

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 26^h 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


Niclas Johansson
CEO

DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory



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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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
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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 Högvist, Lars Johnsson


Date 02 July 2021

Project Manager



Jan Högvist Specialist
DELTA

Responsible



Lars Johnsson. Head of quality
DELTA

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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

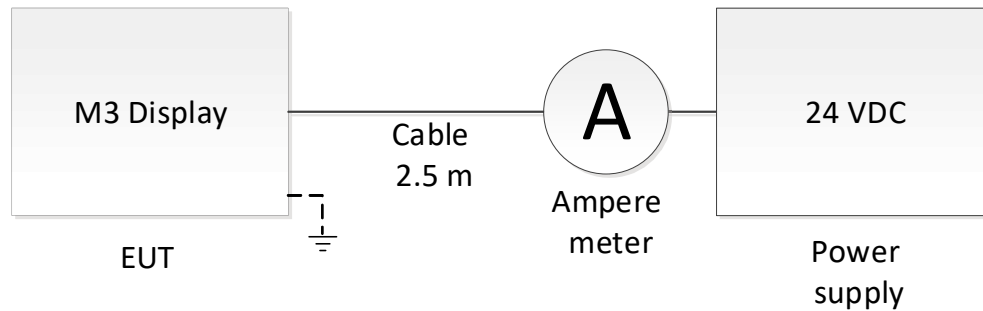


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

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 10 μ F 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	EN/(IEC) 61000-4-2:2009				Temperature	20 °C
Characteristics	Discharge network: 150 pF, 330 Ω				Humidity	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.

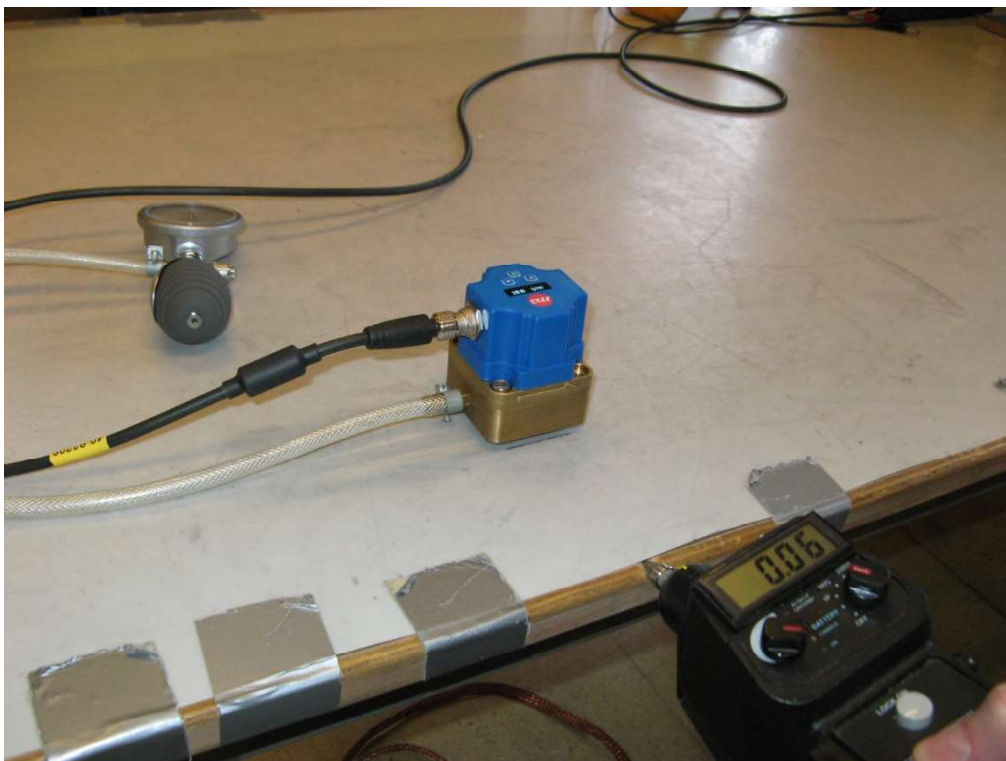


Photo 4.1.2 Test setup regarding immunity to electrostatic discharges.
Discharges via HCP indirect coupling in four directions.

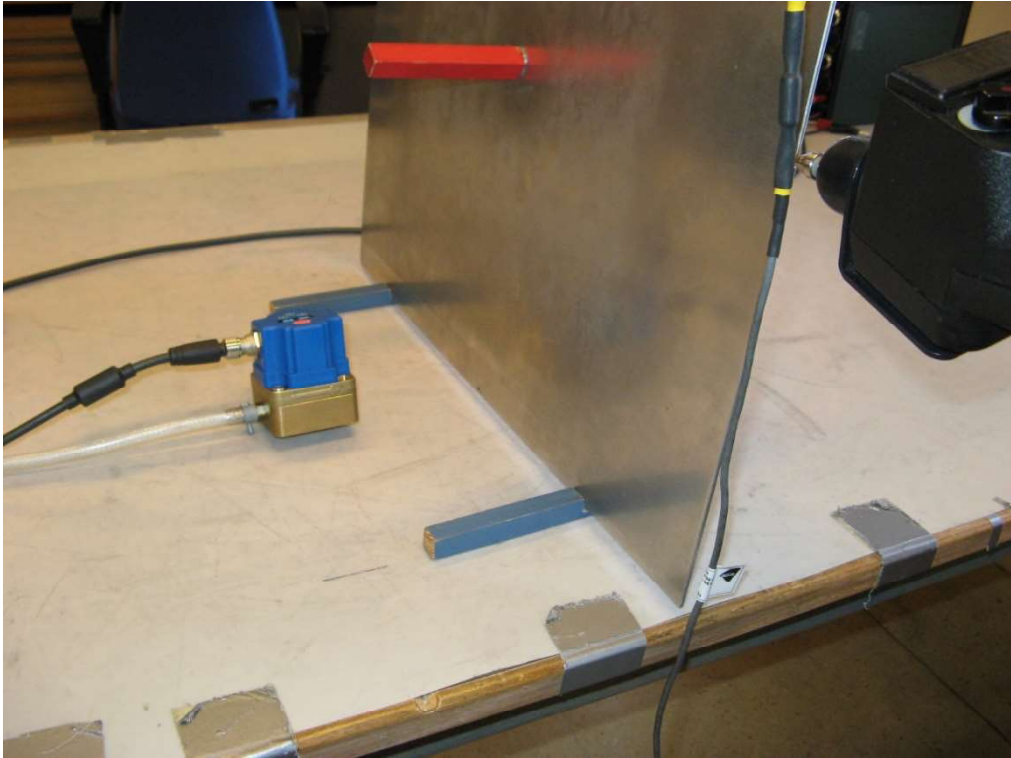


Photo 4.1.3 Test setup regarding immunity to electrostatic discharges. Discharges via VCP indirect coupling in five directions.



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	EN/(IEC) 61000-4-3:2020			Temperature	23 °C
Characteristics	16 point pre-Calibration			Humidity	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 $\leq 4.5\%$ 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	<p>The test shall normally be performed with the field generating antenna facing each side of the test object.</p> <p>When technically justified the test object can be tested by exposing fewer faces to the generating antenna.</p> <p>In agreement with the client, the sides assumed to be most susceptible were tested here.</p> <p>During the test the EUT case was not separately grounded.</p>



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

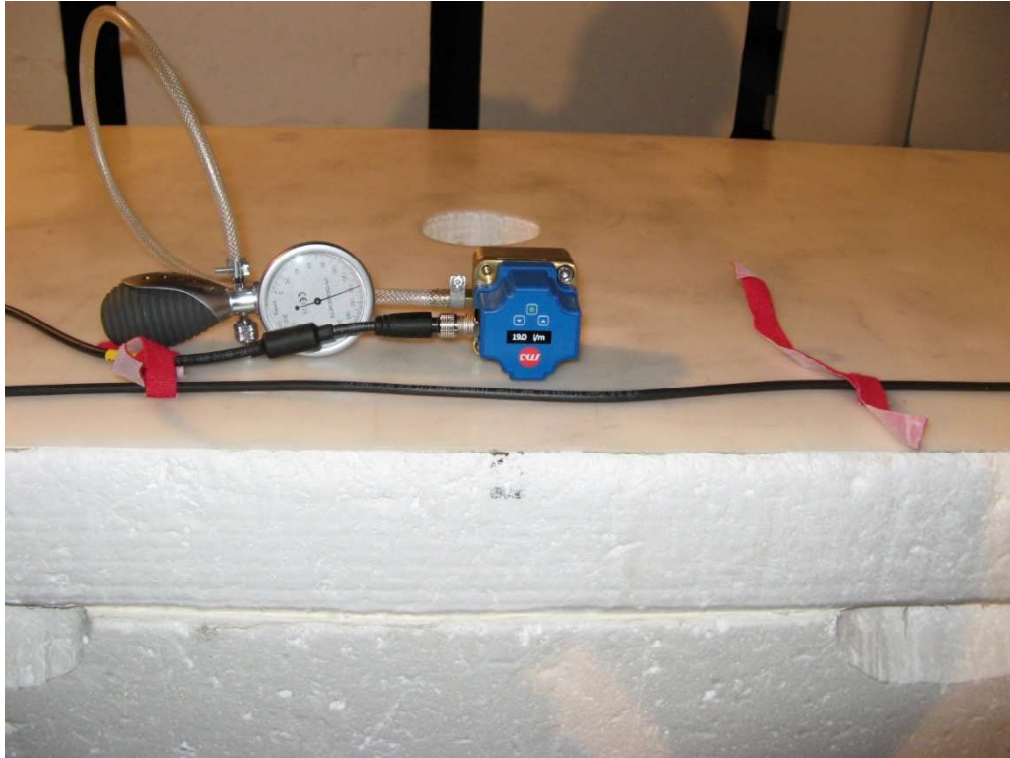


Photo 4.2.2 Test setup regarding immunity to radio frequency electromagnetic field. Front side exposed to the field.

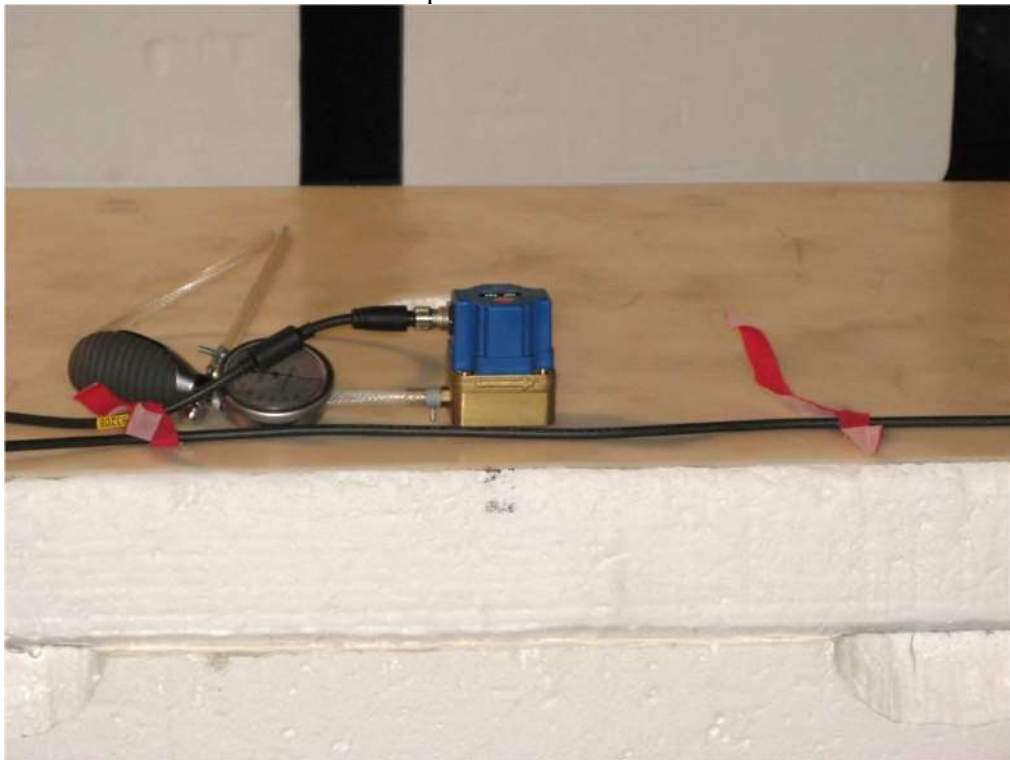


Photo 4.2.3 Test setup regarding immunity to radio frequency electromagnetic field. Bottom side exposed to the field.

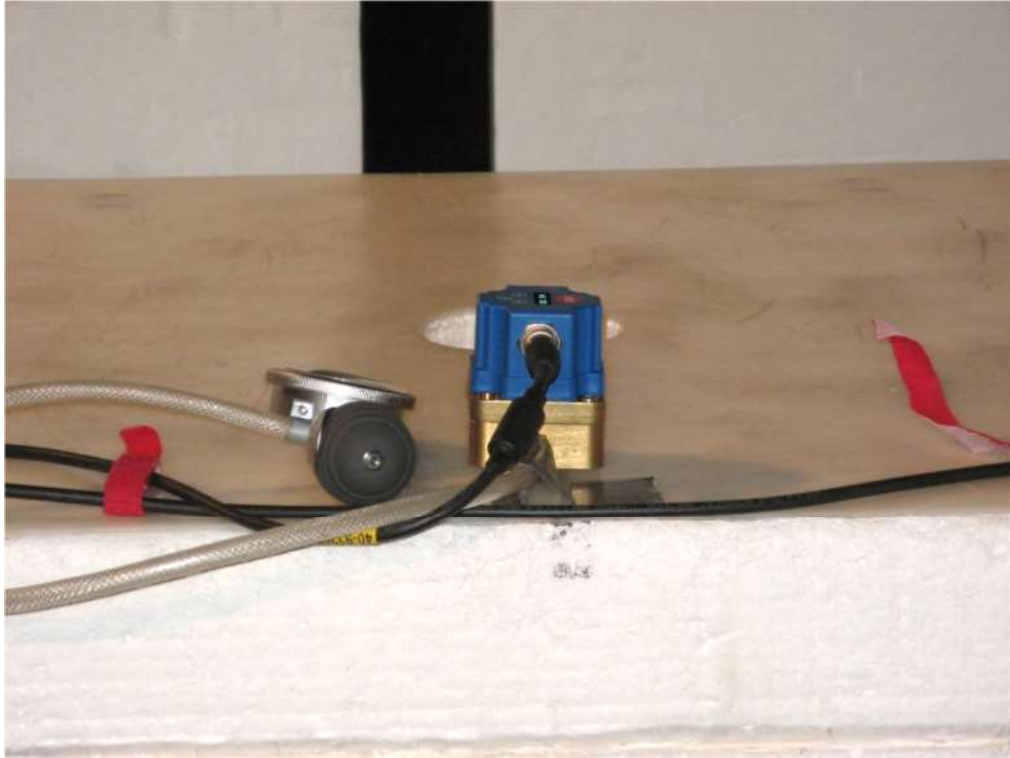


Photo 4.2.4 Test setup regarding immunity to radio frequency electromagnetic field. Left side (with cable inlet) exposed to the field.

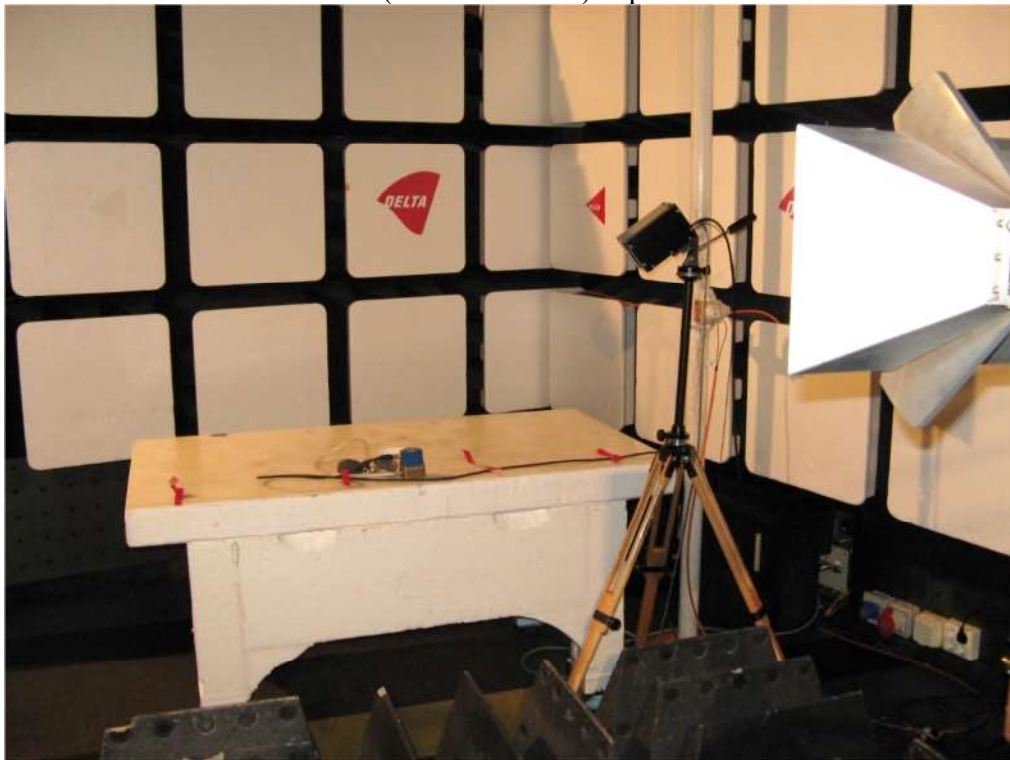


Photo 4.2.5 Test setup regarding immunity to radio frequency electromagnetic field for test above 1 GHz.

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.

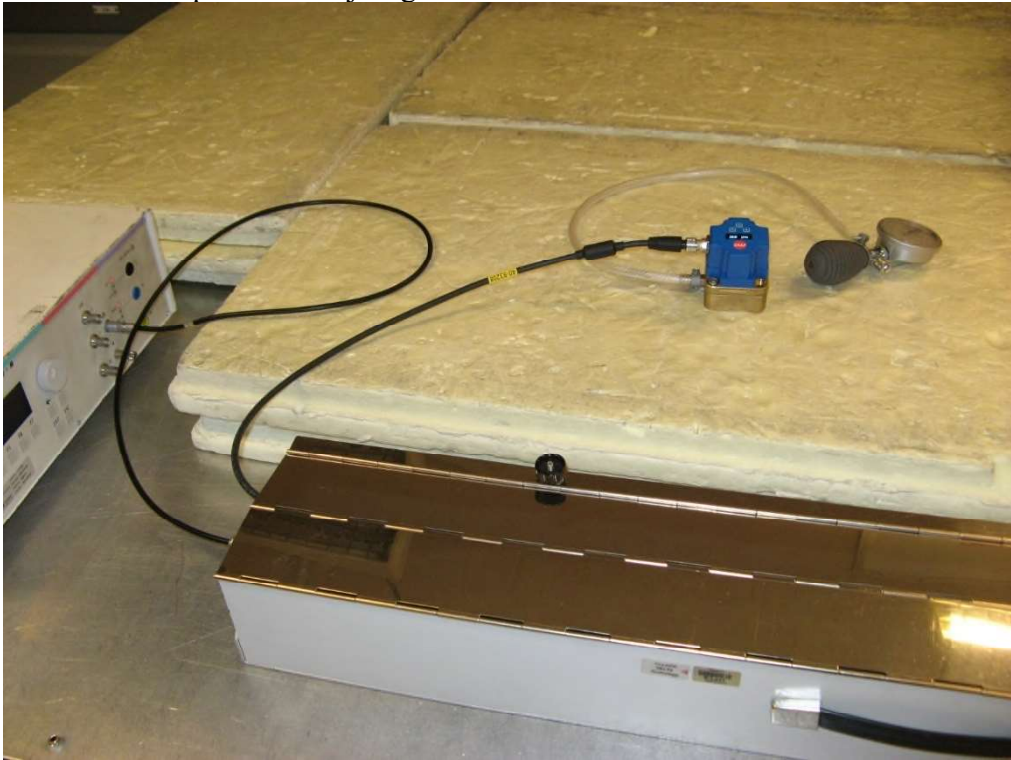


Photo 4.3.2 Test setup regarding immunity to fast transients on power + signal port. Test object not grounded.

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	EN/(IEC) 61000-4-5:2014+A1				Temperature	23 °C	
Characteristics	Open circuit volt.: 1.2/50 µs. Short circuit curr.: 8/20 µs				Humidity	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

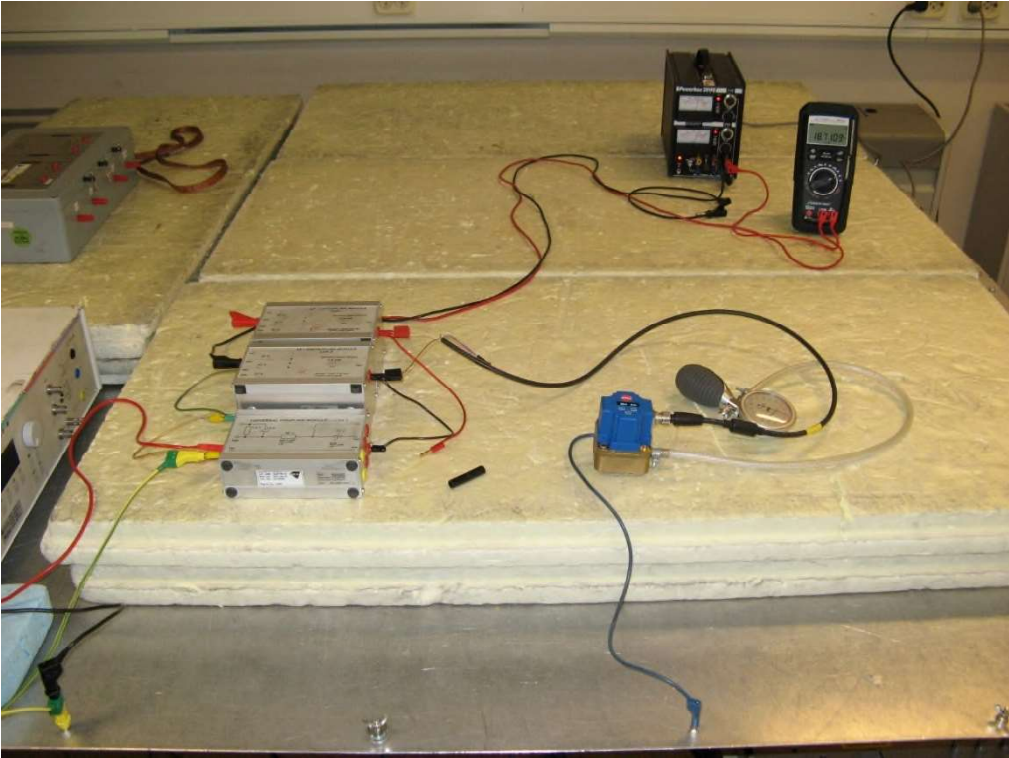


Photo 4.4.1 Test setup regarding immunity to surge transients.

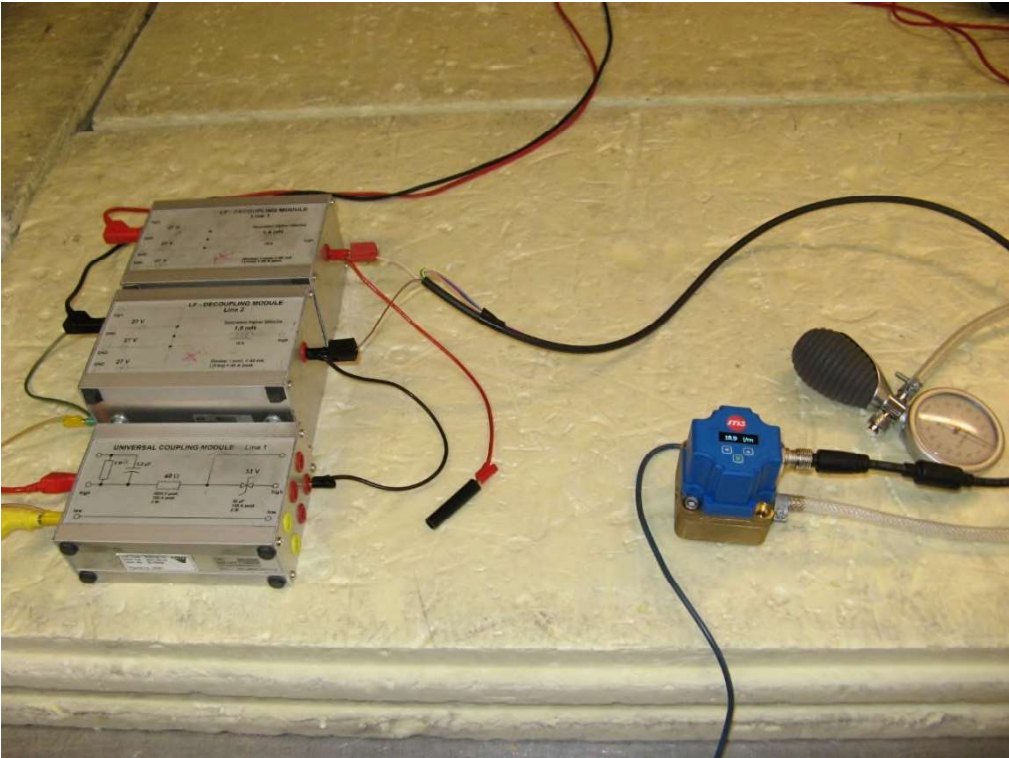


Photo 4.4.2 Test setup regarding immunity to surge transients on power + signal port. Test object grounded.

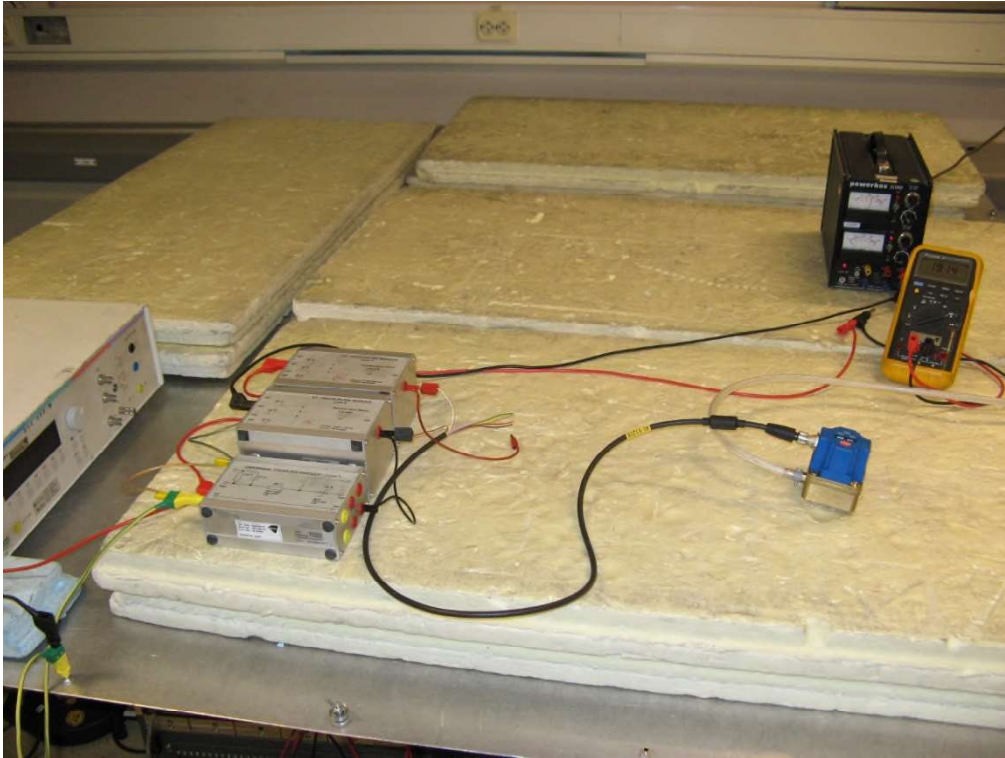


Photo 4.4.3 Test setup regarding immunity to surge transients on power + signal port. Test object not grounded.

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
<p>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.</p>					

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

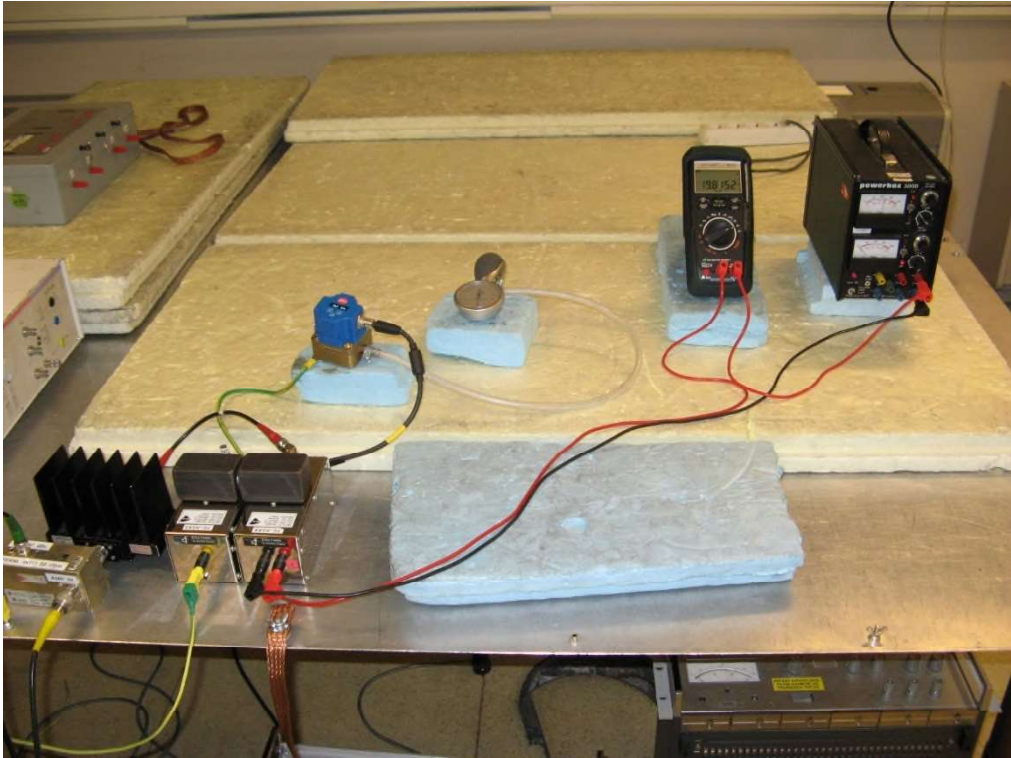


Photo 4.5.1 Test setup regarding immunity to conducted radio frequency disturbances.

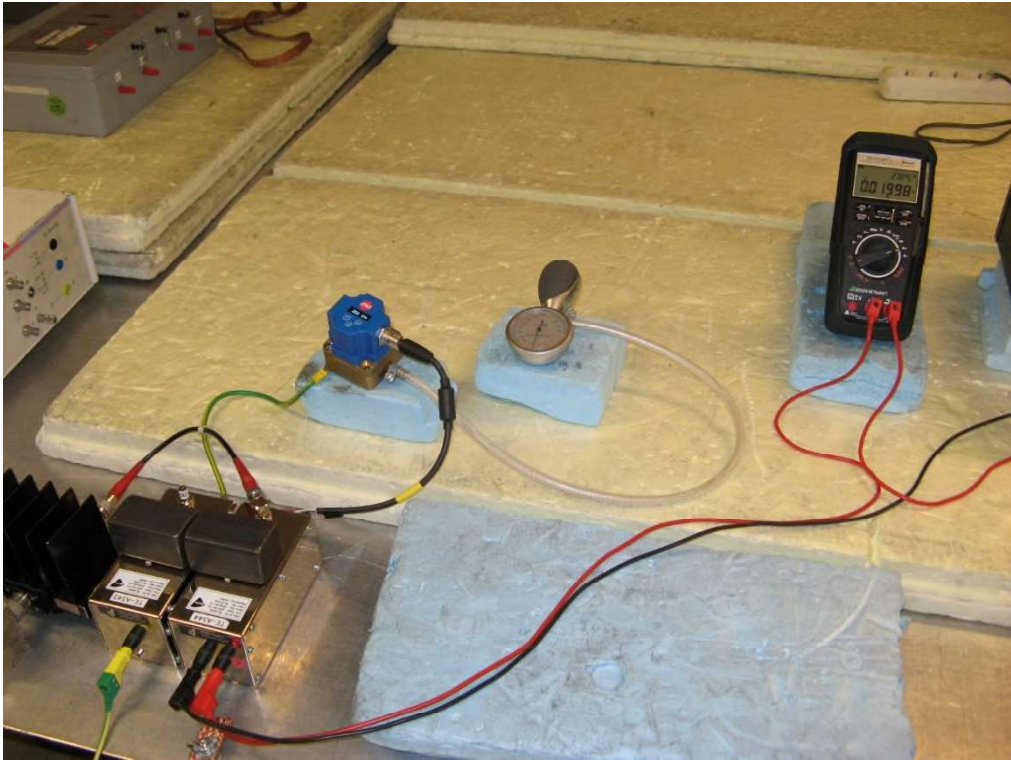


Photo 4.5.2 Test setup regarding immunity to conducted radio frequency disturbances on power + signal port. Test object grounded.

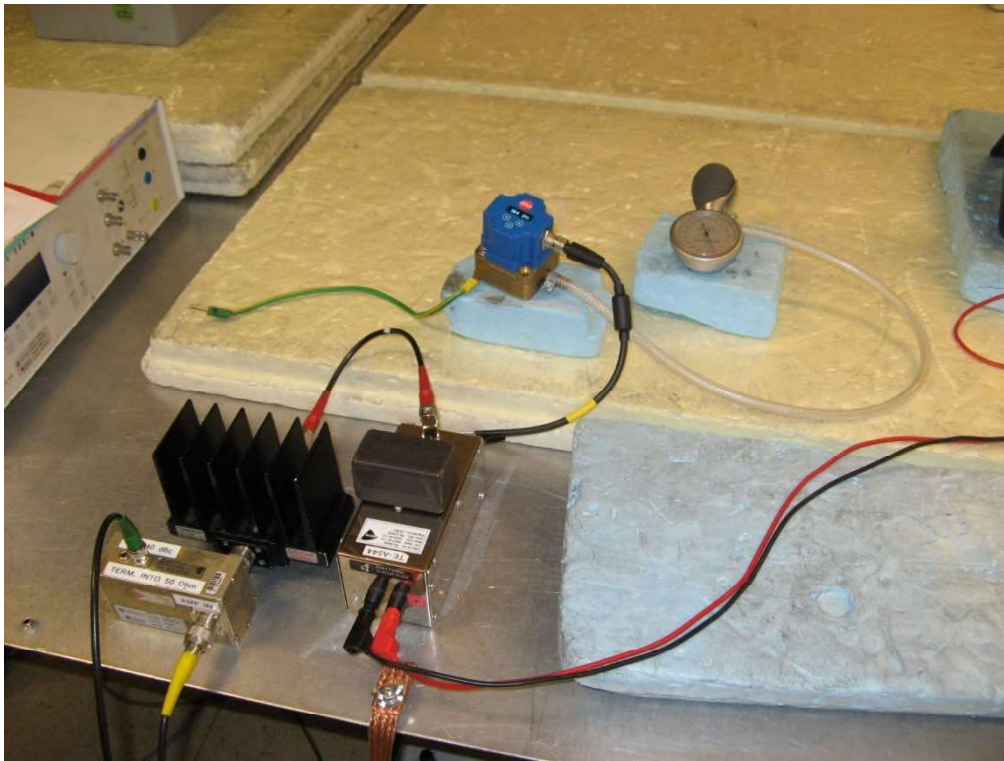


Photo 4.5.3 Test setup regarding immunity to conducted radio frequency disturbances on power + signal port. Test object not grounded.

4.6 Measurement of radio frequency electromagnetic field

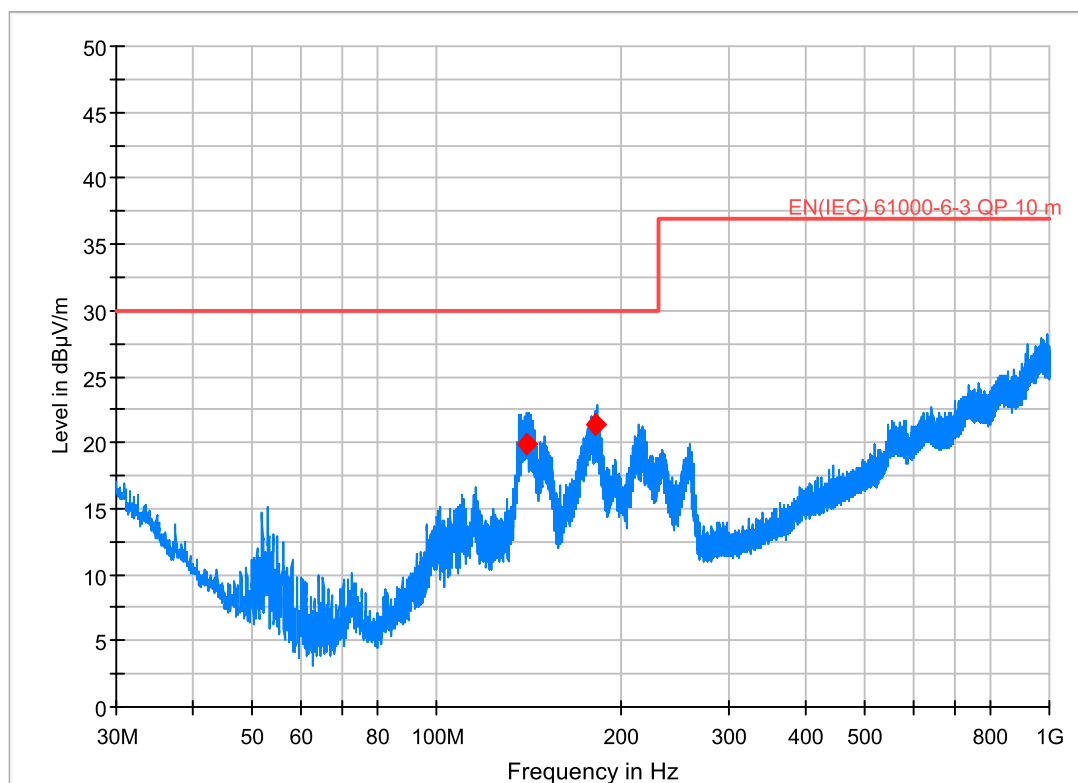
Test object	M3 Display	Project no.	621-20045
Type	M3 Display	Date	28 May. 2021
Serial no.	000	Initials	LAJ
Specification	EN/(IEC) 61000-6-3:2007+A1	Frequency	30-1000 MHz

Test method	CISPR 16-2-3:2016	Temperature	22 °C
Characteristics	Complete search, antenna distance 10 m	Humidity	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	<p>Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.</p> <p>CMAD absorption clamp was used on power supply cable.</p> <p>During the test the EUT case was not separately grounded.</p>

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

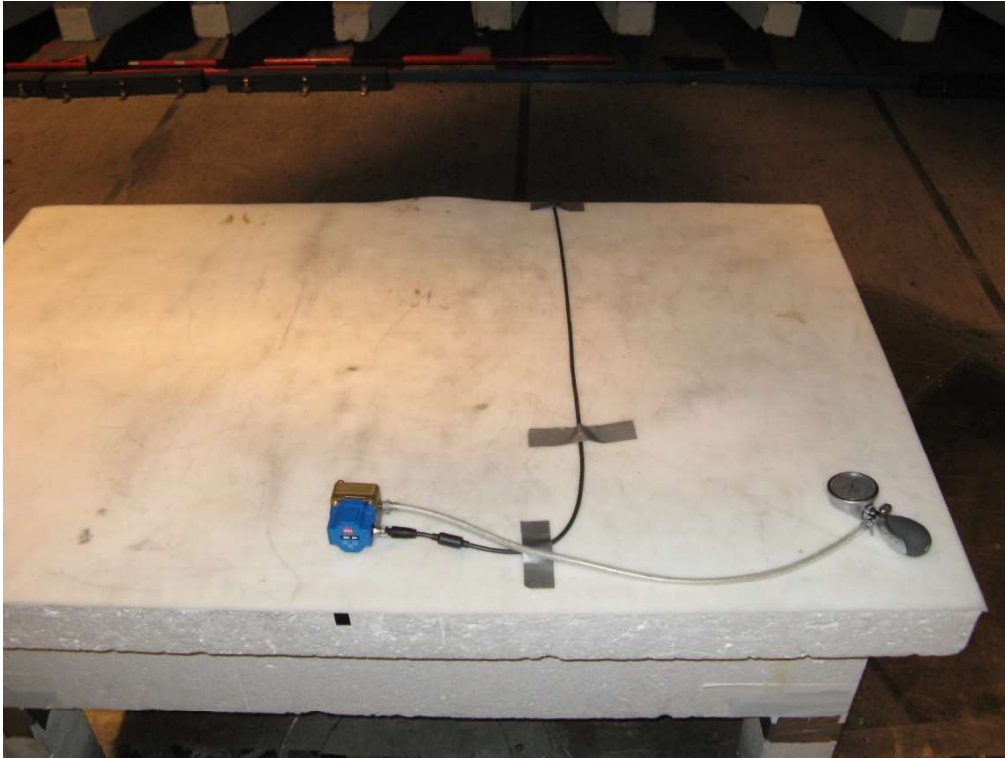


Photo 4.6.1 Test setup regarding measurement of radio frequency electromagnetic field.



Photo 4.6.2 Test setup regarding measurement of radio frequency electromagnetic 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					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.15	5.0 dB
<input checked="" type="checkbox"/>	36020	Measuring receiver	Rohde & Schwarz	ESU26	
<input checked="" type="checkbox"/>	IE-B928	Antenna Bilog	Chase	CBL6111A	
<input checked="" type="checkbox"/>	36151	Preamplifier	FORCE	Preamp 0.5MHz-4GHz	
<input checked="" type="checkbox"/>	36166	Power supply	Mascot	6823 Mod.	
<input type="checkbox"/>	36130	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
<input checked="" type="checkbox"/>	36071	Controller	Maturo	NCD	
<input checked="" type="checkbox"/>	36072	Tilt antenna mast	Maturo	TAM 4.0-E	
<input checked="" type="checkbox"/>		Turntable	Heinrich Deisel	DT 440	

Setup VIA3					
Immunity to conducted radio frequency disturbances					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.00	1.4 dB
<input checked="" type="checkbox"/>	E-H908	Signal generator	Marconi	2024	
<input checked="" type="checkbox"/>	E-H909	Amplifier	Amplifier Research	75A250	
<input checked="" type="checkbox"/>	36148	Average Power Sensor	Rohde & Schwarz	NRP18A	
<input checked="" type="checkbox"/>	E-I026	-40 dBc Voltage Sampler	DELTA-Denmark		
<input checked="" type="checkbox"/>	E-I022	RF attenuator 6 dB	Weinschel Corp	65-6-3	
<input checked="" type="checkbox"/>	TE-A543	CDN, 0.15-230 MHz	Erika Fiedler	CDN M1	
<input checked="" type="checkbox"/>	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					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
<input checked="" type="checkbox"/>	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
<input checked="" type="checkbox"/>	36026	Coupling network	EM TEST	CNI 503	
<input checked="" type="checkbox"/>	E-L443	Coupling clamp	EM TEST	HFK	

Setup VIC2					
Immunity to electrostatic discharges					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
<input checked="" type="checkbox"/>	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
<input checked="" type="checkbox"/>	E-K534	Coupling module	EMC-Partner	CN-U	
<input checked="" type="checkbox"/>	E-K536	Decoupling module LF	EMC-Partner	DN-LF1	
<input checked="" type="checkbox"/>	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
<input checked="" type="checkbox"/>	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.20	1.8 dB
<input checked="" type="checkbox"/>	36102	Signal Generator	Rohde & Schwarz	SMB100A	
<input checked="" type="checkbox"/>	304	Field Strength Meter	Amplifier Research	AR-FM 2000	
<input checked="" type="checkbox"/>	IE-B886	E-field Sensor	Amplifier Research	FP 2000	
<input checked="" type="checkbox"/>	36103	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
<input checked="" type="checkbox"/>	36104	Average Power Sensor	Rohde & Schwarz	NRP-Z91	
<input checked="" type="checkbox"/>	36100	Broadband Amplifier	Rohde & Schwarz	BBA150-D200	
<input checked="" type="checkbox"/>	36101	Broadband Amplifier	Rohde & Schwarz	BBA150-E100	
<input checked="" type="checkbox"/>	36105	Horn Antenna	Rohde & Schwarz	HF907	

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

Other instruments used					
Used	ID no.	Description	Manufacturer	Type no.	Setup uncertainty
<input checked="" type="checkbox"/>	35149	Temperature- and hygrometer	Ecolog	TH 1	
<input checked="" type="checkbox"/>	IM-A308	Temperature- and hygrometer	Vaisala	HMI31	

DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory



EMC test of D-series upgrade

Performed for Eletta Flow AB

622-20134-10-R0

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08 August 2022

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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 Högvist


Date 08 August 2022

Project Manager



Jan Högvist Specialist
DELTA

Responsible



Lars Johnsson. Head of quality
DELTA

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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	Elettta 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

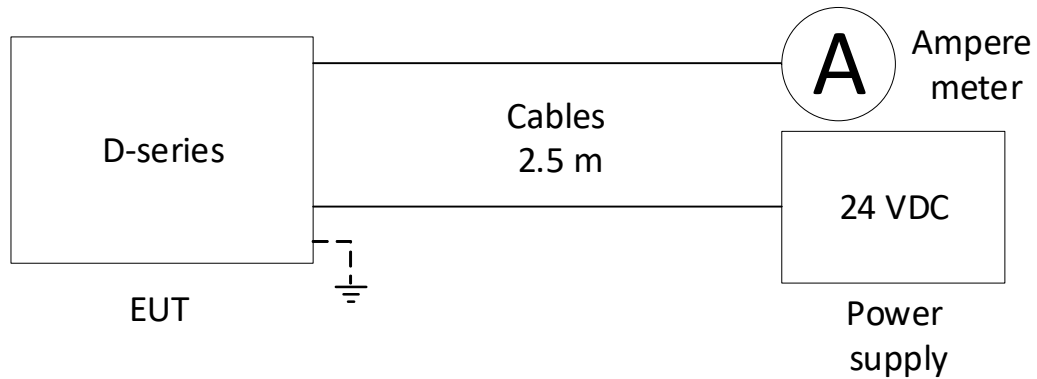


Figure 3.1.1 Block diagram of test object with cables and auxiliary equipment.

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 $< \pm 2\%$ FS.

Influence on the display indicator shall be $< \pm 2\%$ 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	EN/(IEC) 61000-4-2:2009				Temperature	24 °C
Characteristics	Discharge network: 150 pF, 330 Ω				Humidity	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.

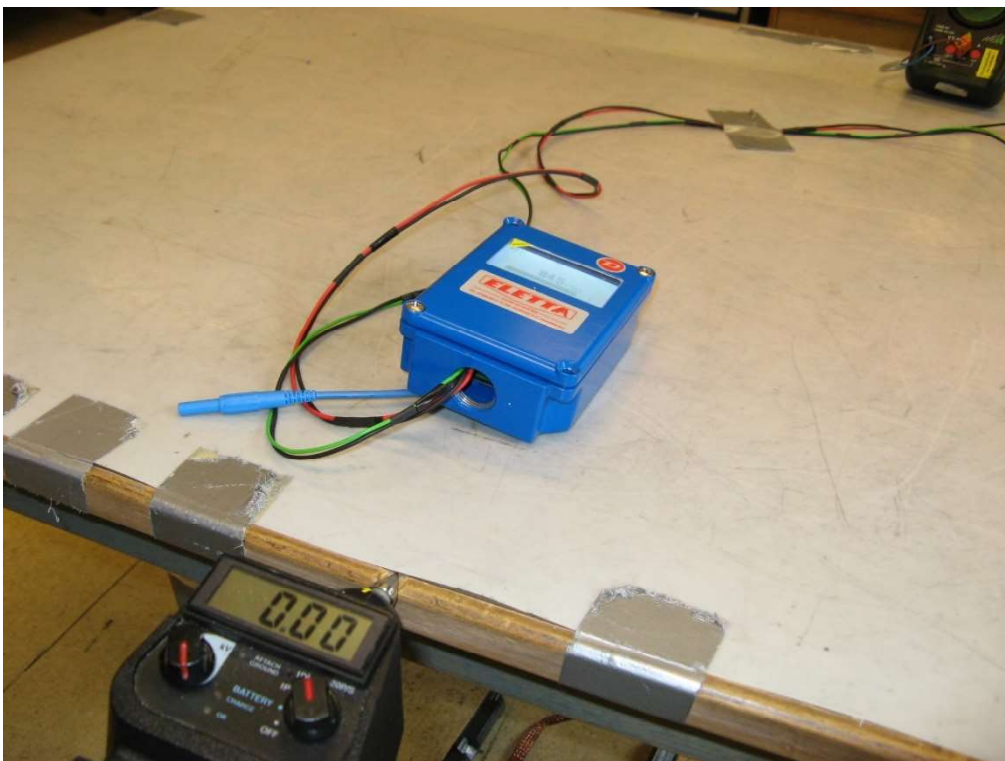


Photo 4.1.2 Test setup regarding immunity to electrostatic discharges.
Discharges via HCP indirect coupling.

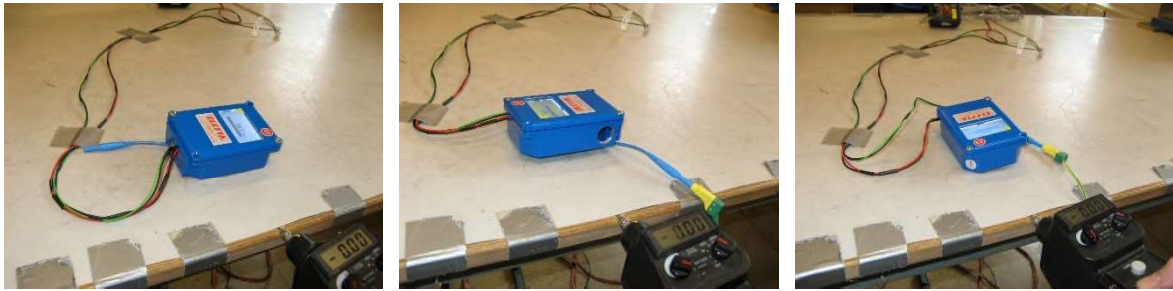


Photo 4.1.3 Test setup regarding immunity to electrostatic discharges.
Discharges via HCP indirect coupling.

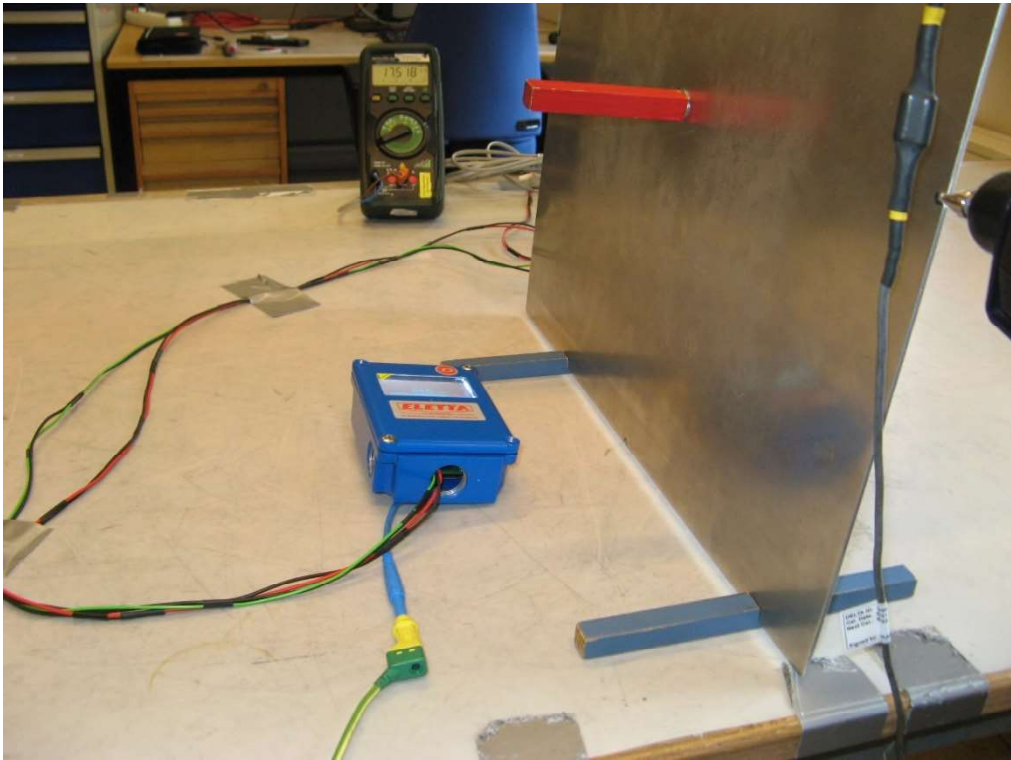


Photo 4.1.4 Test setup regarding immunity to electrostatic discharges.
Discharges via VCP indirect coupling.



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	EN/(IEC) 61000-4-3:2020			Temperature	24 °C
Characteristics	16 point pre-Calibration			Humidity	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	<p>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.</p> <p>In agreement with the client, the sides assumed to be most susceptible were tested here.</p> <p>During the test the EUT case was grounded.</p>

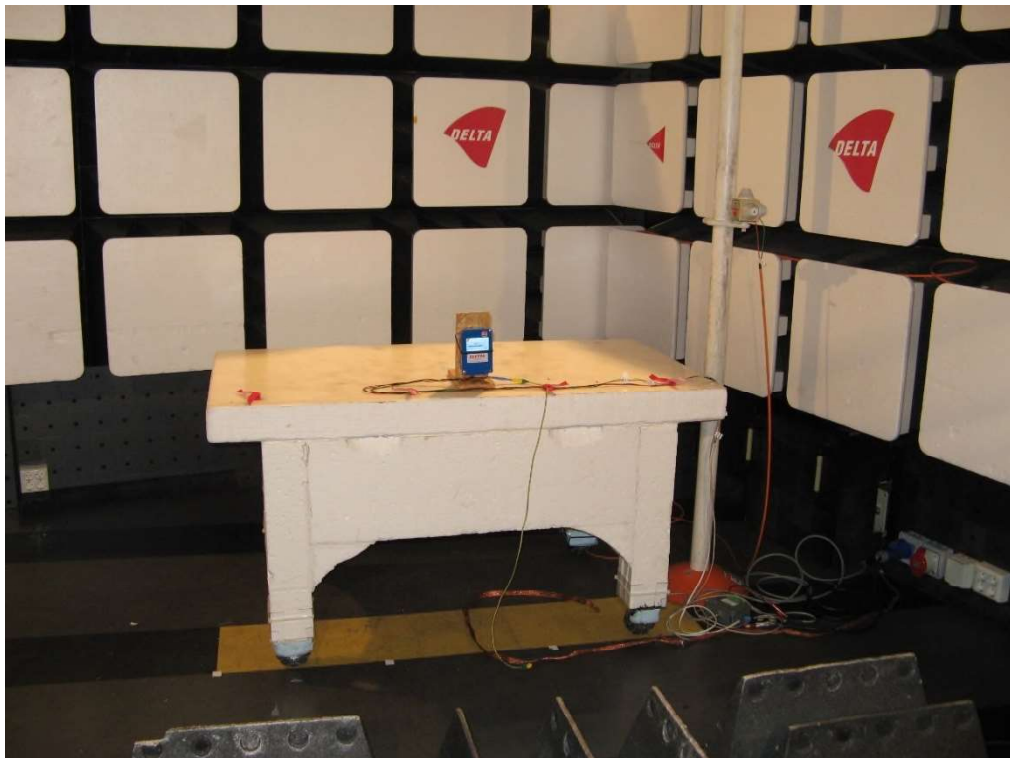


Photo 4.2.1 Test setup regarding immunity to radio frequency electromagnetic field for test between 80-1000 MHz.

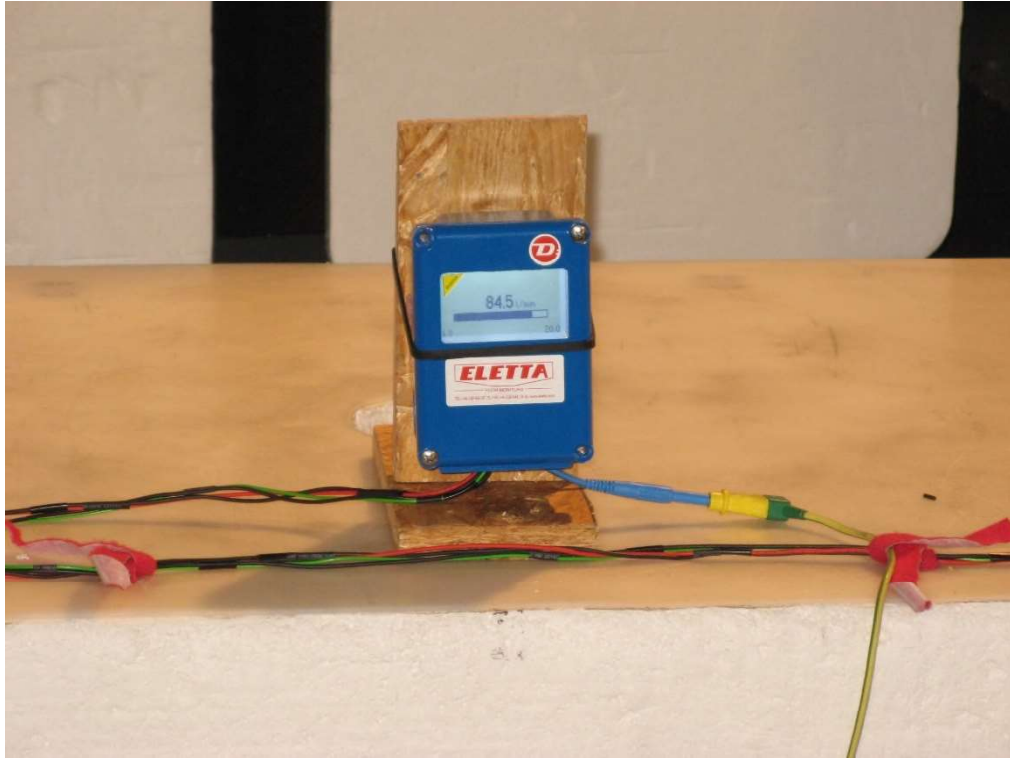


Photo 4.2.2 Test setup regarding immunity to radio frequency electromagnetic field. Front side exposed to the field.

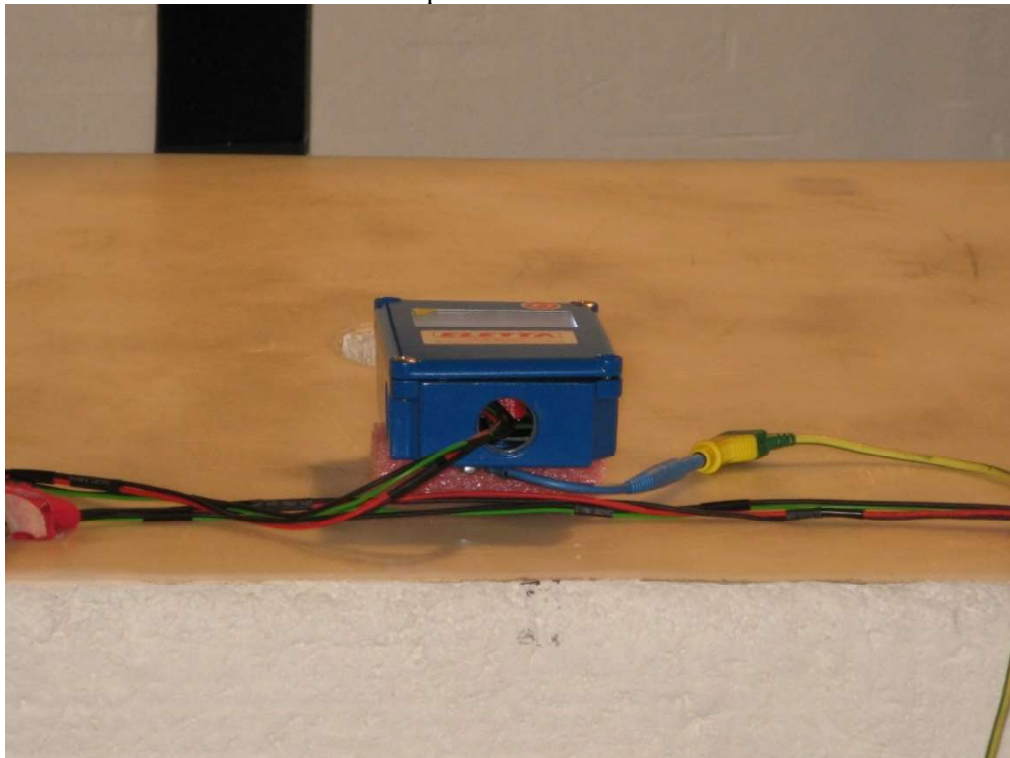


Photo 4.2.3 Test setup regarding immunity to radio frequency electromagnetic field. Bottom side (with cable inlet) exposed to the field.

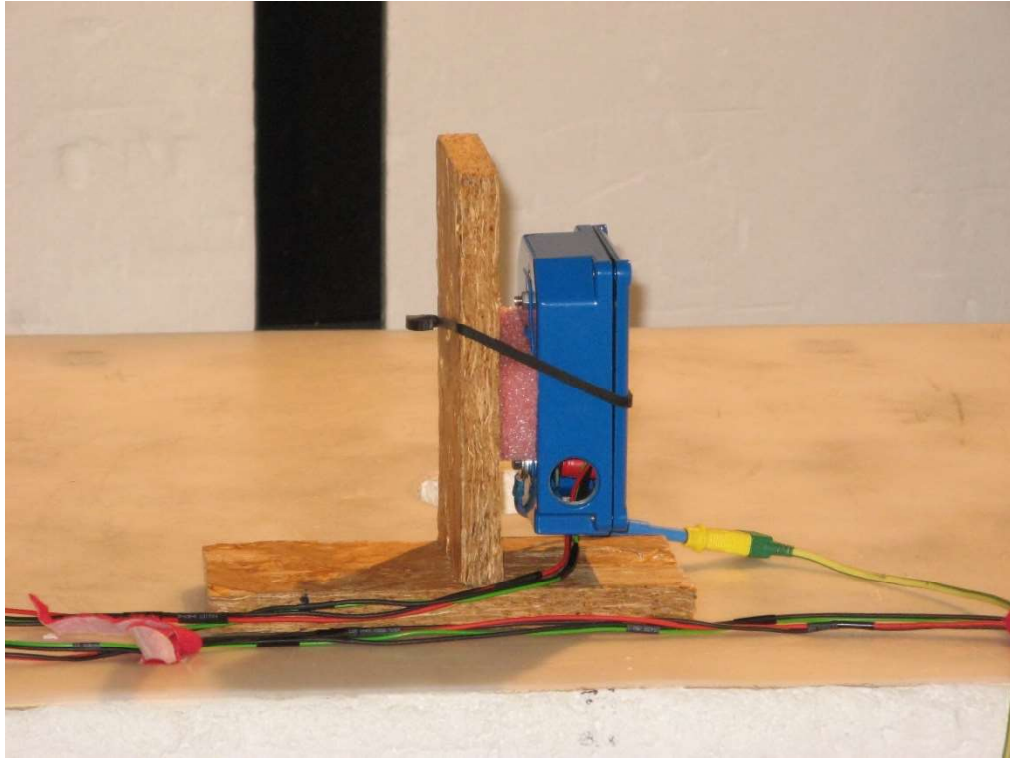


Photo 4.2.4 Test setup regarding immunity to radio frequency electromagnetic field. Left side exposed to the field.



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	EN/(IEC) 61000-4-4:2012				Temperature	24 °C
Characteristics	5 kHz bursts of 15/300 ms and 100 kHz bursts of 0.75/300 ms				Humidity	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.

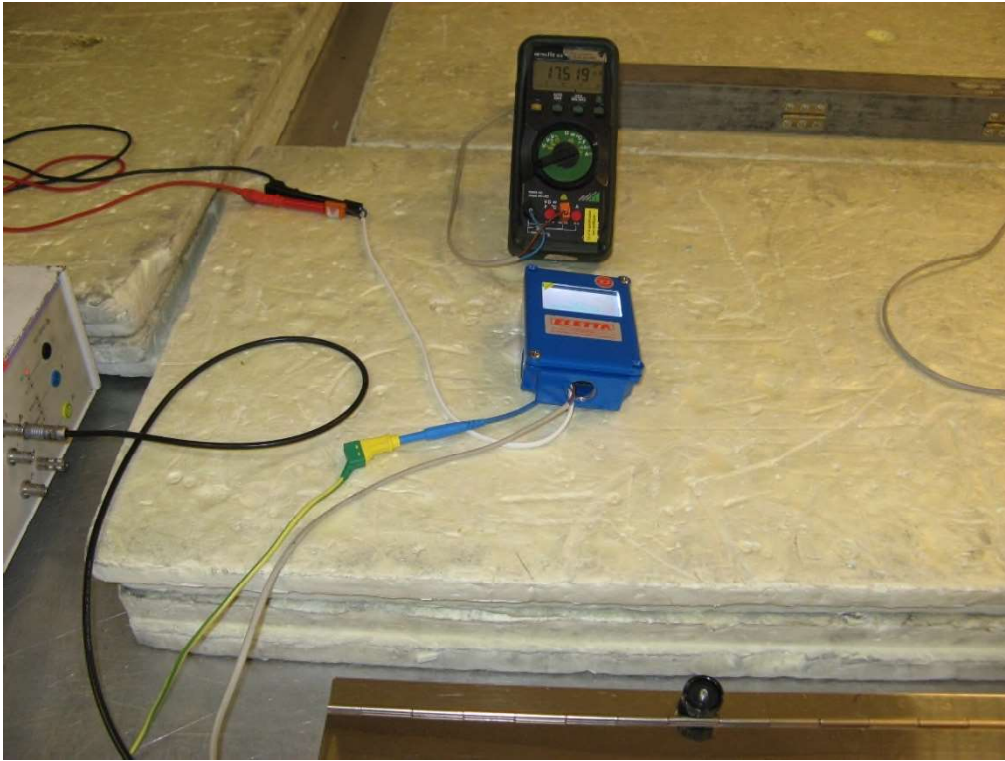


Photo 4.3.3 Test setup regarding immunity to fast transients on analog output port. Test object case grounded.

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	EN/(IEC) 61000-4-5:2014+A1				Temperature	24 °C
Characteristics	Open circuit volt.: 1.2/50 µs. Short circuit curr.: 8/20 µs				Humidity	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

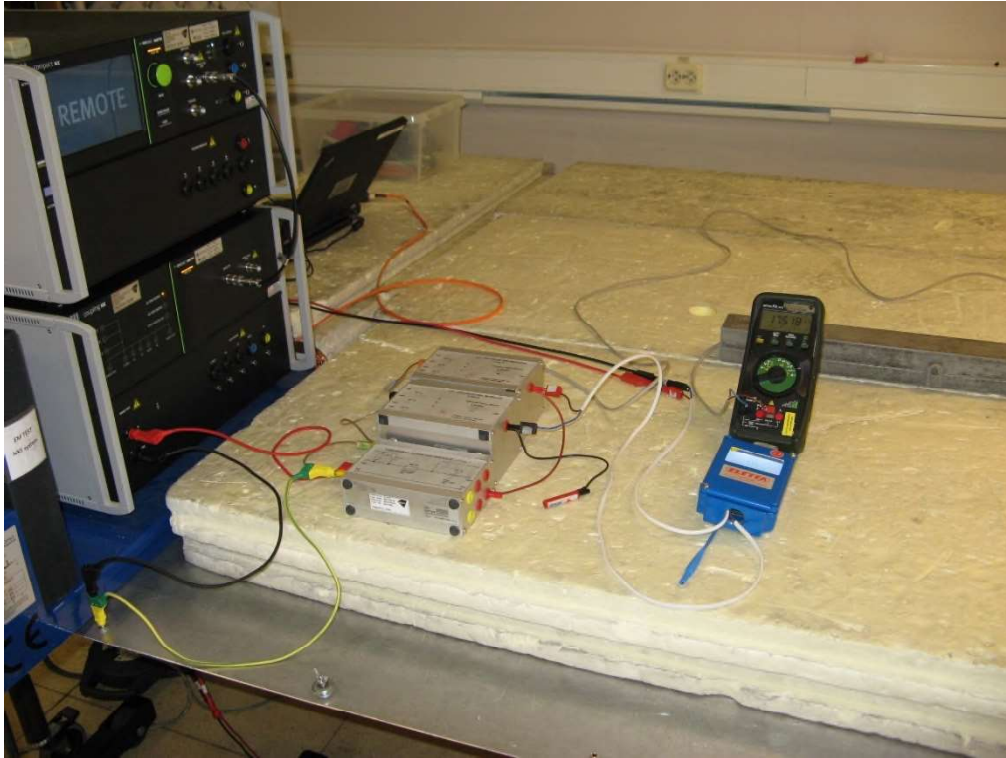


Photo 4.4.1 Test setup regarding immunity to surge transients.

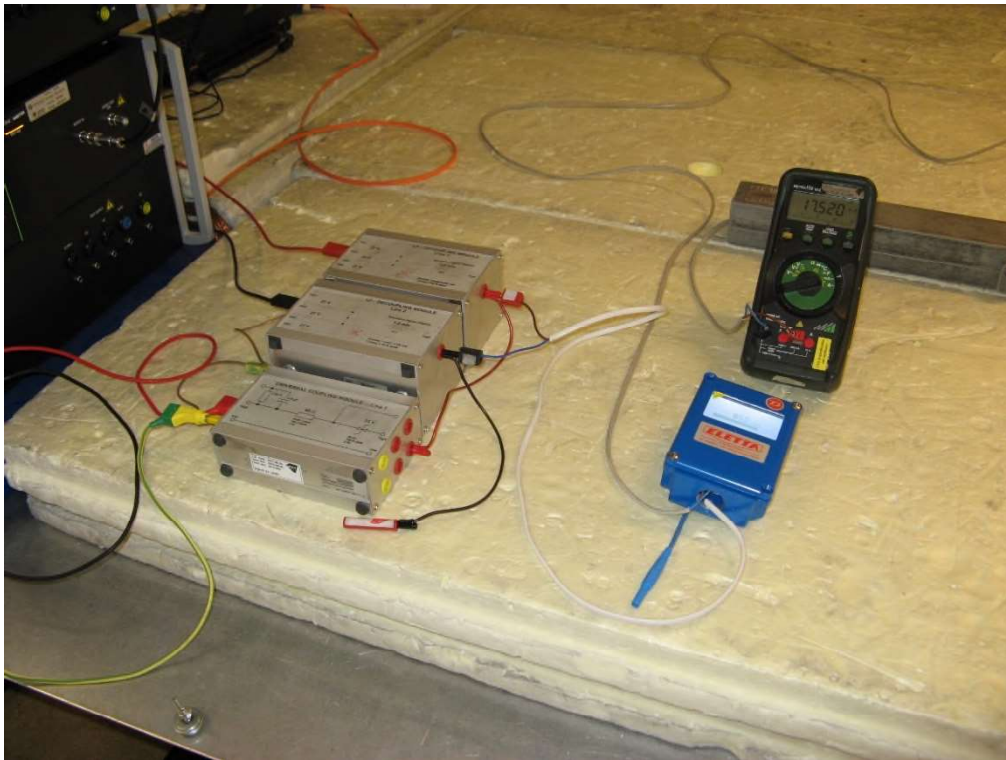


Photo 4.4.2 Test setup regarding immunity to surge transients on DC power port.
Test object case not grounded.

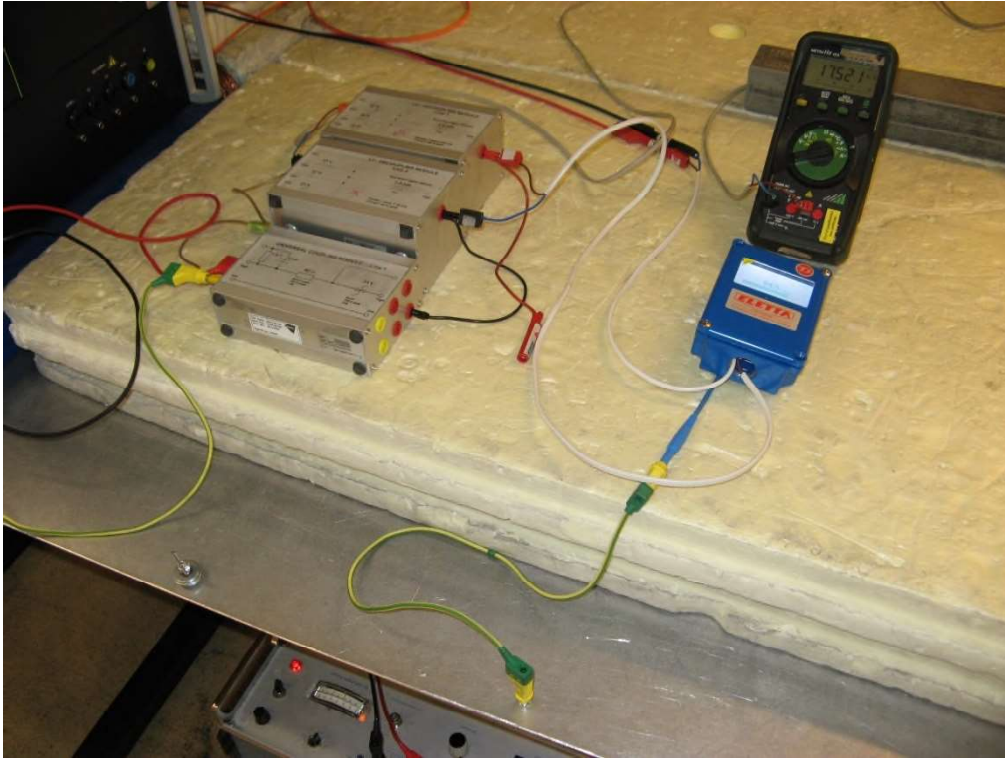


Photo 4.4.3 Test setup regarding immunity to surge transients on analog output port. Test object case grounded.

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	EN/(IEC) 61000-4-6:2014			Temperature	24 °C
Characteristics	Frequency range: 0.15-80 MHz, modulation: 80 % AM 1 kHz			Humidity	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

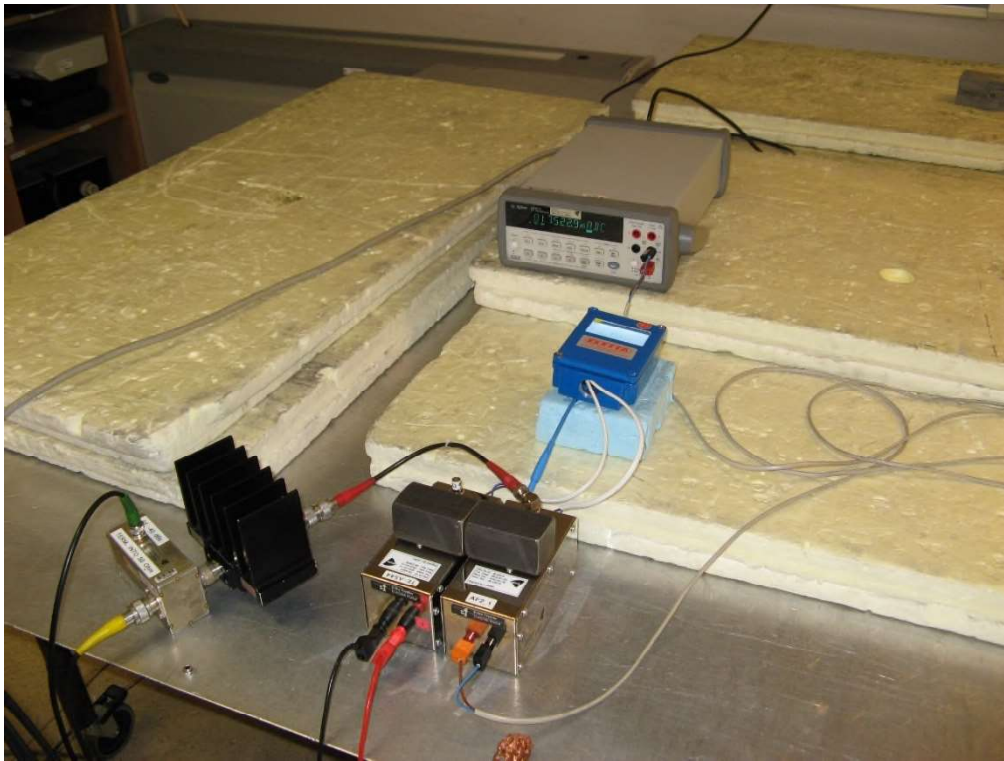


Photo 4.5.1 Test setup regarding immunity to conducted radio frequency disturbances.



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

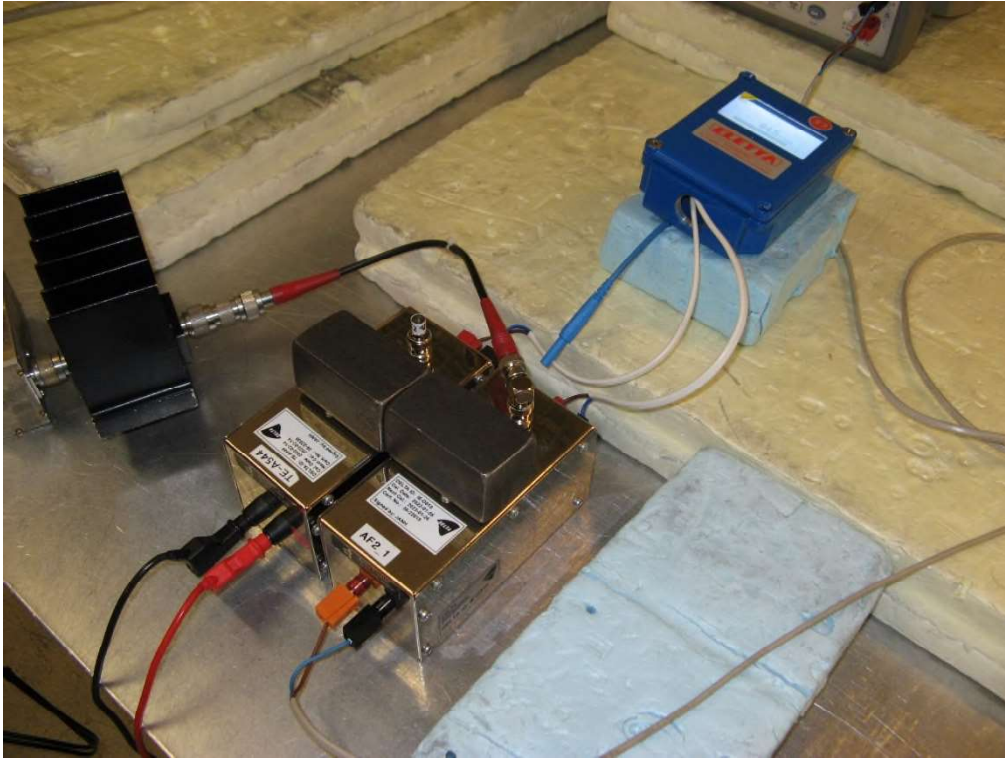


Photo 4.5.3 Test setup regarding immunity to conducted radio frequency disturbances on analog output port. Test object case not grounded.

4.6 Measurement of radio frequency electromagnetic field

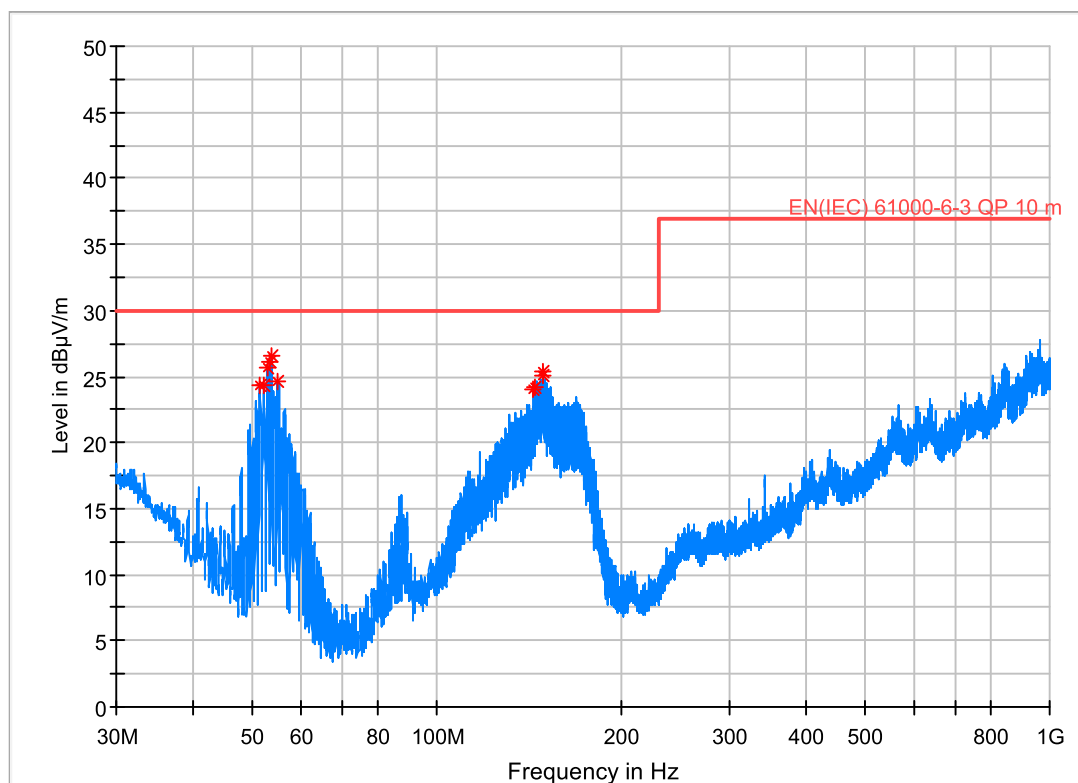
Test object	D-series upgrade	Project no.	622-20134
Type	D-series	Date	03 May 2022
Serial no.	00000	Initials	JANH
Specification	EN IEC) 61000-6-3:2021	Frequency	30-1000 MHz

Test method	CISPR 16-2-3:2016	Temperature	21 °C
Characteristics	Complete search, antenna distance 10 m	Humidity	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	<p>16 scans measurement were carried out with the EUT case grounded and not grounded.</p> <p>The highest measured radiated emission was observed with the case not grounded.</p> <p>See the 3 graphs in the figures below. Scans with the case not grounded, grounded and complete measurement.</p> <p>The complete measurement was performed on the EUT with the case not grounded.</p> <p>Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation.</p> <p>CMAD absorption clamps were used on power supply cable and analog output cable.</p>

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 Högvist
 Test Specification: EN IEC 61000-6-3:2021
 Comment: Not grounded



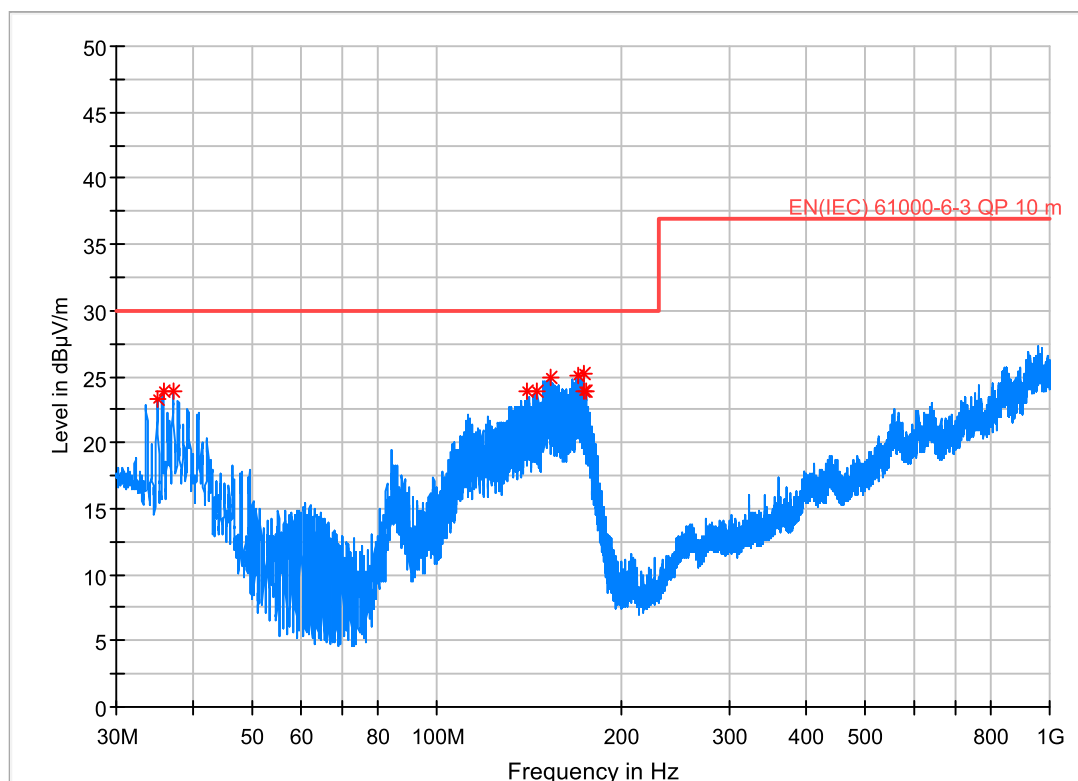
— T220503 T1 RE PK * Critical_Freqs PK+ — EN(IEC) 61000-6-3 QP 10 m

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 Högvist
 Test Specification: EN IEC 61000-6-3:2021
 Comment: Grounded



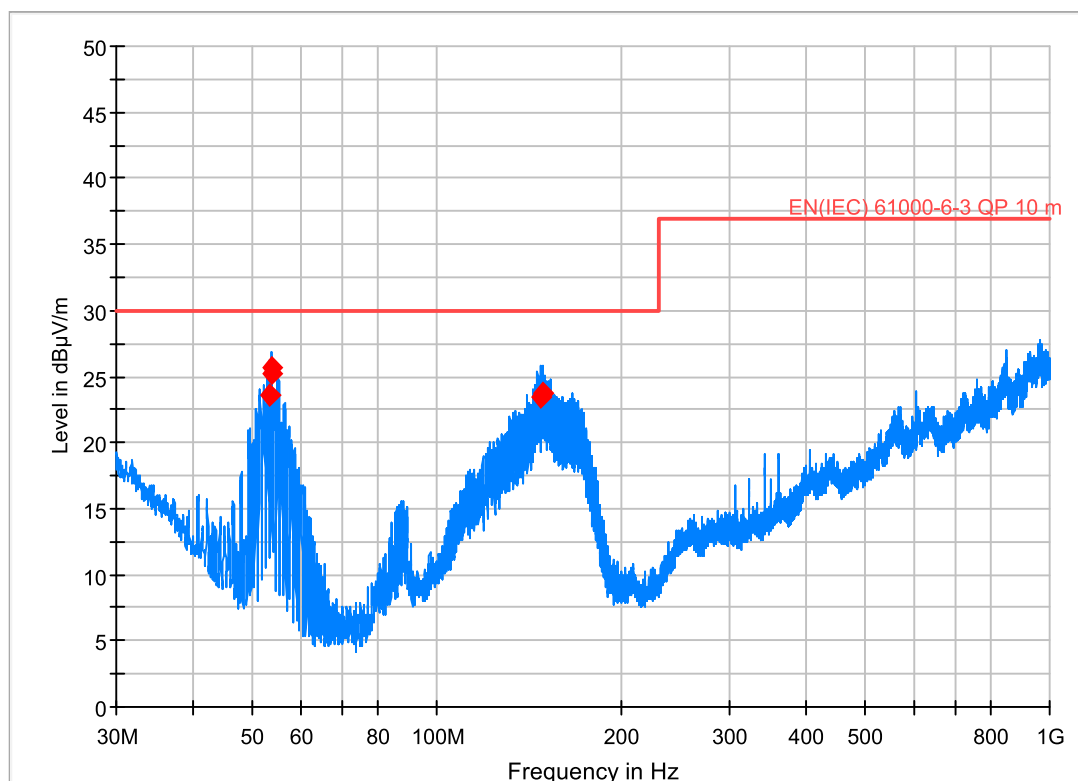
— T220503 T2 RE PK * Critical_Freqs PK+ — EN(IEC) 61000-6-3 QP 10 m

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 Högvist
 Test Specification: EN IEC 61000-6-3:2021
 Comment: Test object not grounded



— 622-20134 T1 RE 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)
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

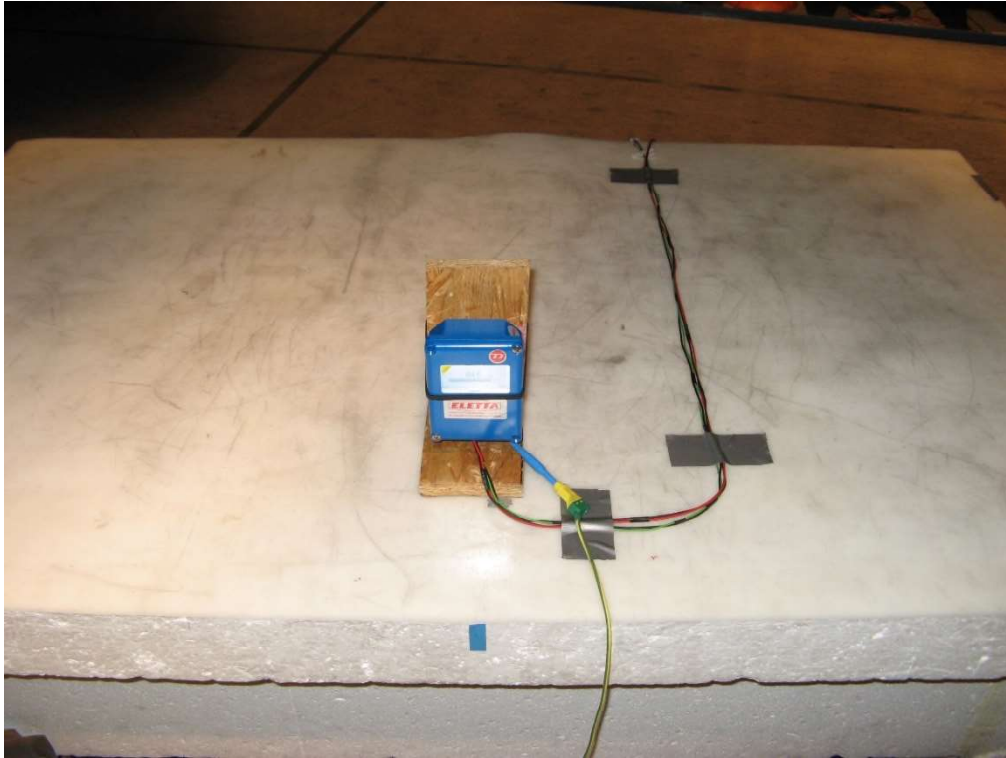


Photo 4.6.1 Test setup regarding measurement of radio frequency electromagnetic field. Test object case grounded.

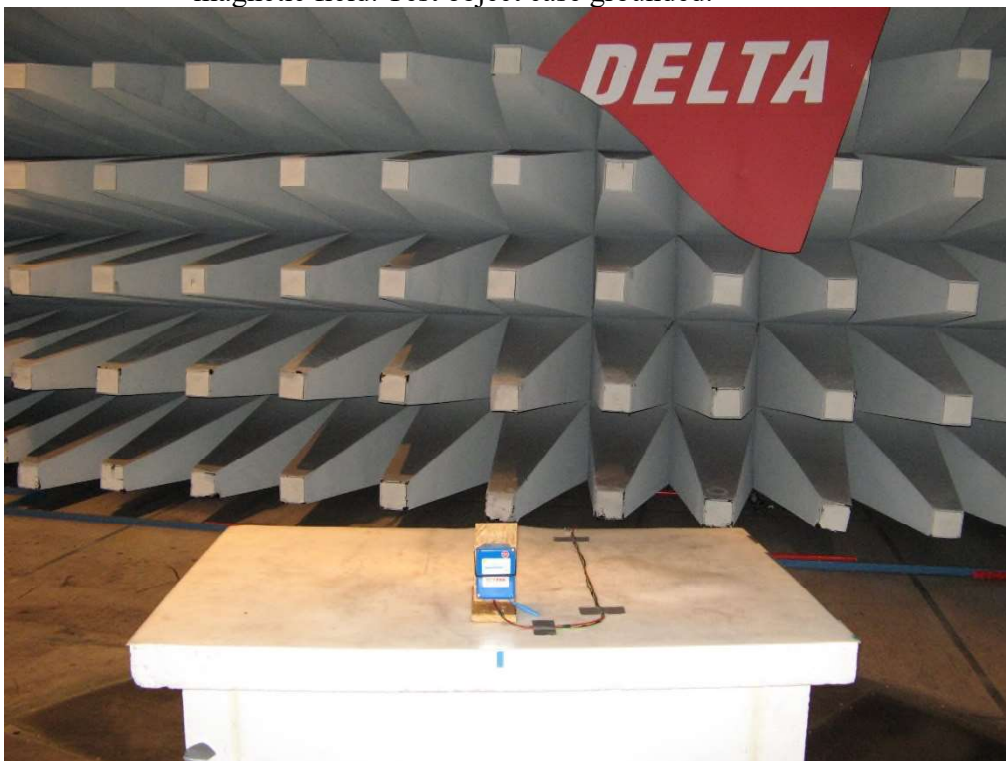


Photo 4.6.2 Test setup regarding measurement of radio frequency electromagnetic field. Front view. Test object case not grounded.



Photo 4.6.3 Test setup regarding measurement of radio frequency electromagnetic 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					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.15	5.0 dB
<input checked="" type="checkbox"/>	36205	Measuring receiver	Rohde & Schwarz	ESW44	
<input checked="" type="checkbox"/>	IE-B928	Antenna Bilog	Chase	CBL6111A	
<input checked="" type="checkbox"/>	36151	Preamplifier	FORCE	Preamp 0.5MHz-4GHz	
<input checked="" type="checkbox"/>	36166	Power supply	Mascot	6823 Mod.	
<input type="checkbox"/>	36129	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
<input type="checkbox"/>	36130	CMAD Absorption clamp	DELTA	CMAD D25/16-1-4	
<input checked="" type="checkbox"/>	36071	Controller	Maturo	NCD	
<input checked="" type="checkbox"/>	36072	Tilt antenna mast	Maturo	TAM 4.0-E	
<input checked="" type="checkbox"/>		Turntable	Heinrich Deisel	DT 440	

Setup VIA3					
Immunity to conducted radio frequency disturbances					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36070	Software	Rohde & Schwarz	EMC32 ver. 10.60.00	1.4 dB
<input checked="" type="checkbox"/>	E-H908	Signal generator	Marconi	2024	
<input checked="" type="checkbox"/>	E-H909	Amplifier	Amplifier Research	75A250	
<input checked="" type="checkbox"/>	36148	Average Power Sensor	Rohde & Schwarz	NRP18A	
<input checked="" type="checkbox"/>	E-I026	-40 dBc Voltage Sampler	DELTA-Denmark		
<input checked="" type="checkbox"/>	E-I022	RF attenuator 6 dB	Weinschel Corp	65-6-3	
<input checked="" type="checkbox"/>	IE-D010	CDN, 0.15-80 MHz	Erika Fiedler	CDN AF2_1	
<input checked="" type="checkbox"/>	TE-A543	CDN, 0.15-230 MHz	Erika Fiedler	CDN M1	
<input checked="" type="checkbox"/>	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					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	36035	Software	EM TEST	ISMIEC ver. 4.10	1.1 dB
<input checked="" type="checkbox"/>	E-L444	Burst/ Surge generator	EM TEST	UCS 500 M4	
<input checked="" type="checkbox"/>	36026	Coupling network	EM TEST	CNI 503	
<input checked="" type="checkbox"/>	E-L443	Coupling clamp	EM TEST	HFK	

Setup VIC2					
Immunity to electrostatic discharges					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	29838	ESD simulator	KeyTek	MiniZap MZ-15/EC	1.1 dB

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

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

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

Other instruments used					
<i>Used</i>	<i>ID no.</i>	<i>Description</i>	<i>Manufacturer</i>	<i>Type no.</i>	<i>Setup uncertainty</i>
<input checked="" type="checkbox"/>	35149	Temperature- and hygrometer	Ecolog	TH 1	
<input checked="" type="checkbox"/>	IM-A308	Temperature- and hygrometer	Vaisala	HMI31	