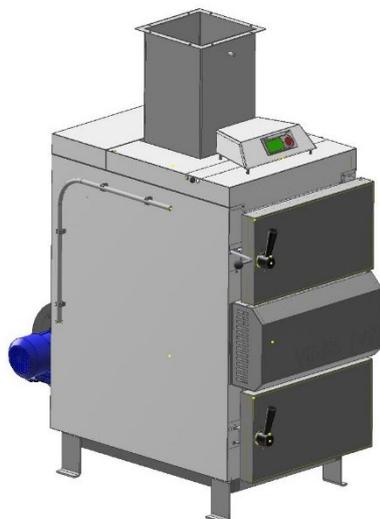
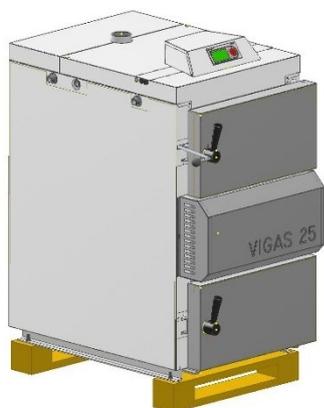
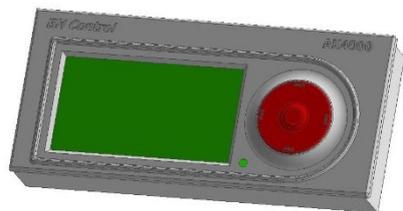


VIGAS

Gasifying boilers

BOILER SERVICE MANUAL VIGAS TECHNICAL DESCRIPTION

CONTROL SYSTEM AK 4000



CONTENTS	Page
1. INTRODUCTION.....	5
1.1 PURPOSE OF THE DOCUMENT.....	5
1.2 USERS.....	5
1.3 NOTICE TO SERVICE PERSONNEL.....	5
2. GENERAL VIGAS BOILERS.....	6
2.1 TECHNICAL DESCRIPTION AND CONSTRUCTION OF VIGAS AND VIGAS DPA BOILERS.....	6
2.2 VIGAS TECHNICAL DATA.....	7
2.3 DIMENSION SKETCHES.....	10
2.4 SCHEMES OF BOILERS.....	12
2.4.1 Schemes of VIGAS hot water boilers.....	12
2.4.2 Scheme of VIGAS DPA combined boilers.....	13
2.4.3 Scheme of the hot air boiler VIGAS 25 TVZ.....	13
3. BASIC PARTS OF BOILERS.....	14
3.1 BOILER BODY.....	14
3.1.1 VIGAS boiler body.....	14
3.1.2 VIGAS DPA combined boiler body.....	14
3.1.3 Boiler body VIGAS 25 TVZ – HEATED AIR.....	15
3.2 BOILER BODY COVER SHEETS.....	15
3.2.1 Disassembly - assembly of the upper front cover.....	16
3.2.2 Disassembly - assembly of the left and right side covers.....	16
3.2.3 Disassembly - assembly of the door cover.....	17
3.3 BOILER DOOR.....	17
3.3.1 Replacing the door seal.....	17
3.3.2 Aerated concrete lining of the door TYPE: KALINIT ŽO 1200.....	18
3.3.3 Door latch, door hinge and door adjustment.....	18
3.4 VIGAS BOILER FANS.....	19
3.4.1 Pressure fan type EBM.....	19
3.4.2 Cooling fan type Konvektor WBS–2 for VIGAS 25 TVZ.....	19
3.5 SHEET UNDER THE FAN (SUF).....	20
3.5.1 Sheet under the fan VIGAS STANDARD.....	20
3.5.2 Sheet under the VIGAS LAMBDA CONTROL fan.....	21
3.5.3 Sheet under the VIGAS DPA fan.....	22
3.6 IGNITE CONCRETE, IGNITE CONCRETE FOLDERS AND CRACLOTTE BRICKS.....	22
3.6.1 Aerated concrete lining.....	22
3.6.2 Fired concrete blocks.....	23
3.6.3 Fireclay bricks.....	24
3.7 COMBUSTION CHAMBER (ASH TRAY).....	24
3.7.1 Retractable combustion chamber.....	24
3.7.2 Hanging combustion chamber for VIGAS DPA boilers.....	25
3.8 CHIMNEY FLAP, CHIMNEY THROAT AND BOILER EXCHANGER.....	25
3.8.1 Chimney flap.....	25
3.8.2 Chimney neck.....	25
3.8.3 Boiler exchanger and its cleaning.....	26
3.9 PRIMARY AIR PIPE.....	26
3.10 COOLING SAFETY EXCHANGER.....	27
3.11 THERMAL INSULATION OF THE BOILER.....	27
4. VIGAS DPA BOILER PELLET TANK.....	28
4.1 PELLET BASE.....	28
4.1.1 Pellet stand.....	29
4.1.2 Pellet hopper.....	29
4.1.3 Engine, gearbox and auger.....	29
4.1.4 Air distributor.....	29
4.1.5 Pellet feeder.....	30
4.1.6 Ignition coil.....	31
4.1.7 Pellet EXPANDER.....	31
5. VIGAS BOILER CONTROL SYSTEM – AK 4000.....	32
5.1 POWER BOARD FOR VIGAS STANDARD AND VIGAS HEATED AIR.....	32
5.2 POWER BOARD FOR VIGAS LAMBDA CONTROL.....	33
5.2.1 AK 4005 LSU for Lambda probe LSU 4.9.....	33
5.2.2 AK 4000 SL for Lambda probe LSM 11.....	34

	Page
5.3 POWER BOARD FOR VIGAS DP ^A COMBINED BOILERS.....	34
5.4 STB FUSE.....	35
5.5 TEPLONER KOTLA typ KTY.....	35
5.6 FLUES THERMOMETER type PT1000.....	35
5.7 ACCUMULATION (ACCU) TANK THERMOMETER type KTY.....	36
5.8 ROOM THERMOSTAT (RT).....	36
6. ACCESSORIES FOR VIGAS BOILERS.....	37
6.1 EXHAUST FAN.....	37
6.2 CONTROL SYSTEM EXPANDER AK 4000.....	38
6.2.1 EXPANDER AK4000 – Technical description.....	38
6.2.2 Installation of the EXPANDERA system.....	38
6.2.3 Basic parts of the EXPANDERA AK4000 control system.....	39
6.2.3.1 AK4000E EXPANDER module.....	39
6.2.3.2 Thermometer type KTY.....	40
6.2.3.3 Thermometer external type KTY.....	40
6.2.3.4 Connecting cable AK BUS E.....	40
6.2.3.5 Thermometer for ACCU tank type KTY 4m.....	40
6.2.3.6 Thermometer for KRB and SOLAR type PT1000.....	40
6.2.4 Additional accessories EXPANDERA AK4000.....	41
6.2.4.1 Pump or two-way solenoid valve.....	41
6.2.4.2 Actuator with four-way or three-way valve.....	41
6.2.4.3 Room thermostat (RT).....	42
6.2.4.4 Cooperation of the VIGAS boiler with the ACCU storage tank.....	42
6.2.4.5 External boiler.....	43
6.2.4.6 Hot water fireplace.....	43
7. CONTROL AND ADJUSTMENT OF THE AK4000 CONTROL SYSTEM.....	44
7.1 MENU STRUCTURE - BASIC SETTINGS.....	44
7.2 MENU DESCRIPTION - BASIC SETTINGS.....	45
MENU 1 – TEMPERATURE SETTING.....	45
MENU 2 – SETTING THE BOILER PARAMETERS.....	48
MENU 3 – SETTING THE CLOCK.....	50
MENU 4 – ERROR MESSAGES.....	51
MENU 5 – TIME PROGRAM SETTING.....	53
MENU 6 – HARDWARE AND SOFTWARE INFORMATION.....	53
MENU 7 – SERVICE SETTINGS.....	54
MENU 7.1 , 7.2 SETTING THE HEATING CIRCUIT OF THE CENTRAL HEATING (CH).....	55
MENU 7.9 HOT WATER HEATING (DHW) SETTING.....	56
MENU 7.10 SOLAR HEATING SETUP.....	57
MENU 7.11 SETTING THE BOILER PARAMETERS.....	58
MENU 7.12 SETUP FOR AK4000 M MODULE.....	60
MENU 7.13 MOVEMENT SERVICE CHECK.....	61
MENU 7.14 SETTING THE HYDRAULIC DIAGRAM OF THE BOILER.....	62
MENU 7.15 INFO – ELECTRICAL CONNECTION OF INPUTS AND OUTPUTS.....	73
MENU 7.16 LINE DISPLAY OF DATA.....	74
MENU 7.17 SETTINGS FOR HOT WATER FIREPLACE.....	74
MENU 7.19 SPECIAL SERVICE SETTINGS.....	75
8. PROBLEMS, CAUSES AND THEIR SOLUTION.....	80
9. ELECTRIC SCHEME VIGAS A VIGAS LC – AK 4005S, AK4005 LSU.....	83
10. ELECTRIC SCHEME VIGAS DP^A – AK 4005 LSU.....	84
11. ELECTRIC SCHEME VIGAS TVZ – AK 4005S.....	85
12. ELECTRIC SCHEME VIGAS TVZ – AK 4000S.....	85
13. ELECTRIC SCHEME VIGAS DP^A – AK 4000 SL.....	86
Example: Hydraulic installation Scheme 7.....	87
Example: Hydraulic installation Scheme 9.....	88
Location of VIGAS 12 DP ^A , Location of VIGAS 18 DP ^A , Location of VIGAS 26 DP ^A	89
Location of VIGAS 16-25, Location of VIGAS 40, Location of VIGAS 60-100.....	90

1. INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This document provides the service worker with a detailed technical description of VIGAS boilers, necessary for expert and professional handling of service operations. The document also includes a description of the AK 4000 control system along with a description of its basic and special functions, options for expanding the control system with Expander modules, and how to improve it with newer versions of the control software. The document does not represent individual operating instructions for VIGAS boilers, which you also need to familiarize yourself with.

1.2 USERS

This document is intended for service personnel of VIGAS boilers.

1.3 NOTICE TO SERVICE PERSONNEL

When repairing and maintaining VIGAS boilers, the following principles must be observed:

1. During the operation of the boiler, no interventions may be carried out on the electrical equipment and the electrical installation of the boiler, such as:
 - uncovering electrical equipment, e.g. fan, thermal fuse, electrical regulation,
 - replacement of fuses,
 - repair of damaged cable insulation, etc.
2. Maintenance or repair of the boiler, which requires uncovering the electrical parts of the boiler, can only be performed by a person authorized to do so by the manufacturer and a person authorized to do so in terms of the decree 718/2002 Z.z .
3. Before removing the cover from the boiler or any electrical device connected to the boiler, it is necessary to disconnect all mains leads to the boiler by pulling it out of the socket. The inlets can only be inserted after the boiler covers have been re-placed in their original places.
4. In case of detection of an electrical fault. equipment or damage to the boiler installation, it is necessary: - not to touch any part of the boiler, - immediately disconnect the boiler from the voltage by pulling the mains supply from the network.

2. GENERAL BOILERS VIGAS

2.1 TECHNICAL DESCRIPTION AND DESIGN OF VIGAS AND VIGAS DPA BOILERS

VIGAS hot water boilers are designed for burning dry wood from sawdust to logs in length according to the size of the filling chamber and a maximum diameter of 20 cm. Sawdust, shavings, chips and offcuts must be burned together with logs.

The boilers are welded from 4 and 6 mm thick steel sheets. The inner sheets of the boilers, which are in contact with the flue gas, have a wall thickness of 6 mm, the other walls are made of sheet metal with a thickness of 4 mm. The heat exchanger is welded from steel tubes 57x4.5 mm. The outer casing is made of sheet metal with a thickness of 0.8 mm. The thermal insulation of the boiler consists of insulating material made of mineral wool with a thickness of 20 to 50 mm. The flue gases are discharged through the steel throat into the chimney.

The internal space of the boiler consists of a filling chamber, where the fuel is dried and gasified. The generated wood gas passes through the hot concrete nozzle into the combustion chamber, where it burns with the help of secondary air. The flue gases are intensively cooled in the exchanger. Unburned waste is swept out of the combustion chamber. For heating, the boiler is equipped with a heating damper controlled by a rod in the front part of the boiler. In order for the boiler to meet the requirements for easy operation, it is equipped with an AK 4000 control unit located in the upper part of the boiler. The used control system allows for very efficient burning of different types of fuel.

Combined hot water boilers VIGAS DPA combine two different fuel combustion systems. When burning wood, the gasification method is used, which is more efficient and is applied to all VIGAS boilers. However, the burning of pellets takes place by classic burning on a grate made of heat-resistant steel, where the pellets are fed by a screw conveyor.

VIGAS DPA boilers are designed for burning pellets with a diameter of 6 mm and a length of up to 40 mm and dry wood from sawdust to logs up to 520 mm in length for VIGAS 18DPA VIGAS 26DPA up to 370 for VIGAS 12DPA and a maximum diameter of 20 cm. Sawdust, shavings, chips and offcuts should be burned together with logs.

The boilers are welded from boiler steel sheets of thickness 4 and 6 mm. The inner sheets that are in contact with the flue gas have a wall thickness of 6 mm, the other walls are made of sheet metal with a thickness of 4 mm. The heat exchanger is welded from steel pipes 57x 4.5 mm. The outer casing is made of sheet metal with a thickness of 0.8 mm. The thermal insulation of the boilers consists of insulating material made of mineral wool with a thickness of 20 to 50 mm. The flue gases are discharged through the steel throat into the chimney. The pellet tank is made of 1.5 mm thick sheet metal and its volume is 225 l for the 12DPA boiler, 250 l for the 18 DPA boiler and 340 l for the 26 DPA boiler. The boiler includes a front gearbox, an electric ignition device, a safety turnstile, an air distributor with a servo-drive and a fan, a chimney temperature sensor and an ultrasonic pellet level sensor. The internal space of the boilers consists of a filling chamber, where the fuel is dried and gasified. The generated wood gas passes through the hot concrete nozzle into the combustion chamber, where it burns with the help of secondary air.

When burning pellets, they are precisely dosed from the pellet storage directly into the combustion chamber of the boiler, where they are burned with the help of a regulated amount of air. The flue gases pass through a double-row tube exchanger, where they are intensively cooled. Unburned waste and ash settles in the combustion chamber, which needs to be cleaned approximately once a week.

VIGAS TVZ hot air boilers are designed for burning dry wood from sawdust to logs up to 35 cm long and 20 cm in diameter. Sawdust, shavings, chips and offcuts must be burned together with logs. The boilers are welded from 4 and 6 mm thick steel sheets. The inner sheets of the boilers, which are in contact with the flue gas, have a wall thickness of 6 mm, the other walls are made of sheet metal with a thickness of 4 mm. The heat exchanger is welded from steel pipes 57x 4.5 mm. The outer casing is made of sheet metal with a thickness of 0.8 mm. The thermal insulation of the boiler consists of insulating material made of mineral wool with a thickness of 20 and 50 mm. The flue gases are discharged through the steel throat into the chimney.

2.2 TECHNICAL DATA

Table 1

THERMAL BOILERS																
VIGAS		16	16 LC	25	25 LC	40	40 LC	60	60 LC	80	80 LC	100	100 LC	UD 29		
Energy efficiency class		A+	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+		
Nominal boiler output		kW		16	25	40	60	80	100	29						
Boiler ecodesign requirements CR (EU) 2015/1189		☑												-		
Boiler class acc. to EN 303-5: 2023		5												3		
Max. operating pressure		bar														
Fuel		Wood, max. moisture 20% of heat value min. 15 MJ/kg												Brown coal		
Output capacity		kW		8 - 18	8 - 31	14 - 41	15 - 72	25 - 92	25-100	8-35(8-29)*						
Fuel consumption with nominal output		kg/hrs.		4,2	4,1	6,6	6,5	10,5	10,3	16,1	15,7	21,4	20,8	26,7	26,0	7,8 (8,0)*
Alternative fuel		wood waste, wood chips, sawdust, sawdust briquettes,														
Chimney draught		mBar		0,10-0,20	0,15-0,25	0,20 - 0,30	0,25 - 0,35	0,15 - 0,25								
Weight		kg		400	430	460	760	930	950	430						
Height with control		A mm		1135		1385	1420	1120								
Height of outlet branch		B mm		1075		1310	1370	1045								
Height of inlet branch		C mm		115		125	215	110								
Height of water-feed valve		D mm		55		70	135	55								
Height of chimney outlet		E mm		890		1110	1160	890								
Width including lever		F mm		645		795	645									
Width including panels		G mm		590		760	590									
Depth		H mm		840	1070	1260	1690	1070								
Exhaust brand		I mm		240		545	240									
Diameter of chimney outlet		J mm		Ø 160		Ø 196	Ø 160									
Depth from edge		K mm		188	305	880	1210	218								
Spacing of insert		L mm		405		70	350									
Diameter of inlet brand		G		2"												
Diameter of outlet brand		G		2"												
Diameter of water-feed valve		G		½"		¾"	½"									
Water volume		l		60	75	93	180	205	215	75						
Gas temperature:																
Nominal output		°C		240												
Minimum output		°C		150												
Gasification chamber dimension - Depth		mm		400	570	750	1150	1090	490/440							
Height		mm		500		750	730	500								
Width		mm		380		440	575	440								
Gasification chamber dimension (w-h)		mm		435 -255		575 - 318	435 - 255									
Max. fuel weight		kg		20	35	55	95	150	140	30						
Capacity of chamber		dm ³		80	120	185	315	483	457	105						
Noise level		dB		45	45,5	47,7	51,4	54,2	45,5							
Max. electric input		W		13,8	25,1	21,9	32,9	34,4	45,9	48,8	60,0	62,1	73,2	142,0	153,8	21,9
Voltage/ frequency		V/Hz														
Pressure loss of water :																
Δt 10 °C		mBar		9,70	9,75	10,48	12,77	11,83	11,53	9,97						
Δt 20 °C		mBar		1,00	1,05	2,55	3,19	2,96	2,84	1,15						
Heat Exchanger																
- inlet water temperature		°C		4 - 15												
- inlet water pressure		bar		min 1 - max 4												
Safety		Drain valve for heat exchanger HONEYWELL TS 131 ¾"														
		Opening temperature 95 °C														
		STB fuse, blow temperature 100°C (tolerance: -6 °C - 0 °C)														
Weight flow of gases		kg/s		0,034 - 0,047												

* specification for wood fuels

2.3 TECHNICAL DAT		Table 2		
WARM WATER BOILER				
Combined boiler Wood and Pellets		VIGAS 12 DPA	VIGAS 18 DPA	26 DPA
Energy efficiency class		A+	A+	A+
Boiler ecodesign requirements CR (EU) 2015/1189		☑	☑	☑
Nominal boiler output WOOD/PELLETS	kW	16 / 12	24 / 18	36 / 26
Boiler class acc. EN 303-5+A1:2023		5		
Max. operating pressure		3		
Fuel WOOD		Max. wood moisture 20% of heating value. 15 MJ/kg		
Fuel PELLETS		Pellets diameter 6 mm, lenght 40 mm (16,5 – 19 MJ/kg) Standard: ÖNORM M 7135, DIN 51731, EN plus A1		
Power range WOOD	kW	7 – 17	8 - 24	15 - 38
Power range PELLETS	kW	1,8 – 12,9	1,8 - 18	6 - 28
Fuel consumption with nominal output WOOD/PELLETS	kg/hrs	4,2 / 2,8	6,3 / 4,5	9,5 / 5,5
Chimney draught	mBar	0,15 - 0,20		0,15 – 0,25
Minimum height /chimney diameter	m/mm	8 / Ø160		8 / Ø200
Temperature setting option	°C	70 - 85		
Weight	kg	530	570	610
Water volume	l	60	75	105
Average gases temperature				
Nominal power (Wood)/(Pellets)	°C	165/155	210/160	260/165
Minimum power (Wood)/(Pellets)	°C	105/75	105/90	105/100
Wood chamber capacity	l	80	105	160
Door dimension (w-h)	mm	435 -255		
Wood chamber dimension				
Depth	mm	370	520	
Height	mm	500		740
Width	mm	380		
Max. weight of wood fuel	kg	20	35	50
Pellet container capacity	l	225	250	340
Max. weight of pellet fuel	kg	135	165	225
Noise level	dB	45,5		
Max. el. power during ignition	W	1600		
Max. el. input during burning (Wood)/(Pellets)	W	13,8 / 84,9	29,9 / 84,9	37,6 / 130,5
Voltage/ frequency	V/Hz	230ACV/50		
Pressure water loss :				
Δt 10 °C	mBar	4,26	9,97	10,48
Δt 20 °C	mBar	1,06	1,15	2,55
Burning time at nominal power				
Wood	hours	4,5	6,0	4,2
Pellets	hours	48	35	40
Cooling heat exchanger				
- water temperature inlet	°C	4 – 15		
- water pressure inlet	bar	min. 1 – max. 4		
SAFETY		Drain valve HONEYWELL TS 131 ¾" Release temperature 95 °C STB fuse, release temperature 100 °C (tolerance: -6 °C – 0 °C)		
Flue gas mass flow		0,034 – 0,047		

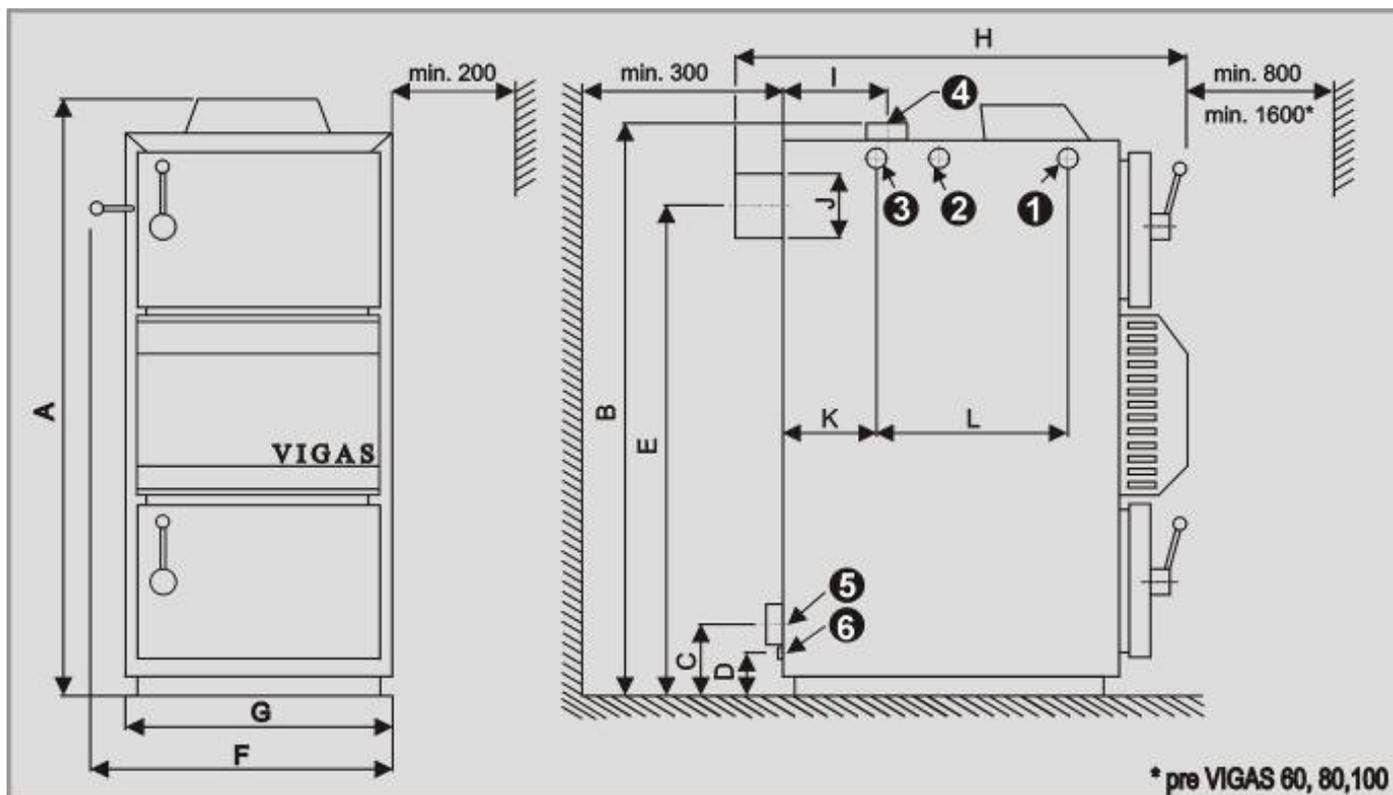
2.4 TECHNICAL DATA HOT AIR BOILERS VIGAS TVZ

Table 3

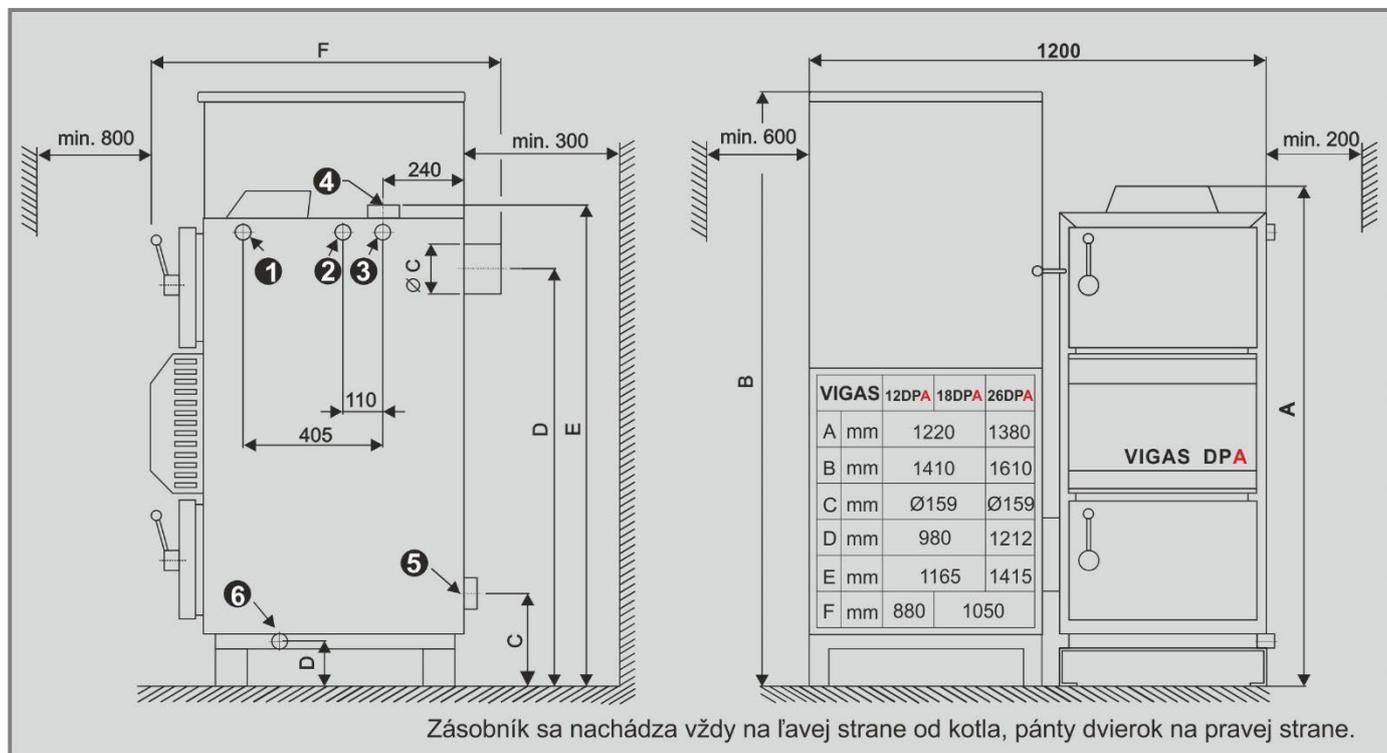
Hot air boilers VIGAS TVZ		
Output capacity	kW	25
Fuel		Wood, max. moisture 20% of heat value min. 15 MJ/kg
Output capacity	kW	5 -28
Fuel consumption with nominal output	kg/hrs	7,6
Efficiency	%	85
Alternative fuel		wood waste, wood chips, sawdust, sawdust briquettes,
Chimney draught	mBar	0,15 – 0,20
Temperature adjustment range	°C	40 - 120
Weight	kg	450
Height with regulation	A mm	1250
Exit neck height	B mm	1540
Suction neck height	C mm	330
Chimney neck height	D mm	1000
Width with drawbar	E mm	645
Width	F mm	590
Depth	G mm	1280
Outlet nozzle	H mm	240
The size of the outlet	mm	250 x 250
The diameter of the chimney neck	I mm	Ø160
Flue gas temperature at rated power	°C	260
at minimum power	°C	170
Emissions		
CO	%	do 0,2
Nox	%	do 0,01
Dimensions of the filling chamber		
Depth	mm	490
Height	mm	500
Width	mm	440
Dimensions of the filling hole (w-h)	mm	435 - 255
Max. weight of fuel	kg	28
Filling chamber volume	l	110
Noise	dB	70,5
Electric input	W	640
Burning time at min. performance	hod	3,80
Mass flow of flue gas	kg/s	0,034 – 0,047
Voltage/frequency	V/Hz	230ACV/50

2.5 DIMENSION SKETCHES

Dimensional sketch of VIGAS hot water boilers to table 1.

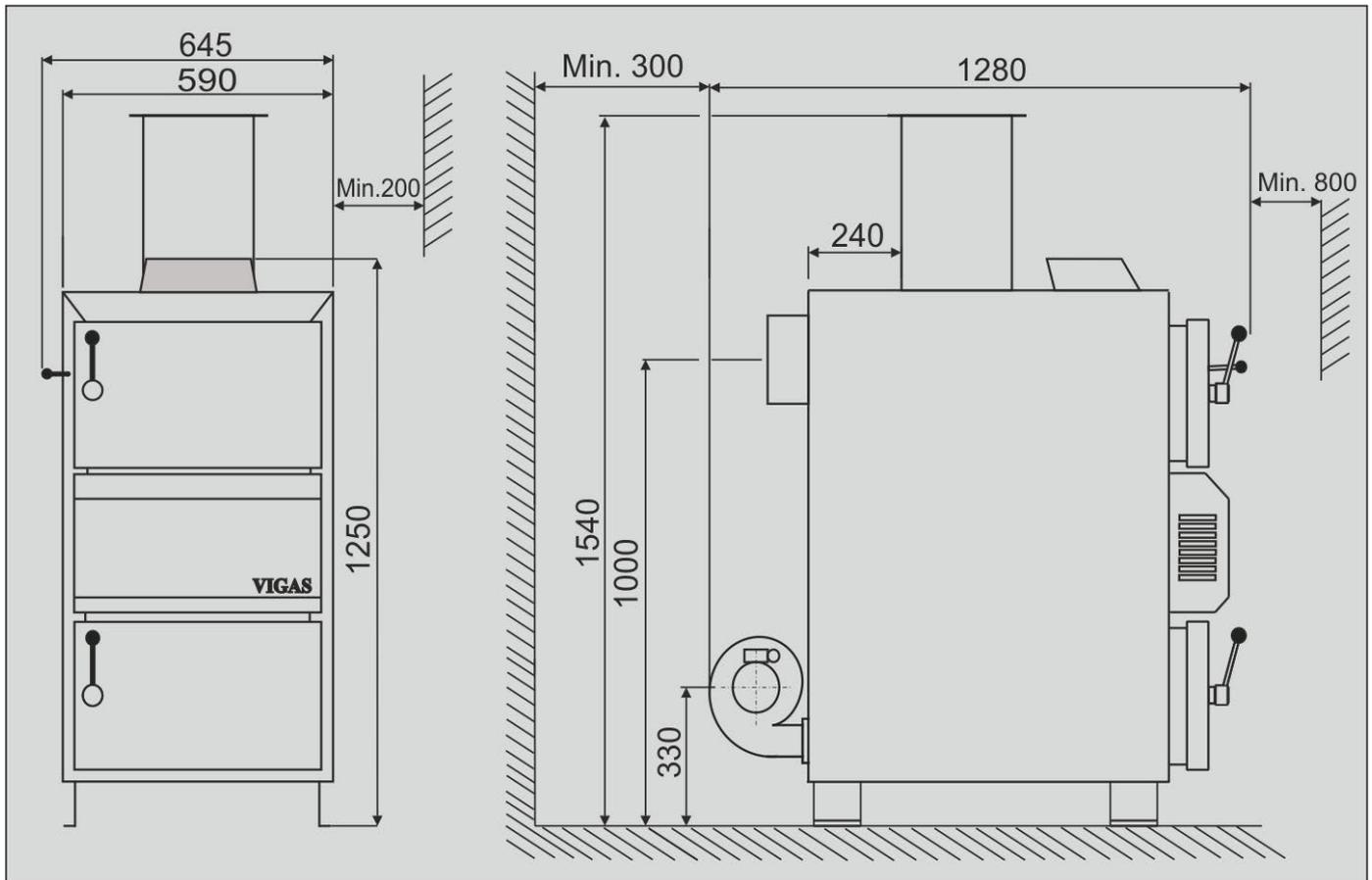


Dimensional sketch of VIGAS DPA hot water boilers to table 2.

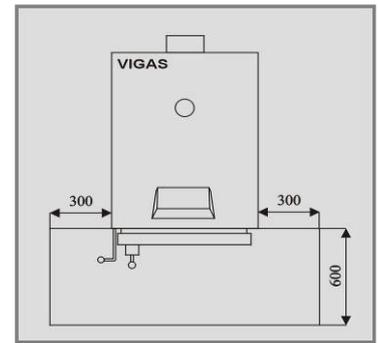
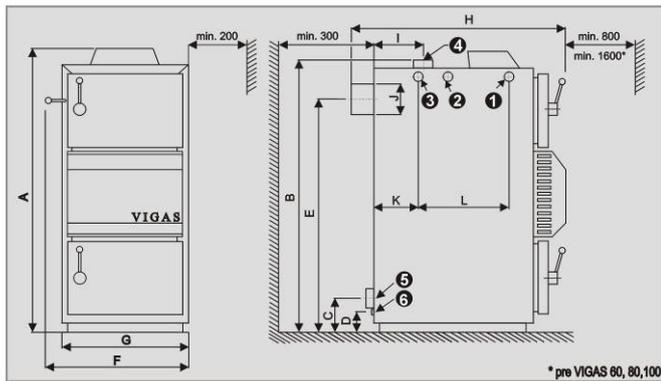


1. Inlet for drain valve
2. Hole for immersion valve housing
3. Cooling water outlet 3/4"
4. Hot water outlet
5. Return water inlet
6. Filling valve

Dimensional sketch of the VIGAS hot air boiler to table 3.



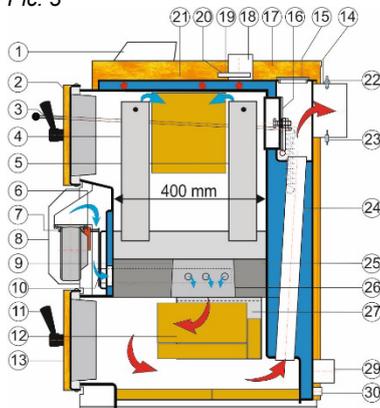
2.6 DIMENSION CHART AND THE POSITION OF SAFETY PLATE TO ENSURE PROTECTION OF INFLAMMABLE FLOORING



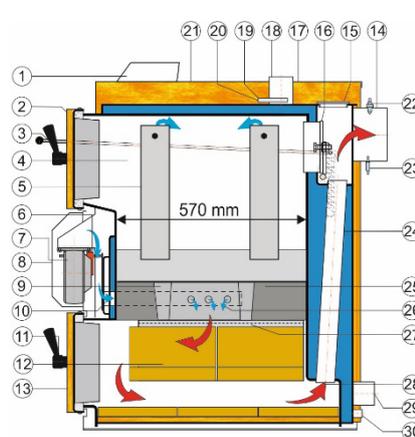
2.6.1 BOILER SCHEMATICS

Schematic VIGAS 16

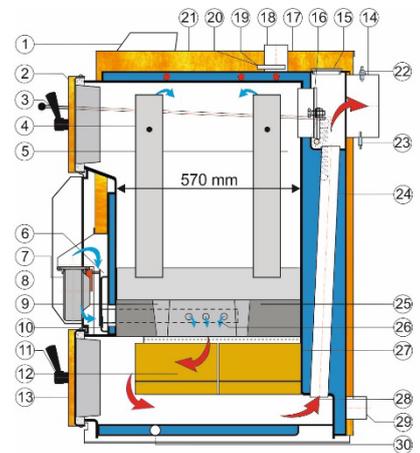
Pic. 3



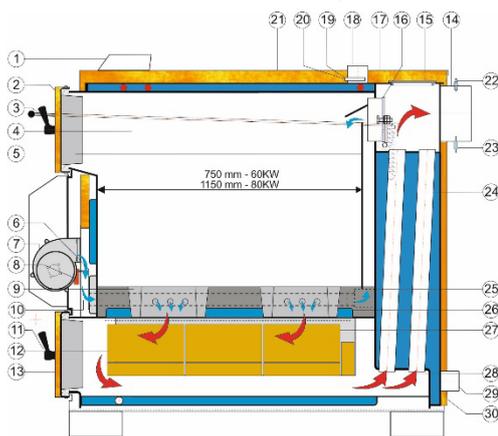
Schematic VIGAS 25



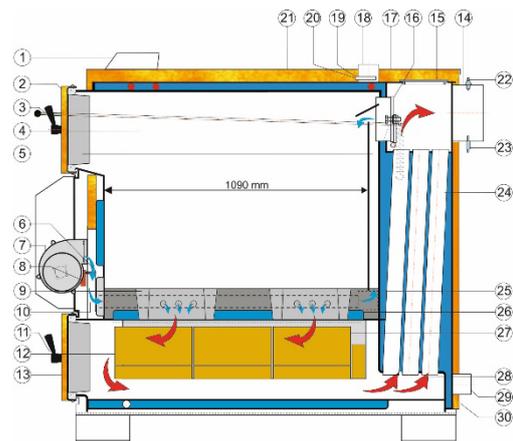
Schematic VIGAS 40



Schematic VIGAS 60,80



Schematic VIGAS 100



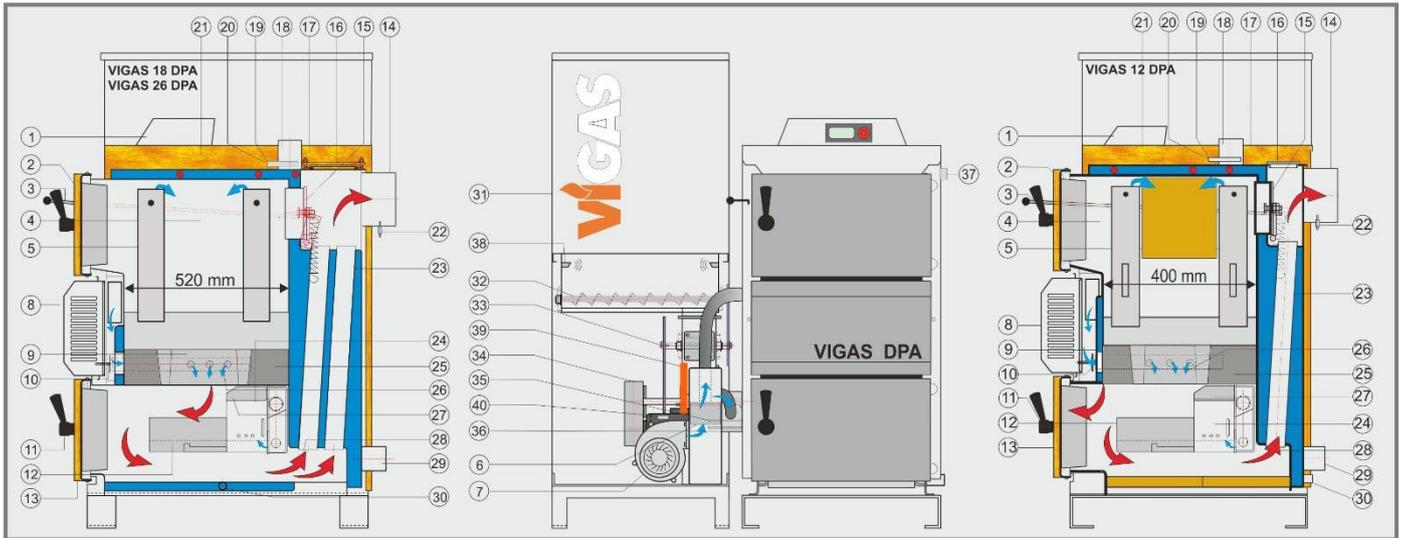
DESCRIPTION

1. Control AK4000
2. Upper door
3. Chimney flap operating rod
4. Chamber area
5. Primary air conduction
6. Flap for servo Belimo
7. Fan
8. Fan cover
9. Nozzle
10. Secondary air flap

11. Handle
12. Fireclay bricks
13. Bottom door
14. Chimney output
15. Exchanger cover
16. Light up flap
17. Upper back panel
18. Water outlet
19. Thermal fuse
20. Thermometer
21. Upper front panel

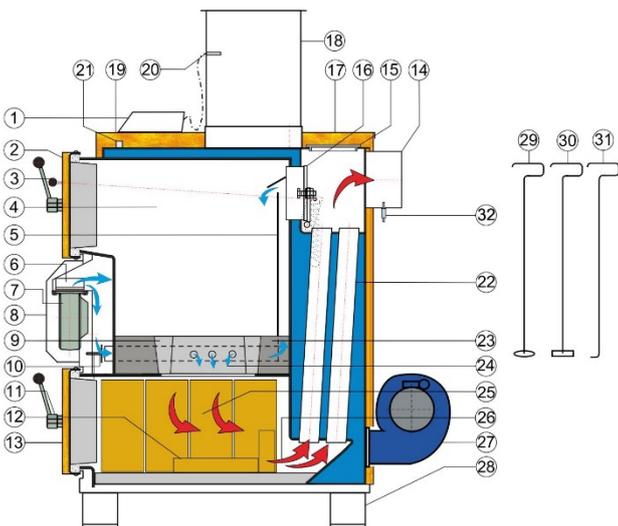
22. Lambda sonda
23. Gases thermometer
24. Exchanger pipes
25. Heat proof/concrete filling
26. Secondary air
27. Combustion chamber
28. Gases direction
29. Reverse water leak
30. Filling leak

2.6.2 Scheme of combined boilers VIGAS DPA



DESCRIPTION		
1. Control AK 4000	14. Chimney flue	28. Flue gas direction
2. Upper door	15. Firing shutter	29. Return water mounting
3. Chimney flap opening rod	16. Heat exchanger cover	30. Water inlet
4. Wood chamber	17. Upper back cover panel	31. Pellet container
5. Primary air supply	18. Water outlet	32. Pellet screw feeder
6. Shutter	19. Fuse STB	33. Chamber feeder (tourniquet)
7. Fan	20. Temperature sensor	34. Driving gear
8. Cover panel	21. Upper front cover panel	35. Ignition coil
9. Nozzle	22. Gas temperature sensor	36. Connection device
10. Secondary air shutter	23. Heat exchanger pipes	37. Safety cooling exchanger
11. Handle	24. Pellet burner	38. Ultrasound pellet sensor
12. Fire clay bricks	25. Fire proof lining	39. Servo-drive
13. Bottom door	26. Secondary air	40. Safety temperature sensor
	27. Brick LAC 45 (deflector)	

2.6.3 Scheme of a hot air boiler VIGAS 25 TVZ



DESCRIPTION		
1. Control AK 4000	11. Door lock	22. Heat exchanger tubes
2. Upper door	12. Fireclay bricks	23. Fired concrete lining
3. Chimney damper rod	13. Bottom door	24. Secondary air
4. Storage space	14. Chimney neck	25. Combustion chamber
5. Primary air line	15. Exchanger cover	26. Flue gas direction
6. Blower fan flap	16. Chimney flap	27. Cooling fan
7. Blowing fan	17. Upper back cover	28. Legs
8. Fan cover	18. Outlet nozzle	29. Sweeping plate
9. Aerated concrete nozzle	19. Upper front cover	30. Sweeping scraper
10. Aperture sec. air	20. Thermometer	31. Sweeping hook
	21. Thermal fuse	32. Flue gas thermometer

3. BASIC PARTS OF BOILERS

3.1 BOILER BODY

The boiler bodies are welded from steel sheets 4 and 6 mm thick. The inner sheets of the body that are in contact with flue gases have a wall thickness of 6 mm. The heat exchanger is welded from steel pipes (57x 4.5 mm). Depending on the type of boiler, the heat exchanger is designed as single-row for boilers VIGAS 12DPA, 16, 25,40, as double-row for boilers VIGAS 18DPA, 26DPA, 60, 80, 25 TVZ and three-row for boiler VIGAS 100. In the case of boilers marked LAMBDA CONTROL (LC), the standard boiler body according to Fig.1 is used. All hot water bodies are equipped with an overheating exchanger according to STN EN 303-5+A1:2023 as standard. The exchanger is made of a Cu pipe with a diameter of 18 mm. The housings are welded in robotic workplaces using MAG technology. After welding, each body is pressure-tested according to the control procedure (KP-002/2008). The test is carried out with pressure medium (water) at a pressure of 4 bar for at least 30 min.

3.1.1 BOILER BODY VIGAS

The body includes fireclay bricks in the combustion chamber, a refractory concrete nozzle and refractory concrete lining, an exchanger cover and a chimney damper rod. In terms of production, we divide bodies into "Right" and "Left". As standard, all boilers are supplied in the right version (Fig.1). The hinges of the door on the right side, the handle of the chimney damper and the sockets for connecting the cooling circuit are located on the left side of the body. In the case of delivery of the left body, the hinges are on the left side and the handle of the chimney damper and sockets on the right side. All bodies have removable lateral air ventilation.

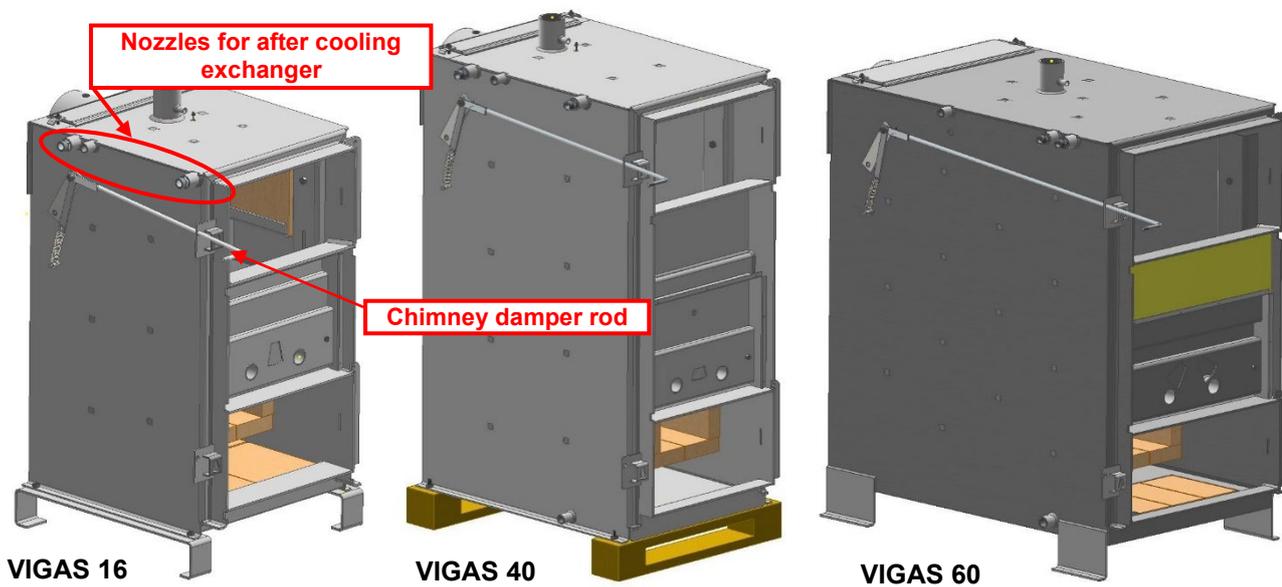


Fig.1

3.1.2 VIGAS DPA COMBINED BOILER BODY

Includes fireclay bricks in the combustion chamber, hot concrete nozzle and hot concrete lining, heat exchanger cover and chimney flap rod. The bodies are supplied only in the right version according to fig.2. The chimney flap rod is located on the left side, the nozzles for connecting the cooling circuit and the filling nozzle are located on the right side of the body.

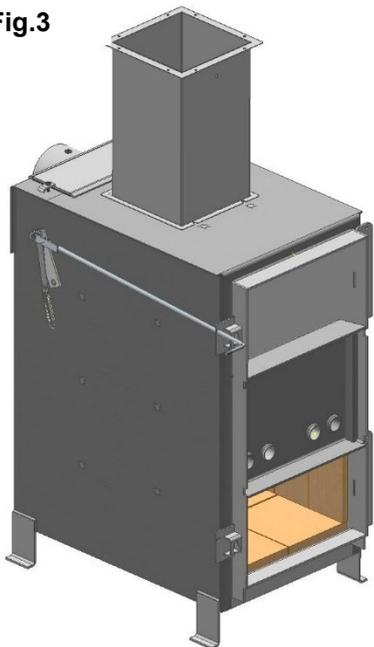


Fig.2

3.1.3 VIGAS 25 TVZ BOILER BODY - HOT AIR

Included are fireclay bricks in the combustion chamber (P2 8 pcs), (P3 4 pcs), (P4 4 pcs), refractory concrete nozzle and refractory concrete lining, heat exchanger cover, chimney flap rod and hot air outlet in the upper part of the boiler body. The bodies are supplied only in the right version according to fig.3.

Fig.3

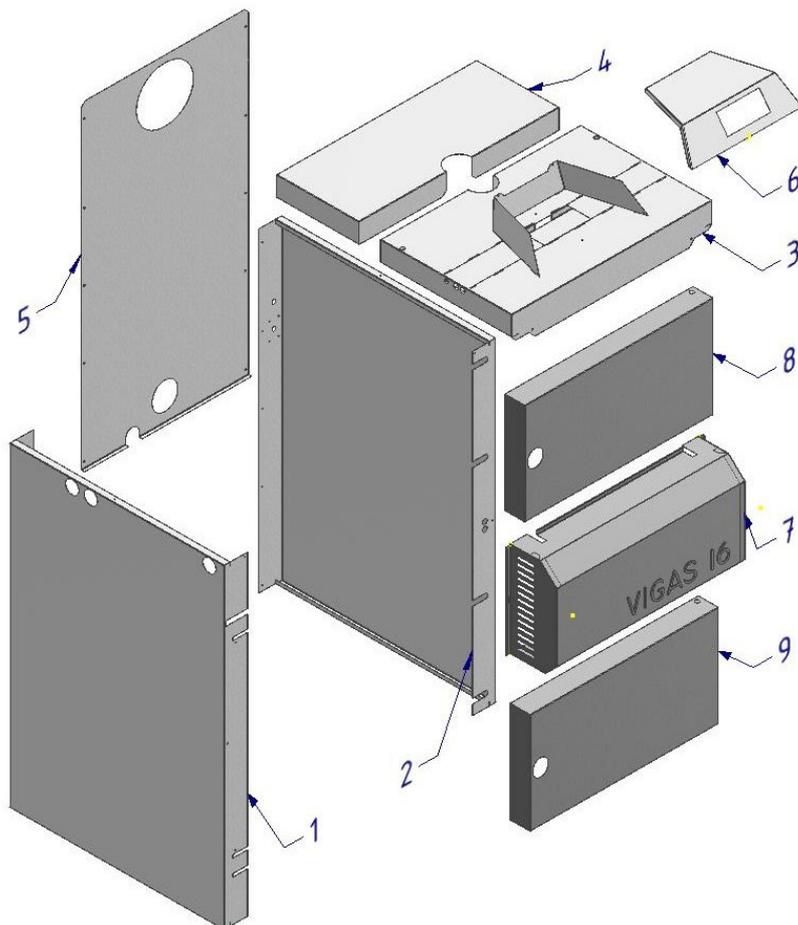


VIGAS 25 TVZ hot air

3.2 BOILER BODY COVER SHEETS

By the term covering sheets we mean the casing of the boiler body made of sheet metal with a thickness of 0.8 mm, which is sprayed with powder fired paint. The spray protects the cover sheets against corrosion. Fig. 4 shows the assembly of VIGAS 16 cover sheets, hinges on the right side. In case of damage to the cover parts, it is necessary to specify the "CODE of the spare part" when ordering the spare part according to tab. 4.

Fig.4



POS	Title
1	Left side cover
2	Right side cover
3	Upper front cover
4	Rear upper cover
5	Back cover
6	AK4000 regulation cover
7	Fan cover
8	Door cover UPPER
9	Door cover LOWER

Note:

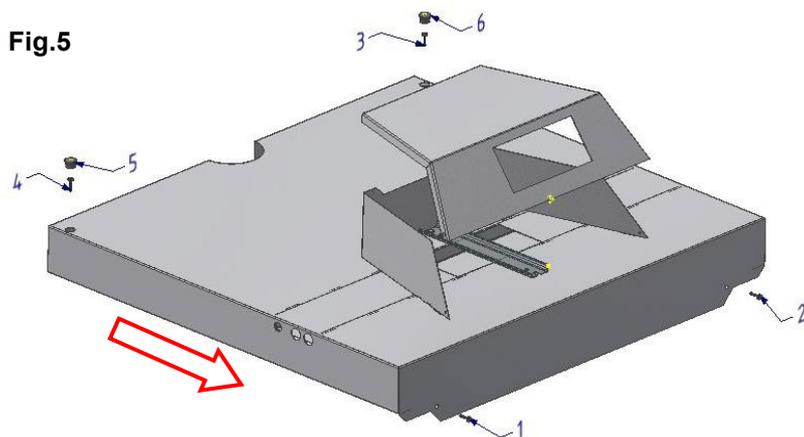
In the case of the fan cover (7), it is necessary to specify the inscription. (E.g. VIGAS 16 or VIGAS 16 LC.)

Color:

RAL 9006 Silver - (fig. 4 – pos. 1, 2, 3, 4, 5, 6)
RAL 7005 Gray - (fig.4 - pos.7, 8, 9)

BOILER TYPE	Position according to fig.4								
	1	2	3	4	5	6	7	8	9
	Spare part code (SP)								
VIGAS 16	0902	0901	0906	0907	0905	1007	0909	0908	
VIGAS 16 LEFT	0904	0903	0916						
VIGAS 25	0912	0911							
VIGAS 25 LEFT	0914	0913							
VIGAS 40	0924	0923	0940	0927	0939	0944	0942	0943	
VIGAS 40 LEFT	0926	0925							
VIGAS 60	0936	0935	0953	0940	0939	0944	0942	0943	
VIGAS 60 LEFT	0938	0937							
VIGAS 80	0949	0948							
VIGAS 80 LEFT	0951	0950							
VIGAS 100	0949	0948	0906	0907	0905	0909/B	0908		
VIGAS 100 LEFT	0951	0950							
VIGAS 12 DPA	0902/A	0901/A	0916	0907	0905	0909/B	0908		
VIGAS 18 DPA	0912/A	0911/A							
VIGAS 26 DPA	0925/A	0924/A	1000	1001	0999	0931/B	0909		
VIGAS 25 Hot air	0912/A	0911							

3.2.1 Disassembly - assembly of the upper front cover (fig. 4 - pos. 3)

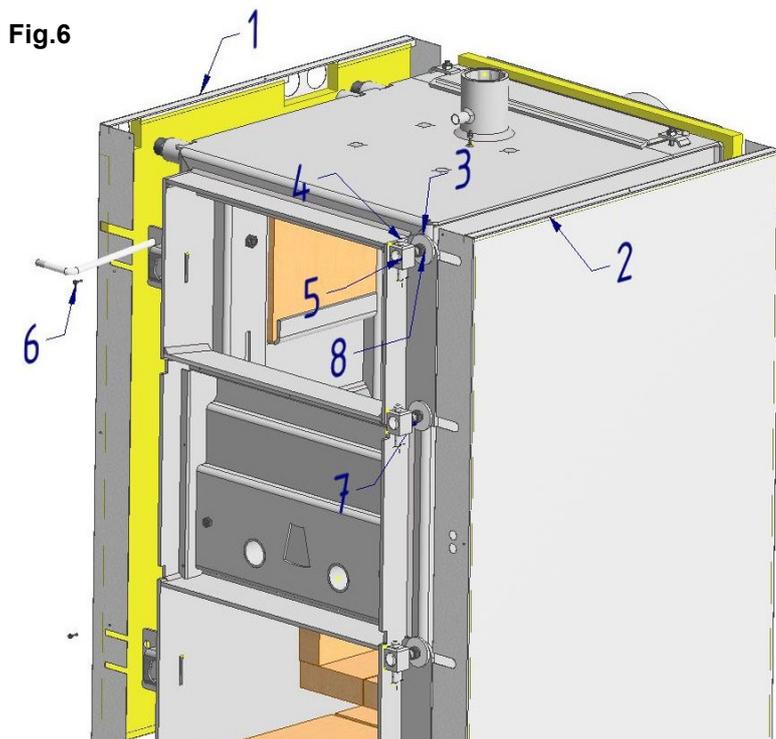


In the case of dismantling the top cover, proceed as follows:

1. Disconnect the boiler from the electrical network.
2. We unscrew the screws (1, 2).
3. Using a flat screwdriver, carefully remove the plastic covers of the holes (5, 6).
4. Loosen the screws (3, 4) slightly.
5. Move the cover approx. 1 cm in the direction of the arrow and then carefully lift it up.

By releasing the upper front cover, the boiler thermometer and the STB fuse capillary, which are located in the boiler outlet nozzle, become accessible.

3.2.2 Disassembly - assembly of the left and right side covers

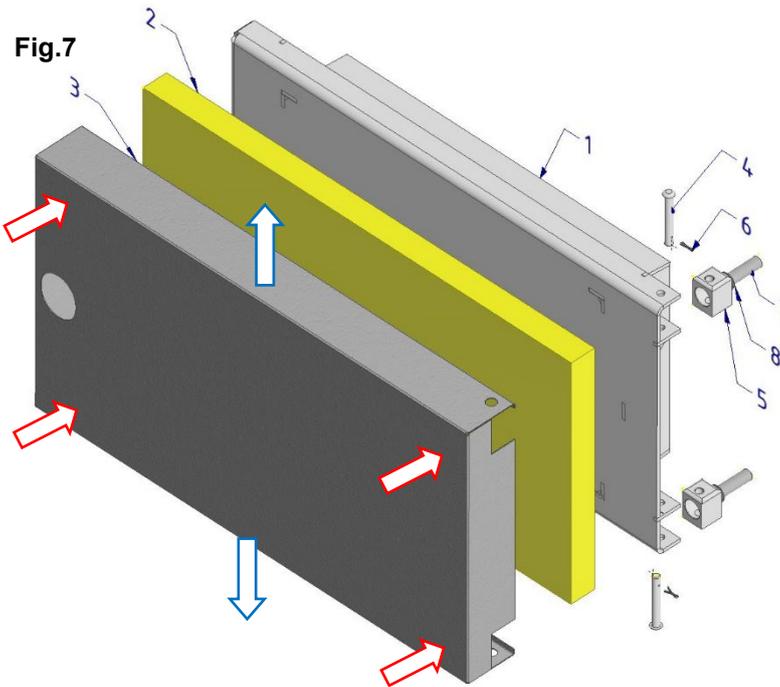


When disassembling the side covers, we proceed as follows: First, we must dismantle the upper front cover according to the above procedure. Subsequently, we also take off the upper back cover (fig. 4-pos. 4). Unscrew and remove the fan cover (fig. 4-pos. 7). Before disassembling the side covers, the upper and lower doors must be sufficiently closed so that the doors do not move. From the back side, unscrew all the self-tapping screws that connect the back cover (fig. 4-5) and this will release both side covers 1 and 2. When disassembling the cover on the hinge side (2), loosen all the nuts (8) that press on the galvanized washer (3). When disassembling the cover on the side of the lid (1), unscrew the two self-tapping screws (6) located under the door lid. The covers can then be dismantled.

Notice:

We proceed carefully when disassembling the cover (2), because it includes the wiring to the fan and flue gas thermometer, or Lambda probe.

3.2.3 Disassembly - assembly of the door cover (fig. 4 – pos. 8, 9)



In the case of disassembling the door cover, proceed as follows:

First, we dismantle the entire door by first pulling out the cotter pins (6) and then removing the hinge pins (4) and the lid blocks (5). Place the door (1) with the concrete part down. Open the door cover (3) on the long sides in the direction of the blue arrows and remove it.

When installing a new door cover, proceed as follows:

Place the door insulation (2) on the door (1). We gradually press the door cover (3) with force in the corners in the direction of the red arrows. The door cover is only bumped!!! Then we put on the hinge cubes (5) and insert the pins (4) and pins (6).

Notice:

We mount the cube hinge (5) by rounding the upper edge upwards. In the case of the left version of the boiler, the standard door is only turned. In this case, the cubes of the hinge (5) are also turned from the factory, so that the rounding of the edge of the cube points upwards.

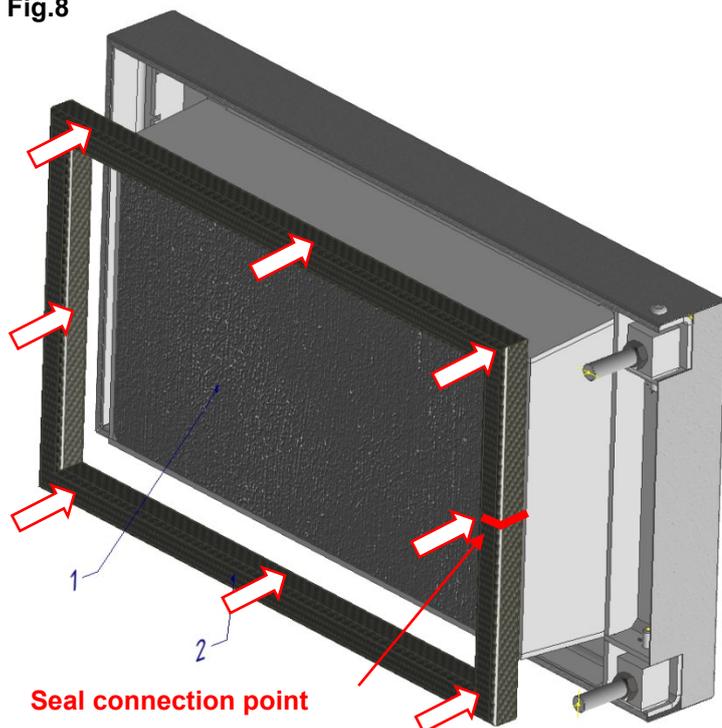
- 1. Door - weld
- 2. Door insulation
- 3. Door cover
- 4. Hinge pin (thread Ø8-60)
- 5. Hinge cube
- 6. Cotter pin DIN 94 (2 x 10)
- 7. Hinge screw M12, for VIGAS 60, 80,100 - M16
- 8. Hinge nut M12, for VIGAS 60, 80,100 – M16

3.3 BOILER DOOR

In general, on VIGAS boilers, we distinguish between an upper door that closes the storage space and a lower door that closes the combustion chamber. The door is designed in such a way as to prevent heat transfer to the boiler room space as much as possible. They have double thermal insulation, which is located under the door cover and insulation, which is located under the hot concrete lining.

3.3.1 Replacing the door seal

Fig.8



The most frequently performed maintenance of the door (1) is the replacement of the door seal (2). The reason for the replacement is usually smoke from the top door to the boiler room. When replacing or rotating the seal, proceed as follows:

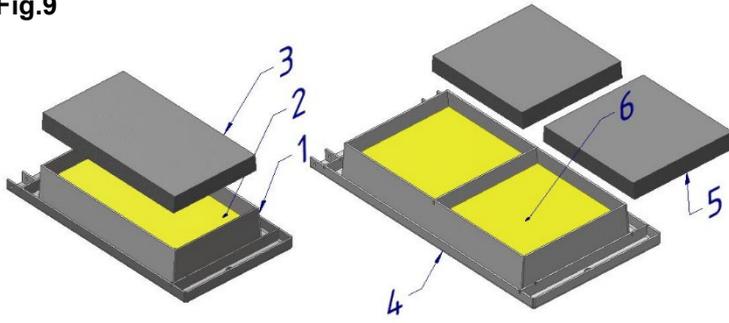
1. Open the boiler door to the maximum.
2. On the side of the hinges, with the help of a flat screwdriver, we find the center where the gasket is connected.
3. Then gradually remove the hardened gasket with a screwdriver.
4. Connect the ends of the new or turned old gasket together and push it into the groove in the middle between the hinges.
5. We divide the remaining length of the seal evenly on the remaining sides and push it into the groove in the middle of each side.
6. When pushing the seal, proceed from the center to the corners of the door. We make sure that the gasket is not twisted and that the corners are completely filled.

Code SP	Boiler type VIGAS	Length L (mm)
0401	16 – 40, 12,18,26 DPA	1450
0402	60,80,100 UPPER	1800
0403	60,80,100 LOWER	1700

- 1. The door
- 2. Door seal (glass fiber dimension 25 x 25 - L)

3.3.2 Aerated concrete lining of the door TYP: KALINIT ŽO 1200

Fig.9



The most common cause of damage to the lining of the upper door is fuel being pushed through the door. When repairing a damaged refractory concrete wall, we proceed as follows:

1. We disassemble the door by pulling out the latches and pins (fig. 7 - pos. 4, 6), the damaged lining must be cut out. Under the lining is the Nobasil thermal insulation material (fig. 9 - pos. 2,6), which we will leave there.
2. We will prepare the required amount of hot concrete mixture, which we will mix with water.

Notice:

Aerated concrete mixture, in which the chemical hardening reaction has already started, can no longer be additionally diluted with water!!!

3. Fill the door space with the mixture and smooth it.
4. Manipulation with the door only after the mixture has hardened after approx. 24 hours.

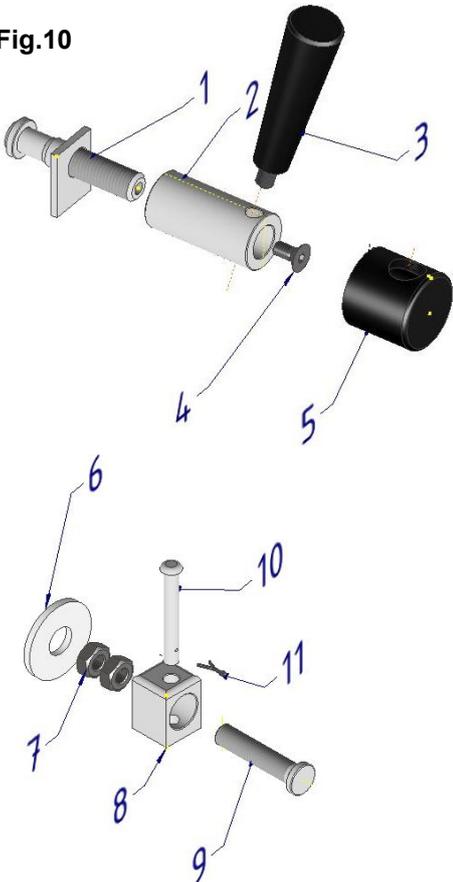
VIGAS DOOR12-40

VIGAS DOOR 60-100

DOOR TYPE	Weight of dry concrete (kg)	Water* (L)
For VIGAS 16-40, DPA	10	1,2-1,4
For VIGAS 60-80 UPPER	14	1,7-2
For VIGAS 60-100 LOWER	11	1,3-1,5
* working water(12-14 L/100kg)		

3.3.3 Door latch, door hinge and door adjustment

Fig.10



DOOR CLOSURE		
Position	Code SP	Popis
1	0603	The opposite of the closure
2	0602	M16 door lock
3	0604	Cap handle
4	-	Screw DIN 7991 M8x20
5	-	Plastic cap
DOOR HINGE		
6	0611	Hinge pad Ø12
	0611/A	Hinge washer Ø16 for VIGAS 60,80,100
7	0610	Nut M12 Zn
	0610/A	Nut M16 Zn for VIGAS 60,80,100
8	0607	Hinge cube Ø12
	0607/A	Hinge cube Ø16 for VIGAS 60,80,100
9	0608	Hinge screw M12
	0606	Hinge screw M16 for VIGAS 60,80,100
10	0609	Hinge thread Ø8x60
11	-	Cotter pin DIN 94 2-10
12	0601	Cap complete

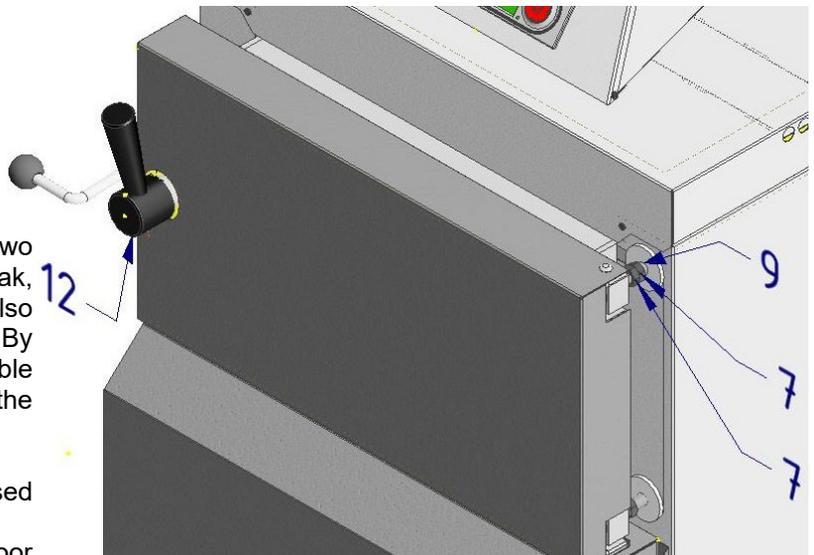
DOOR ADJUSTMENT PROCEDURE

The boiler door is stabilized at three points, on two pivot pins (10) and a cap (12). In case of a door leak, in addition to closing it with a twist cap, it is also possible to adjust it further from the hinge side. By loosening and countersunk the nuts (7), it is possible to turn the hinge screw (9) and thereby move the door in the desired direction.

NOTICE:

When adjusting the door, the door must be closed using the cap (12) !!!

If the nuts on the hinge side were loosened, the door would "sag".

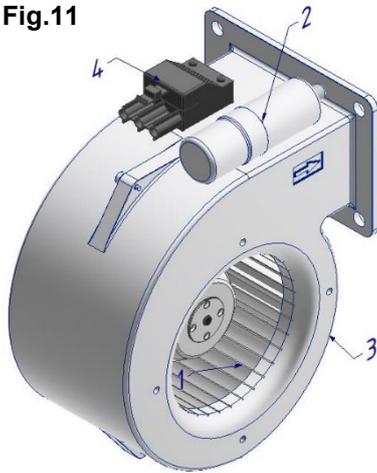


3.4 VIGAS BOILER FANS

VIGAS boilers are designed as positive pressure, which means that the necessary amount of air for combustion is supplied by a pressure fan. In connection with the AK 4000 boiler regulation, EBM pressure fans are always supplied. In the case of the VIGAS 25 TVZ hot air boiler, a KONWEKTOR type WBS-2 fan is additionally used for cooling. A V25 or V80 exhaust fan with an ATAS engine can be used as an accessory for all types of boilers.

3.4.1 EBM pressure fan

Fig.11



1. Impeller with motor
2. Starting capacitor
3. EBM fan
4. Connection connector

The purpose of the EBM pressure fan is to deliver the required amount of air reliably and for a long time. In practice, it often happens that the fan works in a dirty and dusty environment. This results in an increase in noise and a reduction in performance or a complete stop of the fan at reduced performance. The boiler gradually loses power and its emission parameters deteriorate.

For this reason, it is necessary to regularly check the fan.

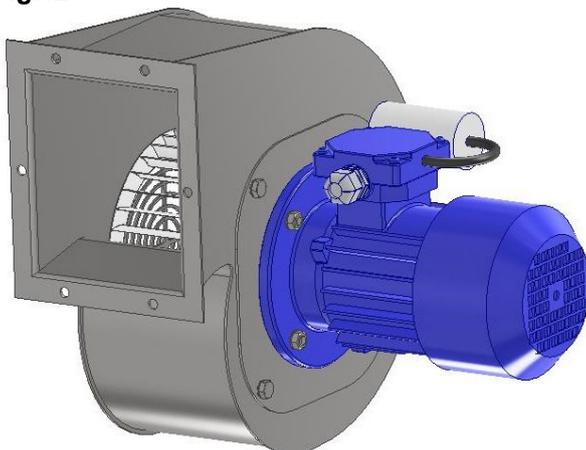
Description of the fault	Removal
The boiler loses power, it does not burn like when it was new.	Dust may be deposited on the blades of the impeller (1). Use a long, thin screwdriver or a brush to clean the impeller. If the problem is not eliminated - replace the fan.
The fan is noisy.	Damage to bearings, deformed impeller - fan replacement
The fan does not spin.	Check fuses F1 and F2 on the power board, check the cable to the fan - replace the fan.
The fan does not spin, but it starts up by turning it with your hand.	Damaged start-up capacitor - replace the capacitor.

NOTICE:
The fan speed is modulated by the voltage from the AK 4000 control unit according to the type of boiler, which means that the input voltage to the fan measured with a classic voltmeter will not be 230V.

TYPE of fan	Boiler type VIGAS									
	16	25	40	60	80	100	12 DPA	18 DPA	26 DPA	25 TVZ
	Spare part code (SP)									
EBM - G2E 108	0514	0514	0514	0514	0514	-	0514	0514	-	0514
Capacitor 1,5 µF	0515	0515	0515	0515	0515	-	0515	0515	-	0515
EBM - G2E 120	-	-	-	-	-	0516	-	-	0516	-
Capacitor 2,0 µF	-	-	-	-	-	0515/A	-	-	0515/A	-
KONWEKTOR WBS - 2	-	-	-	-	-	-	-	-	-	0513

3.4.2 Cooling fanKonwektor WBS–2 for VIGAS 25 TVZ

Fig.12



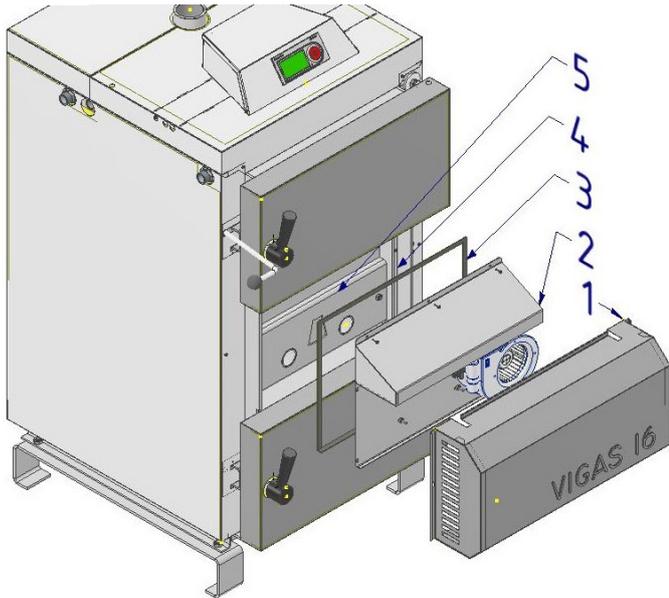
With the hot air boiler VIGAS 25 TVZ, a cooling fan located in the rear part of the boiler is used to cool the body. The cooling fan is switched on automatically depending on the chimney temperature. The temperature at which the cooling fan is switched on is selected in the boiler parameter settings (**start** **MENU 2**). The cooling fan turns off **10 °C** below the switch-on temperature. The value can be set in a range **from 70 °C to 220 °C**. The recommended value is **120°C**.

Description of the fault	Removal
The fan is noisy.	Damage to bearings, deformed impeller - fan replacement
The fan does not spin.	Check fuses F1 and F2 on the power board, check the cable to the fan - replace the fan.

NOTICE:
Without the correct operation of the cooling fan, the hot air boiler cannot be operated at all.

3.5 SHEET UNDER THE FAN (SUF)

Fig.13



The basic part of every VIGAS boiler is the sheet under the fan (SUF). It serves to divide the air into primary and secondary lines. According to boiler type and functionality, we divide them into:

1. **VIGAS STANDARD**
2. **VIGAS LAMBDA CONTROL**
3. **VIGAS DPA**

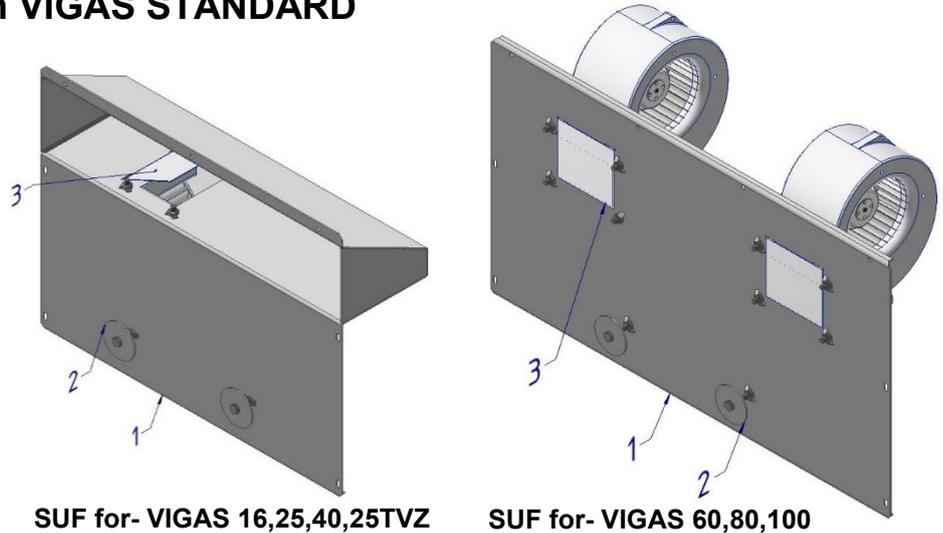
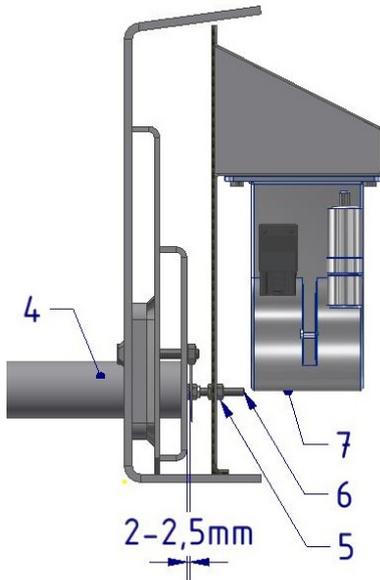
The SUF (2) is located under the fan cover (1). It is screwed to the body of the boiler with self-tapping screws located around the perimeter of the sheet metal. There is a fiberglass sealing cord (3) between the boiler body and the SUF. The seal contains a self-adhesive layer and is glued to the frame (4) of the boiler body. Under the SUF there is a removable air plate (5), which has two circular holes for leading secondary air to the nozzle and one central hole for leading primary air to the filling chamber. The ratio of primary and secondary air is set in the version **STANDARD** a **DPA** manually and in version **LAMBDA CONTROL** automatically using the BELIMO servo.

Type of sheet under the fan (SUF)	Boiler type VIGAS									
	16	25	40	60	80	100	12 DPA	18 DPA	26 DPA	25 TVZ
	Spare part code (SP)									
STANDARD *		0921		0946		0946/A		-		0921
LAMBDA CONTROL *		0910		0947		0947/A		-		-
VIGAS DPA *								0921/A		-
SEALING SUF		0407			0409				0407	

* SUF it is delivered without a fan, without air flaps, without a servomotor.

3.5.1 Sheet under the fan VIGAS STANDARD

Fig.14



1. Sheet under the fan (SUF)
2. Secondary air flap
3. Safety valve
4. Secondary air tube
5. Flap lock nut sec. air
6. Setting screw sec. air
7. EBM pressure fan

The standard plate under the fan consists of an EBM pressure fan (one or two depending on the boiler type and performance, see tab. 5), secondary air flaps (2) and safety flap (3).

Procedure for setting the secondary air flaps (2):

After installing and fixing the SUF with self-tapping screws, loosen the locking nut (5). Using a screwdriver, turn the screw (6) clockwise until it is pressed against the pipe (4). Then we turn the screw (6) **back about 2.5 turns**. Secure with a nut (5) and install the fan cover. We always set both flaps!!!

NOTICE:

The adjustment of the secondary air flaps must always be performed after each assembly of the SUF. With a small opening, incomplete combustion may occur, or with a large opening, the so-called "banging in the cauldron".

3.5.2 Sheet under the fan VIGAS LAMBDA CONTROL

For VIGAS boilers with the Lambda Control (LC) designation, a valve (2) controlled by a servo motor (5) is used to divide primary and secondary air. The opening position of the flap changes depending on the value of lambda λ measured using the Lambda probe located on the outlet chimney neck of the boiler. In order for the system to work reliably, it is important to correctly adjust and align the flap (2).

Air flap adjustment procedure(2, 2-A):

1. Before assembling the SUF, disconnect the boiler from the electrical network, disconnect the servo and fan connector.
2. If necessary, remove the air plate (9) and clean the primary air line. Let's start the sheet of air.
3. Before starting the PPV, loosen the nut (7) on the servo (5). This releases the flap axis (6) from the servo (5). Then we check the SUF seal (fig. 13 - item 3) and, if necessary, replace it (tab. 6).
4. Subsequently, we install the SUF and fasten it with screws.
5. Gently press the flap axis onto the air plate (9) and secure it with a nut (7). **We make sure that the flap (2) is evenly pressed over the entire surface of the air plate (9).**

NOTICE:

The position of the valve in which it is secured is not important, because after connecting the boiler to the electrical network, a RESET of the servo position is performed, in which position stops (3) are used. The position is reset every time there is a power outage, or every 24 hours.

TIP:

On the servomotor (5) there is a "magnetic gear release" point (7-A), on which, when we apply the magnetic part of the orange cover of the servomotor, the movement fuse of the axis holder will be released. Subsequently, by inserting a screwdriver into the groove on the axis (6), we can rotate the valve (2) freely and test its easy operation. Through the sight glass (8) we can check the position and pressing of the flap (2). After the magnet is removed, the movement fuse is secured again.

6. We connect the boiler to the electrical network. This is followed by a RESET of the servo (fig. 16). The servo goes to the closed position on the AK4000 display, the servo 0% is displayed. In this damper position, both primary and secondary air must be closed. After turning the boiler "ON", the servo moves to the servo 100% position. In this damper position, both primary and secondary air must be open. Another important position is servo 45%. In this position, the secondary air is closed and the primary air is open. The servo moves to the position (**servo 45%**) if the value of the measured lambda " λ " is greater than the desired value. The recommended value is " $\lambda = 1.35$ " which represents approx. 6% of oxygen in the flue gas.

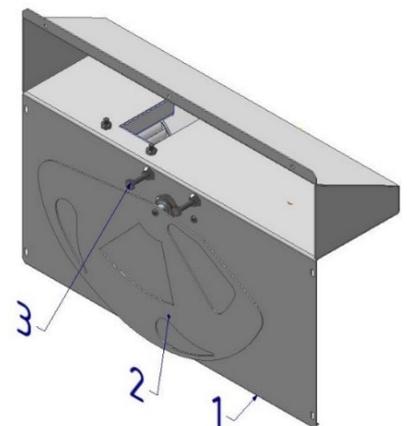
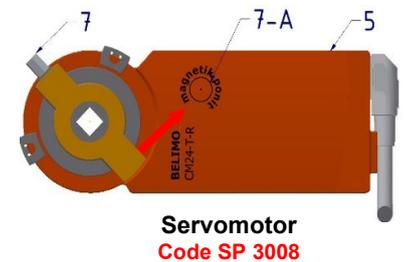
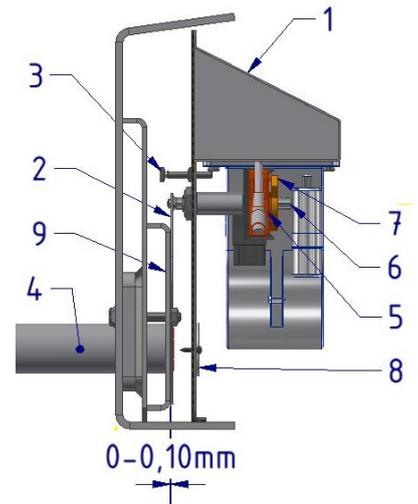
7. Install the fan cover.

NOTICE:

The cause of increased oxygen content in flue gas ($\lambda = 2.2$) can be:

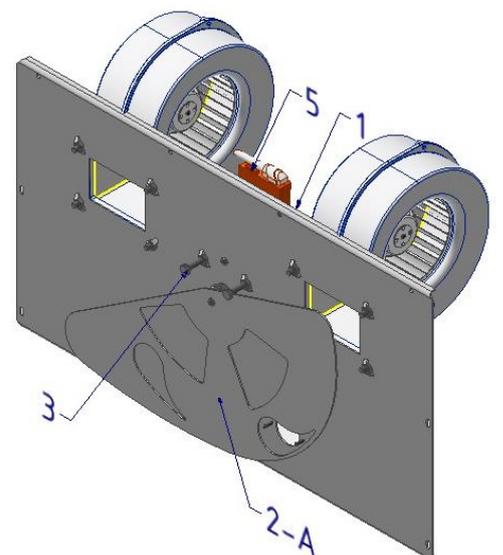
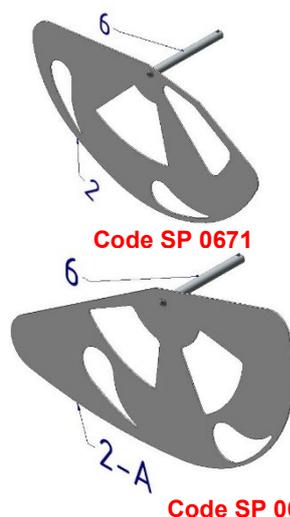
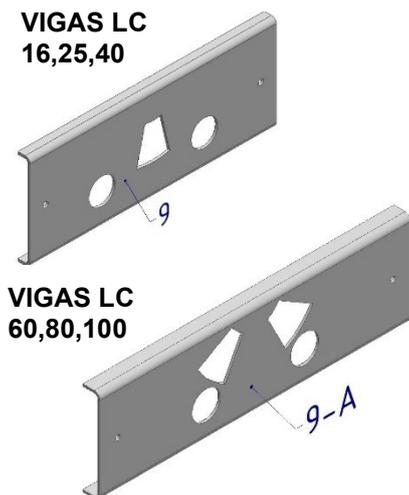
- incorrect flap setting (2),
- leakage of the chimney flap (see chap. 3.8.)
- low burning layer of wood (pahreba)
- use of large pieces of wood (small fuel gasification area).

Fig.15

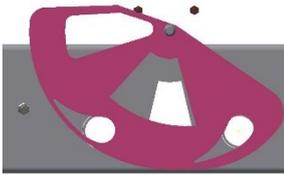


VIGAS LC
16,25,40

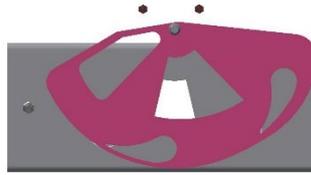
VIGAS LC
60,80,100



OPEN
servo – 100%



K 200*
servo - 45%



K 210*
servo - 47%



Closed
servo - 0%



Fig.16

* constant K 200 is a special constant that sets the position of the servo when the desired value is exceeded (set value default: $\lambda - 1.35$). The control range of the servo at K 200 is from 45% to 100%. With K 210, the control range of the servo is from 47% to 100%. The flap opens the secondary air more.

Setting the constant MENU 7.19 "SPECIAL BOILER SERVICE SETTINGS"

WARNING: DEFAULT – K 200, DO NOT CHANGE THE VALUE.

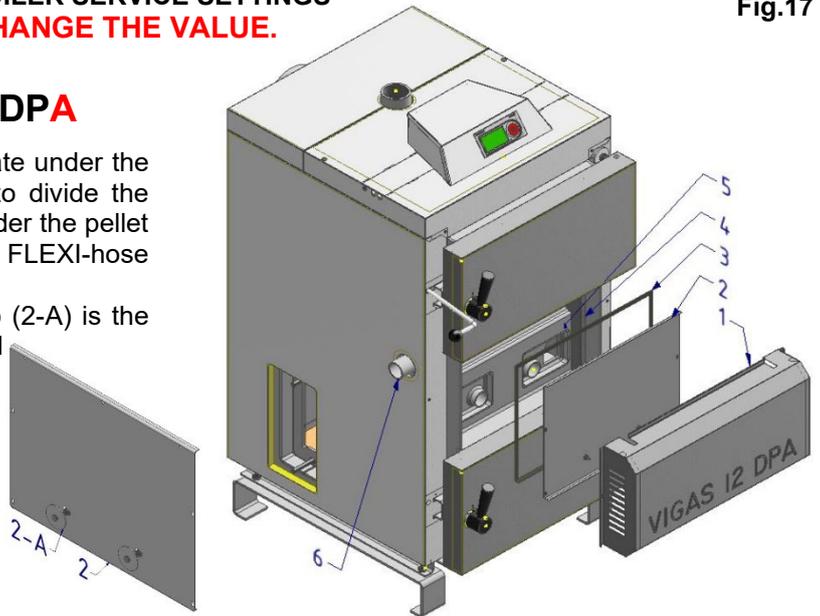
Fig.17

3.5.3 Sheet under the fan VIGAS DPA

For combined VIGAS boilers marked **DPA**, a plate under the fan (2) without an EBM pressure fan is used to divide the primary and secondary air. The fan is located under the pellet hopper and air is supplied to the boiler using a FLEXI-hose through the neck (6).

The procedure for setting the secondary air flap (2-A) is the same as for SUF VIGAS **STANDARD** chap. 3.5.1

1. Fan cover
2. Sheet under the fan (SUF) **DPA**
- 2-A Secondary air flap
3. SUF seal
4. SUF framework
5. Sheet of air (fixed)
6. Socket for connecting a FLEXI hose



3.6 IGNITE CONCRETE, IGNITE CONCRETE FOLDERS AND CRACLOTTE BRICKS

3.6.1 Aerated concrete lining

Refractory concrete is a heat-resistant material with a hydraulic bond, delivered in a dry state, intended after mixing with water for processing by pouring and vibrating. Two types of aerated concrete are used in VIGAS boilers:

1. **KALINIT ŽO 1200**
 - door lining (chapter 3.3.2),
 - body lining VIGAS 60,80,100 (fig.19-pos.4)
2. **KALINIT ŽO 1400**
 - body lining VIGAS 16-40, DPA, 25TVZ (fig. 19 – pos. 4).

In the construction of the boiler, the heated concrete lining divides the body into two parts. There is a fuel tank above the lining and a combustion chamber below. The lining also fills the space around the inserted nozzle (1) and at the same time protects the secondary (2L, 2P) or primary air (5L, 5P) pipes. The thickness of the lining, depending on the type of boiler, is between 3 and 10 cm.

VIMAR production process:

Formwork is inserted through the bottom door. The nozzle (1,2) is inserted into the dilatation insert (1-A,2-A) and then 6 sockets (3) are inserted into the holes of the nozzle. We insert the nozzle prepared in this way into the body of the boiler, we move the sleeves into the holes of the secondary air line. Pour the prepared mixture (fig. 19 - item 4) up to the height of the nozzle and vibrate. After 24 hours, we will remove the formwork. The amount of dry concrete used is shown in tab. 7.

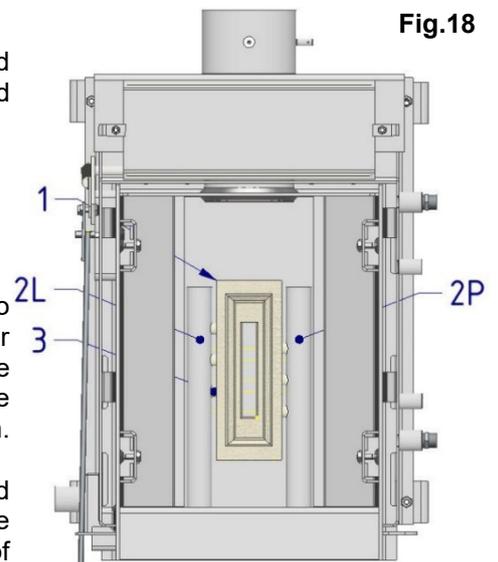
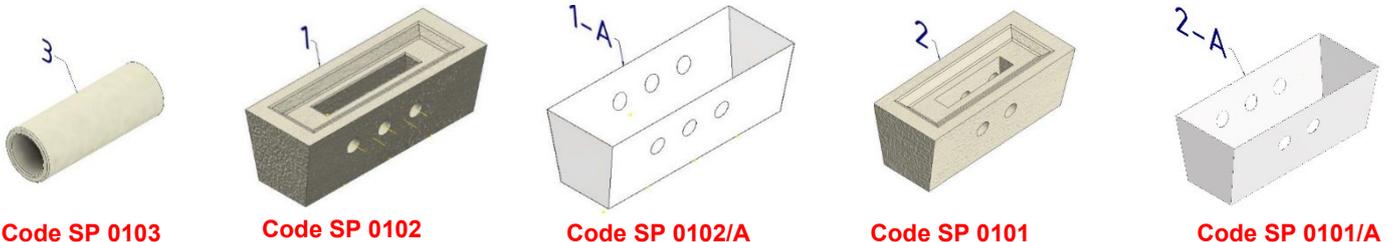


Fig.18

VIGAS 18 DPA
before watering



Code SP 0103

Code SP 0102

Code SP 0102/A

Code SP 0101

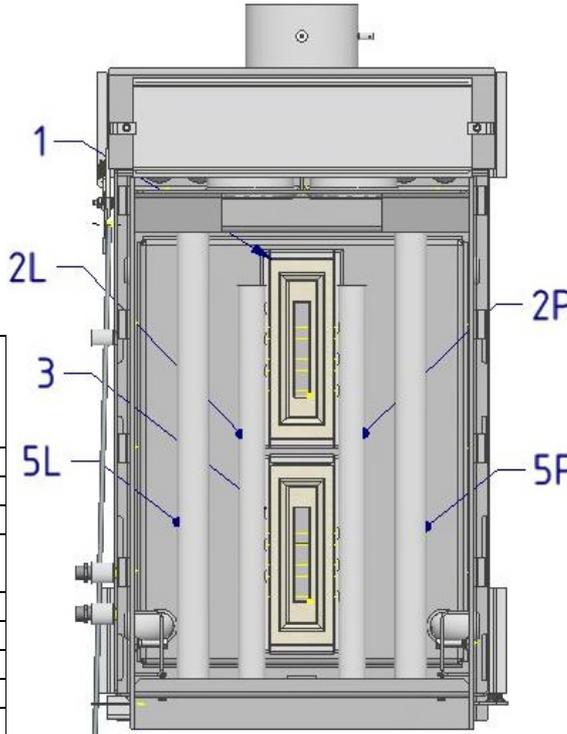
Code SP 0101/A

- 1. Nozzle
- 1A. Expansion pad (paper)
- 2L. Left management sec. air
- 2P. The right management sec. air
- 3. Paper tube
- 4. Aerated concrete lining
- 5L. Left management prim. air
- 5P. Right management prim. air

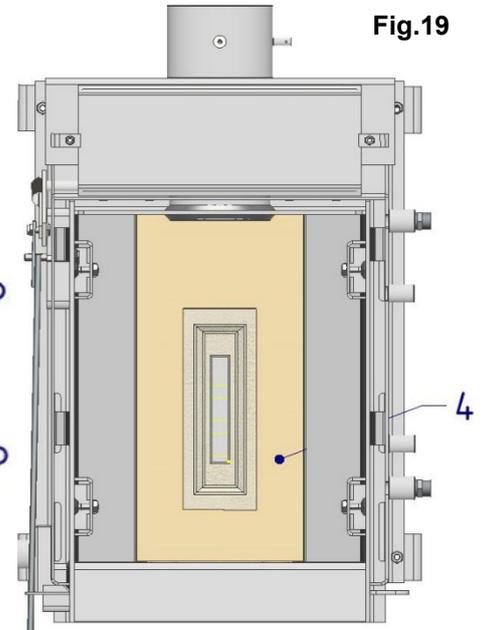
Tab.7

Type Boiler VIGAS	Weight of dry concrete (kg)	Water* (L)
16	20	2,4-2,8
25-40	25	3-3,5
12 DPA	20	2,4-2,8
18 DPA	25	3-3,5
26 DPA		
60	50	6-7
80	85	10,2-11-2
100	75	9-10,5
25 TVZ	35	4,2-4,9

*working water (12-14 L/100kg)



VIGAS 60
before watering



VIGAS 18 DPA
after watering

Fig.19

NOTICE:

Due to the functionality of the boiler, small cracks and fissures in the refractory concrete lining are not a defect. The problem can be caused by exposure of the primary or secondary air pipes or damage to the nozzle. In particular, if the nozzle is not replaced in time, the lining may be damaged, and the repair is then more difficult. Most often, in such a case, the repair of the lining is also combined with the replacement of the nozzle.

Work procedure for repairing the lining:

Before repairing the lining, we will order the necessary spare parts according to the damage. The required amount of dry hot concrete (table 7 shows the weight of dry hot concrete for the entire lining), nozzles (1), dilatation inserts (1-A) and paper sleeves (3) according to the type of boiler (table 8). We remove the damaged material so that the minimum thickness of the lining is 3 cm. We remove the dust and pour water. According to the type of boiler, we will use lower formwork. We then proceed according to the VIMAR manufacturing procedure mentioned above. After 24 hours, we remove the formwork and can use the boiler.

Work procedure when replacing the nozzle:

The conical shape of the nozzle (1) and the use of an expansion insert (1-A) in the VIMAR production process contribute to relatively easy replacement of a damaged or worn nozzle. First, we remove the original nozzle, clean the surfaces and corners of the original nozzle, then insert the new nozzle. We make sure that it fits most precisely into the original opening and by turning on the fan we check the flow of secondary air.

3.6.2 Fired concrete blocks

Fired concrete blocks used in VIGAS boilers are made of special material LACfire 1800/20 SiC, they are fired at a temperature of 950 °C. They are characterized by high strength and dimensional stability at high temperatures.

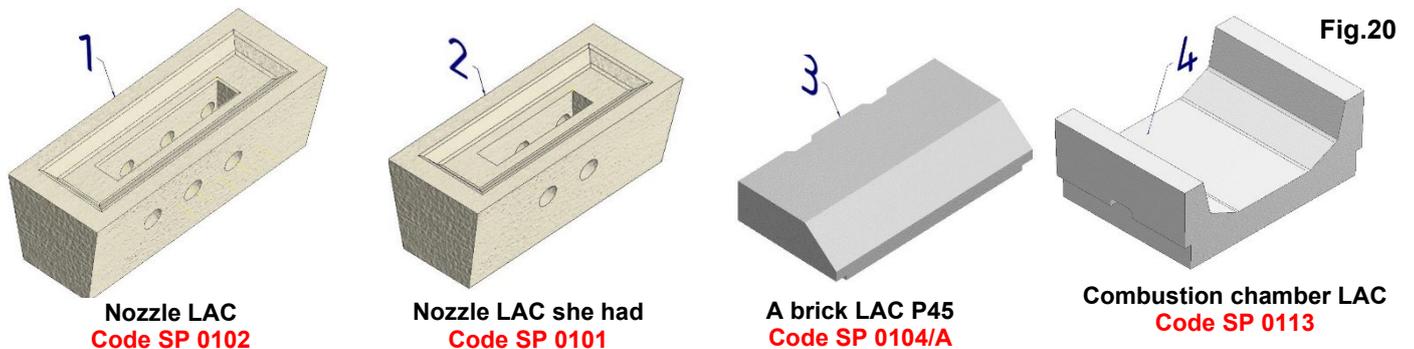
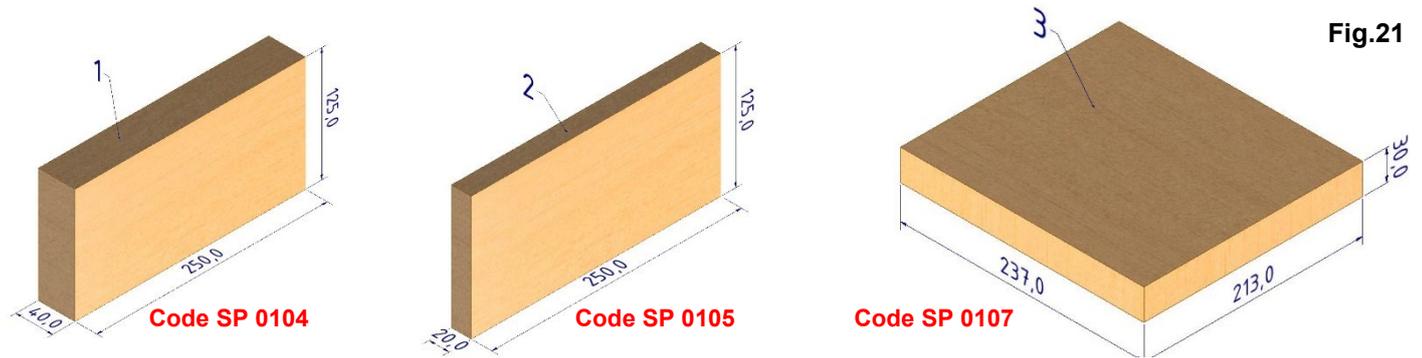


Fig.20

- 1. LAC nozzle – Used in all types of VIGAS boilers except VIGAS 16 and VIGAS 12 DPA.
- 2. Small LAC nozzle – Used only with VIGAS 16 and VIGAS 12 DPA boilers.
- 3. Brick LAC P45 – Used in all VIGAS DPA boilers. It is inserted above the burner and used as a deflector.
- 4. Combustion chamber LAC - Used in all VIGAS DPA boilers. It is placed on a pellet burner.

3.6.3 Fireclay bricks

Fireclay is a material based on Al_2O_3 , which is pressed either by plastic or semi-dry method. It withstands sudden temperature changes and elevated temperatures in dry glow conditions well. Two types of bricks of standard dimensions P4 and P2 and a special block P3 are used in VIGAS boilers.



1. **A brick P4** Used in all combustion chambers (ash pans) of VIGAS 16-100 boilers.
2. **A brick P2** Used in hot air boiler VIGAS 25 TVZ as side protection of the combustion space and in boilers VIGAS 60-100 as additional bottom protection.
3. **A brick P3** Used as protection for the bottom of VIGAS 16, 25, 12 DPA, 25 TVZ boilers and VIGAS 16 and 12 DPA boilers as well as side protection of the tank. In the VIGAS 25TVZ boiler as fan protection.

3.7 COMBUSTION CHAMBER (ASH TRAY)

The combustion chamber serves to burn off the gases released in the loading chamber (tank). It is always located under the nozzle so that it can be perfectly mixed with secondary oxygen and then burned. It is exposed to temperatures up to 1200 °C. According to the type of boiler, we divide the combustion chambers into:

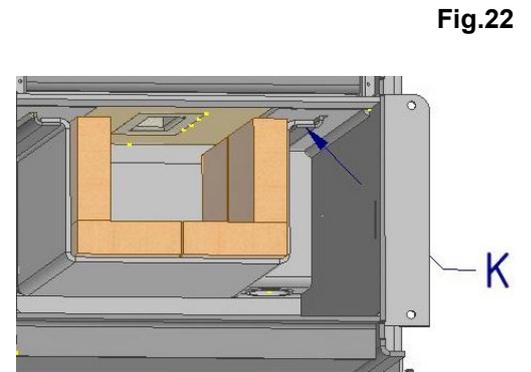
- **Retractable:** Used for standard VIGAS hot water boilers
- **Hanging:** Used for combined hot water boilers VIGAS DPA

3.7.1 Retractable combustion chamber

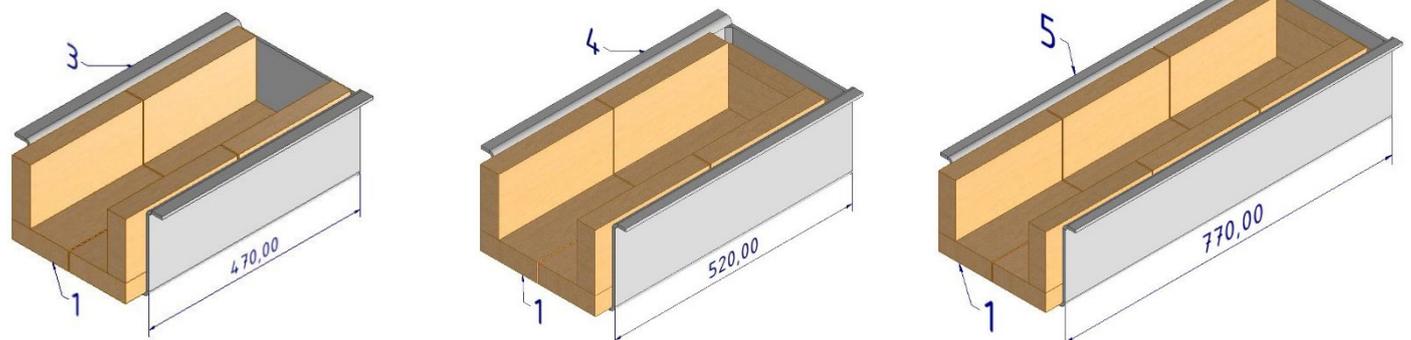
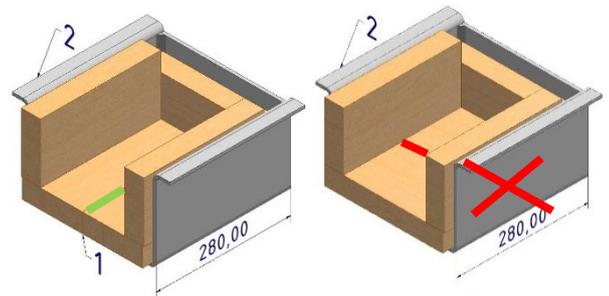
The retractable combustion chamber has a simple construction. It consists of two basic parts, P4 fireclay bricks and a combustion chamber. It is inserted into the body of the boiler on two "K" rails according to fig.22.

NOTICE:

Make sure the combustion chamber is pushed back as far as it will go and the bottom bricks are laid lengthwise as shown, not across. **Never operate the boiler without P4 fireclay bricks.**



POS	Title	Code SP	pieces P4
1	Fireclay brick P4	0104	-
2	For VIGAS 16	0629	5 ks
3	For VIGAS 25 a 40	0632	8 ks
4	For VIGAS 60	0630	9 ks
5	For VIGAS 80 a 100	0631	13 ks



3.7.2 Hanging combustion chamber for VIGAS boilers DPA

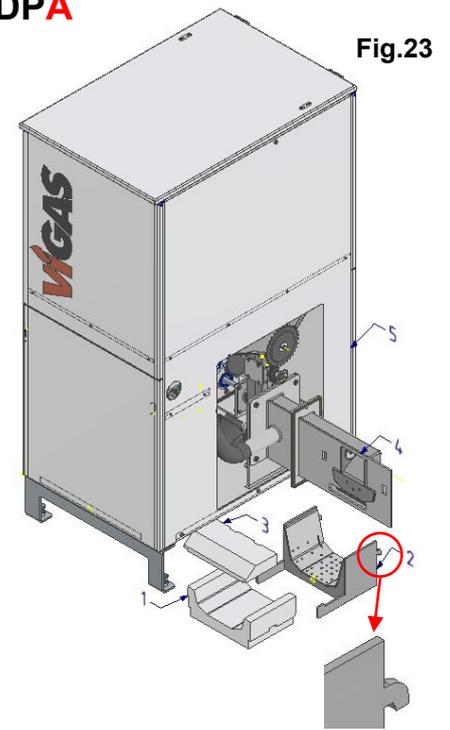
The hanging combustion chamber for VIGAS DPA combined boilers consists of three parts. LAC combustion chamber (1), which is placed on the pellet burner (2) from the front, and LAC P45 brick (3), which is placed on the pellet burner from above. At the same time, the pellet burner is suspended from the pellet feeder (4), which is part of the pellet hopper (5).

NOTICE:

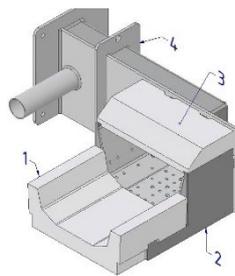
Positions 1, 2 and 3 are the same for all DPA boilers.

The combustion chamber is inserted only after the tank (5) is connected to the VIGAS DPA boiler. If it is necessary to separate the storage tank from the boiler, it is first necessary to disassemble the parts of the combustion chamber and only then can the storage tank (5) be pulled out.

Cleaning the combustion chamber: Due to the fact that there are air holes in the pellet burner (2), it is necessary to take it down once a month and clean it by knocking it out and pouring out the ash.



POS	Title	Code SP
1	LAC combustion chamber	0113
2	Pellet burner	0633/B
3	Brick LAC P45	0104/A
4	Pellet feeder 12.18 DPA	0681
4	Pellet feeder 26 DPA	0681/A



3.8 CHIMNEY FLAP, CHIMNEY THROAT AND BOILER EXCHANGER

3.8.1 Chimney flap

The tightness of the chimney flap (1) is one of the most important conditions for the proper combustion of the VIGAS boiler. In the case of reduced performance or increased emissions in the case of a control measurement, it is necessary to check the tightness (fitting of flap 1) to the surface of the throat (7). The leak can be detected during the operation of the boiler (**the flap must be closed**) by carefully removing the exchanger cover (11) and observing the escape of smoke. Subsequently, only after the fuel has burned off can we open the valve and clean the contact surface. The mechanism of the chimney flap consists of a rod (9), a rotating arm (10), a tension spring (8) and a shaft - weld (2).

NOTICE:

The flap must be loosely attached to the arm, so that there is a gap of **min. 1 mm**. This will ensure that the valve is free and will rest on the entire surface of the throat (7) after pulling the rod (9).

3.8.2 Chimney neck

The chimney neck serves to connect the VIGAS boiler to the chimney body. Two dimensions (outer diameters) are used according to the power and type of boiler:

Ø 159 mm for VIGAS 12DPA, 18 DPA, 16, 25, 25TVZ.

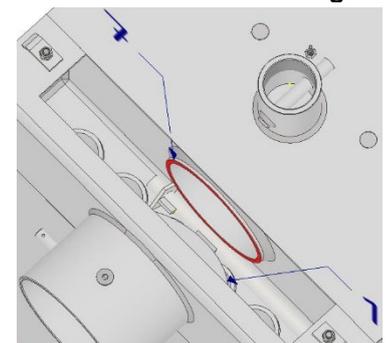
Ø 194 mm for VIGAS 26 DPA, 40, 60 80 100.

Part of every VIGAS boiler is a chimney temperature sensor (4) **type PT1000** located and secured on the side in the nipple. In the case of Lambda Control boilers, the **BOSCH LSU 4.9** type lambda probe (5) is screwed from the top.

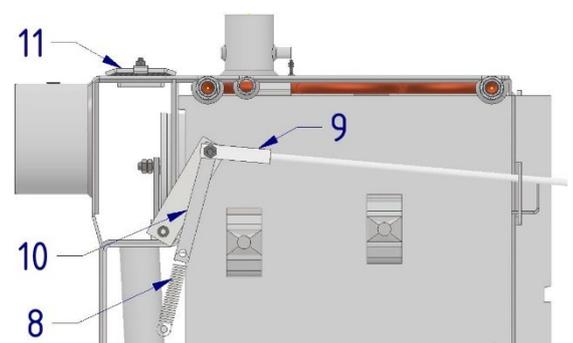
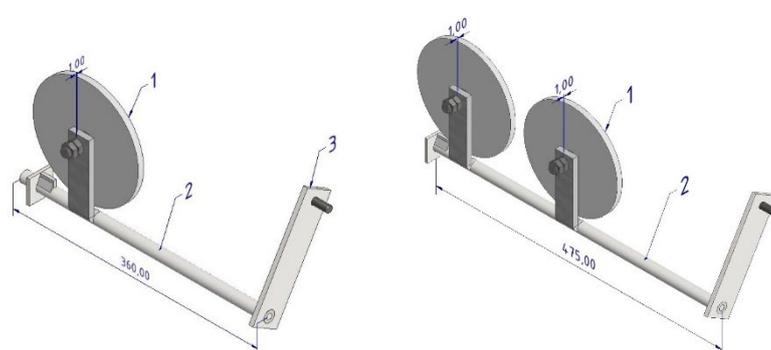
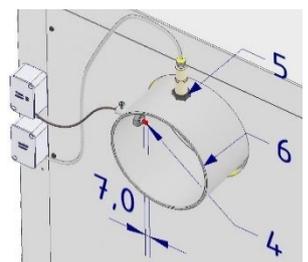
NOTICE:

In order for the displayed chimney temperature to be correct, the sensor must be pushed out approx. **7mm** and regularly cleaned of soot **once a month**. It is enough to loosen the screw, pull out and wipe. Likewise, the Lambda probe when cleaning the exchanger, always wipe with a cloth !!!

Fig.24



Flap tightness



3.8.3 Boiler exchanger and its cleaning

The exchanger (1) is the part of the boiler in which the hot flue gases transfer heat to the water, or in the case of the hot air boiler VIGAS 25 TVZ to the surrounding air. In all boilers, it is designed as a vertical pipe and, depending on the boiler performance, as a single-row for VIGAS 16, 25, 40, 12 DPA, a double-row for VIGAS 25 TVZ, 18 DPA, 26 DPA, 60 and a three-row for VIGAS 100. Only a clean and unlogged exchanger has high efficiency. Therefore, it is necessary to regularly clean or check it at least **once a month**.

NOTICE:

The fact that the exchanger is clogged can also be observed by the gradual increase of the chimney temperature on the regulation display.

In the case of the requirement to reduce the high temperature of the flue gases and thereby increase the efficiency of the boiler, it is possible to equip the boiler with a specified number of turbulators (6). Turbulators are mainly used in boilers where very dry fuel is used.

Cleaning the exchanger:

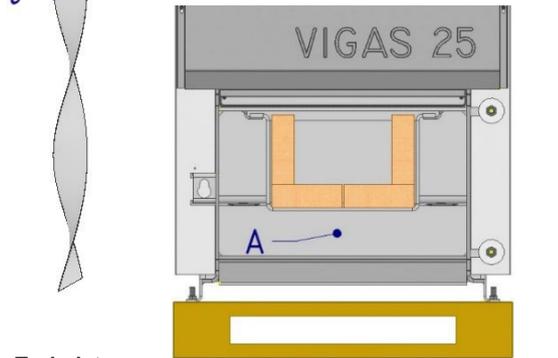
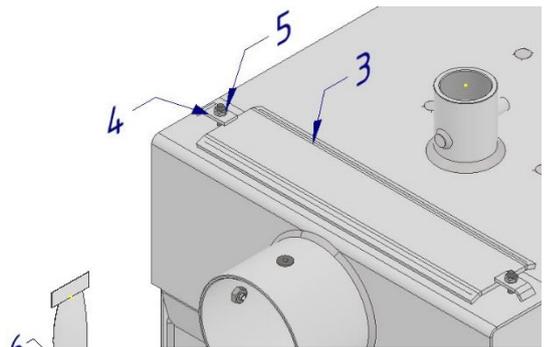
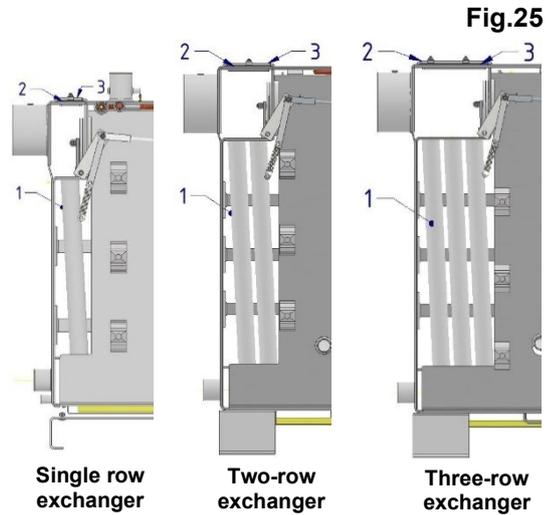
By removing the rear cover (fig. 4 - pos. 4), access to the exchanger cover (3) is freed. After loosening the nuts (5), we can turn the holder (4) by 90° and carefully remove the exchanger cover (3). We take care to remove the exchanger gasket (2) together with the cover. Afterwards, clean the pipes of the heat exchanger with the attached accessory (plate). We remove the attached ash from the space under the heat exchanger (A) through the front lower door.

TIP: In the case of an installed exhaust fan V25 or V80, we leave it running during cleaning, thereby limiting dust in the boiler room.

NOTICE:

If the exchanger is extremely clogged, we can help ourselves by first heating the boiler to the maximum temperature, or even with the top door open without a fan, and cleaning while hot. Tar and soot are loosened and easier to remove. In the case of an extremely clogged boiler in a short time, it is necessary to eliminate the cause, which may be:

- wet fuel,
- clogged chimney, low chimney draft, small chimney height,ñ
- not enough air from the fan, clogged blades (ch. 3.4.1),
- incorrectly set secondary air (chapter 3.5),
- clogged primary air line (ch. 3.9),
- leakage of the chimney flap (ch. 3.8.1).



Turbulator

3.9 PRIMARY AIR PIPE

The primary air line (1) serves to supply the required amount of air to the loading chamber. In VIGAS boilers it is removable for easy cleaning. From the fan, the air is led through the hole (5) into the space (4) in the case of VIGAS 12 DPA to 40 boilers and then into the line (1). In the case of VIGAS 60 to 100 boilers, the air is also led through the pipe (2) to the rear ventilation.

The performance of the boiler depends on the cleanliness and patency of the primary line. Therefore, it is necessary min. Check and clean once a season. If sawdust or small shavings are used as fuel to a large extent, it is necessary to check the line more often.

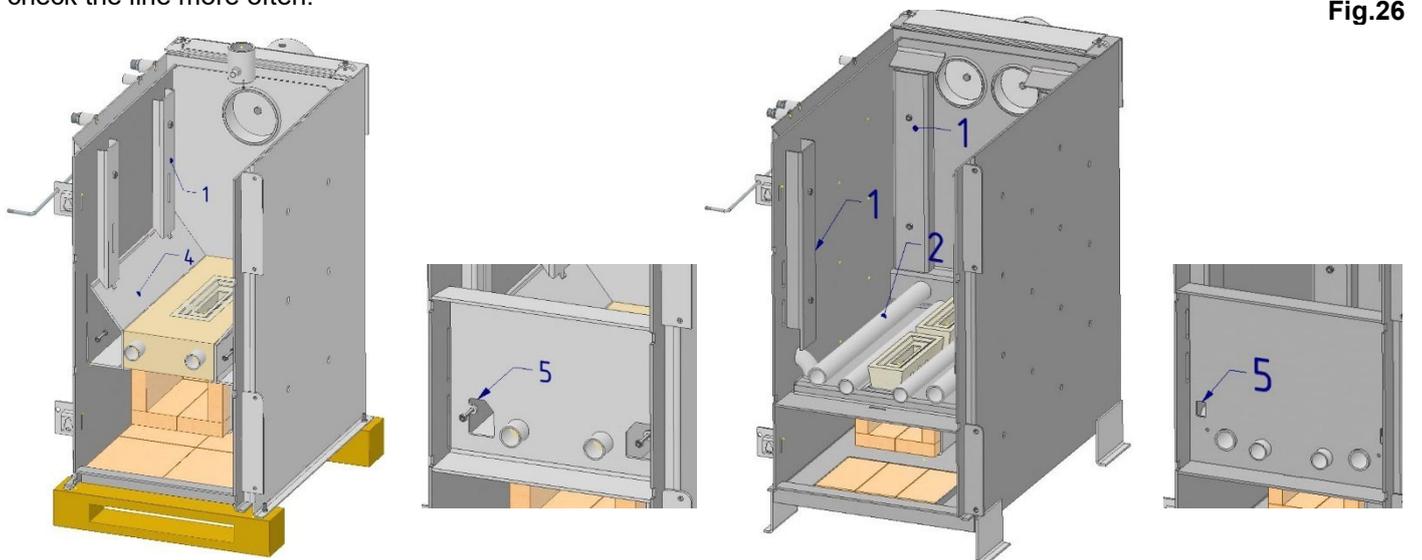


Fig.26

3.10 COOLING SAFETY EXCHANGER

Fig.27

The cooling safety exchanger (1) together with the Honeywell TS131 3/4" release valve serves to protect VIGAS hot water boilers against overheating, especially in the event of a power failure or boiler pump failure.

It is made of a Ø18mm copper pipe and installed in the body of the boiler using two special nozzles (2) with a 3/4" internal thread. The exchanger is sealed by pressing the nipple (3) onto the washer (4) and the sealing O-ring (5).

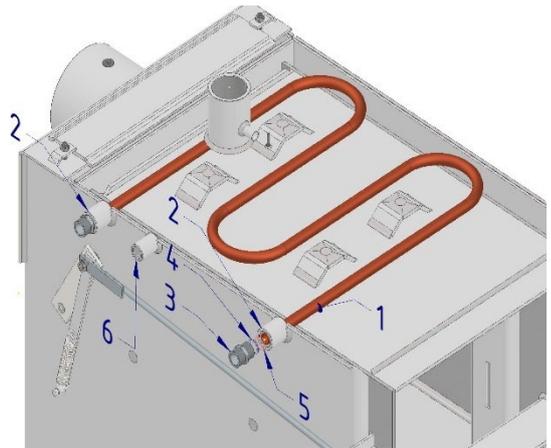
NOTICE:

When mounting the drain valve TS131 (3), we take care not to loosen the nipple (3), which can result in a leaky connection. We install the valve so that the cooling exchanger is not under the pressure of the cooling water.

NOTICE: The arrow on the valve must point to the boiler.

We supply water to the TS131 valve. From the second, free nipple (2), we lead the pipe into the waste sewer. We seal the TS131 valve insert into the 1/2" socket (6), into which we then insert the valve capillary.

The discharge valve is controlled by the temperature of the water leaving the boiler. If the outlet water temperature reaches 95°C, the valve opens. The flowing water absorbs the temperature from the boiler and thus prevents overheating or boiler damage.



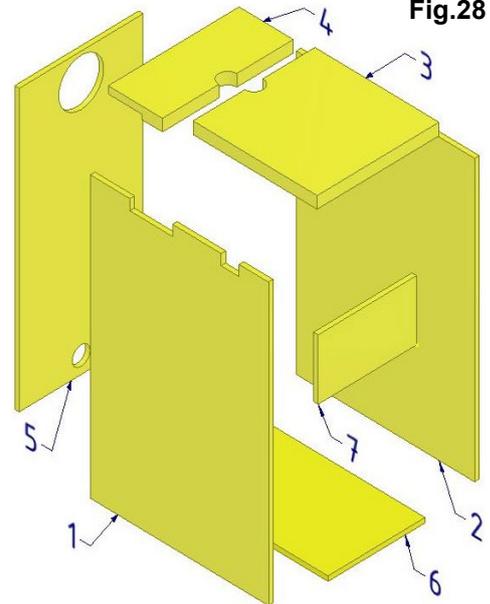
Relief valve TS131 3/4"
Code SP 0645



3.11 THERMAL INSULATION OF THE BOILER

The thermal insulation of the boiler is made of NOBASIL mineral wool. The thickness, depending on the individual parts, is from 2 cm to 5 cm. The sides of the boiler (1) and (2) are supplied for service without cut-out holes, they must be cut on site.

Fig.28



POS	Title
1	Left side insulation
2	Right side insulation
3	Insulation top front
4	Insulation top back
5	Butt insulation
6	Bottom insulation
7	Insulation behind the fan

Boiler type	Position according to Fig. 28							Tab.8
	1	2	3	4	5	6	7	
	Spare part code (SP)							
VIGAS 16	0835/A	0802	0801	0803	0805	0838	-	
VIGAS 25	0807	0801			0812	0839		
VIGAS 40	0813	0816	0817	0818	-	0840		
VIGAS 60	0823	0824			-	0841		
VIGAS 80	0831	0832			-	-		
VIGAS 100			0801	0803	0805	-		
VIGAS 12 DPA	0835/A	0802	0801	0803	0812	-		
VIGAS 18 DPA	0807	0801					0805	-
VIGAS 26 DPA	0813	0802	0804	0806	0838	-		
VIGAS 25 TVZ	0807	0802					0804	0806

4. BOILER PELLET TANK VIGAS DPA

Fig.29

The **VIGAS DPA** boiler stack is produced in three sizes. For boiler **VIGAS 12 DPA**, **18 DPA** and **26 DPA**. It consists of two basic parts:

1. Pellet base,
2. Base covers.

The pellet hopper is always delivered together with the boiler. In the case of passing through a narrow space and easier handling, the tank can be separated from the boiler.

Procedure for disassembling the magazine:

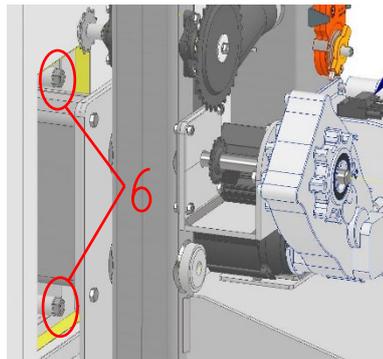
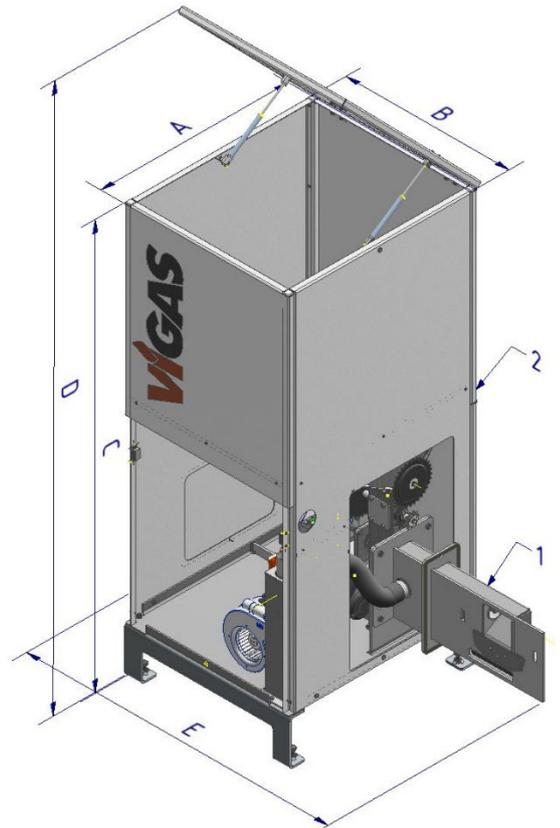
Step 1: Open the bottom door of the boiler and then remove the hanging combustion chamber, see chapter 3.7.2.

Step 2: We take off the front cover of the magazine. Disconnect the air hose (4), fan connector (1), servo drive connector (2). Disconnect the communication connector (3) and the L, N, PE power supply (5) from the pellet expander.

Step 3: We take off the back cover of the magazine. Using open-end wrench 19 or using the GOLA set, unscrew both nuts (6). Then we pull out the extension rollers, which are located under the nuts. With the help of 2 workers, we move the reservoir away from the boiler.

CAUTION:

Be careful when moving the tank and check the wires to avoid catching the wires and possibly damaging them by forceful pulling.



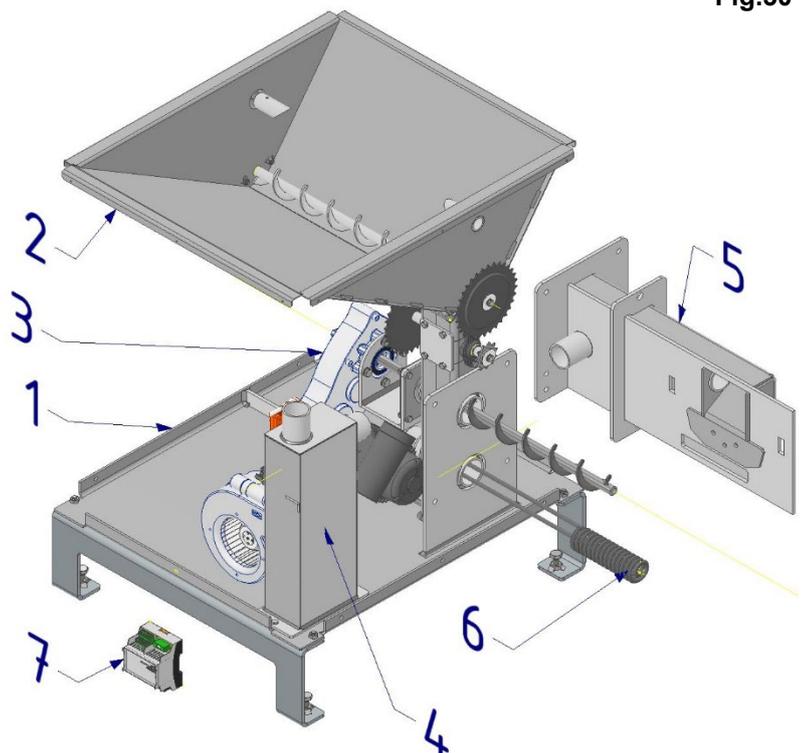
POS	Basic dimensions (mm)		
	12 DPA	18 DPA	26 DPA
A	660	830	
B	560		
C	1400		1600
D	1860		2170
E	1015		
1	Pellet base		
2	Base covers		

4.1 Pellet base

Fig.30

The base of the **VIGAS DPA** pellet boiler is produced in two sizes. It is common for the **VIGAS 18 DPA** and **26 DPA** boilers, dimension (A) is 830 mm, and for the 12 DPA boiler, dimension (A) is 660 mm. It consists of seven basic parts:

1. Pellet stand,
2. Pellet hopper,
3. Engine, gearbox and worm,
4. Air distributor,
5. Pellet feeder,
6. Ignition coil,
7. Pellet Expander.



4.1.1 Pellet stand

The base of the pedestal is made up of a massive weld (1), which includes a connecting flange connected to a vertically placed leg, to which the pellet hopper is then connected.

The leg of the pedestal has a hole for inserting a safety tourniquet (4) **Code SP 0634/A**. Bearings (7) **Code SP 0677** are placed on the turnstile shaft from the side and fixed using **M6-16 screws**. Gears are fitted to the ends of the shaft. Larger (5) with the number of teeth **32z Code SP 0641/A** and smaller (6) with the number of teeth **11z Code SP 0641/A** and with the help of **M6-16 screw** and washer $\text{Ø}6 \times 30$ are fixed. The turnstile is covered with a cover (3) and secured with a flange (2).

If necessary, the turnstile can be inspected by removing the flange (2) and the cover (3).

Part of the base are adjustable legs (8), which can be used to center the entire pellet hopper.

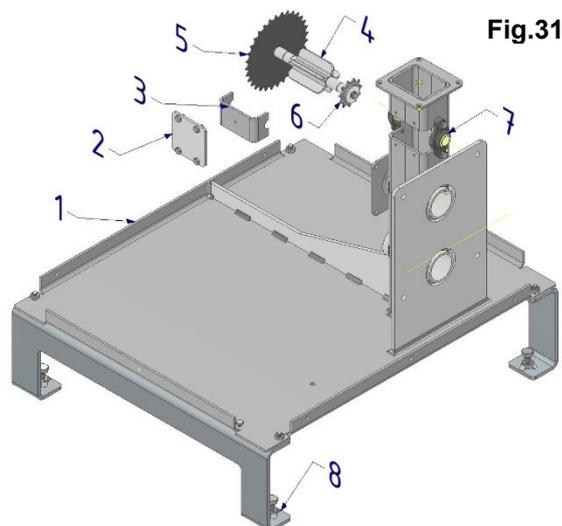


Fig.31

4.1.2 Pellet hopper

The base of the hopper consists of a 1.5mm sheet weld and a flange for connection to the pellet base. The snail (4) **Code ND 0637/A** is inserted into the hopper and then the bearings (2) **Code ND 0677** are placed on the side and fixed using M6-16 screws. One end of the shaft is secured with a **DIN 471 16x1** circlip and a 32z gear wheel **Code ND 0641/A** is placed on the other. It is fixed using the M6-16 screw of the $\text{Ø}6 \times 30$ washer.

After connecting the hopper to the base, a transmission chain **Code ND 0660/B** with the number of **40 links** is placed on the gears. The pipes (5) serve to insert and secure the ultrasound sensors.

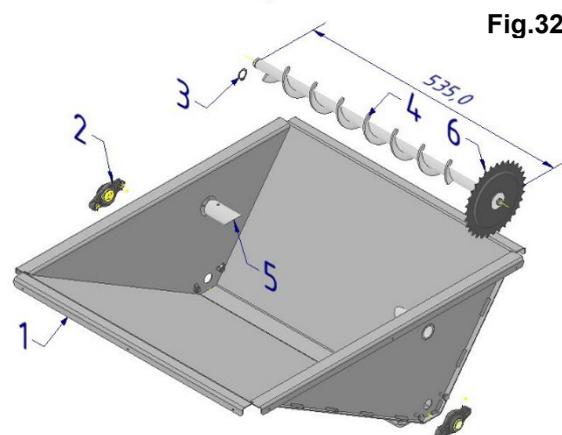


Fig.32

4.1.3 Engine, worm gearbox

The driving mechanism of **VIGAS DPA** boilers is a motor with a gearbox **Type TTM 203** (1) **Code SP 0640/A**. A screw (6) **Code ND 0636/A** is inserted into the gearbox and secured with two retaining rings (4) **DIN 471 16x1** and a pin **DIN 6885 5x5-20**. It is then subsequently connected to the pellet base with a flange (2) and covered with a sheet (3). After connecting to the base, a transmission chain **Code SP 0660/C** with the number of links **42** is placed on the gears.

NOTICE:

In the case of replacing the screw, it is recommended to dismantle the flange (2) from the pellet section and then dismantle the snail (6).

Snail (6) - **length 600mm NEW TYPE**

More ch. 4.1.5 Pellet feeder.

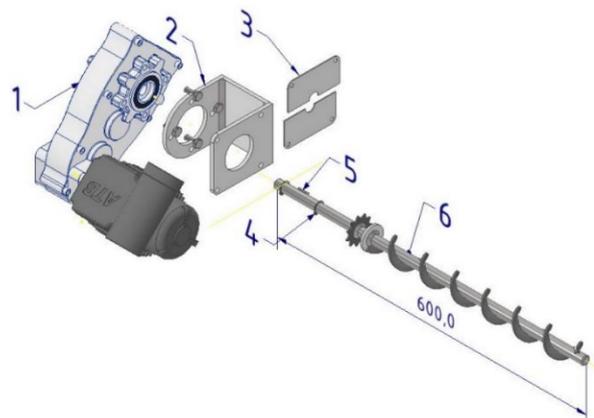


Fig.33

4.1.4 Air distributor

The air distributor is produced in two sizes for **VIGAS 12 and 18 DPA** (2) and for **26 DPA** (7). It is a device that distributes the air from the fan (1) to the **VIGAS DPA** boiler and the pellet feeder using a servomotor (5). The servo controls the flap (10) based on the selected fuel:

WOOD - air goes to hose (3) or (8).

PELLETS - the air goes into the hose (4) or (9).

NOTICE:

On the servomotor (5) there is a "magnetic gear release" point, to which when we apply the magnetic part of the orange cover of the servomotor, the fuse for the movement of the axis holder will be released. Subsequently, by inserting a screwdriver into the groove on the valve (10), we can rotate the axis freely and test its easy operation. The position of the damper in which it is secured is **not important**, because after connecting the boiler to the electrical network, a **RESET** of the servo position is performed, in which the extreme positions are used. The position reset is always performed in the event of a power outage, fuel change or every 24 hours.

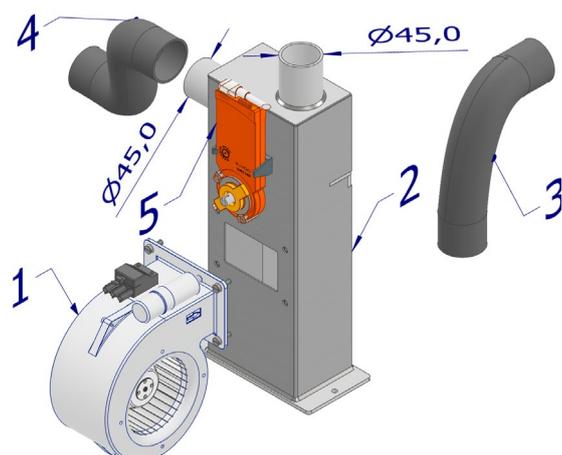


Fig.34

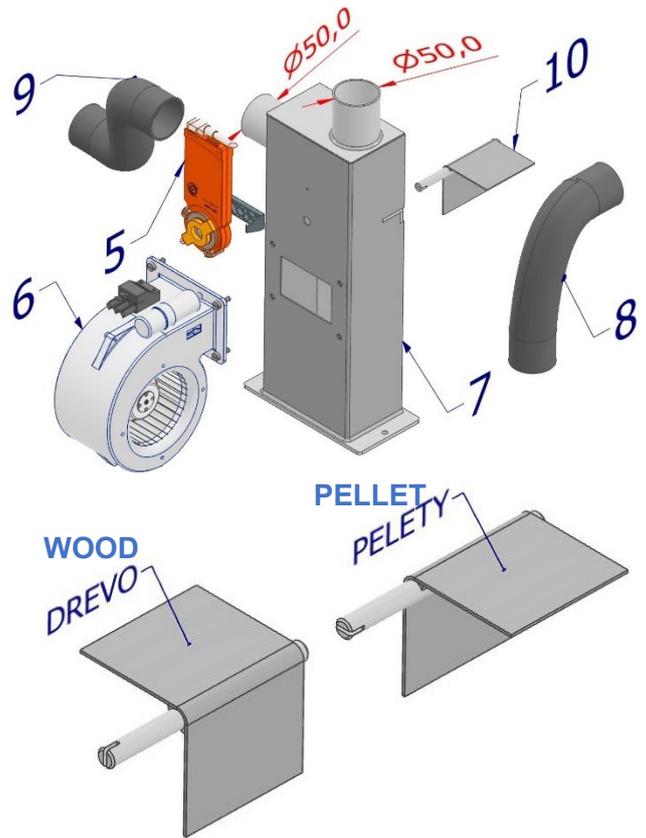
NOTICE 1:

When choosing **"WOOD"** fuel, it is possible to set the partial opening of the flap (10) so that a small amount of so-called of the third air went directly into the combustion chamber of the boiler, which significantly reduces emissions and increases the efficiency of **DPA** boilers.

Setting the opening constant MENU 7.19 "BOILER SPECIAL SETTINGS"

NOTICE 2:

When **"WOOD"** fuel is selected during a power outage or after the boiler is turned **"OFF"**, the flap switches to the **"PELLET"** position, which prevents air flow through the chimney draft and thus boiler combustion.



POS	Title	Code SP
1	Fan EBM 108 for 12-18 DPA	0514
2	Air distributor 12-18 DPA	-
3	Hose OREGON Ø45 – 300 mm	-
4	Hose OREGON Ø45 – 350 mm	-
5	Servo BELIMO 24V	3008
6	Fan EBM 120 for 26 DPA	0516
7	Air distributor 26 DPA	-
8	Hose OREGON Ø50 – 300 mm	-
9	Hose OREGON Ø50 – 300 mm	-
10	Air flap	-

4.1.5 Pellet feeder "NOS"

The pellet feeder is a device that is produced in two sizes. For **VIGAS 12 and 18 DPA** (1) and for **VIGAS 26 DPA** (3). In fact, they differ only in the diameter of the connecting pipe. For **12 and 18 DPA Ø45** and for **26 DPA Ø50**. The new types are supplied in a shortened snail size of **600 mm**. The original length of the screw was 770 mm. The functional parts of the feeder, which are exposed to high temperatures, are made of high-strength heat-resistant steel.

SERVICE NOTE:

The reason for the design shortening was to avoid the passage of the axis of the screw through the combustion chamber, to eliminate the possible bending of the screw and the feeder due to high temperature, and thus to limit the possible whistling of the screw.

In the case of replacing the feeder (NOS), it is possible to keep the original screw, just shorten it **by 170 mm** to a size of **600 mm** and replace the old damaged feeder with a new one according to the type of boiler.

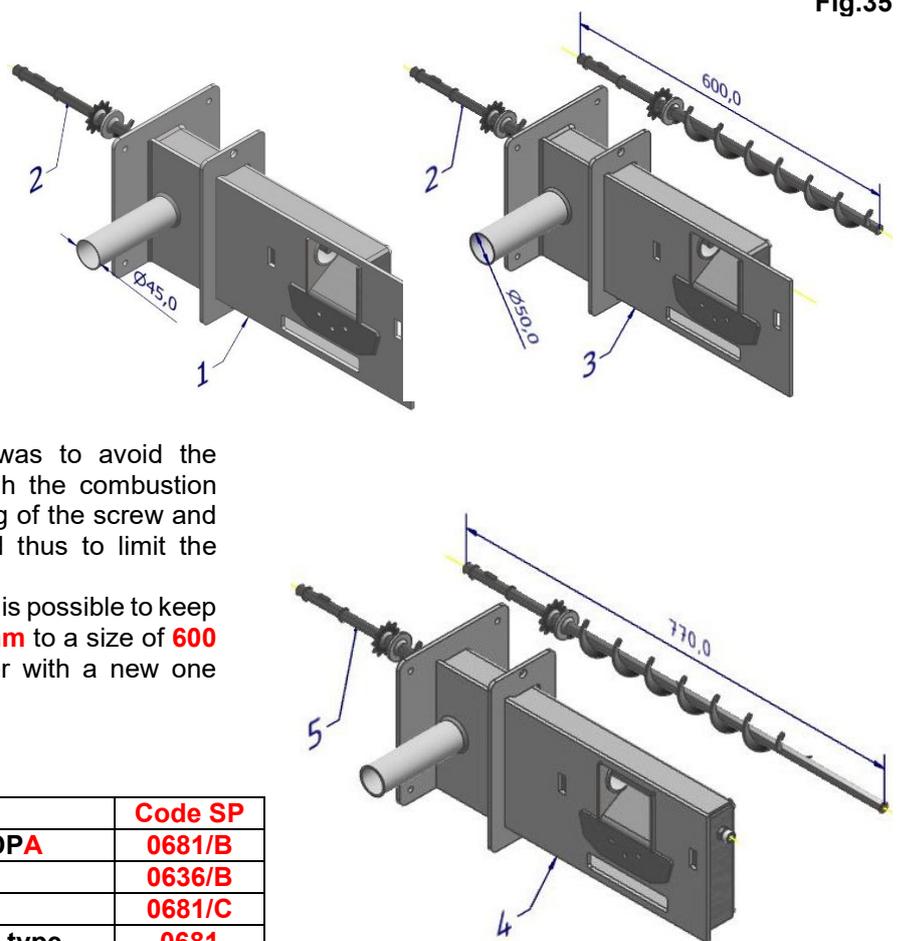


Fig.35

POS	Title	Code SP
1	Pellet feeder VIGAS 12 and 18 DPA	0681/B
2	Feeder screw 600 mm	0636/B
3	Pellet feeder VIGAS 26 DPA	0681/C
4	Pellet feeder 12 and 18 DPA old type	0681
-	Pellet feeder 26 DPA old type	0681/A
5	Feeder screw 770 mm old type	0636/A

4.1.6 Ignition coil

Fig.36

The ignition spiral (1) serves to ignite the pellets. It is a consumable depending on the number of ignitions. The length of time in the switched-on state can be viewed in **MENU 7.19 "BOILER SPECIAL SERVICE SETTINGS"**.

SPIRAL REPLACEMENT:

In case of malfunction of the coil, disconnect the boiler from the electrical network, then remove the coil from the feeder. We unscrew the cover (3), disconnect the contacts and pull off the cover (2). We will put it on the new spiral. We connect the contacts and carefully screw the cover (3). Insert the new spiral into the feeder.



4.1.7 Pellet Expander

The Pellet Expander is a device for connecting the inputs and outputs of the **DPA** boiler.

Inputs	Description
UR	Sensor ultrasound receiver
UT	Sensor ultrasound transmitter
TM	Engine thermometer
D	Door (jumper)
Outputs	Description
LS	Screw motor-Phase 230V
NS	Screw motor-Zero
PE	Power-Ground
L	Power supply-Phase 230V
N	Power-Zero
LZ	Ignition Coil-Phase
NZ	Ignition Coil-Zero
PE	Screw motor-Earth

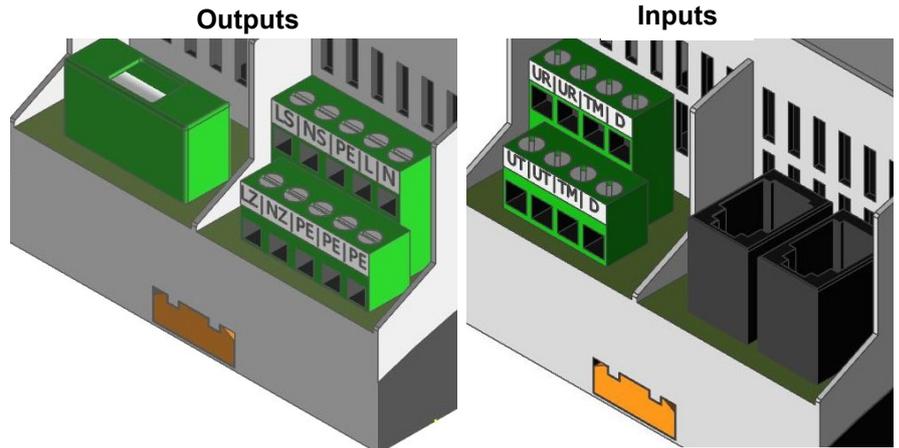
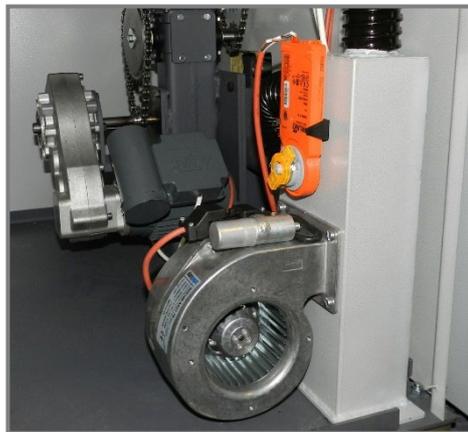


Fig.37



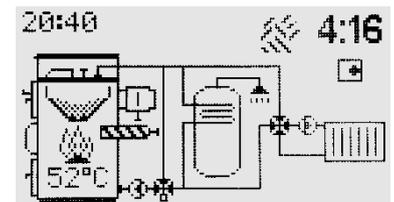
Sensor ultrasound transmitter UT
Code SP 4011



Sensor ultrasound receiver UR
Code SP 4010



Thermometer MOTOR type KTY
Code SP 1004

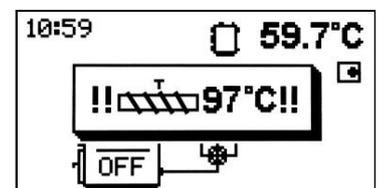


Ultrasonic sensors UT and UR are used to measure the state of pellets in the magazine. If they are "visible", it means that the pellet level has dropped to a minimum. This status is signaled to the operator on the graphic display by the symbol "⚠️". At the same time, the information line displays the time (eg 4:16), after which the boiler will be shut down. This state is shown by the empty stack symbol "⚠️" and the statement "END". If the tank is filled with pellets above the level of the sensors, the full tank symbol is displayed and the boiler continues to burn.

NOTICE:

In practice, it often happens that even though the tank is full, the "⚠️" symbol is shown on the display and the boiler shuts down. In this case, it is necessary to check the fixing of the wires of both ultrasonic sensors, because if they are close to the power wires of the fan or the ignition coil, **signal interference occurs**.

The auger motor thermometer has a safety function. The thermometer sensor is inserted in the cooling fin of the engine. If the gearbox motor overheats above 80 °C, the boiler will shut down and the display will show the overheating statement with the current temperature. In this case, it is necessary to check whether the turnstile, auger, etc. have not been blocked. chapter 4.1.

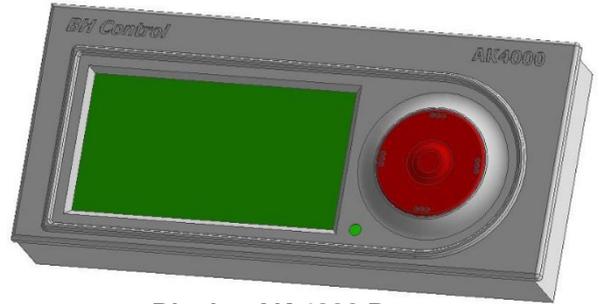


5. VIGAS BOILER CONTROL SYSTEM – AK 4000

The **AK 4000** control system is characterized by a control panel (AK4000 D), which is used in all types of VIGAS boilers. The control software loaded in the **AK4000 D** control panel allows you to set the configuration according to the type and power of the boiler. **The default configuration is always for the VIGAS 25 boiler.** Therefore, it is important that when replacing the **AK 4000 D** control panel, the boiler type is set in the service settings (more in MENU 7.11) to match the boiler type indicated on the production label. By connecting the AK 4000 control panel with the power part, a complex control system for VIGAS boilers is created. According to the type of power part used, the system is designed for boilers:

1. VIGAS STANDARD AND VIGAS WARM AIR
2. VIGAS LAMBDA CONTROL
3. VIGAS DPA COMBINED WOOD-PELLETS

Fig.38



Display AK 4000 D
Code SP 4001

5.1 POWER BOARD FOR VIGAS STANDARD AND VIGAS HEATED AIR

3 types of power plates are used in **VIGAS STANDARD** and **TVZ** boilers:

1. AK 4005 S **Code SP 4002/A**
2. AK 4001 S – **no longer produced**, replacement is AK 4005 S + jumper
3. AK 4000 S - **no longer produced**, replacement is AK 4005 S + jumper

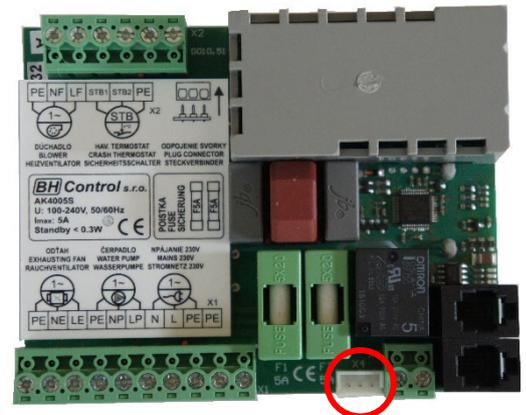
NOTICE:

The AK 4005 S power board has a three-pin connector for connecting the thermometer module!!!!

In the case of replacing the power plate of a standard or hot air boiler, only the **AK 4005 S** power plate is available. In order to replace the power boards AK 4001 S and AK4000 S, it is necessary to order a thermometer jumper (Code SP 3040) with the AK 4005 S, which is terminated with a three-pin connector. The UNI boiler thermometer, flue gas thermometer and STB fuse remain original.

In case of damaged wiring of the module for connecting thermometers, it is necessary to order the correct type (with or without a connector) according to the used power board.

Fig.39



AK 4005S
Code SP 4002/A



Module for connecting thermometers with a connector
Code 3022/A Short
Code 3023/A Long



Thermometer jumper
Code SP 3040



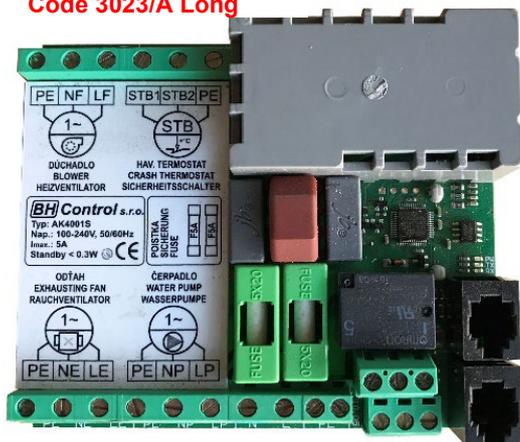
Module for connecting thermometers without a connector
Code SP 3022 Short
Code SP 3023 Long



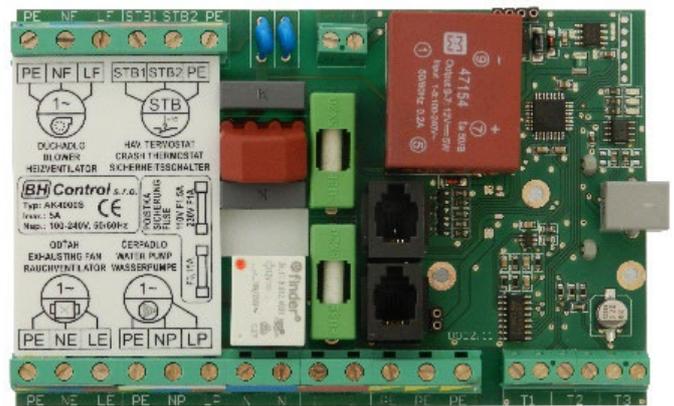
Boiler thermometer UNI
Code SP 3026



Flue gas thermometer KTY
Code SP 3032



AK 4001S



AK 4000S

5.2 POWER BOARD FOR VIGAS LAMBDA CONTROL

VIGAS LAMBDA CONTROL boilers use 2 types of power plates according to the type of LAMBDA PROBE used:

1. TYPE Lambda probe - LSU 4.9 power plate AK 4005 LSU - Code SP 4003/A
2. TYPE Lambda probe - LSM 11 power plate AK 4000 SL - Code SP 4003

NOTICE:

In the case of replacing the power board, be sure to order the correct type with the correct ND code according to the type of Lambda probe used.

5.2.1 AK 4005 LSU for Lambda probe LSU 4.9

Due to the fact that the BOSCH company discontinued the production of the LSM 11 type Lambda probe and replaced it with the LSU 4.9 type, we had to proceed with the production of a new power plate with the designation AK 4005 LSU. Start of use in VIGAS boilers from 20.10.2017.

Due to the ease of assembly and the possible risk of replacing wires when replacing the board, the new power board was equipped with three connectors for connecting the lambda probe cable, the servo drive cable and the thermometer module, and at the same time, the clamps for connecting the power parts were also replaced with two removable connectors.

NOTICE:

When handling the connectors, always check that the boiler is disconnected from the mains.

Two AA size 1.5V batteries are used in the event of a power failure to move the servo flap to the closed position. See chap. 3.5.2 and fig.16. This will prevent the boiler from burning due to the draft of the chimney. Battery life is therefore dependent on the number of power outages. The battery discharge status is shown on the display at the top left.

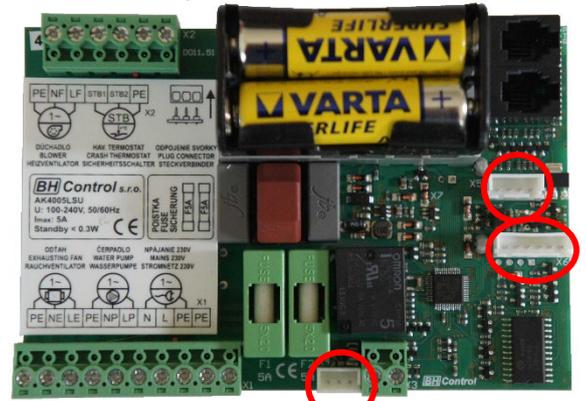


Fig.40

AK 4005 LSU
Code SP 4003/A

Modul pre pripojenie teplomerov a kábel pre lambda sondu sú vyvedené dozadu na kryt boku kotla.



Lambda probe LSU 4.9
Code SP 3009/A



Cable for LSU 4.9
Code SP 3024/A short*
Code SP 3035/A long



Cable to servo drive
Code SP 3013/A



Module for connecting thermometers
Kód 3022/A short *
Kód 3023/A long



Fan cable
Code SP 3010 short *



Fan cable
Code SP 3011 long *



Cable set for STB fuse
Code SP 3015



STB fuse
Code SP 3029



Boiler thermometer UNI
Code SP 3026



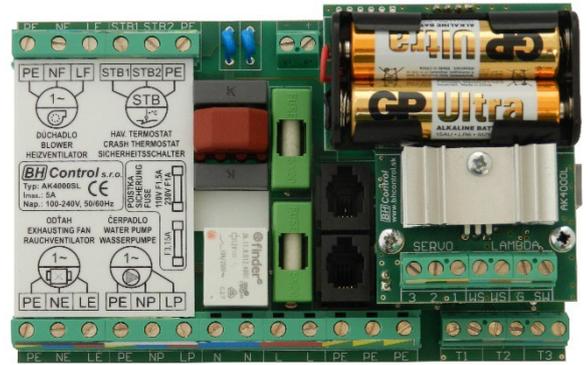
Flue gas thermometer
Code SP 3027

* short – for VIGAS 16-40 LC
* long – for VIGAS 60-100 LC

5.2.2 AK 4000 SL for Lambda probe LSM 11

The power lambda board **AK 4000 SL** is available as a spare part for VIGAS LC boilers with the AK4000 control system, where a lambda probe type **LSM 11** was used. It has a similar construction to the power board AK 4000 S, but the basic power converter has been replaced by an **external power supply RS 25-12**. Two AA size 1.5V batteries are used in the event of a power failure to move the servo flap to the closed position. See chap. 3.5.2 and fig.16. Both modules are brought out to the back on the side cover of the boiler.

Fig.41



AK 4000 SL
Code SP 4003

Cables and components of AK 4000 SL regulation



Lambda probe LSM 11
Code SP 3009



**Connection module
Lambda probes**
Code SP 3024 short
Code SP 3035 long



**Module for connecting
thermometers**
Code SP 3022 short
Code SP 3023 long



Fan cable
Code SP 3010



Fan cable
Code SP 3011 long *



Cable set for STB fuse
Code SP 3015



STB fuse
Code SP 3029



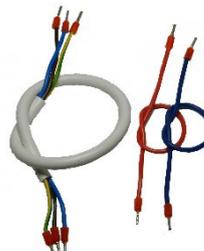
Cable to servo drive
Code SP 3013



**Flue gas
thermometer**
Code SP 3027



**Power supply RS 25
for AK 4000 SL**
Code SP 4004



**Set of cables to
the RS 25 source**
Code SP 4005



Boiler thermometer UNI
Code SP 3026

5.3 POWER BOARD FOR VIGAS DPA COMBINED BOILERS

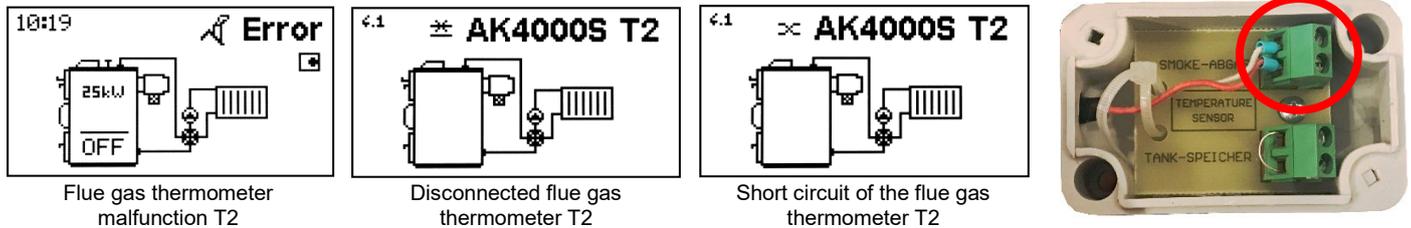
2 types of power plates are used in **VIGAS DPA** combined boilers:

1. **TYPE AK 4005 LSU** - Code SP 4003/A - **started to be used from 10.2017**
2. **TYPE AK 4000 SL** - Code SP 4003 - **used until 10.2017**

Used cabling and components for each type of power board used are listed above.

NOTICE:

- In the case of replacing the power plate, make sure to order the correct type with the correct ND code according to the type of the original power plate used,
- **Lambda probe is not used in VIGAS DPA combined boilers.**



5.7 ACCUMULATION (ACCU) TANK THERMOMETER type KTY

Fig.45

The ACCU tank thermometer is an additional accessory of the AK 4000 control system. Before installing it, you must first set the hydraulic scheme **"Scheme 1"** in the boiler configuration (see MENU 7.14). In the basic version (without Expander), it is connected to the **"TANK-SPEICHER"** contacts. If the Expander is used, it is connected to the Expander module according to the selected scheme (see MENU 7.14).

NOTICE:

By default, the "Scheme 0" scheme is preset in VIGAS boilers. With this scheme, the **"TANK-SPEICHER"** contact is used to connect the **room thermostat**. If RT is not connected, a jumper **must be inserted on the "TANK-SPEICHER" contact**.

Only after selecting "Scheme 1" can the thermometer be installed. We release the **"TANK-SPEICHER"** contacts, remove the jumper and connect the ACCU thermometer.

NOTICE:

The accumulation tank thermometer sensor is always placed in the highest part of the ACCU tank.



Thermometer module, „B“



Storage ACCU tank thermometer
Code SP 3032



ACCU tank

5.8 ROOM THERMOSTAT (RT)

Fig.46

The room thermostat is an additional accessory of the AK 4000 control system. Connecting the room thermostat increases the comfort of operating the boiler, reduces fuel consumption and thereby extends the interval between fuel refills. Before installing it, it is necessary to first check the setting of the hydraulic scheme in the boiler configuration (see MENU 7.14). The room thermostat uses **"Scheme '0', '2', '3' and '4'.**

NOTICE:

By default, the **"Scheme 0"** scheme is preset in VIGAS boilers. With this scheme, the **"TANK-SPEICHER"** contact in the thermometer module "B" is used to connect the room thermostat. If RT is not connected, a jumper must be inserted on the **"TANK-SPEICHER"** contact (fig. 46).

When installing RT, we release the **"TANK-SPEICHER"** contacts, remove the jumper and connect the wires from the room thermostat.

NOTE:

The **"TANK-SPEICHER" contact is voltage-free, switching.**

When the **"TANK-SPEICHER"** contact is open, the display shows **"OFF"**. In this case, the output of the boiler is gradually reduced. The status of the boiler is displayed by the symbol . After switching on the room thermostat again, the boiler goes into the "Heating" mode for wood fuel, or to the "Ignition" mode for pellet fuel. **More in the boiler manual.**



Thermometer module, „B“

6. ACCESSORIES FOR VIGAS BOILERS

6.1 Flue gas extraction fan

The flue gas extraction fan "2" is used to limit the leakage of smoke into the boiler room when fuel is added to the VIGAS boiler. If the chimney does not meet the minimum dimensions "A" and "B", we recommend installing a flue gas extraction fan according to the type of boiler.

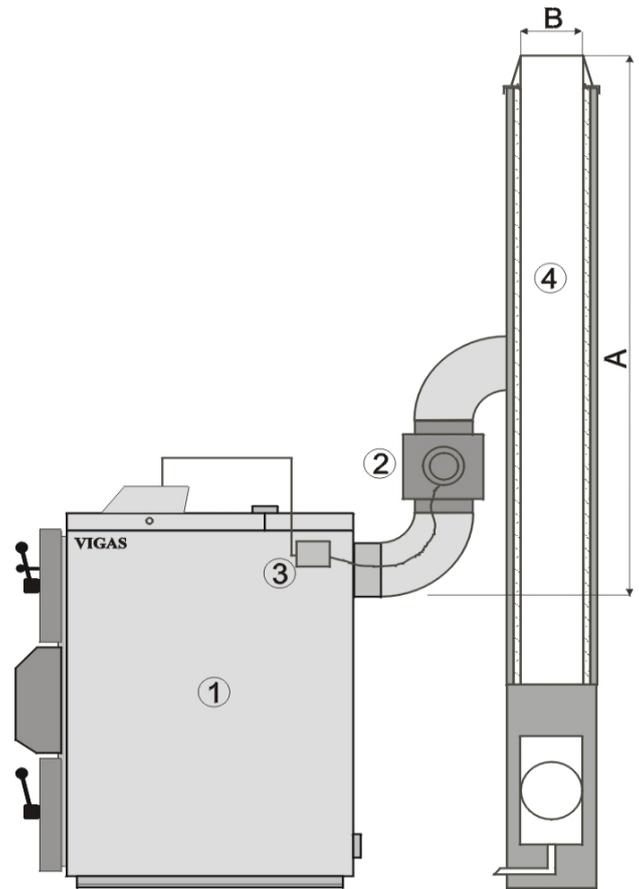
It is installed between the outlet chimney neck of the boiler and the chimney body. Condenser "3" is mounted on the side of the boiler cover plate. It is electrically connected to the power unit at the contacts marked "□X□".

NOTICE:

In MENU 7.11, it is necessary to set the option to "☒" yes".

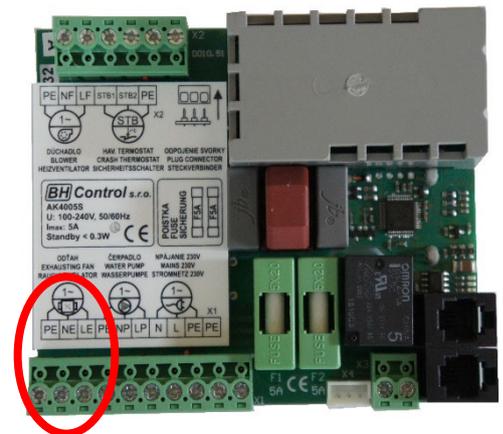
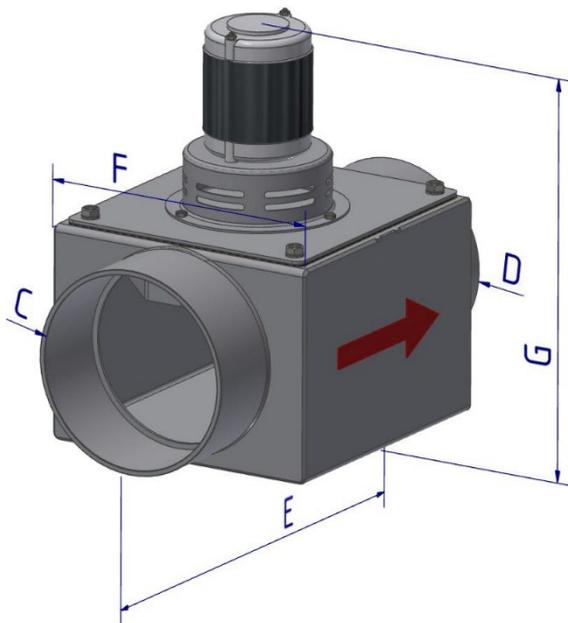
In this case, the **AK 4000** control system adapts the control of the boiler with the exhaust fan. More in the boiler manual. It comes in two sizes according to the diameter of the chimney neck.

- V25 (code SP 0507)** – for VIGAS 12DPA, 16,18 DPA, 25, DPA,25
- V80 (code SP 0508)** – for VIGAS 26 DPA, 40, 60, 80, 100.



BOILER TYPE	Min A	Min B
VIGAS 16,12 DPA,18 DPA,25	8 m	160 mm
VIGAS 26 DPA, VIGAS 40	8 m	200 mm
VIGAS 60,80,100	12 m	200 mm

DIMENSION (mm)	FAN TYPE	
	V25	V40
C – internal diameter	161	198
D – outer diameter	159	203
E	385	
F	235	
G	335	370



6.2 EXPANDER AK 4000 control system

6.2.1 Expander AK4000 - technical description

The AK4000 expander is an additional accessory to the AK4000 boiler control. It expands the capabilities of the boiler control system by controlling individual central heating (CH) circuits, including the regulation of the temperature of domestic hot water (DHW) when using multiple heat sources. It allows you to control the heating system using a room thermostat, equithermal regulation (according to the outside temperature) or a combination of them. It allows you to control an external boiler (gas or electric), a hot water fireplace pump or a solar system together with an AKU tank. Expander AK4000 is supplied in sets. For individual wiring diagrams, it is supplied as a **basic set (code SP 5001)** or a **double set (code SP 5002)**. In principle, the basic set controls one mixing circuit and the double set controls two mixing circuits. It is therefore necessary to mount the Expander box on the wall near the controlled circuits and the control unit of the AK4000 boiler so that nothing prevents the introduction of additional cables and thermometers. **The expander needs a separate 230V/50Hz power supply.**



Basic set – (code SP 5001)



Double set – (code SP 5002)

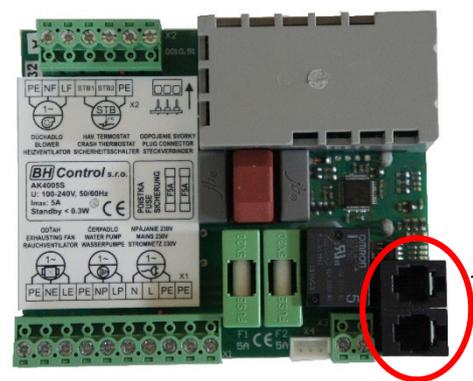
The basic set includes:

- 1x AK4000E Expander Module
- 2x Thermometer type KTY - 1.5m
- 1x external thermometer (without connecting wire)
- 1x AK BUS E connecting cable - 4m
- 1x EU power cord, 230V

Double set includes:

- 2x AK4000E Expander Module
- 3x Thermometer type KTY - 1.5m
- 1x external thermometer (without connecting wire)
- 1x AK BUS E connecting cable - 4m
- 1x EU power cord, 230V

6.2.2 Installing the Expander system



4P4C socket for connecting the AK BUS E communication cable on the AK4000 power board.

NOTICE:

Do not connect the Expander AK4000 to the 230V network before completing the installation of the cables (thermometers, pumps, servos). After connecting the boiler to the 230V network and connecting the Expander AK4000 via AK BUS E, only communication with the boiler display will be active, so that the positions of the inputs and outputs **MENU 7.15**, possible errors **MENU 4** can be detected.

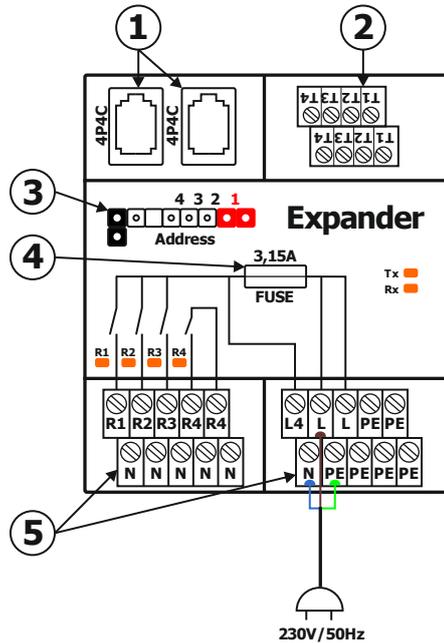


We insert the AK BUS E cable through the hole on the side of the top cover of the boiler and then insert it into the free socket on the AK4000 power board. For **DPA** boilers, it is necessary to use the socket on the pellet expander module **AK4000EP**, which is located under the pellet hopper (fig. 29).

6.2.3 Basic parts of the AK4000 Expander control system

6.2.3.1 AK4000E Expander module

The AK 4000E Expander module is a basic element of every set. It consists of four inputs and outputs. The use of individual inputs and outputs is conditioned by the currently selected scheme and configuration (**MENU 7.14**) of the AK4000 control system on the VIGAS boiler.

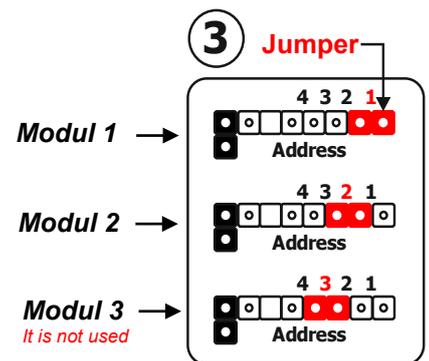
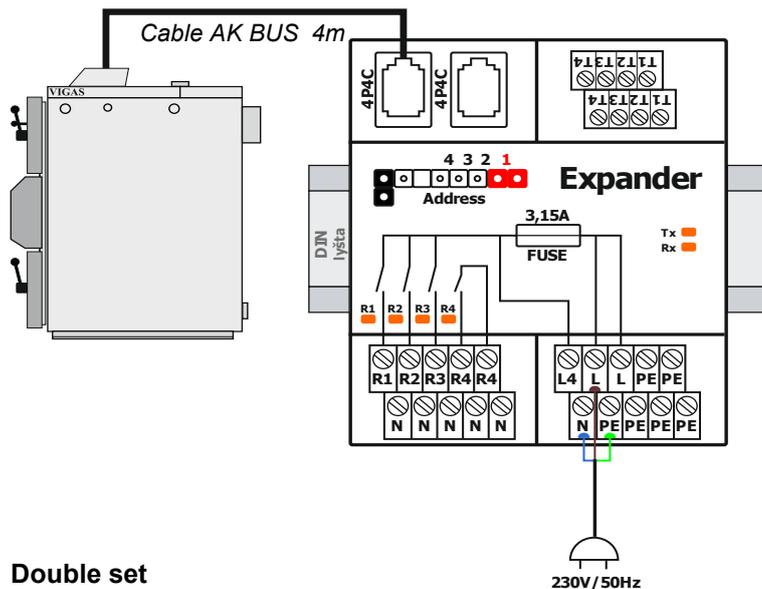


1. BH BUS connector. The bus ensures communication between the boiler and the Expander module, and in the case of a double set, also between the Expander modules.
2. Four inputs for connecting thermometers or a room thermostat. More in the electrical connection table: Inputs, outputs. **Menu 7.15**
3. Addressing Expander modules.
Basic set - Expander module - Address 1
Double set - 1 module - Address 1
- 2 module - Address 2
4. Fuse (5x20 3.15A) secures the Expander outputs.
5. Four outputs, R1-R2-R3 – **switches the phase**, R4 and R4 forms a **potential-free contact**. More in the electrical connection table: Inputs, outputs or **MENU 7.15**

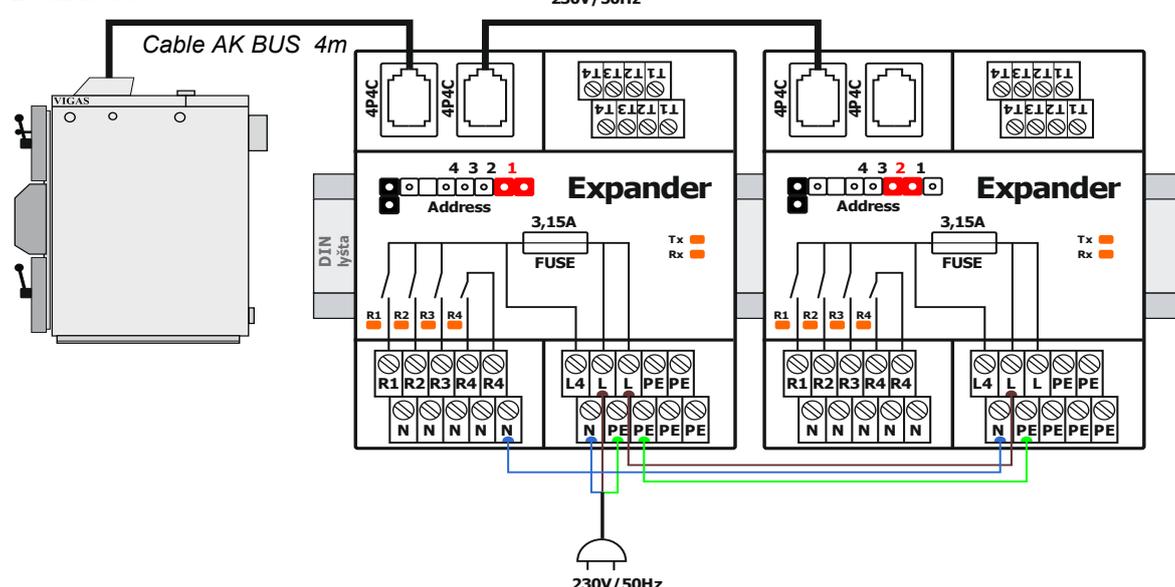


Expander module AK 4000E
Code SP 5004

Basic set



Double set



6.2.3.2 Thermometer type KTY

Attachment thermometer type KTY. It is supplied in a length of 1.5 m. The recommended installation is approx. 0.5 m behind the mixing valve (three-way or four-way circuit). The active metal end must be positioned so that it touches the pipe as much as possible and wrapped with insulating material. The thermometer wire is made of silicone material for temperatures up to 150 °C and is suitable for placement under pipe insulation. If necessary, the conductor can be extended up to a length of 20 m.

The **basic set contains 2 pieces**, the **double set contains 3 pieces** of thermometer.

NOTE: For a given wiring diagram, check the number of thermometers used. If necessary, the thermometer can be ordered separately (code SP 1004).



6.2.3.3 Thermometer external type KTY

External (external) thermometer type KTY. It is delivered without a driver. The recommended installation is on the north side of the building up to a height of approx. 2m above ground level. **The set always contains 1 pc.**

WARNING:

In the event that the thermometer cannot be placed correctly and the thermometer heats up, e.g. the surface on which it is placed, it is possible to correct the outside temperature in the range of 0 to -5°C. More in MENU 7.11.



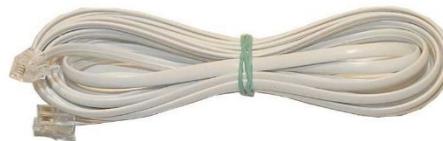
6.2.3.4 Connecting cable AK BUS E

The connecting cable AK BUS E is used for communication between the Expander set and the AK4000 boiler control unit. Length 4m.

The set always contains 1 connecting cable.

NOTICE:

Any free 4P4C connector on the AK4000E Expander module and the AK4000 power board can be used for connection. In the case of VIGAS DPA boilers on the AK4000 EP module.



6.2.3.5 Thermometer for ACCUMULATION (ACCU) type KTY 4m

Attached thermometer for ACCU tank type KTY. It is supplied in a length of 4 m. Installation in the well in the upper part of the AKU tank is recommended. The thermometer wire is made of silicone material for temperatures up to 150 °C and is suitable for placement under pipe insulation. If necessary, the conductor can be extended up to a length of 20 m.

NOTICE:

The Expander set does not include this thermometer. If necessary, order separately (code SP 3032) or use a free thermometer (code SP 1004) and extend as needed.



6.2.3.6 Thermometer for KRB and SOLAR type PT1000

Attached thermometer designed for measuring the temperature of the chimney in the case of a hot water fireplace and measuring the temperature in the solar circuit. It is supplied in a length of 0.5m or 1.5m. The thermometer wire is covered with stainless steel wire. If necessary, the conductor can be extended up to a length of 10 m.

NOTICE:

The Expander set does not include this thermometer. If necessary, order separately

Code SP 3027 - 0.5m

Code SP 0703 - 1.5m.



6.2.4 Additional accessories of Expander AK4000

According to the selected hydraulic scheme (MENU 7.14), it is possible to connect additional accessories to the Expander AK 4000 module, which ensure optimal operating conditions and at the same time comfortable operation of the VIGAS boiler. The control system is set so that the boiler is always protected. The condition for opening and controlling the heating and hot water circuits is a minimum boiler temperature of 60°C.

Conversely, in the event of a threat of boiler overheating above 95°C due to the heating of all circuits CH and DHW, from the point of view of safety, the CH and DHW circuits can be gradually opened safely so that only excess heat is dissipated into CH or DHW. In this boiler protection mode, the set maximum temperature for individual DHW and DHW circuits is used.

More in MENU 7.1 and 7.2. If there is still insufficient heat dissipation, the release valve is activated together with the cooling safety exchanger. More in chapter 3.10.

6.2.4.1 Pump or two-way solenoid valve

The AK4000 Expander control system is designed to control pumps with a connection voltage of 230V/50Hz. Both standard and electronic pumps can be used. The operation of the pump for the given circuit is shown by the flashing  pump pictogram on the graphic display diagram. Switching the DHW pump on or off depends on the DHW temperature, the state of the room thermostat (ON, OFF) for the given circuit and the heating requirement for the given circuit.

In addition to the pump, the  two-way valve with a connection voltage of **230V/50Hz** can be used for hot water heating.

The advantage of using a two-way valve compared to a pump is that, when the valve is closed, hot water is not pushed into the DHW tank from other pumps and thus does not cause an unwanted increase in the temperature in the DHW tank.

The choice of pump  or electric valve  for DHW heating must be assessed by the plumber mainly based on the distance from the heat source.

It is set in MENU 7.9.

Electrically, the pump or solenoid valve is connected to the Expander module to the contacts according to the electrical connection table for the selected scheme. MENU 7.14.

R – phase (230V/50Hz) brown or black conductor color.

N – zero, blue conductor color.

PE – ground, green-yellow conductor color.



6.2.4.2 Actuator with four-way or three-way valve

The AK4000 Expander control system is designed to control a servo drive with a connection voltage of 230V/50Hz and a transition time from 30 to 300s. Our offer includes the products of the Swedish company ESBE:

- Servo drive ESBE ARA 661, 120s, 230V, (code SP 0643/A)

- Three-way mixing valve ESBE VTC 131, 1", (code SP 0646/A)

- Four-way mixing valve ESBE VTC 141, 1", (code SP 0646/B)

The choice of the appropriate valve size must be assessed by the plumber.

NOTICE:

Servo drives from other manufacturers can also be connected to the Expander module, but they must meet the requirement of 230V/50Hz and a transition time in the range from 30 to 300s.



Electrically, the servo drive is connected to the Expander module to the contacts according to the electrical connection table for the selected scheme. **More MENU 7.14.**

R1 – -1 **ON** phase (230V/50Hz) valve opening.

R2– -1 **OFF** phase (230V/50Hz) valve closing.

N – zero, blue conductor color.

PE – ground, green-yellow conductor color.

6.2.4.3 Room thermostat

The control system of the Expander AK 4000 makes it possible to control heating circuits using a room thermostat. After choosing a suitable scheme, it is possible to choose the option "no" or "BIN" for the room thermostat. More in MENU 7.1, 7.2.

"no" - the room thermostat will not be used

"BIN" - binary room thermostat (standard room thermostat)

If "BIN" is selected, the given circuit will be controlled by the room thermostat. The "Heated space" status (reach of the set temperature in the room) is signaled on the boiler display,  **1 OFF**, the actuator is moved to the closed position and the pump for the given circuit is subsequently switched off. The state "Heating" is signaled,  **1 ON**. The given circuit is heated to the desired (set) or calculated (equithermal) temperature. The pump always works in the "Heating" state for the given circuit. All types of potential-free room thermostats can be connected to the AK4000 Expander, i.e. j. such that no electric current flows through the contacts. We recommend using temperature sensing with settings in increments of **0.2 °C**. (standard after 0.5 °C).

Electrically, the room thermostat is connected to the Expander module to the contacts according to the electrical connection table for the selected scheme. **More in MENU 7.14.**



6.2.4.4 Cooperation of the VIGAS boiler with the ACCU tank

By default, in VIGAS boilers, one load is sufficient for 12 hours of operation, which means that less than 30% of the nominal power is used. From the point of view of the life of the boiler, it is advantageous if the boiler works at least at 50% of the rated output. When connecting a VIGAS boiler with an ACCU tank, 100% of the boiler's power is used to achieve the desired boiler temperature. If there is a demand for heating at the same time, 100% of the boiler's output is divided into recharging the ACCU tank and heating. In this case, the tank is recharged only by the excess output of the boiler. Due to the fact that the boiler and the ACCU tank are hydraulically connected to each other, the temperature in the ACCU tank and in the boiler rises to the required temperature of the boiler together. After this temperature is exceeded by 1°C, the boiler goes into attenuation mode . In the case of "PELLET" fuel, the boiler must be overheated by up to 3°C (MENU 7.19 parameter 15) in order for the boiler to shut down completely. In damping mode, tank charging and heating are controlled only by pumps. A big advantage of the control system used is that in the damping mode it is possible to add "WOOD" fuel to the boiler at any time without overheating the ACCU tank, which in practice extends the time between adding fuel. The boiler will only be reheated if the required temperature to (CH, DHW) is higher than the temperature in the ACCU tank, or if the temperature in the ACCU tank drops to the set value. The depletion temperature of the ACCU tank can be set from 20°C to 90°C. After the fuel burns out and the chimney temperature drops to the boiler shutdown temperature  and the boiler shuts down. In the case of the VIGAS DPA combined automatic boiler, after the "WOOD" fuel has burned out, the boiler can automatically switch to the "PELLET" fuel and continue heating for several more days.

NOTICE:

For all hydraulic connections with the ACCU tank, it is necessary to place the sensor in the nipple or under the insulation in the upper part of the ACCU tank so that the full volume of the ACCU tank is used.



6.2.4.5 External boiler

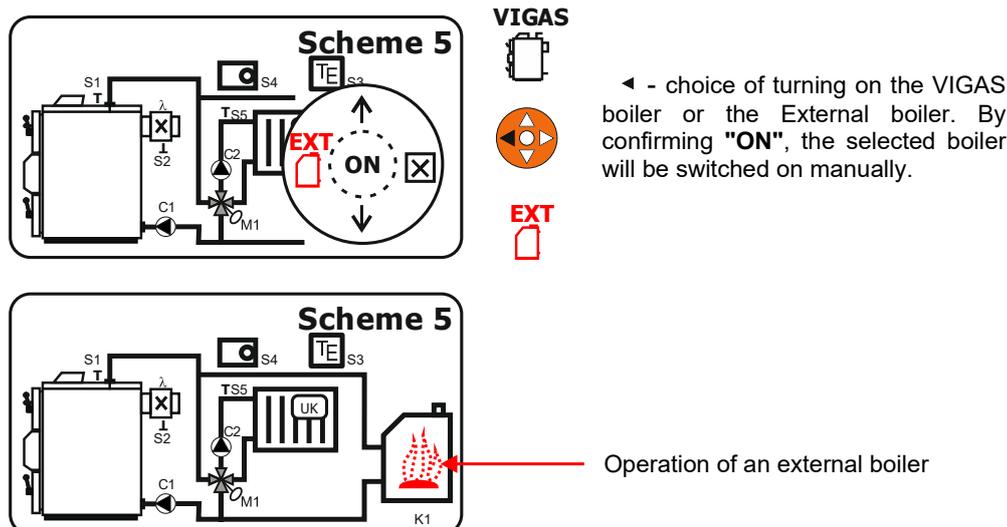
The control system of the Expander AK4000 allows you to connect and control the switching on of an external boiler (gas or electric). We use contacts R4 and R4 on the Expander AK 4000E module for this. It is possible to connect an external boiler in two ways:

1. By using the contact of the external boiler to connect the room thermostat. These are fed to the AK4000E Expander module on R4 contacts. In this case, the control of the external boiler will be performed by switching the contact of the room thermostat of the external boiler. The external boiler must be switched on. This connection is advantageous if the external boiler is also used for hot water heating.

2. Another option to control the external boiler is to connect the supply voltage (phase L) of the external boiler via contacts R4. In this case, the external boiler will be switched on and off using the relay via contact R4.

In the case of choosing a scheme with an **external boiler** (see MENU 7.14), the option to switch on the external boiler will be added „“.

Pressing "Enter" will display the circular controller. With a button „“ it is possible to choose the boiler to be used. After selection „“ and confirmed „**ON**“ will turn on and the external boiler will work. The control system also enables automatic switching on of the external boiler after the fuel has burned out and the chimney temperature has dropped to the set value „end “. See MENU 1 - Settings for "Aut" mode.



6.2.4.6 Hot water fireplace "KRB"

The Expander AK4000 control system allows you to connect and control a hot water fireplace pump. We recommend connecting the fireplace to the ACCU tank and ensuring the water flow with a fireplace pump. The pump is automatically switched on whenever the fireplace heats up and the set chimney temperature is reached. More in MENU 7.17.

NOTICE:

As a temperature sensor, use a thermometer type **PT1000 (code SP 3027)**. Place the thermometer in the chimney neck of the fireplace.

The Expander set does not include this thermometer. If necessary, it can be ordered separately in two lengths:

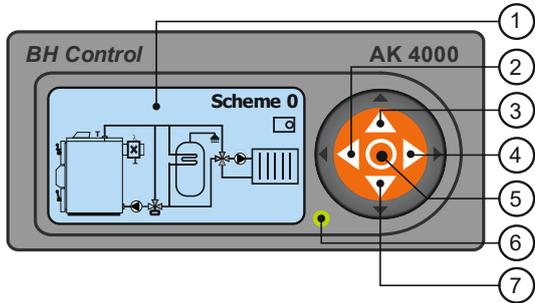
Code SP 3027 - 0.5m

Code SP 0703 - 1.5m.



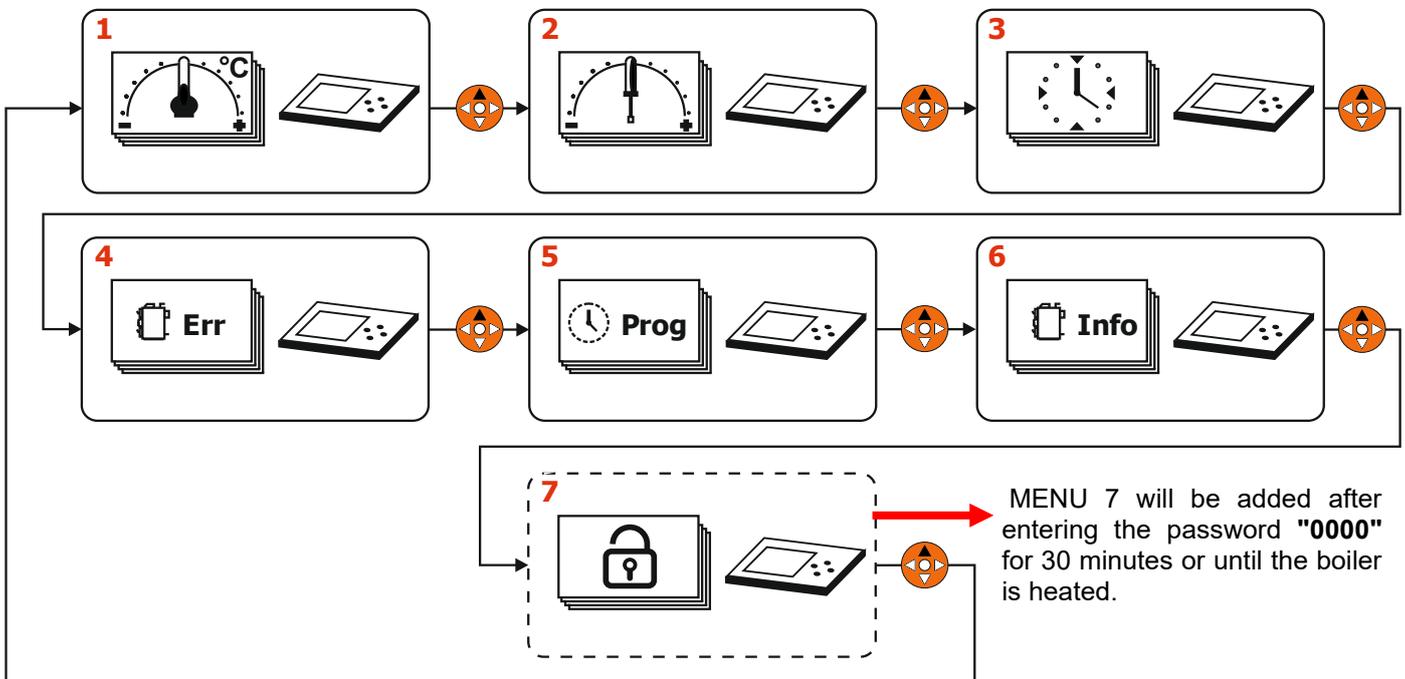
7. CONTROL AND ADJUSTMENT OF THE AK4000 CONTROL SYSTEM

Control and setting options depend on the selected program and the current configuration of the boiler. Part of the electronic regulation is a control panel with buttons, boiler status symbols and a display. The functions of the individual buttons are combined and depend on the accompanying text shown on the display.



1. Graphic display 128 x 64 pixels
2. Button ◀ with functions, input
3. Button ▲ with functions
4. Button ▶ with functions, exit (ESC)
5. Button ● (ENTER) with function - short, long press
6. LED light (green OK, red error (ERR))
7. Button ▼ with functions

7.1 MENU STRUCTURE - BASIC SETTINGS



- MENU 1 – Temperature setting
- MENU 2 – Boiler parameters setting (Boiler operating instructions)
- MENU 3 – Clock setting
- MENU 4 – Error messages
- MENU 5 – Setting the time program (only in the case of schemes with Expander AK 4000)
- MENU 6 – Information on hardware and software (Boiler operating instructions)
- MENU 7 – Service settings under password

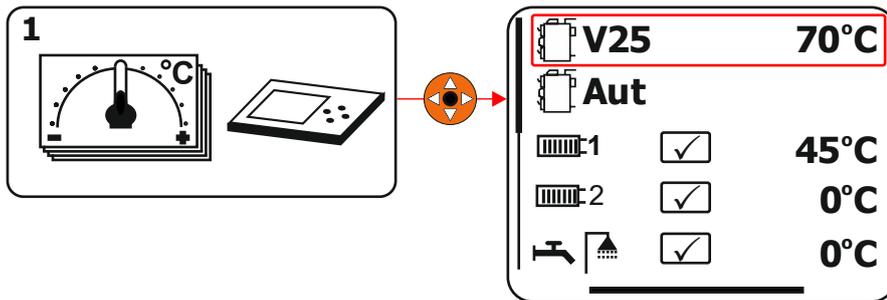
7.2 MENU DESCRIPTION - BASIC SETTINGS

MENU 1 – TEMPERATURE SETTING

For the basic hydraulic connection schemes - Scheme 0 to Scheme 4 - it is possible to set only the boiler temperature in **MENU 1**. After expanding the control system with the additional accessory EXPANDER AK4000 and selecting Scheme 5 or more, the "Temperature setting" MENU will be supplemented with the setting of the temperatures of the CH, DHW circuits and their priorities with the option of heating in case of fuel burnout in the VIGAS boiler. Burnout and shutdown of the boiler is signaled by the **AUT** statement. The display of individual options depends on the selected scheme.

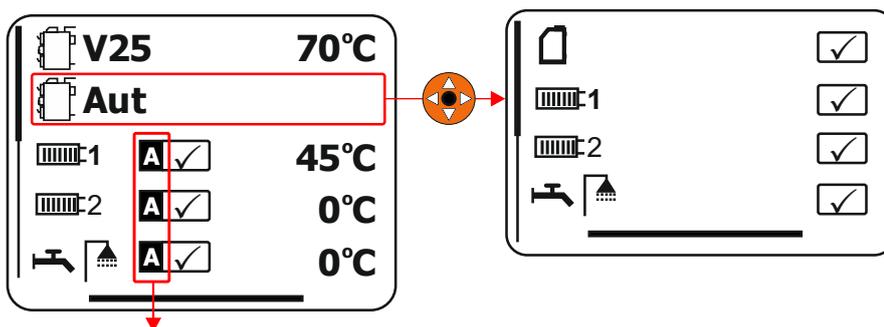
See **MENU 7.14**.

Setting the desired boiler temperature



V25 - setting the desired temperature for the VIGAS 25 boiler. The standard setting range is from 70°C to 85°C. In **MENU 7.11**, it is possible to increase the range up to 90°C if necessary (**connection with ACCU tank**).

Setting for mode „Aut“



If the VIGAS boiler is already in "AUT" mode, which is shown by the symbol, **A**, circuit control continues to the displayed temperature.

Aut - "Auto" mode is a special state of the VIGAS boiler after the fuel has burned out, when the chimney temperature, **end**, drops below the set temperature. **More in MENU 2** (Instructions for operating the boiler). This boiler status is displayed only for Schemes 5 and above. In this mode, the VIGAS boiler is shut down, but in the case of an external heat source such as an ACCU tank or an external boiler, the heating of the CH and DHW circuits can continue.

Depending on the selected hydraulic scheme, further choices can be made:

external boiler (gas or electric)

- after switching to "Aut" mode, the external boiler is automatically switched on.

off - after switching to "Aut" mode, the external boiler remains switched off.

1, **2**, **DHW** - heated circuit CH1, CH2, DHW.

- after switching to the "Aut" mode, standard heating of the CH1, CH2 and DHW circuits occurs.

off - after switching to the "Aut" mode, the CH1, CH2 or DHW circuit remains **unheated**.

+ - heating priority. It can be assigned to only one of the circuits. If the marked circuit is not heated to the desired temperature, **the other circuits will be unheated**.

Setting the desired temperature for the central heating (CH) circuit- ,

The temperature setting of the heated circuit depends on the control method of the given CH circuit. It can be controlled (according to the choice of the operator) according to the outside temperature, the so-called equithermal heating  1, according to the room thermostat  1 or a combination thereof.

NOTICE:

The choice of equithermal regulation and room thermostat can be selected for each heated area separately.

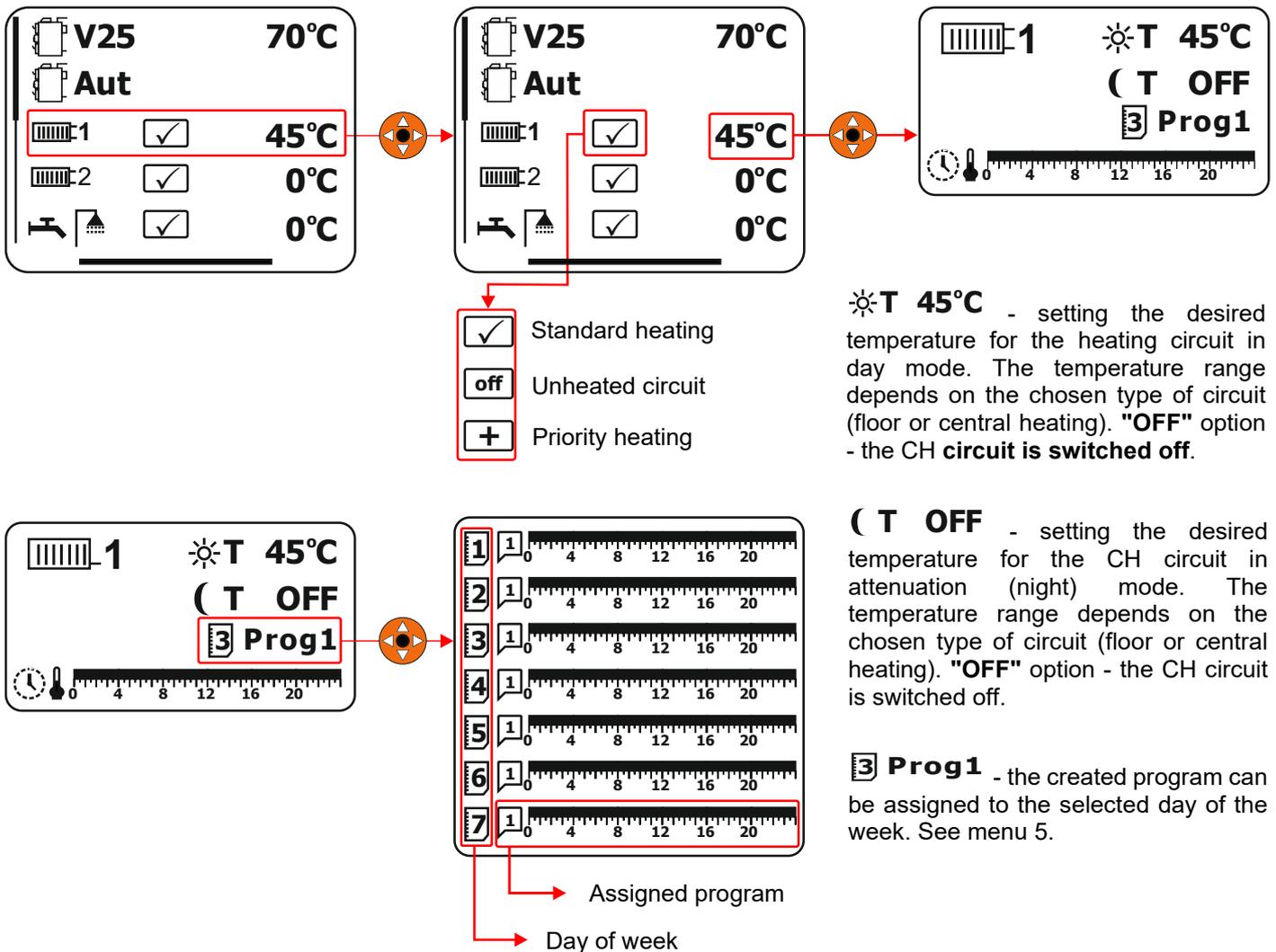
For example circuit CH1  1 can be regulated on the basis of equithermal regulation and room thermostat, but CH2 circuit  2 only based on the room thermostat. More in MENU 7.1 and 7.2.

The desired temperature can be set in two ways:

- by directly setting the desired temperature for the CH and DHW circuits.
- by control according to the outside temperature "equithermal regulation".

Heating control directly to the desired temperature:

If the equithermal heating option is not selected,  1 - no the temperature of the heated circuit is entered directly. Control of the heating circuit to the selected temperature only takes place if the temperature of the VIGAS boiler exceeds 60°C (this does not apply if the VIGAS boiler is already in "Aut" mode, see above) and the room thermostat is in the "ON" state. The CH circuit pump always works if the CH temperature is higher than the desired CH temperature, the servo drive is open (1-100%) and the room thermostat is in the "ON" state. In the case of a heated space (room thermostat in the "OFF" state), the servo drive gradually closes to 0% and the pump of the CH circuit is subsequently switched off.



Control according to the outside temperature "equithermal regulation"

If the equithermal heating option is selected $\boxed{\text{E}} 1$ - „yes“, the temperature of the heated circuit is calculated automatically based on three parameters:

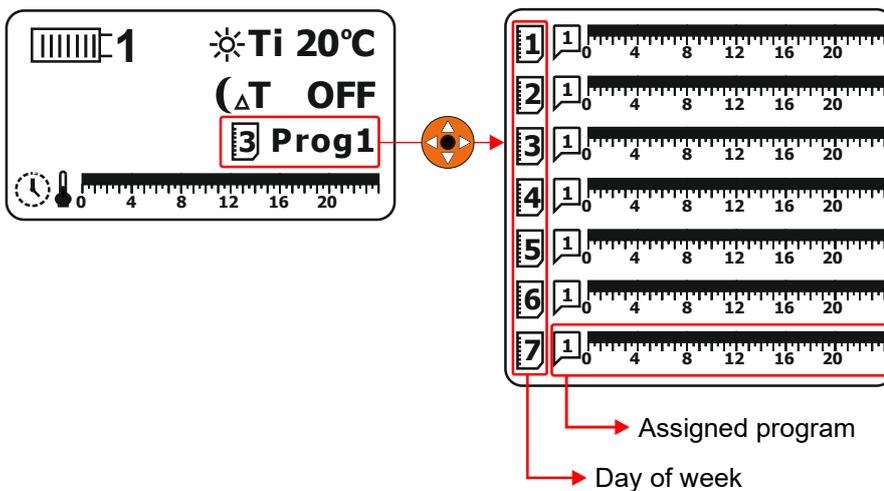
1. outdoor temperature,
2. parameter "T0", (temperature at outside temperature 0°C)
3. parameters of the desired temperature in the room "Ti" (interior temperature).

Outside temperature - part of the Expander AK4000 set is a box with a thermometer (ch. 6.2.3.3) for measuring the outside temperature. We recommend mounting the box on the north side of the building for correct measurement of the outside temperature. If necessary, it is possible to correct the measured temperature, see **MENU 7.11**.

Parameter "T0" - setting of the equithermal curve. At the outside temperature $T - 0^{\circ}\text{C}$, the temperature of the heated circuit will be regulated to the set value, see MENU 7.1 and 7.2. For example, if the temperature is set to 50°C for the "T0" parameter, it means that at the outside temperature 0°C , the temperature of the water to the CH will be regulated to 50°C (at "Ti" = 20°C). The setting of the parameter depends on the heating system and the insulation properties of the object.

The parameter of the desired temperature in the room "Ti" - the parameter serves to increase or decrease the temperature of the water in the heating circuit (advancement of the equithermal curve). For example, if we increase the "Ti" parameter to 22°C , then at $T0 = 50^{\circ}\text{C}$ the temperature will be regulated to CH at 52°C , i.e. $+2^{\circ}\text{C}$. In the case of a combination of "equithermal regulation" and a room thermostat, the "Ti" value can be chosen with a larger margin, because when the desired temperature is reached in the room (**heated space - room thermostat status "OFF"**), the servo drive closes and the given circuit will not be heated.

Recommendation to the boiler operator: To increase or decrease the temperature for the regulated circuit, use the parameter "Ti" in particular, which is normally accessible and it is not necessary to enter the password to change "T0".



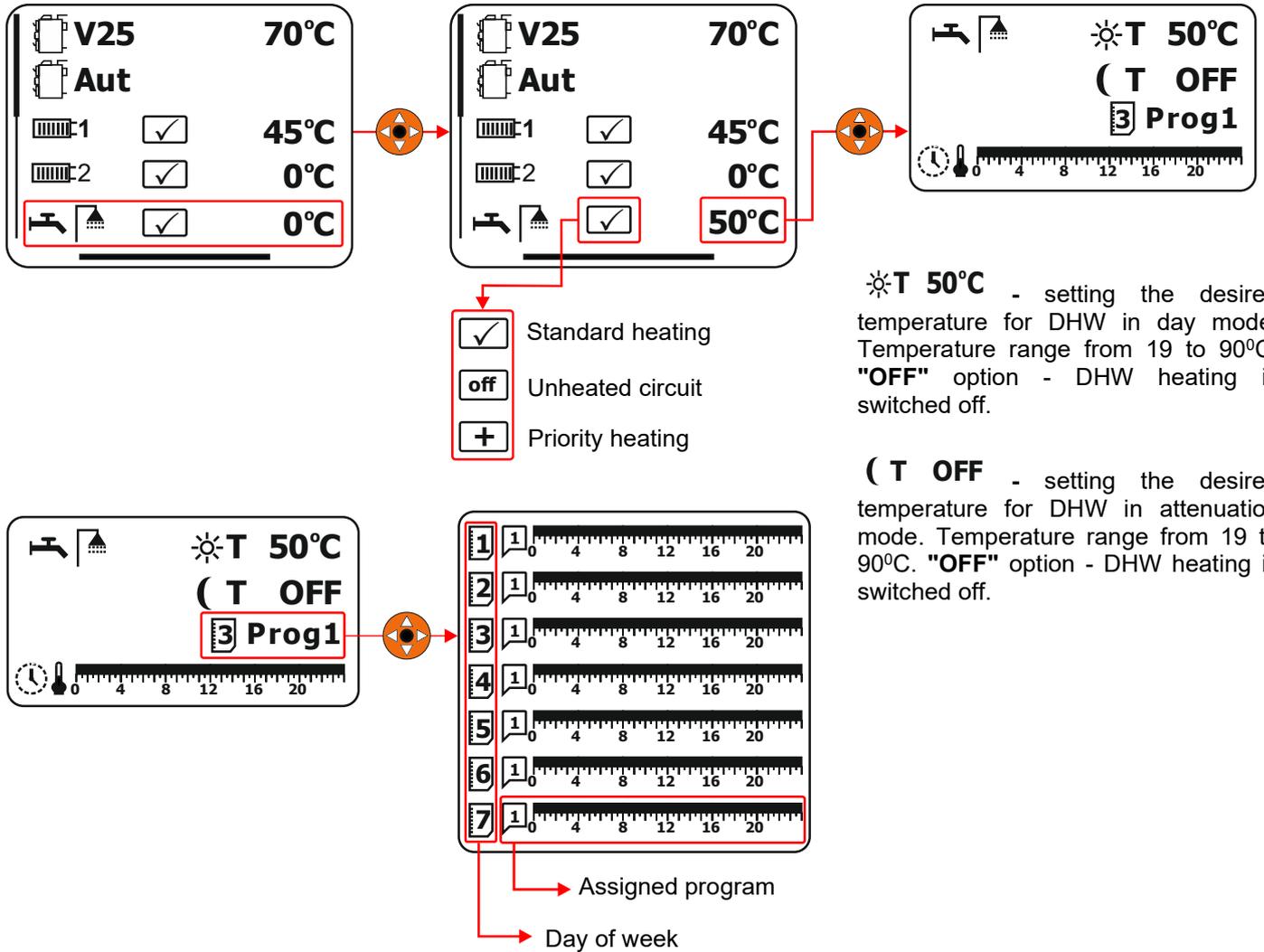
\odot **Ti 20°C** - setting the desired temperature in the room (interior). Range from 10 to 30°C . "OFF" option - the CH circuit is switched off.

$(\Delta T \text{ OFF})$ - setting the temperature attenuation in the room (interior). Range from -7 to -1°C . "OFF" option - the CH circuit is switched off. The temperature in the heated CH circuit is reduced by the set temperature.

$\boxed{3}$ **Prog1** - the created program can be assigned to the selected day of the week. See menu 5.

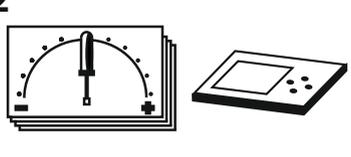
Setting the desired temperature for hot domestic hot water (DHW) -

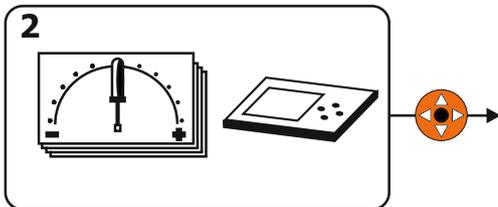
Domestic hot water (DHW) heating is controlled by means of a pump or electric valve (open without voltage), see **MENU 7.9**. The DHW is heated to a comfortable (daytime) or reduced (nighttime) temperature. From a practical point of view, it is advantageous for DHW to use only a comfortable temperature.



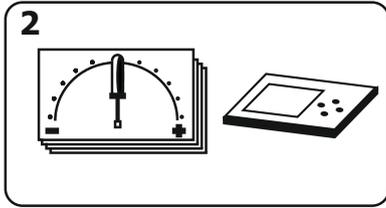
MENU 2 – SETTING THE BOILER PARAMETERS

Attention: Setting the parameters of the boiler in MENU 2 depends on the type of boiler, the configuration of the boiler and the selected fuel.

<p>2</p> 	<p> max</p> <p>Maximum chimney temperature - WOOD The maximum flue gas temperature at which the EBM fan speed is reduced. The temperature can be set in the range from 130°C to 320°C. The temperature setting depends on the quality of the fuel and the chimney draft. The recommended value is 220°C.</p>
<p> end</p> <p>Boiler shut-off chimney temperature - WOOD The flue gas temperature at which the boiler and boiler pump will automatically shut down. The temperature can be set in the range from 20°C to 130°C. The chosen temperature can influence the size of the burning base for the next heating. If the value is set to low, the fuel will burn completely, if the value is too high, ash may accumulate in the fuel tank. Recommended temperature: - connections without ACCU tank 50°C, - connection with ACCU tank 80°C and more.</p>	



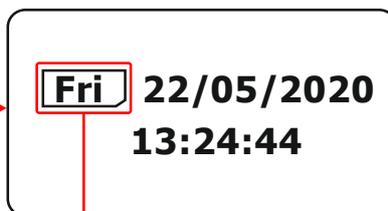
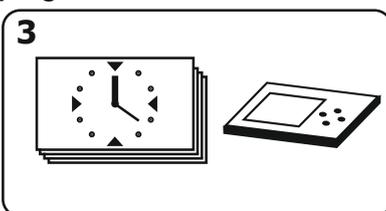
<p>2</p> <p>λ</p>	<p>Choice of "lambda" value - WOOD - Lambda Control The "lambda" value determines the excess of oxygen in the flue gas. The recommended value is 1.35, which represents approx. 6% O₂. The value can be set in the range from 1.2 to 1.5. By increasing the O₂ content in the flue gas, the efficiency of the boiler decreases and harmful emissions increase.</p>
<p>Δ </p>	<p>EBM fan speed correction – WOOD By increasing or decreasing the value, you change the nominal output of the boiler. The value can be set in the range from -3 to +3. One level represents about 10% of the boiler's output. Setting the value to "0" corresponds to the nominal boiler output parameter. In the transitional heating period, we recommend reducing the value.</p>
<p>Δ </p>	<p>EBM fan - DPA speed correction By setting the fan correction Δ  it is possible to increase or decrease the amount of supplied air in the case of DPA boilers. The value can be set in the range from -5% to +25%. Setting the value to "0" corresponds to EN Plus A1 pellet quality. The correction can also be used for: Low chimney draft correction.....+ High chimney draft correction..... - Lower quality pellets correction.....+</p>
<p> min</p>	<p>Correction of minimum fan speed EBM – WOOD By increasing it, you change the value of the minimum fan speed. The value can be set in the range from 0% to 70%. The recommended value is 0.</p>
<p> MinT</p>	<p>The minimum temperature in the ACCU tank WOOD, DPA Setting the minimum temperature in the ACCU tank. The display is active only if the hydraulic scheme with the AKU tank is selected. Adjustment range 25–70°C. If the boiler exceeds the desired temperature by 1°C, the boiler will go into the attenuation state, . If the boiler exceeds the desired temperature by parameter 15 (DPA) or parameter 25 (WOOD), the boiler will be completely shut down. See MENU 7.19. The boiler will only be reheated if the required temperature for CH, DHW is higher than the temperature in the ACCU tank, or if the temperature in the ACCU tank drops to the set value.</p>
<p> on</p>	<p>Setting the exhaust fan operation If the exhaust fan is installed and selected (see MENU 11), it can also be used to increase the efficiency of the chimney by means of permanent operation. The speed can be set from 30% to 100% or completely turned off by setting it to "OFF". If the percentage of continuous operation is selected, the exhaust fan works in parallel with the push fan.</p>
<p>Δ </p>	<p>Correction of the performance of DPA boilers Performance correction Δ  can be used to increase or decrease the pellet dosing time in one period. The value can be set in the range from -3 to +3. One correction step = change of dosing time in one period by 0.5s. The correction can be used to achieve optimal combustion of pellets, or to adjust the boiler performance. For pellet quality according to the EN Plus A1 standard, we recommend setting the correction to the value "0". The set correction is reflected in the displayed maximum boiler output.</p>



	<p>Choice of DPA boiler fuel type The VIGAS DPA boiler is a semi-automatic boiler for burning pellets and pieces of wood. When using "PELLET" fuel, it is necessary to select a graphic symbol, . When using "WOOD" fuel, it is necessary to select a graphic symbol, .</p>
<p>Start </p>	<p>Cooling fan start temperature – TVZ You select the flue gas temperature at which the cooling fan turns on. The value can be set in the range from 70°C to 220°C. The recommended value is 120°C. When the selected value is reached, the fan turns on. The cooling fan switches off 10°C below the switch-on temperature.</p>
	<p>Automatic selection of transition WOOD – PELLETS When the "AUTO" mode is selected, "WOOD" will occur after the fuel has burned out and the flue gas temperature has been reached to automatically switch to "PELLET" fuel and then continue burning with pellet fuel.</p>
	<p>Display brightness You choose the brightness value of the display. The value can be set in the range from 0 to 100.</p>
	<p>Display contrast You select the display contrast value. The value can be set in the range from 16 to 24.</p>
<p>Roll</p>	<p>Option to scroll the data of the display info row By selecting "yes", the current values of the boiler are gradually displayed in the information line of the display. For example boiler output, boiler temperature, flue gas temperature, etc.. When choosing "no", select the data in the information line with the buttons .</p>

MENU 3 – SETTING THE CLOCK

Attention: Correct setting of the real date and time is important for the functionality of the Expander AK4000 programs.



22/05/2020 –
Selection of the current date in the form of DD/MM/YYYY. Selecting the current date automatically adjusts the day of the week.

13:25:44 - Selection of the current hour in hh:mm:ss format.

Days of the week:
Mon - Monday, Tue - Tuesday,
Wed - Wednesday,
Thu - Thursday, Fri - Friday,
Sat - Saturday, Sun - Sunday.

MENU 4 – ERROR MESSAGES

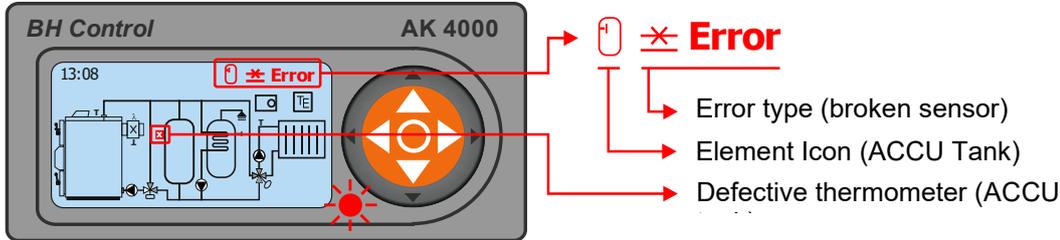
In general, if the boiler is switched off, the "OFF" LED does not light up. In the "ON" state of the boiler, the LED lights up.

If all elements of the boiler are fault-free, the LED lights up  (green). In the event of an error, the LED lights up  (Red).

The error description is displayed:

1. statement in a text line
2. listing in the error MENU 4

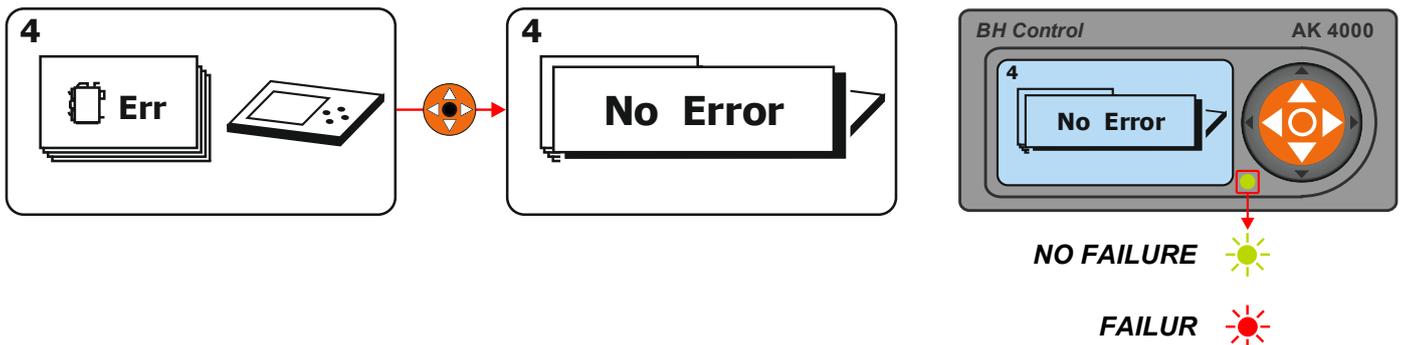
1. Listing in a text line (example of a broken ACCU tank temperature sensor)



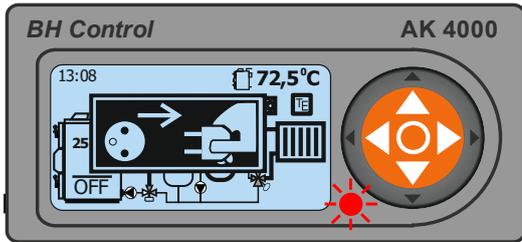
Typ	DESCRIPTION OF A PROBLEM	SOLUTION
	Interrupted (not connected) sensor.	Checking the wiring, replacing the sensor.
	Sensor short circuit.	Checking the wiring, replacing the sensor.
	Interrupted sensor input.	Checking the cabling, routing the cabling outside the power line.
COM	Communication error with the module.	Checking the communication cable, checking the power supply of the module (23V/50Hz), replacing the module.
I2C	Communication error with the measuring transducer.	Replacement of the module (power board, Expander) on which there is an input with this error.
STA	Error processing commands in the module.	SW update, replacement of the module on which there is an input with this error.
	Supply voltage error for Lambda probe, low voltage.	Checking the 12V power supply, replacing the power Lambda board.
	Too little current in the lambda probe heating circuit.	Checking the wiring (interrupted wiring), replacing the Lambda probe.
	Excessive current in the Lambda probe heating circuit.	Checking the wiring, replacing the Lambda probe.
	Servo control voltage too small.	Checking the wiring, checking the movement of the servo, checking the batteries, replacing the servo, replacing the lambda board.
	High auger motor temperature	Check the auger (jawed auger), check the engine temperature sensor.
	Battery voltage too low.	Checking the batteries, checking the battery holder, checking the leakage of batteries into the electronics.
	Dead batteries	Battery replacement. (2x 1.5V – AA)

1. Error listing in error MENU 4

All available errors are always displayed in error MENU 4, that is, errors displayed in the text line as well.



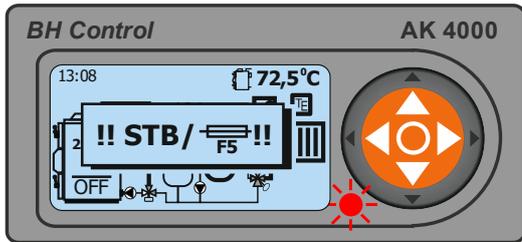
2. Faults and warnings on the display



Main power:

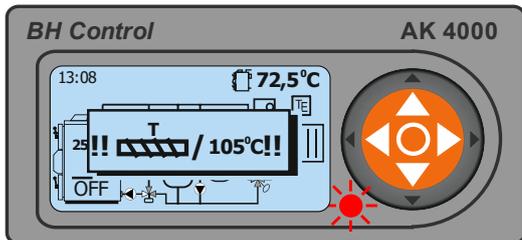
Short-term power failure (230V, 50Hz) without affecting the function of the boiler. If the warning appears frequently, check the supply voltage, use a different supply phase. By confirming the center button "●" we delete the listing.

Warning: In the case of DPA or Lambda control boilers, in the event of a power failure, the air supply is closed by self-propelled (preventing the boiler from burning by the draft of the chimney), which can result in short battery life (2x 1.5V – AA) in case of frequent power failures. See chap. 5.2.1.



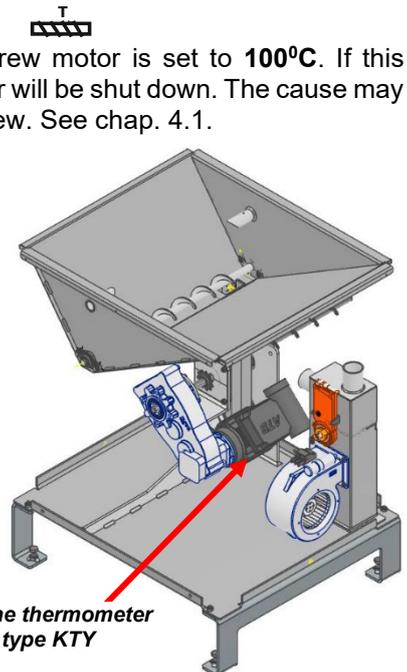
STB / FUSE 1A, STB / FUSE 5A, STB / FUSE, STB

Emergency thermostat error or blown fuse on the power board. Check fuses (1A, 5A) or emergency thermostat. In the event of a "STB" failure, the boiler may have overheated. The thermal fuse has been activated (see picture). In this case, the blower fan is disconnected from the voltage. The boiler can only be switched on again after the mechanical protection "STB" has been pressed, while the temperature of the boiler must drop below 60 °C, or after replacing the fuse. You can turn the boiler on again by confirming the center button "●". See chapter 5.4.

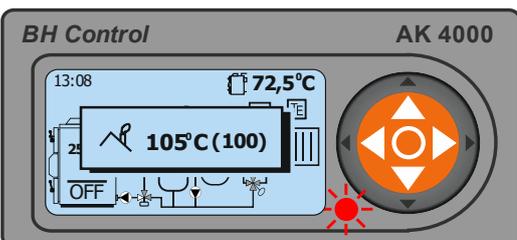


High auger motor temperature

The safety temperature of the screw motor is set to **100°C**. If this temperature is exceeded, the boiler will be shut down. The cause may be mechanical jamming of the screw. See chap. 4.1.



Engine thermometer type KTY



High flue gas temperature

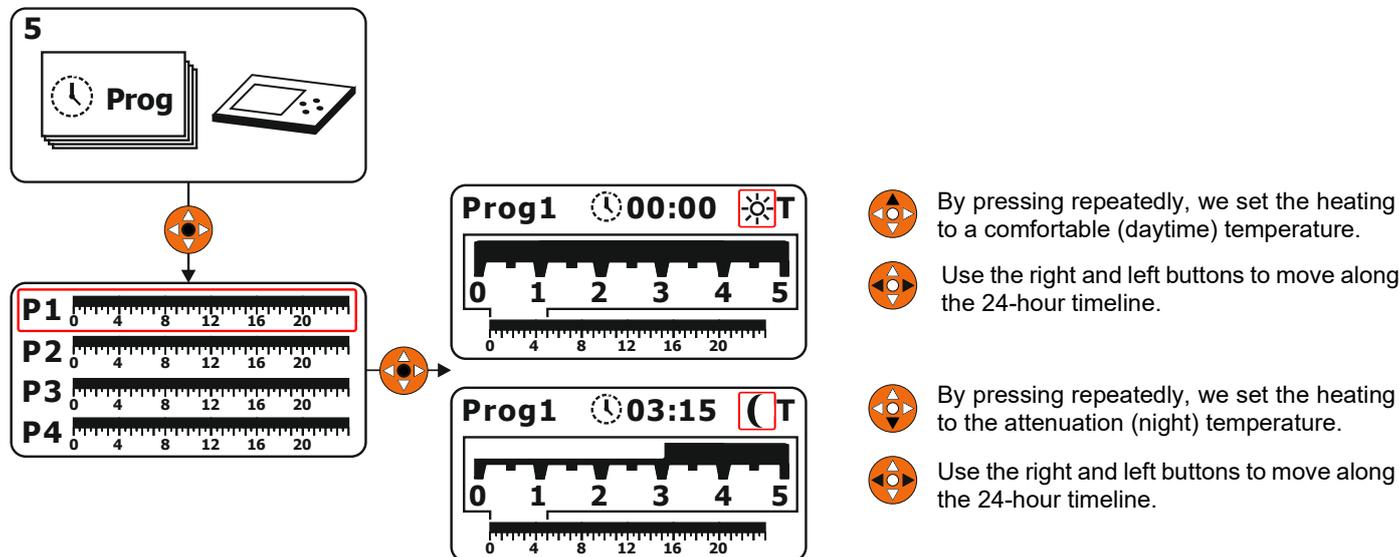
The warning is displayed for DPA boilers. The condition for starting pellet ignition is a lower chimney temperature than 100°C. During the discharge, the blower fan works, reduces (cools) the chimney temperature below 100°C, and only then can the boiler switch to pellet ignition mode. The reason for reducing the stack temperature is so that the pellet ignition process does not start at a high stack temperature, which could result in the system evaluating the pellets as not igniting, while the pellets burn.

The listing will automatically go out below a temperature of 100°C. See chapter 5.6.

MENU 5 - TIME PROGRAM SETTING

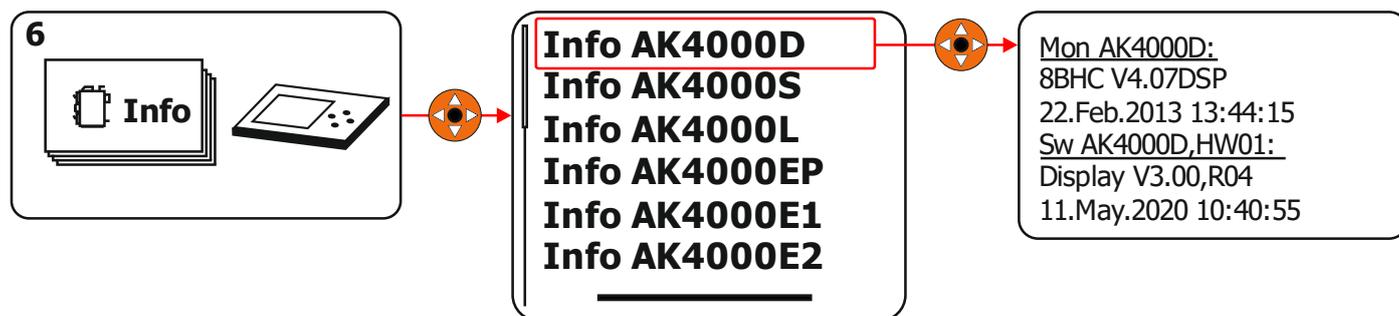
The time program determines the use of comfort, ☀, (daily) and attenuation, ☾, (night) temperature in the heating circuits. The control system of the Expander AK4000 allows you to set up to 16 different time programs in 15-minute intervals. Each CH and DHW heating circuit can be assigned one of 16 independent time programs for each day of the week.

MENU 1 - Setting the temperatures of the CH and DHW circuits.



MENU 6 - HARDWARE AND SOFTWARE INFORMATION

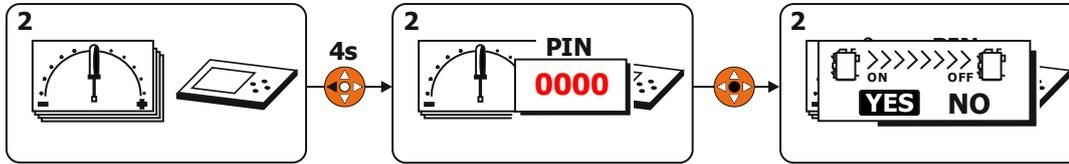
If a service technician needs it, MENU 6 is used to find out the current software and hardware used in individual modules. Only used modules are always displayed. Example of display of the used AK4000D module.



MENU 7 – SERVICE SETTINGS

MENU STRUCTURE - PASSWORD SETTING "0000"

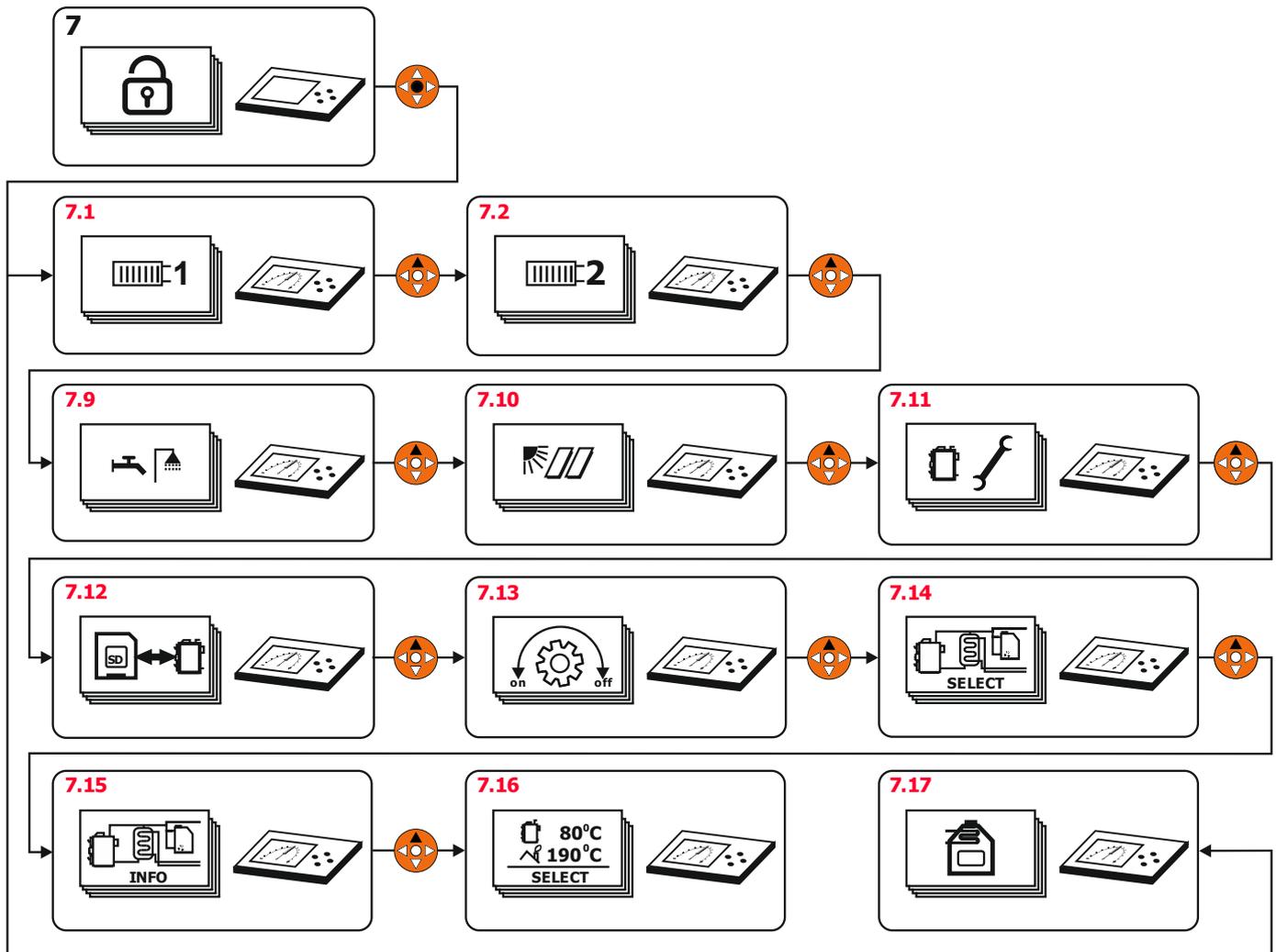
Service settings under the password PIN 0000 are used only in reserved cases. These settings must only be performed by a professionally trained service technician (if necessary, also by the customer). In the service settings, the type of boiler with accessories, the hydraulic wiring diagram of the boiler, etc. is set.



When entering the menu under the password if the boiler is switched on, it is necessary to switch off the boiler first.

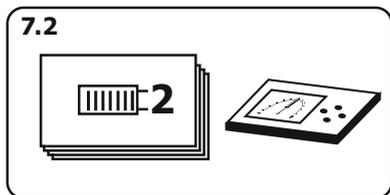
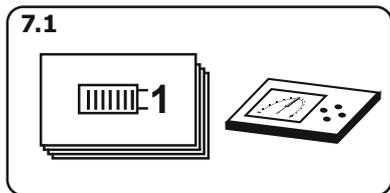
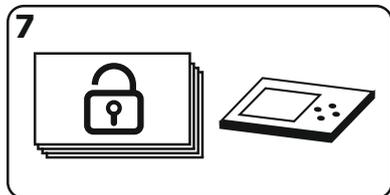
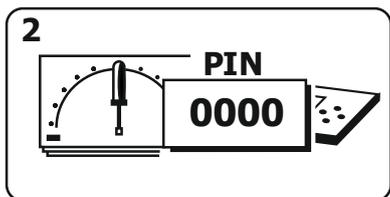
MENU STRUCTURE "7" - SETTINGS UNDER PIN PASSWORD "0000"

The menu structure depends on the selected hydraulic scheme in MENU 7. Only the MENU related to the selected hydraulic scheme will be accessible.



- MENU 7.2, 7.2 – Settings for central heating (CH) circuits
- MENU 7.9 – Settings for domestic hot water heating (DHW)
- MENU 7.10 – Settings for solar heating
- MENU 7.11 – Setting boiler parameters
- MENU 7.12 – Settings for the AK4000M module
- MENU 7.13 – Service control of movement
- MENU 7.14 – Boiler hydraulic diagram settings
- MENU 7.15 – INFO - installation
- MENU 7.16 – Settings for line display
- MENU 7.17 – Settings for hot water fireplace

MENU 7.1, 7.2 SETTING THE HEATING CIRCUIT OF THE CENTRAL HEATING SETTING UNDER PASSWORD "0000"



	1 MaxT	70°C	35-80 °C
	1 T0	40°C	20-80 °C
	1	120s	30-300 s
	1	Bin	Bin/no
	1		/
	1	yes	yes/no
	1 Max	22°C	15-35 °C

	2 MaxT	40°C	25-40 °C
	2 T0	35°C	20-40 °C
	2	120s	30-300 s
	2	Bin	Bin/no
	2		/
	2	yes	yes/no
	2 Max	22°C	15-35 °C

	1 MaxT	70°C	35-80 °C
	1 T0	40°C	20-80 °C
	1	120s	30-300 s
	1	Bin	Bin/no
	1		/
	1	yes	yes/no
	1 Max	22°C	15-35 °C

	2 MaxT	40°C	25-40 °C
	2 T0	35°C	20-40 °C
	2	120s	30-300 s
	2	Bin	Bin/no
	2		/
	2	yes	yes/no
	2 Max	22°C	15-35 °C

MaxT - setting the maximum temperature for the heated circuit / .

T0 - setting the equithermal curve. At an outside temperature of **T-0°C**, the temperature of the heated circuit will be regulated to the set value. When the outside temperature changes, the system automatically recalculates the required temperature for the heated circuit.

1 - setting the transition time of the servo drive of the heated circuit. The data is indicated on the packaging of the servo drive in sec.

1 - room thermostat setting BIN- Binary / no - none for the given circuit.

1 - heating circuit setting

- central heating

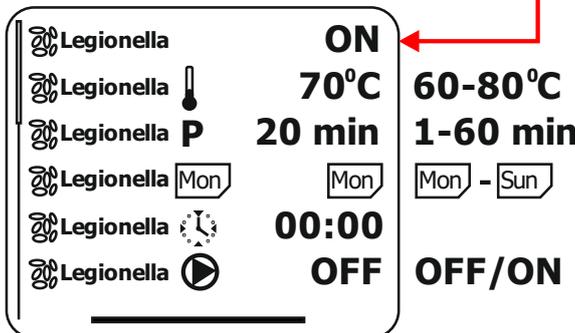
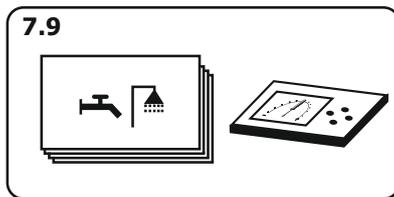
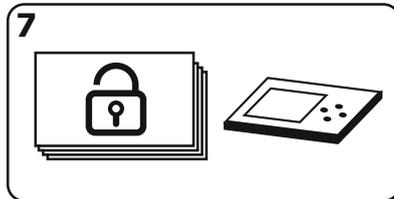
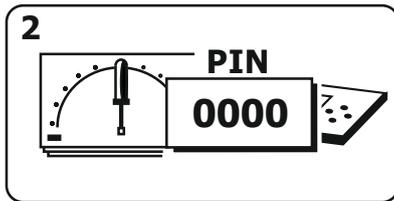
- in-floor heating

1 - setting of equithermal heating (according to the outside temperature) of the heated circuit.

yes - no.

1 **Max** - setting the maximum outdoor temperature for equithermal regulation. If the outside temperature reaches the set temperature, the CH circuit will not be heated (servo closed, pump off).

MENU 7.9 DOMESTIC HOT WATER (DHW) HEATING SETTING SETTING UNDER "0000" PASSWORD



max - setting the maximum temperature for domestic hot water (DHW).
Warning: If there is a threat of overheating of the boiler, the temperature „ max“ used for faster cooling of the boiler (the DHW pump is switched on or the electric valve is opened). The excess heat of the boiler is thus used to heat the DHW.

- For DHW heating, it is possible to use a pump or a two-way electric valve with a voltage-free open function. The controlled element must be selected according to the design of the hydraulic diagram CH.

- pump
 - solenoid valve open without voltage

Legionella - setting protection against Legionella.
OFF
ON

Legionella - temperature setting for the destruction of water bacteria.

Legionella P - setting the holding time (**parking**) for the water bacteria destruction temperature.

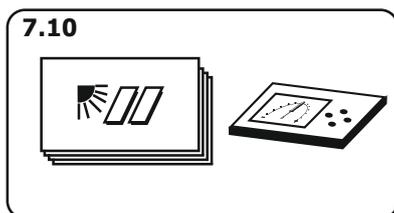
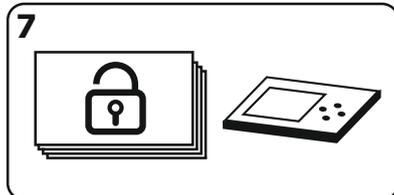
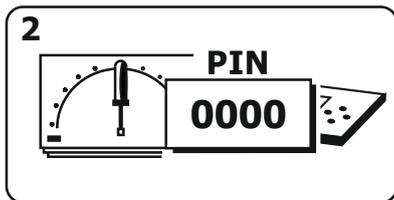
Legionella Mon - setting the day of the week for the destruction of water bacteria.
Mon - Monday

Legionella - start time setting.

Legionella - setting the pump to turn on at the time of bacteria destruction.

Legionella is a dangerous water bacterium found in warm water. The bacterium reproduces intensively in the range of 20-50°C. Bacteria do not multiply above 50°C and die above 70°C. The AK4000 regulation allows you to set the overheating of the DHW tank once a week according to the selected parameters to destroy the Legionella water bacterium.

MENU 7.10 SOLAR HEATING SETUP SETTING UNDER "0000" PASSWORD



	ON	ON/OFF
max	95°C	30-250 °C
	-30°C	-30 - 5 °C
on	0K	0-15K
off	0K	0-15K

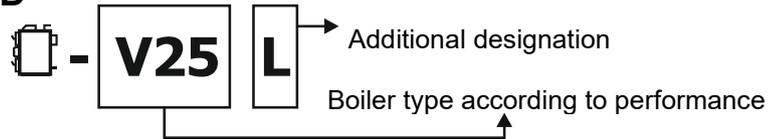
- zapnutie, vypnutie solárneho okruhu.
 „ON“ – switched on
 „OFF“ - switched off

max - setting the maximum temperature in the solar circuit. If the temperature exceeds the set value, the pump in the solar circuit is switched off.

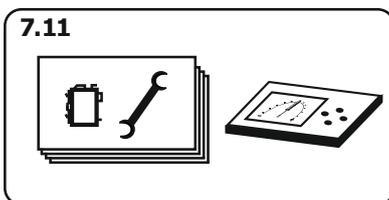
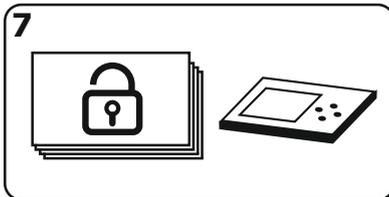
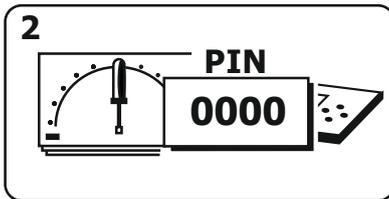
- setting the minimum temperature in the solar circuit. If the temperature drops below the set value, the pump in the solar circuit is switched off.

on , **off** - Hysteresis of turning on and off the pump in the solar circuit with respect to the temperature of the circuit that is heated from the solar circuit.

MENU 7.11 SETTING THE BOILER PARAMETERS SETTING UNDER "0000" PASSWORD



Attention:
 The boiler type designation together with the additional designation must always match the designation on the boiler's nameplate.
 When the boiler is switched off in the "OFF" state, the current setting of the boiler type is shown on the display.
 When replacing the display, the settings must always be checked.



	V25L	Typ kotla
	yes	yes/no
	yes	yes/no
	no	yes/no
	KTY	KTY/Pt1000
	60°C	60-75 °C
	85°C	75-90 °C
	yes	yes/no
	30°C	20-90 °C
	30°C	20-90 °C
	0°C	-5 - 0 °C
	50Hz	50/60/Auto
Temper.unit	°C	°C/°F
Summer	yes	yes/no

Designation of boiler type according to power (KW)					
Boilers for piece wood					
V16	V25	V40	V60	V80	V100
Combined boilers (DPA)					
V12	V18	V26			
Hot air boilers (TVZ)					
V25					
Additional designation					
-	Standard boiler type				
L	Lambda Control				
DPA	WOOD-PELLETS-AUTOMATIC				
DPAL	Not used				
DP	WOOD - PELLETS				
UD	UD COAL - WOOD				
TVZ	Hot air boiler				
TVZL	Not used				
Change of boiler control system					
AK 2000	Change of control system of the boiler from type AK2000 regulation to type AK4000				

λ - Lambda Control. In the case of choosing a boiler with the additional designation "L" Lambda Control, the Lambda probe can be disabled by choosing "no". The function is used in the event of a Lambda probe malfunction until it is replaced with a new one. At this time, the servo flap uses only two positions: closed and 30% open.

- chimney thermometer. Each boiler is equipped with a chimney temperature measurement as standard. In the event of a malfunction of the thermometer, it can be disabled by selecting "no". All functions controlled by the chimney temperature will be blocked. Shutdown of the boiler will be governed by the temperature of the water, not the temperature of the chimney.



- exhaust fan. Additional boiler accessories. See chapter 6.1. After its assembly and electrical connection to the AK4000 control, it is necessary to select the "yes" option. By choosing "**yes**", the fan can be used in two modes:

1. **Warming up and loading:** The fan works at **100%** power according to the needs of the operator.
2. **Increasing chimney draft:** In the fan operation settings, the speed can be set from **30% to 100%**. The fan works in parallel with the pressure fan. When "OFF" is selected, it is switched off.



- selection of boiler temperature sensor type.

KTY - standard type (**all VIGAS boilers**)

PT1000 - spare type of thermometer (**HVS**)



- return temperature setting. Boiler protection against low-temperature corrosion can be ensured by a controlled three-way valve. Only for scheme "14". See MENU. 7.14.



- setting the maximum boiler temperature limit. The upper limit is used when connecting a boiler with an accumulation tank.



- pump selection in the short circuit of the boiler. When choosing the "5", "7" Expander hydraulic scheme (MENU 7.14), the protection of the boiler return is ensured by a controlled four-way valve at a temperature of 60°C. In the case of gravitational water flow in a short circuit, the pump can be disabled by selecting "**no**".



- setting the minimum temperature in the storage tank. When choosing a hydraulic scheme with an accumulation tank (MENU 7.14), the boiler will be reheated after the tank has cooled down to the selected temperature.

Attention: The reheating of the boiler will also occur at the moment when there is a demand for heat supply and the storage tank no longer has a sufficient temperature.

Condition of use,  **MinT**, is that the boiler must exceed the set temperature by at least 1.5 °C and the boiler output will drop to 0%.



- setting the minimum heat source temperature. It does **NOT apply to VIGAS** boilers. It is used in the case of the additional accessory **EXPANDER AK4000** for an external heat source with temperature measurement.



- outdoor temperature correction setting. If there is an inaccuracy in the measurement of the outdoor temperature sensor due to warming from the building, it is possible to adjust the measured outdoor temperature with a correction.



- voltage frequency setting. For the **EU** it is **50Hz**. For the US and Canada it is 60Hz. If you do not know the frequency, select "**AUTO**".

Warning: Incorrect choice of frequency will cause deviation of clock time.

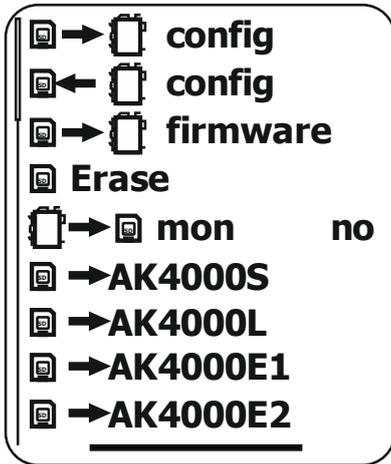
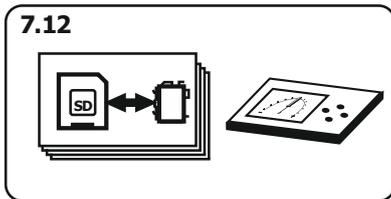
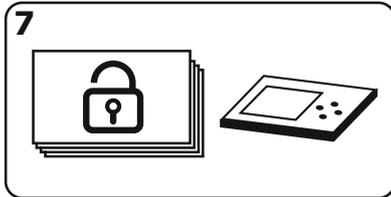
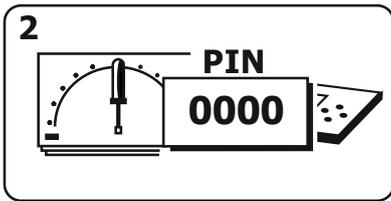
Temper.unit

- setting the units for the temperature display. Option to choose °C - degrees Celsius or °F - degrees Fahrenheit.

Summer

- setting automatic transition to summer time.

MENU 7.12 SETUP FOR AK4000 M MODULE SETTING UNDER "0000" PASSWORD



In necessary cases, it is possible to connect the AK 4000 M module to the AK4000 regulation.

Using the module, it is possible to update the firmware (control program) or backup the current configuration (boiler type settings of the displayed scheme, settings of individual values, etc.) of the boiler control unit. The AK 4000 M module includes a data line for connection to the power board AK4000 BH BUS and a USB cable for connection to a personal PC.



☐ → ☐ **config** - uploading a new configuration (circuit diagram). It is mainly used in systems controlled by EXPANDER AK 4000 E, where it is possible to upload an individual circuit diagram. The configuration file is named: **CfAk4000.bin**.

☐ ← ☐ **config** - backup of the current configuration. It is used in boiler monitoring.

Execute before starting monitoring! After starting the process, two files are created in the AK 4000 M module directory:

CfAk4000.bck - backup of the current configuration
CfAk4000.bin - current configuration

If necessary, it is possible to return to the original configuration by renaming the **bck** extension to **bin** and use the function ☐ → ☐ **config**.

☐ → ☐ **firmware** - uploading the current firmware (boiler control software). The procedure for saving the current firmware (**FwAk4000.bin**) to the AK4000M module and uploading it is given on the website: www.vimar.sk/podpora/software.sk
PASSWORD: 1973

☐ → ☐ **mon** - monitoring and writing data from the boiler into the memory of the AK4000M module. It is mainly used for the analysis of boiler work by service technicians. Before starting "yes" monitoring, it is necessary to write the current configuration of the boiler, ☐ ← ☐ **config** „. Data from the boiler will be written every 3 seconds to the file Ak4000.300.

From the website: www.vimar.sk/podpora/software.sk PASSWORD:1973 download and run the data conversion program KonvAK4000.exe → select the file Ak4000.300 and start the conversion. Subsequently, a new workbook of the EXCEL program is created in the AK4000M module directory, which can be clearly analyzed.

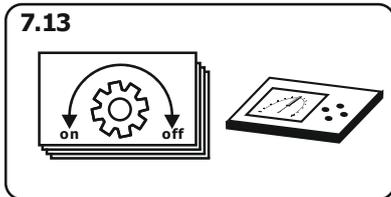
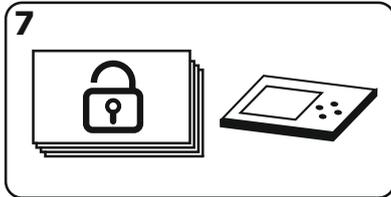
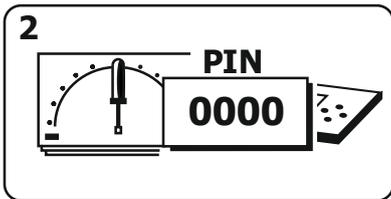
☐ **Erase** - erasing all data from the AK4000M module.

☐ → **AK4000S** - power board software playback. Used only by the manufacturer.

☐ → **AK4000L** - playing the software of the power Lambda board AK4000L. Used only by the manufacturer.

☐ → **AK4000E1** - playing Expander AK4000E1 or AK4000E2 software. Used only by the manufacturer.

MENU 7.13 MOVEMENT SERVICE CHECK SETTING UNDER "0000" PASSWORD



In the service settings, you can check the functionality of individual boiler components according to the symbols on the display. After selecting the component and confirming "ON", the component is started. The components shown depend on the boiler configuration.

- pressure fan.

- exhaust fan.

- boiler pump.

- servo valve drive. For VIGAS DPA and VIGAS Lambda Control boilers.

- pellet feeding auger. When "ON" is confirmed, the auger works in the period for 100% nominal boiler output. At the same time, this mode makes it possible to check the supplied amount of pellets for a given type of boiler at rated output.

VIGAS 12DPA 2,8kg, 18DPA-4,5kg, 26DPA-5,5kg.
Procedure: We disassemble the burner and replace it, e.g. a paper box into which the pellets will fall. By confirming "ON", let the auger work for **30 min.** We then weigh the pellets and multiply by **2x**. If the amount of attacked pellets does not correspond to the declared consumption at the rated power, we will adjust the dosage by correcting the power Δ and we repeat the test. Recommended deviation **up to 0.1 kg.**

	OFF	OFF/ON
	OFF	
1 ON	OFF	
1 OFF	OFF	
1	OFF	
	OFF	
2 ON	OFF	
2 OFF	OFF	
2	OFF	
	OFF	
	OFF	
	OFF	

- pellet ignition spiral for DPA boilers.

1 ON - servo drive DHW1 - opening.

1 OFF - servo drive DHW - closing.

1 - heating circuit pump.

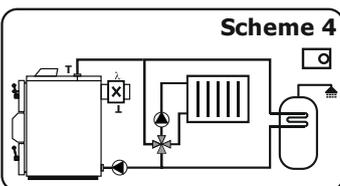
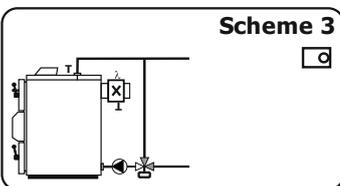
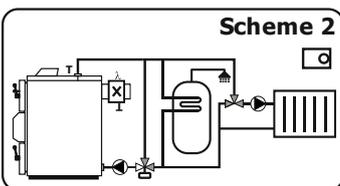
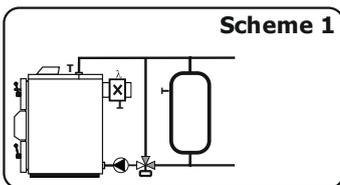
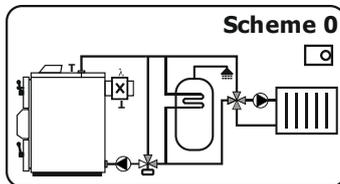
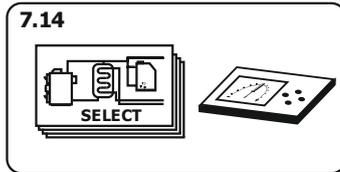
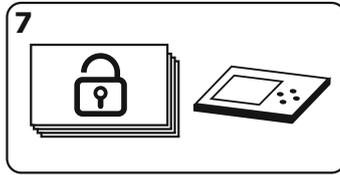
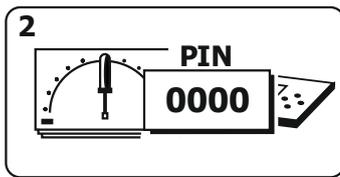
- switching on the relay for the external boiler.

- hot water pump (DHW).

- solar circuit pump.

- hot water fireplace pump.

MENU 7.14 SETTING THE HYDRAULIC DIAGRAM OF THE BOILER SETTING UNDER "0000" PASSWORD



By changing the hydraulic wiring diagram, the control of the pump output, boiler configuration, etc. will change. Therefore, it is important that the software setting of the hydraulic scheme corresponds to the actual connection of the boiler in the central heating system. Basic hydraulic diagrams (diagram 0 to 4) and hydraulic diagrams intended for control with the AK4000 Expander (diagram 5 to 14) are stored in the memory of the **AK4000 control unit**.

SCHEME 0

Control: Basic control AK4000

The boiler is protected against low-temperature corrosion by a three-way ESBE thermostatic valve (60°C). A manually controlled four-way mixing valve is used to regulate the water to CH. A combined DHW storage tank is used for DHW heating. Both pumps must be connected to the AK4000S power board together at the "Pump" terminals. A room thermostat can be connected to terminal T3 of the AK4000 power board.

SCHEME 1

Control: Basic control AK4000

Connection with storage tank. To protect the boiler against low-temperature corrosion, a three-way thermostatic valve ESBE (60°C) is used. The pump must be connected to the AK4000S power board at the "Pump" terminals. It is necessary to connect a tank thermometer type KTY code SP 3032 (additional accessory) to terminals T3.

Warning: With scheme 1, it is not possible to connect a room thermostat.

SCHEME 2

Control: Basic control AK4000

The scheme is identical to scheme "0", only a manually controlled three-way mixing valve is used to regulate the water to CH.

Attention: When connecting with a three-way mixing valve, always connect the combined DHW tank as well.

SCHEME 3

Control: Basic control AK4000

Connection with three-way thermostatic valve ESBE (60°C). The pump must be connected to the AK4000 power board at the "Pump" terminals. A room thermostat can be connected to terminal T3 of the AK4000 power board.

SCHEME 4

Control: Basic control AK4000

Connection with a manually operated four-way valve, which is used to regulate the temperature of the water to UK. It is possible to use a combined DHW storage tank for DHW heating. Both pumps must be connected to the AK4000S power board together at the "Pump" terminals. A room thermostat can be connected to terminal T3 of the AK4000S power board.

Notice:

Connection without a three-way thermostatic valve (ESBE) does not provide sufficient protection against low-temperature corrosion (60°C). From the point of view of prolonging the life of the boiler, it is advisable to use the connection according to scheme "0".

Wiring diagrams with EXPANDER AK4000

After confirming the wiring diagram with the Expander (Diagram 5 and above), the service settings are automatically supplemented with options for individual CH and DHW heating circuits. A description of each option is provided below.

 **1** - heating circuit setting

 - central heating

 - in-floor heating

 **1** - voľba ekvitermickej regulácie

 **1** - room thermostat selection for circuit 1.

BIN- Binary / **no** - none.

 - choice of external boiler. When "no" is selected, the external boiler is not displayed on the diagram.

 - choice of hot water fireplace. When "no" is selected, the fireplace is not displayed on the diagram. More in the menu 7.17.

 **2** - heating circuit setting

 - central heating

 - in-floor heating

 **2** - voľba ekvitermickej regulácie pre okruh 2.

 **2** - room thermostat selection for circuit 2.

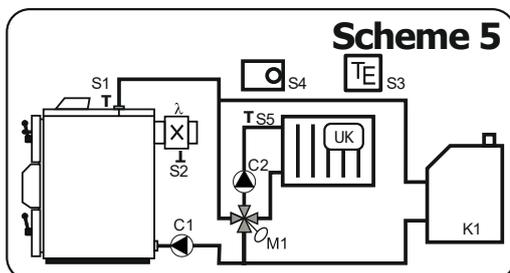
BIN- Binary / **no** - none.

 - pump selection in the short circuit of the boiler. The choice applies to schemes 5 and 7. In the case of gravitational water flow in the short circuit, it is possible to disable the pump (C1) from the short circuit by choosing "no". The pump will not be displayed in the diagram.

SCHEME 5

Control: Basic regulation AK4000 + Expander AK4000 basic set (code 5001)

Connection with one CH controlled heating circuit for floor or radiator heating. The CH temperature (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. Separately controlled boiler pump (C1) and CH pump (C2). Controlled four-way mixer with servo drive (M1) ensures protection of the boiler against low-temperature corrosion. If the boiler circuit does not reach 60°C, the servo will be closed. The free contacts of the Expander AK4000 can be used to control an external boiler (K1).



	yes	yes/no
	no	no/BIN
		 / 
	no	no/yes
	no	no/yes

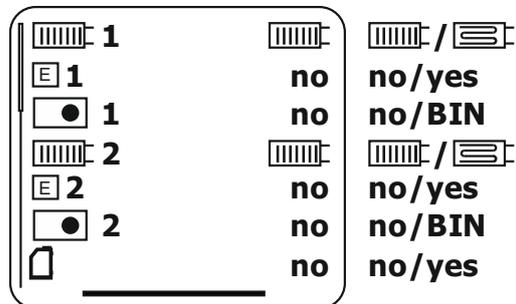
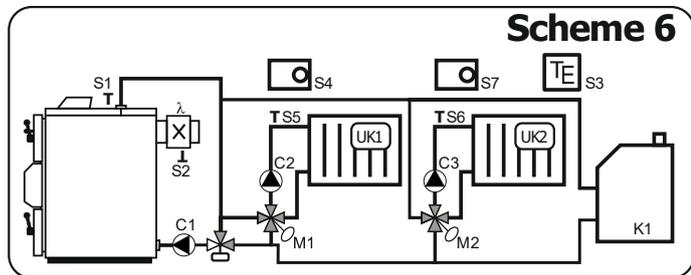
Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O		Description
AK400X Sxxx		T1	S1	Boiler temperature
		T2	S2	Flue gas temperature (chimney)
		LP	C1	Short circuit pump
		LE		Exhaust fan
AK4000E1	 1	T1	S4	Room thermostat for CH1
		T2	S5	Temperature CH1
		T3	S3	Outside temperature
	 1 ON	R1	M1	Servo CH1 opening
		R2	M1	Servo CH1 closing
		R3	C2	Pump CH1
		R4	K1	External boiler (gas, electric)
		R4	K1	External boiler (gas, electric)

SCHEME 6

Control: Basic regulation AK4000 + Expander AK4000 double set (code SP 5002)

Connection with two independently controlled circuits with servo-drive. Possibility to choose floor, radiator heating or their combination. The temperature CH1 (S5) can be regulated based on the outside temperature (S3), room thermostat CH1 (S4) or a combination of them. The temperature CH2 (S6) can be regulated based on the outside temperature (S3), the room thermostat CH1 (S7) or a combination of them. Separately controlled pumps CH1 (C2), CH2 (C3) and boiler pump (C1). The boiler is protected against low-temperature corrosion by a three-way ESBE thermostatic valve (60°C). The free contacts of the Expander AK4000 can be used to control an external boiler (K1).



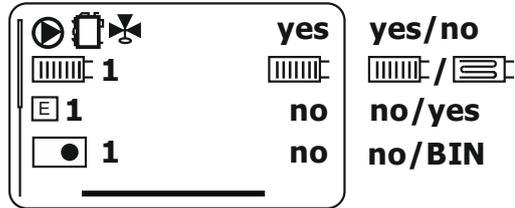
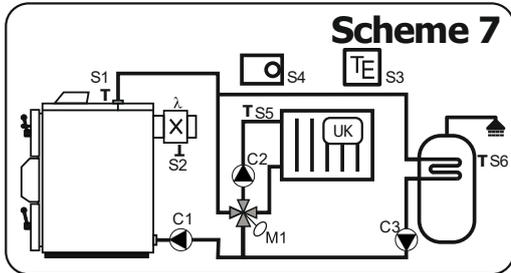
Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O	Description
AK400X Sxxx	Vstup	T1 S1	Boiler temperature
		T2 S2	Flue gas temperature (chimney)
	Výstup	LP C1	Short circuit pump
		LE	Exhaust fan
AK4000E1	Vstup	1 T1 S4	Room thermostat for CH1
		1 T2 S5	Temperature CH1
		T _E T3 S3	Outside temperature
	Výstup	1 ON R1 M1	Servo CH1 opening
		1 OFF R2 M1	Servo CH1 closing
		1 R3 C2	Pump CH1
		R4 K1	External boiler (gas, electric)
		R4 K1	External boiler (gas, electric)
AK4000E2	Vstup	2 T1 S7	Room thermostat for CH2
		2 T2 S6	Temperature CH2
	Výstup	2 ON R1 M2	Servo CH2 opening
		2 OFF R2 M2	Servo CH2 closing
		2 R3 C3	Pump CH2

SCHEME 7

Control: Basic regulation AK4000 + Expander AK4000 basic set (code SP 5001)

Connection with one CH controlled heating circuit for floor or radiator heating. The CH temperature (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. DHW heating controlled by pump (C3) or electric valve - see menu 7.9. Separately controlled boiler pump (C1) and CH pump (C2). Controlled four-way mixer with servo drive (M1) ensures protection of the boiler against low-temperature corrosion. If the boiler circuit does not reach 60°C, the servo will be closed.



Electrical connection table: Inputs, outputs. Menu 7.15

Modul		Symbol	I/O		Description
AK400X Sxxx	Vstup		T1	S1	Boiler temperature
			T2	S2	Flue gas temperature (chimney)
	Výstup		LP	C1	Short circuit pump
			LE		Exhaust fan
AK4000E1	Vstup	1	T1	S4	Room thermostat for CH1
		1	T2	S5	Temperature CH1
			T3	S3	Outside temperature
			T4	S6	DHW temperature
	Výstup	1 ON	R1	M1	Servo CH1 opening
		1 OFF	R2	M1	Servo CH1 closing
		1	R3	C2	Pump CH1
			R4	C3	DHW pump
		R4		Bring the phase from L4 to contact R4	

SCHEME 8

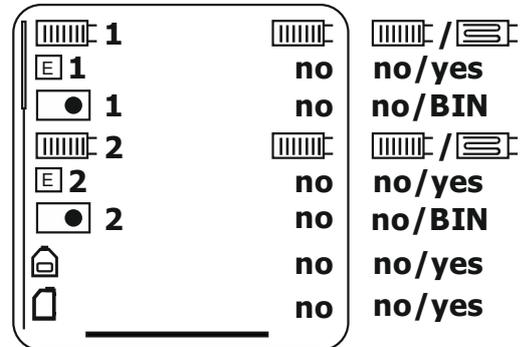
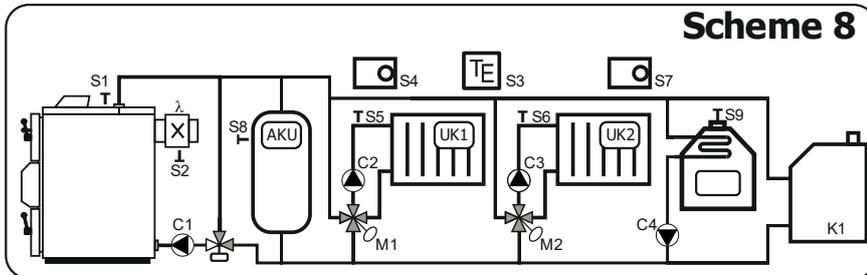
Control: Basic regulation AK4000 + Expander AK4000 double set - (code SP 5002)

Connection with two separately controlled heating circuits CH1, CH2, ACCU tank and the option of heating with a hot water fireplace (KRB and/or an external boiler (K1). Possibility to choose floor, radiator heating or their combination. The temperature of CH1 (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The CH2 temperature (S6) can be regulated based on the outside temperature (S3), the room thermostat (S7) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way ESBE thermostatic valve (60 °C).

Notice:

Expander AK4000E double set does not include:

1x thermometer for ACCU tank (S8)-(code SP 3032), 1x thermometer for KRB (S9)-(code SP 3027).



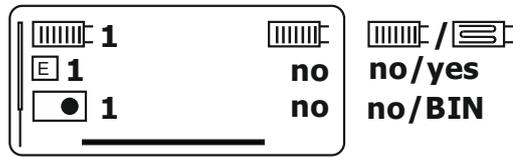
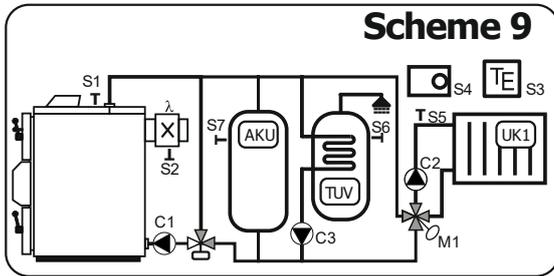
Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O	Description
AK400X Sxxx	Vstup	T1 S1	Boiler temperature
		T2 S2	Flue gas temperature (chimney)
	Výstup	LP C1	Short circuit pump
		LE	Exhaust fan
AK4000E1	Vstup	T1 S4	Room thermostat for CH1
		T2 S5	Temperature CH1
		T3 S8	ACCU tank temperature
		T4 S3	Outside temperature
	Výstup	R1 M1	Servo CH1 opening
		R2 M1	Servo CH1 closing
		R3 C2	Pump CH1
		R4 K1	External boiler (gas, electric)
		R4 K1	External boiler (gas, electric)
		R4 K1	External boiler (gas, electric)
AK4000E2	Vstup	T1 S7	Room thermostat for CH2
		T2 S6	Temperature CH2
		T4 S9	KRB temperature (Thermometer type PT1000)
	Výstup	R1 M2	Servo CH2 opening
		R2 M2	Servo CH2 closing
		R3 C3	Pump CH2
		R4 C4	Hot water fireplace pump
		R4	Bring the phase from L4 to contact R4
		R4	
		R4	

SCHEME 9

Control: Basic regulation AK4000 + Expander AK4000 basic set (code SP 5001)

Connection with one CH controlled heating circuit with servo drive and storage tank (ACCU). DHW heating controlled by pump (C3) or electric valve, see Menu.7.9. The CH temperature (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way ESBE thermostatic valve (60 °C).



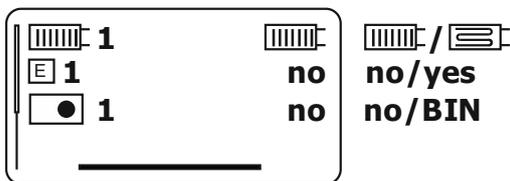
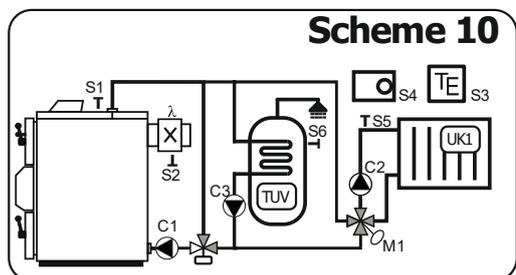
Electrical connection table: Inputs, outputs. Menu 7.15

Modul		Symbol	I/O		Description
AK400X Sxxx	Vstup		T1	S1	Boiler temperature
			T2	S2	Flue gas temperature (chimney)
			T3	S7	ACCU tank temperature
	Výstup		LP	C1	Short circuit pump
			LE		Exhaust fan
AK4000E1	Vstup	1	T1	S4	Room thermostat for CH1
		1	T2	S5	Temperature CH1
			T3	S3	Outside temperature
			T4	S6	DHW temperature
	Výstup	1 ON	R1	M1	Servo CH1 opening
		1 OFF	R2	M1	Servo CH1 closing
		1	R3	C2	Pump CH1
			R4	C3	DHW pump
			R4		Bring the phase from L4 to contact R4

SCHEME 10

Control: Basic regulation AK4000 + Expander AK4000 basic set - (code SP 5001)

Connection with one CH controlled heating circuit with servo-drive. DHW heating controlled by pump (C3) or electro-valve, see MENU 7.9. The CH(S5) temperature can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way ESBE thermostatic valve (60 °C).



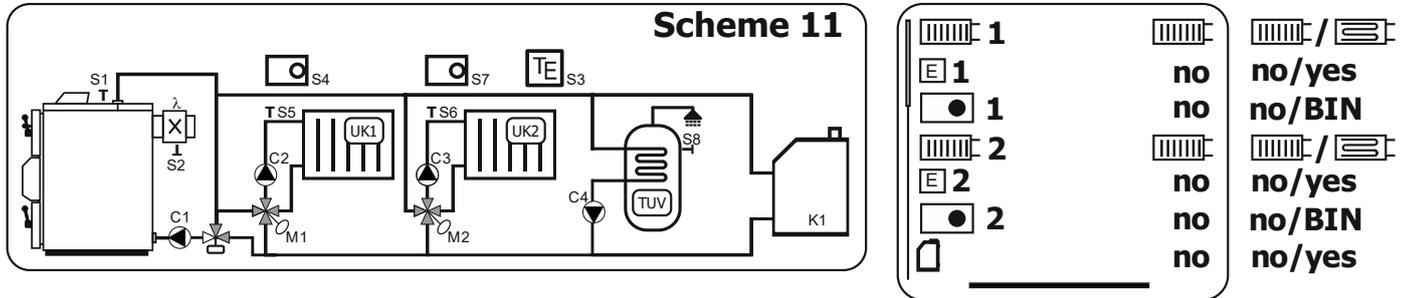
Electrical connection table: Inputs, outputs. Menu 7.15

Modul		Symbol	I/O		Description
AK400X Sxxx	Vstup		T1	S1	Boiler temperature
			T2	S2	Flue gas temperature (chimney)
	Výstup		LP	C1	Short circuit pump
			LE		Exhaust fan
AK4000E1	Vstup	1	T1	S4	Room thermostat for CH1
		1	T2	S5	Temperature CH1
			T3	S3	Outside temperature
			T4	S6	DHW temperature
	Výstup	1 ON	R1	M1	Servo CH1 opening
		1 OFF	R2	M1	Servo CH1 closing
		1	R3	C2	Pump CH1
		1	R4	C3	DHW pump
		R4		Bring the phase from L4 to contact R4	

SCHEME 11

Control: Basic regulation AK4000 + Expander AK4000 double set - (code SP 5002)

Connection with two controlled heating circuits CH1 and CH2 with servo drive. DHW heating is controlled using a pump (C4) or an electric valve, see Menu 7.9. Possibility to choose floor, radiator heating or their combination. The temperature of CH1 (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The CH2 temperature (S6) can be regulated based on the outside temperature (S3), the room thermostat (S7) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way thermostatic valve ESBE (60 °C).



Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O	Description
AK400X Sxxx	Vstup	T1 S1	Boiler temperature
		T2 S2	Flue gas temperature (chimney)
	Výstup	LP C1	Short circuit pump
		LE	Exhaust fan
AK4000E1	Vstup	T1 S4	Room thermostat for CH1
		T2 S5	Temperature CH1
		T3 S3	Outside temperature
	Výstup	R1 M1	Servo CH1 opening
		R2 M1	Servo CH1 closing
		R3 C2	Pump CH1
		R4 K1	External boiler (gas, electric)
		R4 K1	External boiler (gas, electric)
AK4000E2	Vstup	T1 S7	Room thermostat for CH2
		T2 S6	Temperature CH2
		T3 S8	DHW temperature
	Výstup	R1 M2	Servo CH2 opening
		R2 M2	Servo CH2 closing
		R3 C3	Pump CH2
		R4 C4	DHW pump
		R4	Bring the phase from L4 to contact R4

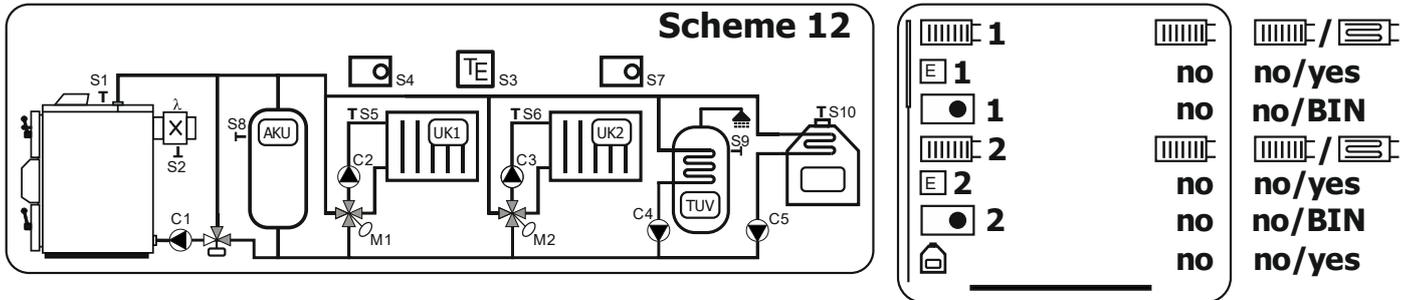
SCHEME 12

Control: Basic regulation AK4000 + Expander AK4000 double set (code SP 5002)

Connection with two controlled heating circuits CH1 and CH2 with a servo drive and the option of heating with a hot water fireplace. DHW heating controlled by pump (C4) or electric valve, see Menu 7.9. Possibility to choose floor, radiator heating or their combination. The temperature of CH1 (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The CH2 temperature (S6) can be regulated based on the outside temperature (S3), the room thermostat (S7) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way thermostatic valve ESBE (60 °C).

Notice:

Expander AK4000 double set does not include: 1x thermometer for ACCU reservoir (S8)-(code SP 3032) and 1x thermometer for KRB (S10)-(code SP 3027).



Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O	Description
AK400X Sxxx	Vstup	T1 S1	Boiler temperature
		T2 S2	Flue gas temperature (chimney)
	Výstup	LP C1	Short circuit pump
		LE	Exhaust fan
AK4000E1	Vstup	T1 S4	Room thermostat for CH1
		T2 S5	Temperature CH1
		T3 S8	ACCU tank temperature
		T4 S3	Outside temperature
	Výstup	R1 M1	Servo CH1 opening
		R2 M1	Servo CH1 closing
		R3 C2	Pump CH1
		R4 C4	DHW pump
		R4	Bring the phase from L4 to contact R4
AK4000E2	Vstup	T1 S7	Room thermostat for CH2
		T2 S6	Temperature CH2
		T3 S9	DHW temperature
		T4 S10	KRB temperature (Thermometer type PT1000)
	Výstup	R1 M2	Servo CH2 opening
		R2 M2	Servo CH2 closing
		R3 C3	Pump CH2
		R4 C5	Hot water fireplace pump
		R4	Bring the phase from L4 to contact R4

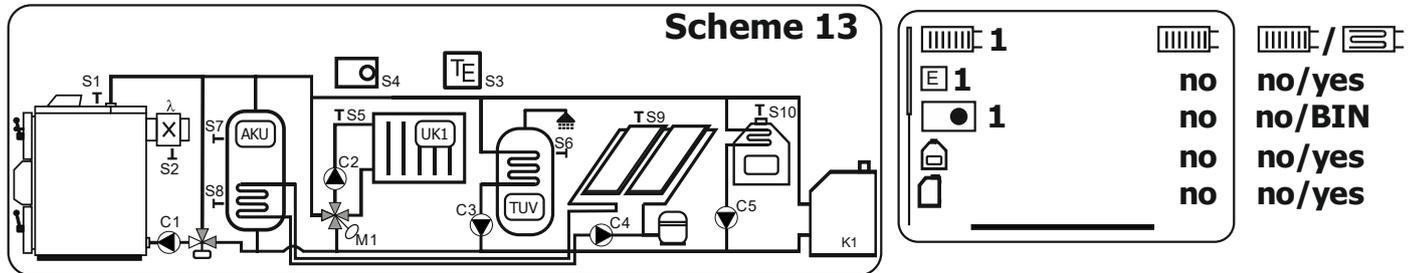
SCHEME 13

Control: Basic regulation AK4000 + Expander AK4000 double set - (code SP 5002)

Connection with one CH controlled heating circuit with servo drive and storage tank (ACCU) and the option of heating with a hot water fireplace, external boiler (K1) or solar panels. DHW heating controlled by pump (C3) or electric valve, see Menu 7.9. The CH temperature (S5) can be regulated based on the outside temperature (S3), the room thermostat (S4) or a combination of them. The boiler is protected against low-temperature corrosion by a three-way thermostatic valve ESBE (60 °C).

Notice:

Expander AK4000E double set does not include: 2x thermometer for ACCU tank (S7,S8)-(code SP 3032), 1x thermometer for KRB (S10)-(code SP 3027) and 1x thermometer for SOLAR (S9)-(code SP 3027).



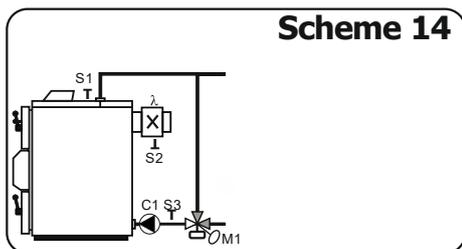
Electrical connection table: Inputs, outputs. Menu 7.15

Modul	Symbol	I/O	Description
AK400X Sxxx	Vstup	T1 S1	Boiler temperature
		T2 S2	Flue gas temperature (chimney)
	Výstup	LP C1	Short circuit pump
		LE	Exhaust fan
AK4000E1	Vstup	T1 S4	Room thermostat for CH1
		T2 S5	Temperature CH1
		T3 S7	ACCU tank temperature UP
		T4 S8	ACCU tank temperature DOWN
	Výstup	R1 M1	Servo CH1 opening
		R2 M1	Servo CH1 closing
		R3 C2	Pump CH1
		R4 K1	External boiler (gas, electric)
		R4 K1	External boiler (gas, electric)
AK4000E2	Vstup	T1 S9	Solar circuit temperature
		T2 S6	DHW temperature
		T3 S3	Outside temperature
		T4 S10	KRB temperature (Thermometer type PT1000)
	Výstup	R1 C3	DHW pump
		R2 C4	SOLAR pump
		R4 C5	Hot water fireplace pump
		R4	Bring the phase from L4 to contact R4

SCHEME 14

Control: Basic regulation AK4000 + Expander AK4000 basic set - (code SP 5001)

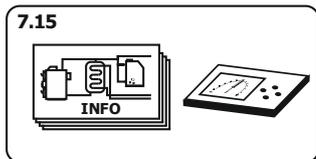
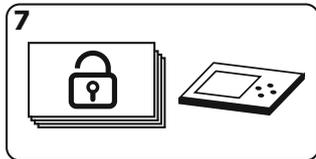
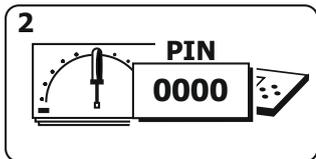
Connection with a controlled three-way valve for the set return temperature (S3). Range from 60 to 75 °C.



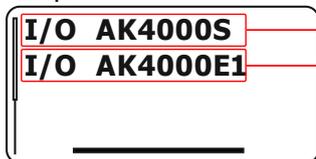
Electrical connection table: Inputs, outputs. Menu 7.15

Modul		Symbol	I/O		Description	
AK400X Sxxx	Vstup		T1	S1	Boiler temperature	
			T2	S2	Flue gas temperature (chimney)	
	Výstup		LP	C1	Short circuit pump	
			LE		Exhaust fan	
AK4000E1	Vstup		T1	S3	Short circuit temperature (return)	
	Výstup		ON	R1	M1	SERVO short circuit
			OFF	R2	M1	SERVO short circuit

MENU 7.15 INFO – ELECTRICAL CONNECTION OF INPUTS AND OUTPUTS OF THE CONTROL SYSTEM SETTING UNDER "0000" PASSWORD



Example: 9

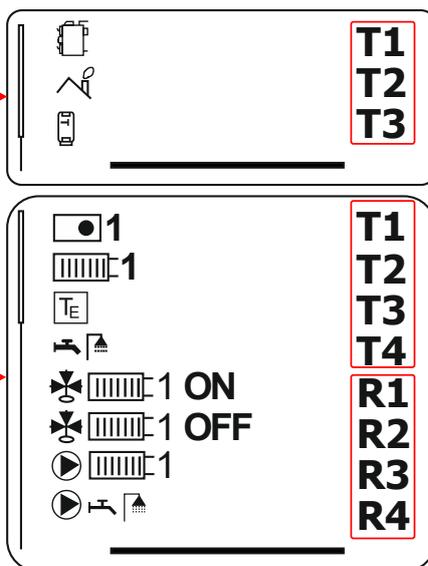


For the electrical installation, it is necessary to know the position of the inputs and outputs of the individual sensors (thermometers) and controlled elements (pumps, servo drive, etc.) on the Expander AK4000 module. Depending on the selected hydraulic scheme, the positions of inputs and outputs change and are listed in a separate table for each hydraulic scheme. MENU 7.15 allows the display of inputs and outputs according to the selected scheme for individual modules:

AK4000S - power base plate of the VIGAS boiler

AK4000E1 - Expander E1 module

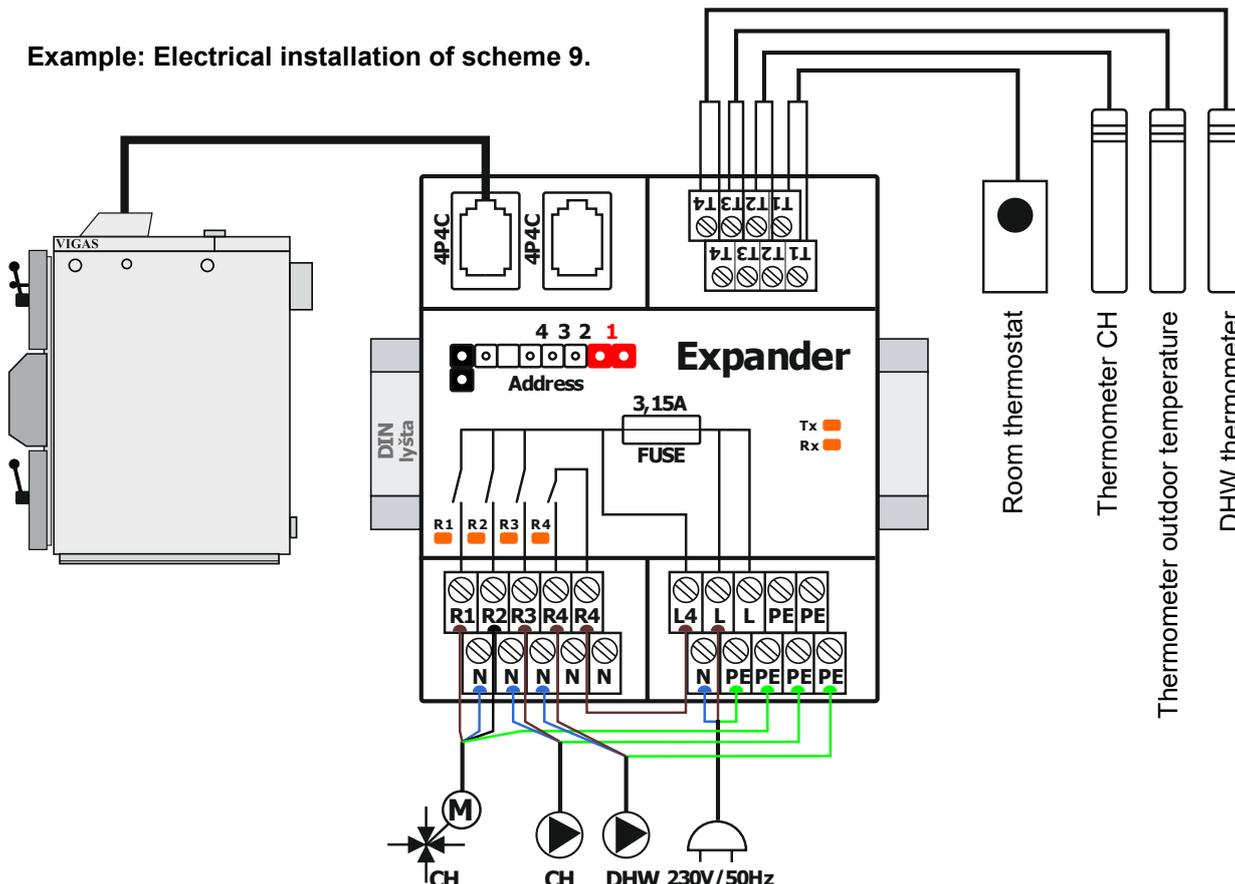
AK4000E2 - Expander E2 module



Inputs on the power base plate **T1** and **T2** are always connected from the factory. The use of input **T3** depends on the selected hydraulic scheme. It can be used to connect a room thermostat or an ACCU tank thermometer. More wiring diagram in the boiler operating instructions.

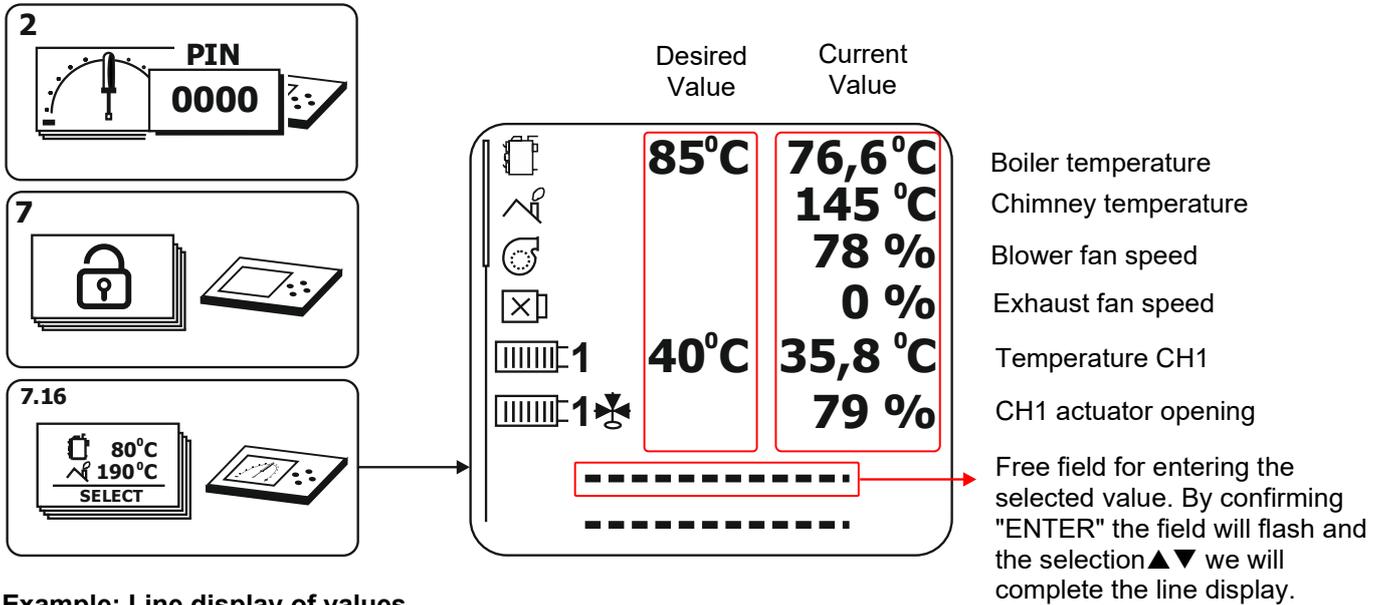
The input positions (**T**) are intended for connecting thermometers and the output positions (**R**) are intended for connecting controlled components (pump, servo drive, etc.) More in the electrical connection table.

Example: Electrical installation of scheme 9.

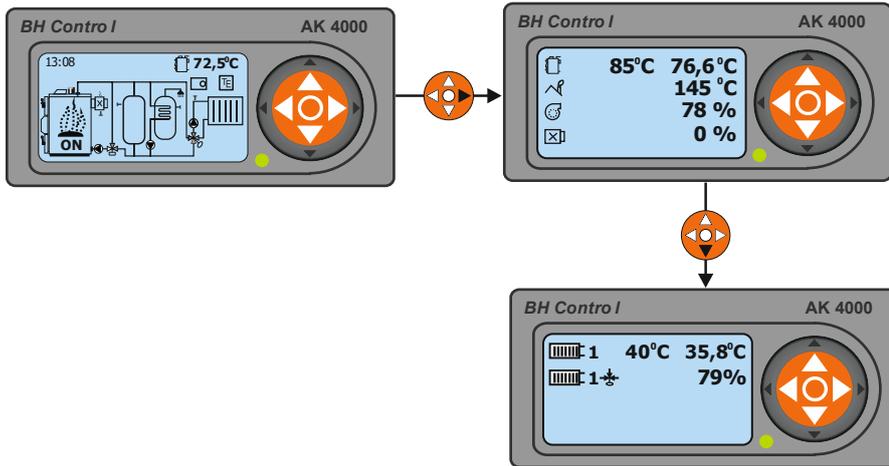


MENU 7.16 LINE DISPLAY OF DATA - SETTING UNDER "0000" PASSWORD

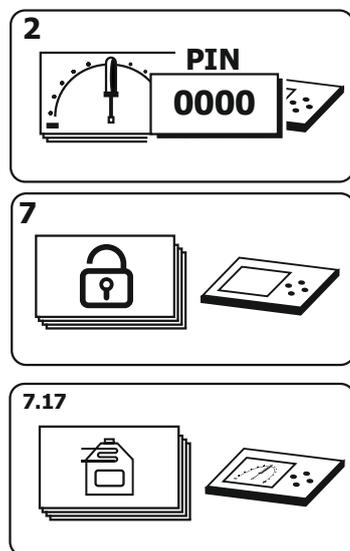
The line display allows you to clearly display the individual data of the AK4000 control system. According to the selected boiler configuration, all available information can be clearly arranged in a line menu.



Example: Line display of values.



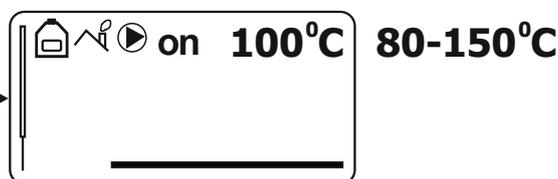
MENU 7.17 SETTINGS FOR HOT WATER FIREPLACE SETTING UNDER "0000" PASSWORD



In hydraulic schemes with an accumulation tank, it is also possible to use a hot water fireplace as a heat source. We recommend connecting the fireplace to the ACCU tank and ensuring water flow with a fireplace pump. The pump is automatically switched on whenever the fireplace heats up and the set chimney temperature is reached.

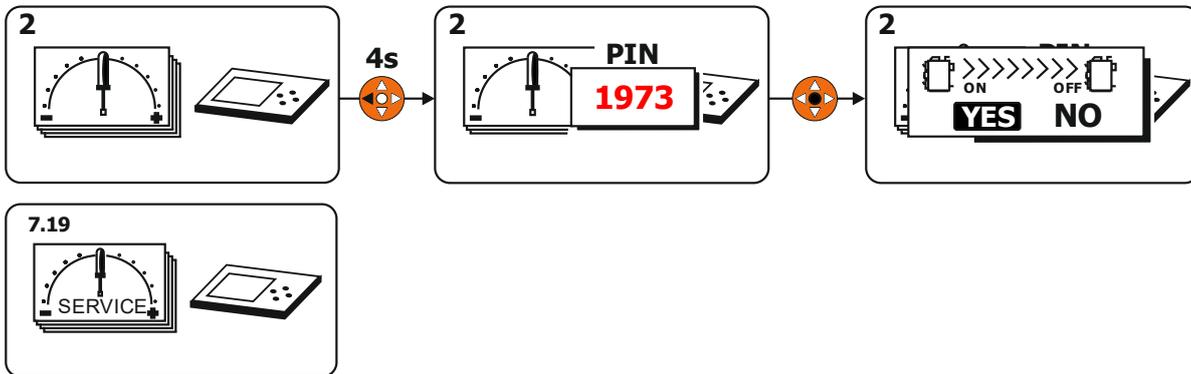
NOTICE:

As a temperature sensor, it is necessary to use a thermometer type PT1000 (code SP 3027), which is placed in the chimney of the fireplace.



MENU 7.19 SPECIAL SERVICE SETTINGS SETTING UNDER "1973"

Special service settings under the password PIN 1973 are used only in reserved cases. These settings must only be performed by a professionally trained service technician. They are used to modify and fine-tune selected boiler parameters with regard to boiler installation and fuel properties. After confirming the PIN 1973 password, MENU 7.19 will be directly accessible.



Before entering the menu under the password if the boiler is switched on, the boiler must first be switched off by confirming "YES".

1		K	200	0-450
2		min	0.20	0.05-0.99
3		max	0.36	0.05-0.99
4		kor λ-	15s	5-240s
5		kor λ+	30s	5-240s
6		kor λ	5%	1-50%
7		start	5s	1-60s
8		start	0.73	max-0.99
9		Max ON	60min	60-90min
10		ON	40°C	30-60°C
11		MinT	70°C	50-70°C
12		end	500min	
13		Max	4.2s	
14			0.6s	OFF- Max
15		ΔT	3.0°C	1.5-3.0
16		ΔT →	1.5°C	1.0-15.0
17			110s	40-120s
18			105s	45-120s
19			0.34	0.05-0.99
20			2.5°C	2.0-3.5
21		Max	100°C	80-120°C
22		kor	6s	0-10s
23			yes	yes/no
24		on	00:00:00	
25		ΔT	2.0°C	1.5-3.0°C
26		ΔT →	3.0°C	1.0-15.0°C
27			5min	OFF-60min
28		Red	10	0-99
29		Green	15	0-99

1. Damper position constant „ K 200“.

In the case of LAMBDA CONTROL boilers, the value of the constant "K -200" sets the position of the servo flap so that the primary air is open to **100%** and the secondary air is closed, if the measured value λ is higher than the desired value. More in chap. 3.5.2. Fig. 16. The default parameter is set to **200**.

The speed of the pressure fan

The AK4000D control panel contains control software for all types of VIGAS boilers. The specific difference between the individual types of boilers is the range of usable speeds of the pressure fan, taking into account the power of the boiler and the type of pressure fan used. The values of parameters 2 and 3 define the working range of the fan set by the manufacturer for the given type of boiler, while value **2 = 1%** and value **3 = 100%** of the revolutions displayed on the control panel display. The speed control of the pressure fan works on the principle of a PID controller for the desired temperature of the boiler modified by BH Control especially for VIGAS boilers.

2. Minimum fan speed for wood fuel, „ min“.

The value 0.20 represents 20% of 100% of the full power of the VIGAS 16 kW boiler fan.

Warning: Do not set less than **0.20**, it may cause the fan to stop completely. The operator of the boiler can change the value of the minimum revolutions within the permitted range and only up to "+" in steps of 1% in the boiler parameter settings according to the operating instructions „ min“ **MENU 2**. This option is used especially in the case of worn fan bearings, when the condition that the fan does not rotate at 1% is observed. If increasing the minimum speed does not help, it is necessary to replace the pressure fan.

3. Maximum fan speed for wood fuel, „ max“.

Example: The value 0.36 represents 36% of 100% of the full power of the VIGAS 16 kW boiler fan, that means that when the power of 100% is displayed on the control panel display, the fan will only go to 36% of full power.

Attention: The value determines the maximum output of the boiler, so change the parameter only in exceptional cases. The boiler operator can also change the maximum speed according to the operating instructions in the boiler parameters setting section „**Δ**“ **MENU 2** in the allowed range from **-3 to +3 (WOOD)**. The value **0** corresponds to **100%** of the boiler's nominal output. One step represents a 10% increase or decrease in performance. For example, if we set the value to -1, the control panel display will show only 90% power, and +3 the power will be **130%**.

Parameters for controlling the LAMBDA CONTROL boiler flap

During the fuel combustion process, the measured value λ constantly changes depending on many factors, such as the quantity and quality of fuel, temperature and pressure in the loading chamber, the amount of combustion air, chimney draft, etc. The goal of the AK 4000 Lambda Control control system is to stabilize these conditions as much as possible and thus create an environment for perfect fuel combustion with a minimum amount of emissions with the highest possible efficiency. Achieving and maintaining such a state is possible only by sensitive intervention of the control system in the flap position, so that the measured value λ oscillates as much as possible around the desired (set) value $\lambda - 1.35$ (approx. 6%O₂).

Three states can occur in the management process:

1. λ measured = λ desired (1,35 ± 0,02) → no reaction
2. λ measured (2,20) > λ desired (1,35) → ⚙ kor $\lambda+$
3. λ measured (1,15) < λ desired (1,35) → ⚙ kor $\lambda-$
4. Damper closing speed when the lambda value rises,, ⚙ kor $\lambda+$
5. If the measured value exceeds the desired value, the servo will move by the parameter value 6 (5%) every set 30s. The increase in the lambda value (more O₂) usually occurs gradually and slowly as the amount of fuel in the chamber decreases.
6. Damper opening speed when the lambda value decreases ,, ⚙ kor $\lambda-$
7. If the measured value falls below the desired value, the servo will move by the parameter value 6 (5%) every set 15s. On the other hand, the lambda value decreases (less O₂) by leaps and bounds, burning out of the formed vault and its subsequent sliding or raking of the fuel, etc.
8. Flap displacement step,, ⚙ kor λ The displacement step value is 5%.

Parameters of the push fan start

The fan start parameters are mainly used during the transition of the VIGAS boiler from the state of classic heating of fuel (wood) to the gasification process by closing the chimney flap. During classic heating, almost all of the loaded fuel burns up in the loading chamber and a large amount of wood gas is released from it with the support of the chimney draft. By closing the chimney flap and the lower door, the pressure conditions and the access of combustion air will change in an instant. For this reason, it is desirable to supply a larger amount of air for a short time at the beginning of the gasification process using the increased power of the pressure fan. Parameter 8 (0.50=50%) sets the starting power of the pressure fan and parameter 7 (5s) sets the period of decrease to parameter 3 (100%) of the boiler power.

7. The period of decrease in the speed of the pressure fan,, ⚙ start " in seconds
The fan speed decreases after every set seconds. Setting range 1-60s. Default 5s.

8. Starting power of the push fan,, ⚙ start

The power of the pressure fan from which the revolutions start to decrease. The setting range is from the selected maximum revolutions of parameter 3 to 0.99, which represents 100% of the maximum possible revolutions of the pressure fan.

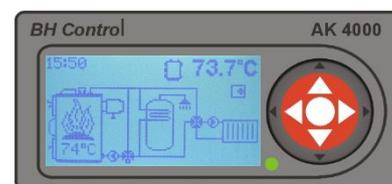
Warning: The optimal setting is approx. 0.30 above parameter 3 ,, ⚙ max ⚙".

Default according to boiler type: VIGAS 12 DPA, 16, 25 – 0.73, VIGAS 18 DPA – 0.77, VIGAS 40 – 0.92, VIGAS 25 TVZ, 26 DPA, 60,80,100 – 0.99,

9. The maximum duration of the COOLING mode time „Max ON“

The "ON" heating mode is always started after the boiler is switched on, or after adding fuel by confirming the central button on the AK4000 control panel. During the heating mode, the chimney temperature is checked. If the chimney temperature in this mode exceeds the set one (\wedge_{end}) o 10 °C, the heating mode is terminated and the boiler goes into the burning mode (displayed temperature) "74°C". If the chimney temperature at the time of switching on (e.g. after adding fuel) was higher than set (\wedge_{end}) + 10 °C the boiler remains in heating mode "ON" for another 2 min. The "Max ON" parameter is used when re-igniting the fuel if the boiler was in a long-term shutdown 🌧 or when adding wet fuel to an unburnt boiler and the like, where we need a longer time for the fuel to ignite. The "Max ON" value determines how long the boiler can be in the heating state. If the set time is not exceeded (\wedge_{end}) o 10 °C, the boiler is shut down. Shutdown will be displayed with the statement "END" or, in the case of connection with the ACCU tank, displayed "AUT".

Setting range,,Max ON" from 60 to 90 min. Default is 60min.



10. Boiler pump start-up temperature,, ⚙ ON

The boiler pump switch-on temperature parameter is used to set the pump switch-on temperature. The default parameter is set to 40°C. The setting range is from 30 to 60°C.

11. Minimum adjustable boiler temperature, MinT “

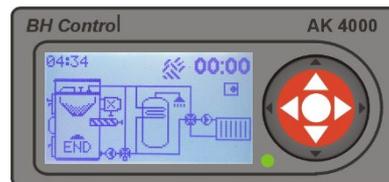
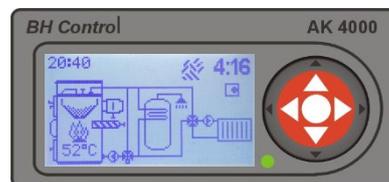
The minimum adjustable boiler temperature parameter is used to determine the lower limit of the desired boiler temperature setting. The default parameter is set to **70°C**. The setting range is from **50 to 70°C**. The parameter is related to the use of the **ESBE 60°C** thermostatic valve. If the boiler operator were allowed to set a lower temperature than the opening temperature of the ESBE valve, the valve would never open.

12. Setting the pellet boiler shutdown time DPA end“

In the case of the selected fuel "PELLET" for **DPA** combined boilers, the "END" or "AUT" boiler will be shut down only after the pellet tank has been emptied. An ultrasonic sensor is placed in the boiler reservoir, which detects the level of the amount of pellets. If the pellets are above the sensor level (the magazine is full), this status is displayed by the magazine symbol, .

If the pellets are below the level of the sensor (the magazine is half empty), this state is displayed by a symbol, . At the same time, the information line displays the time after which the boiler will be shut down. This state is shown by an empty magazine symbol  and the statement "END". Parameter,  end “ determines how many minutes from the state when the ultrasound sensors are visible, the boiler should still work at 100% power. When the power is reduced, the time is automatically extended. Default parameter for **12 DPA – 500 min, 18 DPA and 26 DPA – 60 min.**

If pellets remain in the hopper and the boiler is already in the "END" or "AUT" state, parameter 12 can be increased and thereby extend the time until the boiler shuts down.



13. Pellet dosing time of DPA boilers at rated output, Max in seconds

The pellet dosing system in VIGAS boilers uses a **period of 15 seconds**. Parameter,  Max  determines how long the dosing auger will be in operation at rated output from 15s. Default parameter for **12 DPA – 4.2s , 18 DPA – 7.4s and 26 DPA – 10.6s**. The remaining time until the 15s period, the auger will stop. The value can only be reduced.

The boiler operator can perform a performance correction,  only in boiler parameter settings according to the operating instructions. The value can be set in the range from **-3 to +3**. One correction step = change of dosing time in one period by **0.5s**. The correction can be used to achieve optimal combustion of pellets, or to adjust the boiler performance. For pellet quality according to **the EN Plus A1** standard, we recommend setting the correction to the value "0". The set correction is reflected in the displayed maximum boiler output.

Attenuation mode, pellet boilers DPA (flame maintenance)

The damping mode is the operating state that the boiler enters after exceeding the desired (set) temperature of the boiler **by 1°C**. After reaching the temperature, the boiler goes into attenuation (flame maintenance) mode, during which the auger works only during the time set by **parameter 14** from the **15s period**.

Attention: The power shown on the display in attenuation mode is calculated from parameter 13, 14 and,  therefore it can be different. The advantage of the damping mode is minimizing the number of ignitions using the ignition coil, which extends the life of the coil and reduces the consumption of electricity.

14. Pellet dosing time in attenuation mode, in seconds

The damping mode can be set from the possibility of **switching off the "OFF"** mode to the maximum time set by **parameter 13**. During,  mode, pellets are dosed by **parameter 14**. Default for all **DPA** boilers is **0.6s**. In exceptional cases, it is possible to disable the mode by setting it to "OFF".

Warning: In this case, the benefits of attenuation mode are lost. If set to "OFF", the boiler will go into mode after exceeding the desired (set) boiler temperature by **1°C**,  with zero power . When the boiler temperature **drops by 3°C below** the desired temperature, the fuel will be re-ignited using the spiral. When installing without an EXPANDER, the boiler goes into mode every time the room thermostat (RT) is turned off,  with zero power  and when the RT is turned on, the fuel will be re-ignited using the coil.

In the case of using a storage tank (ACCU), switching off the damping mode is at the discretion of the service technician. We recommend not turning off the mode and setting parameter 15 to a minimum of 1.5°C !!!

15. Temperature at the end of the attenuation mode fuel PELLET, ΔT “

With **parameter 15**, it is possible to set the termination temperature of the damping mode, that is, the temperature by which the boiler must exceed the desired (set) temperature in order for the boiler output to **drop to 0%**. **Default is set to 3.0°C**. The setting range is from **1.5 to 3°C**.

16. Safety opening temperature of the actuator for EXPANDER fuel PELLET, ΔT → “

The parameter sets the safety opening of the servo valve to the CH1 circuit when the boiler temperature is overheated by **parameter 16**. **The default is set to 1.5°C**.

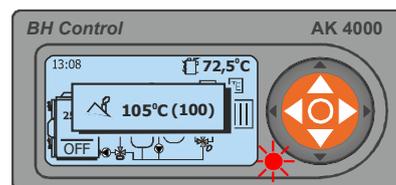
Warning: Safety opening with PELLET fuel occurs under the condition that the room thermostat is switched off,  1 off“ and the temperature in CH1 must not be higher than desired.

Pellet ignition mode

In the pellet ignition mode, four parameters (17,18,19,20) and the flue gas temperature are used. For successful ignition of pellets, the most important parameter is 20, that is the temperature by which the flue gas temperature recorded at the start of the ignition mode must exceed. After reaching this temperature, the ignition coil is finished. The ignition mode continues, without the ignition coil, when another condition must be met - the temperature of the flue gas must rise by another 2°C. Once this condition is met, the ignition mode is terminated and the boiler switches to the burning mode. If it does not exceed this temperature in the given time, the boiler will shut down with a statement (END) and an ignition error.

Notice:

The ignition mode can be started (manually or automatically) only if the flue gas temperature is lower than 100°C. If it is higher, a statement with the flue gas temperature will be displayed in which the blower fan works at 100% and lowers the flue gas temperature.



17. The pellet dosing time when the pellets are ignited „ “ (starting dose of pellets)

The pellet dosing time parameter during ignition can be set from 40 to 120 seconds. Default is set to 110s. The parameter can be adjusted according to the quality and size of the pellets. Especially if the quality of the pellets does not meet the A1 plus standard and the pellets are of a smaller fraction, which means that a larger amount of pellets is dosed with a dosing time of 110s. We recommend slightly shortening the dosing time. On the contrary, with a short starting dose, a smaller amount of pellets ignited may not raise the flue gas temperature to the required temperature, and the boiler will shut down "END" with an error message.

Note: The status of the small starter batch can be determined by the fact that, despite the displayed ignition error, the pellets on the burner are burned out. This indicates that the pellets were burning, but the ignition conditions were not met.

Type: Check the position and cleanliness of the flue gas thermometer. See chap. 5.6.

18. Ignition glow timešpirály „ “ during ignition mode

The ignition coil glow time parameter can be set from 45 to 120 seconds. Default is set to 110s. Upon confirmation of the start, the ignition mode, the spiral will start to glow for the time set by parameter 18, after the set time, the pellet dosing set by parameter 17 will begin. After the end of the dosing time, the spiral will continue to glow for a maximum of 270 seconds. Incandescence of the spiral is also terminated earlier if the temperature of the flue gases exceeds the temperature recorded at the start of the ignition mode by parameter 20.

19. Fan speed, „ “ during ignition mode

During the ignition mode, the reduced speed of the blower fan set by parameter 19 is used. The default is set according to the DPA boiler type. VIGAS 12 DPA and VIGAS 18 DPA – 0.34, VIGAS 26 DPA – 0.25. A significant increase in the parameter may cause the pellets to blow off during the ignition mode, a decrease in the parameter may increase the ignition time of the pellets.

20. End of spiral heating, „ “ during ignition mode

Parameter 20 determines the temperature of the flue gas at which the spiral glow will end. Default is set to 2.5°C. At the moment of starting (manually or automatically) the ignition mode, the current chimney temperature is read (it must be lower than 100°C). After exceeding the measured temperature by parameter 20, the ignition coil glow will be turned off.

21. Safety temperature of the auger motor, „ Max“

The temperature determines the maximum temperature of the pellet feeder auger motor. Default is set to 100°C. After exceeding the set temperature, the boiler will be shut down. More in MENU 4 – Error messages and chapter 4.1.7 – Pellet Expander.

22. Air flap opening time for VIGAS DPA boilers with WOOD fuel, „ kor“

In the case of DPA boilers, parameter 22 is used to add the so-called of the third combustion air directly into the combustion chamber with the selected WOOD fuel. Default is set to 6s. When choosing the WOOD fuel, the servo-controlled flap moves to the WOOD position fig.34 chap. 4.1.4 "Air distributor", but then it opens (returns) after a set time. By adding a small amount of third air, combustion emissions are reduced.

23. Choice of ultrasonic sensing of the level of pellets in the reservoir of VIGAS DPA boilers „“

In the case of a damaged ultrasonic level sensor, the sensors can be disabled by selecting "no". In this case, the control system will always consider the pellet hopper full and the boiler will never be shut down from the pellet level sensor.

24. Checking the running time of the ignition coil of DPA boilers,, on “ 00:00:00

In the case of VIGAS DPA boilers, the operating time of the ignition coil is calculated. The service technician has the opportunity to find out the total operating time of the coil. The time can be reset when replacing the spiral. By confirming the "ENTER" button, the time will flash, by pressing the ▲ or ▼ button, the time will be overwritten to "00:00:00", and by confirming the "ENTER" it will be saved.

Attenuation mode,,“ for WOOD fuels

The damping mode is the operating state that the boiler enters after exceeding the desired (set) temperature of the boiler by **1°C**, or when the room thermostat is turned **off**, which is shown on the display as,, off“. In attenuation mode with RT off, the fan is off. If the temperature drops below **60°C** while the IT is off, the control system automatically maintains the boiler temperature at **60°C**. After turning on RT,, on“ the boiler goes back to heating mode,,**ON**“. In the case of connection with an ACCU tank but without an expander, **(the room thermostat cannot be used, because the contact is used to connect the tank thermometer ,chap. 5.7)**, the boiler will go into attenuation mode with 0% fan power after exceeding the desired (set) boiler temperature by **parameter 25**. It will only go into the "ON" heating mode again if the temperature in the ACCU tank drops to the minimum temperature set by the parameter „ MinT“. The boiler will only be reheated if the required temperature for CH, DHW is higher than the temperature in the ACCU tank, or if the temperature in the ACCU tank drops to the set value.

25. The temperature of the start of the damping mode fuel WOOD,, ΔT“

With parameter **25**, it is possible to set the temperature at which the attenuation mode ends, that is, the temperature by which the boiler must exceed the desired (set) temperature in order for the boiler output to drop to,, 0%“. **The setting range is from 1.5 to 3°C. Default is set to 2.0°C.**

In the case of using an accumulation tank (ACCU), we recommend setting the parameter to 1.5°C.

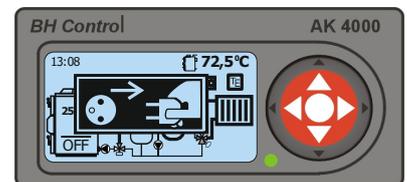
26. Safety opening temperature of servo drive for EXPANDER fuel WOOD,, ΔT→“

The parameter sets the safety opening of the servo valve to the CH1 circuit when the boiler temperature is overheated by parameter **25**. Default is set to **3.0°C**.

Warning: Safety opening with WOOD fuel occurs when the room thermostat is turned off,, 1 off“and the temperature in CH1 must not be higher than desired.

27. Information about power outages „“

When the power goes out and is reconnected, the display shows information about the power outage. Parameter **27** determines the time, how long the statement is displayed on the display. **The default is set to 5 min**. After the set time, the statement is lost.

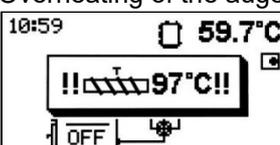
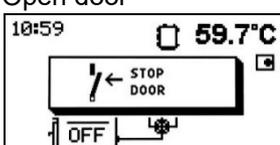
**Notice:**

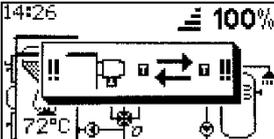
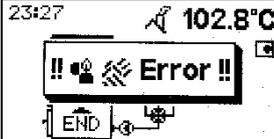
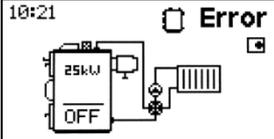
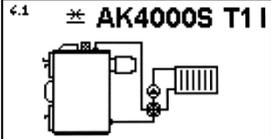
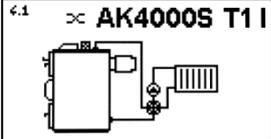
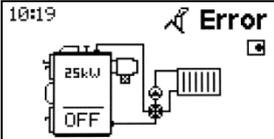
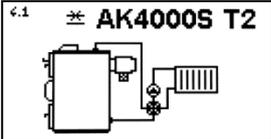
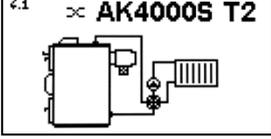
During a power outage, the real time clock is stopped. Therefore, it is necessary to check and set the real time when the electricity is reconnected. The boiler will return to the mode it was in before the power failure.

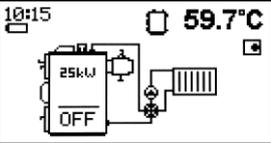
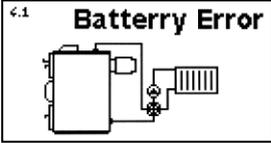
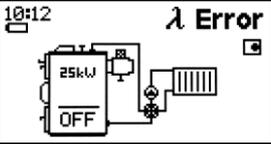
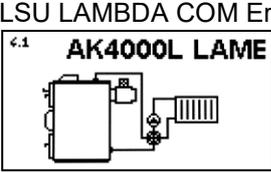
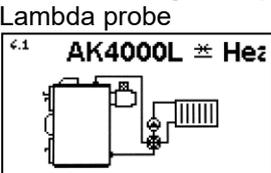
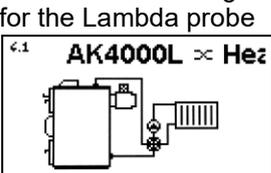
28. Setting the brightness of the red LED,,*Red“ Range 0-99, Default 20.**29. Setting the brightness of the green LED,,*Green“ Range 0-99, Default 20.**

8. PROBLEMS, CAUSES AND THEIR SOLUTION

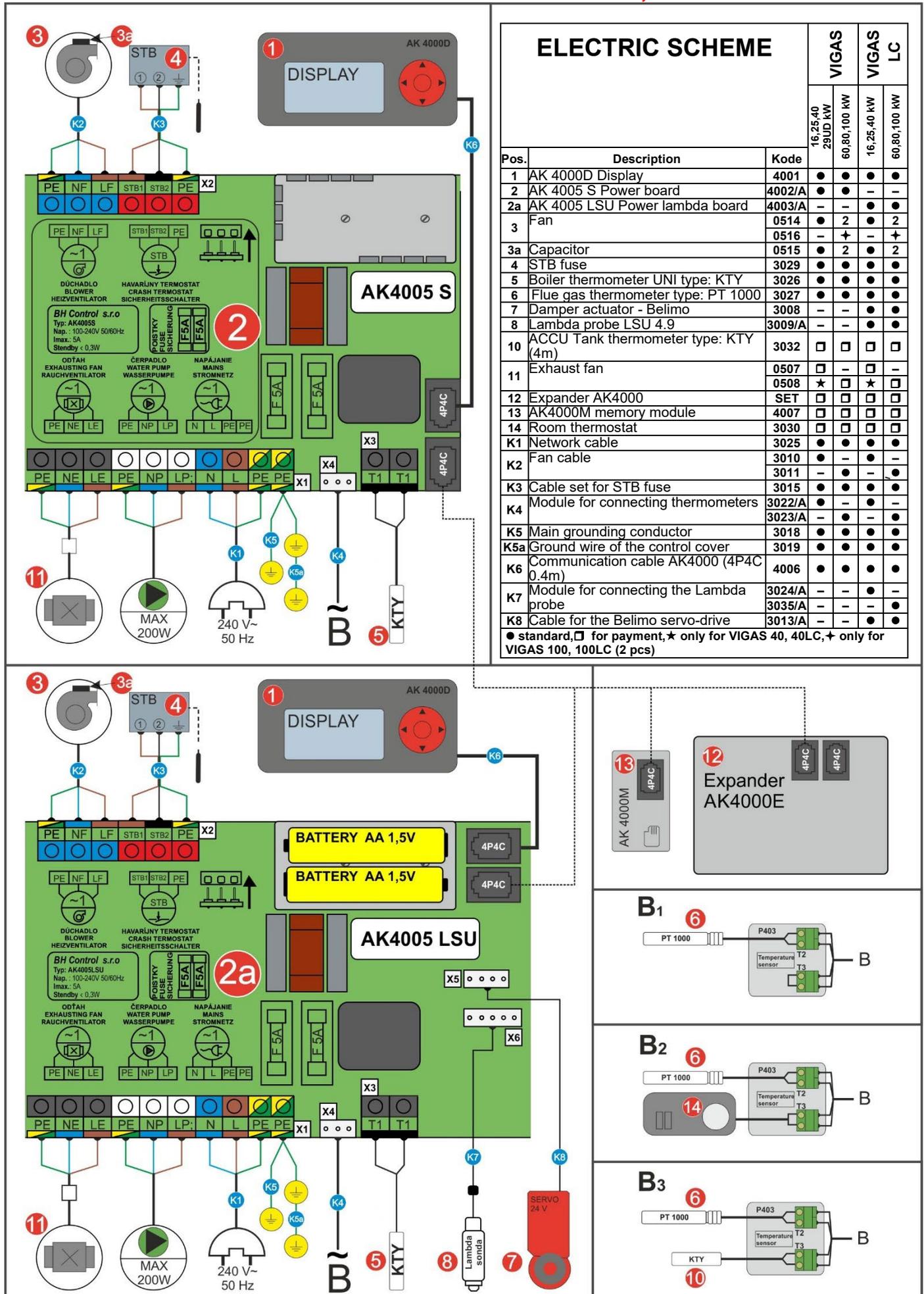
A problem	Cause/Solution
When heating with wood, the boiler performance decreased compared to the previous period.	Use of fuel that is too wet. Clean the ventilation system. See chapter 3.9. Clean the fan blades. See chapter 3.4.
After closing the chimney flap, the boiler burns for a while, then just smokes.	A small amount of primary air. Clean the primary ventilation system. See chapter 3.9.
There are large pieces of unburnt fuel in the combustion chamber.	Enlarged nozzle opening. Replace the nozzle. Check the setting of the secondary air flaps. See chapter 3.5. Lower the temperature  end. Setting MENU 2.
After closing the door, smoke escapes through the seal.	Insufficient door tightness. Adjust the door. Check the tightness of the door. Remove and turn the sealing cord. Replace the sealing cord. See chapter 3.3.
The chimney flap cannot be opened.	Sticking the chimney flap with tar. Increase the operating temperature of the boiler. Use dry fuel. Raise the temperature  end. Setting MENU 2.
After opening the upper door and the chimney flap, smoke enters the boiler room.	Low chimney draft. The diameter of the chimney must be larger than the diameter of the outlet flue from the boiler. We recommend the installation of an exhaust fan. See chap. 6.1.
Cracked aerated concrete lining.	There is no mistake. It separates the combustion chamber from the gasification chamber.
The fan does not spin. After spinning the hand, it starts running.	Faulty start capacitor. Replace the fan condenser. See chapter 3.4.1.
The boiler is shut down, but the fan is still running.	Damaged wiring to the fan. The neutral wire of the fan cable is connected to the ground wire.
The pump is running, even if the symbol  the pump does not signal.	Damaged wiring to the pump. The neutral wire of the pump cable is connected to the ground wire.
During the ignition mode, the pellets will not ignite.	Faulty ignition coil. Check the functionality of the spiral. See chapter 4.1.6. and MENU 7.13.
During the pellet dosing mode, the gearbox (auger) does not move.	Check the chain gears, check the turnstile, check the gear motor. See chapter 4.1.

Error indication	Error identification	Cause/Solution
Tmax error The display will show "MAX" if the boiler temperature exceeds 93 °C. The red LED light is on		<input type="checkbox"/> When the temperature drops below the desired temperature, the boiler starts working again.
Chyba STB  The red LED is flashing		<input type="checkbox"/> Overheated boiler - after the boiler has cooled down, it is necessary to reset the STB mechanically. See chapter 5.4.
Overheating of the auger motor  The red LED is flashing		<input type="checkbox"/> If the gearbox motor overheats above 100 °C, the boiler will shut down. Check whether the turnstile, auger, etc. have not been blocked. See chapter 4.1.
Open door  The red LED is flashing		<input type="checkbox"/> Door safety contact. When opened, the boiler will be switched off. See contact D – D on the AK4000EP wiring diagram. <input type="checkbox"/> The contact is not used. See chapter 4.1.7.

Error indication	Error identification	Cause/Solution
<p>Broken fuse 3.15A</p>  <p>The red LED is flashing</p>		<ul style="list-style-type: none"> <input type="checkbox"/> Broken 3.15A fuse that powers the boiler pump. <input type="checkbox"/> Connection checkčerpáďa.
<p>Upozornenie na komínový teplomer</p>  <p>The red LED is flashing</p>	<p>The warning is displayed if, after igniting the pellets, the chimney temperature at 100% boiler output does not exceed the chimney temperature measured at the end of the ignition mode within 2 min. by 5°C.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Clogged chimney thermometer. <input type="checkbox"/> Opened chimney flap during pellet ignition. <input type="checkbox"/> Increase performance correction (MENU 2). <input type="checkbox"/> Increase fan correction (MENU 2). <input type="checkbox"/> Pull out the chimney thermometer, clean it and put it back in. See chapter 5.6.
<p>Pellet ignition control</p>  <p>The red LED is flashing</p>	<p>The boiler will be shut down if, after lighting the pellets, the chimney temperature at 100% boiler output does not exceed the chimney temperature measured at the end of the ignition mode within 2 min. by 2°C.</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Clogged chimney thermometer. <input type="checkbox"/> Opened chimney flap during pellet ignition. <input type="checkbox"/> Increase performance correction (MENU 2). <input type="checkbox"/> Increase fan correction (MENU 2). <input type="checkbox"/> Pull out the chimney thermometer, clean it and put it back in.
<p>Pellet ignition error</p>  <p>The red LED is flashing</p>	<p>The error is displayed if, after the end of the pellet ignition mode, the chimney temperature does not exceed the temperature of the chimney measured at the moment of the ignition mode by parameter 20, MENU 7.19</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Clean the burner chap. 3.7.2 large amount of ash on the burner. <input type="checkbox"/> Check the condition of the pellets in the hopper. <input type="checkbox"/> Check the functionality of the ignition coil. See chapter 4.1.6. and MENU 7.13.
<p>Boiler temperature measurement error</p>  <p>The red LED is flashing</p>	<p>Disconnected boiler thermometer AK4000D T1 type KTY</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Disconnected boiler thermometer - checking the thermometer. <input type="checkbox"/> Damaged boiler thermometer - replacement required. See chapter 5.5.
	<p>Shorted boiler thermometer AK4000D T1 type KTY</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Damaged boiler thermometer - replacement required <input type="checkbox"/> Short circuit at the thermometer connection point - check See chapter 5.5.
<p>Flue gas temperature measurement error</p>  <p>The red LED light is on</p>	<p>Disconnected flue gas thermometer AK4000D T2 type PT1000</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Disconnected flue gas thermometer of the boiler - check the thermometer. <input type="checkbox"/> Damaged boiler flue gas thermometer - replacement required. See chapter 5.6
	<p>Shorted flue gas thermometer AK4000D T2 type PT1000</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Damaged boiler flue gas thermometer - replacement required. <input type="checkbox"/> Short circuit at the thermometer connection point - check. See chapter 5.6.

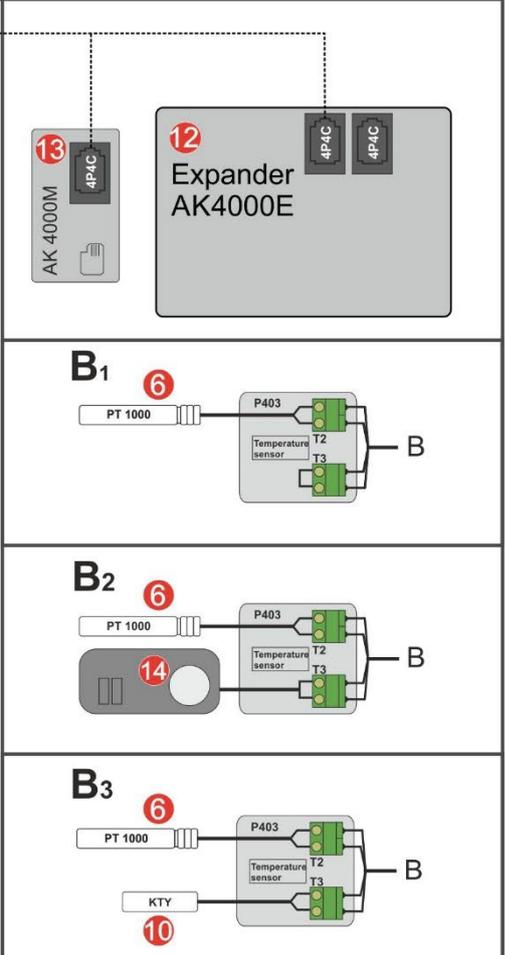
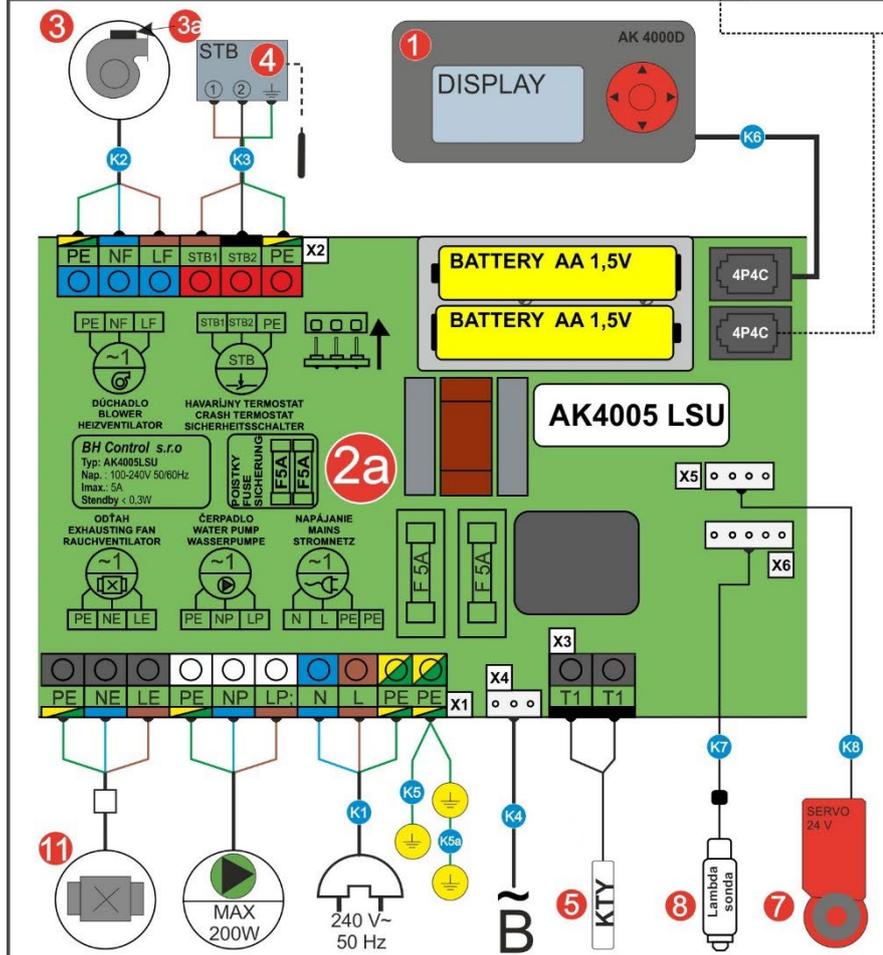
Error indication	Error identification	Cause/Solution
<p>Battery status 2x AA - 1.5V</p>  <p>The red LED light is on</p>	<p>Dead batteries</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Replacement of batteries
<p>Lambda probe evaluation error</p>  <p>The red LED light is on</p>	<p>Communication error with AK4005 LSU LAMBDA COM Error</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Damaged AK4005 LSU module. See chapter 5.2.1.
	<p>Disconnected glow supply for Lambda probe</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Broken cabling <input type="checkbox"/> Faulty Lambda probe <input type="checkbox"/> See chapter 5.2.1.
	<p>Short circuit of the glow plug supply for the Lambda probe</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Interrupted heating of LS <input type="checkbox"/> Interrupted line to LS

9. ELECTRIC SCHEME VIGAS A VIGAS LC – AK 4005S, AK4005 LSU



ELECTRIC SCHEME			VIGAS		VIGAS LC	
			16,25,40 29UD kW	60,80,100 kW	16,25,40 kW	60,80,100 kW
Pos.	Description	Kode				
1	AK 4000D Display	4001	●	●	●	●
2	AK 4005 S Power board	4002/A	●	●	-	-
2a	AK 4005 LSU Power lambda board	4003/A	-	-	●	●
3	Fan	0514	●	2	●	2
3a	Capacitor	0516	-	+	-	+
4	STB fuse	3029	●	●	●	●
5	Boiler thermometer UNI type: KTY	3026	●	●	●	●
6	Flue gas thermometer type: PT 1000	3027	●	●	●	●
7	Damper actuator - Belimo	3008	-	-	●	●
8	Lambda probe LSU 4.9	3009/A	-	-	●	●
10	ACCU Tank thermometer type: KTY (4m)	3032	□	□	□	□
11	Exhaust fan	0507	□	-	□	-
		0508	★	□	★	□
12	Expander AK4000	SET	□	□	□	□
13	AK4000M memory module	4007	□	□	□	□
14	Room thermostat	3030	□	□	□	□
K1	Network cable	3025	●	●	●	●
K2	Fan cable	3010	●	-	●	-
		3011	-	-	-	-
K3	Cable set for STB fuse	3015	●	●	●	●
K4	Module for connecting thermometers	3022/A	●	-	●	-
		3023/A	-	●	-	●
K5	Main grounding conductor	3018	●	●	●	●
K5a	Ground wire of the control cover	3019	●	●	●	●
K6	Communication cable AK4000 (4P4C 0.4m)	4006	●	●	●	●
K7	Module for connecting the Lambda probe	3024/A	-	-	●	-
		3035/A	-	-	-	●
K8	Cable for the Belimo servo-drive	3013/A	-	-	●	●

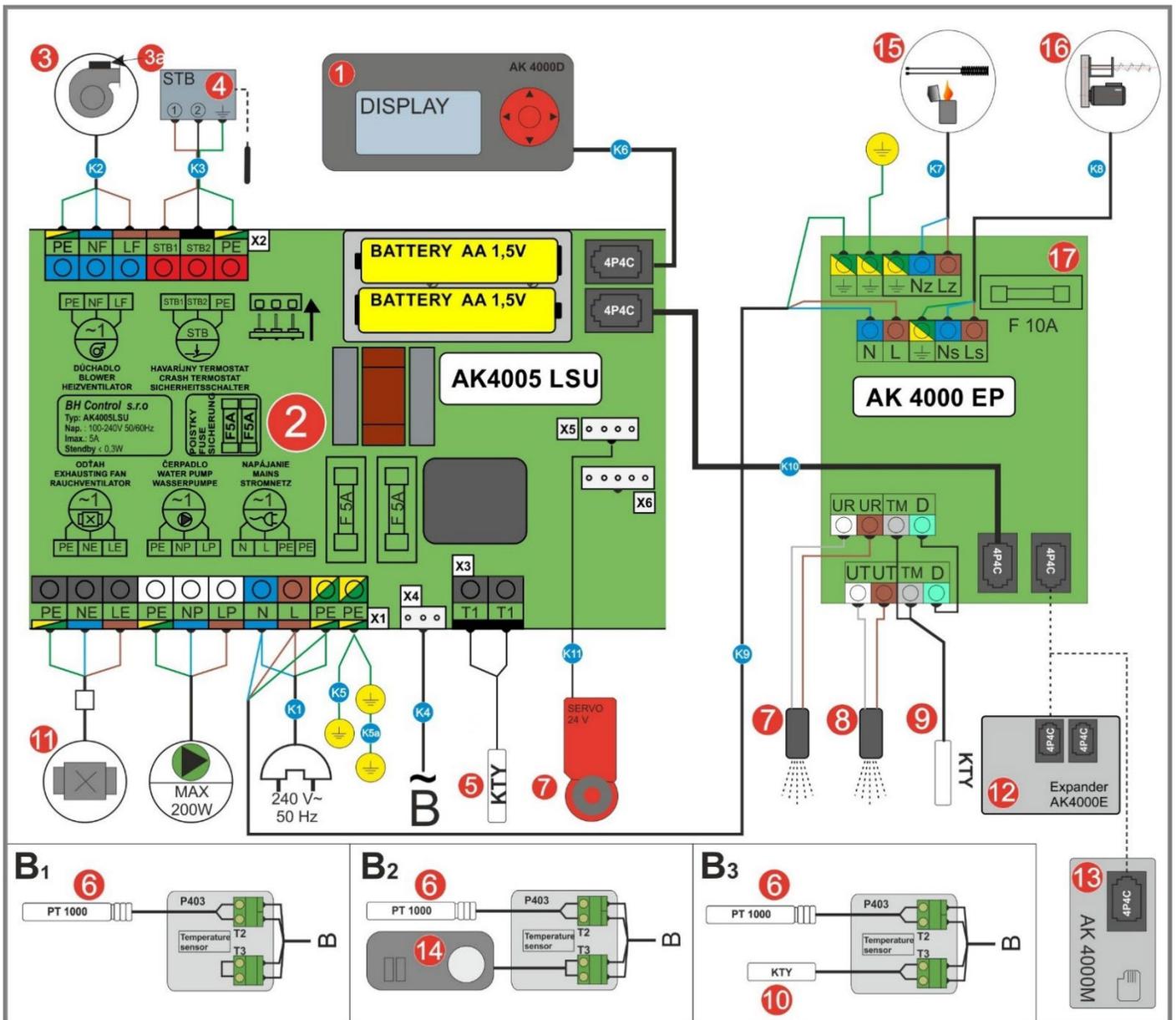
● standard, □ for payment, ★ only for VIGAS 40, 40LC, + only for VIGAS 100, 100LC (2 pcs)



10. ELECTRIC SCHEME VIGAS DPA – AK 4005 LSU

no.	Description	Code
1	AK 4000D Display	4001
2	AK 4000SL Lambda board	4003/A
3	Fan EBM 108-18DPA	0514
3a	Fan EBM 120-26DPA	0516
4	Capacitor	0515
4	STB fuse 100 °C	3029
5	Boiler sensor UNI type KTY	3026
6	Gas sensor type PT 1000	3027
7	Ultrasound receiver	4010
8	Ultrasound transmitter	4011
9	Motor sensor type KTY	1104
10	Container sensor type KTY	3032
11	Discharge fan V25 for 12,18 DPA	0507
12	Discharge fan V80 for 26 DPA	0508
12	Expander AK4000	SET
13	Memory modul AK4000M	4007
14	Room thermostat	3030/A
15	Ignition coil	0638
16	Motor + gear box TTM 203	0640/A
17	Pellet. EXPANDER AK4000EP	4009
18	Servounit Belimo 24V	3008
K1	Power cord EU	3025
K2	Fan cable	3010
K3	Cable set for STB fuse	3015
K4	Sensor connection modul	3022/A
K5	Main ground wire	3018
K5a	Ground wire for control panel	3019
K6	Communication wire AK4000D	4006
K7	Ignition coil cable	4014
K8	Cable motor + gear box	3013
K9	Power cable AK 4000EP	4012
K10	Communication cable AK4000 EP	4015
K11	Cable for servounit Belimo	3013/A

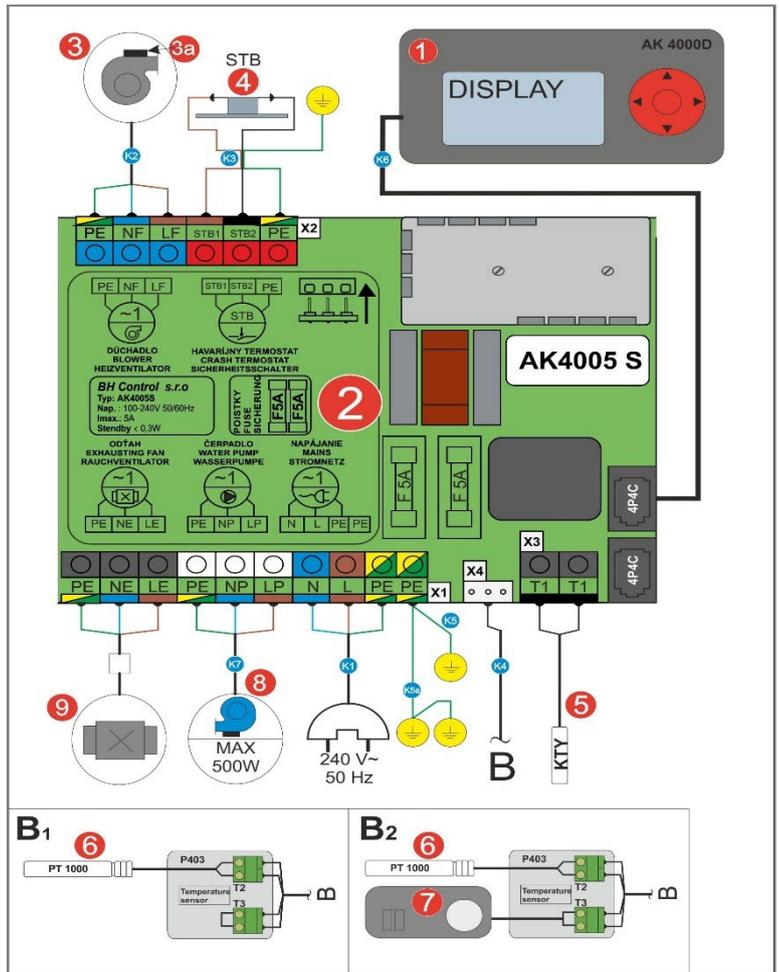
● standard □ for payment ★ VIGAS 26 DPA



11. ELECTRIC SCHEME VIGAS TVZ – AK 4005S

ELECTRIC SCHEME VIGAS 25 TVZ Hot air boiler			
Pos.	Description	Code	
1	AK 4000D	4001	●
2	AK 4005S	4002/A	●
3	Fan EBM 108	0514	●
3a	Capacitor	0515	●
4	Thermal fuse 1400C	0216	●
5	Boiler thermometer type KTY	1104	●
6	Flue gas thermometer type PT1000	3027	●
7	Room thermostat	3030	□
8	Cooling fan	0513	●
9	Exhaust fan V25	0507	□
K1	Network cable	3025	●
K2	Fan cable	3010	●
K3	Cable to thermal fuse	3016	●
K4	Module for connecting thermometers	3022/A	●
K5	Main grounding conductor	3018	●
K5a	Ground wire of the control cover	3019	●
K6	Communication cable AK4000	4006	●
K7	Cooling fan cable	3012	●

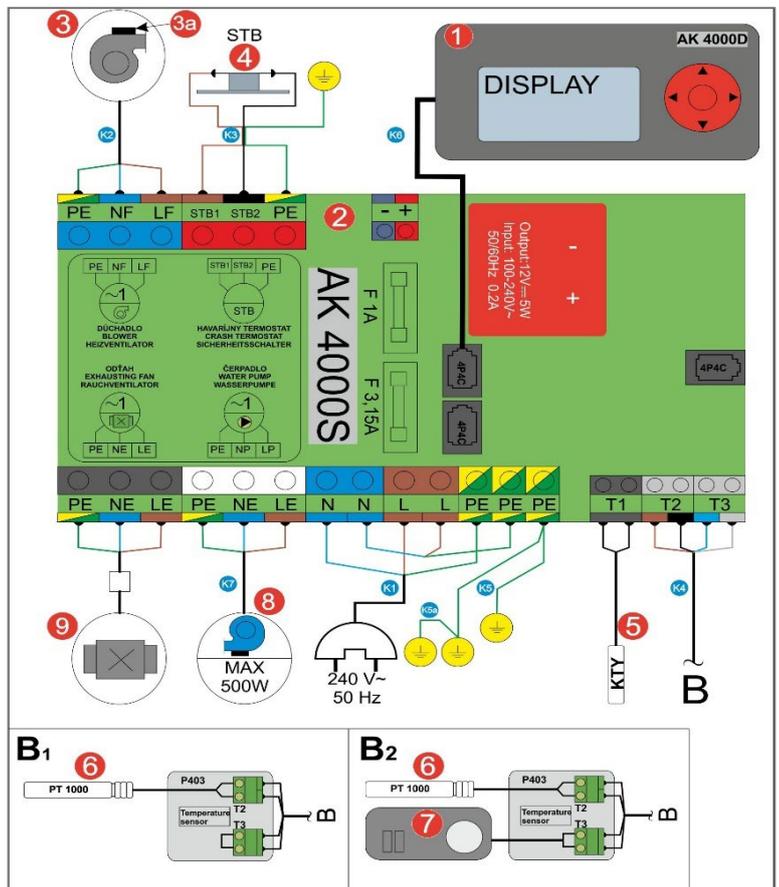
● standard □ for payment
When ordering spare parts, use the spare part code listed in the table.



12. ELECTRIC SCHEME VIGAS TVZ – AK 4000S

ELECTRIC SCHEME VIGAS 25 TVZ Hot air boiler			
Pos.	Description	Code	
1	AK 4000D	4001	●
2	AK 4000S	4002	●
3	Fan EBM 108	0514	●
3a	Capacitor	0515	●
4	Thermal fuse 1400C	0216	●
5	Boiler thermometer type KTY	1104	●
6	Flue gas thermometer type PT1000	3027	●
7	Room thermostat	3030	□
8	Cooling fan	0513	●
9	Exhaust fan V25	0507	□
K1	Network cable	3025	●
K2	Fan cable	3010	●
K3	Cable to thermal fuse	3016	●
K4	Module for connecting thermometers	3022	●
K5	Main grounding conductor	3018	●
K5a	Ground wire of the control cover	3019	●
K6	Communication cable	4006	●
K7	Fan cable	3012	●

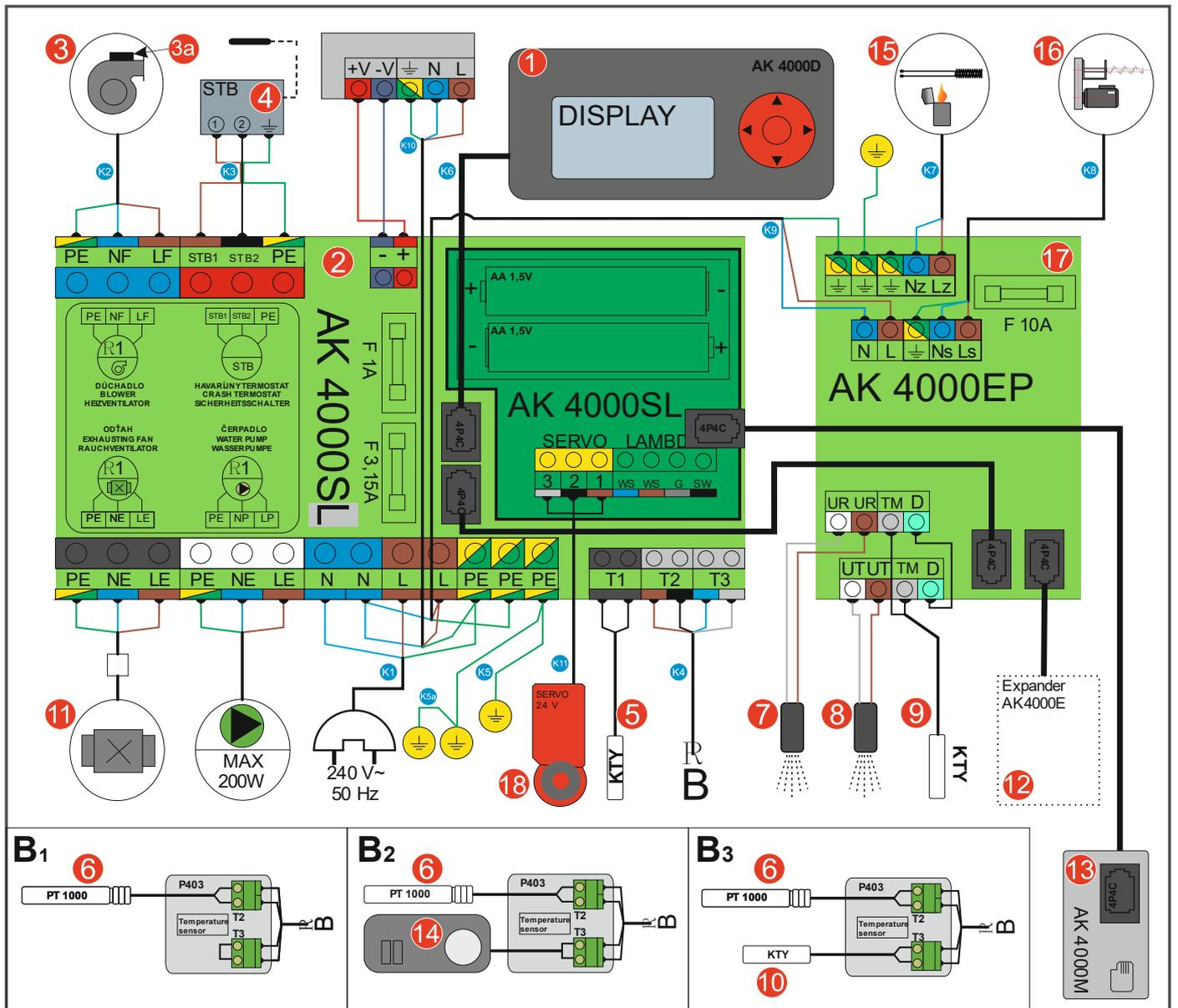
● standard □ for payment
When ordering spare parts, use the spare part code listed in the table.



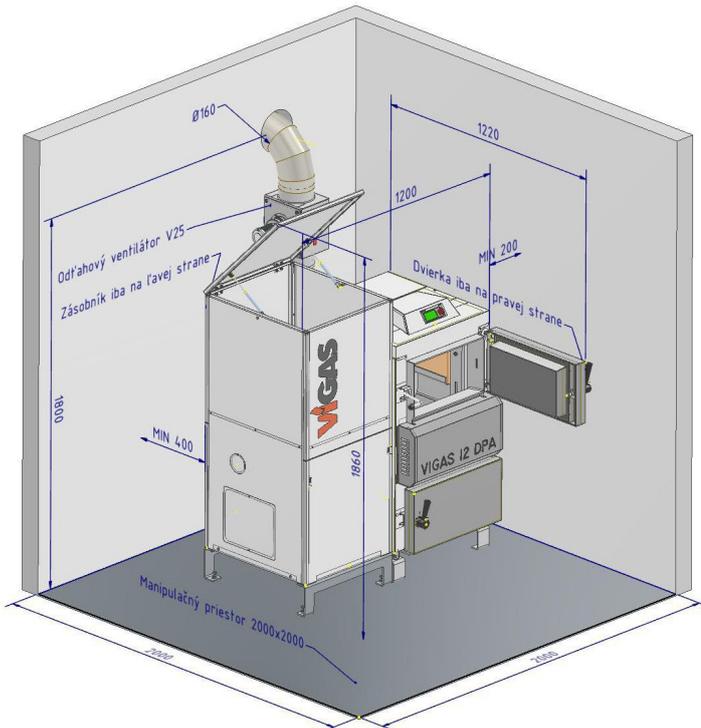
14. ELECTRIC SCHEME VIGAS DPA – AK 4000 SL

ELECTRIC SCHEME VIGAS DPA		
no.	Description	Code
1	AK 4000D Display	4001
2	AK 4000SL Lambda board	4003
3	Fan EBM 108	0514
3a	Capacitor	0515
4	STB fuse 100 °C	3029
5	Boiler sensor UNI type KTY	3026
6	Gas sensor type PT 1000	3027
7	Ultrasound receiver	4010
8	Ultrasound transmitter	4011
9	Motor sensor type KTY	1104
10	Container sensor type KTY	3032
11	Discharge fan	0507
12	Expander AK4000	SET
13	Memory modul AK4000M	4007
14	Room thermostat	3030
15	Ignition coil	0638
16	Motor + gear box TTM 203	0640/A
17	Pellet. EXPANDER AK4000EP	4009
18	Servounit Belimo 24V	3008
K1	Power cord EU	3025
K2	Fan cable	3010
K3	Cable set for STB fuse	3015
K4	Sensor connection modul	3022
K5	Main ground wire	3018
K5a	Ground wire for control panel	3019
K6	Communication wire AK4000D	4006
K7	Ignition coil cable	4014
K8	Cable motor + gear box	3013
K9	Power cable AK 4000EP	4012
K10	Communication cable AK4000	4015
K11	Cable set for power supply	4005
K12	Cable for servounit Belimo	3013

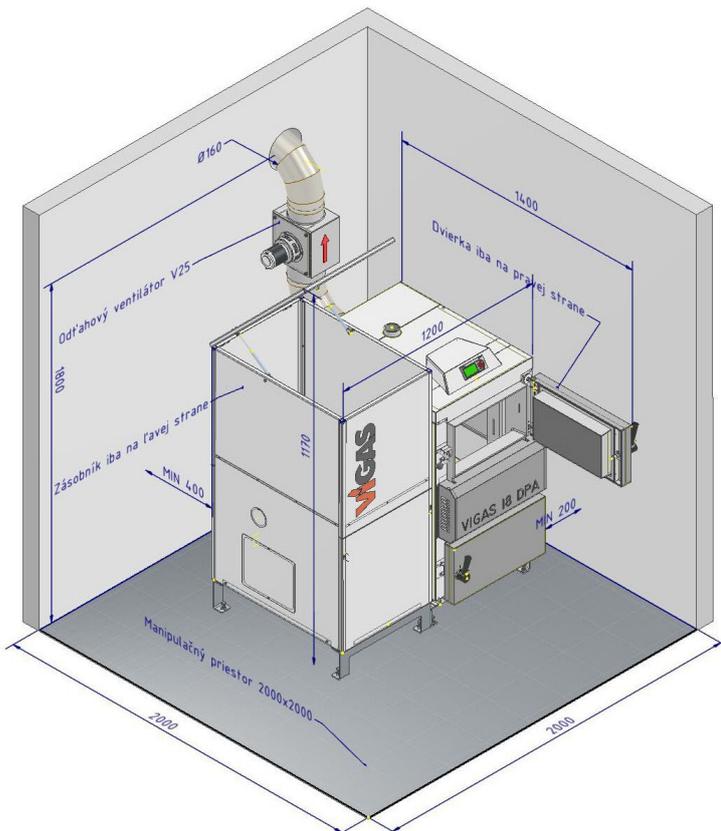
● standard □ for payment



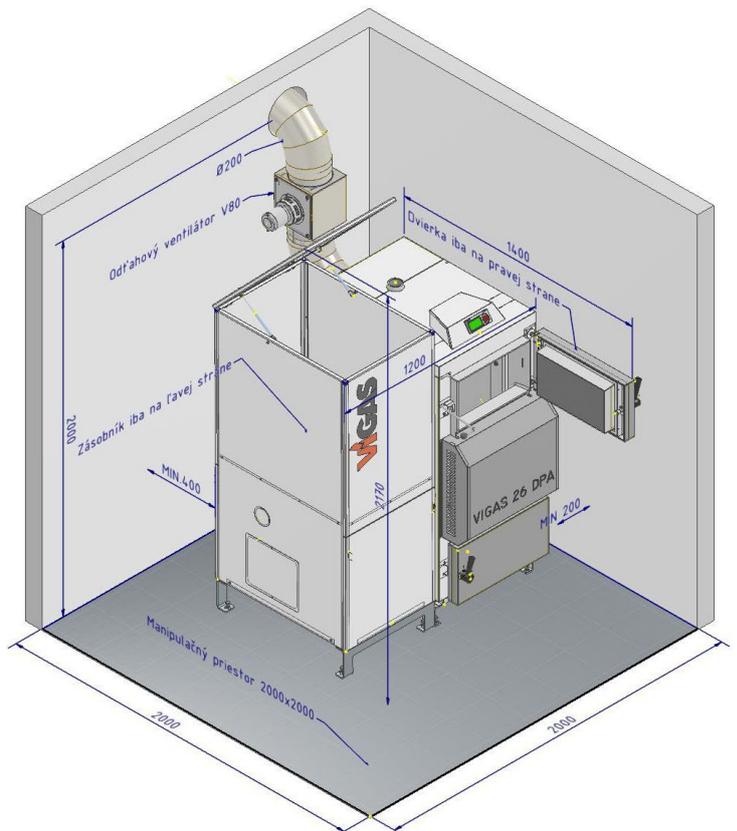
Location of VIGAS 12 DPA



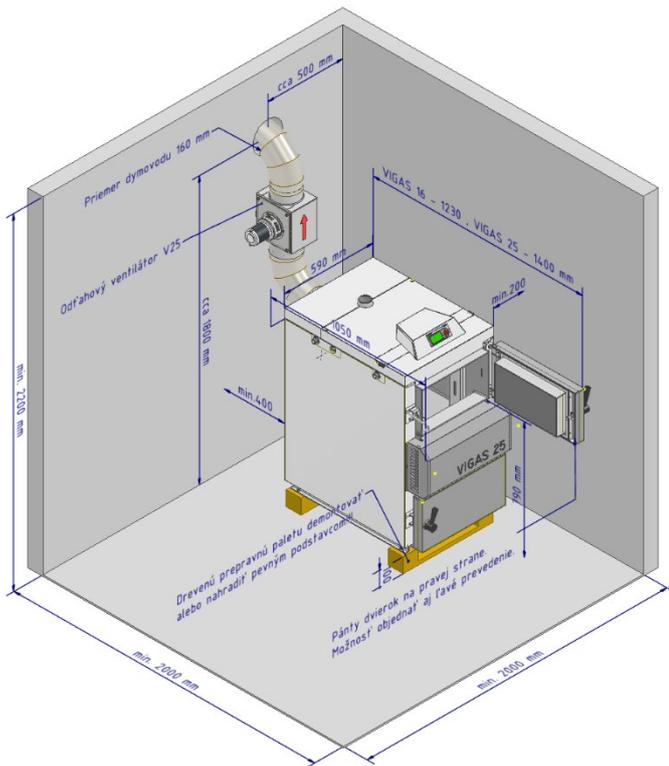
Location of VIGAS 18 DPA



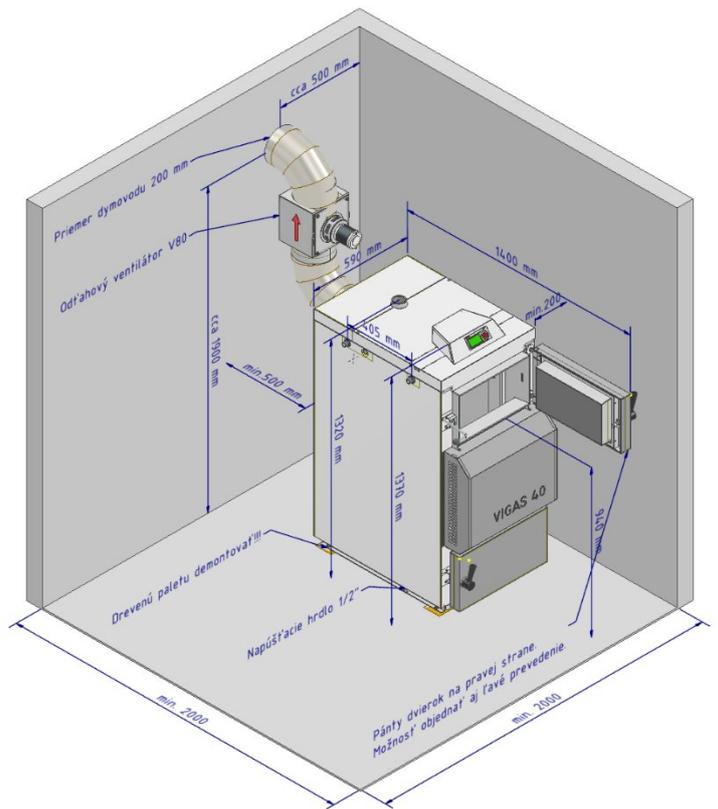
Location of VIGAS 26 DPA



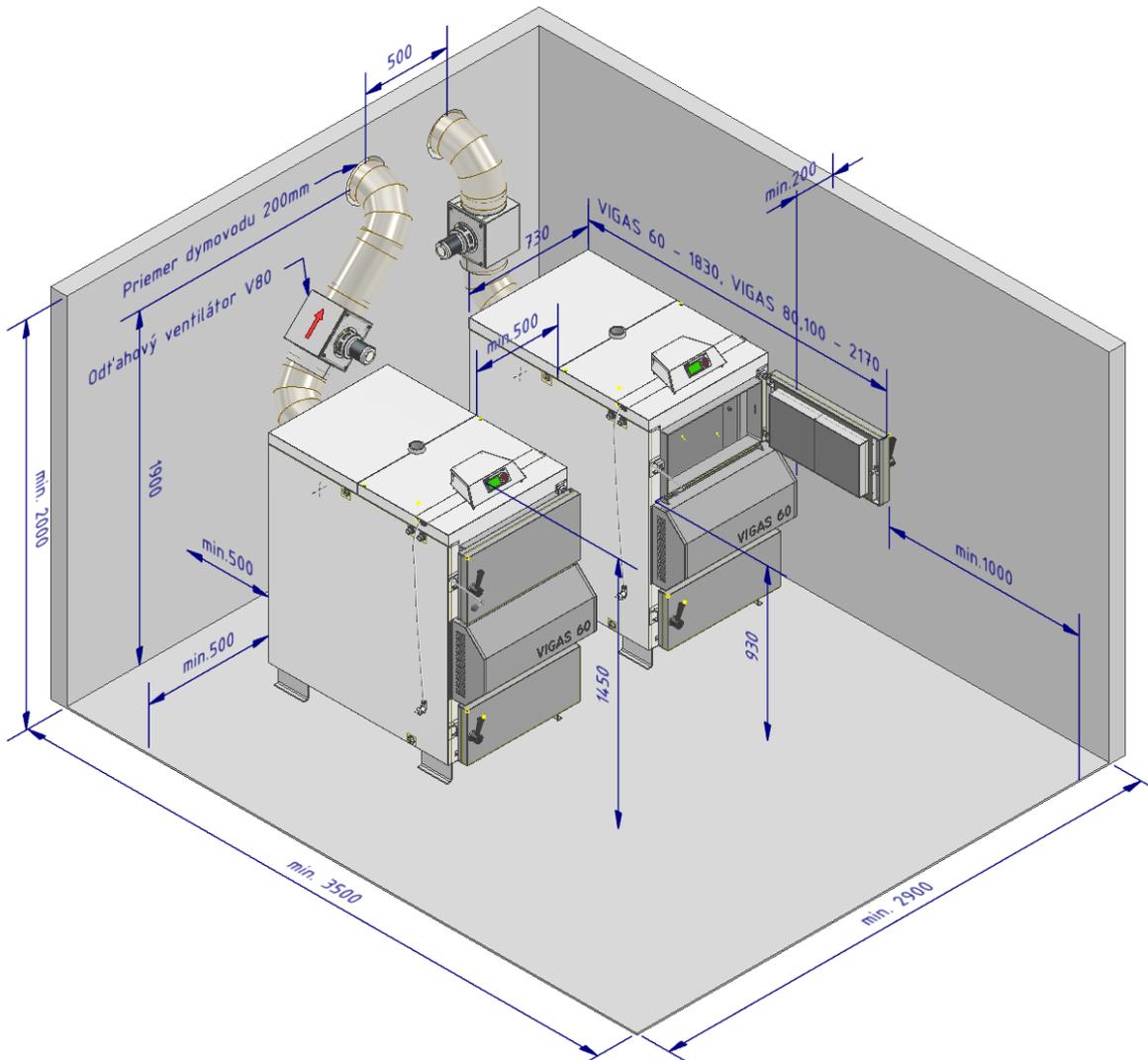
Location of VIGAS 16, 25



Location of VIGAS 40



Location of VIGAS 80, 100



Notes:

BH Control

VIGAS

Gasifying boilers

Producer:

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