

**Kotao
na čvrsto
gorivo/ *SOLID*
FUEL HEATING
*BOILER***

**SERIJA
FK/ *SERIE*
*FK***



INSTRUKCIJE/ *INSTRUCTION MANUEL*

Montaža, korišćenje i održavanje kotla/ Asseby, use and maintenance of heating boiler

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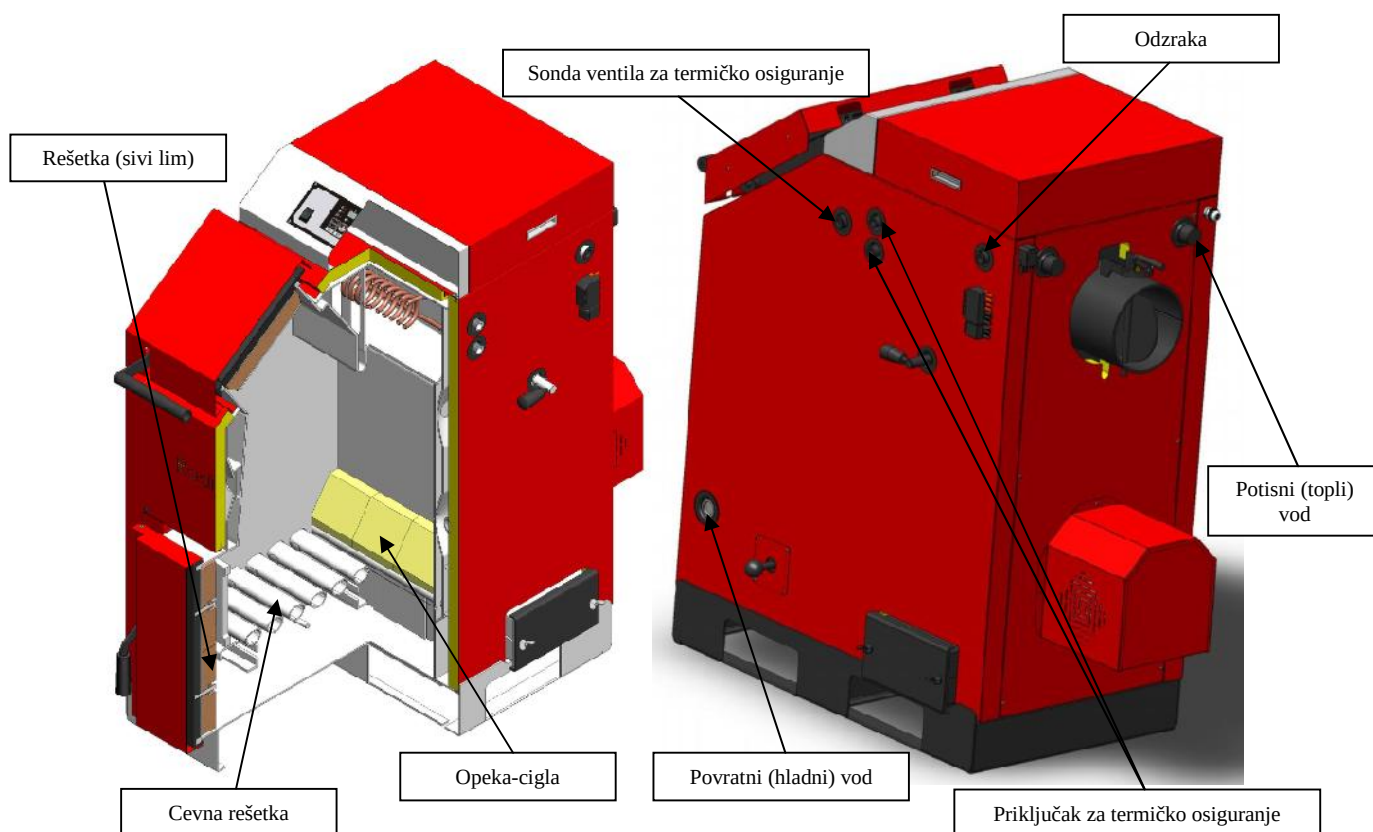
VAŽNA UPOZORENJA

Podsećamo da korišćenje uređaja na čvrsto gorivo i koji imaju kontakt sa električnom energijom i vodom zahtevaju poštovanje sigurnosnih mera i to:

- Zabranjeno je korišćenje kotla od strane dece i osoba sa ograničenim mogućnostima bez pratnje
- Zabranjeno je korišćenje kotla na instalacijama sa radnom temperaturom većom od 110°C, i radnim pritiskom većim od 3 bara.
- Zabranjeno je korišćenje lako zapaljivih goriva (alkohol, nafta) radi bržeg paljenja drveta
- Zabranjeno je odlaganje lako zapaljivih materijala u blizini kotla i u blizini vrata za loženje. Pepeo se mora odlagati u zatvorene i nezapaljive spremnike.
- Zabranjeno je spaljivanje otpada i materijala čije sagorevanje prouzrokuje plamen ili opasnost od eksplozije (npr. plastične kese, piljevinu, ugljenu prašinu, blato itd.)
- Zabranjena je bilo kakva intervencija tehničkog lica ili čišćenje pre nego se kotao isključi sa električnog napajanja postavljajući glavni prekidač uređaja na (0) "isključeno".
- Zabranjena je izmena na sigurnosnim elementima
- Zabranjeno je zatvaranje ventilacionih otvora na prostoriji u kojoj se nalazi kotao. Ventilacioni otvori su neophodni za pravilno sagorevanje
- Zabranjeno je izlaganje kotla atmosferskim nepravilnostima. Sam kotao nije predviđen za spoljnu montažu i ne sadrži sistem protiv smrzavanja.
- Zabranjeno je isključivanje kotla ukoliko spoljna temperatura može da padne ispod NULE (opasnost od smrzavanja)

1. Opis kotla

Kotao serije “FK” celicne je tropromajne konstrukcije za ciju izgradnju se koriste ugljenicni kotlovski limovi kvaliteta 1.0425 EU standard odnosno P265GH EU standard EU II.U osnovi lozista je cevna rešetka napravljena od kotlovskih besavnih cevi kvaliteta St.35.4.Resetkasta vrata na otvoru za ciscenje i potpalu napravljena su od sivog livenog gvozdja.U zadnjem delu lozista postoje cigle koje su izradjene od vatrostalnog materijala koji akumulira toplotu. Sve celicne pozicije kotla seku se najmodernijim laserskim postupkom i zavaruju vrhunskim tehnologijama zavarivanja ukljucujuci i robotsku.Ispitivanje i atestiranje kotla izvršeno je u skladu sa evropskim normama EN303-5.



2. Montaža

Kotao se isporučuje sa spoljnom oblogom koja sadrži izolaciju debljine 30mm

 Kotlovi serije FK mogu se priključiti na hidraulične sisteme samo ako je maksimalni radni pritisak 3 bara i maksimalna radna temperatura 90 stepeni Celzijusa

 Kotao je sa ventilatorom i automatikom i oba uređaja koriste napajanje 230V, tako da nepravilno instaliranje i neoprezno rukovanje mogu da ugroze ljudski život strujnim udarom.

 Kotao na cvrsto gorivo i prinudnom promajom treba instalirati prema vazecim normama i zakonskim propisima. Svaka izmena ili na mehanickoj konstrukciji ili na elektricnoj instalaciji smatra se narušavanjem garancijskih uslova i dovede do njenog narušavanja.

Osnovni zahtevi koje treba ispostovati prilikom montiranja su:

- Kotao može da bude priključen i na zatvoreni i na otvoreni sistem centralnog grejanja. Ukoliko je sistem zatvoren, kotao poseduje bakarni izmenjivač za priključenje ventila za termičko osiguranje oticanjem (VTO).
- Kotao mora da se nalazi na sigurnoj udaljenosti od lako zapaljivih materijala.
- Elektricno napajanje kotla je 230V i 50Hz i priključenje svih uređaja koje kotao sadrži treba uraditi prema vazecim propisima i priključenje radi lice sa odgovarajucim ovlascenjem.
- Priključenje na dimnjak takodje se radi prema obavezujucim propisima kao i preporukama proizvođača sto se može videti u narednom tekstu.

 Prilikom montaže na hidrauličku instalaciju kotao mora biti obezbeđen na propisan način od prekoračenja maksimalne radne temperature i pritiska.

 Za propisnu montažu odgovoran je instalater centralnog grejanja koji priključuje kotao na hidraulički sistem.

 Radijator inženjering, kao proizvođač kotla, ne preuzima nikakvu odgovornost za štete prouzrokovane lošim instaliranjem kotla.

3.1 Mere i uređjaji bezbednosti kod kotlova FK

Za bezbedan rad kotla potrebno je ugraditi i održavati ih ispravnim sledeće elemente:

- Ventil sigurnosti na pritisak (slika 1)



Slika 1



Slika 2

- Ventil sigurnosti na pritisak mora biti nazivnog prečnika 1/2 cola baždaren na maksimalno 3 bara.
Ovaj sigurnosni element koji spada u grupu limitatora pritiska mora da bude takve konstrukcije da izdrži i kratkotrajna prekoračenja i temperature i pritiska kao i određen sadržaj glikola u tečnosti za grejanje.
Obično na istom mestu se priključuju još i odzraka (slika 2) i manometar tako da ova tri elementa zajedno sačinjavaju sigurnosnu grupu i montiraju se preko „T” priključka.
Ovaj sigurnosni element mora da podleže i periodičnim ponovnim baždarenjima o čemu investitor tj. korisnik kotla mora da poseduje validnu dokumentaciju.
- Ventil sigurnosti mora biti montiran na najvišoj tački kotla i direktno na kotlu bez bilo kakvog cevovoda ili bilo kojih drugih elemenata između. Za ovu svrhu postoji i posebno predviđen priključak (videti sliku). Strogo je zabranjeno bilo kakvo reduciranje prečnika ovog priključka.
- Ispusni tj. izduvni deo ventila sigurnosti mora da bude od cevi čiji je prečnik najmanje jednak nazivnom prečniku ispusnog dela ventila. Takođe dozvoljeno je za njegovu izradu koristiti najviše jedan luk radijusa $r > 3d$.
- Sigurnosni ventil mora posedovati nazivnu pločicu i na njoj sledeće podatke:
 - naziv proizvođača
 - oznaka tipa sigurnosnog ventila/godina ispitivanja
 - nazivni protok
 - podatak za koji toplotni učinak je sigurnosni ventil podešen
 - najviši pritisak otvaranja tj. 3 bara
- Obavezna je provera ispravnosti rada u određenim vremenskim periodima kao i ponovna baždarenja od strane sertifikovanih firmi. Ove obaveze se sprovode u skladu sa zakonom svake zemlje u kojoj je kotao namontiran. Obavezno čuvati pisani dokument o podacima zadnjeg baždarenja sigurnosnog ventila.
- Na povratnom vodu montirati barem još jedan ventil sigurnosti na pritisak.

- Ventil termičkog osiguranja oticanjem (slika 3)



Slika 3

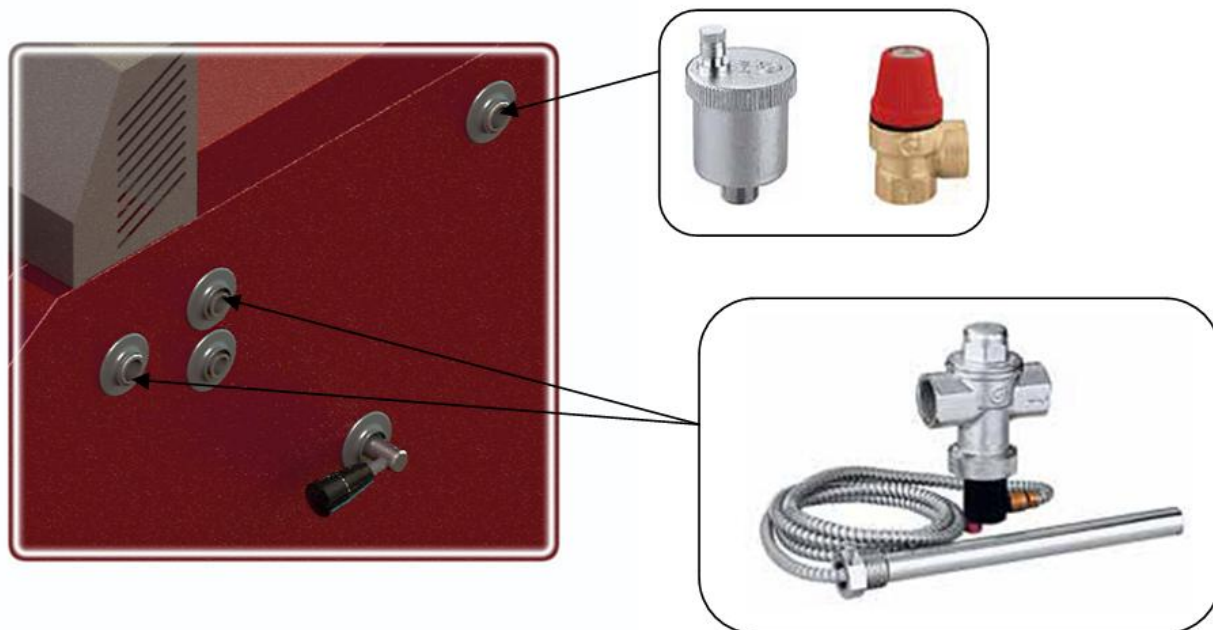
Ovaj sigurnosni element ima takođe ulogu ograničivača temperature. U daljem tekstu biće označen sa skraćenicom VTO.

- U nekim ekstremno opasnim situacijama prelaz vode u vodenu paru je takav da ventili sigurnosti za pritisak nisu dovoljni da obezbede sigurnost hidrauličkog sistema. Iz ovog razloga je obavezna ugradnja VTO. U zavisnosti od zakonskih regulativa zemalja u kojima se kotao montira, VTO je potrebno ugraditi samo za snage veće od određenih ili za svaku snagu kotla obavezno ugraditi VTO.
- Mesto ugradnje prikazano je na šemi montaže kotla na instalaciju i na slici 4.
U kotlu se isporučuje bakarna spirala tako da je potrebno koristiti VTO sa izmenjivačem kao na slici 3. Do VTO-a se dovodi hladna sanitarna voda. Kada sonda VTO-a ima informaciju da je temp. preko 95 stepeni VTO se otvara i voda prolazi kroz bakarnu spiralu. Posle izvesnog vremena temp. vode u kotlu se vraća na normalnu.
- Jedan priključak spirale koristimo za VTO a drugi za ispuštanje vode koja je prošla kroz spiralu. Koji je priključak spirale za VTO a koji je ispuštanje je nebitno. Obavezno je pridržavati se uputstava ugradnje koje je dao proizvođač VTO
- Obavezno u određenim vremenskim periodima proveravati funkciju VTO.

Kao što je već rečeno jedan kraj VTO je za montažu na izmenjivač kotla a do drugog se dovodi hladna voda pod pritiskom. Naročito je bitno da protok te vode bude neometan i pri nestanku el. energije.



Ukoliko je nemoguće obezbediti dotok hladne sanitarne vode i pri nestanku el. energije, obavezno kotao priključiti na otvoren sistem.

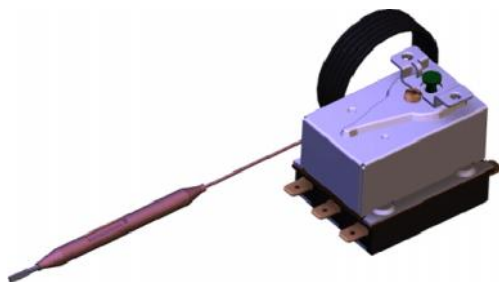


Slika 4. Prikaz postavljanja sigurnosnih elemenata

Termostati u automatici kotla

- U samoj automatici koja vodi proces sagorevanja i utiče na rad dva kruga grejanja postoje dva termostata. Oba su slične konstrukcije kao termostat prikazan na slici 4. i imaju i sigurnosne funkcije kao limitatori temp. vode u kotlu. Zbog sigurnosne uloge u funkcionisanju kotla oba termostata imaju nezavisne sonde za merenje temperature vode. Prvi termostat je tzv. radni i on služi da ograniči temperaturu do nivoa koji želi korisnik. Drugi termostat je sigurnosni jer prekida rad ventilatora koji pospešuje plamen, odnosno dodaje novu energiju. Sigurnosna temperatura je ograničena na 95 stepeni Celzijusa.

Pumpu za grejanje je veoma važno priključiti preko automatike iz sigurnosnih razloga. Kada temp. vode u kotlu dostigne kritičnu vrednost od 95 stepeni ventilator staje sa radom ali pumpa se obavezno uključuje kako bi razmenila toplotu vode kroz radijatore.

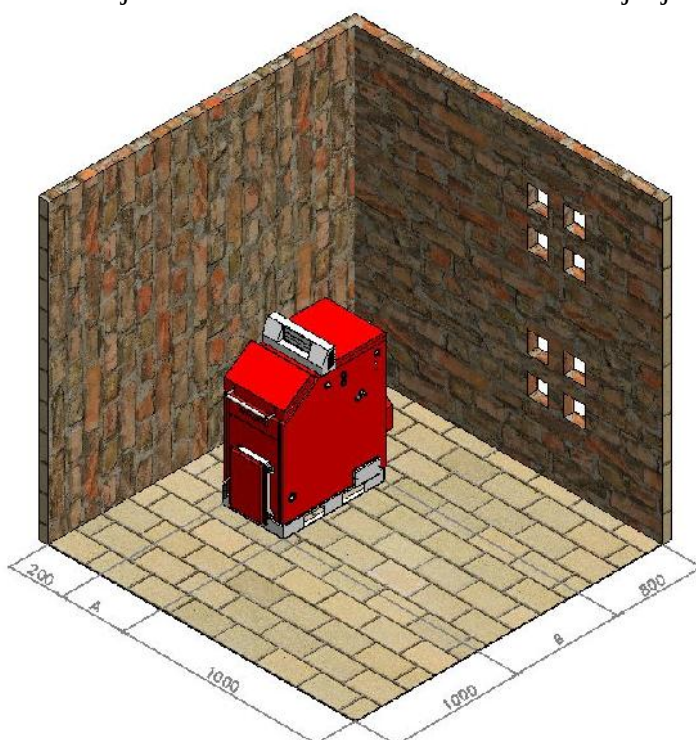


Slika 5

3.1. Kotlarnica

Kotlarnica mora biti obezbedjena od smrzavanja.

Pod kotla urađjen je u obliku metalne palete visine 110mm sa otvorima za paletni viljuskar. Ova visina je dovoljna udaljenost od poda (olaksano je ciscenje i kolicina vazduha za ventilator) tako da nije potrebna nikakva posebna betonska ploca u kotlarnici. Podloga za kotao u kotlarnici mora biti od nezapaljivog materijala. Preporucene vrednosti udaljenosti sve cetri strane kotla u odnosu na zidove kotlarnice ili neka druga kruta tela (akumulacioni bojler itd.) prikazane su na skici. Ove vrednosti udaljenosti omogucavaju siguran pristup prilikom lozenja, dovoljan prostor za ciscenje i nesmetan pristup ventilatoru i ventilu za punjenje i praznjenje. Situacija polozaja kotla u odnosu na bocni zid sa skice moze biti i ogledalno simetricna jer kotao poseduje bocne otvore za ciscenje sa obe strane. Rucica klapne za potpalu je demontazna i moze se staviti i na levu i na desnu stranu kotla. Kotlarnica mora da poseduje dovoljne otvore za ventilaciju kako za svez vazduh tako i za odvodjenje istrosenog vazduha.



slika 6. Prikaz pozicioniranja kotla u kotlarnici

Ukupna površina ovih otvora je minimalno 150cm² za snage do 50kW a za snagu preko 50kW površina mora biti veća za još 2cm² po kilovatu.

$$A = 150 \text{ cm}^2 + \frac{2 \text{ cm}^2}{\text{kW}} \times (\sum Q_n - 50 \text{ kW}) \quad \sum Q_n = \text{moguće snage preko 50 kW}.$$

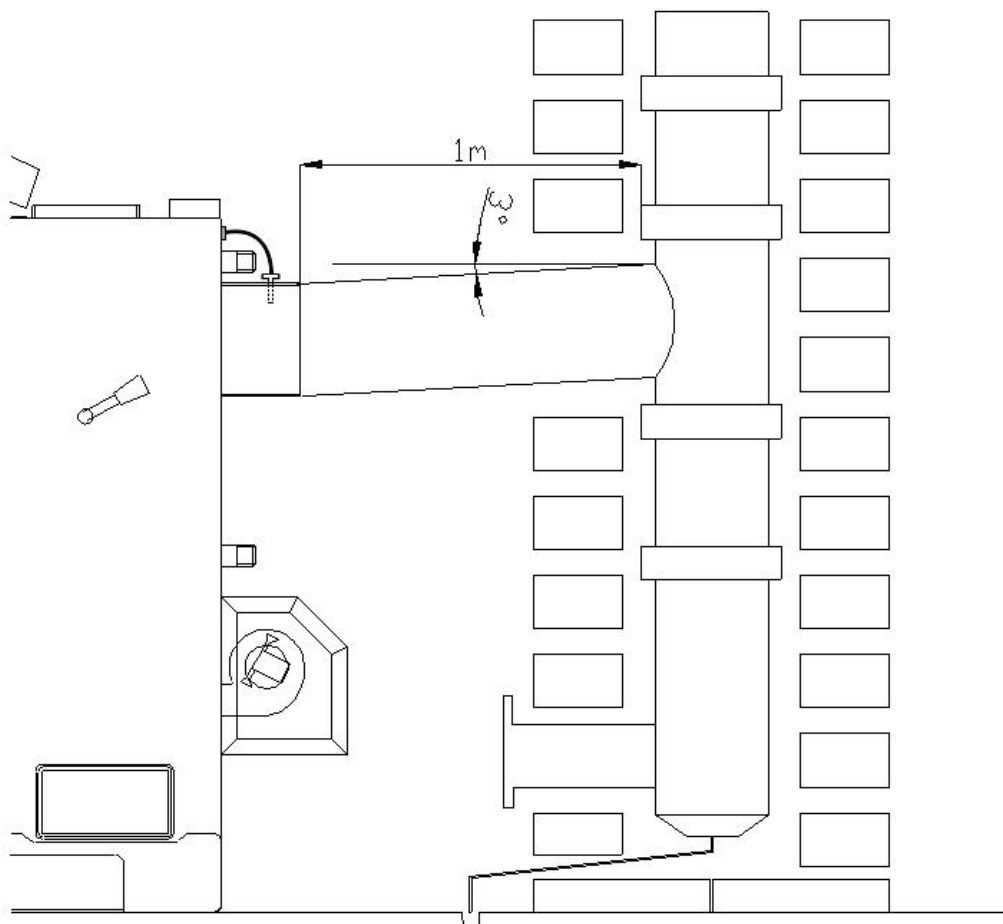
Nedostatak dovoljne ventilacije u kotlarnici može da uzrokuje više problema u radu kotla. Glavni problem je nemogućnost postizanja visokih temperature izlazne vode tj. ne postizanje maksimalne snage što dovodi do kondezovanja u kotlu.

- Uzeti u obzir neophodan minimalni prostor koji je potreban za prilaz sigurnosnim elementima i za izvršenje operacija čišćenja

- Utvrditi da li je stepen elektricne zastite u skladu sa karakteristikama prostorije u kojoj ce kotao biti smesten
- Zabranjeno je izlaganje kotla atmosferskim neprilikama. Sam kotao nije predvidjen za spoljnu montazu i ne sadrzi sistem protiv smrzavanja.
- Zabranjeno je zatvaranje ventilacionih otvora na prostoriji u kojoj se nalazi kotao. Ventilacioni otvori su neophodni za pravilno sagorevanje

3.2. Priključenje na dimnjak

Najoptimalnije postavljanje kotla na dimnjacu je takvo da prava koja spaja centar izlaza dimnih gasova iz kotla i centar prikljucenja na dimnjak bude u blagom usponu (do 3%)(pogledati skicu).

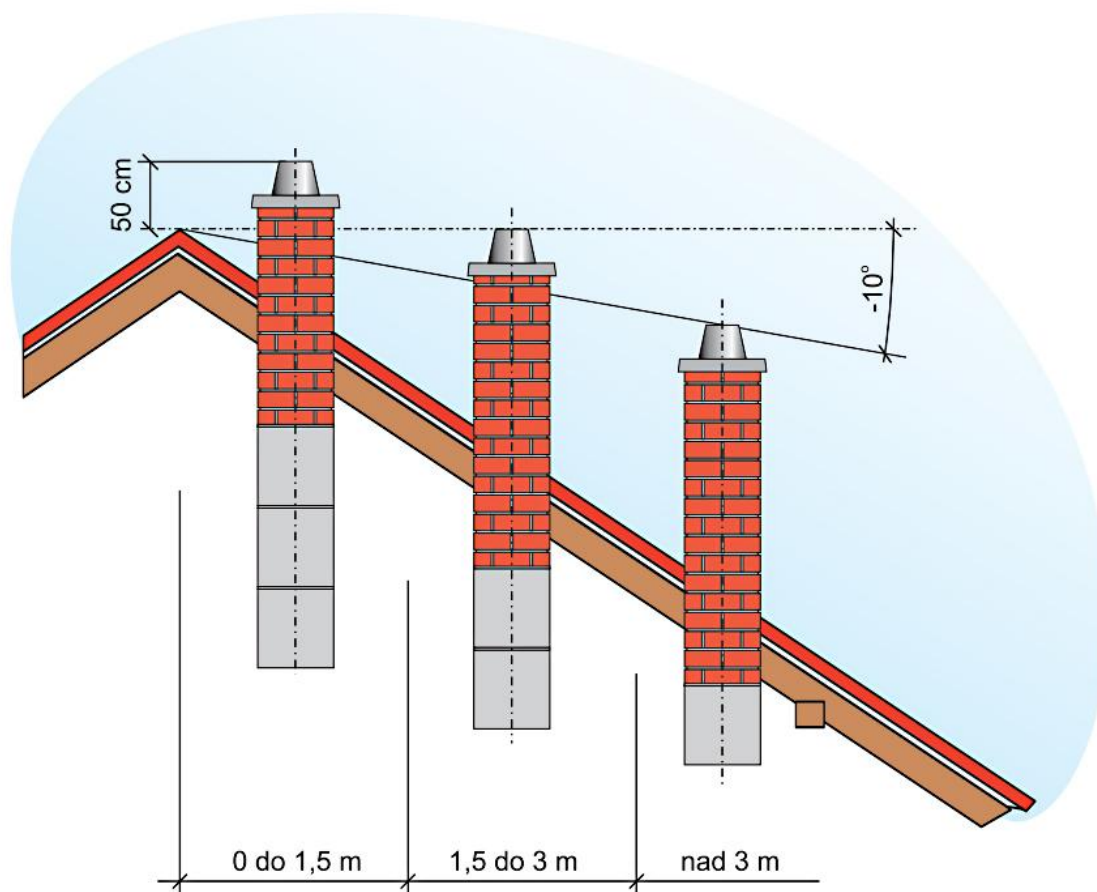


slika 7. Prikaz prikljucenja kotla na dimnjak

Treba izbegavati ako je moguće lukove, a ako nije onda je maksimalni broj lukova (2). Dimni kanal od kotla do dimnjaka poželjno je izolovati, posebno ako ima lukova i dužih deonica. Sam dimnjak treba da je napravljen od keramičkih cevi, oko njih treba da je izolacija debljine 3-5cm i zadnji spoljni sloj je cigla ili specijalni dimnjacki elementi.

Ako dimnjak ipak nije od keramike već od cigle, površina svetlog preseka takvog dimnjaka mora da bude 30% veća nego ovakva površina keramičkog dimnjaka. Minimalne dimenzije preseka oba dimnjaka i minimalne visine date su u tabeli 1.

Dimnjak mora da ima i vratanca za ciscenje a ona moraju dobro da dihtuju. Izlaz dimnjaka na krovu mora da bude po odredjenim propisima. Razlikuju se dva slucaja: ako je ugao krova manji od 12° i ako je ugao krova veći od 12° . Za ugao manji od 12° visine dimnjaka iznad krova je 1m a za ugao veći od 12° treba pogledati skicu.

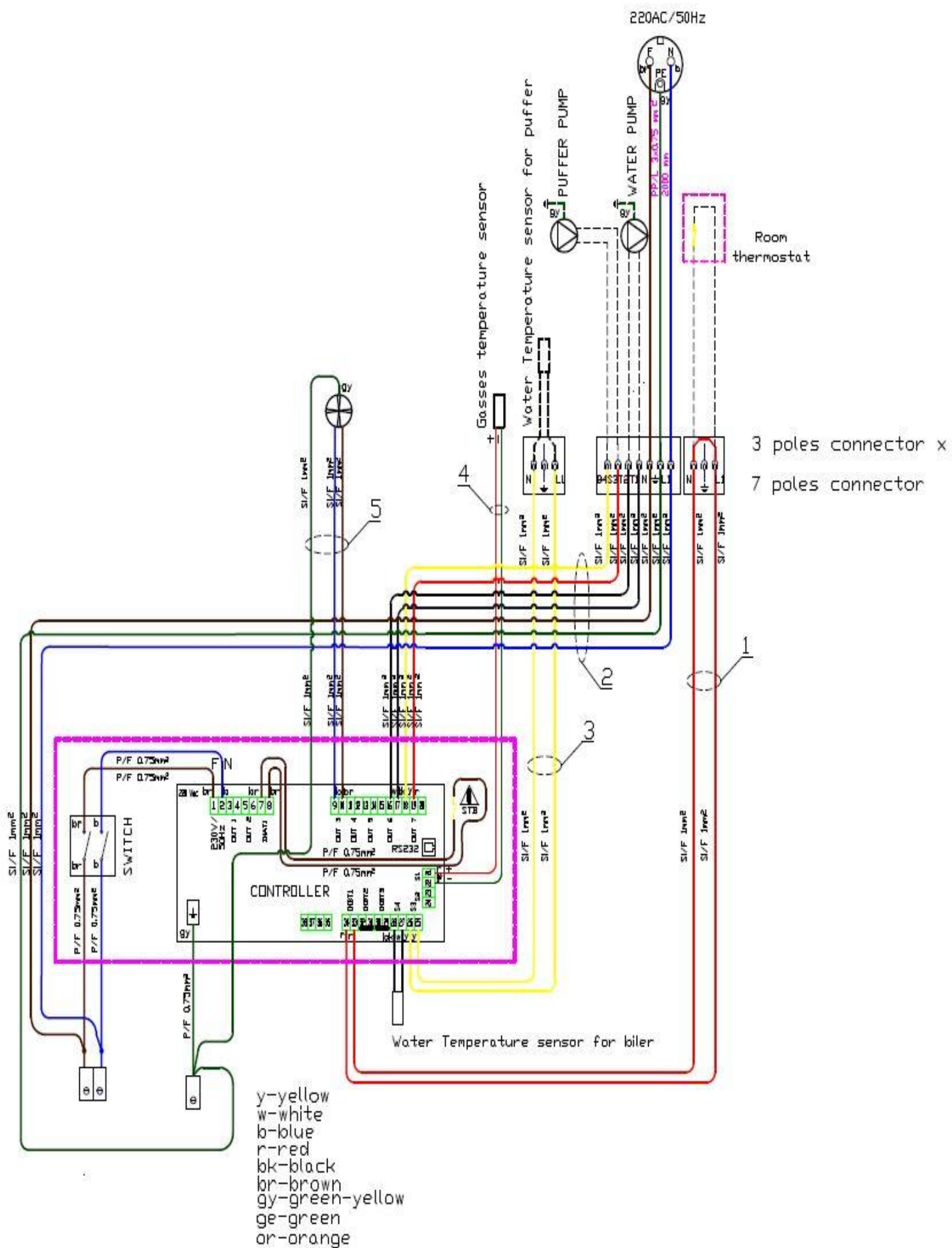


Ukoliko mislite da je dimnjak prejak i da isuviše hladnog vazduha prolazi kroz kotao, na izlazu iz kotla postoji klapna kojom može da se smanji protok izduvnih gasova. Dimnjak treba redovno da se čisti i barem jedanput godišnje.



Ukoliko dimnjak nije propisne visine, poprečnog preseka ili ako se ne čisti moguće su komplikacije u radu kotla. Pre svega nije moguć visokotemperaturni režim rada, tj. nema maksimalne radne snage, a posledice toga je pojava kondenzacije što utiče na radni vek kotla.

5. Električna šema spoljnih priključenja



Sve linije koje su prikazane isprekidano na šemi spoljnih priključenja su provodnici koje je potrebno da instalira tehničko lice prilikom priključenja spoljnih uređaja na automatiku kotla. Sva priključenja dodatnih uređaja tehničko lice obavlja preko tri konektora koja se nalaze na zadnjem delu kotla. Dva konektora su trolpolna a jedan je sedmopolni. Jedan trolpolni je za priključenje sobnog termostata što je prikazano na nalepnici samog konektora.



Za sobne termostate bitno je da budu sa baterijskim napajanjem, tj. da nemaju na sebi bilo kakav dovod napona 220 V. Na samom termostatu za povezivanje se koristi NC (normalno zatvoreni kontakt).

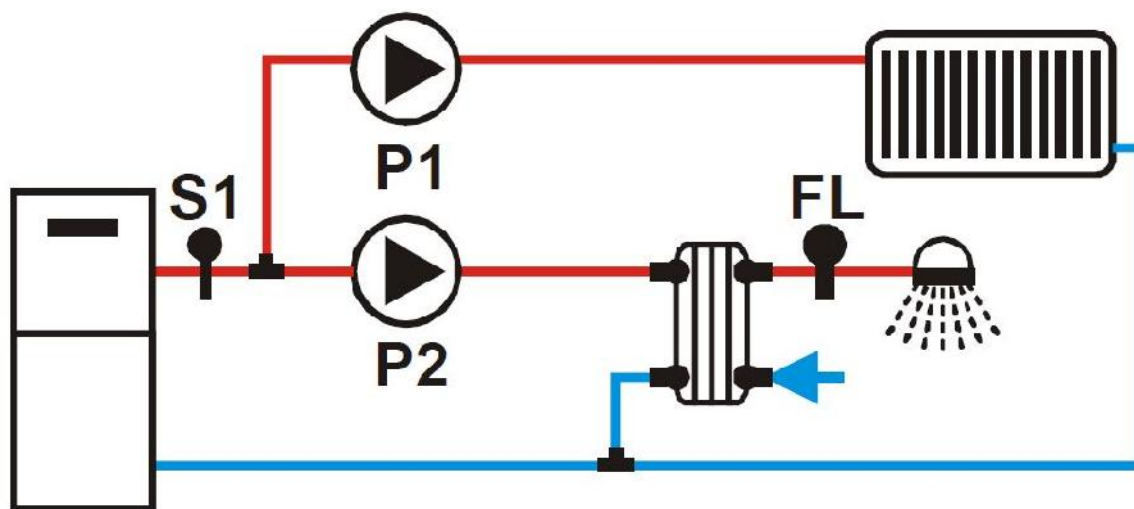
Drugi trolpolni konektor je za priključenje sonde za merenje temperature u akumulatoru ili bojleru za sanitarnu vodu. Ova sonda se uvek isporučuje uz kotao. Ukoliko sonda za merenje temperature vode u akumulatoru odnosno bojleru sanitarne vode nije dovoljno dugačka moguće je produžiti običnim provodnicima.

Sedmopolni konektor je za priključni mrežni kabal i za priključenje cirkulacione pumpe i pumpe akumulatora odnosno bojlera za sanitarnu vodu.



Kotao može da radi i u slučaju da nije priključena nijedna pumpa ali preporuka proizvođača je da bude priključena barem pumpa1 (pumpa centralnog grejanja) jer ona ima i funkciju sigurnosnog elementa. Uključuje se kada temperatura vode u kotlu preraste 90 stepeni Celzijusa.

Kotao je prema fabričkim podešavanjima prilagođen hidro instalaciji kao na slici 8.



slika 8

Očigledno je da postoji samo jedno merno mesto S1 a ta sonda je već fabrički postavljena. Druga sonda koja je povezana na konektoru na zadnjoj strani kotla u ovom slučaju ostaje neupotrebljena.

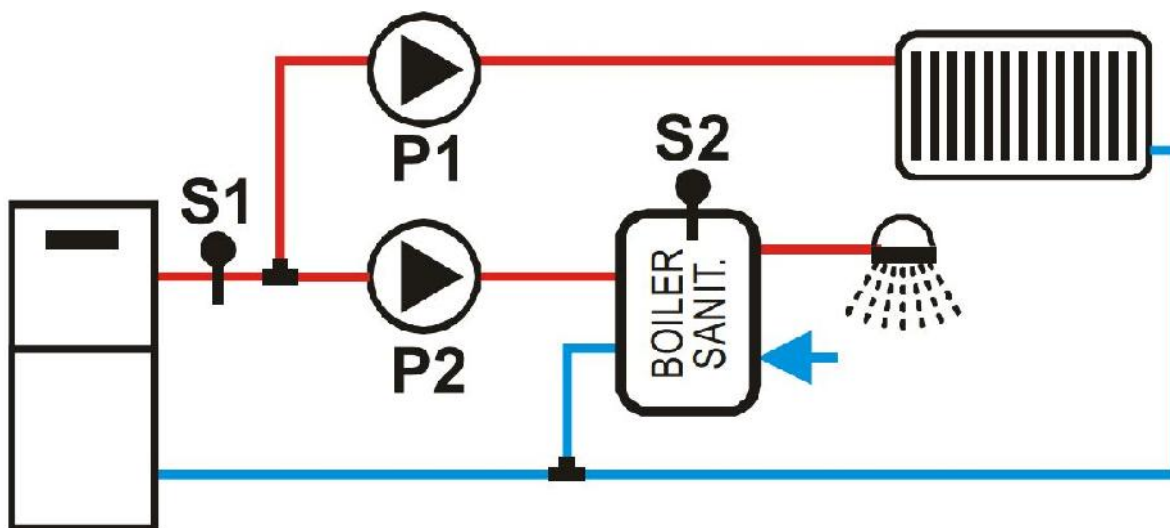
⚠ Pumpu P2 koja služi za sanitarnu vodu ne moramo da ugradimo. Parametar koji određuje tip hidro instalacije u samoj automatici je P37 i za ovakvu hidro šemu je P37 podešen na 1.

Ukoliko želimo da koristimo automatiku da vodi proces i zagrevanja akumulatora preko odgovarajuće pumpe, onda hidraulička šema treba da je kao na **slici 10**. Mesto merenja sonde temperature vode u akumulatoru je označeno sa S2.

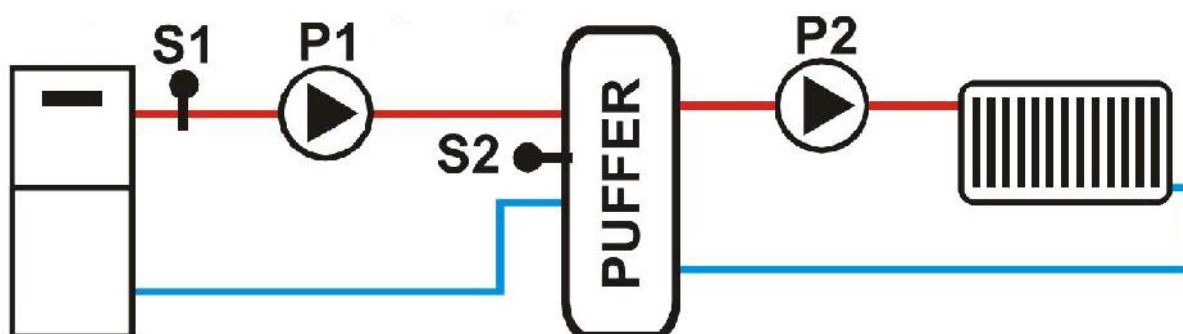
Da bi automatika pravilno vodila rad te pumpe za hidrauličku vezu i sa akumulatorom onda je potrebno parametar P37 podesiti na vrednost 4.

Ukoliko želimo da automatika vodi proces zagrevanja sanitarne vode i to preko odgovarajuće pumpe, onda hidraulička šema treba da je kao na **slici 9**.

Da bi automatika pravilno vodila rad te pumpe za zagrevanje bojlera sanitarne vode onda je potrebno parametar 37 podesiti na vrednost 3.

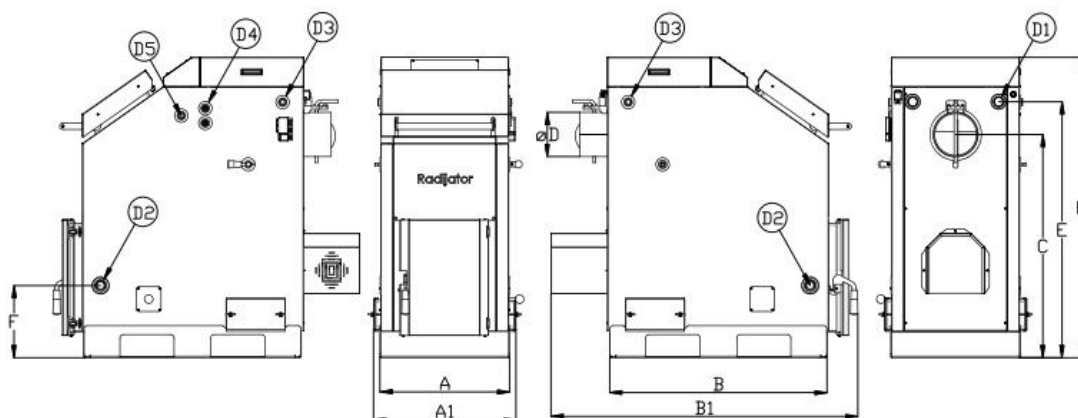


slika 9



slika 10

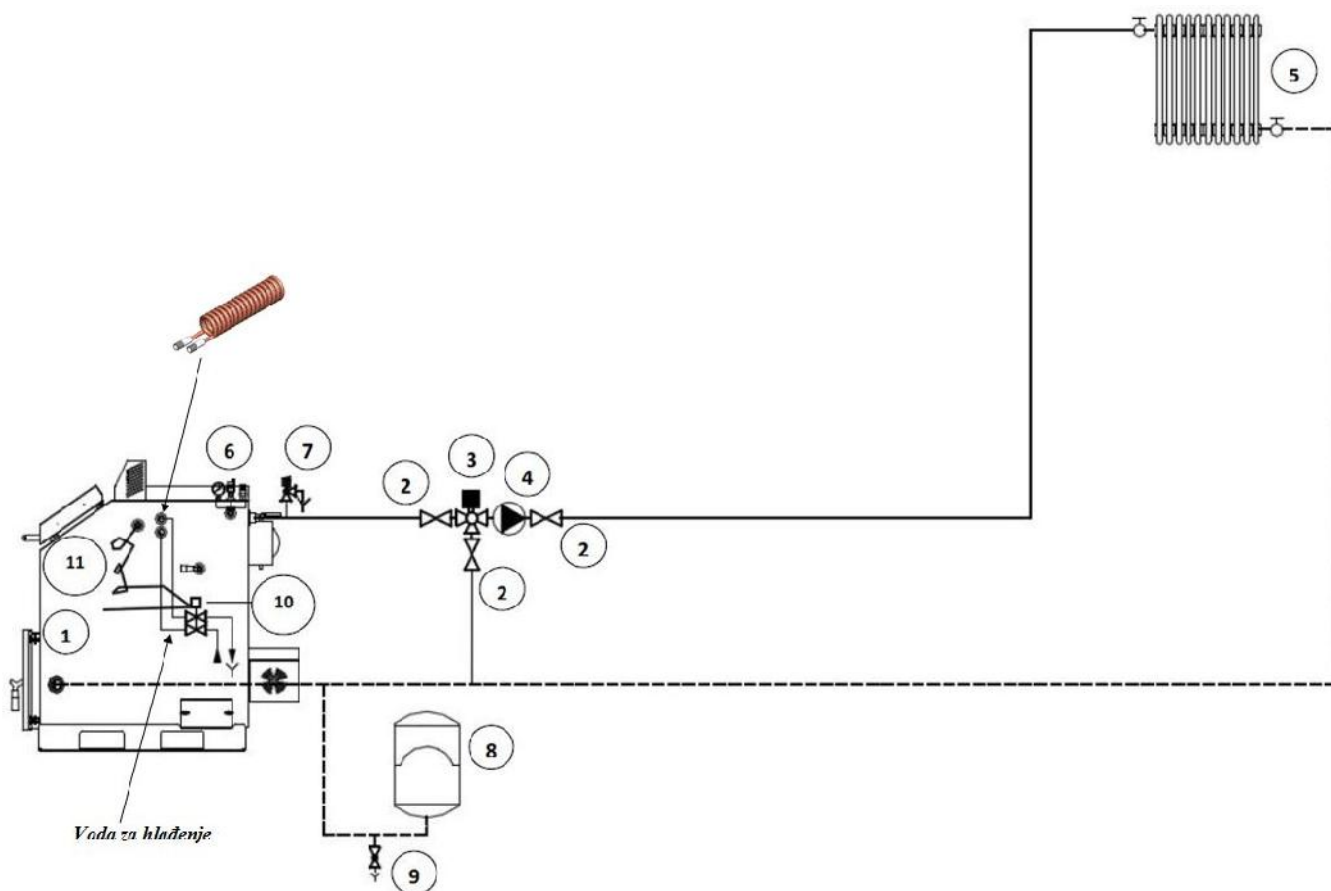
6. Tabela sa tehničkim podacima



Tip kotla		FK1	FK2	FK3	FK4	
	mere					
Snaga	kW	15/23	25/33	33/40	40/49,5	
Radni pritisak	kPa	300	300	300	300	
Probni pritisak		450	450	450	450	
Zapremina vode u kotlu	L-cca	55	72	87	100	
Masa kotla	kg	282	374	428	453	
Potrebna promaja	Pa	17	18	20	22	
Max.temp.potisnog voda	C☐	90	90	90	90	
Min.temp.povratnog voda	C☐	60	60	60	60	
Zapremina magacina za ogrev	m³	0.08	0.09	0.13	0.16	
Stepen iskoriscenja	%	>85	>85	>85	>85	
DIMENZIJE	A	mm	480	528	578	668
	A1		540	580	640	728
	B		790	885	955	965
	B1		1150	1280	1311	1340
	C		807	907	957	1107
	ØD		160	180	200	200
	E		940	1040	1072	1122
	F		290	294	304	302
	H		1162	1220	1274	1324
	D1	col	1"	1"	5/4"	5/4"
	D2		1"	1"	5/4"	5/4"
	D3		1/2"	1/2"	1/2"	1/2"
	D4		1/2"	1/2"	1/2"	1/2"
	D5		1/2"	1/2"	1/2"	1/2"

- D1-priključci za toplu vodu iz kotla
- D2- priključci za hladnu,povratnu vodu iz radijatora
- D3- priključci za odzračivanje i ventil sigurnosti na pritisak
- D4- priključci za ventil termičkog osiguranja oticanjem VTO
- D5- priključak za sondu VTO

7. Hidraulička šema povezivanja FK kotla



Hidraulička šema

Opis:

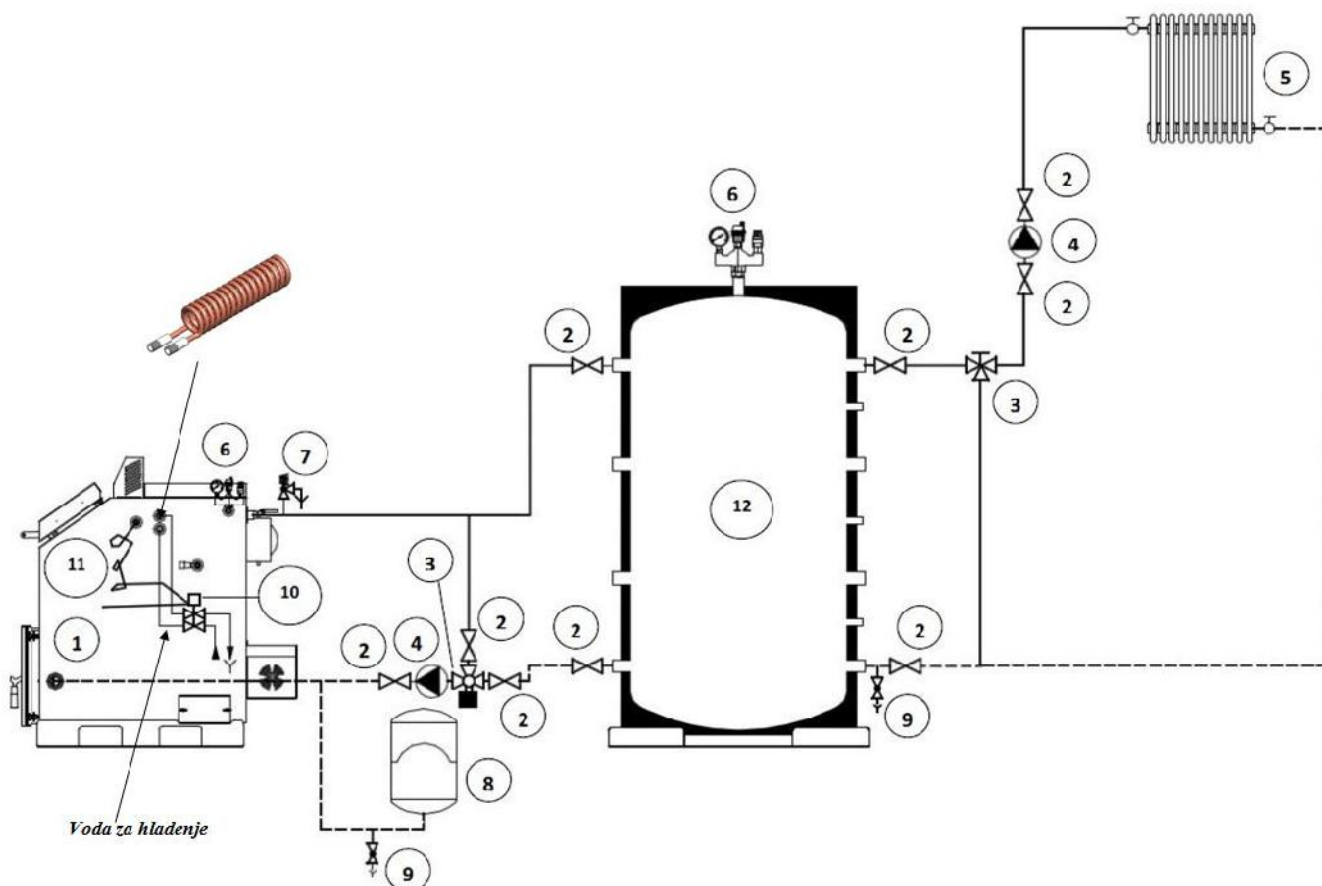
1. Kotao FK
2. Ventil
3. Mešni ventil
4. Pumpa
5. Izmenjivač (radijator)
6. Sigurnosna grupa
7. Sigurnosni ventil
8. Ekspanziona posuda
9. Slavina
10. Ventil termičkog osiguranja
11. Sonda ventila termičkog osiguranja



Prilikom montaže na hidrauličku instalaciju kotao mora biti obezbeđen na propisan način od prekoračenja maksimalne radne temperature i pritiska.

⚠ Za propisnu montažu odgovoran je instalater centralnog grejanja koji priključuje kotao na hidraulički sistem.

⚠ Radijator inženjering ,kao proizvođač kotla, ne preuzima nikakvu odgovornost za štete prouzrokovane lošim instaliranjem kotla.



Hidraulička šema sa akumulatorom

1. Kotao FK
2. Ventil
3. Mešni ventil
4. Pumpa
5. Izmenjivač (radijator)
6. Sigurnosna grupa
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8. Ekspanziona posuda
9. Slavina
10. Ventil termičkog osiguranja
11. Sonda ventila termičkog osiguranja
12. Akumulator

8. Start rada kotla, loženje i održavanje kotla

Pre početka eksploatacije treba biti siguran da je cela instalacija, a narucito kotao dobro odzračen i da nema curenja.



Automatiku ne smete uključivati u struju dok niste apsolutno sigurni da svi električni delovi i provodnici nisu u kontaktu sa vodom.



Kotao ne potpaljivati dok niste pogledali unutar njega i na spoljne strane da slučajno nema curenja vode iz kotla.



Ukoliko neposredno iz kotla postoje ventili proveriti da li su otvoreni.

Tek kada je korisnik siguran u prethodne činjenice može pristupiti loženju kotla. Loženje kotla treba uraditi po redosledu sledećih operacija:

8.1. Start rada kotla na čvrsto gorivo

Sledeća procedura potpale kotla i starta rada automatike odnosi se na situaciju prvog paljenja po instaliranju na hidraulički sistem ili kada se kotao potpuno gasi radi detaljnog čišćenja pa ponovo pušta u rad, s tim da tada neke korake preskačemo.

1. Proveriti da li je kotao pravilno priključen na hidraulički sistem. Naročito proveriti da li je iz kotla ispušten sav vazduh.

2. Utikač za glavno napajanje ubaciti u utičnicu mrežnog napajanja. Pritisnuti glavni prekidač na automatici. Tada dolazi do oživljavanja displeja i na njemu bi posle par sekundi trebalo da piše „OFF”.

3. Na dimovodnoj cevi a što bliže kotlu izbušiti otvor za sondu dimnih gasova. Otvor treba da bude u gornjoj zoni da ne bi vremenom došlo do prekrivanja sonde pepelom. Takođe, proveriti da klapna na dimnjači kotla ne udara u sondu. **Bez sonde za temp. dimnih gasove kotao ne može da radi.**

4. Unutar kotla postoji klapna za usmerivanje dimnih gasova u dva režima „radni” i položaj za potpalu. Ovom klapnom se rukuje pomoću ručice na bočnoj strani kotla. Pomeriti ručicu u smeru ka dimnjaku. Tada je klapna u položaju za potpalu.

Takođe klapna na izlazu iz kotla, tj. na dimnjači treba da je maksimalno otvorena.

5. Otvoriti donja vrata, a zatim i mala rešetkasta vrata. Na cevni rost staviti nešto materijala za potpalu u vidu papira i suvih tankih komada drveta. Najbolje je koristiti hemijske potpaljivače koji su u obliku kocki za potpalu drveta. Ručno potpaliti i sačekati da se plamen razgori.

6. Kada već imamo dobar, jak plamen dodati malo veću količinu goriva nego prvi put i to kroz gornja vrata. Zatvoriti sva vrata i pritisnuti komandno dugme 4 „START”. Dugme držati sve dok se na displeju ne pojavi „ACC”. To znači da je i automatika ušla u fazu potpale, pali se ventilator i dolazi do porasta temp. dimnih gasova.

Posle izvesnog vremena kotao ulazi u normalni radni režim a to se manifestuje tako što na displeju nema nikakve poruke osim trenutne temperature vode.

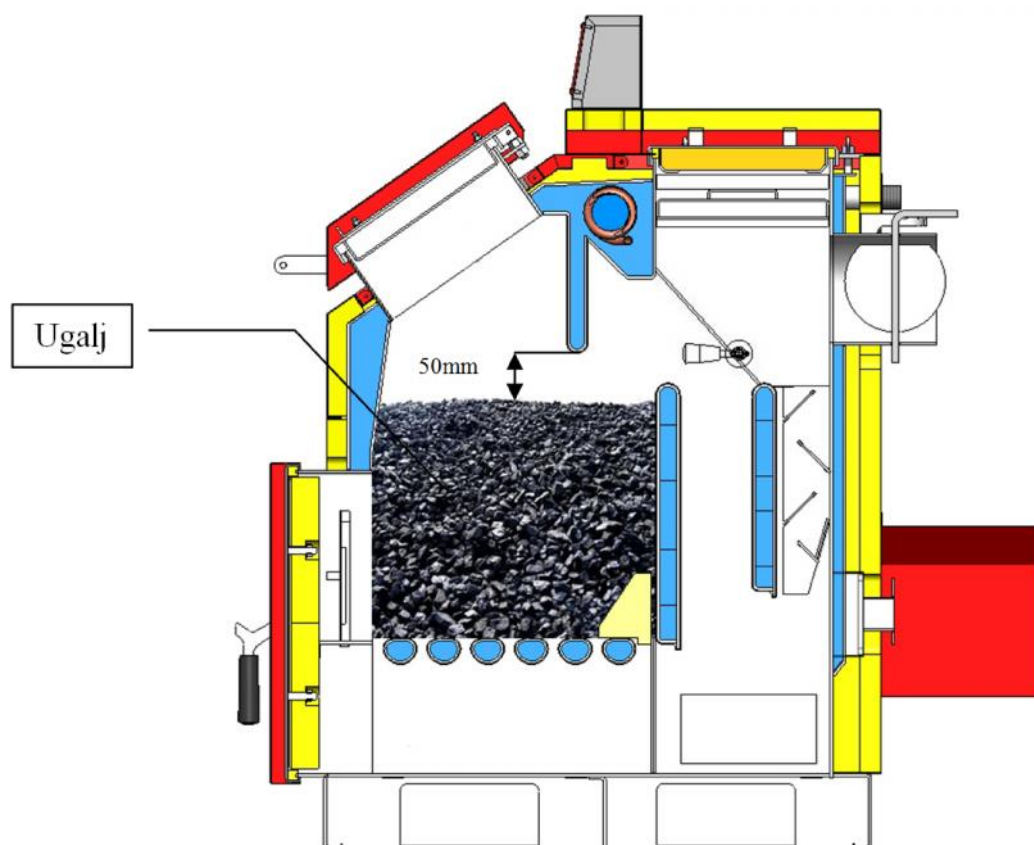
7. Kada temp. dimnih gasova pređe otprilike 200 stepeni Celzijusa, treba klapnu unutar kotla sa kojom se rukuje ručicom sa bočne strane, gurnuti ka prednjoj strani odnosno u radni položaj. Očitavanje temp. dimnih gasova se vrši tako što se kratko pritisne komandno dugme 1 pa komandno dugme 3 a zatim i komandno dugme 2. Na displeju se tada pojavi temp. dimnih gasova. Ovo je opisano i u uputstvu za brzo rukovanje automatikom.

8.2. Loženje kotla

Tokom rada kotla moguće je dopuniti količinu uglja ili drveta u njemu ali prethodno treba prekinuti rad ventilatora i to pritiskom na dugme STOP (videti brzo uputstvo za rad automatike).

Kotao je moguće ložiti i ugljenom prasinom i redosled operacija je isti. Razlika je u tome što se kotao prvo napuni ugljenom prasinom a na vrh se stavi papir i drvo za potpalu.

Kotao se koristi i za drva i za ugalj kao gorivo ili za njihovu mešavinu s tim da je naša preporuka da maksimalni nivo punjenja sa ugljem bude nešto niži, što je prikazano na slici 11.



Slika 11. Prikaz maksimalne visine loženja ugljem

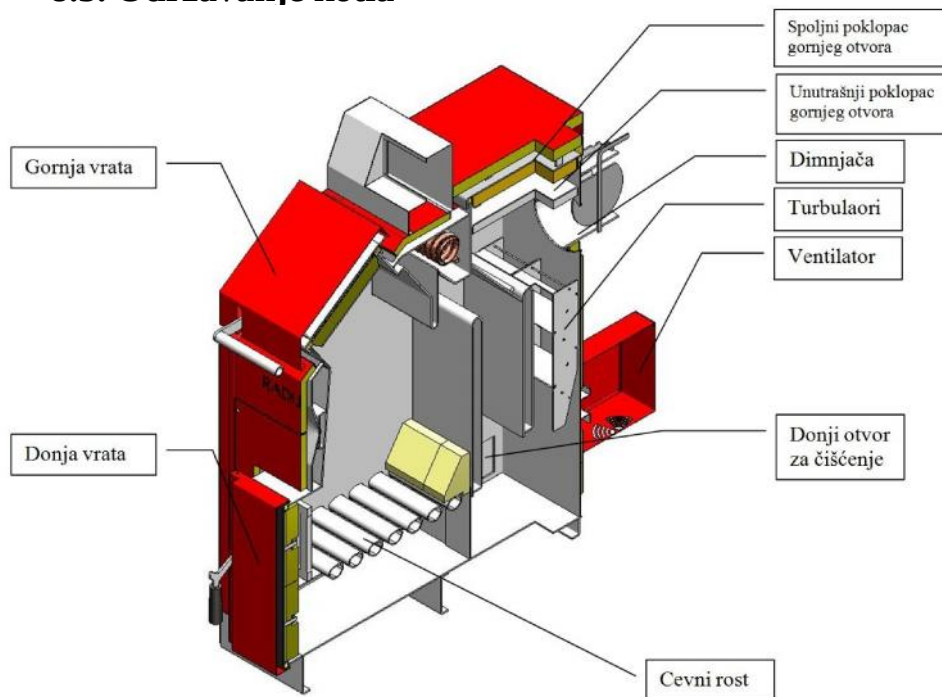
A technical drawing of a mechanical part, likely a bracket or a connector. The part consists of a central vertical shaft with a circular hole at its base. A horizontal arm extends from the right side of the shaft, and a curved arm extends from the top of the shaft. Dimension 1 is indicated by a vertical line with arrows at both ends, measuring the height of the curved arm. Dimension 2 is indicated by a horizontal line with arrows at both ends, measuring the length of the horizontal arm. The drawing includes various lines and symbols to represent the geometry and dimensions of the part.

poz.1 otvorena klapna
poz.2 zatvorena klapna



⚠ Otvaranje gornjih vrata za loženje u toku rada raditi sto redje i to samo radi pregleda rada kotla. Vrata tada moraju da se otvore veoma sporo, a oprezno i to prvo samo malo i tako ih zadržati desetak sekundi, a onda do kraja. Veoma je opasno otvoriti gornja vrata u situaciji kada ventilator neradi. Tada stvoreni gasovi sagorevaju i izlaze kroz vrata i u kontaktu sa kiseonikom burno sagorevaju. U ovim slucajevima može doći do laksih i tezih povreda lozaca ili zapaljenja kotlarnice. Zato se vrata otvaraju na već opisan način i po mogućstvu sto pre posle funkcije ventilatora koja se zove “provetravanje”.

8.3. Održavanje kotla



Svakodnevno održavanje kotla odnosi se na izbacivanje pepela iz prostora između poda i cevnog rosta. Ukoliko tu postoji velika količina pepela gorivo ne dobija veliku količinu vazduha za sagorevanje. Obratiti pažnju da izlaz vazduha iz ventilatorskih kanala uvek bude bez smetnji.



Na svakih sedam dana kotao treba detaljno ocistiti, tako što se skine poklopac oplate na krovu i spoljni i unutrašnji poklopac na kotlu i kroz otvor na krovu kotla priborom za ciscenje treba skinuti garez i katran sa svih unutrasnjih površina kotla. Tada treba izvaditi i turbulatore (usmerivace dima) i takodje ih ocistiti. Uraditi i ciscenje lozista i to kroz gornja i donja vrata. Svaki milimetar katrana na unutrasnjoj površini kotla je 5% slabije provodjenje toplote.



Naročito je bitno redovno vaditi iz kotla i čistiti turbulatore. U suprotnom dolazi do situacije da je turbulatore nemoguće izvaditi iz kotla a pepeo ih je potpuno blokirao tako da nema prolaska dimnih gasova.

Na svaki sedam dana treba ocistiti i ventilator. Do njega se dolazi skidanjem limene zastite koja je spojena sa limenom izolacijom kotla elasticnom vezom. Samo ciscenje ventilatora nikako ne raditi vodom vec mehanicki nezno po turbine, ilipneumatski.

Ukoliko u toku rada dodje do kondenzacije, kondenz obavezno ocistiti i kotao iznutra premazati baznim sredstvom za ciscenje ili bar kretnim mlekom. Na ovaj nacin neutralisace se kiseline koje su ostale u kotlu.

Na kraju greje sezone kotao obavezno detaljno ocistiti i izvršiti neutralizaciju kiselina na vec pomenuti nacin. Sve otvore zatvoriti da ne dodje do cirkulacije vazduha kroz kotao jer i tako moze doci do pojave vlage u kotlu.



Održavanje kotla je jedan od najbitnijih faktora za duzinu radnog veka kotla. Kotao ne sme da saceka narednu sezonu grejanja neociscen i bez neutralizacije kiselina

9. Kratko uputstvo za korisnika automatike

- Uključiti glavni prekidač



- Pritisnuti taster  i držati 5 sekundi.



- Prekid rada kotla na pelet vrši se pritiskom na taster  i držajem 5 sekundi.

8.1. Promena jačine ventilatora u radnom režimu



8.2. Promena zadate temperature u kotlu



8.3. Kako očitati temperaturu vode u akumulatoru ili bojleru (ukoliko sistem poseduje akumulator tople vode ili bojler)



8.4. Kako očitati temperaturu dimovodnih gasova



8.5. Ulazak u skriveni meni



- Pritisnuti taster  i držati, odmah zatim pritisnuti taster  i držati oba taster 5 sekundi. Odmah po ulasku u skriveni MENI na displeju piše **CL 00**. To je prvi parametar.



- Za povratak korak nazad, koristite tester .

AUTOMATSKO UPRAVLJANJE KOTLOM

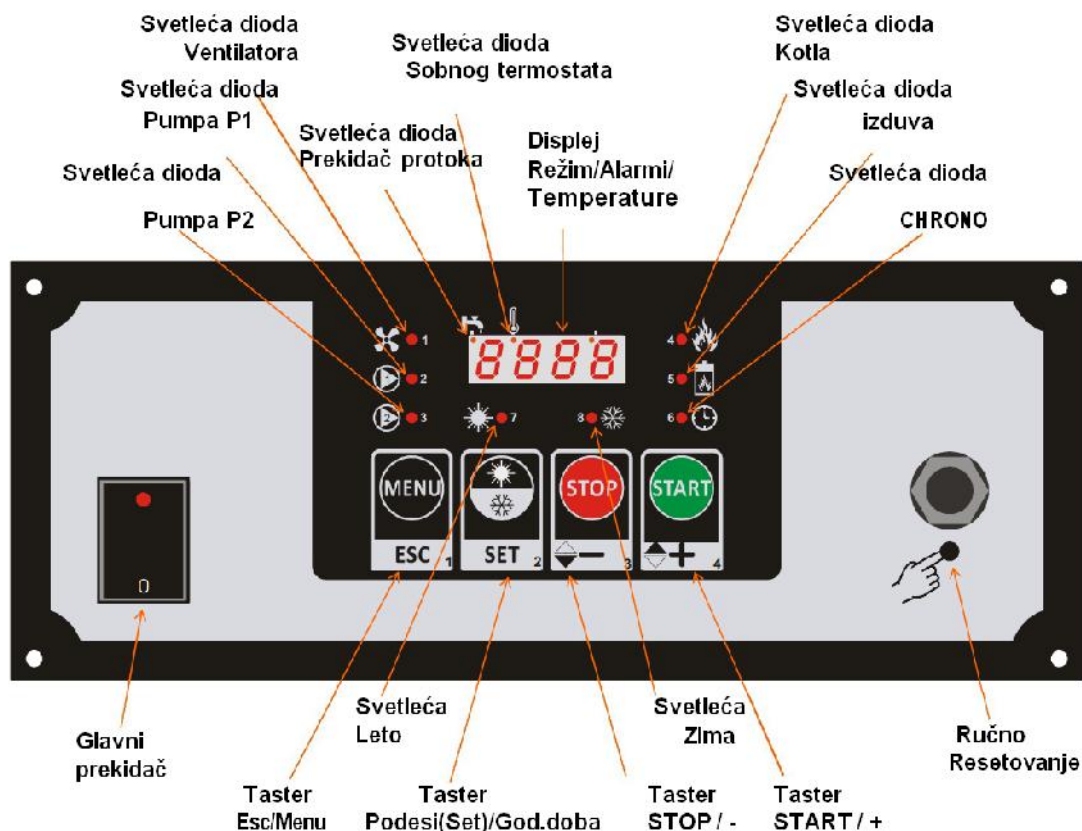
Sve funkcije koje obavlja automatika izvršavaju se na osnovu dve ulazne informacije a to su temperatura vode u kotlu i temperatura dimnih gasova na izlazu iz kotla.

8.6. Kontrol panel

Komandni panel sačinjavaju:

Glavni prekidač, dugme sigurnosnog termostata, displej, grupa komandnih tastera (dugmića), grupa svetlosnih dioda pokazivača

Sledeća slika je prikaz kontrolnog panela.



9.6.1. Komandni tasteri

U DONJEM DESNOM UGLU SVAKOG KOMANDNOG TASTERA OZNAČEN JE BROJ.

- **START/+ KOMANDNO DUGME 4** : Uključuje rad sistema (ON) kada se drži neprekidno 5 sekundi. Pritiskom u **Meniju (Menu)** povišava vrednost parametara.
- **STOP/- KOMANDNO DUGME 3** : Isključuje rad sistema (OFF) kada se drži neprekidno 5 sekundi. Pritiskom u **Meniju (Menu)** snižava vrednost parametara.
- **SET/Sezona KOMANDNO DUGME 2** : Kada se neprekidno drži pritisnutim 5 sekundi bira godišnje doba Leto/Zima. Pritiskom u **Meniju (Menu)** menja prikaz od koda parametara do vrednosti i odobrava se sačuvanje novog podešenja.
- **ESC/Menu KOMANDNO DUGME 1** : Ovim tasterom se ulazi/izlazi iz **Menija (Menu)**. Ukoliko menjate podešavanja i pritisnete ovo dugme, promene u podešavanjima neće biti sačuvane.

NAPOMENA:

U režimu **Isključen (OFF)** ili u režimu **Gašenje** možete resetovati prikaz Alarma pritiskom na tastere + ili -, ali ako je uzrok alarma i dalje prisutan alarm će se ponovo uključiti.

9.6.2. Svetleće diode

1. **Svetleća dioda Ventilator:** UKLJUČEN kada je ventilator za pomaganje sagorevanja radi.
2. **Svetleća dioda Pumpa P1:** UKLJUČEN je kada pumpa P1 radi. **TREPĆE** kada je pumpa P1 isključena od strane sobnog termostata.
3. **Svetleća dioda Pumpa P2:** UKLJUČEN je kada ventil/pumpa P2 radi. **TREPĆE** kada je pumpa P2 isključena od strane sobnog termostata.
4. **Svetleća dioda Kotao:** UKLJUČEN kada je temperatura vode u kotlu ispod vrednosti **T-KOTAO[A03] – ModulacijaDelta1[A05]**. **TREPĆE** kada je temperatura vode u kotlu iznad zadate temperature. **ISKLJUČEN** kada je temperatura vode u kotlu iznad temperature **T-KOTAO[A03]**.
5. **Svetleća dioda Izduv:** UKLJUČEN kada je temperatura izduva iznad **T-IZDUV-UKLJ[F18]**. **TREPĆE** tokom režima predgašenje(**Vreme predgašenja[t06]**)
6. **Svetleća dioda Chrono:** UKLJUČEN kada je ulaz **Chrono** zatvoren.
7. **Svetleća dioda Leto:** UKLJUČEN kada je izabrano godišnje doba Leto.
8. **Svetleća dioda Zima:** UKLJUČEN kada je izabrano godišnje doba Zima.
9. **Svetleća dioda protok prekidača:** UKLJUČEN kada je priključak ulaza protok-prekidača zatvoren.
10. **Svetleća dioda sobnog termostata:** UKLJUČENA kada je priključak ulaza sobnog termostata zatvoren.

9.6.3. Display

· Display\Režim\Alarmi\Temperatura:

Tokom rada sistem prolazi kroz razne faze o čemu obaveštava i korisnika odgovarajućim natpisima na displeju. Vrlo bitna obaveštenja iz domena bezbednosti, a to su situacije kada sistem prekoračuje granične temperature, takođe se pojavljuju na displeju.

Na displeju se očitavaju I sve temperature vezano za vodu u kotlu I dimne gasove.

	= Isključen (OFF)
	= Paljenje
	= Ponovno paljenje
	= Modulacija 1
	= Modulacija 2
	= Mirovanje
	= Sigurnosni režim
	= Isključen sistem sa Alarmima

Ukoliko je alarm uključen, Displej će pokazati alternativne kodove-grešaka:

ES_c = Otvoren je priključak za ručno resetovanje

CALd = Prekoračenje temperature vode u kotlu

R_{cc}F = Ne uspelo paljenje

SPAc = Slučajno gašenje

10. Garancija

1. Radijator inženjering pokriva različite garancijske periode za različite delove (što je navedeno u daljem tekstu) samo ako su ispunjeni sledeći uslovi garancije:

- 1.1. Kotao mora biti priključen po navedenim hidrauličkim šemama iz tehničkog uputstva, naročito obratiti pažnju na sigurnosne ventile, termičko osiguranje oticanjem, mešajući ventil za zaštitu hladnog kraja kotla odnosno protiv kondenzacije, opseg radnog pritiska kotla, opseg radne temperature kotla, uslove u kotlarnici itd.
(videti tačku 3 i 7. Tehničkog uputstva)
- 1.2. Kotao mora biti priključen na dimnjak propisanog poprečnog preseka, karakteristika izolacije i visine. **(videti tačku 3.3 . Tehničkog uputstva)**
- 1.3. Dimovod od kotla do dimnjaka mora biti izveden po tehničkom uputstvu.
- 1.4. Korisnik mora da se pridržava navedenih uputstava o korišćenju i održavanju.
(videti tačku 8 i 9. Tehničkog uputstva)

2. Garancijska izjava

Izjavljujemo:

- da proizvod ima propisana i deklarirana kvalitetna svojstva.
Obavezujemo se, da ćemo na zahtev kupca ako pravovremeno u garancijskom roku podnese zahtev za popravku, o svakom trošku izvršiti sve popravke kvarova, tako da će proizvod raditi u skladu sa deklariranim svojstvima,
- da će proizvod u garancijskom roku raditi besprekorno ako se budu poštovala uputstva za upotrebu, rad i montažu,
- da ćemo u garancijskom roku biti spremni da otklonimo sve kvarove na proizvodu i držati na zalihama sve potrebne rezervne delove,
- **garancijski rok počinje od DANA KUPOVINE I TRAJE 60 MESECI ILI 72MESECA OD DATUMA PROIZVODNJE (datum proizvodnje nalazi se na nalepnici sa zadnje strane kotla)**
- **garancija važi ako je garantni list overen od strane prodavca i ako je upisan datum kupovine i priložen račun.**

3. Garancijski period od dve godine važi za sledeće delove:

- ventilator,
- automatiku kotla sa sigurnosnim termostatom i ostalim elektro delovima,
- sondu dimovodnih gasova,
- sondu temperature kotlovske vode,
- turbulatore,
- elektro konektore,
- izolacijske materijale na vratima i otvorima za čišćenje.

4. Garancijski rok ne važi:

- kod kvarova koje je načinio kupac zbog nestručnog rukovanja proizvodom,
- kod mehaničkih kvarova načinjenih prilikom transporta i prilikom korišćenja (čvrsti predmeti),
- ako je proizvod instaliran nestručno, suprotno važećim propisima iz tog područja,
- ako je kupac koristio proizvod iznad deklariranih svojstava i u normalnim okolnostima,
- ukoliko se utvrdi da hidraulička šema nije urađena po preporukama firme „Radijator inženjering”,
- ukoliko se utvrdi da kotao u toku korišćenja nije redovno održavan i čišćen,
- na opeka u ložištu,
- na livena rešetkasta vratanca,

5. Garancijski rok prestaje da važi:

- ako se ustanovi da je kvarove otklanjala neovlašćena osoba ili neovlašćeni servis,
- ako kod popravke nisu bili upotrebljeni i ugrađeni originalni delovi,
- kad ističe garancijski rok.

6. Kod prijave kvarova obavezno je dati sledeće podatke:

- naziv i tip proizvoda,
- datum kupovine,
- fabrički ili radionički broj kamina,
- kratak opis kvara, odnosno nedostatka,
- tačnu adresu i kontakt telefon, mejl.

CONTENTS:

1. Important warning;
2. Description of the boiler;
3. Assembly;
 - 3.1. Measures and safety devices for boilers;
 - 3.2. Boiler room;
 - 3.3. Connection to the chimney;
4. Cross-section of FK Boiler with a description of the boiler elements;
5. Schematic connection of automation;
6. Table of technical data;
7. Hydraulic scheme;
8. Boiler Operation and Maintenance;
 - 8.1. Operation start of the solid fuel boiler;
 - 8.2. Adding fuel during operation of solid fuel boiler;
 - 8.3. Maintenance of boiler;
9. Short instruction for users of automation.
10. Warranty

GENERAL WARNING

- After removing the packing material you should be assured about the completeness of the delivery, and in case of the lack, you should contact the seller who sold the heating boiler
- Heating boiler must be used exclusively for the purpose foreseen by the manufacturer. Any responsibility by the manufacturer is excluded for the damage caused by the persons, animals or things, in case of mistakes in assembly, regulation, maintenance and improper use.
- In case of leakage of water the device should be switched off the electric power supply, water supply should be shut and authorized servicing department or authorized assembly operator informed.
- This manual is the constituent part of this unit and must be kept with attention and the unit itself **MUST** always be watched, and in case of the change of the owner or user, or in the case of connecting to another installation system. In case of a damage or being lost a new copy should be asked from the authorized seller.

1. Important warnings

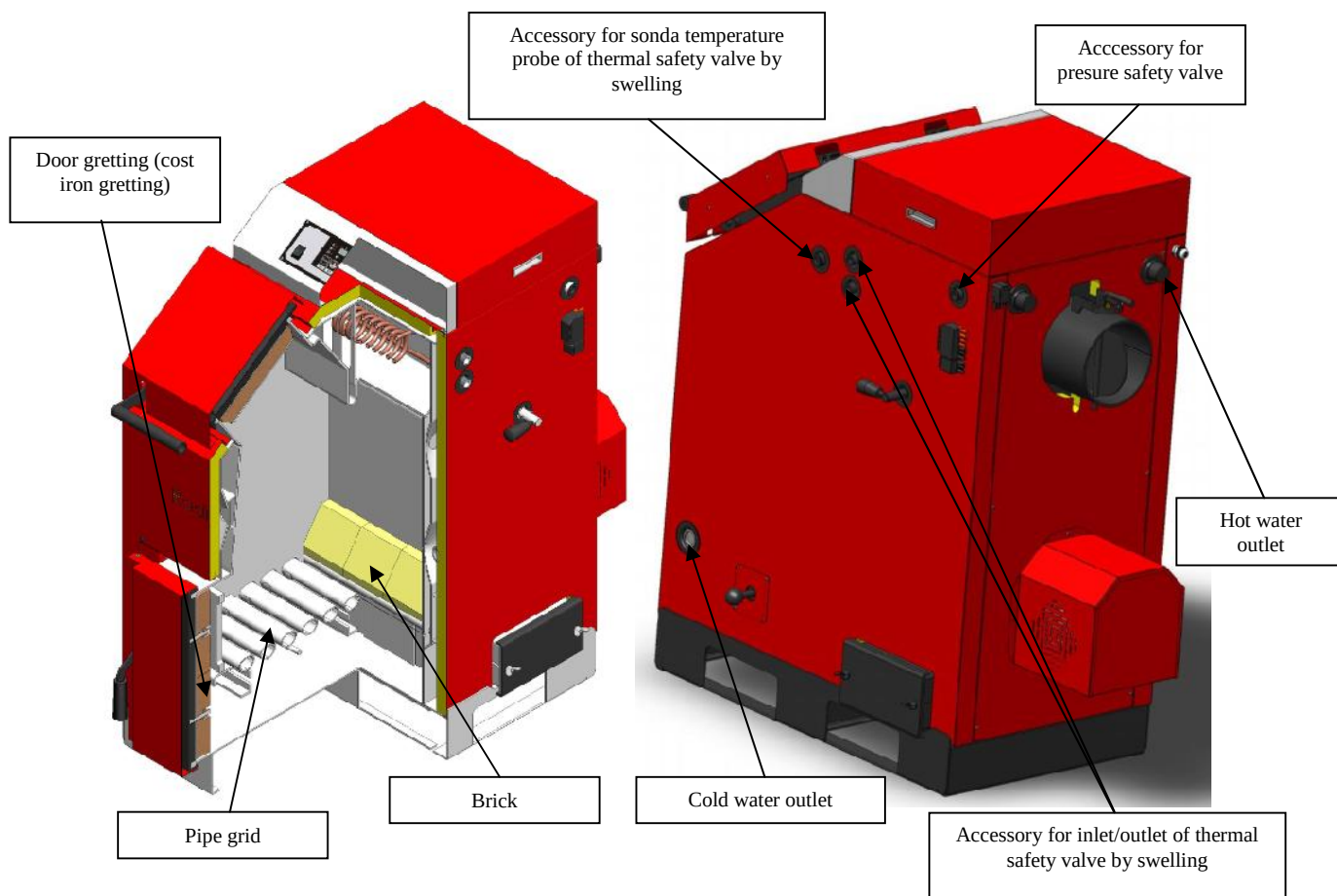
As a reminder, the use of the solid fuel heating boiler having the contact with electric power and water asks for the respect of safety measures such as:

- It is forbidden to use the heating boiler by children and persons with limited capabilities without attendance
- It is forbidden to use boiler installations operating at temperatures higher than 110 ° C, and pressure greater than 3 bar.
- It is forbidden to use the easy inflammable fuels (alcohol, oil) for a faster firing of wood
- It is forbidden to place easy inflammable materials close to the unit and firing door. Ashes must be put aside into the closed and non-firing containers.
- It is forbidden to burn the waste materials and materials whose combustion causes the flame or explosion danger (Example: plastic bags, sawdust, coal dust, mud etc.)
- Any intervention by technical operator is forbidden or cleaning before the heating boiler is disconnected from the electric supply, so as the switch should be positioned to “0” – “disconnected”.
- Any change in safety elements is forbidden.
- Valves’ ventilation openings in the room where the heating boiler is placed is forbidden. Ventilation openings are necessary for proper combustion.
- It is forbidden to expose the heating boiler to atmospheric negative influences. The heating boiler itself is not foreseen for exterior assembly and does not have the ante-freezing system.
- It is forbidden to switch off the unit if the outer temperature can fall below ZERO (freezing danger).

2. Description of the boiler

The solid fuel heating boiler of the series “FK” is in steel three-fold drought construction, and for its construction carbon sheets for manufacture of heating boilers are used of the quality 1.0425 EU Standard, i.e. P265GH EU Standard EU II. In the base of the fire place there is the pipes lattice manufactured in seamless pipes for heating boilers of the quality St.35.4. Lattice door in the opening for cleaning and firing is manufactured in gray iron. In the rear part of the firing place there are the bricks made of refractory material which accumulates the heat.

All steel items of the heating boiler are cut by means of the most up-to-date laser procedure and are welded in the top quality welding technology including robotics. Testing and certificate obtaining has been performed in accordance with European norms EN303-5.



2. Assembly

Solid fuel heating boiler is delivered with outer lining containing the insulation 30 mm thick.



The unit is equipped with the fan and automation system and both devices use the power supply of 230V, so that improper assembly and incautious maintenance can endanger human life by means of electric current shock.



Solid fuel heating boiler, even with forced draught, should be assembled according the valid norms and legal regulations. Any change either in mechanical construction or electric system shall be understood as the violation of the guarantee conditions and will lead to its violation.



In an assembly the boiler should be properly protected against the excessive overpressure and overheating.



For the proper installation the plumber/installer is responsible.



The manufacturer (Radijator inženjering) does not take any responsibility coming from the incorrect installation of the boiler.

Basic requirements that should be delivered during assembly are:

- the unit must be connected onto the open heating system
- the unit must be located at a safe distance from easy inflammable materials
- Electric power supply of the unit is 230V and 50 Hz and the connection of all items belonging to the unit should be performed according to the valid regulations, and the connecting itself is done by the authorized person.

Connection to the chimney is also performed according to the bounding regulations as well as to the recommendations of the manufacturer which is clear in the text to come.

3.1 Measures and safety devices for boilers

For safe operation of boiler it is necessary to assemble and maintain the following elements in working condition:

- Pressure Safety valve (Figure 1)



Figure 1



Figure 2

- Pressure safety valve must be of nominal diameter of 1/2 inch calibrated to a maximum of 3 bars.

This security element which belongs to the group of pressure limiters must be of such construction to withstand short-term overdrafts and temperatures and pressure as well as the content in the liquid glycol for heating.

Usually in the same place the vent (Figure 2) and the pressure gauge are connected so that these three elements together constitute a security group and can be mounted over T" connector.

This safety element must be subjected to periodic re-calibration , of which the investor, i.e. the user of the boiler must have valid documentation.

- Safety valve must be mounted on the highest point directly to the boiler and the boiler without any pipeline or any other elements in between. For this purpose there is a specially designed connector (see picture). Any reduction in diameter of the connector is prohibited.
- The vent ie. the exhaust of safety valve must be of pipes with a diameter at least equal to the nominal diameter of the exhaust part of valve. Also, it is allowed to use maximum one bend of the radius $r > 3d$.
- The safety valve must have a nameplate and the following information on it
 - Name of manufacturer
 - Designation of type of safety valve / year of testing
 - Nominal flow rate
 - Data for which thermal effect the safety valve is set
 - The highest opening pressure 3 bars

It is obligatory to check the correct functioning at regular intervals as well as the re-calibration by certified companies. These responsibilities are carried out in

accordance with the law of every country in which the boiler is assembled. Always keep the written documentation of the last calibration data for the safety valve.

- On the return line assemble at least another pressure safety valve.

- The valve of thermal safety by swelling (Figure 3)



Figure 3

This safety element also has a role of a limiter of temperature. Below it will be marked with the abbreviation VTO.

- In some extremely dangerous situations in the transformation of water into vapor is such that the pressure safety valves are not sufficient to ensure the safety of the hydraulic system. For this reason, the installation of VTO is mandatory. Depending on the regulations of the countries in which the boiler is assembled, it is necessary to install the VTO only for the determined higher powers or for each power of a boiler it is the obligatory to instal the VTO.
- Place the installation is shown in the Assembly diagram of boiler onto the installation in Figure 4
The boiler is supplied with a copper coil so it is necessary to use the VTO with the exchanger, as shown in Figure 4. Cold sanitary water is brought to the VTO. When the VTO-probe has the information that the temperature is over 95 degrees the VTO is opened and water flows through copper coil. After some time the temperature of water in boiler returns to its normal state.
- One connection of coil is used for VTO and the other for draining of water that has passed through the coil. The choice of either connection; for VTO or for the discharge is irrelevant. It is necessary to follow the installation instructions provided by the manufacturer of the VTO.
- Be sure to check up, in certain periods of time, the functioning of the VTO.

As stated above one end of the VTO is for the mounting on the exchanger of the boiler, and the other is supplied with cold water under pressure. It is particularly important that the water flow is unobstructed even when the electricity is switched off.

⚠ If it is impossible to provide the inflow of cold sanitary water at the time of electricity switch off, the boiler must be connected onto the open system.

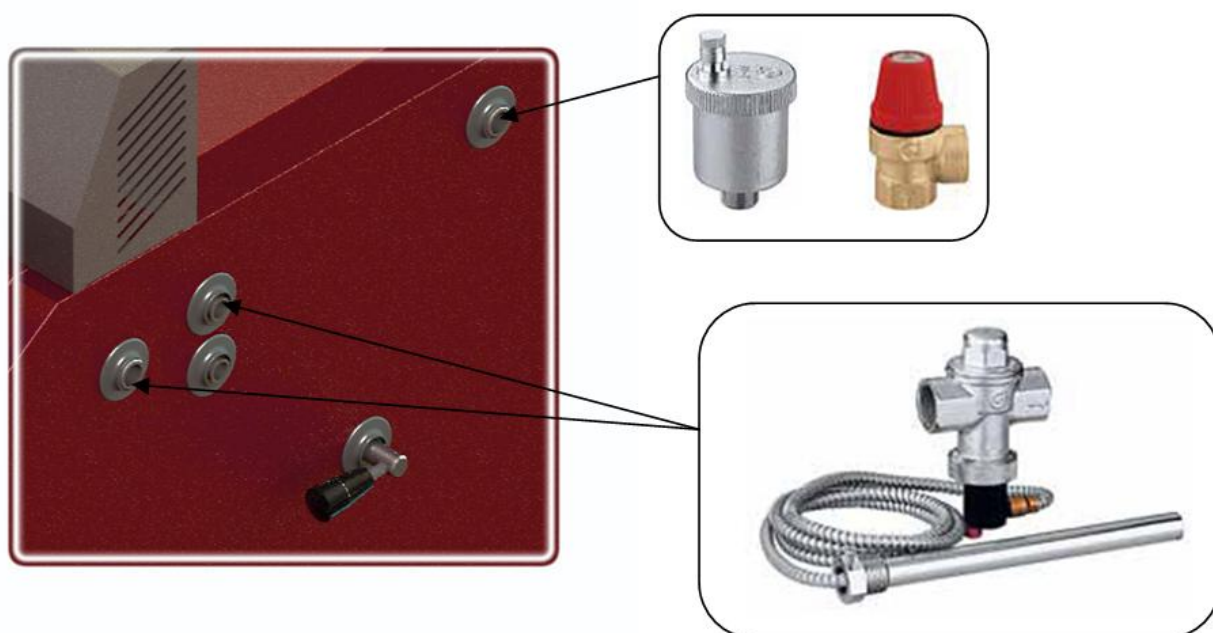


Figure 4. Installation of safety elements

Thermostats in the automation of the boiler (Figure 5)

- Within the automation itself that leads the combustion process and influences the work of two cycles of heating, there are two thermostats. Both are of similar construction as the thermostat shown in Figure 6 and they have safety functions as limiters of the temperature of water in the boiler. Because of the safety role in the functioning of the boiler, both thermostats have the independent probes for measuring of water temperature. The first thermostat is the so-called „working thermostat” work and it serves to limit the temperature to a level the user wants. Another thermostat is the „safety thermostat” because it stops the operation of the fan which favors the flame, and adds a new energy. Safety temperature is limited to 95 degrees Celsius.

It is very important to connect the pump for heating through automation for safety reasons. When the temperature of water in the boiler reaches the critical value of 95 degrees the fan stops working, but the pump is necessarily switched on to exchange the heat of water through radiators.

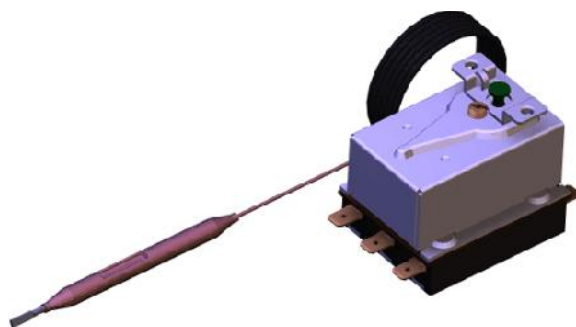


Figure 5

3.2 Boiler room

Boiler room must be secured against freezing.

The support surface of the boiler in the boiler room must be of non-combustible material. Recommended distance of all four sides of the boiler in relation to the boiler walls or other solid body (water heater, etc..) are shown in **Figure 6**. These values allow a safe distance access when firing, sufficient space for cleaning and easy access to fan and valve for filling and emptying. Boiler at its left hand side should be away from the wall 100 to 200 mm i.e. as much as needed for the connection of valves for thermal safety by over flow. If the valve is not to be installed then the space can be smaller. The flap handle for firing is removable and can be placed either on the left or right side of the boiler. The space on the right side of the boiler, which is recommended to be at least 800mm from the silo is important because after cleaning the boiler the user then goes and pulls out the ashtray from the back of the firebox. Boiler room must have sufficient ventilation holes for fresh air as well as for the outlet of the exhaust air.

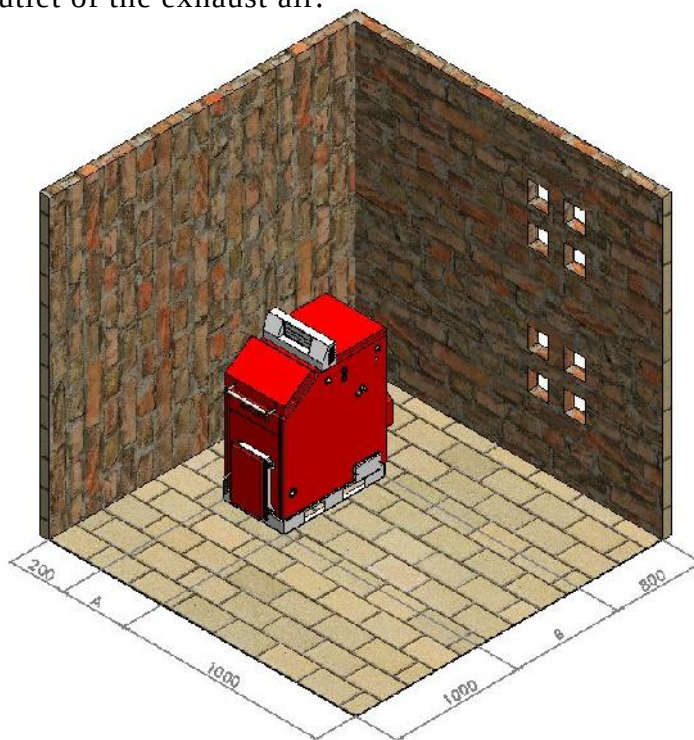


Figure 6. Positioning of boiler in the Boiler room

Total space of this openings is minimum 150cm² from the boilers of the power of 50kW and for the power over 50kW the space must be larger for another 2cm² per 1kW.

$$A = 150 \text{ cm}^2 + \frac{2 \text{ cm}^2}{\text{kW}} \times (\sum Q_n - 50 \text{ kW}) \quad \sum Q_n = \text{possible power of over 50 kW.}$$

The lack of sufficient ventilation in the boiler room can cause more problems in the work of boiler. Main problem is the inability to achieve high output water temperature i.e. the lack of maximum power which leads to condensation in the boiler.

- Take into account the required minimum space required for access and security elements to carry out cleaning operations
- Determine whether the degree of electrical protection is in accordance with the characteristics of the room where the boiler will be located
- No exposure to atmospheric influences. The boiler itself is not anticipated for outdoor use and contains no anti-freeze system.
- It is forbidden to close the vents in the boiler room in which the openings are necessary for proper combustion.

3.3 Connection to the chimney

The boiler TKAN works on forced draft, but the rules should be respected as if the selection of the chimney were for the boiler working on over-pressure in the combustion chamber some other fuel, like oil fuel, for example. Otherwise the problems may occur in the work, especially in the ignition phase and in the mode of solid fuel.

It is recommended that the diameter of the chimney is at least equal to the diameter of the flue has, and minimum height of 7 to 8 meters, depending on the coverage of the chimney by some other high buildings next to it.

The most optimal positioning of the boiler onto the flue outlet is such that connecting the center of the exit gases from the boiler flue and chimney connection to the center is slightly raised (up to 3 %) (**see Figure 7**).

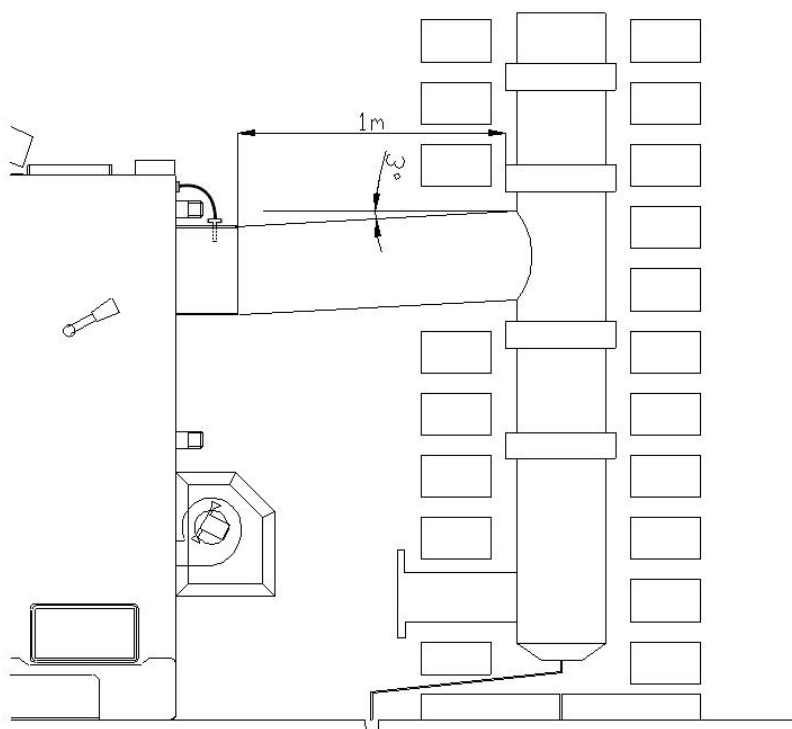


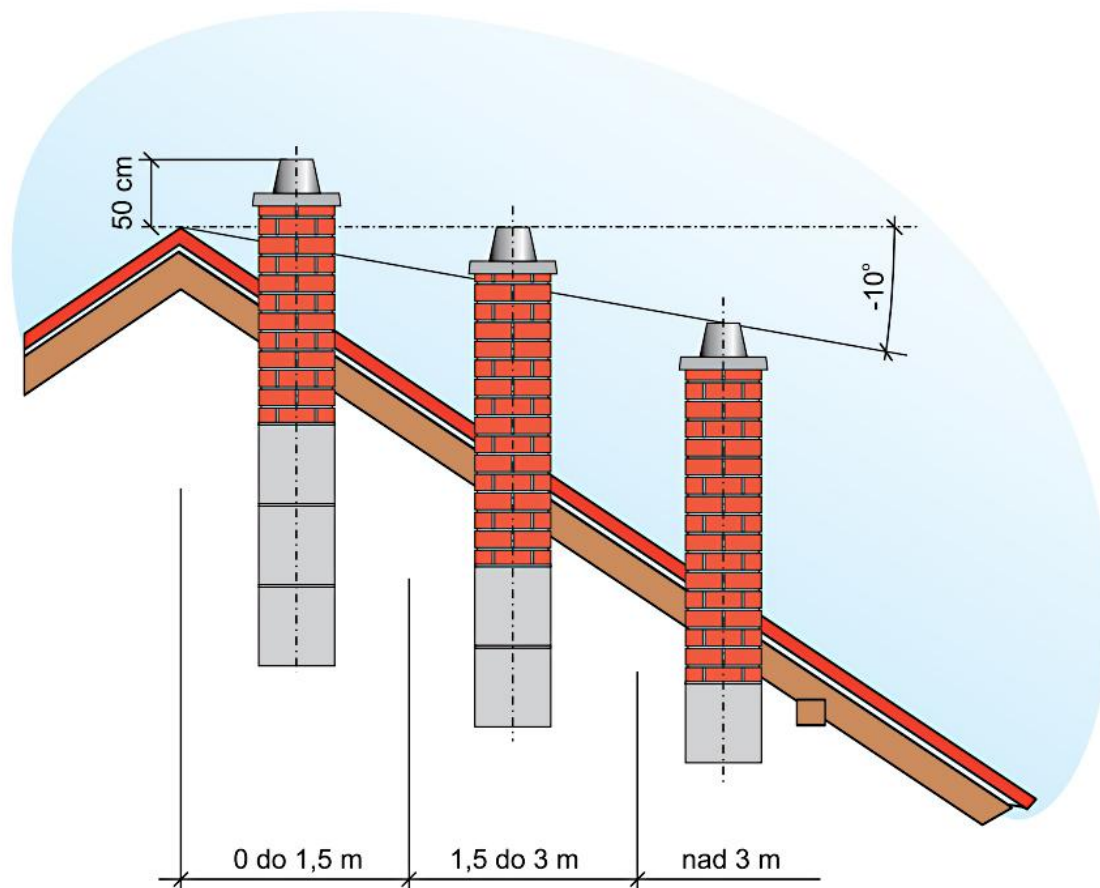
Figure 7. Connection to chimney

If possible, arcs should be avoided, but if not possible, then the maximum number of arcs is 2. The fume channel from the boiler to the chimney, should desirably be insulated, specially if it has arcs and longer sections.

On the smoke pipe, approximately 100mm from the flue outlet from boiler, a hole should be drilled and a temperature gauge should be mounted for flue gas temperature measurings. Without information about the temperature of flue gases there isn't the automatic mode of the boiler.

The chimney itself should be made of ceramic pipes, and around them there should be the insulation of 3- 5cm thickness and the outer layer is of the bricks or special elements. If the chimney is not from ceramic pipes but of bricks, the light opening area of such chimney shall be 30 % higher than the surface of this ceramic pipes chimney. Minimal sectional dimensions of both chimneies and the minimum heights are given in table 1.

The chimney must have a door for cleaning and it must be well sealed. Chimney outlet on the roof must be according to certain regulations. There are two cases: if the angle of the roof is less than 12° and if the roof angle is bigger than 12°. For angle less than 12° the height of the chimney above the roof is 1 m and for the larger than 12°, then look at the sketch.



If you think that the chimney is too strong and too much cold air passes through the boiler, at the exit of the boiler there is a valve which can reduce the flow of exhaust gases. The chimney should be cleaned regularly or at least once a year.

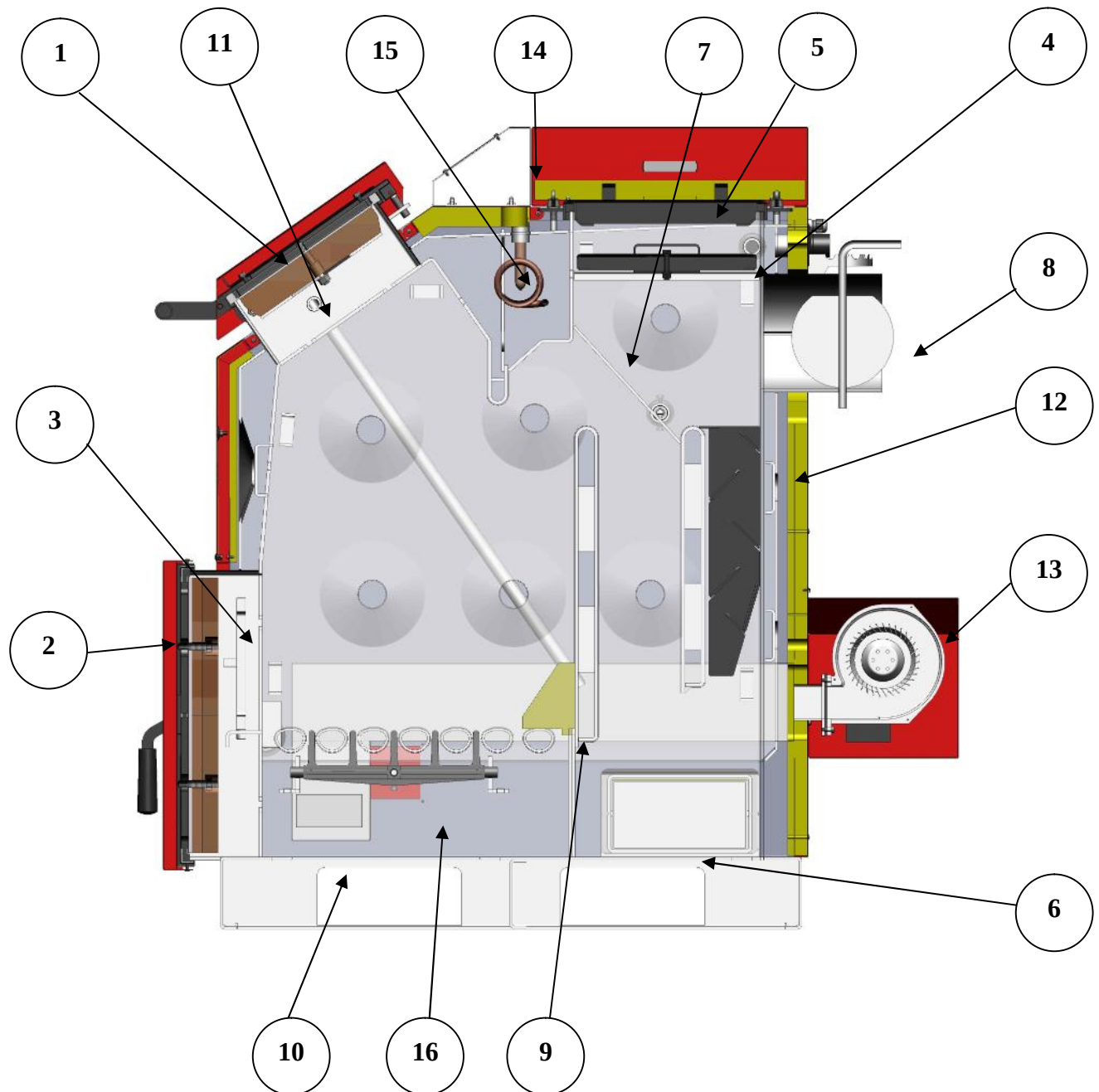


If the chimney is not of proper height, cross section, or if it is not enough clean as possible, then the complications in the work of boiler are possible. First, of all it is not possible to achieve the high temperature regime of work, i.e. there is not the maximum operation power, and the consequence of that is the occurrence of condensation which affects the life of the boiler.



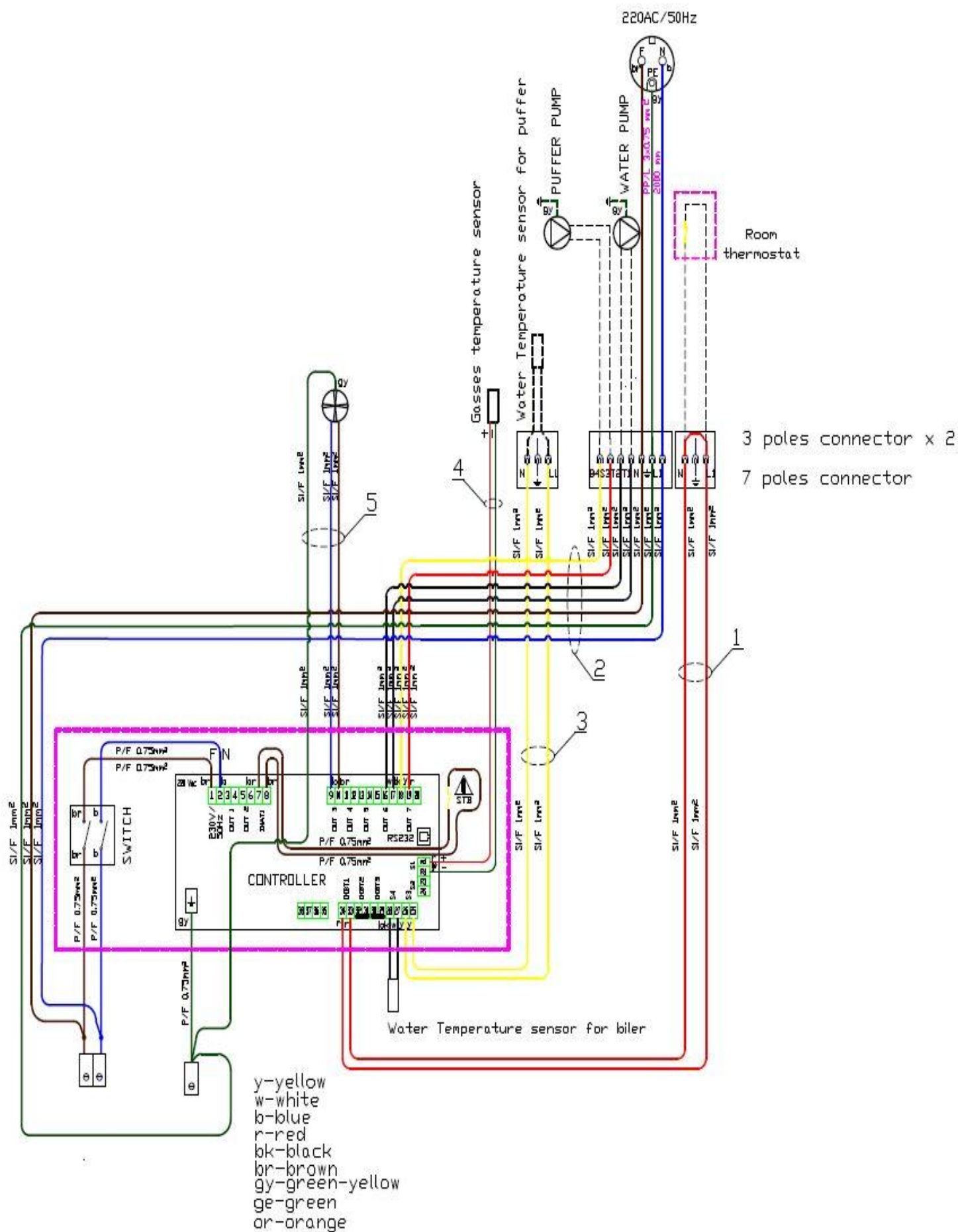
Weak/poor chimney is the main reason when during the ignition of the boiler or during the operation there is the appearance of smoke on the upper or lower door, especially at higher fan speeds.

3. Cross-section of FK Boiler with a description of the boiler elements



1. Upper door for wood loading	9. Brick
2. Lower door for firewood and cleaning	10. Channel to air
3. Door gretting (cost iron gretting)	11. Pipe for secondary air
4. Inside cover for cleaning	12. Turbulators
5. Outside cover for cleaning	13. Fan
6. Lateral lower cover for cleaning	14. Automatic
7. Flap for the working position and the position of the ignition	15. Copper spiral for thermal security
8. Flap of chimney	16. Cleaner

Schematic connection of automation



All lines that are displayed in the intermittent form in the diagram of external connections are the conductors which should be installed by the technician when connecting the external devices onto the automation system of the boiler. All the connections of the additional devices are performed by the technician through three connectors located at the rear of the boiler. Two connectors are three-pole connectors while one is seven-pole connector. One three-pole connector serves for the connection of the room thermostat as shown on the label the connector itself.



For the room thermostats it is important to be battery-powered on, i.e. they should not have any supply of the voltage of 220 V. On the thermostat for the connection NC is used (normally closed contact).

The second three-pole connector for connecting the probe for measuring the temperature in the battery or in boiler for domestic sanitary water. This probe is always supplied with the boiler. If the probe for measuring water temperature in the battery or in the hot water heater is not long enough it is possible to extend it with ordinary conductors.

Seven-pole connector is for connecting network cable and for the connection of the circulation pump and the battery pump i.e. of the heater for sanitary water.



The boiler can operate even if none of the pumps is connected, but manufacturer's recommendation is that, at least, the pumpa1 (central heating pump) because it has the function of a security element. It is switched on when the boiler water temperature exceeds 90 degrees Celsius.

The boiler is adjusted according to the default factory hydro installation as in Figure 8.

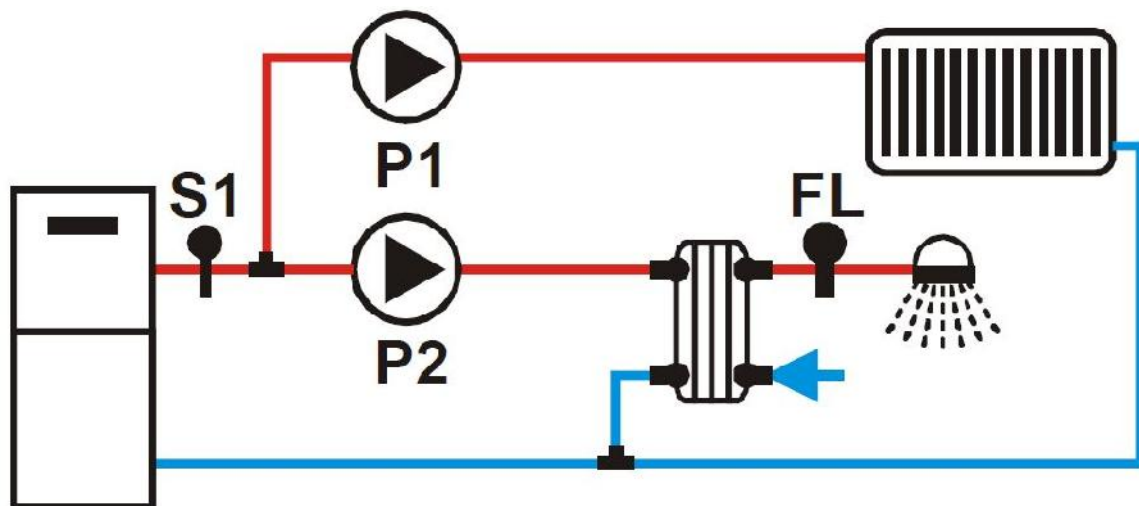


Figure 8.

It is obvious that there is only one measuring point S1 and that probe is already positioned. The second probe that is connected onto the connector on the back of the boiler, in this case, remains unused.

 We need not assemble the pump P2 which serves for the hot water. The parameter which determines the type of hydro installation inside the automation system is P37 and for this hydro scheme is P37 set to 1.

If we want to use automation to keep the process and the puffer warming up through the appropriate pump, then the hydraulic scheme should be as shown in Figure 10. The point of probe measuring for water temperature in the puffer is marked with S2.

In order to run operation of automation properly for the hydraulic connection and with the, then it is necessary to adjust the parameter P37 onto the value 4.

If we want the automation to keep the process of heating the sanitary water through the appropriate pump, then the hydraulic scheme should be as in Figure 9.

In order the automation system should keep the operation of that pump for heating the boiler with sanitary water, then it is necessary to adjust the parameter 37 onto the value 3.

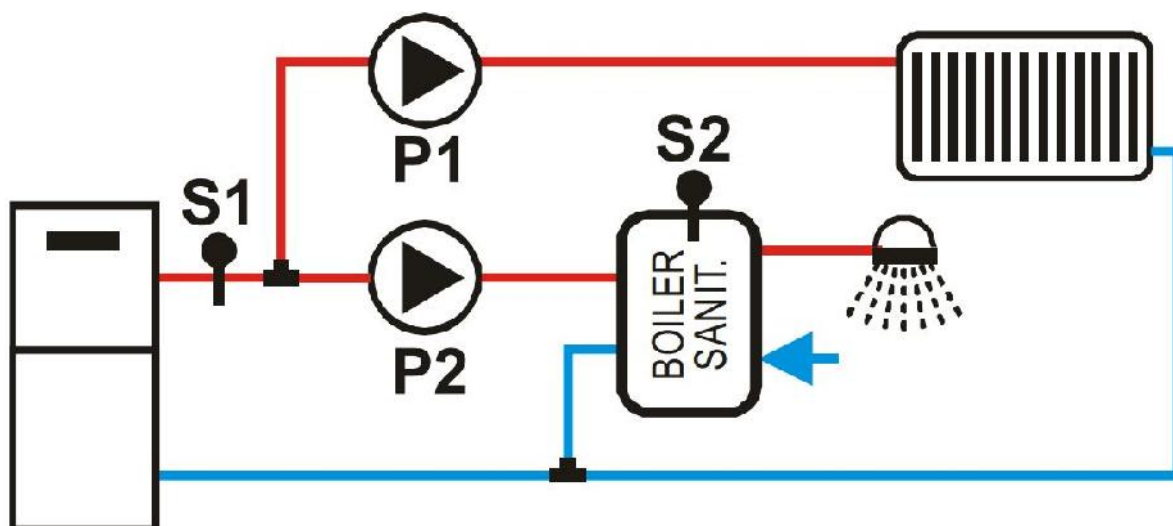


Figure 9.

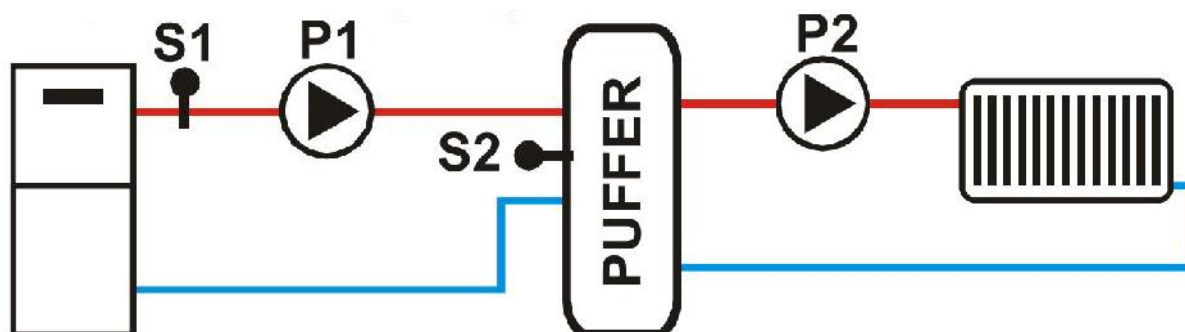
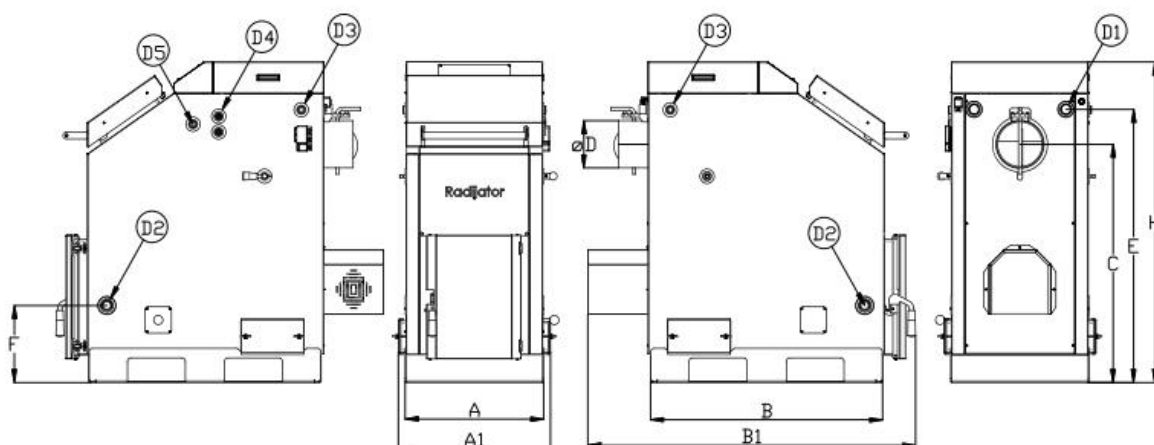


Figure 10.

4. Table of technical data



Type of boiler		FK1	FK2	FK3	FK4	
	mere					
Power	kW	15/23	25/33	33/40	40/49,5	
Working pressure	kPa	300	300	300	300	
Test pressure		450	450	450	450	
Volume of water in boiler	L-cca	55	72	87	100	
Weight of boiler	kg	282	374	428	453	
Necessary draft	Pa	17	18	20	22	
Max.temp.hot water	C☐	90	90	90	90	
Min.temp.cold water	C☐	60	60	60	60	
Volume of fuel in boiler	m³	0.08	0.09	0.13	0.16	
Efficiency	%	>85	>85	>85	>85	
Dimensions	A	mm	480	528	578	668
	A1		540	580	640	728
	B		790	885	955	965
	B1		1150	1280	1311	1340
	C		807	907	957	1107
	ØD		160	180	200	200
	E		940	1040	1072	1122
	F		290	294	304	302
	H		1162	1220	1274	1324
	D1	col	1"	1"	5/4"	5/4"
	D2		1"	1"	5/4"	5/4"
	D3		1/2"	1/2"	1/2"	1/2"
	D4		1/2"	1/2"	1/2"	1/2"
	D5		1/2"	1/2"	1/2"	1/2"



Accessories for safety devices are: D3,D4 i D5

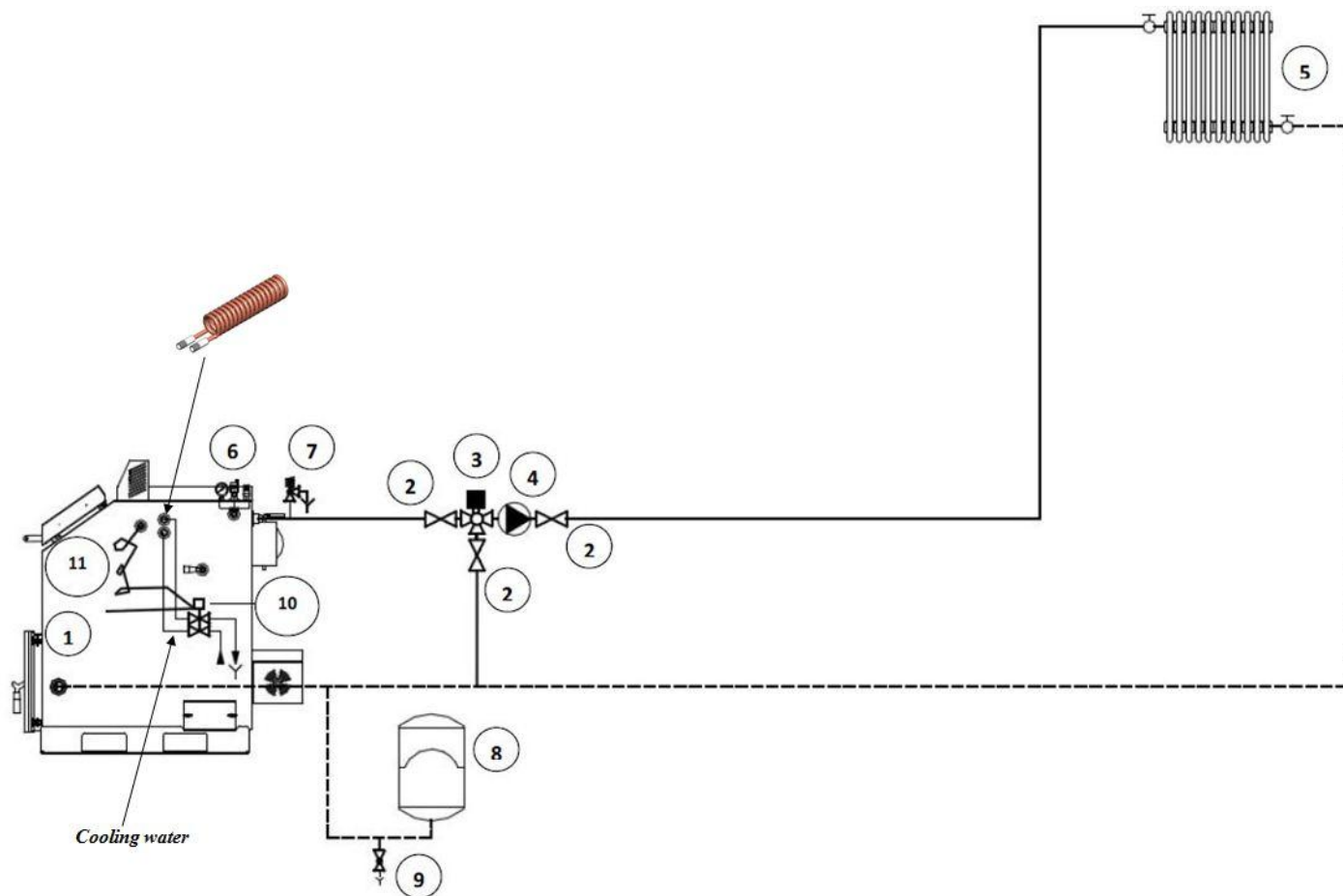
- D1 – hot water outlet;
- D2 – cold water inlet;
- D3 – Accessory for pressure safety valve;
- D4 – Accessory for inlet/outlet of thermal safety valve by swelling;
- D5 – Accessory for sonda temperature prube of thermal safety valve by swelling.

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e-mail: radijator@radijator.rs

5. Hydraulic scheme



Hydraulic scheme

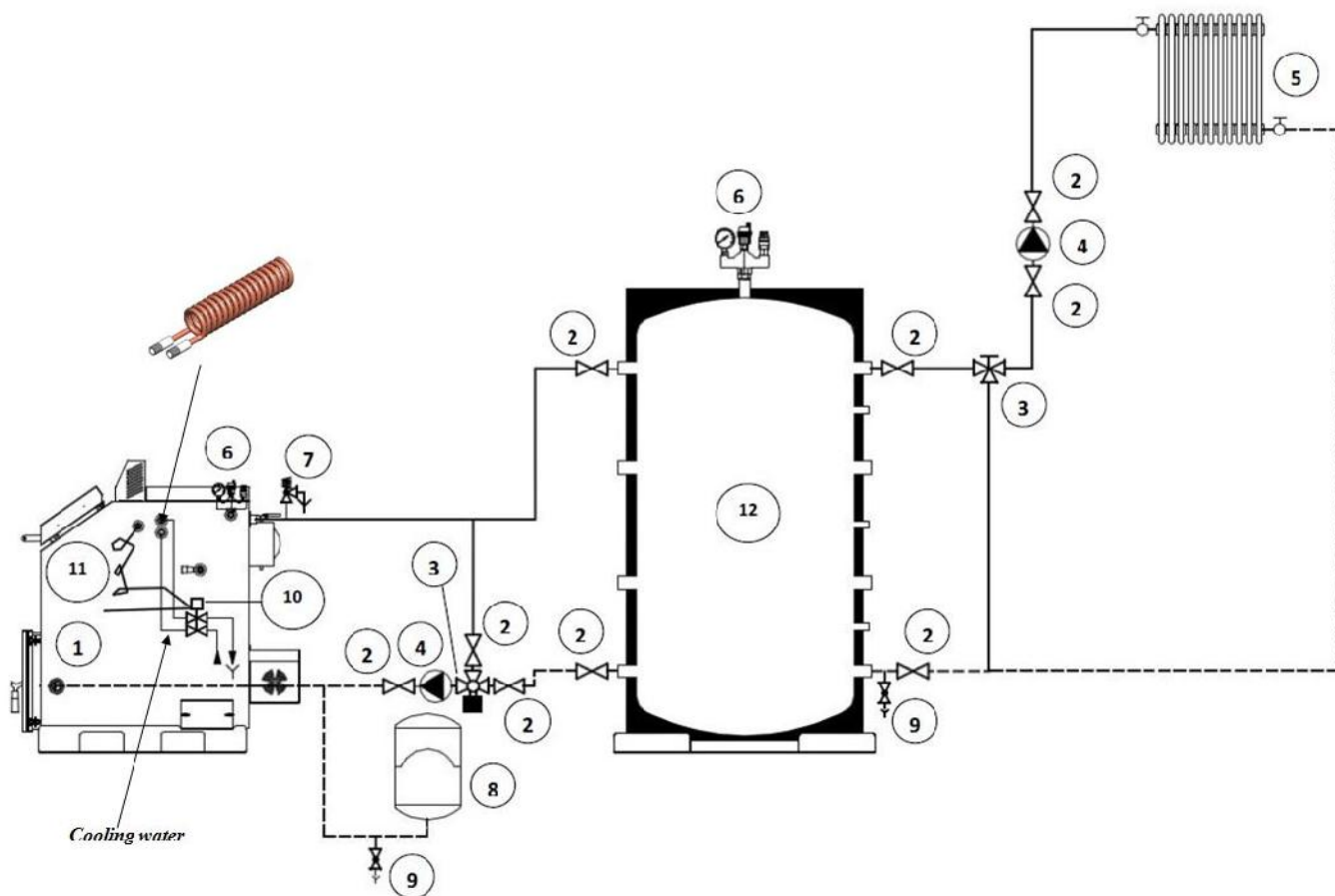
Description:

1. FK boiler;
2. Valve;
3. Mixing valve;
4. Pump
5. Heat exchanger;
6. Safety group;
7. Safety valve;
8. Expansive vessel;
9. Valve for filling/emptying;
10. Over heating temperature safety valve;
11. Sonda probe for safety valve.

 ***In an assembly the boiler should be properly protected against the excessive overpressure and overheating.***

 ***For the proper installation the plumber/installer is responsible.***

 **The manufacturer (Radijator inženjering) does not take any responsibility coming from the incorrect installation of the boiler.**



Hydraulic scheme with akumulator

Description:

1. FK boiler;
2. Valve;
3. Mixing valve;
4. Pump
5. Heat exchanger;
6. Safety group;
7. Safety valve;
8. Expansive vessel;
9. Valve for filling/emptying;
10. Over heating temperature safety valve;
11. Sonda probe for safety valve;
12. Akumulator.

8. Boiler Operation and Maintenance

Before the start of operation be sure that the entire installation, specially the boiler is well vented with no leaks.



Automation must not be switched on if you are not absolutely sure that all electrical parts and conductors are not in contact with water.



The boiler is not ignited if you have not looked inside it and at the outside sides to be sure there is no leakage of water from the boiler.



If there are direct valves from the boiler check whether they are open.



Check whether the safety devices on the hydro installation are correctly positioned and whether they are in the function mode.

Only when the user is sure of the previous facts he can be start the ignition of the boiler. Starting fire in boiler should be done according to the order of the following operations:

8.1. Operation start of the solid fuel boiler

The following procedure of boiler ignition and the start of automation system refers to the situation of first firing of the boiler after the installing onto the hydraulic system or when the boiler shuts down completely for thorough cleaning and and then it is re-started into the operation, with a note that then some steps are skipped.

1. Check whether the boiler is properly connected to the hydraulic istem. Specially verify whether the whole air is vented out of the boiler
2. Plug the mains supply into the network socket. Press the main switch of the automation system. Then the display starts and is visible and after a few seconds there should appear 'OFF'.
3. On the hot gas pipe, as close as possible to the boiler, drill the hole for the boiler flue gas probe. The opening should be in the upper zone so as not to produce the covering of the probe with ashes. Also, check the flue damper is not hitting the probe. Without the temperature probe for boiler flue gases the boiler can not work.
4. Inside the boiler there is a flap for directing the boiler flue gases in two regimes," the working position" and the „ignition“ regime. This flap is operated by means of the lever on the side of the boiler. Move the lever in the direction towards the chimney. Now the flap is in the position for ignition. It is the position - „ open " - in the picture „ Figure of the position of flap“ which is on the next page.

Also, the flap on the outlet of the boiler, i.e. on the flue gas passage should maximum be opened. It is the position in the Figure 1 „Figure of the position of the flap on the flue gas pipe“



Flue gas flap on the outlet from the boiler is under the direct effect of the hot flue gasses. Ako the boiler is operating for a long period of time this flap should be handled only with protective equipment for hands because of the possibility of burns.

5. Open the lower door, then the grid door. Put some material for ignition on the grate bars as paper and dry thin wood pieces. It is best to use chemical ignition units for firing being in the form of cubes for ignition of firewood. Make fire manually and wait for the fire to be intensive.

6. When we already have good, strong flame, add a bigger quantity of fuel than the first time but through the upper door. Close all doors and press the command button, 4,, "START". Hold the button until the display shows,, "ACC. This means that the automation entered the stage of ignition, the fan is started and there comes to the increase in temperature of flue gases.



When firing, make sure that firewood does not struck onto the upper door with great force, in which case it is ejected out of balance and returns to the closed position. Then the boiler operator can have the injuries.

After some time the boiler enters the normal operating mode and this is manifested in such a way that there are no messages on the display except for the current water temperature.

7. When the temperature of flue gases exceeds about 200 degrees Celsius, the flap inside the boiler with handle lever on the side, should be pushed towards the front or into the working position. Reading of temperature of the flue gases is done by briefly pressing the command button 1, then command button 3 and then the command button 2. On the display there will appear the temperature of flue gases. This is described in the instructions for fast handling of automation.

8.2. Adding fuel during operation of solid fuel boiler

During operation of the boiler it is possible to add the amount of coal or wood in it, but previously the work of blower fan should be stopped by pressing the "STOP" button (see Quick guide for automation).



When firing during the operation, the upper door should be opened cautiously only for 2-3 cm, and hold it like that for about ten seconds. Only after that open he door completely. This prevents possible explosive penetration of flames from the firebox towards the operator. The boiler is possible to fire up with the coal dust and sequence of operations is the same. The difference is that first the boiler is filled with coal dust and on the top some paper is placed as well as the firewood.

The boiler is used both for wood and coal as fuel or with their mixture, with the note, that our recommendation is that the maximum filling level coal is somewhat lower, as shown in the Figure 11, "Display of the maximum amount of coal for firing."

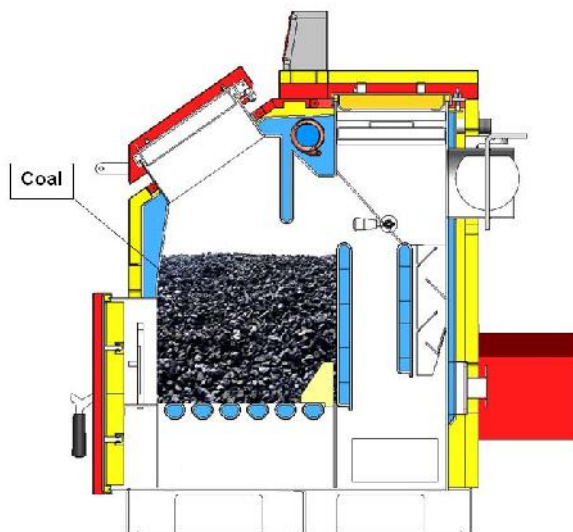


Figure 11. Maximum height of fuel when firing with Coal

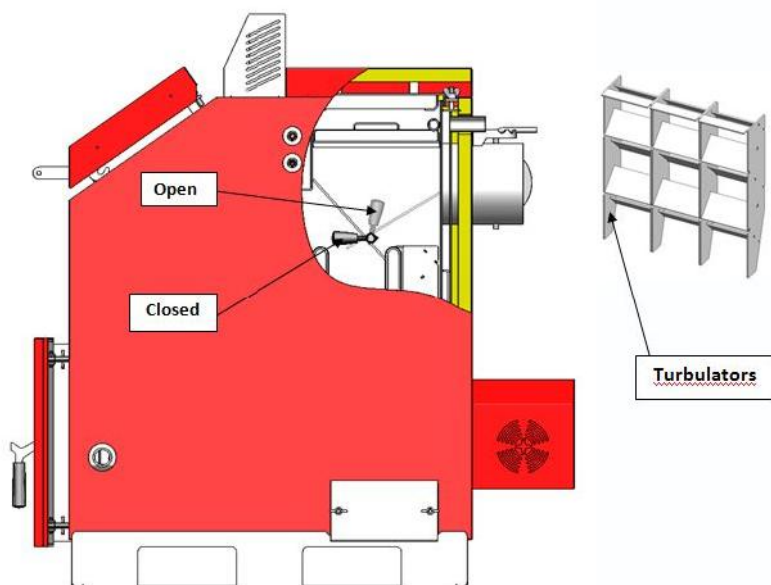
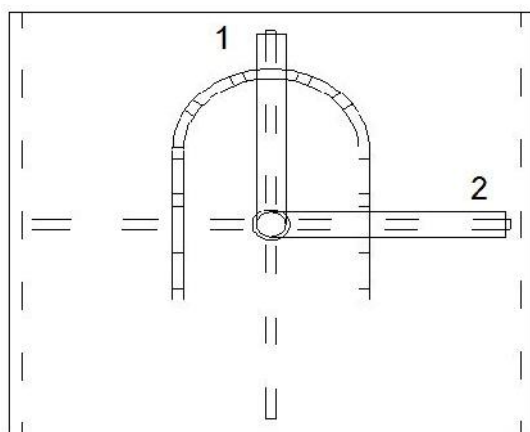


Figure 12. Positions of Flap in OPEN and CLOSE modes and look of TURBULATORS



Flap of flue gas chute

Position 1: Open flap

Position 2: Closed flap

Figure 13. View of the positions of flap on the flue gas chute

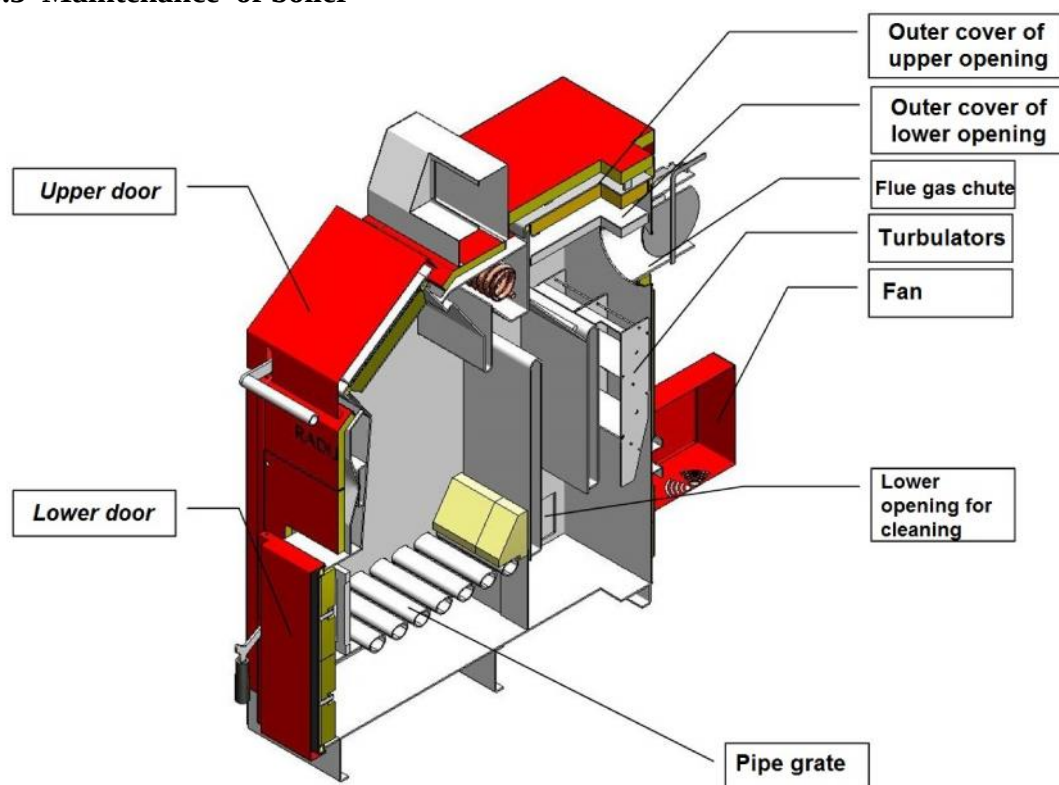


When working with coal dust, the boiler must not be added with fuel during its operation. Adding of fuel is done only after when the previous fuel has burned out.



Opening the upper door for firing during the operation should be performed as rarely as possible, only for an examination of the boiler. The door must then be opened very slowly and cautiously, at first only slightly, keeping it in that position for ten seconds and then open it fully. It is very dangerous to open the upper door in the situation when the fan is not working. Then the created combustion gases exit through the door, and in contact with oxygen burn turbulently. In these cases it could result in heavy and light injuries, or putting the boiler room on fire. That is why the door is opened as described above, and preferably, as soon as after fan's function, the so-called "ventilation".

8.3 Maintenance of boiler



Daily maintenance of the boiler refers to the ejection of ash from the space between the floor and pipe grate. If there is a large amount of ashes the fuel is not receiving a large amount of air for combustion. Pay attention that the output channel of air from the fan should always have a free passage without obstacles.



Within every seven days, the boiler should be thoroughly cleaned, by removing the cover of the lining on the roof, as well as the outer and inner covers on the boiler, and through the hole on the roof of boiler by means of cleaning equipment remove the tar and grime from all surfaces of the boiler. Then take out the turbulators (directing gas units) and clean them, too. Cleaning of fire box should be done through the upper and lower doors. Each millimeter of tar on the inside surface of the boiler results in 5% less heat conduction.



It is particularly essential to regularly remove and clean the boiler turbulators. Otherwise there is a situation that the turbulators are impossible to remove from the boiler and the ashes have completely blocked them so that there is no passage of flue gases.

Within every seven days clean the fan. The access to it by removing the metal protection that is joined with a tin boiler insulation by elastic connection. Cleaning the fan should not be done with water but mechanically, gently for the turbines, or pneumatically.

If in the course of operation the comes to the condensation, condensate should be cleaned and boiler must be coated inside with alkaline detergent for cleaning or else by means of slaked lime solution. This way the acid remaining in the boiler will be neutralized.

At the end of the heating season the boiler must be cleaned thoroughly and carry out the neutralization of acid in the already mentioned manner. All openings are to be closed so as the air circulation does not pass through the boiler and, also this can cause moisture in the boiler.



Maintenance of the boiler is one of the most important factors for the length of working life of the boiler. The boiler should not wait for the next heating season uncleaned and without acid neutralization.

9. Short instruction for Users of Automation

- Turn the main switch

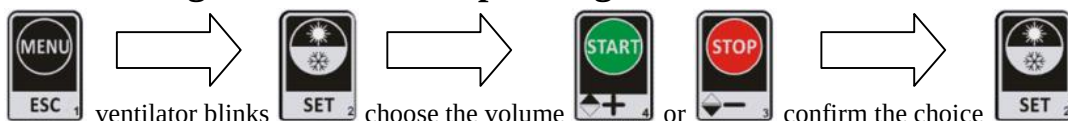


- Push the button  and keep it in that position for 5 seconds.

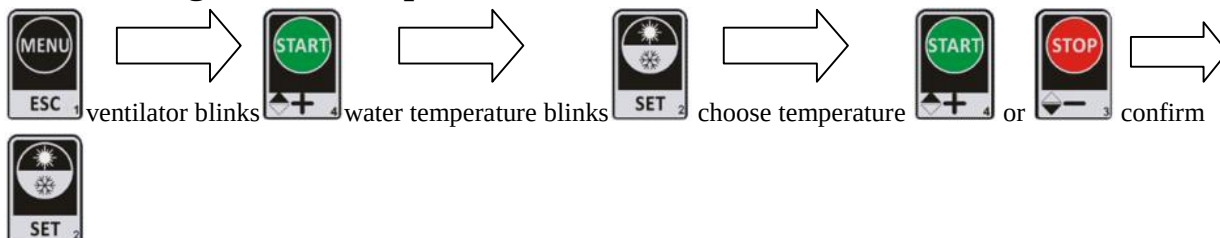


- Break of operation of pellet boiler is done by pressing the button  and keeping for 5 seconds.

9.1. Change in volume fan operating mode



9.2. Change the set temperature in the boiler



9.3. How to read the water temperature in the battery or water heater (if the system has a battery pack or hot water heater)



9.4. How to read the temperature of flue gases



9.5. Entry into the hidden menu

Push button  and keep, immediately push button  and keep both button for 5 seconds. Immediately after the entry into the hidden MENU on the display there appears **CL 00**. It is the first parameter.



To go one step back, use the button

AUTOMATIC MANAGEMENT OF BOILERS

All functions performed by the automation are performed on the basis of a two-input information such as:

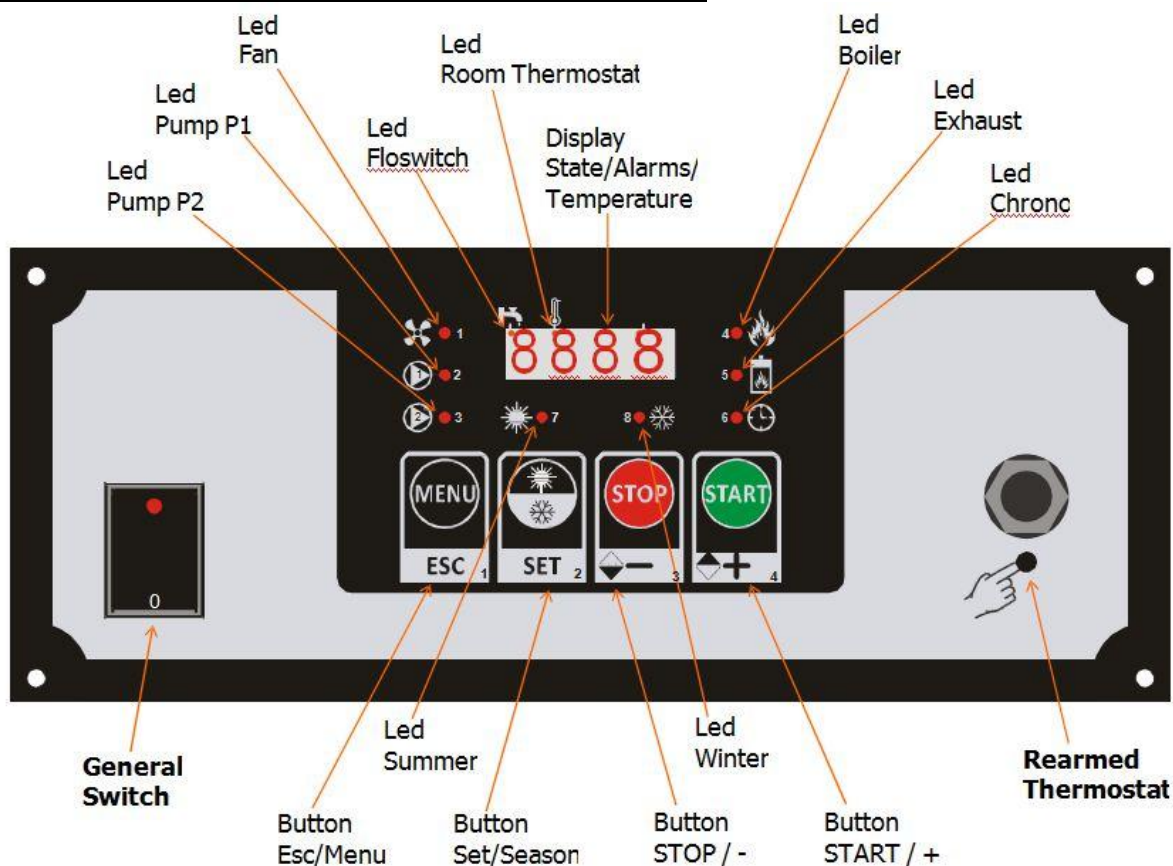
the boiler water temperature and the temperature of the flue gases flowing out of from boiler.

9.6. Kontrol panel

Control panel consisting of:

The main switch, safety thermostat button, the display, the group command buttons, a group of light-emitting diode indicator

The following picture is to present of the control panel.



9.6.1. BUTTONS

START/+: Pushed for five seconds it switches ON the System. Pushed in **Menu** it increments a parameter's value.

STOP/-: Pushed for five seconds it switches OFF the System. Pushed in **Menu** it decrements a parameter's value.

SET/Season : Pushed for five seconds it selects the Season Summer/Winter.

Pushed in **Menu** it changes the visualization from parameter's code to parameter's value and it permits to save a new setting.

ESC/Menu : This button permits to enter/exit the Menu. If you are changing a setting and you push this button you will exit without saving the new value.

NOTE:

In **OFF** or **Extinguishing** State you can reset an Alarm visualization by pushing **button +** or **-**, but if the alarm were still there you would visualize it again.

9.6.2. LEDS

1. **LedFan** : ON when the Combustion Fan is ON;
2. **LedPumpP1** : ON when the Pump P1 is ON. **Blinking** when the Pump P1 is switched OFF by the Room Thermostat;
3. **LedPumpP2** : ON when the Valve/Pump P2 is ON. **Blinking** when the Pump P2 is switched OFF by the Room Thermostat;
4. **LedBoiler**: ON when the Water temperature is under the value **TH-BOILER[A03]** – **ModulationeDelta1[A05]**. **Blinking** when the Water temperature is over that value OFF when the Water temperature is over **TH-BOILER[A03]**.
5. **LedExhaust** : ON when Exhaust temperature is over **TH-EXHAUST-ON[F18]**. **Blinking** during the Pre-Extinguishing phase (**Pre-Extinguishing TIME[t06]**)
6. **LedChrono** : ON when the Chrono Input contact is closed.
7. **LedSummer** : ON when the selected Season is Summer.
8. **LedWinter** : ON when the selected Season is Winter.
9. **LedFloswitch** : ON when the Flowswitch Input contact is closed.
10. **LedRoomThermostat** : ON when the Room Thermostat Input contact is closed.

9.6.3. DISPLAY

Display\State\Alarms\Temperature : The 4 digit Display visualizes water temperature, the functioning State of the system and eventual alarms.
 States' Codes:

OFF	= Off
Acc	= Ignition
rEc	= Recover ignition
Mod1	= Modulation 1
Mod2	= Modulation 2
Ant	= Standby
S, c	= Safety
ALt	= System off with alarms

**If there are alarms the Display will show alternatively ALt / ErrorCode.
Errors' Codes:**

ES, c = Rearmed Safety Thermostat contact is open

CALd = Over Temperature Water

RccF = Failed Ignition

SPAc = Accidental Extinguishing

10. Warranty

1. Co.”Radiator Engineering” covers different warranty periods for different parts (as specified further on) only if the following conditions of guarantee are fulfilled:

- 1.1. The boiler must be connected to the aforementioned hydraulic schemes of technical instruction , especially pay attention to the safety valves, thermal fuse swelling, mixing valve for protection of the cold portion of boiler or against condensation, the range of work pressure of boiler, r operating temperature of the boiler, the conditions in the boiler room, etc. **(see item 3 and 7)**
- 1.2. The boiler must be connected to the chimney of prescribed cross-section, characteristics of insulation and height. **(see item 3.4)**
- 1.3. Flue gas outlet from boiler to the chimney must be constructed according to the technical instructions.
- 1.4. The user must follow the following instructions on how to use and maintain the boiler.**(see item 8 and 9)**

2. Warranty statement

We herewith declare:

- the product has the prescribed and declared quality properties . We are committed, we will, on the request of the buyer, if he timely submits the Request for the repair within the warranty period, do at any expense all repairs, so that the product will operate in accordance with the declared properties,
- that the product is will operate flawlessly within the warranty period if the instructions for the use, installation and operation are respected,
- that in the warranty period will be ready to remove all product failures and keep in stock all the necessary spare parts,
- **warranty period starts from the DATED OF PURCHASE AND LASTS FOR 60 or 72 MONTHS, from the date of manufacture (the date of manufacture is located on the label on the back of the boiler),**
- **warranty is valid if the warranty card is stamped by the Seller, with the registered date of purchase and the attached Sale Invoice/Bill.**

3. Warranty period of two years applies to the following parts:

- fan,
- boiler automation system with safety thermostat,
- probes for flue gases,
- the probe for temperature of boiler water,
- turbulators,
- electrical connectors,
- insulating materials on doors and openings for cleaning.

4. Warranty period does not apply:

- when failures are made by the purchaser due to improper handling of the product,
- with mechanical failures made during transport and during use (solid objects),
- if the product is installed improperly, contrary to the regulations in force in that area,
- if the customer was using the product over the declared properties in normal circumstances,
- if it is determined that the hydraulic scheme is not done according to the recommendations of the "Radijator inženjering",
- if it is determined that the boiler during use is not regularly maintained and cleaned,
- on bricks in boiler,
- on cast iron gratings door.

5. Warranty period expires:

- if it is determined that the defects were removed by the unauthorized persons or unauthorized service,
- if at repair the original parts were not built in,
- when the warranty period expires.

6. When Reporting failures it is necessary to give the following information:

- name and type of product,
- the date of purchase,
- factory or workshop of the fireplace,
- a brief description of the fault, or lack of,
- full address of owner and contact telephone number, e-mail.

GARANTNI LIST / GUARANTEE LIST

Tip kotla / Boiler type

Fabrički broj / Factory No.

Garantni rok / Guarantee period

60 MESECI/ 60 MONTHS

**Datum proizvodnje /
Date of manufacture**

**Potpis ovlašćenog lica /
Signature of Authorized person**

pečat / stamp

Prodato u firmi / Company of Sale

Adresa / Address

Telefon / Phone

Datum prodaje / Date of Sale

Potpis / Signature

pečat / stamp

*Potrošač ima sva prava na osnovu Zakona o zaštiti potrošača ("Sl.glasnik RS", br. erbia62/2014). Garancija ne isključuje niti utiče na prava potrošača koja proizilaze iz zakonske odgovornosti prodavca za nesaobziornost robe u ugovoru./ The consumer shall exercise all rights under the Consumer Protection Law ("OJ of RS" No 62/2014). The guarantee does not exclude nor affect the consumer's rights derived from the legal liability of the seller for any lack of conformity of the goods under a Contract.

*Gore navedeno važi za kupce na prostoru Republike Srbije./ The aforementioned applies to purchasers of the Republic of Serbia.