ThermoBloc™ boiler protection recirculation and distribution unit

281 series

CALEFFI BIOMASS

ISO 9001 FM 21654 ISO 9001 No. 0003

CALEFFI

01224/13 NA

Replaces 01224/12 NA

Function

The ThermoBloc™ boiler protection recirculation and distribution unit is used in hydronic heating systems with non-condensing boilers, including solid fuel, biomass, gas LP or oil-fired. It can be installed with steel, cast iron and copper tube style boilers, automatically controlling the return water temperature, protection against corrosion from condensation occurring when a minimum flue gas temperature is not otherwise maintained. The ThermoBloc™ unit is compact for easy installation, reducing required space and fittings. It combines the functionality of a boiler protection valve with a circulation pump and a unique flapper check valve allowing for thermosyphon flow between the boiler and distribution system during a power outage. The ThermoBloc™ includes three temperature gauges and is encased in an insulation shell.

Product range

281 series ThermoBloc™ boiler protection recirculation and distribution unit .....connections 1" and 1-1/4" NPT male and sweat union

Technical specifications

Materials	- body:	brass
	- shutter:	PSU
	- spring:	stainless steel
	- flapper check valve:	PPS
	- seal:	EPDM
	- thermostatic sensor:	wax

Performance

Suitable fluids:	water, up to 50% glycol solutions
Max. working pressure:	150 psi (10 bar)
Working temperature range:	40–210°F (5–100°C)
Termperature gauge scale:	30–250°F (0–120°C)
Thermostatic sensor cartridge:	130°F (55°C) standard
Optional cartridges (consult factory):	115°F (45°C)
	140°F (60°C)
	160°F (70°C)
Sensor cartridge accuracy:	±4°F (±2°C)
By-pass closed temperature:	Tset +18°F (10°C)
Connections: - NPT male union	1" and 1-1/4"
- sweat union	1" and 1-1/4"

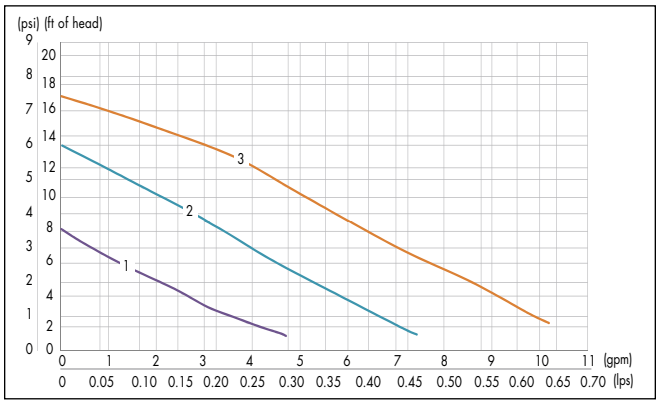
Insulation

Material:	EPP
Mean thickness:	30 mm
Density:	45 kg/m³
Working temperature range:	40–210°F (5–100°C)
Thermal conductivity:	0.037 W/(m·K) at 10°C
Reaction to fire (UL94):	class HBF

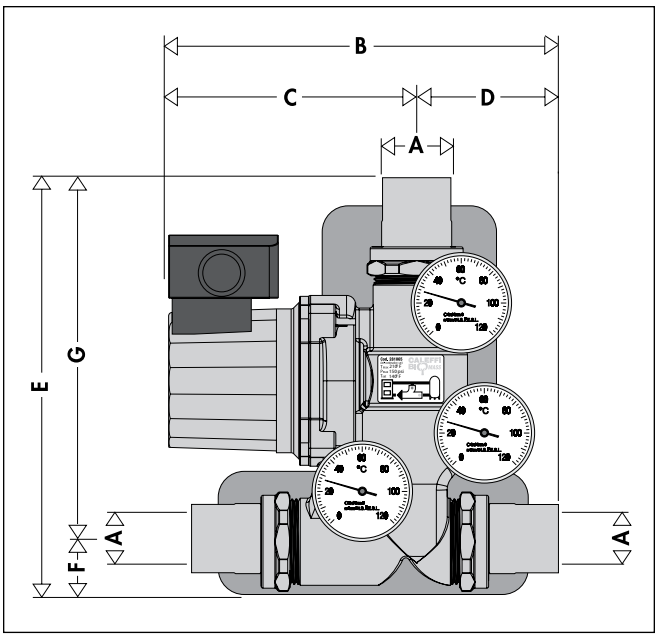
Pump

Three-speed pump:	Wilo Star S-16
Body:	cast iron
Power supply:	115 V–60 Hz
Max. pressure:	85 psi (6 bar)
Max. temperature:	203°F (95°C)
Agency approval:	cULus

Wilo Star S-16 hydraulic characteristics



Dimensions

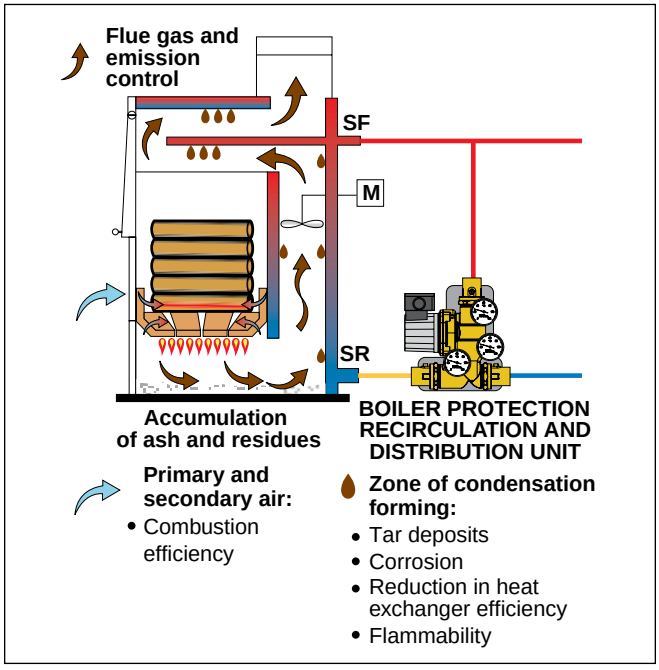


Code	A	B	C	D	E	F	G
281165A	1" NPT	8¾"	5⅝"	3"	9⅞"	1⅞"	8"
281965A	1" SWT	8¾"	5⅝"	3"	9⅞"	1⅞"	8"
281175A	1¼" NPT	8¾"	5⅝"	3"	9⅞"	1⅞"	8"
281975A	1¼" SWT	8¾"	5⅝"	3"	9⅞"	1⅞"	8"

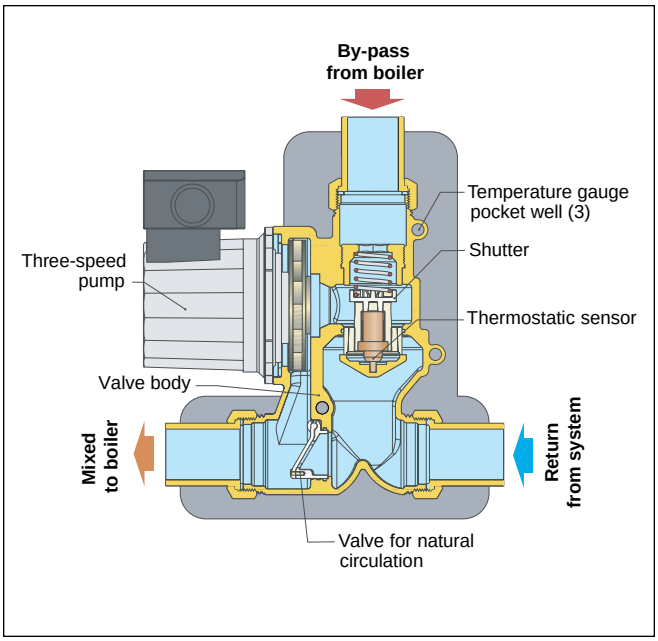
Wood biomass and condensation build-up

Wood contains a variable moisture content depending on the type (logs, pellets, woodchips, etc.). Water vapor is released during the solid fuel drying phase inside the combustion chamber. The presence of cold surfaces in the boiler or flue gas chimney can lower the temperature of the flue gas down to the dew point, causing condensation. Water vapor condenses on the boiler surfaces, together with soot and part of the unburnt hydrocarbons contained in the flue gas, producing tar deposits. These substances stick to the walls of the boiler, covering most of the inner surfaces. In addition to being dangerous due to its flammability, tar is damaging to the integrity of the boiler and limits the efficiency of the flue gas system water exchanger.

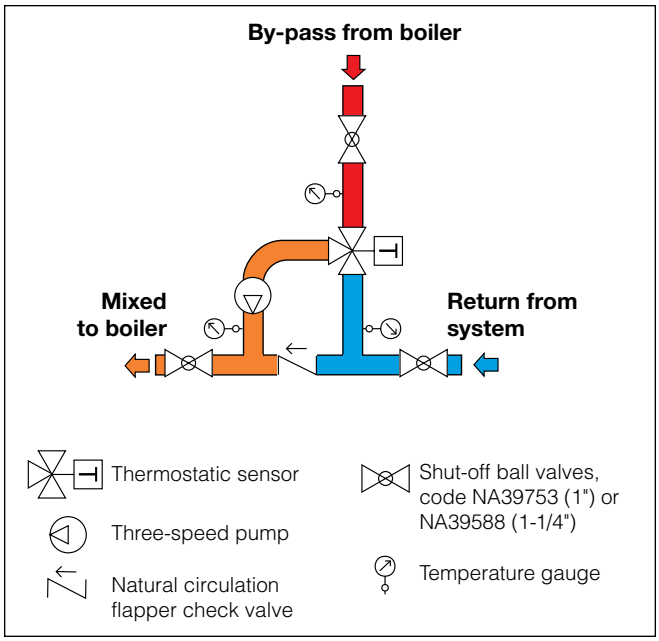
By keeping the boiler walls at the highest possible temperature, the boiler protection valve limits the formation of these substances thereby increasing combustion efficiency, controlling emissions into the environment and prolonging boiler life.



Characteristic components



Hydraulic diagram

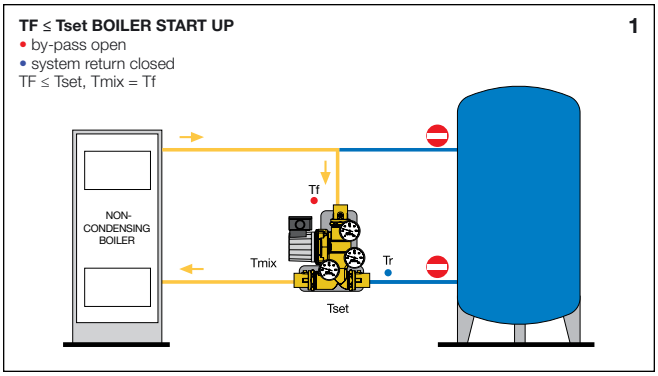


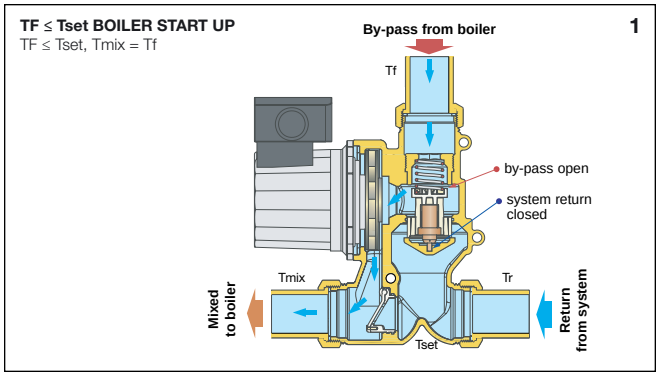
Operating principle

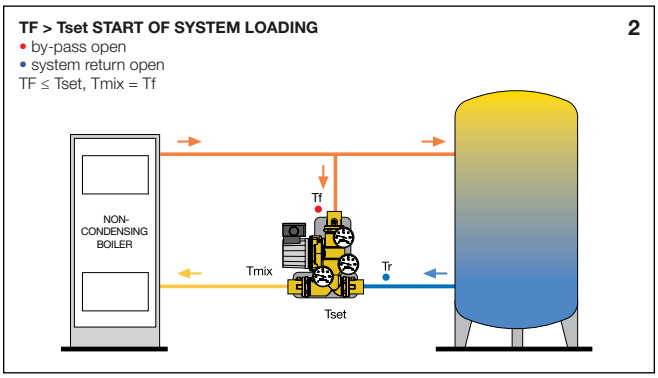
The thermostatic sensor, completely immersed in the medium, controls the movement of a shutter that regulates the by-pass flow from the boiler and toward the system. At boiler startup, the boiler protection recirculation and distribution unit recirculates the by-pass flow from the boiler to bring the boiler up to temperature as quickly as possible (fig. 1). When the by-pass flow from the boiler Tf exceeds the setting of the fixed thermostatic sensor Tset, the unit's return from the system port starts opening to produce the water mixing Tmix: in this phase the system loading begins (fig. 2).

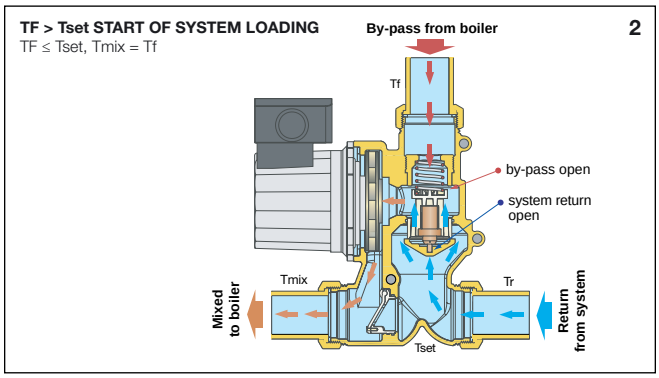
When the mixed flow to the boiler temperature Tmix is greater than the set point of the boiler protection recirculation and distribution unit by approximately 18°F (10°C), the by-pass flow from the boiler port closes and water returns to the boiler at the same temperature as the return flow from the system (fig. 3).

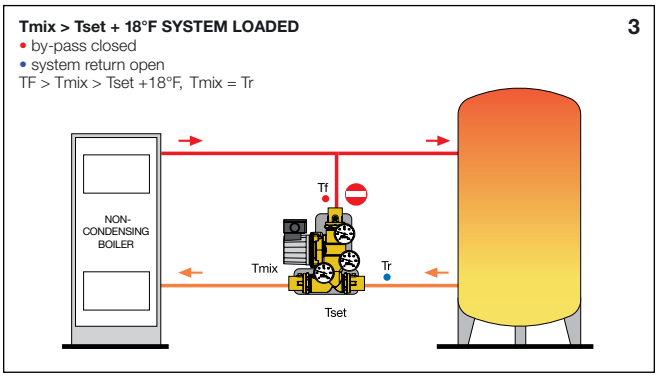
When power is out and the circulation pump stops running, the flapper check valve, which is closed during normal operation, opens with a slight pressure differential resulting from the effects of heated water in the boiler and cooler water in the distribution syste, a natural thermosyphon flow. This prevents a excessive heat buildup which eventually would cause the pressure relief valve to open (fig. 4).

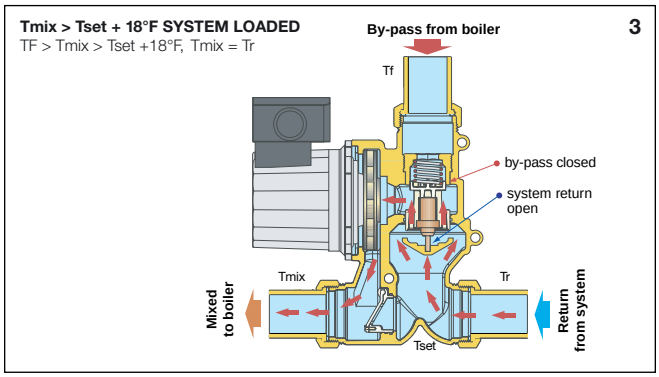


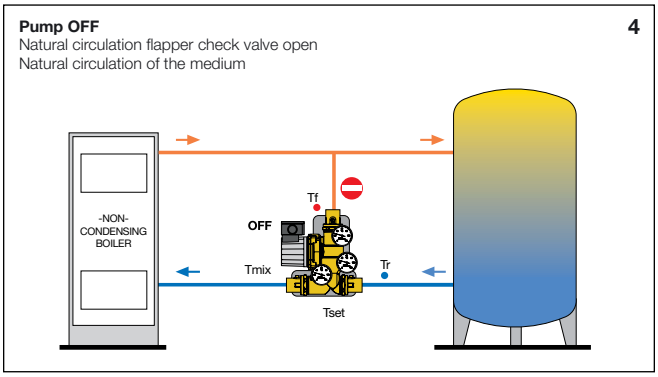


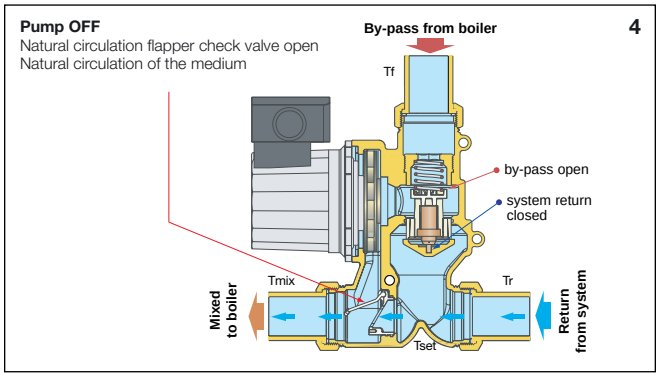












Tf = By-pass flow from boiler temperature, **Tset** = Boiler protection valve set point temperature,
Tmix = Mixed water temperature, **Tr** = Return from system temperature

Construction details

Single casting and reversibility

The compact brass body casting houses the pump and all functioning components, offering easy installation, either on the right or left side of the boiler. The temperature gauges can be easily removed and re-inserted on the back side of the unit.

Brass body

The brass body prevents the formation of ferrous residues in the system, prolonging boiler operating life.

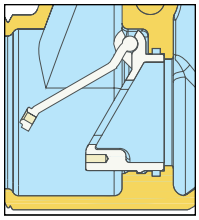
Thermostatic sensor

The unit features a thermostatic sensor to control the temperature of water returning to the boiler to prevent condensation.

Insulation

The ThermoBloc™ boiler protection recirculation and distribution units come complete with an insulation shell to provide perfect thermal insulation.

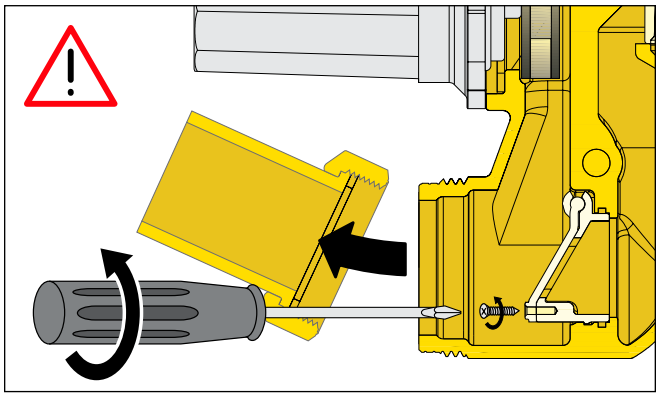
Natural circulation flapper check valve



The flapper check valve allows the natural thermosyphon circulation of the system heat transfer fluid when the pump stops running due to power failure. When the pump is running under normal conditions the thust of the flowing medium keeps the flapper closed, forcing flow past the thermostatic sensor. When the pump stops running and the fluid in the boiler is at high temperature, natural circulation begins, by-passing the thermostatic sensor, preventing overheating in the boiler.

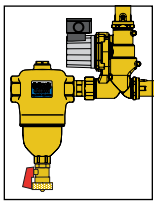
Flapper check valve – lock

Before installation, remove the screw that keeps the flapper check valve closed. This screw is factory-installed to prevent breakage during shipment. Removing the protective screw ensures full functionality of the flapper check valve as a natural circulation device. To do this, unscrew the union located on the mixed water outlet port (to boiler) and access the screw inside the valve body, unscrewing it using a phillips head screw driver.



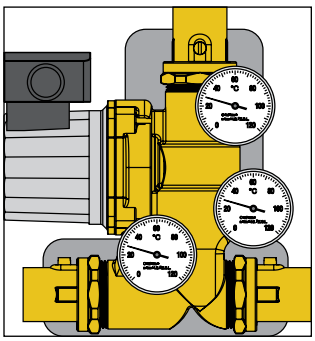
Dirt separator

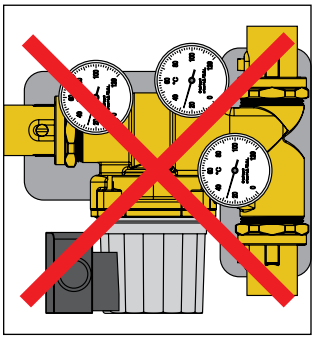
The Caleffi DIRTCAL® 5462 series dirt separator should be installed to perform continuous dirt separation.

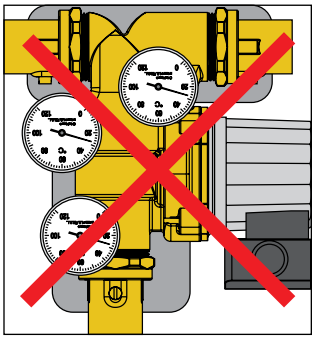


Installation

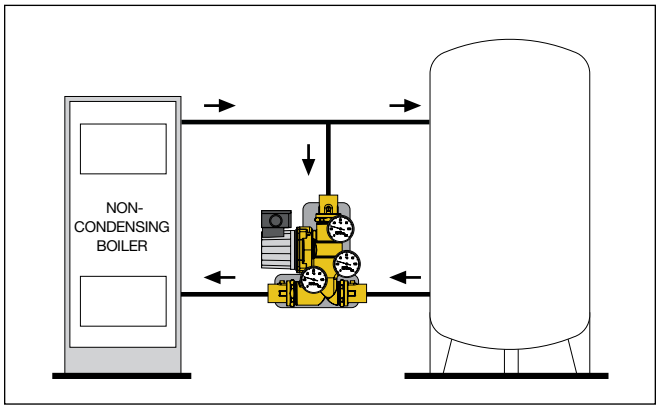
The ThermoBloc™ boiler protection recirculation and distribution unit can be installed on both sides of the boiler following the flow directions indicated on the body. Installation is recommended on the return to the boiler in mixing mode, in vertical postion (axis of the pump horizontal and the axis of the thermostatic sensor vertical). This allows for the proper functionality of the natural circulation flapper check valve.



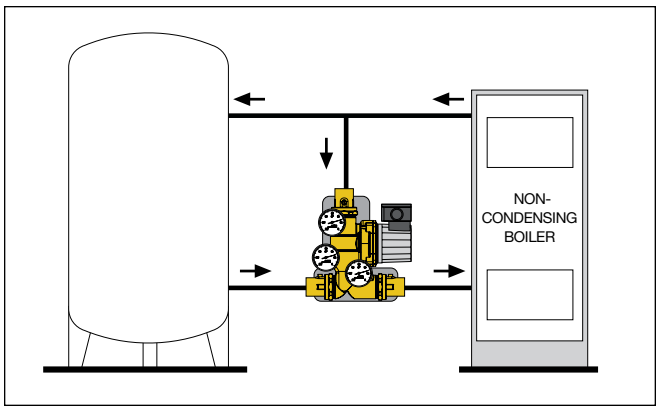




Installation on right side of generator

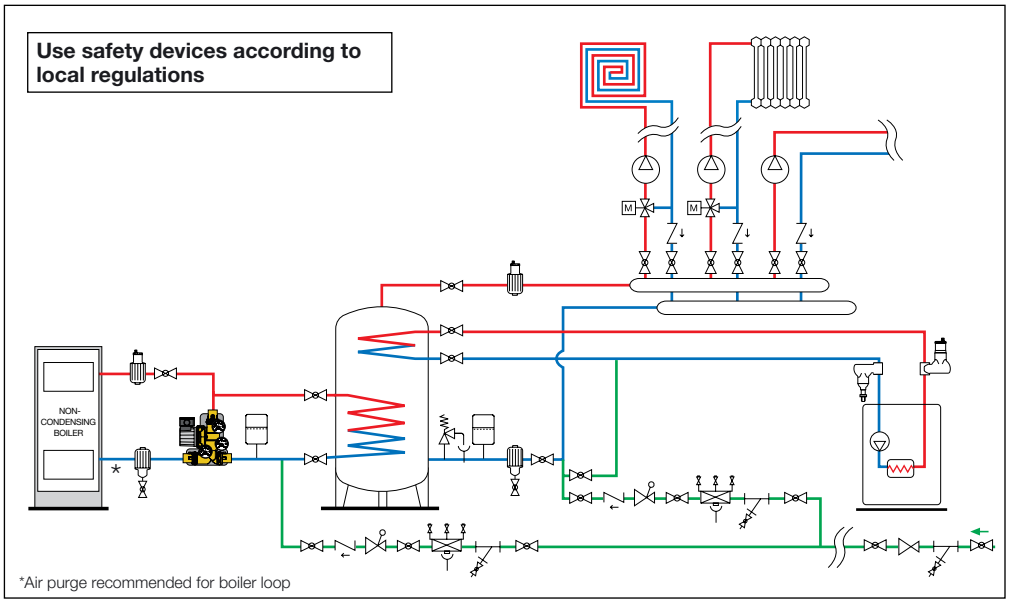


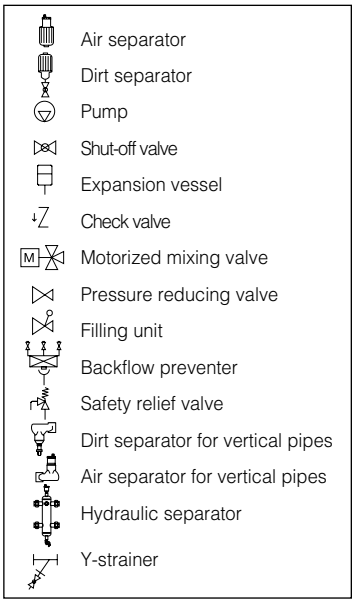
Installation on left side of generator



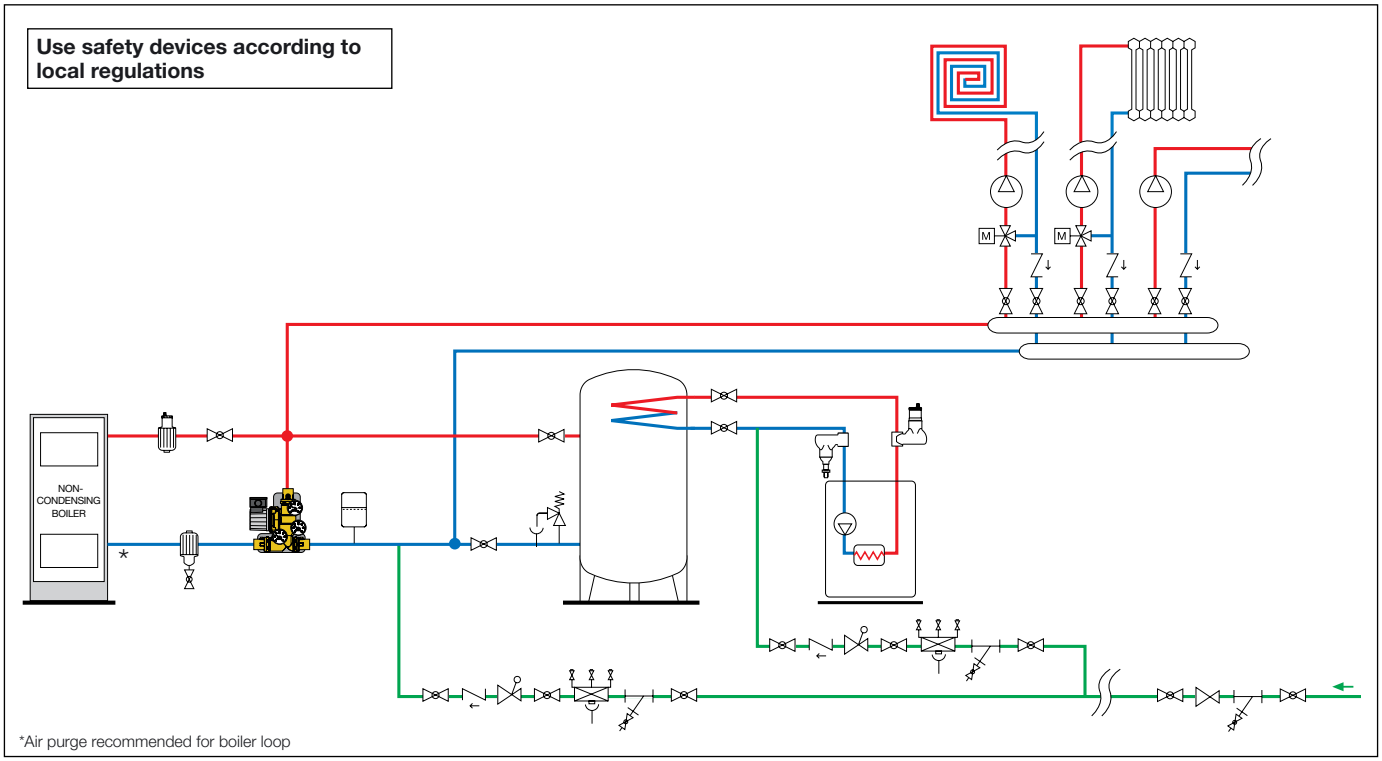
Application diagrams

Non-condensing boiler system with buffer tank

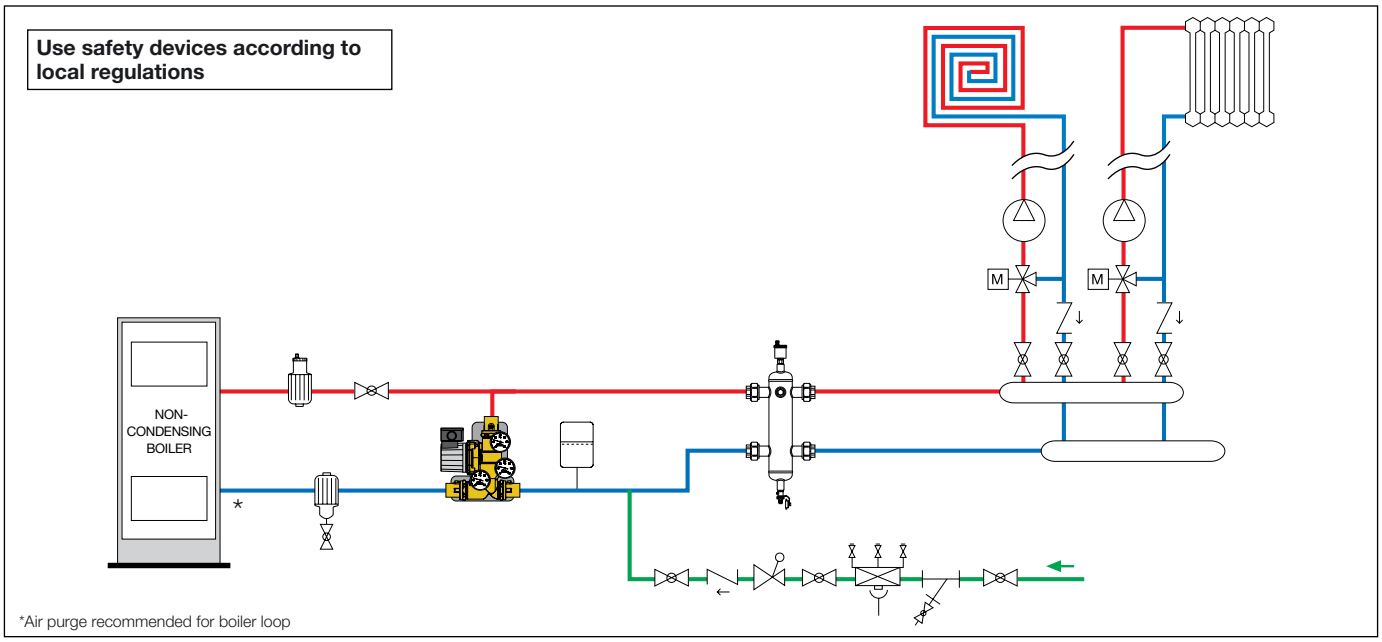




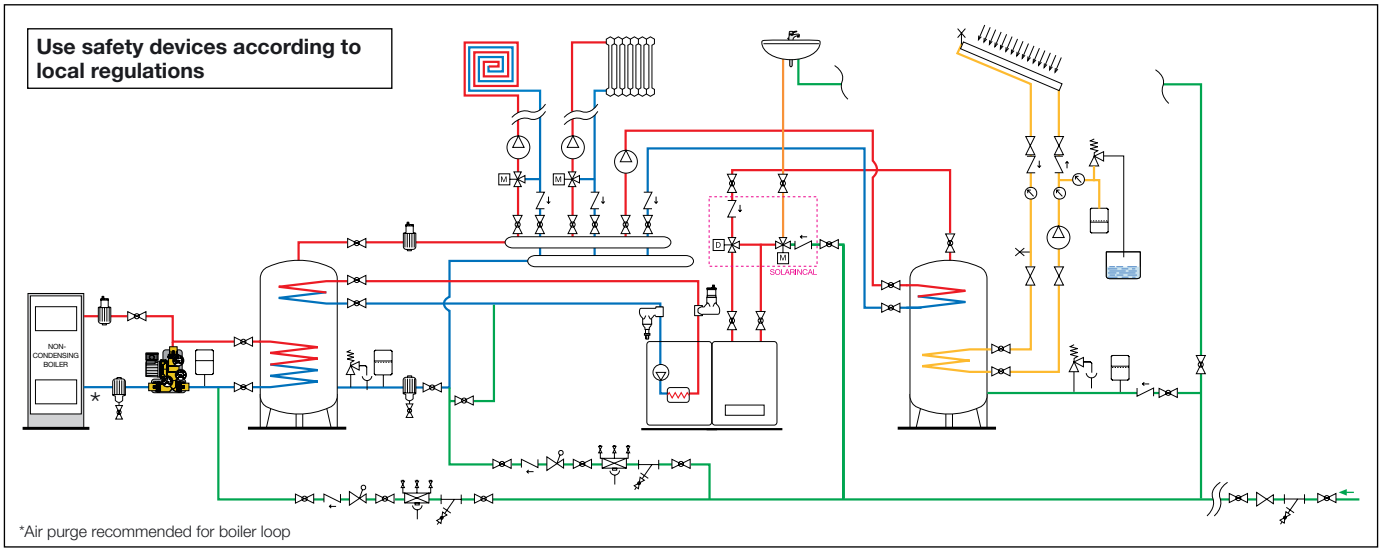
Non-condensing boiler, connection to buffer tank in parallel



Non-condensing boiler, direct supply to the system



Non-condensing boiler, direct connection to buffer tank



SPECIFICATION SUMMARIES

ThermoBloc™ 281 series

Boiler protection recirculation and distribution unit. Connections 1" and 1-1/4" NPT male and sweat with unions. Brass body. Brass shutter locking nut. PSU shutter. Stainless steel spring. Polyphenylene Sulfide (PPS) flapper check valve. EPDM seal elements. Medium water and glycol solutions. Maximum percentage of glycol 50%. Maximum working pressure 150 psi (10 bar). Working temperature range 40–210°F (5–100°C). Temperature gauge scale 30–250°F (0–120°C). Built-in wax thermostatic sensor: setting temperature 130°F (55°C) standard; 115°F (45°C), 140°F (60°C) and 160°F (70°C) optional. Sensor cartridge accuracy ±4°F (±2°C). Hot inlet from boiler complete closed temperature Tset +18°F (10°C). Three-speed pump model Wilo Star S-16. Electric supply 115 V – 60 Hz. Complete with insulation.

CALEFFI Hydronic Solutions

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