

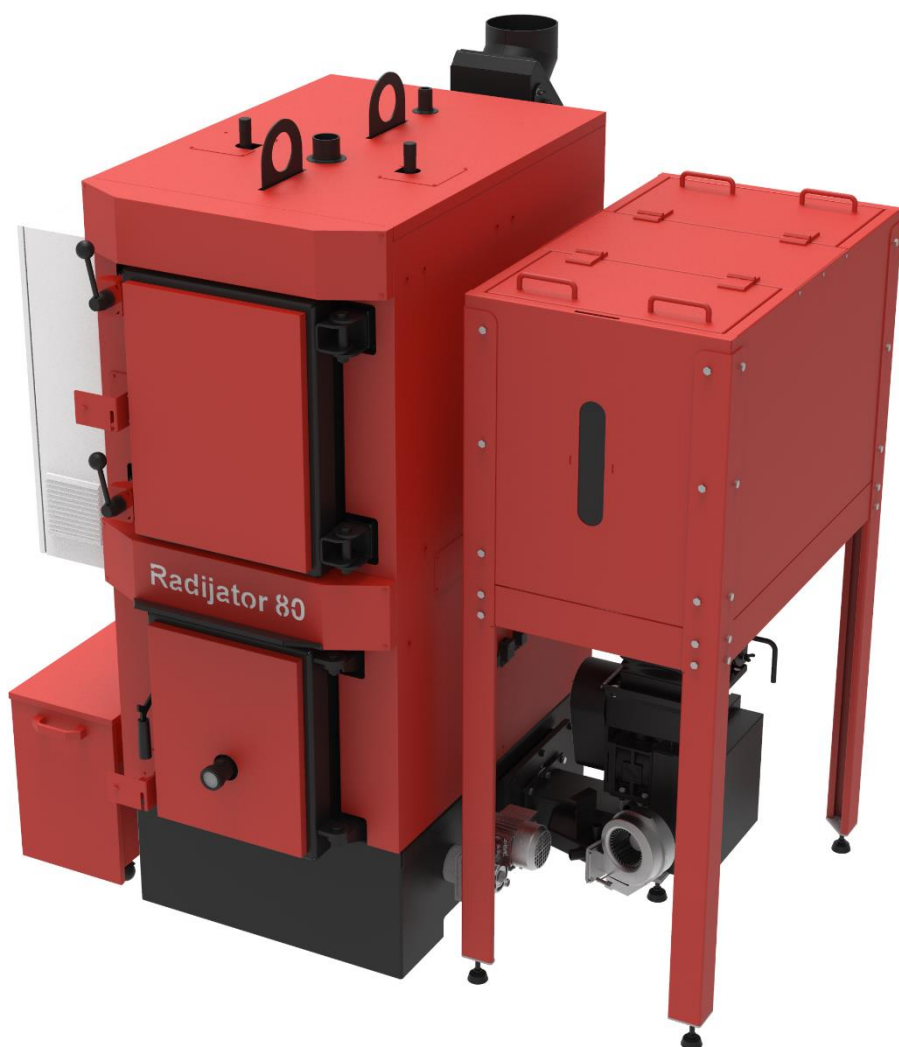


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**Kotao  
na BIOMASU/  
BIOMASS  
BOILER**

**SERIJA\SERIES  
TKAN  
60-300kW**



## **INSTRUKCIJE / INSTRUCTIONS**

Montaža, korišćenje i održavanje kotla/ Installation, use and maintenance of the boiler

## Sadržaj:

1. Važna upozorenja;
2. Opis kotla;
3. Montaža;  
  
Opšta upozorenja;  
  
Kotlarnica;  
  
Priključenje na dimnjak;
4. Presek TKAN kotla sa opisom elemenata;
5. Tabela sa dimenzijama;
6. Hidraulična šema;
7. Objašnjenje rada automatike za TKAN;
8. Održavanje kotla
9. Garancija

## 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 curenja vode isključiti uređaj sa električnog napajanja, 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 uređaja na bio masu i 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 90°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 i to tako što se utičnica izvadi sa priključka elektro mreže.
- Zabranjena je izmena na sigurnosnim elementima. Obavezan je periodični pregled sigurnosnih elemenata u skladu sa zakonima države u kojoj je kotao namontiran.
- Zabranjeno je zatvaranje ventilacionih otvora na prostoriji u kojoj se nalazi kotao. Ventilacioni otvori su neophodni za pravilno sagorevanje
- Zabranjeno je izlaganje kotla atmosferskim neprilikama. 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)
- Za elektro napajanje velikih industrijskih kotlova serije TKAN koristi se trofazna el. energija. Ukoliko korisnik koristi agregate koji se uključuju kada nestane struje, obavezan je da proveriti da u toj situaciji el. motori za transport peleta imaju isti smer kao i kada su na mrežnom napajanju. Ukoliko motori rade sa suprotnim smerom može doći do velikih oštećenja na kotlu.

## 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

Kotao TKAN je razvijen sa ciljem da RADIJATOR INŽENJERING ponudi tržištu kotao koji je po svojim mehaničkim i termičkim osobinama izrazito namenjen biomasi kao gorivu.

Koristeći uopšteni pojam „BIOMASA“ naravno da se pre svega misli na pelet, ali treba istaći i mogućnost loženja sa košticama voća i to pre svega višnja, trešnja. **Ukoliko korisnik želi da koristi neki oblik biomase koji nije naveden, obavezno treba da kontaktira službu konstrukcije i razvoja Radijator Inženjering-a ili ovlašćenog prodavca, jer vrlo često pojedini oblici biomase zahtevaju posebna, specifična rešenja sagorevanja.** Prilikom korišćenja navedenih goriva podrazumeva se automatska kontrola glavnih parametara rada. U svim navedenim primerima korišćenja biomase zahteva se određen stepen suvoće goriva.

Sa druge strane zahtevi tržišta su uvek okrenuti ka što većoj univerzalnosti goriva, tako da je TKAN moguće ložiti i sa drvetom i tada je loženje ručno.

Ložište TKAN industrijskih kotlova je znatno manje nego kod klasičnih kotlova na drvo. Zbog toga je loženje drvetom i iznošenje pepela otežano. Zaključak je da ih i ne treba upotrebljavati za sagorevanje velikih količina drveta, već samo za par dana. U tim situacijama treba koristiti štitnike ložišta kao i štitnike puževa za čišćenje pepela. Njihov izgled prikazan je u odeljku "Start rada na drvo".

Samo sagorevanje se u ovoj situaciji odvija pod prinudnom promajom ventilatora, tako da je TKAN u ovim uslovima efikasniji nego njegovi prethodnici koji funkcionišu po principu slobodne promaje.

Serijski industrijskih kotlova TKAN proizvodi se u sledećim snagama: TKAN 60, TKAN 80, TKAN 100, TKAN 150, TKAN 200, TKAN 250 i TKAN 300.

### KONSTRUKCIJA

Po spoljašnjem dizajnu, dimenzijama ložišta, otvorima za loženje i čišćenje TKAN je zadržao sve dobre osobine predhodnih modela po kojima je RADIJATOR INŽENJERING prepoznatljiv na tržištu.

Vodeni deo kotla, njegov način izmene toplote između dimnih gasova i vode putem cevnog izmenjivača, prilagođen je biomasi. Zbog primene ventilatora tj. prinudne promaje put dimnih gasova duži je nego kod standardnih kotlova. Iz istih razloga moguća je primena usmerivača dimnih gasova tzv. turbulatora koji dodatno povećavaju stepen iskorišćenja kotla. Turbulatori su spirale napravljene od šipkastog materijala. Ukoliko su uslovi eksploatacije takvi (pre svega misli se na dimnjak) da dolazi do previše dima na vratima kotla u fazi potpale ili da automatika teško ide u fazu gorenja, tehnički je opravdano koristiti kotao bez turbulatora (ili sa smanjenim brojem).

Stepen korisnosti na pelet je preko 90%. Pri normalnim režimima temperatura dimnih gasova na izlazu je oko 160 °C, a pri maksimalnim režimima je ispod 180 °C. Ove vrednosti mogu u svakom trenutku da se očitaju na displeju.

Industrijski TKAN kotlovi **poseduju** izmenjivač od bešavnih cevi za montažu **ventila za termičko osiguranje oticanjem**. Na kotlovima postoje priključci koji omogućavaju laku montažu ventila koji direktno ubacuju vodu za termičko osiguranje u prostor kotla.

Svi delovi vodenog dela kotla izrađeni su od bešavnih cevi kvaliteta **ST 35.4** i kotlovskih limova debljine 5mm i više, u zavisnosti od snage kotla. Limovi su kvaliteta **1.0425 EU** standard odnosno **P265GH** standard **EUII**.

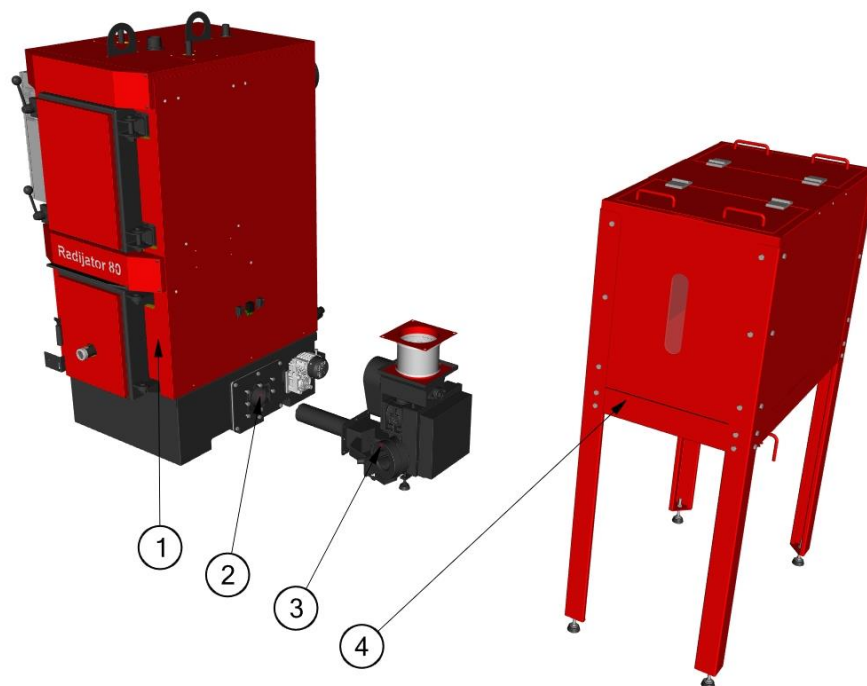
Ložište je po svojem principu rada tzv. „izviruće“, gde gorivo iz zone transporta ide vertikalno uvis tj. izvire do zone sagorevanja. Napravljeno je od masivnih izolacijskih materijala i sivog liva. Transport goriva obezbeđen je pužnim transporterima. Gorivo dolazi iz silosa zapremine od 457 Lit pa do 1610 Lit. u zavisnosti od veličine kotla.. U slučaju potrebe vrlo je lako, demontirati ceo sklop u tri nezavisne celine: silos (**sl.1 poz.4**), mehanizam za nalaganje (**sl.1 poz.3**) i kotao sa ložištem (**sl.1 poz.1 i 2**). Kod ložišta se izdvaja poseban sklop - POLUAUTOMATSKO ČIŠĆENJE LOŽIŠTA KOTLA. Kotao TKAN 60 nema pužnu osovinu za izbacivanje pepela u prostoru ložišta. Kotlovi TKAN 80 i TKAN 100 poseduju po jednu pužnu osovinu, a kotao TKAN 150 i veći tj. TKAN 200, TKAN 250 i TKAN 300 imaju po dve pužne osovine za izbacivanje pepela.

Veoma važna napomena u vezi konstrukcije TKAN industrijskih kotlova je da ona omogućuje i dodatnu opremu. Dodatna oprema se naručuje pre isporuke kotla, pojedini elementi se mogu i naknadno ugraditi na licu mesta, a neki moraju biti fabrički ugrađeni.

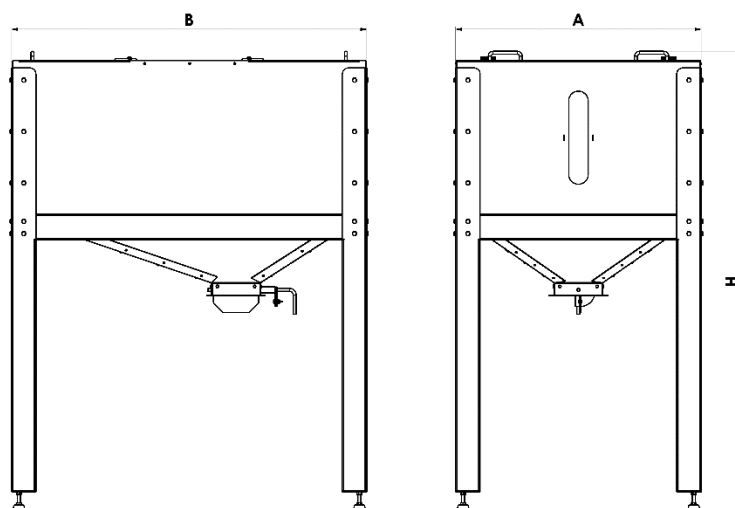
Elementi dodatne opreme su:

-**Veći dnevni silosi koji su uz kotao**. Standardni silosi (**slika 2**) su navedeni u tabeli sa dimenzijama, međutim ako kupac ima prostora u kotlarnici i želi veći tzv. dnevni silos prema posebnim dimenzijama, moguće je takav naručiti u proizvodnji Radijator Inženjeringa. Isporuka ovakvog silosa moguća je i naknadno kad je kotao već u kotlarnici.

-**Višednevni magacini za pelet**. Moguće je isporučiti i silose koji su kapaciteta i nekoliko desetina tona i koji su pužnim transportnim sistemom povezani sa malim dnevnim silosom. Punjenje ovakvih silosa vrši se iz tzv. džambo vreća od jedne tone kofičastim elevatorom. Ovu opremu takođe je moguće naknadno isporučiti.



*Slika 1. Prikaz demontažnih celina kotla*



*Slika 2. Standardni silos za TKAN-kotlove*

*Tabela 1. Dimenzije silosa*

	<b>DIMENZIJE</b>				
	<b>A</b>	<b>B</b>	<b>H</b>	<b>V</b>	<b>Količina peleta koja staje u silosu</b>
	<b>mm</b>			<b>liters</b>	<b>kg</b>
<b>TKAN 80</b>	606	1020	1736	290	180
<b>TKAN 100</b>	810	1176	1611	305	190
<b>TKAN 150</b>	1010	1456	1875	680	410
<b>TKAN 200/250/300</b>	1394	1830	1822	1600	1000
	1394	1830	2130	2330	1500
	1394	1830	2445	3115	2000

Kod kotlova TKAN Integra 200/250/300 postoji mogućnost da se u kotlarnici ugradi jedna od tri varijante silosa, naravno po želji kupca. Gabaritne mere tih silosa prikazane su u tabeli 1.



## 3. Montaža

### 3.1. Opšta upozorenja



Kotlovi TKAN su predviđeni za maksimalni radni pritisak od 3 bar-a i maksimalnu radnu temperaturu od 90 °C, dakle oni spadaju u kategoriju toplovodnih kotlova. Rad kotla na većim vrednostima od navedenih može da dovede do velikih materijalnih šteta i ugrožavanja ljudskih života.



Strogo je zabranjeno reduciranje poprečnih preseka sigurnosnih vodova. Takođe, strogo je zabranjeno instaliranje sigurnosne opreme čiji je radni pritisak veći od 3 bar-a. Preporučuje se ugradnja ventila za termičko osiguranje oticanjem i to u skladu sa zakonom države u kojoj se oprema instalira.



Kotao je sa ventilatorom, automatikom, mehanizmom za transport peleta, eventualno i sa mehanizmom za čišćenje ložišta ili cevnog snopa. Svi ovi uređaji koriste napajanje 230V ili 3x 380V, tako da nepravilno instaliranje i neoprezno rukovanje mogu da ugroze ljudski život strujnim udarom.



Pre puštanja kotla u rad proveriti da li je smer motora mehanizma za transport peleta takav da obezbeđuje dotok peleta u ložište. Takođe, ako se u slučaju nestanka el. energije koriste agregati proveriti da li je smer motora takav da pelet ide u prostor za loženje. U suprotnom može doći do trajnih oštećenja na kotlu.



Prilikom svake intervencije na elektro sistemu kotla (npr. promena elektro grejača za potpalu, intervencija na motoru reduktora ili ventilatora itd.) obavezno isključiti glavno napajanje i to tako što se izvadi utičnica iz priključka mrežne instalacije. Na ovaj način izbegavaju se mogući strujni udari i ugrožavanje ljudskih života tehničkih lica koja izvode intervenciju.



Kotao na čvrsto gorivo i prinudnom promajom treba instalirati prema važećim normama i zakonskim propisima. Svaka izmena ili na mehaničkoj konstrukciji ili na električnoj instalaciji smatraće se narušavanjem garancijiskih uslova i dovešće do njenog narušavanja.

Prilikom unošenja kotla u kotlarnicu veoma često se dešava da kompletan kotao ne može da prođe kroz postojeća vrata ili mu smeta neki drugi objekat u kotlarnici. Veoma je lako u takvim situacijama rastaviti kotao na tri osnovna sklopa:

- vodeni izmenjivač sa ložištem
- mehanizam za transport peleta
- silos

Fabrički položaj silosa je sa desne strane kotla. Ukoliko kupac želi sa leve strane, prilikom naručivanja mora da naglasi.

Osnovni zahtevi koje treba ispoštovati prilikom montiranja su:

Prilikom postavljanja kotla treba voditi računa o njegovoj bočnoj i udaljenosti zadnje strane od mogućih prepreka. Na taj način ostavlja se mogućnost prilaza radi čišćenja pepela iz kotla ili eventualnog demontiranja sklopa mehanizma za transport peleta. Detaljnije u odeljku 3.2.

Kotao može da bude priključen na otvoreni sistem centralnog grejanja, ali i na zatvoren 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. Kod ove serije kotlova treba koristiti ventile za termičko osiguranje sa direktnim ubacivanjem hladne vode u kotao. Za montažu ovih ventila na samom kotlu postoje odgovarajući priključci.

Ako u kotlarnici gde se kotao instalira dolazi do čestih prekida el. energije koristiti dodatne mere bezbednosti i zaštite rada kotla. Ako postoje delovi instalacije koji su „potopljeni“, tj. na nižem su nivou od kotla i nekih grejnih tela, onda se preporučuje otvoreni sistem grejanja.

Kotao mora da se nalazi na sigurnoj udaljenosti od lako zapaljivih materijala.

Električno napajanje kotla je 3x380V (izuzev za TKAN 80) i 50Hz i priključenje svih uređaja koje kotao sadrži treba uraditi prema vazećim propisima i priključenje radi licesa odgovarajućim ovlašćenjem.

Priključenje na dimnjak takođe se radi prema obavezujućim propisima kao i preporukama proizvođača što se može videti u narednom tekstu.

### 3.2 Kotlarnica

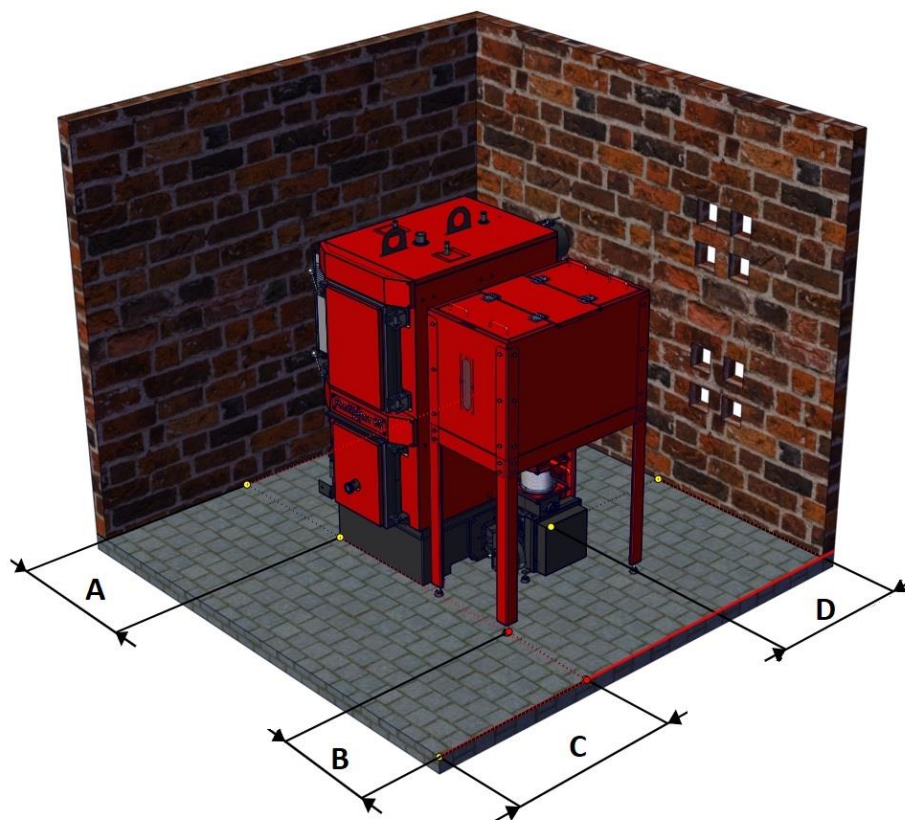
Kotlarnica mora biti obezbedjena od smrzavanja.

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 *sluci 3*.

Ove vrednosti udaljenosti omogućavaju siguran pristup prilikom loženja, dovoljan prostor za čišćenje i nesmetan pristup ventilatoru, mehanizmu za transport peleta, el. grejaču za potpalu i ventilu za punjenje i pražnjenje. Kotao sa svoje strane suprotno od silosa treba da bude udaljen od zida od 500 do 600mm i to samo kada ima poluautomatsko čišćenje ložišta. Taj prostor je potreban za manipulaciju sa kutijom za pepeo

Ukoliko kotao nema poluautomatsko čišćenje pepela onda je dovoljno da bude 100mm udaljen od zida. Sa strane silosa kotao treba udaljiti od zida od 400 mm do 900 mm (mereno od silosa) u zavisnosti od snage kotla. Te mere su u daljem tekstu date tablično za svaku snagu. Ovaj prostor je potreban u slučaju bilo kakvih većih intervencija na mehanizmu za transport peleta, odnosno u situaciji kada ga treba demontirati od kotla. Prostor sa zadnje strane kotla treba da omogući lak pristup

dimnjači i otvorima za čišćenje pepela na njoj. Sa prednje strane kotla potrebno je omogućiti lako otvaranje svih vrata i eventualno omogućiti ugrađivanje pneumatskog čišćenja.



*Slika 3. Pozicioniranje kotla u kotlarnici*

*Tabela 2. Pozicioniranje kotla u kotlarnici*

	<b>DIMENZIJE</b>			
<b>Tip kotla</b>	<b>A* (mm)</b>	<b>B (mm)</b>	<b>C (mm)</b>	<b>D (mm)</b>
<b>TKAN 60</b>	100	400	1000	800
<b>TKAN 80</b>	500	400	1000	800
<b>TKAN 100</b>	500	400	1000	800
<b>TKAN 150</b>	500	550	1000	1000
<b>TKAN 200</b>	600	650	1000	1000
<b>TKAN 250</b>	600	900	1000	1100
<b>TKAN 300</b>	600	900	1000	1100

**NAPOMENA: Svi kotlovi osim kotla TKAN 60 imaju poluautomatsko čišćenje.**

Kotlarnica mora da ima potrebnu ventilaciju, odnosno dovoljno velike otvore za ulaz svežeg i izbacivanje potrošenog vazduha.

Ukupna površina ovih otvora je minimalno 200cm<sup>2</sup> za snage do 80kW a za snagu preko 80kW površina mora biti veća za još 2cm<sup>2</sup> po kW.

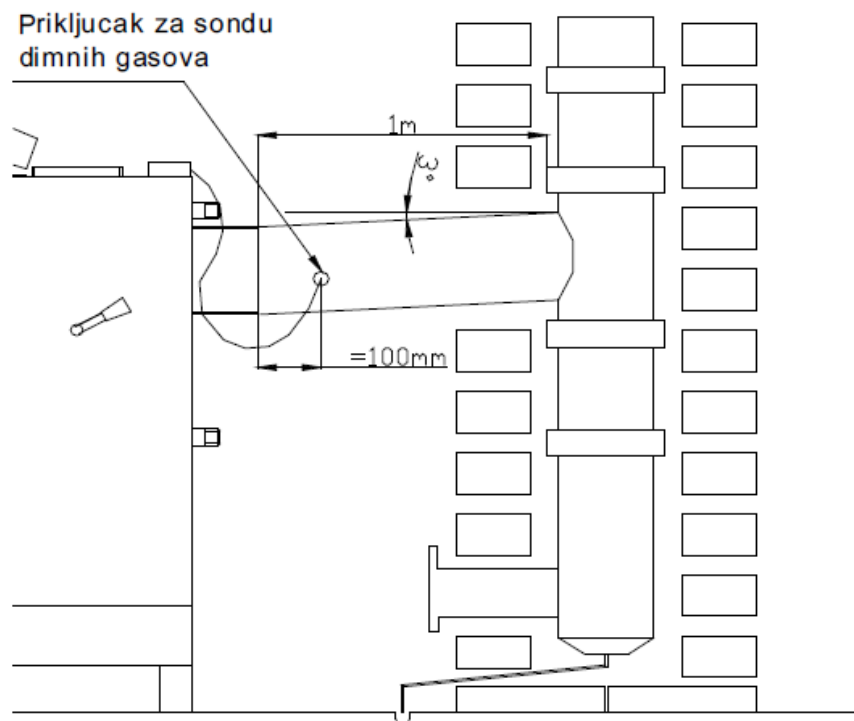
$$A = 200 \text{ cm}^2 + \frac{2 \text{ cm}^2}{\text{kW}} \times (\sum Q_n - 80 \text{ kW}) \quad \sum Q_n = \text{moguće snage preko 80kW}$$

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 i servisa elektro i mehaničkih komponenti;
- ✓ Utvrditi da li je stepen električne zaštite u skladu sa karakteristikama prostorije u kojoj će kotao biti smešten;
- ✓ 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.

### 3.3 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%) (pogledati **sliku 4**).

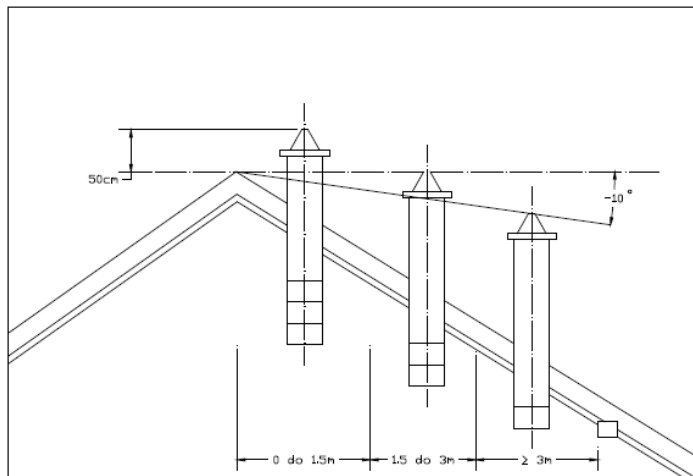


*Slika 4. Prikaz priključenja na dimnjak*

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.

Na dimnoj cevi, približno 100mm od dimnjače kotla, treba izbušiti otvor i montirati uložak za temperaturnu sondu dimnih gasova. Bez informacije o temperaturi dimnih gasova nema ni automatskog režima rada kotla. 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.

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  $12^\circ$  I ako je ugao krova veći od  $12^\circ$ . Za ugao manji od  $12^\circ$  visina dimnjaka iznad krova je 1m a za ugao veći od  $12^\circ$  pogledati sliku 5.



Slika 5. Visina dimnjaka

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.***



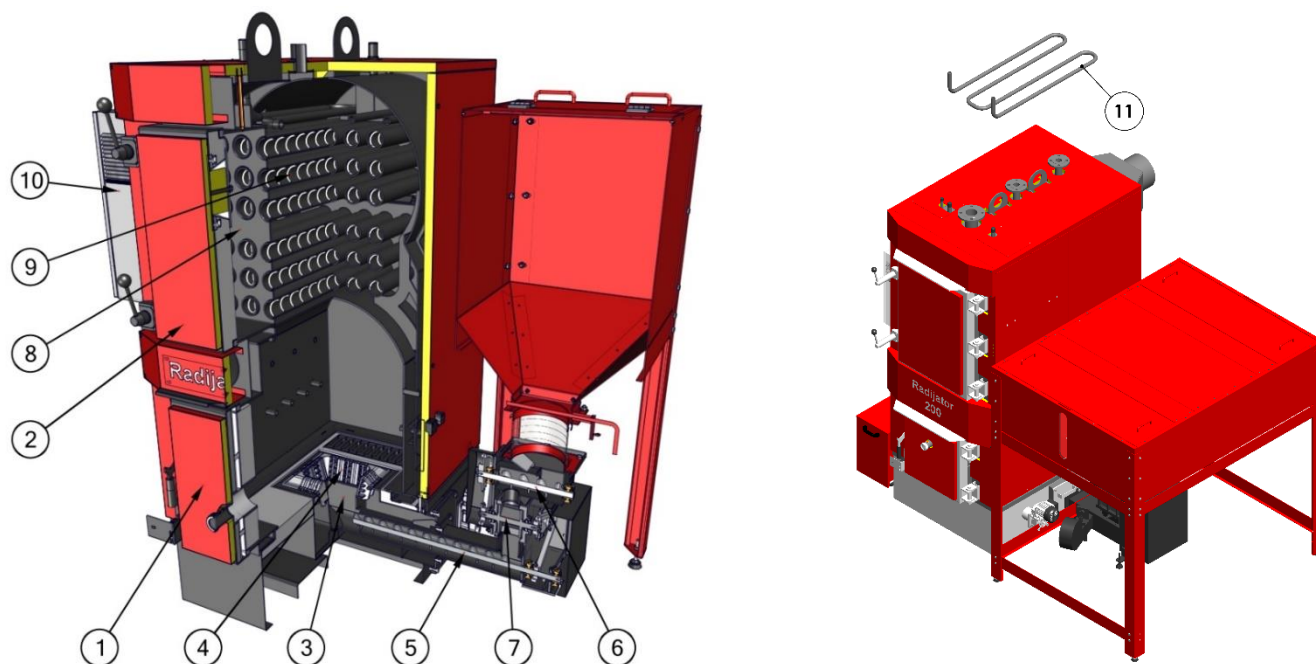
***Slab dimnjak je glavni razlog da u toku potpale kotla ili u toku rada imamo pojavu dima na gornjim ili donjim vratima, naročito pri većim brojevima obrtaja ventilatora.***



***Ukoliko prilikom potpale kotla ima previše dima na vratima i u kotlarnici, ili temperatura dimnih gasova nema dovoljan rast da kotao krene u radni režim a sve zbog nedovoljno jakog dimnjaka, tehnički je opravdano izvaditi žičane turbulatore iz cevnog izmenjivača.***



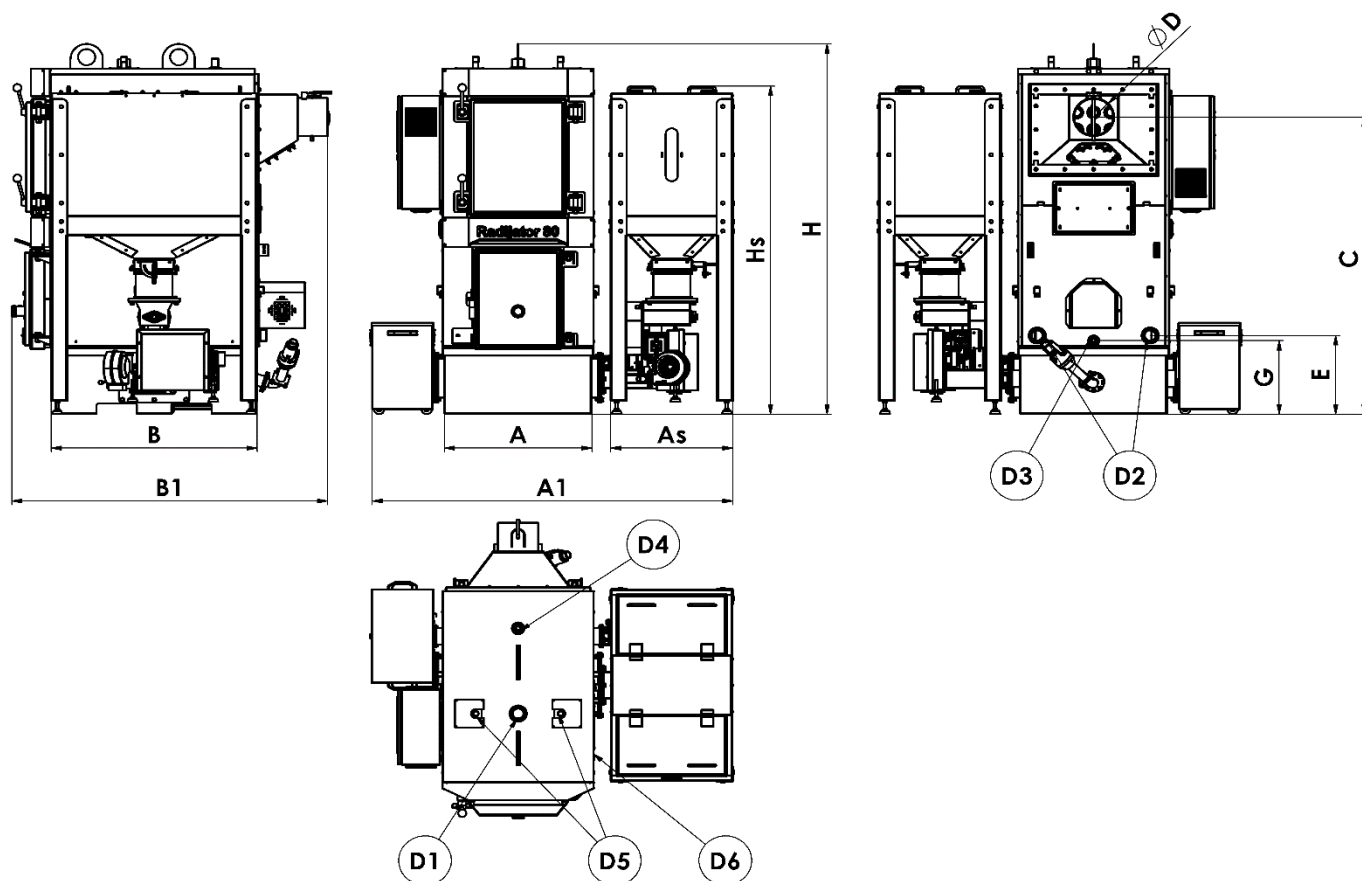
## 4. Presek TKAN kotla sa opisom elemenata



*Slika 6. Presek kotla TKAN*

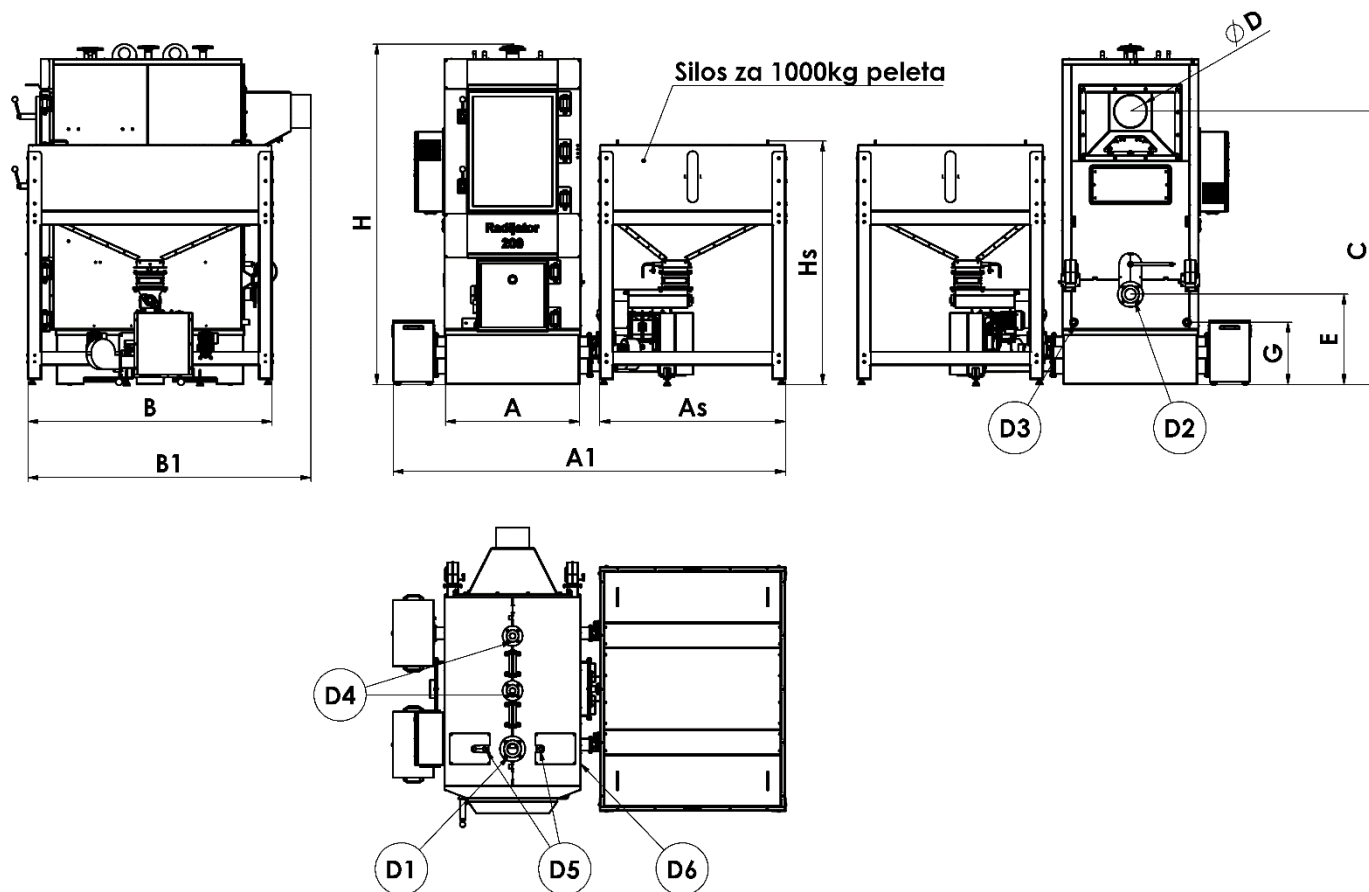
1. Vrata za loženje i potpalu
2. Vrata za čišćenje cevnog izmenjivača i samog kotla
3. Ložište
4. Liveni segmenti
5. Donja osovina pužnog transportera
6. Gornja osovina pužnog transportera
7. Čelijasti dozator (valvola)
8. Cevni izmenjivač
9. Turbulatori
10. Automatika
11. Izmenjivač termičkog osiguranja

## 5. Tabela sa dimenzijama



Slika 7. Crtež sa dimenzijama i priključcima za TKAN 80, TKAN 100 i TKAN 150





Slika 8. Crtež sa dimenzijama i priključcima za TKAN 200, TKAN 250 i TKAN 300

Priključci:

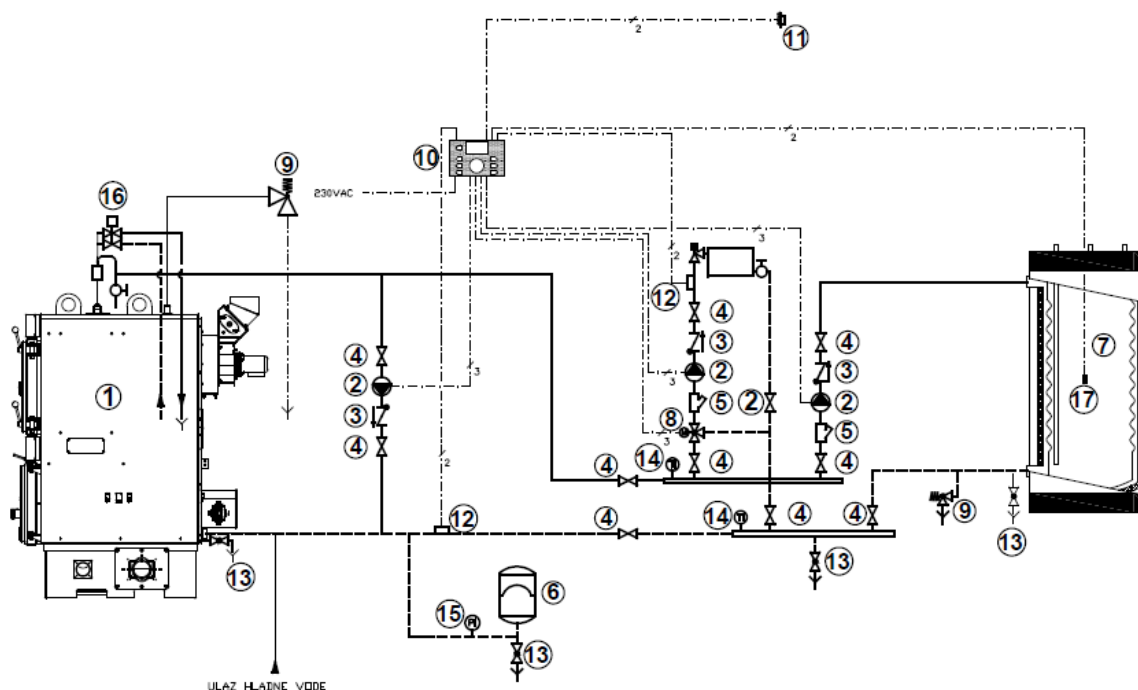
- D1-Priključak za toplu vodu
- D2-Priključak za hladnu vodu
- D3-Priključak za punjenje i pražnjenje
- D4-Priključak za sigurnosnu grupu (I-sigurnosni ventil pritiska; II-vod otvorenog sistema)
- D5-Priključak za ventil termičkog oticanja
- D6-Priključak za sondu ventila termičkog osiguranja

Na crtežu sa dimenzijama za TKAN 200, TKAN 250 i TKAN 300, prikazan je silos koji može da primi 1000kg peleta, u tabeli sa dimenzijama date su vrednosti za isti. U slučaju da se kupac odluci za neku drugu varijantu silosa potrebno je kontaktirati Radijator Inženjering kako bi se dobile informacije vezane za gabarite tog silosa.

Tabela 3. Dimenzije kotlova

Tip kotla			TKAN 60	TKAN 80	TKAN 100	TKAN 150	TKAN 200	TKAN 250	TKAN 300
Snaga		kW	60	80	100	150	200	250	300
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-cca	276	368	460	690	920	1150	1380
Masa kotla + masa silosa		kg	655+ 106	915+ 100	1073+ 110	1665+ 162	2260+ 180	2800+ 220	3080+ 220
DIMENZIJUE	A	mm	680	730	730	850	1005	1260	1260
	A1		1355	1787	2080	2395	2945	3456	3455
	As		610	610	810	1010	1394	1394	1394
	B		1020	1020	1176	1456	1830	1830	1830
	B1		1518	1565	1727	2070	2121	2546	2546
	C		1125	1573	1573	1681	2044	2114	2114
	ØD		200	200	200	250	250	300	300
	E		675	417	417	785	675	707	707
	G		360	389	389	360	465	467	467
	H		1564	1960	1960	2151	2547	2663	2663
	Hs		1740	1736	1611	1875	1822	1822	2070
	D1	col	6/4"	2"	2"	2"	DN80 NP6	DN80 NP6	DN80 NP6
	D2		6/4"	2"	2"	2"	DN80 NP6	DN80 NP6	DN80 NP6
	D3		1/2"	1/2"	1/2"	1/2"	1"	1"	1"
	D4		3/4"	3/4"	3/4"	3/4"	DN40 NP16	DN40 NP16	DN40 NP16
	D5		1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
	D6		1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

## 6. Hidraulična šema



Slika 9. Hidraulična šema TKA 80

1. Toplovodni kotao na pelet
2. Cirkulaciona pumpa
3. Nepovratni ventil
4. Zaporna slavina
5. Hvatač nečistoća
6. Zatvorena ekspanziona posuda
7. Bojler sanitarne tople vode
8. Trokraki mešni ventil
9. Ventil sigurnosti
10. Upravljačka jedinica-regulator
11. Spoljni senzor temperature
12. Cevni senzor temperature
13. Slavina za punjenje i pražnjenje
14. Termometar
15. Manometar
16. Ventil za termičko osiguranje
17. Senzor akumulatora tople vode

## 7. Objašnjenje rada automatike TKAN



**Prvo puštanje kotla u rad obavlja tehničko lice koje ima sertifikat izdat od strane Radijator Inženjeringa. Obavezna je obuka korisnika kotla.**

*Na taj način to lice je ovlašćeno da prijavi servisnoj službi u samoj fabrici vreme kada je kotao počeo da radi i u kakvom je stanju kotao bio prilikom prvog paljenja, dok kopiju izveštaja o puštanju kotla u rad zadržava. Garancija i uputstvo za upotrebu se daje kupcu. Jedan primerak garancije se šalje proizvođaču.*

*Ako garancija nije ispunjena, ona nije važeća.*

*Samo kotlovi koji su pušteni u rad od strane ovlašćenog tehničkog lica podležu uslovima kompletne garancije od dve godine.*

*Naredni tekst je namenjen samom korisniku kotla, kao jedna vrsta podsetnika, da ako ugasi kotao (npr. zbog čišćenja) bude u stanju da samostalno pokrene kotao.*



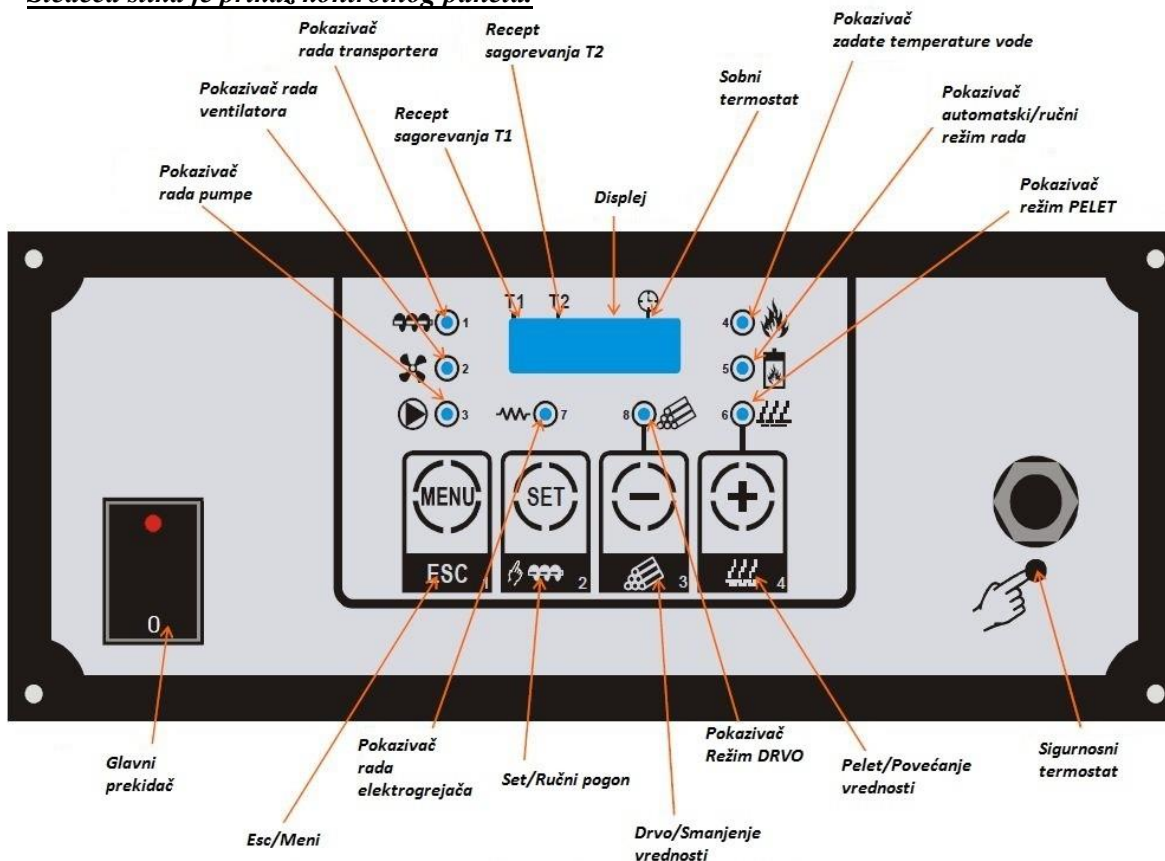
***Parametri vezani za rad kotla a koji su dostupni korisniku su na samom displeju. Ostale parametre koji su u tzv. skrivenom meniju ne treba menjati bez saglasnosti tehničkog lica koje je pustilo kotao u rad ili same fabrike.***

## Displej automatike

Komandni panel sačinjavaju:

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

Sledeća slika je prikaz kontrolnog panela.



Slika 10. Prikaz kontrolnog panela

## Komandni tasteri

U DONJEM DESNOM UGLU SVAKOG KOMANDNOG TASTERA OZNAČEN JE BROJ.

- **UKLJ.-ISKLJ.PELET/+KOMANDNO DUGME 4** : Uključuje rad sistema na pelet kao gorivo kada se drži neprekidno 5 sekundi. Takođe isključuje sistem iz rada gde se kao gorivo koristi pelet držeći ovaj taster neprekidno 5 sekundi. Pritiskom u **Meniju (Menu)** povišava vrednost parametara.
- **UKLJ.-ISKLJ.DRVO/- KOMANDNO DUGME 3** : Uključuje rad sistema na čvrsto gorivo kada se drži neprekidno 5 sekundi. Takođe isključuje sistem iz rada na čvrsto gorivo držeći ovaj taster neprekidno 5 sekundi. Pritiskom u **Meniju (Menu)** snižava vrednost parametara.
- **SET/Puž KOMANDNO DUGME 2** : Kada se neprekidno drži pritisnutim u režimu ISKLJUČEN uključuje se ručno punjenje ložišta peletom. Tokom ove radnje na displeju će biti prikazan natpis "LoAd". Ručno punjenje ložišta peletom se završava kada pustite ovaj taster.

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.

## Svetleće diode

1. **Svetleća dioda Puž**: UKLJUČENA kada je ventilator za pomaganje sagorevanja radi.
2. **Svetleća dioda Ventilator**: UKLJUČENA kada je ventilator za pomaganje sagorevanja radi.
3. **Svetleća dioda Pumpa P**: UKLJUČENA je kada pumpa radi. **TREPĆE** kada je pumpa isključena od strane sobnog termostata.
4. **Svetleća dioda Kotao**: UKLJUČENA 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** : UKLJUČENA kada je temperatura izduva iznad **T-IZDUV-UKLJ[F18]**. **TREPĆE** tokom režima predgašenje.
6. **Svetleća dioda Pelet** : UKLJUČENA kada kotao radi na u modu pelet. **TREPĆE** tokom režima predgašenje (**Vreme predgašenja[t06]**).
7. **Svetleća dioda Grejač paljenja** : UKLJUČENA kada je radi grejač za paljenje.
8. **Svetleća dioda Drvo** : UKLJUČENA kada kotao radi u modu na čvrsto gorivo.
9. **Svetleća dioda Recept 1** : UKLJUČENA kada je izabran Recept 1.
10. **Svetleća dioda Recept 2** : UKLJUČENA kada je izabran Recept 2.

## 11. Svetleća dioda Chrono : UKLJUČENA kada je ulaz **Chrono** zatvoren

### Displej

**Displej\Režim\Alarmi\Temperatura:** Četvoro cifreni/slovni Displej prikazuje temperaturu vode u kotlu, radni režim i eventualne alarme

Prikaz	Opis	Prikaz	Opis
OFF	Isključen (OFF)	Mod	Modulacija
Chc	Provera	MRn	Mirovanje
Acc	Paljenje	Si c	Sigurnosni režim
Stb	Stabilizacija	SPE	Gašenje
rEc	Ponovno paljenje	ALt	Isključen sistem sa alarmima

Prikaz	Opis	Prikaz	Opis
tSi c	Otvoren je priključak sigurnosnog termostata – tastera za ručno resetovanje	SPAc	Slučajno gašenje
Si c	Sigurnosni režim	Sond	Očitavanje sonde van opsega
Acc	Ne uspeo paljenje		

### NAPOMENA:

- Uključivanje Termoleguratora putem Glavnog prekidača, Kod proizvoda i Verzija firmiera su prikazane u dužini od 2 sekunde.

Prikaz	Opis	Prikaz	Opis
St08	Kod proizvoda	Ur 10	Verzija programa

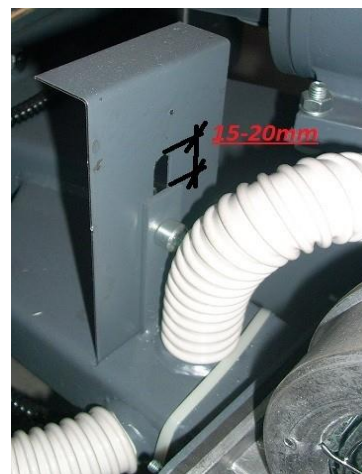
### Start rada kotla na biomasu

- Kotao priključen na hidraulički sistem.
- Izbušiti otvor prečnika 4 mm na gornjoj strani dimne cevi u zoni koja je veoma blizu dimnog izlaza kotla.
- Uveriti se da je mehanizam za transport peleta čvrsto oslonjen na pod, da je klapna ventilatora maksimalno otvorena i da je vođica klapne za sigurnosni vazduh od 15 do 20 mm. (slika 11. i 12.)





*Slika 11. Položaj klapne ventilatora*



*Slika 12. Položaj max. otvorene klapne vent.*

- Utičnice (trozana i monofazna) na zadnjoj strani kotla spojiti sa glavnim mrežnim napajanjem. Trofazna je potrebna za rad motora dozera, dok je monofazna neophodna za fan ventilatora.
- Sipati manju količinu peleta u silos i zatvoriti ga.
- Pre same faze potpale, štitnike skinuti sa ložišta.
- U ovoj fazi potrebno je ubaciti pelet u komoru za sagorevanje i to radom transportnog mehanizma za pelet (pellet feeding system). Na taj način postizemo kontinualno raspoređen pelet od komore za sagorevanje pa do silosa. Do pokretanja mehanizma za pelet može doći samo u fazi rada kada na displeju piše „OFF“. Tada pritiskom na komandno dugme 2 koje u svom donjem delu i ima simbol za pužni transporter, dolazi do pokretanja mehanizma. Sve dok držimo dugme pritisnuto mehanizam radi. Kada dugme pustimo mehanizam stane.

Nalaganje komore peletom tzv. ručnom komandom vršiti nešto niže do početka delova od sivog liva, što je prikazano **slikom 13**.





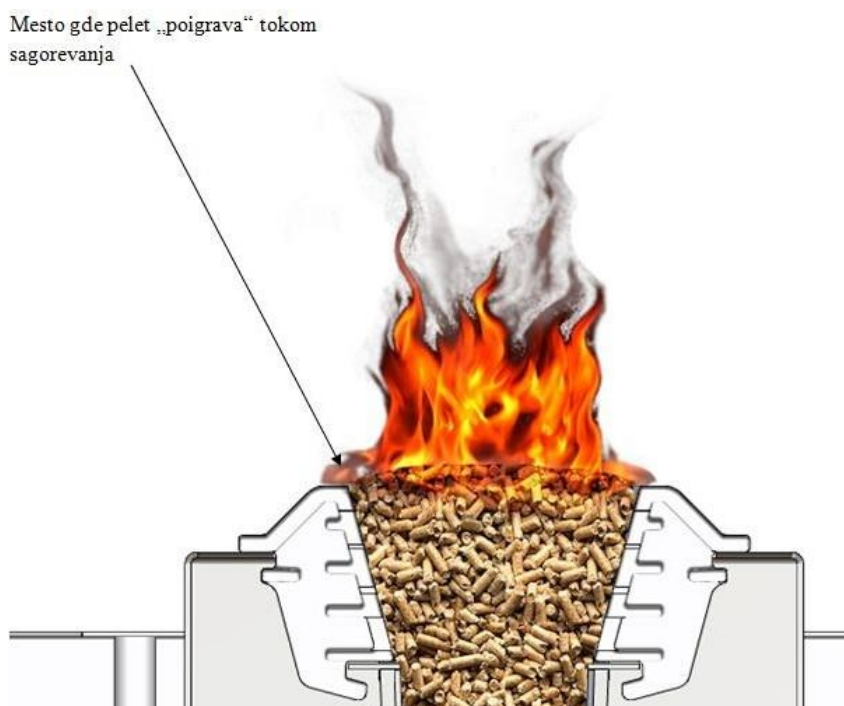
*Slika 13. Prikaz nivoa peleta*

- Sada kada imamo pelet u komori za sagorevanje i kada je on u zoni grejača za potpalu, možemo da startujemo početak rada kotla.  
Start se izvodi tako što pritisnemo i držimo komandno dugme 4 više od 3 sekunde. Na donjem delu ovog dugmeta prikazan je i simbol za rastresit materijal, odnosno pelet.  
U trenutku kada kotao krene u potpalu na displeju piše Chc i u ovih nekoliko sekundi radi samo ventilator. Za vreme ove faze automatika proverava da li su svi uređaji neophodni za rad zaista i priključeni.  
Sledeći korak je kada na displeju piše Acc. Ovo je oznaka faze paljenja. Tada se osim ventilatora pali i grejač za potpalu što se vidi i na automatici jer sijaju signalne lampice sa brojevima 2 i 7. U fazi potpale u jednom trenutku treba očekivati da se uključi i sistem za transport i da se nivo peleta u komori dopuni. Idealno je da kad posle ove dopune pelet bude do samog početka delova od sivog liva.  
Kotao je u fazi potpale sve dok dimni gasovi ne pređu temperaturu koja je određena parametrom **F18**. Prema fabričkim podešavanjima ova temperatura je **50°C**. Prvo se pojavi dim a u periodu od 7 do 10 minuta i plamen.
- Kada dimni gasovi pređu graničnu temperaturu paljenja na displeju se pokazuje natpis Stb. Ovo znači da je kotao u fazi stabilizacije plamena tj. sada automatika meri da li dimni gasovi imaju dovoljan prirast za određeno vreme. Ventilator radi prema parametru za fazu stabilizacije, a i dolazi do dopune ložišta peletom takođe prema parametrima puža u fazi stabilizacije. U trenutku kada je i ovaj faktor zadovoljen kotao ide u radni režim.
- Kotao je u radnom režimu kada na displeju ne piše ništa osim trenutne temperature vode u kotlu. Treba sačekati od 20 do 30 minuta i videti da li pelet gori na vrhu komore za sagoravanje. Takođe u ovom periodu treba pratiti i kolika je temperatura dimnih gasova. To se radi tako što se kratko pritisne komandno dugme 1 pa dugme 3 i na kraju dugme 2. Na displeju je tada broj koji označava temperaturu dimnih gasova.
- Na automatiku može biti povezan sobni termostats na zahtev korisnika. U ovom slučaju, važno je podesiti temperaturu prostorije koja je glavni parametar za rad kotla i temperaturu

vode u kotlu ( $70^{\circ}\text{C}$ ). Kada je aktiviran rad sobnog termostata, kotao najpre ima zahtev za postizanjem temperature sobe, stim da je ograničen zadatom temperaturom vode u njemu. Postoji mogućnost da kotao prestane sa radom pre zadate temperature sobnog termostata, u ovom slučaju treba podići zadatu temperaturu vode u kotlu npr.  $70^{\circ}\text{C}$ .

- Sagorevanje peleta, bez obzira na snagu sa kojom kotao radi, neophodno je podesiti tako da je na vrhu prostora za sagorevanje (**prikazano na slici 14**). Ovo se postiže podešavanjem doziranja peleta i količine vazduha. U slučaju da nivo plamena počinje da se spušta, neophodno je da se produži vreme doziranja ili smanjenje količine vazduha. Ako želimo da smanjimo toplotnu moć, neophodno je da smanjimo količinu vazduha. Ako se desi da se nivo plamena podiže, možemo da smanjimo vreme nalaganja ili povećamo količinu vazduha. Za tačno određivanje parametara potrebno je pratiti proces rada najmanje sat vremena.

**NAPOMENA: Uvek se treba pridržavati nominalne ili maksimalne snage sagorevanja peleta, tj. kada pelet sagoreva na vrhu gorionika. U ovom slučaju smanjenje toplotne moći vršimo smanjenjem zadate temperature vode u kotlu ili zadate temperature sobnog termostata.**



*Slika 14. Prikaz idealnog sagorevanja peleta*

**Upozorenje: Obavezno izvršiti analizu dimnih gasova nakon završetka instalacije kotla. Izmeriti procenat kiseonika ( $\text{O}_2$ ).**

## Start rada kotla na čvrsto gorivo

U slučaju da korisnik želi rad kotla na čvrsto gorivo treba odraditi sledeće korake:

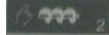
- Ako kotao nikad ranije nije korišćen na pelet već se prvi put koristi na čvrsto gorivo onda je potrebno neku malu količinu peleta povući do komore za sagorevanje. Na ovaj način se sprečava tzv. falš vazduh kroz kanale dozatora.
- Kroz donja vrata pripremiti malu količinu drveta i potpaliti. Posle dobijanja većeg plamena dodati gorivo. Radi manje količine dima otvoriti klapnu unutar kotla i to tako što ručku koja je na bočnoj strani kotla gurnemo ka dimnjaku tj. u položaj otvoreno.
- Obratiti pažnju na signalne lampice broj 6 i broj 7. Ako je upaljena lampica 6 to znači da je kotao u radnom režimu Pellet. Tada treba držati pritisnuto komandno dugme 4 i to više od 3 sekunde. Na taj način gasimo režim Pellet. Odmah nakon toga pritisnuti komandno dugme 3 i držati više od 3 sekunde. Na taj način startujemo režim rada Drvo.
- Posle 20 do 30 minuta kada je kotao krenuo u normalni radni režim klapnu unutar kotla vratiti u radni režim i to tako što ručku sa bočne strane gurnemo ka prednjim vratima kotla.
- Prostor za sagorevanje peleta **nikako ne prekrivati** kutijama za pepeo i slično, jer se kroz taj prostor dobija vazduh potreban za sagorevanje drveta ili uglja.

## Kratko uputstvo za upotrebu automatike

### DOPUNA LOŽIŠTA SA PELETOM, PRIPREMA ZA PALJENJE

- Sipati pelet u silos
- Na glavnom displeju more da piše **OFF**



- Pritisnuti i držati dugme . Sve dok držimo dugme transporter radi i na displeju piše **LOAD PELET**.


### START POTPALE NA PELET, PREKIDA RADA NA PELET

- Uključiti glavni prekidač




- Pritisnuti dugme  i držati 4-5 sekundi.



- Prekid rada kotla na pelet vrši se pritiskom na dugme  i držanjem 4-5 sekundi.

### PROMENA VREMENA DOZIRANJA TRANSPORTERA U RADNOM REŽIMU





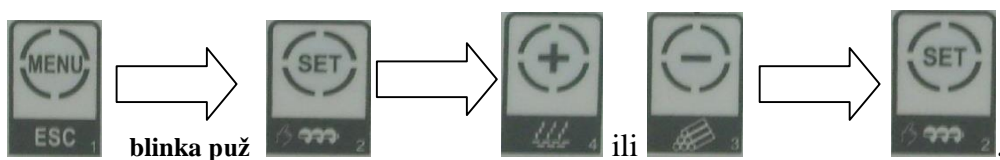
- Pritisnuti jednom kratko .



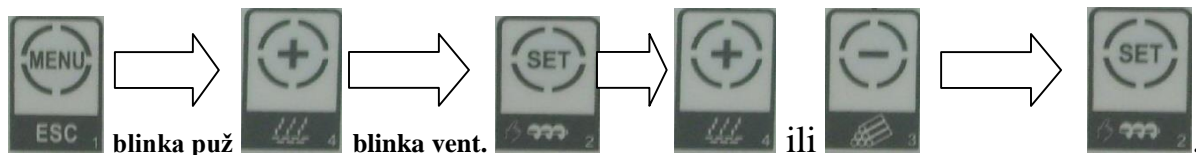
Ako lampica 1 pored samog simbola za puž blinka pritisnuti ,



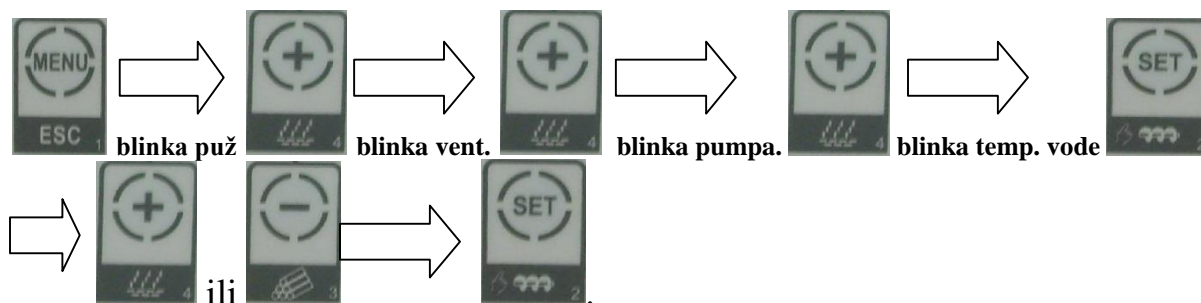
 i  promeniti vrednosti doziranja puža na željenu i ponovo pritisnuti



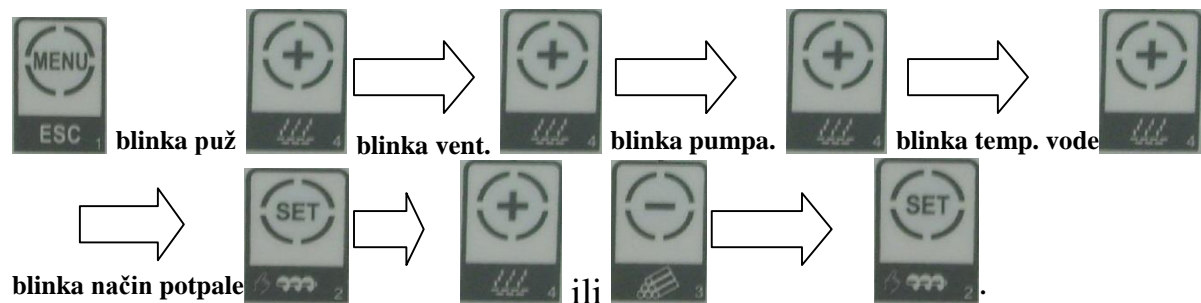
### PROMENA JAČINE VENTILATORA U RADNOM REŽIMU.



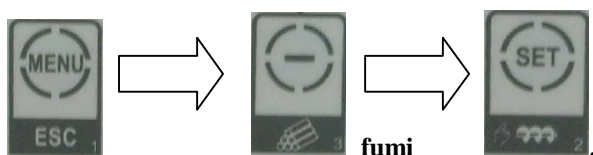
### PROMENA ZADATE TEMPERATURE VODE U KOTLU.



### PROMENA NAČINA POTPALE RUČNO ILI AUTOMATSKI.





### KAKO OČITATI TEMPERATURU DIMOVODNIH GASOVA.



## ULAZAK U SKRIVENI MENI.



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

### Greške prilikom startovanja kotla

Sve moguće greške u početnoj fazi rada tj. prilikom potpale mogu da se podele u tri velike grupe:

- **Grupa I** .Greške u potpali koje se odnose na situaciju kada nema pojave varnica, dima ni bilo kakvog plamena više od 20 minuta od trenutka kada se upalio grejač za potpalu.
- **Grupa II** .Greške u potpali koje se odnose na situaciju kada je došlo do pojave plamena ali se kotao posle izvesnog vremena(nekoliko minuta) ipak ugasio.
- **Grupa III** .Kotao je uspešno potpalio i radio nekoliko sati. Dostigao je zadatu temperaturu i duže vremena nema potrebe da se uključuje ni dozirni sistem ni ventilator (najčešće je ova situacija tokom noći). Zatim temperatura pada ili korisnik želi višu temp. (najčešće ujutru) i kotao dobija signal da krene u fazu potpale, ali do plamena ne dolazi.

### Grupa I

Moguć **uzrok 1**.

- **PROBLEM 1** – Zatvorena klapna ventilatora za primarni vazduh.Ventilator se nalazi na dozatoru.
- Postupak za rešavanje **PROBLEMA 1** – Otvoriti klapnu ventilatora maksimalno

Moguć **uzrok 2**.

- **PROBLEM 2** – Crevo koje spaja kanal vazduha od ventilatora do grejača nije pravilno postavljeno.
- Postupak za rešavanje **PROBLEMA 2** – Pričvrstiti crevo za vazduh i na kućište grejača i na cev kanala za vazduh

Moguć **uzrok 3**

- **PROBLEM 3** – Prostor u dubini ložišta gde sagoreva pelet je pun nesagorelih ostataka odnosno šljake tako da nema dodira peleta i vrelog vazduha.



- Postupak za rešavanje **PROBLEMA3** – Očistiti dubinu ložišta i to prvo krupniju šljaku mehanički a sitniju je moguće pokupiti i usisivačem.

#### Moguć **uzrok 4**

- **PROBLEM 4** – Pelet koji se koristi je velike vlažnosti.
- Postupak za rešavanje **PROBLEMA 4** – Probati sa peletom koji je većeg stepena suvoće.

#### Moguć **uzrok 5**

- **PROBLEM 5** – Mrežni napon na koji je priključen kotao je znatno manji od 220-230V tako da je i snaga grejača manja.
- Postupak za rešavanje **PROBLEMA 5** – Priključiti mrežni ispravljač napona ili potpaliti ručno.

#### Moguć **uzrok 6**

- **PROBLEM 7** – Posle ručnog nalaganja i automatske dopune ložišta u fazi potpale nivo peleta je takav da pelet nije u kontaktu sa grejačem.
- Postupak za rešavanje **PROBLEMA 7** – Dopuniti nivo peleta.

#### Moguć **uzrok 7**

- **PROBLEM 7** – Prebačen je kotao iz automatskog u ručni režim rada. Ako tokom čitave faze potpale ne gori lampica za grejač onda smo sigurni da je kotao u ručnom režimu.
- Postupak za rešavanje **PROBLEMA 7** – Prebaciti kotao u automatski režim potpale.

#### Moguć **uzrok 8**

- **PROBLEM 8** – Neispravan elektro grejač za potpalu. Isključiti kotao iz mrežnog napajanja i na priključnim kablovima elektro grejača izmeriti omsku otpornost.
- Postupak za rešavanje **PROBLEMA 8** – Promeniti elektro grejač

## Grupa II

#### Moguć **uzrok 1.**

- **PROBLEM 1** – Brzina ventilatora u fazi potpale. Brzina ventilatora za primarni vazduh u ovoj fazi je određena parametrima Uc00 i Uc01. Ukoliko je brzina drastično promenjena u odnosu na fabrički podešenu nije dobro ni značajno je smanjiti ni povećati. U slučaju kad je ventilator u potpali slab onda nema porasta temp. dimnih gasova a ako je prejak može doći do brze potrošnje peleta u komori što opet dovodi do smanjenja temp. dimnih gasova u potpali.

- Postupak za rešavanje **PROBLEMA 1** – Podesiti vrednosti parametara Uc00 i Uc01 na fabričke ili blizu fabričkih.

#### Moguć uzrok 2

- **PROBLEM 2** – Brzina ventilatora u fazi stabilizacije plamena. Kotao uđe u potpalu, pojavi se dim, na displeju piše Stb što znači da je u fazi stabilizacije plamena ali posle toga kotao se ugasi. Najčešće uzrok ovome je preslab ventilator u fazi stabilizacije što je određeno parametrom Uc04.
- Postupak za rešavanje **PROBLEMA 2** – Pojačati brzinu ventilatora parametrom Uc04.

#### Moguć uzrok 3

- **PROBLEM 3** – Previše ili premalo peleta u fazi stabilizacije. Ako ima malo ili previše peleta dok na displeju piše Stb tj. stabilizacija, može doći do zagušenja plamena i vraćanja kotla u stanje gašenja. Količina peleta u fazi stabilizacije se reguliše parametrom CL04.
- Postupak za rešavanje **PROBLEMA 3** – vrednost parametra CL04 na fabričku ili blisku fabričkoj.

#### Moguć uzrok 4

- **PROBLEM 4** – Kotao je ušao u fazu stabilizacije ali ide u fazu gašenja jer nema dovoljan prirast temp. dimnih gasova. Naročito je stagnacija odnosno mali pad temp. dimnih gasova uočljiv u trenutku kada kreće dopuna ložišta sa peletima.
- Postupak za rešavanje **PROBLEMA 4** – Podići temp. dimnih gasova za ulazak sistema u Fire ON a to je parametar F18. Na taj način novi pelet koji ulazi u komoru za sagorevanje teže obara temp. dimnih gasova jer je plamen jači iz razloga što mu se dalo više vremena do trenutka dopunjavanja. Ovaj problem se najčešće javlja kad su slabi dimnjaci ili je vuča dimnjaka iz nekog drugog razloga slaba.

#### Moguć uzrok 5

- **PROBLEM 5** – Kotao je ušao u fazu stabilizacije ali posle izvesnog vremena ide u gašenje.
- Postupak za rešavanje **PROBLEMA 5** – Zaboravljena da se vrati u kotao ili potpuno zatvori fioka za pepeo.



## Grupa III

### Uvod

Kada kotao dostigne zadatu temperaturu vode u njemu ili vazduha u prostoriji gde je sobni termostat, prelazi u fazu mirovanja, odnosno održavanja plamena ili u originalu Standby fazu. Najbolji primer za ovakav način rada kotla je noćni rad. Osnovni cilj ove faze je održati plamen odnosno žar u ložištu tokom višesatnog mirovanja. To se postiže periodičnim uključivanjem i pelet transportera i ventilatora u određenim periodima vremena.

- U trenutku kada je kotao dostigao zadatu temperaturu on ulazi u fazu održavanja plamena. Posle određenog perioda vremena, što je određeno parametrom t04 (u minutima) transporter kreće u rad i ventilatori se aktiviraju. U ovim periodima dolazi do aktiviranja kotla sve dok ne dobije komandu za start zbog postizanja zadate temperature.
- Vreme trajanja jednog procesa rada transportera i ventilatora određen je parametrom t05 (u sekundama).
- Tokom samog procesa uključivanja transportera njegov rad je određen aktivnim, radnim periodom što je određeno parametrom CL09 (u sekundama) ali i periodom pauze što je određeno parametrom CP09 (u sekundama).
- Za vreme procesa održavanja plamena ventilator za primarno sagorevanje se uključuje sa snagom koja je određena parametrom Uc09.

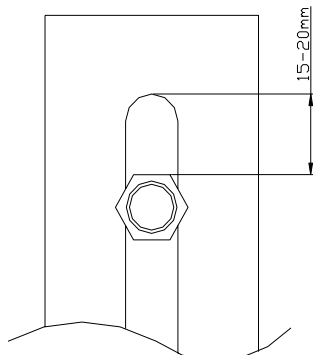
Moguće greške u radu vezane za fazu održavanja plamena:

- Kotao i pored funkcionisanja faze održavanja plamena nema dovoljno peleta za start i rad u normalnom režimu.
- Otklanjanje uzroka greške :
  1. Smanjiti parametar t04, odnosno povećati učestanost rada transportera i ventilatora u fazi mirovanja.
  2. Povećati vreme trajanja procesa tj. parametar t05.
- Previše nesagorelog peleta pri kretanju kotla u rad.
- Otklanjanje uzroka greške :
  1. Povećati parametar t04
  2. Smanjiti parametar t05
  3. Smanjiti snagu ventilatora za primarno sagorevanje u fazi održavanja plamena parametar Uc09.

### *Start rada kotla na biomasu*

- Napuniti silos gorivom. Silos je zapremine 240 L. Obavezno zatvoriti poklopac silosa.
- Uveriti se da je sigurnosna klapna u takvom položaju da se kanal za kretanje klapne vidi u dužini od 15÷20 mm (**slika 15.**)

Ukoliko je sigurnosna klapna u krajnjem donjem položaju sav vazdeuh ide kroz masu goriva i ne dozvoljava povrat plamena. Ako je klapna u krajnjem gornjem položaju sav vazduh ide na dizne sagorevanja u sivom livu. Postoji mogućnost da se kanal za transport i puž tako zagreju da se silos za gorivo zapali.



*Slika 15. Prikaz položaja sigurnosne klapne*

- Proveriti da li su ventilator, motor i lančanici u svojoj kutiji neoštećeni posle transporta i smeštanja u kotlarnicu.
- Proveriti da li je sonda za merenje temperature ozduvnih gasova postavljena u dimnoj cevi. Bez sonde u dimnoj cevi nemoguć je rad kotla.
- Uključiti dovod struje u automatiku i dopuniti pelet, odnosno neko drugo gorivo do polovine ložišta. To je visina kad gorivo postaje vidljivo gledajući kroz donja vrata kotla. Dopunu ložišta možemo izvršiti na dva načina: više puta paliti i gasiti kotao ili primenom specijalne funkcije za to, što je detaljno objašnjeno u poglavlju (**AUTOMATIKA**).  
 Ako je funkcija startovanja kotla ON pravilno urađena, na automatici će da svetli lampica elektro grejača potpale. El.grejač je smešten u donjoj zoni ložišta i ako je on u kontaktu sa gorivom, posle 5÷6 min. osetiće se dim u ložištu.  
 Tada treba otvoriti klapnu kotla zbog mogućnosti izbijanja dima na donja i gornja vrata. Kada se početni plamen razgori i temperatura dimnih gasova pređe 50 °C kotao ulazi u radni ciklus i počinje sa automatskim dodavanjem goriva.
- Posle od prilike pola sata proveriti temperaturu dimnih gasova (**objašnjeno u poglavlju AUTOMATIKA**) i ako je ona relativno visoka preko 180 °C, zatvoriti klapnu kotla. Ukoliko se klapna ostavi duže vreme otvorena postoji opasnost da dimni gasovi pređu 250 °C posle čega kotao prelazi u samogašenje tj. samoodržavanje plamena.

Osnovna dva parametra koja korisnik reguliše na osnovu vrste goriva i snage plamena su: vreme dotura goriva u ložište dugme „9” i snaga (broj obrtaja) ventilatora dugme „8”

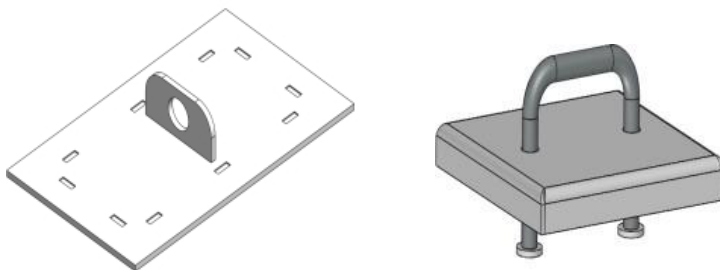
Ova dva parametra moraju da budu u takvom međusobnom odnosu da se proces sagorevanja uvek vrši na vrhu ložišta. Sagorevanje treba da bude tako da nema ni prosipanja goriva van ložišta od sivog liva, ali ni povrata plamena ka silosu.

Korektno našteloovati sagorevanje u kotlu je moguće za od prilike sat vremena. Orijentacione vrednosti tih parametara nezahvalno je navoditi iz razloga različitih uslova prilikom puštanja kotla u rad.

### ***Start rada kotla na čvrsto gorivo***

U slučaju da korisnik želi rad kotla na čvrsto gorivo treba odraditi sledeće korake:

- U ložište kotla postaviti nosače rostova i rostove od sivog liva. Ovo je dodatna oprema i ove delove treba posebno poručiti. Ceo ovaj sklop je potpuno demontažan što se vidi na **slici 16**.
- Na rostove ubaciti ogrev za potpalu i ručno potpaliti. U trenutku pojave plamena uključiti na automatski režim rada „Drvo”. Ako je prethodno kotao bio u režimu „Pelet” isključiti ovaj režim.
- U režimu rada „Drvo” sagorevanje se vrši uz pomoć vazduha koji dolazi od ventilatora koji se koristi kada se loži i pelet. Sam vazduh prolazi kroz ložište za pelet tako da je ovaj prostor zabranjeno prekrivati sa kutijama za pepeo ili nekim drugim zaštitama.



*Slika 16. Prikaz poklopca za pokrivanje komore gde izvire pelet i pokrivanje komore spirale koja odvodi pepeo u kantu*

## 8. Održavanje kotla

Kotao TKAN zahteva svakodnevno i periodično čišćenje.

- Svakodnevno (barem sedmično) čišćenje se odnosi i na prostor samog ložišta od sivog liva gde stalnim izbacivanjem pepela omogućavamo bolji rad elektro grejača za potpalu i bolje sagorevanje tj. veću količinu vazduha kroz vazdušne kanale u sivom livu. Takođe pepeo već u toku dana počinje da se taloži na podu, prostoru oko samog ložišta. Pri prosečnim parametrima sagorevanja 100kg peleta proizvede 1kg pepela ali ovaj podatak znatno varira u zavisnosti od vrste i kvaliteta peleta.
- Na svakih 7 do 10 dana preporučuje se gašenje kotla, njegovo hlađenje od nekoliko sati i ručno ili najbolje vakum usisivačem čišćenje dubine prostora komore za sagorevanje. Ovako se odstranjuju i krupniji komadi nepotpuno sagorelog peleta koji mogu da izazovu neprijatan zvuk tokom rada i da izazovu kraći radni vek pužne spirale koja gura pelet u prostor za sagorevanje.
- Jednom u mesec dana potrebno je otvoriti i gornja vrata za čišćenje, izvaditi turbulatore i sa cevi izmenjivača ukloniti naslage katrana i čađi. Sve što se tada skine pokupi se na gornjoj površini krova ložišta ili u dimnoj kutiji. Previše pepela u cevima izmenjivača smanjuje iskorišćenje kotla i dovodi do previsokih temperatura u ložištu koje mogu da utiču i na njegove deformacije, naročito donjih vrata.

**Napomena:** U zavisnosti od režima i uslova rada, kvaliteta peleta odnosno biomase navedeni periodi čišćenja mogu da budu i češći.

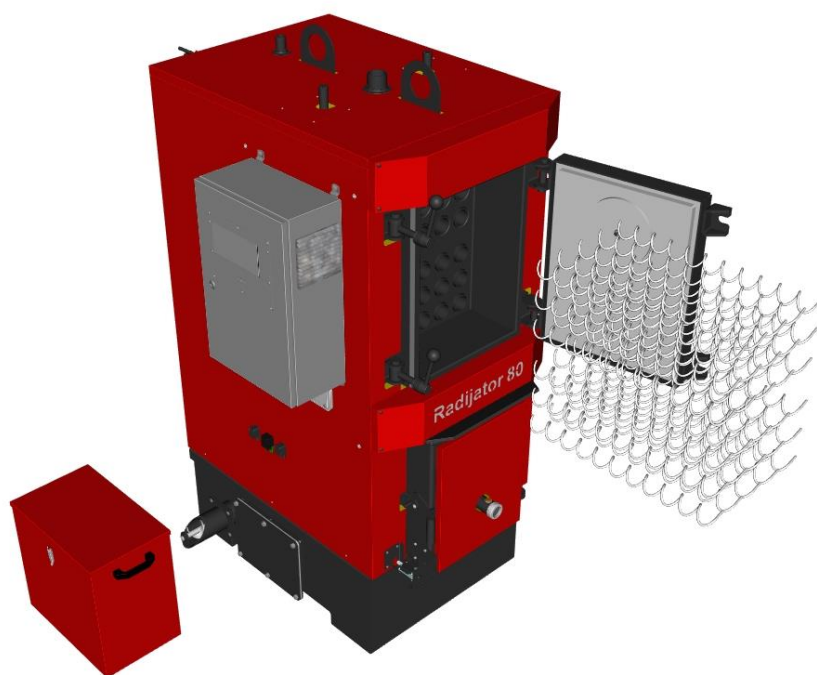
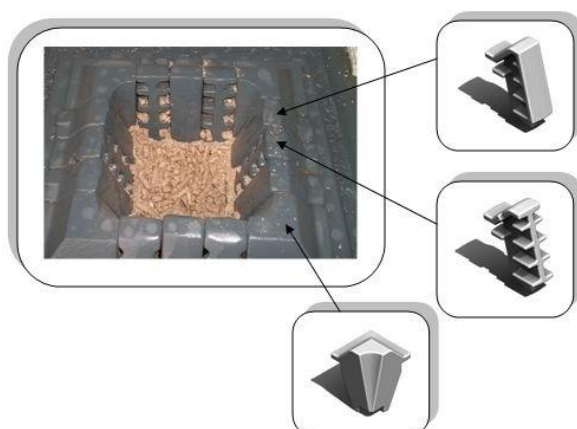
Ukoliko u kotlu, tokom korišćenja javi kondenzacija, potrebno je pokupiti kondenzat a ceo kotao iznutra premazati baznim sredstvima za čišćenje ili barem vodenim rastvorom građevinskog kreča. Na taj način se vrši neutralizacija kiselina usled kondenzacije.



***Na ovaj način obavezno konzervirati kotao na kraju grejne sezone. U toj situaciji zatvoriti i sve otvore na kotlu da ne dodje do cirkulacije vazduha kroz kotao jer i tako može doći do pojave vlage u kotlu.***



***Održavanje kotla je jedan od najbitnijih faktora za dužinu radnog veka kotla. Naročito je bitno da u vansezoni kotao bude očišćen i da se izvrši neutralizacija kiselina na već opisan način.***



*Slika 17. Prikaz vadenja turbulatora iz kotla TKAN, demontaža livenih segmenata ložišta i čišćenje kante za pepeo*

## 9. Garancija

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

Kotao mora biti priključen po navedenim hidrauličkim šemama iz tehničkog uputstva, naročito obratiti pažnju na sigurnosne ventile, termičko osiguranje oticanjem, mešajući ventil-pumpe za zaštitu hladnog kraja kotla odnosno protiv kondenzacije, opseg radnog pritiska kotla, opseg radne temperature kotla, uslove u kotlarnici itd. **(videti tačku 6.)**

Kotao mora biti priključen na dimnjak propisanog poprečnog preseka, karakteristika izolacije i visine. **(videti tačku 3.3).** Dimovod od kotla do dimnjaka mora biti izveden po tehničkom uputstvu.

Kod kotla moraju biti izvršena i navedena elektro priključenja iz tehničkog uputstva, naročito se misli na karakteristike sobnog termostata, karakteristike mrežnog napona koji mora biti u određenim granicama.

Korisnik mora da se pridržava navedenih uputstava o korišćenju i održavanju.  
**(videti tačku 8.)**

### 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 zaliham a sve potrebne rezervne delove,
- **garancijski rok počinje od DANA KUPOVINE I TRAJE 60 MESECI ILI 72 MESECA OD DATUMA PROIZVODNJE (datum proizvodnje nalazi se na nalepnici sa zadnje strane kotla),**
- **GARANCIJA OD 60 MESECI VAŽI SAMO AKO SE KOTAO REDOVNO SERVISIRA OD STRANE CENTRALNOG SERIVISA RADIJATOR INŽINJERINGA u periodu naznačenom za isti (dalje u tekstu),**  
**garancija važi ako je garantni list overen od strane prodavca i ako je upisan datum kupovine i priložen račun. TAKOĐE BITNO JE IMATI I NALOG ZA PUŠTANJE U RAD. (overen od strane ovlašćenog servisa)**

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

- Za sve ležajeve serije UCFL,
- elektro grejača za potpalu,
- Ležajeve čelijastog sigurnosnog transportera (valvole),

### **4. Garancijski period od dve godine važi za sledeće delove:**

- Motor reduktor,
- lance za prenos obrtnog momenta 083,
- donje pužne spirale,
- ventilator primarnog vazduha,
- ventilator sekundarnog vazduha,
- automatiku kotla sa sigurnosnim termostatom,
- sondu dimovodnih gasova,
- sondu temperature kotlovske vode.
- segmente za sagorevanje od sivog liva,
- elektro konektore,
- izolacijske materijale na vratima i otvorima za čišćenje,
- delove čelijastog sigurnosnog transportera (valvole) koji su od sivog i nodularnog liva.

### **5. Garancijski rok ne važi:**

- ukoliko se posle svake grejne sezone ne odradi redovan servis,
- za zamenu delova kod redovnog godišnjeg održavanja u skladu sa uputstvima,
- 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,
- ukoliko se utvrdi da hidraulička šema nije urađena po preporukama firme „Radijator inženjering”,
- ako je kupac koristio proizvod iznad deklarisanih svojstava i u normalnim okolnostima,

### **6. 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.



## 7. 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.

## 8. Redovan godišnji servis

Redovan servis se odrađuje na kraju svake grejne sezone u period od 15.4. do 31.8. i naplaćuje se utvrđenim cenovnikom firme “Radijator Inženjering”. Servisni postupak tehničkih lica koja obavljaju redovne godišnje servise, a koja su od strane proizvođača ovlašćena za to, obuhvataju sledeće operacije:



**NAPOMENA: Serviser je dužan da pregleda sve navedene delove (sa liste) dozatora i izmenjivača, i ukoliko dođe do zamene bilo kojih delova na iste korisnik dobija gore navedenu garanciju kao i garanciju na još 12 meseci na telo kotla (izmenjivač). Garancija se može produžiti do 5 god. od datuma puštanja u rad. Servis i produženje servisa može da obavlja lice koje šalje centralni servis “Radijator Inženjering”-a. Na nezamenjene delove posle odrađenog servisa garancija ne važi.**

Servisni postupak:

1. Demontaža silosa za pelet od pelet transportera;
2. Demontaža pelet transportera od kotla;
3. Skidanje oba lanca, lančanika i ležajeva sa pelet transportera;
4. Demontaža segmenata sa sagorevanje od ložišta i čišćenje prostora ložišta ispod segmenata. Provera stanja segmenata i njegovog međusobnog zazora;
5. Čišćenje prostora cevi ložišta u kojoj se okreće donja pužna spirala;
6. Podmazivanje svih ležajeva gornje i donje pužne osovine i provera njihove ispravnosti. Ležaj ne sme da ima otežano okretanje ili naprsline na kućištu. U suprotnom ležaj se menja. Ukoliko se utvrdi da je do oštećenja ležaja došlo zbog upadanja čvrstog predmeta ili nagomilavanja prašine, zbog lošeg kvaliteta peleta, u pelet transporteru, Radijator inženjering naplaćuje vrednost ležaja. Ako je do oštećenja ležaja došlo zbog povlačenja plamena u sam pelet transporter i to iz razloga loše postavljenih parametara prilikom korišćenja, Radijator inženjering naplaćuje vrednost ležaja;
7. Skidanje lanaca sa obe strane vratila ćelijastog sigurnosnog transportera (valvole) i



provera ispravnosti ležajeva u valvoli. Ukoliko je okretanje ležajeva otežano, zameniti ležajeve sa obe strane. Ukoliko je do oštećenja ležaja valvole došlo zbog upada čvrstog tela koje nije iz samog kotla (zbog greške korisnika ili proizvođača peleta) Radijator inženjering naplaćuje vrednost ležajeva;

8. Proveriti oštrinu ivica rotora;
9. Izvaditi sondu dimnih gasova i očistiti je od naslaga;
10. Provera ventilator primara i sekundara i ventilator na ciklonu ukoliko se ciklon kao dodatna oprema nalazi na kotlu;
11. Provera dihtovanja gornjih i donjih vrata;
12. Provera održavanja kotlovskog izmenjivača;
13. Provera ispravnosti sistema za oprašivanje ukoliko se sistem za otprašivanje nalazi na kotlu kao dodatna oprema;
14. Provera stanja ciklona na kotlu u koliko se ciklon kao dodatna oprema nalazi na kotlu;
15. Provera stanja spirali za čišćenje i motor reduktora na istim;
16. Provera ispravnosti fena za potpalu.



## **RADIJATOR-Inženjering d.o.o**

Živojina Lazića Solunca br.6

36000 Kraljevo

telefoni za kontakt:

036/399-140, 399-150

e-mail: [radijator@radijator.rs](mailto:radijator@radijator.rs)

## 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 nesposobnost 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.

## TABLE OF CONTENTS:

1. Important warnings;
2. Description of the boiler;
3. Installation;  
  
General warnings;  
  
Boiler room;  
  
Connecting to the chimney;
4. Cross-section of the TKAN boiler with the description of elements;
5. Table with dimensions;
6. Hydraulic diagram;
7. Explanation on how the TKAN automatic controls system functions;
8. Maintenance of the boiler;
9. Warranty

## 1. Important warnings

### GENERAL WARNINGS

- Upon removing the package, make sure that the delivery is complete and, in case that something is missing, refer to the seller who sold the boiler
- The boiler must exclusively be used for the purpose intended by the seller. No responsibility will be taken by the manufacturer for the damage caused to people, animals, or things in case of installation errors, regulation, maintenance, or improper use.
- In case of water leakage, remove the device from the electric power supply, stop the water supply, and inform the licensed service department or the licensed fitter.
- This manual is an integral part of the device and has to be kept with care and **ALWAYS** has to come with the device in case of changing owner or user, or in case of being connected to another installation. In case of being damaged or lost, request a new copy from the licensed seller.

### IMPORTANT WARNINGS

We remind you that, while using the device on biomass or solid fuel and those in contact with electricity and water, it is required to follow safety measures:

- It is forbidden for children and persons with certain limitations without supervision to use the boiler
- It is forbidden to use the boiler on installations with an operating temperature higher than 90°C and operating pressure higher than 3 bars.
- It is forbidden to use easily flammable fuels (alcohol, oil) for the purpose of faster combustion of wood
- It is forbidden to store highly flammable materials near the boiler and furnace doors. Ash must be stored in sealed and inflammable containers.
- It is forbidden to incinerate waste and materials whose combustion produces flame or explosion hazards (e.g. plastic bags, sawdust, coal dust, mud, etc.)
- It is forbidden to perform any kind of intervention by the technician or cleaning before the boiler is removed from the electric power supply by removing the outlet from the electric network.
- It is forbidden to alter safety elements. A periodical inspection of safety elements is mandatory according to the laws of the country where the boiler was installed.
- It is forbidden to close ventilation openings in a room where the boiler is. Ventilation openings are necessary for proper combustion
- It is forbidden to expose the boiler to extreme weather. The boiler itself is not intended to be installed externally and does not have an anti-freezing system.
- It is forbidden to shut down the boiler if the external temperature might drop below ZERO (freezing hazard)
- To supply large industrial TKAN series boilers with electricity, three-phase electric energy is used. If the user uses generator units that turn on when electricity goes out, it is necessary to check if electric motors for transporting pellets have the same direction as when they are on the mains power supply. If motors are operating in opposite directions, great damages to the boiler may result.

## The minimal distance from flammable materials

- Ensure the appropriate distance from flammable materials and, if necessary, provide their protection.
- The minimal distance from flammable materials is regulated by law – please seek information from professionals whose profession is heating and chimneys.
- The minimal distance between the boiler and flue gas discharge pipes from the materials of low and average flammability rate should be at least 100mm.
- The minimal distance from easily flammable materials is 200mm and the same applies to materials of an unknown flammability rate.

### Fire hazard!

- Storing flammable materials and liquids close to the boiler is forbidden.
- It is mandatory to inform users of the necessary minimal distance between flammable materials and the boiler.

A ... inflammable	asbestos, stone, building stone, ceramic wall tiles, terracotta, stucco, glazed concrete (without organic additives)
B ... not easily flammable	drywall, glass fibers, and isolation panels (AKUMIN, IZOMIN, RAJOLIT, LIGNOS, VELOKS, HERAKLIT)
C1... slow burn rate	beech and oak wood, composite wood, felt, and isolation panels (HOBREKS, VERZALIT, UMAKARTA)
C2 ... average burn rate	pine wood, larch wood, and fir wood, composite materials
C3 ... easily flammable	asphalt, cardboard, cellulose materials, particleboard, cork, polyurethane, polystyrene, polypropylene, polyethylene, floor fibers

## 2. Description of the boiler

The goal of developing the TKAN boiler was such that RADIJATOR INZENJERING could offer the boiler to the market which is, according to its mechanical and thermal properties, distinctly intended for biomass fuel.

Using the general term 'BIOMASS', it is, of course, thought of pellets, but the possibility of firing with fruit pits, more precisely sour cherry and sweet cherry, should be pointed out as well. **If the user wants to use some unlisted form of biomass, the construction and development department of Radijator inženjering, or the licensed seller should be contacted, because some specific types of biomass require special, specific combustion solutions.** While using mentioned fuels, the automatic control of main operation parameters is implied. With all listed examples of using biomass, a certain degree of fuel aridity is required.

On the other hand, market demands always lean towards even greater universality of fuel, therefore TKAN can also be fired with wood and, then, firing is manual.

The furnace of TKAN industrial boilers is significantly smaller than in traditional boilers on wood. Therefore, firing with wood and extracting ash is made harder. The conclusion is not to use them when combusting huge amounts of wood and just for a couple of days. In these situations, furnace shields and shields for ash cleaner screws should be used. They are represented in section 'Starting the boiler on wood'.

In this situation, the combustion is done under the forced draft of the fan, therefore TKAN in these conditions is more efficient than its predecessors which operate according to the free draft principle.

Industrial boilers TKAN series are manufactured in the following powers: TKAN 60, TKAN 80, TKAN 100, TKAN 150, TKAN 200, TKAN 250, and TKAN 300.

### CONSTRUCTION

Speaking of the external design, furnace dimensions, firing and cleaning holes, TKAN preserved all good characteristics of previous models which distinguish RADIJATOR INZENJERING on the market.

The water part of the boiler, its method of exchanging heat between flue gases and water through the pipe exchanger, is adapted to biomass. Because of the fan, more precisely forced draft, the route of flue gases is longer than in standard boilers. Due to the same reasons, it is possible to flue gases deflectors, so-called turbulators that further increase the degree of utilization of the boiler. Turbulators are spirals made of pipe-like material. If, while using, (chimney) there is too much smoke on boiler doors in the firing phase or automatic controls system encounters difficulties when entering the combustion phase, it is technically justified to use the boiler without turbulators (or with a smaller number of).

The degree of utilization on pellets exceeds 90%. On normal modes, the temperature of flue gases on exit is around 160°C, and on maximum modes is below 180°C. These values can be read on the display at any moment.

Industrial TKAN boilers **have** the exchanger made of seamless pipes for the installation of **vents for thermal leakage protection**. On these boilers, the existing sockets enable easy installation of vents that directly load water into the boiler for thermal protection.

All parts of the water part of the boiler are made of seamless pipes (quality **ST 35.4**) and at least 5mm thick boiler sheets depending on the power of the boiler. Sheets are **1.0425 EU** standard (speaking of quality), more precisely **P265GH** standard **EUII**.

According to its principle of operation, the furnace is the so-called ‘spring’, where the fuel from the transport zone goes vertically upwards, that is springs to the combustion zone. It is made of massive insulation materials and grey cast iron. Fuel transport is ensured by screw conveyors. The fuel comes from the silo capable of holding from 457l to 1610l depending on the size of the boiler. When needed, it is easy to disassemble everything into three separate units: a silo (**picture 1, position 4**), a loading mechanism (**picture 1, position 3**), and a boiler with a furnace (**picture 1, positions 1 and 2**). A separate assembly within the furnace stands out – a semi-automatic boiler cleaning. Boiler TKAN 60 does not have a screw axle for ejecting ash inside the furnace. Boilers TKAN 80 and TKAN 100 have one screw axle each, and TKAN 150 and higher, that is TKAN 200, TKAN 250, and TKAN 300 have two screw axles for ejecting ash each.

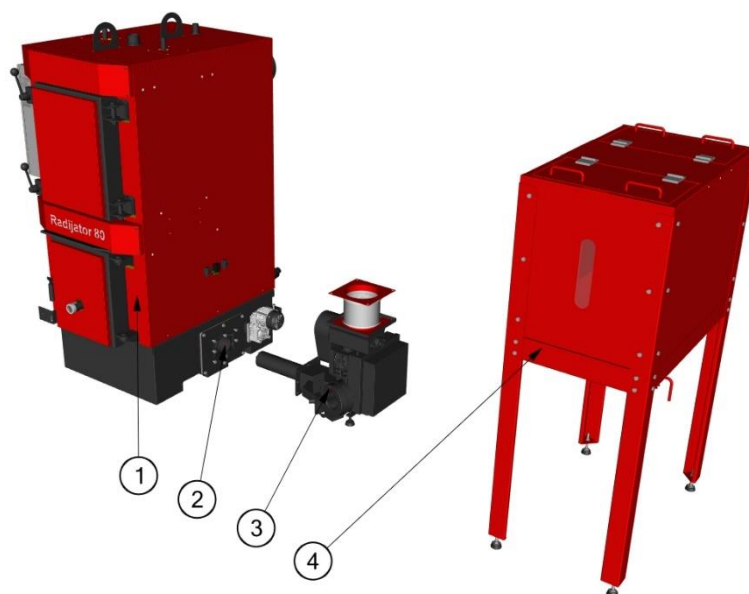
A very important notice regarding the construction of TKAN industrial boilers is that it also enables additional equipment. The additional equipment is ordered prior to the boiler delivery, some elements can be additionally installed on spot, and some of them have to be factory installed.

Additional equipment elements are:

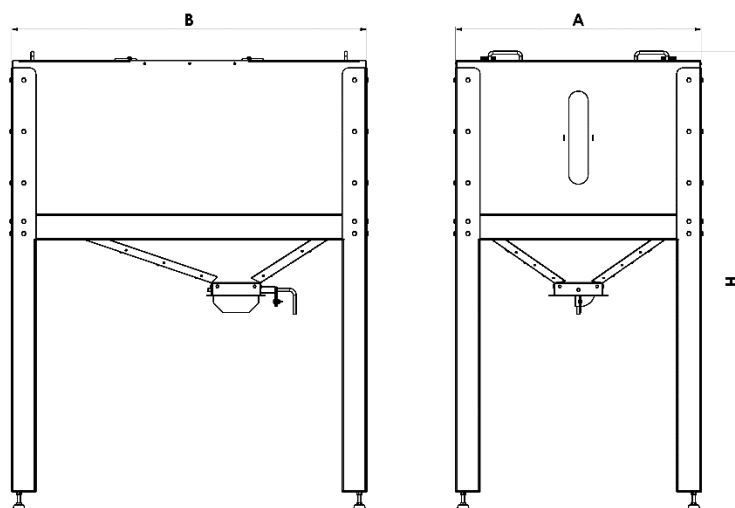
**-Larger daily silos are next to the boiler.** Standard silos (picture 2) are listed in the table with dimensions, however, if a buyer has more space in the boiler room and prefers a larger, so-called daily silo in special dimensions, it is possible to order one made by Radijator inženjering. The delivery of this silo is possible additionally after the boiler is already placed in the boiler room.

**-Multi-day containers for pellets.** It is also possible to deliver silos of tens of tons in capacity and which are connected to a small daily silo with the screw conveyor system. Loading these silos is done from a so-called jumbo one-ton bag by bucket elevators. This equipment is also possible to be delivered additionally.





*Picture 1 The representation of the dissassemblable boiler units*



*Picture 2. Standard silo for TKAN boilers*

Table 1 - Silo dimensions

	DIMENSIONS				
	A	B	H	V	Pellet capacity
	mm			liters	kg
<b>TKAN 80</b>	606	1020	1736	290	180
<b>TKAN 100</b>	810	1176	1611	305	190
<b>TKAN 150</b>	1010	1456	1875	680	410
<b>TKAN 200/250/300</b>	1394	1830	1822	1600	1000
	1394	1830	2130	2330	1500
	1394	1830	2445	3115	2000

Boilers TKAN Integra 200/250/300 provide a possibility to have one of three silo variants installed in the boiler room, depending on the buyer's preference of course. Template measures are given in table 1.

## 3. Installation

### 3.1. General warnings



TKAN boilers are intended for the maximum working pressure of 3 bars and maximum working temperature of 90°C, therefore they fit into the category of hot water boilers. Operating at higher values than listed can cause great material damages and endanger human lives.



It is strictly forbidden to reduce cross-sections of safety supply valves. It is also strictly forbidden to install safety equipment whose working pressure is higher than 3 bars. It is recommended to install vents for thermal leakage protection in accordance with the law of the country where the equipment is installed.



The boiler has the fan, automatic controls system, the pellets transport mechanism eventually the furnace or pipe bundle cleaning mechanism. All these devices use a 230V or 3x380V power supply, therefore improper installation and careless handling can endanger human life by electrocution.



Before starting the boiler, check if the direction of the pellets transportation motor enables the supply of pellets into the furnace. In case generators are used in case of a power outage, also check if the direction of the motor directs pellets into the firing chamber. On the contrary, that can lead to permanent boiler damages.



During each intervention on the boiler's electric system (e.g. changing electric heater for firing, electric gear motor interventions or fan interventions, etc.) it is mandatory to shut down the main power supply by disconnecting the socket from the network installation. This way, possible electric shocks and endangering lives of technicians performing the intervention are avoided.



Solid fuel and forced draft boiler should be installed according to valid norms and law regulations. Every change either on the mechanical construction or on the electrical installation will be considered a violation of warranty terms and lead to their violation.

While bringing the boiler into the boiler room, it is very frequent that the entire boiler cannot fit through the existing door or some other object in the boiler room represents an obstacle. In such situations, it is very easy to disassemble the boiler into three basic assemblies:

- water exchanger with furnace
- pellets transport mechanism
- silo

The factory position of the silo is on the right side of the boiler. If the customer wants it on the left side, that must be emphasized while ordering.

Basic requirements that must be met during installation are:

When installing the boiler, pay attention to its side distance and rear distance from possible obstacles. In this way, the access point is created to clean ash from the boiler or even dismantle the assembly of the mechanism for transporting pellets. More details in section 3.2.

The boiler can be connected to an open central heating system, but to a closed central heating system as well. In case of the connection to a closed system, it is recommended to install the valve for thermal leakage protection, which is determined by the relevant laws of each country in which the boiler is connected. In this series of boilers, thermal safety valves with direct injection of cold water into the boiler should be used. There are appropriate sockets for mounting these valves on the boiler itself.

In the boiler room, where the boiler is installed, if there are frequent power outages use additional safety measures and measures to protect the boiler while operating. If there are parts of the installation that are "submerged", that is, they are at a lower level than the boiler and some heating bodies, then the open heating system is recommended.

The boiler has to be located at a safe distance from easily flammable materials.

The power supply of the boiler is 3x380V (except for TKAN 80) and 50Hz and the connection of all devices that the boiler contains should be done according to the valid regulations and the connection is made by a person with the appropriate authorization.

The connection to the chimney is also conducted according to the binding regulations the manufacturer's recommendations as well as, which can be seen in the following text.

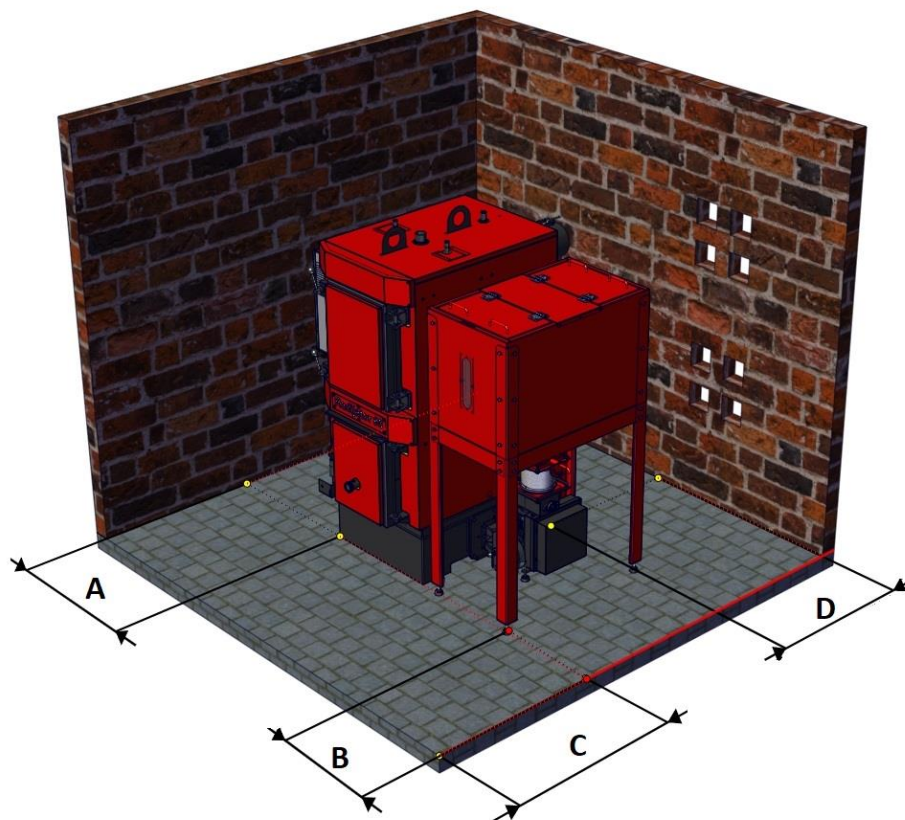
## 3.2 Boiler room

The boiler room must be secured against freezing.

The boiler base in the boiler room has to be made of inflammable material. Recommended distances of all four sides of the boiler in relation to the walls of the boiler room or some other rigid bodies (storage boiler, etc.) are shown in *picture 3*.

These distance values allow safe access when firing, enough space for cleaning, and free access to the fan, pellet transport mechanism, electric ignition heater, and charging and discharging valve. The boiler on its side opposite the silo should be distanced from the wall 500 to 600mm and only when there is a semi-automatic cleaning of the furnace. That space is needed for handling the ash dump

If the boiler does not have semi-automatic ash cleaning, then, it is enough to be 100mm away from the wall. On the silo side, the boiler should be 400 mm to 900 mm away from the wall (measured from silos) depending on the power of the boiler. These measures are given below in the table for each power. This room is needed in case of any major interventions on the pellet transport mechanism, that is, in a situation where it needs to be dismantled from the boiler. The space at the back of the boiler should allow easy access to the chimney and ash cleaning holes on it. From the front side of the boiler, it is required to ensure easy opening of all doors and eventually allow the installation of pneumatic cleaning.



*Picture 3 Positioning the boiler in the boiler room*

*Table 2 Positioning the boiler in the boiler room*

	DIMENSIONS			
Boiler type	A* (mm)	B (mm)	C (mm)	D (mm)
<b>TKAN 60</b>	100	400	1000	800
<b>TKAN 80</b>	500	400	1000	800
<b>TKAN 100</b>	500	400	1000	800
<b>TKAN 150</b>	500	550	1000	1000
<b>TKAN 200</b>	600	650	1000	1000
<b>TKAN 250</b>	600	900	1000	1100
<b>TKAN 300</b>	600	900	1000	1100

**NOTICE:** All boilers except the TKAN 60 boiler have semi-automatic cleaning.

The boiler room must have necessary ventilation, that is, openings big enough for the fresh air to enter and exhaust air to leave.

The total surface of these openings is a minimum of 200cm<sup>2</sup> for power up to 80kW and for power over 80kW the surface has to be larger by another 2cm<sup>2</sup> per kW.

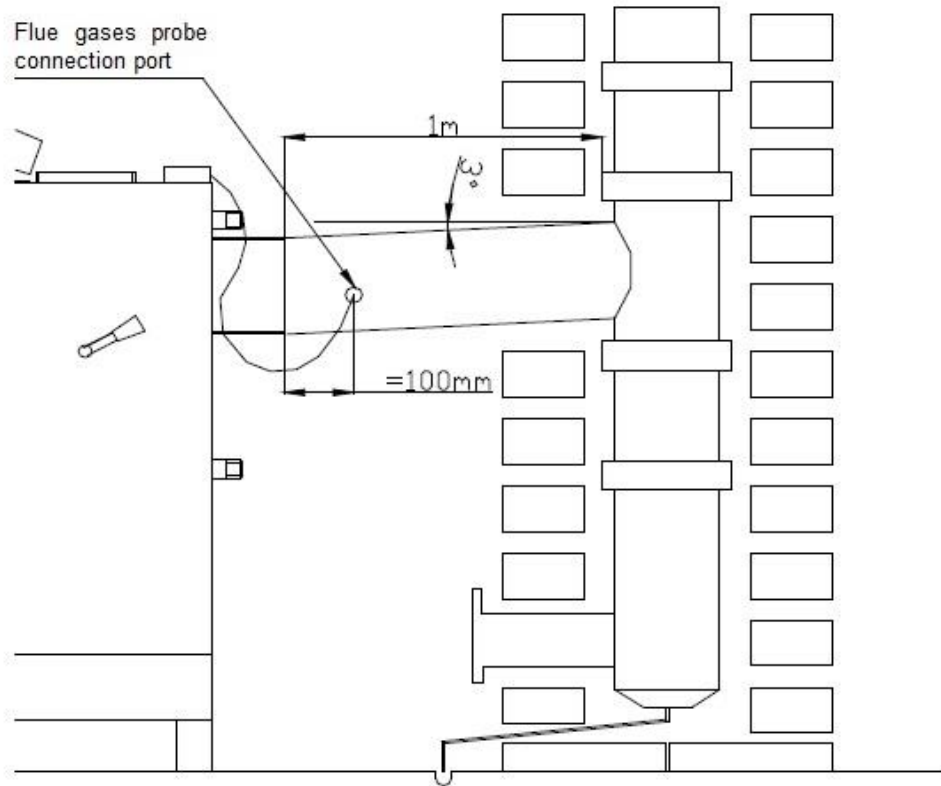
$$A = 200 \text{ cm}^2 + \frac{2 \text{ cm}^2}{\text{kW}} \times (\sum Q_n - 80 \text{ kW}) \quad \sum Q_n = \text{possible powers over 80kW}$$

The lack of sufficient ventilation in the boiler room can cause numerous problems in the operation of the boiler. The main problem is the inability to achieve high outgoing water temperatures, that is, not achieving maximum power leading to condensation in the boiler.

- ✓ Take into account the necessary minimum space required to access the safety elements and to execute cleaning and service operations of electrical and mechanical components;
- ✓ Make sure if the degree of electrical protection is in accordance with the characteristics of the room where the boiler is to be placed;
- ✓ It is forbidden to expose the boiler to extreme weather conditions. The boiler itself is not intended for external mounting and does not have an anti-freezing system;
- ✓ It is forbidden to close the ventilation openings in the room where the boiler is located. Ventilation openings are necessary for proper combustion.

### 3.3 Connecting to the chimney

The most optimal placement of the boiler on the chimney is such that the line connecting the center of the exiting point of flue gases from the boiler and the center of connection point to the chimney is in a slight rise (up to 3%) (see **picture 4**).



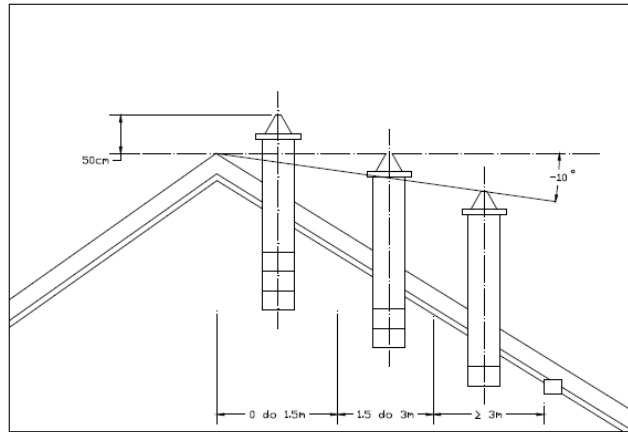
*Picture 4 - The representation of how to connect to the chimney*

Arches should be avoided if possible, and if not then the maximum number of arcs is (2). It is desirable to insulate the smoke channel from the boiler to the chimney, especially if there are arches and longer sections.



On the smoke pipe, approximately 100mm from the chimney of the boiler, an opening should be drilled, and install an insert for flue gas temperature probe. Without the flue gas temperature information, there is no automatic boiler operation mode. The chimney itself should be made of ceramic pipes, there should be 3 - 5 cm thick insulation around them and the final outer layer is brick or special chimney elements. If the chimney is not made of ceramics though, but of brick, the surface of the light section of such a chimney must be 30% larger than this area of the ceramic chimney.

The chimney must also have a cleaning door and they must seal well. The chimney exit on the roof has to be in accordance with certain regulations. There are two different cases: if the angle of the roof is smaller than  $12^\circ$  and if the angle of the roof is greater than  $12^\circ$ . For an angle smaller than  $12^\circ$ , the height of the chimney above the roof is 1m and for an angle greater than  $12^\circ$ . see picture 5.



Picture 5. Height of the chimney

If you think that the chimney is too powerful and that too much cold air flows through the boiler, at the exit of the boiler there is a flap that can reduce the flow of exhaust gases. The chimney needs to be cleaned regularly or at least once a year.



***If the chimney is not of the correct height, cross-section, or if it is not cleaned, complications in boiler operation might occur. First of all, a high-temperature mode of operation is not possible, i.e. there is no maximum operating power, the consequence of this is the occurrence of condensation which affects the service life of the boiler.***

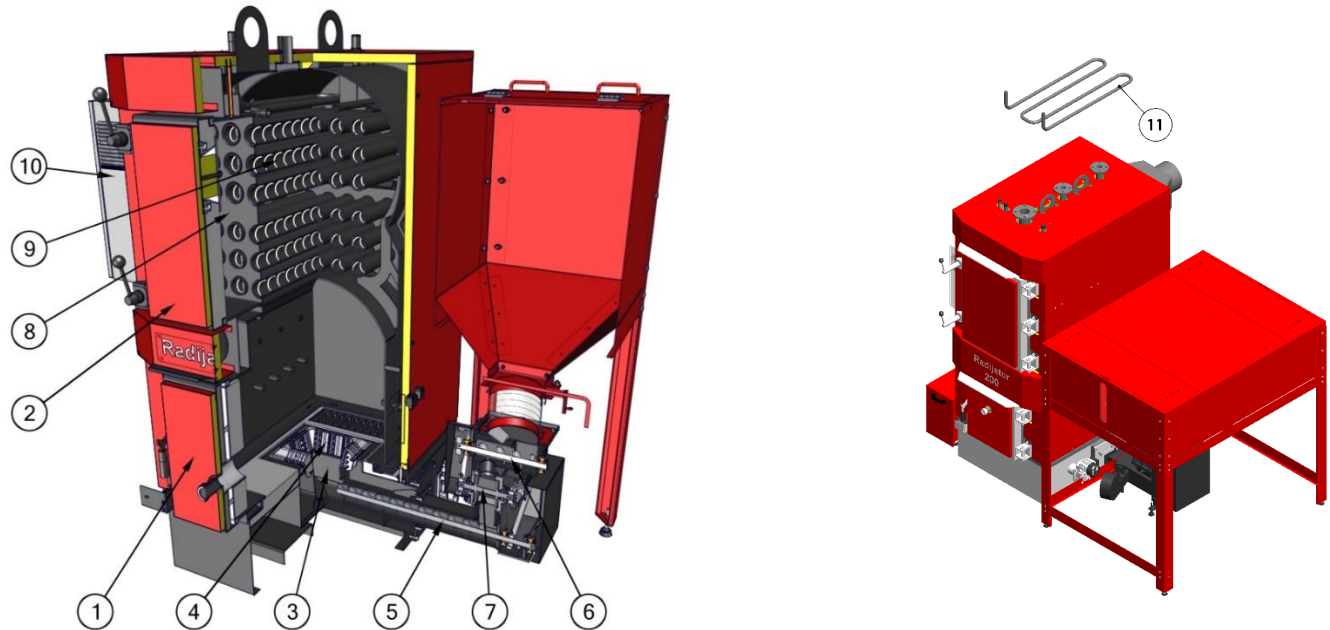


***A weak chimney is the main reason for having a smoke on the upper or lower door, especially at higher fan speeds during the ignition or during operation of the boiler.***



***If there is too much smoke on the door and in the boiler room during the ignition of the boiler, or the flue gas temperature does not rise enough for the boiler to start operating and all because of the insufficiently strong chimney, it is technically justified to remove the wire turbulators from the pipe exchanger.***

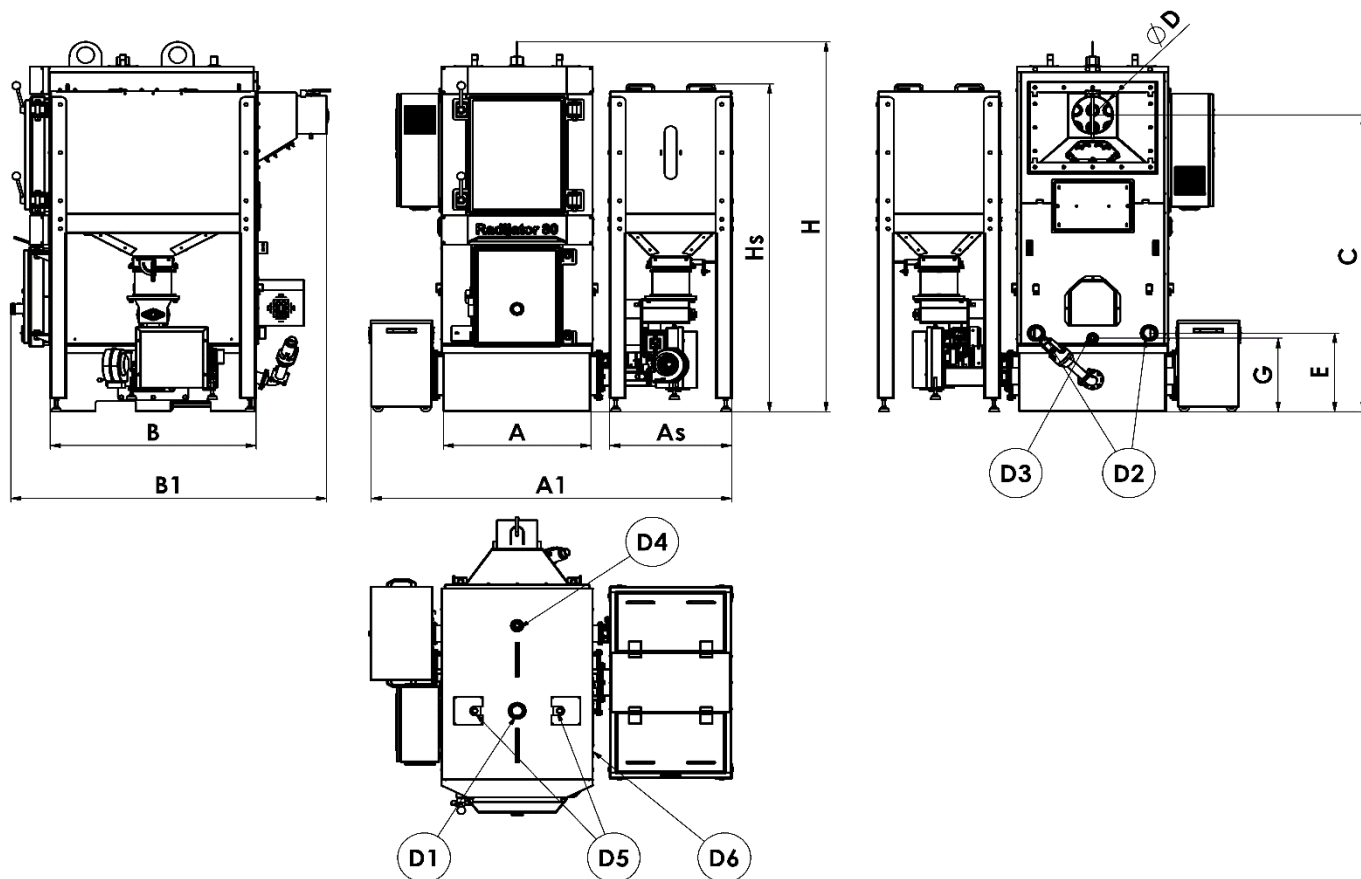
#### 4. The cross-section of the TKAN boiler with the description of elements



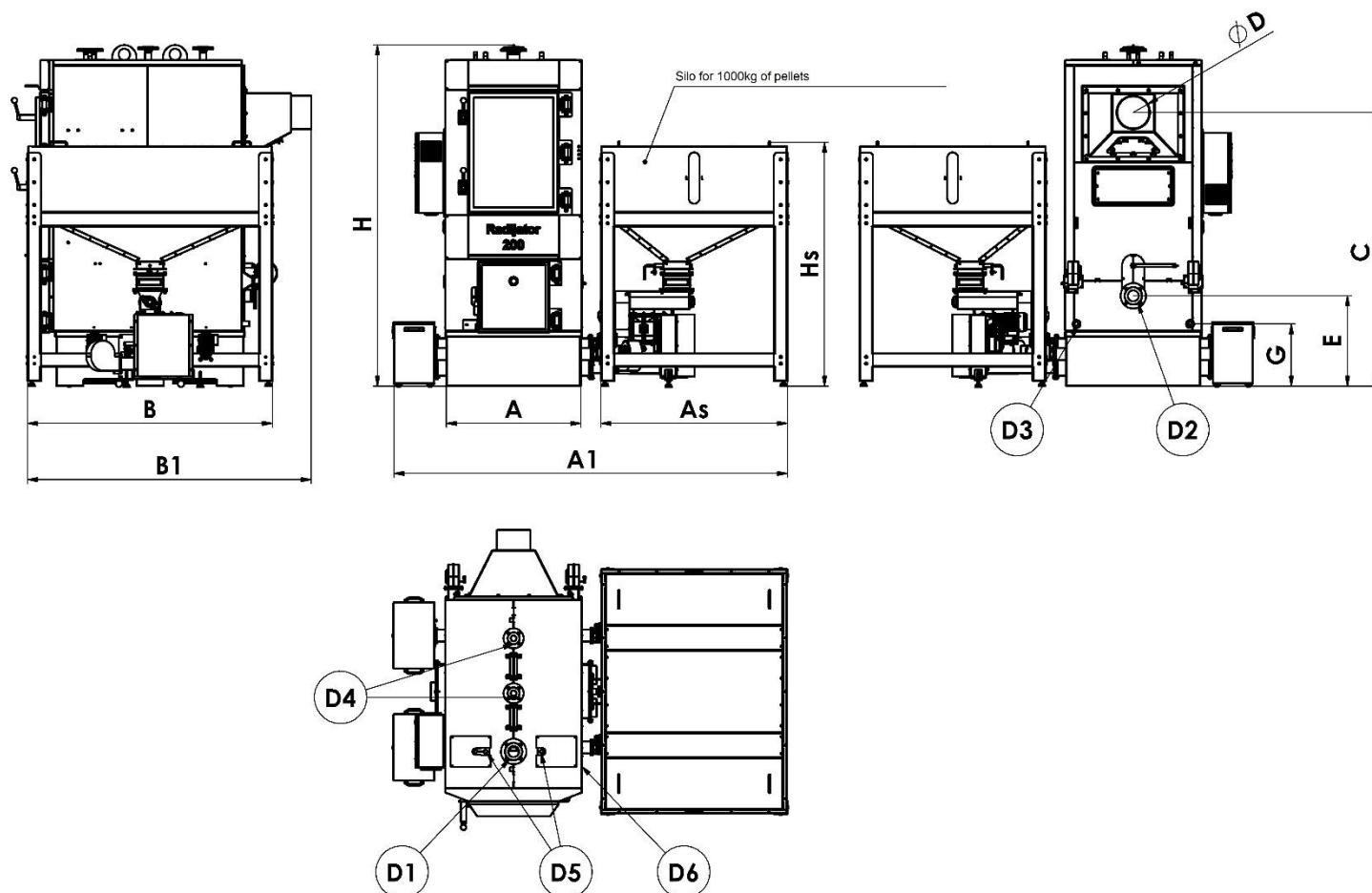
*Picture 6 - The cross-section of the TKAN boiler*

1. Door for firing and ignition
2. Door for cleaning the pipe exchanger and the boiler itself
3. Furnace
4. Cast iron segments
5. Lower axle of the screw conveyor
6. Upper axle of the screw conveyor
7. Cellular dispenser/doser (valve)
8. Pipe exchanger
9. Turbularors
10. Automatic controls system
11. Thermal safety exchanger

## 5.The table with dimensions



Picture 7 - The design with dimensions and connection ports for TKAN 80, TKAN 100, and TKAN 150



Picture 8 – The design with dimensions and connection ports for TKAN 200, TKAN 250, and TKAN 300

Ports/connections:

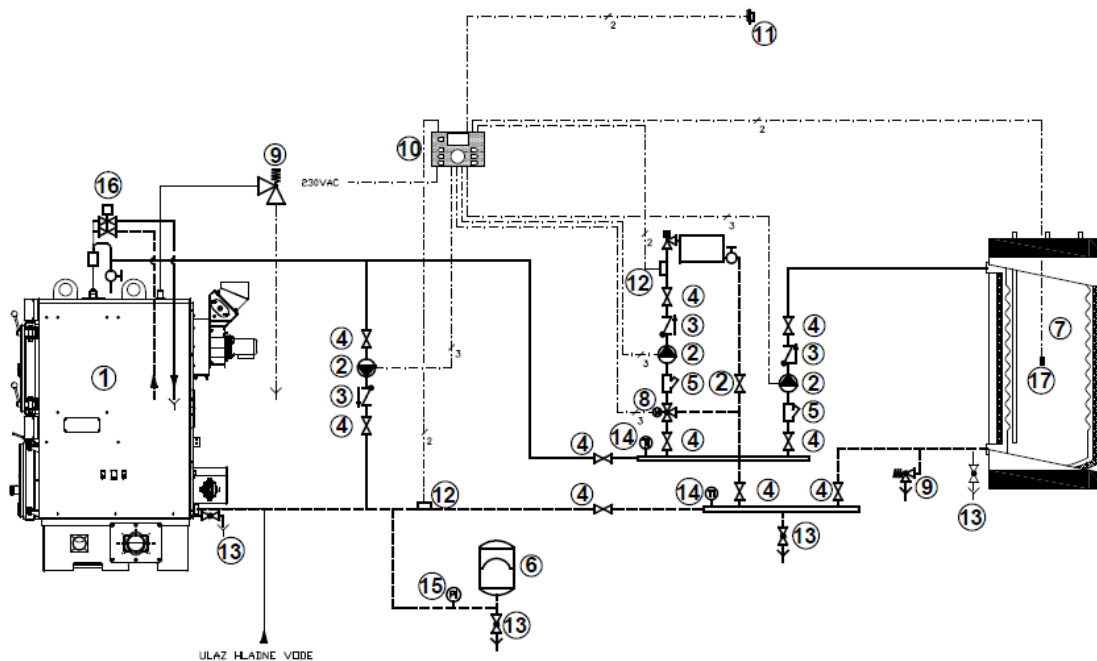
- D1- hot water
- D2- cold water
- D3- charging and discharging
- D4- safety group (I – safety pressure valve; II – open system supply)
- D5- thermal protection valve
- D6- probe of tie thermal protection valve

The design with dimensions for TKAN 200, TKAN 250 and TKAN 300 renders a silo that can carry 1000kg of pellets, in the table with dimensions are given the values for the same silo. In case the buyer decides for another variant of the silo it is necessary to contact Radijator inženjering to obtain information related to the dimensions of that silo.

Table 3 Dimensions of boilers

Boiler type			TKAN 60	TKAN 80	TKAN 100	TKAN 150	TKAN 200	TKAN 250	TKAN 300
Power		kW	60	80	100	150	200	250	300
Working pressure		kPa	300	300	300	300	300	300	300
Test pressure		kPa	450	450	450	450	450	450	450
Volume of water in the boiler		L-cca	276	368	460	690	920	1150	1380
Weight of water + weight of the silo		kg	655+ 106	915+ 100	1073+ 110	1665+ 162	2260+ 180	2800+ 220	3080+ 220
DIMENSIONS	A	mm	680	730	730	850	1005	1260	1260
	A1		1355	1787	2080	2395	2945	3456	3455
	As		610	610	810	1010	1394	1394	1394
	B		1020	1020	1176	1456	1830	1830	1830
	B1		1518	1565	1727	2070	2121	2546	2546
	C		1125	1573	1573	1681	2044	2114	2114
	ØD		200	200	200	250	250	300	300
	E		675	417	417	785	675	707	707
	G		360	389	389	360	465	467	467
	H		1564	1960	1960	2151	2547	2663	2663
	Hs		1740	1736	1611	1875	1822	1822	2070
	D1	col	6/4"	2"	2"	2"	DN80 NP6	DN80 NP6	DN80 NP6
	D2		6/4"	2"	2"	2"	DN80 NP6	DN80 NP6	DN80 NP6
	D3		1/2"	1/2"	1/2"	1/2"	1"	1"	1"
	D4		3/4"	3/4"	3/4"	3/4"	DN40 NP16	DN40 NP16	DN40 NP16
	D5		1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
	D6		1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

## 6. Hydraulic diagram



*Picture 9 – Hydraulic diagram of TKAN 80*

1. Hotwater boiler on pellets
2. Circulation pump
3. Non-return valve
4. Shut-off valve
5. Dirt sifter
6. Closed expansion vessel
7. Hot sanitary water boiler
8. Three way mixing valve
9. Safety valve
10. Control unit – regulator
11. External temperature sensor
12. Pipe temperature sensor
13. Tap for filling and emptying
14. Thermometer
15. Manometer
16. Thermal safety valve
17. Hot water boiler sensor

## 7. Explanation on how to use TKAN automatic controls



***The first initiation of the boiler is performed by the technician certified by Radijator inženjering. Training for the user of the boiler is mandatory.***

*Accordingly, that person is licensed to report the initiation time of the boiler and its condition at that particular time to the service department while keeping a copy of the initiation report. A warranty and user's manual are given to the buyer. One copy of the warranty is sent to the manufacturer.*

*If the warranty isn't followed, it isn't valid.*

*Only boilers initiated by the licensed technician are subjected to a complete two-year warranty.*

*The following text is intended for the user of the boiler, as a reminder to be able to initiate the boiler by himself or herself in case of shutting down the boiler (e.g. cleaning)..*



*Parameters related to the operation of the boiler available to the user are located on the display. Other parameters located in the so-called hidden menu shouldn't be changed without the consent of the technician who initiated the boiler or the factory itself.*

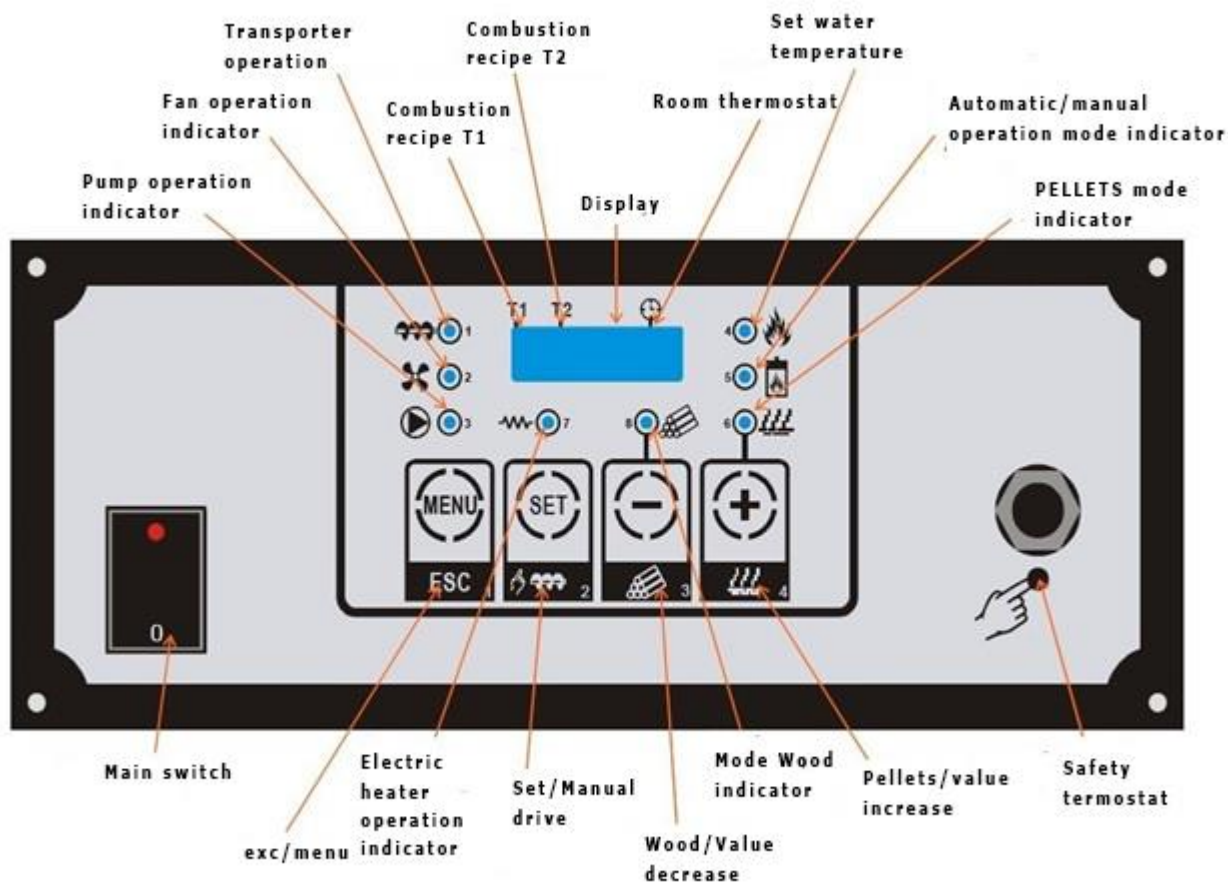


## Automatic controls display

The control panel is comprised of:

The main switch, safety thermostat button, display, group of control keys (buttons), group of light diode indicators

The following picture represents the control panel.



Picture 10. The representation of the control panel

## Control buttons

In the bottom right corner of each command button, there is a number.

- **TURN ON-OFF PELLETS/+ CONTROL BUTTON 4:** Initiates the system on pellets as fuel when held for 5 seconds. Also, shuts down the system in which pellets are used as fuel by holding this key for 5 seconds. By pressing in the Menu, the value of parameters is increased.
- **TURN ON-OFF WOOD/+ CONTROL BUTTON 3:** Initiates the system on solid fuel when held for 5 seconds. Also, shuts down the solid fuel system by holding this key for 5 seconds. By pressing in the Menu, the value of parameters is decreased.
- **SET/Screw CONTROL BUTTON 2:** While held in the mode OFF, manual loading of pellets into the furnace starts. During this process, the LOAD message will appear on the display. Manual loading of the furnace with pellets stops upon release of this key.

Pressing in the **MENU** the display of the parameter code changes to the value and saving new settings is allowed.

- **ESC/Menu CONTROL BUTTON 1:** This key enters/exits the MENU. If you are changing settings and press this button, changes in settings will not be saved.

## NOTICE:

In the OFF mode or SHUT DOWN mode you can reset the Alarm display by pressing keys + or - , but if the cause of the alarm is still present the alarm will start again.

## Light diodes

1. **Light diode Screw: ON:** ON when the auxiliary combustion fan works.
2. **Light diode Fan: ON** when the auxiliary combustion fan works.
3. **Light diode Pump P: ON:** when the pump works. BLINKS when the pump is shut down by the room thermostat.
4. **Light diode Boiler: ON** when the water temperature in the boiler goes below value T-BOILER[A03] – ModulationDelta1 [A05]. BLINKS when the water temperature in the boiler is above the set value. OFF when the water temperature in the boiler is above temperature T-BOILER [A03].
5. **Light diode Exhaust: ON** when the exhaust temperature is above T-EXHAUST-ON[F18]. BLINKS during the pre-shutdown mode.
6. **Light diode Pellets: ON** when the boiler works in pellets mode. BLINKS during the pre-shutdown mode (pre-shutdown time[t06]).
7. **Light diode Initiation heater: ON:** when the initiation heater works.
8. **Light diode Wood: ON** when the boiler works in solid fuel mode.
9. **Light diode Recipe 1: ON** when Recipe 1 is selected.
10. **Light diode Recipe 2: ON** when Recipe 2 is selected.
11. **Light diode Chrono: ON** when the Chrono output is closed.

## Display

**Display\Mode\Alarms\Temperature:** The 4-digit/letter display shows the water temperature in the boiler, operation mode, and eventual alarms

Display	Description	Display	Description
OFF	Turned off (OFF)	Mod	Modulation
Chc	Check	NRn	Standby
Acc	Ignition	Si c	Safety mode
Stb	Stabilization	SPE	Shutdown
rEc	Reignition	ALt	Alarm system turned off

Display	Description	Display	Description
tSi c	Safety thermostat socket is open – manual reset button	SPAc	Accidental shutdown
Si c	Safety mode	Sond	Reading out of reach probe
Acc	Failed ignition		

#### NOTICE:

- Turning the thermoregulator on via the main switch, the Product code, and the Firmware version are displayed for two seconds.

Display	Description	Display	Description
St08	Product code	Ur 10	Program version

### The initiation of the biomass boiler

- The boiler is connected to the hydraulic system.
- Make a 4mm diameter hole on the upper side of the smoke pipe in the area close to the boiler's smoke exit.
- Make sure that the pellets transportation mechanism is firmly supported on the floor, that the flap of the fan is completely open and that the flap guide for the safety air from 15 to 20mm. (pictures 11 and 12)



*Picture 11. The position of the flap of fan*

*Picture 12. The position of the completely open flap of the fan*

- Connect the sockets (three-phase and single-phase) on the back of the boiler to the main mains power supply. The three-phase one is necessary for the doser motor to work, while the single-phase one is necessary for the dryer fan.
- Load a smaller amount of pellets into the silo and close it.
- Prior to the ignition phase, remove shields from the furnace.
- In this phase, it is necessary to load the pellets into the combustion chamber via the pellets feeding system. That way, we achieve continually distributed pellets from the combustion chamber to the silo. The initiation of the pellets feeding system can only be done during the operation and OFF is shown on the display. Then, by pressing control button 2 which in its bottom right corner has the screw feeder symbol, the system starts. While holding the button, the system is working. Upon releasing the button, the system stops.

Load the chamber with pellets via so-called manual command somewhat lower until you reach parts made of grey cast iron, as represented by picture 13.



*Picture 13. The representation of the level of the pellets*

- Now that we have pellets in the combustion chamber and when it's in the ignition zone of the heater, we can initiate the boiler.
- Initiation is performed by pressing and holding the control button 4 more than 3 seconds. In the bottom part of this button, the loose material, more precisely pellets symbol is shown.
- When starting the ignition, Chc is written on the display, and in these couple of seconds only the fan works. In this phase, automatic controls are checking if all necessary devices are actually connected.
- The next step is Acc on the display. This is the ignition phase display. Then, except for the fan, the ignition heater activates which can be seen on the automatic controls because signaling lights 2 and 7 are on. In the ignition phase, at one point, we can expect the feeder system to start and the level of the pellets in the chamber to be refilled. Ideally, pellets are up to the very top of cast iron parts after this refill.
- The boiler is in the ignition phase until flue gasses don't go over the temperature determined by the F18 parameter. According to factory settings, this temperature is 50°C. Firstly, smoke appears, and between 7 to 10 minutes flame as well.
- Once flue gases exceed the ignition temperature limit, the display shows Stb. This means that the boiler is in the flame stabilization phase, that is automatic controls are measuring if flue gases have a sufficient increase in a certain time period. The fan works according to the stabilization phase parameter, and the chamber is refilled with pellets according to the parameters of the screw feeder in the stabilization phase. Once this factor is met, the boiler goes into operation mode.
- The boiler is in operation mode when nothing is shown on the display except for the current water temperature in the boiler. Wait 20 to 30 minutes and see if pellets burn at the top of the combustion chamber. In this period, also monitor the temperature of flue gases. That is done by pressing control button 1 shortly, button 3, and finally button 2. Then, on the display, the number denoting flue gases temperature is shown.
- To automatic controls, a room thermostat can be connected should the user request. In this case, it is important to set the room temperature which is the main parameter for the boiler to operate, and the water temperature in the boiler (70°C). Once the room thermostat is activated, the boiler primarily requires to increase the room temperature, having in mind that it is limited by the set



water temperature inside. There is a possibility that the boiler stops before the set temperature of the room thermostat is reached and, in this case, the set water temperature in the boiler should be increased to, for example, 70°C.

- The combustion of pellets, no matter the power of the boiler, is necessary to be set in a way that it is on top of the combustion space (refer to picture 14). This is achieved by setting pellets dosing and the amount of air. In case that the level of flames starts decreasing, it is necessary to prolong the dosing period or decrease the amount of air. If the level of flames is increasing, we can decrease the loading time or increase the amount of air. To determine parameters precisely, it is necessary to monitor the operation for at least one hour.

**NOTICE: Always adhere to the nominal or peak power of pellets combustion, that is when pellets are burning on top of the burner. In this case, decreasing thermal power is done by decreasing the set temperature of water in the boiler or set temperature of the room thermostat.**



*Picture 14 The representation of the perfect combustion of pellets*

**Warning: It is mandatory to analyze flue gases upon installing the boiler.**

**Measure percentage of oxygen (O<sub>2</sub>).**

### **The initiation of the biomass boiler**

In case that the user wants the boiler to run on solid fuel, the following steps should be done:

- If the boiler has never before run on pellets but is being used for the first time on solid fuel, it is necessary to force a small number of pellets into the combustion chamber. This way, a so-called false air through doser channels is prevented.
- Through the lower door prepare a small amount of wood and ignite. Upon getting a stronger flame, add fuel. For the purpose of less smoke, open the flap inside the boiler by pulling the lever on the side of the boiler that is into the open position.
- Pay attention to signal lights number 6 and 7. If light 6 is on, that means the boiler is in the Pellets operation mode. Control button 4 should be held for more than 3 seconds. That turns off Pellets mode. Right after, press control button 3 and hold more than 3 seconds. That initiates Wood operation mode
- After 20-30 minutes when the boiler is in normal operation mode, return the flap inside the boiler into the operating mode by pulling the lever on the side towards the front door of the boiler.
- The combustion chamber mustn't be covered with ash dumps etc. because the necessary air for combusting wood or coal is provided through that space.

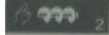


## Brief instruction on how to use automatic controls

### RECHARGING THE FURNACE WITH PELLETS, PREPARING FOR IGNITION

- Insert pellets into the silo
- The main display has to indicate **OFF**



- Press and hold the . While holding the button, the feeder is working and the display is indicating **LOAD PELLETS**.


### STARTING THE IGNITION ON PELLETS, STOPPING THE OPERATION ON PELLETS

- Flip the main switch



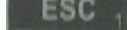

- Press the  button and hold for 4-5 seconds.



- Stopping the operation of the boiler on pellets is done by pressing the  and holding it for 4-5 seconds.

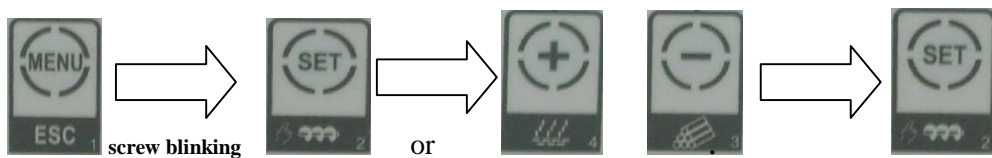
### CHANGING THE DOSING TIME OF THE FEEDER WHILE IN THE OPERATING MODE



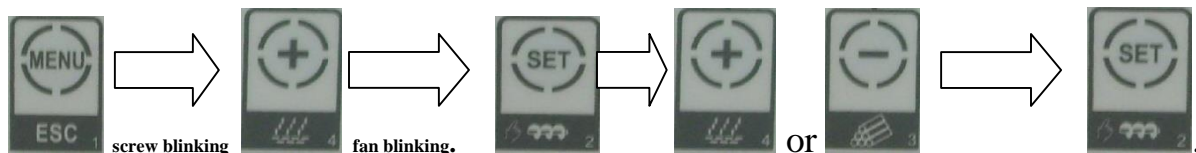
- Press the  button quickly. If light 1 next to the screw symbol is blinking, press the  with



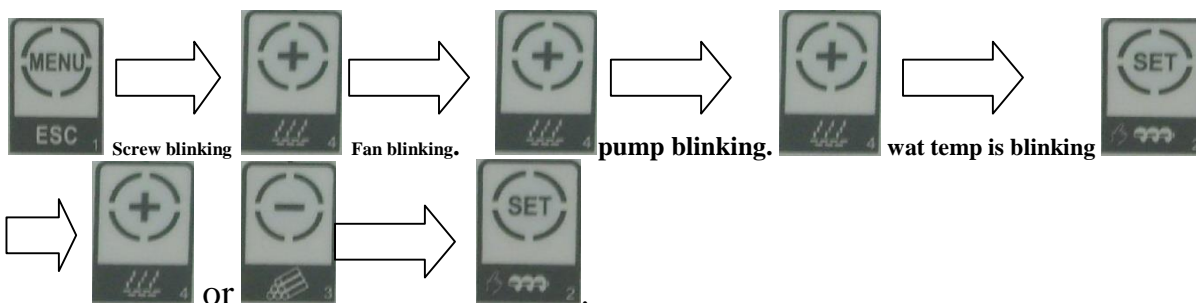
change dosing values of the screw to desired and press the SET again



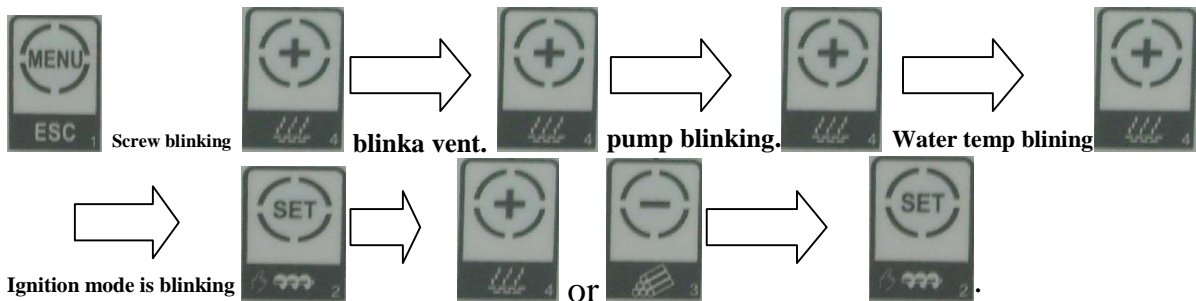
### CHANGING THE POWER OF THE FAN IN THE OPERATION MODE.



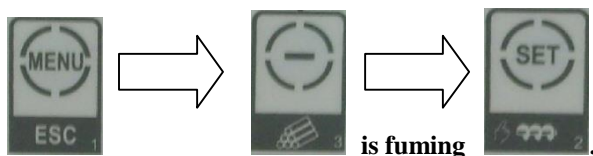
### CHANGING THE SET WATER TEMPERATURE IN THE BOILER.



### CHANGING THE IGNITION MODE MANUAL OR AUTOMATIC.



### READING THE FLUE GASES TEMPERATURE.



## ENTERING THE HIDDEN MENU.



Press and hold  right after press  and hold both buttons for five seconds. Right upon entering the hidden menu, the display CL 00. That is the first parameter.

### Errors on starting the boiler

All possible errors in the initial operation phase, that is during ignition can be split into three big groups:

- **Group I** Errors during ignition relating to the situation without sparks, smoke, or any flame for more than 20 minutes from the moment of starting the ignition heater.
- **Group II** Errors during ignition relating to the situation in which flame appeared but the boiler shut itself down after a certain period (a few minutes).
- **Group III** The boiler successfully ignited and was working for a few hours. Reached the set temperature and, for a longer time, there is no need to turn on neither the dosing system nor the fan (this situation is mostly overnight). Right after, the temperature is dropping and the user wants a higher temperature (mostly in the morning), and the boiler receives a signal to enter the ignition phase, but there is no flame.

### Group I

Possible **cause 1.**

- **PROBLEM 1** – The flap of the fan for primary air is closed. The fan is located on the doser.
- How to solve **PROBLEM 1** – Open the flap completely.

Possible **cause 2.**

- **PROBLEM 2** – The hose connecting air channels from the fan to the heater is not properly set.
- How to solve **PROBLEM 2** – Affix the air hose both to the case of the heater and to the air channel pipe

Possible **cause 3**

- **PROBLEM 3** – Space deep in the furnace where pellets are combusted is full of uncombusted remnants, that is cinders, therefore, there is no contact between pellets and hot air.
- How to solve **PROBLEM 3** – Clean the depth of the furnace, primarily larger cinders mechanically and smaller cinders can be vacuumed.

Possible **cause 4**

- **PROBLEM 4** – Pellets used are highly moist.
- How to solve **PROBLEM 4** – Try drier pellets.

**Possible cause 5**

- **PROBLEM 5** – Mains voltage to which the boiler is connected is significantly lower than 220-230V, therefore the power of the heater is lesser.
- How to solve **PROBLEM 5** – Priključiti mrežni ispravljač napona ili potpaliti ručno.

**Possible cause 6**

- **PROBLEM 6** – The boiler is switched from automatic to manual operation mode. If during the entire ignition phase, the heater light isn't on, then the boiler is certainly in manual mode.
- How to solve **PROBLEM 6** – Refill pellets.

**Possible cause 7**

- **PROBLEM 7** – The boiler is switched from automatic to manual operation mode. If during the entire ignition phase, the heater light isn't on, then the boiler is certainly in manual mode.
- How to solve **PROBLEM 7** – Switch the boiler to the automatic ignition mode.

**Possible cause 8**

- **PROBLEM 8** – The electric heater malfunctioned. Disconnect the boiler from mains voltage and measure the electrical resistance of connection cables of the electric heater.
- How to solve **PROBLEM 8** – Replace the electric heater

## Group II

**Possible cause 1.**

- **PROBLEM 1** – Fan speed in the ignition phase. Fan speed for primary air in this phase is determined by parameters Uc00 and Uc01. If the speed is drastically changed in comparison to the factory set one, it is not good to either drastically decrease or increase it. In case the fan, while igniting, is weak, the temperature of flue gases doesn't increase and if it is too powerful, it is possible to rapidly consume pellets in the chamber which leads to decreasing temperature of flue gases while igniting.

- How to solve **PROBLEM 1** – Set values of parameters Uc00 and Uc01 to the factory values or near-factory values.

#### Possible **cause 2**

- **PROBLEM 2** – Fan speed in the flame stabilization phase. The boiler enters the ignition phase, smoke appears, the display indicates Stb which means it's in the flame stabilization phase but after that, the boiler shuts down. The most common cause of this is a too weak fan in the stabilization phase which is determined by parameter Uc04.
- How to solve **PROBLEM 2** – Increase fan speed using parameter Uc04.

#### Possible **cause 3**

- **PROBLEM 3** – Too big or too small amount of pellets in the stabilization phase. If there are not much or too many pellets while the display is indicating Stb, that is stabilization, flame congestion can occur and the boiler may return to the shutdown phase. The amount of pellets in the stabilization phase is regulated by parameter CL04.
- How to solve **PROBLEM 3** – value of parameter CL04 to the factory value or near-factory.

#### Possible **cause 4**

- **PROBLEM 4** – The boiler entered the stabilization phase but still enters the shutdown phase because the temperature increase is not sufficient. Particularly stagnation, that is marginal drops of the temperature of flue gases is noticeable at the moment of refilling the furnace with pellets.
- How to solve **PROBLEM 4** – Increase the temperature of flue gases for system to enter Fire ON and that is parameter F18. That way, it is harder for new pellets entering the combustion chamber to reduce the temperature of flue gases because the flame is stronger because it was given more time until refilling. This problem is the most common in case of weak chimneys or the traction of a chimney is weak due to some other reason.

#### Possible **cause 5**

- **PROBLEM 5**– The boiler entered the stabilization phase but after some time enters the shutdown sequence.
- How to solve **PROBLEM 5** – The ash dump was forgotten to be put back into the boiler or to be closed firmly.

## Group III

### Introduction

When the boiler reaches the set temperature of the water inside or the temperature of the air in the room with the room thermostat, it enters the standby phase, more precisely the flame maintaining phase or the original standby phase. The best example of this way of working is the night mode. The basic goal of this phase is to maintain phase, more precisely embers in the furnace during the multi-hour standby. That is achieved by initiating periodically both the pellets feeder and fan at certain time intervals.

- When the boiler reaches the set temperature, it enters the flame maintaining phase. After a certain time period, as it is determined by parameter t04 (minutes), the feeder starts working and fans are activated. In these periods, the boiler is activating until the start command is given due to reaching the set temperature.
- One process of the feeder and fan lasts according to the parameter t05 (seconds).
- During the process of initiating the feeder its operation is determined by the active operation period determined by parameter CL09 (seconds) and by the pause period determined by parameter CP09 (seconds).
- During the flame maintaining process, the primary combustion fan is initiated and has power determined by parameter Uc09.

Possible operation errors related to the flame maintaining phase:

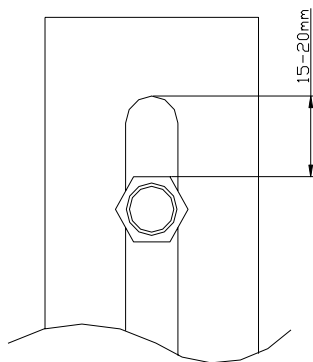
- The boiler, despite the functional flame maintaining phase, has an insufficient amount of pellets to start and operate in the normal mode.
- Removing the cause of this error:
  1. Decrease parameter t04, more precisely increase the frequency of the operation of the feeder and fan in the standby phase.
  2. Increase the length of the process, that is parameter t05.
- Large quantity of uncombusted pellets during the initiation of the boiler.
- Removing the cause of this error:
  1. Increase parameter t04
  2. Decrease parameter t05
  3. Decrease the power of the fan for primary combustion in the flame maintaining phase parameter Uc09

### ***Starting the boiler on biomass***

- Fill the silo with fuel. The silo has the capacity of 240l. It is required to close the silo's lid.
- Make sure that the safety flap of the silo is positioned so that the length of the flap moving channel is 15-20mm (see picture 15)

If the safety flap is in the lower-end position, all air goes through the fuel mass and does not allow flames to return. If the flap is in the upper-end position, all air goes to combustion nozzles in the grey cast iron. The transport channel and the screw might get so hot and the fuel silo might burst in flames.

*Picture 15. The representation of the position of the safety flap*



- Inspect if the fan, motor and chainwheel are in their box intact after being transported and put in the boiler room.
- Inspect if the probe for measuring the temperature of exhaust fumes placed inside the smoke pipe. Without the probe in the pipe, it is impossible for the boiler to operate.
- Supply electricity to automatic controls and refill pellets, that is some other fuel up to one-half of the furnace. That is the height when the fuel inside becomes visible through the lower door of the boiler. Refilling the furnace can be done in two ways: repeatedly turn the boiler on and off or by using the special intended function, which is thoroughly explained in section AUTOMATIC CONTROLS.

If the boiler's starting function ON is executed properly, automatic controls will have the electric combustion heater light on. The electric heater is located in the lower zone of the furnace and if it is in contact with fuel, after 5 to 6 mins, smoke can be smelled in the furnace.

Then, open the flap due to the possibility of smoke bursting through the lower and upper door.

When the initial flame bursts and the temperature of flue gases exceed 50 °C, the boiler enters the operating cycle and starts refilling fuel automatically.

- After approximately 50 minutes, inspect the temperature of flue gases (explained in section AUTOMATIC CONTROLS) and if it is relatively high over 180°C, close the boiler's flap. If the flap remains open longer, flue gases might exceed 250°C after which the boiler enters the self-shutdown phase, that is the flame self-maintaining phase.



The basic two parameters which the user regulates based on the type of fuel and flame intensity are: the time needed to supply fuel into the furnace button 9 and the fan's power (rotation per minute) button 8

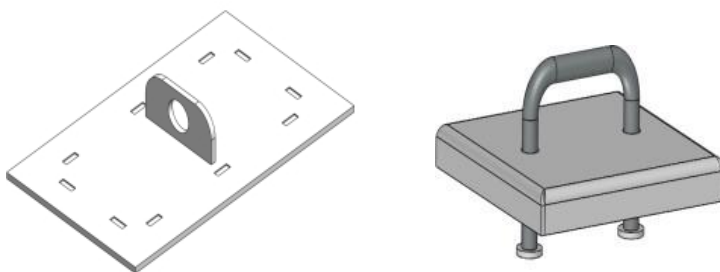
These two parameters, at all times, have to be in such correlation that the combustion process is always done at the top of the furnace. The combustion should be such that there is no fuel spilling out of the grey cast iron furnace nor returning flames toward the silo.

It is possible to set the combustion in the boiler correctly in about an hour. It is ungrateful to state the approximate values of these parameters due to different conditions when starting the boiler.

### ***Starting the boiler on solid fuel***

In case that the user prefers the boiler working on solid fuel, the following steps should be done:

- Place supports for iron grates as well as grates of grey cast iron in the boiler's furnace. This is the additional equipment and these parts should be separately ordered. This entire assembly is completely disassemblable as seen in picture 16.
- Put the ignition fuel on grates and ignite manually. When flame appears turn on the 'Wood' mode in automatic controls. If the boiler was previously in the 'Pellets' mode turn this mode off.
- In the 'Wood' mode, combustion is done by air coming from the fan being used during firing with pellets as well. The air itself passes through the pellets furnace so that this space mustn't be covered with ash dumps or any other protections.



*Picture 16. The representation of the lid which covers the chamber where pellets come out and which covers the chamber of the screw which leads ash into bins*

## 8. Boiler maintenance

TKAN boiler requires daily and periodical cleaning.

- Daily (at least weekly) cleaning also applies to the boiler's space of grey cast iron where we, by constantly ejecting ash, enable more efficient operation of the electric heater for firing and more efficient combustion, that is larger amount of air through air channels in the grey cast iron. Also, ash starts piling up during the day on the floor, in the area around the furnace itself. According to average combustion parameters, 100kg of pellets produce 1kg of ash, but this information significantly varies depending on the type and quality of ash.
- Each 7 to 10 days, shutting down the boiler is recommended, cooling off a few hours, and manual or, the best, vacuuming depths of the combustion chamber. This removes even larger pieces of uncombusted pellets which can cause unpleasant sound while the boiler is working and decrease the lifespan of the screw spiral which pushes pellets into the combustion space.
- Once a month, it is necessary to open the upper door for cleaning as well, remove turbulators and remove layers of tar and soot from pipes of the exchanger. Everything removed at that point is picked on the upper surface of the furnace roof or in the smokebox.

Too much ash in pipes of the exchanger decreases utilization of the boiler and leads to excessive temperatures in the furnace which can cause deformations to it, that is to the lower door.

**NOTICE: Depending on the mode and working conditions, quality of pellets, that is biomass, listed cleaning periods may even be more frequent.**

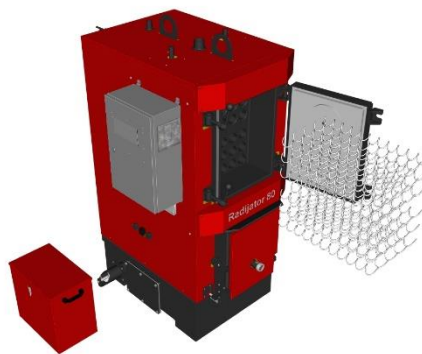
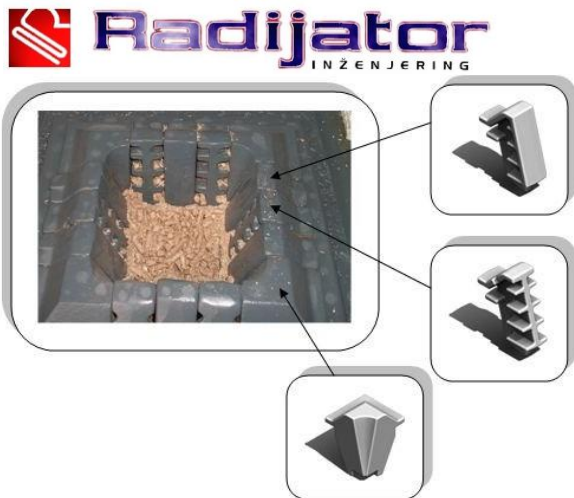
If condensation occurs in the boiler while using it, it is necessary to deal with the condensation and to coat the entire boiler from inside with basic cleaners or at least with aqueous solution of builder's lime. That way, the neutralization of acid due to condensation is done.



***This way, conserve the boiler imperatively at the end of the heating season. In that situation, close all holes on the fireplace to avoid air circulation through the fireplace because that can result in the appearance of moisture inside.***



***Servicing the fireplace is one of the most important factors for its long working life. Between two seasons, it is particularly important to clean the fireplace and neutralize the acid as described***



*Picture 17. The representation of removing the turbulator from the TKAN boiler, disassembling cast-iron segments of the furnace, and cleaning the ash bin*

## 9. Warranty

### 1. Radijator inženjering covers different warranty periods for various parts (as listed in the following text) only if the following warranty conditions are met:

The boiler has to be connected according to all hydraulic diagrams from the technical instruction manual, especially pay attention to safety valves, thermal leakage protection, the mixing valve-pumps for protecting the cold end of the boiler, that is, against condensation, range of the working pressure of the boiler, range of the working temperature of the boiler, conditions of the boiler room, etc. (see point 6)

The boiler has to be connected to the chimney of a regulated cross-section, characteristics, isolation, and height (see point 3.3). The smoke channel from the boiler to the chimney has to be done by the technical instruction manual..

The boiler also has to have listed electric connections from the technical instruction manual, especially characteristics of the room thermostat, characteristics of the mains voltage which has to be within certain limits..

The user has to follow the listed instructions on how to use and maintain. (See point 8)

### 2. Warranty statement

We state:

- that the product has regulated and declared quality properties. We oblige to, on the request of the buyer if he/she timely within warranty period submits the repair request, cover all repair costs so that the product will operate according to its declared properties,
- that the product will work flawlessly within the warranty period provided that the use, operation, and installation instructions are followed,
- that we will be ready to remove all product malfunctions and have all necessary spare parts in stock within the warranty period,
- **the warranty period starts from the DAY OF PURCHASE AND LASTS 60 MONTHS OR 72 MONTHS FROM THE PRODUCTION DATE (the production date is located on the label at the back of the boiler),**
- **THE 60-MONTH WARRANTY APPLIES ONLY IF THE BOILER IS REGULARLY SERVICED BY THE RADIATOR INZENJERING CENTRAL MAINTENANCE in the period listed for it (hereinafter). the warranty applies if the warranty paper is certified by the seller and if the purchase date is written and if the receipt is attached. IT IS ALSO IMPORTANT TO HAVE INITIATION WARRANT (certified by the licensed maintenance department)**

**3. The 1-year warranty period applies to the following parts:**

- All UCFL series bearings,
- electrical heater for ignition,
- bearings of cellular safety transporter (valve)

**4. The 2-year warranty period applies to the following parts:**

- electric gear motor,
- torque transmission chain 083,
- lower screw coil,
- primary air fan,
- secondary air fan,
- automatic control system of the boiler with safety valve,
- smoke gases probe,
- boiler water temperature probe.
- cast iron segments for combustion,
- electric connectors,
- insulation materials on doors and cleaning holes,
- parts of cellular safety transporter (valve) made of grey and modular cast iron

**5. Warranty period doesn't apply:**

- unless the regular maintenance is done after each heating season,
- in case of the replacement of parts during the annual maintenance in accordance with the instructions,
- in case of malfunctions caused by the buyer because of unprofessional handling
- if the product was installed unprofessionally, contrary to the valid regulations in that aspect,
- if it is found that the hydraulic diagram was not made according to the recommendations of company Radijator inženjering the buyer used the product outside of declared properties in normal circumstances,

**6. Warranty period isn't valid:**

- if it is found out that malfunctions were removed by an unauthorized person or an unauthorized maintenance department,
- if during the repair the original parts were not used and installed,
- upon the expiration of the warranty period.

## 7. When reporting malfunctions, it is mandatory to provide the following information:

- name and type of the product,
- date of purchase,
- factory or workshop number of the fireplace,
- brief malfunction description, that is the description of a defect,
- exact address and contact number, mail.

## 8. Regular yearly maintenance

Regular maintenance is done at the end of each heating season from April 15th to August 31st and is charged according to the set price list of Radijator inženjering company. The maintenance procedure, performed by technicians performing regular yearly maintenances authorized by the company, include the following operations:



**NOTICE: The servicing technician is obliged to inspect all listed parts (from the list) of the dosing unit and exchanger and if it comes to the replacement of any parts the user receives the aforementioned warranty and the additional 12-month warranty for the boiler body (exchanger) as well. The warranty can be extended up to 5 years from the initiation date. The maintenance and extension can be done by the person sent by the central maintenance department of Radijator inženjering. The warranty isn't valid to unchanged parts upon completing maintenance.**

Maintenance procedure:

1. Disassembling the pellet silo from the pellet transporter;
2. Disassembling the pellet transporter from the boiler;
3. Removing both chains, sprockets and bearings from the furnace
4. Disassembling combustion parts from the furnace and cleaning the space beneath the boiler parts for cleaning; Inspecting the condition of parts and the gap between them;
5. Cleaning the space of pipes where the lower screw spiral rotates;
6. Lubricating all bearings of upper and lower screw axle and inspecting their functionality. The bearing mustn't have aggravated rotation or have any cracks on the case. On the contrary, the bearing is replaced. If it is determined that damages on bearings was caused by certain solid object or accumulated dust, bad quality of pellets in the pellets transporter, Radijator inženjering charges the value of the bearing. If the damage of the bearing was caused by the withdrawal of flame into the pellet transporter because of improperly set parameters while using, Radijator inženjering charges the value of the bearing;
7. Removing chains from both sides of shaft of the cellular safety transporter (valve) and

insprcting functionality of bearings in the valve. If the rotation of bearings is made aggravated, replace them brom both sides. If the damage of valve bearing was caused by a solid object not from the boiler itself falling in (user's mistake or pellet manufacturer's mistake). Radijator inženjering charges the value ot the bearings;

8. Inspect the sharpness of rotor's edges;
9. Remove the fle gases probe and clean it from deposits;
10. Inspection of primary and secondary fan and cyclone fan if the cyclone is in the boiler as the additional equipment;
11. Inspection of sealing of upper and lower door;
12. Inspection of boiler's exchanger maintenance;
13. Inpection of the pollination system if the pollination system is on the boiler as the additional equipment;
14. Inspecting the condition of cyclone on the boiler if the cyclone is on the boiler as the additional equipment;
15. Inspecting the condition of cleaning coils and electric motor redactor on them;
16. Inspecting the functionality of firing fan.



## **RADIJATOR-Inženjering d.o.o**

Živojina Lazića Solunca br.6

36000 Kraljevo

telefoni za kontakt:

036/399-140, 399-150

e-mail: [radijator@radijator.rs](mailto:radijator@radijator.rs)



## 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. 62/2014). Garancija ne isključuje niti utiče na prava potrošača koja proizilaze iz zakonske odgovornosti prodavca za nesaobraznost robe u ugovoru. / The consumer shall exercise all rights under the Consumer Protection Law ("OI 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.