

Kotao na
čvrsto
gorivo/ Solid
fuel heating
boiler

Serije K/
Series K



INSTRUKCIJE/ Instruction manual

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

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1. Važna upozorenja

OPŠTA UPOZORENJA

- Nakon uklonjenog pakovanja uveriti se u kompletnost isporuke, i u slučaju nedostataka, obratiti se prodavcu koji je prodao kotao.
- Kotao mora biti upotrebljen isključivo za namenu koju je predvideo proizvođač. Isključuje se bilo kakva odgovornost od strane proizvođača za štetu uzrokovanu osobama, životinjama ili stvarima, u slučaju grešaka pri montaži, regulaciji, održavanju ili nepravilnom korišćenju.
- U slučaju curenje vode prilikom punjenja instalacije, zatvoriti napajanje vodom i obavestiti ovlašćeni servis ili ovlašćenog montera.
- Ovo uputstvo je sastavni deo uređaja i mora se čuvati sa pažnjom i mora **UVEK** pratiti uređaj i u slučaju promene vlasnika ili korisnika ili u slučaju priključenja na drugu instalaciju. U slučaju oštećenja ili nestanka tražiti novi primerak od ovlašćenog prodavca.



VAŽNA UPOZORENJA

Podsećamo da korišćenje kotlova na čvrsto gorivo 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 izmena na sigurnosnim elementima.
- Zabranjeno je zatvaranje ventilacionih otvora na prostori 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).
- Voditi računa o položaju klapne sigurnosnog vazduha (detaljnije objašnjenje u poglavlju **START RADA KOTLA**).

- Rad sa uređajem kotla zabranjen je ljudima sa posebnim potrebama (uključujući i decu) kako fizičkim tako i mentalnim, osim uz nadzor staratelja i ljudi koji su odgovorni za njihova ponašanja.
- Deca moraju biti pod nadzorom staratelja kako se ne bi igrala sa uređajem kotla.

1.1 Minimalna udaljenost od zapaljivih materijala

- Obezbedite odgovarajuću udaljenost od zapaljivih materijala, ako je potrebno obezbediti zaštitu istih.
- Minimalna udaljenost od zapaljivih materijala je propisana zakonom- molimo da se o tome raspitate kod stručnih lica, koja se bave grejanjem, i dimničara.
- Minimalna udaljenost kotla i cevi za odvod dimnih gasova od slabo i prosečno gorivih materijala treba da bude najmanje 100mm.
- Minimalno rastojanje od lako zapaljivih materijala je 200mm, a isto važi i za materijale čija zapaljivost nije poznata.



Opasnost od požara!

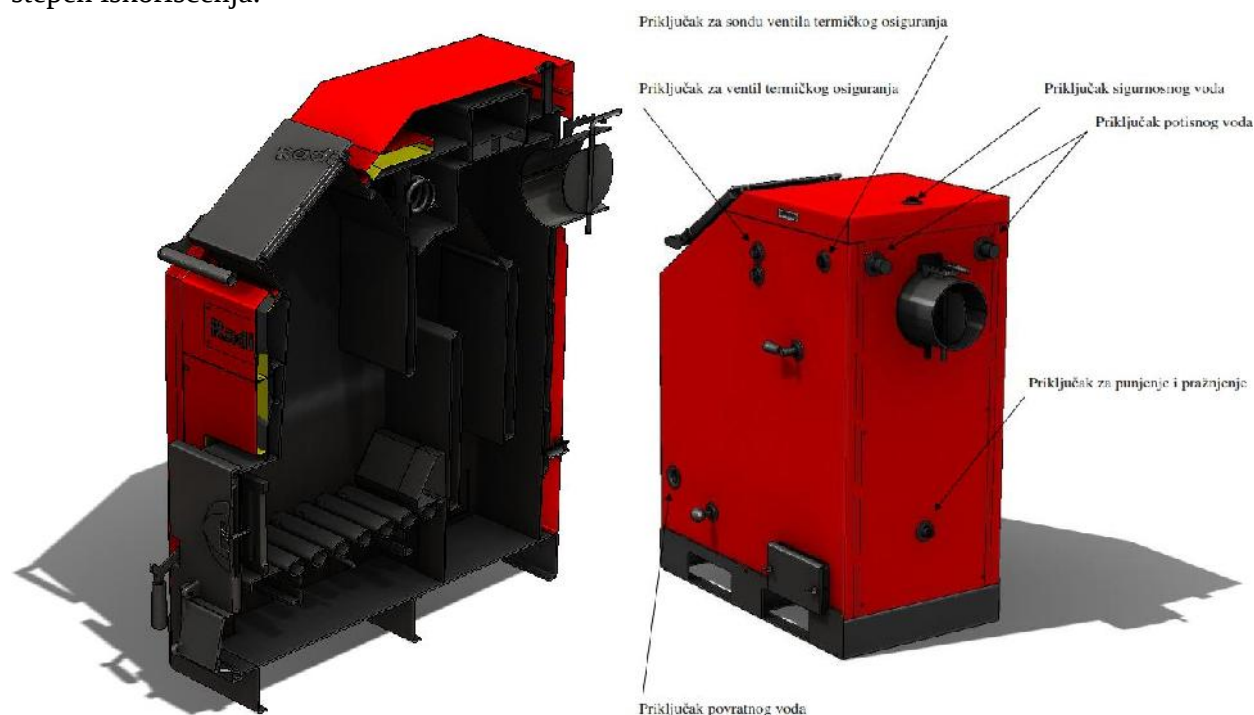
- Skladištenje zapaljivih materijala i tečnosti u blizini kotla je zabranjeno.
- Obavezno upozorite korisnike o potrebnoj minimalnoj udaljenosti zapaljivih materijala od kotla.

Zapaljivost građevinskih materijala	
A ... nezapaljivi	azbest, kamen, građevinski kamen, keramičke zidne pločice, terakota, malter, cementna glazura (bez organskih dodataka)
B ... koji nisu lako zapaljivi	gipsane kartonske ploče, staklena vlakna, ploče od AKUMINA, IZOMINA, RAJOLITA, LIGNOSA, VELOKSA i HERAKLITA
C1 ... slabo gorivi	bukovo i hrastovo drvo, kompozitno drvo, filc, ploče od HOBREKSA, VERZALITA, UMAKARTA
C2 ... prosečno gorivi	drvo bora, tise i jele, kompozitni materijali
C3 ... lako zapaljivi	Asfalt, karton, celulozni materijali, iverica, pluta, poliuretan, polistiren, polipropilen, polietilen, podna vlakna

2.Opis kotla serije „K“

Kotao serije „K“ je zavarene robusne konstrukcije sa dvostrukim zidom i vodom hlađenom rešetkom, tako da obliva sve površine koje su u dodiru sa plamenom i vrelin gasovima. Kotlovi ove serije izrađuju se u snagama od 18 do 80 kW. Svaka veličina kotla serije „K“ poseduje bakarni izmenjivač za priključivanje ventila za termičko osiguranje kao i klapnu za potpalu. Svi delovi vodenog dela kotla izrađeni su od bešavnih cevi kvaliteta **ST 35.4** i kotlovskih limova debljine 5mm, u zavisnosti od snage kotla. Limovi su kvaliteta **1.0425 EU** standard odnosno **P265GH** standard **EUII**.

Analizom poprečnog preseka kotla (**slika 1**) vidi se da su kod ovih kotlova izmenjivačke površine postavljene vertikalno i da su svojim dimenzijama i rasporedom obezbedili veoma dugačak put vrelin gasovima kroz kotao. Merenjima je ustanovljeno i znatno manja brzina gasova na izlazu iz kotla kao i niža temperatura na ulazu u dimnjak u odnosu na druge konstrukcije u našem proizvodnom programu, pa se zaključuje da ova konstrukcija ima i najveći stepen iskorišćenja.



Slika 1. Poprečni presek kotla i prikaz priključaka na kotlu

Kotlovi serije „K“ imaju tzv. donje sagorevanje, pa su izrazito trajnožareći, tj. moguće ih je napuniti gorivom do samih vrata za loženje bez bojazni da će se vatra ugasiti. Posедуje veliki spremnik za ogrev, tako da je moguće celodnevno korišćenje kotla sa jednim do dva punjenja. U zadnjem delu ložišta postavljene su vatrostalne opeke od šamotnog temperaturski akomulirajućeg materijala. One se zagreju na temperaturu koja je dovoljna da sagori inače teško sagorljive čestice u dimovodnim gasovima.

U kotlovima je ugrađen i bakarni izmenjivač toplote za priključenje ventila za termirko osiguranje (objašnjeno u **tački 3.2**, prikazano i na hidrauličkoj šemi u **tački 6**), takođe na kotlu je ugrađen sistem za čišćenje rešetke odn.prostor između vodom hlađene cevi gde se vrši sagorevanje (prikazano i objašnjeno u **tački 7.2**)

Ova konstrukcija, kada je gorivo drvo, dostiže izuzetno visoke stepene iskorišćenja (i preko 80%), odlični su rezultati i u slučaju mešanja drveta i uglja, a loženje samo ugljem kad god je moguće treba izbegavati jer je stepen iskorišćenja manji.

Konstrukcija kotla omogućava lako loženje i čišćenje kotla. (objašnjeno u **tački 7.1 i 7.2**) Konstrukcija kotla omogućava priključak na dimnjak na zadnjoj strani kotla, takođe kotao ima dvojne priključke za spajanje na instalaciju centralnog grejanja. Osim dvojnih priključaka za spajanje sa instalacijom (priključci potisnog i povratnog voda), kotao ima i ostale potrebne priključke a to su (**slika 1**):

- Priključak za punjenje i pražnjenje;
- Priključak za regulator promaje;
- Priključak sigurnosnog voda;
- Priključak za ventil termičkog osiguranja;
- Priključak za sondu ventila termičkog osiguranja;

Kotao je obložen oplatom od plastificiranog lima debljine 1mm ispod koga je mineralna vuna debljine 50mm, koja služi kao izolacija.

3. Montaža

3.1 Opšta upozorenja

Kotao mora biti pravilno postavljen zbog pravilnog rada!

Kotao se isporučuje sa spoljnom oblogom koja sadrži izolaciju debljine 50mm. Kotao mora biti postavljen na betonsko postolje visine 100mm u odnosu na pod prostorije (kotlarnice). Kotao mora biti tako postavljen da bude omogućen pristup kotlu sa svih strana radi čišćenja i održavanja. (dalje u **tački 3.3**)

Za normalan rad potrebno je dovođenje svežeg vazduha u kotlarnicu (**tačka 3.3**), takođe za normalan rad kotla potrebno je da dimnjak bude popisanih karakteristika i izrađen od šamotnih cevi propisanog prečnika (**tačka 3.4**).



Maksimalni radni pritisak kotla je 3 bar-a, minimalni 1 bar, a maksimalna radna temperatura kotla je 110°C.



Kotao na čvrsto gorivo treba instalirati prema važećim normama i zakonskim propisima. Svaka izmena na mehaničkoj konstrukciji smatraće se narušavanjem garancijskih uslova i dovešće do njenog narušavanja.



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.

Osnovni zahtevi koje treba ispoštovati prilikom montiranja su:

- Kotao može da bude priključen na otvoreni sistem centralnog grejanja, ali i na zatvoreni sistem centralnog grejanja. U slučaju priključenja na zatvoreni sistem ,preporučuje se ugradnja ventila za termičko osiguranje oticanjem, što je određeno i odgovarajućim zakonima svake države u kojoj se kotao priključuje.
- Kotao mora da se nalazi na sigurnoj udaljenosti od lako zapaljivih materijala.
- Priključenje na dimnjak takođe se radi prema obavezujućim propisima kao i preporukama proizvođača što se može videti u narednom tekstu.

3.2 Mere i uređaji bezbednosti kod kotla serije “K”

Za bezbedan rad kotla serije „K” potrebno je ugraditi sledeće elemente i potrebno ih je održavati ispravnim:

- Ventil sigurnosti na pritisak, odzračni ventili i manometar;
- Regulator promaje;
- Ventil termičkog osiguranja oticanjem.

Ventil sigurnosti na pritisak (slika 2), odzračni ventili (slika 3) i manometar (slika 4):



Slika 2. Sigurnosni ventil



Slika 3. Odzračni ventil



Slika 4. Manometar

- 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 3.**) i manometar (**slika 4.**) 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 8.**) . 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.

Regulator promaje (slika 5):

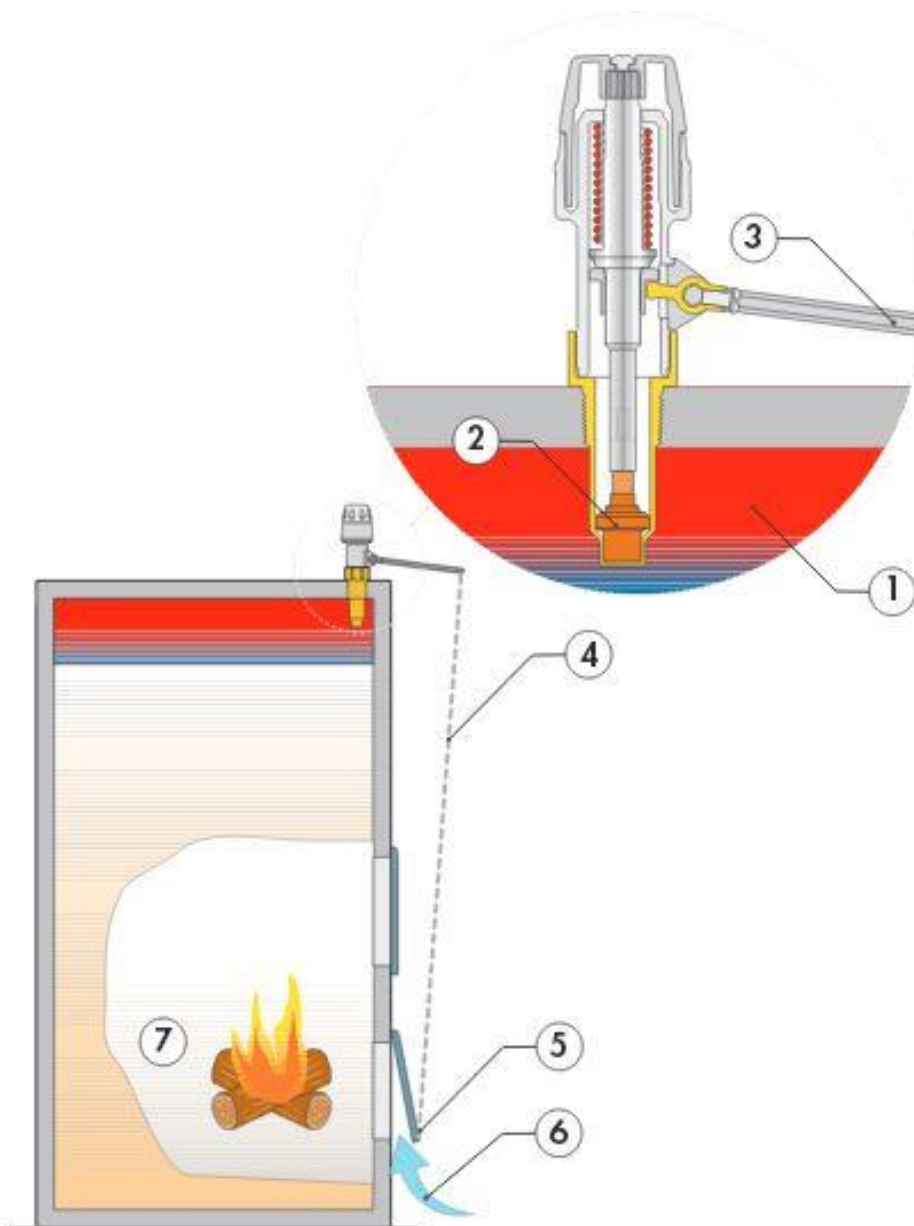


Slika 5. Regulator promaje

Regulator promaje instalira se na kotao i pomoću termostatskog elementa koji je uronjen u fluid, automatski podešava protok vazduha i obezbeđuje stalno i potpuno sagorevanje.

Princip rada (**slika 6**): Regulator promaje deluje na vrednost promaje kotla na čvrsto gorivo, menjajući pri tome poprečni presek a time i protok vazduha za sagorevanje. Ako se temperatura vode unutar kotla promeni (**slika 6, prikaz 1**), širenjem ili kontrakcijom termostatskog senzora (**slika 6, prikaz 2**) koji je povezan polužnim mehanizmom koji se sastoji od kontrolne poluge (**slika 6, prikaz 3**) i lanca (**slika 6, prikaz 4**), regulator promaje menja otvaranje vrata (**slika 6, prikaz 5**) za dovod vazduha (**slika 6, prikaz 6**) za sagorevanje. Kada temperatura vode padne ispod podešene vrednosti, regulator promaje povlači lanac (**slika 6, prikaz 4**) i povećava otvorenost vrata (**slika 6, prikaz 5**) kako bi ušla veća količina vazduha u komoru za sagorevanje (**slika 6, prikaz 7**), čime pospešuje sagorevanje. Kada temperatura vode poraste, regulator promaje popušta lanac (**slika 6, prikaz 4**) i zatvara vrata otvora (**slika 6, prikaz 5**), čime

ograničava ulaz vazduha (**slika 6, prikaz 6**) za sagorevanje. Na ovaj način proces sagorevanja je pod kontrolom, tako da je temperatura vode u kotlu konstantna sprečavajući pregrevanje i prekomernu potrošnju goriva.



Slika 6. Princip rada regulatora promaje

Ventil termičkog osiguranja oticanjem (slika 7)



Slika 7. Ventil termičkog osiguranja

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 8**.
U kotlu se isporučuje bakarna spirala tako da je potrebno koristiti VTO sa izmenjivačem kao na **slici 8**. 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 ispus vode koja je prošla kroz spiralu. Koji je priključak spirale za VTO a koji je ispusni 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.



Ukoliko je sanitarna voda koja je dovedena na ventil termičkog osiguranja preko dodatne pume, obavezno kotao priključiti na otvoren sistem.

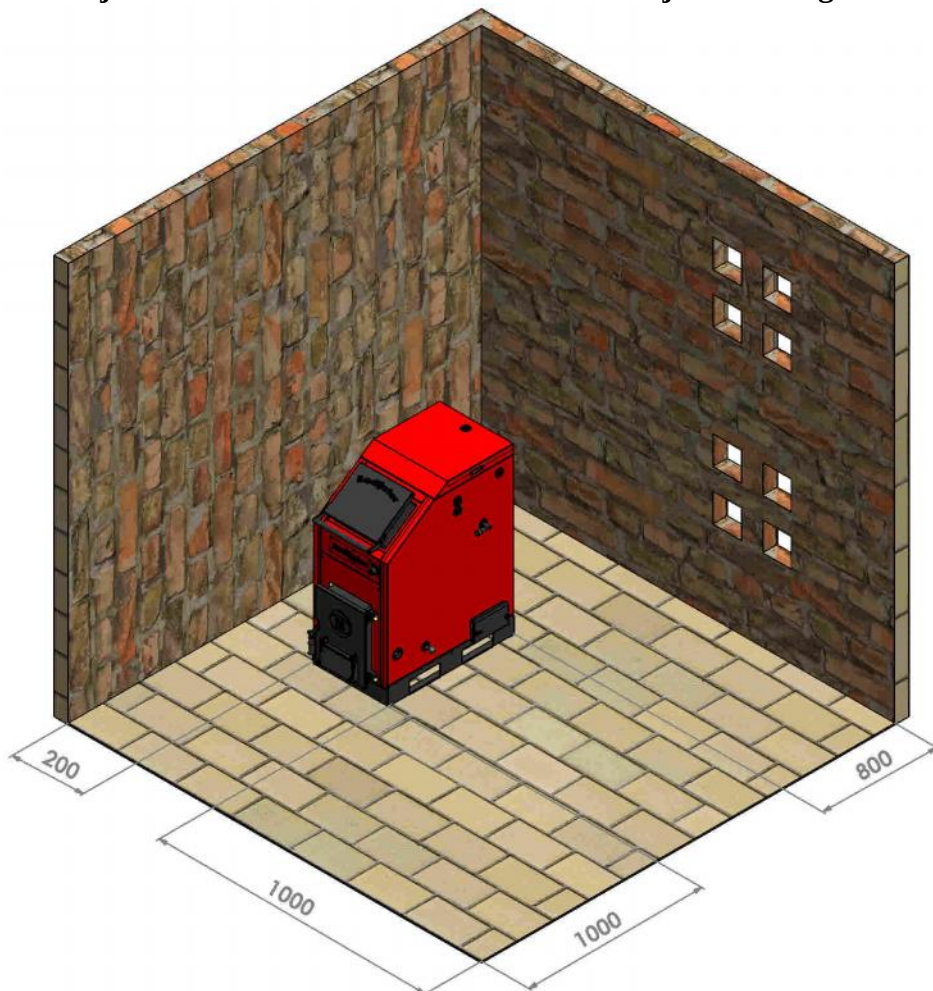


Slika 8. Prikaz postavljanja sigurnosnih elemenata

3.3 Kotlarnica

Kotlarnica mora biti obezbeđena od smrzavanja!

Pod kotla urađen je u obliku metalne palete visine 110mm sa otvorima za paletni viljuškar. Ova visina je dovoljna udaljenost od poda (olakšano je čišćenje) tako da nije potrebna nikakva posebna betonska ploča u kotlarnici. Podloga za kotao u kotlarnici mora biti od nezapaljivog materijala. Preporučene vrednosti udaljenosti sve četiri strane kotla u odnosu na zidove kotlarnice ili neka druga kruta tela (akumulacioni bojler itd.) prikazane su na **slici 9**. Ove vrednosti udaljenosti omogućavaju siguran pristup prilikom loženja, dovoljan prostor za čišćenje i nesmetan pristup ventilu za punjenje i pražnjenje. Situacija položaja kotla u odnosu na bočni zid sa skice može biti i ogledalno simetrična jer kotao poseduje bočne otvore za ciscenje sa obe strane. Ručica klapne za potpalu i ručica za čišćenje proreza između cevi u ložištu je demontažna i može se staviti i na levu i na desnu stranu kotla. **Kotlarnica mora da poseduje dovoljne otvore za ventilaciju kako za svež vazduh tako i za odvođenje istrošenog vazduha.**



Slika 9. Pozicioniranje 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.

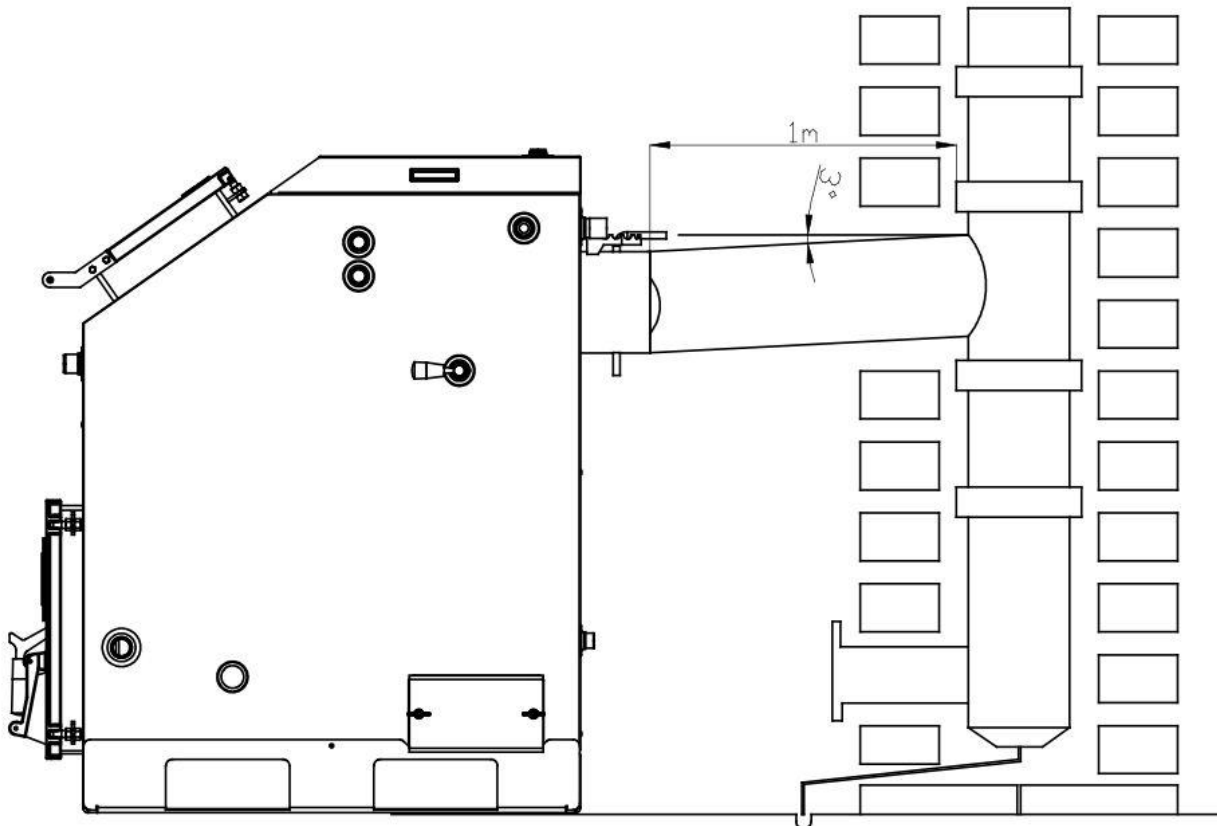
$$A = 150\text{cm}^2 + \frac{2\text{cm}^2}{\text{kW}} \times (\sum Q_n - 50\text{kW}) \quad \sum Q_n = \text{moguće snage preko 50kW.}$$

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.
- Zabranjeno je izlaganje kotla atmosferskim neprilikama. Sam kotao nije predviđen za spoljnu montažu i ne sadrži sistem protiv smrzavanja.
- Zabranjeno je zatvaranje ventilacionih otvora na prostoriji u kojoj se nalazi kotao. Ventilacioni otvori su neophodni za pravilno sagorevanje.

3.4 Priključenje na dimnjak

Najoptimalnije postavljanje kotla na dimnjaču je takvo da prava koja spaja centar izlaza dimnih gasova iz kotla i centar priključenja na dimnjak bude u blagom usponu (do 3%)(**slika 10**).



Slika 10. Prikaz priključenja kotla na dimnjak

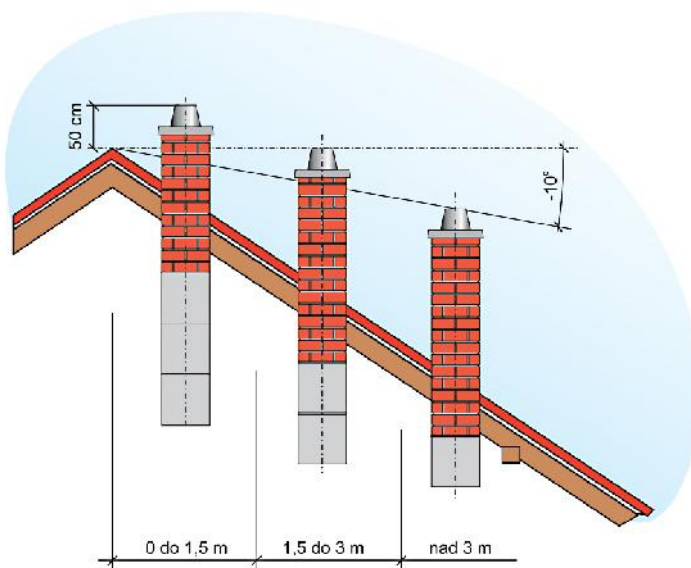
Treba izbegavati ako je moguće lukove, a ako nije onda je maksimalni broj lukova (2). Dimni kanal od kotla do dimnjaka poželjno je izolovati, posebno ako ima lukova i dužih deonica. Sam dimnjak treba da je napravljen od keramičkih cevi, oko njih treba da je izolacija debljine 3-5cm i zadnji spoljni sloj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

NAZIV KOTLA	SNAGA KOTLA	POTREBAN DIMNJAK	
		PREČNIK	VISINA
K18	18 kW	Ø 180 mm	H = 7 m
K25	25 kW	Ø 200 mm	H = 8 m
K33	33 kW	Ø 200 mm	H = 9 m
K40	40 kW	Ø 200 mm	H = 11 m
K50	50 kW	Ø 250 mm	H = 12 m
K65	65 kW	Ø 250 mm	H = 13 m
K80	80 kW	Ø 300 mm	H = 14 m

Tabela 1. Preporuka prečnika i visine dimnjaka za kotlove serije „K”

Dimnjak mora da ima i vratanca za čišćenje a ona moraju dobro da dihtuju. Izlaz dimnjaka na krovu mora da bude po određenim propisima. Razlikuju se dva slučaja: 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 ili barem jedanput godišnje.

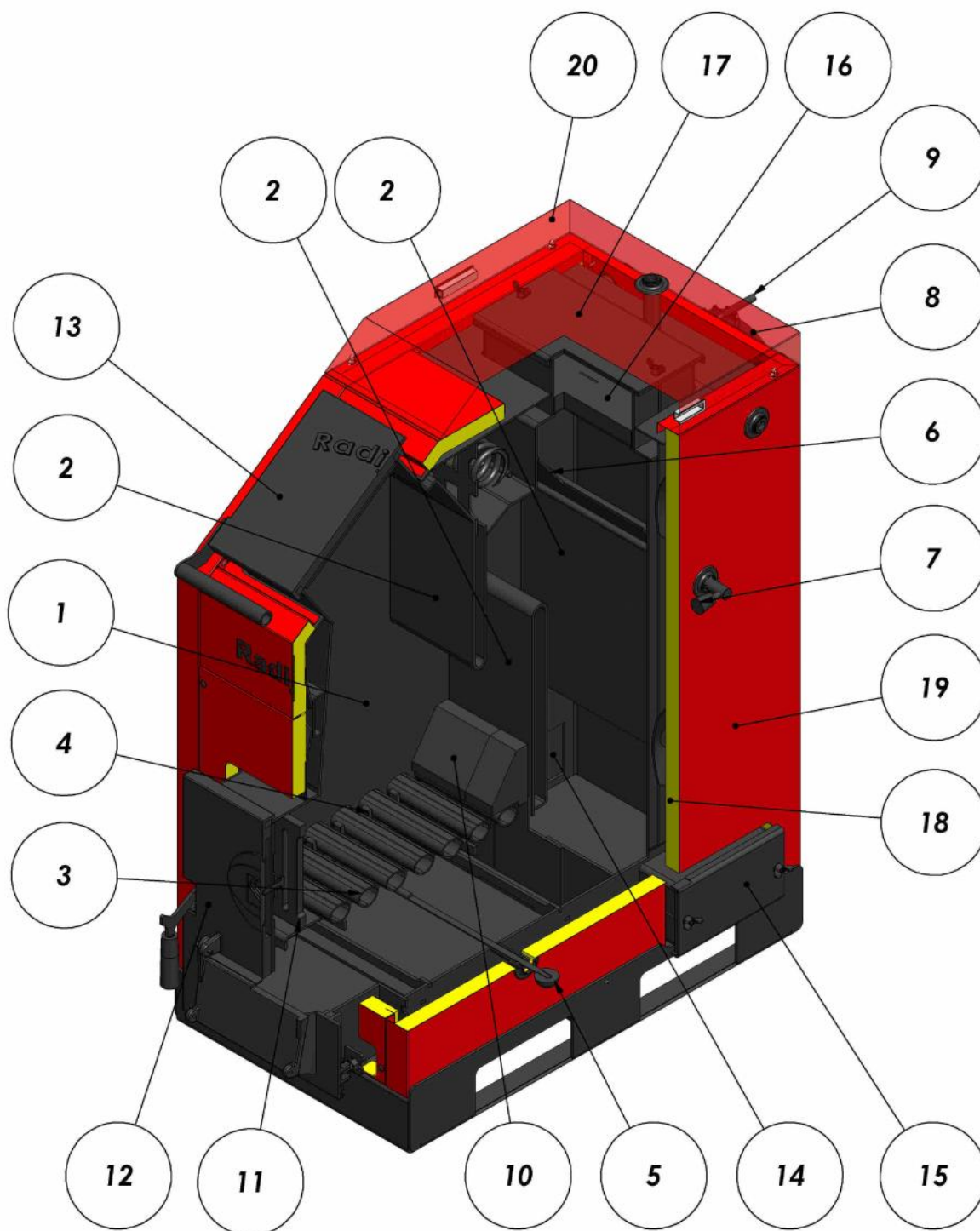


Ukoliko dimnjak nije propisne visine, poprečnog preseka ili ako se ne čisti moguće su komplikacije u radu kotla. Pre svega nije moguć visokotemperaturni režim rada, tj. nema maksimalne radne snage, a posledice toga je pojava kondenzacije što utiče na radni vek kotla.



Slab dimnjak je glavni razlog da u toku potpale kotla ili u toku rada imamo pojavu dima na gornjim ili donjim vratima, naročito pri većim brojevima obrtaja ventilatora.

4. Presek kotla „K“ sa opisom elemenata

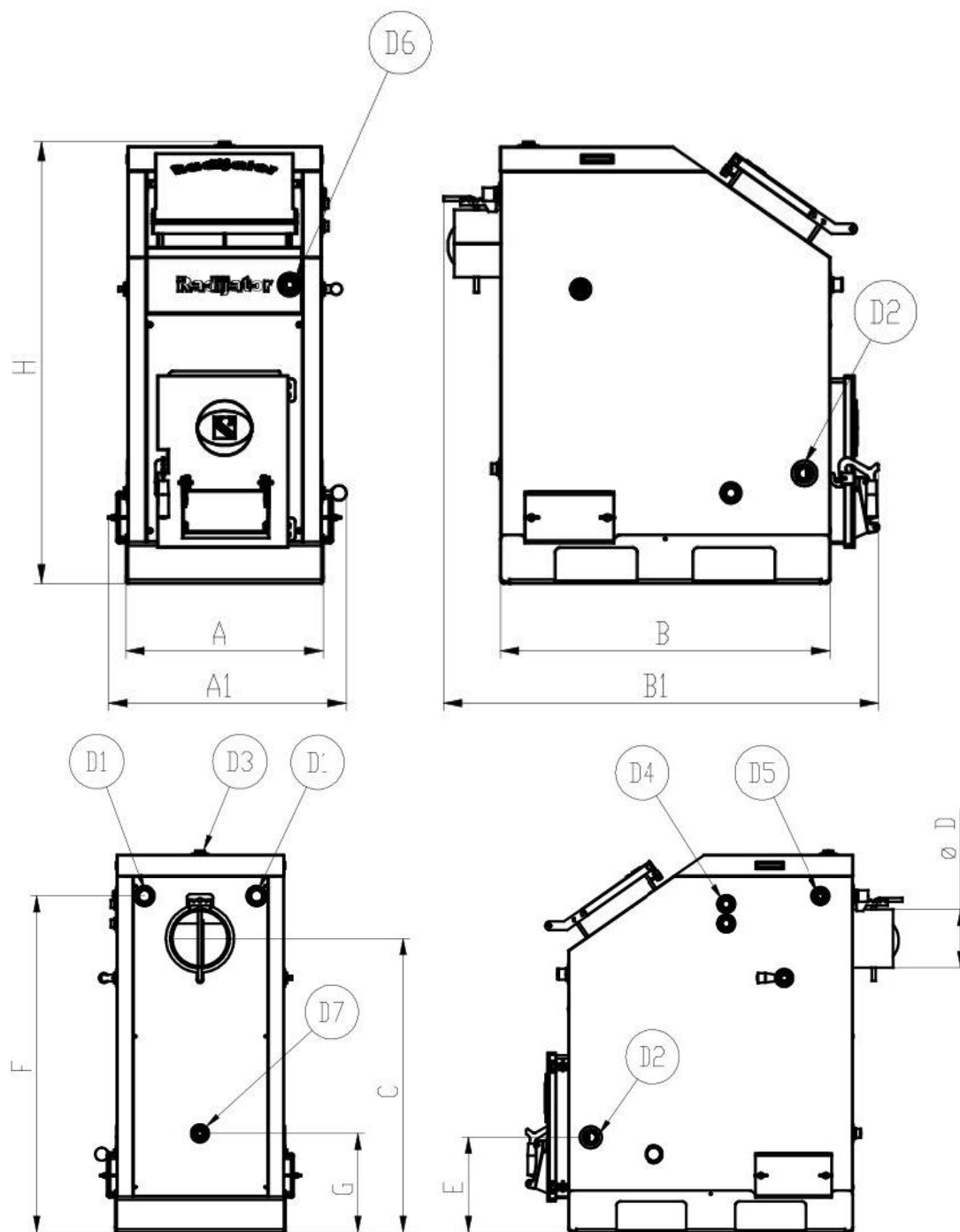


Slika 11. Presek kotla serije „K“ sa opisom elemenata

Opis:

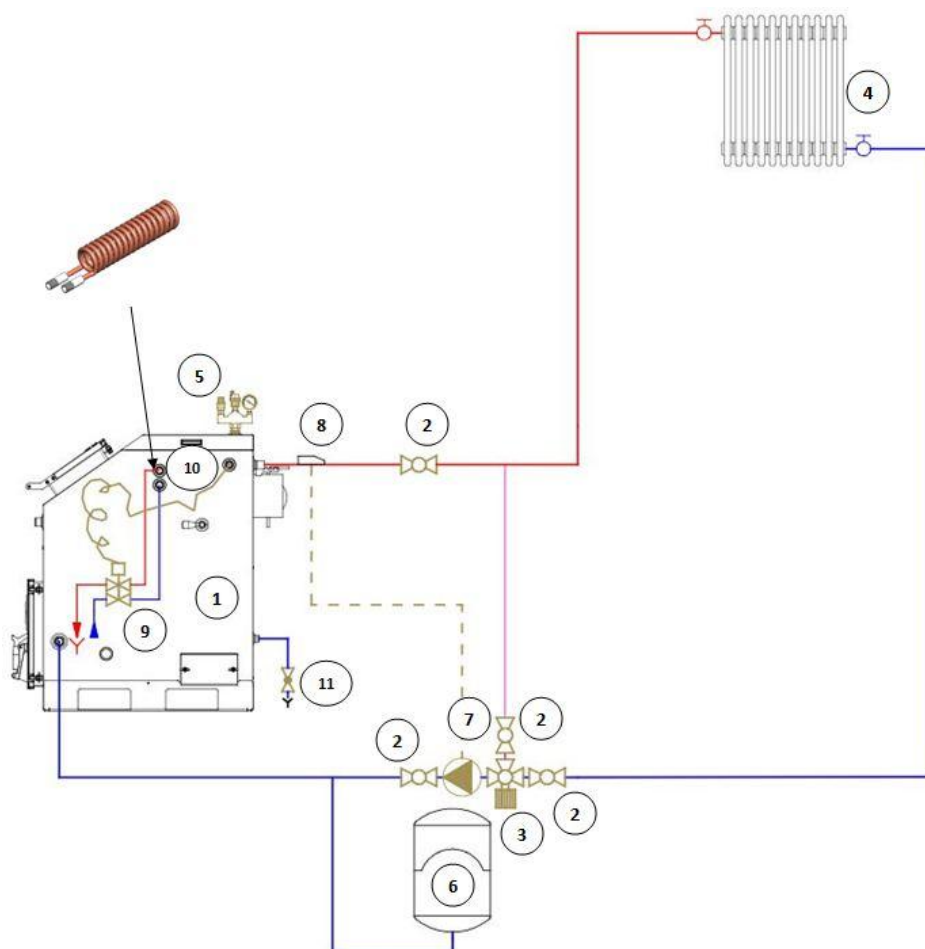
1. Telo kotla;
2. Vertikalni kutijasti izmenjivači;
3. Cevni rost;
4. Liveni češalj za čišćenje prereza između cevi rosta;
5. Ručica češlja za čišćenje;
6. Klapna kotla;
7. Ručica klapne na kotlu;
8. Dimnjača;
9. Ručica klapne na dimnjači;
10. Opeka;
11. Livena rešetkasta vrata;
12. Donja livena vrata za potpalu i čišćenje;
13. Gornja livena vrata za loženje;
14. Donji bočni unutrašnji poklopac prereza za čišćenje;
15. Donji bočni spoljni poklopac prereza za čišćenje;
16. Gornji unutrašnji poklopac prereza za čišćenje;
17. Gornji spoljni poklopac prereza za čišćenje;
18. Izolacija kotla;
19. Oplata kotla;
20. Demontažni poklopac oplata.

5. Tabela sa tehničkim podacima



TIP KOTLA		K18	K25	K33	K40	K50	K65	K80
Snaga kotla	kW	18	25	33	40	50	65	80
Radni pritisak	kPa	300	300	300	300	300	300	300
Probni pritisak	kPa	450	450	450	450	450	450	450
Zapremina vode u kotlu	L	55	72	87	100	140	155	180
Masa kotla	kg	240	332	375	422	465	527	565
Potrebna promaja dimnjaka	Pa	17	18	20	22	23	24	24
DIMENZIJE								
	A	480	530	580	670	770	870	920
	A1	590	640	700	790	790	930	975
	B	790	885	955	965	965	965	1010
	B1	1040	1170	1230	1235	1260	1260	1310
	C	810	910	955	1010	1050	1075	1075
	ØD	180	180	200	200	200	250	250
	E	290	295	305	305	310	315	315
	F	940	1040	1075	1130	1175	1225	1225
	G	305	305	315	315	315	320	320
	H	1080	1180	1235	1285	1285	1340	1340
Priključci za toplu iz kotla	D1	1"	1"	5/4"	5/4"	5/4"	6/4"	6/4"
Priključci za hladnu vodu iz kotla	D2	1"	1"	5/4"	5/4"	5/4"	6/4"	6/4"
Priključci za odzračivanje i ventil sigurnosti na pritisak	D3	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Priključak za ventil termičkog osiguranja običanjen VTO	D4	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Priključak za sondu ventila termičkog osiguranja običanjen VTO	D5	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Priključak za regulator promaje	D6	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Priključak za punjenje i praznjenje	D7	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
*zadržavamo pravo izmene								

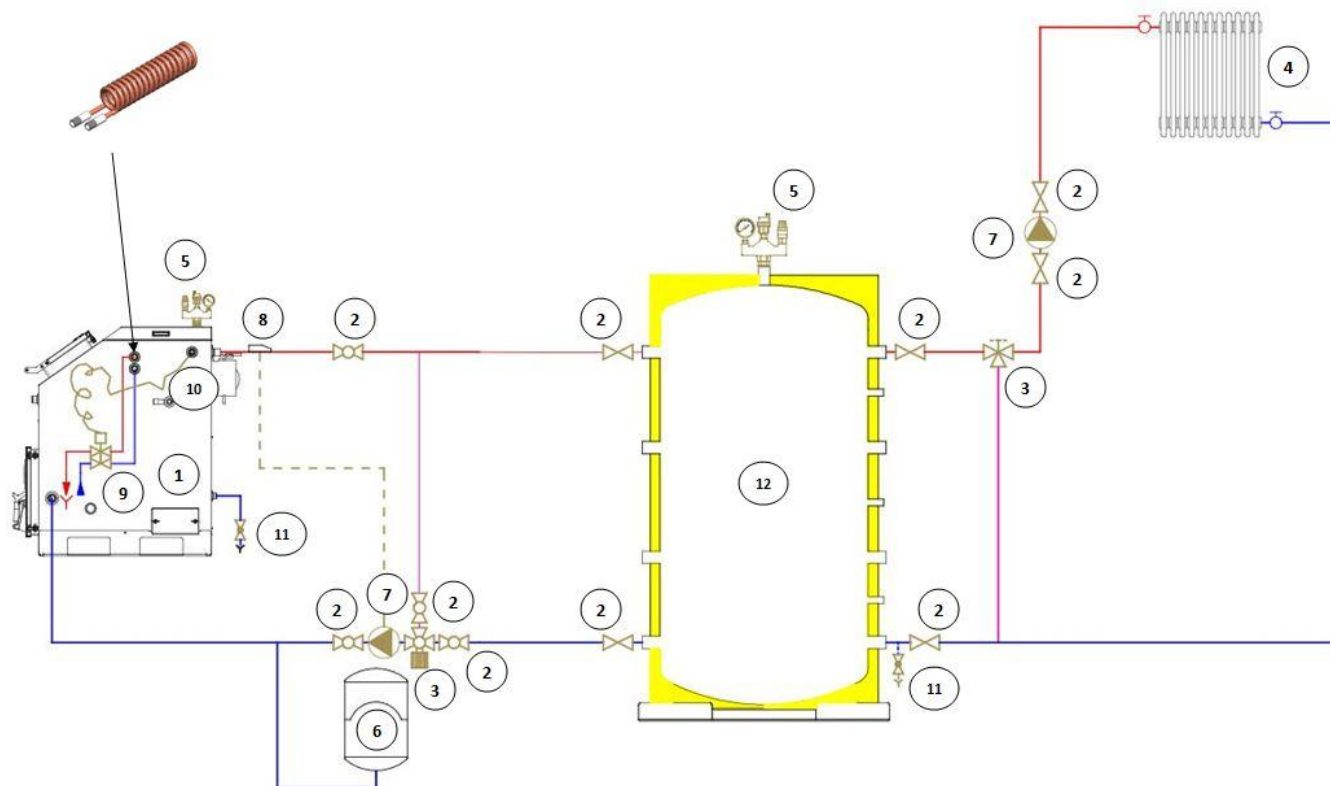
6. Hidraulična šema



Hidraulična šema

Opis:

1. Kotao serije „K“;
2. Ventil;
3. Mešni ventil;
4. Izmenjivač;
5. Sigurnosna grupa;
6. Ekspanziona posuda;
7. Pumpa;
8. Nalegajući termostat;
9. Ventil termičkog osiguranja;
10. Sonda ventila termičkog osiguranja;
11. Ventil za punjenje/pražnjenje.



Hidraulična šema sa akumulatorom

Opis:

1. Kotao serije „K“;
2. Ventil;
3. Mešni ventil;
4. Izmenjivač;
5. Sigurnosna grupa;
6. Ekspanziona posuda;
7. Pumpa;
8. Nalegajući termostad;
9. Ventil termičkog osiguranja;
10. Sonda ventila termičkog osiguranja;
11. Ventil za punjenje/pražnjenje;
12. Akumulator.

 ***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.***

 ***Ukoliko instalacija nije urađena po propisima odn.ne sadrži elemente prikazane po preporukama firme “Radijator inženjering”, GARANCIJA SE NEĆE UVAŽITI.***

7. Start rada kola i čišćenje

7.1 Start rada kotla i loženje

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



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.



Dimnjak i njegov odvod moraju biti čisti i u dobrom stanju.



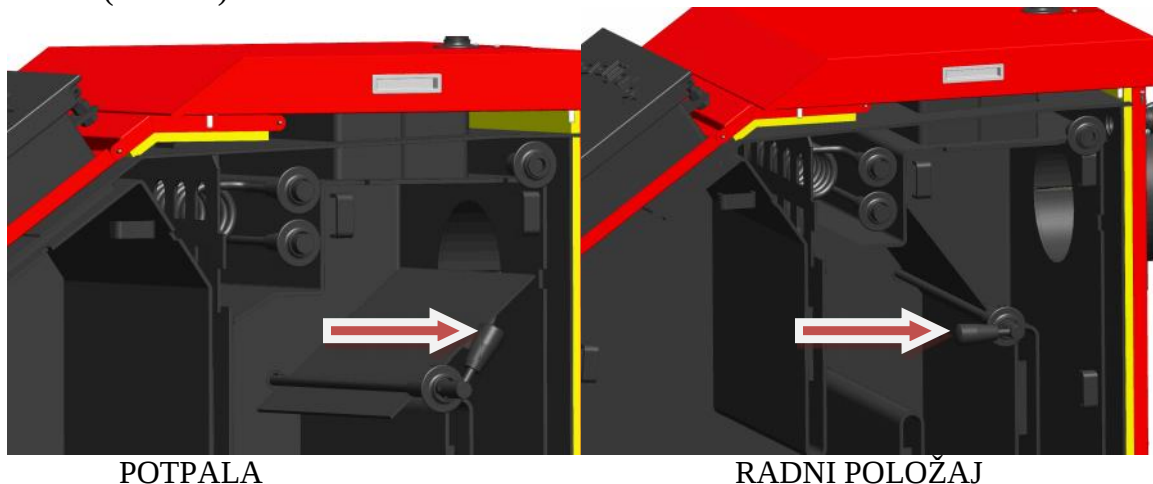
Proveriti da li je kotao pravilno priključen na hidraulički sistem. Naročito proveriti da li je iz kotla ispušten sav vazduh.



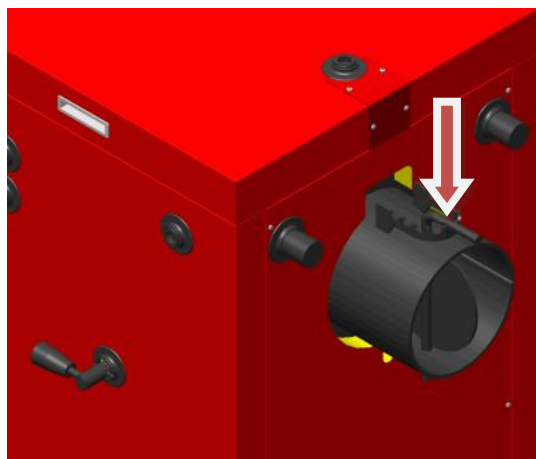
Kotao mora imati instalirane sve sigurnosne uređaje za sistem centralnog grejanja.

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

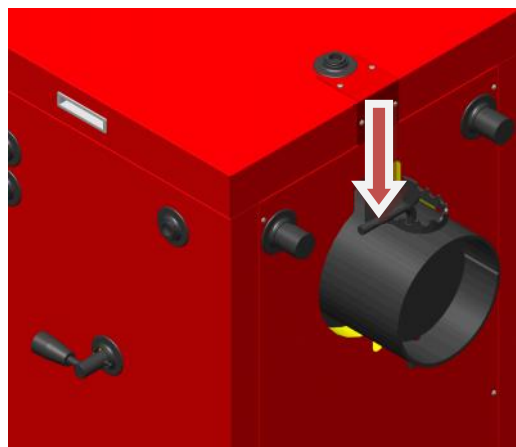
1. Unutar kotla postoji klapna za usmerivanje dimnih gasova u dva režima „radni” i položaj za „potpalu“. Ovom klapnom se rukuje pomoću ručice na bočnoj strani kotla. Pomeriti ručicu u smeru ka dimnjaku. Tada je klapna u položaju za potpalu. (slika 12) Takođe klapna na izlazu iz kotla, tj. na dimnjači treba da je maksimalno otvorena. (slika 13)



Slika 12. Prikaz položaja klapne u kotlu prilikom potpale i rada kotla



OTVORENO



ZATVORENO

Slika 13. Prikaz položaja klapne na dimnjači

2. 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.
3. Kada već imamo dobar, jak plamen dodati malo veću količinu goriva nego prvi put i to kroz gornja vrata. Zatvoriti sva vrata i pustiti da se kotao razgori. Otvaranje gornjih vrata u toku rada kotla raditi što ređe i to samo radi pregleda rada kotla. Vrata tada moraju da se otvore sporo, a oprezno i to prvo samo malo i tako ih zadržati desetak sekundi, a onda do kraja. Veoma je opasno naglo otvoriti gornja vrata prilikom rada kotla. Tada stvoreni gasovi sagorevanja izlaze kroz vrata i u kontaktu sa kiseonikom burno sagorevaju. U ovom slučaju može doći do lakših i težih povreda ližača ili zapaljenja kotlarnice.
4. Kada se vatra unutar kotla razgori, treba klapnu unutar kotla sa kojom se rukuje ručicom sa bočne strane, gurnuti ka prednjoj strani odnosno u „radni“ položaj. (slika 12)



Prilikom rada kotla, sva vrata moraju biti zatvorena.



Za loženje kotla upotrebljavati strogo suvo drvo da bi se izbeglo rošenje u kotlu.



Iz bezbednosnih razloga, zbog eventualnog požara i dužeg veka trajanja kotla zabranjeno je kotao podlagati gumom, plastičnom masom, organskim otpacima, tekstilnim krpama.

P A Ž N J A

Preniska temperatura polazne i povratne vode utiče na pojavu kondenzacije, što direktno utiče na vek trajanja kotla. U ekstremnim slučajevima može doći do stvaranja kondenza koji se može meriti litrima, pa kad konenz iscuri posumlja se da kotao curi. Kondenz u sebi ima sumpornu kiselinu koja se stvara tako što se sumpor izdvoji iz produkta sagorevanja. Sumporna kiselina prouzrokuje koroziju lima. Tačka rošenja zavisi od vrste goriva, atmosferskog pritiska i vlažnosti vazduha i kreće se u intervalu od 45°C - 50°C. Zbog toga moramo paziti da kod rada kotla povratna voda nikada ne padne ispod 65°C. KOTAO NIJE KONSTRUISAN ZA NISKO – TEMPERATURNI RAD. Posebno treba obratiti pažnju da kotao nije ugrađen na sistem neodgovarajućeg kapaciteta, jer će doći do podhlađivanja i kondenza. Ako je kotao obložen katranom i čađi slab je prenos toplote pa će, takođe, doći do podhlađivanja i kondenza.

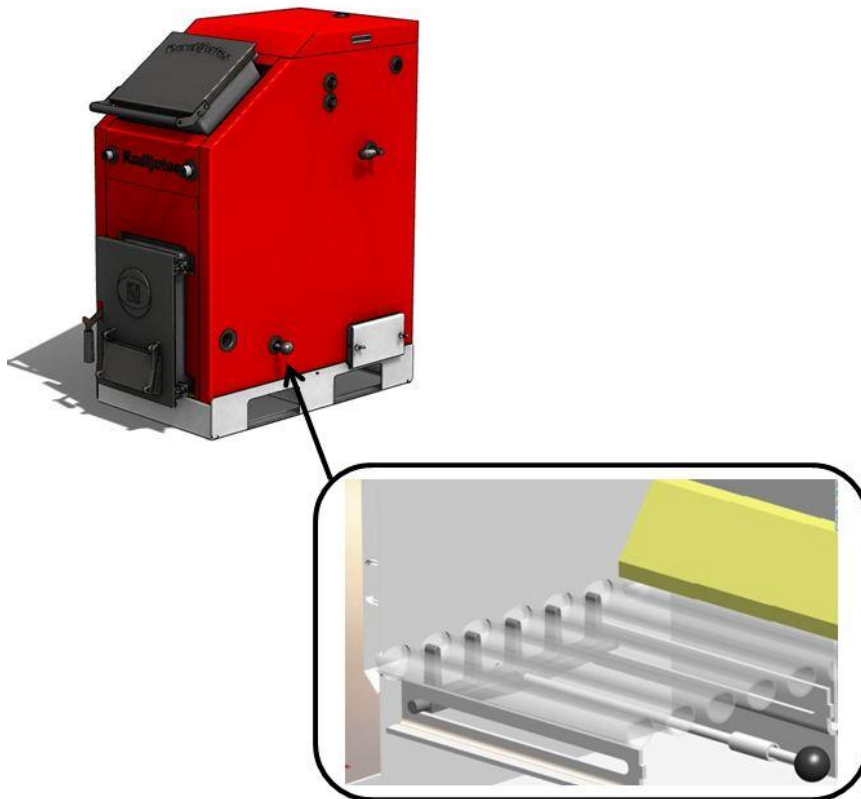
Kondenzaciju u kotlu moguće je izbeći:

1. Propisano izabranim dimnjakom,
2. Propisanim načinom loženja i propisanim vrstom goriva,
3. Pravilnim održavanjem kotla i dimnjaka, a naročito,
4. Upotrebom četvorokrakog ili trokrakog mešnog ventila.

7.2 Održavanje kotla

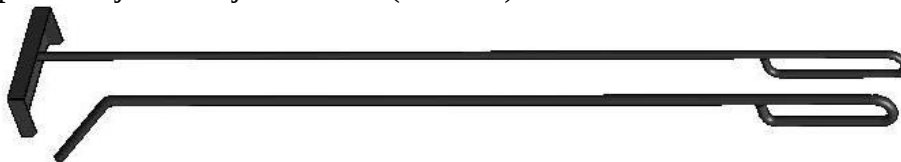
Kotao serije “K” zahteva svakodnevno i periodično čišćenje.

- Svakodnevno čišćenje se odnosi na prostor samog ložišta odn. na prostor između cevi rosta. Na samom kotlu sa bočne desne strane (fabrički postavljeno) nalazi se ručica, kojom korisnik čisti prostor između cevi rosta (**videti sliku 14**). Ova ručica može lako da se skine i istu prebaciti sa leve strane kotla.



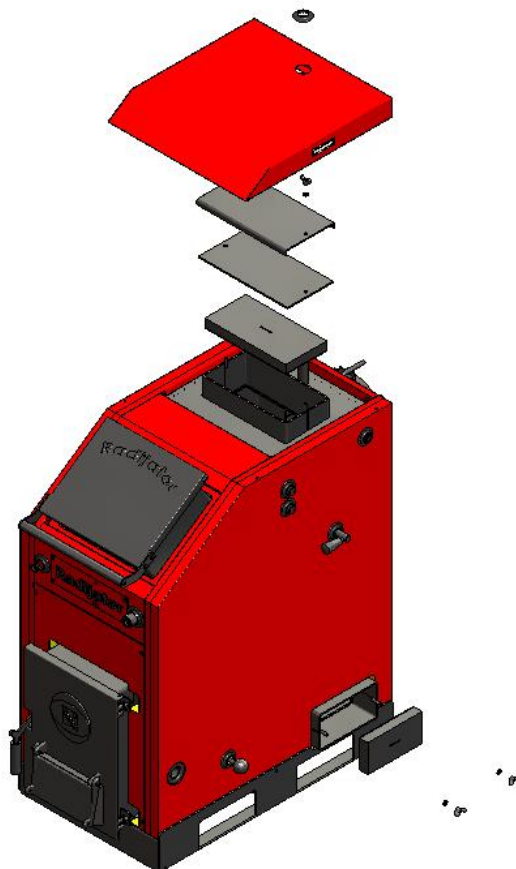
Slika 14. Prikaz ručice za čišćenje prostora između cevi rosta

- Na svakih 3 do 7 dana potrebno je pokupiti sav pepeo u ložištu kako bi kotao lakše radio odn. kako bi svež vazduh imao nesmetan prodor kroz sam kotao.
- Prilikom korišćenja čvrstog goriva u kotlu se nataloži, relativno brzo, sloj čađi i katrana. Zato se preporučuje svakodnevno čišćenje pepela i ložišta. Za čišćenje i održavanje kotla koristiti pribor koji se dobija uz kotao. (**slika 15**)



Slika 15. Prikaz pribora za čišćenje

- Kod čišćenja moramo dovesti veću količinu svežeg vazduha u kotlarnicu da nebi došlo do gušenja ložača.
- Kotao je takve konstrukcije da je moguće izmenjivačke površine očistiti kroz gornja ložišna vrata. Prilikom čišćenja izmenjivačkih površina u zadnjem delu kotla, skinuti revizione poklopce kako bi lakše prišli izmenjivačkim površinama. (**slika 16**)



Slika 16. Prikaz revizionih otvora za čišćenje

- Kada se kotao detaljno očisti treba jedan sat ložiti jače da temperatura u kotlu dostigne 85°C, što doprinosi sagorevanju čađi i štetnih materija u ložištu kotla. Na taj način kotao će imati bolji stepen iskorišćenja.
- Preporučujemo redovni nadzor dimničara.
- Posle čišćenja poklopce na spoljnoj oplati pažljivo vratiti da pravilno dihtuju, da ne bi promenili rad kotla.
- Po prestanku grejne sezone kotao treba detaljno očistiti, a zatim zatvoriti sva vrata uključujući i vratanca regulacije promaje. Na ovaj način sprečava se da i u letnjem periodu dimnjak ne pravi strujanje vazduha kroz kotao, odn. eliminiše se mogućnost podhlađivanja krajeva izmenjivačkih kutija i efekat rošenja. Eventualno rošenje kotla i u letnjem periodu negativno utiče na vek trajanja.

7.3 Natpisna pločica

Natpisna pločica je nalepljena na dobro vidljivo mesto na kotlu i sadrži sledeće (videti sliku u tački NALEPNICE):

1. Tehnički podaci sa nalepnice:

- Proizvođač (Radijator inženjering)
- Serijski broj kotla (primer: N°:20314084)
- Godina proizvodnje (primer: 2014)
- Tip kotla (K25)
- Snaga kotla (25 kW)
- Zapremina vode u kotlu (72 L)
- Potrebna promaja dimnjaka (18Pa)
- Dimenzije AxB (640x1170)
- Težina kotla (332 kg)

2. Nalepnica uvoznika

3. OEEEO

4. Ostale oznake na kotlu



7.4 Nalepnice

Na kotlu serije „K“ nalaze se nalepnice za označavanje priključaka kao i nalepnica za za šemu povezivanja i nalepnica pažnje, takođe na poledini kotla nalazi se nalepnica sa tehničkim podacima.

Nalepnice koje označavaju priključke za povezivanje instalacije:

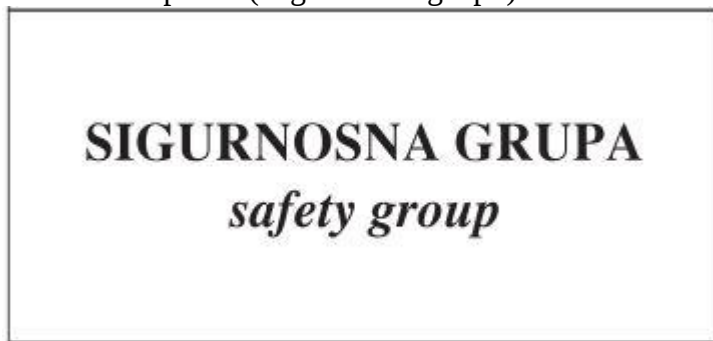
1. Nalepnica (Potisni vod) 32mm x 74mm



2. Nalepnica (Povratni vod) 32mm x 74mm



3. Nalepnica (Sigurnosna grupa) 32mm x 74mm



4. Nalepnica (Punjenje/pražnjenje) 32mm x 74mm

PUNJENJE/PRAŽNJENJE
cold water inlet/outlet

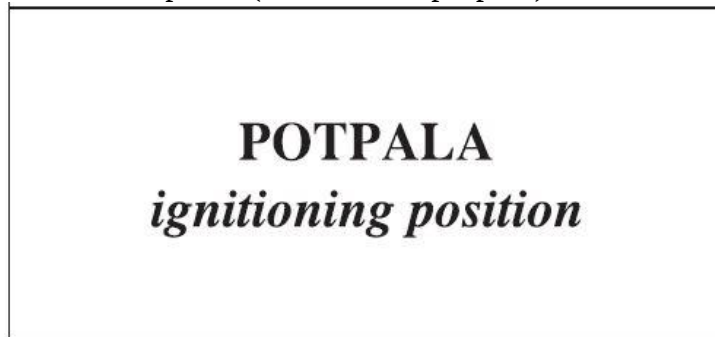
5. Nalepnica (Izmenjivač termičkog osiguranja) 32mm x 74mm

**IZMENJIVAČ TERMIČKOG
OSIGURANJA**
*inlet/outlet of thermal safety
relief valve*

6. Nalepnica (Sonda termičkog osiguranja) 32mm x 74mm

**SONDA VENTILA
TERMIČKOG OSIGURANJA**
*probe of temperature safety
relief valve*

7. Nalepnica (KLAPNA - potpala) 32mm x 74mm



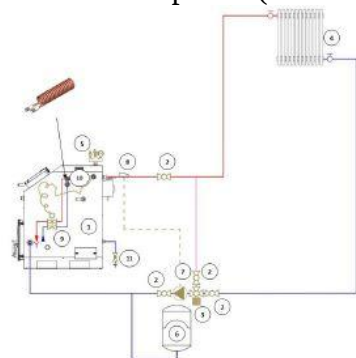
8. Nalepnica (KLAPNA – radni položaj) 32mm x 74mm



9. Nalepnica (Regulator promaje) 32mm x 74mm



10. Nalepnica (Hidraulička šema) 152mm x 210mm



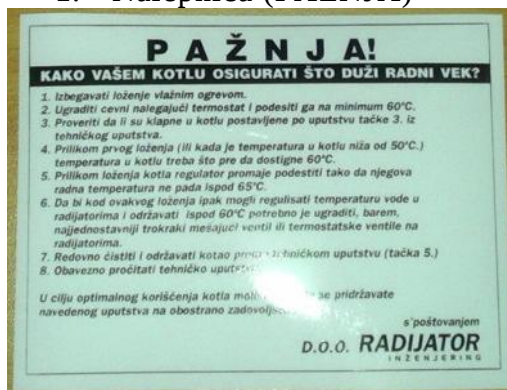
Hidraulička šema

Opis:

1. Kotao serije „K“;
2. Ventil;
3. Mešni ventil;
4. Izmenjivač;
5. Sigurnosna grupa;
6. Ekspanzijska posuda;
7. Pumpa;
8. Nakaljači termostata;
9. Ventil termičkog osiguranja;
10. Sonda ventila termičkog osiguranja;
11. Ventil za punjenje/praznjenje.

Nalepnice pažnje

1. Nalepnica (PAŽNJA)



2. Nalepnica (Otpad)



Nalepnice sa tehničkim podacima:

Živojina Lazića Solunca br.6
Grdica-36000 Kraljevo
Srbija

N^o 21015324
K25



Živojina Lazića Solunca br.6
Grdica-36000 Kraljevo
Srbija
e-mail: radijator@radijator.rs
www.radijator.rs



Pressure max	Temp. max
Max. pritisak	Max. temp.
3 bar/300kPa	90°C

N^o: 21015324

Godina/Year: 2015

TIP - MODEL	K25
TYPE-MODEL	
SNAGA KOTLA	25 kW
POWER BOILER	
ZAPREMINA VODE U KOTLU	72 l
VOLUME OF WATER	
POTREBNA PROMAJA DIMNJAKA	18 Pa
REQUIREMENT AIR FLUE	
DIMENZIJE AxB	640x1170 mm
DIMENSION AxB	
TEŽINA KOTLA	332 Kg
WEIGHT BOILER	



7.5 Proizvođač



RADIJATOR D.O.O.
Živojina Lazića Solunca br.6
36000 Kraljevo, Srbija

9. Garancija

1. Radijator inženjering pokriva garancijski period od 60 MESECI 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 6.)
- 1.2. Kotao mora biti priključen na dimnjak propisanog poprečnog preseka, karakteristika izolacije i visine. **(videti tačku 3.4)**
- 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 7.1 i 7.2)

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**
- **garancija važi ako je garantni list overen od strane prodavca i ako je upisan datum kupovine i priložen račun.**

3. Garancijski period od godinu dana važi za sledeće delove:

- opeka u ložištu,
- livena rešetkasta vratanca,
- liveni deo za čišćenje cevi rosta.

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,

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 instructions;
 - 1.1 Minimal distance from flammable materials;
2. Description of “K” series boiler;
3. Installing;
 - 3.1. General warnings
 - 3.2. Safety measures and devices for “K” series boilers;
 - 3.3. Boiler room;
 - 3.4. Connection to chimney;
4. Section of “K” series boiler with description of parts;
5. Table with technical data;
6. Hydraulic diagram;
7. Boiler starting and maintenance;
 - 7.1. Boiler starting and stoking;
 - 7.2. Boiler maintenance;
 - 7.3. Inscription plate;
 - 7.4. Labels;
 - 7.5. Manufacturer;
8. Warranty

1. Important warnings

GENERAL WARNINGS

- After removal of packaging make sure that the delivery is complete, and in case of missing parts, contact the seller who has sold the boiler.
- The boiler must be used exclusively for the purpose which is foreseen by the manufacturer. The maker excludes any responsibility for damages caused to persons, animals or objects in cases of improper installation, regulation, maintenance or improper use.
- In case of water leaking during filling of the system, close water delivery and inform authorized service or authorized installer.
- This instruction is the part of the boiler installation and must be carefully kept and must **ALWAYS** follow the boiler, also in the case when owner or user is changed or in the case when the boiler is connected to another installation. In case if the instruction is damaged or missing ask for a new copy from authorized seller.



IMPORTANT WARNINGS

We are reminding that use of solid fuel boilers require the obeying of safety measures as follows:

- Children and persons with limited abilities must not use the boiler without accompaniment of an able person.
- It is forbidden to use the boiler in installations with working temperature greater than 110°C, and working pressure greater than 3 bars.
- It is forbidden to use easily flammable fuels (alcohol, fuel oil) for faster ignition of wood.
- It is forbidden to store easily flammable materials near the boiler and near the stocking door. The ash must be stored in closed and not flammable containers.
- It is forbidden to burn waste and materials which combustion causes flame or explosion danger (e.g. plastic bags, sawdust, coal dust, mud etc.).
- Change on safety elements is forbidden.
- It is forbidden to close the ventilation openings on the room in which the boiler is placed.
- Ventilation openings are necessary for proper burning.
- It is forbidden to expose the boiler to the atmospheric conditions. The boiler itself is not foreseen for outdoor installation and do not contain the system against freezing.
- It is forbidden to put out the fire in the boiler if the outside temperature can fall below ZERO (danger of freezing).

- Take care of the position of safety air cover (more detailed explanation in chapter **STARTING BOILER OPERATION**)
- Operation with boiler installation is forbidden to physically and mentally disabled persons (including children), except when under supervision of guardians and people responsible for their behavior.
- In order not to play with boiler installation children must be under supervision of guardians

1.1 Minimal distance from flammable materials

- Provide appropriate distance from flammable materials; if necessary provide protection for such materials.
- Minimal distance from flammable materials is prescribed by law – please inform about that with competent persons, which are involved in heating, and chimney sweeps.
- Minimal distance for boiler and flue gas evacuation pipes from hardly and average flammable materials should be at least 100 mm.
- Minimal distance from easily flammable materials is 200 mm; same is applicable for materials which flammability is not known.



Fire danger

- It is forbidden to store flammable materials and liquids near the boiler.
- It is obligatory to inform users about necessary minimal distance of flammable materials from the boiler.

Flammability of building materials	
A ... nonflammable	asbestos, stone, building stone, ceramic wall tiles, terra-cotta, mortar, cement glaze (without organic additives)
B ... which are not easily flammable	gypsum cardboard plates, glass fibers, plates made of AKUMIN, IZOMIN, RAJOLIT, LIGNOS, VELOKS and HERAKLIT
C1... poorly combustible	beech and oak wood, composite wood, felt, plates made of HOBREKS, VERZALIT, UMAKART
C2... with average combustibility	pine, yew and fir wood, composite material
C3... easily flammable	asphalt, cardboard, cellulose materials, chipboard, cork, polyurethane, polystyrene, floor fibers

2. Description of “K” series boiler

“K” series boiler is of welded robust structure with double wall and grill which is water cooled in such way that water drenches all surfaces which are in contact with flame and hot gases. Boilers of this series are made with output from 18 to 80 kW. Each size of “K” series boiler has copper exchanger for connection of the valve for thermal safety as well as the cover for ignition. All parts of water section of the boiler are made of seamless pipes of **ST 35.4** quality and 5 mm thick boiler plates, which depends on the boiler power. Plates are of quality **1.0425 EU** standard that is **P265GH** standard **EUII**.

Analyzing the transverse section of the boiler (**figure 1**) it can be seen that in these boilers heat exchanging surfaces are placed vertically and that by their dimensions and disposition have provided a very long way for the hot gases through the boiler. By measurements it was found that the velocity of gases at the exit from boiler and the temperature at entrance to the chimney are significantly lower compared to the other constructions in our production programme, therefore it is concluded that this construction has the highest degree of utilization.

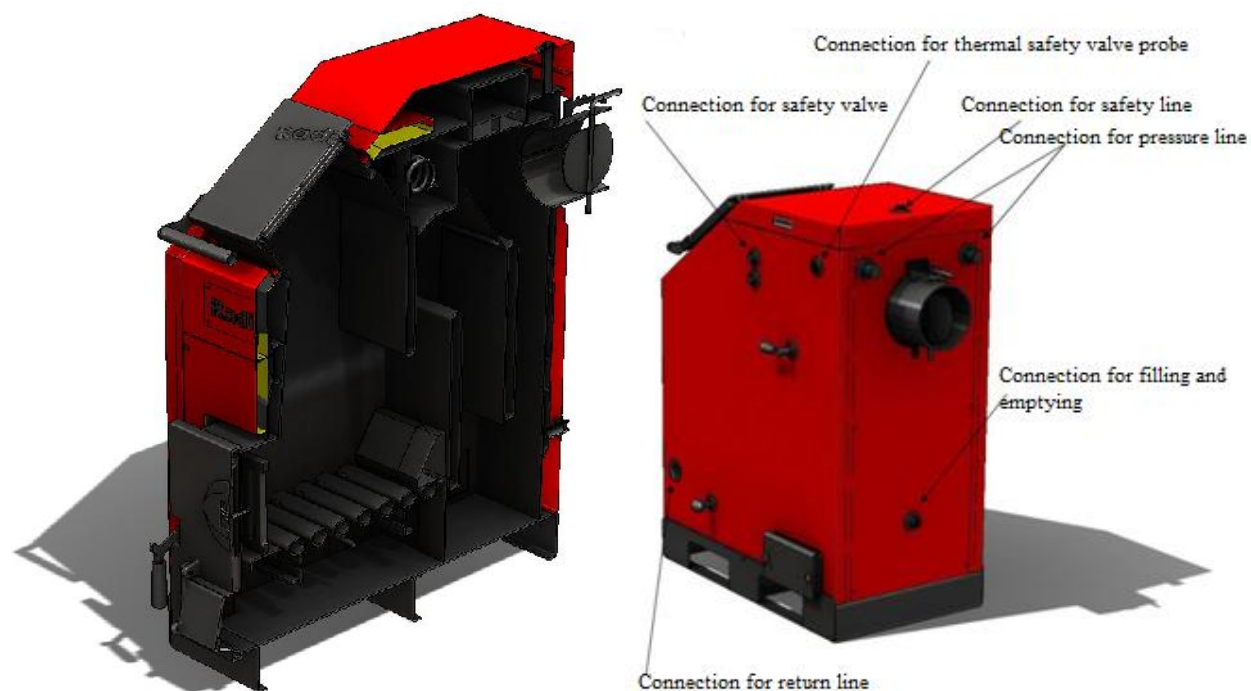


Figure 1. Transverse section of the boiler and disposition of connections on the boiler

“K” series boilers have so called burning from the bottom, accordingly they are with distinct permanent burning, it is possible to fill it with fuel up to the stocking door without fear that the fire will go out. The boiler has a big space for fuel; accordingly it is possible to use the boiler for the whole day with one or two fillings. Refractory bricks made of temperature accumulating material are placed in the aft part of the furnace. They heat to the temperature which is sufficient to burn otherwise hardly burning particles in the flue gases.

Heat exchanger made of copper for connection of the valve for thermal safety is installed in the boilers (explained in **point 3.2**, shown in hydraulic diagram **point 6**), the system for cleaning the grate is also installed in the boiler, that is a space between the water cooled pipe where the burning takes place (shown and explained in **point 7.2**).

This type of construction, when the fuel is wood, reaches extremely high utilization factors (over 80%), excellent results are also obtained when wood and coal are mixed, and fueling with coal should be avoided whenever possible as the utilization factor is lower.

The design of the boiler enables easy stocking and cleaning of the boiler (explained in **point 7.1** and **7.2**). The design of the boiler enables connection to the smokestack at the aft side of the boiler, the boiler also has double connections for connecting to the central heating installation. Beside double connections for connecting to the installation (connections for pressure and return line), the boiler also has the other necessary connections as follows (**figure 1**):

- Connection for filing and emptying;
- Connection for draft regulator;
- Connection for safety line;
- Connection for thermal safety valve;
- Connection for thermal safety valve probe;

The boiler is lined with the shell made of 1 mm thick sheet steel lined with plastic under which is 50 mm thick mineral wool, which serves as insulation.

3. Installation

3.1 General warnings

To work properly the boiler must be properly placed!

The boiler is delivered with outside covering which contains 50 mm thick insulation. The boiler must be placed on concrete stand which, in relation to the floor of the room (boiler room), is 100 mm high. The boiler must be placed in such way that the access is possible from all sides for the purpose of cleaning and maintenance (further in **point 3.3**)

For normal operation supply of fresh air to the boiler room is necessary (**point 3.3**), also for normal operation of the boiler it is necessary that the chimney is made with prescribed characteristics and made of chamotte pipes with prescribed diameter (**point 3.4**).



Maximum working pressure of the boiler is 3 bar, minimum pressure is 1 bar, and maximum working temperature of the boiler is 110 °C.



Solid fuel boiler shall be installed according to current norms and law regulations. Every change on mechanical structure will be considered as breach of warranty conditions and will lead to its violation.



During connection to hydraulic installation the boiler must be secured in proper way not to exceed maximum working temperature and pressure.



The person who is installing the central heating and who is connecting the boiler to the hydraulic system is responsible for proper installation of the boiler.



Radijator engineering, as the manufacturer of the boiler, shall not take any responsibility for damages caused by the bad installing of the boiler.

Basic requirements which have to be respected during installation are:

- The boiler can be connected to the open system for central heating, but also to the closed system for central heating. When connecting to the closed system, it is recommended to install the valve for thermal protection, which is also prescribed by corresponding laws of every state in which the boiler is connected to the installation.

- The boiler must be placed at the safe distance from easily flammable materials.
- The connection to the chimney is also done according to the binding regulations as well as according to the manufacturer recommendations which can be seen from the following text.

3.2 Safety measures and devices for “K” series boiler

To obtain safe operation of “K” series boiler it is necessary to install following elements and to maintain them in order:

- **Pressure safety valve, air bleeding valve and pressure gauge;**
- **Draught control device;**
- **Flow out valve for thermal insurance.**

Pressure safety valve (figure 2), air bleeding valve (figure 3) and pressure gauge (figure 4):



Figure 2. Safety valve



Figure 3. Air bleeding valve



Figure 4. Pressure gauge

- Pressure safety valve must be with nominal diameter of 1/2 inch and calibrated on maximum 3 bar.
This safety element which is in the group of pressure limiting instruments must be made in such way to withstand for short time higher temperatures and overpressure as well as certain content of glycol in the heating fluid.
Usually at the same place are connected air bleeding valve (**figure 3.**) and pressure gauge (**figure 4.**) in such a way that this three elements together form the safety group and are mounted using „T” connections.
This safety element must be recalibrated from time to time, which should be shown in valid documents which must be in possession of the investor that is user of the boiler.

- The safety valve must be installed at the highest place on the boiler and directly on the boiler without any piping or any other elements between. Special connection for this purpose exists (see figure 8.). Any reduction of the diameter of this connection is strictly forbidden.
- Exhaust part of the safety valve must be made from the pipe with diameter at least the same as the nominal diameter of the exhaust part of the valve. It also permitted to use in its construction not more than one arch with radius $r > 3d$.
- Safety valve must have the identification plate with following information:
 - name of the manufacturer
 - mark of the safety valve type / year of testing
 - nominal flow
 - data on which thermal output the safety valve is calibrated
 - the highest opening pressure that is 3 bar
- In prescribed periods of time it is obligatory to check the proper operation and calibrate the valve by certified companies. These obligations will be done according to the law of the country in which the boiler is installed. It is obligatory to keep written document with data from last calibration of the safety valve.
- At least one more safety pressure valve shall be installed in the return line.

Draught governor (figure 5):



Figure 5. Draught governor

Draught governor is installed on the boiler using thermostat element submerged in the fluid, it regulates the air flow in automatic way and provides for constant and complete burning.

Operating principle (**figure 6**): Draught governor acts on the air draught value in the solid fuel boiler, by changing the cross section and by this the flow of the air for burning. If water temperature inside the boiler is changed (**figure 6, item 1**), by widening or contraction of the thermostatic probe (**figure 6, item 2**) which is connected to the lever gear consisting of control lever (**figure 6, item 3**) and chain (**figure 6, item 4**), draught governor changes opening of the door (**figure 6, item 5**) for combustion air supply (**figure 6, item 6**). When water temperature falls under preset value, draught governor pulls the chain (**figure 6, item 4**) and increase the opening of the door (**figure 6, item 5**) so that more air can enter the combustion chamber (**figure 6, item 7**), which increase the rate of burning. When water temperature rises, draught governor slackens the chain (**figure 6, item 4**) and closes the door of the opening (**figure 6, item 5**), which limits entrance of combustion air (**figure 6, item 6**). In this way the burning process is kept under control, so that the water temperature in the boiler is constant preventing overheating and excessive consumption of fuel.

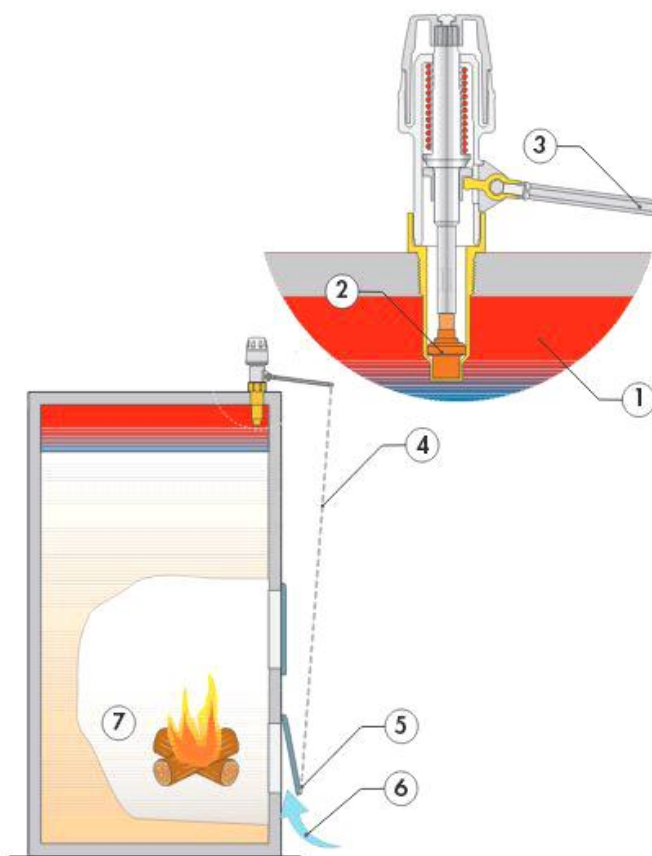


Figure 6. Operating principle for draught governor

Flow out thermal safety valve (figure 7)



Figure 7. Thermal safety valve

This safety element also has the role to limit the temperature. In the following text it is marked by abbreviation VTO.

- In some extremely dangerous situations transformation of water to steam is such that safety pressure valves are not sufficient to provide for the safety of hydraulic system. Due to this reason installation of VTO is obligatory. Depending on legal regulations in countries in which the boiler is installed, VTO must be installed only for powers greater than prescribed or VTO must be installed for all powers.
- Place for installation is shown in installation diagram for the boiler and in picture 8. Copper spiral is delivered in the boiler so it is necessary to use VTO with exchanger as in **figure 8**. Cold sanitary water is fed to VTO. When the probe in VTO has the information that the temperature is over 95 degrees VTO opens and the water passes through the copper spiral. After some time the temperature of the water in the boiler returns to normal.
- One connection of the spiral is used for VTO and the other for letting out the water which has passed through the spiral. It does not matter which connection of the spiral is for VTO and which for letting out the water. It is obligatory to observe the instructions for installation which the manufacturer of VTO has given.
- It is obligatory to check the function of VTO in prescribed time intervals.

As already said one end of VTO is for installation on the heat exchanger of the boiler and to the other cold water under pressure is fed. It is very important that the flow of that water is unobstructed also when there is no supply of electric power.

If it is not possible to provide for the flow of cold sanitary water also when there is no supply of electric power the boiler must be connected to an open system.



If it is not possible to provide the flow of the cold sanitary water even when there is no electric power, the boiler must be connected to the open system.



If the supply of sanitary water to the thermal insurance valve is through and additional pump the boiler must be connected to the open system.



Figure 8. Illustration of placing the safety elements

3.3 Boiler room

The boiler room must be protected against freezing.

The floor of the boiler is made in the form of metal pallet 110 mm high with openings for pallet fork lift truck. This height is adequate distance from floor (cleaning is made easier) so there is no need for any concrete plate in the boiler room. Foundation for boiler in the boiler room must be of non flammable material. Recommended values of distances for all four sides of the boiler related to the walls of boiler room or some other rigid bodies (accumulating boiler etc.) are shown in **figure 9**. This values of distances enable safe access during stoking, adequate space for cleaning and unobstructed access to the valve for filling and emptying. Placing of the boiler related to the side wall shown in the figure can be also as the mirror image as the boiler has side openings for cleaning on both sides. The handle of the cover for starting the fire and the handle for cleaning the slits between the pipes in the firebox can be dismantled and can be placed on the left and on the right side of the boiler. **The boiler room must have adequate openings for ventilation for the fresh air and for the evacuation of the spent air.**

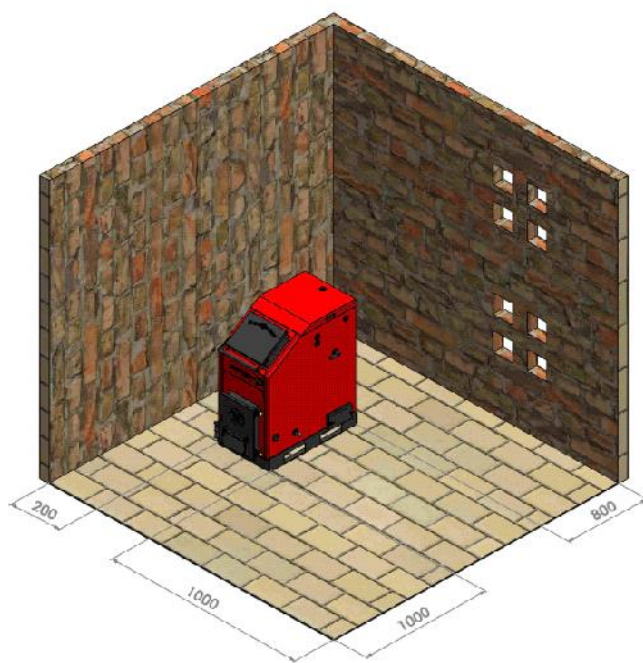


Figure 9. Position of the boiler in the boiler room

Total area of these openings is minimum 150 cm^2 for output up to 50 kW and for output above 50 kW must be greater for additional 2 cm^2 per kilowatt possible outputs over 50 kW.

Lack of sufficient ventilation in the boiler room can cause numerous problems in boiler operation. Main problem is impossibility to attain high temperatures of outgoing water that is not attaining the maximum power which leads to the condensation of the water inside boiler.

- Take into account necessary minimum space which is needed for access to the safety elements and for performing the cleaning operation.
- It is forbidden to expose the boiler to bad weather conditions. The boiler itself is not foreseen for outside installation and do not include the system against freezing.
- It is forbidden to close ventilation openings of the room in which the boiler is placed. Ventilation openings are indispensable for proper combustion.

3.4 Connection to the chimney

The optimal placing of the boiler regarding the uptake is such that the strait line which connects the centre of exit of smoke gases from the boiler and the centre of connection to the chimney is raising gentle (up to 3%)(**figure 10**).

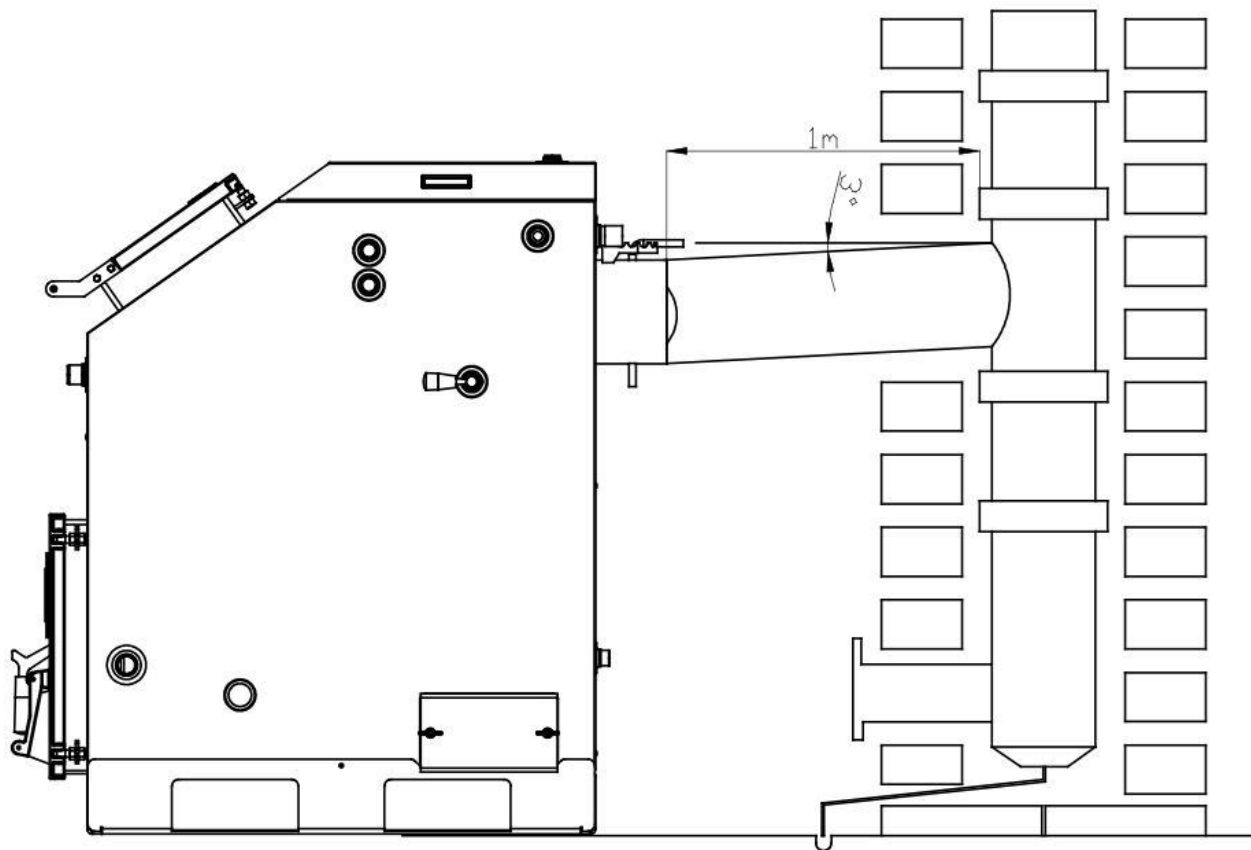


Figure 10. Connection of the boiler to the chimney is shown

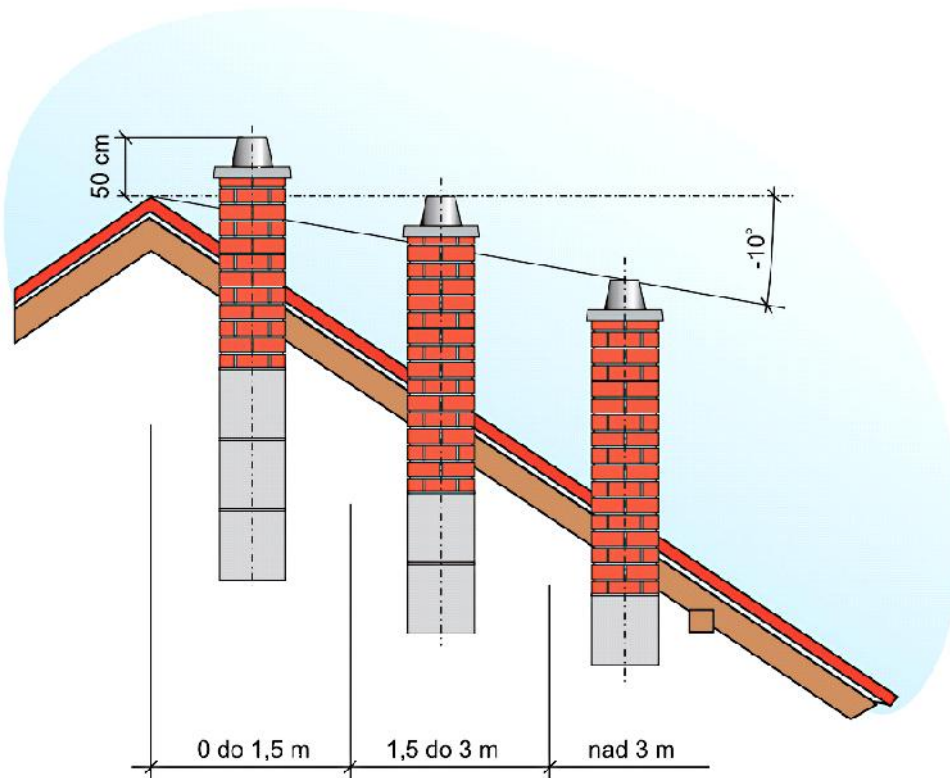
If possible arches shall be avoided, if not possible than the maximum number of arches is two (2). It is preferable to insulate the smoke channel from the boiler to the chimney, especially if there are arches and longer parts. The chimney itself shall be made of ceramics pipes, around the pipes 3 – 5 cm thick insulation shall be placed and the last outside layer shall be made of brick or special chimney elements.

If the chimney is not made of ceramics but of bricks, the area of unobstructed section of such chimney shall be 30% greater than the area of the chimney made of ceramics. Minimum cross sections of both chimneys and minimum heights are shown in **table 1**.

BOILER NAME	BOILER POWER	REQUIRED CHIMNEY	
		DIAMETER	HEIGHT
K18	18 kW	Ø 180 mm	H = 7 m
K25	25 kW	Ø 200 mm	H = 8 m
K33	33 kW	Ø 200 mm	H = 9 m
K40	40 kW	Ø 200 mm	H = 11 m
K50	50 kW	Ø 250 mm	H = 12 m
K65	65 kW	Ø 250 mm	H = 13 m
K80	80 kW	Ø 300 mm	H = 14 m

Table 1. Recommended diameter and height of the chimney for series „K” boilers

The chimney must have small doors for cleaning which must seal well. Chimney exit on the roof must be in accordance with the determined regulations. There are two different cases: if the angle of the roof is less than 12° and if the angle of the roof is greater than 12°. For the angle less than 12° the height above roof is 1 m and for the angle which is greater than 12° the sketch should be seen.



17

If you are of opinion that the chimney is too strong and that too much of cold air passes through the boiler, at the exit there is a cover by which the flow of the exhaust gases can be reduced. The chimney should be regularly cleaned at least once a year.



If the chimney is not with the proper height, cross section or if not cleaned complications in boiler operation are possible. Above all high temperature operation is not possible, that is there is no maximum operating power, and the consequence is appearance of condensation which influence the operating age of the boiler.



Weak chimney is the main reason that during ignition of the boiler the smoke appears on upper or lower door, especially when number of revolution of the ventilator is higher.

4. Cross section of „K“ boiler with description of elements

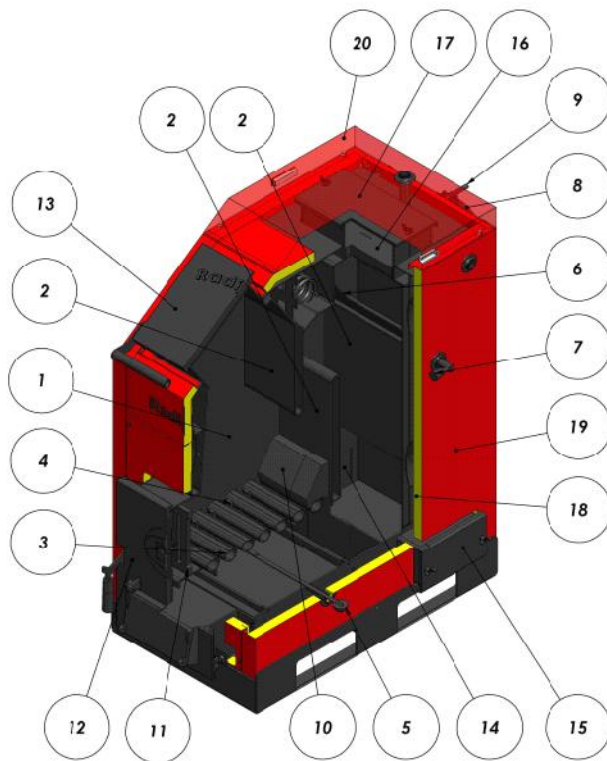
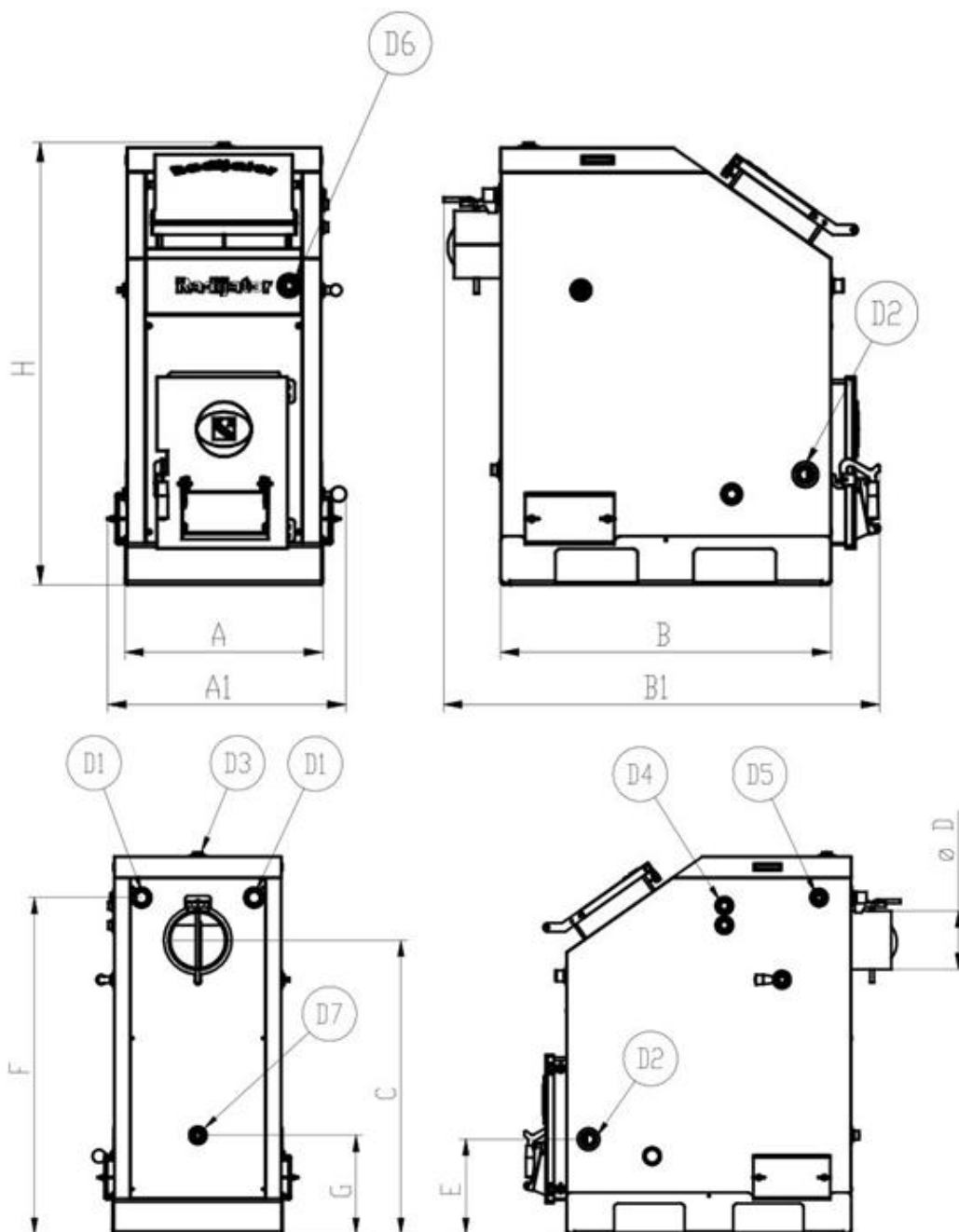


Figure 11. Section of „K” series boiler with description of elements

Description:

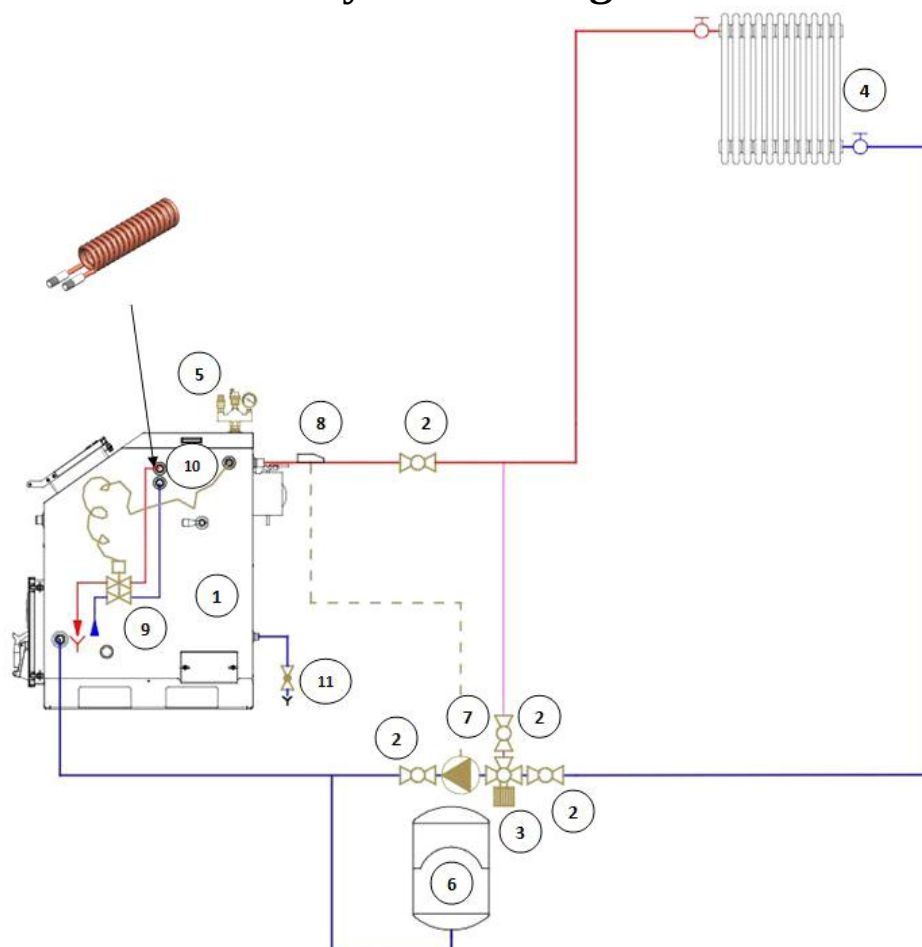
1. Boiler body;
2. Vertical box exchangers;
3. Pipe grill;
4. Cast iron comb for cleaning of slits between grill pipes;
5. Handle of cleaning comb;
6. Boiler cover;
7. Handle of boiler cover;
8. Uptake;
9. Handle of uptake cover;
10. Brick;
11. Cast iron grill door;
12. Lower cast iron door for ignition and cleaning;
13. Upper cast iron door for stocking;
14. Lower side inside cover of cleaning slits;
15. Lower side outside cover of cleaning slits;
16. Upper inside cover of cleaning slits;
17. Upper outside cover of cleaning slits;
18. Boiler insulation;
19. Boiler shell;
20. Dismountable shell cover.

5. Table with technical particulars



Boiler type		K18	K25	K33	K40	K50	K65	K80
Boiler power	kW	18	25	33	40	50	65	80
Working pressure	kPa	300	300	300	300	300	300	300
Test pressure	kPa	450	450	450	450	450	450	450
Volume of the water in boiler	L	55	72	87	100	140	155	180
Boiler mass	kg	240	332	375	422	465	527	565
Necessary draught of chimney	Pa	17	18	20	22	23	24	24
Dimensions								
	A	480	530	580	670	770	870	920
	A1	590	640	700	790	790	930	975
	B	790	885	955	965	965	965	1010
	B1	1040	1170	1230	1235	1260	1260	1310
	C	810	910	955	1010	1050	1075	1075
	ØD	180	180	200	200	200	250	250
	E	290	295	305	305	310	315	315
	F	940	1040	1075	1130	1175	1225	1225
	G	305	305	315	315	315	320	320
	H	1080	1180	1235	1285	1285	1340	1340
Connections for hot water from boiler	D1	1"	1"	5/4"	5/4"	5/4"	6/4"	6/4"
Connections for cold water from boiler	D2	1"	1"	5/4"	5/4"	5/4"	6/4"	6/4"
Connections for deaeration and pressure safety valve	D3	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Connections for valve for thermal protection by outflow VTO	D4	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Connections for probe for valve for thermal protection by outflow VTO	D5	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Connection for draught control	D6	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"
Connections for filling and emptying	D7	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
*Right for changes is retained								

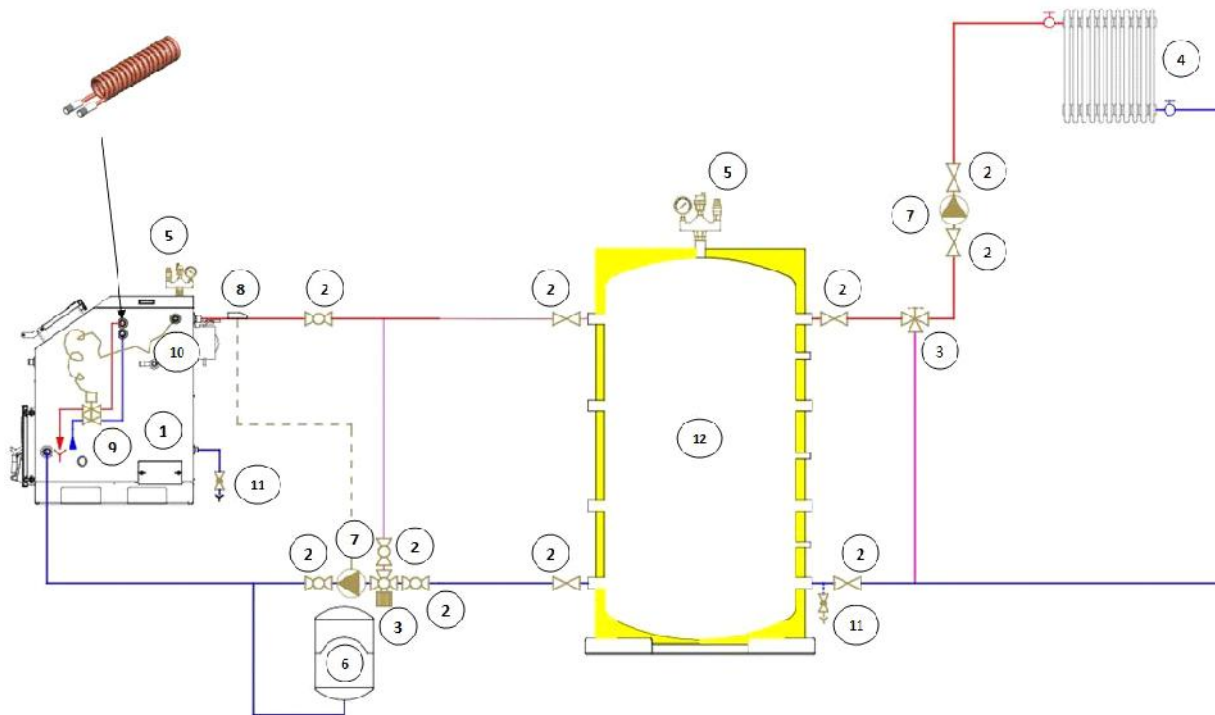
6. Hydraulic diagram



Hydraulic diagram

Description:

1. „K“ series boiler;
2. Valve;
3. Mixing valve;
4. Exchanger;
5. Safety group;
6. Expansion vessel;
7. Pump;
8. Leaning thermostat;
9. Thermal protection valve;
10. Probe for valve for thermal protection;
11. Valve for filling/emptying.



Hydraulic diagram with accumulator

Description:

1. „K“ series boiler;
2. Valve;
3. Mixing valve;
4. Exchanger;
5. Safety group;
6. Expansion vessel;
7. Pump;
8. Leaning thermostat;
9. Thermal protection valve;
10. Probe for valve for thermal protection;
11. Valve for filling/emptying.
12. Accumulator



When being mounted on the hydraulic installation the boiler must insured be in proper way against exceeding maximum operating temperature and pressure.



The person who is connecting the boiler to hydraulic system is responsible for proper installation.



Radijator inženjering, as the manufacturer of the boiler, does not take any responsibility for damages caused by the bad installing of the boiler.



*If the installation is not done according to regulations, that is do not contains the elements shown in recommendations of the company “Radijator inženjering”, **THE WARRANTY WILL NOT BE ACCEPTED.***

7. Starting boiler operation and cleaning

7.1 Starting boiler operation and stocking

Before starting to use the boiler it must be ascertained that the whole installation, and especially the boiler well deaired and that there are no leaks.



The boiler shall not be ignited before it was inspected from inside and outside to convince that there is no leaking of water from the boiler.



If there are valves immediately after the boiler check if they are open.



Chimney and its drain must be clean and in good condition.



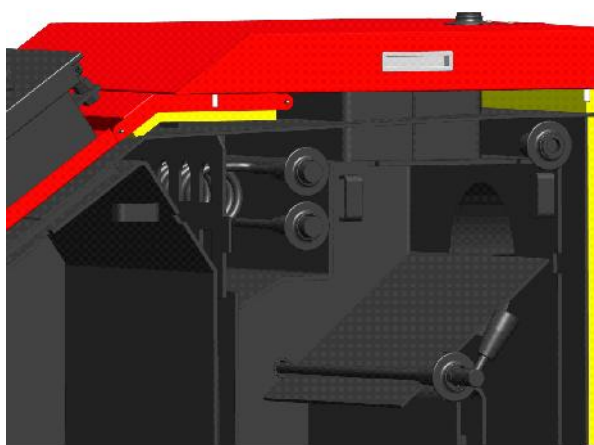
Check if the boiler is correctly connected to the hydraulic system. Check especially if all air has been taken out from the boiler.



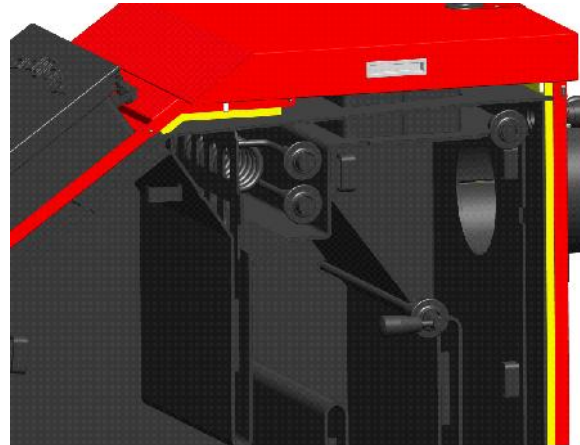
All safety devices for the central heating system must be installed in the boiler. Only when the user is ascertained in above facts stocking of the boiler can begin. Stoking shall be done according to the sequence of the following operations.

- Inside the boiler there is a cover for directing the flue gas in two modes „operating” and position for „ignition”. This cover is operated by the handle on the side of the boiler. Move the handle in the direction towards the chimney. Than the cover is in the position for „ignition”. (**figure 12**).

Also cover at the exit from boiler, that is on the uptake must be fully opened. (**figure 13**).

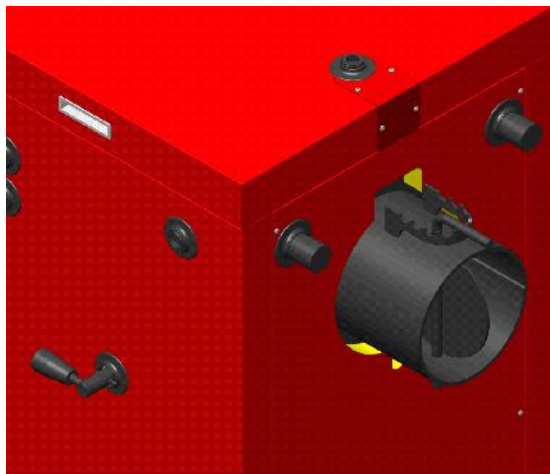


IGNITION

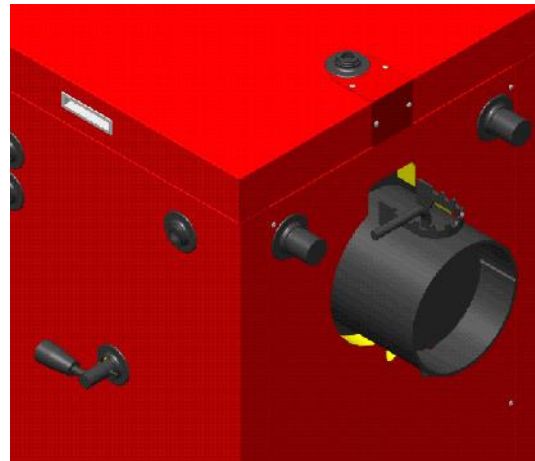


OPERATING POSITION

Figure 12. Shows position of cover in the boiler during ignition and operation of the boiler



OPEN



CLOSED

Figure 13. Position of the cover in uptake is shown

- Open lower door and small grate door. Put some material for ignition consisting of paper and dry thin pieces of wood on the pipe grate. It is the best to use chemical igniters which are in form of cubes for ignition of wood. Ignite by hand and wait for flame to begin to burn well.
- When good strong flame is obtained add through upper door a quantity of wood which is greater than one placed firstly. Close all doors and let the boiler to start to burn well. During operation of the boiler the upper door shall be opened as rare as possible and only to observe the operation of the boiler. The door must be opened slowly and carefully first only little and keep it in this position for ten seconds and then open it completely. It is very dangerous to abruptly open the upper door during operation of the boiler. Than gasses created in burning come out rapidly and burn strongly in contact with oxygen. In this case the stoker may be lightly or heavily injured or the boiler room can catch fire.
- When the fire inside boiler becomes strong, the cover inside the boiler which is operated by handle on the boiler side shall be pushed towards front side that is in „operating” position. (figure 12)



All doors must be closed during operation of the boiler.



In order to avoid forming the dew inside the boiler only very dry wood shall be used for stocking the boiler.



For safety reasons, to avoid eventual fire and longer operating time of the boiler it is not allowed to burn in the boiler rubber, plastic materials, organic waste, textile rugs.



Extreme low temperature of incoming and out coming water influence the appearance of condensation, which directly influence the time in which the boiler will be able to operate. In extreme cases, the condensate which can be measured in litres can form, and when this condensate leaks out it can be suspected that the boiler is leaking. Condensate contains sulphuric acid which is formed by separation of sulphur from products of burning. Sulphuric acid causes corrosion of steel plates. The dew point depends on the type of fuel, atmospheric pressure, and air humidity and is in the interval of $45^{\circ} - 50^{\circ} \text{C}$. Accordingly we must take care that when the boiler is operating the return water never falls under 65°C . THE BOILER IS NOT CONSTRUCTED FOR LOW TEMPERATURE OPERATION. Special attention shall be paid that the boiler is not installed in the system with the capacity which is not appropriate, since this will lead to fall of the temperature and forming of condensate. If the boiler is lined with tar and soot heat transfer is weak which shall also lead to fall of temperature and forming of condensate.

Condensing in the boiler can be avoided by:

1. Properly chosen chimney,
2. Proper way of stoking and proper type of fuel,
3. Correct maintenance of boiler and chimney, and especially,
4. Using the four-way or three-way mixing valve.

7.2 Maintenance of the boiler

“K” series boiler requires daily and periodical cleaning.

- Daily cleaning relates to the combustion space itself, which is to the space between pipes of the grill. On right side of the boiler there is a handle (factory placed) which serves for the user to clean the space between the pipes of the grill (**see figure 14**). This handle can be taken down and moved to the left side of the boiler easily.

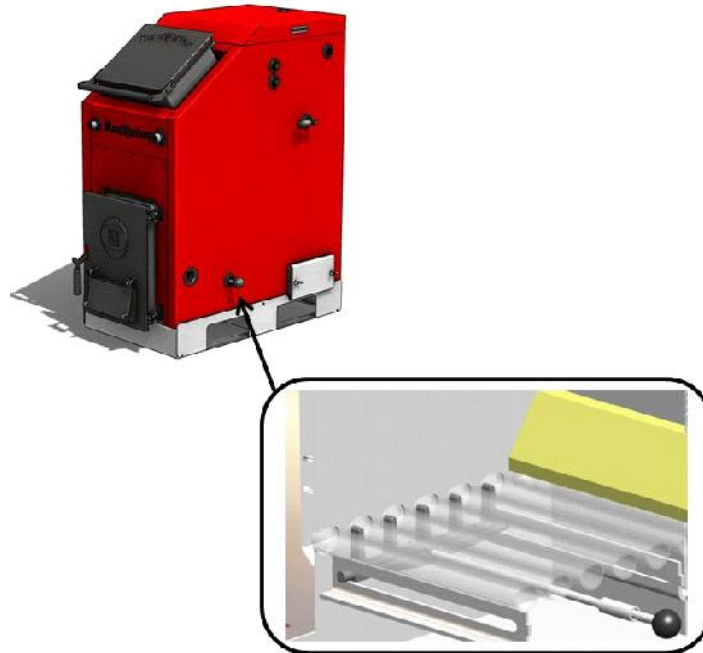


Figure 14. Shows handle for cleaning spaces between pipes of the grill

- Every 3 to 7 days it is necessary to collect all ashes from the fireplace so that the boiler can operate easily, that is the fresh air has unobstructed passage through the boiler.
- When solid fuel is used a layer of soot and tar is deposited, relatively rapidly, in the boiler. Therefore everyday cleaning of ash and is recommended. Equipment which is supplied with the boiler shall be used for cleaning and maintenance of the boiler (**figure 15**).



Figure 15. Shows equipment for maintenance

- When cleaning larger quantity of fresh air must be brought to the boiler room to prevent the stocker to suffocate.
- The boiler is constructed in such way that it is possible to clean upper exchange surfaces through the upper door of the fire place. When cleaning exchange surfaces in the aft part of the boiler, revision covers shall be dismantled to enable easier access to the exchange surfaces. (**figure 16**)

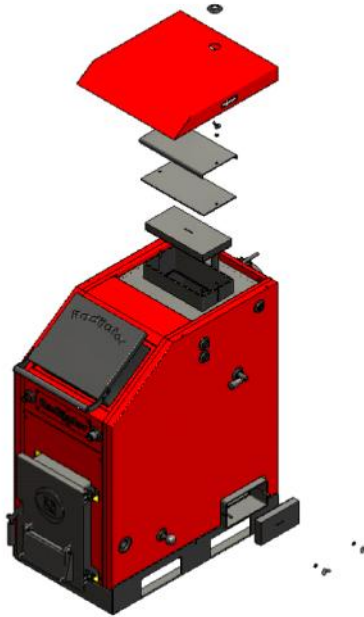


Figure 16. Shows revision openings for cleaning

- When the boiler is cleaned in detail stocking shall be more intensive for one hour to bring the temperature in the boiler to 85° C, which will contribute to burning the soot and harmful matters in the fire place. In this way the utilization factor of the boiler will be better.
- We recommend permanent supervision by chimney sweep.
- After cleaning covers on the outside shell should be carefully returned in place to seal well, so that operation of the boiler is not changed.
- When the heating season is finished the boiler should be cleaned in detail, and then all doors should be closed including the small door for draught. In this way it is prevented in summer period that the chimney makes flow of air through the boiler, that is possibility of excessive cooling of ends of exchange boxes and forming of dew is prevented. Eventually forming of dew even in summer period has negative influence on durability of the boiler.

7.3 Name plate

Name plate is glued on well visible place on the boiler and contain following (see figure in point LABELS):

1. Technical data from the label:

- Manufacturer (Radijator inženjering)
- Boiler serial number (example: N^o:20324084)
- Year of production (example:2014)
- Boiler type (K25)
- Boiler power (25 kW)
- Volume of water in the boiler (72 L)
- Necessary draught of the chimney (18Pa)
- Dimensions AxB (640x1170)
- Boiler weight (332 kg)

2. Label of the importer

3. OEEO

4. Other markings on the boiler



7.4 Labels

On „K“ series boiler are placed labels which designate the connections as well as the label with connection diagram and for attention, also on the back side of the boiler there is label with technical data.

Labels which designate connections for connecting the installation:

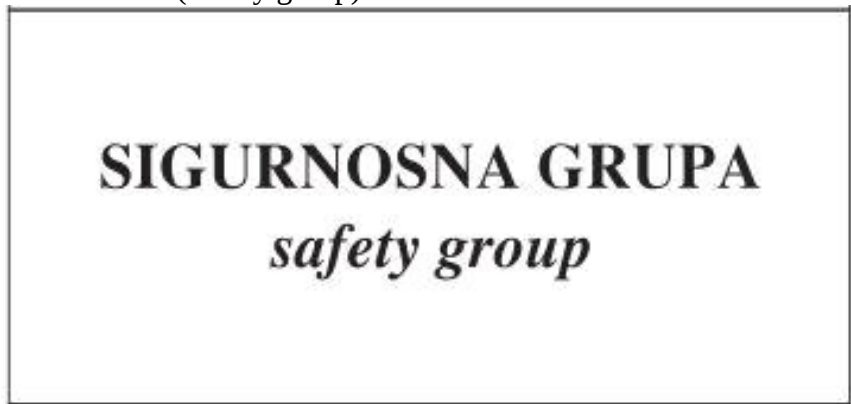
1. Label (Hot water) 32mm x 74mm



2. Label (Cold water) 32mm x 74mm



3. Label (Safety group) 32mm x 74mm



4. Label (Cold water inlet/outlet) 32mm x 74mm

PUNJENJE/PRAŽNJENJE
cold water inlet/outlet

5. Label (Inlet/outlet of thermal safety relief valve) 32mm x 74mm

**IZMENJIVAČ TERMIČKOG
OSIGURANJA**
*inlet/outlet of thermal safety
relief valve*

6. Label (Probe of temperature safety relief valve) 32mm x 74mm

**SONDA VENTILA
TERMIČKOG OSIGURANJA**
*probe of temperature safety
relief valve*

7. Label (COVER – ignition position) 32mm x 74mm

POTPALA
ignitioning position

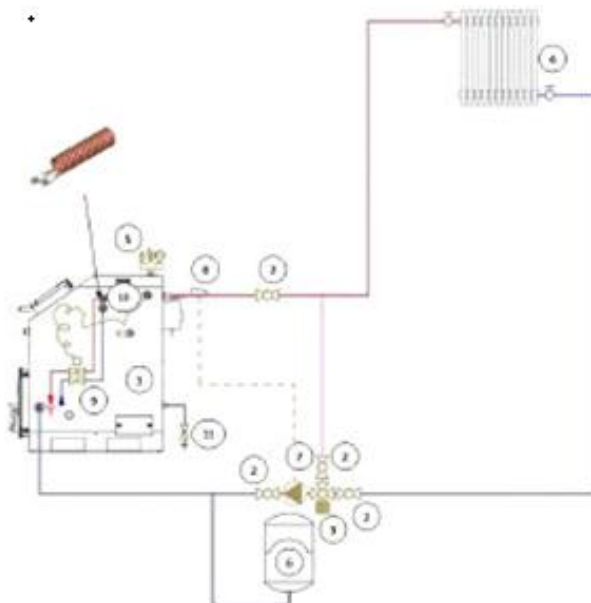
8. Label ((COVER – working position) 32mm x 74mm

RADNI POLOŽAJ
working position

9. Label (Draught regulating valve) 32mm x 74mm

REGULATOR PROMAJE
draught regulating valve

10. Label (Hydraulic diagram) 152mm x 210mm



1. K series boiler;
2. Valve;
3. Mixing valve;
4. Exchanger;
5. Safety group;
6. Expansion vessel;
7. Pump;
8. Leaning thermostat;
9. Thermal protection valve;
10. Probe for valve for thermal protection;
11. Valve for filling/emptying;

Labels for attention

1. Label (ATTENTION)



2. Label (Waste material)



Labels with technical data:



Živojina Lazića Solunca br.6
 Grdica-36000 Kraljevo
 Srbija

N° 21015324

K25



Živojina Lazića Solunca br.6
 Grdica-36000 Kraljevo
 Srbija
 e-mail: radijator@radijator.rs
 www.radijator.rs



Pressure max	Temp. max
Max. pritisak	Max. temp.
3 bar/300kPa	90°C

N°: 21015324

Godina/Year: 2015

TIP - MODEL	K25
TYPE-MODEL	
SNAGA KOTLA	25 kW
POWER BOILER	
ZAPREMINA VODE U KOTLU	72 l
VOLUME OF WATER	
POTREBNA PROMAJA DIMNJAKA	18 Pa
REQUIREMENT AIR FLUE	
DIMENZIJE AxB	640x1170 mm
DIMENSION AxB	
TEŽINA KOTLA	332 Kg
WEIGHT BOILER	



7.5 Manufacturer



RADIJATOR D.O.O.
Živojina Lazića Solunca br.6
36000 Kraljevo, Srbija

9. Warranty

1. Radijator inženjering will cover warranty period of 60 MONTHS only if following warranty conditions are fulfilled:

- 1.1 The boiler must be connected according to technical diagrams given in technical instructions; special attention shall be paid to safety valves, thermal insurance by flow out, mixing valve for protection of cold end of the boiler that is against condensation, boiler operating pressure range, boiler operating temperature range, conditions in boiler room etc. **(see points 3 and 6.)**
- 1.2 The boiler must be connected to the chimney with prescribed cross section, particulars of insulation and height **(see point 3.4)**
- 1.3 The uptake from boiler to the chimney must be done according to the technical instructions.
- 1.4 The owner must follow stated instructions about use and maintenance.
(see points 7.1 and 7.2)

2. Warranty declaration

We declare:

- that the product has prescribed and declared quality characteristics.
We are obliged to, at the request of the buyer if request for repair is submitted in due time in the warranty period, at our expense carry out all repairs of damages, in such way that the product will operate in accordance with declared features,
- that the product will operate irreproachable in the warranty period if all instructions for use, operation and installation are followed,
- that in the warranty period we will be ready to eliminate all damages on the product and keep in stock all necessary spare parts.,
- **the warranty period starts from the DAY OF PURCHASE AND LASTS 60 MONTHS**
- **the warranty is valid if the warranty sheet is stamped by the seller and if date of purchase is written on it and the bill is enclosed.**

3. Warranty period of one year is valid for the following parts:

- bricks in fire place,
- cast iron grill doors,
- cast iron part for cleaning the pipes of the grill.

4. Warranty period is not valid:

- for damages that were made by the buyer due to bad handling of the product,
- for mechanical damages made during transport and in use (solid objects),
- if the product is inexpertly installed, contrary to the valid regulations from that area,
- if the buyer has used the product above declared particulars and in normal conditions,
- if it is found that hydraulic diagram is not done according to recommendations of “Radijator inženjering” company,
- if it is found that in use the boiler was not regularly maintained and cleaned,

5. Warranty period becomes invalid:

- if it is found that damages have been repaired by unauthorized person or unauthorized service shop,
- when for repairs original spare parts were not used and installed,
- when warranty period expires,

6. When reporting damages following particulars must be given:

- name and type of the product,
- date of purchase,
- factory or workshop number of the boiler,
- short description of damage, that is malfunction,
- exact address and contact phone number, 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 nesaobzirnost 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.