

Prüfbericht-Nr.: <i>Test Report No.:</i>	28108160 001	Auftrags-Nr.: <i>Order No.:</i>	8738814	Seite 1 von 12 <i>Page 1 of 12</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	8704834	Auftragsdatum: <i>Order date:</i>	26-02-2015		
Auftraggeber: <i>Client:</i>	Fronius International GmbH Gunter Fronius Strasse, 1 _ 4600 Wels-Thalheim _ Austria				
Prüfgegenstand: <i>Test item:</i>	Photovoltaic grid tied Inverter				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Fronius Primo serie				
Auftrags-Inhalt: <i>Order content:</i>	Type Test				
Prüfgrundlage: <i>Test specification:</i>	DC-Injection NOTA DE INTERPRETACIÓN TECNICA DE LA EQUIVALENCIA DE LA SEPARACIÓN GALVÁNICA DE LA CONEXIÓN DE INSTALACIONES GENERADORAS EN BAJA TENSIÓN				
Wareneingangsdatum: <i>Date of receipt:</i>	09-03-2015				
Prüfmuster-Nr.: <i>Test sample No.:</i>	Sample No.1				
Prüfzeitraum: <i>Testing period:</i>	-				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland Italia S.r.l.				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Italia S.r.l.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:	kontrolliert von / reviewed by:				
27/07/2015 Pierangelo Lobbia/PM	28/07/2015 Marco Piva / BFM				
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster nicht vollständig oder beschädigt <i>Test item complete and undamaged</i>		
<p>* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet</p> <p>Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</p>					
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i></p>					

v04

Test item particulars	-
Type of item tested.....	Solar PV Grid Tied inverter
Description of equipment function	Item converts the DC power coming from a DC source into an AC power to be connected to the grid.
Installation/overvoltage category	AC side: OVC III ; PV input: OVC II
Pollution degree	PD3 outside, PD2 inside the enclosure.
Environmental rating	Outdoor / Indoor.
Equipment mobility.....	Stationary.
Connection to mains supply.....	Permanent connection.
Operating conditions	1~NPE 220 / 230 output current (A)= 35,7 A 50 Hz
Overall size of the equipment (W*H*D)	428 x 628 x 205 mm
Mass of the equipment	21,6 kg
Marked degree of protection to IEC 60529.....	IP65
Accessories and detachable parts included in the evaluation.....	-
Options.....	N/A
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	09/03/2015
Date (s) of performance of tests	27/07/2015
General remarks:	
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
The test results presented in this report relate only to the items tested.	
"(see remark #)" refers to a remark appended to the report.	
"(see annex #)" refers to an annex appended to the report.	
"(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 point is used as the decimal separator.	

Product Description

Inverter type Fronius Primo serie (50 Hz, 230 V) is a single-phase solar inverter. It is responsible for converting the direct current generated by photovoltaic panels into single-phase alternative current for feeding into the electrical power distribution grid.

The inverter only operates when it is connected to the electrical power distribution line and cannot operate as a stand-alone unit or in case of AC grid distribution.

The inverter contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power electronics components are mounted on the heat sink but through an isolation sheet. The heat sink is placed in front side outside of the enclosure with electronic components. LCD panel and 3 indicator LED lights on the front panel provide information on the operational status of the inverter. A LED "Power" is lights when inverter is working , a LED indicates "Fault" conditions and a LED indicates "GFI" (Ground fault indicator) conditions. There are also 4 push buttons to navigate through the display panel information. There are communication socket for connecting external Data communication equipment.

When connections to the DC source and to the Grid are through terminal blocks or Photovoltaic connectors both, DC input and Grid, have to be protected by a mechanical switch or circuit breaker.

Models of the same family:

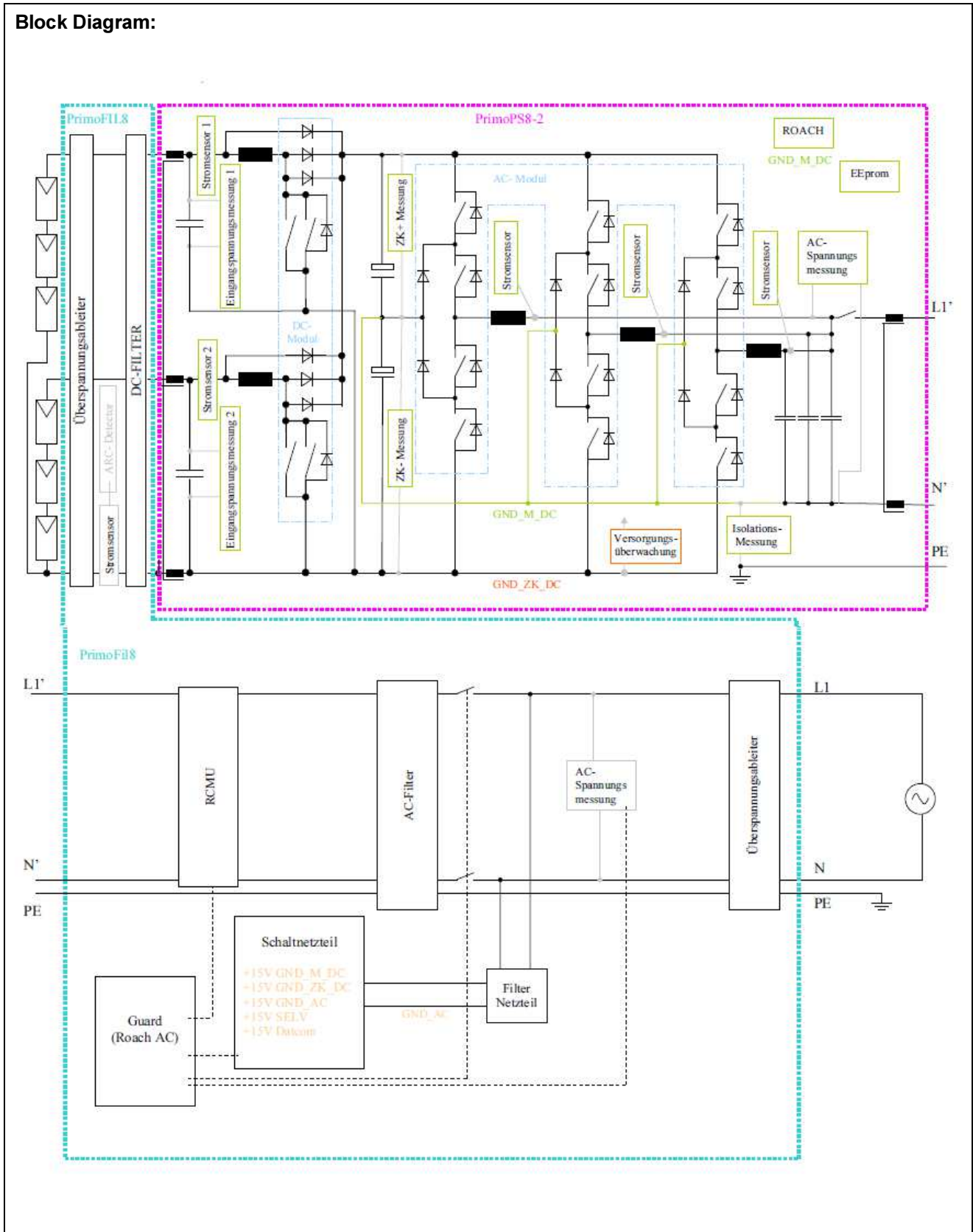
Table A:				
Model	Rated Output Voltage (V)	Rated Output Current (A)	Maximum apparent power (VA):	Nominal active power (W) @ cosφ 0,9
Fronius Primo 8.2-1	230 Vac	35,7	8200	7380
Fronius Primo 6.0-1	230 Vac	26,1	6000	5400
Fronius Primo 5.0-1	230 Vac	21,7	5000	4500
Fronius Primo 5.0-1 AUS	230 Vac	20,0	5000	4500
Fronius Primo 4.6-1	230 Vac	20,0	4600	4140
Fronius Primo 4.0-1	230 Vac	17,4	4000	3600
Fronius Primo 3.6-1	230 Vac	16,0	3680	3312
Fronius Primo 3.5-1	230 Vac	15,2	3500	3150
Fronius Primo 3.0-1	230 Vac	13,0	3000	2700

All models have the same release firmware version, electronic control boards. The only difference is related to the output power that is limited by a software parameter.







The differences between the models are described below.
(see next pages)

THECNICAL INFORMATION (tested model highlighted):







Model	Fronius Primo								
	8.2-1	6.0-1	5.0-1	5.0-1 AUS	4.6-1	4.0-1	3.6-1	3.5-1	3.0-1
DC input									
MPP voltage range (V)	270-800	240-800				210-800	200-800		
Max input Voltage (V)	1000 V								
Max input current MPPT1 / MPPT2	18	18	12	18	12	12	12	12	12
Max Short circuit current of the solar modules	54	54	36	54	36	36	36	36	36
AC output									
Nominal active power (W) @cosφ=0.9	7380	5400	4500	4500	4140	3600	3312	3150	2700
Nominal active power (W) @cosφ=1	8200	6000	5000	4600	4600	4000	3680	3500	3000
Maximum apparent power S_{max} (VA)	8200	6000	5000	5000	4600	4000	3680	3500	3000
Nominal grid Voltage (V)	1~NPE 220 / 230								
Max Grid Voltage (V)	270								
Rated output current (A)	35.7	26.1	21.7	20	20	17.4	16.0	15.2	13.0
Nominal Frequency Hz	50/60								
Power factor cos phi	0.85 – 1 inductive / capacitive								
Class of equipment	Class I								
Degree of protection	IP65								
Dimensions h x w x d	628 x 428 x 205 mm								
Weight	21,6 kg								
Permissible ambient temperature	- 40°C to +55°C								
EMC emission	Class B								
Overvoltage category DC / AC	II / III								
DC disconnect	integrated								

Block Diagram:








Copy of marking plate:
Fronius Primo 3.0-1

 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 13.6 A 13.0 A IAC max 13.7 A Smax 3000 VA
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					Pmax (cos φ=0.9) 2700 W cos φ 0.85-1 ind./cap. UDC mpp 200 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 12.0 A / 12.0 A Isc pv 36.0 A
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					







Fronius Primo 3.5-1

 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 15.9 A 15.2 A IAC max 16.0 A Smax 3500 VA
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					Pmax (cos φ=0.9) 3150 W cos φ 0.85-1 ind./cap. UDC mpp 200 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 12.0 A / 12.0 A Isc pv 36.0 A
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					







Fronius Primo 3.6-1

 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 16.7 A 16.0 A IAC max 16.8 A Smax 3680 VA
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					Pmax (cos φ=0.9) 3310 W cos φ 0.85-1 ind./cap. UDC mpp 200 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 12.0 A / 12.0 A Isc pv 36.0 A
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					

Fronius Primo 5.0-1

 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 22.7 A 21.7 A IAC max 22.9 A Smax 5000 VA Pmax (cos φ=0.9) 4500 W cos φ 0.85-1 ind./cap. UDC mpp 240 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 12.0 A / 12.0 A I _{sc} pv 36.0 A
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					

Fronius Primo 6.0-1

 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 27.3 A 26.1 A IAC max 27.5 A Smax 6000 VA Pmax (cos φ=0.9) 5400 W cos φ 0.85-1 ind./cap. UDC mpp 240 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 18.0 A / 18.0 A I _{sc} pv 54.0 A
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					

Fronius Primo 8.2-1







 www.fronius.com					UAC nom 220 V 230 V fAC nom 50 / 60 Hz Grid 1~NPE IAC nom 37.3 A 35.7 A IAC max 37.5 A Smax 8200 VA Pmax (cos φ=0.9) 7380 W cos φ 0.85-1 ind./cap. UDC mpp 270 - 800 V UDC max 1000 V IDC max +1 / IDC max +2 18.0 A / 18.0 A I _{sc} pv 54.0 A
Model No. _____ Part No. _____ Ser. No. _____					
WLAN / LAN / Webserver					
IEC62109-1/-2 / EN61000-3-2/-3 / EN61000-6-2/-3 / EN62233 CEI 0-21 VDE 0126-1-1 Safety Class 1 IP 65					

TABLE: DC-Injection					P
DC current limit (mA):		0,5% I _R = 178,5 mA			
Output power (Grid Nominal Voltage)			Measured DC Current		
Setting	Measured		Measured Value Phase A	Measured Value Phase B	Measured Value Phase C
	(VA)	(%)			
(30±5)%	2315	28,23	9 mA	--	--
(40±5)%	3153	38,45	11 mA	--	--
(50±5)%	3985	48,60	9 mA	--	--
(60±5)%	4675	57,01	15 mA	--	--
(70±5)%	5649	68,89	11 mA	--	--
(80±5)%	6351	77,45	13 mA	--	--
(90±5)%	7313	89,18	11 mA	--	--
(100±5)%	8241	100,50	10 mA	--	--

Supplementary information:

With reference to all other models, the max. DC current limit (**Idcmax**) is shown on below table:

Power [W]	V	I _n	Idcmax [mA]
8200	230	35.7	178,5
6000	230	26.1	130,5
5000	230	21.7	108,5
4600	230	20.0	100,0
4000	230	17.4	87,0
3600	230	15.7	78,5
3500	230	15.2	76,0
3000	230	13.0	65,0

TESTING INSTRUMENT LIST

		MANUFACTURER	MODEL	TÜV RHEINLAND ITALIA Ref.
X	Power Analyzer	YOKOGAWA	WT500	87020193
	Power Analyzer	YOKOGAWA	WT230	87010027
	Power Quality Analyzer (with 6 probes)	Chauvin Arnoux	C.A 87334B	87010232
	Current Shunt DC	RS	100A dc	98020198
X	Oscilloscope	YOKOGAWA	DLM2054	87020194
X	Current probe	YOKOGAWA	7011930	87020195
X	Differential voltage probe	YOKOGAWA	7011926	87020196
	Scope corder	YOKOGAWA	SL 1400	87020239
	Current probe	YOKOGAWA	96033	87020240 87020241 87020242
X	RLC Load	N.B.N AUTOMATION RLC	Load	87020226
X	Grid Simulator	AMETEK	MX30	87010273
X	Dc Power Supply	REGATRON	Top Con Quadro	87010278
	Harmonics and Flicker analyzer	EM Test	DPA503	87010274
	Artificial lumped impedance for flicker	EM Test	AIF503N32	87010275
	Digital Multimeter	AGILENT TECHNOLOGIES	U1242A	87010022
	Current Clamp For Digital Multimeter	ALCRON	DT-98	87010033
	Digital Multimeter	ISO-TECH	IDM 305	87020142
	Test Fingernail	ATS GALBUSERA	01.10	87010127
	Safety Tester	FLUKE	601PRO XL	87010179
	Data Acquisition Unit	AGILENT TECHNOLOGIES	34970A	87010205
	Probe For Oscilloscope	GMW	GE 3121	87010220
	Earth Continuity Tester	KIKUSUI	TOS6210	87010238
	HV Tester	SCHLEICH	GLP1-e HV-AC	87010239
	Dummy Load For HV Tester	SCHLEICH	4000987	87010240

		MANUFACTURER	MODEL	TÜV RHEINLAND ITALIA Ref.
	Surge Generator	EMTEST	VSS 500 N6	87010269
	Load Cell	LAUMAS ELETTRONICA	CTL 200	87010245
	Phono-meter	BRÜEL & KJÆR	2236	87020108
	Thermal chamber	VÖTSCH	VT4004	87020091
	Thermal chamber	Angelantoni Industrie	Higros 50	87020030
	Thermal chamber	Weiss Technik	SB22/300/40	87020044
	Thermal chamber	Vötsch	VT7012S2	87020094
	Thermal chamber	Vötsch	VCV4057-5	87020093
	Thermal chamber	Angelantoni Industrie	CH600CVT	87020105
	Caliper	MITUTOYO	CD-6"C	87020051

Metodi di Prova /Testing Methods.	Incertezza /Uncertainty	Fattore di copertura k /coverage factor K
Misura di Tensione in Continua <i>/direct voltage measurement</i>	0,50% lett	2,00
Misura di Corrente in Continua <i>/direct current measurement</i>	0,35% lett	2,00
Misura di Tensione Alternata in regime Dinamico <i>/Alternate Voltage measurement (Dynamic regime)</i>	0,75% lett	2,10
Misura di Tensione Alternata in regime Statico <i>/Alternate Voltage measurement (Static regime)</i>	0,40% lett	2,00
Misura di Corrente Alternata in regime Dinamico <i>/Alternate current measurement (Dynamic regime)</i>	0,75% lett	2,10
Misura di Corrente Alternata in regime Statico <i>/Alternate Current measurement (Static regime)</i>	0,35% lett	2,00
Misura di Potenza Attiva/Reattiva/Apparente in regime dinamico <i>/Active/Reactive/Apparend power measure ment (Dynamic regime)</i>	1,4% lett	2,20
Misura di Potenza Attiva/Reattiva/Apparente in regime statico <i>/Active/Reactive/Apparend power measurement (Static regime)</i>	0,40% lett	2,00
Misura del fattore di potenza <i>/Power factor measurement</i>	0,014	2,20
Prova di Riscaldamento - Misura mediante Termocoppie <i>/Heating test – Thermocouples method</i>	4,1 °C	2,20
Prova di Riscaldamento – Misura della Variazione di Resistenza <i>/Heating test – change of resistance method</i>	4,5 °C	2,00
Prova di Riscaldamento nel triedro di prova <i>/Heating on test corner</i>	3,3 °C	2,16
Prova di Rigidità Dielettrica <i>/Dielectric strength test</i>	2,4% lett	2,00
Misura della Resistenza di Isolamento <i>/insulation resistance test</i>	2,5% lett	2,00
Misura della Continuità di Terra <i>/Earth continuity test</i>	2,3% lett	2,05
Misura della Corrente di Dispersione <i>/Leakage current test</i>	3,0% lett	2,00
Misura della Tensione Residua ai Capi della Spina <i>/Residual voltage test</i>	5,2%	2,06
Prova di Freddo IEC/EN 60068-2-1 <i>/Cold test</i>	1,9 °C	2,05
Prova di Caldo Secco IEC/EN 60068-2-2 <i>/Dry heat test</i>	2,3 °C	2,11
Prova di Caldo Umido IEC/EN 60068-2-78 <i>/Humidity test</i>	5,7%RH	2,00
Prova del Filo Incandescente (Glow Wire test)	11,2 °C	2,11
Prova di Resistenza alla Fiamma ad Ago <i>/Niddle flame resistance</i>	0,63 sec	2,23
Prova di Vibrazioni Sinusoidali IEC/EN 60068-2-6	3,5% acc.gen.	2,00

Metodi di Prova /Testing Methods.	Incertezza /Uncertainty	Fattore di copertura k /coverage factor K
<i>/Sinusoidal vibration test</i>		
Prova di Nebbia Salina IEC/EN 60068-2-11 <i>/Salt mist test</i>	2,3 °C	2,11
Prova del cambio di temperatura IEC/EN 60068-2-14 <i>/Change of temperature test</i>	2,3 °C	2,11
Misura della Correnti Armoniche IEC/EN 61000-3-2 e IEC/EN 61000-3-12 <i>/Harmonics current test IEC/EN 61000-3-2 and IEC/EN 61000-3-12</i>	4,1% lett	2,00
Misura delle Fluttuazioni di Tensione e dei Flicker IEC/EN 61000-3-3 e IEC/EN 61000-3-11 <i>/Flicker test IEC/EN 61000-3-3 and IEC/EN 61000-3-11</i>	5,0%	2,00
Misura dei Tempi / Frequenza <i>/Time measurement - frequency</i>	0,025%	2,13
Prova dell'Impulso di tensione (Surge test)	4,2% Vset	2,00
	90 ns salita	2,23
	1,9 us emival	2,23
Grado di Protezione IPX3 <i>/ Degrees of protection IPX3</i>	4,0 % lett.	2,00
Grado di Protezione IPX4 <i>/ Degrees of protection IPX4</i>	1,7 % lett.	2,00
Grado di Protezione IPX5 <i>/ Degrees of protection IPX5</i>	3,5 % lett.	2,00
Grado di Protezione IPX6 <i>/ Degrees of protection IPX6</i>	2,9 % lett.	2,00
Tutte le incertezze sopra riportate sono espresse normalmente con livello di fiducia 95%. All the above mentioned uncertainties are expressed with a coverage probability of 95%.		

END TEST REPORT