

Unical

MODULEX EXT



BREVETTO
Unical
PATENT

15 claims

MODULAR GAS CONDENSING UNIT EQUIPPED WITH PRIMARY RING AND PREMIX MODULATING LOW NO_x BURNERS CLASS 6

OUTPUT RANGE

from 100 to 1500 kW and in battery up to 8 units

EMISSIONS

Class 6 NO_x

SUPPLY

Natural Gas or LPG

MODELS

100 150 200 250 300 350 440 550 660 770 900 1000 1100 1160 1200 1500

THERMAL MODULES n°

2 3 4 5 6 7 4 5 6 7 8 9 10 11 11 14

SEASONAL EFFICIENCY



Heat Exchanger in Aluminum / Silicon / Magnesium

Low water content

Ready for outdoor installation (IPX5D)

It can be equipped with mixing header (hydraulic separator) or plate heat exchanger

* Appliances not covered by Directive 2009/125/CE. The scope of the ERP Directive is up to 400 kW.

MAIN COMPONENTS

Thermal element in cast aluminum / silicon / magnesium, consisting of combustion chamber with **total radiation burner**, **modulating fan**, **modulating gas valve**, flame ignition and control device (**BMM**), **NTC temperature control sensor** and its own **safety thermostat**.

- Adjacent cast aluminium alloy sections for optimal reduction of the heat losses
- Hydraulic connections among the adjacent sections without any hydraulic interception, realized through hydraulically balanced manifolds
- Integral insulation with anallergic synthetic wool, 50 mm thick
- **Total premix modulating burners** with fame surface in “**metallic sponge**” **FeCrAlloy fibre**. The premixing takes place in the fan, equipped **with integral non return valve**
- Suction / feeding system of the combustive air from boiler house completely filtered
- Covered by a casing in electro-coated steel panels, painted with epoxy-polyester powders and completely impermeable (IPX5D)
- **Thermoregulation Ufly P** inserted in the special disappearing panel board
- Standard supplied: **outer temperature sensor**, **boiler temperature sensor**, **flow temperature sensor** and **DHW storage tank temperature sensor**
- C.H. system loads up to 2 mixed circuits (up to 15 with optional expansion modules), loading of the DHW storage tank and of a solar system
- **D.H.W. production** through the temperature sensor for the control, in priority, of the storage tank loading pump or of the three way deviating valve (through Ufly P, BCM 2.0, SHC)
- Possibility of control of the power of each single thermal module
- **Automatic management of the delivered power**, of the temperature set-point and the 0-10 V signal to the modulating pump according to the parameters of the C.H. system (BCM 2.0)
- **Monitoring** of the operation state and the temperatures
- Management of the alarms
- Introduction of the parameters
- **ADDITIONAL FUNCTIONS OF BCM 2.0** (delivered in the supply):
 - Analogical outlet 0÷10 V for the control of a modulating pump
 - Characteristics of the communication system of the BMS (Building Management System), through the BCM card, that constitutes physically the communication port, which communicates through the Modbus protocol. Hardware type: RS485 Modbus protocol
 - Emergency operation: anti black-out through BCM 2.0
 - Restoration (after 60 seconds) of the normal operation with “constant temperature Set-point” of 70°C (or otherwise selectable), at a maximum 50% power
 - Alarm Signalling Relay



Detail of the HEAT EXCHANGER
in Al/Si/Mg



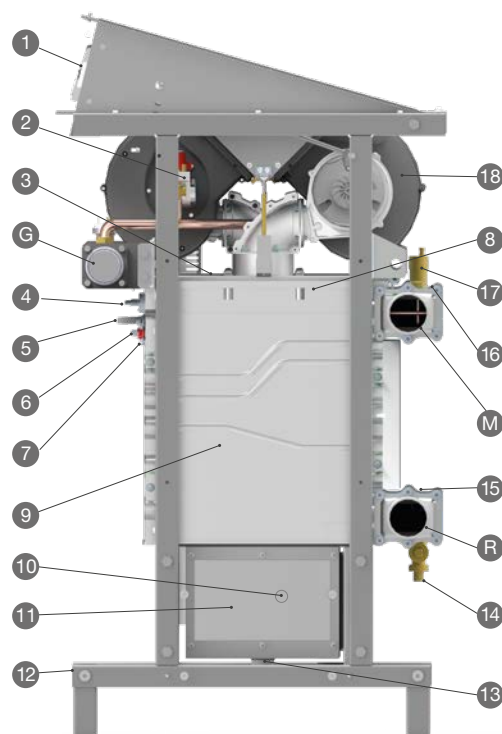
CROSS-SECTION OF THE
PREMIX MULTI-BURNER



PREMIX BURNERS WORKING
AT CONSTANT CO₂



BUILT-IN NON RETURN
SMOKE VALVES



Key:

- | | |
|--|---|
| 1 - Command panel Ufly P | 12 - Frame |
| 2 - Gas valve | 13 - Condensates drain connection |
| 3 - Burner cover | 14 - Boiler drain cock |
| 4 - Ignition electrode | 15 - Global NTC return temperature sensor |
| 5 - Ionization electrode | 16 - Global NTC flow temperature sensor |
| 6 - Local NTC temperature sensor | 17 - Automatic air vent |
| 7 - Local limit thermostat | 18 - Fan |
| 8 - Burner | G - Gas pipe |
| 9 - Heat exchanger in aluminium alloy | M - Central heating flow |
| 10 - Condensates level sensor | R - Central heating return |
| 11 - Condensates tray - chimney connection | |

PRE-ASSEMBLED THERMAL ELEMENTS IN Al/Si/Mg

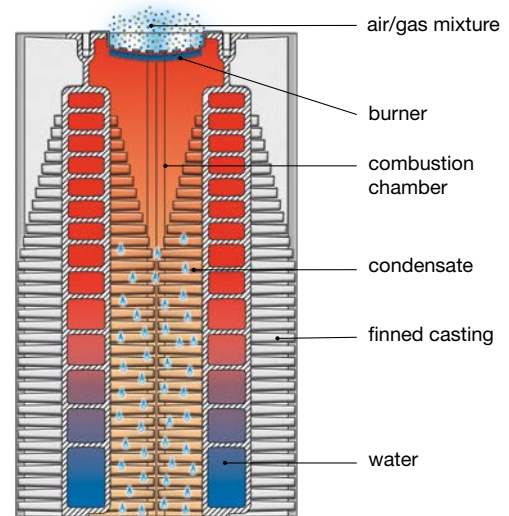
The basic element is formed by **two aluminium alloy castings** that, on the smoke side, have dense **fins**, with increasing height toward the smoke evacuation, placed in lower part of the casting, in order to increase its exchange surface (Unical patent).

Inside the castings there are the water channels that, always with more reduced section, zigzag cross the casting, granting an exceptional heat transfer from combustion gases to the water.

Every thermal element is equipped with:

- premix modulating radiation burner
- modulating gas valve
- electronic ignition and ionization
- NTC working temperature sensor
- safety thermostats
- flame sight glass.

The smoke and acidic condensate of the thermal elements are collected in a stainless steel tray.



THE PREMIX

The very high performances of MODULEX EXT depend on the combustion generating unit

The combustion mixture is regulated in parts always proportionate air and gas to produce, through the multigas burner, the most efficient thermal energy transmission system, the "irradiated combustion".

The wide surface, on which the combustion happens, guarantees:

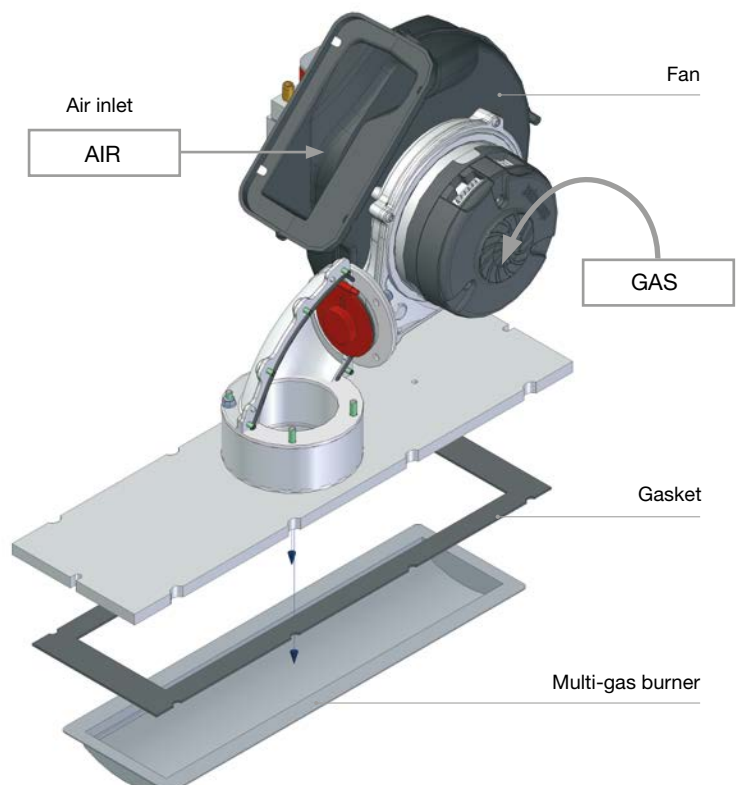
- **low combustion temperature**
- **reduced turbulence**

with the following **advantages**:

- **long lasting of the burner**
- **high combustion silentness**
- **reduced maintenance**
- **very small production of pollutants**
- **excellent combustion efficiency**
- **rapid reaching of the dew point**
- **limited "excess of air"**

HIGH INTEGRATION:

The valve is directly fitted on the fan. Inside its volute the air/gas mixing takes place exactly calibrated.



PRODUCT PLUS VALUES

MAXIMUM SAVING AND SEASONAL EFFICIENCY

High efficiency thanks to:

- Certified efficiency up to 109% at the minimum modulated capacity (ex Dir. 92/42)
- Seasonal efficiency: + 30% if compared with the conventional boilers
- Modulation ratio: UP TO 1:69
- Modulating pump directly managed by the boiler to assure the maximum condensation at all regimes
- $\eta_s = 92\%$ (dir. ErP)

TOTAL SAFETY

- High reliability due to MULTIBURNER composition and to the low number of parts in movement
- Emergency operation in case the Ufly P controller is out of service through BCM 2.0
- Working and safety temperature sensors on every casting section
- Pre-mixing in the fan with integrated non-return valve

OPERATING ASSURANCE (MULTIBURNER)

The functional autonomy of the heating elements / combustion units, independent of each other, guarantees complete reliability of the unit which, in the event of faults on a heating element, always ensures the operation of the generator.

SELF-ADAPTATION OF POWER

It drastically reduces the number of switching on and off of the generator (possible customization of the required power)

It follows:

- **Increased efficiency** and lower losses on the chimney due to the burner off
- **Longer life** of moving parts and ignition systems

INSTANT ANSWER TO REQUEST CHANGES

The generator operates at reduced load, pushing itself to fractions below 30%.

MODULEX EXT adapts its power to these needs in real time, thanks to its low water content, and, being equipped with a modulating pump, reduces electrical consumption to a minimum.

FLEXIBILITY OF INSTALLATION

- Outdoor installation: protection degree IPX5D
- compact, light, of easy connection:
 - reversible hydraulic and gas connections (up to the mod. 350 kW)
 - smoke evacuation: possible on 3 sides (for all the models)

LOW ENVIRONMENTAL IMPACT

- Low NO_x emissions, referred to GCV: $< 30 \text{ mg/kWh}$
- Low NO_x class 6 (EN 15502-1)
- Low acoustic impact
- Low chimney flue losses
- Totally premix, radiation, modulating burners, working at constant CO_2

EXCLUSIVE ELECTRONIC TECHNOLOGY

- Electronic management and thermal regulation completely automatic and pre-programmed (patented)
- Predisposition for telemanagement and telecontrol
- Possible cascade installation **up to 8 boilers** ($8 \times 1500 = 12000 \text{ kW}$)



MAXIMUM EFFICIENCY

OPERATION PRINCIPLES

The particularity of the Thermoregulation Ufly P is that to maintain in operation the **greatest number of modules** at the **smallest possible power** (as shown in the examples).

Exploiting this peculiarity we will have always the system under the conditions of maximum possible efficiency, independently from the delivered power.

Always with the same principle, when the load is progressively reduced, the power of every module will also be adjusted and reduced in proportional measure.

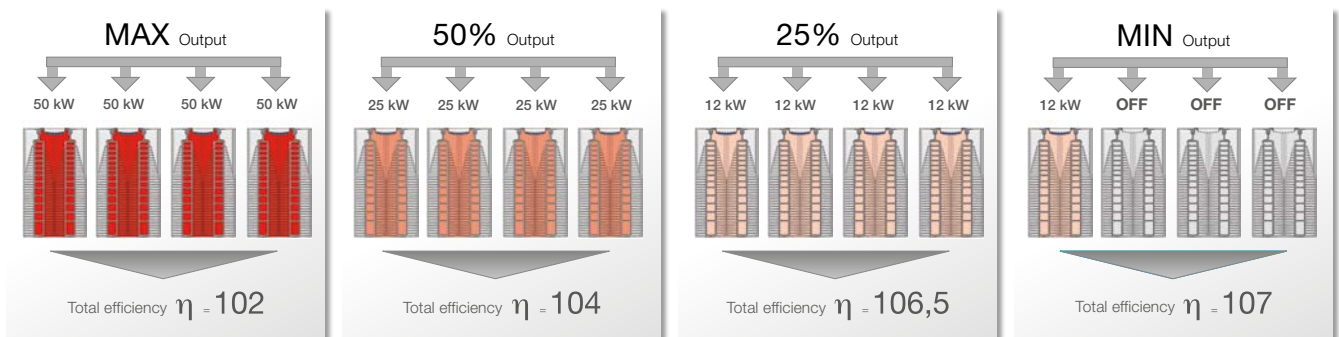
Being the minimum power of each module 12 kW (for the models

up to 350 kW), if the required output is less than the total amount of the minimum powers of the single modules (n° of modules $\times$ 12 kW), only the modules necessary to the attainment of the required output will be maintained in operation power and disabled the others.

Besides, to assure an equal daily rotation of the modules, every 24 hours the lighting of the modules will be alternate so that every one operates for the same number of hours.

The same criterion is applied for the range 440-1500 kW, but with modulation up to a minimum of 22 kW.

Output sharing of MODULEX EXT of 4 modules of 50 kW



Self-adaptation of power

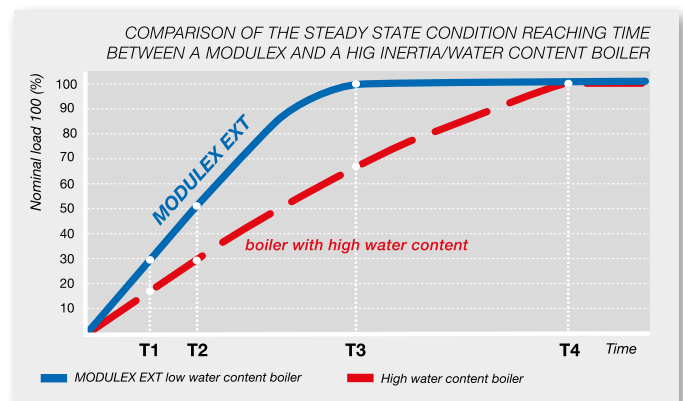
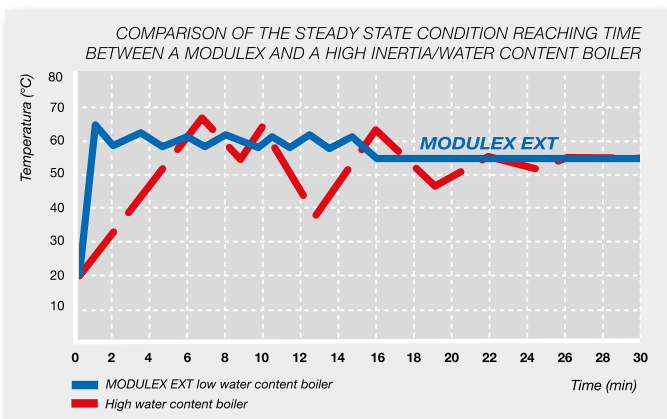
This function allows to drastically reduce the number of switching ON and OFF of the boiler. (Possible customization of the requested output).

Advantages:

- Higher efficiency and lower flue losses when burner is OFF.
- Longer lasting of the parts in movement and of the ignition systems.

Speed of response to changes in request

On average a boiler operates for satisfying the actual 50% of the thermal needs of the C.H. installation and descend also below 30%. MODULEX EXT adjusts in real time its output to these necessities, because it is not influenced by the thermal inertia, thanks to its low water content and, being equipped with modulating pump, it further reduces the electric consumptions.



After the time "T1" from the starting, MODULEX EXT succeeds in satisfying the 30% of the load unlike a traditional boiler that, in the same time, is just at 15%.
After the time "T2" MODULEX EXT is at 50% of the load, while the traditional one is at 30%.
After the time "T3" MODULEX EXT is at 100% of the load and the traditional one is only to 70%. This is an example of speed of a genial boiler!

APPLICATION ON THE INSTALLATIONS

Ideal for new installations or as replacement of obsolete generators serving large-scale buildings, such as condominiums, industrial buildings, shopping centers, school buildings, hospitals, etc.



MODULEX EXT

is the ideal solution for:

- applications on new installations
- substitutions for efficiency improvement

REDUCED DIMENSIONS AND HIGH POWER

Ideal for solving situations in which the space of the boiler house is reduced or difficult to reach, thanks to an excellent weight-power ratio.

VERY HIGH SELF-ADAPTATION CAPACITY

- instantaneous power adaptation, thanks to the very low water content
- very high modulation ratio, up to 1:69



INSTALLATION IN COLD CLIMATIC ZONES



INSTALLATION SPEED

It is supplied, together with the assembly kit, almost pre-built. In a morning it can replace the faulty generator of a condominium.

OPTIMIZED SYSTEM INTERFACE

(mixing header / stainless steel plate heat exchanger)

OUTDOOR INSTALLATION

Approved for outdoor installation, even open sky, with IPX5D electric protection as standard and anti-freeze protection up to -15°C .

LOW NO_x CLASS 6 (ACCORDING TO EN 15502-1)

“Ecological”, thanks to special total premixing, modulating, irradiation burners, at constant CO₂, which allow low NO_x emissions and low heat losses to the chimney.



OUTDOOR INSTALLATION



INSTALLATION IN BOILER HOUSE

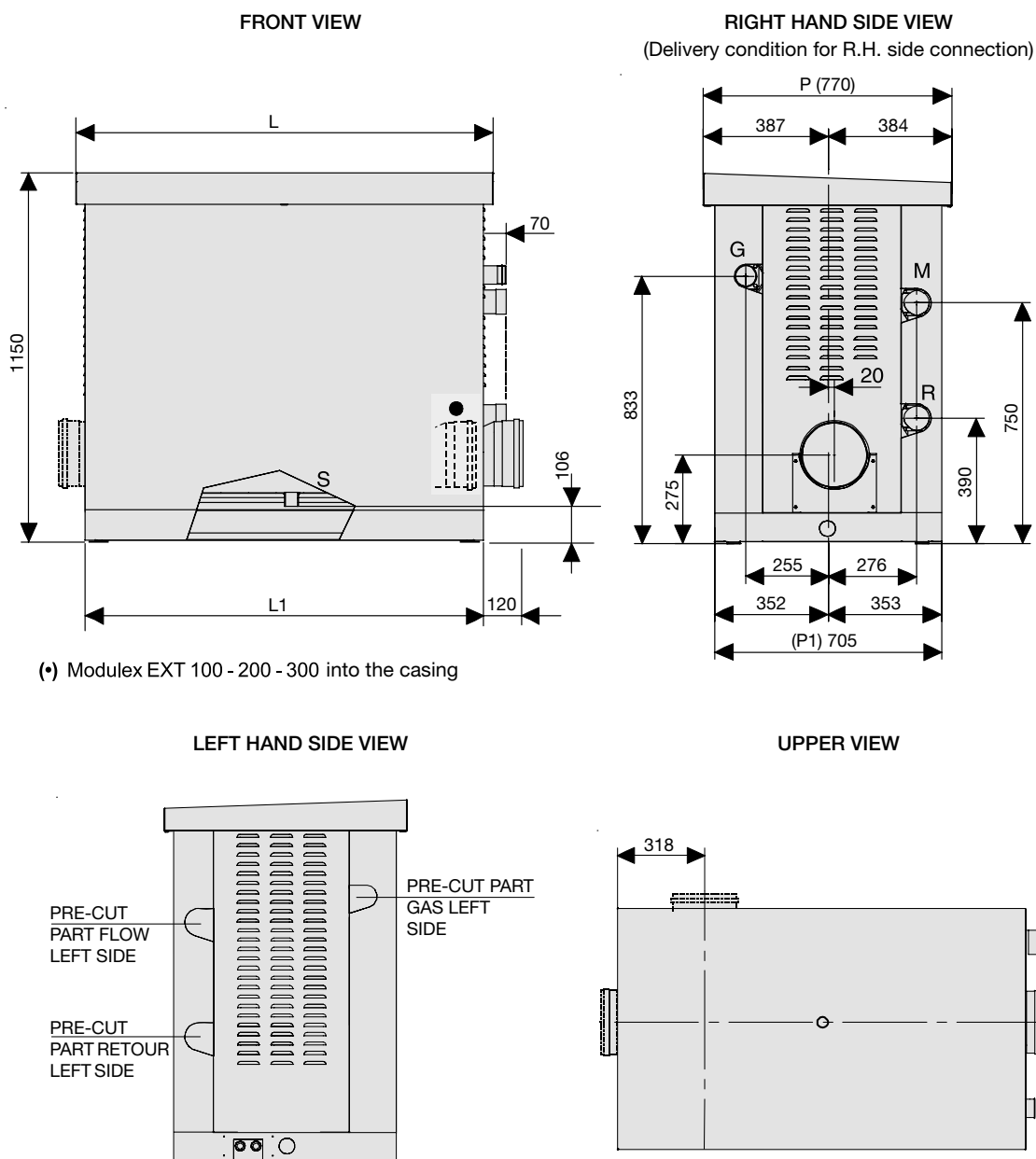
NOISELESSNESS

The particular configuration of the exchanger and the use of premix burners reduce the acoustic emissions even at full power, making it suitable for installation even in critical areas.

COMPLETE WITH PLUG & PLAY ACCESSORIES

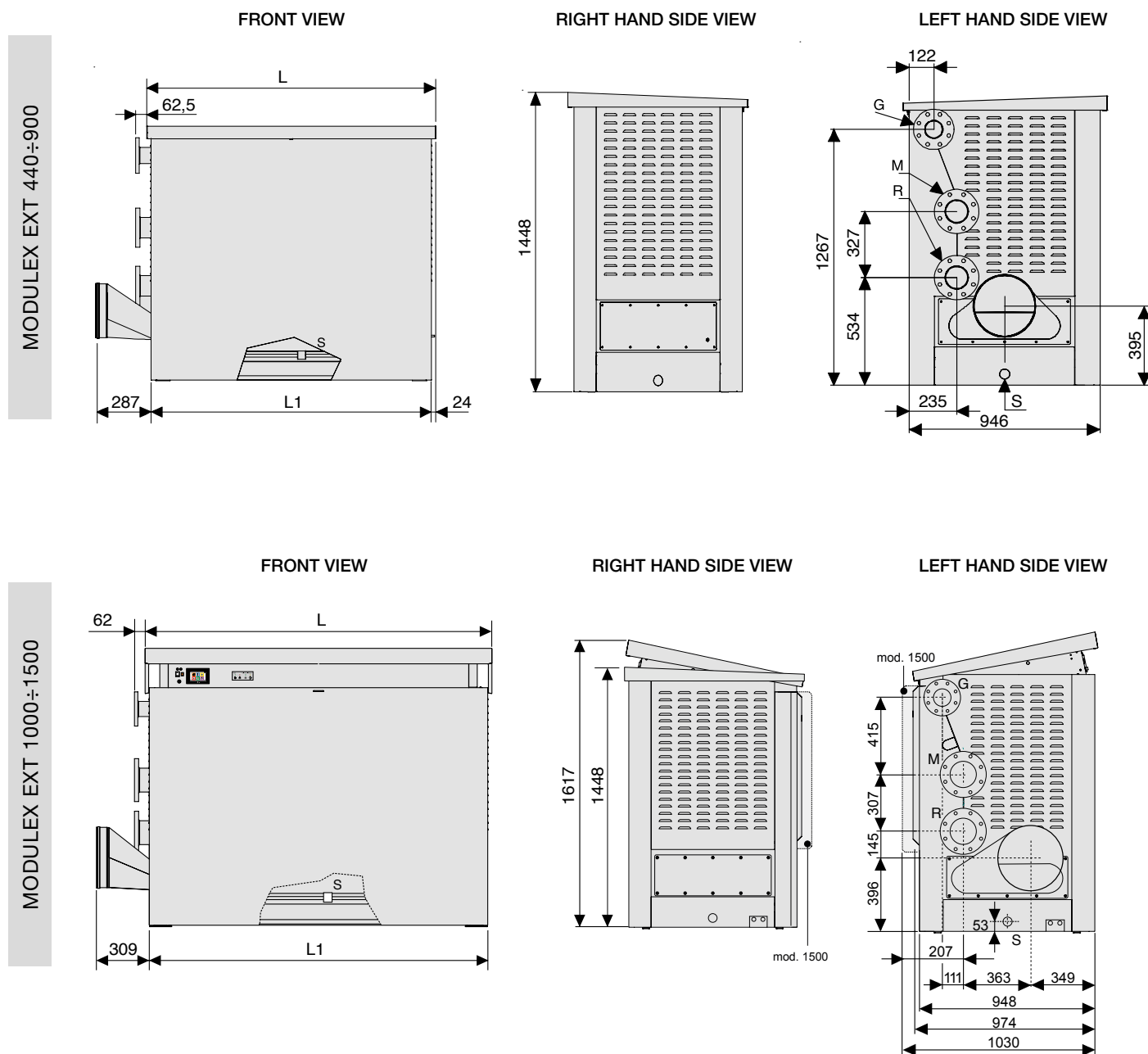
Hydraulic kits with INAIL safety devices, including mixing header or plate heat exchanger, both designed for optimal management of the system downstream of the boiler.

DIMENSIONS MODULEX EXT 100÷350



MODULEX EXT		100	150	200	250	300	350
No. of Modules		2	3	4	5	6	7
Height	mm	1150	1150	1150	1150	1150	1150
Width "L"	mm	764	764	1032	1032	1300	1300
Width "L1"	mm	706	706	974	974	1242	1242
Depth "P"	mm	770	770	770	770	770	770
Depth "P1"	mm	705	705	705	705	705	705
Connections							
Gas	mm (inch)	50 (2)	50 (2)	50 (2)	50 (2)	50 (2)	50 (2)
C.H. system Flow M	mm (inch)	64 (2½)	64 (2½)	64 (2½)	64 (2½)	64 (2½)	64 (2½)
C.H. system Return R	mm (inch)	64 (2½)	64 (2½)	64 (2½)	64 (2½)	64 (2½)	64 (2½)
Chimney connection "D"	mm	150	150	150	200	200	200
Condensate drain diameter	mm	40	40	40	40	40	40
Gross Weight (with packaging)	kg	203	236	295	325	386	419

DIMENSIONS MODULEX EXT 440÷1500



MODULEX EXT		440	550	660	770	900	1000	1100	1160	1200	1500
No. of Modules		4	5	6	7	8	9	10	11	11	14
Height	mm	1448	1448	1448	1448	1448	1448	1448	1448	1448	1448
Width "L"	mm	1087	1355	1355	1623	1623	2025	2025	2025	2025	2427
Width "L1"	mm	1039	1307	1307	1575	1575	1977	1977	1977	1977	2379
Depth	mm	946	946	946	946	946	975	975	975	975	1030
Connections											
Gas	mm (inch)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)	80 (3)
C.H. system Flow M	mm (inch)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	125 (5)	125 (5)	125 (5)	125 (5)	125 (5)
C.H. system Return R	mm (inch)	100 (4)	100 (4)	100 (4)	100 (4)	100 (4)	125 (5)	125 (5)	125 (5)	125 (5)	125 (5)
Chimney connection	mm	250	250	300	300	300	350	350	350	350	350
Condensate drain diameter	mm	40	40	40	40	40	40	40	40	40	40
Gross Weight (with packaging)	kg	585	643	707	806	858	980	1020	1120	1120	1400

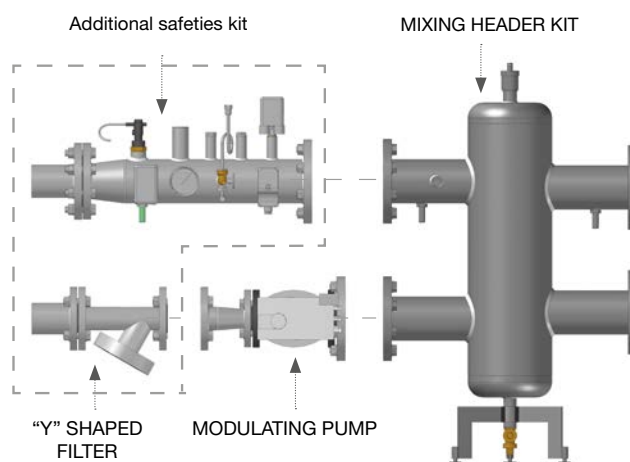
PRIMARY RINGS WITH MIXING HEADER

The PRIMARY RING with MIXING HEADER

is composed from:

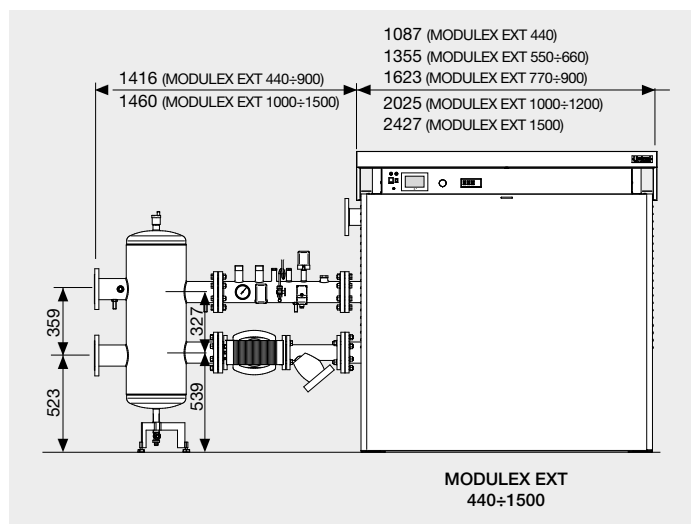
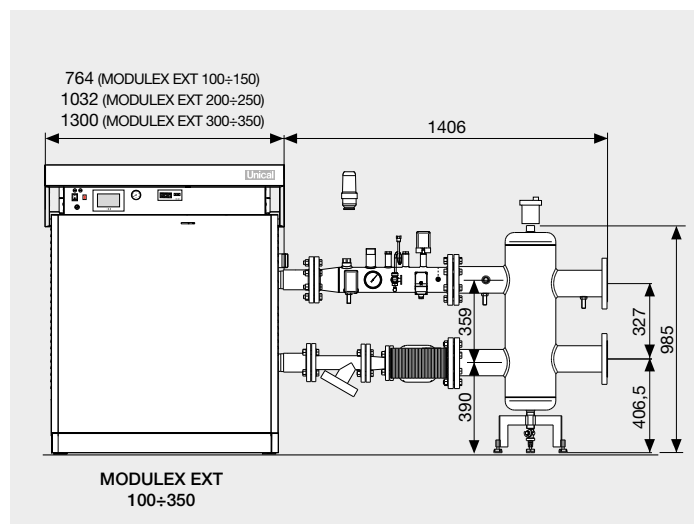
- MIXING HEADER KIT
- COMPLETE ADDITIONAL SAFETY DEVICES KIT
- MODULATING PUMP
with electronic interface 0-10 V
- “Y” SHAPED FILTER
- BOLTS AND GASKETS

PRIMARY RINGS WITH MIXING HEADER combinations with MODULEX EXT	Maximum controlled power kW
100 ÷ 150	150
200 ÷ 250	250
300 ÷ 350	350
400 ÷ 770	756
900*	864
1000 ÷ 1500	1512



* On request, for larger outputs, other sizes are available.
Some devices are not supplied because their size depends on the extension and type of the heating system.

DIMENSIONS WITH MIXING HEADER

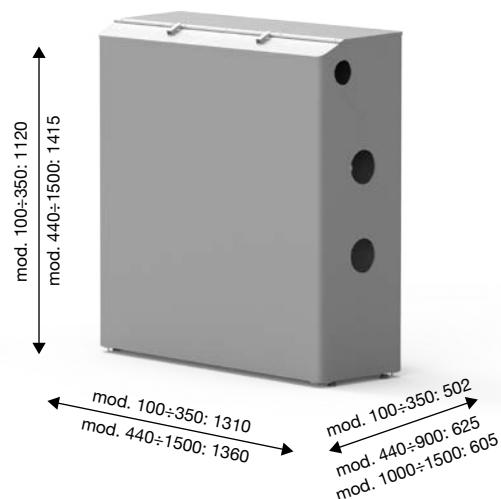


NOTE: Up to 350 kW the inversion (R.H. Side to L.H. Side) of the connections is possible.

OGNITEMPO EXT (optional) for primary ring with MIXING HEADER

Insulated protection case for outdoor installation according to the standards (IPX5D).

OGNITEMPO EXT protection casing for MIXING HEADER combinations with MODULEX EXT	Dimensions BOX L x P x H (mm)
100 ÷ 350	1310 x 502 x 1120
440 ÷ 900	1360 x 625 x 1415
1000 ÷ 1500	1360 x 605 x 1415



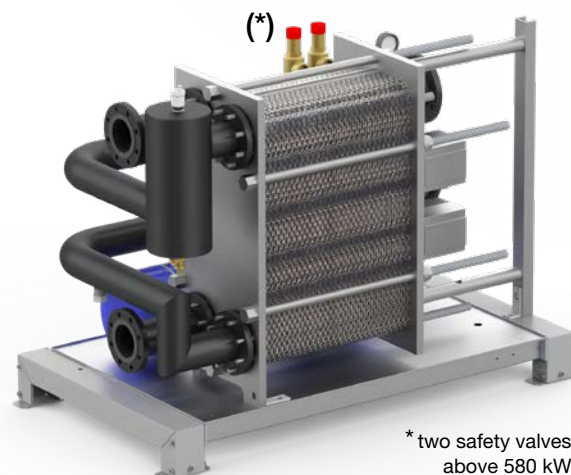
PRIMARY RINGS WITH PLATES HEAT EXCHANGER

The PRIMARY RING with PLATES HEAT EXCHANGER

is composed from:

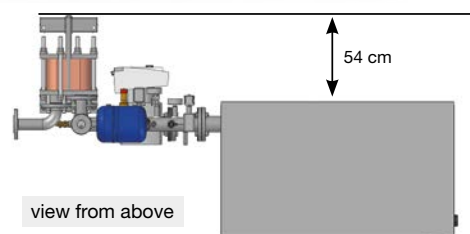
- PLATES HEAT EXCHANGER in specific stainless steel
- ADDITIONAL SAFETY DEVICES KIT
- MODULATING PUMP WILO STRATOS "CLASS A"
- EXPANSION VESSEL 8 liters (mod. 100÷350) 24 liters (mod. 440÷1500)
- AUTOMATIC AIR VENT
- FLOW AND RETURN PIPES
- DRAIN COCK 3/4"
- FLANGES / ADAPTERS AND FITTINGS
- ADJUSTABLE SUPPORTING ELEMENTS
- SMALL PARTS AND GASKETS

PRIMARY RINGS WITH PLATES HEAT EXCHANGER combinations with MODULEX EXT	Maximum controlled power kW
100 ÷ 200	200
250 ÷ 350	350
440 ÷ 550	550
660	660
770	770
900	900
1000 ÷ 1500	1512

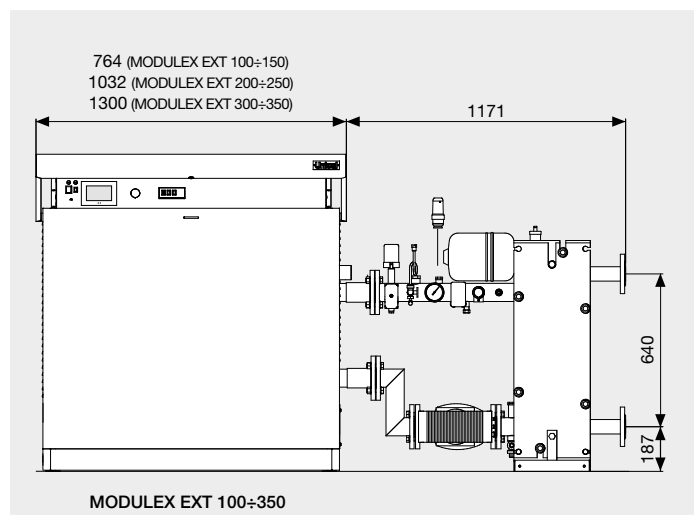


* two safety valves
above 580 kW

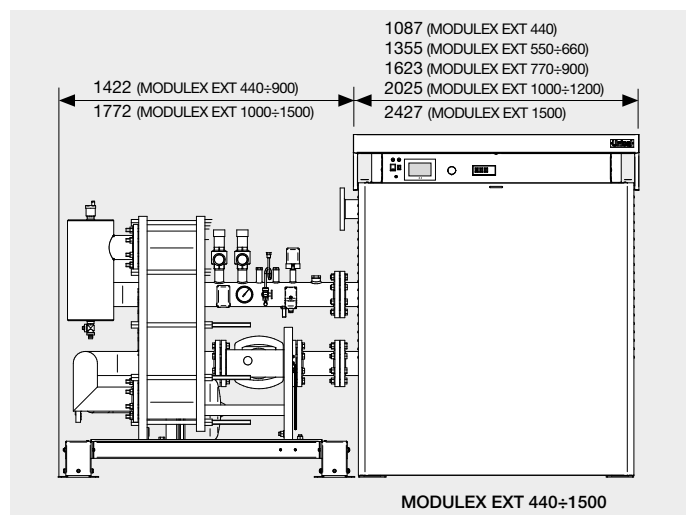
Up to 350 kW:
possibility of reversing
the primary ring
position (54 cm rear
depth)



view from above

DIMENSIONS WITH PLATES HEAT EXCHANGER

MODULEX EXT 100÷350



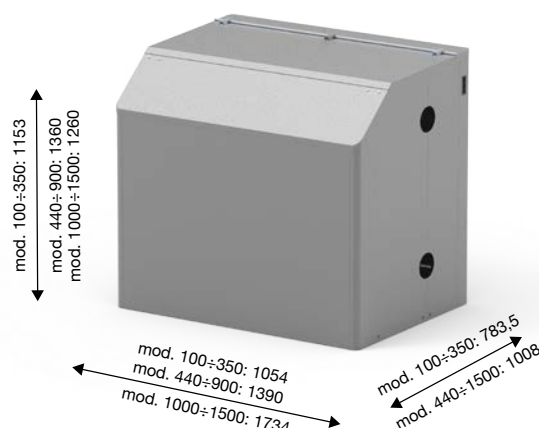
MODULEX EXT 440÷1500

NOTE: Up to 350 kW the inversion (R.H. Side to L.H. Side) of the connections is possible.

OGNITEMPO EXT (optional)**for primary ring with PLATES HEAT EXCHANGER**

protection box for outdoor installation in conformity
to the standards (IPX5D)

OGNITEMPO EXT protection casing for PLATES HEAT EXCHANGER combination with MODULEX EXT	Dimensions BOX W x D x H (mm)
100 ÷ 350	1054 x 783,5 x 1153
440 ÷ 900	1390 x 1008 x 1360
1000 ÷ 1500	1734 x 1008 x 1260



ACCESSORIES (optional)

CONTROLLER FOR ADDITIONAL ZONES

- **Kit CONTROL MANAGER Ufly P** made of:
cascade manager card BCM 2.0, viewer / programmer Ufly P, power pack 24V, outdoor temperature sensor, D.H.W. temperature sensor

Can be used for cascade management up to 8 modules

- kit **GATEWAY P** for Ufly P remote connection

- **PT 1000 TEMPERATURE SENSOR** for solar collectors control

- **SHC MULTIFUNCTION MODULE (for zones management)**
+ 3 control probes
(it is possible to drive up to a maximum of 4 SHC cards).

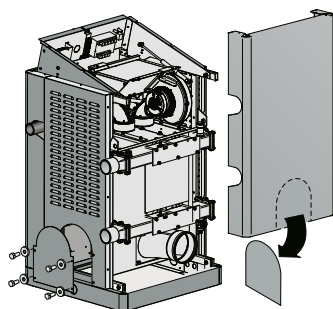
- **NTC SENSOR FOR SHC MODULE**



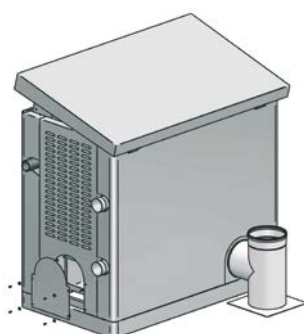
Ufly P

SMOKES EVACUATION KIT

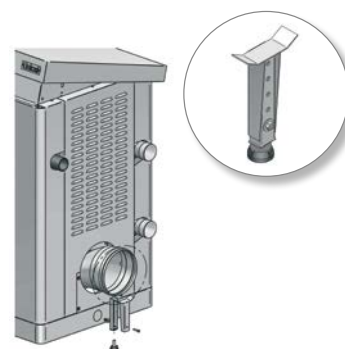
- CLOSING PANEL KIT FOR PRE-CUTTING for MODULEX EXT 100÷200
- REAR SMOKE OUTLET KIT for MODULEX EXT 250÷350
- SUPPORTING KIT FOR SMOKE TERMINAL
- C63 sealed room kit MODULEX 100-350
- C63 sealed room kit MODULEX 440-1500



Closing panel kit for MODULEX EXT 100÷200



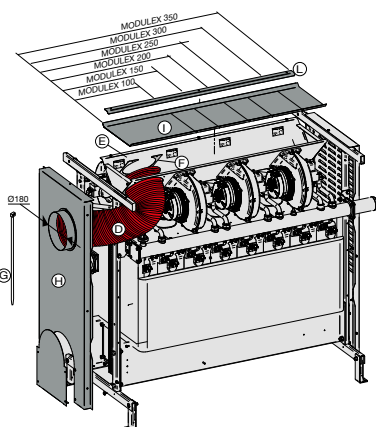
Rear smoke outlet kit for MODULEX EXT 250÷350



Supporting kit for smoke terminal

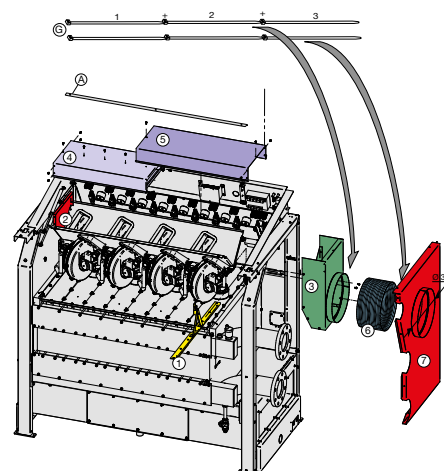
C63 sealed room kit
MODULEX 100-350
code 00362187

- Insert the hose "D" into the hole of the fans room "E", fix the pipe by means of the brackets "F" in the fans room "E". Fix the other end of the hose through the clamp "G", on the left side "H".
- Cut the cover of fans room "I" depending on the model of boiler at pre-sliced
- Close the fans room with the metal fans "L"
- Covering the boiler.



C63 sealed room kit
MODULEX 440-1500
code 00362188

- Secure the mounting bracket smokebox "1", fix the closing "2", the smoke box end "3".
- Close the fan room through the telescopic cover "4 + 5" and lock the fans room with the closing bracket "A".
- Insert the hose into the hole "6" into the fans room and into the hole on the left side "7" with the ties "G".
- Mantle of the boiler.



CONDENSARTE NEUTRALIZATION SYSTEMS

- CONDENSATE NEUTRALIZERS

KIT NH 300 - up to 300 kW

KIT NH 1500 (without pump) - up to 1500 kW

KIT NH 1500-P (with pump) - up to 1500 kW

Neutralizer salt Refill NH 25 kg

DATI DI FUNZIONAMENTO MODULEX EXT 100÷350

ELECTRICAL, HYDRAULIC, INSTALLATION DIAGRAMS AND CONTROLLERS can be unloaded from the web site www.unical.eu at the page of the product

MODULEX EXT		100	150	200	250	300	350
Boiler category		II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}
Modulation ratio		1:8.3	1:12.5	1:16.7	1:20.8	1:25	1:29
Rated heat output on P.C.I. Q _n	kW	100	150	200	250	300	348
Minimum heat output on P.C.I. Q _{min}	kW	12	12	12	12	12	12
Rated useful power (Tr 60 / Tm 80 °C) P _n	kW	97.2	146.1	195.2	244.5	294	341.7
Minimum useful power (Tr 60 / Tm 80 °C) P _n min	kW	11.7	11.7	11.7	11.7	11.7	11.7
Rated useful power (Tr 30 / Tm 50 °C) P _{cond}	kW	100.1	150	200.4	251.3	302.7	354.6
Minimum useful power (Tr 30 / Tm 50 °C) P _{cond} min	kW	12.8	12.8	12.8	12.8	12.8	12.8
Rated power performance (Tr 60 / Tm 80 °C)	%	97.2	97.4	97.6	97.8	98.0	98.2
Minimum power performance (Tr 60 / Tm 80 °C)	%	97.16	97.16	97.16	97.16	97.16	97.16
Rated power performance (Tr 30 / Tm 50 °C)	%	100.1	100.0	100.2	100.5	100.9	101.9
Minimum power performance (Tr 30 / Tm 50 °C)	%	106.5	106.5	106.5	106.5	106.5	106.5
Performance at 30% of the load (Tr 30 °C)		107.3	107.3	107.3	107.3	107.3	107.3
Combustion efficiency at nominal load	%	97.8	97.8	97.8	98.0	98.1	98.3
Combustion efficiency with reduced load	%	98.3	98.3	98.3	98.3	98.3	98.3
Casing heat loss with burner operating (Q _{min})	%	1.2	1.2	1.2	1.2	1.2	1.2
Casing heat loss with burner operating (Q _n)	%	0.6	0.4	0.2	0.2	0.1	0.1
Net flue gas temperature tf-ta (min)(*)	°C	33.4	33.4	33.4	33.4	33.4	33.4
Net flue gas temperature tf-ta (max)(*)	°C	44.2	45.1	46.5	47.3	48.2	49.1
Maximum permitted temperature	°C	100	100	100	100	100	100
Maximum operating temperature	°C	85	85	85	85	85	85
Flue gas mass flow rate (min)	kg/h	19.6	19.6	19.6	19.6	19.6	19.6
Flue gas mass flow rate (max)	kg/h	163	245	327	409	490	569
Excess air	%	28.2	28.2	28.2	28.2	28.2	28.2
Heat loss at chimney with burner on (min)	%	1.7	1.7	1.7	1.7	1.7	1.7
Heat loss at chimney with burner on (max)	%	2.2	2.2	2.2	2.2	1.9	1.7
Minimum heating circuit pressure	bar	0.5	0.5	0.5	0.5	0.5	0.5
Maximum heating circuit pressure	bar	6	6	6	6	6	6
Water content	l	10.1	14.2	18.3	22.4	26.5	30.6
Methane gas consumption G20 (pow.sup. 20 mbar) at Q _n	m³/h	10.6	15.9	21.1	26.4	31.7	36.8
Methane gas consumption G20 (pow.sup. 20 mbar) at Q _{min}	m³/h	1.3	1.3	1.3	1.3	1.3	1.3
Gas consumption G25 (pow.sup. 20/25 mbar) at Q _n	m³/h	12.3	18.4	24.6	36.7	36.9	42.8
Gas consumption G25 (pow.sup. 20/25 mbar) at Q _{min}	m³/h	1.5	1.5	1.5	1.5	1.5	1.5
Propane gas consumption (pow. sup. 37/50 mbar) at Q _n	kg/h	7.8	11.6	15.5	19.4	23.3	27
Propane gas consumption (pow. sup. 37/50 mbar) at Q _{min}	kg/h	0.9	0.9	0.9	0.9	0.9	0.9
Chimney base maximum pressure available	Pa	100	100	100	100	100	100
Max condensate production	kg/h	15.3	23	30.6	38.3	45.9	53.6
Emissions							
CO at maximum heat output with 0% of O ₂	mg/kWh	57	54	62	71	55	58
NO _x at maximum heat output with 0% of O ₂	mg/kWh	52	38	36	44	42	40
NO _x Class		6	6	6	6	6	6
(***) Sound pressure level	db (A)	52	52	52	52	52	52
Electrical data							
Power supply voltage/frequency	V/Hz	230 / 50					
(**) Protection rating	IP	X5D					

Room Temperature = 20°C

(*) Temperature detected with appliance operation flow rate 80°C / ret. 60°C

Seasonal Efficiency η_s according to Directive 2009/125/EC for Outputs < = 400 kW. See ErP TableStand-by heat loss ΔT 30°C - P_{stby} - see ErP tableConsumption in stand-by - P_{sb} - see ErP table

(**) The protection IP is obtained with cap down

(***) 1 meter away in open field

TECHNICAL DATA MODULEX EXT 440÷1500

ELECTRICAL, HYDRAULIC, INSTALLATION DIAGRAMS AND CONTROLLERS can be unloaded from the web site www.unical.eu at the page of the product

MODULEX EXT		440	550	660	770	900	1000	1100	1160	1200	1500
Boiler category		II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}	II _{2H3P}
Modulation ratio		1:19.6	1:24.5	1:29.4	1:34.3	1:39.2	1:44	1:49	1:53	1:54	1:69
Rated heat output on P.C.I. Qn	kW	432	540	648	756	864	972	1080	1158	1188	1512
Minimum heat output on P.C.I. Qmin	kW	22	22	22	22	22	22	22	22	22	22
Rated useful power (Tr 60 / Tm 80 °C) Pn	kW	424.3	530.4	636.5	742.6	849.0	947	1052	1130	1157	1473
Minimum useful power (Tr 60 / Tm 80 °C) Pn min	kW	20.6	20.6	20.6	20.6	20.6	20.7	20.7	20.7	20.7	20.7
Rated useful power (Tr 30 / Tm 50 °C) Pcond	kW	445.0	557.8	670.1	783.2	900.3	1015	1130	1202	1237	1574
Minimum useful power (Tr 30 / Tm 50 °C) Pcond min	kW	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9
Rated power performance (Tr 60 / Tm 80°C)	%	98.2	98.2	98.2	98.2	98.2	97.4	97.4	97.6	97.6	97.6
Minimum power performance (Tr 60 / Tm 80°C)	%	93.5	93.5	93.5	93.5	93.5	93.9	93.9	93.9	93.9	93.9
Rated power performance (Tr 30 / Tm 50°C)	%	104	104	104	104	104	104	104	104	104	104
Minimum power performance (Tr 30 / Tm 50°C)	%	109	109	109	109	109	108.5	108.5	108.5	108.5	108.5
Performance at 30% of the load (Tr 30°C)		107.3	107.5	108.3	107.8	107.6	107.6	107.6	107.7	107.6	107.6
Combustion efficiency at nominal load	%	97.8	97.8	97.8	97.8	97.8	97.7	97.9	97.9	97.9	97.9
Combustion efficiency with reduced load	%	98.5	98.5	98.5	98.5	98.5	98.6	98.6	98.6	98.6	98.6
Casing heat loss with burner operating (Qmin)	%	5.04	5.04	5.04	5.04	5.04	4.4	4.4	4.4	4.4	4.4
Casing heat loss with burner operating (Qn)	%	0.1	0.1	0.1	0.1	0.1	0.2	0.4	0.28	0.45	0.5
Net flue gas temperature tf-ta (min)(*)	°C	31	31	31	31	31	30	30	30	30	30
Net flue gas temperature tf-ta (max)(*)	°C	46.7	46.7	46.7	46.7	45.8	44	44	43.3	44	44
Maximum permitted temperature	°C	100	100	100	100	100	100	100	100	100	100
Maximum operating temperature	°C	85	85	85	85	85	90	90	90	90	90
Flue gas mass flow rate (min)	kg/h	37	37	37	37	37	36	36	36	36	36
Flue gas mass flow rate (max)	kg/h	740	925	1111	1296	1515	1636	1818	1948	1999	2545
Excess air	%	29.5	29.5	29.5	29.5	29.5	29	29	29	29	29
Heat loss at chimney with burner on (min)	%	1.5	1.5	1.5	1.5	1.5	1.44	1.44	1.44	1.44	1.44
Heat loss at chimney with burner on (max)	%	2.58	2.53	2.51	2.58	2.58	2.15	2.15	2.15	2.15	2.15
Minimum heating circuit pressure	bar	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Maximum heating circuit pressure	bar	6	6	6	6	6	6	6	6	6	6
Water content	l	67	80	94	108	122	140	154	168	168	215
Methane gas consumption G20 (pow.sup. 20 mbar) at Qn	m³/h	45.68	57.10	68.52	79.94	91.36	102.8	114.2	122.4	125.6	159.9
Methane gas consumption G20 (pow.sup. 20 mbar) at Qmin	m³/h	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33	2.33
Gas consumption G25 (pow.sup. 20/25 mbar) at Qn	m³/h	53.13	66.41	79.69	92.97	106.25	119.5	132.8	142.4	146.1	185.9
Gas consumption G25 (pow.sup. 20/25 mbar) at Qmin	m³/h	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71	2.71
Propane gas consumption (pow. sup. 37/50 mbar) at Qn	kg/h	33.53	41.92	50.30	58.68	67.01	75.5	83.8	89.9	92.2	117.4
Propane gas consumption (pow. sup. 37/50 mbar) at Qn	kg/h	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Chimney base maximum pressure available	Pa	100	100	100	100	100	100	100	100	100	100
Max condensate production	kg/h	73.4	91.7	110	128.4	146.7	156	174	188	191	191
Emissions											
CO at maximum heat output with 0% of O ₂	mg/kWh	58	58	56	61	58	60	60	54	60	64
NO _x at maximum heat output with 0% of O ₂	mg/kWh	40	40	38	36	37	34	34	35	34	36
NO _x Class		6	6	6	6	6	6	6	6	6	6
(***) Sound pressure level	db(A)	54	54	54	54	56	54	54	54	54	54
Electrical data											
Power supply voltage/frequency	V/Hz	230 / 50									
(**) Protection rating	IP	X5D									

Room Temperature = 20°C

(*) Temperature detected with appliance operation flow rate 80°C / ret. 60°C

Seasonal Efficiency η_s according to Directive 2009/125/EC for Outputs < = 400 kW. See ErP TableStand-by heat loss ΔT 30°C - P_{stby} - see ErP tableConsumption in stand-by - P_{sb} - see ErP table

(**) The protection IP is obtained with cap down

(***) 1 meter away in open field

TECHNICAL DATA ACCORDING TO ErP DIRECTIVE

ELECTRICAL, HYDRAULIC, INSTALLATION DIAGRAMS AND CONTROLLERS can be unloaded from the web site www.unical.eu at the page of the product

MODULEX EXT			100	150	200	250	300	350
EFFECTIVE NOMINAL OUTPUT	P_n	kW	97	146	195	244	294	342
SEASONAL ENERGY EFFICIENCY TO HEAT THE ROOM	η_s	%	92	92	92	92	92	92
SEASON EFFICIENCY CLASS TO DISCHARGE 			A	A	A	A	A	A
FOR BOILERS TO HEAT THE ROOM AND MIXED BOILERS: USEFUL HEAT OUTPUT								
USEFUL HEAT OUTPUT with high temperature capacity (Tr 60 °C / Tm 80 °C)	P_4	kW	97.2	146.1	195.2	244.5	294.0	341.7
RATED HEAT OUTPUT EFFICIENCY with high temperature capacity (Tr 60 °C / Tm 80 °C)	η_4	%	87.49	87.67	87.85	88.03	88.21	88.38
USEFUL POWER AT 30% OF THE RATED HEAT OUTPUT with low temperature capacity (Tr 30 °C)	P_1	kW	32.2	49.3	64.4	80.5	96.6	112
PERFORMANCE AT 30% OF THE RATED HEAT OUTPUT with low temperature capacity (Tr 30 °C)	η_1	%	96.7	96.7	96.7	96.7	96.7	96.7
BOILER WITH OUTPUT RANGE ADJUSTMENT: YES / NO			NO	NO	NO	NO	NO	NO
AUXILIARY ELECTRICITY CONSUMPTION								
WITH A FULL LOAD	el_{max}	kW	0.240	0.360	0.451	0.542	0.633	0.724
WITH A PARTIAL LOAD	el_{min}	kW	0.040	0.040	0.040	0.040	0.040	0.040
STANDBY MODE	P_{SB}	kW	0.019	0.019	0.019	0.019	0.019	0.019
OTHER ELEMENTS								
HEAT DISPERSION ON STANDBY	P_{stby}	kW	0.787	0.94	0.98	1.10	1.15	1.39
NITROGEN OXIDES EMISSIONS referred to GCV	NO_x	mg/kWh	30	30	30	30	30	30
NO_x CLASS			6	6	6	6	6	6
CONSUMPTION OF ANNUAL ELECTRICITY	Q_{HE}	GJ	306	459	612	766	920	1069

MODULEX EXT			440	550	660	770	900	1000	1100	1160	1200	1500
EFFECTIVE NOMINAL OUTPUT	P_n	kW	424	530	636	743	849	947	1152	1130	1157	1473
SEASONAL ENERGY EFFICIENCY TO HEAT THE ROOM	η_s	%	92	92	92	92	92	92	92	92	92	92
SEASON EFFICIENCY CLASS TO DISCHARGE 			*	*	*	*	*	*	*	*	*	*
FOR BOILERS TO HEAT THE ROOM AND MIXED BOILERS: USEFUL HEAT OUTPUT												
USEFUL HEAT OUTPUT with high temperature capacity (Tr 60 °C / Tm 80 °C)	P_4	kW	-	-	-	-	-	947.5	1052	1129.8	1157.1	1473
RATED HEAT OUTPUT EFFICIENCY with high temperature capacity (Tr 60 °C / Tm 80 °C)	η_4	%	-	-	-	-	-	87.8	87.8	87.9	87.8	87.8
USEFUL POWER AT 30% OF THE RATED HEAT OUTPUT with low temperature capacity (Tr 30 °C)	P_1	kW	-	-	-	-	-	313.8	348.7	374.5	383.3	488.1
PERFORMANCE AT 30% OF THE RATED HEAT OUTPUT with low temperature capacity (Tr 30 °C)	η_1	%	-	-	-	-	-	97.0	97.0	97.0	96.9	96.9
BOILER WITH OUTPUT RANGE ADJUSTMENT: YES / NO			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
AUXILIARY ELECTRICITY CONSUMPTION												
WITH A FULL LOAD	el_{max}	kW	0.626	0.783	0.940	1.096	1.252	1.64	1.82	1.960	2.00	2.54
WITH A PARTIAL LOAD	el_{min}	kW	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
STANDBY MODE	P_{SB}	kW	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
OTHER ELEMENTS												
HEAT DISPERSION ON STANDBY	P_{stby}	kW	0.2114	0.2114	0.2114	0.2114	0.2114	0.2	0.2	0.2114	0.2114	0.2114
NITROGEN OXIDES EMISSIONS referred to GCV	NO_x	mg/kWh	27	27	27	27	27	26	26	26	25	28
CONSUMPTION OF ANNUAL ELECTRICITY	Q_{HE}	GJ	1303	1633	1959	2286	2612	2954	3278	3519	3609	4592

* Appliances not covered by Directive 2009/15/CE

ADDITIONAL SAFETY AND CONTROL DEVICES according to the italian law

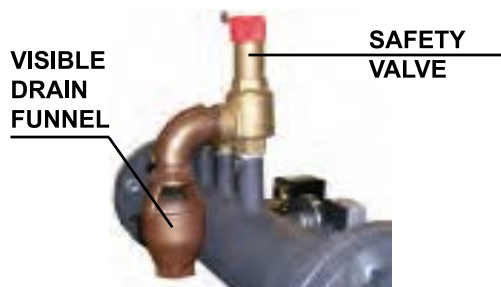
CERTIFICATION OF THE ADDITIONAL SAFETY DEVICES:

DISPOSITIVI DI SICUREZZA

- 1 On-off gas valve:** a device which has the function of cutting off the gas supply when the water temperature reaches the max. predetermined value. The sensible element has to be installed as nearest as possible to the generator (flow pipe) at a distance which has to be < 500 mm and must not be able to be cut-off. **Not supplied by Unical.**

Pressure relief valve: it has the function of discharging in the atmosphere the fluid contained in the generator when this has, for whatever motive, reached the maximum working pressure. **Not supplied by Unical.**

- 2a Visible drain funnel.** **Not supplied by Unical.**



A pressure relief valve must be fitted on the flow pipe, within 0,5 m from the boiler. It must be dimensioned for the capacity of the boiler and must comply to the regulations in force,



WARNING!

Please remember that it is forbidden to interpose, between the boiler and the pressure relief valve, any type of cutting-off device. Moreover it is recommended to use cutting-off valves which do not exceed the maximum allowable operating pressure.

WARNING!

In correspondence to the heating pressure relief valve foresee the installation of a discharge pipe with a funnel and a siphon which lead to an adequate drainage. The drainage has to be controllable by sight. If this precaution is not made, an eventual intervention of the pressure relief valve could cause injury to persons, animals or damage to property. The manufacturer shall not be held liable for any injury and/or damage.

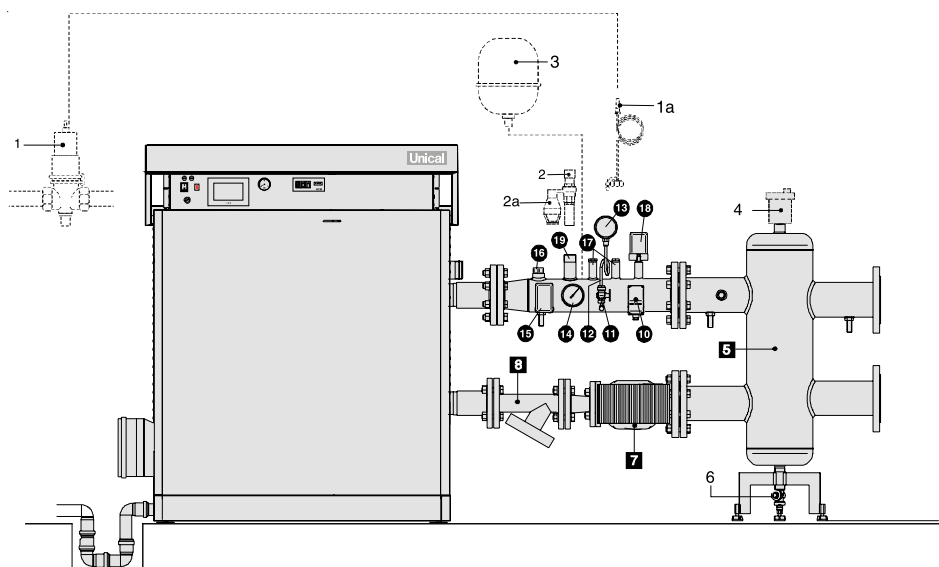
PROTECTIVE DEVICES

- 10 Overheat thermostat:** it has the function of shutting down the generator if the safety thermostat fitted in the boiler malfunctions. It must be calibrated to a value of < 100°C, which **MUST** not be changed.
- 15 Minimum pressure switch:** it has the function of shutting down the generator in case of low pressure (can be calibrated from 0.5 to 1.7 bar). It must be able to be reset manually.
- 16 Additional plug G1”:**
- 18 Safety pressure switch:** it has the function of shutting down the generator if it reaches the maximum working pressure (can be calibrated from 1 to 5 bar).

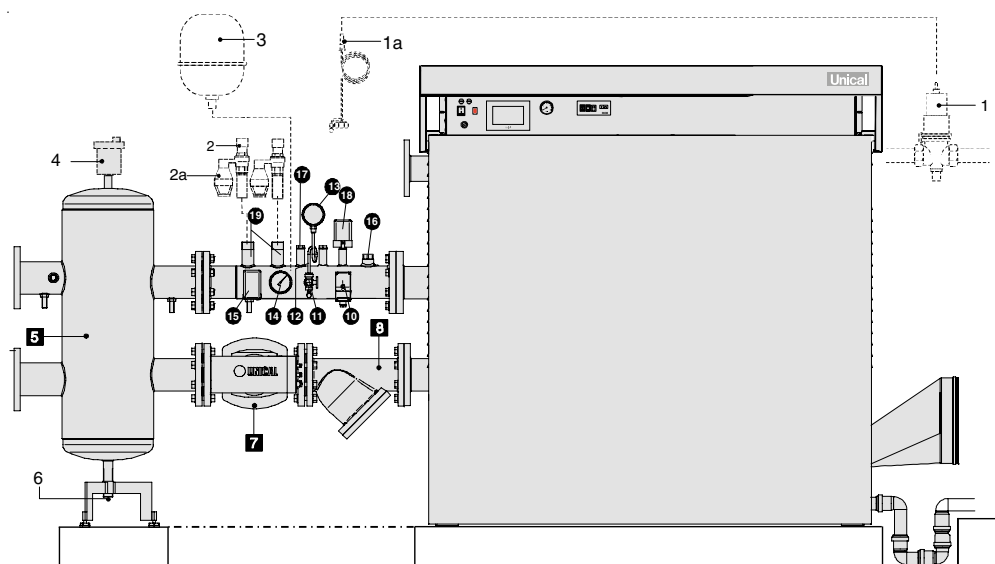
CONTROL DEVICES

- 13 (Pressure Indicator - not provided by Unical) with (12) and shock tube (11) tap-port gauge:** Indicates the actual pressure existing in the generator must be calibrated in “bar”, having the full scale of the maximum pressure related operation and be provided with a three-way valve with manometer control
- 14 Thermometer:** it indicates the effective water temperature contained in the generator. It must be graduated in degrees Celsius with a temperature scale not exceeding 120°C.
- 17 Inspection pocket:** approved for inserting the control thermometer
- 19 Plug G1 1/4”:** for the safety valves connection
- 3 Calibrated expansion vessel:** it permits the absorption of the increase in volume of the system's water following an increase in temperature; The pressure must not exceed the safety valve set pressure. **Not supplied by Unical.**
- 8 Y filter**
- 7 Modulating pump (Not supplied in kit ISPELS)**
- 5 Mixing bottle (Not supplied in kit ISPELS)**
- 4 Automatic air vent. Not supplied by Unical**
- 6 Drain cock. Not supplied by Unical.**

ADDITIONAL SAFETY, PROTECTION AND CONTROL DEVICES

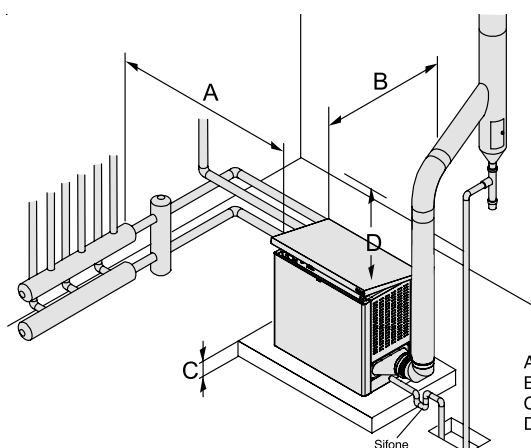


MODULEX EXT 100÷350



MODULEX EXT 440÷900

POSITIONING IN THE BOILER HOUSE



The installation has to comply with the rules in force
The positioning has to guarantee the operations of
ordinary and extraordinary maintenance and cleaning.

- A > 400 mm
- B > 400 mm
- C = 100 mm
- D = 500 mm

PRIMARY RING PUMP SIZING (MODULEX EXT 100÷350)

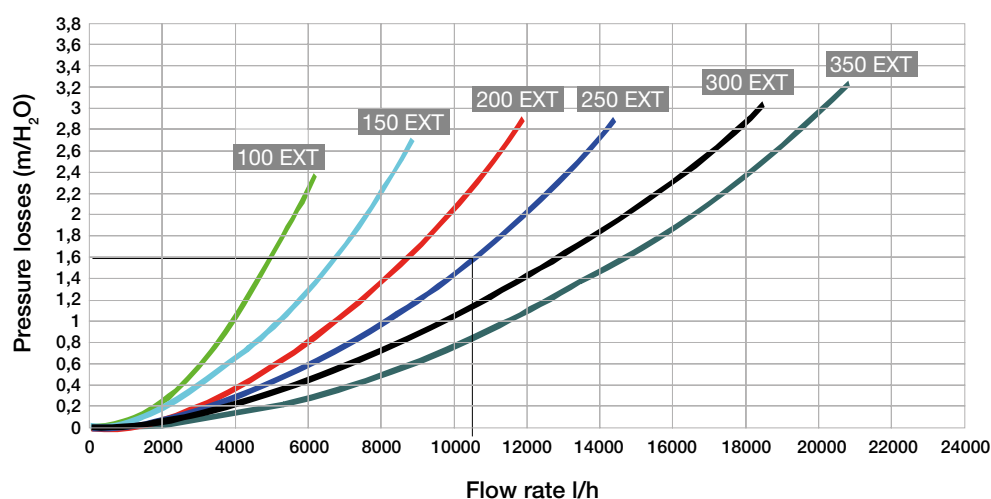
The boiler pump must have a delivery head which can ensure the water flow rate as shown in the diagram “Water pressure losses”. The following table gives an indication of the pump’s flow rate in function of the Δt of the primary circuit if the installation has a mixing header. The size of the pumps must be determined by installers or technical engineers according to boiler data and

system design.

The water side resistance curve of the boiler is shown in the following diagram.

The pump is not an integral part of the boiler. It is recommended to choose a pump with the rate and delivery head at about 2/3 of its characteristic heating curve.

Output in kW	100	116	150	200	250	300	350
Maximum flow rate in l/h ($\Delta t=15K$)	5573	6471	8376	11192	14018	16856	19712
Nominal requested flow rate in l/h ($\Delta t=20K$)	4180	4853	6282	8394	10514	12642	14784



NOTE

The mixing header, between the circuit boiler and the C.H. circuit is always advisable; it becomes NECESSARY if the C.H. system requires flow rates higher than the maximum flow rate allowed in the boiler, i.e. with ΔT smaller than 15K.

EXAMPLE

For a ΔT of 20 K in a MODULEX 250 the maximum requested water flow rate is 10514 l/h.

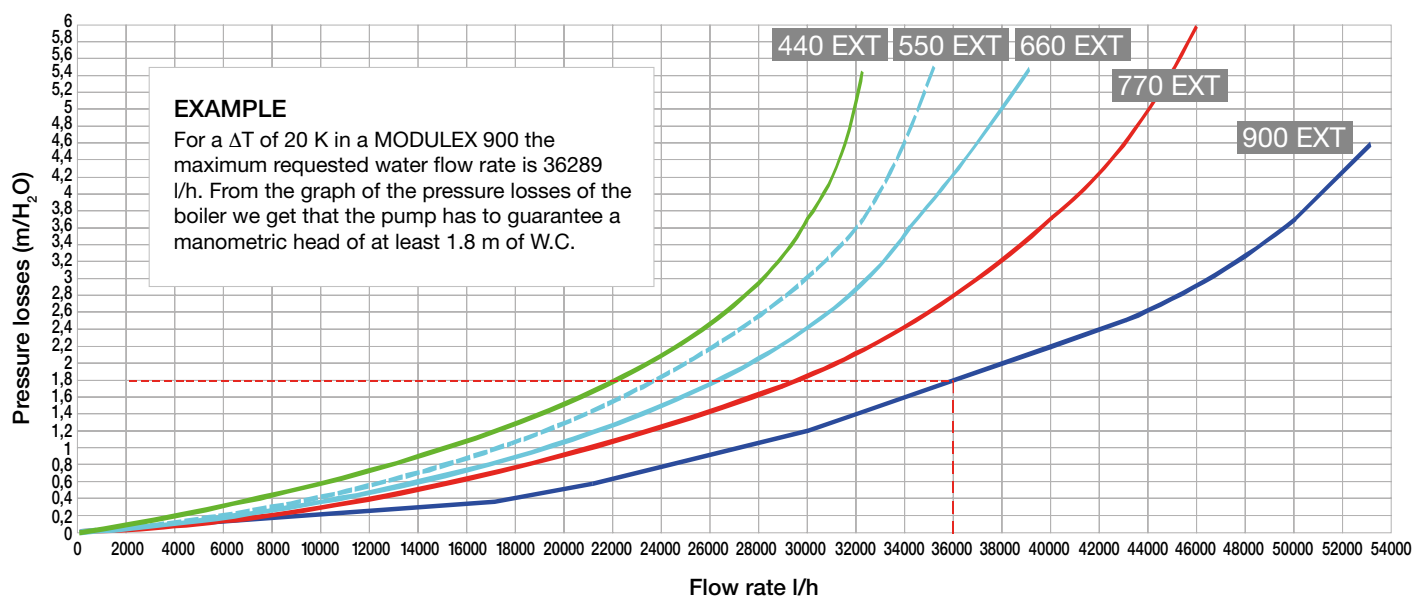
From the graph of the pressure losses of the boiler we get that the pump has to guarantee a manometric head of at least 1.6 m of W.C.

PRIMARY RING PUMP SIZING (MODULEX EXT 440÷900)

Output in kW	440	550	660	770	900
Maximum flow rate in l/h ($\Delta t=15K$)	24326	30404	36487	42570	48647
Nominal requested flow rate in l/h ($\Delta t=20K$)	18243	22804	27365	31926	36487

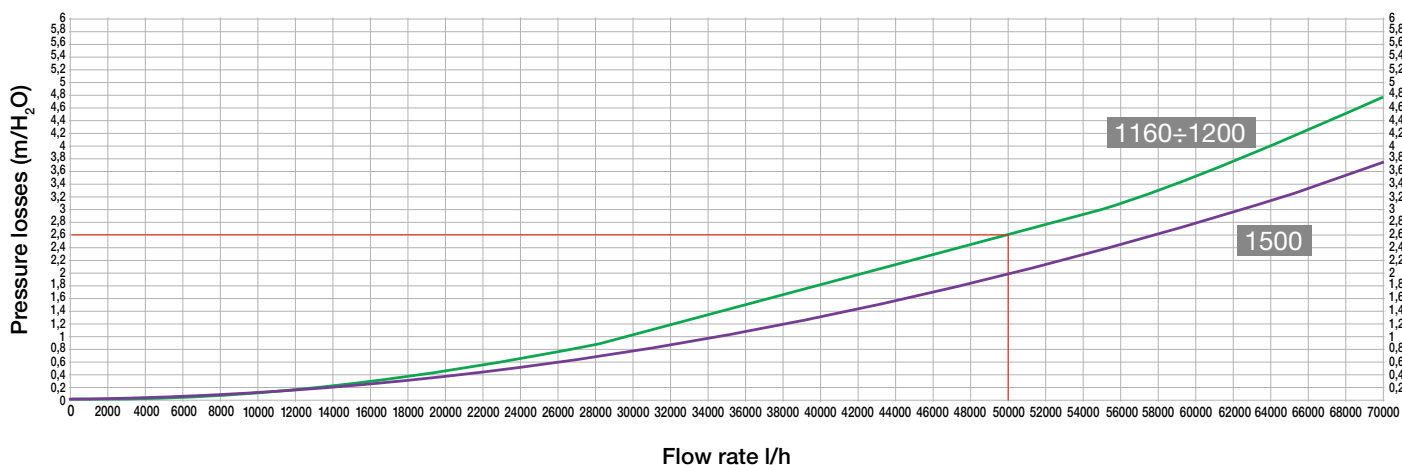
NOTA

The mixing header, between the boiler circuit and the C.H. circuit is always advisable; it becomes NECESSARY if the C.H. system requires flow rates higher than the maximum flow rate allowed in the boiler, i.e. with ΔT smaller than 15K.



PRIMARY RING PUMP SIZING (MODULEX 1000÷1500)

Output in kW	1000	1100	1160	1200	1500
Maximum flow rate in l/h ($\Delta t=15K$)	54290	60320	64787	66335	84450
Nominal requested flow rate in l/h ($\Delta t=20K$)	40720	45240	48590	49751	63350



EXAMPLE

For a ΔT of 20 K in a MODULEX 1200 the maximum requested water flow rate is 49.751 l/h. From the graph of the pressure losses of the boiler we get that the pump has to guarantee a manometric head of at least 2.6 m of W.C.

NOTE

The use of a hydraulic separator (mixing bottle) between the boiler circuit and the system is always recommended.

CONNECTION TO THE CHIMNEY

Model	Modules	Ø Flue socket
100	2	150
150	3	150
200	4	150
250	5	200
300	6	200
350	7	200

Model	Modules	Ø Flue socket
440	4	250
550	5	250
660	6	300
770	7	300
900	8	300
1000	9	350
1100	10	350
1160	11	350
1200	11	350
1500	14	350

CHIMNEY REQUIREMENTS

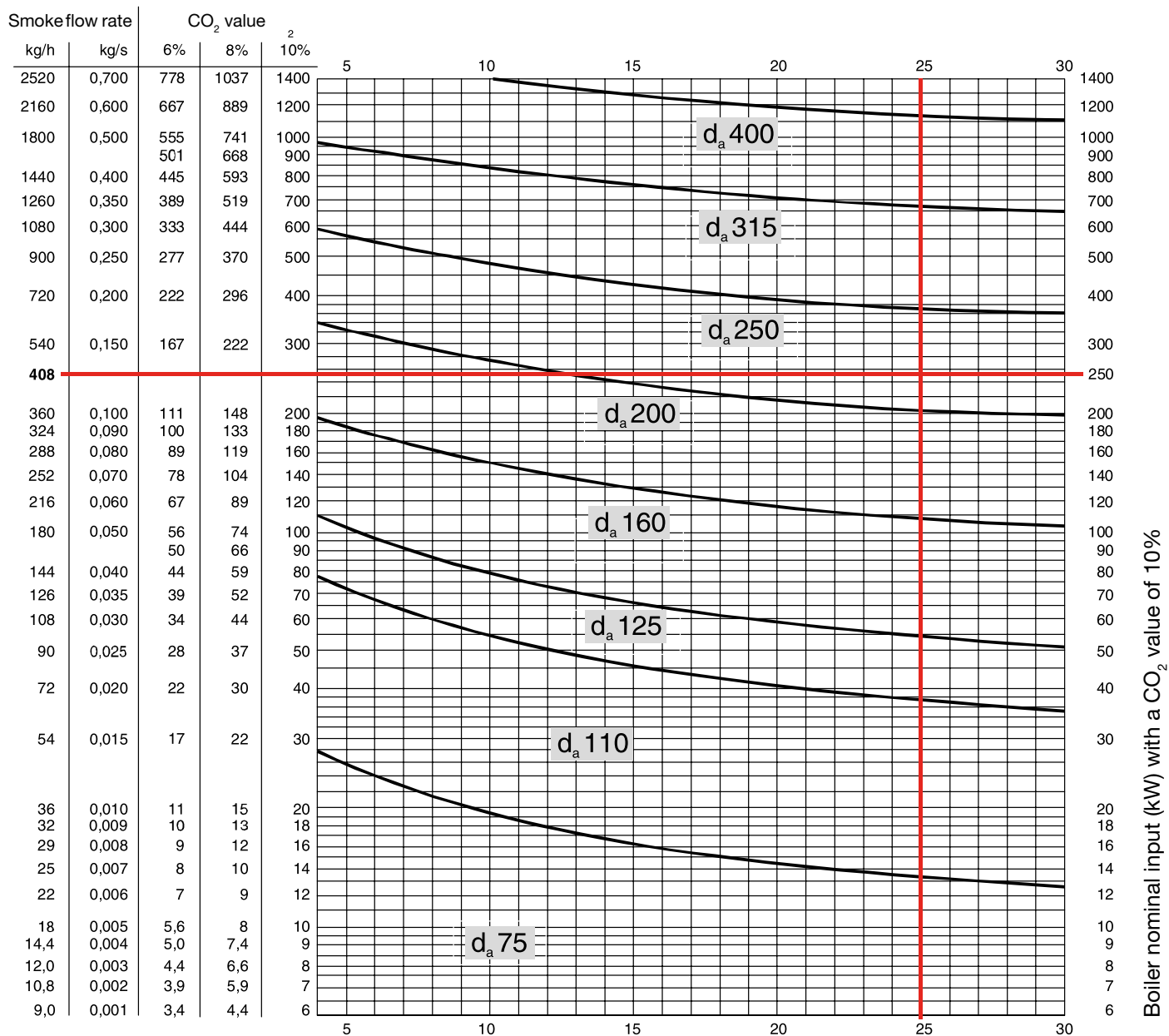
In the condensing boilers the smoke temperature reaches around 90°C. The chimney has to comply with the relevant requirements as stated by the standards. Particularly the resistance and the impermeability to the condensates and to the frost. Other standards to be complied with are: EN 13384-1-2. The chimney

must be realized with materials belonging to the class of construction W1 (EN 1443), normally in stainless steel or certified plastic material. Antifreeze protection: if the condensate needs to be neutralized it is up to the installer to foresee a suitable antifreeze protection.

CHIMNEY SIZING (indicative values) according to DIN 4705

Chimney sizing
according to DIN 4705

Smoke temperature 40°C
Available pressure 40 Pa



Flue gas mass flow rate

MODULEX EXT	Flue gas mass flow rate (max)
model	kg/h
100	163
150	245
200	327
250	409
300	490
350	569

Example:

MODULEX 250

Flue gas mass flow rate: 408.6 kg/h

Chimney height: 25 m

Chimney connection Ø: 250 mm

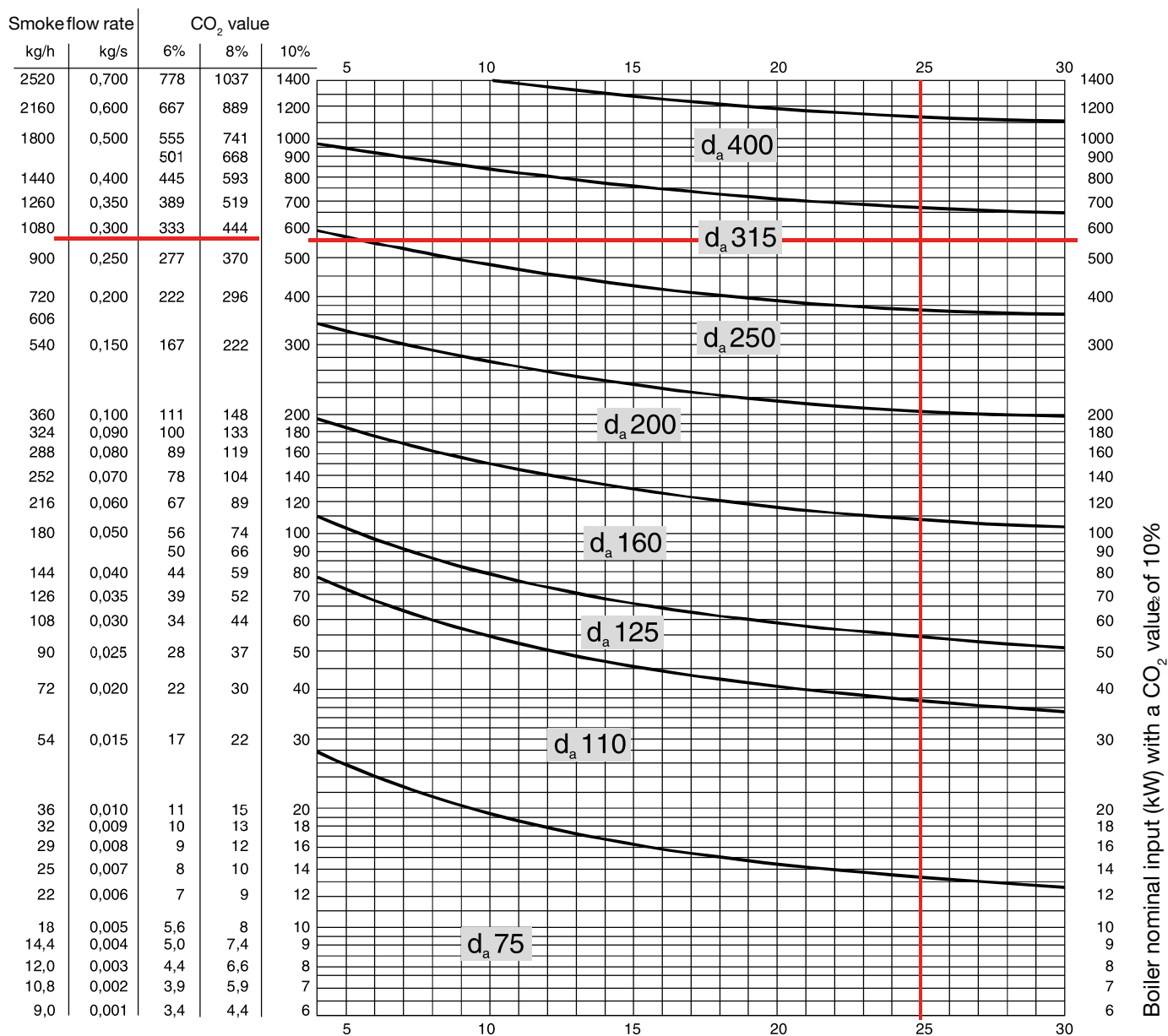
NOTE:

The diagram supplies only indicatives values.

CHIMNEY SIZING (indicative values) according to DIN 4705

**Chimney sizing
according to DIN 4705**

Smoke temperature 40°C
Available pressure 40 Pa



Flue gas mass flow rate

MODULEX EXT	Flue gas mass flow rate (max)
model	kg/h
440	740
550	925
660	1111
770	1296
900	1515
1000	1636
1100	1818
1160	1948
1200	1999
1500	2545

Example:

MODULEX 660

Flue gas mass flow rate: 1040 kg/h

Chimney height: 25 m

Chimney connection Ø: 315 mm

NOTE:

The diagram supplies only indicative values.

CONDENSATE DRAIN

The Standards regulate also the way to evacuate the condensates.
Particularly the run of the condensates evacuation.

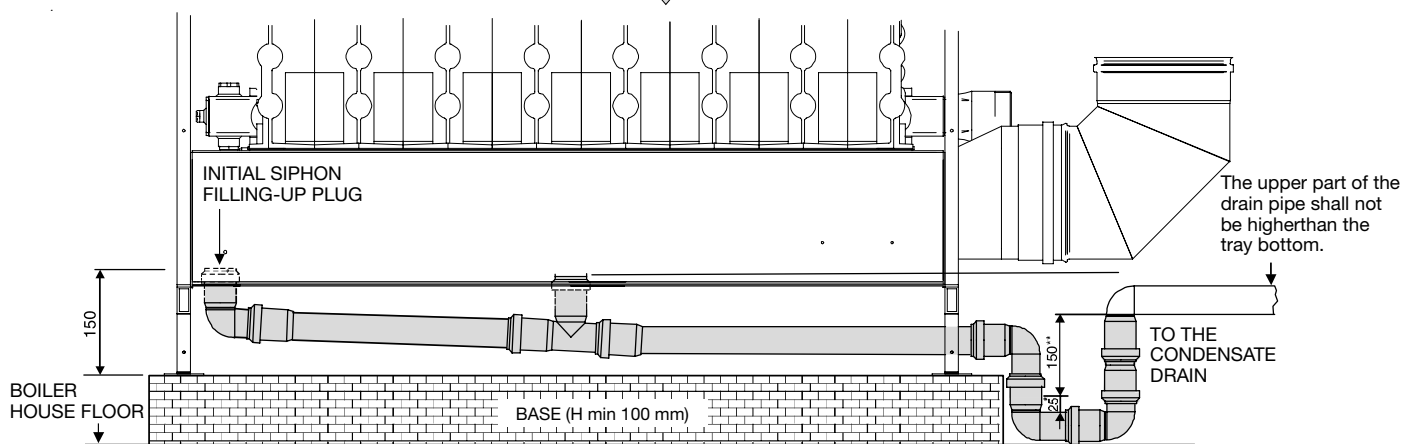
Materials suitable for the condensate evacuation:

PE: Polyethylene

PPI: Polypropylene

MODULEX EXT 100÷350

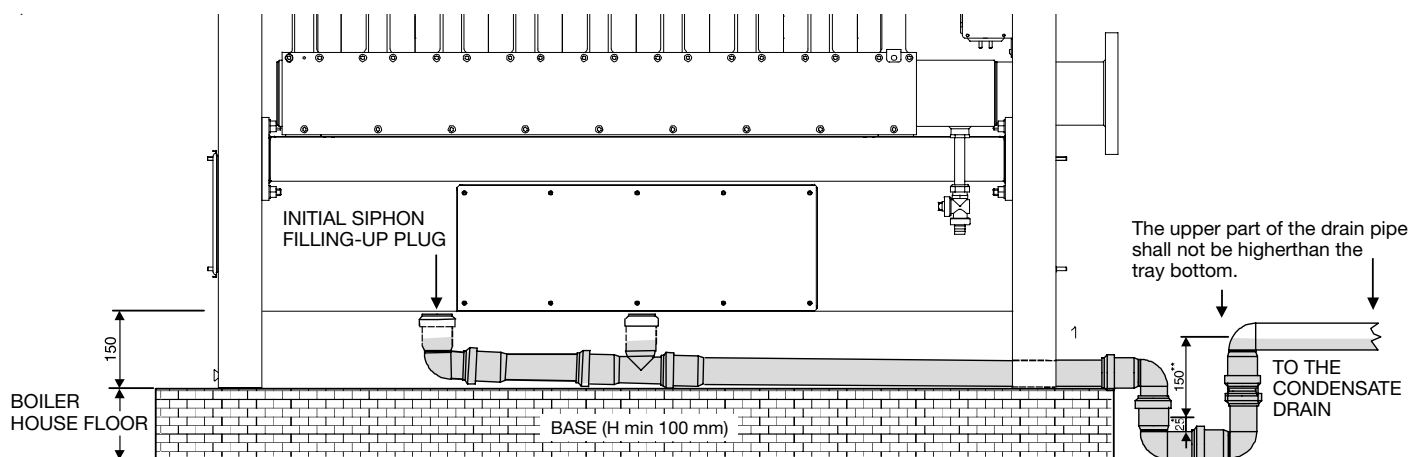
FRONT SIDE



* Min. height of the condensate column, with all fans operating at max. speed, requested by the EN standards.

** Min. height of the condensate column, with all fans operating at max. speed. In the case it is not possible to create a 100 mm basement, install the boiler on the floor and foresee a min. 100 mm well to lodge the siphon.

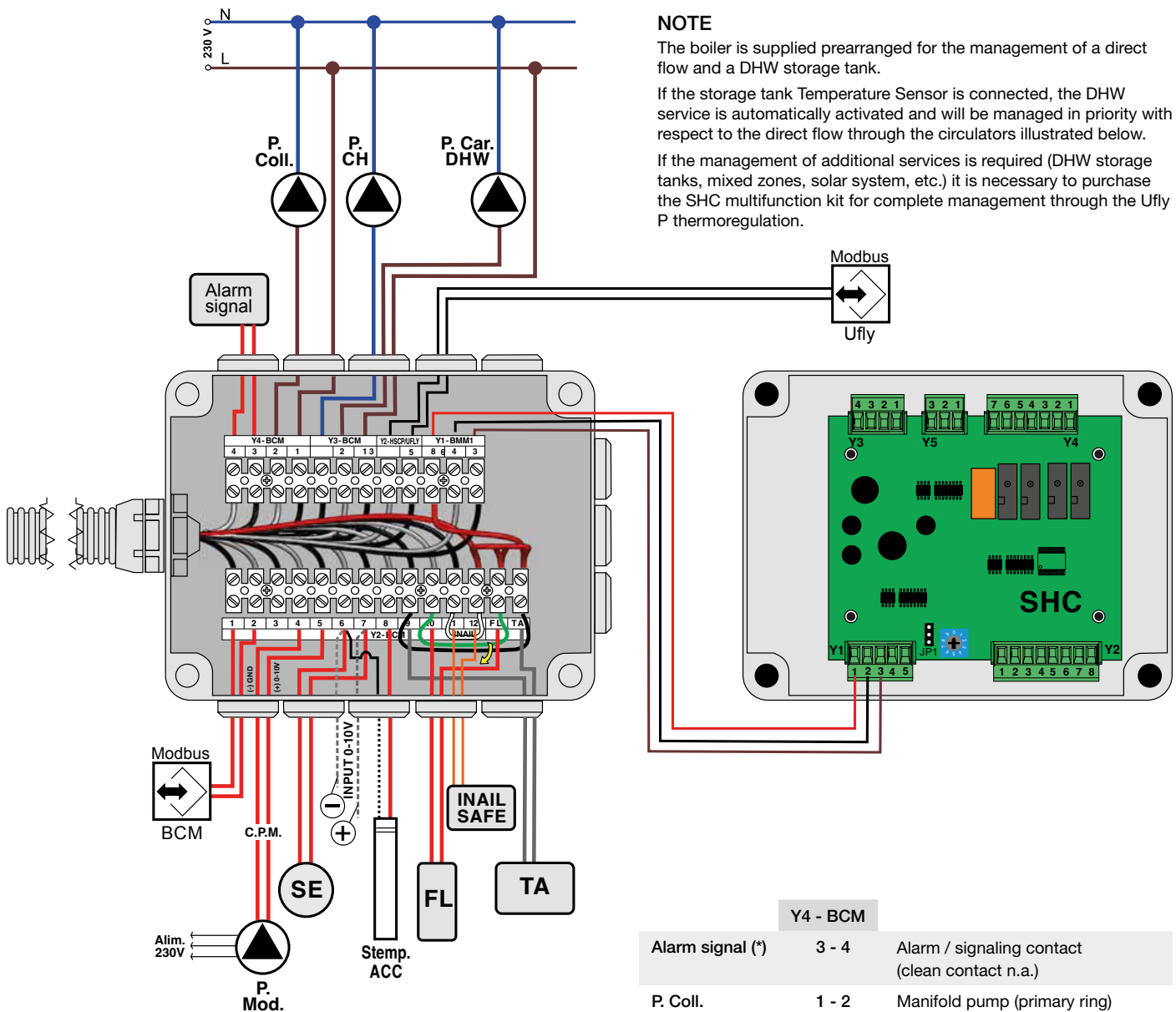
MODULEX EXT 440÷1500



* Min. height of the condensate column, with all fans operating at max. speed, requested by the EN standards.

** Min. height of the condensate column, with all fans operating at max. speed. In the case it is not possible to create a 100 mm basement, install the boiler on the floor and foresee a min. 100 mm well to lodge the siphon.

BASIC SCHEME OF SYSTEM OPERATION



Connections for:

Y2 - BCM		
Modbus BCM		Remote boiler management
A	1	A (1) Data connection
B	2	B (2) Data connection
P. mod	4 - 5	Heating modulating pump
SE	6 - 7	External temperature sensor
- / +	6 - 7	0 / 10 V signal contact
Stemp ACC	6 - 8	DHW storage tank Temperature Sensor
FL	FL - 10	Flow switch (remove bridge)
INAIL	11 - 12	Safety devices (remove bridge)
TA	TA - 9	Room thermostat / Clock remove bridge

Y4 - BCM		
Alarm signal (*)	3 - 4	Alarm / signaling contact (clean contact n.a.)
P. Coll.	1 - 2	Manifold pump (primary ring)

Y3 - BCM		
P. CH	1 - 3	Heating circuit pump
P. Car DHW	1 - 2	DHW Storage tank loading pump

Y4 - UFLY		
Modbus Ufly		Remote thermoreg. management
A	5	A (5) Data connection
B	6	B (6) Data connection

Y1 BMM1		
SHC (**)	8 - 4 - 3	Optional multifunction module (to be inserted in the box lid)

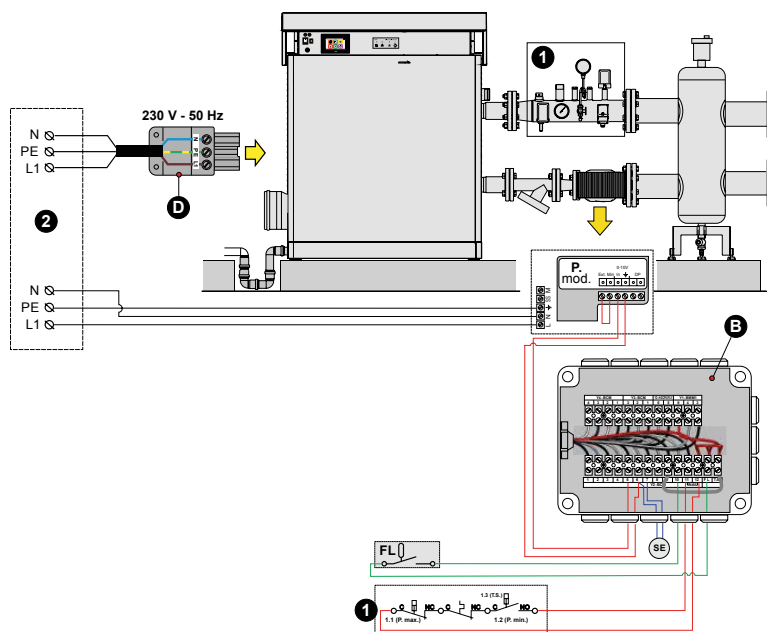
(*) Contact of a relay which closes when in alarm.

(**) optional SHC

The system can power only one SHC module. If more SHCs are necessary, these modules must be placed externally in a dedicated electrical panel and powered with their own power supply.

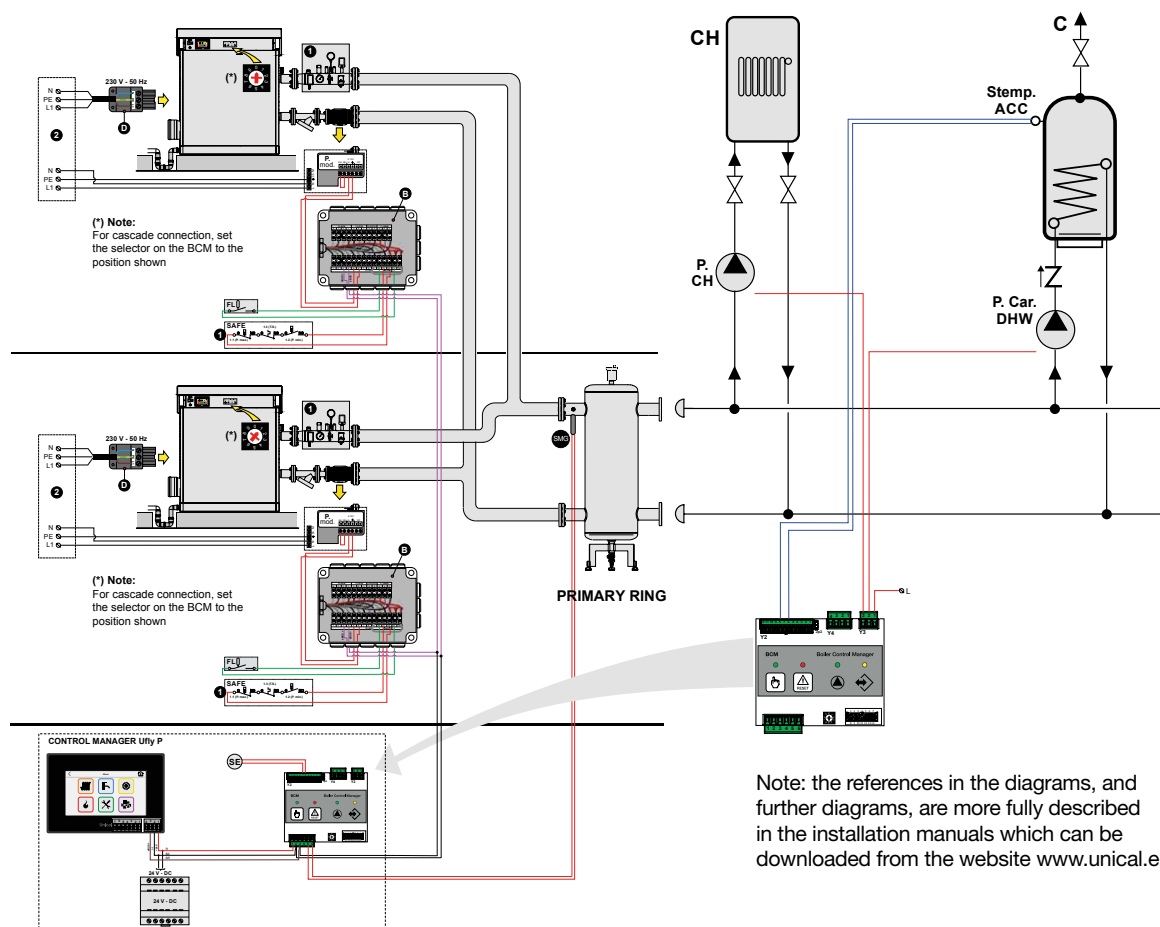
BASIC SCHEMES OF SYSTEM OPERATION

Electrical Supply, INAIL Devices, Modulating Pump, Outer Temperature Sensor, Flowswitch



1	Safety devices
2	General panel board (not supplied)
B	Card of supply distribution
D	WIELAND 3 pole plug for supply
FL	Terminals for flowswitch
SE	Outdoor temperature sensor
SMG	General Flow Temperature Sensor
P on_off	Terminals for On-Off Pump (manifold)
P mod	Terminals for Modulating Pump

2 MODULEX EXT in battery, managed by cascade manager, with a direct zona + D.H.W. production



Note: the references in the diagrams, and further diagrams, are more fully described in the installation manuals which can be downloaded from the website www.unical.eu.