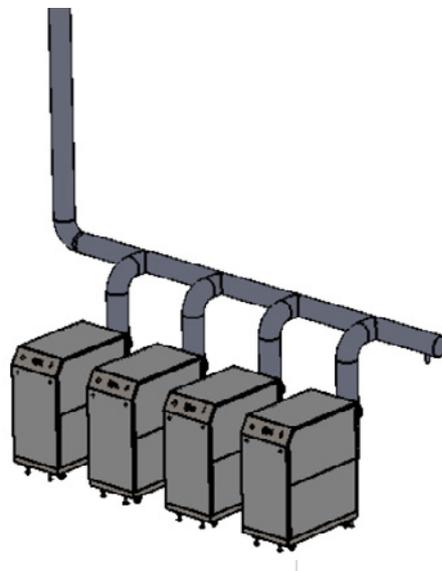


MARK POWERFLEX - APPENDIX B: CASCADE

0660470



APPENDIX B - CASCADE

1 GENERAL

Chapter 2 to 8 explains the functionality and wiring of the cascading system. While chapter 9 to the end describes the common flue gas overpressure system. Read the whole document before installing the cascade system.

The integrated cascading functionality of the display (DSP49G2193), makes it possible to connect, up to a maximum of 6 boilers, together without the use of an external cascading controller. The cascade algorithm is to run in parallel as many boilers as possible, optimized for condensing boilers. The first boiler of the chain is the master of the cascading logic and heat requests handling. All other boilers in the chain are slaves. The last boiler is called the terminal slave. All displays (DSP) are equal and can be interchanged. Always keep in mind that the first boiler in chain is the master. After being correctly wired the auto detection of the cascading chain is initiated from the master boiler.

After a successful auto detection the role of each single boiler (master, slave, terminal slave) is shown in the installer menu from each boiler (Technician menu, cascade, cascade info, CASCADE ROLE).

2 REGULAR CASCADE

In a regular cascade system all boilers are managed for CH and/or DHW. The CH and /or DHW demand is validated by an external controller which generates a CH demand. The cascade system will only take care that a certain temperature is reached at its output (at the cascade temperature sensor).

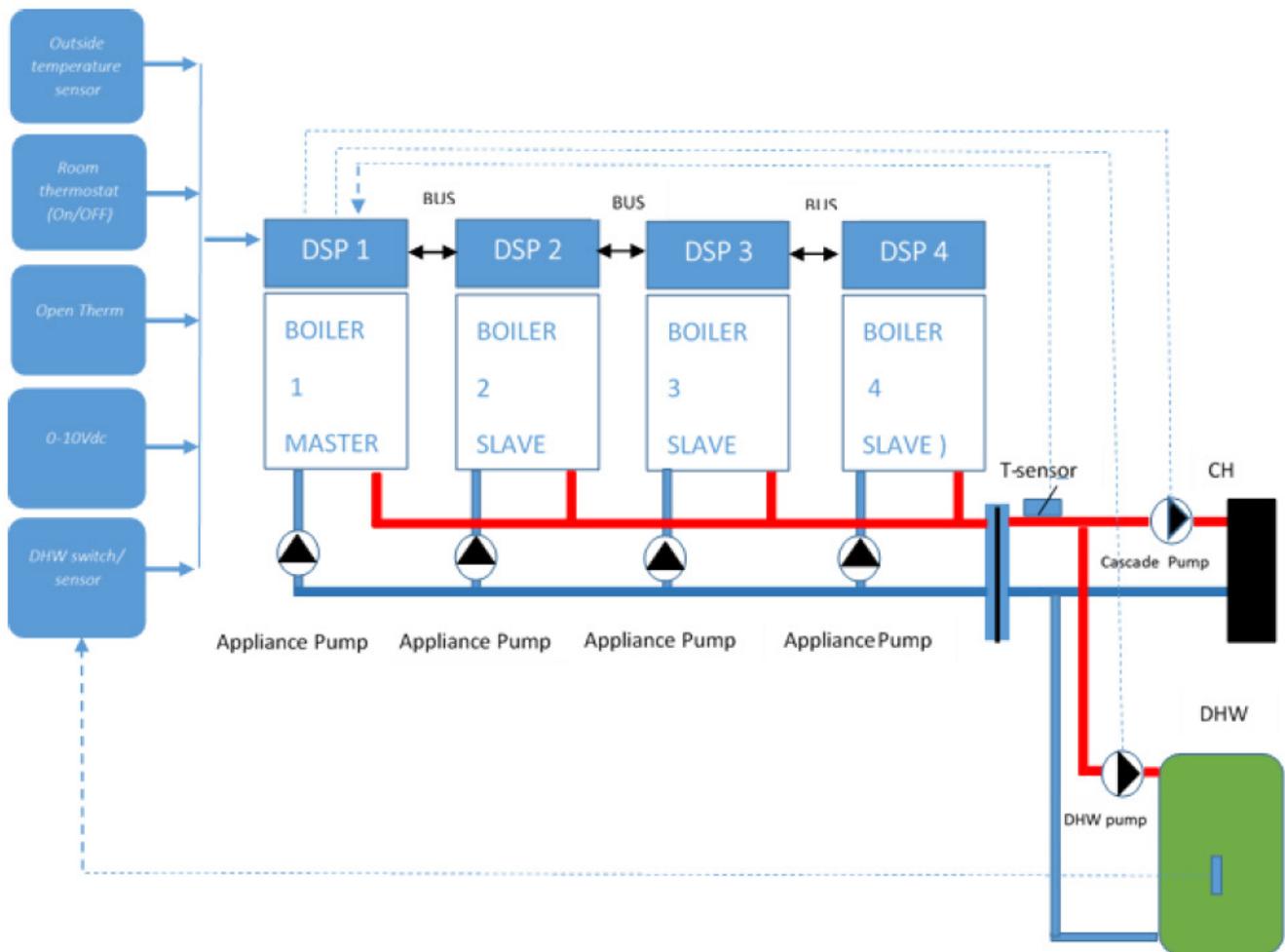
With this integrated cascade controller it is possible to let the cascade system do the DHW validation by itself. The DHW sensor or switch has to be connected to only the first (master) boiler. In case of a DHW demand the cascade controller will regulate the cascade sensor directly to the DHW setpoint. All boilers will be on, without the need to follow the CH algorithm. The cascade system pump output relays from the master boiler will be switched off. The DHW pump or 3WV of each boiler will be switched on. In case of a CH demand also connected to the first (master) boiler, the cascade system will follow the CH algorithm (minimum time, slope) and regulate the cascade sensor to the CH setpoint. The cascade system pump output relay (master only) will be activated. Boilers are added clockwise and removed counterclockwise. Every heat demand the next boiler (clockwise) will be the first to start. When a demand last for more than 24 hours also a rotation will take place.

From the master boiler display the CH and/or DHW request type must be set correctly. All boilers in the chain are supposed to be equal meaning having the same maximum capacity and minimum modulation level. Both are parameters of the cascade setting. To determine the wanted number of boilers on is the requested power in kW divided by the minimum (cascade) power in kW. The minimum cascade power is the minimum modulation level of a single boiler, while the maximum cascade power is the maximum single boiler power multiplied with the number of boilers in the chain. A parameter CASCADE SWITCH DELAY can be set to prevent that boilers are too frequently added or removed to obtain the requested cascade power.

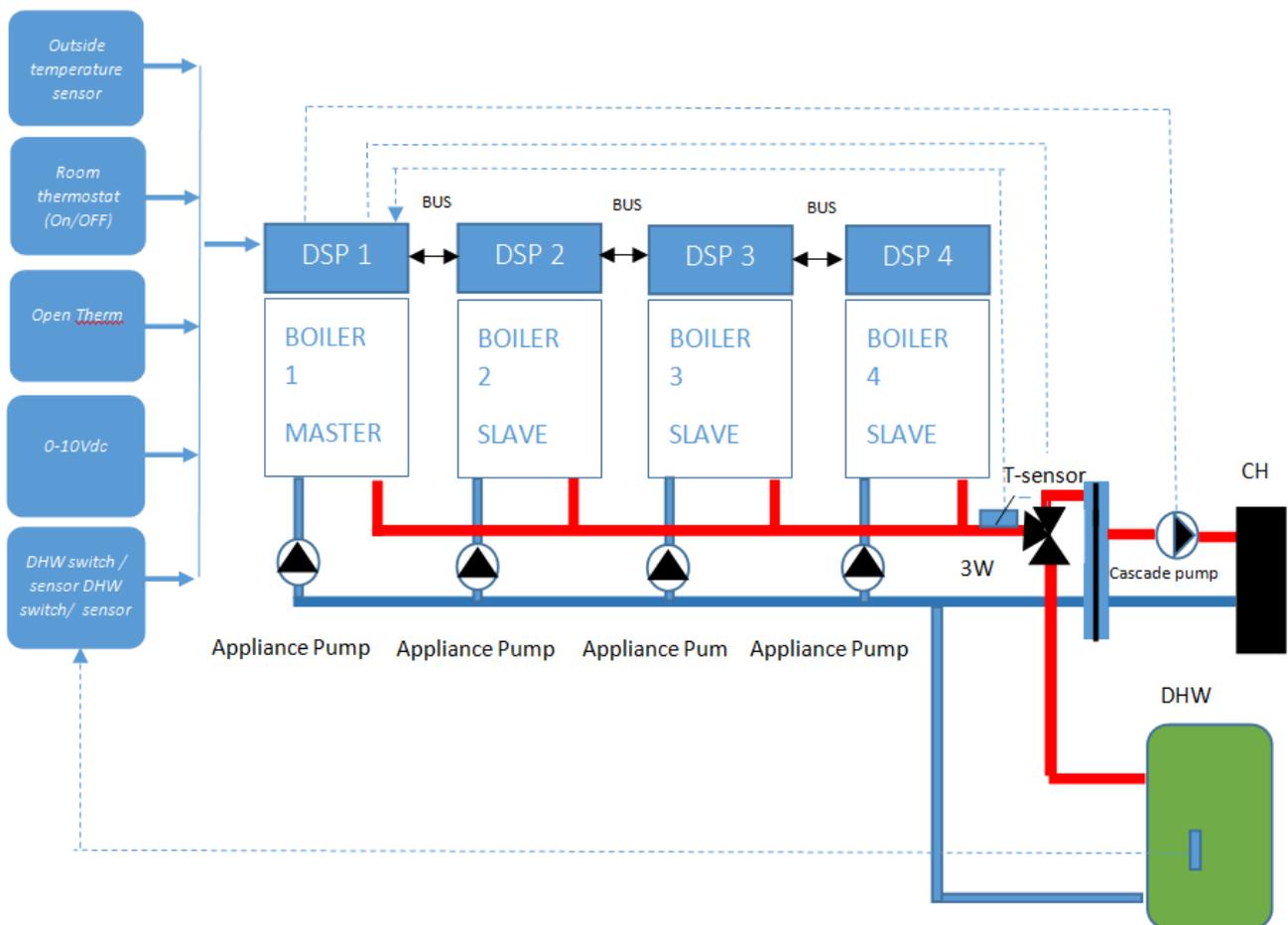
From the master display the parameter BOILERS FOR DHW must be set to 0 (default) and DIFFERENT BOILER SIZE must be disabled (default).

Capacity limitations for either CH or DHW done from the master menu (advanced settings) will limit the capacity for each boiler in the chain. See chapter 5.4 installer (technician) menu for the menu layout. (Technician/ Cascade/cascade set/..)

Example 1 : Cascade system. Each boiler is equal, and all boilers for CH and / or DHW



Example 2 : Cascade system. Each boiler is equal, and all boilers for CH and / or DHW



3 SPLITTED DHW

Instead of assigning all boilers to CH and/or DHW it is also possible to assign only some of the boilers to CH + DHW while the other boilers are available to serve only CH. This is called “splitted DHW”. In case there is no DHW heat demand all the boilers will be available for CH. Splitted DHW configuration is done by setting the parameter BOILER FOR DHW in the cascade set menu (MASTER) to the number of boiler that should serve DHW. See example 3 . The DHW boilers must be the first boilers in the cascade chain.

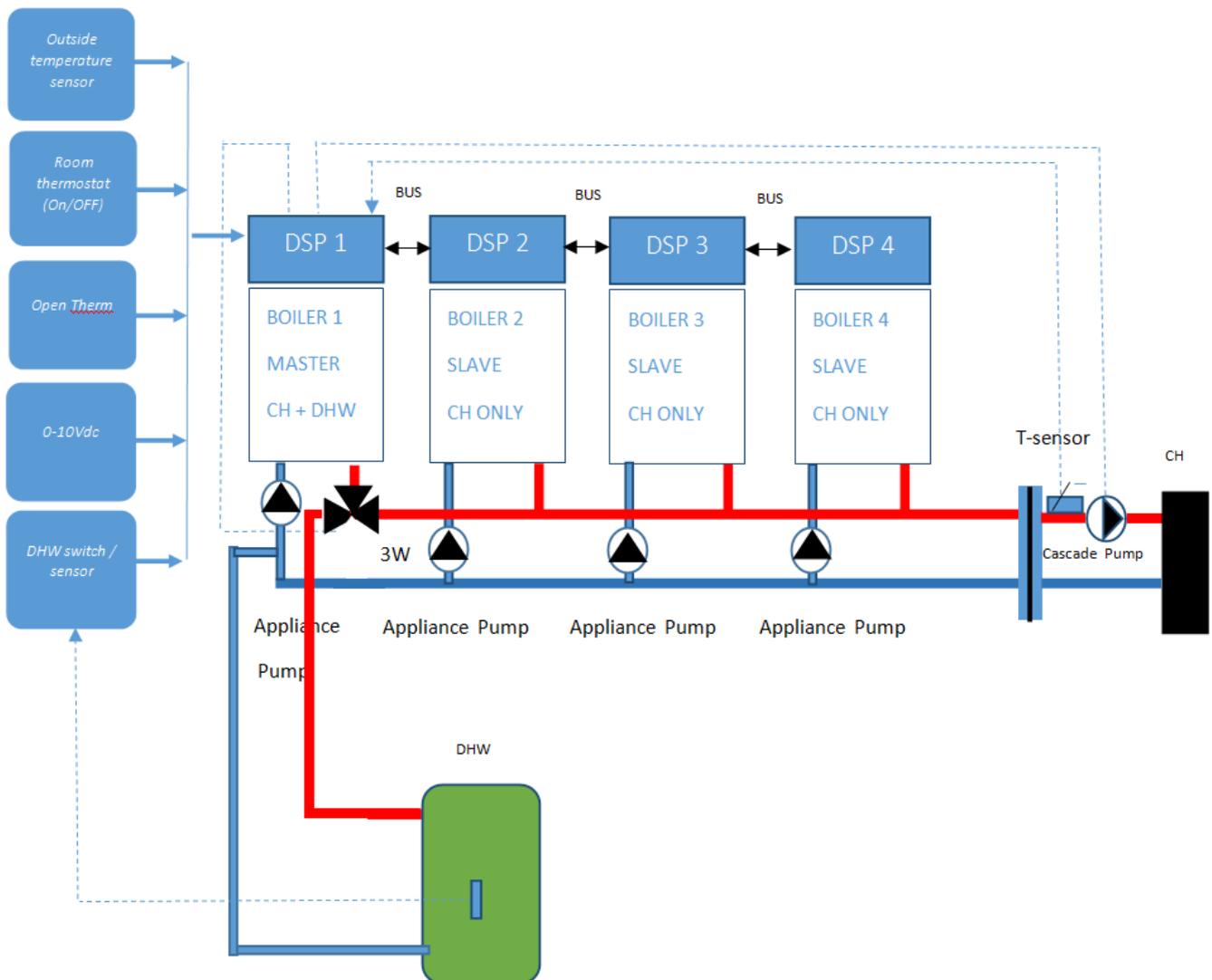
The CH and DHW heat demands are connected to and managed by the first (master) boiler. In case of a DHW request all DHW boilers will regulate the temperature to the DHW setpoint and control the pump(s) and 3WV as in a normal local DHW demand.

In case of a CH request and no DHW request at the same time the demand is processed by a rotating system, where boilers are added clockwise and removed counterclockwise, respecting the CASCADE SWITCH DELAY parameter.

In case of a mutual request (CH and DHW) each boiler will either serve for DHW or CH depending on the group it is belonging to.

Remember to set the parameters of the CH and DHW request from the first (master) boiler. Instead of a 3WV a DHW pump may be configured.

Example 3 : Splitted DHW cascade system. Each boiler is equal, 3 for CH only and 1 for CH + DHW (Parameter in cascade set , BOILER FOR DHW = 1 , but may differ)



(Parameter in cascade set , BOILER FOR DHW =1 , but may differ)

4 HETEROGENEOUS CASCADE

Besides of creating two groups (DHW + CH group and CH only) in which each boiler is equal , it is also possible to allow a different power rating to the DHW + CH group boilers compared to the CH only group boilers.

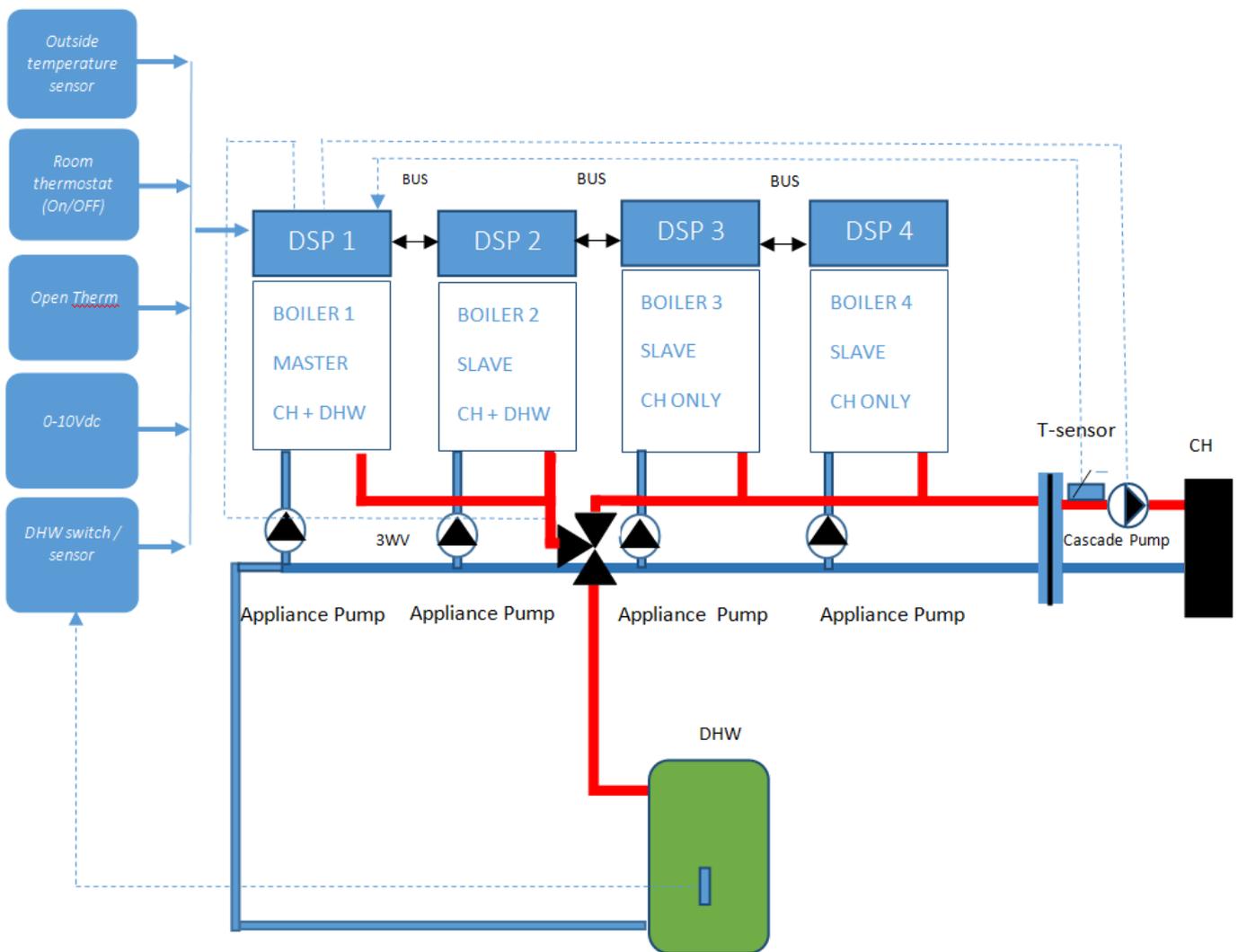
This is called a heterogeneous cascade system (example 4) . In the cascade set menu the parameter DIFFERENT BOILER SIZE must be enabled.

The parameters SINGLE BURNER POWER and CASCADE MIN POWER in the master display are obtained from the first DHW + CH boiler and set for all the boiler belonging to the same group.

Likewise is the power rating for each boiler in CH only group equal and set after AUTO DETECTION initialized from the master.

In case of a CH request and no DHW request the demand is processed by the CH only boilers first and after reaching the maximum modulation level also the CH +DHW boilers are added to serve for CH demand.

Example 4 : Heterogeneous Cascade system. 2 CH only and 2 CH + DHW boilers.

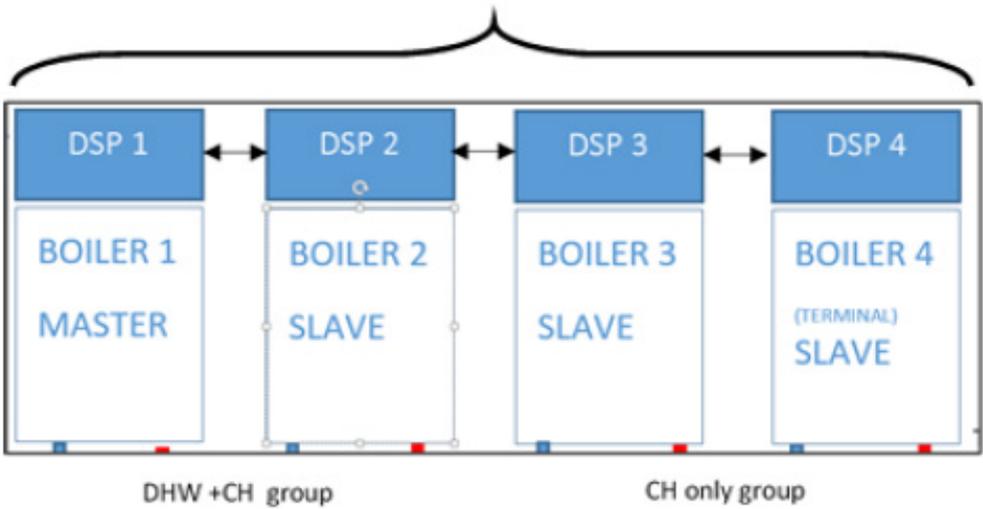


5 WIRING THE CASCADE CHAIN

The integrated cascading functionality of the display (DSP49G2193) , makes it possible to connect , up to a maximum of 6 boilers together without the use of an external cascading controller.

When all boilers are equal, the first boiler in the chain is the master and the other are slaves. When there are two groups defined , (DHW + CH group and CH only group) start the chain with all boilers of the CH + DHW group followed by all boilers of the CH only group. The first DHW + CH boiler is the master. All the others are slaves.

Are boilers are equal for CH and/or DHW



The number of boilers assigned to each group can differ



Each boiler has 3 terminal strips (C1..C3) and 5 cable guides.
On the right side : 3 x 230Vac
On the left side: 2 x 24V



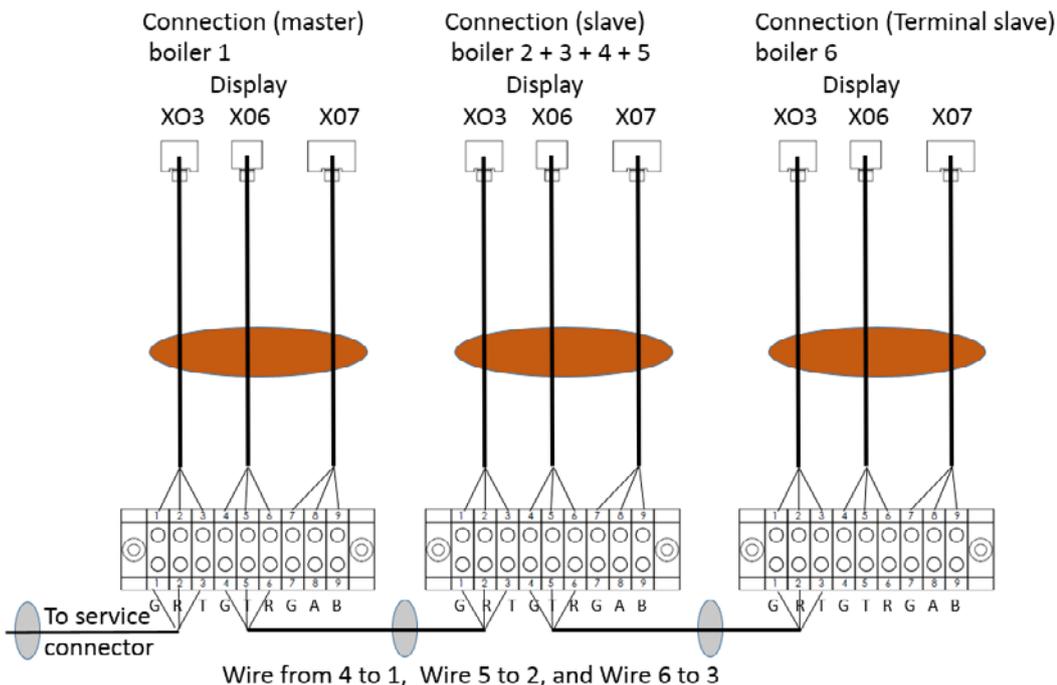
xDisconnect the 230V supply voltage from all the boilers and open the front of the boilers.

Remove the service connector cable from C3 strip (terminals 1,2,3) for all slaves including terminal slave (second boiler to the last boiler).

Do not remove the service connector itself, but roll up the cable and put it on the back of the burner controller mounting plate.

Do not remove the master service connector cable from C3.

Wiring diagram cascade-modbus



Starting from the first boiler to the next and the next till the last, wire up the cascade chain as shown in the picture above. Use the lowest cable guide (low voltage).

Do use a 3 wire shielded cable with a maximum length of 10 meter.

The heat demands (CH, DHW) must be connected to the master (=first) boiler to terminal strip C2. Use the low voltage cable guide. From the master technician menu the correct CH and DHW request must be selected.

DHW pump and or 3WV connections can be done from every boiler in the DHW + CH group, depending on the configuration of the DHW of each boiler but preferred from only the master, this because of the communication delay.

The cascade supply sensor (12k at 25 °C) needs to be connected to the terminal strip C2 : 15,16 of the master boiler, otherwise error 92 will occur.

The terminal strip CI contacts 19, 20 of the master provides in a cascade system pump voltage free relays output (230V, max 0,8 A).

The terminal strip CI contacts 17, 18 of each boiler provides in voltage free alarm relays output (230V, max 0,8 A).

BC	Burner control
D	Display
CI	Connector 230V
C2	Connector low voltage
CH-P	Central heating pump
DHW-P	Domestic hot water pump
PWM-P	Modulating pump
A-P	Appliance pump max 0,8A
HE	Heat exchanger
NTC1	Flow temperature sensor
NTC2	Return temperature sensor
NTC3	Domestic hot water sensor or switch
NTC4	Outside temperature sensor
NTC5	Flue gas temperature sensor
NTC6	Cascade sensor
WPS	Waterpressure sensor
APS	Air pressure switch
SPS	Siphon pressure switch
GPS	Gas pressure switch
GV	Gas valve
S	Switch on/off
3WV	3 way valve
OT-RT	Opentherm or room thermostat on/off
OTC	Outdoor temperature control 12K
F	Fuse
SPS-B	Siphon pressure switch block
B-L	Burner lock
A	Alarm potential free contact
C-P	Cascade pum potential free contact
B-B	Burner block
PE	Earth cable or connector
Fr	Frame
MP	Mounting plate
CP	Cover plate
FP	Front plate

6 CASCADE ERRORS

Each boiler has a potential free alarm relays contact on terminal strip C1: 17,18, which closes when an error (Lock, block) occurs , in the same ways as operating in standalone mode. Also is the number of the error displaced on its user interface .

Because the master manage all the heat request the same error is also visible on the master display. An reset can be done from either the master or boiler with the error, after resolving the problem.

In the upper right corner of the master display the number of the boiler with the error is indicated.

Eventually the alarm output of the master will close indicating there is a problem in the cascade chain.

The 230V supply power of a single boiler in the chain , even when in error mode may not be switched off. When switched off the next boiler(s) cannot be reached by the master resulting in a cascade bus error (E98). When a boiler must be switched off for a longer time , the cascade chain must temporarily be rewired by taken the boiler out of the chain. C3: 4,5,6, of the boiler before the boiler with the error must be connected to C3: 1,2,3 of the boiler following the boiler with the error.

After the re wiring re do an AUTO DETECTION , resulting in the new numbers of boilers found . When reentering a boiler, do not forget to bring the original wiring back in to order and after again performing the AUTO DETECTION , the original number of boilers will be available.

E97: Cascade structure mismatch

The cascade depth or structure (count of displays, burner controllers) has been changed.

Resolving: check wiring, order of display , change of structure: re do auto detection (master)

Error code	Description	Explanation	Check list
E89	Incorrect settings	Parameter mismatch: parameter settings min max disturbed / display has integrated cascade functionality, mode not set.	Check setting of OTC. Wrong display or burner controller.
E90	Firmware mismatch	Display or burner controller not supported.	Replace with correct versions.
E91	Cascade sensor shorted.	The cascade sensor has to be connected to the C2: 15,16 of only the master.	Check wiring , sensor defect. Connect correct sensor .
E92	Cascade sensor open.	The cascade sensor has to be connected to the C2: 15,16 of only the master.	Check wiring , sensor defect. Connect correct sensor .
E95	Cascade CH supply sensor error.	Malfunction of the cascade supply sensor.	Check wiring, sensor defect. Replace sensor.
E97	Cascade structure mismatch.	The cascade depth or structure (count of displays, burner controllers) has been changed.	Check wiring, order of display , change of structure: re do auto detection (master).
E98	Communication error between two displays.	Missing communication , wiring, powered off, fuses in burner controller.	Repair / replace defect followed by auto detection (master).
E99	Communication error between display and burner controller.	Communication error between display and burner controller.	Check cable between display and controller, fuses. Repair /replace defect followed by auto detection (master).

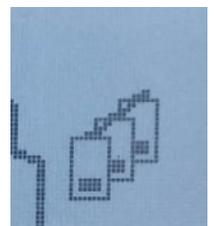
7 CASCADE PARAMETERS

From the first (master) boiler the cascade related parameters can be set , technician menu, 6 cascade, 1 cascade set.

TECHNICIAN MENU FIRST (MASTER) BOILER				
6 Cascade			Default	Access to cascade information and settings
	1 Cascade set			Cascade related parameters
		1 cascade switch delay	30	Delay between switching on and of different boilers
		2 cascade min power	20	Minimum power of boilers in cascade
		3 Single Burner power	170/210/250/290	Max power of SINGLE boiler in cascade
		4 Boiler for DHW	0	Number of boilers assigned to DHW
		5 PI loop period	5	Base time for PI loop calculation: faster --> slower
		6 Burner water flow delay	30	Water propagation time delay. Distance cascade sensor from master.
		7 Different boiler size		Heterogeneous mode with 2 power groups DHW+ CH /CH only
			Disabled	Disable Heterogeneous mode
			Enabled	Enable Heterogeneous mode
		8 Cascade pump speed max	100	Cascade pump full speed
		9 Cascade pump min speed	40	Cascade pump min speed
	2 Cascade info			Cascade related info
		1 Cascade role		Role of boiler in cascade mode= MASTER, SLAVE, TERMINAL SLAVE. If not in cascade mode : STANDALONE
		2 System temperature *		Cascade temperature value. Hitting OK when highlighted will open graph that shows the latest 120 variable values stored every 12 minutes (over the past 24 hours). Samples will not be averaged over the 12 minutes period.
		3 Numbers of burners on		Number of burners that are switched on
		4 Number of burners		Number of burner in cascade
		5 Modulation level		Actual percentage of cascade modulation level
	3 Cascade auto-detect			Pressing OK will start the auto detection of the cascade configuration. Can only be started from the master boiler.

8 AUTO DETECTION

After being correctly wired the auto detection of the cascading chain is initiated from the master boiler. In case the (hydraulic) configuration is designed to operate as a splitted DHW system , set the parameter BOILERS FOR DHW to the number of boilers belonging the CH +DHW group. When the CH only group has a different power rating , set the parameter DIFFERENT POWER SIZE to enabled. Disable all heat demands and power on all the boilers. Set the correct CH and/or DHW request type and the correct numbers of pumps (or pump and 3WV) from the first (master) boiler. From the first (master) boiler start the AUTO DETECTION. When successful the numbers of burners (boilers) is shown on the display. Press OK button to confirm. If the number is incorrect press ESC and check the wiring between the boilers. After a successful configuration in the upper right corner the each display the cascade symbol will be shown. Create a CH and/or demand and check for correct operation of the cascade chain. After changing a cascade set parameter re do an auto detection.



9 GENERAL INFORMATION

The installation must be done in accordance with all local and national codes, regulations and standards, and in accordance with the directives of all relevant authorities.

1. The boiler must only be installed in an area where it is allowed to install it. Make sure that this area is protected against the danger of freezing.
2. The area should have sufficient ventilation and cooling to prevent overheating. 1)
3. When delivered the boiler is on a pallet. Straps may be inserted beneath the boiler, from one side to the other, to facilitate lifting. Install the boiler on a flat non-combustible floor and level it by using its positioning bolts.
4. A minimum free space should be left on each side of the boiler for service access. See chapter 10.
5. Remove the sealing/protection caps from the connection tubes. Warning : take care as residual water from testing may drip.
6. Fill the condensate trap with clean water. This can be done by flushing some water into the aluminium exhaust connection. This water will then drain into the syphon and fill it.
7. Fill the condensate trap of the common flue gas system with clean water.

1) Aeration and vent openings

The area must have sufficient ventilation for 3 reasons:

- The combustion air for each boiler is taken from the boiler room.
- To restrict the temperature in the boiler room ($>0^{\circ}\text{C}$ and no overheating).
- To drain pollution (like flue gas leakages) from the boiler room.

Air supply:

- Incoming air must be free from foreign bodies. It may not contain dust or corrosive elements such as solvents or coolants.
- Incoming air must be outside air.
- Grate must be at least 30 cm above the surface level, obstacles or roof.
- The clear cross section in $[\text{cm}^2]$ for each boiler must be at least $3.3 \times \text{max. boiler heat input nett. So number of boilers} \times 3,3 \times \text{max boiler heat input nett for the whole system.}$

Air exhaust:

- Draught height: top of the grate must be at least 170cm above the top of the air supply.
- Position: together with the air supply a good draught must be achieved in the boiler room. Rule : distance between air supply and air exhaust at least 1 m.
- Air exhaust must end in the outside air.
- The clear cross section in $[\text{cm}^2]$ must be at least equal to the air supply.

Both air supply and air exhaust may not be closed and must be installed in the same pressure area.

Important notice:

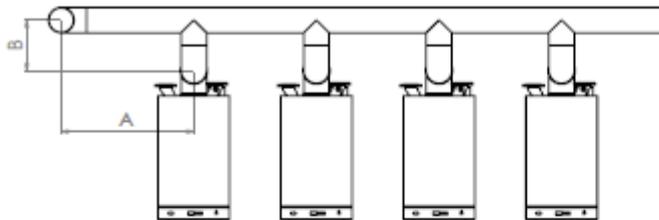
- Connect the master boiler error relay , or external controller relay to a warning system where it can be noticed.
- Install a CO sensor in the boiler room, which will shut down the appliance and connect it to a warning system where it can be noticed.

10 COMMON OVERPRESSURE FLUE GAS SYSTEM

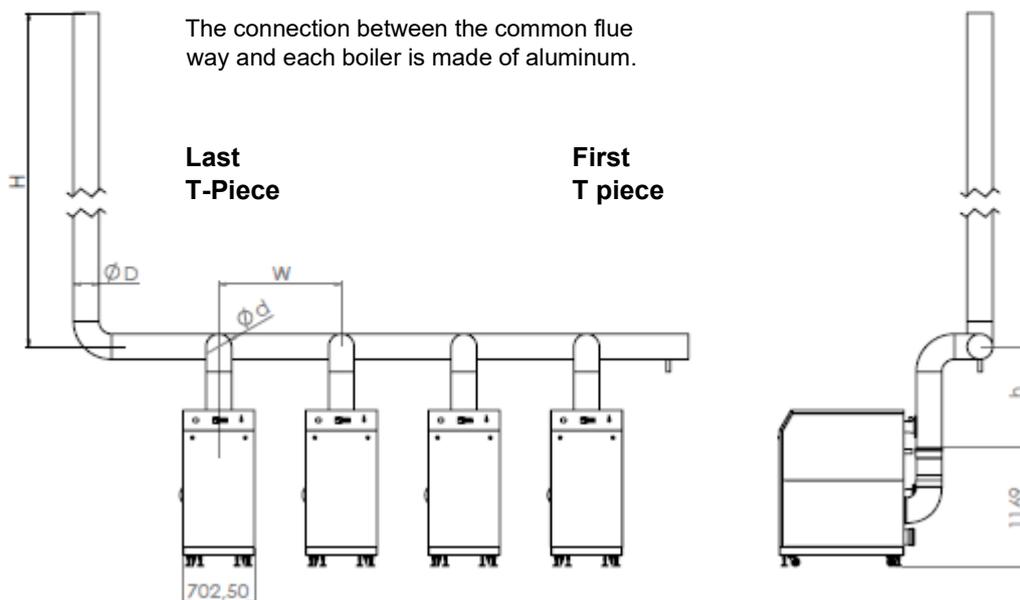
Only boilers with C(11)3 marked on the name plate may be connected to the common overpressure flue gas system, otherwise follow the appliance type of the specific boiler (e.g. B23..). Boilers marked with C(11)3, do have a non-return valve mounted between the fan and burner hood and a mesh filter between the gas valve and venturi tube.

The cascade algorithm is optimized for condensing boilers. Therefore:

- either all boilers connected to the common flue gas system are equal (= same max. and min. input). See regular and splitted DHW cascade system.
- or in case a different power rating is needed, maximum 2 power groups can be created. All boilers in the same group must be equal (= same max. and min. input). See HETEROGENEOUS cascade system.



The common flue way is made of INOX 316L.



- A: distance between last T-piece and vertical common flue gas collector.
- B: distance between boiler flue gas outlet and common flue gas collector.
- H: vertical length of the common flue gas collector.
- h: distance between boiler flue gas outlet and T-piece.
- W: distance between the boilers. (outlet to outlet).
- ϕd : diameter boiler flue gas outlet = 250mm.
- ϕD : diameter common flue gas collector (300,350,400 mm).

The cascade flue gas system is fully made of inox 316L 0.6 flue- system, type SP with outer seal. The collector is constructed with straight flue sections between T pieces with a 87 degree entrée. The entry must be horizontal. See picture above.

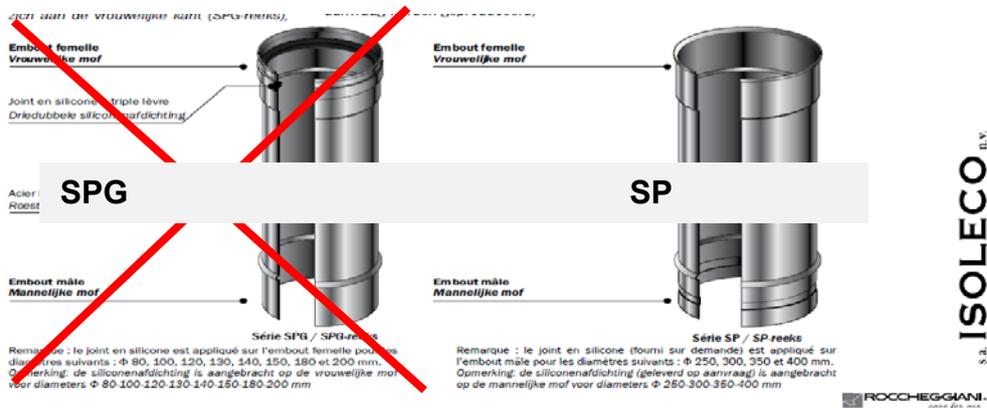
The connection between common flue system and each boiler is made of aluminum. The Aluminum OEM article no. are the same as mentioned in the boiler installation manual and must be obtained from M&G. The combustion air for each boiler is taken from the boiler room. If the air inlet contains dust or dirt one should install an air filter or a leaf catcher in the air supply.

The cascade common flue gas system is part of the ROCHEGGIANI program and can be downloaded from Isoleco.be (member of the M&G Group).

<https://www.isoleco.be/wp-content/uploads/2016/11/Roccheggiani-Isoleco-catalogue-2015-I.pdf>

<https://mg-group.com>

<https://www.isoleco.be>

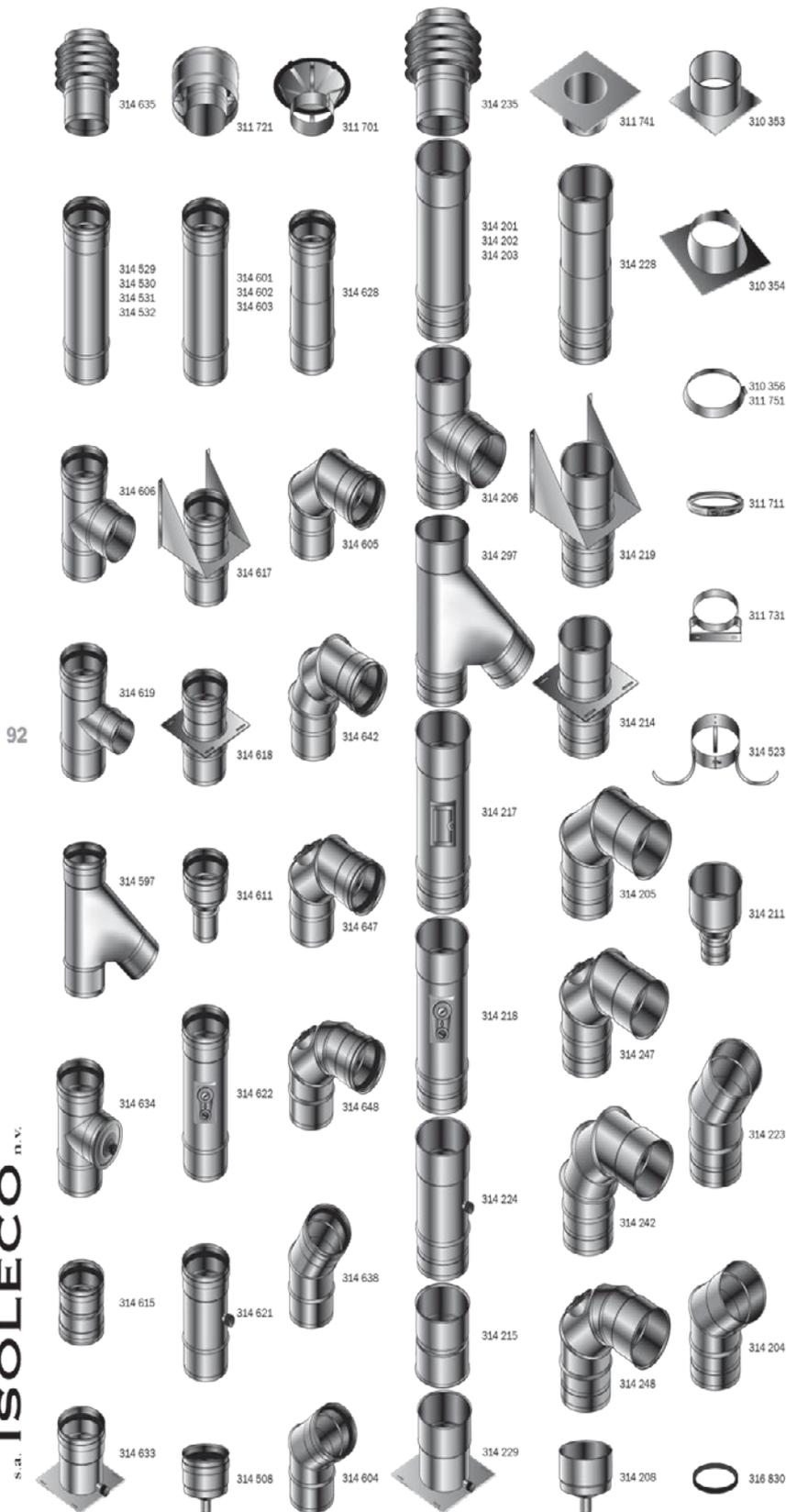


SP product identification (see chapter I6):

- EN I856-I T200 PI WV2 L50060 060: øD 300 mm.
- EN I856-I T200 PI WV2 L50060 090: øD 350 and øD 400 mm.



Séries SPG et SP / SPG/SP-reeks



92

s.a. **ISOLECO** n.v.

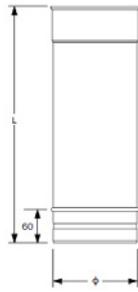
ROCCHEGGIANI
care for air



Remark: The diameter of the T-piece of the common flue system is part of the article number. The side connection of the T-piece which is always 250M, must be mentioned in the description when ordering.

Article no.	Article description
31.420.13.00	SP Straight pipe Length Lg=1000 d.300
31.420.13.50	SP Straight pipe Length Lg=1000 d.350
31.420.14.00	SP Straight pipe Length Lg=1000 d.400
31.420.23.00	SP Straight pipe Length Lg=500 d.300
31.420.23.50	SP Straight pipe Length Lg=500 d.350
31.420.24.00	SP Straight pipe Length Lg=500 d.400
31.420.33.00	SP Straight pipe Length Lg=250 d.300
31.420.33.50	SP Straight pipe Length Lg=250 d.350
31.420.34.00	SP Straight pipe Length Lg=250 d.400
31.420.53.00	SP Bend 87° d.300
31.420.53.50	SP Bend 87° d.350
31.420.54.00	SP Bend 87° d.400
31.420.63.00	SP T-piece 87° d.300 Side connection d250M
31.420.63.50	SP T-piece 87° d.350 Side connection d250M
31.420.64.00	SP T-piece 87° d.400 Side connection d250M
31.420.83.00	SP Condense trap d.300
31.420.83.50	SP Condense trap d.350
31.420.84.00	SP Condense trap d.400
31.421.93.00	SP Wall mount d.300
31.421.93.50	SP Wall mount d.350
31.421.94.00	SP Wall mount d.400
31.422.83.00	SP Adjustable pipe length d.300
31.422.83.50	SP Adjustable pipe length d.350
31.422.84.00	SP Adjustable pipe length d.400
31.171.12.50	SP Clamp d.250
31.171.13.00	SP Clamp d.300
31.171.13.50	SP Clamp d.350
31.171.14.00	SP Clamp d.400
31.683.03.00	SP Outer seal d.300
31.683.13.50	SP Outer seal d.350
31.683.14.00	SP Outer seal d.400
31.173.13.00	SP Wall mount bracket d.300
31.173.13.50	SP Wall mount bracket d.350
31.173.14.00	SP Wall mount bracket d.400
31.422.53.00	SP Roof terminal (roof: flat) inox d.300
31.422.53.50	SP Roof terminal (roof: flat) inox d.350
31.422.54.00	SP Roof terminal (roof: flat) inox d.400
31.035.53.00	SP Roof terminal (roof: slope) inox , lead slab d.300
31.035.53.50	SP Roof terminal (roof: slope) inox , lead slab d.350
31.035.54.00	SP Roof terminal (roof: slope) inox , lead slab d.400
31.035.63.00	SP Storm collar inox d.300
31.035.63.50	SP Storm collar inox d.350
31.035.64.00	SP Storm collar inox d.400
31.452.33.00	Spacer holder d 300
31.452.33.50	Spacer holder d 350
31.452.34.00	Spacer holder d 400
31.421.12.50	SP reducer d.250F x d.200M

314 201-202-203
Élément droit / Recht element



Diamètre / Diameter Ø (mm)
250
300
350
400

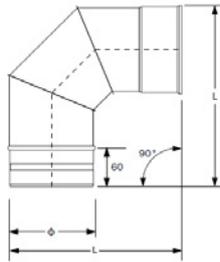
201 L = 1000 mm
202 L = 500 mm
203 L = 250 mm

Straight pipe length:

Article no.: 314 length diameter
e.g. 314 201 300

Remark: The outer seal (male side) must be ordered separately.

314 205
Coude à 90° / 90° bochstuk



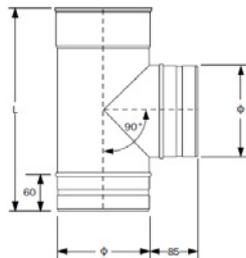
Diamètre / Diameter Ø (mm)	L (mm)
250	395
300	410
350	460
400	510

90° Bend:

Article no.: 314 205 diameter
e.g. 314 205 300

Remark: The outer seal (male side) must be ordered separately.

314 206
Té à 90° / 90° T-stuk



Diamètre / Diameter Ø (mm)	L (mm)
250	450
300	500
350	550
400	600

T-piece 90°:

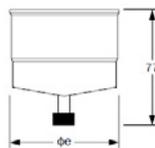
Article no.: 314 206 diameter
e.g. 314 206 300

Remark: The outer seal (male side) must be ordered separately.

The side connection must be mentioned by ordering (ød =250mm).

Remark: the T-connection must be mounted HORIZONTAL.

314 208
Collecteur de condensat / Condenscollector



Diamètre / Diameter Ø (mm)
250
300
350
400

Condense trap

Article no.: 314 208 diameter
e.g. 314 208 300

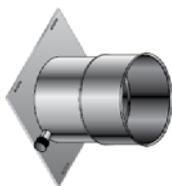
Siphon ød 3/4" (not included)

Remark: Extra 90° bend is needed.

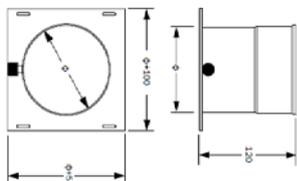
OR

314 229

Plaque de base avec purge de condensat latérale
Basisplaat met zijdelingse condensaftap



Diamètre / Diameter Φ (mm)
250
300
350
400



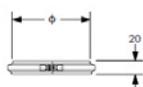
Condense trap

Article no.: 314 229 diameter
e.g. 314 229 300

EN

311 711

Bride de sécurité / Klemband



Diamètre / Diameter Φ (mm)
80
100
120
130
140
150
180
200
250
300
350
400

Clamp :

Article no.: 311 711 diameter
e.g. 311 711 300

To secure the joint between 2 elements.

316 830

Joint / Afdichting



316 830

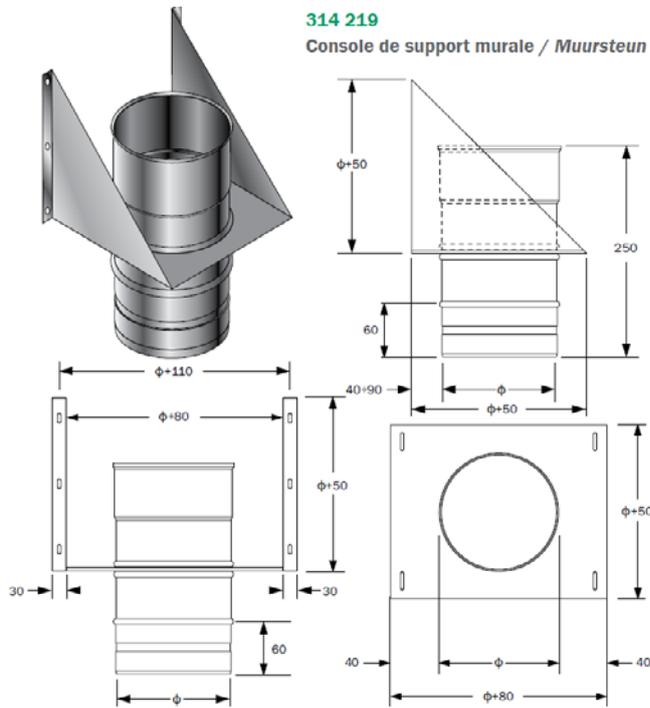


Code / Code	Diamètre du tuyau Buisdiameter Φ (mm)
316 830 250	250
316 830 300	300
316 830 350	350
316 830 400	400

Outer seal:

Article no.: 316 830 diameter
e.g. 316 830 300

Remark: must be ordered separately.



Diamètre / Diameter Φ (mm)
250
300
350
400

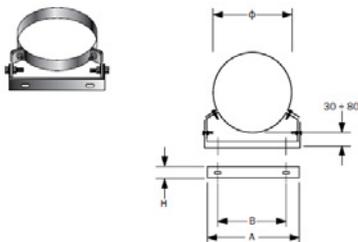
Wall mount:

Article no.: 314 219 diameter
 e.g. 314 219 300

Remark: The outer seal (male side) must be ordered separately.

Remark: supporting element, only for vertical use, as shown.

311 731
Collier de fixation murale / Muurbevestigingsbeugel



Diamètre / Diameter Φ (mm)	A (mm)	B (mm)	H (mm)
130	144	72	40
150	160	95	40
180	190	105	50
200	210	120	80
250	260	170	50
300	310	235	50
350	355	265	50
400	410	340	50

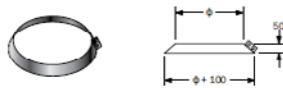
Réglable / Verstelbaar

Wall mount bracket:

Article no.: 311 731 diameter
 e.g. 311 731 300

Remark not a supporting element, vertical or horizontal use.

310 356 - 311 751
Collet de solin / Stormkraag



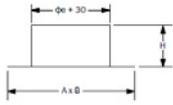
Code / Code	Diamètre Diameter Φ (mm)
310 356 080	80
310 356 100	100
310 356 120	120
310 356 130	130
310 356 140	140
310 356 150	150
310 356 180	180
310 356 200	200
310 356 250	250
310 356 300	300
311 751 050	500
311 751 400	400

Storm collar:

Article no.: 310 356 diameter
 e.g. 310 356 300

310 353

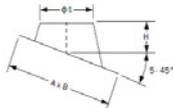
Solin toits plats / Dakdoorvoer voor platte daken



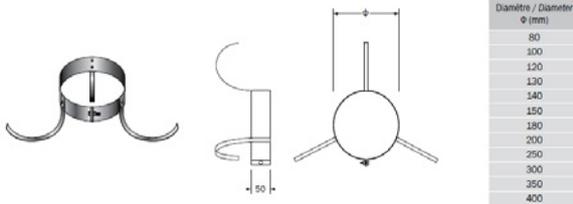
Code Code	Diamètre intérieur Binnendiameter ϕ_i (mm)	Diamètre extérieur Buitendiameter ϕ_e (mm)	H (mm)	A x B (mm)
310 353 130	80	130	200	500 x 500
310 353 150	100	150	200	500 x 500
310 353 180	130	180	200	500 x 500
310 353 200	150	200	200	630 x 630
310 353 230	180	230	200	630 x 630
310 353 250	200	250	200	630 x 630
310 353 300	250	300	200	630 x 630
310 353 350	300	350	200	750 x 750

310 354

Solin toits inclinés (bavette plomb)
Dakdoorvoer voor hellende daken (loodslab)



Code Code	Diamètre intérieur Binnendiameter ϕ_i (mm)	Diamètre extérieur Buitendiameter ϕ_e (mm)	ϕ_1 (mm)	H (mm)	A x B (mm)
310 354 130	80	130	150	200	750 x 750
310 354 150	100	150	170	204	750 x 750
310 354 180	130	180	200	212	750 x 750
310 354 200	150	200	220	216	750 x 750
310 354 230	180	230	270	228	800 x 800
310 354 250	200	250	270	228	800 x 800
310 354 300	250	300	320	239	1000 x 1000
310 354 350	300	350	370	250	1000 x 1000



Roof term (Alu) Roof: flat

Article no.: 310 353 + (external) diameter
e.g. 310 353 300

Roof term (Inox) Roof: flat

Article no.: 314 225 + (external) diameter
e.g. 314 225 300

Roof term (inox+ lead slab) Roof : Slope

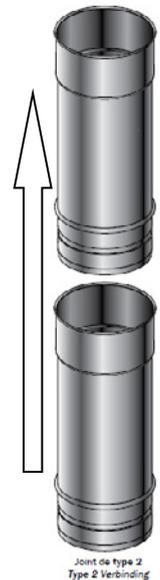
Art code: 310 335 + (external) diameter
e.g. 310 335 300

Spacer holder

Art code 314 523 + diameter.
e.g. 314 523 300

Installing flue gas system

- Do not use materials from different manufacturers for the exhaust.
- Only the manufacturer of exhaust components as mentioned in the manual may be used.
- Flue gas system must be mounted free of tension.
- The horizontal collector must be installed with a fall of 3 ° (50 mm /m).
- Drain the condensate via a tundish and U – trap to the sewer. See picture on page 14.
- The T- piece must be mounted with the side connection horizontal. See picture on page 14.
- The flue gas flow direction is as shown in the picture.



Joint de type 2
Type 2 Verbinding

Brackets, Mounting

Vertical

- Mounting is from bottom to top starting with the supporting wall mount.
- Use Clamps to secure the joint between 2 elements and stability.
- The maximum (draught) length H = 30m.
- The maximum length between two supporting wall mounts is 25m.

Horizontal

- A wall mount bracket must be mounted at every T piece.
- Use Clamps to secure the joint between 2 elements and stability.

In case wall mounting is not possible use a rail mounted to the sealing .
Use clamps with rubber weft.

Bifix bracket for spiral ducts.

<https://www.walraven.com/nl>



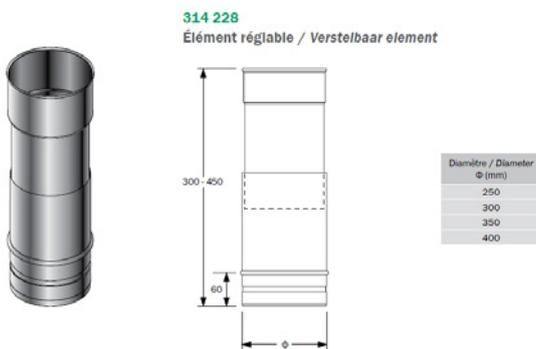
<https://www.vanwalraven.com/en/catalog/fixings/pipe-brackets-metal-with-liner/2-schroefsbeugels/bifix-bracket-for-spiral-ducts/229630/groups/g+c+p+a+nr+view>

General:

- **It is not allowed to shorten** any component of the common flue way.

In this case use :

Adjustable pipe length:



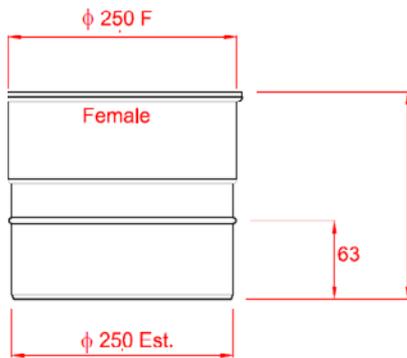
Article no.: 314 228 diameter
e.g. 314 228 300

Remark: The outer seal (male side) must be ordered separately.

Remark: DO NOT USE IN VERTICAL POSITION.

- For smooth joining only use a soap solution (1% in water). Do not use oil, grease or (acid free) vaseline.

Inox adaptor between T-piece and aluminum flue-gas connection to the boiler:



Article no.: 314 211 250 + description REDUCER 250Fx 250M

Remark: also order 311.711.250 : SP clamp d 250

141 Remark: also order 316.830.250: SP outer seal d 250.

The aluminum connections between adaptor and boiler must be obtained from M&G and are the same as mentioned in the boiler installation manual.

EN

Components	OEM article no. M&G
EXTENSION ALU 250x1000	40.045.16.84
EXTENSION ALU 250x500	40.045.16.83
ELBOW ALU 250 90°	40.045.16.86
WALL BRACKET 250	40.045.22.35
SEAL SIL 250 mm (for DN ALU 250)	40.045.18.15

General boiler information.

Type	PowerFlex 340-5	PowerFlex 425-6	PowerFlex 510-7	PowerFlex 595-8	Unit
Heat input nett max	340	425	510	595	kW
Heat input nett min	68	85	102	119	kW
Ignition rate nett	130	160	190	220	kW
Ignition rate	20	20	20	20	%
CO2 max input	9.3	9.3	9.3	9.3	%
CO2 min input	9.1	9.1	9.1	9.1	%
T flue max , max input	70	70	70	70	°C
T flue min input	30	30	30	30	°C
Back pressure max input	250	250	300	300	Pa
Backpressure min input	25	25	25	25	Pa
Boiler flue gas connection	250	250	250	250	mm
Output (80-60) °C	331	413.1	495.7	578.3	kW
Output (50-30) °C	350.5	438.2	525.8	613.4	kW

In case of a regular or splitted DHW cascade system the capacity of each boiler is equal (same max. and min. input). In case of a heterogeneous cascade system , max. two groups of different power rating can be created. All boiler belonging to the same group must be equal (same max. and min. input). For all systems the no. of needed boilers can be selected from the next table.

E.g.:

- Calculate the needed power at 80-60 or 50-30 °C. e.g. 1753 kW at 50-30°C..

- Lookup the needed power in the table below. E.g. 1753 kW

- On the same row , in the column's the right the no. of boilers is shown. E.g.: 1 x PowerFlex 510-7. Or 2x PowerFlex 595-8.

- On the same row, in the column's to the left, the allowed diameter(s) (ϕD) of the common flue gas system are given. E.g. : only 400 mm

ϕd : diameter boiler flue gas outlet = 250mm.

ϕD : diameter common flue gas collector (300,350,400 mm).

W: distance between the boilers. (outlet to outlet).

No of Boilers	Dn [mm] Fluegas			Nom. Input [kW]	P output power		Intermodul			
	300	350	400		P [kW] (80-60 °C)	P [kW] (50-30 °C)	340-5	425-6	510-7	595-8
2	300	350	400	680	661	701	2	0	0	0
2	300	350	400	765	744	789	1	1	0	0
2	300	350	400	850	826	876	0	2	0	0
2	300	350	400	850	826	876	1	0	1	0
2	300	350	400	935	909	964	1	0	0	1
2	300	350	400	935	909	964	0	1	1	0
2	300	350	400	1020	991	1052	0	0	2	0
2	300	350	400	1020	991	1052	0	1	0	1
3	300	350	400	1020	991	1052	3	0	0	0
2	300	350	400	1105	1074	1139	0	0	1	1
3	300	350	400	1105	1074	1139	2	1	0	0
2	300	350	400	1190	1157	1227	0	0	0	2
3		350	400	1190	1157	1227	2	0	1	0
3		350	400	1190	1157	1227	1	2	0	0
3		350	400	1275	1239	1315	2	0	0	1
3		350	400	1275	1239	1315	0	3	0	0
3		350	400	1360	1322	1402	0	2	1	0
4		350	400	1360	1322	1402	4	0	0	0
3		350	400	1360	1322	1402	1	0	2	0
3		350	400	1445	1405	1490	0	2	0	1
3		350	400	1445	1405	1490	0	1	2	0
4		350	400	1445	1405	1490	3	1	0	0
3		350	400	1530	1487	1577	0	0	3	0
3		350	400	1530	1487	1577	1	0	0	2
4		350	400	1530	1487	1577	3	0	1	0
4		350	400	1530	1487	1577	2	2	0	0
3		350	400	1615	1570	1665	0	0	2	1
3		350	400	1615	1570	1665	0	1	0	2
4		350	400	1615	1570	1665	3	0	0	1
4		350	400	1615	1570	1665	1	3	0	0
3			400	1700	1652	1753	0	0	1	2
4			400	1700	1652	1753	0	4	0	0
4			400	1700	1652	1753	2	0	2	0
5			400	1700	1652	1753	5	0	0	0
3			400	1785	1735	1840	0	0	0	3
4			400	1785	1735	1840	0	3	1	0

Remark: For more information contact your supplier or manufacturer.

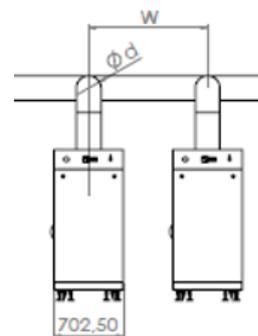
Remark: max. length H =30m.

- A: distance between last T-piece and vertical common flue gas collector.
- h: distance between boiler flue gas outlet and T-piece.
- B: distance between boiler flue gas outlet and common flue gas collector.
- H: vertical length of the common flue gas collector.

A minimum free space of 50 cm should be left on each side of the boiler for service access. Because it is not allowed to shorten the components of the common flue-system, 1 meter default pipe length must be used.

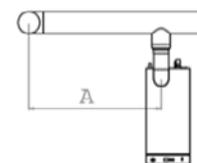
The table below shows the distance between two boilers when 1 meter default pipe length is used.

W	øD [mm]			
Straight pipe length [mm]	300	350	400	
1000	1380	1430	1480	W in [mm]
	678	728	778	Distance between 2 boilers [mm]



The max. length H =30 m., mentioned in the tables above is stated by length according the next table.

A	øD [mm]			
Straight pipe length [mm]	300	350	400	
1000	1390	1440	1490	



Extra horizontal length and bends may only be added in A and/or H. In case extra length and/or bends are needed the equivalent in meters must be subtracted from the maximum length H.

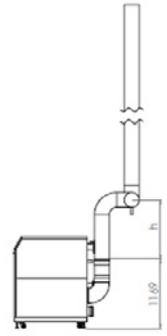
Equivalent in [m]	øD [mm]			
Elbow type	300	350	400	
45°	2.8	3.3	3.8	[m]
90°	4.7	5.5	6.3	[m]

The connection (h and B) between the boiler outlet and the T-piece is made of aluminum. The length (h) between boiler flue gas outlet and the common flue gas pipe must be at least 1 m. with a maximum of 5 m. (with 87° bend add 260mm).

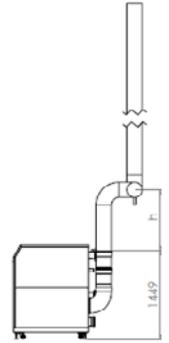
The length of h and B together is limited to 5 m. (without 87° bend , inox adapter and T-piece side connection)

Straight pipe length [mm]	B in [mm] (Bend + pipe length + inox adaptor + T –Piece side connection)		
	øD [mm] 300	øD [mm] 350	øD [mm] 400
1000	1575	1625	1650
2000	2575	2625	2650
3000	3575	3625	3650
4000 ⁴⁾	4575	4625	4650

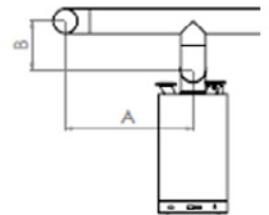
⁴⁾ more than 4m. straight pipe length not allowed.



PowerFlex 425-6,
510-7, 595-8



PowerFlex 340-5
(2x silencer)



II ADJUSTMENT OF MINIMUM HEAT INPUT

The minimum heat input must be adjusted for connecting the boiler to the common flue gas system. Follow the table below, how to adjust the minimum heat input.

	INTERNAL CASCADE CONTROLLER CH and/or DHW heat demands are only connected to the “master” boiler.	EXTERNAL CASCADE CONTROLLER CH and /or DHW heat demands are connected to each boiler
Central heating demand: RT+SP OTC OT 0-10Vdc (SP) (SP=set point mode)	FOR ONLY THE MASTER Adjust the min CH power via Display: <MENU> <TECHNICIAN> (CODE) <ADVANCED CH> <CH POWER SET> <MIN POWER> A (next table)	FOR EACH BOILER Adjust the min CH power via Display: <MENU> <TECHNICIAN> (CODE) <ADVANCED CH> <CH POWER SET> <MIN POWER> A (next table)
DHW Switch or DHW sensor	FOR ONLY THE MASTER Adjust the min DHW power via Display: <MENU> <TECHNICIAN> (CODE) <ADVANCED DHW SETTINGS> <DHW POWER SET> <MIN POWER> A (next table)	FOR EACH BOILER Adjust the min DHW power via Display: <MENU> <TECHNICIAN> (CODE) <ADVANCED DHW SETTINGS> <DHW POWER SET> <MIN POWER> A (next table)
MODBUS (CH, DHW)	FOR ONLY THE MASTER The minimum heat input must be limited by the MODBUS controller. C (next table)	FOR EACH BOILER The minimum heat input must be limited by the MODBUS controller. C (next table)
0-10Vdc [%]	FOR ONLY THE MASTER The minimum heat input must be limited by the 0-10Vdc controller B (next table)	FOR EACH BOILER The minimum heat input must be limited by the 0-10Vdc controller B (next table)
Chimney Sweeper	FOR EACH BOILER While using the chimney sweeper, value D (next table) must entered manually	FOR EACH BOILER While using the chimney sweeper, value D (next table) must entered manually

RT: room thermostat on/off or “open herm” thermostat (OT).

SP: (temperature) setpoint mode.

%. power mode.

	A Via Display CH/DWH min power [%]	B External controller 0-10Vdc [%] min voltage [Vdc]	C External controller CH/DHW Min heat input [%]	D Chimney Sweeper/ Manual test [%]
PowerFlex 340-5	4	2.4	4	4
PowerFlex 425-6	4	2.4	4	4
PowerFlex 510-7	4	2.4	4	4
PowerFlex 595-8	4	2.4	4	4

CH: Central heating.

DHW: Domestic hot water.

In case of an external controller 0-10Vdc [%] or [SP] terminal strip C2: 1,2 must be bridged. To end the heat demand the voltage must become below 1 volt.



Due to pressure difference between flue gas outlet - and combustion air inlet pipe the minimum heat input is defined:

- Min heat input $Q_{i \text{ min @}(0 \text{ Pa})}$ in [kW].
- Min heat input $Q_{i \text{ min @}(25\text{Pa})}$ in [kW].

See next chapter.

	Minimum heat input $Q_{i \text{ @}}$ (pressure difference =0 [Pa]) In [kW]	Minimum heat input $Q_{i \text{ @}}$ (pressure difference =25 [Pa]) in [kW]
PowerFlex 340-5	75	68
PowerFlex 425-6	93	85
PowerFlex 510-7	112	102
PowerFlex 595-8	136	119

12 C(11)3 BOILER INFORMATION LABEL

When installed as a C(11)3 boiler , an information label must be placed at the backside of the boiler left from the default type name plate(s).

The information label C(11)3 contains the following information:

- Read this manual.
- This boiler is a C(11)3 boiler.
- This boiler is specially adjusted for connection to the common overpressure flue gas system. See chapter :Adjustment minimum heat input.
- The manufacturer’s logo, and address . type and name of the boiler connected to the flue gas system, in case the boiler needs to be replaced

You will find the information label , together with the installer-instructions manual of the boiler. information label (PowerFlex 340-5,425-6,510-7,595-8).



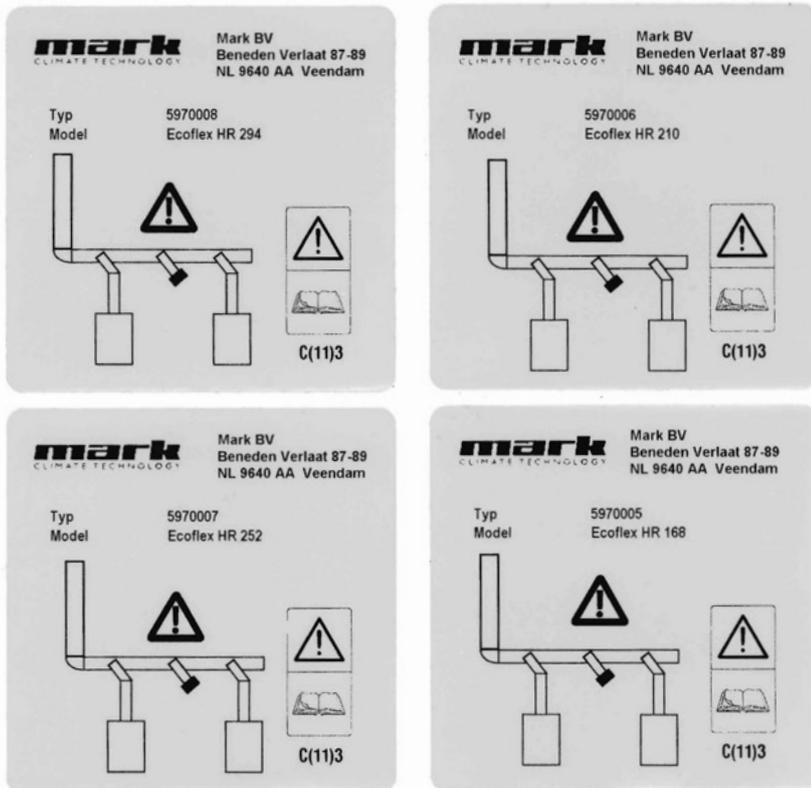
13 C(11)3 WARNING LABEL

At the location of any connection interface (T-piece) of the common flue gas system a warning label must be placed.

You will find the warning label, together with the installer-instructions manual of the boiler.

Each boiler type has its own warning label (PowerFlex 340-5, 425-6,510-7,595-8).

Attention: the warning labels on the left are an example.



The warning label contains the following information:

- Read this manual.
- The common flue gas system is for C(11)3 boilers.
- A warning when the boiler is disconnected from the common flue gas system, the combustion product (flue gas) inlet opening shall be closed and checked on tightness.
- The manufacturer's logo, address, type and name of the boiler connected to the flue gas system, in case the boiler needs to be replaced.

14 C(11)3 BOILER IDENTIFICATION

Boilers with a non-return valve inside and suitable for C(11)3 are marked with C(11)3 on the box label and nameplate of the boiler. Attention: labels below are an example.

Box label



Name plate



15 ANNUAL INSPECTION, MAINTENANCE

Maintenance and inspection must be done by a qualified installer or technician. ** Inspection of the appliance must be done once every 2 years according the table on page 37. Maintenance must be done once every 2 year according table on page 37. Because all the boilers have been installed as a C(11)3 boiler the state and the correct operation of the non- return valve of each boiler must be checked annually (during maintenance and inspection).

Warning: Always switch off the boiler and disconnect from the mains electricity, gas supply during inspection- and maintenance- activities.

Note: Be careful during inspection/maintenance not to damage seals.

Note: Follow the instructions in the boiler installation manual how to adjust the gas valve for the correct CO₂/CO and load figures.

Also look at the ADJUSTMENT OF MINIMUM HEAT INPUT chapter of this manual.

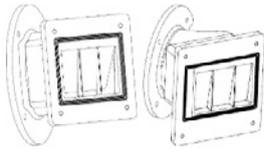
Remark: Aps: air pressure switch, SPS : syphon pressure switch.

Inspection

Inspection set (article no 101 181) must be used. Remove the syphon and clean it. Refill the condensate trap with clean water and reconnect it with the new O-ring from he inspection set.

Remove ignition- and flame rod. Finally the fan together with the burner-hood, the gasvalve and the gas pipe. Now the burner is visible and can be taken out and inspected. If necessary clean the cold side with a vacuum cleaner (or carefully with compressed air) and a nylon brush (never use a steel brush). Inspect the combustion chamber. In case of a dirty heat-exchanger it can be cleaned with water.

water.



Remove the burner-hood from the fan (G3G200 or G3G250). The non-return valve will be visible now.

Inspect the non-return valve for:

- Correct opening.
- Correct spring return closing.
- Deformations of the valve. (Which can result in a leakage.)
- Damaged foam. (Which also can result in a leakage.)
- Stucked valve. . (Leakage and incorrect loads)



When the valve needs cleaning because of dust, use compressed air (low pressure) and /or a soft brush (never use a steel brush).

In case of a damaged / stucked valve also re-check the burner, mesh filter between venturi and outlet of the gas valve and the gas valve itself for defects. Eventually clean and dry with compressed air (low pressure).

The valve itself is not repairable and must be replaced completely. Check the burner and gas valve seals and replace if necessary. Tighten with torques as mentioned in the table on page 38.

Replace the ignition electrode and seal, check the distance between the two pins ($4,5 \pm 0,5$ mm). Also replace the flame detection electrode and seal.

Put the boiler into operation on max. load. Determine the heat input of the boiler. Check % CO₂. Repeat for min load. Check the gas-parts for leakages and correct eventually.

Check the flue-gas parts for flue-gas leakages and condensate leakages and correct eventually. Check in general for leakages and correct if necessary. Compare the heat input (max and min) with that measured at installation as an C(11)3 boiler. If the figures as mentioned in table on page 39 are comparable the inspection is done.

Remark:

Follow the instructions in the boiler installation manual for the correct figures and how to adjust the CO₂. Also look at the ADJUSTMENT OF MINIMUM HEAT INPUT chapter of this manual.

If the heat input is now considerably lower then there is probably an obstruction in the air inlet or the flue-outlet or in the boiler itself.

Switch off the boiler. Disconnect from the mains electricity supply. First check the air-inlet and the exhaust flue-outlet. Remove the front cover, top cover and side cover.

Remove the inspection cover of the sump on the front side beneath the controls.

The inner part of the sump and the bottom part of the heat-exchanger should be inspected and, if necessary, be cleaned.

If the bottom part of the heat-exchanger is clogged, the inspection covers on the left-hand side of the heat-exchanger should be removed. Using a special tool makes it possible to clean the heat-exchanger lids partially. See page 36 for procedure putting back in place inspection covers on the left-hand side of the heat-exchanger.

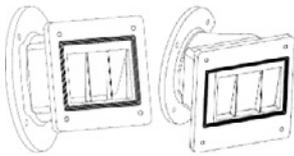
Put everything back in its place. Tighten with torques as mentioned in the table on page 35. Check the CO₂-content and correct if necessary. Check the gas-parts for leakages. Check the flue-gas parts for flue-gas leakages and condensate leakages. Fill in the data in table on page 38.

Maintenance

Maintenance set (article no 101 104) must be used. All parts of the set should be used as replacement. Remove the front cover, top cover and side cover. Remove the syphon and clean it.

Remove the inspection cover of the sump on the front side beneath the controls. The inner part of the sump and the bottom part of the heat-exchanger must be cleaned. Remove the inspection covers on the left-hand side of the heat-exchanger. Using a special tool makes it possible to clean the heat-exchanger lids partially. See page 36 for procedure putting back in place inspection covers on the left-hand side of the heatexchanger.

Also inspect the upper part of the heat-exchanger. Remove ignition- and flame rod. Finally the fan together with the burner hood, the gas valve and the gas pipe. Now the burner is visible and can be taken out and inspected. Clean the cold side with a vacuum cleaner (or carefully with compressed air) and a nylon brush (never use a steel brush). Inspect the combustion chamber. In case of a dirty heat-exchanger it must be cleaned with water.



Remove the burner-hood from the fan (G3G200, or G3G250). The non-return valve will be visible now.

Inspect the non-return valve for:

- Correct opening.
- Correct spring return closing.
- Deformations of the valve. (Which can result in a leakage.)
- Damaged foam. (Which also can result in a leakage.)
- Stucked valve. (Leakage and incorrect loads.)



When the valve needs cleaning because of dust, use compressed air (low pressure) and /or a soft brush (never use a steel brush).

In case of a damaged / stucked valve also re-check the burner, mesh filter between venturi and outlet of the gas valve and the gas valve itself for defects. Eventually clean and dry with compressed air (low pressure).

The valve itself is not repairable and must be replaced completely. Check the burner and gas valve seals and replace if necessary. Tighten with torques as mentioned in the table on page 38. Check the burner seal and replace it by a new one. Tighten with torques as mentioned on page 38. Refill the condensate trap with clean water and reconnect it.

Replace the ignition electrode and seal, check the distance between the two pins ($4,5 \pm 0,5$ mm). Also replace the flame detection electrode and seal.

Put everything back in its place. Check the CO₂-content and correct if necessary.

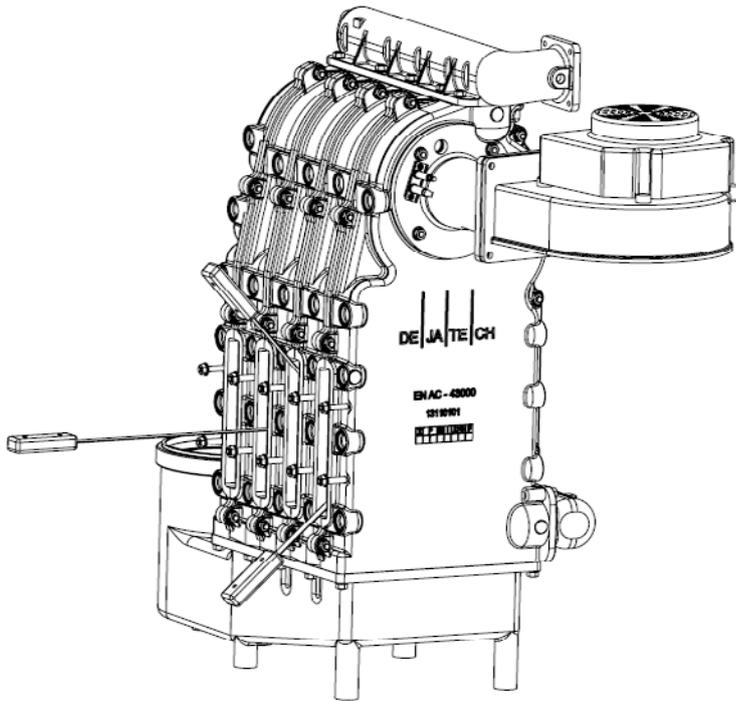
Check the gas-parts for leakages and correct eventually.

Check the flue-gas parts for flue-gas leakages and condensate leakages and correct eventually. Check for in general for leakages and correct if necessary. Fill in the table on page 37.

Special tool for cleaning.

When commissioning / inspecting the boiler CO₂, CO, T flow, T return, ΔPAPS and Psp pressure switch must be measured and the measured values must be written down in the table below.

Measure these values when the boiler is in equilibrium at maximum load. Repeat for minimum load.



During annual inspection and maintenance measure and write down these values also and compare them to the previous values and analyse any change.

At the factory the maximum load of the boiler was measured within 5% tolerance from the nominal load. In the field the load can decrease due to increased resistance in the boiler, the air inlet or the exhaust outlet or due to malfunctioning of the fan or other causes.

At maximum load the installation should be designed for nominal ΔT of 15 K to 20 K.

When the ΔT is higher than 25 K, the boiler cannot continue at maximum load anymore and will start to modulate because water flow through the boiler is insufficient.

T flow and T return can be read in “info mode” on the display (see 5.4 diagnostics).

Valves, malfunctioning pumps, dirt, corrosion products from the installation, dirty filters etc. can have negative impact on water flow through the boiler.

Before ignition the boiler control checks ΔP_{aps} during pre-purge. During burner operation this check will be carried out. If the value decreases over successive years, this could indicate a problem e.g. malfunctioning of the fan, dirty air inlet, dirty burner, dirty heat exchanger or dirty exhaust system.

Syphon pressure (P_{sps}) should be lower than the maximum allowable flue resistance. If P_{sps} is too high (> 12.4 mbar), the boiler will be stopped. In this case the exhaust system may be blocked.



Tubing and fixation

The tubing (P1 & P2) and its fixation is part of the security of the boiler. During the inspection and maintenance also all the tubing and its fixations must be checked. Check for leakage and correct fixation. In case of doubt replace tubing and or fixation. After reconnection of the tubing check for proper functioning of the boiler and also check the input and CO/CO₂ figures.

Torque table

Concerning part	Torque in Nm
Inspection cover sump	4
Burnerhood on heat-exchanger	30
Venturi on fan	12
Fan on burnerhood	7
Air-inlet on fan	4
Gas valve on fan	4
Electrode ignition	1,5
Electrode ionisation	1,5
Inspection cover on left-hand side heat-exchanger middle	5
Inspection cover on left-hand side heat-exchanger front	5
Inspection cover on left-hand side heat-exchanger back	5
Connection PN flow	30
Connection PN return	30

Table Article numbers

Inspection set	101 181
Maintenance set	101 104

Must be ordered separately	
Non -Return valve complete (+ outer seal) G3G200 (34-5 and 425-6)	101 025
Non -Return valve complete (+ outer seal) G3G250 (510-7,595-8)	101 026

Meshfilter cascade C(11)3 / gas filter	101 179
Outer seal non- return valve G3G200 (34-5 and 425-6)	100 998
Outer seal non- return valve G3G250 (510-7,595-8)	100 999
Seal burner - burnerhood	100 182
Seal gas valve alu. adapter -venturi	100 879
O ring joint gas valve (47x3)	101 187
O ring MCB gas valve	101 185

These article numbers are part of the maintenance set. When needed during inspection , they must be ordered separately.

While using the chimney sweeper function (entry 6 in the user menu / entry 4.3 manual test in the technician menu of the display), the percentage for the minimum heat input mentioned in ADJUSTMENT OF MINIMUM HEAT INPUT must also be corrected manually (Value D in table).

C(11)3 information:

- Working temperature Q_i nom and Q_i min : 50°C.
- $\Delta p_{max,saf}(min)$: 25 [Pa]
- $\Delta p_{max,saf}(start)$: 25 [Pa]
- $\Delta p_{max,saf}(max)$: 77 [Pa]
- $\Delta p_{max,func}(start)$: 77 [Pa]
- $\Delta p_{min,saf}$: -100 [pa]
- Recirculation 10 [%]

Date	Gasflow [m3/h] or load [kW] max	CO ₂ [%] max	CO [ppm] max	T _{flow} [°C] max	T _{return} [°C] max	P air pressure switch [mbar]	P siphon pressure switch [mbar]	Gasflow [m3/h] or load [kW] max	CO ₂ [%] max	CO [ppm] max	T _{flow} [°C] max	T _{return} [°C] max	P air pressure switch [mbar]	P siphon pressure switch [mbar]
Installed														
Installed + 1 year inspection														
Installed + 2 years maintenance														
Installed + 3 years inspection														
Installed + 4 years maintenance														
Installed + 5 years inspection														

16 SP PRODUCT IDENTIFICATION

The flue gas system must be installed with the corresponding DOP's.

EN 1856-1:

- T200 PI WV2 L50060 060: \varnothing D 300 mm (flue: rigid, single, designation 2)
- T200 PI WV2 L50060 090: \varnothing D 350 and \varnothing D 400 mm (flue rigid, single, designation 2)

The latest SP product identification can be downloaded from:

<https://www.isoleco.be/download-center/certificaten/>

DECLARATION OF PERFORMANCE

N° 054 DOP 2013-07-01 SP2

1.	Unique identification code of the product-type:	Single Wall Metal System Chimney EN 1856-1:2009																						
2.	Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of Regulation (EU) N° 305/2011:	<p style="text-align: center;">"SP2" Single Wall Series (wall 1.4404)</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Designation 1</td> <td style="width: 40%;">T250 N1 W V2 L50060 O60</td> <td style="width: 30%;">for diameters DN 180 ÷ 300 mm</td> </tr> <tr> <td>Designation 1</td> <td>T250 N1 W V2 L50060 O90</td> <td>for diameters DN 350 - 400 - 450 mm</td> </tr> <tr> <td>Designation 1</td> <td>T250 N1 W V2 L50060 O120</td> <td>for diameters DN 500 - 550 - 600 mm</td> </tr> <tr> <td>Designation 1</td> <td>T250 N1 W V2 L50060 O240</td> <td>for diameters above DN 601 mm</td> </tr> <tr> <td>Designation 2</td> <td>T200 P1 W V2 L50060 O60</td> <td>for diameters DN 180 ÷ 300 mm</td> </tr> <tr> <td>Designation 2</td> <td>T200 P1 W V2 L50060 O90</td> <td>for diameters DN 350 - 400 - 450 mm</td> </tr> <tr> <td>Designation 2</td> <td>T200 P1 W V2 L50060 O120</td> <td>for diameter DN 500 mm</td> </tr> </table>		Designation 1	T250 N1 W V2 L50060 O60	for diameters DN 180 ÷ 300 mm	Designation 1	T250 N1 W V2 L50060 O90	for diameters DN 350 - 400 - 450 mm	Designation 1	T250 N1 W V2 L50060 O120	for diameters DN 500 - 550 - 600 mm	Designation 1	T250 N1 W V2 L50060 O240	for diameters above DN 601 mm	Designation 2	T200 P1 W V2 L50060 O60	for diameters DN 180 ÷ 300 mm	Designation 2	T200 P1 W V2 L50060 O90	for diameters DN 350 - 400 - 450 mm	Designation 2	T200 P1 W V2 L50060 O120	for diameter DN 500 mm
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Designation 2	T200 P1 W V2 L50060 O90	for diameters DN 350 - 400 - 450 mm																						
Designation 2	T200 P1 W V2 L50060 O120	for diameter DN 500 mm																						
3.	Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:	Convey the products of combustion from heating appliances to the outside atmosphere																						
4.	Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5) of Regulation (EU) N° 305/2011:	<p style="text-align: center;">ROCCEGGIANI Spa Via 1° Maggio, 10 60021 CAMERANO (AN) - Italy Tel: +39 (0)71 7300023 Fax: +39 (0)71 7304005 Email: info@rocceggiani.it</p>																						
5.	Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2) of Regulation (EU) N° 305/2011:	Not applicable																						
6.	System or systems of assessment and verification of constancy of performance of the construction product as set out in Annex V of Regulation (EU) N° 305/2011:	<p style="text-align: center;">System 2+ (for metal system chimney products) System 4 (for terminals)</p>																						
7.	In case of the declaration of performance concerning a construction product covered by a harmonised standard:	<p>The notified factory production control certification body TÜV SÜD Industrie Service GmbH (N° 0036) performed the initial inspection of the manufacturing plant and of factory production control and the continuous surveillance, assessment and approval of factory production control and issued the following certificates of conformity of the factory production control: - Certificate 0036 CPD 9811 007 for Designation 1 and Designation 2</p>																						
8.	In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:	Not applicable																						
9.	Declared performance:	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Essential characteristics</th> <th style="width: 30%;">Performance</th> <th style="width: 40%;">Harmonized technical specification</th> </tr> </thead> <tbody> <tr> <td>Compressive strength (at chimney section)</td> <td> <p>Designation 1 and Designation 2:</p> Diameter DN 180 mm : up to 62 N Diameter DN 200 mm : up to 60 N Diameter DN 220 mm : up to 52 N Diameter DN 230 mm : up to 49 N Diameter DN 250 mm : up to 45 N Diameter DN 280 mm : up to 41 N Diameter DN 300 mm : up to 38 N </td> <td style="text-align: center; vertical-align: middle;">EN 1856-1:2009</td> </tr> </tbody> </table>		Essential characteristics	Performance	Harmonized technical specification	Compressive strength (at chimney section)	<p>Designation 1 and Designation 2:</p> Diameter DN 180 mm : up to 62 N Diameter DN 200 mm : up to 60 N Diameter DN 220 mm : up to 52 N Diameter DN 230 mm : up to 49 N Diameter DN 250 mm : up to 45 N Diameter DN 280 mm : up to 41 N Diameter DN 300 mm : up to 38 N	EN 1856-1:2009															
Essential characteristics	Performance	Harmonized technical specification																						
Compressive strength (at chimney section)	<p>Designation 1 and Designation 2:</p> Diameter DN 180 mm : up to 62 N Diameter DN 200 mm : up to 60 N Diameter DN 220 mm : up to 52 N Diameter DN 230 mm : up to 49 N Diameter DN 250 mm : up to 45 N Diameter DN 280 mm : up to 41 N Diameter DN 300 mm : up to 38 N	EN 1856-1:2009																						

EN

Essential characteristics	Performance	Harmonized technical specification
	Diameter DN 350 mm : up to 32 m Diameter DN 400 mm : up to 28 m Diameter DN 450 mm : up to 21 m Diameter DN 500 mm : up to 19 m Diameter DN 550 mm : up to 17 m Diameter DN 600 mm : up to 16 m Diameter DN 650 mm : up to 14 m Diameter DN 700 mm : up to 14 m For further information of compressive strength on chimney sections, fittings and supports see the installation instructions	
Resistance to fire	Designation 1: Diameters DN 180 + 300 mm : T250 - O60 Diameters DN 350 + 450 mm : T250 - O90 Diameters DN 500 + 600 mm : T250 - O120 Diameters DN 650 + 700 mm : T250 - O240 - Tested without enclosure and with ventilated floors Designation 2: Diameters DN 180 + 300 mm : T200 - O60 Diameters DN 350 + 450 mm : T200 - O90 Diameter DN 500 mm : T200 - O120 - Tested without enclosure and with ventilated floors	
Gas tightness/leakage	Designation 1: Diameters DN 180 + 700 mm : N1 Designation 2: Diameters DN 180 + 500 mm : P1	
Flow resistance of chimney sections, fittings and terminals	According to EN 13384-1	
Thermal resistance	Designation 1 and Designation 2: Diameters DN 180 + 700 mm : 0 m ² /KW	
Thermal shock resistance:		
- sootfire resistance	Designation 1 and Designation 2: No (because destroyed)	
- thermal performance under normal operating conditions	Designation 1: Diameters DN 180 + 700 mm : T250 Designation 2: Diameters DN 180 + 500 mm : T200	EN 1856-1:2009
Flexural tensile strength:		
- tensile strength (only for means of connection for chimney sections)	Designation 1 and Designation 2: Diameter DN 180 mm : up to 85 m Diameter DN 200 mm : up to 80 m Diameter DN 220 mm : up to 63 m Diameter DN 230 mm : up to 60 m Diameter DN 250 mm : up to 55 m Diameter DN 280 mm : up to 51 m Diameter DN 300 mm : up to 47 m Diameter DN 350 mm : up to 47 m Diameter DN 400 mm : up to 39 m Diameter DN 450 mm : up to 29 m Diameter DN 500 mm : up to 18 m Diameter DN 550 mm : up to 13 m Diameter DN 600 mm : up to 10 m Diameter DN 650 mm : up to 8 m Diameter DN 700 mm : up to 8 m	
- non vertical installation	NPD (No Performance Determined)	
- components subject to wind load	Designation 1 and Designation 2: Diameters DN 180 + 350 mm : - free standing height 1,5 m above last support - maximum spacing between lateral supports 2,5 m Diameters DN 400 + 700 mm : - NPD (No Performance Determined)	
Durability:		
- water vapour diffusion resistance	Designation 1 (Diameters DN 180 + 700 mm): Yes Designation 2 (Diameters DN 180 + 500 mm): Yes	
- condensate penetration resistance	Designation 1 (Diameters DN 180 + 700 mm): Yes Designation 2 (Diameters DN 180 + 500 mm): Yes	
- against corrosion	Designation 1 (Diameters DN 180 + 700 mm): V2 Designation 2 (Diameters DN 180 + 500 mm): V2	
- freeze thaw resistance	Designation 1 and Designation 2: Yes	

10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

Roccheggiani Marco, General Manager

Camerano, 01-07-2013





CERTIFICATE

0036 CPD 9811 007
Revision 04

In compliance with the Directive 89/100/EEC of the Council of European Communities of 21st December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive – CPD) amended by the Directive 93/68/EEC of the Council of European Communities of 22nd July 1993, it has been stated that the construction product

System chimney type SP single wall models

Model 1	1856-1	T250 N1 W V2 L50040 OXXX
Model 2	1856-1	T250 N1 W V2 L50050 OXXX
Model 3	1856-1	T250 N1 W V2 L50060 OXXX
Model 4	1856-1	T200 P1 W V2 L50040 OXXX
Model 5	1856-1	T200 P1 W V2 L50050 OXXX
Model 6	1856-1	T200 P1 W V2 L50060 OXXX
Model 7 (SPGV)	1856-1	T200 P1 W V2 L50040 OXXX
Model 8 (SPGV)	1856-1	T200 P1 W V2 L50050 OXXX

1) for details of designation see second page of certificate

produced by

Roccheggiani S.p.A.
Via 1^o Maggio, 10
IT-60021 Camerano

in the factory

Roccheggiani S.p.A.
IT-60021 Camerano

is submitted to

- a **initial type test** and
- a **factory production control**

The Notified Body TÜV SÜD Industrie Service GmbH has performed the initial inspection of the factory and the factory production control and performs the continuous surveillance, assessment and approval of the factory production control.

This certificate attests that all provisions concerning the attestation of factory production control described in Annex ZA of the standard

EN 1856-1: 2009-06

were applied.

This certificate was first issued on 2005-12-20 and - with respect to the conditions of the certification contract - remains valid as long as the conditions laid down in the harmonised technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly.

Munich, 2012-03-15

J. Steiglechner

Model 1 designations:

up to DN 300	T250 N1 W V2 L50040 O60
from DN 301 to 450	T250 N1 W V2 L50040 O90
from DN 451 to 600	T250 N1 W V2 L50040 O120
above DN 601	T250 N1 W V2 L50040 O240

Model 2 designations:

up to DN 300	T250 N1 W V2 L50050 O60
from DN 301 to 450	T250 N1 W V2 L50050 O90
from DN 451 to 600	T250 N1 W V2 L50050 O120
above DN 601	T250 N1 W V2 L50050 O240

Model 3 designations:

up to DN 300	T250 N1 W V2 L50060 O60
from DN 301 to 450	T250 N1 W V2 L50060 O90
from DN 451 to 600	T250 N1 W V2 L50060 O120
above DN 601	T250 N1 W V2 L50060 O240

Model 4 designations:

up to DN 300	T200 P1 W V2 L50040 O60
from DN 301 to 450	T200 P1 W V2 L50040 O90
from DN 451 to 600	T200 P1 W V2 L50040 O120
above DN 601	T200 P1 W V2 L50040 O240

Model 5 designations:

up to DN 300	T200 P1 W V2 L50050 O60
from DN 301 to 450	T200 P1 W V2 L50050 O90
from DN 451 to 600	T200 P1 W V2 L50050 O120
above DN 601	T200 P1 W V2 L50050 O240

Model 6 designations:

up to DN 300	T200 P1 W V2 L50060 O60
from DN 301 to 450	T200 P1 W V2 L50060 O90
from DN 451 to 600	T200 P1 W V2 L50060 O120
above DN 601	T200 P1 W V2 L50060 O240

Model 7 designations:

DN 60-100	T200 P1 W V2 L50040 O60
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Model 8 designations:

DN 60-100	T200 P1 W V2 L50040 O60
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INSTALLATION, USE AND MAINTENANCE

“SP” Single Wall series – Metal Chimney System EN 1856-1:2003

1) INSTALLATION

The installation of chimney begins by fixing the first support of chimney system to the floor or to the wall.

For floor application, the first element to install is “the base with side condensate drain”.

For wall application, the first element is the “chimney support”, which must be installed as shown in the assembling diagram.

These elements are fixed through 8 mm diameter bolts, which are not standard supplied.

Then follow the condensate collector, the inspection element, the union tee piece to connect the duct to the chimney and the straight elements above (the max. height above the last support is 1,5 m); then the chimney terminal.

All the elements must be installed with the “bell” (female side) placed upwards and the male side placed downwards to avoid condensate leaks. Elements are fixed with clamps that guarantee stability to mechanical stress.

Brackets on the vertical section must have a space from each other of 2,5 m. These must be tightened around the chimney using the special bolts to ensure good fixing to the support structure.

The installation of chimney system outside the building is allowed until diameter 350 mm.

2) USE

The chimney system must be used in accordance with the connectable thermal capacity and current standards.

- 3) KIND OF WORKING :**
- with negative pressure
 - with positive pressure

Negative pressure working:

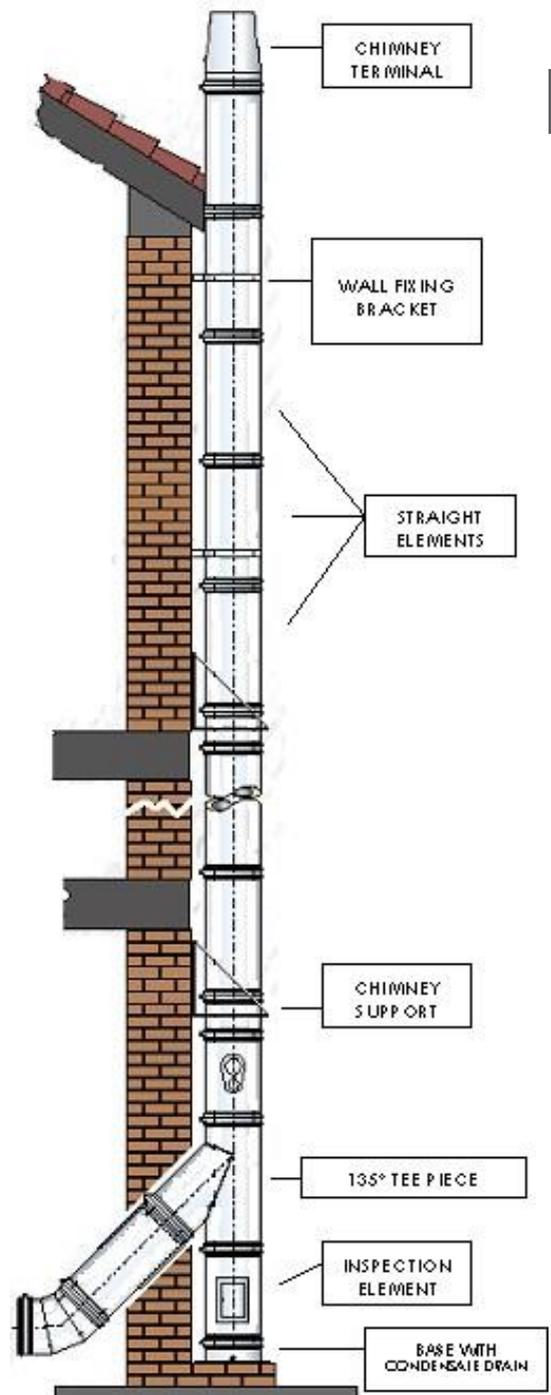
When single wall system made in *stainless steel Aisi 316L (1.4404)* works with negative pressure (N1 class), this has the following designation in accordance with the standard EN 1856-1:2003 :

Chimney System EN 1856-1 T250 N1 W V2 L50050 O60

Where:

T250: temperature class

N1: pressure level



W: condensate resistance, the chimney system is fit for wet working

V2: corrosion resistance class

L50050: specification of internal wall material

material: 1.4404 (AISI 316L) minimum

thickness : 0,50 mm

O60 : the chimney system is not sootfire resistant and the minimum distance from combustible materials shall be 60 mm

Chimney system working with negative pressure does not has the silicon seal.

The available diameters to use with negative pressure are:

160, 180, 200, 220, 230, 250, 280, 300, 350, 400, 450, 500, 550, 600, 650, 700.

Positive pressure working:

When single wall system made in *stainless steel Aisi 316L (1.4404)* works with positive pressure (P1 class), it has the following designation in accordance with the standard EN 1856-1:2003 :

Chimney System EN 1856-1 T200 P1 W V2 L50050 O60

Where:

T200: temperature class

P1: pressure level

W: condensate resistance, the chimney system is fit for wet working

V2: corrosion resistance class

L50050: specification of internal wall material; material: 1.4404 (AISI 316L), minimum thickness: 0,50 mm

O60 : the chimney system is not sootfire resistant and the minimum distance from combustible materials shall be 60 mm

Chimney system working with positive pressure has the silicon seal to obtain a perfect tightness of elements.

The available diameters for positive pressure working are:

80, 100, 120, 130, 140, 150, 180, 200, 220, 230, 250, 280, 300, 350, 400.

4) IDENTIFICATION METAL PLATE OF CHIMNEY SYSTEM

At the end of installation, the installer shall compile the identification metal plate of chimney system (supplied by manufacturer) and shall put it near or at the base of single wall chimney system.

On this metal plate shall be written the installer data , the designation of installed chimney (according to standard EN 1443), chimney nominal diameter and the distance from combustible materials declared by manufacturer.

Roccheggiani product designation according to the standard EN 1443 shall list the following information:

Single wall in stainless steel Aisi 316L (1.4404):

negative pressure working: Chimney System EN 1443 T250 N1 O W 2 R00 C60 **positive pressure working:** Chimney System EN 1443 T200 P1 O W 2 R00 C60

Where:

T250, T200: temperature class

P1, N1: pressure level (P1 is the positive pressure class, N1 is the negative pressure class) O: non sootfire resistant

W: condensate resistance, the chimney system is fit for wet working

2: corrosion resistance class for Italian market (*note: C2 class applicable for French market*) R00: the value of thermal resistance is zero

C60: the installation distance of chimney system from combustible materials shall be 60 mm

Hereunder we show an example of the identification metal plate

 <p>ROCCEGGIANI canne fumarie inox - componenti aeraulici - trattamento aria</p>	<p>Via 1° Maggio, 10 60021 Camerano (AN) – ITALIA Tel.+39.071.7300023</p>
<p>Fax.+39.071.7304005 e-mail: info@rocceggiani.it</p>	
<p>“SP” Series – Single Wall</p>	
<p>CHIMNEY SYSTEM - EN 1856-1</p>	 0036
<p>T250 N1 W V2 L50050 O60 T200 P1 W V2 L50050 O60 Certificate N° 0036 CPD 9811 007</p>	
<hr/> <p>Space for the installer</p>	
<p>Designation according to EN 1443:</p> <p>_____</p>	
<p>Nominal diameter : _____ <u>mm</u></p>	 
<p>Distance to combustible material: _____ <u>mm</u></p>	
<p>Installer (name, address): _____ _____</p>	
<p>Installation date: _____</p>	
<p>ATTENTION: The metal plate shall not be removed or changed !</p>	

5) MAINTENANCE

Maintenance of fume duct consists of regular checks of chimney conditions, and visual checks. Controls are carried out also for: the right connection of modular elements, the integrity of single wall, the cleaning and removal of internal sediments (wall cleaning had to be carried out with materials that do not change the features of stainless steel, for example nylon brushes), the disposal of acid condensations or rain through the discharge, and through the inspection opening for solid materials which may obstruct the right outflow of rain condensates.

6) STORAGE

The elements, during the storing, should be kept in a non-corrosive environment and should not be placed outside the building exposed to state of the atmosphere.



To avoid the crushing they shall not be stored one over the other in vertical position; as a matter a fact the crushing could compromise their performance features.

Note: further information and translations are available on our Internet web site www.roccheggiani.it

***) Important notice:**

If instructions as written above are not followed and or the materials for air inlet and flue gas exhaust as quoted above are not used Mark Climate Technology cannot be held responsible for eventual consequences.

*****) Important notice:**

The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge. Children, even if being supervised, must not play with the appliance.

In the case of failure or malfunction of the appliance, do not attempt to repair it yourself. Please contact your installer. Repairs must only be carried out by qualified technicians. Failure to comply with these requirements can compromise the safety of the appliance.

Important notice:

Be careful during inspection/maintenance not to damage seals.

Warning:

Always switch off the boiler and disconnect from the mains electricity supply during inspection- and maintenance- activities.

Warning:

When the boiler is disconnected from the common flue gas system (e.g.: defective non return valve) , the combustion product (flue gas) inlet opening must be closed and checked on tightness.



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