TEST REPORT

EN 60998-2-1:2004 and IEC 60998-2-1:2002

Connecting devices for low voltage circuits for household and similar purposes Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units

Report Reference No.	97995-594558
Tested by (name + signature)	Jean-Baptiste PASSIEUX
Witnessed by (name + signature)	/
Supervised by (name + signature)	/
Approved by (name + signature)	Michel BAILLEUL
Date of issue	22 March 2010
Number of pages	11

LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES
S.A.S au capital de 15 745 984 €
RCS Nanterre B 408 163 174
33 avenue du General Leclerc
F-92260 FONTENAY-AUX ROSES

CB Testing laboratory name	**Laboratoire Central des Industries Electriques**
Address	**33 av du Général Leclerc**
Testing location/ procedure	CBTL ☒ TMP ☐ WMT ☐ SMT ☐
Testing location/ address	

Applicant's name	**LEGRAND**
Address	**128 avenue du MI de Lattre de Tassigny F87000 Limoges**

Test specification:

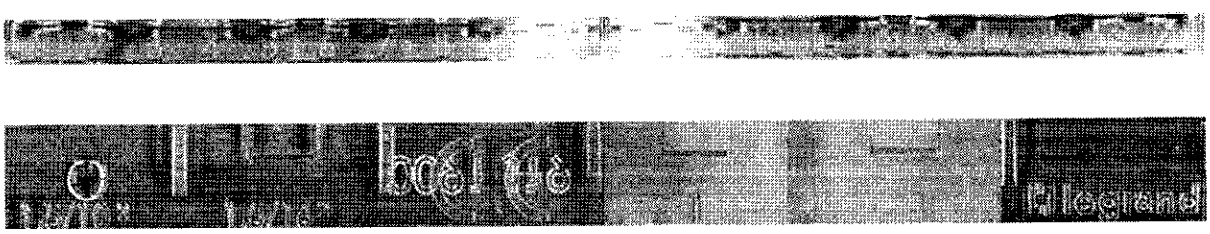
Standard	☒ IEC 60 998-2-1:2002 (see also IEC 60 998-1:2002)
	☐ EN 60 998-2-1:2004 (see also EN 60 998-1:2004)
Test procedure	☐ CCA
	☐ CB
Non-standard test method	N/A

Test Report Form No	IECEN60998_2_1A
TRF originator	KEMA
Master TRF	2004-07

Procedure deviation	
Type of test object	**Connecting devices**
Trademark	**LEGRAND**
Model/type reference	**4 61VF600**
Manufacturer	**LEGRAND**
Rating	**1,5/10² ; 1,5/16² ; 400V ; 40°C**

Test item particulars:	
Number of terminals	☐ single ☒ multiway
Function	☐ junction ☒ tapping ☐ junction and tapping
Protection against electric shock	☐ with ☒ without
Means of fixing	☒ with ☐ without
IP number	IP 00
Ambient temperature	☒ without T marking ☐ with T marking (°C):
Type of terminals, screw-type	☒ pillar ☐ saddle
	☐ screw ☐ mantle
	☐ stud ☐ unprepared
Rated connecting capacity (mm²)	☐ 0,5 mm² ☐ 0,75 mm² ☐ 1 mm² ☒ 1,5 mm²
	☒ 2,5 mm² ☒ 4 mm² ☒ 6 mm² ☒ 10 mm²
	☒ 16 mm² ☐ 25 mm² ☐ 35 mm²
Type of connector	☒ rigid ☒ flexible
Rated voltage (V a.c. / V d.c.)	☒ AC ☐ DC

Copy of marking plate and summary of test results (information/comments):



Informations

reference of product	0461VF600
reference catalogue	601290

Nomenclature			
Description	Quantity	Material	Review
Transparent support	1	PC	
Bar 1 8 holes	1	brass	4 hole diameter 4.5 4 hole diameter 5.5
Screw diameter 4mm	4	galvanized steel	
Screw diameter 5mm	4	galvanized steel	

Summary of testing:

Full tests

Possible test case verdicts:

- test case does not apply to the test object ..... : **N(.A.)**
- test object does meet the requirement..... : **P(ass)**
- test object does not meet the requirement..... : **F(ail)**

Testing ..... :

Date of receipt of test item..... : 12/02/2010

Date (s) of performance of tests..... : February – March 2010

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.

Throughout this report a ☒ comma or ☐ point is used as the decimal separator.

EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
8	**MARKING**		
8.1	On main part:		
	a) rated connecting capacity (mm²) ..... :		P
	b) rated insulation voltage (V)..... :		P
	c) T marking (°C) (if > 40 °C or < -5 °C)..... :		N/A
	d) type reference..... :		P
	e) manufacturer's or responsible vendor's name, trademark or identification mark..... :		P
	f) IP if > IP20 ..... :		N/A
	Type of acceptable conductor "r" or "f"		N/A
	Small devices: only d) and e) indicated on device		N/A
	All marks visible on smallest package unit		N/A
8.2	Multiway terminal devices: at least two adjacent		N/A
8.4	Marking: durable and easily legible; 15 s water; 15 s hexane		P
9	**PROTECTION AGAINST ELECTRIC SHOCK**		
	Live parts not accessible		N/A
10	**CONNECTION OF CONDUCTORS**		
10.1	Connecting devices allow correct connection of conductors		P
10.101	Terminals accept two or more conductors and		P
	accept rigid and/or flexible unprepared conductors		P
10.102	Each terminal accepts conductors (table 101) and provides the connection of at least two successive smaller cross-sectional areas:		P
	Rated connecting capacity (mm²)..... :	1,5-10 / 1,5-16	
	Suitable for connecting cross-sectional areas (mm²) ..... :	1,5-10 / 1,5-16	P
10.103	Terminals accept rigid and flexible conductors (table 101), unless otherwise specified (see 8.1)		P
	Smallest diameter (mm); largest diameter (mm) .... :	1,5 – 4,2 / 1,5 – 5,3	
	Tightened and loosened 5 times; torque (Nm); table number ..... :	1,2 / 2; III	
	During the test: terminals show no damage		P

EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
10.104	Terminals clamp the conductor without undue damage:		
	Smallest cross-sectional area (mm²); height H (mm); mass (kg) ..... :	1,5 ; 260 ; 0,4	
	Largest cross-sectional area (mm²); height H (mm); mass (kg) ..... :	10 ; 280 ; 2 16 ; 300 ; 2,9	
	Torque: as 10.103; during the test: the conductor does not slip out, no break near clamping unit and no damage	1,2 / 2	P
10.105	Pull test:		
	- min. cross-sectional area (mm²); pull (N) ..... :	1,5 ; 40	
	- max. cross-sectional area (mm²); pull (N) ..... :	10 ; 90 / 16 ; 100	
	- torque (Nm) (table 102) ..... :	1,2 / 2	
	- during the test the conductor does not come out		P
10.106	Rigid conductor: rated cross-sectional area (mm²) .:	10	
	Flexible conductor: rated cross-sectional area (mm²) ..... :	6	
	Torque: as 10.103; after the test no wire of the conductor escaped	1,2 / 2	P

11	**CONSTRUCTION**		
11.2	Clamping units clamp conductors reliably and between metal surfaces		P
11.3	Connecting devices: insulation of conductors not in contact with live parts of different polarity		P
11.4	Insulating lining: adequate mechanical strength and secured in a reliable manner		P
11.5	Current-carrying parts: adequate mechanical strength, electrical conductivity and resistance to corrosion; type of metal ..... :		P
	Current-carrying parts not made with electroplated coating if subjected to mechanical wear		P
11.6	Terminals: possible to connect number of conductors as specified by the manufacturer:		P
	- number of conductors ..... :	1	
	- rigid, cross-sectional area (mm²) ..... :	10 / 16	
	- flexible, cross-sectional area (mm²) ..... :	6 / 10	
11.7	Fixing means of bases do not serve any other purpose		P

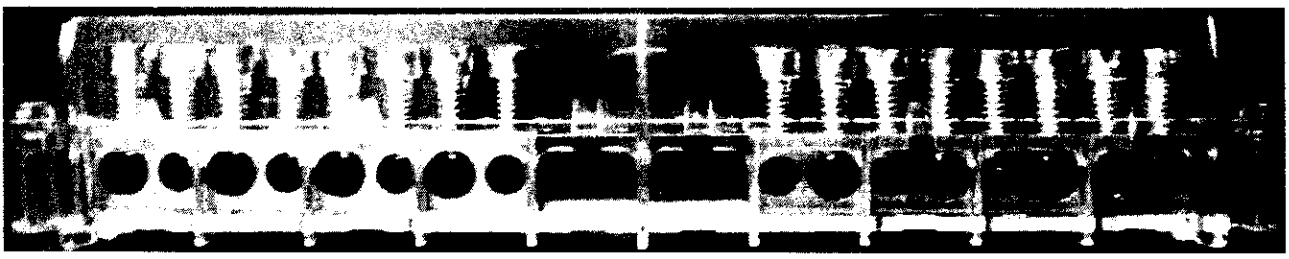
EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
11.101	Screws and nuts of earthing terminals adequately locked against accidental loosening		P
	Not possible to loosen without a tool		P
11.102	Screws and nuts do not serve to fix any other component, and		P
	are not of metal which is soft, such as zinc or aluminium		P
11.103	Rigid wire or wire of flexible conductor cannot slip out		P
11.104	Terminals permit insertion of largest conductor:		P
	- rigid conductors: cross-sectional area (mm²); max. diameter (mm).....:	10 ; 4,2 16 ; 5,3	P
	- flexible conductors: cross-sectional area (mm²); max. diameter (mm).....:	6 ; 2,9 10 ; 3,9	P
12	**RESISTANCE TO AGEING, TO HUMIDITY CONDITIONS, TO INGRESS OF SOLID OBJECTS AND TO HARMFUL INGRESS OF WATER**		
12.1	Connecting devices resistant to ageing; after the test (168 h): no cracks visible, not sticky or greasy, no damage; test temperature (°C).....:	☒ 70 °C ☐ T + 30 °C =	P
12.2	After humidity test (91-95%): no damage; test duration (168 h for connecting devices > IPx2, 48 h for all other).....:	☐ 168 h ☒ 48 h	
12.3	IP test (IEC 529).....:	IP00	NA
	After the test, electric strength test as 13.4, and	IPx	NA
	no appreciable entry of water		NA
13	**INSULATION RESISTANCE AND ELECTRIC STRENGTH**		
13.3	Clamping unit connected with: smallest cross-sectional area (mm²); largest cross-sectional area (mm²).....:		
	Insulation resistance (500 V d.c. for 1 min):		
	1) between all clamping units connected together and the body > 5 MΩ.....:		P
	2) between each clamping unit and all others connected to the body > 5 MΩ.....:		P
	3) between metal foil and the body > 5 MΩ.....:		NA

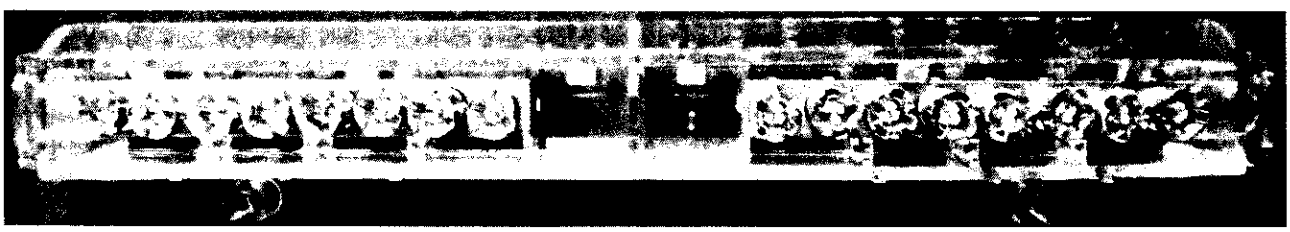
EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
	3a) if necessary, between live parts and metal covers and enclosures > 5 MΩ ....:		NA
	3b) if necessary, between live parts and surface on which the base is mounted > 5 MΩ ....:		NA
13.4	Electric strength (a.c. for 1 min): no flashover or breakdown:		
	1) test voltage (V) ....:	2500	P
	2) test voltage (V) ....:	2500	P
	3) test voltage (V) ....:		NA
	3a) test voltage (V) ....:		NA
	3b) test voltage (V) ....:		NA
14	**MECHANICAL STRENGTH**		
14.2	Tumbling barrel (for < 50 g): 50 falls; after the test no damage		NA
14.3	Impact test (for > 50 g): 10 blows:		
	- height of fall: 7,5 cm		P
	- height of fall: 10 cm		NA
	- height of fall: 20 cm		NA
	- height of fall: 25 cm		NA
	After the test, no damage and live parts shall not become accessible		P
15	**TEMPERATURE RISE**		
	Terminal....:	☐ single ☒ multiway	
	T marking (°C)....:	☐ Yes (°C):	NA
	Largest cross-sectional area (mm²)....:	10 / 16	
	Conductors ....:	rigid	P
	Torque (Nm); table number....:	1,2 / 2 ; III	
	Rated connecting capacity (mm²)....:	10 / 16	
	Test current (A)....:	57 / 76	
	Temperature rise does not exceed 45 K (1)....:	≤ 24 (57A)	P
	Temperature rise does not exceed 45 K (2)....:	≤ 24 (76A)	P
	Temperature rise does not exceed 45 K (3)....:		N/A

EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
16	**RESISTANCE TO HEAT**		
16.2	Heating cabinet: no damage, after the test, markings still legible; test temperature (°C)	☒ 85 °C ☐ T + 45 °C =	P
16.3	Ball-pressure test (125 °C) for parts necessary to retain current-carrying parts in position		P
	Ball-pressure test for parts not necessary to retain current-carrying parts in position; test temperature (°C).....	☐ 70 °C ☐ 40 + ...	N/A
	Diameter of impression not exceeding 2 mm.....:	< 2 mm	P
17	**CREEPAGE DISTANCES, CLEARANCES AND DISTANCES THROUGH SEALING COMPOUND**		
	Creepage distances (mm) and clearances (mm) between live parts of different polarity.....:	> 8 ; > 8	
	idem, requirement (mm).....:	≥ 4 ; ≥ 4	P
	Creepage distances (mm) and clearances (mm) between live parts and metal covers and enclosures .....:		
	idem, requirement (mm).....:		N/A
	Creepage distances (mm) and clearances (mm) between live parts and surface on which the base is mounted .....:	> 8 ; > 8	
	idem, requirement (mm).....:	≥ 4 ; ≥ 4	P
	Distances (mm) through sealing compound between live parts and surface on which the base is mounted .....:		
	idem, requirement (mm).....:		N/A
18	**RESISTANCE OF INSULATING MATERIAL TO ABNORMAL HEAT AND FIRE**		
	Glow-wire test (850 °C) for parts necessary to retain current-carrying parts in position		P
	Glow-wire test (650 °C) for parts not necessary to retain current-carrying parts in position		N/A
	No visible flames and no sustained glowing, or if flame and glowing, extinguish within 30 s.....:		P
	No ignition of the tissue paper or scorching of the board		P

EN 60 998-2-1:2004 and IEC 60 998-2-1:2002			
Cl.	Requirement - Test	Result - Remark	Verdict
19	**RESISTANCE OF INSULATING MATERIAL TO TRACKING**		
	50 drops, 175 V, solution A (IEC 112): no flashover	Creepage distances > 2 x 4mm Installation in distribution board	N/A

Re





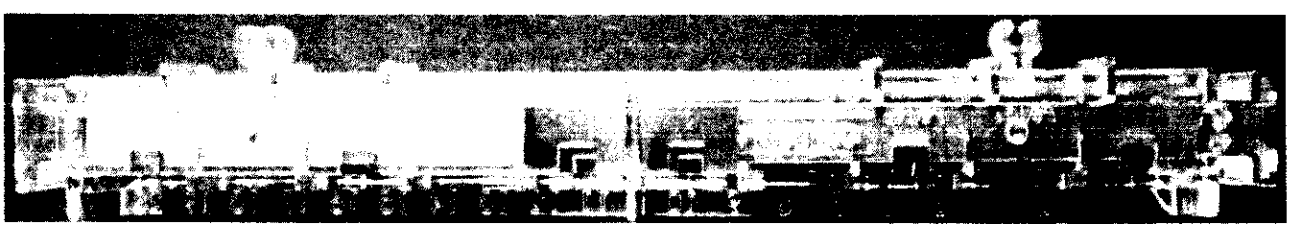


PHOTO OF TEST SAMPLE(S)

Re

MAXIMUM UNCERTAINTIES CHART
ANNEX N°1

This chart shows the maximum uncertainty values according to test that may be related in this document

Test	**Measurement uncertainty (k = 2)**
Insulation resistance measurement	± 6 %
Dielectric strength verification	± 4.5 %
Temperature rise test	± 3.5 K
Temperature measurement (with thermocouple)	± 2.8 °C
Ball-pressure test – impression measurement	- 0 mm + 0.25 mm
Clearance and creepage distances and other dimensional measurements performed with a calliper rule	± 0.13 mm
Time measurement performed with an oscilloscope	± 3.5 %
Power dissipation measurement	± 3.3 %
Crushing of pins of plugs and portable socket-outlets	± 0.02 mm
Impulse withstand voltage 1.2/50 (voltage amplitude)	± 4 %
Residual voltage verification with nominal discharge current	± 4 %
Resistance measurement	± 2 %
Power measurement	± 2.1 %
Current measurement	± 2.1 %
Voltage measurement	± 2.1 %
Leakage current measurement	± 2 %
Time or time interval • Range from 1s to 9 min • Range > 9 min	 ± 0.3 s ± 0.1 %
Humidity measurement (hygroscopic treatment, conditioning) • 50 % RH to 90 % RH • > 90 % RH	 ± 3% RH ± 4% RH
Force measurement (dynamometer) for mechanical strength test, pull test, test probe entry	± 2,5 %
Mass measurement (weight) • 0 g to 5 kg (0 N to 49.05 N) • 5 kg to 9 kg (49.05 N to 88.29 N) • 9 kg to 50 kg (88.29 N to 490.5 N)	 ± 0.2% ± 3 g (± 0.03 N) ± 14 g (± 0.14 N)
Earth resistance measurement	± 2 %
Dimensional measurement performed with a rule	± 0.7mm
Needle flame test – Flame height	± 1.8 mm
Comparative tracking index measurement	± 25 V

k = coverage factor

APP_INSTALL_E_V2