JUNKERS

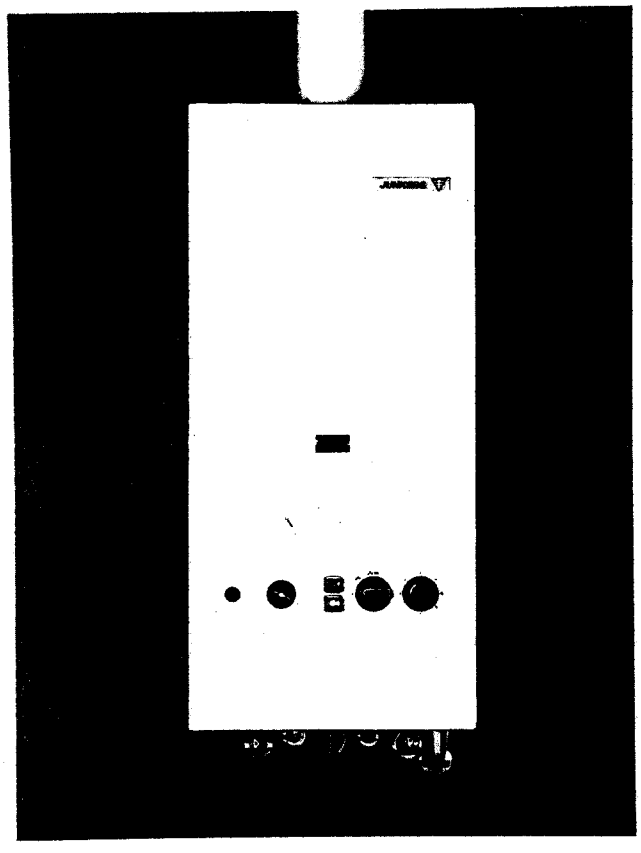
Gas Central Heating Appliances

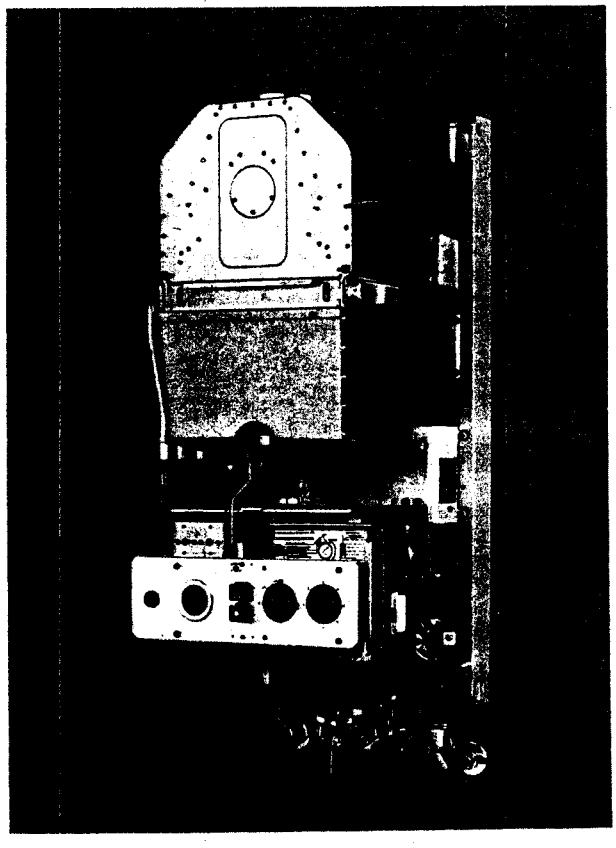
Models ZR 11 K . ., ZR 18 K . . and ZR 24 K . .

for Central Heating – **HEATING UNITS**
suitable for use with Pressure Storage Tank Model SR 90-1

Models ZWR 18 K . . and ZWR 24 K . .

for Central Heating and Domestic Hot Water Supply – **COMBI UNITS**





These appliances will work properly only if the following Instructions, together with the Operating Instructions supplied with every heater, are carried out in every detail. – Modifications reserved. – Upon completion of the installation, these Instructions should be handed to the user for future reference.
The installation must be carried out by a certified installer.

6 720 601 326 (10.82)

Appliance Measurements
(in millimetres unless otherwise stated)

Appliance with mounting plate (Fig. 1)

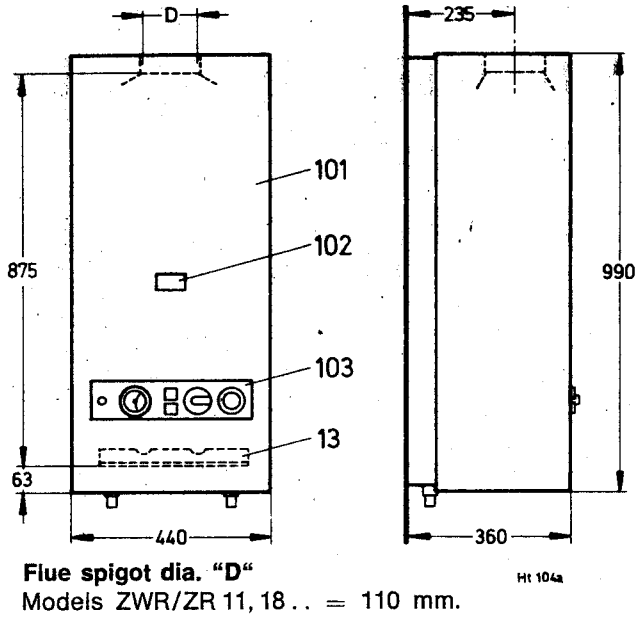


Fig. 1

Flue spigot dia. "D"
Models ZWR/ZR 11, 18 . . = 110 mm.
ZWR/ZR 24 . . = 130 mm.

Fixing of the appliance (Fig. 2)

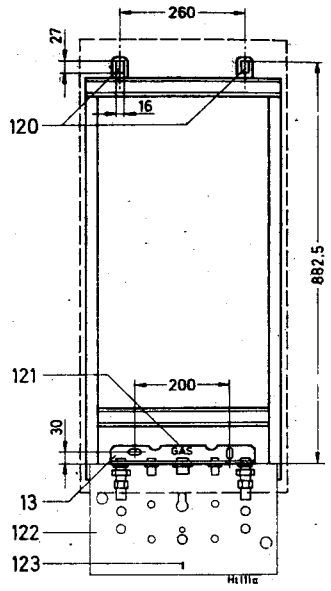


Fig. 2

Mounting plate

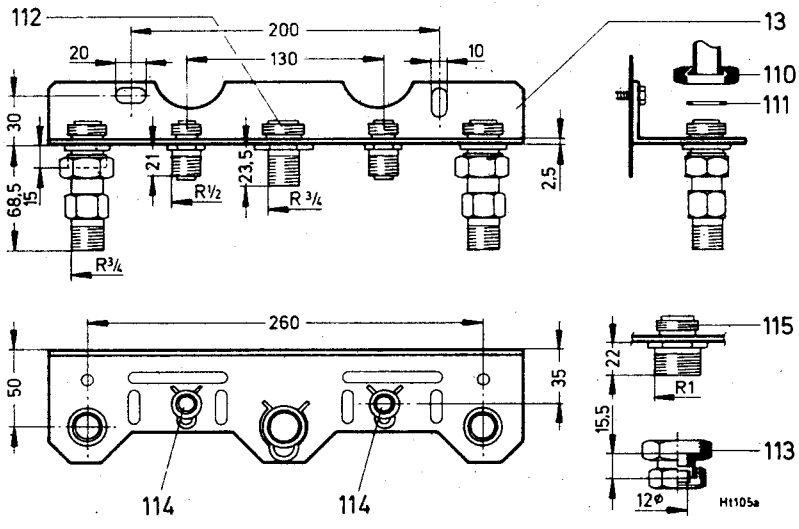


Fig. 3

All dimensions in millimetres

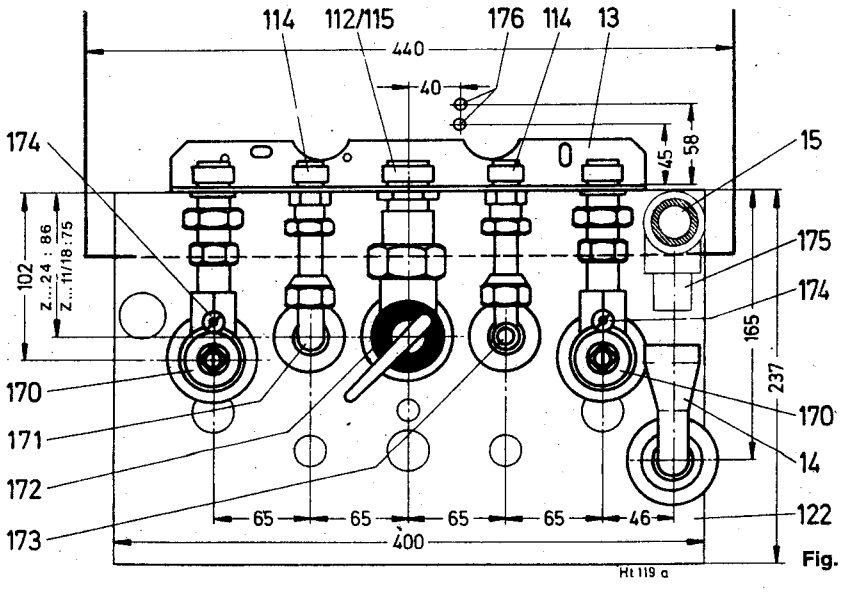
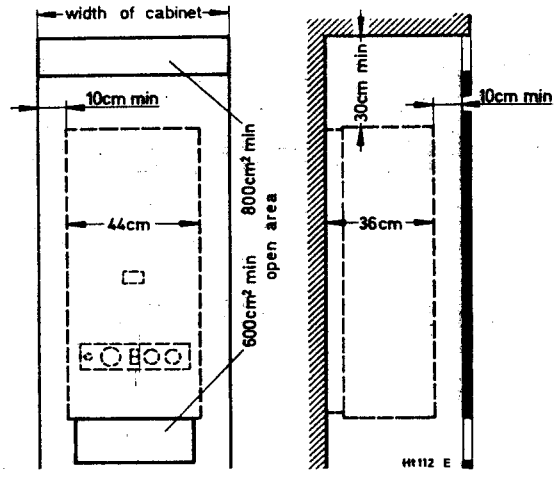


Fig. 4

13 Mounting plate
14 Overflow funnel
15 Diaphragm safety valve (at appliance)
101 Casing
102 Lighting aperture
103 Control panel
110 Union nuts for flow and return (at appliance)
111 Washer
112 ¾" gas connecting nipple (supplied loose)
113 Reducing nipple 1" to Ermeto 12 mm (supplied loose for LPG heaters)
114 ½" cold & hot water connecting nipples (for COMBI only)
115 1" gas connecting nipple (completely mounted)
120 Suspension eyes at appliance
121 Point of letter "A" = centre of mounting plate
122 Mounting template
123 Slot = centre of mounting template
170 Service cocks in flow and return lines (angle-type)
171 Elbow pipe (hot water), (COMBI only)
172 Gas shut-off cock or diaphragm valve
173 Angle-type valve (cold water), (COMBI only)
174 Drain
175 Blow-off port
176 Cable connection for main power and room thermostat

Installation



All dimensions in millimetres.

Fig. 5

Locality

Any national, regional, or local rules, regulations, by-laws, etc. pertaining to installation and operation of heating plants should be strictly observed.
Heating appliances must never be installed in rooms containing corrosive vapours, e. g., sprays, or in plastics- and lacquer-processing shops.
The measurements of the required venting apertures, the distances between outer case and heater casing as well as the min. ceiling clearauce are shown in Fig. 5.
Any existing regulations as regards fire precautions and the application of combustible construction materials, etc., must be carefully observed.
General measurements
See Figs. 1 and 2. Min. clearance between upper edge of appliance and ceiling to be 300 mm. (12 in.), see Fig. 5.

Installation accessories

3/4" angle-type service cock with drain, chrome-plated, with rosette;
3/4" through-type service cock with drain, chrome-plated;
3/4" and 1" angle-type gas cocks, chrome,plated, with rosette;
3/4" and 1" through-type gas cocks, chrome-plated;
Reducing nipple 1" / Ermeto 12 mm. (for use with LPG);
Angle-type diaphragm shut-off valve, Ermeto 12 mm., chrome-plated, with rosette;
3/4" overflow funnel, chrome-plated, with rosette, 1" connection for drain.

For COMBI Units only:

Water connection accessory for concealed pipe fitting:
1/2" angle-type valve and 1/2" elbow pipe, both chrome-plated, with rosette;
2 copper pipes 12/10 mm. dia. with shoulder, 100 mm. (4") long, inclusive of 1/2" union nut and washers.
Water connection accessory for surface pipe fitting:
1/2" through-type valve and 1/2" connecting union, both with 1/2" union nut and 1/2" female thread, chrome-plated, with washers.

Supply pipes and installation accessories

The use of galvanized or aluminium radiators is not recommended as these tend to form gas bubbles.

Mounting plate

This is required for the proper installation of all pipe connections for concealed fitting on plastered or tiled walls.
For surface pipe fitting, the pipe connections are fixed with the aid of mounting template 122, Ordering No. ZFN 691/1 (Fig. 4). The type designation of the appliance to be fitted must show on the upper edge. With LPG models the bore marked "G 12 mm" has to be used. The mounting template must be removed prior to the fitting of the installation accessories and of the mounting plate.
All the washers required for the unions are tied to the bottom of the appliance. The fixing screws (6 x 50 mm.) together with the accessories are packed with the mounting plate.

Flow and return lines

It is definitely recommended to provide one service cock each *) – angle-type for concealed, through-type for surface pipe fitting. At the lowest point of the system, a filling and drain valve has to be provided.

Gas supply

Pipe sizes to be determined in the customary way. Every mounting plate 13 is fitted with a 1" gas connecting nipple 115. A 3/4" connecting nipple 112 is supplied loose and may be exchanged after release of the spring. For use with LPG a reducing nipple 1" to Ermeto 12 mm. (113) is supplied with the appliance. Ahead of the appliance a gas shut-off cock *), or diaphragm shut-off valve for LPG *), respectively, should be provided.

Diaphragm safety valve 15

This is an integral part of the appliance and is fitted to the air separator.

Drain line (14)

Bore "A" of the mounting template marks the connection of the overflow funnel to the drain line. If the drain line ends in the sewage system, then an odour seal must be provided.

Cold and hot water supply lines (COMBI only)

Rules, regulations, etc. of the local Water Works to be observed!
For concealed pipe fitting, the cold water connection is made with the 1/2" angle-type valve, the hot water connection with the 1/2" elbow pipe, in both cases by a copper pipe joint *). The connection measurements of the mounting template – bores „K" and "W" – will suit the purpose.
For surface pipe fitting, a 1/2" through-type valve and a 1/2" connecting union are available *).

Fixing of the appliance (Fig. 2)

Position of fixing screws or the appliance to be marked out in accordance with Fig. 2. Screws (6 x 70 mm.) and dowels, etc., are packed with the heater.

Flue installation

Flue pipe to be leakage-tight and to comply with any local, regional, or national requirements. It must be fitted so that its vertical portion is as long, and its horizontal run as short as possible, the latter wtih a slight pitch upward towards the chimney.
Motor-controlled dampers may be connected to the switch-box via adapter 159. The only approved thermically-controlled damper may be obtained from Fa. Kutzner & Weber, Industriestr. 13, D-8031 Gröbenzell/ Germany.

*) Installation Accessories

Electrical connection

All electrical installations work and protective measures have to be carried out in full compliance with the applicable national standards and local regulations. The electrical outfit is splashwater-, contact-, and radio-interference-proofed.

Power supply to be connected to terminal strip within switchbox. No additional outlets must branch off. Plug to be let at position II. If a different control method is required, then hints in Fig. 6 or in the cover of the terminal box should be observed.

Pump control method

With room thermostat:

preferably plug in position II; return thermostat 136 controls main gas only; room thermostat controls main gas supply and pump.

With outside (weather-sensitive) control:

preferably plug in position III; the pump is continuously running during the heating operation.

Connection of thermostats

The 220-volt power supply for the clockwork thermostat or weather-sensitive thermostat, respectively, must be separate from the 24-volt circuit.

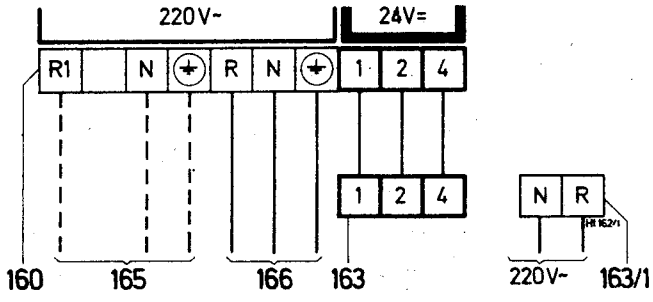


Fig. 6

Connection of 24-volt modulating Junkers Series ... 21 room thermostat to terminal strip

Junkers Interlocking Control Model SH 27/..

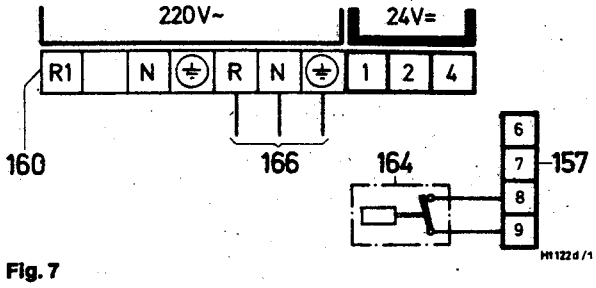


Fig. 7

If HEATING Unit and gas water heater cannot be operated at the same time, then an interlocking control has to be fitted to the water heater which automatically cuts off the HEATING Unit while hot water is being drawn. Fig. 7 shows the wiring of an interlocking control if a 24-volt Junkers Series ... 21 Room Thermostat is employed. If a 220-volt thermostat is to be connected, then this has to be wired in series with the interlocking control.

Indirect-heated Pressure Storage Tank Model St 90 1

For HEATING Units only

If the HEATING Unit is to be run in conjunction with a storage tank, then an adapter has to be connected to the terminals 6, 7, 8 and 9 (see No. 157 on Fig. 9).

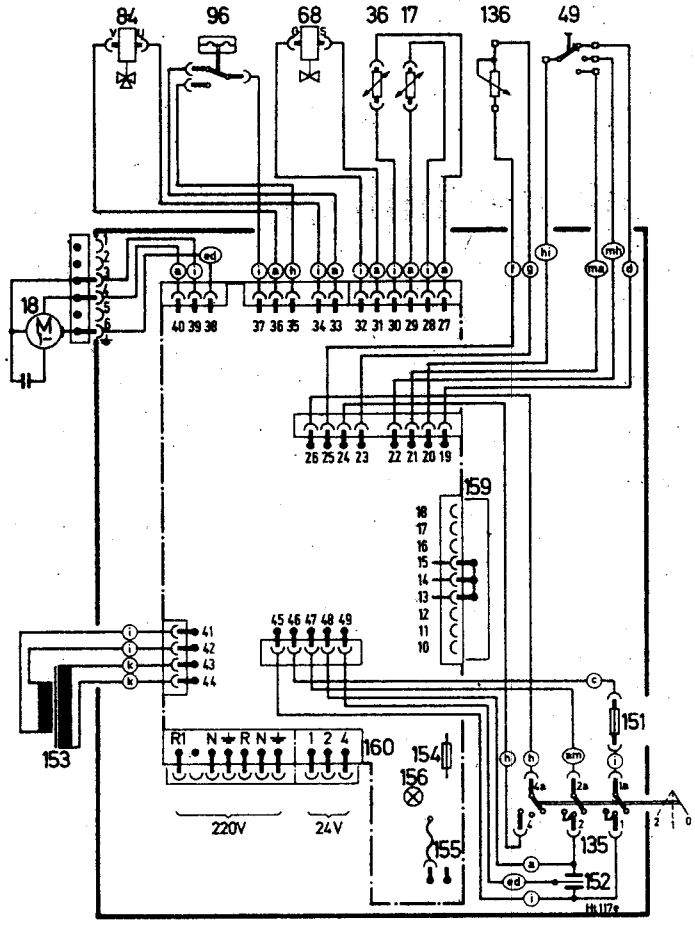


Fig. 8 COMBI Units

17 Return thermostat
18 Circulation pump with capacitor
36 Flow thermostat
49 Gas control switch
68 Control solenoid valve
84 Control solenoid
96 Microswitch
135 Main switch
136 Temp. selector control for HEATING
151 Fuse 2.5 amps.
152 Anti-interference element
153 Transformer
154 Fuse 0.4 amp.
155 Pump switch
156 Tell-tale lamp
157 Terminal strip for connection of storage tank (HEATING Units only)
158 Bridge
159 Adapter
160 Terminal strip

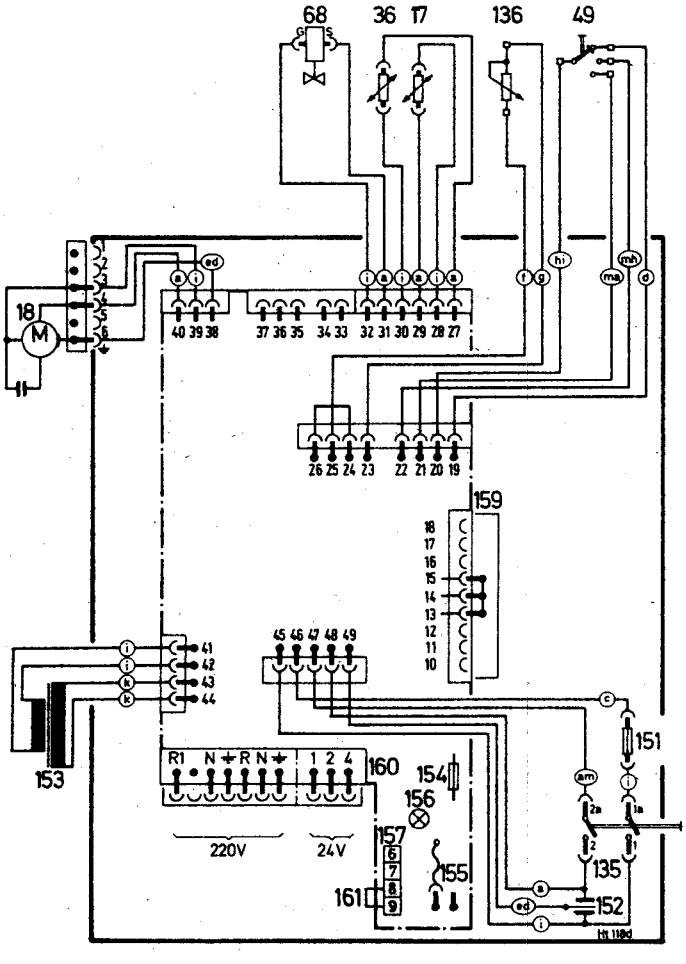


Fig. 9 HEATING Units

a = blue
b = light-blue
c = brown
d = yellow
e = green
f = grey
g = pink
h = red
i = black
k = violet
m = white

Wiring diagrams (Figs. 9 and 10)

All COMBI and HEATING Units are supplied completely wired with the pump switch arranged for control method II. If a room thermostat is provided this will control pump and gas supply. Without room thermostat, temperature selector control 136 controls the gas supply.

The temperature limiter sensors 2 and 9 are placed in the thermocurrent circuit.

Commissioning

Filling the plant

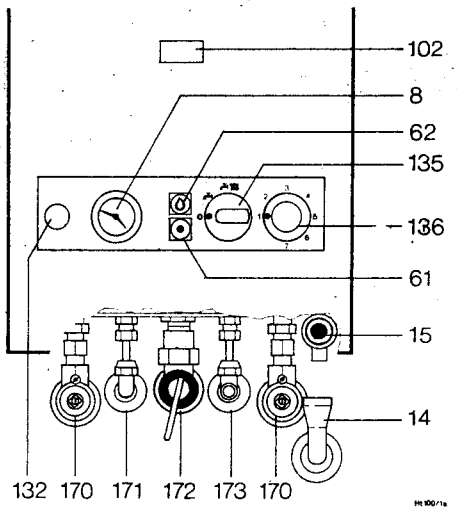


Fig. 10 COMBI UNIT

8 Comb. thermo-/manometer	136 Heating temperature selector control
14 Overflow funnel	170 Service cocks in flow and return lines
15 Diaphragm safety valve	171 Elbow pipe (hot water), (COMBI only)
61 "OFF" button	172 Gas shut-off cock
62 "ON" button	173 Angle-type valve (cold water), (COMBI only)
102 Lighting aperture	
132 Pump lid	
135 Main switch	

Prior to filling, the system without the appliance has to be well flushed. For filling, sealing screw of quick-venting valve 27 to be undone for approx. 3 threads so that the air collected by air separator 19 may escape. Radiators to be vented; venting valves must no be closed before water only issues.

Systems of up to 10 metres (33 ft.) static head: filling cock to be turned off if manometer 8 indicates a pressure of approx. 1.2 bar (17 psi).

Systems of above 10 metres (33 ft.) static head: filling cock to be turned off if manometer indicates a pressure of approx. 0.2 bar (2.8 psi) above the actual static head, e.g., approx. 1.4 bar (20 psi) at 12 metres (39 ft.) static head.

Pump

If the main burner goes out after a short period of time, then the run of the pump has to be checked:

Main switch 135 on control panel 103 to be set to position "○";

pump lid 132 and sealing plug at pump to be removed.

Screwdriver is then placed in slot of pump motor shaft and turned in direction as indicated.

Temperature selector control 136 in return line

The temp. selector control may be set between 35 and 70° C (95 and 158° F). Depending on the circulating water volume, flow temperatures up to 90° C (194° F) may be obtained.

In the range between 0 and approx. 40 % of the heating or hot water requirements the control works with a fixed switching interval. From 40 % up to the rated heating output the control is modulating.

Temperature limiter 6

This is set to a fixed value of 110$_{-4}$ °C (230$_{-7}$ °F).

Functional check

Flue installation to be checked with a dew plate.

For checking the thermoelectric flame failure device, gas shut-off cock 172 is turned off for 60 secs. while the pump is running. Upon turning the cock on again, neihter pilot, nor main gas must issue.

Check whether temperature selector control 136 will, with any temperature as set, cut off the gas supply to the main burner.

Replenishing

With radiator valves turned open, the plant has to be heated up to max. flow temperature for an appropriate period of time and to be vented. Screw of quick-venting valve 27 to be turned in finger-tight after the start to avoid loss of water. After the water has cooled down to approx. 50 °C (122 °F), the filling hose is vented and the plant replenished, if necessary.

Plants up to 10 metres (33 ft.) static head:

filling pressure approx. 1.5 bar (21.8 psi);

Plants above 10 metres (33 ft.) static head:

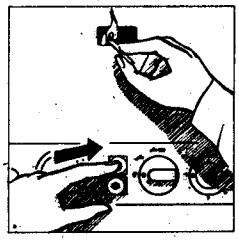
filling pressure should be approx. 0.5 bar (7.2 psi) above the actual static head, e.g., 1.7 bar (24.5 psi) at a static head of 12 metres (39 ft.).

If the plant is heated up again, water may issue in drops at the blow-off line of the diaphragm safety valve 15.

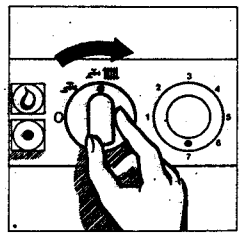
Operation

In order to operate

Set switch at 0
Open the gas shut-off valve and, if necessary, the cold water corner valve.

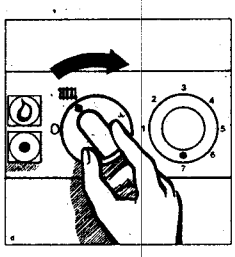


Press button [flame] .
Light the gas. Hold the button pressed approx. 15 secs.



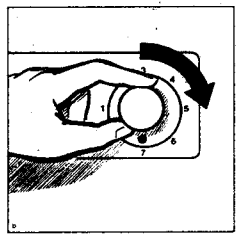
Combi-boiler ZWR

Switch
winter:
summer:

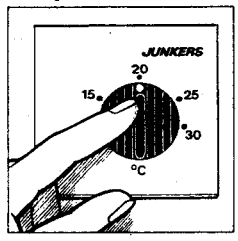


ZR-boiler

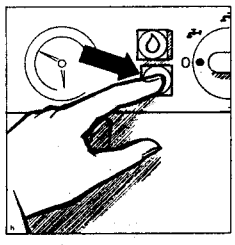
Switch:



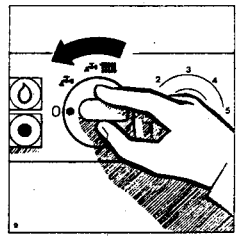
In systems with a room thermostat, set temperature selector at "7".



Set room thermostat to desired temperature. See operating instructions for other regulating methods.



Press button [flame] .
Flame goes out.



Set switch at 0.

Setting of gas rate

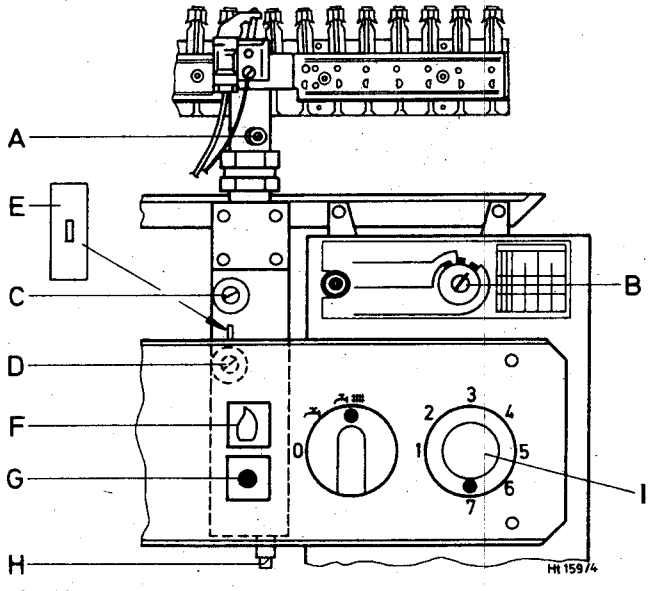


Fig. 11

A	Orifice pres. measuring point 3	E	Cover 65
B	Gas control switch 49	F	"ON" button 62
C	Setting screw for min. gas rate 64	G	"OFF" button 61
D	Setting screw for max. gas rate 63	H	Gas inlet pres. measuring point 7
		I	Temperature selector control

Junkers appliances are fitted for use with fuel gas as stated on the performance badge. Different fuel gases require the heaters to be converted in accordance with Sec. 13.

The setting of the rated heating input may be effected either by the orifice pressure method, or by the volumetric method. Both methods require the use of a U-type pressure gauge.

Note: The orifice pressure is time-saving and therefore to be preferred.

Setting of pilot flame: Not required.

Orifice pressure method

Wobbe index to be ascertained from local gas works.

1. Lead-sealed cover "E" (Fig. 11) above both gas setting screws to be removed.
2. Sealing screw at "A" (Fig. 11) to be turned out and U-gauge to be connected.
3. Gas shut-off cock to be opened and appliance to be started in accordance with page 7. The appliance must now be kept running for at least 5 minutes.
4. Gas control switch "B" (Fig. 11) to be set to position "MAX".

5. Applicable orifice pressure (mbar) for "MAX" to be taken from Table on page 14. This pressure is set by means of setting screw "D" (Fig. 11); turned in direction +: more, in direction –: less gas.

   With LPG appliances, the screw "D" is turned in against stop.

6. Temperature selector control "I" to be set to position "right".
7. Gas control switch "B" to be set to position "START".
8. Applicable orifice pressure (mbar) for "START" to be taken from Table on page 14 and to be set with setting screw "C" (Fig. 11).
9. Gas shut-off cock to be closed, U-gauge taken off, and sealing screw at "A" tightened.
10. Sealing screw at "H" to be removed and U-gauge to be connected to pressure point.
11. Gas shut-off cock to be opened and appliance to be started.
12. Gas inlet flowing pressure required

    for town gas: between 7.5 and 15 mbar (3 and 6 in. w.g.)

    for natural gas: between 18 and 25 mbar (7 and 10 in. w.g.).

    If the inlet flowing pressure measured differs from the above stated figures, the reason therefor has to be found out and the situation remedied. If this is not possible, the local gas works must be notified.

    With pressures between 5 and 7.5 mbar (2 and 3 in. w.g.) in the case of town gas, and between 15 and 18 mbar (6 and 7 in. w.g.) in the case of natural gases, only 85 % of the rating (MAX) to be set. With pressures below 5 mbar (2 in. w.g.) or above 15 mbar (6 in. w.g.) for town gas, and below 15 mbar (6 in. w.g.) or above 25 mbar (10 in. w.g.) for atural gases, the appliance must neither be set nor operated. Heater to be made ineffective on gas side.
13. Extraordinary flame picture necessitates checking of orifice.
14. Gas shut-off cock to be closed, U-gauge taken off, and sealing screw at "H" tightened.
15. Cover "E" for gas settig screws to be replaced and lead-sealed.
16. Gas control switch "B" to be set to "OPERATION" (BETRIEB).
17. User to be instructed how the appliance is operated.

Volumetric method

This method may be applied only if it is ensured that the gas works will, during peak hours, not feed additional fuel gas into the supply network.

Wobbe index and operational c.v. to be ascertained from gas works.

1. Lead-sealed cover "E" (Fig. 11) above both gas setting screws to be removed.
2. Gas shut-off cock to be opened and appliance to be started in accordance with page 7. The appliance must now be kept running for at least 5 minutes.
3. Gas control switch "B" (Fig. 11) to be set to position "MAX".
4. Applicable gas flow in litres (cu. ft.)/min. for "MAX" to be taken from Table on page 15. This flow is set by means of setting screw "D" (Fig. 11) with the aid of the gas meter;

   turned in direction +: more, in direction –: less gas.
5. Gas control switch "B" to be set to position "START".
6. Temperature selector control "I" to be set to position "right".
7. Applicable gas flow in litres (cu. ft.)/min. for "START" to be taken from Table on page 15 and to be set with setting screw "C".
8. Gas shut-off cock to be closed.
9. Sealing screw at "H" (Fig. 11) to be removed and U-gauge to be connected to pressure point.
10. Gas shut-off cock to be opened and appliance to be started.
11. Gas inlet flowing pressure required

    for town gas: between 7.5 and 15 mbar (3 and 6 in. w.g.)

    for natural gas: between 18 and 25 mbar (7 and 10 in. w.g.).

    If the inlet flowing pressure measured differs from the above stated figures, the reason therefor has to be ascertained and the situation remedied.

    If this is not possible, the local gas works must be notified.
12. Gas shut-off cock to be closed, U-gauge taken off, and sealing screw at "H" tightened.
13. Rough check of the orifice pressure: see Table on page 14 and instructions under orifice pressure method paras. 1 to 9 and 13.
14. Gas shut-off cock to be closed, U-gauge taken off, and sealing screw at "A" to be tightened.
16. Further sequence of setting operations, orifice pressure method paras. 15–17.

Informing the user

The installer should explain to the user how the appliance works. Modifications or repairs at the appliance must not be carried out by the user.

Troubleshooting

A tell-tale lamp in the switchbox indicates that all electrical components of the appliance are powered.

Smell of gas

Gas shut-off cock (172) to be turned off and room to be ventilated.

Appliance and heating system do not heat up

Pilot flame is out: lighting procedure to be repeated. Pilot flame is alight, and tell-tale lamp lights up: Plant to be checked for proper filling and venting, see Filling the plant.

Pilot flame is alight, but tell-tale lamp does not light up: Setting of room thermostat and of temperature selector control to be checked. If the tell-tale lamp still does not light up, then the appliance is not powered. Power supply to be checked; if necessary, the two fuses 151 and 154 in the switchbox to be exchanged (spare fuses are supplied with the heater). If this does not result in the operation of the appliance, then the printed-circuit plate has to be exchanged.

Appliance heats up, but system remains cold

Radiator valves to be opened. If pump is not running, then it has to be started as per Sec. Pump. If this does not lead to satisfactory results, then there may be trouble at the changeover valve assy. (on COMBI only).

Leakage in domestic hot water circuit

Cold water shut-off valve (to the right of the gas shut-off cock) to be closed.

If appliance cannot be started, installer or serviceman to be notified.

Maintenance work

Replenishing and venting of the plant as well as the checking of the water level at the manometer should be demonstrated (see Replenishing).

Main burner flames to be observed through lighting aperture 102: Flames must burn steady but with full force and without yellow envelope.

At regular intervals the appliance should be looked over and checked and, if necessary, cleaned by an experienced serviceman.

Important hints

Ventilation openings of the room in which the appliance is installed must neither be reduced in cross-sectional area, nor closed.

If COMBI or HEATING Units are installed in houses or flats which are not permanently inhabited, then an anti-refrigerant, e.g., "Antifrogen N", should be added to the heating water.

Maintenance

To be checked after every 3 heating periods. Necessity for cleaning depends on the condition of the fuel gas used.

Hot water heating block 35

If the heating block has to be taken out, the sensor bulbs 2 and 9 as well as the flow thermostat 36 have to be pulled out; the block is then flushed with a powerful jet of water. Heavily soiled blocks to be dipped – fins down – into hot regreasing solution and well rinsed afterwards.

Max. pressure for leakage test: 4 bar (58 psi)

Re-assembly of heating block with undamaged washers; both sensor bulbs and flow thermostat to be replaced in their proper positions.

Main burner 30

To be looked over once every year.

Lint to be removed from air intake ports. Thermocouple 32 and burner tray to be cleaned.

Diaphragm safety valve 15

To be checked for proper working.

For COMBI only:

Domestic hot water supply line 34

If the normal hot water outlet temperature cannot be obtained, then the appliance has to be descaled. Descaling pump and commercial descaling agent to be used.

The pump is connected at $^1/_2$" hot water connecting nipple of mounting plate 13 after removal of copper elbow pipe 171, and at the screwed outlet of the pressure differential valve assy.

Re-commissioning

To be carried out as per Secs. Filling the plant, Funktional check and setting of gas rate.

Spare and replacement parts

To be ordered by Spare Parts List, quoting description and part No.

Greasing compounds

For greasing, only special Junkers Compounds must be used.

Water valve assy.: Unisilkon L 641

Gas valve assy, incl. burner: HFt 1 v 5

Planning hints

Application

Heating

The heating Unit Model ZR... with modulating control is particularly suitable for heating flats and single-family houses, and the Combi Unit ZWR... likewise for additional domestic hot water supply. Both models can be applied for all hot water heating systems, including floor heating. Heating water temperatures below 40° C (104° F) are possible. A minimum circulating water flow is not reuqired for the operation of these appliances.

These models may be run in conjunction with thermostatic radiator valves. Economic operation will result if the heating system is fitted with the Junkers Series ...21 Room Thermostats providing modulating control. This also applies to plants with thermostatic radiator valves.

The hot water heating block is, on account of its combination of construction materials (copper for circulation water, stainless steel for flue gases), highly resistant against soiling and permits a considerable increase of the maintenance intervals. There is no need for a thermostatically controlled bypass.

The appliances are fitted with all safety and control equipment. The temperature limiters act upon the thermoelectric flame failure device. In order to prevent stoppages even under adverse operational conditions, a limiting sensor is placed in the flow which at excessive heating water temperatures controls the flow of the main gas. Automatic air separation and a quick-venting valve simplify the starting of the plant.

Domestic hot water supply

There are three different possibilities:

If there is no space for a second appliance, then a COMBI Unit (Model ZWR...) represents the best solution. It guarantees a mean water outlet temperature of approx. 60° C (140° F), the modulating control permitting the heater, also on the hot water side, to adapt itself to any hot water requirements. All single-lever water outlet fittings and thermostatic mixing valves may be applied.

If there is sufficient space for a second appliance, then the hot water needs may be covered by a separate gas water heater Model W/WR 250/325... An interlocking control safeguards that only one of the two appliances can be operated at the same time.

If a greater hot water comfort is required, then the HEATING Unit may be combined with an indirect-heated pressure storage tank Model SR 90-1; an adapter at the storage tank provides for the control of the HEATING Unit.

General information

Any national, regional, or local rules, regulations, by-laws, etc. pertaining to the installation and operation of heating plants must be strictly observed.

Expansion vessel

At a heating water mean temperature of 80° C (90/70° C) = 176° F (194/158° F), the max. water contents of the heating plant is determined from the static head above the appliance:

Static head above appliance

metres	up to	10	11	12	13	14	15
feet		33	36	39	43	46	49

Max. water contents of plant

litres	192	179	167	154	154	128
Imp. gal	42	39	37	34	31	28

In individual cases, an increase in capacity may be obtained if the pressure within the vessel is reduced to 0.5 bar (7.1 psi) by opening the filling valve 26.

Pump diagram

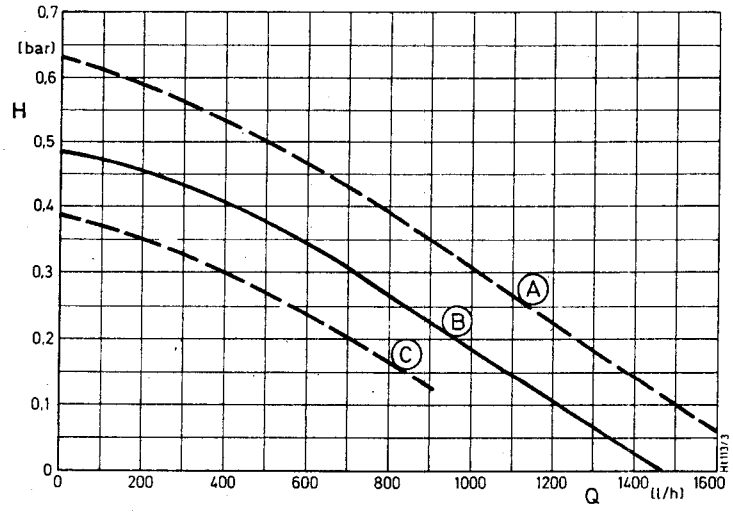


Fig. 14

A: Stronger pump on request

B: Built-in standard pump ZR/ZWR 18, 24

C: Built-in standard pump ZR 11

H: Residual delivery head

Q: Circulating water flow

Performance data

Model		ZR 11 K..	ZR 18 K.. ZWR 18 K..	ZR 24 K.. ZWR 24 K..
Rated heating output	kW (Mcal/h)	10.9 (9)	17.4 (15)	23.3 (20)
	Btu/h	36,000	60,000	80,000
Rated heating input	kW (Mcal/h)	13.2 (11.4)	20.9 (18)	27,9 (24)
	Btu/h	45,600	72,000	96,000
Min. heating output to be set	kW (Mcal/h)	5.5 (4.8)	7.0 (6)	9.3 (8)
	Btu/h	19,200	24,000	32,000
Min. heating input to be set	kW (Mcal/h)	6.6 (5.7)	8.4 (7.2)	11.2 (9.6)
	Btu/h	21,600	28,800	38,400
Min. gas inlet flowing pressure for Index figs. "11", "12" & "13"	mbar	7.5	7.5	7.5
	in. w.g.	3	3	3
for Index figs. "21" & "23"	mbar	18.0	18.0	18.0
	in. w.g.	7–1/8	7–1/8	7–1/8
for Index figs. "31" & "32"	mbar	30.0	30.0	30.0
	in. w.g.	11–3/4	11–3/4	11–3/4
Max. pump capacity at t = 20° C (36° F)	litres/h	450	750	1000
	Imp. gal/h	99	165	220
Remaining delivery head for the pipe system in relation to max. capacity	bar (ft. w.g.)	0.29 (9 1/2)	0.28 (9 1/4)	0.18 (6)
Flow temperature up to approx	° C (° F)	90 (194)	90 (194)	90 (194)
Membrane expansion vessel:				
Total capacity	litres (Imp. gal)	10 (2.2)	13 (2.9)	13 (2.9)
Effective contents	litres (Imp. gal)	4.7 (1.0)	6.2 (1.4)	6.2 (1.4)
Filling pressure	bar (psi)	0.75 (10.9)	0.75 (10.9)	0.75 (10.9)
Power supply	Volts/cps	220/50	220/50	220/50
Rated current input	Amps.	0.45	0.45	0.45
Pump rating, approx	Watts	44	44	44
COMBI only				
Domestic hot water flow	litres (Imp. gal)/min.		2.0–5.5 (0.44–1.2)	2.6–7.5 (0.57–1.65)
Min. flowing pressure	bar (ft. w.g.)		0.1 (3' 3")	0.1 (3' 3")
Mean outlet temperature	° C (° F)		60 (140)	60 (140)
Shipping weight	kg (lbs)	48 (106)	54 (119)	54 (119)

All models are DVGW- and VDE-approved

The designation of the models is supplemented by 2-digit index figures denoting the fuel gas for which the appliance is factory-preset.

Index Fig.	Range of Wobbe Nos. *)	Kind of Fuel Gas
11	6.6 to 7.6	Town and grid gases, Group A; propane/air and natural gas/air mixtures
12	7.6 to 8.8	Town and grid gases, Group B
13	6.8	Butane/air
21	11,6 to 13,3	Natural gases and oil gases, Group L, and rich gases
23	13.3 to 15.5	Natural gases and oil gases, Group H
31	22.6 to 25.6	LP-gases (propane and butane)
32	22.6	Propane

*) Based on kWh

Constructional Details

A = gas valve assy.; B = change-over valve assy.;
C = pressure differential valve assy.

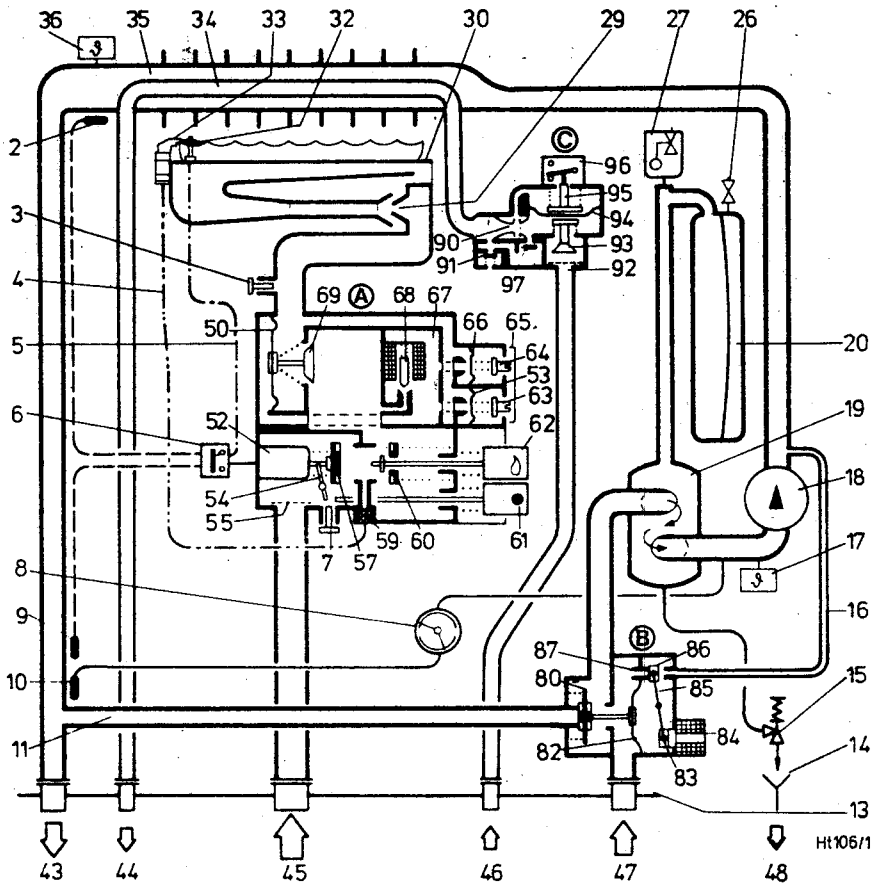


Fig. 14: Diagram of COMBI Unit

2 Limiting sensor bulb (heating block)
3 Orifice pres. measuring point
4 Pilot gas pipe
5 Thermocouple lead
6 Temperature limiter
7 Gas inlet pres. measuring point
8 Comb. thermo-/manometer
9 Limiting sensor bulb (flow)
10 Thermometer sensor bulb
13 Mounting plate
14 Overflow funnel
15 Diaphragm safety valve
16 Control duct (COMBI only)
17 Return thermostat
18 Circulation pump
19 Air separator
20 Membrane expansion vessel
26 Nitrogen filling valve
27 Quick-venting valve
29 Injector orifice
30 Main burner
32 Thermocouple
33 Pilot burner
34 Domestic H.W. supply (COMBI only)
35 Hot water heating block
36 Flow thermostat
43 Flow
44 Hot water
45 Gas
46 Cold water
47 Return
48 Overflow
50 Valve diaphragm
52 Magnetic unit
54 Interrupter
55 Gas filter
57 Main gas valve head
59 Pilot gas filter
60 Valve head
61 "OFF" button
62 "ON" button
63 Max. gas rate setting screw
64 Min. gas rate setting screw (start)
65 Cover
66 Starting load diaphragm
67 Control chamber
68 Control solenoid valve
69 Gas control valve
80 Double-seat valve head (COMBI only)
82 Diaphragm (COMBI only)
83 Magnet armature (COMBI only)
84 Control solenoid (COMBI only)
85 Balance (COMBI only)
86 Control valve head (COMBI only)
87 Compensating port (COMBI only)
90 Venturi (COMBI only)
91 Blow-off valve (COMBI only)
92 Water strainer (COMBI only)
93 Volumetric water governor (COMBI only)
94 Diaphragm (COMBI only)
95 Plunger with contact cam (COMBI only)
96 Microswitch (COMBI only)

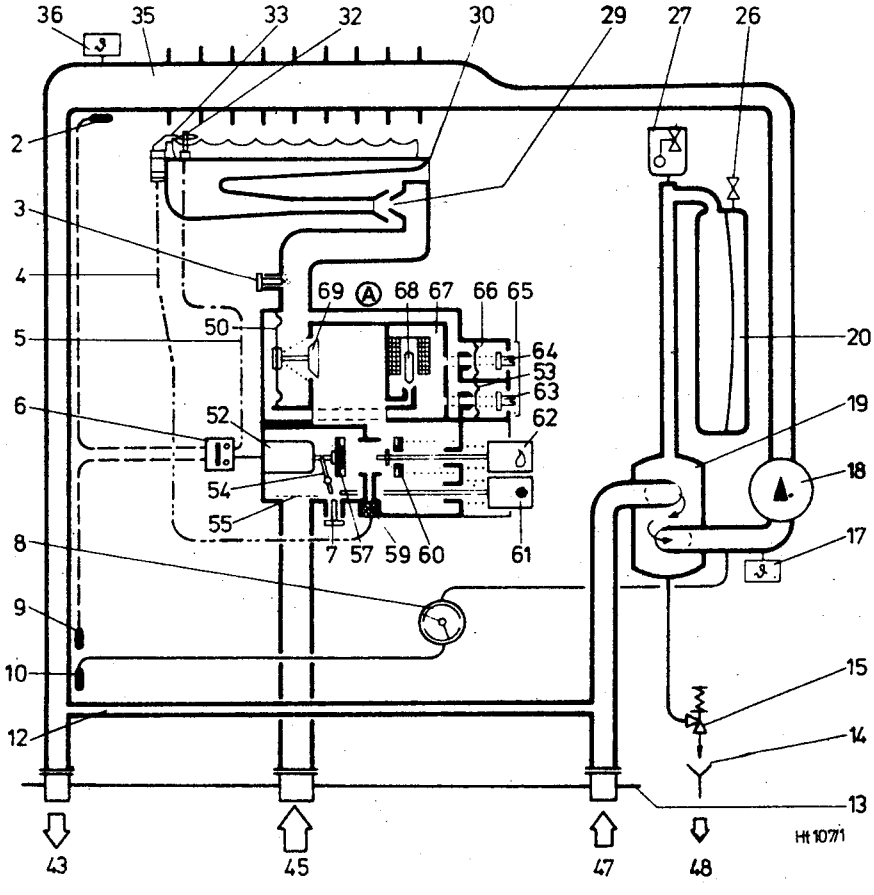


Fig. 15: Diagram of HEATING Unit

Conversion

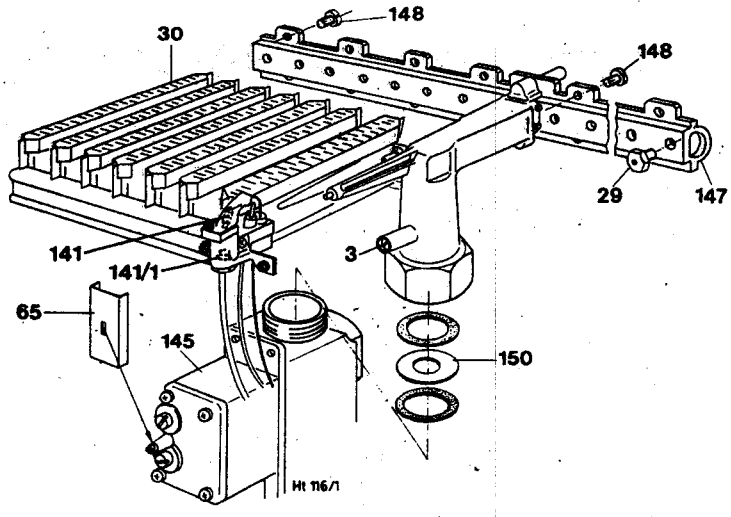


Fig. 16

3 Orifice pres. measuring point
29 Injector orifice
30 Main burner group, left and right
65 Cover
141 Pilot orifice
141/1 Choke orifice
145 Conversion plate
147 Distributor tube
148 Screw (short)
150 Throttling disc

From town gases to natural gases (Fig. 1)

Unscrew left-hand and right-hand main burner group (30) and change injector orifices (29) (7 mm);

After undoing of pilot deflector, the pilot orifice (141) is exchanged.

Remove cap (65)

Unscrew control plate (145) (see conversions parts and exchange.

Gas flow

To be set in accordance with section "setting of gas rate"

Natural gas

Appliances of model . . . 23 can be operated using the SRG method.

When converting models of group "21" to "23" it is necessary to exchange the injector orifices (see conversion parts).

Conversion parts

Marking for Models ZR 11	..11	..12	..13	..21	..23	..31
Injektor orifice (29)	216	195	220	120	110	62
Pilot orifice (141)	51	black	black	blue	blue	red
Choke orifice (141/1)	–	–	13	–	–	–
Conversion plate (145) 8 745 502 . . .	. . . 122	. . . 122	. . . 122	. . . 115	. . . 115	. . . 130
Marking for Models ZR/ZWR 18	**..11**	**..12**	**..13**	**..21**	**..23**	**..31**
Injektor orifice (29)	216	195	220	125	110	69
Pilot orifice (141)	51	black	black	blue	blue	red
Choke orifice (141/1)	–	–	13	–	–	–
Conversion plate (145) 8 745 502 . . .	. . . 122	. . . 122	. . . 122	. . . 115	. . . 115	. . . 130
Marking for Models ZR/ZWR 24	**..11**	**..12**	**..13**	**..21**	**..23**	**..31**
Injektor orifice (29)	216	195	220	120	110	69
Pilot orifice (141)	51	black	black	blue	blue	red
Choke orifice (141/1)	–	–	13	–	–	–
Conversion plate (145) 8 745 502 . . .	. . . 122	. . . 122	. . . 122	. . . 115	. . . 115	. . . 130

Orifice Pressures

mbar *)
in. w.g.

Fuel Gases →		Butan-Air	Town Gases										Natural Gases										LPG "31" 30 mbar	
Index Fig.		"13"	"11" (A)				"12" (B)						"21" (L)					"23" (H)						
Models	Heating Output	Wobbe-Index W_o = 5 850	5 800	6 000	6 200	6 400	6 600	6 800	7 000	7 200	7 400	7 600	10 100	10 400	10 700	11 000	11 300	11 600	11 900	12 200	12 500	12 800	13 100	13 400	19 400 [2]	22 000
ZR 11 K..	Max.	2,9	3,7	3,4	3,2	3,0	4,0	3,8	3,6	3,4	3,2	3,0	10,3	9,7	9,2	8,7	8,2	11,2	10,6	10,1	9,6	9,2	8,8	8,4	26,0	26,0
		1,15	1,45	1,35	1,25	1,2	1,55	1,5	1,4	1,35	1,25	1,2	4,05	3,8	3,6	3,4	3,25	4,4	4,2	4,0	3,8	3,6	3,45	3,3	10,25	10,25
	85 %	2,1	2,7	2,5	2,3	2,2	2,9	2,7	2,6	2,5	2,3	2,2	7,4	7,0	6,6	6,3	6,0	8,1	7,7	7,3	6,9	6,6	6,4	6,1	18,8	18,8
		0,8	1,05	1,0	0,9	0,85	1,15	1,05	1,0	1,0	0,9	0,85	2,9	2,75	2,6	2,5	2,35	3,2	3,05	2,9	2,7	2,6	2,5	2,4	7,4	7,4
	Start	0,7	0,9	0,9	0,8	0,8	1,0	1,0	0,9	0,9	0,8	0,8	2,6	2,4	2,3	2,2	2,1	2,8	2,7	2,5	2,4	2,3	2,2	2,1	8,4	6,5
		0,28	0,35	0,35	0,3	0,3	0,4	0,4	0,35	0,35	0,3	0,3	1,0	0,95	0,9	0,85	0,8	1,1	1,05	1,0	0,95	0,9	0,85	0,8	3,3	2,6
	Orifice marking	220	216				195						120					110							62	
ZR 18 K.. · ZWR 18 K..	Max.	3,8	4,8	4,5	4,2	3,9	5,4	5,1	4,8	4,5	4,3	4,1	11,8	11,1	10,5	9,9	9,4	15,2	14,5	13,8	13,1	12,5	11,9	11,4	26,0	26,0
		1,5	1,9	1,75	1,65	1,55	2,1	2,0	1,9	1,75	1,7	1,6	4,65	4,4	4,15	3,9	3,7	6,0	5,7	5,45	5,15	4,95	4,7	4,5	10,25	10,25
	85 %	2,7	3,5	3,3	3,0	2,8	3,9	3,7	3,5	3,3	3,1	3,0	8,5	8,0	7,6	7,2	6,8	11,0	10,5	10,0	9,5	9,0	8,6	8,2	18,8	18,8
		1,05	1,4	1,3	1,2	1,1	1,55	1,45	1,35	1,3	1,2	1,2	3,35	3,15	3,0	2,85	2,65	4,35	4,15	3,95	3,75	3,55	3,4	3,25	7,4	7,4
	60 % [1]	1,3	1,7	1,6	1,5	1,4	1,9	1,8	1,7	1,6	1,5	1,4	4,2	4,0	3,8	3,6	3,4	5,5	5,2	5,0	4,7	4,5	4,3	4,1	12,0	9,4
		0,5	0,65	0,6	0,6	0,55	0,75	0,7	0,65	0,6	0,6	0,55	1,65	1,55	1,5	1,4	1,35	2,15	2,05	1,95	1,85	1,75	1,7	1,6	4,7	3,7
	Start	0,6	0,8	0,8	0,7	0,7	0,9	0,9	0,8	0,8	0,7	0,7	1,9	1,8	1,7	1,6	1,5	3,1	2,9	2,8	2,6	2,5	2,4	2,3	5,4	4,2
		0,25	0,3	0,3	0,28	0,28	0,35	0,35	0,3	0,3	0,28	0,28	0,75	0,7	0,65	0,6	0,6	1,2	1,15	1,1	1,0	1,0	0,95	0,9	2,15	1,65
	Orifice marking	220	216				195						125					110							69	
ZR 24 K.. ZWR 24 K..	Max.	4,2	5,1	4,8	4,5	4,2	5,9	5,6	5,3	5,0	4,7	4,5	14,6	13,8	13,0	12,3	11,7	15,8	15,0	14,3	13,6	13,0	12,4	11,9	26,0	26,0
		1,65	2,0	1,9	1,75	1,65	2,3	2,2	2,1	1,95	1,85	1,8	5,75	5,45	5,1	4,85	4,6	6,2	5,9	5,65	5,35	5,1	4,9	4,7	10,25	10,25
	85 %	3,0	3,7	3,5	3,3	3,0	4,3	4,0	3,8	3,6	3,4	3,2	10,5	10,0	9,4	8,9	8,5	11,4	10,8	10,3	9,8	9,4	9,0	8,6	18,8	18,8
		1,2	1,45	1,35	1,3	1,2	1,7	1,6	1,5	1,4	1,35	1,25	4,15	3,95	3,7	3,5	3,35	4,5	4,25	4,05	3,85	3,7	3,55	3,4	7,4	7,4
	Start	0,7	0,8	0,8	0,7	0,7	0,9	0,9	0,8	0,8	0,7	0,7	2,3	3,2	2,1	2,0	1,9	3,2	3,0	2,9	2,8	2,6	2,5	2,4	5,4	4,2
		0,28	0,3	0,3	0,28	0,28	0,35	0,35	0,3	0,3	0,28	0,28	0,9	0,85	0,8	0,78	0,75	1,25	1,2	1,15	1,1	1,0	1,0	0,95	2,15	1,65
	Orifice marking	220	216				195						120					110							69	

*) Jet in steady state condition after heating up

[1]) Applies to heating outpt 11 kW

[2]) For propane (30 mbar) approx. 88 % of rated output

Gas Consumption per min.*)

Fuel Gases →			Town Gases (Index Figs. "11" and "12")							Natural Gases (Index Figs. "21" and "23")							
Models	Heating Output		**Gross c.v.** Btu/cu.ft	4000	4200	4400	4600	4800	5500	6500	8000	8400	8800	9200	9600	10000	10400	10800
			Btu/cu.ft	420	442	462	482	504	576	683	840	880	920	965	1010	1050	1090	1135
			Net c.v. kcal/m³	3400	3550	3750	3950	4100	4700	5600	6800	7150	7500	7850	8200	8500	8850	9200
			kcal/m³	355	372	393	415	430	492	585	715	750	785	825	860	890	930	965
ZR 11 . .	MAX.	litres		56	54	51	48	46	40	34	28	27	25	24	23	22	21	21
		cu.ft		1.98	1.90	1.80	1.70	1.62	1.41	1.2	1.0	0.95	0.88	0.85	0.81	0.78	0.74	0.74
	85 %	litres		47	45	43	41	39	34	29	24	23	22	21	20	19	18	18
		cu.ft		1.66	1.59	1.52	1.45	1.38	1.2	1.02	0.85	0.81	0.77	0.74	0.71	0.67	0.64	0.64
	START	litres		28	27	25	24	23	20	17	14	13	13	12	12	11	11	10
		cu.ft		1.0	0.95	0.88	0.85	0.81	0.71	0.6	0.49	0.46	0.46	0.42	0.42	0.39	0.39	0.35
ZR 18 K . . ZWR 18 K . .	MAX.	litres		88	85	80	76	73	63	54	44	42	40	38	37	35	34	33
		cu.ft		3.1	3.0	2.82	2.68	2.58	2.22	1.9	1.55	1.48	1.41	1.34	1.31	1.24	1.2	1.17
	85 %	litres		75	72	68	65	62	54	46	37	36	34	32	31	30	29	28
		cu.ft		2.65	2.54	2.4	2.3	2.19	1.9	1.62	1.3	1.27	1.2	1.13	1.09	1.06	1.02	0.99
	60 % [1])	litres		53	51	48	46	44	38	32	26	25	24	23	22	21	20	20
		cu.ft		1.87	1.8	1.7	1.62	1.55	1.34	1.13	0.92	0.88	0.85	0.81	0.78	0.74	0.71	0.71
	START	litres		35	34	32	30	29	25	21	17	16	16	15	14	14	13	13
		cu.ft		1.24	1.2	1.13	1.06	1.02	0.88	0.74	0.6	0.56	0.56	0.53	0.49	0.49	0.46	0.46
ZR 24 K . . ZWR 24 K . .	MAX.	litres		118	113	107	101	98	84	71	59	56	53	51	49	47	45	43
		cu.ft		4.17	4.0	3.8	3.57	3.46	2.97	2.51	2.08	1.98	1.87	1.8	1.73	1.66	1.59	1.52
	85 %	litres		100	96	91	86	83	71	60	50	48	45	43	42	40	38	37
		cu.ft		3.53	3.39	3.21	3.04	2.93	2.51	2.12	1.76	1.7	1.59	1.52	1.48	1.41	1.34	1.31
	START	litres		47	45	42	40	39	33	28	23	22	21	20	19	18	18	17
		cu.ft		1.66	1.59	1.48	1.41	1.38	1.17	0.99	0.81	0.78	0.74	0.71	0.67	0.64	0.64	0.6

*) Set in steady state condition after heating up

[1]) Applies to heating output 11 kW