1.1.4 Machinery Directive

In accordance with the Machinery Directive 89/392/EC, it should be ensured that if SIMADYN D fails or executes an incorrect function, that this does not result in the machine/system going into a potentially hazardous condition. This must always be taken into account when configuring the machine/system.

The system may not be commissioned until it has been proven that the final product is in conformance with the Directive.

Low-Voltage Directive

The Low-Voltage Directive 73/23/EC is only applicable for products with supply voltages of ≥ 50 V AC and/or > 75V DC.

For SIMADYN D, this involves the following components:

- SP 7 6DD 1683-0BB0
- SP 8.5 6DD 1683-0BC0
- SP 9.5 6DD 1683-0BE5
- SP 22.5 6DD 1683-0CC5
- SP 23.5 6DD 1683-0CD5
- SB 60 6DD 1681-0AF4
- SB 70 6DD 1681-0AG2
- SRT 400 6DD 1662-0CG0

These components correspond to the requirements of the Low-Voltage Directive.

WARNING

Open equipment
SIMADYN D is regarded as open equipment. This means that you must always install SIMADYN D in a cubicle, cabinet or electrical control room that can only be accessed using a key or tool. Only trained or authorized personnel are allowed access to such cubicles, cabinets or electrical operating rooms.

1.1.4.1 SIMADYN D outputs

DANGER

When the equipment is powered-up or powered -on, the outputs have undefined statuses while the power supply voltages are running-up. This fact must be taken into account when designing the system.

1.1.4.2 Professionally-trained and knowledgeable personnel

Only professionally-trained, knowledgeable personnel may configure, install, commission and operate SIMADYN D.

1.1.4.3 CE Mark

SIMADYN D components have **no** CE Mark for the following reasons:

- they cannot be practically used autonomously
- they are not generally available
- they can only be used by specially-trained personnel

NOTE If a CE Mark is required, this is the responsibility of the manufacturer of the machine/complete system.

1.1.4.4 Connecting external voltages

If external voltages (e. g. pulse encoders) are connected to SIMADYN D inputs, which are supplied from an external power supply, then this external supply must also be shutdown when the SIMADYN D power supply is shutdown or fails.

1.1.5 Mounting

SIMADYN D components must be mounted in a metal cabinet, enclosed on all sides.

1.1.6 Cables

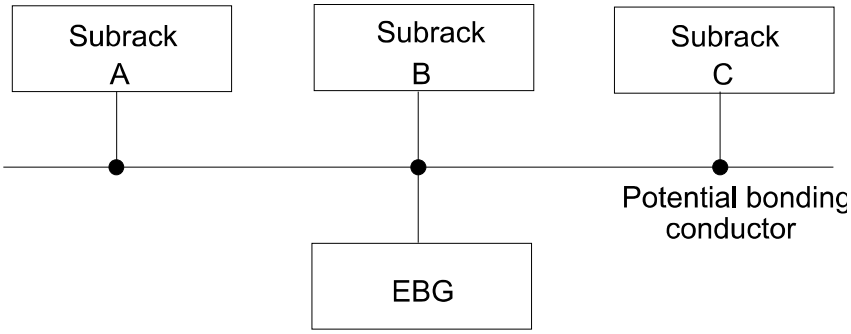
All signal cables which are connected to SIMADYN D must be screened.

1.1.7 Potential bonding

In order to ensure disturbance-free operation, the components which are connected and communicate with one another may not be at different potentials. This means that all components must be connected with one another through potential bonding cables.

1.1.8 Principle when connecting components

All of the components (subracks, power supplies etc.), which are connected using signal cables, must also be connected with potential bonding cables (exception: Components with fiber-optic cable connections).

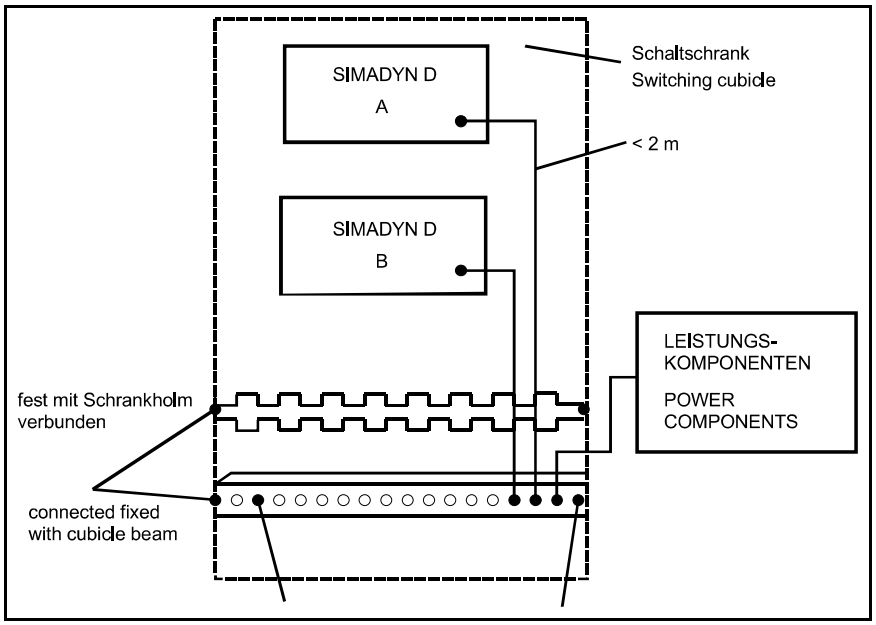


1.1.9 Potential bonding rail

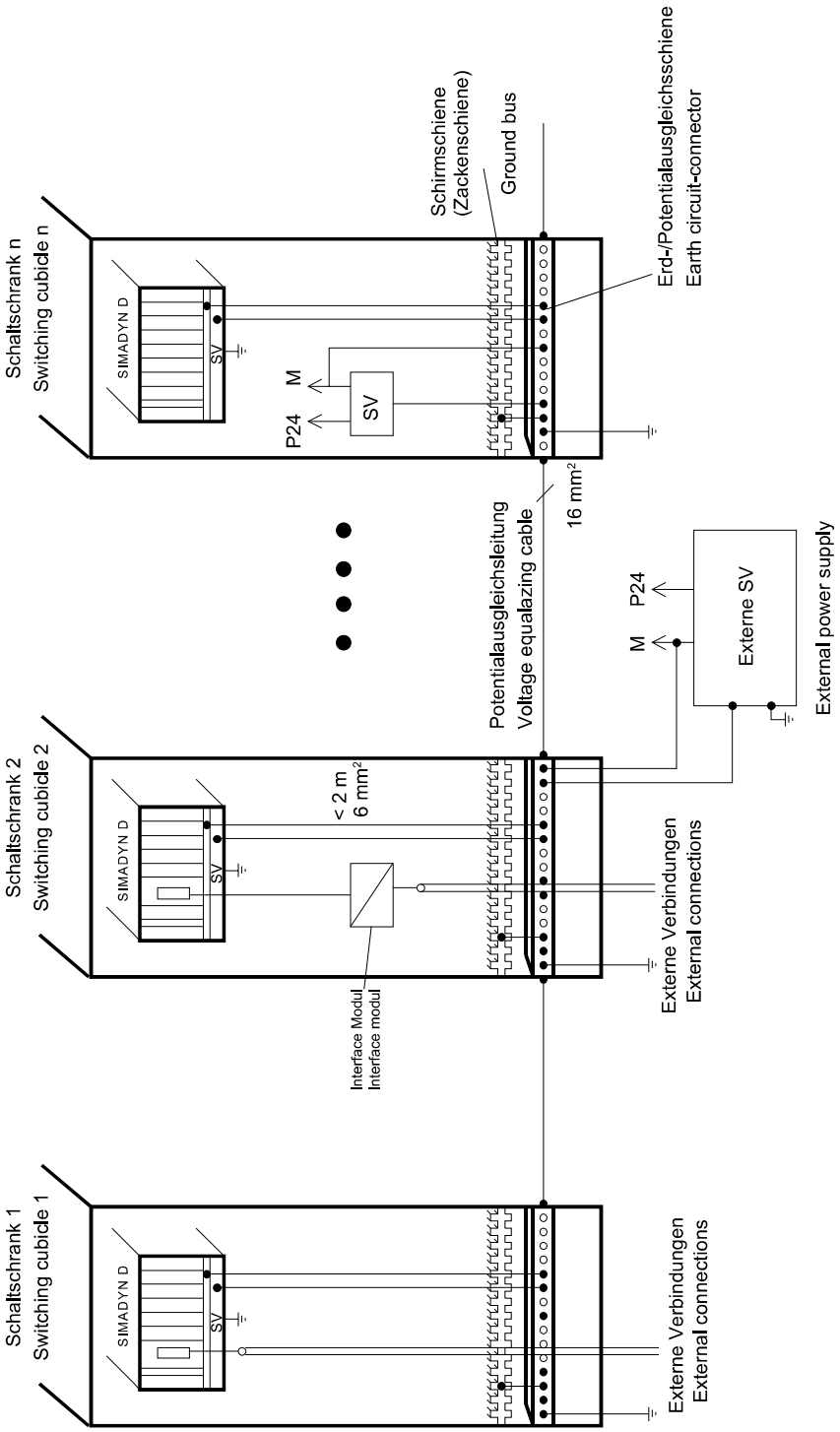
A potential bonding- or grounding rail must be provided in each cabinet to allow simple wiring.

All of the internal and external components must be connected to this potential bonding- and grounding rail.

Basic circuit



1.1.10 Actual example of a multi-motor drive



1.1.11 Protective grounding

The protective ground is connected via the protective conductor (PE) at the cabinets and components. For SIMADYN D, the potential bonding conductor/cable does not have a protective conductor function. For SIMADYN D it is required for reliable operation and noise suppression.

The protective conductor must be routed in accordance with DIN VDE 0100 and DIN VDE 0160.

For subracks, the protective conductor cross-section must be $\geq 6\ mm^2$ and for cabinets, $\geq 10\ mm^2$.

1.1.12 Radios

It is not permissible to use radios > 2W close to SIMADYN D.

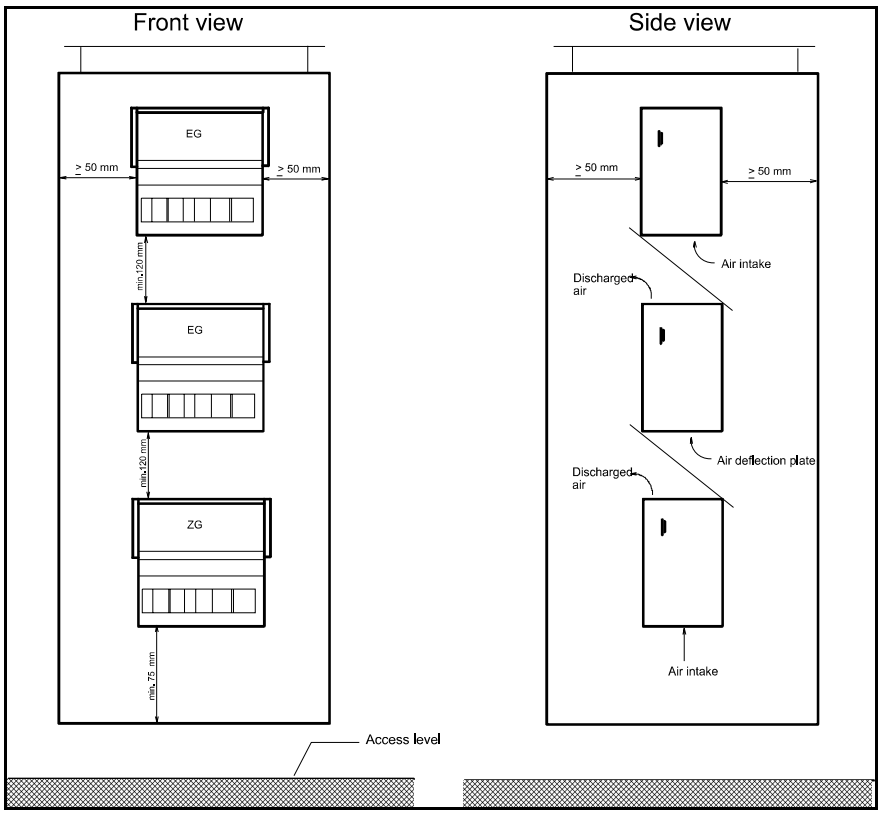
For low-rating radios, a distance of > 1m must be maintained between the radio and SIMADYN D.

1.1.13 Cabinet

- All SIMADYN D components must be mounted in a metal cabinet
- Each cabinet must have a ground/potential bonding rail, which is connected to the cabinet frame at both ends.
- All SIMADYN D subracks must be connected to the grounding/potential bonding rail through a 6 mm^2 cable which should be as short as possible. The connection via the PE connection of the power supply is not sufficient.
- Non-damped contactors may not be used in a cabinet with SIMADYN D components.
- If non-damped contactors are used in a cabinet next to SIMADYN D, then the cabinets must be separated by a metal partition.
- All of the cabinets associated with multi-motor SIMADYN D drives must be connected through a potential bonding conductor with at least a 16 mm^2 cross-section (the customers PE connection is not sufficient).
- Each cabinet in which SIMADYN D components are installed/mounted must have a screen rail. Serrated rails are suitable. The screen rail must be connected directly to the cabinet frame.
- No gas discharge lamps may be used in the cabinet.
- The screens of incoming cables must be connected directly to the screen rail.
- The cabinets must be designed so that air can circulate freely within them.

1.1.14 Mounting clearances

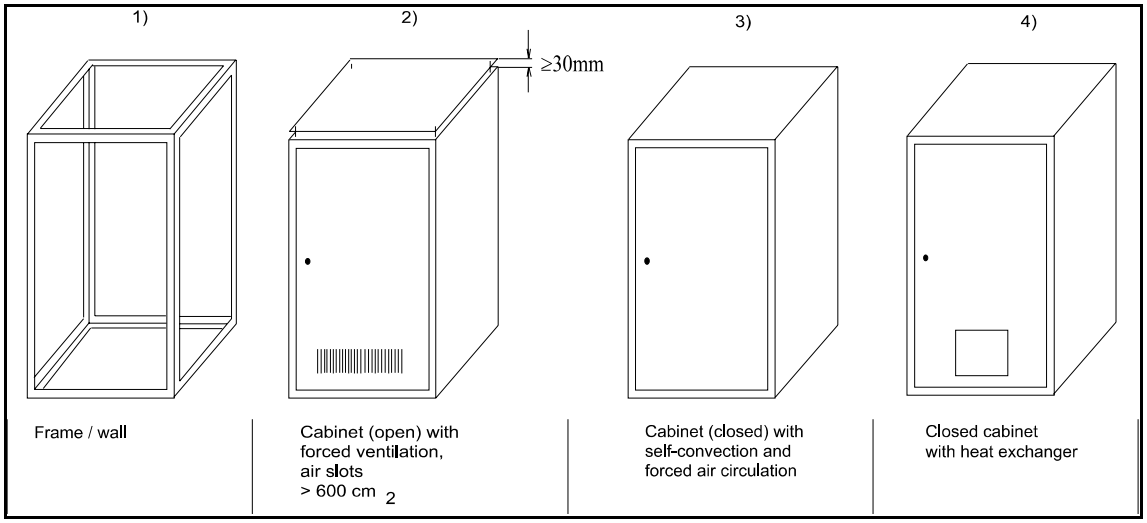
The following minimum clearances must be maintained if SIMADYN D subracks are mounted one on top of the other:
(For 2200 × 600 × 600 mm cabinets)



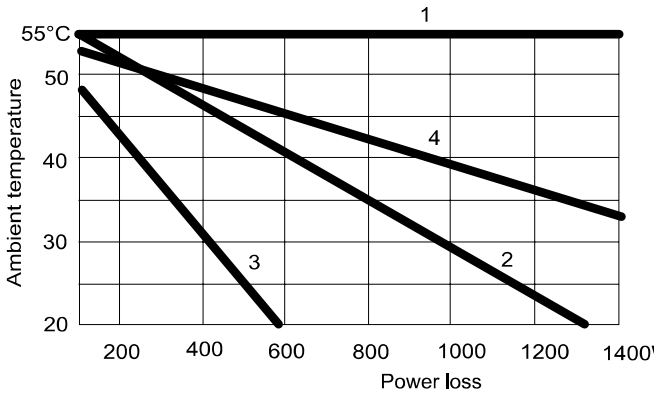
1.1.15 Power loss in the cabinet

Different maximum temperature values are obtained for the SIMADYN D components, depending on the installation type

- open rack
- cabinet with air mesh
- closed cabinet with forced convection
- closed cabinet with heat exchanger



The power loss dissipated from a cabinet depends on the cabinet design, its ambient temperature and the arrangement of the various devices in the cabinet.



Nominal values for permissible ambient temperatures of a cabinet with the dimensions 600 mm × 600 mm ×2200 mm as a function of the installed power loss can be taken from the figure above.

1. Open unit / wall
2. Cabinet with air slots
3. Closed cabinet with self-convection and forced air circulation using an equipment fan
4. Closed cabinet with heat exchanger

If a cabinet is ventilated from below via the cable duct, more favorable conditions are obtained as illustrated under 2).

For mounting types 1) and 2), it is assumed, that there is a minimum of 1m clearance between the cabinet and the ceiling.

1.1.16 Power supply

Measures against noise voltages

The following instructions to suppress noise in systems/plants must be observed so that noise voltage spikes on the supply cable in the cabinet are eliminated.

Suppressing supply cables

When the equipment is supplied from a 115/230 V supply, a line filter must be installed in the cable as close as possible to where the cable enters the cabinet (e. g. 250 V AC/ 10 A). The ground connection of the line filter must be connected to the central grounding point in the cabinet through the shortest possible path.

Discharge capacitors for DC supplies

If a cabinet is connected to a central 24 V supply, noise voltages can be coupled-into the cabinet via the supply cable.

We recommend that noise suppression capacitors are installed where the 24 V supply cable enters the cabinet. These capacitors can be mounted on the cabinet ground or the screen rail.

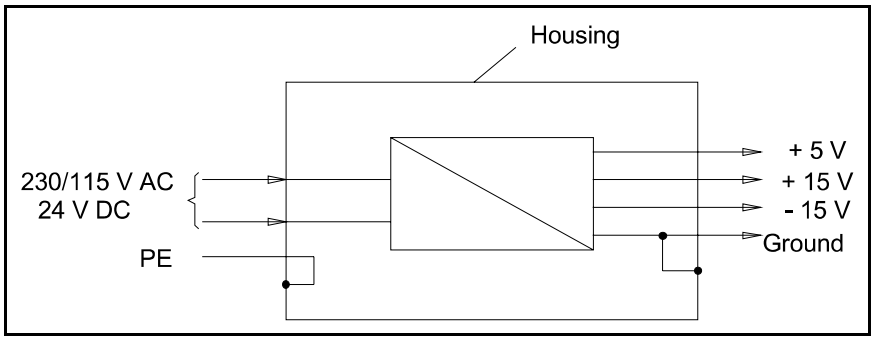
If several 24 V power supplies are used in networked systems, then the grounds of the power supplies must be connected with on another via the grounding / potential bonding rail and connected to the subrack.

In order to diminish the effects of noise and disturbances, a line filter should be provided for the 24V DC power supply of the digital inputs and outputs (e.g. line filter SIFI-B, Order No. B84112-B-.... from Epcos / line filter NF 1-1 from Phönix Contact). This should be located as close as possible to the terminal block. The shield connection of the line filter must be connected to ground through the shortest possible distance.

WARNING Protective separation in accordance with VDE 0160 must be guaranteed for all power supply units which are used to supply SIMADYN D units and modules.

Power supply potentials

For SIMADYN D, the grounds of all secondary voltages must be connected together and connected to the subrack housing and grounded; this enhances the discharge of noise signals and voltages.



Using clocked power supplies

If a clocked power supply is used for the 24V supply, the rated output of the clocked power supply units must be designed for the inrush current of SIMADYN D (the factor is 200 % of the rated current). Otherwise, the clocked power supply can ramp-up along the short-circuit current limiting and undefined conditions can occur.

1.1.17 Subracks

- The subracks must be connected to the grounding/potential bonding rail using the shortest possible 6mm^2 cable.
- All of the boards must be screwed into subracks. This is also required during the commissioning phase!
- Empty slots must be provided with SIMADYN D slot covers.
- If modules are inserted in an adapter during the commissioning phase, the front panel must be electrically connected to the housing through the shortest possible path.
- Modules may neither be removed nor inserted under voltage.
- The connectors for serial interfaces must be screwed to the front panel.
- The maximum temperature of the air drawn-in by the subrack is 55ºC. The subrack must be mounted so that air can freely circulate. It must be ensured that heat cannot build-up (no hotspots).
- The air drawn-in by the subrack must be as dust-free as possible.

1.1.18 Cables

Cables from the outside (e. g. to the terminal modules) may not be routed in a common cable duct with internal cables in the cabinet.

For incoming screened cables (analog and binary), the screen must be connected to the screen rail where the cable enters the cabinet. The cable must then be routed, still screened up to the terminal module/module. Screens are not connected to terminal modules/modules.

Serial connecting cables must be screened. The screen must be connected to a metallized connector housing. Further, it must also be connected to the screen rail. The cable screen may not be connected to pin 1 of the connector.

Screening using just the front panels of the modules is not effective

The screen cables must be connected at both ends to the screen rails in the cabinets.

All analog signal cables must be screened, both in the cabinet as well as outside the cabinet.

Single-ended grounding of cable screens

For analog signal cables, which only conduct low signal levels (mV or μA), the cable screen is connected to the cable rail at one side in the cabinet.

Screening, permissible cable lengths

All of the signal cables must be provided with screen.

Module	Cable length, screened
Outputs	1000 m
Inputs, 230 V AC	1000 m
Inputs, 24...60 V DC	1000 m

Below 500 V AC, a minimum clearance of > 10 cm must be maintained between signal cables and power cables; for power cables above 1 kV AC, a clearance > 30 cm must be maintained.

1.1.19 Mounting SIMADYN D unit in drive converters

When mounting SIMADYN D modules in drive converters, the following should be observed:

- The tachometer cables of the pulse encoders should have double screens for lengths >10m.
- Only terminal modules and cables in the SIMADYN D program may be used.
- All cable screens must be connected through the largest possible surface area to the screen rail. The screen rail must be grounded using the shortest possible 10mm^2 cable.

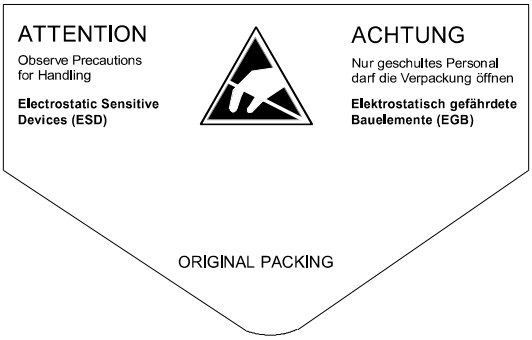
- Avoid installing the drive converters close to radio transmitter antennas
- The drive converters must always be mounted in enclosed metal cabinets.

1.2 ESD guidelines

1.2.1 What is ESD?

Almost all of the SIMADYN D modules have highly-integrated devices. These devices are, from their very nature, extremely sensitive to overvoltage conditions, and therefore also to electrostatic discharge.

ESD The abbreviation stands for electrostatic discharge



Modules, which use these devices have the following warning label on the component side:

Electrostatic sensitive devices can be destroyed by voltage- and energy level which lie far below the perception levels of human beings. Voltages such as these occur when personnel touch a component or a module without having first being previously electrostatically discharged. Components, which have been subject to such overvoltage conditions, can generally not be immediately identified as being faulty, as this is only manifested after a somewhat longer operating time.

1.2.2 Handling ESD modules

- As a general rule, electronic modules should only be touched if this is absolutely necessary.
- Components may only be touched if the person
  - is continuously grounded through an ESD bracelet, or
  - is wearing ESD shoes or ESD shoe grounding strips.

- Before touching an electronics module, you must electrically discharge your body. This can be simply done by touching a conductive, grounded object immediately beforehand (e. g. bare metal cabinet parts, water pipe etc.)
- Modules may not come into contact with highly insulating materials which can be statically charged. This includes plastic foils, insulating desktops, clothing manufactured out of man-made fibers.
- Modules may only be placed down on conductive surfaces (desktop with ESD surface, conductive ESD foam rubber, ESD packing bags, ESD transport containers, cardboard- or paper surfaces).
- Modules may not be brought close to data terminals, monitors or television sets.

1.2.3 Measuring and making changes on ESD modules

- It only permissible to make measurements at the modules, if
  - the measuring unit is grounded (e. g. via protective conductor) or
  - before making measurements with an electrically-isolated measuring device, the probe is briefly discharged (for example by touching a bare metal control housing).

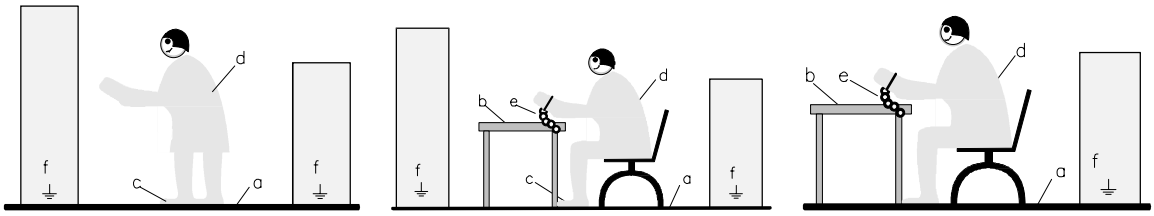
When carrying-out soldering work on modules, ESD soldering irons must be used or at least the soldering iron tip grounded.

1.2.4 Transporting modules

Modules and components may only be stored and transported in conductive packing materials (e. g. metallized plastic boxes, metal containers).

If the packaging is not conductive, then the modules must first be wrapped in conductive packaging materials. This can include, for example conductive foam rubber or normal household aluminum foil.

The necessary ESD protective measures are clearly shown in the following diagram.



a = conductive flooring surface

d = ESD coat/jacket

b = ESD desk = ESD chain

c = ESD shoes

f = grounding connection for the cabinets

1.3 Ambient conditions

The following **safety regulations** must be applied:	VDE 0160
	Electric power equipment with electronic devices
	Data for „Protective separation“ of 115/230 V AC power supply parts with respect to PELV circuits
	Data for „Protective separation“ of 25V AC/ 60V DC signal voltages with respect to PELV circuits
	VDE 0106 Part 1
	Data regarding shock protection
Protective class according to VDE 0106 Part	I (with protective conductor) for 115/230V supply voltage
	II (safety extra-low voltage) for 24V supply („protective separation“)
Air intake temperature for self- or forced cooling It should be observed whether the module is designed for natural air cooling or forced ventilation	0 degrees C up to + 55 degrees C
Storage temperature	-25 degrees C up to +70 degrees C
Mechanical specifications: Testing in accordance with SN 29050	
in operation	Severity grade, class 12
during transport	Severity grade, class 22
certification	Manufacturers certification for EMC (in accordance with the EC Directive)