

**FD 100
TIMBER DRYER
&
SCB 2016
CONTROL BOX**



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OPERATION

These instructions must be read carefully and followed before setting the system into operation. Ignoring this point Ebac will not be responsible for any damage or warranty.

1 Foreword

These instructions are made to guarantee a safe and secure operation of the machinery. It will help to avoid dangerous operations, minimise failures of the machinery and give you a reliable system.

For further information the Ebac experts for after-sales-service are at your disposal.

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2 Introduction

The switchboard Ebac SCB 2016 had especially been constructed for the control of the timber dryer Ebac FD 100. The built in control unit BC 2000 allows a fully automatically drying cycle.

In this switch board all the necessary elements are integrated, like protection and security elements for the dryer, fans, venting unit, and when ordered also for humidification or additional heating.

The SCB 2016 was developed on the base of the long experience of Ebac in wood drying. This SCB 2016 complies with DIN EN 60 204 (VDE 0113; electrical equipment of industrial machinery) and EMV- guidelines.

This operating manual is intended to aid operation of the control unit and SCB, to provide assistance in resolving any problems. See attached diagram No. 9.

3 General information

The SCB 2016 is manufactured in accordance with general regulations and updated to the latest technical standard. The operator must follow the given security information only then the handling of the equipment can be done safely.

WARNING

When this is shown in the text then only an experienced electrician is allowed to repair.

4 Operation

4.1 Installation

Operating manual is inside the control box

With main switch Q1 you switch on L1, L2 and L3. Electricity is "on" for the whole circuit and the Low Voltage Circuit (24 V DC).

Attention

The life of electrical motors depends on the correct voltage. Low supply voltage will put strain on the motor and thus shorten their life. To prevent this, the cables must be to VDE.

The earth separation clamp U2 that connects EARTH and L-(OV) 24V transformer is stipulated by VDE. This is provided to indicate errors in the 24V circuit

Switch on "System On" and the BC 2000 can be programmed (see operating instructions BC2000 HT).

After starting the drying program the ventilating fans (K1...) and the fans inside the machine will start. Dehumidification (K2), heating (K3), venting unit (K4) and humidification (K5) (if installed) will be controlled and set into function by the control unit. Control lamps show activity.

After power failure the control unit automatically starts the drying process again.

When current is available again the unit will start automatically after 10 minutes (display shows „Auto-Start“) if no button was touched on the keyboard. The control will continue the program where it stopped before power failure.

WARNING

When the program starts again automatically the ventilating fans and fans inside the machine will start delayed. To avoid danger for persons the doors must be secured with switches that make sure that only the installation can start again when the chamber door(s) are closed.

4.2 Dehumidification

The compressor is switched on by the BC2000 HT (see manual). When a new drying cycle is started the compressor does not immediately start, as this would cause ice to build up on the evaporator coil. The “Drying” lamp indicates when the compressor has started

4.2.1 Function of the FD 100

The fan motor inside the FD100 draws the humid air into the machine; the evaporator coil cools this air below its dew point, removing moisture which is collected in the drain tray and lead away. The cool air then passes over the hot condenser coil where it is reheated before being discharged back into the chamber.

4.2.2 Function of cooling circuit

Within the evaporator coil the refrigerant vaporises which cools the coil surface down to approx. 20°C. The humidity in the air condenses and the water flows into the drain tray. The refrigerant (in vapour form) passes from the compressor into the condenser, where it's reheated and changes back to liquid. The heat from the evaporator and the compressor is used to warm up the air. Then the cooling liquid passes through the condenser and filter dryer and flows back to the evaporator.

The air blown out of the machine has a higher temperature and a lower relative humidity.

4.3 Heating

Inside the machine are heating elements (FD100 = 1,5kW). Depending on chamber temperature (see manual BC2000 HT) heating is controlled (on or off). The “Heating” lamp indicates when the system is heating.

The maximum chamber temperature can be limited through temperature climate plan, trip curve, heating up per day or drying speed.

1. Maximum chamber temperature is limited by climate plan e.g. if at a certain wood moisture a maximum temperature of 40°C is allowed and the other components would allow 55°C, the chamber will be heated up only to 40°C.
2. Maximum chamber temperature is limited through trip curve (temperature/humidity if max. compressor capacity is reached).
3. Maximum chamber temperature is limited through given heating up data per day. If the chamber temperature is 25°C and is heating up 10°C per day up to 35°C but other components would allow a temperature or 40°C, the chamber will be heated up only to 35°C.
4. Maximum chamber temperature is limited through drying speed (speed 1⇒ 45°C, speed 2⇒ 55°C, speed 3⇒ not possible). If other components would allow a higher temperature than the chosen speed will not allow it.

If the SCB 2016 has a connection for external heating (special version) then this heating is controlled by the BC2000.

4.3.1 Additional electrical heating

The electrical heating elements are to be installed in front of the auxiliary fan directly within the airflow. With a switch you can choose machine heating, additional external heating or both forms of heating together.

4.3.2 Additional heating with hot water

When heating is done with hot water the water temperature must at least have 80°C, this temperature is controlled by a temperature sensor. If the water temperature is lower then this heating is automatically cut off and the internal heating of the machine starts.

4.4 Venting

The chamber must have a venting unit to avoid the chamber overheating. This venting unit is controlled by the BC2000 HAT (see manual). The “Vent” lamp indicates when the vent is operation. The vent unit pulls in external cold air and blows out humid air. This in turn reduces the temperature inside the chamber.

4.5 Humidification (Temperature & Humidity sensor applications)

When drying delicate species e.g. oak, a spraying facility is absolutely necessary.

This equipment ensures the relative humidity in the chamber does not fall below the required humidity level. The humidification is controlled by the BC2000 HT (see operating manual). The “Humidify” control lamp indicates when humidification is operational.

The control sequence allows only “heating on” or “humidification on”, never both. When the required humidity is reached heating up will start again.

These regulations are programmed and cannot be changed

4.6 Measuring of chamber humidity (relative humidity) and temperature

The FD100 has a temperature sensor. Chamber temperature is taken by a NTC-resistor. If the chamber has a temperature/humidity sensor then the humidity is taken by a hair-hygrometer (change of length through humidity). These signals are transferred into °C and % relative humidity.

4.7 Measuring wood humidity

The moisture content is based on measuring the electrical resistance of the wood that has to be dried. The control unit starts to take the data at certain intervals and calculates the resistance into % wood humidity.

ATTENTION! MOISTURE PROBES

Please ensure the following points are followed: -

1. Choose boards of same species
2. Choose boards that dry slowest
3. Probes diagonally to wood fibre
4. Probe distance 32mm
5. Depth 1/3 Of wood thickness
6. When drying hard wood drill holes of \varnothing 3,5mm
7. Do not knock in at end of board (outside)
8. Distance from end of board 300-500mm
9. Position into the pile to the „1/3 rule“
10. Loading/unloading the chamber please take care of the cables

5 Safety Device / Error Report

5.1 Safety device FD 100, final switch chamber door

WARNING

The safety devices may under no circumstances be changed, short cut or bridged. This could cause an overheating of the compressor or damage the heating of the machine.

WARNING

The final switch (es) in the chamber door(s) must be installed to secure an automatic start of the machinery and may not be interrupted by any means. Otherwise the automatic starting fans could do harm to persons.

Within the FD100 there is an overheat protector to control the heating. This will cut off the machine when the temperature gets too high (e.g. when a fan inside the machine stops).

The control lamp will show „Fault“. After having deleted the error the machine must be put into function manually (see error report)

The final switch (es) at the chamber door(s) switches off the machines when chamber door(s) are opened. This means that all equipment as fans, heating... is switched off. After closing the door(s) the machines must be put into function manually (see error report). When the door(s) is open the control lamp will show „Fault“.

5.2 Fault Lamp

The “Fault” control lamp as the following possible causes:

- Chamber door(s) is/are open
- Overheat protector FD100 has cut off electricity
- Motor protector of fans has cut off electricity

Attention

The protector which caused the cut off can be identified by looking at the Position of the on/off switches. To turn the machines on again press red button “0” and then green button “1“.

6 Error Elimination

6.1 Reset

Reset after “Fault“ is done by switching the unit “off“ and then back “on“ The “Fault“ lamp will go out and the control will start automatically.

Attention

After about 10 minutes the drying process will start automatically and proceed at the point where it had been stopped.

Please make sure that the error had been eliminated!

WARNING

Before working on any of the components of the unit the main switch must be turned off and made sure that no one can turn it on. This work has to be done according to accident prevention regulations for electrical installations (VBG 4).

6.2 Chamber door(s) open

Close the door(s) and verify that it (they) are really locked.

6.3 FD 100 Overheat Protector Trip

When the overheat protector has tripped investigate the following reasons:

- Fan motor inside the machine inoperative ⇒ Fan motor seized exchange motor
- Fan blades damaged ⇒ exchange fan blade
- Evaporator /condenser dirty ⇒ must be cleaned
- Inlet / Outlet Grille dirty ⇒ must be cleaned
- Air Inlet blocked by wood stack ⇒ Create free space for ventilation

Allow the machine cool down and do the reset. Should an error still appear then ask your electrician to check the overheat protector alternatively ask an Ebac technician.

Attention

When the overheat protector has tripped, the unit it will restart automatically once cooled down. The fault can be cleared, however but the actual fault may not have been eliminated. The control lamp will show “Heating“, after a short period the overheat protector will switch off the unit again and show error.

6.4 Motor protector switch for fans

Motor protector switch has tripped, investigate the following reasons:

- Motor protector switch incorrect adjusted ⇒ must be adjusted by an electrician
- Motor protector switch defective ⇒ must be exchanged by an electrician
- Fans seized ⇒ free seizure or exchange motor
- Fan motor(s) defective ⇒ must be exchanged by an electrician
- Cable defective ⇒ must be checked by an electrician
- Fans dirty ⇒ must be cleaned

7 Service

7.1 Interval service

Attention

Ensure the main switch is turned off, and locked in the OFF position.

To ensure an efficient and continuous operation, the equipment must be maintained in regular intervals.

	In intervals of... Or after...		Point
1.	6 weeks 700 hours, depending on water quality more often	Clean the humidification facility and control it (if existing)	7.5 S. 14
2.	6 months 2.000 hours	Check the condenser and evaporator for cleanness	7.2 S. 13
		Check fan blades on fastening	7.2 S. 13
		Check fan motors if clean and easy turning	7.2 S. 13
		Check fans in the chamber for cleanness and easy turning	7.3 S. 14
		Check venting unit for cleanness and function	7.4 S. 14
		Check temperature/humidity sensor for cleanness	7.6 S. 15
3.	12 months 4.000 hours	Check cooling circuit for tightness	7.2 S. 13

7.2 Timber dryer FD 100

Remove the 2 front panels by unscrewing the 4 (6) screws. All necessary repair work can be carried out

WARNING

<p>WARNING: DO NOT STEAM CLEAN REFRIGERATION COILS</p>

Due to the high pressure inside the cooling circuit this could cause an explosion.

Clean the surface of the evaporator and condenser coils with compressed air. Maintain a distance of approximately 150mm to avoid damage. Clean the drain tray and ensure that the condensate hose is not blocked and has enough incline.

Check the fan blades are tight on the motor shaft and are positioned in the middle of the fan case.

The motor itself is sealed and needs no grease.

The cooling circuit is a hermetic closed system. Service is not necessary, however periodic checks of all joints for tightens are recommended. For this purpose a refrigerant leak detector which shows a leakage rate of 14g per year is required.

7.3 Fans

The ventilation fans do not need grease. The only maintenance required is to clean the fan blades. The fans can be cleaned with compressed air, maintaining a distance of 150mm.

Pull the fan blades to ensure they are securely fastened onto the motor shaft. Manually rotate to ensure free rotation.

7.4 Venting unit

Same procedure as point 7.3. The opening flaps can be cleaned with compressed air and take care that the insulation felt gets not damaged. The motor inside the flaps is maintenance free.

7.5 Humidification

Ebac-spraying facility consists of nozzles for micro distribution of water, magnetic valve, water filter, reverse valve and stopcock. The water pressure must be 5 bars for an optimal function.

To guarantee a perfect performance of the spraying facility a regular service is necessary.

As the water quality differs very much we can only recommend the interval approximately.

We suggest cleaning every **six weeks** the following:

1. Cleaning the water filter:

- Open reverse valve
- Leave it open for a minimum of 15 seconds
- Filter must be free of dirt and the water must come out clearly.
- Close the valve

2. Cleaning the nozzles:

- Close valve
- Screw off nozzles
- Clean under running water, eventually take a brush
- Attention! Do not harm the sieve!
- Check tube ends for dirt and remove it
- Screw nozzles in
- Open valve

More frequent cleaning is required if the water is dirty!

Attention

Should the water contain too much lime cleaning can be assisted by using a lime remover e.g. vinegar.

During the drying cycle, if the humidity level is seen to be rising slowly, this indicates the nozzles are full of lime or dirt and require cleaning. Then the drying process must be stopped and the nozzles cleaned as described above.

7.6 Temperature /humidity sensor

The temperature/humidity sensor requires no maintenance. Only the safety tube must be cleaned with a wet cloth or blown out with compressed air. To avoid damage use low pressure compressed air i.e. below 0.5 bars

Attention

The Temperature / Humidity Sensor is supplied calibrated and does not require any further adjustment. Adjustment without the correct equipment may cause incorrect drying conditions

8 Technical data

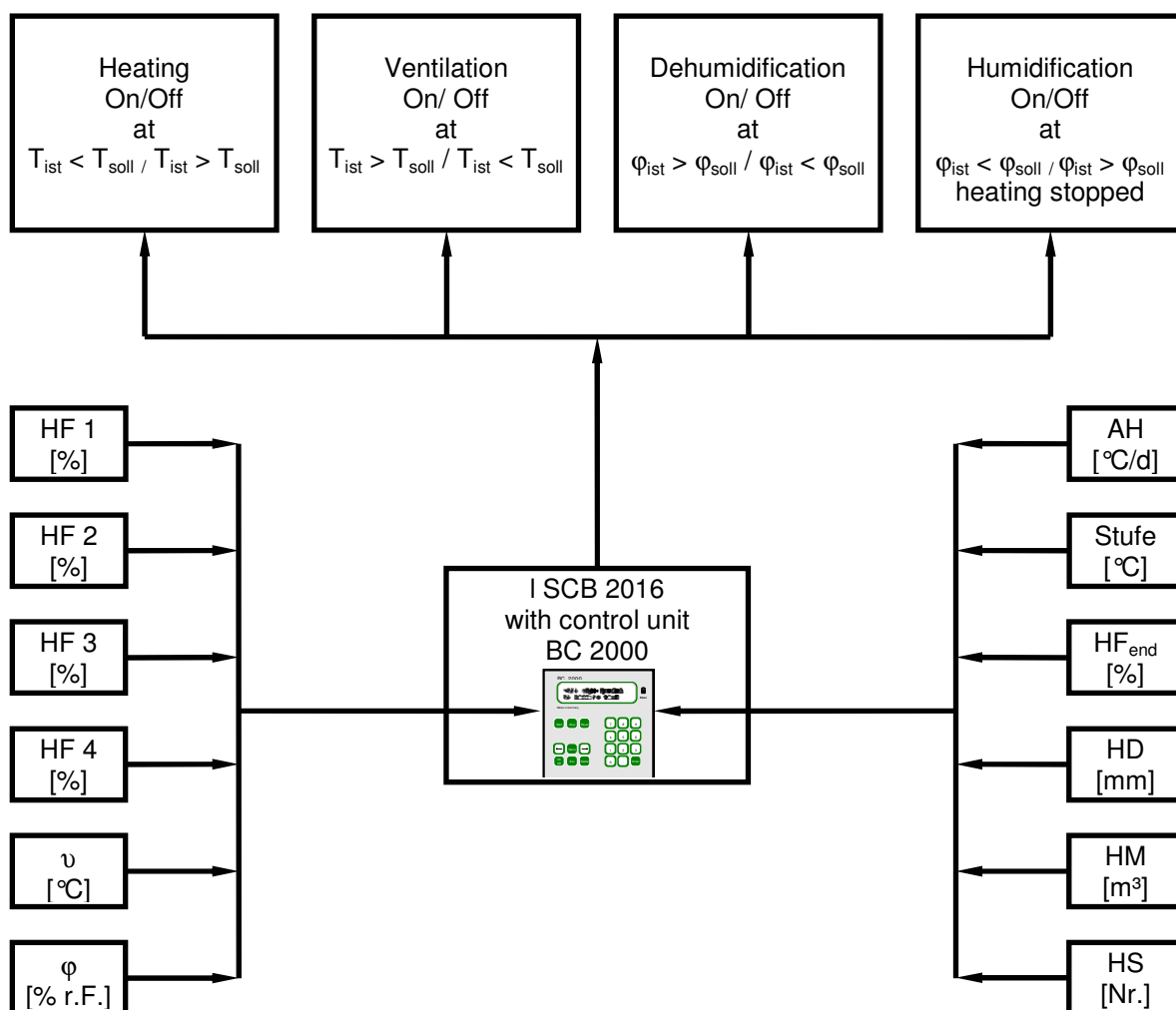
8.1 Technical data FD 100

Model:	FD 100
Max. power consumption	1,2 kW
Compressor:	
Heating:	1,5 kW
Max. drying temperature:	55 °C
Average water extracting:	40 l/d
Width:	1070 mm
Depth:	290 mm
Height:	820 mm
Weight:	76 kg

8.2 Technical data SCB 2016

Technical data of SCB 2016 you will find in the manual.

9 Wiring sketch



Used short cuts

HF 1	Moisture probe 1	} Measurement control unit
HF 2	Moisture probe 2	
HF 3	Moisture probe 3	
HF 4	Moisture probe 4	
v	Chamber temperature	
φ	Relative humidity in the chamber	
HF _{end}	Desired final humidity	} Enter on keyboard
Stufe	Max. Chamber temperature	
HS	Species	
HM	Quantity of wood	
HD	Thickness of wood	
AH	Heating up per day	

SPARE PARTS LIST

<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>PART NUMBER</u> <u>1322220</u>
Furrel	2	2320520
Washer	2	2320521
Insulator Washer	2	2321626
Insulator Washer	2	2321627
Evaporator Coil	1	2321701
Capillary Tube 0.042"	11.6ft	3014254
Compressor	1	3020216
Condensor Coil	1	3020723
Filter Dryer	1	3020909
Fan Motor	2	3030160
Heating Element	1	3031607
Overheat Protector	1	3031710
Fan Blade	2	3040147
Refrigerant	0.76kg	R134a

"This product contains fluorinated greenhouse gases covered by the Kyoto Protocol. The refrigeration system is hermetically sealed.

The Global Warming Potential (GWP) of refrigerants used in products manufactured by Ebac Industrial Products Ltd is as follows

R134a – 1300

R407c – 1610

For type and weight of refrigerant contained in this unit, please refer to the product data label"



Drawing	: - TPC245
Issue	: - 1
Date	: - 13/10/03

- 1 – FD100 DEHUMIDIFIER
- 2 – HIGH TEMPERATURE VENT
- 3 – FALSE CEILING
- 4 – TEMPERATURE SENSOR (HUMIDITY
OPTIONAL)
- 5 – TIMBER STACK
- 6 – AUXILLARY FANS



Drawing :- TPC245
 Issue :- 1
 Date :- 13/10/03

Inspection record for electrical installations DIN VDE 0701

	Dryer	Venting unit	Humidifying	Add. Heating	Fan 1	Fan 2	Fan 3	fan 4	Fan 5	Fan 6	Fan 7	Fan 8	Fan 9	Fan 10
Visible check:														
- insulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- case	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- connecting cables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
- other parts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Measuring:														
Protectors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insulation resistance	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>	M <input type="checkbox"/>
Current derivation	mA	mA	mA	mA	mA	mA	MA	mA	mA	mA	mA	mA	mA	mA
Voltage check	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Measuring ok:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Function check dryer:														
ok	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
labels existing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Security checked according to DIN VDE 0701 geprüft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unit may not be used under this condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Security after DIN VDE 0701 is not given	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Date:

Signature of inspector:



Drawing	: - TPC245
Issue	: - 1
Date	: - 13/10/03



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