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1. Description

The combustion burners Types BR600 – BR1000 are oil heated pressure flow heaters, designed as a strictly regulated modular system. All the basic types BR600, BR750, BR900 and BR1000 have the same basic design and assemblies. The only differences are the different construction heights of heating coils and casings.

This system allows a large range of varieties. The varieties can easily be adjusted according to the required application.

2. Assemblies

The combustion chambers mainly consist of the following assemblies: (See also exploded view page 8)

Burner Type B90 (See also exploded view page 12)

The BR series of vertical burners have proven themselves over the years and the design is applied unchanged for all types of combustion chambers. The different capacities are achieved by the fitting of fuel nozzles with different flow rates and corresponding changes in air flow.

Heating coil (See also exploded view page 8, Pos.37)

An efficient high capacity is achieved by using double wound heating coils. Their tube wall thickness is strongly over dimensioned, so that normally a long lifetime is guaranteed. Almost all applications can be covered due to the large range of varieties:

Material: steel, stainless steel 1.4301 and 1.4571
 Dimensions: 3/8" and 1/2"
 Range of pressure: up to 700 bar

Casing (See also exploded view page 8, P. 35 + 36)

Between the inner and the outer casing is an integrated ventilator housing building a ring gap.

Through this ring gap the burner is provided with combustion air. The following advantages arise from this method:

- The outer casing is cooled.
- The combustion air is preheated.
- Due to the double casing the construction is very stable and extremely rigid.
 Galvanized, powder coated steel sheet and stainless steel 1.4301 are the available materials.

Ventilator motor, ventilator fan and oil pump are the next assembly. (page 8, P. 22, 20 and 24).

A solenoid valve controls the oil supply of the burner thermostatically. Normally a delta fuel pump with integrated solenoid valve is installed. An SP-pump with separate magnetic valve can be supplied on request.

The combustion chamber is formed by an extremely heat resistant tube reaching deeply into the flame area. This prevents the still cold heating coil being sprayed by unburned oil during the start period, thus reducing distortion of the heating coil.

The insulation plate (page 8, P. 34) made from oxide ceramic prevents the combustion chamber from burning out. It absorbs unburned sprayed heating oil as well as condensation water. During operation of the burner it will evaporate immediately. The insulating plate will not be damaged by these procedures.

The safety device consists of:

Switch box with switch elements (P. 8, Pos. 19 + S. 16), Temperature limiting safety device (P. 8, Pos. 5 + P.13, Pos.10)
Flame control (P. 13, Pos. 18), Adjustable thermostat (P. 13 Pos. 20), Safety valve (P. 8 Pos. 30),
Flow switch (P. 8 Pos. 29) and manometric switch (P. 8 Pos. 31).

These safety devices guarantee the safe operation of the burner and regulate the desired water temperature.

The ignition transformer (P. 8, Pos. 18) with 20 mA secondary current ensures high ignition capacity and thus a safe start even under unfavourable conditions. It is mounted outside the switch box either on the outer casing or at the switch box support to achieve better heat dissipation and moisture exclusion.

3. Definition and application

The BR series of burners have been designed to provide almost instant heating of water under pressure. The water may be mixed with cleaning chemicals. However, in this case special attention has to be paid to the choice of material for the wetted parts and if the chemicals are corrosive, a stainless steel coil material 1.4201 is recommended to be ordered.

The areas of application are primarily in cleaning applications for example:

- Car washing in the automobile section,
- Cleaning of façades (among others: removal of graffiti),
- Floor cleaning (among others: removal of bubble gums),
- Renovation of buildings and ships,
- Cleaning of food production areas, abattoirs, sterilisation, etc.

4. Recommendations for installation

Mobile installation

Installation sites which are permanently under surveillance do not need a flame control. However, burners used in these installations have to be provided with a permanent ignition spark. This applies particularly to mobile machines.

Stationary installation

Those installations which are not under permanent surveillance necessarily require a flame control.

Range of pressure

Low pressure range 4 – 20 bar

The normally fitted manometric/pressure switch has a shift point of 20 bar. For use in a low pressure range this switch is not necessary and has either to be by-passed or to be removed. For low pressure use, the heating coil should be of 1/2" tubing. Thus the production of steam bulbs which might lead to premature coil failure is avoided.

High pressure range 20 bar and above

Here mainly the 3/8"- heating coils are used, though the 1/2"- heating coils can be installed up to 200 bar depending on the desired flow rates.

Safety valve (P. 8 Pos. 30)

The operator should never adjust the safety valve.

Before putting into operation the installer should adjust the safety valve as follows:

1. Bring the machine to the required operating pressure.
2. Loosen the lock nut (the upper nut from the two nuts above the pressure spring).
Loosen the lower of the two nuts by turning slowly to the left until drops come out at the angled bush (P. 8 Pos. 28).
3. Close the nut again until water is no longer dripping out.
4. Then make another half turn to the right and lock the nut by tightening the upper nut tightly against the lower nut.

Wrongly adjusted safety valves may lead to bursted heating coils and hoses as well as danger to the operators.

Installation of the combustion chambers in closed machines or areas.

The following points should always be considered.

- The combustion chamber has to be installed in such a manner that the maintenance of the burner can be carried out at any time without having to remove parts of the machine or the chimney.
- Air damper (page 8, item 21) and oil pump (page 8, item 24) must be accessible for adjustment.
Enough space should be available to install and read an oil pressure gauge.
- The perforated air intake side of the ventilator housing may not be covered; otherwise the lack of air leads to building up of soot inside the burner.
- The installation and removal of the combustion chamber should easily be possible (to enable general cleaning and the exchange of the heating coil).
- In closed areas one has to make sure that sufficient additional ventilation is available.
- The heat emission of pumps, motors, transformers and the combustion chamber has to be removed by the appropriate ventilator devices.

Exhaust gas control

The German regulations LBauO / FeuVO have to be considered. Please refer to the appropriate authorities during planning. The clear opening and height of the exhaust systems have to be sized in such a way that the exhaust air will vent into the open air during all expected operating conditions. There has to be a permanent vacuum of at least 0.5 mbar with respect to the surrounding rooms.

We recommend a chimney diameter of at least 200 mm.

See also diagram for determination of the chimney diameter on page 18!

Connecting piece for the connection of the chimney see page 18!

The mouth of the chimney has to be at least 40 cm above the roofridge or at least 1m away from the roof surface.

The burner must be fitted with a flame monitor.

The chimney connecting pipe, page 18, makes the chimney connection easier.

The connecting pipe is available either in open or in closed type. However, the open type makes the starting procedure easier. Please refer to page 18 for examples of some of the connectins available.

When connecting more than one combustion chamber to one chimney please seek expert advice.

Installation rooms and additional air control (German regulations LBauO / FeuVO have to be considered).

Fireplaces with a total heat capacity of more than 50 KW may only be installed in rooms, which are not being used in any other way. The only exception is the simultaneous installation of heating pumps, engine-based cogenerators and internal combustion engines.

The heating rooms must have a volume of at least 8m³ and a height of 2 m.

There has to be at least one exit to the open air or to a floor. For the ventilation of the room an upper and a lower opening for fresh air has to be installed. These openings must have the following dimensions:

For 50 KW –cross section of the opening 300 cm² each + 2.5 cm² for every further KW.

Alternatively outside air suction can be carried out by means of a pipe system.

A suitable ventilator joint is available from the TEHA accessories range.

The nominal diameter of the tube shall be Ø ≥110 mm. In case of danger of frost a motor driven lid is recommended.

This lid should be coupled with the burner control in such a way that the burner cannot be startet, if the lid is closed.

Special attention has to be paid to the fact that the burner ventilator should not suck in its own or foreign exhaust gases. The same applies to dust of all kinds, like for example wheel swarf and lacquer dust in production areas in industry and in workshops. The following are just two problems likely to be caused by excessive dust in the intake air:

1. The dust particles are polluting the baffle plate, leading to malfunction of the burner.
2. The dust particles will secrete on the heating coil and the inner casing and thus causing corrosion.

Oil pump and fuel filter

The fuel supply should be carried out by means of two caoutchouc hoses reinforced by metal tissue via a two strand fuel filter. The operator has to mount the fuel filter on the machine.

Attention! The oil pump must always be protected against running dry or being left idle for long periods.

Calcareous water

A decalcifying device has to be installed in case the machine is being operated with calcareous water with a high calcium or mineral content. The coil might clog irreparably within short notice if the water is extremely calcareous.

5. Service and maintenance

All maintenance should be carried out by well trained professionals only.

Maintenance is necessary every half a year even in light duty operation. For the burner Type BR750 the maintenance rate of 500 operating hours should be maintained. This figure may vary up or down depending on the operating conditions.

Burners without difusor should be controlled every 400 operating hours. If necessary, it should be cleaned.

Mixing device, (page 8, P. 3 and page 12)

Remove the spark plug sockets (P. 12, Pos.13) Loosen the connection of the fuel tube (P. 12, Pos.12), Loosen the 3 fastening screws (P. 8, Pos. 2) Carefully pull out the entire mixing device (P. 8, Pos. 3), Loosen the fastening screw (P. 12, Pos. 9) and pull off the centering device (P. 12, Pos. 5) together with the igniting electrodes (P. 12, Pos. 8). Thoroughly clean all pieces. Replace nozzle (P. 12, Pos. 6) and igniting electrodes (P. 12, Pos. 8) with new ones, if necessary. Re-assemble everything in reverse order. Adjust igniting electrodes as shown in drawing MIEIRI/3 (P. 15).

The adjustment of the burner is aimed to achieve the best possible exhaust values, with high effectivity and good ignition behaviour. The following measured values with the recommended limiting values serve as a guide:

Exhaust gas temperature:	< 220 °C
CO ₂ - value:	> 11%
Smoke appearance:	<= 1
Oil pressure:	9 – 11 bar

The following possibilities exist to influence these values:

5.2.1 Changing the quantity of the primary air shifting the air damper (P. 8, Pos. 21)

Air damper upward means more air, air damper downward means less air.

5.2.2 Changing the quantity of the secondary air by shifting the nozzle tube (P. 12, Pos.11)

and (P. 13) This is how the ring gap between the baffle plate and the flame tube is changed. This leads to a change of the distribution of the air quantities between the baffle plate on the one hand and the ring gap on the other hand.

Attention! Act very sensitively: the smallest movement shows its effect.

5.2.3 Changing the pump pressure.

On the lid of the housing of the oil pump (page 8, item 24) a slotted screw with the indication „P“ can be found. Unscrew the screw and install a suitable oil pressure gauge. The oil pressure is changed by means of the hexagon socket screw sited at the lower side of the pump housing. Turning to the right produces more pressure, turning to the left produces less pressure.

5.2.4 Adjustment of the regulating devices, 5.2, Pos. 1–3, leads to the following changes:

- | | |
|------------------------------------|---|
| 1) more air: | better smoke appearance
lower CO ₂ – value
higher exhaust gas temperature
worse ignition behaviour |
| 2) pulling out of the nozzle tube: | better smoke appearance
lower CO ₂ – value
better ignition behaviour |
| 3) higher oil pressure: | worse smoke appearance
higher CO ₂ – value
higher exhaust gas temperature
worse ignition behaviour
better heating capacity |

By changing the values a compromise has to be found which produce the best possible performance.

Inspection of the burner chamber

Remove the mixing device as described under item 5.1.

Remove outer lid (P. 8, Pos. 6) Pull out the inner lid (P. 8, Pos. 7) with flame tube, inner tube and chimney and remove possible soot accumulation. Now the inner part of the heating coil can be reached and examined by means of an exterior source of light (a torch e.g.).

Small layers of soot and corrosion can be loosened by using a scratch brush and removed by using a vacuum cleaner. (Attention: Avoid damaging the insulating plate (P. 8, Pos. 34))

Spray the entire heating coil with soot spray as completely as possible before re-assembly. After correct adjustment of the burner the soot will burn out, however be prepared for some excessive smoke while the burner clears this soot.

Defective heating coil (entirely sooted, entirely calcified, damaged by frost, excessive pressure or faulty material)

The replacement of the heating coil requires the removal of the entire combustion chamber.

Having removed the combustion chamber the procedure is as follows:

Remove the mixing device as described under item 5.1.

Remove the outer and the inner lid as described under item 5.3.

Turn the combustion chamber from its vertical axis for 180° and place it with its heating coil on a cylinder with diameter Ø 270mm x height 200 mm (approx. measurements).

Remove 2 brass nuts (P. 8, Pos. 25) Pull off the outer casing upward (P. 8, Pos. 35) Remove 2 spacer tubes (P. 8, Pos. 33)

Pull off the inner casing upward (P. 8, Pos. 36) Remove remainder of the insulating plate (P. 8, Pos. 34)

Place the new heating coil onto the assistant cylinder. Re-assemble in reverse order.

A new insulating plate absolutely has to be used and make sure that the spacer tubes are not forgotten (P. 8, Pos. 33) + (P. 8, Pos. 38)

Fuel Filter

- The filter cartridge should be exchanged at least every year or more often depending on use and quality of fuel.
- The delta fuel pump has a fuel strainer located behind the lid of the housing. Every year the cover of the housing has to be removed by loosening the 4 fastening screws and the fuel strainer has to be cleaned with either cleaning petrol or compressed air.
- The fuel tubing has to be checked for leaks.

6. Safety Notice

Service and repairs should only be carried out by trained professionals.

Stationary installations (see also 4.1.2!) always have to be equipped with a flame control system. Otherwise the flame might stop or start off unnoticed. If the flame stops, unburned oil may continue to be injected and the leaking oil may cause severe damage. In the worst case this might lead to detonations or explosions with damage by fire and/or injuries of the personnel.

For low pressure range use the heating coil should be ½" tubing.

It has to be made sure that the minimum flow pressure of the water is 4 bars.

Otherwise steam bubbles may build up inside the heating coil, which leads to an intermittent flow. In case of breakdown of the over temperature relay the combustion chamber may burn out possibly resulting in fire damages and/or injuries of the operator or on looking personnel.

The safety valve always has to be adjusted precisely to the operating pressure (see 4.3!). Pressure peaks caused by switching impulses or choked nozzles will not be relieved by an improperly adjusted valve, and this may cause the heating coil or valves to burst. In the worst case this may lead to serious injuries to the operator or adjacent personnel.

Make sure that the exhaust gas and the additional air venting is appropriate (see 4.5 + 4.6!).

Exhaust gas conduits which are not properly fitted or not sufficiently dimensioned as well as insufficient additional air conduits may cause damage to buildings and in the worst case cause injuries to persons.

7. Warranty

The machines will be delivered in the following construction specifications as ordered:

7.1 Machines without control system and without safety devices.

7.2 Machines for mobile use with control system and safety device, but without flame control.

7.3 Machines for stationary use with control system, safety device and flame control.

If supplied as under item 7.1 the customer will install the control system and safety devices as appropriate. The manufacturer does not have any control over the safety devices fitted, neither can the manufacturer take over liability for defects or damages resulting from non-existent, faulty or non-expert executed control systems and safety devices. For the basic machine the legal one-year warranty is valid.

If supplied as described under items 7.2 and 7.3 the factory will deliver the machines ready for operation.

The manufacturer has no control over the proper installation (adjustment of the safety valves, correct conduit of the additional air and the exhaust gas).

The manufacturer cannot assume liability for defects or damages resulting from non-expert installation. Otherwise the legal one-year-warranty is valid in case of correct installation.

In case the product is resold by the dealer from his store after a longer storage period, the one-year-warranty will be extended only, if the final customer returns to us a copie of the invoice. The manufacturer's liability is not valid, if the user does not follow the directions for mounting and operation and uses spare parts that are not covered by warranty.

In all other cases our general conditions for sale and supply shall apply.

Technical Data

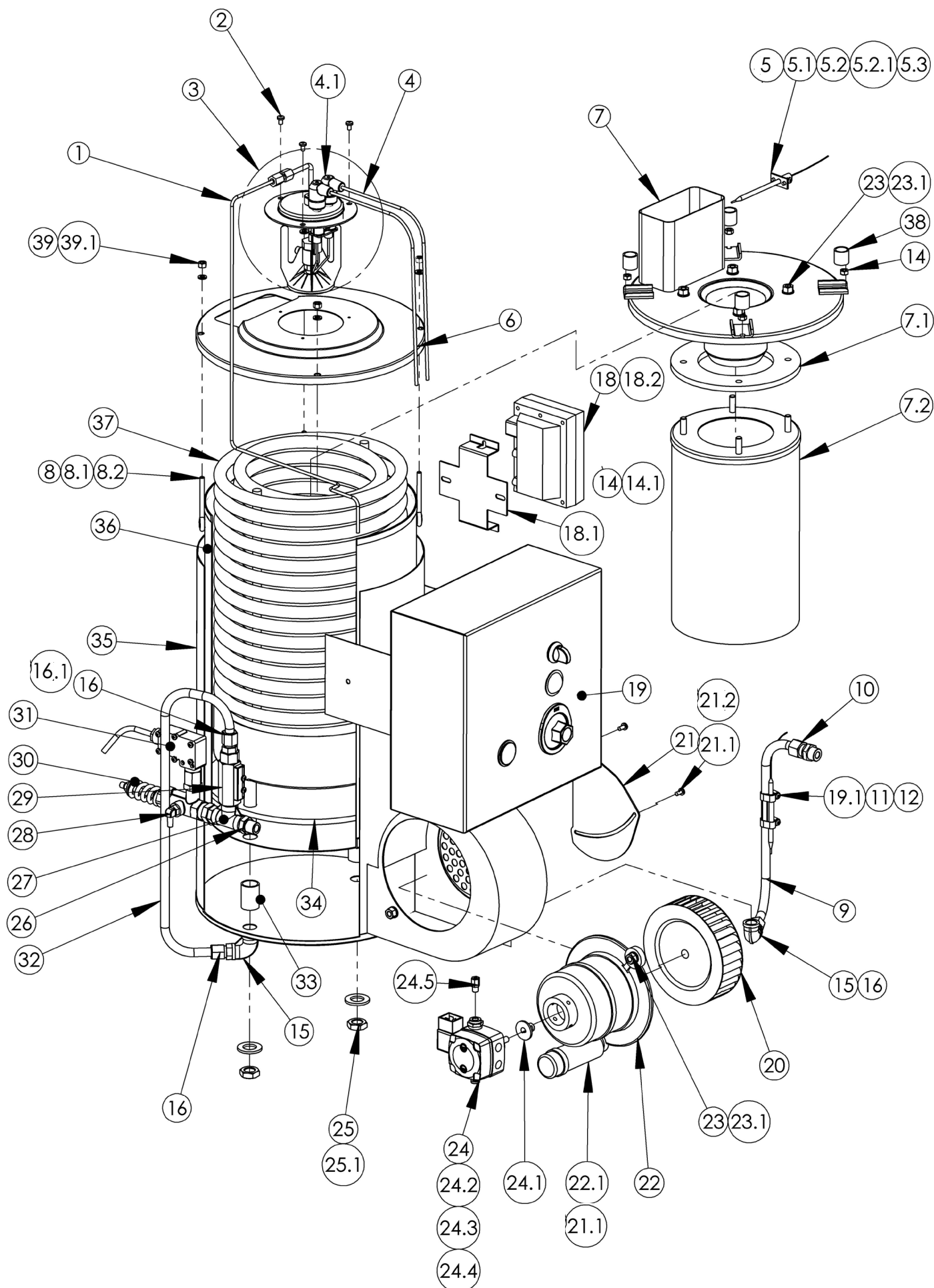
Type	BR 600	BR 750	BR 900	BR 1000
Nominal capacity [KW]	40	58	63	72
Combustion efficiency	88%			
Loss of exhaust gas	10 - 12 %			
Max. exhaust gas temperature	230°C			215°C
Measurements BxWxH [mm]	425x560x535	425x560x625	425x560x710	425x560x810
Weight with 3/8" heating coil [kg]	46,5	49,5	73	76,6
Voltage / frequency	230 V / 50 Hz alt. 110 V / 50 Hz			
Max. operating temperature	95 °C			
Max. operating pressure	see table heating coils!			
Oil pressure [bar]	10	10	11	11
Heating coil - For details see table coils!	H260	H275	H290	H310

The weight of the safety device is 8,8 kg and has to be added to the above mentioned weights.

Technical data for possible variations of heating coils

Type	Material	Nominal-width [mm]	Capacity [KW]	max. pressure [bar]	Tube size [mm]	Joint-thread	Tube-length [m]	Contents of the heating coil
BR600	St35.8	3/8"	40	300	17,2 x 2,9	G3/8"	23	2,35
	St35.8	3/8"	40	400	17,2 x 3,2	G3/8"	23	2,10
	Stainless steel 304	3/8"	40	200	17,2 x 2,0	G3/8"	23	5,15
	St35.8	1/2"	40	200	21,3 x 2,65	G1/2"	20	4,62
BR750	St35.8	3/8"	58	300	17,2 x 2,9	G3/8"	28	2,85
	St35.8	3/8"	58	400	17,2 x 3,2	G3/8"	28	2,56
	Stainless steel 304	3/8"	58	200	17,2 x 2,0	G3/8"	28	3,84
	St35.8	1/2"	58	200	21,3 x 2,65	G1/2"	24	4,82
BR900	St35.8	3/8"	63	300	17,2 x 2,9	G3/8"	34	3,46
	St35.8	3/8"	63	400	17,2 x 3,2	G3/8"	34	3,11
	St52.4	3/8"	63	700	18 x 5	G3/8"	34	1,7
	Stainless steel 304	3/8"	63	200	17,2 x 2,0	G3/8"	34	4,65
	Stainless steel 316	3/8"	63	400	17,2 x 3,2	G3/8"	34	3,11
	St35.8	1/2"	63	200	21,3 x 2,65	G1/2"	28	5,62
BR1000	St35.8	3/8"	72	300	17,2 x 2,9	G3/8"	39	3,97
	St35.8	3/8"	72	400	17,2 x 3,2	G3/8"	39	3,57
	St52.4	3/8"	72	700	18 x 5	G3/8"	39	1,96
	Stainless steel 304	3/8"	72	200	17,2 x 2,0	G3/8"	39	5,34
	Stainless steel 316	3/8"	72	400	17,2 x 3,2	G3/8"	39	3,57
	St35.8	1/2"	72	200	21,3 x 2,65	G1/2"	32	6,43
	Stainless steel 304	1/2"	72	200	21,3 x 2,66	G1/2"	32	6,43

Notice: The nominal capacity may vary by $\pm 15\%$ due to tolerances of the nozzle and the manufacturing process.



List of spare parts for oil heated combustion chamber Types BR600/3 - 1000/3,
110 and 230 V, vertical, all variations upto 700 bar, application as of June 01, 2003

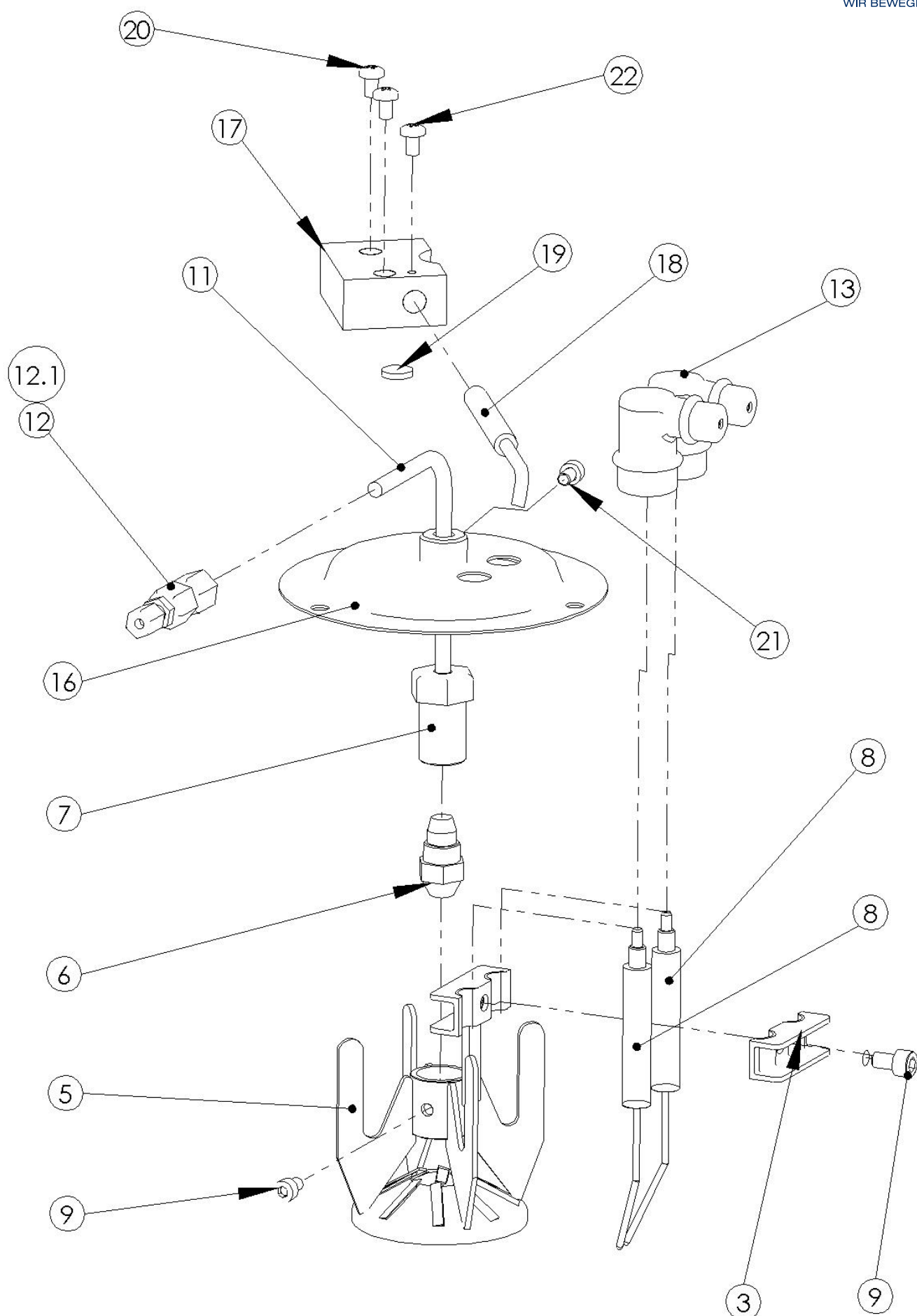
Pos.	Code-No.	Pieces	Description
1	B10400092	1	Fuel tube BR600, copper
	B1040006901	1	Fuel tube BR750, copper
	B10400236	1	Fuel tube BR900, copper
	B10400237	1	Fuel tube BR1000, copper
2	E10400229	3	Fastening screw 4,2x13, galvanised
3	B10400169	1	Mixing device, complete, see separate list of parts, without fotocell
4	E10400155-2	2	Ignition cable with connector plug for transformer, 1100 mm long
4.1	E10400091-1	2	Spark plug socket with rubber caps
5	E10400657-3	1	Temperature limiting safety device, flue gas sensor
5.1	B10400104	1	Support for flue gas sensor
5.2	E10710025	2	Oval head screw M5x8 VA
5.2.1	E10700066	2	Hexagon nut M5 VA
5.3	E10440074	1	Oval head screw M4x6 VA
6	B10400059-1	1	Outer lid, red RAL3000
	B1040005902-1	1	Outer lid, stainless steel
7	B10400058-2	1	Inner lid, chimney, flame tube, insulating plate
7.1	E10400763	1	Insulating plate for inner tube Drm 181 (belongs to 7)
7.2	B10400077	1	Inner tube, BR600
	B10400096	1	Inner tube, BR750
	B10400096-1	1	Inner tube, BR900 and BR1000
8	B10400201	4	Eyebolt, complete.8 with countersunk bolt., washer, nut
8.1	E10400252-2	4	Eyebolt M6x50, galvanised
8.2	E10400769	4	Countersunk bolt M6x10, galvanised
9	B10400251	1	Water outlet 3/8" up to 400bar, Ermeto tube, galvanised
	B10400314	1	Water outlet 1/2" up to 200bar, Ermeto tube, galvanised
10	E10460003	1	Connector GAI 12 PLR, straight, 3/8"-i-12, galvanised
	E10440049	1	Connector GAI 18 PLR, straight, 1/2"-i-18, galvanised
11	E1040020601	2	Hose clamp, Drm 12-22 mm, galvanised
12	B10440037-10	1	Split taper socket for thermal sensor, 3/8", copper
	B10440037-12	1	Split taper socket for thermal sensor, 1/2", copper
14	E10400126	2	Fastening nut M6, galvanised
14.1	E10400197	2	Washer 6,6, galvanised
15	E10460003-1	2	Connector GAI 12 LRCFX, galvanised
	E1044004901	2	Connector GAI 18 LRCFX, galvanised
16	E10850093	2	Connector EW 12 LCF, angle galvanised
	E10850060	2	Connector EW 18 LCF, angle, galvanised
16.1	E1046000201	1	Connector GE 12 PLR ED, galvanised
	E10850003	1	Connector GE 18 PLR ED, galvanised
18	E10400014-3	1	Ignition transformer, 20 mA 100% ED, 230V, 50/60Hz
	E10400013	1	Ignition transformer, 20 mA 100% ED, 110V, 50/60Hz
18.1	B1040008501	1	Transformer support, galvanised
18.2	E10400014-3-1	1	Connecting cable with plug for transformer, 1500 mm long
19	B10400253	1	Switch box, complete (see page 9)

Pos.	Art.-Nr.	Stück	Bezeichnung
20	E10400742	1	Ventilating wheel 160x62, left
21	B10400070-1	1	Adjustable damper for air, convex, galvansied
21.1	E10400229	2	Fastening screw 4,2x13, galvanised
21.2	E10400831	5	Washer 12, galvanised
22	E10400246-01	1	Ventilating motor 230V, 50Hz, 150W
	E10400143-01	1	Ventilating motor 110V, 50/60Hz, 150W
22.1	B10400317	1	Capacitor for 230 V- Motor, galvanised
23	E10400101	2	Washer 8,4, galvanised
23.1	E10400102	2	Fastening nut M8, galvanised
24	E10400810	1	Oil pump, Delta 230V (Alu) with solenoid valve, coil and cable 700 mm
	E10400811	1	Oil pump, Delta 110V (Alu) with solenoid valve, coil and cable 700 mm
24.1	E10400326	1	Coupling, diameter 8 mm, palstic
24.2	E10400458	1	Solenoid valve coil, Delta – pump 230V until 30.09.2004
	E10400459	1	Solenoid valve coil, Delta – pump 110V until 30.09.2004
	E10400529	1	Solenoid valve coil, Delta – pump 24V until 30.09.2004
	E10400458-2	1	Solenoid valve coil, Delta – pump 230V since 01.10.2004
	E10400459-1	1	Solenoid valve coil, Delta – pump 110V since 01.10.2004
	E1040052905	1	Solenoid valve coil, Delta – pump 24V since 01.10.2004
24.4	E10400061	1	Joint cable, solenoid valve, 1050 mm
	E10400061-1	1	Joint cable, solenoid valve, 700 mm
			alternatively the following SP-pump
24.1	E10400002	1	Oil burner pump, SP
24.1	E10400325	1	Plug-in coupling, SP - pump, DN 6
24.2	E10400330	1	Filter, SP - pump (spare part SP-pump)
24.3	E10400527	1	Filter housing, SP - pump (spare part SP-pump)
24.4	E104000601	1	Solenoid valve, 230V, 50Hz, SP Pump
	E10400506		Solenoid valve, 110V, 50Hz, SP Pump
	E10400048	1	Solenoid valve coil, 230V, 50Hz, SP Pump
24.5	E10400042		Connector GE 04 LLR, 1/8“, galvanised
25	E10400245	2	Brass-nut flat 3/8“
	E10400489	2	Brass-nut flat 1/2“
25.1	E10400133	2	Washer 17, galvanised, 3/8“
	E10720009	2	Washer 25, galvanised, 1/2“
26	E10400199	2	Double nipple, 3/8“, OT-OT, galvanised
	E10710063	2	Double nipple, 1/2“, OT-OT, galvanised
27	E10460022	1	T-piece, 3/8“, IT-IT, stainless steel
	E10450012	1	T-piece, 1/2“, IT-IT, stainless steel
28	E10400147	1	Angular joint, Polyamid
29	E104500021	1	Flow switch RMU-B12, G 3/8“
	E104500611	1	Flow switch RMU-B12, G 1/2“
30	E10400009	1	Safety valve, 250bar
	E104000091	1	Safety valve, 500bar
31	E10400558	1	Pressure switch, 1/4“, 300bar
	E10400581	1	Pressure switch, 1/4“, 600 bar
32	B10400252	1	Water inlet 3/8“ up to 400bar, Ermeto tube galvanised

Pos.	Art.-Nr.	Stück	Bezeichnung
32	B10400314	1	Water inlet 1/2" up to 200bar, Ermeto tube, galvanised
33	E10400057	2	Spacer
34	E10400166	1	Oxydceramic disk, Ø290 x 8, 2 holes
35	B10400202	1	Outer casing BR600, 3/8", galvanised, powder coated, RAL9005
	B10400203	1	Outer casing BR750, 3/8", galvanised, powder coated, RAL9005
	B10400203-1	1	Outer casing BR750, 1/2", galvanised, powder coated, RAL9005
	B10400205	1	Outer casing BR900, 3/8", galvanised, powder coated, RAL9005
	B1040020501	1	Outer casing BR900, 1/2", galvanised, powder coated, RAL9005
	B10400204	1	Outer casing BR1000, 3/8", galvanised, powder coated, RAL9005
	B10400204-1	1	Outer casing BR1000, 1/2", galvanised, powder coated, RAL9005
36	B10400094	1	Inner casing BR600, galvanised
	B10400071	1	Inner casing BR750, galvanised
	B10400198	1	Inner casing BR900, galvanised
	B10400163	1	Inner casing BR1000, galvanised
37	B10400097-1	1	Heating coil HZ60, steel, 3/8", 300bar, BR600
	B10400060-1	1	Heating coil HZ75, steel, 3/8", 300bar, BR750
	B10400194-1	1	Heating coil HZ90, steel, 3/8", 300bar, BR900
	B10400145-1	1	Heating coil HZ100, steel, 3/8", 300bar, BR1000
			Heating coils for further nominal Ø, materials and operating pressures upon request
38	E10400161	4	Spacer tube, D 16 x 1 x 23
39	E10400196	4	Cap nut M6, galvanised
39.1	E10400197	4	Washer 6,6, galvanised

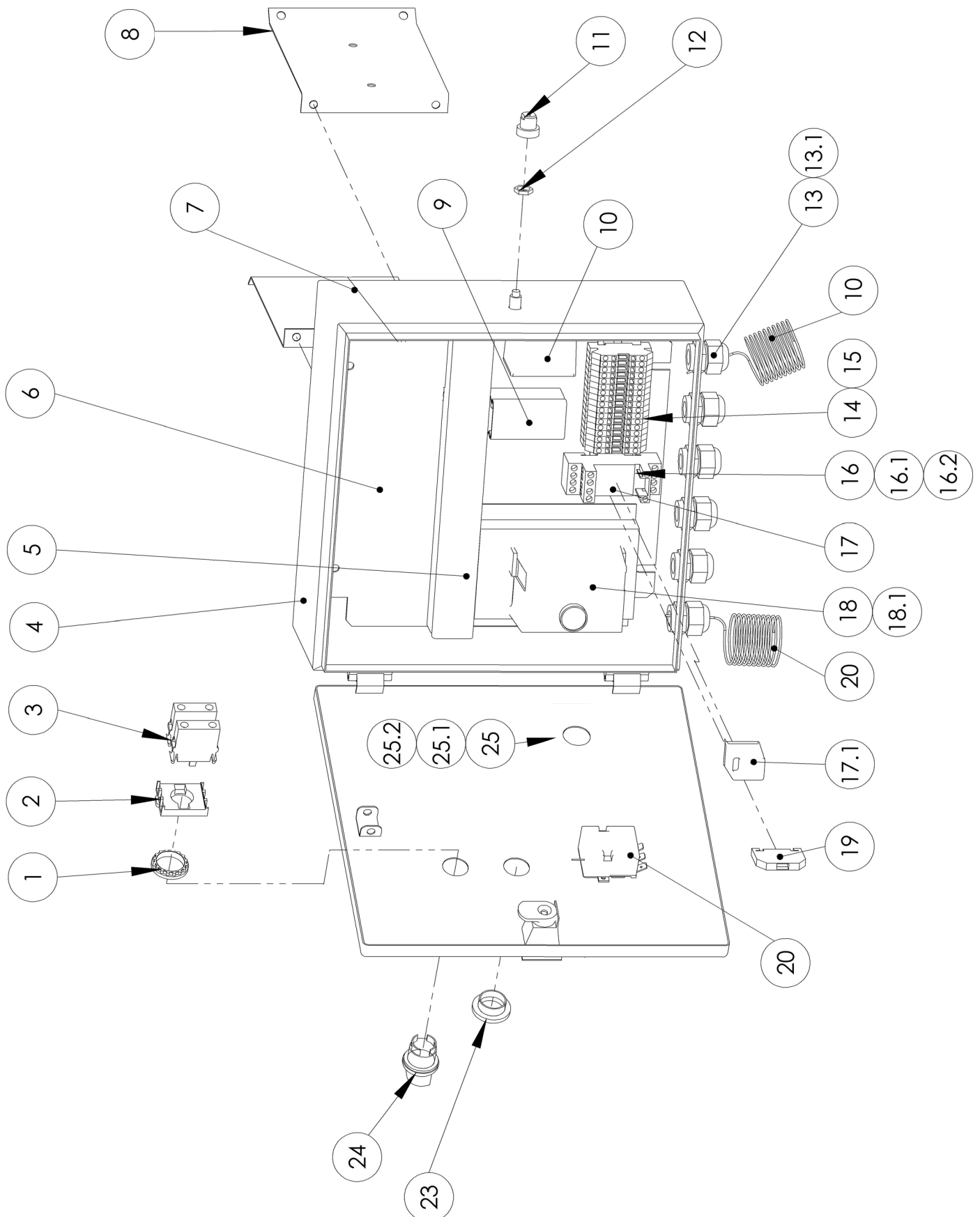
List of parts, mixing device BR600-BR1000

Pos.	Art.-Nr.	Stück	Bezeichnung
3	B10400006	1	Electrode holder, half
5	B10400087	1	Centering device, since 1992
6	E10400023	1	Oil nozzle 1,25/45°S, BR600
	E10400022	1	Oil nozzle 1,50/45°S, BR750
	E10400327	1	Oil nozzle 1,75/45°S, BR900 and BR1000
7	E10400118-1	1	Nozzle holder with thread M8, hexagon, brass
8	E10400464-2 CIM	2	Igniting electrode, short. since 2011
9	E10440040	2	Hexagon socket screw M6 x 12, galvanised
11	B10400199	1	Nozzle tube
12	E10400789	1	Connector (for 8mm tube), GR 8/4 - LL, galvanised
12.1	E10400042	1	Connector (1/8" OT), GE 4 LLR, galvanised
13	E10400091-1	2	Spark plug socket with rubber caps
16	B10400086	1	Support flange, galvanised
17	B10400185	1	Photocell holder with screws, Pertinax
18	E1040045601	1	Photocell, 230V/110V
19	E10400400	1	Glas for photocell, 14,2 x 3 mm
20	E10850036	2	Sheet metal screw, 3,9 x 9,5, galvanised
21	E10440040	1	Hexagon socket screw M6 x 12, stainless steel
22	E10400571	1	Oval head screw M4 x 10, galvanised



Mixing device

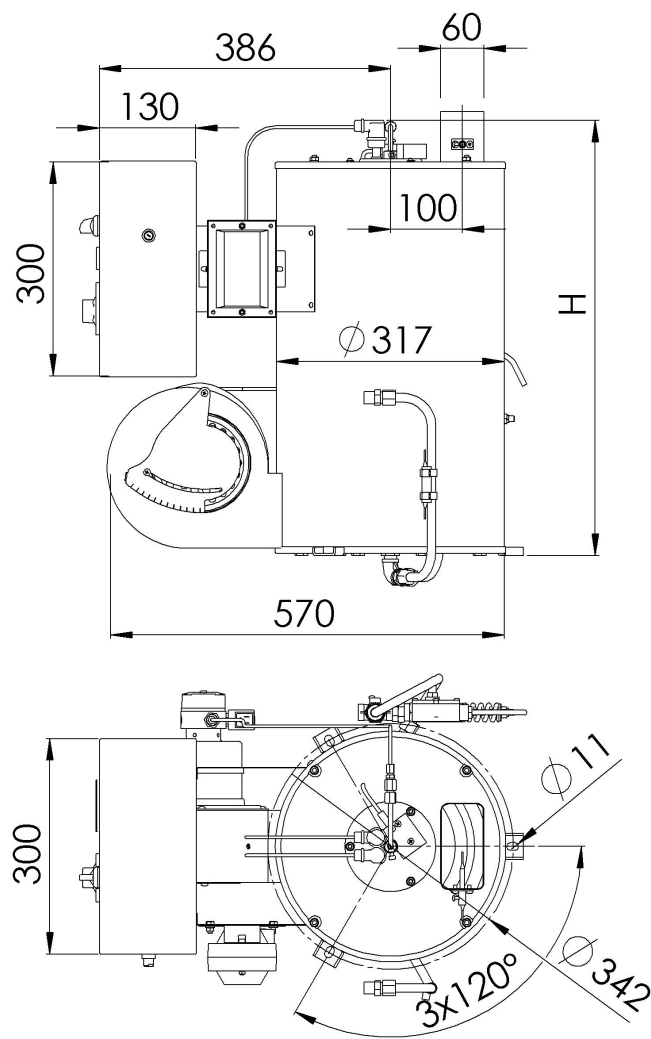
Drawing No.: Mischeinrichtung_BR6-12
21.11.2002



Switch box BR600-BR1000, oil heated
Drawing No.: Schaltkasten_KPL300x300

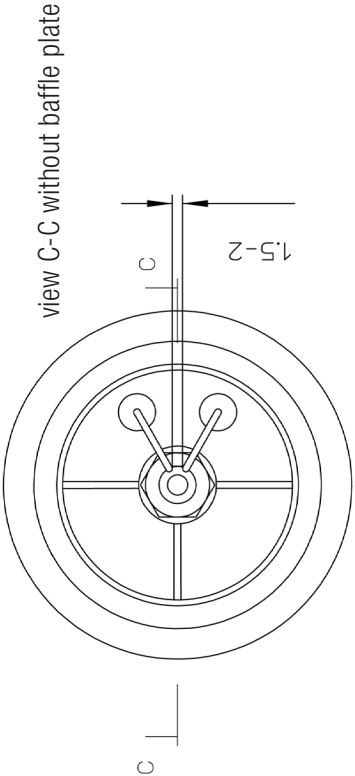
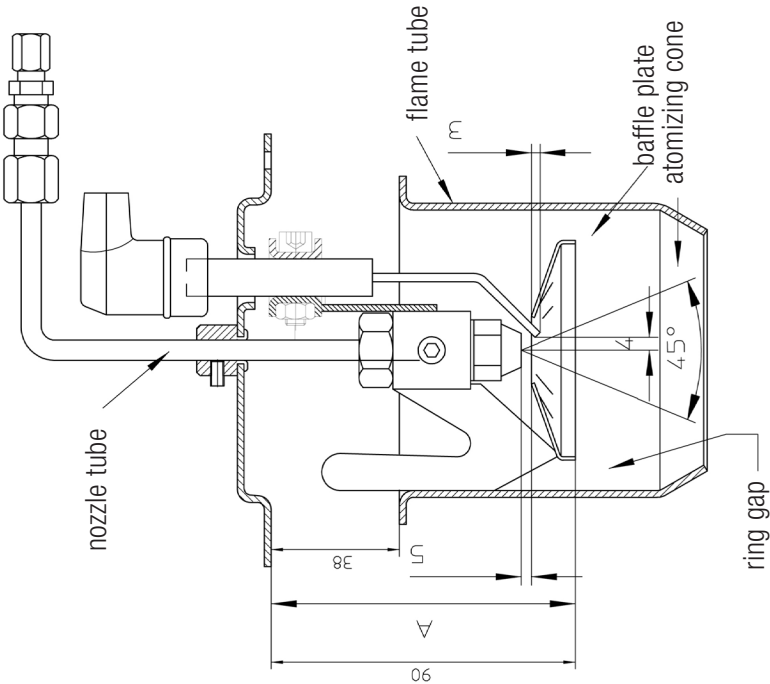
Parts List, Switch box BR600-BR1000

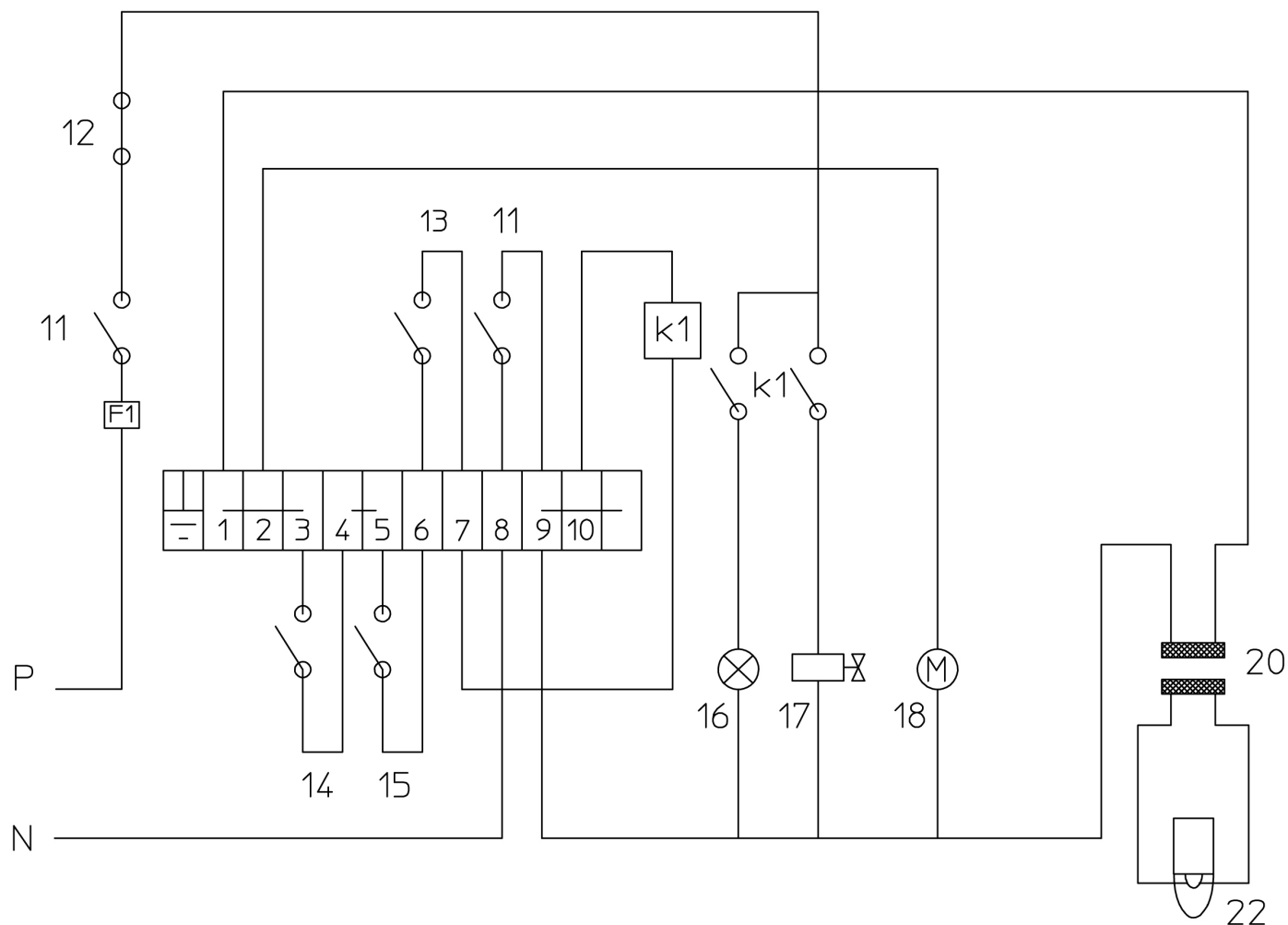
Pos.	Code-No.	Pieces	Description
1	see Pos 24	3	Counter nut (belongs to item 24)
2	E10400741	3	Fastening adaptor M22 A
3	E10460034	2	Switch link M22 K10
4	E10850009	1	Switch box, 150 x 150 x 120 mm
5	E10850021-2	1	Cable channel NF25, 260 mm
6	see Pos. 4	1	Mounting plate (belongs to switch box)
7	B10440032-2	1	Support for switch box, left
8	B10440032-3	1	Support for switch box, right
9	E10850021-3	1	Cable channel NF25, 170 mm
10	E10400657-3	1	STBG with flue gas sensor 230°C, complete
11	E10400657-1	1	Cap for reset button (belongs to item 10)
12		1	Counter nut (belongs to item 10)
13	E10400690	6	Cable connector M16, Polyamid
13.1	E1040009501	6	Counter nut M16 x 1,5, brass
14	E10400151	14	Passage terminal, 2,5 qmm
15	E10400153	3	Earth terminal 2-Leiter, 2,5 qmm
	E10400672	1	Safety fuse terminal
16.1	E10850013	1	Fine wire fuse 5 x 20 mm, 4 A at 220V
	E10850013-1	1	Fine wire fuse 5 x 20 mm, 6 A at 110V
16.2	E10850030	1	End and intermediate plate
	E10440041	1	Socket for relay
17.1	E1044004201	1	Plug-in relay, 4, 230V/50Hz
	E10440042	1	Plug-in relay, 4, 24V/50Hz
	E10400485	1	Base for flame control
18.1	E1040047504	1	Flame control , 230V AC, 50/60 Hz
	E1040047501	1	Flame control , 110V AC, 50 Hz
	E10400673	1	End plate grey
20	E10400972	1	Rotary switch for thermostat, 45 up to 95°C
20.1	B1040029602	1	Guide washer Stop 30 - 95°C
20.2	E10400831-1	1	Secondary washer for 95°C Stop
21	E10400611	1	Cover plate and handle for thermostat
22	E10400610	1	Rotary switch for thermostat
23	E10400865	1	Monitoring light, green, M22-L-G
24	E10460032	1	Switch, 2, M22 WRK
25	E10400805	1	Light button M22-DL-R
25.1	E10400800	1	Electronic piece M22-AK10
25.2	E10400864	1	LED M22-LED230-R



	A		B		H
	3/8"	1/2"	3/8"	1/2"	
BR 600 /3	126	132	99	101	535
BR 750 /3	126	132	99	101	625
BR 900 /3	126	132	99	101	710
BR 1000 /3	126	132	99	101	810

Type	BR600	BR750	BR900	BR1000
A ca.	90	90	90	90
Düse	1,25 45°S	1,50 45°S	1,5045°S	1,75 45°S
Oldruck	8-10 bar	8-11 bar	8-11 bar	8-11 bar



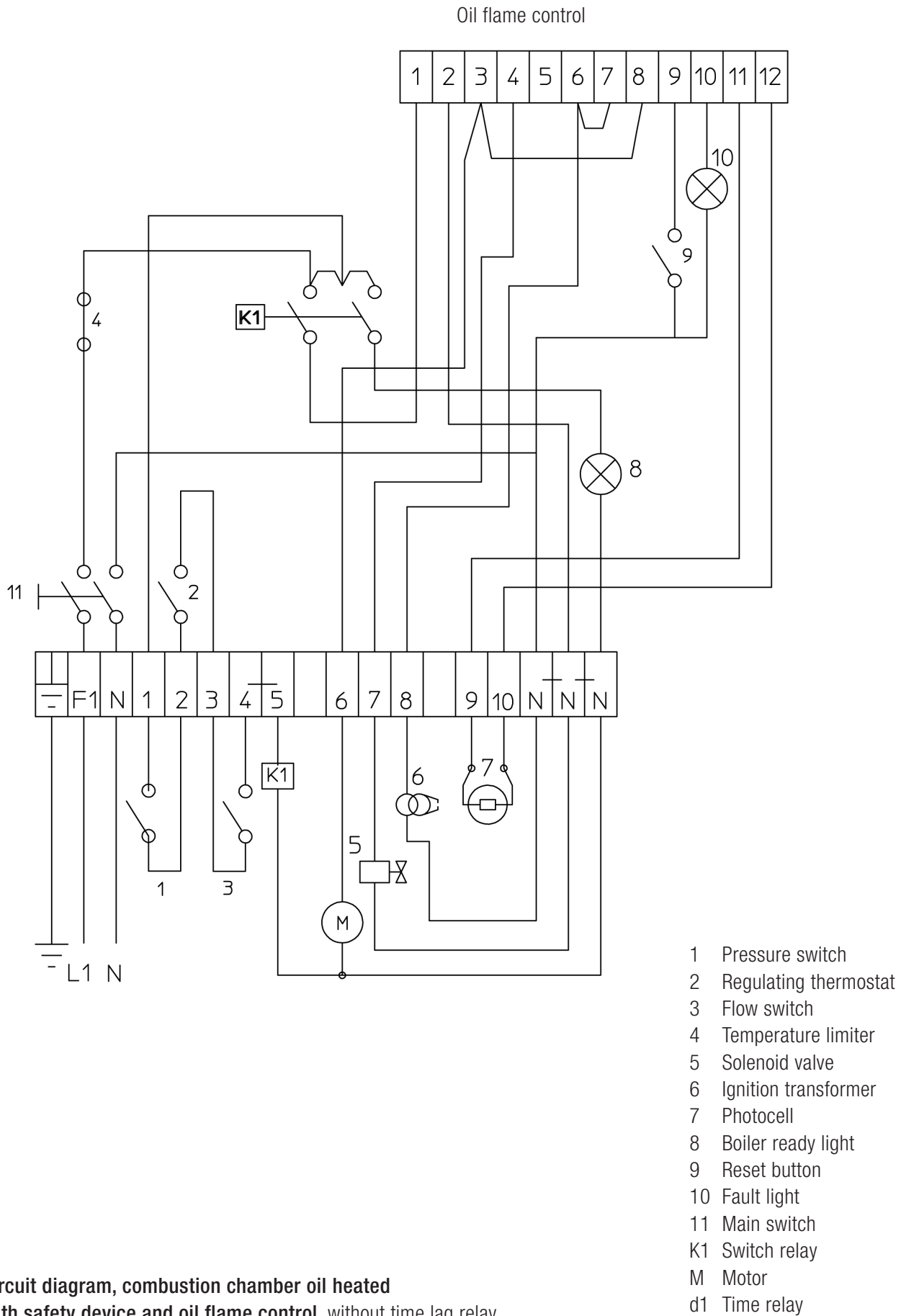


- 1-10 clamps
- 11 Main switch
- 13 Regulating thermostat
- 15 Flow switch
- 12 Temperature limiter
- 14 Pressure switch
- 18 Solenoid valve
- 20 Ignition transformer
- 16 Boiler ready light
- K1 Contactor
- F1 Safety fuse

**Circuit diagram, combustion chamber oil heated
with safety device without oil flame control**

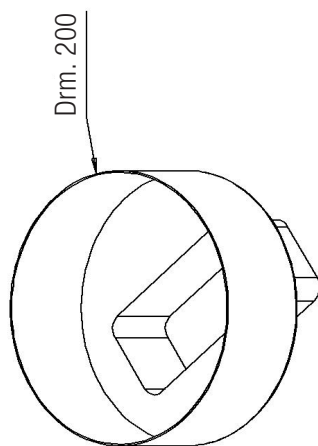
BR 600 / 750 / 900 / 1000

Drawing No.: splHM_öl

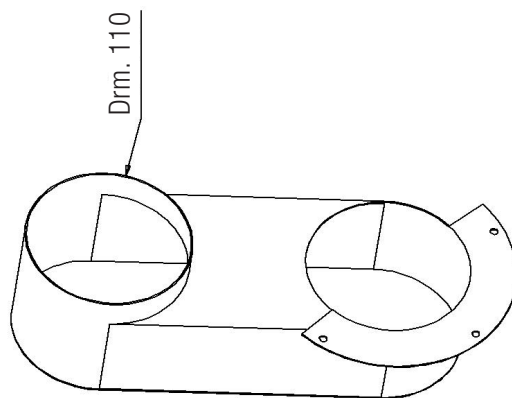


Circuit diagram, combustion chamber oil heated
with safety device and oil flame control, without time lag relay
 BR 600 / 750 / 900 / 1000
 Drawing No.: splHM_öl

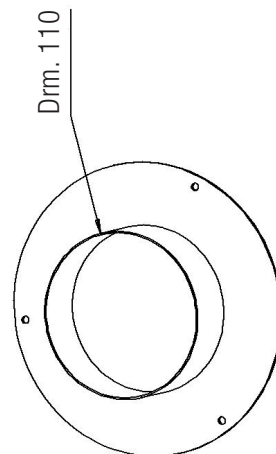
Chimney and Ventilator Joint Elements



Chimney transition piece, square on round
Drm. 200, open bottom -
No.: E10400360-200

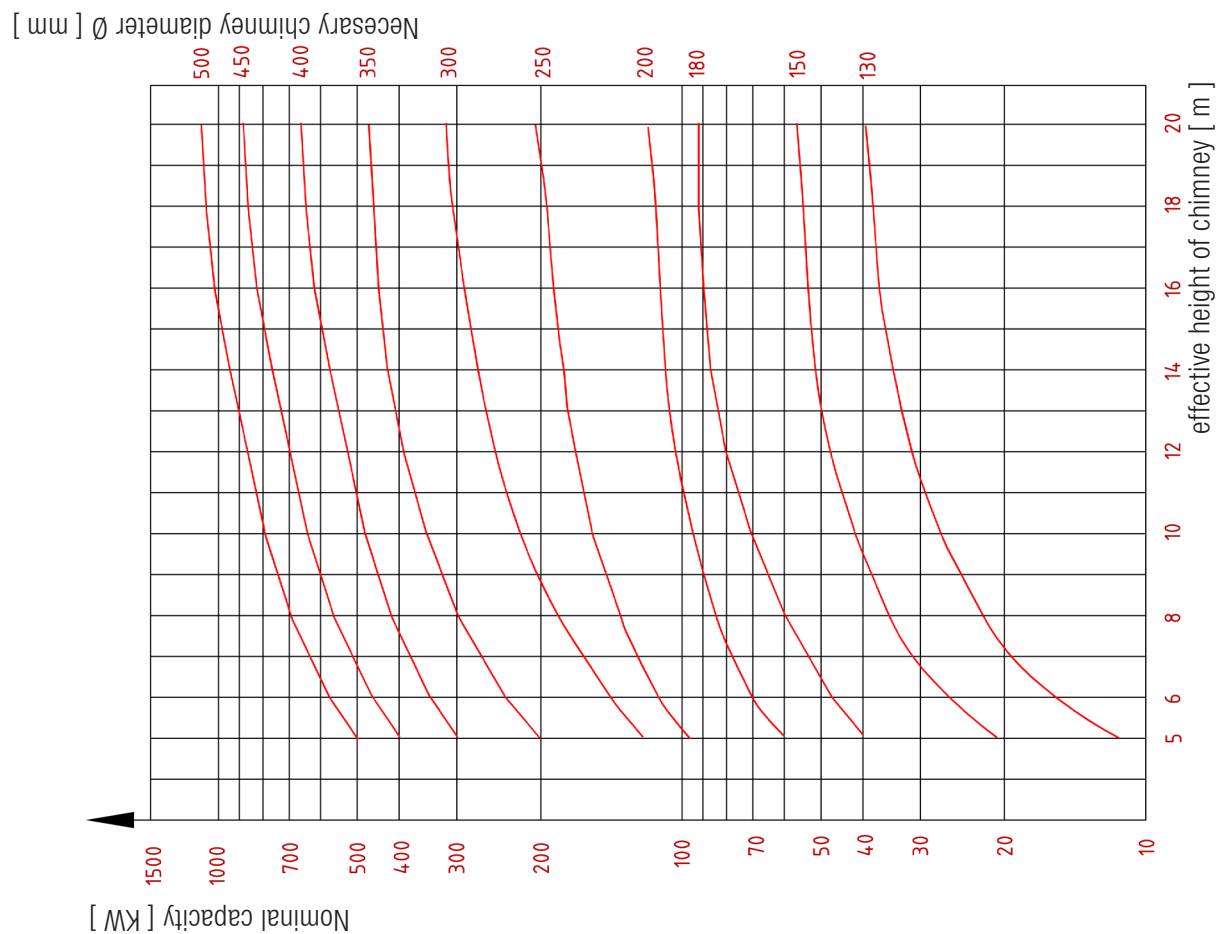


Air intake for double aggregate,
left boiler, DN10,
No.: V10400053-1



Air intake connecting piece
for ventilator DN110
No: V10400053

Diagram to determine the diameter of the chimney of
oil and gas heated combustion chambers
BR 600 – BR 1000



Trouble Shooting Guide - In connection with operation of oil heated combustion chambers.

Preface

For many years now TEHA combustion chambers have been proven appliances to provide instant hot water, especially for use in cleaning applications. They have distinguished themselves by their trouble free working, long life and their robustness. Nevertheless, failures may occur, like with all technical appliances – last but not least due to bad or no maintenance at all. Therefore we would like to provide you with this guideline, which enables you to help yourself in many cases. This is a collection of data detailing various problems and some possible ways to solve them. We have aimed to make this trouble shooting guide easy to understand and simple to follow. Yours faithfully Theodor Henrichs GmbH

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2.2.2 The burner does not start, ventilator starts for a moment, followed by a fault message (red lamp on)

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3. Malfunction during operation

3.1 The burner operates; water does not heat up properly

3.1.1 The heating coil has become furred

3.1.2 The heating coil has become sooty

3.1.3 The inner tube has come off the inner lid

3.1.4 The inner casing and / or inner lid have burned out.

3.2 The water becomes too hot inspite of correctly regulated temperature

3.3 Water escapes from the lower seams of the outer casing.

3.3.1 The heating coil has a crack.

3.3.2 Excessive building up of perspiration water.

3.4 Extreme corrosion after a short period of operation.

See 3.1 and 3.2 !

3.4.1 The temperature limiting safety device always cuts off.

1. Basic information regarding the misbehavior of combustion chambers.

The misbehaviour of combustion chambers becomes noticeable by a few measurable indications most of the times.

These are:

- Exhaust temperatures out of the normal range. ($>200^{\circ}\text{C}$).
- Temperature of the outer casing out of the norm range ($>60^{\circ}\text{C}$).
- Smoke appearance is bad, cannot be adjusted (>1)
- Water temperature at the outlet is deviating from the norm.
- The oil pump pressure is not within the rated range and varies (9-11 bar).

The service engineer needs the following basic equipment to check these values:

Smoke analyser, electronic thermometer (measuring range 0 – 500°C), with one flue gas sound each and a contact sensor, oil pressure gauge, joint thread G1/8" AG, measuring range 0 – 20 bar.

2. General requirements for starting.

The following fundamental requirements have to be fulfilled before each start:

110 / 230 V input voltage	: existing
On-switch	: on
Adjustable thermostat	: on
Temperature limiting safety device (reset button at the right side of the switch box below the black cap)	: on
Water inflow	: on
Water pump	: on, minimum quantity of water 6 Ltr / min / combustion chamber
Fuel	: available

2.1 Combustion chamber without flame control

(circuit diagram splHM_Ö/oF, operating instructions page 16)

The indications of the items 2.1 refer to this circuit diagram.

2.1.1 The fan motor does not run, green lamp is not lighting.

Have the requirements as mentioned under item 2 been complied with?

(General requirements for starting)

Check the safety fuse F1 in the switch box.

Check the burner motor.

2.1.2 The fan motor runs, the green lamp is not lighting.

Is there voltage at clamp No. 7?

Yes: Check contactor K1.

No: Check all switches 11 – 15 one after the other. In case of failure of the contactor check the position of the controller. The cut-off-point is indicated on a scale at the housing of the contactor.

The cut-off-point can be changed by adjusting the reed contact.

2.1.3 The fan motor works, green lamp lights.

Is there voltage at clamp No. 7, circuit diagram page 16?

Does the magnetic valve open?

Does the ignition transformer work?

Are the ignition cables and the spark plug socket okay?

Are the igniting electrodes okay? Check the wires for electrode consumption and the ceramic for cracks!

Is the adjustment of the electrodes correct? See drawing MIEIRI/3, operating instruction page 15!

Is the mixing device free from soot and correctly adjusted?

Does the oil pump produce sufficient and stable pressure?

Install the pressure gauge, the oil pressure has to be between 9 and 11 bar.

The indicator of the gauge must remain stable. A leakage exists in the suction- or pressure pipe, if the indicator flutters. Consequence: starting problems, unclean combustion.

2.1.4 Checking nozzle function

Connect the mixing device to the oil pipe while out of the burner.

Pull the spark plug socket off the igniting electrodes.

Aim the nozzle into a direction where no damage can be caused.

Start the burner and observe the atomizing cone.

Does a clean atomizing cone build up? If not, change the nozzle.

Does the atomizing cone spray onto the electrodes? If yes, pull back the electrodes just out of reach of the cone.

2.1.5 Checking ignition function

Bring the mixing device in the position as mentioned under 2.1.4.

Pull the connector plug off the magnetic valve.

Plug the spark plug socket in the igniting electrodes again.

Start the burner and observe the ignition spark.

Where does it ignite?

a. at the isolating ceramic of an electrode?

If this is the case, the ceramic has hairline cracks, exchange both electrodes for new ones.

b. between the electrode and the baffle plate?

If this is the case, the top distance between the electrodes is bigger than the distance between the electrode and the baffle plate. Correctly adjust the electrodes according to drawing MIEIRI/3, operating instructions, p15.

2.2 Combustion chamber with flame control

(circuit diagram spIHM_ÖI, operating instructions page 17)

The indications of the items 2.2 refer to this circuit diagram

2.2.1 Burner does not start, no fault message (red lamp out)

Have the requirements as mentioned under item 2 been fulfilled?

Check the safety fuse F1.

Is there voltage at clamp No. 5, operating instructions page 17?

Yes : Check the all-or-nothing relay K1 (bypass for the test, if necessary)

No : Check all switches 1 – 4. Check the position of the overload in case of failure of the contactor (item 3).

The cut-off-point is indicated on a scale at the housing of the contactor.

The cut-off- point can be changed by adjustment of the reed contact.

2.2.2 The burner does not start, ventilator starts for a moment, followed by a fault message (red lamp on).

Does the magnetic valve open?

Does the ignition transformer work?

Are the ignition cables and the spark plug socket okay?

Are the igniting electrodes okay? Check the wires for electrode consumption and the ceramic for cracks!

Is the adjustment of the electrodes correct?

See drawing MIEIRI/3, operation instructions page 15!

Is the mixing device free from soot and correctly adjusted?

Does the oil pump produce sufficient and stable pressure?

Fix the pressure gauge: the oil pressure has to be between 9 and 11 bar.

The indicator of the gauge must remain stable. A leakage exists in the suction- or pressure pipe,

if the indicator flutters. Consequence: starting problems, unclean combustion.

Does the photocell work?

Remove the photocell from its holder, disconnect both connections and meter the voltage by means of a microammeter and with light (day light or artificial source of light)

The photocell is defective if the voltage is lower than 5µA and thus has to be replaced with a new one.

2.2.3 Checking nozzle function

See 2.1.4! This method can be applied here too with a slight modification.

When starting the burner the photocell has to be darkened during the time of pre-rinsing and has to be illuminated at the ignition start time. This procedure can be done as follows:

Pull the photocell off the support. Cover it so no light intrudes during the time of pre-rinsing, then uncover it at the beginning of the ignition time, so that the photocell is exposed to bright daylight.

The ventilator fan starting shows the beginning of the pre-rinsing time.

The ignition sound indicates the beginning of the ignition time.

2.2.4 Checking ignition function

See 2.1.5! This method can be applied here too with a slight modification.

When starting the burner the photocell has to be darkened during the time of pre-rinsing and has to be illuminated at the ignition start time. This procedure can be done as follows:

Pull the photocell off the support. Cover it so no light intrudes during the time of pre-rinsing, then uncover it at the beginning of the ignition time, so that the photocell is exposed to bright daylight.

The ventilator fan starting shows the beginning of the pre-rinsing time.

The ignition sound indicates the beginning of the ignition time.

3. Malfunction during operation

3.1 The burner operates; water does not heat up properly

3.1.1 The heating coil has become furred

The exhaust temperature exceeds 220°C by far.

The temperature of the outer casing exceeds 60°C.

The temperature limiting safety device cuts off.

Check the pressure difference between the inlet and the outlet of the coil.

The coil has become furred if the difference exceeds 2 bar. The calcium has the effect of an insulator. Thus only part of the produced energy can be delivered to the water. The water will not heat up properly.

The heating coil must be acidulated with a specific circulation pump until all the calcium is removed.

3.1.2 The heating coil has become sooty

The exhaust temperature exceeds 220°C by far.

The temperature of the outer casing exceeds 60°C.

The temperature limiting safety device cuts off.

The smoke appearance is very bad and no longer adjustable.

The water does not heat up properly.

Reason: The soot has the effect of an insulator. Only part of the produced energy can be delivered to the water.

The exhaust channels are mostly blocked by soot. The combustion chamber is entirely overheated.

The inner casing and later the outer casing will burn out, if this condition lasts for any length of time.

Remedy: Remove the heating coil and clean it with a high pressure cleaner.

The procedure has been described in the operating instructions on page 5, item 5.4.

3.1.3 The inner tube has come off the inner lid

The exhaust temperature exceeds 220°C by far.

The temperature of the outer casing exceeds 60°C.

The temperature limiting safety device cuts off.

The burner can no longer be correctly adjusted.

The cause may be overheating due to the lack of water.

The inner tube drops down. The exhaust gases take the short way through the upper region of the heating coil and leave the combustion chamber through the chimney, without releasing energy.

3.1.4 The inner casing and / or inner lid have burned out.

The exhaust temperature exceeds 220°C by far.

The temperature of the outer casing exceeds 60°C.

The temperature limiting safety device cuts off.

The burner can no longer be correctly adjusted.

Reasons for this may be: Overheating due to lack of water, aggressive surrounding air sucked in by the ventilator (chlorine, fluorine, dusts of all kinds, its own exhaust gases etc.).

3.2 The water becomes too hot inspite of correctly regulated temperature

The exhaust temperature exceeds 220°C by far.

The temperature of the outer casing exceeds 60°C.

The water temperature reaches steam condition.

The temperature limiting safety device cuts off.

The connecting pipes become overheated and burst.

Main reason: The regulating thermostat works incorrectly.

Remedy: Check the sensor and the capillary tube, exchange the thermostat if necessary

3.3 Water escapes from the lower seams of the outer casing.**3.3.1 The heating coil has a crack.**

The exhaust temperature is normal.

The smoke appearance is bad and not adjustable.

The exhaust gases are saturated with vapour and thus a smoke picture cannot be drawn.

Remedy: Exchange the heating coil with a new one. The procedure has been described in the operating instructions under 5.4.

3.3.2 Excessive building up of perspiration water.

The exhaust temperature is normal.

The smoke appearance is bad and not adjustable.

Fluid escapes off the seams of the outer casing.

The exhaust gases are saturated with vapour and thus a smoke picture cannot be drawn.

Reasons: The quantity of water passing through is by far too much for the burner.

The inflow water is very cold.

Unfavourable weather conditions, high humidity.

Remedy: Reduce the quantity of water; if possible increase the capacity of the burner by increasing the oil pressure.
If necessary add on further combustion chambers.

3.4 Extreme corrosion after a short period of operation.

Reasons: The ventilator sucks in the exhaust gases of its own burner or the exhaust gases of extraneous fireplaces as well dusts of all kind, for example sanding dust, lacquer vapour. The dusts adhere to the heating coil and the inner casing. Dust particles have the effect of germ cells, where corrosion starts.

Remedy: Be careful to avoid the sucking in of exhaust gases and dust particles under all circumstances, take special care during the installation of the combustion chamber.

3.5 The temperature limiting safety device always cuts off.

See 3.1 and 3.2!