IES 300

Service Manual

01.2000
V 1.xx

ERBE

IES 300 No. 10321-000 Standard Version

ISO 9001
EN 46001 CE

IES 300 No. 10321-001 UL Version

ISO 9001
EN 46001

Manual part number: 80116-441
for IES 300 International and UL Version

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ERBE IES 300

Service Manual

Contents

1 Safety notes for servicing

WARNING ⚠ The safety instruction WARNING denotes a danger which can cause injury to persons.

CAUTION ⚠ The safety instruction CAUTION denotes a danger which can cause damage to property.

ATTENTION The safety instruction ATTENTION denotes a danger which can cause failure of the device.

Applicable operating instructions

The operating instructions pertaining to the IES 300 are part of these service instructions. The knowledge fo their contents, of the kind of installation and of commissioning described there, and also of its operation are the precondition for carrying out any service activities.

Safety precautions against the threat of electric shocks

WARNING! Only connect the IES 300 using the mains cable supplied by ERBE, or one of at least the same quality, to a properly installed grounded outlet. If you use an equipment cart, this also applies to the power cord of the cart. The power cord must bear the national mark of conformity.

For safety reasons, multiple outlets and extension cables should not be used. If their use is unavoidable, they, too, must be provided with proper grounding.

WARNING! Unplug the power cord from the outlet before exchanging parts of the device or cleaning it.

WARNING! Do not plug in a mains cable which is wet into the device or into an outlet.

WARNING! Do not touch any unprotected wires or conductive surfaces while the device is disassembled and is under voltage. Never carry a grounding belt while working with a device under voltage.

WARNING! The unit is protected by mains fuses. If one of these fuses blows, the unit must not be used on patients until it has been checked by a properly trained technician. Only replacement fuses of the rating specified on the unit's name plate may be used.

Exclusion of warranty

There are no warranty claims given for damages which have been caused by third-party accessories or by third-party consumables.

ERBE is assuming responsibility for appliances regarding safety, reliability, and function only if assembling, new settings, alterations, extensions, and repairs are carried out by ERBE or by an organisation authorized by ERBE.

The safety of the user and the problem-free operation of the appliance are ensured only when using ERBE original appliance components. If third-party accessories or third-party consumables are used, ERBE cannot grant any guarantee for the safe operation and safe function of the IES 300.

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2 Installation

Electric connection

The IES 300 is connected to a socket outlet with earthing contact, which must be installed near the appliance.

The power consumption of the IES 300 is, depending on the kind of combination with the surgical appliance, max. 16 A; therefore, we recommend not to connect any further consumers to this electrical supply circuit.

For any further electrical devices which can be installed at the work place of the user a sufficient number of socket outlets with earthing contact should be provided.

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3 Function and configuration of unit

Fig. 1: overall view

(1) Front panel

(2) Main filter

(3) Filter locking

The basic IES 300 unit is consisting of:

- Internal synchronous activation
- Automatic switch-off system
- Filter monitoring system
- Electronically controlled brushless blower
- Main filter unit (ULPA and 3-stage gas filter)
- Hose
- Prefilter set
- Suction tube
- Mains cable

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3.1 Description of function

The IES 300 is an electrically operated medical unit cleaning in rooms used for medical purposes the air from fumes and gas constituents arising during vaporisation of human or animal tissue. Typically, these fumes arise when using laser or electro-surgical units and normally is consisting of water vapour, aerosols, and organic gases.

The IES 300 is improving the environmental conditions in the operating theatre:

- reducion of dust load by removing respirable particles
- improvement of view
- removal of foul-smelling and partly toxic organic gases
- exhausting and filtering of dangerous bio-aerosol (filtration of viruses)

The IES 300 sucks in the fume-laden air through a device positioned at the surgical application part or through a hose hand-held close to the application part. The sucked-in air is then cleaned and the hazardous matter removed by a high-efficiency filter and returned again into the air circulation.

Cleaning of the air refers to constituents like aerosols, which are being retained by means of an ULPA high-efficiency particle filter, as well as also to organic gases, which, amongst other reasons, are being noted because of an odour, unpleasant for human beings, and which are absorbed by a special gas filter.

3.1.1 Schematic presentation of functional relationships

The opposite Figure 2 is showing the functional relationships of the IES 300.

The fumes (6) produced by the surgical unit (1) are removed through the extraction channel (7) by the extraction unit (5), consisting of the filter and the blower. The suction unit (5) is controlled by the control electronics (4) integrated in the unit, which is receiving its activation signals either from the operator's station (8) or, however, from the current sensor (3), monitoring the power input of the surgical unit (1).

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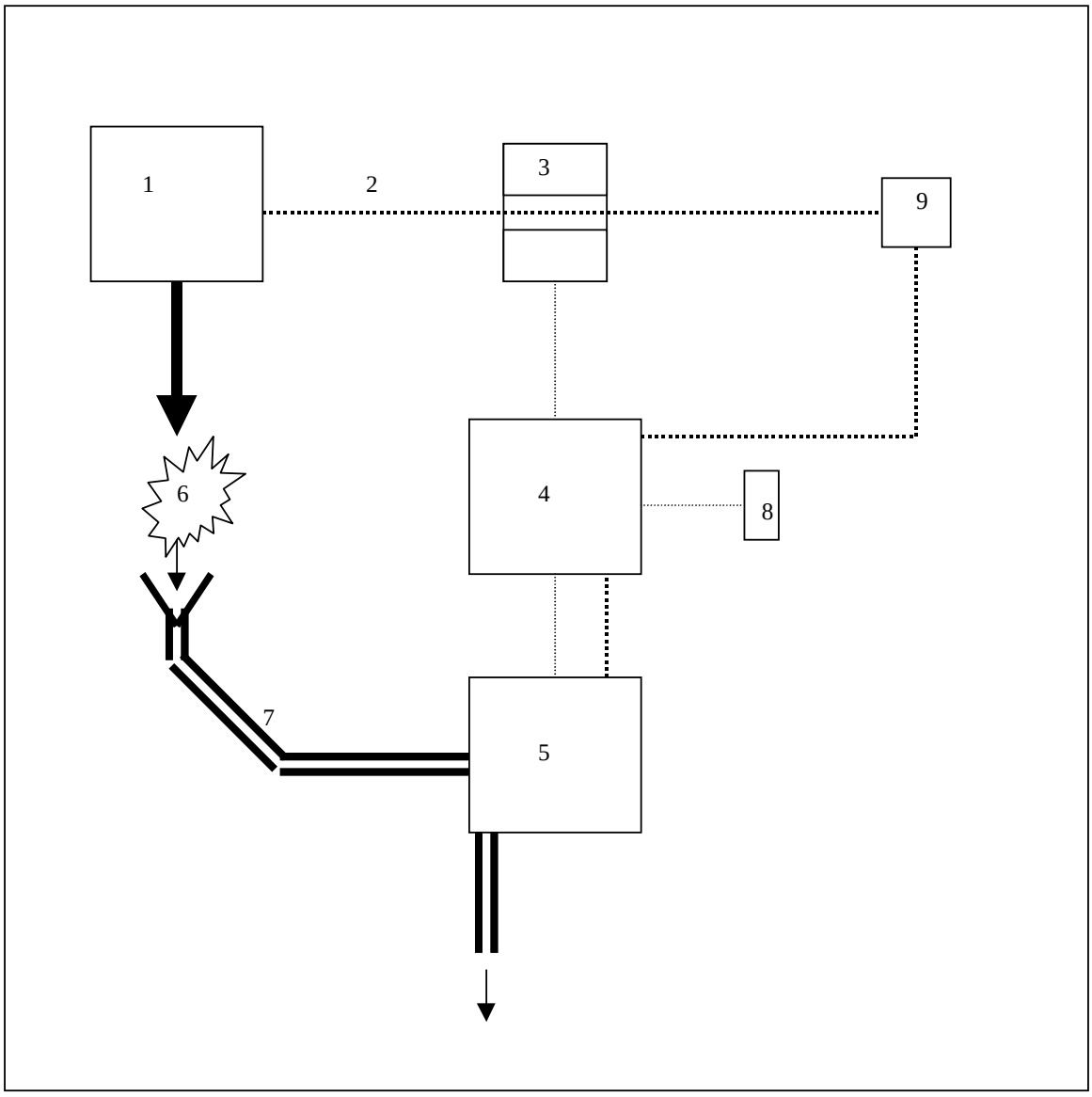

Electric connection
Electric mains connection
Suction channel
Air suction

1. Surgical equipment
2. Mains connection of surgical equipment
3. Current sensor
4. Control electronics
5. Suction unit with filter and blower
6. Fumes at point of reaction
7. Suction channel
8. Operator's and display station
9. Supply from mains

Fig. 2: Function chart

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3.2 Software function

3.2.1 Operation-Mode

No button pressed when IES 300 is switched on.

Basic program

Display „80“ (depending on latest setting value)

LED  (= operation suction)

Button	Description
	Increase the value
	Decrease the value
	Switch-over of setting of operation suction, base suction, run-on time
	Switching off equipment (also no base suction)
	Activate device

Operating overview

LED	Description
	Operation suction (active)
	Base suction intensity
	Run on time

Operation suction

Operation suction can be altered at any time. To do this, LED Operation suction must be lit.

 Press button until LED Operation suction (active) switches on.

 Increase the value

 Decrease the value

The value can be set between 20 and 100 %. This corresponds to an suction rate of approx. 150 to approx. 630 l/min.

By prolonged pressing of button  or  quick adjustment is effected, i. e. the value is increased or decreased very quickly.

When activated, there is automatic switch-over to Operation suction setting.

When there is no filter, the IES 300 cannot be activated.

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Base suction

Base suction can be altered at any time. To do this, LED Base suction must be lit.

Press button until LED Base suction switches on.

Increase the value

Decrease the value

The value can be set between 0 und 30 %.

By prolonged pressing of button or quick adjustment is effected, i. e. the value is increased or decreased very quickley.

Base suction time:

The base suction time can be set in the service level. The time can be set from 0 seconds (= no base suction) up to 98 seconds and duration. The base suction time is active only, when base suction time is not set on 0 seconds and the base suction value is not set on 0 %.

When there is no filter, base suction does not take place.

Run-on-time

Follow-up time can be altered at any time. To do this, LED Run-on-time must be switch on. Any change of Run-on-time is allowed for at next activation.

Press button until LED Delay time switches on.

Increase the value

Decrease the value

The value can be set between 0 and 100 seconds and duration (= ON).

By prolonged pressing of button or quick adjustment is effected, i. e. the value is increased or decreased very quickley.

Suction indication

Suction indication is shown a bar graph display (15 LEDs):

With activated suction (active and delay) there is a standardised display:

- with free suction all LEDs are switched on.
- the lower the suction, the fewer LEDs are lit.
- 1 LED will always remain.

With base suction the display will follow the set suction rate:

0 %	No LED is switched on.
1 – 9 %	1 LED is switched on.
10 – 19 %	2 LEDs are switched on.
20 – 30 %	3 LEDs are switched on.

When the unit is switched off, there is no display.

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Filter indication

Filter indication is shown in a bar graph display (15 LEDs):

Filter indication

Filter indication is shown in of a bar graph display (15 LEDs):

- when all 15 LEDs are lit, the filter is new
- the older the filter, the less LEDs are activated
- when there are no more LEDs flashing, the filter exchange warning (red) begins to be flash, some time later the filter exchange display starts flashing
- when there is no filter there, the unit cannot be activated
- when the filter is removed while the unit is being activated or works in base suction of filters, the unit is switched off automatically
- when an empty filter is inserted, display FIL appears in the 7-segment display and an acoustic warning signal is given.

Suction errors indication

The unit recognises possible suction errors.

Display:

Iluminates red (on left of suction indication)

Acoustic signal, 1 second on, 1 second off

Following suction errors recognition the unit is in OFF condition (without base suction)

Following suction error recognition the unit is in OFF condition (without base suction)

Error indication

The equipment recognize following errors:

Display:

E 01 Calibration error

E 02 Temperature error: Excess temperature (70 °C) or low temperature (0 °C)

E 03 Data error: No setting values existing (EEPROM reading error)

E 05 Calibration error: Step value too low

E 06 Calibration error: Step value too high

E 07 Auxiliary supply voltage fails

The error / defect is shown in the display and stored. The error list can be read in the service modus. The unit must be switched off (no further operation possible).

Activation

The unit can be activated in 3 different ways:

1. By button  (Active) on the front panel
2. By the interal current sensor (automatically by the HF unit)
3. By the external connection (footswitch, remote) on the rear side

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1. Button (Active)

The suction action is on as long as the button is pressed. Thereafter, the suction action continues until the run-on time has passed. Following the run-on time a base suction may take place.

When there is no filter, no activation is effected.

2. Current sensor (automatical by the HF unit)

The suction action is on as long as the HF unit is activated. Thereafter, the suction action continues until the delay time has passed. Following the run-on time a base suction may take place.

The HF unit must be connected to the socket-outlet at the IES 300. The IES 300 must be adjusted with the HF unit (see service mode).

The current sensor is active only when the function has been switched on in the service mode.

When there is no filter, no activation is effected.

3. External connection (interlink, footswitch)

The suction action is on as long as activation is applied to the interlink connection. Thereafter, the suction action continues until the run-on time has passed. Following the run-on time a base suction may take place.

When run-on time is set on Continuous (= ∩∩) the unit can be activated by single-action activation at the interlink connection. With second activation the unit is put again into OFF condition (= foot switch function).

Connection: Voltage supply (5 volt stabilized, max. 50 mA) activation with 5 VDC. When there is no filter, no activation is effected.

3.2.2 Service mode

retain pressed, when switching on: change into service mode

Basic program

Service mode: Display S 0

Selection of service sub-program

Calling the corresponding sub-program

Exit from service mode

Sub-programs - overview

Display	Description
S 0	Change brightness of display
S 1	Automatic activation on / off
S 2	Block suction detection on / off
S 3	Change base suction period
S 4	Calibration of auto activation (automatic)

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S5 Calibration of auto activation (manual)

S6 Service display: display error storage

S7 Erase error storage

S0 Change brightness of display

Display: 01.....10 (Brightness value)

Button	Description
⇧	Brightness +
⇩	Return (incl. store)

S1 Automatic Activation on / off

Display: 10 (Activation off) 11 (Activation on)

Button	Description
⇧	Activation on
⇩	Activation off
▽	Return (incl. store)

The activation by means of the integrated current sensor can be switched on and off as required.

S2 Block suction detection on / off

Display: 20 (Suction adherence indication off) 21 (Suction adherence indication on)

Button	Description
⇧	Block suction detection on
⇩	Block suction detection off
▽	Return (incl. store)

WARNING ⚠

Block suction detection can be switched on and off as required. With switched off suction adherence indication the unit is not switched off and there is also no acoustic warning signal.

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5 3 Change base suction time

Display: 3 0 ..... 3 99

Button	Description
⇧	Base suction time +
⇩	Base suction time -
▽	Return (incl. store)

Here, the base suction time can be set. The unit remains in the base suction mode, as determined by this time setting. Thereafter, the unit is switched off. With setting 99 there is no time limit for the base suction.

5 4 Calibration of auto-activation (automatic)

Display: 4 99 ..... 4 00 (Potentiometer setting in %)

Button	Description
⇧	Start of calibration
▽	Abort

IES 300 and electrosurgery unit must be matched to one another in regard to *Automatic Activation*. If you match the *IES 300* to an ICC 350 but connect a different electrosurgical unit subsequently, you must carry out the calibration again! Calibration is done in two steps in programs 5 4 and 5 5.

Connect the electrosurgical unit to the *IES 300* (see Chapter 3 *Installation*). In one channel of the electrosurgical unit, set the lowest power at which you will later be working. Activate this channel of the electrosurgical unit with no load until calibration is completed. Start calibration using the ⇧ button.

The *IES 300* searches for the suitable setting value. After autocalibration, the *IES 300* independently changes to the program 5 5 *calibration of the Automatic Activation (manual)*. The changeover takes place when the determined autocalibration value is accepted. Manual calibration is used as a control.

5 5 Calibration of auto-activation (manual)

Display: 5 00 ..... 5 99 (Potentiometer setting in %)

Button Description

Button	Description
⇧	Activation threshold + (less sensitive)
⇩	Activation threshold – (more sensitive)
▽	back (incl. save)

Set the activation threshold in such a way that the LEDs on the *suction power display* are illuminated when the electrosurgical unit is activated and are off when the electrosurgical unit is not activated.

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5 6 Yxx display: Display error storage

Display: Y = Selected point (in hex)
xx = corresponding value (in hex)

Button	Description
⇧	Selection +
⇩	Selection -
▽	Return

Display		Description
0	xx	Number of errors stored(xx = Number errors in hex)
1	xx	Error code of most recent appeared error (xx = Error code)
2	xx	1. appeared error (xx = Error code
3	xx	2. appeared error (xx = Error code
4	xx	3. appeared error (xx = Error code
5	xx	4. appeared error (xx = Error code
6	xx	5. appeared error (xx = Error code
7	xx	6. appeared error (xx = Error code
8	xx	7. appeared error (xx = Error code
9	xx	8. appeared error (xx = Error code
A	xx	9. appeared error (xx = Error code

Here, the current error (= most recent appeared) and the corresponding history can be read out. The number of stored errors is 9, the number counter is counting to max. 255 (=FF).

Error code: see Error messages

5 7 Erase error storage

Display: 0 - (not yet erased) - (erased)

Button	Description
⇧	Erase error storage
▽	Abort / Return

Here, the internal error storage can be erased (error counter and error storage).

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3.2.3 Calibration mode(influences mainly suction indication and block suction detection)

and and pressed when switching on: Entry into calibration mode.

Display: C 0 (wait for start command).

Button	Description
	Start
	Abort (possible only as long as display C 0 is on, hereafter, no abort possible any more!!)

Button	Description
C 0	Waiting for start command: The filter must be there (new filter), but nothing must be connected. The unit must not be working ! (the unit is working at high speed (rpm), therefore, delay operation of up to 60 s is possible after switching off)
C 1	Input of "open values" (wait)
C 2	End of calibration, switch of unit

Calibration takes place automatically, it is necessary only to enter in display status C 0 a start command. After C 0 the input of values takes place in display C 1 without connected hose. When there is a fault or a error message, calibration must be repeated, because otherwise no further operation of the unit is possible!

Restoring the basic setting

The IES 300 is delivered with a basic setting. If you change this setting and then wish to restore it, keep the *higher value* button depressed when you switch on the unit.

Caution

The basic setting cancels the settings you have made previously!

Basic setting

User level:

Operation suction *80%*

Basic suction *10%*

Run-on time *15 s*

Program level:

Brightness *8*

Automatic Activation *on*

Blocked suction detection *on*

Basic suction time *99* (i.e.: no time limitation)

Activation threshhold for *Automatic Activation 9*

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3.3 Description of hardware

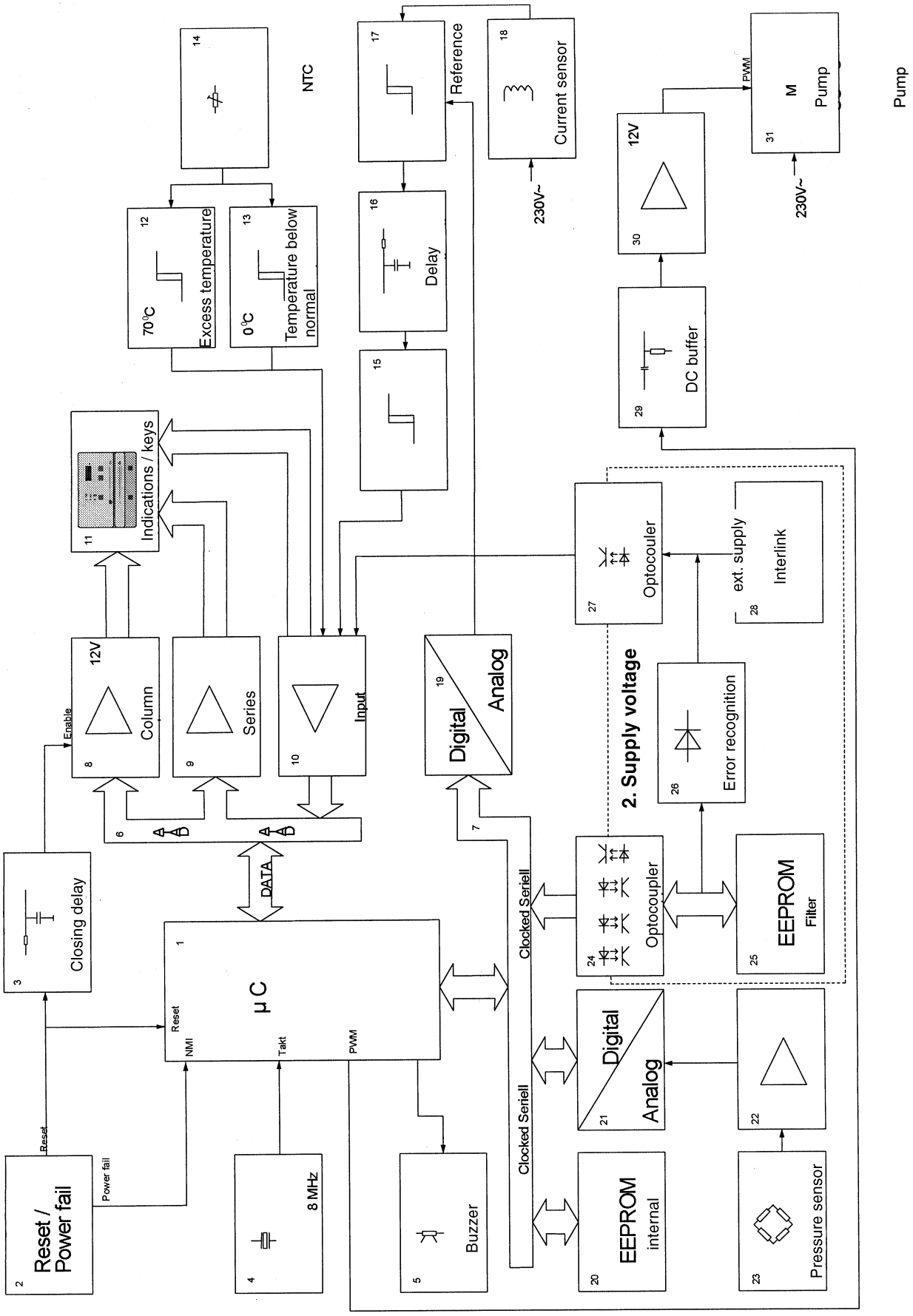

Fig. 3. Block diagramm (Date: 01.09.1999)

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Voltage supply

The electronics are supplied with 230 V~. The main transformer (TR1) generates the 12 V voltage for the display and the PWM signal to the unit as well as the 5 V supply voltage. The secondary transformer generates the secondary supply voltage (5 V). Voltages are controlled by means of voltage regulator.

Description of function

(numbers in brackets refer to fig. 3 on page 15)

Power On

The processor (1) receives the reset signal by the reset IC (2). The switch on delay time (3) prevents during switch on a flicker of the display LEDs. When delay time has elapsed the drivers column (8) and row (9) are released. The processor (1) is being clocked by an internal generator and the external quartz (4).

Power Down

The reset IC (2) produces a power-fail signal which generates in the processor (1) an interrupt (NMI). The power-fail signal initiates with power down the storage of the data into the internal EEPROM (20).

Buzzer

The built-in buzzer (5) receives a switching signal from the processor (1) via an output port. Because the buzzer (5) has built-in electronics there are no further components required.

Data bus

The drivers column (8, row (9), and input (10) are being operated via a parallel data bus (6) by the processor (1). A further data bus is the serial bus clocked serial (7), supplying the components EEPROM internal (20), AD transformer (21), EEPROM filter (25), and the digital potentiometer (19).

Display

The LEDs fo the display (11) are triggered by drivers column (8) and row (9). The supply voltage of the LEDs is 12 V through a series resistor. The LEDs are arranged as a matrix 8 x 8 and are multiplexed by the processor through a timer interrupt.

Inputs

All inputs are read through driver input (10) through data bus (6) by the processor. The buttons (11) are taken separately (no matrix) to the driver.

Thermal protector

The temperature is measured by means of an NTC (14) which is soldered to the board. This produces a temperature-dependent voltage which is being evaluated through comparators excess temperature (12) and low temperature (13). The two comparators are interconnected at the output so that there is one signal line to driver input (10). The fume extractor does not differentiate between excess or low temperature.

Current sensor

The current sensor (18) detects currents which are being taken from the 230 V~ power socket at the fume extractor. The current sensor (18) converts the current into a corresponding voltage. The voltage is then compared at the comparator (17) with a reference voltage (reference) by the digital-analog converter (19). When reference voltage is exceeded there is no interference by the delay (16) so that the comparator (15) is switching through directly. The output signal of the comparator (15) is evaluated through driver input (10) by the processor. In order that the signal is reliably recognised by the processor the delay (16) generates a pulse expansion (corresponds to a switch-off

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delay). The digital-analog converter (19) consists of a digital potentiometer which is being triggered through the serial bus clocked serial (7).

Unit control

The unit (31) is equipped internally with electronics. These electronics contain all the components for operating the unit (31). The speed (rpm) / performance of the unit (31) is controlled by means of a PWM signal. The PWM signal has a frequency of approx. 150 Hz. The unit (31) is supplied by 230 V~ voltage and is metallically separated internally from the trigger circuit by a optocoupler.

PWM-Signal

The PWM signal for triggering the unit (31) is controlled by the processor (1) through a timer. The timer signal is led through DC buffer (29). By this means running of the unit (31) is safely stopped in case of processor failure. Behind the buffer signal conditioning takes place by the amplifier (30), increase the PWM signal to 12 V.

Data storage

The processor (1) contains 64 Byte RAM and 4 KByte ROM. For the storage of settings (also of calibration values) there is in addition the EEPROM (20) required. This is triggered by the serial bus clocked serial (7). The storage of the set values active intensity, base intensity, and delay time is effected by the NMI routine (during switching off). All the other values are stored in the EEPROM (20) immediately after confirmation of the same.

Filter data

The filter data are stored in EEPROM filter (25). This EEPROM is installed into each filter and carries the information of the same. The data in EEPROM filter (25) are pre-programmed at the supplier's works and are only altered in the fumes extractor. Triggering takes place also through the serial bus clocked serial (7) as with EEPROM internal (20), while the signals, however, are metallically separated by the optocoupler (24). In this manner double insulation from the remaining signals is secured. This is necessary because this voltage is accessible to user contact.

Interlink input

The interlink input is effected through socket (28), which is equipped with suppression capacitors directly at the input. To this socket the secondary voltage (5 VDC) is connected, which is limited additionally by a resistor (explosion protection per EN 60601-1). By means of this supply voltage the optocoupler (27) is triggered by activating a footswitch, which can be connected to the socket. This signal is led on to driver input (10) and read there by the processor (1).

Error recognition secondary supply voltage

When there is no second supply voltage this will cause failure of the fumes extractor. In order that this condition can reliably be separated from other operating conditions error recognition is applied. For this, the signal CS-EEPROM filter, which first was led through the optocoupler (24), is coupled into the remote input via a diode (26). The processor (1) is setting at interrogation of the secondary voltage the signal CS-EEPROM filter and evaluates the result at the interlink input. In case of absence of secondary voltage also the corresponding signal will be lacking.

Note:
This error recognition does not function when an external supply is permanently connected to the interlink input.

Suction measurement

Determination of actual air suction is effected by measuring differential pressure. For this purpose a diaphragm is installed in the air channel between filter and unit (31), which is increasing the differential pressure with increasing air suction. This differential pressure is measured by the pressure sensor (23). The output signal of the pressure

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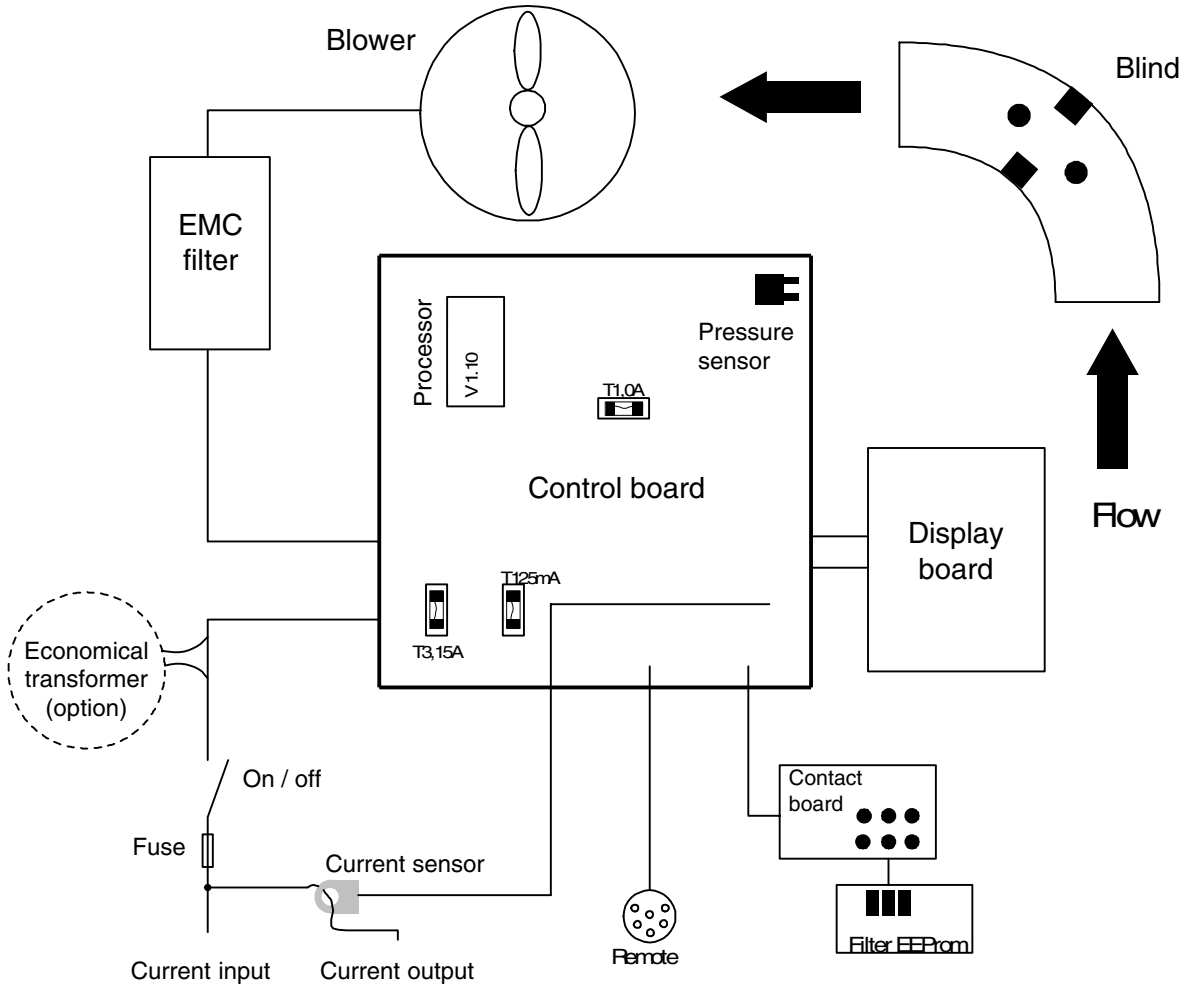
sensor is amplified (22) and passed on to the 16 Bit analog-digital converter (21). The converter is controlled and read by the processor (1) through the serial bus clocked serial (7). Calibration of the pressure sensor takes place processor-controlled in a calibration routine. No potentiometer is needed for calibration. In addition, automatic zero-balancing is carried out with the unit (31) at rest.

3.4 Description of componentry

Fig. 4. Description of componentry (Date: 01.09.1999)



3.4.1 Electrical system

The power supply side consists of the following components:

- the inlet connector for non-heating apparatus of the power socket
- the mains switch
- the mains fuses, which are installed in the housing of the power socket
- the autotransformer (with WORLD version only)
- the auxiliary power socket (the power outlet)
- the EMC filter

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- the blower (unit)
- the transformers on the control board

3.4.2 Electronics

The electronics components are the following:

- the current sensor (a 50 Hz current converter)
- the control board (incl. fuses and the differential pressure sensor)
- the display board (incl. operating and display elements)
- the contact board, which is solely the interface between control board and filter
- the filter board, which is positioned inside the filter and carries an EEPROM only
- the interlink socket (remote), which is positioned at the rear of the unit

3.4.3 Air passage

The air suction is passing the following components:

- the accessory parts, like suction funnel/ nozzles/handles, hoses, and prefilters
- the main filter (particle / gas filter)
- the measuring diaphragm in the hose arc
- the blower (unit)
- the outblow (i.e. the noise-attenuated air outlet)

3.5 Connector assignment

Interlink socket:

Pin 1: + 5V (control board: remote: pin 2)
Pin 2: nc
Pin 3: Optocoupler (control board: remote: pin 3)
Pin 4: nc
Pin 5: 0V (GND) (control board: remote: pin 4)

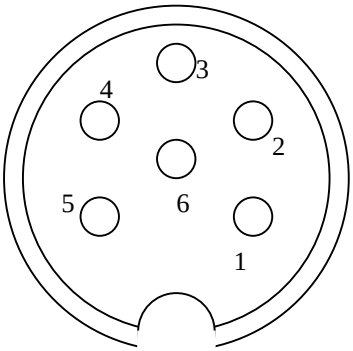

Fig. 5. Interlink socket

Potential-free signal input (e.g. by means of foot-operated switch / button or potential-free switch-contact from laser): The switch is connected to Pin 1 and Pin 3.

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3.6 Test and measuring points

On the control board the voltages can easily be taken for measuring purposes at the following points:

❶ GND: Negative potential of 12V voltage (from large transformer)

❷ +Vs Positive potential (12V from large transformer)

❸ PWM Pulse-width modulated input signal of blower

❹ GNDa Negative potential of 5V voltage (from small transformer / for the outputs)

❺ V+ Positive potential (5V from small transformer)

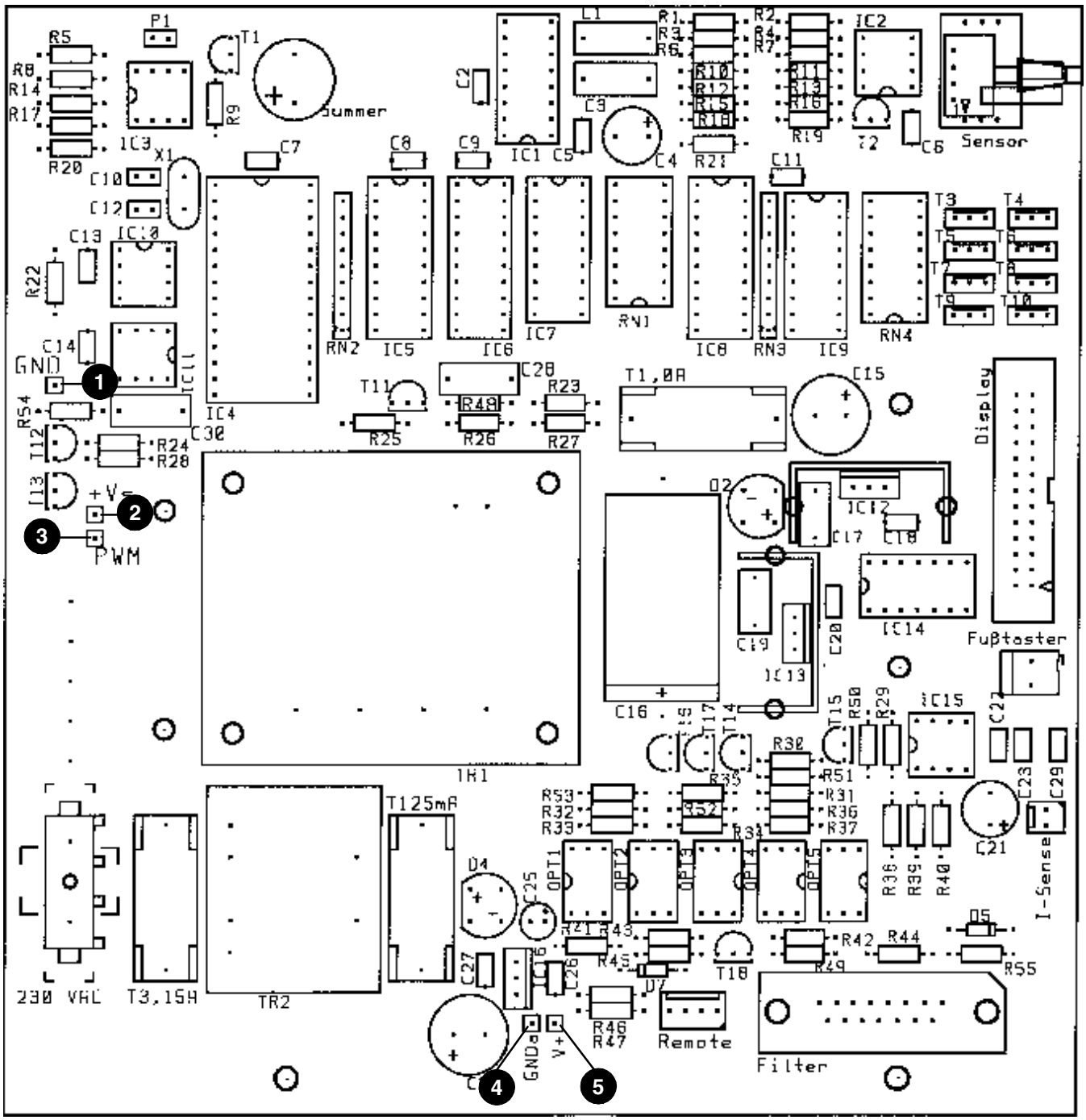

Fig. 6. Board V 2 (Date: 01.09.1999)

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4.0 Replacement of components

The design of the “wear parts”, for instance seals and gaskets and similar parts, is such that during the first 10 years and with normal operation no replacement of components (except for filters and consumables) should become necessary.

The following parts may become subjected to replacement in case of service work done: Contact springs in contact board: These can be taken out, after removing the main filter, by strongly pulling by hand (without having opened the housing).

Boards, blower, and other internal components: These can be removed using tools after taking off the housing cover. When opening and closing the housing cover it is absolutely necessary to take care of the protective conductor mounting at the cover.

Foam plastic support for blower: Should the blower have been replaced and the upper foam plastic support been removed, it is a must to take care that during assembly of the components the cooling passages of the blower into the open are kept clear. Particular care must be paid to the air passages in the foam plastic! Place foam plastic correctly on blower and take care of the ventilation slots.

·Software: In order to replace the software with micro-controller it is not necessary to dismount the control board. Replace only IC 4 (Figure 6) and pay attention to direction of installation; the pins must not be bent or broken!

Front membrane: Should the front membrane have to be replaced, this can be lifted using a tool, and drawn off. With more aged units remainders of adhesive may remain on the front frame. These can be softened using a chemical label solvent and then removed (e.g. Solvent Etikettenlöser).

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5 Elimination of operational and functional problems

Before doing any installation or repair work the unit and the fuse on the house side must be switched off !

Symptom of problem	Possible cause	Remedy
Unit does not start	- Power plug not fitting correctly - No mains voltage - Fuse defective	- Check connection at wall socket - Check house fuse - Replace fuse
Insufficient flow	- Leaks in hose lines - Main filter is blocked - Prefilter is blocked	- Check hose lines for firm seating - Replace main filter - Replace prefilter
Display: E 01, E 05, E 06	- Calibration defect of internal pressure sensor	- Carry out calibration on site. See description of software
Display: E 02	- Excess temperature (>69°C) or low temperature (<0°C)	- Switch off unit and wait until temperature inside unit returns to normal
Display: E 03	- Data fault on main board	- Switch unit off and on again, and carry out new calibration on site.
Display: E 04	- Blower does not work	- Switch unit off and on again. Blower possibly defective or replace control board. With renewed defect check internal fuses.
Filter exchange warning remains lit up	- Filter EEPROM defective - Contact failure to main filter	- Replace main filter - Clean contact surface (gold-plated) at filter - Clean contact springs in filter channel - Pull contact springs and check for ease of movement; replace if applicable
Display: E 07	- Auxiliary supply voltage lacking - voltage is missing	- Check fuse on control board for voltage; replace if applicable

Display E 04 only IES 300 Versions before 1.21

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6 Maintenance and servicing

6.1 General notes

For carrying out tests and checks it is mandatory to observe the regulations and specifications of the respective country (e.g. VDE 0751 or DIN 57751). After repairs, the characteristics relevant for safety must be examined to the extent to which they may have been affected by the repair work. For the protection of the person carrying out the examination the inspection should be carried out in the sequence as stated.

6.2 Inspection requirements

6.2.1 Visual inspection

1. Completeness and legibility of inscriptions, in particular the marking of fuses, is to be checked.

2. The fusible links are to be checked for correct values (rated current and rated voltage) and fusing characteristics.

3. The unit is to be checked for external damage (power cable, hoses, filter, handle, housing ...).

4. All mechanical parts (also printed boards and similar) are to be checked for proper mounting and for possible damage.

5. The wear parts are to be examined and, if necessary, to be cleaned or replaced.

6. Hose assemblies and sealing systems are to be inspected for indications of leaks and fractures.

6.2.2 Electric inspection

1. Measurement of protective conductor resistance per EN 60601-1

Measuring points: - Equipotential plug

- Base plates of individual modules

- Housing bottom (earthing point)

2. Measurement of earth leaking current per EN 60601-1 and comparison with the value measured first, which must not be exceeded by more than 50 %.

3. Documentation of evaluation and inspection per EN 60601-1.

6.2.3 Function test

Functions of unit as described in the Operating instructions.

Leak-tightness of air passage: With closed main filter opening no hissing noise, indicating a leak, must be heard. Leaks can occur predominantly at the transition between the filter housing and the main filter.

Contacts to main filter: Regarding the electric contacts, which become accessible when the main filter is removed from the unit, one should check whether the springs are still freely moving and do not become stuck. Should the springs become stuck, the spring contacts are to be pulled from the bush and be replaced. Do not adjust by bending manually! Bent contacts must always be replaced.

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7 Spare parts and accessories

7.1 Spare parts

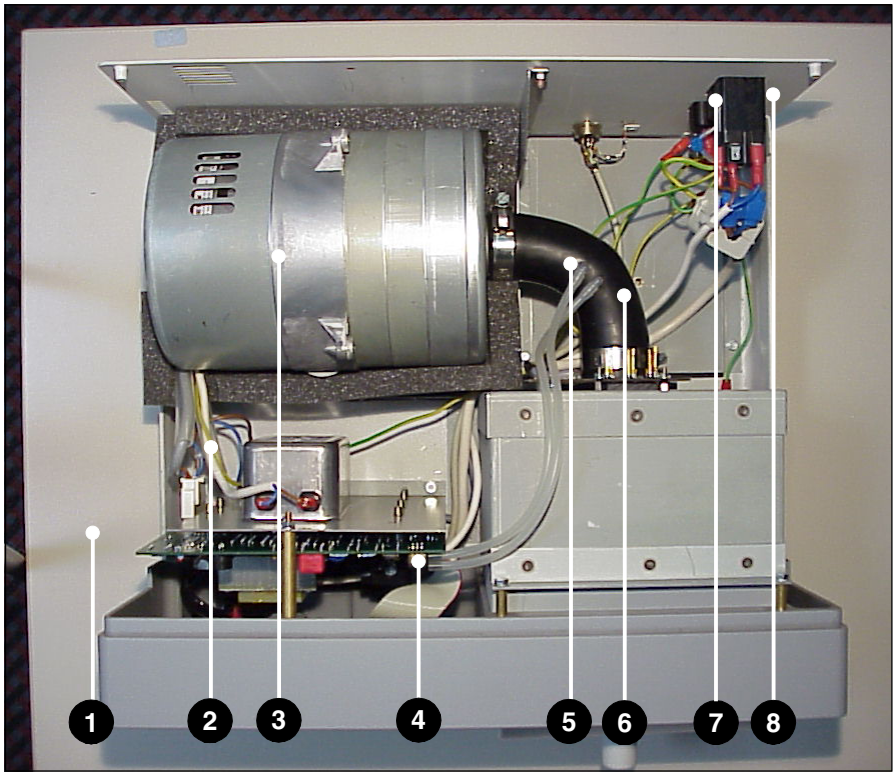

Fig. 7: internal view

IES 300
❶ Control board
❷ Interference suppressor filter
❸ Blower
❹ Hose for pressure sensor
❺ Measuring diaphragm (in hose)
❻ Hose arc
❼ Auxiliary power socket
❽ Power socket for non-heating

EPROM V 1.21 40321-100
Bottom plate 40321-111
Unit base 40321-112
Cover plate 40321-113
Rare panel 40321-114
❶ Control board 40321-115
(please quote serial number of unit,
see section 9.1 "Unit versions")
Display pcb 40321-116
Contact spring 40321-117
❽ Power socket for non-heating apparatus .. 40321-118
Drawer for 40321-118 40321-119
❼ Auxiliary power socket 40321-120
Front panel 40321-121
Front membrane 40321-122
Foam plastic set for blower support 40321-123
❸ Blower, 4-stage 40321-124
❻ Hose arc Ø 32 40321-125
Hose connector for hose arc 40321-126
❹ Hose for differential pressure sensor 5.0x2 40321-127
Filter flange 40321-128
Attenuation mat for outblow 40321-129
Current sensor with cable 40321-130
Cable end switch-pcb 40321-131
Cable end board-blower 40321-132
Cable end mains input-interference
suppressor filter 40321-133
Cable end non-heating apparatus-POAG 40321-134
Cable end PE cover plate-POAG 40321-135
Cable end PE bottom plate-POAG 40321-136
Cable end fuse-main switch 40321-137
Cable end remote board 40321-138
Cable end power input-fuse 40321-139
Ferrite core 40321-140
❷ Interference filter 40321-141
Interlink socket 40321-142
Screw cover, light-grey for housing screws ... 40321-143
Housing screw M5 x 20, countersunk 40321-144
Main switch 40321-145
❺ Measuring diaphragm for hose arc 40321-146
Outer cardboard box 40321-147
Inner packaging 40321-148
Cover caps for standard rail 40321-149
Rubber seal for filter flange 40321-150

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7.2 Accessoires

20321-000	Filter cartridge
20321-001	Footswitch explosion protected
20321-002	Evacuation tubing single use, Ø 22 mm
20321-003	Prefilter
20321-004	Evacuation wand, reusable
20321-005	Adapter 22 mm - 22 mm, reusable
20321-006	Adapter 22 mm - 10 mm, reusable
20321-007	Clip-on handle, sterile, single use
20321-008	Electrode handle, sterile, single use
20321-009	Evacuation tubing, reusable
20321-010	Evacuation funnel
20321-011	Footswitch not explosion protected
20321-012	Evacuation tubing 210 mm
20321-013	Fixing set IES 300
20321-014	Tubing support arm
20321-015	Standard rail

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8 Technical data

Technical data	
Supply voltages (incl. tolerances)	230 VAC ± 10%
Supply frequencies (incl. tolerances)	50...60 Hz ± 1%
Power connection	appliance connector built in mains socket
Auxiliary power outlet (IEC 320)	100 - 120 V / 8 A - 230 V / 6.3 A
current consumtion	3.0 A (UL and Japan Version 3.0 - 6.0 A)
Blower air capacity (free flow)	1,600 l/min
Equipment air capacity	650 l/min at 100 % electronically controlled
Activation	Activation, front panel button, signal at activation input, optional via footswitch
Operating mode	Suitable for continuous operation
Protective measures	The blower motor has thermal fuse protection
Fuse (breaking capacity H)	230V: T 3,15 A (250V)
Acclimatization regulations	(Before initial operation): acclimatize for 4 hrs after cold transport
Maintenance	Filter change and change of disposable items by the user
Repair	Repair by ERBE Customer Service or authorized by ERBE according to national directives (in Germany DIN VDE 0751).
Ambient temperatures	In operation: +10 °C … +40°C For transport and storage: –40 °C… – 70 °C
Air humidity	5 % … 95 % (without condensation)
Air pressure	+700 … 1060 hPa
Weight	14 kg
Dimensions (W x H x D)	W 410 mm x H 210 mm x D 368 mm
Noise level	max. 52 dB (A) @ 1 m (according to ISO 7779)
Interfaces	(Inputs and outputs) suction hose connection 7/8" (22 mm), potential equalization, activation input, power connection
Protection class	I
Classification in accordance with EC Directive 93/42/EWG	Class I
Type of applied part	CF

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9 Unit versions

Hardware

up to 5/99: Control board V1

- on the soldering side there are several additional components mounted

from 6/99: Control board V2

- additionally equipped with 1 resistor on soldering side
- the filter contact board is being adapted with its cable through a filter-D-plug (no longer through a single-line white plug)
- the current sensor (for ISA) is being adapted with its cable through a single-line white plug (no longer through the green screw terminal)
- measuring points provided (see Figure 5)

Software

up to 26.5.99: IC4 with software V 1.01

- 1. delivery condition

from 02.06.99: IC4 with software V 1.10

- The run-on time can be set for permantent activation (000 ...100), thereafter appears ON. Foot-switch simulation has become possible in this way.
- At expiration of filter life appears display FIL (not when main filter is removed).
- Differentiation of ISA is improved.

from 11.1999 with Software V 1.21

- operation suction: 20 .... 100 %, on
- Technical Data: max Flow 760 l/min. (230 Volt)
- Unrestricted use of this maximum power on of the unit is only possible if there is free flow. If narrow tubes and connections are fitted, or if the filter is dirty, the unit will automatically reduce the power.
- The IES 300 is delivered with a basic setting. If you change this setting and then wish to restore it, keep the higher value ⇧ button depressed when you switch on the unit.
  Operation suction 80%
  Basic suction 10%
  Run-on time 15 s
- Service-Mode:
  Brightness 8
  Automatic Activation on
  Blocked suction detection on
  Basic suction time 99 (i.e.: no time limitation)
  Activation threshhold for Automatic Activation 9
- Note: After the basic setting the system starts immediately and the suction will increased.
- Error 4 not displayed

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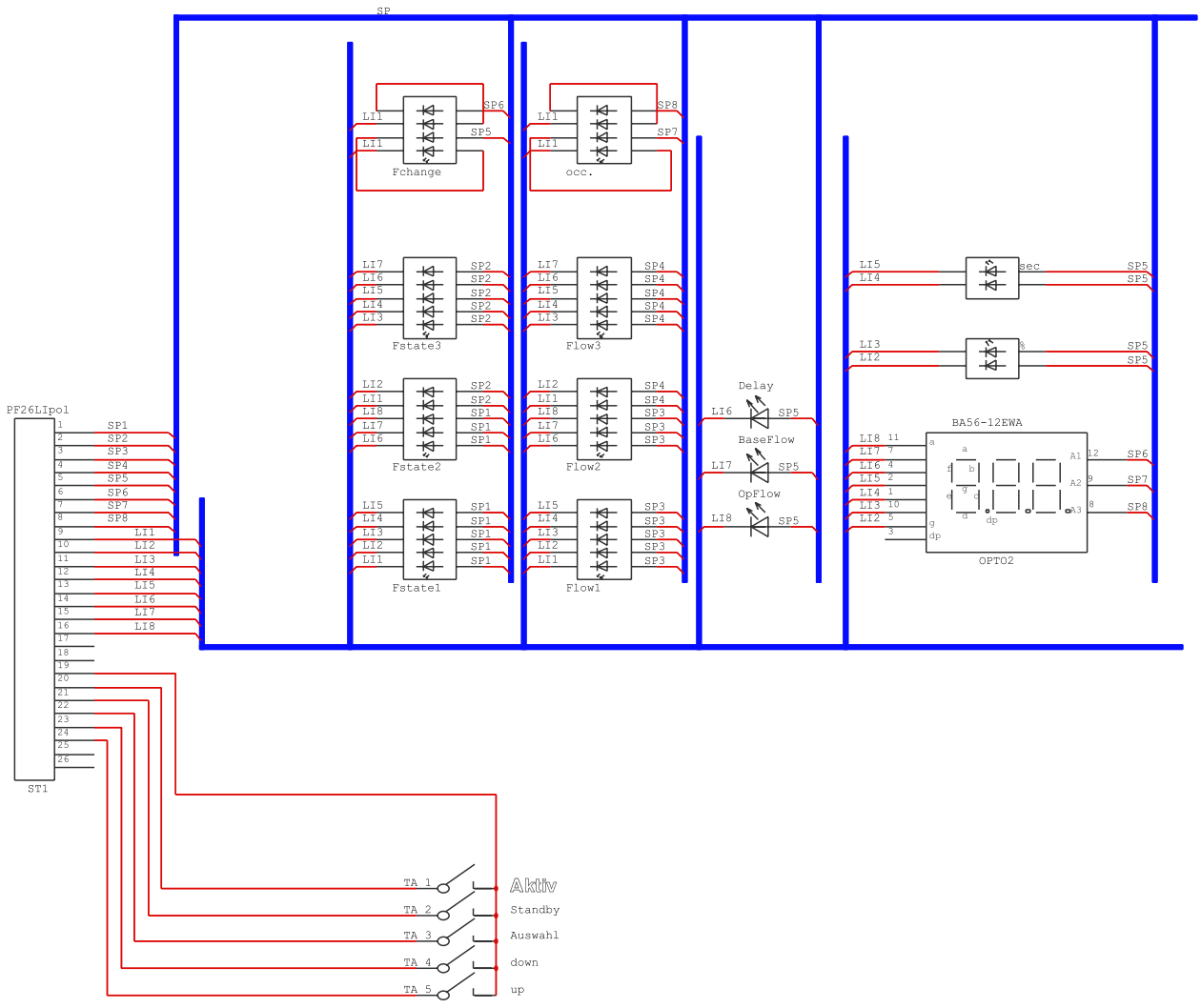
10 Circuit diagrams



Smoke evacuation Display board

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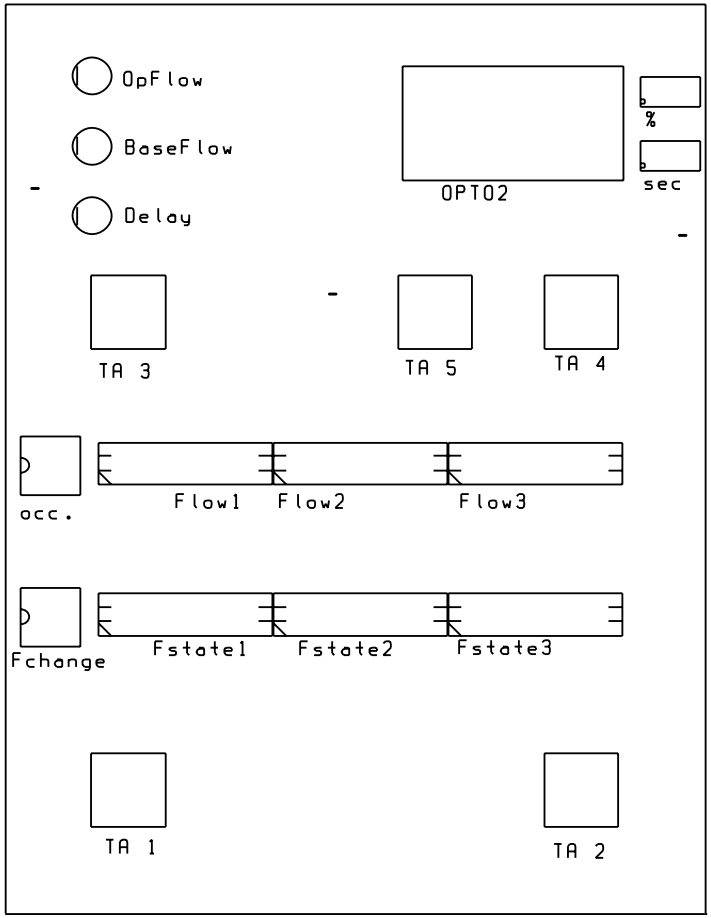
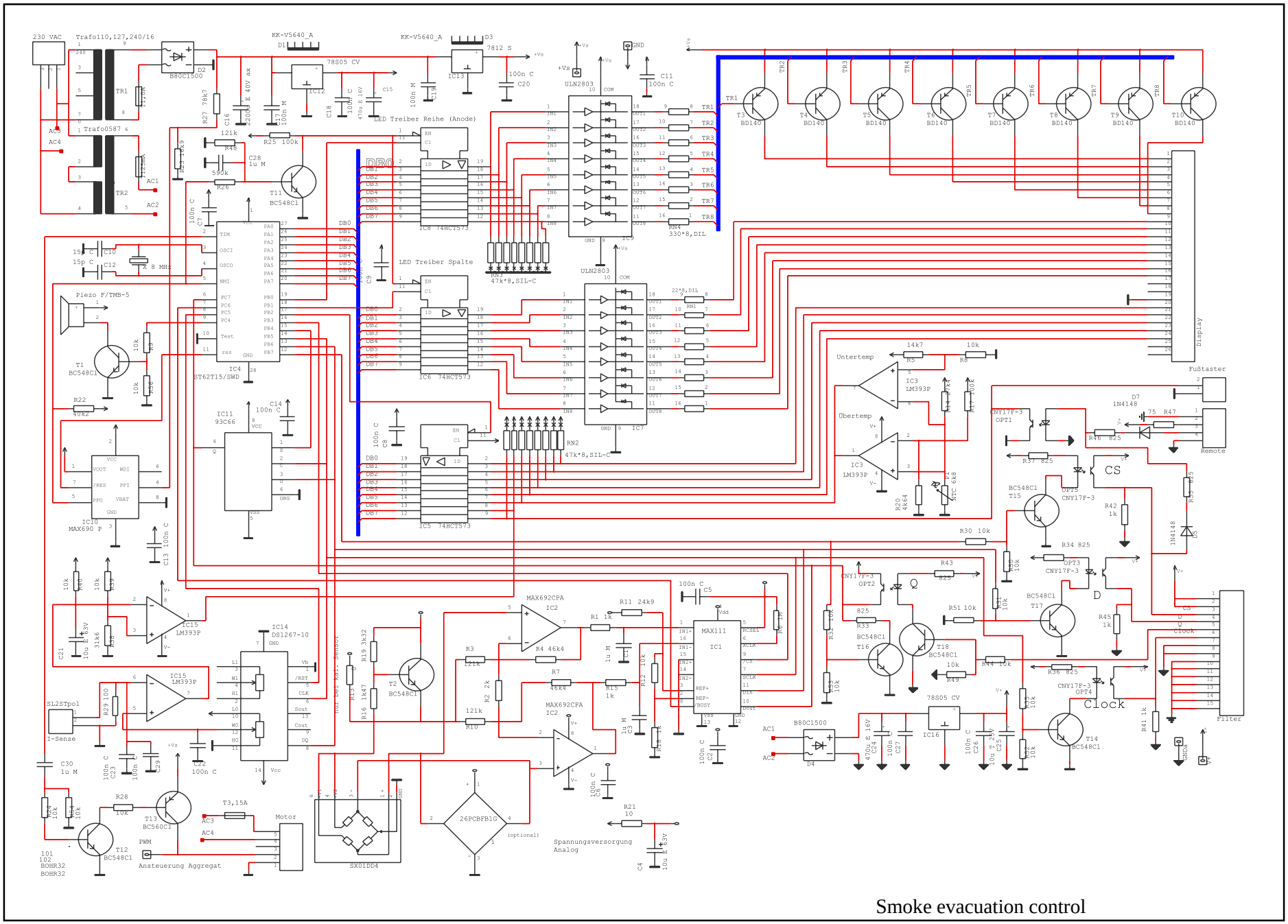
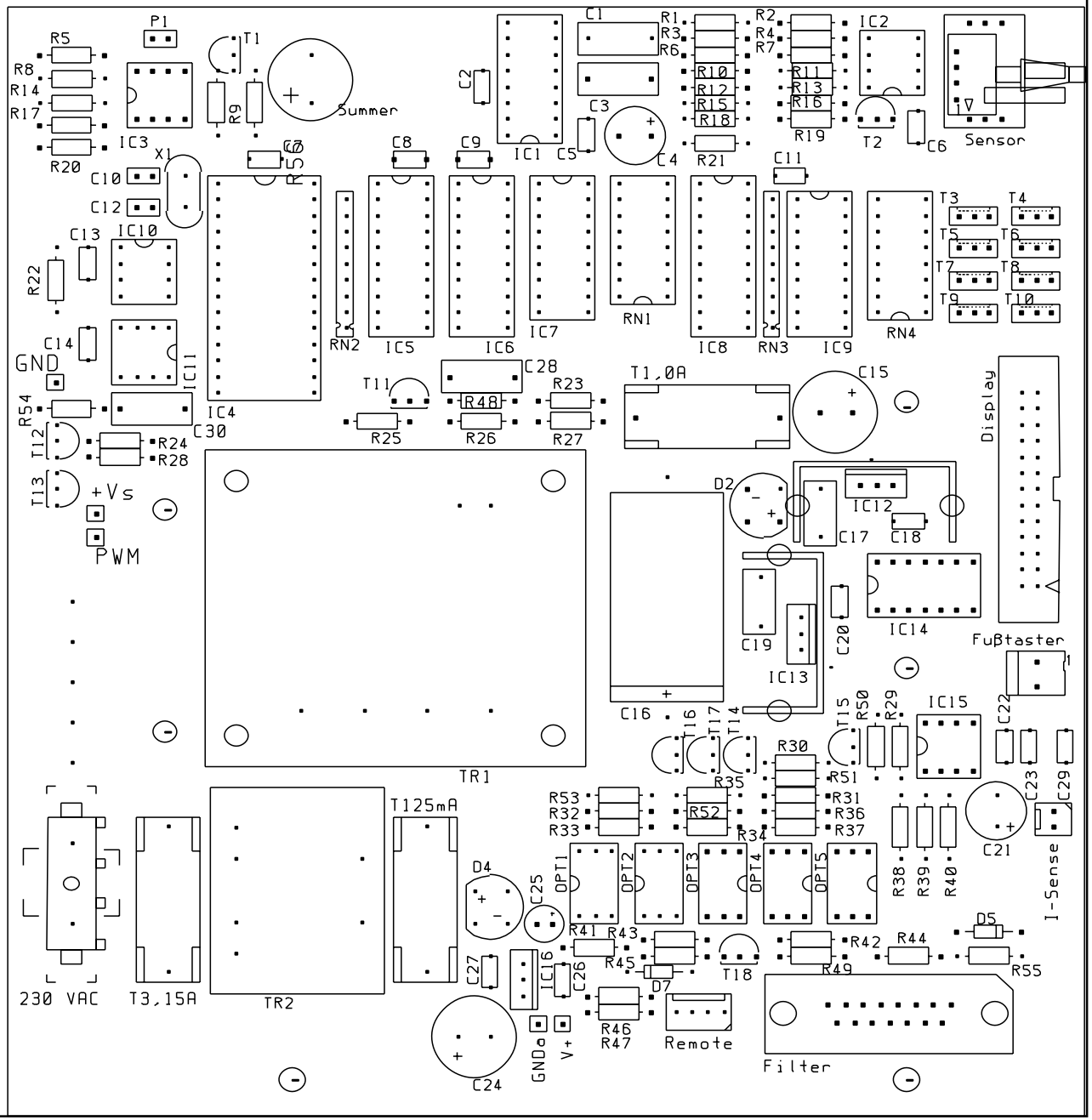


Smoke evacuation Display board

plan of component parts



Smoke evacuation control



Smoke evacuation

Control - Plan of component parts

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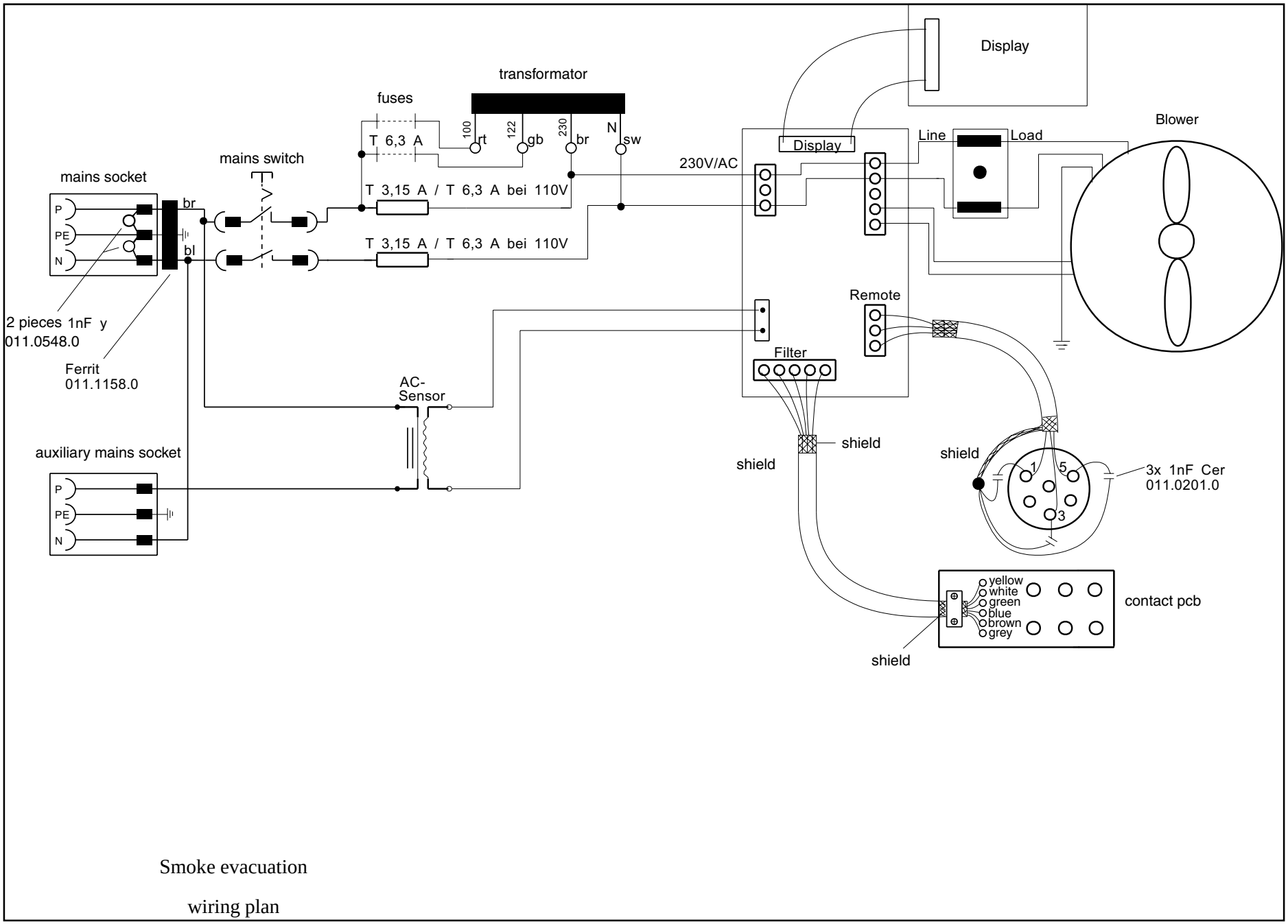
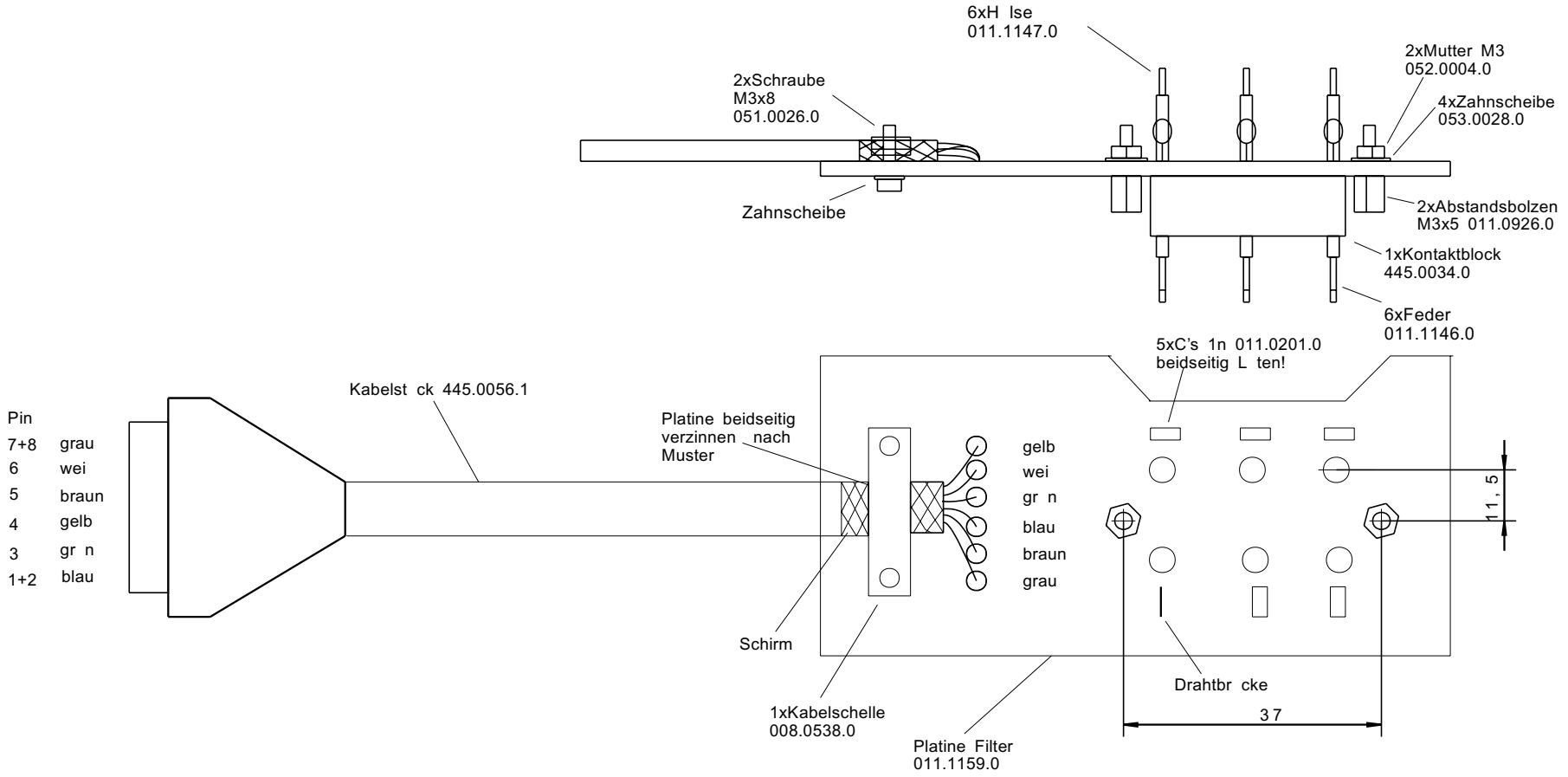


Smoke evacuation

wiring plan



Smoke evacuation

Filter board