FRISTAR

Version 2.02 EN

Manual version 2

Fresh water station

Operating manual

en

TECHNISCHE ALTERNATIVE

Table of contents

Safety instructions

These instructions are intended exclusively for authorised professionals. To avoid accidents and damage due to incorrect operation, carefully read through these operating instructions before you start working with the freshwater station. If you carry out any alterations to the construction of the freshwater station or the safety devices, you may invalidate your right to make guarantee claims. Always observe the local regulations.

Intended use

The freshwater station may only be installed in heating systems between the buffer tank and the drinking water circuit. The technical limit values specified in this manual must be considered.
Incorrect use will result in the negation of any liability claims.

Electrical connection

Any electrical connections must be made by qualified electricians. Connection cables must be routed in the recesses provided in the insulated base in such a way that direct contact with the pump casing and the pipes is prevented.
Before switching on, check whether the supply voltage matches that stated on the power rating plates of the pump and the controller. All connections must correspond to the local regulations.

Safety standards during installation, commissioning and maintenance

Installation, commissioning and maintenance may only be carried out by qualified persons who are familiar with these operating instructions.
Before you start work on the system, ensure that the system is switched off and all components are cooled down. When replacing the pump, turn the 4 ball valves into the closed position.
In multi-occupancy dwellings, legionella protection must be observed in accordance with the local regulations.

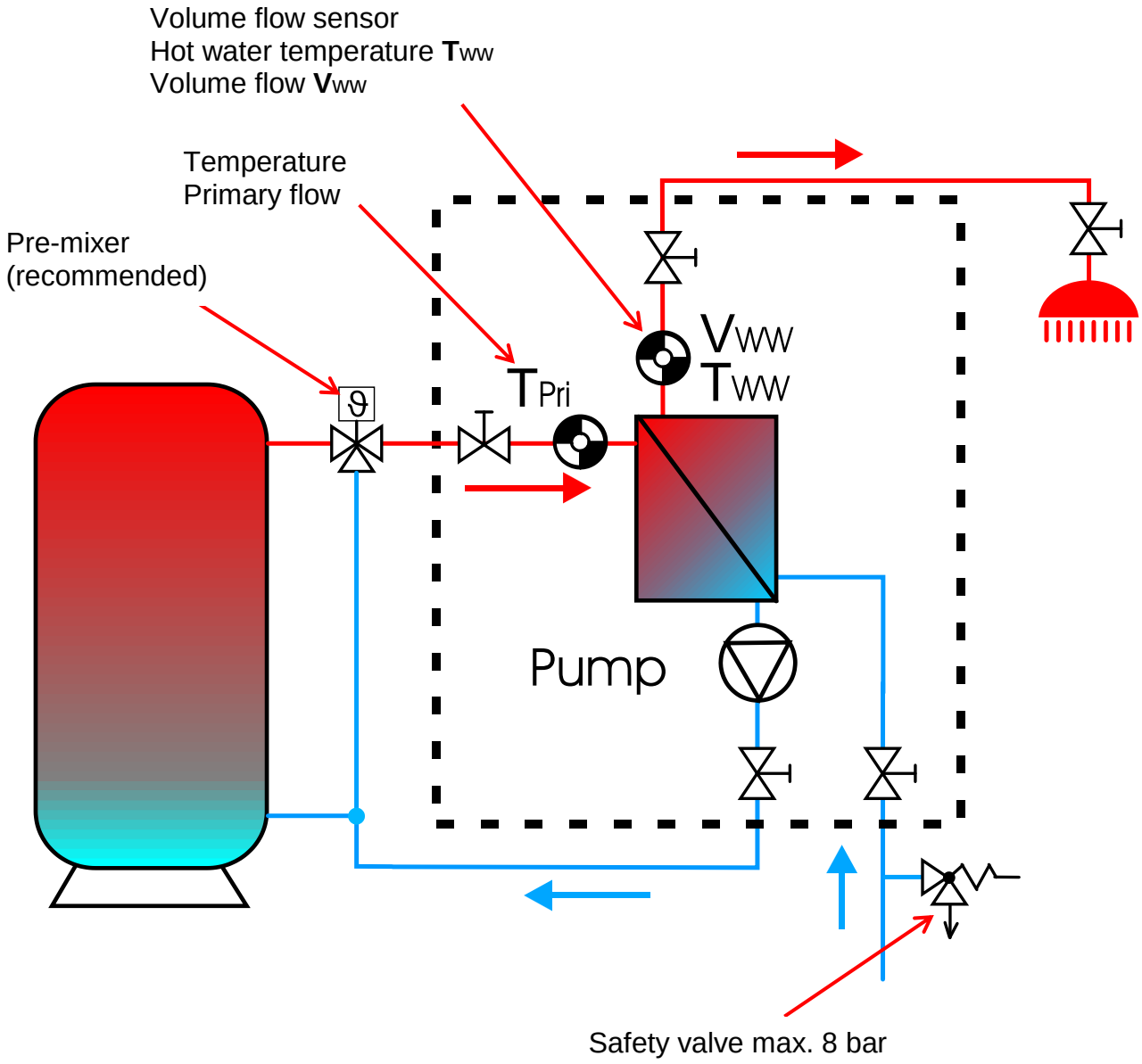
WARNING! Dependent on the pump and system operating conditions, the surface temperatures can be very high. Direct contact with the pump or pipes can result in burns!

Important note:
The secondary flow rate (cold / hot water) must never be more than 40 l/min!

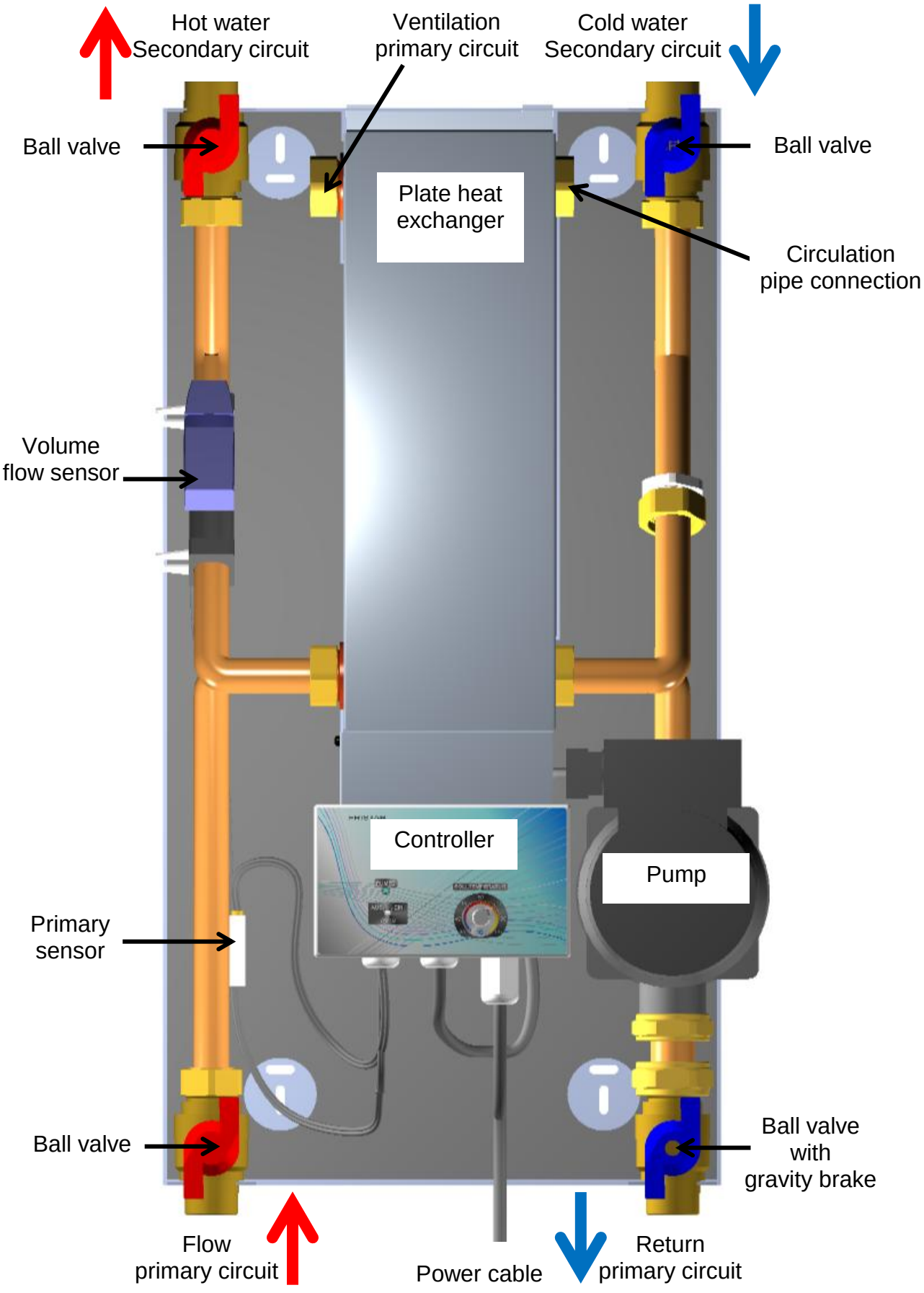
Mode of operation

Through use of the instantaneous heating concept, drinking water is heated both hygienically and with low energy consumption in the **FRISTAR** freshwater station.
If water is drawn from the mains, the primary circuit pump transports tank water from a buffer tank through the plate heat exchanger.
On the secondary side of the heat exchanger the drinking water flowing through is heated to the set temperature. The cooled tank water is returned to bottom layer of the buffer tank.
The speed control of the primary circuit pump takes place in the **FRISTAR** controller based on the measurements of the volume flow sensor in the hot water pipe (temperature **T**$_{ww}$ and volume flow **V**$_{ww}$) and the temperature sensor in the primary flow **T**$_{Pri}$). The pump is controlled using wave packet control. The optimum matching of the control behaviour to the pump and the heat exchanger guarantees perfect constant maintenance of the outlet temperature.

Hydraulic circuit diagram



Components


Hot water
Secondary circuit
Ventilation
primary circuit
Cold water
Secondary circuit
Ball valve
Ball valve
Plate heat
exchanger
Circulation
pipe connection
Volume
flow sensor
Controller
Pump
Primary
sensor
Ball valve
Ball valve
with
gravity brake
Flow
primary circuit
Power cable
Return
primary circuit

Installation

Preparation

- A **safety valve** (max. 8 bar) must be installed in the cold water supply corresponding to standards DIN 1988 und 4753, part 1 and TRD 721.
- If the cold water pressure > 8 bar, fit a **diaphragm pressure reducer** max. 8 bar.
- The installation of **flushing equipment** before and after the plate heat exchanger in the primary and secondary circuits is recommended for descaling or cleaning as necessary.

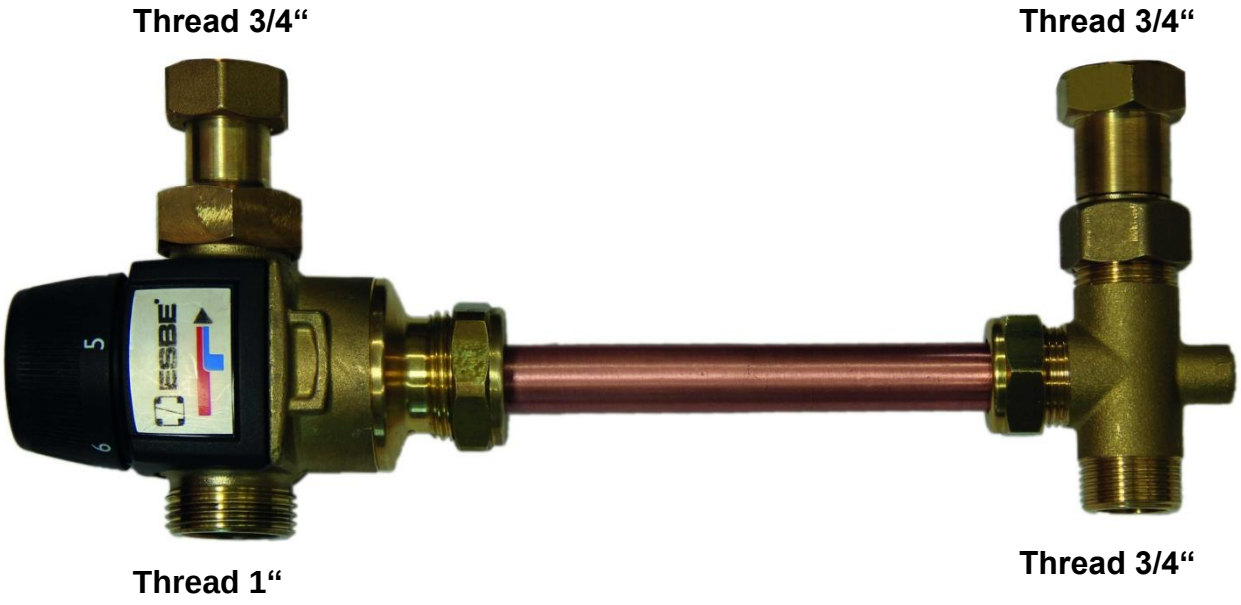
Special accessories: VMS pre-mixing set

If the tank is operated at a temperature higher than 70°C a **pre-mixer** that restricts the temperature to less than 70°C must be used in the primary circuit.

In order to prevent damage from calcification, the maximum pre-mixing temperature must be 70°C with a water hardness of up to 10°dH, 65°C with up to 15°dH and 60°C at most with a hardness above 15°dH.

The **VMS** pre-mixing set is suitable for both Fristar models (left pump, right pump).

Figure: Connection for Fristar with **right pump**



Technical data	
Maximum temperature of primary circuit	95 °C, short term: 100 °C
Setting range:	45°C – 65°C
Flow coefficient of mixing valve	4.5m³/h
Connections for Fristar	¾”

The thermal mixing valve is also available as an extra under the **TMV** designation.

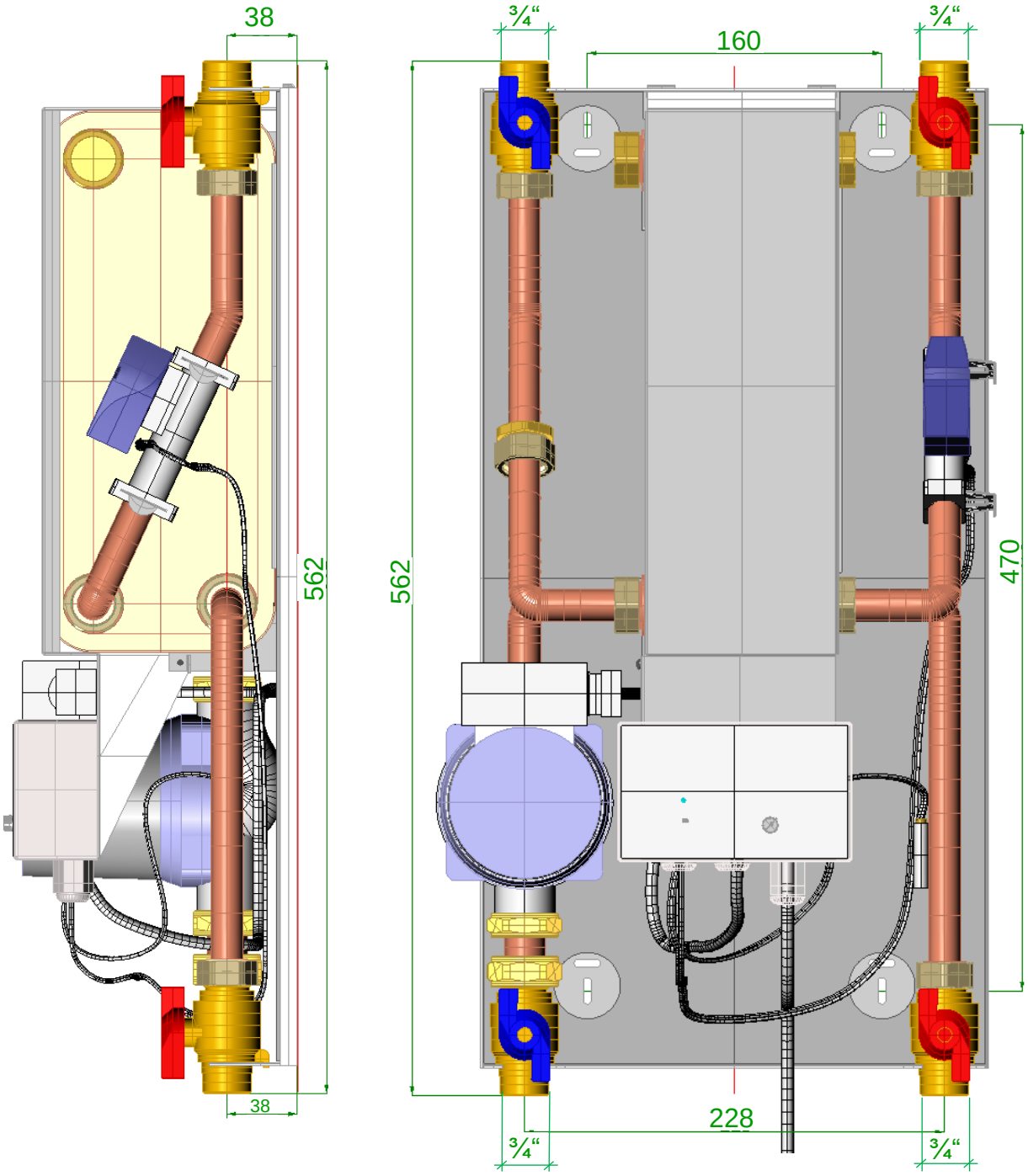
Installation

- Mounting position: Only **vertical**
- Pull off the cowling in a forwards direction.
- If necessary: Interchange the right/left connections (see chapter "Interchanging connections").
- Mark the fastening points, insert rawlplugs, fasten the station to the wall.
- Fitting and connection of the pipe connections (3/4" outside thread connector). Plan for as short as possible pipes in the primary circuit (tank -> freshwater station).
- Electrical connection
  The freshwater station is pre-wired ready for installation, connection to the electricity mains takes place on site:
  - using a plug in a wall socket or
  - using a double pole isolator with a permanent connection.

Commissioning

- Before filling the system, thoroughly flush both the primary and secondary side systems. To do this the locking bolt of the return valve with the gravity brake is placed in a 45° position so that it is non-operational.
- **Slowly** fill the house system with drinking water via the secondary side ball valves.
- Vent the house system at the draw-off valves.
- **Slowly** fill the system with hot water via the ball valves in the primary flow.
- Vent the primary circuit using the venting opening of the plate heat exchanger.
- Set the pump to continuous operation and check pump running. Audible background noise during operation of the circulating pump indicates air in the system. **Warning!** Only start the pump when it is filled.
- Check all connections, including in the freshwater station, for correct seating and leaktightness. If necessary, retighten to the necessary torque.
- Activate the gravity brake at the primary system return valve (place locking bolt vertically)
- Place the cowling on the bottom part
- Set the pump in automatic mode and select the setpoint temperature.

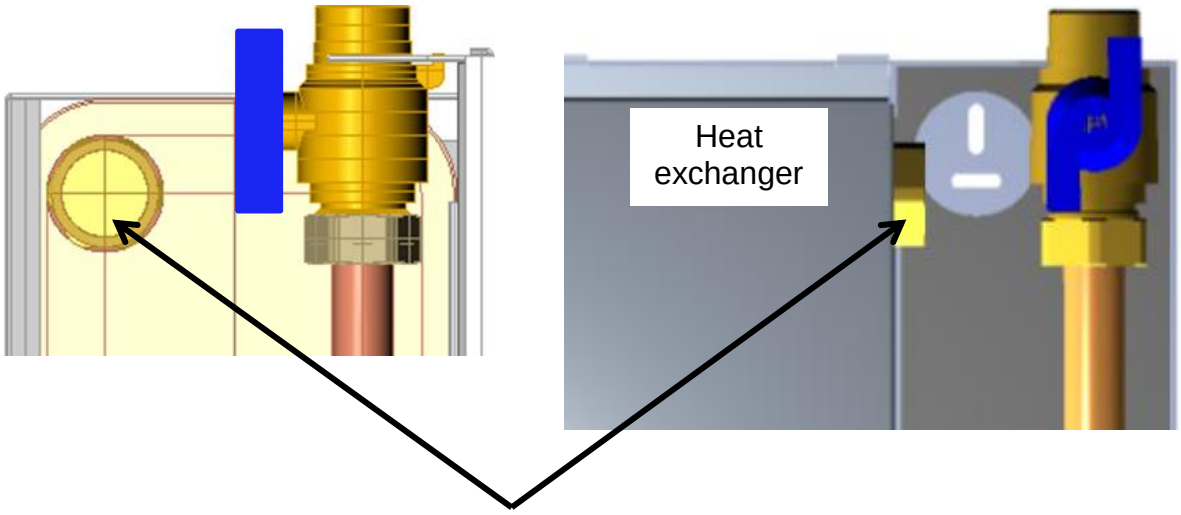
Dimensions



Housing dimensions:
W x H x D = 366 x 573 x 160 mm

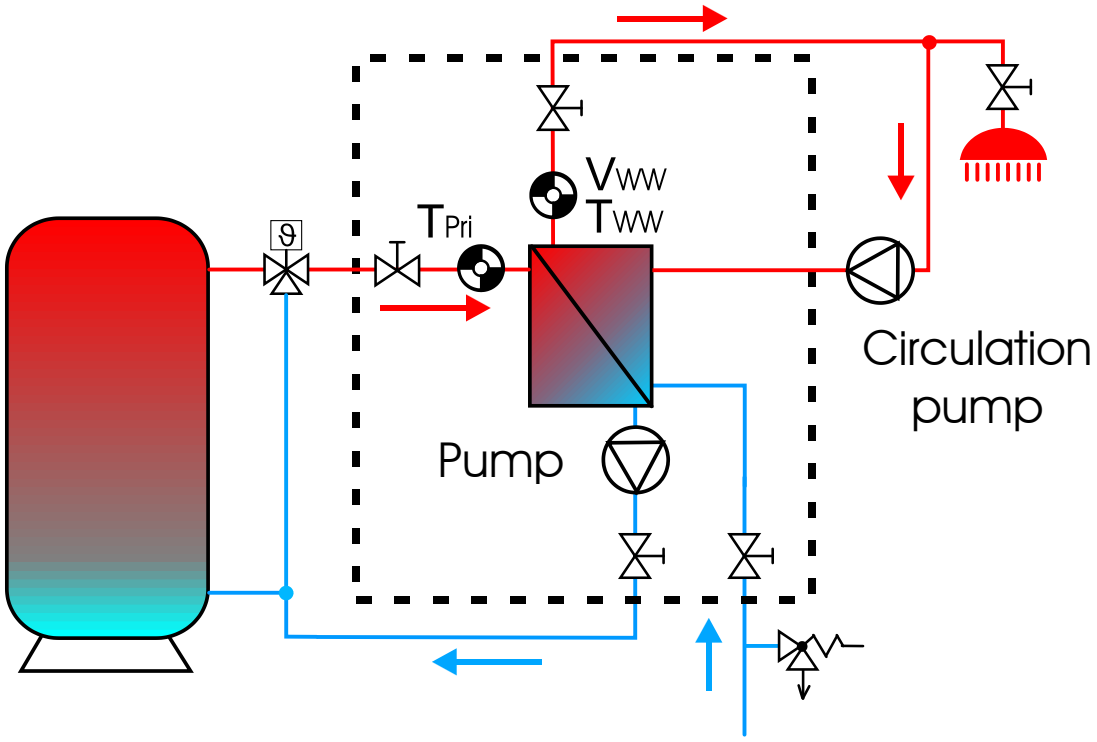
Connection of a circulation line

The plate heat exchanger is provided with a connection for a circulation line. To lead the circulation line through to the heat exchanger, the isolation cap must be cut out to suitable dimensions.



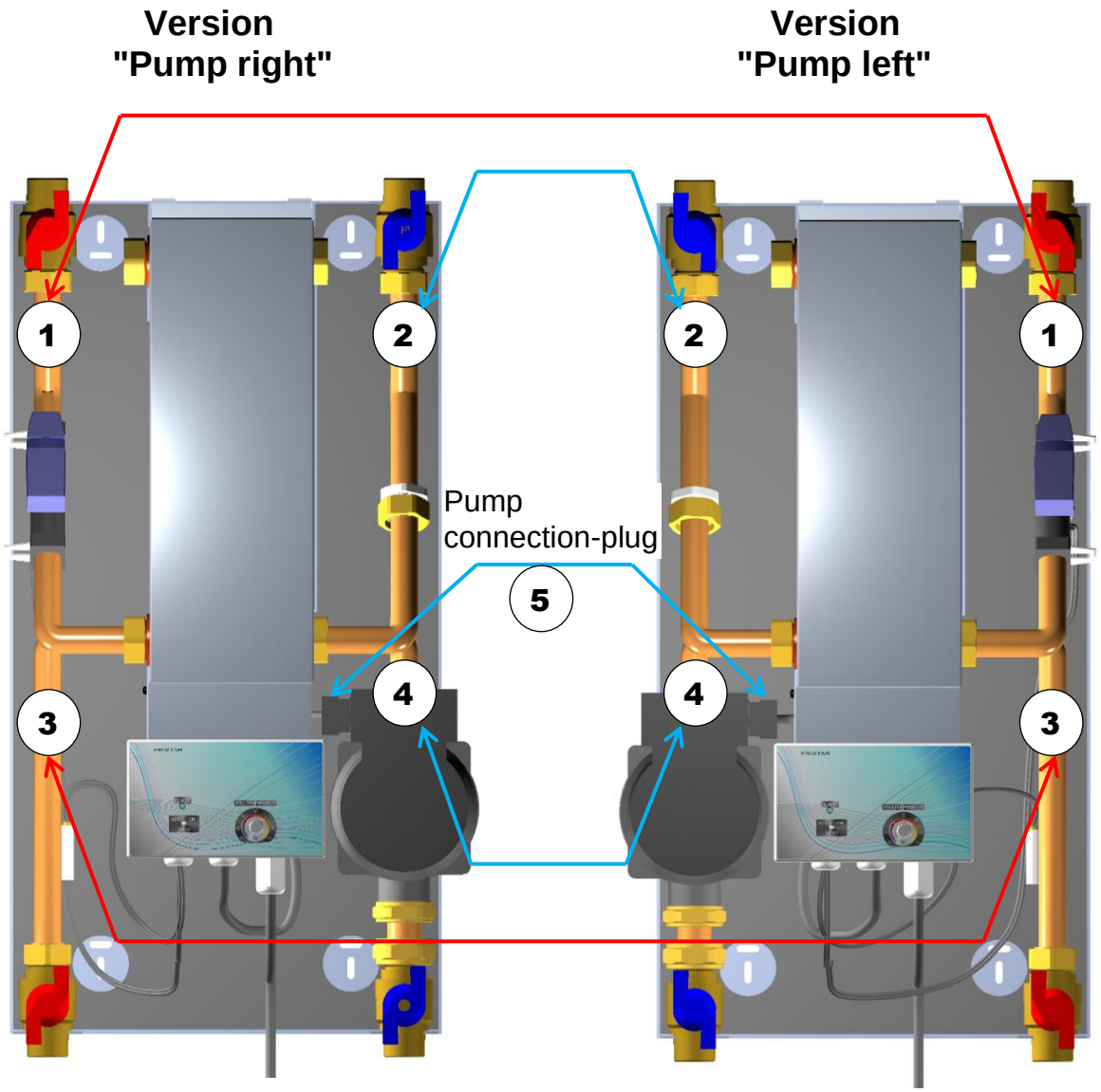
Connection
Circulation line

Hydraulic circuit diagram with circulation line:



Interchanging connections

For optimum matching of the pipelines to the freshwater station it is possible to interchange the connections (right/left). Doing this does not change the circulation line heat exchanger openings or the venting of the primary circuit.



Procedure:

1. Demounting of pipe elements 1 - 4 including pump from the heat exchanger
2. Removal of the pump and installation in the correct position.
3. Remount pump connection plug 5 on the other side.
4. Mounting of pipe elements 1 - 4 and the pump on the heat exchanger (see figures above) on the other side, correct positional setup of the volume flow sensor
5. Commissioning according to the "Commissioning" chapter

Important: The primary and secondary connections must be exchanged together!

Cascade switching

At most, a maximum of 4 FRISTAR fresh water stations may be used in parallel in cascade switching.

The first module is fed directly, all others stations are added with stop valves, if necessary. These valves must open or close in at least 30 seconds. The **UDV** universal 3-way valve from Technische Alternative is excellent for this purpose.

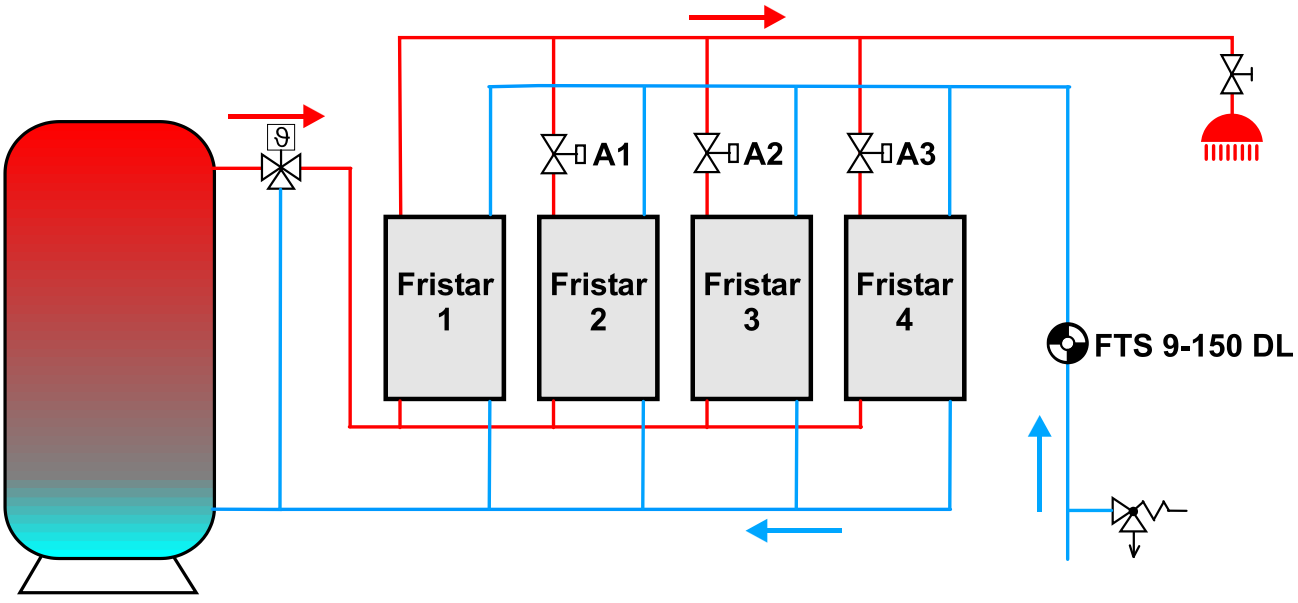
Valves are added via overriding controller with a volume flow sensor that measures the total volume flow. Sensor FTS5-85DL is sufficient for up to three modules, sensor FTS9-150DL must be used with 4 modules.

Because the sensors in the FRISTAR stations must never be loaded with more than 40 litres per minute, the overriding controller must increase the number of stations in steps of approx. 8-10 l/min. This ensures that the sensors in the FRISTAR stations are not strained excessively. In the following “step-by-step“ instructions, the first stage with 9l/min was selected because sensor FTS9-150DL is activated properly starting at 9 l/min only.

A three circuit controller UVR61-3R (or UVR63) can switch the modules. Of course, the cascade switching can also be integrated in the program of a UVR1611.

Hydraulic circuit diagram of a cascade with four FRISTAR fresh water stations

Figure with fresh water stations version, version “Pump on the right“

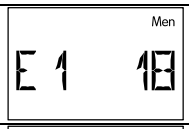
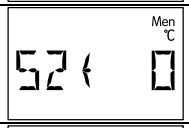
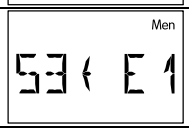
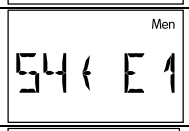
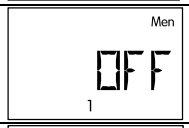
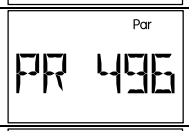
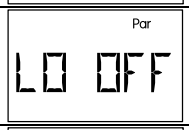
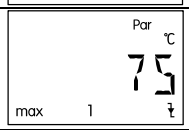
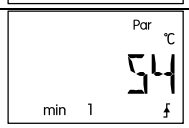
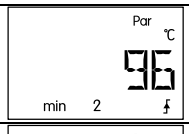
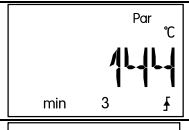
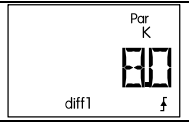


The initial designations for stop valves **A1** – **A3** refer to controllers UVR61-3R or UVR63.

Cascade switching control with UVR61-3R or UVR63

Controllers UVR61-3R and UVR63 have exactly the same settings.

Step-by-step instructions for UVR61-3R:

	Menu ENTER		Access to menu ***Men*** with Code 64, to menu ***Par*** with Code 32.
1	***Men*** **EXT DL**		Adoption of the volume flow on sensor FTS9-150DL as external sensor **E1**. With use of FTS5-85DL, "**E1 17**" is entered.
2	***Men*** **SENSOR**		Adoption of external sensor value **E1**on sensor **S1**
3	***Men*** **SENSOR**		Fixed temperature value **0°C** on sensor **S2**
4	***Men*** **SENSOR**		Adoption of external sensor value **E1** on sensor **S3**
5	***Men*** **SENSOR**		Adoption of external sensor value **E1** on sensor **S4**
6	***Men*** **SYS PF / CET 1**		Selection of sub-menu CET 1 (collector excess temperature shutdown 1)
7	***Men*** **SYS PF / CET 1**		Deactivation of excess temperature shutdown, activated in the factory settings
8	***Par***		Selection of program **496**
9	***Par***		The **LO OFF** setting remains set to factory setting
10	***Par***		All three **max** input and output thresholds are left with factory settings 75/70°C because they do not influence control.
11	***Par***		Because the flow values of the sensors are displayed as temperatures, the switch-on value means "54°C" 540 l/h (= 9l/min) for threshold **min1**. The switch-off value of 49°C is entered for **min1**. Output **A1** is switched via these thresholds.
12	***Par***		Switch-on value "96°C" (= 960l/h = 16 l/min) for value **min2**. The switch-off value of 91°C is entered for **min2**. Output **A2** is switched via these thresholds.
13	***Par***		Switch-on value "144°C" (=1440ll/h = 24 l/min) for value **min3**. The switch-off value of 139°C is entered for **min3**. Output **A3** is switched via these thresholds.
	Par		All three **diff** input and output thresholds are left at factory settings 8.0/4.0K because they do not influence control. All other settings in the ***Par*** menu are likewise left at factory settings.

The three outputs **A1**, **A2** and **A3** for the stop valves are switched on if the associated flow thresholds **min1** (540 l/h), **min2** (960 l/h) and **min3** (1440 l/h) are exceeded.
The low switch-on thresholds makes it probable that the last workstation is rinsed at least several times a day and that no standing water collects.

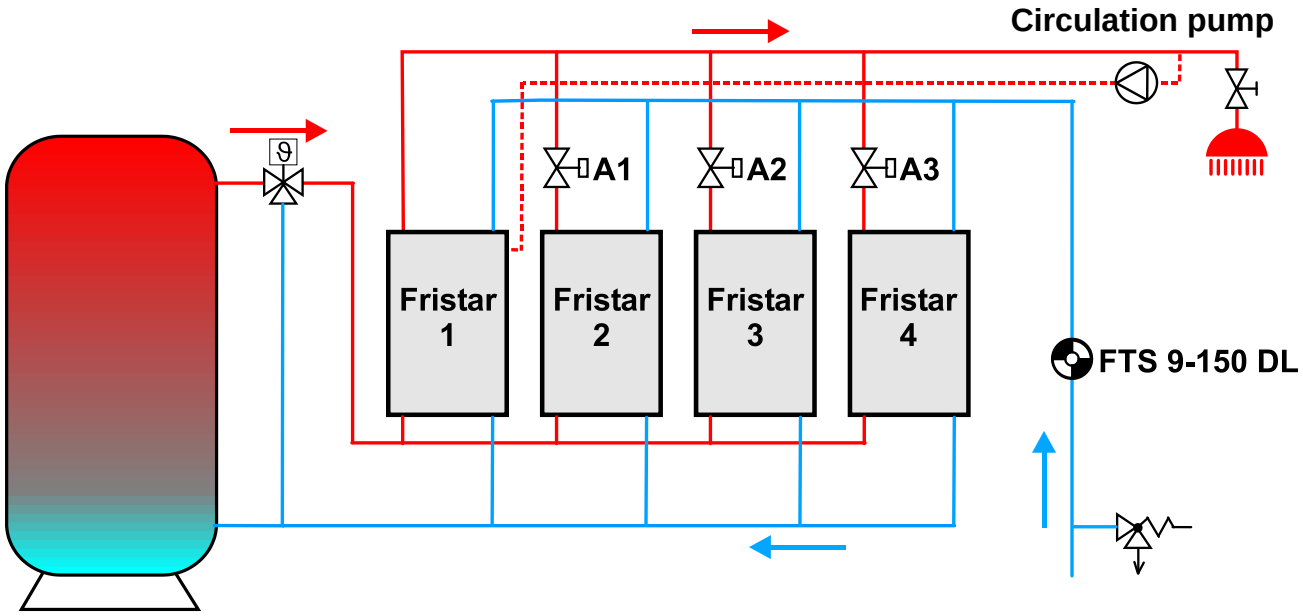
Control of cascade switching with UVR1611 or UVr16x2

The outputs for stop valves **A1** – **A3** are switched on via comparison functions. The associated switch-on and switch-off thresholds are identical to those of the UVR61-3.

Cascade switching with circulation line

Hydraulics schematic diagram

Figure with fresh water stations version, version “Pump on the right“



The circulation pump is connected only to the always ready FRISTAR 1 and must not generate a flow larger than 18 l/min.

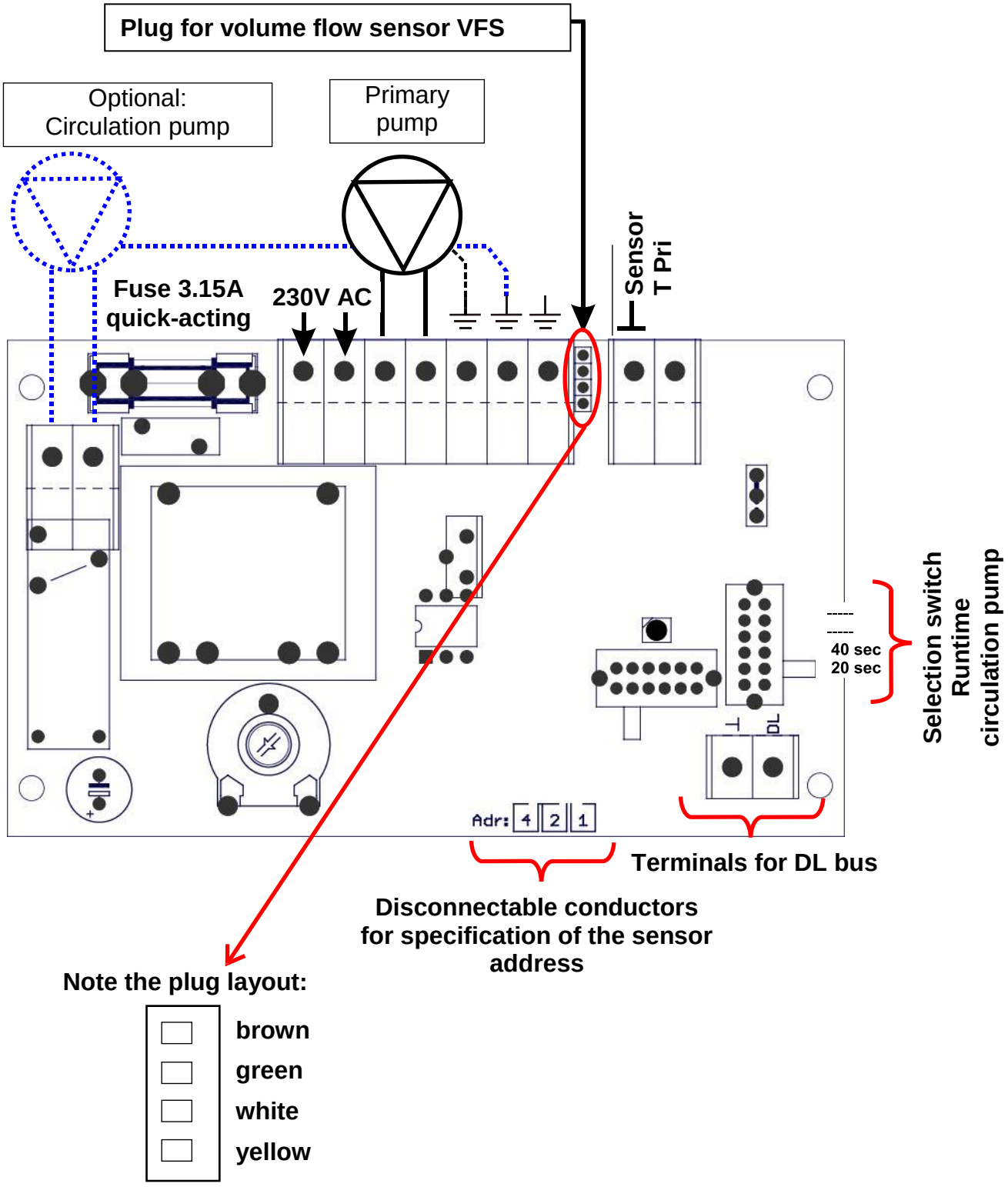
If the system is to be switched via UVR61-3R or UVR63, three FRISTAR modules at most are possible. Program 480 for switching modules 2 and 3 via outputs **A1** and **A2** must then be used. The circulation pump is switched via the distance **S5** – **S4** on output **A3**.

If UVR1611 or UVR16x2 is used, the circulation pump can be controlled with the “circulation” function.

Circulation pump (optional)

If an external circulation pump is connected then it will work in pulse mode. If water is drawn, the circulation pump runs with the run time (20 or 40 seconds) set with the selector switch. After the end of the run time, pump start-up is permitted only after a 10 minutes break.

Electrical circuit diagram



The polarity of the DL bus connections (DL and “Earth”) is **not** interchangeable and must be observed.

Data transfer with DL bus

The Fristar controller has a connection for the DL bus. The DL bus enables transfer of sensor values and set value via the DL inputs of the TA controllers. This also makes logging of the values possible.

With the control unit UVR16x2, a set value can be predefined via a DL **output** which overrides the setting on the Fristar controller.

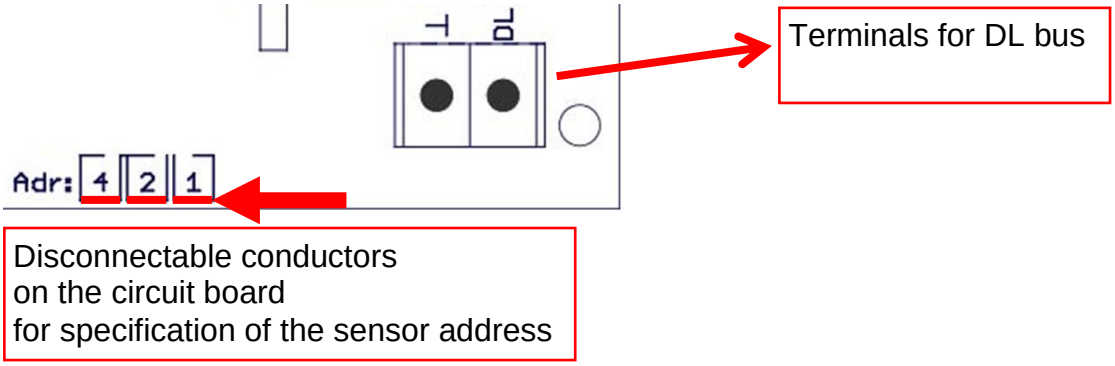
Upon querying by the controller (**ESR21**, **UVR61-3** and **UVR63H** from version 5.0, **ESR31**, **UVR63**, **UVR1611** from version A3.00 **and** serial number 13286 as well as **UVR16x2**), the Fristar controller returns the corresponding measured value.

The request is made up of the **DL address** of the Fristar controller and **index** of the value.

The **address** is specified on the PCB of the Fristar controller by breaking the conductors which are labelled 1, 2 and 4. These are located on the outer PCB edge. If none of the conductors are cut, the Fristar controller is assigned address 1 (factory setting). Provided no other sensors are connected to the DL bus, no change of address is required.

The new address is derived from address 1 (= factory setting) plus the sum of all the cut through values.

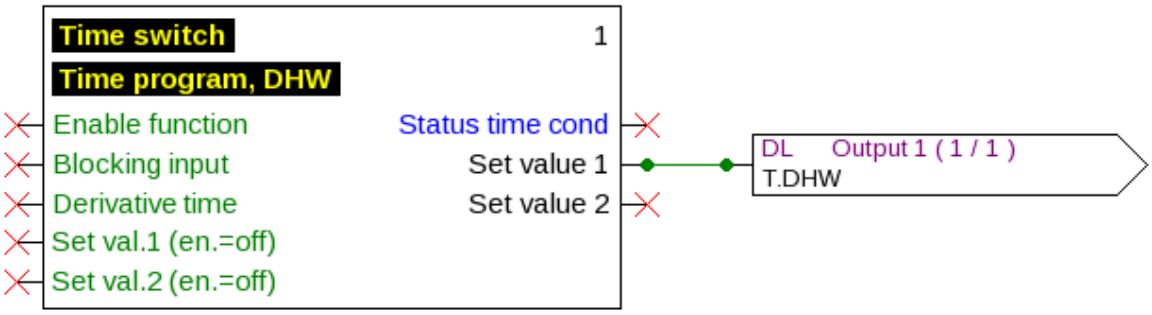
Example: required address 6 = 1 (from factory setting) + 1 + 4
= conductors 1 and 4 must be cut.



The **index** of the respective values is fixed:

Index:	***Measurement:***
1	Actual hot water temperature T_{ww} [0.1°C]
2	Volume flow [1l/h]
3	Temperature of primary flow T_{Pri} [0.1°C]
4	Current hot water set temperature [0.1°C]

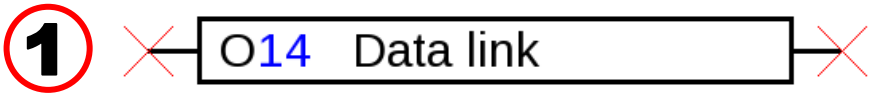
UVR16x2: The measured values are parameterised in the menu "**DL bus**" as DL inputs. Specifying a set value is possible through the parameterisation of a DL output.
Example: Specification of the set temperature via the function "Time switch"

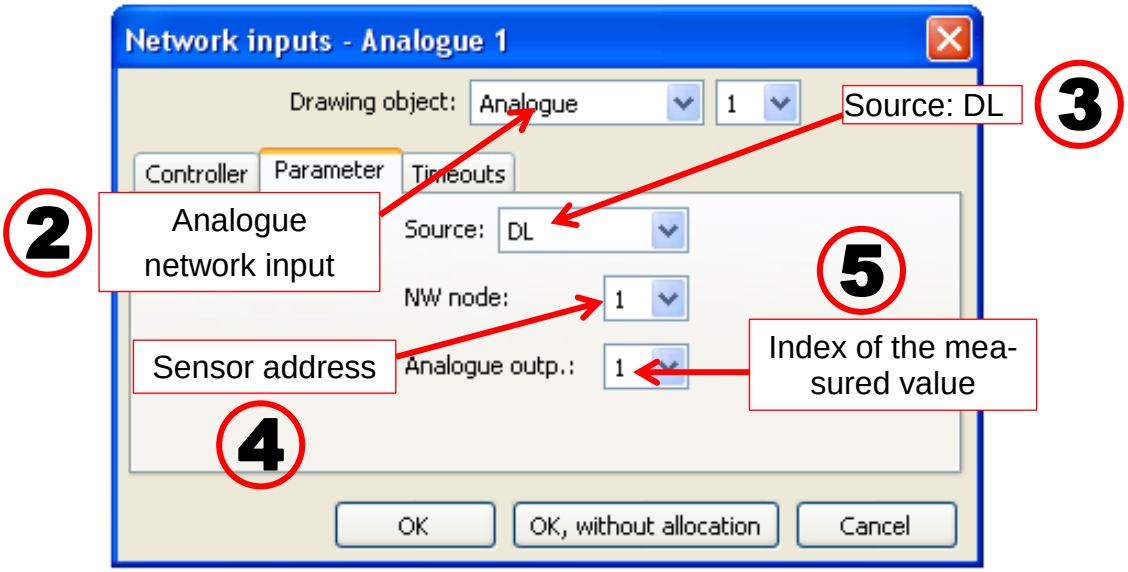


UVR1611: The measurements are parameterised as **analogue** network inputs:

NW.node: **DL address**
Anal. netw.outp.: **Index of the measured value**
Source: **DL**

TAPPS 2 – Programming UVR1611:

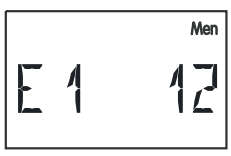




A still unused network input variable must be selected for each new value.

ESR21, ESR31, UVR61-3, UVR63, UVR63H:

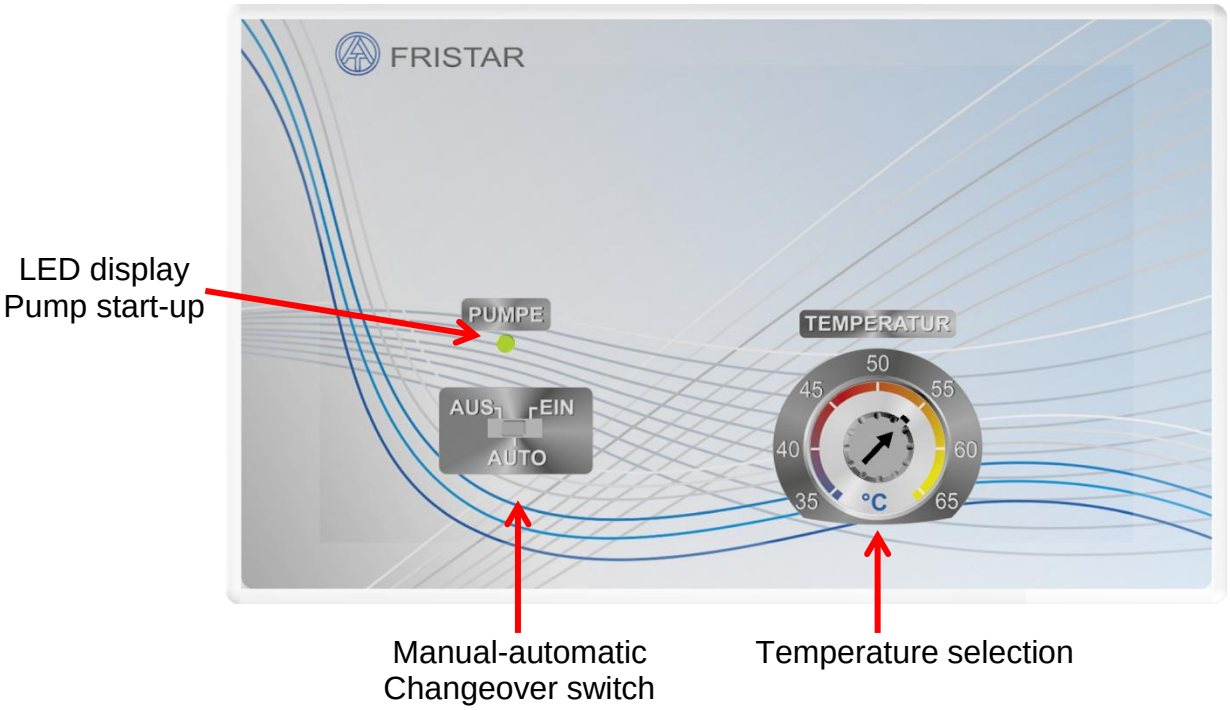
Adjustment of the measurements takes place in the menu **EXT DL** (external sensors)



Example: The external sensor 1 has address 1; the value of the volume flow should be adopted (index 2).

Controller settings

Operation of the controller has been kept as simple as possible, so that it can also be operated by inexperienced users.



Temperature selection on the Fristar controller is possible only if no set value is predefined by controller UVR16x2 via the DL bus.

Manual-automatic changeover switch

Switch position	
OFF (AUS)	The pump is permanently switched off.
AUTO	The pump runs according to the controller settings.
ON (EIN)	The pump is switched on continuously at full speed, independent of the control temperature.

Selection switch runtime circulation pump

The selection occurs by means of a slide switch on the right border of the board. There is no access possible to the slide switch from outside.

Switch position	Runtime
PWM.I	Without function
PWM.N	Without function
PuT.2	**40 seconds**
PuT.1	**20 seconds**

Technical data

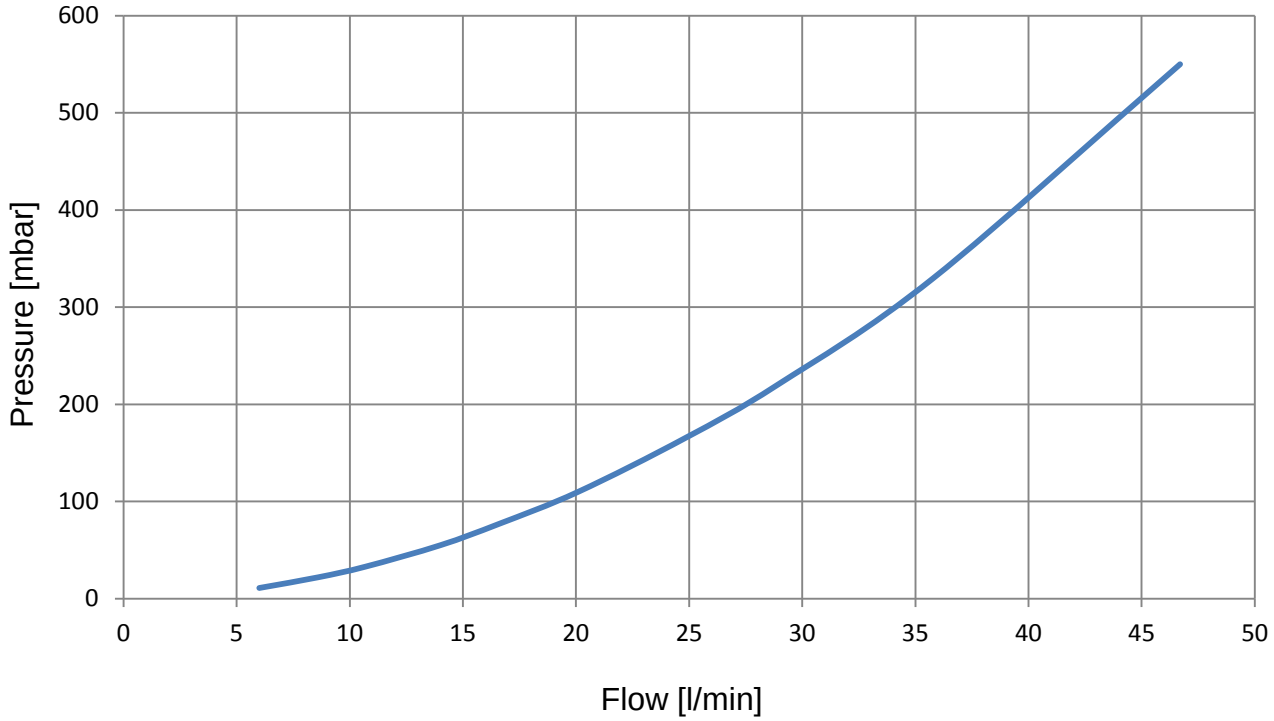
Rated power	70 kW
Min. flow	2 l /min
Max. flow for 65°C tank and 45°C outlet temperature	30 l/min
Max. permissible flow	40 l/min
Max. operating pressure primary side (tank water)	4 bar
Max. operating pressure secondary side (cold water)	8 bar
Max. permissible water hammer pressure	15 bar
Rated temperatures primary flow / return	65 / 20 °C
Rated temperatures secondary flow / return	45 / 10 °C
Max. operating temperature primary/secondary	90 °C
Pressure loss secondary side (Kv value)	2.60 m³/h
Connection thread primary and secondary	G ¾" external thread
DL bus load	10%
Materials (corresponding to DVGW/W270):	
Fittings	Brass CW617N
Heat exchanger	Stainless steel 1.4401, copper soldered
Pipes	Copper 99.96%
Seal material	PTFE, EPDM, Klingersil C-4324
Pump primary circuit	WILO ST20/7-3C
Volume flow sensor	Grundfos VFS 2-40
Primary sensor	PT1000
Controller	FWR21-FRISTAR

Indication referring to COMMISSION REGULATION (EU) No 622/2012:
The benchmark for the most efficient circulators is EEI ≤ 0.20.

Transmission power with different flow and outlet temperatures:

Pump mode	Buffer flow [°C]	Return [°C]	Cold water supply [°C]	Hot water outlet [°C]	Power [kW]	Flow [l/h]
100%	59.3	25.0	10.3	45.0	68.7	1700
100%	55.4	27.0	10.3	45.0	56.5	1400
100%	50.3	33.2	10.3	45.4	34.7	850
100%	50.2	25.2	10.3	40.3	50.6	1450

Pressure loss characteristic curve plate heat exchanger:



Pressure loss characteristic pump

(1 m WC = 98 mbar)

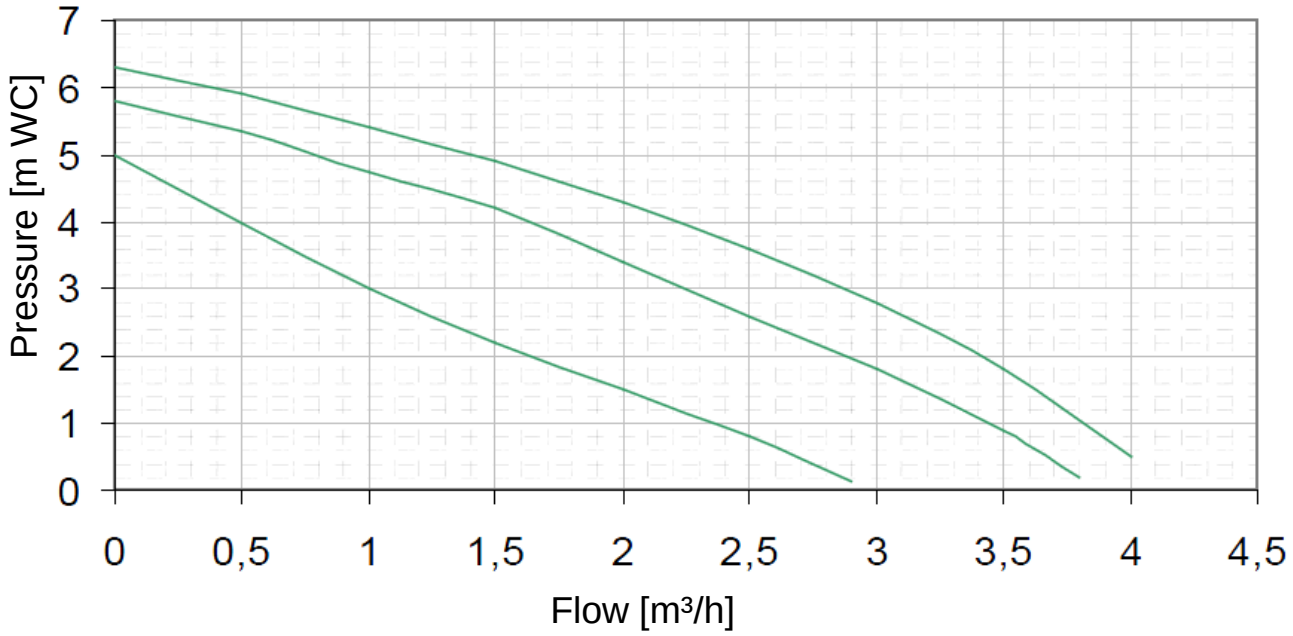
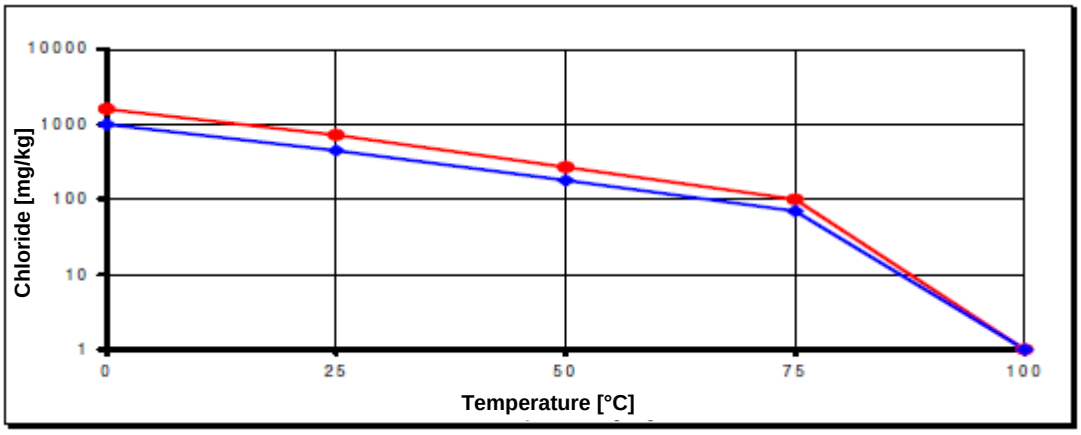


Plate heat exchanger corrosion resistance

The corrosion behaviour of stainless steel and copper solder must be considered.

Water containing material	
Chloride	See diagram
Iron	< 0.2 mg/l
Manganese	< 0.1 mg/l
Ammonia	< 2 mg/l
pH value	7 - 9
Electrical conductivity	10 – 500 µS/cm
Free carbonic acid	< 20 mg/l
Nitrate	< 100 mg/l
Sulphate	< 100 mg/l
Saturation index SI	-0.2 < 0 < +0.2
Total hardness	6 – 15 °dH
Filterable substances	< 30 mg/l
Free chlorine	< 0.5 mg/l
Hydrogen sulphide	< 0.05 mg/l
Hydrogen carbonate	< 300 mg/l
Hydrogen carbonate/sulphate	> 1 mg/l
Sulphide	< 1mg/l
Nitrite	< 0.1 mg/l



We reserve the right to make technical changes.

EC- DECLARATION OF CONFORMITY

Document- Nr. / Date:	TA12025 / 19.11.2012
Company / Manufacturer:	Technische Alternative elektronische SteuerungsgerätegesmbH.
Address:	A- 3872 Amaliendorf, Langestraße 124

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Product name:	FRISTAR
Product brand:	Technische Alternative GmbH.
Product description:	Fresh water station

The object of the declaration described above is in conformity with Directives:

2006/95/EG	Low voltage standard
2004/108/EG	Electromagnetic compatibility
2011/65/EU	RoHS Restriction of the use of certain hazardous substances
2006/42/EG	Machinery Directive (WILO pump)

Employed standards:

EN 60730-1: 2011	Automatic electrical controls for household and similar use – Part 1: General requirements
EN 61000-6-3: 2007 +A1: 2011	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN 61000-6-2: 2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

For WILO pump: EN 809, EN ISO 12100-1, EN ISO 12100-2, EN ISO 14121-1, EN 60335-1, EN 60335-2-51, EN 61800-3, EN 61800-5-1

Position of CE - label: On packaging, manual and type label

CE

Issuer:	Technische Alternative elektronische SteuerungsgerätegesmbH. A- 3872 Amaliendorf, Langestraße 124

This declaration is submitted by

Kurt Fichtenbauer, General manager,
19.11.2012

This declaration certifies the agreement with the named standards, contains however no warranty of characteristics.

The security advices of included product documents are to be considered.

Guarantee conditions

Note: The following guarantee conditions do not in any way limit the legal right to a guarantee, rather expand your rights as a consumer.

1. The company Technische Alternative elektronische Steuerungsgerätegesellschaft m. b. H. provides a two-year guarantee from the date of purchase by the end consumer for all the devices and parts which it sells. Defects must be reported immediately upon detection and within the guarantee period. Technical support knows the correct solution for nearly all problems. In this respect, contacting us immediately will help to avoid unnecessary expense or effort in troubleshooting.

2. The guarantee includes the free of charge repair (but not the cost of on-site fault-finding, removal, refitting and shipping) of operational and material defects which impair operation. In the event that a repair is not economically worthwhile according to the assessment of Technische Alternative, the goods will be replaced.

3. Not included is damage resulting from the effects of overvoltages or abnormal ambient conditions. Likewise, no guarantee liability can be accepted if the device defect is due to: transport damage for which we are not responsible, incorrect installation and assembly, incorrect use, non-observance of operating and installation instructions or incorrect maintenance.

4. The guarantee claim will expire if repairs or actions are carried out by persons who are not authorised to do so or have not been so authorised by us or if our devices are operated with spare, supplementary or accessory parts which are not considered to be original parts.

5. The defective parts must be sent to our factory with an enclosed copy of the proof of purchase and a precise description of the defect. Processing is accelerated if an RMA number is applied for via our home page www.ta.co.at. A prior clarification of the defect with our technical support is necessary.

6. Services provided under guarantee result neither in an extension of the guarantee period nor in a resetting of the guarantee period. The guarantee period for fitted parts ends with the guarantee period of the whole device.

7. Extended or other claims, especially those for compensation for damage other than to the device itself are, insofar as a liability is not legally required, excluded.

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