Installation and Operating Manual for the ProCon MCS 320 -2150kW Floor Standing Gas Condensing Boilers

MHG Heating Ltd Unit 4 Epsom Downs Metro Centre, Waterfield, Tadworth, Surrey KT20 5LR
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020315 Draft

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Appliance Type

There are currently Five base boiler models in the range which are combined in cascades to provide a further seventeen boilers within the ProCon MCS range.

ProCon MCS 210
ProCon MCS 260
ProCon MCS 320
ProCon MCS 400
ProCon MCS 535
Cascade Unit (Hidro)
ProCon MCS 580 Hidro
ProCon MCS 670 Hidro
ProCon MCS 740 Hidro
ProCon MCS 800 Hidro
ProCon MCS 850 Hidro
ProCon MCS 940 Hidro
ProCon MCS 1000 Hidro
ProCon MCS 1250 Hidro
ProCon MCS 1320 Hidro
ProCon MCS 1380 Hidro
ProCon MCS 1450 Hidro
ProCon MCS 1600 Hidro
ProCon MCS 1800 Hidro
ProCon MCS 1850 Hidro
ProCon MCS 1920 Hidro
ProCon MCS 2000 Hidro
ProCon MCS 2150 Hidro

The ProCon MCS range is designed to be applied to systems requiring direct on boiler weather compensated heating and priority hot water production via a separate high recovery calorifier/cylinder.

The ProCon MCS range is supplied complete with weather proofed casings, allowing the units to be located externally to the building without the need for a purpose built structure

Dedicated cascade controllers, communication adapters, hydraulic kits form part of the Hidro units.

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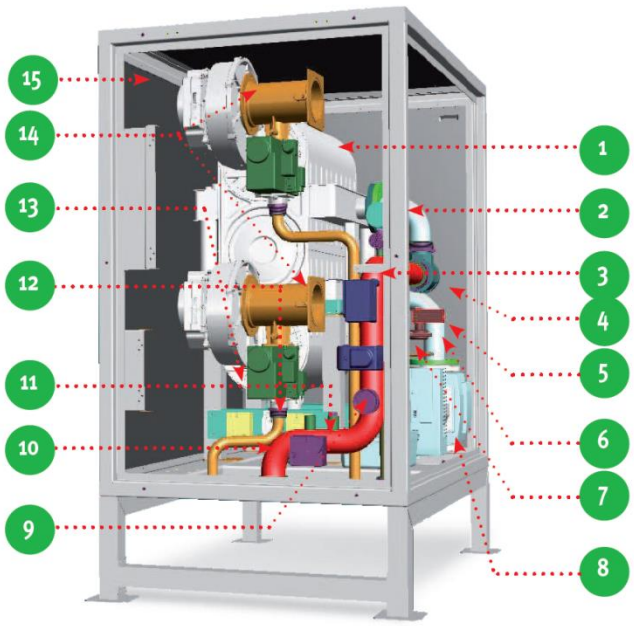
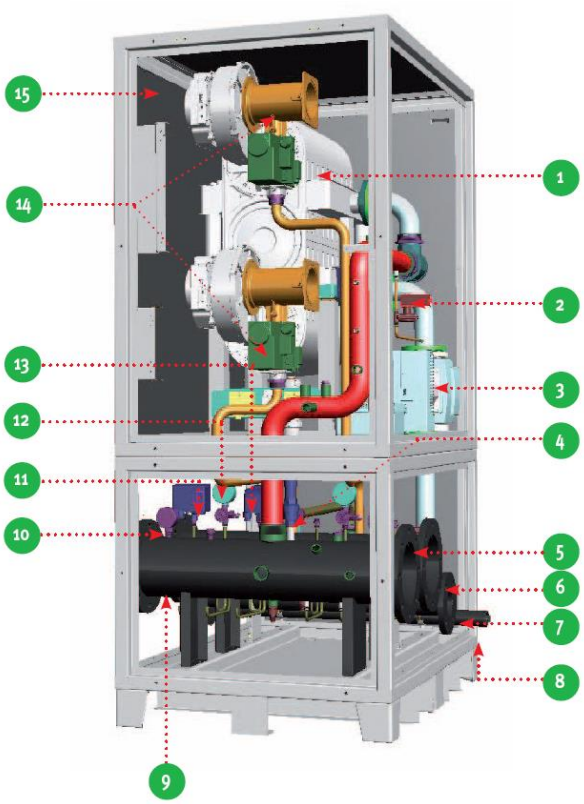
ProCon MCS Configuration. (210-535)



1	Stainless Steel Double Heat Exchanger
2	Manometer
3	Pressure Switch Maximum
4	Pump Differential Pressure Switch
5	Return Pipework
6	6bar Pressure Relief Valve.
7	Pressure Switch Minimum
8	High Head Pump
9	Thermometer
10	Flow Pipework
11	Limit Thermostat
12	Gas Pipework
13	Condensate Discharge Pipework
14	Low NOx Premix Burner
15	Weather Proof Casing.

ProCon MCS Hidro Configuration. (580-2150)



1	Stainless Steel Double Heat Exchanger
2	Pump Differential Pressure Switch
3	High Head Pump
4	6bar Pressure Relief Valve.
5	Common Flow Pipework DN150 PN6
6	Common Return Pipework DN150 PN6
7	Common Gas Pipework DN65 PN16
8	Common Condensate Discharge Pipework DN50
9	Limit Thermostat
10	Thermometer
11	Manometer
12	Pressure Switch Maximum
13	Pressure Switch Minimum
14	Low NOx Premix Burner
15	Weather Proof Casing.

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Installation Regulations and Requirements

The installation of ProCon MCS boilers must be in accordance with the relevant requirements of Gas Safety (Installation & Use) Regulations 1994, Health & Safety at Work Act, Building Regulations, IEE Regulations, Construction (Design & Management) Regulations 1994, Local Authority Bye-Laws, National, Fire Regulations and Insurance Company requirements.
The following Codes of Practice are also applicable:-
BS 5440-1: 2008 Installation of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases).
Part 1: Specification for the installation of flues.

BS 5440-2: 2009 Installation of flues and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases).
Part 2: Specification for installation and maintenance of ventilation for gas appliances.

BS 5449: 1990 Specification for forced circulation hot water central heating systems for domestic premises.
BS 6644: 2011 Specification for gas fired hot water boilers of rated inputs between 70kW (net) and 1.8MW(net) (2nd and 3rd family gases).
BS 6798: 1987 Specification for installation of gas fired hot water boilers of rated input not exceeding 60 kW.
BS 6880: 1988 Code of Practice for low temperature hot water heating systems of output greater than 45kW. Parts 1, 2 & 3.
BS 6891: 1988 Specification for installation of low pressure gas pipework of up to 28mm (R1) in domestic premises (2nd family gases)
BS 7593: 1992 Code of Practice for treatment of water in domestic hot water central heating systems.
BS 7671: 1992 Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition.
CISBE Guide reference sections B7, B11 and B13.
CP342 Part 2: 1974 Code of Practice for centralized hot water supply.
GE/UP/2 Gas installation pipework, boosters and compressors on industrial and commercial premises.
IGE/UP/4 Commissioning of gas fired plant on industrial and commercial premises
IGE/UP/10 Installation of gas appliances in industrial and commercial premises. Part 1: Flued appliances. And any addition prevailing regulation and or code of practice not detailed above.

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Appliance Warranties

All MHG appliances enjoy a full 24 month warranty as detailed in our terms and conditions.
The guarantee period shall begin on the day of commissioning, or within 3 months after delivery has been made.

The customer shall only be able to claim against MHG under guarantee if the commissioning of the object of delivery has been carried out by MHG staff or the authorized supplier. Only if the customer has followed MHG's instructions relating to the treatment and maintenance of the object of delivery, and if no replacement parts of outside origin have been fitted.

Parts subject to wear such as ignition electrodes, seals etc. are strictly excluded from the guarantee.
In addition to the above warranties, the Primary Heat Exchangers carry a 60 month guarantee against manufacturing or material defect.

Supplied Components

All MCS units are test fired prior to dispatch.
Due to shipping/handling issues the Hidro units are dismantled prior to shipping.
The interconnecting power and cascade wirings and plugs are shipped within the master unit packaging.

The Theta Cascade Controller is supplied with the following sensors:

Common Flow sensor * Must be installed*

Outside air sensor (Optional, required to activate direct on boiler weather compensation)

HWS Sensor (Optional, A volt free enable can be used.)(A parameter adjustment will be required.)

Mixed Zone 1 Flow Sensor (Optional)
Mixed Zone 2 Flow Sensor (Optional)

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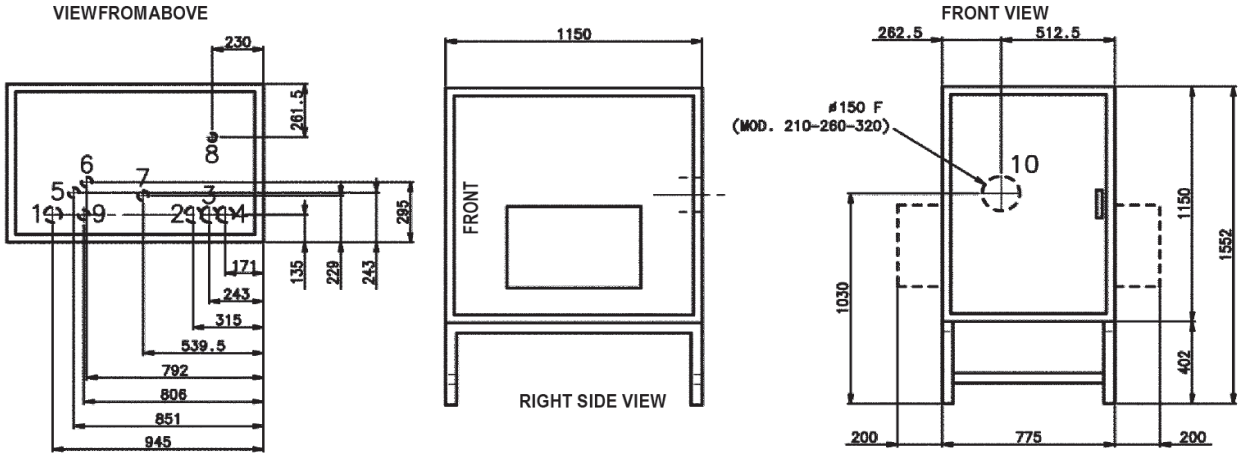
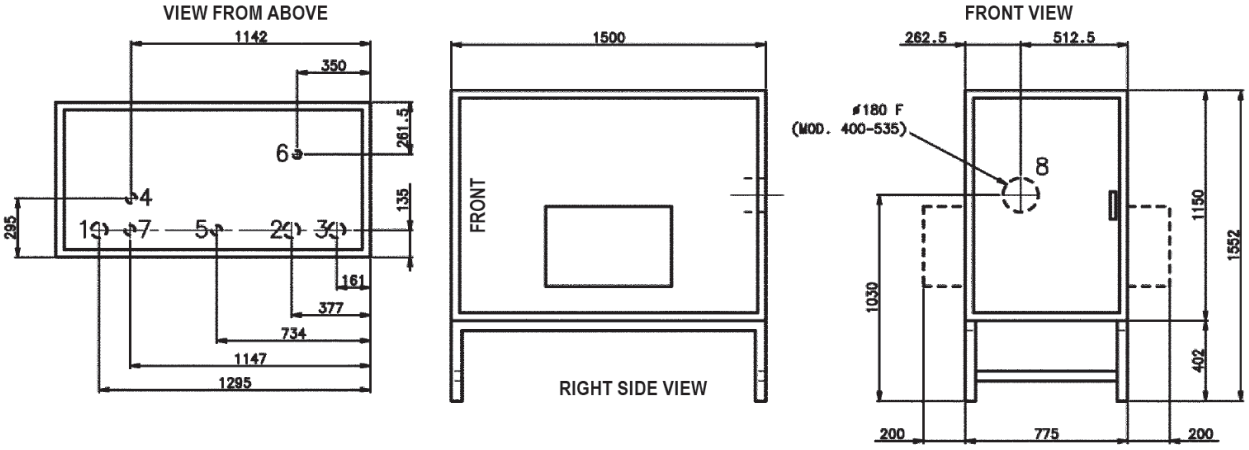
Dimensions

ProCon MCS 320 (210 & 260 for use in Hidro Cascade units only)



Manifold Connection Dimensions		
1	System Delivery	G 2"1/2 Male
2	System Return MCS 210	G 2"1/2 Male
3	System Return MCS 260	G 2"1/2 Male
4	System Return MCS 320	G 2"1/2 Male
5	Gas Inlet 210/260	G 1"1/2 Male
6	Gas Inlet320	G 1"1/2 Male
7	3 Way Water Outlet Valve	G 1"1/2 Male
8	Condensate Discharge	Ø25
9	Relief Valve Discharge	G1"1/2 Male
10	Fume Discharge	Ø=150 Female

ProCon MCS 400 and 535



Manifold Connection Dimensions		
1	System Delivery	G 2"1/2 Male
2	System Return MCS 400	G 2"1/2 Male
3	System Return MCS 535	G 2"1/2 Male
4	Gas Inlet	G 1"1/2 Male
5	3 Way Water Outlet Valve	G 1"1/2 Male
6	Condensate Discharge	Ø25
7	Relief Valve Discharge	G1"1/2 Male
8	Fume Discharge	Ø=180 Female

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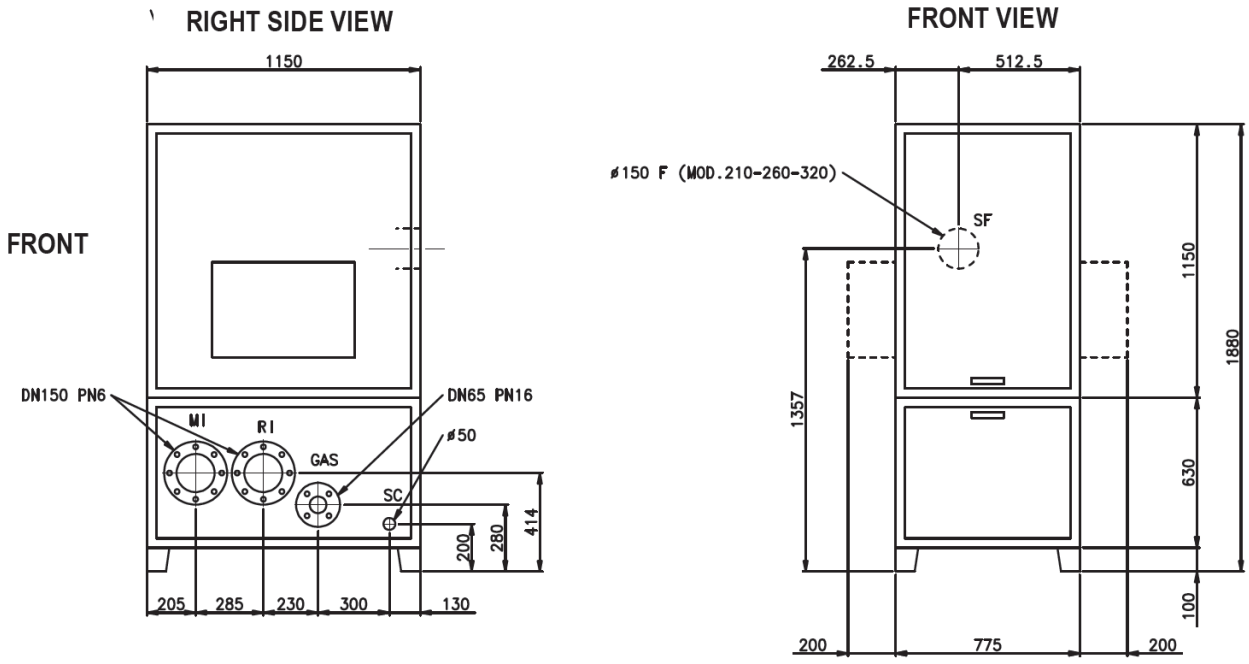
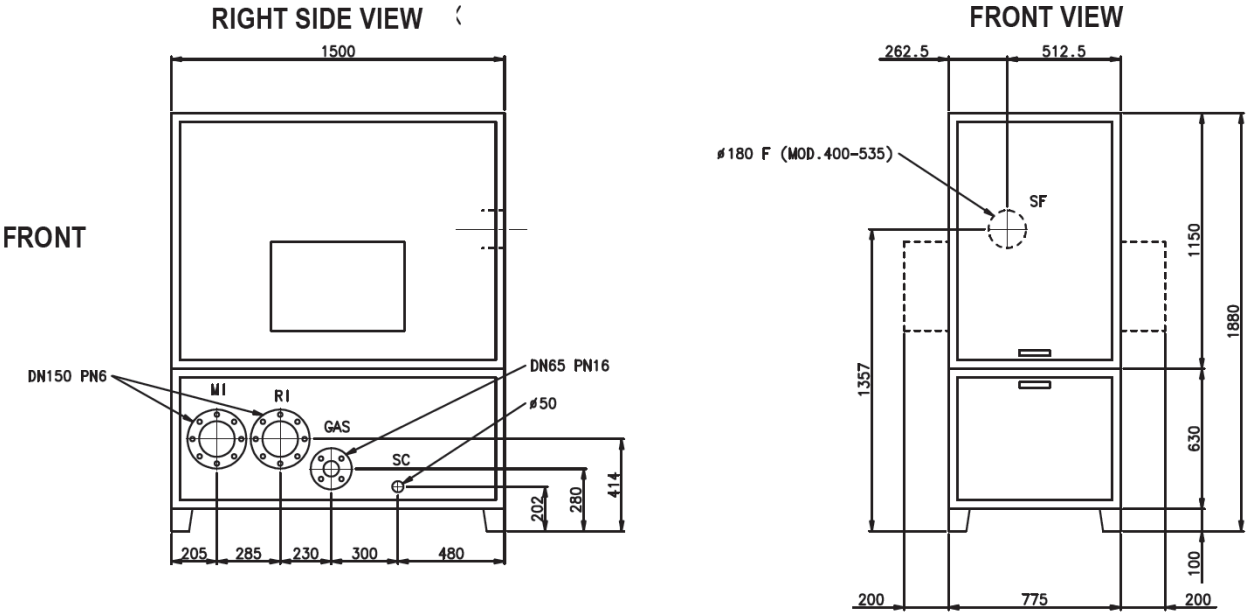
ProCon MCS Hidro Units

ProCon MCS 320 Hidro (210 & 260 for use in Hidro Cascade units only)



ProCon MCS 400 and 535 Hidro



Item	Description
MI	Flow Header Connection
RI	Return Header Connection
SC	Condensate Water Connection
SF	Flue Gas Spigot

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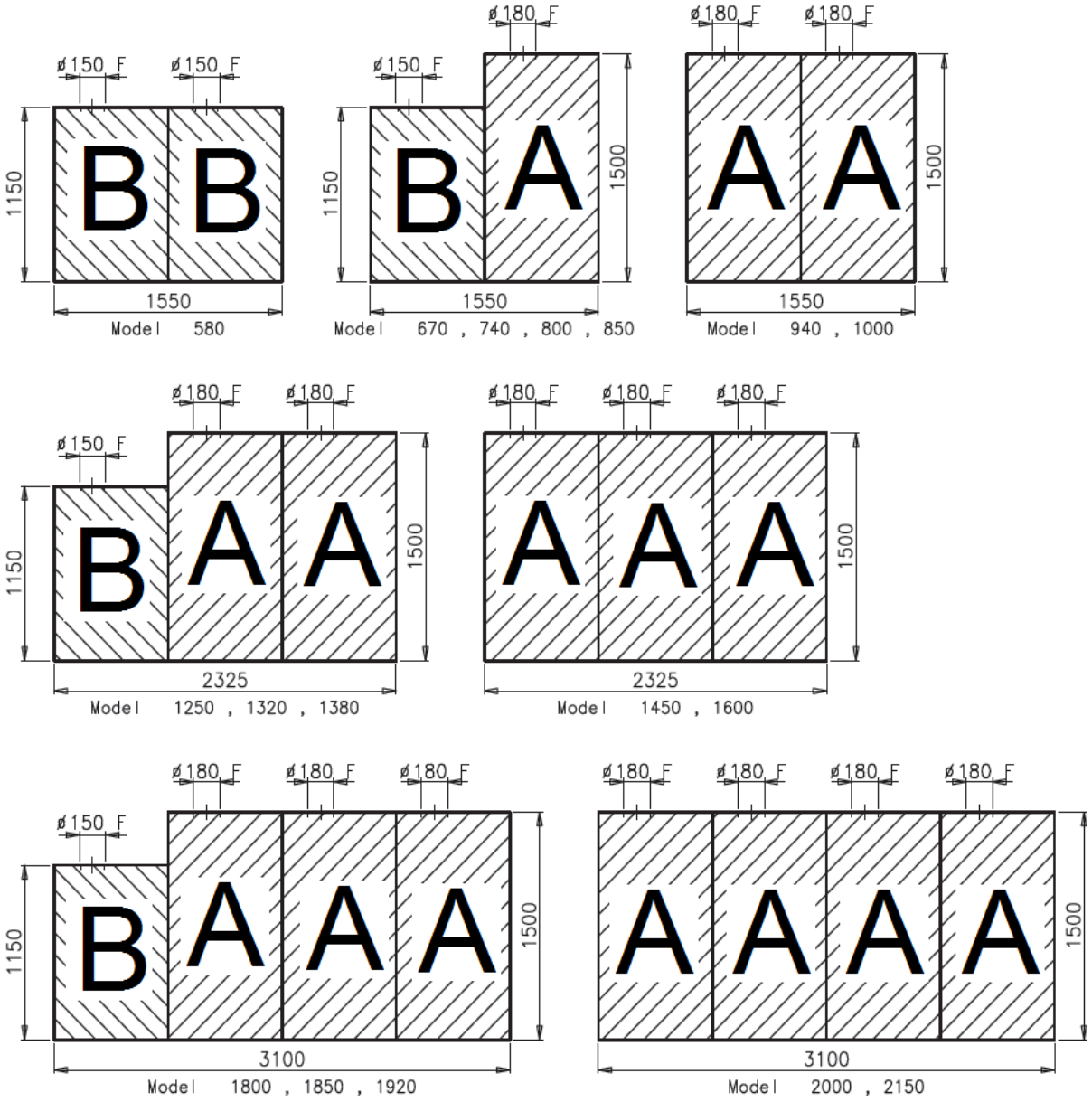
ProCon MCS Hidro Layouts

A = 400kW and 535kW units B = 210kW, 260kW and 320kW Units



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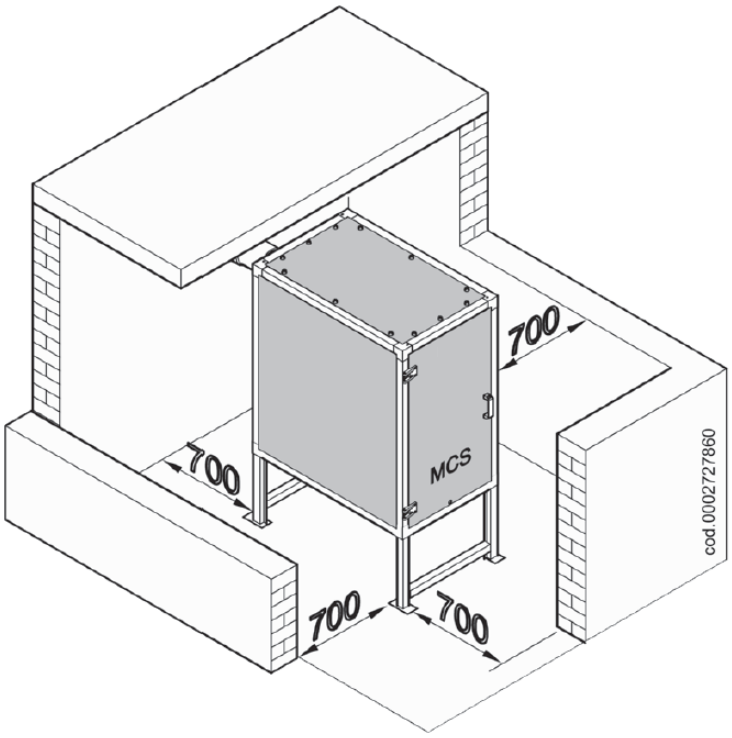
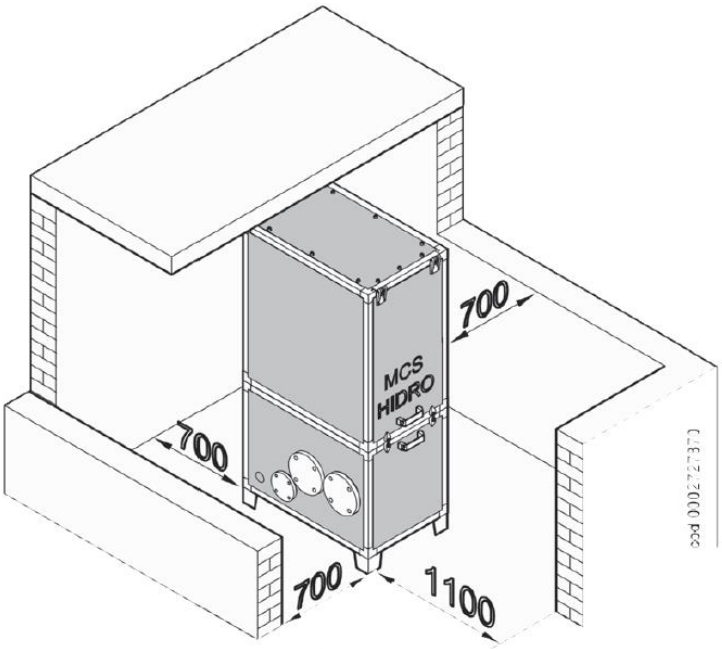
Installation and Service Clearances

ProCon MC 210, 260, 320, 400 & 535



ProCon MCS Hidro All models



If these clearances cannot be achieved please contact MHG's technical department for guidance.

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Delivery and Mobility

All ProCon MCS's are supplied fully tested and therefore may contain residual test water.
The test water utilised contains additives that will help prevent the pump from sticking and other metals from oxidising.

To maintain the structural integrity of the appliance the internal components should not be used during the lifting and positioning of the unit.

All packaging materials should be disposed of in an environmentally way.

Case Removal

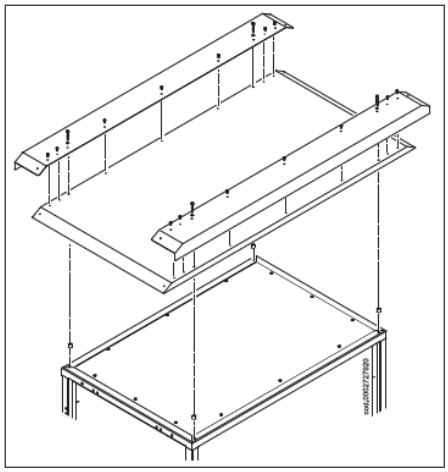
The MCS front case is removable and secured in place by four screw tight swizzle lugs.

The MCS Hidro front case is hinged at the top and secured in place by four screw tight swizzle lugs.

The Theta cascade controller is mounted in a clear fronted housing secured on the left or right of the unit.

All other casing panels are secured in place with screw tight swizzle lugs.

Weather Proof Casing



Craning the Boiler.

If the boiler is to be raised in to position via a crane, it is essential that the base of the unit and the components immediate inside are protected from damage by using correctly located strops please contact MHG's technical department for guidance.

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Technical Data

ProCon MCS		210 (Used in Hidro Cascade)	260 (Used in Hidro Cascade)
Nominal Heating Capacity	kW	20-200	25-250
Nominal Thermal Power (80/60°C)	kW	19.52-195.2	24.45- 244.5
Nominal Thermal Power (50/30°C)	kW	21.3-213.0	26.63-266.3
Thermal Efficiency at Max Output (80/60°C)	%	97.6	97.8
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.52
NOx Class		5	5
Gas Consumption G20	m^3/h	2.12-21.16	2.65-26.46
Gas Consumption G30	Kg/h	1.58-15.77	1.97-19.72
Gas Consumption G31	Kg/h	1.55-15.54	1.94-19.42
Min/Max Working Pressure	Bar	1/6	1/6
Number of Burners	#	2	2
Water Content of Individual Heat X	L	22	26
Water Content of Unit	L	26.6	31.6
Equipment Type		B23	B23
Power Supply/Power		230V/1400	230V/1500
Empty Weight	Kg	275	306
Dimension WxDxH	Mm	775x1150x1552	775x1150x1552
Flue Gas Mass Flow	Kg/h	33.7-337.2	42.1-421.4
Filled Weight	Kg	320	351
Residual Flue Pressure	Pa	100	100
Carbon Dioxide Concentration	%	9.0	9.0

ProCon MCS		320	400	535	580 Hidro
Nominal Heating Capacity	kW	30-300	38-380	50-500	25-550
Nominal Thermal Power (80/60°C)	kW	29.39-293.9	37.3-373	49.1-491	24.45-538.4
Nominal Thermal Power (50/30°C)	kW	31.95-319.5	40.47-404.7	53.25-532.5	24.45-585.8
Thermal Efficiency at Max Output (80/60°C)	%	98.0	98.2	98.2	97.89
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.5	106.5	105.51
NOx Class		5	5	5	5
Gas Consumption G20	m^3/h	3.17-31.75	4.02-4021	5.29-52.91	2.65-58.21
Gas Consumption G30	Kg/h	3.37-23.66	3.00-29.97	3.94-39.43	1.97-43.38
Gas Consumption G31	Kg/h	2.33-23.31	2.95-29.52	3.88-38.84	1.94-42.73
Min/Max Working Pressure	Bar	1/6	1/6	1/6	1/6
Number of Burners	#	2	2	2	4
Water Content of Individual Heat X	L	30	39	55	56
Water Content of Unit	L	36.7	46.7	63.8	132.3
Equipment Type		B23	B23	B23	B23
Power Supply/Power		230V/1750	230V/1900	230V/2000	230V/3250
Empty Weight	Kg	361	366	409	1000
Dimension WxDxH	Mm	775x1150x1552	775x1150x1552	775x1150x1552	1550x1150x1552
Flue Gas Mass Flow	Kg/h	50.6-505.7	64.1-640.6	84.3-842.9	42.1-927.1
Filled Weight	Kg	361	366	409	1000
Residual Flue Pressure	Pa	100	100	100	100
Carbon Dioxide Concentration	%	9.0	9.0	9.0	9.0

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ProCon MCS		670 Hidro	740 Hidro	800 Hidro	850 Hidro
Nominal Heating Capacity	kW	25-630	20-700	25-750	30-800
Nominal Thermal Power (80/60°C)	kW	24.45-617.5	19.52-686.2	24.45-735.5	29.39-784.9
Nominal Thermal Power (50/30°C)	kW	26.63-671	21.3-745.5	26.63-798.8	31.95-852
Thermal Efficiency at Max Output (80/60°C)	%	98.02	98.03	98.06	98.11
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.5	106.5	106.51
NOx Class		5	5	5	5
Gas Consumption G20	m^3/h	2.65-66.67	2.12-74.07	2.65-79.37	3.17-84.66
Gas Consumption G30	Kg/h	1.97-49.69	1.58-55.2	1.97-59.15	2.37-63.09
Gas Consumption G31	Kg/h	1.94-48.94	1.55-54.38	1.94-58.26	2.33-62.15
Min/Max Working Pressure	Bar	1/6	1/6	1/6	1/6
Number of Burners	#	4	4	4	4
Water Content of Individual Heat X	L	65	77	81	85
Water Content of Unit	L	142.3	154.4	159.4	164.5
Equipment Type		B23	B23	B23	B23
Power Supply/Power		230V/3400	230V/3400	230V/3500	230V/3750
Empty Weight	Kg	1032	104	1075	1085
Dimension WxDxH	Mm	1550x1150x1552	1550x1150x1552	1550x1150x1552	1550x1150x1552
Flue Gas Mass Flow	Kg/h	42.1-1062	33.7-1180.1	42.1-1264.3	50.6-1348.6
Residual Flue Pressure	Pa	100	100	100	100
Carbon Dioxide Concentration	%	9.0	9.0	9.0	9.0

ProCon MCS		940 Hidro	1000 Hidro	1250 Hidro	1320 Hidro
Nominal Heating Capacity	kW	38-880	50-1000	25-1200	25-1250
Nominal Thermal Power (80/60°C)	kW	37.3-864	49.1-982	19.52-1177.2	24.45-12226.5
Nominal Thermal Power (50/30°C)	kW	40.47-937.2	53.25-1065	21.3-1278	26.63-1331.3
Thermal Efficiency at Max Output (80/60°C)	%	98.11	98.20	98.10	98.12
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.5	106.5	106.5
NOx Class		5	5	5	5
Gas Consumption G20	m^3/h	4.02-93.12	5.29-105.82	2.12-126.98	2.65-132.28
Gas Consumption G30	Kg/h	3-69.4	3.94-78.86	1.58-94.63	1.97-98.58
Gas Consumption G31	Kg/h	2.98-68.36	3.88-77.68	1.55-93.22	1.94-97.1
Min/Max Working Pressure	Bar	1/6	1/6	1/6	1/6
Number of Burners	#	4	4	4	4
Water Content of Individual Heat X	L	94	110	132	136
Water Content of Unit	L	174.5	191.6	250.2	255.2
Equipment Type		B23	B23	B23	B23
Power Supply/Power		230V/3900	230V/4000	230V/5400	230V/5500
Empty Weight	Kg	1117	1160	1624	1655
Dimension WxDxH	Mm	1550x1150x1552	1550x1150x1552	1550x1150x1552	1550x1150x1552
Flue Gas Mass Flow	Kg/h	64.1-1483.5	84.3-1685.8	33.7-2023	42.1-2107.2
Residual Flue Pressure	Pa	100	100	100	100
Carbon Dioxide Concentration	%	9.0	9.0	9.0	9.0

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ProCon MCS		1380 Hidro	1450 Hidro	1600 Hidro	1800 Hidro
Nominal Heating Capacity	kW	30-1300	38-1380	50-1500	20-1700
Nominal Thermal Power (80/60°C)	kW	29.39-1275.9	37.3-1355	49.1-1473	1952.1668.2
Nominal Thermal Power (50/30°C)	kW	31.95-1384.5	40.47-1469.7	53.25-1597.5	21.3-1810.5
Thermal Efficiency at Max Output (80/60°C)	%	98.15	98.19	98.20	98.13
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.5	106.5	106.5
NOx Class		5	5	5	5
Gas Consumption G20	m^3/h	3.17-137.57	4.02-146.03	5.29-158.73	2.12-179.89
Gas Consumption G30	Kg/h	3.37-102-52	3-108.83	3.94-118.29	1.58-134.06
Gas Consumption G31	Kg/h	2.33-100.89	2.95-107.2	3.88-116.52	1.55-132.06
Min/Max Working Pressure	Bar	1/6	1/6	1/6	1/6
Number of Burners	#	6	6	6	8
Water Content of Individual Heat X	L	140	149	165	187
Water Content of Unit	L	260.3	270.3	287.4	346
Equipment Type		B23	B23	B23	B23
Power Supply/Power		230V/5750	230V/5900	230V/6000	230V/7400
Empty Weight	Kg	1665	1697	1740	2204
Dimension WxDxH	Mm	2325x1500x1552	2325x1500x1552	2325x1500x1552	3100x1500x1552
Flue Gas Mass Flow	Kg/h	50.6-2191.5	64.1-2362.4	84.3-2528.7	33.7-2865.9
Residual Flue Pressure	Pa	100	100	100	100
Carbon Dioxide Concentration	%	9.0	9.0	9.0	9.0

ProCon MCS		1850 Hidro	1920 Hidro	2000 Hidro	2150 Hidro
Nominal Heating Capacity	kW	25-1750	30-1800	38-1880	50-2000
Nominal Thermal Power (80/60°C)	kW	24.45-1717.5	29.39-1766.9	37.3-1846	49.1-1964
Nominal Thermal Power (50/30°C)	kW	26.63-1863.8	31.95-1917	40.47-2002.2	53.25-2130
Thermal Efficiency at Max Output (80/60°C)	%	98.11	98.16	98.19	98.20
Thermal Efficiency at 30% Output (50/30°C)	%	105.3	105.3	105.3	105.3
Thermal Efficiency at Max Output (50/30°C)	%	106.5	106.5	106.5	106.5
NOx Class		5	5	5	5
Gas Consumption G20	m^3/h	2.65-185.19	3.17-1+0.48	4.02-198.94	5.29-211.64
Gas Consumption G30	Kg/h	1.97-198.01	2.37-141.95	3-148.26	3.94-157.72
Gas Consumption G31	Kg/h	1.94-135.94	2.33-139.73	2.95-146.04	3.88-155.36
Min/Max Working Pressure	Bar	1/6	1/6	1/6	1/6
Number of Burners	#	8	8	8	8
Water Content of Individual Heat X	L	191	195	204	220
Water Content of Unit	L	351	356.1	366.1	383.2
Equipment Type		B23	B23	B23	B23
Power Supply/Power		230V/7500	230V/7750	230V/7900	230V/8000
Empty Weight	Kg	2235	2204	2277	2320
Dimension WxDxH	Mm	3100x1500x1552	3100x1500x1552	3100x1500x1552	3100x1500x1552
Flue Gas Mass Flow	Kg/h	42.1-2950.1	50.6-3034.4	64.1-3169.3	84.3-3371.6
Residual Flue Pressure	Pa	100	100	100	100
Carbon Dioxide Concentration	%	9.0	9.0	9.0	9.0

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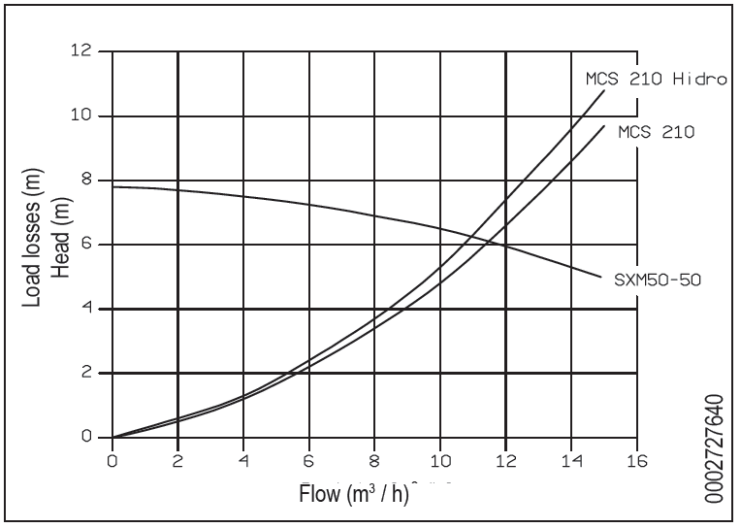
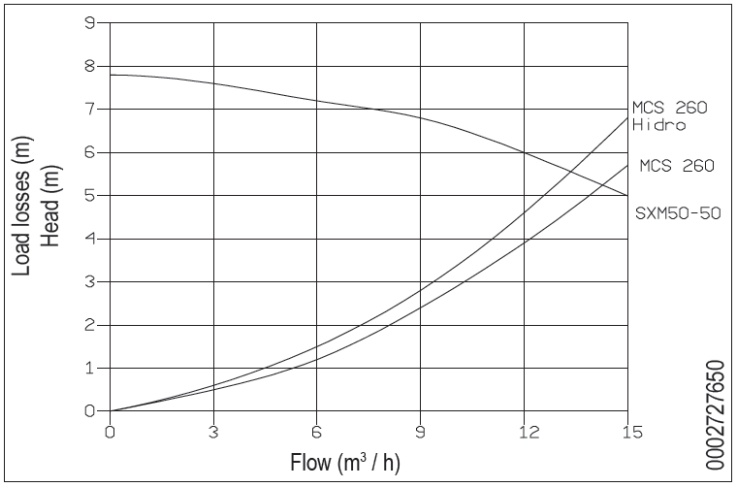
Load Loss on Water Input Side Curve (DT=20C)

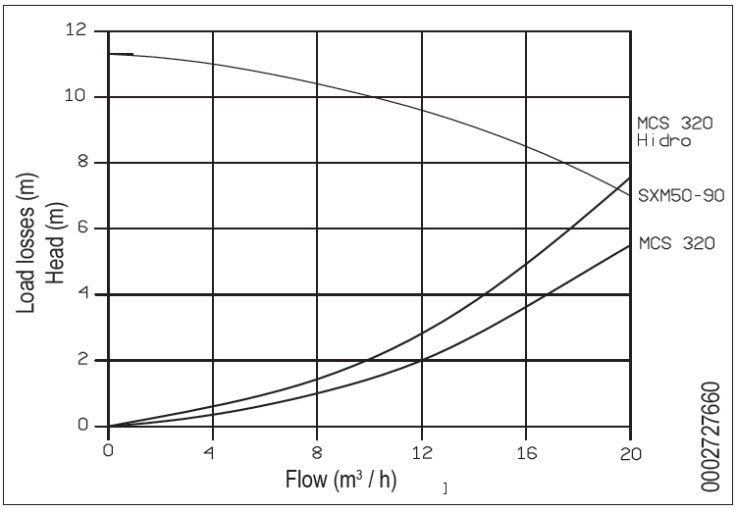
ProCon MCS210 (Hidro Use Only)



ProCon MCS260 (Hidro Use Only)



ProCon MCS320



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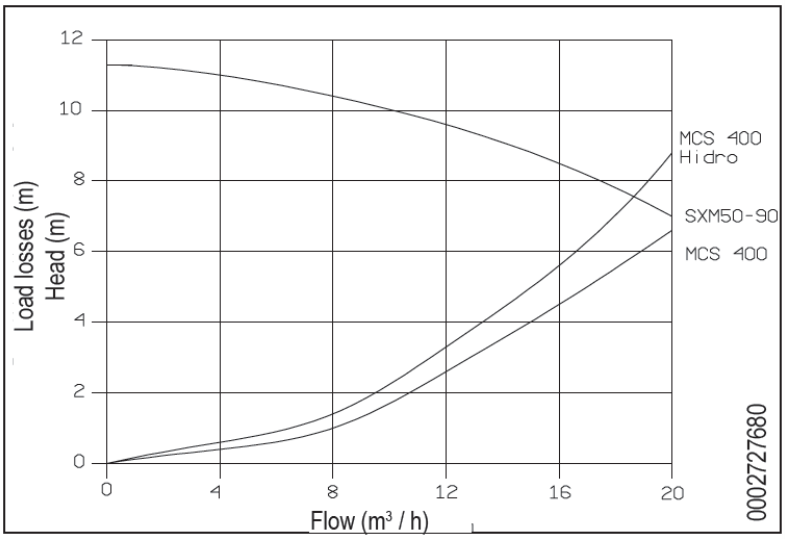
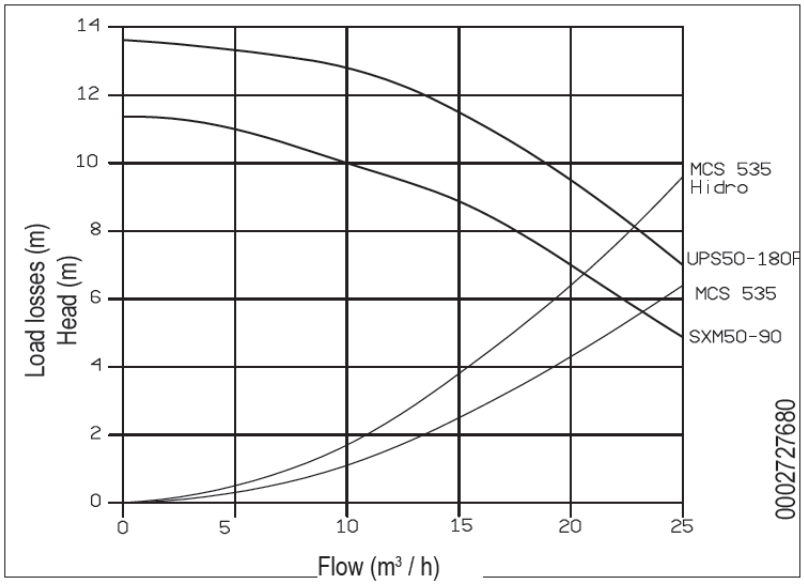
ProCon MCS400



ProCon MCS535



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Pressure (Safety) Relief Valve

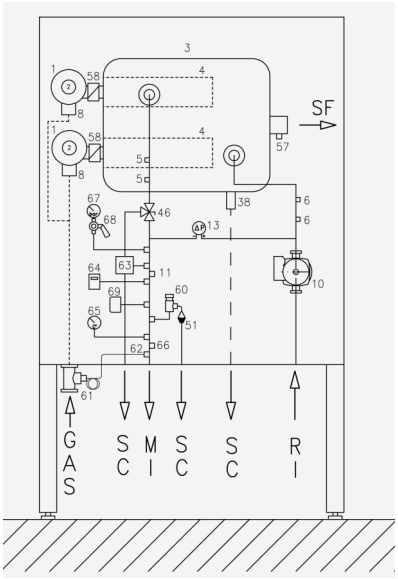
In accordance with the prevailing British Standard 5440/6644, the installer shall install as suitably sized Pressure (Safety) Relief Valve.

The location of this valve is important with respect to the applied pressure of the boiler circulation pump, it is therefore recommended to locate the Pressure (Safety) Relief Valve on the flow pipe immediately adjacent to the boiler; furthermore, there must not be any means of isolation between the boiler and the Pressure (Safety) Relief Valve.

A pressure Relief Valve has been supplied within the unit.

Setting: 5.4bar

Item # 60



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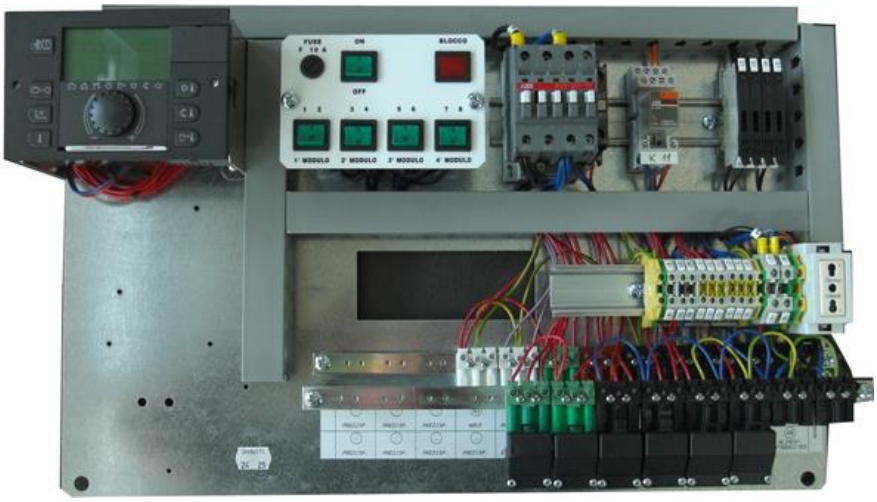
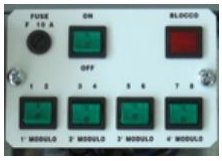
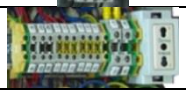
Electrical Connections

Basic electrical connection for the ProCon MCS



Legend

Item	Description
	**Theta Cascade Manager** Providing Access to Each Modules Controller Data
	**Appliance and Module Power Isolators (Green)** **Lockout Indicator (Red)** Providing central control of power to each appliance (pair of burners)
	**K3 Relay** Safety interlock relay
	**K11Relay** Cascade commination interlock relay
	Module Fuses 10 Amp
	Main Power Supply and transfer terminal rails
	Sensor, E-Bus Cascade, RS485 Cascade & Module Power Supply Plugs

All power and communication leads are supplied reformed with colour coded plugs and leads cut to the correct length.

All modules are assembled wired test fired then dismantle for shipping.

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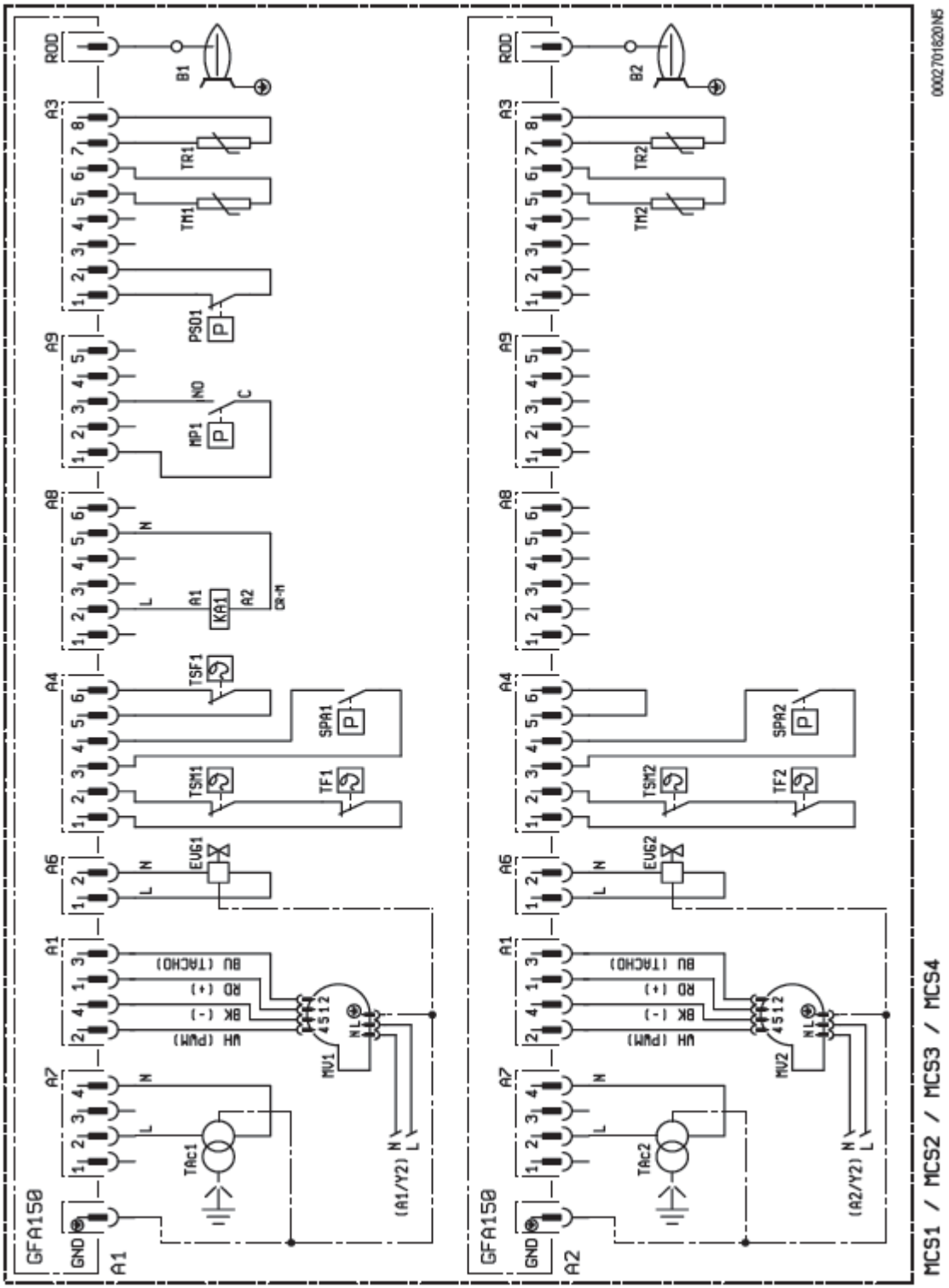
Module GFA Controller Wiring Diagram



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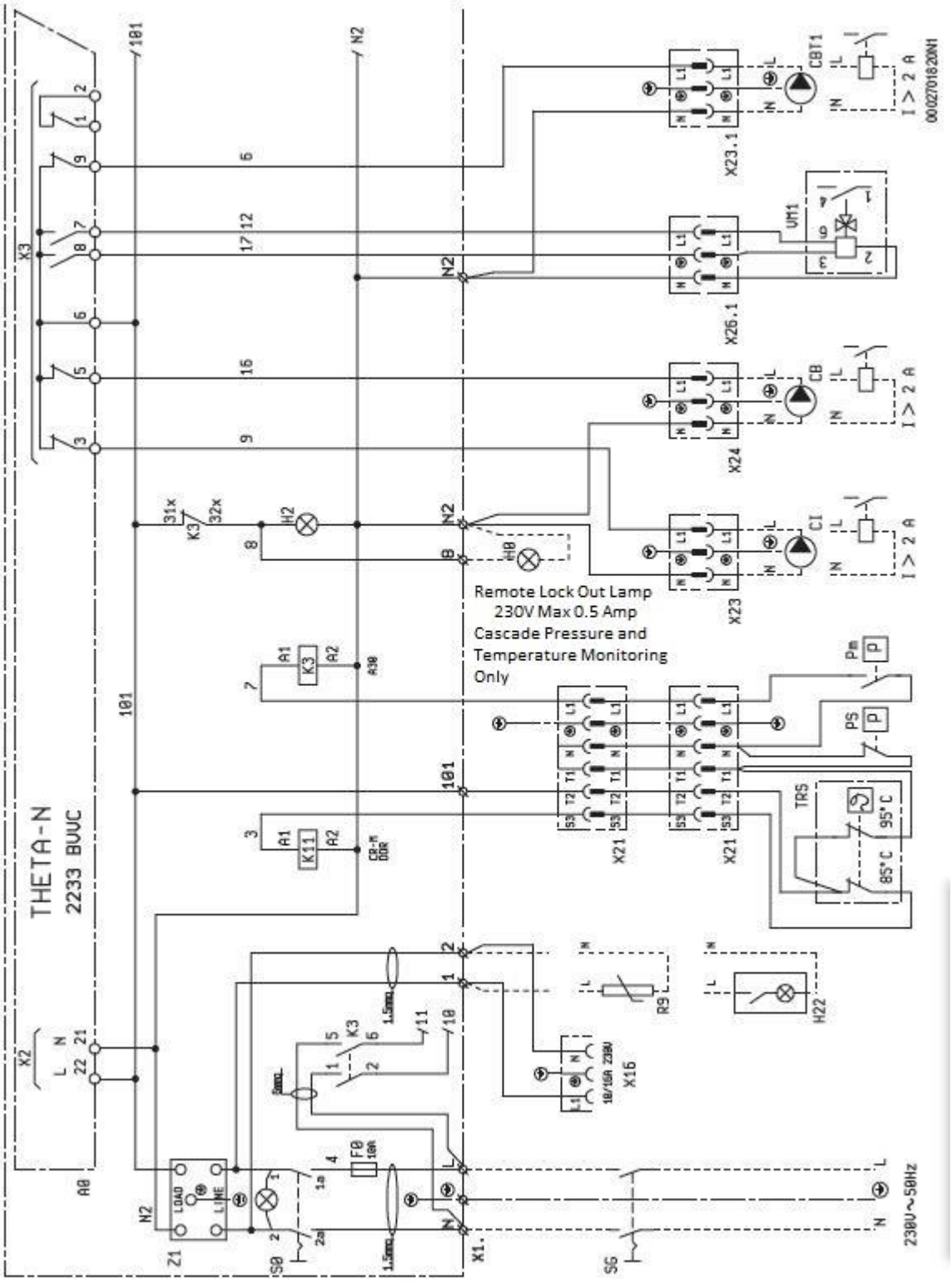
Theta Cascade Wiring Diagram



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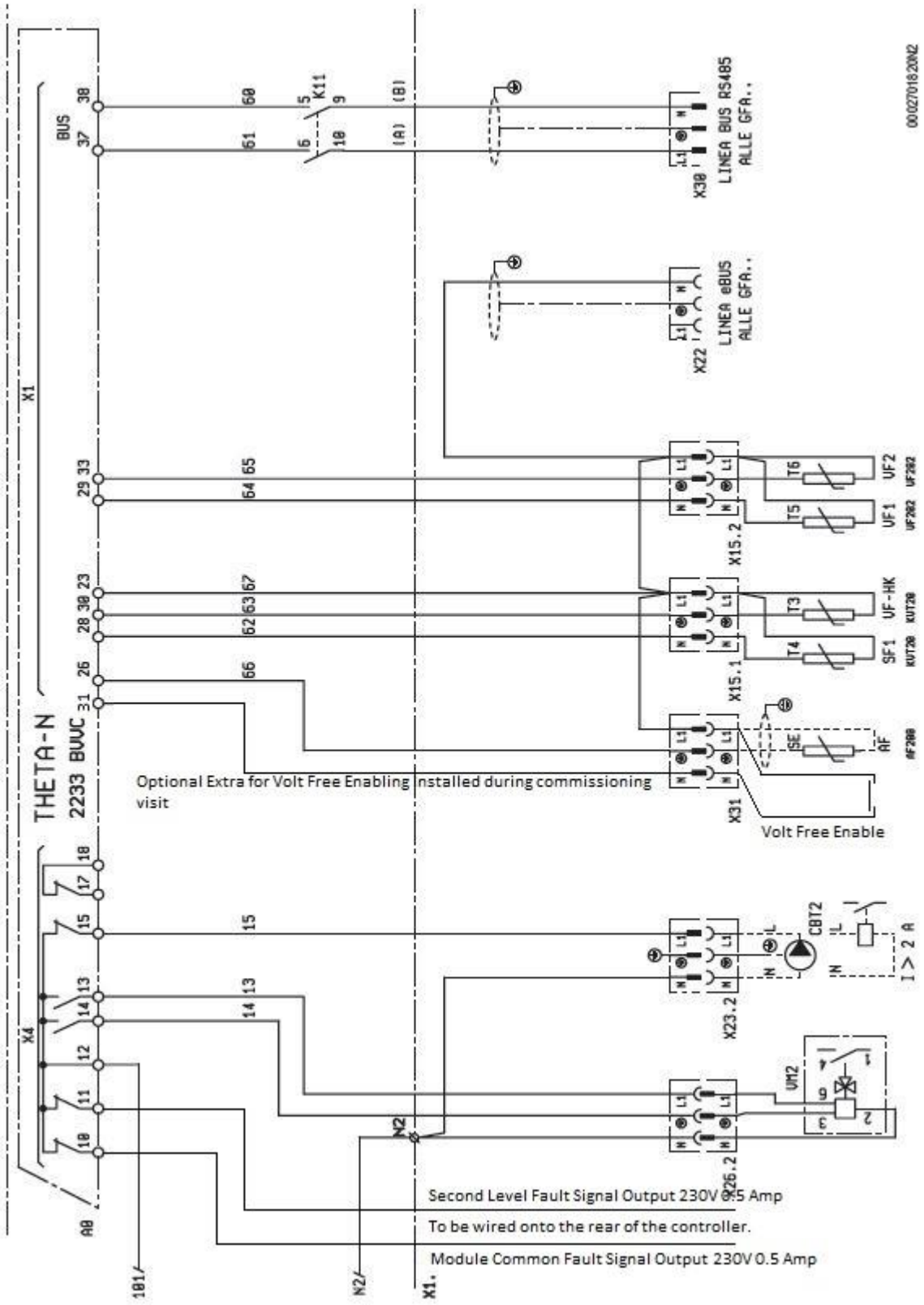

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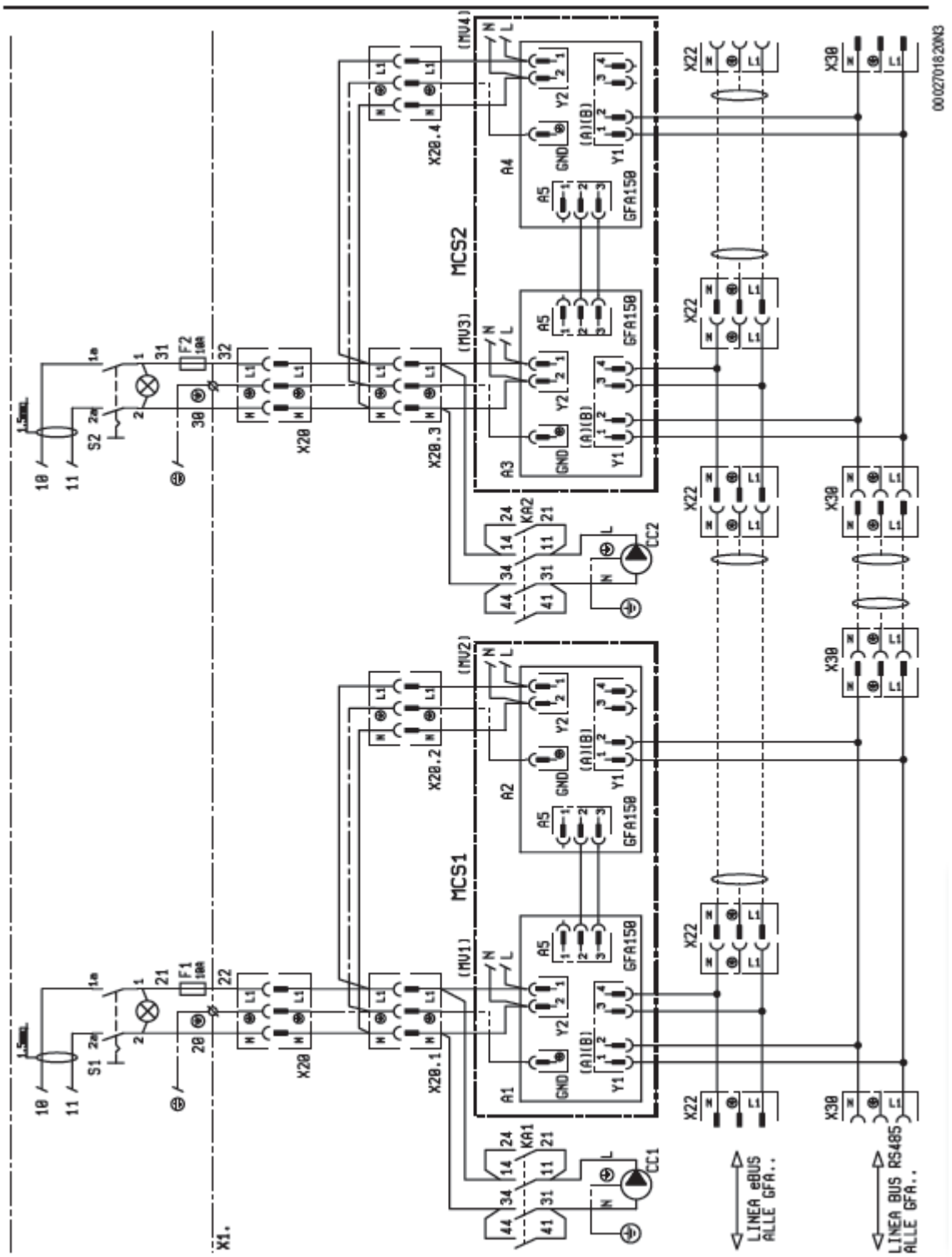
Theta Cascade Module Wiring Diagram



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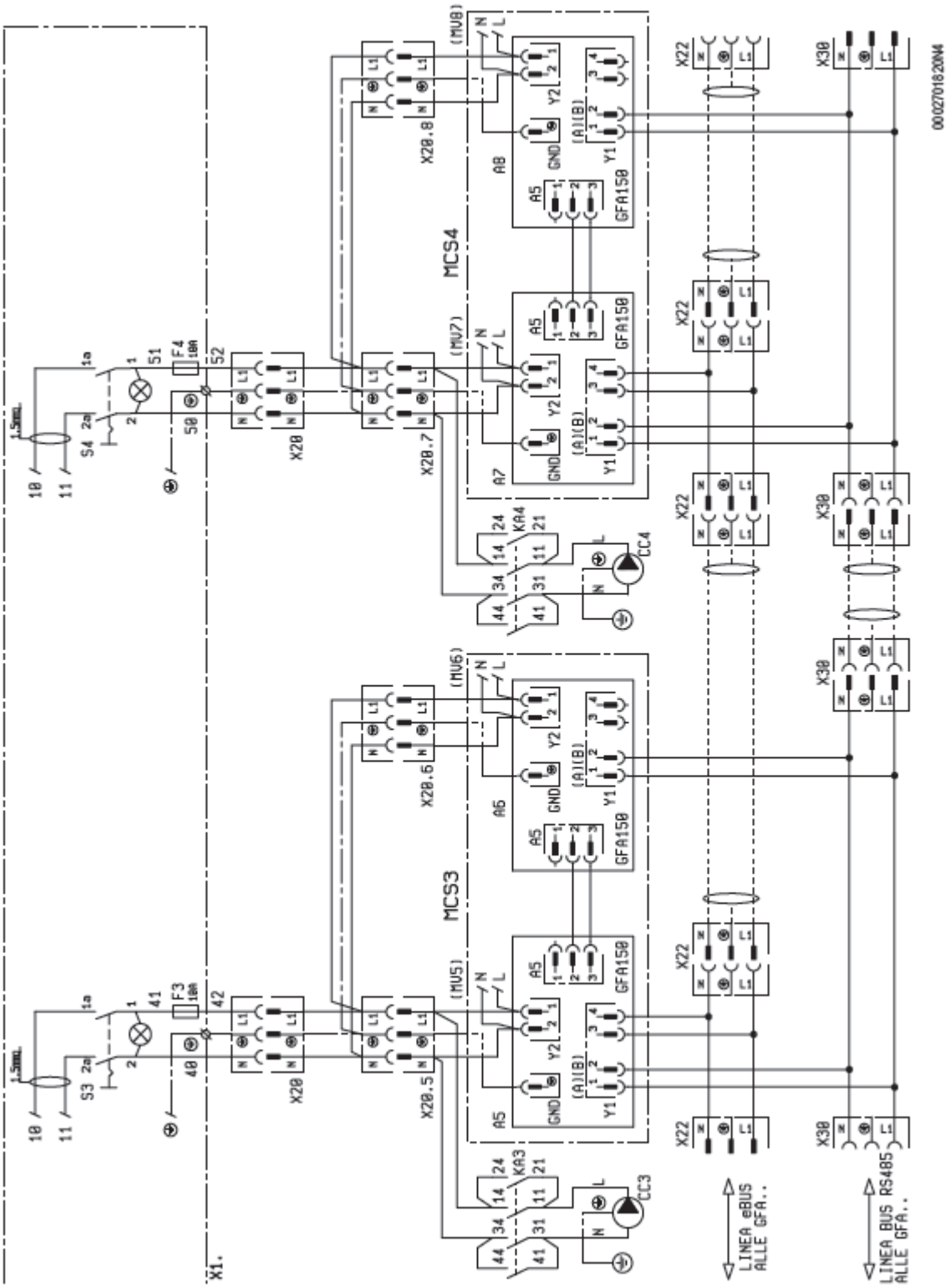

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Wiring Diagram Legend

#	Description	Location		#	Description	Location
A0	Theta Cascade Controller	Control		S1	Module 1 Main Power Switch	Control
A1	Combustion Fan Control Voltage	Module		S2	Module 2 Main Power Switch	Control
A2	Not Used	NA		S3	Module 3 Main Power Switch	Control
A3	Flow and Return Sensors	Module		S4	Module 4 Main Power Switch	Control
A4	Control & Limit Thermostats	Module		SE	Outside Air Sensor (AF)	Control
A5	Module to Module Internal Communication	NA		SG	RCD Breaker	Control
A6	Gas Valve	Module		SPA1	Module Fan Damper Switch (Upper)	Module
A7	Ignition Transformer	Module		SPA2	Module Fan Damper Switch (Lower)	Module
A8	Pump (Upper Module Only)	Module		T3	Common Flow Sensor	Control
A9	Pump Differential Switch (Upper Module Only)	Module		T4	HWS Sensor / Volt Free Enable	Control
B1	Module Rectification Electrode (Upper)	Module		T5	Mixing Zone Flow Sensor	Control
B2	Module Rectification Electrode (Lower)	Module		T6	Mixing Zone Flow Sensor	Control
CB	HWS Charging Pump (Supplied By Others)	System		TAc1	Module Ignition Transformer (Upper)	Module
CBT1	Mixing Zone 1 Pump (Supplied By Others)	System		TAc2	Module Ignition Transformer (Lower)	Module
CBT2	Mixing Zone 2 Pump (Supplied By Others)	System		TF1	Module Flue Thermal Fuse (Upper)	Module
CI	Main Heating Circuit Pump (Supplied By Others)	System		TF2	Module Flue Thermal Fuse (Lower)	Module
CC1	Module 1 Pump	Module		TM1	Module Flow Sensor (Upper)	Module
CC2	Module 2 Pump	Module		TM2	Module Flow Sensor (Lower)	Module
CC3	Module 3 Pump	Module		TR1	Module Return Sensor (Upper)	Module
CC4	Module 4 Pump	Module		TR2	Module Return Sensor (Lower)	Module
EVG1	Gas Valve (Upper Module)	Module		TRS	Module Limit Thermostat	Module
EVG2	Gas Valve (Lower Module)	Module		TSF1	Module Flue Gas Thermostat	Module
F0	Main 16 Amp	Control		TSM1	Module Control Thermostat (Upper)	Module
F1	Module 1 10 Amp	Control		TSM2	Module Control Thermostat (Lower)	Module
F2	Module 2 10 Amp	Control		VM1	Mixing Zone 1 Valve (Supplied By Others)	System
F3	Module 3 10 Amp	Control		VM2	Mixing Zone 2 Valve (Supplied By Others)	System
F4	Module 4 10 Amp	Control		X1	Main Terminal Board	Control
H0	Remote Lockout Lamp	Control		X15.1	HWS, Common Flow Sensors Plug	Control
H2	Lockout Lamp	Control		X15.2	Mixing Zone Sensors Plug	Control
H22	Control Panel Light (Optional Extra)	Control		X16	Power Supply (2 Pin, 1 Amp Max)	Control
K3	Lockout Auxiliary Relay (System Limit Controls)	Control		X20	Module Power Supply Plug	Control
K11	Lockout Auxiliary Relay (System Temperature Control)	Control		X21	System Safety Group Plug	Control
KA1	Module 1 Pump Contactor	Module		X22..	E-Bus Cascade Communication Plugs	Control
KA2	Module 2 Pump Contactor	Module		X23	Main Heating Circuit Pump Plug	Control
KA3	Module 3 Pump Contactor	Module		X23.1	Mixing Zone 1 Pump Plug	Control
KA4	Module 4 Pump Contactor	Module		X23.2	Mixing Zone 2 Pump Plug	Control
MP1	Module Pump Differential Pressure Switch	Module		X24	HWS Charging Pump Plug	Control
MV1	Module Combustion Fan Motor (Upper)	Module		X26.1	Mixing Zone 1 Valve Plug	Control
MV2	Module Combustion Fan Motor (Low)	Module		X26.2	Mixing Zone 2 Valve Plug	Control
Pm	System Water Low Pressure Switch	Module		X30	RS485 Cascade Communication Plug	Control
PS	System Water High Pressure Switch	Module		X31	Outside Air Sensor Plug	Control
PS01	Condensate Level Limit Pressure Switch	Module		Y1	Cascade Communication Terminals	Module
R9	Anti-Sludge Sensor (Optional Extra)	Control		Z1	Filter	Control
S0	Theta Controller Main Power Switch	Control				
BK	Black			BU	Blue	
RD	Red			BN	Brown	
WH	White			GR	Grey	

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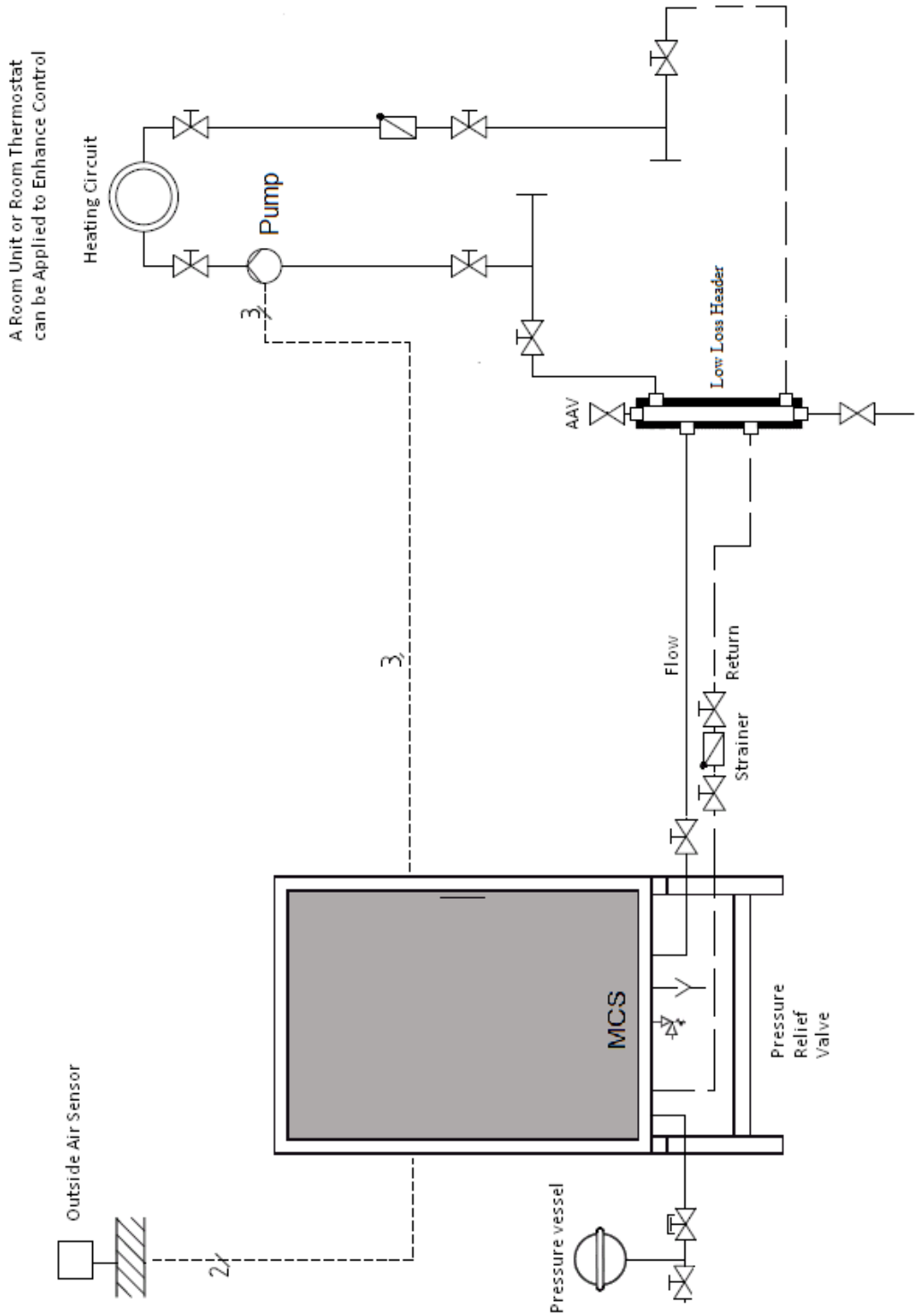
020315 Draft

Hydraulic Design Single Unit (Option 1) Heating Only (Direct on Boiler Weather Compensation.)



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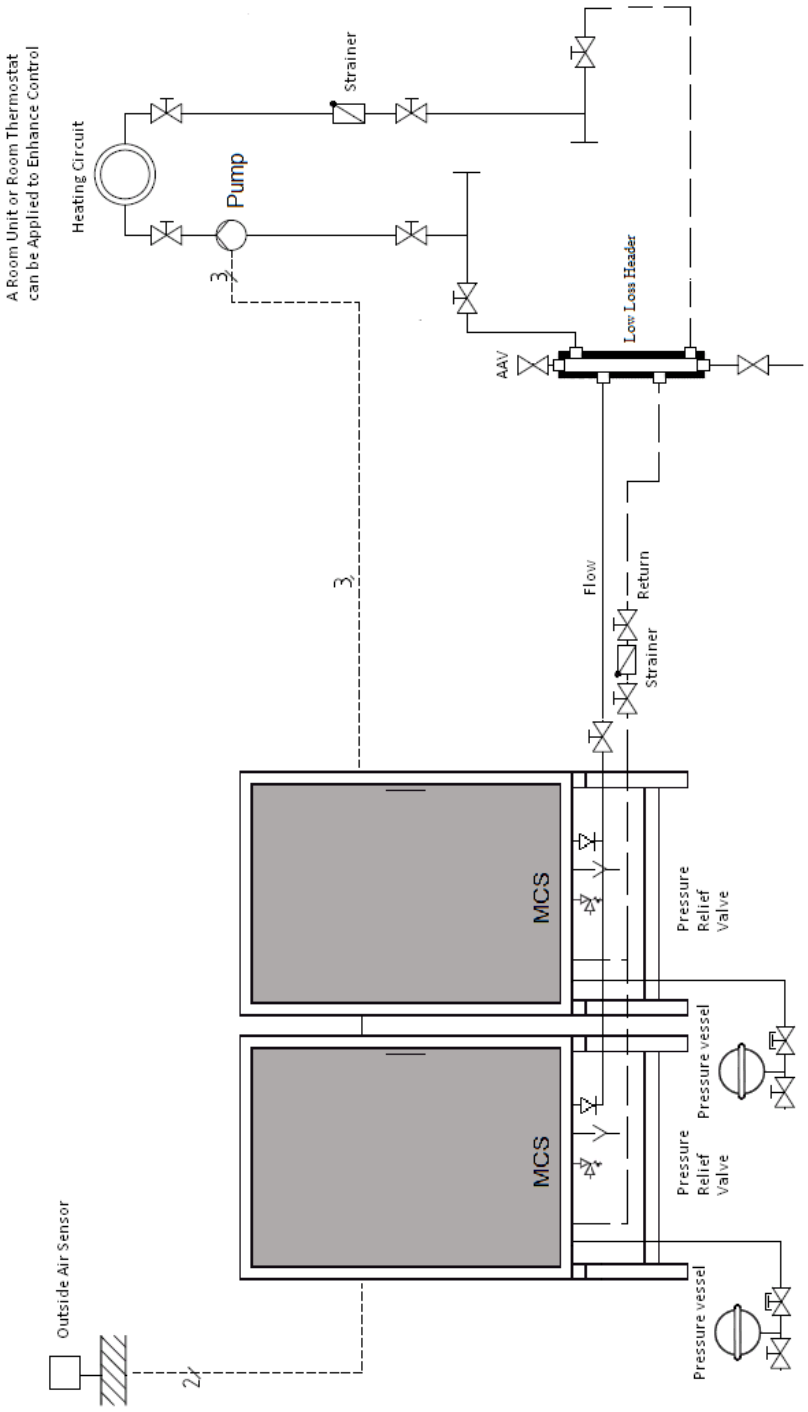
Hydraulic Design Single Units (Option 2) Heating Only (Direct on Boiler Weather Compensation.)



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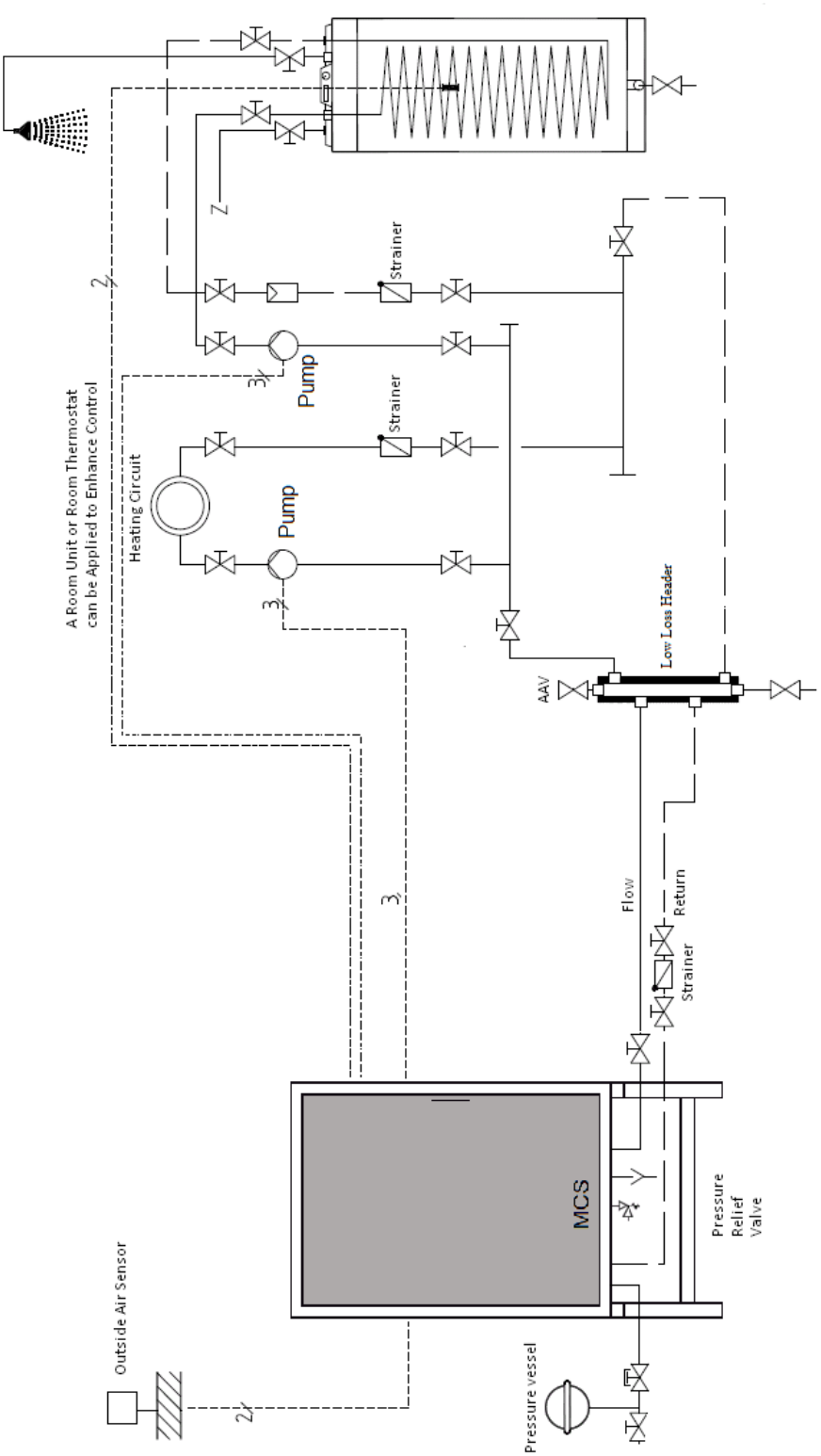
Hydraulic Design Single Unit (Option 3) Heating & HWS



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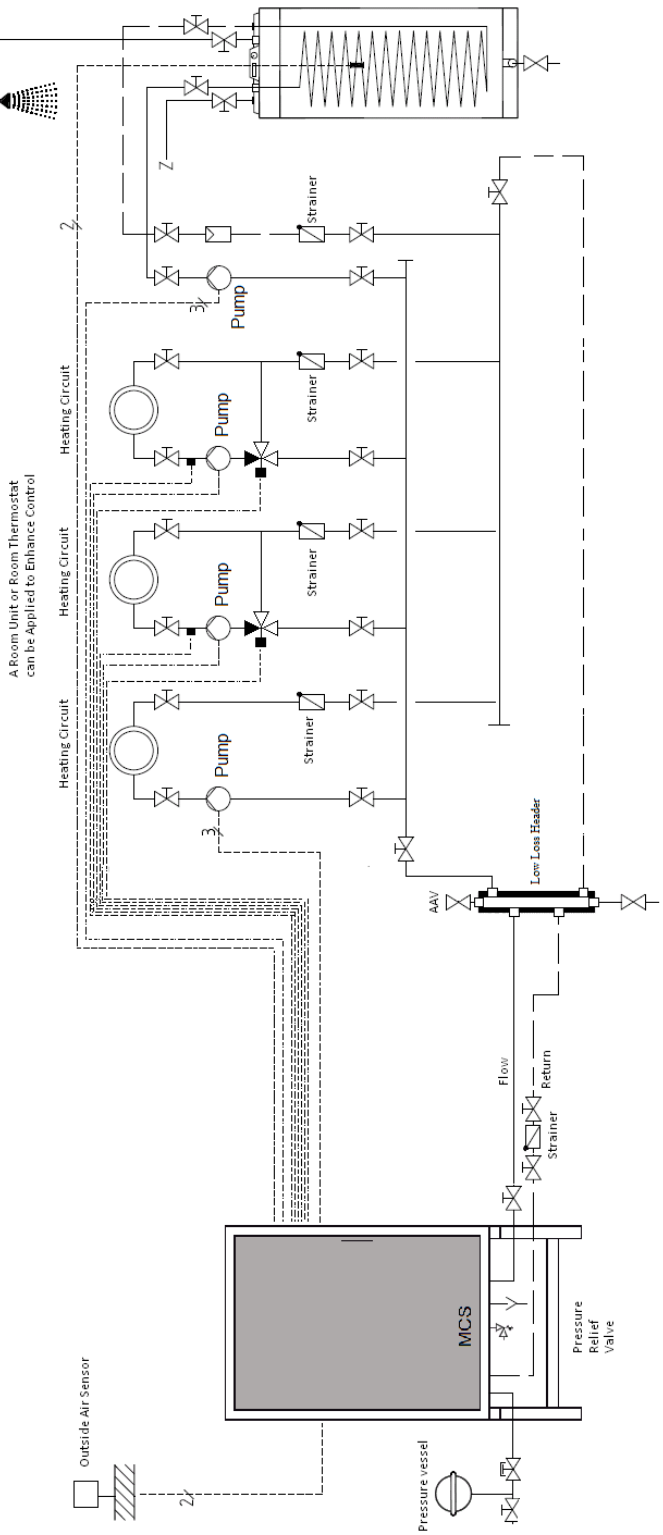
Hydraulic Design Single Unit (Option 4) Heating Multi Zone & HWS



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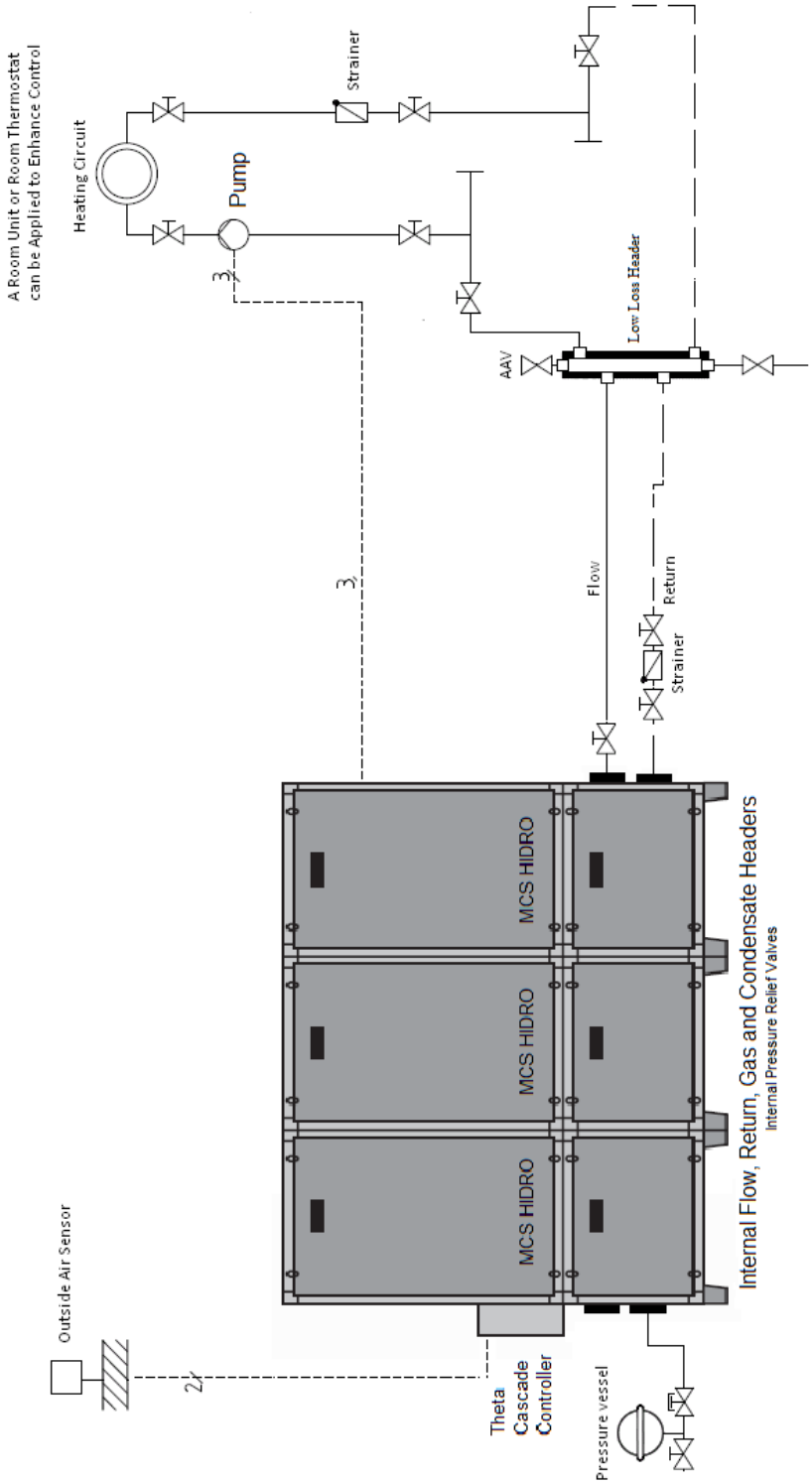
Hydraulic Design Hidro Units (Option 1) Heating Only (Direct on Boiler Weather Compensation.)



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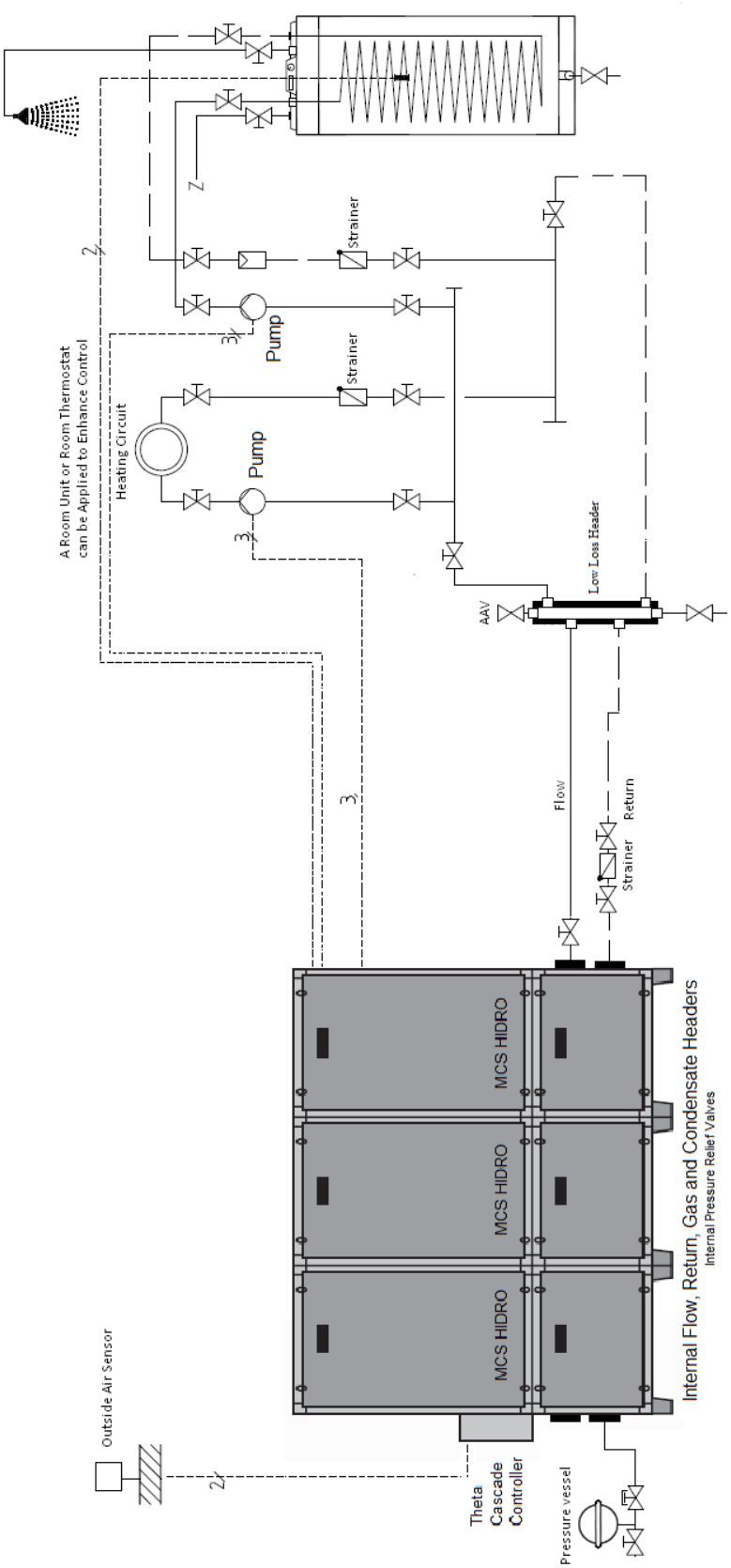
Hydraulic Design Hidro Units (Option 2) Heating & HWS



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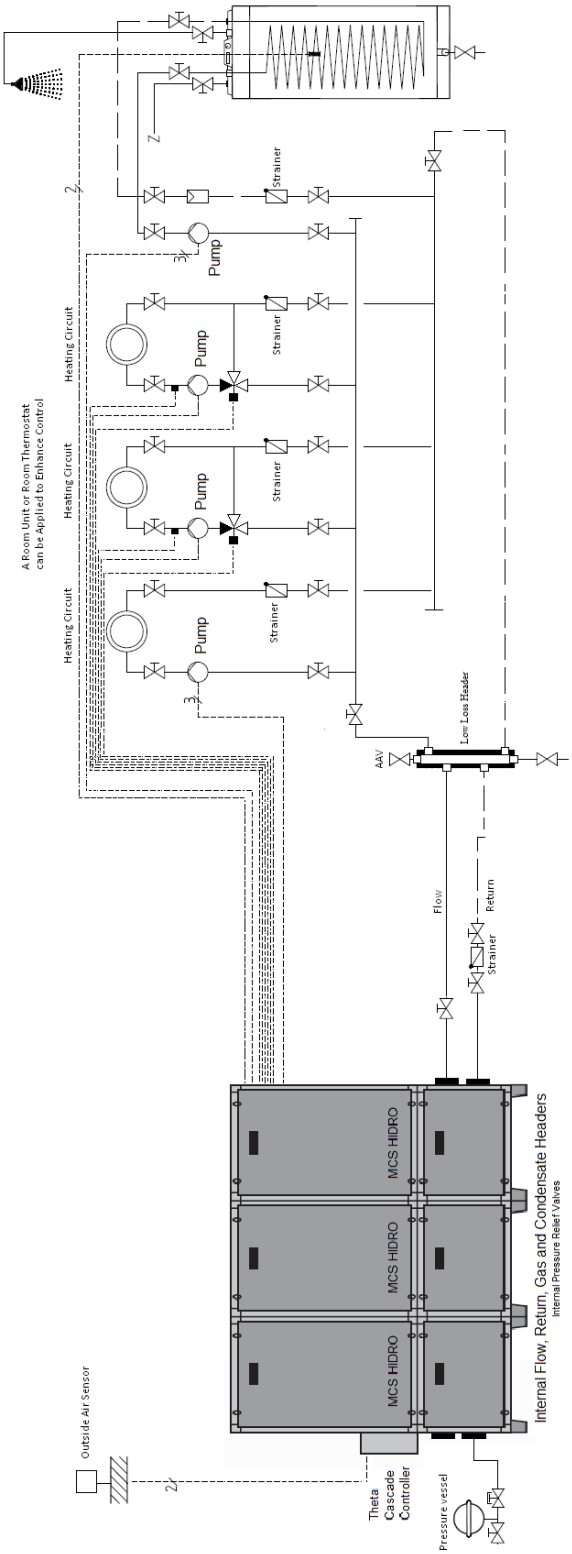
Hydraulic Design Hidro Units (Option 3) Heating Multi Zone & HWS



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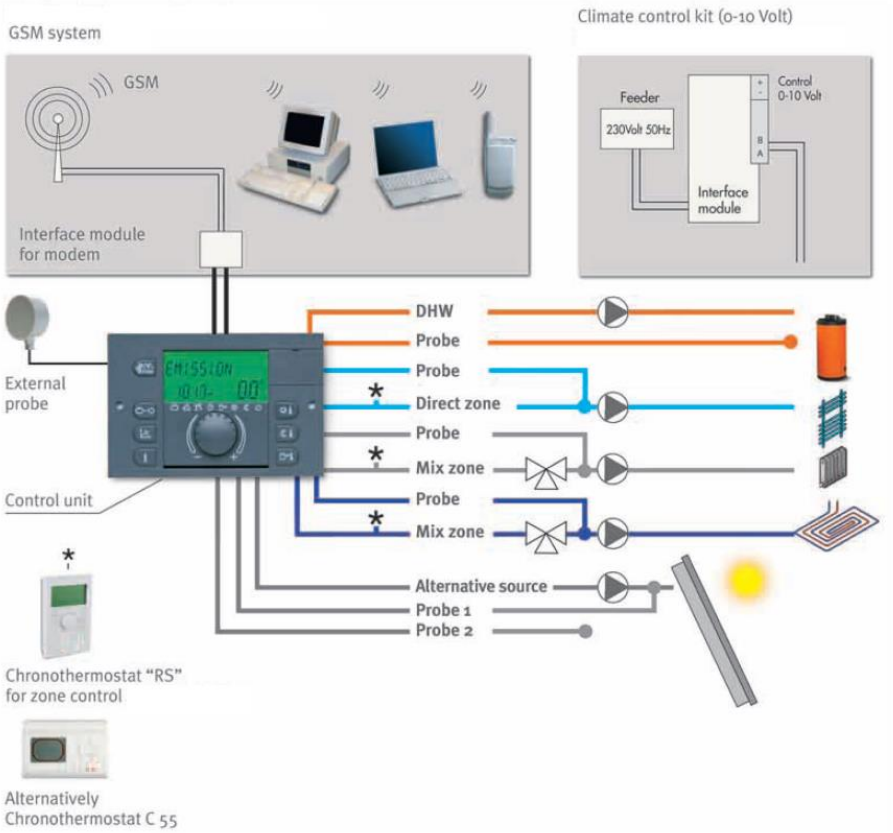
Theta Cascade Manager

The Theta Cascade Manager can be used to control up to Four ProCon MCS Single or Hidro units.
A Master Theta Cascade Manager can control up to four slave Theta controllers enabling extended control of up to Twenty ProCon MCS units.
The unit is supplied in a dedicated housing and associated sensors.
The Theta Cascade Controller can proved direct control of:
Up to Four ProCon MCS.
One Direct Heating Zone. (With Optional Room Unit. With or Without Direct on Boiler Compensation.)
Two Variable Temperate (3 Way Mixing Valve) Zones. (With Optional Room Unit. With or Without Compensation.)
Direct Hot Water Generation.
Thermal Solar Input to Domestic Hot Water Generation.
0-10 Volt Drive response.
Remote monitoring and adjustmet via The Internet (LAN) or Mobile Network (GSM)



Please refer to the separate Theta Controller manual for guidance on parameter settings.

A copy is supplied with the unit, is availible from the website or from MHG's Technical Department.

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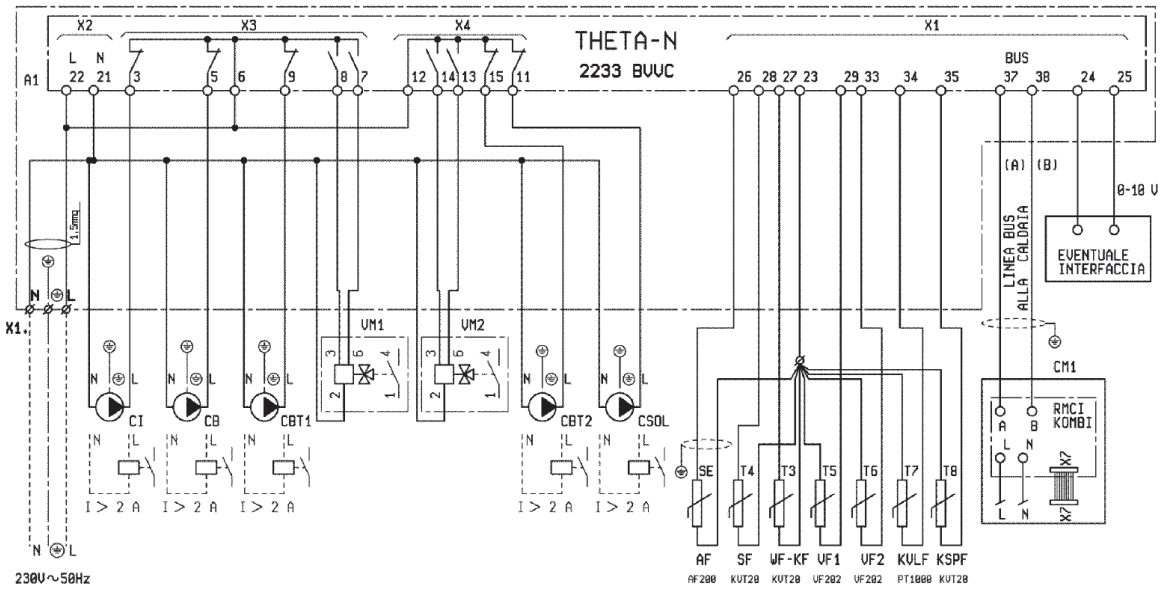
Theta Electrical Connections



Legend

#	Terminals	Plug	Description
A1	~		Theta Controller
CB	5 / N	X 24	HWS Primary Pump
CBT1 / CBT2	9 / 15	X 23.1.2	Mixing Zone Pumps
CI	3 / N	X 23	System Heating Pump
CMI	37 / 38 / N		ProCon MCS GFA Controller
CSOL	11 / N		Solar Pump
SE	26 / 23	X 31	Outside Air Sensor
T3	27 / 23	X 15.1	Common Flow Sensor
T4	28 / 23	X 15.1	HWS Sensor / Volt Free Enable
T5	29 / 23	X 15.2	Mixing Circuit 1 Sensor
T6	33 / 23	X 15.2	Mixing Circuit 2 Sensor
T7	34 / 23		Solar Collector Sensor
T8	35 / 23		Solar Buffer Sensor
VM1 / VM2	7 / 8 / 13/ 14 / N	X 26.1.2	Mixing Circuit Mixing Valves
X1	~		Low Voltage Connections
X2	21 / 22		230 Volt Input Connections
X3	~		230 Volt Output Connections
X4	~		230 Volt Output Connections
1-10 V	24 / 25		0 – 10 Volt Interface Module

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Fluing Options

Please note that excessive resistance within the flue will lead to a reduction in the output of the appliance and induce operational faults.

DN160 PPS Flue Components (Pa Resistances)	**MCS**
1955mm Flue Extension	TBC
955mm Flue Extension	TBC
500mm Flue Extension	TBC
87° Bend	TBC
45° Bend	TBC
30° Bend	TBC
DN200 PPS Flue Components (Pa Resistances)	
Exhaust Pipe Terminal	TBC
Air Pipe Terminal	TBC
1955mm Flue Extension	TBC
955mm Flue Extension	TBC
500mm Flue Extension	TBC
333mm Flue Extension	TBC
87° Bend	TBC
45° Bend	TBC
30° Bend	TBC

When flues are installed with horizontal sections/portions a 3^0 fall back to the boiler must be maintained. This will not only ensure condensate removal preventing premature seal failure, but also prevent nuisance condensate dripping from a wall termination.

Flexible Flue Options

A range of DN160 flexible flue systems are available.

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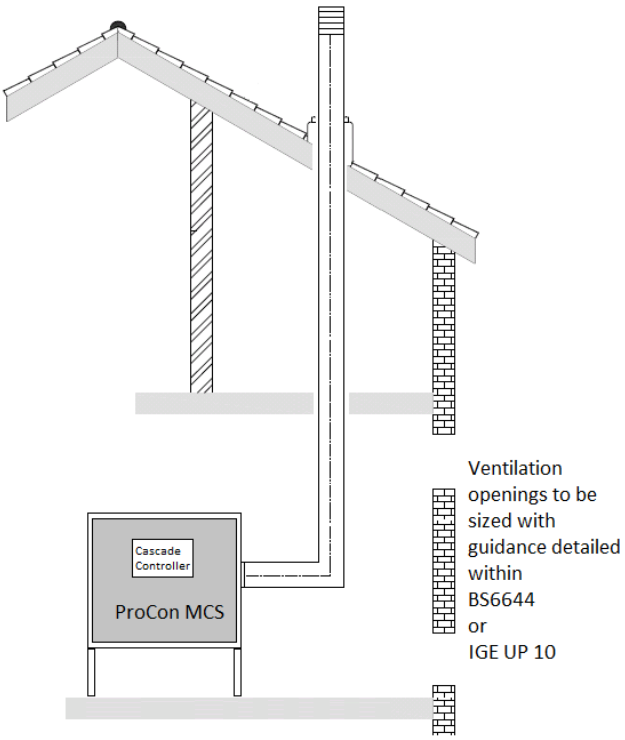
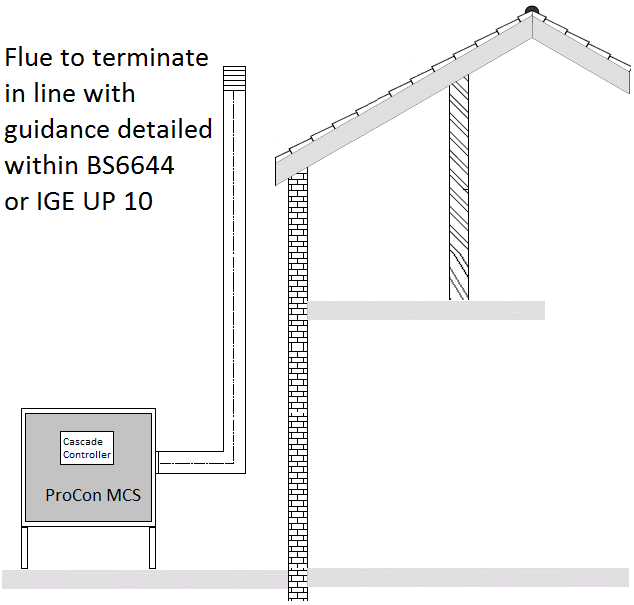
Single Unit Flue Options

Internal Boiler



External Boiler



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Air Supply, Ventilation and Balance Flue Terminal Positioning Quick Reference Guide for; BS 5440-1:2008, BS 5440-2:2009, BS 6644:2011 & IGE/UP/10 (ed3)

BS5440-2:2009. Installation and maintenance of flue and ventilation for gas appliances of rated input not exceeding 70 kW net (1st 2nd & 3rd family gases)

Open Flued Appliances Installed within a Room (Natural ventilation requirements direct to Outside Air)

Total rated net input not in excess of (70 kW – 7 kW) x 5cm^2 = Ventilation opening free area

Open Flued Appliances Installed within a compartment (Natural ventilation requirements)

Ventilation route / Grille Location	Ventilation to room or internal space (The internal space ventilated into must be ventilated as detailed above to outside air)	Ventilation direct to outside air
High Level (Free Area/kW)	10 cm^2	5 cm^2
Low Level (Free Area/kW)	20 cm^2	10 cm^2

Balanced Flued Appliances Installed within an Enclosure (Natural ventilation requirements)

Ventilation route / Grille Location	Ventilation to room or internal space	Ventilation direct to outside air
High Level (Free Area/kW)	10 cm^2	5 cm^2
Low Level (Free Area/kW)	10 cm^2	5 cm^2

Document Intended for quick guidance only. Absolute guidance must be sought from BS5440 2:2009 directly

For BS 6644 and IGE UP 10 Installations the ventilation openings might need to be increased if the following air temperatures are exceeded. (@15ºC Ambient)

High-Level (100mm Below Ceiling Level)	42C
Mid-level (1500mm Flow Floor Level)	32C
Low-Level (100mm Above Floor Level)	25C

As a guide, reduction of air temperature may be achieved by increasing the inlet and outlet air supply by 0.15 m^3/h or 0.2 cm^2/kW of net heat input per ºC of temperature reduction required

BS6644:2011 Specification for the Installation of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases)

Open Flued Appliances Installed within an Enclosure (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	5 cm^2	6 cm^2	7 cm^2
Low Level (Free Area/kW)	10 cm^2	11 cm^2	12cm^2

Open Flued Appliances Installed within a Boiler Room (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)	Heating &/or HWS Operation > 50% < 75% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)	Heating &/or HWS Operation > 75% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)
High Level (Free Area/kW)	2 cm^2 (3 cm^2)	3 cm^2 (4 cm^2)	4 cm^2 (5 cm^2)
Low Level (Free Area/kW)	4 cm^2 (6 cm^2)	5 cm^2 (7 cm^2)	6 cm^2 (8 cm^2)

Balanced Flued Appliances Installed within an Enclosure (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	5 cm^2	5 cm^2	5 cm^2
Low Level (Free Area/kW)	5 cm^2	5 cm^2	5 cm^2

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020315 Draft

Balanced Flued Appliances Installed within an Enclosure (Natural ventilation requirements to a room or internal space)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	10 cm^2	10 cm^2	10 cm^2
Low Level (Free Area/kW)	10 cm^2	10 cm^2	10 cm^2

Balanced Flued Appliances Installed within a Boiler Room (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	2 cm^2	3 cm^2	4 cm^2
Low Level (Free Area/kW)	2 cm^2	3 cm^2	4 cm^2

Document Intended for quick guidance only. Absolute guidance must be sought from BS6644 : 2011 directly.

Open Flued Appliances Installed with a Draught Diverter

(Mechanical ventilation flow rate requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level Extract (Difference Between Inlet and Extract Air)	2.07 +/- 0.18 (m^3/h/kW)	2.07 +/- 0.18 (m^3/h/kW)	2.07 +/- 0.18 (m^3/h/kW)
Low Level Inlet	2.8 (m^3/h/kW)	3.52 (m^3/h/kW)	4.24 (m^3/h/kW)

Open Flued Appliances Installed without a Draught Diverter (With or without stabilizers)

(Mechanical ventilation flow rate requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level Extract (Difference Between Inlet and Extract Air)	1.35 +/- 0.18 (m^3/h/kW)	1.35 +/- 0.18 (m^3/h/kW)	1.35 +/- 0.18 (m^3/h/kW)
Low Level Inlet	2.6 (m^3/h/kW)	3.32 (m^3/h/kW)	4.04 (m^3/h/kW)

Where high level/discharge openings are not mechanically assisted, the free area must be calculated as detailed above (Open Flued Appliances Installed within a Boiler Room (Natural ventilation requirements direct to Outside Air)

All air inlet and extract fans must be fitted with automatic controls (interlocks) causing safety shut-down or lockout of the installed gas burning appliances in the event of an inlet or extract air flow failure

Document Intended for quick guidance only. Absolute guidance must be sought from BS6644:2011 directly

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IGE/UP/10 Part 1 Edition 3 Installation of gas appliances in industrial and commercial premises

Guidance for Boiler installations with Inputs in Excess of 1.8 MW net.(2nd and 3rd family gases)

Open Flued Appliances Installed within an Enclosure (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	5 cm^2	6 cm^2	7 cm^2
Low Level (Free Area/kW)	10 cm^2	11 cm^2	12cm^2

Room Sealed Appliances Installed within an Enclosure (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	5 cm^2	6 cm^2	7 cm^2
Low Level (Free Area/kW)	5 cm^2	6 cm^2	7 cm^2

Room Sealed Appliances Installed within an Enclosure (Natural ventilation requirements Via an internal Space)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
High Level (Free Area/kW)	10 cm^2	11cm^2	12 cm^2
Low Level (Free Area/kW)	10 cm^2	11cm^2	12 cm^2

Open Flued Appliances Installed within a Boiler Room (Natural ventilation requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)	Heating &/or HWS Operation > 50% < 75% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)	Heating &/or HWS Operation > 75% time operation during summer months (Biomass/Solid Fuel Boiler Additional Free Area)
High Level (Free Area/kW)	2 cm^2 (3 cm^2)	3 cm^2 (4 cm^2)	4 cm^2 (5 cm^2)
Low Level (Free Area/kW)	4 cm^2 (6 cm^2)	5 cm^2 (7 cm^2)	6 cm^2 (8 cm^2)

1. For lighter than air gases where high and low level ventilation is not practicable and the volume of the space is equal to or greater than 1m^3 per 2kW total net input, it is permitted to install 6cm^2 per kW of total ventilation at high level only provided more than one ventilator is fitted. This is not permitted for heavier than air gasses
2. For lighter than air gases where the plant room does not exceed 1m^3 per 2kW total net heat input, ducting of ventilation air to low level without mechanical assistance is not recommended

Open Flued Appliances. Modern low radiation losses and low excess air burners

(Mechanical ventilation flow rate requirements direct to Outside Air)

System Type & Operational Time / Grille Location	Heating &/or HWS Operation < 50% time operation during summer months	Heating &/or HWS Operation > 50% < 75% time operation during summer months	Heating &/or HWS Operation > 75% time operation during summer months
Appliances with draught diverters			
High Level Extract (Difference Between Inlet and Extract Air)	2.07 +/- 0.18 (m^3/h/kW)	2.07 +/- 0.18 (m^3/h/kW)	2.07 +/- 0.18 (m^3/h/kW)
Low Level Inlet	2.8 (m^3/h/kW)	3.52 (m^3/h/kW)	4.24 (m^3/h/kW)
Appliances without draught diverters with or without draught stabilisers			
High Level Extract (Difference Between Inlet and Extract Air)	1.35 +/- 0.18 (m^3/h/kW)	1.35 +/- 0.18 (m^3/h/kW)	1.35 +/- 0.18 (m^3/h/kW)
Low Level Inlet	2.6 (m^3/h/kW)	3.32 (m^3/h/kW)	4.04 (m^3/h/kW)

Where high level/discharge openings are not mechanically assisted, the free area must be calculated at 2 cm^2/kW net input

All air inlet and extract fans must be fitted with automatic controls (interlocks) causing safety shut-down or lockout of the installed gas burning appliances in the event of an inlet or extract air flow failure

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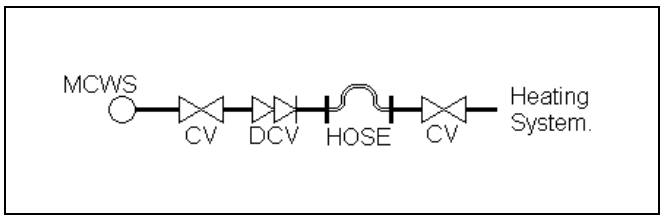
Filling The System

The Initial filling of a sealed heating system, and subsequent refilling, must be by a method that has been approved by the Water Regulation Advisory Scheme (WRAS) for that type of heating system.

i.e.	Domestic (*In-House*)	Fluid Category 3 (*C-3*)
	Non Domestic (Other than *In-House*)	Fluid Category 4 (*C-4*)

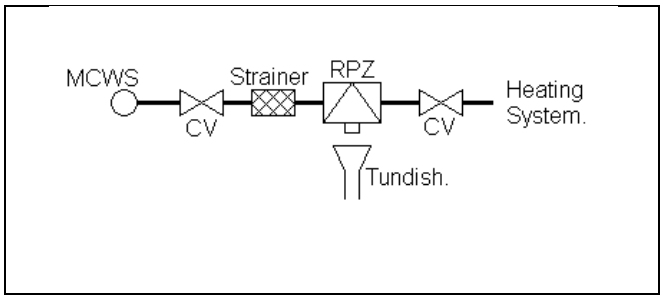
For Category 3 systems, the approved method of filling must comprise of the following components in the arrangement shown;

Control Valve incorporating a Double Check Valve on the Mains Cold Water pipework.
Temporary Connecting Hose, which must be disconnected after use.
Control Valve, on the heating system.



For Category 4 systems, the approved method of filling must comprise of the following components in the arrangement shown;

Control Valve.
Strainer.
Verifiable Backflow Device with Reduced Pressure Zone (RPZ Valve).
Incorporating a 'Type BA' Air Gap.
Tundish.
Control Valve.



Furthermore, in accordance with BS 6644: 2011 system with an input greater than 70kW (nett), an automatic water replenishment unit shall be installed to automatically replenish any lost or evaporated water.

Please refer to BS 6644: 2011 for allowable water replenishment methods for use with sealed/pressurized heating systems.

For information on a comprehensive range of pressurization units that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

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Expansion Vessel

In accordance with BS 6644: 2011, WRAS Regulations, and Local Authority Water Regulations, as applicable, the installer shall install a suitably sized, and approved, Expansion Vessel to ensure that the water capacity of the system has ample expansion capacity. In complete compliance with BS6644:2011 a tapping is provided at the base of the boiler for the connection if a dedicated expansion vessel.

The location of the expansion vessel shall only be isolatable from the system via a Lockable Type Service Valve, which shall be locked in the *OPEN* position, to prevent accidental isolation.
Furthermore, a drain facility should be provided adjacent to the expansion vessel to aid the routine maintenance, overhaul, of the vessels Air Pressure setting.

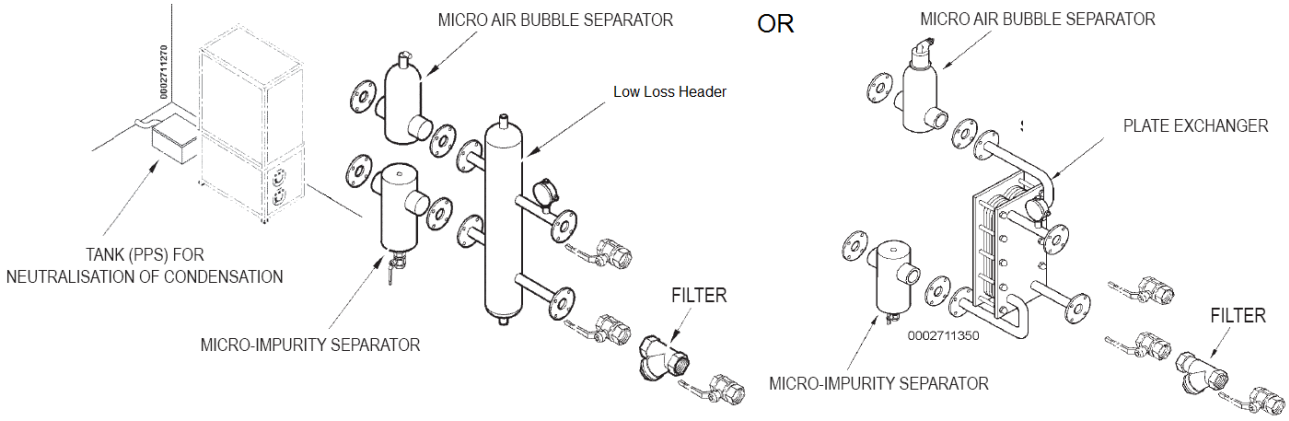
For information on a comprehensive range of expansion vessels that comply with current British Standards and WRAS Regulations, please contact MHG Heating Ltd Sales.

System Water Quality

Cleaning, flushing and water treatment must be carried out in accordance with the requirements of prevailing Building Regulations, British Standards, CIBSE Guides and related documents.

The entire system/s MUST be thoroughly cleaned and flushed to remove debris, flux residues, etc. before opening the boiler isolation valves & flooding the boiler.

Particular care must be taken where the ProCon boiler is being retro-fitted into an old/existing system, as system silt or magnetite can be very damaging to the new boiler. Consideration must be given to the installation of a MHG matched plate heat exchanger. Failing this a suitable straining/filtering device must be utilized to remove water borne debris.



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Following the cleansing and flushing the system MUST be dosed with a good quality water treatment to prevent corrosion and the formation of scale. FAILURE TO OBSERVE THESE REQUIREMENTS WILL RENDER THE WARRANTEE ON THE APPLIANCE VOID.

Repeated draining planned or via leaks and refilling of the system, without replenishment of water treatment, must be avoided, as this is very damaging to the boiler and system components.

Before activating the boiler following the initial installation or hydraulic remedial work on the system, allow the system to circulate for at least 2 hours with the boiler off. This will allow the system installed devices to capture/remove any water borne debris. (Micro Air Bubble & Impurity separators.) These devices must then be cleaned prior to commissioning the boiler. Additional device cleaning may be required during the first heating cycles.

The system water must have the following characteristics to ensure the long term operation security of all boiler and system components.

pH: ..... from 9.6 to 10.5
$Ca^{++} + Mg^{++}$: ..... below 0.5° f
$OH^- + 1/2\ CO_3^{--}$: ... from 5 to 15° f
P_2O_5: ..... from 10 to 30 mg/l
Na_2SO_3: ..... from 20 to 50 mg/l

For specific guidance on water treatment, direct contact is advisable with:-

Betz Dearborn Limited
(Sentiel)
Foundry Lane
Widnes
Cheshire
WA8 8UD
Tel: 0151 424 5351

Alpha-Fry Technologies (Fernox)
Cookson Electronics
Forsyth Road
Woking
Surrey
GU21 5RZ
Tel: 0208 665 6666

Care With The Use of Solder Flux

The ProCon MCS range has heat exchangers fabricated from 304L Stainless Steel. It is most important that the compatibility of any flux is checked with the supplier before use, and that any flux manufactures recommendations are strictly followed with regards to use in conjunction with Stainless Steel.

If you are applying any of the ProCon Range to a system where the water quality cannot be cleansed or treated please consider installing a system separation plate heat exchanger to ensure absolute separation of the system water and the boiler water.

Please refer to our website for further details on our matched brazed and gasketed plate heat exchanger range.

Appliance Controls

All appliance operational mode adjustments and settings are undertaken via the Theta Cascade Manager.

The individual modules are not equipped with display panels.

The controller can provide the following levels of information and adjustment.

- System Configuration
- Control Configuration
- Weather Compensation Configuration
- Temperature Configuration
- Speed Configuration
- Pump Configuration
- Historical Error Code Recovery

To prevent functional parameters from being altered in error they are located behind a code.

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Appliance Fault Codes

The display will read as _:__. The first digit identifies the boiler module at fault.

The figures after the : are the fault codes detailed below.

THETA Code	Reset	Description	Effect
3	Manual	Intervention of the water safety thermostat	The burner turns off and the circulating pump operates at maximum speed. The lock-out disappears and the regulator resets when the temperature detected by the water safety thermostat falls below the temperature limit
4	Manual	The ionization electrode does not detect a flame	The flame control board goes into lock-out
5	Manual	The ionization electrode does not detect the flame during operation of the burner	The ignition is repeated
6	Automatic	Maximum delivery temperature exceeded	The burner turns off and the circulating pump remains in operation
10	Manual	Internal error	The ignition of the burner is impeded
11	Manual	The ionization electrode has detected a flame before the burner has turned on	The ignition of the burner is impeded
12	Automatic	The delivery temperature sensor is interrupted or not working	The burner turns off
14	Automatic	The return temperature sensor is interrupted or not working	The burner turns off
15	Automatic	Protection for reaching the maximum Delta T permitted between delivery and return temperatures.	The burner turns off and the circulating pump remains in operation
16	Automatic	Antifreeze function	The circulating pump operates for 5 minutes at maximum speed to withdraw heat from the system
20	Manual	The ionization electrode detects the flame after the burner has turned off	The ignition of the burner is impeded
21	Manual	The combustion fan has broken and the Non Return valve has locked open	The ignition of the burner is impeded
24	Automatic/Manual	Electric fan speed out of control	The ignition is repeated when the fan speed is equal to +/-10% of that required or it attempts to start immediately by pressing the reset button
25	Manual	The fume safety thermostat has been interrupted	The burner turns off. The burner is reactivated using the RESET button after the temperature of the flue has fallen below the limit
26	Automatic	Combustion fan does not stop	The ignition of the burner is impeded
29	Manual	The condensate syphon/drain is blocked	The ignition of the burner is impeded
30	Manual	The service settings are disturbed by electromagnetic interference	The ignition of the burner is impeded
31	Manual	Safety parameters errors	The ignition of the burner is impeded
32	Automatic	The power supply is lower than 190Vac	The burner ignition procedure waits until the supply voltage is greater than 200Vac
38	Manual	The factory settings are disturbed by electromagnetic interference	The ignition of the burner is impeded
40	Automatic	An insufficient circulation of water has been detected after 10 seconds of start up	The burner turns off
41	Automatic	Presence of air in the circulating pump	None
42	Automatic	The circulating pump is blocked	Circulating pump and burner turn off
43	Automatic	Circulating pump wiring defective	The burner turns off
56	Automatic	Communication interrupted with one or more thermal modules	The ignition of the burner is impeded. The error received from the cascade eBus is not detected by the local eBus: this action leads to the blocking of the entire cascade
57	Automatic	Communication interrupted with one or more thermal module burners	The ignition of the burner is impeded. The error received from the local eBus is not detected by the local eBus: this action leads to the blocking of the entire cascade

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Converting The Appliance To Burn LPG (G31)

Unless specified at the time of ordering the appliance/s will be supplied ready to operate on a Natural Gas (G20) fuel supply.

The appliances data badge will indicate the type of fuel gas the modules have been set to operate with.

If the appliance is required to operate on LPG the following controller adjustments must be undertaken.

Boiler Type	Module Range	Fuel	Injector	CO_2 % @ Max Output	Fan Speed @ Max Output	CO_2 % @ Min Output	Fan Speed @ Min Output
MCS 210	10-100kW	Nat Gas G20	None	9.10	5600	8.90	1700
MCS 210	10-100kW	Propane G31	None	8.70	5600	8.55	1700
MCS 260	25-125kW	Nat Gas G20	None	9.10	6600	8.90	1800
MCS 260	25-125kW	Propane G31	None	8.70	6300	8.55	1800
MCS 320	30-150kW	Nat Gas G20	None	9.10	5400	8.90	1500
MCS 320	30-150kW	Propane G31	None	8.70	5200	8.55	1500
MCS 400	38-190kW	Nat Gas G20	None	9.10	5500	8.90	1500
MCS 400	38-190kW	Propane G31	None	8.70	5100	8.55	1500
MCS 535	50-249.5kW	Nat Gas G20	None	9.10	5850	8.90	1667
MCS 535	50-249.5kW	Propane G31	None	8.70	5535	8.55	1535

No mechanical restrictor / injectors are required.

Please refer to the controller adjustment section to make the necessary alteration to the fan speeds.

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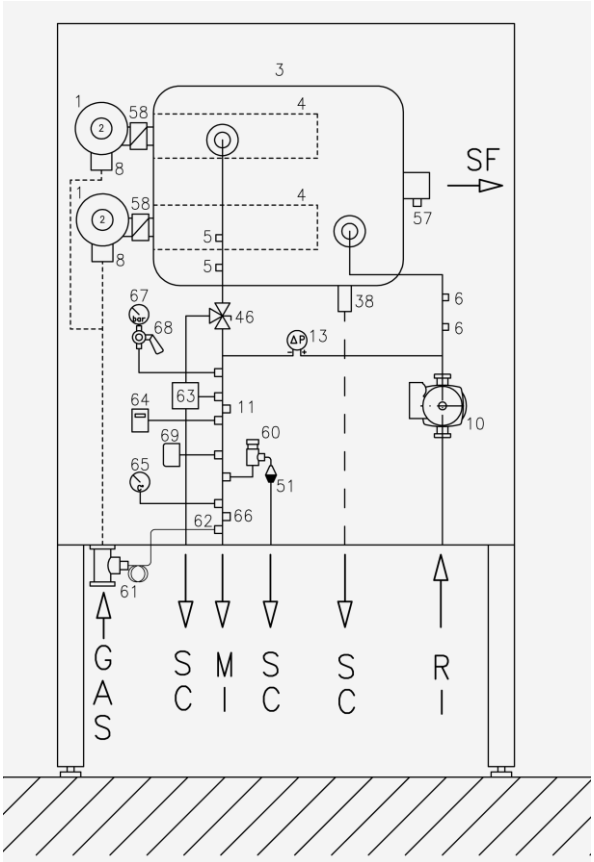
Commissioning The Appliance

Pre-Commissioning Checks

Prior to undertaking the commissioning of the unit please ensure that the system water has been cleansed and treated with a suitable inhibitor as detailed in Filling the System and System Water Quality.

Prior to applying power to the appliance its circulation pump (10) should be bled and checked to ensure free rotation of the armature and the automatic air vent (a) should be opened and allowed to vent the heat exchanger and associated pipework. Better access to the pump can be achieved by removing the air duct from the fan inlet Venturi.
Also ensure that the ignition electrodes spark gap is set to 4mm.



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Combustion System Commissioning

To ensure correct operation of the combustion system the gas valve must be set at Maximum and Minimum outputs.

The commissioning mode can be activated regardless of the operating status of the heating and how water control system. If zone or mixing valves are installed within the system ensure that these are open to allow for complete circulation of the generated heat.

The High Fire commissioning mode is activated by pressing the MODE & + buttons simultaneously.

The Low Fire commissioning mode is activated by pressing the MODE & - buttons simultaneously.

To leave the commissioning mode press the RESET button or the + & - Button simultaneously.

It is advisable to check the combustion figures on High and Low Fire prior to carrying out any adjustments.

Adjusting the High Fire has a marked effect on the Low Fire figures. Where as adjusting the Low Fire has little effect on the High Fire figures.

The High fire adjustment is carried out via red sheathed screw (4).

The High Fire adjustment is a Gate type restrictor.

Therefore turning the screw clockwise will close the Gate and thus restrict the quantity of gas passing through to the burner.

The Low fire adjustment is carried out via the 4mm TORX head (2).

The Low Fire adjustment is a diaphragm governor.

Therefore turning the screw clockwise will increase the pressure on the diaphragm and thus increase the quantity of gas passing through to the burner.

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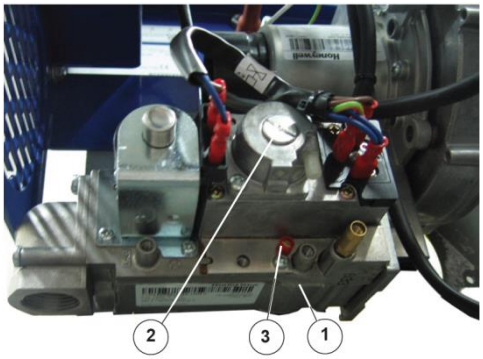
MCS 210 & 260 Valve Adjustment

Legend

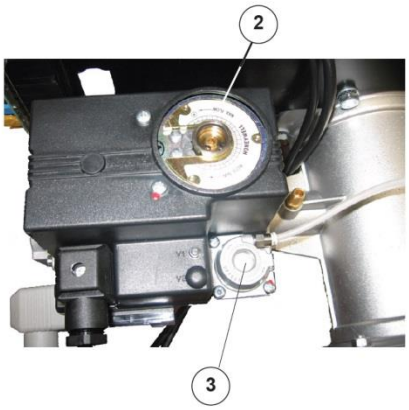
1. Gas Valve Assembly
2. High Fire Adjuster (Gate Type) (Make small adjustments only)
3. Low Fire Adjuster (Governor Type) (Under dust cap)



MCS 320, 400 & 535 Valve Adjustment

Legend

2. High Fire Adjuster (Gate Type) (Make small adjustments only)
3. Low Fire Adjuster (Governor Type) (Under dust cap)



A flue gas analyser must be used to ensure that the correct combustion setting is achieved.

This is undertaken by inserting the analyser's probe in to plugged hole within the flue collector of the appliance or in the tapping in the flue immediately above the appliance if present.

The combustion setting required for all ProCon appliances are as detailed in the following table.

Boiler Type	Module Range	Fuel	O2% at pmax	CO_2 % at Max Output	O2% at pmin	CO_2 % at Min Output
MCS 210	10-100kW	Nat Gas G20	4.8	9.10	5.2	8.90
MCS 210	10-100kW	Propane G31	5.5	8.70	5.8	8.55
MCS 260	25-125kW	Nat Gas G20	4.8	9.10	5.2	8.90
MCS 260	25-125kW	Propane G31	5.5	8.70	5.8	8.55
MCS 320	30-150kW	Nat Gas G20	4.8	9.10	5.2	8.90
MCS 320	30-150kW	Propane G31	5.5	8.70	5.8	8.55
MCS 400	38-190kW	Nat Gas G20	4.8	9.10	5.2	8.90
MCS 400	38-190kW	Propane G31	5.5	8.70	5.8	8.55
MCS 535	50-249.5kW	Nat Gas G20	4.8	9.10	5.2	8.90
MCS 535	50-249.5kW	Propane G31	5.5	8.70	5.8	8.55

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Fan Speeds and Modulation rates

Fan Speed @ Max Output	Fan Speed @ Min Output	Module Ignition Rate	Output of 1st Module During Ignition of 2nd
5600	1700	55%	70%
5600	1700	55%	70%
6600	1800	55%	70%
6300	1800	55%	70%
5400	1500	55%	70%
5200	1500	55%	70%
5500	1500	55%	70%
5100	1500	55%	70%
5850	1667	55%	70%
5535	1535	55%	70%

Routine Inspection and Servicing

As with all Gas Appliances, we would highly recommended that a competent heating engineer services the ProCon MCS, at least every 12 months. This is assuming a normal daily usage of 8 – 10 hours.
If however the boiler is to be operated 24 hours a day, 7 days a week, we would recommend services every 6 months.

If the Installer/Commissioning Engineer is unable to undertake the Routine Service Inspection, as detailed in the following, please contact the MHG Technical Department, who will be able to arrange the Routine Service Inspection to be undertaken.

Routine Service Inspection

Before commencing any service/maintenance work, the following tasks must be undertaken.

a) Ask the end user about any problems with the operation of the boiler unit and note their comments.
b) Check the water pressure of the installation.
c) Remove the boiler casing and visually inspect all pipe and water joints for signs of leakage.
d) Inspect the top of the casing and the top of the heat exchangers for signs of water leakage or ingress.
e) Run the unit in Commissioning Mode HIGH FIRE; with the use of a flue gas analyzer record the CO_2 level.
f) Run the unit in Commissioning Mode LOW FIRE; with the use of a flue gas analyzer record the CO_2 level.
g) Listen to the sound of the combustion fan. Utilizing the appliances fascia review the units Operating Error Codes, and note the recorded codes onto the Service Report.
h) Undertake a System Water Analysis to check the concentration level of the Water Treatment, and note the level onto the Service Report.
i) Check the flue route including the terminal position for conformity with prevailing regulations, and trim back any foliage that may be around the terminal.
j) Check the plant room/compartment ventilation system for conformity with prevailing regulations.
k) Check the Pressure (Safety) Relief Valve size, rating and orientation, for conformity with prevailing regulations.

The results of the Inspections undertaken above must be acted upon, and all discrepancies should be recorded on the Service Report and brought to the Client / End User's attention.
Undertake any maintenance, and if necessary any preventative maintenance, that's required.

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Routine Cleaning & Maintenance

As part of the Routine Service Inspection, certain areas of the boiler need to the checked and cleaned as necessary.

a) Turn the boiler OFF at the ON/OFF switch and electrically isolate the boiler by removing the plug or fuse from the boiler supply.
b) Turn off the gas at the boiler isolation tap, fitted by the installer, adjacent to the appliance.
c) Remove the electrical connections, Gas valve balancing pipe and air inlet duct from the units fan assemble.
d) Disconnect the earth lead, HT cap and Lead from the ignition electrodes.
e) Loosen and disconnect the inlet gas supply form the gas valve. (Inspect and clean the inlet filter of the gas valve.)
f) Disassemble the burner by removing the six M6 nuts around the burner door, using a 10mm Spanner. Pull the burner forward and remove from the heat exchanger. Gently put to one side.
g) Once access has been gained to the combustion chamber and lower heat exchanger, visually inspect the heat exchanger coils.

   It is usually only necessary to clean the lower section of the heat exchanger. If server deposits are found, the upper section of the heat exchanger should also be checked and cleaned, which may necessitate the removal of the heat exchanger from the boiler.

   If any coils appear to be significantly dis-coloured, then a blockage of either scale, magnetite, or general system debris has occurred which will have allowed excessive overheating to have occurred within the coil. If dis-colouration has occurred, then specialist de-scaling of the heat exchanger will be required, however, stress cracking may have occurred, and the heat exchanger may become porous following the de-scale works.
h) If the heat exchanger has not suffered from dis-colouration, as 'Item g' above, then a Standard Service can be undertaken. Using a natural bristled brush ONLY, remove the worst of the mineral/debris build up. With the use of the dissolved *ProCon Combustion Chamber Cleaning Granules*, spray the solution onto the heat exchanger surface and leave for approximately 5 minutes. This will help to remove any stubborn mineral deposits and clear the condensate drain connections. Finally brush the heat exchanger whilst rinsing thoroughly with copious amounts of fresh water. *ProCon Combustion Chamber Cleaning Granules* are available from MHG Heating Ltd Spares Department.

   A STEEL OR PVC BRUSH MUST NOT BE USED TO CLEAN THE HEAT EXCHANGER.
i) Following the cleaning of the Heat Exchangers, the condensate syphon must be flushed to ensure that all mineral deposits/debris that has been washed from the heat exchanger surface is correctly removed. Open the syphon cleaning point cap at the base of the boiler, with a suitable receptacle directly below to collect the syphon contents. Safely dispose of the contents of the syphon. Replace the receptacle below the cleaning point and poor 2 litres of clean tap water into the heat exchanger, which will drain through the cleaning point. Refit the cleaning point cap and poor one litre of clean tap water into the heat exchanger to ensure the syphon is re-flooded. Check the cleaning point cap for leaks.
j) Visually check the burner surface for signs of damage and debris build-up. Remove any debris build up with compressed air. If excessive debris build-up is identified, the burner lance should be removed and the inner metal surface should be washed and cleaned.

   A BRUSH, OF ANY KIND, MUST NOT BE USED TO CLEAN THE BURNER SURFACE.

   If damage has occurred to the burner surface, the burner MUST be replaced.
k) To ensure that the rectification circuit operates correctly the resistance between the burner and burner door must be check with a multi-meter to ensure that it is less than 1 Ohm (<1 Ohm.)

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l) Clean with abrasive material and inspect the ignition electrode. Replace if necessary. Adjust the spark gap to 4mm.

m) Check the combustion fan blades for debris build-up. Remove any debris with a soft bristle brush or preferably compressed air.

DO NOT TOUCH OR SPIN THE FAN BLADES WITH YOUR FINGERS AS THIS COULD AFFECT THE BALANCING OF THE FAN BLADES.

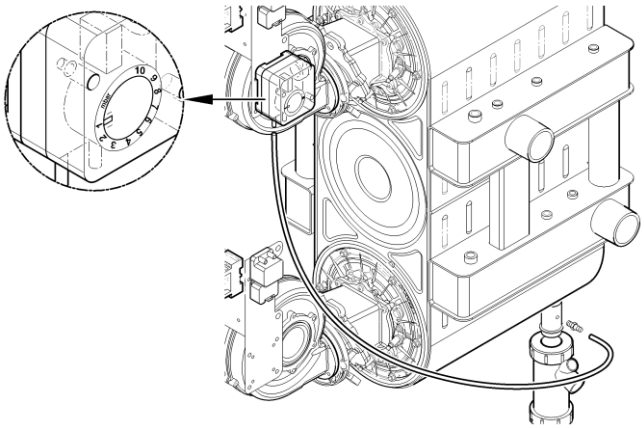
n) Re-fit the Burners, in the reverse order of dismantling, ensure that all electrical connections are correctly and securely connected.

o) Inspect all water joints. Any joints found to be leaking MUST be replaced. It is also advisable when replacing water joints to also change any adjacent joints at the same time.

p) Inspect all gas joints with a suitable leak detection method. Any joints found to be leaking MUST be replaced. It is also advisable when replacing gas joints to also change any adjacent joints at the same time.

q) Via the tappings on the boiler connector adapter, elbow or straight a flue gas recirculation check must be undertaken when the boiler is operating on high and low fire modes.

r) Drain and clean the condensate syphon assembly. Check the operation of the level pressure switch.



s) If fitted inspect and clean the condensate neutralising tank, replenishing the neutralising granules as required. Granules available from MHG Heating Ltd Spares Department.

t) With the use of a suitable Flue Gas Analyser, check and adjust the combustion settings, as detailed in the previous commissioning section.

u) Inspect the general condition of the flue system, including the termination, repair as necessary or advise on any remedial action as required.

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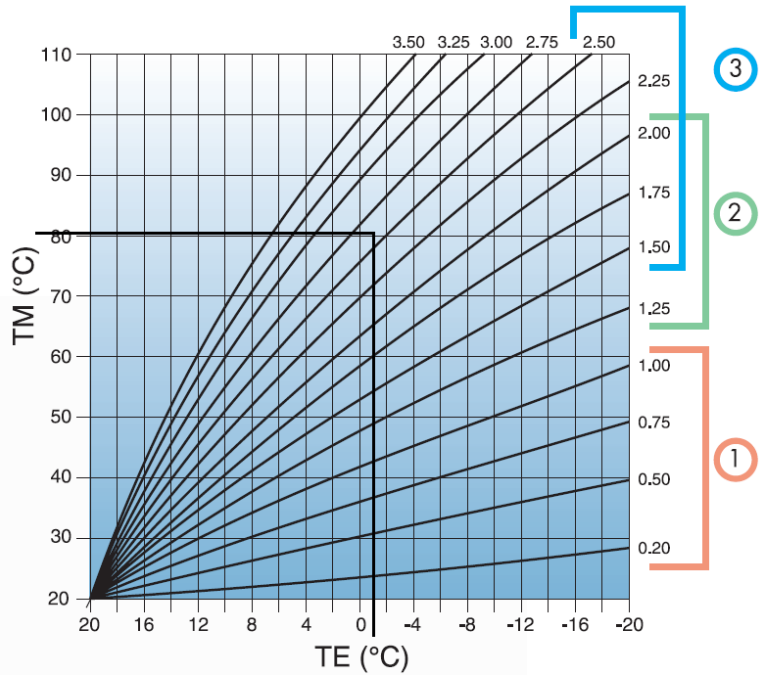
Weather Compensation Slope

System Flow Temperature



Outside Air Temperature

1 = Under Floor Heating

2 = Radiator Heating

3 = Convector Heating

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Programing a Replacement GFA Module Controller

Replacement GFA Module controller are supplied for use in any location within the cascade.

The GFA module control will require programming prior to re-commissioning the combustion.

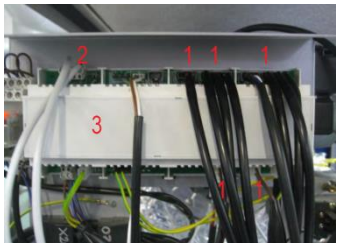
A cascade communication error message will be displayed if the following process is not undertaken.

Prior to undertaking any work with a PCB please earth yourself by touching a secure earth connection within the boiler.

1. Check the build version of the Theta Controller. Data Badge on Rear of unit. This must be >E05.

2. Check the software version of the Theta Controller by switching the unit ON and pressing and holding the “I” Button. The version must be 20:03 V 3.3 or greater.

3. Electrically isolate the Theta Controller and all or the modules.
   Disconnect the module electrical connections. Dedicated plugs are used to prevent misapplication.



1, Locking Tab connectors. 2, BUS 1 Connectors, 3 GFA Controller Housing

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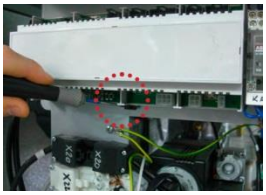
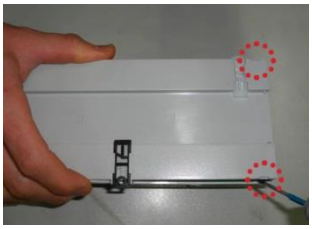
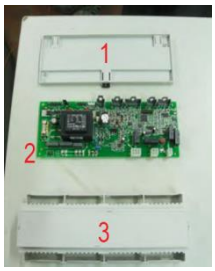
4. Release the GFS controller from the DIN rail using a flat bladed screw driver.



5. Open the GFA controller housing using a flat bladed screw driver.

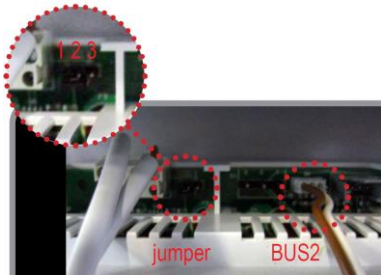


6. Install the GFA PCB within the existing GFA housing.



1, bottom housing 2, New GFA PCB 3, Top Housing.

7. Clip the new controller on to the DIN rail and reconnect the dedicated plug assemblies. Special attention needs to be paid to the JUMPER location and the connection of the BUS2 plug. This must be located between PIN 1 & 2 (Counted from the left)



Each new controllers must now be allocated a cascade address via the Theta controllers.

****This must take place one at a time!!!****

Leave the X20 connected to the newly replaced GFA Module controller.

All existing GFA Module controllers within the cascade must be disconnected from the power supply by removing all other Plug X20s

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Apply power to the new GFA module controller.

Set the Theta Controller to STANDBY

Press and hold the  and  buttons simultaneously for 3 seconds.

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User Information

The ProCon's display panel provides operational information and a means of adjusting the unit to provide the required level of heating and hot water generation.

Following the powering up of the appliance a series of internal checks are undertaken,
This can take a number of minutes.

If the unit fails to operate and displays an error code please make a note of the code prior pressing the RESET button.
If site support is required the noting of the error code will assist with the fault diagnosis and the provision of suitable replacement components if required.
If the cause of the operational error has not been rectified the boiler will display a further error code following a period of up to 5 minutes during which time the unit is undergoing an internal diagnosis process.

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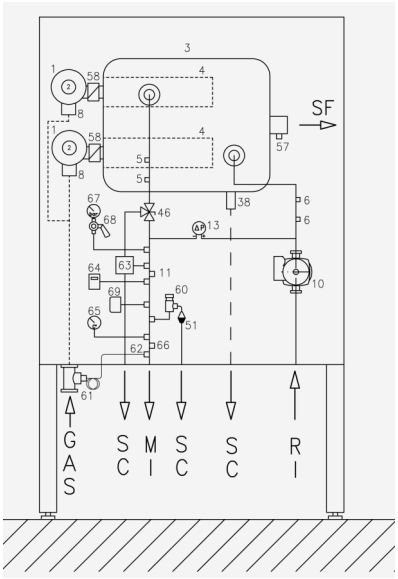
Operational Diagram ProCon MCS



Legend

Item	Description
MI	Boiler Flow
GAS	Gas Inlet
SC	Condensate Outlet
RI	System Return
1	Combustion Fan
2	Air Gas Mixing Venturi
3	Heat Exchanger
4	Premix Burner
5	Flow Sensor NTC 1
6	Return Sensor NTC 2
7	Gas Valve
8	Automatic Air Vent
9	Boiler Pump
10	Minimum System water Pressure Switch
11	Pressure Relief Valve
12	Control Panel
15	Outside Air Sensor
16	Condensate Trap
17	Pressure Gauge
18	Tundish
19	Flue Gas Analyser Test Point
20	Flue Gas Thermostat

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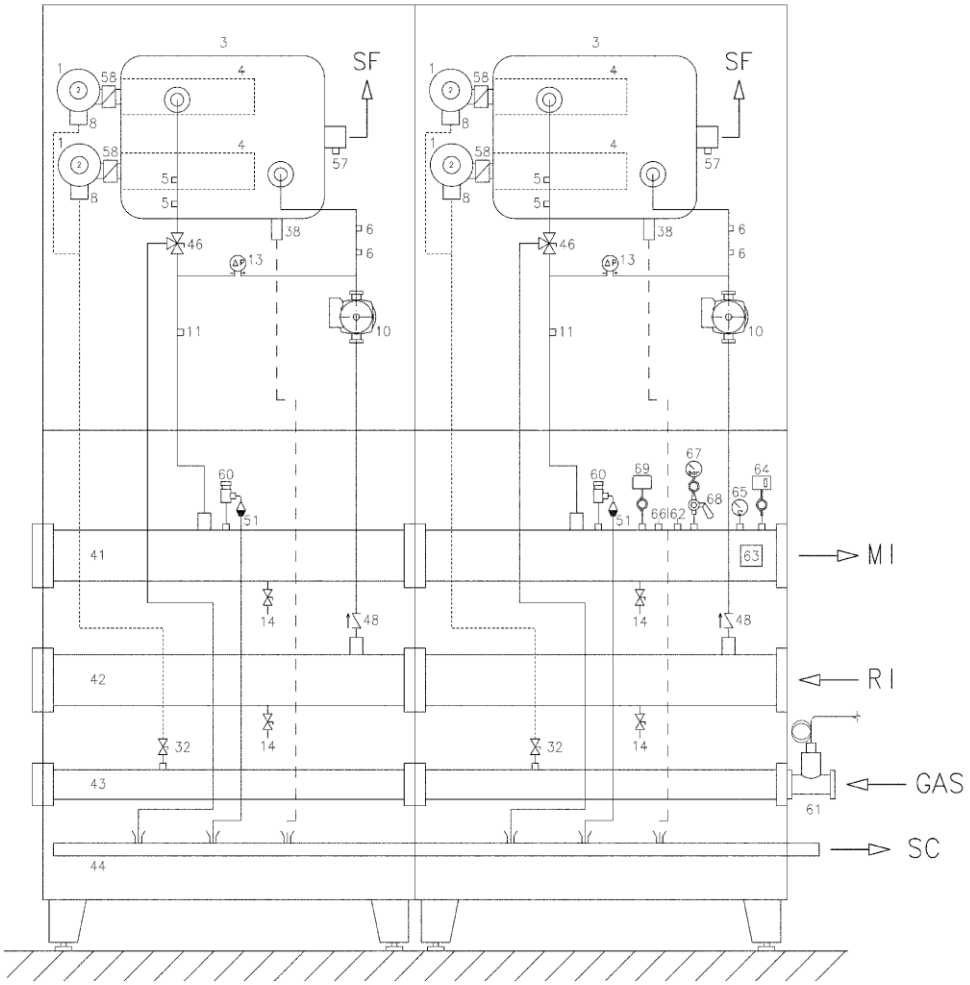
Operational Diagram ProCon MCS Hidro Two Unit



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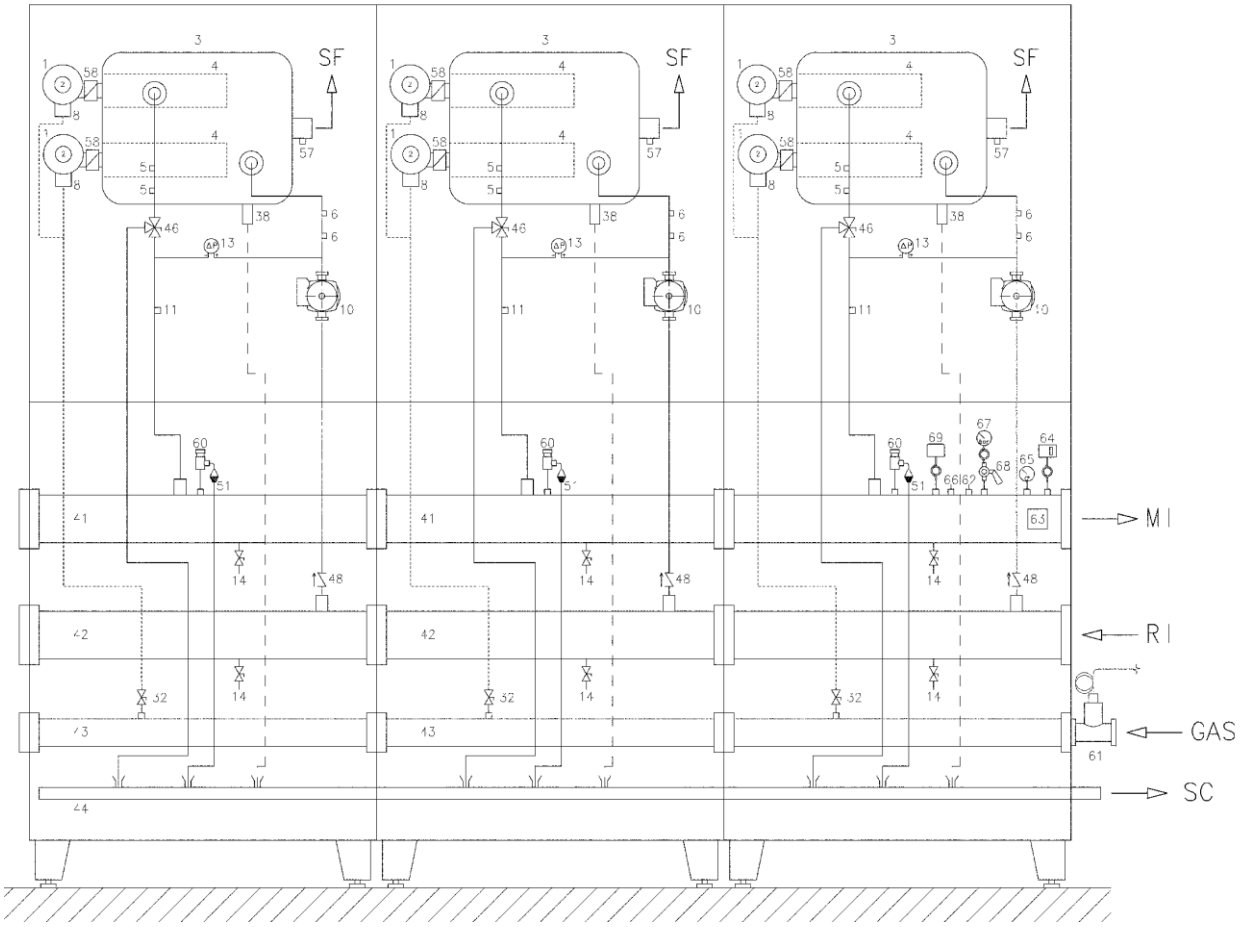
Operational Diagram ProCon MCS Hidro Three Unit



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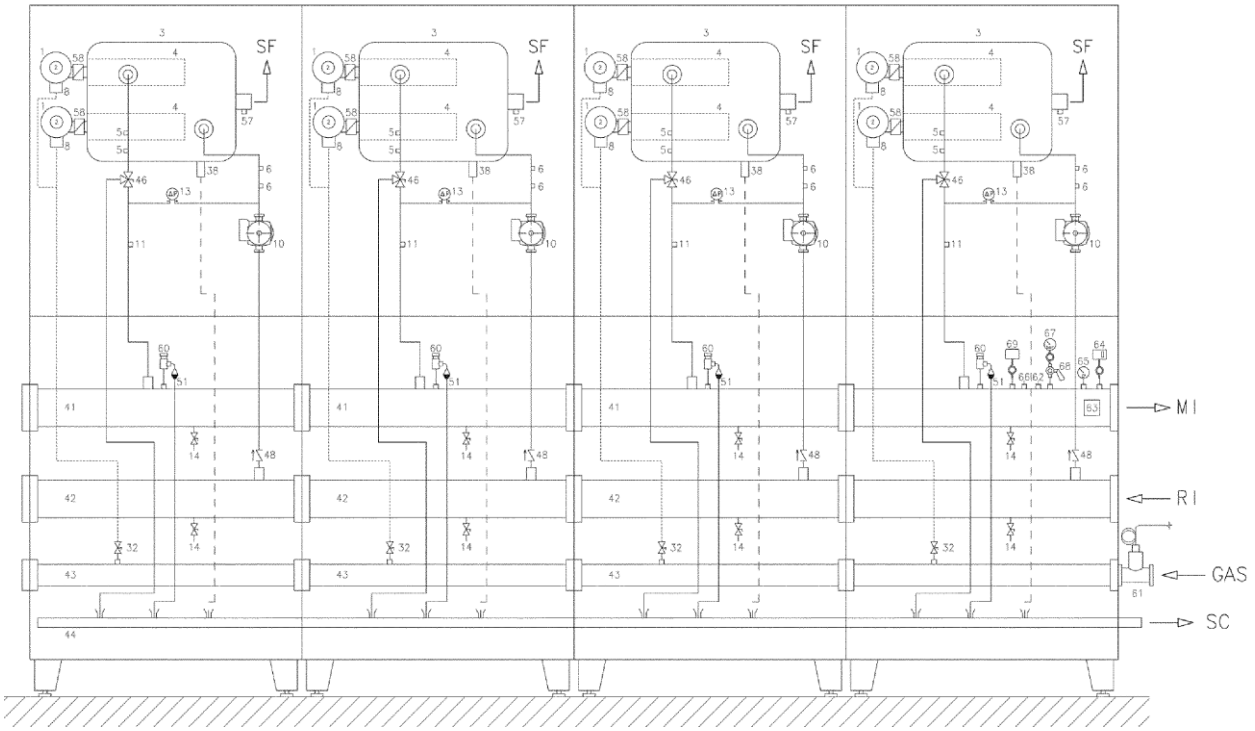
Operational Diagram ProCon MCS Hidro Four Unit



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Sensor Resistance Table

Outside Air Sensor

T(°C)	R(kΩ)
-20	1.383
-18	1.408
-16	1.434
-14	1.459
-12	1.485
-10	1.511
-8	1.537
-6	1.563
-4	1.590
-2	1.671
±0	1.644
2	1.671
4	1.699
6	1.727
8	1.755
10	1.783
12	1.812
14	1.840
16	1.869
18	1.898
20	1.928
25	2.002
30	2.078

Flow Sensors

T(°C)	R(kΩ)
10	1.783
12	1.812
14	1.840
16	1.869
18	1.898
20	1.928
25	2.002
30	2.078
35	2.155
40	2.234
45	2.314
50	2.395
55	2.478
60	2.563
65	2.648
70	2.735
75	2.824
80	2.914
85	3.005
90	3.098
95	3.192
100	2.002

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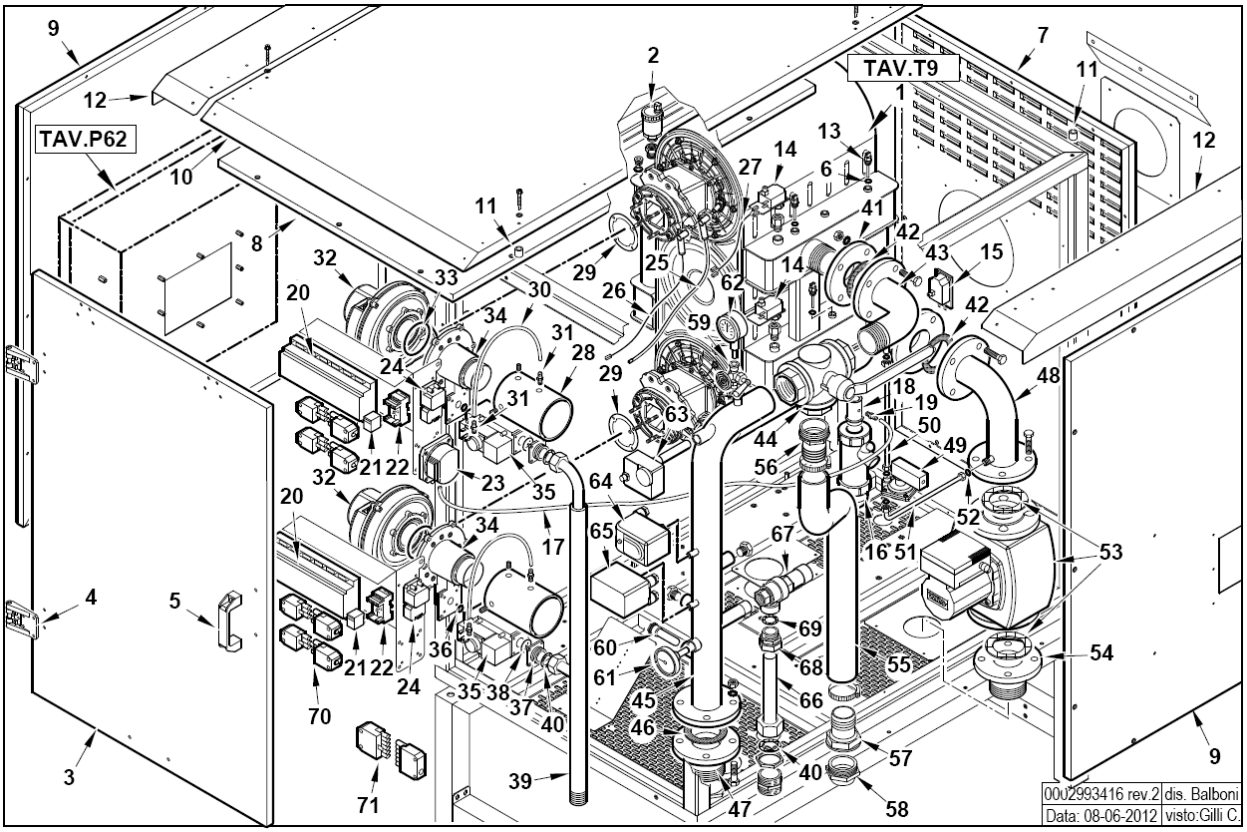
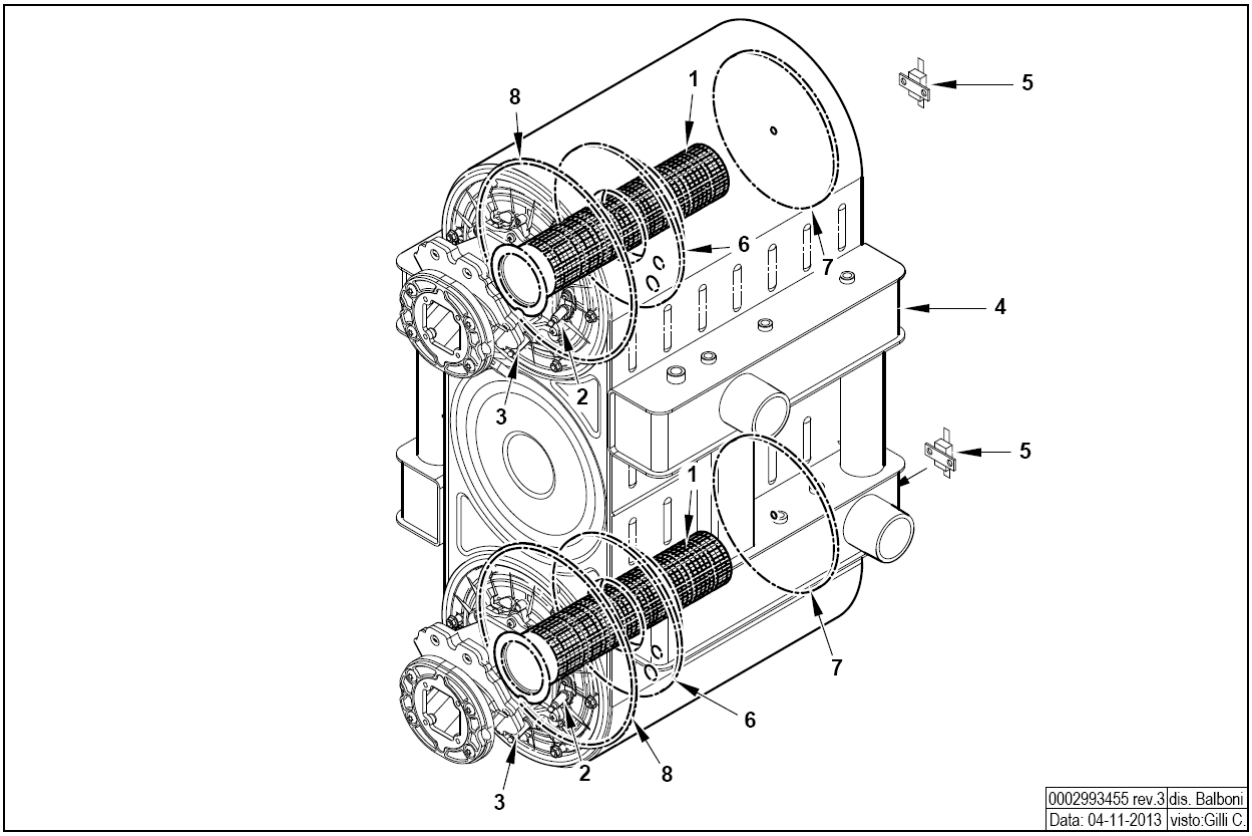
Exploded Spares Diagram MCS 210





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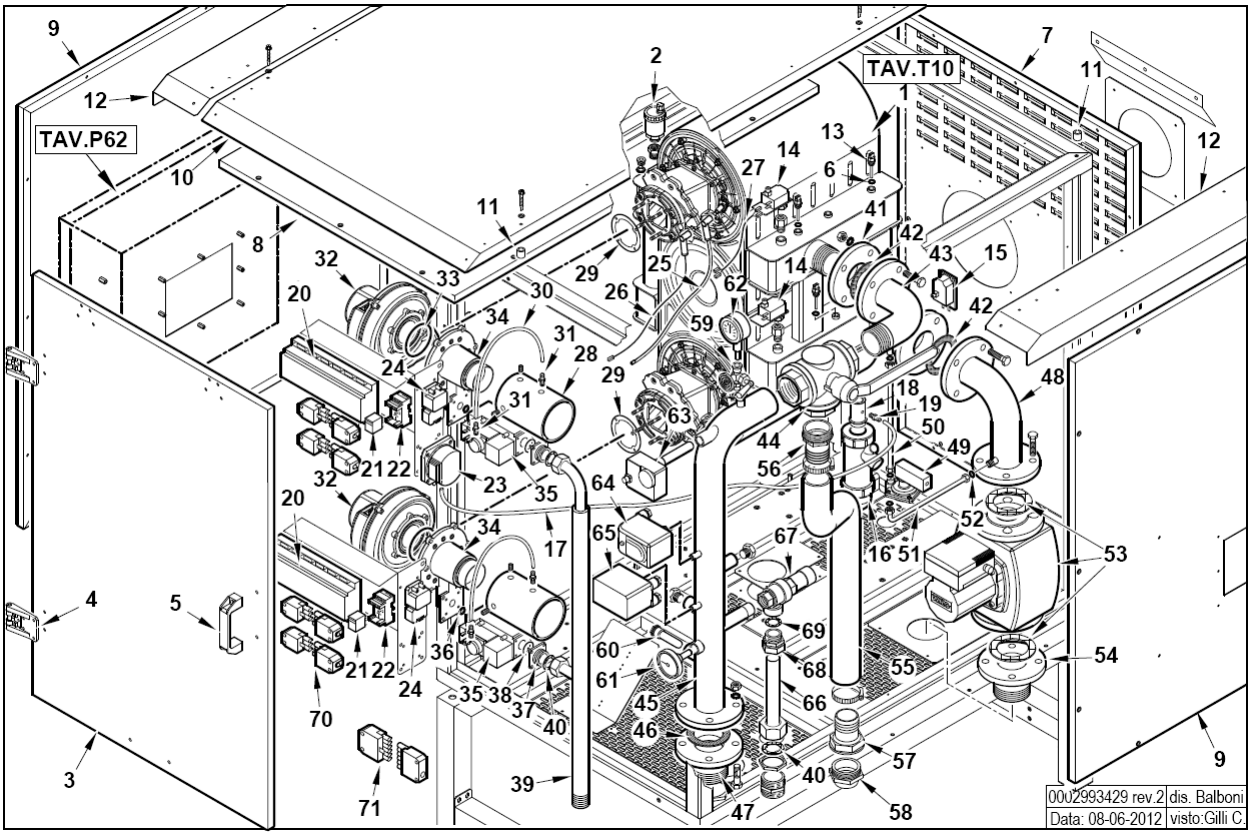
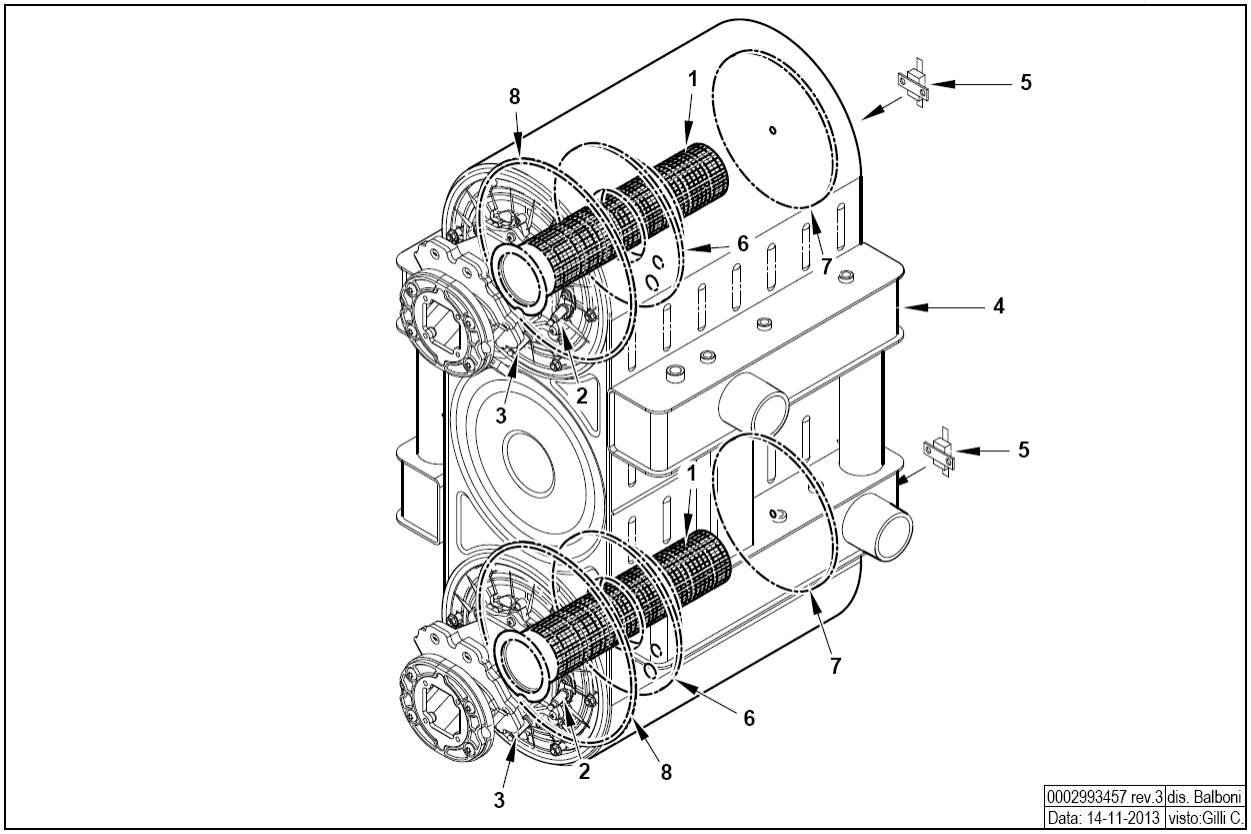
Exploded Spares Diagram MCS260





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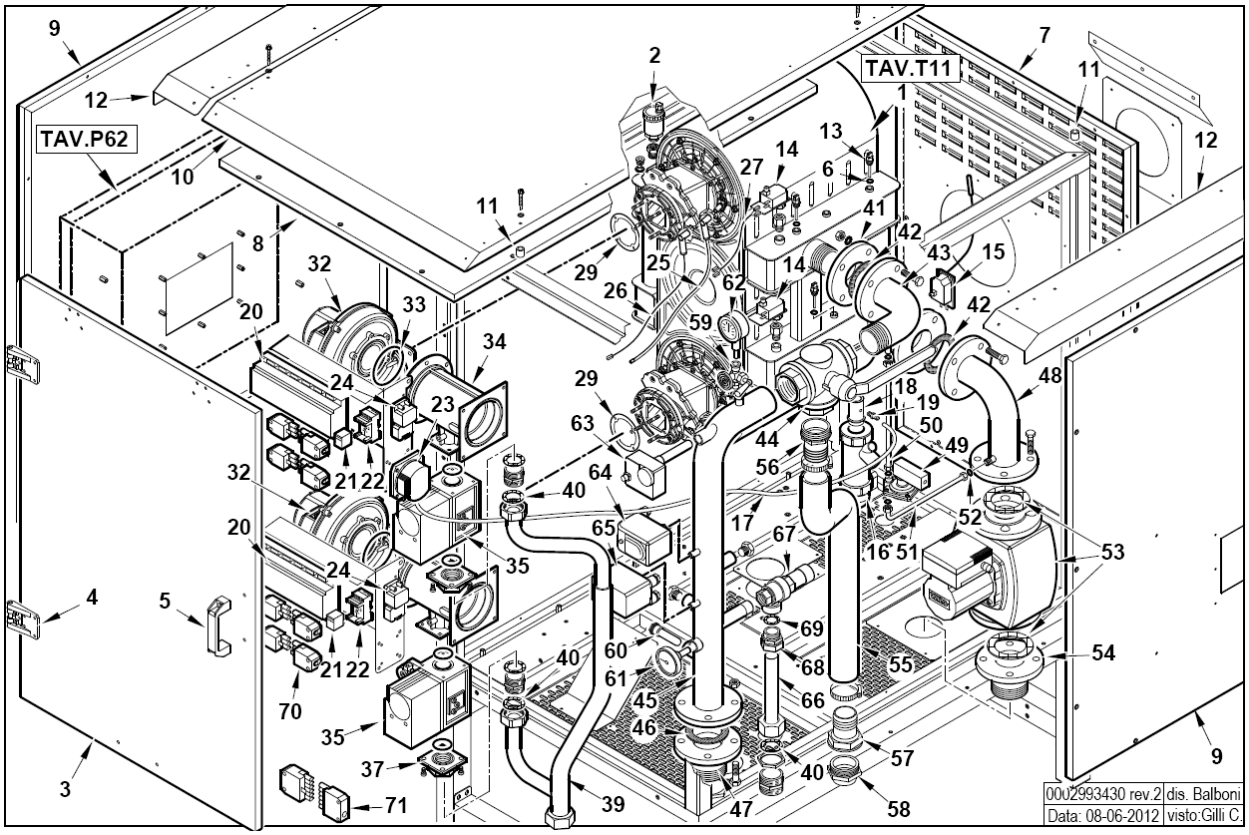
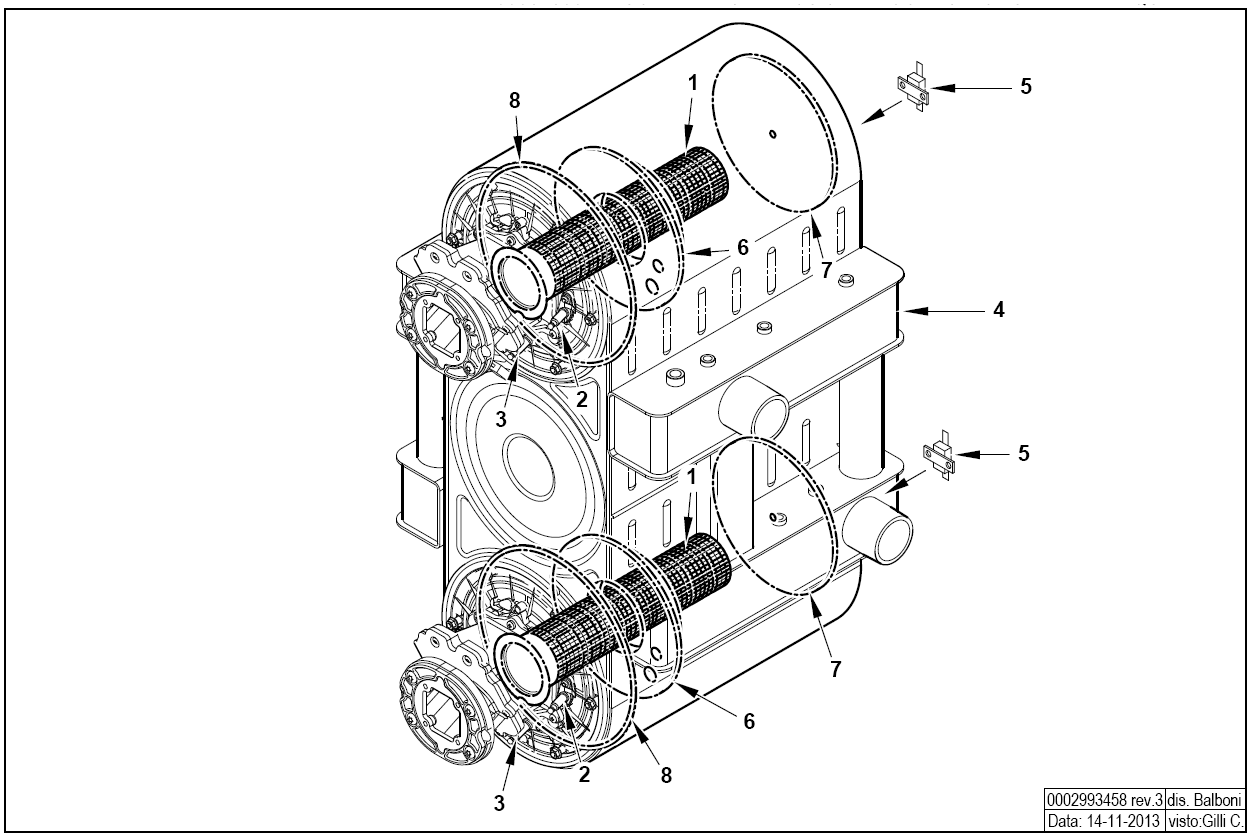
Exploded Spares Diagram MCS360





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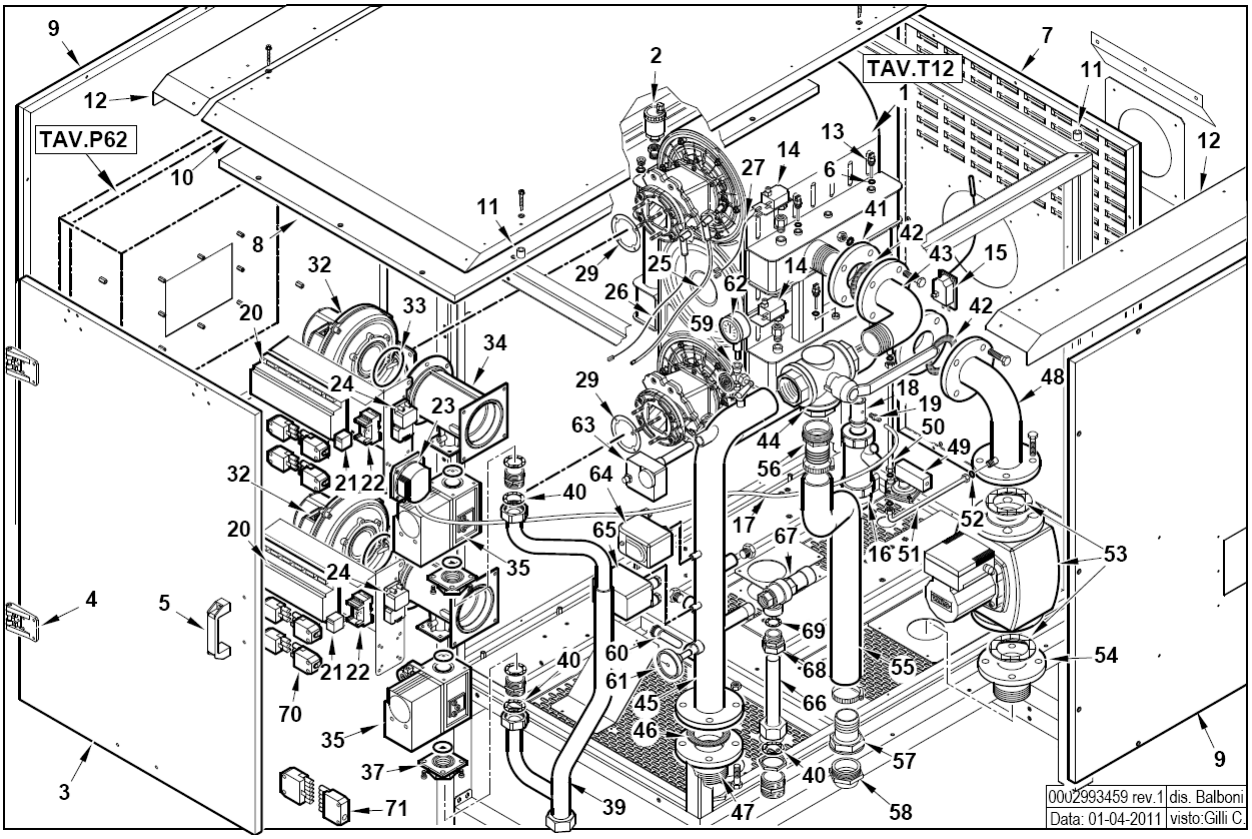
Exploded Spares Diagram MCS400



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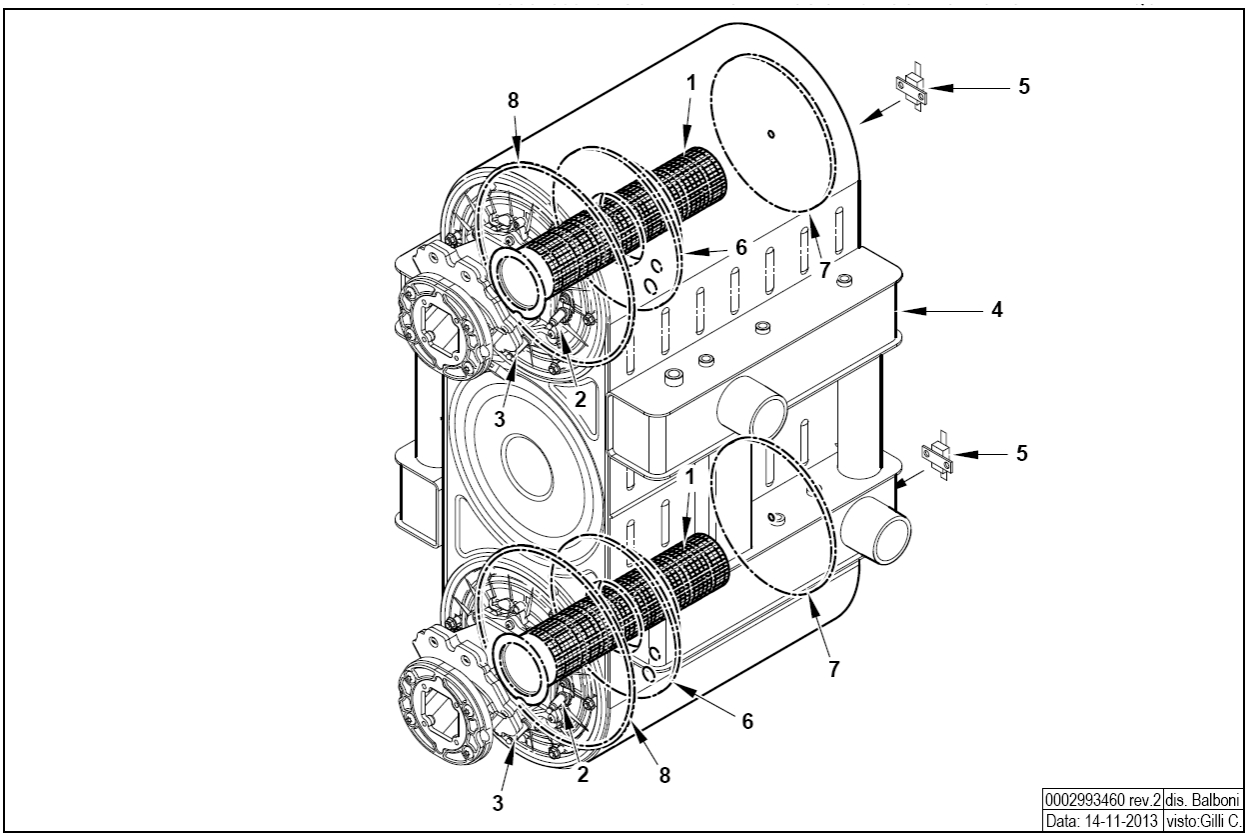

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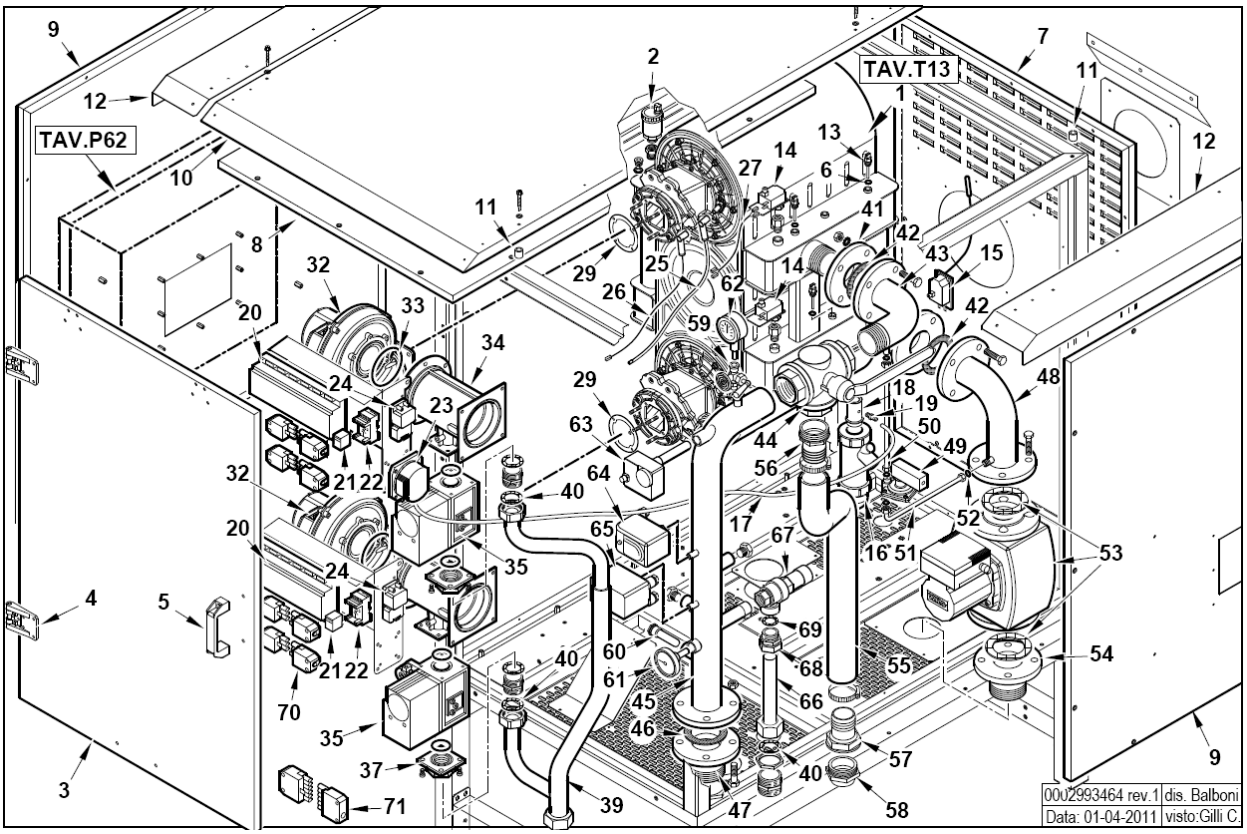
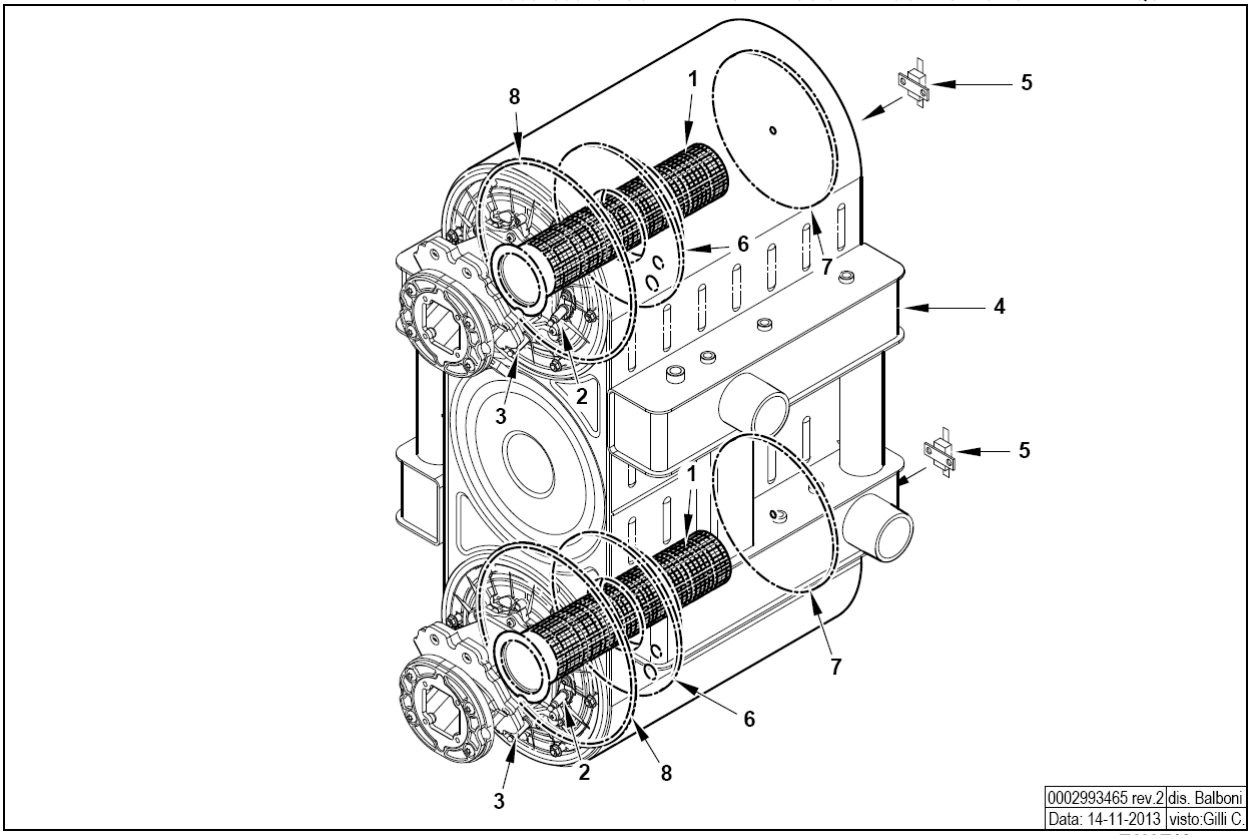
Exploded Spares Diagram MCS535





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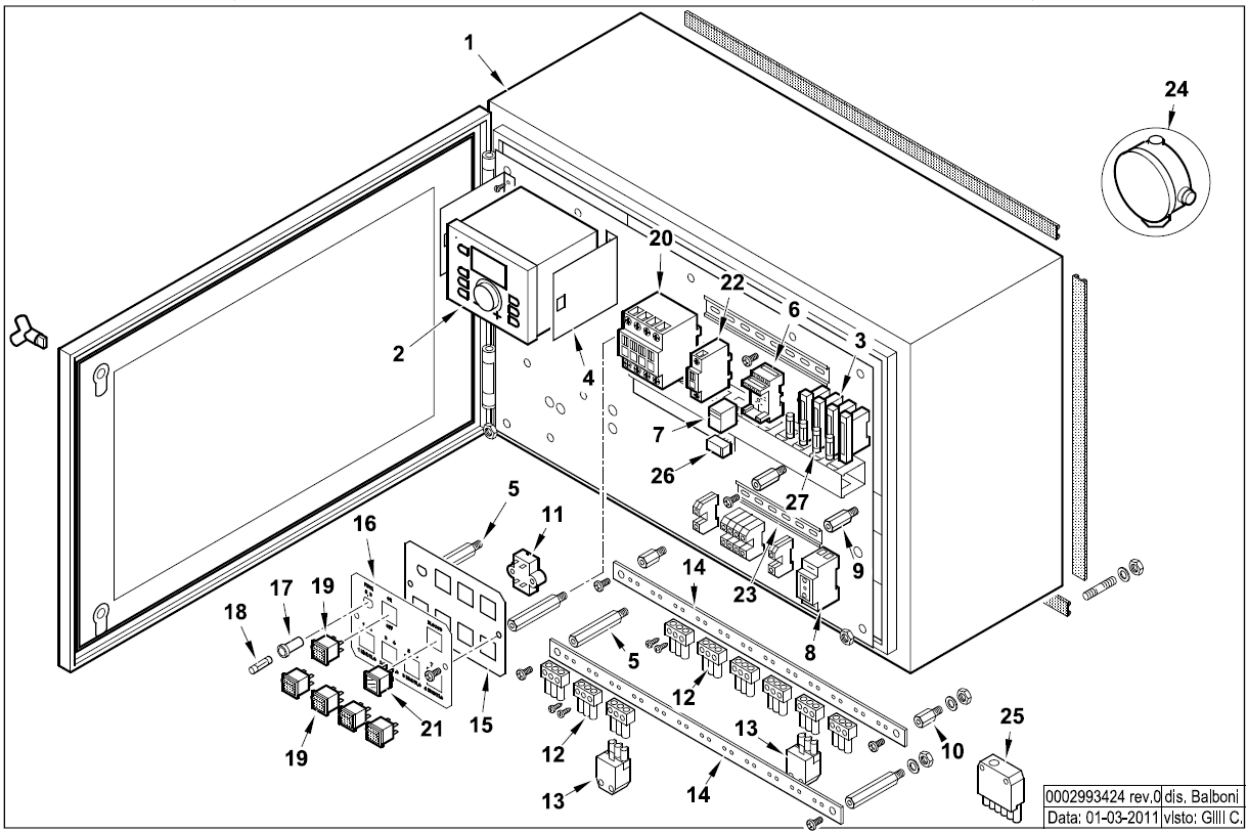
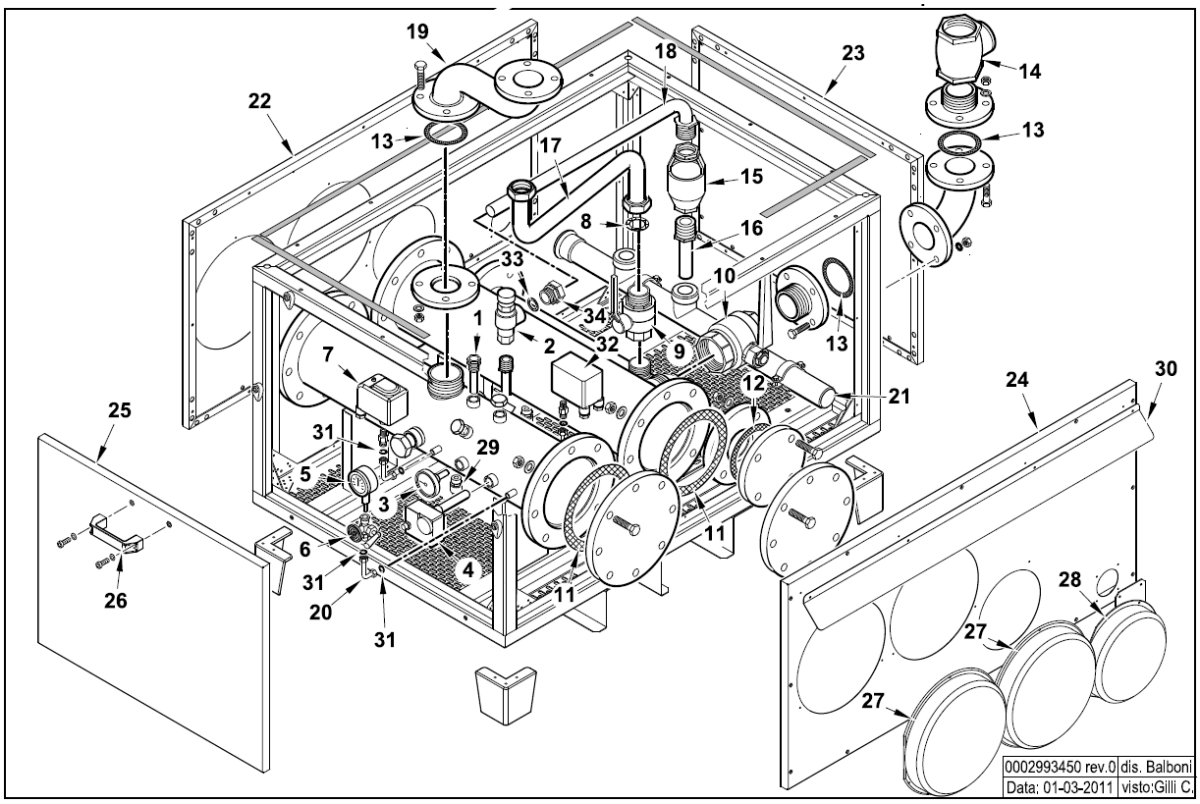
Exploded Spares Diagram Control Panel All Models



Exploded Spares Diagram Hidro 210



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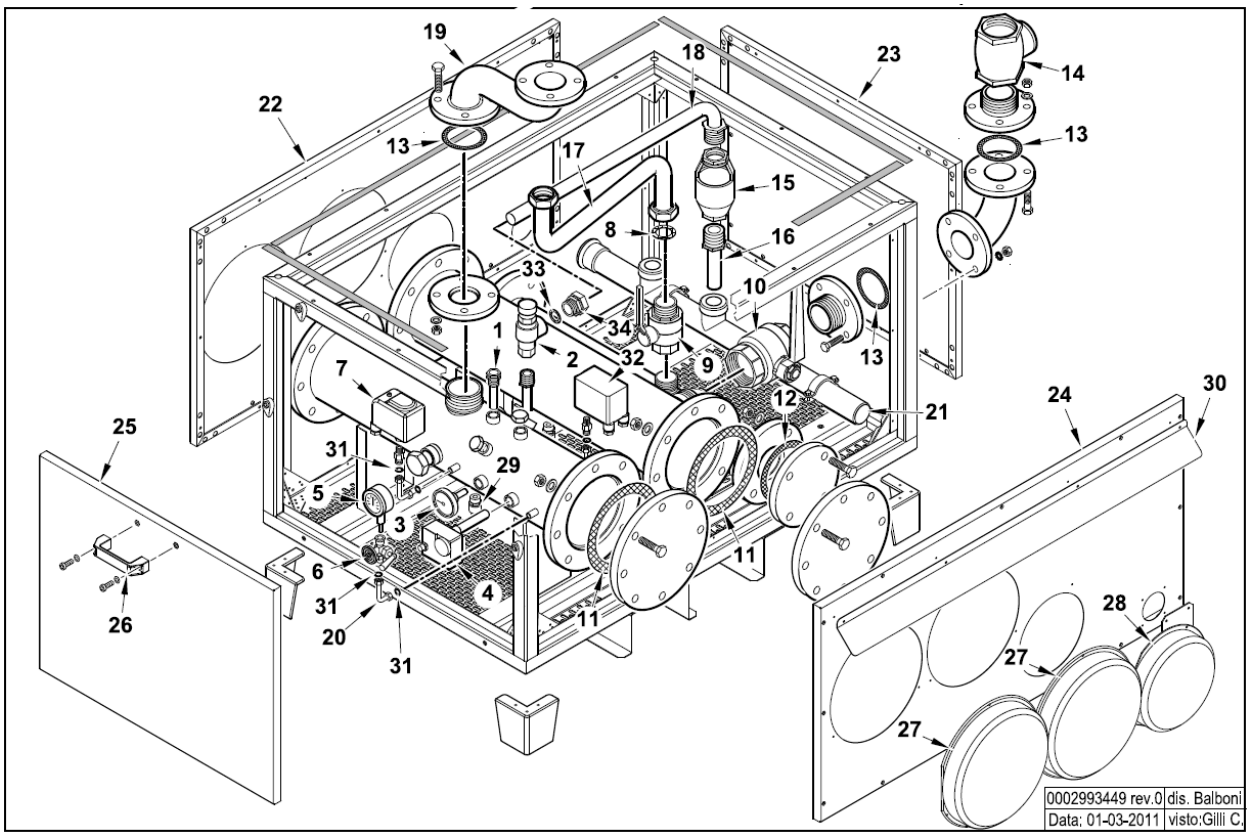
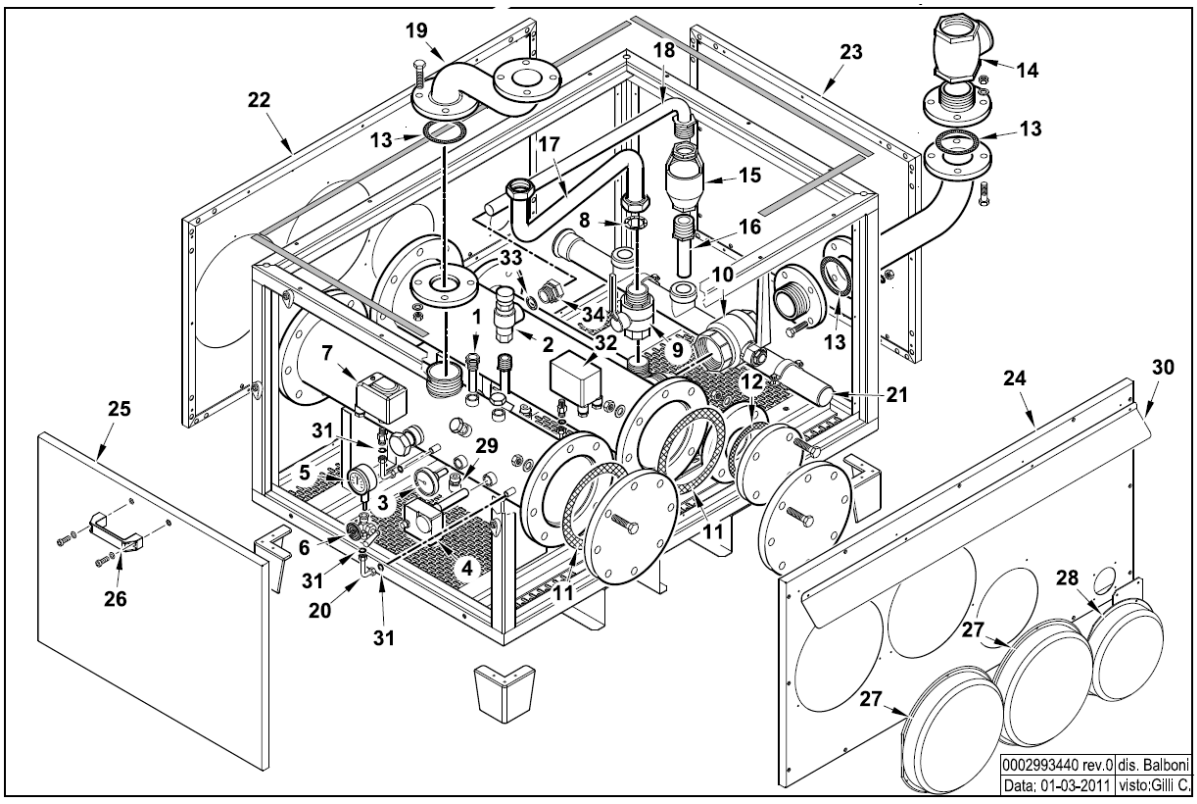
Exploded Spares Diagram Hidro 260



Exploded Spares Diagram Hidro 320, 400 & 535



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Notes

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