

Electromagnetic Compatibility EMC TEST REPORT 288799-1

Test Report

Electromagnetic Compatibility (EMC)



Equipment Under Test: Valve Positioner

Trademark: -

Model: NDX

Type: NDX2512LG

Manufacturer: Metso Flow Control Oy
Vanha Porvoontie 229
FI-0138 Vantaa
FINLAND

Customer: Metso Flow Control Oy
Vanha Porvoontie 229
FI-0138 Vantaa
FINLAND

The Equipment Under Test Was Tested According To Following Standard(s)

Title of the standard - <i>Product / test environment</i>	Reference standard	Amendment(s) of the standard
Emission - Generic standard - <i>Industrial environments</i>	EN 61000-6-4:2007	A1:2011
Emission - Generic standard - <i>Residential, commercial and light-industry environments*</i>	EN 61000-6-3:2007	A1:2011
Immunity - Generic standard - <i>Industrial environments</i>	EN 61000-6-2:2005	-

*) Note: At the request of the customer, only the Conducted Emissions test for the DC Power Port was performed.

Date: 7.6.2017

Issued by:

Jonas Dahlgren
Testing Engineer

Date:

7.6.2017

Checked by:

Jarno Lindström
Testing Engineer

Table of Contents

PRODUCT DESCRIPTION	4
Equipment Under Test (EUT)	4
Type of the EUT	4
Power Requirements	4
Mechanical Size of the EUT	4
Cable Lengths and Types	4
Peripherals	5
Disclaimer	6
TEST CONDITIONS	7
Performance Criteria A for Immunity Testing	7
Performance Criteria B for Immunity Testing	7
Performance Criteria C for Immunity Testing	7
EUT Test Conditions During Testing	8
Photographs of the EUT	9
SUMMARY OF TESTING	16
Test Suite	17
EMISSION TEST RESULTS	18
Conducted Emissions from the Power Supply Cable	19
Radiated Emissions	22
IMMUNITY TEST RESULTS	24
Electrostatic Discharge Immunity	24
Radiated RF-field Immunity	25
Electrical Fast Transient Immunity	26
Surge Immunity	27
Conducted RF-field Immunity	28
Power Frequency Magnetic Field Immunity	29
TEST EQUIPMENT	31
Conducted Emissions	31
Radiated Emissions	31
Electrostatic Discharge Immunity	31
Radiated RF-field Immunity Test	32
Electrical Fast Transient	32
Surge Immunity	33
Conducted RF-field Immunity	33
Power Frequency Magnetic Field Immunity	33

Equipment Under Test (EUT)

The EUT is a Valve positioner.

Model: NDX
Type: NDX2512LG
Serial: PH17990001

Type of the EUT

The EUT was tested as a tabletop unit.

Power Requirements

Rated voltage: 12-30 VDC (24 VDC used in tests)
Rated current: 20 mA

The EUT does not have an external power source. It is powered through the milliamper input (4-20 mA) signal cable (12 mA was used during testing). The Position transmitter (PT) is powered with 12-30 VDC through signal cable (24 VDC was used during testing).

Mechanical Size of the EUT

Height: 285 mm Width: 590 mm Depth: 285 mm

Cable Lengths and Types

Port	Cable:	Length:	Type:
Milliamper input	Signal cable	10.0 m	Double shielded, 2-pairs
PT (Position transmitter)	Signal cable	10.0 m	Double shielded, 2-pairs

All cables are specified as max >30 m and grounded at both ends regarding the EN 61000-4-5 test.

Peripherals

Fluke 705 Loop Calibrator

- provided the 12 mA Milliampere input for the EUT in all tests
- provided by the customer

TTi EL302 POWER SUPPLY type 30V 2A

- provided the 24 VDC signal for the EUT Position transmitter (PT) in all tests
- provided by the customer

Multimeter METRA Hit 29S CAT IV

- used to check (provided more redundancy) the 12mA current signal output of the EUT Position transmitter (PT) during the radiated RF-field immunity test
- provided by the customer

Agilent 34972A LXI Data Acquisition / Switch Unit

- used in the immunity monitoring system as the position transmitter (PT) data logger in all immunity tests
- provided by the customer

D-Link DUB-E100 USB 2.0 Ethernet Adapter

- used in the immunity monitoring system as the adapter between the Agilent 34972A LXI Data Acquisition / Switch Unit and Laptop PC in all immunity tests
- provided by the customer

VIT HART MODEM HART-USB-001 USB HART Interface

- used in the immunity monitoring system as the adapter between the HART communication interface of the EUT and Laptop PC in all immunity tests
- provided by the customer

HP 6730b Laptop PC with various software

- used in the monitoring system for analyzing of the monitored data and measured values
- provided by the customer

Compressed air

- used in all tests for constant pressurizing of the EUT's pressure container
- provided by SGS Fimko

Disclaimer

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only. This document cannot be reproduced except in full, without prior approval of the Company.

Performance Criteria A for Immunity Testing

The EUT shall continue to operate as intended during and after the test. No degradation of performance is allowed.

Permitted loss of performance specified by the manufacturer is as follows:

PT output current shall stay within $\pm 0.5\%$ from undisturbed output during disturbance. Physical valve position shall stay within $\pm 0.5\%$ from undisturbed position during disturbance. Valve position reading indicated by LUI display shall stay within $\pm 0.5\%$ from undisturbed reading during disturbance. No input change of the HART communication is allowed.

Performance Criteria B for Immunity Testing

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

During the test, degradation of performance is however allowed, provided that temporary degradation of performance or loss of function is self-recovered during or after the test. No change of actual operating state, loss of memory or stored data is allowed.

Permitted loss of performance specified by the manufacturer is as follows:

PT output current shall stay within $\pm 1.0\%$ from undisturbed output during disturbance. PT output current is allowed to change during disturbance. Physical valve position shall stay within $\pm 1.0\%$ from undisturbed position when disturbance has deceased. Physical valve position is allowed to change during disturbance. Valve position reading indicated by LUI display shall stay within $\pm 1.0\%$ from undisturbed position when disturbance has deceased. Valve position reading indicated by LUI display is allowed to change during disturbance. Breaks in HART communication are allowed during testing.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance Criteria C for Immunity Testing

Permitted loss of performance specified by the manufacturer is as follows:

The content of LUI display may become unreadable during testing but the content is recoverable when disturbance has deceased.

EUT Test Conditions During Testing

Configuration of the EUT was made to correspond to the actual assembling conditions as far as possible. Air pressure of 4 Bar was fed to the EUT's pressure container. The Milliampere input was fed with 12 mA during testing. 24 VDC was fed to the PT output.

See the figure below for an overview of the system configuration during the tests.

During the emission tests:

The measurements were performed on a normally operating valve positioner. Pressure container, power and input signal source via PT and milliampere input are connected to the positioner. Peripheral device Fluke 705 Loop calibrator was connected to the EUT during the test. Fluke 705 was inside the test chamber during emission tests. The TTI EL302 POWER SUPPLY was outside the radiated emissions test chamber and connected through the filters to the turntable terminal.

During the immunity tests:

The measurements were performed on a normally operating valve positioner. Pressure container, power and input signal source via PT and milliampere input are connected to the positioner.

Redundancy was built in the performance monitoring to distinguish between disturbing of the EUT (LUI display, true valve position) and the peripheral equipment.

EUTs valve position movement was monitored with two digital vernier calibers.

EUTs display was monitored visually.

EUTs state was also monitored with manufacturer's computer software Agilent Benchmark Datalogger 2 and a python script hart_commtest.py for HART communication monitoring.

Tests were started after EUT startup adaptive phase if EUT was restarted.

A video camera and/or human eye was used to monitor the valve position %-value displayed by the LUI display during the immunity tests.

The EUT ground terminal was connected to ground in all tests when permitted.

The test conditions were proposed by the customer.

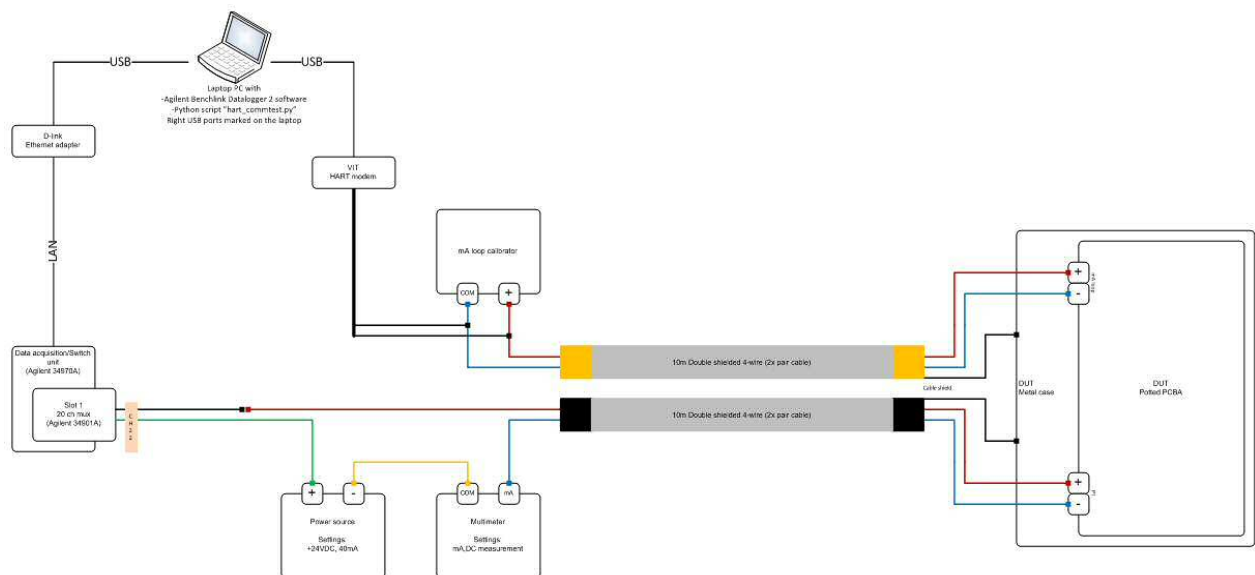
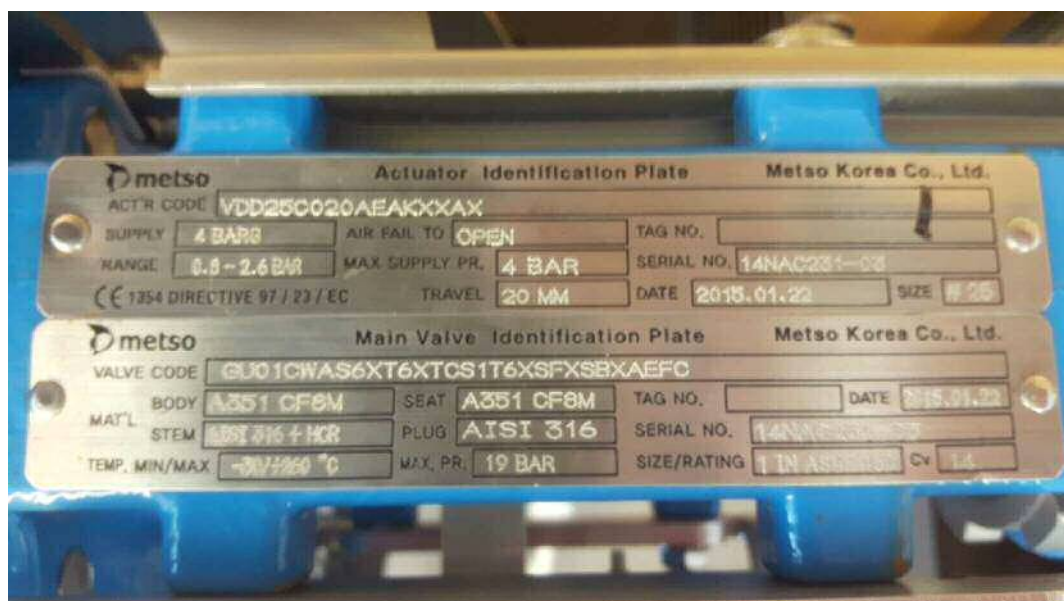


Figure 1. The system configuration during the tests including the performance monitoring parts

Photographs of the EUT**Photograph 1. The EUT**



Photograph 2. The EUT marking plates

Conducted Emissions



Photograph 3. The EUT and test set-up for conducted emission test



Photograph 4. The EUT and test set-up for radiated emission test



Photograph 5. The EUT and test set-up for electrostatic discharge immunity.



Photograph 6. The EUT and test set-up for electrostatic discharge immunity.



Photograph 7. The EUT and test set-up for electrostatic discharge immunity.



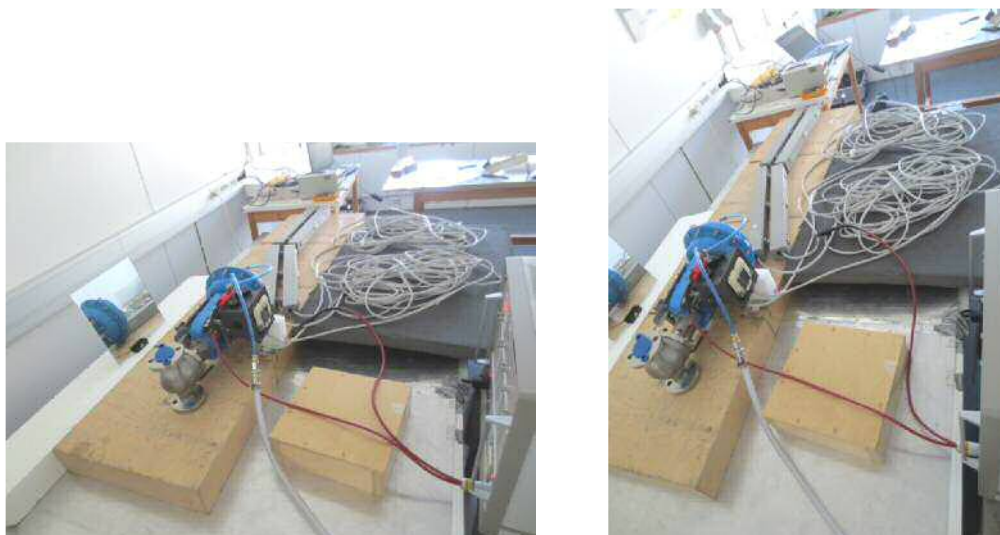
Photograph 8. The EUT and test set-up for electrostatic discharge immunity.



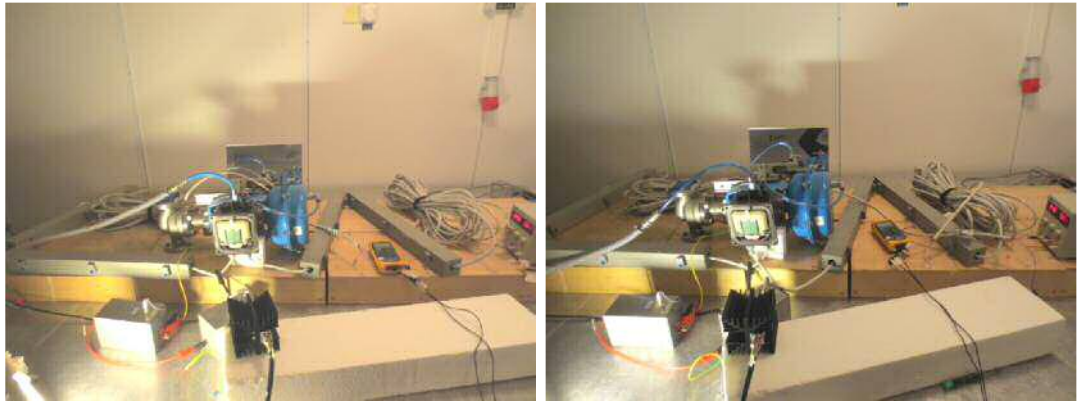
Photograph 9. The EUT and test set-up for radiated RF-field immunity.



Photograph 10. The EUT and test set-up for electrical fast transient immunity.



Photograph 11. The EUT and test set-up for surge immunity.



Photograph 12. The EUT and test set-up for conducted RF-field immunity.



Photograph 13. The EUT and test set-up for power frequency magnetic field immunity.

Conducted Emissions
Test Suite

Measurement/Test	Reference standard		Test site	Result
Conducted Emissions from the Power Supply Cable	EN 55016-2-1:2009 EN 55022:2010			PASS
Radiated Emissions	EN 55016-2-3:2010 EN 55011:2009		3m	PASS
Electrostatic Discharge Immunity	EN 61000-4-2:2009			PASS
Radiated RF-field Immunity	EN 61000-4-3:2006	A1:2008, A2:2010	3m	PASS
Electrical Fast Transient Immunity	EN 61000-4-4:2012			PASS
Surge Immunity	EN 61000-4-5:2014			PASS
Conducted RF-field Immunity	EN 61000-4-6:2014			PASS
Power Frequency Magnetic Field Immunity	EN 61000-4-8:2010			PASS
Voltage Dips and Short Interruptions Immunity	EN 61000-4-11:2004			N/A ^a

^{a)} The test was not required for DC input power ports.

Testing location:	
☒ Testing Laboratory:	SGS Fimko Ltd
☒ Testing Location / address: All tests.	SGS Fimko Ltd Särkiniementie 3 FI-00210, HELSINKI FINLAND
☐ Testing Location / address:	SGS Fimko Ltd Karakaarenkuja 4 FI-02610, ESPOO FINLAND

Conducted Emissions from the Power Supply Cable

Product family standard: EN 55016-2-1, EN 55022

Tested by: JDA

Date: 18.5.2017

Temperature: 25 °C

Humidity: 35 %

Barometric pressure: 1016 mbar

Measurement uncertainty: ± 3.03 dB

Level of confidence 95 % (k = 2).

Test result: **PASS**

Test Plan

Conducted disturbance voltage was measured with an artificial mains network from 150 kHz to 30 MHz with 1.5 kHz steps and a resolution bandwidth of 10 kHz. Measurements were carried out with peak and average detectors from the positive and negative lines of the signal cable.

The EUT was working as described in the section "EUT Test Conditions".

Test results

Milliamper input:

EN 61000-6-3 Voltage on Mains 2-Line-LISN DC power limits

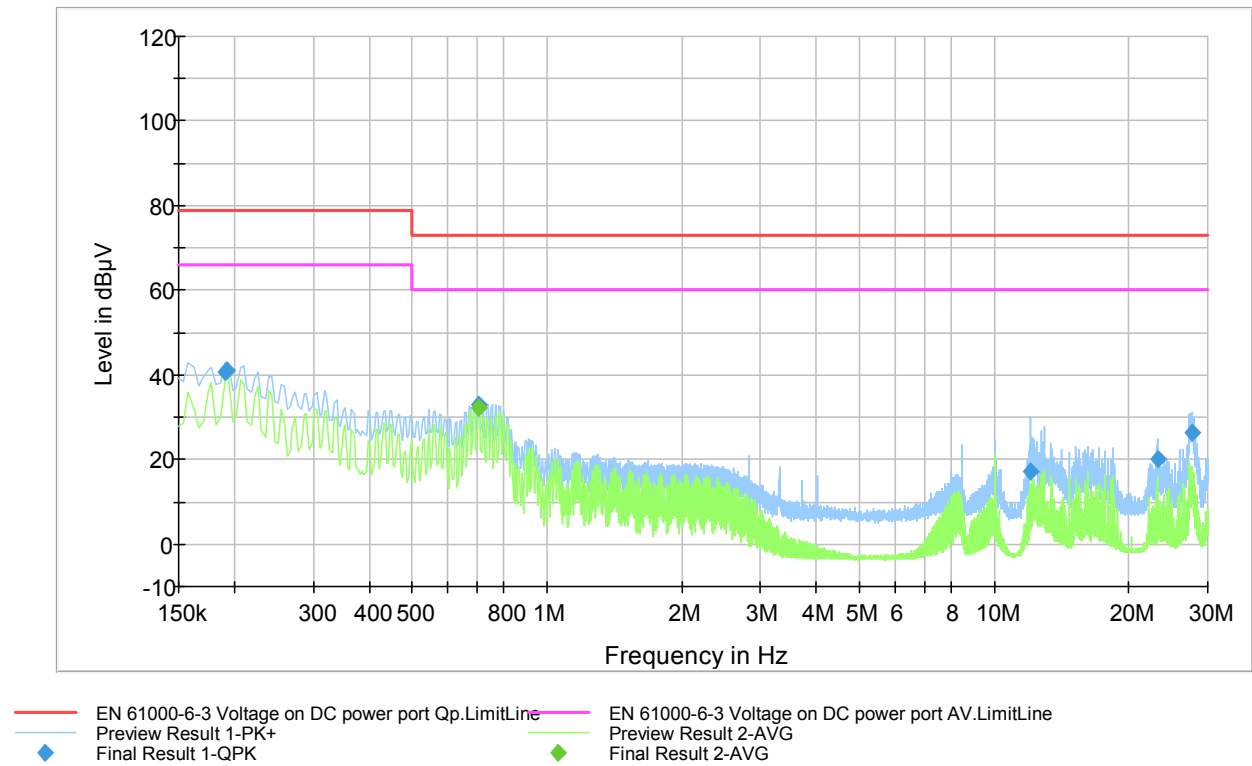


Figure 2. The measured curves with peak- and average-detectors

Table 1. Final quasi-peak measurements from the worst frequencies *

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.190501	40.8	1000.0	10.000	GN	L1	9.9	38.2	79.0	
0.192501	41.0	1000.0	10.000	GN	L1	9.9	38.0	79.0	
0.703501	32.9	1000.0	10.000	GN	N	10.0	40.1	73.0	
12.046501	17.3	1000.0	10.000	GN	L1	10.7	55.7	73.0	
23.129501	20.1	1000.0	10.000	GN	L1	11.4	52.9	73.0	
27.634501	26.5	1000.0	10.000	GN	L1	11.7	46.5	73.0	

Table 2. Final average measurements from the worst frequencies *

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.702501	32.3	1000.0	10.000	GN	N	10.0	27.7	60.0	

*Note: The indicated quasi-peak and average values are the measured values corrected with the correction factor (Corr.).

No final measurements were required because the margin to the limit was larger than 10dB.

PT (Position transmitter):

EN 61000-6-3 Voltage on Mains 2-Line-LISN DC power limits

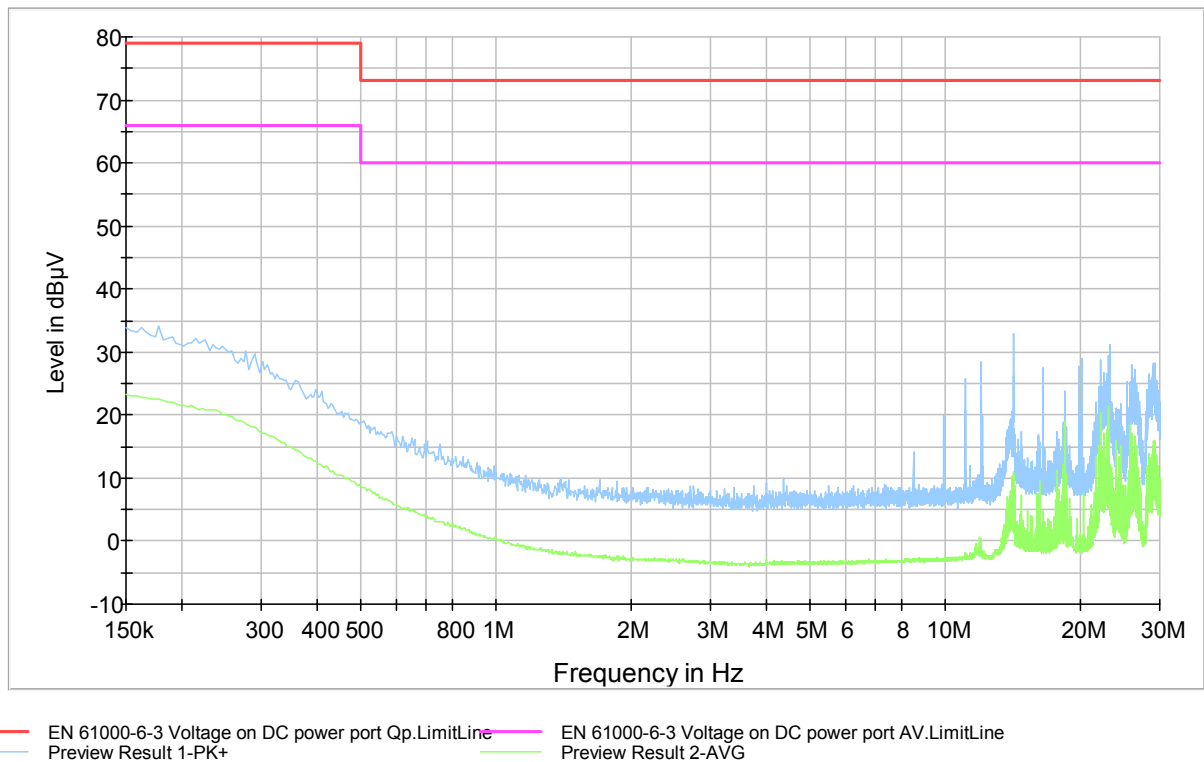


Figure 3. The measured curves with peak- and average-detectors

No final measurements were made because the margin to the limit was larger than 10dB.

Radiated Emissions

Radiated Emissions

Basic standard:	EN 55016-2-3, EN 55011	
Tested by:	JDA	
Date:	18.5.2017	
Temperature:	22 °C	
Humidity:	38 %	
Barometric pressure:	1016 mbar	
Measurement uncertainty:	± 4.34 dB (30 – 1000 MHz)	Level of confidence 95 % (k = 2).
Limit:	Class A	
Test result:	PASS	

Test plan

The radiated emission measurements were done within a semi anechoic screened chamber. The EUT was placed on a table 0.8 m above the reflecting ground plane. The measurement distance was 3 meters. The worst interferences were determined during measurements by rotating the turntable and adjusting the antenna height. The measurements were done in horizontal and vertical antenna polarizations. The supply voltage (24 VDC) to the turntable was fed through the filters.

Field strength results were converted to correspond to 10 meter measuring distance as described in Clause 7.2.3 or 8.3.4 of CISPR 11 or clause 7.3.4 of basic standard CISPR 16-2-3 so that they can be directly compared with CISPR 11 / EN 55011 limits at the specified distance for determining compliance.

Radiated measurement settings

Preliminary testing:

Turntable movement:	30 ° step
Turntable position:	0 ° to 330°
Antenna movement:	1.5 m step
Antenna height:	1.0 m to 4.0 m
Antenna polarization:	Vertical and horizontal

Final testing:

Turntable movement:	Continuous
Turntable position:	± 15 °
Antenna movement:	Continuous
Antenna height:	± 0.75 m
Antenna polarization:	Vertical and horizontal

Test results

EN 61000-6-4 Electric Field Strenght

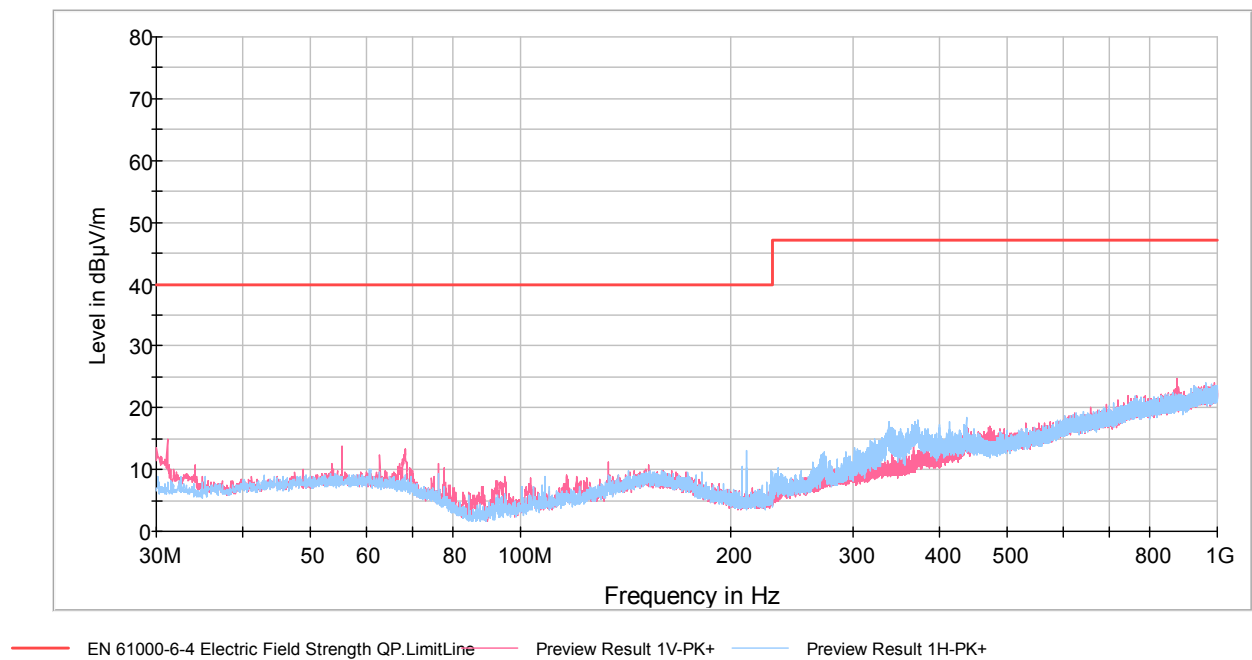


Figure 4. The measured curves with the peak-detector and both measuring antenna polarization

No final measurements were made because the margin to the limit was larger than 10dB.

Electrostatic Discharge Immunity

Basic standard: EN 61000-4-2
Tested by: JDA
Date: 18.5.2017
Temperature: 20 °C
Humidity: 59 %
Barometric pressure: 1015 mbar
Performance criteria: Valve position and PT output :A
LUI display: C
Test result: **PASS**

Test plan

Tests were done by using the air discharge to non-conductive and the contact discharge to all conductive parts of the EUT. Also the indirect contact discharges were given to VCP (Vertical Coupling Plate) in order to simulate the objects placed near to the EUT. Indirect contact discharges to HCP (Horizontal Coupling Plane) were considered not applicable due to the type of the EUT. At least ten discharges were given with both polarities to the selected points. Ferrite clamps were added to the wires going to the AE (peripherals) to protect the AE from the disturbance.

Test results

Discharge method: Air discharge
Test levels: ± 2 kV, ± 4 kV, ± 8 kV
EUT test point: Non-conductive enclosure including LUI display and touch buttons and screw terminals where applicable
Test remarks: Discharge observed with ± 4 kV and ± 8 kV. With ± 4 kV the LUI display was disturbed or shuts down and had to be restarted by pressing the touch panel button if it did not recover in reasonable amount of time between the given discharges. With ± 8 kV, the same problem existed, and was worse with +8 kV.
Maximum variation in the measured position during the test was 0.42 %. Valve did not move. No other loss of performance was observed

Discharge method: Indirect contact discharge
Test level: ± 2 kV, ± 4 kV
EUT test side: Front of EUT LUI display
Test remarks: No loss of function was observed.

Discharge method: Contact discharge
Test levels: ± 2 kV, ± 4 kV
EUT test point: Conductive parts, screws, terminals, inlets etc. around LUI display enclosure and some points at valve construction - see the EUT test setup photographs
Test remarks: When discharges were given to the terminals of the EUT, the LUI display was disturbed or shuts down and had to be restarted by pressing the touch panel button if it did not recover in reasonable amount of time between the given discharges.
Maximum variation in the measured position during the test was 0.50 %. Valve did not move. No other loss of performance was observed other than the EUT showed some very slow stair-type fluctuation of the measured value during and after the test, and a spike was observed in the measured curve of the position deviation at every transition in the fluctuation.

Radiated RF-field Immunity

Basic standard: EN 61000-4-3
Tested by: JDA
Date: 17.5.2017
Temperature: 22 °C
Humidity: 38 %
Barometric pressure: 1022 mbar
Performance criteria: Valve position: A
PT output, HART and LUI display: B
Test result: **PASS**

Test plan

Test was done in a semi-anechoic chamber. Signal generator was set to 1 % logarithmic step size for the whole frequency range. The floor of the chamber was covered by ferrite tiles and wedged absorbers. All four sides of the EUT were tested with both antenna polarizations. Ferrite clamps were added to the wires going to the AE (peripherals) outside the test chamber to protect the AE from the disturbance.

The EUT was placed on a table 0.8 m above non-reflecting ground plane.

Test results

Frequency range: 80 – 1000 MHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 10 V/m
Dwell time: 2 sec
Antenna polarization: Horizontal and vertical
EUT test side: Front, rear, right and left side
Test remark: Maximum variation in the measured position during the test was 0.76 % (LUI display towards antenna in vertical polarization). Valve did not move. No other loss of performance was observed

Frequency range: 1400 – 2700 MHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 3 V/m
Dwell time: 2 sec
Antenna polarization: Horizontal and vertical
EUT test side: Front, rear, right and left side
Test remark: No loss of performance was observed

Electrical Fast Transient Immunity

Basic standard: EN 61000-4-4
Tested by: JDA
Date: 19.5.2017
Temperature: 23 °C
Humidity: 44 %
Barometric pressure: 1012 mbar
Performance criteria: A
Test result: **PASS**

Test plan

Both polarities of the test voltage were tested. All lines of each cable were tested simultaneously. The EUT and cables were placed on an insulating support height of 10 cm height above a ground reference plane. Ferrite clamps were added to the wires going to the AE (peripherals) outside the ground reference plane to protect the AE from the disturbance.

EUT ports were considered DC power ports that are not connected to AC/DC-adapters.

Test results

Tested terminal: Milliamper input
Coupling method: Capacitive clamp
Coupling mode: Common
Test level: ± 2000 V
Test time: 120 seconds (for a one polarity of the test voltage)
Burst period: 300 ms
Burst duration: 15 ms
Impulse repetition rate: 5 kHz
Test remarks: Maximum variation in the measured position during the test was 0.11 %. Valve did not move. No other loss of performance was observed

Tested terminal: PT
Coupling method: Capacitive clamp
Coupling mode: Common
Test level: ± 2000 V
Test time: 120 seconds (for a one polarity of the test voltage)
Burst period: 300 ms
Burst duration: 15 ms
Impulse repetition rate: 5 kHz
Test remarks: No loss of function was observed

Surge Immunity

Basic standard: EN 61000-4-5
Tested by: JDA
Date: 19.5.2017
Temperature: 23 °C
Humidity: 44 %
Barometric pressure: 1011 mbar
Performance criteria: A
Test result: **PASS**

Test plan

Test was done to the EUT ports with capacitive coupling. Testing was started with the lowest test level. Both test voltage polarities were tested with five pulses. The EUT was placed on a support 0.1 m above the ground plane.

Ferrite clamps were added to the wires going to the AE (peripherals) outside the ground reference plane to protect the AE from the disturbance.

According to the manufacturer, the EUT cables are grounded at both ends, and thus surge test for cables grounded at one end was not applicable. Test pulses were applied between EUT enclosure and cable shield app. 10 m in the AE direction.

The EUT was working as described in the section "EUT Test Conditions".

Test results

Tested cable: PT
Coupling method: Capacitive coupling
Coupling path: Line to PE
Test level: $\pm 500\text{ V}, \pm 1000\text{ V}$
Pulses: 5
Repetition rate: 20 seconds
Test remarks: No loss of function was observed.

Tested cable: Milliamper input
Coupling method: Capacitive coupling
Coupling path: Line to PE
Test level: $\pm 500\text{ V}, \pm 1000\text{ V}$
Pulses: 5
Repetition rate: 20 seconds
Test remarks: No loss of function was observed.

Conducted RF-field Immunity

Basic standard: EN 61000-4-6
Tested by: JDA
Date: 18.5.2017
Temperature: 26 °C
Humidity: 35 %
Barometric pressure: 1016 mbar
Performance criteria: Valve position and LUI display: A
PT output and HART: B
Test result: **PASS**

Test plan

Test was done to the cables with direct injection. The injections were given to whole frequency range with 1 % logarithmic frequency steps. The EUT, some AE and cables were placed on an insulating support height of 5 – 10 cm height above a ground reference plane.

Ferrite clamps were added to the wires going to the AE (peripherals) outside the ground reference plane to decouple and protect the AE from the disturbance.

The EUT was working as described in the section “EUT Test Conditions”.

Test results

Tested cable: Milliamper input
Coupling: Direct
Decoupling: Ferrite clamp
Return path: EUT enclosure ground CDN M1
Frequency range: 150 kHz - 80 MHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 10 Vrms
Dwell time: 2 sec
Test remark: Maximum variation in the measured position during the test was 0.10 %. Valve did not move. No other loss of performance was observed

Tested cable: PT
Coupling: Direct
Decoupling: Ferrite clamp
Return path: EUT enclosure ground CDN M1
Frequency range: 150 kHz - 80 MHz
Modulation: 80% AM with 1 kHz modulation frequency
Test level: 10 Vrms
Dwell time: 2 sec
Test remark: No loss of performance was observed

Power Frequency Magnetic Field Immunity

Basic standard: EN 61000-4-8
Tested by: JLI
Date: 22.5.2017
Temperature: 23 °C
Humidity: 41 %
Barometric pressure: 1007 mbar

Performance criteria: Valve position: A
PT output, HART and display: B

Test result: **PASS**

Test plan

Test was done by the immersion method to the EUT. The EUT was placed in the centre of the coil. The EUT was positioned with different orientations in order to expose the EUT to the field. Also all the cables were exposed to the field for length of 1 m. The magnetic field intensity was measured with a calibrated magnetic field sensor before the test.

Test results

Test level: 30 A/m
Test current: 2.67 A
Frequency 50 Hz
Measured field: 31.3 A/m
Test time: 120 seconds
Polarization: Vertical (0 degree)
Test remarks: Maximum variation in the measured position during the test was 0.55 %. Valve did not move. No other loss of performance was observed

Test level: 30 A/m
Test current: 2.69 A
Frequency 60 Hz
Measured field: 32.2 A/m
Test time: 120 seconds
Polarization: Vertical (0 degree)
Test remarks: Maximum variation in the measured position during the test was 0.23 %. Valve did not move. No other loss of performance was observed

Test level: 30 A/m
Test current: 2.67 A
Frequency 50 Hz
Measured field: 31.3 A/m
Test time: 120 seconds
Polarization: Vertical (90 degree)
Test remarks: Maximum variation in the measured position during the test was 0.26 %. Valve did not move. No other loss of performance was observed

Test level: 30 A/m
Test current: 2.69 A
Frequency 60 Hz
Measured field: 32.2 A/m
Test time: 120 seconds
Polarization: Vertical (90 degree)
Test remarks: Maximum variation in the measured position during the test was 0.24 %. Valve did not move. No other loss of performance was observed

Power Frequency Magnetic Field Immunity

Test level: 30 A/m
Test current: 2.67 A
Frequency 50 Hz
Measured field: 31.3 A/m
Test time: 120 seconds
Polarization: Horizontal
Test remarks: Maximum variation in the measured position during the test was 0.37 %. Valve did not move. No other loss of performance was observed

Test level: 30 A/m
Test current: 2.69 A
Frequency 60 Hz
Measured field: 32.2 A/m
Test time: 120 seconds
Polarization: Horizontal
Test remarks: Maximum variation in the measured position during the test was 0.40 %. Valve did not move. No other loss of performance was observed

Conducted Emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test receiver	ROHDE & SCHWARZ	ESS	9469	2016-11-15	2017-11-15
LISN	ROHDE & SCHWARZ	ESH3-Z5	4129	2016-08-29	2017-08-29
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	8392	2016-12-29	2017-12-29

Radiated Emissions

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMC Chamber 3m NSA	TDK	3 m Lauttasaari		2015-03-11	2018-03-11
EMI test receiver	ROHDE & SCHWARZ	ESCI 3	8264	2016-06-14	2017-06-14
Antenna	SCHWARZBECK	VULB 9168	9963	2015-08-21	2017-08-21
Turntable	DEISEL	DS 420	5015	-	-
Antenna mast	DEISEL	MA 240T	5017	-	-
Controller	EMC AUTOMATION	4630-100	5018	-	-

Electrostatic Discharge Immunity

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ESD Generator	SCHAFFNER	NSG 438	7877	2017-04-25	2018-04-25
Vertical coupling plane	SGS-FIMKO	-	-	-	-

Test Equipment
Radiated RF-field Immunity Test

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMC chamber 3m NSA	TDK	3 m Lauttasaari		2015-03-11	2018-03-11
Test software	ROHDE & SCHWARZ	EMC32	-	-	-
RF Power amplifier	OPHIR CORP.	5127RE	9767	-	-
Switch Controller	EMC AUTOMATION	RSM-1	5033	-	-
Power meter	ROHDE & SCHWARZ	NRVD	9777	2015-06-16	2017-06-16
Insertion Unit	ROHDE & SCHWARZ	URV5-Z4	8372	2015-08-21	2017-08-21
RF Signal generator	MARCONI	2031	7951	2015-06-03	2017-06-03
System interface	EMC AUTOMATION	SI-200	5021	-	-
E-field Sensor	AMPLIFIER RESEARCH	FP3000A (0.01- 1000MHz)	5024	2015-05-27	-
Antenna	ETS- LINDGREN	3142C	7788	2015-01-06	-
Voltage probe	ROHDE & SCHWARZ	URV5-Z4	9779	2015-06-18	2017-06-18
Turntable	DEISEL	DS 420	5015	-	-
Controller	EMC AUTOMATION	4630-100	5018	-	-
Antenna mast	DEISEL	MA 240 T	5017	-	-
Turntable	DEISEL	DS 420	5015	-	-
GPIO / RS232 Controller	KALMUS	IF488		-	-

Electrical Fast Transient

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EFT generator	EM TEST	EFT 500N5.5	9949	2017-05-02	2018-05-02
Capacitive coupling device	HAEFELY	IP4A	9758	2015-06-17	2017-06-17

Test Equipment
Surge Immunity

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Surge generator	HAEFELY	PSURGE 4.1 (2kV max)	9932	2017-03-01	2018-03-01

Conducted RF-field Immunity

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test software	ROHDE & SCHWARZ	EMC32	-	-	-
RF Power amplifier	AR	50W1000M3	4112	-	-
Attenuator	SCHAFFNER	6dB/50W	5176	2017-01-03	2018-01-03
Directional Coupler	WERLATONE	C2630	4961	2009-01-26	-
Signal generator	MARCONI	2032 +OPT08	8017	2015-08-25	2017-08-25
Power meter	R & S	NRVD	9517	2016-08-22	2017-08-22
Voltage probe	R & S	URV5-Z2	9519	2016-08-22	2017-08-22
Direct coupling box	SGS FIMKO		5119	2017-02-27	2018-02-27
Direct coupling box	SGS FIMKO		5117	2017-02-27	2018-02-27

Power Frequency Magnetic Field Immunity

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Magn.imm.ant	SGS FIMKO	-	-	-	-
ELF Survey meter	HOLADAY	HI-3604	9503	2015-11-27	2017-11-27
Power supply	CALIFORNIA INSTRUMENTS	500i-400	9487	-	-
Power analyzer	VOLTECH	PM6000	9588	2017-01-27	-