

Technical Manual

95 S – 730 S



CE 0085




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Any use, installation, maintenance that is not effected according to the rules as asserted in the technical manual, or unauthorized modifications on the original version as delivered from manufacturer leads to expiration of any right to warranty.

Further on our „Conditions of Sales and Delivery“ are valid.

Technical modification for product improvement are subject to change without notice.

Edition: Mai 2005

 Warm air heaters, type S, are direct-fired and highly variable units.

In contrary to other heating systems they can be installed inside the room. The devices are made exclusively for industrial use in halls and large capacities of each kind, especially in locations where heat is immediately needed.

The warm air heaters (S) are made of high-quality material and are manufactured clean cut. Thus they guarantee trouble-free operation and durability. Special attention is given to a simple and quick installation and ease of servicing.

The **case** is constructed as solid galvanized framework. The double-shelly screwed panel consists of 1 mm galvanized steel sheet - inside and outside. Due to the framework construction and the removable panels, the warm air heaters can be dismantled.

Radiator: The combustion chamber is made of chrome-alloyed, high-heat resistance stainless steel. The tubular heat exchanger is made of standard steel with baffle. Combustion chamber and heat exchanger are screwed via a flanged joint.

Thus the whole unit can easily be decomposed in two pieces. Therefore it can be set up quickly in small rooms, replaced or partly-renewed without any problems.

Upon request the heat exchanger can be delivered in stainless steel with condensate nozzle (extra price).

Fan : In the bottom part, silent tangential fans and maintenance-free ball bearing are mounted. Driving is made via a three-phase standard motor with V-belt-drive. All units are standard equipped with a switch box and a fan-burner and a safety thermostat.

The plenums are open to three sides with horizontal air conduction lamellas. Upon request and extra price, further plenum solutions or a ductwork can be delivered.

General information:

As to the installation of the units, the respective security specifications and directives of each country have to be respected.

The decrees for carrying out the „Immissions Security Regulation“ and according to this the enacted legal decrees have to be observed as described in your country.

Only tested oil burners in warm air heater-type or gas burners may be used.

In case of ex factory delivered units incl. oil- or gas burner the separately additional working instructions have to be observed.

Pay special attention:

- To the list guidelines of warm air heaters
- To the general safety-relevant requirements
- To set up and operate according to your countries regulations
- Fuel supply according to your countries regulations
- Technical rules for gas installation according to your countries regulations
- the VDE - regulations
- Warm air heaters are as fire places in principle permission and indicate requiring.
- consider the rules for the prevention of accidents and other safety-relevant regulations and guidelines

As to the installation of the units, the respective security specifications and directives of each country have to be respected.

Place of installation

Before installation the following requirements have to be proved:

- a) fire protection
- b) function (e.g. room heating, with plenum or duct system, negative or overpressure...)
- c) specific requirements as heat demand, air delivery, ambient or outer air demand, room temperature, air diffusion, space capacities)
- d) connection to the chimney
- e) installation, repair and maintenance possibilities
- f) relation room volume - rated heating power, especially in naturally ventilated rooms.

A sufficient natural air delivery, necessary for the combustion, means e.g. that the room volume in m³ is equivalent to the tenfold rated heat load in kW of all heating units in the room and that windows and doors assure a natural ventilation.

Good and natural ventilation means e.g.

1. the room volume in m³ is equivalent to the 30fold rated heat load of all heating units in the room and windows and doors assure natural ventilation
2. the room offers openings near floor and ceilings which cannot be locked-up, corresponding to 0,003 fold rated heat load in kW of all units in the room.

The combustion air should be free of each kind of pollutants. If - due to production conditions - pollutants (e.g. chloride, CKW, FKCW etc.) comes to the warm air heater, the combustion air for the burner should be taken from outside and a burner casing (see accessories) has to be used

The influx of enough combustion air is guaranteed when suction from::

- installation room, if this meets the requirements to the volume-rated heating efficiency ratio of the construction supervision ($4 \text{ m}^3 / \text{kW}$);
- installation room, if this is heated by the warm air heater – outside air- or secondary air-driven – with guaranteed outside air rate; a fixed room power ratio is not necessary;
- installation room, with not lock up openings outwards, according to the requirements of the construction supervision;
- outwards, through a pipe connected with the burner/heater or its housing whose profile is big enough – it must be adapted to the available free air capacity of the burner/heater and the line resistance (including the suction protective grating), that an efficient combustion is guaranteed.

For installation of the apparatus you have to follow the regulations and decrees of each country. The apparatus are suitable for the use of suck in- and blow out-attachments. It has to be guaranteed, that the fan power (nominal pressure) is adapted according to each air-side resistance (test rated current) The apparatus are not suitable for the excluding use as induction system.

- The apparatus have to be installed steadfast.
- Pallet or wooden frame have to be removed before installation.
- In case of installation on the ground the apparatus should better be installed on a separate foundation – free of tension and secure.
- The suction of air may only occur according to the suction port. When the bottom of the apparatus is not designed as suction variant it has to be closed to avoid infiltrated air suction.
- If heavily pollution of the air in the installation room is eventually expected you have to conduct the return air suction through appropriate filter (apparatus accessories). In this connection you have to observe the suck-side resistance and according to this you have to suit the fan power.
- You have to guarantee the admission of combustion air. In case of eventually super pressure or low pressure or heavily pollution in the installation room you have to install a burner-fresh-air-suction. Pay attention to a free air suction- and air blow-out possibility.

Exhaust connection

An exhaust system has to be guaranteed according to the rules. The construction must be according to DIN 18160 part 1 (construction and mounting of chimneys), the measuring according to DIN 4705 part 1 or part 2 (firing technological calculation of chimney dimension) The exhaust connection must be carried out workmanlike/professional after the valid regulations.



Caution:

The exhaust connection may only occur on chimneys which are approved before. The chimney draft may maximum amount 0,2 mbar (appropriate: 20 Pa, 0,2 h Pa), otherwise damages of the radiator will be possible. Pay attention to extreme weather conditions, roof shapes, settings, etc. In doubtful case you have to use a draft regulator.

Electric installation

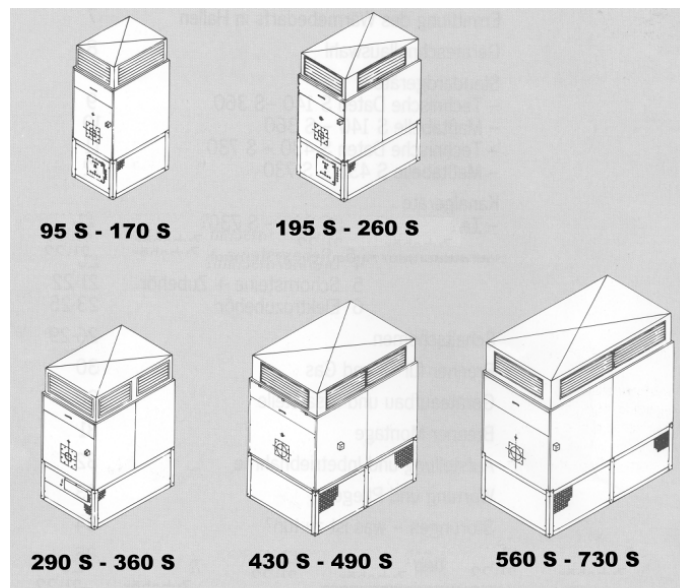
The electric instrument connection has to be done by authorised experts after DIN EN 60335-1 and VDE 0116. On apparatus with nominal heating efficiency over 50 kW you have to apply an emergency switch on good accessible place outside the installation room. It must be save towards unauthorised operation. The room thermostat (accessories) has to be attached at advantageous place for temperature regulation. The thermostat sensor may not directly be exposed to extremely cold or hot air stream. To install an automatic day/ night temperature regulation you have to operate as described before.

The connection of a day/ night temperature regulation or of a room thermostat takes place at the connecting strip inside the control box (watch the circuit diagram inside the control box).

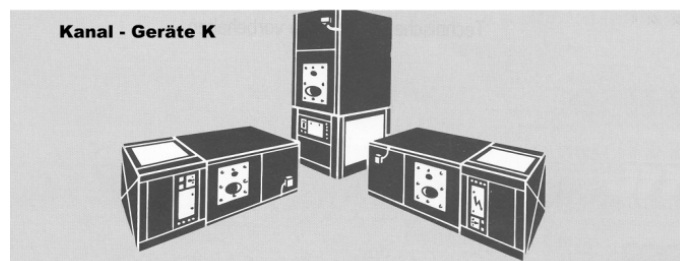
Connection of fan motor

The apparatus are wired completely in the factory. In case of changes or exchange of motors you have to care about the right motor connection. Doing this you always have to follow the separate attached valid circuit diagram, lying in the switch box. The start of the motors is factory adjusted till 3,0 kW directly in the Y, above 3,0 kW by a Y/Δ circuit.

Completely with suction components and plenum open to three sides; with drive, switch box, thermostat, totally wired.



Without suction and blow components for higher pressure with drive, switch box, thermostat, completely wired, lying or standing types



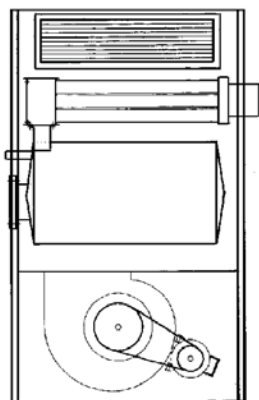
Volume	Type	Rated heating power	Air delivery	Efficiency motor
m ³		kW	m ³ /h	kW
1500-2350	95S	85	6800	0,75
2000-2900	110S	100	8000	1,10
2700-4100	140S	120	9200	1,10
3100-4700	170S	150	11800	2,20
3800-5700	195S	180	13800	1,50
4300-6400	260S	230	18400	3,00
5000-7500	290S	260	20600	3,00
6000-8900	360S	300	23400	5,50
7200-11000	430S	390	29500	5,50
9200-13000	490S	450	35000	7,50
10000-15000	580S	500	37500	5,50
10500-16000	650S	550	42600	7,50
11000-18000	730S	600	48300	11,00

Technical data 95 S - 195 S

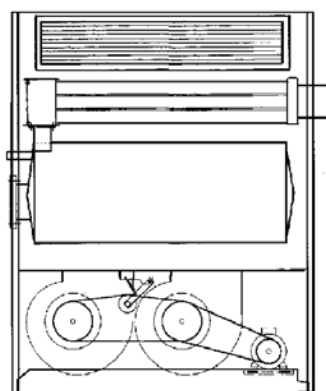


Warm air heater for oil- or gas firing, with plenum. Completely with suction components and plenum 210, open to three sides, with drive, integrated switch box, exhaust socket to the back, completely wired with drilled burner plate (inside the burner: extra price).

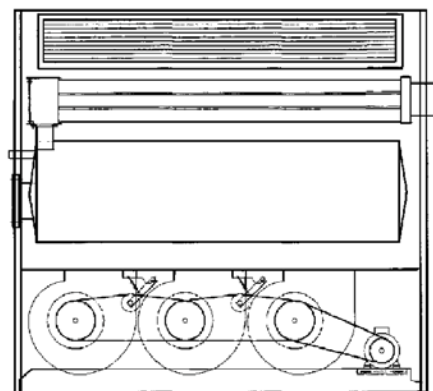
		95S	110S	140S	170S	195S	260S	290S
Rated heating power	Q_N [kW]	85	100	120	150	180	230	260
Rated heat load	Q_B [kW]	92	108	129	163	194	250	280
Rated air rate 20°C	V_N [m³/h]	6000	7000	8000	10300	12000	16000	18000
Hot air rate	V [m³/h]	6800	8000	9200	11800	13800	18400	20600
Temperature rise	Δt [K]	42	42	44	43	44	42	42
Exhaust temperature difference	Δt [K]	160	172	154	172	152	166	155
Efficiency of firing	η [%]	92,6	92,0	92,7	92,0	92,6	92,1	92,7
Chimney draught demand	[Pa]	0	0	0	0	0	0	0
On-resistance (combustion chamber)	[Pa]	23	38	25	44	108	155	112
Max. oil flow	[kg/h]	7,8	9,1	10,8	13,7	16,3	21	23,5
Max. gas flow	[m³/h]	8,8	9,6	12,4	15,7	18,6	24	26,9
Blower motor performance	[kW]	0,75	1,1	1,1	2,2	1,5	3,0	3,0
Outlet pressure	[Pa]	70	78	90	100	90	100	80
Noise level (without burner) standard type	[dB(A)]	62	65	67	70	68	71	71
Noise level oil burner	[dB(A)]	73	73	73	73	75	75	74
Noise level gas burner	[dB(A)]	72	72	75	75	75	75	73
Range of throw	[m]	28	30	28	31	30	32	30
Weight (without burner)	[kg]	295	300	399	405	495	503	662
Current type and voltage		3 Ph x 400 x 50						
CE - Ident-no. according to EU-gas units regulation		CE-0085-BM0299						
DVGW Reg.Nr./DIN Reg. Nr.		BMPi136985aPO/14027 22301						



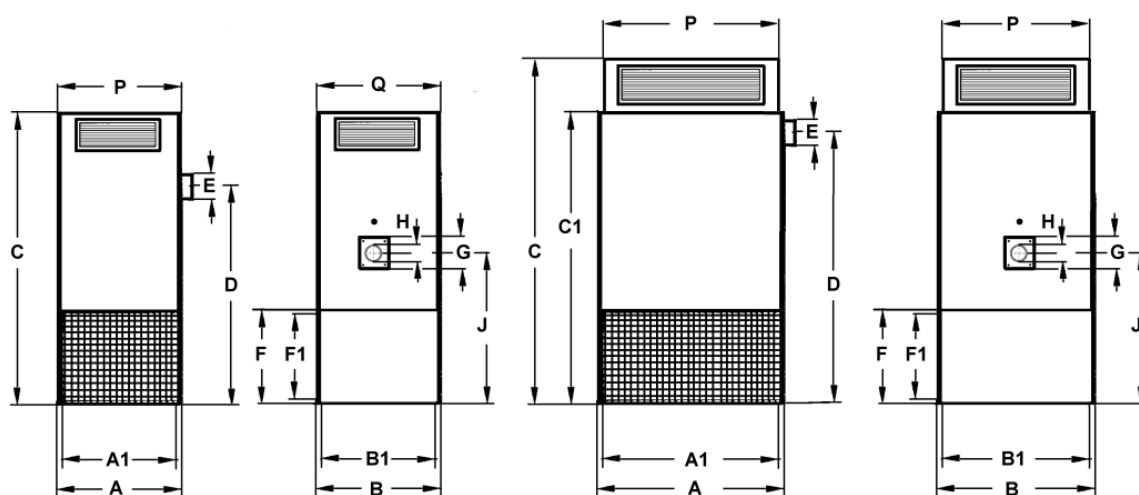
95 S - 110 S



140 S - 170 S



195 S - 360 S



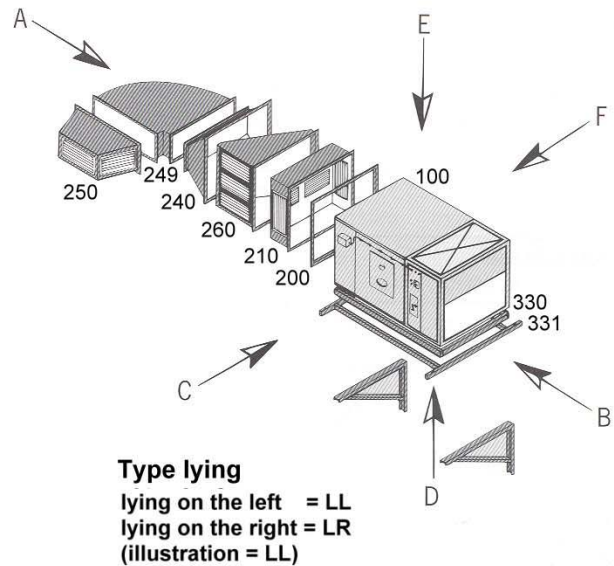
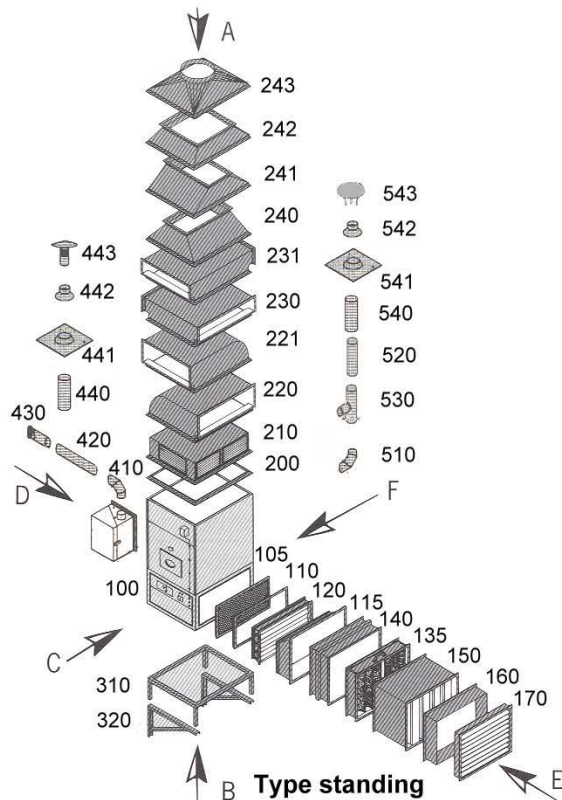
Type S	A	A1	B	B1	C	C1	D	E Ø	F	F1	G	H Ø	J	P	Q
95 - 110	1080	990	800	710	1850	-	1420	149	605	575	250	130	948	960	680
140 - 170	1250	1160	1025	935	2180	1780	1600	249	635	605	290	130	1029	1160	935
195 - 260	1750	1660	1025	935	2180	1780	1600	249	635	605	290	130	1029	1660	935
290 - 360	2200	2110	1025	935	2180	1780	1600	249	635	605	290	130	1029	2110	935
430 - 490	2200	2100	1220	1090	2645	2245	2020	299	800	770	330	160	1237	2100	1120
580 - 730	2700	2600	1220	1090	2745	2245	2020	299	800	770	330	160	1237	2600	1120

Dimensions in mm

Attachments



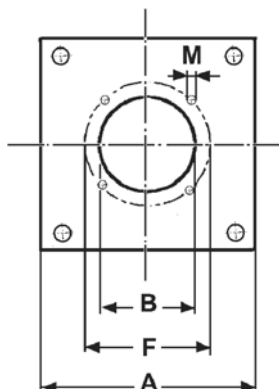
The air heaters for duct systems can be equipped or supplemented with the indicated attachments. The components are made of galvanised sheet metal.



1	Suction components	2	Blow components	3	Fixing elements	5	Exhaust-gas components
100	false cover		blow components 200 and 220 to 243 for connection to duct systems	310	stand frame	510	exhaust-gas elbow
105	suction grid (inserted in standard types according to air rate)	200	duct frame connection	320	wall console	520	exhaust-gas pipe
110	duct frame connection	210	standard plenum for direct blowing	330	base frame for floor	530	exhaust-gas cleaning tee
120	louver (at least necessary double-sided with automatic reversal)	219	plenum	331	base frame for ceiling suspension	540	roof connection
130	flat filter	220	plenum to the long side			541	roof plate
135	cassette filter	221	plenum to the front side	4	Air supply elements for burner	542	rosette
140	fire lid	230	tee-cowl to the long side	400	burner casing	543	rain bowl
150	silencer	231	tee-cowl to the front side	410	suction elbow		
160	wall socket	240	plenum to the top, long side	420	suction pipe		
170	weather-protective grid	241	plenum to the top, front side	430	suction parts with screen (wall duct)		
		242	plenum to the top, square	440	roof duct		
		243	plenum to the top, rounded	441	roof plate		
		249	elbow	442	rosette		
		250	blow-off head	443	rain bowl		

Burner plate

The bore holes for burner fixing are made in the middle of the burner plate and are predrilled corresponding to the following table. Other measures for diameter **B** and **F** only upon special request.



Measure (mm)	Type		
	95S - 110S	140S- 360S	430S - 730S
A2	250	290	330
B Ø	130	130	160
F Ø	150 + 170	150 + 170	226
M	M8	M8	M 10

Electric connection of the burner

Kroll Warm air heaters are designed in a way that usually every tested burner brand can be used. It is connected via a rapid assembly plug-and-socket connection (230 V 7-polar) which is attached to the warm air heater. A permanent wiring is made from 3~ 400 V burners on.

If burner is provided by customer, the connector plug (enclosed with each burner) for 230 V and for 400 V has to be installed according to circuit diagram.

If burner is provided by customer always indicate if it is with 230 V a.c. or with 400 V three-phase-motor and send valid circuit diagram. A fixed wiring takes place from burner type 3 ~ 400 V.

Fuel oil connection

A sufficient fuel supply has to be guaranteed.

The installation of the fuel oil supply has to be done by authorised experts according to the regulations for oil warm air heaters in your country.

You must specially pay attention that the cross section of the line will be designed for the complete line resistance, the suction height and an increased viscosity in case of lower temperatures.

If necessary a oil feeding aggregate has to be used.

The suction pipe has to be supplied with a foot valve in the tank head.

Attention !

If external temperature is low, enough free-flowing oil has to be at burners' disposal.

Gas connection

Corresponding to the units' requirements, the necessary gas quantity and gas pressure always have to be obeyed.

The installation of the gas connection has to be done by authorised experts after DIN 4756 or after DVGW-working sheet G 600 for gas fired warm air heaters, as well as the TRF for liquid gas.

Gas pressure regulation apparatus and stop cocks has to be prepared on the part of the builder.

The power cross section is designed on the base of gas connection, performance resistance and pre-pressure. Before initial operation gas lines have to be cleaned and checked.

Exhaust of combustion gas

The units have to be connected to an own chimney, steel or bricked. The chimney type has to be according to DIN 18160 part 1, the chimney measures according to DIN 4705 part 1 or part 2. For the optimum function of the fire place, the chimneys should be installed near the ridge and overlap this by minimum 0,5 meters. If amming velocity heads (e.g. by katabatic winds or because of buildings in the neighbourhood) are expected. In this case the dimension of the chimney should be correspond to this.

Chimneys out of steel will normally be approved as exceptional case, if there are no fire protection considerations. The DIN 1298 is valid for the exhaust gas tube-connectors between apparatus and chimney. The connectors should not be longer than 2 meters.

The exhaust gas connection has generally to be installed on approved chimneys.

The chimneys can be bricked or made of metal.

1. Checking the drive

Check fan direction of rotation, watch directional marker at fan box.
Check priming of driving belt.
Check if fixing bolts of complete drive are screwed up.

2. rated current – measure current consumption

To avoid incorrect measures, all provided suction- or blind sheets have to be mounted on apparatus and the grille screens in the air channel and in the blowing out hood have to be opened. The existing system voltage has to be checked.

a) Direct start

The measured rated current (ampere) may not exceed the value given on the motor type plate. Thermally adjust overload relay according to rated current of motor.

b) Y/Δ - start

The measured rated current (ampere) may not exceed the value given on the motor type plate. Multiply rated current of motor with factor 0,58 and the thermally adjust overload relay according to calculated value. To avoid errors of measurement, each phase should be measured separately.

3. Thermally overload relay

By removing a safety fuse the function of the overload relay or its control value can be checked. In orderly function resp. adjustment the relay should release after about 30 seconds.

4. When charging current consumption is too high

If the motor takes up too much current although the electrical connection is done orderly and the voltage supply is sufficient, the thermally over current release must not no account be set higher and it must not be bridged. For remedy the air suction and the air outlet (eventually duct compression) have to be checked. Remedial measures have to be taken.

First starting

The first starting of the unit and its blowpipe have to be done by the manufacturer or by another expert who is authorised by the manufacturer.

Doing this the function and the correct adjustment of all control, regulating- and safety devices have to be checked.

- Check all screws and nuts of the fan- and burner fastening are jammed tight.
- Check voltage of driving belt..
- If need be, open the out-blow grating and adjust it according to the requirement.
- Check the adjustments on triple combination regulator (burner 75° C, fan 45° C)
- Switch on the build-laterally main switch/ fuse
- Check fan direction of rotation (operating switch in position: "ventilation")
- Adjust room thermostats higher than actual room temperature.
- Open fuel supply
- Operating switch in position "heating".



CAUTION!

After the first 40 running hours in heating operation the screws of the cleaning cover at the radiator as well as the screws of the connecting flange between the combustion chamber and the heat exchanger have to be checked and, if need be, tighten up. Therefor the case cleaning cover above the burner has to be opened. This control has also be done at each regular service.

The fuel oil resp. the gas throughput (of a unit) has to be adjusted according to the thermal stress of the unit (watch unit type plate).

The burner has to be adjusted according to the producer's data to optimum values, but minimum to those of the "Bundes-Immissionsschutzgesetzes BImSchG.

The chimney draft has to be measured in cold and warm condition (watch also page 9).

To avoid (the danger of) falling below of the point condensation and (out of this) the resulting corrosion in the heat exchanger, the exhaust gas temperature-difference (Δt) from 160 Kelvin must not be fallen below.

The first start up must only be done by authorised personal.



A measuring report has to be done and handed over to the operator for keeping !

The operator has to be intimated with the unit !

Heating

- Switch on the build-laterally main switch/ fuse
- Open fuel supply
- Set operating switch in position "heating".
- Adjust room thermostats on wished room temperature.

In case of heat requirement, the blowpipe switches on itself automatically. The supply air fan won't be switched on until desired temperature has been reached. Doing this you avoid the out blow of cold air. Now the unit works fully automatic according to the desired room temperature.

Ventilation

Set operating switch in position: "ventilation"

Unit works as permanence ventilation. A thermostatic regulation is not possible

Turning off

Set operating switch in position: "0"

The supply air fan keeps running for cooling the heat exchanger. Until final turning off it can start up several times.



Never switch off the unit at the main- or emergency switch before the whole operating sequence of the re-cool phase (except in an emergency).

In case of a longer lasting interruption of operation, the build-laterally main switch resp. the fuse should be switched off after the turning off and the fuel supply should be shut off.

Dismount V-belt pulley

- Release the tension of the V-belt and take it off
- Turn out the inner-hexagon cap screw (watch figure 1)
- Tap a screw into the tapped hole of the socket and screw it up.
- The socket will be detached in tightening the screw.
- The loosen pulley can now be pulled off the shaft.

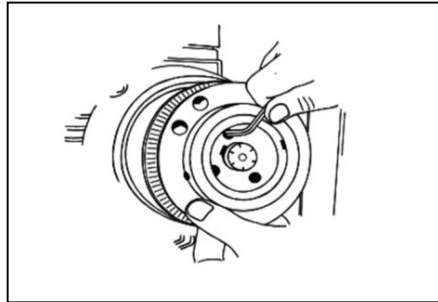


fig. 1

Mount V-belt pulley

- After cleaning and degreasing the pulleys and the socket will be set into each.
The holes must cover each other, then you can tap in the inner-hexagon cap screw.
- Push pulley and socket on the shaft and align them.
- Motor and fan pulley have to align exactly.
- The inner-hexagon cap screws are tightened at the same time (fig. 2).

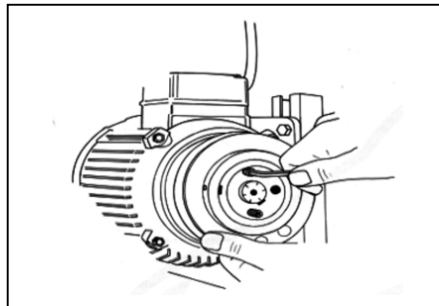
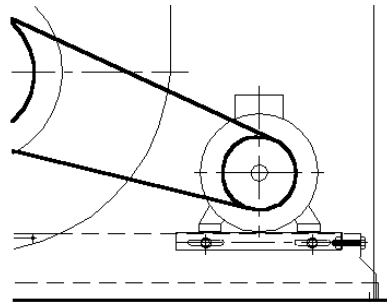


fig. 2

Before initial start up, as well as in regular intervals and at the services, the V-belt' s situation and its tight fit . Eventually the V-belt has to be adjusted resp. exchanged.

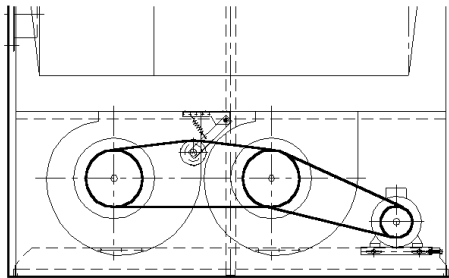
1.) Adjustment of V-belt between motor and fan

- Loosen the 4 screws at the side a bit (A), but do not screw them out totally.
- Pull the Motor saddle with both screws at the front side (B) away from the fan. Doing this, the V-belt will be stretched.
- Tighten up gain the screws at the side (A).



2.) Adjustment of V-belt between the fans

- The V-belt will be tensioned automatically with a drive belt (C).
- When required engage the spring into another hole.



Assembly of suck and pressure side accessories



1.) Attachment of conduit (pressure side)

The attachment of pressure side accessories has to be done by self-tapping screws in the top unit edge. A jointing ring has to be put between the accessory and the unit.

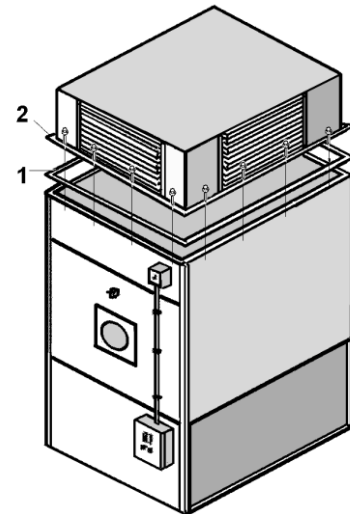
2.) Attachment of suck side accessories

Assembly of accessories

1. Lay the jointing ring between bonnet and unit (1)
2. Fix the bonnet at the case frame with self-tapping screws (2), e. c. 5,5 x 19 mm).

A fixing in the edges is not possible.

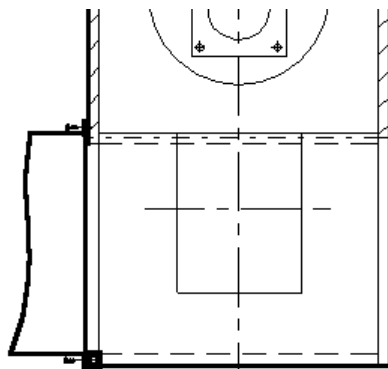
The fixing of the accessories has to be done identically



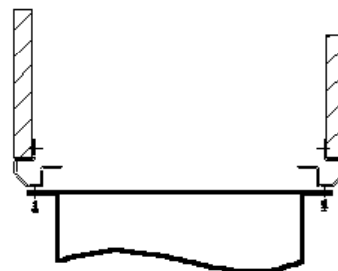
The attachment of suck side ordered accessories has to be done by self-tapped screws in the unit edges (put on).

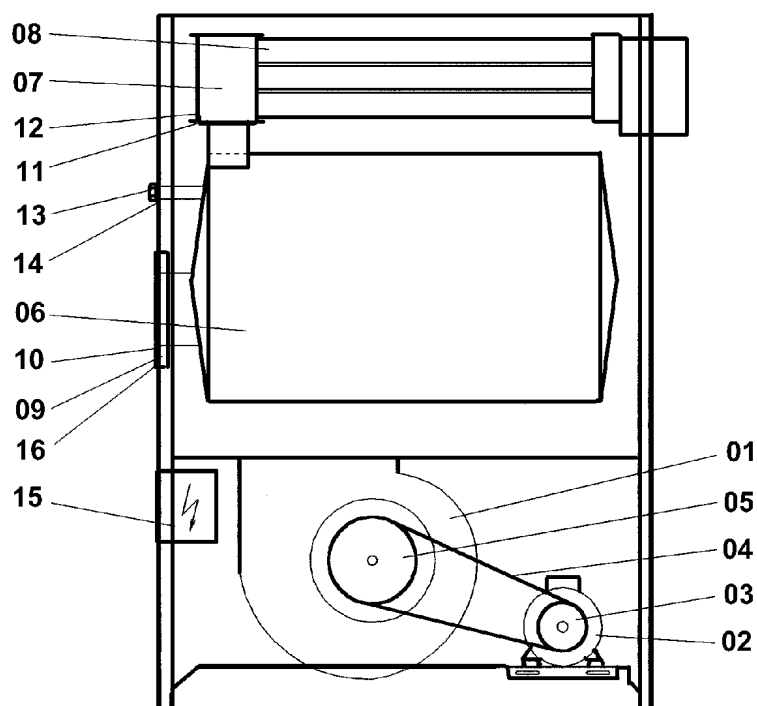
Between the accessory and the unit you have to lay a jointing ring

View

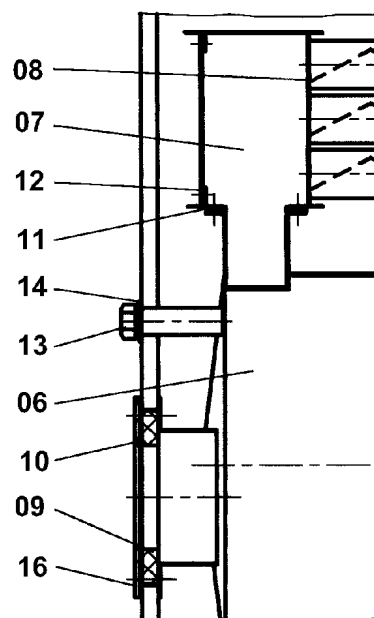


View on top

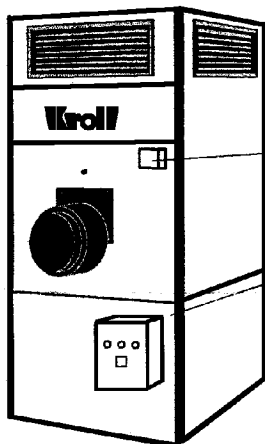




- 01 Ventilator
- 02 Driving motor
- 03 Motor pulley
- 04 V-belt
- 05 Fan pulley
- 06 Combustion chamber
- 07 Heat exchanger
- 08 Exhaust-gas whirls
- 09 Seal for combustion chamber
- 10 Seal for burner plate
- 11 Seal for heat exchanger
- 12 Seal - cleaning cap
- 13 Socket for sight glass
- 14 Seal sight glass
- 15 Thermostat
- 16 Burner plate



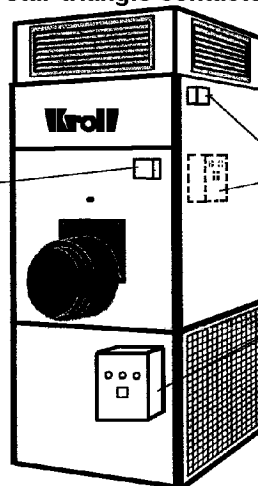
Standard switch box up to 3 kW motor performance



Three-way
safety thermostat

Switch box placed
at the appliance

Standard switch box up to 4 kW motor performance star-triangle-contactor-combination



alternativ

Switch box placed
at the appliance

For motor performances up to 3,0 kW the switch box is mounted to the unit. Type with selector switch „heat - zero - ventilate“. Thermostat is mounted to the unit separately at the front or long side.

From October 2001 on, the three separate thermostats will be mounted with the switch box. If filter control is necessary, external thermostats will be used due to space saving.

For motor performances from 4,0 kW on, the switch box is always mounted outside to the unit, front or long side.

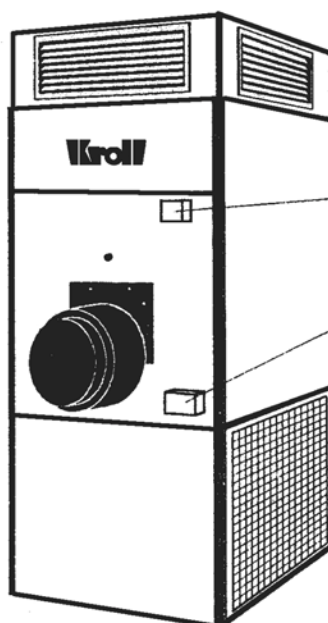
This type also has selector switch „heat - zero - ventilate“. Thermostat also always mounted outside to the unit, front or long side

Switch Box

To choose separate – for extra charge

Upon request and for extra price the switch box can also be delivered for wall-mounting.

In this case an additional clamp box will be installed and wired at the unit. Specific switch boxes of each kind upon request for special price



Three-way thermostat

Clamp box
Switch box separate



in accordance with CE - Directive

EG - Richtlinie	89/392/EWG	directive for machines
	91/368/EWG	gas consuming appliances
EG - Richtlinie	73/23/EWG	Low tension directive
EG - Richtlinie	89/336/EWG	EMC-directive
EG - Richtlinie	90/396/EWG	gas consuming appliances

Construction of the device

S95, S110, S140, S170, S195, S225, S260, S290, S360, S430, S490, S580, S650, S730

Product-ID-Nr. CE-0085BM0299

We herewith declare, that the below mentioned machines correspond, on the base of their conception and their type of construction in the version brought into the market through our company, to the relevant basic security restrictions of the EC.

In case of any modification of the device that has not been agreed with us, this declaration becomes void.

The following norms are applicated: **DIN 4794, part 1 + 3 (edition 12.1980)**

A technical documentation is completely at hand.

Kirchberg/Murr, den 15. Oktober 2002

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Peter Scheuer

Geschäftsführer / Director / Directeur