CASCADE BOILER ROOMS

CATALOGUE OF COMPONENTS

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Thermona®

Czech Producer of Boilers

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WHAT IS A BOILER CASCADE?

A boiler cascade is a system where several boilers are connected, one after another. The uniqueness of the THERM boiler connection and design allows to increase the installed capacity continuously, starting with the minimum output of the smallest boiler used. In the case of higher outputs (up to 3040 kW), the boiler cascade system provides some great advantages. The use of THERM 45 KD.A, 65 KD and 90 KD.A boilers is especially convenient in terms of the built-in area and installed capacity while preserving the advantages of a cascade connection with a continuous output modulation.

However, the cascade connection is not only limited to the use of the THERM 45 KD.A, 65 KD and 90 KD.A boilers. The boilers can also be combined with other THERM boilers and the whole set can thus be adapted to the calculated heat loss of the building, as well as the needs for hot water supply. The cascade system is a pioneer method in the heating system technologies, providing optimisation of installations with a high output. Instead of one boiler with a high output that has to work as a whole, even when a small heat volume is needed, the cascade design enables the activation of the necessary number of boilers that are needed in the given moment. The number of boilers to be activated is regulated electronically.

Practical experience shows that only 50% of the boiler capacity is used 80% of the time in the heating season. The boiler is thus only used at 30% throughout the season on average. That is quite a low utilisation rate and inefficient operation. The cascade system provides an immediate required capacity by gradually assigning several "smaller" boilers when compared with one large boiler with inefficient operation at low output. The cascade regulation with program control eliminates the unpleasant issues with setting up the optimal ratio between the system capacity and heat consumption. The broad range of regulation of the cascade allows for a long-term operation at lower heating water temperatures, thus reducing the loss by radiation and loss during the standby mode of the system. It immediately increases the utilisation and makes the temperature conditions in the environment more pleasant, i.e., increases the user comfort.

Until recently, the boiler room operation was provided by an expensive design, the cascade controllers. A great development came with the communication interface installed in the boilers, providing for a transfer of information between the boilers and a continuous modulation of the output of all boilers in the cascade at the same time.

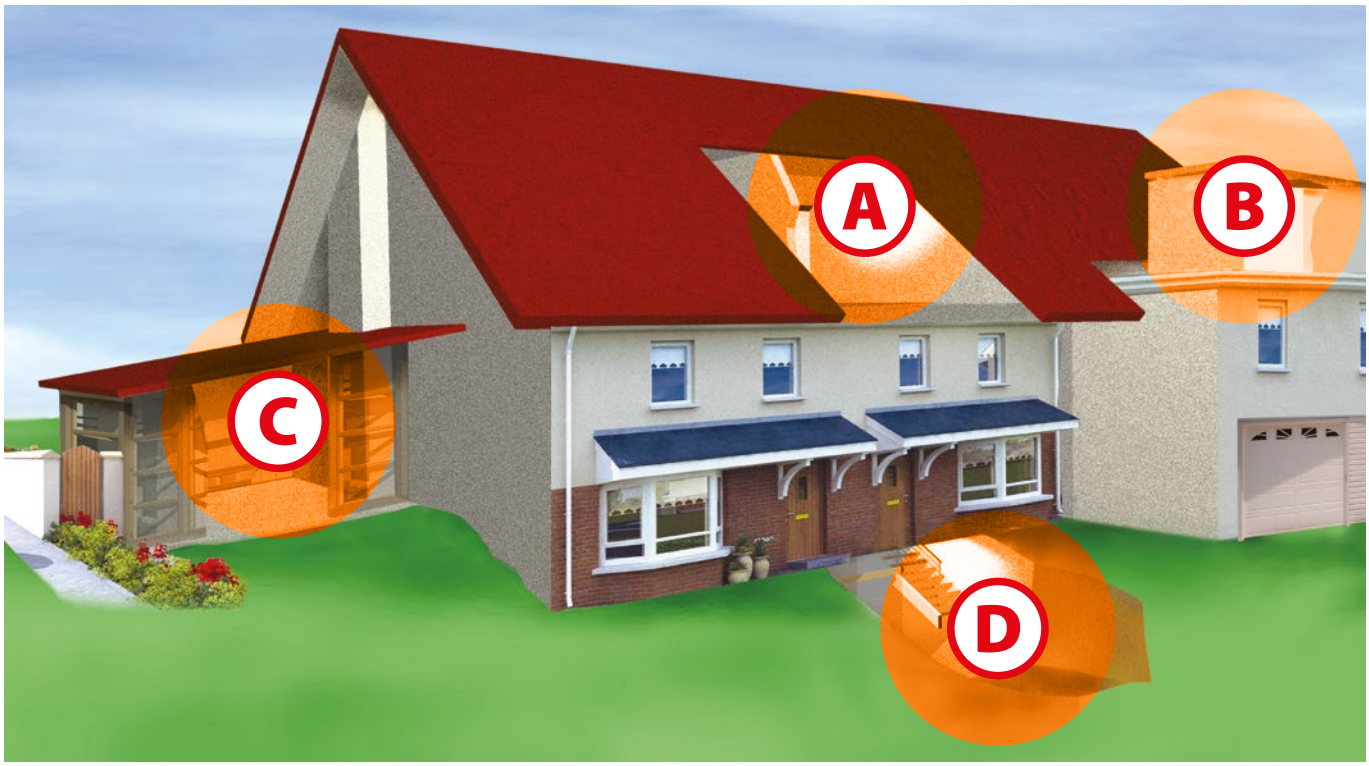
The latest currently used TKR system builds on this time-tested system and fundamentally supplements it with more options in the field of communication, regulation, maximum number of operated boilers, and so on. The control system thus allows not only to achieve the optimal output setting at every moment of operation, but also provides immediate access to information about the current activity and a potential diagnosis of an error of the cascade boiler room.

WHY A THERM BOILER CASCADE?

THERM wall-hung boiler are basically designed to allow for continuous output regulation from approx. 10% to 100% (differs according to the boiler type) of the rated output. The THERM boiler cascade allows to extend this range of continuous output regulation from the minimum output of one boiler to the maximum output of up to 32 boilers in a unique and yet very simple way. It corresponds to the range of regulation from 0.1% to 100% of the output for a cascade of 32 boilers. The implementation is very easy – each boiler is equipped with a TKR KOM board (only CLASSIC boiler series), connected to the TKR MAS control unit with a pair of conductors, and a full-value cascade is completed. The cascade control is the easiest thing – activate all the boilers and use the first one to set the heating temperature. The boilers will "arrange" the rest. If you need to increase the number of boilers, simply add a boiler, insert the TKR KOM board, connect a few conductors and the cascade continues in its operation. There are no intricacies in the activation of the cascade. The control unit is configured using a touch display and that makes the cascade functional. The initial settings are done by the service technician, no further complicated settings are required. If you need to control the heating water temperature in relation to the outside temperature - equithermic regulation - just add an outside sensor and the entire cascade will work according to the outside temperature. Equithermic control of the boiler room operation in the case of an installation of a condensing cascade boiler room is more than recommended.

Another great advantage of the THERM boiler cascade comes in the water heating (hereinafter only WW). We do not need to design and connect a pump to "refill the tank". Each tank (or heating insert) is directly connected to a boiler in the cascade using a three-way valve, the tank thermostat is connected to the corresponding boiler and the water heating is complete. All the THERM boilers connected in the cascade can heat up water.

SELECTION OF THE CASCADE BOILER ROOM LOCATION



The location of the boiler room in a building is variable. Which part of the building is the most suitable for the location of the cascade boiler room needs to be decided on the basis of the properties and dispositional possibilities of the building. The individual boiler room locations (see the picture) have their pros and cons. When making the decision **, it is essential to consider the options of the flue gas installation, boiler room ventilation, hydraulic design of the entire heating system, the dimensions of the installation site, etc**.

The low demands on the location of the cascade boiler room make it possible to install it almost anywhere. An installation of boilers in the attic saves space and eliminates the necessity to build a tall chimney in bad dispersion conditions.

A BOILER ROOM UNDER THE ROOF

B ROOF BOILER ROOM

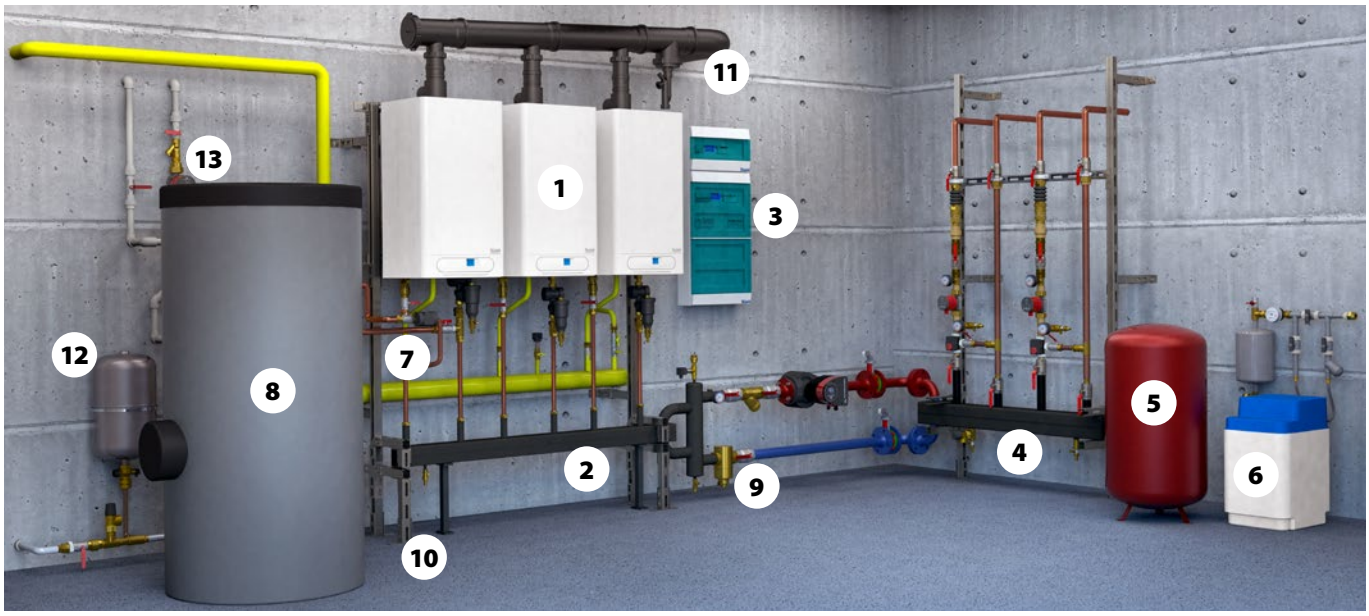
C BOILER ROOM IN AN EXTENSION

D BASEMENT BOILER ROOM

List of the main advantages of THERM cascade boiler rooms

- Exceptional investment advantage
- High savings in the operating costs when compared with other heat sources
- Above-standard economy of the operation
- An economically-undemanding and highly-effective design of the cascade communication
- Fully automated operation
- Environmentally friendly (up to 70% reduction in emission values when compared with regular gas sources on the market)
- High operating reliability
- A broad modulation of the output of the entire boiler room (up to 3040 kW)
- A simple and transparent technical design
- Easy installation and activation
- Simple and intuitive control
- A small built-in area, without taking up the floor space
- Optimal adjustment for the connection of an external hot water storage tank
- Boiler room diagnostics and monitoring with maximum service support

THERM CASCADE BOILER ROOM COMPONENTS



1. THERM Boiler Units
2. THERMSET LINE Hydraulic Distributor (connection of units in the boiler cascade)
3. Boiler Room Regulation (security, remote communication, etc.)
4. Heating Branch + Pump Distributor
5. Heating System Security – Expansion Vessel
6. Appliance for Heating Water Treatment
7. Three-Way Valve for Heating Water
8. Indirect Heating External Storage Tank
9. Impurity Separator
10. Boiler Support Frames
11. Boiler Cascade Smoke Extraction
12. Hot Water Expansion Vessel
13. Hot Water Circulation Pump

1. BOILERS USED IN CASCADE BOILER ROOMS

The most frequently suggested boilers for cascade connection include THERM 45 KD.A, 65 KD and 90 KD.A. The technical advancement of the boiler cascade system allows to connect all THERM boilers in a cascade.

The connection of the intelligent Thermona boiler control and the condensing principle of the boiler operation brings an interesting reduction in the cost of heating the building, as well as heating water, while keeping very low emission values.

Similarly to THERM cascade gas boiler rooms, it is also possible to build cascade boiler rooms using the THERM electric boilers. All the THERM electric boilers can be mutually connected into a cascade. The intelligent control of the electric boiler cascade enables the use of the cascade as a single source of heat with continuous output regulation. The THERM electric boiler cascade enables heating water in the tank similarly to the THERM gas boiler cascade.

And the last, but not the least, interesting alternative of a cascade boiler room is the possibility to build a hybrid boiler cascade, consisting of both gas and electric boilers.

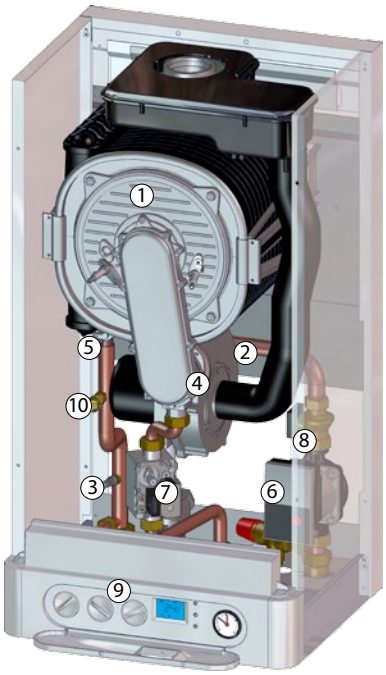
GAS CONDENSING BOILERS			
Boiler type with the option to connect to a cascade	**Maximum boiler output (kW)**	**Minimum boiler output (kW)**	**Heating of water in the external storage tank**
THERM 90 KD.A	95.0	25.0	○
THERM 45 KD.A	45.0	13.0	○
THERM 65 KD	68.5	7.3	○
THERM 35 KD	37.0	3.4	○
THERM 35 KDZ	37.0	3.4	✓

ELECTRIC BOILERS			
Boiler type with the option to connect to a cascade	**Maximum boiler output (kW)**	**Minimum boiler output (kW)**	**Heating of water in the external storage tank**
THERM EL 45	45.0	5.0	○
THERM EL 38	37.5	5.0	○
THERM EL 30	30.0	5.0	○
THERM EL 23	22.5	2.5	○

✓ possible combination

○ possible –with additional equipment

Parameters of selected boilers, most frequently used in cascades



THERM 45 KD.A

1 - Condensing chamber
2 - Ventilator
3 - Heating temperature probe
4 - Mixer
5 - Emergency thermostat
6 - Circulation pump
7 - Gas valve
8 - Flow switch
9 - Control panel
10 - Pressure switch

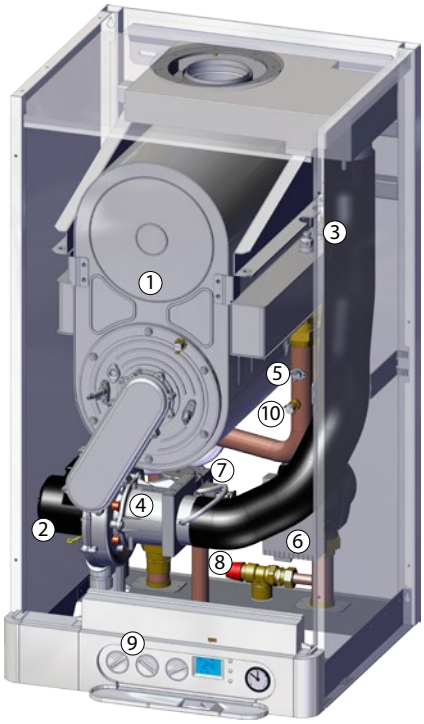
THERM 45 KD.A boilers

Technical description	Unit	THERM 45 KD.A
Class of seasonal energy efficiency of heating	-	A
Min. – max. thermal output for heating	kW	13.0-45.0
Consumption of gas	$m^3.h^{-1}$	1.28-4.52
Min. – max. overpressure of heating system	bar	0.8-3.0
Max. output temperature of heating water	°C	80
Flue-gas installation alternatives	mm	80/125, 2x 80
Boiler efficiency	%	98-106
NOx class of boiler	-	6
Nominal supply voltage / frequency	V / Hz	230 / 50 ~
Auxiliary electricity at the nominal thermal input power	W	141.4
Nominal current of the circuit breaker for consumer appliance	A	2
Level of coverage of electrical part	-	IP 41 (D)
Dimensions of boiler: height / width / depth	mm	800 / 430 / 370
Weight of boiler	kg	45
Order number	-	1065.7

THERM 90 KD.A boilers

Technical description	Unit	THERM 90 KD.A
Class of seasonal energy efficiency of heating	-	A
Min. – max. thermal output for heating	kW	25.0-95.0
Consumption of gas	$m^3.h^{-1}$	2.57-9.52
Min. – max. overpressure of heating system	bar	0.8-4.0
Max. output temperature of heating water	°C	80
Flue-gas installation alternatives	mm	110/160, 2x 110
Boiler efficiency	%	98-106
NOx class of boiler	-	6
Nominal supply voltage / frequency	V / Hz	230 / 50 ~
Auxiliary electricity at the nominal thermal input power	W	288.0
Nominal current of the circuit breaker for consumer appliance	A	2
Level of coverage of electrical part	-	IP 41 (D)
Dimensions of boiler: height / width / depth	mm	970 / 530 / 500
Weight of boiler	kg	85
Order number	-	1090

THERM 90 KD.A



1 - Condensing chamber
2 - Ventilator
3 - Heating temperature probe
4 - Mixer
5 - Emergency thermostat
6 - Circulation pump
7 - Gas valve
8 - Safety valve
9 - Control panel
10 - Pressure switch

Parameters of selected boilers, most frequently used in cascades

THERM 65 KD

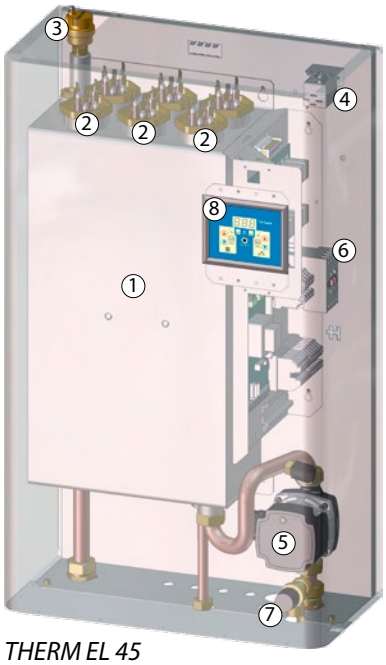
1 - Condensing chamber
2 - Ventilator
3 - Heating temperature probe
4 - Emergency thermostat
5 - Circulation pump
6 - Gas valve
7 - Safety valve
8 - De-aerating valve*
9 - Control panel
10 - Compound ignition and ionising electrode
11 - Pressure gauge
12 - Gulley trap (siphon)

THERM 65 KD boilers

Technical description	Unit	THERM 65 KD
Class of seasonal energy efficiency of heating	-	A
Min. – max. thermal output for heating	kW	8.4-68.5
Consumption of gas	$m^3.h^{-1}$	0.8-6.3
Min. – max. overpressure of heating system	bar	0.8-3.0
Max. output temperature of heating water	°C	80
Flue-gas installation alternatives	mm	80/125, 2x 80
Boiler efficiency	%	98-106
NOx class of boiler	-	6
Nominal supply voltage / frequency	V / Hz	230 / 50 ~
Auxiliary electricity at the nominal thermal input power	W	74.5
Nominal current of the circuit breaker for consumer appliance	A	2
Level of coverage of electrical part	-	IP x1D
Dimensions of boiler: height / width / depth	mm	800 / 430 / 455
Weight of boiler	kg	42
Order number	-	10120

Electric boilers - THERM EL 23, EL 30, EL 38, EL 45

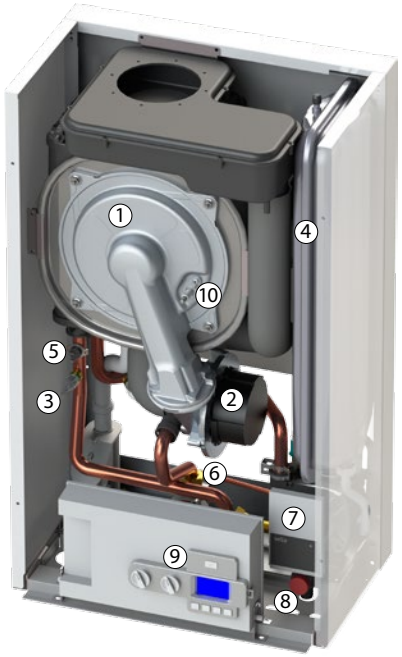
Technical description	Unit	THERM EL 23	THERM EL 30	THERM EL 38	THERM EL 45
Nominal heat output	kW	22.5	30.0	37.5	45.0
Minimum regulation level of the output	W	2500	2500/5000	2500/5000	2500/5000
Number of output regulation levels	-	9	9	9	9
Rated current	A	33	44	55	66
Level of electric coverage	-	IP 40	IP 40	IP 40	IP 40
Nominal supply voltage / frequency	V / Hz	3 x 400 + N + PE / 50 ~			
Maximum rated current	A	3 x 36	3 x 48	3 x 60	3 x 72
Main circuit breaker for electric installation	A	40	50	63	80
Rated current of the control circuit breaker	A	1.25	1.25	1.25	1.25
Electric service life of relay	-	1.10^5 cycles (16 A, 250 V/50 Hz)			
Mechanical service life of relay	-	10.10^6 cycles			
Input - output for heating water	G	3/4" outer	G 1" outer		
Min. - maximum working overpressure of heating system	bar	0.5-3.0	0.5-3.0	0.5-3.0	0.5-3.0
Maximum temperature of heating water	°C	80	80	80	80
Water volume of the boiler	l	14.5	28.0	28.0	28.0
Efficiency at the rated power	%	99.5	99.5	99.5	99.5
Volume of expansion tank	l	7	-	-	-
Maximum number of boilers in the cascade	pcs	32	32	32	32
Dimensions: height / width / depth	mm	805 / 475 / 238			
Weight of the boiler without water	kg	39	43	44	45
Order number	-	1603.1	1604.1	1605.1	1606.1



THERM EL 45

1 - Boiler exchanger
2 - Heating body
3 - Automatic de-aerating valve
4 - Emergency thermostat
5 - Circulation pump
6 - Safety switch contactor
7 - Safety valve
8 - Control display

Parameters of selected boilers, most frequently used in cascades



THERM 35 KD

1 - Condensing chamber
2 - Ventilator
3 - Heating temperature probe
4 - Expansion heating vessel
5 - Emergency thermostat
6 - Gas valve
7 - Energy saving pump
8 - Safety valve
9 - Control panel
10 - Compound ignition and ionising electrode

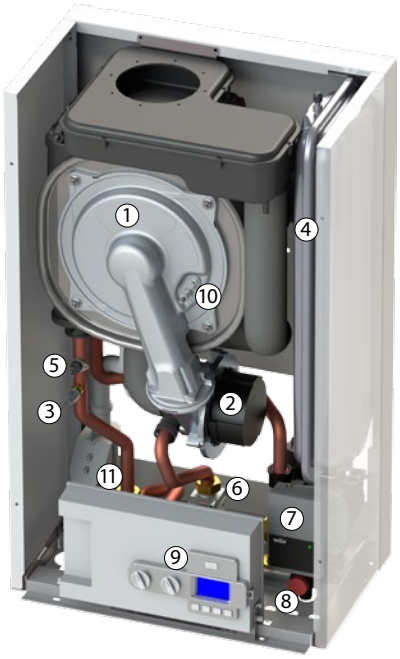
THERM 35 KD boilers

Technical description	Unit	THERM 35 KD
Class of seasonal energy efficiency of heating	-	A
Min. – max. thermal output for heating	kW	3.4-37.0
Consumption of gas	$m^3.h^{-1}$	0.33-3.50
Min. – max. overpressure of heating system	bar	0.8-3.0
Max. output temperature of heating water	°C	80
Flue-gas installation alternatives	mm	60/100, 80/125, 2x 80
Boiler efficiency	%	97-106
Volume of the expansion tank for heating water	l	7
NOx class of boiler	-	6
Nominal supply voltage / frequency	V / Hz	230 / 50 ~
Auxiliary electricity at the nominal thermal input power	W	68.2
Nominal current of the circuit breaker for consumer appliance	A	2
Level of coverage of electrical part	-	IP 41 (D)
Dimensions of boiler: height / width / depth	mm	725 / 430 / 300
Weight of boiler	kg	28
Order number	-	10117

THERM 35 KDZ boilers

Technical description	Unit	THERM 35 KDZ
Class of seasonal energy efficiency of heating	-	A
Min. – max. thermal output for heating	kW	3.4-37.0
Nominal thermal output for heating HW	kW	34.0
Consumption of gas	$m^3.h^{-1}$	0.33-3.50
Min. – max. overpressure of heating system	bar	0.8-3.0
Max. output temperature of heating water	°C	80
Flue-gas installation alternatives	mm	60/100, 80/125, 2x 80
Boiler efficiency	%	97-106
Volume of the expansion tank for heating water	l	7
NOx class of boiler	-	6
Nominal supply voltage / frequency	V / Hz	230 / 50 ~
Auxiliary electricity at the nominal thermal input power	W	68.2
Nominal current of the circuit breaker for consumer appliance	A	2
Level of coverage of electrical part	-	IP 41 (D)
Dimensions of boiler: height / width / depth	mm	725 / 430 / 300
Weight of boiler	kg	29
Order number	-	10118

THERM 35 KDZ



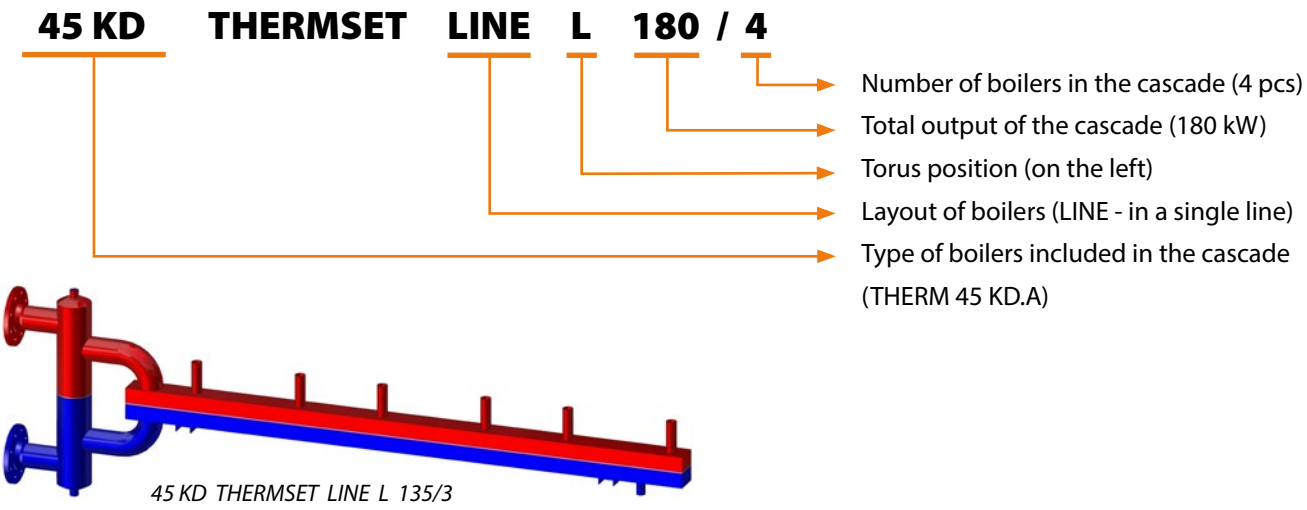
1 - Condensing chamber
2 - Ventilator
3 - Heating temperature probe
4 - Expansion heating vessel
5 - Emergency thermostat
6 - Gas valve
7 - Energy saving pump
8 - Safety valve
9 - Control panel
10 - Compound ignition and ionising electrode
11 - Three-way valve

2. THERMSET HYDRAULIC DISTRIBUTOR

It is essential to separate the boiler and heating circuits to ensure correct activity of the cascade boiler system, because the volumetric flow rate of water in the boiler circuit is variable in relation to the number of running boilers. The volumetric flow rate of water in the heating circuit also changes when mixing valves are used for the regulation of the individual heating zones. To separate the boiler and heating circuit, a hydraulic dynamic pressure compensator (HDPC), or a torus, is used.

We recommend using the standardized "THERMSET" hydraulic distributor with an integrated torus when designing a specific application of the connection of the hydraulic part of the THERM boiler cascade, in order to maintain the high efficiency of the condensing cascade boiler room operation. The Manufacturer's portfolio includes a wide range of distributors in various options according to the number and type of connected boilers and boiler room layouts. The THERMSET hydraulic distributors are manufactured in the left (HDPC on the left side) and right (HDPC on the right side) option. Both types are further divided into THERMSET LINE and THERMSET BACK. THERMSET LINE is used for a simplified connection of boilers installed in a single line. THERMSET BACK is used for connecting boilers in a cascade in two rows, back to back. This system can be used in cascades installed in the centre of the boiler room, for example due to the layout, where boilers are hung on a supporting frame.

Example of the legend of THERMSET hydraulic distributor denomination



45 KD THERMSET LINE L 135/3

	Order number	Name of item	Description
	**43544**	Automatic de-aerating valve	It is equipped with a return valve for an easier replacement.
	**24229**	Discharging valve	Two pieces are required for the connection.
	**29078**	Temperature sensor well	For easier installation of the temperature sensor.

Supplied types of THERMSET hydraulic dividers

Order number	Divider type	Total output of the cascade / number of boilers	Torus position
37286.1	45 KD THERMSET BACK *	180 / 4	
37287.1	45 KD THERMSET BACK *	270 / 6	
37288.1	45 KD THERMSET BACK *	360 / 8	
37289.1	45 KD THERMSET BACK *	450 / 10	
36498.1	45 KD THERMSET LINE *	90 / 2	P
36499.1	45 KD THERMSET LINE *	135 / 3	P
36500.1	45 KD THERMSET LINE *	180 / 4	P
36501.1	45 KD THERMSET LINE *	225 / 5	P
36502.1	45 KD THERMSET LINE *	270 / 6	P
36508.1	45 KD THERMSET LINE *	90 / 2	L
36509.1	45 KD THERMSET LINE *	135 / 3	L
36510.1	45 KD THERMSET LINE *	180 / 4	L
36511.1	45 KD THERMSET LINE *	225 / 5	L
36512.1	45 KD THERMSET LINE *	270 / 6	L

*** Also used for electric boilers**

Note:

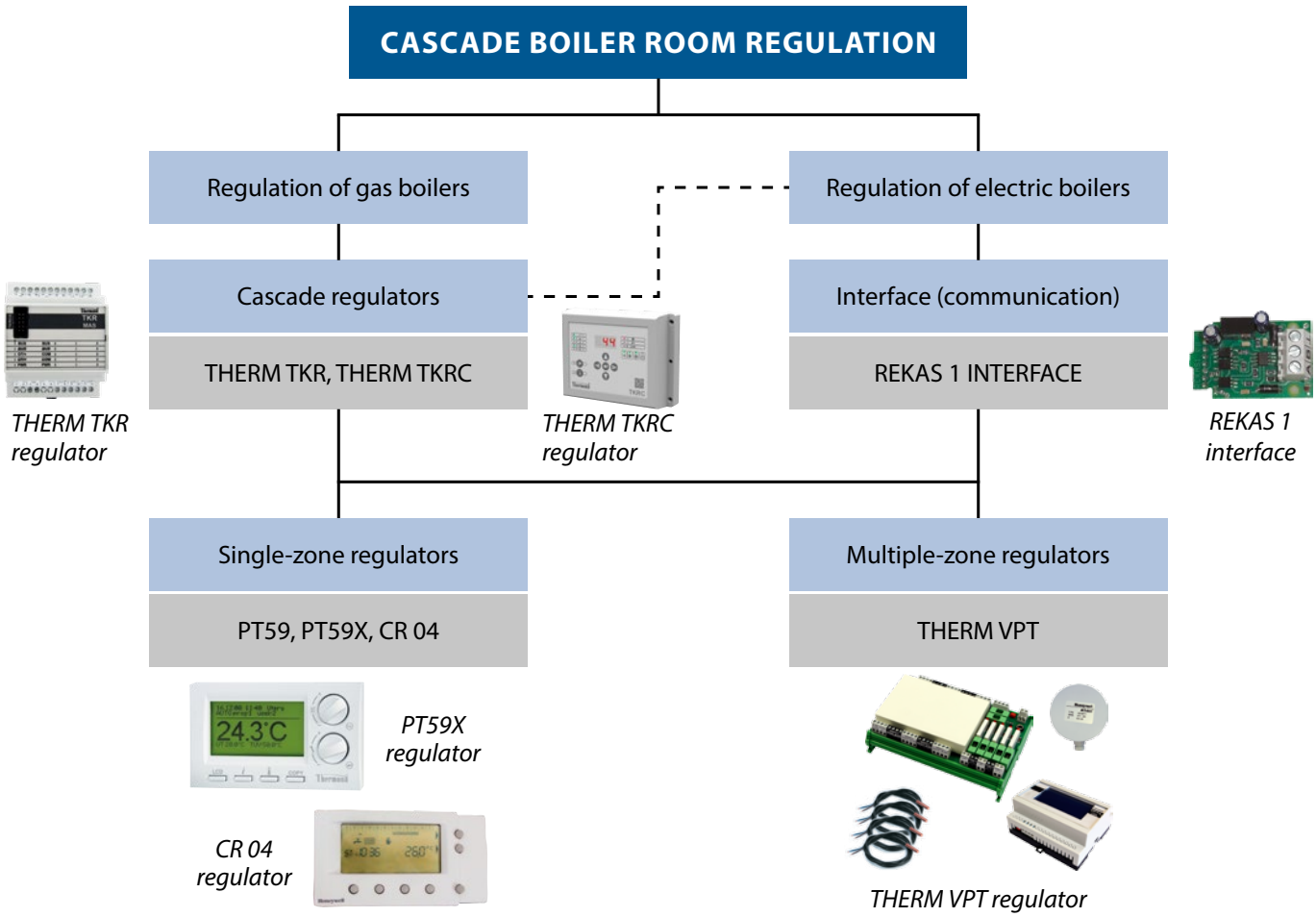
P - torus to the right of the collector
L - torus to the left of the collector
LINE - boilers installed in a line, one next to another
BACK - boilers installed in two rows, back to back

Order number	Divider type	Total output of the cascade / number of boilers	Torus position
37300	90 KD THERMSET BACK	380 / 4	
37301	90 KD THERMSET BACK	570 / 6	
37302	90 KD THERMSET BACK	760 / 8	
37303	90 KD THERMSET BACK	950 / 10	
37304	90 KD THERMSET LINE	190 / 2	P
37295	90 KD THERMSET LINE	285 / 3	P
37305	90 KD THERMSET LINE	380 / 4	P
37306	90 KD THERMSET LINE	475 / 5	P
37307	90 KD THERMSET LINE	570 / 6	P
37308	90 KD THERMSET LINE	190 / 2	L
37296	90 KD THERMSET LINE	285 / 3	L
37309.1	90 KD THERMSET LINE	380 / 4	L
37310	90 KD THERMSET LINE	475 / 5	L
37311	90 KD THERMSET LINE	570 / 6	L

Order number	Divider type	Total output of the cascade / number of boilers	Torus position
37378	65 KD THERMSET BACK	274 / 4	
37379	65 KD THERMSET BACK	411 / 6	
37380	65 KD THERMSET BACK	548 / 8	
37381	65 KD THERMSET BACK	685 / 10	
37382	65 KD THERMSET LINE	137 / 2	P
37383	65 KD THERMSET LINE	206 / 3	P
37384	65 KD THERMSET LINE	274 / 4	P
37385	65 KD THERMSET LINE	343 / 5	P
37386	65 KD THERMSET LINE	411 / 6	P
37387	65 KD THERMSET LINE	137 / 2	L
37388	65 KD THERMSET LINE	206 / 3	L
37389	65 KD THERMSET LINE	274 / 4	L
37390	65 KD THERMSET LINE	343 / 5	L
37391	65 KD THERMSET LINE	411 / 6	L

3. CASCADE BOILER ROOM REGULATION

The THERMONA boiler cascade control is provided by the THERMONA TKR (TKRC) cascade regulator, connected to the cascade sensor installed on the torus outlet that measures the cascade output temperature. If we need an equithermic regulation of the output temperature of the heating water, we have to install an outside sensor on the north (or north-east) side of the building, connected to the regulator. In the regulator menu, select a suitable equithermic curve, you can also set the equithermic curve shift, and the regulator then regulates the output temperature in relation to the outside temperature. If a master regulator is connected to the TKR (TKRC) regulator, it can use the OT/+ communication protocol to assign the required temperature at the cascade output to the TKR (TKRC) regulator, based on the time programs set by the user.



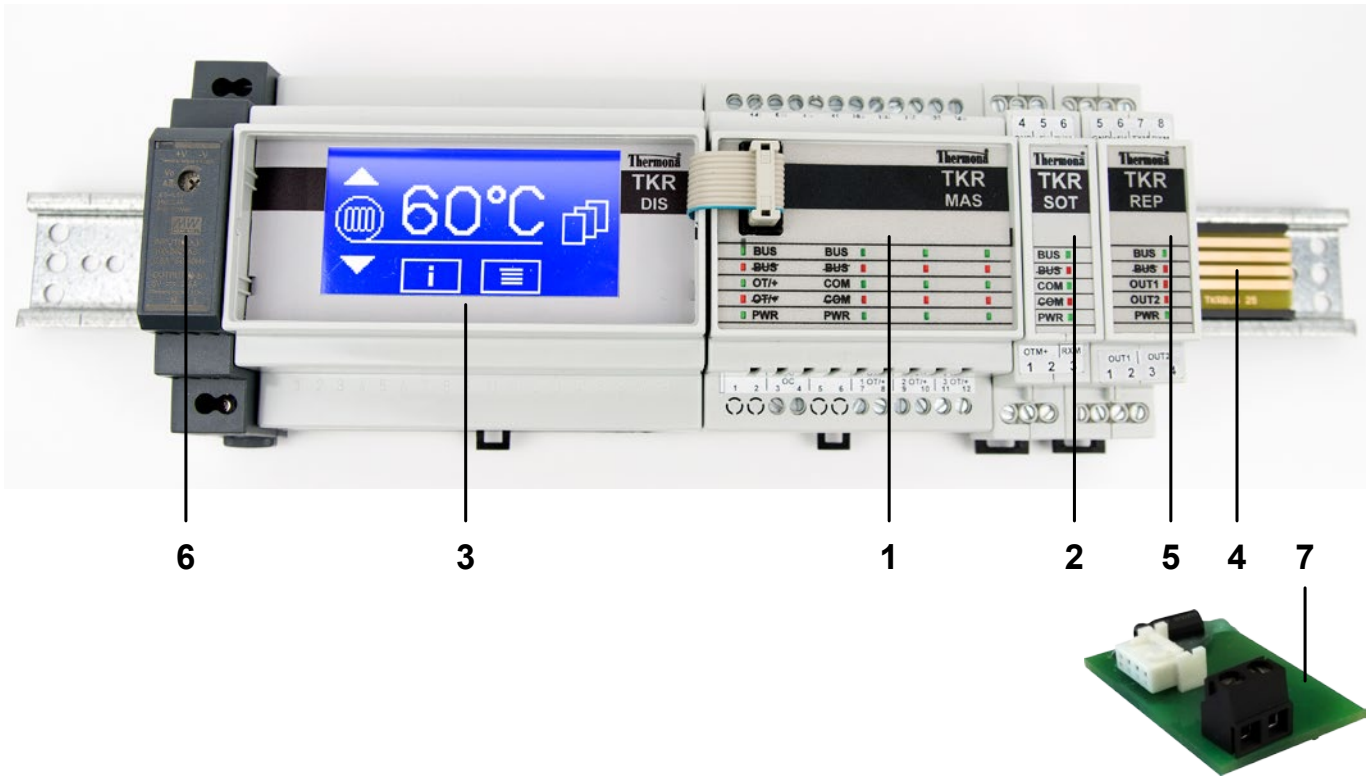
3.1 Cascade regulators

Control with a master cascade regulator

THERM TKR Cascade regulator

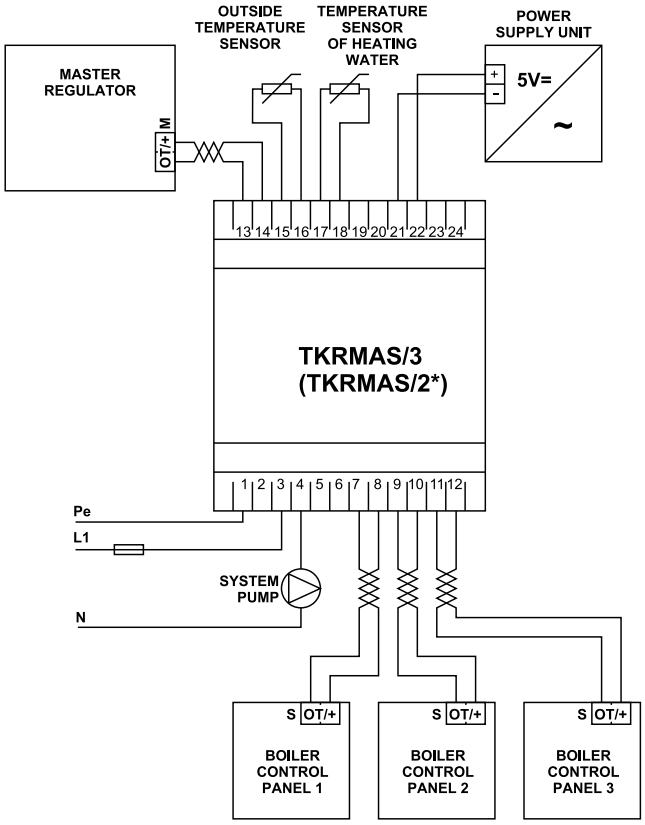
The THERM TKR regulator represents the simplest method of controlling wall-mounted THERM boilers, connected in a cascade. The regulator can control a cascade with up to 32 boilers, which represents the output of up to 3 MW! All THERM condensation boilers can be connected in a cascade, as well as the formerly manufactured boilers with mono-thermal exchanger and DIMS and H-DIMS automatics, and also THERM EL boiler series. The regulator is equipped with an input for connecting a master regulator with communication OT/+ and an input for controlling with voltage of 0 – 10 V, in case of control with a regulator that does not support communication via OT/+.

The TKR MAS regulator control modules are delivered with basic setting for 2 or 3 boilers with an atmospheric burner, with activated equitherm regulation, and 60-minute run-down of the heating system pump. The regulator must be fed from a 5 V power supply and it must have a temperature sensor installed on the output of the circular ring. In case of requirement for equitherm regulation, an outside temperature sensor must also be connected.

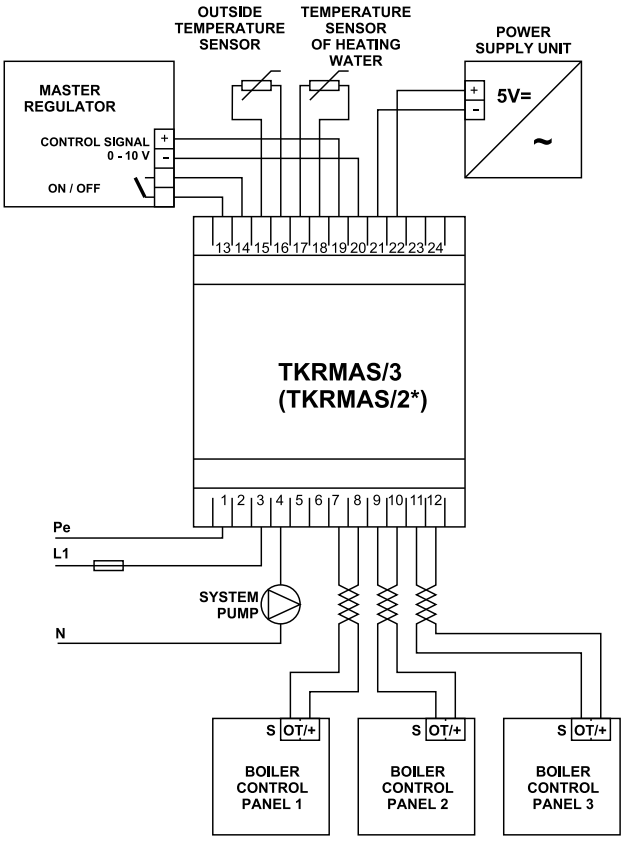


1. **TKR MAS/3** – o/n 42717 – basic module of the THERM TKR regulator – controls a cascade of up to 3 boilers independently
   (**TKR MAS/2** – o/n 42727 – controls a cascade of up to 2 boilers independently).
2. **TKR SOT** – o/n 42718 – extension module – used for connecting additional boiler to the cascade.
3. **TKR DIS** – o/n 42719 – touch display for setting additional functions, displaying the status of the regulator and parameters of all boilers connected to the cascade. When the option of setting and permanent display is not required, it is possible to use a service display, REK GTP-S during service activity for THERM EL electric boilers (the regulator works according to the last setting entered on the display when the setting is complete the display disconnected).
4. **TKR BUS** – o/n 42722 – bus bar for fast and reliable connection of the TKR MAS regulator, with TKR SOT extension modules and TKR REP signalling modules. When only one additional module is used, the connection can be made using wire jumpers.
5. **TKR REP** – o/n 42720 – module for signalling malfunction of one of the boilers in the cascade or for signalling an emergency when all boilers in the cascade are malfunctioning.
6. **Power supply** – o/n 42721.1 - 230 V / 5 V, 2.4 A – to feed the TKR regulator and all additional modules.
7. **TKR KOM** – o/n 42728 – communication module for connecting boilers with DIMS and H-DIMS automatics to the cascade.

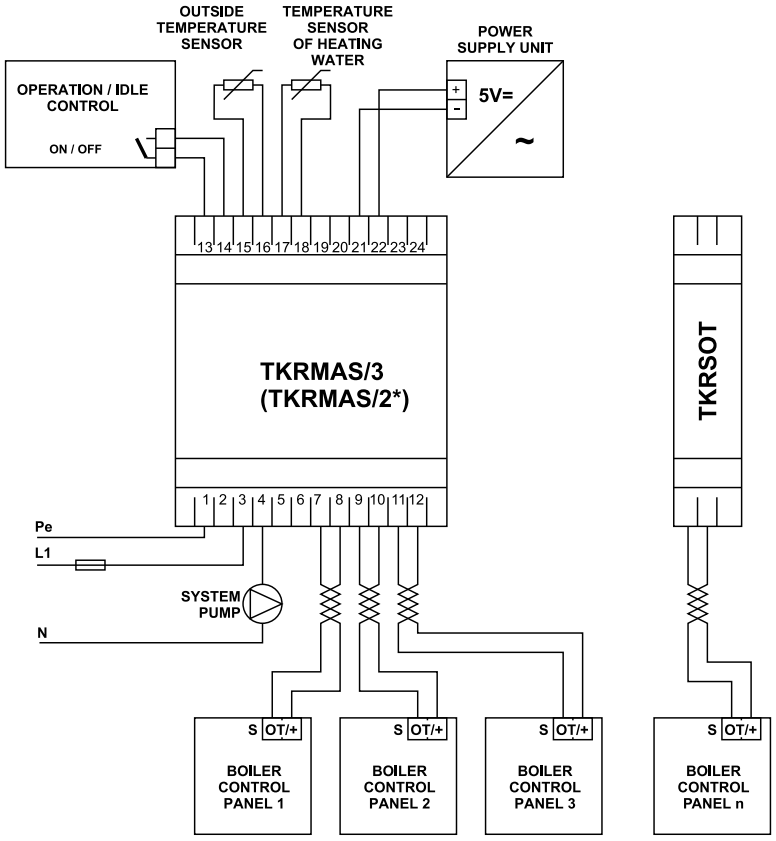
Control options



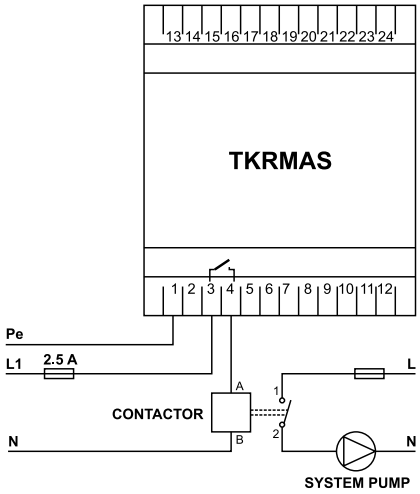
Wiring diagram for control with a master regulator with OT/+ protocol



Wiring diagram for control with a master regulator with 0 – 10 V output

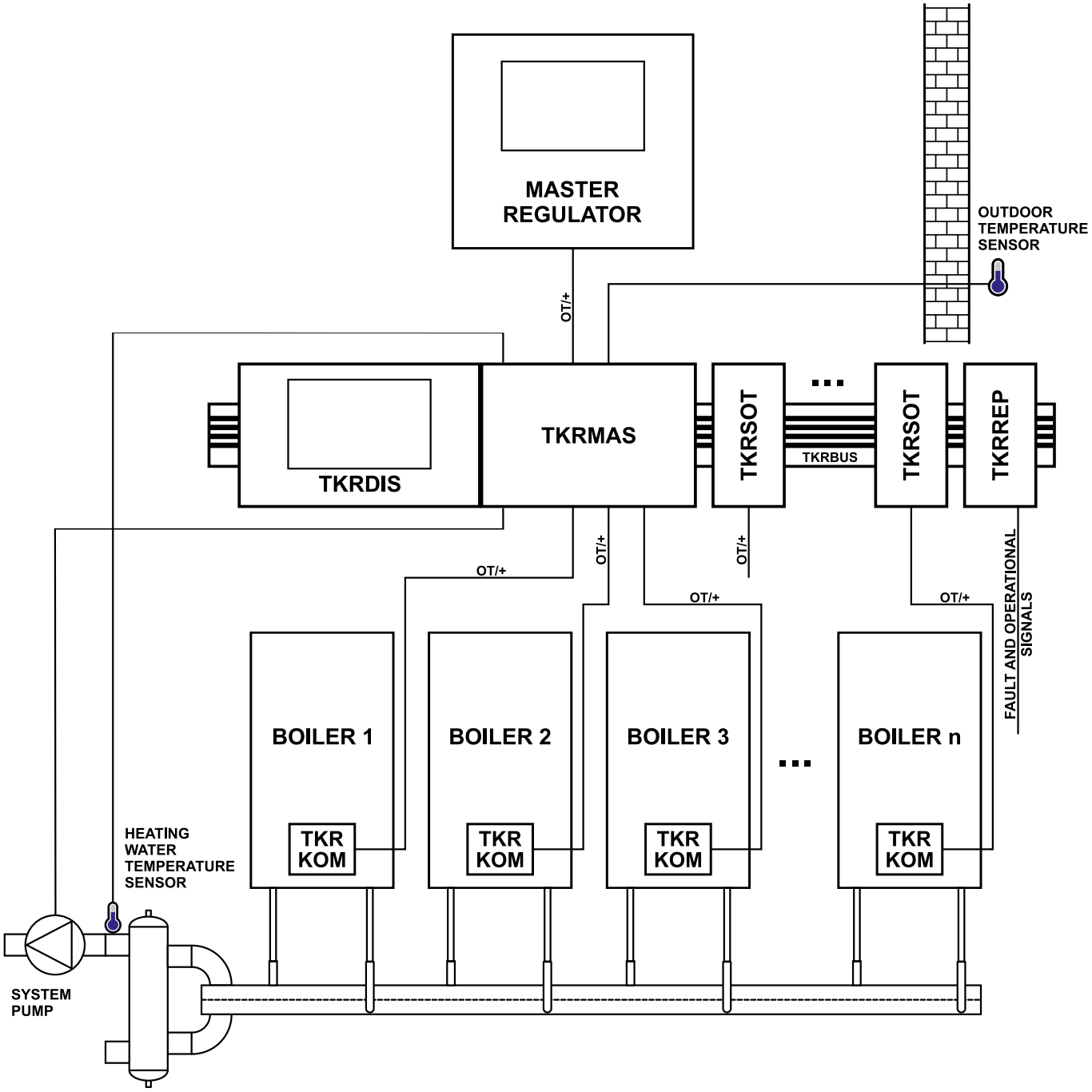


Wiring diagram for equitherm cascade regulation



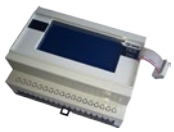
Connection of the PE protective conductor and system pump

Block diagram of the THERM TKR cascade regulator



All sensors required for the activity of the cascade regulator are connected to the basic TKR MAS regulator module – in any case, a heating system sensor located on the output pipe from the anchor ring, and also an outside temperature sensor in case equitherm regulation is required. A contactor of the heating system pump is also connected to the regulator, as well as a master regulator and OT/+ communication to the boilers. When installing the TKR MAS regulator module on a DIN-rail with a built-in TKR BUS bar, the contact spots are connected with the bus bar, providing communication and power supply for all modules. The power supply must always be connected using a cable to the TKR MAS regulator module! The display is mounted on the DIN-rail to the left of TKR MAS, using a flat cable with a connector.

	Order number	Sign	Name of item	Description
	**43753**	TKR BOX	TKR regulator for 3 boilers in an installation box 1x18 modules	The TKR MAS/3 cascade regulator built-in the installation box is designed to be mounted on the wall (or load-bearing frame) next to the boilers. In addition to the regulator, the TKR BOX contains a power supply, contactor for switching the system pump, a switch, a fuse, and the TKR BUS. It includes a temperature sensor of the heating system, an outside sensor and three TKR KOM communication modules. The length of the DIN-rail allows adding up to five TKR SOT extension modules for controlling a cascade of up to 8 boilers (or up to 7 boiler when the TKR REP signalization module is used).
	**43749**	TKR BOX II	TKR regulator for 3 boilers in an installation box 2x18 modules	The TKR MAS/3 cascade regulator built-in the installation box is designed to be mounted on the wall (or load-bearing frame) next to the boilers. In addition to the regulator, the TKR BOX II contains a power supply, contactor for switching the system pump, a switch, a fuse, and the TKR BUS. It includes a temperature sensor of the heating system, an outside sensor, TKR REP signalization module and three TKR KOM communication modules. The length of the DIN-rail allows adding up to twenty TKR SOT extension modules for controlling a cascade of up to 23 boilers.
	**42717**	TKR MAS/3	TKR regulator for controlling a cascade of up to three boilers	The TKR MAS/3 cascade regulator independently controls a cascade of up to three boilers. TKR SOT extension modules are used for increasing the number of boilers in the cascade (up to 32!). The regulator display is used for setting the constant output temperature or the equithermic curve, or you can use the mater regulator with OT/+ communication to enter the output temperature, or the output temperature may be controlled by voltage of 0 – 10 V. Supply voltage 5 V, installed on DIN-rail, 4-module width.
	**42727**	TKR MAS/2	TKR regulator for controlling a cascade of two boilers	The TKR MAS/2 cascade regulator independently controls a cascade of up to two boilers. TKR SOT extension modules are used for increasing the number of boilers in the cascade (up to 32!). The regulator display is used for setting the constant output temperature or the equithermic curve, or you can use the mater regulator with OT/+ communication to enter the output temperature, or the output temperature may be controlled by voltage of 0 – 10 V. Supply voltage 5 V, installed on DIN-bar, 4-module width.
	**42053**	TKR MAS/3 SET	TKR regulator set for controlling a cascade of up to three boilers	The discounted set of the TKR MAS/3 regulator for controlling a cascade of up to three boilers contains all the basic components: the TKR MAS/3 cascade regulator, 5V/2A power source for DIN-rail, cascade temperature sensor, three TKR KOM communication interfaces.
	**42729**	TKR MAS/2 set	TKR regulator set for controlling a cascade of up to two boilers	The discounted set of the TKR MAS/2 regulator for controlling a cascade of two boilers contains all the basic components: the TKR MAS/2 cascade regulator, 5V/2A power source for DIN-rail, cascade temperature sensor, two TKR KOM communication interfaces.
	**42718**	TKR SOT	Boiler extension module	The TKR SOT extension module is used for connecting another boiler to the TKR MAS/2 or TKR MAS/3 regulator, it is installed on the DIN-rail, 1-module width; the connection with the regulator is provided by TKR BUS installed in the DIN-rail.
	**42054**	TKR SOT SET	Discounted boiler extension set	The discounted TKR SOT boiler extension set contains the boiler TKR SOT boiler extension module and the TKR KOM communication interface.
	**42722**	TKR BUS	TKR BUS designed to connect TKR SOT and TKR REP modules	The TKR BUS is installed in the DIN-rail and it is designed for a swift and reliable connection of the TKR MAS regulator with the TKR SOT and TKR REP extension modules, it provides power supply and communication with the regulator. (A wire jumper may be used when only one extension module is used.)
	**42721.1**		Power supply unit	Power supply unit 230 V / 5 V, 2.4 A – for feeding the TKR cascade regulator, used for cascades from 2 to 32 boilers.

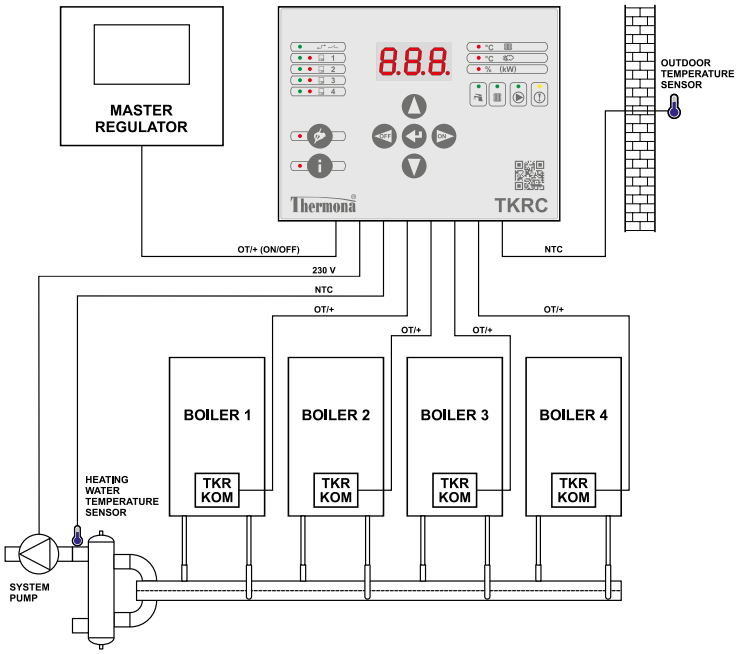
	Order number	Sign	Name of item	Description
	**42719**	TKR DIS	Display for DIN-rail	The TKR DIS touch display is used for setting additional functions, for displaying the cascade status and the parameters of each boiler in the cascade, or for changing the factory setting of the regulator parameters. Width of display: 5 modules, installed on the DIN-rail to the left of the regulator, it is permanently connected to the regulator, the communication and power supply are provided by the connecting cable supplied with the display. (The service technician may use REK GTP-S for service settings – a service display for electric boilers that has to be disconnected after the setting.)
	**42720**	TKR REP	Signalization module	The signalization module signals any errors of any boiler in the cascade and accidents of all boilers in the cascade, or signals the activation of any boiler in the cascade and activation of the heating system pump. The TKR REP signalization module is installed on the DIN-rail, 1.5-module width, the connection with the regulator is provided by TKR BUS installed in the DIN-rail.
	**42728**	TKR KOM	Communication module	A communication module with a connector for connecting boilers with DIMS and H-DIMS automatics to the TKR MAS/2 or TKR MAS/3 cascade regulator, or to the TKR SOT boiler extension module.
	**43515**	REK GTP-S	Service display	The service touch display for REK GTP-S electric boilers is equipped with a 1-metre-long connecting cable and it is designed for service settings of the regulator performed by the service technician; it must be disconnected after the setting.
	**23657.1**		Cascade temperature sensor	The NTC temperature sensor with a cable is essential for the regulator function. It is used for measuring the cascade output temperature and it is installed on the torus outlet.
	**40579.1**		Outside temperature sensor	The outside temperature sensor is essential when the equithermic regulation - regulation according to the outside temperature is required.
	**40779.1**		HAG contactor, ES110A, 25A, 230V	The contactor is controlled by the TKR MAS regulator that activates the heating system pump whenever any boiler turns on and deactivates, according to the settings, after 30-210 minutes after the last boiler has been turned off, or provides a continuous operation of the pump. The contactor has the option of forced and permanent manual deactivation or activation.
	**43569**		SV 116 – 16A	The main switch of the TKR BOX regulator is designed for deactivating the power supply of the entire regulator, it is installed on the DIN-rail.

THERM TKRC cascade regulator

The THERM TKRC regulator is designed for controlling a cascade of up to four Thermona boilers. All THERMONA boilers with DIMS and H-DIMS automatics, all THERMONA condensing boilers and the THERM EL electric boiler series can be connected in the cascade.

- Control of a cascade of up to four boilers
- Using NTC sensor to measure the temperature of the cascade output water
- Cascade system pump activation
- Optional connection of the NTC sensor for measuring outside temperature
- Option to read outside temperature data from one of the controlled boilers
- Supporting the water heating controlled by slave boilers
- Option to control the cascade by the OT/+ master regulator
- Option of autonomous operation - ON/OFF regulator control (voltage-free contact) or equithermic regulation with voltage-free contact operation blocking
- Built-in three-digit numerical display and keyboard with seven buttons
- LED operating and error signalization
- Mains power supply, universal power supply unit 120 – 230 Vst, 50 – 60 Hz
- Wall installation, resistant compact box

Block diagram of the THERM TKRC cascade regulator



	Order number	Sign	Name of item	Description
	**43797**	TKRC SET	TKRC regulator set for boiler room regulation	The set for the regulation of a small boiler room contains the TKRC regulator, outside sensor and system temperature sensor.
	**42728**	TKR KOM	Communication module	A communication module with a connector for connecting boilers with DIMS and H-DIMS automatics to the cascade regulator, or to the TKR SOT boiler extension module.

3.2 Communication Interface for Electric Boilers

REKAS 1 INTERFACE

An alternative, more compact connection variant is available for the THERM EL electric boiler cascade. The simple REKAS 1 interface allows connecting up to 32 boilers in a single intelligent cascade that is able to modulate output from the minimum output of one boiler to the sum of the maximum outputs of all boilers.

All boilers have include the REKAS 1 interface (not included in the boiler delivery), moreover, a master regulator may be connected to the master boiler (the selection of a master and slave boiler is done in the service menu). Then, the master boiler is connected to the system temperature sensor, the system pump contactor, and the optional outside sensor.

	Order number	Name of item	Description
	**42188**	REKAS 1 INTERFACE	Communication interface for the cascade connection of electric boilers. It is used universally for the master boiler and all other controlled boilers in the cascade.
	**23657.1**	Cascade temperature sensor	The NTC temperature sensor with a cable is essential for the regulator function. It is used for measuring the cascade output temperature and it is installed on the torus outlet.
	**40579.1**	Outside temperature sensor	The outside temperature sensor is essential when the equithermic regulation - regulation according to the outside temperature is required.
	**40779.1**	HAG contactor, ES110A, 25A, 230V	The contactor activates the heating system pump whenever any boiler turns on and deactivates, according to the settings, after 30-210 minutes after the last boiler has been turned off, or provides a continuous operation of the pump. The contactor has the option of forced and permanent manual deactivation or activation.

Example of using single-zone regulators

3.3 Single-Zone Regulators

Control with a master single-zone regulator and outside sensor (equithermic regulation) - for one heating circuit without a mixing valve

If there is a heating system with one heating circuit only, we can regulate the temperature of the heating water at the cascade outlet without using the mixing valve. The THERMONA TKR regulator will control the operation of the boilers in the cascade at the required temperature according to the set equithermic curve. If we need to change the required temperature according to the time programs during the day or week, we can connect a master regulator, PT59, PT59X or CR 04, to the THERMONA TKR cascade regulator (or the master electric boiler). The master regulator sends the requirement for the output water temperature to the cascade and the cascade controls the number of boilers and their outputs and sends information about the cascade status to the regulator. The cascade also informs the regulator in the case of a malfunction.

	Order number	Name of item	Description
	**43452**	CR 04	A programmable regulator providing control of the cascade boiler room with one heating zone. Possibility to set a weekly time program.
	**43507**	PT59	A programmable regulator providing control of the cascade boiler room with one heating zone. Possibility to set a weekly time program.
	**43506**	PT59X	A programmable regulator providing control of the cascade boiler room with one heating zone. Possibility to set a weekly time program. Moreover, this regulator allows for the addition of GST and MS2 external modules.
	**43460**	GST1	An additional GSM module for PT59X regulators. It allows remote control and receiving information on the cascade status and malfunctions.
	**43570**	MS2	An additional module for PT59X regulators that provides cascade boiler room malfunction signalization. It allows to activate light or sound signalling. It can be combined with the GST1 module.
	**40579.1**	Outside temperature sensor	It is used for equithermic regulation of boilers and cascade boiler rooms depending on the value of the outside temperature. It is suitable for all THERM boiler types and VPT and TKR regulators.
	**43556**	Room temperature sensor	It is used as a referential room sensor when the regulator is installed in another area than needed for temperature reading, or when the regulator is not equipped with a built-in sensor. It can be used with PT59X regulators, VPT regulators, or with the THERM EL electric boilers.

3.4 Multi-Zone Regulators

Control with a master multi-zone regulator and outside sensor (equithermic regulation)

The cascade regulation is similar to the single-zone regulators. In addition, the THERM VPT regulator assesses the requirements of the individual heating branches and then sends information to the boiler, similarly to the single-zone regulators.

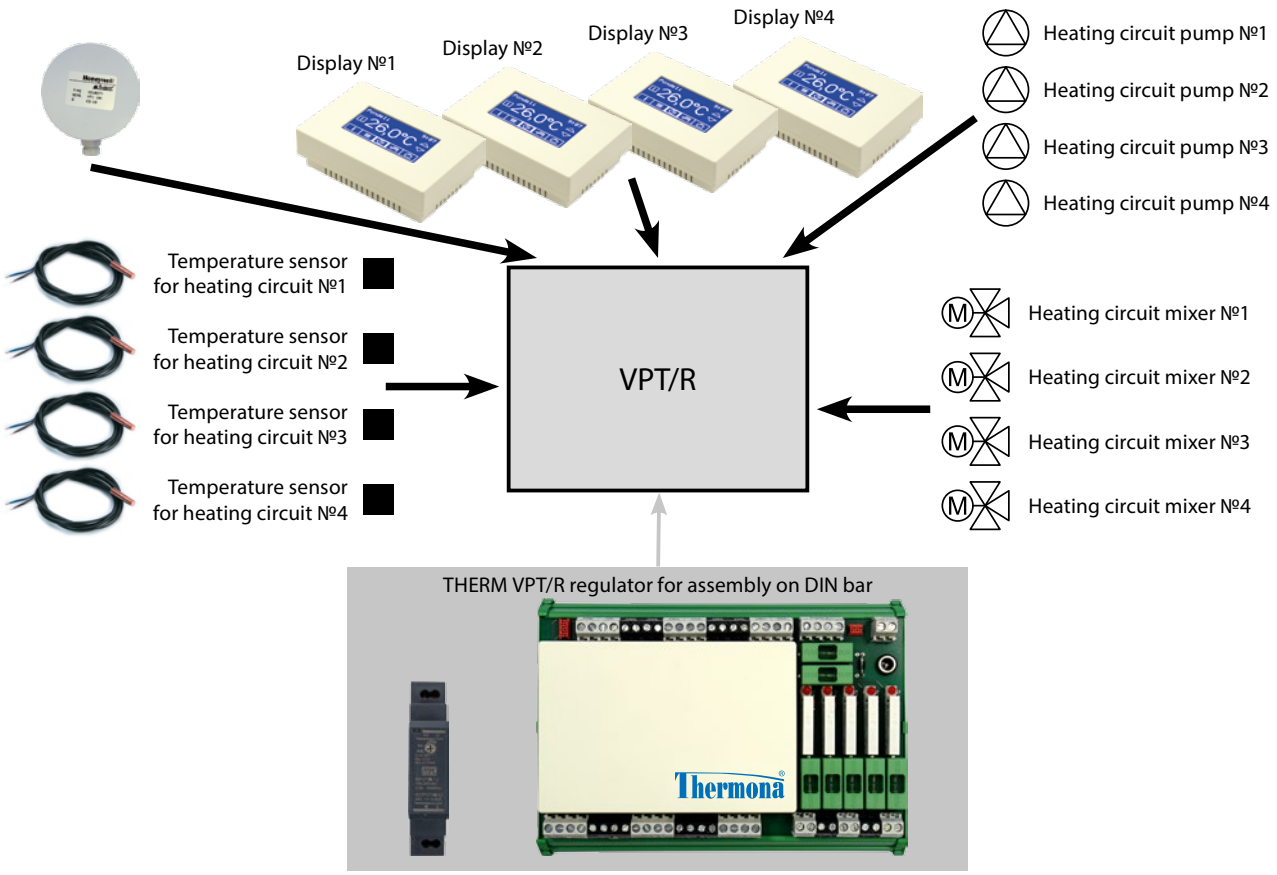
THERM VPT regulator for 1 – 4 heating circuits

- Regulation according to outside temperature and room temperature
- Regulator is placed on DIN bar into the switchboard
- Option to control the servo drives by 24 V or 230 V voltage
- Option for automatic filling of the heating system
  - VPT ADS module
- Option to connect additional displays
- Remote control option
  - LAN module
  - WiFi module
  - GSM module (through SMS)
- Possibility of signalling errors
  - VPT PSK module

The THERM VPT regulator is designed for controlling the system with up to four mixing (or only pumping) branches with the boiler or a cascade of boilers in possible combination with securing and automatically charging the heating system. Each circuit is regulated independently according to the outside temperature (equithermic regulation) or according to the temperature of the reference room or for the constant temperature of hearing water. The advantage of the simple setting and the touch screen control is the comparison of individual parameters in several language versions, which enables easy user orientation in the menu for the device and simple changes to the heating parameters.

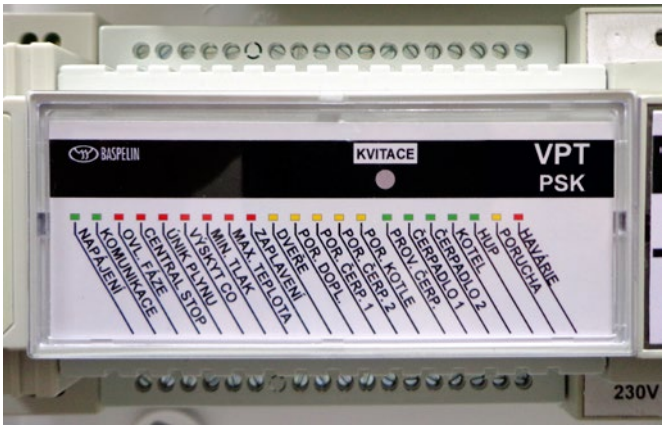
For medium and high-output boiler rooms where it is necessary to solve the boiler room security, and even automatic filling, we designed the THERM VPT PSK additional module that contains a summary of the most frequent requirements for the boiler room operation security.

The THERM VPT PSK module allows for the connection with the THERM VPT regulator and together they display any error conditions and provide their transfer via GSM, LAN or Wi-Fi, or via the RS485 line. The unit is equipped with basic LED diode indication to allow for it to be used independently. It also provides the function of a substitute of two system pumps when the unit automatically activates the second pump in the case one of the pumps is deactivated due to a malfunction, and the unit also signals the malfunction of the defective pump. The THERM VPT PSK unit is capable of operation in an autonomous mode when each malfunction is signalled by a lit indicator for its duration, or by flashing of the indicator after it has been resolved until confirmed by pressing the button.

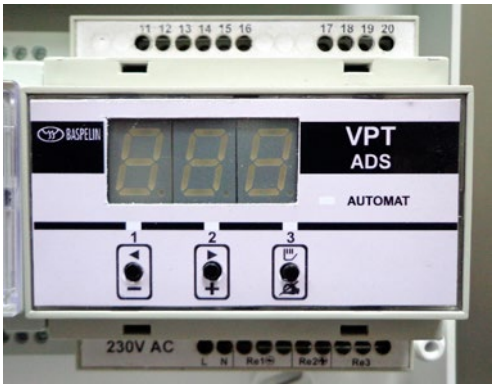


VPT PSK security module

- Gas leak in the boiler room
- CO occurrence in the boiler room
- Minimum water pressure in the heating system
- Exceeded maximum temperature in the boiler room
- Boiler room flooding
- Emergency button for shut-down of the boiler room
- Signalization and registration of boiler room door opening
- Emergency gas shut-off control
- Deactivation of the power supply of boilers
- Error signalling
- Boiler room accident signalling
- Controlling two pumps in the automated backup mode



VPT PSK security module



THERM VPT ADS filling module

When the THERM VPT ADS automatic filling module is added, the entire set measures and monitors pressure in the heating system and when needed, it refills the heating system using a solenoid valve (according to the pressure and the restricted refill time).

The set of the THERM VPT regulator, the THERM VPT PSK security module and the THERM VPT ADS filling module provides a solution of security and regulation with a single compact system at a reasonable price. Everything can be monitored using a regular web browser on the internet, or via SMS messages in the case of an error. The set communicates with the THERM boiler or the THERMONA cascade boiler room via the OpenTherm communication interface and it further expands the possibilities of the use of cascade boiler rooms and brings their comfort to a higher level.

THERM VPT regulators in distributors

To simplify and accelerate the installation of THERM VPT regulation, THERMONA supplies VPT regulators built in the distributors, with a single test report according to the valid legislation.

The customer can choose the most suitable version from the following table:

	Order number	Name of item	Description
	**43800.1**	VPT PSK ADS FI switchboard	The distributor with a VPT regulator, a PSK boiler room protection module and ADS automatic fill-up module is designed for boiler rooms with up to four heating branches.
	**43801.1**	VPT PSK FI switchboard	The distributor with a VPT regulator, a PSK boiler room protection module is designed for boiler rooms with up to four heating branches.
	**43820**	VPT switchboard	The distributor with a VPT regulator is designed for smaller boiler rooms without the requirement to protect the boiler room, with up to four heating branches.

43800.1

43801.1

43820

To select the suitable switchboard option, use the following table:

Switchboard components			
Table for the VPT regulator assembly	**Switchboard order number**		
Components	**43800.1**	**43801.1**	**43820**
VPT regulator, VPT-L DIS display	YES	YES	YES
VPT PSK boiler room security module	YES	YES	NO
VPT ADS automatic filling module	YES	NO	NO
Power supply unit 24 V	2.5 A	2.5 A	0.63 A
Main switchboard circuit breaker 20 A	YES	YES	YES (16 A)
Residual current device FI (sockets and boiler room lights)	YES	YES	NO
Circuit breaker for the service and installation sockets in the boiler room 16 A	YES	YES	NO
Circuit breaker for boiler rooms 10 A	YES	YES	NO
Circuit breaker for boilers 16 A	YES	YES	YES (10 A)
Circuit breaker for the power supply for TKR BOX regulation 6 A	YES	YES	NO
Circuit breaker 10 A - backup	NO	NO	YES
Contactor for deactivation of the boiler power supply	YES	YES	NO
2 contactors for the pumps in the backup mode	NO (*	NO (*	NO
Contactors for the heating branches pumps	4	4	4
Emergency gas shut-off control	YES	YES	NO
Boiler room flooding sensor	YES	YES	NO
VPT-L LAN or VPT-L Wi-Fi communication module	(**	(**	(**
Temperature sensor of the heating branches	NO (***	NO (***	NO (***
Sensors for the VPT PSK module	NO (***	NO (***	NO
Pressure sensor and solenoid for the VPT ADS module	NO (***	NO	NO
Space for the installation of auxiliary relays of the GIC40 detector	YES	YES	NO
Switchboard dimensions (DIN-rails x modules)	4 x 18	4 x 18	3 x 12

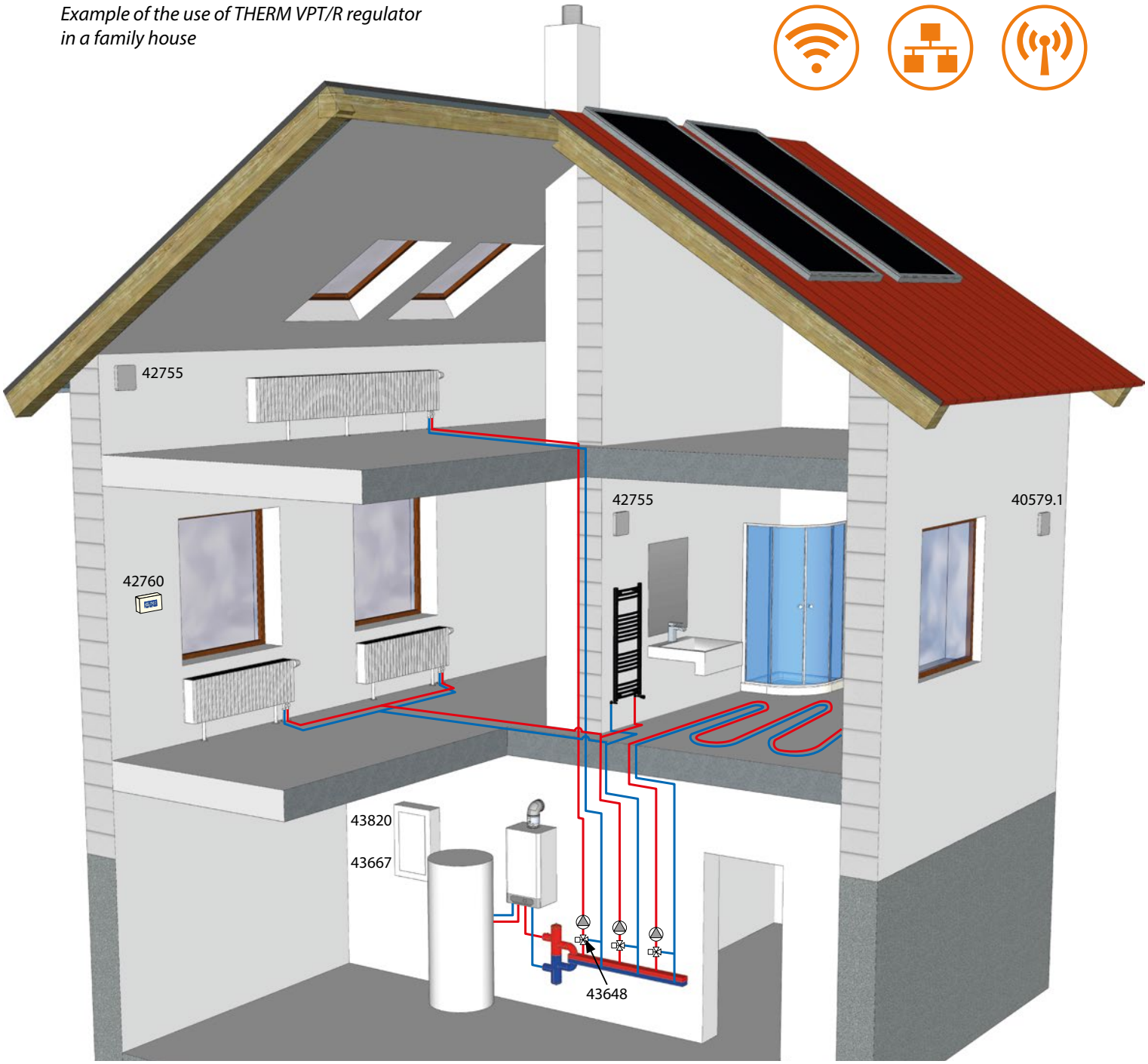
(* - available for purchase
(** - prepared installation site
(*** - delivered on order

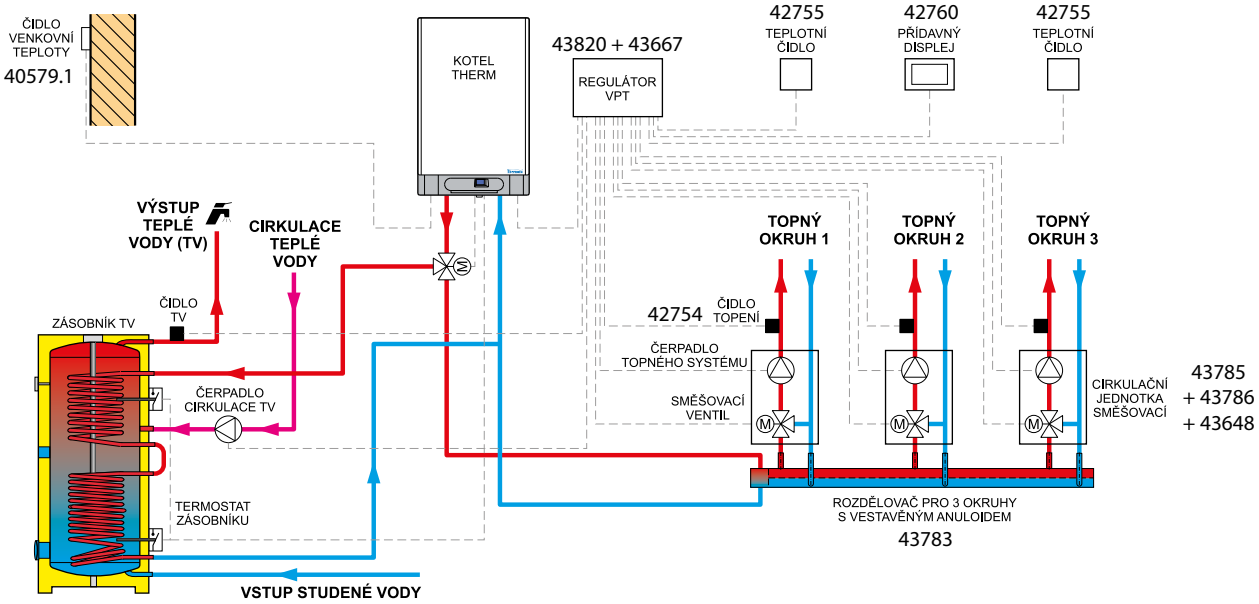
Remember to order the required additional equipment when ordering the switchboard.

Table of additional equipment for VPT switchboards		Switchboard order number		
		43800.1	43801.1	43820
Order number	Name of item	pcs	pcs	pcs
23657.1	Temperature sensor with a cable (for each circuit)	1 – 4 *)	1 – 4 *)	1 – 4 *)
40579.1	Outside temperature sensor	0 / 1	0 / 1	0 / 1
43648	Proportional servo-drive 0-10V, 24V DC	1 - 4	1 - 4	1 - 4
42755	Room temperature sensor	0 - 4	0 - 4	0 - 4
43633	VPT-THERM 14-01 – boiler room thermostat	0 / 1	0 / 1	NO
43625	CENTRAL STOP - with a de-blocking button	0 / 1	0 / 1	NO
43612	Flooding probe	0 / 1	0 / 1	NO
43632	Light and sound signalization	0 / 1	0 / 1	NO
72089	Pressure sensor 0 – 6 Bar	0 / 1	NO	NO
42760	VPT DIS SET – referential room display	0 - 4	0 - 4	0 - 4
	Communication module available on order – it is delivered separately, the installation site in the switchboard is prepared			
43667	VPT-L WIFI – communication module	(1!)	(1!)	(1!)
43668	VPT-L LAN – communication module	(1!)	(1!)	(1!)
43669	VPT-L GSM – SMS communication module	(1!)	(1!)	(1!)
	Module for 3-point servo-drives – it is delivered separately, the installation site in the switchboard is prepared			
42763	VPT RSB – output module for 3-point servo-drive.	(0 – 4)	(0 – 4)	(0 – 4)

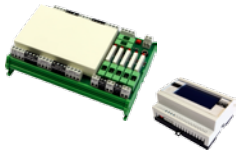
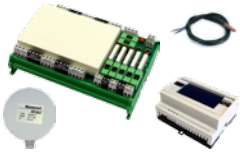
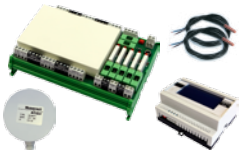
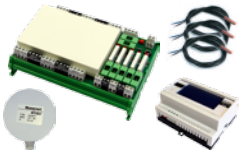
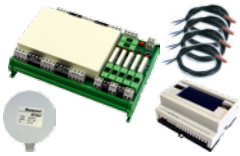
1 – 4 *) - a temperature sensor has to be ordered for each heating branch + also for measuring temperature in the boiler according to the project
(1!) - it is possible to choose between Wi-Fi or LAN or GSM (not two or three at the same time!)
(0 – 4) - it is only used for 3-point servo-drives- not used when proportional servo-drives are installed

Example of the use of THERM VPT/R regulator in a family house





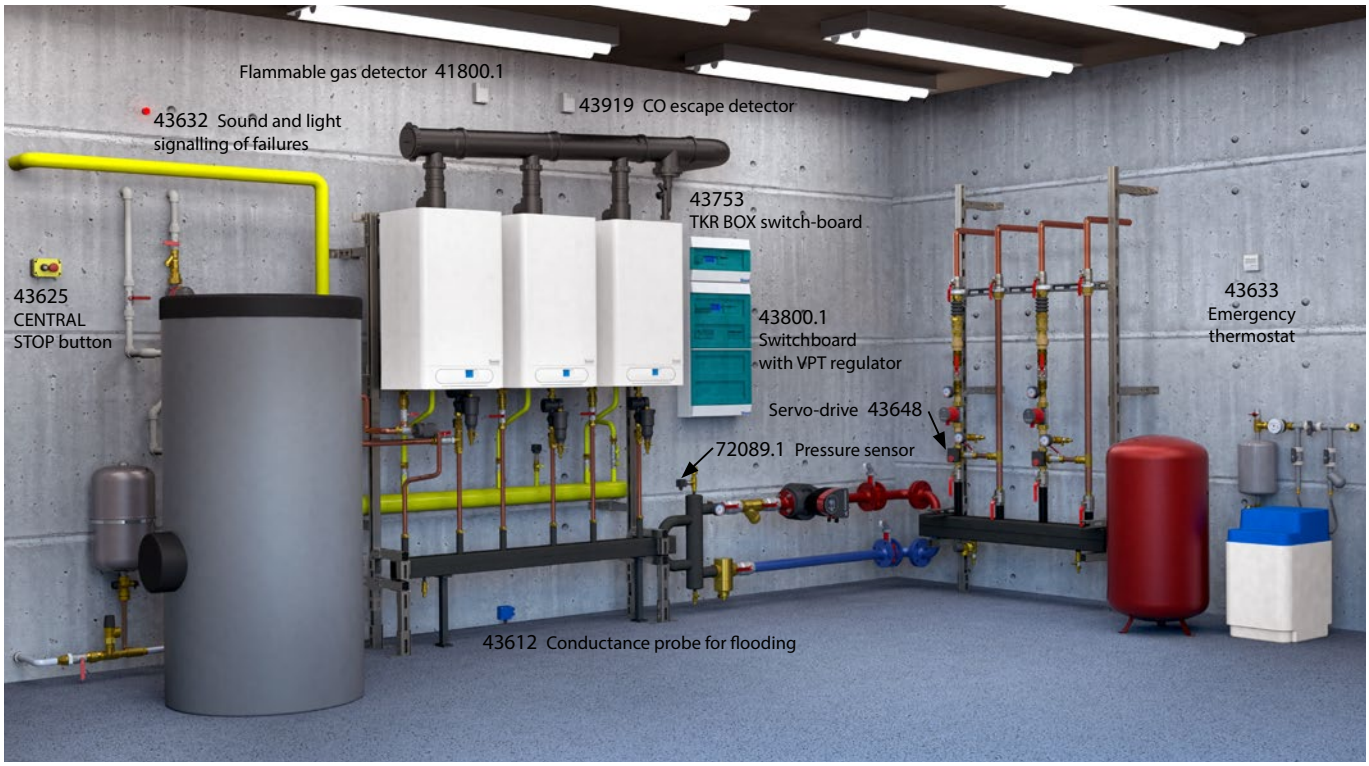
List of VPT/R regulation components - switchboard version

	Order number	Sign	Name of item	Description
	**42736.1**		Power source 24 V/0.63 A - on DIN-rail	The 24 V power source unit on DIN-rail to be built-in the switchboard is used for feeding the basic set to the switchboard. When the VPT PSK or VPT ADS modules are connected, or the more powerful servo-drives (more than 2 VA), the 42726 power supply must be used. The power source is not included in any set – it must be specified in the order!
	**42726.1**		Power source 24 V/2.5 A - on DIN-rail	The 24 V, 2.5 A power source unit on DIN-rail to be built-in the switchboard is used for feeding the VTP regulator as well as the VPT PSK and VPT ADS additional modules, or larger servo-drives. The power source is not included in any set – it must be specified in the order!
	**42730**	VPT/R SET	Switchboard set - basic	The basic set - terminal block for the switchboard for regulating the heating branches contains a terminal block with relays for installation on the DIN-rail in the switchboard with preparation for the control unit and for the communication module, control unit module, display set + display clamps for installation on the DIN-rail. A corresponding power supply unit must be added.
	**42731**	VPT/R - 1 SET	Switchboard set - 1 circuit - equitherm	The set for regulation of one heating branch with an analogue servo-drive 0 – 10 V contains, in addition to the basic set, one clamp-on sensor for the heating branches and outside sensor, the set is designed to be installed in the switchboard, which is not included in the delivery. A corresponding power supply unit must be added.
	**42732**	VPT/R - 2 SET	Switchboard set - 2 circuits - equitherm	The set for regulation of two heating branches with analogue servo-drives 0 – 10 V contains the basic set, two clamp-on sensors for the heating branches and outside sensor, the set is designed to be installed in the switchboard, which is not included in the delivery. A corresponding power supply unit must be added.
	**42733**	VPT/R - 3 SET	Switchboard set - 3 circuits - equitherm	The set for regulation of three heating branches with analogue servo-drives 0 – 10 V contains the basic set, three clamp-on sensors for the heating branches and outside sensor, the set is designed to be installed in the switchboard, which is not included in the delivery. A corresponding power supply unit must be added.
	**42734**	VPT/R - 4 SET	Switchboard set - 4 circuits - equitherm	The set for regulation of four heating branches with analogue servo-drives 0 – 10 V contains the basic set, four clamp-on sensors for the heating branches and outside sensor, the set is designed to be installed in the switchboard, which is not included in the delivery. A corresponding power supply unit must be added.
	**42760**	VPT DIS SET	Additional display set	The additional display set for setting the VPT regulator consists of the display, the bottom part of the box and a mounting plate for installation on the wall. It is used as a room controller with a built-in temperature sensor. Up to 8 displays can be connected to one regulator.
	**42763**	VPT RSB	Output module for 3-point servo-drive	Output module for 3-point servo-drive - it has to be used when the 3-point servo-drive is required, it supports all models with the power supply of 24 V or 230 V.

	Order number	Sign	Name of item	Description
	**43667**	VPT-L WIFI	Wi-Fi communication module - on DIN-rail	The Wi-Fi communication module provides communication with the regulator via connection to a Wi-Fi router of a local Ethernet network, it cannot be used independently, only as a supplement of the switchboard set; configuration is done on the regulator display. The distance to the Wi-Fi router needs to be taken into account when installing in the switchboard.
	43668	VPT-L LAN	LAN communication module - on DIN-rail	The LAN communication module provides communication with the regulator via connection to a local Ethernet network, it cannot be used independently, only as a supplement of the switchboard set; configuration is done on the regulator display.
	43669	VPT-L GSM	GSM communication module - on DIN-rail	The GSM communication module provides communication with the regulator via SMS, it cannot be used independently, only as a supplement of the switchboard set; configuration is done on the regulator display.
	**23657.1**		Clamp-on temperature sensor	The clamp-on temperature sensor is installed on the outlet pipeline into the heating system, at least. 0.5 m behind the heating branch pump to avoid the effect of the pump warming. The sensor is attached using a thermally conductive strip, sensor deformation must be avoided. It can also be mounted in a well, Ø 6.5 mm.
	**40579.1**		Outside temperature sensor	The outside temperature sensor is used for measuring the outside temperature when equithermic regulation is required and the outside temperature sensor is not connected to the boiler for any reason (or the boiler does not support OpenTherm communication). It is installed according to the rules of outside sensor installation (north or north-west, height from the ground, effect of structural openings, heat sources, etc.).
	**42755**	VPT CTT	TANGO interior temperature sensor	The interior temperature sensor in the TANGO design is used for measuring temperature in the room where the room unit is not installed. It is installed on a standard installation box according to the rules of room thermostat installation (wall selection, height from the ground, effect of other heat sources, sun...).
	**43660**	VPT-L DDL	Display for DIN-rail	The VPT-L DDL display is designed to be installed on the DIN-rail in combination with the VPT/R regulator. It is also included in the VPT PSK ADS switchboard.

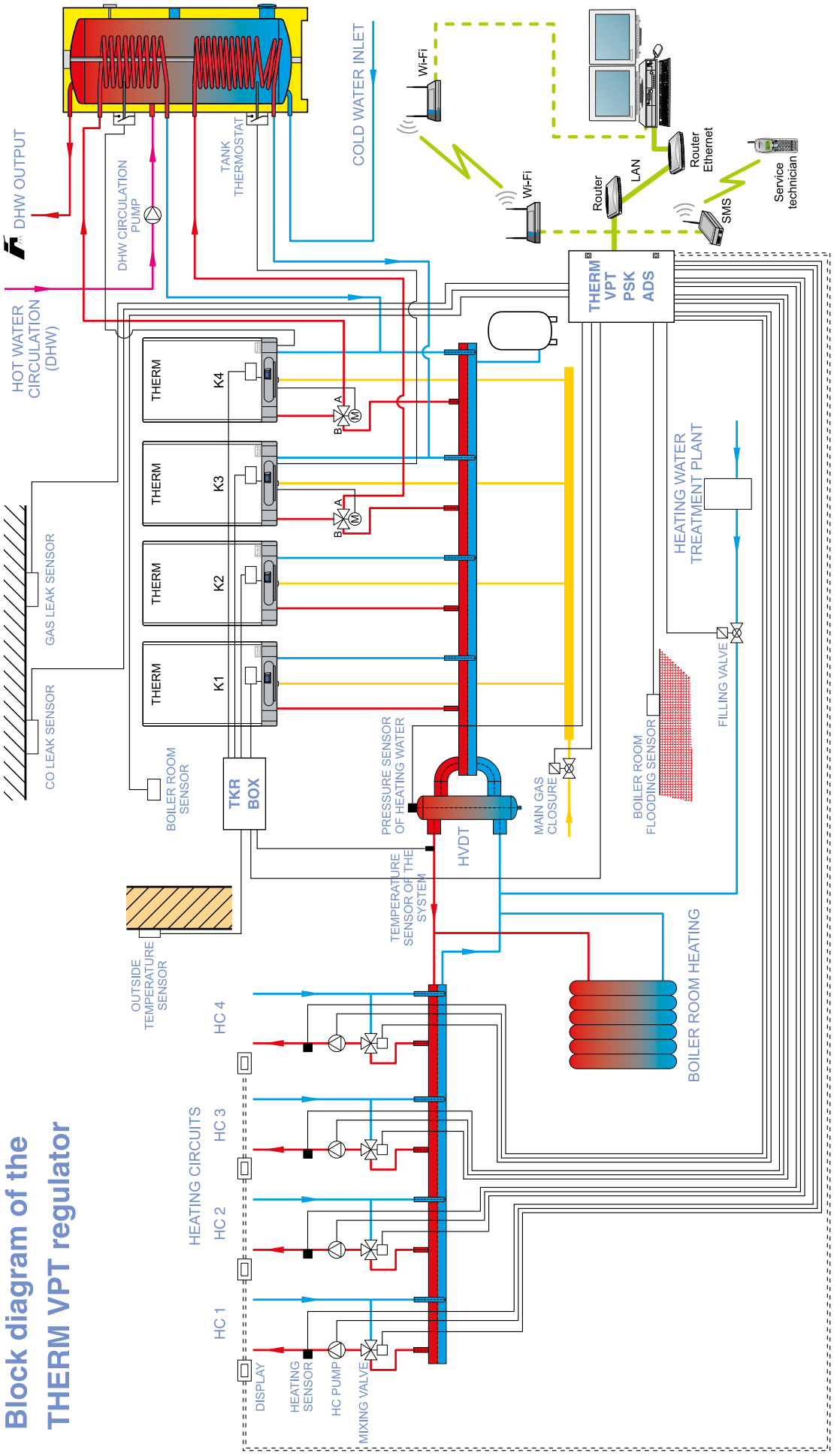
	Order number	Sign	Name of item	Description
	**43648**		Servo-drive, ESBE ARA639, 24VAC / DC, analogue 0-10V	Servo-drive of the mixing valve of the heating branch, supply voltage 24V, control voltage 0-10V, 6Nm, switch time 15-120s.
	**43633**	VPT-THERM 14-01	Emergency boiler room thermostat	The VPT-THERM 14-01 emergency boiler room thermostat is designed for the connection of the VPT PSK boiler room security module, power supply from the module 24 V, temperature range of up to 49°C, actual temperature shown on the thermostat display, engaged contact is signalled by a red diode and a symbol on the display.
	**43625**	CENTRAL STOP with blocking	STOP button with malfunction de-blocking	The complete STOP button for emergency shut-down of the boiler room and technology contains a locking button for confirmation and de-blocking of the malfunction; it is located near the boiler room door and is designed to be connected to the VPT PSK module.
	**43612**	DS	DS conductance probe	The DS conductance probe is used in cooperation with the DZ 4 flood sensor; it is located 1 - 3 cm above the boiler room floor. It monitors flooding of the boiler room on the basis of conductance.
	**43632**	AD16-22SM/ R230V	AD16-22SM/ R230V light and sound signalization	The light and sound signalization is used for signalling boiler room errors. It emits a distinct sound signal in combination with a flashing red light.
	**72089.1**	MBS-6Bar	Pressure sensor	The MBS-6Bar pressure sensor is designed to be connected to the VPT ADS module, signal 4 - 20 mA, thread 1/2".
	**43630**	EV220W	Filling valve	The EV220W filling valve is designed to be connected to the VPT ADS module and provides refills of the heating system, coil 220 V, thread 1/2".
	**43631**	KPI 35 - 8Bar	Pressure switch KPI 35 – 8Bar, G1/4"	The KPI 35 - 0.2 - 8 Bar pressure switch is used in the case when the automatic water filling module is not used in the system. It is used for obtaining information about a low water pressure in the heating system. It is designed to be connected to the VPT PSK module.
	**43611**	DZ 4	DZ 4 flood sensor	The DZ 4 sensor monitors flooding of the boiler room in cooperation with the DS conductance probe.
	**41800.1**	GS 120	Flammable gas detector	The GS 120 detector is sued for indication of a natural gas leak, it indicates two levels of gas concentration. The device signals gas leaks optically and acoustically.
	**43919**	GIC40	CO escape detector set	The CO escape detector set is used for the detection of an escape of carbon dioxide. It is connected directly to the VPTPSK module. The set contains a detector and two coupling relays.

	Order number	Sign	Name of item	Description
	**43628**	VPT PSK	Boiler room security module	The VPT PSK boiler room security module is designed for boiler rooms with medium output and it resolves the most important tasks in protecting the boiler room. It has 12 inputs and 6 outputs, it can be used separately or together with the VPT regulator, with which it communicates via the DIS bus (RS 485).
		It monitors the following parameters: - Gas leak in the boiler room - CO occurrence in the boiler room - Minimum water pressure in the heating system - Malfunction in refilling of the heating system - Exceeded maximum temperature in the boiler room - Boiler room flooding - Malfunctions of two system pumps - CENTRAL-STOP emergency button for shut-down of the boiler room - Boiler room power supply malfunction It provides: - Emergency shut-down of the boiler room - Signalization and registration of boiler room door opening - Emergency gas shut-off control - Deactivation of the power supply of boilers - Error signalling - Boiler room accident signalling - Controlling two pumps in the automated backup mode		
	**43629**	VPT ADS	Automatic filling module	The VPT ADS automatic filling module monitors pressure in the heating system, the time of filling (switching on the filling valve), the time of repeated filling, and it provides information about a low water pressure in the heating system. It is used separately or in combination with the VPT regulator. Its proper function requires a 4-20 mA signal from the DMU02 pressure sensor.
	**43658**	VPT TBI	Module for controlling branches with ON/OFF signal	It is used for switching on branches using a voltage-free contact – e.g. the ventilation branch, the branch for heating the hot water tank, the branch for heating a pool, etc.



Example of the use of THERM VPT/R regulator in the boiler room

Operating Diagram of the THERM VPT PSK ADS Cascade Regulation



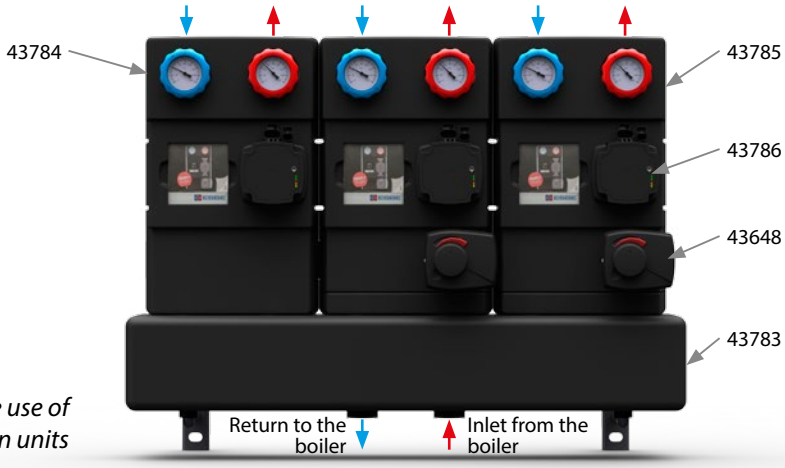
Block diagram of the THERM VPT regulator

4. HEATING BRANCH DISTRIBUTOR

When several heating branches are required, the boiler room is equipped with a distributor that provides for their hydraulic distribution, and also enables independent regulation of the individual branches using mixing valves. The customer can thus use various levels of heating water temperature in the individual parts of the heated building and increase the overall heating comfort. The distributor is supplemented with individual circulation pumps according to the heating system project.

	Order number	Name of item	Description
	**43643**	ESBE VRG132 DN20_4	Three-way mixing valve 1", external thread PN10, flow rate 4.0 m³/h.
	43644	ESBE VRG132 DN20_6.3	Three-way mixing valve 1", external thread PN10, flow rate 6.3 m³/h.
	43645	ESBE VRG132 DN25_6.3	Three-way mixing valve 5/4", external thread PN10, flow rate 6.3 m³/h.
	43646	ESBE VRG132 DN25_10	Three-way mixing valve 5/4", external thread PN10, flow rate 10.0 m³/h.
	43647	ESBE VRG132 DN32_16	Three-way mixing valve 6/4", external thread PN10, flow rate 16.0 m³/h.
	**43648**	Servo-drive, ESBE ARA639, 24VAC / DC, analogue 0-10V	Servo-drive of the mixing valve of the heating branch, supply voltage 24V, control voltage 0-10V, 6Nm, switch time 15-120s. It is used within the VPT and TRONIC regulation.
	43649	Servo-drive ESBE ARA661, 230V, 3-point	Servo-drive of the mixing valve of the heating branch, supply voltage 230V, 3-point, 6Nm, switch time 120s.
	-	Grundfos Magna 3 circulation pump	Designed for larger heating systems. We are able to deliver various variants according to the project specification.
	-	Grunfos Alpha 3 circulation pump	Designed for small to medium heating systems. We are able to deliver various variants according to the project specification.
	**43780**	Compact distributor - two circuits	Distributor for two circuits without built-in HDPC, maximum transmitted output 70 kW at Δt = 20°C, includes a holder and thermal insulation.
	**43781**	Compact distributor - three circuits	Distributor for three circuits without built-in HDPC, maximum transmitted output 70 kW at Δt = 20°C, includes a holder and thermal insulation.
	**43782**	Compact distributor - two circuits + HDPC	Distributor for two circuits with built-in HDPC, maximum transmitted output 70 kW at Δt = 20°C, includes a holder and thermal insulation.
	**43783**	Compact distributor - three circuits + HDPC	Distributor for three circuits with built-in HDPC, maximum transmitted output 70 kW at Δt = 20°C, includes a holder and thermal insulation.
	**43864**	Double-pipe distributor 6/4" - 3 outlets	Distributor for central heating, 3 outlets with a spacing of 125 mm, 6/4" connection to the system. Maximum transmitted output 95 kW at Δt = 20°C.
	**43865**	43864 thermal insulation of the distributor	The thermal insulation of the distributor for central heating provides an insulation and aesthetic function.

	Order number	Name of item	Description
	**43868**	Double-pipe distributor 6/4" - 4 outlets	Distributor for central heating, 4 outlets with a spacing of 125 mm, 6/4" connection to the system. Maximum transmitted output 95 kW at Δt = 20°C.
	**43869**	43868 thermal insulation of the distributor	The thermal insulation of the distributor for central heating provides an insulation and aesthetic function.
	**43810**	1" hydraulic compensator with insulation	Hydraulic dynamic pressure compensator, with insulation, maximum operating pressure of 10 bars, maximum flow rate 2.5 m^3/h. It is equipped with an automatic air bleed valve with a check valve and a discharge valve.
	43811	6/4" hydraulic compensator with insulation	Hydraulic dynamic pressure compensator, with insulation, maximum operating pressure of 10 bars, maximum flow rate 6.0 m^3/h. It is equipped with an automatic air bleed valve with a check valve and a discharge valve.
	**43784**	Direct circulation unit	DN 25, without a mixing valve, designed for direct heating branches (HVAC, hot water heating, etc.), must be supplemented with the Grundfos UPM3 circulation pump.
	**43785**	Mixing circulation unit	DN 25, with integrated VRG 430 three-way mixing valve (progressive characteristics, Kvs 2 - 8 m^3/h), must be supplemented with the Grundfos UPM3 circulation pump and ESBE ARA639 or ARA661 servo-drive.
	**43786**	Grundfos UPM3 circulation pump	Economical electronic pump, 25-70, with delivery of up to 7 m, suitable for installation in circulation units.



Example of the use of circulation units

5. HEATING SYSTEM SECURITY - EXPANSION VESSEL

The expansion vessel is selected according to the planned total water volume in the heating system. Usually, one or more expansion vessels are selected in relation to the accessibility and layout of the boiler room.

	Order number	Name of item	Description
	-	Expansion vessel	We are able to deliver expansion vessels of various types and capacity according to the project specification.

6. APPLIANCE FOR HEATING WATER TREATMENT

To provide the required quality of the heating water, a chemical water treatment plant is installed in the cascade boiler room, which also softens water, among other things. The treated water is important for the provision of trouble-free and long-lasting service life not only of the boilers and their heat exchangers, but also of the other parts of the boiler room hydraulics.

	Order number	Name of item	Description
	**72007**	BUVA 150/EM water treatment appliance	The water treatment appliance is suitable for boiler rooms of up to 500 kW, it is equipped with an electromagnetic valve for the option of automatic water filing (in combination with VPTADS).
	72006	BUVA 200/EM water treatment appliance	The water treatment appliance is suitable for boiler rooms over 500 kW, it is equipped with an electromagnetic valve for the option of automatic water filing (in combination with VPTADS).
	**72008**	Regenerative salt tablets (25 kg)	Used for the regeneration of both types of the water treatment appliance.
	**72009**	Sodium phosphate - jar	Used for softening and alcalination of the added or filling water.
	**72010**	Sodium sulphite - jar	Added in order to prevent pit corrosion of steel surfaces in the heating systems.

7. THREE-WAY VALVE FOR HEATING WATER

The three-way valve is used for distributing the flow of heating water into the heating system or the storage tank. It is used when the tank is connected directly to the boiler (boilers) within the primary cascade circuit. This three-way valve is not required when water heating is provided by the heating circuit distributor.

	Order number	Name of item	Description
	**43464**	G1" SPST three-way valve head, including cable	Drive for the control of the three-way valve, fed directly from the boiler control automatics, switch time 6s.
	**43465**	1" three-way valve body	Used for connecting THERM 45 KD.A and EL 45 boilers to the tank.
	43466	3/4" three-way valve body	Used for connecting boilers with an output below 30 kW to the tank.
	**43649**	Servo-drive of the ESBE ARA661 three-way valve, 230V	Drive for the control of the three-way valve, used for THERM 90 KD.A boilers, switch time 120s.
	**43647**	ESBE G6/4" three-way valve body	Used for connecting THERM 90 KD.A boilers to the tank.

8. INDIRECT HEATING EXTERNAL STORAGE TANK

Thermona provides a wide range of indirect heating storage tanks for heating up water. NTR storage tanks includes one exchanger for the conversion of energy from heating water to hot water. NTRR storage thanks use two exchangers. This enables to heat water from a source with a higher output, or to connect two various heat sources. For example, a combination of a gas boiler and solar system water heating.

	Order number	Name of item	Class of energy efficiency	Description
	**14314**	OKC 200 NTR	C	Capacity 208 l, exchanger output 32 kW
	14315	OKC 200 NTRR	C	Capacity 200 l, exchanger output 24/24 kW
	14457	OKC 250 NTR	C	Capacity 242 l, exchanger output 32 kW
	14352	OKC 250 NTRR	C	Capacity 234 l, exchanger output 24/24 kW
	14394	OKC 300 NTRR/BP (*	C	Capacity 285 l, exchanger output 35/24 kW
	14411	OKC 400 NTRR/BP (*	C	Capacity 363 l, exchanger output 58/26 kW
	14412	OKC 500 NTRR/BP (*	C	Capacity 433 l, exchanger output 59/37 kW
	14413	OKC 750 NTRR/BP (*	C	Capacity 710 l, exchanger output 60/33 kW
	14476	OKC 1000 NTRR/BP (*	C	Capacity 930 l, exchanger output 76/32 kW

(* - two thermostats for water temperature regulation must be added to storage tanks with a capacity of 300 l and higher

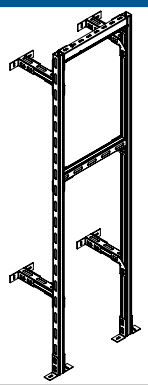
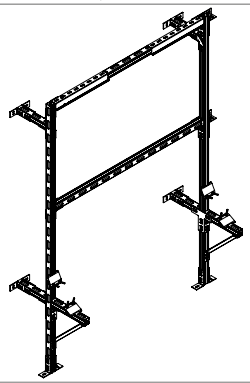
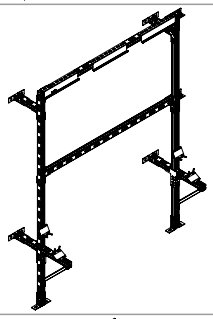
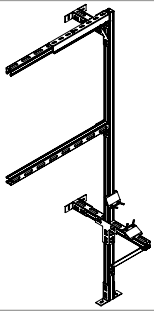
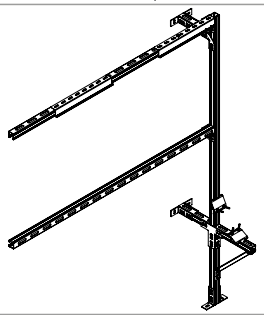
9. IMPURITY SEPARATOR

The heating water impurity separator needs to be installed onto the heating water return pipeline before its entry to the torus, or the boiler. The separator reliably separates impurities and sludge from water that may block and clog the piping and, above all, boiler exchangers. The separator is also equipped with a magnet that collects small metal particles and protects the circulation pumps. The collected impurities may be simply purged through the discharge valve, during the full operation of the equipment, without the need to interrupt water supply. It effectively removes even the finest solid particles from 10 µm, resulting in clear fluid. This equipment is basically essential in the case of old heating systems.

	Order number	Name of item	Description
	**43685**	1" impurity separator with magnet and filter	Used for THERM 45 KD.A and EL 45 boilers, installation below the individual boilers in the cascade, usually for cascades of up to 4 boilers.
	43684	3/4" impurity separator with magnet and filter	Used for boilers with an output of up to 35 kW, installation below the individual boilers in the cascade, usually for cascades of up to 4 boilers.
	**43567**	1" impurity separator with magnet	Used for THERM 45 KD.A and EL 45 boilers, installation below the individual boilers in the cascade, usually for cascades of up to 4 boilers.
	43566	3/4" impurity separator with magnet	Used for boilers with an output of up to 35 kW, installation below the individual boilers in the cascade, usually for cascades of up to 4 boilers.
	**43697**	5/4" impurity separator with magnet	
	**43698**	6/4" impurity separator with magnet - horizontal installation	Used for THERM 90 KD.A boilers, horizontal installation below the individual boilers in the cascade.
	43774	2" impurity separator with magnet - horizontal installation	
	-	Impurity separator	Designed for larger cascades. We are able to deliver various variants according to the project specification.

10. BOILER SUPPORT FRAMES

We offer boiler support frames to make the installation of boilers in a cascade easier. The frame is designed to be mounted in the wall and in the floor of the boiler room. Its large load-bearing capacity provides for reliable mounting of boilers and Thermset, including their interconnection. The modular structure provides for an easy and swift installation.

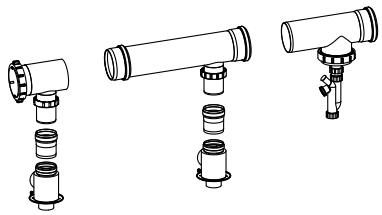
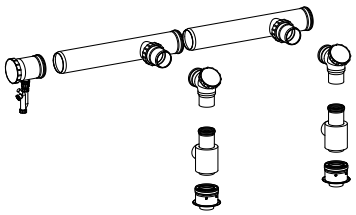
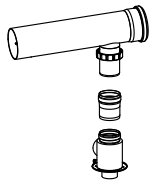
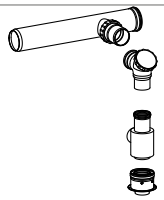
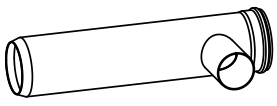
	Order number	Name of item
	**72400**	Support frame - 1 boiler 45 KD.A, 35 KD, 65 KD
	72404	Support frame - 1 boiler 90 KD.A
	**72401**	Support frame - 2 boilers 45 KD.A, 35 KD, 65 KD
	72405	Support frame - 2 boilers 90 KD.A
	**72402**	Support frame - 3 boilers 45 KD.A, 35 KD, 65 KD
	**72403**	Support frame - extension module for 1 boiler 45 KD.A, 35 KD, 65 KD
	72406	Support frame - extension module for 1 boiler 90 KD.A
	**72407**	Support frame - extension module for 2 boilers 90 KD.A

11. BOILER CASCADE SMOKE EXTRACTION

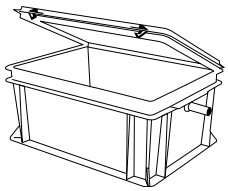
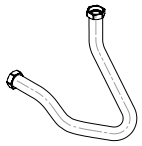
The condensing boiler cascade venting can be solved in two ways:

The first one includes separate coaxial venting. Separated systems are an alternative to the individual smoke flues (both air and smoke have their own ducts).

The second way of boiler cascade smoke extraction is to use combined venting. All the boilers connected to the combined smoke flue must be equipped with non-return chimney flaps that are designed to prevent the potential penetration of smoke to the boiler room through boilers that are not currently running. Combustion air suction is alternatively from the room, or an outside space.

	Order number	Name of item
	**43760.1**	Set UV STABIL for 2 boilers, ø 125 mm
	43761.1	Set UV STABIL for 2 boilers 45 KD.A, 65 KD, ø 160 mm
	**43763.1**	Set UV STABIL for 2 boilers 90 KD.A, ø 160 mm
	43764.1	Set UV STABIL for 2 boilers 90 KD.A, ø 200 mm
	**43759.1**	Boiler extension UV STABIL, ø 125 mm
	43762.1	Boiler extension UV STABIL, 45 KD.A, 65 KD, ø 160 mm
	**43765.1**	Boiler extension UV STABIL, 90 KD.A, ø 200 mm
	**43766.1**	87° elbow, reduced 160/80 UV STABIL (suction 45 KD.A, 65 KD)
	43768.1	87° elbow, reduced 160/110 UV STABIL (suction 90 KD.A)
	**43767.1**	87° elbow, reduced 160/80, 0.63 m UV STABIL (suction 45 KD.A, 65 KD)
	43769.1	Pipe component with branch 160/110, 1.00 m UV STABIL (suction 90 KD.A)
	**43771.1**	Reduction ø 80 mm, neck-neck UV STABIL (for suction 45 KD.A, 65 KD)
	43723.1	Reduction ø 110 mm, neck-neck UV STABIL (for suction 90 KD.A)

12. OTHER EQUIPMENT

	Order number	Name of item	Description
	-	Hot water expansion vessel	We are able to deliver expansion vessels of various types and capacity according to the project specification.
	-	Hot water circulation pump	Circulates hot water. We are able to deliver various variants according to the project specification.
	**36522**	CONLIFT1 condensate pumping station	Designed for boilers or boiler rooms installed below the sewage level. It pumps condensate to a higher location.
	**43799**	Neutralization appliance CONLIFT pH+ Box	The neutralization appliance is suitable for applications where lower pH condensate needs to be neutralized. The neutralization unit for the pumps can also be used separately in combination with the CONLIFT1 condensate pumping station. The package includes one batch of neutralization pellets, 1.2 kg.
	43798	CONLIFT pellet refill - 6 kg	
	**43907**	Neutralization box with accessories - up to 350 kW	The neutralization box with accessories contains: a set of pipes and sealing for the connection to the sewage system, pH measuring paper strips, limestone gravel.
	43908	Neutralization box with accessories - up to 1500 kW	The neutralization box with accessories contains: a set of pipes and sealing for the connection to the sewage system, pH measuring paper strips, limestone gravel.
	**43909**	Refill for the 350 kW neutralization box - 10 kg	Refill limestone gravel for the neutralization box.
	43910	Refill for the 1500 kW neutralization box - 25 kg	Refill limestone gravel for the neutralization box.
	**72548**	Stainless hose for the connection of gas to the 90 KD.A boiler	Flexible stainless hose DN32, G5/4"-G5/4", length 800 mm

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