

**PRIVATE COMPANY FOR PRODUCTION,
SERVICES AND TRADE**

TOPLING d.o.o. PRNJAVOR

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USER GUIDE



Hot Water Pellet Boiler BTA

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I PREFACE

NOTE: YOU MUST READ THIS USER GUIDE BEFORE TURNING ON THE SYSTEM AND YOU MUST COMPLY WITH THIS USER GUIDE.

The aim of this User Guide is to make you completely acquainted with our system. Instructions for installation and use of the delivered system are given in this User Guide.

Please comply with this User Guide and this system will always function at your pleasure.

KEEP THIS USER GUIDE FOR LONG-TERM USE AND IN AN ACCESSIBLE PLACE FOR FURTHER REFERENCE.

Please feel free to contact us if we can provide you with any further information

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II OPERATOR

NOTE: You must read this User Guide for use of the system and comply with the safety and exploitation instructions.

The operator of the system must have degree of vocational education – technical course. The operator must be trained by the producer for operating the system and safety requirements. When the boiler is commissioned by the authorized person, in the same time the operator appointed by the buyer is trained. After the training is finished the Record on successfully completed training is signed.

When a customer wants to change the system operator, he/she is obliged to inform the producers about it and arrange the training of a new operator. In the case of non-compliance with this obligation, the producer does not bear any responsibility for any possible damages which occurred in connection with an untrained operator.



1. NOTES ON THIS USER GUIDE

1.1 Introductory notes

EASY AND SAFE USE	This guide contain significant information for appropriate and safe use of hot water boiler type BTA. If you follow these Instructions, you can avoid risky situations, reduce maintenance costs, avoid failure, provide reliability and prolong boiler life.
READ USER GUIDE	<p>This User guide must be read and applied by anyone using the boiler type BTA.</p> <p>We keep developing and enhancing our boilers. All information regarding this Guide that are related to the boiler type BTA are correct at the moment of print out.</p>
TECHNICAL CHANGES	Before the use, all details mentioned herein concerning standards and legislation must be checked and compared to standards and legislation applied in the location where the boiler is to be installed.
COPY RIGHT	<p>We reserve the right to make changes on the boilers that would differ in technical data and drawings herein.</p> <p>Written approval of Topling d.o.o. to copy, store in electronic form, transfer information in electronic format, photography, translation of this manual in whole or in part is required.</p>

1.2 Glossary

Table1 – Explanation of terms

Term	Explanation
Engine gear	The part of system intended for moving pellet screw conveyor.
Screw conveyor	Serves for the transport of pellet from storage to firebox.
Automatic cleaning	Part of program intended for cleaning firebox just before damping down a fire.
Display	Display of central unit for furnace operating control
BTA	Boiler intended for burning of pellet
Central Unit	Electric controller for managing boiler operation
Pellet	Type of solid fuel made of sawdust previously dried, then pressed and in such manner making a cylindrical form with 6 mm diameter and 20-50mm length.
PP set	System for preventing fire in pellet reservoir. It is activated if temperature in pellet feeder pipe exceeds 95°C.
Pellet Storage	Reservoir for storing a pellet that is transported to firebox by screw conveyor.
Probe	Serves for detecting certain parameters (temperature, feeder level, etc.) and forwards them to the central unit for further processing.

2. SAFETY INSTRUCTIONS

2.1. Proper use

MAIN PRINCIPLES

MAIN PRINCIPLES OF SYSTEM CONSTRUCTION

The boiler is made in accordance with the known principles of safe use. Improper use may cause harm, injury or even death to those who do not comply with safety guidelines as well as to third parties, which may result in damage to the boiler, and damage to other resources in the immediate environment

Specialized person who made the boiler installation and commissioning should demonstrate you how to use it.

Use boiler only when it is completely in order. Use it the right way and for the purpose for which it is intended, always taking care of your own safety and the safety of others and the safety of property. Constantly comply with this User Guide.

Any defect which may impair safety must be immediately removed.

RELIABLE AND UNRELIABLE USE

USE OF BOILER

The boiler is designed to burn pellet.

Use of any other fuel is not allowed. The manufacturer is not liable for any damages resulting from improper use. In case of improper use the responsibility is borne by the one who used boiler improperly.

As a user, you can enter or alter the operating parameters within the limits prescribed by these instructions. Entering any other value of the operating parameters that are not listed in this leaflet, can lead to errors in the functioning of the system

ALLOWED FUEL

Only pellet that is made from sawdust is allowed to burn.

Pellet is cylindrically pressed into cylindrical shapes. It is made from wood residues generated in wood processing. Pellet must have a standard diameter and length. Chips from which the real pellet is made, are pressed under high pressure and must have a low percentage of humidity.

RECOMMENDED

CHARACTERISTICS OF PELET

Topling' recommends pellet of 6 mm diameter and a 10-30 mm length. Quality and geometric characteristics of pellets are prescribed by the German Standard DIN 51731 or Austrian Standard ONORM 7135



Pay special attention to the quality of pellet, both when ordering and admission.

Use pellet that meets the standards of DIN or ONORM.

For additional information regarding the pellet, see Section 3.4. Requirements regarding fuel quality in chapter "3 Functional Description"

2.2 Always present risks

Despite of all precautions, the below given risks should be always considered:



Attention!

High temperature surfaces.

Contact with such surfaces may cause burns.

Wait for the boiler to cool to touch these uninsulated surfaces.



Warning!

Danger of choking carbon monoxide.

When boiler is used, carbon monoxide can be emitted through openings in the boiler.

Do not leave boiler doors open more than required

2.3 Used warning and safety signs

The below listed warning and safety signs are used in the User Guide:



Danger!

Danger from electrical current.

Work on devices marked with this symbol is only allowed for the qualified persons.



Warning

Work in areas that are marked with this symbol could result in serious injury or create serious damage.



Attention

Possible hand injury.

Work in areas marked with this symbol can lead to hand injuries.



Attention

High temperature surfaces.

Work in areas marked with this symbol can lead to burns.



Attention

Flammable.

Work in areas marked with this symbol can lead to fire.



Attention

Danger of freezing.

Work in areas marked with this symbol can lead to freezing.



Notes on proper disposal.

Additional information for the operator.

2.4 Duty- be informed

READING

USER GUIDE

Anyone who intends to use the boiler is required to read and understand this manual, and special attention must be paid to the Chapter 2, Safety instructions. This especially refers to those who only occasionally use the boiler, for example, only when cleaning or other tasks related to the maintenance of the boiler.

This manual must be constantly "at hand" where the boiler is installed.



Particular attention should be paid to the standards applicable to the place where the boiler is in

3. DESCRIPTION AND PURPOSE

3.1. Summary

Boiler BTA has modern construction and design, and is made of quality certified materials.

Construction of the boiler is in the compliance with European Directives:

2006/42/EC, PED 97/23/EC, LVD 2006/95/EC, EMC 2004/108/EC

and European Standards:

EN ISO 12100:2012, EN 10204:2004, EN ISO 7000:2012, EN 12953-1:2002, EN 12953-2:2002 ,

EN 12953-3:2002 , EN 12953-4:2002, EN 12953-5:2002 ,EN 12953-6:2012,

EN 12953-8:2001, EN 12953-9:2007, EN 12953-10:2003, EN 12953-11:2003,

EN 287-1:2011, EN ISO 15614-1:2004+A1:2008, EN 60204-1:2006, EN 61000-6-3:2006

Boiler testing was done according to mentioned standards and meets all requirements for connection to the central heating system.

Hot water boiler is designed for heating of small residential units, family houses, shops and small manufacturing units.

Automatic operation of the boiler provides the user with an enviable comfort considering that you need to take into account only the charge of pellet reservoir, which makes it suitable for widespread use.

Pellet is an environmentally clean fuel produced from sawdust. Sawdust is initially dried and then pressed under high pressure. The final product is fuel of exceptional calorific power and pure composition with no chemical additives. The percentage of ash in the combustion of pellets is very low and amounts to 1%.

Calorific power of pellet is about 18000 kJ/kg , which means that 2 kgs of pellet corresponds to 1l of heating oil.
--

From a functional point of view the pellet boiler is not behind the oil or gas heating systems, while in fuel consumption it is significantly more cost-effective.

Compared to boilers with heating oil the savings with pellet boilers is up to three times. Pellet is renewable, which means that, as such, is environmentally friendly.

Pellet tank is an integral part of the boiler plant and needs to be recharged as needed.

The firebox and convective part of boiler are made of quality sheet metal by welding technology. The boiler is well insulated with hard-pressed mineral wool in a quality tin plating.

Assembly and commissioning of the furnace are simple, and the connectors are standard. Boiler is tested for water resistance. Allowable working pressure is 2.5 bar.



EC-DECLARATION OF CONFORMITY

In accordance EN45014:1998



We : **TOPLING**
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78430 Prnjavor
Bosna i Hercegovina

We state with personal responsibility that the product:

Mark..... : **boiler BTA**

Type / Model.. : BTA350, BTA450, BTA550, BTA750, BTA1000,
BTA1200, BTA1500, BTA2000

Year of production : 2013

On which this declaration is stuck on, in accordance with the following normative documents :

In accordance with EC-Directives : EC-Directive – Machine safety 2006/42/EC
EC- Directive-Equipment under pressure 97/23/EC
EC Directive-Low voltage 2006/95/EC
EC Directive-electromagnetic compatibility 2004/108/EC

Applied standards, especially:

EN ISO 12100:2012, EN ISO 7000:2012, EN 12953-1:2002, EN 12953-2:2002 , EN 12953-3:2002 , EN 12953-4:2002, EN 12953-5:2002 ,EN 12953-6:2012,
EN 12953-8:2001, EN 12953-9:2007, EN 12953-10:2003, EN 12953-11:2003,
EN 60204-1:2006, EN 61000-6-3:2006

And other standards :

EN 287-1: 2011, EN 15614-1; EN 10204:2004; EN ISO 7000 :2012;

Applied procedure for declaration of conformity: Modul B1

Emission limits according (class):

Issue certificates: EC Control type-Certificat br. _____

Accredit laboratory: TÜV Thüringen e. V. Service-Center Südthüringen
Industriestr. 13 98544 Zella-Mehlis

We hereby state that the above mentioned product in its concept and way of production, is in accordance with the safety and protection norms which are in accordance with the above mentioned directives and standards.

Also, all drive conditions and conditions of use are in accordance with the attached instructions for use and technical documentation.

If only one change of the product is done, which has not been agreed with us, this declaration automatically loses its validity.

Surname, name and title of signatory :

Prnjavor

Živanić Radislav bach.eng.manager

.....
Place and date

.....
signature, seal

3.2. Technical Description

Hot Water Boiler BTA is made of quality boiler steel plate with welding technology with connection to external pellet burner. The boiler is completely covered by sheet plate.

External pellet burner is an device in which pellet burning process takes place so that already formed hot gas stream comes to the firebox. Burner has cylindrical shape with tangentially positioned channel through which fuel is dosed. The burner is insulated with a thick layer of concrete for thermal insulation and it has connections for air inlet and the outlet of combustion products towards the boiler. Centrifugal fan is mounted on the burner, which has a role to accelerate the combustion process and routing - flowing of gases to the boiler and chimney

Storage with feeder consists of storage, screw conveyor and rotary feeder. Screw conveyor and rotary feeder are driven by electric motor and gear.

Multi Cyclone separates large particles from the flue gases, in order to reduce environmental pollution and to prevent the release of sparks that could cause a fire. Flue gas fan through the flue pipe transports flue gases to the chimney.

Counter controller automatically leads the combustion process regarding the lower and upper fixed point of boiler water temperature.

The chimney must be properly selected. Proper chimney dimensioning is a precondition for safe boiler operation and heating efficiency. At the bottom of the chimney there is a door for cleaning. The interior chimney dimensions depend on the chimney height and the power of hot water boiler.

For proper boiler operation it is necessary to provide a minimum airflow in the chimney which is achieved by suitable section and chimney height.

Boiler installation is correctly calculated by the designer and expertly performed to achieve maximum efficiency and to avoid malfunctions and unwanted consequences.

The system is easy for servicing, maintenance and cleaning. Combustion process is very good, so the contamination of exchange surfaces is minimal, and layers of ashes can be simply removed.

Cleaning equipment is delivered together with this system by the producer.

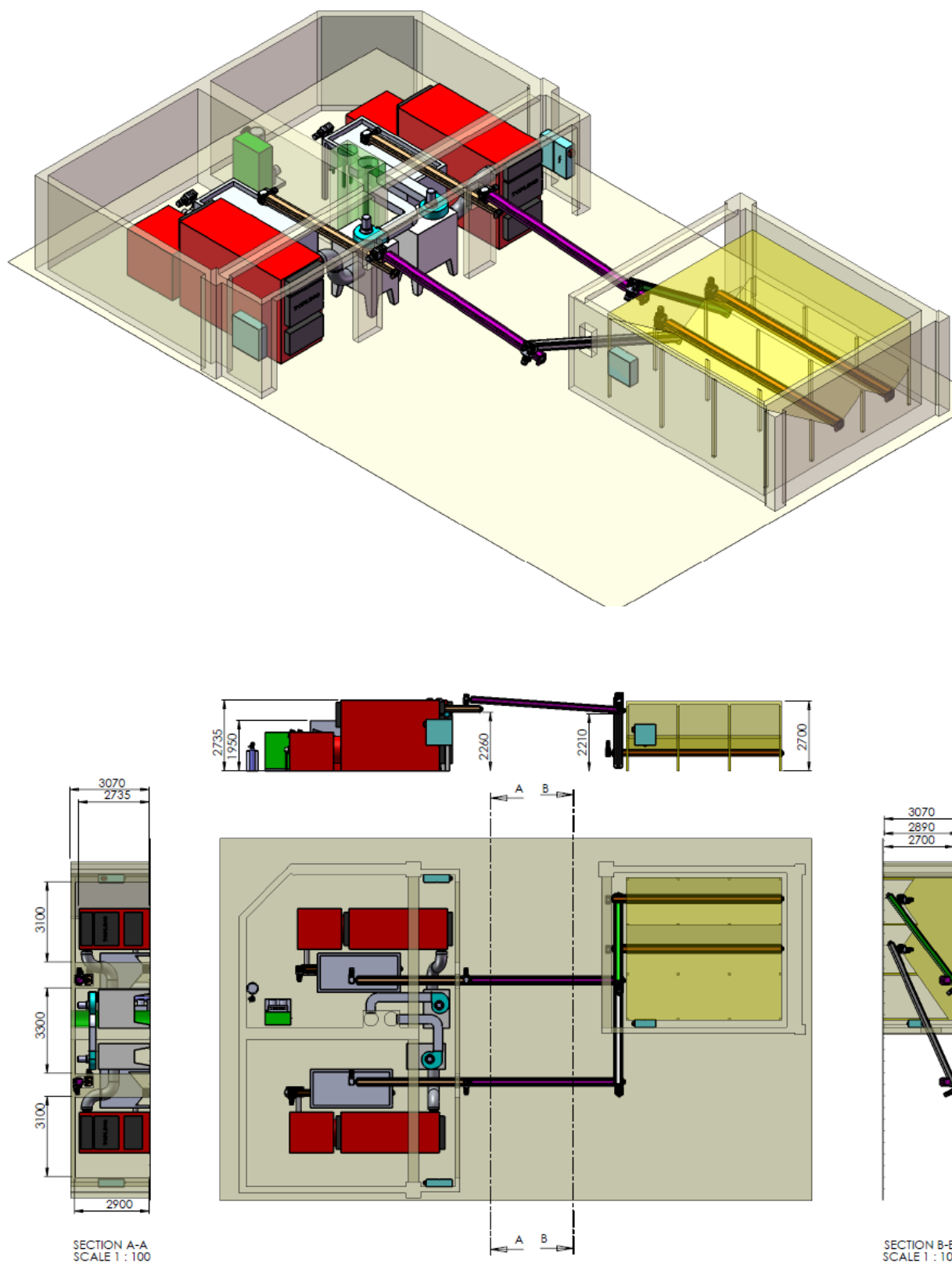


Figure 1 . Boiler room with two system units and external silo

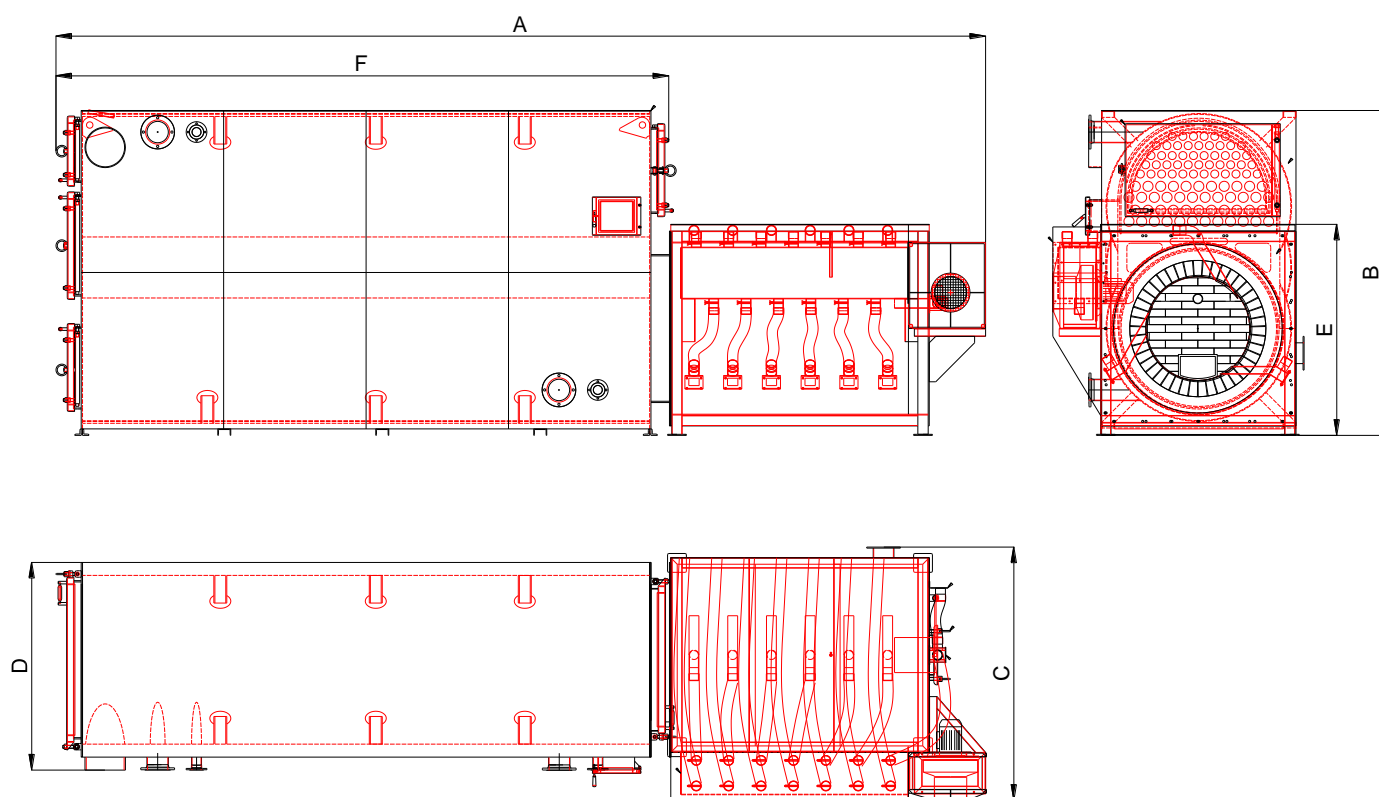


Figure 2. Boiler dimensions with pellet burner

Table 2. Technical characteristics

Power (kW)	350	450	550	750	1000	1200	1500	2000
η (%)	92-95	92-95	92-95	92-95	92-95	92-95	92-95	92-95
Flue gas temperature (°C)	max.190	max.190	max.190	max.190	max.190	max.190	max.190	max.190
Noise (dB)	78	78	78	78	78	78	78	78
El. power (kW)	9 ⁽¹⁾	9 ⁽¹⁾	9 ⁽¹⁾	11 ⁽¹⁾	11 ⁽¹⁾	11 ⁽¹⁾	13 ⁽¹⁾	13 ⁽¹⁾
Boiler weight (kg)	5320	6120	6320	6610	7420	7920	8350	8910
Burner weight (kg)	2950	3150	3450	3785	3850	4050	4240	4500
Amount of water in boiler(l)	2550	2950	3550	4040	4530	4760	5135	5320
A (mm)	5300	5400	5933	6260	6460	6970	7176	7370
B (mm)	2500	2500	2500	2500	2500	2500	2500	2730
C (mm)	1502	1602	1702	1802	1802	1902	1902	1902
D (mm)	1500	1500	1500	1500	1500	1500	1500	1500
E (mm)	1400	1400	1465	1473	1473	1573	1573	1673
F (mm)	3540	3740	3940	4140	4340	4540	4746	4946
Chimney height (mm)	8000	10000	10000	10000	10000	12000	12000	14000
Chimney diameter (mm)	400	450	500	550	600	600	600	600
Maximal working water pressure (bar)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Maximal water temperature (°C)	90	90	90	90	90	90	90	90
Test pressure (bar)	5	5	5	5	5	5	5	5
Flue gas fan (type)	LM33	LM33	LM39	LM39	Ekovent C4-62 No4.5	Ekovent C4-62 No4.5	Ekovent C4-62 No4.5	Ekovent C4-62 No4.5
Fuel consumption (kg/h)	70	90	100	150	200	240	300	500
Pressure drop from water side (mbar)	165	180	200	270	310	335	375	415
Pressure drop from flue side (mbar)	2.0	2.2	2.5	3.0	3.3	3.7	4.1	4.3
Starting line 90/70(DN)	80	80	100	125	125	125	150	150
Return line 90/70(DN)	80	80	100	125	125	125	150	150
Safety line (DN)	50	50	50	65	65	65	65	80

(1)-note

Electrical power is given for the standard dosing system with one screw conveyor . In the case of more complex systems when the dosing silo is away from the rotary feeder so the transportation is performed with multiple screw conveyers, electrical power should be increased by the number of screw conveyers x1.5kW.

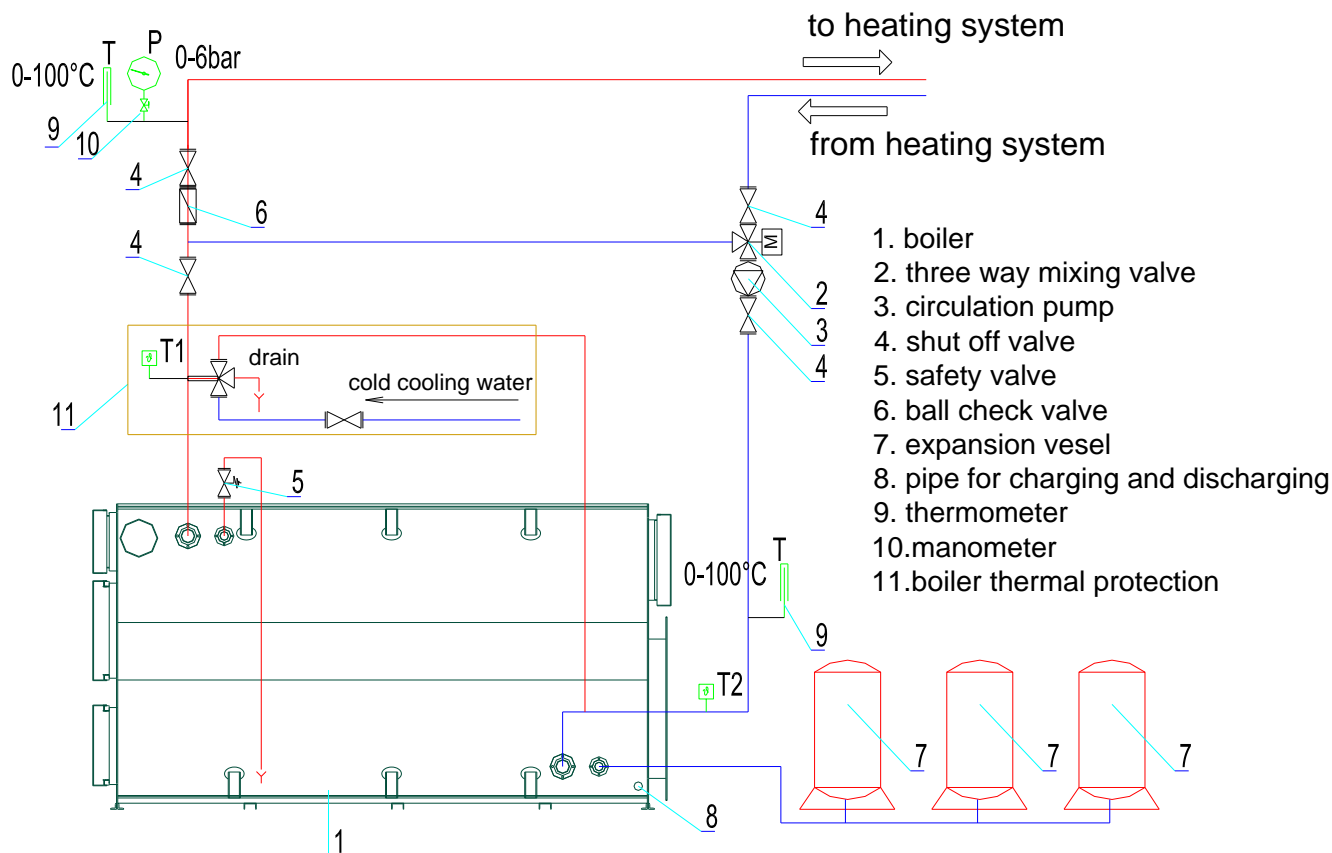


Figure 2a. (scheme of connecting boiler to the system)

The central heating system, in the vicinity of boiler, must be equipped with pressure gauge to show the pressure of water in the boiler. (Fig.2a, poz.10)

The central heating system, in the vicinity of boiler, must be equipped with thermometer to show the temperature of boiler water. (Fig.2a, poz.9)

Softened water is recommended for filling the boiler from the system. Circulation pump is put into operation only when the heating system is filled with water. What must be taken into account is that the system is vented.

The central heating system, in the vicinity of boiler, must be equipped with safety valve to prevent the increasing of water pressure . (Fig.2a, poz.5) . The safety valve must be set to 2.5 bar.

The safety valve is not supply with the boiler and must be installed in the central heating system.

Safety valves are used for controlling pressure on boilers in heating systems and generally in all systems feeded by water or mixtures of water and vector liquids (glycol, for example). When calibrated pressure is reached, the valve opens and, by means of the discharge to atmosphere, prevents the pressure of the system from reaching levels which would be dangerous for the boiler

and the components of the system itself. The discharge pressure of the valve is calibrated by the manufacturer, and no change of this calibration is possible if the valve itself is not broken. The safety valve must be installed in line with flow direction indicated by the arrow on the valve body.

Before the first firing, it is necessary to check whether the chamotte is properly placed in the furnace and check that the transportation and installation of the boiler has not caused movement of refractory bricks.

When connecting the furnace and chimney, the flue pipe should be placed horizontally or vertically. All connections must be well sealed.

Risk of boiler overheating

When wooden logs or coal are used as a fuel, there is a risk of overheating in case of interruption of power supply (in that case the circulation pump stops working)

Remedy

- battery backup supply for circulating pump or
- safe removal of residual heat as described in figure below

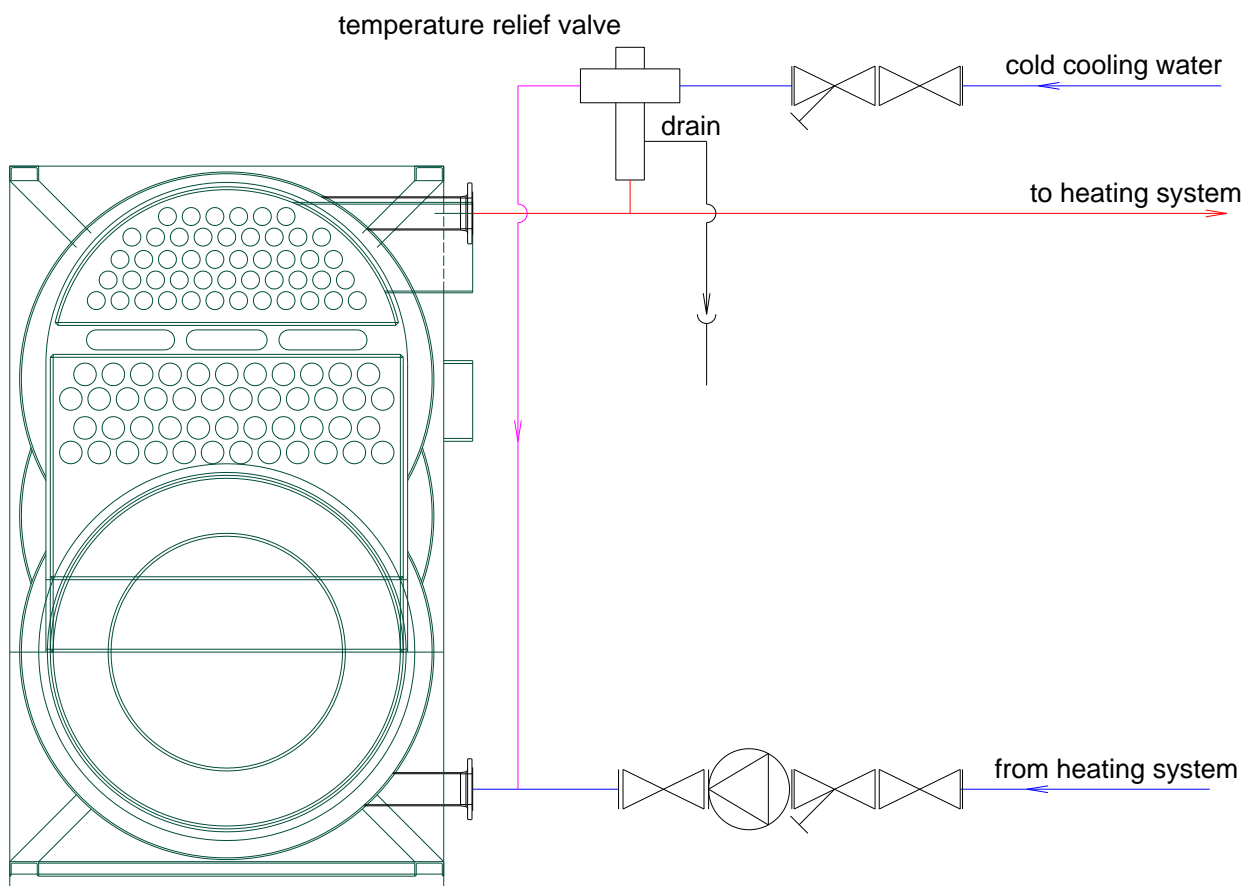


Figure 2b. Installation of temperature relief valve

The temperature relief valve is used to ensure safety in heating system using solid fuel. The temperature relief valve is set to 95°C. When the setting temperature is reached, the cold cooling water inlet to the boiler and the overheated boiler hot water is drained and pass to the

heating system simultaneously until the temperature drops below the trigger value. When the setting value is reached, the inlet cold cooling water and discharge apertures are close simultaneously.

Note-As usual, the arrow on the valve body indicates the cold water supply pipe inlet point. The valve may be installed vertically or horizontally, but the discharge must always be facing downwards. It must not be install upside down. The valve should be installed at the uppermost point of the boiler.

When pellet is used as fuel, there is a risk of overheating also.

Remedy

The boiler BTA is equipped with safety thermostat, which in case of water temperature excess above 95°C, interrupt the power supply of regulator. In that case the dosing system stops, and pellet is not enter into the boiler.



Connecting the control panel of boiler to the network

When installing the boiler, power supply cord must be connected to the boiler. The power supply is single-phase 220 V, 50 Hz. Installation must be performed by an expert because there is a danger of electrical shock.

Before putting into operation the work You must check:

- the pressure in the boiler and installation,
- whether complete installation is properly vented,
- whether boiler cables do not rely on the warm (hot) portions of the boiler or the cables are not physically damaged,
- before feeding pellets into the reservoir, check that there are no mechanical hard objects that could impede the work of the screw conveyor.

In a closed heating system the installation of a certified expansion vessel (figure 2a, poz.7) is required to avoid hydraulic shock. Locking element must not be installed between the safety valve, expansion vessel and boiler. Expansion vessel is not supply with the boiler and must be installed in the central heating system.

Water temperature in boiler may not fall below 55°C not to cause condensate.



In the event of severe winter weather and low temperature, and when the boiler is not used it is necessary to drain water from the system or fill it with antifreeze liquid.

Flue gas fans

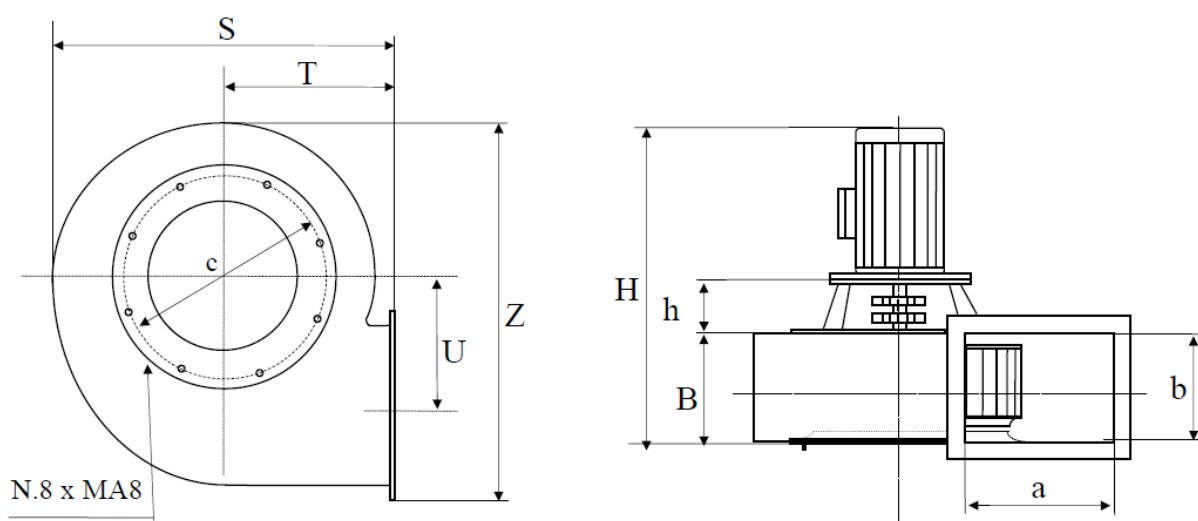


Figure 3 – Flue gas fan type LM

Table 3. LM Flue gas fan dimensions

Mod./Type	a	b	c	B	h1	H	S	T	U	Z
LM 25	220	160	280	167	120	524	430	195	180	515
LM 33	295	200	370	209	120	644	570	248	260	700
LM 39	350	248	430	258	120	703	685	300	310	830

Table 4. LM Flue gas fan characteristic

	Motor			Flow: Q _v = m³/h																									
Type	Mark	kW	o/min	660	720	840	960	1080	1200	1320	1500	1920	2160	2400	2700	3000	3300	3600	4200	4800	5400	6000	6600	7200	8400	dB(A)			
	80A-4	0,55	1375	35	36	38	40	40	41	40	40	32							Presure drop (mm H ₂ O)										51
LM 28	80B-4	0,75	1375		38	40	42	44	45	47	48	52	52	50	45	40											56		
LM 33	90S-4	1,1	1410		58	59	60	60	61	62	63	68	70	73	73	72	70	66	56								61		
LM 39	112M-4	4	1420						84	85	86	89	90	93	95	98	101	103	110	115	118	118	118	115	113	73			

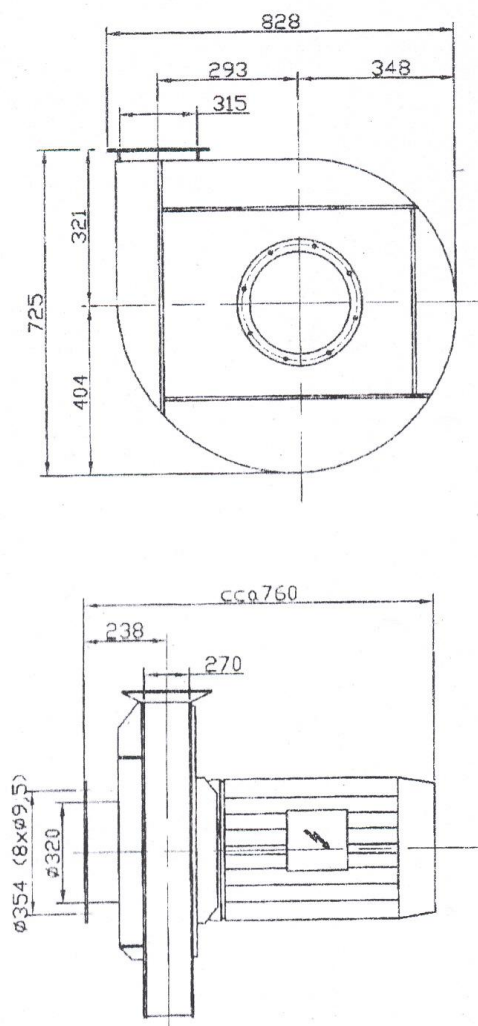


Figure 4 . Ekovent C4-62 No4.5 Flue gas fan

Centrifugal fan for high temperature, made of steel sheet and profiles, rotor dynamically balanced, mounted directly on the electrical motor shaft, forcedly cooled by self-cooling rotor. It is covered with the paint for high temperatures.

Technical characteristics

- type C4-62 No4.5
- $q = 2\text{m}^3/\text{s}$
- $t \leq 250^\circ\text{C}$
- $p_F = 1200\text{ Pa}$ at 250°C
- $p_F = 2300\text{ Pa}$ at 20°C
- $P_E = 4\text{ kW}$
- $N = 2800\text{ o/min}$
- $U = 3 \times 400\text{ V}$
- $f = 50\text{ Hz}$

Ekovent C4-62 No4.5 Flue gas fan characteristics

Silo

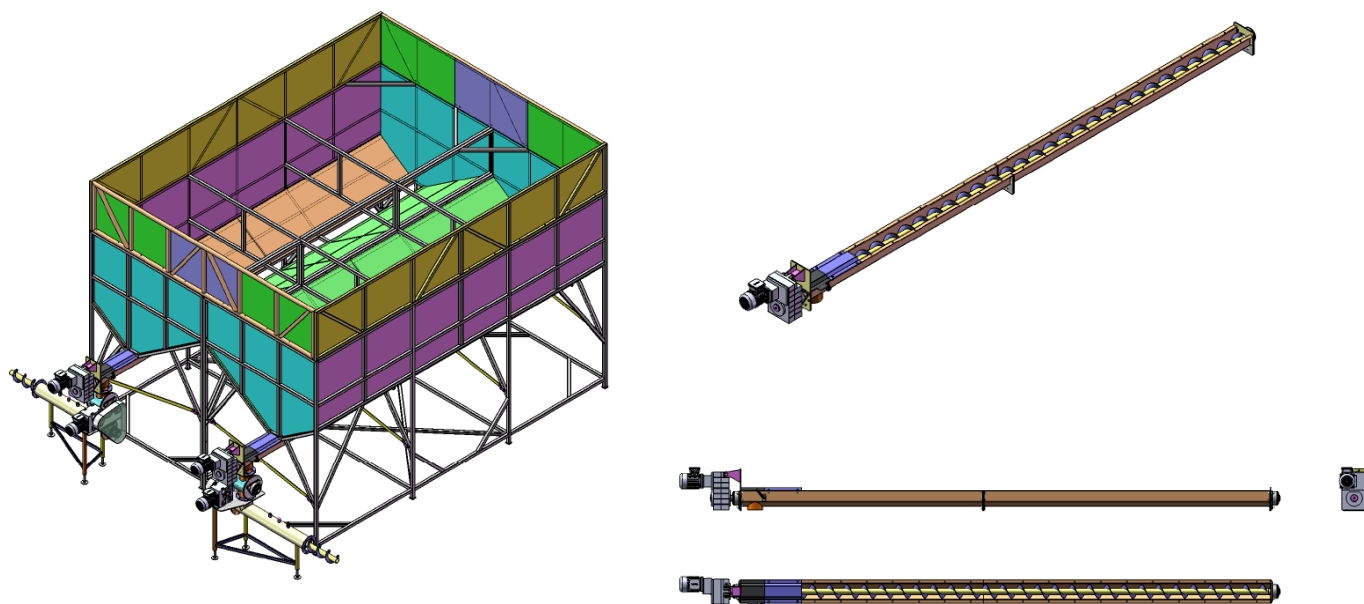
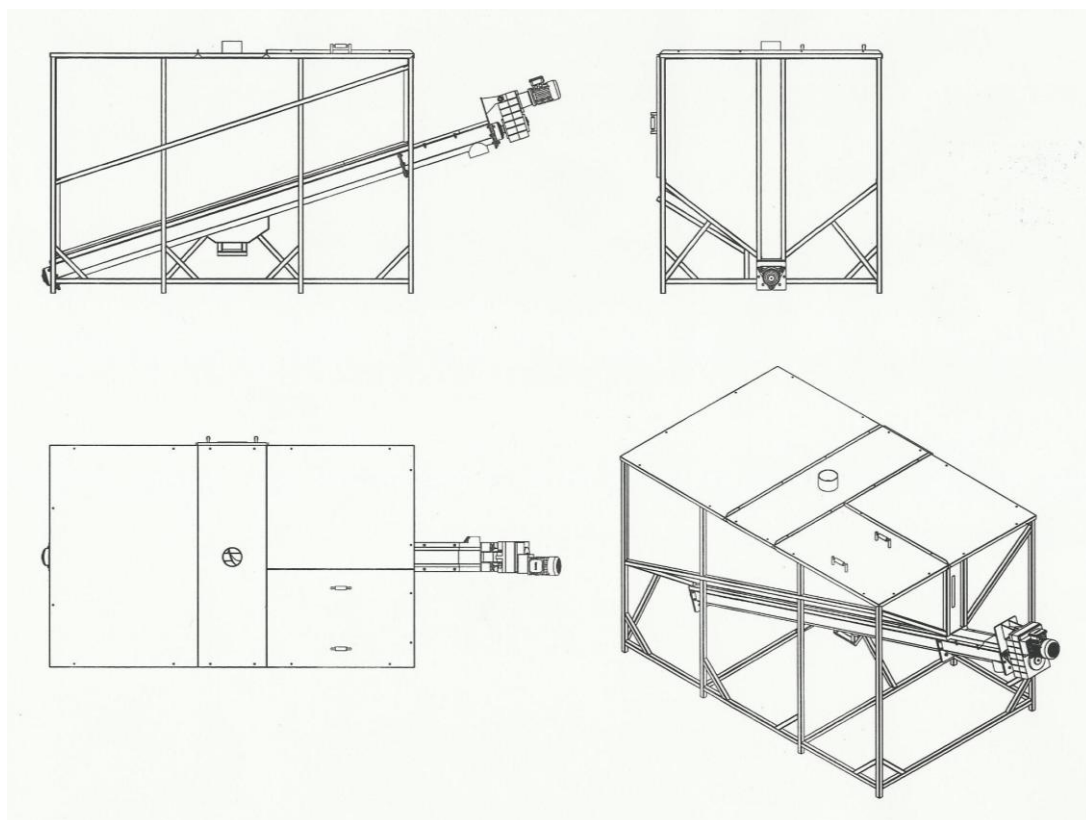
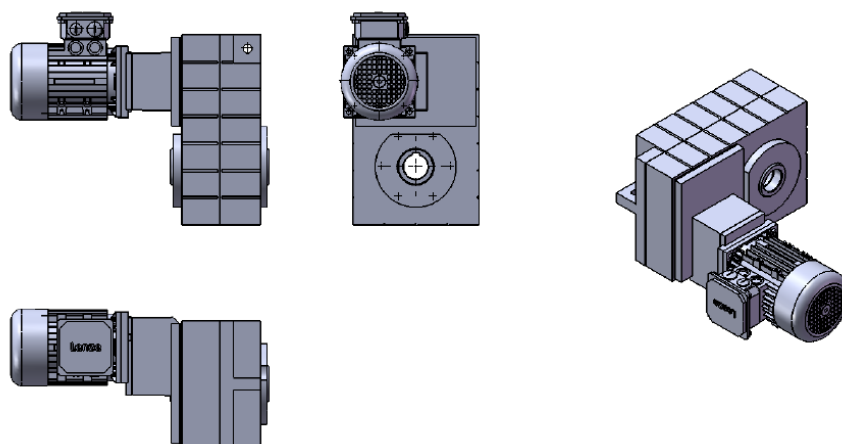
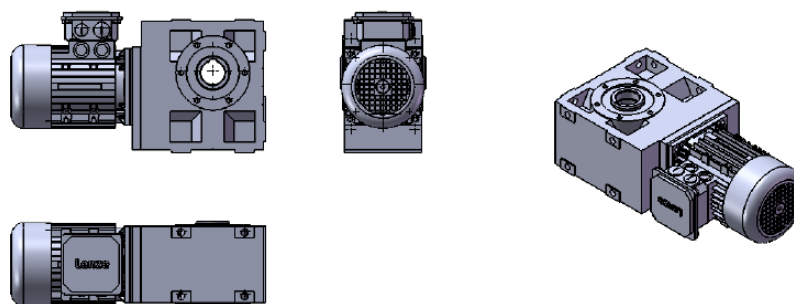


Figure 5. According to available space, silos of different dimensions and shapes are added on BTA systems.



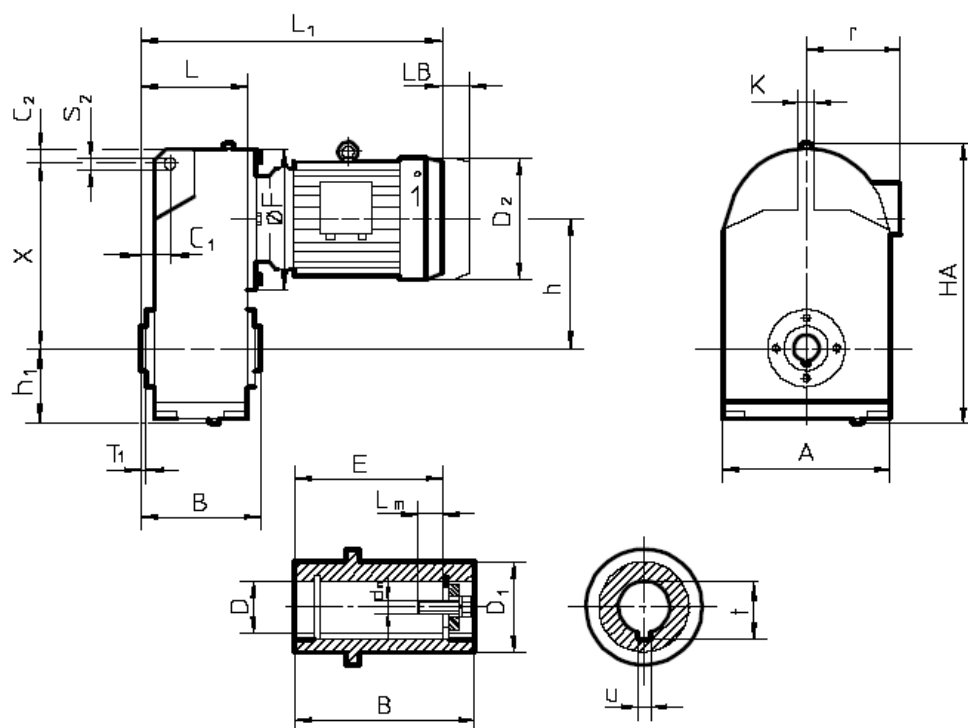
Gear motor GFL, producer Lenze.



Gear motor GSS, producer Lenze.

Figure 6. Depending on the boiler power ratings, geometric characteristics of boiler room and the customer's requirements, different types of gear motors are used accordingly.

helical shaft mounted gear motors (tip 112 N)
(screw feeder and inter screws.)



Carrier

Output shaft

Tip	A	B	C ₁	C ₂	S ₂	X	h ₁	HA	T ₁	h	k	L	φF	D ₁	d _m	L _m	D	E	u	t
90 N	150	119,5	40	20	12	142	81	249	2	102	12	105	120	45	M 8	15	30	103	8	33,3
100 N	190	145	48	25	16	188	77	316	2	133	15	125,5	160	60	M16	23	40	123	12	43,3
112 N	225	178,5	57,5	30	22	230	114	382	2	160	20	157	200	70	M16	28	50	151	14	53,8
132 N	270	203	64	40	22	216	131	473	2	209	25	180	250	85	M20	32	60	171	18	64,4

Motor

Tip	63 A , B	71 A , B	80 A , B	90 S	90 L	100 L, Ld	112 M	132 S	132 M	160 M	160 L
D ₂	123	140	154	170	170	192	216	247	247	285	285
r	95	102	110	113	113	132	145	183	183	246	246
LB	45	57	60	84	84	89	79	117	117	122	122
L ₁											
90 N	340	322	350	389	414						
100 N	334,5	336,5	363,5	402,5	417,5	457,5					
112 N		386	392	431	456	486	529	570	608		
132 N			407	445	470	500	507	546	584	672	716

Figure 7. Dimensions of helical shaft mounted gear motors

TORQUE SUPPORT (tip OM-112N)

At N-type gear (shaft mounted) reactive torque balance must be balanced with relevant supporter and prevent gear motor rotation. Supporter is connected with gear motor via rubber elements - the shock absorber.

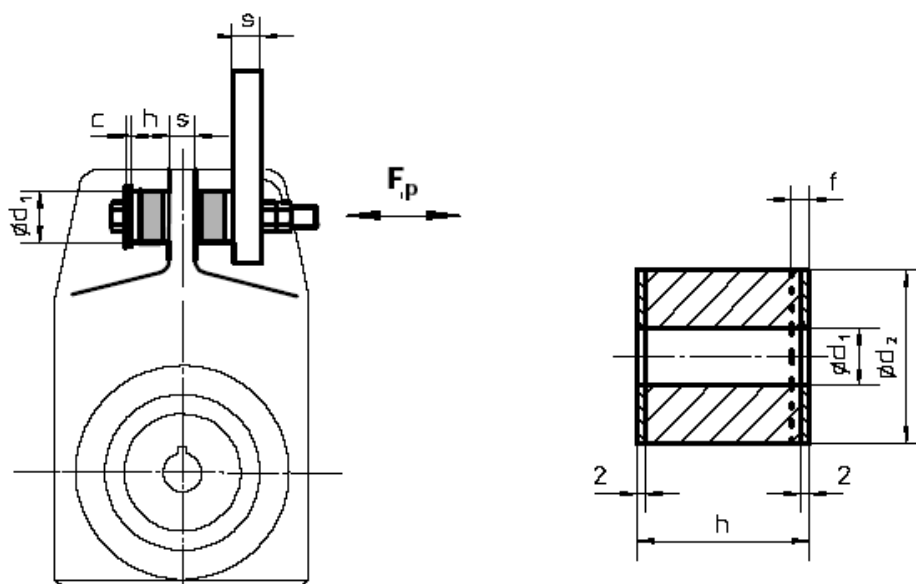


Figure 8 – Shock absorber

Table 5. Dimensions of shock absorber

type	dimensions						Torque T_{max} (Nm)	compressive force F_p N	screw
	s	c	h	d1	d2	f			
OM-90N	12	5	20	12,5	40	1,5	300	2700	M12x80
OM-100N	15	5	20	18	40	2,5	500	3300	M14x100
OM-112N	20	10	30	24	60	3	900	5000	M20x120
OM-132N	25	10	30	24	60	4	1800	8100	M20x120

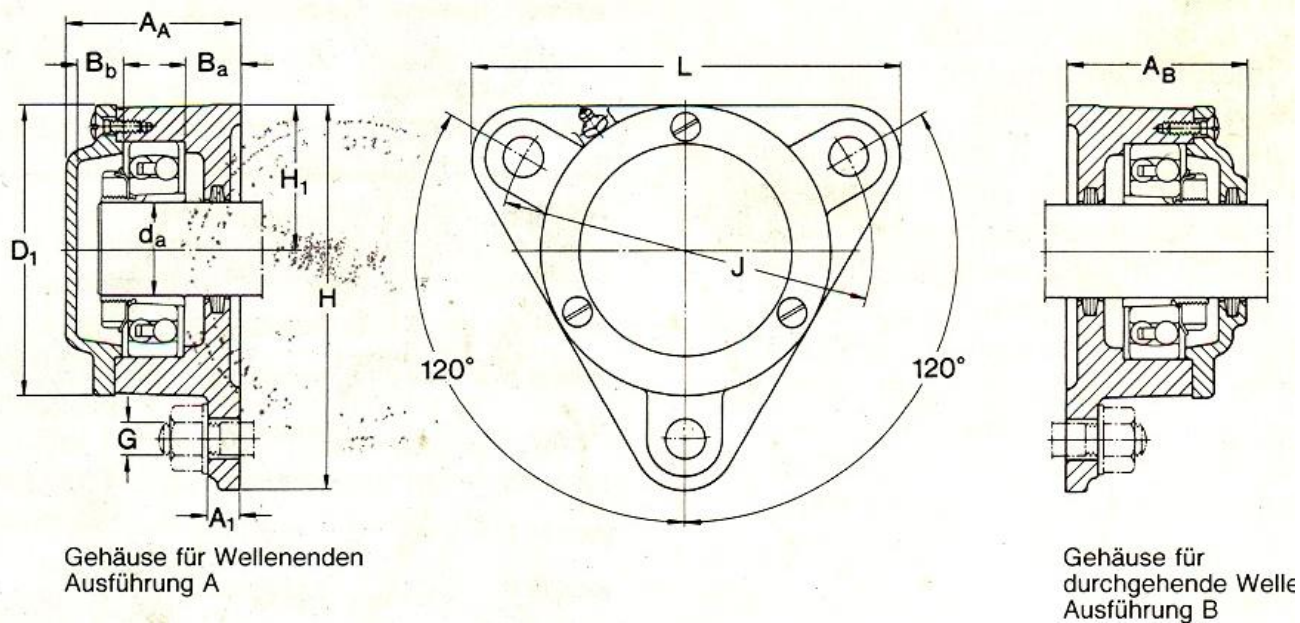


Figure 9. Bearings SKF 722509 DA (screw feeder, rotary feeder)

Table 6. Dimensions and marks of bearings

d_a	A_A	A_B	A_1	B_a	B_b	D_1	H	H_1	J	L	G	kg	A	B
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	—	—
20	51,5	56,5	10	15	12,5	75	100	38	96	110	10	1,10	722505 DA	722505 DB
25	57	59,5	12	16	15	86	117	44	116	130	10	1,50	722506 DA	722506 DB
30	59,5	63,5	12	16	14,5	97	130	48,5	130	145	12	1,80	722507 DA	722507 DB
35	64	65,5	12	17	18	108	143	54	140	160	12	2,30	722508 DA	722508 DB
40	64,5	69,5	12	19	16,5	113	160	60	160	180	12	3,00	722509 DA	722509 DB
45	68,5	73	15	22	17,5	118	160	60	160	180	12	3,00	722510 DA	722510 DB
50	75,5	81,5	15	24	19,5	128	172	65	170	192	12	4,10	722511 DA	722511 DB
55	77	82	15	23	19	142	189	72	180	210	12	4,80	722512 DA	722512 DB
60	80	86	15	22	20	152	203	78	190	225	12	5,90	722513 DA	722513 DB

mm	—	—	—	—	—
20	1205 EK 2205 EK 22205 EK	H 205 H 305 H 305	1 FRB 5/52 1 ZW 42×52 1 ZW 42×52	FS 110	M 5×16
25	1206 EK 2206 EK 22206 EK	H 206 H 306 H 306	1 FRB 6/62 1 ZW 50×62 1 ZW 50×62	FS 190	M 5×16
30	1207 EK 2207 EK 22207 EK	H 207 H 307 H 307	1 FRB 8/72 1 ZW 65×72 1 ZW 65×72	FS 190	M 5×16
35	1208 EK 2208 EK 22208 EK	H 208 H 308 H 308	1 FRB 7/80 1 ZW 70×80 1 ZW 70×80	FS 190	M 5×16
40	1209 EK 2209 EK 22209 EK	H 209 H 309 H 309	1 FRB 6/85 1 ZW 75×85 1 ZW 75×85	FS 190	M 6×20
45	1210 EK 2210 EK 22210 EK	H 210 H 310 H 310	1 FRB 5/90 1 ZW 80×90 1 ZW 80×90	FS 190	M 6×20
50	1211 EK 2211 EK 22211 EK	H 211 H 311 H 311	1 FRB 6/100 1 ZW 85×100 1 ZW 85×100	FS 260	M 6×20
55	1212 EK 2212 EK 22212 EK	H 212 H 312 H 312	1 FRB 8/110 1 ZW 90×110 1 ZW 90×110	FS 260	M 6×20
60	1213 EK 2213 EK 22213 EK	H 213 H 313 H 313	1 FRB 10/120 1 FRB 2/120 1 FRB 2/120	FS 260	M 6×20

The system includes rotary feeder which gradually separates two screw feeders and prevents the return of fire into the main silo.

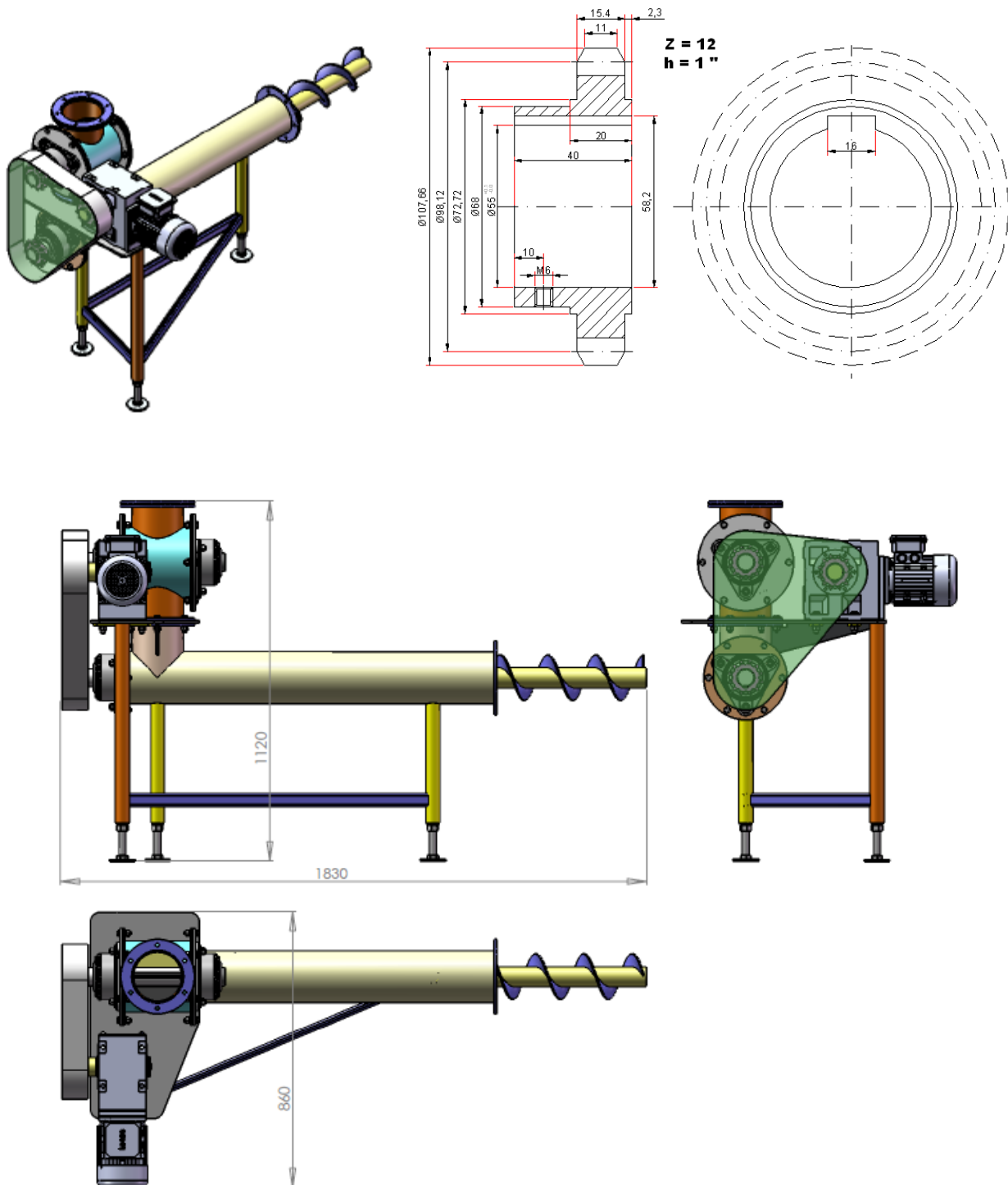


Figure 10 Rotary feeder

The system must not be put into operation without protective chain cover. The chain cover must not be removed during the operation of the system.

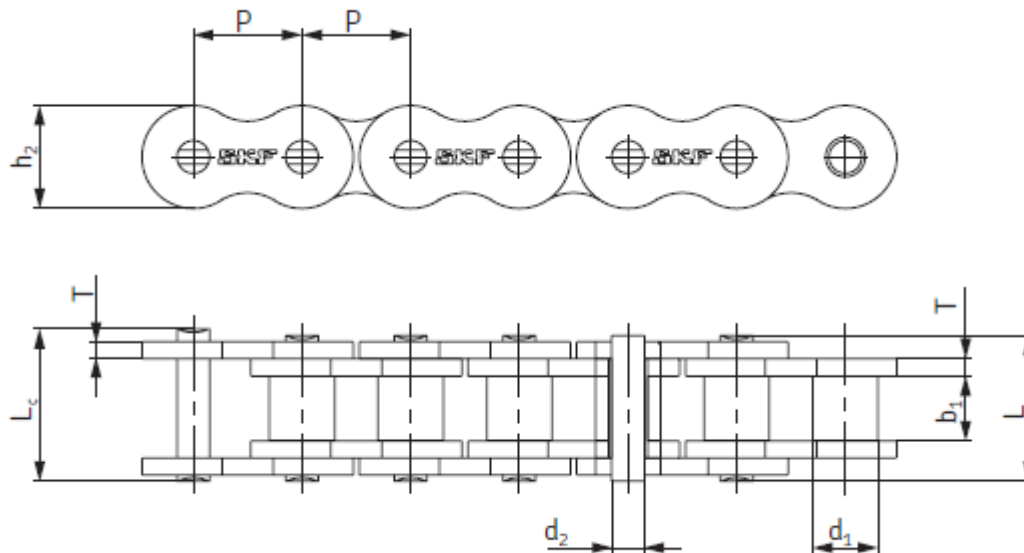


Figure 11. Power transmission by sprockets and roller chains

Table 7. Sprockets

ANSI Chain No.	BS/ISO Chain No.	Pitch	Roller diameter	Width between inner plates	Pin diameter	Pin length		Pin length cottered	Inner plate height	Plate thickness
		P	d ₁ max	b ₁ max	d ₂ max	L max	L _c max	L _c max	h ₂ max	T max
		mm	mm	mm	mm	mm	mm	mm	mm	mm
35H-1*	-	9,525	5,08	4,77	3,58	13,3	14,3	-	9,0	1,50
40H-1	08AH-1	12,700	7,95	7,85	3,96	18,8	19,9	-	12,00	2,03
50H-1	10AH-1	15,875	10,16	9,40	5,08	22,1	23,4	24,4	15,09	2,42
60H-1	12AH-1	19,050	11,91	12,57	5,94	29,2	31,0	31,6	18,00	3,25
80H-1	16AH-1	25,400	15,88	15,75	7,92	36,2	37,7	39,4	24,00	4,00
100H-1	20AH-1	31,750	19,05	18,90	9,53	43,6	46,9	46,9	30,00	4,80
120H-1	24AH-1	38,100	22,23	25,22	11,10	53,5	57,5	57,5	35,70	5,60
140H-1	28AH-1	44,450	25,40	25,22	12,70	57,6	62,2	62,2	41,00	6,40
160H-1	32AH-1	50,800	28,58	31,55	14,27	68,2	73,0	73,0	47,80	7,20
180H-1	36AH-1	57,150	35,71	35,48	17,46	75,9	81,6	-	53,60	8,0
200H-1	40AH-1	63,500	39,68	37,85	19,85	86,6	93,5	93,5	60,00	9,50
240H-1	48AH-1	76,200	47,63	47,35	23,81	109,6	115,9	-	72,30	12,70
60H-2	12AH-2	19,050	11,91	12,57	5,94	55,3	57,1	57,7	18,00	3,25
80H-2	16AH-2	25,400	15,88	15,75	7,92	68,8	70,3	72,0	24,00	4,00
100H-2	20AH-2	31,750	19,05	18,90	9,53	82,7	86,0	86,0	30,00	4,80
120H-2	24AH-2	38,100	22,23	25,22	11,10	102,4	106,4	106,4	35,70	5,60
140H-2	28AH-2	44,450	25,40	25,22	12,70	109,8	114,4	114,4	41,00	6,40
160H-2	32AH-2	50,800	28,58	31,55	14,27	130,1	134,9	134,9	47,80	7,20
200H-2	40AH-2	63,500	39,68	37,85	19,85	164,9	171,8	171,8	60,00	9,50
60H-3	12AH-3	19,050	11,91	12,57	5,94	81,4	83,2	83,8	18,00	3,25
80H-3	16AH-3	25,400	15,88	15,75	7,92	101,4	102,9	104,6	24,00	4,00
100H-3	20AH-3	31,750	19,05	18,90	9,53	121,8	125,1	125,1	30,00	4,80
120H-3	24AH-3	38,100	22,23	25,22	11,10	151,2	155,2	155,2	35,70	5,60
140H-3	28AH-3	44,450	25,40	25,22	12,70	162,0	166,6	166,6	41,00	6,40
160H-3	32AH-3	50,800	28,58	31,55	14,27	192,0	196,8	196,8	47,80	7,20
200H-3	40AH-3	63,500	39,68	37,85	19,85	243,2	250,1	250,1	60,00	9,50

It is only necessary to connect flue gas fan, which is flanged for multi cyclone, and the chimney through the square chimney pipe. Multi cyclone is connected by chimney pipe, of round cross section to the boiler, and then by the flue gas fan to chimney. Chimney pipes should be insulated with mineral wool against the fire.

The connections between multi cyclone and boiler, multi cyclone and chimney are done by clamp with thermo resistant pads. Flue gas pipe between the flue gas fan and chimney must be angled out more than 10°

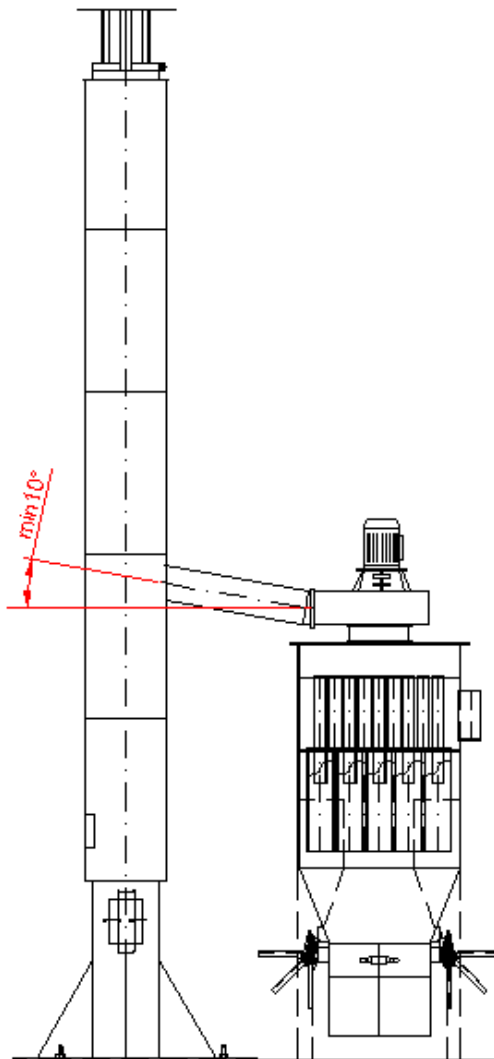


Figure 12 Multi cyclone – chimney connection

Before installation of the chimney, it is necessary to make the basis of the chimney with anchor bolt M36. Anchor bolts are delivered by the producer, as well as the sketch of the basis,

A buyer is obliged to perform all construction works regarding the boiler room, silo and the basis of the chimney, before the installation.

The Figure below shows the scheme of the basis of chimney. Concrete basis has dimensions P x P horizontally and with depth X.

Value P: 1200 mm for systems up to 450 kW including 450 kW
1500 mm for systems above 450 kW

Value P: 1200 mm for chimneys alongside the facility
1500 mm for chimneys not alongside the facility

During the concreting, anchor bolts are positioned at axial distance MxM as shown on the Figure, so that they are 75 mm above the concrete in order to tighten anchor plate and chimney with two nuts.

Value M: 800 mm for systems up to 450 kW including 450 kW
1000 mm for systems above 450 kW

On the prepared basis, anchor plates positioned together with chimney. Anchor plate has dimensions N x N with openings which are suitable to axial distance of anchor bolts.

Value N: 1000 mm for systems up to 450 kW including 450 kW
1200 mm for systems above 450 kW

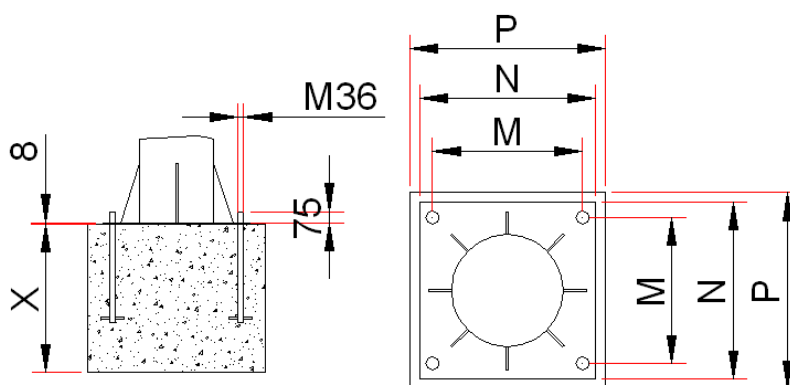


Figure 13. The basis of chimney

Ears are welded for the chimney by with the help of which with the crane a concrete basis is straightened and placed, and then additional bind to the facility if it is alongside it.

CAUTION: During the installation, the safety measures must be taken to ensure that no person is present during the chimney lifting. Be sure to make vertical to $90 \pm 1^\circ$ and a strong connection with foundations.

The chimney is installed via anchor plate and is tightened with nuts. Necessary Tightening torque is 236 kpm. The chimney is first covered with mineral wool, and then with sheet metal. This installation is done on the site.

4 BOILER ROOM AND FUEL STORAGE

It is mandatory that individuals who have mounted the boiler or other responsible persons related to the installation of the boiler are present during the initial commissioning. The company carrying out the installation of the boiler is required to inform the customer with all the rules of operation and the work of the whole system.

4. 1. Boiler room

The room in which the system is installed and where the operation is ongoing must meet the following conditions:

- Temperature in boiler room - +5 to + 40 ° C
- humidity in the room to 90% at 20 ° C,
- Light in the room not less than 500 lux.

The boiler unit with its associated fittings and supporting equipment (torch, extra tank, multi-cyclone, flue gases fan) is placed in boiler, and chimney and storage of fuel are outside the building. Izvan facility can accommodate And the multi-cyclone in the free version. There must have at least two safety exits in boiler room in case of fire. All approaches, such as stairs, platforms, etc. (if any) must be secured by a fence of min. 800 mm height. Boiler room must be so high that between the ceiling or the beams of the roof structure and the boiler is at least 1.80 m. The boiler room should be sufficiently ventilated and lighted, and the inspection of the boiler is enabled, as well as work regarding any potential repairs and cleaning.

Fresh air for combustion must be provided in the boiler room. The boiler room must be safe from frost, and well ventilated. If you do not follow these instructions, a guarantee for any damages arising from any of these reasons will be void.

Boilers over 290 kW must have two permanent and useful outputs, preferably placed opposite each other, one of which leads directly to the outside. As such, the output can be considered a window with metal stairs to the bottom. Boiler room door must be opened in the direction of the exit, and doors that do not lead directly to the outside must be inflammable. The boiler room must have at least one window looking out. Bright surface of windows should be at least one-twelfth of the main boiler. Apparatus for opening and closing the window must be within reach and easy to handle.

The walls, ceiling and floor of boiler room must be made of inflammable material.

Table 8. Dimensions of min. intake and outake holes of fresh air in the boiler room.

Q (kW)	350	450	550	750	1000	1200	1500	2000
A_0 (cm ²)	3741	4243	4690	5477	6325	6928	7746	8944
$a_0 \times b_0$ (cm)	61x61	65x65	69x69	74x74	80x80	84x84	88x88	95x95
A_1 (cm ²)	1247	1414	1563	1827	2108	2309	2582	2981
$a_1 \times b_1$ (cm)	35x35	38x38	40x40	43x43	46x46	48x48	51x51	55x55

A_0 (cm²) – surface of openings for air supply

$A_0 = 200\sqrt{Q}$, Q (kW) - power of boiler

A_1 (cm²) - surface of openings for air outlet

$A_1 = 1/3 \cdot A_0$

Boiler and burner must be distant and protected from parts of flammable building materials and built-in furniture so that temperatures of mentioned boiler heating capacity over 80 ° C cannot occur. Otherwise, you must maintain a distance of at least 80 cm.

Mouth for the air intake and outake must always be open, in its full cross section. Air intake must be directly from outside. Air intake must be located 50 cm the most above the bottom edge of the tank. The air intake mouth is preferably placed under the ceiling on the outer wall of the boiler. If the boiler does not have outer walls, the ventilation needs to be regulated by channel distribution. The air outake mouth must not have a grid.

Minimum recommended distance from the wall for the assembly and maintenance should be taken from the manufacturer's recommendations.

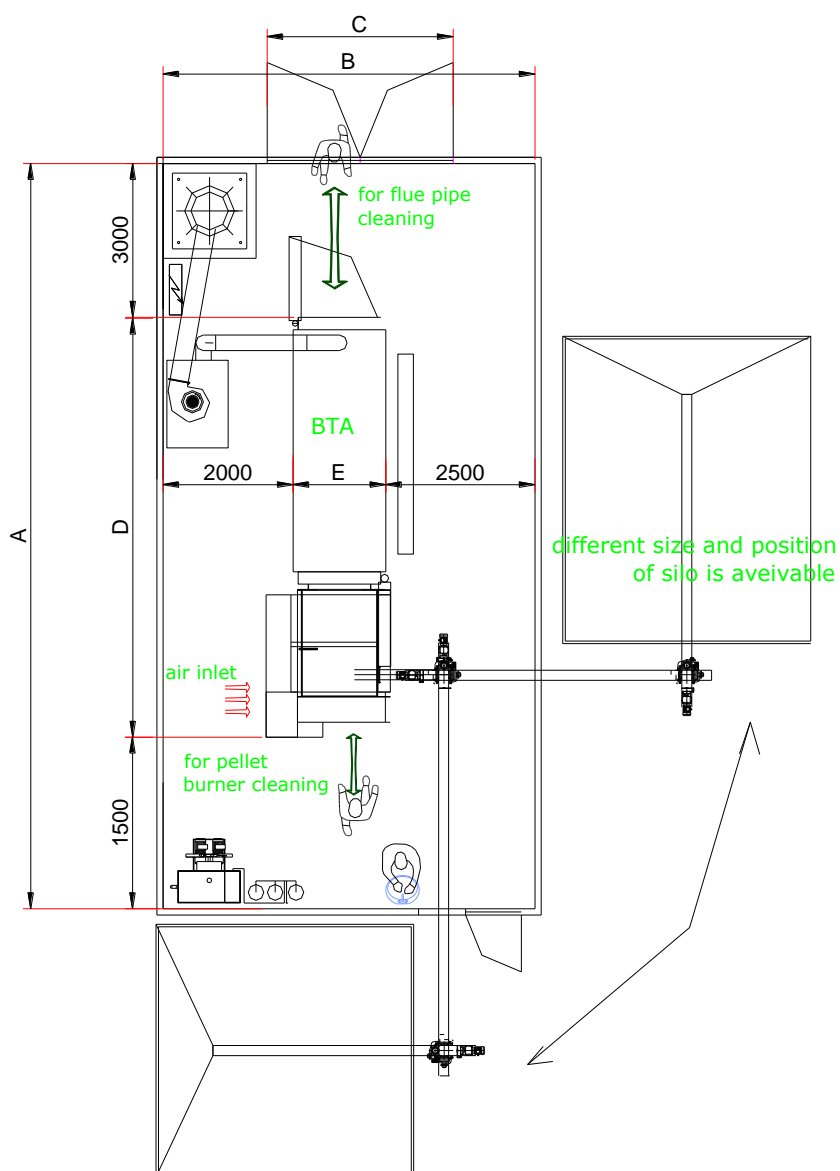


Figure 14. Recommended boiler room dimensions

Table 9. Recommended boiler room dimensions according to boiler power

BTA	350	450	550	750	1000	1200	1500	2000
A(mm)	9500	10000	11000	11000	11000	11500	11500	12000
B(mm)	6000	6000	6000	6000	6000	6000	6000	6000
C(mm)	2500-3000	2500-3000	2500-3000	2500-3000	2500-3000	2500-3000	2500-3000	2500-3000
Boiler room height(mm)	min. 3500	min. 3500	min. 3500	min. 3500	min. 3500	min. 3500	min. 3500	min. 3500
Door height(mm)	3000	3000	3000	3000	3000	3000	3000	3000

4. 2. The fuel storage

Fuel must be stored in such a way to prevent the risk of injury from fire, explosion and injury.

The fuel storage is not allowed inside the boiler plant, except for devices for mixing and dispensing, fuel supplying, dispenser and feeding device.

Pellets are stored inside the chambers and tanks. Chambers and tanks are reservoirs and facilities for storage of fuel in the form of shaft of circular or rectangular sections, which are usually filled from the top and released in the bottom.

If the fuels are stored in other areas, then the same protection measures against fire and explosion are applied as to the chambers and tank.

For pellets storage fire-resistant protection of the boiler area must be made. This practically means that the room where the boiler plant is located must have wall resistant to the fire on the side of fuel storage. Normally the fire resistance of such wall is 60 minutes provided that no openings such as windows exist. If the wall has a door, it should also be 60 minutes fire resistant.

Extruded or briquetted fuel is stored protected from the environmental influence.

Chambers and tank for the storage of fuel are to be built in the open air, in, within or above the furnace. In the lower area, they must be accessible and must be safely discharged. Chambers and walls for fuel storage must have a fireproof walls that meet the requirements for fire protection. In this event it means that chambers or tank are built of bricks, blocks, reinforced concrete and other inflammable materials. In the event of small warehouse with medium fire load (including the chambers and tank for this purpose) resistance of the walls should be 60 minutes. A brick wall of 12 cm thickness, hollow brick wall of 10 cm thickness, reinforced concrete wall of 7.5 cm thickness, non-reinforced concrete wall of 10 cm thickness etc. have such resistance.

Chambers and tank that do not meet these requirements must have fireproof walls where no unprotected openings can be found. Fire walls resistance should be as in the previous case. Should the walls need the entrance door, it must have the same fire resistance as the walls. Mouth covers for pressure relief shall be made of non-combustible materials.

Chambers and tank that are close to the building must be constructed of non-combustible material and separated by fireproof walls of neighboring buildings. Fireproof walls may be part of the chamber or tank or adjacent buildings. Walls resistance to fire should be as in the previous cases, but the wall that separates the chambers or tank of the building for other purposes may not have any openings.

Chambers and tank that are in free area and are built of non-combustible materials, for example of steel, must be at least 5 cm away from the building, which exterior walls do not meet the requirements for fire resistant walls or can be made of

combustible material if there is no risk of fire transfer (radiating or fire sparkling) from these objects to chambers or tank.

Only devices that are required for operation and maintenance of chambers and tank and do not obstruct the normal flue flow are placed in them.

All accesses and ports of chambers and tank must be secured from unauthorized access. All openings for pressure relief, discharge and input must be prevented from falling, for example by firmly embedded grid.

Chambers and tank must not be overcharged, and channel mouths and pressure relief vents must remain free. Permitted filling level must be controlled and be visible.

Chambers, tank and other equipment for the storage, filtration chambers and separators must be equipped with fire extinguishers resistant to frost, which provides fire suppression without opening the access door. Extinguisher is not installed if the fuel charging channel is equipped with extinguisher.

Tanks and chambers where fuel is stored must be tightly sealed on the top to prevent entry of precipitation and various waste therein. Increased moisture in the fuel reduces plant's power and causes significant contamination of the burner. Also, strange items mixed with fuel (nails, wire, various metal pieces, and large pieces of wood which due to the dimensions can not pass through the screw conveyor, can cause damage to the dosing system. In case of system failure caused by the above-mentioned cases, the manufacturer shall not be responsible.

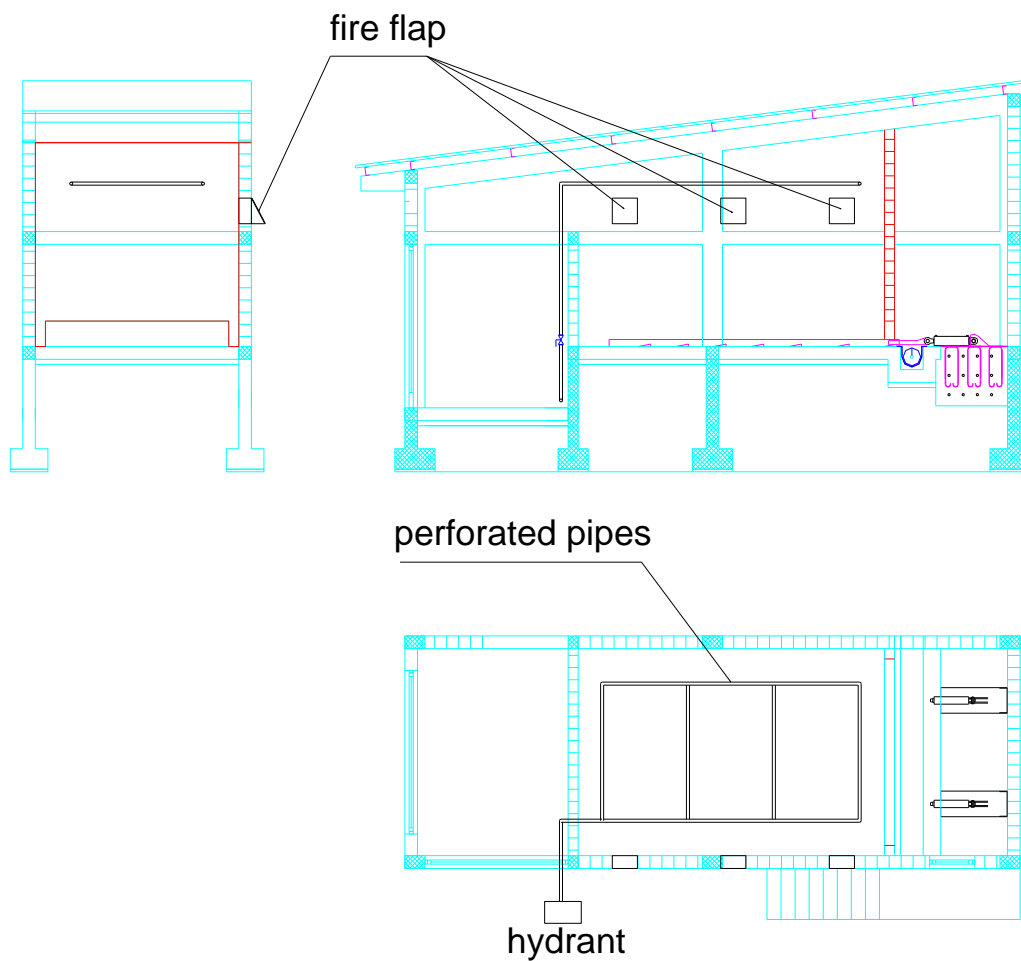


Figure 15 Example of tank with an integrated fire protection

4.3. Requirements for pellet quality

GERMAN STANDARD DIN 51731

Pellet in group of size HP5 is made of pressed wood chips of intact wood including bark, with no additional bonding materials. The energy that is contained in 2 kgs of pellet corresponds roughly to the energy contained in 1 liter of heating oil (10 kWh).

AUSTRIAN STANDARD ÖNORM M 7135

Austrian standard contains requirements regarding the quality of pellets, pellet testing procedures, the method of pellet production control and labeling of the same.

DIN PLUS STANDARD

Standard DINplus is a combination of the two previous standards.

Certification procedures is performed by the pellet manufacturer verified by a body that has a DIN Certco. Independent testing should be carried out at regular intervals in order to ensure the required quality of pellet.

PELLET CHARACTERISTICS

Table 10. Pellet characteristic

Standard	DIN 51731	ÖNORM M7135	DINplus	AS/NZS 4014.6
Length	max. 50 mm	max. 5 x Ø	max. 5 x Ø	max. 38 mm
Diameter Ø	4 – 10 mm	max. 10 mm	4 – 10 mm	max. 10 mm
Energy value	17.5 - 19.5 MJ/kg	min. 18.0 MJ/kg	min. 18.0 MJ/kg	18.0 - 21.0 MJ/kg
Pellet density	1.0 – 1.4 kg/dm ³	min. 1.12 kg/dm ³	min. 1.12 kg/dm ³	N/A
Bulk density	min. 650 kg/m ³	min. 650 kg/m ³	N/A	min. 640 kg/m ³
Water content	max. 12%	max. 10%	max. 10%	max. 8%
Ash content	max. 1.5%	max. 1.5%	max. 0.5%	max. 0.5%
Abrasion of pellet	N/A	max.2.3%	max.2.3%	N/A
Sulphur content	N/A	max. 0.04%	max. 0.04%	N/A
Nitrogen content	N/A	max. 0.3%	max. 0.3%	N/A
Chlorine content	N/A	max. 0.02%	max. 0.02%	N/A

5. INSTALLATION OF FURNACE

5.1. Connecting furnace to the central heating system



Furnace installation should be done by qualified and authorised personnel.

Before the furnace is connected to the existing heating system, the heating system must be thoroughly rinsed to remove dirt and sediment.

Dirt and sediment are normally collected in the furnace and can lead to localized overheating, noise and corrosion. For damages arising out of it, your warranty will be void. In the present case strainer should be mounted.

Furnace is connected to district heating installation through the initial and backflow route. When connecting the furnace, any stretching that might be caused by pipework should be avoided. The weight of the pipe lines must be handled by the supporters. All connections and fittings on the boiler should be mounted so that it is possible to clean boiler smoothly. If possible, air vent should be set just above the boiler at the initial route.

Connecting pipelines should be made by welding. Flanged connections are only allowed at the point where the fittings are connected with pipelining.

All heat consumers or heating circuits must be connected to the extensions of initial and backflow route. Do not attach to the safety cables or other accessories. It is recommended to install a shut-off parts so that water does not have to be discharged from the entire installation during the later works on the furnace and the heating circuit.

ATTENTION: When installing the pump, the direction of the pumps must be taken into account.

The boiler is connected to the water supply system by flanges. Boiler filling is not performed if the ambient temperature is below 5° C.

To verify the tightness of the boiler testing is performed at a pressure of 3 bars in the production process, and the same procedure is repeated before and after the assembly on the spot. What is done on-site is a visual inspection of the boiler, check of the manometer so that charging complete installation can be proceeded. Open the door to check the boiler operation.

If no pressure drop occurs during rehearsals, then you can proceed further installation.

ATTENTION: Safety distribution line and security backflow route must be without closing device.

Safety cables must not show any narrowings and must be laid to the expansion vessel with such a climb to be provided with water circulation and to be prevented from collecting the air.

When setting up a parallel group of multiple systems, one or both of the cables as a common (safety distribution or safety backflow route) may be extended. To prevent the lowering

of the water level in the exclusion of one of the systems, each can be separately linked to the expansion vessel. In the event that group of several systems need a possibility of closure in the distribution connection for each in the return line, then for each of those systems one own security distribution or return line (or both) must be set up so that a connection between distribution and return line of each of these systems and expansion vessel is provided.

Insurance for group system can be implemented as for a single system if the security cable is dimensioned according to the total boiler group performance.

In each open hot water heating system the expansion vessel must be at the highest point of the whole plant. The expansion vessel is usually placed vertically above the boiler. If this is not possible because of the construction, then the total extension of the safety lines shall not exceed ten times the value of vertically derived part of the boiler safety line.

In order to ensure the circulation of water in the expansion vessel for open facilities, one connection line of the given diameter of 20 mm (internal tubing diameter with built-in device for damping) shall be provided between the distribution line and the lower part of the expansion vessel or its connector for safe return line.

Diameter of mouth of vent and overflow pipe shall be at least equal to the diameter of the safety distribution line, but must not be less than 25 mm. Overflow line must end in the boiler room with the open end, and in such a place that it can be monitored. Vent and overflow pipe must not be taken out. Overflow pipe can also be used as a vent pipe, if a curved branch is expanded in the level of expansion vessel.

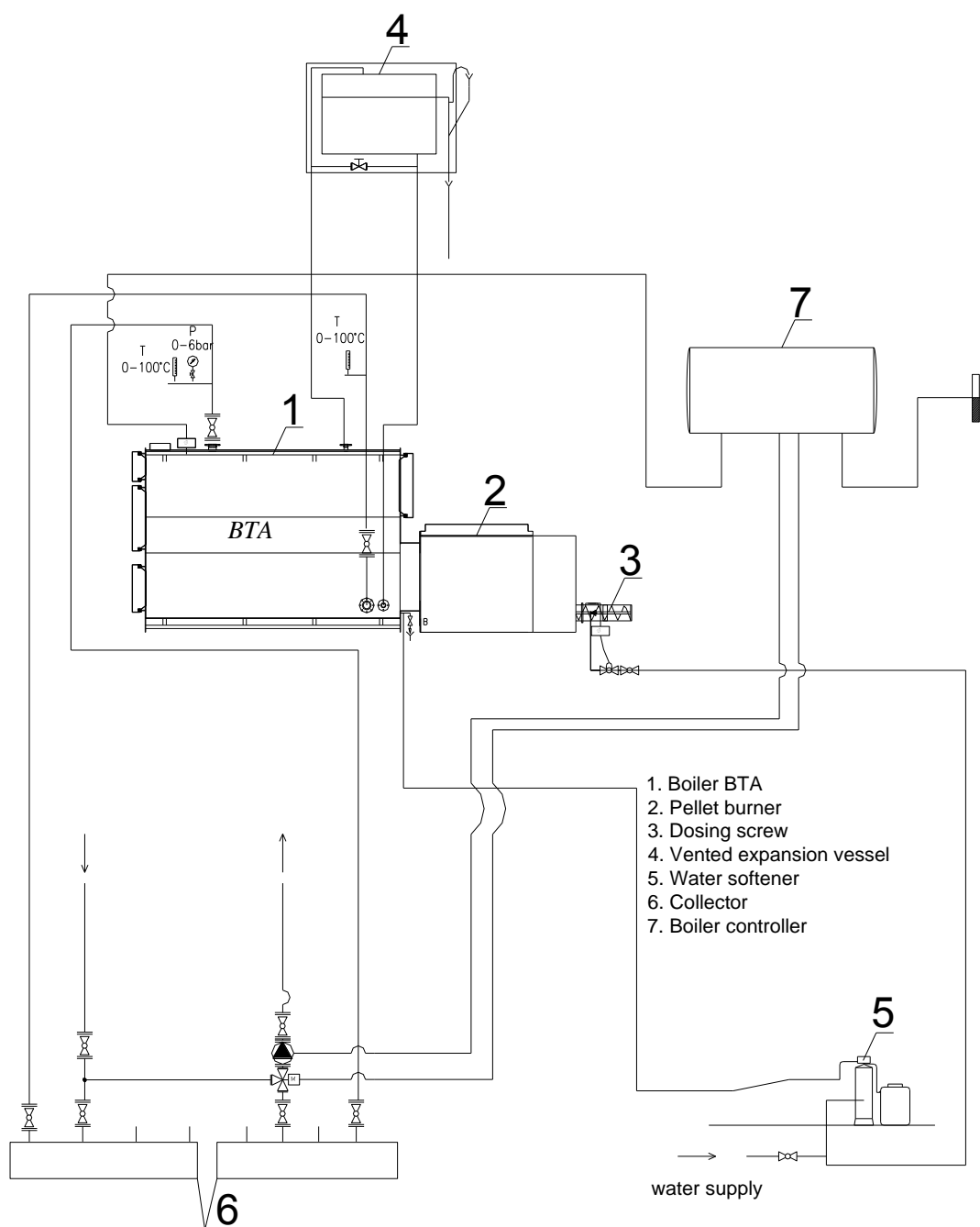


Figure 16. Connecting hot water boiler BTA to heating system with an open expansion vessel

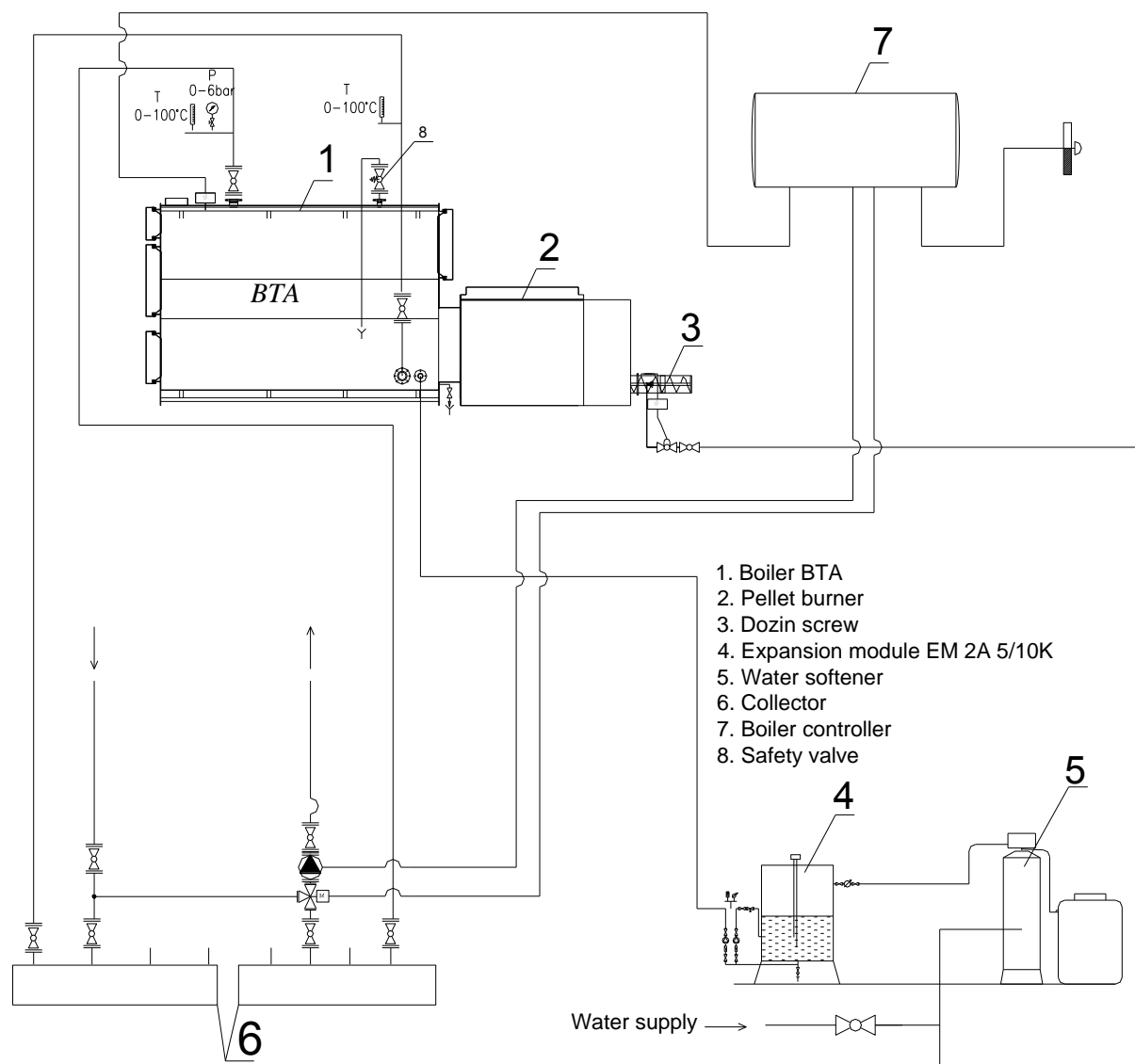


Figure 17. Connecting hot water boiler BTA to heating system with an expansion module

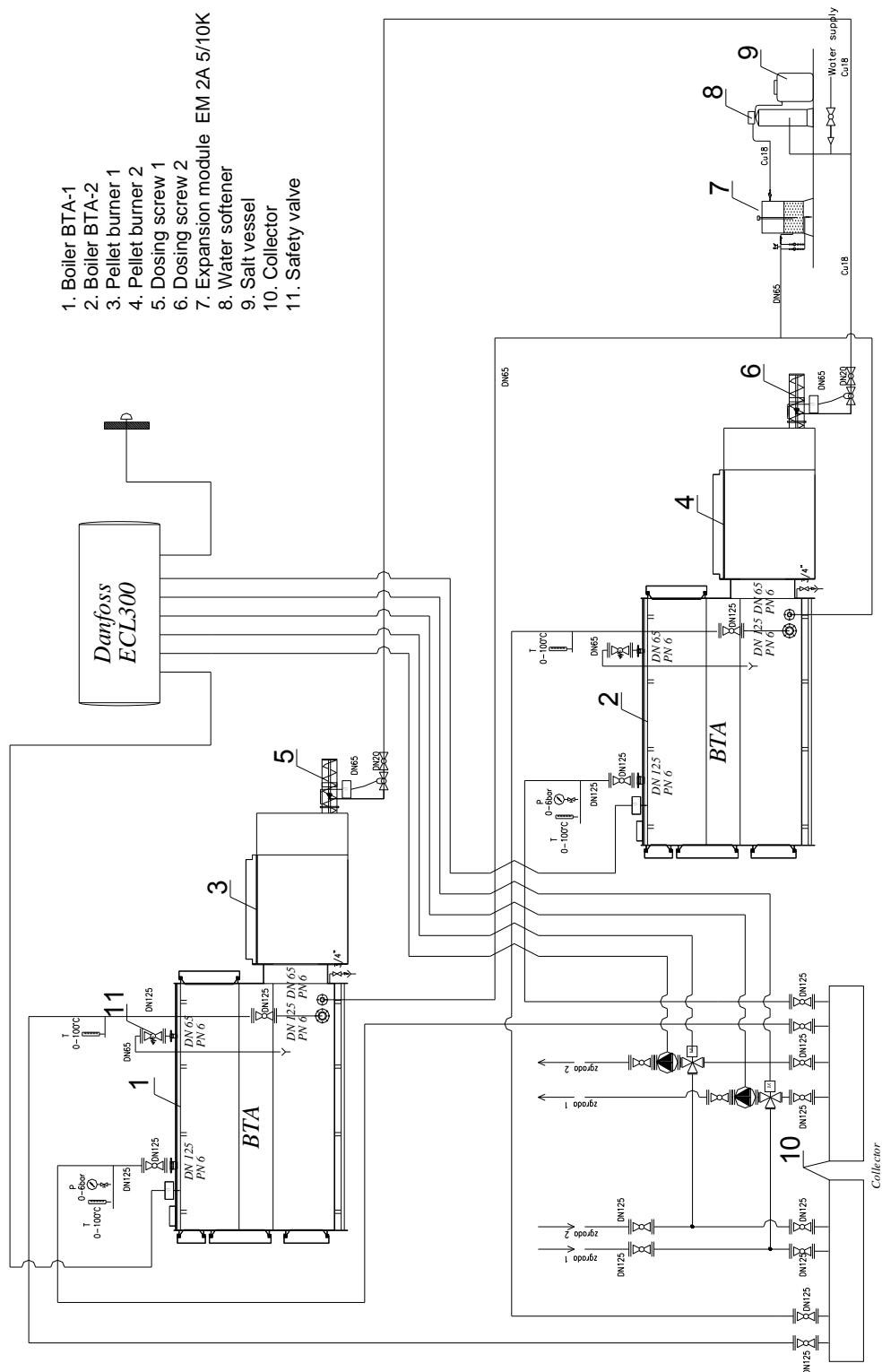


Figure 18. Connecting two hot water boilers BTA to heating system with an expansion module ad two heating circuits.

Furnace is preferably placed as close as possible to the chimney.

Do not close free air supply to the boiler.



WARNING

- The furnace must be placed on a stable, flat surface. Setup and installation of the furnace must be conducted by a **professional**.
- Water supply connections must be provided in the furnace room, plus a connection for possible drainage and electrical connection with **mandatory grounding**.
- The furnace room should have natural ventilation that provides fresh air.
- The floor and inside the boiler room must be made of fireproof materials.

It is desirable that the room is not damp, in order to avoid the corrosion of metal parts, with the goal of extending life.

Softened water is recommended for filling the boiler in the system.

Circulation pump is put into operation only when the heating system is filled with water. What must be taken into account is that the system is vented.

When connecting the furnace and chimney, the flue pipe should be placed horizontally or vertically. All connections must be well sealed.



The chimney must be sized according to the diagram in Figure No. 5.

Insufficient airflow, ie. when geometric features of chimney as indicated in Figure 5 herein have not been met, there is a real risk of transmission of the flame from the firebox into the pellet feeder tube, and then in the pellets reservoir which can cause a fire.

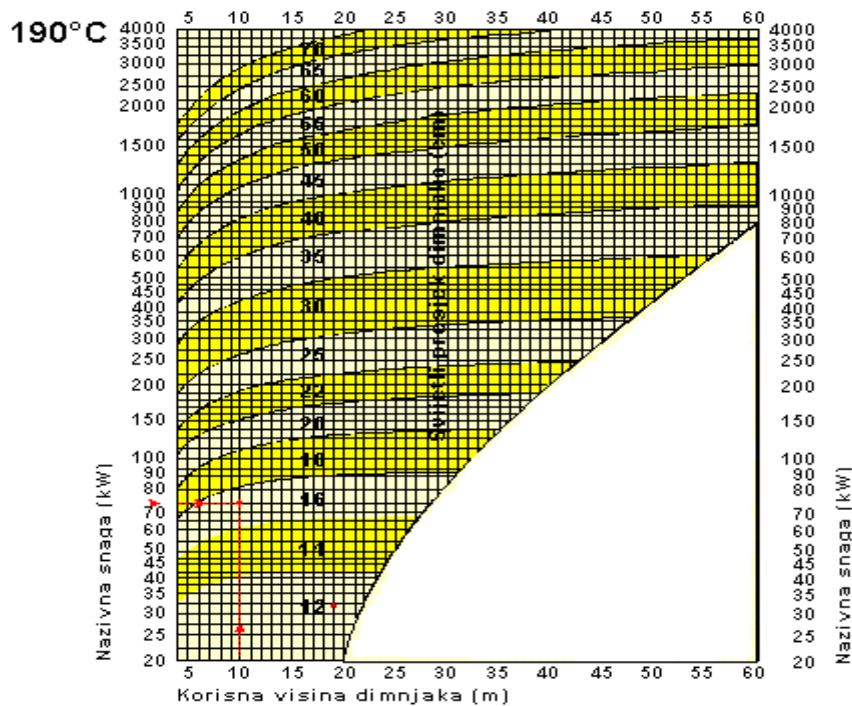


Figure 19. Selection of chimney section (Schiedel)

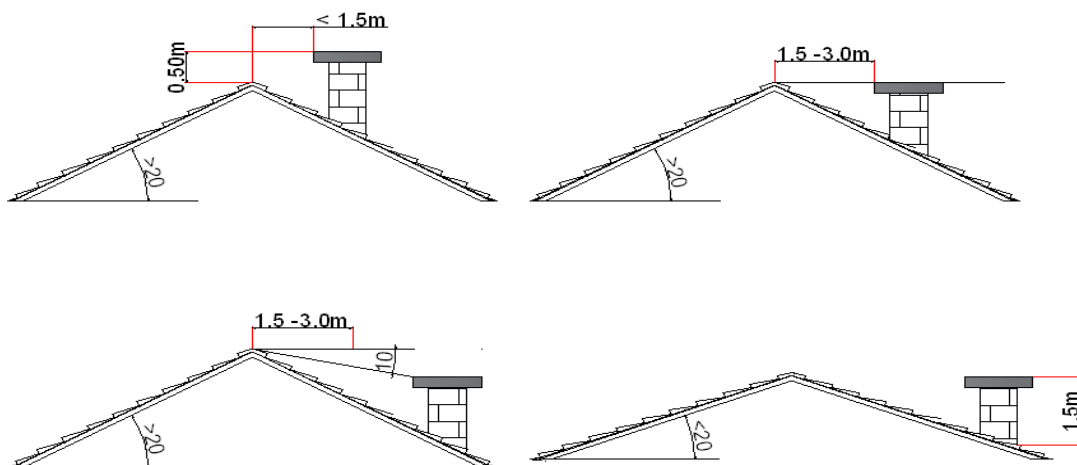


Figure 20. Samples of properly set and dimensioned chimneys

In a closed heating system the installation of a certified safety valve with opening pressure of 2.5 bars is required, and installation of expansion vessel. Locking element must not be installed between the safety valve and expansion vessel.

Water temperature in boiler may not fall below 55°C not to cause condensate.



In the event of severe winter weather and low temperature, and when the boiler is not used it is necessary to drain water from the system or fill it with antifreeze liquid.

5.2 Instruction for automated control of boiler

The front of the control cabinet that is accessible to the user looks like the following figure. All important settings for the boiler are made on the keyboard of control automation (PLC).

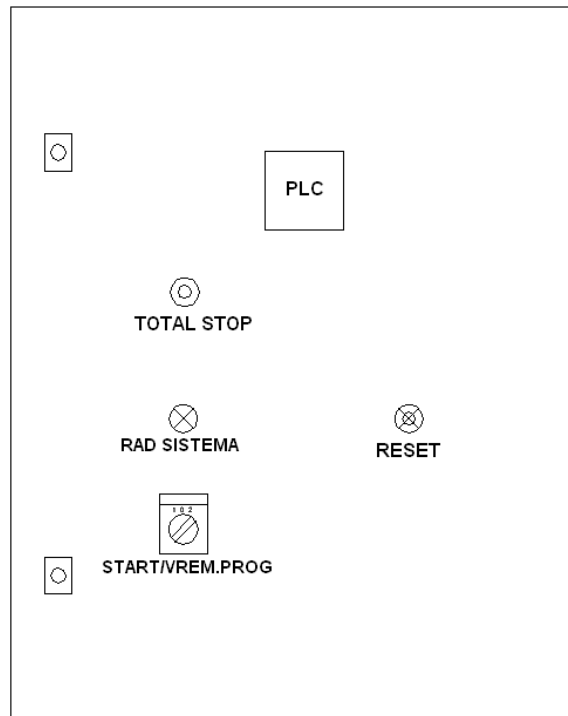




Figure 21. Front of the control cabinet

Red rounded button (**TOTAL STOP**) is used for switching off the boiler in the event of an emergency, in case of fire or other irregularities in the system when it comes to a quick stop operation of the boiler. A light, sheer pressure is needed to activate the switch. This switch is deactivated by turning the switch head in the direction of the clockwise. Red button switch (**RESET**) on the right side of the control cabinet is used for reset automated control. This button is also illuminated light that flashes when an alarm is activated. To reset the automated control it is necessary to press the **RESET** button for 5 seconds. Black button (**START / VREM.PROG.**) is used to start and stop operation of the boiler. By setting the switch (**START / VREM.PROG.**) in the left position the boiler will operate continuously. By setting the switch (**START / VREM.PROG.**) in the right position the boiler will be working by the set time, as set in the appropriate submenu. Green light (**RAD SISTEMA – SYSTEM OPERATION**) is used to indicate the condition of the boiler:



- light is off - the boiler is off,
- light is on - the boiler is on,
- light blinks – the boiler is in burner firing phase.

By supplying control cabinet by electricity, after a short time, on the PLC display appears display, which requires entering a password to access the controller. To enter a password press the button , enter the correct password and confirm the input by pressing the button . The password is a four-digit numeric string.



If an incorrect password is entered, the home screen remains on the display and if a correct password is entered, the display shows a basic menu. Along the right side of this screen display the information on the current boiler temperature is given.



The main menu has ten items, which are listed by keys  and . By pressing the appropriate number the one enter in the selected menu item. On the right side of the display the current temperature of the boiler is shown. The menu items are as follows:



1. TEMPERATURE
2. PELLET FEEDING
3. AIR SUPPLY
4. SUBPRESSURE
5. TIME
6. SCREW CONVEYOR
7. SOLAR CELL
8. MANUALLY
9. ALARMS
10. EXIT

TEMPERATURE

There are two options under item TEMPERATURE:

1. SET TEMPERATURE,
2. DISPLAY TEMPERATURES.

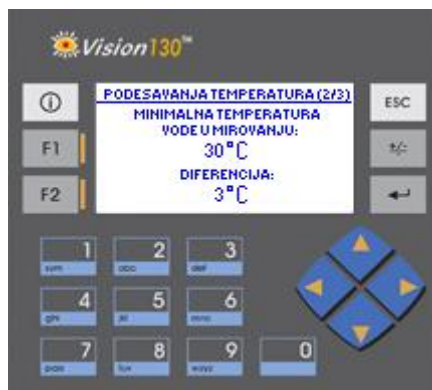


There is the current temperature of the boiler shown in the bottom left scale of the display, and the scale on the right shows the current temperature of the burner. pressing the button '1' you are taken to the submenu TEMPERATURE SETTINGS with three displays, and moving from one to other is done by buttons  and .

On the first display of the submenu TEMPERATURE SETTINGS the maximum temperature of the boiler during operation is set. When the boiler temperature reaches this value, fuel delivery stops and subpressure in the boiler is maintained at a lower value.



At the next display minimum temperature of the boiler when idle is adjusted. If the boiler is switched off, the temperature set here will continue to maintain in the boiler. The boiler is switched off when the switch **START / VREM.PROG.** is in neutral position or is set to work by the time program and the current time is not such that the boiler should work.



At the last display under the submenu TEMPERATURE SETTINGS the maximum and minimum temperature of the burner is set. If the burner temperature exceeds the defined maximum temperature of the burner or falls below the defined minimum temperature of the burner, the boiler stops working and goes into a state of alarm.



PELLETS DOSAGE

Fuel (pellets and air) feeding rate is linked to the current temperature of the burner. Temperature at the burner is measured with ceramic probe to the burner fireclay pinned in the middle, from its upper side. There are eight temperature intervals where dosing of pellets and air can be adjusted. Temperature limits are set on displays PELLETS DOSAGE (1/3) and PELLETS DOSAGE (2/3) and the same limitation is transferred to the air supply. Along the right side of the display the time of screw conveyor (puller) that delivers pellet power to the rotary encoder is adjusted. The values of these times are given in seconds and the first digit refers to the operating time, and the second digit refers to the break (work / pause). Number of rotations of this screw is adjusted at the frequency converter. Motor-reducer which drives the rotary encoder and screw conveyor runs continuously as long as the boiler is in operation phase.



When the boiler is idle, pellets supply is performed periodically to maintain a minimum amount of zeal in the burner. These times are set on the following display (PELLETS DOSAGE (3/3)). Operation time of the screw conveyor is ss.hh, while the pause is in mm:ss. Upon completion of puller, rotary encoder and screw conveyor are left to work for some time. This time is referred to as THE DELAY IN SWITCHING OFF SCREW CONVEYOR and it is in mm:ss.



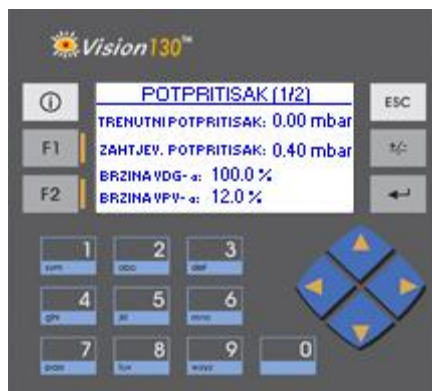
AIR SUPPLY

On the displays AIR SUPPLY (1/2) and AIR SUPPLY (2/2) the speed of the fan, which injects air into the burner at various temperature intervals of the burner is adjusted. Values are given in percentages, and the fan speed is automatically regulated with frequency converter.



SUBPRESSURE

The pressure in the boiler is constantly maintained at a lower pressure than atmospheric pressure in the vicinity of the boiler. Differential pressure transducer measures the difference of pressure in the boiler and boiler environment and based on that information adjusts the fan speed of flue gases through the frequency converter. At various stages of the work the different subpressures in the boiler are required. At the first of two displays under VACCUM there are information about the current subpressure in the boiler, the required subpressure, current fan speed of flue gases (in percent) and the current rate of primary air fan (in percent).



At the next display the values of the subpressures in phase of the boiler operation and its rest are set. Here you can define the minimum and maximum fan speed of flue gases (in percent).



TIME

There are four options in the menu TIME:

1. TIME SETTINGS
2. TIME OF THE OPERATION
3. HOURS OF SYSTEM OPERATION
4. DISPLAY LIGHTNING
- 5.






By pressing the suitable number, you enter into the desired menu. Real time and date are set on the following display:



In submenu OPERATION TIME (VRIJEME RADA), time intervals of boiler operation and rest are set. It is possible to set time interval program separately for every day, four intervals for operation and four intervals for rest.



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By pressing the number in front of the name of the day in a week, time settings for the day are enabled. After entering desired values and by pressing the button  the controller ask if you want to copy the same scheme for the following day. If you want, by pressing the button  the same time scheme will be copied for the following day in a week. By pressing the button  the time scheme will not be copied, and the time scheme for the following day will appear with previously entered values.



HOURS OF SYSTEM OPERATION (BROJ SATI RADA SISTEMA) is the information about total number of boiler operation hours.



On DISPLY LIGHTING (OSVJETLJENJE DISPLEJA) the time after which the background lights turn off.



SCREW FEEDER

There are to safety measures if the fire occurs because of the possible fire return through the screw feeder. There is a probe on the screw feeder pipe which measures the temperature of feeder pipe, and the information is forwarded to the controller. Current temperature of screw feeder is shown in the first line of the text on the following display. If the temperature of screw

feeder is higher than the set TEMP. AT WHICH SCREW FEEDER SHUTS DOWN, solenoid valve, which releases water into the screw feeder, starts to open and close periodically. In this situation, the boiler stops with the operation and alarm turn on. Engine of the puller and primary air fan stop to operate, while motor of the rotor sensor and screw feeder operates constantly and turns back the fire in the burner. Negative pressure is kept at set value. The notification about the alarm is shown on the display. The time during which solenoid valve is closed or open are set below the words OPERATION (RAD) and PAUSE (PAUZA) (ss.hh. format). If released water manages to extinguish the fire in the screw feeder and the temperature of the screw feeder drops, solenoid valve closes. However, if this is not enough and the temperature of the screw feeder continues to be higher, solenoid valve opens and continually releases the water in the screw feeder until the fire is extinguished.

There is thermo valve which opens and releases water not screw feeder at the temperature of 80 °C. In the lower left corner, the information about the solenoid valve (open/closed) is shown.



PHOTOCELLS

The photocell is located in a hole in the back of the burner. Photocell serves as a flame detector in the burner and sends the information to the controller if there is a flame in the burner. On the side of the photocells there is a fan for cooling in order to prevent burning of the photocell. There are three displays under the option (PHOTOCELL) FOTOČELIJA in main menu.

On the first display in the right top corner, there is an indication of the state of photocell. If the flame is currently registered in the burner, light bulb is shown, and if the flame is not registered the symbol of the moon is shown.

Variable LIGHT (SVJETLO) and DARK (TAMA) are used to eliminate the rapid changes of the photocells. ALLOWED TIME of THE DARK (DOZVOLJENO VRIJEME MRAKA) is the maximum time that can pass that photocell does not register the flame in the burner, during boiler operation. This value is specified in mm.ss format if the photocell is in dark during this time, the boiler stops normal operation and begins the process of "firing"



Parameters important for the process of firing are set on display PHOTOCELL (FOTOČELIJA)(2/3). One attempt of firing: wait that certain amount of pellet defined with

(DOS. PELLET) DOZ. PELETA (in seconds) is dosed and wait for the time defined with FIRING CYCLE (CIKLUS POTPALJIVANJA) (in mm.ss)

Primary air fan speed in the firing stage is set in DOS.AIR (DOZ.VAZDUHA) and negative pressure boiler is set below. If the firing process repeats as many times as it is defined in a number of firing attempts and photocells does not register the flame, in that time the boiler is in a state of alarm FIRING FAILURE. On the other hand, as soon as the photocell registers the flame at the burner in the process of firing, the boiler starts regular operation and doses pellets and air as it is set for current temperature of the burner.



On the last display of this series of PHOTOCELLS (3/3) the temperature at which the fan of the photocell is turned on is set.



MANUALLY

By pressing the button 8 in the main menu, the boiler stops operating, it switches to the display MANUALLY (RUČNO) and then is possible to turn on individual elements of the system. Certain elements of the system are turned on by setting "1" in front of their name, and are turned off by setting "0". Pressing button **ESC** you exit manual mode of the boiler and the boiler returns in the state it was before switching to manual mode.



ALARMS

In the case of any alarm, the boiler stops the regular operation and goes into operation depending on the present alarm. At the time of the alarm, information about the alarm is immediately shown on the display. In the case of concurrent multiple alarms, information with the names of the alarms shows on the display alternately; and number of the present alarms are continually display on the bottom line. Pressing the button **ESC** you enter the main menu, but after a while, the controller returns to display ALARMS. If you want to enter display ALARMS from the main menu, press the button 9. From the main menu changes to the display by pressing the button ALARMS nine. During the alarm, control box continuously flashes red light RESET. This light is also the button, and pressing it for five seconds the controller resets.



The list of possible alarms and the explanations:

1. Fire in feeder pipe – it is shown in the case if the fire return into the feeder pipe
2. Cover of the puller – it is shown if there is overfilling of the space above roto sensor and the cover of the puller is lifted.
3. Screw feeder motor – it is shown when the motor of screw feeder is overloaded, when bimetallic protection reacts.
4. Flue gas fan – it is shown when flue gas fan is overloaded or in the case if some other fault on frequency regulator.
5. Fan of the burner – it is shown when fan of the burner is overloaded or in the case of some other fault on frequency regulator.
6. Engine puller – it is shown when motor of the puller is overload or in the case of some other fault on frequency regulator.
7. Anti-condensation pump – it is shown when the pump motor is overloaded, and when bimetallic protection reacts.
8. Firing failure – if the photocell does not register the flame in the burner for predicted number of attempts.
9. Safety thermostat – if the boiler overheats. Thermostat is on the upper side whose temperature limit is 115 °C.
10. Too high temperature of the burner – it shows when the temperature of the burner exceeds the maximally allowed temperature of the burner
11. Decrease in temperature of the burner – it shows when the temperature of the burner falls below minimally allowed temperature of the burner.
12. Overpressure – if the flue gas fan cannot keep the requested overpressure, i.e. if the current pressure in the boiler is lower than the requested for defined time interval.

EXIT

Here is possible to pass on stand by and lock the controller. It is possible to enter stand by display by pressing the button **①** for two seconds.

6. MAINTENANCE OF BOILER

6.1. Periodical cleaning and maintenance

To enable long and useful lifetime of your furnace, it is necessary to take certain actions of regular cleaning and maintenance. In this way you avoid costly repairs.



Periods of maintenance depend on the quality of pellets as well as the emissioned furnace capacity. In principle, it is necessary to comply with the maintenance periodicals listed in the table below.



Turn off the automated control of boiler and boiler main switch before proceeding the operations described in the table below

Table 11 *Periods of maintenance*

interval	component	How to do it
Every three days	Clean the opening for solar cell	Use the four screws to remove the cover where solar cells are placed, and clean the same. During this operation, remove solar cell not to damage it.
	Clean convective beam	Open the top door of the boiler and a brush for cleaning of tubes pass through the tube several times. Soot, which fell into the multi-cyclone when cleaning of tubes, should be removed through the inspection opening on multicyclone.
A week	Clean the multi-cyclone	Multicyclone a revision holes arranged in three zones. All three holes open izgrabiti deposited soot and ash.
	Clean burner and inspect firebox	Open the burner from from side and push the ashe into the boiler. Check the degree of firebox soiling and move ash on drainage spirals.
Every six months	Check cleanliness of chimney, flue gas pipe, flue gas channels and clean them if necessary.	Wait the boiler to cool down, inspect chimney and flue gas pipe through the inspection opening, and clean them with the same cleaning kit that comes with the boiler.
	Check the water probe and flue gas probe and clean them if necessary.	Probes to be carefully drawn out of their beds and clean soot deposits on them (for flue gas probe) and possibly scaling (for water probe), if necessary
Annually	Detailed annual cleaning at the end of the heating season	Clean all the components that are listed in the upper part of this table

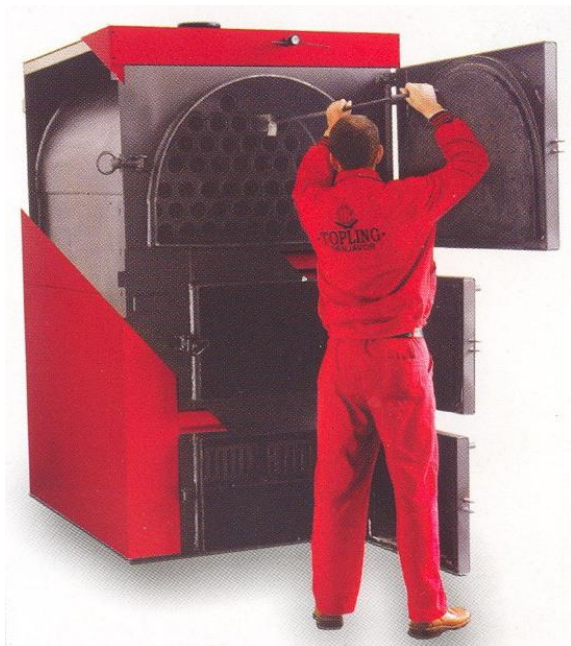


Figure 22. *Cleaning of tubes*

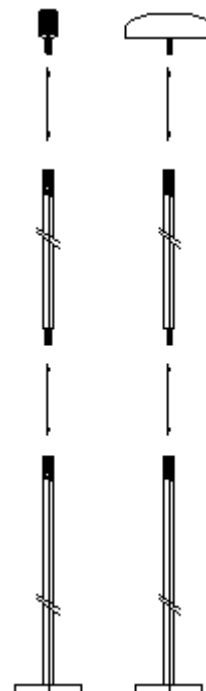


Figure 23. *Cleaning kit*

If in the course of exploitation you hear noisy operation of flue gas ventilation, the highest probability is that the impeller is dirty. Then at the first stop of the system, the bolts on the flange of the flue gases fan should be unfastened on the top of multicyclone, and then the cleaning of fan circuit and the fan body is carried out.

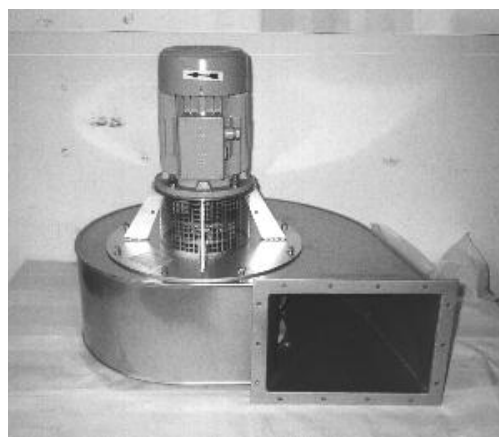
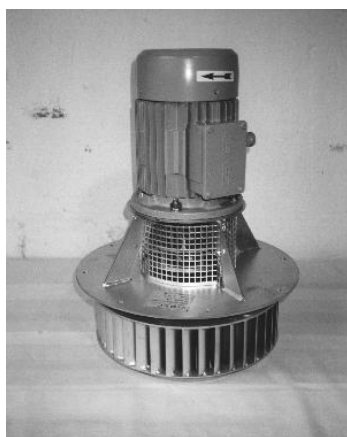


Figure 24. *Cleaning of tubes*

Important: Cleaning shall be performed only when the system is not in operation. After termination of the operation, wait for 15 minutes and then start cleaning.



The amount of ash in the firebox is highly dependent on the quality of pellet. If the pellet is good, there will be little ash content and need to be cleaned will be less often. Higher quality of pellet in its tank leaves a small amount of dust.



When cleaning chimney, flue gas channel and the curve there is a risk of burns because the formation of this surface may have a temperature up to 200°C in the operating mode. It is necessary to cool them down.



In all of the cleaning works there is the danger of suffocation with carbon monoxide if the burning process is not yet complete, and cleaning procedures are carried out carelessly. In this case, carbon monoxide is emitted through openings in the boiler (i.e. open doors, removed flue pipe or curve). Never leave the boiler door open except when necessary.

NOTE

At the end of the heating season, the boiler must be cleaned thoroughly as it increases the life of the boiler exploitation.

Maintenance of motor carriers

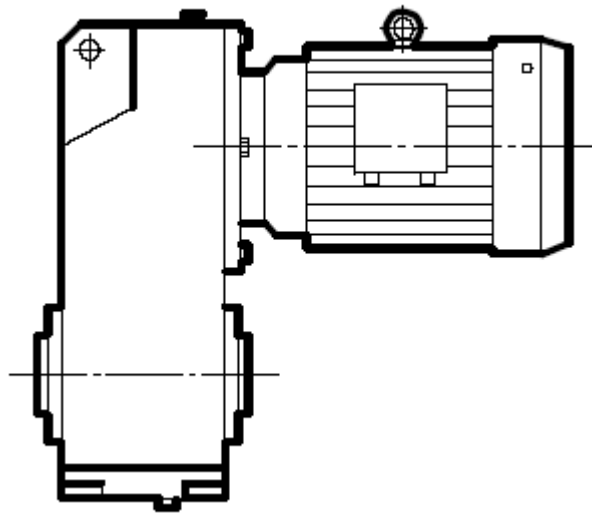


Figure 25 Motoreductor

Maintenance of carriers and motor carrier includes inspection of:

- carrier and engine temperature,
- motor power, voltage,
- noise and vibration,
- oil (level, fizz, the presence of water, viscosity, replacing worn-out),

Bearings, which are lubricated with grease may not be fully charged to avoid overheating.

Following approx. 3000 operating hours, at least semiannually, control oil and change it if necessary.

Regardless of the number of hours of the gear, mineral oil is advisable to change at least after 2 years, and synthetic one after 4 years but not more than 10,000 hours of work for a mineral oil or, 20000 h of the synthetic oil. Oils of different manufacturers should not be mixed. Oil change is done when the gear is idle gear in warm operating condition. After the release of old oil and flushing the body, the new oil is poured through the vent opening up to the level opening. When needed, refilling should also be done up to that level.

If during the carrier operation it is necessary to remove the engine, care must be taken not to damage the cogs on the first and second gear carrier. The first gear mounted on the motor shaft, can be removed by using the appropriate tools. When disassembling and assembling complete gear, among other things, particular attention should be paid to the correctness of shaft seals, gaskets and klingerits.

Lubrication of carrier

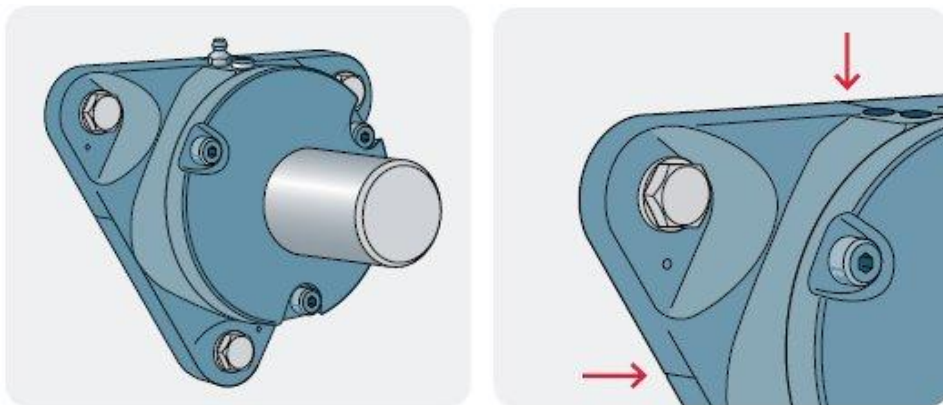
All carriers come from the factory ready to drive, filled with standard lubricant for the desired mounting position, where the sound power level LWA and effective vibration velocity is in accordance with applicable standards.

Installation and repair of FNL housings with double seal

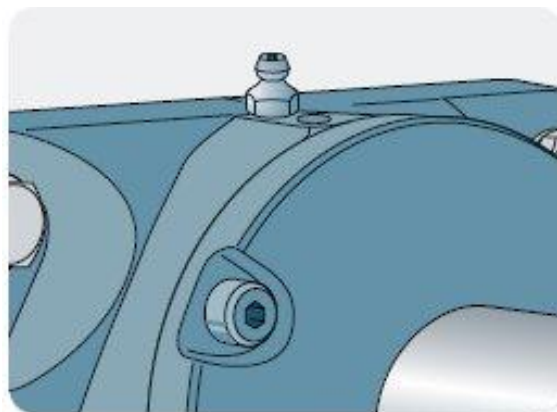
Remove the cover from housing by unscrewing the three screws that hold it merged with the body of the case. After removing the cover the protective cap should be taken out in the central opening of the case. There are two sealing caps (seals), lubricators and safety cap packed in plastic bags in case. On the outer side of the case, there are two holes next to each other. Protective rubber should be removed and proceed with setting lubricator. Lubricator is placed in the hole that is farther from the body cover, and the other opening is sealed with safety cap. The gaskets (one on the front and one to the back of the case in envisaged grooves) are installed in the case. Such case with no cover is to be pulled to the shaft and fixed to the flange with three bolts. Shaft diameter is in the field of tolerance of h9, quality of tolerance is IT5. If the roughness of overlapping surface of the flange overlapped by the case is $R_a < 12.5\mu\text{m}$, overlapping can be achieved without fitting.

Now take the appropriate bed through which the sleeve is put (sleeve, paper tube). It is necessary to check from which side the entire sleeve passes the bed by its whole length and pull the same throught the same. If the pass goes hard, turn the bed and pull the sleeve from other side.

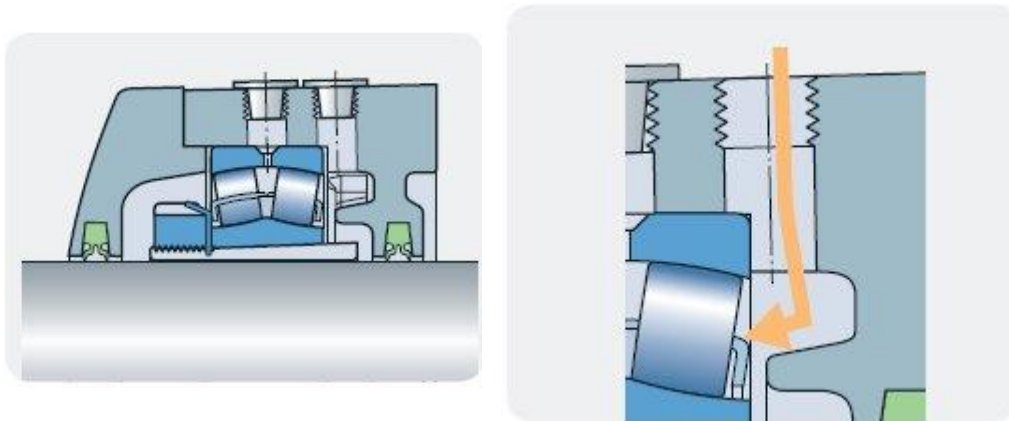
Do not pull a sleeve through by force since this case will not work.



Housing Assembly



Lubricator



Channels for lubrication

Figure 26. Installation and repair of FNL housings

Sleeve and bed are to be mounted on the shaft to the bottom of the housing. Butterfly fuse is placed in the gutter with the wings facing us. Then clamping nut having four slots is put on the fuse, and is tighten up as much as possible. After tightening, one of the fuse wings is to be turned over one of the clamping nut slots.

Accordingly, the shaft is mounted in the housing. It is necessary to check if the shaft rotates slowly in the housing. The verification is performed by rotating the shaft by hand. The the screw base should be empty to reduce resistance to rotation. If the rotation is done easily without resistance, installation is successful. Otherwise, find the cause of failure. (sleeve is not correctly placed in the shaft, the housing bearing flange is not at the right angle, etc.). At the end the housing cover is set and tighten to the body by three screws.

After assembling the shaft is lubricated with the amount of lubricant according to table 25. Check the status of system tightness after 24 hours. If free shaft motion in the axial direction is greater than 10 mm, it is necessary to tighten the clamping nut on the sleeve.

Shafts are to be lubricated once a week.

During the repair (replacement of beds), the cover from housing is removed, the butterfly fuse wing is unscrewed, clamping nut is released a few laps (not fully released) and clamping nut is slightly hit with bakelite hammer or some other less hard tool so the same flattens from the axis, afterward the housing is then stripped from the symmetrical axis. Should there is not enough space to maveuver to remove thereof, the same procedure should be applied to the other end and pull out the shaft on the opposite side.

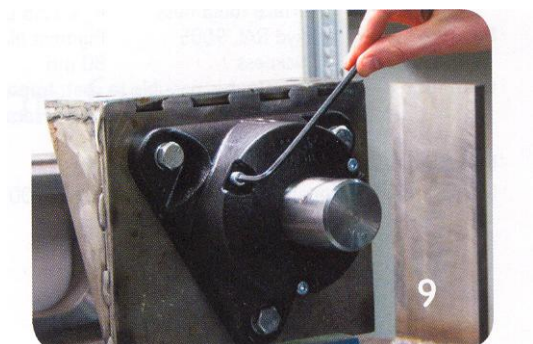
In case of damage to certain parts of bearing assembly during overhaul or exploitation, do not install damaged parts but install new ones.



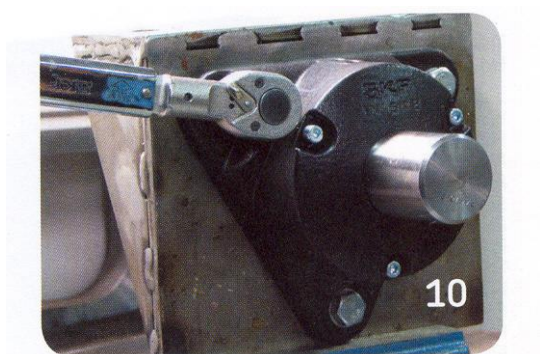
Seal on the bottom of the shaft housing



Inspection of mouth position
on overlapping surfaces



Tightening the housing cover



Tightening housing to the flange



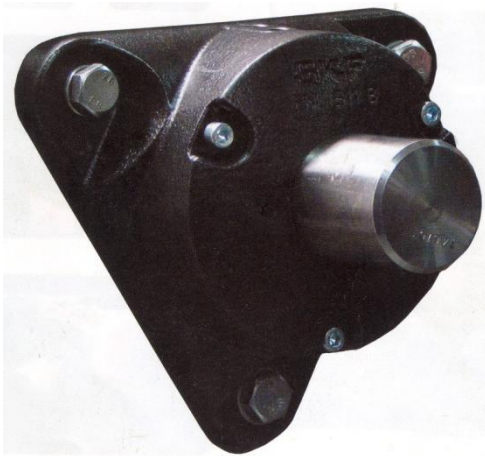
Setting lubricator

Figure 27. Instalation of housing

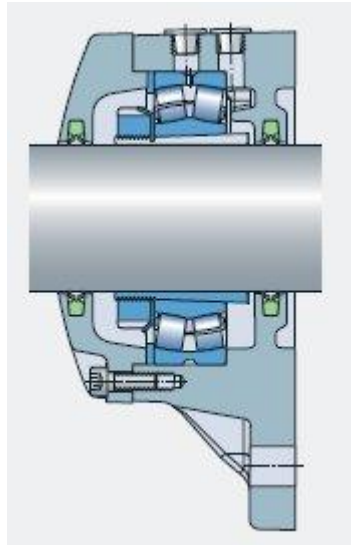
Table 99 shows the screws and lubricant amount for certain housings. On screw conveyors and rotating dispensers the housings of type FNL 509 DB are used, where D denotes the triangular base housing, and B a housing through which the shaft entirely passes through. If there is a label A instead of B, it would apply to the case in which the shaft ends.

Table 12 Housing-technical data

Table 1 Housing	Cover bolts 8.8 Tightening torque Nm		Attachment bolts 8.8 Tightening torque Nm		Grease quantity Initial fill kg
FNL 505	M 5	6	M 10	47	0,015
FNL 506	M 5	6	M 10	47	0,025
FNL 507	M 5	6	M 12	81	0,035
FNL 508	M 5	6	M 12	81	0,045
FNL 509	M 6	10	M 12	81	0,050
FNL 510	M 6	10	M 12	81	0,050
FNL 511	M 6	10	M 12	81	0,060
FNL 512	M 6	10	M 12	81	0,090
FNL 513	M 6	10	M 12	81	0,12
FNL 515	M 8	24	M 16	197	0,25
FNL 516	M 8	24	M 16	197	0,30
FNL 517	M 8	24	M 16	197	0,35
FNL 518	M 8	24	M 16	197	0,40
FNL 520	M 10	47	M 20	385	0,50
FNL 522	M 10	47	M 20	385	0,65



Housing type DB



Housing type DA

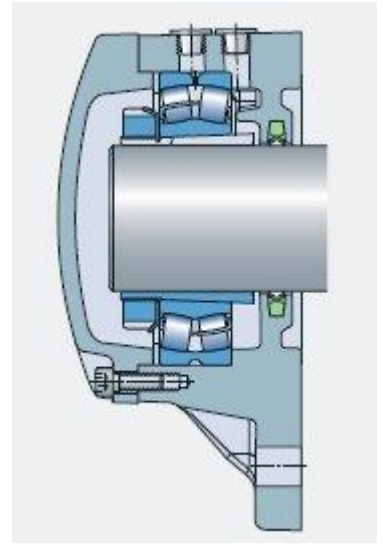


Figure 28. Type of housing

7. WARRANTY

7.1. The warranty period

You have a one-year warranty on the boiler.

7.2. Conditions of the warranty

- The boiler must be put into operation by the Topling company or our authorized service provider
- The boiler must be used in accordance with the recommendations stated in this user guide
- The quality of pellet must comply with recommendations stated in this user guide

7.3. The warranty does not apply to cases

- The guarantee does not apply if the damage resulted from improper use or improper installation of the boiler to the central heating system
- If the boiler is not maintained in accordance with the recommendations stated in this user guide
- If the damage was caused by natural disasters (earthquakes, floods, fires, lightning, etc.).
- If the damage was due to inadequate power supply (too high or too low voltage)

8. Addendum 1

8.1. Boiler feed water

The water quality has an effect on the life expectancy of the system as well as of the whole installation.

The costs of water preparation are lower than the costs of the repair of heating installation.

Damages occurred due to corrosion and scale are not included into the warranty.

The water quality has an effect on work safety, life expectancy and boiler efficiency. Boiler feed water can be: raw, softened, condensed and distilled. Raw water is atmospheric water, surface and ground water.

Atmospheric water is the water from snow and rain. Approaching the ground, it mixes with dust and various gases: oxygen, carbon dioxide and nitrogen. Atmospheric water is the softest one of all raw waters.

Surface water includes water from rivers, lakes and seas. It contains dissolved minerals and gases. It contains mechanical admixtures of mineral and organic origin.

Groundwater is located in wells or appears on the surface as a spring. It contains higher content of dissolved salts and gases and are among the hardest waters.

Softened water is produced after the purification of raw water during certain chemical processes (addition).

Condensates are formed by the condensation of water vapour. They do not contain dissolved salts, but may have particles of oil and certain mechanical impurities.

Distilled water is formed by evaporation of water in certain containers and the re-condensation of water vapour in coolers.

Impurities in the water may include mechanical, colloidal and dissolved. Mechanical admixtures can float and deposit depending on their specific weight. They are soil, sand, etc. Colloidal particles are organic and mineral; these particles are very small. They include oil, grease, fine dust, and clay particles. Dissolved impurities in water are salts and gases. Significant salts in water are: bicarbonates and sulphates of calcium and magnesium. Gases dissolved in water are: carbon monoxide, oxygen and nitrogen.

Effects of feed water admixtures on boiler operation. All admixtures are harmful for the safe operation and boiler efficiency. Admixtures of the boiler feed water cause the following: the deposition of mud, boiler scale, foaming water and boiler metal parts corrosion.

Scale appears on all boiler surfaces that are covered by water. Scale prevents the normal cooling of boiler plates and pipes which are in contact with the hot flue gases, or prevents the transfer of heat from the boiler heating surface on the boiler water. The mentioned causes overheating of boiler plates and pipes, the material structure changes, boiler components deform, and in severe cases up to the explosion. The strength of metal decreases when it is heated. At a temperature of 500 ° C the strength decreases by 75%. It is clear that such metal can not bear the working pressure of the boiler.

Deposition of scale in the boiler affects the reduction of the efficiency. Table shows that the fuel consumption increases if the scale thickness increases.

Table 13. Increase of fuel consumption acc to scale thickness

Scale thickness mm	1	2	3	4	5
Increase of fuel consumption %	2	3.5	5	6.5	7.5

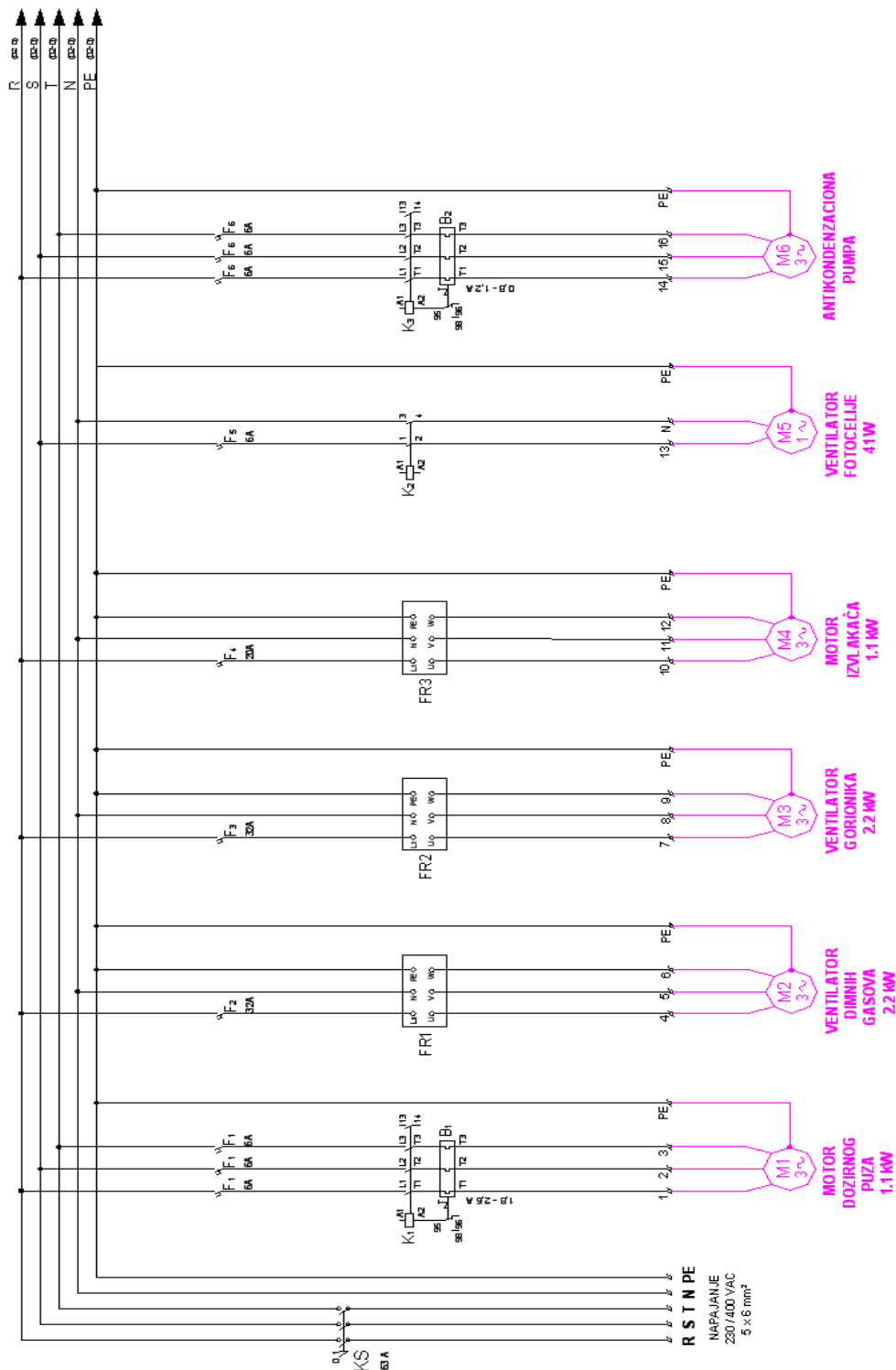
Corrosion of boiler metal surfaces in contact with the boiler water occurs because of the effect of gases contained in boiler water (especially the dangerous effects of oxygen when in contact with iron oxide produces) and the effects of salt contained in the water. Boiler scale at a temperature of 600 ° C decomposes and causes damaging of boiler sheet metals. The process of corrosion is helped by high temperature. The consequences of corrosion are the damaged boiler tubes and sheets; it reduces the thickness of materials and the impossibility of bearing the working pressure of the boiler. Above-mentioned also shortens the life of the boiler.

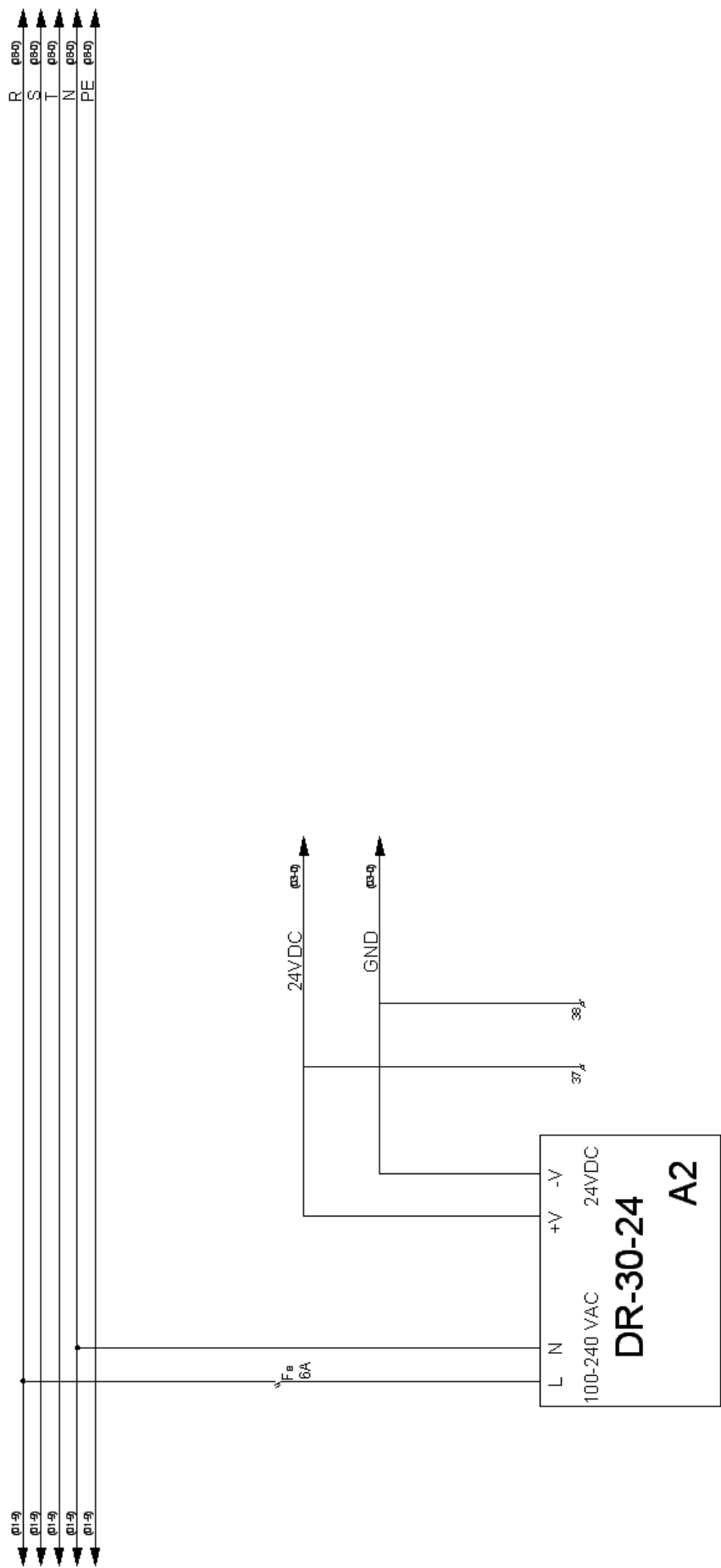
In Addendum, complete instructions for water **softener** JOP 1 manufacture red by Klenik - Gradiska.

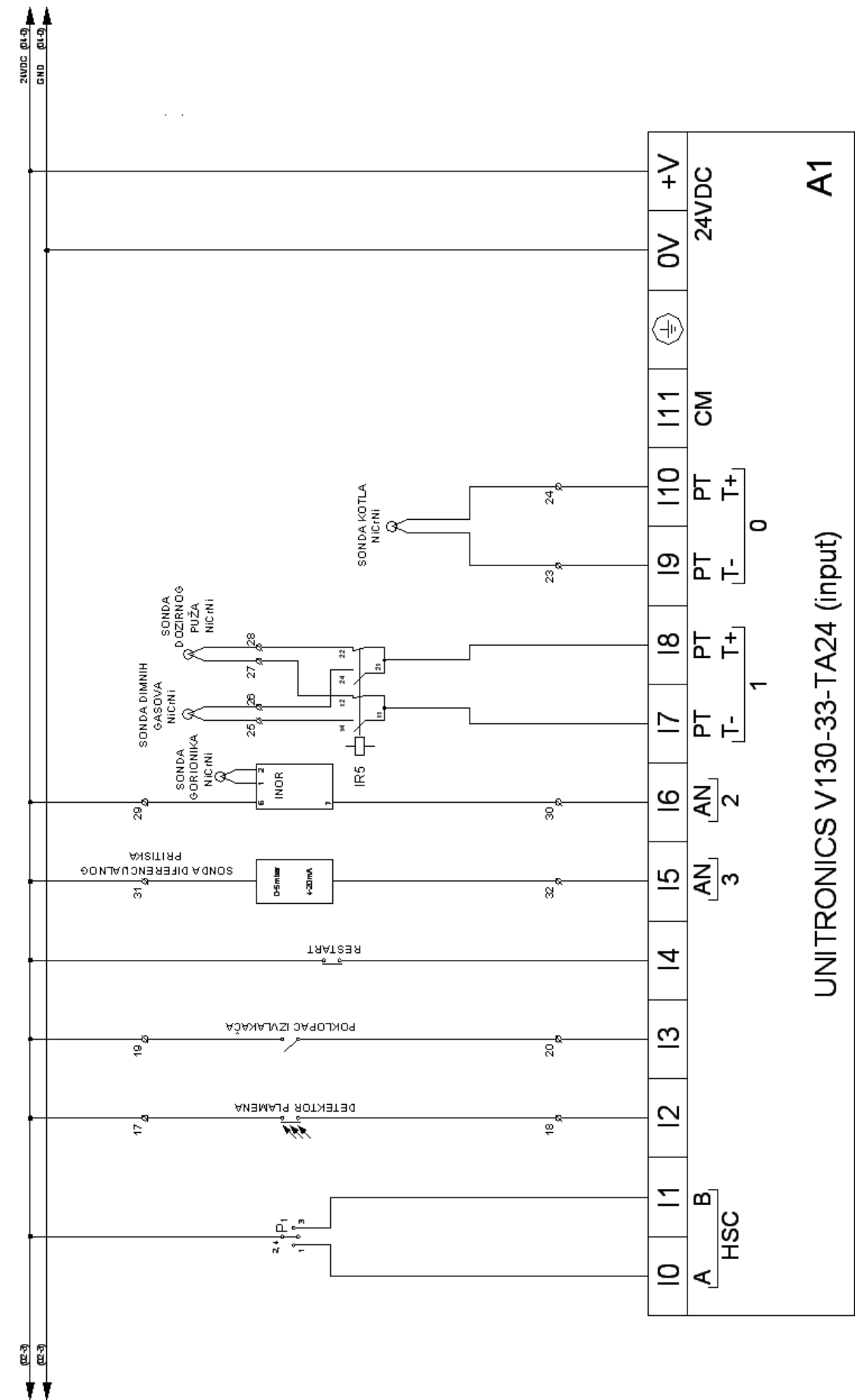
9. Addendum 2

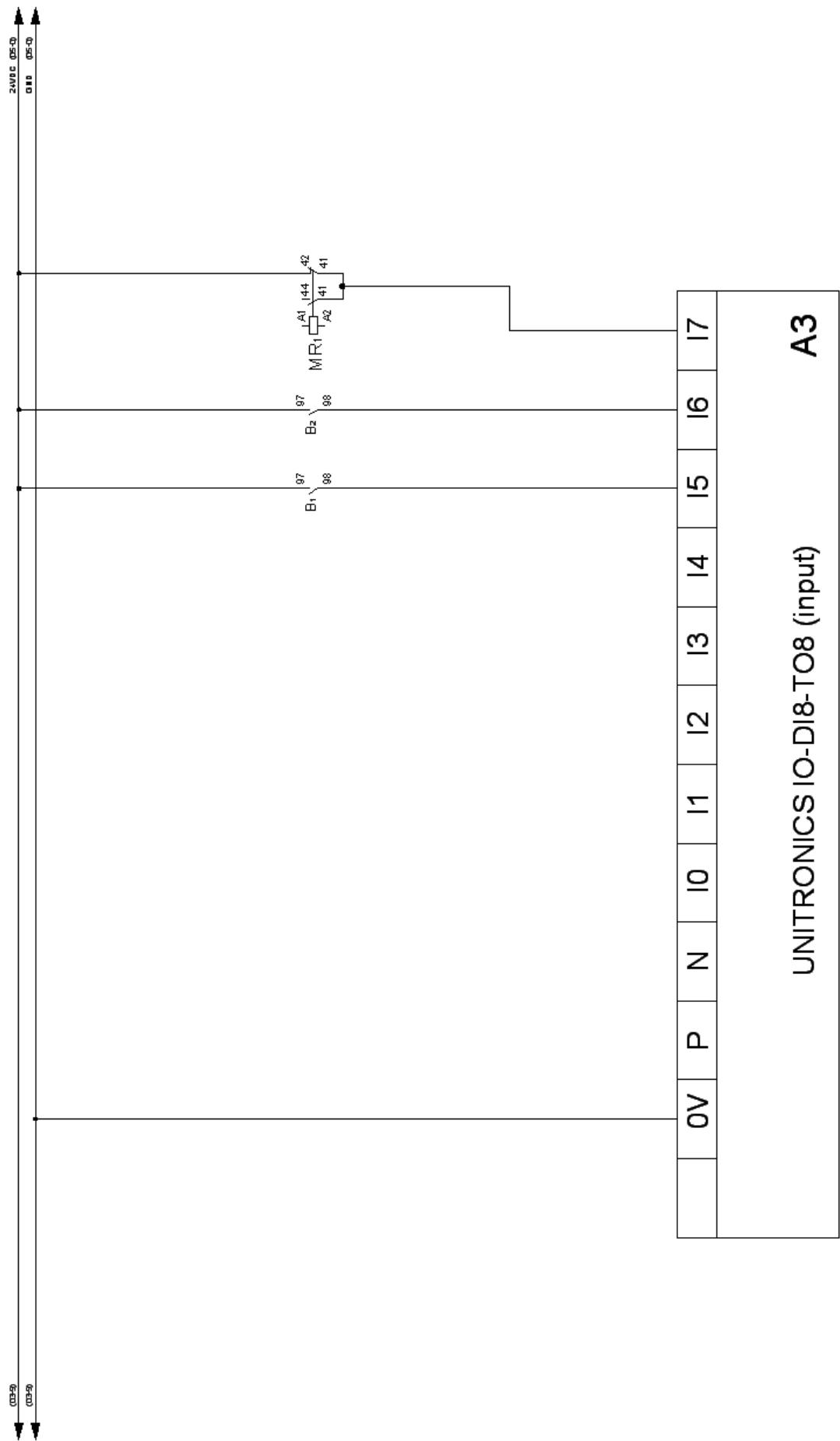
9.1. Wiring diagram

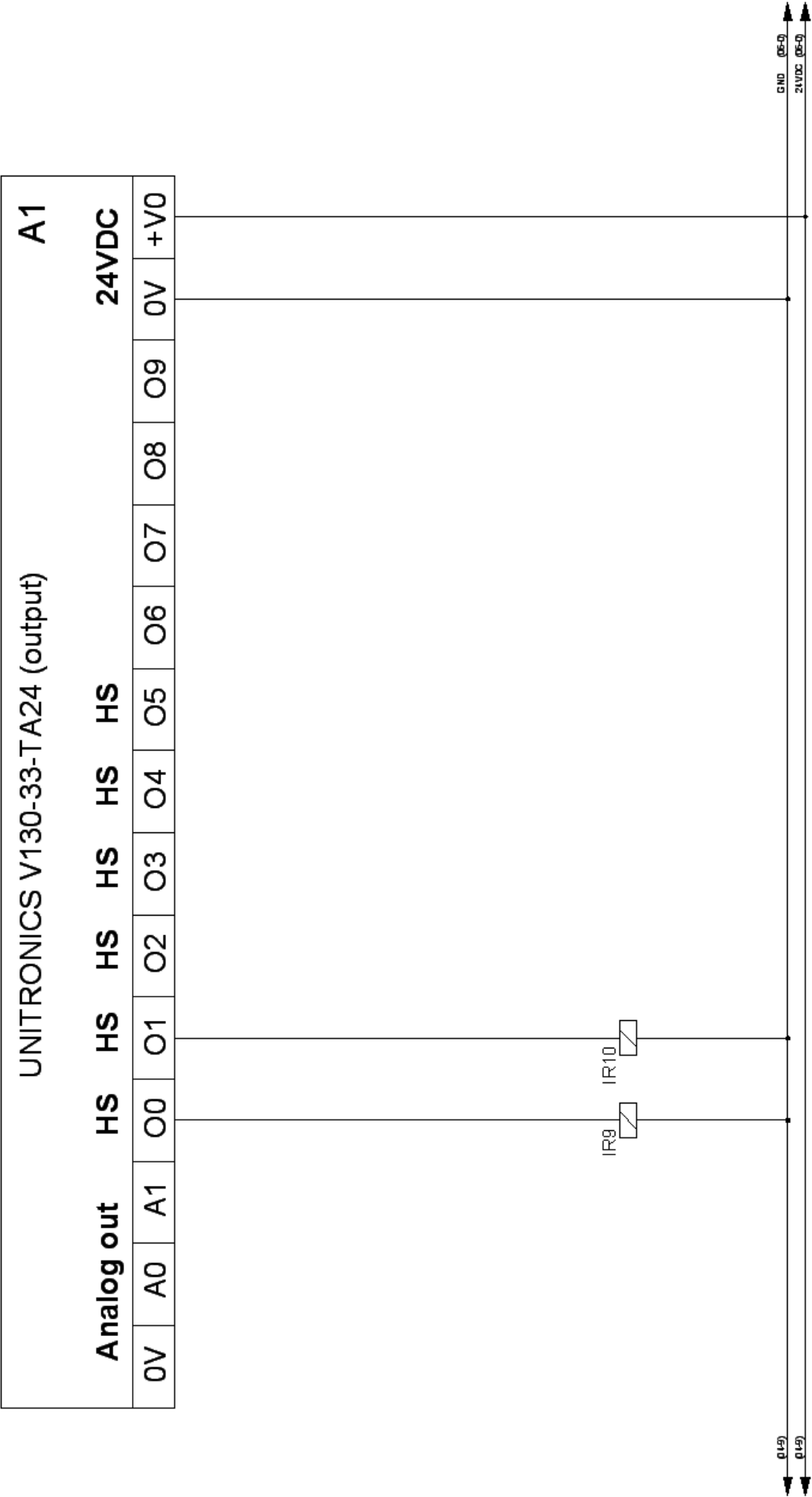
Wiring diagram of the control cabinet is shown in several figures in this Section.

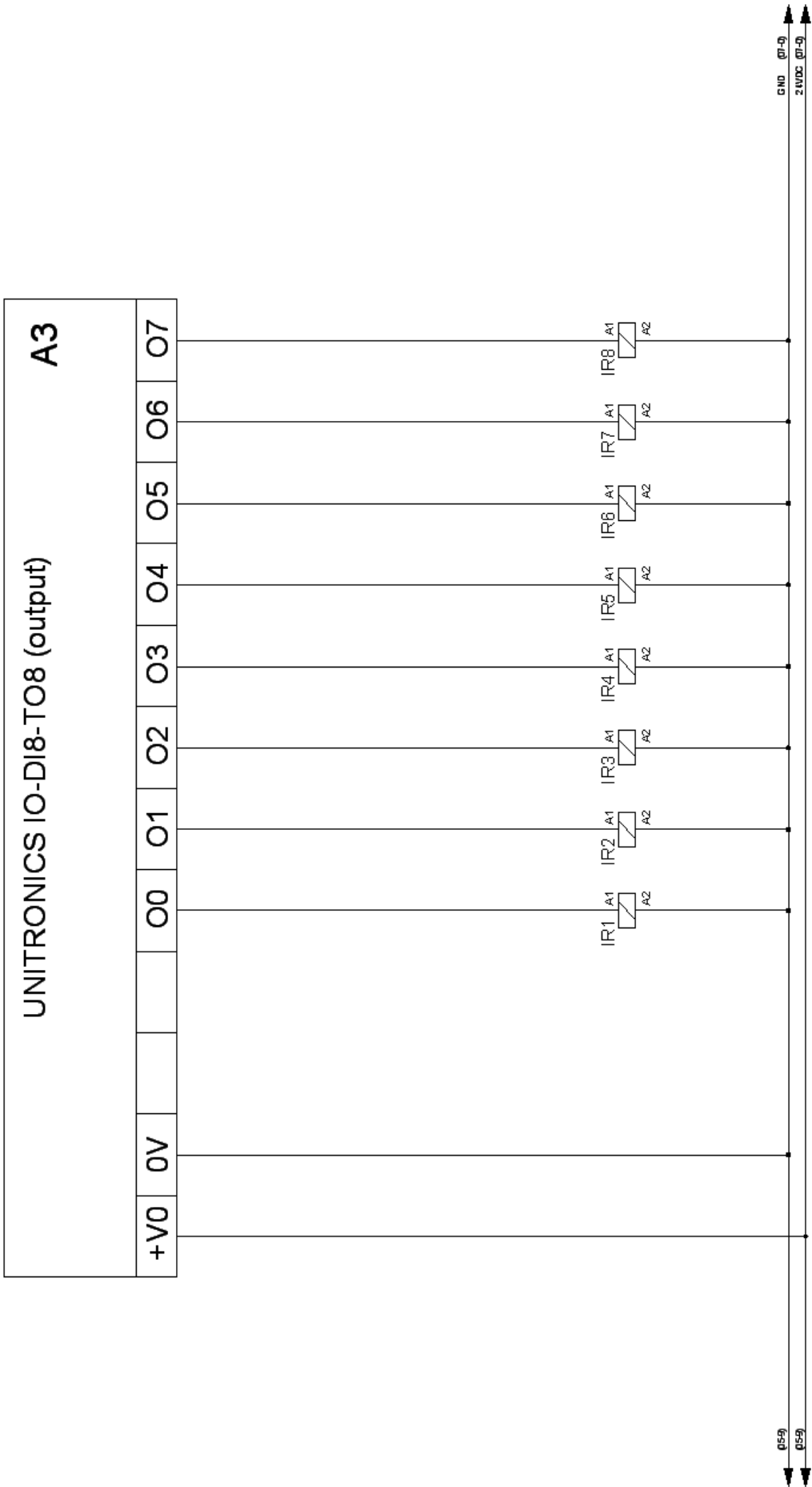


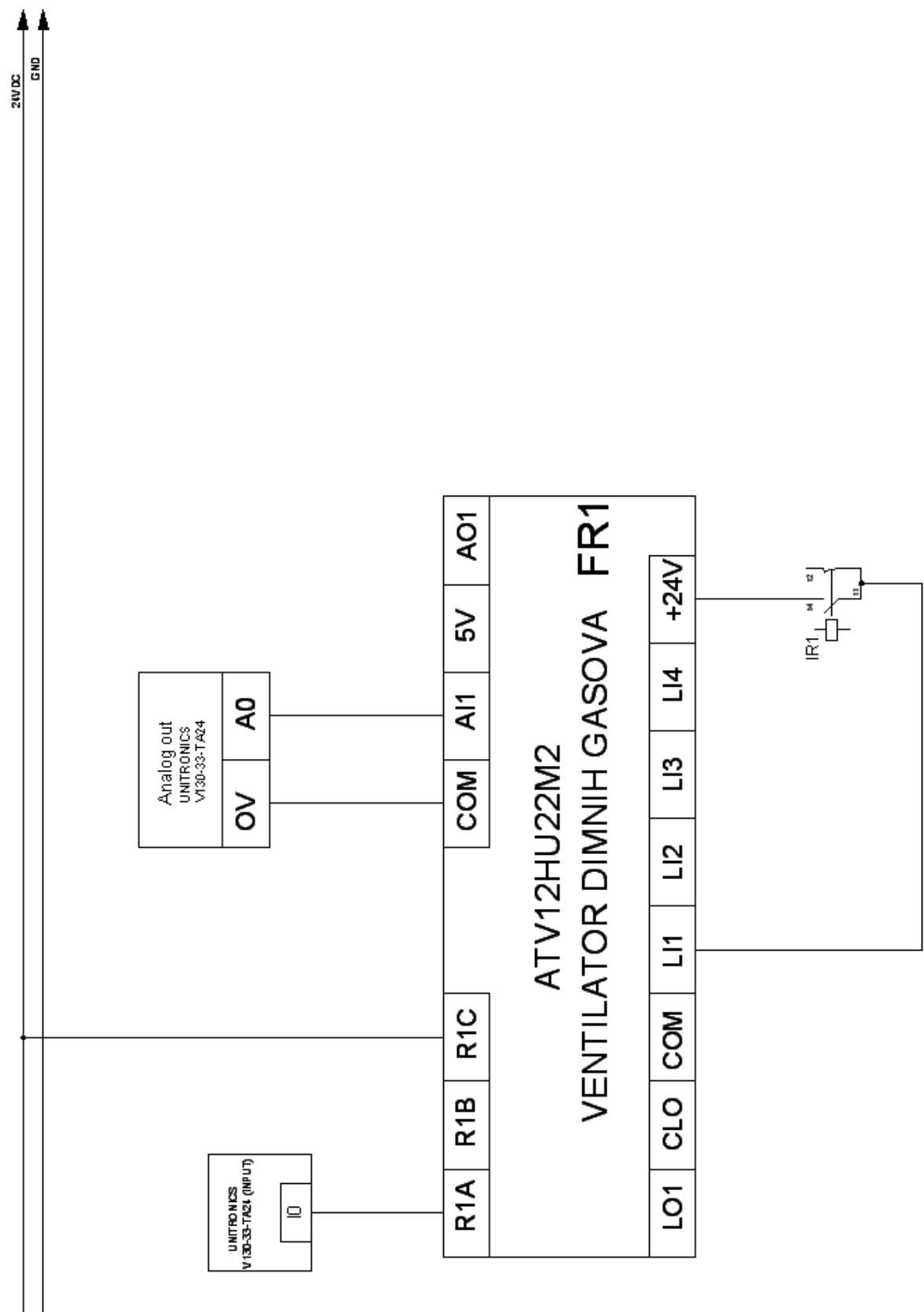


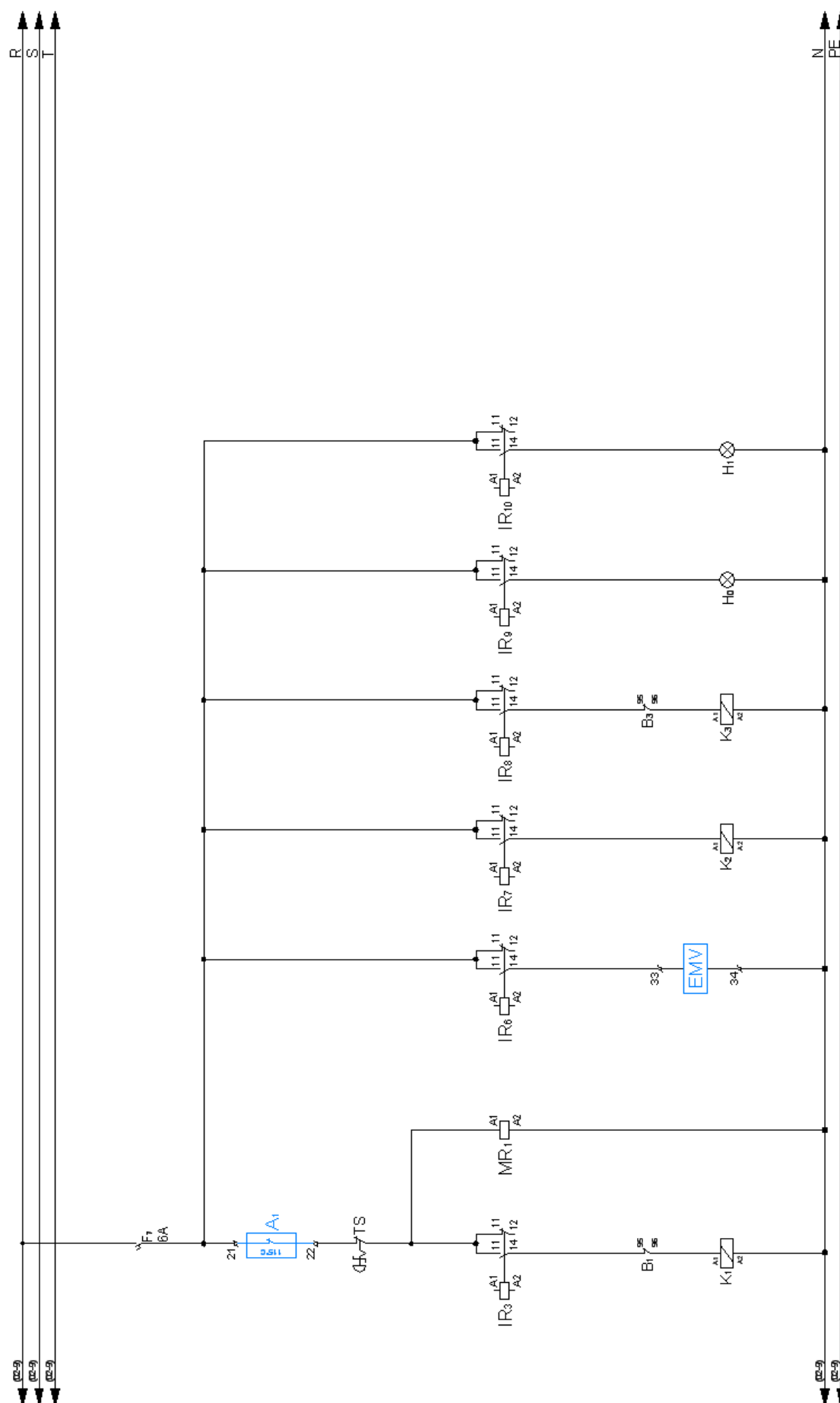




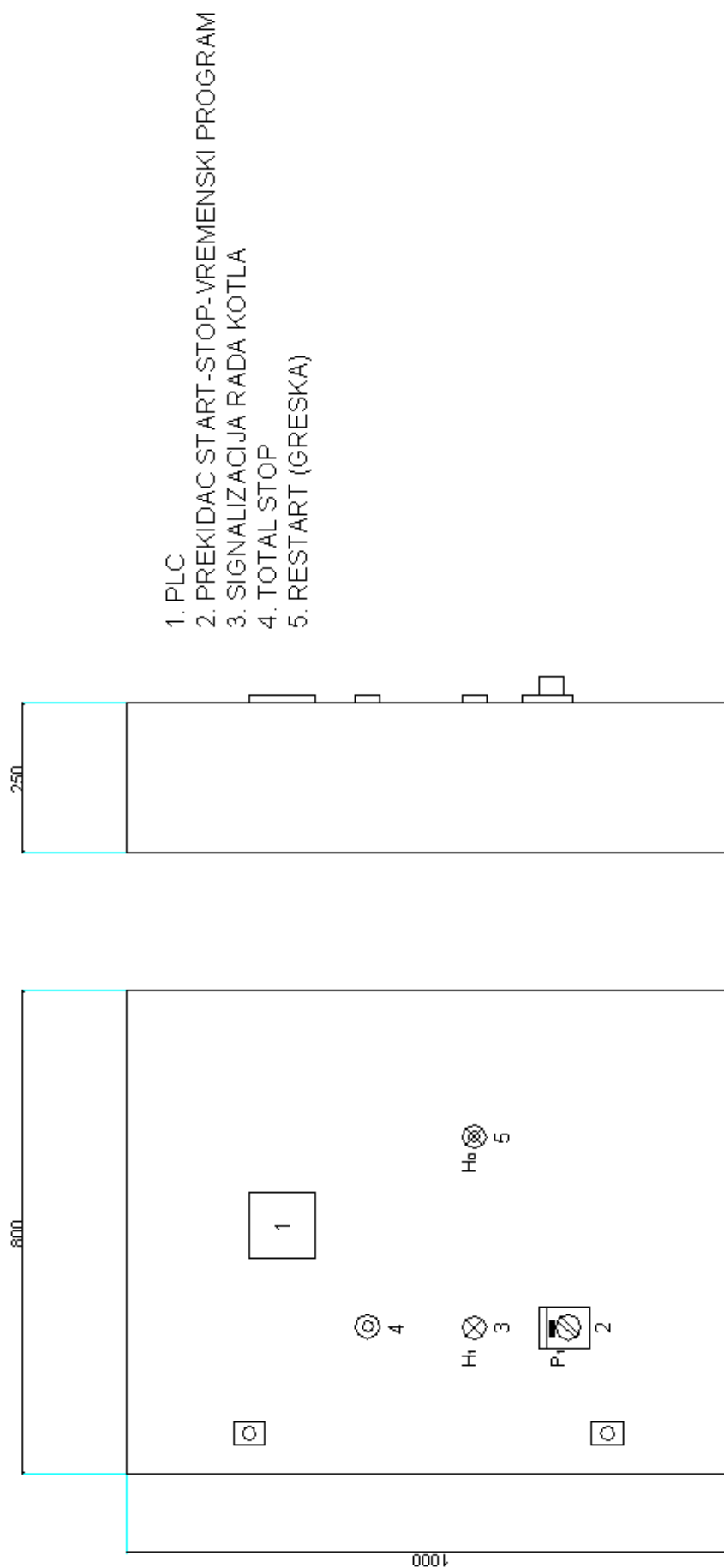


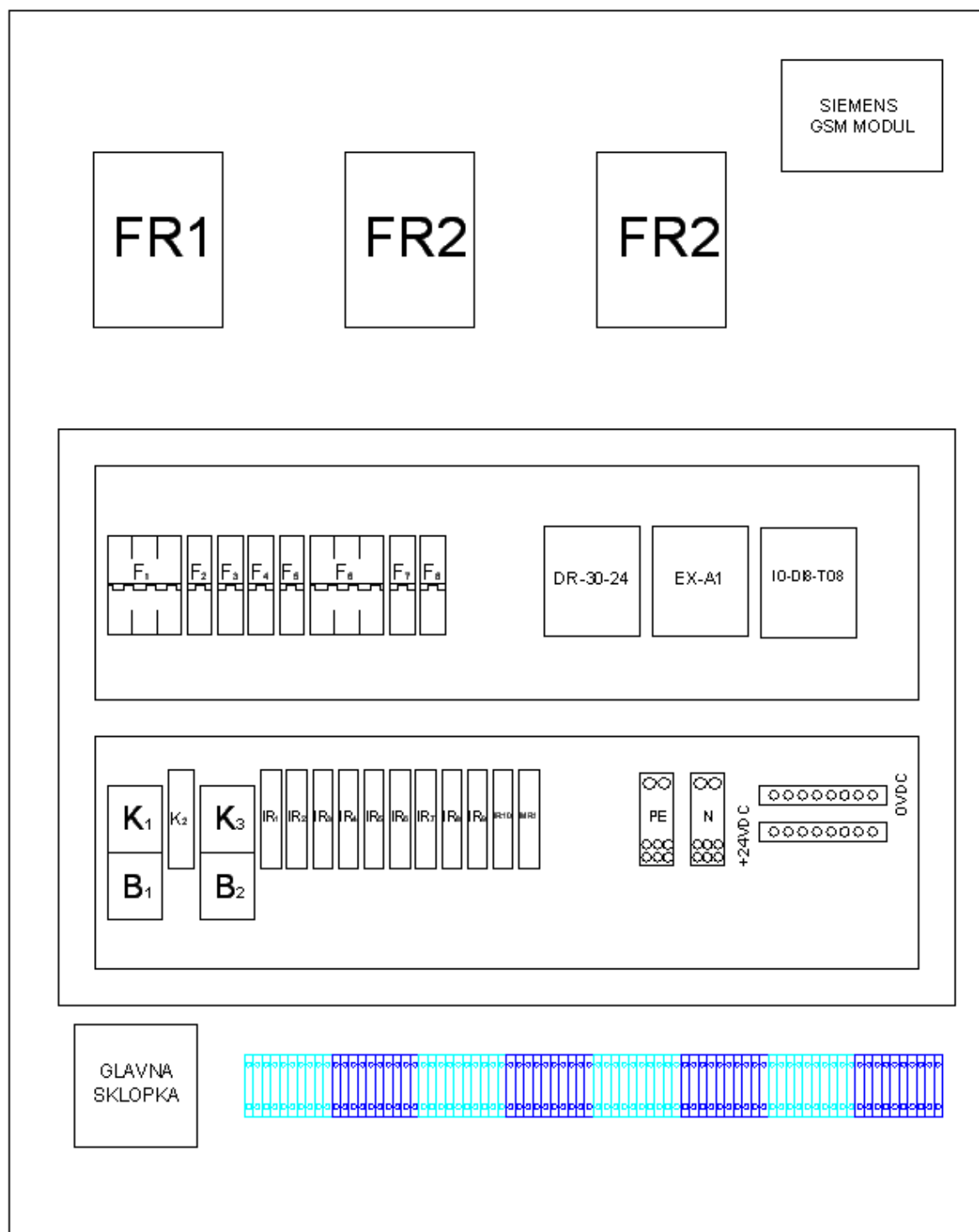






29	30	31	32	33	34	35	36	37	38
⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗	⊗
SONDA GORIONIKA			SONDA DIFFERENCIJALNOG PRITISKA			EMV		REZERVA	24VDC





WARRANTY

PRODUCT :	BTA_____
PRODUCER:	»TOPLING« D.O.O. PRNJAVOR
HOLDER OF THE WARRANTY:	»TOPLING« D.O.O. PRNJAVOR
AUTHORIZED SERVICE :	»TOPLING« D.O.O. PRNJAVOR

SERIAL NUMBER:	___/___
DATE OF PRODUCTION	20__
DATE OF THE COMMISSIONING :	

INFORMATION ABOUT THE BUYER AND THE OWNER OF THE PRODUCT:

NAME OF THE BUYER :	
PLACE:	
ADDRESS	
NAME OF THE OWNER	
PLACE:	
ADDRESS:	

WARRANTY STATEMENT

- 1. I guarantee that the above-mentioned product will function properly if it is handled properly in the compliance with this User guide.***
- 2. We are obliged to, upon the request of the owner of warranty sheet within the warranty period, repair and remove the defects which occurred during standard use of the product, i.e. those which are included into Warranty Sheet. Deadline for providing the service is 7 days after the investigation of malfunction.***
- 3. We guarantee service maintenance and necessary spare parts for the delivered product within 7 years.***
- 4. The warranty is not valid in the following cases:***
 - if the user does not comply with this user guide*
 - if the user improperly handles the product*
 - if unoriginal spare parts are fitted to the product*
 -
 - The following damages are not included into the warranty: damages caused during the transport after the shipment, damages due to improper instalment or maintenance, mechanical damages caused by the user's fault, damages caused by overvoltage, and damages caused by exceeding the allowable pressure, force majeure and similar.*

ROK GARANCIJE : 12 months after the date of commissioning

Signature of the authorized person

