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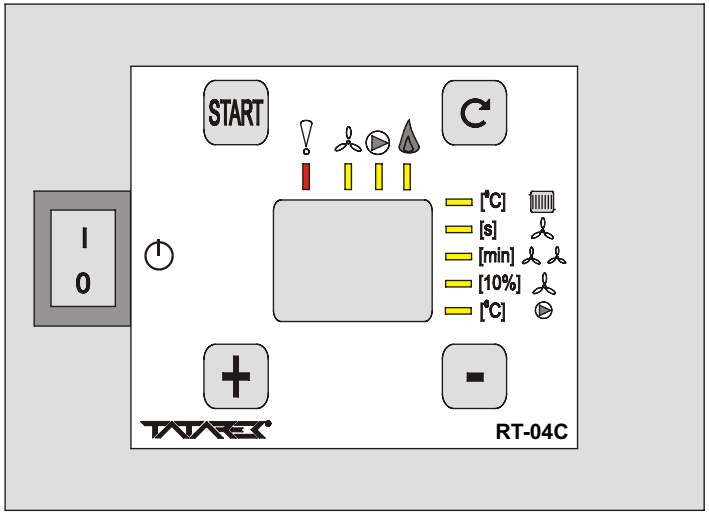
USER MANUAL

MICROPROCESSOR TEMPERATURE CONTROL OF CENTRAL HEATING FINE COAL BOILER

RT-04C

(15/07/2010 program version from v.1.0)



1.Basic technical parameters

Power	230V/50Hz
Power consumption without load	4W
Maximum connection power	580VA
Operation conditions	0÷40°C
Load of blower output	1,5A/230V/50Hz
Load of circulating pump output	1A/230V/50Hz
Range of temperature measurement	0 °C÷100 °C
Measurement error	1 °C
Temperature limit of boiler	93 °C
Switch-on temperature of alarm thermostat STB	94 °C
Range of temperature setting	40÷90 °C
Scavenge time	1÷30 s
Scavenge break	2÷10 min
Efficiency of blower	10÷100%
Temperature switch-off of the control	30 °C

2. Principle of operation

The RT-04C control unit controls the C.H. system with a fine coal boiler in which by controlling blower efficiency the boiler temperature is changed. Additionally the C.H. circulating pump operation is controlled.

Fine coal boiler operates in the following cycle: Burn-up ; Work ; Extinguish.

The Burn-up phase starts with the START button. Going over to the other phases is automatically done. The control kicks off the blower and the circulating pump. Through that the fine coal is burnt up and boiler temperature gradually goes up. Reaching 35 °C finishes the Burn-up phase. The Burn-up duration is restricted to up to 2 hours. If the temperature doesn't increase, the RT-04C control goes to the Extinguish phase.

At the Extinguish phase you can turn off the boiler by long pressing (at least ~2 secs) the START button. The Extinguish phase is signaled by a blinking PRACA diode.

The control skips the Burn-up phase and automatically switches on the boiler if water temperature exceeds 35° C after turning on the mains.

At the Work phase the control keeps boiler temperature at the preset level.

If the boiler temperature is lower than the preset level, the blower starts (its rotation is automatically set). Temperature increase above the preset level stops the blower. There are boiler scavenges at that stage in order to get rid of combustion gas (acc. to the preset values). The Work is signaled by a constant lighting of the PRACA diode.

During boiler operation you can press the START button (a longer press is required at 2 secs.). It causes then an interim blower switch-off e.g. for cleaning up the furnace. The state is signaled by a fast blinking of the PRACA diode. After 30 mins. the control automatically goes over to a normal operation. The pause in blower work can be shortened by pressing once more the START button.

The temperature fall below 35 °C starts the Extinguish phase of the boiler. If for 45 min temperature doesn't increase then the blower stops and the cycle of boiler work is finished. The Extinguish phase is signaled by a blinking PRACA diode . (At the end of boiler operation the diode goes off)

At the Extinguish phase you can turn off the boiler by long pressing (~2 secs) the START button.

3. Alarm signal

The control recognizes the following emergency situations: damage of the temperature sensor of the boiler, disconnection of the temperature sensor of the boiler, activation of the STB alarm thermostat and exceeding the boiler temperature of 93°C. Emergency situation is stored into the control memory (also after power is off), generated a sound and the red ALARM diode blinks. Pressing any button turns off the sound and if the cause of breakdown is out, brings back a normal operation (alarm thermostat is off after cooling down to ~70 °C). If the red ALARM diode still blinks, it means that the cause of breakdown still exists. During ALARM situation the control decreases the boiler temperature by turning off the blower and turning on the central heating (C.H.) circulating pump.

Admission date	Realization date	Signature	Remarks

WARRANTY

1.Warranty is valid [24] months from the date of sale.
2.Producer does not take responsibility for any mechanical damages made by user.
3.MAKING REPAIRS OR MODYFYING THE DEVICE BY USER IS FORBIDDEN AND CAUSES WARRANTY CANCELATION
4.Warranty card is valid only with date of sale, seller's signature and stamp
5.Warranty and after-warranty repairs should be done only by producer, damaged regulators should be sent to producer in order to make all repairs needed.
6.Warranty protection involves the EU
7.Warranty does not exclude, not restrict and not suspend buyer's rights coming from the incompatibility of the article with the agreement (Laws Journal No. 141 Pos. 1176)

WARNING !

ANY MODIFICATION OF THE REGULATOR MADE BY USER CAN BE THE CAUSE OF SAFETY CONDITIONS DETERIORATION AND CAN EXPOSE THE USER TO ELECTRIC SHOCK OR DAMAGE DEVICES SUPPLIED.

Connection cable of regulator may be replaced only by producer or his authorized service locations

WARNING!
1. Producer does not take the responsibility for damage caused by atmospheric discharge
2. and overvoltage in the mains
3. Burnt fuses are not subject to warranty replacement

Date of sale **Seller's signature and stamp**

Register No.. GIOS: E 0002240WZ

Worn out electronic and electric devices must be transfered to the utilization collection place, where will be accepted for free

ARGO-FILM
Recycling Plant No. 6
180 Krakowska st., 52-015 Wroclaw
ph.: 071 794 43 01,
0 515 122 142

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Emergency	Display output	Remarks
Damage/disconnection of the boiler temperature sensor	99 blinks	ALARM It needs to be cancelled
Activation of the STB safety sensor	"cb" blinks interchangeably with the temperature measured by boiler sensor	ALARM It needs to be cancelled
Boiler temperature 93...99 °C	Temperature measured by boiler sensor blinks	ALARM - WARNING Alarm automatically resets if temp. falls below 91 °C. It prevents emergency switch-off of the boiler in case of occasional exceeds of the maximum temperature.
Boiler temperature over 99 °C	99 blinks	ALARM It needs to be cancelled

4. Blower operation

The control automatically controls blower effeciency. Implemented PID algorithm allows the operation with an automatic modulation of boiler power. The needed heat is generated by which the combustion process is linear (there're no sudden alterations of the temperature in the combustion chamber and the chimney), ensuring more effective and long-lasting lifetime of the heating system.
By analyzing the tendencies of temperature changes the control modifies its settings gradually up to the balance point. The user has 2 choices:

1. The first one (the default) if the temperature exceeds the preset value the RT-04C turns off the blower and realizes scavenges. Scavenge parameters are defined by "Czas przedmuchu" (Scavenge time) and "przerwa przedmuchu"(scavenge break) (see chapter 6) and "Wydajność dmuchawy w czasie przedmuchu" (blower efficiency during scavenge) (see chapter 6)
2. The second one forces blower operation. Exceeding the preset temperature by 3 C causes the blower to be operating with minimum rotation and in the range zone of 3 5 C the scavenges are modified (see chapter 6) Going over to the standard scavenges takes place finally at 5 °C above the preset temperature of the boiler operation. To start that you need to set the parameter F2=1 (see chapter 6)

Blower operation is indicated by the DMUCHAWA diode (Fig.1 „3")

5. Circulating pump operation

Operation phase	Diode PRACA	Pump	
		Switch-off temperature of circulating pump T.POMPY = 30	Switch-off temperature of circulating pump T.POMPY = 31..50
Burn-up	blinks	runs	Runs if temp. is above T.POMPY+2 °C
			Doesn't run if temp. is below T.POMPY
Work	lights	runs	Runs if temp. is above T.POMPY +2 °C
			Doesn't run if temp. is below T.POMPY
30-min operation break	Fast blink	Runs if temp. is above 32 °C	Runs if temp. is above T.POMPY +2 °C
		Doesn't run if temp. is below 30 °C	Doesn't run if temp. is below T.POMPY
Extinguish	blinks	runs	Runs if temp. is above T.POMPY +2 °C
			Doesn't run if temp. is below T.POMPY
End of operation	off	Runs if temp. is above 32 °C	Runs if temp. is above T.POMPY +2 °C
		Doesn't run if temp. is below 30 °C	Doesn't run if temp. is below T.POMPY

*** CO=C.H. /Central heating

Pump operation is indicated by the flashing POMPA diode (Fig. 1 "4")

! The control realizes an after-season rundown of the pump-it switches on for a minute if it doesbn't run for a week

! If the boiler temperature falls below 5 °C then the C.H. pump turns on getting boiler water circulating and postponing water freezing.

! Parameter value [$] is indirectly related to the voltage of the engine

! Correction of the rotation is related to the chosen type of an engine (F3). Every type has its own settings P0 and P1

! Setting 100% rotation always corresponds to the full-controlled engine. The P0 correction sets the rotation at 1% and P1 at 99%. In the parameters "WYDAJNOSĆ DMUCHAWY" (BLOWER EFFICIENCY) you can set only the value by every 10% but automatic controlling includes a full range of the settings (by every 1%)

9. Solution of problems

MAINS=SIEĆ (PL)

Problem	Possible cause	Solution
Control turns off	1.Wrong connection of mains cable 2.Damaged fuse 3.MAINS switch is off	1.Check the supply connection 2.Check the fuses, swap them for new ones acc. to the documentation 3.Set the MAINS switch to I
Wrong boiler temp. displayed by control	1.Temp. sensor disconnected 2.Temp. sensor damaged	1.Check sensor connection 2.Get in touch with the service
Control unit does not control boiler, diode ALARM blinks	1.Not deleted the memory of alarms 2.The cause of alarm still exists 3.Temp. sensor damaged	1.Press any button to delete the memory of alarms 2. Wait till the end of alarm (e.g. a safety device sensor cools down) 3. Get in touch with the service
Boiler temperature strongly higher than that preset one.	1.Too fast burning	1. Change the scavenge parameters

10. Installing the regulator

! THE REGULATOR IS SUPPLIED BY 230V/50HZ . ANY MOVES REGARDING INSTALLATION SHOULD BE MADE AT THE DISCONNECTED MAINS.

! THE REGULATOR HAS TO BE CONNECTED TO THE MAINS WITH THE ZERO-PIN.

! THE REGULATOR SHOULD NOT BE EXPOSED TO WATER AFFECTING. ITS ENVIRONS OUGHT TO BE CLEAN.

! THE PRODUCER DOESN'T TAKE ANY RESPONSIBILITY FOR DAMAGES CAUSED BY WRONG USAGE OF THE REGULATOR.

The control is designed to mount on the C.H. boiler. The blower and pump have to be connected to the corresponding cables .The integrated temperature sensor /alarm thermostat has to be located in the special hole of the boiler housing..

In order to guarantee a proper thermal conductance, that hole should be filled with machine oil or silicon paste. The cables should be directed in such way so they cannot be exposed to overheating

Parameter	Code	Value	Default	Remarks
Blower efficiency during Scavenges x10[%]	F0	1÷10 (10÷100%)	8 (80%)	
Blower efficiency during Modified scavenges in the range of 3…5°C x10[%]	F1	1÷10 (10÷100%)	1 (10%)	Important in case of setting the extended PID algorithm (that is F2=1). In the zone of modified scavenges the scavenge time is normal and the break between scavenges is modified.
Extended PID algorithm [0-OFF 1-ON]	F2	0÷1	0	In the extended algorithm a blower operation is forced
Operation mode of blower	F3	0÷2	1	0 No changing rotations, operation based on ON/OFF rule. The mode is for all the engines which are especially not vulnerable to the steady control of rotation 1 Steady control of rotation 2 Steady control of rotation, it relates to engine class RV-14
Blower hysteresis at ON/OFF operation [°c]	F4	0÷5	2	Insensibility zone, temperature ON to OFF difference

8. Service procedure: adjusting the control to the engine of the blower

The control cooperates with typical engines of blowers. With the additional parameter F3 you can change the engine type, if despite that the blower doesn't run properly in the whole range of rotation you can set an individual control characteristics. It's based on setting the voltage of engine operation for minimum and maximum controllable rotation.

Access to the service procedure is possible if during switching on the RT-04C control you press at the same time the + buttons “24” and “25”. At the moment that the ALARM “2” and BLOWER (DMUCHAWA) “3” diode starts blinking you must within 2 secs release the +/- buttons and press the START button “21” and the display shows “P0” , that is the code of the first parameter.

You can change the code cyclically with the ZMIEŃ button. The current parameter value is shown after pressing START, then you can alter it with the +/- buttons. The pass to the level of changing parameters with the START or ZMIEŃ button.

The START button also turns on the engine of the blower, which enables the observation of its operation. In case of P1 the engine gradually is stepped up from minimum to maximum rotation. The blower diode blinks. After reaching the preset rotation the diode lights constantly.

Finishing setting the parameters needs the control to be switched off.

Parameter	Code	Value	Default	Remarks
Controlling engine at minimum rotation [$]	P0	10÷80 $	34$	at F3=2 engines class RV-14 default 41$
Controlling engine at maximum rotation [$]	P1	10÷90 $	64$	at F3=2 engines class RV-14 default 72$

6. Handling of the control

Power switch is located on the front panel Turning off the control with the switch "23" (Fig. 1) disconnects the power supply of the blower and the circulating pump as well. The Control Panel (Fig. 1) is designed to insert control adjustments. When no parameter diode (“6”-“10”) lights, then the display “1” shows current temperature of the boiler. The Burn-up phase is started with the START button “21”. Once more pressing that one “21” and holding on for at least 2secs turns off the boiler if the temeprature is lower than 35°C (the PRACA diode “5” blinks). If the boiler temperature is higher (the PRACA diode lights contantly) a longer pressing the START button causes the blower to be turned off for 30mins e.g. for cleaning up the furnace. The state is signalled by fast blinking of the PRACA diode. After 30mins the control automatically goes over to the normal operation state. The break of the blower operation can be shortened by once again pressing the START button.

The display “1” shows the value of the parameter chosen with the ZMIEŃ button “22” indicated by one of the diodes “6”-“10”. The value can be altered with the +/- buttons “24” and “25”. If the buttons are not pressed for a time of 10sec up the control autoamtically goes over to showing up the current temperature of the boiler.

Parameter	Diode No	Range of changes	Default
PRESET TEMPERATURE	**6**	40÷90 °C	70°C
SCAVENGE TIME	**7**	1÷30 secs	10 secs
SCAVENGE BREAK	**8**	2÷10 mins	3 mins
BLOWER EFFICIENCY x10%	**9**	1÷10 (that is 10÷100%)	10 (that is 100%)
SWITCH-OFF TEMPERATURE OF CIRCULATING PUMP (CHANGE OF OPERATION MODE OF PUMP)	**10**	30-50°C 30 Pump runs always during the Burn-up, Work and Extinguish phase of the boiler. If the boiler doesn’t operate the pump runs if temperature is above 32 °C, the pump turns off if temperature is below 30 °C 31-50 Pump turns on when temperature is above T.POMPY+2°C and turns off when temp. is below T.POMPY	35°C

TEMPERATURA ZADANA (PRESET TEMPERATURE)
CZAS PRZEDMUCHU (SCAVENGE TIME)
PRZERWA PRZEDMUCHU(SCAVENGE BREAK)
WYDAJNOŚĆ DMUCHAWY(BLOWER EFFICIENCY)
TEMPERATURA WYŁĄCZENIA POMPY(SWITCH-OFF TEMPERATURE OF PUMP)

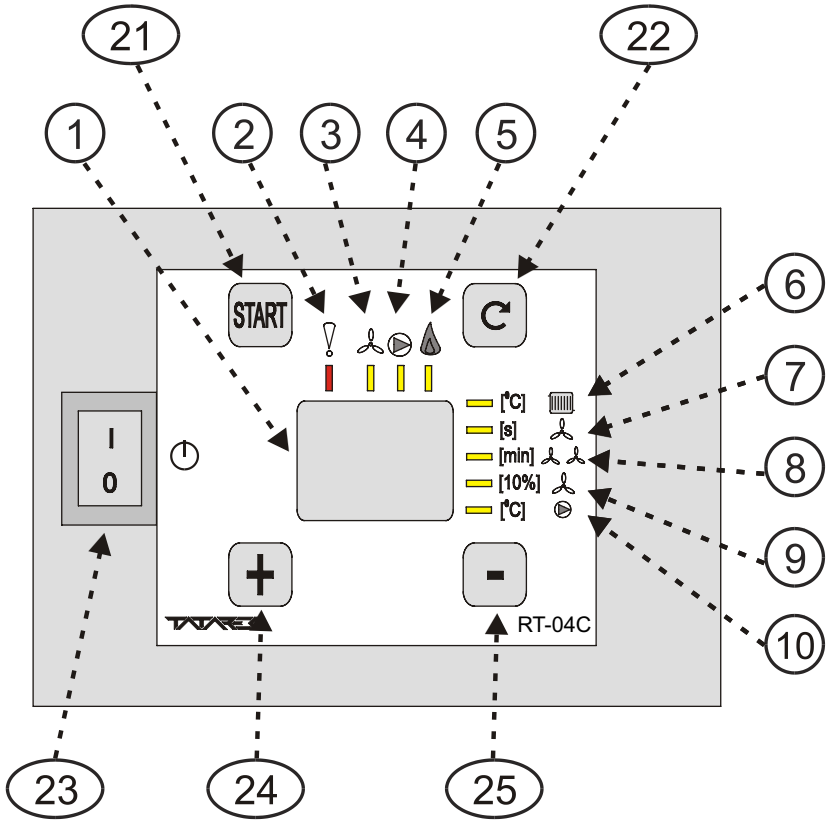

Fig.1 View of control panel

Display of measured temperature/parameter value

1. Diode signalling ALARM caused by exceeding the limit temperature or activating the safety sensor
2. Blower diode
3. Circulating pump diode
4. Circulating pump diode
5. Diode of the boiler
6. Diode indicating showing the value TEMPERATURA ZADANA (PRESET TEMPERATURE)
7. Diode indicating showing the value CZAS PRZEDMUCHU (SCAVENGE TIME)
8 Diode indicating showing the value PRZERWA PRZEDMUCHU(SCAVENGE BREAK)
9. Diode indicating showing the value WYDAJNOŚĆ DMUCHAWY(BLOWER EFFICIENCY)
10. Diode indicating showing the value TEMPERATURA WYŁĄCZENIA POMPY (SWITCH-OFF TEMPERATURE OF THE PUMP)

21. Start of the boiler operation(START)
22. Button of choosing a parameter(ZMIEŃ)
23. Power switch
24. Upbutton (+)
25. Downbutton (-)

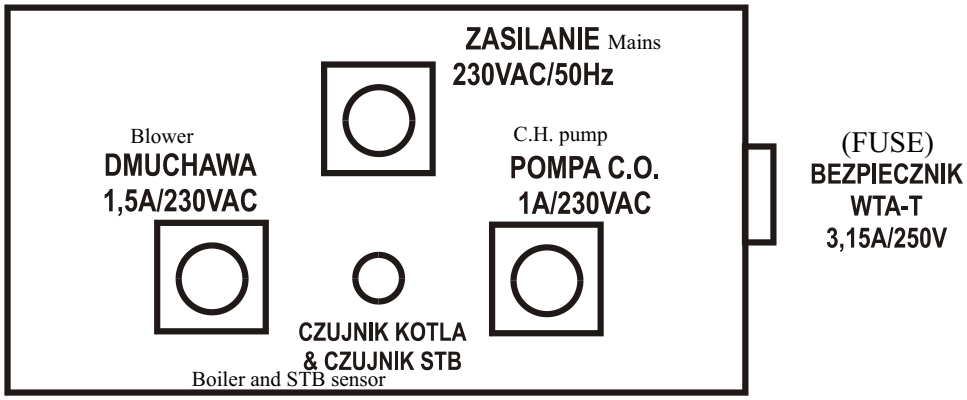

Fig.2 View of connections

7. Additional parameters

Apart from the parameters of 6th chapter being mentioned, the control can be fitted to C.H. installation and user's wishes by additional parameters. Their value has a significant meaning for a proper operation of the control and casual changes are not allowed.

Access to the additional parameters is possible if while switching on the control you press the ZMIEŃ button “22”.At the moment that the ALARM “2” and PRACA “5” diode starts blinking you have to release the ZMIEŃ button “22” within 2secs and press the START button “21”. As a result you see on the display a code of “F0”, that is the code of the first parameter. The code can be cyclically changed with the ZMIEŃ button. The current value of the parameter is shown after pressing the START button that can be altered with the +/- buttons. The pass to the level of choosing parameters with the START or ZMIEŃ button. After setting the parameters you must switch off the control.