Test Report issued under the responsibility of:

Kontron Embedded Computer GmbH

TEST REPORT

IEC 60950-1: 2005 (2nd Edition) and/or EN 60950-1:2006
Information technology equipment – Safety –
Part 1: General requirements

Report Reference No. .....:	1134.01
Date of issue .....:	2010-03-17
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CB/CCA Testing Laboratory.....:	
Address .....:	
Applicant's name.....:	Kontron Embedded Computer GmbH
Address .....:	Oskar-von-Miller-Str. 1, 85386 Eching, Germany
Manufacturer's name .....:	Kontron Embedded Computer GmbH
Address .....:	Oskar-von-Miller-Str. 1, 85386 Eching, Germany
Factory's name .....:	Kontron Embedded Computer GmbH
Address .....:	Werner-von-Siemens-Str. 1, 93429 Roding, Germany
Test specification:	
Standard.....:	☐ IEC 60950-1:2005 (2nd Edition) and/or ☒ EN 60950-1:2006
Test procedure .....:	CB / CCA
Non-standard test method……..:	N/A
Test Report Form No. .....:	IECEN60950_1C
Test Report Form(s) Originator.....:	SGS Fimko Ltd
Master TRF .....:	Dated 2007-06

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.
This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

If this Test Report Form is used by non-CCA members, the CIG logo and the reference to the CCA Procedure shall be removed.
This report is not valid as a CCA Test Report unless signed by an approved CCA Testing Laboratory and appended to a CCA Test Certificate issued by an NCB in accordance with CCA

Test item description .....:	2U Industrial Computer
Trade Mark.....:	kontron
Manufacturer .....:	see above
Model/Type reference .....:	**KISS 2U 45-y**
Ratings .....:	AC: 100-240 VAC; 50-60 Hz; max. 2.5 A ; DC: 24 - 32VDC; max. 7,5A

Summary of testing:

Test item is in compliance with EN 60950-1:2006 standard.

Tested by (name + signature) .....: Mr. Hugo Novak

Approved by (+ signature).....: Mr. Vesely Petr

Tests performed (name of test and test clause):

Clause 1.6.2 Power Input Measurements
Clause 1.7.1 Power Rating
Clause 2.1.1.1 Accessibility to Energized parts
Clause 2.2 SELV circuits – voltage measurements (normal and fault conditions)
Clause 2.5 Limited power sources
Clause 2.6.3.4 Resistance of earthing conductors and their terminations
Clause 2.9.2 Humidity conditioning test
Clause 4.1 Stability
Clause 4.2 Mechanical strength test
Clause 4.5 Thermal requirements
Clause 4.6.4.2 Openings in enclosures
Clause 5.1 Touch current and protective conductor current measurements
Clause 5.2 Electric strength
Clause 5.3 Abnormal operating and fault conditions tests

Testing location:

Kontron Embedded Computers GmbH
EMC & Safety Test Laboratory
Oskar-von-Miller-Str. 1
85386 Eching, Germany

Summary of compliance with National Differences:

DE (Germany)
UK (United Kingdom)
CH (Switzerland)
ES (Spain)

Copy of marking plate for 2-A0DE-2xxx:

Copy of marking plate for 2-A0EE-2xxx:

Test item particulars ..... :	
Equipment mobility ..... :	[] movable [] hand-held [] transportable [X] stationary [X] for building-in [] direct plug-in
Connection to the mains ..... :	[X] pluggable equipment [X] type A [X] type B [X] permanent connection [X] detachable power supply cord (AC) [X] non-detachable power supply cord (DC) [X] not directly connected to the mains
Operating condition ..... :	[X] continuous [] rated operating / resting time:
Access location ..... :	[X] operator accessible [] restricted access location
Over voltage category (OVC) ..... :	[] OVC I [X] OVC II [] OVC III [] OVC IV [] other:
Mains supply tolerance (%) or absolute mains supply values ..... :	-10/ +6 %
Tested for IT power systems ..... :	[] Yes [X] No
IT testing, phase-phase voltage (V) ..... :	
Class of equipment ..... :	[X] Class I [] Class II [X] Class III [] Not classified
Considered current rating (A) ..... :	
Pollution degree (PD) ..... :	[] PD 1 [X] PD 2 [] PD 3
IP protection class ..... :	IP 20 (Front only)
Altitude during operation (m) ..... :	
Altitude of test laboratory (m) ..... :	465 m
Mass of equipment (kg) ..... :	Approx. 10 kg
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item ..... :	2010-01-21
Date(s) of performance of tests ..... :	2010-01-21– 2010-02-22

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Note: This TRF includes EN Group Differences together with National Differences and Special National Conditions, if any. All Differences are located in the Appendix to the main body of this TRF.

Throughout this report a comma (point) is used as the decimal separator.

General product information:

The Kontron Industrial KISS 2U 45-y with the Kontron KTQ-45 CPU-Board is a computer for applications in industrial environment. Within this test report always the stronger test requirements were taken under consideration!

1. **The Power Supply (PSU)**
   All computer types are powered by internal installed Switch Mode Power Supplies (PSU)
   - Those PSU are certified in accordance with EN 60950-1, IEC 60950-1 and UL 60950-1.
   - Input of all AC PSU's is either (100 - 240 VAC)
   - Input of the DC PSU is either (24-32 VDC)
   - All PSU-Outputs fulfill SELV conditions

   For more PSU-Information please refer to table " list of critical component "

2. **Series, 2U KISS type designation:**

The KISS 4U 45-y, 2-A0ED-2xxx (horizontal mounted PCIe) and 2-A0EE-2xxx (vertical height mounted PCIe), with KTQ45/ATXE Kontron CPU-Board provides numerous customer options with an especially low installation height (88,90mm) 19" platform. Each Series can be individually equipped with components like drives, interface cards, e.g. as long as the components are mentioned in the list of critical components or correspond with described requirements.

The character "y" represents the type of PSU and can be any letter from A to Z. The list of critical components shows all types of already tested PSU's and includes a reference list of letters A to Z and belonging PSU.

Following types were tested within this investigation:

3. **Technical Data:**

KISS AC Model Type A:	**KISS 2U 45-A**
	Input: 100 - 240 VAC 60 - 50 Hz max. 2,5 A
KISS DC Model Type B:	**KISS 2U 45-B**
	Input: 24 - 32 VDC max. 7,5 A
KISS AC Model Type C:	**KISS 2U 45-C**
	Input: 100 - 240 VAC red. 60 - 50 Hz max. 2,5 A

4. Insulation system (Type: 2-A0ED-2xxx and 2-A0EE-2xxx)

There are Mains- and SELV-Circuits. Following insulation systems are existing:

A. Mains to PE ---> Required, Basic Insulation (BI)

Fulfilled by the use of certified PSU

B. Mains to SELV ---> Required, Reinforced Insulation (RI)

Fulfilled by the use of certified PSU

C. Operational Insulation

The compliance of this insulation system was evaluated within belonging investigation

5. Test conditions

Within this test report all PSU were taken under consideration. A self-test program took care that computer and peripherals were steady running under max. working conditions. All standard tests were conducted with a maximum equipped computer-system (basic unit configuration). Where necessary (for instance chapters heating tests, single fault condition tests) extra tests where performed in order to show the standard compliance of options/peripherals not used in basic unit configuration.

Via the term

Following is an overview regarding the measured power consumption of basic unit configuration:

Type: 2-A0ED-2xxx, 2-A0EE-2xxx

a) CPU Board ----> 75 W
b) All Drives/Peripherals ----> 50 W
c) Additional Power * ----> P

* = The total secondary loading power depends on the output data of the PSU. For testing the output power requirements, given by the PSU-Data sheets (technical data sheets, certificates), were taken into consideration.

Additional power (P) was simulated with PCIe- Interface boards (Graphic and LAN card e.g. 110W max.) inside the unit.

“ Additional Power (P) = permitted max. Secondary-Output minus power of all drives/peripherals “, that means: -Power (X) minus worst CPU-Boards-Power

X and P from 2-A0ED-2xxx and 2-A0EE-2xxx in dependence of used PSU-Type:

PSU-Type A (400W) ----> X = 400 as a result P = 230 W

The available P additional power limited for the tests: 70 W (2xPCIe).

For the PSU-Type A is defined:

a. The power supply cord is intended to serve as the disconnect device, the installation instructions shall state that the socket-outlet shall be installed near the equipment and shall be easily accessible.
b. The power of each used PCI interface should not be higher than 25 W.
c. The normal rating of each used USB interface should not be higher than 3,5 W.
d. Max. continuous total DC output power (+3.3V & +5V & +12V) shall not exceed 280 W.
e. The total output power at +3,3V and +5V together max.130W
f. Always taking care that the cooling openings of the unit are free for unhindered stream of air.

PSU-Type B (250W/300W) ----> X = 300 as a result P = 230 W

The available P additional power limited for the tests: 70 W (2xPCIe).

For the PSU-Type B is defined:

a. The power supply cord is intended to serve as the disconnect device, the installation instructions shall state that the socket-outlet shall be installed near the equipment and shall be easily accessible.
b. The power of each used PCI interface should not be higher than 25 W.
c. The normal rating of each used USB interface should not be higher than 3,5 W.
d. Max. continuous total DC output power (+3.3V & +5V & +12V) in dependence input voltage rating from 19….23VDc shall not exceed 250 W.
e. Max. continuous total DC output power (+3.3V & +5V & +12V) in dependence input voltage rating from 24….32VDc shall not exceed 300 W.
f. The total output power at +3,3V and +5V together max.150W
g. Always taking care that the cooling openings of the unit are free for unhindered stream of air.

PSU-Type C (380W) red. ----> X = 380 as a result P = 255 W

The available P additional power limited for the tests: 70 W (2xPCIe).

For the PSU-Type C is defined:

a. The power supply cord is intended to serve as the disconnect device, the installation instructions shall state that the socket-outlet shall be installed near the equipment and shall be easily accessible.
b. The power of each used PCI interface should not be higher than 25 W.
c. The normal rating of each used USB interface should not be higher than 3,5 W.
d. Max. continuous total DC output power (+3.3V & +5V & +12V) shall not exceed 380 W.
e. The total output power at +3,3V and +5V together max.140W
f. Always taking care that the cooling openings of the unit are free for unhindered stream of air.

CAUTION

The DC KISS with the PSU Type –B connects to the dc source by permanent wiring methods. It must be secured that the device about an easy accessible 2-pole disconnecting device (in the DC supply circuit of the building) can be switched ON and switched OFF. The hazardous energy level must be removed within 2 s of the disconnecting point. The disconnecting devices include also isolating switches external from the equipment. The choice of the disconnecting device and the installation instruction is in own responsibility of the distributor of equipment.

6. General principles of safety

There are two types of persons whose safety needs to be considered, USERS (or OPERATORS) and SERVICE PERSONS. In general, USERS should not have access to hazardous parts, and to this end, such parts should only be in SERVICE ACCESS AREAS or in equipment located in RESTRICTED ACCESS LOCATIONS.

OPERATOR ACCESS AREA: An area to which, under normal operating conditions, one of the following applies:

– access can be gained without the use of a TOOL;

– the means of access is deliberately provided to the OPERATOR;

– the OPERATOR is instructed to enter regardless of whether or not a TOOL is needed to gain access.

SERVICE ACCESS AREA: An area, other than an OPERATOR ACCESS AREA, where it is necessary for SERVICE PERSONS to have access even with the equipment switched on.

Energy related hazards

Injury or fire may result from a short circuit between adjacent poles of high current supplies causing:

– burns;

– arcing;

– ejection of molten metal.

Even circuits whose voltages are safe to touch may be hazardous in this respect. Examples of measures to reduce risks include:

– separation;

– covering;

– SAFETY INTERLOCKS.

 Installed in the RAL (Restricted Access Location). A location for equipment where both of the following paragraphs apply:

a) access can only be gained by SERVICE PERSONS; and
b) access is through the use of a TOOL or lock and key, or other means of security, and is controlled by the authority responsible for the location.

Information about potential hazards can be marked on the equipment or provided with the equipment, depending on the likelihood and severity of injury, or made available for SERVICE PERSONS. In general, USERS shall not be exposed to hazards likely to cause injury, and information provided for USERS should primarily aim at avoiding misuse and situations likely to create hazards, such as connection to the wrong power source and replacement of fuses by incorrect types.

In the *practice*, equipment that meets one of the following requirements:

- The RAL location can be a 19” rack mount with a separated access (front side whit controls) for user and a separated access (The door on the rear side to the DC mains supplies) for service persons.
- Information about potential hazards can be marked with a Safety Massage label on the equipment or provided with the equipment.
- A readily accessible disconnect device, isolating switches, circuit breakers or any equivalent device must be incorporated in the building installation wiring. This installation instruction is in own responsibility of the distributor of equipment.
- When installed in a non-RAL location, all communication ports must be connected to SELV circuits, for example, a port on a personal computer or Ethernet hub/router or other information technology (IT) equipment.
- Does not have electrical cables that exit the building unless those ports are TNV (Telecommunication Networks Voltage) circuits.
- Has a written consent (or in other evidence) that its connecting port towards the SELV circuit port is not a telecommunication network.

7. SELV Circuits (Safety)

Extra-Low Voltage (SELV) circuits are ports that have maximum DC working voltage level less than 60 V (42.4 VAC). In addition, the ports must not be connected to telecommunication networks as defined in EN 60950 (see CEI/ IEC 60950-1:2006, standard clause 1.2.13.8).

8. Required Routine Test in the Factory for all AC-Models (please see page 5) of KISS:

- **The resistance of the protective bonding conductor 2.6.3.4**
  Compliance must be checked on each sample by measurement. The voltage drop in a protective bonding conductor is measured after conducting the test current for the time period specified below, protective current rating of the circuit (Ipc) ≤ 30A, duration of the tests 2 min. The resistance of the protective bonding conductor, calculated from the voltage drop, shall not exceed 0,1 Ω. After the test, the protective bonding conductor shall not be damaged.

- **Electric strength tests 5.2.2**
  The routine tests on each sample to be conducted in accordance with 5.2.2 are required. It is permitted to reduce the duration of the electric strength test in the factory on 1 s.

1	GENERAL	P

1.5	Components		P
1.5.1	General		P
	Comply with IEC 60950-1 or relevant component standard	(see appended table 1.5.1)	P
1.5.2	Evaluation and testing of components	All safety critical components are certified. Non-certified components were tested according to this standard.	P
1.5.3	Thermal controls	Only within certified PSU	N/A
1.5.4	Transformers	Only within certified PSU	P
1.5.5	Interconnecting cables		N/A
1.5.6	Capacitors bridging insulation	Only within certified PSU	P
1.5.7	Resistors bridging insulation	Only within certified PSU	P
1.5.7.1	Resistors bridging functional, basic or supplementary insulation	Only within certified PSU	P
1.5.7.2	Resistors bridging double or reinforced insulation between a.c. mains and other circuits	Only within certified PSU	P
1.5.7.3	Resistors bridging double or reinforced insulation between a.c. mains and antenna or coaxial cable		N/A
1.5.8	Components in equipment for IT power systems	Power supplies have been evaluated for IT power systems	N/A
1.5.9	Surge suppressors	Only within certified PSU	P
1.5.9.1	General	Lightning arrestors	N/A
1.5.9.2	Protection of VDRs	Varistors	N/A
1.5.9.3	Bridging of functional insulation by a VDR		N/A
1.5.9.4	Bridging of basic insulation by a VDR		N/A
1.5.9.5	Bridging of supplementary, double or reinforced insulation by a VDR		N/A

1.6	Power interface		P
1.6.1	AC power distribution systems		P
1.6.2	Input current	(see appended table 1.6.2)	P
1.6.3	Voltage limit of hand-held equipment		N/A
1.6.4	Neutral conductor		P

1.7	Marking and instructions		P
1.7.1	Power rating		P
	Rated voltage(s) or voltage range(s) (V) .....:	(see appended table 1.6.2)	P

	Symbol for nature of supply, for d.c. only .....:	d.c. certified PSU	P
	Rated frequency or rated frequency range (Hz) ...:	50-60	P
	Rated current (mA or A) .....:	(see appended table 1.6.2)	P
	Manufacturer's name or trade-mark or identification mark .....:	kontron	P
	Model identification or type reference .....:	**KISS 2U 45-y** (see general product information)	P
	Symbol for Class II equipment only .....:		N/A
	Other markings and symbols .....:		P
1.7.2	Safety instructions and marking	Safety instructions sufficient explained in the general safety instructions for IT-Equipment provided with the equipment.	P
1.7.2.1	General		P
1.7.2.2	Disconnect devices	The AC power supply cord is intended to serve as the disconnected device. Connector/Inlet type A.	P
1.7.2.3	Overcurrent protective device	Only within certified PSU's	P
1.7.2.4	IT power distribution systems		N/A
1.7.2.5	Operator access with a tool		N/A
1.2.7.6	Ozone		N/A
1.7.3	Short duty cycles		N/A
1.7.4	Supply voltage adjustment .....:		N/A
	Methods and means of adjustment; reference to installation instructions .....:		N/A
1.7.5	Power outlets on the equipment .....:		N/A
1.7.6	Fuse identification (marking, special fusing characteristics, cross-reference) .....:	Non operator replaceable: PTC's on CPU-Boards and fuses within certified PSU's. Technical unit documentation is provided with sufficient in-formation	P
1.7.7	Wiring terminals		P
1.7.7.1	Protective earthing and bonding terminals .....:	Within certified AC PSU's	P
1.7.7.2	Terminals for a.c. mains supply conductors		N/A
1.7.7.3	Terminals for d.c. mains supply conductors		N/A
1.7.8	Controls and indicators	Power ON (LED)	P
1.7.8.1	Identification, location and marking .....:		N/A
1.7.8.2	Colours .....:		N/A
1.7.8.3	Symbols according to IEC 60417 .....:	5009	P
1.7.8.4	Markings using figures .....:		N/A
1.7.9	Isolation of multiple power sources .....:		N/A

1.7.10	Thermostats and other regulating devices ..... :		N/A
1.7.11	Durability		N/A
1.7.12	Removable parts		N/A
1.7.13	Replaceable batteries ..... :	Only lithium battery on CPU boards	P
	Language(s) ..... :		—
1.7.14	Equipment for restricted access locations ..... :	In general, USERS should not have access to hazardous parts and the installation instructions shall contain a statement to this effect. Please see “General product information”.	N/A

2	PROTECTION FROM HAZARDS: In general, USERS have not access to hazardous parts.		P
2.1	Protection from electric shock and energy hazards		P
2.1.1	Protection in operator access areas	Operator access to SELV only.	P
2.1.1.1	Access to energized parts	No energized parts in user access area. Please see “General product information”.	N/A
	Test by inspection ..... :	Protection is established by insulation materials, barriers or guarded parts.	P
	Test with test finger (Figure 2A) ..... :	No access to above mentioned parts	P
	Test with test pin (Figure 2B) ..... :	No access to above mentioned parts	P
	Test with test probe (Figure 2C) ..... :	No access to TNV circuit	P
2.1.1.2	Battery compartments		N/A
2.1.1.3	Access to ELV wiring		N/A
	Working voltage (Vpeak or Vrms); minimum distance through insulation (mm)	(see appended table 2.10.5)	—
2.1.1.4	Access to hazardous voltage circuit wiring	Only trained and qualified personnel should be allowed to install or replace this equipment. No hazardous voltage wiring in the operator access area.	N/A
2.1.1.5	Energy hazards ..... :	No energy hazard in operator access area. Operator has access only to SELV area.	P
2.1.1.6	Manual controls		N/A
2.1.1.7	Discharge of capacitors in equipment	Only within certified PSU	N/A
	Measured voltage (V); time-constant (s)..... :		—

2.1.1.8	Energy hazards – d.c. mains supply	Wen the hazardous energy level is removed within 2 s of the disconnection. External points of disconnection include isolating switches external to the equipment. This installation instruction is in own responsibility of the distributor of equipment.	N/A
	a) Capacitor connected to the d.c. mains supply ..:	Only within certified PSU	N/A
	b) Internal battery connected to the d.c. mains supply .....:		N/A
2.1.1.9	Audio amplifiers .....:	See cl. 2.1.1.1 See separate test report IEC/EN 60065	N/A
2.1.2	Protection in service access areas		P
2.1.3	Protection in restricted access locations		N/A

2.2	SELV circuits		P
2.2.1	General requirements	<42.4Vpk/60Vdc under normal and fault conditions	P
2.2.2	Voltages under normal conditions (V) .....:	Below ELV circuit limits	P
2.2.3	Voltages under fault conditions (V) .....:	Below ELV circuit limits	P
2.2.4	Connection of SELV circuits to other circuits .....:	SELV-Circuits only connected with SELV-Circuits	P

2.3	TNV circuits		N/A
2.3.1	Limits		N/A
	Type of TNV circuits.....:		—
2.3.2	Separation from other circuits and from accessible parts		N/A
2.3.2.1	General requirements		N/A
2.3.2.2	Protection by basic insulation		N/A
2.3.2.3	Protection by earthing		N/A
2.3.2.4	Protection by other constructions .....:		N/A
2.3.3	Separation from hazardous voltages		N/A
	Insulation employed .....:		—
2.3.4	Connection of TNV circuits to other circuits		N/A
	Insulation employed .....:		—
2.3.5	Test for operating voltages generated externally		N/A

2.4	Limited current circuits		P
2.4.1	General requirements		P

2.4.2	Limit values		N/A
	Frequency (Hz) ..... :		—
	Measured current (mA) ..... :		—
	Measured voltage (V) ..... :		—
	Measured circuit capacitance (nF or µF) ..... :		—
2.4.3	Connection of limited current circuits to other circuits		N/A

2.5	Limited power sources		P
	a) Inherently limited output		P
	b) Impedance limited output		N/A
	c) Regulating network limited output under normal operating and single fault condition		N/A
	d) Overcurrent protective device limited output		N/A
	Max. output voltage (V), max. output current (A), max. apparent power (VA) ..... :		—
	Current rating of overcurrent protective device (A) .:		—

2.6	Provisions for earthing and bonding	(already certified PSU's)	P
2.6.1	Protective earthing	Only within certified AC PSU's	P
2.6.2	Functional earthing		N/A
2.6.3	Protective earthing and protective bonding conductors		N/A
2.6.3.1	General		P
2.6.3.2	Size of protective earthing conductors	Applied in certified PSU's	P
	Rated current (A), cross-sectional area (mm^2), AWG ..... :		—
2.6.3.3	Size of protective bonding conductors	Applied in certified PSU's	P
	Rated current (A), cross-sectional area (mm^2), AWG ..... :		—
	Protective current rating (A), cross-sectional area (mm^2), AWG ..... :		
2.6.3.4	Resistance of earthing conductors and their terminations; resistance (Ω), voltage drop (V), test current (A), duration (min) ..... :	Series check in the production	P
2.6.3.5	Colour of insulation ..... :	Applied in certified PSU's	P
2.6.4	Terminals	Applied in certified PSU's	P
2.6.4.1	General		N/A
2.6.4.2	Protective earthing and bonding terminals		N/A
	Rated current (A), type, nominal thread diameter (mm) ..... :		—

2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors		N/A
2.6.5	Integrity of protective earthing	Applied in certified PSU's	P
2.6.5.1	Interconnection of equipment		N/A
2.6.5.2	Components in protective earthing conductors and protective bonding conductors	No switches or fuses	P
2.6.5.3	Disconnection of protective earth	AC Supply inlet connector	P
2.6.5.4	Parts that can be removed by an operator		P
2.6.5.5	Parts removed during servicing		P
2.6.5.6	Corrosion resistance		P
2.6.5.7	Screws for protective bonding		N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system		N/A

2.7	Overcurrent and earth fault protection in primary circuits		P
2.7.1	Basic requirements	KISS 2U 45-A and -C is 'Pluggable Type A', the building installation is regarded as providing adequate protection.	P
	Instructions when protection relies on building installation	– For 'pluggable equipment type A', isn't necessary an instruction. – For 'permanently connected equipment' is a instruction necessary in own responsibility of the distributor.	P
2.7.2	Faults not simulated in 5.3.7		N/A
2.7.3	Short-circuit backup protection		N/A
2.7.4	Number and location of protective devices .....:	Mains fuse within certified PSU's, is not operator accessible.	P
2.7.5	Protection by several devices	See clause 2.7.4 above	P
2.7.6	Warning to service personnel .....:		N/A

2.8	Safety interlocks		N/A
2.8.1	General principles		N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches and relays		N/A

2.8.7.1	Contact gaps (mm) ..... :		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test	(see appended table 5.2)	P
2.8.8	Mechanical actuators		N/A

2.9	Electrical insulation		P
2.9.1	Properties of insulating materials	Not rubber, asbestos or hy-groscopic materials are not used	P
2.9.2	Humidity conditioning		P
	Relative humidity (%), temperature (°C) ..... :	Non condensing: Operating 20% - 90% Non-Operating 10% - 90%	—
2.9.3	Grade of insulation	RI and BI: Requirements of this chapter fulfilled by the use of EN/IEC-Approved PSU's	P
2.9.4	Separation from hazardous voltages	Fulfilled by the use of certified PSU's	P
	Method(s) used ..... :		—

2.10	Clearances, creepage distances and distances through insulation		P
2.10.1	General	Fulfilled by the use of certified PSU's	P
2.10.1.1	Frequency ..... :		N/A
2.10.1.2	Pollution degrees ..... :	2	P
2.10.1.3	Reduced values for functional insualtion		N/A
2.10.1.4	Intervening unconnected conductive parts		N/A
2.10.1.5	Insulation with varying dimensions	Applied in certified PSU's	P
2.10.1.6	Special separation requirements		N/A
2.10.1.7	Insulation in circuits generating starting pulses		N/A
2.10.2	Determination of working voltage	Fulfilled by the use of certified PSU's	P
2.10.2.1	General		P
2.10.2.2	RMS working voltage	Fulfilled by the use of certified PSU's	P
2.10.2.3	Peak working voltage	Fulfilled by the use of certified PSU's	P
2.10.3	Clearances	Fulfilled by the use of certified PSU's	P
2.10.3.1	General		P
2.10.3.2	Mains transient voltages	Overvoltage Category 2	P

	a) AC mains supply .....:	1kV sym. / 2kV asym.	P
	b) Earthed d.c. mains supplies .....:		N/A
	c) Unearthed d.c. mains supplies .....:	0,5 kV	P
	d) Battery operation .....:		N/A
2.10.3.3	Clearances in primary circuits	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.4	Clearances in secondary circuits	(see appended table 2.10.3 and 2.10.4)	P
2.10.3.5	Clearances in circuits having starting pulses	(see appended table 2.10.3 and 2.10.4)	N/A
2.10.3.6	Transients from a.c. mains supply .....:		N/A
2.10.3.7	Transients from d.c. mains supply .....:		N/A
2.10.3.8	Transients from telecommunication networks and cable distribution systems .....:		N/A
2.10.3.9	Measurement of transient voltage levels		N/A
	a) Transients from a mains suplply		N/A
	For an a.c. mains supply .....:		N/A
	For a d.c. mains supply .....:		N/A
	b) Transients from a telecommunication network :		N/A
2.10.4	Creepage distances		P
2.10.4.1	General		P
2.10.4.2	Material group and caomparative tracking index		N/A
	CTI tests.....:	Material group IIIb is assumed to be used	—
2.10.4.3	Minimum creepage distances	(see appended table 2.10.3 and 2.10.4)	P
2.10.5	Solid insulation		N/A
2.10.5.1	General		N/A
2.10.5.2	Distances through insulation	(see appended table 2.10.5)	N/A
2.10.5.3	Insulating compound as solid insulation		N/A
2.10.5.4	Semiconductor devices		N/A
2.10.5.5.	Cemented joints	(see appended table 2.10.3 and 2.10.4)	N/A
2.10.5.6	Thin sheet material – General		N/A
2.10.5.7	Separable thin sheet material		N/A
	Number of layers (pcs).....:		—
2.10.5.8	Non-separable thin sheet material		N/A
2.10.5.9	Thin sheet material – standard test procedure		N/A
	Electric strength test	(see appended table 2.10.5)	—
2.10.5.10	Thin sheet material – alternative test procedure		N/A
	Electric strength test	(see appended table 2.10.5)	—

2.10.5.11	Insulation in wound components	Applied in certified PSU's	P
2.10.5.12	Wire in wound components	Applied in certified PSU's	P
	Working voltage .....:		P
	a) Basic insulation not under stress .....:		N/A
	b) Basic, supplemetary, reinforced insulation .....:		P
	c) Compliance with Annex U .....:		N/A
	Two wires in contact inside wound component; angle between 45° and 90° .....:		N/A
2.10.5.13	Wire with solvent-based enamel in wound components		N/A
	Electric strength test	(see appended table 2.10.5)	—
	Routine test		N/A
2.10.5.14	Additional insulation in wound components	Applied in certified PSU's	P
	Working voltage .....:	Applied in certified PSU's	P
	- Basic insulation not under stress .....:		N/A
	- Supplemetary, reinforced insulation .....:		P
2.10.6	Construction of printed boards		P
2.10.6.1	Uncoated printed boards	(see appended table 2.10.3 and 2.10.4)	P
2.10.6.2	Coated printed boards	(see appended table 2.10.3 and 2.10.4)	N/A
2.10.6.3	Insulation between conductors on the same inner surface of a printed board	(see appended table 2.10.3 and 2.10.4)	P
2.10.6.4	Insulation between conductors on different layers of a printed board		P
	Distance through insulation	(see appended table 2.10.5)	N/A
	Number of insulation layers (pcs) .....:		N/A
2.10.7	Component external terminations	(see appended table 2.10.3 and 2.10.4)	N/A
2.10.8	Tests on coated printed boards and coated components		N/A
2.10.8.1	Sample preparation and preliminary inspection		N/A
2.10.8.2	Thermal conditioning		N/A
2.10.8.3	Electric strength test	(see appended table 5.2)	N/A
2.10.8.4	Abrasion resistance test		N/A
2.10.9	Thermal cycling		N/A
2.10.10	Test for Pollution Degree 1 environment and insulating compound		N/A
2.10.11	Tests for semiconductor devices and cemented joints		N/A
2.10.12	Enclosed and sealed parts		N/A

3	WIRING, CONNECTIONS AND SUPPLY		P
3.1	General		P
3.1.1	Current rating and overcurrent protection		P
3.1.2	Protection against mechanical damage		P
3.1.3	Securing of internal wiring		P
3.1.4	Insulation of conductors	(see appended table 5.2)	P
3.1.5	Beads and ceramic insulators		N/A
3.1.6	Screws for electrical contact pressure	Applied in certified d.c. PSU	P
3.1.7	Insulating materials in electrical connections	Applied in certified PSU's	P
3.1.8	Self-tapping and spaced thread screws		N/A
3.1.9	Termination of conductors		N/A
	10 N pull test		N/A
3.1.10	Sleeving on wiring		N/A

3.2	Connection to a mains supply		P
3.2.1	Means of connection	See clause 2.7.4 above	P
3.2.1.1	Connection to an a.c. mains supply	Appliance inlets	P
3.2.1.2	Connection to a d.c. mains supply	Permanently connected e-quipment	P
3.2.2	Multiple supply connections		N/A
3.2.3	Permanently connected equipment		N/A
	Number of conductors, diameter of cable and conduits (mm) .....:		—
3.2.4	Appliance inlets	IEC approved appliance inlet	P
3.2.5	Power supply cords	Certified power cords	P
3.2.5.1	AC power supply cords	Certified power cords	P
	Type .....:		—
	Rated current (A), cross-sectional area (mm^2), AWG .....:		—
3.2.5.2	DC power supply cords	Not provided	N/A
3.2.6	Cord anchorages and strain relief		N/A
	Mass of equipment (kg), pull (N) .....:		—
	Longitudinal displacement (mm) .....:		—
3.2.7	Protection against mechanical damage		P
3.2.8	Cord guards		N/A
	Diameter or minor dimension D (mm); test mass (g) .....:		—
	Radius of curvature of cord (mm).....:		—
3.2.9	Supply wiring space		N/A

3.3	Wiring terminals for connection of external conductors		P
3.3.1	Wiring terminals		N/A
3.3.2	Connection of non-detachable power supply cords		N/A
3.3.3	Screw terminals	Already certificed DC PSU type -B	P
3.3.4	Conductor sizes to be connected	1 - 2.5 mm^2	P
	Rated current (A), cord/cable type, cross-sectional area (mm^2) ..... :		—
3.3.5	Wiring terminal sizes	Already certificed DC PSU type -B	P
	Rated current (A), type, nominal thread diameter (mm) ..... :		—
3.3.6	Wiring terminal design	Already certificed PSU	N/A
3.3.7	Grouping of wiring terminals	Already certificed PSU	N/A
3.3.8	Stranded wire		N/A

3.4	Disconnection from the mains supply		P
3.4.1	General requirement	The AC appliance coupler is considered the disconnect device.	P
3.4.2	Disconnect devices	AC PSU refer to above	P
3.4.3	Permanently connected equipment	Only for DC equipment: Unless the equipment is accompanied by installation instructions in accordance with 1.7.2, stating that an appropriate disconnect device shall be provided as part of the building installation.	P
3.4.4	Parts which remain energized		N/A
3.4.5	Switches in flexible cords		N/A
3.4.6	Number of poles - single-phase and d.c. equipment	– Disconnect ac variant, disconnects all poles simultaneously. – The dc variant appropriate disconnect device as external device part. Please consider the included “General Safety Instructions for IT Equipment” and all hints of the manual.	P
3.4.7	Number of poles - three-phase equipment		N/A
3.4.8	Switches as disconnect devices	Only within certified PSU’s	P
3.4.9	Plugs as disconnect devices	Appliance coupler is the regarded disconnected device	P

3.4.10	Interconnected equipment		N/A
3.4.11	Multiple power sources		N/A

3.5	Interconnection of equipment		P
3.5.1	General requirements		P
3.5.2	Types of interconnection circuits .....:	SELV	P
3.5.3	ELV circuits as interconnection circuits		N/A
3.5.4	Data ports for additional equipment	COM, USB, LAN, VGA, DVI	P

4	PHYSICAL REQUIREMENTS		P
4.1	Stability		P
	Angle of 10°		P
	Test force (N) .....:		N/A

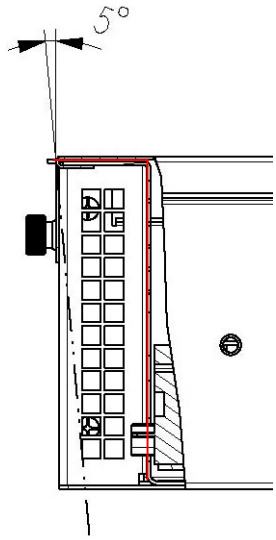
4.2	Mechanical strength		P
4.2.1	General		P
4.2.2	Steady force test, 10 N		P
4.2.3	Steady force test, 30 N		P
4.2.4	Steady force test, 250 N		P
4.2.5	Impact test		N/A
	Fall test	Tests conducted inside the computer at the enclosure of certified PSU's	P
	Swing test		N/A
4.2.6	Drop test; height (mm) .....:		N/A
4.2.7	Stress relief test		N/A
4.2.8	Cathode ray tubes		N/A
	Picture tube separately certified .....:	(see separate test report or attached certificate)	N/A
4.2.9	High pressure lamps		N/A
4.2.10	Wall or ceiling mounted equipment; force (N) .....:		N/A

4.3	Design and construction		P
4.3.1	Edges and corners		P
4.3.2	Handles and manual controls; force (N).....:		N/A
4.3.3	Adjustable controls		N/A
4.3.4	Securing of parts		P
4.3.5	Connection by plugs and sockets	Applied in certified PSU's	P
4.3.6	Direct plug-in equipment		N/A

	Torque ..... :		—
	Compliance with the relevant mains plug standard ..... :		N/A
4.3.7	Heating elements in earthed equipment		N/A
4.3.8	Batteries	Only the lithium battery on the CPU board.	P
	- Overcharging of a rechargeable battery		P
	- Unintentional charging of a non-rechargeable battery		N/A
	- Reverse charging of a rechargeable battery		P
	- Excessive discharging rate for any battery	Operator didn't replace the battery.	N/A
4.3.9	Oil and grease		N/A
4.3.10	Dust, powders, liquids and gases		N/A
4.3.11	Containers for liquids or gases		N/A
4.3.12	Flammable liquids ..... :		N/A
	Quantity of liquid (l) ..... :		N/A
	Flash point (°C) ..... :		N/A
4.3.13	Radiation		N/A
4.3.13.1	General		N/A
4.3.13.2	Ionizing radiation		N/A
	Measured radiation (pA/kg) ..... :		—
	Measured high-voltage (kV) ..... :		—
	Measured focus voltage (kV) ..... :		—
	CRT markings ..... :		—
4.3.13.3	Effect of ultraviolet (UV) radiation on materials		N/A
	Part, property, retention after test, flammability classification ..... :		N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation ..... :		N/A
4.3.13.5	Laser (including LEDs)	(see separate test report of IEC/EN 60825-1 / IEC/EN 60825-2)	N/A
	Laser class ..... :		—
4.3.13.6	Other types ..... :		N/A

4.4	Protection against hazardous moving parts		P
4.4.1	General	DC-fans located in protected area.	P
4.4.2	Protection in operator access areas ..... :		P
4.4.3	Protection in restricted access locations ..... :		N/A
4.4.4	Protection in service access areas		P

4.5	Thermal requirements		P
4.5.1	General		P
4.5.2	Temperature tests		P
	Normal load condition per Annex L .....:		—
4.5.3	Temperature limits for materials	(see appended table 4.5)	P
4.5.4	Touch temperature limits	(see appended table 4.5)	P
4.5.5	Resistance to abnormal heat .....:	(see appended table 4.5.5)	P

4.6	Openings in enclosures		P
4.6.1	Top and side openings Evaluation measures for larger openings (see Figure 4C for examples).	The quadratic side openings are well provided and protected with louver that is 90° shaped and deflect outwards all external vertically falling objects.  The side openings (as shown in Figure), that are not located vertically bounded by a 5° vertical projection up to the size of opening. Behind exist space volumes in which bare parts at HAZARDOUS VOLTAGE or which are energy hazards, are not located. The Limited Power Source (as defined in subclause 2.5) is established on all PWB's.	P
	Dimensions (mm) .....:	4,9 x 4,9	—
4.6.2	Bottoms of fire enclosures	Made of metal	P
	Construction of the bottomm, dimensions (mm) ..:	430 x 470	—

4.6.3	Doors or covers in fire enclosures	By the service personal removable enclosure part is the top cover. This part is only seldom (in case of changing the computer configuration). On the rear side located it's a removable interlock for simply changing of the PCI or PCIe cards (in case of changing the computer configuration). On the front side located its non-removable front case door made of metal (below hinged to 8,5 x 43 cm). The door has opening for visual look on signalization LED's and ventilation slits for airflow. Behind this door its unit metal cover and all unit drives like FDD, CD-ROM, DVD, e.g. and air filter cover are located. Under normal operating conditions this door is closed and locked up. The correct use of unit is with closed and locked door.	P
4.6.4	Openings in transportable equipment		N/A
4.6.4.1	Constructional design measures		N/A
	Dimensions (mm) .....:		—
4.6.4.2	Evaluation measures for larger openings	13 mm accessibility requirements, behind the larger openings, between metal enclosure and aviable circuits or components, its > 15 VA.	N/A
4.6.4.3	Use of metallized parts		N/A
4.6.5	Adhesives for constructional purposes		N/A
	Conditioning temperature (°C), time (weeks) .....:		—

4.7	Resistance to fire		P
4.7.1	Reducing the risk of ignition and spread of flame	Appropriate use of components and suitable construction.	P
	Method 1, selection and application of components wiring and materials	(see appended table 4.7)	P
	Method 2, application of all of simulated fault condition tests	(see appended table 5.3)	N/A
4.7.2	Conditions for a fire enclosure		P
4.7.2.1	Parts requiring a fire enclosure		N/A
4.7.2.2	Parts not requiring a fire enclosure		P
4.7.3	Materials		P
4.7.3.1	General		P

4.7.3.2	Materials for fire enclosures	Metal	P
4.7.3.3	Materials for components and other parts outside fire enclosures	Metal	P
4.7.3.4	Materials for components and other parts inside fire enclosures		P
4.7.3.5	Materials for air filter assemblies	Min. V2 for material grade or HF-2 for foam.	P
4.7.3.6	Materials used in high-voltage components		N/A

5	ELECTRICAL REQUIREMENTS AND SIMULATED ABNORMAL CONDITIONS		P
5.1	Touch current and protective conductor current		P
5.1.1	General		P
5.1.2	Configuration of equipment under test (EUT)		P
5.1.2.1	Single connection to an a.c. mains supply		P
5.1.2.2	Redundant multiple connections to an a.c. mains supply		N/A
5.1.2.3	Simultaneous multiple connections to an a.c. mains supply		N/A
5.1.3	Test circuit	5a	P
5.1.4	Application of measuring instrument		P
5.1.5	Test procedure		P
5.1.6	Test measurements		P
	Supply voltage (V) ..... :	254,4 V a.c.	—
	Measured touch current (mA) ..... :	Type-A: 50 Hz: < 0,6 mA 60 Hz: < 0,8 mA	—
	Max. allowed touch current (mA) ..... :	3,5 mA r.m.s.	—
	Measured protective conductor current (mA) ..... :	Max. 0,078	—
	Max. allowed protective conductor current (mA) .. :		—
5.1.7	Equipment with touch current exceeding 3,5 mA		N/A
5.1.7.1	General ..... :		N/A
5.1.7.2	Simultaneous multiple connections to the supply		N/A
5.1.8	Touch currents to telecommunication networks and cable distribution systems and from telecommunication networks		N/A
5.1.8.1	Limitation of the touch current to a telecommunication network or to a cable distribution system		N/A
	Supply voltage (V) ..... :		—
	Measured touch current (mA) ..... :		—
	Max. allowed touch current (mA) ..... :		—
5.1.8.2	Summation of touch currents from telecommunication networks		N/A
	a) EUT with earthed telecommunication ports ..... :		N/A
	b) EUT whose telecommunication ports have no reference to protective earth		N/A

5.2	Electric strength		P
5.2.1	General	(see appended table 5.2)	P
5.2.2	Test procedure		P

5.3	Abnormal operating and fault conditions		P
5.3.1	Protection against overload and abnormal operation	(see appended table 5.3)	P
5.3.2	Motors	(see appended Annex B)	P
5.3.3	Transformers	(see appended Annex C)	N/A
5.3.4	Functional insulation .....:		P
5.3.5	Electromechanical components		N/A
5.3.6	Audio amplifiers in ITE .....:	See separate test report IEC/EN 60065	N/A
5.3.7	Simulation of faults		P
5.3.8	Unattended equipment		N/A
5.3.9	Compliance criteria for abnormal operating and fault conditions		P
5.3.9.1	During the tests		P
5.3.9.2	After the tests		P

6	CONNECTION TO TELECOMMUNICATION NETWORKS		N/A
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N/A
6.1.1	Protection from hazardous voltages		N/A
6.1.2	Separation of the telecommunication network from earth		N/A
6.1.2.1	Requirements	(see appended table 5.2)	N/A
	Supply voltage (V) ..... :		—
	Current in the test circuit (mA) ..... :		—
6.1.2.2	Exclusions ..... :		N/A

6.2	Protection of equipment users from overvoltages on telecommunication networks		N/A
6.2.1	Separation requirements		N/A
6.2.2	Electric strength test procedure		N/A
6.2.2.1	Impulse test	(see appended table 5.2)	N/A
6.2.2.2	Steady-state test	(see appended table 5.2)	N/A
6.2.2.3	Compliance criteria		N/A

6.3	Protection of the telecommunication wiring system from overheating		N/A
	Max. output current (A) ..... :		—
	Current limiting method ..... :		—

7	CONNECTION TO CABLE DISTRIBUTION SYSTEMS		P
7.1	General		P
7.2	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment	Only when the equipment located in RESTRICTED ACCESS LOCATIONS and protected earth must be connected.	N/A
7.3	Protection of equipment users from overvoltages on the cable distribution system	Protected earth is connected and the cable distribution area is located in the service area or the OPERATOR is instructed to enter regardless of whether or not a TOOL is needed to gain access.	P
7.4	Insulation between primary circuits and cable distribution systems		N/A
7.4.1	General		N/A
7.4.2	Voltage surge test	(see appended table 5.2)	P
7.4.3	Impulse test	(see appended table 5.2)	N/A

A	ANNEX A, TESTS FOR RESISTANCE TO HEAT AND FIRE		N/A
A.1	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)		N/A
A.1.1	Samples ..... :		—
	Wall thickness (mm)..... :		—
A.1.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.1.3	Mounting of samples ..... :		N/A
A.1.4	Test flame (see IEC 60695-11-3)		N/A
	Flame A, B, C or D ..... :		—
A.1.5	Test procedure		N/A
A.1.6	Compliance criteria		N/A
	Sample 1 burning time (s)..... :		—
	Sample 2 burning time (s)..... :		—
	Sample 3 burning time (s)..... :		—
A.2	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)		N/A
A.2.1	Samples, material ..... :		—
	Wall thickness (mm)..... :		—
A.2.2	Conditioning of samples; temperature (°C) ..... :		N/A
A.2.3	Mounting of samples ..... :		N/A
A.2.4	Test flame (see IEC 60695-11-4)		N/A
	Flame A, B or C ..... :		—
A.2.5	Test procedure		N/A
A.2.6	Compliance criteria		N/A
	Sample 1 burning time (s)..... :		—
	Sample 2 burning time (s)..... :		—
	Sample 3 burning time (s)..... :		—
A.2.7	Alternative test acc. to IEC 60695-11-5, cl. 5 and 9		N/A
	Sample 1 burning time (s)..... :		—
	Sample 2 burning time (s)..... :		—
	Sample 3 burning time (s)..... :		—
A.3	Hot flaming oil test (see 4.6.2)		N/A
A.3.1	Mounting of samples		N/A
A.3.2	Test procedure		N/A
A.3.3	Compliance criterion		N/A

B	ANNEX B, MOTOR TESTS UNDER ABNORMAL CONDITIONS (see 4.7.2.2 and 5.3.2)		P
B.1	General requirements	Transformer within certified drives	P
	Position ..... :	please refer to the table " list of critical components "	—
	Manufacturer ..... :		—
	Type ..... :		—
	Rated values ..... :		—
B.2	Test conditions		N/A
B.3	Maximum temperatures	(see appended table 5.3)	N/A
B.4	Running overload test	(see appended table 5.3)	N/A
B.5	Locked-rotor overload test		N/A
	Test duration (days) ..... :		—
	Electric strength test: test voltage (V) ..... :		—
B.6	Running overload test for d.c. motors in secondary circuits		N/A
B.6.1	General		N/A
B.6.2	Test procedure		N/A
B.6.3	Alternative test procedure		N/A
B.6.4	Electric strength test; test voltage (V) ..... :		N/A
B.7	Locked-rotor overload test for d.c. motors in secondary circuits		N/A
B.7.1	General		N/A
B.7.2	Test procedure		N/A
B.7.3	Alternative test procedure		N/A
B.7.4	Electric strength test; test voltage (V) ..... :		N/A
B.8	Test for motors with capacitors	(see appended table 5.3)	N/A
B.9	Test for three-phase motors	(see appended table 5.3)	N/A
B.10	Test for series motors		N/A
	Operating voltage (V) ..... :		—

C	ANNEX C, TRANSFORMERS (see 1.5.4 and 5.3.3)		P
	Position ..... :	Transformer within certified PSU	—
	Manufacturer ..... :	please refer to the table " list of critical components "	—
	Type ..... :	please refer to the table " list of critical components "	—
	Rated values ..... :		—
	Method of protection ..... :		—
C.1	Overload test	(see appended table 5.3)	N/A

C.2	Insulation	(see appended table 5.2)	N/A
	Protection from displacement of windings .....:		N/A

D	ANNEX D, MEASURING INSTRUMENTS FOR TOUCH-CURRENT TESTS (see 5.1.4)		P
D.1	Measuring instrument		P
D.2	Alternative measuring instrument		N/A

E	ANNEX E, TEMPERATURE RISE OF A WINDING (see 1.4.13)	N/A

F	ANNEX F, MEASUREMENT OF CLEARANCES AND CREEPAGE DISTANCES (see 2.10 and Annex G)	P

G	ANNEX G, ALTERNATIVE METHOD FOR DETERMINING MINIMUM CLEARANCES		N/A
G.1	Clearances		N/A
G.1.1	General		N/A
G.1.2	Summary of the procedure for determining minimum clearances		N/A
G.2	Determination of mains transient voltage (V)		N/A
G.2.1	AC mains supply .....:		N/A
G.2.2	Earthed d.c. mains supplies .....:		N/A
G.2.3	Unearthed d.c. mains supplies .....:		N/A
G.2.4	Battery operation .....:		N/A
G.3	Determination of telecommunication network transient voltage (V) .....:		N/A
G.4	Determination of required withstand voltage (V)		N/A
G.4.1	Mains transients and internal repetitive peaks ....:		N/A
G.4.2	Transients from telecommunication networks .....:		N/A
G.4.3	Combination of transients		N/A
G.4.4	Transients from cable distribution systems		N/A
G.5	Measurement of transient voltages (V)		N/A
	a) Transients from a mains supply		N/A
	For an a.c. mains supply		N/A
	For a d.c. mains supply		N/A
	b) Transients from a telecommunication network		N/A
G.6	Determination of minimum clearances .....:		N/A

H	ANNEX H, IONIZING RADIATION (see 4.3.13)	N/A

J	ANNEX J, TABLE OF ELECTROCHEMICAL POTENTIALS (see 2.6.5.6)		N/A
	Metal(s) used .....:		—

K	ANNEX K, THERMAL CONTROLS (see 1.5.3 and 5.3.8)		N/A
K.1	Making and breaking capacity		N/A
K.2	Thermostat reliability; operating voltage (V) .....:		N/A
K.3	Thermostat endurance test; operating voltage (V) .....:		N/A
K.4	Temperature limiter endurance; operating voltage (V) .....:		N/A
K.5	Thermal cut-out reliability		N/A
K.6	Stability of operation	(see appended table 5.3)	N/A

L	ANNEX L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.2)		N/A
L.1	Typewriters		N/A
L.2	Adding machines and cash registers		N/A
L.3	Erasers		N/A
L.4	Pencil sharpeners		N/A
L.5	Duplicators and copy machines		N/A
L.6	Motor-operated files		N/A
L.7	Other business equipment		N/A

M	ANNEX M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)		N/A
M.1	Introduction		N/A
M.2	Method A		N/A
M.3	Method B		N/A
M.3.1	Ringing signal		N/A
M.3.1.1	Frequency (Hz) .....:		—
M.3.1.2	Voltage (V) .....:		—
M.3.1.3	Cadence; time (s), voltage (V) .....:		—
M.3.1.4	Single fault current (mA) .....:		—
M.3.2	Tripping device and monitoring voltage .....:		N/A
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage		N/A
M.3.2.2	Tripping device		N/A
M.3.2.3	Monitoring voltage (V) .....:		N/A

N	ANNEX N, IMPULSE TEST GENERATORS (see 1.5.7.2, 1.5.7.3, 2.10.3.9, 6.2.2.1, 7.3.2, 7.4.3 and Clause G.5)	N/A

N.1	ITU-T impulse test generators		N/A
N.2	IEC 60065 impulse test generator		N/A

P	ANNEX P, NORMATIVE REFERENCES	—

Q	ANNEX Q, Voltage dependent resistors (VDRs) (see 1.5.9.1)		N/A
	a) Preferred climatic categories .....:		N/A
	b) Maximum continuous voltage .....:		N/A
	c) Pulse current .....:		N/A

R	ANNEX R, EXAMPLES OF REQUIREMENTS FOR QUALITY CONTROL PROGRAMMES		N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6.2)		N/A
R.2	Reduced clearances (see 2.10.3)		N/A

S	ANNEX S, PROCEDURE FOR IMPULSE TESTING (see 6.2.2.3)		N/A
S.1	Test equipment		N/A
S.2	Test procedure		N/A
S.3	Examples of waveforms during impulse testing		N/A

T	ANNEX T, GUIDANCE ON PROTECTION AGAINST INGRESS OF WATER (see 1.1.2)		N/A
		See separate test report	—

U	ANNEX U, INSULATED WINDING WIRES FOR USE WITHOUT INTERLEAVED INSULATION (see 2.10.5.4)		N/A
		See separate test report	—

V	ANNEX V, AC POWER DISTRIBUTION SYSTEMS (see 1.6.1)		N/A
V.1	Introduction		N/A
V.2	TN power distribution systems		N/A

W	ANNEX W, SUMMATION OF TOUCH CURRENTS		N/A
W.1	Touch current from electronic circuits		N/A
W.1.1	Floating circuits		N/A
W.1.2	Earthed circuits		N/A
W.2	Interconnection of several equipments		N/A
W.2.1	Isolation		N/A
W.2.2	Common return, isolated from earth		N/A

W.2.3	Common return, connected to protective earth		N/A

X	ANNEX X, MAXIMUM HEATING EFFECT IN TRANSFORMER TESTS (see clause C.1)		N/A
X.1	Determination of maximum input current		N/A
X.2	Overload test procedure		N/A

Y	ANNEX Y, ULTRAVIOLET LIGHT CONDITIONING TEST (see 4.3.13.3)		N/A
Y.1	Test apparatus .....:		N/A
Y.2	Mounting of test samples .....:		N/A
Y.3	Carbon-arc light-exposure apparatus .....:		N/A
Y.4	Xenon-arc light exposure apparatus .....:		N/A

Z	ANNEX Z, OVERVOLTAGE CATEGORIES (see 2.10.3.2 and Clause G.2)	P

AA	ANNEX AA, MANDREL TEST (see 2.10.5.8)	N/A

BB	ANNEX BB, CHANGES IN THE SECOND EDITION	—

EN 60950-1:2006 – CENELEC COMMON MODIFICATIONS		
Contents	Add the following annexes: Annex ZA (normative) Normative references to international publications with their corresponding European publications Annex ZB (normative) Special national conditions Annex ZC (informative) A-deviations	N/A
General	Delete all the “country” notes in the reference document according to the following list: 1.4.8 Note 2; 1.5.1 Note 2 & 3; 1.5.7.1 Note 1.5.8 Note 2; 1.5.9.4 Note; 1.7.2.1 Note 4, 5 & 6 2.2.3 Note; 2.2.4 Note; 2.3.2 Note 2.3.2.1 Note 2; 2.3.4 Note 2; 2.6.3.3 Note 2 & 3 2.7.1 Note; 2.10.3.2 Note 2; 2.10.5.13 Note 3 3.2.1.1 Note; 3.2.4 Note 3.; 2.5.1 Note 2 4.3.6 Note 1 & 2; 4.7 Note 4; 4.7.2.2 Note 4.7.3.1 Note 2; 5.1.7.1 Note 3 & 4; 5.3.7 Note 1 6 Note 2 & 5; 6.1.2.1 Note 2; 6.1.2.2 Note 6.2.2 Note 6.; 2.2.1 Note 2; 6.2.2.2 Note 7.1 Note 3; 7.2 Note; 7.3 Note 1 & 2 G.2.1 Note 2; Annex H Note 2	N/A
1.3.Z1	Add the following subclause: 1.3.Z1 Exposure to excessive sound pressure The apparatus shall be so designed and constructed as to present no danger when used for its intended purpose, either in normal operating conditions or under fault conditions, particularly providing protection against exposure to excessive sound pressures from headphones or earphones. NOTE Z1 A new method of measurement is described in EN 50332-1, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 1: General method for “one package equipment”, and in EN 50332-2, Sound system equipment: Headphones and earphones associated with portable audio equipment - Maximum sound pressure level measurement methodology and limit considerations - Part 2: Guidelines to associate sets with headphones coming from different manufacturers.	N/A
1.5.1	Add the following NOTE: NOTE Z1 The use of certain substances in electrical and electronic equipment is restricted within the EU: see Directive 2002/95/EC	N/A
1.7.2.1	Add the following NOTE: NOTE Z1 In addition, the instructions shall include, as far as applicable, a warning that excessive sound pressure from earphones and headphones can cause hearing loss	N/A

2.7.1	Replace the subclause as follows: Basic requirements To protect against excessive current, short-circuits and earth faults in PRIMARY CIRCUITS, protective devices shall be included either as integral parts of the equipment or as parts of the building installation, subject to the following, a), b) and c): a) except as detailed in b) and c), protective devices necessary to comply with the requirements of 5.3 shall be included as parts of the equipment; b) for components in series with the mains input to the equipment such as the supply cord, appliance coupler, r.f.i. filter and switch, short-circuit and earth fault protection may be provided by protective devices in the building installation; c) it is permitted for PLUGGABLE EQUIPMENT TYPE B or PERMANENTLY CONNECTED EQUIPMENT, to rely on dedicated overcurrent and short-circuit protection in the building installation, provided that the means of protection, e.g. fuses or circuit breakers, is fully specified in the installation instructions. If reliance is placed on protection in the building installation, the installation instructions shall so state, except that for PLUGGABLE EQUIPMENT TYPE A the building installation shall be regarded as providing protection in accordance with the rating of the wall socket outlet.	c)
2.7.2	This subclause has been declared ‘void’.	P
3.2.3	Delete the NOTE in Table 3A, and delete also in this table the conduit sizes in parentheses.	P
3.2.5.1	Replace “60245 IEC 53” by “H05 RR-F”; “60227 IEC 52” by “H03 VV-F or H03 VVH2-F”; “60227 IEC 53” by “H05 VV-F or H05 VVH2-F2”. In Table 3B, replace the first four lines by the following: | Up to and including 6 | | 0,75 [a)] | | Over 6 up to and including 10 | (0,75) [b)] | 1,0 | | Over 10 up to and including 16 | (1,0) [c)] | 1,5 | In the conditions applicable to Table 3B delete the words “in some countries” in condition [a)]. In NOTE 1, applicable to Table 3B, delete the second sentence.	P
3.3.4	In Table 3D, delete the fourth line: conductor sizes for 10 to 13 A, and replace with the following: | Over 10 up to and including 16 | 1,5 to 2,5 | 1,5 to 4 | Delete the fifth line: conductor sizes for 13 to 16 A.	N/A
4.3.13.6	Add the following NOTE: NOTE Z1 Attention is drawn to 1999/519/EC: Council Recommendation on the limitation of exposure of the general public to electromagnetic fields 0 Hz to 300 GHz. Standards taking into account this Recommendation which demonstrate compliance with the applicable EU Directive are indicated in the OJEC.	N/A
Annex H	Replace the last paragraph of this annex by: At any point 10 cm from the surface of the OPERATOR ACCESS AREA, the dose rate shall not exceed 1 µSv/h (0,1 mR/h) (see NOTE). Account is taken of the background level. Replace the notes as follows: NOTE These values appear in Directive 96/29/Euratom. Delete NOTE 2.	N/A

Biblio-graphy	Additional EN standards.	—

ZA	NORMATIVE REFERENCES TO INTERNATIONAL PUBLICATIONS WITH THEIR CORRESPONDING EUROPEAN PUBLICATIONS	—

ZB	SPECIAL NATIONAL CONDITIONS	
1.2.4.1	In **Denmark**, certain types of Class I appliances (see 3.2.1.1) may be provided with a plug not establishing earthing conditions when inserted into Danish socket-outlets.	N/A
1.5.7.1	In **Finland**, **Norway** and **Sweden**, resistors bridging BASIC INSULATION in CLASS I PLUGGABLE EQUIPMENT TYPE A must comply with the requirements in 1.5.7.2.	N/A
1.5.8	In **Norway**, due to the IT power system used (see annex V, Figure V.7), capacitors are required to be rated for the applicable line-to-line voltage (230 V).	N/A
1.5.9.4	In **Finland**, **Norway** and **Sweden**, the third dashed sentence is applicable only to equipment as defined in 6.1.2.2 of this annex.	N/A
1.7.2.1	In **Finland**, **Norway** and **Sweden**, CLASS I PLUGGABLE EQUIPMENT TYPE A intended for connection to other equipment or a network shall, if safety relies on connection to protective earth or if surge suppressors are connected between the network terminals and accessible parts, have a marking stating that the equipment must be connected to an earthed mains socket-outlet. The marking text in the applicable countries shall be as follows: In Finland: "Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan" In Norway: “Apparatet må tilkoples jordet stikkontakt” In Sweden: “Apparaten skall anslutas till jordat uttag”	N/A
1.7.5	In **Denmark**, socket-outlets for providing power to other equipment shall be in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-3a, DK 1-5a or DK 1-7a, when used on Class I equipment. For STATIONARY EQUIPMENT the socket-outlet shall be in accordance with Standard Sheet DK 1-1b or DK 1-5a.	N/A
2.2.4	In **Norway**, for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	N/A
2.3.2	In **Finland**, **Norway** and **Sweden** there are additional requirements for the insulation. See 6.1.2.1 and 6.1.2.2 of this annex.	N/A
2.3.4	In **Norway**, for requirements see 1.7.2.1, 6.1.2.1 and 6.1.2.2 of this annex.	N/A
2.6.3.3	In the **United Kingdom**, the current rating of the circuit shall be taken as 13 A, not 16 A.	N/A
2.7.1	In the **United Kingdom**, to protect against excessive currents and short-circuits in the PRIMARY CIRCUIT of DIRECT PLUG-IN EQUIPMENT, tests according to 5.3 shall be conducted, using an external protective device rated 30 A or 32 A. If these tests fail, suitable protective devices shall be included as integral parts of the DIRECT PLUG-IN EQUIPMENT, so that the requirements of 5.3 are met.	N/A
2.10.5.13	In **Finland**, **Norway** and **Sweden**, there are additional requirements for the insulation, see 6.1.2.1 and 6.1.2.2 of this annex.	N/A

3.2.1.1	In **Switzerland**, supply cords of equipment having a RATED CURRENT not exceeding 10 A shall be provided with a plug complying with SEV 1011 or IEC 60884-1 and one of the following dimension sheets: SEV 6532-2.1991 Plug Type 15 3P+N+PE 250/400 V, 10 A SEV 6533-2.1991 Plug Type 11 L+N 250 V, 10 A SEV 6534-2.1991 Plug Type 12 L+N+PE 250 V, 10 A In general, EN 60309 applies for plugs for currents exceeding 10 A. However, a 16 A plug and socket-outlet system is being introduced in Switzerland, the plugs of which are according to the following dimension sheets, published in February 1998: SEV 5932-2.1998 Plug Type 25 3L+N+PE 230/400 V, 16 A SEV 5933-2.1998 Plug Type 21 L+N 250 V, 16 A SEV 5934-2.1998 Plug Type 23 L+N+PE 250 V, 16 A	P
3.2.1.1	In **Denmark**, supply cords of single-phase equipment having a rated current not exceeding13 A shall be provided with a plug according to the Heavy Current Regulations, Section 107-2-D1. CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules shall be provided with a plug in accordance with standard sheet DK 2-1a or DK 2-5a. If poly-phase equipment and single-phase equipment having a RATED CURRENT exceeding 13 A is provided with a supply cord with a plug, this plug shall be in accordance with the Heavy Current Regulations, Section 107-2-D1 or EN 60309-2.	P
3.2.1.1	In **Spain**, supply cords of single-phase equipment having a rated current not exceeding 10 A shall be provided with a plug according to UNE 20315:1994. Supply cords of single-phase equipment having a rated current not exceeding 2,5 A shall be provided with a plug according to UNE-EN 50075:1993. CLASS I EQUIPMENT provided with socket-outlets with earth contacts or which are intended to be used in locations where protection against indirect contact is required according to the wiring rules, shall be provided with a plug in accordance with standard UNE 20315:1994. If poly-phase equipment is provided with a supply cord with a plug, this plug shall be in accordance with UNE-EN 60309-2.	P
3.2.1.1	In the **United Kingdom**, apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to BS 1363 by means of that flexible cable or cord and plug, shall be fitted with a ‘standard plug’ in accordance with Statutory Instrument 1768:1994 - The Plugs and Sockets etc. (Safety) Regulations 1994, unless exempted by those regulations. NOTE ‘Standard plug’ is defined in SI 1768:1994 and essentially means an approved plug conforming to BS 1363 or an approved conversion plug.	P
3.2.1.1	In **Ireland**, apparatus which is fitted with a flexible cable or cord and is designed to be connected to a mains socket conforming to I.S. 411 by means of that flexible cable or cord and plug, shall be fitted with a 13 A plug in accordance with Statutory Instrument 525:1997 - National Standards Authority of Ireland (section 28) (13 A Plugs and Conversion Adaptors for Domestic Use) Regulations 1997.	P
3.2.4	In **Switzerland**, for requirements see 3.2.1.1 of this annex.	P
3.2.5.1	In the **United Kingdom**, a power supply cord with conductor of 1,25 mm2 is allowed for equipment with a rated current over 10 A and up to and including 13 A.	P

3.3.4	In the **United Kingdom**, the range of conductor sizes of flexible cords to be accepted by terminals for equipment with a RATED CURRENT of over 10 A up to and including 13 A is: • 1,25 mm^2 to 1,5 mm^2 nominal cross-sectional area.	P
4.3.6	In the **United Kingdom**, the torque test is performed using a socket outlet complying with BS 1363 part 1:1995, including Amendment 1:1997 and Amendment 2:2003 and the plug part of DIRECT PLUG-IN EQUIPMENT shall be assessed to BS 1363: Part 1, 12.1, 12.2, 12.3, 12.9, 12.11, 12.12, 12.13, 12.16 and 12.17, except that the test of 12.17 is performed at not less than 125 °C. Where the metal earth pin is replaced by an Insulated Shutter Opening Device (ISOD), the requirements of clauses 22.2 and 23 also apply.	P
4.3.6	In **Ireland**, DIRECT PLUG-IN EQUIPMENT is known as plug similar devices. Such devices shall comply with Statutory Instrument 526:1997 - National Standards Authority of Ireland (Section 28) (Electrical plugs, plug similar devices and sockets for domestic use) Regulations, 1997.	P
5.1.7.1	In **Finland**, **Norway** and **Sweden** TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s. are permitted only for the following equipment: • STATIONARY PLUGGABLE EQUIPMENT TYPE A that ○ is intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, for example, in a telecommunication centre; and ○ has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR; and ○ is provided with instructions for the installation of that conductor by a SERVICE PERSON; • STATIONARY PLUGGABLE EQUIPMENT TYPE B; • STATIONARY PERMANENTLY CONNECTED EQUIPMENT.	N/A

6.1.2.1	In **Finland**, **Norway** and **Sweden**, add the following text between the first and second paragraph of the compliance clause: If this insulation is solid, including insulation forming part of a component, it shall at least consist of either - two layers of thin sheet material, each of which shall pass the electric strength test below, or - one layer having a distance through insulation of at least 0,4 mm, which shall pass the electric strength test below. If this insulation forms part of a semiconductor component (e.g. an optocoupler), there is no distance through insulation requirement for the insulation consisting of an insulating compound completely filling the casing, so that CLEARANCES and CREEPAGE DISTANCES do not exist, if the component passes the electric strength test in accordance with the compliance clause below and in addition - passes the tests and inspection criteria of 2.10.11 with an electric strength test of 1,5 kV multiplied by 1,6 (the electric strength test of 2.10.10 shall be performed using 1,5 kV), and - is subject to ROUTINE TESTING for electric strength during manufacturing, using a test voltage of 1,5 kV. It is permitted to bridge this insulation with a capacitor complying with EN 132400:1994, subclass Y2. A capacitor classified Y3 according to EN 132400:1994, may bridge this insulation under the following conditions: - the insulation requirements are satisfied by having a capacitor classified Y3 as defined by EN 132400, which in addition to the Y3 testing, is tested with an impulse test of 2,5 kV defined in EN 60950-1:2006, 6.2.2.1; - the additional testing shall be performed on all the test specimens as described in EN 132400; - the impulse test of 2,5 kV is to be performed before the endurance test in EN 132400, in the sequence of tests as described in EN 132400.	N/A
6.1.2.2	In **Finland**, **Norway** and **Sweden**, the exclusions are applicable for PERMANENTLY CONNECTED EQUIPMENT, PLUGGABLE EQUIPMENT TYPE B and equipment intended to be used in a RESTRICTED ACCESS LOCATION where equipotential bonding has been applied, e.g. in a telecommunication centre, and which has provision for a permanently connected PROTECTIVE EARTHING CONDUCTOR and is provided with instructions for the installation of that conductor by a SERVICE PERSON.	N/A
7.2	In **Finland**, **Norway** and **Sweden**, for requirements see 6.1.2.1 and 6.1.2.2 of this annex. The term TELECOMMUNICATION NETWORK in 6.1.2 being replaced by the term CABLE DISTRIBUTION SYSTEM.	N/A
7.3	In **Norway** and **Sweden**, there are many buildings where the screen of the coaxial cable is normally not connected to the earth in the building installation.	N/A
7.3	In **Norway**, for installation conditions see EN 60728-11:2005.	N/A

ZC	A-DEVIATIONS (informative)	P

1.5.1	**Sweden** (Ordinance 1990:944) Add the following: NOTE In Sweden, switches containing mercury are not permitted.	N/A
1.5.1	**Switzerland** (Ordinance on environmentally hazardous substances SR 814.081, Annex 1.7, Mercury - Annex 1.7 of SR 814.81 applies for mercury.) Add the following: NOTE In Switzerland, switches containing mercury such as thermostats, relays and level controllers are not allowed.	N/A
1.7.2.1	**Denmark** (Heavy Current Regulations) Supply cords of CLASS I EQUIPMENT, which is delivered without a plug, must be provided with a visible tag with the following text: Vigtigt! Lederen med grøn/gul isolation må kun tilsluttes en klemme mærket  If essential for the safety of the equipment, the tag must in addition be provided with a diagram, which shows the connection of the other conductors, or be provided with the following text: "For tilslutning af de øvrige ledere, se medfølgende installationsvejledning."	N/A
1.7.2.1	**Germany** (Gesetz über technische Arbeitsmittel und Verbraucherprodukte (Geräte- und Produktsicherheitsgesetz – GPSG) [Law on technical labour equipment and consumer products], of 6th January 2004, Section 2, Article 4, Clause (4), Item 2). If for the assurance of safety and health certain rules during use, amending or maintenance of a technical labour equipment or readymade consumer product are to be followed, a manual in German language has to be delivered when placing the product on the market. Of this requirement, rules for use even only by SERVICE PERSONS are not exempted.	P
1.7.5	**Denmark** (Heavy Current Regulations) With the exception of CLASS II EQUIPMENT provided with a socket outlet in accordance with the Heavy Current Regulations, Section 107-2-D1, Standard Sheet DK 1-4a, CLASS II EQUIPMENT shall not be fitted with socket-outlets for providing power to other equipment.	N/A
1.7.13	**Switzerland** (Ordinance on chemical hazardous risk reduction SR 814.81, Annex 2.15 Batteries) Annex 2.15 of SR 814.81 applies for batteries.	P
5.1.7.1	**Denmark** (Heavy Current Regulations, Chapter 707, clause 707.4) TOUCH CURRENT measurement results exceeding 3,5 mA r.m.s. are permitted only for PERMANENTLY CONNECTED EQUIPMENT and PLUGGABLE EQUIPMENT TYPE B.	N/A

1.5.1	TABLE: List of critical components				P
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
PSU Type A	FSP Technology Inc. SPI Electronic Co.Ltd.	FSP400-60PFB	100-240 VAC, 80 Plus max.6,0A/115Vrms/60Hz; max.3,0A/230Vrms/50Hz Output VDC: 3,3 /5 /12V1/12V2/ -12/ 5vsb; 20/20/ 16 / 16 / 0,5 / 2,5A short circuit & over load protection on DC outputs.	IEC60950-1 /2001	UL E104405 CSA, CB, TÜV, NEMKO
PSU Type B	Bicker	BES 630-C	24 VDC /20A fuse rating 30A 0-40°C operating Output: 3,3 / 5 / 12 / -12 / 5vsb 15 /30 /15 / 2 / 1,2 over voltage & current and short circuit protection on DC outputs.	EN60950-1 UL 60950-1	
PSU Type C red.	Zippy Technology Corp.	R1S2-5380V4V	100-240 VAC full range 5,5A/115Vrms/60Hz; 2,5A/230Vrms/50Hz, 0-40°C operating, Efficiency 82% Output: 3,3 / 5 / 12 / -12 / 5vsb 20 /20 /30 / 0,5 / 2,5 over voltage & current and short circuit protection on DC outputs.	IEC60950-1 UL 60950-1	TÜV; UL; CSA, CB, CCC
CPU Board	Kontron®	KTQ45/ATXE	ICMP Core2 Quad Q9400 2.66GHz	UR	UR, E194252 Fault condition tests
Lithium battery	Panasonic	CR 2032	Manganese Dioxid Lithium Coin battery; 3VDC; 225 mAh; standard load 0,2mA; operating temp. –30 to +60°C	UL	UL
Lithium battery alternate	Various	CR 2032	3VDC; 225 mAh; standard load 0,2mA; operating temp. –30 to +60°C	UL	UL
CPU active cooler JZH22A-H	CoolJag Chia Cherne Industrie Co., LTD	Fun model No.: F128025BU AF	12VDC/4W brushless fun 66,76 CFM / 1.83 m^3/min operating temperature –10 to +70°C	UL	Fault condition tests 1035-5961
CPU active cooler alternate	Various	Various	12V DC fan, 11,5 CFM / 0.32 m3/min operating temperature –10 to +70°C	UL	UL
Hot plug System Fans	Sunon	KDE1207PTV2	DC 12V/ 1,3 W; 7 CFM	UL	E77551
HD SATA	Hitachi	HDS721616PLA	Dekstar 7K160; 1.9 A (12V) & 1.1 A (5V); 4,9 W idle	UL	UL

Hard Disc Drive alter-nate	Various	Various	1.9 A (12V) & 1.1 A (5V); 4,9 W idle	UL	UL
PCIe DVI/VGA	ATI Radeon	SAPPHIRE HD 4350	512MB DDR2 PCI-E HDMI Visual Interface: VGA, DVI, HDMI Out	UL	UL
CD/DVD SATA	Sony-Optiarc	AD-7240S		UL	--
PCIe Network	SysKonect	SK-9E21D	PCI-Express Native Hot Plug according to PCI-Express 1.0a; 10/100/1000 Base-T (RJ-45 connec-tors); Auto-negotiation, full-duplex and half-duplex support.	UL	UL
PCB's	Sereval	Sereval	Min. UL94-2	UL 94	UR
Air Filter	BRIDGE-STONE CORP	R8225	Type HR , up to 50 mm thick, Class 2.	AJZV, UL900	UL
Air Filter	various	various	Min HB – UL94	--	--
Inner plastic parts	Sereval	Sereval	Basich material UL94-2	UL94	UR
[1]) An asterisk indicates a mark which assures the agreed level of surveillance					
Supplementary information:					

1.6.2a	TABLE: Electrical data (in normal conditions) Test conducted with 2-A0ED-2xxx; 2-A0EE-2xxx PSU Type A and conditions as explaned under chapter general description. Aditional power (P) = 70 was simulated with PCIe load inside the unit. The fuse location is inside of the certified PSU.					P
U (V)	I (A)	Irated (A)	P (W)	Fuse #	Ifuse (A)	Condition/status
50 Hz measurements						
90	1,8	max. 2,5	162	*	*	See upper mentioned comments
100	1,58	max. 2,5	158	*	*	See upper mentioned comments
115	1,37	max. 2,5	157	*	*	See upper mentioned comments
230	0,74	max. 2,5	170	*	*	See upper mentioned comments
240	0,71	max. 2,5	170	*	*	See upper mentioned comments
254,4	0,69	max. 2,5	175	*	*	See upper mentioned comments
60 Hz measurements						
90	1,77	max. 2,5	159	*	*	See upper mentioned comments
100	1,43	max. 2,5	143	*	*	See upper mentioned comments
115	1,37	max. 2,5	157	*	*	See upper mentioned comments
230	0,76	max. 2,5	175	*	*	See upper mentioned comments
240	0,74	max. 2,5	177	*	*	See upper mentioned comments
254,4	0,72	max. 2,5	183	*	*	See upper mentioned comments
Supplementary information: * Main fuses located in certified PSU’s						

1.6.2b	TABLE: Electrical data (in normal conditions) Test conducted with 2-A0ED-2xxx; 2-A0EE-2xxx PSU Type B and conditions as explaned under chapter general description. Aditional power (P) = 70 was simulated with PCIe load inside the unit. The fuse location is inside of the certified PSU.					P
U (V)	I (A)	Irated (A)	P (W)	Fuse #	Ifuse (A)	Condition/status
19	7,5	max. 7,5	142,5	*	*	See upper mentioned comments
20	7,1	max. 7,5	142	*	*	See upper mentioned comments
23	6,2	max. 7,5	142,6	*	*	See upper mentioned comments
24	6,0	max. 7,5	144	*	*	See upper mentioned comments
29	4,9	max. 7,5	142.1	*	*	See upper mentioned comments
32	4,4	max. 7,5	140,8	*	*	See upper mentioned comments
Supplementary information: * Main fuses located in certified PSU’s						

1.6.2c	TABLE: Electrical data (in normal conditions) Test conducted with 2-A0ED-2xxx; 2-A0EE-2xxx PSU Type C and conditions as explaned under chapter general description. Aditional power (P) = 40 was simulated with PCIe load inside the unit. The fuse location is inside of the certified PSU.					P
U (V)	I (A)	Irated (A)	P (W)	Fuse #	Ifuse (A)	Condition/status
50 Hz measurements						
90	2,467	max. 2,5	222	*	*	See upper mentioned comments
100	2,079	max. 2,5	208	*	*	See upper mentioned comments
115	1,804	max. 2,5	207	*	*	See upper mentioned comments
230	0,91	max. 2,5	209	*	*	See upper mentioned comments
240	0,871	max. 2,5	209	*	*	See upper mentioned comments
254,4	0,82	max. 2,5	208	*	*	See upper mentioned comments
60 Hz measurements						
90	2,324	max. 2,5	209	*	*	See upper mentioned comments
100	2,074	max. 2,5	207	*	*	See upper mentioned comments
115	1,79	max. 2,5	206	*	*	See upper mentioned comments
230	0,899	max. 2,5	206	*	*	See upper mentioned comments
240	0,868	max. 2,5	208	*	*	See upper mentioned comments
254,4	0,818	max. 2,5	208	*	*	See upper mentioned comments
Supplementary information: * Main fuses located in certified PSU’s						

2.10.3 and 2.10.4	TABLE: Clearance and creepage distance measurements					P
Clearance (cl) and creepage distance (cr) at/of/between:	U peak (V)	U r.m.s. (V)	Required cl (mm)	cl (mm)	Required cr (mm)	cr (mm)
Functional:						
Basic/supplementary:						
Reinforced:						
Supplementary information: Only applicable for certified PSU’s. No further evaluation has been conducted.						

2.10.5	TABLE: Distance through insulation measurements				N/A
Distance through insulation (DTI) at/of:	U peak (V)	U rms (V)	Test voltage (V)	Required DTI (mm)	DTI (mm)
Supplementary information:					

4.3.8	TABLE: Batteries								P
The tests of 4.3.8 are applicable only when appropriate battery data is not available						Battery data is available			N/A
Is it possible to install the battery in a reverse polarity position?						yes			P
	Non-rechargeable batteries			Rechargeable batteries					
	Discharging		Un-intentional charging	Charging		Discharging		Reversed charging	
	Meas. current	Manuf. Specs.		Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.	Meas. current	Manuf. Specs.
Max. current during normal condition									
Max. current during fault condition									
Test results:									Verdict
- Chemical leaks									
- Explosion of the battery									
- Emission of flame or expulsion of molten metal									
- Electric strength tests of equipment after completion of tests									
Supplementary information: Only Lithium Battery on CPU Board. For more information please refer to table list of critical components									

4.5	TABLE: Thermal requirements						P
	Supply voltage (V) .....:						—
	Ambient T_{min} (°C) .....:						—
	Ambient T_{max} (°C) .....:						—
Maximum measured temperature T of part/at::		T (°C)					Allowed T_{max} (°C)

Supplementary information:

Additional power (P) was simulated with special electronic load PCIe- Interface boards inside the unit.

Unit 2-A0ED-2xxx; 2-A0EE-2xxx allowed to be run at an ambient temperature of a max. 50°C. Temperatures at components and surrounding measured with thermocouples. Minimal temperature classes or temperature resistance taken under consideration.

5 or 6 fans cool the unit: 3x standard hot-plugging chassis fans (each 7,7 CFM) within computer frame and 1 or 2 fans within the certified PSU's (Single and Redundant). These fans controlled the inside temperature.

The Intel Core 2 Quad CPU (from 95 to 105W TDP, TJunction-Max. 100°C) with active heatsink gets the fresh air from the chassis fans. The test specimen was checked for the surroundings conditions sufficiently.

Purpose of testing shows also compliance with IEC 60068 PT2-1, PT2-2 and PT2-14 (see separate test report: *Test Report No. 311009.001internal*). The view of done tests shows not critical operating temperatures.

Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class

Supplementary information: Appliance only for already certified a.c. PSU's

4.5.5	TABLE: Ball pressure test of thermoplastic parts		N/A
	Allowed impression diameter (mm) .....:	≤ 2 mm	—

Part	Test temperature (°C)	Impression diameter (mm)

Supplementary information:

Appliance only for already certified a.c. PSU's

4.7	TABLE: Resistance to fire				P
Part	Manufacturer of material	Type of material	Thickness (mm)	Flammability class	Evidence
Supplementary information: All components or the inside used plastic materials fulfill fire enclosure requirements! For more information please refer to table list of critical components					

5.2	TABLE: Electric strength tests, impulse tests and voltage surge tests		P
Test voltage applied between:	Voltage shape (AC, DC, impulse, surge)	Test voltage (V)	Breakdown Yes / No
Functional: F6			
Electric strength tests only on the AC PSU's Input (60 sec.) still in a well-heated condition immediately following the heating test.	AC	1500	No
Surge test 10 pulses (5+ and 5– pulses) on the AC PSU's Input mains	1,2/50 (8/20) t_r/ t_h µs	±1000 symmetrical ± 2 000 asymmetrical	No
Surge test 10 pulses (5+ and 5– pulses) on the DC PSU Input mains	1,2/50 (8/20) t_r/ t_h µs	± 500 symmetrical	No
Surge test 10 pulses (5+ and 5– pulses) on each shielded data lines > 5m	1,2/50 (8/20) t_r/ t_h µs	± 1 000 asymmetrical	No
Basic/supplementary:			
Reinforced:			
Supplementary information:			

5.3	TABLE: Fault condition tests					P
	Ambient temperature (°C) ..... :		20°C			—
	Power source for EUT: Manufacturer, model/type, output rating ..... :		PSU Type B			—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
Test 1	Hot plugging chassis system fans removed	19V	2 Std.	--	--	**CT** -- No critical behavior. The additional power (P) = 70 W simulated with PCIe Interface boards inside the unit. The all CPU's working with 100% load. The Continuous maximal temperature of Core #0 97°C, Core #1 89°C, Core #2 94°C, Core #3 93°C. The thermal shutdown Tjunction (100^C) is not released.
Test 2	All housing air openings was closed	19V	2 Std.	--	--	**CT** -- No critical behavior. The additional power (P) = 70 W simulated with PCIe Interface boards inside the unit. The all CPU's working with 100% load. The Continuous maximal temperature of Core #0 99°C, Core #1 91°C, Core #2 96°C, Core #3 96°C. The thermal shutdown Tjunction (100^C) is not released.
Remark: Tested sample 2-A0ED-2xxx Result Key = Constant temperatures were obtained						
Tests on CPU Motherboard KTQ45/Flex						

VGA CN1B	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS1	2,04	**IP** -- During test unit worked normal.
PS2 J3	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS2	2,36	**IP** -- During test unit worked normal.
USB 6-7 USBx4	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS3	3,15	**IP** -- During test unit worked normal.
USB 4-5 USB&RJ45 L2	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS4	3,21	**IP** -- During test unit worked normal.
USB 0-1 USBx4	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS5	2,99	**IP** -- During test unit worked normal.
USB 10-11 J7	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS6	3,08	**IP** -- During test unit worked normal.
USB 2-3 USB&RJ45 L1	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	FS8	3,42	**IP** -- During test unit worked normal.
PCIe Graphic Card – Radeon 4350 Saphire						
DVI	Short +5Vcc Pin & GND Pin	254,4	< 1 Sec.	F1	0,3	**IP** -- During test unit worked normal.

Supplementary information:

Results Key:

IP = Internal protection operated (component indicated) **CT** = Constant temperatures were obtained **TW** = Transformer winding opened **CD** = Components damaged (damaged components indicated) **NB** = No indication of dielectric breakdown **YB** = Dielectric breakdown (time and location indicated) **NC** = Cheesecloth remained intact **YC** = Cheesecloth charred or flamed **NT** = Tissue paper remained intact **YT** = Tissue paper charred or flamed

The connected Indoor cables: Indoor cable ampacity is based on an assumed maximum allowable conductor temperature. The heat for cables installed indoors will flow from the conductor through the cable insulation (for inner conductor) and jacket to the cable surface where it is radiated away from the cable.