ELECTROTECHNICAL TESTING INSTITUTE
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No. of the Test Report: 802532-03/01

Issued:4.2.2009

TEST REPORT

Name of product:	**Surge voltage protector**
Type of product:	**ZS-1P**
Ratings:	**230 V / 50 Hz, Uc: 275 V/ 50 Hz, Up: < 1200 V, Uoc: 6 kV**
Serial number:	---
Manufacturer:	HAKEL spol. s r. o., Bratří Štefanů 980, 500 03 Hradec Králové, Slezské Předměstí, Czech Republic
Production site:	HAKEL spol. s r. o., Bratří Štefanů 980, 500 03 Hradec Králové, Slezské Předměstí, Czech Republic
EZÚ product coding system:	020499 – other
Ordering firm:	HAKEL spol. s r. o., Bratří Štefanů 980, 500 03 Hradec Králové, Slezské Předměstí, Czech Republic
Number of tested samples:	1
Samples submitted on:	17.6.2008
Location of testing:	EZÚ
Tested from	13.1.2009 **through** 4.2.2009
Other data:	Test report HAKEL spol.s r.o. No.08-0516, č.07-1101, ŠKODA VÝZKUM s.r.o No.VYZ-0757-0075-01A .
The product was tested according to:	EN 61643-11:02+A11:07 (ident.ČSN EN 61643-11:03+A11:07) cl.7.2,6.1.2,7.2.2,7.4,7.4.1,7.5.3,7.7.4,7.7.6,7.9.2,7.9.2.1, 7.9.3,7.9.3.1,7.9.3.2,7.9.4,7.9.5,7.9.5.2,7.9.5.2.1,7.9.6,7. 9.7,7.9.8.

The test results contained in this report refer to the tested items only. The values presented in this report were measured with the accuracy specified in the testing regulations. All measuring instruments used are properly traceable.
This Report shall not be reproduced except as a whole.

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Tested according to EN 61643-11:02+A11:07 (ident. ČSN EN 61643-11:03+A11:07).

The following tests were carried out:

Cl. 7.2 Identification and marking

Carried out in accordance with the requirements in Cl.6.1.1 and 6.1.2.

The manufacturer provided the following information:

a) Manufacturer's name or trade mark, type	*	Hakel, ZS-1P
b) Location category		inner
c) Number of electrodes		2
d) Method of installation		In-line distribution, floor boxes
e) Highest permanent operating voltage Uc and rated frequency	*	275 V AC/50 Hz
f) SPD type and discharge parameters	*	111 , T3 ; Uoc:6 kV
g) Rated discharge current In	*	---
h) Voltage protection level Up	*	< 1200 V
i) Rated load current IL		----
j) Protection degree IP (if IP > 20)	*	IP 20
k) Short-circuit withstand capability		----
l) Max. recommended level of overcurrent protection	*	----
m) Effect indication of the disconneter		----
n) Position when normally used, if significant		----
o) Marking of leads (if necessary)	*	----
p) Installation instructions		Stated in documentation
q) Type of current *	*	AC
r) Specific energy W/R (kJ/Ω)		---
s) Temperature limit*		-5°C to +40°C
t) Interrupt level of the follow-on current		----
u) Any requirements on external SPD disconnecter		----
v) Residual current (optional)		----
w) Temporary overvoltage characteristics		----

Passed

Cl. 6.1.2 Marking

*) marking is compulsory to be stated on the body of SPD or stuck to the body of SPD.

Marking is ineffaceable, tested in accordance with Cl. 7.2.2. with the passing result.

Passed

Cl. 7.2.2 Ineffaceability test of the marking

Tested by manual abrasion for the period of 15 sec with a piece of cotton cloth damped in water and subsequently for 15 sec with a piece of cotton cloth damped in petrol.
Marking remained legible after the test.

Passed

Cl. 7.3 Terminals and connections
Cl. 7.3.2 Screw terminals
Cl. 7.3.2.1 Screw, current part and connection reliability test
Cl. 7.3.2.2 Terminal reliability test for connection of external conductors

Surge voltage protector ZS-1P is equipped with Cu conductors of size 0.75 mm2 in diameter and approx. 21 cm long, colour blue, black and yellow-green.
Connection of the terminals can be judge only upon connection of the surge voltage protector with the to terminals.

Not evaluated

Cl. 7.4 Protection against direct contact test
Cl. 7.4.1 Insulated parts

Tested with a test finger in accordance with ČSN EN 60529:1993 .
When correctly assembled and built-in, the live parts with the exception of output conductors cannot be touched. With the protruding conductors the protection is IP00 (manufacturer states protection of IP20).

Passed

Cl. 7.4.2 Metal parts

Does not apply

Cl. 7.5.3 Test method for measuring of the arc-over voltage with voltage pulses 1.2/50.

Tested by the Test Record Hakel spol.s r.o. No. 08-0516 dated 16/05/2008.

Passed

Cl.7.7.4 – Failure test by temporary overvoltage (TOV)

Tested by the Test Record ŠKODA VÝZKUM s.r.o No. VYZ-0757-0075-01A dated 10/01/2008.

Passed

Cl. 7.7.6 Test of the characteristics of the temporary overvoltage TOV

Tested by the Test Report HAKEL spol. s r.o. No. 07-1101 dated 01/11/2007.

Passed

Cl. 7.9.2 Mechanical strength

- 7.9.2.1 Tested with beater in height 10 cm (taken as the built-in version). The total number of 5 impacts were applied.
After the test, there was no damage or breach of the desired protection degree.

Passed

Cl. Cl.7.9.3 Thermal resistance

-7.9.3.1 Tested in the heat box with temperature of (100 ± 2) °C.
No change to the sample after the test.

Passed

-7.9.3.2 A test with ball impression was carried out resulting in:

Tested part	Set temperature (°C)	Diameter of impression (mm)
insulation cover grey	75 ± 2	0.6
Printed circuit	125 ±2	0.5

Insulating parts (holder of the connecting bolt) are ceramic – not subject to test.

Prescribed max. 2 mm

Passed

Cl. 7.9.4 Resistance to abnormal heat and fire

Tested in accordance with ČSN EN 60695-2-11: 2001 with the following result:

Tested part	Loop temperature (°C)		Result
insulation cover grey	650 ± 10	melts, fumes, does not trickle, does not burn	Passed
Printed circuit	850 ± 15	fumes, glows, after removal glowing stops in 1 s	Passed

Passed

Cl. 7.9.5 Creepage distances and clearances check

-7.9.5.1 SPD for exterior use

Does not apply

-7.9.5.2 SPD for interior use

Check carried out according to the table 15 (up to 200-450 V)

-7.9.5.2.1 Test: Measuring

Clearances (mm):

Measured between	Prescribed	Measured
1Live parts of different polarity circuit)	3	3.12 (measured between L1-PE on the printed
2) live parts and -screws for fixation of the cover, which must be removed during installation of SPD	3	---
-attachment surfaces (note 2)	6 (3)	3 (measured between the outgoing sections on the printed circuit and the surface)
- with screws or other means of attachment of SPD (note 2)	6 (3)	---
-with bodies (note 1 and 2)	3	3,2 (measured between the membrane of the piezoelectric siren and the surface) 3 (measured between the outgoing sections on the printed circuit and the surface)
3) metal parts of the mechanism of the disconnecter and -bodies (note 1)	3	---
- screws or other means of attachment of SPD (note 1)	3	---

Passed

Creepage distances (mm):

Measured between	Prescribed	Measured
4)live parts of various polarity	3	3,12(measured between L1-PE on the printed circuit)
5)live parts and -screws and other means of attachment of the covers, which must be removed during the assembly of SSPD	3	---

-screws or other means of attachment of SPD (note 2)	6 (3)	3 (measured between the outgoing sections on the printed circuit and the surface)
-bodies (note 1)	3	3 (measured between the outgoing sections on the printed circuit and the surface)

Note 1: for definitions see Cl. 7.9.7.2.
Note 2: If the creepage distances and clearances between the live parts of the device and the metal shielding and the surface on which the SPD is attached are dependent only on the construction of SPD, they cannot be reduced in case the SPD is attached in the most favourable position (in the metal case), the values on lines 1 and 4 are satisfactory.

Passed

Cl. 7.9.6 Surface railway resistance

Manufacturer (ISOLA-GROUP) of the insulating material for the printed circuit guarantees resistance to sneak currents
CTI 175 – 250 V, material group IIIa (see written statement dated 04/02/2009).

Passed

Cl. 7.9.7 Insulating resistance

-7.9.7.1 The humidity test for the duration of 48 h was carried out
Relative humidity 95%.
Ambient temperature (22 ± 2)°C.

After the test, there were no changes preventing further use.

- 7.9.7.2 Measured with ss voltage of 500V after the humidity test and with the following configuration:

Measured between	Insulating resistance (M Ω)	Test voltage (kV)
all connected live parts and the SPD body accessible to the dangerous touch	5.10^3	2.2

Prescribed max. 5 MΩ

Passed

Cl. 7.9.8 Electrical strength

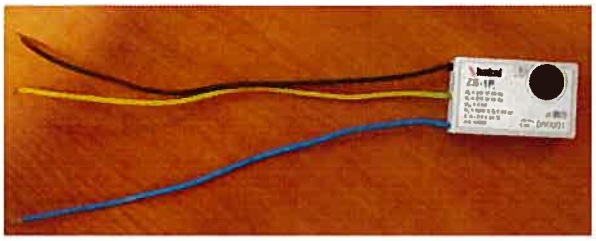
Tested in the same configuration as in Cl.7.9.7.2.
During the test no puncture or flashover occurred.

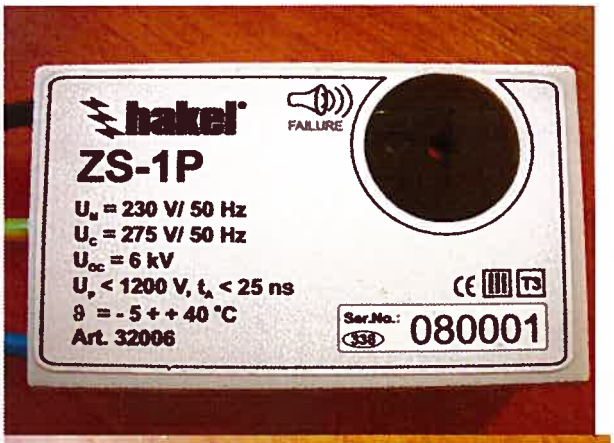
Passed

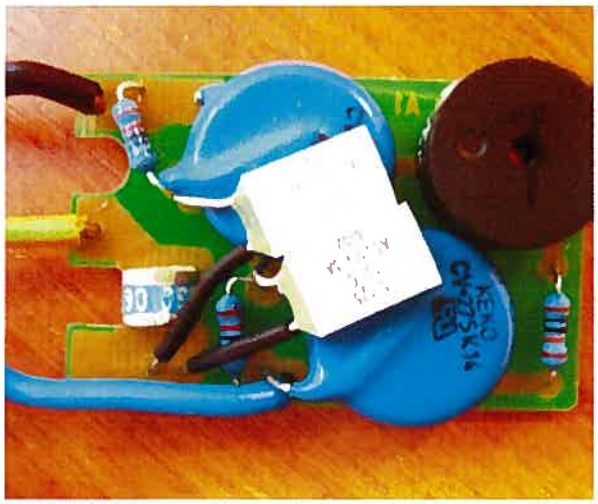
Cl. 7.9.9 Resistance to ingress of solid objects and harmful ingress of water

Designated for mounting of in-line distributions and floor boxes. The protection of the mechanism IP20 (see Cl.7.4.1) with the protruding conductors IP00 – it can be evaluated after building the surge voltage protector in the distribution or the box.

Not evaluated







Apparatus used:

Slide gauge	No.DHM 20264
Test beater	No.DKP 3317
Power supply vn WIP 6	ZP 76-3921
PPU 311	DKP 16980
Digital stopwatch DS 35	DKP 16300
Thermistor thermometer	DHM 20233

Tested by: J.Klípa 04th February 2009.