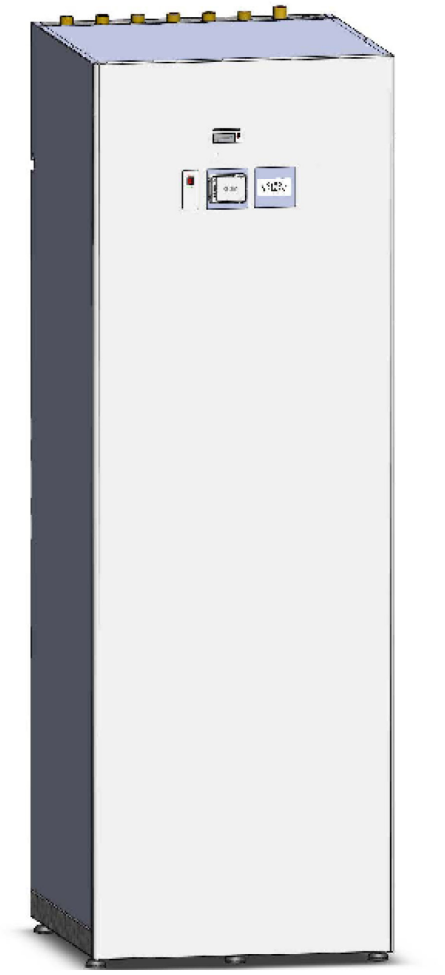
ModuSat FS 300 & 400

Instructions for Installation and Service



ModuSat FS Standard & Premier 300 & 400
Floor Standing Storage Models

Evinox Ltd T. +44 (0)1372 722277 E. technical@evinox.co.uk W. www.evinox.co.uk

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Contents

1 GENERAL INFORMATION

Please read this manual carefully before installing, commissioning and using the ModuSat.
This document must be kept with care by the user.
ModuSat is intrinsically safe for the end user because there is no combustion inside the unit, nor it employs any sort of gas. It also does not require a chimney connection.
The Evinox ModuSat satellite heating system has been designed to provide apartments and communal housing developments with independent fast recovery hot water and high efficiency heating.
With a big DHW capacity, the system suits a variety of applications such as:

- Large luxury apartments
- Sheltered accommodation
- Student accomodation

Consisting of a fast recovery hot water tank with a plate heat exchanger, pump and mixing valve set for the heating circuit, the ModuSat offers a total heating solution. In addition to this the ModuSat can provide direct control of underfloor heating without the need for any underfloor pumps, blending valves or mixing valves.
The design of the ModuSat provides the end user with the same autonomy as if they had their own boiler and tank. This includes a meter for billing of energy usage and cold water consumption for each apartment or house, and where required it also offers a facility for both heating and cooling.
The ModuSat draws energy from the main heating primary circuit delivered from a centralised plant room. This is in line with latest legislation encouraging centralised plant rather than the use of individual heating and hot water systems.
The integrated energy meter can be tailored to meet the requirements of the building operator and residents, ranging from simple read-only meters, to a complete remote billing solution using BUS communication to provide the end user with a fully itemised energy bill.

1.1 Warnings

The ModuSat satellite requires connections to the electric power line for the control panel, pump and valves and to the primary hot/cold water supply coming from the central heating/cooling system.
A pre-installation rig is available to the installer, to help position and space the pipes to be connected to the unit.
Installation and start up maintenance and service must be carried out by a registered engineer according to the current governing regulations.
The non observance of the instructions and procedures concerning the verification of the system correct operation may cause injuries to people.
Therefore it is requested to the user to report any wrong operation or defect to authorised personnel.
Any work or alteration done on the system without EVINOX official authorisation invalidates the warranty and relieves the manufacturer from any liability.
The manufacturer has the right to make any change to the products without prior notice.

Warning to the User

Do not remove or adjust any component part of this unvented water heater: contact the installer.
If this unvented water heater develops a fault, such as a flow of hot water from the discharge pipe, switch the heater off and contact the installer.

Warning to the installer

This installation is subject to building regulation approval; notify the Local Authority of intention to install.
Use only manufacturer's recommended replacement parts.
Please leave this manual with the householder after installation.

INSTALLED BY: Name: _____
Address: _____
Tel No. _____
Completion date: _____

Manufacturer	**Evinox Ltd** Unit B Blenheim House 1 Blenheim Road Epsom Surrey KT19 9AP Tel : + 44 (0)1372 722277 Fax : + 44 (0)1372 744477 www.evinox.co.uk	
Main features (BS EN12897 2006)	**ModuSat FS 300**	**ModuSat FS 400**
Max primary pressure	8,0 bar	8,0 bar
Max operating primary temperature	80 °C	80 °C
Max water supply pressure	12,0 bar	12,0 bar
DHW storage max pressure	8,0 bar	8,0 bar
Water expansion vessel charge pressure	3,5 bar	3,5 bar
Safety thermostat intervention	85 °C	85 °C
DHW setting range	20-85 °C	20-85 °C
Max secondary circuit pressure	3 bar	3 bar
Immersed electric heater	9 kW-400 Vac	9 kW -400 Vac
Apartment circuit max. operating pressure	3,0 bar	3,0 bar
Expansion vessel charge	1,0 bar	1,0 bar
Expansion relief setting	6,0 bar	6,0 bar
Weight (full load)	520 kg	650 kg
Pressure/Temperature relief valve	7 bar / 90 °C	7 bar / 90 °C
PT valve part number	Series 309	Series 309
Laboratory test results (BS EN12897 2006)	**ModuSat FS 300**	**ModuSat FS 400**
Storage capacity	300 l	400 l
Primary heating power	29,60 kW	29,60 kW
Max cylinder power rating	50,0 kW	50,0 kW
Primary flow rate	2.000 l/h	2.000 l/h
Reheat time	28 min	28 min
DHW draw off	96%	97%
Primary pressure drop (at nominal flow rate)	0,35 bar	0,35 bar

1.2 Benefits

- Completely independent heating and hot water for each residence
- Simple to install due to factory assembled pipe work, internal wiring and integrated heat meter
- Integrates readily with renewable energy sources
- Reduced installation costs
- No flue or gas requirement in each apartment
- Central plant dramatically reduces kW load for the building compared to individual boilers
- Option of fast recovery hot water tank or high-capacity plate heat exchanger
- Read only meters or complete remote surveillance and billing solution
- Easy access for servicing
- Minimal maintenance requirements
- No additional room ventilation required
- Remote monitoring, alarms and diagnostics
- Can be controlled by homeowner sending SMS (text) message
- No annual gas appliance inspections required

1.3 Integrating renewable energy

We are all conscious of the effect that man is having on the planet and aware also of the spiralling cost of energy and the legislation covering this.
Over a third of all UK carbon emissions are generated in the home so any use of renewable energy or energy saving can have a large impact on our contribution to global warming.
The Evinox ModuSat satellite heating system can be integrated with renewable technology very effectively. The main plant can include a combination of renewable energy sources such as solar, ground source heat pumps or CHP, with top up boiler plant, to further improve energy savings.

1.4 ModuSat central plant

The use of a central boiler plant is more energy efficient than employing multiple boilers, in each individual dwelling, no matter how efficient they are.
Not only is the carbon footprint reduced but it also makes energy use much easier to measure with individual metering for each end user.
When installing the ModuSat, the centralised plant space can be greatly reduced due to the increased thermal storage facility being utilised in each apartment.
For example an installation that requires 900kW of boiler plant when combined with plate heat exchanger units, would only require 600kW of boiler plant when using the ModuSat unit. Evinox provide central plant which can include

- Gas, LPG or oil fired boilers
- Wood chip or pellet boilers
- Combined heat and power
- Ground source heat pumps
- Air source heat pumps
- Solar thermal

Importantly we offer a total system solution, which includes the centralised plant, with all elements of the system chosen to work together to create a totally integrated system that operates at optimum performance and efficiency. The client therefore has just one place to go for product support.

1.5 Regulation and monitoring system

Each ModuSat is provided with a regulation system that allows the user to set the desired room comfort, the DHW storage temperature and to read heating and water consumptions. The regulation system is suitable for both, radiators or floor heating, and has been developed to permit the remote consumption download and monitoring, alarms and diagnostic.

CE Compliance

EVINOX declares that all ModuSat units comply with European Standards 73/23/CE and 93/68/CE for low voltage electric safety, it also declares that they meet the European Standards 89/336/CE for electromagnetic compatibility.

INSTRUCTIONS FOR PROPER DISPOSAL OF THE PRODUCT IN COMPLIANCE WITH THE EUROPEAN STANDARD 2002/96/CE

At the end of its useful life this product cannot be disposed together with urban waste. It must be taken to authorised sites equipped to dispose such products. The icon shown on the left indicates the obligation to follow the rules above.

1.6 Symbols

Follows a list of symbols used in this manual:

IMPORTANT NOTE REGARDING THE CORRECT DESIGN AND PRODUCT INSTALLATION

CAUTION !

IMPORTANT NOTE REGARDING PEOPLE SAFETY AND ENVIRONMENT CARE

CAUTION !

DANGER OF ELECTRIC SHOCK!

1.7 Safety Instructions

All installation and maintenance operations must be carried out by registered engineers according to the current governing regulations
In case of water leaks:

- Remove the electric power supply
- Close the main water supply valve
- Inform the authorised maintenance personnel

In case the pump is directly connected to an ambient thermostat, make sure that this is provided with an ON/OFF switch.

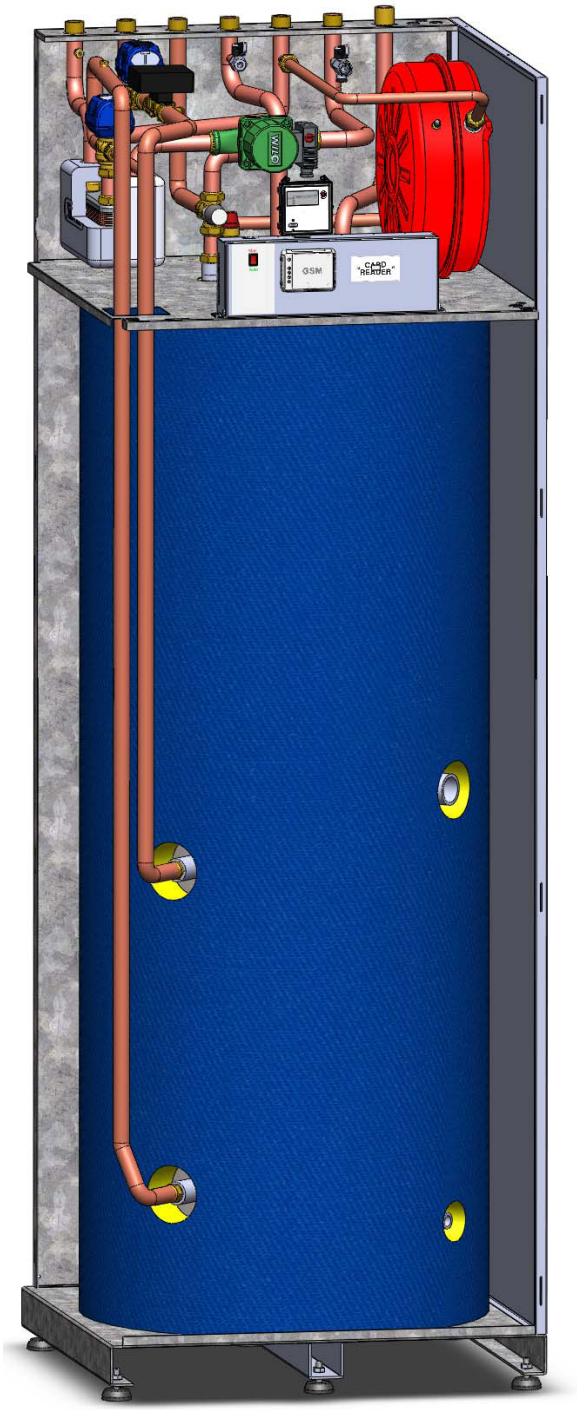
We recommend the unit to be checked at least once a year by authorised maintenance personnel. If the unit is on heavy duty, we recommend to have it checked more than once per year.

Disconnect the electric supply before starting any work on a ModuSat.

1.8 Legislation

All ModuSats intrinsically comply with the current legislation governing the use of these products including heat control and energy metering.
Each user has obligations to maintain the units.
Of course the user is not allowed to tamper metering devices that are regularly checked by a supervisor/controller.

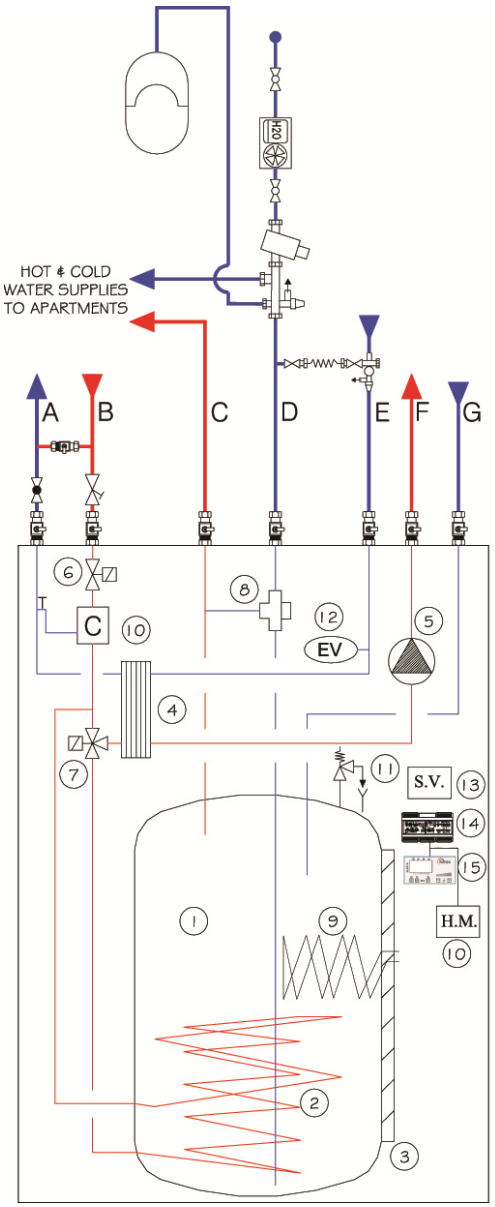
2 TECHNICAL FEATURES



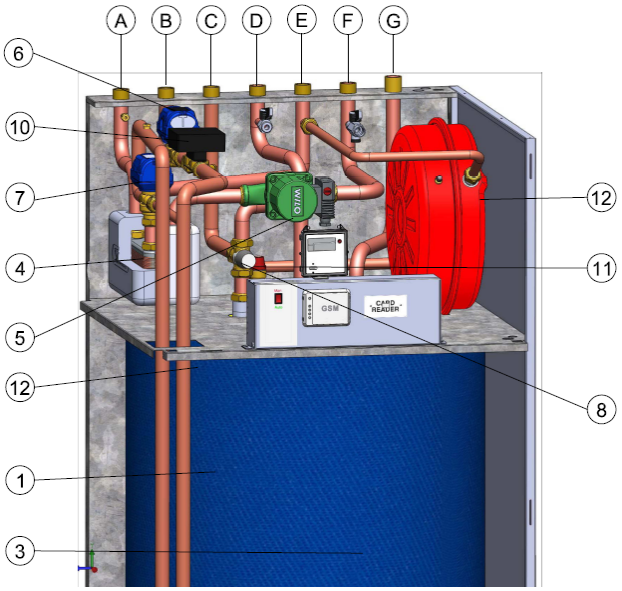
ModuSat is a terminal for district heating plants for heating, cooling and domestic hot water production thanks to its 300 or 400 litre storage, and ready for remote reading.
The primary hot fluid is provided by a central boiler that supplies all units through a main pump.
A plate heat exchanger is placed between the primary and secondary circuits in order to separate them and allow an independent regulation in each apartment, thus simplifying the design and installation.
A 3-speed pump is used on each secondary circuit to ensure proper operation.
A variable pump can be used, as an option, on each secondary circuit to ensure proper operation and water flow: the system allows to set the temperature gradient of the apartment circuit for a better comfort control together with electric energy saving.
An thermostatic blending valve automatically controls the domestic hot water (DHW) output temperature.
The ModuSat is provided with an electronic controller that can be either an ON-OFF type or a climatic type according to the model.
A class C Ultrasonic heat meter with nominal flow **rate of 2,5 m3/h provides consumption measurement for both heating and domestic hot water. The unit can be fitted with an additional meter for water consumption monitoring and h**as been developed to permit the remote consumption download and monitoring, alarms and diagnostic.
A three-way valve (option) controls the DHW temperature in the storage and an immersed electric heater (option) permits the DHW production in the case the main boiler is not operating.
The ModuSat is provided with a shut-off valve to stop the primary circuit flow when heating and/or DHW production are not required.
Pipes are constructed from copper and the DHW tank from stainless steel AISI 316 L.
All hydraulic connections are 1” male and are placed on the unit upper part.

2.1 Schematic principle

ModuSat unit for heating, DHW production, heat and fresh water metering, ready for remote reading. It's composed of:



A: primary circuit return
B: primary circuit supply
C: domestic hot water
D: domestic cold water
E: apartment circuit return
F: apartment circuit supply
G: domestic hot water return
1: domestic hot water storage AISI 316L
2: heat exchanger
3: insulation (75 mm thick)
4: plate heat exchanger
5: circulation pump (var. speed option)
6: 2-way valve
7: 3-way valve
8: thermostatic valve
9: electric heater (option)
10: heat meter
11: safety valve
12: Expansion vessel (14 l)
13: Supply voltage
14: MM control unit
15: Ambient unit



Inside the ModuSat is housed the electronic unit that controls all regulation and heat metering functions. The room unit for user interface is included in the package and is to be installed in the apartment. The cabinet is made of painted steel, white colour RAL 9010.

Dimensions:
Modusat 300 (hxlxd) 1982x760x792 mm
Modusat 400 (hxlxd) 2272x760x792 mm
Electric supply: 230 Vac, 50 Hz

During the design stage of a centralised heating/cooling system using remote satellites it's very important to identify the arrangement that can guarantee the optimum distribution of the primary fluid trough out the entire system. Wherever the units are not connected with a inverse return piping, balancing valves must be connected outside each module.

2.2 Versions available

ModuSat FS is available in three different configurations, Standard, Plus and Premier. The following table shows the components fitted on board according to the three versions.

Legend: **X included**
O option

Component	300-400 STANDARD	300-400 PLUS	300-400 PREMIER
Copper pipework	X	X	X
Pipework insulation	X	X	X
DHW storage	X	X	X
DHW heat exchanger	X	X	X
Plate heat exchanger	X	X	X
3-speed pump	X	X	X
Variable speed pump		O	O
2-way cut-off valve	X	X	X
2-way balancing valve		X	X
2-way mixing valve		X	X
3-way diverter valve			X
Blending valve	X	X	X
Immersion electric heater	O	O	O
Heat meter	O	X	X
Water meter	O	O	O
PT relief valve	X	X	X
Expansion vessel	X	X	X
MM control unit	X	X	X
Ambient unit		X	X
Expansion vessel	X	X	X
Wall spacer	O	O	O

2.3 Technical characteristics

Electrical	ModuSat 300	ModuSat 400
Electric supply	230 (400 Vac with immersion heater)	
Frequency	50 Hz	
Current absorption (w/o el. Heater)	1,5 A	
Immersed electric heater	9000 W – 400 Vac	

Hydraulic connections	ModuSat 300	ModuSat 400
Primary circuit supply	1” ext. thread	
Primary circuit return	1” ext. thread	
Apartment circuit supply	1” ext. thread	
Apartment circuit return	1” ext. thread	
DHW supply	1” ext. thread	
DCW inlet	1” ext. thread	

Materials in contact with potable water	ModuSat 300	ModuSat 400
Storage	Steel AISI 316 L	
Piping	Copper	
Gaskets	Rubber WRAS approved	

Hydraulic characteristics	ModuSat 300	ModuSat 400
Max primary temperature	80 °C	
Max primary pressure	8 bar	
Max apartment pressure	3 bar	
Min apartment pressure	1 bar	
Max water supply pressure	12 bar	
Max DHW storage pressure	8 bar	
PT relief valve setting	7 bar – 90 °C	
Heating circuit water capacity	18 l	
DWH storage capacity	300 l	390 l

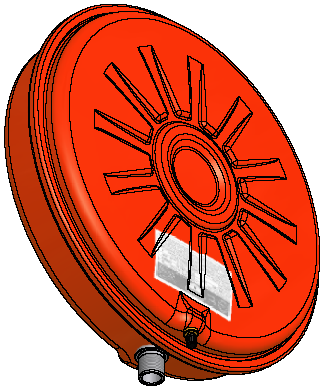
Weight and dimensions	ModuSat 300	ModuSat 400
Weight (full load)	~ 220 + 300 kg	~ 260 + 390 kg
Depth	792 mm	
Length	760 mm	
Height	1.982 mm	2.272 mm

In most cases communal heating installations use a max pressure of 4 bars. This means that the components must be tested at least at 6 bars.
In order to cope with such unusual situations, the MODUSAT is designed to work up to 6 bars and is tested at 12 bar. All components used are the rated to withstand this working pressure. The boiler safety valves must be properly sized and placed.
Be aware also of the high pressure generated by pumps on circuits with high resistance.

2.4 Components

Please find here listed the main components technical characteristics.

2.4.1 Expansion vessel

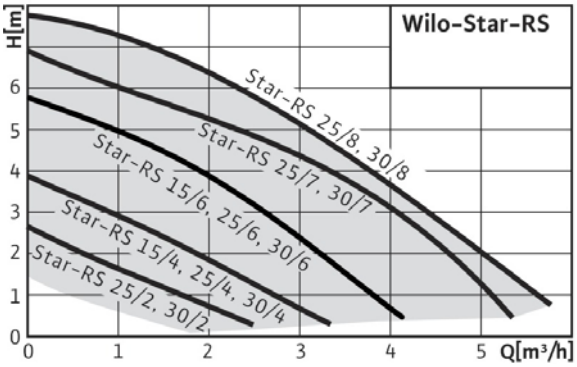


- Max operating pressure: 4,5 bar
- Max operating temperature: +90 °C
- Factory charge: 1 +/- 20% bar
- Nominal volume: 14 litres
- Colour: red

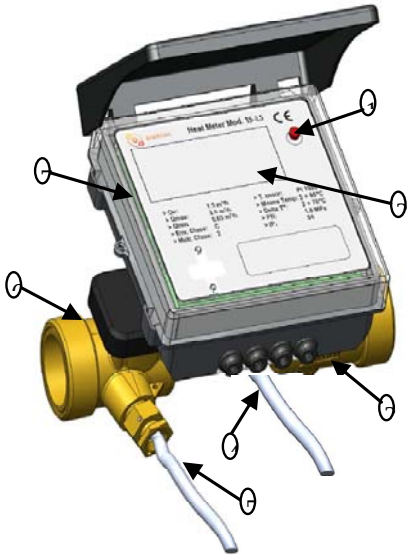
Where secondary return circuits are used then an additional expansion vessel may be required

2.4.2 Pump

- Model: STAR RS 25/8
- Permissible temperature range -10°C to +110°C
- Mains connection 1~230 V, 50 Hz
- Protection class IP 44
- Threaded connection Rp 1¼
- Max operating pressure 10 bar



2.4.3 Heat meter



1. Display Button
2. Display
3. Wiring Holder
4. M-Bus Output Cable
5. Temperature Probe
6. Ultrasonic Transducer
7. Electronic Calculator Unit

- Metrological Class : 2
- Environmental Class : C
- Nominal flow rate Qn: 2,5 m³
- Maximum flow rate Qmax: 5,0 m³
- Minimum flow rate Qmin: 0,05 m³
- Water temperature range: 2 to 95 °C

- Temperature difference range: 3 / 70 °C (max accuracy)
- Temperature sensors: Pt1000, DIN/IEC751B
- Max. temperature deviation of pairing sensors: <0,01 °C
- Internal storage: EEPROM
- Display: LCD (8 digits + prompting character) word height 8,5 mm
- Communication mode: M-BUS or RS485
- Heat unit displayed: kWh
- Battery life: A 3,6 V lithium battery cell capable of working continuously for minimum 6 years
- Working temperature: +5 / +55 °C, Storage temperature: -30 / +60 °C
- Max working pressure 1,6 MPa
- Pressure loss at nominal flow rate: 200 mbar
- Protection class: IP65
- Weight: 0,75 kg
- The meter can be mounted vertically or horizontally
- Temperature sensor cable length: 1,5 m (one sensor fitted on flow rate transducer)
- Dimensions (LxHxW): 130x86x120 mm
- Connections: 1” male

2.4.4 Cut-off valve

VMR 2-way valves are motorized valves used in home applications and small installations to control the flow of hot and cold water. The 2 ports are designed for On-Off zone control of domestic systems. The valve, thanks to its cylindrical shut-off, shuts flow which is independent from the differential pressure between ports. This shut-off can have two operating positions depending on how the electric motor that moves it is powered. The head of the valve can be removed without draining down the plumbing system: this makes valve maintenance quick and flexible. Without the head the valve is normally closed. Valves have an external lever for manually positioning the shut-off in its central position.

2.4.5 Diverter valve

VMR 3-way valves are motorized valves used in home applications and small installations to control the flow of hot and cold water. The 3 ports are designed for On-Off control of domestic DHW tanks. The valve, thanks to its cylindrical shut-off, shunts flow which is independent from the differential pressure between the various ports. This shut-off can have two operating positions depending on how the electric motor that moves it is powered. The head of the valve can be removed without draining up the plumbing system: this makes valve maintenance quick and flexible. Valves have an external lever for manually positioning the shut-off in its central position.

2.4.6 DHW safety valve

The temperature and pressure relief valves (TP) 309 series are made in compliance with the essential safety requirements laid down by Directive 97/23/EC of the European Parliament and the Council of the European Union for harmonisation of Member States with regard to pressurised equipment.

Function

The TP relief valve controls and limits the temperature and pressure of the hot water contained in a domestic storage heater and prevents it from being able to reach temperatures of over 100°C, with the formation of steam.

On reaching the settings, the valve discharges a sufficient amount of water into the atmosphere so that the temperature and pressure return within the system's operating limits.

This particular series of valves is certified as conforming to the performance requirements of the European standard EN 1490. (setting 7 bar – 90 °C).

2.4.7 Safety thermostat

Max storage temperature safety device having the following main characteristics:

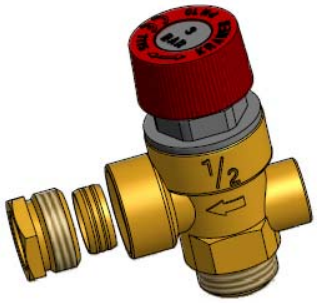
- Rated impulse voltage: 2,5 kV
- Switching point: 85 °C
- Max bulb temperature: 125 °C
- Ambient temperature effect: -0,25 °C/°C

2.4.8 Plate heat exchanger

Due to their unique manufacturing process, ZB series brazed heat exchangers are particularly suitable for heating and DHW production.

- Model: ZB 207
- Material: Stainless steel
- Brazing: Copper
- Dimensions: 207x77 mm
- Socket distance: 172/42 mm
- N. of plates: 40
- Connections: ½" + ¾" Inox

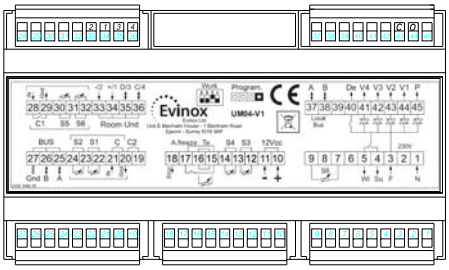
2.4.9 HE safety valve



Diaphragm safety valve with male inlet and female outlet connections. Fitted with ¼" pressure gauge connection.

- Set pressure: 3 bar
- Size ½"
- EC PED compliant
- Design temperature: 0-110 °C
- Overpressure: 10%
- Resetting pressure: 20% (min 0,6 bar)

2.4.10 Electronic control



This is a custom designed electronic controller for heat/cooling management units.
It includes all the measurement and control circuits to drive pumps, valves and other devices used in such applications. It has also three communication channels to connect it to slave devices as well as to a main communication bus used to collect data from the modules.

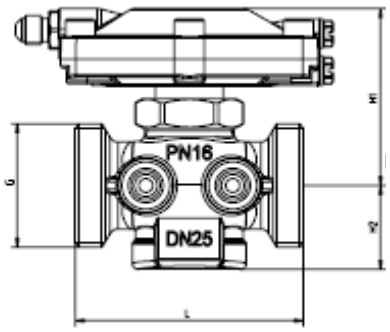
- Relay outputs : 2 (2Amax at 230Vac)
- Triac outputs : 5 (3Amax at 230Vac)
- Analog Outputs : 1 - 0÷10Vdc, 1 – 3Vdc (20mA)
- On/Off inputs : 2 (clean contact)
- Sensor inputs : 4 Pt1000, 3 NTC(range 0÷100°C)
- Communication channels : 1 RS485 (isolated)
- 1 RS485 non (isolated), 1 local bus
- Power supply: 12÷18Vdc
- Max current: 250mA
- Operating temperature : 5÷60°C

2.4.11 Immersed electric heater

- Elements length: 350 mm
- Voltage: 400 V
- Rated power: 9000 W
- Cold resistance: min 16,7 W – max 19,5 W
- Dielectric strength: ~ 1500 V – 3 sec
- Insulation resistance: >20 MW
- Protection fuse: up 70 16 A
- Surface load: 10,9 W/cm^2

The device is equipped with overheating safe guard which switches the heater off in case of emergency.

2.4.12 Differential Pressure Controller (Optional)



- Maximum operating pressure 16 bar
- Test pressure Maximum differential pressure on the body 2 bar
- Minimum operating temperature 2 °C (pure water)
- Minimum operating temperature -20 °C (frost protection)
- Maximum operating temperature 120 °C
- Differential pressure 50 kPa

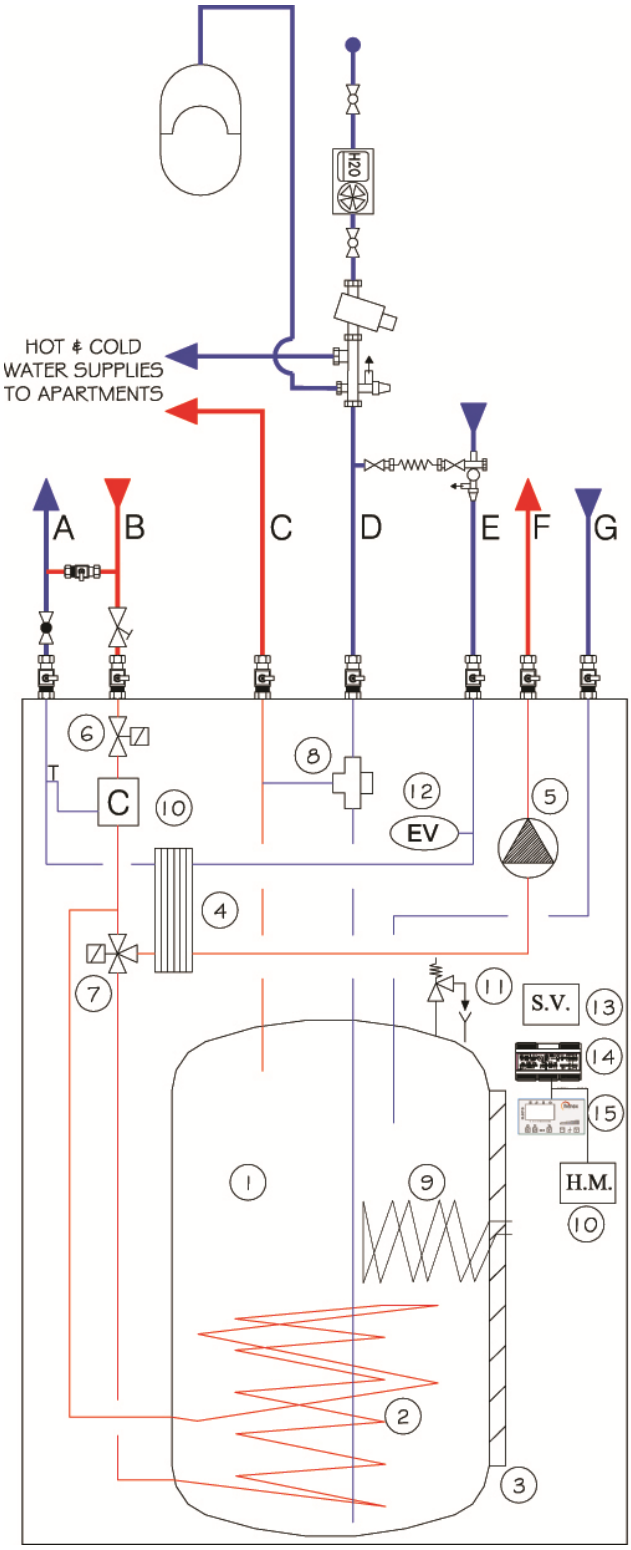
2.4.13 Unvented kit

When the system installed is "Unvented" it is necessary to fit the "unvented kit" on the cold water supply. The "Unvented kit" contains pressure reducing valve, non-return valve,

pressure relief valve and optional use balanced cold water connector. It is good practice to fit the "unvented kit" above the top level of the EBS-1 tank. In this way if it is required to replace the "unvented kit" it is not necessary to drain all tank. Please find below how to install the "unvented kit".

1. Unvented kit
2. Expansion vessel
3. Expansion vessel connection
4. Tundish
5. Cold water
6. Cold water to Modusat
7. To drain valve
8. Balanced cold water
9. Discharge
10. Pressure relief valve
11. Pressure reducing valve

2.5 Control specification



All Evinox satellites are equipped with a regulation system for heating and DHW temperature control. The regulation strategy foresees different applications: radiators, fancoils, underfloor heating and can be configured accordingly.

2.5.1 Heating

When the room temperature Ta drops below the set point Ts:

- Pump (5) ON – Valve (6) OFF for 90 sec (UFH)
- Calculation of water supply temperature Tmc (climatic control UFH))
- Valve (6) ON to regulate S4 according to Tmc
- Pump control to keep the set value S4-S5 (priority con S4 control with variable speed pump)
- Pump (5) + Valve (6) OFF when Ta>Ts+DTs (DTs = 0,5 – 1,5 °C)
- Pump (5) + Valve (6) OFF when S4>Tmmax (UFH = 45 – 55 °C)

2.5.2 DHW production

When S3 drops below the tank set-point Tas:

- Valve (6) – Valve (7) ON
- Valve (7) OFF when S3>Tmacs+DTs (DTs = 3 – 7 °C)
- With no request for heating valve (6) OFF

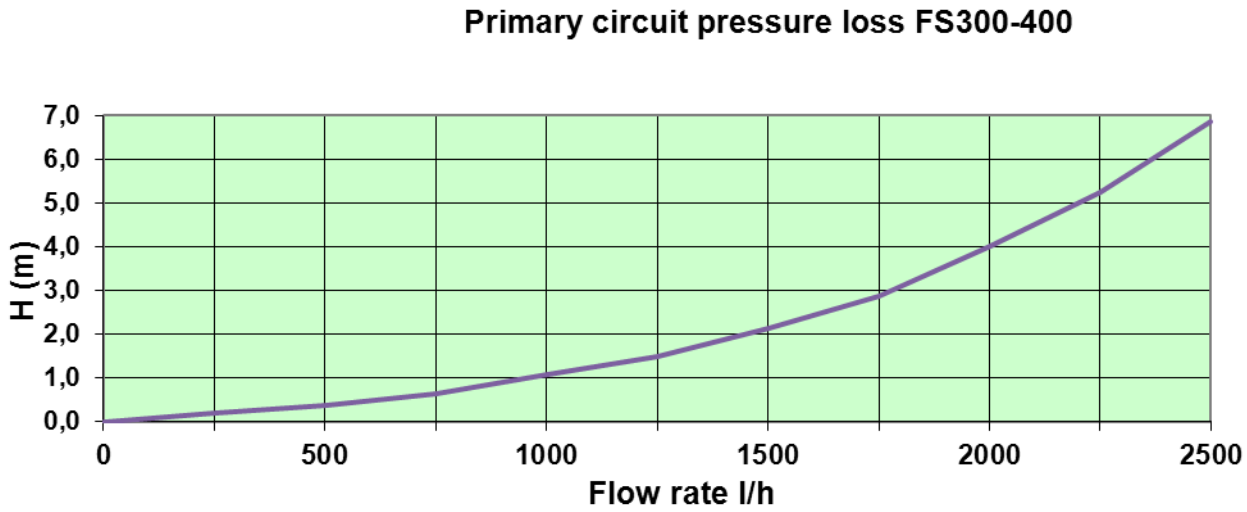
2.5.3 Safety control

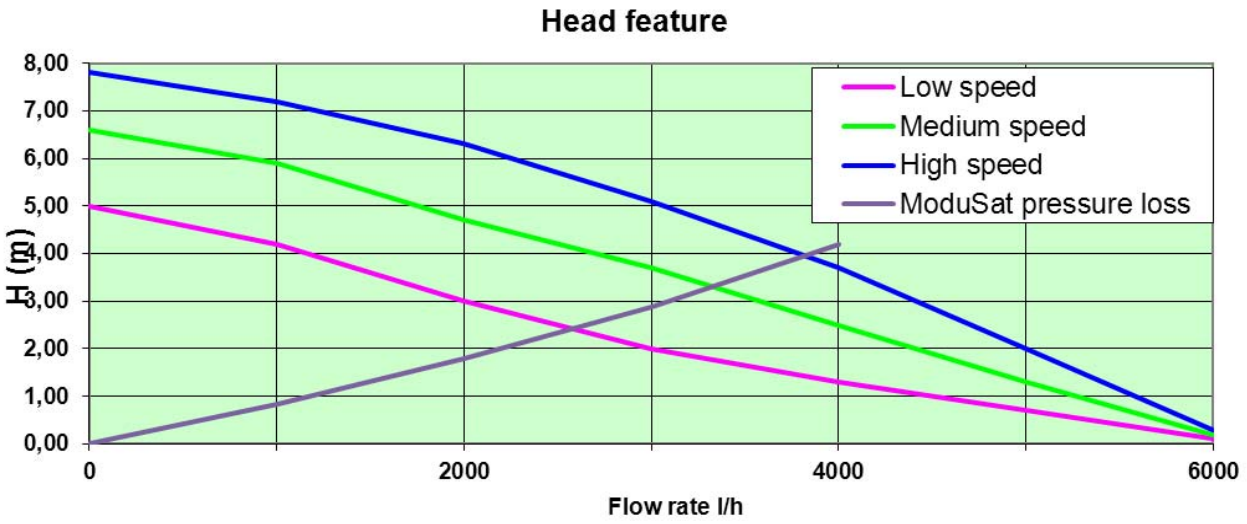
In case of pressure switch ON:

- Heating and DHW production OFF

2.6 Pressure loss and head

The following diagrams show the primary circuit pressure loss according to the ModuSat equipping and the head feature head available to the apartment circuit.





The head available for the apartment circuit is given by the difference between the pump head and the ModuSat pressure loss.
The ModuSat ensures that the heating and the production of hot domestic water can be achieved simultaneously. Due to the low heat losses required in modern homes by ensuring that enough power is provided to meet the domestic hot water requirements it will make it possible to determine the primary flow necessary for each apartment.

2.7 DHW capacity

The quantity of DHW depends on the storage capacity, the supply temperature, the primary temperature and the cold water temperature.
The following table shows the max DHW quantity according to the tank capacity and the primary circuit temperature with:

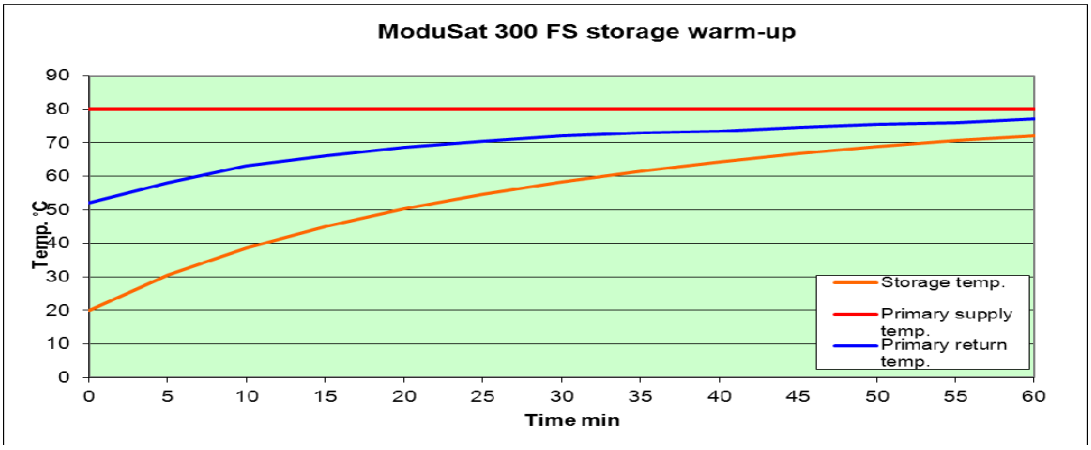
- Cold water temperature: 10 °C
- DHW temperature: 45 °C

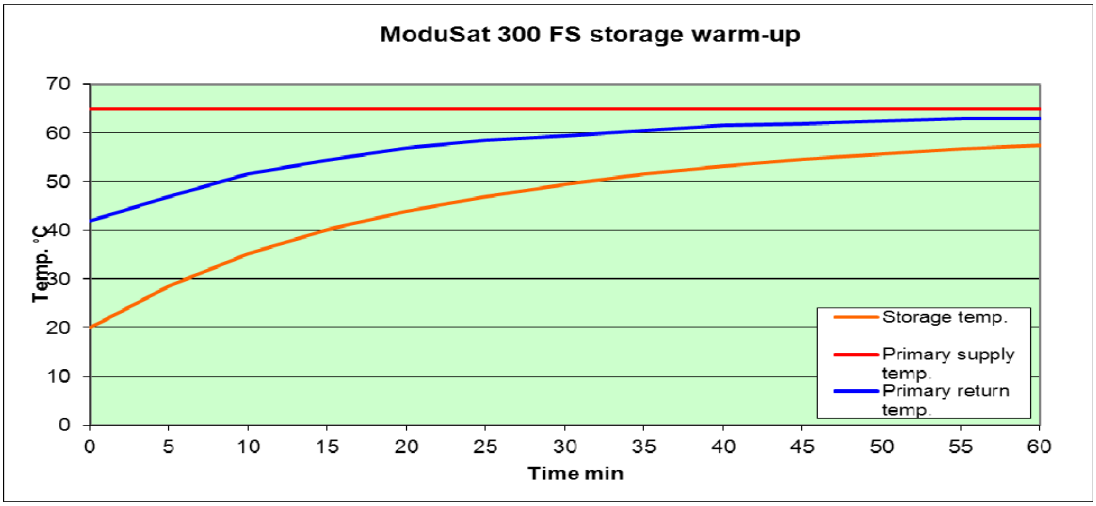
Primary circuit temperature °C	ModuSat 300	ModuSat 400
50	340 l	440 l
60	430 l	550 l
70	510 l	670 l
80	600 l	770 l

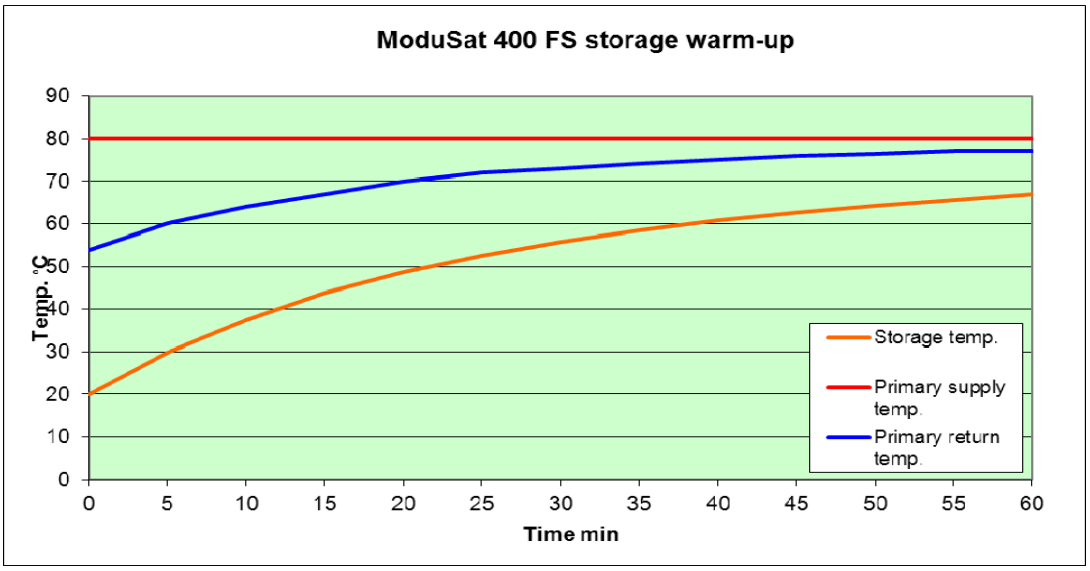
The re-heat time depends upon:

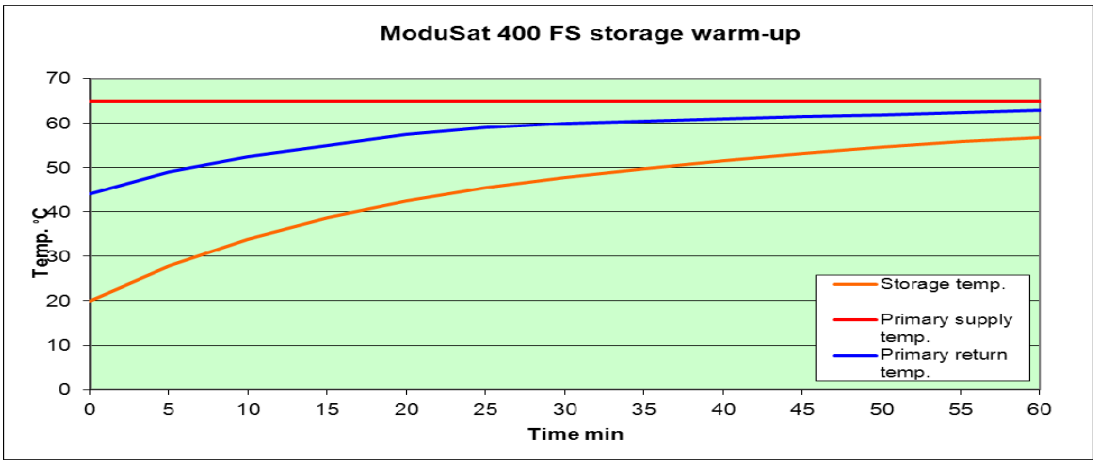
- Primary circuit temperature
- Primary circuit flow rate
- Cold water temperature

The following diagrams show the re-heat times with cold water temperature at 10 °C for the two ModuSat models both fed with 2000 l/h at 80 and 65 °C.







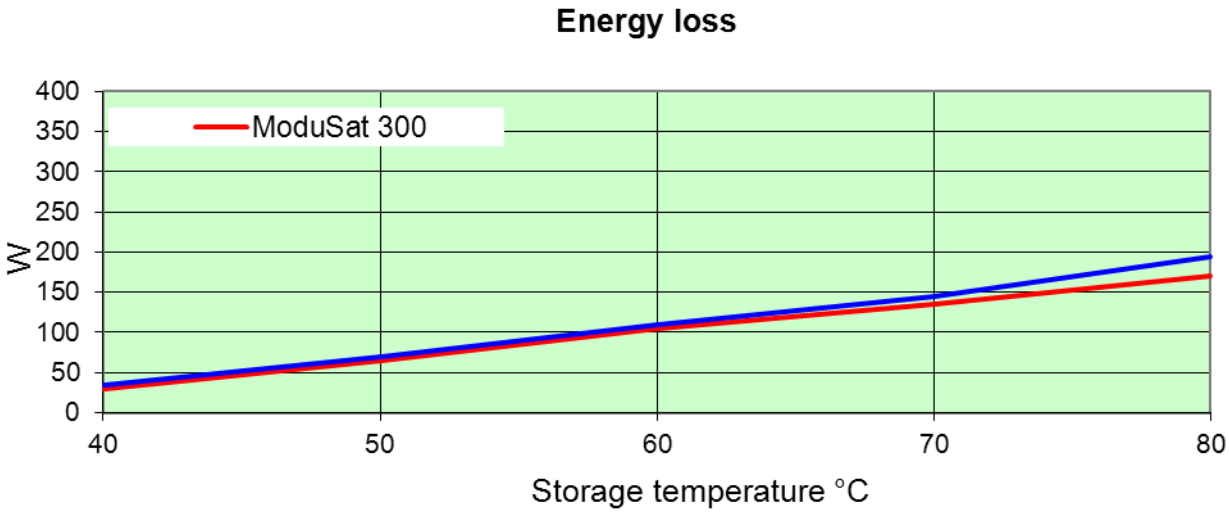


For a satisfactory domestic comfort, it is generally allowed to adopt a value of 15 l/min for a bathroom comprising a 150-litre bath and 9 l/min shower. It should be noted that the reduction in the primary flow will influence the time of the warm up of the stored water regeneration, but that at the moment of the first draw off, the ModuSat contains the total capacity at the temperature of the primary circuit (the specific flow takes into account two successive hot water draw of)

The values of the primary flow and the temperature of distribution can be lowered to 65°C while preserving the hot water service at a level of acceptable comfort, (the temperature of cold water is higher in the summer). Therefore the losses of heat of the primary circuit are reduced for the summer period as well as the semi-season.

2.8 Energy loss

A thermal storage involves heat loss due to transmissions, radiations etc. The diagram here below shows the heat losses for the three different models according to the storage temperature. The tests have been carried out with a room temperature of 20 °C.



2.9 Problems and solutions

Problems only occur with ModuSat installations if our instructions are not adhered to. Poor insulation can result in various problems so it is imperative that the insulation standards of BS.3958 and BS.5422 are followed at all times.

Insulation of the primary circuit

Noted errors	Effects	Solutions
Primary riser and connecting pipes to the ModuSat not well insulated	Overheating of common areas Overheating of flat/apartment	Follow recommendation to insulate below
Primary and cold water distribution not well insulated	Cold water reaches 20 °C and more	Separate cold water pipes Insulate according to current regulations
Primary riser and connecting pipes to the ModuSat not well insulated	Lack of hot water Lack of heating	Carry out correct balancing

The primary distribution circuits, which supply the ModuSat, may be maintained at a temperature of 65°C for the summer period and at 80°C for the winter period. The total output of the installation of the system will be dependent on the quality of the insulation of the primary circuit. It will be necessary to take care to choose an insulation material of good quality and to ensure a good installation of the chosen material. Pipe rings/supports will be selected with an integral insulation, which will limit the thermal conduction towards the fabric of the building. Particular care will have to be taken to the insulation of the branch connections and changes of direction. In the same way as the rising mains the horizontal distribution network to the ModuSat units will be insulated perfectly up to the satellite. The length of the horizontal distribution pipework should be limited to the minimum while placing the rising mains as near as possible to the satellites.

Insulation thickness within service voids and risers

NOTE: A minimum of 20mm thickness insulation should be applied to all pipework within the ModuSat cupboard.

Primary pipework concealed in the fabric of the building

This solution should not be used in a new building as it can cause serious overheating problems of the building if detailed attention is not given to this type of installation practice. Evinox will not be held responsible for problems generated by bad design or bad installation practice.

Pipe Size	Min wall thickness
15 to 35	25 mm
35 to 60	35 mm
60 to 100	50 mm

Recommendations:

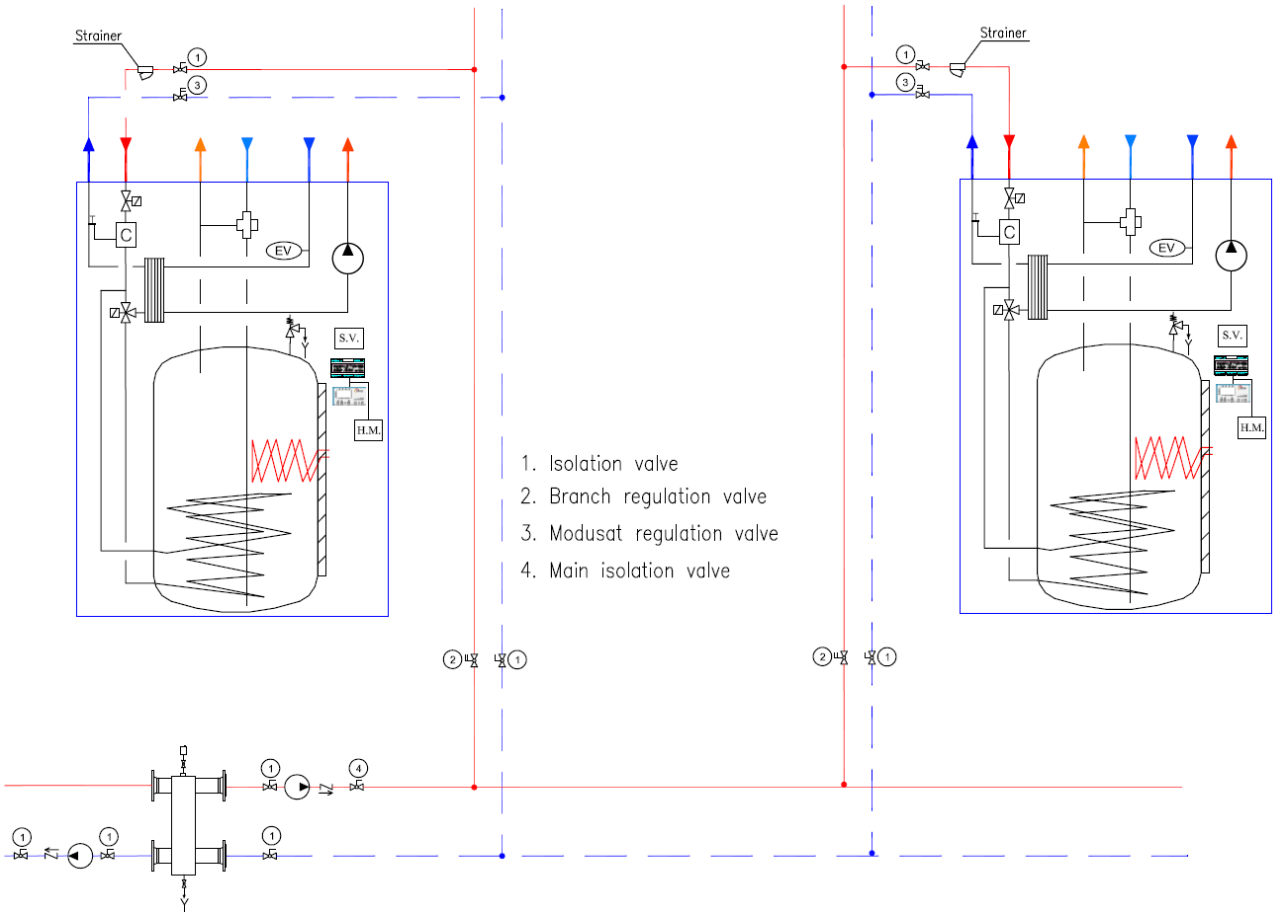
- Use good installation practice by using pitcher tees and swept bends instead of square tees and elbows
- Use high quality pipe insulation installed by a thermal insulation contractor
- Obligatory use of the optional 230V energy cut off valve when the heating and hot water are satisfied (Not applicable to solar and CHP systems)
- Use insulated pipe rigs to prevent thermal transfer of heat into the fabric of the building

2.10 Sizing of the primary circuit

The primary circuit will be sized in order to satisfy the flow necessary to each ModuSat installed in each apartment. The total flow D supplied by the circulating pumps of the boiler room being the sum of the individual flows of each ModuSat, is:

$$D = \sum_{1}^{n} dn$$

The sizing of the piped circuit constituting the primary circuit could be carried out in order to obtain a self-balancing of the installation. The diameter of the rising main primaries will be selected so that the pressure loss is weak compared to each apartment branch pipework. The reduction in diameter between each branch connection will be limited or even better non-existent. The use of a speed lower than 1 m/s, for example 0,5 m/s will be optimal.



This way, the apartments closest to the boiler room will not require a very reduced setting of the balancing valves. A diameter of 28 mm will be optimal for branches towards each apartment. The pressure loss of each satellite is reported on chapter 2.6 (4 m approx at 2000 l/h)

In order to guarantee the hydraulic independence of the boilers and of the installation, a mixing header is installed between the boilers and the primary distribution system. Use either Evinox headers or Evinox packaged boilers with built in headers.

2.10.1 Design of the boiler room

The ModuSat's provide each apartment with heating and the production of hot water and are supplied by a primary circuit coming from a central boiler room. When the boiler room

supplies one or more buildings, its power usually exceeds 72kW and it must satisfy the regulations relating to this size of plant. For smaller operations, it is possible to install several small boiler rooms of power lower than 72kW, each one supplying a riser, for example four ModuSats 300-400 (the power heating of the new luxury apartments seldom exceeds 15 to 18 kW).

2.10.2 Determining the kW load required for the boiler plant

The power of the boiler room will be calculated in a traditional way starting from the losses of the building and the power absorbed for the production of domestic hot water (increased by a coefficient, which will take into account the losses of distribution: for example x 1.05). The ModuSat can be classified in the system of production of hot water with semi-accumulation. Its average power of reheating of 16 kW (primary to 80°C) ensures fast reheating. Its design ensures that it functions naturally in hot water priority. The storage capacity of the ModuSat makes it possible to individually satisfy a 10 -minute high peak consumption for each home.

2.10.3 Peak hour requirements

Peak hour requirements correspond to the use of domestic hot water equipment that consumes the most energy (showers or baths).

Example:
F4 3 standard bath: 45 l/min for 10 min = 450 l _T 30K = 15,660 Wh ModuSat 300
F6 4 standard baths: 60 l/min for 10 min = 600 l _T 30K = 20,880 Wh ModuSat 400

The peak hour period, taking into account the natural proliferation of collective housing buildings, enables the power for heating and domestic hot water not to be added. A coincidence factor has been defined statistically for centralised hot water production systems.

See the table below (ref. GDF/SDIG gas fired collective heating).

N	10	20	30	50	75	100	200
T hours	1.72	2.45	2.87	3.34	3.65	3.83	4.14
S	0.50	0.40	0.36	0.31	0.29	0.27	0.24

N = number of standard housing units T = peak period in hours S = Coincidence factor

The examples below correspond to the sizing of ‘standard’ housing units. For installations known as ‘luxury’ or for specific hot water requirements, please contact the technical department at Evinox.

$$S = \frac{1}{\sqrt{N-1}} + 0.17 \qquad T = 5 \times \frac{N^{0.905}}{15 + N^{0.92}}$$

The calculated power is the power required at the boiler room outlet. The basic hypotheses for these calculations tend to the best sizing of the boiler room plant in order to obtain the best efficiency of annual generation. Under these conditions, the flow temperature is allowed to undergo a slight drop during the peak hot water period in extreme winter conditions.

2.10.4 Small installations up to 10 units

Taking into account the relatively short peak period, storage, and speed of regeneration, the coincidence factor typically used for sizing a hot water production unit located in the boiler room can be weighted. Indeed, even if the boiler room only has to satisfy mainly the production of hot water, this will only be for a short period, during which the inertia of the building will limit any lowering of the room temperature.
For these applications, the weighting is obtained by using a forfeit value F of 12 kW and 16 kW respectively for ModuSat 300 and 400 for the production of hot water. Where heat losses are greater than these values, it is the heating power of the apartment that is used as the basis of calculation, by adding 2 kW per housing unit for domestic hot water.

P1 = (losses) + (N x 2 kW) x 1.05

P2 = F x N x 1.05

The upper value of P1 or P2 will be used.

Example:
Installation of 10 housing units featuring ModuSat 300.
Average heating power 10 kW per housing unit.
P1 = [(10 x 10 kW) + (10 x 2 kW)] x 1.05 = 121 kW
P2 = 10 x 10 kW x 1.05 = 105 kW
The minimum power required is 121 kW.

2.10.5 Installations with more than 20 units

In these cases, the coincidence factor will be used notably to ensure that the power of the boiler room can meet the total power required for the hot water. The power of the boiler room will therefore be:

P1 = (losses + 2 kW x N) x 1.05
P2 = N x Pi x s x 1.05

Pi being the average power absorbed by the sum of the ModuSat's installed.

s = coincidence factor
The minimum power retained will be the highest value of P1 or P2.

Example 1:
30 housing units fitted with ModuSat 300. Average losses of 10 kW per housing unit.
P1 = [(30 x 10 kW) + (30 x 2 kW)] x 1.05 = 363 kW
P2 = 30 x 16 x 0.36 x 1.05 = 181 kW
The minimum power required is 363 kW.

Example 2:
50 housing units fitted with ModuSat 300.Average losses of 8 kW per housing unit.
P1 = [(50 x8 kW) + (50 x 2 kW)] x 1.05 = 505 kW
P2 = 50 x 16 x 0.31 x 1.05 = 260 kW
The minimum power required is 505 kW

2.10.6 Refurbishment projects

When the ModuSat is installed within a refurbishment project and the central boiler room is preserved, the power of this boiler room will in the majority of the cases be reduced. The fact of individualising the production of domestic hot water (300 or 400 litres available in each apartment) can imply a lower power boiler plant size for the provision of hot water.
In addition, the operations of refurbishment of the building by the replacement of windows, the improvement of the insulation and ventilation will also bring a considerable reduction in the requirements in heating.
The minimum capacity of the boiler room will be calculated as before.

2.10.7 Cleaning

The cleaning of the system must be carried out strictly in accordance with BSRIA cleaning guidelines and the relevant British Standards. It is necessary to proceed by stages:

- Clean the boiler room plant
- Cleaning of the primary circuit, with the isolating valves of the ModuSat closed
- Cleaning of the horizontal pipework and the ModuSat satellite
- Use the dirt separator in the boiler room and strainer on each ModuSat to help in cleaning the system

The system can then be filled; all the air eradicated by bleeding and adjust the system pressure. The system has to be cleaned in accordance with the latest building regulations BSRIA or British Standards that form part of the design criteria and specification. If the tender specification does not enforce a particular standard then we would always recommend the BSRIA standard.
Note: Never leave the system filled with raw untreated water for any length of time.

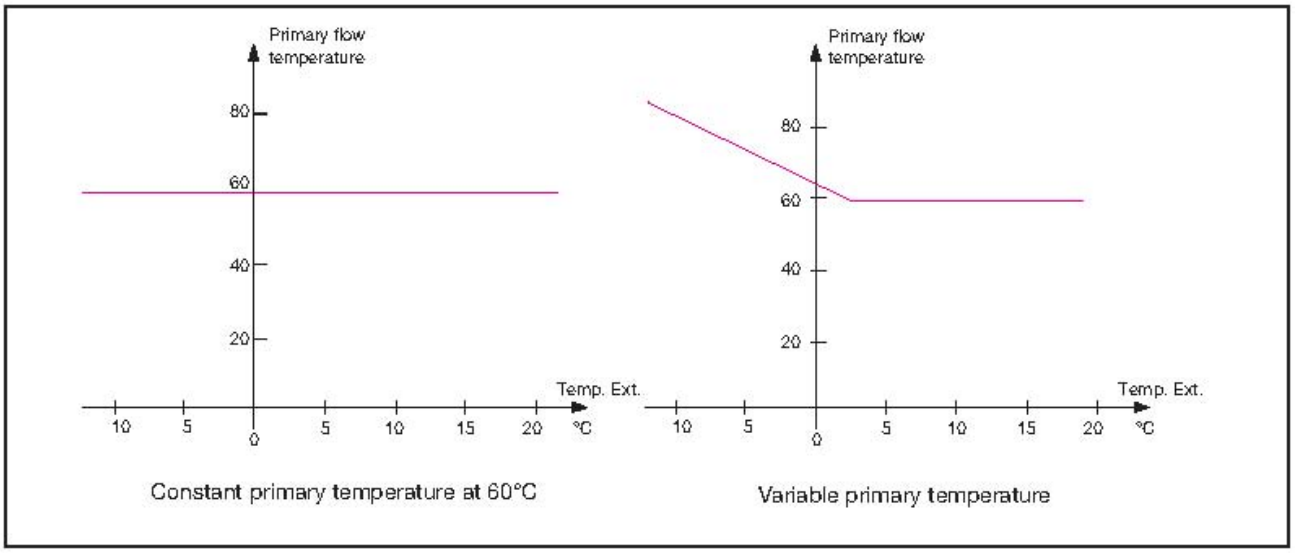
2.10.8 Balancing

Hydraulic balancing is very important because it will ensure the flow necessary to each satellite. The system balancing valves shall be adjusted and set using flow metering equipment.

2.10.9 Maximising the performance of the ModuSat installation

The collective heating systems producing centralised hot water require the operation in circulation, of the recycling loop all year long.
The ModuSat, which removes the domestic loop, nevertheless requires the operation in circulation of the primary circulation loop in summer.
In order to reduce the energy consumption, the primary circuit will have to be perfectly isolated and its temperature could be lowered to 65°C, for the summer period. In order to preserve a service of production of optimal hot water, in spite of wide programming or a low primary temperature, the capacity stored in each apartment could be voluntarily over sized.
For example, the ModuSat 300 which, supplied with a primary circulation flow of 2000 l/h with 80°C, makes it possible to satisfy the requirements of hot water for 3 or 4 bathrooms simultaneously, this could be fed with only 1000 l/h at 65°C to largely satisfy the needs for 2 bathrooms. The maintenance all year, of the temperature of the primary circuit with 65°C by over sizing the radiators in the flats/ apartments, will also make it possible to increase the efficiency of the boilers.
The assembly on the ModuSat of the 230V energy cut off valve will also have the advantage of reducing the thermal losses of the primary circuit particularly during the summer and of thus improving the total efficiency. The energy cut off valve limits the

primary circulation of the horizontal distributions to the hours of use of hot water and thermal maintenance of the hot-water tanks (i.e. a few hours per day).
The boiler room can profit from the systems of regulation and programming. Nevertheless, the temperature of the primary circuit will not be lowered under 60°C, in order to ensure a production of satisfactory domestic hot water on demand.
The small units will be able to satisfy an individual regulation of the boiler, which will maintain the constant primary temperature.



2.10.10 Energy Cut Off Valve

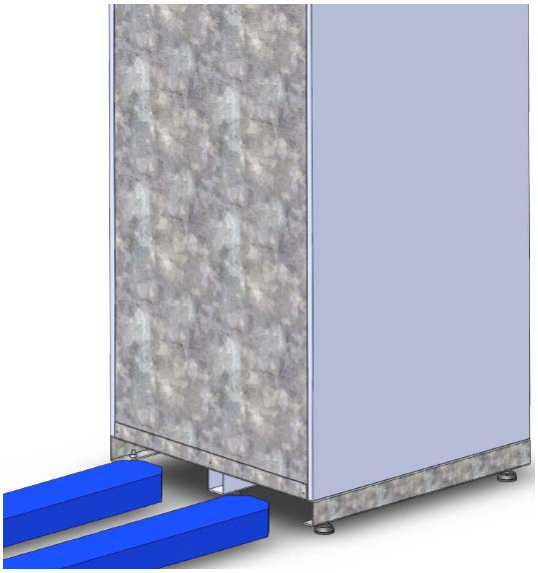
The 230 V energy cut off valves make it possible to cut primary circulation when there is no request for reheating hot water or request for heating. Operation by closing the primary circulation circuit (in particular in summer) results in energy saving by limiting the losses of the primary circuit.

3 INSTALLATION

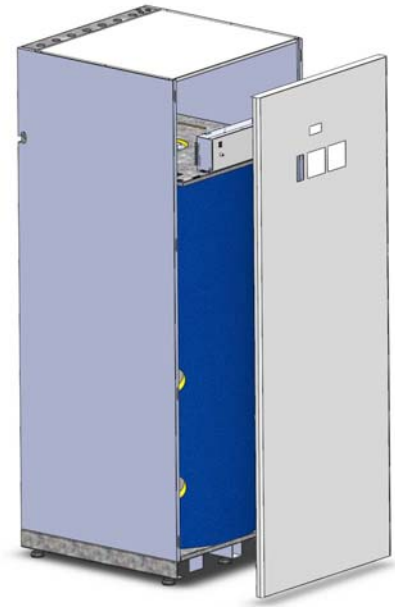
MODUSAT is delivered in a proper packaging, after removing it check the integrity of the unit as well as the presence of all parts. In case of damage or missing parts contact the supplier. Packaging materials must not be left at children's reach because potentially harmful. The installation and commissioning must be carried out only by authorised and qualified personnel according to the local governing laws and regulations.

3.1 Recommended handling procedure

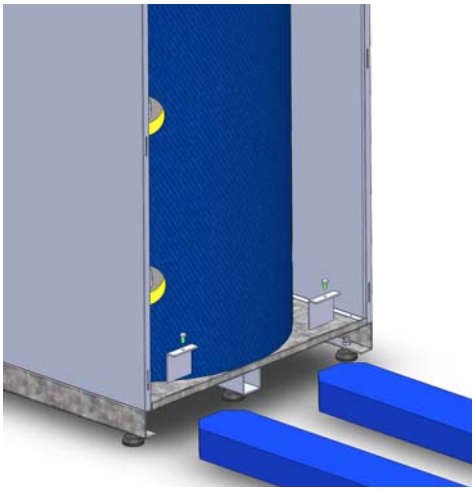
The unit should be carried into position as shown below:



Handling from the back



Handling from the front:
Remove the front panel
Remove the transit brackets
Manoeuvre into position



For the carriage of carton it is recommended at least two people perform any lift. Clear the carriage route of the carton from point of delivery to point of installation. Take care to avoid trip hazards, slippery or wet surfaces and when climbing steps and stairs. Always use assistance if required. If a sack truck is used it is recommended the carton is strapped to the truck.

For the unpacking of the appliance from the carton, it is recommended at least two people perform any lift. It is recommended to cut the base end of carton and open the carton flaps.
Ensure the protective packing over the ModuSat tappings on the top of unit is kept in place, then remove carton by sliding up over the unit.

When lifting this appliance the back should be kept straight at all times. Avoid twisting at the waist - reposition the feet instead.

Avoid upper body bending when holding the appliance and keep the ModuSat as close to the body as possible. Safety footwear and gloves are recommended PPE when lifting this appliance - to protect against sharp edges and ensure good grip.

3.2 ModuSat positioning

There is no limitation about where the unit can be located due to size and air flow.

In order not to compromise the correct unit operation the site working temperature must not exceed 60 °C with the humidity between 15% to 85% RH. (NON CONDENSING).

The unit must be sheltered from atmospheric agents (harsh weather). Don't install or stock this product outdoor. ModuSat is designed to be used only inside and in a protected area.

The equipment must be levelled and the floor strength must be ample to sustain the weight of the equipment (refer to technical characteristics, chapter 2.3).
600mm clearance should be left on the front and 50 mm on both sides of the unit for access are required for maintenance and replacement.
Do not install the ModuSat around other electronic equipment or other precision instruments. Other devices may affect the ModuSat with electrical noise during operation.
If the Machine is installed near other electronic equipment, such as a TV or a radio, interference to the unit, such as noise or flickering, may occur.

Make sure the environment where the ModuSat is to be installed comply with governing rules and laws.

3.3 Checks before connecting the ModuSat

Before connecting the ModuSat to the piping, wash them thoroughly and remove all residual parts of metal and any other dirt that may be present and would compromise the correct operation.
Next rinse the entire circuit to make sure all products used to wash it are removed. During this process, it is forbidden to use any chemical or other products not approved by EVINOX. The non observance of this rule invalidated the warranty.

Remove the electric power supply before any installation operation.
The unit needs a 230/240Vac – 50Hz supply line, check also the Line and Phase polarity. Protect the cables so to prevent any damage.
Make sure an efficient earth connection is present to guarantee the safety against electric shocks.

Have the electric wiring checked by qualified personnel; EVINOX will not be liable for damage caused by incorrect electric wiring, bad or missing earth connection.
Check also that the electric supply line is protected by a thermal and a differential switch. These switches must be adequate for the ModuSat current consumption and the wiring cables must be adequately sized.

No valve shall be fitted between the tank and the expansion valve.

In case an antifreeze fluid is required, ONLY EVINOX APPROVED products are allowed. The non observance of this directive may result in the damage of the units and circuits.

3.4 Expansion devices

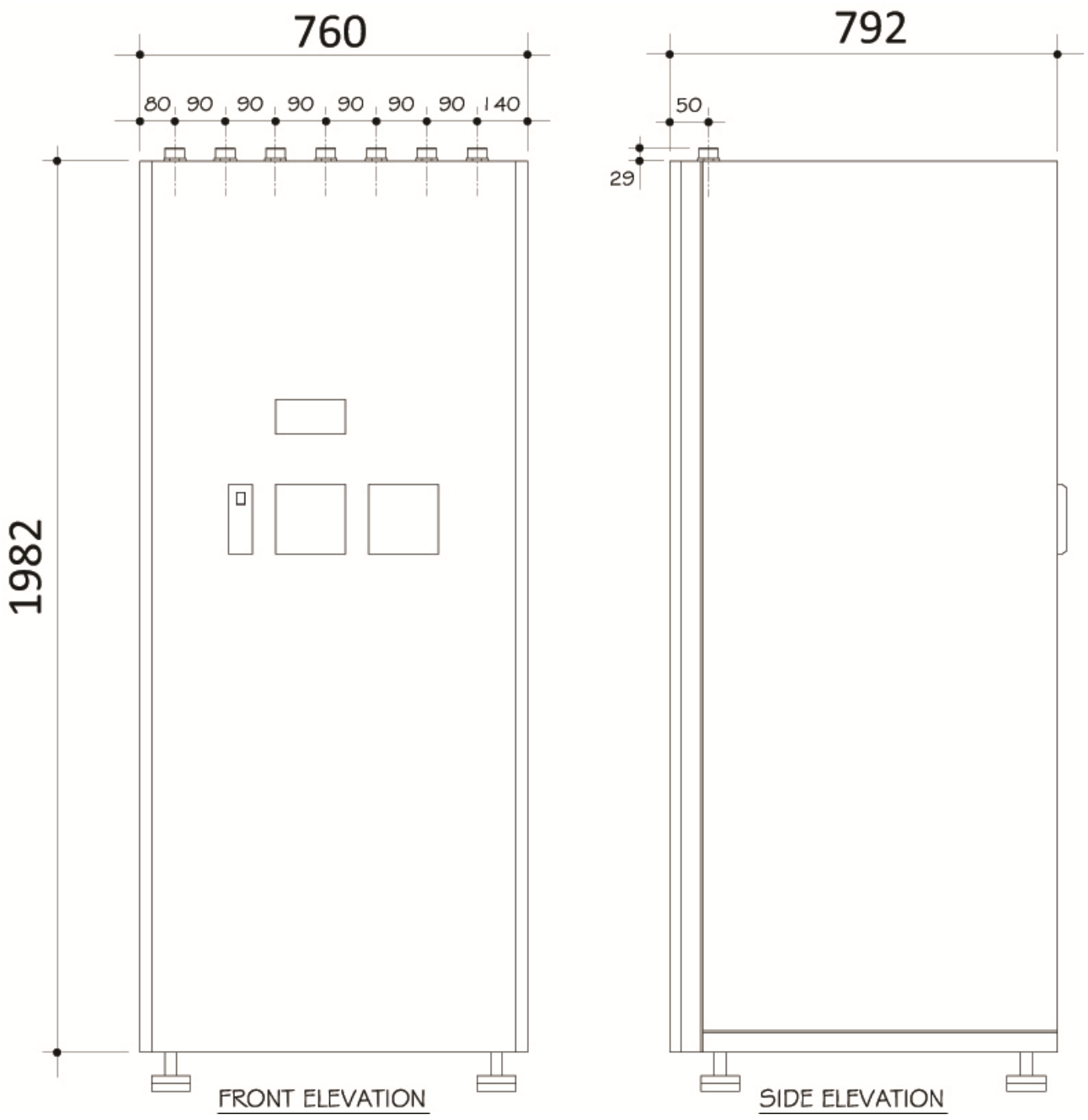
The ModuSat shall be fitted, on the cold-water inlet, with:

- a hydraulic safety group conforming to EN 148
- where required, a pressure reducing valve conforming to EN 1567
- DHW expansion vessel: the expansion vessel accommodates expansion that results from heating the water inside the unit; the expansion vessel must be connected between the expansion valve and the cylinder; the location of the expansion vessel should allow access to recharge the pressure as and when necessary

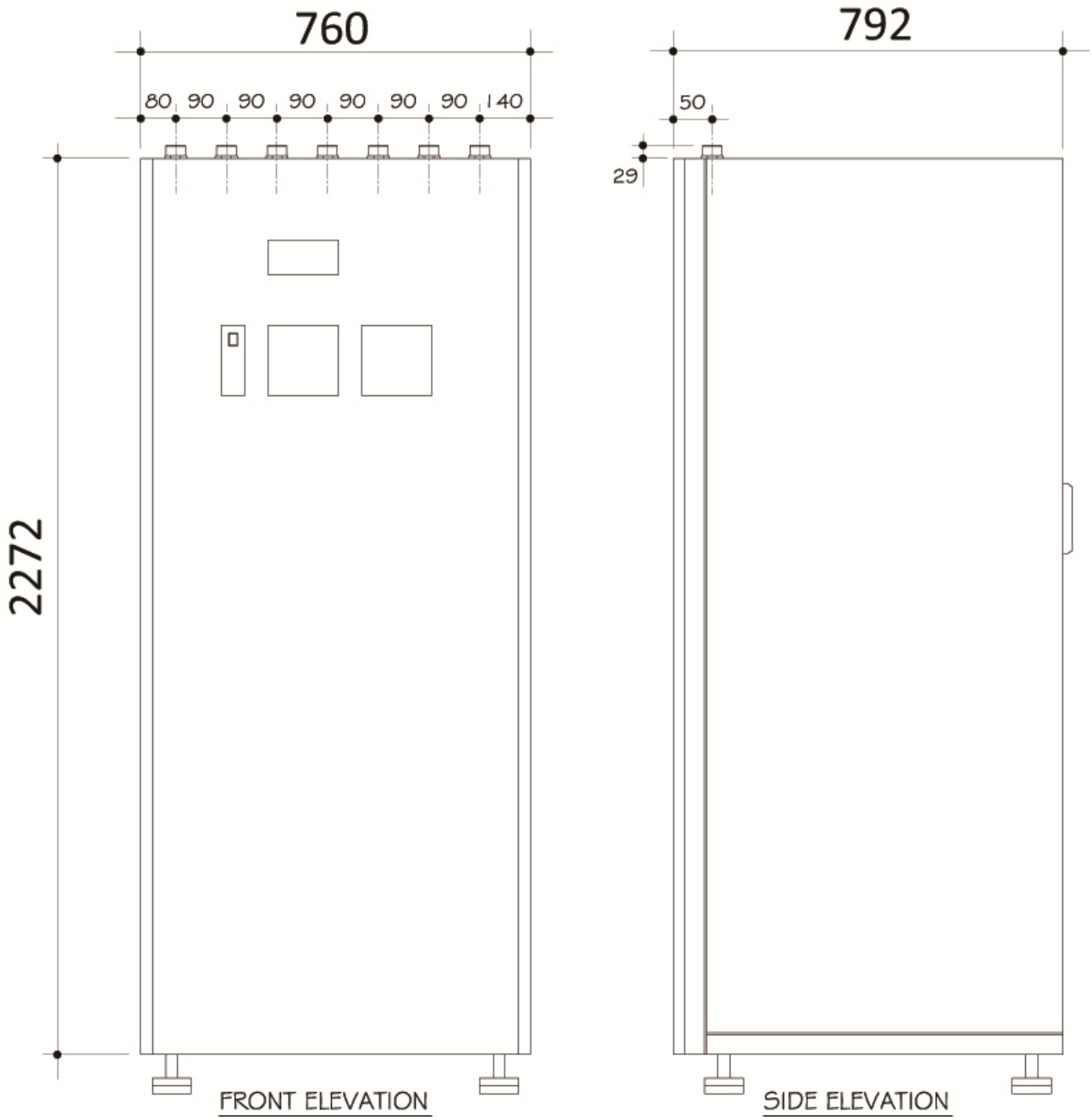
3.5 Pressure gauge and relief valve (Safety Kit) (CA-100 855)

Installation of pressure gauge and relief valve is supplied loose. This kit is to be installed on the secondary heating circuit.

3.6 ModuSat 300 dimensions



3.7 ModuSat 400 dimensions



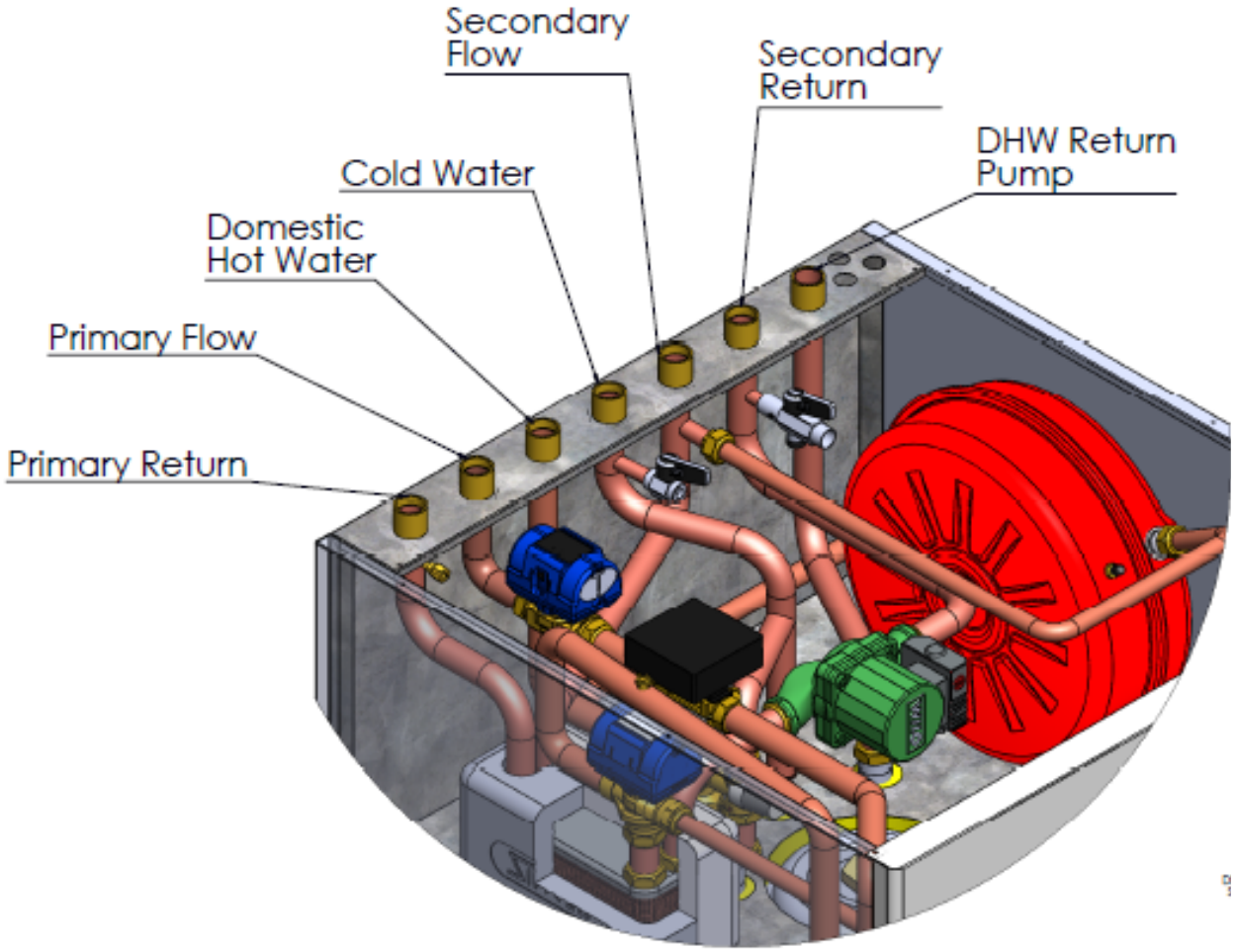
3.8 Hydraulic connections

The ModuSat is designed to be floor mounted with the hydraulic connections on the upper part. In order to ease the installation and maintenance of the unit, it is recommended to follow the instructions about minimum spacing.
The primary circuit must be equipped with :

- Al the devices indicated in the current norms
- One or more pumps suitable to handle the pressure drops on the primary circuit, in order to guarantee the proper operation of all modules.
- The circuit must be filled with clean water. Refer to EVINOX technical office for approved additional products.

The apartment circuit must guarantee the sufficient and correct flow of fluid into the module.

The safety valve drain pipe must be connected to a tundish that allows a visual check in order to prevent, in case of activation, damage to people, animals and objects that cannot be attributed to the manufacturer or to the supplier.



3.9 Pre installation rig

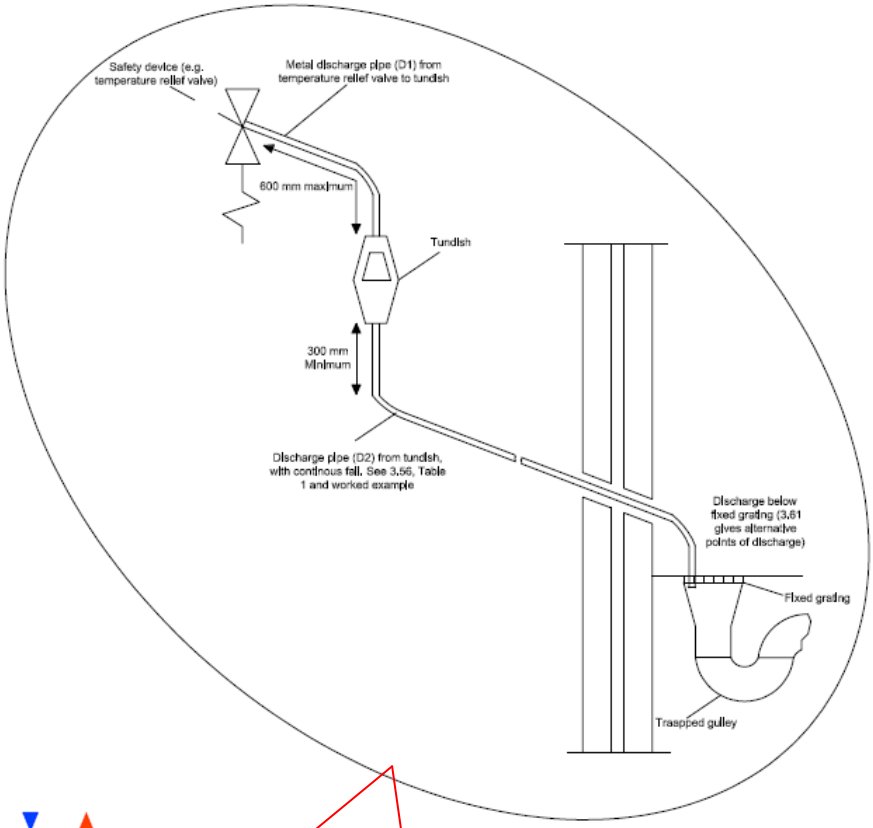
A pre installation rig is available on request. It consists of a frame constructed in steel with the upper and lower connections to arrange the piping entering and leaving the unit.

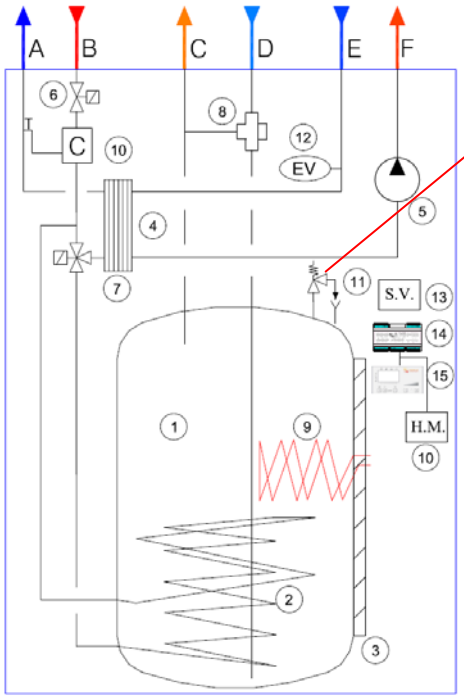
3.10 Position of the tundish

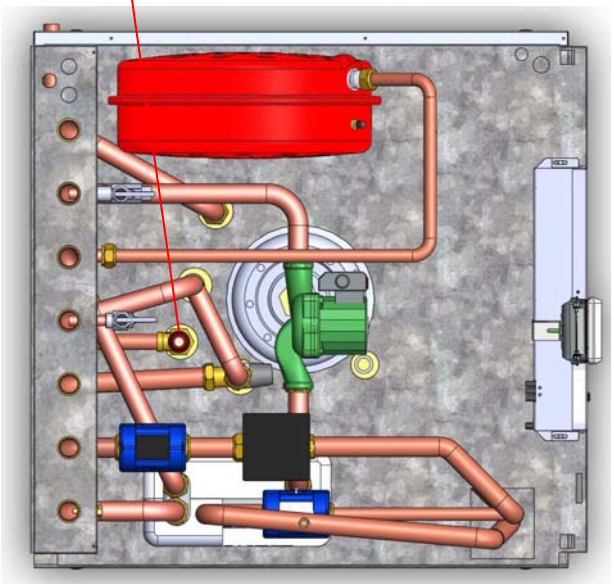
The opening temperature of the P & T valve is 90°C.

The position of the tundish shall be visible to the occupants and shall be positioned away from any electrical devices. Refer to the drawing on this page for tundish position, discharge pipe and connection details. The relief valve connections should not be altered or used for any other type of connection.

The incoming cold water supply pipe must be fitted with a stopcock before the cold water unvented kit. A drain cock must be fitted between the unvented kit and the tank.







3.10.1 Worked example

The example below is for a G 1/2 temperature relief valve with a discharge pipe (D2) having 4 no. elbows and length of 7m from the tundish to the point of discharge.

From Table 1

- Maximum resistance allowed for a straight length of 22mm copper discharge pipe (D2) from a G 1/2 temperature relief valve is 9.0m
- Subtract the resistance for 4 no. 22mm elbows at 0.8m each = 3.2m
- Therefore, the maximum permitted length equates to 5.8m
- 5.8m is less than the actual length of 7m, therefore calculate the next largest size
- Maximum resistance allowed for a straight length of 28mm pipe (D2) from a G1/2 temperature relief valve equates to 18m.
- Subtract the resistance for 4 no.28mm elbows at 1.0m each = 4m
- Therefore the maximum permitted length equates to 14m
- As the actual length is 7m, a 28mm (D2) copper pipe will be satisfactory.

Table 1
Sizing of copper discharge pipe D2 for common temperature relief valve outlet sizes

Valve outlet size	Minimum size of discharge pipe D1	Minimum size of discharge pipe D2 from tundish	Maximum resistance allowed expressed as a straight pipe (i.e. no elbows or bends)	Resistance created by each elbow or bend
G 1/2	15mm	22mm 28mm 35mm	Up to 9m Up to 18m Up to 27m	0.8m 1.0m 1.4m
G 3/4	22mm	28mm 35mm 42mm	Up to 9m Up to 18m Up to 27m	1.0m 1.4m 1.7m

4 CIRCUIT FILLING WATER

Being the primary a closed circuit, it isn't connected to the fresh water supply. Therefore the circuit must be checked for leakage that can compromise the integrity and correct operation of the unit.

4.1 Water treatment

Parameter	Recommended
Hardness (TH)	About 10 °F
Clorides	Up to 100 mg/l
PH	7 to 8,5
Resistivity	Higher than 2000 Ohm/cm
Salinity	Up to 50 mg/l
Conductivity	200 crs
TDS	0-200 ppm
Iron	Up to 1 mg/l
Free copper	Up to 1 mg/l

It's important to prevent corrosion and oxidisation so that all parts work in the best conditions, thus it's necessary to check the quality of the water circulating in the circuit. A non correct water quality increase the chance of scale build up in the wormer parts as well as corrosion due to the presence of dissolved oxygen.
It is therefore necessary to apply suitable water treatment using approved chemicals.
pH – this measures the alkalinity of the water, neutral alkalinity is pH7. Heating systems require an alkaline pH.
TDS – this measures the dissolved solids in the system and is a measure of the cleanliness of the water. Recommended levels 0-200 ppm.
Conductivity – this is the measure of the ability of water to pass an electrical current and is affected by the presence of dissolved solids. Recommended levels 200 crs.
Free copper – this measures the level of copper in the system in mg/litre. Recommended levels are under 1 mg/l .
Total iron – this measures iron concentration in mg/litre. Recommended levels are under 1 mg/l.

4.2 Water characteristics

In order to guarantee the optimal performance of the unit check that the water parameters fit the values in the table above:
SCALE BUILD UP AND CORROSION Topping up the circuit with non treated fresh water can produce :

- Dissolved oxygen (cause corrosion): install a relief valve, in a higher position, after each heat generator or on the main fold.
- Carbonates : (produce scale build up): the water top ups must be reduced to the minimum. It is also necessary to install a flow meter and disable the automatic filling system.

N.B: Scale and other residues may clog the heat meter causing errors in the energy consumption calculation.

WATER TREATMENT IS MANDATORY IN THE FOLLOWING CASES:

- Circuits with large capacity that produce large amounts of dissolved oxygen.
- Frequent top ups due to leaks, repair and maintenance.
- Use of water with non suitable characteristics (check the table)

4.3 Precautions

The correct operation of a unit, as well as the whole heating system, depends on the water quality. Often water treatment is considered an unnecessary cost, not considering the amount of damage that can result from this choice.

The warranty of the ModuSat is strictly related to the absolute respect of the instructions and procedures indicated in this manual as well as the
The warranty doesn't cover damage caused by scale and corrosion due to unsuitable water treatment.

Check also that the parts and materials use to build the system don't produce dissolved oxygen that cause corrosion:

- make sure there is no depression pockets in the system
- remove gas permeable parts and materials
- make sure the expansion vessels are properly sized and the pre-charge pressure value in order to guarantee positive pressure values, with respect to the ambient pressure, throughout the circuits.
- use suitable chemicals (BIONIBAL- BIONIBAGEL) compatible with the materials used and that can **PREVENT CORROSION**.

During a unit installation or circuit service it's important to consider a few points about the supply water used, in order to guarantee the optimal system performance, energy saving and trouble prevention.

For this reason it's necessary to adopt some precautions in order to guarantee that the wet surfaces and the heat exchanging paths of the unit remain clean thus preventing the build up of scale, limes and other residues non compatible with the water used in the circuits. The company in charge of the installation must therefore use the appropriate solution to achieve the results expected, in compliance with the technical specifications.

Our technical personnel, who will visit when the installation is fully completed to arrange for its final commissioning and calibration, do not perform the role of quality control or inspector of the installation or provide approval for the works carried out. The systems compliance with current standards and legislation and accordance with the consultant's requirements remains the exclusive responsibility of the installation company.

4.4 Corrosion prevention

BIONIBAL corrosion inhibitor for hot and cold water circuits resulting from a specific research work and is ideal to protect you heating system circuits in four ways :

- **FIRST LEVEL** corrosion inhibition and block of rust build up.
- **SECOND LEVEL** acidic component that stops bacteria and algae growth, particularly useful in under floor heating working at low temperature.
- **THIRD LEVEL** prevents the aggregation of suspended particles such as tartar, keeping the surfaces clean (pumps, valves, heat meters, etc.).
- **FOURTH LEVEL** enables its traceability to monitor the dosage so to guarantee the best protection level.

Electrolytic corrosion prevention, in a circuit employing different metals.
IT IS ADVISABLE to **ADD** the corrosion inhibitor **BIONIBAL** before the system is put in function (except when different directives are given for boiler protection).

4.5 Bionibal dosage and use

NEW INSTALLATIONS:

Fill the circuit with water to check for leakage. Empty the circuit in order to discard all sorts of residuals that could cause problems (if necessary clean it with appropriate products and make sure that the circuit is well rinsed at the end).

Once the circuit is well cleaned, fill it with water again and add **BIONIBAL** according to the dosage indicated.

EXISTING INSTALLATIONS:

Because **BIONIBAL** doesn't dissolve existing limes and other residuals accumulated over the years, proceed with empting the circuit and perform a thorough cleaning process of it. Use accredited companies for this work.

Once the circuit is well cleaned, fill it with water again and add **BIONIBAL** according to the dosage indicated below :

To guarantee the ModuSat, Evinox insists that only its own heating system water conditioning products are used :

- BIONIBAL corrosion inhibitor
- BIONIBAGEL antifreeze and corrosion inhibitor.

IMPORTANT WARNING

Bionibal or Bionibagel must only be put in a clean installation that has been checked. It is therefore imperative to fill the entire system one or more times with clean water as required. In some cases, the system may need washing by a suitable product:

SUGGESTED DOSE

- Without under-floor heating: or connection using reinforced polyethylene type pipes:1% (0.5 l of BIONIBAL for 50 l of water).
- With under-floor heating or radiators connected in reinforced polyethylene type pipes:2% (1 l of BIONIBAL for 50 l of water).

Over dosage doesn't cause damage to the circuits.

Restore the correct concentration every time the circuit is emptied.

4.6 Freeze prevention

In case it is necessary to guarantee frost as well as corrosion prevention, **IT IS ADVISABLE** to use **BIONIBAGEL,** being this compatible with BIONIBAL (except when different directives are given for boiler protection)
BIONIBAGEL has specifically been developed to be used in circuits treated with BIONIBAL or as a multi-function fluid for new installations.
The following table indicate the percentage of additive to use according to the protection temperature chosen.

Protection temperature	Circuit capacity			
	50	100	150	200
- 5 °C	7	15	22	30
- 10 °C	12	25	37	50
- 15 °C	17	35	50	70
- 20 °C	20	40	60	80
- 30 °C	22	45	67	90

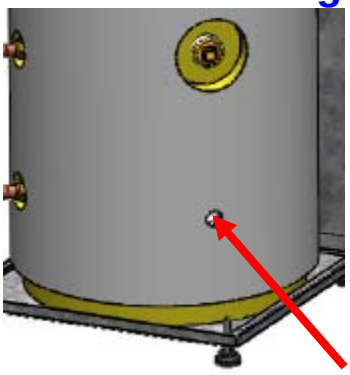
4.7 Unit filling

The DHW storage tank must be filled and pressurised before applying pressure to the primary circuit. In order to guarantee the safety and correct functioning of the unit, the start up must be carried out by qualified technical personnel.

To fill the DHW tank proceed as follows:

- open the heating circuit ball valves in the unit
- release the air contained by opening the relief valve

4.8 Unit draining



The cylinder draining is placed on the bottom part of the tank.
Procedure:

- Switch off and isolate all mains electricity supply to the system
- Close mains supply cock
- Drain down hot water system including the tank (use drain cock)
- Check pressure in expansion vessel(s) and recharge if necessary

5 ELECTRIC CONNECTIONS

MODUSAT requires a 230/240V mains connection.

Before attempting and installation, repair or maintenance work remove the electric supply line, possibly with an external switch.
Follow the instructions below to connect the electric power supply to the unit:
cover pipes and cables in order not to damage them

- use cables of suitable size for electric connections
- ask a qualified technician to check the electric wiring because the manufacturer/supplier is not responsible for possible damage due to missing earth connection or any other anomalies.
- check also that the supply line is adequate for the maximum electric power needed and indicated on the label. Make also sure that the cable size is correct and in any case not less than 1.5 mm²

An efficient earth connection is indispensable to guarantee the safety against electric shocks.
The unit is supplied with a 3 pole cable to be connected to 230/240Vac – 50Hz supply.
Make sure to identify the earth wire and connect it to the relevant earth point.
Important! The connection to the electric power supply line must be fixed (no plugs), a fused switch (6A – 3mm gap min) must also be used to break the supply.
In case it's required to change the supply cable, refer to qualified personnel.
Extension cords, multiple plugs, and other adapters are not allowed.

It is ABSOLUTELY FORBIDDEN to use the pipings for electric earth connections. ModuSat has no protection against lightings or other overvoltage shocks. The unit is not protected from lightning.

5.1 Auxiliary connections

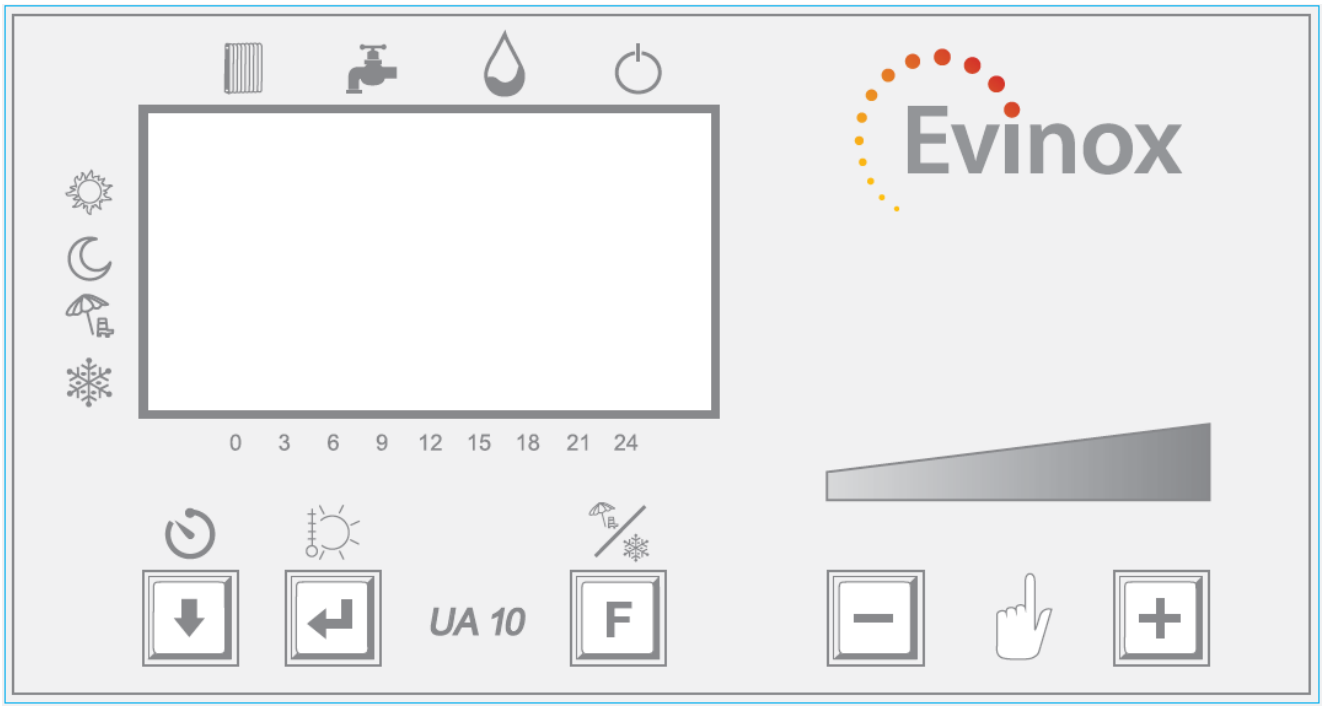
Don't connect the mains power supply to the Room Unit, it would destroy it!

- Use the relevant 4 pole connector and a suitable 4 wire shielded cable (4x0,35 mm^2) for this connection and follow the procedure indicated below
- Remove the electric supply to the unit using the external switch
- Remove front panel
- Remove then the screw blocking the electric box and swivel it

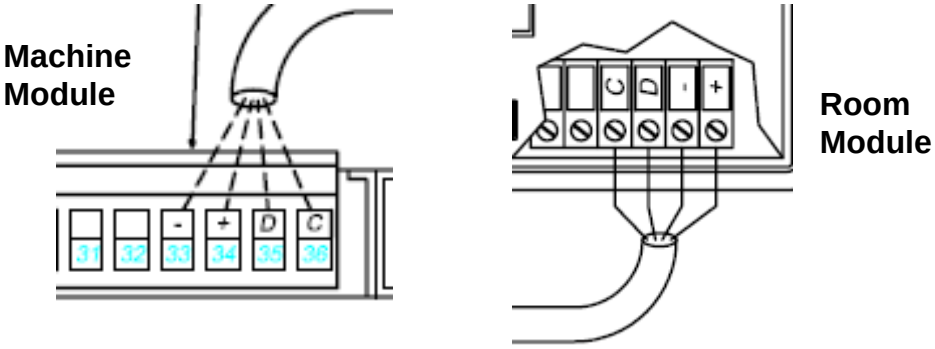
Now you can access the high and low voltage connectors.

5.2 Room Module connection

The Room Module is a white ABS box with graphic display. It must be installed in the apartment in such a way to read the average room temperature. It has to be connected to the ModuSat (please refer to the electrical diagram) by means a 4x0.35 mm2 screened cable. The cable must not be installed adjacent to other 230 Volt lines. The ModuSat room controller's power is supplied by the ModuSat board and does not require batteries.

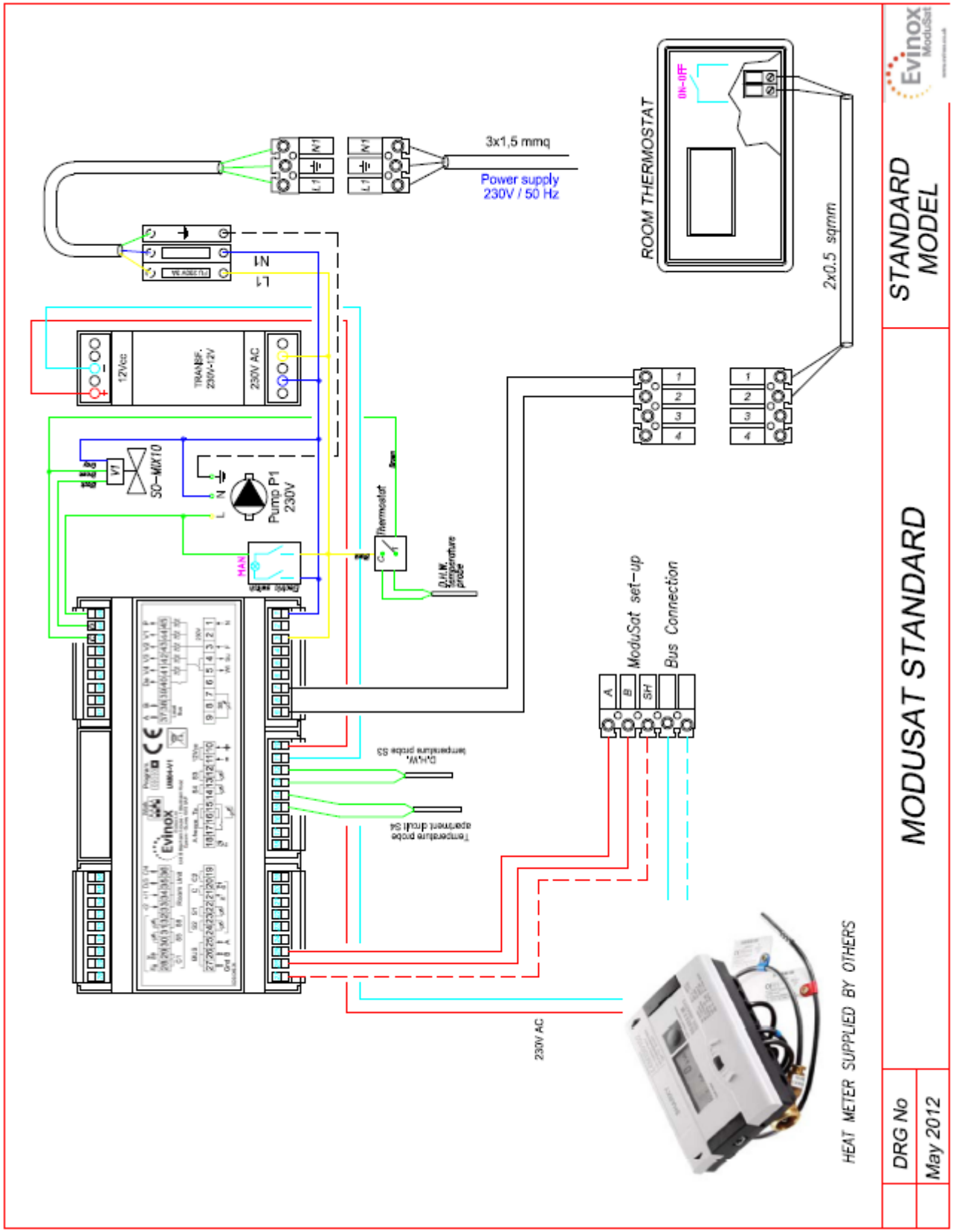


For the room module wiring please refer to the folling instructions.

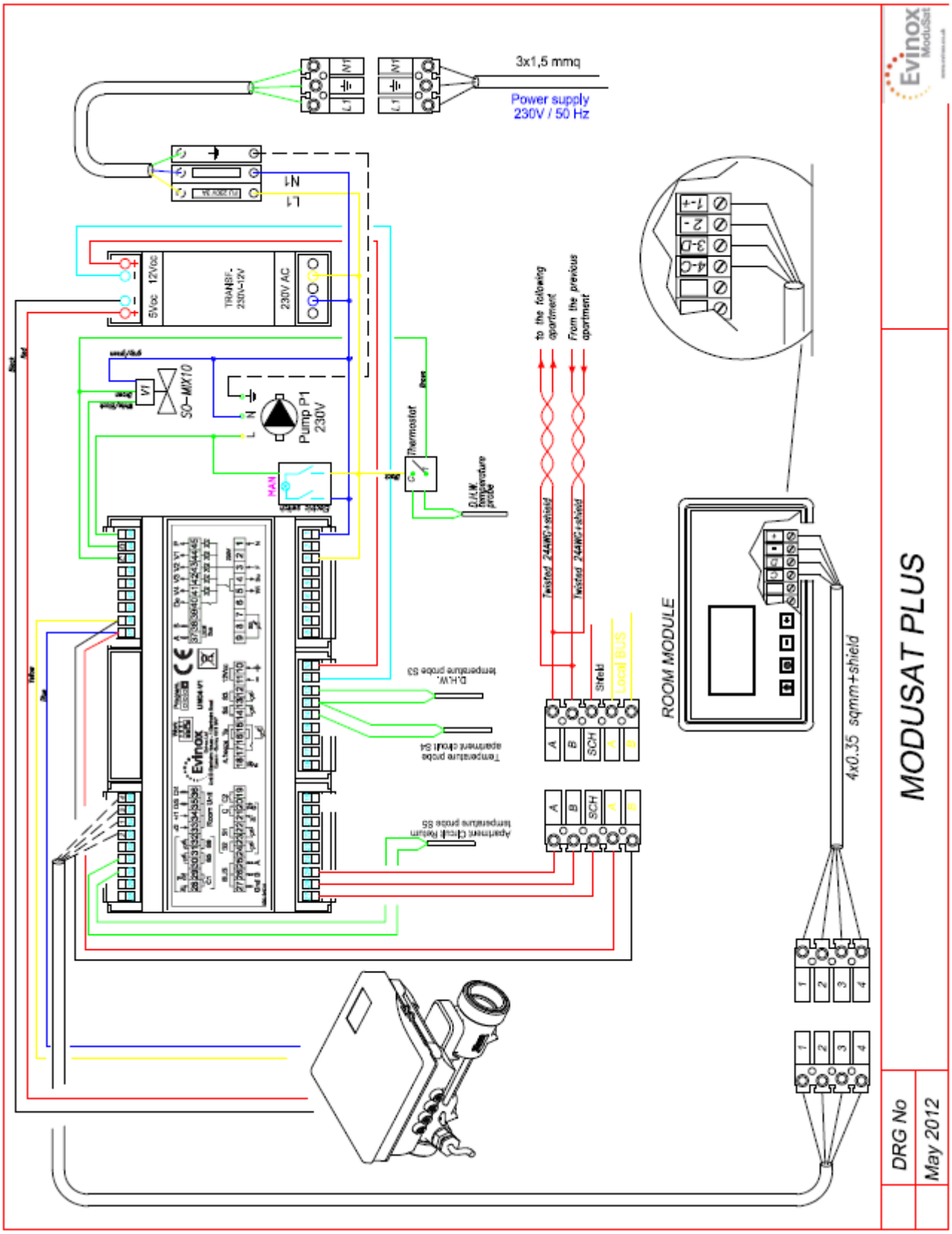


Dimensions: H= 86 mm
L= 150 mm
D= 34 mm

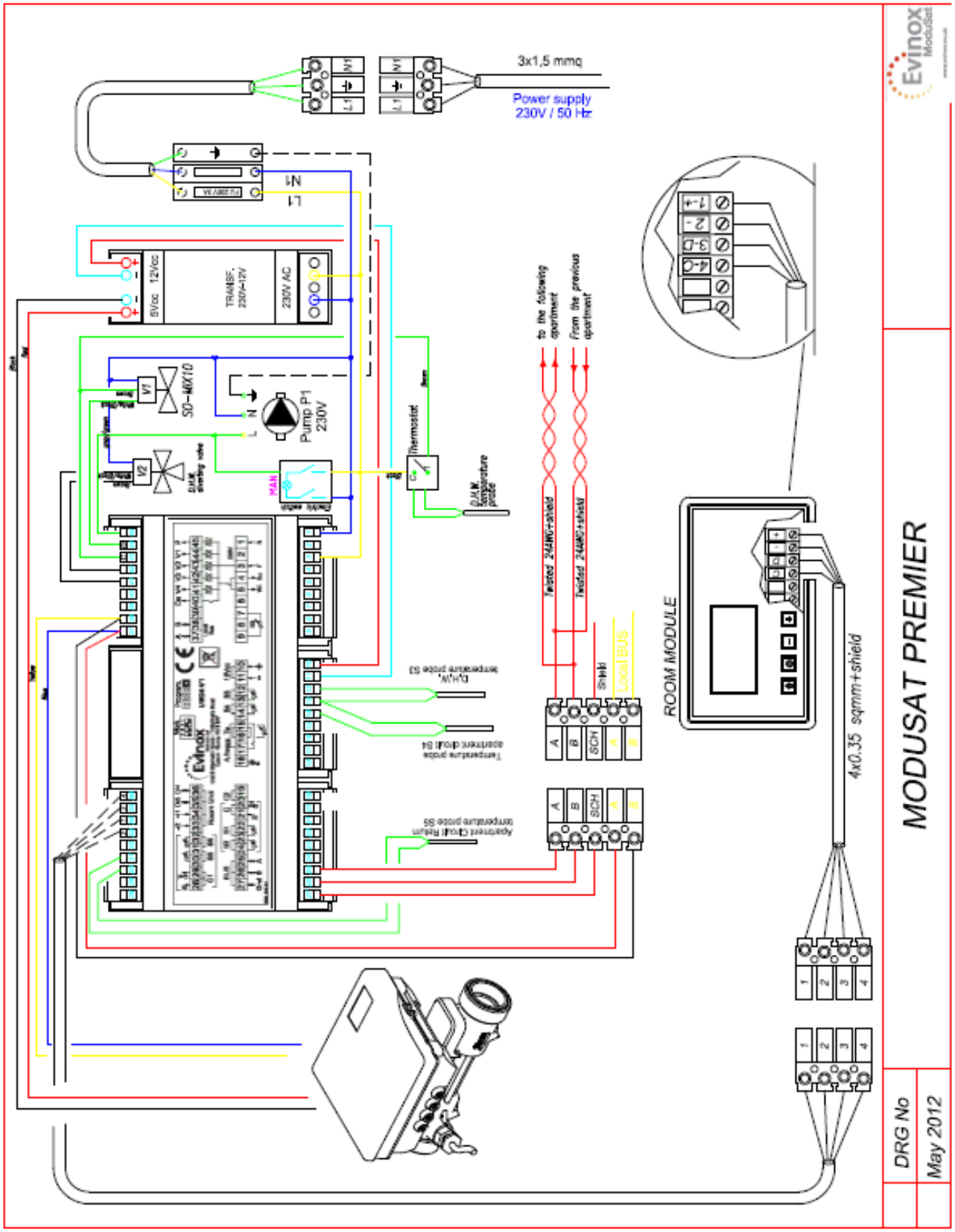
5.3 Electric diagram ModuSat Standard



5.4 Electric diagram ModuSat Premier



5.5 Electric diagram ModuSat Premier



6 COMMISSIONING

Before starting to use the unit:

- check that the tank, primary and secondary circuits are full or relevant fluids
- check that the air has been removed from the circuits and that the relief valve is properly closed
- check that the pipes connected to the DHW circuit are connected properly
- check all pipe connections for tightness
- close drain cock
- check pressure(s) in expansion vessel and recharge if necessary
- chock open P & T valve on top of tank (by fitting manual lever)
- open stopcock and fill tank with water until if freely discharges through the outlet from the P & T valve
- remove chock and close P & T valve.
- test delivery of water from tank by opening and running all taps, both hot and cold water and any other water discharges points (showers etc)
- check operation of expansion relief valve on Cold Water Supply kit by lifting manual release lever and discharging water
- make sure that the electric wiring is made according to diagrams and instructions
- check that there is no leakage
- check that the voltage and frequency of the supply line is correct (see the unit label) and that the earth connection is efficient
- check the connection of other components, when present (thermostats, probes, etc.)
- check that the pump runs properly, in case it's blocked remove the plastic cover and use a screw driver on the shaft to unlock it
- if the pressure is less than 1 bar, add some water to the circuit
- make sure all manual valves are in the open position

If any of the above listed checks fail, the unit MUST NOT BE OPERATED.

Only after having checked that all the checks gave a positive result the unit can be put in function. According to the installation type, identify the operations to use to start the unit, then:

- apply electric power to the unit using the external switch
- check that the Room Unit display powers on
- check that the regulation components work properly
- check that the storage tank temperature raises
- check the correct operation of the safety thermostat (when present)

Note: Our technical personnel, who will visit when the ModuSat has been installed to arrange for its final commissioning and calibration, do not perform the role of inspector and/or approval officer for the system. Its compliance with standards and instructions remains the exclusive responsibility of the installation company.

The ModuSat may have been transported and handled many times if you consider the on-site storage, handling and installation, therefore it is vitally important that all unions and connections are checked and tightened as required.

NOTE: Check flow and return connections are correct before any water flows through the ModuSat to prevent damage to the heat meter.

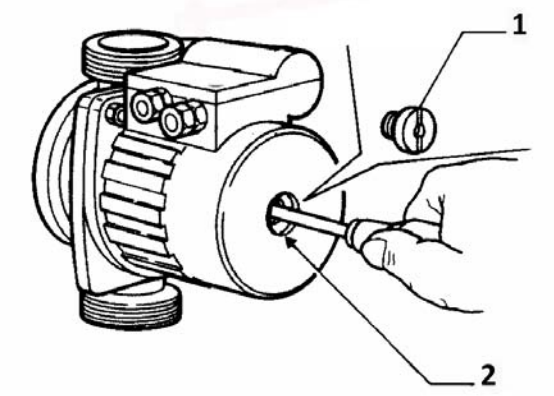
Hydraulic Connections
Each input / output of the ModuSat must be isolated to allow for maintenance. Operating pressure must remain within the values indicated in the technical data. Close the isolation immediately and cut electricity if there is leakage inside the module.

Electrical Connections
The electrical power supply must be connected after having checked that the electrical connections are correct and the hydraulic connections are sealed.

Heat Meter
Check the values read by the meter (see room module instructions). Above all verify the input and output temperature, the instantaneous flow rate and the total measured energy. Note the total measured energy at the moment it starts. Check that the meter does not present errors.

Pump Release
Before powering the ModuSat, check that the pump rotor is not jammed (this can occur after a period of inactivity).
Act as follows to release it:

Isolate the electricity to the pump before draining it.



1. Remove the cap, making sure that the water coming out does not cause any damage.

2. Introduce a screwdriver in the shaft trace and turn it both ways to unblock it. Screw the cap back on and check the correct position of the gasket. Whenever the heating is turned on or after a long period of inactivity ensure that the pump starts freely.

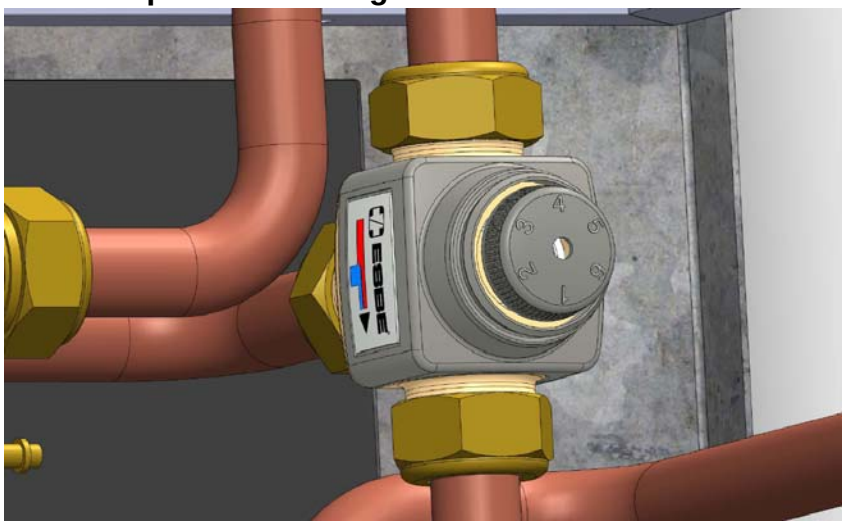
It is normal that a small amount of water may leak out during this operation.

Volumetric Meters
Note the measured values at the moment it starts. Check that actual reading increase on the board and/or ModuSat room controller display.

Expansion Vessel
Check the water heater expansion vessel charge.

Temperature Setting
Set the DHW storage temperature (from the board or ModuSat room controller). Set the heating delivery temperature (from the board or ModuSat room controller). If there is climatic operation, set the curve and temperature limit i.e. UFH.

DHW temperature setting



A thermostatic blending valve automatically controls the DHW delivery temperature. To set the valve remove the plastic cover and adjust the gear to regulate the desired DHW temperature.

DHW Production

Check the actual hot water output at the set temperature (if this is possible depending on the requested flow rate and the primary temperature).

Heating Delivery

Activate heating with the relevant room unit (thermostat or ModuSat room controller) and ensure that the pump starts. Delivery temperature must remain at the set value (as long as the primary is up to temperature).

6.1 Warranty

The warranty has value if good practice has been strictly observed for installation and use. Evinox is not liable for equipment breakdown and damage to persons and objects caused by:

- Transportation
- Installation in which the Standards in force and good practice were not complied with
- Improper use of the device, abnormal use conditions, tampering by unauthorised personnel or inadequate maintenance; therefore by: Corrosion and/or sludge accumulation; lack of electrical energy; absence of suitable drainage; exceeding operating pressures; electrical and water system anomalies
- Freezing or fortuitous causes
- Wear due to normal use
- Malfunctioning of control and safety parts
- Corrosion due to oxygenation or roaming currents

From commissioning, ModuSat appliances are guaranteed against all manufacturing faults and material defects for a period of:

- 5 years for the stainless steel tank and its integrated exchange
- 2 years for parts and labour * (Where Evinox do not carry out the commissioning or have a developer agreement in place the two year warranty will cover parts with no labour cover)

However, the ModuSat warranty will always start from the date of the serial number and will be extended by a maximum of 6 months to allow for project completion. If the ModuSat is commissioned before the 6 month extensions the warranty will start from the commissioning date.

This guarantee is strictly limited to the supply, free of charge, of parts acknowledged as being defective after inspection by our technical departments, with the exclusion of labour and transport costs arising from this. These parts once again become the property of Evinox and must be returned to them without delay.
Failure to comply with the relevant installation requirements of the Building Regulations, Local Water Byelaws and Building Standards will invalidate any warranty claim.

The ModuSat must be fitted with an isolation valve for servicing and warranty work. Warranty calls that include draining the system will be chargeable if isolation valves have not been fitted.
It is imperative that the level of corrosion protector within the system is kept within industry guidelines at all times. Special attention should be given to ensure that, after any decoration or building works where radiators might be removed, the system is replenished with chemicals. Non-use of inhibitor will invalidate the warranty.
We will register the warranty when we commission the boiler and ModuSat units.
Any warranty claims that are a result of user error, poor installation or lack of servicing will be chargeable. Please note that all replacement parts provided under warranty are subject to factory inspection to determine cause of failure. Replacement parts are chargeable until passed as faulty by Evinox, when a credit will be provided. Any parts that have failed as a result of poor servicing or misuse will not be covered by our warranty.
Any modifications to the appliance will invalidate the warranty.
Your Evinox appliance is one of the most reliable and technically advanced products available. However, it is imperative that it is installed correctly, commissioned and serviced in accordance with Evinox installation and servicing manuals to ensure long life, reliability and fuel savings.

Exclusion of the Guarantee
The following are not covered by the guarantee:
a) Electric indicators

- Electric degradation of parts resulting from connection and installation on electricity supply whose voltage measured at the entry of the apparatus would be lower by 15 % or higher of 10 % than the nominal voltage of 230 volts
- Degradation of parts coming from external elements with apparatus (effect of storm, moisture, freezing, etc)
- Seals
- Automatic air vents
- All consecutive incidents resulting from a lack to check the safety components (unvented kit etc)
- Scaling, nor its consequences
- Corrosions due to chloride concentrations in domestic hot water higher than 60 mg/l
- The wear of the P and T valve

b) Postage costs of the parts, labour and displacement
Note: in a constant preoccupation with an improvement of our materials, any modification considered to be useful by our engineering departments and commercial can intervene without notice.
* See full terms and conditions of warranty

7 USE

Ensure the instructions below are followed to guarantee the correct operation.

Before starting any maintenance operation remove the electric supply using the switch outside the unit. Then close the manual valves of the circuits object of the maintenance.

Empty the parts that contain hot water before proceeding; this must be done using the circuits connected to them.

The adjustment of the thermostatic/mixing valve cannot be altered by the end user; only qualified personnel can do this operation.

Check periodically that no air is present in the circuit and eventually remove it.

Check the correct operation of control and safety devices at least once a year.

Before discharging hot water, make sure that the discharge pipe is connected to the drain in order to avoid burning people or damaging objects.

All discharge pipes must allow air to flow through them.

If the safety group leaks occasionally, it could be due to materials expansion or valve clog.

Follow the instruction for pump maintenance.

Check the correct operation of valves, taps and electric accessories used.

At every maintenance operation clean the “Y” filter when present.
A clogged filter would affect the correct operation and eventually cause the unit to stop working altogether.

Before starting any maintenance work on the unit remove the electric supply using the switch outside the unit. This is because the unit is permanently supplied, even when the external thermostat is off.

7.1 Automatic/Manual operation

On the front panel the ModuSat is provided with a red button to set the working mode of the unit:

- Automatic: according to room unit setting;
- Manual: in manual mode the ModuSat electric devices are directly supplied thus allowing heating and DHW production without any automatic regulation;

The manual working mode is to be set in case of regulation system failure.

7.2 Maintenance

Warning: before commencing any maintenance work, switch off and isolate all mains electricity supply to the system

It is recommended to carry out the following controls on the appliance at least **once a year**:

- The control and safety devices (sensors, thermostats, etc.) must work correctly
- The system must be watertight
- DHW flow must be regular

Procedure:

- Close mains supply cock
- Drain down hot water system including the tank (Use drain cock and/or the expansion relief valve)
- Check pressure in expansion vessel(s) and recharge if necessary.
- Remove filter in line strainer; Clean or replace; Reassemble; Refill system
- Check all pipework for leaks
- Open P & T valve and check that it discharges water
- Check operation of all controls

Every two years, the following additional maintenance should also be carried out after draining down:

- Inspect interior of tank and clean out any debris
- Re-assemble using a new gasket on the flange and tighten bolts
- Refill system and check for leaks around flange
- Carry out annual inspection as above

The system should not be emptied frequently except for modifications or repairs. In zones subject to freezing, the system must be emptied if it remains inactive.

The system should not be emptied frequently except for modifications or repairs. In zones subject to freezing, the system must be emptied if it remains inactive.

The operation can be avoided only by adding appropriate antifreeze. N.B.: In zones where water is particularly hard, it is recommended to install a water softener or de-scaling device on the cold water input in order to prevent lime scale from forming quickly.

Repair work must be carried out using original spare parts only and must be done by qualified personnel only. The non observance of this directive may compromise the unit operation and performance. This will decline any responsibility from the manufacturer and supplier.

As the Modusat has no internal combustion, it requires a limited amount of maintenance. There is no need for regular maintenance other than the annual inspection. **Only the filter, when installed outside, needs to be cleaned at commissioning and when a flow reduction is reported**. A flow reduction reduces the Modusat performance, although there is no increase in the energy consumption.

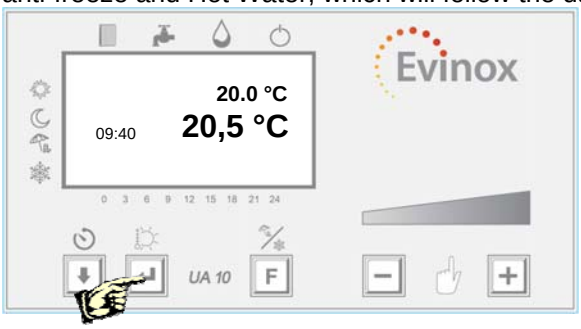
An opening on the top of the storage tank allows, after having emptied it, to inspect the tank itself as well as the sacrificial anode conditions.

Please follow these instructions:

- close the cold water inlet valve
- open hot eater tap in order to remove the pressure in the tank
- undo the anode head using an appropriate key
- check that its weight is more than 150g, in case replace it together with its gasket
- undo the metal cap of the drain valve
- connect a drain pipe to the valve and turn the ring nut counter clockwise
- open the top inspection device and clean inside
- close the top inspection device, turn the ring nut and screw the metal cap
- open the cold water inlet valve to restore working conditions

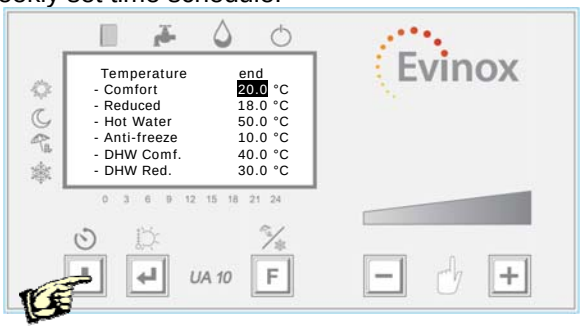
7.3 Room Unit

Parameter Setting This operation allows the user to set the temperature set point for comfort, reduced, anti-freeze and Hot Water, which will follow the daily or weekly set time schedule.



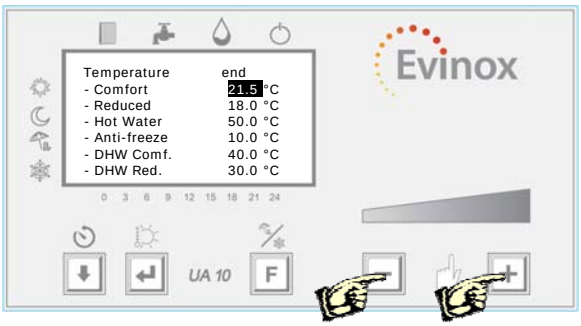
1

Press and hold down 'ENTER' for more than 3 sec



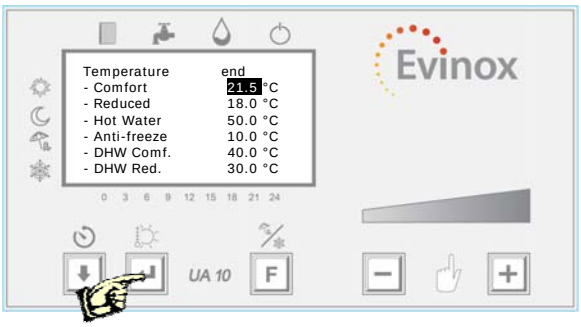
2

Use the 'Down Arrow' to select a parameter



3

Use the '-' or '+' buttons to decrease or increase the value

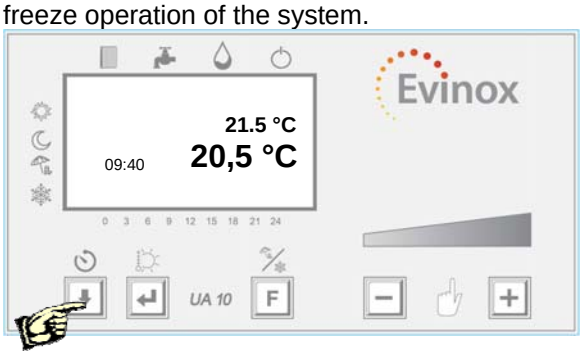


4

Scroll through using the 'Down arrow' until 'end' is highlighted and press 'ENTER' to exit the screen

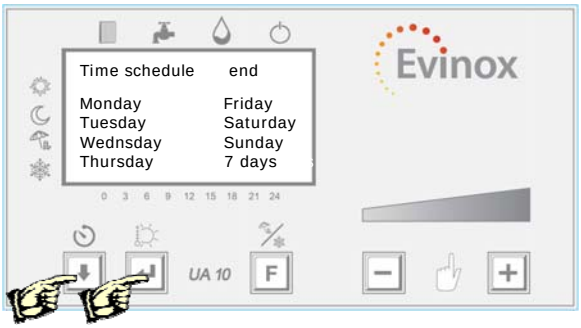
The temperature set point can be changed using the '+' or '-' buttons. The set temperature can be changed within +/- 3 °C.

Time Schedule Programming The time schedule can be set to control the comfort, reduced or anti-freeze operation of the system.



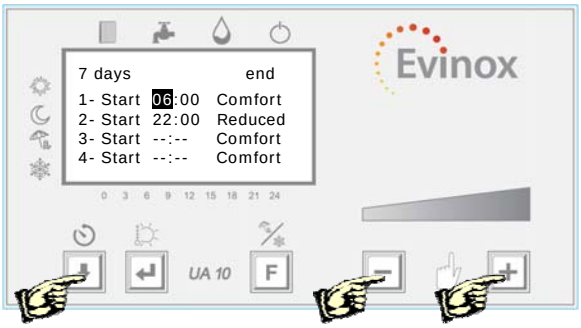
1

Press and hold the 'Down Arrow' button for more than 3 sec



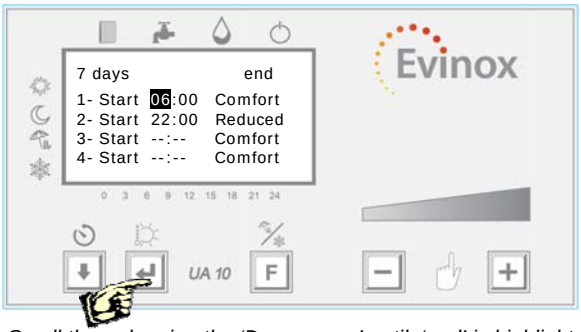
2

Use the 'Down Arrow' button to select a parameter and press 'ENTER'



3

Use the '-' or '+' buttons to change the value

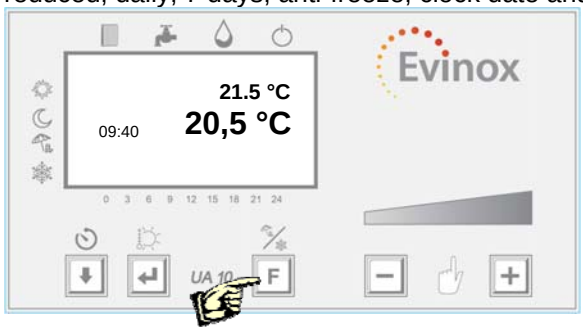


4

Scroll through using the 'Down arrow' until 'end' is highlighted and press 'ENTER' to exit the screen

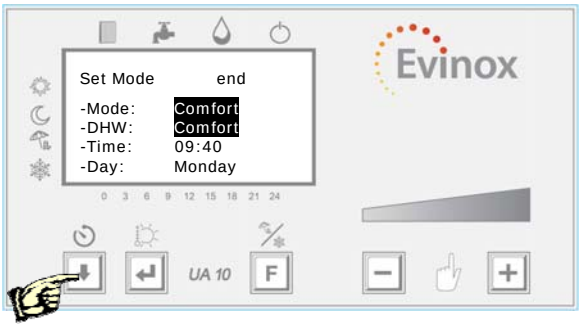
Operating Mode Selection

This operation allows the user to set the operating mode: comfort, reduced, daily, 7 days, anti-freeze, clock date and time.



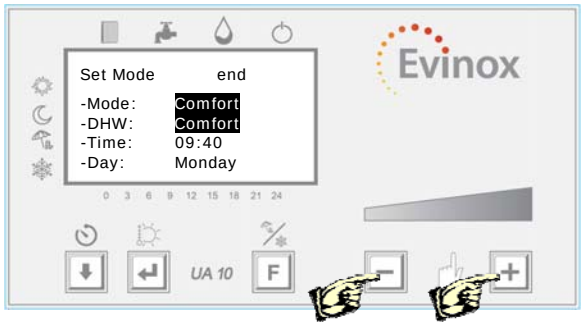
1

Press 'F"' to enter the menu



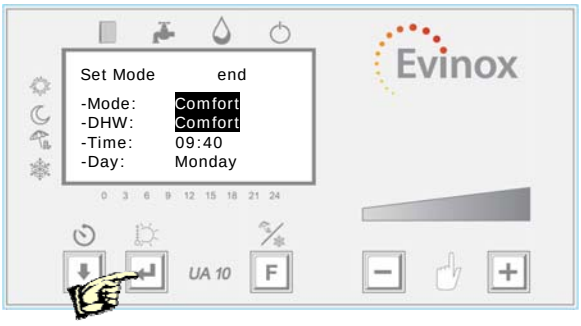
2

Use the 'Down Arrow' to scroll down and select a parameter



3

Use the '-' or '+' buttons to change the value

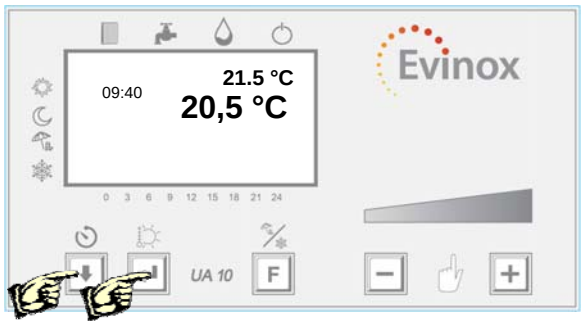


4

Scroll through using the 'Down arrow' until 'end' is highlighted and press 'ENTER' to exit the screen

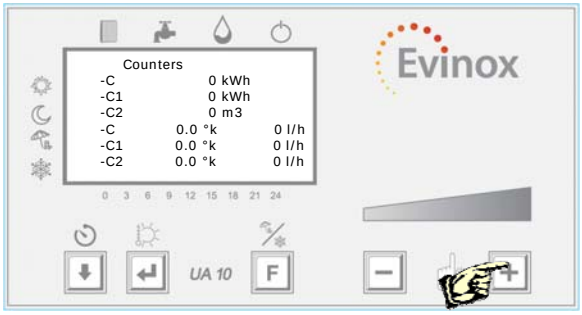
Reading Consumption Figures

The user can read the consumption figures for the unit, for example: C for heating, C1 cooling (when present) and C2 cold water (Only when a cold water meter is installed within the dwelling and connected to the Evinox system) The display also shows the temperature and flow rate related to the three counters.



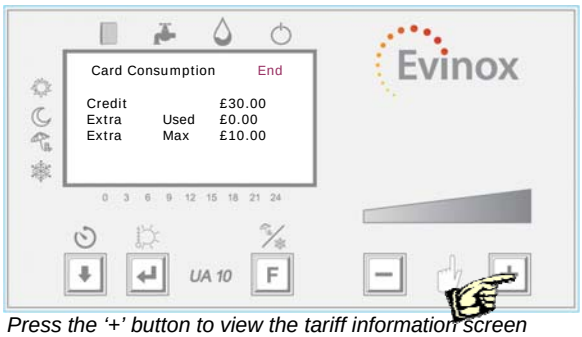
1

Press and hold 'ENTER' and the 'Down Arrow' button together for more than 3 sec



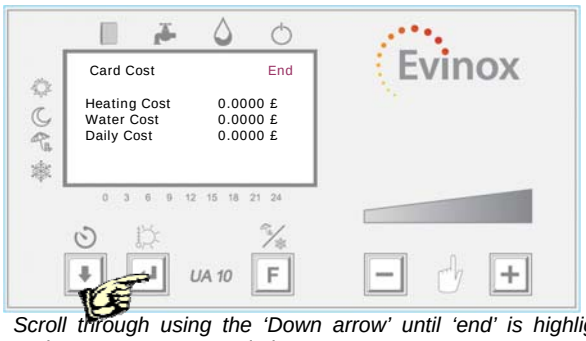
2

Press the '+' button to view the card consumption screen



3

Press the '+' button to view the tariff information screen
(Please note, if you exit this screen you must wait for 15 seconds before pressing the '+' button to get back in)



4

Scroll through using the 'Down arrow' until 'end' is highlighted and press 'ENTER' to exit the screen

8 UK APPROVAL

Certificate

kiwa
Partner for progress

UK APPROVAL
Certificate Number: 1204702

Date Issued: 24th April 2012
Date Expired: 24th April 2017

Description: 'ModuSat' Range of stainless steel, floor standing cased and insulated unvented hot water storage cylinders. Maximum working pressure on primary circuit is 3.0 bar. Maximum working pressure on secondary circuit is 6.0 bar.

Product Designation: ModuSat 75, ModuSat 150, ModuSat 300 And ModuSat 400.

This is to certify that the above range of products manufactured / supplied by

DAE SRL

1. Has been tested and found to comply with the requirements of the Water Supply (Water Fittings) Regulations 1999 for England and Wales, the Water Byelaws 2000, Scotland and the Water Regulations Northern Ireland.

2. The requirements of the UK Building Regulations:
The Building Regulations 2010 (England & Wales)
Requirements G3, L1 & Regulation 7.
The Building (Scotland) Regulations 2004.
Schedule 5, Regulation 9, Section 4.9 & 6.4
The Building Regulations (Northern Ireland) 2000.
RegulationB2, F4 & P5.

This certificate must be read in conjunction with the acceptance letter for this product.
This approval is intended for compliance with the above Regulations and must not be considered equivalent to the product certification provided by Kiwa N.V. To comply with the Regulations and Byelaws all products require the correct installation. Details of the installation requirements (IRN's) can be obtained from the acceptance letter supplied with this certificate.

Applicable IRN's for this certificate – R001, R140, R360

Authorised Signature
Kiwa Quality Services Ltd

Kiwa Watertec
(A Trading Division of Kiwa Ltd)
The Innovation Centre,
Festival Drive, Ebbw Vale,
Gwent, NP23 8XA
UNITED KINGDOM
Tel: 0044 (0) 1495 356795
Fax: 0044 (0) 1495 350020
Web: www.kiwa.co.uk

Certificate Issued to –
DAE SRL
Via Trieste 4/E
Santa Lucia di Piave (TV)
Italy

kiwa approved product
kiwa approved product

Evinox Ltd **T. +44 (0)1372 722277** **E. technical@evinox.co.uk** **W. www.evinox.co.uk**

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