



ELECTROTECHNICAL TESTING INSTITUTE
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No. of the Test Report: 802532-06/01

Issued:4.2.2009



TEST REPORT

Name of product: Overvoltage protection
Type of product: Series P-k16
Ratings: DC 12 , 24, 48, 110 V; AC 230 V/ 50 Hz; 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: 5
Samples submitted on: 17.6.2008
Location of testing: EZÚ
Tested from 20.10.2008 through 4.2.2009
Other data: ---
The product was tested according to: EN 61643-11:02+A11:07
(ident. ČSN EN 61643-11:03+A11:07)
cl 6, 6.1.1, 6.1.2, 7.2.2, 7.3, 7.3.2, 7.4, 7.4.1, 7.5,
7.5.4, 7.5.3, 7.9.2, 7.9.3, 7.9.4, 7.9.5, 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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Order from 27th June 2008
 Samples supplied on 17th June 2008
 Contract signed on 07th August 2008

Subject of certification:

**Overvoltage protection PK 16 series, rated values P-k16/12DC; P-k16/24DC;
 P-k16/48DC; P-k16/110DC; P-k16/230AC 50 (60) Hz, Uoc=6kV, IP 20**

Supplied by the manufacturer:

1. 5 pcs of samples
2. Test Report Hakel No.08-0423 z 23.04.2008 pro PK2; P-k16/12,24,48,110 DC; P-k16/230 AC. Tested according to ČSN EN 61643-11:03+A11:07 – tested Uoc=6kV (1,2/50 and Uoc=10 kV (1,2/50) with passing result.
3. Technical list for the insulating compound – SLOVAMID 6 GF 25 FRA 5 by PLASTCOM spol. s r.o., Hattalova 4, 831 03 Bratislava.
4. Test Record No.01-1030 dated 31st August.2001- type of test - measuring Up at 0,1; 0,2; 0,5; 1,0 and 2 multiply In (5kA) RG 550 combined mode with the passing result.
5. The product is provided with a catalogue sheet with the wiring diagram, technical data, component specification card.
6. Drawing documentation – drawings of outer casing (including inner construction parts) and wiring drawing (including el. specification card).

Tested according to:

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

Cl.6 Requirements

6.1.1 Identification

Manufacturer must provide the following minimal amount of information:

Manufacturer provided the following information:

- | | | |
|----|---|---|
| a) | Manufacturer's name or trade mark, type * | HAKEL logo and type P-k16/12, 24, 48, 110DC and P-k16/230AC |
| b) | Location category | inner |
| c) | number of electrodes | 2 |
| d) | Method of assembly | solid |
| e) | Highest permanent operating voltage Uc * | AC 275 V |
| f) | SPD type* | type 3, Uoc=6Kv |
| g) | Rated discharge current In for SPD type 1 and 2* | type 3 (T 3) |
| h) | Voltage level Up* | - <120 V, 160 V, 230 V, 440 V and <1 kV |
| i) | Rated load current IL | Not required |
| j) | Protection degree IP * | IP 20 |
| k) | Short-circuit withstand capability | - -- |
| l) | Max. recommended level of overcurrent protection *In=6 kA(L/N, L/PE), | |

		10 kA (N/PE)
m)	Effect indication of the disconnecter	optical
n)	Position when normally used, if significant	on bar DIN 35 mm
o)	Marking of leads * (type P-k16/230VAC)	L, N, PE
p)	Installation instructions	Supplied instructions manual
q)	Type of current *	AC
r)	Specific energy W/R	--
s)	Temperature limit* (Stated on the product)	-40 - +55°C
t)	Interrupt level of the follow-on current	--
u)	Any requirements on external disconnecter no	--
v)	Residual current	--
w)	Temporary overvoltage characteristics	--
x)	Total discharge current I_{total}	--
	Other markings	CE,

Passed

Label provided on the product:







Passed

CI.6.1.2 Marking

Marking point a), e), g), h), j), l), o), and q) are required on the body or permanently attached to the body of SPD.

Marking must be ineffaceable and legible and cannot be placed over screws and removable components.

Findings:

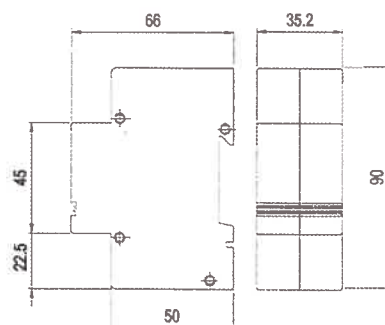
Information marked * are stated on the body of the instrument and marking is legible.

Other data is stated in the technical documentation:

P- k16/* DC



P- k16/230 AC

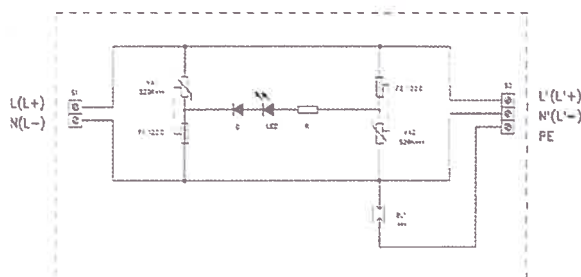


P- k16

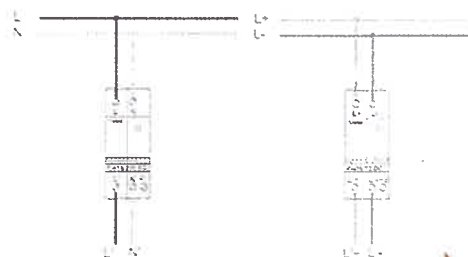
Typová řada svodičů P- k16 je určena k ochraně citlivých elektronických zařízení v rozvodech stejnosměrných nebo střídavých sítí nn před pulzním přepětím. Svodiče jsou konstruovány pro jmenovitý proud 16 A a jsou usazeny pro montáž na lištu DIN 35 mm. Splňují požadavky naorem IEC 616 43-1 a EN 616 43-11. kladené na svodiče přepětí pro třídu III – 3. stupeň ochrany. Správná funkce zabudovaných ochranných prvků MOV varistorů je signalizována zelenou kontrolkou na předním panelu přístroje.

Typ	P-k16/12DC	P-k16/24DC	P-k16/48DC	P-k16/110DC	P-k16/230AC
Třída svodiče podle IEC 61643-1 a ČSN EN 61643-11			III T3		
Použití pro síť			DC		TNS
Jmenovité pracovní napětí	U_n 12V=	24V=	48V=	110V=	230V 50Hz
Maximální trvalé pracovní napětí	U_c 20V=	36V=	80V=	170V=	275V/50Hz
Jmenovitý proud	I_n		16A		
Maximální svodový proud $I_{pr max}$ (8/20)		4kA	13kA		16kA
Kombinovaný impulz	U_{oc}		6kV (L+ / L-, PE) 10kV (L- / PE)		6kV (L / N, PE) 10kV (N / PE)
Napětová ochranná úroveň při U_{oc}	U_p <120V (L+ / L-)	<160V (L+ / L-) <660V (L / PE)	<230V (L+ / L-)	<440V (L+ / L-) <800V (L / PE)	<1000V (L, N) <1000V (L, N / PE)
Doba odezvy	t_d		<25ns (L+ / L-) <100ns (L, N / PE)		<25ns (L / N) <100ns (L, N / PE)
Doporučené předjstění			16 A		
TOV výraznost	U_r	-	-	-	335V/5s (L/N) 1200V= U_c /200ms (L/PE)
Doporučený průřez připojovaných			max. 4mm ² Cu		
Stupeň krytí			IP 20		
Materiál pouzdra			Polyamid PA6		
Způsob montáže			na lištu DIN 35mm		
Životnost			min. 100.000h		
Pracovní teplota	θ		-40 až +80°C		
Hmotnost	m		90g		
Katalogové číslo	30 001	30 002	30 014	30 012	30 008

Vnitřní schéma zapojení P- k16



Doporučené zapojení P- k16



Passed

Cl.7.2.2 Ineffaceability of the marking test

Marking in form of self-adhesive label and is ineffaceable.
Information is legible.

Passed

Cl.7.3. Terminals

7.3.1 According to the manufacturer, terminals allow maximum size of conductor 2.5 mm².
A test of conductor connection was carried out according to tab.4=1-2,5 mm².
Terminals are possible to be connected with conductors of size 1-2,5 mm².

Passed

7.3.2 Screw terminals**7.3.2.1**

A reliability test of screws, current-carrying parts and connections.
Screws of the terminals were tightened 5 times with torque 0.5 Nm according to tab.5:
Screws were did not unfasten themselves and no damage to terminal or cover occurred.

Passed

Cl.7.4 Protection against direct contact test**Cl. 7.4.1 Insulation parts**

Tested with a test finger in accordance with ČSN EN 60529:1993 .
It was not possible to touch the live parts during the test.

Passed

Cl.7.5 Defining of the measured terminating voltage

According to tab.10 – a defining of the measured terminating voltage for class to III is done through test 7.5.4.

Cl.7.5.4 Test method for measuring arc-over voltage with combined pulse

Test Record No. 01-1030 dated 31/10/2001 was supplied by the test lab No. 1314 of HAKEL spol.s r.o. with the passing result.

Passed

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

Test Record No. 08-0423 dated 23/04/2008 was supplied by the test lab HAKEL spol. s r.o. with the passing result.

Passed

Cl.7.9.2 Mechanical strength

- 7.9.2.1 Tested with a beater from the height of 200 mm in accordance with tab.13. Total number of 4 strokes were applied.

After the test, there was no damage or breach of the desired protection degree.

Passed

Cl.7.9.4 Thermal resistance

-7.9.3.1 Tested in the heating box with temperature (100 ± 2) °C for the period of 1 hour.

After the test (during the test) no deformations occurred; it was not possible to touch the live parts.

Passed

7.9.3.2 Tested with a ball-pointed tool which impresses the tested part with the force of 20 N for the period of 1 hour at temperature of $125^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

Measured Ø impression

Grey material of the cover	1.1 mm
Green material of the terminal board	1.34 mm
Diameter of the impression cannot be smaller than	2 mm.

Passed

Cl.7.9.4 – Resistance to abnormal heat and fire

Tested in accordance with ČSN EN 60695-2-11:01 – temperature of the glow-wire $850 \pm 15^{\circ}\text{C}$.

Result:

Grey material carrying the terminals and the green material of the terminal board burns upon touching of the glow-wire, trickles but does not ignite the tissue paper and after removal of the glow-wire burning immediately stops.

Passed

Cl.7.9.5 Creepage distances and clearances test

Creepage distances and clearances for the SPD type P-k16/230AC – inner category – were tested according to the table.15:

[mm]

Creepage distances:		measured
1between live parts of different polarity	3	>4
2between live parts and body	3	>5

Clearances:

4between live parts of different polarity	3	>4
5between live parts and body	3	>5

Passed

Cl.7.9.6 Surface railway resistance

The used insulation material SLOVAMID 6 GF 25 FRA 5 which has some specific characteristics in the natural version:

Sneak currents CTI, A: >225 V (see the technical sheet provided by PLASTCOM spol.s r.o., Hattalova 4, 831 03 Bratislava).

In accordance with IEC 60112, the result A with the test voltage of 175 V.

Passed

Cl.7.9.7 Insulating resistance

-7.9.1 The sample was put in the humidity chamber with humidity of RV 91-95 %. The test samples were left in the humidity chamber for 48 hours.

-7.9.2 Once extracted the product from the humidity chamber, after 30-60 minutes, the insulating resistance was measured for the period of 60 seconds at DC 500 V.

Measuring of SPD P-k16/230AC was carried out:

- a) Between all interconnected live parts and the SPD body accessible to random touch.

Insulating resistance measured was > 1000 MΩ

Insulating resistance cannot be smaller than 5 MΩ.

Passed

Cl.7.9.8 Dielectric strength

SPD, category inner, was tested as stated in 7.9.7.2 a).

SPD type P-k16/230AC was tested with alternating voltage according to tab.16 Uc up to 450 V = alternating voltage 2.2 kV applied for 1 minute. During the test no puncture or flashover occurred.

Passed

Apparatus used:

Humidity chamber	ZP 76 - 3970
Hygrometer	DKP 16 667
PU 311	DKP 16 979
El. strength WIP 6	ZP 76 - 3921
Thermistor thermometer	DHM 20 233
Torque screwdriver	N 700900-N 700903
Test finger	DHM 21 365, DHM 21 371
Test beater	DKP 3317
Glow-wire	ZP 82 - 4477
Electronic stop-watch	DKP 10 122
Heating box	ZP 76 - 3902, ZP 84 - 4628
Electronic slide gauge	DHM 551392







Alena Rezková

Tested by: Rezková Alena

Date: 4th February 2009