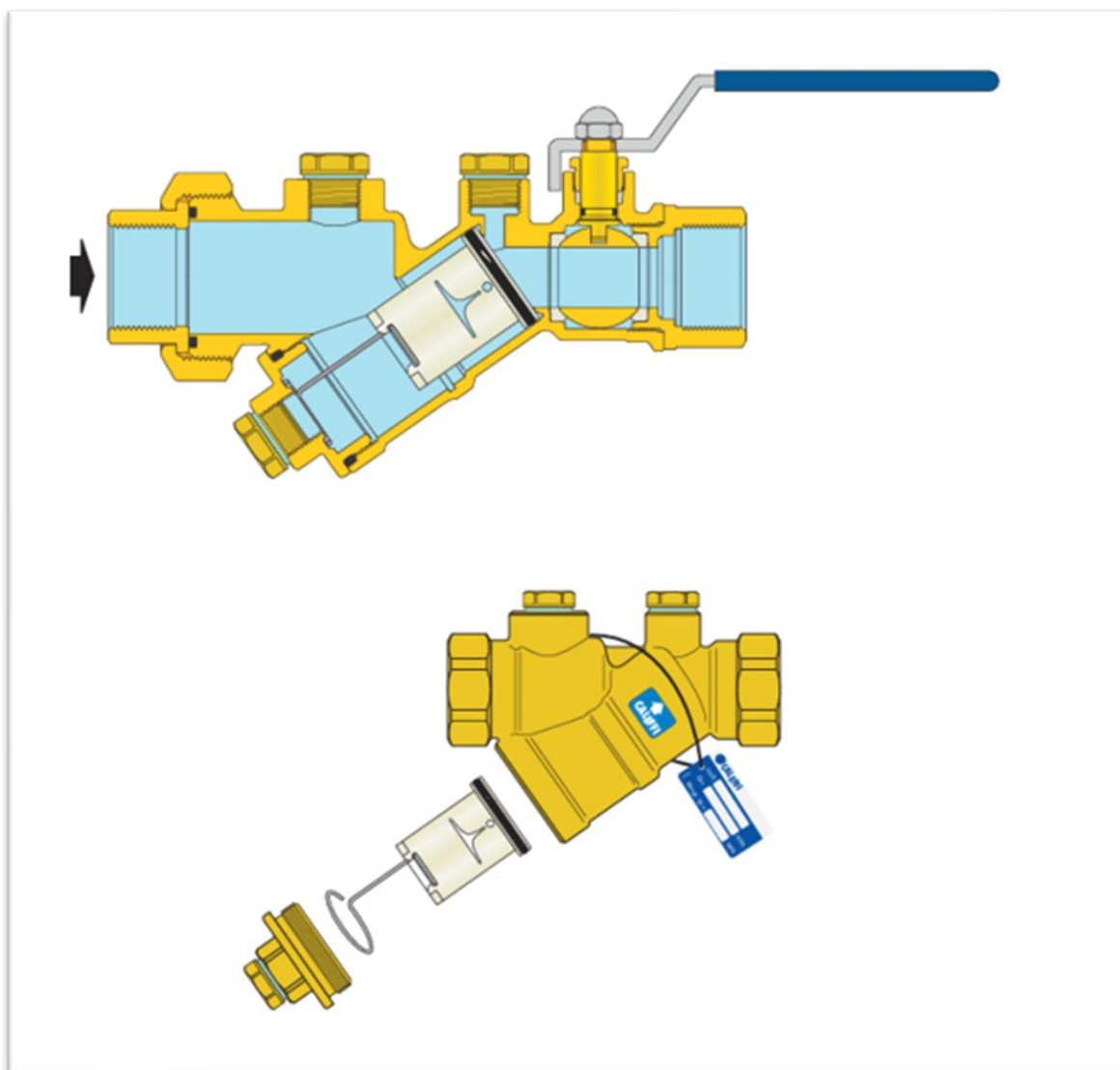
If the flow rate through the unit is too high or low this could also indicate an issue with the cartridge.

The cartridge can also be removed during inline conditioning, where the system water undergoes demineralisation/polishing. **Please refer to ioniX FS mobile manual for more information on this process.**

With the vessel isolated and drained, the cartridge can be removed.

The cartridge is retained in the body by a wire clip and retaining ring.

To access the cartridge, remove the outer securing plug, the plug is secured with an “O” ring.



When removing and reinserting ensure the cartridge isn't damaged.

If a replacement cartridge is required ensure the correct model is ordered for the reaction vessel in use. Failure to do so may result in excessive flow rate through the vessel and insufficient water treatment.

12.10 Accessing the pressure gauges and mA meter

To replace the pressure gauges the front meter panel will need removing.

Unscrew the 6 retaining screws.

Slowly remove the meter panel, the pressure gauges and mA meter are still connected at this point, remove with caution not to cause any damage to the pressure gauge hoses or mA meter wiring.

12.11 Replacing the pressure gauges

The pressure gauges are connected to the vessel body by a high pressure nylon reinforced hose, capable of withstanding pressures exceeding 300 bar.

The hose connects to the vessel body and pressure gauge using a screwed fitting.

To remove the hose from the gauge, the pressure gauge needs to first be removed.

The pressure gauges are held in place with a securing “O” ring.

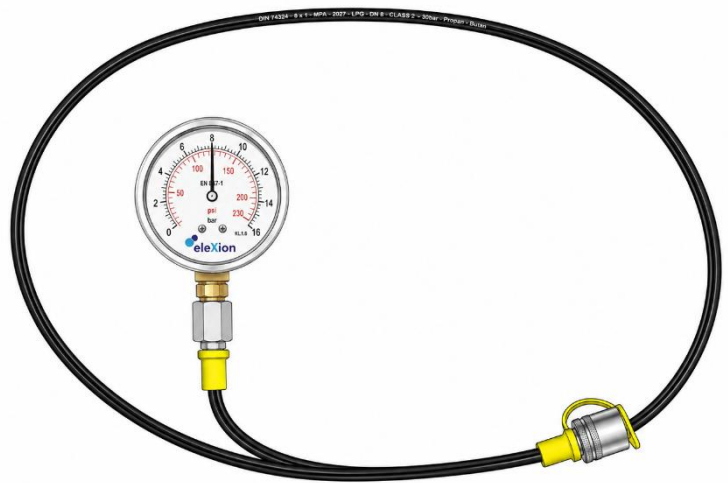
The “O ring” can be pulled back over the body of the gauge to release it from the housing.

The pressure gauge will then need to be secured to unscrew it from the hose adaptor fitting.

Secure the gauge using a suitable spanner by securing the brass fitting.

Then remove the union nut using a suitable spanner.

When replacing the pressure gauge do not over tighten or use any sealant, the fitting itself provides a mechanical seal.



12.12 Replacing the mA meter

The mA meter is held in position by three screws.

Remove the screws and pull the mA meter from the meter box housing.

At the rear of the mA meter are the electrical connections, each connection is held in place with a securing nut.

Using a suitable spanner remove the nut and ring terminal.

Replace the mA meter ensuring the positive (+) & negative (-) connections are in the correct orientation.



12.13 Replacing the AAV

The AAV is a non serviceable item and should the air vent leak it requires replacing.

To replace the AAV, the vessel must be isolated and drained to relieve the pressure (**see section 12.2**).

Once drained the AAV can be simply unscrewed using a suitably sized spanner.



13. Monitoring / testing.

eleXion recommends that the redoX reaction vessel is maintained at least once per year.

On systems which are not “closed” in terms of corrosion or have suffered severe corrosion in the past, the maintenance regime will need to be increased to suit site specific conditions.

It is recommended that, alongside the full strip down services of the redoX reaction vessel, the water is analysed regularly to ensure corrosion within the system is under control.

eleXion promotes the tracking of sampling trends rather than looking at each individual parameter separately.

Providing that trends of metal content within the water are not increasing and the system is stabilising, maintaining a non corrosive state, elevated levels should simply be monitored. Only increasing trends and sudden increases in dissolved oxygen levels, a reduction in pH or a significant increase in electrical conductivity will require immediate intervention.

eleXion recommended parameters		
Analysis	Target parameter	Notes
Dissolved oxygen	<0.1mg/l	Must be recorded in closed vacuum (real time corrosion monitoring only)
pH	8.2-10 8.2-9	Systems containing aluminum
Electrical conductivity	10-200 uS/cm 10-100 uS/cm 10-50uS/cm	Atmospherically closed systems Troubled systems Systems containing aluminum &/or high ingress of O2
Total hardness	Dependent on system size	Refer to heat exchanger manufacturer's requirements
Total iron	<1 mg/l	Decreasing trend on older systems/retro fit installations
Dissolved Iron	<0.5 mg/l	
Total copper	<1 mg/l	
Dissolved copper	<0.5 mg/l	
Aluminum	<1 mg/l	
Zinc	<1 mg/l	
Suspended solids	<30 mg/l	Decreasing trend on systems where inline conditioning has taken place
Chloride	<10 mg/l	
Sulphate	<10 mg/l	

The water meter should also be recorded to ensure the system has been operational throughout the year.

The mA reading should be recorded to ensure the system is operating as intended and corrosion levels are being actively maintained.

14. FAQ / Troubleshooting

Q: The water meter dial isn't moving?

A: Check external valves are turned on and nothing is isolated.

Check external pumps are operational.

Remove water meter and check propeller manually.

Replace water meter if system checks pass and manual checks on the water meter indicate a fault.

Q: The mA meter reads zero

A: Check to see if there is flow through the unit, during prolonged stagnant periods due to no flow as a result of system shut downs, it is possible the mA meter will read zero as the water within the vessel has been fully treated.

Check all electrical connections.

Ensure the anode connecting sockets are not accidentally touching the lid (these must be insulated with the supplied washers).

Test the mA meter with a 1.5 v battery, if the gauge doesn't move it may be faulty and require replacing.

Isolate the redoX vessel from the system and drain the vessel (approximately by ¼ of its volume), the mA meter should start to rise after a few minutes, indicating the mA meter is working correctly.

Inspect the anodes and clean, if depleted or badly worn please replace.

Q: After 1 year the mA meter still reads maximum

A: The redoX reaction vessel may be undersized for the system, check the system volume calculation.

Oxygen ingress is above the estimated quantities, investigate the source and reason behind this and rectify.

Install a second reaction vessel to combat the issue of oxygen ingress if the source or entry cannot be cured (replacing non barrier pipe/hoses etc).

Q: After 1 calendar year the pH has not risen to the desired levels.

A: Ensure sufficient flow and hydraulic connection to the system.

Replace the anodes and check all connections are correct.

The redoX system is potentially under sized.

The system may have extremely low oxygen levels, resulting in low reaction within the vessel.

Check the mA meter records for the year. Has the mA output been low since installation?

Check the Dissolved oxygen level within the system.

15. Maintenance log:

[illegible]

16. Sound Engineering Practice (SEP) Statement:

Pressure Equipment Directive (PED) 2014/68/EU:

Sound Engineering Practice (SEP) Statement:

The pressure vessels supplied by eleXion water treatment Ltd are designed and manufactured for use within sealed heating and water treatment systems containing water (Group 2 fluid) with the following maximum operating conditions:

Maximum allowable pressure (PS): 10 bar

Maximum operating temperature: 95 °C

Maximum vessel volume: 300 litres

The vessels contain non-hazardous water-based fluid classified as a Group 2 liquid under the Pressure Equipment Directive 2014/68/EU.

In accordance with Article 4 and the classification tables of Directive 2014/68/EU, vessels containing Group 2 liquids are only subject to categorised conformity assessment and CE marking requirements where the applicable pressure and volume thresholds are exceeded.

For the equipment supplied:

PS = 10 bar

V = 300 litres

PS × V = 3000 bar – litres

The equipment does not exceed the applicable threshold limits for categorised pressure equipment under PED 2014/68/EU for vessels containing Group 2 liquids.

Accordingly, the vessels fall within the scope of:

Article 4(3) – Sound Engineering Practice (SEP) and therefore:

- are not subject to PED Categories I, II, III, or IV,
- do not require involvement of a Notified Body,
- and are not required to bear the CE marking in respect of PED 2014/68/EU.

The equipment is nevertheless designed and manufactured in accordance with recognised Sound Engineering Practice applicable within the European Union, including appropriate consideration of:

- material suitability
- pressure containment integrity
- weld quality
- hydrostatic pressure testing
- temperature and pressure design limits
- and safe operation within intended service conditions.

Hydrostatic pressure testing is conducted at an appropriate test pressure exceeding maximum allowable operating pressure.

This statement applies solely to conformity assessment under PED 2014/68/EU and does not remove obligations