SIEMENS

Prüf-Nr./Q-Nr.: *Certificate No.:* **2768 b**

Dienststelle: *Department:* **I IA CE CP R&D-VI 4 / Drutschmann**

Ort: *Place:* **Amberg** Tag: *Date:* **2013-06-11**

Anlagen: *Enclosures:* **Test Summary no.: 2768 b**

Prüfbescheinigung / *Test – Certificate*

Erzeugnis / *Product:* **Solid-State Relay, Solid-State Contactor**

Typ: *Type:* **3RF20, 3RF21, 3RF22, 3RF23, 3RF24, 3RF29**

Tech. Daten: *Specification:* **U_e / U_i = 600 V**
$I_{e\ (AC51)}$ = 7,5 - 88 A

Hersteller: *Manufacturer:* **Siemens AG I IA CE**

Art der Prüfung / *Type of test:* **Type Test**

Prüfer / *Tested by:* **I IA CE CP R&D-VI 2 / Mr. Zimmerer**

Labor / *Laboratory:* **LOVAG registered and DAkkS accredited Testing Laboratory Siemens AG, Amberg**

Angewandte Prüfbestimmungen / *Test specifications applied:*
IEC 60947-4-3, Edition 1.2: 2011-07
IEC 60947-5-1, Edition 3.1: 2009-07

Durchgeführte Prüfungen / *Tests conducted:*
According to IEC 60947-4-3: Test Sequences I, II, III, IV, EMC Emission, EMC Immunity
According to IEC 60947-5-1: Test Sequences II, III, IV

Prüfergebnis / *Test results:*
All requirements of the test specification are met.

Bemerkungen / *Remarks:* **Issued: 2006-05-12**
Index a, dated 2009-07-01: Standards updated; EMC test report added.
Index b, dated 2013-06-11: Standards updated
Covers all solid-state switching devices for resistive loads type 3RF2 and accessories type 3RF29.

Unterschrift / *Signature*

Gegengezeichnet / *Released by:*

i.V. Schweiger
I IA CE CP R&D-VI Mr. Schweiger

i.V.
I IA CE CP R&D-EN Mr. Knauer

SIEMENS AG **Industry Sector**

S. Russwurm (Head)

SIEMENS

LOVAG

DAkkS Deutsche Akkreditierungsstelle D-PL-11055-04-01

Certificate no.: 2768b

Test summary

Manufacturer: ***Siemens AG I IA CE Amberg***
Werner-von-Siemens-Str. 48, 92220 Amberg

Test device: ***Solid state relay and contactors***

Type: ***3RF2..***

Test specification: ***IEC 60947-4-3 (2011-07), IEC 60947-1 (2011-03),***
IEC 60947-5-1 (2009-07)

Test report No.: ***03045TE +03074TEI + 03076TEI +03091TEI + 05115TEI + 08021TEI***
+ 12045ENI01 + 13030ENI01
A&D ATS 6 / 03-M235a + 06-M0602199-A1 + 09-E003873-BM-A01

Test report No.: 03045TE

Test-sequence and sub-clause	**Test**	**Tested Device**
IEC 60947-4-3 Test-sequence I 9.3.3.3 9.3.3.4	 Verification of temperature-rise Verification of dielectric properties	3RF2310-1AA24 3RF2320-2AA24 3RF2330-1AA26 3RF2340-1AA24 3RF2350-1AA26 3RF2370-3AA06 3RF2390-3AA06 3RF2340-1AA14 3RF2340-1AA34 3RF2120-1AA24 3RF2130-1AA04 3RF2150-1AA04 3RF2170-3AA04 3RF2190-3AA06
Test-sequence II 9.3.3.6.1. 9.3.3.6.2. 9.3.3.6.3.	 Verification of thermal stability Verification of overload capability Verification of blocking and commutating, including verification of operating and operating limits	3RF2310-1AA24 3RF2320-1AA24 3RF2330-1AA26 3RF2340-1AA24 3RF2350-1AA26 3RF2370-3AA26 3RF2390-3AA06 3RF2120-1AA24 3RF2130-1AA04 3RF2150-1AA04 3RF2170-3AA06 3RF2190-3AA06

Test-sequence III 9.3.4	Performance under short-circuit conditions	3RF2310-1AA04 3RF2320-1AA26 3RF2330-1AA04 3RF2340-1AA26 3RF2350-1AA26 3RF2370-3AA06 3RF2120-1AA04 3RF2130-1AA04 3RF2150-3AA06 3RF2170-3AA06
Test-sequence IV IEC 60 947-1 8.2.4	Mechanical properties of terminals	3RF2310-1AA26 3RF2320-2AA24 3RF2330-1AA26 3RF2340-1AA26 3RF2350-1AA26 3RF2370-1BA06 3RF2390-3AA06 3RF2120-1AA04 3RF2120-2AA24 3RF2190-2AA06 3RF2190-2AA04
IEC 60947-4-3 EMC Emission test 9.3.5.1.1 9.3.5.1.2	See Test report no.: A&D ATS 6 / 03-M235 EMC-Laboratory Erlangen Conducted radiofrequency emission test Radiated radio-frequency emission test	3RF2310-1AA02 3RF2330-1BA14 3RF2370-3AA22 3RF2030-1AA02 3RF2070-1AA24 3RF2330-1AA42 3RF2320-1CA02 3RF2320-1CA14 3RF2900-0EA18 3RF2920-0FA08 3RF2920-0GA36 3RF2920-0HA13
EMC Immunity test 9.3.5.2.1 9.3.5.2.2 9.3.5.2.3 9.3.5.2.4	See Test report no.: A&D ATS 6 / 03-M235 EMC-Laboratory Erlangen Electrostatic discharge Radiofrequency electromagnetic field Fast transient (5/50 ns) Surge (1,2/50µs – 8/20µs)	see EMC Emission test
IEC 60947-5-1 Test-sequence II 8.3.3.5.2 8.3.3.5.5.b	 Making and breaking capacities of switching elements under normal conditions Dielectric properties	 3RF2310-1BA06 3RF2310-1BA04 3RF2320-1BA06 3RF2340-1BA06 3RF2340-1BA04 3RF2370-1BA06 3RF2390-1BA06

Test-sequence III 8.3.3.5.3 8.3.3.5.5.b	Making and breaking capacities of switching elements under abnormal conditions Dielectric properties	3RF2310-1BA06 3RF2310-1BA04 3RF2320-1BA06 3RF2340-1BA06 3RF2340-1BA04 3RF2370-1BA06 3RF2390-1BA06

Test report No.: 03074TEI

Test-sequence and sub-clause	**Test**	**Tested Device**
IEC 60947-4-3 Test-sequence I 9.3.3.3 9.3.3.4	 Verification of temperature-rise Verification of dielectric properties	 3RF2900-0EA18 tested with 3RF2340-1BA06 3RF2920-0FA08 tested with 3RF2320-1BA06

Test report No.: 03076TEI

Test-sequence and sub-clause	**Test**	**Tested Device**
IEC 60947-4-3 Test-sequence I 9.3.3.3 9.3.3.4	 Verification of temperature-rise Verification of dielectric properties	 3RF2050-1AA04
Test-sequence III 9.3.4	Performance under short-circuit conditions	3RF2020-1AA24 3RF2030-1AA04 3RF2050-1AA04
IEC 60 947-1 Test-sequence IV 8.2.4	 Mechanical properties of terminal	 3RF2050-1AA04

Test report No.: 03091TEI

Test-sequence and sub-clause	**Test**	**Tested Device**
IEC 60947-4-3 Test-sequence I 9.3.3.3 9.3.3.4	 Verification of temperature-rise Verification of dielectric properties	 3RF2950-0GA36 tested with 3RF2350-1AA26 3RF2950-0HA16 tested with 3RF2350-1BA04
EMC Emission test 9.3.5.1.1 9.3.5.1.2	See Test report no.: 03045TE Conducted radiofrequency emission test Radiated radiofrequency emission test	 3RF2920-0GA36 3RF2920-0HA13
EMC Immunity test 9.3.5.2.1 9.3.5.2.2 9.3.5.2.3 9.3.5.2.4	See Test report no.: 03045TE Electrostatic discharge Radiofrequency electromagnetic field Fast transients (5/50 ns) Surges (1,2/50 µs – 8/20 µs)	 3RF2920-0GA36 3RF2920-0HA13
IEC 60947-5-1 Test-sequence II 8.3.3.5.2 8.3.3.5.5 b)	 Making and breaking capacities of switching elements under normal conditions Dielectric properties	 3RF2990-0GA13 3RF2990-0GA36
Test-sequence IV 8.3.4 8.3.3.5.5 b)	 Performance under conditional short circuit current Dielectric properties	 3RF2990-0GA33

IEC 60947-4-3		Test sequence			
Test sample	**Rating**	**I**	**II**	**III**	**IV**
3RF2230-1AB45 3RF2255-3AB45 3RF2230-1AC45 3RF2255-3AC45 3RF2410-1AB05 3RF2420-2AB45 3RF2430-1AB35 3RF2440-1AB45 3RF2450-3AB55 3RF2410-1AC05 3RF2420-1AC15 3RF2430-1AC35 3RF2440-1AC45 3RF2450-1AC45	I_{th} = 30 A I_{th} = 55 A I_{th} = 30 A I_{th} = 55 A I_{th} = 7 A I_{th} = 15 A I_{th} = 22 A I_{th} = 30 A I_{th} = 38 A I_{th} = 7 A I_{th} = 15 A I_{th} = 22 A I_{th} = 30 A I_{th} = 38 A Ui=600V Uimp=6kV	**X**			
3RF2230-1AB45 3RF2255-3AB45 3RF2230-1AC45 3RF2255-3AC45 3RF2410-1AB45 3RF2420-1AB45 3RF2430-1AB55 3RF2440-3AB45 3RF2450-3AB55 3RF2410-2AC45 3RF2420-1AC45 3RF2430-1AC55 3RF2440-1AC45 3RF2450-1AC55	X=1,1; Tx=60; F=50; S=30; X = 1,5 / 1,9; Tx = 300 / 10; F = 50 S = 6 / 180		**X**		
3RF2230-1AB45 3RF2410-1AB45 3RF2420-1AB45 3RF2430-1AB45 3RF2450-1AB45	Coordination type 1: Iq=50kA Utest=550V Cylindrical fuse: gL/gG 3NW6210-1; 25A 3NW6210-1; 25A 3NW6217-1; 40A 3NW6117-1; 40A 3NW6117-1; 40A			**X**	

IEC 60947-4-3		Test sequence			
Test sample	**Rating**	**I**	**II**	**III**	**IV**
3RF2410-1AC45 3RF2420-1AC45 3RF2430-1AC45 3RF2450-1AC45	3NW6210-1; 25A 3NW6217-1; 40A 3NW6117-1; 40A 3NW6117-1; 40A			**X**	
3RF2230-1AB45 3RF2410-1AB45 3RF2420-1AB45 3RF2430-1AB45 3RF2450-1AB45 3RF2410-1AC45 3RF2420-1AC45 3RF2430-1AC45 3RF2440-1AC45	Coordination type 1: Iq=50kA Utest=660V LV HRC fuse: gL/gG 3NA6810-6; 25A 3NA6810-6; 25A 3NA6817-6; 40A 3NA6817-6; 40A 3NA6817-6; 40A 3NA6810-6; 25A 3NA6817-6; 40A 3NA6817-6; 40A 3NA6817-6; 40A			**X**	
3RF2230-1AC45 3RF2410-2AC45 3RF2230-2AC45	IP 20				**X**

Remark to the test sequence III: 9.3.4 Performance under short-circuit conditions

The device 20 A, two phase and three phase controlled contactor (3RF2420-1AB/C..) is identical with 55 A, two phase and three phase controlled relay (3RF2255-1AB/C..), therefore only 3RF2420-1AB/C.. was tested.

The device 10 A, three phase controlled contactor (3RF2410-1AC..) is identical with 30 A, three phase controlled relay (3RF2230-1AC..), therefore only 3RF2410-1AC.. was tested.

The device 40 A, two phase and three phase controlled contactor (3RF2440-1AB/C..) is identical with 50 A, two phase and three phase controlled contactor (3RF2450-1AB/C..), therefore one time 3RF2450-1AB45 was tested, other time 3RF2440-1AC45 was tested.

Test report No.: 08021TEI

Test-sequence and sub-clause	Test	Tested Device
IEC 60 947-4-3 Test-sequence I 9.3.3.3 9.3.3.4	 Verification of temperature-rise Verification of dielectric properties	 3RF2340-1DA04-0KNO
Test-sequence II 9.3.3.6.1. 9.3.3.6.2. 9.3.3.6.3.	 Verification of thermal stability Verification of overload capability Verification of blocking and commutating, including verification of operating and operating limits	 3RF2340-1DA04-0KNO

Test report No.: 12045ENI01

Test sequence I			
Sample No.	**Test sample**	**Date code**	**Rating**
12045EN001	3RF2330-2DA64	G/120420	I_{th}= 22A, Us=110V dc Ui=600V, Uimp=6kV
Test sequence II			
12045EN002	3RF2320-1AA65	G/120420	X = 1,7 Tx = 10; F = 50; S = 180

Test report No.: 13030ENI01

Sample No.	Test sample	Date code	Rating
13030EN001 up to 13030EN006	3RF2420-2AB45*	G/130219, E01	Electrical terminal test, main circuit
13030EN010 up to 13030EN025	3RF2420-2AB45*	G/130219, E01	Electrical terminal test, control circuit

***The Tests carried out with 3RF2420-2AB45 are representative for the whole series, because of identical terminals.**

The tests were carried out on devices, representative for the whole series, fixed on page 9 and 13.
The tests were carried out in the ***Type Test Center Siemens AG I IA CE Amberg***
Werner-von-Siemens-Str. 48, 92220 Amberg
Accredited-No.: ***D-PL-11055-04-01***

The EMC-Tests were carried out in the accredited laboratory of
Siemens AG, EMV-Zentrum Erlangen
Günther-Scharowsky-Str. 21, 91058 Erlangen
Accredited-No.: ***D-PL-11055-13-01***

Nomenclature Breakdown

Series: 3RF2

3RF2	1	20	-	1	A	A	0	2
I	**II**	**III**		**IV**	**V**	**VI**	**VII**	**VIII**

I Basic unit designation:
solid state relay and contactors

II Kind of device:

0 - SSR Solid State Relay single phase 45 mm
1 - SSR Solid State Relay single phase 22,5 mm
2 - SSR Solid State Relay three phase
3 - SSC Solid State Contactor single phase
4 - SSC Solid State Contactor three phase

III Size SSR

20 - 20 A
30 - 30 A
50 - 50 A
55 - 55 A
70 - 70 A
90 - 90 A

III Size SSC

10 - 10 A
20 - 20 A
30 - 30 A
40 - 40 A
50 - 50 A
70 - 70 A
90 - 90 A

IV Type of terminals:

1 - main terminal screw, aux terminal screw
2 - main terminal cage clamp, aux terminal cage clamp
3 - main terminal ring lug, aux terminal screw
4 - main terminal screw, aux terminal cage clamp

V Special function:

A - zero point switching
B - instantaneous switch
C - low noise, zero point switching
D - zero point switching, high inrush

Continuation: Nomenclature breakdown

VI Number of the controlled phases:

A	-	not use
B	-	two-phase controlled
C	-	three phase controlled

VII Rated control supply voltage, Uc:

0	-	DC 24 V
1	-	UC 24 V
2	-	AC 110…230 V
3	-	AC 110 V
4	-	TTL 4…30 V
5	-	AC 230 V
6	-	DC 110 V

VIII Rated voltage, Ue:

2	-	24…230 V
4	-	48…460 V
5	-	48…600 V (1200 V reverse voltage)
6	-	48…600 V (1600 V reverse voltage)

3RF2340-1DA04-0KN0:

Special version of solid state contactor with Ie = 36A, control circuit with Ith < 10mA at the rated control voltage.

Continuation: Nomenclature breakdown

Series: 3RF29

3RF2	9	00	-	0	E	A	1	8
I	**II**	**III**		**IV**	**V**	**VI**	**VII**	**VIII**

I Basic unit designation:
solid state relay and contactors

II Kind of device:

9 - Accessories/option modules

III Size SSR, SSC

00 - All
04 - 4 A
06 - 6 A
16 - 16 A
20 - 20 A
32 - 32 A
50 - 50 A
90 - 90 A

IV Type of terminals:

0 - no main terminals, for option moduls

V Special function:

E - Converter
F - Load monitor Basic
G - Load monitoring
J - Load monitoring
H - Power controller / Regulator
K - Power controller / Controller

VI Number of the controlled phases:

A - not used or NO for Load monitor basic
B - NC for Load monitor basic

VII Rated control supply voltage, Uc:

0 - DC 24 V
1 - UC 24 V
3 - AC 110 V

Continuation: Nomenclature breakdown

VIII Rated Valtage, Ue:

3 - 110 – 230 V
6 - 400 – 600 V
8 - Option modules, access to main voltage

Remarks

Test report: 03045TEI

IEC 60947-4-3 seq II

9.3.3.6.3 Verification of blocking and commutating capability, including operation and operation limits.

Table 7:
Test values: 1,1*Ue= 440 V, Ie= 10 A, cos phi= 0,8

Every device was tested with the values above, representative for the whole series.

IEC 60947-5-1 seq II, III

Utilization category: AC 15

Making and breaking capacities of switching elements under normal and abnormal conditions

Tested device:	Ie (AC15)	Ue	Devices covered by the tested devices (same semiconductor)
3RF2310-1BA06	6 A	600 V	
3RF2310-1BA04	6 A	400 V	3RF2310-.BA.2 Ue = 230 V
3RF2320-1BA06	15 A	600 V	3RF2320-.BA.. Ie (AC15) =12 A, every rated voltage
			3RF2330-.BA.. Ie (AC15)=15 A, every rated voltage
3RF2340-1BA06	25 A	600 V	3RF2340-.BA.. Ie (AC15) =20 A, every rated voltage
			3RF2350-.BA.. Ie (AC15) =25 A, every rated voltage
3RF2340-1BA04	20 A	400 V	3RF2340-.BA.2 Ie (AC15)=20 A, Ue 230 V
3RF2370-1BA06	27,5 A	600 V	3RF2370-.BA.. Ie (AC15) =27,5A, every rated voltage
3RF2390-1BA06	30 A	600 V	3RF2390-.BA.. Ie (AC15) =300 A, every rated voltage

Test report: 03074TEI
Tests for accessory converter and load monitoring.

Test report: 03091TEI
Tests for accessory (45mm) load monitoring and power controller.

Test report: 03076TEI
The solid state relay 3RF20.. is constructed identically to 3RF21.. and 3RF23.
For Test sequence II (IEC 60947-4-3) and IV (IEC 60947-1) see test report no.: 03045TE

Test sequence II
9.3.3.6.1 Verification of thermal stability

9.3.3.6.2 Verification of overload capability

9.3.3.6.3 Verification of blocking and commutating capability, including operation and operation limits.

Was carried out with 3RF21.., 3RF23..

Test sequence IV
8.2.4 Mechanical properties of terminals

To test the mechanical stability, only the test of mechanical strength of terminals (8.2.4.2), was carried out.

Test report: 08021TEI

Test of special version of solid state contactor. Therefore only sequence I and II is conducted. For other test sequences see Test report 03045TEI.

Test report No.: 12045ENI01

Additional tests were made for new control supply voltage 110V DC.

Test report No.: 13030ENI01

Electrical terminal test for screwless type clamping units was conducted.

Amberg, 2013-05-24
Location, Date

Signature
(Authorized representative)
Mr. Stadlbauer

Reviewed
(Laboratory manager)
Mr. Bogner