Operating Manual
Oil Fired Heaters
BV 385

Perfection is our aim

EC – Declaration of Conformity

according to machine directive 2006 / 42 / EEC

appendix II A

Structure of the machine

Mobile oil-fired heaters (with and without heat exchanger)

Description:

BV 385

is designed, constructed and manufactured in accordance with the above-mentioned directive and the low voltage directive 2014 / 35 / EEC and also EMV 2014 / 30 EEC.

The following harmonized standards have been used:

- DIN EN 6100-3-2	Electromagnetic compatibility
- EN 55011	Product standard for wideband interferences
- DIN EN ISO 12100	Safety of machinery
- DIN EN 60335-1	Safety of electrical appliances
- DIN EN ISO 13857	Safety of machinery, safety distances

Note: The observance of DIN EN ISO 13857 refers only to the protection against accidental contacts of the fan. For the complete fulfillment of EN 13857 the user resp. installer is responsible.

The following national standards, directives and specifications have been used:

- DIN EN 13842 „Mobile oil-fired heaters (with and without heat exchanger)“

Mönchengladbach,
17.04.2020

Managing Director

Place, Date | Signature

Index Type BV 385 Page

Important Notice!

1. Use only clean (if possible filtered) Heizöl EL (Diesel).

2. Clean fuel filter regularly.

A T T E N T I O N :

Notice: Heizöl EL changes viscosity in low temperature.

Remedy: Use cerosine (petroleum) or mix Diesel and cerosine (Heizöl / petroleum) 50 : 50.

This heater is **standard** equipped with a fuel preheating device. This requires also during the heating interruptions (during the night, on weekends) tension, so it remains effective. Therefore, leave the plug into the socket, switch to position "Heizen" (Heating) and set the room thermostat to a low temperature (frost protection) **(230 V only)**.

When ordering spare parts please give the type, serial number of the heater and the part number, otherwise a correct delivery is not possible.

The admissible ambient temperature for securing the function of the control is – 15°C and max. + 50°C. This is to be especially taken into consideration whilst drying grain or using the heater outdoors. The heater resp. the flame control has to be protected against direct influence from the bright sun light.

Technical specifications are subject to changes without any notice!

Read carefully before starting your heater!

IMPORTANT NOTICE

This unit is a space heater with indirect heating, heat exchanger and exhaust. The heater may not be set up near explosive or flamable materials and may not be used in explosion or fire endangered rooms. It may also not be used in areas with high dust development. The heater should be positioned at adequate distance to flamable material such as wood etc. It is essential that there is a sufficient ventilation of the room. The heater may not be worked on or transported during operation.

If the heater is used for drying of grain the set-up has to be in a right angle in front of the radial fan or alternatively with sufficient distance. This has to be done so that the function of the heater is not influenced by the immense suction of the radial fan.

The heater is **standard** equipped with a fuel pre-heating device. This requires also during the heating interruption (during the night, on weekends) tension so it remains effective. Therefore leave the plug into the socket, switch to position "Heizen" (Heating) and set the room thermostat to a low temperature (frost protection).

T E C H N I C A L D A T A

Type:		**BV 385**
Voltage	V/Hz	230/50
Rated current	A	10,2
Nominal capacity	kW	2,0
Protection		IP 44
Capacity	kW kcal/h	110 94.600
Air volume	m^3 /h	8.200
Max. fuel consumption	appr. kg/h	9,2
Dimensions	L mm W mm H mm	1985 895 1385
Weight	kg	305
Cone	Ø mm	520
Chimney	Ø mm	200
Photo cell		standard
Room thermostat for use in high humidity		standard with 10 m cable
Noise level (EN ISO 11201)	dB (A)	72

1. How to start the heater

a) Fill a drum or a tank with clean Heizöl EL (Diesel) and set it up according to the local regulation. Connect fuel intake and return line of the heater with the drum or tank. Open the valve at the fuel filter.

b) Install exhaust system according to the drawing, see page 7.

c) If warm air hoses are used, avoid sharp bendings.

d) Power supply: Connect heater to the 230 V - 50 Hz power supply.

e) Put room thermostat on suitable place in the room and set to desired temperature. (Must be above ambient temperature).

A T T E N T I O N

The heater is standard equipped with a fuel preheating device. The function of the preheating is only given if the heater remains on stand-by with plugged-in electrical plug for appr. 15-20 min. before the first starting.
During this time the oil is preheated so that the sorting out of paraffine is avoided.

Start the heater only with connected fuel hoses. Otherwise the fuel pump will be destroyed.

During service always obbey the surface temperature from the fuel preheating device. Disconnect the heater first from the power supply and let it cool down (danger of burning).

Operation "Heating"

Set main switch to position "Heating" (Heizen).

The automatic heating operation is started when the switch is set to position "Heating" (Heizen).

The oil burner starts and heats first the heat exchanger to appr. 35°C, only then the fan starts and supplies immediately warm air.

Operation "Ventilation"

Set main switch to position "Ventilation" (Lüften).
In this case only the fan runs in continuous operation and blows cold air. Therefore the heater can be used during the summertime for ventilation. The room thermostat does not function during this kind of operation.

2. How to stop the heater

Set main switch to pos. "0".
If the heater has been running on position "Heating" (Heizen) it has an automatic cooling of the heater until it completely shuts off.

Important!

Pull the main plug only after the heater has cooled down and stopped.
Before repairing or servicing always pull the main plug.
On operation "Ventilation" (Lüften) the unit shuts off immediately.

3. Safety and control devices

In case there is no flame - for example caused by lack of fuel - the oil burner relay shuts off the heater. The control lamp on the side of the burner reset button lights up.

After the cause of the malfunction has been cleared the reset button can be pushed after a waiting time of appr. 60 sec. and the burner can be restarted.

Combi control

The combi control is equipped with 3 temperature sensors which are straight in the warm air stream.
The first sensor controls the starting retardation and the postpurge of the fan.
The second sensor controls the operation temperature. If the max. operating temperature of 80° C is exceeded, the sensor shuts the burner off while the fan continues to run for cooling.
The third sensor serves as a safety thermostat against overheating, for example in case of malfunction of the fan.
After the cause of overheating has been eliminated the reset button of the safety thermostat has to be pushed in order to restart the heater.

Room thermostat

The thermostat has a temperature regulation range of 5° C - 30° C and shuts the burner off after the preset temperature has been reached. The fan continues to run in order to cool the heater down to a temperature of appr. 30° C before it stops. After the room temperature drops several °C the heater automatically starts running again.

4. Transport

The heater can be transported and is equipped with hooks for crane transportation. These hooks are especially marked. Please use only these devices.

5. Cleaning

The heater should be cleaned minimum once a year. Therefore remove the lid of the insert (Pos. 10 page 12).

Before repairing or servicing the heater pull the main plug!

Repair or service of electrical components may only be made by authorized specialists!!!

6. Trouble Shooting

Fault	Cause	Remedy
Main switch on position "Heating" (Heizen). Heater does not start.	No electricity.	Check if there is power. Check main fuse.
	Setting of room thermostat. The preset temperature is lower than the ambient temperature.	Reset thermostat.
	Safety thermostat shuts off.	Push reset button of safety thermostat. Restart heater.
Burner starts shortly and shutts off. The red lamp lights up.	Lack of fuel.	Check fuel intake and return line.
	Air bubbles in the suction line.	Check oil level in tank. Check if the valve at the fuel filter is opened. Push reset button.
On initial start the burner runs shortly and shutts off.	Lack of fuel.	Push the rest button until enough fuel is injected.
	Air bubbles in the suction line. There is not enough fuel.	
Burner shuts off during operation.	Fuel filter dirty.	Clean (replace) fuel filter.
	Photo cell dirty.	Clean the photo cell carefully.
Safety thermostat shuts off during operation.	Sharp bendings in warm air hoses.	Use warm air hoses properly. Push reset button of safety thermostat. Restart heater.

If your heater does not work properly in spite of these checks, call your nearest service.

6. Important Notice

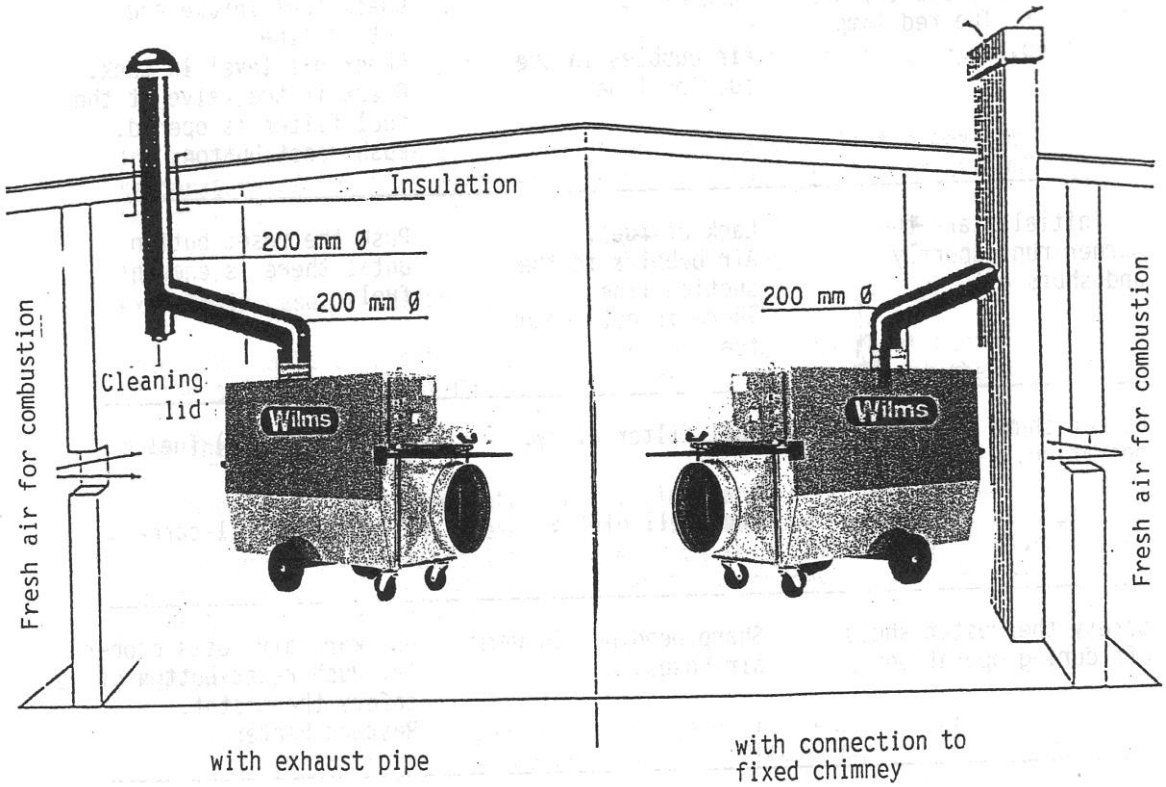
These units are oil fired space heaters, equipped with a chimney connection. If connected to a chimney the installation should be made only according to the below drawing.

The connection should be made only with a fixed chimney according to the regulations or an installed exhaust pipe as shown in the drawing.

Never start the heaters connected to just an exhaust pipe which has been lead through the wall.

Use it only with an additional exhaust pipe, minimum above the ridge. In case of horizontal outlet through the wall, use only with T-shaped pipe, refer below drawing.

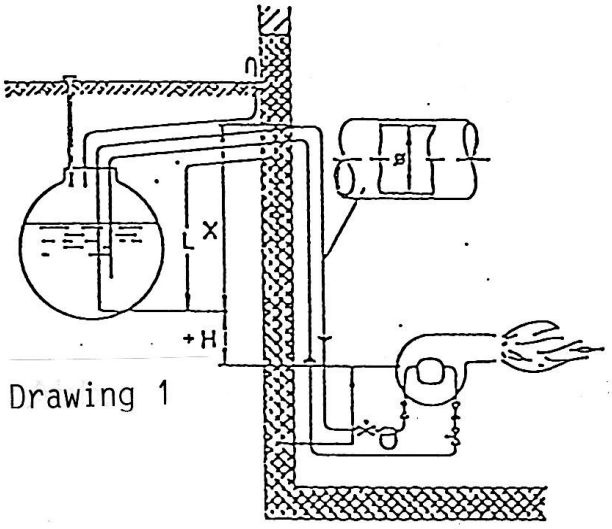
Top of exhaust pipe or chimney
should be 0,5 m above ridge.



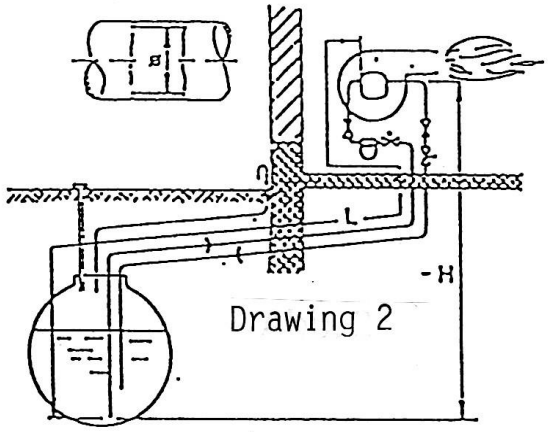
Exhaust pipe should have upgrade of minimum 10 cm per meter pipe.

8. Length and diameter of fuel lines

The table refers to Heizöl EL 4,3 cST and inside diameter of the fuel lines. In regard of the length of the fuel lines 4 elbows, 1 valve and 1 relief valve were considered for the resistance.



Drawing 1

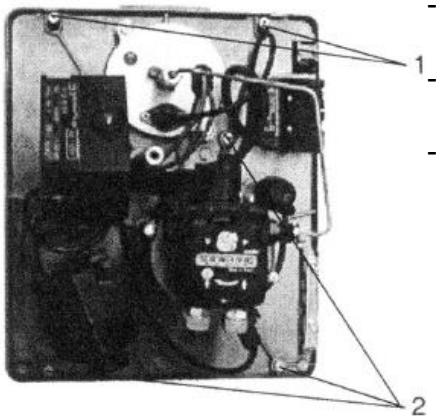


Drawing 2

H	L	L	L
	ø6mm	ø8mm	ø10mm
4,0	34	100	100
3,5	32	95	100
3,0	30	89	100
2,5	28	82	100
2,0	26	75	100
1,5	24	68	100
1,0	22	63	100
0,5	20	55	100
0,0	17	48	95
– 0,5	15	41	90
– 1,0	13	35	83
– 1,5	11	28	75
– 2,0	9	21	58
– 2,5	6	16	43
– 3,0	–	11	25
– 3,5	–	5	14

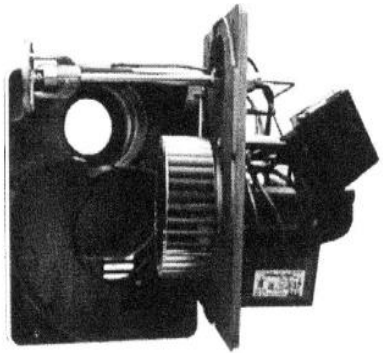
Measures H + L in Meter

9. Service position



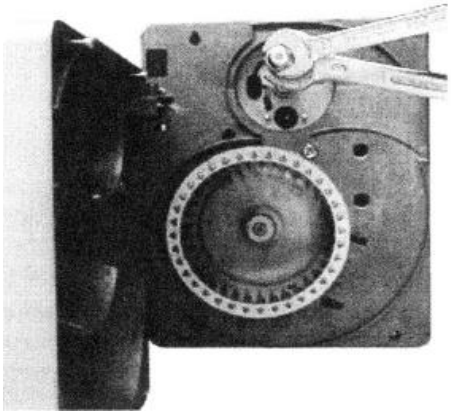
- Turn out 2 socket head screws SW 4 (1) appr. 1 cm.
- Demount 3 socket head screws SW 4 (2).
- Pull base plate out of the housing.

During assembly put the base plate into the housing and fasten with the 5 socket head screws.



A T T E N T I O N !!! Watch for correct position of the base plate in the housing.

10. Change of nozzle

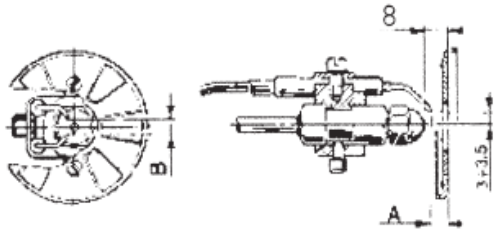


- Disconnect ignition wire from the electrode.
- Disconnect baffle plate and pull upside.
- Loosen nozzle (spanner SW 16) and secure nozzle block with a spanner SW 19 against turning (picture).
- Replace nozzle.

Assembly in reverse sequence.
When mounting the baffle plate take care that the distance nozzle - baffle plate is exactly 8 mm (refer "11. Adjustments")

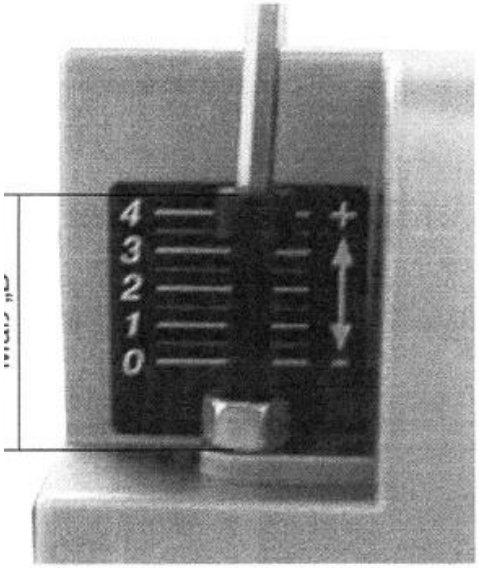
11. Adjusting of electrodes

The electrodes are preset. The given measurements are for control only.



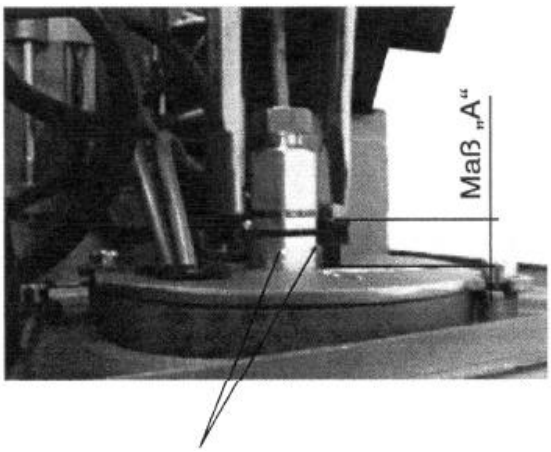
A	1 - 4 mm
B	4 - 5 mm

12. Adjusting of air flow measurement "B" and measurement "A"



Measurement "B"

The scale serves as assistance for easier adjustment of the air flow. With a socket head wrench (SW 4) the air flow is changed depending on the output according to the adjustment index.
With excess pressure in the combustion chamber the value has to be adjusted higher.
On low pressure the value has to be reduced.
In any case a readjustment is necessary according to the heater set-up.
In order to reach equal combustion values we recommend the use of a draught regulator.



Adjustment marking

Measurement "A"

The measurement "A" (refer adjustment table) serves as assistance for the burner adjustment.
Measurement "A" describes the position of the nozzle plate with baffle plate in the burner cone.
Example: Right turn of the adjustment screw, the air flow is increased, the CO^2 - content in the exhaust drops and the air pressure in front of the baffle plate also drops. By measuring the CO^2 at the measuring point in the exhaust pipe the correct setting of measurement "B" and measurement "A" are checked.

Type		BV 385
Burner		GG175-WLE
Width of turbulator		42 mm
Date		14.10.99

Adjustment specifications

Nozzle		Danfoss
Spray character		fully
Nozzle size	USgal/h	2,25
Spray angle	°	60
Nozzle type		EN
Pump pressure	bar	12,5
Fuel throughput	kg/h	9,185
Delivered capacity	kW	108,43

Exhausts

CO^2	%	-
O^2	%	2,9
CO^2 from O^2	%	13,2
CO	ppm	0
NOx	ppm	87,0
CO	mg/kWh	
NOx	mg/kWh	
Soot	Ba	0,1

Temperature

Exhaust	°C	220,1
Ambient	°C	23,7
Combustion chamber	°C	-

Various informations

Pressure baffle plate	hPa	4,3
Press. combust. chamber	hPa	0,78
Pressure exhaust	hPa	0,12
Loss through exhaust	%	8,82
Efficiency	%	91,18
Measurement A	mm	14,0
Measurement B	mm	15,9
Measurement C	mm	35
Nozzle-baffle plate		8 mm

These dates are from the test set-up. Different conditions for the heaters can result in variations of these values.

Spare Parts List

BV 385

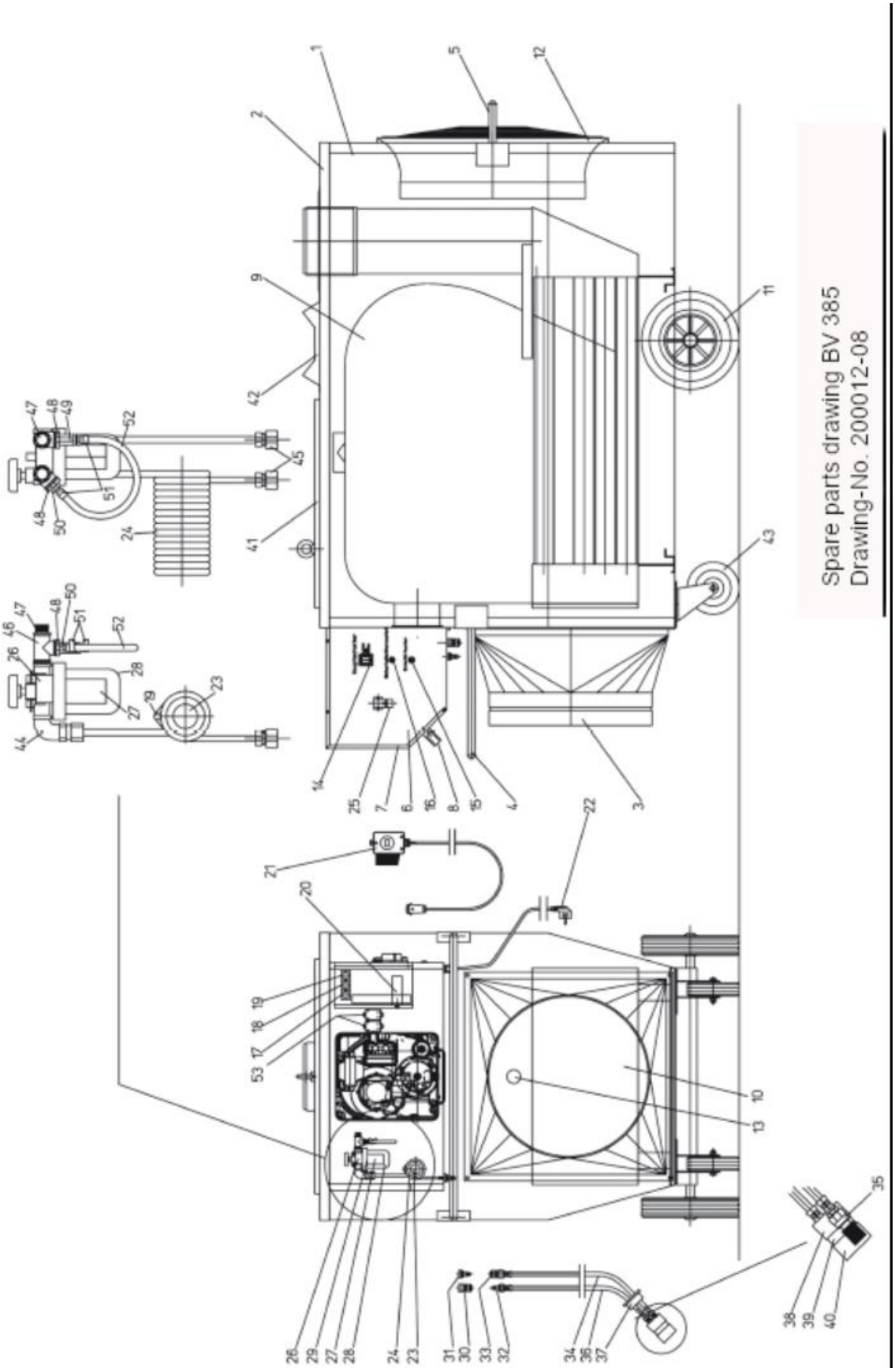
Pos.	Order-No.	D E S C R I P T I O N	Qty.
01	6163951	Housing incl. front and rear	01
02	6163952	Cover Top	01
03	6162953	Cone	01
04	6163776	Burner Protection Bar	01
05	6163955	Fan Protection Bar	01
06	6163956	Burner Housing	01
07	6163957	Cover for Burner Housing	01
08	6161414	Handle	01
09	6163958	Combustion Chamber complete	01
10	6163959	Cleaning Lid	01
11	6162834	Wheel	02
12	6163810	Axial Fan	01
13	6169604	Cap for Inspection Hole	01
14	6162511	Switch	01
15	6162811	Reset Botton	01
16	6161318	Safety Thermostat	01
17	6162509	Min. Thermostat	01
18	6162510	Control Thermostat	01
19	6162510	Control Thermostat	01
20	6163811	Condensor	01
21	6162821	Special Room Thermostat for high humidity with cable and plug	01
22	6162616	Power Cord with Plug	01
23	6162812	Preheater	01
24	6162813	Oil Preheating Spiral	01
25	6162808	Quick Coupling for Room Thermostat	01
26	6162613	Oil Filter - double line	01
27	6162627	Filter Insert	01
28	6162589	Filter Bowl	01
29	6162588	Gasket for Filter Bowl	01
30	6162814	Coupling - return line	01
31	6162815	Nipple Intake	01
32	6162816	Hose Nipple Return	01
33	6162817	Hose Coupling Intake	01
34	6162818	Suction Line with Coupling	01
35	6162617	Plastic Valve	01
36	6162819	Return Line incl. Nipple	01
37	6163893	Cap for Tank Opening	01
38	6163894	Plastic Cap - upper part	01
39	6163895	Pipe	01
40	6163896	Plastic Cap - lower part	01
41	6163961	Changeable Plate	01
43	6163963	Swivel Wheel	01
43 a	6163964	Swivel Wheel with break	01
44	6162840	Elbow Screwing	01

Spare Parts List

BV 385

Pos.	Order-No.	D E S C R I P T I O N	Qty.
45	6162841	Screwing	02
46	6162842	T-Bar	02
47	6162674	Hose Nipple	02
48	6162843	Red-Piece	02
49	6162845	Valve	01
50	6162846	Clamp	01
51	6162847	Clamp	02
52	6162848	Bypass-Hose	01
53	6162430	Contactor	02
54	6163966	Oil Burner complete	01

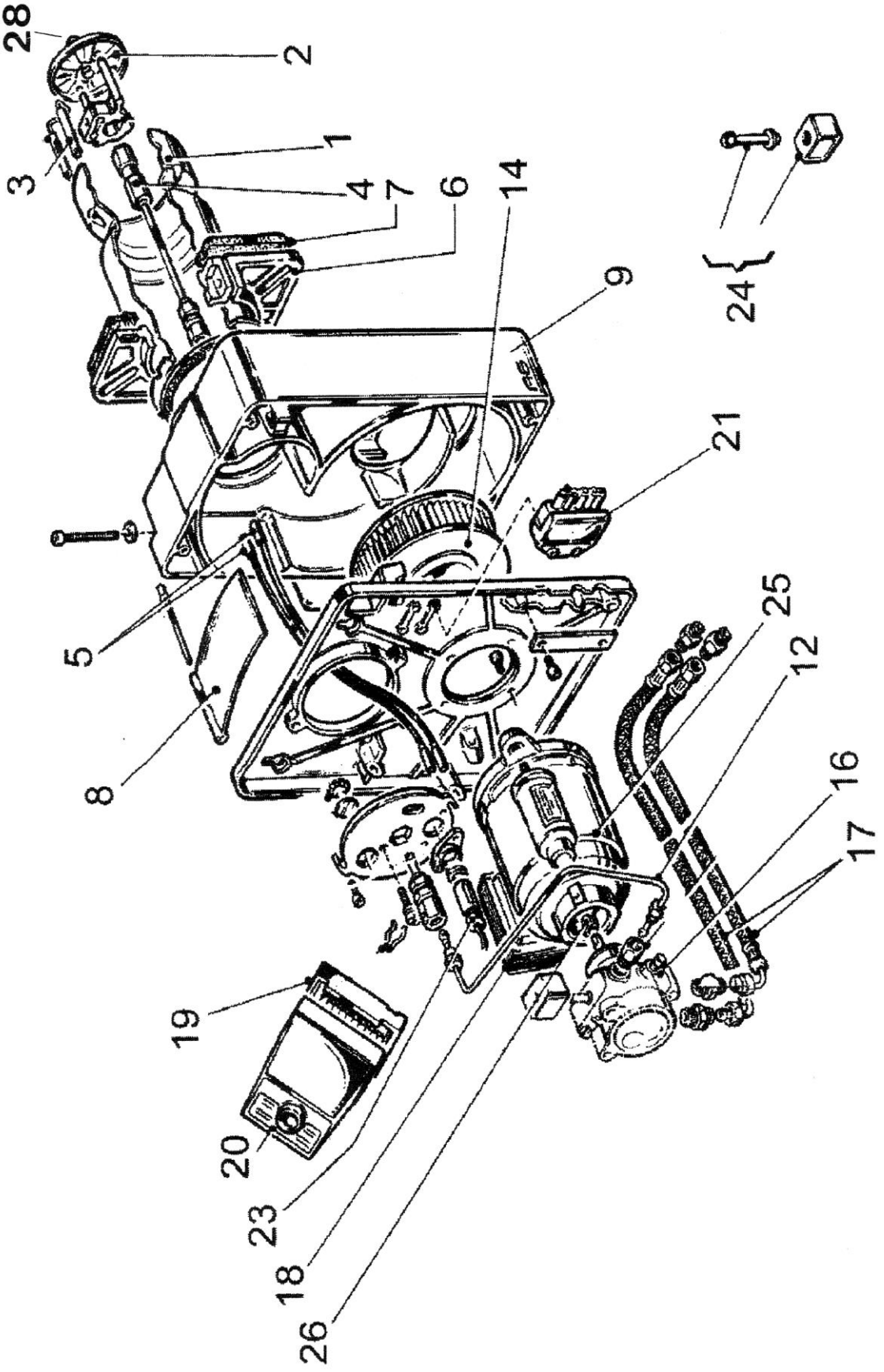
Exploded View BV 385



Spare Parts List

Burner BV 385

Pos.	Order-No.	D E S C R I P T I O N	Qty.
01	6163970	Burner Pipe	01
02	6163971	Baffle Plate with Holder and Twin Electrode	01
03	6163999	Twin Electrode	01
04	6163974	Nozzle Plate complete	01
05	6163975	Ignition Cable 700 mm	02
06	6163976	Sliding Flange, straight	01
07	6163977	Burner Flange Gasket	01
08	6163978	Air Flap Burner	01
09	6163979	Housing without Suction Absorber	01
12	6163980	Pressure Pipe Pump - Nozzle Plate	01
14	6163981	Fan Wheel	01
16	6162710	Suntec Pump AS 47 D	01
17	6162751	Fuel Hose - 750 mm	02
18	6162644	Ignition Transformer, complete	01
19	6162762	Control Box Socket	01
20	6162763	Control Box LMO 24	01
21	6163983	Bushing, 7-poles	01
23	6162764	Flame Control QRB4	01
24	6162701	Solenoid Valve	01
25	6163985	Motor	01
26	6163986	Coupling	01
27	6162757	Fixing Set	01
28	6163032	Burner Nozzle 2,25 GPH - 60° S	01
	6162753	Relay	01
	6162765	Misfire Relay	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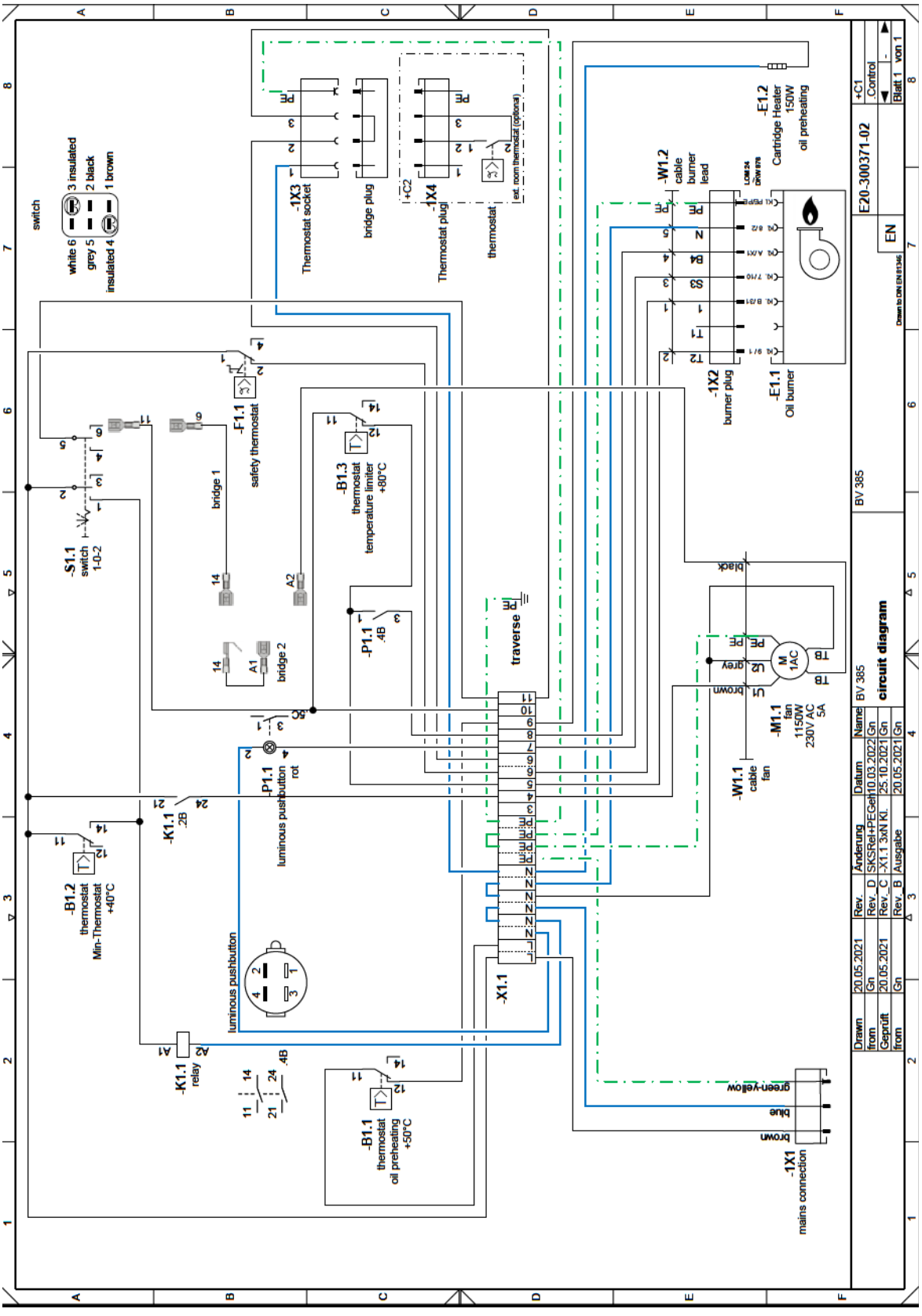
circuit diagram
BV 385
E20-300371-02
EN
-S1.1 switch 1-0-2
-F1.1 safety thermostat
-B1.3 thermostat temperature limiter +80°C
-B1.2 thermostat Min-Thermostat +40°C
-B1.1 thermostat oil preheating +50°C
-K1.1 relay
-P1.1 luminous pushbutton rot
luminous pushbutton
-X1.1
-1X1 mains connection
-1X2 burner plug
-1X3 Thermostat socket
-1X4 Thermostat plug
-W1.1 cable fan
-W1.2 cable burner lead
-M1.1 fan 1150W 230V AC 5A
-E1.1 Oil burner
-E1.2 Cartridge Heater 150W oil preheating
traverse
bridge 1
bridge 2
bridge plug
thermostat
switch
white 6
grey 5
insulated 4
3 insulated
2 black
1 brown
brown
blue
green-yellow
black
grey
Drawn 20.05.2021 Gn
Geprüft 20.05.2021 Gn
Rev. Änderung Datum Name
Rev_D SKSRel+PEGel 10.03.2022 Gn
Rev_C -X1.1 3xN KL. 25.10.2021 Gn
Rev_B Ausgabe 20.05.2021 Gn
+C1 Control
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