Ferroli

Opera

Large water volume heat generator

MODULAR GENERATOR

With large water content, for high efficiency construction

The OPERA range consists of six high water content condensation modular generators, the ideal solution for redevelopment interventions of thermal plants and for new design systems.

The OPERA technical characteristics, and in particular the water content, allow them to be integrated in every type of heating system, independently of the plant engineering solutions that the designer intends to implement.

The OPERA range generators can be installed individually or with three modules in cascade for a maximum overall output of 1350 kW.

The OPERA range efficiency allows the customer to access the economic incentives currently envisaged for the redevelopment of climatic systems.

+

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Opera | Theta+ | System energy class A+

OUR RANGE

the range consists of 6 generators, **B23**-certified

mod. 70
THERMAL INPUT 65.5 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 69.9 kW
CLASS ERP A

mod. 125
THERMAL INPUT 116 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 125 kW
EFFICIENCY AT PMAX (50°C-30°C) 106.8%

mod. 160
THERMAL INPUT 150 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 160 kW
EFFICIENCY AT PMAX (50°C-30°C) 106.8%

mod. 220
THERMAL INPUT 207 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 220 kW
EFFICIENCY AT PMAX (50°C-30°C) 106.8%

mod. 320
THERMAL INPUT 299 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 320 kW
EFFICIENCY AT PMAX (50°C-30°C) 106.8%

mod. 450
THERMAL INPUT 466.4 kW
USEFUL THERMAL OUTPUT (50°C-30°C) 448.6 kW
EFFICIENCY AT PMAX (50°C-30°C) 106.8%

THE IDEAL SOLUTION FOR EACH SYSTEM

The design

The large water content of the boiler and the vertical configuration of the OPERA series exchange group ensure extremely low load losses, also with high flow rates, enabling the generator to work with very high ΔT.

All this translates into superior plant engineering flexibility that frees the designer from the limits imposed by the type of generator. It can also be connected directly to the system without the interposition of separation elements, even in the case of multiple-zone systems, usually characterised by significant variations of the flow rates and of the Δt between boiler delivery and return.
This features make it particularly suitable in the cases of:

A) Systems with high water flow rates and modulating circulation systems

The generator, given its physical characteristics, is perfectly suited to working on systems with high water flow rates with multiple simultaneously operating “zones”. The possibility of working in a very wide Δt range promotes combining with variable speed circulation and low consumption systems.

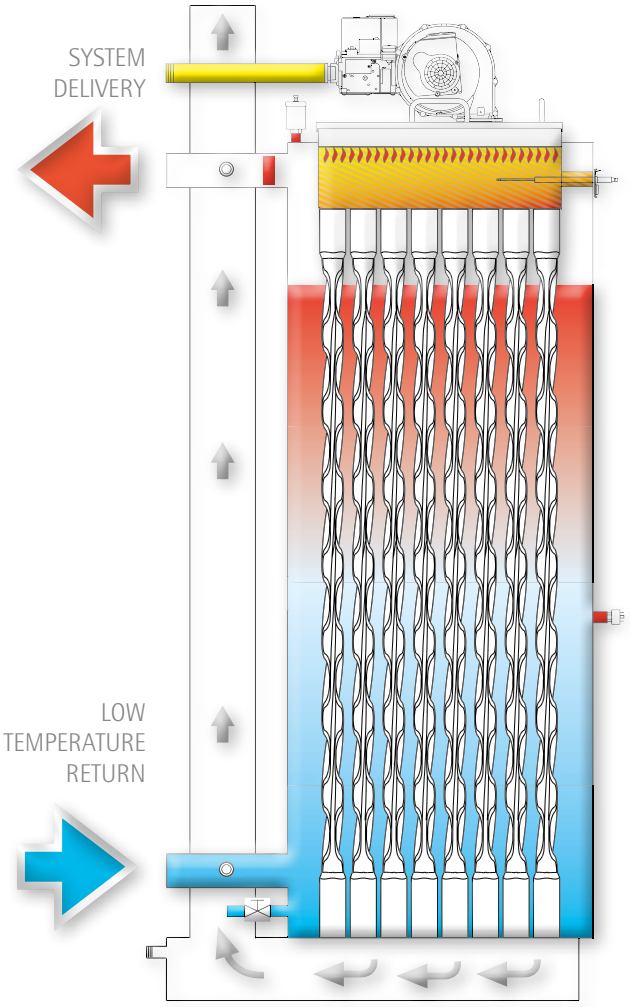
B) Redevelopment of existing systems

Choosing a generator that can be integrated with every type of heat distribution system obviously leaves a broader scope for design. In addition, it can be perfectly paired with separation elements that can be typically positioned between the boiler and the system to prevent sludge ending up in the boiler, compromising its efficient operation.

C) Replacing the old generator in thermal plants

Its “independence” from the type of system makes OPERA the best solution in terms of technical performance and characteristics in the case of replacement of the old heat generator. The 4-star certification is the guarantee of raising of the system's efficiency and of the consequent reduction of consumption.

Water diagram



Water content

mod. 70 **160 litres**	mod. 125 **265 litres**	mod. 160 **380 litres**
mod. 220 **380 litres**	mod. 320 **530 litres**	mod. 450 **561 litres**

CHARACTERISTICS

Product benefits

- **AISI 316 L** stainless steel exchanger with vertical development helical section flue gas pipes
- Combustion group with emissions in **class 6 according to EN 15502-1**. The modules can work both with Natural Gas and with LPG.
- Generator protection systems: **Double sensor (delivery and return)** system for **operation at constant ΔT** / Flue gas safety sensor / Water pressure switch with minimum threshold at 0.8 bar
- Air / Flue Gas Circuit with extraction at the place of installation and **built-in non-return clapet valve** on the extraction unit in order to be able to size the pressurised flue gas manifold
- **Seasonal efficiency** of the room heating among the highest in its category: **ηs 94%**. Combined with the remote modulating control and with the external probe (optional), it reaches the **upper efficiency class A+**
- The **large volume of water** of the generator means being able to connect the boiler to the system without the need for separation elements and enables a **very high design Δt**
- Management of the modules in series with **self-configuring MASTER/SLAVE** system (which does not require additional regulators)
- **Setting of switching on and off of the generators** (that can be switched on and off sequentially or can work at the same time in parallel) via the MASTER generator control panel
- The electronics on the machine are able to manage a **direct two-zone system or a heating zone and domestic hot water storage tank.** For more complex systems with hybrid heat generation and multiple heating zones, the THETA+ series temperature regulation must be installed.
- **RANGE RATED** certified generator to adjust the output generated to the needs of the systems, thereby increasing the efficiency of the system and preserving the mechanics of the machine
- The generators (individual or in series) can be controlled remotely with the THETA+ temperature regulation combined with the HEATAPP gateway via a Wi-Fi network
- Electronic control of the microprocessor allows the **modulation of 1/5** on the individual generator and of 1/15 for the maximum configuration (3 x 450 modules in series)
- **Four sturdy floating wheels** assembled in series to facilitate discharge and mobility in the thermal plant. Positioning feet integrated in the wheel group

THE PRODUCT IN A NUTSHELL

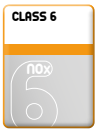
Remote control of boiler parameters via remote control

Appliance operating in **climatic regulation** at sliding system temperature (optional external temperature probe)

Device suitable for operation in a **partially protected place** with minimum temperature of -5°C as standard

"Range rated" certified device in compliance with UNI EN 483

Cascade operation



Minimum polluting emissions **(class 6 according to EN 15502-1)** already in line with that envisaged by the 26.09.2018 ErP directive (emissions NOx < 56mg/kWh)

Appliance especially designed to be **particularly simple** to install and maintain

Generator equipped with devices to **facilitate handling** during transport and installation

Stainless steel exchanger **AISI 316 L patented**

OPERA
The components

1. Premix group with flue gas anti-return clapet valve
2. Electronic control and user interface
3. Flue gas outlet
4. Flue gas thermostat
5. Manifold with condensate drain
6. Floating wheels with lock device
7. Air bleed valve
8. System delivery sensor
9. Water pressure switch
10. Safety valve connection (not supplied)
11. System delivery
12. Generator drain tap
13. System return
14. System return probe
15. Gas inlet

HYDRAULIC, GAS AND FLUE GAS OUTLET CONNECTIONS

MODEL		70	125	160	220	320	450
3	Flue gas outlet (mm)	80	100	160	160	200	200
11	System delivery	1' 1/4	1' 1/4	2'	2'	DN65	DN65
13	System Return	1' 1/4	1' 1/4	2'	2'	DN65	DN65
15	Gas inlet	3/4'	1'	1'	1'	1'	1'
12	Boiler drain	3/4'	3/4'	3/4'	3/4'	3/4'	3/4'

OPERA
The art of constructing



To create the exchanger and the condensate collection tank **AISI 316 stainless steel** was used, thereby guaranteeing maximum mechanical resistance against corrosion. The design of the exchanger pipes and their helical development guarantee a greater exchange surface area, an improved heat transmission coefficient between the water and the flue gases and a very low thermal load.

PREMIX COMBUSTION UNIT

OPERA is supplied with a total premix combustion unit, with variable speed fan, working with **Natural Gas or LPG**.
The particular geometry of the front combustion burner and the use of an air/gas mix diffusion grid ensure a perfect division of the thermal load across the entire section of the combustion chamber, protecting the burner and the exchanger against any thermal fluctuations.

The extremely small vertical configuration of the burner means being able to use the entire extension of the burner, with obvious benefits for the condensation and the stratification in the boiler.

FLUE GAS ANTI-REFLUX VALVE

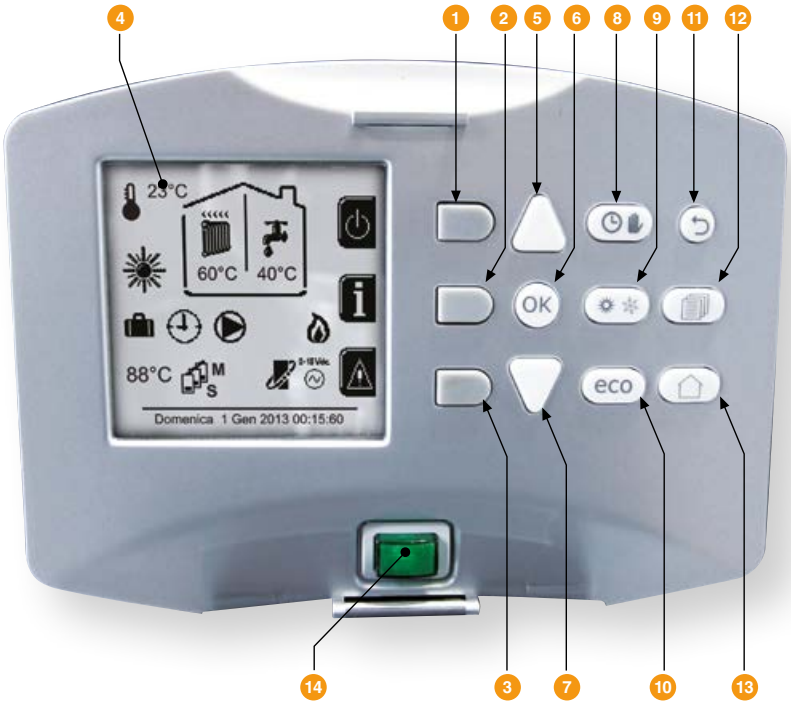
A valve with mobile shutter is installed on the premix group fan inlet which prevents the return of flue gases through the boiler in the installation room.

This enables expelling of the pressurised combustion products and consequently being able to size more easily the flue system with reduced diameter pipes compared to the classic depression systems.

OPERA
Control panel

Characterised by a large dot-matrix display as well as keys for setting the basic functions of the generator and for selecting the parametrisation menus.

The interface has been designed to facilitate the reading of the parameters and the navigation between the menus both for the USER for the adjustment and setting of the basic functions and for the TECHNICIAN for maintenance and advanced parametrisation.



LEGEND

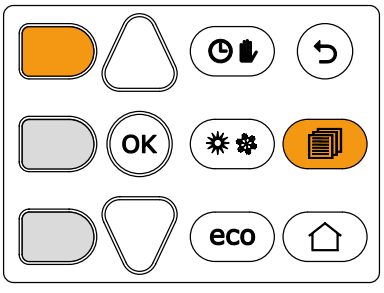
1 Contextual key 1
2 Contextual key 2
3 Contextual key 3
4 Dot-matrix display (main screen example)
5 Menu navigation key
6 Menu confirm/entry key
7 Menu navigation key
8 Automatic/Manual heating/DHW operation key
9 Summer/Winter mode selection key
10 Economy/Comfort mode selection key
11 Menu exit key
12 Main menu key
13 Home key (return to main screen)
14 Main switch

CONTEXTUAL KEYS (part. 1, 2, 3) can be distinguished by their grey colour, the lack of screen printing and can take on a different meaning depending on the selected menu. It is essential to follow the indication provided by the display (icons and texts). for example, using contextual key 2 (part. 2) it is possible to access device information such as: sensor temperatures, operating powers, etc.

DIRECT KEYS (part. 8, 9, 10) always have the same function

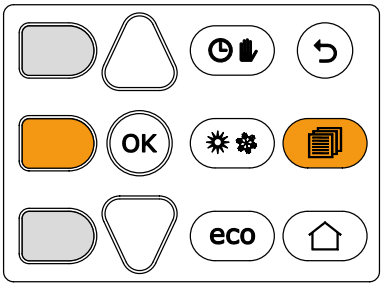
NAVIGATION/MENU KEYS
The navigation/menu keys (part. 5, 6, 7, 11, 12, 13) are used to navigate between the various menus implemented in the control panel

From the main menu of the control panel it is possible to access two distinct levels of parametrisation:



USER level

Not password protected, it allows the “system manager” to set the operating modes of the single generator or cascade, to best synchronise them with the type of system, according to user needs



TECHNICIAN level

Password protected, it allows the “authorised technician” to check and possibly modify the thresholds of the individual components, of the generator and of the boiler/system.

CHARACTERISTICS
Control electronics

For all its “PROFESSIONAL” series high output condensation heat generators, Ferroli uses a single electronic platform and the same interface panel that is able to manage the correct operation and the safety of the generator, installation in cascade and the main components of a heating system and for the production of domestic hot water.

INPUT

REMOTE COMMUNICATION PROTOCOLS
0 - 10 Vdc signal
Modbus
Opentherm

MASTER-LAVE COMMUNICATION

REMOTE RESET

TEMPERATURE PROBE CASCADE DELIVERY

1ST AREA HEAT REQUEST
(T.A. or remote timer control)

2ND AREA HEAT REQUEST
(T.A. or remote timer control)

DOMESTIC HOT WATER REQUEST
(T.A. or remote timer control)

POTENTIAL FEATURES OF THE ELECTRONIC BOARD

OUTPUT

1ST DIRECT AREA SYSTEM CIRCULATOR
Power supply 230 Vac - 50 Hz

2ND DIRECT AREA SYSTEM CIRCULATOR/DHW 3-WAY CIRCULATOR OR VALVE
Power supply 230 Vac - 50 Hz

DHW RECIRCULATION CIRCULATOR
Power supply 230 Vac - 50 Hz

MASTER-SLAVE COMMUNICATION

REMOTE SIGNAL ANOMALY
Power supply 230 Vac - 50 Hz

REMOTE BURNER ON / ANTI-LEGIONELLA ON SIGNAL

SUPPORT CONTACT
Power supply 230 Vac - 50 Hz

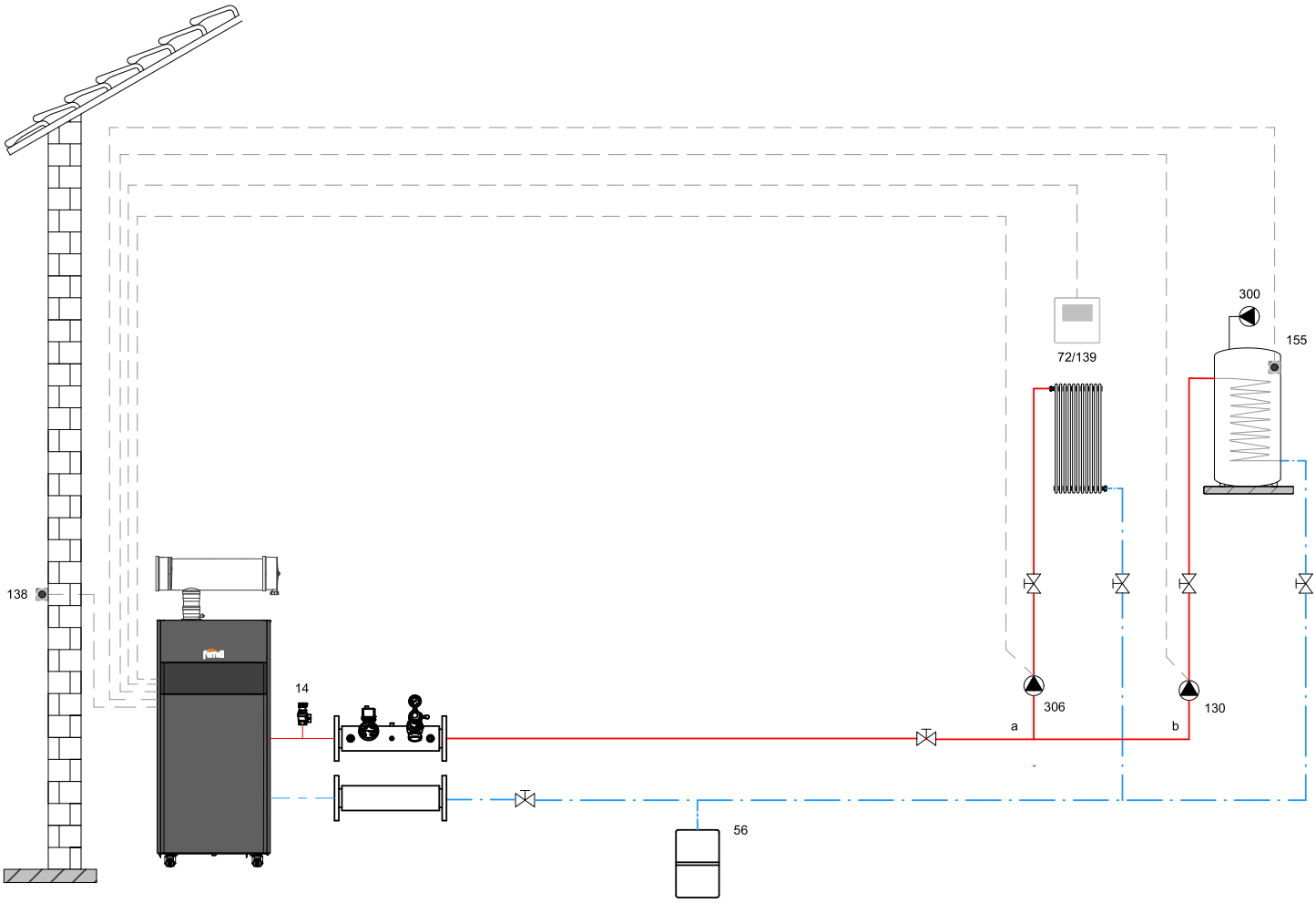
LEGEND (referred to the diagrams on the next page)
32 Boiler circulator **72a** Room thermostat 1st zone (mixed) **72b** Room thermostat 2nd zone (mixed) **72c** Room thermostat 3rd zone (direct) **138** External probe **139a** Remote Timer Control 1st zone (mixed) **139b** Remote Timer Control 2nd zone (mixed) **139c** Remote Timer Control 3rd zone (direct) **155** Boiler probe **300** Anti-legionella circulator **315a** Mixer valve 1st zone **315b** Mixer valve 2nd zone (mixed) **317a** Safety thermostat 1st zone (mixed) **317b** Safety thermostat 2nd zone (mixed) **318a** Circulator 1st zone (mixed) **318b** Circulator 2nd zone (mixed) **318c** Circulator 3rd zone (direct) **319a** Delivery sensor 1st zone (mixed) **319b** Delivery sensor 2nd zone mixed) **a** 1st zone (mixed) **b** 2nd zone (mixed) **c** 3rd zone (direct) **d** Boiler circuit
FZ4 B Zone control board

CHARACTERISTICS
Control electronics

In the case of installation of OPERA in a direct two-zone system (heating and domestic hot water load circuit type), the basic electronics are able to manage the system independently without the need for optional external equipment.
On high and low operating temperature mixed systems, the boiler must be combined with the THETA+ temperature regulation module.

CASE A: REPLACEMENT OF THE EXISTING GENERATOR ON A HIGH TEMPERATURE SYSTEM

Thermal system consisting of a high temperature circuit combined with a storage tank for the domestic hot water. The OPERA electronic control, besides guaranteeing correct operation of the generator, directly manages each component of the system.



LEGEND
14 Safety valve **72/139** Room thermostat/remote timer control **56** Expansion vessel **138** External probe **155** Boiler temperature probe **130** Boiler circulator **300** Anti-legionella circulator **306** System circulator **a** First zone **b** Boiler circulator **- - - -** Electrical connections

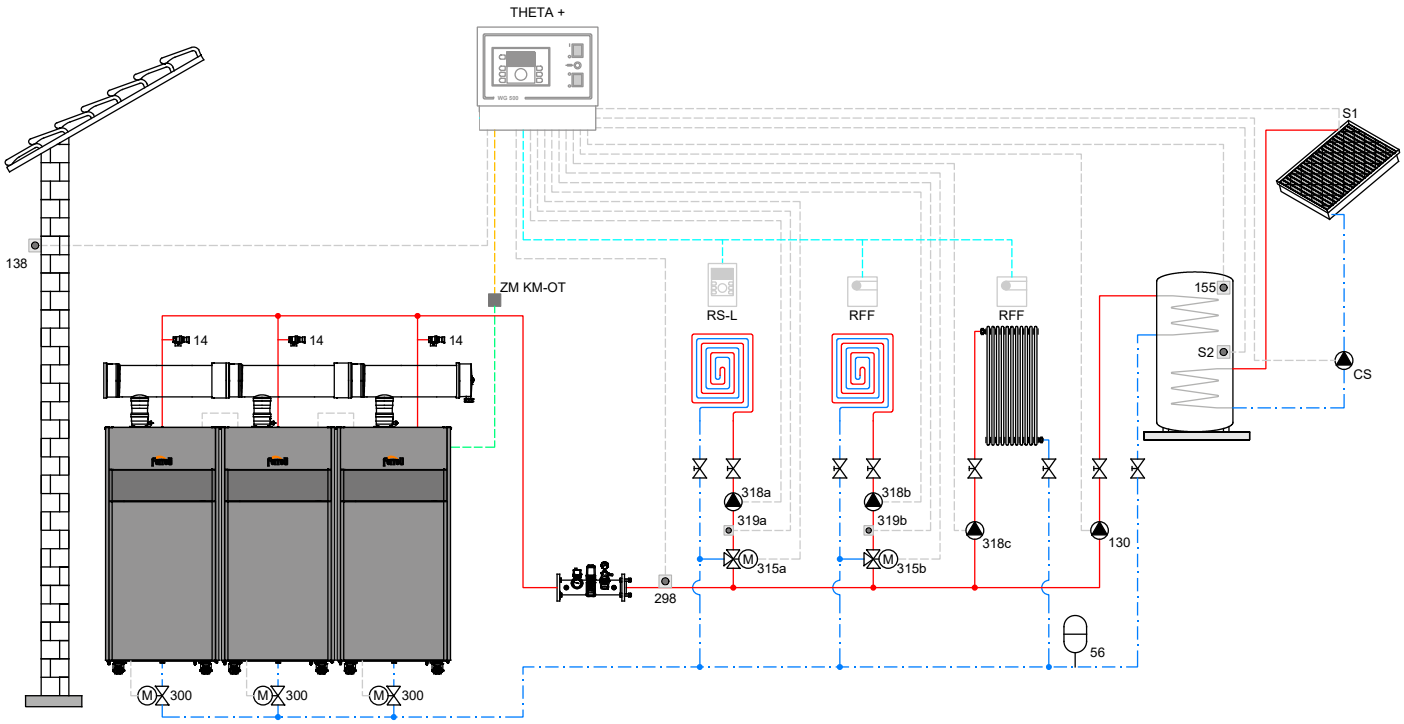
CHARACTERISTICS
Control electronics

CASE B: NEW DESIGN SYSTEM

The heat generator consists of a system of three OPERAS in series. The electronics on board each boiler are able to manage the cascade independently, with the MASTER/SLAVE type self-configuring system.

The distribution system consists of three heating circuits (two mixed at low temperature and one direct at high temperature), a double coil storage tank for the DHW with an integration solar system.

The THETA+ thermal unit with the aid of room units/sensors (two sensors plus a room unit for the remote programming) is able to manage each component of the circuit including the solar system. In the case of systems with a greater number of zones, it is possible to manage up to a max of 10 mixed zones and 5 direct zones, thereby creating a cascade (max 5) of THETA+ thermal units.
The zones can be controlled by three RFF type room sensors or by three RS-L type remote room units or by a mix of the two.



LEGEND
THETA+ Temperature regulation thermal unit and cascade manager installed in the WG500 wall support **ZM KM-OT** Module for management of the cascade and of the communication between the generator and the THETA+ unit via Open Therm **RS-L** Room unit **RFF** Room probe **a** Low temperature mixed zone **b** Low temperature mixed zone **c** High temperature direct zone **d** DHW production with double coil storage tank **298** System delivery manifold probe **14** Safety valve **56** Expansion vessel **300** Butterfly valve **138** External probe **315 a/b** Motorised mixer valve **318 a/b/c** Heating system circulator **319 a/b** Mixed zone delivery probe **155** Boiler probe **130** Domestic hot water storage tank load circulator **S1** Solar field delivery probe **S2** Boiler temperature probe **CS** Solar circulator
*- - - ZM KM-OT *- - - RS-L / RFF *- - - OpenTherm

CHARACTERISTICS
Control electronics

THETA+
TEMPERATURE REGULATION AND CASCADE MANAGER SYSTEM

Unit for the climatic temperature regulation of heating systems, for the active management of cascade heat generators and the direct control of mono-, two-stage and modulating blown air burners. Class ErP (EU 811/2013) VI.
Each THETA+ control unit is able to manage a thermal system with:
- 2 low temperature mixed zones
- 1 high temperature direct zone
- 1 domestic hot water storage tank
- Thermal solar system, biomass or puffer multi-energy generators with two programmable outputs
- Cascade of thermal generators up to 8 modules

HEATAPP!
SYSTEM FOR REMOTE CONTROL OF THE THETA+ REGULATOR

Heatapp!, via a home Internet network, is able to manage, fully remotely, the functions of the THETA+ regulator

The Heatapp! was designed on multiple levels of access in order to be able to profile the various users that need to access the parameters.

The Heatapp! system is not compatible with the RS-L room unit or with the RFF room sensor.

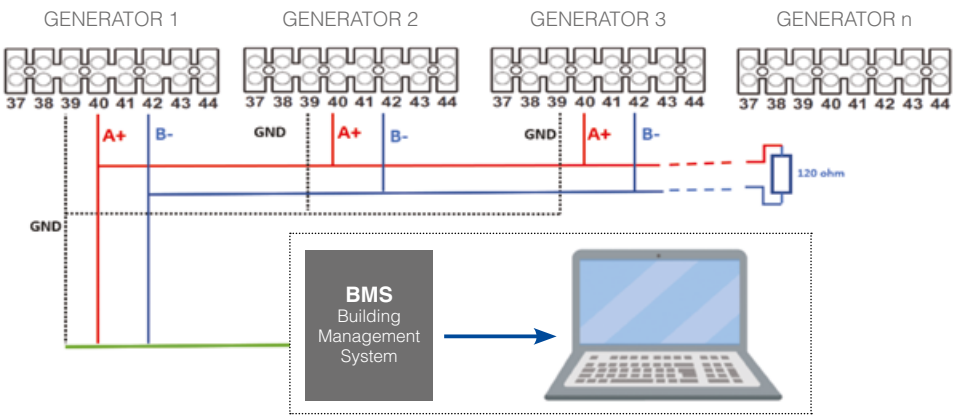
MODBUS

The Ferroli OPERA line generators can interface via the **Modbus** protocol with the devices of a BUILDING MANAGEMENT SYSTEM for the integrated management of thermal generators and for control of the same remotely.

MODBUS CONNECTION TERMINALS

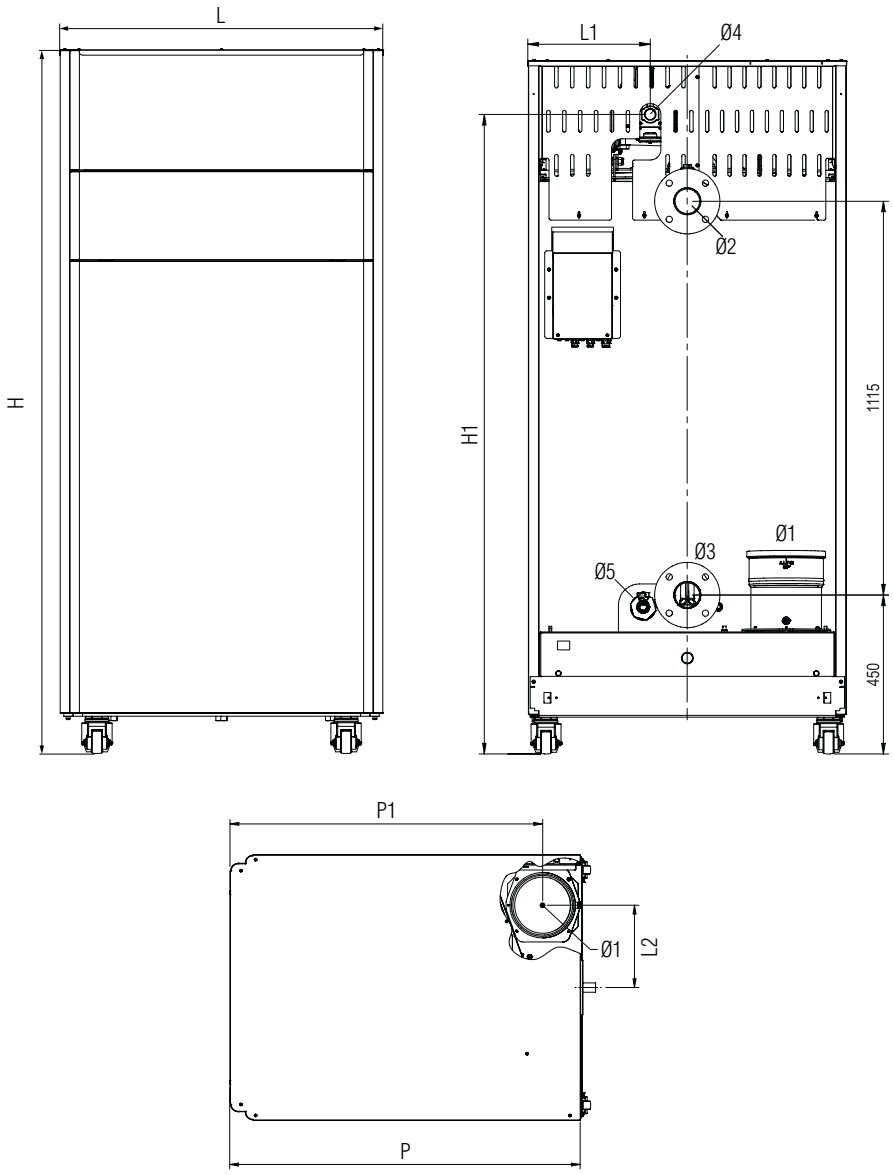
Terminals	Descriptions
39	MODBUS Gnd
40	Rs485+ / MODBUS A
42	RS485- / MODBUS B

EXAMPLE OF BOILER CONNECTION ON MODBUS NETWORK



TECHNICAL DATA

Dimensions



HYDRAULIC, GAS AND FLUE GAS OUTLET CONNECTIONS

MODEL		70	125	160	220	320	450
Ø 1	Flue gas outlet (mm)	80	100	160	160	200	200
Ø 2	System delivery	1'1/4	1'1/4	2'	2'	DN65	DN65
Ø 3	System Return	1'1/4	1'1/4	2'	2'	DN65	DN65
Ø 4	Gas inlet	3/4'	1'	1'	1'	1'	1'
Ø 5	Boiler drain	3/4'	3/4'	3/4'	3/4'	3/4'	3/4'

PRODUCTS AND DIMENSIONS

ITEMS	L	L1	L2	H	H1	P	P1
	mm	mm	mm	mm	mm	mm	mm
OPERA 70	540	305	210	1883	1815	730	685
OPERA 125	660	390	160	1903	1800	880	810
OPERA 160	780	450	240	1933	1815	1050	950
OPERA 220	780	300	240	1933	1770	1050	950
OPERA 320	900	350	280	1963	1810	1190	1060
OPERA 450	900	345	280	2200	2050	1190	1060

TECHNICAL DATA
Summary Table

MODEL		70	125	160	220	320	450
ERP Class		A	-	-	-	-	-
Room heating energy efficiency	η_s%	94	94	94	94	94	93
Efficiency and performance							
Max. heating thermal input	kW	65.5	116.0	150.0	207.0	299.0	420.0
Min. heating thermal input	kW	14.0	23.0	41.0	41.0	62.0	80.0
Max. heating thermal output (80/60°C)	kW	64.4	114.0	147.0	204.0	294.5	412.7
Min. heating thermal output (80/60°C)	kW	13.7	22.5	40.2	40.2	60.8	78.4
Max. heating thermal output (50/30°C)	kW	69.9	123.9	160.0	221.0	319.3	448.6
Min. heating thermal output (50/30°C)	kW	15.0	24.8	44.2	44.2	66.8	86.2
Pmax efficiency (80/60°C)	%	98.3	98.3	98.4	98.5	98.5	98.3
Pmin efficiency (80/60°C)	%	98.0	98.0	98.0	98.0	98.0	98.0
Pmax efficiency (50/30°C)	%	106.8	106.8	106.8	106.8	106.8	106.8
Pmin efficiency (50/30°C)	%	107.7	107.7	107.7	107.7	107.7	107.7
Efficiency 30% (30°C)	%	109.6	109.6	109.5	109.6	109.6	109.3
NOx class		6	6	6	6	6	6
Max Heating Temperature	°C	90	90	90	90	90	90
Max domestic hot water temperature	°C	70	70	70	70	70	70
ΔT max exchanger	°C	60	60	60	60	60	60
Maximum flue duct head Pmax	pascal	200	150	200	200	200	200
Min / max operating pressure	bar	0.8 - 6	0.8 - 6	0.8 - 6	0.8 - 6	0.8 - 6	0.8 - 6
Structural characteristics							
Water content	litres	160	265	380	380	530	561
Empty weight	Kg	180	280	400	400	500	450
Electrical features							
Supply voltage	V/Hz	230 / 50	230 / 50	230 / 50	230 / 50	230 / 50	230 / 50
Degree of electrical protection	IP	X0D	X0D	X0D	X0D	X0D	X0D
Electric power absorbed	W	105	200	260	260	330	800
Hydraulic and gas connections							
System delivery		1' 1/4	1' 1/4	2'	2'	DN 65	DN 65
System return		1' 1/4	1' 1/4	2'	2'	DN 65	DN 65
Gas inlet		1'	1'	1'	1'	1'	1'
Flue gas outlet ø (mm)		80	100	160	160	200	200
Combustion							
Type of appliance		B23	B23	B23	B23	B23	B23
Combustion efficiency Pmax (80/60°C)	%	98.3	98.3	98.3	98.3	98.3	98.3
Combustion efficiency Pmin (80/60°C)	%	98.7	98.7	98.7	98.7	98.7	98.7
Burner flue duct losses Pmax	%	1.7	1.7	1.7	1.7	1.7	1.7
Burner flue duct losses Pmin	%	1.3	1.3	1.2	1.3	1.3	1.2
Flue gases temperature Pmax / Pmin (80/60°C)	°C	68 / 60	66 / 60	67 / 61	67 / 61	67 / 61	67 / 61
Flue gases temperature Pmax / Pmin (50/30°C)	°C	43 / 32	43 / 32	45 / 31	45 / 31	45 / 31	45 / 31
Flue gas flow rate Pmax	kg/h	107.1	189.6	244.8	338.4	488.8	672
Flue gas flow rate Pmin	kg/h	23.3	39.9	72	71.1	107.5	133
CO_2 Pmax / Pmin	%	9.3 / 9.1	9.3 / 8.7	9.3 / 8.7	9.3 / 8.7	9.3 / 8.7	9.0 / 8.5
CO O_2=0% Pmax	mg/kWh	17	30	15	40	35	13
CO O_2=0% Pmin	mg/kWh	1	2	1	2	3	1
NOx O_2=0% Pmax	mg/kWh	69.7	50	78	44	41	148
NOx O_2=0% Pmin	mg/kWh	13.3	10	12	9	10	17
NOx O_2=0% weighted	mg/kWh	18	17	22	22	20	53
Internal sound power level LWA	dB	58	62	72	72	76	77

CASCADE INSTALLATION

Ferroli has **identified 27 types of modular installations** consisting of two or three generators.

IT IS in fact possible to connect in cascade from a minimum of two 70kW generators up to a maximum of three 450 kW generators, in the combinations shown in the table.
For all these configurations, the Company guarantees correct operation and provides all the hydraulic, gas and flue gas accessories.

COMBINATIONS OF 2 GENERATORS IN SERIES

THERMAL OUTPUT (50/30°C)	OPERA MODELS		SERIES MODULATION PMIN/PMAX (50/30°C)	
kW	1°	2°	kW	MODULATION RATIO
139.8	70	70	15.0/139.8	1 / 9
194.9	70	125	15.0 / 194.9	1 / 13
250.0	125	125	24.8 / 250.0	1 / 10
285.0	125	160	24.8 / 285.0	1 / 11
320.0	160	160	44.2 / 320.0	1 / 7
380.0	160	220	44.2 / 380.0	1 / 9
440.0	220	220	44.2 / 440.0	1 / 10
540.0	220	320	44.2 / 540.0	1 / 12
640.0	320	320	66.8 / 640.0	1 / 10
818.6	320	450	66.8 / 768.6	1 / 11
897.2	450	450	86.2 / 897.2	1 / 10

COMBINATIONS OF 3 GENERATORS IN SERIES

THERMAL OUTPUT (50/30°C)	OPERA MODELS			SERIES MODULATION PMIN/PMAX (50/30°C)	
kW	1°	2°	3°	kW	MODULATION RATIO
209.7	70	70	70	15.0 / 209.7	1 / 14
264.8	70	70	125	15.0 / 264.8	1 / 18
319.9	70	125	125	15.0 / 319.9	1 / 21
375.0	125	125	125	24.8 / 375.0	1 / 15
410.0	125	125	160	24.8 / 410.0	1 / 16
445.0	125	160	160	24.8 / 445.0	1 / 18
480.0	160	160	160	44.2 / 480.0	1 / 11
540.0	160	160	220	44.2 / 540.0	1 / 12
600.0	160	220	220	44.2 / 600.0	1 / 14
660.0	220	220	220	44.2 / 660.0	1 / 15
760.0	220	220	320	44.2 / 760.0	1 / 17
860.0	220	320	320	44.2 / 860.0	1 / 19
960.0	320	320	320	66.8 / 960.0	1 / 14
1088.6	320	320	450	66.8 / 1088.6	1 / 16
1217.2	320	450	450	66.8 / 1217.2	1 / 18
1345.8	450	450	450	86.2 / 1345.8	1 / 15

CASCADE INSTALLATION

Practical and smart

Every detail has been designed to facilitate the installations in cascade.

1 The hydraulic connections have been positioned at the same heights in order to promote the connection to the system delivery and return manifolds.

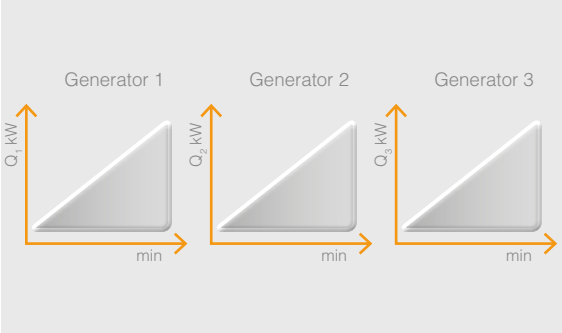
2 The “satellite” flue gas outlet with respect to the body of the generator and the anti-reflux shutter positioned directly on the fan facilitate the sizing and creation of the flue gas manifold (pressurised).

3 The OPERA range is combined with a complete series of accessories for multiple combinations in series of two or three generators, until reaching a maximum output of 1350 kW.

4 The electronics assembled in series were designed to be able to manage independently the dynamics of multiple generators in cascade, with the MASTER-SLAVE logics, up to a maximum number of 6.

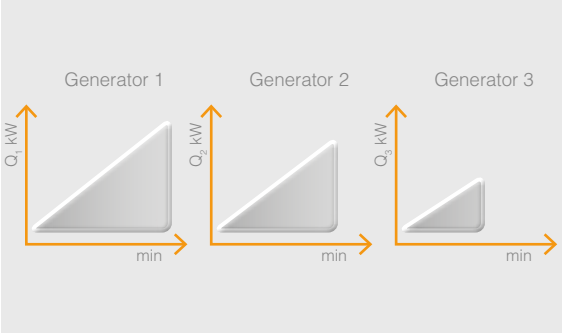
5 Via parameterisation of the cascade MASTER board, it is possible to set the switching on and off sequence of the various modules and the rotation of the switch on sequence in order to distribute the number of operating hours evenly.

6 Each complete configuration of the flue gas, hydraulic and gas accessories has been subjected to tests by the Ferroli technicians.



Parallel operation

The “parallel” operation of the modules entails switching on, modulation of the output and switching off of the burners simultaneously.
This solution offers maximum efficiency of the system as the greatest number of generators on at the lowest output guarantees the maximum level of condensation.
Instead, the system output modulation range is limited



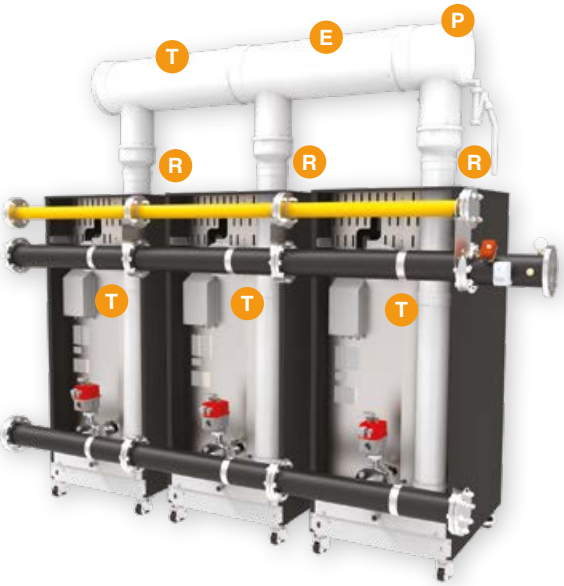
Sequential operation

Sequential switching on and modulation of the output of the burners guarantees a wide range of modulation which spans from the minimum output of a single generator to the maximum sum of outputs of all the burners when on.
This makes the system more flexible with respect to the thermal needs of the system but at the expense of the loss of a certain degree of energy efficiency.

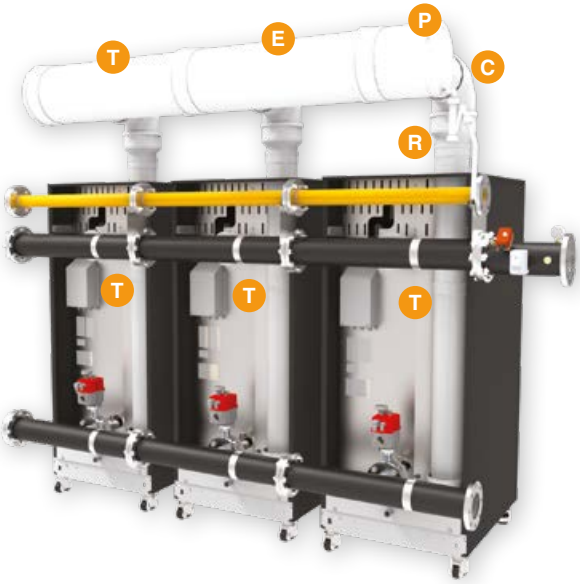
CASCADE INSTALLATION

Flue gas manifold accessories

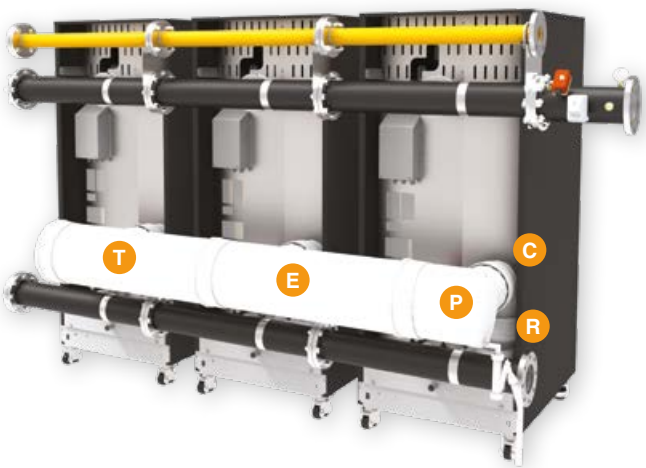
HIGH OUTPUT FLUE GAS MANIFOLDS



MEDIUM OUTPUT FLUE GAS MANIFOLD



LOW OUTPUT FLUE GAS MANIFOLD



THE RANGE OF FLUE GAS ACCESSORIES WAS DESIGNED TO BE ABLE TO CREATE THE DUCT TO VARIOUS HEIGHTS AND WITH OUTPUT TO THE RIGHT AND LEFT. THIS CHOICE, IN THE CASE OF REPLACEMENT OF AN OLD GENERATOR, FACILITATES CONNECTION WITH THE INLET OF THE EXISTING FLUE DUCT

P		flue gas manifold closure end	160 mm	041066X0
			200 mm	041068X0
			300 mm	041070X0
E		flue gas manifold	160 mm	041067X0
			200 mm	041069X0
			300 mm	041071X0
T		M/F flue gas pipe in PPS length 500 mm	100 mm	041072X0
			160 mm	041074X0
			200 mm	041076X0
T		M/F flue gas pipe in PPS length 1000 mm	100 mm	041073X0
			160 mm	041018X0
			200 mm	041062X0
			300 mm	041063X0
C		elbow 90° M/F in PPS	100 mm	041077X0
			160 mm	041015X0
			200 mm	041060X0
			300 mm	041061X0
R		reduction M/F in PPS	80-100 mm	041078X0
			100-160 mm	041079X0
			160-200 mm	041080X0

FLUE GAS ACCESSORIES
NECESSARY FOR THE CORRECT INSTALLATION OF 2 OPERA GENERATORS IN SERIES

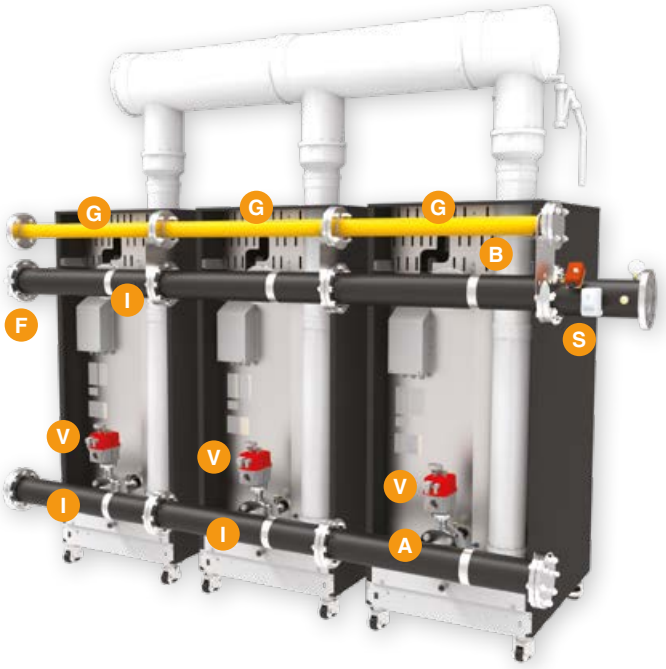
					P	P	P	E	E	E	T	T	T	T	T	T	C	C	C	R	R	R
					Start flue gas manifold F 300 mm	Start flue gas manifold F 200 mm	Start flue gas manifold F 160 mm	Flue gas manifold F 300 mm	Flue gas manifold F 200 mm	Flue gas manifold F 160 mm	Pipe f 200 M-F L 1000 mm PPS	Pipe f 200 M-F L 500 mm PPS	Pipe f 160 M-F L 1000 mm PPS	Pipe f 160 M-F L 500 mm PPS	Pipe f 100 M-F L 1000 mm PPS	Pipe f 100 M-F L 500 mm PPS	Elbow 90° F 200 M-F PPS	Elbow 90° F 160 M-F PPS	Elbow 90° F 100 M-F PPS	Reduction F 160-200 mm M-F PPS	Reduction F 100-160 mm M-F PPS	Reduction F 80-100 mm M-F PPS
																						
THERMAL OUTPUT (50/30°C) KW	OPERA MODULES			FLUE GAS EXPULSION	041070X0	041068X0	041066X0	041071X0	041069X0	041067X0	041062X0	041076X0	041018X0	041074X0	041073X0	041072X0	041060X0	041015X0	041077X0	041080X0	041079X0	041078X0
	1	2	3		nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.
139.8	70	70	-	Low			1			1									2			2
				Medium			1			1					2	2			2			2
				High			1			1					2	2						2
194.9	70	125	-	Low			1			1									2			1
				Medium			1			1					2	2			2			1
				High			1			1					2	2						1
250.0	125	125	-	Low			1			1									2			
				Medium			1			1					2	2			2			
				High			1			1					2	2						
285.0	125	160	-	Low		1			1									2			1	2
				Medium		1			1				1	2	1	1		2			1	2
				High		1			1				1	2	1	1					1	2
320.0	160	160	-	Low		1			1									2				1
				Medium		1			1				2	2				2				1
				High		1			1				2	2								1
380.0	160	220	-	Low		1			1									2				
				Medium		1			1				2	2				2				
				High		1			1				2	2								
440.0	220	220	-	Low		1			1									2				
				Medium		1			1				2	2				2				
				High		1			1				2	2								
540.0	220	320	-	Low	1			1									2			1		
				Medium	1			1			1	1		3			2			1		
				High	1			1			1	1		3						1		
640.0	320	320	-	Low	1			1									2					
				Medium	1			1			2	2					2					
				High	1			1			2	2										
818.6	320	450	-	Low	1			1									2					
				Medium	1			1			4						2					
				High	1			1			4											
897.2	450	450	-	Low	1			1									2					
				Medium	1			1			4	4					2					
				High	1			1			4	4										

FLUE GAS ACCESSORIES
NECESSARY FOR THE CORRECT INSTALLATION OF 3 OPERA GENERATORS IN SERIES

				P	P	P	E	E	E	T	T	T	T	T	T	C	C	C	R	R	R
				Start flue gas manifold F 300 mm	Start flue gas manifold F 200 mm	Start flue gas manifold F 160 mm	Flue gas manifold F 300 mm	Flue gas manifold F 200 mm	Flue gas manifold F 160 mm	Pipe f 200 M-F L 1000 mm PPS	Pipe f 200 M-F L 500 mm PPS	Pipe f 160 M-F L 1000 mm PPS	Pipe f 160 M-F L 500 mm PPS	Pipe f 100 M-F L 1000 mm PPS	Pipe f 100 M-F L 500 mm PPS	Elbow 90° F 200 M-F PPS	Elbow 90° F 160 M-F PPS	Elbow 90° F 100 M-F PPS	Reduction F 160-200 mm M-F PPS	Reduction F 100-160 mm M-F PPS	Reduction F 80-100 mm M-F PPS
																					
THERMAL OUTPUT (50/30°C) KW	OPERA MODULES			FLUE GAS EXPULSION	041070X0	041068X0	041066X0	041071X0	041069X0	041067X0	041062X0	041076X0	041018X0	041074X0	041073X0	041072X0	041060X0	041015X0	041077X0	041080X0	041079X0	041078X0
	1	2	3		nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.
209.7	70	70	70	Low			1			2									3			
				Medium			1			2					3	3			3			
				High			1			2					3	3						
264.8	70	70	125	Low			1			2									3			
				Medium			1			2					3	3			3			
				High			1			2					3	3						
319.9	70	125	125	Low			1			2									3			
				Medium			1			2					3	3			3			
				High			1			2					3	3						
375.0	125	125	125	Low		1			2									3			3	
				Medium		1			2						3	3		3			3	
				High		1			2	2					3	3					3	
410.0	125	125	160	Low		1			2									3			2	
				Medium		1			2				1	2	2	2		3			2	
				High		1			2				1	2	2	2					2	
445.0	125	160	160	Low		1			2					2				3			1	
				Medium		1			2				2	4	1	1		3			1	
				High		1			2				2	4	1	1					1	
480.0	160	160	160	Low		1			2									3				
				Medium		1			2				3	3				3				
				High		1			2				3	3								
540.0	160	160	220	Low		1			2									3				
				Medium		1			2				3	3				3				
				High		1			2				3	3								
600.0	160	220	220	Low	1			2									3			3		
				Medium	1			2						9			3			3		
				High	1			2						9						3		
660.0	220	220	220	Low	1			2									3			3		
				Medium	1			2						9			3			3		
				High	1			2						9						3		
760.0	220	220	320	Low	1			2									3			2		
				Medium	1			2			1	1		6			3			2		
				High	1			2			1	1		6						2		
860.0	220	320	320	Low	1			2									3			1		
				Medium	1			2			2	2		3			3			1		
				High	1			2			2	2		3						1		
960.0	320	320	320	Low	1			2									3					
				Medium	1			2			3	3					3					
				High	1			2			3	3										
1088.6	320	320	450	Low	1			2									3					
				Medium	1			2			6	6					3					
				High	1			2			6	6										
1217.2	320	450	450	Low	1			2									3					
				Medium	1			2			6	6					3					
				High	1			2			6	6										
1345.8	450	450	450	Low	1			2									3					
				Medium	1			2			6	6					3					
				High	1			2			6	6										

CASCADE INSTALLATION

Hydraulic and gas accessories



THE HYDRAULIC AND GAS ACCESSORIES ARE DESIGNED TO FACILITATE ASSEMBLY AND ARE USED TO CONNECT THE SERIES TO THE SYSTEMS WITH INDEPENDENT OUTPUTS ON THE RIGHT OR LEFT TO MAKE THE REPLACEMENT OF OLD GENERATORS EASIER.

G		gas manifold	1' 1/2-1'	042050X0
			2' -1'	042051X0
			2' 1/2-1'	042052X0
I		hydraulic manifold	DN50-1 1/2'	042053X0
			DN65-2'	042054X0
			DN100-DN65	042055X0
S		safety pipe (including Equipment)	DN50	042056X0
			DN65	042057X0
			DN100	042058X0
V		motorised butterfly valve, DN 50 powered 230V - 50Hz for model 70 and 125		052000X0
		motorised butterfly valve, DN 65 powered 230V - 50Hz for model 160, 220 and 320		052001X0
A		flange - sleeve	DN50 - 1'1/4	042065X0
			DN65 - 2'	042066X0
A		reduction nipple M - F	2' - 1'1/4	042064X0
B		union F - F	1' 1/4	042062X0
			2'	042063X0
F		flange kit (including nuts, bolts and gaskets)	DN50	042059X0
			DN65	042060X0
			DN100	042061X0

HYDRAULIC AND GAS ACCESSORIES
NECESSARY FOR THE CORRECT INSTALLATION OF 2 OPERA GENERATORS IN SERIES

					G	G	G	I	I	I	F	F	F	B	B	A	A	A
					Gas manifold 1" 1/2 - 1"	Gas manifold 2" - 1"	Gas manifold 2" 1/2 - 1"	Hydraulic manifold DN50 - 2"	Hydraulic manifold DN65 - 2"	Hydraulic manifold DN100 - DN65	Flange kit DN50	Flange kit DN65	Flange kit DN100	Union F-F 1"1/4	Union F-F 2"	Reduction nipple 2" - 1"1/2 M-F	Flange DN50 - sleeve 1"1/4	Flange DN65 - sleeve 2"
																		
THERMAL OUTPUT (50/30°C) KW	OPERA MODULES			MANIFOLD	042050X0	042051X0	042052X0	042053X0	042054X0	042055X0	042059X0	042060X0	042061X0	042062X0	042063X0	042064X0	042065X0	042066X0
	1	2	3		nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.
139.8	70	70	-	Gas	2													
				Delivery				2			1			2				
				Return				2			1						4	
194.9	70	125	-	Gas	2													
				Delivery				2			1			2				
				Return				2			1						4	
250.0	125	125	-	Gas	2													
				Delivery				2			1			2				
				Return				2			1						4	
285.0	125	160	-	Gas		2												
				Delivery					2			1			2	1		
				Return					2			1				1		4
320.0	160	160	-	Gas		2												
				Delivery					2			1			2			
				Return					2			1						4
380.0	160	220	-	Gas		2												
				Delivery					2			1			2			
				Return					2			1						4
440.0	220	220	-	Gas		2												
				Delivery					2			1			2			
				Return					2			1						4
540.0	220	320	-	Gas			2					1						
				Delivery						2			1					1
				Return						2			1					1
640.0	320	320	-	Gas			2					1						
				Delivery						2			1					
				Return						2			1					
818.6	320	450	-	Gas			2					1						
				Delivery						2			1					
				Return						2			1					
897.2	450	450	-	Gas			3					1						
				Delivery						3			1					
				Return						3			1					

HYDRAULIC AND GAS ACCESSORIES
NECESSARY FOR THE CORRECT INSTALLATION OF 3 OPERA GENERATORS IN SERIES

					G	G	G	I	I	I	F	F	F	B	B	A	A	A
					Gas manifold 1" 1/2 - 1"	Gas manifold 2" - 1"	Gas manifold 2" 1/2 - 1"	Hydraulic manifold DN50 - 2"	Hydraulic manifold DN65 - 2"	Hydraulic manifold DN100 - DN65	Flange kit DN50	Flange kit DN65	Flange kit DN100	Union F-F 1"1/4	Union F-F 2"	Reduction nipple 2" - 1"1/2 M-F	Flange DN50 - sleeve 1"1/4	Flange DN65 - sleeve 2"
																		
THERMAL OUTPUT (50/30°C) KW	OPERA MODULES			MANIFOLD	042050X0	042051X0	042052X0	042053X0	042054X0	042055X0	042059X0	042060X0	042061X0	042062X0	042063X0	042064X0	042065X0	042066X0
	1	2	3		nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.	nr.
209.7	70	70	70	Gas	3													
				Delivery				3			1			3				
				Return				3			1						6	
264.8	70	70	125	Gas	3													
				Delivery				3			1			3				
				Return				3			1						6	
319.9	70	125	125	Gas	3													
				Delivery				3			1			3				
				Return				3			1						6	
375.0	125	125	125	Gas		3												
				Delivery					3			1			3	3		
				Return					3			1				3		6
410.0	125	125	160	Gas		3												
				Delivery					3			1			3	2		
				Return					3			1				2		6
445.0	125	160	160	Gas		3												
				Delivery					3			1			3	2		
				Return					3			1				2		6
480.0	160	160	160	Gas			3					1						
				Delivery						3			1					3
				Return						3			1					3
540.0	160	160	220	Gas			3					1						
				Delivery						3			1					3
				Return						3			1					3
600.0	160	220	220	Gas			3					1						
				Delivery						3			1					3
				Return						3			1					3
660.0	220	220	220	Gas			3					1						
				Delivery						3			1					3
				Return						3			1					3
760.0	220	220	320	Gas			3					1						
				Delivery						3			1					2
				Return						3			1					2
860.0	320	320	220	Gas			3					1						
				Delivery						3			1					1
				Return						3			1					1
960.0	320	320	320	Gas			3					1						
				Delivery						3			1					
				Return						3			1					
1088.6	320	320	450	Gas			3					1						
				Delivery						3			1					
				Return						3			1					
1217.2	320	450	450	Gas			3					1						
				Delivery						3			1					
				Return						3			1					
1345.8	450	450	450	Gas			3					1						
				Delivery						3			1					
				Return						3			1					

NOTES

NOTES

NOTICE FOR SALES AGENTS:
With a view to constantly improve its production range and customer satisfaction levels, the Company hereby specifies that aesthetic and/or dimensional features, specifications and accessories may be subject to changes.

Please place the utmost care to ensure all technical and/or sales documents (lists, catalogues, brochures, etc.) provided to the final Customer are updated according to the latest edition.

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