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ELMAC GmbH informs the client that testing is done in accordance with the standard procedures stated under paragraph 2. All deviations will be listed separately. The test results of this report exclusively refer to the specific sample tested under stated test conditions. ELMAC GmbH shall have no liability for any deductions, inferences or generalisations drawn from the test results. This report must only be reproduced in full. Publications or reproductions in the form of extracts have to be approved in written form by ELMAC GmbH.

## 2. Test specifications

### Emission

Document No.	Title	Limit class
EN 60730-1:2000-11 + A11:2002 IEC 60730-1:1999-04 (modified) DIN EN 60730-1:2002-01+Berichtigung 1:2002-08+A11:2002-0	Automatic electrical controls for household and similar use; Part 1: General requirements	

### Immunity

Document No.	Title	Severity level
EN 61000-6-2:2001 IEC 61000-6-2:1999,modified DIN EN 61000-6-2:2002-08	Electromagnetic Compatibility; Generic Standards; Immunity for industrial environments	
EN 60730-1:2000-11 + A11:2002 IEC 60730-1:1999-04 (modified) DIN EN 60730-1:2002-01+Berichtigung 1:2002-08+A11:2002-0	Automatic electrical controls for household and similar use; Part 1: General requirements	

emvID: 1429

### 3. Equipment Under Test (EUT)

Name	<b>Relais-Extension</b>	
Model	<b>Relais-Extension</b>	
S/N	-	
Manufacturer	Barix	
Kind/Type of EUT	Relais-Extension	
Day of receipt	11/09/2004	
Kind of EUT handling	Table top	During the tests: As table top equipment
Base unit covering the EUT	-	
Accessories (Part of the EUT)	-	
Support equipment (Not part of the EUT)	-	
Connected cables and lines	-	
Power supply	15 VAC	
Class of protection against electrical shock	III (safety electrical low voltage )	
Remarks		

eutID: 1792

#### Tested operation modes

Emission	Immunity	Inadmissible degradations of performance or losses of function during or as consequence of the immunity testing
cyclic switch of the relais	cyclic switch of the relais	Unwanted changes of selected operation mode: - t > 3s (t = time for one run) - RESET, command loss
Remarks:		

## 4. General Test Conditions

### 4.1. Environment conditions

If not stated otherwise in this test report the tests have been carried out under the following environment conditions:

Temperature: 15 ... 35 °C  
Relative Humidity: 30 ... 60 %  
Atmospheric pressure: 860 ... 1060 hPa

### 4.2. Calibration of test equipment

All test equipment having an important influence on the certainty of the test results is incorporated into a system of regular calibration and maintenance. The calibration system is a part of ELMAC's quality management system.

### 4.3. Measurement uncertainty

All EMC tests have a measurement uncertainty. The measurement uncertainty is a parameter related to a quantitative testing characterizing the range of values that with a certain probability still can be assigned to the result. Commonly the measurement uncertainty is given so, that the named probability is 95 %.

The emission limits and immunity severity levels (test levels) given in common EMC generic and product standards are related to the requirements for EMC test equipment defined by the EMC basic standards (like CISPR 16-x, IEC 61000-4-x).

That means: Under the condition that the EMC test equipment used for tests is compliant with the parameters defined by the EMC basic standards it can be assumed ...

- for emission tests: The equipment under test (EUT) passed the test, if the measurement value is lower or equal to the limit;
- for immunity tests: The EUT passed the test, if the EUT complies with the required performance criterion at the stated or higher test level.  
(See prEN 50222:1995.)

ELMAC's quality management system including calibration system guarantees that the above condition is given.

### 4.4. Performance criteria

If no other performance criteria specified in the standards listed in section 2. The performance criteria of EN 61326:1997 + A1:1998+A2:2001 section 6.5 are applied.

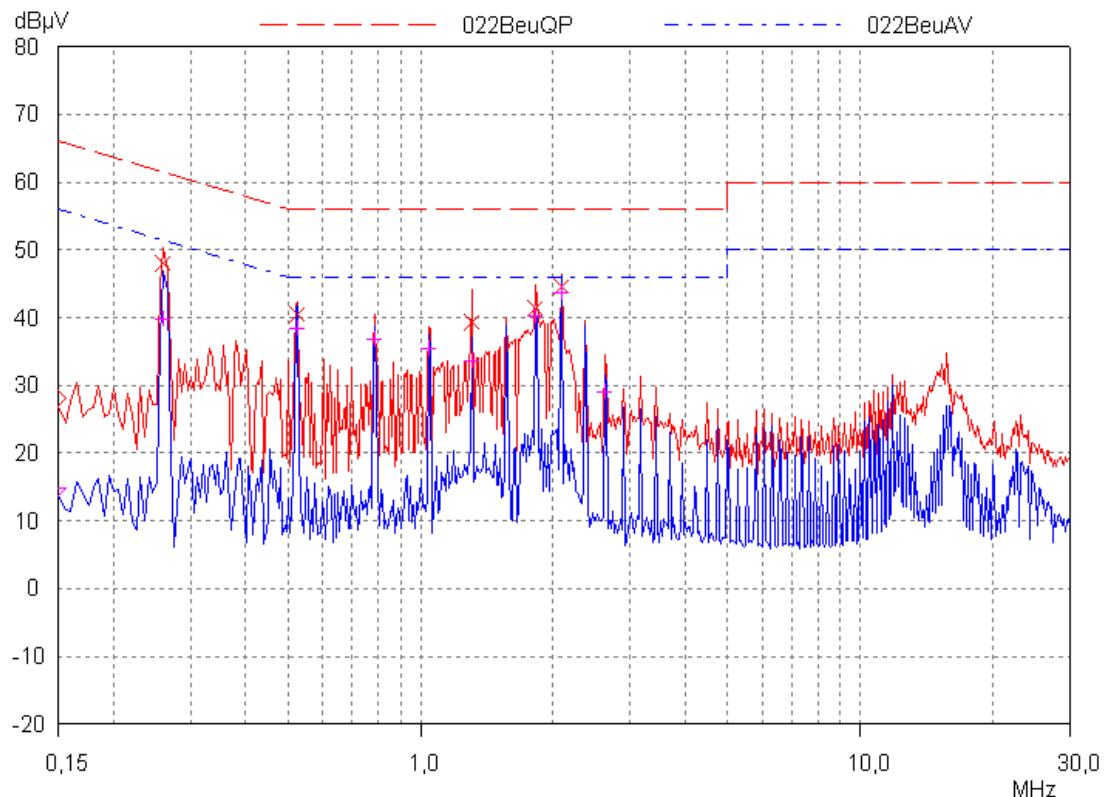
## 5. Test Results

See next pages.

**5.1.1 Conducted emissions at AC mains terminals  
150 kHz - 30 MHz**

eunID: 1597

EUT:	Relais-Extension Relais-Extension	Kind of test:	Emission
		Generic standard:	EN 55011:1998 + A1:1999 + A2:2002
Operation mode:	cyclic switch of the relais		
Port:	15 VAC, L1		
Date of test:	11/04/2004		
Tested by:	RH	EUT modified:	No
Limit class:	B	Result:	Passed
Remarks:			

**PEAK Detection**

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
V-LISN	MN2050D	Schaffner	1403	251	
EMI Receiver	ESHS 10	R&S	862970/012	35	

**ad 5.1.1 Conducted emissions at AC mains terminals  
150 kHz - 30 MHz****- Continuation -**

eunID: 1597

EUT:	Relais-Extension Relais-Extension		
Operation mode:	cyclic switch of the relais		

**QUASI-PEAK Detection**

Frequency MHz	QP Level dB $\mu$ V	QP Limit dB $\mu$ V	QP Delta dB
0,26	48,01	61,43	13,42
0,525	40,37	56,00	15,63
1,305	39,29	56,00	16,71
1,83	41,28	56,00	14,72
2,08998	44,50	56,00	11,50

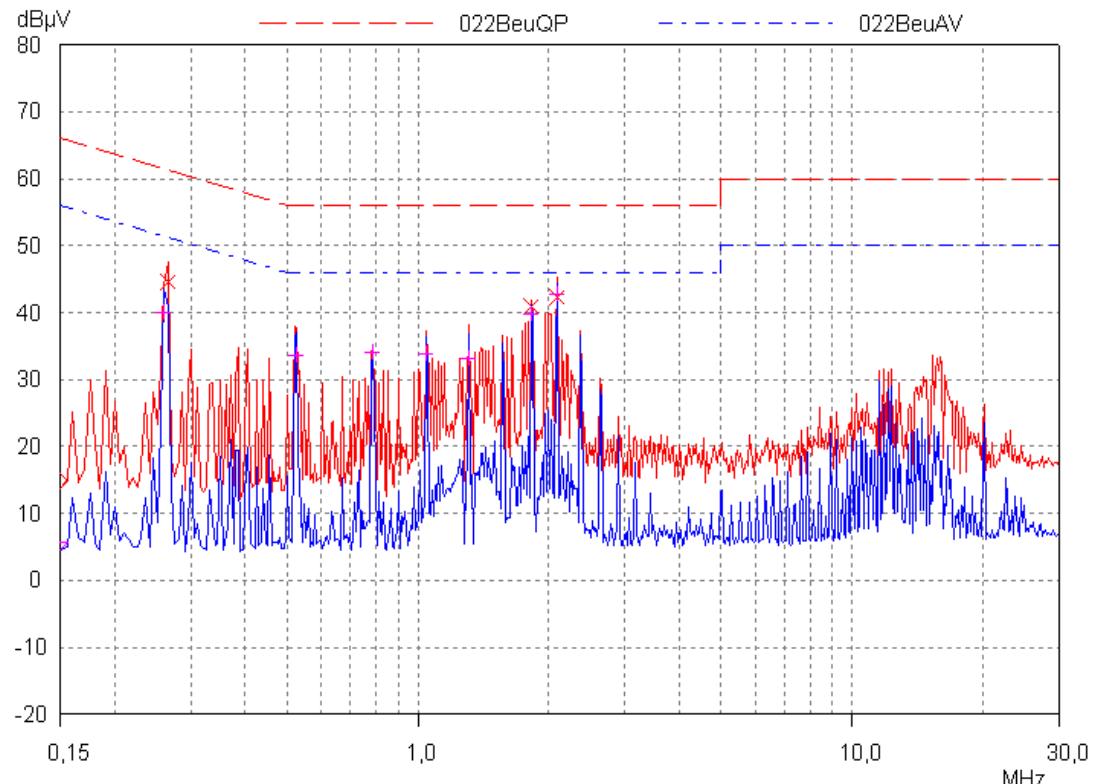
**AVERAGE Detection**

Frequency MHz	AV Level dB $\mu$ V	AV Limit dB $\mu$ V	AV Delta dB
0,26	39,84	51,43	11,59
0,525	38,41	46,00	7,59
0,785	36,82	46,00	9,18
1,04499	35,36	46,00	10,64
1,305	33,51	46,00	12,49
1,83	40,24	46,00	5,76
2,08998	43,61	46,00	2,39
2,615	29,12	46,00	16,88

**5.1.2 Conducted emissions at AC mains terminals  
150 kHz - 30 MHz**

eunID: 1598

EUT:	Relais-Extension Relais-Extension	Kind of test:	Emission
		Generic standard:	EN 55011:1998 + A1:1999 + A2:2002
Operation mode:	cyclic switch of the relais		
Port:	15 VAC, N		
Date of test:	11/04/2004		
Tested by:	RH	EUT modified:	No
Limit class:	B	Result:	Passed
Remarks:			

**PEAK Detection**

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
V-LISN	MN2050D	Schaffner	1403	251	
EMI Receiver	ESHS 10	R&S	862970/012	35	

**ad 5.1.2 Conducted emissions at AC mains terminals  
150 kHz - 30 MHz****- Continuation -**

eunID: 1598

EUT:	Relais-Extension Relais-Extension		
Operation mode:	cyclic switch of the relais		

**QUASI-PEAK Detection**

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB
0,265	44,49	61,27	16,78
1,83	40,94	56,00	15,06
2,095	42,40	56,00	13,60

**AVERAGE Detection**

Frequency MHz	AV Level dBµV	AV Limit dBµV	AV Delta dB
0,26	39,99	51,43	11,44
0,525	33,60	46,00	12,40
0,785	34,13	46,00	11,87
1,04499	33,78	46,00	12,22
1,31	33,09	46,00	12,91
1,83	39,85	46,00	6,15
2,08998	42,74	46,00	3,26

**ad 5.1.2 Conducted emissions at AC mains terminals  
150 kHz - 30 MHz**

eunID: 1598

EUT:	Relais-Extension		
	Relais-Extension		

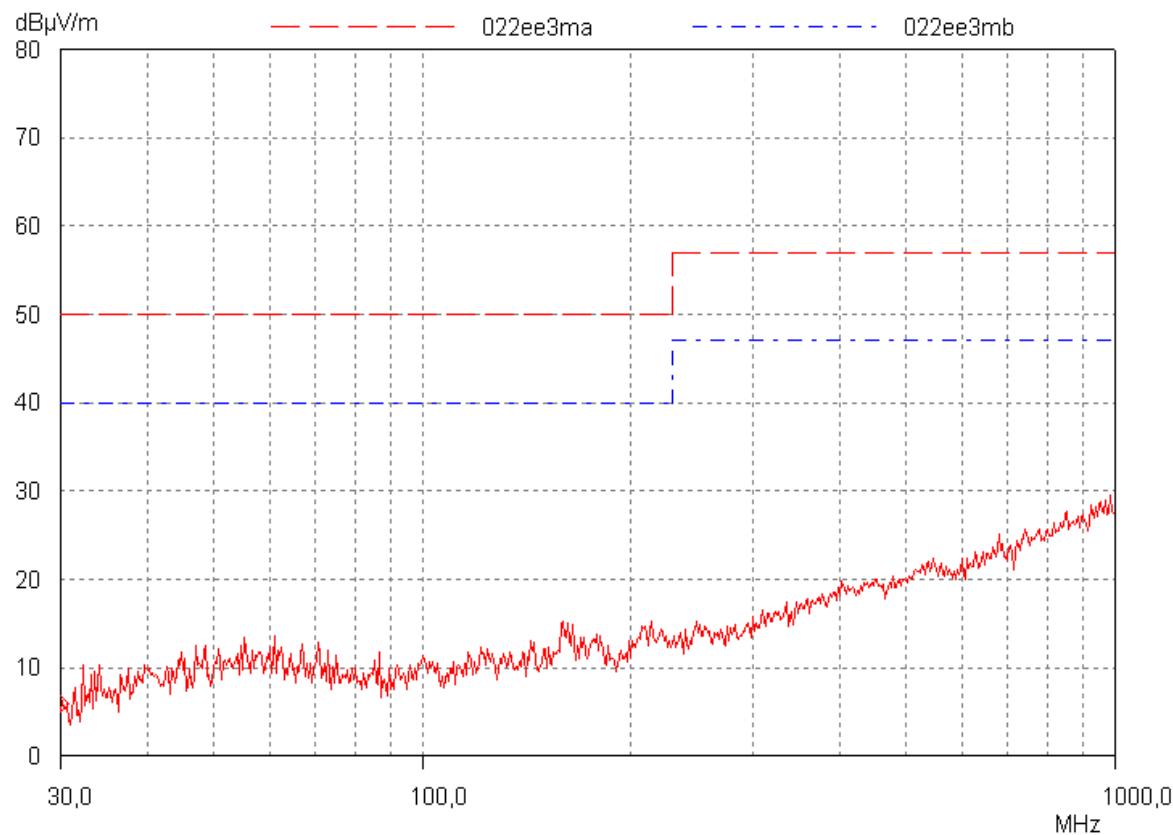


Eun-1.jpg

**5.2.1 Radiated emissions - electromagn. fields  
30 MHz - 1000 MHz Horizontal**

eeID: 1774

EUT:	Relais-Extension Relais-Extension	Kind of test:	Emission
		Generic standard:	EN 55011:1998 + A1:1999 + A2:2002
Operation mode:	cyclic switch of the relais		
Port:	Enclosure		
Date of test:	11/04/2004		
Tested by:	RH		
Prescan:	Done		
Final test:	Done		
Test site (final):	Fully Anechoic Chamber	EUT modified:	No
Antenna distance:	3 m	Result:	<b>Passed</b>
Limit class:	B		
Remarks:			

**QUASI-PEAK Detection**

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
Biconilog Antenna	3142	EMCO	9705-1153	282	
Spectrum Analyzer	HP 8566B	HP	2311A02223	32	

**ad 5.2.1 Radiated emissions - electromagn. fields****30 MHz - 1000 MHz Horizontal****- Continuation -**

eeID: 1774

EUT:	Relais-Extension Relais-Extension		
Operation mode:	cyclic switch of the relais		

**QUASI-PEAK Detection**

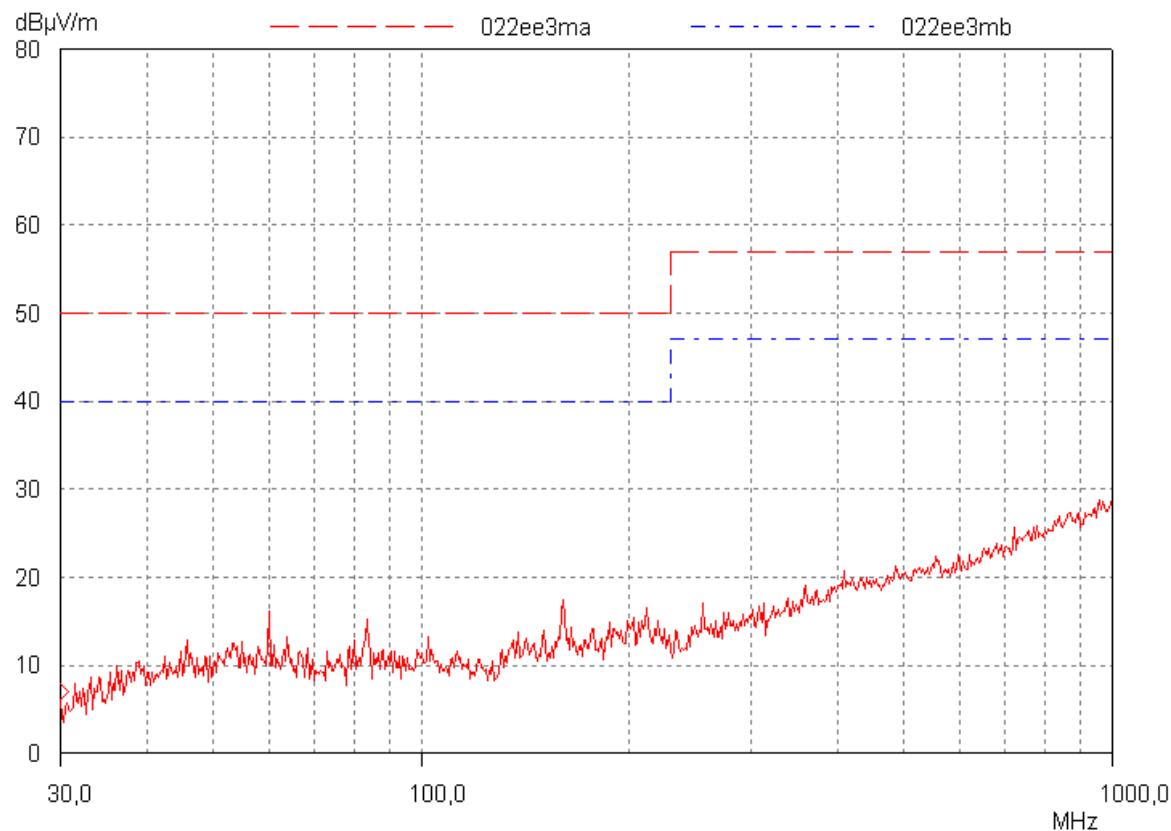
Frequency MHz	Field Strength Level at 3 m dB $\mu$ V/m	Limit (B) dB $\mu$ V/m	DELTA dB	Remarks
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No results.

**5.2.2 Radiated emissions - electromagn. fields  
30 MHz - 1000 MHz Vertical**

eID: 1775

EUT:	Relais-Extension Relais-Extension	Kind of test:	Emission
		Generic standard:	EN 55011:1998 + A1:1999 + A2:2002
Operation mode:	cyclic switch of the relais		
Port:	Enclosure		
Date of test:	11/04/2004		
Tested by:	RH		
Prescan:	Done		
Final test:	Done		
Test site (final):	Fully Anechoic Chamber	EUT modified:	No
Antenna distance:	3 m	Result:	<b>Passed</b>
Limit class:	B		
Remarks:			

**QUASI-PEAK Detection**

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
Biconilog Antenna	3142	EMCO	9705-1153	282	
Spectrum Analyzer	HP 8566B	HP	2311A02223	32	

**ad 5.2.2 Radiated emissions - electromagn. fields****30 MHz - 1000 MHz Vertical****- Continuation -**

eeID: 1775

EUT:	Relais-Extension Relais-Extension		
Operation mode:	cyclic switch of the relais		

**QUASI-PEAK Detection**

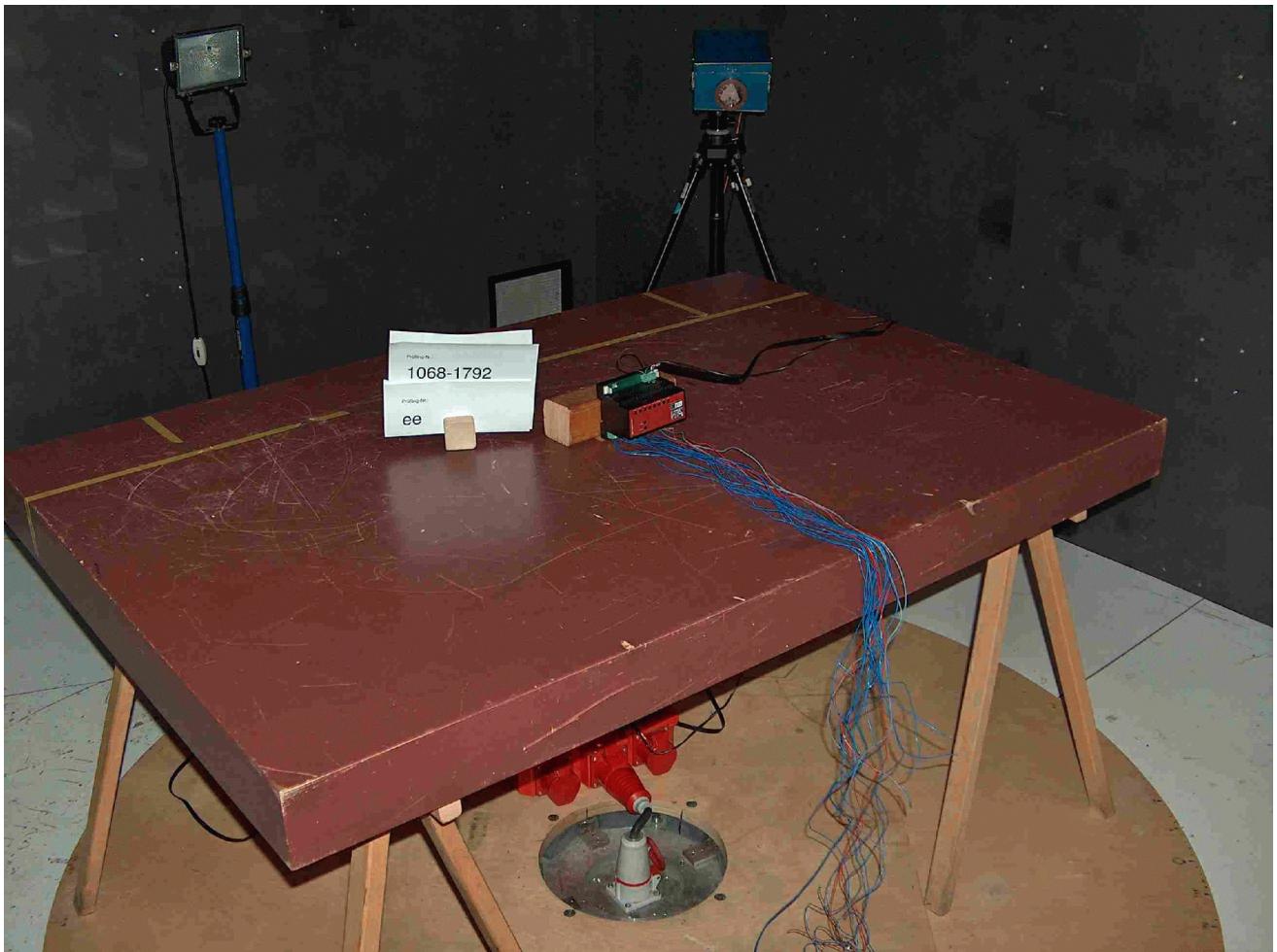
Frequency MHz	Field Strength Level at 3 m dB $\mu$ V/m	Limit (B) dB $\mu$ V/m	DELTA dB	Remarks
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No results.

**ad 5.2.2 Radiated emissions - electromagn. fields  
30 MHz - 1000 MHz**

eeID: 1775

EUT:	Relais-Extension		
	Relais-Extension		

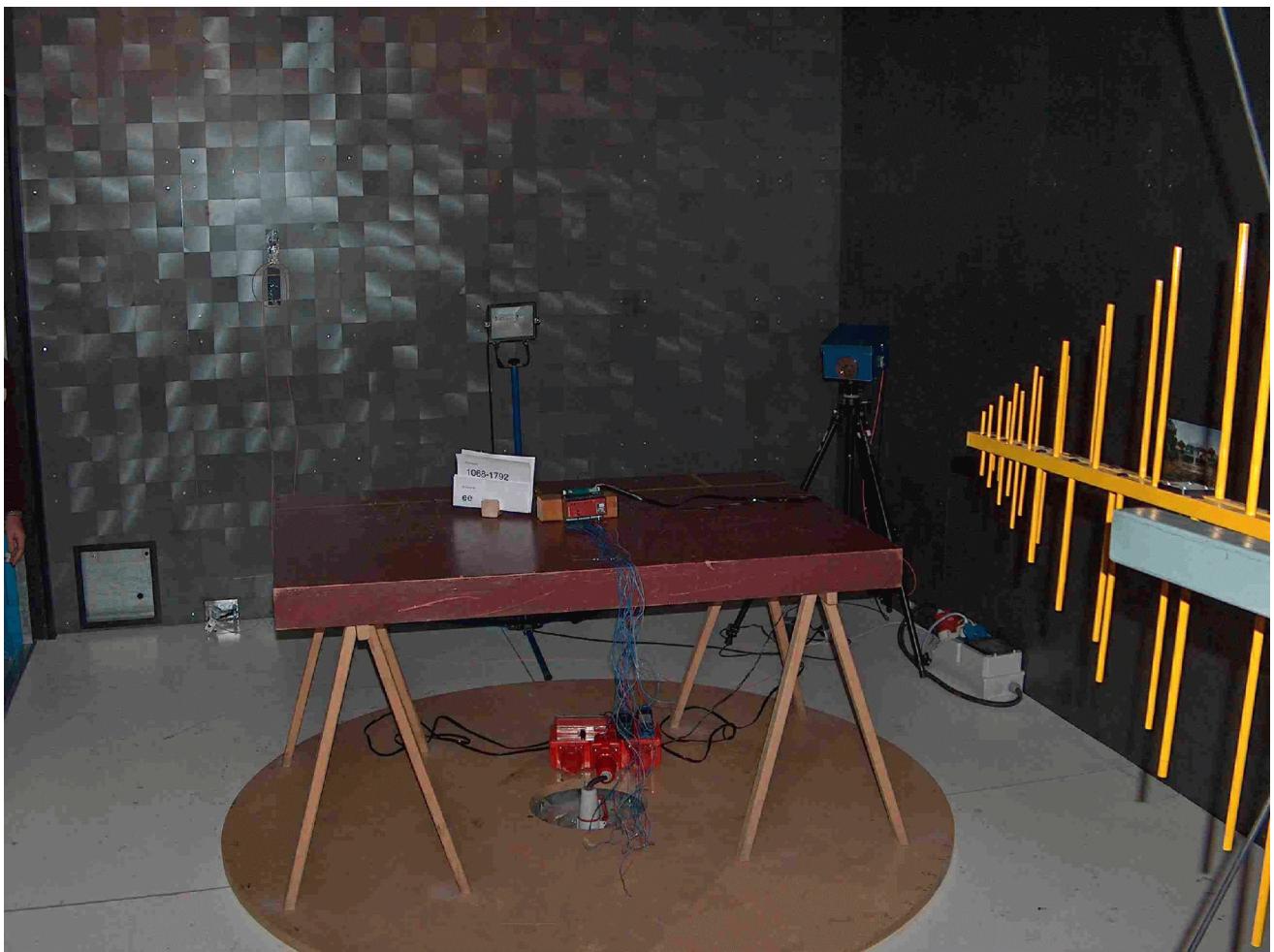


Ee-1.jpg

**ad 5.2.2 Radiated emissions - electromagn. fields  
30 MHz - 1000 MHz**

eeID: 1775

EUT:	Relais-Extension Relais-Extension		



Ee-2.jpg

### 5.3. Electrostatic discharge (ESD)

idID: 994

EUT:	Relais-Extension Relais-Extension	Kind of test: Basic standard:	Immunity EN 61000-4-2:1995 + A1:1998 + A2:2001
Operation mode:	cyclic switch of the relais		
Geprüfter Port:	Enclosure		
Date of test:	11/04/2004		
Tested by:	RH	EUT modified:	No
Required performance criterion	B	Result:	Passed
Remarks:			

Kind of discharge	Kind of coupling	Done	Test points of EUT				Max. test voltage (kV)	Passed Performance criterion	Remarks
			U		VKP:	U			
Air	Direct	U	all accessible non conductive enclosure surface				8	A	
Contact	Direct	U	all accessible conductive enclosure surface				6	A	
	Indirect	U	HKP:	U		VKP:	U	6	A

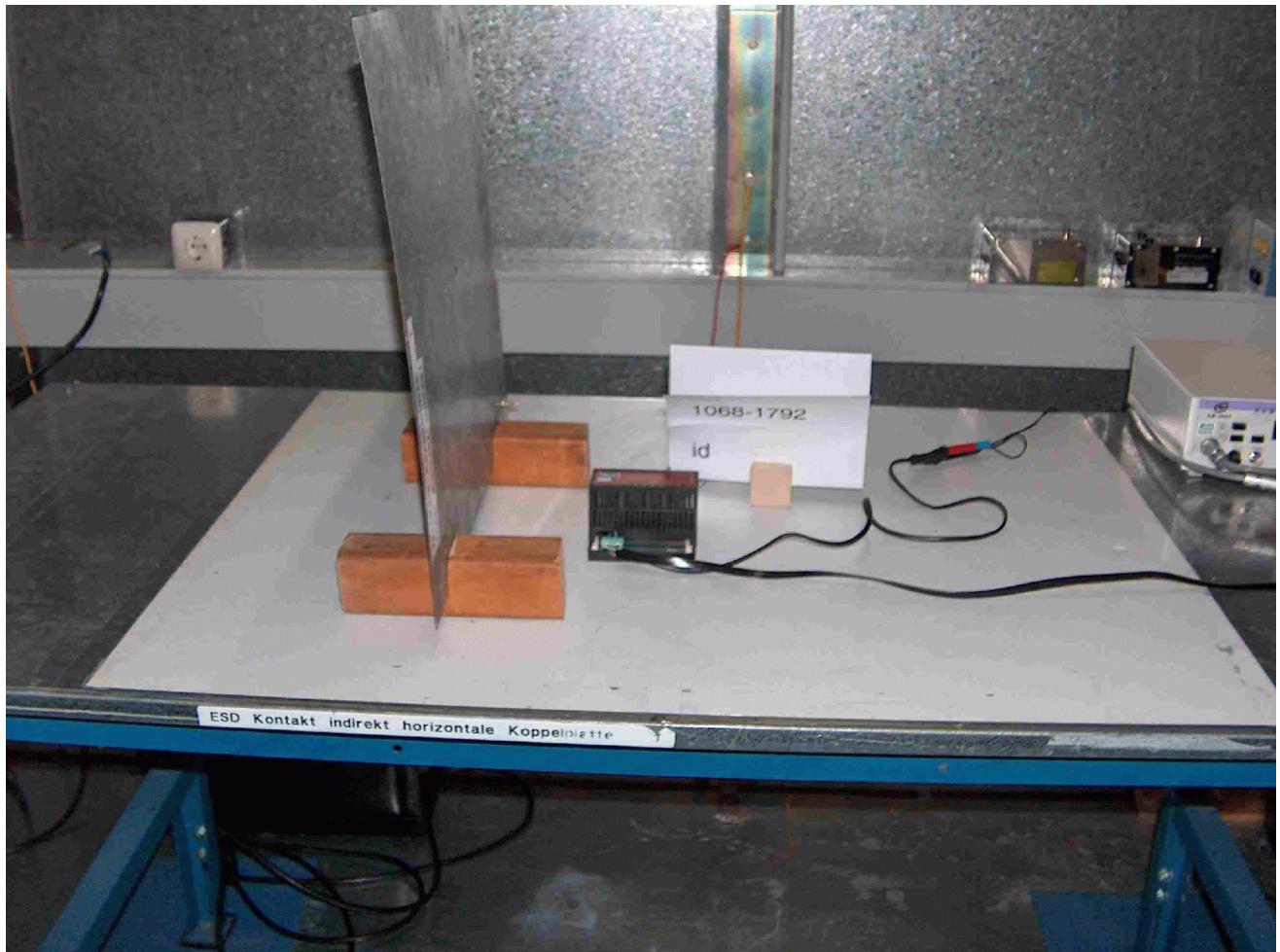
Notes:  
 HKP = Horizontal coupling plate  
 VKP = Vertical coupling plate  
 All tests were done at the following steps of test voltage (until max. test voltage): 2 / 3 / 4 / 6 / 8 kV.  
 At each test voltage at least 10 positive test pulses with a time interval of 1 s and 10 negative test pulses with a time interval of 1 s were carried out.

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
ESD Generator	NSG 435	Schaffner	222	182	

**ad 5.3. Electrostatic discharge (ESD)**

idID: 994

EUT:	Relais-Extension Relais-Extension		



Id-1.jpg

**5.4. Radio-frequency electromagnetic fields  
80 MHz - 1000 MHz**

ifID: 1349

EUT:	Relais-Extension Relais-Extension	Kind of test:	Immunity
		Basic standard:	EN 61000-4-3:2002-04+A1:2002-10
Operation mode:	cyclic switch of the relais		
Port:	Enclosure		
Test site:	Fully Anechoic Chamber		
Date of test:	11/04/2004		
Tested by:	RH	EUT modified:	No
Required performance criterion:	A	Result:	<b>Passed</b>
Remarks:			

Test parameters	Settings	
	Amplitude-modulated Field	Puls-modulated Field
Frequency range	80 MHz - 1000 MHz	
Frequency step	1 %	
Dwell time	1 s	
Modulation	1 kHz/AM 80%	
Test level (field strength)	10 V/m	
Polarization	horizontal + vertical	
Distance transmitting antenna - EUT	2.40 m	
Tested sides of the EUT	EUT oriented to all three orthogonal directions	
<b>Result</b>		
Passed Performance criterion	A	
Remarks		

Test equipment used						
Name	Model	Manufacturer	S/N	INV	Remarks	
Signal Generator	SML03	R&S	100935	353		
RF Pulse Modulator	CPM9830	Schaffner	1017	216		
Power Amplifier	100W1000M1	Ampl. Res.	12812	45		
BiLog Antenna	CBL6140A	Schaffner	1118	219		

**ad 5.4. Radio-frequency electromagnetic fields  
80 MHz - 1000 MHz**

ifID: 1349

EUT:	Relais-Extension Relais-Extension		



lf-1.jpg

**ad 5.4. Radio-frequency electromagnetic fields  
80 MHz - 1000 MHz**

ifID: 1349

EUT:	Relais-Extension		
	Relais-Extension		



lf-2.jpg

**ad 5.4. Radio-frequency electromagnetic fields  
80 MHz - 1000 MHz**

ifID: 1349

EUT:	Relais-Extension		
	Relais-Extension		

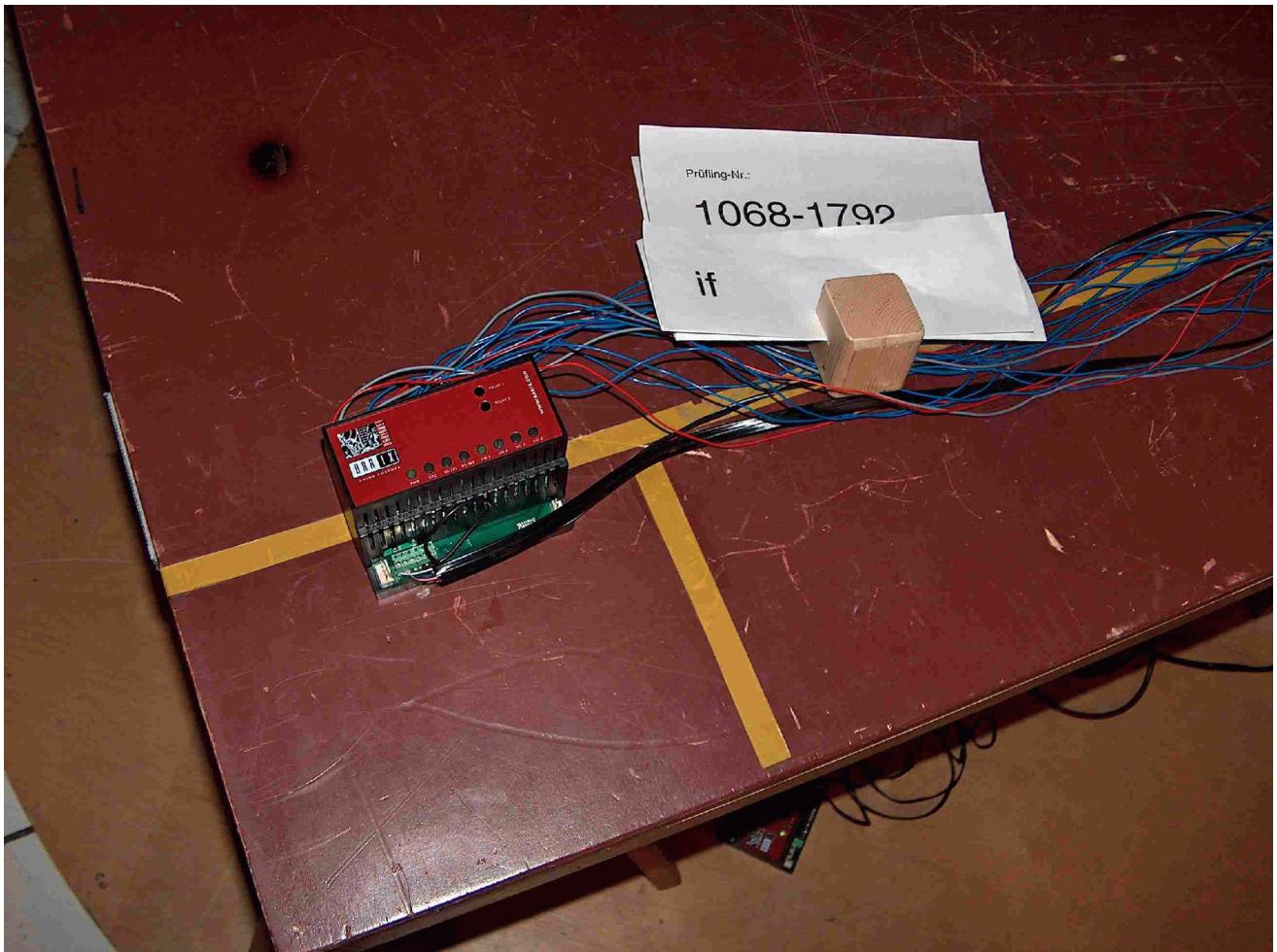


lf-3.jpg

**ad 5.4. Radio-frequency electromagnetic fields  
80 MHz - 1000 MHz**

ifID: 1349

EUT:	Relais-Extension		
	Relais-Extension		



lf-4.jpg

## 5.5. Electrical fast transients (Burst)

ibID: 1028

EUT:	Relais-Extension Relais-Extension	Kind of test:	Immunity
		Basic standard:	EN 61000-4-4:1995 + A1:2001+A2:2001
Operation mode:	cyclic switch of the relais		
Date of test:	11/04/2004		
Tested by:	Sc	EUT modified:	No
Required performance criterion:	B	Result:	Passed
Remarks:			

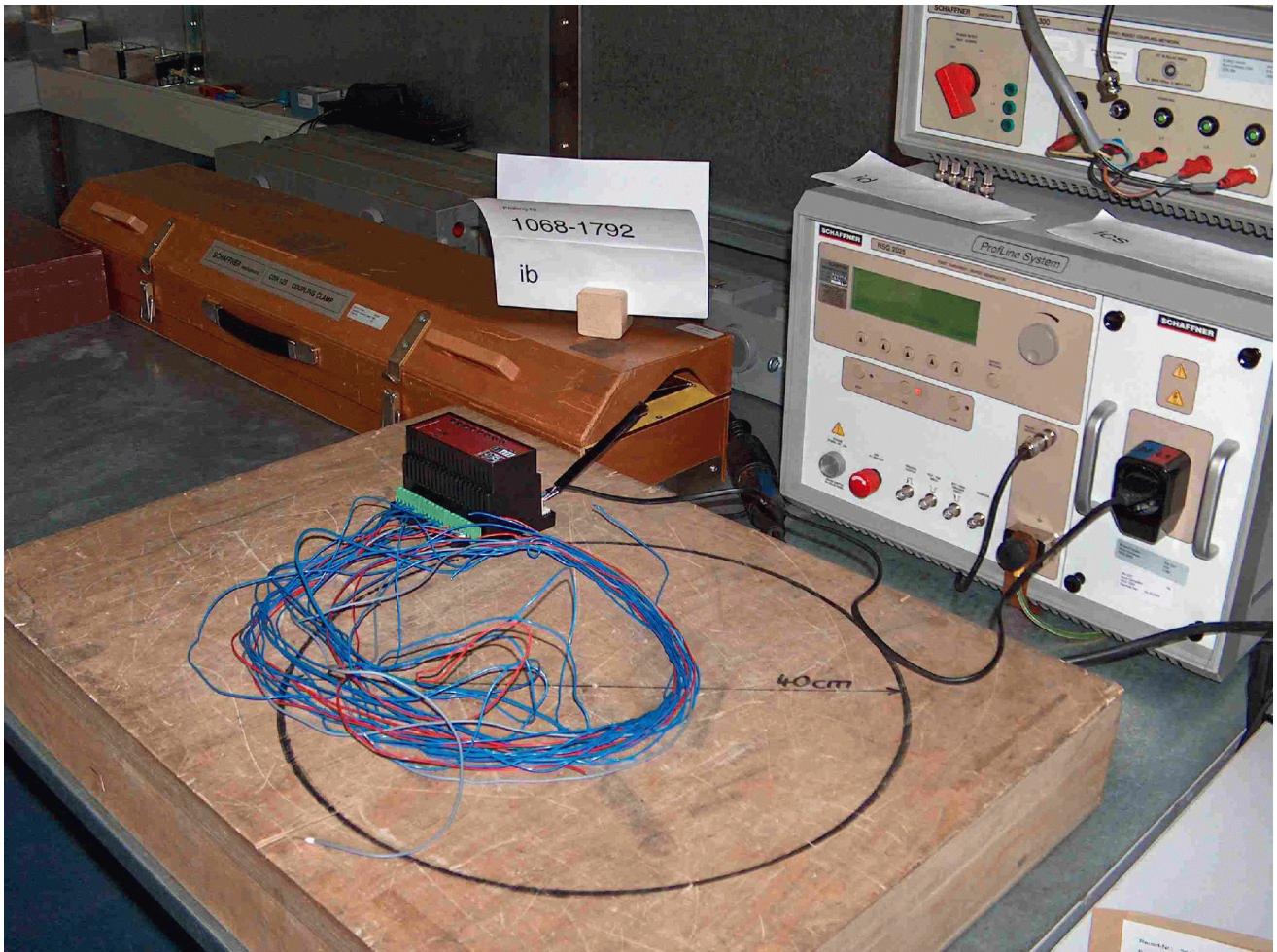
Coupling devices and Kind of coupling	Tested cables/lines	Test voltage (kV)	Passed Performance criterion	Remarks
Coupling device network (in each case unsymmetrically and asymmetrically)	24 VAC	2	B	Expiration disturbances up to 5s - Stop
Notes:				
Tested polarization: Positive + Negative (at each kind of coupling) Duration of test: 60 s at each polarity and kind of coupling Test puls: 5/50 ns; $Z_i = 50 \text{ Ohm}$ Repetition frequency: 5 kHz; at test level \$ 4 kV: 2.5 kHz				
Each cable/line was tested separately.				

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
Burst Generator	NSG 2025	Schaffner	1188	237	
Capacitive Coupling Clamp	CDN 125	Schaffner	647	239	

**ad 5.5. Electrical fast transients (Burst)**

ibID: 1028

EUT:	Relais-Extension Relais-Extension		



lb-1.jpg

<b>5.6. Surge</b>			
isID: 933			
EUT:	Relais-Extension Relais-Extension	Kind of test: Basic standard:	Immunity EN 61000-4-5:1995+ A1:2001
Operation mode:	cyclic switch of the relais		
Date of test:	11/04/2004 / 11/29/2004		
Tested by:	Sc	EUT modified:	No
Required performance criterion:	B	Result:	Passed
Remarks:			

Tested port	Lines	Kind of coupling	Coupling impedance	Max. test voltage (kV)	Passed Performance criterion	Remarks
15 VAC	L1 - N	s	18 µF	1	A	
15 VAC	L1/N - PE	u	9 µF + 10 Ohm	2	A	

## Notes:

Kind of coupling:                    s = symmetrically  
     u = unsymmetrically

Test puls:                         1.2/50µs;  $Z_i = 2 \text{ Ohm}$   
 Polarity:                         positive and negative at each test voltage  
 Number of test pulses:         6 at each test voltage  
 Time interval between pulses: 60 s  
 Tested voltage steps:           0.5 / 1 kV, if max. test voltage = 1 kV  
                                       0.5 / 1, 5 / 2 kV, if max. test voltage = 2 kV  
                                       1 / 2 / 3 / 4 kV, if max. test voltage = 4 kV  
 Tested phase angels (at AC): 90°/180°/270°

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
Surge Wave Generator	NSG 623/600	Schaffner	1212	272	

**ad 5.6. Surge**

isID: 933

EUT:	Relais-Extension Relais-Extension		



ls-1.jpg

<b>5.7. Conducted disturbances, induced by radio-frequency fields 150 kHz - 80 MHz</b>			
icsID: 964			
EUT:	Relais-Extension Relais-Extension	Kind of test: Basic standard:	Immunity EN 61000-4-6:1996 + A1:2001
Operation mode:	cyclic switch of the relais		
Date of test:	11/04/2004		
Tested by:	Sc	EUT modified:	No
Required performance criterion:	A	Result:	Passed
Remarks:			

Test parameter	Settings	
Frequency range	150 kHz - 80 MHz	
Frequency step	1 %	
Dwell time	1 s	
Modulation	1 kHz/AM 80%	
Test voltage	10 V	
Tested cables/lines	Cable/line/port of the EUT	Coupling device used
	15 VAC	CDN 801 AF2 INV 98
	RS485	CDN 725 INV 218
	Relais OUT	CDN 725 INV 218
Result		
Passed Performance criterion	A	
Remarks	RS485: 10 MHz: with approx. t = 3s	

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
RF Generator	NSG 2070-1	Schaffner	135	222	
Coupling Network	CDN 801 AF2	E. Fiedler		98	
EM Injection Clamp	CDN 725	Schaffner	133	218	
EM Injection Clamp	CDN 725	Schaffner	133	218	

**ad 5.7. Conducted disturbances, induced by radio-frequency fields  
150 kHz - 80 MHz**

icsID: 964

EUT:	Relais-Extension Relais-Extension		

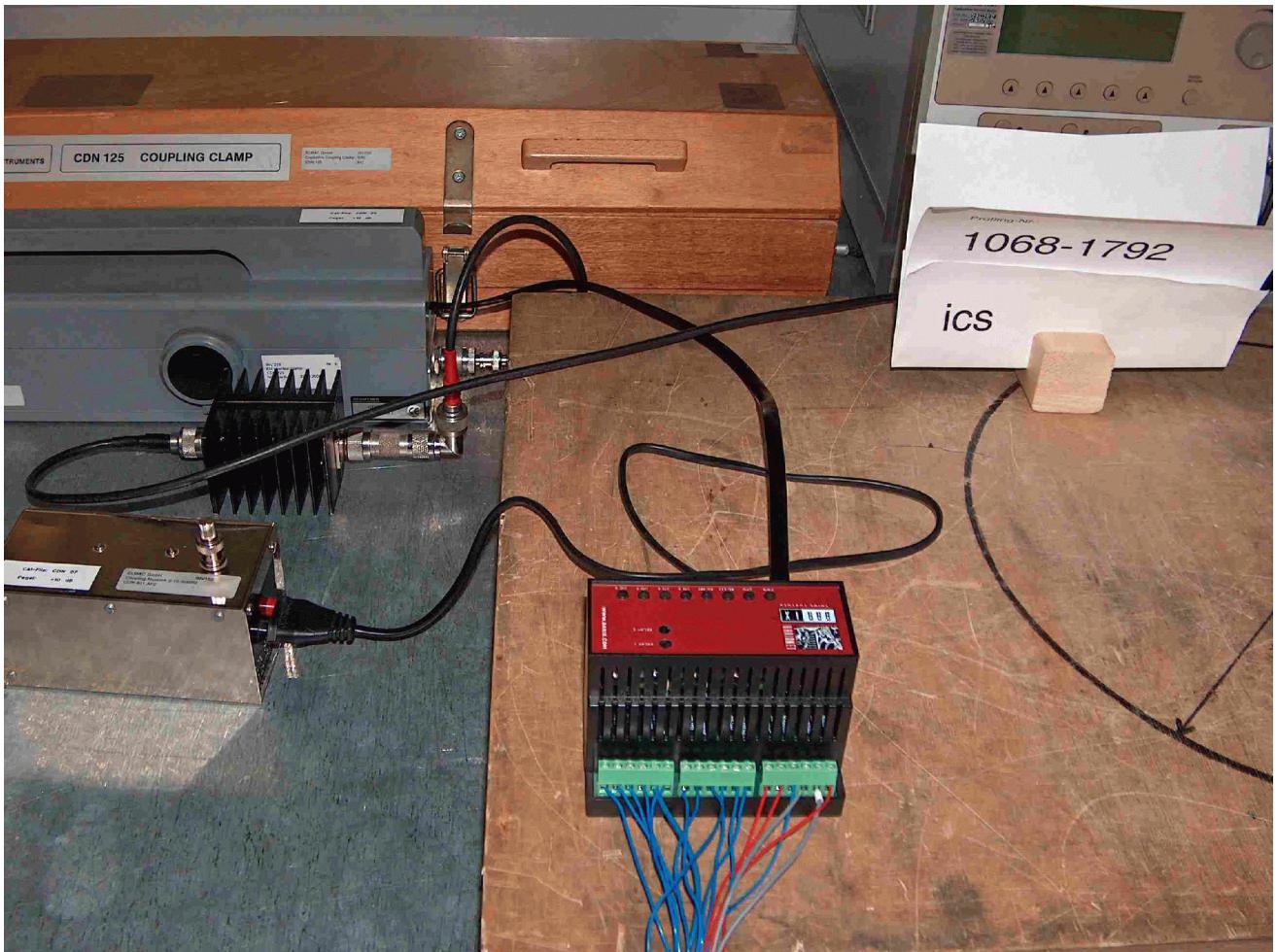


lcs-1.jpg

**ad 5.7. Conducted disturbances, induced by radio-frequency fields  
150 kHz - 80 MHz**

icsID: 964

EUT:	Relais-Extension		
	Relais-Extension		

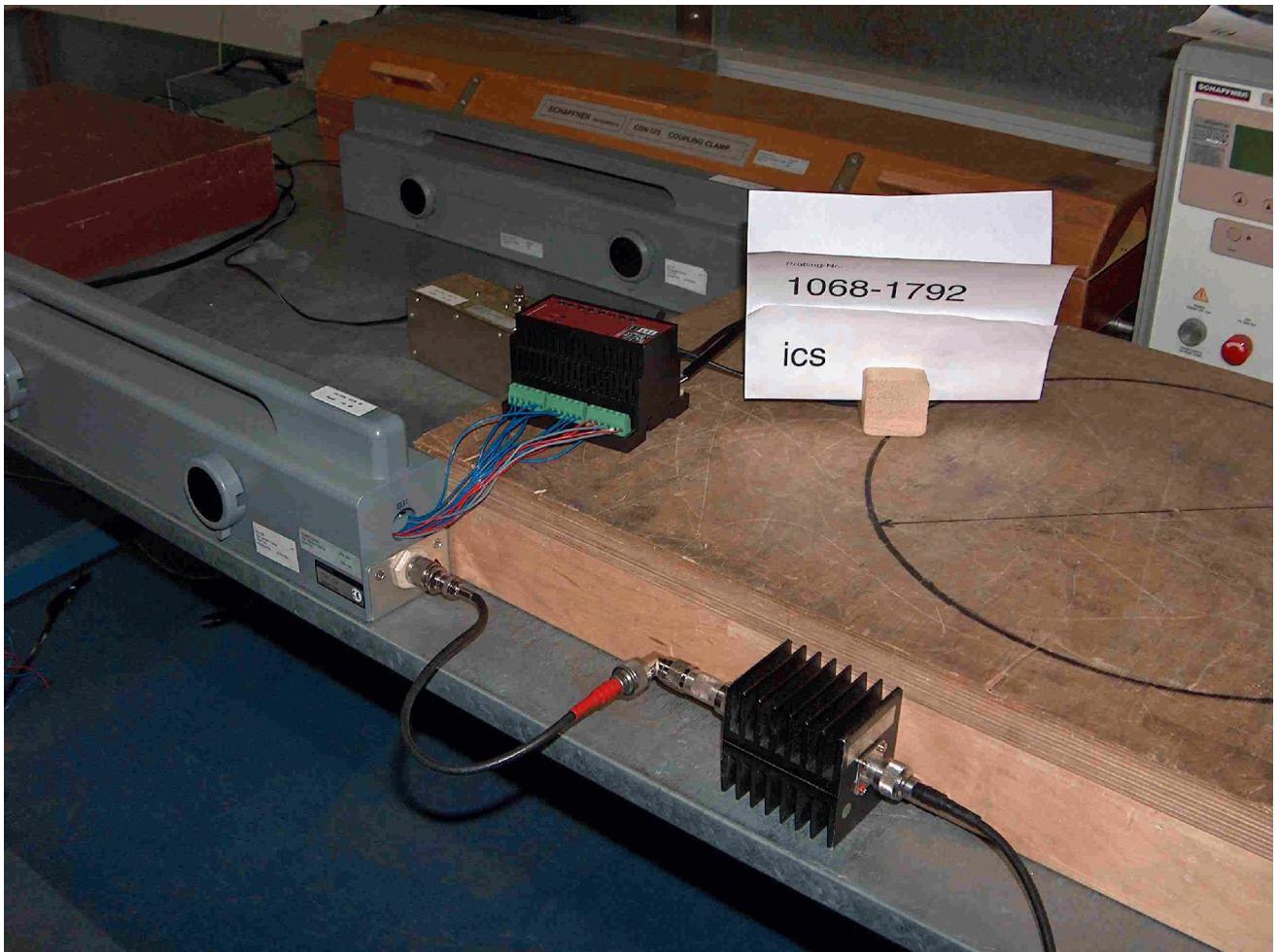


lcs-2.jpg

**ad 5.7. Conducted disturbances, induced by radio-frequency fields  
150 kHz - 80 MHz**

icsID: 964

EUT:	Relais-Extension Relais-Extension		



lcs-3.jpg

## 5.8. Voltage dips and short interruptions and change of the supply voltage

iuuID: 868

EUT:	Relais-Extension Relais-Extension	Kind of test:	Immunity
		Basic standard:	EN 61000-4-11:1994-08 + A1:2001-02
Operation mode:	cyclic switch of the relais		
Port:	AC-mains		
Reference voltage:	$U_{Ref} = 15 \text{ V}$		
Date of test:	11/04/2004		
Tested by:	Sc	EUT modified:	No
		Result:	Passed
Remarks:			

Severity level (Voltage at EUT)	Test level	Duration	Performance criteria		Remarks
% $U_{Ref}$	% $U_{Ref}$	s	Required	Passed	
70	30	0,5	B	A	
70	30	0,01	C	A	
40	60	0,1	C	A	
40	60	1	C	A	
0	0	0,02	B	A	
0	0	0,06	C	C	
0	0	0,5	C	A	
0	0	5	C	C	
20 -> 100 % with 40% / s			B	B	
100 -> 20 % with 40% / s			B	B	

Further parameters:

Number of dips/interruptions at each severity level: 10  
 Time interval between two test events: 10 s

Test equipment used					
Name	Model	Manufacturer	S/N	INV	Remarks
Line Dropout/Var. Simulator	NSG 603A/600	Schaffner	2919106	273	
Motorgenerator	NSG 642	Schaffner	100	274	