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22 Januar 2020

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Prüfbericht / Test Report

Nr. / No. 69360-79266-01 (Edition 1)

Auftraggeber <i>Applicant</i>	CSS Electronics ApS
Geräteart <i>Type of equipment</i>	Data logger
Typenbezeichnung <i>Type designation</i>	CAN bus data logger
Seriennummer / <i>Serial number</i>	29FBE386
Auftragsnummer / <i>Order No.</i>	713179266
Prüfgrundlage <i>Test standards</i>	ISO 7637-2:2011



Summary

Prüfergebnisse / Test Results	Auftragsnummer / Order No. 713179266				
Die Prüfungen wurden nach folgenden Vorschriften durchgeführt: <i>Tests were performed according to:</i> ISO 7637-2:2011					
Durchgeführte Prüfung Test performed	Prüfergebnis Test result				
	Erfüllt <i>Passed</i>	Nicht erfüllt <i>Not Passed</i>	Nicht zutreffend <i>Not applicable</i>	Nicht durchgeführt <i>Not performed</i>	Kriterium <i>Criterion</i>
Voltage transient emissions test on supply lines	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transient immunity test on supply lines	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Bemerkungen / Remarks:

Die Prüfergebnisse beziehen sich ausschließlich auf das zur Prüfung vorgestellte Prüfmuster. Ohne schriftliche Genehmigung des Prüflabors darf der Prüfbericht auszugsweise nicht vervielfältigt werden. *The test results relate only to the individual item which has been tested. Without the written approval of the test laboratory this report may not be reproduced in extracts.*

Datum / Date	Geprüft von / Tested by	Freigabe durch / Checked by	Prüfergebnis / Test Result <input checked="" type="checkbox"/> Erfüllt / Passed <input type="checkbox"/> Nicht erfüllt / Not passed
2020-01-22	 Michael Karsten Responsible for testing	 Thomas Eberl Reviewer	



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1 Administrative Data

Application details	
Applicant:	CSS Electronics ApS Soeren Frichs Vej 38K8230 AabyhoejDenmark
Contact person:	Mr. Martin Falch
Order number:	713179266
Receipt of EUT:	2020-01-17
Return of EUT:	2020-01-22
Date(s) of test:	2020-01-20 – 2020-01-21
Note(s):	---
Responsible for testing:	Mr. Michael Karsten
Responsible for test report:	Mr. Michael Karsten
Test report checked by:	Mr. Thomas Eberl

Report details	
Report number:	69360-79266-01
Edition:	1
Issue date:	2020-01-22



2 Details about the Test Laboratory

Details about the Test Laboratory

Company name:	TÜV SÜD Product Service GmbH
Address:	Äußere Frühlingstraße 45 D-94315 Straubing Germany
Laboratory accreditation:	DAkKS Registration No. D-PL-11321-11-02
Contact:	Mr. Markus Biberger
	Phone: +49 9421 5522-0 Fax: +49 9421 5522-99

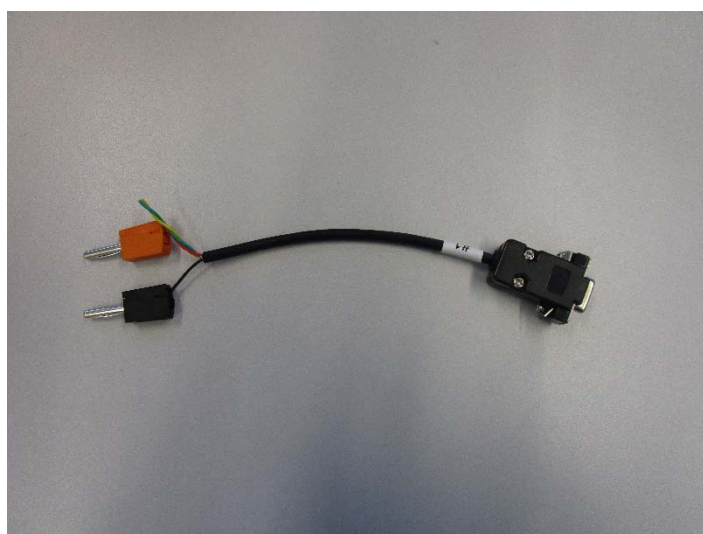


3 Description of the Equipment Under Test

Equipment characteristics	
Type designation:	CAN bus data logger
Parts of the system:	---
Options and accessories:	---
Type of equipment:	Data logger
Serial number:	29FBE386
Manufacturer:	CSS Electronics ApS
Classification	<input checked="" type="checkbox"/> Electrical/electronic sub-assembly (ESA) <input type="checkbox"/> Vehicle without "RESS" (Rechargeable Energy Storage System) <input type="checkbox"/> Vehicle with "RESS" (Rechargeable Energy Storage System)
Power supply:	External DC supply Nominal: 12 V / 24 V Minimum: 7 V Maximum: 32 V Nominal frequency: ---
Version of EUT:	HW 00.01

Photo documentation:





4 Operation Mode and Configuration of EUT

Operation Mode(s)

Power on Ready to use	When input power is applied via Channel 1, the device will power on and the green LED will light up. In this mode, the device is ready to log CAN bus data
--------------------------	--

List of ports and cables

No.	Description	Classification ¹	Cable type	Cable length used	maximum ²
D1	DB9-to-generic adapter	dc power	Unshielded	0,2 m	---
S1		signal/control port	Unshielded	0,5 m	---

List of devices connected to EUT

No.	Description	Type designation	Serial no. or ID	Manufacturer
---	---	---	---	---

List of support devices

No.	Description	Type designation	Serial no. or ID	Manufacturer
---	---	---	---	---

¹ Ports shall be classified as ac power, dc power or signal/control port.

² As specified by applicant



5 Performance Criteria and Methods of Observation

Function performance status	
Referenced Standard:	ISO 7637-1: 2002 / Amd.1: 2008(E)
<i>Functional status</i>	<i>Specification</i>
I	The function performs as designed during and after the test.
II	The function does not perform as designed during the test, but returns automatically to normal operation after the test.
III	The function does not perform as designed during the test and does not return to normal operation without a simple driver/passenger intervention, such as turning off/on the DUT, or cycling the ignition switch after the disturbance is removed.
IV	The function does not perform as designed during and after the test and cannot be returned to proper operation without more extensive intervention, such as disconnecting and reconnecting the battery or power feed. The function shall not have sustained any permanent damage as a result of the testing.

Methods of Observation			
<i>Function</i>	<i>Observed size (with permissible range if appropriate)</i>	<i>Observation method</i>	<i>Immunity</i>
Power on	The device has failed a test if the green LED is no longer on during the test and/or after a power cycle.	visual	<input type="checkbox"/>

6 Referenced Regulations

<i>European publication</i>	<i>International publication</i>	<i>Title</i>
---	ISO 7637-2 Third edition 2011-03-01	Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only
---	ISO 7637-1 Second edition 2002-03-15	Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations
---	ISO 7637-1 Second edition 2002-03-15 AMENDMENT 1 2008-02-01	Road vehicles — Electrical disturbances from conduction and coupling — Part 1: Definitions and general considerations AMENDMENT 1

7 Measurement Uncertainty Values

Radio Interference Emission Testing			
Test	k_p	Expanded Uncertainty	Note
Emission of radiofrequency conducted disturbances (voltages)			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB	1
Emission of radiofrequency conducted disturbances (currents)			
9 kHz to 200 MHz	2	± 3.5 dB	1
Electromagnetic radiation			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Emission of transient conducted disturbances	2	± 10 %	7
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4



Immunity Testing			
<i>Test</i>	<i>k_p</i>	<i>Expanded Uncertainty</i>	<i>Note</i>
Electrostatic Discharges			4
Electromagnetic radiation			
Bulk current injection (BCI) testing method	2	+43.9 / -30.5 %	6
Free field testing method (pre-calibrated field level)	2	+32.2 / -24.3 %	5
Electrical Fast Transient (EFT) / Burst disturbances			4
Surges			4
Electrical Transient Transmission in Road Vehicles	2	± 3.4 %	8

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$.

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$.

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$.

Note 4:

It has been demonstrated that the test equipment used meets the specified requirements in the standard with at least 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$.

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$.

Note 7:

The expanded uncertainty reported according to GUM is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$.

Note 8:

The expanded uncertainty for pulse voltage reported according to GUM is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$. For other pulse parameters it has been demonstrated that the test equipment used meets the specified requirements in the standard with at least 95% confidence.

8 Specifications

8.1 Specifications for electrical/electronic sub-assemblies (ESAs)

Emission Tests

ISO 7637-2 Third edition 2011-03-01

<i>Clause(s)</i>	<i>Test performed</i>	<i>Page</i>	<i>Test Result</i>
4.3	Voltage transient emissions test	15	Test passed

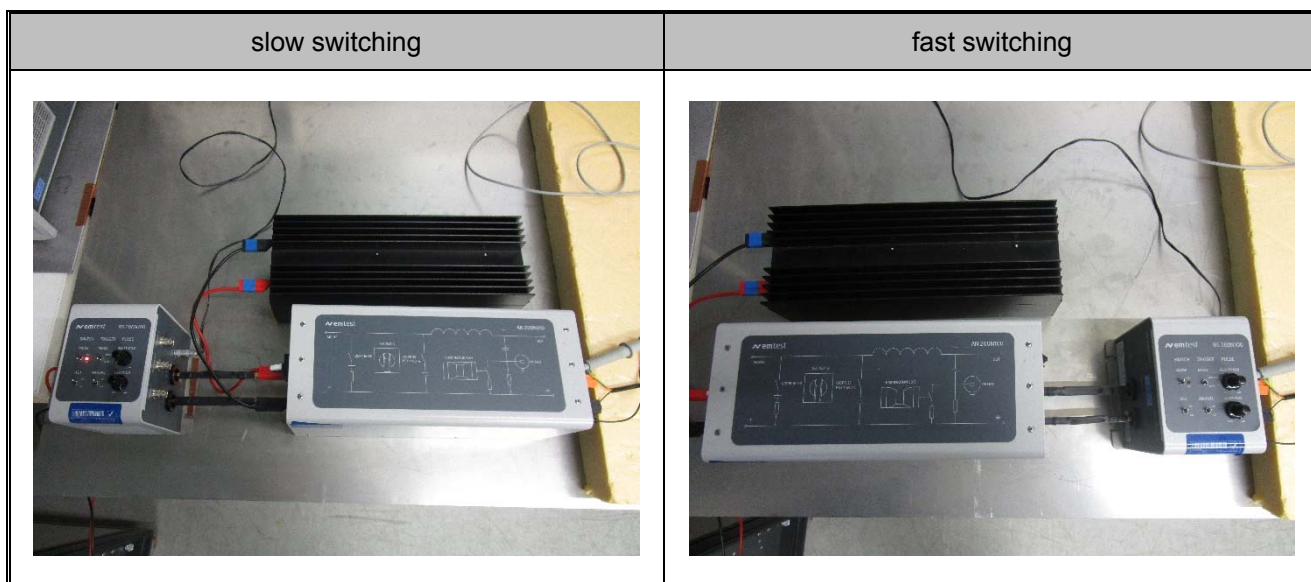
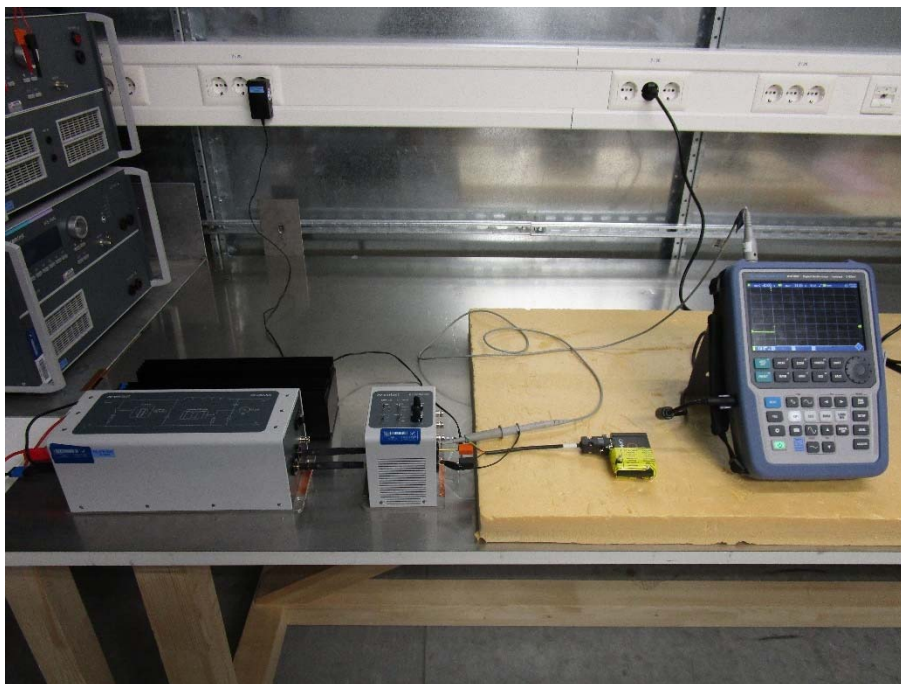
Immunity Tests

ISO 7637-2 Third edition 2011-03-01

<i>Clause(s)</i>	<i>Test performed</i>	<i>Page</i>	<i>Test Result</i>
4.4	Transient immunity test	23	Test passed

8.2 Voltage transient emissions test ESAs on supply lines

8.2.1 Test Setup



8.2.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Voltage supply	VDS 200Q100	2387	P1531162245	EM Test
<input checked="" type="checkbox"/> Ultra Compact Simulator	UCS 200N100	2388	P1522156462	EM Test
<input type="checkbox"/> Load Dump Generator	LD 200N	2389	P1523157871	EM Test
<input type="checkbox"/> Automotive Power Fail Simulator	PFM 200N100	2390	P1425135176	EM Test
<input checked="" type="checkbox"/> Function generator	AutoWave	2064	V0951105646	EM Test
<input type="checkbox"/> Battery switch	INA 5020	1596	199838-631AR	Schaffner
<input type="checkbox"/> Function generator	AutoWave	2064	V0951105646	EM Test
<input type="checkbox"/> Arbitrary Wave Form Generator	Pragmatic 2714A	1649	02100477	EM Test
<input type="checkbox"/> Voltage Drop Generator	VDS 200 PF	1648	0500-07	EM Test
<input type="checkbox"/> Power supply	EA-PS 9080-50	1900	2005410112	EA
<input checked="" type="checkbox"/> Single line artificial Network	AN 200N100	2344	P1425135031	EM Test
<input checked="" type="checkbox"/> Electronic Switch	BS 200N100	2345	P1403129747	EM Test
<input type="checkbox"/> Mechanical Switch	BSM 200N40	2346	P1406130993	EM Test
<input type="checkbox"/> Coupling clamp	CDN 500	1601	293	Schaffner
<input type="checkbox"/> Current clamp	F-120-9B	1514	15	FCC
<input type="checkbox"/> Digital Oscilloscope	Wave Surfer 452	1796	LCRY0301J11938	LeCroy
<input checked="" type="checkbox"/> Isolated Digital Oscilloscope	RTH 1002	(R&S)		Rohde & Schwarz
<input checked="" type="checkbox"/> High voltage probe	10076C	25848	---	Agilent
<input type="checkbox"/> Terminal resistor	8135	1151	15972	Bird
<input type="checkbox"/> Shielded room	No. 1	1451	---	Albatross
<input type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 3	1453	---	Siemens
<input type="checkbox"/> Shielded room	No. 4	1454	3FD 100 544	Euroshield
<input type="checkbox"/> Shielded room	No. 5	1537	5468	Ray Proof Division
<input type="checkbox"/> Fully anechoic room	No. 6	1865	---	Albatross
<input checked="" type="checkbox"/> Shielded room	No. 7	1866	---	Albatross

8.2.3 Test Results

Results for emission of transient conducted disturbances test are documented as listed below.

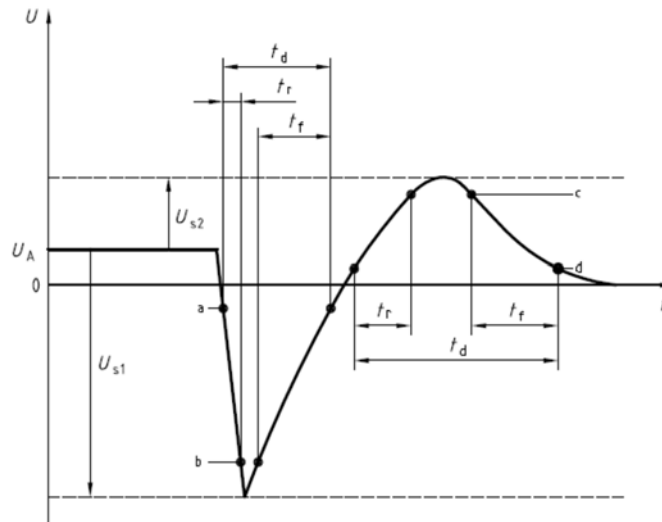
Emission of transient conducted disturbances 12 V

Prüfdatum / Date of test:	2020-01-21
Prüfer / Operator:	Michael Karsten
Messplatz / Test site:	Shielded room, cabin no. 7

Prüfergebnis / Test Result	
<input checked="" type="checkbox"/>	Erfüllt / Passed
<input type="checkbox"/>	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	ISO 7637-2 Third edition 2011-03-01
Basisnorm / Basic standard:	ISO 7637-2 Third edition 2011-03-01
Betriebsart / Operation mode:	Power on
Kommentar / Comment:	---

Grenzwert / Limit:	Table B.2 — Suggested limits for the classification of nominal 12 V equipment			
	Suggested limit for U_s for severity levels I to V			
	I / II	III	IV	V ^a
Positive slow pulses (ms range or slower)	+25 V	+37 V	+75 V	
Negative slow pulses (ms range or slower)	-50 V	-75 V	-100 V	
Positive fast pulses (μ s to ns range)	+50 V	+75 V	+100 V	
Negative fast pulses (μ s to ns range)	-75 V	-112 V	-150 V	
^a Values to be determined by vehicle manufacturer and equipment supplier.				



Pulse amplitude	Slow switch on	Slow switch off	Fast switch on	Fast switch off	Result	Note
U_{s1}	No measurement value present	No measurement value present	No measurement value present	No measurement value present	Passed	1
U_{s2}	20,3 V	No measurement value present	18,8 V	No measurement value present	Passed	---

Note(s):

1 no negative amplitude available

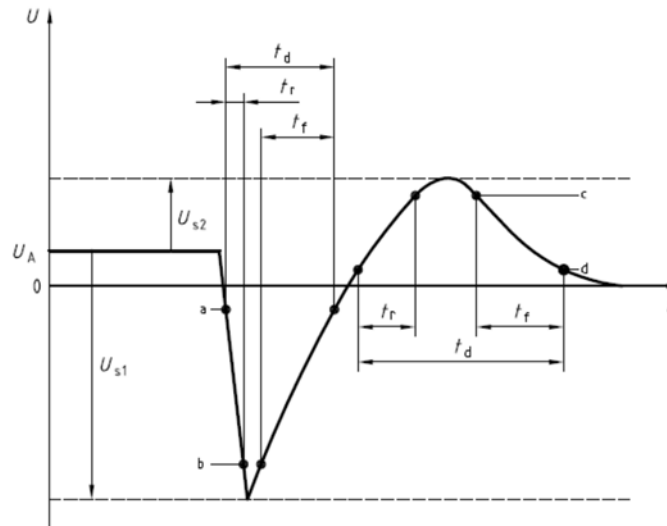
Emission of transient conducted disturbances 24 V

Prüfdatum / Date of test:	2020-01-21
Prüfer / Operator:	Michael Karsten
Messplatz / Test site:	Shielded room, cabin no. 7

Prüfergebnis / Test Result	
<input checked="" type="checkbox"/>	Erfüllt / Passed
<input type="checkbox"/>	Nicht erfüllt / Not passed

Prüfgrundlage / Specifications:	ISO 7637-2 Third edition 2011-03-01
Basisnorm / Basic standard:	ISO 7637-2 Third edition 2011-03-01
Betriebsart / Operation mode:	Power on
Kommentar / Comment:	---

Grenzwert / Limit:	Table B.3 — Suggested limits for the classification of nominal 24 V equipment				
	Suggested limit for U_s for severity levels I to V				
	Pulse amplitude (U_s)				
	I / II	III	IV	V ^a	
Positive slow pulses (ms range or slower)	+25 V	+37 V	+75 V		
Negative slow pulses (ms range or slower)	-100 V	-150 V	-200 V		
Positive fast pulses (μ s to ns range)	+100 V	+150 V	+200 V		
Negative fast pulses (μ s to ns range)	-100 V	-150 V	-200 V		
^a Values to be determined by vehicle manufacturer and equipment supplier.					

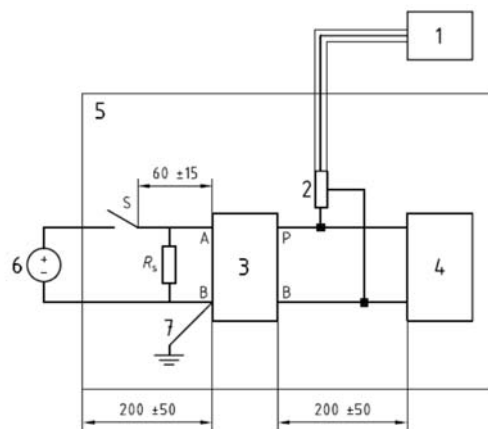


Pulse amplitude	Slow switch on	Slow switch off	Fast switch on	Fast switch off	Result	Note
U_{s1}	No measurement value present	No measurement value present	No measurement value present	No measurement value present	Passed	1
U_{s2}	18,9 V	No measurement value present	19,3 V	No measurement value present	Passed	---

Note(s):

1 no negative amplitude available

Plots taken during slow switching: 12 V



a) Slow pulses (millisecond range or slower)

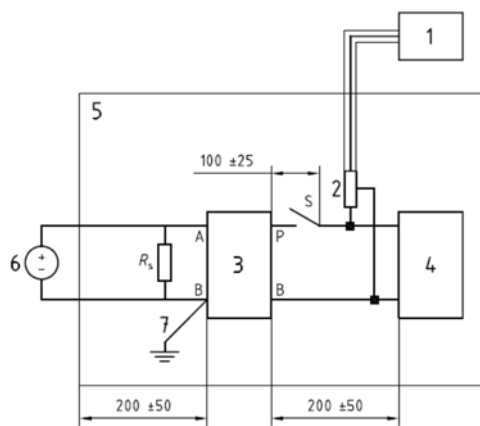
- Key**
- 1 oscilloscope or equivalent
 - 2 voltage probe
 - 3 artificial network
 - 4 DUT (source of transient)
 - 5 ground plane
 - 6 power supply
 - 7 Ground connection; length < 100 mm

Langsames Ausschalten /
 Slow switching off:

Langsames Einschalten /
 Slow switching on



Plots taken during fast switching: 12 V



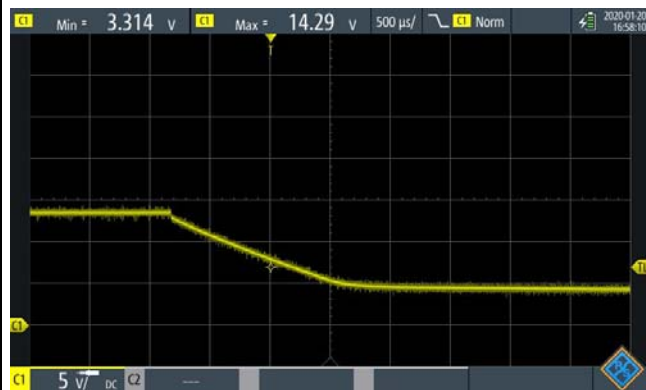
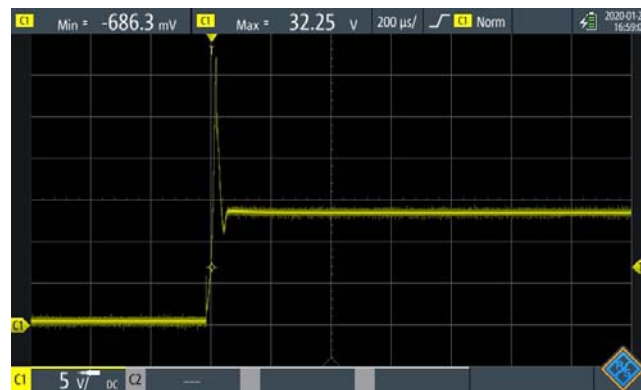
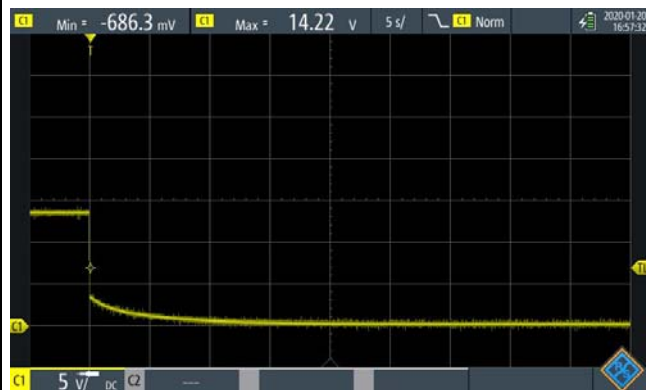
b) Fast pulses (nanosecond-to-microsecond range)

Key

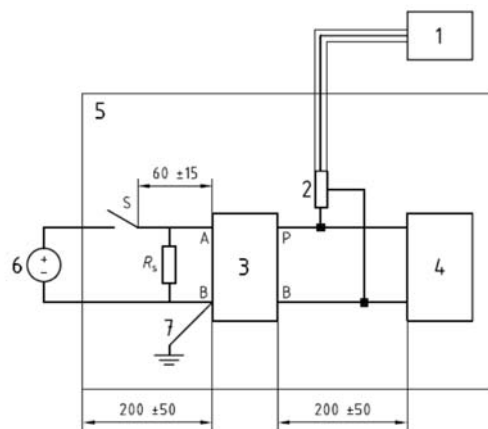
- | | | | |
|---|----------------------------|---|------------------------------------|
| 1 | oscilloscope or equivalent | 5 | ground plane |
| 2 | voltage probe | 6 | power supply |
| 3 | artificial network | 7 | Ground connection; length < 100 mm |
| 4 | DUT (source of transient) | | |

Schnelles Ausschalten /
Fast switching off:

Schnelles Einschalten /
Fast switching on:



Plots taken during slow switching: 24 V



a) Slow pulses (millisecond range or slower)

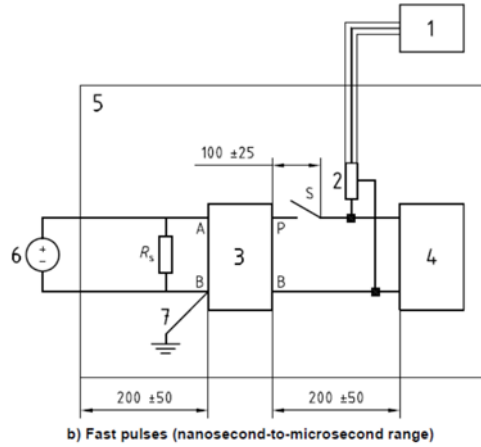
- Key**
- 1 oscilloscope or equivalent
 - 2 voltage probe
 - 3 artificial network
 - 4 DUT (source of transient)
 - 5 ground plane
 - 6 power supply
 - 7 Ground connection; length < 100 mm

Langsames Ausschalten /
 Slow switching off:

Langsames Einschalten /
 Slow switching on



Plots taken during fast switching: 24 V

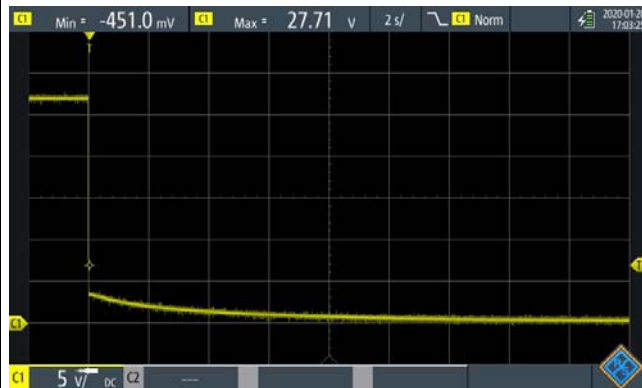


Key

- | | | | |
|---|----------------------------|---|------------------------------------|
| 1 | oscilloscope or equivalent | 5 | ground plane |
| 2 | voltage probe | 6 | power supply |
| 3 | artificial network | 7 | Ground connection; length < 100 mm |
| 4 | DUT (source of transient) | | |

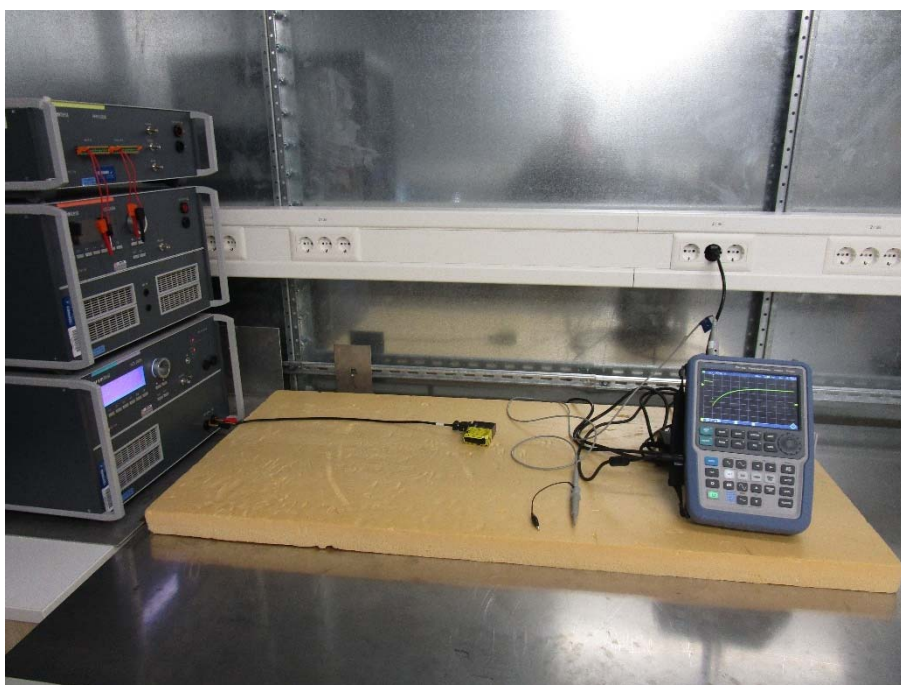
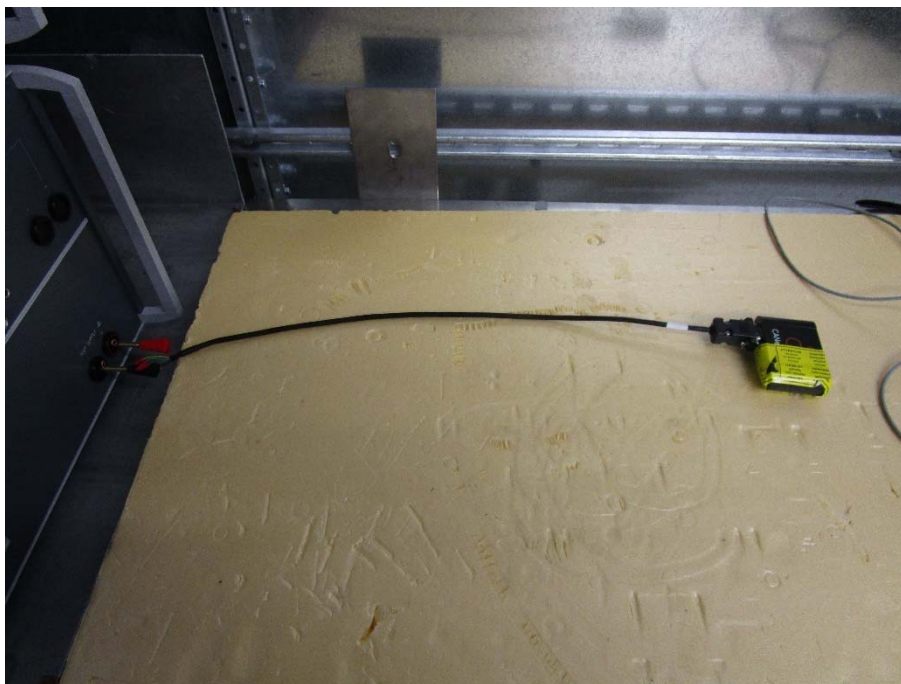
Schnelles Ausschalten /
Fast switching off:

Schnelles Einschalten /
Fast switching on:



8.3 Transient immunity test on supply lines

8.3.1 Test Setup



8.3.2 Test Equipment List

Type	Designation	Inv.-no.	Serial No. or ID	Manufacturer
<input checked="" type="checkbox"/> Voltage supply	VDS 200Q100	2387	P1531162245	EM Test
<input checked="" type="checkbox"/> Ultra Compact Simulator	UCS 200N100	2388	P1522156462	EM Test
<input type="checkbox"/> Load Dump Generator	LD 200N	2389	P1523157871	EM Test
<input checked="" type="checkbox"/> Automotive Power Fail Simulator	PFM 200N100	2390	P1425135176	Schaffner
<input checked="" type="checkbox"/> Function generator	AutoWave	2064	V0951105646	EM Test
<input type="checkbox"/> Arbitrary Wave Form Generator	Pragmatic 2714A	1649	02100477	EM Test
<input checked="" type="checkbox"/> Voltage Drop Generator	VDS 200 PF	1648	0500-07	EM Test
<input type="checkbox"/> Power supply	EA-PS 9080-50	1900	2005410112	EA
<input type="checkbox"/> Single line artificial Network	AN 200N100	2344	P1425135031	EM Test
<input type="checkbox"/> Electronic Switch	BS 200N100	2345	P1403129747	EM Test
<input type="checkbox"/> Mechanical Switch	BSM 200N40	2346	P1406130993	EM Test
<input type="checkbox"/> Coupling clamp	CDN 500	1601	293	Schaffner
<input type="checkbox"/> Current clamp	F-120-9B	1514	15	FCC
<input type="checkbox"/> Digital Oscilloscope	Wave Surfer 452	1796	LCRY0301J11938	LeCroy
<input checked="" type="checkbox"/> Isolated Digital Oscilloscope	RTH 1002	(R&S)		Rohde & Schwarz
<input checked="" type="checkbox"/> High voltage probe	10076C	25848	---	Agilent
<input type="checkbox"/> Terminal resistor	8135	1151	15972	Bird
<input type="checkbox"/> Shielded room	No. 1	1451	---	Albatross
<input type="checkbox"/> Fully anechoic room	No. 2	1452	---	Albatross
<input type="checkbox"/> Semi anechoic room	No. 3	1453	---	Siemens
<input type="checkbox"/> Shielded room	No. 4	1454	3FD 100 544	Euroshield
<input type="checkbox"/> Shielded room	No. 5	1537	5468	Ray Proof Division
<input type="checkbox"/> Fully anechoic room	No. 6	1865	---	Albatross
<input checked="" type="checkbox"/> Shielded room	No. 7	1866	---	Albatross

8.3.3 Test Results

Test results for immunity to conducted transient disturbances are documented as listed below.



Immunity to transient disturbances conducted along supply lines 12 V

Prüfdatum / <i>Date of test:</i>	2020-01-20
Prüfer / <i>Operator:</i>	Michael Karsten
Messplatz / <i>Test site:</i>	Shielded room, cabin no. 7

Prüfergebnis / <i>Test Result</i>	
<input checked="" type="checkbox"/>	Erfüllt / <i>Passed</i>
<input type="checkbox"/>	Nicht erfüllt / <i>Not passed</i>

Prüfgrundlage / <i>Specifications:</i>	ISO 7637-2 Third edition 2011-03-01
Basisnorm / <i>Basic standard:</i>	ISO 7637-2 Third edition 2011-03-01
Betriebsart / <i>Operation mode:</i>	Power on
Kommentar / <i>Comment:</i>	---

Messbezug / <i>Tested on:</i>	DC power line
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<i>Pulse</i>	<i>Count / duration</i>	<i>Functional status re-quired</i>	<i>Functional status achieved</i>	<i>Result</i>	<i>Note</i>
1	500	II	II	Passed	2
2a	500	I	I	Passed	1
2b	10	II	II	Passed	2
3a	1 h	I	I	Passed	1
3b	1 h	I	I	Passed	1

Note(s):

- 1 During and after test no influence observable
- 2 DUT switches off (gren LED off) during pulse, after test automatic return to normal function



Immunity to transient disturbances conducted along supply lines 24 V

Prüfdatum / <i>Date of test:</i>	2020-01-20
Prüfer / <i>Operator:</i>	Michael Karsten
Messplatz / <i>Test site:</i>	Shielded room, cabin no. 7

Prüfergebnis / <i>Test Result</i>	
<input checked="" type="checkbox"/>	Erfüllt / <i>Passed</i>
<input type="checkbox"/>	Nicht erfüllt / <i>Not passed</i>

Prüfgrundlage / <i>Specifications:</i>	ISO 7637-2 Third edition 2011-03-01
Basisnorm / <i>Basic standard:</i>	ISO 7637-2 Third edition 2011-03-01
Betriebsart / <i>Operation mode:</i>	Power on
Kommentar / <i>Comment:</i>	---

Messbezug / <i>Tested on:</i>	DC power line
-------------------------------	---------------

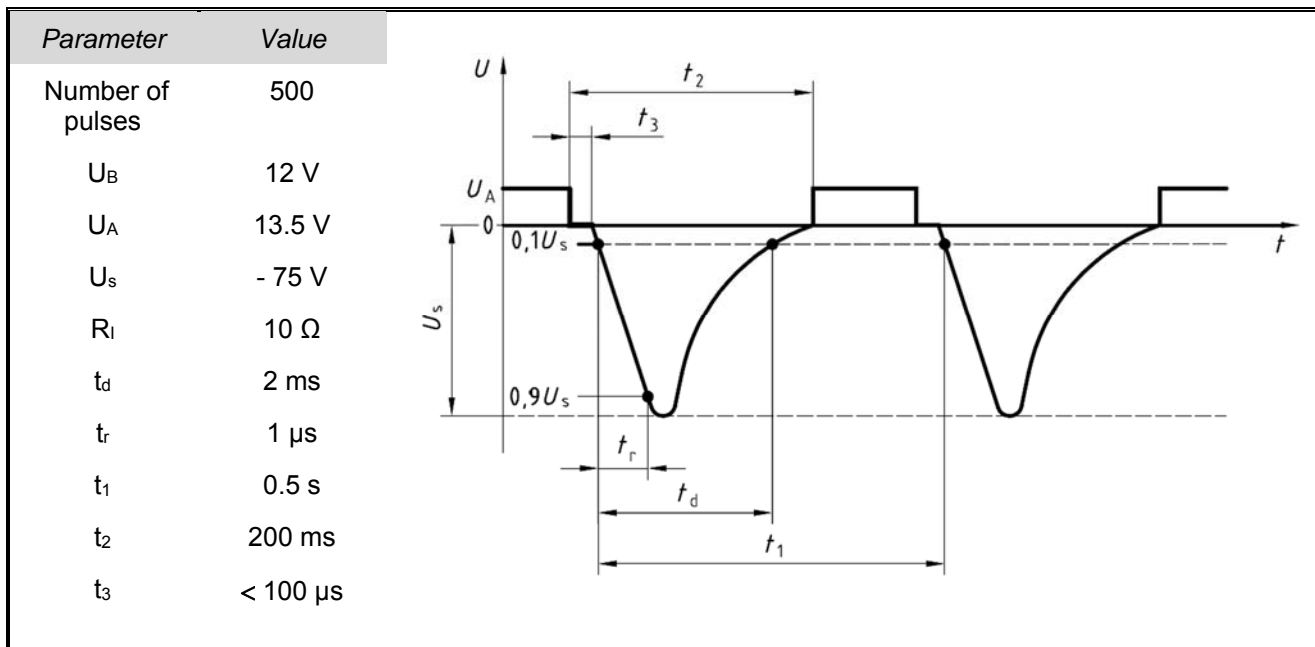
24 V					
<i>Pulse</i>	<i>Count / duration</i>	<i>Functional status re- quired</i>	<i>Functional status achieved</i>	<i>Result</i>	<i>Note</i>
1	500	II	II	Passed	2
2a	500	I	I	Passed	1
2b	10	II	II	Passed	2
3a	1 h	I	I	Passed	1
3b	1 h	I	I	Passed	2

Note(s):

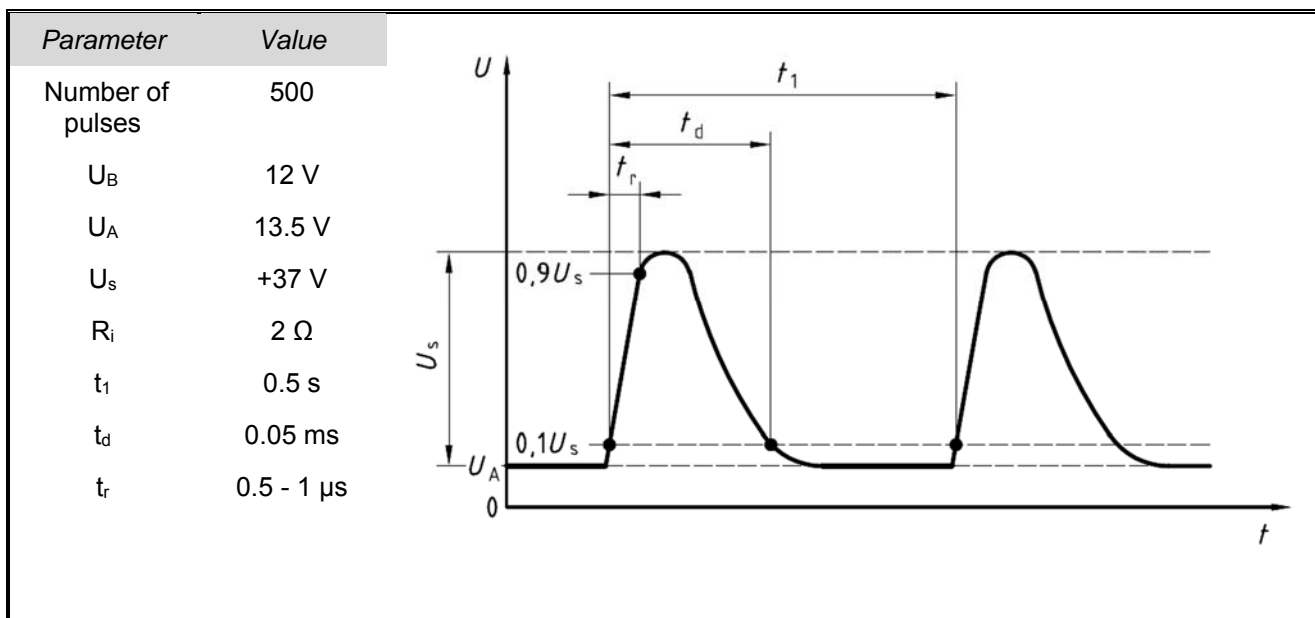
- During and after test no influence observable
- DUT switches off (gren LED off) during pulse, after test automatic return to normal function

Settings of test pulses 12 V

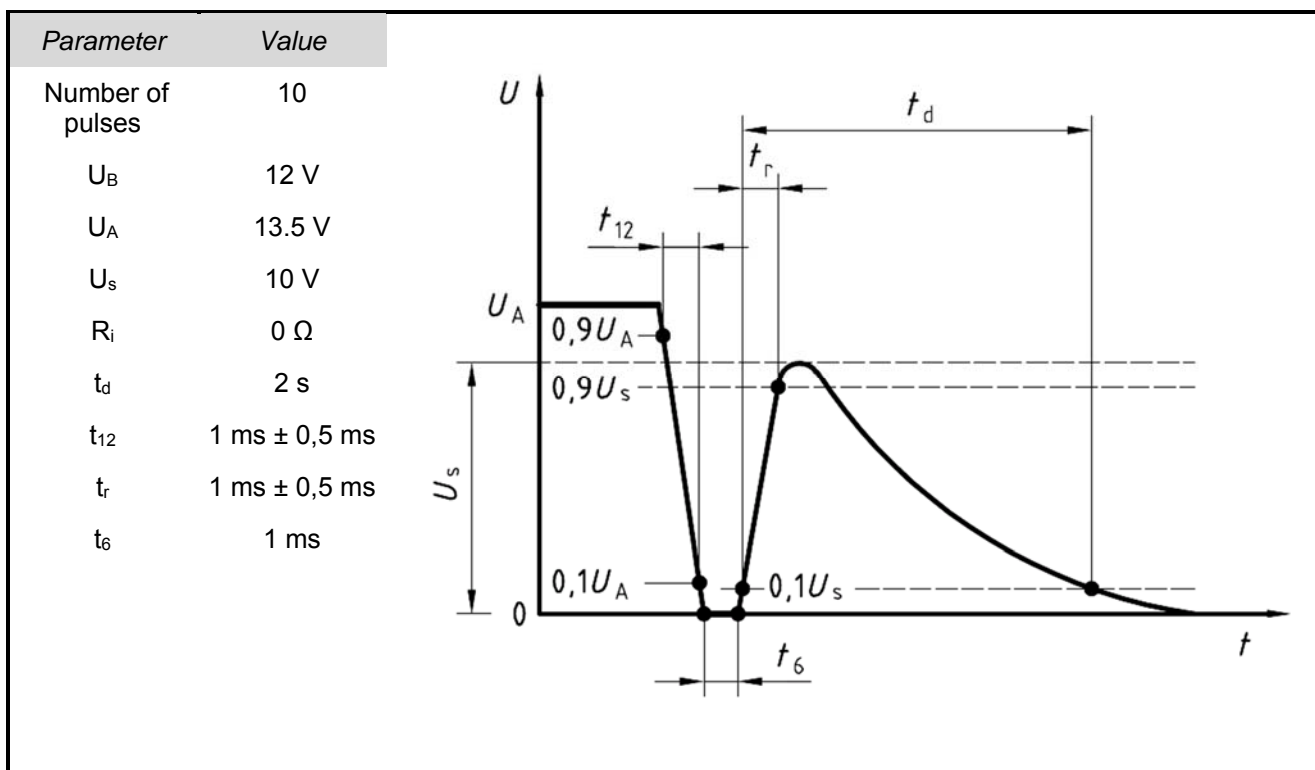
Pulse 1



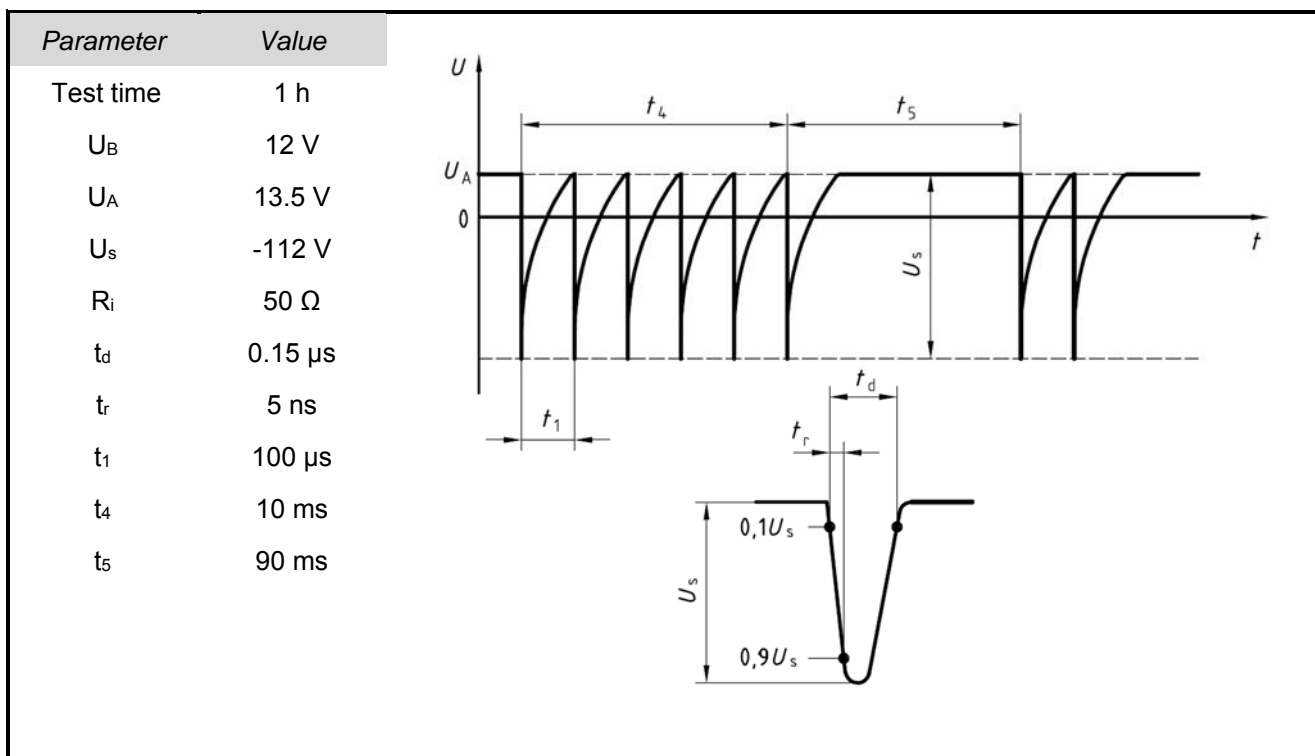
Pulse 2a



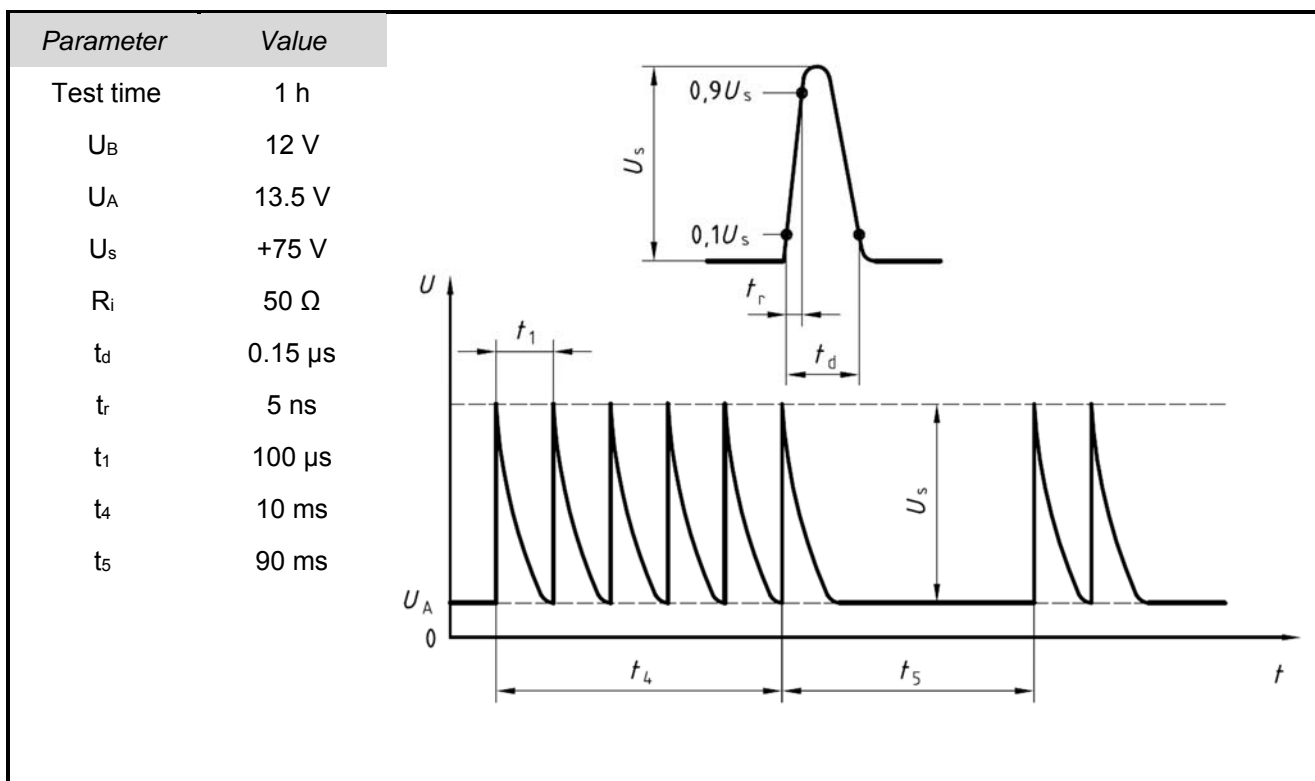
Pulse 2b



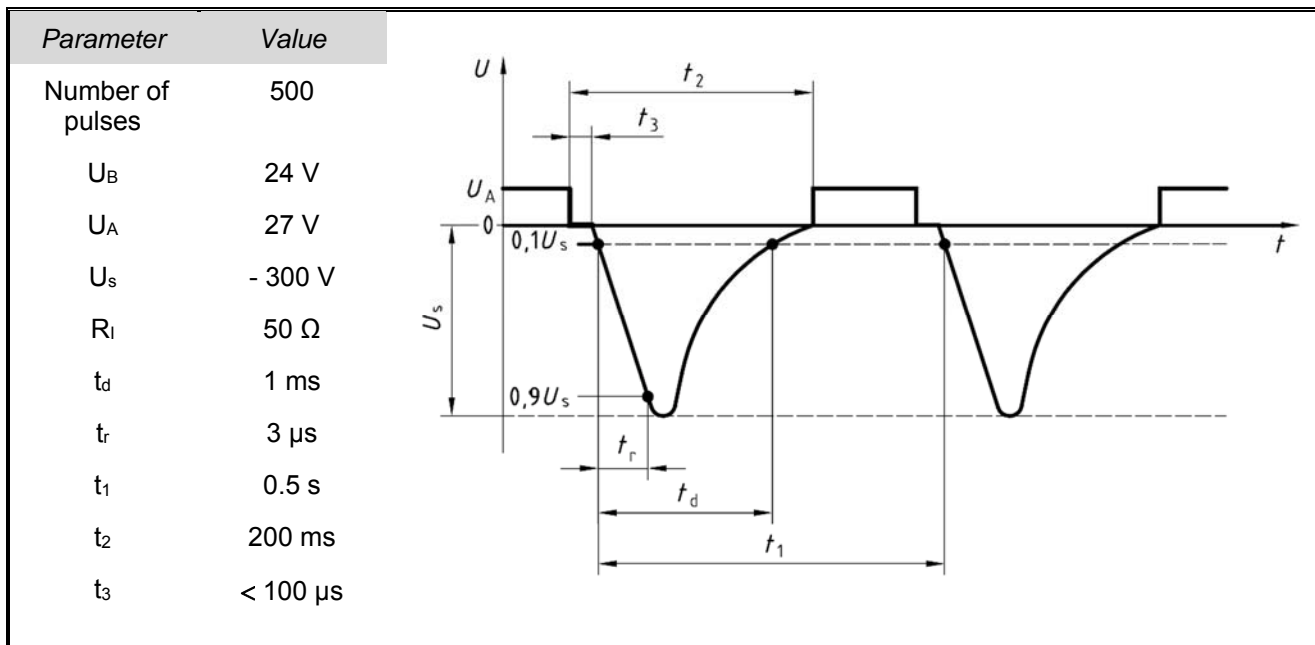
Pulse 3a



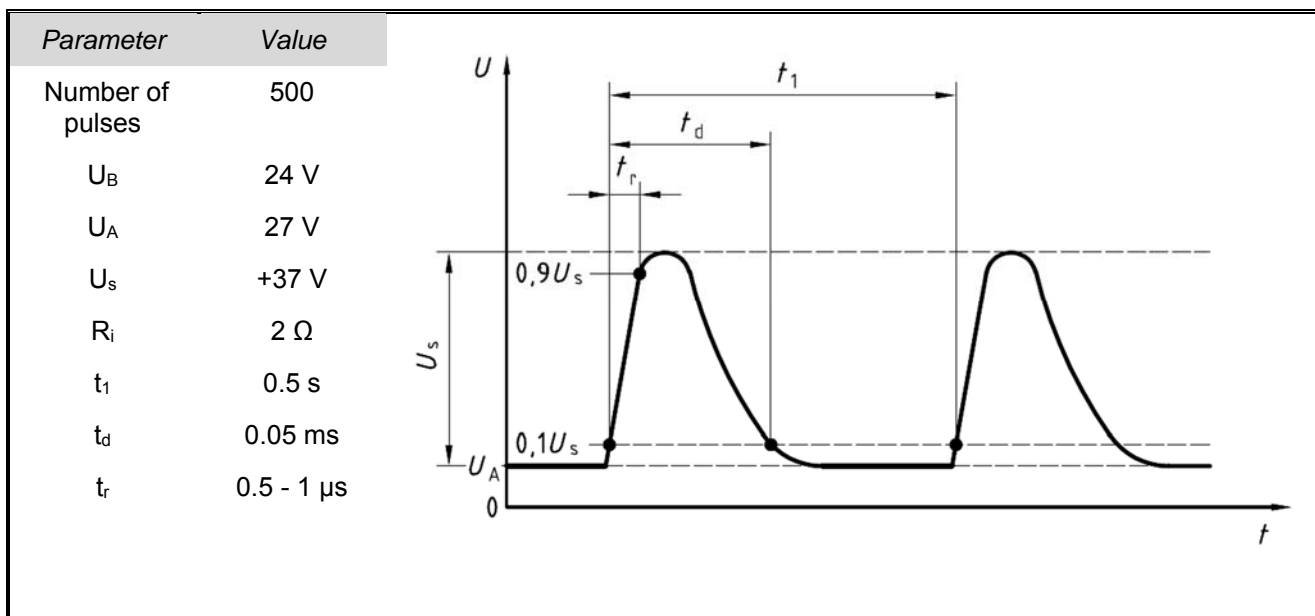
Pulse 3b



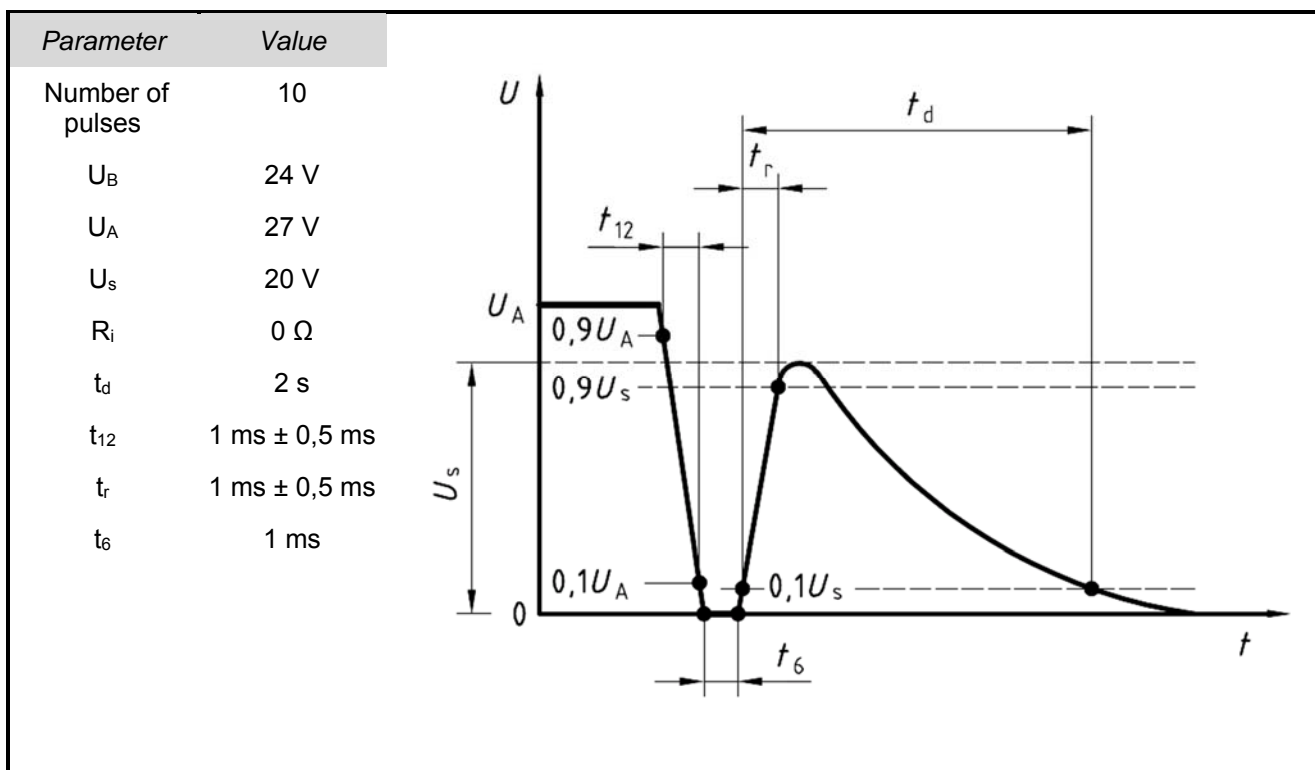
Settings of test pulses 24 V Pulse 1



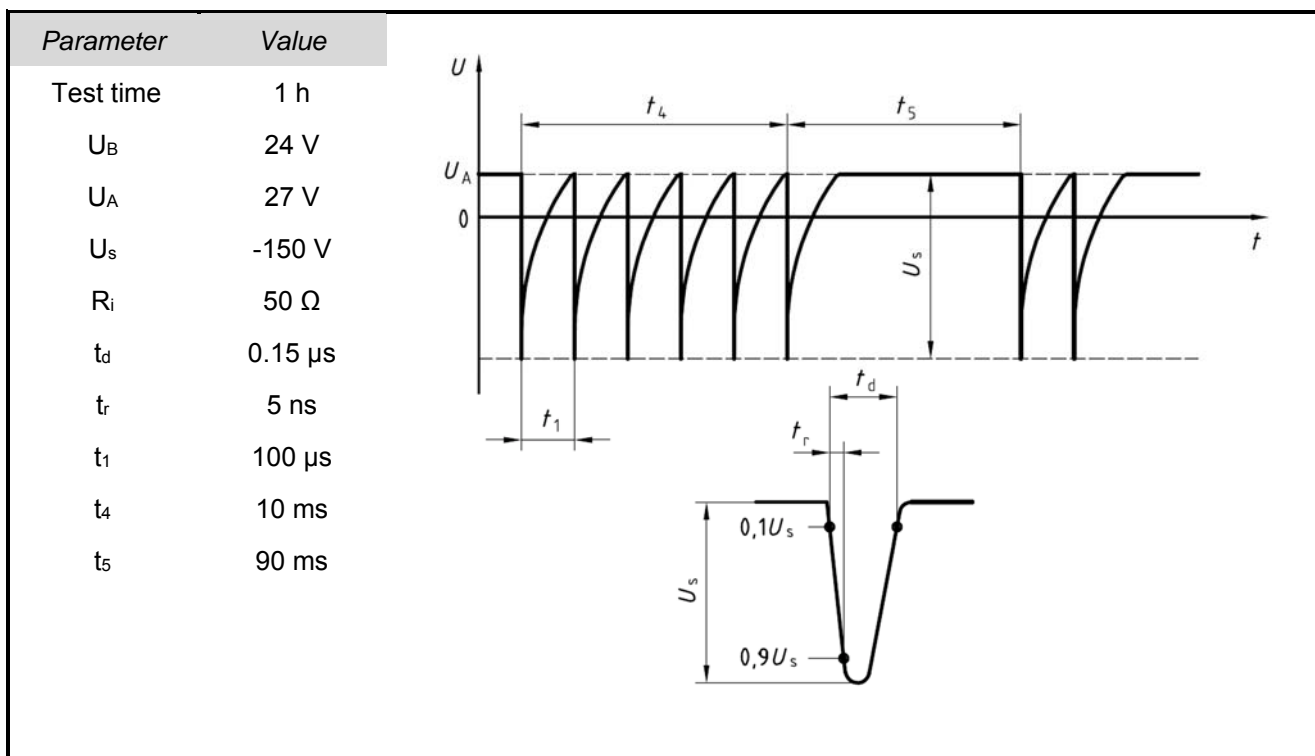
Pulse 2a



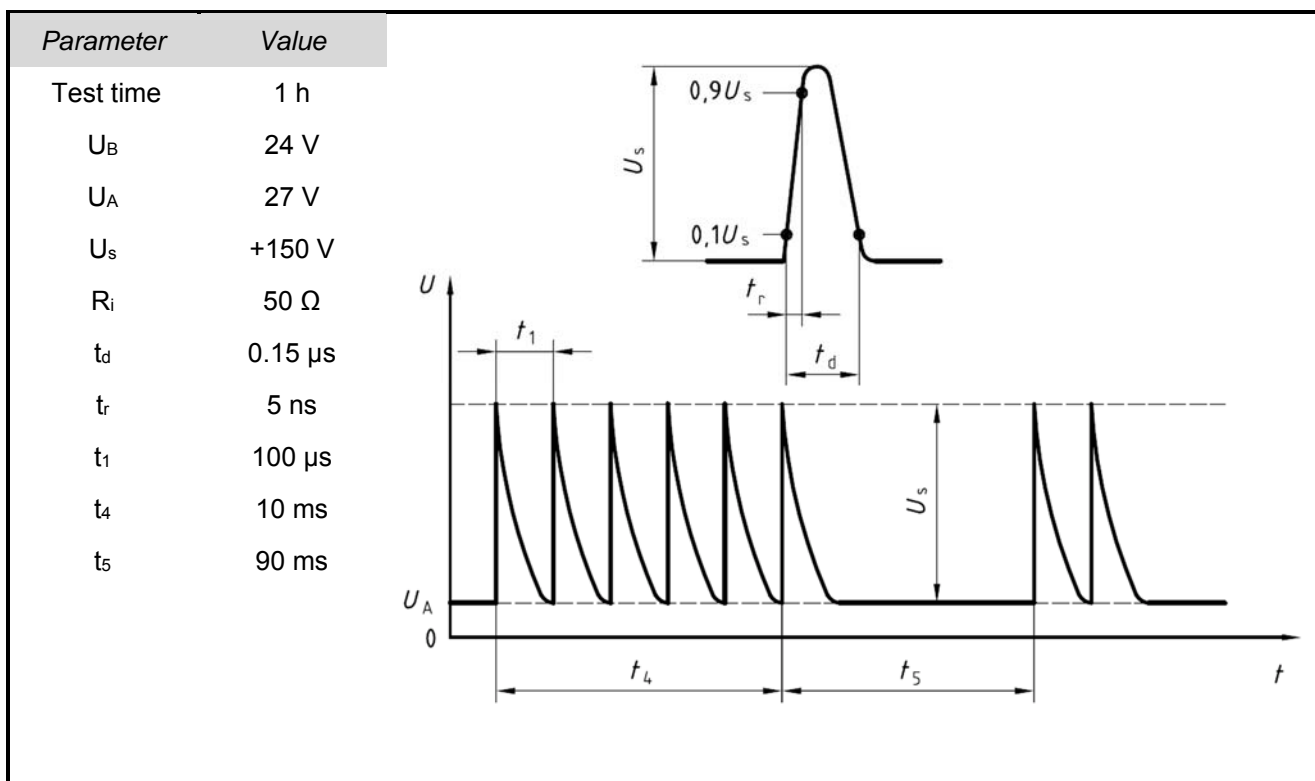
Pulse 2b



Pulse 3a



Pulse 3b





9 Revision History

Revision History			
<i>Edition</i>	<i>Date</i>	<i>Issued by</i>	<i>Modifications</i>
1	2020-01-21	Michael Karsten	First Edition