ELETTA®
FLOW MONITORS

EU Declaration of Conformity

for

Electromagnetic Compatibility according to the Directive 2014/30/EU

The company Eletta Flow AB, Sweden, hereby declares that the Flow Monitors denominated Eletta D-series and M-series, manufactured by Eletta Flow AB, intended for metering, monitoring and controlling of liquid or gas flow in piping systems, are in accordance with:

a) *The COUNCIL DIRECTIVE of 26th February 2014 on the approximation of the laws of the Member States concerning electromagnetic compatibility.*

b) *In compliance with the specifications:*

EN IEC 61000-6-2:2019
EN IEC 61000-6-3:2021
EN/(IEC) 61000-6-3:2007+A1

according to reports no. 622-20134-10-RO and 621-20045-10-RO.

Kungens Kurva, 29 September 2022

Eletta Flow AB

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DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory

Accred. no. 1688
Testing
ISO/IEC 17025

EMC test of M3 Display

Performed for Eletta Flow AB

621-20045-10-R0
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02 July 2021

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DELTA Development Technology AB
is a subsidiary company of
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Title	EMC test of M3 Display
Test object	M3 Display
Report no.	621-20045-10-R0
Test period	15 February 2021 to 28 May 2021
Client	Eletta Flow AB Mälarvägen 3 141 71 Segeltorp Sweden
Contact person	Ahmad Jasim E-mail: ahmad.jasim@eletta.com
Manufacturer	Eletta Flow AB
Specifications	EN IEC 61000-6-2:2019, EN/(IEC) 61000-6-3:2007+A1
Results	The test object was found to be in compliance with the specifications, as listed in Section 1
Test personnel	Jan Högkvist, Lars Johnsson
Date	02 July 2021

Project Manager

Jan Högkvist Specialist
DELTA

Responsible

Lars Johnsson. Head of quality
DELTA

Table of contents

1. Summary of tests

Tests	Test methods	Results
Immunity to electrostatic discharges	EN/(IEC) 61000-4-2:2009	Passed
Immunity to radio frequency electromagnetic fields	EN/(IEC) 61000-4-3:2020	Passed
Immunity to fast transients	EN/(IEC) 61000-4-4:2012	Passed
Immunity to surge transients	EN/(IEC) 61000-4-5:2014+A1	Passed
Immunity to conducted radio frequency disturbances	EN/(IEC) 61000-4-6:2014	Passed
Immunity to power frequency magnetic field	EN/(IEC) 61000-4-8:2010	Not performed Note 1
Measurement of radio frequency electromagnetic field	CISPR 16-2-3:2016	Passed

Note 1: The test object contains no magnetically sensitive devices.

The edition of the basic standards above is equal or newer than those referenced in the standard below.

Conclusion

The test object mentioned in this report meets relevant requirements of the standards stated below, with respect to the test listed above.

- EN IEC 61000-6-2:2019 ”Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments”
- EN/(IEC) 61000-6-3:2007+A1 ”Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments”

The test results relate only to the object tested.

2. Test object and auxiliary equipment

2.1 Test object

Photo 2.1.1 M3 Display with air pump

Test object 2.1.1

Name of test object	M3 Display
Model / type	M3 Display
Part no.	-
Serial no.	000
FCC ID	-
Manufacturer	Eletta Flow AB
Supply voltage	18 - 28 Vdc (24Vdc nominal)
Software version	v1.1
Hardware version	V1.2
Cycle time	-
Highest frequency generated or used	8 MHz
Comment	
Received	Date: 15 Feb. 2021 Status: Prototype

2.2 Auxiliary equipment

Photo 2.2.1 Auxiliary equipment.

Auxiliary equipment 2.2.1

Name of auxiliary equipment	Sphygmomanometer with air pump
Model / type	
Part no.	
Manufacturer	
Comment	Auxiliary equipment supplied by the client, who also has the responsibility for its correct function and set up. Used for simulating pressure to the test object

Auxiliary equipment 2.2.2

Name of auxiliary equipment	Digital multimeter
Model / type	87
DELTA ident no.	IE-B353
Manufacturer	Fluke
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used to measure the input current to the test object

Auxiliary equipment 2.2.3

Name of auxiliary equipment	Digital multimeter
Model / type	MetraHit Ultra BT
DELTA ident no.	36110
Manufacturer	MetraWatt
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used to measure the input current to the test object

Auxiliary equipment 2.2.4

Name of auxiliary equipment	Power supply
Model / type	3000
DELTA ident no.	IE-A190
Manufacturer	Powerbox
Supply voltage	Output set to 24 VDC
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used for power to the test object

3. General test conditions

3.1 Test setup during test

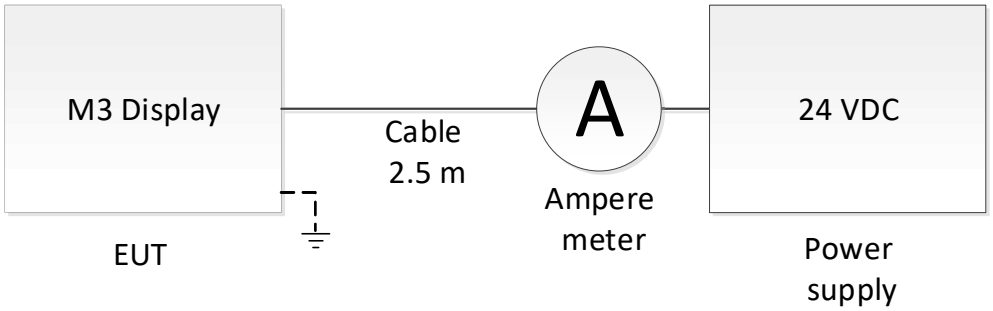


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

3.1.1 Cables

The following cables were used during test.

Port name	Port type	Shielded/ unshielded	Length during test [m]	Maximum length [m]	Remarks
DC power + signal	DC power + signal	Unshielded	0.3 - 2.5	> 30	Cable with ferrite, M12-8

3.1.2 Description and intended use of test object

The object is used for measuring the flow of liquid and gas and utilizes differential pressure to calculate the flow of the medium.

3.1.3 Test modes and supervision during immunity tests

The object connected to manual air pump to simulate a differential pressure inside the object. The test was monitored by measuring the output current and visually observing the display.

3.1.4 Test modes during emission tests

The object connected to manual air pump to simulate a differential pressure inside the object.

3.1.5 Nominal power consumption

Power supply of 18VDC and 4mA output signal = 75mW
Power supply of 28VDC and 20mA output signal = 560mW

3.2 Criteria for compliance during immunity test

Performance criteria according to corresponding standard were applied during immunity tests as follows:

General

The test object shall not become dangerous or unsafe as a result of the application of the tests.

Performance criterion A

The test object shall continue to operate as intended during the test.

Influence on the analog mA output signal shall be < +/-1%.

Influence on the display indicator shall be < 5%

No error or warning signals are allowed.

The test object is not allowed to change operating mode.

Performance criterion B

The test object shall continue to operate as intended after the test.

No change of operating state or stored data are allowed.

Performance criterion C

The test object is allowed to have temporary degradation or loss of function or performance which requires operator intervention or systems reset.

3.3 Modifications of the test object

The following modification was implemented to the test object.

- 1. In order to improve the result of surge transient immunity test the following modification was implemented:

  Bulk capacitor close to the processor.
  The bulk capacitor with a value of 10µF was added close to the processor to stabilize the power-supply.

  Enough energy was stored to compensate short disturbances in the supplied power and created a smooth decrease in power if the supplied power was cut off.

  This did not completely solve the issue since the processor could still reach an undefined state if the power would stabilize between 1.0V and 1.8V. This issue was solved by the brown out detection.

  Brown out detection.
  This was a software solution that solved the issue with an undefined state in the processor. The processor would completely restart if a significant disturbance in the power supply was detected. The significant disturbance is a sustained power-supply voltage of less than 1.8V.

  TVS diode between the VCC (3V3) and protective earth.
  This was added to prevent any overvoltage spikes on the 3V3 power plane. Abruptly changing the supplied power on and off could cause voltage spikes on the power-plane and potentially damage the processor.

  Reinforced ground connection
  The grounding connection between the PCB and protective earth was reinforced with a woven copper strip. This helped divert any unwanted transients from the input and power-plane.

3.4 Test sequence

The tests described in this test report were performed in the following sequence:

1. Immunity to radio frequency electromagnetic fields
2. Immunity to electrostatic discharges
3. Immunity to fast transients
4. Immunity to surge transients. Failed with grounded EUT.
5. Immunity to fast transients with grounded EUT.
6. Modification 1 implemented. See section 3.3 for details.
7. Immunity to surge transients. Retest. Passed.
8. Immunity to conducted radio frequency disturbances
9. Measurement of radio frequency electromagnetic field

4. Test results

4.1 Immunity to electrostatic discharges

Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	15 Feb. 2021
Serial no.	000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method Characteristics	EN/(IEC) 61000-4-2:2009 Discharge network: 150 pF, 330 Ω	Temperature Humidity	20 °C 36 % RH
Test equipm.	EMC Transient lab Västerås Setup VIC2	Uncertainty	1.1 dB

Surface under test	Test standard's name of surface	Coupling of discharges	No of disch. each combin.	Amplitude [kV]	Passed	Remarks
Enclosure Indirect discharge	Enclosure	HCP contact	10	+/- 4	Yes	See Photo 4.1.2
Enclosure Indirect discharge	Enclosure	VCP contact	10	+/- 4	Yes	See Photo 4.1.3 and 4.1.4
Metallic connector housing and case	Metallic	Direct contact	10	+/- 4	Yes	See Photo 4.1.5 and 4.1.6
Plastic enclosure, display and connector housing	Insulated	Direct air	10	+/- 2, 4 and 8	Yes	See Photo 4.1.7

Criteria for compliance	See Section 3.2
Test result	The discharges caused no malfunctions
Compliant	Yes
Comments	During the test the EUT case was not separately grounded.

Photo 4.1.1 Test setup regarding immunity to electrostatic discharges.

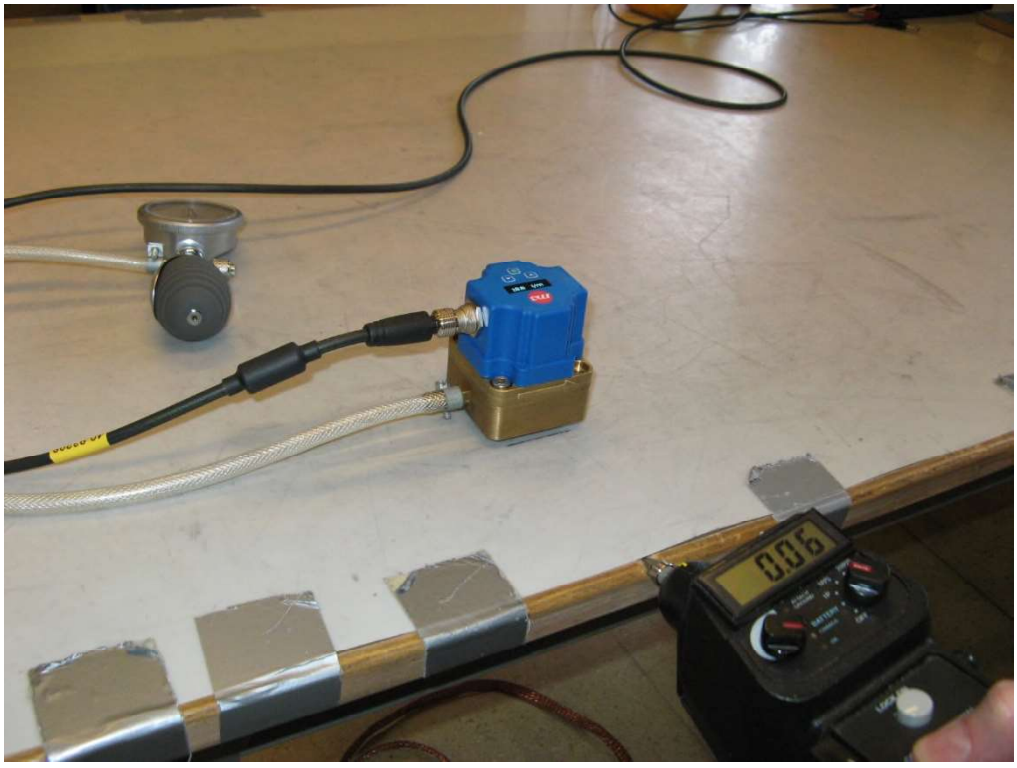


Photo 4.1.2 Test setup regarding immunity to electrostatic discharges.
Discharges via HCP indirect coupling in four directions.

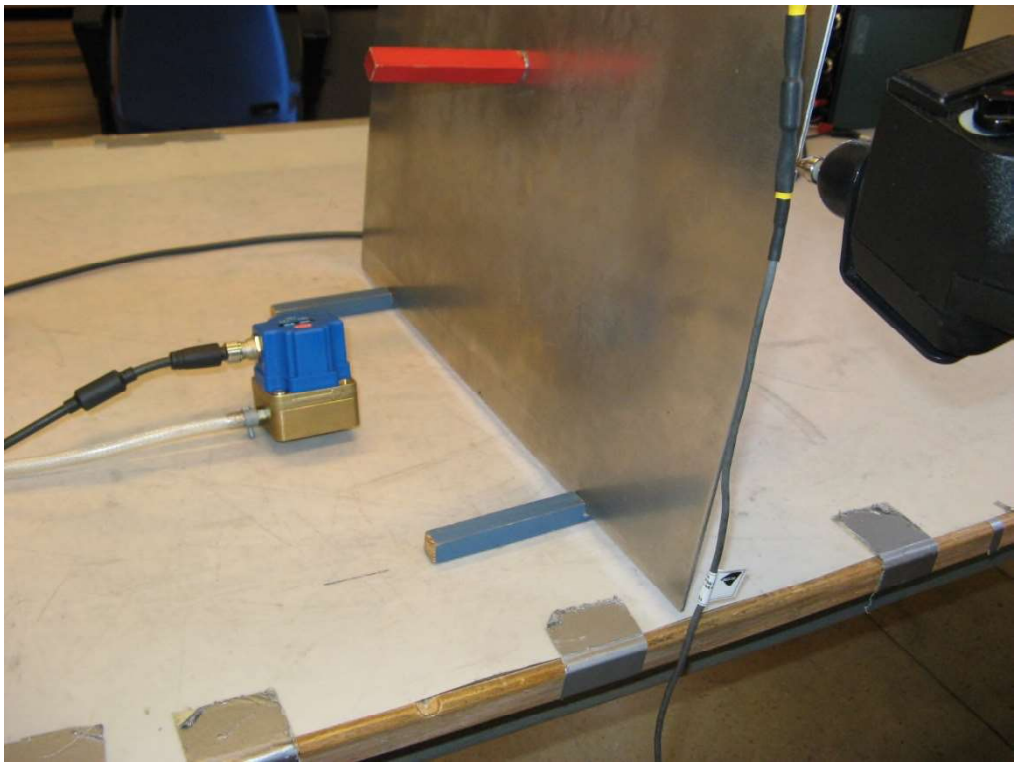


Photo 4.1.3 Test setup regarding immunity to electrostatic discharges. Discharges via VCP indirect coupling in five directions.

Photo 4.1.4 Test setup regarding immunity to electrostatic discharges. Discharges via VCP indirect coupling.

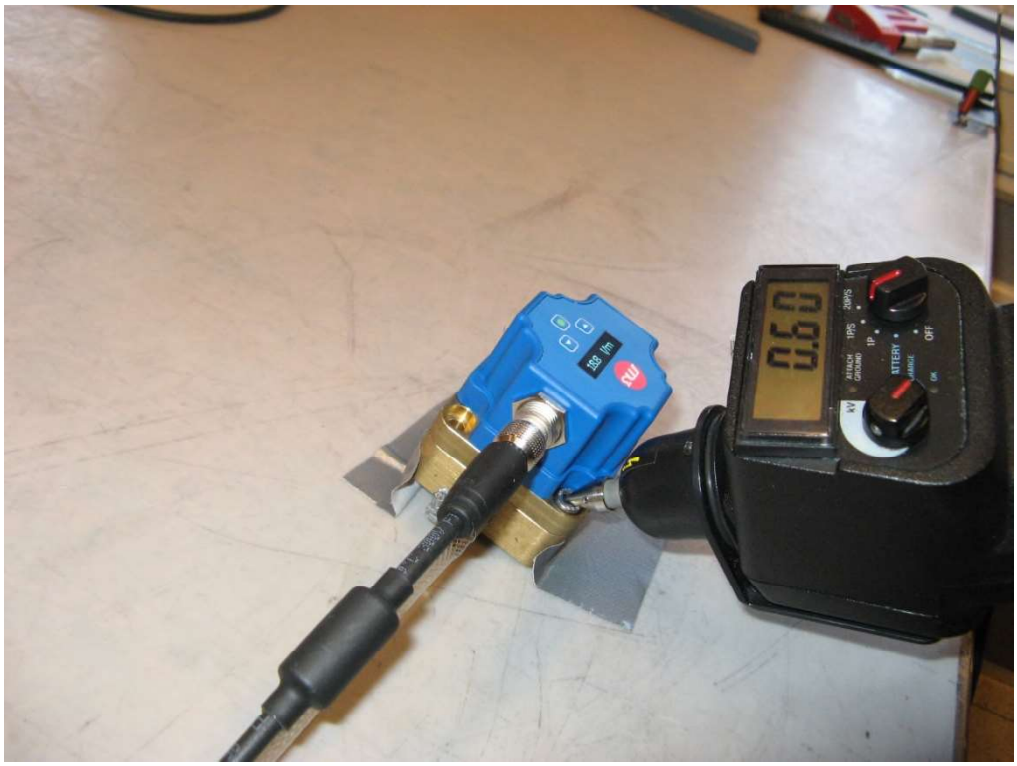


Photo 4.1.5 Test setup regarding immunity to direct contact electrostatic discharges.

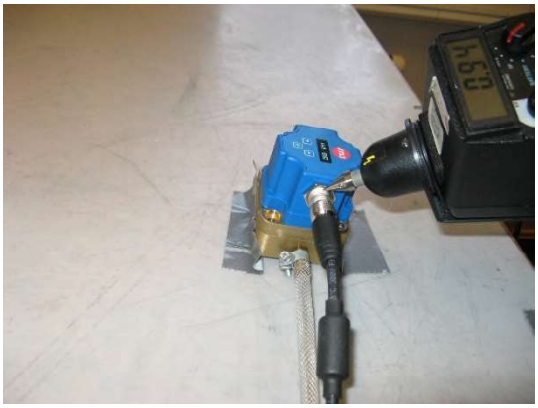


Photo 4.1.6 Test setup regarding immunity to electrostatic discharges. Sample of test points for direct contact discharges.

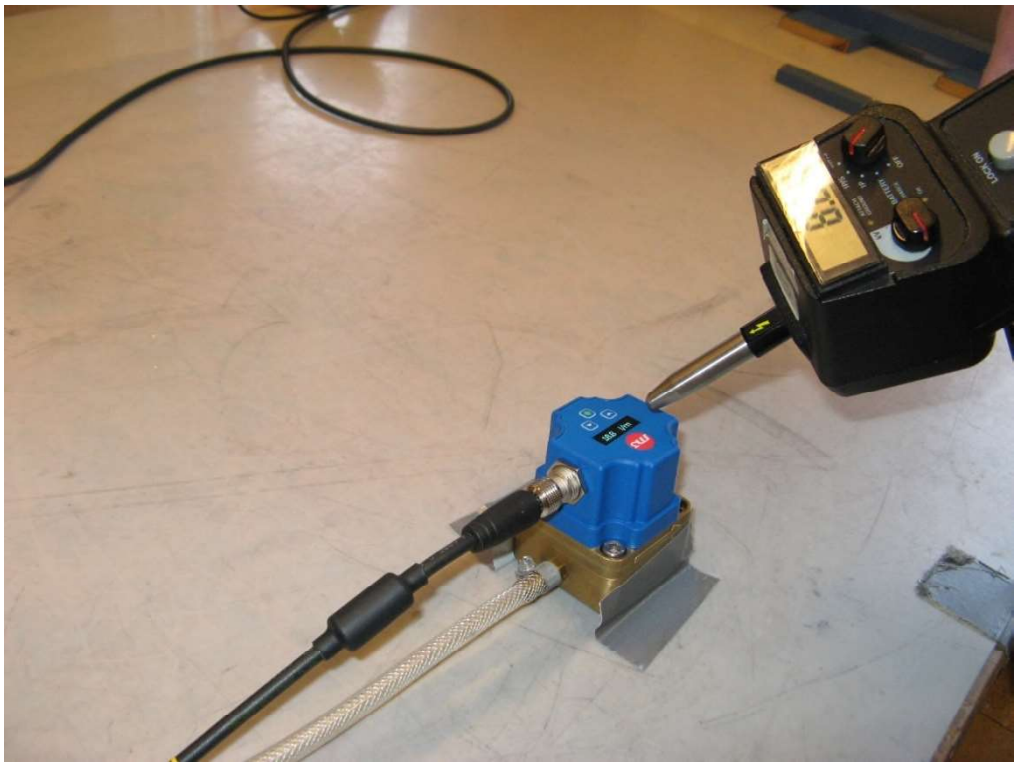


Photo 4.1.7 Test setup regarding immunity to direct air electrostatic discharges.

4.2 Immunity to radio frequency electromagnetic field

Test object	M3 Display	Project no.	621-20XXX
Type	M3 Display	Date	15 Feb. 2021
Serial no.	000	Initials	JANH
Specification	EN/(IEC) 61000-6-2:2005, EN IEC 61000-6-2:2019	Required Perf. criter.	A

Test method Characteristics	EN/(IEC) 61000-4-3:2020 16 point pre-Calibration			Temperature Humidity	23 °C 19 % RH
Test equipm.	0.08 - 1 GHz: EMC Hall B Västerås Setup VIE4 1 - 6 GHz: EMC Hall B Västerås Setup VIE3			Uncertainty	1.9 dB
Frequency range	Modulation	Field direction	Amplitude [V/m]	Passed	Remarks
Front side exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	
Bottom side exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	
Left side (with cable inlet) exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	
Note 1: The display reading was influenced between ~128 – 162 MHz. The deviation of the reading was ≤ 4.5 % but the measured current was not affected. Criteria A was fulfilled.					

Criteria for compliance	See Section 3.2
Test result	The radio frequency electromagnetic field caused no malfunctions
Compliant	Yes
Setup comments	Frequency step: 1 %, dwell time: 1 second
Comments	The test shall normally be performed with the field generating antenna facing each side of the test object. When technically justified the test object can be tested by exposing fewer faces to the generating antenna. In agreement with the client, the sides assumed to be most susceptive were tested here. During the test the EUT case was not separately grounded.

Photo 4.2.1 Test setup regarding immunity to radio frequency electromagnetic field for test between 80-1000 MHz.

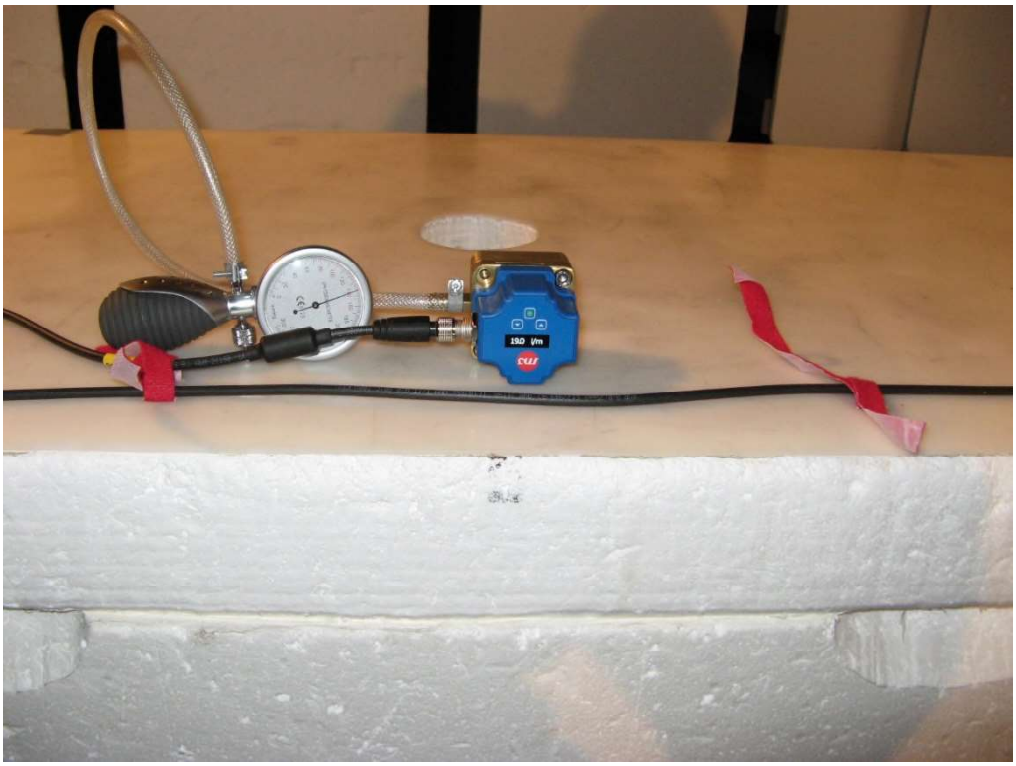


Photo 4.2.2 Test setup regarding immunity to radio frequency electromagnetic field. Front side exposed to the field.

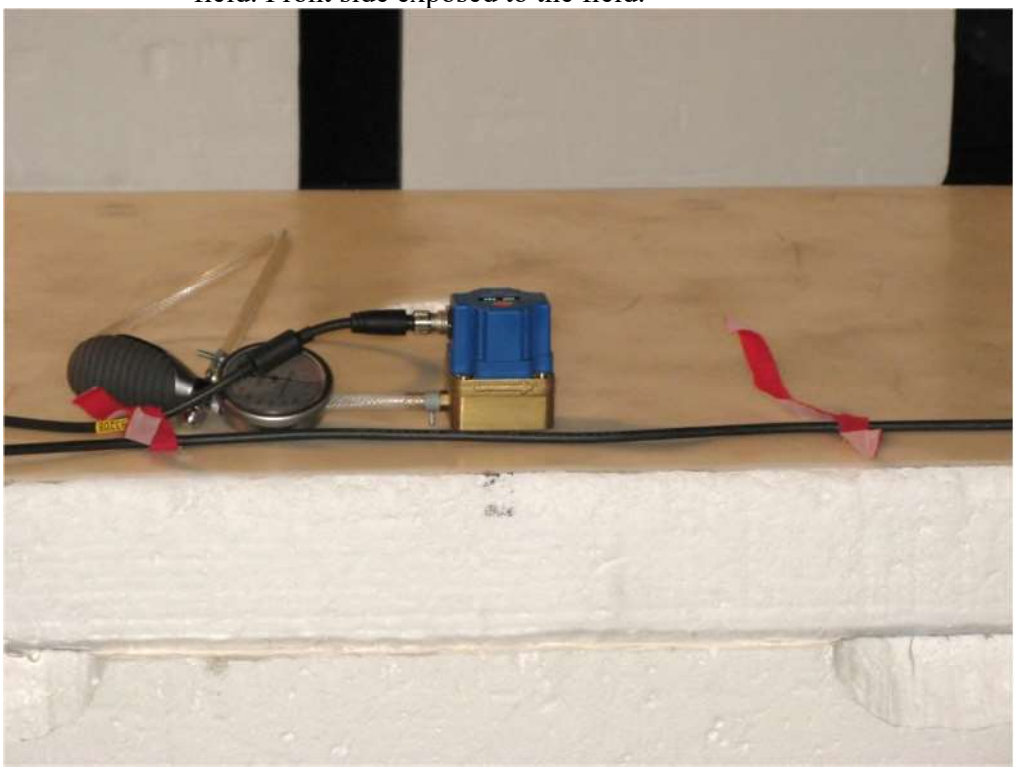


Photo 4.2.3 Test setup regarding immunity to radio frequency electromagnetic field. Bottom side exposed to the field.

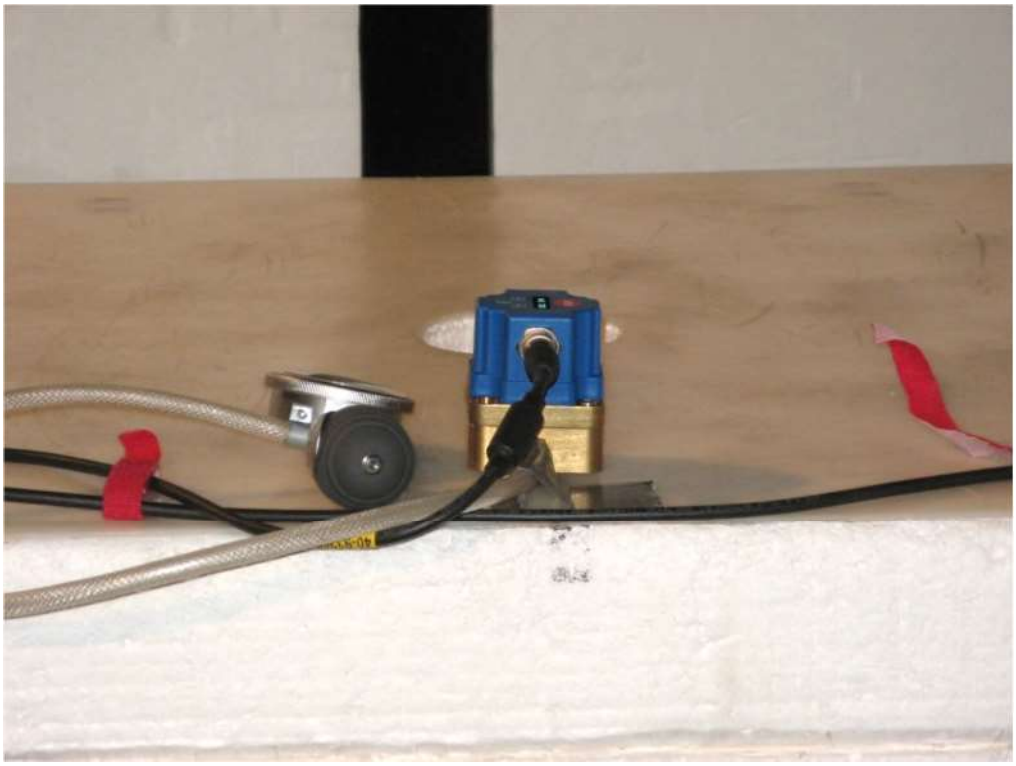


Photo 4.2.4 Test setup regarding immunity to radio frequency electromagnetic field. Left side (with cable inlet) exposed to the field.

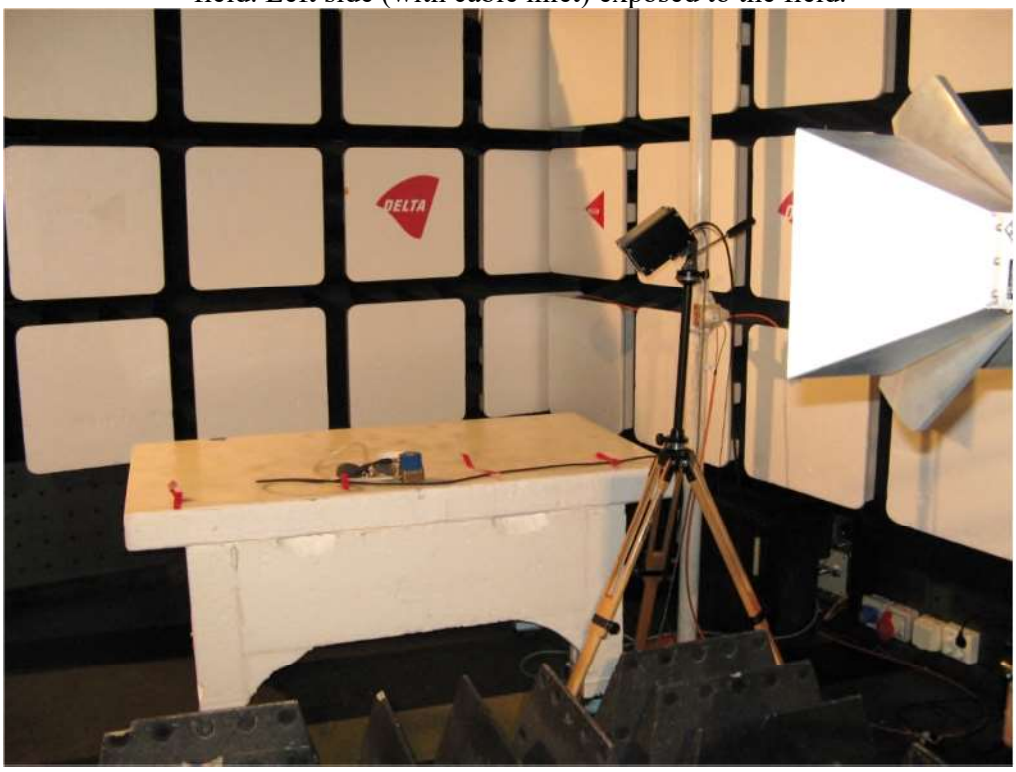


Photo 4.2.5 Test setup regarding immunity to radio frequency electromagnetic field for test above 1 GHz.

4.3 Immunity to fast transients

Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	15 Feb. 18 Mar. 2021
Serial no.	000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method	EN/(IEC) 61000-4-4:2012	Temperature	23 °C
Characteristics	5 kHz bursts of 15/300 ms and 100 kHz bursts of 0.75/300 ms	Humidity	31 % RH
Test equipm.	EMC Transient lab Västerås Setup VIB1	Uncertainty	1.1 dB

Manufacturer's name of port	Test standard's name of port	Coupling	Burst frequency [kHz]	Amplitude [kV]	Passed	Remarks
DC power + signal	Cable	Cap.clamp-GP	5	+/- 1	Yes	Note 1
DC power + signal	Cable	Cap.clamp-GP	100	+/- 1	Yes	Note 1
DC power + signal	Cable	Cap.clamp-GP	5	+/- 1	Yes	Note 2
DC power + signal	Cable	Cap.clamp-GP	100	+/- 1	Yes	Note 2

GP= Ground reference Plane
Note 1: Test object grounded.
Note 2: Test object not grounded.

Criteria for compliance	See Section 3.2
Test result	The fast transients caused no malfunctions
Compliant	Yes
Test time	1 min/polarity
Comments	The EUT was tested with the case both grounded and not grounded

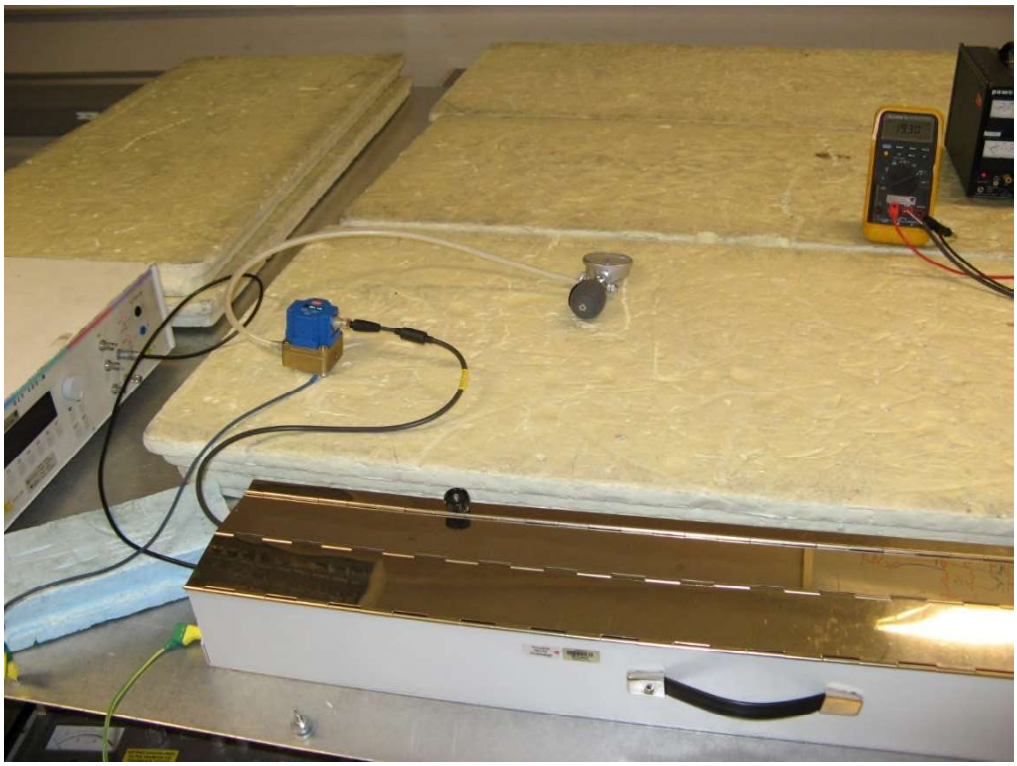


Photo 4.3.1 Test setup regarding immunity to fast transients on power + signal port. Test object grounded.

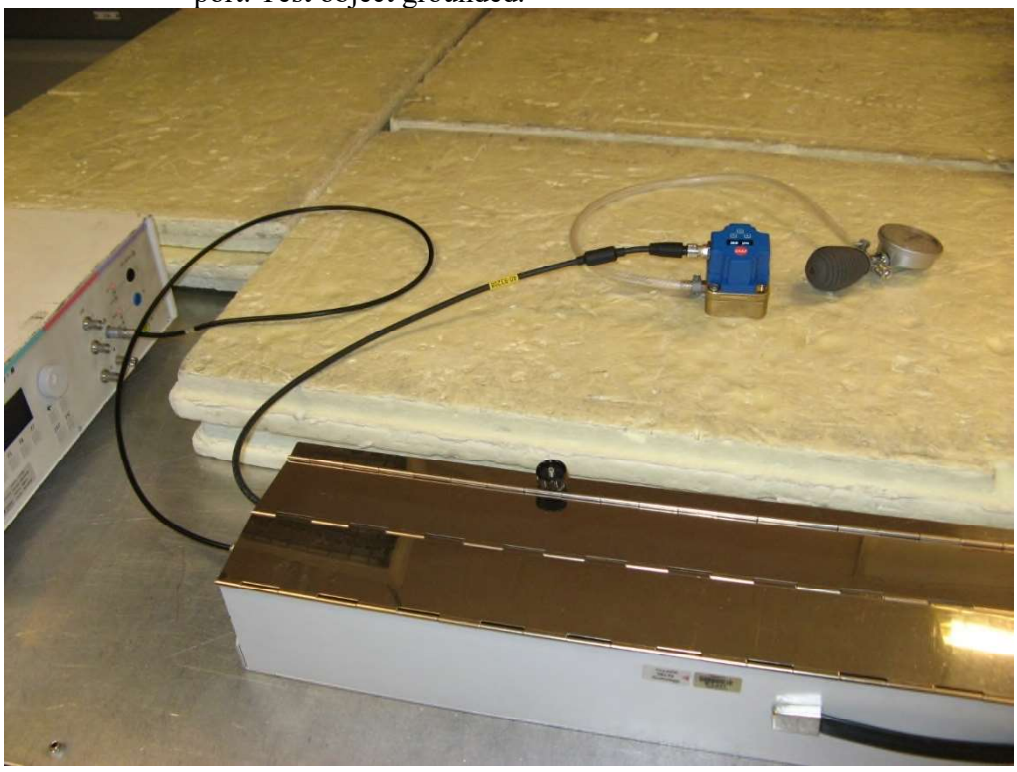


Photo 4.3.2 Test setup regarding immunity to fast transients on power + signal port. Test object not grounded.

4.4 Immunity to surge transients

Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	15 Feb. 25 May 2021
Serial no.	000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method Characteristics	EN/(IEC) 61000-4-5:2014+A1 Open circuit volt.: 1.2/50 µs. Short circuit curr.: 8/20 µs	Temperature Humidity	23 °C 36 % RH
Test equipm.	EMC Transient lab Västerås Setup VID1	Uncertainty	1.1 dB

Manufacturer's name of port	Test standard's name of port	Coupling and generator impedance	No of surges each combin.	Amplitude [kV]	Passed	Remarks
DC power + signal	Unshield.lines	+VDC-PE 42 Ω, 0.5 µF	5	+/- 0.5, 1	Yes	Note 1
DC power + signal	Unshield.lines	0V-PE 42 Ω, 0.5 µF	5	+/- 0.5, 1	Yes	Note 1
DC power + signal	Unshield.lines	+VDC-PE 42 Ω, 0.5 µF	5	+/- 0.5, 1	Yes	Note 2
DC power + signal	Unshield.lines	0V-PE 42 Ω, 0.5 µF	5	+/- 0.5, 1	Yes	Note 2

Note 1: Test object grounded.
Note 2: Test object not grounded.

Time between tests: 10 s

Criteria for compliance: See section 3.2

Test result: With grounded case, the test object restarts for each pulse at 1 kV test level. However, it returns directly to the same condition as before, which means that criterion B is met. Modification 1 was implemented.

Compliant: Yes

Comments: The EUT was tested with the case both grounded and not grounded

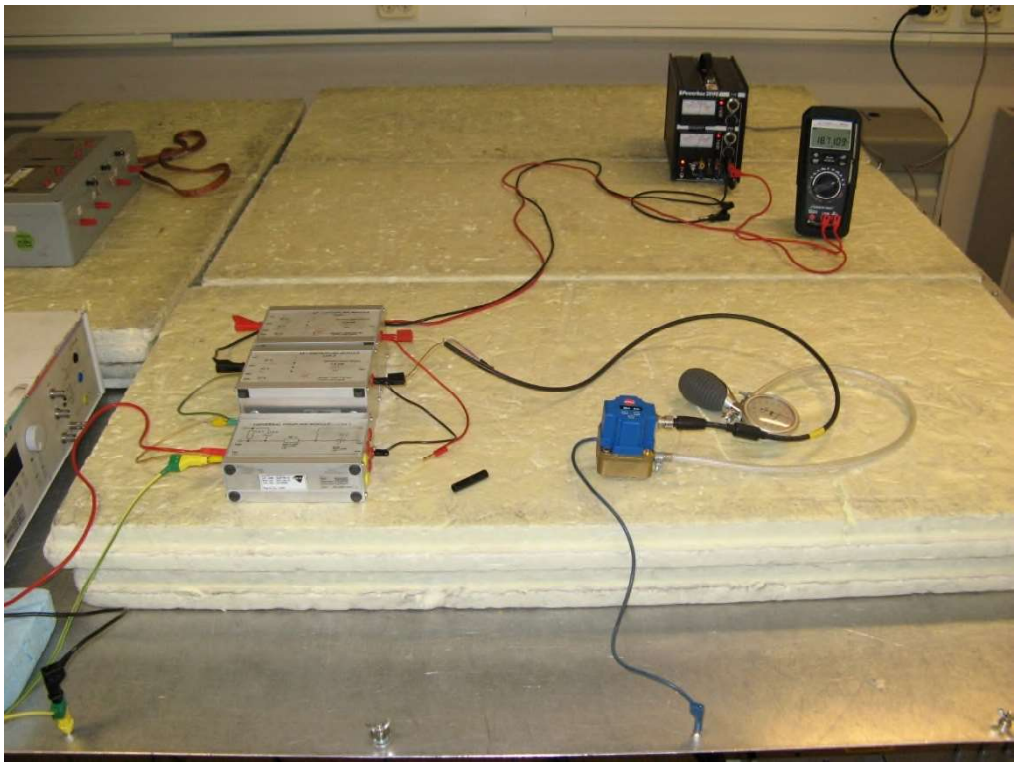


Photo 4.4.1 Test setup regarding immunity to surge transients.

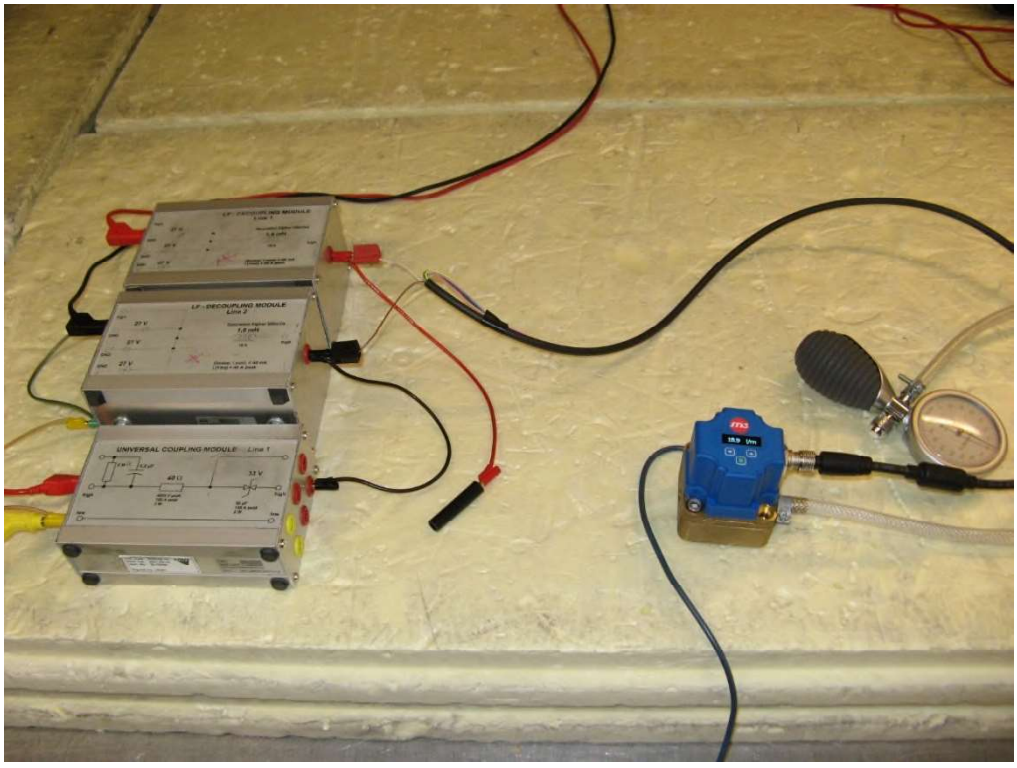


Photo 4.4.2 Test setup regarding immunity to surge transients on power + signal port. Test object grounded.

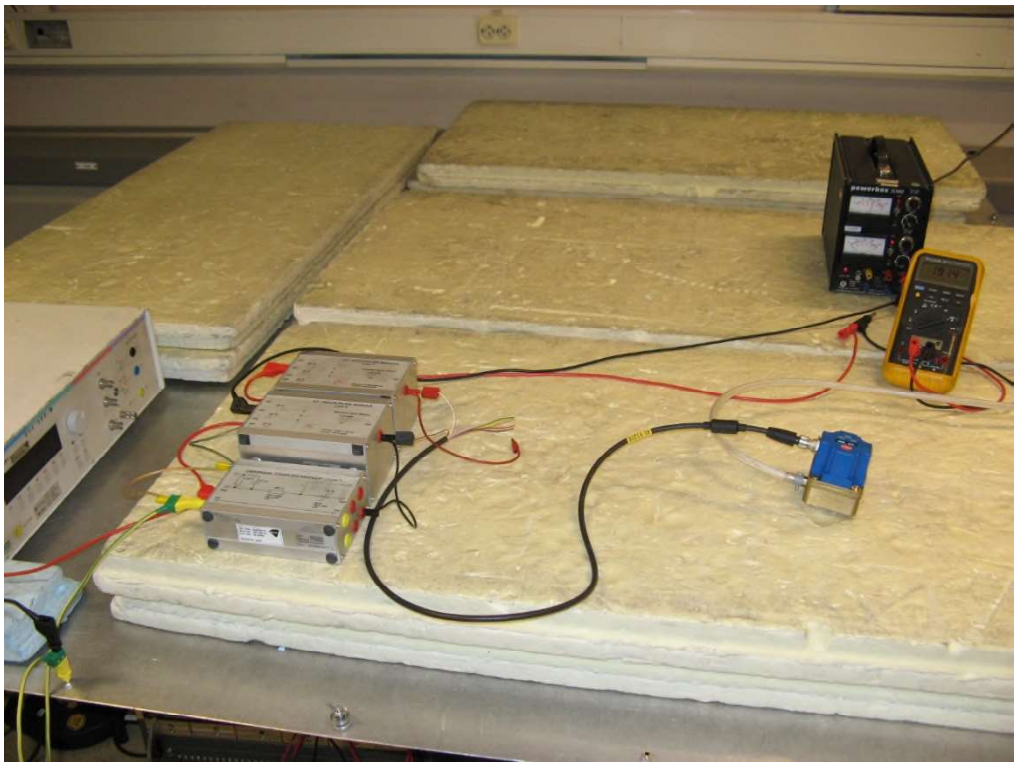


Photo 4.4.3 Test setup regarding immunity to surge transients on power + signal port. Test object not grounded.

4.5 Immunity to conducted radio frequency disturbances

Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	25 May. 2021
Serial no.	000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	A

Test method	EN/(IEC) 61000-4-6:2014	Temperature	23 °C
Characteristics	Frequency range: 0.15-80 MHz, modulation: 80 % AM 1 kHz	Humidity	36 % RH
Test equipm.	EMC Transient lab Västerås Setup VIA3	Uncertainty	1.4 dB

Manufacturer's name of port	Test standard's name of port	Coupling Network	Amplitude [V]	Passed	Remarks
DC power + signal	Unshielded lines	CDN M2, TE-A544	10	Yes	Note 1
DC power + signal	Unshielded lines	CDN M2, TE-A544	10	Yes	Note 2 Note 3

Note 1: Test object grounded.
Note 2: Test object not grounded.
Note 3: The display reading was influenced between ~55 – 70 MHz. The deviation of the reading was ≤ 1.6 % but the measured current was not affected. Criteria A was fulfilled.

Criteria for compliance	See Section 3.2
Test result	The disturbances caused no malfunctions
Compliant	Yes
Setup comments	Frequency step: 1 %, dwell time: 1 second
Comments	The EUT was tested with the case both grounded and not grounded

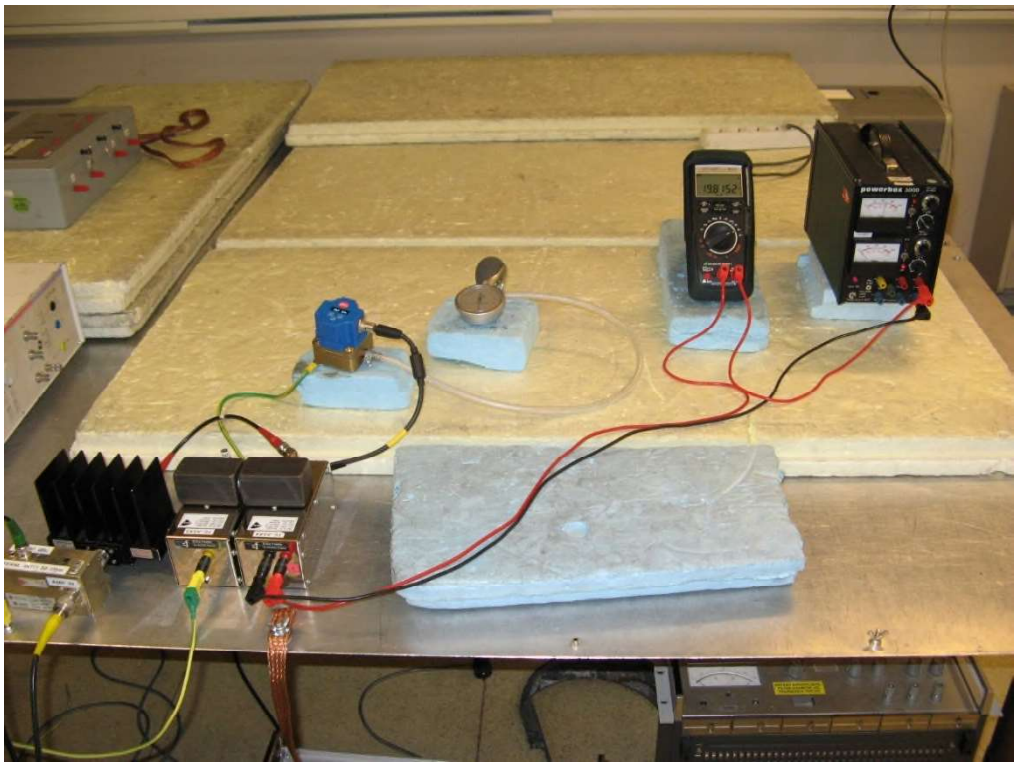


Photo 4.5.1 Test setup regarding immunity to conducted radio frequency disturbances.

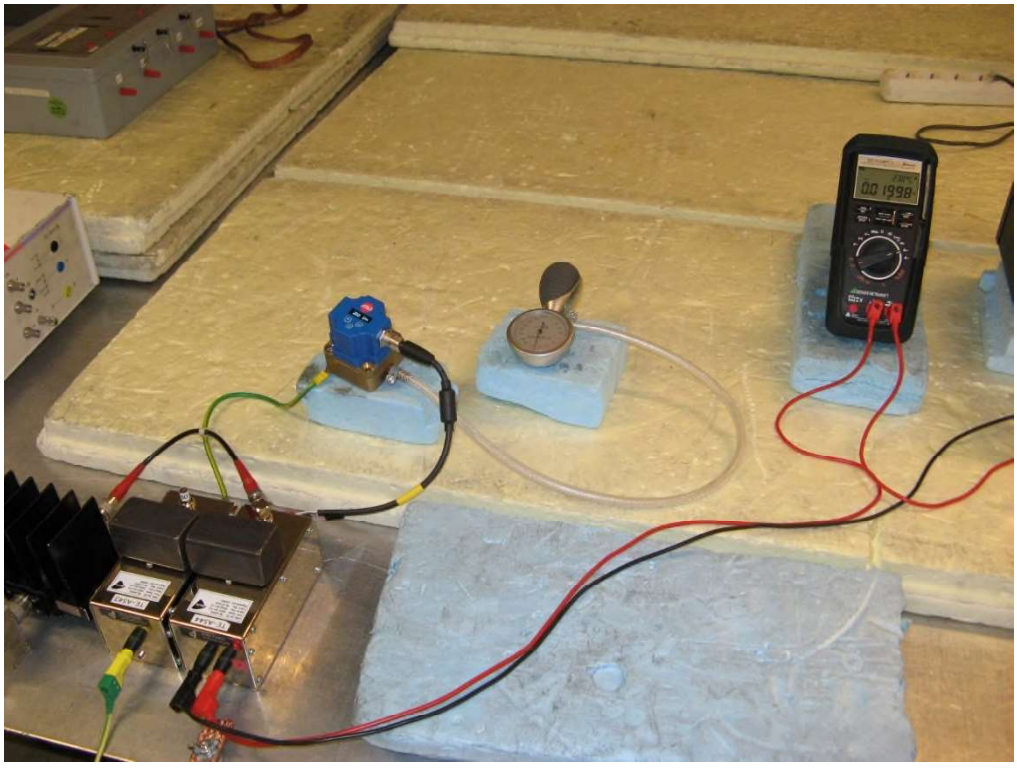


Photo 4.5.2 Test setup regarding immunity to conducted radio frequency disturbances on power + signal port. Test object grounded.

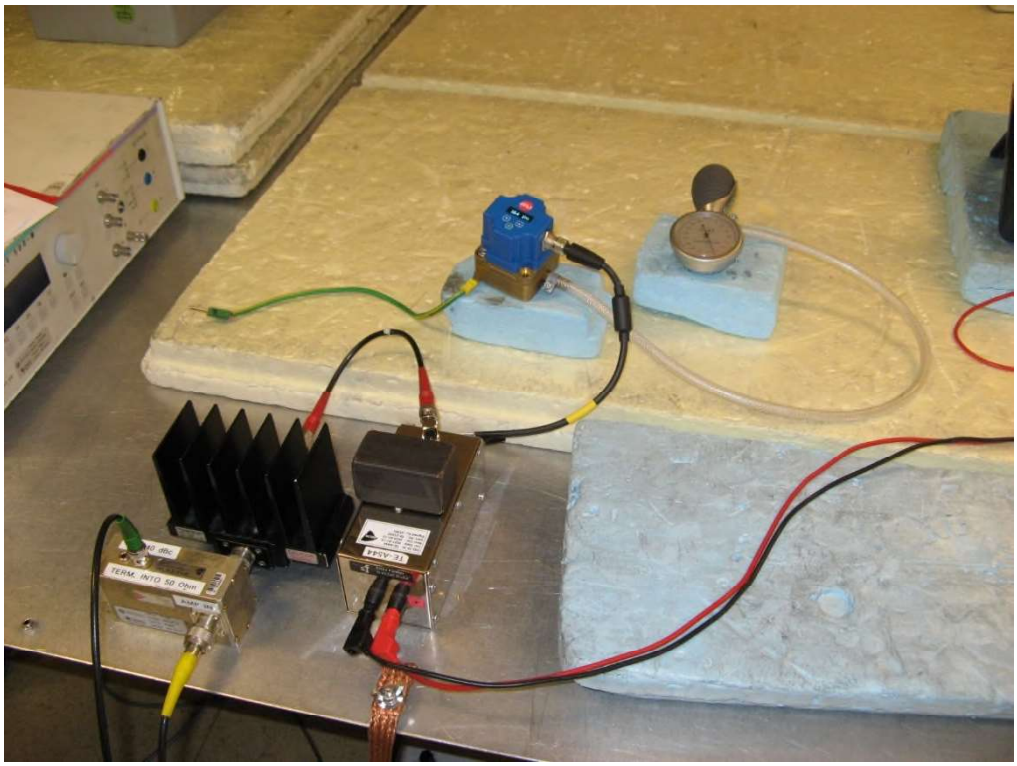


Photo 4.5.3 Test setup regarding immunity to conducted radio frequency disturbances on power + signal port. Test object not grounded.

4.6 Measurement of radio frequency electromagnetic field

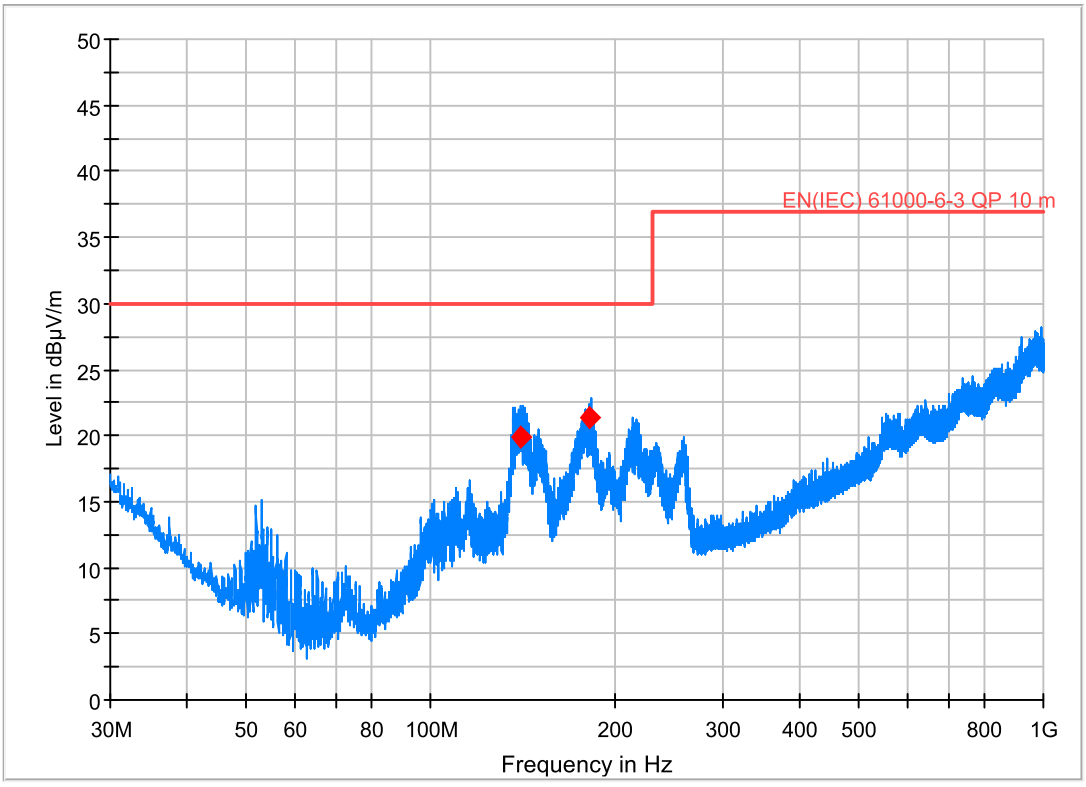
Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	28 May. 2021
Serial no.	000	Initials	LAJ
Specification	EN/(IEC) 61000-6-3:2007+A1	Frequency	30-1000 MHz

Test method Characteristics	CISPR 16-2-3:2016 Complete search, antenna distance 10 m	Temperature Humidity	22 °C 41 % RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMC Hall A Västerås Setup VEC1	Uncertainty	5.0 dB

Test result	The measured field strengths were below the limit
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation. CMAD absorption clamp was used on power supply cable. During the test the EUT case was not separately grounded.

Radiated emission. Complete measurement 30 - 1000 MHz

Test Description:	Radiated emission. Complete measurement 30 - 1000 MHz
Date:	2021-05-28
EUT Name:	M3 Display
Manufacturer:	Eletta Flow AB
Serial Number:	000
Operating Conditions:	Normal operation. 24 VDC supply. 22 l/m "flow"
Test Site:	DELTA Development Technology AB
Operator Name:	Lars J
Test Specification:	EN/(IEC) 61000-6-3:2007+A1
Comment:	



Preview Result 1-PK+ EN(IEC) 61000-6-3 QP 10 m Final_Result QPK

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
140.220000	19.94	30.00	10.06	1000.0	120.000	116.0	V	234.0	-7.1
182.340000	21.30	30.00	8.70	1000.0	120.000	292.0	H	138.0	-9.5

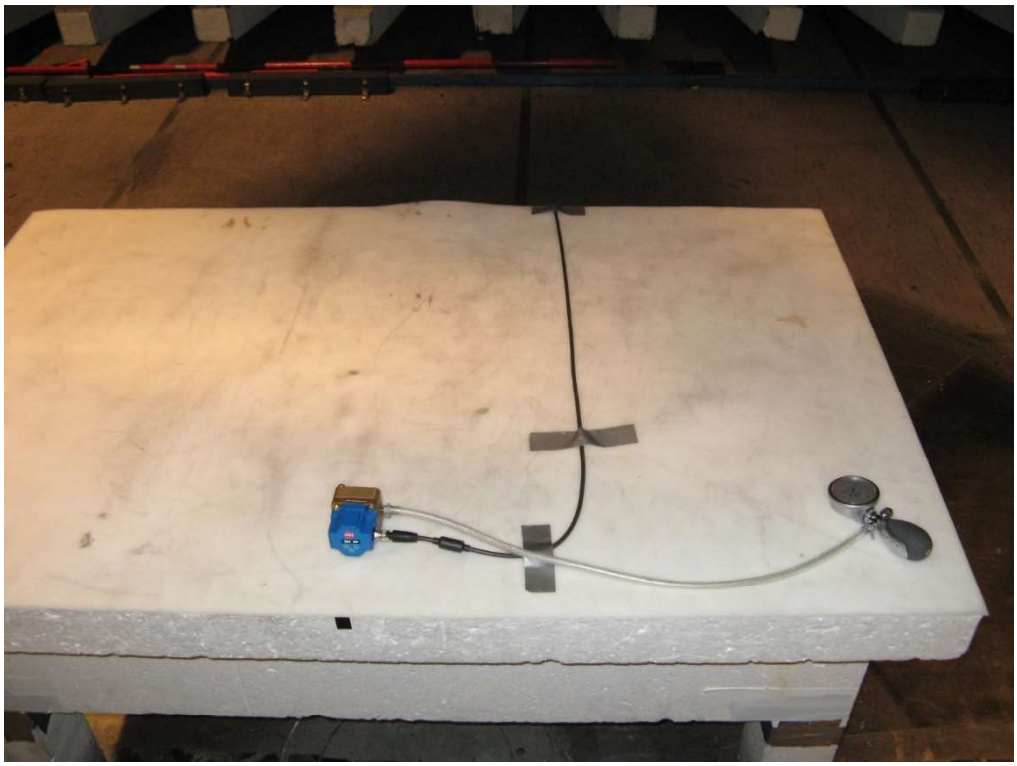


Photo 4.6.1 Test setup regarding measurement of radio frequency electro-magnetic field.

Photo 4.6.2 Test setup regarding measurement of radio frequency electro-magnetic field. Front view.

Photo 4.6.3 Test setup regarding measurement of radio frequency electro-magnetic field. Rear view.

5. National registrations and accreditations

5.1 SWEDAC Accreditation

Organization: Swedish Board for Accreditation and Conformity Assessment - SWEDAC, see www.swedac.se and www.ilac.org

Registration Number: 1688

SWEDAC is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement).

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Designation number: SE0004

Company Number: 187770

Facilities: EMC chamber A 3 m and 10 m

5.3 ISED Registrations

Organization: Innovation, Science and Economic Development Canada

Designation number: SE0006

Company Number: 9347A

Facilities: EMC chamber A 3 m and 10 m

6. List of instruments

Setup VEC1					
Measurement of radio frequency electromagnetic field					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.15	5.0 dB
☒	36020	Measuring receiver	Rohde & Schwarz	ESU26	
☒	IE-B928	Antenna Bilog	Chase	CBL6111A	
☒	36151	Preamplifier	FORCE	Preamp 0.5MHz-4GHz	
☒	36166	Power supply	Mascot	6823 Mod.	
☐	36130	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
☒	36071	Controller	Maturo	NCD	
☒	36072	Tilt antenna mast	Maturo	TAM 4.0-E	
☒		Turntable	Heinrich Deisel	DT 440	

Setup VIA3					
Immunity to conducted radio frequency disturbances					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.00	1.4 dB
☒	E-H908	Signal generator	Marconi	2024	
☒	E-H909	Amplifier	Amplifier Research	75A250	
☒	36148	Average Power Sensor	Rohde & Schwarz	NRP18A	
☒	E-I026	-40 dBc Voltage Sampler	DELTA-Denmark		
☒	E-I022	RF attenuator 6 dB	Weinschel Corp	65-6-3	
☒[1]	TE-A543	CDN, 0.15-230 MHz	Erika Fiedler	CDN M1	
☒[1]	TE-A544	CDN, 0.15-230 MHz	Erika Fiedler	CDN M2	
Note 1: see test sheet for usage of CDN or EM-clamp					

Setup VIB1					
Immunity to fast transients					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
☒	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
☒	36026	Coupling network	EM TEST	CNI 503	
☒	E-L443	Coupling clamp	EM TEST	HFK	

Setup VIC2					
Immunity to electrostatic discharges					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	29838	ESD simulator	KeyTek	MiniZap MZ-15/EC	1.1 dB

Setup VID1					
Immunity to surge transients					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
☒	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
☒	E-K534	Coupling module	EMC-Partner	CN-U	
☒	E-K536	Decoupling module LF	EMC-Partner	DN-LF1	
☒	E-K537	Decoupling module LF	EMC-Partner	DN-LF2	

Setup VIE3					
Immunity to radio frequency electromagnetic fields					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.20	1.8 dB
☒	36102	Signal Generator	Rohde & Schwarz	SMB100A	
☒	304	Field Strength Meter	Amplifier Research	AR-FM 2000	
☒	IE-B886	E-field Sensor	Amplifier Research	FP 2000	
☒	36103	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
☒	36104	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
☒	36100	Broadband Amplifier	Rohde & Schwarz	BBA150-D200	
☒	36101	Broadband Amplifier	Rohde & Schwarz	BBA150-E100	
☒	36105	Horn Antenna	Rohde & Schwarz	HF907	

Setup VIE4					
Immunity to radio frequency electromagnetic fields					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.20	1.8 dB
☒	36185	Signal Generator	Rohde & Schwarz	SMB100B	
☒	304	Field Strength Meter	Amplifier Research	FM 2000	
☒	IE-B886	E-field Sensor	Amplifier Research	FP 2000	
☒	36186	Average Power Sensor	Rohde & Schwarz	NRP6AN	
☒	36187	Average Power Sensor	Rohde & Schwarz	NRP6AN	
☒	36184	Broadband Amplifier	Rohde & Schwarz	BBA150-BC1250	
☒	35105	Antenna Log Periodic	Rohde & Schwarz	HL 023 A1	
☒	29451	Antenna Tower	EMCO	1050	
☒	29452	Tower Controller	EMCO	1050	

Other instruments used					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	35149	Temperature- and hygrometer	Ecolog	TH 1	
☒	IM-A308	Temperature- and hygrometer	Vaisala	HMI31	

DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory

Accred. no. 1688
Testing
ISO/IEC 17025

EMC test of D-series upgrade

Performed for Eletta Flow AB

622-20134-10-R0
Page 1 of 37

08 August 2022

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DELTA Development Technology AB
is a subsidiary company of
FORCE Technology

Title	EMC test of D-series upgrade
Test object	D-series
Report no.	622-20134-10-R0
Test period	03 May 2022 to 06 June 2022
Client	Eletta Flow AB Mälarvägen 3 141 71 Segeltorp Sweden
Contact person	Ahmad Jasim E-mail: ahmad.jasim@eletta.com
Manufacturer	Eletta Flow AB
Specifications	EN IEC 61000-6-2:2019, EN IEC 61000-6-3:2021
Results	The test object was found to be in compliance with the specifications, as listed in Section 1
Test personnel	Jan Högkvist
Date	08 August 2022

Project Manager

Jan Högkvist Specialist
DELTA

Responsible

Lars Johnsson. Head of quality
DELTA

Table of contents

1. Summary of tests

Tests	Test methods	Results
Immunity to electrostatic discharges	EN/(IEC) 61000-4-2:2009	Passed
Immunity to radio frequency electromagnetic fields	EN/(IEC) 61000-4-3:2020	Passed
Immunity to fast transients	EN/(IEC) 61000-4-4:2012	Passed
Immunity to surge transients	EN/(IEC) 61000-4-5:2014+A1	Passed
Immunity to conducted radio frequency disturbances	EN/(IEC) 61000-4-6:2014	Passed
Immunity to power frequency magnetic field	EN/(IEC) 61000-4-8:2010	Not performed Note 1
Measurement of radio frequency electromagnetic field	CISPR 16-2-3:2016	Passed

Note 1: The test object contains no magnetically sensitive devices.

The given result is based on a shared risk principle with respect to the measurement uncertainty.

The edition of the basic standards above is equal or newer than those referenced in the standard below.

Conclusion

The test object mentioned in this report meets the requirements of the standards stated below, with respect to the test listed above.

- EN IEC 61000-6-2:2019 ”Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments”
- EN IEC 61000-6-3:2021 ”Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments”

The test results relate only to the object tested.

2. Test object and auxiliary equipment

2.1 Test object

Photo 2.1.1 D-series upgrade

Test object 2.1.1

Name of test object	D-series upgrade
Model / type	D-series
Part no.	-
Serial no.	00000
FCC ID	-
Manufacturer	Eletta Flow AB
Supply voltage	19 - 28 Vdc (24Vdc nominal)
Software version	V3.0
Hardware version	V1.1
Cycle time	-
Highest frequency generated or used	32 MHz
Comment	
Received	Date: 03 May. 2022 Status: Prototype

2.2 Auxiliary equipment


Photo 2.2.1 Auxiliary equipment.

Auxiliary equipment 2.2.1

Name of auxiliary equipment	Digital multimeter
Model / type	MetraHit 18S
DELTA ident no.	IE-C966
Manufacturer	Metrawatt
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used to measure the output current from the test object

Auxiliary equipment 2.2.2

Name of auxiliary equipment	Digital multimeter
Model / type	34401A
DELTA ident no.	36061
Manufacturer	Agilent
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used to measure the output current from the test object

Auxiliary equipment 2.2.3

Name of auxiliary equipment	Power supply
Model / type	B60-10R
DELTA ident no.	IE-C183
Manufacturer	Oltronix
Supply voltage	Output set to 24 VDC
Comment	Auxiliary equipment supplied by DELTA, who also has the responsibility for its correct function and set up. Used for power to the test object

3. Geeral test conditions

3.1 Test setup during test

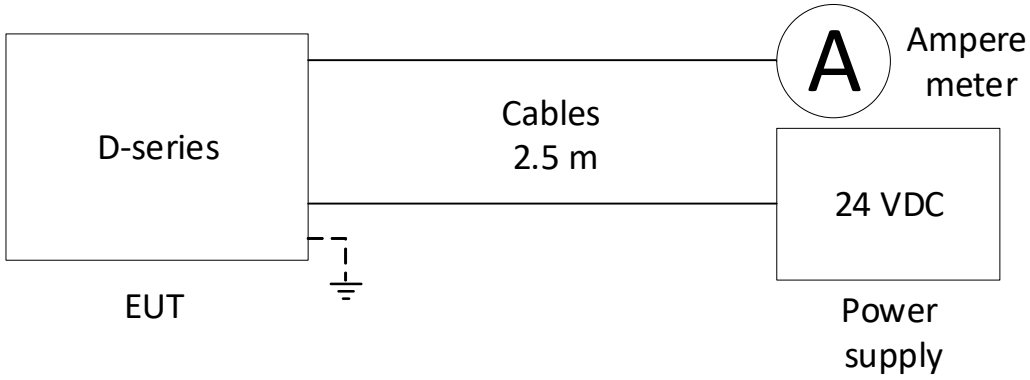


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

3.1.1 Cables

The following cables were used during test.

Port name	Port type	Shielded/ unshielded	Length during test [m]	Maximum length [m]	Remarks
DC power	DC power	Unshielded	0.3 - 2.5	> 30	
Analog output	signal	Unshielded	0.3 - 2.5	> 30	

3.1.2 Description and intended use of test object

The object is used for measuring the flow of liquid and gas and utilizes differential pressure to calculate the flow of the medium.

3.1.3 Test modes and supervision during immunity and emission tests

The potentiometer that measuring mechanical movement is fixed.

The flow monitored on a display. The flow can be monitored by measuring the loop current between the object and the power supply.

The test was monitored by measuring the output current and visually observing the display.

3.1.4 Nominal power consumption

Nominal 24 VDC. 2.4 W.

3.2 Criteria for compliance during immunity test

Performance criteria according to corresponding standard were applied during immunity tests as follows:

General

The test object shall not become dangerous or unsafe as a result of the application of the tests.

Performance criterion A

The test object shall continue to operate as intended during the test.

Influence on the analog mA output signal shall be < +/-2% FS.

Influence on the display indicator shall be < +/-2% FS.

No error or warning signals are allowed.

The test object is not allowed to change operating mode.

Performance criterion B

The test object shall continue to operate as intended after the test.

No change of operating state or stored data are allowed.

Performance criterion C

The test object is allowed to have temporary degradation or loss of function or performance which requires operator intervention or systems reset.

3.3 Modifications of the test object

The following modification was implemented to the test object.

- 1. In order to improve the result of Surge transient immunity test and Conducted RF immunity test the following modification was implemented:
  The following components were misplaced and removed:

Component	Description
R4	B72500E0250K060
D3	CDSF4148
C8	22nF

3.4 Test sequence

The tests described in this test report were performed in the following sequence:

1. Measurement of radio frequency electromagnetic field
2. Immunity to radio frequency electromagnetic fields
3. Immunity to fast transients
4. Immunity to surge transients. Failed.
5. Immunity to conducted radio frequency disturbances
6. Immunity to electrostatic discharges
7. Modification 1 implemented. See section 3.3 for details.
8. Immunity to surge transients. Retest. Passed.
9. Immunity to conducted radio frequency disturbances. Retest.

4. Test results

4.1 Immunity to electrostatic discharges

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	10 May 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method Characteristics	EN/(IEC) 61000-4-2:2009 Discharge network: 150 pF, 330 Ω	Temperature Humidity	24 °C 35% RH
Test equipm.	EMC Transient lab Västerås Setup VIC2	Uncertainty	1.1 dB

Surface under test	Test standard's name of surface	Coupling of discharges	No of disch. each combin.	Amplitude [kV]	Passed	Remarks
Enclosure Indirect discharge	Enclosure	HCP contact	10	+/- 4	Yes	See Photo 4.1.2 and 4.1.3
Enclosure Indirect discharge	Enclosure	VCP contact	10	+/- 4	Yes	See Photo 4.1.4 and 4.1.5
Metallic case and screws	Metallic	Direct contact	10	+/- 4	Yes	See Photo 4.1.6 4.1.7 and 4.1.8
Plastic display	Insulated	Direct air	10	+/- 2, 4 and 8	Yes	See Photo 4.1.9

Criteria for compliance	See Section 3.2
Test result	The discharges caused no malfunctions
Compliant	Yes. Criterion A fulfilled.
Comments	The EUT was tested with the case both grounded and not grounded

Photo 4.1.1 Test setup regarding immunity to electrostatic discharges.

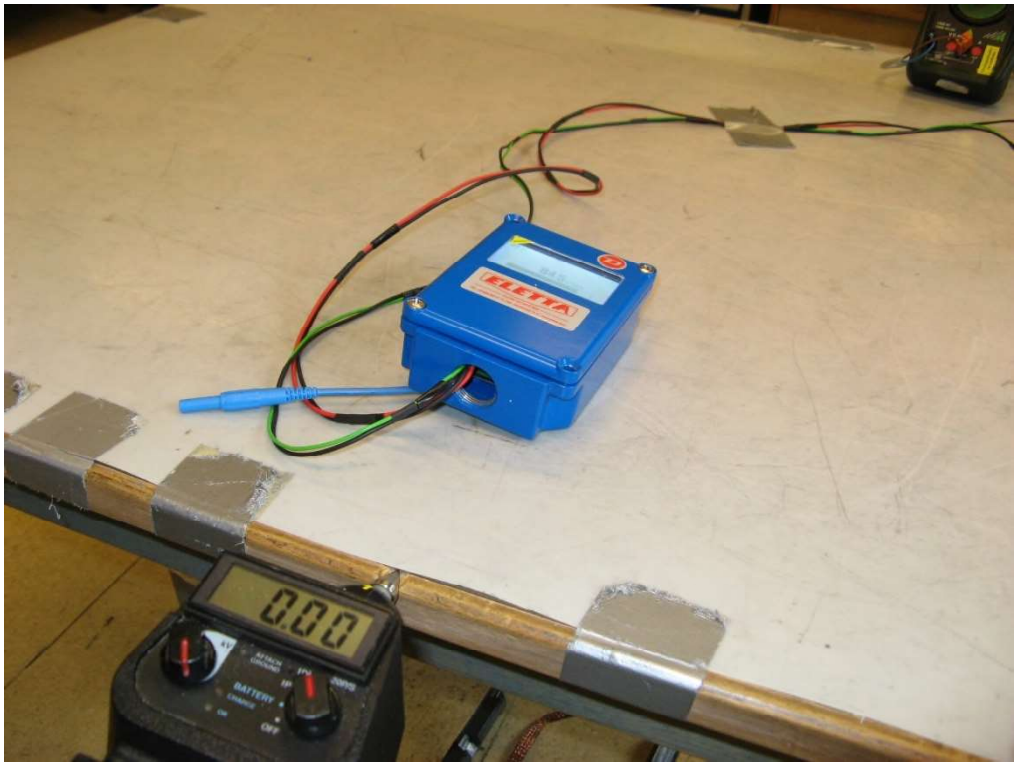


Photo 4.1.2 Test setup regarding immunity to electrostatic discharges. Discharges via HCP indirect coupling.

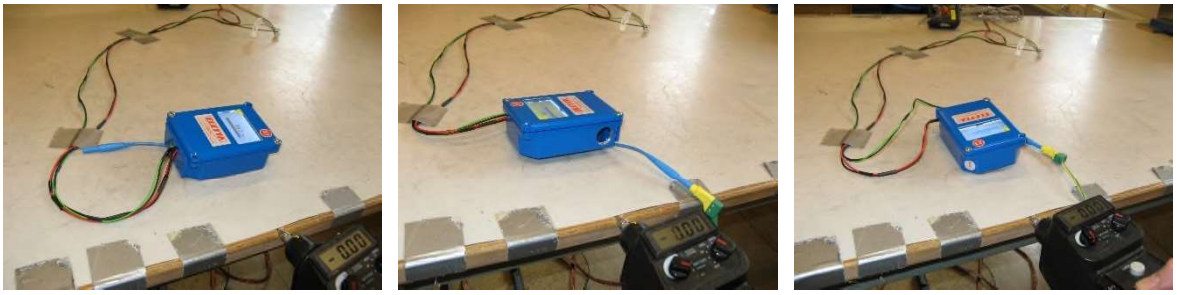


Photo 4.1.3 Test setup regarding immunity to electrostatic discharges.
Discharges via HCP indirect coupling.

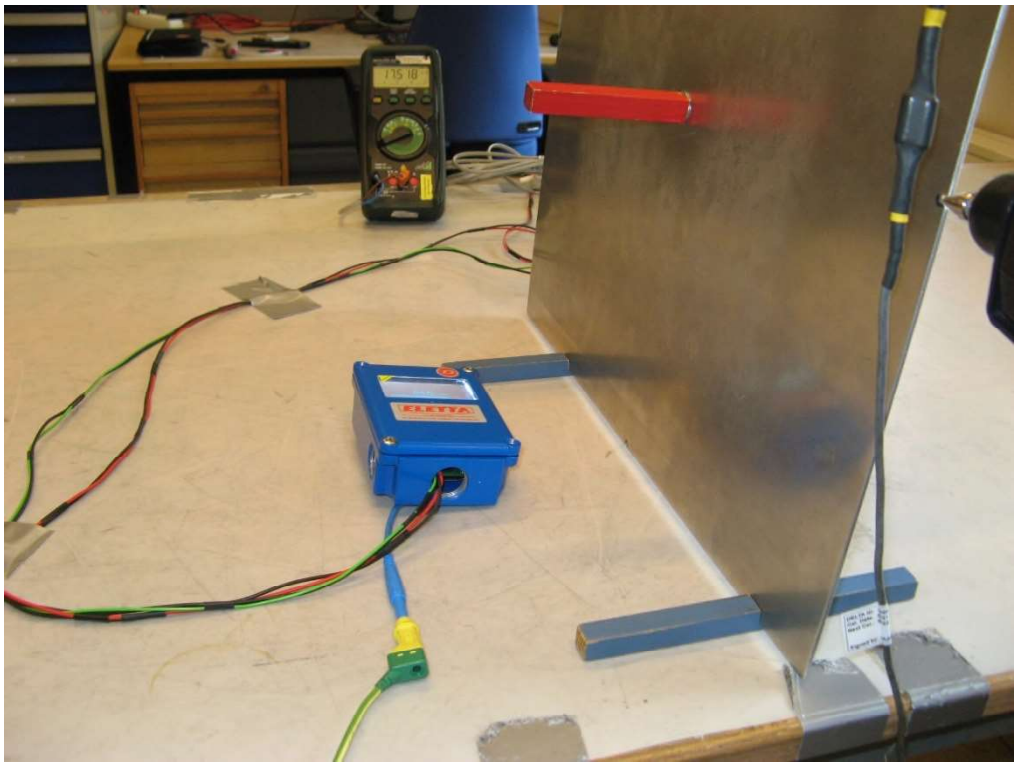


Photo 4.1.4 Test setup regarding immunity to electrostatic discharges.
Discharges via VCP indirect coupling.

Photo 4.1.5 Test setup regarding immunity to electrostatic discharges.
Discharges via VCP indirect coupling.

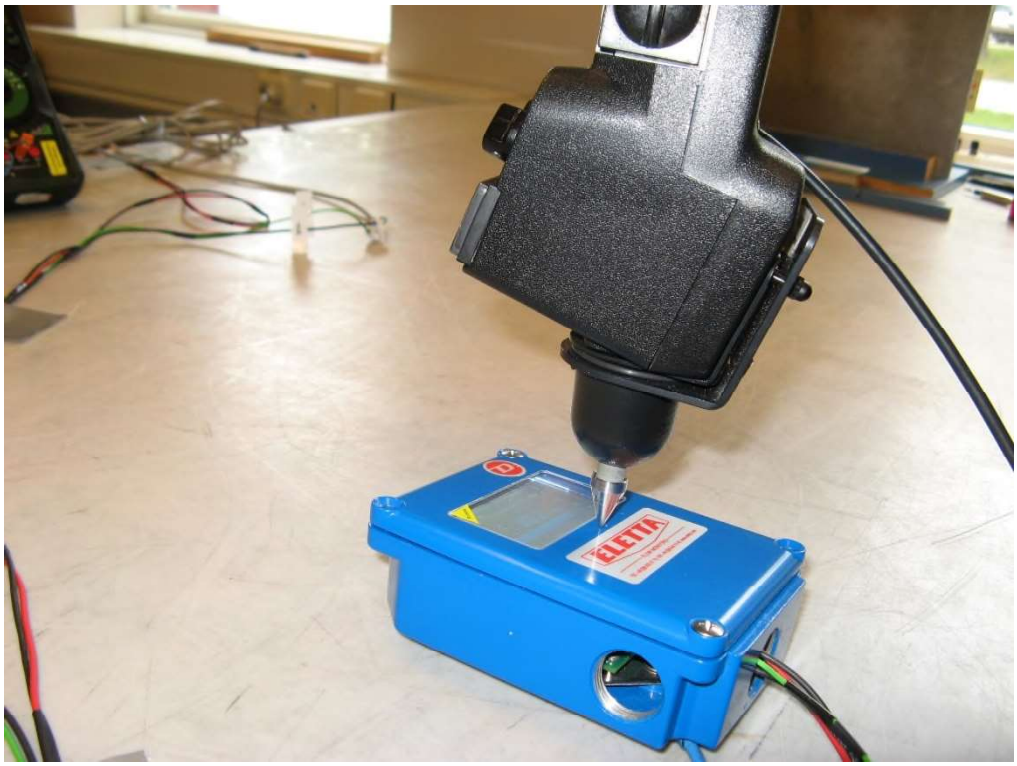


Photo 4.1.6 Test setup regarding immunity to direct contact electrostatic discharges.

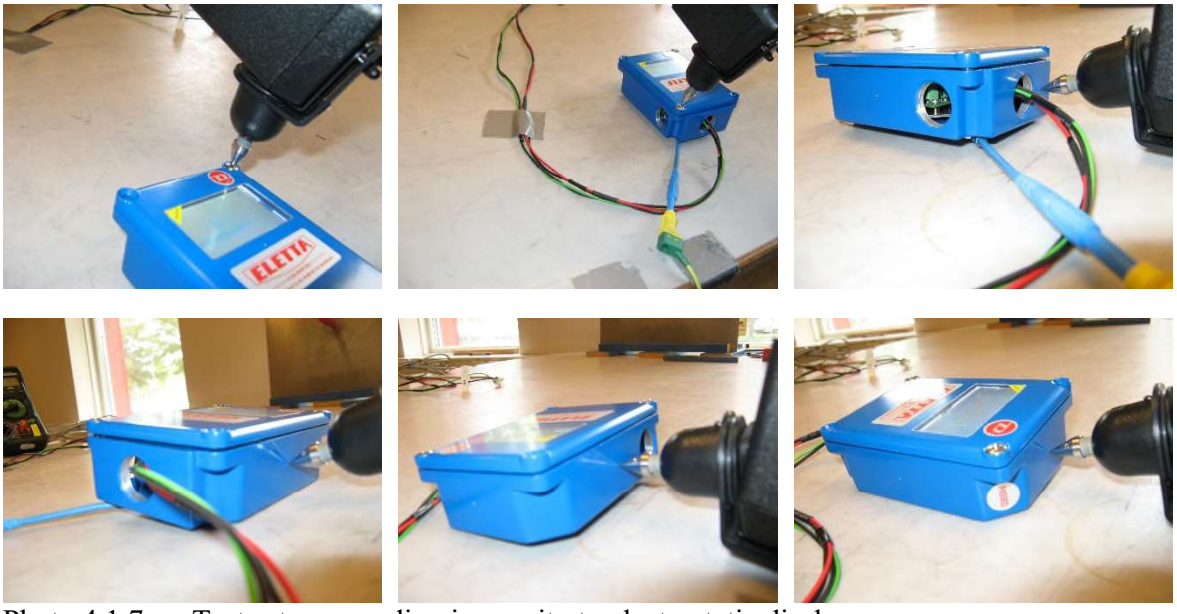


Photo 4.1.7 Test setup regarding immunity to electrostatic discharges.
Test points for direct contact discharges.

Photo 4.1.8 Test setup regarding immunity to electrostatic discharges.
Test points for direct contact discharges.

Photo 4.1.9 Test setup regarding immunity to direct air electrostatic discharges.

4.2 Immunity to radio frequency electromagnetic field

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	05 May 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	A

Test method Characteristics	EN/(IEC) 61000-4-3:2020 16 point pre-Calibration	Temperature Humidity	24 °C 26% RH
Test equipm.	0.08 - 1 GHz: EMC Hall B Västerås Setup VIE4 1 - 6 GHz: EMC Hall B Västerås Setup VIE3	Uncertainty	1.8 dB

Frequency range	Modulation	Field direction	Amplitude [V/m]	Passed	Remarks
Front side exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	Note 1
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	
Bottom side (with cable inlet) exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	Note 1
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	
Left side exposed to the field					
80-1000 MHz	80 % AM 1 kHz	Horizontal	10	Yes	Note 1
80-1000 MHz	80 % AM 1 kHz	Vertical	10	Yes	Note 1
1.4-6 GHz	80 % AM 1 kHz	Horizontal	3	Yes	
1.4-6 GHz	80 % AM 1 kHz	Vertical	3	Yes	

Note 1: The display reading had a small deviation below 100 MHz. The deviation of the reading was less than 2 % but the measured current was not affected. Criteria A was fulfilled.

Criteria for compliance	See Section 3.2
Test result	The radio frequency electromagnetic field caused no malfunctions
Compliant	Yes
Setup comments	Frequency step: 1 %, dwell time: 1 second
Comments	The test shall normally be performed with the field generating antenna facing each side of the test object. When technically justified the test object can be tested by exposing fewer faces to the generating antenna. In agreement with the client, the sides assumed to be most susceptive were tested here. During the test the EUT case was grounded.

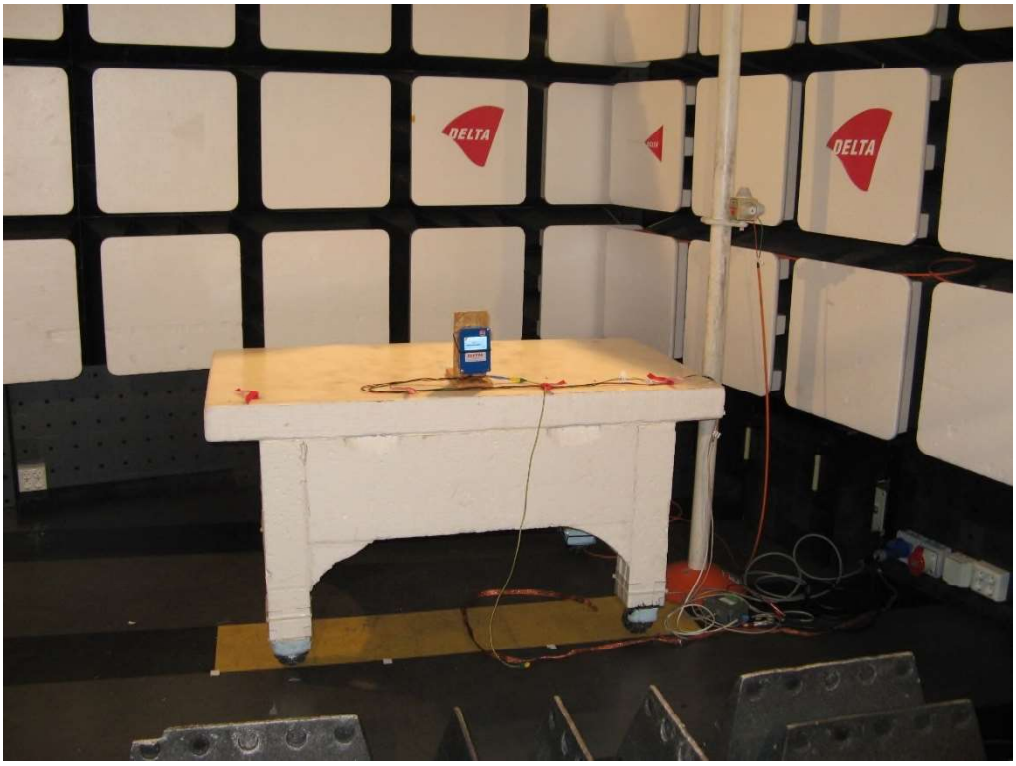


Photo 4.2.1 Test setup regarding immunity to radio frequency electromagnetic field for test between 80-1000 MHz.

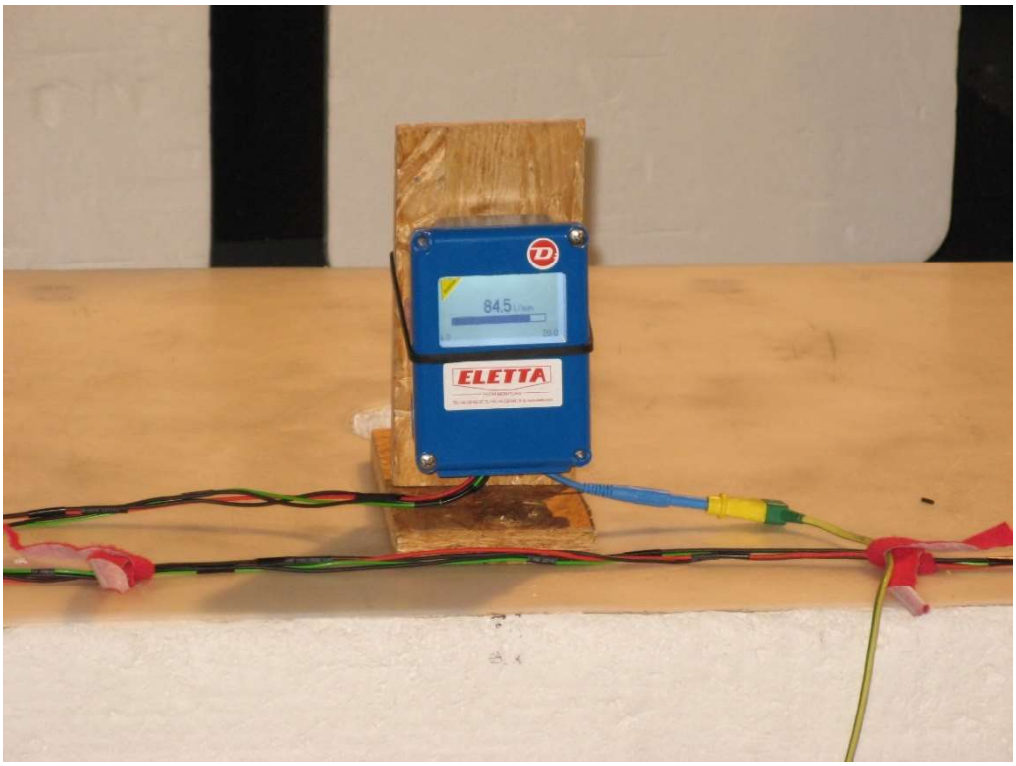


Photo 4.2.2 Test setup regarding immunity to radio frequency electromagnetic field. Front side exposed to the field.

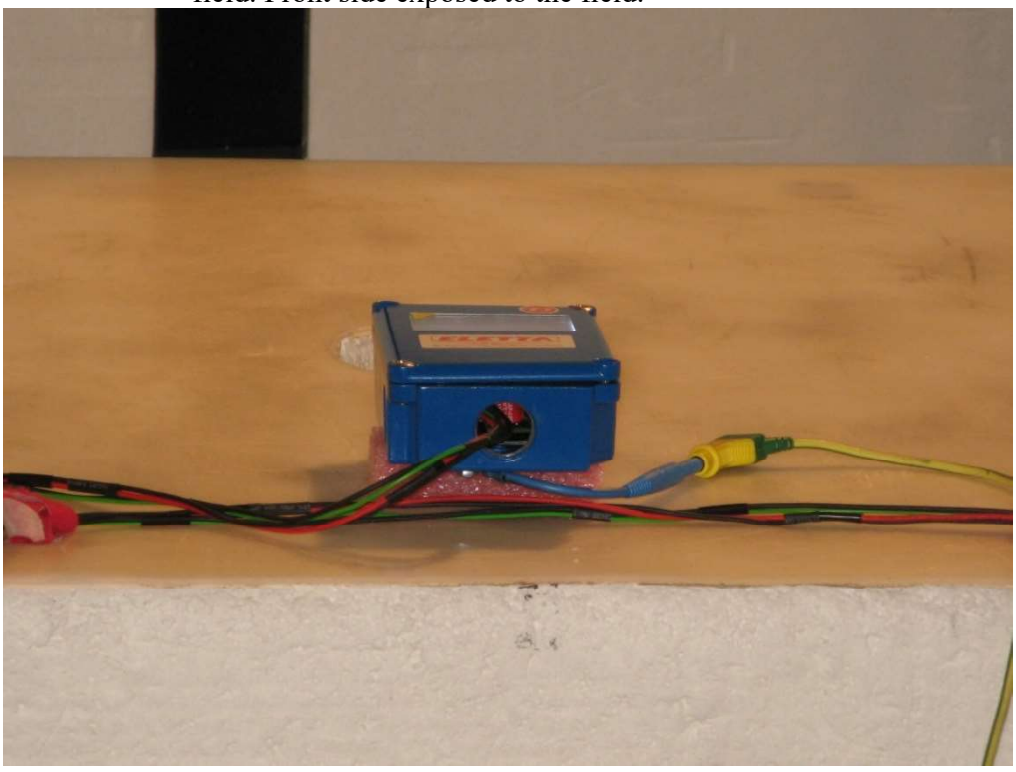


Photo 4.2.3 Test setup regarding immunity to radio frequency electromagnetic field. Bottom side (with cable inlet) exposed to the field.

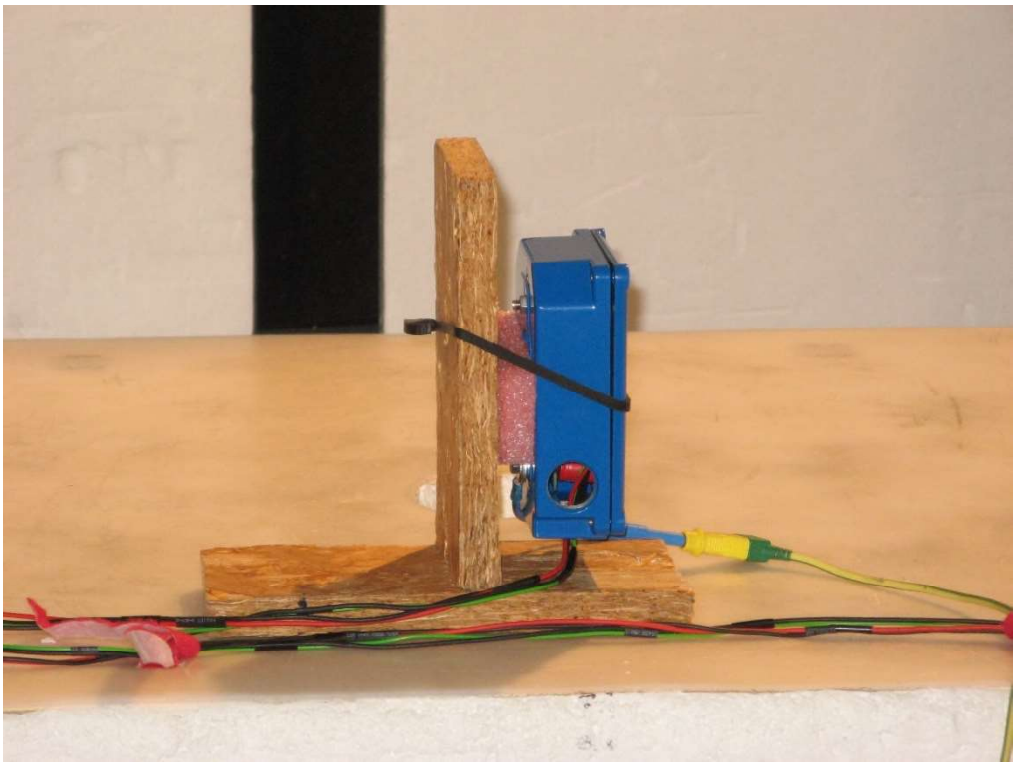


Photo 4.2.4 Test setup regarding immunity to radio frequency electromagnetic field. Left side exposed to the field.

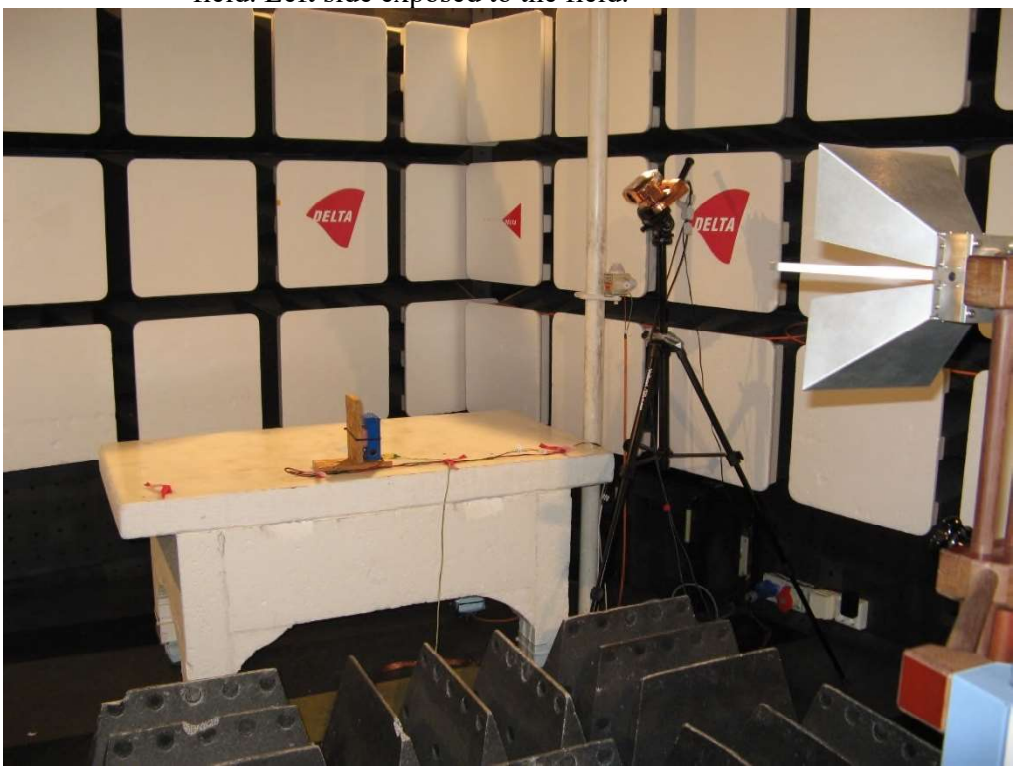


Photo 4.2.5 Test setup regarding immunity to radio frequency electromagnetic field for test above 1 GHz.

4.3 Immunity to fast transients

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	09 May 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method Characteristics	EN/(IEC) 61000-4-4:2012 5 kHz bursts of 15/300 ms and 100 kHz bursts of 0.75/300 ms	Temperature Humidity	24 °C 22% RH
Test equipm.	EMC Transient lab Västerås Setup VIB1	Uncertainty	1.1 dB

Manufacturer's name of port	Test standard's name of port	Coupling	Burst frequency [kHz]	Amplitude [kV]	Passed	Remarks
DC power	DC power	All leads-GP	5	+/- 1	Yes	Note 1
DC power	DC power	All leads-GP	100	+/- 1	Yes	Note 1
DC power	DC power	All leads-GP	5	+/- 1	Yes	Note 2
DC power	DC power	All leads-GP	100	+/- 1	Yes	Note 2
Analog output	Cable	Cap.clamp-GP	5	+/- 1	Yes	Note 1
Analog output	Cable	Cap.clamp-GP	100	+/- 1	Yes	Note 1
Analog output	Cable	Cap.clamp-GP	5	+/- 1	Yes	Note 2
Analog output	Cable	Cap.clamp-GP	100	+/- 1	Yes	Note 2

GP= Ground reference Plane
Note 1: Test object grounded.
Note 2: Test object not grounded.

Criteria for compliance	See Section 3.2
Test result	The fast transients caused no malfunctions
Compliant	Yes
Test time	1 min/polarity
Comments	The EUT was tested with the case both grounded and not grounded

Photo 4.3.1 Test setup regarding immunity to fast transients.

Photo 4.3.2 Test setup regarding immunity to fast transients on DC power port. Test object case not grounded.

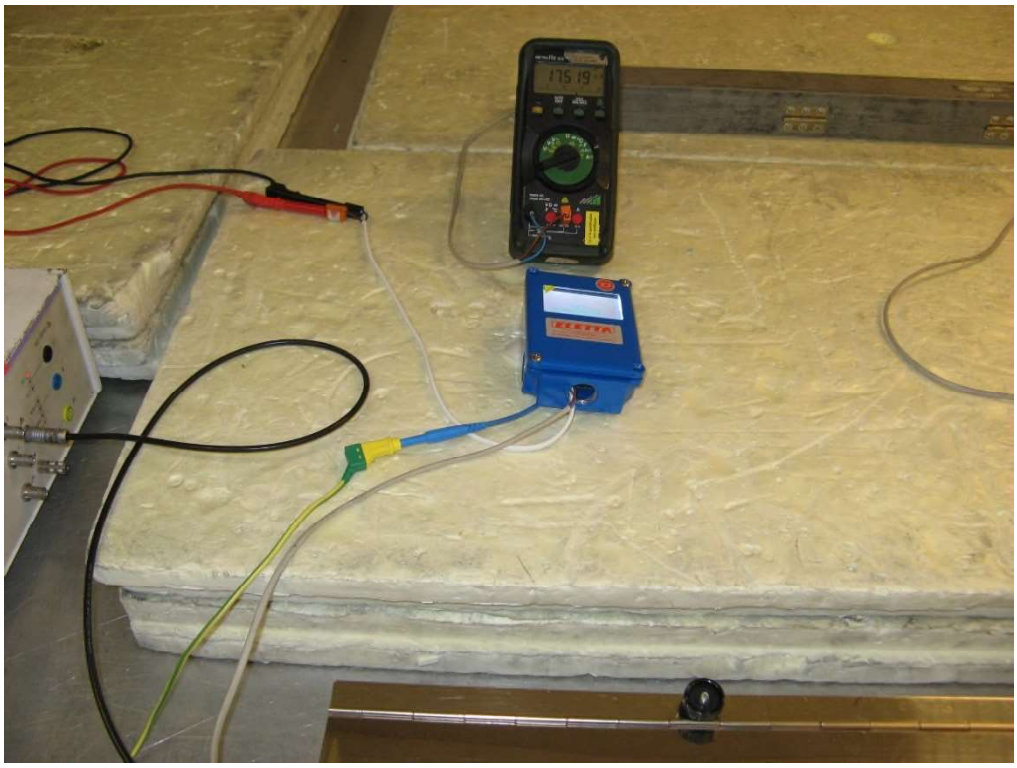


Photo 4.3.3 Test setup regarding immunity to fast transients on analog output port. Test object case grounded.

4.4 Immunity to surge transients

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	09 May, 09 June 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	B

Test method Characteristics	EN/(IEC) 61000-4-5:2014+A1 Open circuit volt.: 1.2/50 μs. Short circuit curr.: 8/20 μs	Temperature Humidity	24 °C 41% RH
Test equipm.	EMC Transient lab Västerås Setup VID5	Uncertainty	1.1 dB

Manufacturer's name of port	Test standard's name of port	Coupling and generator impedance	No of surges each combin.	Amplitude [kV]	Passed	Remarks
DC power	DC power	+VDC - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 1
DC power	DC power	0 V - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 1
DC power	DC power	+VDC - 0 V 42 Ω, 0.5 μF	5	+/- 0.5	Yes	Note 1
DC power	DC power	+VDC - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 2
DC power	DC power	0 V - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 2
DC power	DC power	+VDC - 0 V 42 Ω, 0.5 μF	5	+/- 0.5	Yes	Note 2
Analog output	Unshielded lines	+VDC - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 1
Analog output	Unshielded lines	0 V - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 1
Analog output	Unshielded lines	+VDC - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 2
Analog output	Unshielded lines	0 V - PE 42 Ω, 0.5 μF	5	+/- 0.5, 1	Yes	Note 2

Note 1: Test object grounded.
Note 2: Test object not grounded.

Time between tests	10 s
Criteria for compliance	See section 3.2
Test result	The disturbances caused no malfunctions with modification 1 implemented
Compliant	Yes
Comments	The EUT was tested with the case both grounded and not grounded

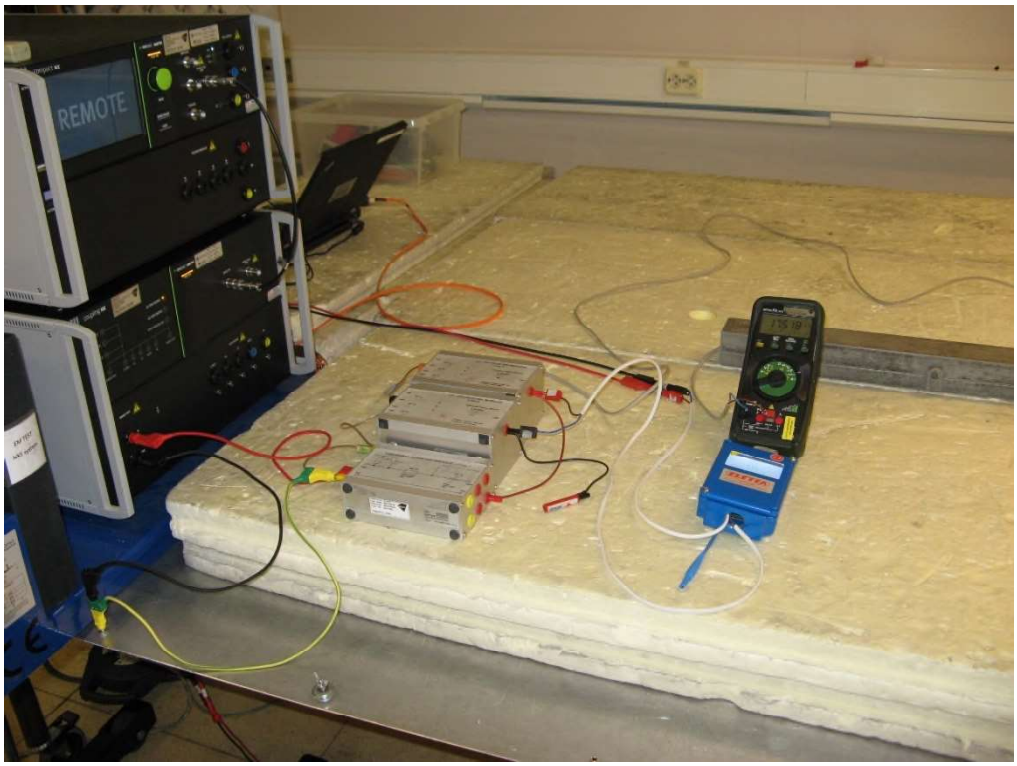


Photo 4.4.1 Test setup regarding immunity to surge transients.

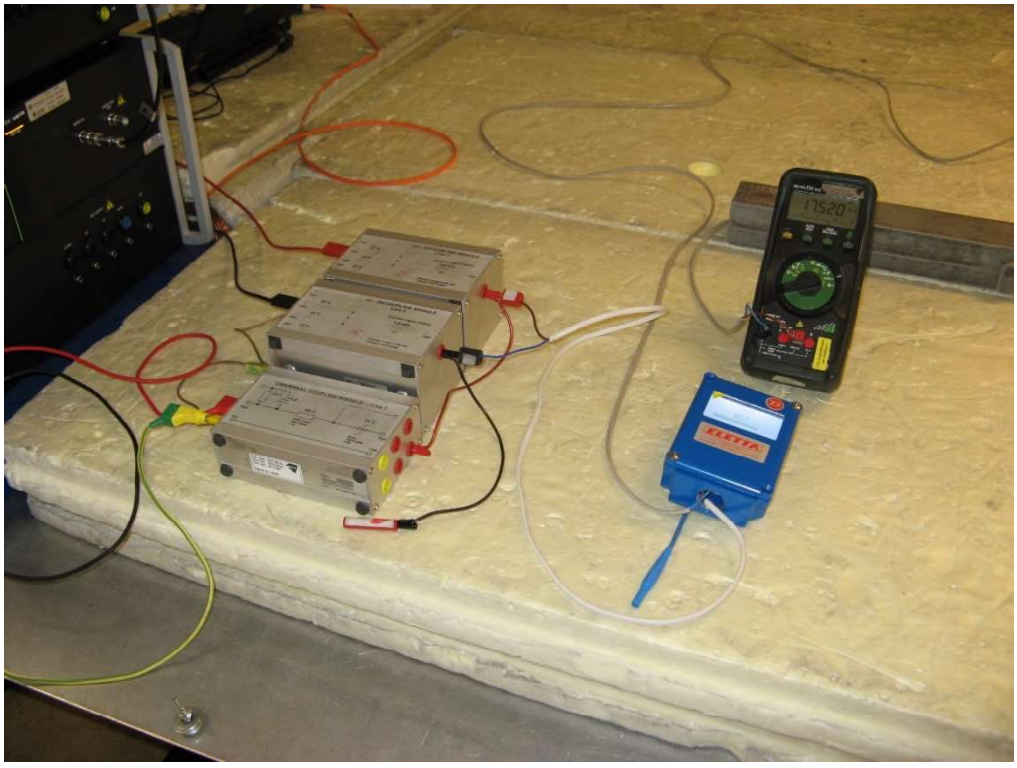


Photo 4.4.2 Test setup regarding immunity to surge transients on DC power port. Test object case not grounded.

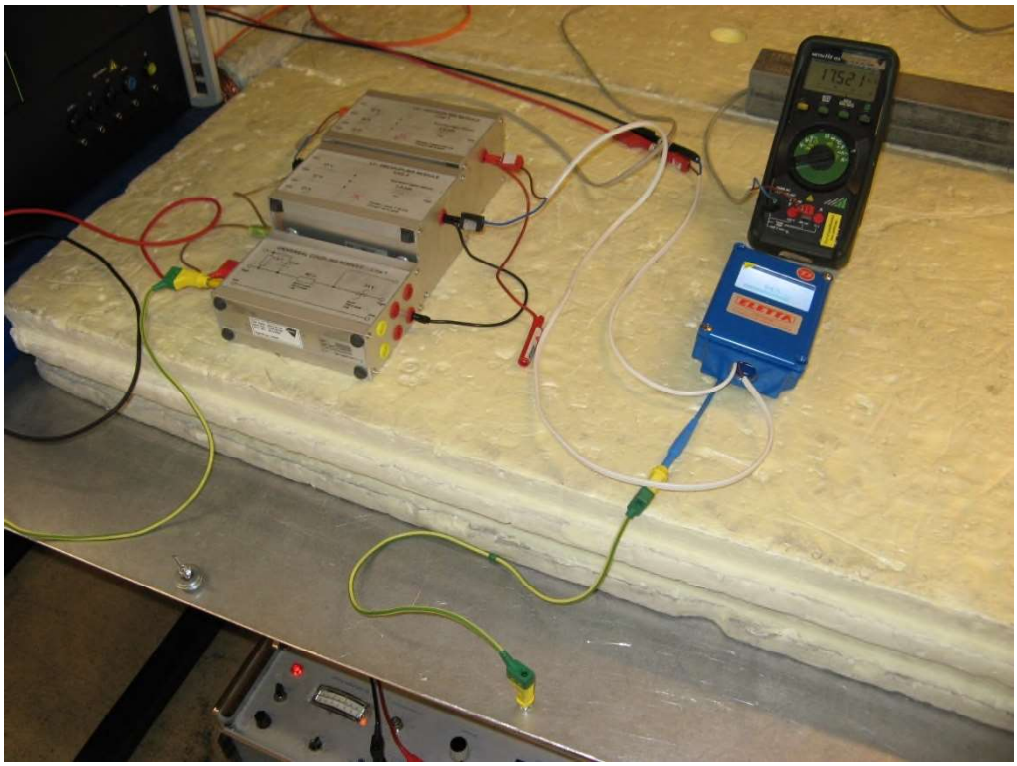


Photo 4.4.3 Test setup regarding immunity to surge transients on analog output port. Test object case grounded.

4.5 Immunity to conducted radio frequency disturbances

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	09 May, 09 June 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC 61000-6-2:2019	Required Perf. criter.	A

Test method Characteristics	EN/(IEC) 61000-4-6:2014 Frequency range: 0.15-80 MHz, modulation: 80 % AM 1 kHz	Temperature Humidity	24 °C 41% RH
Test equipm.	EMC Transient lab Västerås Setup VIA3	Uncertainty	1.4 dB

Manufacturer's name of port	Test standard's name of port	Coupling Network	Amplitude [V]	Passed	Remarks
DC power	DC power	CDN M2, TE-A544	10	Yes	Note 1
DC power	DC power	CDN M2, TE-A544	10	Yes	Note 2
Analog output	Unshielded cable	CDN AF2_1, IE-D010	10	Yes	Note 1
Analog output	Unshielded cable	CDN AF2_1, IE-D010	10	Yes	Note 2

Note 1: Test object grounded.
Note 2: Test object not grounded.

Criteria for compliance	See Section 3.2
Test result	The disturbances caused no malfunctions with modification 1 implemented
Compliant	Yes
Setup comments	Frequency step: 1 %, dwell time: 1 second
Comments	The EUT was tested with the case both grounded and not grounded

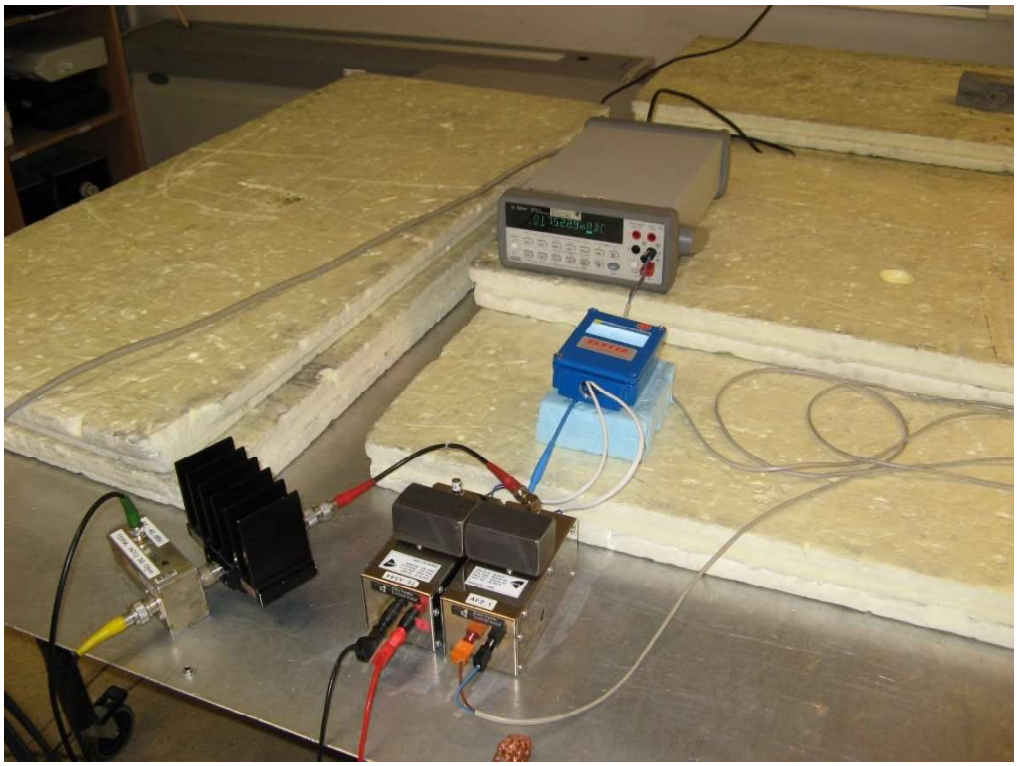


Photo 4.5.1 Test setup regarding immunity to conducted radio frequency disturbances.

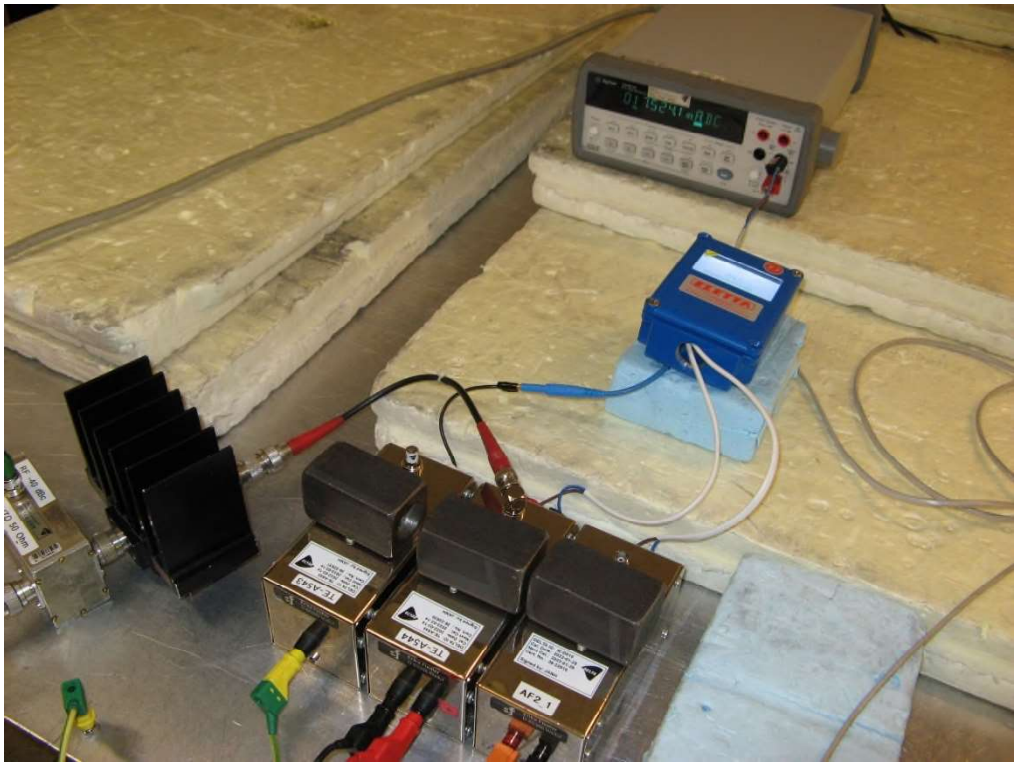


Photo 4.5.2 Test setup regarding immunity to conducted radio frequency disturbances on DC power port. Test object case grounded.

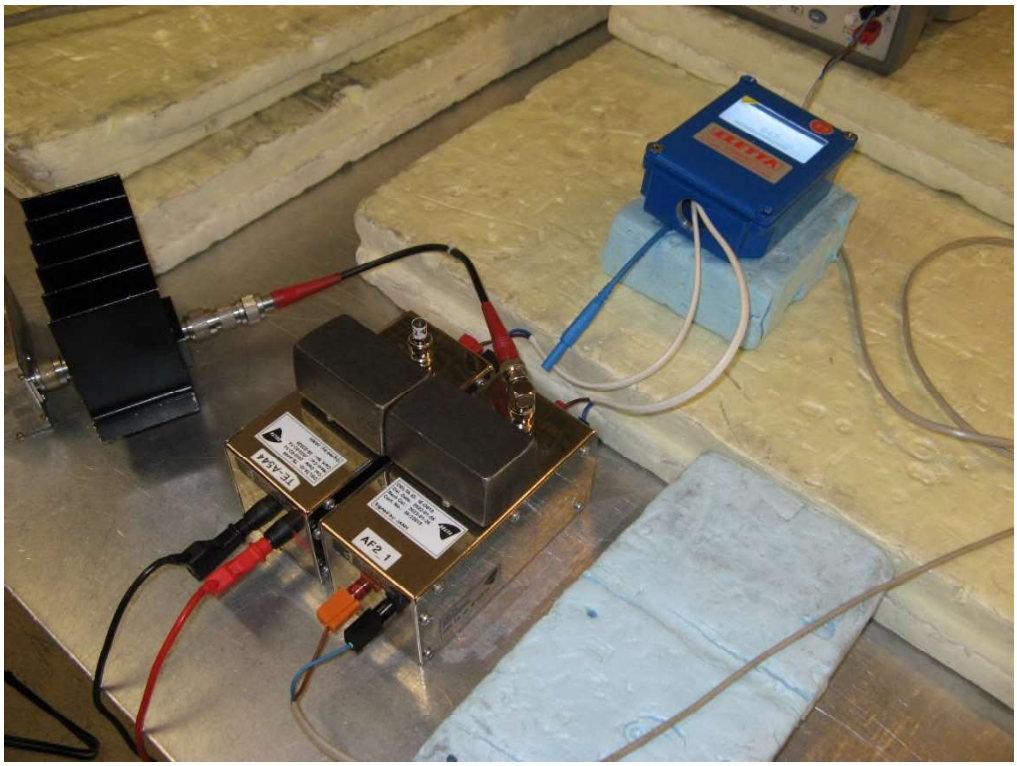


Photo 4.5.3 Test setup regarding immunity to conducted radio frequency disturbances on analog output port. Test object case not grounded.

4.6 Measurement of radio frequency electromagnetic field

Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	03 May 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC) 61000-6-3:2021	Frequency	30-1000 MHz

Test method Characteristics	CISPR 16-2-3:2016 Complete search, antenna distance 10 m	Temperature Humidity	21 °C 38% RH
Detector	Peak and quasi peak	Bandwidth	120 kHz
Test equipm.	EMC Hall A Västerås Setup VEC1	Uncertainty	5.0 dB

Test result: The measured field strengths were below the limit

Compliant: Yes

Comments: 16 scans measurement were carried out with the EUT case grounded and not grounded.
The highest measured radiated emission was observed with the case not grounded.
See the 3 graphs in the figures below. Scans with the case not grounded, grounded and complete measurement.

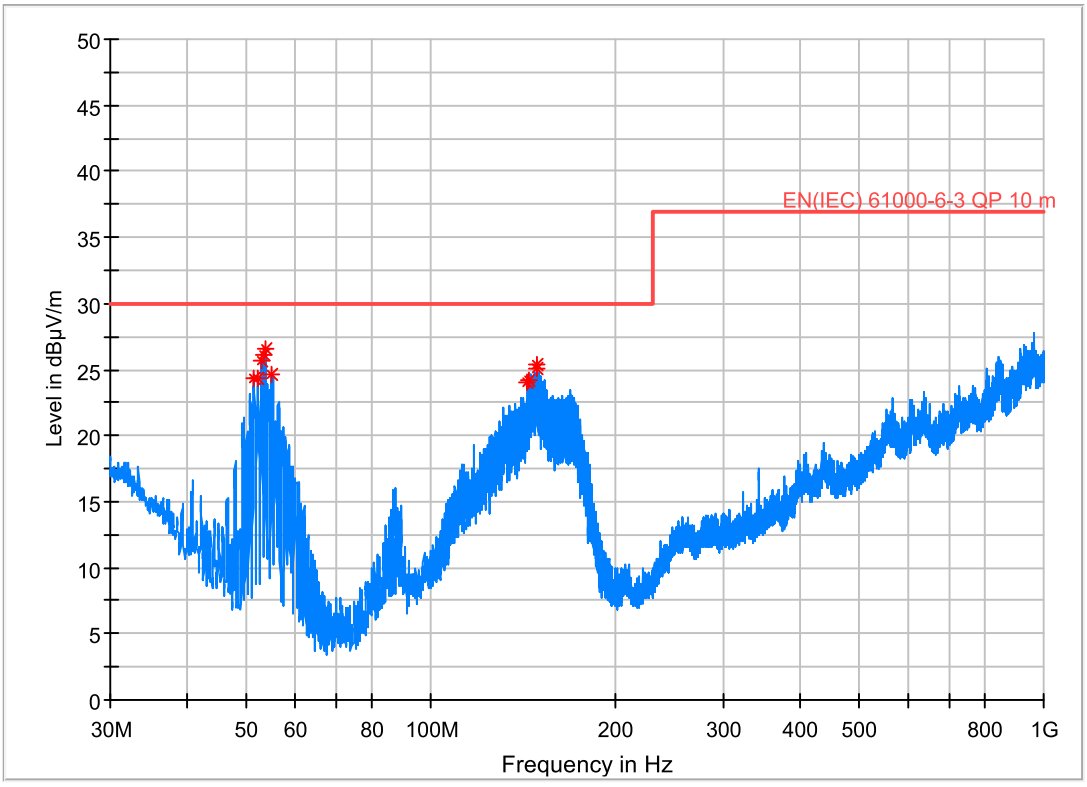
The complete measurement was performed on the EUT with the case not grounded.

Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.

CMAD absorption clamps were used on power supply cable and analog output cable.

Radiated emission. 16 scans measurement 30 - 1000 MHz

Test Description:	Radiated emission. 16 scans measurement 30 - 1000 MHz
Date:	2022-05-03
EUT Name:	D-series upgrade
Manufacturer:	Eletta Flow AB
Serial Number:	00000
Operating Conditions:	Supply voltage 24 VDC
Test Site:	DELTA Development Technology AB
Operator Name:	Jan Högkvist
Test Specification:	EN IEC 61000-6-3:2021
Comment:	Not grounded

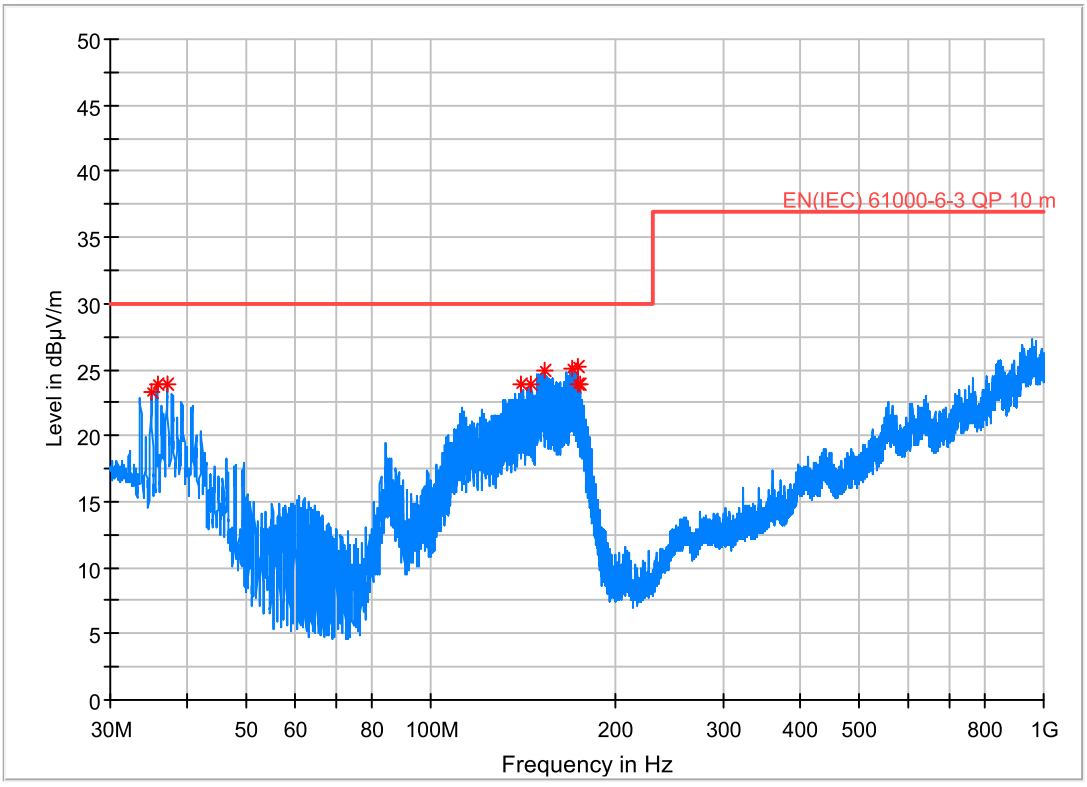


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
51.570000	24.31	30.00	5.69	100.0	V	90.0	-11.1
52.290000	24.34	30.00	5.66	100.0	V	90.0	-11.4
52.830000	25.68	30.00	4.32	100.0	V	90.0	-11.6
53.550000	26.12	30.00	3.88	100.0	V	90.0	-11.8
53.700000	26.54	30.00	3.46	100.0	V	90.0	-11.9
54.960000	24.70	30.00	5.30	100.0	V	90.0	-12.2
144.000000	24.10	30.00	5.90	100.0	V	0.0	-7.4
144.870000	24.25	30.00	5.75	100.0	V	0.0	-7.4
148.440000	25.02	30.00	4.98	100.0	V	0.0	-7.5
149.040000	25.31	30.00	4.69	100.0	V	0.0	-7.5

Radiated emission. 16 scans measurement 30 - 1000 MHz

Test Description:	Radiated emission. 16 scans measurement 30 - 1000 MHz
Date:	2022-05-03
EUT Name:	D-series upgrade
Manufacturer:	Eletta Flow AB
Serial Number:	00000
Operating Conditions:	Supply voltage 24 VDC
Test Site:	DELTA Development Technology AB
Operator Name:	Jan Högkvist
Test Specification:	EN IEC 61000-6-3:2021
Comment:	Grounded

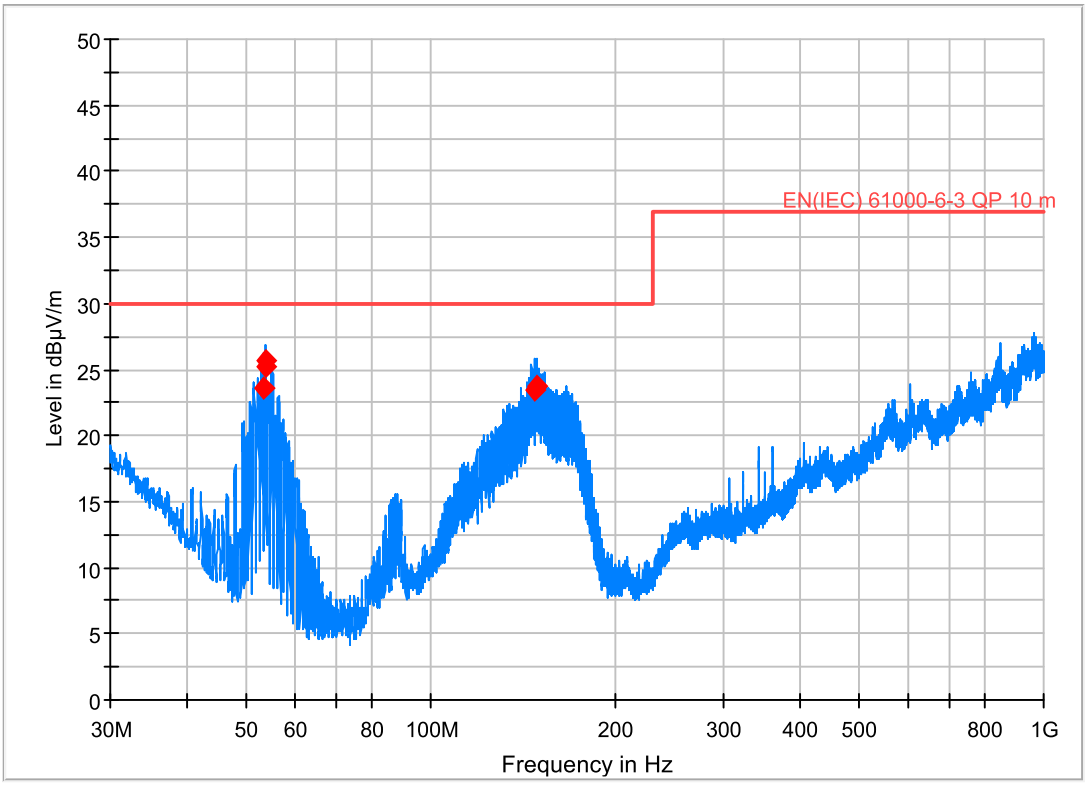


Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
35.070000	23.28	30.00	6.72	100.0	V	270.0	-3.1
35.700000	23.87	30.00	6.13	100.0	V	270.0	-3.4
37.110000	23.95	30.00	6.05	100.0	V	270.0	-4.1
140.400000	23.95	30.00	6.05	100.0	V	0.0	-7.2
145.440000	23.86	30.00	6.14	100.0	V	0.0	-7.4
153.330000	24.97	30.00	5.03	100.0	V	180.0	-7.7
169.830000	25.02	30.00	4.98	100.0	V	0.0	-8.7
173.340000	25.21	30.00	4.79	100.0	V	0.0	-8.9
174.060000	23.95	30.00	6.05	100.0	V	0.0	-9.0
174.810000	23.83	30.00	6.17	100.0	V	0.0	-9.0

Radiated emission. Complete measurement 30 - 1000 MHz

Test Description:	Radiated emission. Complete measurement 30 - 1000 MHz
Date:	2022-05-03
EUT Name:	D-series upgrade
Manufacturer:	Eletta Flow AB
Serial Number:	00000
Operating Conditions:	Supply voltage 24 VDC
Test Site:	DELTA Development Technology AB
Operator Name:	Jan Högkvist
Test Specification:	EN IEC 61000-6-3:2021
Comment:	Test object not grounded



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
53.490000	23.63	30.00	6.37	1000.0	120.000	150.0	V	135.0	-11.8
53.700000	25.67	30.00	4.33	1000.0	120.000	103.0	V	114.0	-11.9
53.730000	25.22	30.00	4.78	1000.0	120.000	103.0	V	126.0	-11.9
147.570000	23.41	30.00	6.59	1000.0	120.000	126.0	V	334.0	-7.4
148.980000	23.76	30.00	6.24	1000.0	120.000	106.0	V	322.0	-7.5

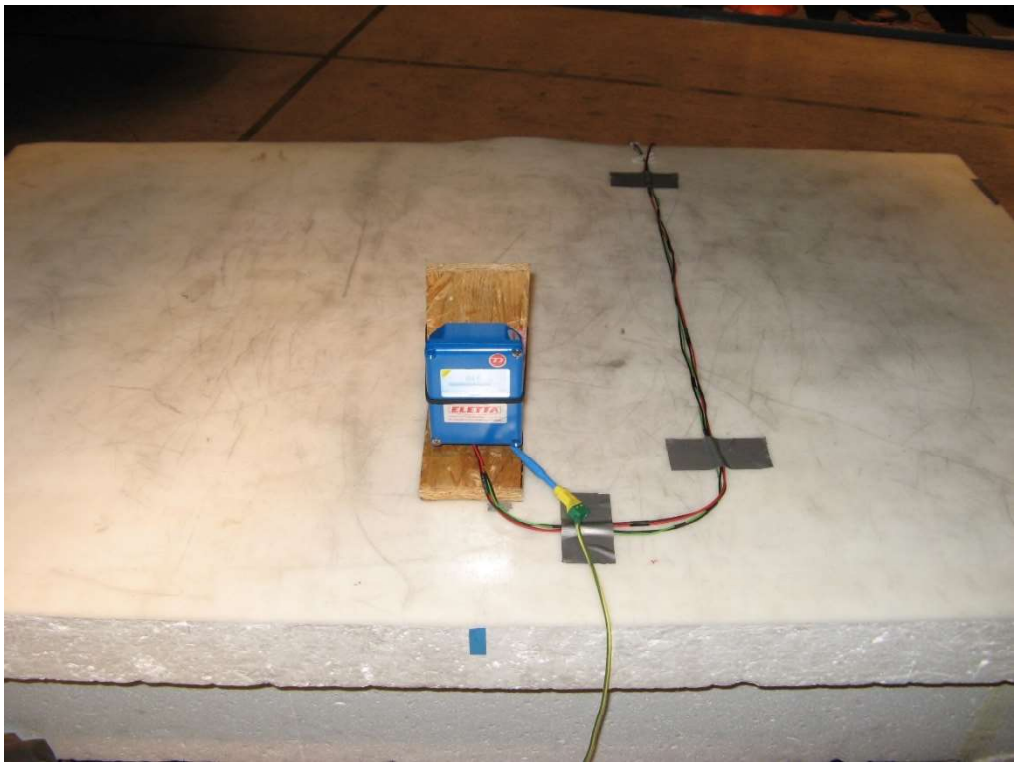


Photo 4.6.1 Test setup regarding measurement of radio frequency electro-magnetic field. Test object case grounded.

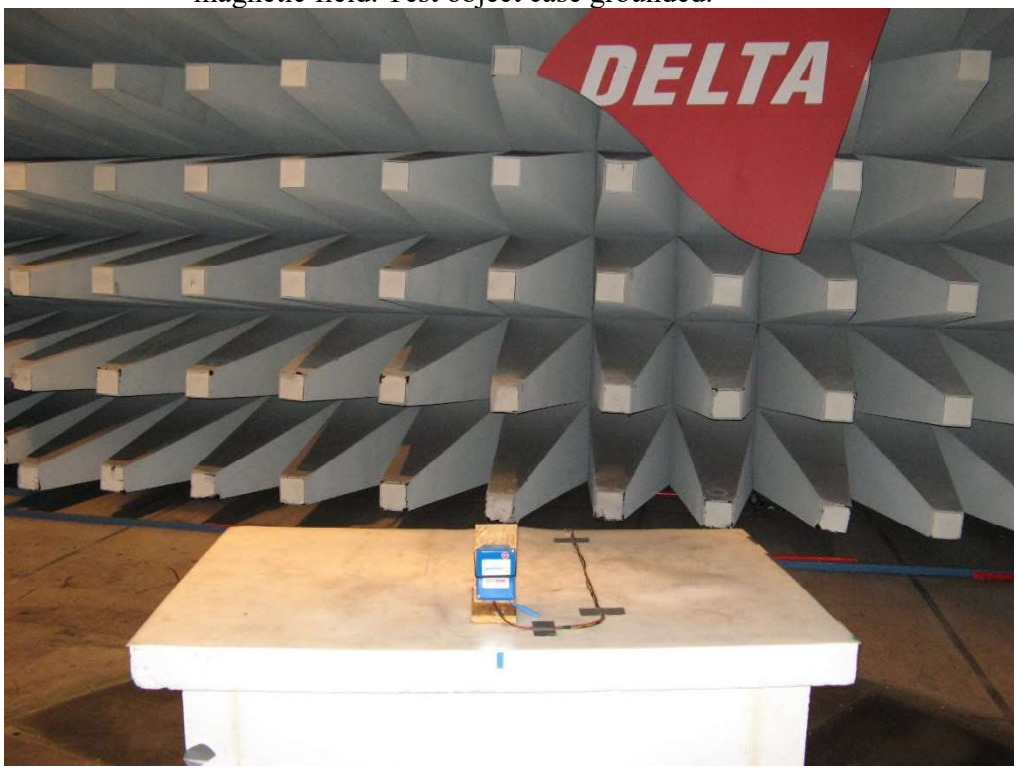


Photo 4.6.2 Test setup regarding measurement of radio frequency electro-magnetic field. Front view. Test object case not grounded.

Photo 4.6.3 Test setup regarding measurement of radio frequency electro-magnetic field. Rear view.

5. National registrations and accreditations

5.1 SWEDAC Accreditation

Organization: Swedish Board for Accreditation and Conformity Assessment - SWEDAC, see www.swedac.se and www.ilac.org

Registration Number: 1688

SWEDAC is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement).

5.2 FCC Registrations

Organization: Federal Communications Commission, USA

Designation number: SE0004

Company Number: 187770

Facilities: EMC chamber A 3 m and 10 m

5.3 ISED Registrations

Organization: Innovation, Science and Economic Development Canada

Designation number: SE0006

Company Number: 9347A

Facilities: EMC chamber A 3 m and 10 m

6. List of instruments

Setup VEC1					
Measurement of radio frequency electromagnetic field					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.15	5.0 dB
☒	36205	Measuring receiver	Rohde & Schwarz	ESW44	
☒	IE-B928	Antenna Bilog	Chase	CBL6111A	
☒	36151	Preamplifier	FORCE	Preamp 0.5MHz-4GHz	
☒	36166	Power supply	Mascot	6823 Mod.	
☐	36129	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
☐	36130	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
☒	36071	Controller	Maturo	NCD	
☒	36072	Tilt antenna mast	Maturo	TAM 4.0-E	
☒		Turntable	Heinrich Deisel	DT 440	

Setup VIA3					
Immunity to conducted radio frequency disturbances					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.00	1.4 dB
☒	E-H908	Signal generator	Marconi	2024	
☒	E-H909	Amplifier	Amplifier Research	75A250	
☒	36148	Average Power Sensor	Rohde & Schwarz	NRP18A	
☒	E-I026	-40 dBc Voltage Sampler	DELTA-Denmark		
☒	E-I022	RF attenuator 6 dB	Weinschel Corp	65-6-3	
☒[1]	IE-D010	CDN, 0.15-80 MHz	Erika Fiedler	CDN AF2_1	
☒[1]	TE-A543	CDN, 0.15-230 MHz	Erika Fiedler	CDN M1	
☒[1]	TE-A544	CDN, 0.15-230 MHz	Erika Fiedler	CDN M2	
Note 1: see test sheet for usage of CDN or EM-clamp					

Setup VIB1					
Immunity to fast transients					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
☒	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
☒	36026	Coupling network	EM TEST	CNI 503	
☒	E-L443	Coupling clamp	EM TEST	HFK	

Setup VIC2					
Immunity to electrostatic discharges					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	29838	ESD simulator	KeyTek	MiniZap MZ-15/EC	1.1 dB

Setup VID5					
Immunity to surge transients					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36165	Software	EM TEST	iec.control ver. 9.2.2	1.1 dB
☒	36158	Transient generator	EM TEST	Compact NX5 bspt-1-300-16	
☒	36159	Coupling-decoupling netwok	EM TEST	coupling NX5-R bs-3-480-32	
☒	E-K534	Coupling module	EMC-Partner	CN-U	
☒	E-K536	Decoupling module LF	EMC-Partner	DN-LF1	
☒	E-K537	Decoupling module LF	EMC-Partner	DN-LF2	

Setup VIE3					
Immunity to radio frequency electromagnetic fields					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.20	1.8 dB
☒	36102	Signal Generator	Rohde & Schwarz	SMB100A	
☒	304	Field Strength Meter	Amplifier Research	AR-FM 2000	
☒	IE-B885	E-field Sensor	Amplifier Research	FP 2000	
☒	36103	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
☒	36104	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
☒	36100	Broadband Amplifier	Rohde & Schwarz	BBA150-D200	
☒	36101	Broadband Amplifier	Rohde & Schwarz	BBA150-E100	
☒	36105	Horn Antenna	Rohde & Schwarz	HF907	

Setup VIE4					
Immunity to radio frequency electromagnetic fields					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.20	1.8 dB
☒	36185	Signal Generator	Rohde & Schwarz	SMB100B	
☒	304	Field Strength Meter	Amplifier Research	FM 2000	
☒	IE-B885	E-field Sensor	Amplifier Research	FP 2000	
☒	36186	Average Power Sensor	Rohde & Schwarz	NRP6AN	
☒	36187	Average Power Sensor	Rohde & Schwarz	NRP6AN	
☒	36184	Broadband Amplifier	Rohde & Schwarz	BBA150-BC1250	
☒	36192	Antenna Log Periodic.	Schwarzbeck	STLP 9128 E	
☒		Antenna Tower	EMCO	1050	
☒		Tower Controller	Heinrich Deisel	HD 100	

Other instruments used					
Used	***ID no.***	***Description***	***Manufacturer***	***Type no.***	***Setup uncertainty***
☒	35149	Temperature- and hygrometer	Ecolog	TH 1	
☒	IM-A308	Temperature- and hygrometer	Vaisala	HMI31	