

Test protocol No.:

Client:

Name:

Street:

Place:

Contractor:

Name:

Street:

Place:

**Name of responsible inspector
(electrically skilled person, competent person)**

Order number:

Test object:

Inventory number:

Serial number:

Type:

Manufacturer:

Type:

Testing specification:

- ☐ Initial inspection
- ☐ Recurring inspection
- ☐ ProdSG
- ☐ Ordinance on Industrial Safety and Health
(BetrSichV)
- ☐ DIN VDE 0113-1 (DIN EN 60204-1)
- ☐ DIN VDE 0105-100
- ☐

Test devices used (according to DIN VDE 0413):

1. Device type / designation:

Inventory number:

Calibration certificate / calibrated until:

2. Device type / designation:

Inventory number:

Calibration certificate / calibrated until:

3. Device type / designation:

Inventory number:

Calibration certificate / calibrated until:

Inspection

- ☐ The equipment can withstand influences at the place of use
- ☐ Marking of connection points and any disconnect points are in order
- ☐ No visible damage identifiable
- ☐ Protective conductors are protected against loosening and corrosion
- ☐ Protection by insulation of all live parts generally present
- ☐ PE, L and N not confused
- ☐ Reserve cores routed to terminals or insulated at the ends
- ☐ Function of mechanical touching elements in order
- ☐ Required protection type respected
- ☐ Various voltage potentials: Insulation of the line / line laid separately
- ☐ Covering on the cable ducts in order
- ☐ Laying of conductor, cable and lines in order
- ☐ Sufficient connection space, cable clamp rail, mounting of cable shielding in order
- ☐ Line colours of main, control and power circuits in order
- ☐ Labelling of equipment, terminals, terminal strips in order
- ☐ Device installation, placement, conductor cross-sections correspond to documentation
- ☐ Overload protection elements (adjustment values) in order
- ☐ Documentation available and in order
- ☐ No double terminal assignment for PE (this is not permitted)
- ☐ PE wired to star point, no looping through the protective conductor
- ☐ Manufacturer instructions followed for double terminal assignment
- ☐ Motor circuit breaker / bi-metal correctly wired
- ☐ Contact protection according to VDE 0660-514 (formerly VDE 0106-100) in order

Supply line measurement

Supply line	Number of lines	<input type="text"/>	Cross-section [mm²]	<input type="text"/>
Overload protection element	Type	<input type="text"/>	I_n [A]	<input type="text"/>
Loop impedance (L - PE)	Z_s [Ω]	<input type="text"/>	I_k [A]	<input type="text"/>
Network internal resistance (L - N)	Z_i [Ω]	<input type="text"/>	I_k [A]	<input type="text"/>

☐ RCD Type A present



☐ RCD Type B present

Type A

Type B

Type

☐ RCD Type AC present (no longer permitted in Germany, must be changed)

☐ Selective RCD present (delayed up to 500 ms)

Rated differential current: $I_{\Delta N}$ [A] **Nominal current:**

Maximum permissible contact voltage: U_L [V] ≤ 25V ≤ 50V

Rated contact voltage U_B [V]

Trigger time with 1 * $I_{\Delta N}$ Pulse current t_a [ms] Direct current t_a [ms] (type B only)

Trigger current: Pulse current I_{Δ} [mA] Direct current I_{Δ} [mA] (type B only)

Protection by automatic shutdown

1. Checking of the consistency of the protective conductor system

Thresholds / requirements

Limit value generation in consideration of conductor material, cross-section and lengths. A measuring current of at least 0.2 A to approx. 10 A must be taken from a power supply of 24 V AC or DC. The inspection must be conducted between the PE terminal and various points which are part of the protective conductor system.

Line cross-section mm ²	Line resistance at 30° C	
	mΩ/m	Ω/m
0,5	37,7265	0,0377
0,75	25,1510	0,0252
1,0	18,8633	0,0189
1,5	12,5755	0,0126
2,5	7,5661	0,0076
4	4,7392	0,0047
6	3,1491	0,0032
10	1,8811	0,0019
16	1,1858	0,0012
25	0,7525	0,0008
35	0,5467	0,0006
50	0,4043	0,0004

Attention:

The specific resistance of copper changes by approx. +4% with a temperature difference of +10°C.

Protective conductor current measurement value [Ω]

Length of protective conductor line [m]

Cross-section of protective conductor [mm²]

Calculated threshold [Ω]

If multiple measurement results are obtained, the worst measurement value shall be noted here.

- ☐ The resistances of all protective conductor systems are in order (PE connection terminals of the external protective earthing system to all relevant points of the machine)
- ☐ A detailed list of all measurement values is provided in the annex.

2. Checking of the impedance of the fault loops and the suitability of the assigned overload protection device (measurement or calculation)

1. Determination of the fault loop impedance Z_S [Ω] (measurement or calculation)
2. Determination of current I_a [A], which triggers the automatic shutdown of the protection device within the required time.
3. Examination of whether the required minimum short circuit current (to maintain shutdown in the given time) is not fallen short of due to an excessively high fault loop impedance. The following condition fulfils this requirement: $Z_S \times I_a \leq U_0$ (U_0 = rated alternating voltage to earth)

- ☐ The fault loop impedance was calculated.
- ☐ The fault loop impedance was measured.
- ☐ The shutdown conditions have been maintained for all protection devices.
- ☐ A detailed list of all measurement values is provided in the annex.

Test of insulation resistance

Thresholds / requirements

Between the conductors of the main circuit and the protective conductor system at least 1 MΩ with a measurement voltage of 500 V DC. Lower values are permitted, such as on busbars or conductor line systems. However, the value may not be less than 50 kΩ. **Attention!** Disconnect overload protection devices before measuring or reduce the measurement voltage to below the response level of the device.

Lowest insulation resistance

R_{ISO} [MΩ]

- ☐ The insulation resistance of all main current circuits has been maintained.
- ☐ A detailed list of all measurement values is provided in the annex.

Voltage test (mostly only in initial inspection)

Threshold / requirements

Maximum test voltage: 1000 V or twice the value of the measurement voltage, whichever value is higher.

Measurements are taken between the conductors of the main circuit and the protective conductor system for approx. 1 second. There must not be any disruptive discharge. Components and devices which are not suitable for this test voltage, or which are being inspected according to their product standard, must be disconnected before measurement.

- ☐ The electrical apparatus must withstand the test voltage.
- ☐ A detailed list of all measurement values is provided in the annex.

Differential current measurement (as supporting measure)

Determination of protective conductor currents using a leakage current clamp (trigger in the μ ampere area) or permanently installed RCM systems (differential current relay) are not a substitute for inspections, but provide valuable indications on the "tightness" of the machine. Instead of the limit values, the values first found constitute the reference values.

Leakage current of first inspection $I_{Leak.}$ [mA]

Actual leakage current

$I_{Leak.}$ [mA]

Protection against residual voltage

Threshold / requirements

After switching the device power supply off on a fixed connection, the live parts must be discharged to 60 V or lower within 5 seconds (after 1 second when removing the plug).

- ☐ The discharge to ≤ 60 V is maintained in all live parts within 5 or 1 second(s).
- ☐ Live parts which are not discharged to ≤ 60 V within the required tie must be specially marked.

Functional test

- ☐ Emergency stop (action in an emergency) in order
- ☐ Locking mechanisms in order
- ☐ Pressure controller in order
- ☐ Main switch / mains switch in order
- ☐ Detection and alarm systems in order
- ☐ Clockwise rotating field for three-phase AC plugs in order
- ☐ PG/M screw connections complete, sealed and in order
- ☐ Protection devices, RCD(s) if any
- ☐ Measures against unintended starting available

Additional measures for loss prevention in control cabinet

It is rare for arc ignition and installation fires to be detected in advance by VDE inspections alone. The following may be causes of inadmissible heat in the control cabinet:

- Harmonic distortion (high currents and surges) caused by the increased use of non-linear components such as frequency converters, switching power supplies, etc.
- Higher load from the expansion, modification use of reserve space
- Loose terminal and bolted connections
- Use of compact switch devices in the most limited space
- Bad heat conduction from high IP protection rating
- Configuration errors (false calculation of the inner power dissipation / dimensioning of conductor cross-section)

Regular monitoring (measurement) of the heat inside the switchgear assembly, particularly following commissioning and after modifications / expansions using a thermal imaging camera or infra-red portable thermometer is recommended.

If required, harmonic currents, voltages, power etc. must be recorded in order to be able to determine the actual operating currents. True root mean square (TRMS) measurement instruments such as professional power analysers must then be used.

- ☐ The heat level in the switchgear assembly is regularly measured.
- ☐ A power analysis with regard to determining the actual operating currents has been carried out.
- ☐ There are defects, see separate report.

Comment:

Test result

- ☐ No defects were found.
- ☐ There are serious defects, which must be properly remedied immediately.
- ☐ There are notes / comments on minor defects.

Comments

Last inspection date:

Next inspection date:

Signatures:

Signature of the client

Signature of the Contractor

Place

Date

Signature of investigator