



INDUSTRIAL SHIELDS by Boot & Work Corp, S.L.



Statement of Conformity

TEST REPORT

INDUSTRIAL SHIELDS FAMILY PRODUCTS STATEMENT OF CONFORMITY - **TEST REPORT**

COMPANY NAME: Boot & Work Corp, S.L.

DATE OF ISSUE: Bellaterra, November 28, 2018 (Last Revision: April 23, 2019)

RESULT: Complies

It has been tested and complies the standard specifications Applicable / See specifications applied on page 12

APPLICABLE STANDARDS

The tests / inspections marked with * are not covered by the accreditation of ENAC

TEST REPORT INCLUDES:

- RFI EMISSION:

EN 61131-2:2007	: Clause 8: Zone A/B EMC and Clause 11: LVD
EN 61000-6-4: 2007	: Limits for harmonic current emission
EN 61000-6-2:2005	: Limitation of voltage fluctuation and flicker in low voltage supply system.

- IMMUNITY:

EN 61131-2:2007	: Product standard
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**TESTED UNITS:****Industrial Shields PLCs Tested:**

Reference Part No:

M-DUINO FAMILY PLCs	GPRS FAMILY PLCs	WiFi & BLE FAMILY PLCs	20 IOs Family PLCs
IS.Mduino.21+	006001000200	007001000200	IS.AB20AN.HF+
IS.Mduino.42+	006001000400	007001000400	IS.AB20REL.HF+
IS.Mduino.58+	006001000600	007001000600	
IS.Mduino.19R+	006001000100	007001000100	
IS.Mduino.38R+	006001000300	007001000300	
IS.Mduino.57R+	006001000500	007001000500	
IS.Mduino.38AR+	006001000700	007001000700	
IS.Mduino.57AAR+	006001000800	007001000800	
IS.Mduino.53ARR+	006001000900	007001000900	
IS.Mduino.54ARA+	006001001000	007001001000	
IS.Mduino.50RRA+	006001001100	007001001100	
	006001001200	007001001200	
	006001001300	007001001300	

Electrical and Electronics
LGAI Technological Center S.A.

The results refer only and exclusively to the sample, product or material delivered for testing in "Received Material" section above. The equipment has been tested under conditions stipulated by standard(s) quoted in this document.

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This is the first page of the document, which consists of 30 pages of which 18 are annexes.



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1. EQUIPMENT RECEIVED AND TESTED

s/n: 001

Power Supply: DC 24V through standard AC/DC adapter

1.1. Test configuration

Power Supply: DC 24V through standard AC/DC adapter

Set-up: Table top

Test exercise: PLC with automatic sequence, in LAN

Equipment size: communication. 120x120x100mm

1.2. Auxiliary and control equipment

-Ancillary M-Duino equipment for LAN communication

-Ancillary LAN router

1.3. Input/output wires

-LAN shielded cable
>3m

1.4. Modification performed

For the test "Radio-frequency Radiated Emissions" a ferrite KITA was added in the DC cable, a ferrite was added in the LAN cable, RS232 cable and RS485 cable were disconnected to pass the test.

For the test "Electromagnetic Field Immunity" a ferrite was added in the LAN cable and the rest of the I/O cables were shielded to pass the test. For the test "Current injections Immunity" a ferrite was added in the RS232 cable to pass the test

Test Product Reception: 2018-10-31

Test initial date: 2018-10-31

Test final date: 2018-11-07



2. APPLICABLE STANDARDS

2.1 EMISSIONS TESTS APPLICABLE STANDARDS

Standard: EN 61131-2: 2007, EN 61000 6-4:2007 based on standards.

Basic standard: CISPR 16-2-3:2016

Radio-frequency radiated emissions (30 -1000MHz) Class: **A** (Table 29)

Note: Clock frequency 16MHz

Basic standard: CISPR 16-2-1:2008+A1:2010

Continuous conducted emissions (0,15-30MHz) Class: **A** (Table 29)

Note: AC port measured

2.1.1. Acceptance criteria for the emissions test

According to standard EN 61131-2: 2007

Limit Table 29



2.2 IMMUNITY TESTS APPLICABLE STANDARDS

Standard: EN 61131-2: 2007, EN 61000-6-2:2005 based on standards.

Basic standard: IEC 61000-4-2:2008

☒ Electrostatic discharge immunity Level AC: 8 kV Level DC: 4 kV

Basic standard: IEC 61000-4-3:2006+A1:2007+A2:2010

☒ Electromagnetic field immunity.

Frequency range: 80MHz-1GHz
Severity: 10 V/m
Modulation: 80% AM 1 kHz Frequency range: 1,4GHz-2GHz Severity: 3 V/m
Modulation: 80% AM 1 kHz Frequency range: 2GHz-2,7GHz Severity: 1 V/m
Modulation: 80% AM 1 kHz

Basic standard: IEC 61000-4-4:2012

☒ Fast transients in burst immunity.
☒ Severity level in signal and control ports, and ground terminal. Severity: 1 kV
☒ Severity level in I/O port of DC power Supply Severity: -- kV Severity: 0.5 kV
☒ Severity level in I/O port of AC power Supply

Basic standard: IEC 61000-4-5:2014+A1:2017

☒ Surge transients immunity.
☒ Signal and control ports. Common mode severity: --
Differential mode severity: --
☒ DC Supply: port . Common mode severity: --
Differential mode severity: --
☒ AC Supply: ports. Common mode severity: 2 kV
Differential mode severity: 1 kV

Basic standard: IEC 61000-4-6:2013

☒ Current injection immunity.
☒ Signal and control ports. Severity: 3 V RMS
☒ AC/DC Supply and access by ground terminal. Severity: 3 V RMS

Basic standard: IEC 61000-4-11:2004

☒ Voltage variation immunity.
☒ Short interruptions.
☒ Voltage dips.



Basic standard: IEC 61000-4-6:2009

☒ Low frequency magnetic field immunity

Intensity: 30
A/m

2.2.1. Acceptance criteria for the immunity test

Section Table 31, A zone equipment

Table 31 – Criteria to prove the performance of a PLC-system against EMC disturbances

Criterion	Performance criterion	
	Operation	
	During test	After test
A	The PLC-system shall continue to operate as intended. No loss of function or performance, according to PFVPs (2.5)	The PLC-system shall continue to operate as intended
B	<p>Degradation of performance accepted</p> <p>Examples: analogue values vary within manufacturer-specified limits, communication delay times vary within manufacturer-specified limits, flickering on HMI display, etc.</p> <p>No change of operating mode</p> <p>Examples: loss of data or uncorrected errors in communication, unintentional state changes of digital I/O which are seen by the system or test set-up, etc.</p> <p>No irreversible loss of stored data, according to PFVPs (2.5)</p>	The PLC-system shall continue to operate as intended. Temporary degradation of performance must be self-recoverable
C	Loss of functions accepted, but no destruction of hardware or software (programme or data)	The PLC-system shall continue to operate as intended automatically, after manual restart or power off/power on.



2.3. Test procedures

Radio-frequency radiated emissions:	C5400277
Continuous conducted emissions:	C5400276
Electrostatic discharges immunity:	C5400282
Electromagnetic field immunity	C5400285
Fast transients in burst immunity:	C5400283
Surge transients immunity:	C5400286
Current injections immunity:	C5400284
Low frequency magnetic field immunity:	C5400287
Voltage variations immunity:	C5400288

2.4 Measuring Uncertainties

Radio-frequency radiated emissions:	± 4,3 dB
Continuous conducted emissions:	± 2,1 dB
Electrostatic discharges immunity:	± 1,65 dB
Electromagnetic field immunity:	± 2,45 dB
Fast transients in burst immunity:	± 1,3 dB
Surge transients immunity:	± 1,3 dB
Current injections immunity:	± 1,7 dB
Low frequency magnetic field immunity:	± 1,01 dB
Voltage variations immunity:	± 0,8 dB

Expanded uncertainty measurement is obtained multiplying the typical uncertainty measurement with a coverage factor $k=2$, which corresponds to a confidence level of 95% for a normal distribution. The typical uncertainty measurement has been determined in accordance with document EA-4/02.



2.5 USED EQUIPMENT FOR TESTING

RADIO-FREQUENCY RADIATED EMISSIONS			
INSTRUMENT	MARK	MODEL	NUMBER
EMI RECEIVER	R&S	ESU 40	1041155
BILOG ANTENNA	SCHWARZBECK MESS- ELEKTRONIK	VULB 9165	104503
HORN ANTENNA	EMCO	3115	05-ER-017
LOG-PERIODIC ANTENNA	R&S	HL050	1041226
PREAMPLIFIER	BONN ELEKTRONIK	BLNA 0110-01N	1041351
PREAMPLIFIER	BONN ELEKTRONIK	BLMA 0126-2M	1041325
PREAMPLIFIER	HP	8449B OPT H02	104361

CONTINUOUS CONDUCTED EMISSIONS			
INSTRUMENT	MARK	MODEL	NUMBER
EMI RECEIVER	R&S	ESCS 30	104952
LISN	SCHWARZBECK MESS- ELEKTRONIK	NNLK 8128	104026
ISN	TESEQ	ISN ST08	1041106
TRANSIENT LIMITER	HP	11947A	05-ER-187

ELECTROSTATIC DISCHARGE IMMUNITY			
INSTRUMENT	MARK	MODEL	NUMBER
ESD GENERATOR	NOISEKEN	ESS-200A	104018
ESD GENERATOR	SCHAFFNER	NSG-435	05-ER-151
ESD GENERATOR	SCHAFFNER	NSG-438	104826



ELECTROMAGNETIC FIELD IMMUNITY			
INSTRUMENT	MARK	MODEL	NUMBER
DOUBLE RIDGED ANTENNA	ETS-LIDGREN	3106	104915
LOG-PERIODIC ANTENNA	SCHWARZBECK MESS- ELEKTRONIK	VUSLP 9111	104814
SIGNAL GENERATOR	R&S	SMB100A	1041266
AMPLIFIER	BONN ELEKTRONIK	BSA 0130-500/125/60D	1041271
POWER METER	R&S	NRP2	1041313
SENSOR PROBE	R&S	NRP-Z91	1041314
SENSOR PROBE	R&S	NRP-Z91	1041315
AMPLIFIER	BONN ELEKTRONIK	BLMA 1040-200/100D	1041324

FAST TRANSIENTS IN BURST IMMUNITY			
INSTRUMENT	MARK	MODEL	NUMBER
FAST TRANSIENT/BURST GENERATOR	SCHAFFNER	NSG 2025	104019
COUPLING CLAMP	SCHAFFNER	CDN 126	104043
CDN	TESEQ	3083-B200	1041540

SURGE TRANSIENTS IMMUNITY (1,2/50)			
INSTRUMENT	MARK	MODEL	NUMBER
SURGE GENERATOR	TESEQ	NSG 3060	1041403
CDN	TESEQ	CDN 3061	1041404



CURRENT INJECTIONS IMMUNITY			
INSTRUMENT	MARK	MODEL	NUMBER
SIGNAL GENERATOR	HP	8648D	104154
SIGNAL GENERATOR	HP	8648D	104524
ATTENUATOR	NARDA	769-3	1041203
ATTENUATOR	NARDA	769-3	1041204
ATTENUATOR	BIRD	150-A-MFN-06	1041645
AMPLIFIER	EMC AUTOMATION	EA4937	104124
INJECTION CLAMP	FCC	F-2031-32mm	104110
INJECTION CLAMP	LÜTHI	TYPE EM101	1041244
DECOUPLING CLAMP	FCC	F-2031-DCN-32mm	104111
DECOUPLING CLAMP	FCC	F-2031-DCN	05-ER-391
CDN	LÜTHI	L-801 M3/32	1041245
CDN	LÜTHI	L-801 M3/32	1041251
CDN	LÜTHI	L-801 M4PE	1041253
CDN	FCC	801-M5-25	05-ER-389
CDN	R&S	L-801 T4 RJ45	104829
CDN	LÜTHI	L-801 M1/32	1041293
CDN	LÜTHI	L-801 M1/32	1041294
CDN	LÜTHI	L-801 M1/32	1041295
CDN	LÜTHI	L-801 M1/32	1041296
CDN	LÜTHI	L-801 M1/32	1041297
CDN	SCHAFFNER	M2-16	104924
CDN	SCHAFFNER	M3-25	104925
WAVEFORM GENERATOR	HP	HP33120A	104177

LOW FREQUENCY MAGNETIC FIELDS IMMUNITY			
INSTRUMENT	MARK	MODEL	NUMBER
INDUCTION COIL	SCHAFFNER	888-0239 VI-00	05-ER-355
MAGNETIC FIELD GENERATOR	HAEFELY TECHNOLOG Y	MAG 100.1	104914
HELMHOLTZ COIL	SERVICIENCIA S.L.	BH1000HP-1-A	1041572
HELMHOLTZ COIL	SCHWARZBECK	HHS 5204-36	104827
MAGNETIC FIELD PROBE	COMBINOVA	MFM 10	104023
FIELD PROBE	PMM	EHP50A	104751
PORTABLE FIELD METER	PMM	8053	104719



VOLTAGE VARIATIONS IMMUNITY			
EQUIPMENT	BRAND	MODEL	NUMBER
ARS (Analyser Reference System)	SPITZENBERGER & SPIES	ARS 16/3	1041156
AIP (Line Impedance Simulation Net.)	SPITZENBERGER & SPIES	AIP 75/3/P/JK	1041157

2.6 ENVIRONMENTAL RESULTS

See results sheets for environmental results (See pag. 19).



3. Results

Boot & Work Corp

Model: M-Duino Family PLCs / Ardbox Family PLCs / WiFi & BLE Family PLCs / GPRS GSM Family PLCs

001 **Power Supply:** DC 24V through standard AC/DC adapter

EMISSION TESTING RESULTS

Radio-frequency radiated emissions.	Pass	Note: 3
Continuous conducted emissions.	Pass	Note: 3

- 1:** The measured results are above the upper limit, even considering the uncertainty interval.
2: The measured results are above the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that non-compliance is more probable than compliance
3: The measured results are below the specified limits, but within the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the results indicate that compliance is more probable than non-compliance
4: The measured results are within the limits, including the uncertainty interval.

IMMUNITY TESTING RESULTS

Electrostatic discharges immunity.	B	Criteria: B
Electromagnetic field immunity.	A	Criteria: A
Fast transients in burst immunity.	A	Criteria: B
Surge transients immunity.	A	Criteria: B
Current injections immunity.	A	Criteria: A
Voltage variations immunity.	A/C	Criteria: A/C
Low frequency magnetic field immunity.	Pass	Criteria: Pass/Fail

Operation criteria according to standard.

Service Quality Assurance

Lifetime 200.000 Cycles duration for Relay outputs [30Vdc at 3A, 220Vac at 5A]
 10 years of reliability [Estimated life span]

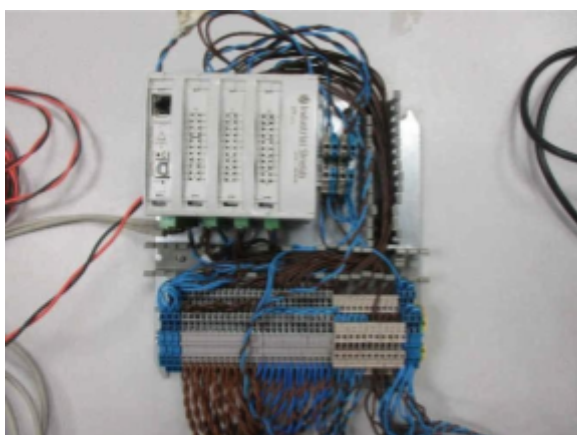
Industrial Shields, guarantees that this work has been made in accordance with our Quality and Sustainability System, fulfilling the contractual conditions and legal norms.

Within our improvement program we would be grateful if you would send us any commentary that you consider opportune.

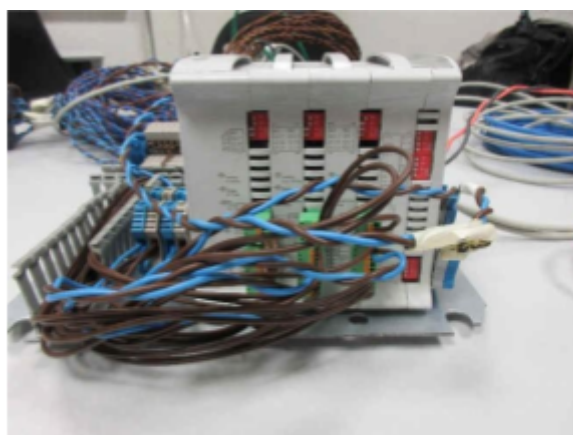


4. ANNEXES

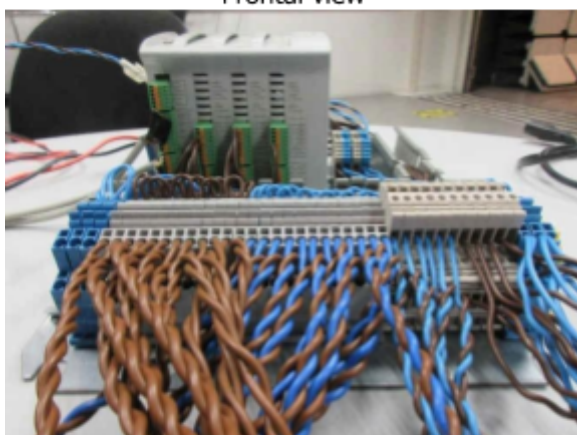
4.1 IDENTIFICATION PICTURES



Frontal view



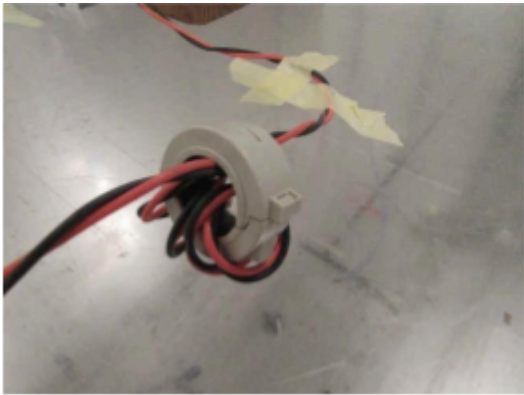
Rear view



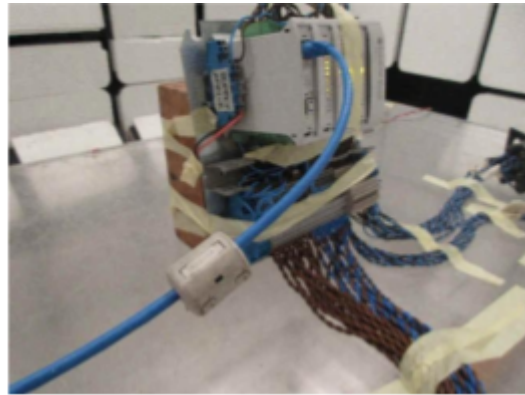
Internal view



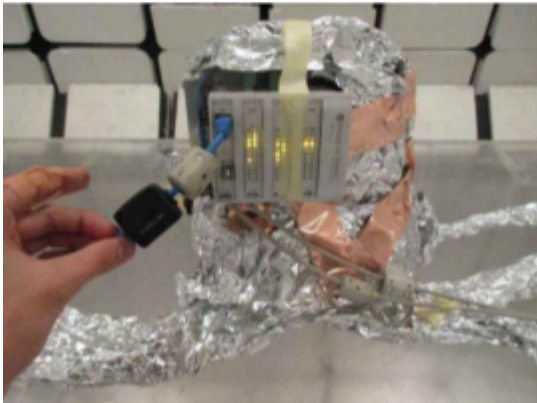
Auxiliary equipment



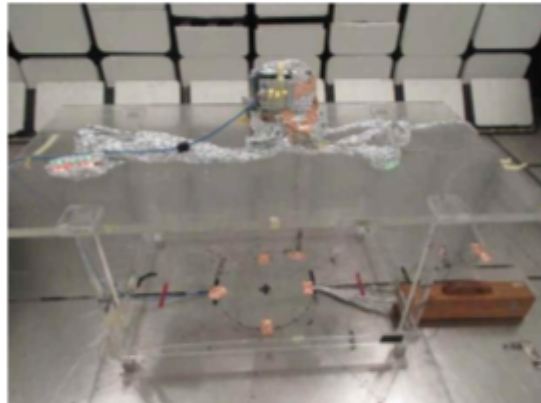
Radio-frequency radiated emissions: Add Ferrite KITA in DC cable



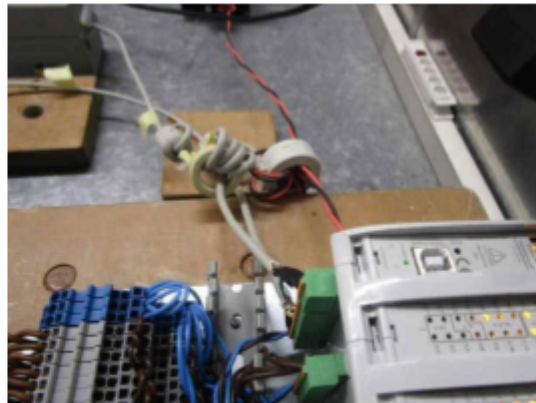
Radio-frequency radiated emissions: Add Ferrite in LAN Cable



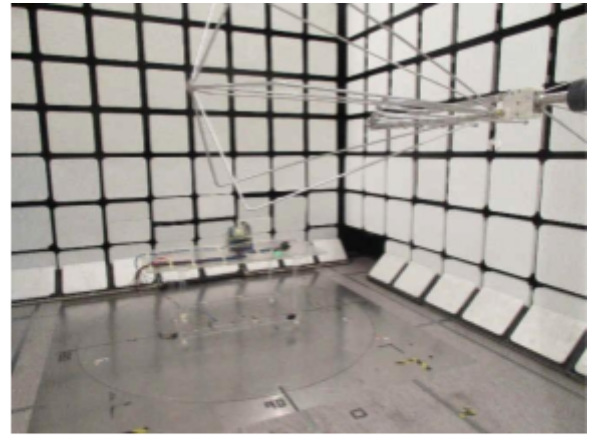
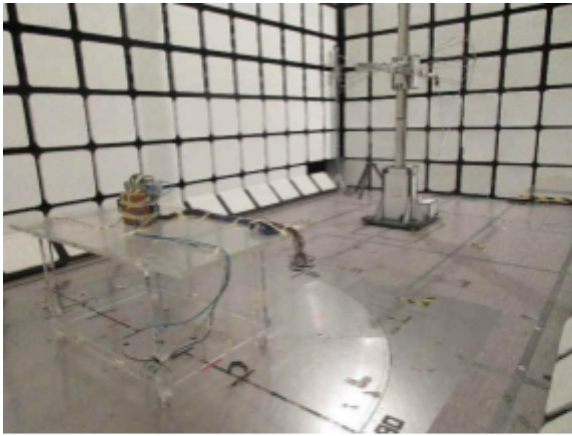
Electromagnetic field immunity: Add Ferrite in LAN cable



Electromagnetic field immunity: Final setup shield



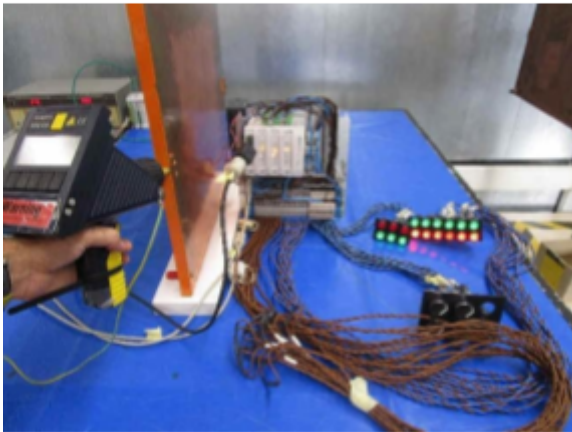
Electromagnetic field immunity: Final setup shield
Add Ferrite in RS323 cable



Radio-frequency radiated emissions



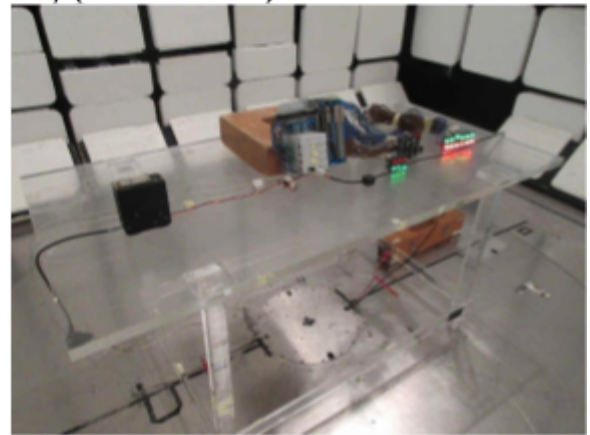
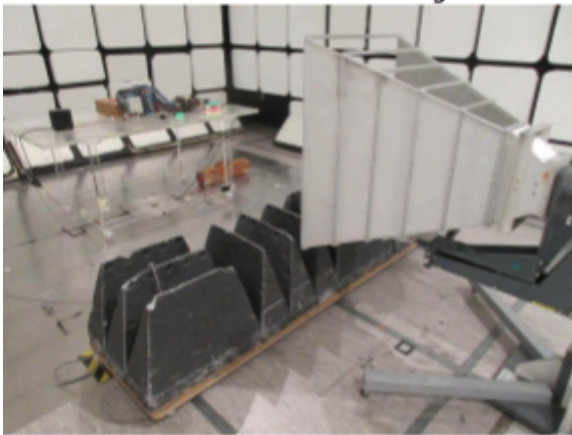
Continuous conducted emissions



Electrostatic discharges immunity



Electromagnetic field immunity (80MHz to 1GHz)

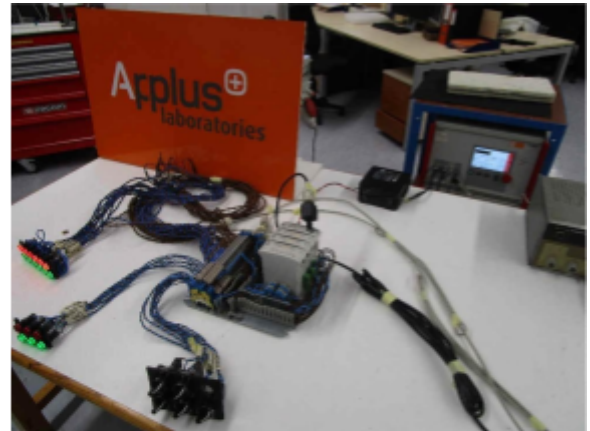
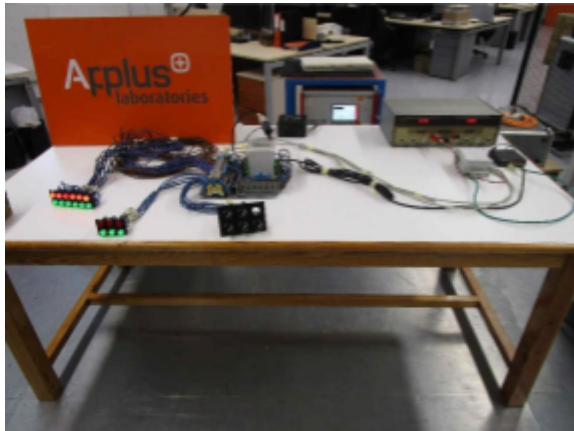


Electromagnetic field immunity (1.4GHz to 2.7GHz)

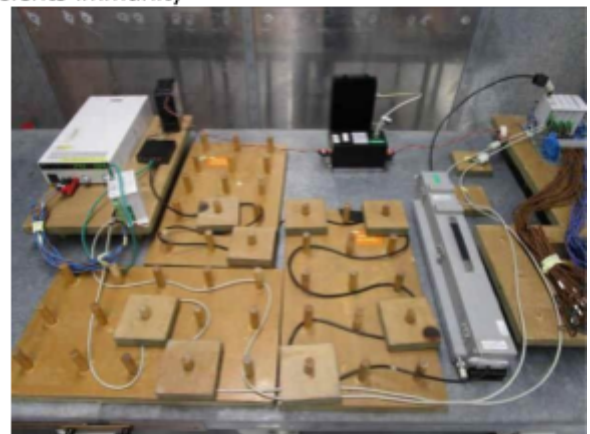


Fast transients in burst immunity





Surge transients immunity



Current injections immunity



Voltage variations immunity



Low frequency magnetic field immunity



4.2 RESULT DETAILS

RADIO-FREQUENCY RADIATED EMISSIONS					
Device under test: M-DUINO PLC Arduino Ethernet 58 Brand: Boot & Work I/Os Analog/Digital Plus Model: M-Duino PLC Serial number: 001 Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication. Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m					
Technician: Gerardo Ballesteros / Juan Carlos Parrilla Test date: 2018-10-31 Measurement equipment: Receiver EMI RS ESU40 Frequency range: 30MHz-1GHz Procedure: C5400277 Test Area: Anechoic chamber, SAC-2					
Basic standard: CISPR 16-2-3:2016 Temperature: 21.7 °C Humidity: 46.9 % Atm. Pressure: 989.6 hPa					
EUT:	Class	Test Area	Distance	PreScan	Evaluation
Table top	A	SAC-2	3 m	4 faces	Individual
RESULTS: Pass					
Identification		Emissions	Main emission source and type		
DUT: Device under test AUX: Auxiliary Devices SYS: DUT + AUX BB : Broad-band NB : Narrow-band QP: Quasi-peak		Limit - $I \leq QP < \text{Limit}$ I=Uncertainty	DUT, NB		
Comments					
Modifications: Added a ferrite in DC cable, added a ferrite RFC-10 in LAN cable and disconnected RS232 and RS485 serial cables					



Radio-Frequency Radiated Emission II

Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os
Analog/Digital Plus

Brand: Boot & Work

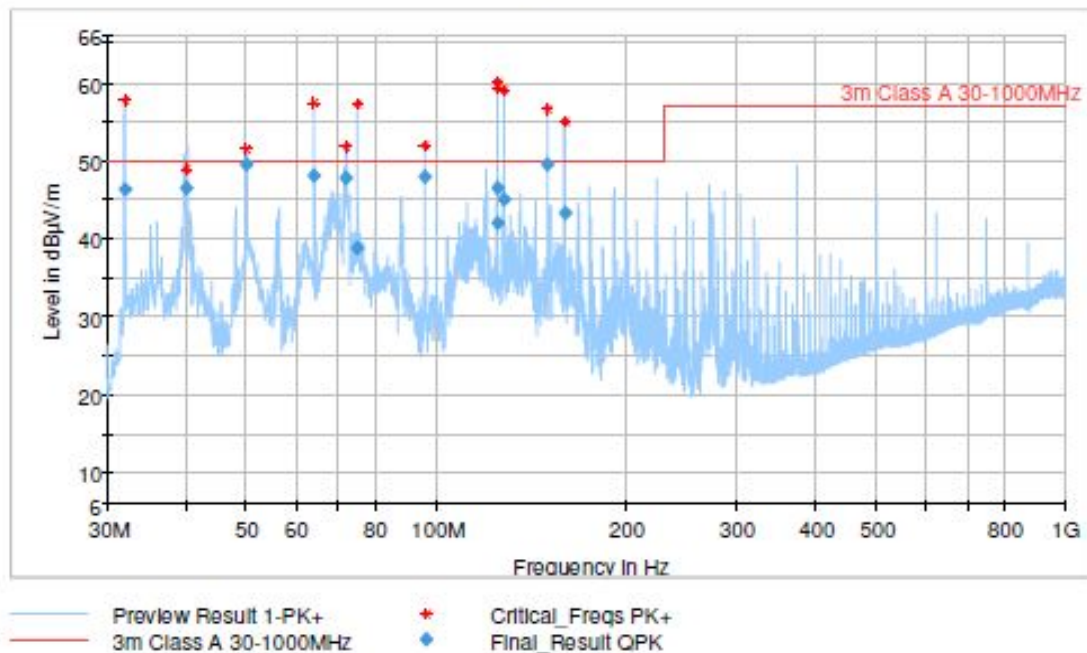
Model: M-Duino PLC

Serial number: 001

Procedure: C5400277

Basic standard: CISPR 16-2-3:2016

PRESCAN



FINAL MEASUREMENTS

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
31.9800 0	46.29	50.00	3.71	133.0	V	301.0
39.990000	46.52	50.00	3.48	136.0	V	302.0
49.980000	49.55	50.00	0.45	134.0	V	167.0
63.990000	48.15	50.00	1.85	125.0	V	89.0
71.760000	47.73	50.00	2.27	264.0	H	335.0
75.000000	38.86	50.00	11.14	268.0	H	333.0
95.970000	47.88	50.00	2.12	334.0	H	183.0
124.980000	41.98	50.00	8.02	145.0	V	252.0
125.010000	46.42	50.00	3.58	136.0	V	261.0
127.980000	45.00	50.00	5.00	400.0	H	192.0
150.000000	49.56	50.00	0.44	146.0	V	191.0
159.990000	43.36	50.00	6.64	355.0	H	184.0

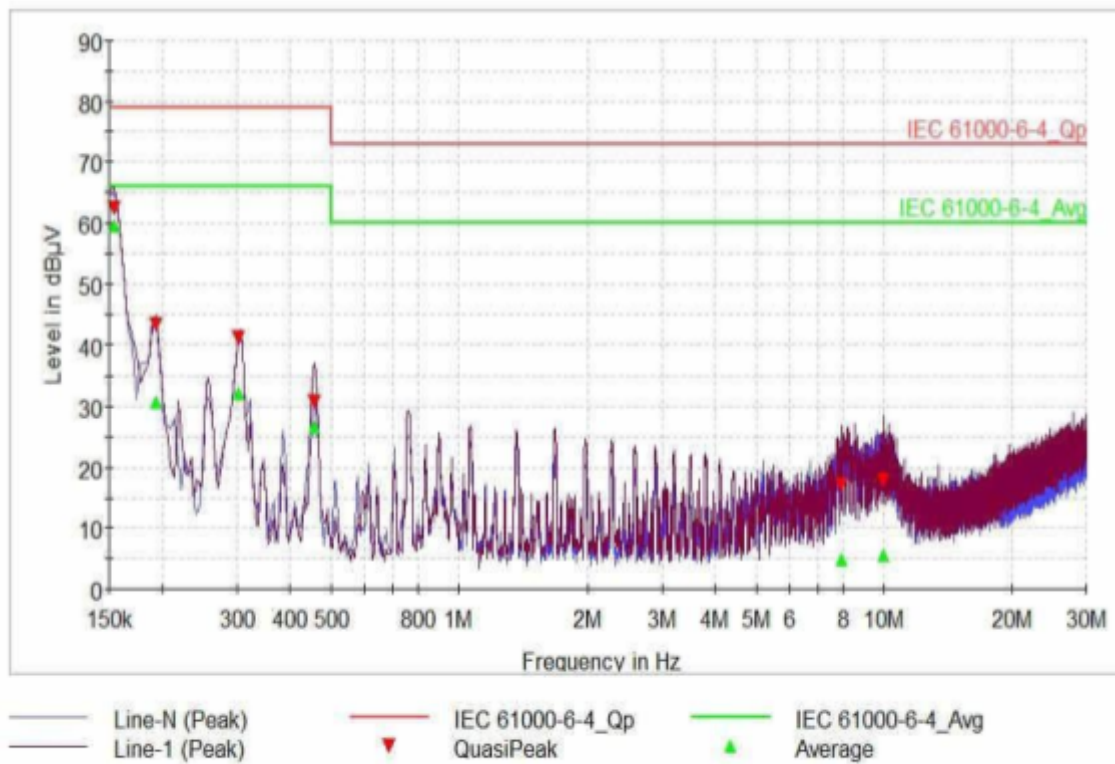


CONTINUOUS CONDUCTED EMISSIONS	
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.	Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m
Technician: Andreu Tey Test date: 2018-11-06 Measurement equipment: Receiver EMI RS ESCS30	Test Area: Faraday Chamber FAC1 Procedure: C5400276
Basic standard: CISPR 16-2-1:2008+A1:2010	
Temperature: 23.4 °C Humidity: 45.3 % Atm. Pressure: 990 hPa	
CONTINUOUS CONDUCTED EMISSIONS	
Supply	
Mains Supply	
T. in power Supply: (dBµV)	Pass Vgp < lim QP ; Vavg < lim AVG *
Source and type of the most important emissions	
Source: Device under test	Type: Narrow Band
Telecommunication ports	
Port type: T. in telecommunication ports (dBµV)	Pass Vpeak < lim AVG
Source and type of the most important emissions	
Source: Device under test	Type: Narrow Band
RESULTS: Pass	
Comments:	
EUT measured in AC port, through AC/DC adapter type	



CONTINUOUS CONDUCTED EMISSIONS II

Device under test: M-DUINO PLC Arduino Ethernet
 58 I/Os Analog/Digital Plus
 Brand: Boot & Work
 Model: M-Duino PLC Serial number: 001



Frequency (MHz)	Limit QPK (dBμV)	QuasiPeak (dBμV)	Margin QPK (dB)	Limit AVG (dBμV)	Average (dBμV)	Margin AVG (dB)	Line	Comment
0.154000	79.0	64.1	14.9	66.0	59.7	6.3	L1	
0.194000	79.0	2.5	36.5	66.0	30.7	35.3	L1	
0.302000	79.0	40.8	38.2	66.0	31.9	34.1	L1	
0.458000	79.0	35.8	43.2	66.0	34.8	31.2	L1	
7.966000	73.0	19.0	54.0	60.0	6.6	53.4	L1	
9.954000	73.0	20.0	53.0	60.0	6.5	53.5	L1	



CONTINUOUS CONDUCTED EMISSIONS III

Device under test: M-DUINO PLC Arduino Ethernet 58
I/Os Analog/Digital Plus

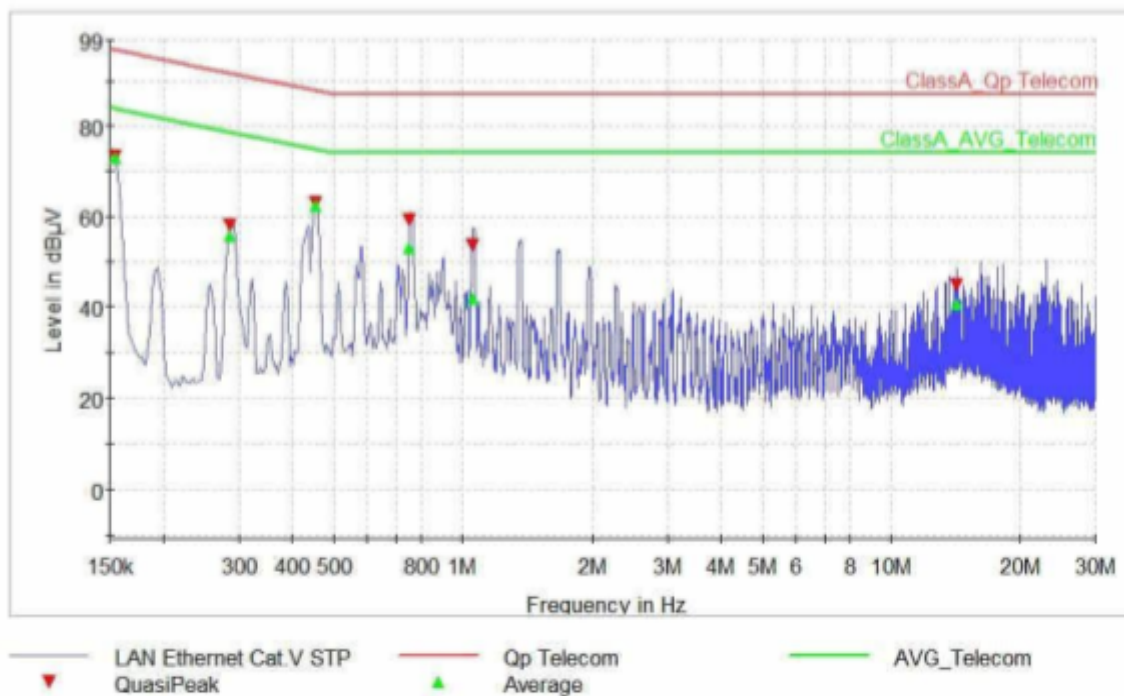
Brand: Boot & Work

Model: M-Duino PLC **Serial number:** 001

Procedure: C5400276

Basic standard: CISPR 16-2-1:2008+A1:2010

LAN ETHERNET RESCAN



Frequency (MHz)	Limit QPK (dBμV)	QuasiPeak (dBμV)	Margin QPK (dB)	Limit AVG (dBμV)	Average (dBμV)	Margin AVG (dB)	Line	Comment
0.154000	96.8	73.1	23.7	83.8	72.8	11.0	N	
0.286000	91.5	58.0	33.5	78.5	55.7	22.8	N	
0.454000	87.8	63.1	24.7	74.8	62.5	12.3	N	
0.754000	87.0	59.2	27.8	74.0	52.9	21.1	N	
1.054000	87.0	53.7	33.3	74.0	41.9	32.1	N	
14.210000	87.0	44.8	42.2	74.0	40.5	33.5	N	



ELECTROSTATIC DISCHARGE IMMUNITY																
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.				Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m												
Technician: Gerardo Ballesteros Test date: 2018-11-07 Measurement equipment: Schaffner NSG 435 Resistance value: 0.945 MΩ				Test Area: Ground plane Procedure: C5400282 Criteria: B												
Basic standard: <table> <tr> <td>Temperature:</td> <td>21.5</td> <td>°C</td> </tr> <tr> <td>Humidity:</td> <td>55.7</td> <td>%</td> </tr> <tr> <td>Atm. Pressure:</td> <td>1002.4</td> <td>hPa</td> </tr> </table>								Temperature:	21.5	°C	Humidity:	55.7	%	Atm. Pressure:	1002.4	hPa
Temperature:	21.5	°C														
Humidity:	55.7	%														
Atm. Pressure:	1002.4	hPa														
DC- Direct Contact, sharp tip				IH- Horizontal coupling, Sharp tip.												
AC- Air Contact, round tip				IV- Vertical coupling, Sharp tip.												
Point	Level	Discharges		Pol +/-	Application point	Results	Comments									
		Nº	Type													
1	4 kV	25	IV	+	0°	A										
				-												
2	4 kV	25	IV	+	90°	A										
				-												
3	4 kV	25	IV	+	180°	A										
				-												
4	4 kV	25	IV	+	270°	A										
				-												
5	4 kV	25	IH	+	0°	A										
				-												
6	4 kV	25	IH	+	90°	A										
				-												
7	4 kV	25	IH	+	180°	A										
				-												
8	4 kV	25	IH	+	270°	A										
				-												
9	4 kV	25	DC	+	USB	B	Note 1									
				-												
10	4 kV	25	DC	+	LAN	B	Note 1									
				-												
Comments: Note 1: communication lost during discharges but the EUT recovered itself at the end of disturbances																



ELECTROSTATIC DISCHARGE IMMUNITY II	
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC	Brand: Boot & Work Serial number: 001
Procedure: C5400282	
Basic standard: IEC 61000-4-2:2008	

DC- Dircet Contact, sharp tip				IH- Horizontal coupling, Sharp tip.			
AC- Air Contact, round tip				IV- Vertical coupling, Sharp tip.			
Point	Level	Discharges		Pol +/-	Application point	Results	Comments
		Nº	Type				
1	8 kV	25	AC	+	Leds front side	A	
				-			
2	8 kV	25	AC	+	Top side	A	
				-			
3	8 kV	25	AC	+	Bottom side	A	
				-			
Comments:							



ELECTROMAGNETIC FIELD IMMUNITY							
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.				Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m			
Technician: Martín Riverola / Juan Carlos Parrilla Test date: 2018-10-31				Test Area: Anechoic chamber, SAC-2 Procedure: C5400282 Criteria: A			
Basic standard: IEC 61000-4-3:2006+A1:2007+A2:2010							
Temperature:		23.4	°C				
Humidity:		48.9	%				
Atm. Pressure:		998.7	hPa				
Frequency range	80MHz – 1GHz		1,4GHz – 2GHz		2GHz – 2,7 GHz		
Severity	10 V/m		3 V/m		1 V/m		
Antenna type	Log-Periodic		Double Ridged		Double Ridged		
Frequency step	1%		1%		1%		
Dwell time	3 s	3 s	3 s		3 s		
Modulation	80% AM 1 kHz		80% AM 1 kHz		80% AM 1 kHz		
Dist. DUT/antenna	3 m	3 m	3 m	3 m	3 m	3 m	
Polarization	H	V	H	V	H	V	
FACE	FRONTAL 0°	A	A	A	A	A	
	LEFT 90°	A	A	A	A	A	
	REAR180°	A	A	A	A	A	
	RIGHT 270°	A	A	A	A	A	
Points of calibrated field: L=0,5m : L=0,5m : 16 (80MHz-1GHz) // L=0,5m : 8 (1GHz-2.7GHz)							
0,3	1,3	2,3	3,3	RESULTS: Pass Comments: A ferrite was added in the LAN cable and the rest of the I/O cables were shielded to pass the test			
0,2	1,2	2,2	3,2				
0,1	1,1	2,1	3,1				
0,0	1,0	2,0	3,0				
Field checking:							



FAST TRANSIENTS IN BURST IMMUNITY					
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.			Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m		
Technician: Aaron Fuente / Juan Carlos Parrilla Test date: 2018-11-05 Measurement equipment: NSG 2025			Test Area: Ground plane Procedure: C5400283 Criteria: B		
Basic standard: EN 61131-2: 2007					
Temperature: 23.5 °C Humidity: 57.3 % Atm. Pressure: 1009.8 hPa					
Test ports	Application	Severity (kV)	Duration	Results	Comments
AC supply	L1+N+GND	+1	2 min	A	
		-1	2 min	A	
LAN	Clamp	0,5	2 min	A	
		-0,5	2 min	A	
RS 232	Clamp	+0,5	2 min	A	
		-0,5	2 min	A	
RS 485	Clamp	+0,5	2 min	A	
		-0,5	2 min	A	
Comments:					



SURGE TRANSIENTS IMMUNITY (1,2/50)									
Device under test: M-DUINO PLC Arduino Ethernet Brand: Boot & Work 58 I/Os Analog/Digital Plus Model: M-Duino PLC Serial number: 001 Test disposition: Table top Supply: DC 24V through standard AC/DC adapter Auxiliary equipment: Input/output cable: -Ancillary M-Duino equipment for LAN communication -LAN shielded cable >3m -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.									
Technician: Martín Riverola / Andreu Tey Test date: 2018-11-07 Measurement equipment: NSG 3060					Test Area: N/A Procedure: C5400286 Criteria: B				
Basic standard: IEC 61000-4-5:2014+A1:2017									
Temperature: 23.4 °C Humidity: 45.5 % Atm. Pressure: 998.3 hPa									
Application	Zo	Line	Phase	Severity (kV)	Nº Pulse s		Results		Comments
					+	-	Polarity +	Polarity -	
AC POWER SUPPLY									
Line to line	2	L1 / N	0°	1	5	5	A	A	
			90°	1	5	5	A	A	
			180°	1	5	5	A	A	
			270°	1	5	5	A	A	
Line to ground	12	L1 / E	0°	2	5	5	A	A	
			90°	2	5	5	A	A	
			180°	2	5	5	A	A	
			270°	2	5	5	A	A	
Line to ground	12	N / E	0°	2	5	5	A	A	
			90°	2	5	5	A	A	
			180°	2	5	5	A	A	
			270°	2	5	5	A	A	
Comments:									
Measured in AC port, through an AC/DC adapter.									



CURRENT INJECTIONS IMMUNITY				
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.		Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m		
Technician: Aaron Fuente / Juan Carlos Parrilla Test date: 2018-11-05 Level de Severity: 3 V RMS Frequency range: 150 kHz - 80 MHz Modulation: 80% AM 1 kHz Increase: 1%		Test Area: Ground plane Procedure: C5400284 Criteria: A Part of a system?: No Dwell time: 3 sec		
Basic standard: IEC 61000-4-6:2013				
Temperature: 23.5 °C Humidity: 57.3 % Atm. Pressure: 1009.8 hPa				
CDN	Severity (V)	Application point	Results	Comments
M2	3	DC supply	A	Note 1
CLAMP	3	LAN	A	
CLAMP	3	RS 232	A	Note 2
CLAMP	3	RS 485	A	
Comments:				
EUT measured in AC port, through AC/DC adapter. Note 1: Non-destructive test applied in DC as worst case. Note 2: Between 550kHz to 10MHz the EUT failed but a ferrite with 4 turns was fitted in the RS232 cable to pass the test				



VOLTAGE VARIATIONS IMMUNITY					
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.		Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m			
Technician: Gerardo Ballesteros / Juan Carlos Parrilla Test date: 2018-11-07 Measurement equipment: EMV D 45000/PAS		Test Area: Ground plane Procedure: C5400288 Criteria: Pass/Fail According to standard			
Basic standard: IEC 61000-4-11:2004					
Temperature: 21.5 °C Humidity: 55.7 % Atm. Pressure: 1002.4 hPa					
VOLTAGE DIPS AND SHORT INTERRUPTIONS					
Nominal voltage	Applied voltage U level %	Duration in ms	Results	Criteria	Comments
230 V / 50 Hz	0	10	A	A	
230 V / 50 Hz	40	200	A	C	
230 V / 50 Hz	70	500	C	C	
230 V / 60 Hz	0	10	A	A	
230 V / 60 Hz	40	200	A	C	
230 V / 60 Hz	70	500	C	C	
VOLTAGE VARIATIONS					
Nominal voltage	Applied voltage U level %	Duration in ms	Results	Criteria	Comments
230 V / 50 Hz	0	5000	C	C	
230 V / 60 Hz	0	5000	C	C	
Comments:					



LOW FREQUENCY MAGNETIC FIELDS IMMUNITY				
Device under test: M-DUINO PLC Arduino Ethernet 58 I/Os Analog/Digital Plus Model: M-Duino PLC Test disposition: Table top Auxiliary equipment: -Ancillary M-Duino equipment for LAN communication -Ancillary LAN router DUT exercise: PLC with automatic sequence, in LAN communication.		Brand: Boot & Work Serial number: 001 Supply: DC 24V through standard AC/DC adapter Input/output cable: -LAN shielded cable >3m		
Technician: Gerardo Ballesteros / Andreu Tey Test date: 2018-11-07 Induction Coil: Haefely MAG 100 AC Power Supply: Spitzenberger + Spies EMV E 10000/PAS Applied voltage to coil (Vrms): 95 Ambient measure (A/m): 0.152		Test Area: Ground plane Procedure: C5400287 Criteria: A Measurement equipment: Combinova magnetometer Stabilizing EUT time: 15 min Coil used: Haefely Tecnología 12...120 A		
Basic standard: IEC 61000-4-6:2009				
Temperature: 21.5 °C Humidity: 55.7 % Atm. Pressure: 1002.4 hPa				
Axe	Intensity (A/m)	Field type	Results	Comments:
X	30	Continuous field (5min)	A	50 Hz
Y	30	Continuous field (5min)	A	50 Hz
Z	30	Continuous field (5min)	A	50 Hz
X	30	Continuous field (5min)	A	60 Hz
Y	30	Continuous field (5min)	A	60 Hz
Z	30	Continuous field (5min)	A	60 Hz
Comments:				



Revision Table

Revision Number	Date
0	28/11/2018
1	23/04/2019

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